TECHNICAL MEMORANDUM

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TO:	Michael Jaworski – Phelps Dodge Tyrone, Inc.	**DATE:**	May 11, 2007
FROM:	Thomas Wythes, P.E., R.G., and Eugene Muller, P.E. – Golder Associates Inc.	**OUR REF.:**	053-2550
RE:	**TYRONE RECLAMATION** **STABILITY OF INTERIOR AND IN-PIT STOCKPILES, DP-1341, CONDITION 78**		

1.0 INTRODUCTION

Golder Associates Inc. (Golder) is performing slope stability studies of waste rock and leached ore stockpiles at Phelps Dodge Tyrone, Inc.'s (PDTI) Tyrone Mine to address the supplemental stability analysis requirements of Condition 78 of the New Mexico Environment Department's Discharge Permit (DP)-1341. Stability evaluations were completed previously for exterior stockpile slopes (Golder, 2006a, 2006b, 2006c, 2007) that toe-out on the outer perimeter of the mine stockpile complex. This technical memorandum documents foundation conditions and evaluates the stability of the reclaimed configurations of the interior waste rock and leached ore slopes around the periphery of the Main, Valencia, and Savannah pits in the interior mine area, and the in-pit waste stockpile. The stability analyses of the interior stockpiles are based on proposed preliminary grading plans prepared by Montgomery Watson Harza (MWH, 2006).

The final configuration of the 8C (in-pit) Waste Stockpile is based on a mitigation and grading plan prepared by PDTI based on recommendations by Call & Nicholas, Inc. (CNI, 2002). The proposed regrading plan and the stockpiles considered in this stability evaluation are shown on Figure 1 and include:

- the interior slopes of the 1B Leach Stockpile,
- the interior slopes of the 5A and 3B Waste Stockpiles,
- the 8C In-Pit Stockpile, and
- the interior slopes of the 2B, 2C, and 7B Leach Stockpiles.

Current stockpile slopes are at angle of repose and on the order of 36 degrees (approximately 1.33H:1V). Occasional step-backs result in flatter overall slopes. For reclamation, slopes will be graded to approximately 16 degrees (3.5H:1V) overall. Portions of the 8C Stockpile

slope will remain at angle of repose. The lower rock-fill toe buttress portion has a proposed slope of 28 degrees.

2.0 METHOD

2.1 Overall Approach

Golder performed stability evaluations through a two-dimensional, limit equilibrium analysis with the computer program SLIDE (Rocscience, 2000) and application of Bishop's Method of Slices (Bishop, 1955) using effective stress parameters. In assessing the level of stability, we generally consider factors of safety above 1.3 for static conditions or 1.0 for pseudostatic conditions to be suitably safe where appropriate material parameters are applied. Khandelwal and Mozumdar, (1992) state that generally, waste rock slopes designed with a (static) factor of safety of 1.10 to 1.15 have only a minor risk of failure.

The following conditions were considered in the analyses:

- base-case (expected) conditions;
- the impact of long-term weathering and decrepitation of the leached ore and waste rock and the potential resulting reduction of strength;
- the impact of weathering and decrepitation at the interface of the leached ore and waste rock stockpiles and foundation, and the potential resulting reduction of shear strength; and
- the potential for liquefaction of Quaternary alluvium (Qal) that occurs locally in the toe area.

Base-case stability analyses represent the predicted stability of the leached ore stockpiles based on measured strength properties and engineering judgment. To address future and/or unknown conditions, Golder conducted sensitivity studies to determine the material strengths required to maintain stable conditions.

2.2 Evaluation of Weathering and Decrepitation

EnviroGroup Limited (2005a and 2005b) investigated the long-term effects of weathering and decrepitation on the strength of waste rock and leached ore at PDTI as a part of the supplemental materials characterization requirements of Condition 80 of DP-1341. The EnviroGroup studies supplement previous material characterization studies by Greystone and Daniel B. Stephens & Associates, Inc., which are referenced in EnviroGroup's reports (2005a and 2005b). The results of the material characterization studies indicate that sulfide

oxidation is occurring in the stockpiles, but at generally low rates due to the low sulfide concentrations. There is a weak correlation between the age of the stockpile materials and the sulfide concentration suggesting that sulfide is being consumed over time.

Based on Golder's sampling and testing, there is no clear relationship between grain size, mineralogy, or clay content (or other factors that may influence shear strength) with the age of the stockpile. The variability of these factors is overwhelmingly attributable to variability in the lithology and hydrothermal alteration of the ore and overburden, and the mechanical segregation of the materials as they were originally placed in the stockpile rather than to post-placement weathering.

The geochemical characterization studies do not provide a direct means to assess the potential long-term strength reductions for the stockpile materials that may be attributable to weathering and chemical decrepitation. However, Condition 78 states that the stability analyses should account for changes in the chemical and physical properties of the stockpile materials from the time of deposition to present day and to a specified time during post-closure. To address this requirement, we have performed back-analyses to determine the maximum leached ore shear strength that results in a minimally acceptable factor of safety of 1.0 under pseudostatic loading and qualitatively assessed the potential that long-term decrepitation could reduce the stockpile and interface shear strength to levels that could lead to instability.

The possible presence of a weak zone at the stockpile-foundation interface is postulated as a result of low pH pregnant leach solutions, or acidic leachate resulting from acid rock drainage seeping along the base of the stockpile and causing chemical alteration (decrepitation) of the soil and stockpile materials or potential strain softening of the material at the interface. To assess the potential that a weak layer at the stockpile-foundation interface will impact the stockpile stability, Golder defined a basal zone in the stability models and completed back-analyses of the required shear strength that results in a computed factor of safety of 1.0 under pseudostatic loading. This was undertaken to qualitatively assess the potential that long-term decrepitation could reduce the interface shear strength to levels that would result in instability.

2.3 Evaluation of Liquefaction

At the 3B Waste Stockpile, waste rock will be advanced over recent alluvium in Niagara Gulch as shown on Section A-A'. To evaluate the impact of potentially liquefiable alluvium in the foundation at Section A-A', a supplemental stability analysis was performed in which the alluvium was assigned a residual, post-liquefaction shear strength.

2.4 DEVELOPMENT OF THE STABILITY MODELS

2.4.1 Geometry, Geology, Groundwater, and Modeling Assumptions

Figure 2 shows cross sections of the leached ore and waste rock stockpiles presented in Section 1.0 and shown on Figure 1. For the selected sections, Golder developed two-dimensional stability models. The locations of the stability models were selected based on the slope height, foundation geology, and the topography of the stockpile foundation. The cross sections illustrate existing and post-regrading stockpile topography and foundation geology.

2.4.2 Geometry

Section A-A' illustrates geological conditions on the south slope of the 3B Waste Stockpile. Regrading the 3B Waste Stockpile will result in material being advanced over recent alluvium in the upper portion of Niagara Gulch. This section was selected to evaluate the impact of potentially liquefiable recent alluvium (Qal) in the foundation at the toe of the regraded stockpile.

The interior slope height at section B-B' at the 1B Leach stockpile has a toe to crest height of 250 feet. The section was selected because it represents one of the higher interior stockpile slopes.

Section C-C' represents the maximum interior slope of the 5A Waste Stockpile adjacent to the Main Pit. The existing slope is 250 feet high and is at angle of repose. The height of the regraded slope at this location will be approximately 250 feet and will have an overall slope angle of 3.5H:1V.

Section D-D' illustrates conditions at the interior slope of the 1B Leach Stockpile located near the crest of the Savannah Pit. The toe to crest height of the regraded slope at this location will be approximately 250 feet.

Section E-E' illustrates foundation conditions and the proposed regrading plan for the 8C In-Pit Waste Stockpile. The 8C Stockpile lies within the Main Pit. The stockpile slopes currently lie at angle of repose (approximately 36 degrees), with two benches, resulting in an overall slope of approximately 29 degrees. The overall slope height is over 1000 feet. The stockpile foundation consists of the granitic rock pit walls exposed during mining.

The stability of the 8C Stockpile was analyzed by CNI (2002) and a regrading plan has been developed by PDTI based on those results. The proposed regrading plan consists of a constructed 200-foot-high, buttress on the lower portion of the slope with a 28-degree slope and 150-foot-wide catch bench above the buttress. The intermediate slope will be 525 feet

high at angle of repose with a 175-foot-wide catch bench at the top. The upper slope segment is up to 300 feet high and is at angle of repose. The benches are intended to control sloughing from the angle of repose slopes. The stability analyses mainly address the global stability of the composite 8C Stockpile slope.

Sections F-F', G-G', and H-H' represent the leach and waste rock stockpile slopes adjacent to the south and southwest walls of the Main and Valencia Pits. Maximum toe to crest height of the regraded slopes in this area will be between 200 to 250 feet.

2.4.3 Geology

Surface geologic information is available from a geologic base provided by PDTI, which is modified from Hedlund (1978) and shown on Figure 1.

On the south and southwest sides of the Main, West Main, and Valencia Pits, stockpiles generally overlie a foundation composed primarily of granitic bedrock. Stockpiles evaluated in this area include the 2B Waste, 2C Leach, and 7B Leach Stockpiles. The thickness of the leached ore and waste rock in this area is relatively thin and slope heights are low relative to exterior stockpile outslopes, which are as much as 450 feet high.

The 3B and 5A Waste Stockpiles, and the 1B Leach Stockpile are located along the north and east limit of the Main and Gettysburg Pits. These facilities lie primarily on a foundation of Upper and Lower Mangas Conglomerate, a local equivalent to the Gila Conglomerate (QTg). Recent alluvium occurs locally in the vicinity of Section A-A' below the 3B Waste Stockpile.

The 8C In-Pit Waste Stockpile and other stockpiles located on the south and southwest walls of the Main and Valencia Pits are underlain primarily by Tertiary Granodiorite, Tertiary diorite and Precambrian granitoid rocks.

Material properties for all soil and rock units incorporated in the interior stockpile stability sections are discussed in Section 2.4.5 and are summarized in Table 1 and on Figure 1.

2.4.4 Groundwater Conditions

2.4.4.1 Test Data and Observations

Information regarding moisture conditions in the stockpiles at Tyrone is available from downhole geophysical logging in sonic drill holes completed in the 3A Stockpile and the 5A Waste Stockpile, and moisture testing in the 1A Stockpile. Conditions within 3A, 5A, and

1A Stockpiles are considered to be indicative of conditions in the interior and in-pit waste rock and leached ore stockpiles.

The 3A Stockpile was under active leaching at the time of geophysical logging. Logging results (EnviroGroup, 2005a) indicate from sonic borehole TSGT-1 indicate a volumetric moisture content between 3 and 19 percent (ft^3/ft^3), and averaging approximately 12 percent. Applying a dry unit weight of 114 pounds per cubic foot (pcf), this represents an average gravimetric moisture content of 1.6 to 10 percent (lbs/lb), averaging approximately 6.6 percent. Applying a specific gravity of soil solids of 2.765 (the average from available laboratory testing), saturated conditions would occur at a gravimetric moisture content of 19 percent. Geophysical logging in drill-hole TBGC-6 in the 6B Leach Stockpile indicated an average gravimetric moisture content of approximately 5 percent, applying the same criteria as described above, and ranged from 2 percent to 7.5 percent. The results from the 6B Leach Stockpile also indicate drained conditions. Although the dry unit weight applied in these conversions are assumed values, consideration of a range of reasonably dry unit weights indicate that the measured moisture contents from geophysical logs are generally below saturation levels and generally unsaturated conditions are indicated, even while under leach.

Geophysical logging conducted in drill-hole TGST-3 in the 5A Waste Stockpile indicates a volumetric moisture content of 2 to 15 percent. These are approximately equivalent to gravimetric moisture contents of 1 to 7 percent and indicate that the waste stockpiles can be considered to be unsaturated.

Moisture content testing (American Society for Testing and Materials D2216) of rotosonic drill-hole samples collected in October 2005 (Golder, 2006a) from the 1A Leach Stockpile indicated gravimetric moisture contents ranging from 4.3 to 22.5 percent, and averaging 10.1 percent. Stockpile material properties are expected to vary; however, we believe that unsaturated conditions are indicated within the leached ore stockpiles. The potential for saturation to occur will be lower under post-closure conditions when leaching is terminated and following placement of a soil cover and surface water controls.

Elevated groundwater levels and local groundwater mounds in the stockpiles that would impact stability are not expected because of the drainage capacity of the stockpiles. In particular, the ore stockpiles have previously been leached at rates that exceed 100-year storm rainfall amounts on a daily basis. Saturation and instability did not occur under these conditions. The potential for elevated groundwater levels will be further reduced upon cessation of leaching operations, cover placement, and implementation of surface water management. In the waste rock piles, surface water management measures instituted at reclamation will reduce long-term infiltration rates and further reduce the potential for the development of elevated groundwater levels that could impact stability.

These data and conclusions are consistent with EnviroGroup (2005a and 2005b) findings, which indicate that the stockpiles are drained, that moisture content correlates with the grain size of the materials, with sands and gravels having low moisture content and zones with higher clay content having higher retained moisture. On the whole, the stockpiles are indicated to be unsaturated.

2.4.4.2 Stability Model Groundwater Assumptions

In the analysis of the long-term stability of the waste rock and ore stockpiles, the bulk of the waste rock and leached ore is assumed to be unsaturated. The stability models incorporate a zone of perched water that encompasses the basal interface zone. The incorporation of a saturated basal zone is conservative because the effective stress used to calculate shear strength is reduced below a water level.

2.4.5 Material Properties

Materials considered in the stability analysis include leached ore, waste rock, decrepitated or weathered ore and waste rock, Qal, liquefied Qal, QTg, a basal stockpile-foundation interface zone and granitic bedrock. The 8C Waste Stockpile will be buttressed with coarse rock fill. Strength parameters have been assigned based on geotechnical investigation, in-situ testing, and laboratory testing programs. Where available information is sparse or lacking, we have applied parameters that are considered conservative based on the available information or have applied sensitivity analyses to back-analyze material parameters. Analyses have been performed using effective stress strength parameters, and the effect of pore pressures was modeled by defining a static water table condition.

2.4.5.1 Leached Ore Stockpile Material

Golder has completed nine shear-strength tests of the Tyrone stockpile materials derived from surface test pits, from the interior of the stockpiles exposed during re-mining and from sonic boreholes. Test results are reported by Golder (2006a). Shear-strength testing included large-scale (6-inch box) direct shear and triaxial shear testing.

Direct shear tests were performed on remolded samples that were nominally compacted and allowed to consolidate at each applied load increment. Fragments larger than 1.5 inches were removed from the direct shear samples. Tests were run under saturated conditions.

Triaxial tests were performed on the minus ¾-inch fraction under consolidated (C), undrained (U) conditions with pore pressure measurements. Strength tests were completed on four leached ore samples. Results of triaxial and direct shear tests are reported in the *Tyrone Supplemental Stability Evaluation Interim Report* (Golder, 2006a).

The laboratory-derived friction angles (ϕ) of the leached and unleached materials are similar and are within a range of 29.0 to 36.9 degrees. The cohesion ranges from 0.4 to11.9 pounds per square inch (psi). We have applied the shear strength at large displacement rather than peak strength when both are reported. However, the stockpile materials generally do not exhibit brittle behavior, and the peak and large displacement strengths are close in value. The average friction angle measured in the leached ore samples was 35.6 degrees and cohesion averaged 0.95 psi. Observations of the interiors of re-mined leached ore stockpiles indicate that they are cemented with sulfate minerals. However, cohesion, real or apparent, has been ignored in these stability analyses, and a friction angle of 35.5 degrees was applied for leached ore in all base-case analyses.

To evaluate the potential impact of a decrease in leached ore strength due to long-term weathering and decrepitation, the friction angle of the ore was varied in the stability analyses to yield a factor of safety of 1.0 under seismic loading. The purpose of these analyses was to determine the shear strength required for minimally acceptable stability conditions.

Geophysical data (EnviroGroup, 2005a) indicate leached ore density from 100 to 150 pcf. The leached ore is assumed to have a moist unit weight of 120 pounds per cubic foot (pcf) and a saturated unit weight of 133 pcf. These unit weights represent typical values for gravelly soils.

2.4.5.2 Waste Rock

Information concerning the composition of the 5A Waste Stockpile is available from the supplemental materials characterization studies (EnviroGroup, 2005a and 2005b). The investigation of the 1D Waste Stockpile (later redesignated the 5A and 3C) indicates that the facility contains primarily Gila Conglomerate and leached cap material. Periodically, low-grade chalcocite/pyrite and chalcopyrite/pyrite ores were deposited.

The log from TSGT-3 (Golder, 2006a) in the 5A Waste Stockpile indicates that the waste rock is composed of well to poorly graded sandy gravels (GW, GP) and gravelly sands (SW, SP). These soil classifications are consistent with the composition indicated in the material characterizations studies, which is predominantly Gila Conglomerate.

In situ density in the 5A Stockpile ranges from approximately 0.8 to 2.4 grams per cubic centimeter (g/cm^3) based on geophysical logging, and averages near 2.0 g/cm^3. The corresponding moist unit weight is on the order of 125 pcf. The waste rock is assigned moist and saturated units weights of 120 and 133 pcf in stability analyses.

CNI (2002) developed strength parameters for the 8C Waste Stockpile materials from three large-scale (12 inch) direct shear tests performed on stockpile material that was scalped of

material larger than 1.5 inch diameter. The results ranged from 33.4 degrees friction and 1.69 psi apparent cohesion for the material with the smallest grain-size distribution to 39.7 degrees friction and an apparent cohesion of 1.57 psi for the coarsest sample tested.

Six waste rock samples from Tyrone were subjected to direct shear and staged triaxial testing during this study (Golder, 2006a). The average angle of internal friction from these test results (32.6 degrees) was assumed for all base-case analyses of the interior waste stockpiles.

The potential effects of waste rock weathering were investigated through back-analysis to obtain a factor of safety of 1.0 under seismic loading. The purpose of these analyses was to determine the shear strength required to maintain minimally acceptable stability conditions

2.4.5.3 Quaternary Alluvium

No strength testing has been performed on Qal samples from the vicinity of the 3B Waste Stockpile. Golder tested two samples of alluvium recovered from the 3A Stockpile seepage collection area from Boreholes 11-9 and 10-4 using staged consolidated, undrained (CU) triaxial tests (Golder, 2007). Triaxial test specimens were remolded to field-measured *in situ* density and moisture content. Effective friction angles of 38.8 and 37.5 degrees were measured in staged CU triaxial tests. These samples are believed to have been derived from reworked Gila Conglomerate and would be similar to the Qal in the vicinity of the 3B Waste Stockpile.

In conjunction with the supplemental stability analysis of the 1 Stockpile (Golder, 2006b), an analysis of standard penetration test (SPT) results was conducted for Qal drill-hole intercepts located in Brick Kiln Gulch. Based on the majority of the SPT results, the Qal in Brick Kiln Gulch would be classified as compact to dense. The corresponding internal friction angle for medium-dense to dense cohesionless soils can be expected to range from 35 to 38 degrees based on empirical values reported by Bowles (1982).

Parry (1977) estimated the internal friction angle of cohesionless soils based on SPT tests results and effective stress as:

$$\phi=25+28*(N/q)1/2 \qquad \text{(Eqn. 1)}$$

where:

N is the SPT blow count, and
q is the effective overburden pressure.

This is analogous to the friction term (N_ϕ) used in conventional bearing capacity calculations. Equation 1 was applied to the uncorrected SPT test results for SB and GA-05 series borehole Qal samples in Brick Kiln Gulch (Golder, 2006b). The resulting calculated internal friction angle ranged from 26.4 to 35.7 degrees, and averaged 28.8 degrees.

For the analysis of the stability of the 3B Waste Stockpile, the internal friction angle (ϕ) for the Qal is assumed to be 29 degrees. For medium-dense to dense cohesionless soils, Bowles (1982) reports moist unit weights of 110 to 140 pcf. Moist and saturated unit weights of 120 and 133 pcf, respectively, have been assumed for the Qal.

For analysis of the effects of liquefaction at the 3B Waste Stockpile, Qal zones beneath the regraded stockpiles were assumed to be liquefiable. Vaid and Thomas (1994) found that the residual strength of sand samples subjected to extension tests ranged from 0.1 to 0.18 times the effective overburden stress ($\sigma_{vo'}$). This is approximately equivalent to an internal friction angle of 5 to 11 degrees. For analysis of the impact of potential liquefaction at the 3B Waste Stockpile, the Qal zones were assigned an internal friction angle of 8 degrees representative of a residual, post-liquefaction shear strength. This strength is within the 5 to 11 degree range of residual shear strength reported by Vaid and Thomas (1994) for loose clean sands.

2.4.5.4 Gila Conglomerate

Call & Nicholas, Inc. (1982) report a peak shear strength of 40.89 degrees from large-scale, direct shear testing of disturbed samples of Gila Conglomerate (QTg). We have applied a friction angle of 39 degrees and moist and saturated unit weights of 120 and 133 pcf to the QTg in these stability analyses.

2.4.5.5 Basal Interface

A triaxial test was recently completed on basal interface material from Borehole TSGT-04 (265 to 268 feet) beneath the 2A Leach Stockpile. Laboratory data are contained in Attachment 1. Conditions in the 2A Leach Stockpile are considered analogous to conditions in the interior leached ore stockpiles, We have also considered the potential for a weak interface at the base of the waste rock stockpiles.

The basal interface sample from the 2A Leach Stockpile yielded an effective friction angle of 38.0 degrees. In each stability section, a 10-foot-thick zone at the base of each stockpile was defined. In base-case stability analyses, the basal interface zone was assigned the strength of the leached ore or waste rock (35.5 or 32.6 degrees respectively), depending upon the composition of the stockpile. To evaluate the potential risk posed by a weak interface, Golder back-calculated the shear strength in the basal interface zone required to maintain a minimally acceptable safety factor of 1.0 under seismic loading conditions.

2.4.5.6 Granodiorite and Diorite Bedrock

Granodiorite, Diorite, and Precambrian granitoid rock underlie the foundation of stockpiles lying on the southern and southwestern perimeter of the Main and Valencia Pits. CNI (1982)

used uniaxial compression and Brazilian disk tests to estimate the intact strength of mine area granitic rocks for pit slope stability studies. Minimum reported estimates for intact bedrock cohesion and internal friction angle are 669 pounds per square inch (psi) and 43.41 degrees, respectively. Strength testing along fractures resulted in a friction angle of 26 to 28 degrees and an apparent cohesion of 13 to 16 psi. Applying the intact strength listed above, a fracture strength of 26 degrees and 16 psi cohesion, and assuming that failure surfaces involve 50 percent intact material with the remainder following preexisting fractures, a strength of 35.6 degrees and 340 psi cohesion is estimated. For these stability analyses, we have applied a rock-mass cohesion of 20 psi and an internal friction angle of 35 degrees to represent the strength of the bedrock.

Wyllie and Mah (2004) report cohesion ranging from 20 to 600 psi and internal friction angles of 35 to 37 degrees for jointed porphyry, kaolinized granite, and weathered granite. General rock-strength characteristics reported by Wyllie and Mah (2004) indicate that an internal friction angle of 35 to 45 degrees is applicable to rock masses and fill containing angular, interlocking particles. For soft rock or hard rock with discontinuities, a cohesion of 200 to 400 psi is indicated The rock strength applied to the granitic bedrock at Tyrone is below the range of strengths reported for similar rocks and is considered a conservative value.

2.4.5.7 8C Waste Stockpile Materials

Materials considered in the analysis of the 8C Waste Stockpile include waste rock, the constructed rock-fill buttress, pit lake sediments that may potentially be present beneath the waste rock at the base of the pit, and granitic bedrock.

Based on the material characterization studies (Envirogroup, 2005a, 2005b), prior to 1996, QTg, leached cap, and low-grade oxide/chalcocite ore represent the bulk of the material placed in the 8C Stockpile.

CNI conducted a geotechnical investigation of the 8C Waste Stockpile as part of their stability evaluation (CNI, 2002). As a result of end-dumping construction techniques and the segregation of grain sizes that occurs when dumping on slopes, the waste rock exhibits coarse- and fine-grained components. CNI collected bulk samples from coarse and fine waste rock zones and subjected the samples to direct shear testing in a 12-inch by 12-inch shear test apparatus. Particles larger than 1.5 inches were excluded from the tested sample.

In summary, CNI shear-strength test results indicate an internal friction angle of 39.7 degrees and cohesion of 1.57 psi for coarse waste rock, while the finer material exhibited an internal friction angle of 33.4 degrees and cohesion of 1.69 psi. Note that the internal friction angle of the finer waste sample as determined by CNI (33.4 degrees) is in good agreement with the average internal friction angle of 32.6 degrees for waste rock samples tested by Golder for

Condition 78 (Golder, 2006a). The Golder waste rock tests were conducted on finer material (minus ¾ to 1 inch) and also reflect the strength of the waste rock without the influence of coarse material. In global stability analyses of the 8C Waste Stockpile, an internal friction angle of 33.4 degrees was applied to the waste rock.

A coarse rock buttress will be constructed at the toe of the 8C Waste Stockpile as part of the measures PDTI proposes to increase stockpile stability. The buttress will be constructed in 10- to 15-foot lifts and compacted by equipment traffic. The coarse waste rock in the buttress was assigned an internal friction angle of 40 degrees. As reported in Wyllie and Mah (2004), the internal friction angle for fill containing angular, interlocking particles ranges from 35 to 45 degrees. Moist and saturated unit weights of 125 and 135 pcf are applied to the rock-fill buttress.

The 8C was advanced by end-dumping into the Main Pit. CNI (2002) predicted that erosion and deposition in the pit lake has resulted in the formation of a layer of fine soil and sediment on the pit floor. The buttress will be advanced on top of these sediments with the pit lake level lowered below the toe of the buttress. A zone of weaker material is incorporated in the 8C Stockpile stability analysis below the buttress. This material is modeled as being 10 feet thick on the pit floor at the base of the waste rock stockpile and beneath the rock-fill buttress. The weak material zone is assigned an internal friction angle of 25 degrees. We have not considered the "during construction" undrained shear strength for the analysis of the long-term post-closure stability.

2.4.5.8 Summary of Material Properties

Material strength parameters applied in the stability models are summarized in Table 1 on the following page. The leached ore, waste rock, alluvium, and Gila Conglomerate are assumed to have moist and saturated unit weights of 120 and 133 pcf, respectively.

TABLE 1
MATERIAL STRENGTH MATRIX, INTERIOR STOCKPILE STABILITY STUDY

Material	Moist/Sat Unit weight (pcf)	Cohesion (psi)	Angle of Internal Friction (ϕ, Degrees)
Leached Ore (base case)	120/133	0	35.5
Leached Ore (decrepitated)	120/133	0	Solve for FOS=1.0
Waste Rock (base case)	120/133	0	32.6
Waste Rock (decrepitated)	120/133	0	Solve for FOS=1.0
Qal (recent alluvium)	120/133	0	29
Gila/Mangas Cong. (QTg)	120/133	0	39
Weathered Interface (basal zone)	120/133	0	Solve for FOS=1.0
Granitic Bedrock	160/160	20	35
8C Waste Rock	120/133	0	33.4
8C Buttress	125/135	0	40
8C Basal Soil Zone	120/133	0	25

Notes:
FOS = factor of safety
pcf = pounds per cubic foot
psi = pounds per square inch

2.4.6 Seismic Loading

Based on the Tyrone seismic hazard analysis prepared by URS Corporation (2005), the peak ground acceleration for a 2,500-year return period at bedrock sites is between 0.08 and 0.09g and results from a magnitude 6.7 earthquake. For sites underlain by local soils and Gila Conglomerate, magnification of bedrock acceleration was predicted to result in a peak acceleration of 0.18g at the ground surface. Hynes and Franklin (1984) discuss the selection of pseudostatic coefficients for use in dam design and recommend the use of one-half the peak acceleration with a 20-percent reduction of the shear strength and a target factor of safety of 1.0. Bray et al. (1993) provide recommendations for seismic design of landfills and note that "the normalized fundamental periods of many solid waste landfills are greater than two, and that for these cases, the maximum horizontal equivalent acceleration value used to represent the seismic loading will be less than one-half of the bedrock maximum horizontal acceleration." Jansen (1985) states that an acceleration of 0.4 to 0.7 times peak ground acceleration is typically suitable for computing the sustained effect of an earthquake on embankment stability.

The 3B, 5A, and 1B Stockpiles lie primarily on a foundation of Mangas Conglomerate (Gila Formation). A pseudostatic coefficient equal to 0.66 times the amplified peak ground

acceleration (i.e., 0.12g) for an event with a 2,500-year return period was used in pseudostatic analyses of these facilities. While the leach stockpiles adjacent to the south and southwest pit walls lie on a bedrock foundation where ground motion would not be amplified, a similar pseudostatic coefficient (0.12g) has been applied in seismic analyses. Golder believes this approach to be appropriate and consistent with standard industry practice.

In the Main Pit, a seismic acceleration coefficient equal to 0.66 times the unamplified peak acceleration (0.09g) was applied in the stability analyses of the 8C Stockpile. The resulting pseudostatic coefficient is 0.06g.

3.0 CALCULATIONS

Circular and block failure searches for critical failure surfaces were completed using SLIDE. Failure mechanisms considered include circular and block failures. In the block failure analyses, failure surface searches were configured to incorporate all foundation layers. In circular failure analyses, failure surface search limits were set to eliminate thin, infinite slope type failure mechanisms. The reported factors of safety are based on Bishop's (1955) Method of Slices.

Base-case analyses incorporate shear strengths measured or estimated based on current conditions and available test results. The factor of safety for the base-case condition was computed for static and pseudostatic loading conditions.

The potential for decrepitation to reduce the stockpile and interface shear strength to levels that could lead to instability was assessed qualitatively. Stability analyses were performed to evaluate the degree of strength loss in the stockpile and the stockpile-foundation interface due to decrepitation and weathering that could lead to instability. The shear strength that would be required to result in instability of the decrepitated ore and waste stockpiles was evaluated through back-analyses using a circular failure surface searches. To evaluate the effect of a weak foundation interface, a 10-foot-thick basal interface zone was defined in the stability models, and the strength parameters were varied until a factor of safety of 1.0 resulted. The effect of a weakened interface was evaluated for block and circular failure modes, as warranted by foundation slope conditions.

As stated above, the impact of potentially liquefiable alluvium beneath the 3B Stockpile was evaluated by assigning a residual, post-liquefaction shear strength of 8 degrees to the alluvium

4.0 RESULTS

4.1 Interior Stockpiles

The results of the stability analyses for the interior stockpiles are presented in Table 2. SLIDE computer output is provided in Attachment 2. As discussed above, base-case analyses use material properties determined through geotechnical testing or based on published information. In evaluation of ore and waste rock weathering, back calculation is used to determine the shear strength required to maintain what we would consider to be a minimally acceptable factor of safety (i.e., 1.0 under seismic loading conditions). The minimum basal interface shear strength is determined in a similar manner. Where Qal occurs, the potential for liquefaction to impact stability is evaluated by applying a post-liquefaction residual shear strength to the Qal in a static stability analysis.

In general, many of the stockpiles peripheral to the open pits lie on foundations of competent materials that slope under the stockpiles and are not susceptible to sliding along a basal interface zone. Where the foundation slope is not susceptible to basal sliding failure, stability analyses are restricted to circular failure searches.

TABLE 2
STABILITY ANALYSIS RESULTS, INTERIOR STOCKPILES

Section	Static FOS	Pseudostatic FOS (0.12g)	Failure Mode	Analysis/Comments
A-A'	2.2 (A-1)	1.5 (A-2)	Block	Base Case
A-A'	2.1 (A-3)	1.4 (A-4)	Circular	Base Case
A-A'	NA	1.0 (A-5)	Block	Weathered Ore Evaluation, Back-Analyzed ϕ = 24º
A-A'	NA	1.0 (A-6)	Circular	Weak Interface Evaluation, Back-Analyzed ϕ = 18º
A-A'	1.4 (A-7)	NA	Block	Liquefied Qal Analysis, ϕ Qal= 8º
B-B'	2.9 (B-1)	2.0 (B-2)	Block	Base Case
B-B'	2.5 (B-3)	1.7 (B-4)	Circular	Base Case
B-B'	NA	1.0 (B-5)	Block	Weathered Ore Evaluation, Back-Analyzed ϕ = 23º
B-B'	NA	1.0 (B-6).	Circular	Weak Interface Evaluation, Back-Analyzed ϕ = 5º
C-C'	1.9 (C-1)	1.4 (C-2)	Circular	Base Case
C-C'	NA	1.0 (C-3)	Circular	Weathered Ore Evaluation, Back-Analyzed ϕ = 25º
C-C'	NA	1.0 (C-4)	Circular	Weak Interface Evaluation, Back-Analyzed ϕ = 8º
D-D'	2.5 (D-1)	1.7 (D-2)	Circular	Base Case
D-D'	NA	1.0 (D-3)	Circular	Weathered Ore Evaluation, Back-Analyzed ϕ = 21º
F-F'	2.8 (F-1)	1.9 (F-2)	Block	Base Case
F-F'	2.6 (F-3)	1.8 (F-4)	Circular	Base Case
F-F'	NA	1.0 (F-5)	Circular	Weathered Ore Evaluation, Back-Analyzed ϕ = 22.5º
F-F'	NA	1.0 (F-6)	Circular	Weak Interface Evaluation, Back-Analyzed ϕ = 4º
F-F'	NA	1.1 (F-7)	Block	Weak Interface Evaluation, Back-Analyzed ϕ = 4º
G-G'	2.8 (G-1)	1.9 (G-2)	Circular	Base Case
G-G'	NA	1.0 (G-3)	Circular	Weathered Ore Evaluation, Back-Analyzed ϕ = 21º
H-H'	2.5 (H-1)	1.7 (H-2)	Circular	Base Case
H-H'	NA	1.0 (H-3)	Circular	Weathered Ore Evaluation, Back-Analyzed ϕ = 23º

Note:
Numbers in parentheses indicate the numbered stability analysis output provided in Attachment 2.
FOS = factor of safety

4.1.1 3B Waste Stockpile, Section A-A'

Section A-A' represents the interior slope of the 3B Waste Stockpile. During final construction of the 3B Stockpile, the toe will be advanced into Niagara Gulch. Section A-A' passes through a zone of Qal in Niagara Gulch.

For base-case conditions, the calculated factor of safety is 2.2 and 1.5, for static and pseudostatic analyses in block failure mode, respectively. In circular failure mode, the static and pseudostatic safety factors were 2.1 and 1.4. The back-analyzed strength required for a minimally acceptable factor of safety of 1.0 for the regraded waste rock slope under pseudostatic loading is an internal friction angle of 24 degrees. In the analysis of waste rock weathering, the 24-degree strength was applied to both the waste rock and the basal interface zone.

For the analysis of the potential that a weak foundation interface may impact stability a basal interface strength of 18 degrees resulted in a factor of safety of 1.0. The foundation geometry beneath the 3B Waste Stockpile is not conducive to basal sliding failure. In this analysis, the base-case strength of 32.8 degrees was applied to the waste rock.

The zone of Qal in Niagara Gulch that will be buried during regrading was assigned a residual, liquefied, shear strength of 8 degrees to evaluate the potential impact of liquefaction. The calculated factor of safety under these conditions was 1.4. Therefore, the risk of failure due to liquefaction is considered to be low.

4.1.2 1B Leach Stockpile, Section B-B'

Section B-B' on the interior slope of the 1B Leach Stockpile overlies Gila Conglomerate (QTg). Under base case conditions, the factors of safety against instability are 2.9 to 2.5 under static conditions and 2.0 to 1.7 for pseudostatic conditions in block and circular failure modes. Input of a waste rock and basal interface zone internal friction angle of 23 degrees resulted in a factor of safety of 1.0 under pseudostatic loading conditions in circular failure mode.

The basal interface zone was assigned a shear strength of 5 degrees to evaluate the impact of decrepitation of the stockpile foundation. The factor of safety against instability was 1.0.

4.1.3 5A Waste Stockpile, Section C-C'

The interior slope of the 5A Waste Stockpile lies on an inward sloping foundation of QTg and is not susceptible to basal sliding along a weak interface layer. The section was evaluated in circular failure mode. Under base-case conditions, the factors of safety are 1.9

and 1.4 for static and pseudostatic conditions, respectively. The back-analysis of the minimum waste rock and basal interface shear strength that maintained a factor of safety of 1.0 for pseudostatic loading yielded an internal friction angle of 25 degrees. An evaluation of interface strength in circular failure mode under pseudostatic loading indicated a minimum interface strength of 8 degrees is required to maintain a safety factor of 1.0.

4.1.4 1B Leach Stockpile, Section D-D'

The interior slope of the 1B Leach Stockpile lies on an inward sloping foundation of QTg. As such, it is not susceptible to a failure along the basal interface. Stability evaluation of Section D-D' was limited to the base case analysis and back-analyses of weathered ore to determine the minimum stockpile shear strength that maintains a factor of safety of 1.0 under pseudostatic loading.

Under base case conditions the factors of safety are 2.5 and 1.7 for static and pseudostatic loading, respectively, in circular failure mode. The back-analysis yielded an ore strength of 22.5 degrees to maintain a factor of safety of 1.0 under pseudostatic loading.

4.1.5 7B Leach Stockpile, Section F-F'

For base-case conditions, the factors of safety against instability are 2.8 to 2.6 under static conditions and 1.9 to 1.8 for pseudostatic analyses for block and circular failure modes, respectively. Input of a weathered ore shear strength of 22.5 degrees resulted in a factor of safety of 1.0.

The underlying foundation slopes inward beneath the stockpile and Section F-F' is not susceptible to basal sliding. Input of a basal interface friction angle of 4 degrees resulted in a factor of safety of 1.1 in block failure mode.

4.1.6 2C Leach Stockpile, Section G-G'

The interior slope of the 2C Leach Stockpile is buttressed by an inward sloping bedrock foundation and is not susceptible to basal sliding failure. Section G-G' was evaluated through circular failure analyses. The factors of safety against instability at Section G-G' are 2.8 and 1.9 for base-case conditions under static and seismic loading conditions. Input of a leached ore internal friction angle of 22 degrees resulted in a factor of safety of 1.0 under seismic loading.

4.1.7 2B Leach Stockpile, Section H-H'

The foundation of the 2B leach stockpile consist of an inward sloping, irregular bedrock surface that is not susceptible to basal interface sliding failure. Analysis of the interior slope through circular surfaces resulted in factors of safety of 2.5 and 1.7 under static and pseudostatic loading, respectively. The back-analyzed leached ore shear strength that results in a minimally acceptable factor of safety of 1.0 is 23 degrees.

4.2 8C In-Pit Stockpile Section E-E'

4.2.1 Analysis Approach

The reclamation plan maintains a pit lake in the Main Pit. The inflows to the pit lake will be pumped to maintain a low post-closure pit water level. The purpose of the 8C Waste Stockpile grading plan proposed by PDTI is to enhance the overall stability of the stockpile and enable the maintenance of post-closure dewatering operations in the pit bottom. The construction of the catch benches and the coarse rock-fill toe buttress will have the effect of decreasing the overall slope of the stockpile and mitigating the potential for global failures that could impact dewatering facilities.

In the CNI (2002) stability study, the risk of shallow slab failures was identified on the angle of repose slopes. These failures are a result of the segregation of particle sizes that occurs during end dumping. Shallow slab failures occur along zones of finer waste rock that parallel the angle of repose slopes. Catch benches at the 5375 and 5800 elevations are intended to contain rubble generated by slab failures on the upper slopes. The buttress, which will be constructed at a slope of 28 degrees with coarse rock fill, will reduce the potential for shallow slab failures on the lower slope.

Because the upper slopes of the 8C Stockpile will remain at angle of repose, slab failures can be anticipated to occur in the future and maintenance of the benches may be required periodically. The stability analysis presented here address the overall or global stability of the 8C Stockpile. Failure surface searches have been configured to identify the potential for significant failures through or near the stockpile toe. Shallow slab failures on the angle of repose slopes were not evaluated. Stability model output for Section E-E' in the 8C Waste Stockpile is contained in Attachment 1.

4.2.2 8C Analysis Results

Stability analysis results for the 8C Stockpile are shown in Table 2. The estimated factors of safety for a crest to toe (or near toe) failure are 1.3 and 1.1 under static and pseudostatic loading conditions, respectively, in both block and circular failure mode.

In circular failure mode, failure surfaces were constrained to pass from the slope crest to the toe of the buttress. With application of similar failure surface constraints, the back-analyzed waste rock strength that results in a factor of safety of 1.0 under pseudostatic loading is 30 degrees.

