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December 7, 2009
J.N. 247-09

3M Industrial Mineral Products Division
c/o RESOURCE DESIGN TECHNOLOGY, INC.
4509 Golden Foothill Parkway, Suite 2
El Dorado Hills, California 95762

Attention: Mr. Andrew White

Subject: Slope Stability Evaluation, 3M Moody Flats Quarry, Shasta County, California

Dear Mr. White:

Pursuant to a request by 3M Industrial Mineral Products Division (the Applicant), Petra Geotechnical, Inc. (Petra) has performed a slope stability evaluation of the proposed Moody Flats Quarry, located in southwest Shasta County, California. The purpose of this evaluation is to determine the potential adverse slope stability impacts associated with the proposed quarry and stockpile slopes and provide mitigation measures for incorporation in the design of the Reclamation Plan.

This report presents the results of slope stability analyses of the proposed mine, which includes the two quarry pits, referred to herein as the north and south pits, and one large stockpile area for overburden materials. Our study was focused on potential adverse slope stability impacts both during operations and following reclamation of the Moody Flats Quarry. By identifying such impacts and provide recommendations for mitigating measures, the proposed Reclamation Plan will reflect final slope configurations that are suitably stable with respect to gross stability (large-scale slope failure) during operation and following reclamation.

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PROJECT UNDERSTANDING

The Applicant is proposing to develop a hard-rock quarry in the southwestern portion of Shasta County, approximately 1.5 miles west of the Interstate 5 off ramp for Wonderland Blvd., 2.75 miles east of the Shasta Dam museum and information center, and 8.3 miles north of the intersection of Highway 44 and Interstate 5 in Redding.

Based upon the draft Reclamation Plan prepared by Resource Design Technologies, Inc. (RDT), relief on the property is approximately 1125 feet, measured between the property gate at the railroad crossing and the apex of the north pit. Surface elevations vary from 905 feet above mean sea level (ft msl) at the railroad crossing to 2030 ft msl (Plates 1 and 2). The north pit is the larger of the two pits and is approximately 4500 feet long (north to south) and 3675 feet wide (west to east). Similarly, the smaller south pit is approximately 2400 feet long and 1625 feet wide. The two closest currently proposed offset distances of either pit from the nearest adjacent property is 845 feet at the south edge of the south pit and 210 feet at the north edge of the north pit.

The Reclamation Plan reflects one overall intermittent drainage course in the area of the proposed quarry that exits the site south of the entry gate at the railroad tracks. Watersheds to the south, west, north, and northwest appear to be unaltered by the proposed plans.

The maximum elevations of the north pit are indicated to be 1890 and 1900 ft msl on the north and northwest respectively, 1700 ft msl on the west, 1395 ft msl on the south, and 1350 ft msl on the east side of this excavation. The bottom of this pit is mapped at 1175 ft msl producing a maximum slope height of 725 feet. The designed overall slope angle of this pit's slope environment varies from 42° to 36.5° from horizontal with individual 50-foot high stepped slopes varying from 79.5° to 54°, each separated by an approximately 60-foot wide horizontal bench.

The maximum elevations of the south pit are indicated to be 1100 ft msl on the north, 1245 ft msl on the west, 1290 ft msl on the southeast, and 1065 ft msl on the east side of this excavation. The bottom of this pit is mapped at 950 ft msl producing a resultant maximum slope height of 340 feet. The designed overall slope angle of this pit's slope environment varies from 38 to 35.5° from horizontal. The individual stepped slopes and intervening benches are similar to those in the north pit.

As shown on Plate 2, overburden material will be stockpiled to the immediate west of the processing/staging area of the quarry. The stockpiled material is proposed to have individual fill slopes of 50 feet in height separated by 30-foot wide horizontal benches for a maximum height of 315 feet. The gradient of the individual 50-foot high fill slopes is currently 2:1 (horizontal to vertical [h:v]). To the best of our knowledge, the current and proposed post-reclamation land use consists of undeveloped open space used for wildlife habitat.

BACKGROUND

In 1980, 3M drilled several core holes in the immediate of the proposed south pit and two core holes in the southern area of the north pit. Portions of the core samples from these borings were reviewed as part of this stability assessment. Based upon the logs of the core holes and visual observation of limited core, the south pit will encounter a relatively thick, but variable, section of weathered bedrock. Logs of the core holes are contained in a subsequent report by Brown and Caldwell (Brown and Caldwell, 2009). Below the weathered section of core, hard, crystalline bedrock extended to the total depth of the borings with minor intervals of weak broken rock intervals. Fractures/joints of various orientations were present, but the non-oriented character of the core precluded obtaining attitudes of these structures.

Subsequent to 3M's initial subsurface field work, CH_2MHill performed a preliminary geotechnical exploration of the proposed plant site (CH_2MHill 1981). Four of their exploratory excavations were situated near the toe area of the now proposed overburden stockpile and "depth

to very dense to hard material" was reported to range from 7 to 20 feet below existing grade. Groundwater was reported to be on the order of 20 feet below ground surface.

A hydrology report for the quarry was produced by Brown and Caldwell in mid-2009 (Brown and Caldwell, 2009). Their report has summarized the background regional geology and includes copies of the 3M core logs from several of the borings. This data is not presented herein. Brown and Caldwell drilled four borings in which monitoring wells were installed. Groundwater was encountered in all four wells, but with reported slow recharge rates, most notably in borings B-2 and B-3. They cautioned that data from these two wells "*should be used with caution*". Based upon their results, groundwater in mid-2009 occurred at elevations ranging from 1097.05 to 1177.14 ft msl (49.80 and 99.70 feet below ground surface respectively).

The existing Reclamation Plan is currently in preparation by RDT. Their grading plans provide the base maps for our field mapping and slope stability analyses. Plates 1 and 2 of this report utilize both their existing and proposed topography.

FINDINGS

Regional Geology

The proposed Moody Flats Quarry is located in the Klamath Mountains geologic province. More specifically the site lies in the eastern Paleozoic belt of this province and contains a widely varying assemblage of plutonic, metamorphic and sedimentary rocks of Ordovician to Jurassic age.

Local Geology

The oldest and dominating formational rock unit in the area of the Moody Flats Quarry is the Copley Greenstone of probable middle Devonian age. This formation is comprised of bedded volcanic basalt flows, pyroclastic flows, tuffs and pillow lavas all of which have been metamorphosed. The predominant lithology of the Copley Formation is an aphanitic, foliated to schistose textured, keratophyre with a characteristic greenish color. In outcrop the bedrock exposures display a weathered reddish-brown patina.

Mapped as locally overlying the Copley Formation are rocks of the Kennett Formation (Diller, 1906). The Kennett Formation reportedly consists of "dark, thin-bedded siliceous mudstone and shale, tuffaceous shale, and limestone" (CH_2MHILL, 1981). Shales presumably of the Kennett Formation are present in the area of the overburden storage area.

Structural Geologic Setting

Bedrock exposed in the two pits comprising the Moody Flats Quarry was easily accessible due to the multiple outcrops throughout the area. Bedrock in the area of the north pit consisted of crystalline fractured rock having a well developed reddish-brown patina. In many of these outcrops, near vertical faces of varying heights, up to 30 feet, were encountered. In addition, very little soil development was present in the upper elevations of the north pit. When present, soil was comprised of silty/sandy gravel, with the gravel being very angular and rhombohedral in shape reflecting the fractures present in local nearby outcrops. In all instances, each outcrop contained a large number of joints/fractures. Each bedrock exposure appeared to be dominated by fracture sets that varied from outcrop to outcrop. Numerous attitudes of these joint features were collected for later analysis. The character of the joints reflected an abundant but seemingly discontinuous nature. No dominant, through-going pattern was observed in the field. Three cross-sections (A-A', B-B' and C-C') were drawn through the north pit depicting the proposed

slope configurations and geologic structure (apparent attitudes). These sections are included herein as Figures 2, 3 and 4.

Bedrock in the area of the south pit consisted of weathered, crystalline, fractured rock having a reddish-brown to yellow-brown color. Outcrops in this area of the proposed quarry not did not produce natural near vertical faces, but rather more subdued rounded hillsides. Many of the outcrops encountered, however, were created by access road cuts that were abundant the south pit area. As opposed to the north pit, soil in the south pit area was better developed and was comprised of clayey, silty gravel. Each outcrop in the area of the south pit contained a large number of joints/fractures; however, these southern outcrops were dominated by a much higher degree of weathering. Thus, many of the joint/fractures encountered may be somewhat displaced by creep action and incipient colluvial development. Each bedrock exposure appeared to be dominated by fracture sets that varied from outcrop to outcrop. Numerous attitudes of these joint features were collected for later analysis. The character of the joints reflected an abundant but seemingly discontinuous nature. No dominant, through-going pattern was observed in the field. Two cross-sections (D-D' and E-E') were drawn through the north pit depicting the proposed slope configurations and geologic structure (apparent attitudes). These sections are included herein as Figures 5 and 6.