TABLE 3
8C WASTE STOCKPILE STABILITY ANALYSIS SUMMARY

Section	Static FOS	Pseudostatic FOS (0.06g)	Failure Mode	Analysis/Comments
E-E'	1.3(E-1)	1.1(E-2)	Block	Base Case
E-E'	1.3(E-3)	1.1 (E-4)	Circular	Base Case
E-E'	NA	1.0(E-5)	Circular	Weathered Ore Evaluation, Back-Analyzed $\phi = 30^o$

Note:
Numbers in parentheses indicate the numbered stability analysis output provided in Attachment 2.

5.0 SUMMARY AND CONCLUSIONS

5.1 Summary of Interior Stockpile Analyses

The base-case strength properties used in these stability analyses are based primarily on recent and previously completed geotechnical testing. Stability evaluations incorporating base-case strength properties indicate that the stockpile in the mine interior will be stable under the reclaimed configurations shown on the proposed regrading plan (MWH, 2006). The minimum factor of safety is 1.4 for base-case conditions at section A-A' (3B Waste Stockpile) and section C-C' (5A Waste Stockpile) in circular failure mode under seismic loading conditions. In general, static safety factors range from 2.1 to 2.9 while in pseudostatic analyses, they range from 1.4 to 2.0.

The long-term effects of weathering and decrepitation on the grain-size distribution and shear strength of the leached ore, waste rock, and basal stockpile-foundation interface cannot be assessed directly. Material characterization studies completed for Tyrone suggest that little loss of strength should be anticipated given the lithology of the ore and waste rock, its current state of alteration, and the ambient conditions to which it is exposed. The laboratory-derived shear strengths were determined on the soil matrix component of the stockpile material. Golder considers the laboratory-measured values for the soil matrix component to be representative of the fully weathered (or decrepitated) condition of the leached ore and waste rock. The effect of oversize fragments, which could enhance stability, has not been incorporated into the shear strength of the leached ore waste rock assumed for the stability analyses.

Outside the main pit, PDTI is planning to regrade all stockpiles to overall 3.5H:1V slopes. At the proposed slope angle, a the maximum friction angle that resulted in a factor of safety of 1.0 for pseudostatic loading was 25 degrees representing an internal friction angle strength reduction of approximately 8 to 10 degrees relative to base-case shear strengths of the waste rock and ore.

The natural topography underlying the interior stockpiles slopes back under the stockpiles and basal sliding along a weak interface is not a critical failure mode.

The average leached ore and waste rock friction angles determined from laboratory shear strength testing are 35.6 and 32.6 degrees, respectively (Golder, 2006a). A considerable change in the physical condition of the leached ore and waste rock would be required before low factors of safety are indicated. However, material characterization studies (EnviroGroup, 2005a and 2005b) do not predict a significant change in material properties over time. Therefore, a long-term reduction in stability of the interior stockpiles due to decrepitation of the stockpile materials is not indicated.

Available information indicates that the stockpiles can be considered to be unsaturated for post-closure stability analyses. Moisture contents will be lower than those measured following reclamation as a result of the cessation of leaching, stockpile draindown, cover placement, and implementation of surface water management measures. The development of groundwater mounds that could impact the long-term stability of the stockpiles is not expected. We also consider the potential for the initiation of flowslide type failures related to stormwater runoff or infiltration near the stockpile crest will be mitigated as a result of cover placement and surface water management.

Regrading of the 3B Stockpile will result in outward movement of the stockpile toes over Qal in Niagara Gulch and the area north of the Main Pit. Application of a residual, post-liquefaction shear strength to the Qal in this area resulted in safety factor of 1.4.

5.2 Summary of 8C Waste Stockpile Analyses

The 8C stockpile was evaluated for overall global stability in block and circular failure modes. A significant aspect of this analysis was to assess the potential that a failure could impact long-term pit dewatering efforts. The minimum computed factor of safety for a global failure is 1.1 for the block and circular failure modes under pseudostatic loading conditions. Under static conditions, the safety factors for block and circular failure modes are 1.3.

A reduction of the shear strength to an internal friction angle of 30 degrees yielded a safety factor of 1.0 under pseudostatic loading conditions in circular failure mode.

5.3 Conclusions

The base-case analyses indicate that the interior stockpiles examined in this report will be stable in their reclaimed configurations. Conservative material strength estimates have been applied to the waste rock and leached ore. These strengths disregard the apparent cohesion values indicated by the laboratory tests, the true cohesion due to cementation observed in stockpiles, and the influence of the coarse fraction of the stockpiles. With these conservative assumptions and limitations, the calculated factors of safety for the reclaimed stockpile slopes are above targeted values for adequate safety.

Back-analyses indicate a reduction in the strength of the stockpiles and stockpile interfaces of approximately 10 degrees of friction angle would be required to reduce the safety factors to levels that would indicate a high potential for instability. The shear-strength parameters that have been applied to the stockpile material are considered to be conservative for assessment of the current level of stability and are considered to be appropriate values for the long term fully decrepitated stockpile shear strength. A further 10 degree reduction in the friction angle due to long-term weathering is not supported by geochemical studies (EnviroGroup, 2005) or from comparisons of the geotechnical properties with the age or leach history of the stockpile materials. Therefore, the regraded interior stockpiles are assessed to be stable for the long term.

The proposed regrading plan for the 8C Stockpile includes catch benches to mitigate the impact of shallow, slab-type failures associated with the upper, end-dumped angle of repose waste rock slopes. Provision of a toe buttress is planned by PDTI based on analyses and recommendations by CNI (2002) as a means of increasing the stability of the overall stockpile slope and reducing the potential for impacts to the post reclamation pit dewatering activities. Results of the analysis of the overall stability of the 8C Waste Stockpile with the proposed buttress met the target factor of safety of 1.3 for static loading and was above the target value of 1.0 for pseudostatic loading. The potential for shallow slab-type failures on the angle of repose slopes can be expected to be relatively high. However the impacts of such failures will be controlled by catch benches and periodic maintenance.

The planned final configuration of the 8C Stockpile is steeper than the other reclaimed stockpiles at Tyrone and the factor of safety is correspondingly lower. The potential that long-term weathering and decrepitation would further reduce the stockpile strength to levels that would lead to instability was assessed through back-analysis. A further reduction in the friction angle of 3.4 degrees would be needed to reach a safety factor of 1.0 for pseudostatic loading. While a 3.4 degree reduction in the friction angle is much more likely than a 10-degree reduction, the current evidence that further strength reductions will occur is not sufficiently established to justify further flattening of the slopes. Also, we would anticipate a low potential for decrepitation in waste stockpiles with low sulfide content.

The common approach to ensure that the steep stockpile slopes do not pose a hazard to access, infrastructure, people, or the reclamation is to implement a slope monitoring program. CNI (2002) recommended that a series of slope monitoring measures be instituted as a means of protecting personnel and equipment operating within the Main Pit in the vicinity of the 8C Waste Stockpile. Because the upper angle of repose slopes may be subject to periodic shallow slab-type failures, it is recommended that slope monitoring measures be implemented and maintained until the behavior of the upper slope is fully understood.

6.0 REFERENCES

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Attachments: Figures 1 and 2
Attachment 1 - Triaxial Test Results, Basal Interface Material (TGST-04)
Attachment 2 - Stability Output

FIGURES

LEGEND

- ROTOSONIC BOREHOLE LOCATION
- STOCKPILE TEST PIT LOCATION
- EXISTING SURFACE CONTOURS
- PRE–MINE SURFACE CONTOURS
- POST REGRADE SURFACE CONTOURS
- INFERRED FAULT
- POST–REGRADE SURFACE DRAINAGE

GEOLOGIC LEGEND

Mine Dumps Alluvium (Qal) Colluvium	Quaternary
Upper Mangas Conglomerate Lower Mangas Conglomerate >(Qtg)	Upper Tertiary/ Quaternary
Latite & Basaltic Andesite (Tml) Wind Mountain Ash–flow Tuff (Twt) Volcanics and Volcaniclastics (Tv) Volcanic Rocks (undiff.) Tonalite–Dacite (Tt)	Tertiary
Igneous Breccia Granodiorite–Tonalite–Dacite (Tg) Diorite/Biotite Diorite (Td) Granodiorite–Quartz Diorite (Tgd)	Tertiary
Andesite\K volcanics Basal volcanics (K?) Colorado Shale \ Beartooth Quartzite	Cretaceous
Diabase Granitoid Rocks (PEg)	Precambrian

REFERENCES

1.) GEOLOGY FROM PDTI PROJECT GEOLOGY MAP.

2.) REGRADE TOPOGRAPHY FROM TyroneMineRegrade.dwg PROVIDED BY MONTGOMERY WATSON HARZA.

3.) STOCKPILE GEOTECHNICAL INVESTIGATION REPORTED IN "SUPPLEMENTAL STABILITY STUDY OF WASTE ROCK PILES AND LEACH ORE STOCKPILES, INTERIM REPORT FOR DP1341, CONDITION 78, TYRONE MINE", GOLDER ASSOCIATES, JANUARY 2003.

4.) PRE–1999 TOPOGRAPHIC BASE MAP PROVIDED BY PHELPS DODGE TYRONE, INC.

5.) 8C REGRADE PLAN BASED ON PDTI SECTION.

SCALE 600 0 600 1200 FEET

PROJECT: phelps dodge TYRONE Inc.

SUPPLEMENTAL STABILITY ANALYSIS
TYRONE MINE, NEW MEXICO

TITLE

INTERIOR AND IN-PIT STOCKPILE STABILITY ANALYSIS CROSS-SECTION LOCATIONS

Golder Associates Tucson, Arizona

PROJECT No.		053–2550	FILE No.		0532550D007
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CADD	ANV	04/30/07	FIGURE		1
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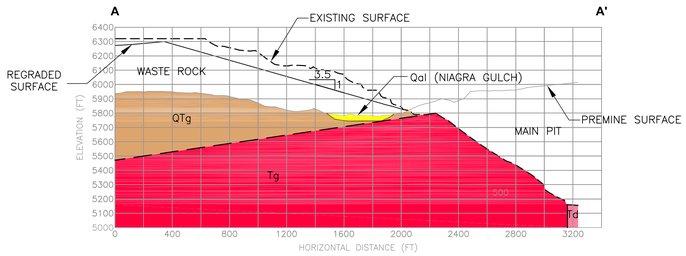
REVIEW	GM	05/10/07			

Drawing File: 0532550D007.dwg May 11, 2007 8:45am



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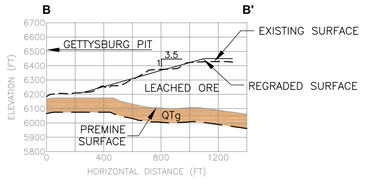

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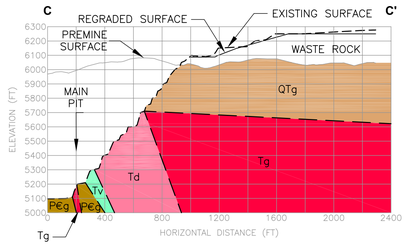

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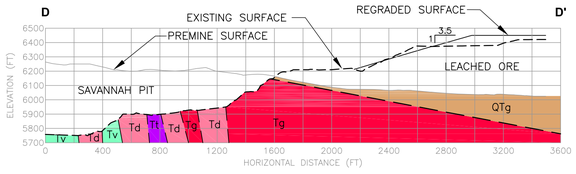

D/2 SECTION D-D' 1B LEACH STOCKPILE

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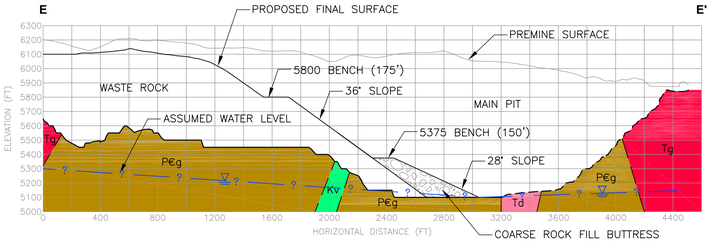

E/2 SECTION E-E' 8C WASTE STOCKPILE

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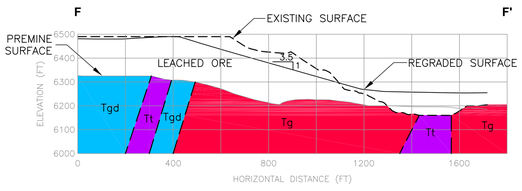

F/2 SECTION F-F' 7B LEACH STOCKPILE

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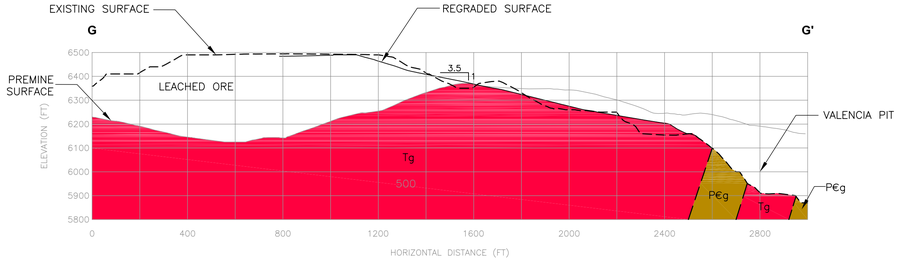

G/2 SECTION G-G' 2C LEACH STOCKPILE

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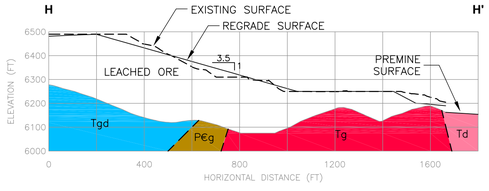


H/2 SECTION H-H' 2B LEACH STOCKPILE

SCALE 300 0 300 600 FEET

LEGEND

INFERRED CONTACT

GEOLOGIC LEGEND

Mine Dumps, Alluvium (Qal), Colluvium	Quaternary
Upper Mangas Conglomerate, Lower Mangas Conglomerate >(Qtg)	Upper Tertiary/ Quaternary
Latite & Basaltic Andesite (Tml), Wind Mountain Ash-flow Tuff (Twt), Volcanics and Volcaniclastics (Tv), Volcanic Rocks (undiff.), Tonalite-Dacite (Tt)	Tertiary
Igneous Breccia, Granodiorite-Tonalite-Dacite (Tg), Diorite/Biotite Diorite (Td), Granodiorite-Quartz Diorite (Tgd)	Tertiary
Andesite\K volcanics, Basal volcanics (K?), Colorado Shale \ Beartooth Quartzite	Cretaceous
Diabase, Granitoid Rocks (PEg)	Precambrian

REFERENCES

1.) GEOLOGY FROM PDTI PROJECT GEOLOGY MAP.

2.) REGRADE TOPOGRAPHY FROM TyroneMineRegrade.dwg PROVIDED BY MONTGOMERY WATSON HARZA.

3.) STOCKPILE GEOTECHNICAL INVESTIGATION REPORTED IN "SUPPLEMENTAL STABILITY STUDY OF WASTE ROCK PILES AND LEACH ORE STOCKPILES, INTERIM REPORT FOR DP1341, CONDITION 78, TYRONE MINE", GOLDER ASSOCIATES, JANUARY 2003.

4.) PRE-1999 TOPOGRAPHIC BASE MAP PROVIDED BY PHELPS DODGE TYRONE, INC.

5.) 8C REGRADE PLAN BASED ON PDTI SECTION.

MATERIAL STRENGTH MATRIX

Material	Moist/Sat Unit weight (pcf)	Cohesion (psi)	Angle of Internal Friction (ϕ, Degrees)
Leached Ore (base case)	120/133	0	35.5
Leached Ore (decrepitated)	120/133	0	Solve for FOS=1.0
Waste Rock (base case)	120/133	0	32.6
Waste Rock (decrepitated)	120/133	0	Solve for FOS=1.0
Qal (recent alluvium)	120/133	0	29
Gila/Mangas Cong. (QTg)	120/133	0	39
Weathered Interface (basal zone)	120/133	0	Solve for FOS=1.0
Granitic Bedrock	160/160	20	35
8C Waste Rock	120/133	0	33.4
8C Buttress	125/135	0	40
8C Basal Soil Zone (Pit floor)	120/133	0	25

Notes:
FOS = factor of safety
pcf = pounds per cubic foot
psi = pounds per square inch

PROJECT
phelps dodge TYRONE Inc.

SUPPLEMENTAL STABILITY ANALYSIS
TYRONE MINE, NEW MEXICO

TITLE

INTERIOR AND IN-PIT STOCKPILE STABILITY ANALYSIS CROSS-SECTIONS

Golder Associates
Tucson, Arizona

PROJECT No.		053-2550	FILE No.		05325500D008
DESIGN	GM	04/26/07	SCALE	AS SHOWN	REV. A
CADD	ANV	04/30/07	FIGURE		2
CHECK	PR	04/30/07			
REVIEW	GM	05/10/07			

Drawing file: 05325500D008.dwg May 11, 2007 - 2:17pm

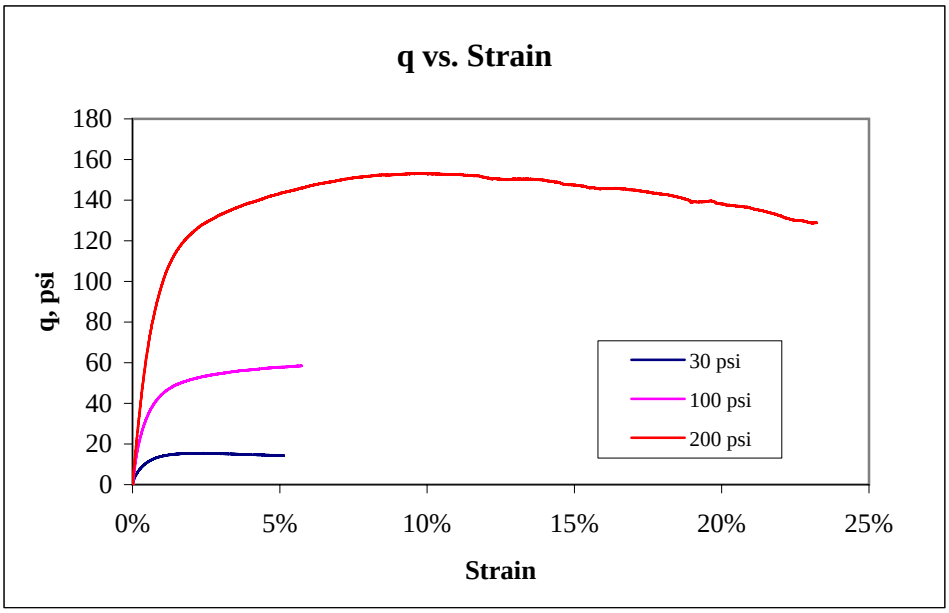
ATTACHMENT 1

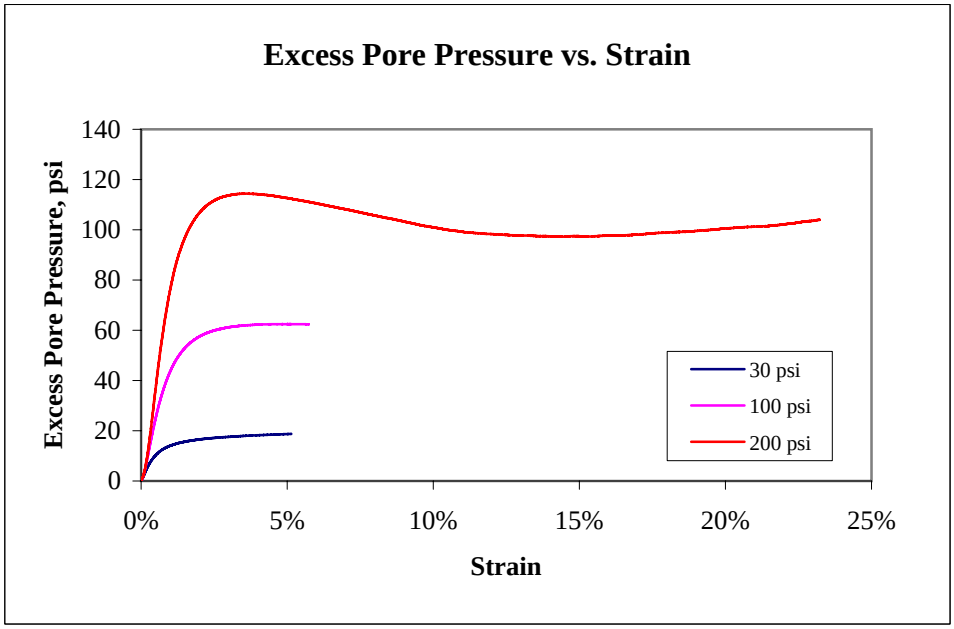
GEOTECHNICAL DATA
BASAL INTERFACE SHEAR-STRENGTH TESTING
BOREHOLE TSGT-04
AT 265 TO 268 FEET

Sample # =	TSTG-04		Sample # =	TSTG-04		Sample # =	TSTG-04	
Point # =	1		Point # =	2		Point # =	3	
	Initial			**Initial**			**Initial**	
Length =	14.67	cm	Length =	14.67	cm	Length =	14.67	cm
Diameter =	7.27	cm	Diameter =	7.27	cm	Diameter =	7.27	cm
Wet Weight =	1235.20	g	Wet Weight =	1235.20	g	Wet Weight =	1235.20	g
Area =	41.5	cm^2	Area =	41.5	cm^2	Area =	41.5	cm^2
Sample Area =	6.43	in^2	Sample Area =	6.43	in^2	Sample Area =	6.43	in^2
Volume =	608.9	cm^3	Volume =	608.9	cm^3	Volume =	608.9	cm^3
Moisture Content =	11.0%		Moisture Content =	11.0%		Moisture Content =	11.0%	
Specific Gravity =	-		Specific Gravity =	-		Specific Gravity =	-	
Dry Weight of Solids =	1112.79	g	Dry Weight of Solids =	1112.79	g	Dry Weight of Solids =	1112.79	g
Wet Unit Weight =	2.03	g/cm^3	Wet Unit Weight =	2.03	g/cm^3	Wet Unit Weight =	2.03	g/cm^3
Dry Unit Weight =	1.83	g/cm^3	Dry Unit Weight =	1.83	g/cm^3	Dry Unit Weight =	1.83	g/cm^3
Wet Unit Weight =	126.6	pcf	Wet Unit Weight =	126.6	pcf	Wet Unit Weight =	126.6	pcf
Dry Unit Weight =	114.0	pcf	Dry Unit Weight =	114.0	pcf	Dry Unit Weight =	114.0	pcf
Cell Pressure =	80	psi	Cell Pressure =	150	psi	Cell Pressure =	250	psi
Back Pressure =	50	psi	Back Pressure =	50	psi	Back Pressure =	50	psi
Confining Pressure =	30	psi	Confining Pressure =	100	psi	Confining Pressure =	200	psi

Notes: Material visually described as sand, reddish-brown, with clay and fine gravel.
Specimen remolded with a light to moderate tamp at visually estimated optimum moisture content.
Failure defined as maximum principal stress ratio.
The strain rate was 0.1mm/min, and t_{50} was 0.1 minutes.
Test was a staged trixial test.

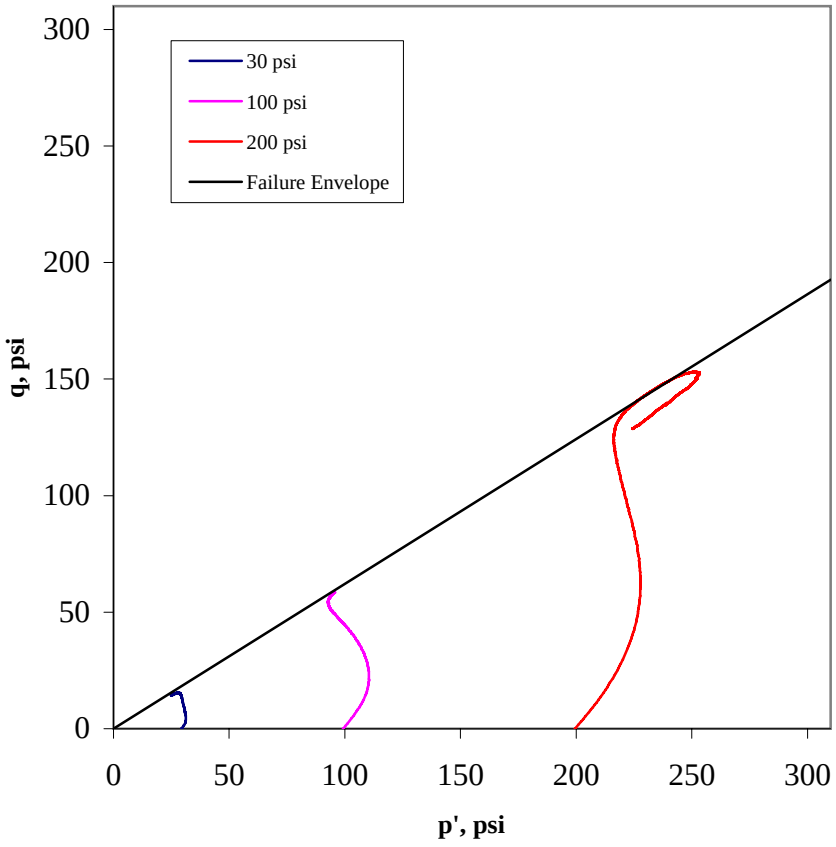
Golder Associates, Inc. **Denver, Colorado**	**Title:** **TRIAXIAL SHEAR TEST REPORT** **SAMPLE DATA AND CALCULATIONS**			
Job Short Title: **PD Tyrone/Stockpile Geotech**				
Sample Number: **TSTG-04 @ 265-268**	**Reviewed:** **JEO**	**Date:** **6/7/2006**	**Job Number:** **053-2550**	**Figure:** **1**





Golder Associates, Inc. **Denver, Colorado**		**Title:** **C-U TRIAXIAL SHEAR DATA** **q AND EXCESS PORE PRESSURE PLOTS**		
Job Short Title: **PD Tyrone/Stockpile Geotech**				
Sample Number: **TSTG-04 @ 265-268**	**Reviewed:** **JEO**	**Date:** **06/07/06**	**Job Number:** **053-2550**	**Figure:** **2**

Stress Path (p'-q) Plot

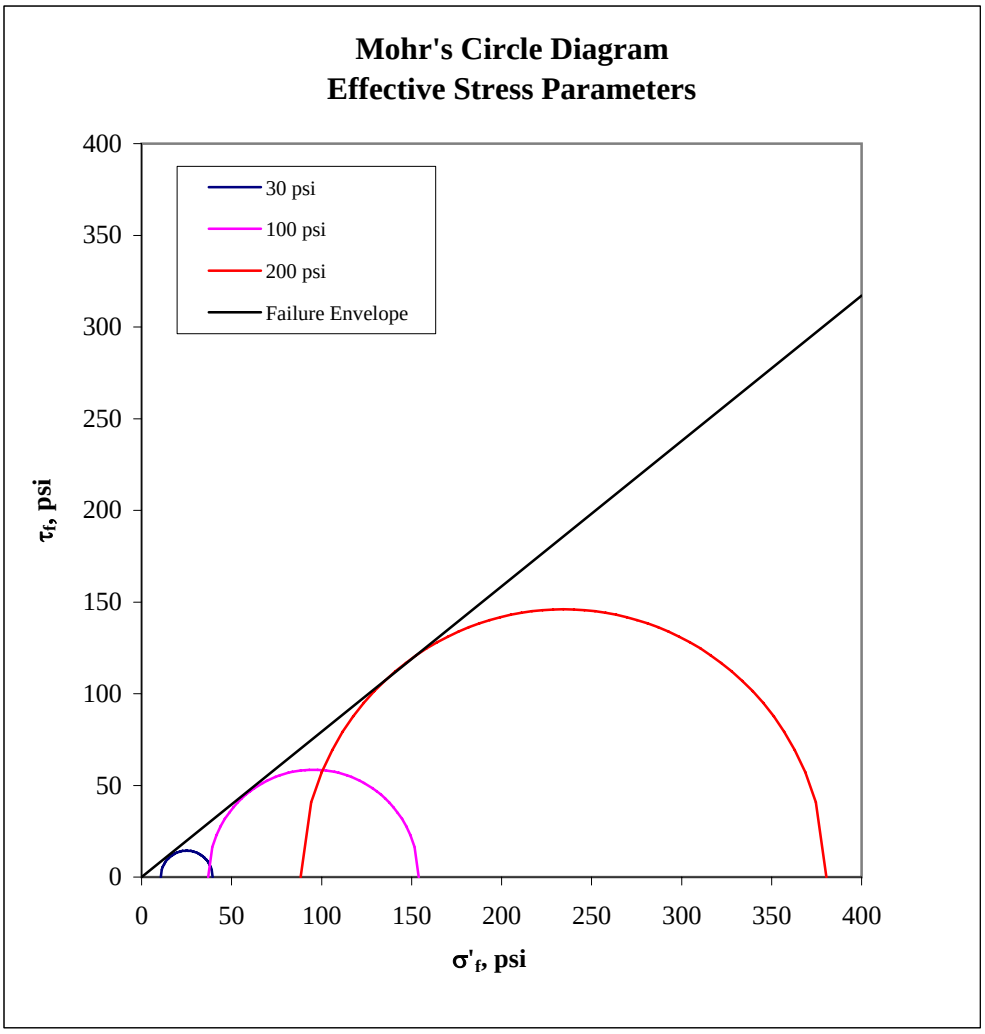


Stress Path Parameters

ψ' = 31.8 degrees

a' = 0.0 psi

Golder Associates, Inc. **Denver, Colorado**		**Title:** **C-U TRIAXIAL SHEAR DATA** **STRESS PATH PLOT**		
Job Short Title: PD Tyrone/Stockpile Geotech				
Sample Number: **TSTG-04 @ 265-268**	**Reviewed:** **JEO**	**Date:** **6/7/2006**	**Job Number:** **053-2550**	**Figure:** **3**



Effective Stress Shear Strength Parameters

ϕ' = 38.4 degrees
c' = 0.0 psi

Golder Associates, Inc. Denver, Colorado		**Title:** C-U TRIAXIAL SHEAR DATA MOHR'S CIRCLE DIAGRAM		
Job Short Title: PD Tyrone/Stockpile Geotech				
Sample Number: TSTG-04 @ 265-268	**Reviewed:** JEO	**Date:** 6/7/2006	**Job Number:** 053-2550	**Figure:** 4

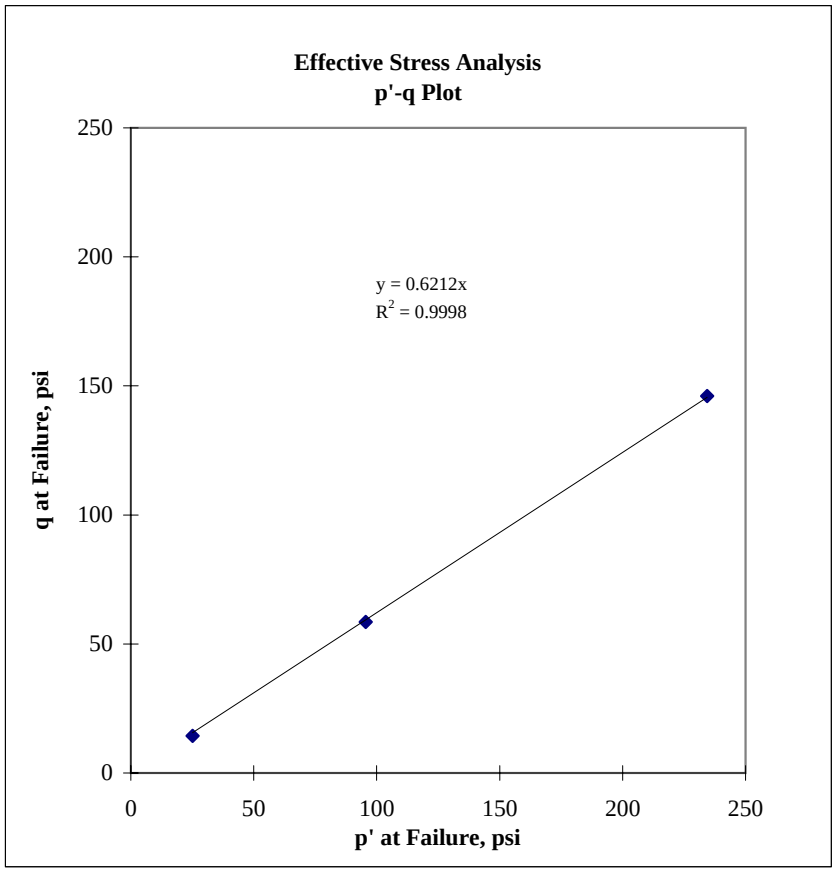
Consolidated-Undrained Triaxial Lab Data
From: GOLDER ASSOCIATES, INC.
Project: **PD Tyrone/Stockpile Geotech**
Project Number: **053-2550**

Sample Number	TSTG-04 @ 265-268
Effective Stress Analysis	

Point Number	p' (psi)	q (psi)
1	25.1	14.4
2	95.5	58.5
3	234.4	146.0

tan(ψ') = **0.6212**
a' = **0.0** **psi**

ϕ' = **38.4** **degrees**
c' = **0.0** **psi**



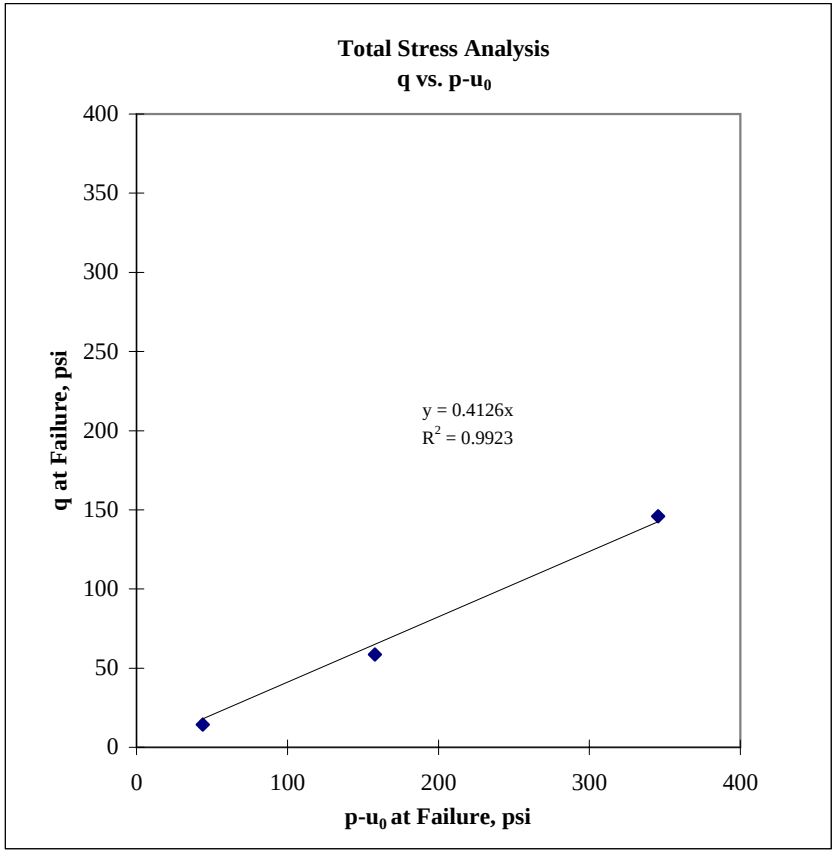
Consolidated-Undrained Triaxial Lab Data
From: GOLDER ASSOCIATES, INC.
Project: **PD Tyrone/Stockpile Geotech**
Project Number: **053-2550**

Sample Number	TSTG-04 @ 265-268
Total Stress Analysis	

Point Number	$p-u_o$ (psi)	q (psi)
1	43.8	14.4
2	157.8	58.5
3	345.5	146.0

$\tan(\psi)$ = 0.4126
a = 0.0 psi

ϕ = 24.4 degrees
c = 0.0 psi



Consolidated-Undrained Triaxial Lab Data
From: GOLDER ASSOCIATES, INC.
Project: **PD Tyrone/Stockpile Geotech**
Project Number: **053-2550**

Mohr-Coulomb Failure Criteria:

$$\tau_{ff} = c' + \sigma'_{ff} \tan(\phi')$$
$$\tau_{ff} = c + \sigma_{ff} \tan(\phi)$$

Where:
c', c = effective and total stress cohesion intercepts

ϕ', ϕ = effective and total stress friction angles

τ_{ff} = shear strength on the failure surface at failure

σ'_{ff}, σ_{ff} = effective and total normal stresses on the failure surface at failure

Stress Path Space:

$$q = \frac{\sigma_1 - \sigma_3}{2} \qquad p' = \frac{\sigma'_1 + \sigma'_3}{2} \qquad p = \frac{\sigma_1 + \sigma_3}{2}$$

Where:
q = maximum shear stress

p', p = mean effective and total stresses

σ'_1, σ_1 = effective and total axial stresses

σ'_3, σ_3 = effective and total confining stresses

Stress Path Failure Criteria:

$$q = a' + p' \tan(\psi')$$
$$q = a + (p - u_0) \tan(\psi)$$

Where:
a', a = intercepts of the q-axis in effective stress and total stress spaces

ψ', ψ = angles of the failure envelopes in effective stress and total stress spaces

q = maximum shear stress at failure

p' = mean effective stress at failure

$p-u_0$ = mean total stress at failure minus the initial pore pressure

The relationships between ψ and ϕ and a and c are as follows:

$$\tan(\psi) = \sin(\phi)$$
$$a = c \cos(\phi)$$

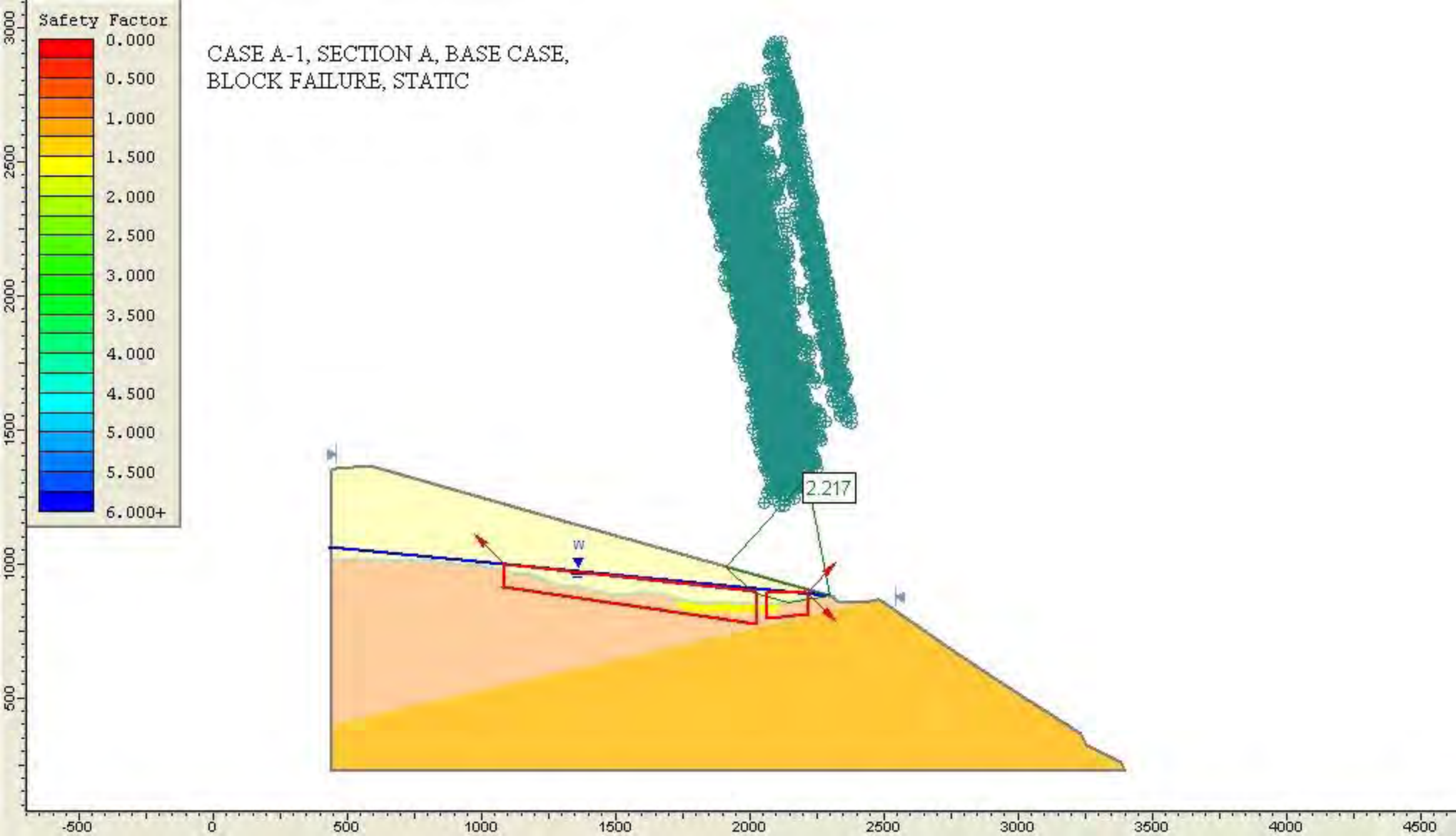
The relationships between ψ' and ϕ' and a' and c' are as follows:

$$\tan(\psi') = \sin(\phi')$$
$$a' = c' \cos(\phi')$$


PD TYRONE/STOCKPILE GEOTEC
053-2550
TSTG=4 @265-268
STAGED TRIAXIAL SHEAR TEST
Golder Associates, Inc.
Denver, Colorado

ATTACHMENT 2

STABILITY MODEL OUTPUT


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE A-1, SECTION A, BASE CASE,
BLOCK FAILURE, STATIC
2.217
W
3000
2500
2000
1500
1000
500
-500
0
500
1000
1500
2000
2500
3000
3500
4000
4500

Slide Analysis Information
Case A-1, Section A, Base Case
Block Failure, Static

Document Name

File Name: SEC-A-BAS_B_P.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): -45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Waste Rock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Material: Qal
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 2.216520
Axis Location: 2214.737, 1327.280
Left Slip Surface Endpoint: 1911.757, 992.102
Right Slip Surface Endpoint: 2301.091, 883.789
Resisting Moment=5.40377e+008 lb-ft
Driving Moment=2.43795e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4977
Number of Invalid Surfaces: 23
Error Codes:
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 21 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

List of All Coordinates

Material Boundary

2314.714	877.830
2318.833	868.390

Material Boundary

444.603	406.320
2486.603	867.072

Material Boundary

444.603	1016.678
778.843	1008.001
801.628	1011.719
930.798	992.830
1003.814	991.555
1134.400	961.813
1184.160	960.878
1287.103	917.830
1366.363	911.427
1508.366	879.563
1648.978	895.441
1714.507	866.950
1844.878	849.115
1899.368	859.012
1952.062	848.639
1966.705	853.541
2085.988	845.717
2122.423	850.463
2255.746	867.830
2294.519	886.664

Material Boundary

444.603	1026.698
779.091	1018.011
802.295	1021.715

934.613 1002.479
1003.377 1001.548
1135.723 971.791
1185.851 970.792
1290.168 927.453
1367.748 921.417
1508.559 889.580
1652.887 904.695
1716.093 876.826
1845.566 859.100
1901.285 868.873
1951.586 859.025
1965.318 863.623
2085.564 855.718
2252.780 877.538
2276.933 889.269

Material Boundary
2336.149 857.830
2397.411 857.755

Material Boundary
1714.507 866.950
1765.721 821.319
1898.193 821.319
2086.063 821.319
2122.423 850.463

External Boundary
3402.045 227.830
3383.722 259.787
3255.036 327.580
3238.120 367.830
2970.385 537.830
2714.178 707.830
2486.603 867.072
2475.385 867.830
2421.159 857.830
2408.449 857.209
2397.411 857.755
2395.880 857.830
2346.094 857.830
2336.149 857.830
2318.833 868.390
2316.428 873.988
2314.714 877.830
2294.519 886.664
2276.933 889.269
1370.131 1144.623
586.556 1367.830
461.847 1356.045
444.603 1354.451
444.603 1026.698
444.603 1016.678
444.603 406.320
444.603 227.830

Water Table

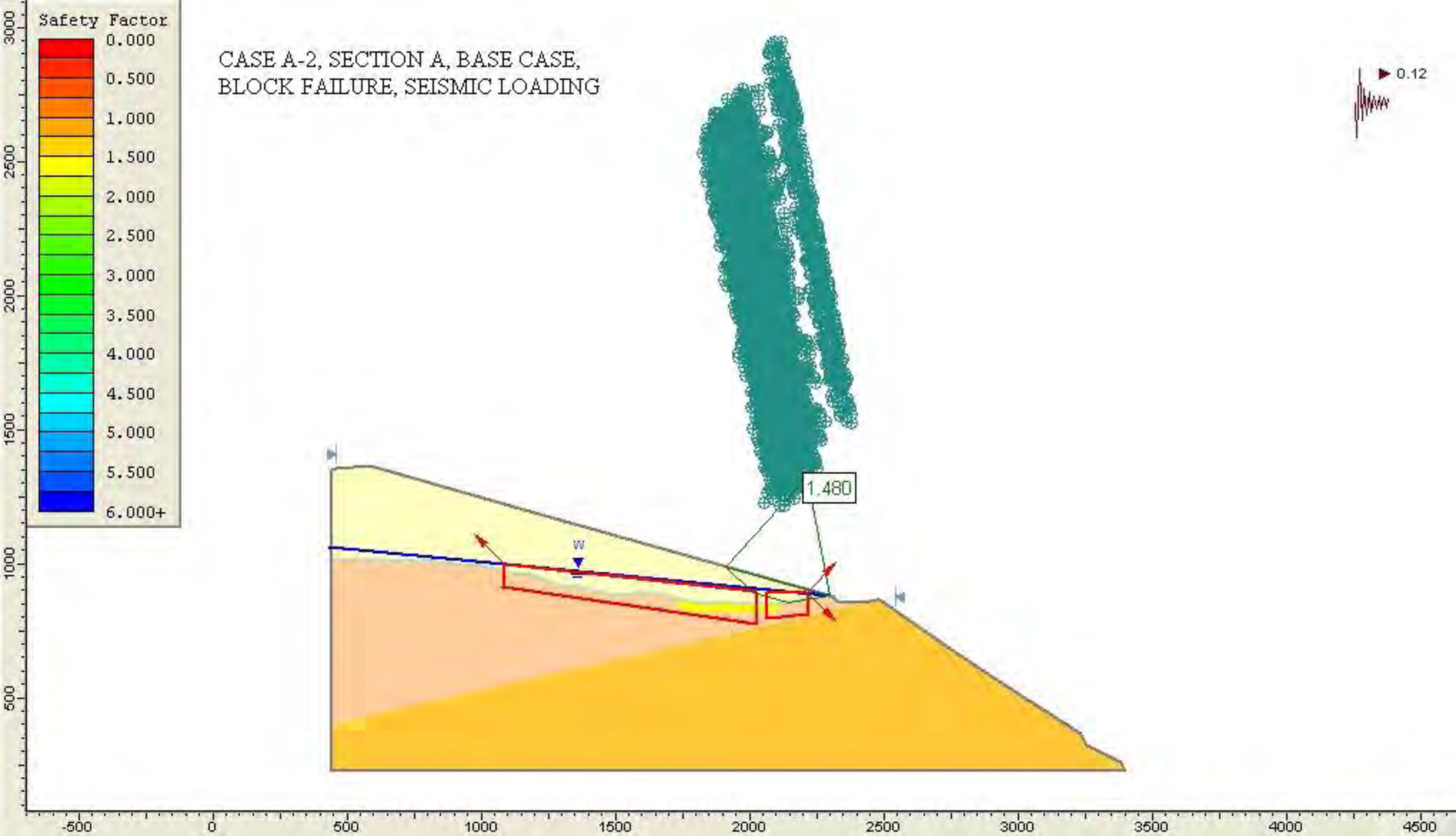
434.232	1067.564
2296.607	886.267

Focus/Block Search Window

2212.566	893.654
2065.437	897.525
2067.373	800.730
2222.245	814.282

Focus/Block Search Window

1087.806	1002.064
1080.063	916.884
2026.719	779.435
2024.783	899.461


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE A-2, SECTION A, BASE CASE,
BLOCK FAILURE, SEISMIC LOADING
0.12
1.480
W
3000
2500
2000
1500
1000
500
-500
0
500
1000
1500
2000
2500
3000
3500
4000
4500

Slide Analysis Information
CASE A-2, SECTION A, BASE CASE, BLOCK FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-A-BAS_B_P.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): -45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Waste Rock
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Material: Qal
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 1.480400
Axis Location: 2214.737, 1327.280
Left Slip Surface Endpoint: 1911.757, 992.102
Right Slip Surface Endpoint: 2301.091, 883.789
Resisting Moment=5.22047e+008 lb-ft
Driving Moment=3.5264e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4975

Number of Invalid Surfaces: 25
Error Codes:
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 21 surfaces
Error Code -111 reported for 2 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-111 = safety factor equation did not converge

List of All Coordinates

Material Boundary

2314.714	877.830
2318.833	868.390

Material Boundary

444.603	406.320
2486.603	867.072

Material Boundary

444.603	1016.678
778.843	1008.001
801.628	1011.719
930.798	992.830
1003.814	991.555
1134.400	961.813
1184.160	960.878
1287.103	917.830
1366.363	911.427
1508.366	879.563
1648.978	895.441
1714.507	866.950
1844.878	849.115
1899.368	859.012
1952.062	848.639
1966.705	853.541
2085.988	845.717
2122.423	850.463

2255.746 867.830
2294.519 886.664

Material Boundary
444.603 1026.698
779.091 1018.011
802.295 1021.715
934.613 1002.479
1003.377 1001.548
1135.723 971.791
1185.851 970.792
1290.168 927.453
1367.748 921.417
1508.559 889.580
1652.887 904.695
1716.093 876.826
1845.566 859.100
1901.285 868.873
1951.586 859.025
1965.318 863.623
2085.564 855.718
2252.780 877.538
2276.933 889.269

Material Boundary
2336.149 857.830
2397.411 857.755

Material Boundary
1714.507 866.950
1765.721 821.319
1898.193 821.319
2086.063 821.319
2122.423 850.463

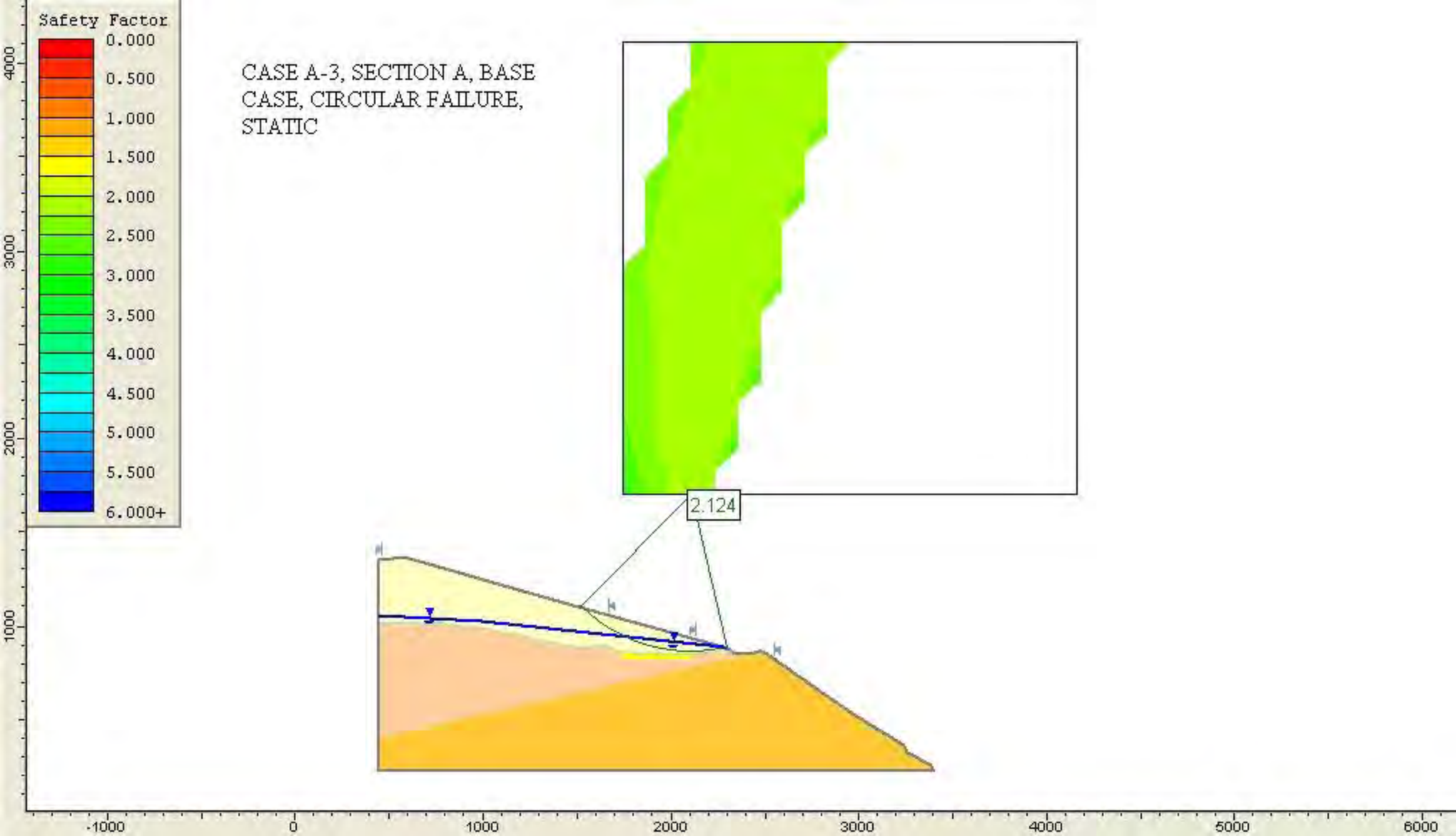
External Boundary
3402.045 227.830
3383.722 259.787
3255.036 327.580
3238.120 367.830
2970.385 537.830
2714.178 707.830
2486.603 867.072
2475.385 867.830
2421.159 857.830
2408.449 857.209
2397.411 857.755
2395.880 857.830
2346.094 857.830
2336.149 857.830
2318.833 868.390
2316.428 873.988
2314.714 877.830
2294.519 886.664
2276.933 889.269
1370.131 1144.623

586.556 1367.830
461.847 1356.045
444.603 1354.451
444.603 1026.698
444.603 1016.678
444.603 406.320
444.603 227.830

Water Table
434.232 1067.564
2296.607 886.267

Focus/Block Search Window
2212.566 893.654
2065.437 897.525
2067.373 800.730
2222.245 814.282

Focus/Block Search Window
1087.806 1002.064
1080.063 916.884
2026.719 779.435
2024.783 899.461


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE A-3, SECTION A, BASE CASE, CIRCULAR FAILURE, STATIC
2.124
4000
3000
2000
1000
-1000
0
1000
2000
3000
4000
5000
6000

Slide Analysis Information
CASE A-3, SECTION A, BASE CASE, CIRCULAR FAILURE, STATIC

Document Name

File Name: SEC-A-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Material Properties

Material: Waste Rock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Material: Qal
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 2.124000
Center: 2110.012, 1704.592
Radius: 843.398
Left Slip Surface Endpoint: 1519.293, 1102.619
Right Slip Surface Endpoint: 2302.082, 883.356
Resisting Moment=3.10878e+009 lb-ft
Driving Moment=1.46365e+009 lb-ft

Method: janbu simplified
FS: 2.026830
Center: 2110.012, 1704.592
Radius: 843.398
Left Slip Surface Endpoint: 1519.293, 1102.619
Right Slip Surface Endpoint: 2302.082, 883.356
Resisting Horizontal Force=3.43824e+006 lb
Driving Horizontal Force=1.69637e+006 lb

Valid / Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 1610
Number of Invalid Surfaces: 3241
Error Codes:
Error Code -110 reported for 7 surfaces
Error Code -1000 reported for 3234 surfaces

Method: janbu simplified
Number of Valid Surfaces: 1610
Number of Invalid Surfaces: 3241
Error Codes:
Error Code -110 reported for 7 surfaces
Error Code -1000 reported for 3234 surfaces

Error Codes

The following errors were encountered during the computation:

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

-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1748.503	1704.592
4158.559	1704.592
4158.559	4114.648
1748.503	4114.648

Material Boundary

2314.714	877.830
2318.833	868.390

Material Boundary

444.603	406.320
2486.603	867.072

Material Boundary

444.603	1016.678
778.843	1008.001
801.628	1011.719
930.798	992.830
1003.814	991.555
1134.400	961.813
1184.160	960.878
1287.103	917.830
1366.363	911.427
1508.366	879.563

1648.978 895.441
1714.507 866.950
1844.878 849.115
1899.368 859.012
1952.062 848.639
1966.705 853.541
2085.988 845.717
2122.423 850.463
2255.746 867.830
2294.519 886.664

Material Boundary
444.603 1026.698
779.091 1018.011
802.295 1021.715
934.613 1002.479
1003.377 1001.548
1135.723 971.791
1185.851 970.792
1290.168 927.453
1367.748 921.417
1508.559 889.580
1652.887 904.695
1716.093 876.826
1845.566 859.100
1901.285 868.873
1951.586 859.025
1965.318 863.623
2085.564 855.718
2252.780 877.538
2276.933 889.269

Material Boundary
2336.149 857.830
2397.411 857.755

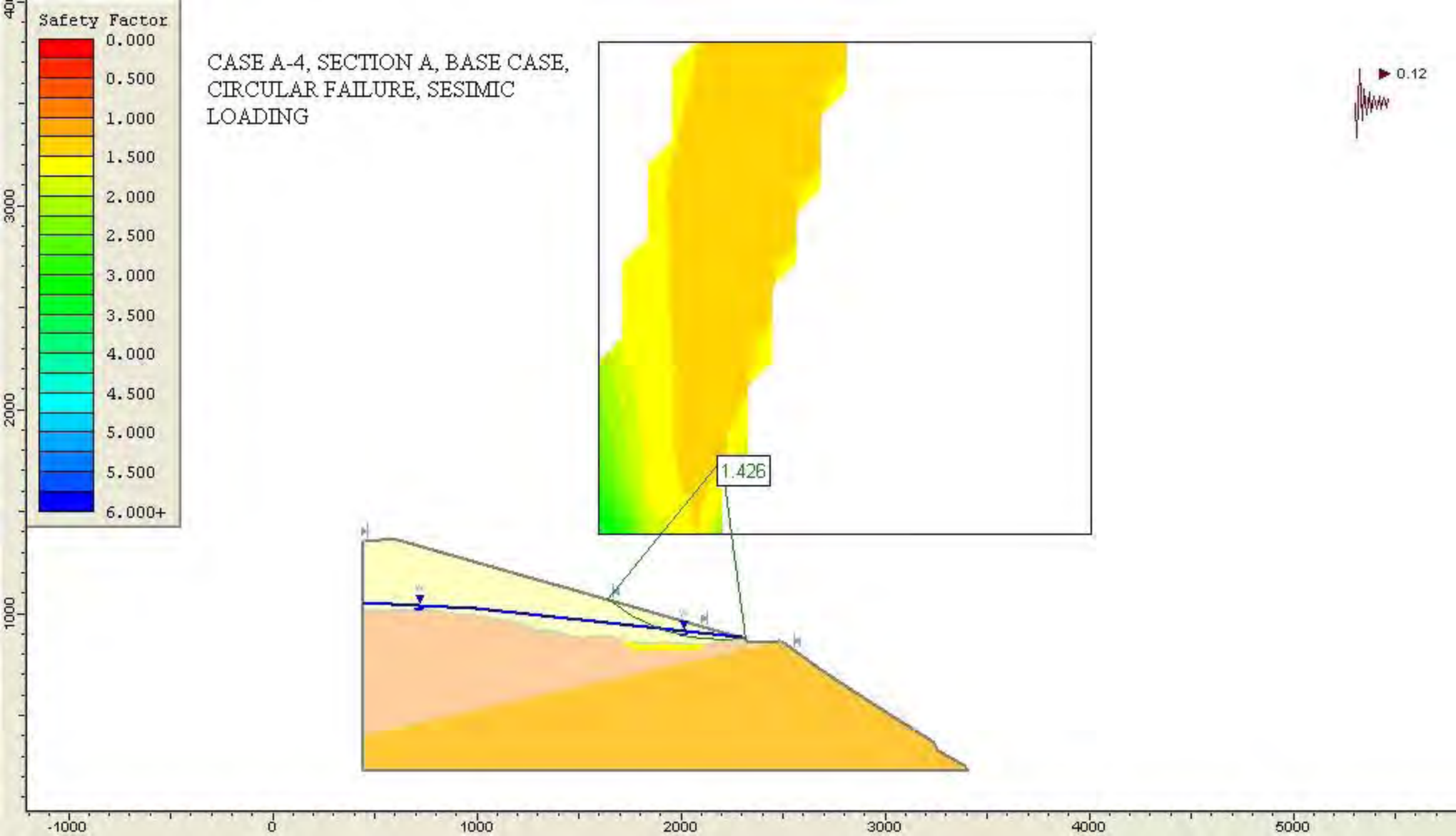
Material Boundary
1714.507 866.950
1765.721 821.319
1898.193 821.319
2086.063 821.319
2122.423 850.463

External Boundary
3402.045 227.830
3383.722 259.787
3255.036 327.580
3238.120 367.830
2970.385 537.830
2714.178 707.830
2486.603 867.072
2475.385 867.830
2421.159 857.830
2408.449 857.209
2397.411 857.755
2395.880 857.830

2346.094	857.830
2336.149	857.830
2318.833	868.390
2316.428	873.988
2314.714	877.830
2294.519	886.664
2276.933	889.269
1370.131	1144.623
586.556	1367.830
461.847	1356.045
444.603	1354.451
444.603	1026.698
444.603	1016.678
444.603	406.320
444.603	227.830

Water Table

444.603	1057.890
994.281	1027.633
2276.933	889.269
2294.519	886.664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0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE A-4, SECTION A, BASE CASE, CIRCULAR FAILURE, SESIMIC LOADING
0.12
1.426
4000
3000
2000
1000
-1000
0
1000
2000
3000
4000
5000

Slide Analysis Information
CASE A-4, SECTION A, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-A-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Waste Rock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3

Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Material: Qal
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.426290
Center: 2199.094, 1754.658
Radius: 886.506
Left Slip Surface Endpoint: 1636.373, 1069.649
Right Slip Surface Endpoint: 2315.601, 875.842
Resisting Moment=2.02707e+009 lb-ft
Driving Moment=1.42122e+009 lb-ft

Method: janbu simplified
FS: 1.346430
Center: 2078.592, 1513.653
Radius: 657.201
Left Slip Surface Endpoint: 1579.966, 1085.533
Right Slip Surface Endpoint: 2281.570, 888.582
Resisting Horizontal Force=3.09428e+006 lb
Driving Horizontal Force=2.29813e+006 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 1644
Number of Invalid Surfaces: 3207
Error Codes:
Error Code -109 reported for 1 surface
Error Code -110 reported for 5 surfaces
Error Code -1000 reported for 3201 surfaces

Method: janbu simplified
Number of Valid Surfaces: 1644
Number of Invalid Surfaces: 3207
Error Codes:
Error Code -109 reported for 1 surface
Error Code -110 reported for 5 surfaces
Error Code -1000 reported for 3201 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1596.580	1393.150
4006.636	1393.150
4006.636	3803.206
1596.580	3803.206

Material Boundary

2314.714	877.830
2318.833	868.390

Material Boundary

444.603	406.320

2486.603 867.072

Material Boundary
444.603 1016.678
778.843 1008.001
801.628 1011.719
930.798 992.830
1003.814 991.555
1134.400 961.813
1184.160 960.878
1287.103 917.830
1366.363 911.427
1508.366 879.563
1648.978 895.441
1714.507 866.950
1844.878 849.115
1899.368 859.012
1952.062 848.639
1966.705 853.541
2085.988 845.717
2122.423 850.463
2255.746 867.830
2294.519 886.664

Material Boundary
444.603 1026.698
779.091 1018.011
802.295 1021.715
934.613 1002.479
1003.377 1001.548
1135.723 971.791
1185.851 970.792
1290.168 927.453
1367.748 921.417
1508.559 889.580
1652.887 904.695
1716.093 876.826
1845.566 859.100
1901.285 868.873
1951.586 859.025
1965.318 863.623
2085.564 855.718
2252.780 877.538
2276.933 889.269

Material Boundary
2336.149 857.830
2397.411 857.755

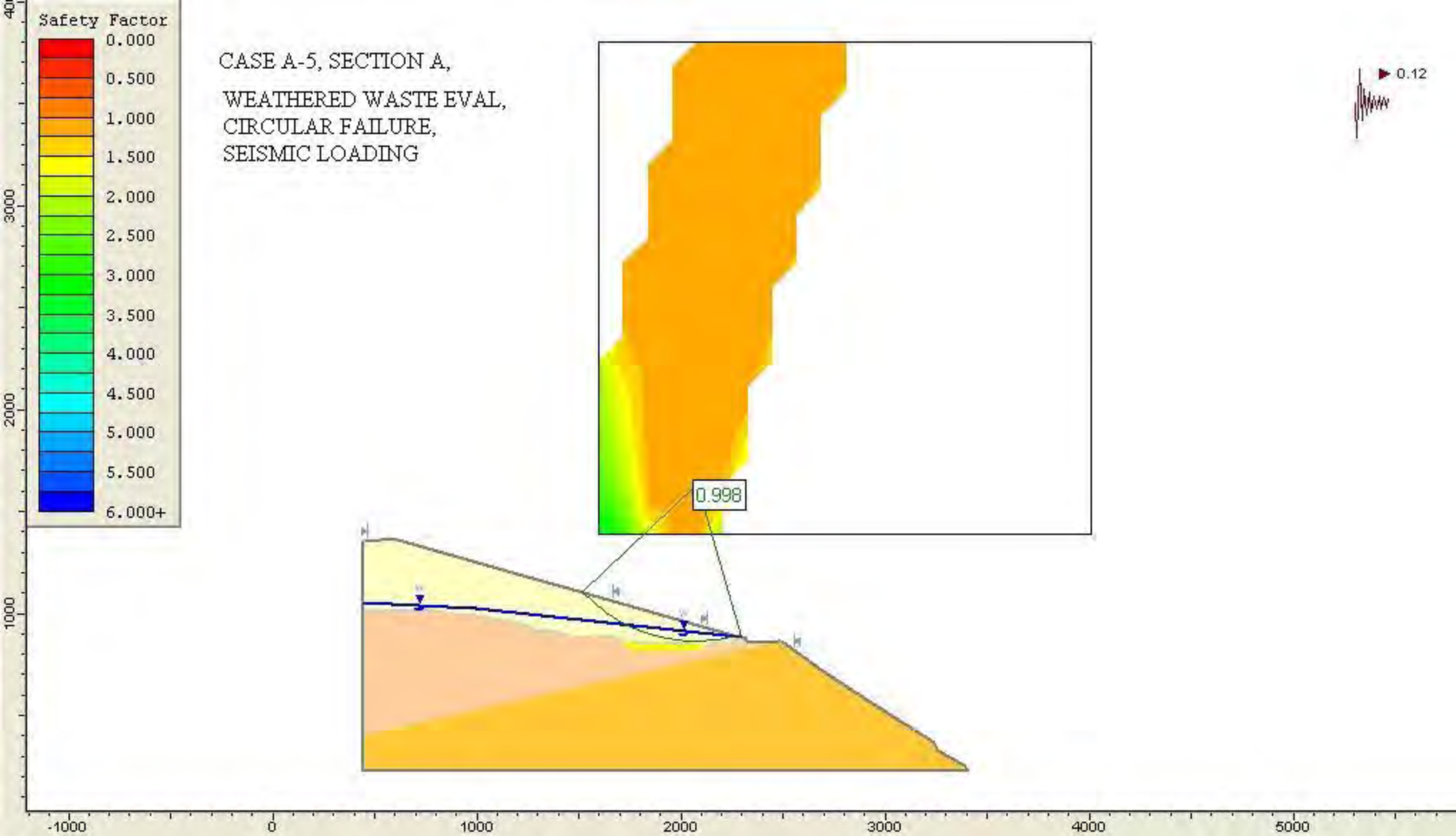
Material Boundary
1714.507 866.950
1765.721 821.319
1898.193 821.319
2086.063 821.319
2122.423 850.463

External Boundary

3402.045	227.830
3383.722	259.787
3255.036	327.580
3238.120	367.830
2970.385	537.830
2714.178	707.830
2486.603	867.072
2475.385	867.830
2421.159	857.830
2408.449	857.209
2397.411	857.755
2395.880	857.830
2346.094	857.830
2336.149	857.830
2318.833	868.390
2316.428	873.988
2314.714	877.830
2294.519	886.664
2276.933	889.269
1370.131	1144.623
586.556	1367.830
461.847	1356.045
444.603	1354.451
444.603	1026.698
444.603	1016.678
444.603	406.320
444.603	227.830

Water Table

444.603	1057.890
994.281	1027.633
2276.933	889.269
2294.519	886.664


Safety Factor
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0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE A-5, SECTION A,
WEATHERED WASTE EVAL,
CIRCULAR FAILURE,
SEISMIC LOADING
0.12
0.998
4000
3000
2000
1000
-1000
0
1000
2000
3000
4000
5000

Slide Analysis Information
CASE A-5, SECTION A, WEATHERED WASTE EVAL, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-A-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Waste Rock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3

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

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 24 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Material: Qal
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 0.997858
Center: 2078.592, 1634.156
Radius: 776.303
Left Slip Surface Endpoint: 1510.485, 1105.099
Right Slip Surface Endpoint: 2290.324, 887.285
Resisting Moment=2.07e+009 lb-ft
Driving Moment=2.07445e+009 lb-ft

Method: janbu simplified
FS: 0.937397
Center: 2078.592, 1513.653
Radius: 657.201
Left Slip Surface Endpoint: 1579.966, 1085.533
Right Slip Surface Endpoint: 2281.570, 888.582
Resisting Horizontal Force=2.1539e+006 lb
Driving Horizontal Force=2.29774e+006 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 1644
Number of Invalid Surfaces: 3207
Error Codes:
Error Code -109 reported for 1 surface
Error Code -110 reported for 5 surfaces
Error Code -1000 reported for 3201 surfaces

Method: janbu simplified
Number of Valid Surfaces: 1644
Number of Invalid Surfaces: 3207
Error Codes:
Error Code -109 reported for 1 surface
Error Code -110 reported for 5 surfaces
Error Code -1000 reported for 3201 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1596.580	1393.150
4006.636	1393.150
4006.636	3803.206
1596.580	3803.206

Material Boundary

2314.714	877.830
2318.833	868.390

Material Boundary

444.603	406.320

2486.603 867.072

Material Boundary
444.603 1016.678
778.843 1008.001
801.628 1011.719
930.798 992.830
1003.814 991.555
1134.400 961.813
1184.160 960.878
1287.103 917.830
1366.363 911.427
1508.366 879.563
1648.978 895.441
1714.507 866.950
1844.878 849.115
1899.368 859.012
1952.062 848.639
1966.705 853.541
2085.988 845.717
2122.423 850.463
2255.746 867.830
2294.519 886.664

Material Boundary
444.603 1026.698
779.091 1018.011
802.295 1021.715
934.613 1002.479
1003.377 1001.548
1135.723 971.791
1185.851 970.792
1290.168 927.453
1367.748 921.417
1508.559 889.580
1652.887 904.695
1716.093 876.826
1845.566 859.100
1901.285 868.873
1951.586 859.025
1965.318 863.623
2085.564 855.718
2252.780 877.538
2276.933 889.269

Material Boundary
2336.149 857.830
2397.411 857.755

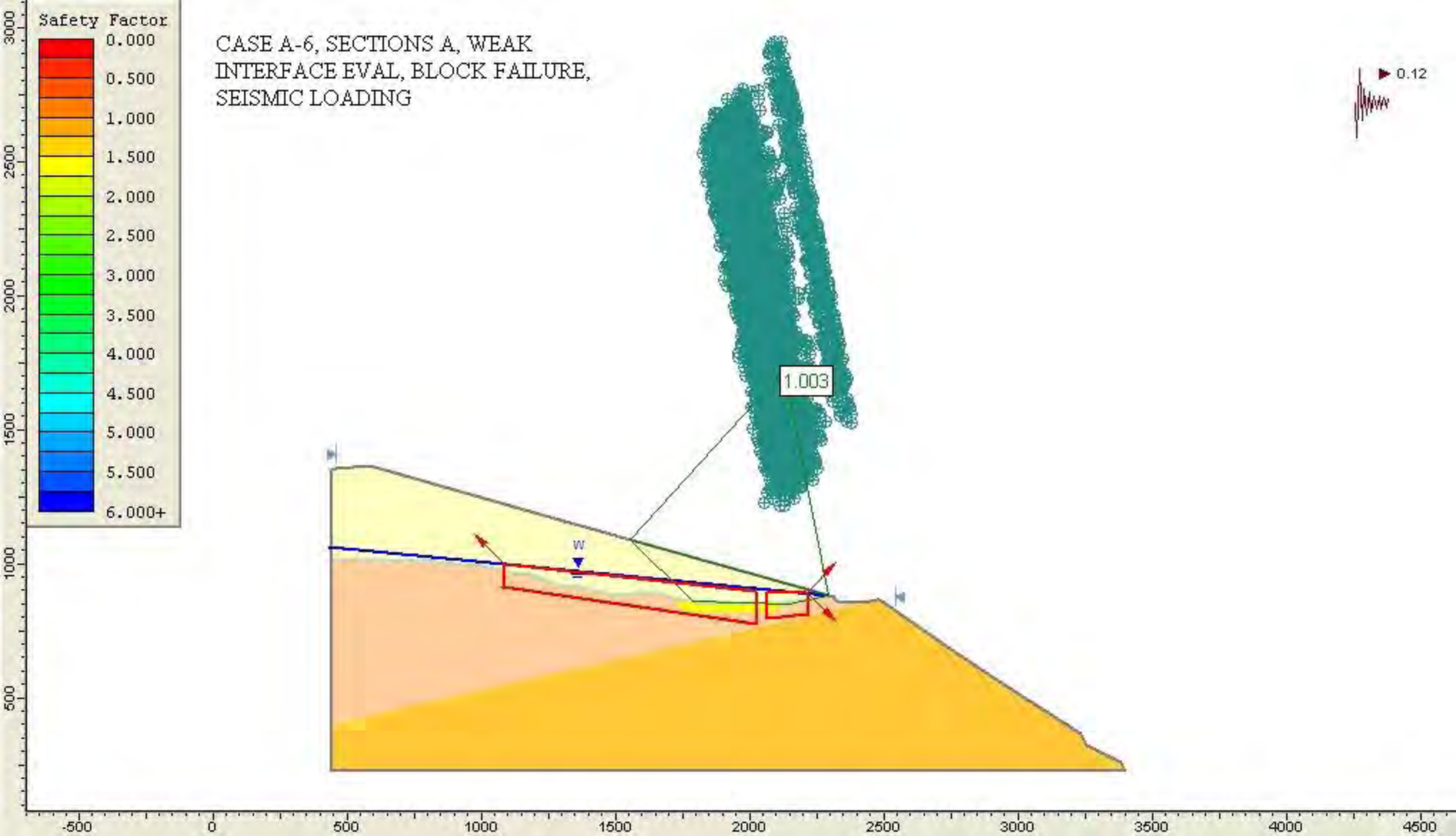
Material Boundary
1714.507 866.950
1765.721 821.319
1898.193 821.319
2086.063 821.319
2122.423 850.463

External Boundary

3402.045	227.830
3383.722	259.787
3255.036	327.580
3238.120	367.830
2970.385	537.830
2714.178	707.830
2486.603	867.072
2475.385	867.830
2421.159	857.830
2408.449	857.209
2397.411	857.755
2395.880	857.830
2346.094	857.830
2336.149	857.830
2318.833	868.390
2316.428	873.988
2314.714	877.830
2294.519	886.664
2276.933	889.269
1370.131	1144.623
586.556	1367.830
461.847	1356.045
444.603	1354.451
444.603	1026.698
444.603	1016.678
444.603	406.320
444.603	227.830

Water Table

444.603	1057.890
994.281	1027.633
2276.933	889.269
2294.519	886.664


Safety Factor
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0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE A-6, SECTIONS A, WEAK
INTERFACE EVAL, BLOCK FAILURE,
SEISMIC LOADING
0.12
1.003
W
3000
2500
2000
1500
1000
500
-500
0
500
1000
1500
2000
2500
3000
3500
4000
4500

Slide Analysis Information
CASE A-6, SECTIONS A, WEAK INTERFACE EVAL, BLOCK FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-A-BAS_B_P.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): -45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Waste Rock
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 18 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Material: Qal
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 1.003280
Axis Location: 2129.398, 1727.303
Left Slip Surface Endpoint: 1555.019, 1092.558
Right Slip Surface Endpoint: 2292.566, 886.953
Resisting Moment=2.32619e+009 lb-ft
Driving Moment=2.3186e+009 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4975

Number of Invalid Surfaces: 25
Error Codes:
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 21 surfaces
Error Code -111 reported for 2 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-111 = safety factor equation did not converge

List of All Coordinates

Material Boundary

2314.714	877.830
2318.833	868.390

Material Boundary

444.603	406.320
2486.603	867.072

Material Boundary

444.603	1016.678
778.843	1008.001
801.628	1011.719
930.798	992.830
1003.814	991.555
1134.400	961.813
1184.160	960.878
1287.103	917.830
1366.363	911.427
1508.366	879.563
1648.978	895.441
1714.507	866.950
1844.878	849.115
1899.368	859.012
1952.062	848.639
1966.705	853.541
2085.988	845.717
2122.423	850.463

2255.746 867.830
2294.519 886.664

Material Boundary
444.603 1026.698
779.091 1018.011
802.295 1021.715
934.613 1002.479
1003.377 1001.548
1135.723 971.791
1185.851 970.792
1290.168 927.453
1367.748 921.417
1508.559 889.580
1652.887 904.695
1716.093 876.826
1845.566 859.100
1901.285 868.873
1951.586 859.025
1965.318 863.623
2085.564 855.718
2252.780 877.538
2276.933 889.269

Material Boundary
2336.149 857.830
2397.411 857.755

Material Boundary
1714.507 866.950
1765.721 821.319
1898.193 821.319
2086.063 821.319
2122.423 850.463