Kinematic Analysis

Kinematic analyses of the structural attitudes were performed to evaluate stability of the conditions anticipated for each overall slope configuration indicated in the two pits of the proposed Reclamation Plan. The results of our analyses indicate the potential for small-scale (bench scale) planar toppling and wedge failures along portions of the proposed slopes. These small-scale failures are common in hard rock quarries, but do not represent a significant slope instability impact. These wedge-failure analyses indicate that such failures are likely to happen. Results of these analyses are included in Appendix A.

Limit Equilibrium Analysis

Limit equilibrium slope stability analyses were performed for proposed quarry slopes of the north and south pits, as well as the proposed overburden stockpile, as depicted on the Reclamation Plan. Geologic cross sections were prepared for representation of the various slope conditions, forming the geometric configurations for the individual analyses, as well as providing the spatial limits for the assignment of the various soil/bedrock strength and density parameters. Limit equilibrium stability analyses were run on six cross-sections (Figures 2 through 6): three representing the north, west and southwest walls of the north pit; two sections representing the west, and southeast, east and northeast walls of the south pit; and, one section through the proposed overburden stockpile fill slope. Groundwater levels were approximated at an elevation in the southern pit at an elevation of 1199. Slope angles and bench configurations were taken from the Reclamation Plan in preparation by RDT. The analyses were performed using the computer program GSTABL7, Version 1.14, prepared by Garry H. Gregory, PE. The analytical method used in the analyses included both the Bishop slip circle and Janbu block slide methods.

Strength parameters for highly weathered bedrock and topsoil were drawn from experience with similar materials and environments. The strength parameters for the rock mass comprising the quarry slopes were estimated using the Slope Stability Probability Classification (SSPC) approach presented by Robert Hack *et al* (Hack, 2002). The process first develops the Exposure Rock Mass (ERM) parameters based on estimates of intact rock strength, discontinuity orientation and spacing, plus discontinuity roughness, infill and karst; then adjusts for method of excavation and degree of weathering to develop the Reference Rock Mass (RRM); and then further adjusts for method of excavation and weathering at the end of engineering lifetime of the slope to give the refined geotechnical parameters of the Slope Rock Mass (SRM) to be used in the analysis. These parameters include angle of internal friction and cohesion in degrees and pounds per square foot, respectively. Results of the analyses are summarized in the following table.

Slope Stability Analyses Summary

I. Shear Strength Parameters and Seismic Coefficients

Material	Unit Weight (pcf)	Angle of Internal Friction (φ)	Cohesion (psf)	Seismic Coefficient
Copley Greenstone – unweathered (Dcg)	165	37.2*	351*	0.15
Copley Greenstone – Weathered	130	32**	400**	0.15
Stockpile materials	125	31**	50**	0.15
Shale bedrock below stockpile	135	35**	400**	0.15
Topsoil overlying shale bedrock	125	15**	300**	0.15

* Derived for SRM by SSPC
** Based on engineering judgment

II. Summary of Stability Calculations

Cross Section	Description	Factor of Safety	
		Static	Seismic
Section A-A'	Height = 720' Unweathered bedrock for full height	1.44	1.10
Section B-B'	Height = 500' Unweathered bedrock for full height	1.51	1.15
Section C-C'	Height = 200' Unweathered bedrock for full height	1.51	1.16
Section D-D' West Slope	Height = 300' Weathered bedrock in upper 60 feet Unweathered bedrock below 60 feet Groundwater at Elevation 1070	1.45	1.04
Section D-D' West Slope	Height = 300' Weathered bedrock in upper 60 feet Unweathered bedrock below 60 feet No Groundwater	1.63	1.24
Section D-D' East Slope	Height = 120' Weathered bedrock in upper 60 feet Unweathered bedrock below 60 feet Groundwater at Elevation 1070	1.94	1.26
Section D-D' East Slope	Height = 120' Weathered bedrock in upper 60 feet Unweathered bedrock below 60 feet No Groundwater	1.79	1.37
Section E-E'	Height = 340' Weathered bedrock in upper 60 feet Unweathered bedrock below 60 feet Groundwater at Elevation 1070	1.40	1.03
Section E-E'	Height = 120' Weathered bedrock in upper 60 feet Unweathered bedrock below 60 feet No Groundwater	1.56	1.19

Cross Section	Description	Factor of Safety	
		Static	Seismic
Fill Stockpile	Failure through fill materials	1.62	1.10
Fill Stockpile	Failure through topsoil below stockpile	1.06	0.73
Fill Stockpile	Stability along bedrock contact after removal of topsoil	1.89	1.29

For potential overall slope failure in weathered to fresh bedrock, the resulting minimum factor of safety was in the north pit was computed at 1.44 for static conditions and 1.10 for pseudo-static (seismic) at the conclusion of operations. In the south pit the minimum factor of safety was in the north pit was computed at 1.45 for static conditions and 1.04 for seismic, assuming groundwater at elevation 1070 ft msl (lowest rim of pit). The stockpile fill slope produced a minimum factor of safety of 1.06 for static and 0.73 for seismic where the fill was placed over the topsoil mantle. The minimum factors of safety were 1.62 and 1.10 for static and seismic, respectively, where the topsoil was stripped to expose the underlying bedrock prior to placement of the fill. The pseudo-static analyses were performed on each section using a seismic coefficient of 0.15 to evaluate the stability of the pit slopes during a seismic event. These factors of safety indicate that the overall quarry and stockpile slopes are grossly stable and they exceed the minimum values to be stable for undeveloped, open space lands.

GENERAL SLOPE STABILITY DISCUSSION

Slope instability can impact a development in a number of ways. Pertaining to this site, the following represent those most applicable:

- Hazard to human occupancy;
- Impact to adjacent property due to unstable land
- Encroachment onto adjacent watersheds, stream capture etc.; and,
- Increased erosion and resultant off-site sediment transport.

In addition to the above items, the Surface Mining and Reclamation Act (SMARA) was implemented to reclaim coal mining activities. In keeping with SMARA requirements, stability

analyses are required for proposed slopes to demonstrate a factor of safety against slope failure suitable for the proposed end use.

The Moody Flats Quarry is presently undeveloped open space and it is understood that the end use will be the same, undeveloped open space. Thus, slope stability does not present a hazard to human occupancy. The indicated offset distances between pit wall and nearest adjacent property line, and/or drainage channel imply the potential for impacts to adjacent property or drainage are highly unlikely. Furthermore, the Reclamation Plans show essentially no alteration of adjacent watersheds. The two pits comprising the quarry reflect an enclosed drainage pattern, therefore, erosion from the finished slopes will be contained/retained within the quarry eliminating the potential of off-site sediment transport. The above discussion demonstrates that the primary slope stability issue is in compliance with SMARA.

CONCLUSIONS AND RECOMMENDATIONS

Petra's slope stability evaluation indicates that if the following recommendations are implemented, then the proposed Reclamation Plan generally results in grossly stable slopes that will mitigate potential large-scale slope failures and complies with SMARA. The following presents our area specific conclusions and recommendations:

North Pit

Conclusions

- Gross stability of the overall proposed quarry slopes is satisfactory per limit equilibrium stability analyses.
- Individual slopes are anticipated to be stable at a gradient of 0.25:1 (horizontal:vertical [h:v]) as proposed.
- Localized layback of the individual slopes may be needed to accommodate unfavorable fracture planes as encountered during quarry activities.

- The results of our kinematic analyses indicate that potential for small-scale (bench scale) planar, toppling and wedge failures along portions of the proposed slopes exist due to inherent fracturing of the bedrock. These small-scale failures are common in many hard-rock quarries and do not represent a significant slope instability impact.

Recommendations for Modification of Reclamation Plan

- Individual quarry slopes may be steepened to vertical to 0.25:1 (h:v), subject to field verification of suitable geologic conditions during construction by a California-registered Certified Engineering Geologist.

- Due to the long term potential for localized failures of the individual quarry slope faces, consideration should be given to restriction of public access.

- Drainage from the North Pit should be directed away from the South Pit.

South Pit

Conclusions

- The area of the South Pit is capped with a variable thickness of highly weathered bedrock with anticipated depths of up to 60 feet below the ground surface. The highly weathered bedrock appears to be more prominent in the eastern portion of the South Pit and will be exposed in the northwest-, west-, and southwest-facing quarry slopes.

- Gross stability of the overall slopes is satisfactory per limit equilibrium stability analyses.

- While the static stability factor of safety was satisfactory, the seismic stability factor of safety of overall slopes is marginal with water in pit to elevation 1070 ft msl. A satisfactory factor of safety was obtained with no water in pit.

- Individual slopes cut in unweathered and weathered bedrock are anticipated to be stable at 0.25:1 (horizontal:vertical [h:v]) as proposed. Individual slopes cut in the shallow highly weathered bedrock are not expected to be stable at 0.25:1 (h:v).

- Localized layback of the individual slopes may be needed to accommodate unfavorable fracture planes.

- There is long-term potential for localized wedge-failures and rock topple due to inherent fracturing of the bedrock.

Recommendations for Modification of Reclamation Plan

- The uppermost portions of the northwest-, west-, and southwest-facing quarry slopes, where highly weathered bedrock is encountered, should be laid back to 1.5:1 (h:v). The vertical extent of the layback is anticipated to be on the order of 60 vertical feet, but is subject to field evaluation by the California-certified Engineering Geologist during construction.

- Individual quarry slopes in the less weathered bedrock may be steepened to vertical to 0.25:1 (h:v), subject to field verification of suitable geologic conditions during construction by a California-registered Certified Engineering Geologist.

- Due to the long term potential for localized failures of the individual quarry slope faces, consideration should be given to restriction of public access.

- Drainage from the North Pit should be directed away from the South Pit.

Overburden Storage Area

Conclusions

- The area is underlain by weathered shale capped with clay topsoil.

- Fill materials are anticipated to be granular and therefore relatively permeable.

- The topsoil is not suitable to support stockpiled fill on sloping ground.

- The overall stability of the stockpile slope is unsatisfactory where underlain by topsoil.

- The stability factor of safety is satisfactory where the topsoil is removed and the stockpile is placed directly on bedrock.

- Individual slopes are not expected to be stable at 2:1 (h:v) unless constructed in an engineered fashion (i.e., compacted).

Recommendations for Modification of Reclamation Plan

- Strip the topsoil from all areas to receive fill soil prior to placement of stockpile soils.

- Flatten the individual slope faces to 2.5:1 (h:v) in view of the lack of uniform compaction.

- Provide erosion protection for the toe of slope where exposed in or adjacent to drainages.

This opportunity to be of continued service is appreciated. Should you have questions, please contact this office.

Respectfully submitted,

PETRA GEOTECHNICAL, INC.

James S. Olbinski, CEG
Associated Geologist
CEG 1462

12-7-09

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Grayson R. Walker, GE
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REGISTERED PROFESSIONAL ENGINEER
GRAYSON R. WALKER
No. 871
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GEOTECHNICAL
STATE OF CALIFORNIA

JSO/GRW/kms

Attachments

Figures: Figure 1 – Site Location Map
Figure 2 – Cross Section A-A'
Figure 3 – Cross Section B-B'
Figure 4 – Cross Section C-C'
Figure 5 – Cross Section D-D'
Figure 6 – Cross Section E-E'

Plates: Plate 1 – Geologic Structure Map West
Plate 2 – Geologic Structure Map East

Appendicies: Appendix A – Kinematic Analyses
Appendix B – Limit Equilibrium Stability Analyses

Distribution: (3) Addressee
(3) 3M Industrial Mineral Products Division, Attention: Mr. Bruce Kramer

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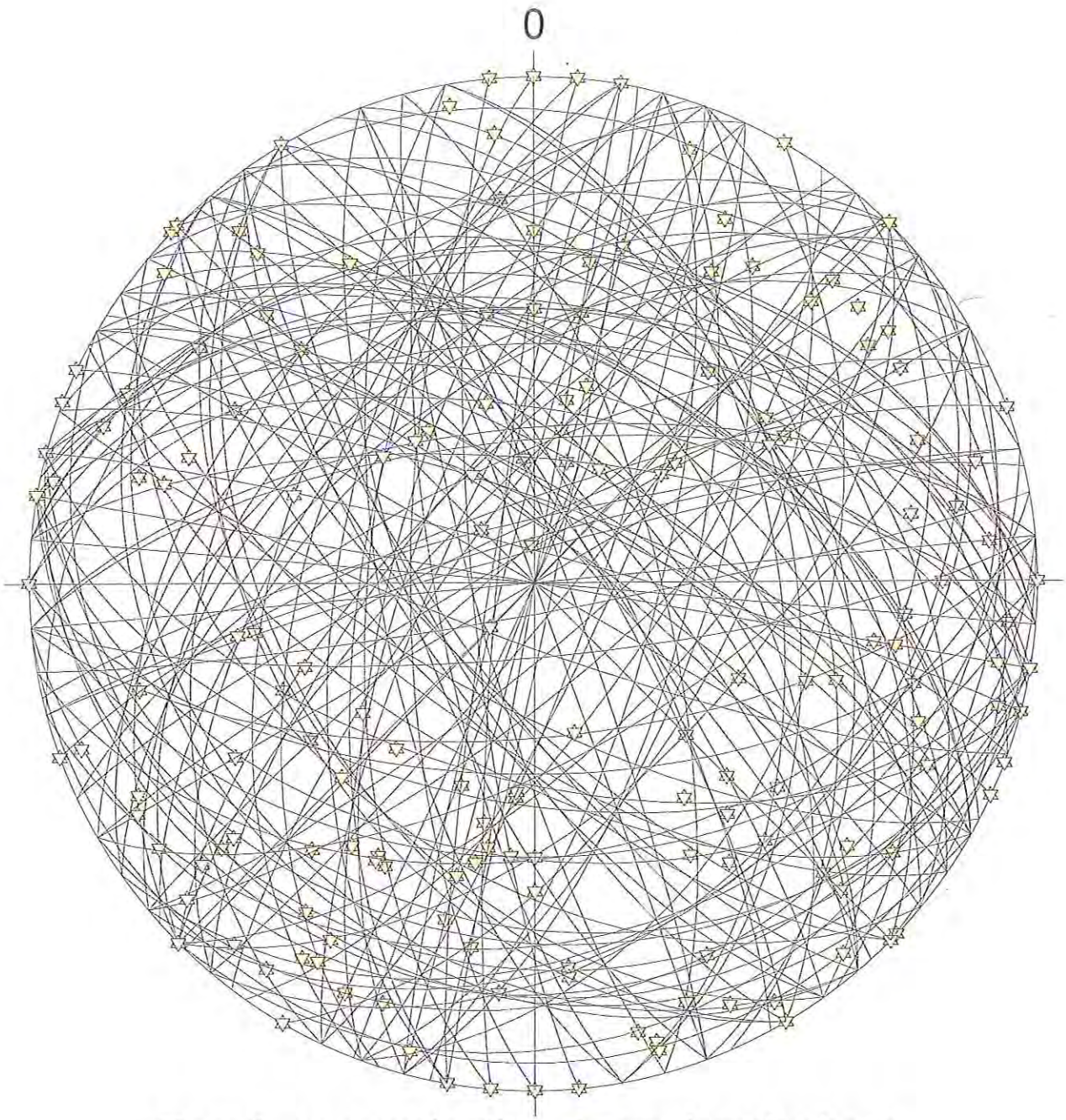
APPENDIX A

KINEMATIC ANALYSES

PETRA



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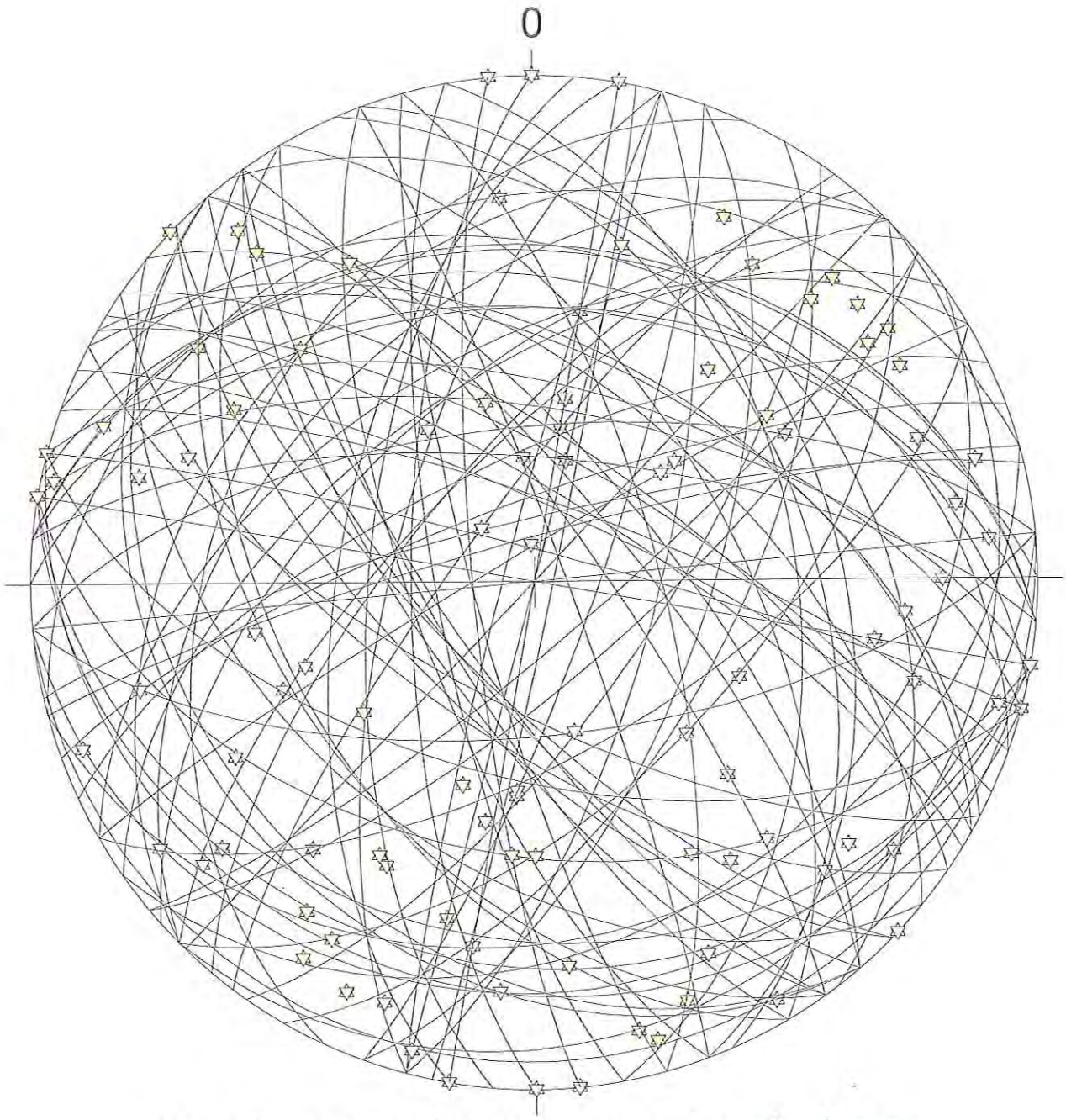
3M Moody Flats Quarry - Kinematic Analysis All Structure