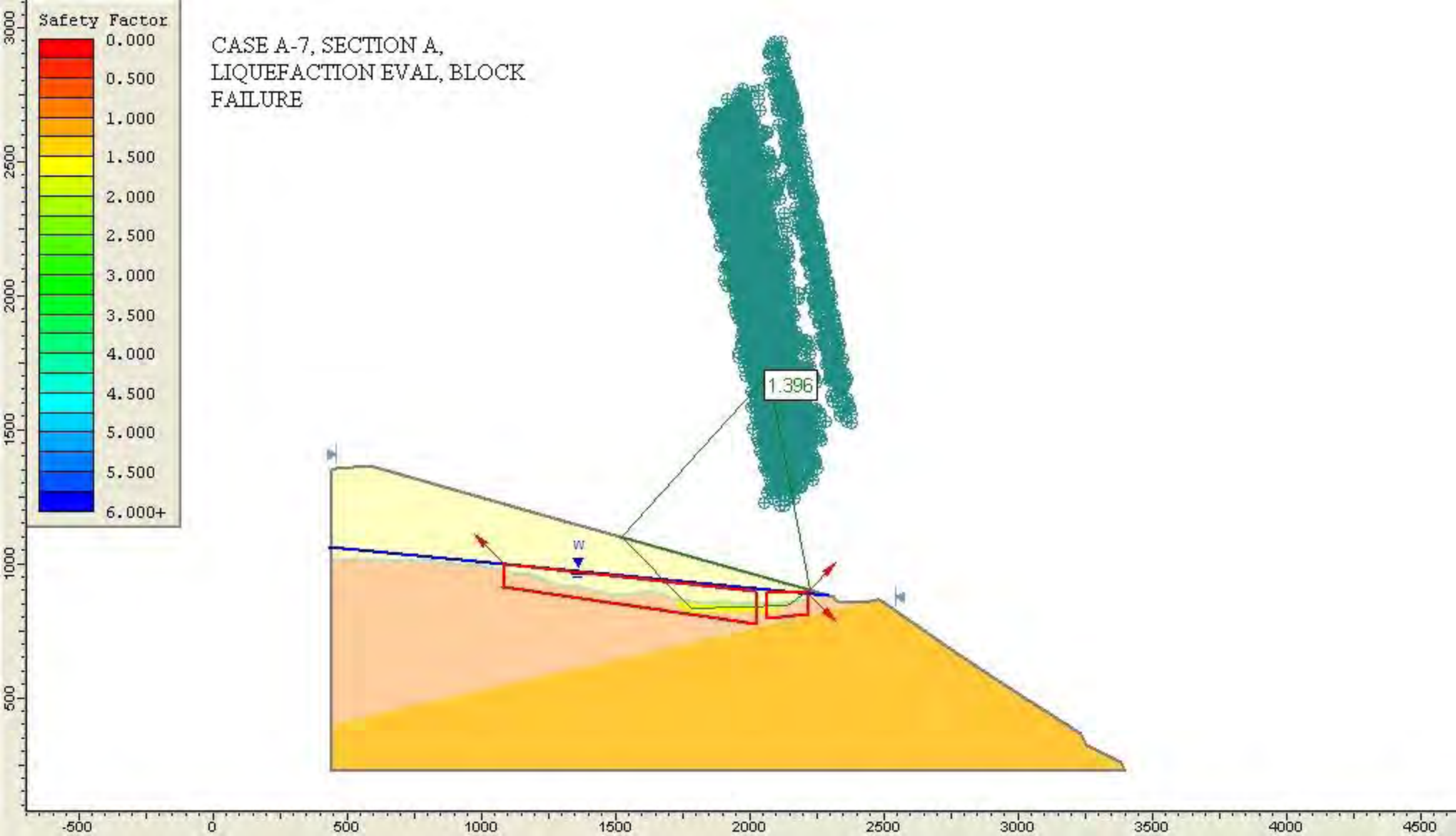
External Boundary
3402.045 227.830
3383.722 259.787
3255.036 327.580
3238.120 367.830
2970.385 537.830
2714.178 707.830
2486.603 867.072
2475.385 867.830
2421.159 857.830
2408.449 857.209
2397.411 857.755
2395.880 857.830
2346.094 857.830
2336.149 857.830
2318.833 868.390
2316.428 873.988
2314.714 877.830
2294.519 886.664
2276.933 889.269
1370.131 1144.623

586.556 1367.830
461.847 1356.045
444.603 1354.451
444.603 1026.698
444.603 1016.678
444.603 406.320
444.603 227.830

Water Table
434.232 1067.564
2296.607 886.267

Focus/Block Search Window
2212.566 893.654
2065.437 897.525
2067.373 800.730
2222.245 814.282

Focus/Block Search Window
1087.806 1002.064
1080.063 916.884
2026.719 779.435
2024.783 899.461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0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE A-7, SECTION A,
LIQUEFACTION EVAL, BLOCK
FAILURE
1.396
W
3000
2500
2000
1500
1000
500
-500
0
500
1000
1500
2000
2500
3000
3500
4000
4500

Slide Analysis Information
CASE A-7, LIQUEFACTION EVAL, BLOCK FAILURE

Document Name

File Name: SEC-A-BAS_B_P.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): -45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Waste Rock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Material: Qal
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 8 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 1.395880
Axis Location: 2070.980, 1706.925
Left Slip Surface Endpoint: 1520.855, 1102.179
Right Slip Surface Endpoint: 2224.702, 903.977
Resisting Moment=2.30236e+009 lb-ft
Driving Moment=1.64939e+009 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4977
Number of Invalid Surfaces: 23
Error Codes:
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 21 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

List of All Coordinates

Material Boundary

2314.714	877.830
2318.833	868.390

Material Boundary

444.603	406.320
2486.603	867.072

Material Boundary

444.603	1016.678
778.843	1008.001
801.628	1011.719
930.798	992.830
1003.814	991.555
1134.400	961.813
1184.160	960.878
1287.103	917.830
1366.363	911.427
1508.366	879.563
1648.978	895.441
1714.507	866.950
1844.878	849.115
1899.368	859.012
1952.062	848.639
1966.705	853.541
2085.988	845.717
2122.423	850.463
2255.746	867.830
2294.519	886.664

Material Boundary

444.603	1026.698
779.091	1018.011
802.295	1021.715

934.613 1002.479
1003.377 1001.548
1135.723 971.791
1185.851 970.792
1290.168 927.453
1367.748 921.417
1508.559 889.580
1652.887 904.695
1716.093 876.826
1845.566 859.100
1901.285 868.873
1951.586 859.025
1965.318 863.623
2085.564 855.718
2252.780 877.538
2276.933 889.269

Material Boundary
2336.149 857.830
2397.411 857.755

Material Boundary
1714.507 866.950
1765.721 821.319
1898.193 821.319
2086.063 821.319
2122.423 850.463

External Boundary
3402.045 227.830
3383.722 259.787
3255.036 327.580
3238.120 367.830
2970.385 537.830
2714.178 707.830
2486.603 867.072
2475.385 867.830
2421.159 857.830
2408.449 857.209
2397.411 857.755
2395.880 857.830
2346.094 857.830
2336.149 857.830
2318.833 868.390
2316.428 873.988
2314.714 877.830
2294.519 886.664
2276.933 889.269
1370.131 1144.623
586.556 1367.830
461.847 1356.045
444.603 1354.451
444.603 1026.698
444.603 1016.678
444.603 406.320
444.603 227.830

Water Table

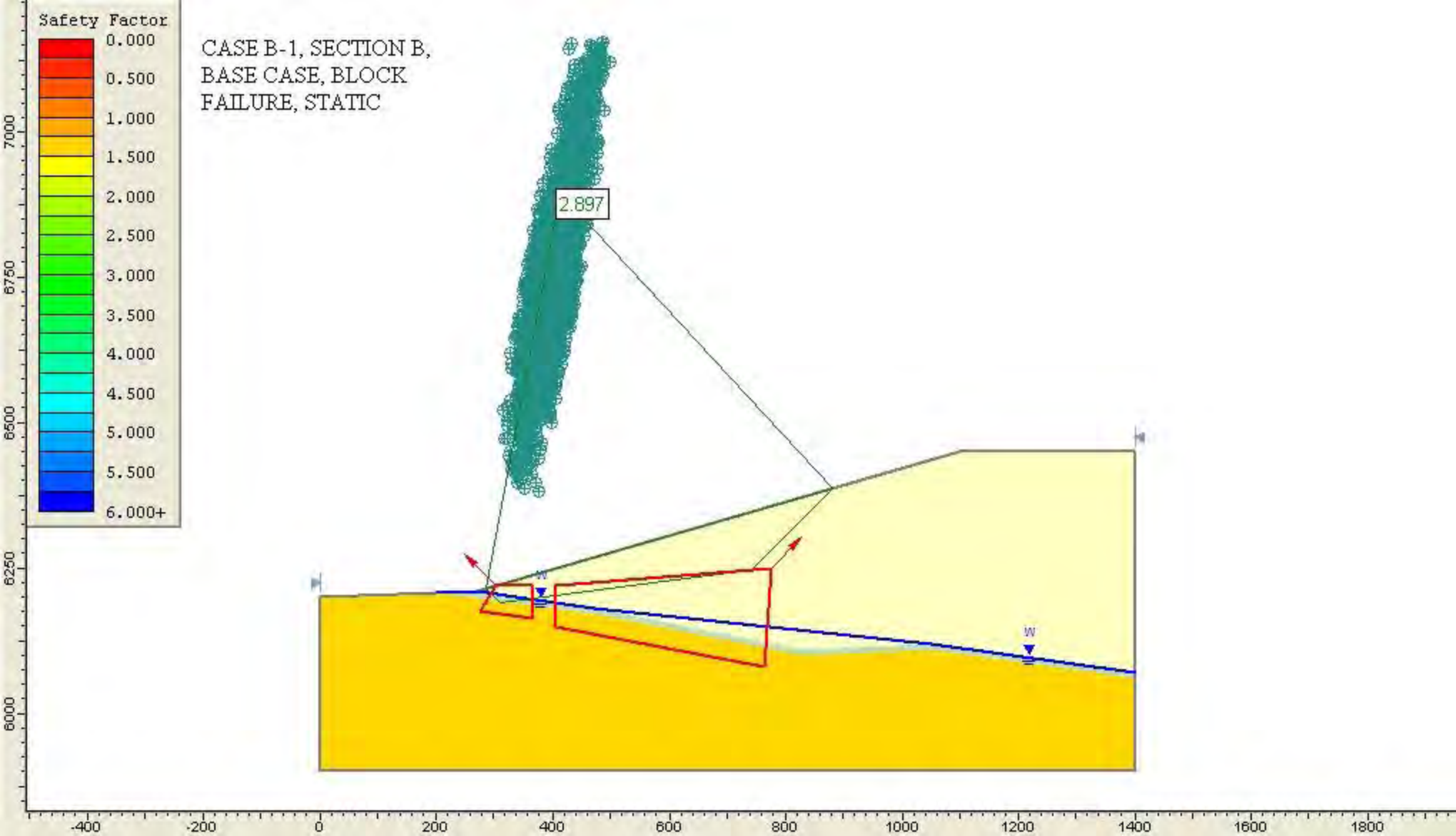
434.232	1067.564
2296.607	886.267

Focus/Block Search Window

2212.566	893.654
2065.437	897.525
2067.373	800.730
2222.245	814.282

Focus/Block Search Window

1087.806	1002.064
1080.063	916.884
2026.719	779.435
2024.783	899.461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0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE B-1, SECTION B,
BASE CASE, BLOCK
FAILURE, STATIC
2.897
W
W
7000
6750
6500
6250
6000
-400
-200
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information
CASE B-1, SECTION B, BASE CASE, BLOCK FAILURE, STATIC

Document Name

File Name: Sec B 1B.sli

Project Settings

Project Title: Section B-B', 1B Leach
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: QTg
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 2.896690
Axis Location: 411.307, 6895.935
Left Slip Surface Endpoint: 285.792, 6214.566
Right Slip Surface Endpoint: 881.093, 6386.702
Resisting Moment=2.11015e+009 lb-ft
Driving Moment=7.28467e+008 lb-ft

Valid / Invalid Surfaces

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

List of All Coordinates

Material Boundary

270.000	6210.000
470.000	6180.000
830.000	6110.000
1050.000	6120.000
1400.000	6070.000

Material Boundary

200.000	6207.000
470.000	6170.000
830.000	6100.000
1050.000	6110.000
1400.000	6060.000

External Boundary

1400.000	5900.000
1400.000	6060.000
1400.000	6070.000

1400.000	6450.000
1100.000	6450.000
270.000	6210.000
200.000	6207.000
0.000	6200.000
0.000	5900.000

Water Table

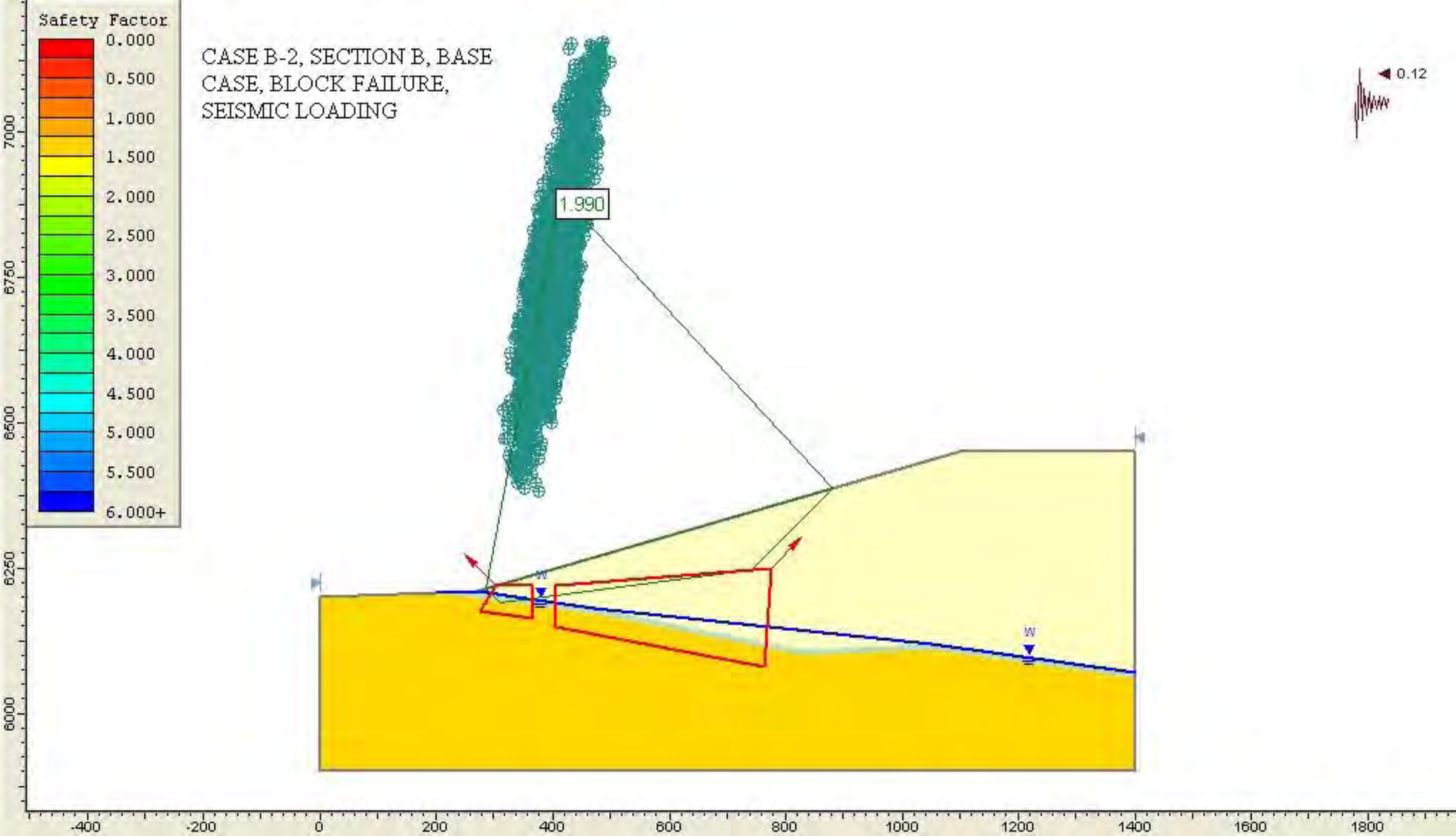
200.000	6207.000
270.000	6210.000
470.000	6180.000
1050.000	6120.000
1400.000	6070.000

Focus/Block Search Window

275.266	6175.793
365.493	6162.903
365.493	6219.617
302.907	6219.515

Focus/Block Search Window

404.162	6150.014
762.492	6080.410
775.381	6250.552
404.162	6219.617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0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE B-2, SECTION B, BASE CASE, BLOCK FAILURE, SEISMIC LOADING
1.990
0.12
W
W
7000
6750
6500
6250
6000
-400
-200
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information
CASE B-2, SECTION B, BASE CASE, BLOCK FAILURE, SEISMIC LOADING

Document Name

File Name: Sec B 1B.sli

Project Settings

Project Title: Section B-B', 1B Leach
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: QTg
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.989500
Axis Location: 411.307, 6895.935
Left Slip Surface Endpoint: 285.792, 6214.566
Right Slip Surface Endpoint: 881.093, 6386.702
Resisting Moment=2.05438e+009 lb-ft
Driving Moment=1.03261e+009 lb-ft

Valid / Invalid Surfaces

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

List of All Coordinates

Material Boundary

270.000	6210.000
470.000	6180.000
830.000	6110.000
1050.000	6120.000
1400.000	6070.000

Material Boundary

200.000	6207.000
470.000	6170.000
830.000	6100.000
1050.000	6110.000
1400.000	6060.000

External Boundary

1400.000	5900.000
1400.000	6060.000
1400.000	6070.000
1400.000	6450.000
1100.000	6450.000
270.000	6210.000
200.000	6207.000
0.000	6200.000
0.000	5900.000

Water Table

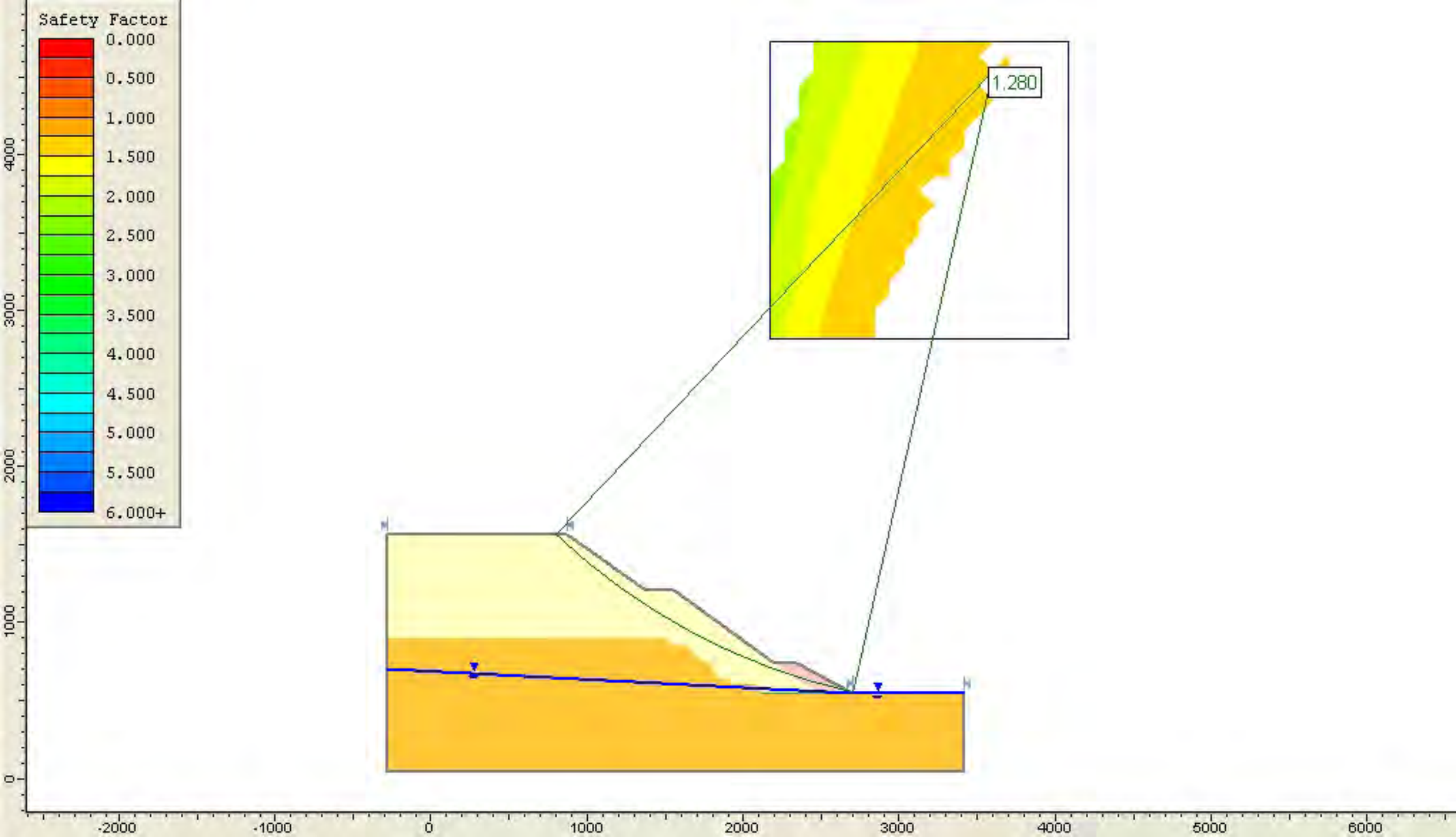
200.000	6207.000
270.000	6210.000
470.000	6180.000
1050.000	6120.000
1400.000	6070.000

Focus/Block Search Window

275.266	6175.793
365.493	6162.903
365.493	6219.617
302.907	6219.515

Focus/Block Search Window

404.162	6150.014
762.492	6080.410
775.381	6250.552
404.162	6219.617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0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
1.280
4000
3000
2000
1000
0
-2000
-1000
0
1000
2000
3000
4000
5000
6000

Slide Analysis Information
CASE B-3, SECTION B, BASE CASE, CIRCULAR FAILURE, STATIC

Document Name

File Name: Sec B 1B.sli

Project Settings

Project Title: Section B-B', 1B Leach
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: QTg
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 2.527370
Center: 225.869, 7186.393
Radius: 977.389
Left Slip Surface Endpoint: 270.000, 6210.000
Right Slip Surface Endpoint: 709.639, 6337.125
Resisting Moment=6.71778e+008 lb-ft
Driving Moment=2.65801e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 3351
Number of Invalid Surfaces: 1500
Error Codes:
Error Code -101 reported for 49 surfaces
Error Code -103 reported for 32 surfaces
Error Code -1000 reported for 1419 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

127.820	6565.415
781.480	6565.415
781.480	7219.076
127.820	7219.076

Material Boundary

270.000	6210.000
470.000	6180.000
830.000	6110.000
1050.000	6120.000
1400.000	6070.000

Material Boundary

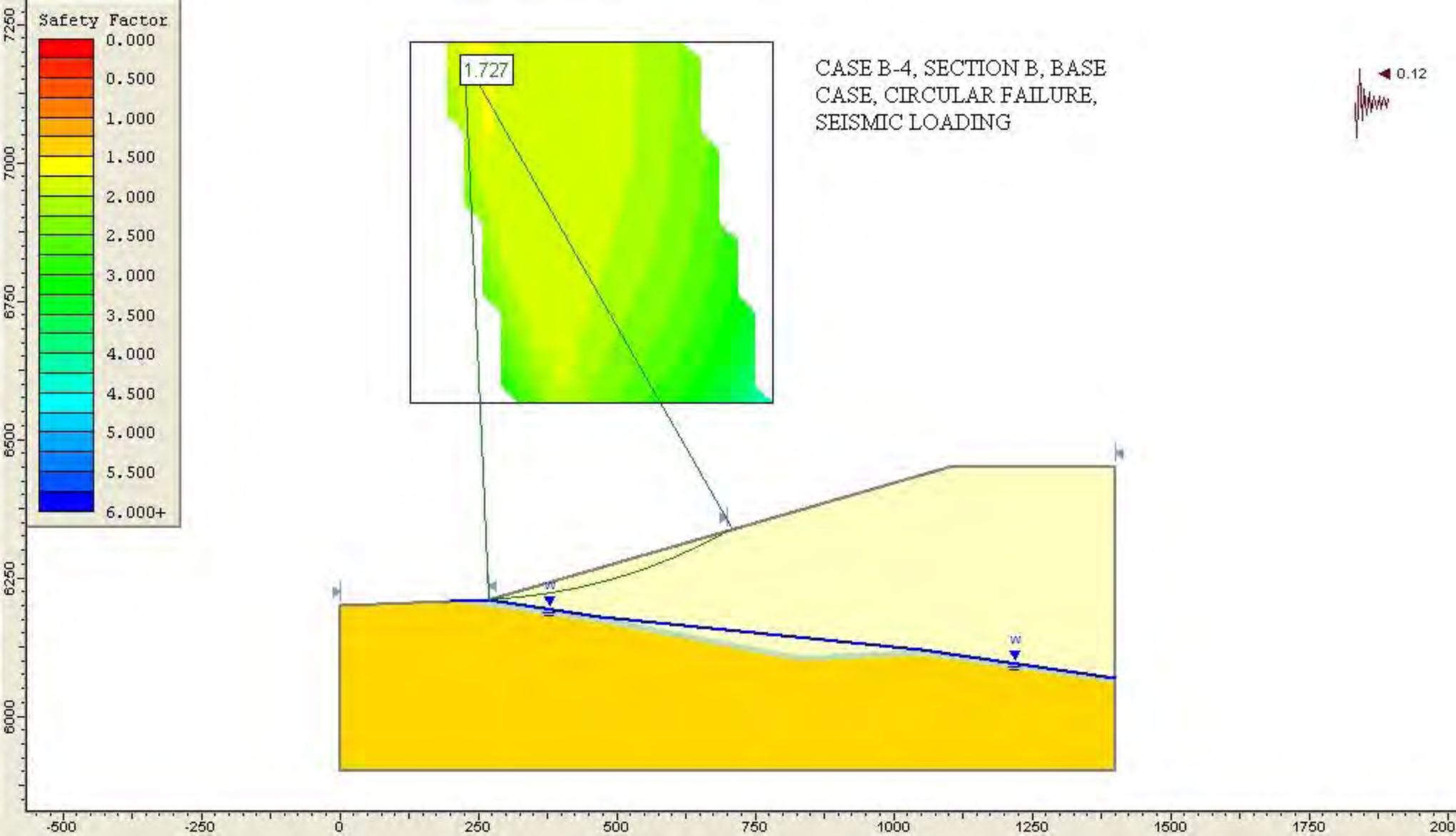
200.000	6207.000
470.000	6170.000
830.000	6100.000
1050.000	6110.000
1400.000	6060.000

External Boundary

1400.000	5900.000
1400.000	6060.000
1400.000	6070.000
1400.000	6450.000
1100.000	6450.000
270.000	6210.000
200.000	6207.000
0.000	6200.000
0.000	5900.000

Water Table

200.000	6207.000
270.000	6210.000
470.000	6180.000
1050.000	6120.000
1400.000	6070.000


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
1.727
CASE B-4, SECTION B, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING
0.12
7250
7000
6750
6500
6250
6000
-500
-250
0
250
500
750
1000
1250
1500
1750
2000

Slide Analysis Information
CASE B-4, SECTION B, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: Sec B 1B.sli

Project Settings

Project Title: Section B-B', 1B Leach
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf

Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: QTg
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.726550
Center: 225.869, 7186.393
Radius: 977.389
Left Slip Surface Endpoint: 270.000, 6210.000
Right Slip Surface Endpoint: 709.639, 6337.125
Resisting Moment=6.49381e+008 lb-ft
Driving Moment=3.76116e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 3351
Number of Invalid Surfaces: 1500
Error Codes:
Error Code -101 reported for 49 surfaces
Error Code -103 reported for 32 surfaces
Error Code -1000 reported for 1419 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

127.820	6565.415
781.480	6565.415
781.480	7219.076
127.820	7219.076

Material Boundary

270.000	6210.000
470.000	6180.000
830.000	6110.000
1050.000	6120.000
1400.000	6070.000

Material Boundary

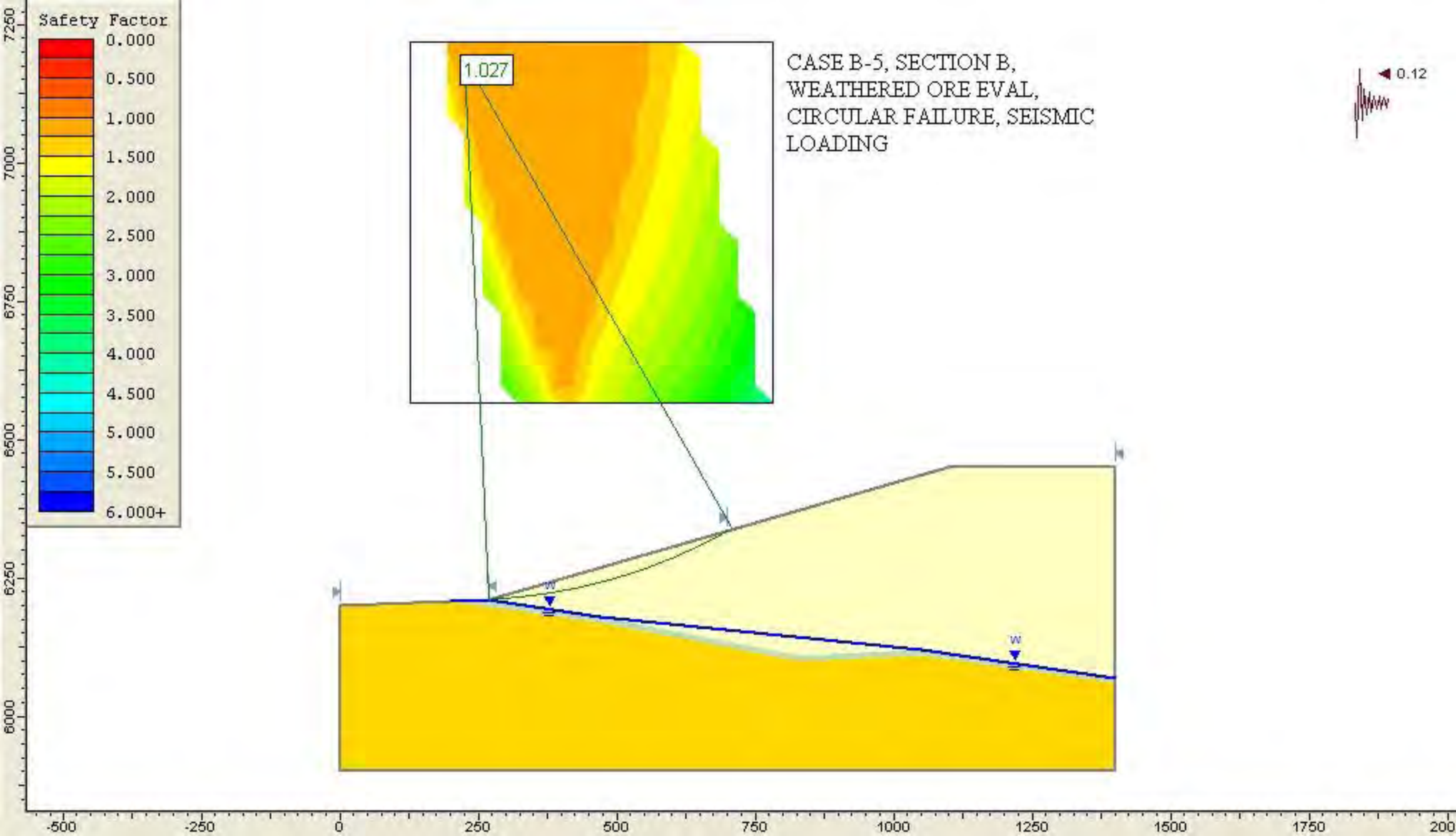
200.000	6207.000
470.000	6170.000
830.000	6100.000
1050.000	6110.000
1400.000	6060.000

External Boundary

1400.000	5900.000
1400.000	6060.000
1400.000	6070.000
1400.000	6450.000
1100.000	6450.000
270.000	6210.000
200.000	6207.000
0.000	6200.000
0.000	5900.000

Water Table

200.000	6207.000
270.000	6210.000
470.000	6180.000
1050.000	6120.000
1400.000	6070.000


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
1.027
CASE B-5, SECTION B,
WEATHERED ORE EVAL,
CIRCULAR FAILURE, SEISMIC
LOADING
0.12
7250
7000
6750
6500
6250
6000
-500
-250
0
250
500
750
1000
1250
1500
1750
2000

Slide Analysis Information
CASE B-5, SECTION B, WEATHERED ORE EVAL, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: Sec B 1B.sli

Project Settings

Project Title: Section B-B', 1B Leach
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf

Friction Angle: 23 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: QTg
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.027230
Center: 225.869, 7186.393
Radius: 977.389
Left Slip Surface Endpoint: 270.000, 6210.000
Right Slip Surface Endpoint: 709.639, 6337.125
Resisting Moment=3.86358e+008 lb-ft
Driving Moment=3.76116e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 3351
Number of Invalid Surfaces: 1500
Error Codes:
Error Code -101 reported for 49 surfaces
Error Code -103 reported for 32 surfaces
Error Code -1000 reported for 1419 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

127.820	6565.415
781.480	6565.415
781.480	7219.076
127.820	7219.076

Material Boundary

270.000	6210.000
470.000	6180.000
830.000	6110.000
1050.000	6120.000
1400.000	6070.000

Material Boundary

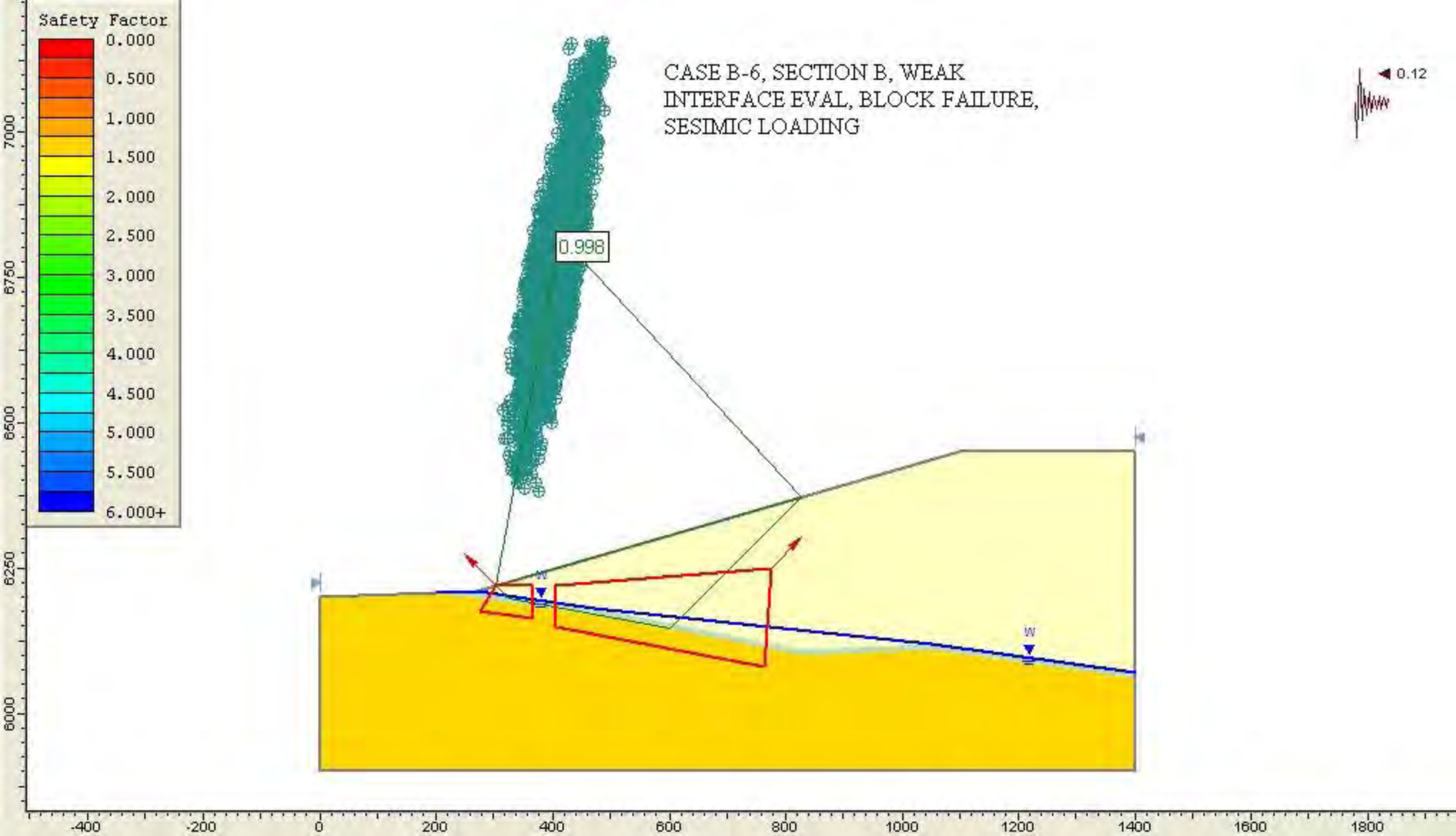
200.000	6207.000
470.000	6170.000
830.000	6100.000
1050.000	6110.000
1400.000	6060.000

External Boundary

1400.000	5900.000
1400.000	6060.000
1400.000	6070.000
1400.000	6450.000
1100.000	6450.000
270.000	6210.000
200.000	6207.000
0.000	6200.000
0.000	5900.000

Water Table

200.000	6207.000
270.000	6210.000
470.000	6180.000
1050.000	6120.000
1400.000	6070.000


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE B-6, SECTION B, WEAK INTERFACE EVAL, BLOCK FAILURE, SESIMIC LOADING
0.12
0.998
W
W
7000
6750
6500
6250
6000
-400
-200
0
200
400
600
800
1000
1200
1400
1600
1800

Slide Analysis Information
CASE B-6, SECTION B, WEAK INTERFACE EVAL, BLOCK FAILURE, SESIMIC LOADING

Document Name

File Name: Sec B 1B.sli

Project Settings

Project Title: Section B-B', 1B Leach
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: QTg
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 0.998182
Axis Location: 412.598, 6820.887
Left Slip Surface Endpoint: 301.758, 6219.183
Right Slip Surface Endpoint: 827.457, 6371.192
Resisting Moment=9.49213e+008 lb-ft
Driving Moment=9.50941e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4986
Number of Invalid Surfaces: 14
Error Codes:
Error Code -112 reported for 14 surfaces

Error Codes

The following errors were encountered during the computation:

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

List of All Coordinates

Material Boundary

270.000	6210.000
470.000	6180.000
830.000	6110.000
1050.000	6120.000
1400.000	6070.000

Material Boundary

200.000	6207.000
470.000	6170.000
830.000	6100.000
1050.000	6110.000
1400.000	6060.000

External Boundary

1400.000	5900.000
1400.000	6060.000
1400.000	6070.000
1400.000	6450.000
1100.000	6450.000
270.000	6210.000
200.000	6207.000
0.000	6200.000
0.000	5900.000

Water Table

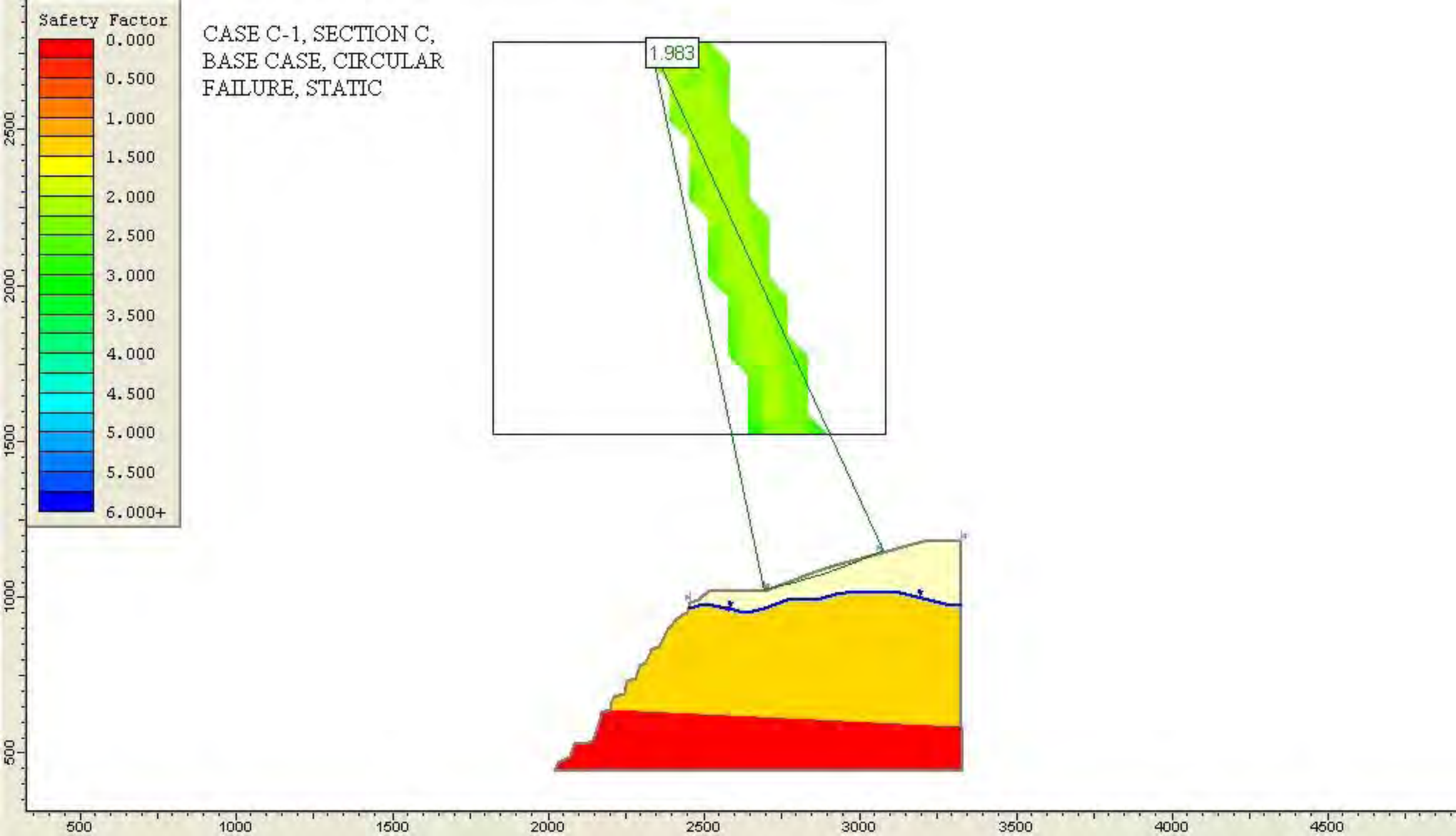
200.000	6207.000
270.000	6210.000
470.000	6180.000
1050.000	6120.000
1400.000	6070.000

Focus/Block Search Window

275.266	6175.793
365.493	6162.903
365.493	6219.617
302.907	6219.515

Focus/Block Search Window

404.162	6150.014
762.492	6080.410
775.381	6250.552
404.162	6219.617


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE C-1, SECTION C,
BASE CASE, CIRCULAR
FAILURE, STATIC
1.983
500
1000
1500
2000
2500
3000
3500
4000
4500

Slide Analysis Information
CASE C-1, SECTION C, BASE CASE, CIRCULAR FAILURE, STATIC

Document Name

File Name: SEC-C-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: None

Material: Interface

Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.982870
Center: 2325.942, 2781.649
Radius: 1800.591
Left Slip Surface Endpoint: 2691.215, 1018.497
Right Slip Surface Endpoint: 3074.585, 1144.071
Resisting Moment=6.66642e+008 lb-ft
Driving Moment=3.362e+008 lb-ft

Method: janbu simplified
FS: 1.977760
Center: 2325.942, 2781.649
Radius: 1800.591
Left Slip Surface Endpoint: 2691.215, 1018.497
Right Slip Surface Endpoint: 3074.585, 1144.071
Resisting Horizontal Force=351867 lb
Driving Horizontal Force=177912 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 892
Number of Invalid Surfaces: 3959
Error Codes:
Error Code -101 reported for 65 surfaces
Error Code -1000 reported for 3894 surfaces

Method: janbu simplified
Number of Valid Surfaces: 892
Number of Invalid Surfaces: 3959
Error Codes:

Error Code -101 reported for 65 surfaces
Error Code -1000 reported for 3894 surfaces

Error Codes

The following errors were encountered during the computation:

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1822.181	1522.245
3081.584	1522.245
3081.584	2781.649
1822.181	2781.649

Material Boundary

2196.973	640.096
3324.967	585.969

Material Boundary

2449.240	964.015
2470.232	960.440
2499.228	971.926
2518.830	970.455
2574.973	955.492
2630.990	940.497
2656.736	943.486
2766.231	980.268
2796.656	985.169
2860.114	983.384
2922.165	998.294
2955.553	1005.268
2982.387	1008.417
3124.543	1005.268
3272.701	969.507
3320.973	961.830

Material Boundary

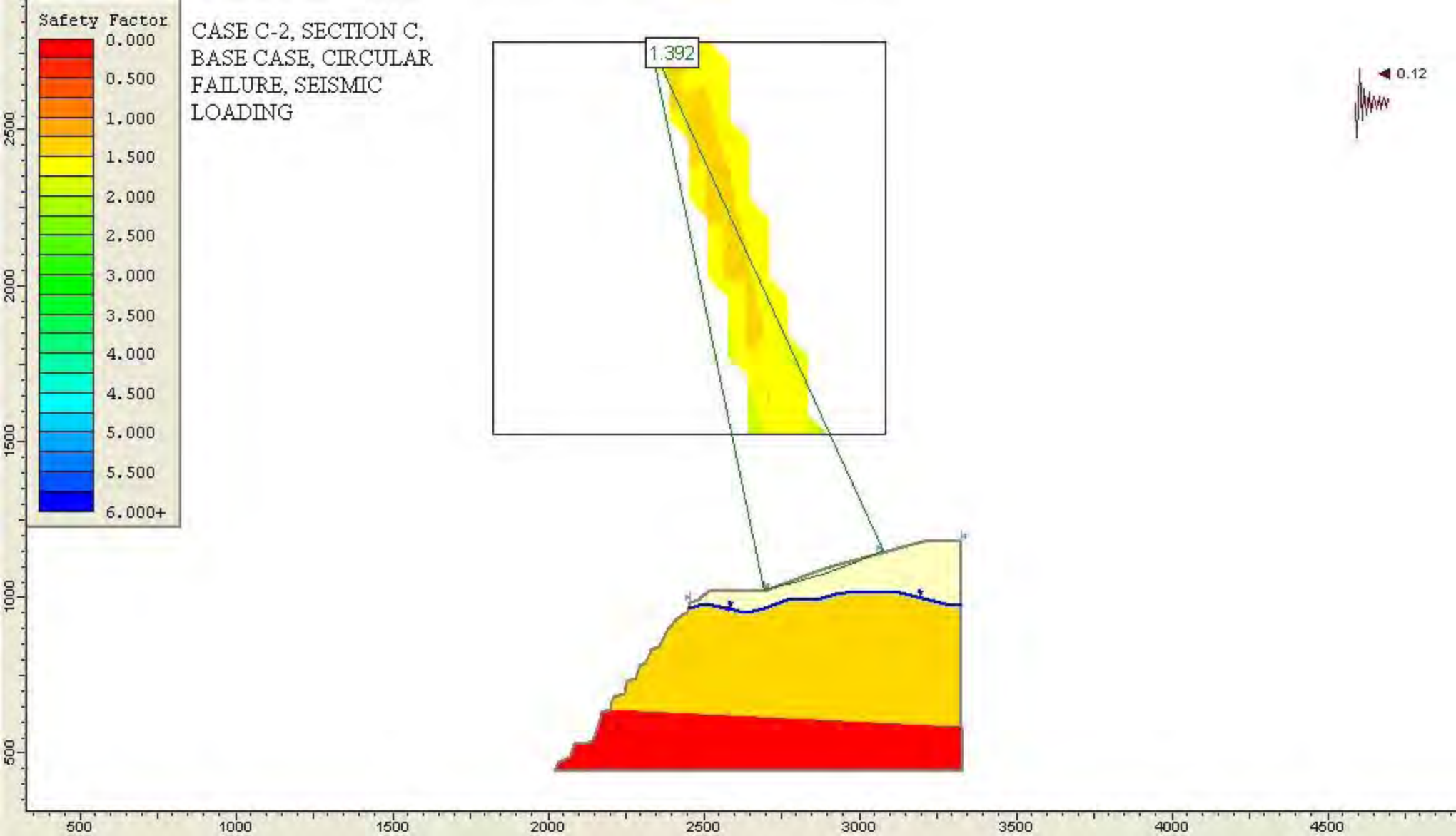
2453.376	973.455
2469.263	970.749
2497.665	981.905
2520.761	980.285
2579.719	964.539
2628.640	950.264
2654.695	953.304
2693.129	964.831
2763.566	989.934
2796.073	995.196

2859.446 993.380
2920.010 1008.088
2953.725 1015.120
2982.020 1018.440
3125.771 1015.268
3274.730 979.300
3320.973 971.879

External Boundary
3320.973 798.020
3320.973 862.611
3320.973 961.830
3320.973 971.879
3320.973 1181.298
3303.901 1180.268
3203.554 1180.268
3167.925 1170.268
3051.038 1137.462
2917.875 1100.077
2847.839 1080.268
2691.215 1018.497
2511.301 1017.074
2479.567 990.268
2455.874 980.268
2453.376 973.455
2449.240 964.015
2443.216 950.268
2410.454 930.268
2385.568 900.270
2385.567 900.268
2385.562 900.263
2353.881 840.268
2329.986 830.268
2310.595 790.268
2291.371 780.268
2278.661 740.268
2252.861 730.268
2246.787 710.268
2241.138 690.268
2210.547 680.268
2204.296 660.268
2197.407 640.268
2196.973 640.096
2170.457 630.268
2168.290 619.881
2149.366 552.548
2143.932 540.268
2116.042 531.599
2088.003 531.213
2083.702 530.268
2079.792 517.665
2071.290 490.268
2033.625 470.268
2020.142 440.268
3325.722 440.268
3324.967 585.969

Water Table

2449.240	964.015
2499.548	977.540
2578.286	964.942
2625.529	952.344
2653.874	953.394
2693.129	964.831
2763.566	989.934
2796.073	995.196
2859.446	993.380
2920.010	1008.088
2953.725	1015.120
2982.020	1018.440
3125.771	1015.268
3274.730	979.300
3320.973	971.879


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE C-2, SECTION C, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING
1.392
0.12
500
1000
1500
2000
2500
3000
3500
4000
4500

Slide Analysis Information
CASE C-2, SECTION C, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-C-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf

Friction Angle: 32.6 degrees
Water Surface: None

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.392290
Center: 2325.942, 2781.649
Radius: 1800.591
Left Slip Surface Endpoint: 2691.215, 1018.497
Right Slip Surface Endpoint: 3074.585, 1144.071
Resisting Moment=6.4097e+008 lb-ft
Driving Moment=4.60373e+008 lb-ft

Method: janbu simplified
FS: 1.387500
Center: 2325.942, 2781.649
Radius: 1800.591
Left Slip Surface Endpoint: 2691.215, 1018.497
Right Slip Surface Endpoint: 3074.585, 1144.071
Resisting Horizontal Force=338199 lb
Driving Horizontal Force=243746 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 892
Number of Invalid Surfaces: 3959
Error Codes:
Error Code -101 reported for 65 surfaces
Error Code -1000 reported for 3894 surfaces

Method: janbu simplified
Number of Valid Surfaces: 892
Number of Invalid Surfaces: 3959
Error Codes:
Error Code -101 reported for 65 surfaces
Error Code -1000 reported for 3894 surfaces

Error Codes

The following errors were encountered during the computation:

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1822.181	1522.245
3081.584	1522.245
3081.584	2781.649
1822.181	2781.649

Material Boundary

2196.973	640.096
3324.967	585.969

Material Boundary

2449.240	964.015
2470.232	960.440
2499.228	971.926
2518.830	970.455
2574.973	955.492
2630.990	940.497
2656.736	943.486
2766.231	980.268
2796.656	985.169
2860.114	983.384
2922.165	998.294
2955.553	1005.268
2982.387	1008.417
3124.543	1005.268
3272.701	969.507
3320.973	961.830

Material Boundary

2453.376	973.455
2469.263	970.749
2497.665	981.905
2520.761	980.285
2579.719	964.539
2628.640	950.264

2654.695	953.304
2693.129	964.831
2763.566	989.934
2796.073	995.196
2859.446	993.380
2920.010	1008.088
2953.725	1015.120
2982.020	1018.440
3125.771	1015.268
3274.730	979.300
3320.973	971.879

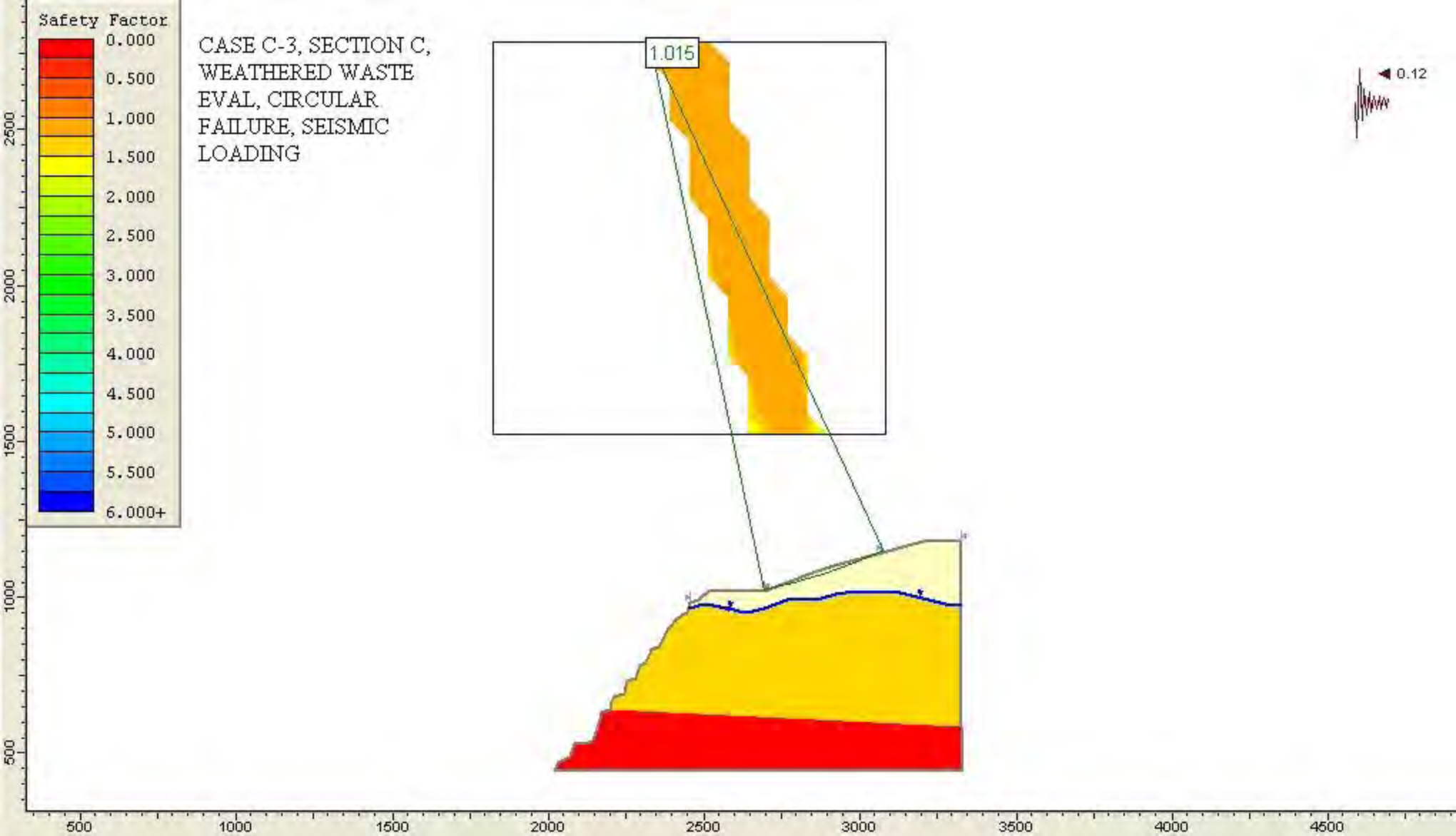
External Boundary

3320.973	798.020
3320.973	862.611
3320.973	961.830
3320.973	971.879
3320.973	1181.298
3303.901	1180.268
3203.554	1180.268
3167.925	1170.268
3051.038	1137.462
2917.875	1100.077
2847.839	1080.268
2691.215	1018.497
2511.301	1017.074
2479.567	990.268
2455.874	980.268
2453.376	973.455
2449.240	964.015
2443.216	950.268
2410.454	930.268
2385.568	900.270
2385.567	900.268
2385.562	900.263
2353.881	840.268
2329.986	830.268
2310.595	790.268
2291.371	780.268
2278.661	740.268
2252.861	730.268
2246.787	710.268
2241.138	690.268
2210.547	680.268
2204.296	660.268
2197.407	640.268
2196.973	640.096
2170.457	630.268
2168.290	619.881
2149.366	552.548
2143.932	540.268
2116.042	531.599
2088.003	531.213
2083.702	530.268
2079.792	517.665
2071.290	490.268

2033.625	470.268
2020.142	440.268
3325.722	440.268
3324.967	585.969

Water Table

2449.240	964.015
2499.548	977.540
2578.286	964.942
2625.529	952.344
2653.874	953.394
2693.129	964.831
2763.566	989.934
2796.073	995.196
2859.446	993.380
2920.010	1008.088
2953.725	1015.120
2982.020	1018.440
3125.771	1015.268
3274.730	979.300
3320.973	971.879


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE C-3, SECTION C, WEATHERED WASTE EVAL, CIRCULAR FAILURE, SEISMIC LOADING
1.015
0.12
500
1000
1500
2000
2500
3000
3500
4000
4500

Slide Analysis Information
CASE C-3, SECTION C, WEATHERED WASTE EVAL, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-C-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf

Friction Angle: 25 degrees
Water Surface: None

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.015030
Center: 2325.942, 2781.649
Radius: 1800.591
Left Slip Surface Endpoint: 2691.215, 1018.497
Right Slip Surface Endpoint: 3074.585, 1144.071
Resisting Moment=4.67292e+008 lb-ft
Driving Moment=4.60373e+008 lb-ft

Method: janbu simplified
FS: 1.011700
Center: 2325.942, 2781.649
Radius: 1800.591
Left Slip Surface Endpoint: 2691.215, 1018.497
Right Slip Surface Endpoint: 3074.585, 1144.071
Resisting Horizontal Force=246599 lb
Driving Horizontal Force=243748 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 892
Number of Invalid Surfaces: 3959
Error Codes:
Error Code -101 reported for 65 surfaces
Error Code -1000 reported for 3894 surfaces

Method: janbu simplified
Number of Valid Surfaces: 892
Number of Invalid Surfaces: 3959
Error Codes:
Error Code -101 reported for 65 surfaces
Error Code -1000 reported for 3894 surfaces

Error Codes

The following errors were encountered during the computation:

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1822.181	1522.245
3081.584	1522.245
3081.584	2781.649
1822.181	2781.649

Material Boundary

2196.973	640.096
3324.967	585.969

Material Boundary

2449.240	964.015
2470.232	960.440
2499.228	971.926
2518.830	970.455
2574.973	955.492
2630.990	940.497
2656.736	943.486
2766.231	980.268
2796.656	985.169
2860.114	983.384
2922.165	998.294
2955.553	1005.268
2982.387	1008.417
3124.543	1005.268
3272.701	969.507
3320.973	961.830

Material Boundary

2453.376	973.455
2469.263	970.749
2497.665	981.905
2520.761	980.285
2579.719	964.539
2628.640	950.264

2654.695	953.304
2693.129	964.831
2763.566	989.934
2796.073	995.196
2859.446	993.380
2920.010	1008.088
2953.725	1015.120
2982.020	1018.440
3125.771	1015.268
3274.730	979.300
3320.973	971.879

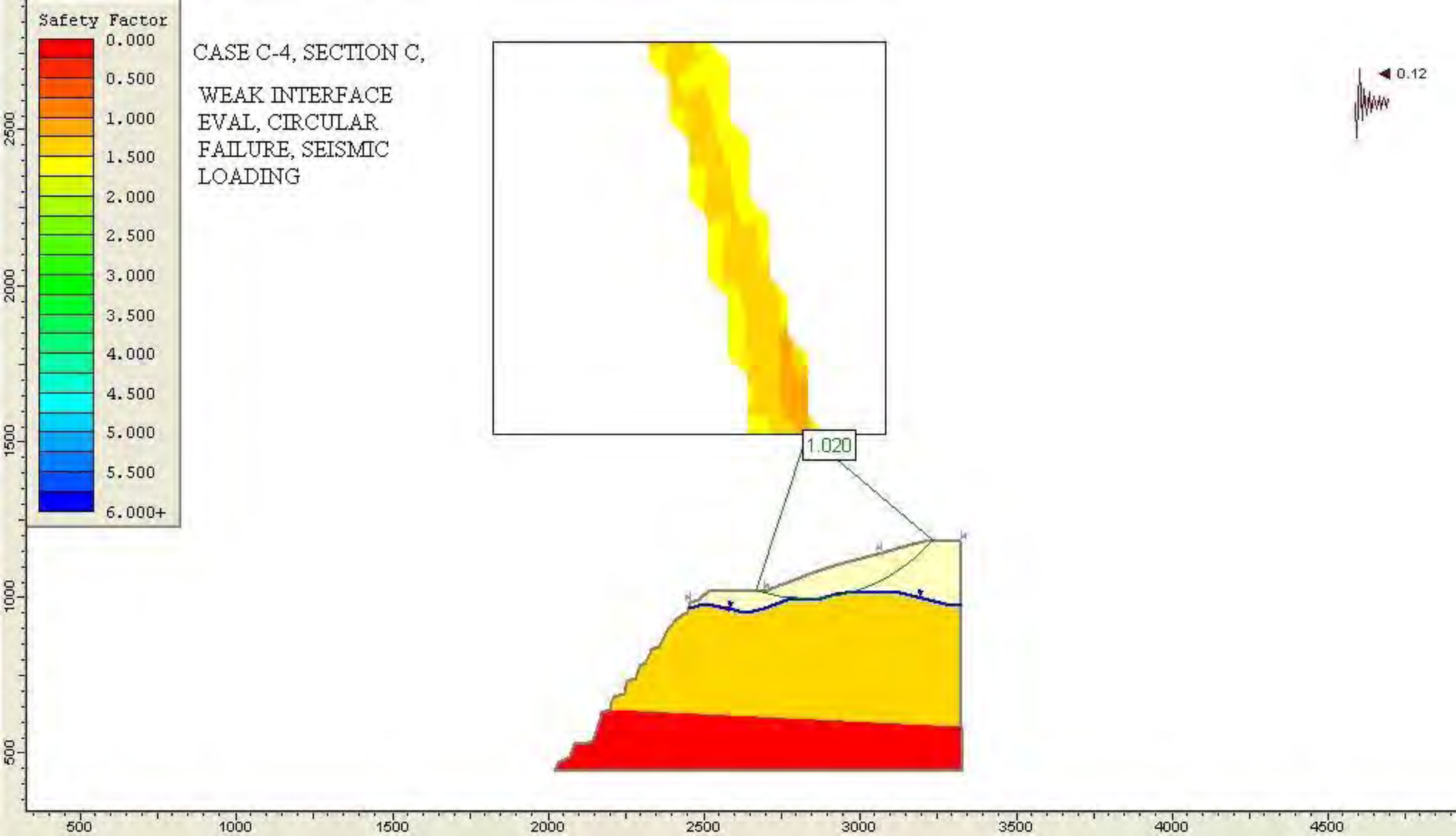
External Boundary

3320.973	798.020
3320.973	862.611
3320.973	961.830
3320.973	971.879
3320.973	1181.298
3303.901	1180.268
3203.554	1180.268
3167.925	1170.268
3051.038	1137.462
2917.875	1100.077
2847.839	1080.268
2691.215	1018.497
2511.301	1017.074
2479.567	990.268
2455.874	980.268
2453.376	973.455
2449.240	964.015
2443.216	950.268
2410.454	930.268
2385.568	900.270
2385.567	900.268
2385.562	900.263
2353.881	840.268
2329.986	830.268
2310.595	790.268
2291.371	780.268
2278.661	740.268
2252.861	730.268
2246.787	710.268
2241.138	690.268
2210.547	680.268
2204.296	660.268
2197.407	640.268
2196.973	640.096
2170.457	630.268
2168.290	619.881
2149.366	552.548
2143.932	540.268
2116.042	531.599
2088.003	531.213
2083.702	530.268
2079.792	517.665
2071.290	490.268

2033.625	470.268
2020.142	440.268
3325.722	440.268
3324.967	585.969

Water Table

2449.240	964.015
2499.548	977.540
2578.286	964.942
2625.529	952.344
2653.874	953.394
2693.129	964.831
2763.566	989.934
2796.073	995.196
2859.446	993.380
2920.010	1008.088
2953.725	1015.120
2982.020	1018.440
3125.771	1015.268
3274.730	979.300
3320.973	971.879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1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE C-4, SECTION C,
WEAK INTERFACE EVAL, CIRCULAR FAILURE, SEISMIC LOADING
0.12
1.020
500
1000
1500
2000
2500
3000
3500
4000
4500

Slide Analysis Information
CASE C-4, SECTION C, WEAK INTERFACE EVAL, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-C-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf

Friction Angle: 32.6 degrees
Water Surface: None

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 8 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.019690
Center: 2829.703, 1522.245
Radius: 529.993
Left Slip Surface Endpoint: 2665.612, 1018.295
Right Slip Surface Endpoint: 3234.603, 1180.268
Resisting Moment=9.33154e+008 lb-ft
Driving Moment=9.15132e+008 lb-ft

Method: janbu simplified
FS: 0.966183
Center: 2829.703, 1522.245
Radius: 529.993
Left Slip Surface Endpoint: 2665.612, 1018.295
Right Slip Surface Endpoint: 3234.603, 1180.268
Resisting Horizontal Force=1.58517e+006 lb
Driving Horizontal Force=1.64065e+006 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 892
Number of Invalid Surfaces: 3959
Error Codes:
Error Code -101 reported for 65 surfaces
Error Code -1000 reported for 3894 surfaces

Method: janbu simplified
Number of Valid Surfaces: 892
Number of Invalid Surfaces: 3959
Error Codes:
Error Code -101 reported for 65 surfaces
Error Code -1000 reported for 3894 surfaces

Error Codes

The following errors were encountered during the computation:

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1822.181	1522.245
3081.584	1522.245
3081.584	2781.649
1822.181	2781.649

Material Boundary

2196.973	640.096
3324.967	585.969

Material Boundary

2449.240	964.015
2470.232	960.440
2499.228	971.926
2518.830	970.455
2574.973	955.492
2630.990	940.497
2656.736	943.486
2766.231	980.268
2796.656	985.169
2860.114	983.384
2922.165	998.294
2955.553	1005.268
2982.387	1008.417
3124.543	1005.268
3272.701	969.507
3320.973	961.830

Material Boundary

2453.376	973.455
2469.263	970.749
2497.665	981.905
2520.761	980.285
2579.719	964.539
2628.640	950.264

2654.695	953.304
2693.129	964.831
2763.566	989.934
2796.073	995.196
2859.446	993.380
2920.010	1008.088
2953.725	1015.120
2982.020	1018.440
3125.771	1015.268
3274.730	979.300
3320.973	971.879

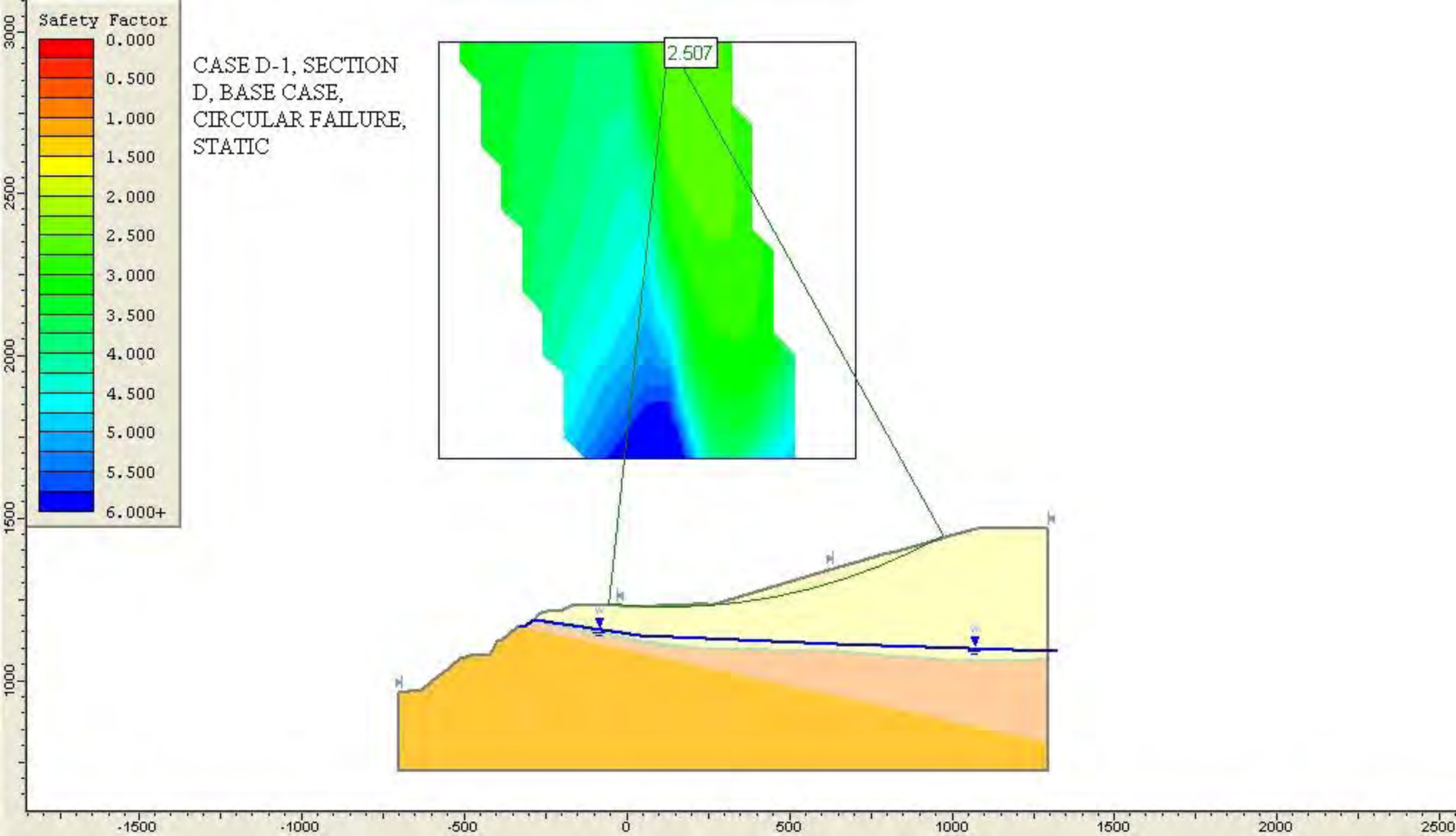
External Boundary

3320.973	798.020
3320.973	862.611
3320.973	961.830
3320.973	971.879
3320.973	1181.298
3303.901	1180.268
3203.554	1180.268
3167.925	1170.268
3051.038	1137.462
2917.875	1100.077
2847.839	1080.268
2691.215	1018.497
2511.301	1017.074
2479.567	990.268
2455.874	980.268
2453.376	973.455
2449.240	964.015
2443.216	950.268
2410.454	930.268
2385.568	900.270
2385.567	900.268
2385.562	900.263
2353.881	840.268
2329.986	830.268
2310.595	790.268
2291.371	780.268
2278.661	740.268
2252.861	730.268
2246.787	710.268
2241.138	690.268
2210.547	680.268
2204.296	660.268
2197.407	640.268
2196.973	640.096
2170.457	630.268
2168.290	619.881
2149.366	552.548
2143.932	540.268
2116.042	531.599
2088.003	531.213
2083.702	530.268
2079.792	517.665
2071.290	490.268

2033.625	470.268
2020.142	440.268
3325.722	440.268
3324.967	585.969

Water Table

2449.240	964.015
2499.548	977.540
2578.286	964.942
2625.529	952.344
2653.874	953.394
2693.129	964.831
2763.566	989.934
2796.073	995.196
2859.446	993.380
2920.010	1008.088
2953.725	1015.120
2982.020	1018.440
3125.771	1015.268
3274.730	979.300
3320.973	971.879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2.500
3.000
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4.000
4.500
5.000
5.500
6.000+
CASE D-1, SECTION D, BASE CASE, CIRCULAR FAILURE, STATIC
2.507
3000
2500
2000
1500
1000
-1500
-1000
-500
0
500
1000
1500
2000
2500

Slide Analysis Information
CASE D-1, SECTION D, BASE CASE, CIRCULAR FAILURE, STATIC

Document Name

File Name: SEC-D-BAS_C_P.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 2.506820
Center: 127.523, 2968.003
Radius: 1745.349
Left Slip Surface Endpoint: -57.540, 1232.493
Right Slip Surface Endpoint: 974.903, 1442.162
Resisting Moment=3.43396e+009 lb-ft
Driving Moment=1.36985e+009 lb-ft

Method: janbu simplified
FS: 2.468250
Center: 191.642, 2968.003
Radius: 1752.011
Left Slip Surface Endpoint: -53.687, 1233.253
Right Slip Surface Endpoint: 1101.545, 1470.799
Resisting Horizontal Force=3.48917e+006 lb
Driving Horizontal Force=1.41362e+006 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2791
Number of Invalid Surfaces: 2060
Error Codes:
Error Code -101 reported for 126 surfaces
Error Code -103 reported for 31 surfaces
Error Code -1000 reported for 1903 surfaces

Method: janbu simplified

Number of Valid Surfaces: 2791
Number of Invalid Surfaces: 2060
Error Codes:
Error Code -101 reported for 126 surfaces
Error Code -103 reported for 31 surfaces
Error Code -1000 reported for 1903 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

-577.790	1685.617
704.596	1685.617
704.596	2968.003
-577.790	2968.003

Material Boundary

-294.245	1183.286
-178.641	1157.040
-93.570	1141.722
69.036	1112.217
87.861	1111.316
109.345	1106.495
225.068	1094.587
438.459	1090.734
497.426	1086.228
578.273	1088.590
600.661	1086.488
643.098	1087.685
795.171	1074.704
981.280	1060.980
1123.832	1056.699
1160.865	1057.159
1175.396	1058.898
1236.406	1055.055
1251.025	1060.078
1296.864	1059.286

Material Boundary

-286.124	1189.654
-176.746	1166.860
-91.721	1151.549
70.126	1122.176
89.205	1121.263
110.940	1116.385
225.365	1104.584
439.330	1100.703
497.682	1096.231
578.919	1098.573
600.836	1096.515
643.562	1097.685
795.617	1084.707
981.742	1070.970
1123.648	1066.709
1159.729	1067.157
1175.412	1068.923
1227.808	1064.773
1249.759	1070.059
1296.864	1069.316

Material Boundary

-332.136	1166.821
1296.864	808.728

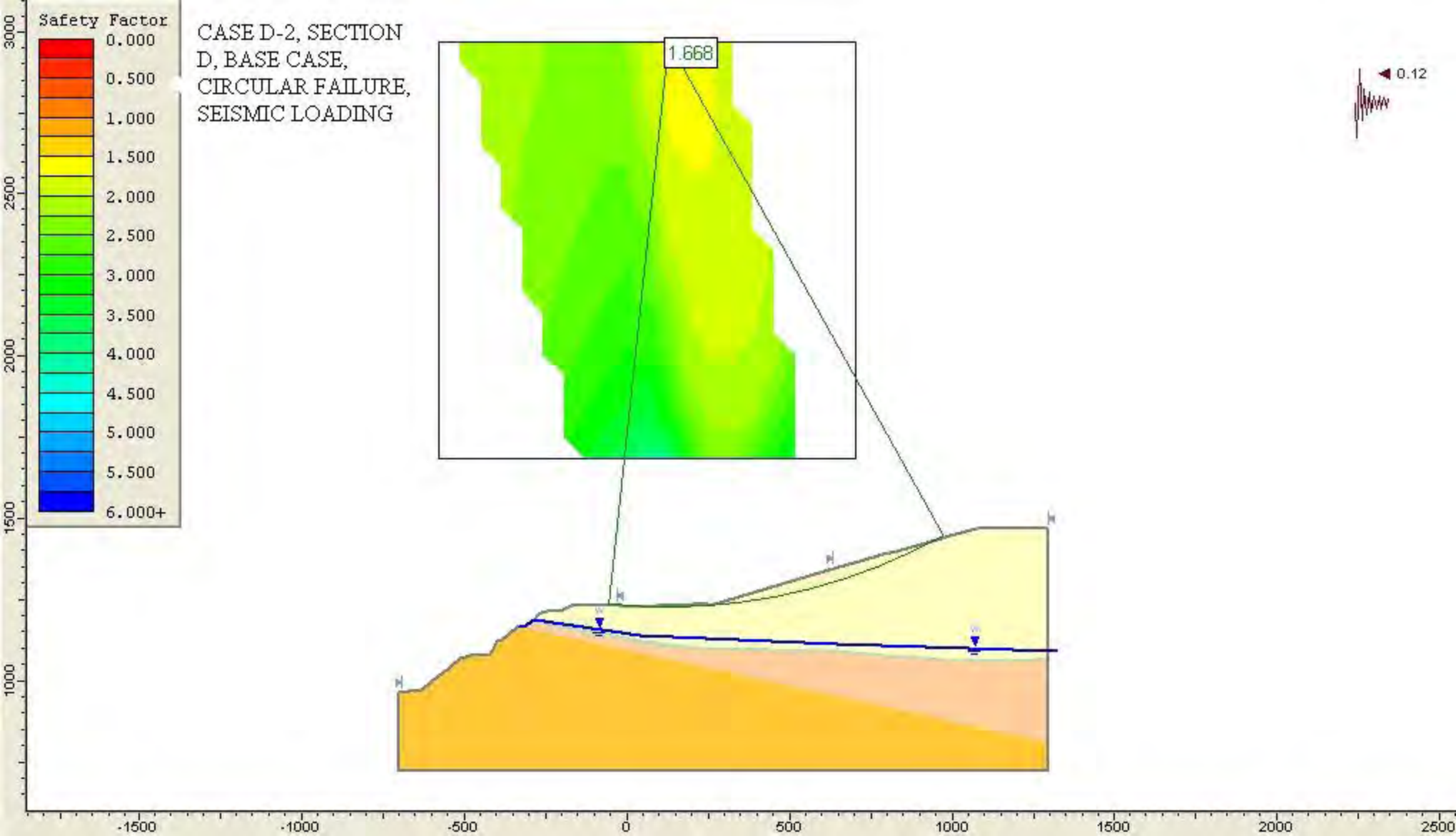
External Boundary

237.462	1240.799
208.788	1238.925
201.650	1238.560
92.480	1230.799
-0.069	1229.884
-21.747	1230.799
-22.636	1233.243
-54.531	1233.254
-64.246	1230.799
-170.386	1230.799
-196.183	1219.383
-221.474	1215.210
-234.618	1216.060
-245.704	1215.228
-261.121	1210.799
-275.826	1200.799
-286.124	1189.654
-294.245	1183.286
-315.351	1167.884
-324.535	1167.753
-332.136	1166.821
-338.838	1164.930
-390.602	1123.991
-399.386	1120.799
-417.364	1090.799
-427.625	1080.799
-438.213	1077.281
-482.650	1076.509
-496.982	1076.287

-514.670	1070.805
-514.682	1070.799
-569.393	1020.799
-580.930	1015.931
-633.744	973.823
-671.436	966.884
-691.936	964.487
-703.136	962.854
-703.136	720.799
1296.864	720.799
1296.864	808.728
1296.864	1059.286
1296.864	1069.316
1296.864	1470.799
1293.611	1470.799
1075.415	1470.799
994.283	1447.684
967.570	1440.073
829.722	1400.799
787.766	1390.799
714.249	1369.215
651.852	1350.799
253.916	1233.336

Water Table

-332.136	1166.821
-315.351	1167.884
-294.245	1183.286
-286.124	1189.654
37.823	1138.224
645.204	1114.080
1320.745	1091.669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1.500
2.000
2.500
3.000
3.500
4.000
4.500
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6.000+
CASE D-2, SECTION D, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING
1.668
0.12
3000
2500
2000
1500
1000
-1500
-1000
-500
0
500
1000
1500
2000
2500

Slide Analysis Information
CASE D-2, SECTION D, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-D-BAS_C_P.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3

Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 32.6 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.668240
Center: 127.523, 2968.003
Radius: 1745.349
Left Slip Surface Endpoint: -57.540, 1232.493
Right Slip Surface Endpoint: 974.903, 1442.162
Resisting Moment=3.33102e+009 lb-ft
Driving Moment=1.99673e+009 lb-ft

Method: janbu simplified
FS: 1.644240
Center: 127.523, 2968.003
Radius: 1745.349
Left Slip Surface Endpoint: -57.540, 1232.493
Right Slip Surface Endpoint: 974.903, 1442.162
Resisting Horizontal Force=1.83145e+006 lb
Driving Horizontal Force=1.11386e+006 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2791
Number of Invalid Surfaces: 2060
Error Codes:
Error Code -101 reported for 126 surfaces

Error Code -103 reported for 31 surfaces
Error Code -1000 reported for 1903 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2791
Number of Invalid Surfaces: 2060
Error Codes:
Error Code -101 reported for 126 surfaces
Error Code -103 reported for 31 surfaces
Error Code -1000 reported for 1903 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

-577.790	1685.617
704.596	1685.617
704.596	2968.003
-577.790	2968.003

Material Boundary

-294.245	1183.286
-178.641	1157.040
-93.570	1141.722
69.036	1112.217
87.861	1111.316
109.345	1106.495
225.068	1094.587
438.459	1090.734
497.426	1086.228
578.273	1088.590
600.661	1086.488
643.098	1087.685
795.171	1074.704
981.280	1060.980
1123.832	1056.699
1160.865	1057.159
1175.396	1058.898