J.N. 247-09



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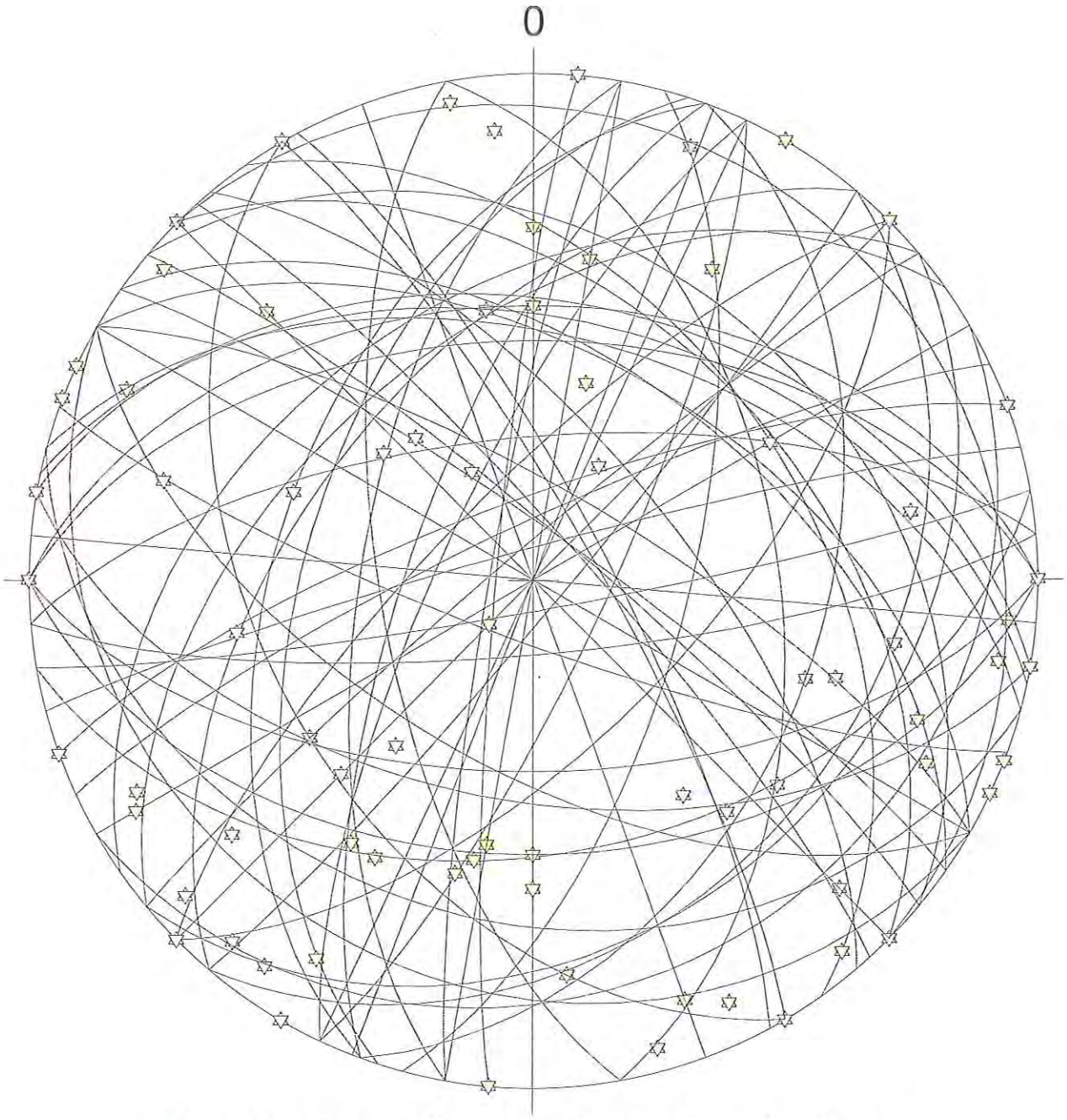
3M Moody Flats Quarry - Kinematic Analysis North Pit All Structure

J.N. 247-09



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3M Moody Flats Quarry - Kinematic Analysis South Pit All Structure

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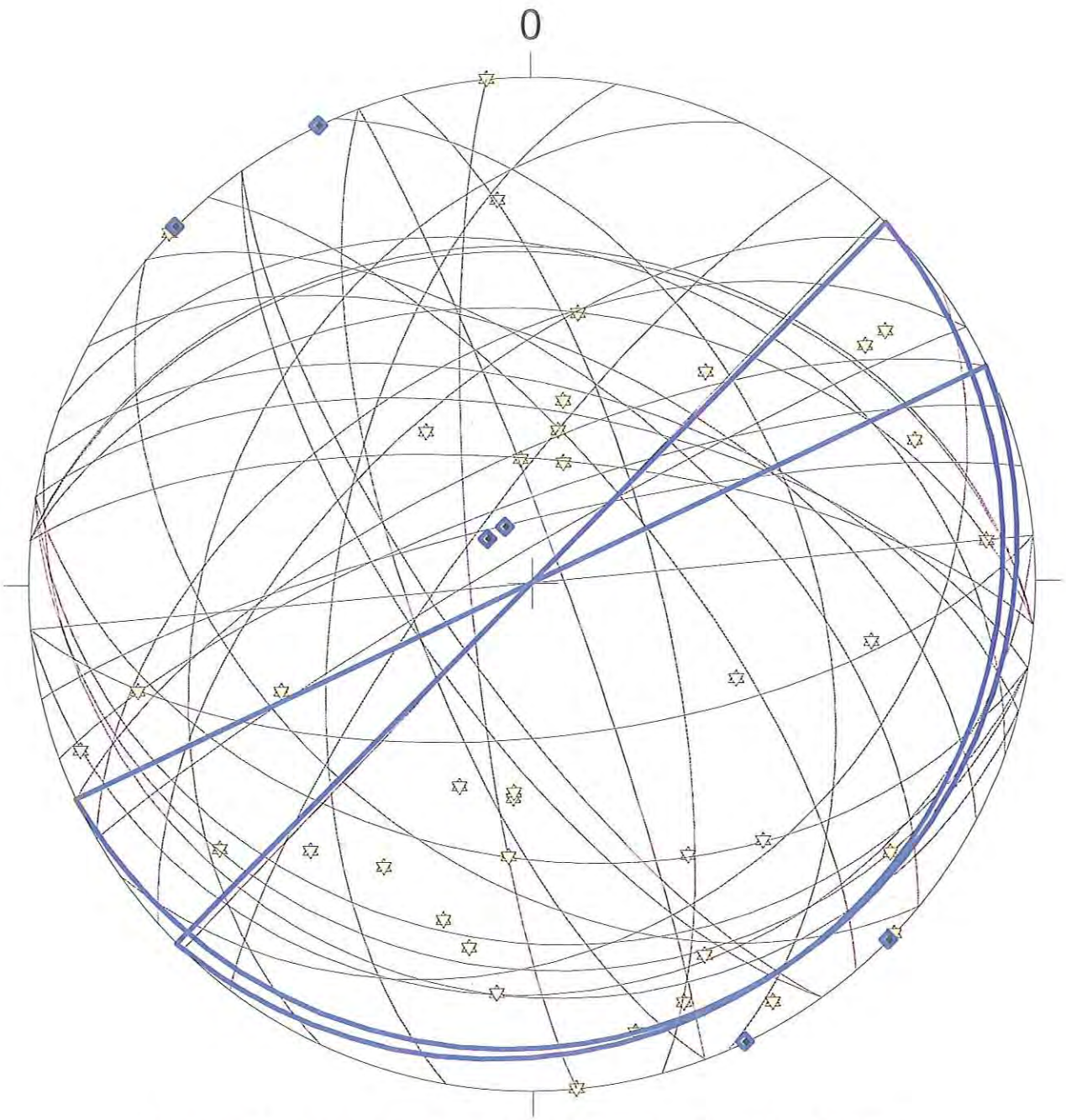

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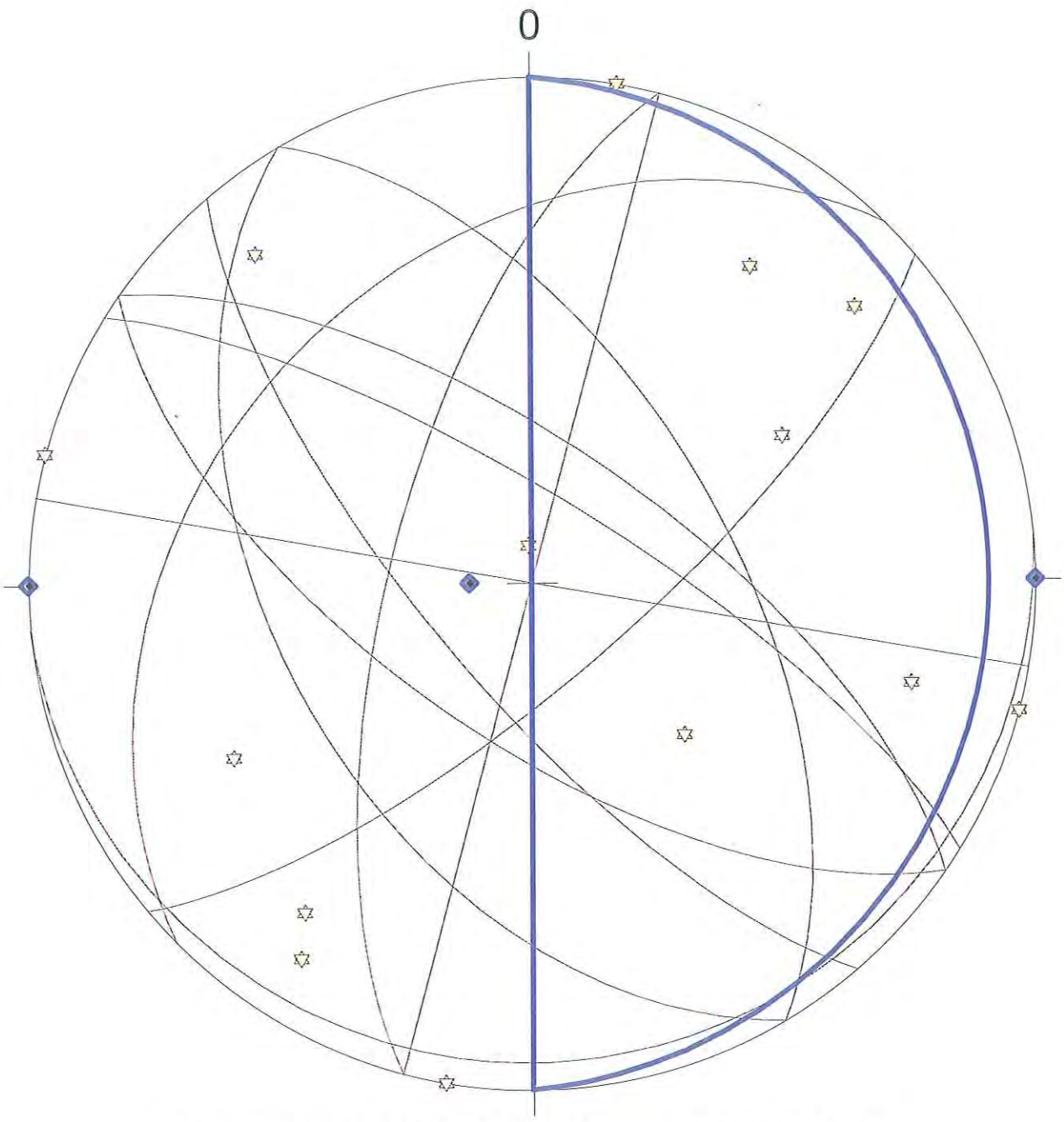
3M Moody Flats Quarry - Kinematic Analysis North Pit NW Quadrant

J.N. 247-09



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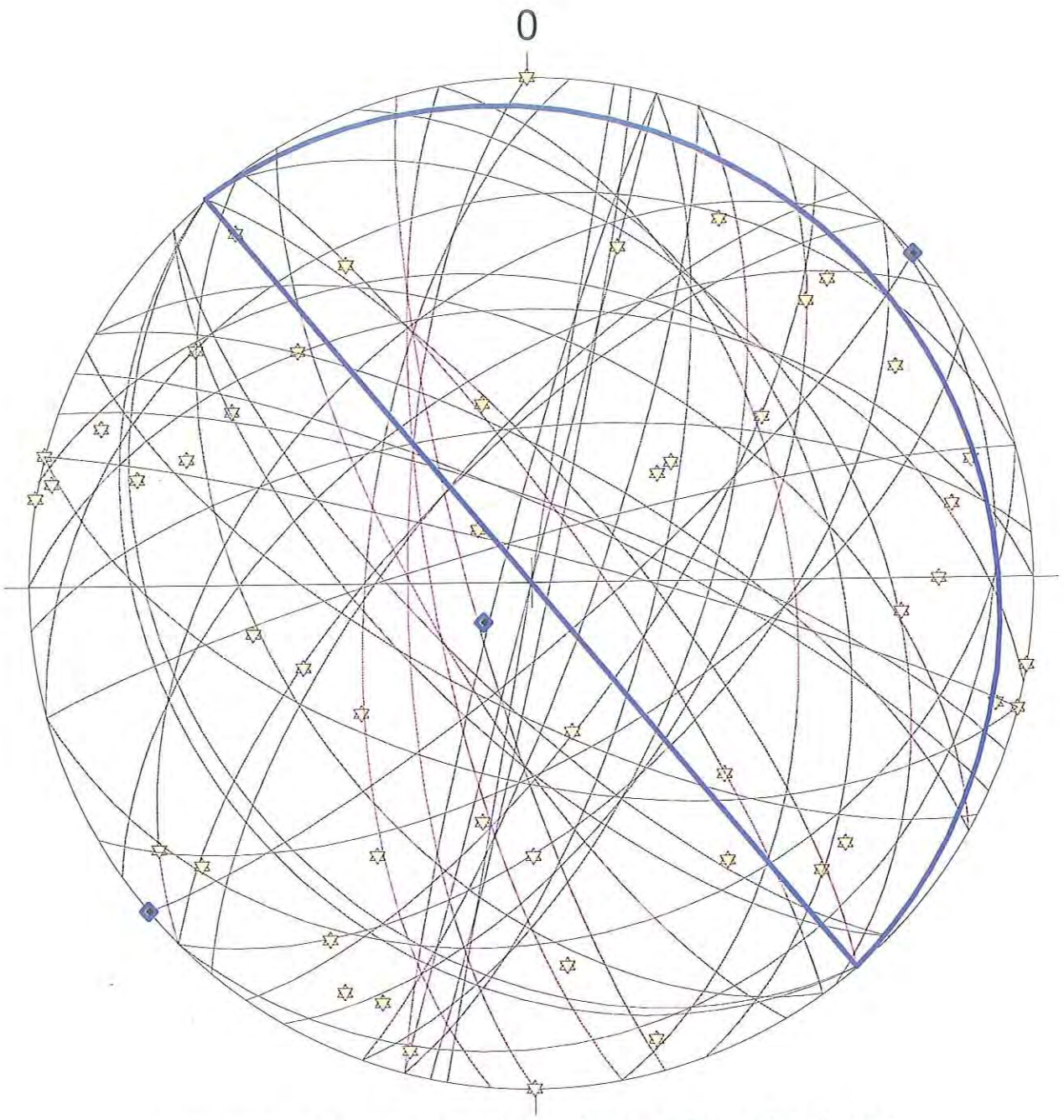
3M Moody Flats Quarry - Kinematic Analysis North Pit W Quadrant