1236.406	1055.055
1251.025	1060.078
1296.864	1059.286

Material Boundary

-286.124	1189.654
-176.746	1166.860
-91.721	1151.549
70.126	1122.176
89.205	1121.263
110.940	1116.385
225.365	1104.584
439.330	1100.703
497.682	1096.231
578.919	1098.573
600.836	1096.515
643.562	1097.685
795.617	1084.707
981.742	1070.970
1123.648	1066.709
1159.729	1067.157
1175.412	1068.923
1227.808	1064.773
1249.759	1070.059
1296.864	1069.316

Material Boundary

-332.136	1166.821
1296.864	808.728

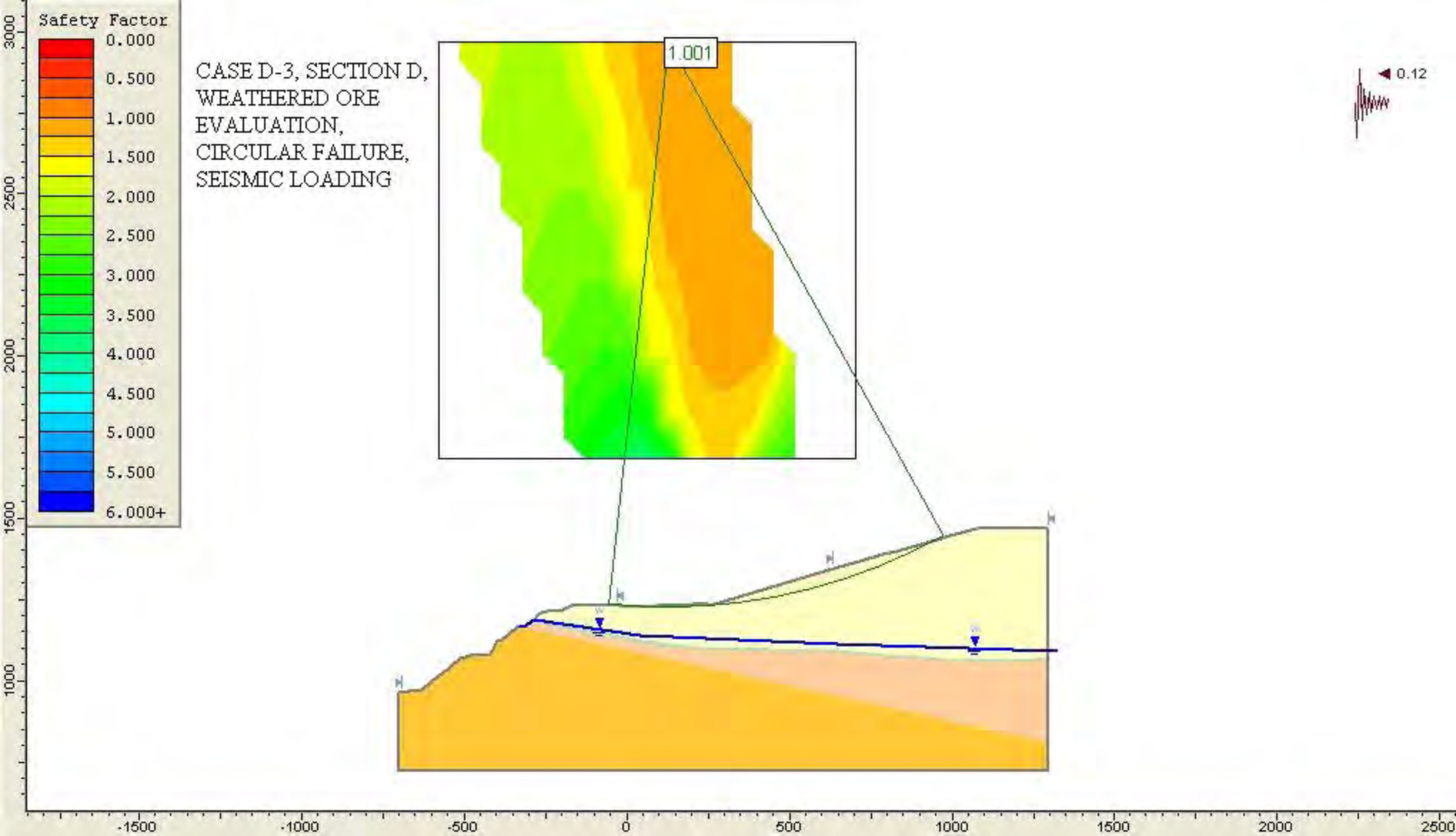
External Boundary

237.462	1240.799
208.788	1238.925
201.650	1238.560
92.480	1230.799
-0.069	1229.884
-21.747	1230.799
-22.636	1233.243
-54.531	1233.254
-64.246	1230.799
-170.386	1230.799
-196.183	1219.383
-221.474	1215.210
-234.618	1216.060
-245.704	1215.228
-261.121	1210.799
-275.826	1200.799
-286.124	1189.654
-294.245	1183.286
-315.351	1167.884
-324.535	1167.753
-332.136	1166.821
-338.838	1164.930
-390.602	1123.991
-399.386	1120.799
-417.364	1090.799

-427.625	1080.799
-438.213	1077.281
-482.650	1076.509
-496.982	1076.287
-514.670	1070.805
-514.682	1070.799
-569.393	1020.799
-580.930	1015.931
-633.744	973.823
-671.436	966.884
-691.936	964.487
-703.136	962.854
-703.136	720.799
1296.864	720.799
1296.864	808.728
1296.864	1059.286
1296.864	1069.316
1296.864	1470.799
1293.611	1470.799
1075.415	1470.799
994.283	1447.684
967.570	1440.073
829.722	1400.799
787.766	1390.799
714.249	1369.215
651.852	1350.799
253.916	1233.336

Water Table

-332.136	1166.821
-315.351	1167.884
-294.245	1183.286
-286.124	1189.654
37.823	1138.224
645.204	1114.080
1320.745	1091.669


Safety Factor
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0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE D-3, SECTION D,
WEATHERED ORE
EVALUATION,
CIRCULAR FAILURE,
SEISMIC LOADING
1.001
0.12
3000
2500
2000
1500
1000
-1500
-1000
-500
0
500
1000
1500
2000
2500

Slide Analysis Information
CASE D-3, SECTION D, WEATHERED ORE EVAL, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-D-BAS_C_P.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3

Cohesion: 0 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Gila
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 39 degrees
Water Surface: None

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.001250
Center: 127.523, 2968.003
Radius: 1745.349
Left Slip Surface Endpoint: -57.540, 1232.493
Right Slip Surface Endpoint: 974.903, 1442.162
Resisting Moment=1.99922e+009 lb-ft
Driving Moment=1.99673e+009 lb-ft

Method: janbu simplified
FS: 0.986928
Center: 127.523, 2968.003
Radius: 1745.349
Left Slip Surface Endpoint: -57.540, 1232.493
Right Slip Surface Endpoint: 974.903, 1442.162
Resisting Horizontal Force=1.09933e+006 lb
Driving Horizontal Force=1.11389e+006 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2791
Number of Invalid Surfaces: 2060
Error Codes:
Error Code -101 reported for 126 surfaces

Error Code -103 reported for 31 surfaces
Error Code -1000 reported for 1903 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2791
Number of Invalid Surfaces: 2060
Error Codes:
Error Code -101 reported for 126 surfaces
Error Code -103 reported for 31 surfaces
Error Code -1000 reported for 1903 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

-577.790	1685.617
704.596	1685.617
704.596	2968.003
-577.790	2968.003

Material Boundary

-294.245	1183.286
-178.641	1157.040
-93.570	1141.722
69.036	1112.217
87.861	1111.316
109.345	1106.495
225.068	1094.587
438.459	1090.734
497.426	1086.228
578.273	1088.590
600.661	1086.488
643.098	1087.685
795.171	1074.704
981.280	1060.980
1123.832	1056.699
1160.865	1057.159
1175.396	1058.898

1236.406	1055.055
1251.025	1060.078
1296.864	1059.286

Material Boundary

-286.124	1189.654
-176.746	1166.860
-91.721	1151.549
70.126	1122.176
89.205	1121.263
110.940	1116.385
225.365	1104.584
439.330	1100.703
497.682	1096.231
578.919	1098.573
600.836	1096.515
643.562	1097.685
795.617	1084.707
981.742	1070.970
1123.648	1066.709
1159.729	1067.157
1175.412	1068.923
1227.808	1064.773
1249.759	1070.059
1296.864	1069.316

Material Boundary

-332.136	1166.821
1296.864	808.728

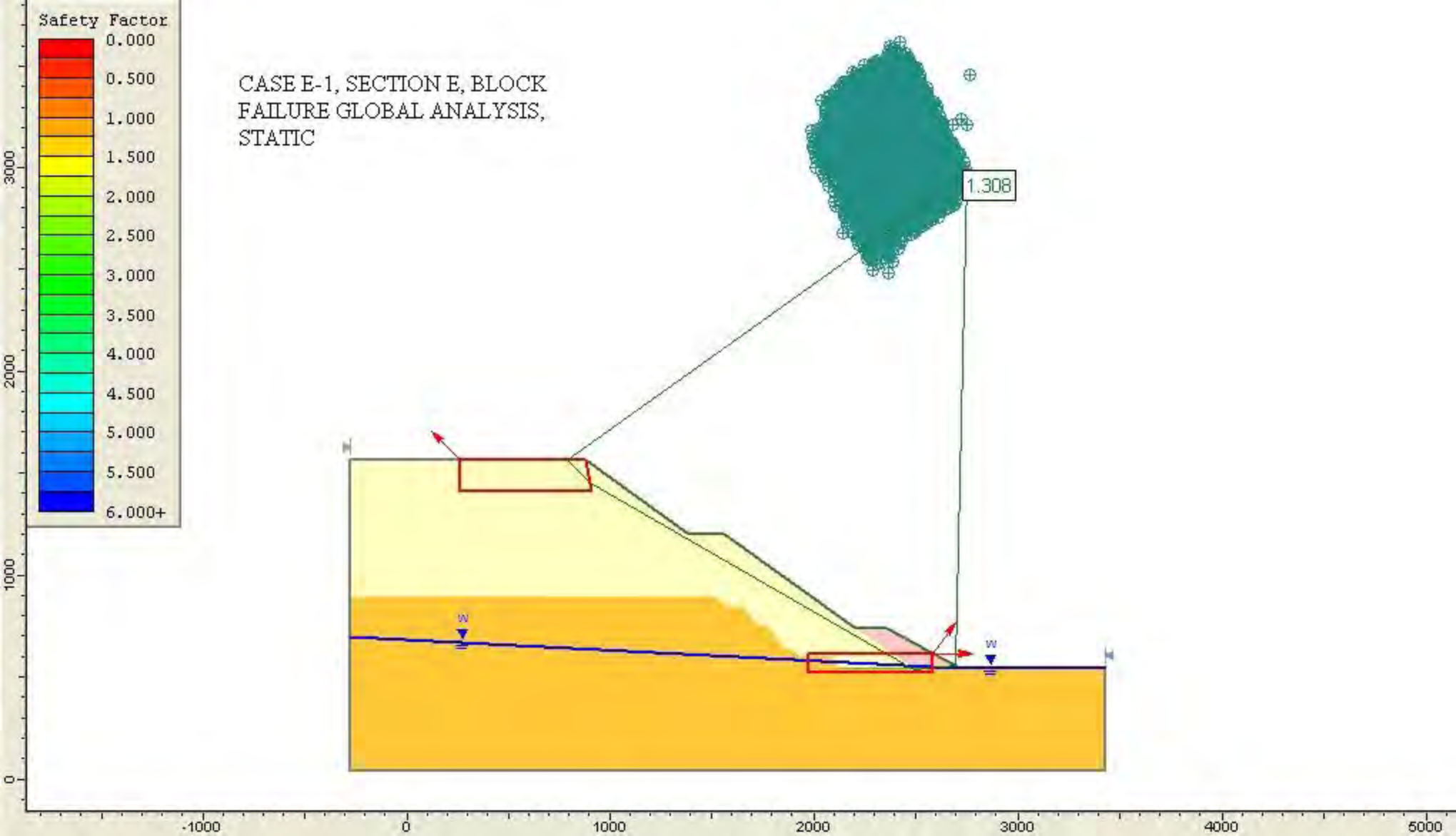
External Boundary

237.462	1240.799
208.788	1238.925
201.650	1238.560
92.480	1230.799
-0.069	1229.884
-21.747	1230.799
-22.636	1233.243
-54.531	1233.254
-64.246	1230.799
-170.386	1230.799
-196.183	1219.383
-221.474	1215.210
-234.618	1216.060
-245.704	1215.228
-261.121	1210.799
-275.826	1200.799
-286.124	1189.654
-294.245	1183.286
-315.351	1167.884
-324.535	1167.753
-332.136	1166.821
-338.838	1164.930
-390.602	1123.991
-399.386	1120.799
-417.364	1090.799

-427.625	1080.799
-438.213	1077.281
-482.650	1076.509
-496.982	1076.287
-514.670	1070.805
-514.682	1070.799
-569.393	1020.799
-580.930	1015.931
-633.744	973.823
-671.436	966.884
-691.936	964.487
-703.136	962.854
-703.136	720.799
1296.864	720.799
1296.864	808.728
1296.864	1059.286
1296.864	1069.316
1296.864	1470.799
1293.611	1470.799
1075.415	1470.799
994.283	1447.684
967.570	1440.073
829.722	1400.799
787.766	1390.799
714.249	1369.215
651.852	1350.799
253.916	1233.336

Water Table

-332.136	1166.821
-315.351	1167.884
-294.245	1183.286
-286.124	1189.654
37.823	1138.224
645.204	1114.080
1320.745	1091.669


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE E-1, SECTION E, BLOCK FAILURE GLOBAL ANALYSIS, STATIC
1.308
W
W
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000

Slide Analysis Information
CASE E-1, SECTION E, BLOCK GLOBAL ANALYSIS, STATIC

Document Name

File Name: SEC-E-BASE_B_S-.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 52
Right Projection Angle (End Angle): 0
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: WASTROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 33.4 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: BASAL ZONE
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: COARSE MATERIAL
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 125 lb/ft3
Saturated Unit Weight: 135 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 1.308440
Axis Location: 2742.139, 2966.094
Left Slip Surface Endpoint: 783.818, 1562.896
Right Slip Surface Endpoint: 2689.705, 557.518
Resisting Moment=2.34774e+010 lb-ft
Driving Moment=1.7943e+010 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4754
Number of Invalid Surfaces: 246
Error Codes:
Error Code -105 reported for 246 surfaces

Error Codes

The following errors were encountered during the computation:

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

List of All Coordinates

Material Boundary
2116.769 547.896
2299.818 547.896
2487.657 547.896

Material Boundary
2112.460 537.896
2299.818 537.896
3422.769 537.896

Material Boundary
2200.464 737.896
2487.657 547.896
2707.802 547.896

Material Boundary
-278.866 897.760
1512.952 897.760
1562.607 848.105
1644.311 847.896
1732.931 744.665

Material Boundary
2112.460 537.896
2116.769 547.896

Material Boundary
2088.671 597.896
2116.769 547.896

Material Boundary
1732.931 744.665
1776.286 744.665
1854.032 634.410
1881.986 634.410
1924.959 598.485

Material Boundary
1924.959 598.485
2088.671 597.896

External Boundary
2707.802 547.896
2350.464 737.896
2200.464 737.896
1556.510 1205.667
1381.510 1205.667
874.523 1562.896
-278.866 1562.896
-278.866 897.760
-278.866 37.940
3422.769 37.940
3422.769 537.896

3422.769 547.896

Water Table

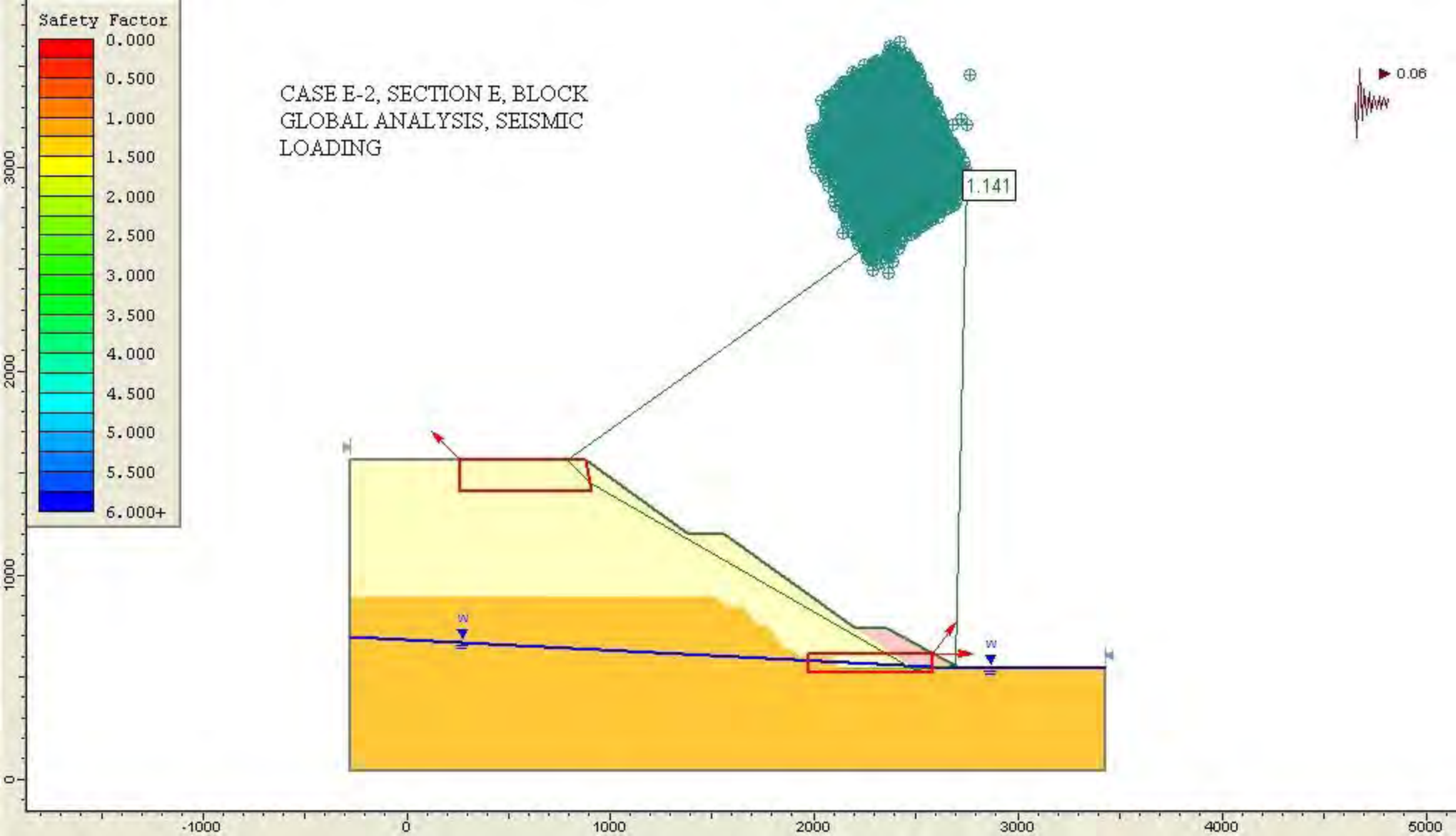
-278.866 698.431
2707.802 547.896
3422.769 547.896

Focus/Block Search Window

1969.752 611.403
1969.752 522.881
2580.788 522.881
2580.788 611.403

Focus/Block Search Window

264.963 1562.896
264.963 1415.103
905.225 1415.103
874.523 1562.896


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE E-2, SECTION E, BLOCK
GLOBAL ANALYSIS, SEISMIC
LOADING
1.141
0.06
W
W
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000

Slide Analysis Information
CASE E-2, SECTION E, BLOCK GLOBAL ANALYSIS, SEISMIC LOADING

Document Name

File Name: SEC-E-BASE_B_S-.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 52
Right Projection Angle (End Angle): 0
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.06

Material Properties

Material: WASTROCK
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 33.4 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BASAL ZONE
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: COARSE MATERIAL
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 125 lb/ft3
Saturated Unit Weight: 135 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 1.140690
Axis Location: 2742.139, 2966.094
Left Slip Surface Endpoint: 783.818, 1562.896
Right Slip Surface Endpoint: 2689.705, 557.518
Resisting Moment=2.28026e+010 lb-ft
Driving Moment=1.99901e+010 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4707
Number of Invalid Surfaces: 293
Error Codes:
Error Code -105 reported for 246 surfaces
Error Code -112 reported for 47 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

List of All Coordinates

Material Boundary
2116.769 547.896
2299.818 547.896
2487.657 547.896

Material Boundary
2112.460 537.896
2299.818 537.896
3422.769 537.896

Material Boundary
2200.464 737.896
2487.657 547.896
2707.802 547.896

Material Boundary
-278.866 897.760
1512.952 897.760
1562.607 848.105
1644.311 847.896
1732.931 744.665

Material Boundary
2112.460 537.896
2116.769 547.896

Material Boundary
2088.671 597.896
2116.769 547.896

Material Boundary
1732.931 744.665
1776.286 744.665
1854.032 634.410
1881.986 634.410
1924.959 598.485

Material Boundary
1924.959 598.485
2088.671 597.896

External Boundary

2707.802	547.896
2350.464	737.896
2200.464	737.896
1556.510	1205.667
1381.510	1205.667
874.523	1562.896
-278.866	1562.896
-278.866	897.760
-278.866	37.940
3422.769	37.940
3422.769	537.896
3422.769	547.896

Water Table

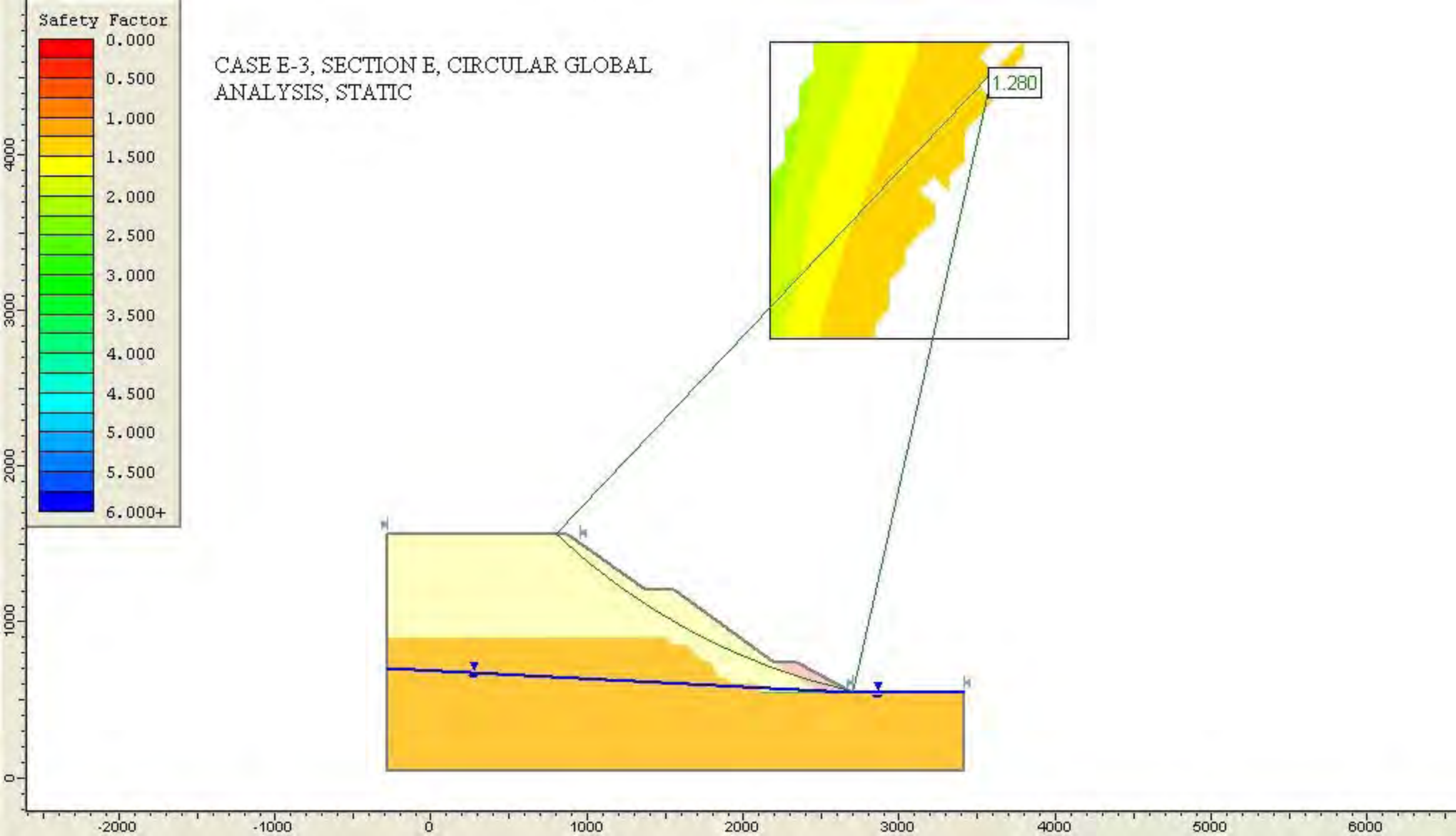
-278.866	698.431
2707.802	547.896
3422.769	547.896

Focus/Block Search Window

1969.752	611.403
1969.752	522.881
2580.788	522.881
2580.788	611.403

Focus/Block Search Window

264.963	1562.896
264.963	1415.103
905.225	1415.103
874.523	1562.896


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE E-3, SECTION E, CIRCULAR GLOBAL ANALYSIS, STATIC
1.280
4000
3000
2000
1000
0
-2000
-1000
0
1000
2000
3000
4000
5000
6000

Slide Analysis Information

Document Name

File Name: SEC-E-BASE_C_S-.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Material Properties

Material: WASTEROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 33.4 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BASAL ZONE
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3

Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: COARSE MATERIAL
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 125 lb/ft3
Saturated Unit Weight: 135 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 1.280090
Center: 3605.698, 4530.386
Radius: 4082.456
Left Slip Surface Endpoint: 802.049, 1562.896
Right Slip Surface Endpoint: 2707.802, 547.896
Resisting Moment=5.67712e+010 lb-ft
Driving Moment=4.43495e+010 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 1992
Number of Invalid Surfaces: 2859
Error Codes:
Error Code -101 reported for 91 surfaces
Error Code -104 reported for 2 surfaces
Error Code -113 reported for 588 surfaces
Error Code -1000 reported for 2178 surfaces

Error Codes

The following errors were encountered during the computation:

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

-104 = Same as -102. Surface / nonslope
intersections also exist, but these points lie outside

the arc defined by the two surface / slope intersections.

-113 = Surface intersects outside slope limits.

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

2175.117	2813.690
4082.558	2813.690
4082.558	4721.130
2175.117	4721.130

Material Boundary

2116.769	547.896
2299.818	547.896
2487.657	547.896

Material Boundary

2112.460	537.896
2299.818	537.896
3422.769	537.896

Material Boundary

2200.464	737.896
2487.657	547.896
2707.802	547.896

Material Boundary

-278.866	897.760
1512.952	897.760
1562.607	848.105
1644.311	847.896
1732.931	744.665

Material Boundary

2112.460	537.896
2116.769	547.896

Material Boundary

2088.671	597.896
2116.769	547.896

Material Boundary

1732.931	744.665
1776.286	744.665
1854.032	634.410
1881.986	634.410
1924.959	598.485

Material Boundary

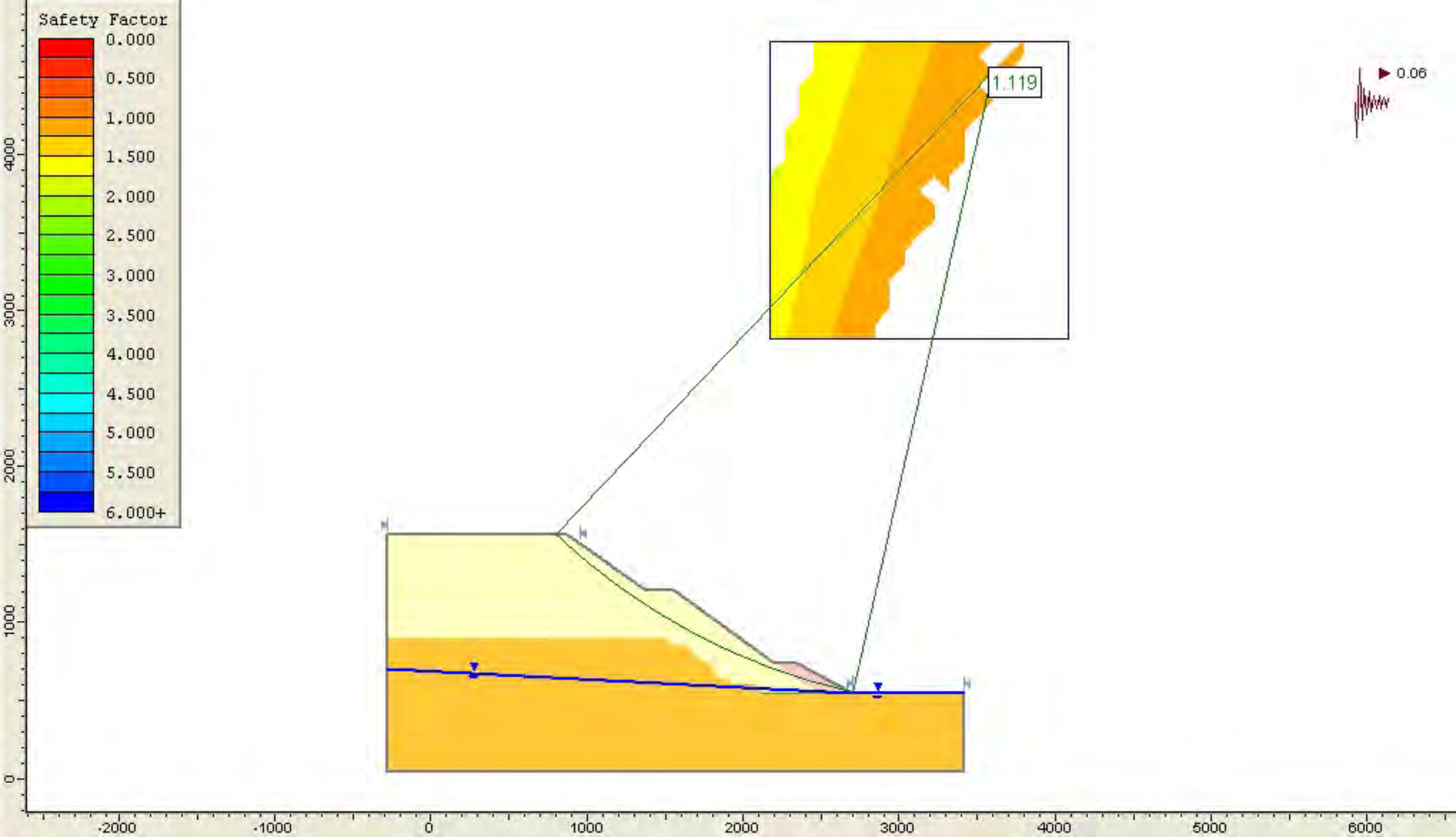
1924.959	598.485
2088.671	597.896

External Boundary

2707.802	547.896
2350.464	737.896
2200.464	737.896
1556.510	1205.667
1381.510	1205.667
874.523	1562.896
-278.866	1562.896
-278.866	897.760
-278.866	37.940
3422.769	37.940
3422.769	537.896
3422.769	547.896

Water Table

-278.866	698.431
2707.802	547.896
3422.769	547.896


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
1.119
0.06
4000
3000
2000
1000
0
-2000
-1000
0
1000
2000
3000
4000
5000
6000

Slide Analysis Information
CASE E-4, SECTION E, GLOBAL CIRCULAR ANALYSIS, SEISMIC LOADING

Document Name

File Name: SEC-E-BASE_C_P-.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Material Properties

Material: WASTROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 33.4 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BASAL ZONE
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: COARSE MATERIAL
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 125 lb/ft3
Saturated Unit Weight: 135 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 1.280090
Center: 3605.698, 4530.386
Radius: 4082.456
Left Slip Surface Endpoint: 802.049, 1562.896
Right Slip Surface Endpoint: 2707.802, 547.896
Resisting Moment=5.67712e+010 lb-ft
Driving Moment=4.43495e+010 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2008
Number of Invalid Surfaces: 2843
Error Codes:
Error Code -101 reported for 93 surfaces
Error Code -113 reported for 638 surfaces
Error Code -1000 reported for 2112 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

2175.117	2813.690
4082.558	2813.690
4082.558	4721.130
2175.117	4721.130

Material Boundary

2116.769	547.896
2299.818	547.896
2487.657	547.896

Material Boundary

2112.460	537.896
2299.818	537.896
3422.769	537.896

Material Boundary

2200.464	737.896
2487.657	547.896
2707.802	547.896

Material Boundary

-278.866	897.760
1512.952	897.760
1562.607	848.105
1644.311	847.896
1732.931	744.665

Material Boundary

2112.460	537.896
2116.769	547.896

Material Boundary

2088.671	597.896
2116.769	547.896

Material Boundary

1732.931	744.665
1776.286	744.665
1854.032	634.410
1881.986	634.410
1924.959	598.485

Material Boundary

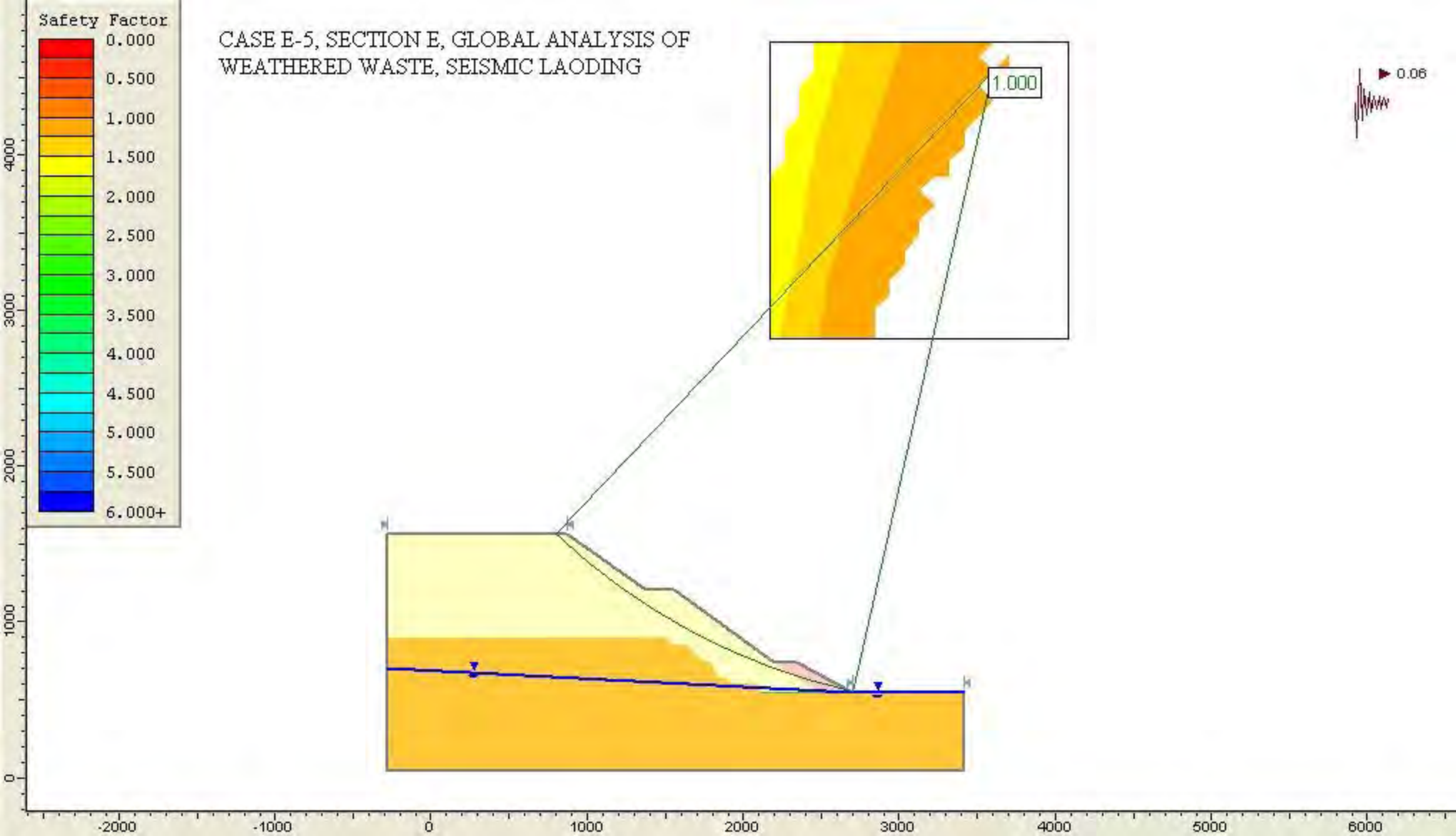
1924.959	598.485
2088.671	597.896

External Boundary

2707.802	547.896
2350.464	737.896
2200.464	737.896
1556.510	1205.667
1381.510	1205.667
874.523	1562.896
-278.866	1562.896
-278.866	897.760
-278.866	37.940
3422.769	37.940
3422.769	537.896
3422.769	547.896

Water Table

-278.866	698.431
2707.802	547.896
3422.769	547.896


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE E-5, SECTION E, GLOBAL ANALYSIS OF
WEATHERED WASTE, SEISMIC LAODING
1.000
0.06
4000
3000
2000
1000
0
-2000
-1000
0
1000
2000
3000
4000
5000
6000

Slide Analysis Information
CASE E-5, SECTION E, GLOBAL ANALYSIS OF WEATHERED WASTE, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-E-DEC_C_P-.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.06

Material Properties

Material: WASTROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3

Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BASAL ZONE
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: COARSE MATERIAL
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 125 lb/ft3
Saturated Unit Weight: 135 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
Water Surface: Water Table
Custom Hu value: 1

Global Minimums

Method: bishop simplified
FS: 0.999563
Center: 3605.698, 4530.386
Radius: 4082.456
Left Slip Surface Endpoint: 802.049, 1562.896
Right Slip Surface Endpoint: 2707.802, 547.896
Resisting Moment=4.91574e+010 lb-ft
Driving Moment=4.91788e+010 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 1992
Number of Invalid Surfaces: 2859
Error Codes:
Error Code -101 reported for 91 surfaces
Error Code -104 reported for 2 surfaces
Error Code -113 reported for 588 surfaces
Error Code -1000 reported for 2178 surfaces

Error Codes

The following errors were encountered during the computation:

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

-104 = Same as -102. Surface / nonslope
intersections also exist, but these points lie outside
the arc defined by the two surface / slope intersections.

-113 = Surface intersects outside slope limits.