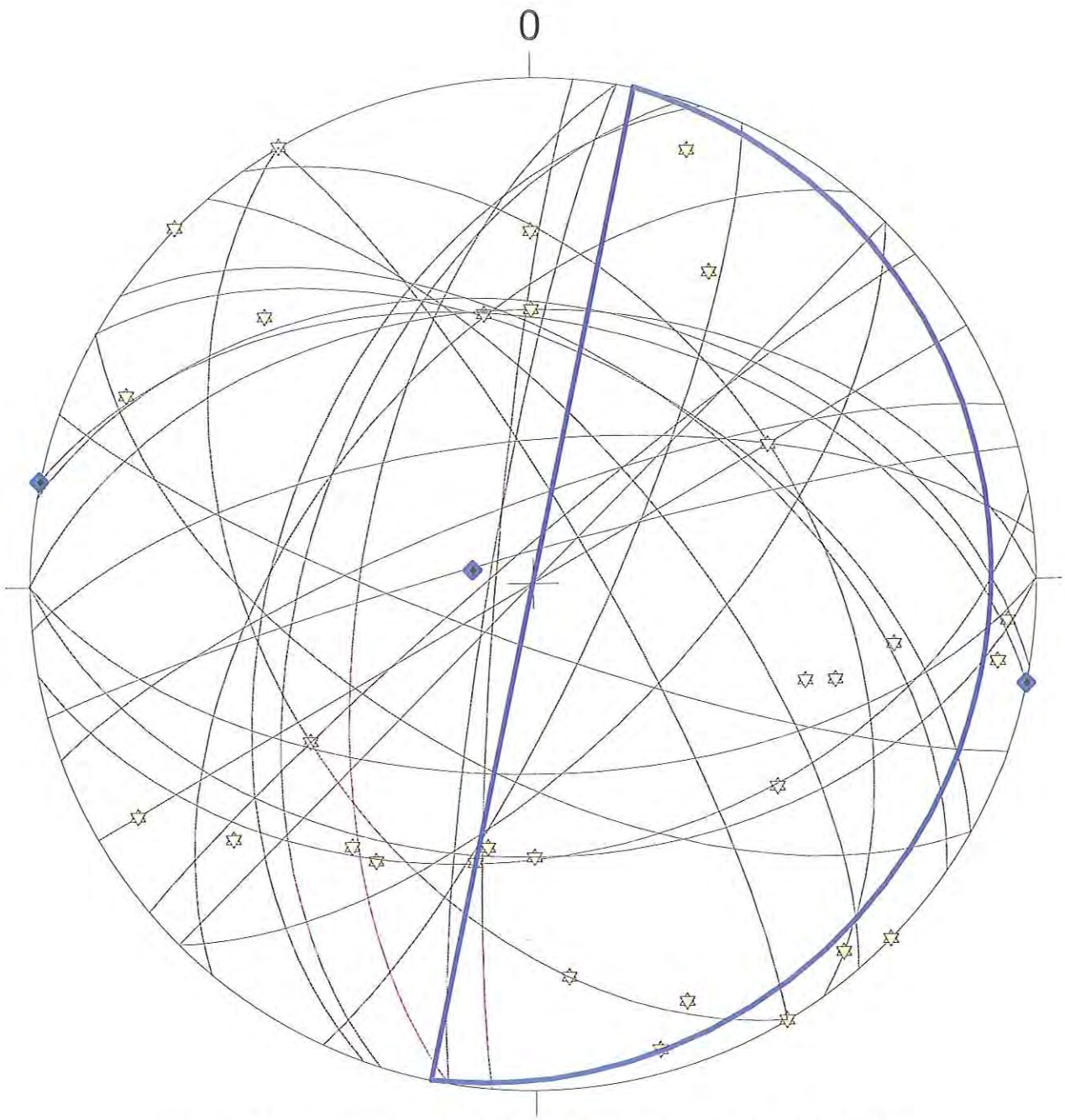
J.N. 247-09



Equal area projection, lower hemisphere

3M Moody Flats Quarry - Kinematic Analysis North Pit SW Quadrant

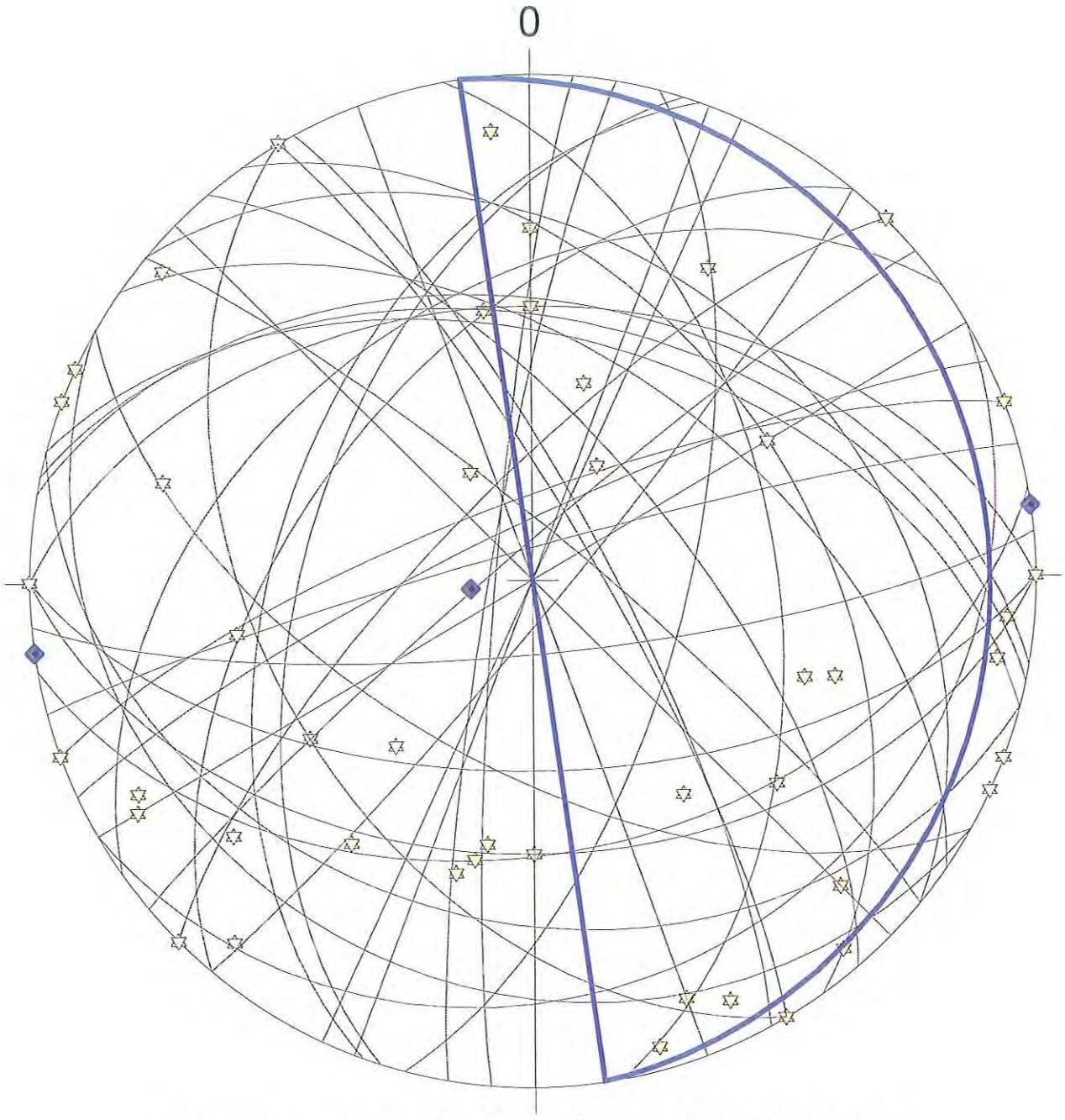
J.N. 247-09



Equal area projection, lower hemisphere

2M Moody Flats Quarry - Kinematic Analysis South Pit NW Quadrant

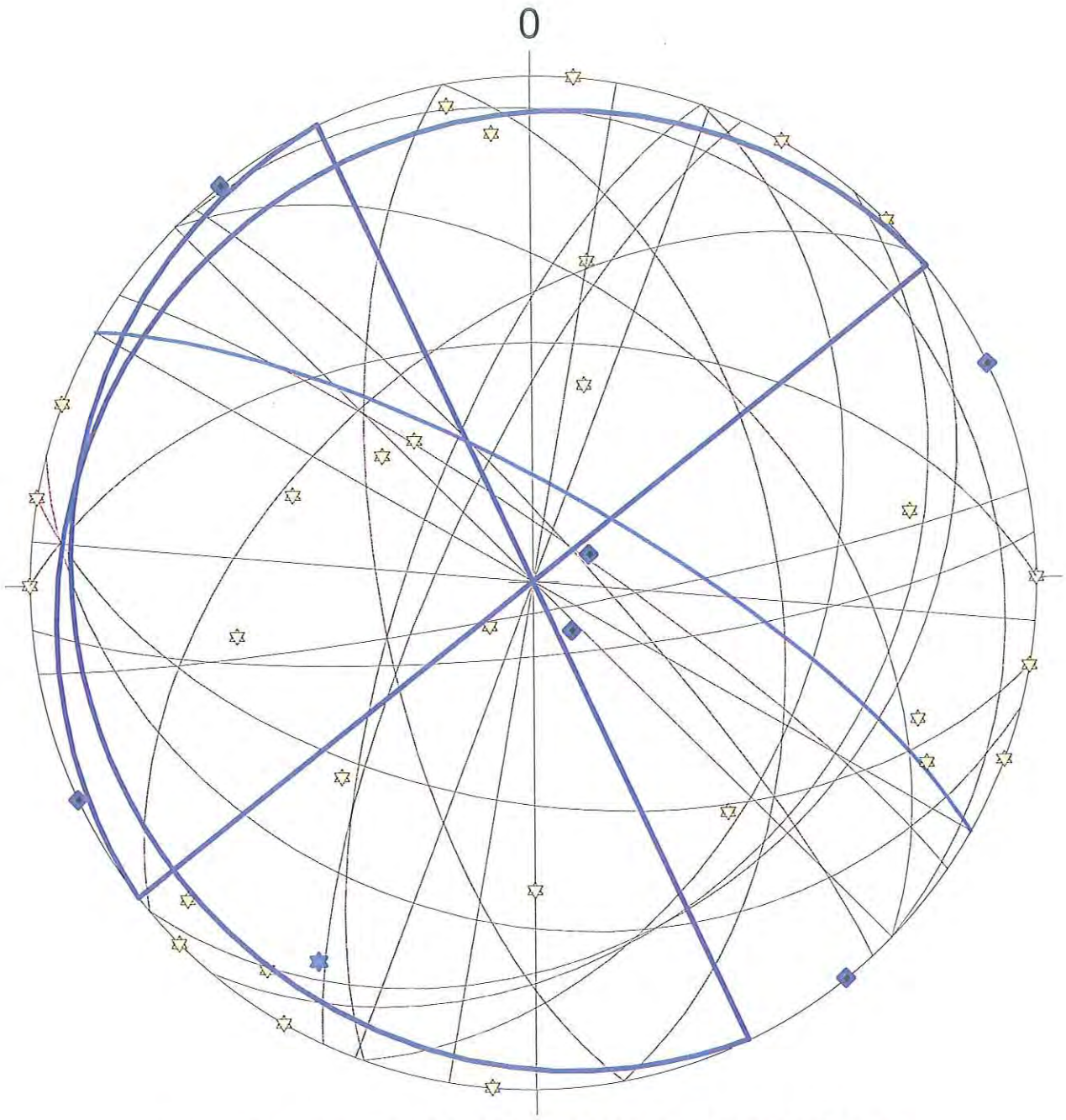
J.N. 247-09



Equal area projection, lower hemisphere

3M Moody Flats Quarry - Kinematic Analysis South Pit W Quadrant

J.N. 247-09



Equal area projection, lower hemisphere

3M Moody Flats Quarry - Kinematic Analysis South Pit SE Quadrant

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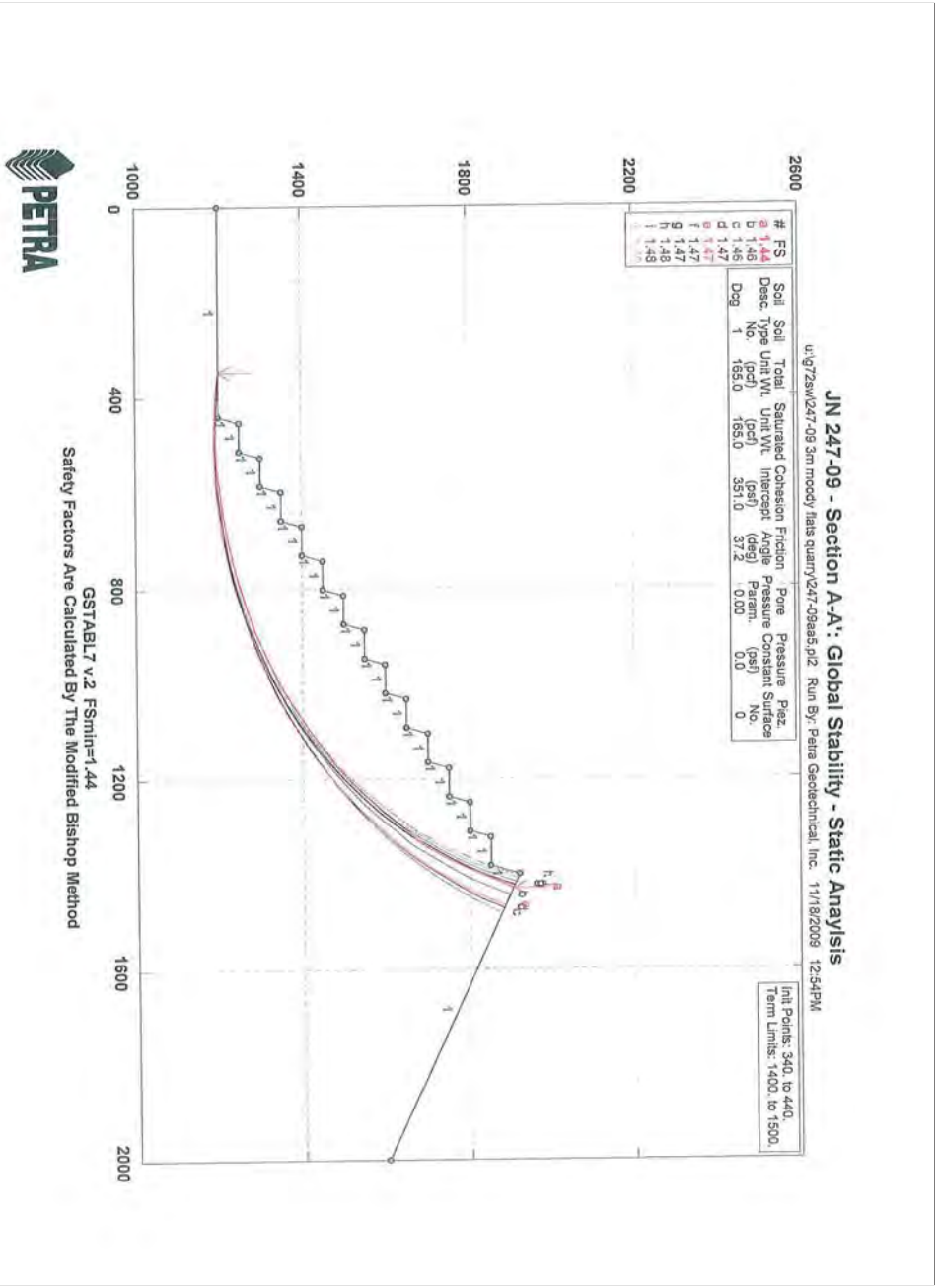
APPENDIX B

LIMIT EQUILIBRIUM STABILITY ANALYSES

PETRA

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                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
      ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
                 (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
          Modified Bishop, Simplified Janbu, or GLE Method of Slices.
          (Includes Spencer & Morgenstern-Price Type Analysis)
          Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
          Nonlinear Undrained Shear Strength, Curved Phi Envelope,
          Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
          Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************

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Run By:                     Petra Geotechnical, Inc.
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Output Filename:            e:\247-09\247-09aa5.OUT
Unit System:                English
Plotted Output Filename:    e:\247-09\247-09aa5.PLT
PROBLEM DESCRIPTION:        JN 247-09 - Section A-A':
                            Global Stability - Static Anaylsis

BOUNDARY COORDINATES
  29 Top   Boundaries
  29 Total Boundaries

Boundary   X-Left      Y-Left      X-Right     Y-Right     Soil Type
  No.       (ft)        (ft)        (ft)        (ft)     Below Bnd
   1         0.00     1200.00      440.00     1200.00        1
   2       440.00     1200.00      452.50     1250.00        1
   3       452.50     1250.00      512.50     1250.00        1
   4       512.50     1250.00      525.00     1300.00        1
   5       525.00     1300.00      585.00     1300.00        1
   6       585.00     1300.00      597.50     1350.00        1
   7       597.50     1350.00      657.50     1350.00        1
   8       657.50     1350.00      670.00     1400.00        1
   9       670.00     1400.00      730.00     1400.00        1
  10       730.00     1400.00      742.00     1450.00        1
  11       742.00     1450.00      802.50     1450.00        1
  12       802.50     1450.00      815.00     1500.00        1
  13       815.00     1500.00      875.00     1500.00        1
  14       875.00     1500.00      887.50     1550.00        1
  15       887.50     1550.00      947.50     1550.00        1
  16       947.50     1550.00      960.00     1600.00        1
  17       960.00     1600.00     1020.00     1600.00        1
  18      1020.00     1600.00     1032.50     1650.00        1
  19      1032.50     1650.00     1092.50     1650.00        1
  20      1092.50     1650.00     1105.00     1700.00        1
  21      1105.00     1700.00     1165.00     1700.00        1
  22      1165.00     1700.00     1177.50     1750.00        1
  23      1177.50     1750.00     1237.50     1750.00        1
  24      1237.50     1750.00     1250.00     1800.00        1
  25      1250.00     1800.00     1310.00     1800.00        1
  26      1310.00     1800.00     1322.50     1850.00        1
  27      1322.50     1850.00     1382.50     1850.00        1
  28      1382.50     1850.00     1400.00     1920.00        1
  29      1400.00     1920.00     2000.00     1600.00        1
 User Specified Y-Origin =          1000.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
 Soil  Total   Saturated  Cohesion  Friction   Pore     Pressure   Piez.
 Type Unit Wt. Unit Wt.  Intercept   Angle   Pressure  Constant  Surface
  No.  (pcf)    (pcf)      (psf)     (deg)    Param.     (psf)     No.
   1   165.0    165.0      351.0     37.2     0.00       0.0       0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
```