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

2175.117	2813.690
4082.558	2813.690
4082.558	4721.130
2175.117	4721.130

Material Boundary

2116.769	547.896
2299.818	547.896
2487.657	547.896

Material Boundary

2112.460	537.896
2299.818	537.896
3422.769	537.896

Material Boundary

2200.464	737.896
2487.657	547.896
2707.802	547.896

Material Boundary

-278.866	897.760
1512.952	897.760
1562.607	848.105
1644.311	847.896
1732.931	744.665

Material Boundary

2112.460	537.896
2116.769	547.896

Material Boundary

2088.671	597.896
2116.769	547.896

Material Boundary

1732.931	744.665
1776.286	744.665
1854.032	634.410
1881.986	634.410
1924.959	598.485

Material Boundary

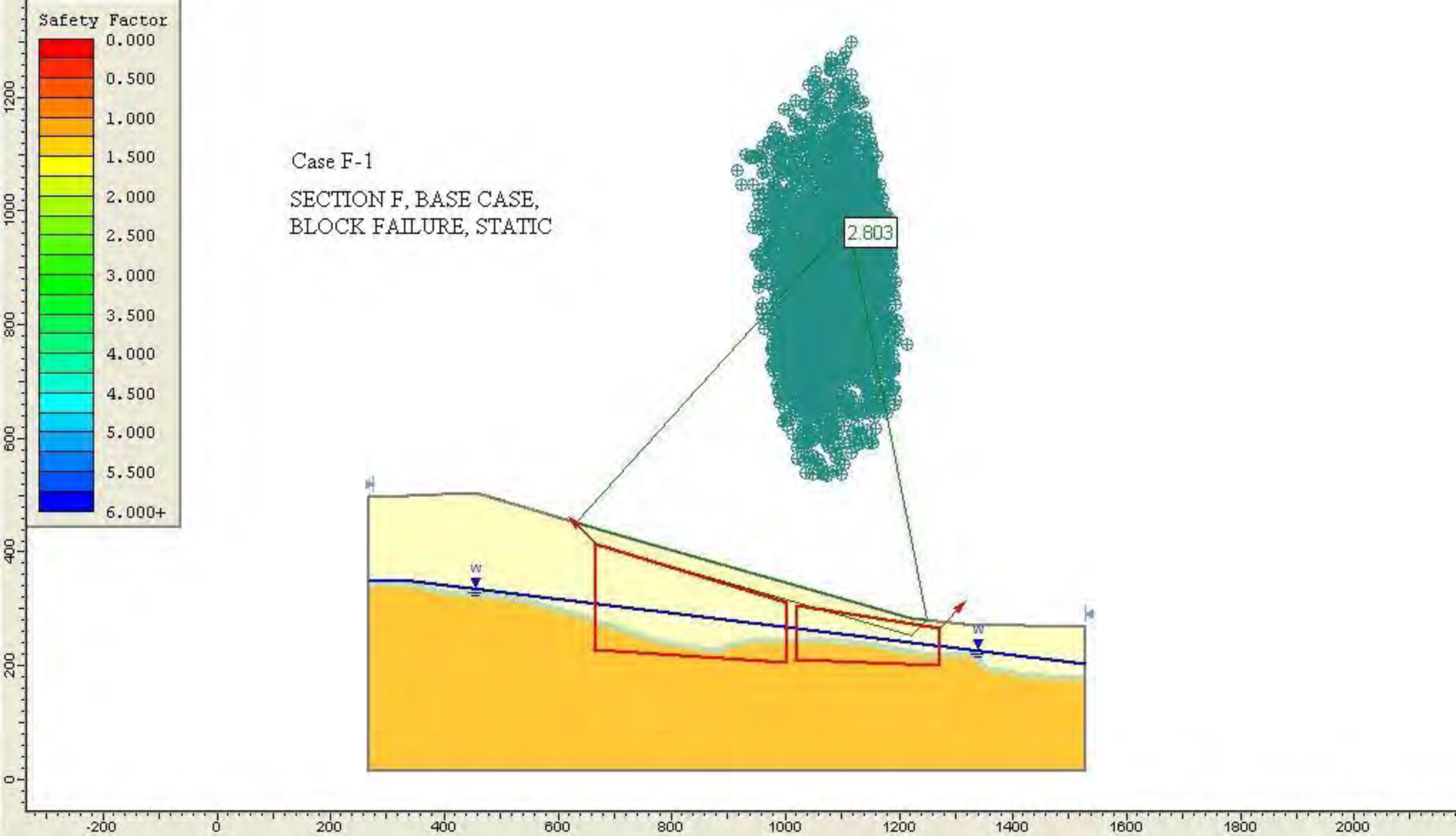
1924.959	598.485
2088.671	597.896

External Boundary

2707.802	547.896
2350.464	737.896
2200.464	737.896
1556.510	1205.667
1381.510	1205.667
874.523	1562.896
-278.866	1562.896
-278.866	897.760
-278.866	37.940
3422.769	37.940
3422.769	537.896
3422.769	547.896

Water Table

-278.866	698.431
2707.802	547.896
3422.769	547.896


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
Case F-1
SECTION F, BASE CASE,
BLOCK FAILURE, STATIC
2.803
W
W
0
200
400
600
800
1000
1200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information
Section F, Case F-1
Base Case, Block Failure, Static

Document Name

File Name: SEC-F-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees

Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 2.803060
Axis Location: 1110.592, 981.917
Left Slip Surface Endpoint: 631.919, 450.912
Right Slip Surface Endpoint: 1248.193, 280.375
Resisting Moment=9.72203e+008 lb-ft
Driving Moment=3.46836e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4996
Number of Invalid Surfaces: 4
Error Codes:
Error Code -108 reported for 2 surfaces
Error Code -111 reported for 2 surfaces

Error Codes

The following errors were encountered during the computation:

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

-111 = safety factor equation did not converge

List of All Coordinates

Material Boundary

266.754	338.405
343.208	338.405
397.000	324.571
425.057	319.891
444.068	321.737
524.674	313.405
644.046	280.826
774.740	238.405
881.054	219.218
894.073	228.055
910.654	233.395
940.760	238.405
1001.358	240.985
1087.496	238.450
1143.492	232.126
1250.938	213.405
1329.035	213.708
1349.749	193.405
1367.319	184.765
1387.299	185.849
1401.346	183.400
1419.174	175.778
1431.525	180.528
1446.207	178.341
1463.649	173.405
1528.173	173.405

Material Boundary

266.754	348.405
344.473	348.405
398.800	334.433
426.209	330.050
443.784	331.756
526.505	323.247
647.474	290.222
777.302	248.089
876.240	229.337
890.429	237.387
908.944	243.350
939.507	248.335
1001.596	250.999
1089.096	248.330
1144.420	242.086
1252.036	223.405
1332.652	224.112
1355.968	201.460
1369.263	194.793
1387.497	195.966
1404.438	193.029
1419.824	186.312
1430.857	190.672
1448.590	188.088
1465.015	183.405
1528.173	183.405

External Boundary

1313.951	273.405
1219.612	283.405
690.701	433.405
455.667	503.405
274.239	496.513
266.754	496.081
266.754	348.405
266.754	338.405
266.754	13.405
1528.173	13.405
1528.173	173.405
1528.173	183.405
1528.173	269.025

Water Table

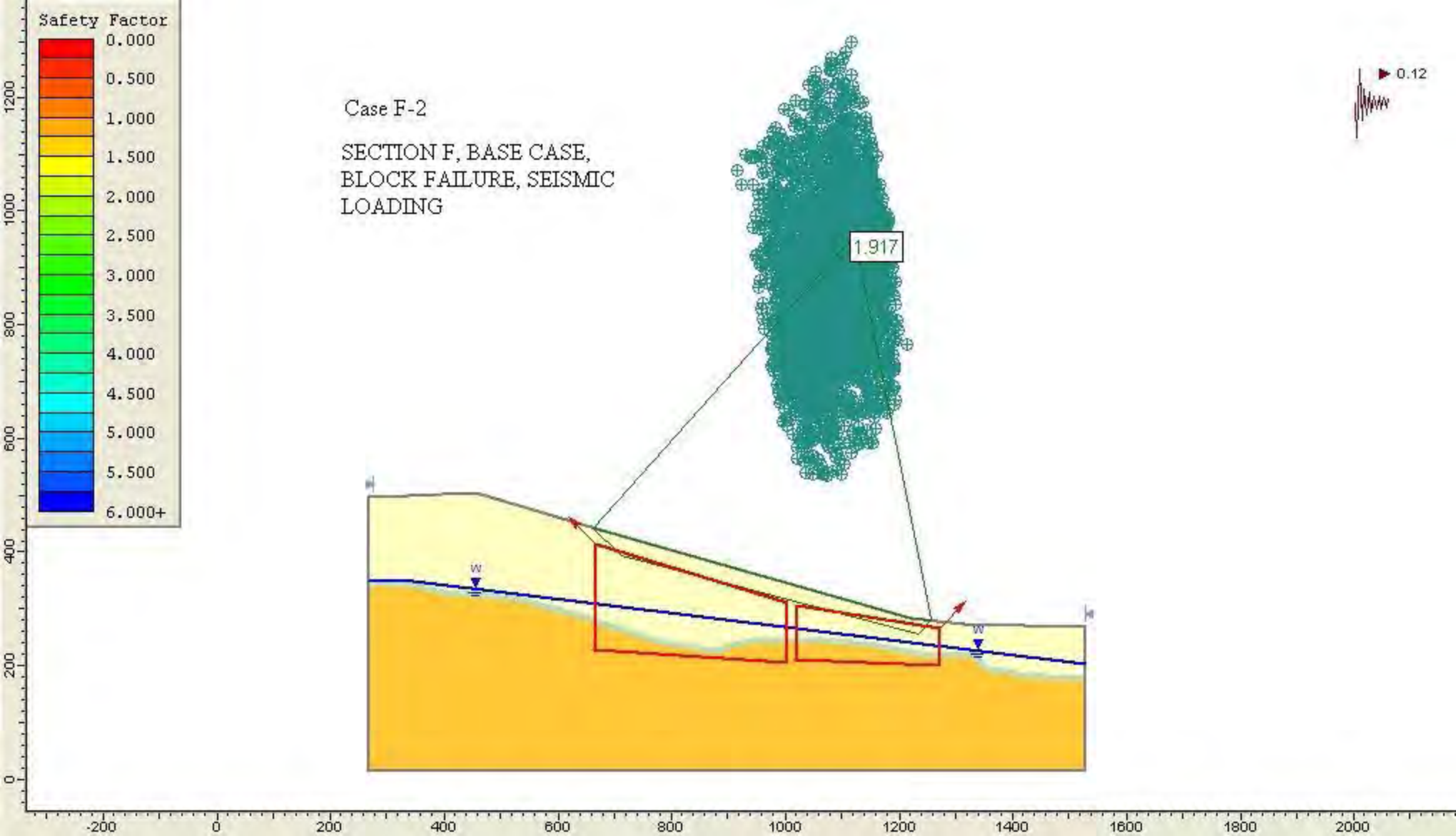
266.754	348.405
344.473	348.405
1528.173	201.909

Focus/Block Search Window

1018.826	305.184
1016.310	209.587
1270.397	199.524
1270.397	264.933

Focus/Block Search Window

664.109	227.197
1001.216	204.556
1001.216	310.216
666.625	413.360


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
Case F-2
SECTION F, BASE CASE,
BLOCK FAILURE, SEISMIC
LOADING
1.917
0.12
W
W
0
200
400
600
800
1000
1200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information
Section F, Case F-2
Base Case, Block Failure, Seismic Loading

Document Name

File Name: SEC-F-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.917290
Axis Location: 1120.996, 956.282
Left Slip Surface Endpoint: 660.518, 442.394
Right Slip Surface Endpoint: 1255.819, 279.566
Resisting Moment=8.90965e+008 lb-ft
Driving Moment=4.64701e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4995
Number of Invalid Surfaces: 5
Error Codes:
Error Code -108 reported for 3 surfaces
Error Code -111 reported for 2 surfaces

Error Codes

The following errors were encountered during the computation:

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

-111 = safety factor equation did not converge

List of All Coordinates

Material Boundary

266.754	338.405
343.208	338.405
397.000	324.571
425.057	319.891
444.068	321.737
524.674	313.405
644.046	280.826
774.740	238.405
881.054	219.218
894.073	228.055
910.654	233.395
940.760	238.405
1001.358	240.985
1087.496	238.450
1143.492	232.126
1250.938	213.405
1329.035	213.708
1349.749	193.405
1367.319	184.765
1387.299	185.849
1401.346	183.400
1419.174	175.778
1431.525	180.528
1446.207	178.341
1463.649	173.405
1528.173	173.405

Material Boundary

266.754	348.405
344.473	348.405
398.800	334.433
426.209	330.050
443.784	331.756
526.505	323.247
647.474	290.222
777.302	248.089
876.240	229.337
890.429	237.387
908.944	243.350
939.507	248.335
1001.596	250.999
1089.096	248.330
1144.420	242.086
1252.036	223.405
1332.652	224.112
1355.968	201.460
1369.263	194.793
1387.497	195.966
1404.438	193.029
1419.824	186.312
1430.857	190.672
1448.590	188.088

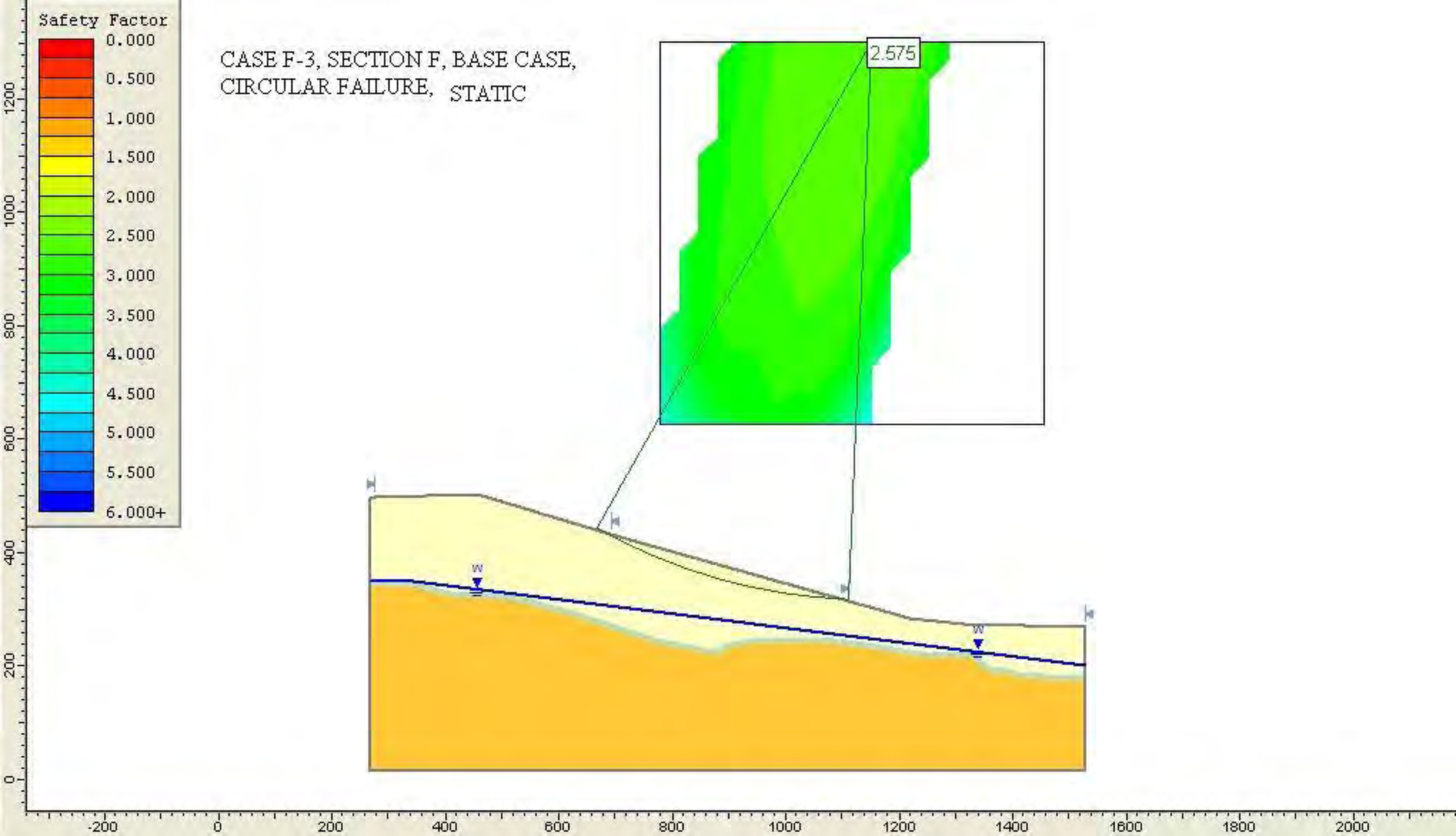
1465.015 183.405
1528.173 183.405

External Boundary
1313.951 273.405
1219.612 283.405
690.701 433.405
455.667 503.405
274.239 496.513
266.754 496.081
266.754 348.405
266.754 338.405
266.754 13.405
1528.173 13.405
1528.173 173.405
1528.173 183.405
1528.173 269.025

Water Table
266.754 348.405
344.473 348.405
1528.173 201.909

Focus/Block Search Window
1018.826 305.184
1016.310 209.587
1270.397 199.524
1270.397 264.933

Focus/Block Search Window
664.109 227.197
1001.216 204.556
1001.216 310.216
666.625 413.360


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE F-3, SECTION F, BASE CASE,
CIRCULAR FAILURE, STATIC
2.575
W
W
0
200
400
600
800
1000
1200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information
CASE F-3, SECTION F, BASE CASE, CIRCULAR, FAILURE, STATIC

Document Name

File Name: SEC-F-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 2.575190
Center: 1150.578, 1300.654
Radius: 987.045
Left Slip Surface Endpoint: 665.940, 440.779
Right Slip Surface Endpoint: 1110.195, 314.435
Resisting Moment=6.85395e+008 lb-ft
Driving Moment=2.66153e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2760
Number of Invalid Surfaces: 2091
Error Codes:
Error Code -101 reported for 53 surfaces
Error Code -103 reported for 14 surfaces
Error Code -1000 reported for 2024 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

779.548	626.054
1454.147	626.054
1454.147	1300.654
779.548	1300.654

Material Boundary

266.754	338.405
343.208	338.405
397.000	324.571
425.057	319.891
444.068	321.737
524.674	313.405
644.046	280.826
774.740	238.405
881.054	219.218
894.073	228.055
910.654	233.395
940.760	238.405
1001.358	240.985
1087.496	238.450
1143.492	232.126
1250.938	213.405
1329.035	213.708
1349.749	193.405
1367.319	184.765
1387.299	185.849
1401.346	183.400
1419.174	175.778
1431.525	180.528
1446.207	178.341
1463.649	173.405
1528.173	173.405

Material Boundary

266.754	348.405
344.473	348.405
398.800	334.433
426.209	330.050
443.784	331.756
526.505	323.247
647.474	290.222
777.302	248.089
876.240	229.337
890.429	237.387
908.944	243.350
939.507	248.335
1001.596	250.999
1089.096	248.330
1144.420	242.086
1252.036	223.405
1332.652	224.112
1355.968	201.460

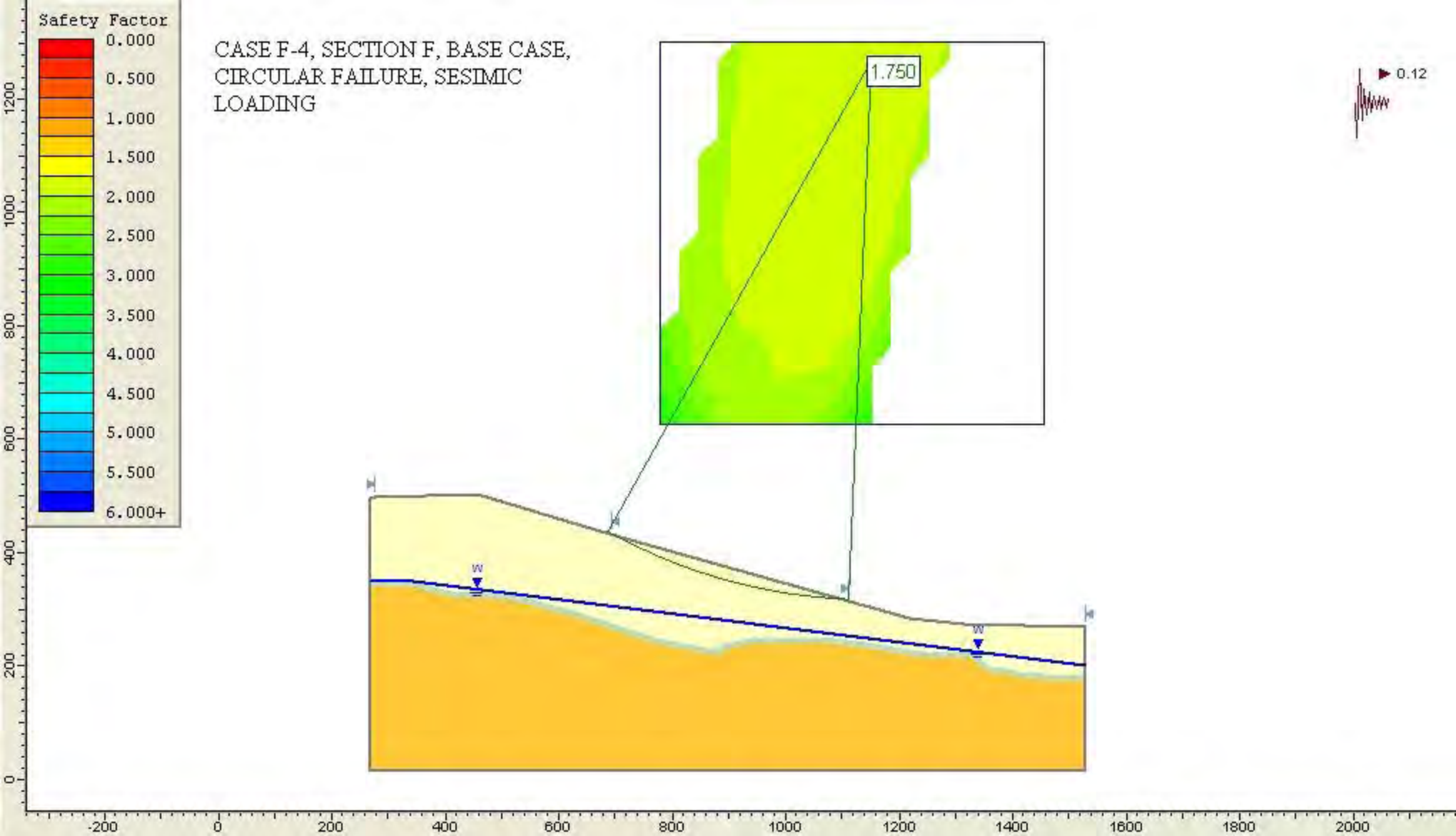
1369.263	194.793
1387.497	195.966
1404.438	193.029
1419.824	186.312
1430.857	190.672
1448.590	188.088
1465.015	183.405
1528.173	183.405

External Boundary

1313.951	273.405
1219.612	283.405
690.701	433.405
455.667	503.405
274.239	496.513
266.754	496.081
266.754	348.405
266.754	338.405
266.754	13.405
1528.173	13.405
1528.173	173.405
1528.173	183.405
1528.173	269.025

Water Table

266.754	348.405
344.473	348.405
1528.173	201.909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0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE F-4, SECTION F, BASE CASE,
CIRCULAR FAILURE, SESIMIC
LOADING
1.750
0.12
W
W
0
200
400
600
800
1000
1200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information
CASE F-4, SECTION F, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-F-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf

Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.750440
Center: 1150.578, 1266.924
Radius: 953.344
Left Slip Surface Endpoint: 684.596, 435.223
Right Slip Surface Endpoint: 1110.195, 314.435
Resisting Moment=5.86173e+008 lb-ft
Driving Moment=3.34872e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2760
Number of Invalid Surfaces: 2091
Error Codes:
Error Code -101 reported for 53 surfaces
Error Code -103 reported for 14 surfaces
Error Code -1000 reported for 2024 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

779.548	626.054
1454.147	626.054
1454.147	1300.654
779.548	1300.654

Material Boundary

266.754	338.405
343.208	338.405
397.000	324.571
425.057	319.891
444.068	321.737
524.674	313.405
644.046	280.826
774.740	238.405
881.054	219.218
894.073	228.055
910.654	233.395
940.760	238.405
1001.358	240.985
1087.496	238.450
1143.492	232.126
1250.938	213.405
1329.035	213.708
1349.749	193.405
1367.319	184.765
1387.299	185.849
1401.346	183.400
1419.174	175.778
1431.525	180.528
1446.207	178.341
1463.649	173.405
1528.173	173.405

Material Boundary

266.754	348.405
344.473	348.405
398.800	334.433
426.209	330.050
443.784	331.756
526.505	323.247
647.474	290.222
777.302	248.089
876.240	229.337
890.429	237.387
908.944	243.350
939.507	248.335
1001.596	250.999
1089.096	248.330

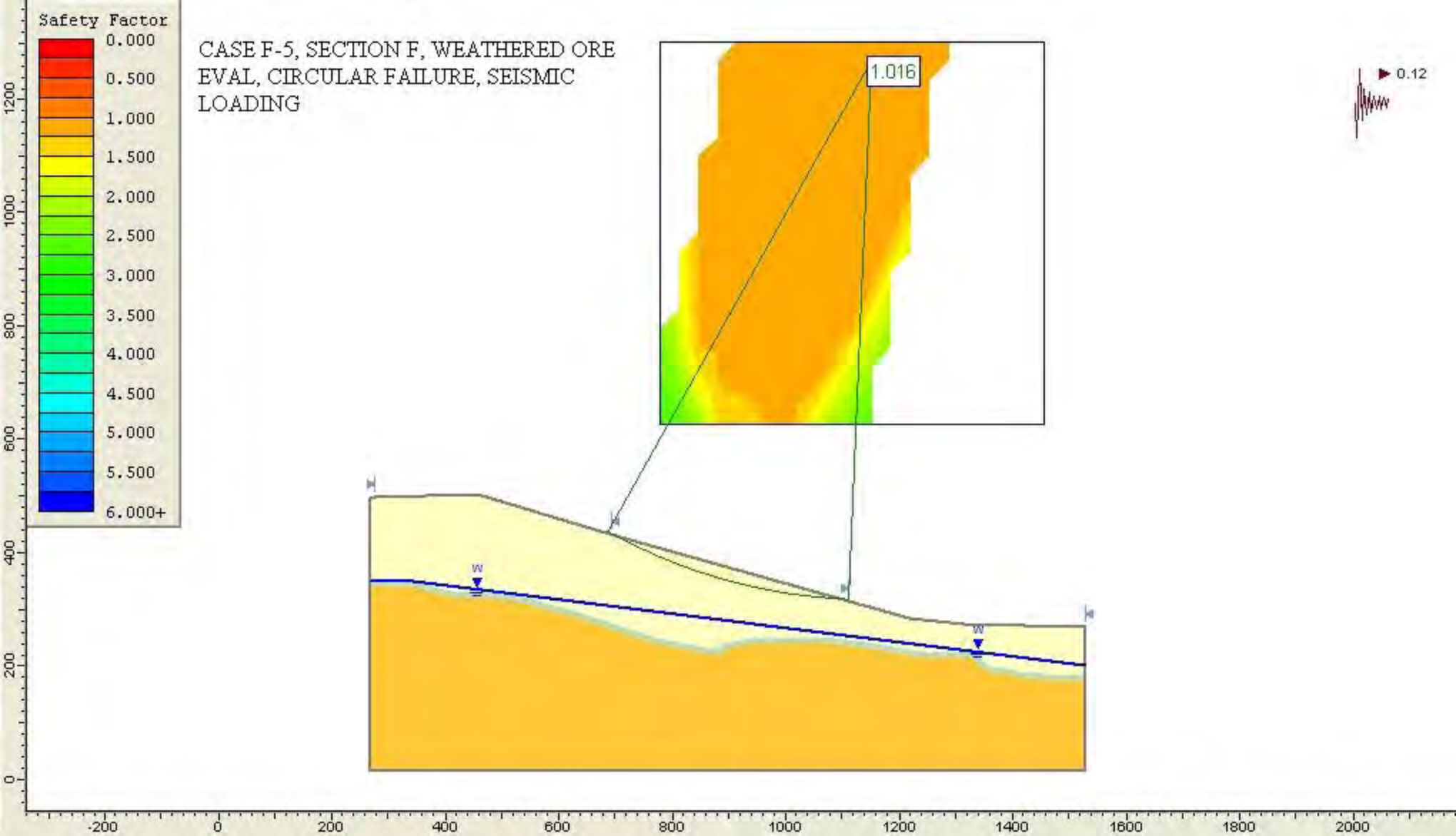
1144.420	242.086
1252.036	223.405
1332.652	224.112
1355.968	201.460
1369.263	194.793
1387.497	195.966
1404.438	193.029
1419.824	186.312
1430.857	190.672
1448.590	188.088
1465.015	183.405
1528.173	183.405

External Boundary

1313.951	273.405
1219.612	283.405
690.701	433.405
455.667	503.405
274.239	496.513
266.754	496.081
266.754	348.405
266.754	338.405
266.754	13.405
1528.173	13.405
1528.173	173.405
1528.173	183.405
1528.173	269.025

Water Table

266.754	348.405
344.473	348.405
1528.173	201.909


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE F-5, SECTION F, WEATHERED ORE EVAL, CIRCULAR FAILURE, SEISMIC LOADING
1.016
0.12
W
W
0
200
400
600
800
1000
1200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information
CASE F-5, SECTION F, WEATHERED ORE EVAL, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-F-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf

Friction Angle: 22.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 22.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.016400
Center: 1150.578, 1266.924
Radius: 953.344
Left Slip Surface Endpoint: 684.596, 435.223
Right Slip Surface Endpoint: 1110.195, 314.435
Resisting Moment=3.40363e+008 lb-ft
Driving Moment=3.34872e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2760
Number of Invalid Surfaces: 2091
Error Codes:
Error Code -101 reported for 53 surfaces
Error Code -103 reported for 14 surfaces
Error Code -1000 reported for 2024 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

779.548	626.054
1454.147	626.054
1454.147	1300.654
779.548	1300.654

Material Boundary

266.754	338.405
343.208	338.405
397.000	324.571
425.057	319.891
444.068	321.737
524.674	313.405
644.046	280.826
774.740	238.405
881.054	219.218
894.073	228.055
910.654	233.395
940.760	238.405
1001.358	240.985
1087.496	238.450
1143.492	232.126
1250.938	213.405
1329.035	213.708
1349.749	193.405
1367.319	184.765
1387.299	185.849
1401.346	183.400
1419.174	175.778
1431.525	180.528
1446.207	178.341
1463.649	173.405
1528.173	173.405

Material Boundary

266.754	348.405
344.473	348.405
398.800	334.433
426.209	330.050
443.784	331.756
526.505	323.247
647.474	290.222
777.302	248.089
876.240	229.337
890.429	237.387
908.944	243.350
939.507	248.335
1001.596	250.999
1089.096	248.330

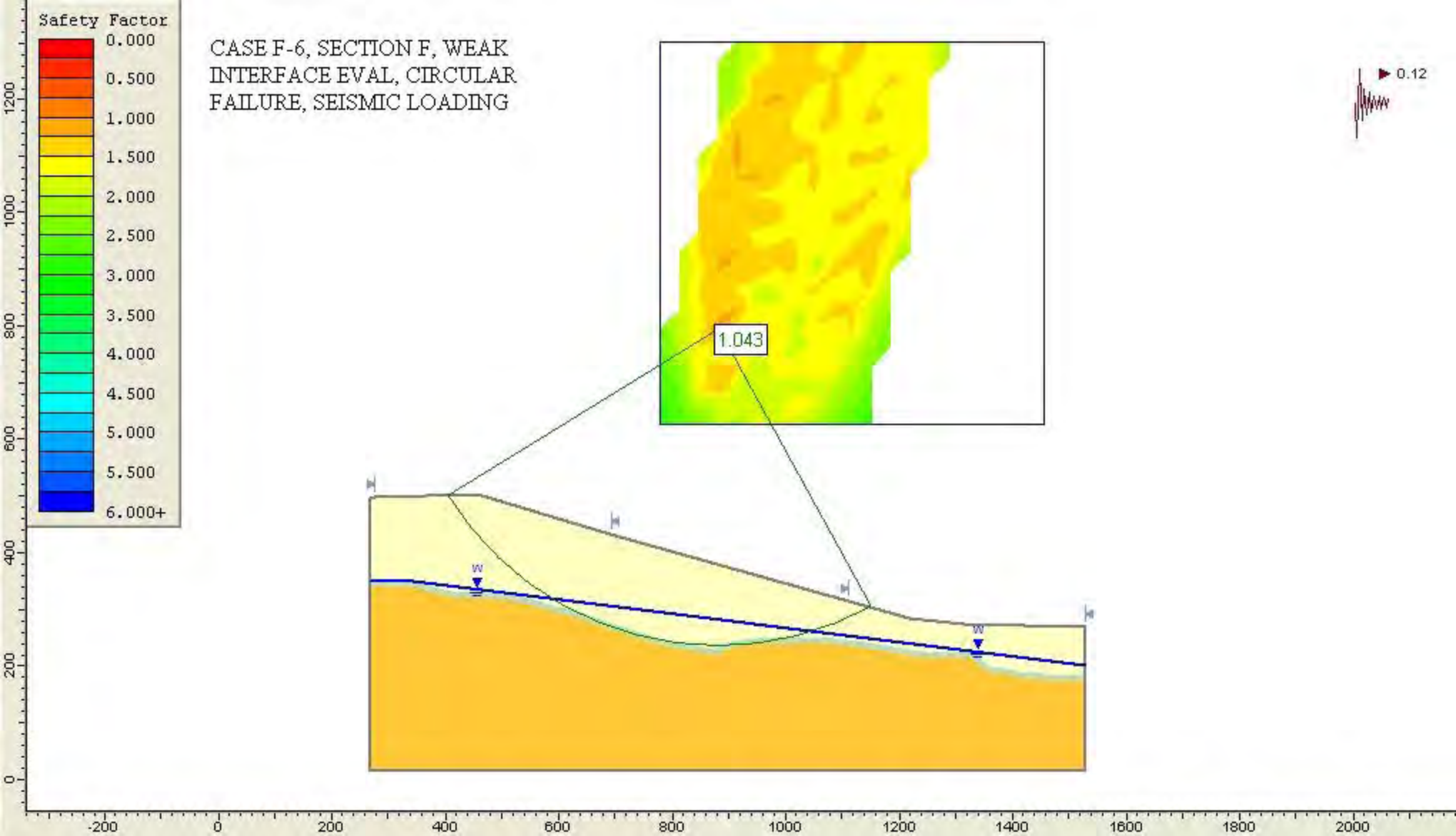
1144.420	242.086
1252.036	223.405
1332.652	224.112
1355.968	201.460
1369.263	194.793
1387.497	195.966
1404.438	193.029
1419.824	186.312
1430.857	190.672
1448.590	188.088
1465.015	183.405
1528.173	183.405

External Boundary

1313.951	273.405
1219.612	283.405
690.701	433.405
455.667	503.405
274.239	496.513
266.754	496.081
266.754	348.405
266.754	338.405
266.754	13.405
1528.173	13.405
1528.173	173.405
1528.173	183.405
1528.173	269.025

Water Table

266.754	348.405
344.473	348.405
1528.173	201.909


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE F-6, SECTION F, WEAK INTERFACE EVAL, CIRCULAR FAILURE, SEISMIC LOADING
1.043
0.12
W
W
0
200
400
600
800
1000
1200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information
CASE F-6, SECTION F, WEAK INTERFACE EVAL, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-F-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf

Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 4 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.042740
Center: 880.738, 794.704
Radius: 560.982
Left Slip Surface Endpoint: 402.548, 501.387
Right Slip Surface Endpoint: 1150.696, 302.949
Resisting Moment=1.99992e+009 lb-ft
Driving Moment=1.91795e+009 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2760
Number of Invalid Surfaces: 2091
Error Codes:
Error Code -101 reported for 53 surfaces
Error Code -103 reported for 14 surfaces
Error Code -1000 reported for 2024 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

779.548	626.054
1454.147	626.054
1454.147	1300.654
779.548	1300.654

Material Boundary

266.754	338.405
343.208	338.405
397.000	324.571
425.057	319.891
444.068	321.737
524.674	313.405
644.046	280.826
774.740	238.405
881.054	219.218
894.073	228.055
910.654	233.395
940.760	238.405
1001.358	240.985
1087.496	238.450
1143.492	232.126
1250.938	213.405
1329.035	213.708
1349.749	193.405
1367.319	184.765
1387.299	185.849
1401.346	183.400
1419.174	175.778
1431.525	180.528
1446.207	178.341
1463.649	173.405
1528.173	173.405

Material Boundary

266.754	348.405
344.473	348.405
398.800	334.433
426.209	330.050
443.784	331.756
526.505	323.247
647.474	290.222
777.302	248.089
876.240	229.337
890.429	237.387
908.944	243.350
939.507	248.335
1001.596	250.999
1089.096	248.330

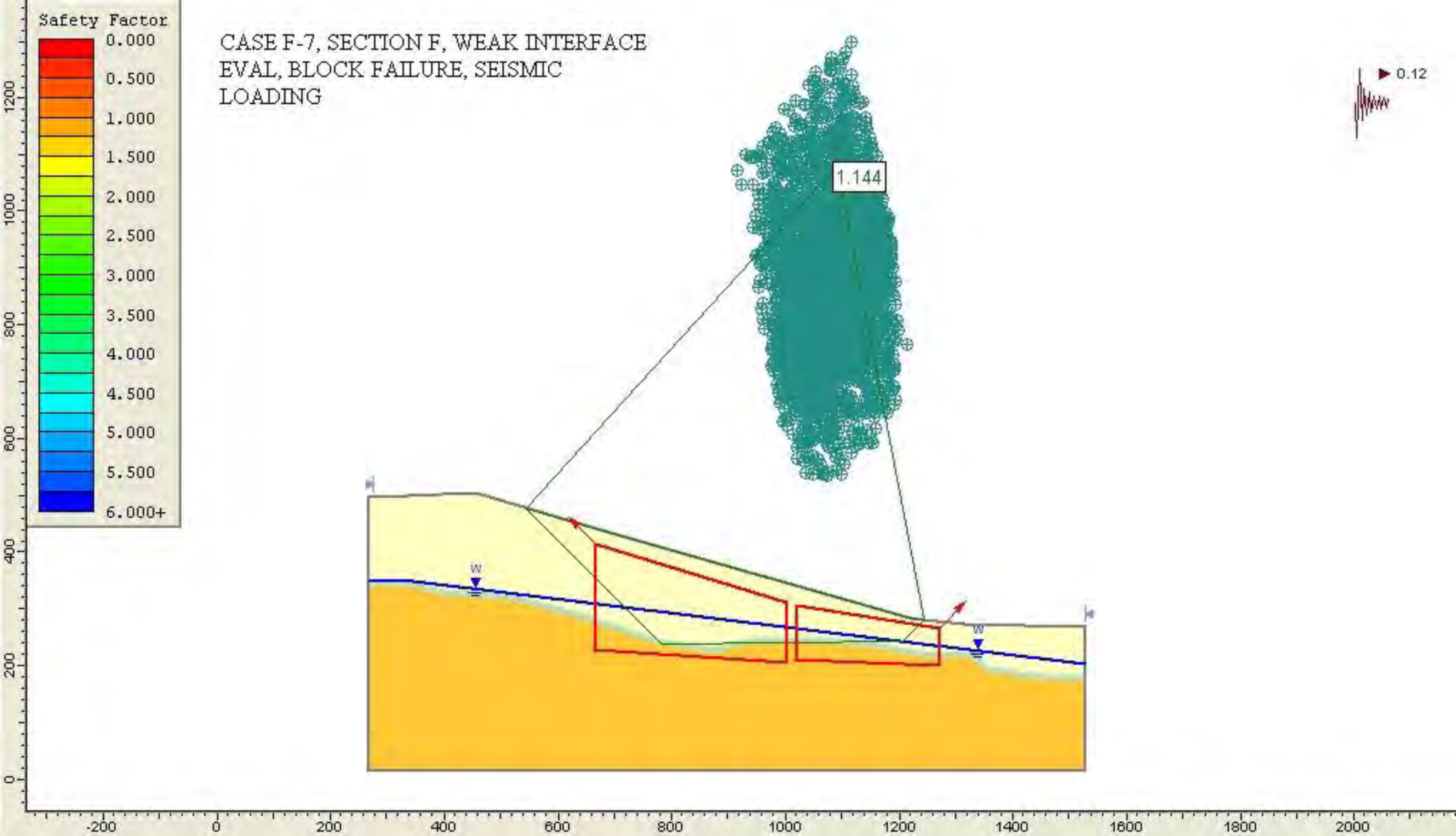
1144.420	242.086
1252.036	223.405
1332.652	224.112
1355.968	201.460
1369.263	194.793
1387.497	195.966
1404.438	193.029
1419.824	186.312
1430.857	190.672
1448.590	188.088
1465.015	183.405
1528.173	183.405

External Boundary

1313.951	273.405
1219.612	283.405
690.701	433.405
455.667	503.405
274.239	496.513
266.754	496.081
266.754	348.405
266.754	338.405
266.754	13.405
1528.173	13.405
1528.173	173.405
1528.173	183.405
1528.173	269.025

Water Table

266.754	348.405
344.473	348.405
1528.173	201.909


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE F-7, SECTION F, WEAK INTERFACE
EVAL, BLOCK FAILURE, SEISMIC
LOADING
1.144
0.12
W
W
0
200
400
600
800
1000
1200
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000

Slide Analysis Information
CASE F-7, SECTION F, WEAK INTERFACE EVAL, BLOCK FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-F-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: WASTE ROCK
Strength Type: Mohr-Coulomb

Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 4 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: BEDROCK
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.143750
Axis Location: 1089.171, 1079.060
Left Slip Surface Endpoint: 542.750, 477.469
Right Slip Surface Endpoint: 1242.591, 280.969
Resisting Moment=2.3526e+009 lb-ft
Driving Moment=2.05692e+009 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4996
Number of Invalid Surfaces: 4
Error Codes:
Error Code -108 reported for 3 surfaces
Error Code -111 reported for 1 surface

Error Codes

The following errors were encountered during the computation:

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

-111 = safety factor equation did not converge

List of All Coordinates

Material Boundary

266.754	338.405
343.208	338.405
397.000	324.571
425.057	319.891
444.068	321.737
524.674	313.405
644.046	280.826
774.740	238.405
881.054	219.218
894.073	228.055
910.654	233.395
940.760	238.405
1001.358	240.985
1087.496	238.450
1143.492	232.126
1250.938	213.405
1329.035	213.708
1349.749	193.405
1367.319	184.765
1387.299	185.849
1401.346	183.400
1419.174	175.778
1431.525	180.528
1446.207	178.341
1463.649	173.405
1528.173	173.405

Material Boundary

266.754	348.405
344.473	348.405
398.800	334.433
426.209	330.050
443.784	331.756
526.505	323.247
647.474	290.222
777.302	248.089
876.240	229.337
890.429	237.387
908.944	243.350
939.507	248.335
1001.596	250.999
1089.096	248.330
1144.420	242.086
1252.036	223.405
1332.652	224.112
1355.968	201.460
1369.263	194.793
1387.497	195.966
1404.438	193.029
1419.824	186.312
1430.857	190.672
1448.590	188.088

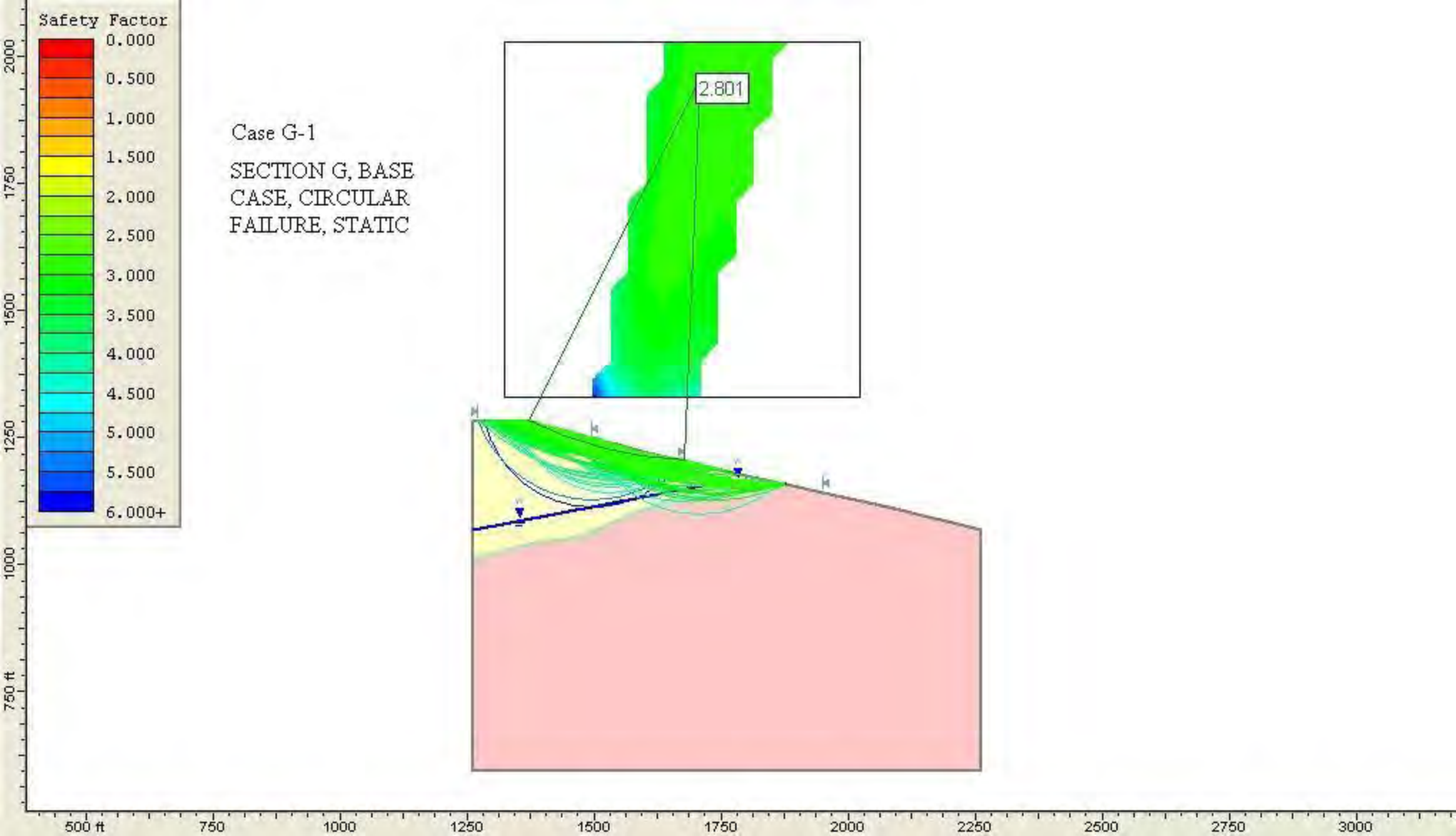
1465.015 183.405
1528.173 183.405

External Boundary
1313.951 273.405
1219.612 283.405
690.701 433.405
455.667 503.405
274.239 496.513
266.754 496.081
266.754 348.405
266.754 338.405
266.754 13.405
1528.173 13.405
1528.173 173.405
1528.173 183.405
1528.173 269.025

Water Table
266.754 348.405
344.473 348.405
1528.173 201.909

Focus/Block Search Window
1018.826 305.184
1016.310 209.587
1270.397 199.524
1270.397 264.933

Focus/Block Search Window
664.109 227.197
1001.216 204.556
1001.216 310.216
666.625 413.360


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
Case G-1
SECTION G, BASE CASE, CIRCULAR FAILURE, STATIC
2.801
2000
1750
1500
1250
1000
750 ft
500 ft
750
1000
1250
1500
1750
2000
2250
2500
2750
3000

Slide Analysis Information
Section G, Case G-1
Base Case, Circular Failure
Static Loading

Document Name

File Name: SEC-G-BAS_C_S.sli

Project Settings

Project Title: 2C Leached Ore Stockpile
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table

Custom Hu value: 1

Material: Basal Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Granodiorite Bedrock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 2.800800
Center: 1708.130, 1959.288
Radius: 756.558
Left Slip Surface Endpoint: 1370.588, 1282.202
Right Slip Surface Endpoint: 1677.136, 1203.365
Resisting Moment=2.0529e+008 lb-ft
Driving Moment=7.3297e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 1733
Number of Invalid Surfaces: 3118
Error Codes:
Error Code -101 reported for 126 surfaces
Error Code -1000 reported for 2992 surfaces

Error Codes

The following errors were encountered during the computation:

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1323.994	1330.702
2022.423	1330.702

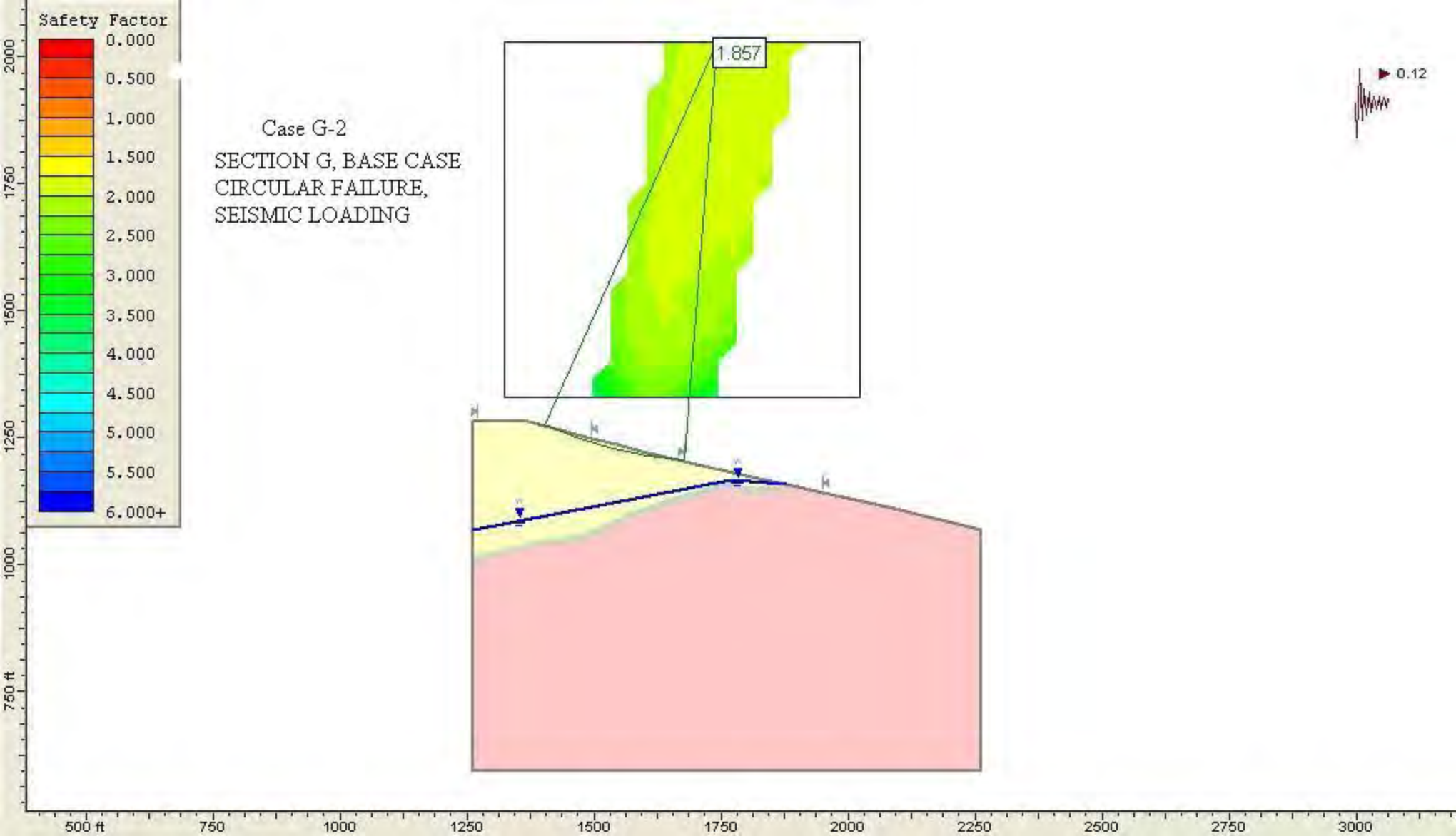
2022.423 2029.131
1323.994 2029.131

Material Boundary
1262.654 1014.425
1288.832 1024.194
1394.218 1049.494
1430.867 1052.137
1475.035 1058.867
1570.678 1101.460
1637.490 1126.611
1771.339 1166.224
1797.007 1151.804
1852.383 1152.682
1876.118 1156.825

Material Boundary
1262.654 1003.752
1292.132 1014.752
1394.406 1039.473
1432.188 1042.224
1477.771 1049.172
1574.536 1092.224
1640.939 1117.224
1770.297 1155.599
1796.217 1141.686
1854.411 1142.224
1876.118 1156.825

External Boundary
1262.654 1280.502
1262.654 1014.425
1262.654 1003.752
1262.654 592.224
2262.654 592.224
2262.654 1067.152
2079.683 1112.224
1948.847 1142.224
1876.118 1156.825
1809.684 1171.600
1592.556 1223.635
1545.195 1235.914
1496.084 1248.321
1372.183 1282.205
1372.116 1282.224
1372.062 1282.224
1270.100 1280.679

Water Table
1262.387 1069.226
1771.339 1166.224
1876.118 1156.825


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
Case G-2
SECTION G, BASE CASE
CIRCULAR FAILURE,
SEISMIC LOADING
1.857
0.12
2000
1750
1500
1250
1000
750 ft
500 ft
750
1000
1250
1500
1750
2000
2250
2500
2750
3000

Slide Analysis Information
Section G Case G-2
Base Case
Circular Failure, Seismic Loading

Document Name

File Name: SEC-G-BAS_C_S.sli

Project Settings

Project Title: 2C Leached Ore Stockpile
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3

Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Basal Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Granodiorite Bedrock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.857060
Center: 1743.051, 2029.131
Radius: 828.392
Left Slip Surface Endpoint: 1402.853, 1273.817
Right Slip Surface Endpoint: 1677.136, 1203.365
Resisting Moment=1.35707e+008 lb-ft
Driving Moment=7.30766e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 1733
Number of Invalid Surfaces: 3118
Error Codes:
Error Code -101 reported for 126 surfaces
Error Code -1000 reported for 2992 surfaces

Error Codes

The following errors were encountered during the computation:

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

1323.994	1330.702
2022.423	1330.702
2022.423	2029.131
1323.994	2029.131

Material Boundary

1262.654	1014.425
1288.832	1024.194
1394.218	1049.494
1430.867	1052.137
1475.035	1058.867
1570.678	1101.460
1637.490	1126.611
1771.339	1166.224
1797.007	1151.804
1852.383	1152.682
1876.118	1156.825

Material Boundary

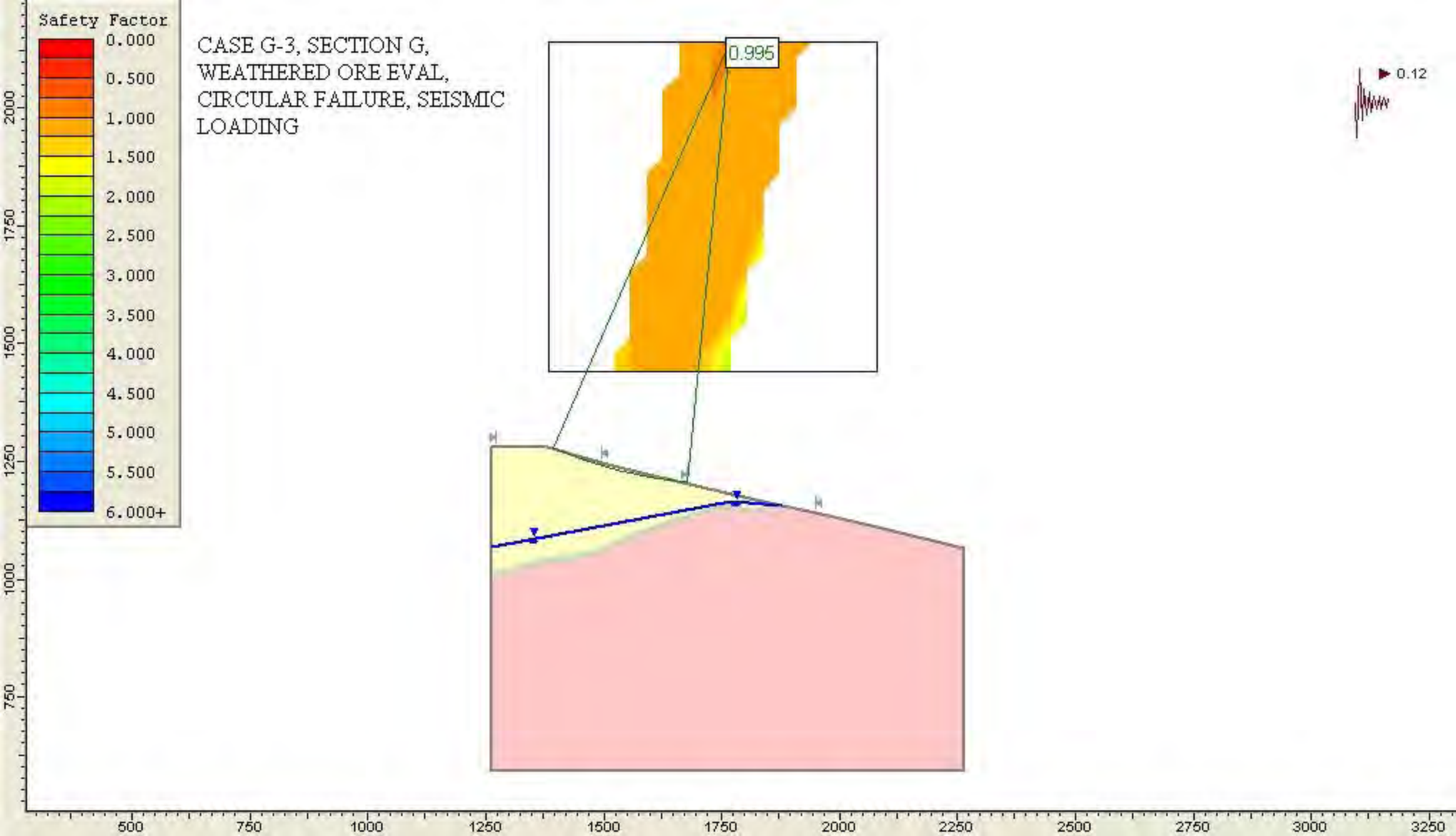
1262.654	1003.752
1292.132	1014.752
1394.406	1039.473
1432.188	1042.224
1477.771	1049.172
1574.536	1092.224
1640.939	1117.224
1770.297	1155.599
1796.217	1141.686
1854.411	1142.224
1876.118	1156.825

External Boundary

1262.654	1280.502
1262.654	1014.425
1262.654	1003.752
1262.654	592.224
2262.654	592.224
2262.654	1067.152
2079.683	1112.224
1948.847	1142.224
1876.118	1156.825
1809.684	1171.600
1592.556	1223.635
1545.195	1235.914
1496.084	1248.321
1372.183	1282.205
1372.116	1282.224
1372.062	1282.224
1270.100	1280.679

Water Table

1262.387	1069.226
1771.339	1166.224
1876.118	1156.825


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE G-3, SECTION G,
WEATHERED ORE EVAL,
CIRCULAR FAILURE, SEISMIC
LOADING
0.995
0.12
2000
1750
1500
1250
1000
750
500
750
1000
1250
1500
1750
2000
2250
2500
2750
3000
3250

Slide Analysis Information
CASE G-3, SECTION G, WEATHERED ORE EVAL, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-G-BAS_C_S.sli

Project Settings

Project Title: 2C Leached Ore Stockpile
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Maximum
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf

Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Basal Interface
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 133 lb/ft3
Cohesion: 0 psf
Friction Angle: 21 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Granodiorite Bedrock
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 160 lb/ft3
Saturated Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 0.995423
Center: 1766.486, 2140.539
Radius: 941.423
Left Slip Surface Endpoint: 1392.118, 1276.753
Right Slip Surface Endpoint: 1677.136, 1203.365
Resisting Moment=8.06713e+007 lb-ft
Driving Moment=8.10423e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 1778
Number of Invalid Surfaces: 3073
Error Codes:
Error Code -101 reported for 103 surfaces
Error Code -1000 reported for 2970 surfaces

Error Codes

The following errors were encountered during the computation:

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

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

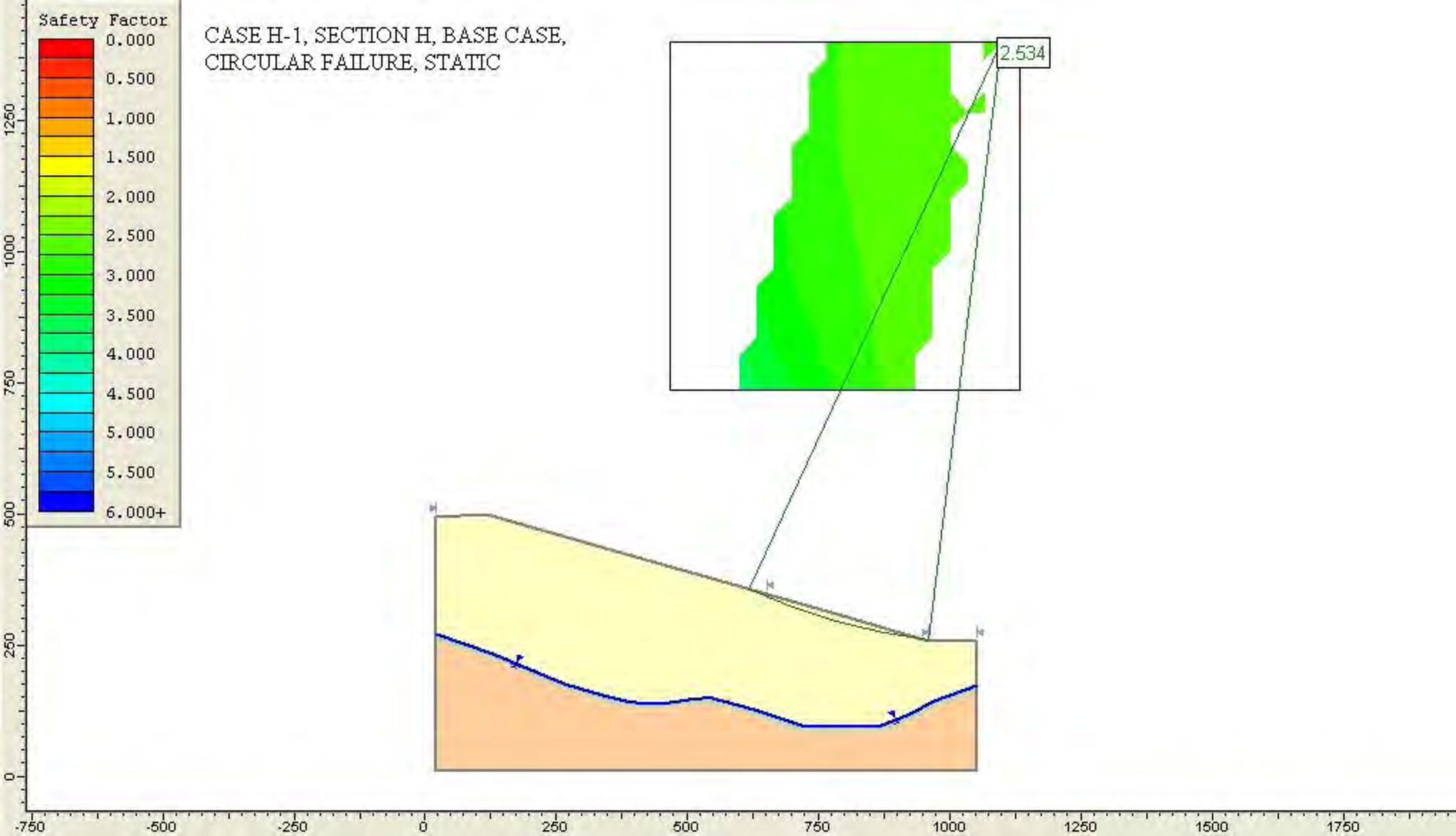
1382.350 1442.110
2080.779 1442.110
2080.779 2140.539
1382.350 2140.539

Material Boundary
1262.654 1014.425
1288.832 1024.194
1394.218 1049.494
1430.867 1052.137
1475.035 1058.867
1570.678 1101.460
1637.490 1126.611
1771.339 1166.224
1797.007 1151.804
1852.383 1152.682
1876.118 1156.825

Material Boundary
1262.654 1003.752
1292.132 1014.752
1394.406 1039.473
1432.188 1042.224
1477.771 1049.172
1574.536 1092.224
1640.939 1117.224
1770.297 1155.599
1796.217 1141.686
1854.411 1142.224
1876.118 1156.825

External Boundary
1262.654 1280.502
1262.654 1014.425
1262.654 1003.752
1262.654 592.224
2262.654 592.224
2262.654 1067.152
2079.683 1112.224
1948.847 1142.224
1876.118 1156.825
1809.684 1171.600
1592.556 1223.635
1545.195 1235.914
1496.084 1248.321
1372.183 1282.205
1372.116 1282.224
1372.062 1282.224
1270.100 1280.679

Water Table
1262.387 1069.226
1771.339 1166.224
1876.118 1156.825


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE H-1, SECTION H, BASE CASE,
CIRCULAR FAILURE, STATIC
2.534
1250
1000
750
500
250
0
-750
-500
-250
0
250
500
750
1000
1250
1500
1750

Slide Analysis Information
CASE H-1, SECTION H, BASE CASE, CIRCULAR FAILURE, STATIC

Document Name

File Name: SEC-H-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 35.5 degrees
Water Surface: None

Material: Interface

Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 2.534160
Center: 1098.416, 1401.355
Radius: 1150.113
Left Slip Surface Endpoint: 615.670, 357.461
Right Slip Surface Endpoint: 959.478, 259.665
Resisting Moment=3.16342e+008 lb-ft
Driving Moment=1.24831e+008 lb-ft

Method: janbu simplified
FS: 2.520910
Center: 1098.416, 1401.355
Radius: 1150.113
Left Slip Surface Endpoint: 615.670, 357.461
Right Slip Surface Endpoint: 959.478, 259.665
Resisting Horizontal Force=263926 lb
Driving Horizontal Force=104695 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2324
Number of Invalid Surfaces: 2527
Error Codes:
Error Code -101 reported for 22 surfaces
Error Code -109 reported for 5 surfaces
Error Code -113 reported for 190 surfaces
Error Code -1000 reported for 2310 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2324
Number of Invalid Surfaces: 2527
Error Codes:
Error Code -101 reported for 22 surfaces
Error Code -109 reported for 5 surfaces
Error Code -113 reported for 190 surfaces
Error Code -1000 reported for 2310 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-113 = Surface intersects outside slope limits.

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

467.117	736.830
1131.642	736.830
1131.642	1401.355
467.117	1401.355

Material Boundary

20.615	271.422
130.646	234.016
265.979	176.930
340.058	154.460
383.202	144.383
421.328	139.863
451.585	140.018
503.056	147.774
527.655	149.132
546.999	148.341
567.690	144.335
625.928	128.890
725.693	94.665
862.381	94.665
923.726	118.795
969.511	143.731
1050.770	174.833

Material Boundary

20.615	261.114
126.886	224.749
262.270	167.628
337.584	144.769
381.481	134.526
420.688	129.883
451.062	129.951
503.551	137.757

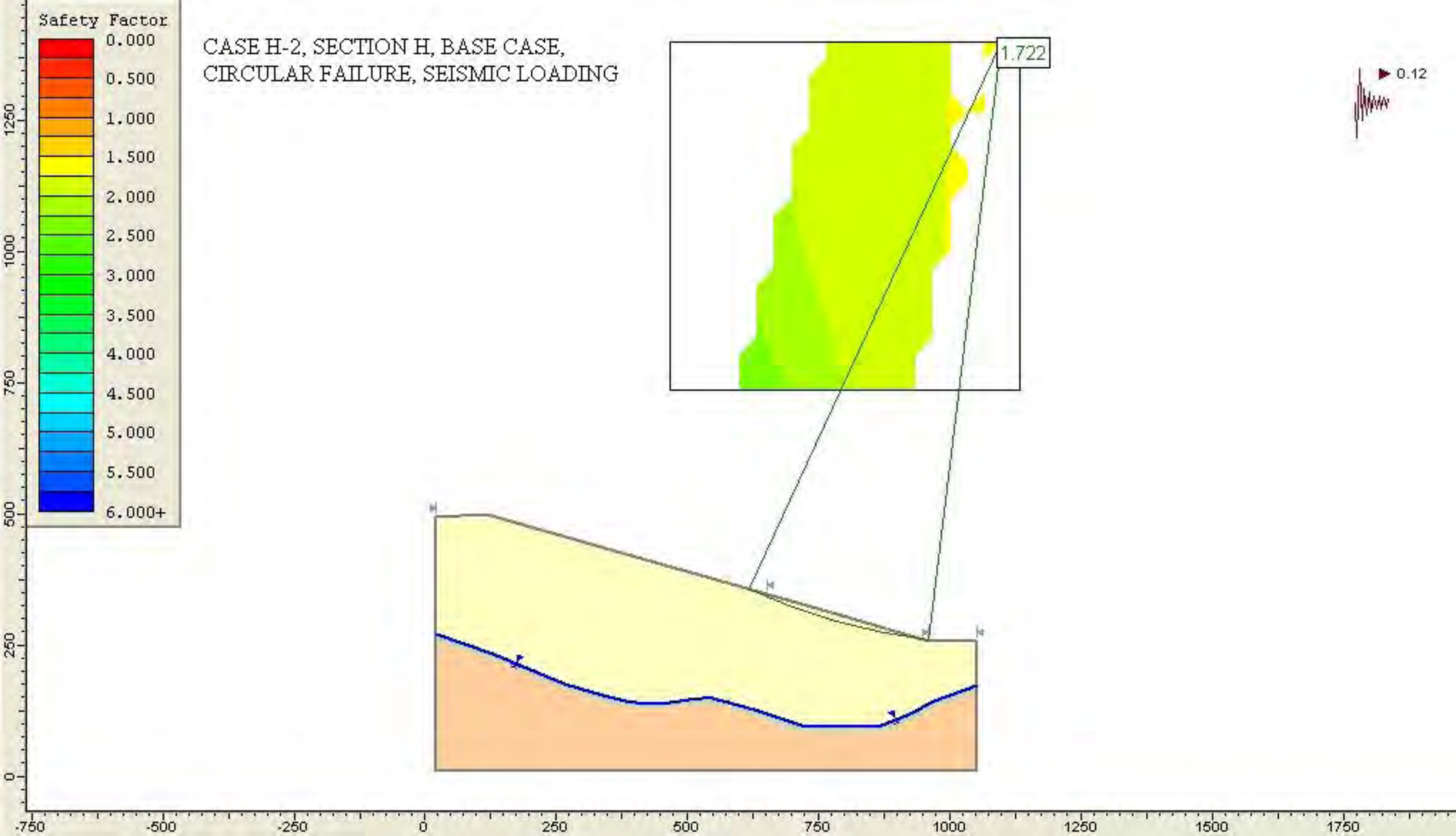
527.803	139.118
546.153	138.367
565.139	134.665
622.943	119.336
724.139	84.665
864.492	84.665
927.863	109.665
973.775	134.665
1050.770	164.278

External Boundary

1050.770	9.665
1050.770	164.278
1050.770	174.833
1050.770	259.665
959.478	259.665
783.745	309.665
488.597	393.596
115.279	499.665
20.615	495.641
20.615	271.422
20.615	261.114
20.615	9.665

Water Table

20.615	271.422
130.646	234.016
265.979	176.930
340.058	154.460
383.202	144.383
421.328	139.863
451.585	140.018
503.056	147.774
527.655	149.132
546.999	148.341
567.690	144.335
625.928	128.890
725.693	94.665
862.381	94.665
923.726	118.795
969.511	143.731
1050.770	174.833


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE H-2, SECTION H, BASE CASE,
CIRCULAR FAILURE, SEISMIC LOADING
1.722
0.12
1250
1000
750
500
250
0
-750
-500
-250
0
250
500
750
1000
1250
1500
1750

Slide Analysis Information
CASE H-2, SECTION H, BASE CASE, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-H-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf

Friction Angle: 35.5 degrees
Water Surface: None

Material: Interface
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 35.5 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.722440
Center: 1098.416, 1401.355
Radius: 1150.113
Left Slip Surface Endpoint: 615.670, 357.461
Right Slip Surface Endpoint: 959.478, 259.665
Resisting Moment=3.05724e+008 lb-ft
Driving Moment=1.77495e+008 lb-ft

Method: janbu simplified
FS: 1.712860
Center: 1098.416, 1401.355
Radius: 1150.113
Left Slip Surface Endpoint: 615.670, 357.461
Right Slip Surface Endpoint: 959.478, 259.665
Resisting Horizontal Force=255054 lb
Driving Horizontal Force=148905 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2324
Number of Invalid Surfaces: 2527
Error Codes:
Error Code -101 reported for 22 surfaces
Error Code -109 reported for 5 surfaces
Error Code -113 reported for 190 surfaces
Error Code -1000 reported for 2310 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2324
Number of Invalid Surfaces: 2527
Error Codes:
Error Code -101 reported for 22 surfaces
Error Code -109 reported for 5 surfaces

Error Code -113 reported for 190 surfaces
Error Code -1000 reported for 2310 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-113 = Surface intersects outside slope limits.

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

467.117	736.830
1131.642	736.830
1131.642	1401.355
467.117	1401.355

Material Boundary

20.615	271.422
130.646	234.016
265.979	176.930
340.058	154.460
383.202	144.383
421.328	139.863
451.585	140.018
503.056	147.774
527.655	149.132
546.999	148.341
567.690	144.335
625.928	128.890
725.693	94.665
862.381	94.665
923.726	118.795
969.511	143.731
1050.770	174.833

Material Boundary

20.615	261.114
126.886	224.749
262.270	167.628

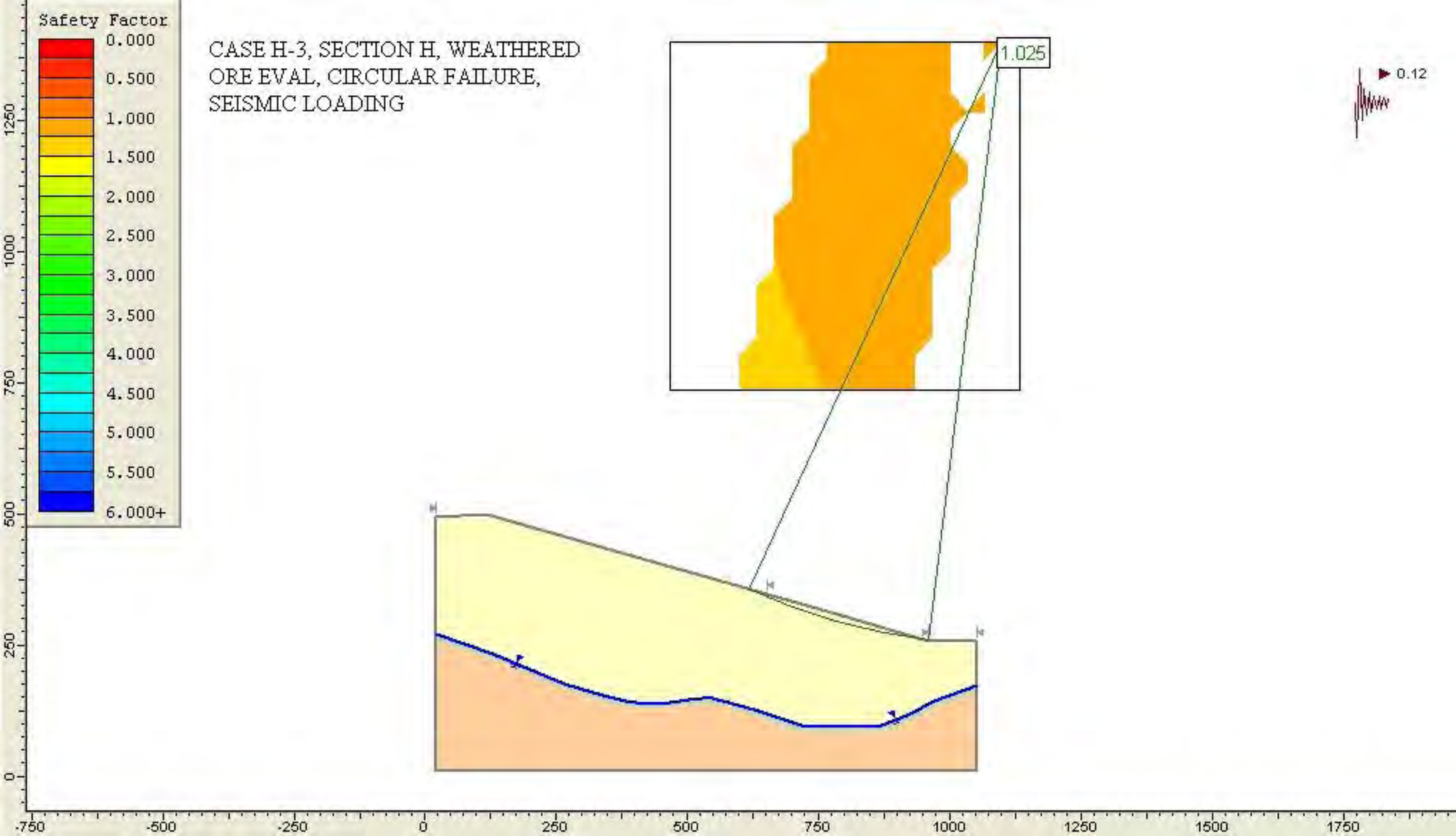
337.584	144.769
381.481	134.526
420.688	129.883
451.062	129.951
503.551	137.757
527.803	139.118
546.153	138.367
565.139	134.665
622.943	119.336
724.139	84.665
864.492	84.665
927.863	109.665
973.775	134.665
1050.770	164.278

External Boundary

1050.770	9.665
1050.770	164.278
1050.770	174.833
1050.770	259.665
959.478	259.665
783.745	309.665
488.597	393.596
115.279	499.665
20.615	495.641
20.615	271.422
20.615	261.114
20.615	9.665

Water Table

20.615	271.422
130.646	234.016
265.979	176.930
340.058	154.460
383.202	144.383
421.328	139.863
451.585	140.018
503.056	147.774
527.655	149.132
546.999	148.341
567.690	144.335
625.928	128.890
725.693	94.665
862.381	94.665
923.726	118.795
969.511	143.731
1050.770	174.833


Safety Factor
0.000
0.500
1.000
1.500
2.000
2.500
3.000
3.500
4.000
4.500
5.000
5.500
6.000+
CASE H-3, SECTION H, WEATHERED ORE EVAL, CIRCULAR FAILURE, SEISMIC LOADING
1.025
0.12
1250
1000
750
500
250
0
-750
-500
-250
0
250
500
750
1000
1250
1500
1750

Slide Analysis Information
CASE H-3, SECTION H, WEATHERED ORE EVALUATION, CIRCULAR FAILURE, SEISMIC LOADING

Document Name

File Name: SEC-H-BAS_C_S.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.12

Material Properties

Material: Leached Ore
Strength Type: Mohr-Coulomb

Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 23 degrees
Water Surface: None

Material: Interface
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1 psf
Friction Angle: 23 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 160 lb/ft3
Cohesion: 20 psf
Friction Angle: 35 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 1.024820
Center: 1098.416, 1401.355
Radius: 1150.113
Left Slip Surface Endpoint: 615.670, 357.461
Right Slip Surface Endpoint: 959.478, 259.665
Resisting Moment=1.819e+008 lb-ft
Driving Moment=1.77495e+008 lb-ft

Method: janbu simplified
FS: 1.019310
Center: 1098.416, 1401.355
Radius: 1150.113
Left Slip Surface Endpoint: 615.670, 357.461
Right Slip Surface Endpoint: 959.478, 259.665
Resisting Horizontal Force=151781 lb
Driving Horizontal Force=148906 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2324
Number of Invalid Surfaces: 2527
Error Codes:
Error Code -101 reported for 22 surfaces
Error Code -109 reported for 5 surfaces
Error Code -113 reported for 190 surfaces
Error Code -1000 reported for 2310 surfaces

Method: janbu simplified
Number of Valid Surfaces: 2324
Number of Invalid Surfaces: 2527
Error Codes:

Error Code -101 reported for 22 surfaces
Error Code -109 reported for 5 surfaces
Error Code -113 reported for 190 surfaces
Error Code -1000 reported for 2310 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-113 = Surface intersects outside slope limits.

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

467.117	736.830
1131.642	736.830
1131.642	1401.355
467.117	1401.355

Material Boundary

20.615	271.422
130.646	234.016
265.979	176.930
340.058	154.460
383.202	144.383
421.328	139.863
451.585	140.018
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527.655	149.132
546.999	148.341
567.690	144.335
625.928	128.890
725.693	94.665
862.381	94.665
923.726	118.795
969.511	143.731
1050.770	174.833

Material Boundary

20.615	261.114

126.886	224.749
262.270	167.628
337.584	144.769
381.481	134.526
420.688	129.883
451.062	129.951
503.551	137.757
527.803	139.118
546.153	138.367
565.139	134.665
622.943	119.336
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864.492	84.665
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