```
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X = 340.00(ft)
                            and   X = 440.00(ft)
Each Surface Terminates Between   X =1400.00(ft)
                            and   X =1500.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =       0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =   500
      Number of Trial Surfaces With Valid FS =  500
      Statistical Data On All Valid FS Values:
         FS Max =  2.051   FS Min =  1.441   FS Ave =  1.741
         Standard Deviation =   0.159   Coefficient of Variation =    9.15 %
      Failure Surface Specified By 30 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1        348.434    1200.000
          2        398.214    1195.316
          3        448.165    1193.111
          4        498.165    1193.390
          5        548.088    1196.152
          6        597.813    1201.391
          7        647.216    1209.093
          8        696.176    1219.240
          9        744.571    1231.806
         10        792.282    1246.760
         11        839.192    1264.067
         12        885.183    1283.682
         13        930.144    1305.557
         14        973.963    1329.639
         15       1016.531    1355.868
         16       1057.744    1384.179
         17       1097.499    1414.502
         18       1135.699    1446.762
         19       1172.250    1480.880
         20       1207.061    1516.772
         21       1240.046    1554.349
         22       1271.123    1593.518
         23       1300.217    1634.182
         24       1327.254    1676.241
         25       1352.169    1719.591
         26       1374.900    1764.125
         27       1395.391    1809.734
         28       1413.590    1856.304
         29       1429.454    1903.720
         30       1429.593    1904.217
      Circle Center At X =   467.562 ; Y =  2199.148 ; and Radius =  1006.224
            Factor of Safety
            ***    1.441    ***
            Individual data on the   57  slices
                                 Water      Water       Tie        Tie      Earthquake Force    Surcharge
                                 Force      Force      Force      Force
Slice   Width     Weight         Top        Bot        Norm       Tan       Hor       Ver       Load
 No.     (ft)      (lbs)        (lbs)      (lbs)      (lbs)      (lbs)     (lbs)     (lbs)      (lbs)
  1      49.8     19234.9        0.0        0.0         0.         0.       0.0       0.0        0.0
  2      41.8     38652.2        0.0        0.0         0.         0.       0.0       0.0        0.0
  3       8.2     31040.4        0.0        0.0         0.         0.       0.0       0.0        0.0
  4       4.3     34478.9        0.0        0.0         0.         0.       0.0       0.0        0.0
  5      45.7    427497.0        0.0        0.0         0.         0.       0.0       0.0        0.0
  6      14.3    132964.3        0.0        0.0         0.         0.       0.0       0.0        0.0
  7      12.5    165971.8        0.0        0.0         0.         0.       0.0       0.0        0.0
  8      23.1    398048.6        0.0        0.0         0.         0.       0.0       0.0        0.0
```



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  9      36.9    620638.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 10      12.5    256370.4        0.0        0.0         0.         0.       0.0       0.0        0.0
 11       0.3      7677.0        0.0        0.0         0.         0.       0.0       0.0        0.0
 12      49.4   1180001.2        0.0        0.0         0.         0.       0.0       0.0        0.0
 13      10.3    237285.8        0.0        0.0         0.         0.       0.0       0.0        0.0
 14      12.5    335116.5        0.0        0.0         0.         0.       0.0       0.0        0.0
 15      26.2    792422.0        0.0        0.0         0.         0.       0.0       0.0        0.0
 16      33.8    984313.7        0.0        0.0         0.         0.       0.0       0.0        0.0
 17      12.0    386931.2        0.0        0.0         0.         0.       0.0       0.0        0.0
 18       2.6     92702.3        0.0        0.0         0.         0.       0.0       0.0        0.0
 19      47.7   1658837.2        0.0        0.0         0.         0.       0.0       0.0        0.0
 20      10.2    339472.5        0.0        0.0         0.         0.       0.0       0.0        0.0
 21      12.5    458213.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 22      24.2    959567.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 23      35.8   1348869.4        0.0        0.0         0.         0.       0.0       0.0        0.0
 24      10.2    401341.8        0.0        0.0         0.         0.       0.0       0.0        0.0
 25       2.3     99810.3        0.0        0.0         0.         0.       0.0       0.0        0.0
 26      42.6   1792963.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 27      17.4    686359.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 28      12.5    528968.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 29      14.0    631707.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 30      42.6   1806838.9        0.0        0.0         0.         0.       0.0       0.0        0.0
 31       3.5    139060.3        0.0        0.0         0.         0.       0.0       0.0        0.0
 32      12.5    541315.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 33      25.2   1143314.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 34      34.8   1448417.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 35       5.0    204077.9        0.0        0.0         0.         0.       0.0       0.0        0.0
 36       7.5    330852.7        0.0        0.0         0.         0.       0.0       0.0        0.0
 37      30.7   1348416.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 38      29.3   1158185.5        0.0        0.0         0.         0.       0.0       0.0        0.0
 39       7.2    283515.2        0.0        0.0         0.         0.       0.0       0.0        0.0
 40       5.2    221684.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 41      29.6   1211901.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 42      30.4   1084302.9        0.0        0.0         0.         0.       0.0       0.0        0.0
 43       2.5     84923.2        0.0        0.0         0.         0.       0.0       0.0        0.0
 44      10.0    360475.0        0.0        0.0         0.         0.       0.0       0.0        0.0
 45      21.1    766047.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 46      29.1    893601.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 47       9.8    255391.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 48      12.5    342121.5        0.0        0.0         0.         0.       0.0       0.0        0.0
 49       4.8    139203.5        0.0        0.0         0.         0.       0.0       0.0        0.0
 50      24.9    625215.4        0.0        0.0         0.         0.       0.0       0.0        0.0
 51      22.7    405595.5        0.0        0.0         0.         0.       0.0       0.0        0.0
 52       7.6     97080.3        0.0        0.0         0.         0.       0.0       0.0        0.0
 53      12.9    170993.6        0.0        0.0         0.         0.       0.0       0.0        0.0
 54       4.6     72366.1        0.0        0.0         0.         0.       0.0       0.0        0.0
 55      13.6    173696.0        0.0        0.0         0.         0.       0.0       0.0        0.0
 56      15.9     74624.9        0.0        0.0         0.         0.       0.0       0.0        0.0
 57       0.1         6.6        0.0        0.0         0.         0.       0.0       0.0        0.0
      Failure Surface Specified By 30 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1        350.040    1200.000
          2        399.745    1194.573
          3        449.657    1191.618
          4        499.655    1191.143
          5        549.615    1193.150
          6        599.414    1197.634
          7        648.928    1204.583
          8        698.037    1213.979
          9        746.620    1225.802
         10        794.555    1240.020
         11        841.727    1256.599
         12        888.017    1275.498
         13        933.313    1296.671
         14        977.503    1320.065
         15       1020.477    1345.623
```

16	1062.130	1373.282
17	1102.360	1402.973
18	1141.067	1434.624
19	1178.155	1468.157
20	1213.534	1503.488
21	1247.117	1540.532
22	1278.820	1579.196
23	1308.566	1619.385
24	1336.281	1661.001
25	1361.896	1703.941
26	1385.350	1748.099
27	1406.584	1793.366
28	1425.545	1839.632
29	1442.188	1886.781
30	1444.945	1896.029

Circle Center At X = 484.304 ; Y = 2197.990 ; and Radius = 1006.981

Factor of Safety

*** 1.459 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.811	1200.000
2	392.555	1194.949
3	442.480	1192.203
4	492.478	1191.767
5	542.443	1193.643
6	592.268	1197.827
7	641.846	1204.309
8	691.071	1213.076
9	739.838	1224.110
10	788.044	1237.385
11	835.584	1252.875
12	882.357	1270.546
13	928.264	1290.360
14	973.205	1312.275
15	1017.086	1336.243
16	1059.811	1362.215
17	1101.291	1390.134
18	1141.435	1419.940
19	1180.159	1451.570
20	1217.380	1484.956
21	1253.017	1520.028
22	1286.995	1556.709
23	1319.241	1594.921
24	1349.686	1634.583
25	1378.266	1675.610
26	1404.918	1717.915
27	1429.586	1761.406
28	1452.218	1805.990
29	1472.764	1851.574
30	1482.452	1876.025

Circle Center At X = 477.038 ; Y = 2272.335 ; and Radius = 1080.703

Factor of Safety

*** 1.459 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	359.679	1200.000
2	409.430	1195.013
3	459.362	1192.406
4	509.361	1192.185
5	559.314	1194.351
6	609.107	1198.898
7	658.626	1205.816
8	707.758	1215.090
9	756.392	1226.698
10	804.417	1240.614

11	851.722	1256.806
12	898.201	1275.238
13	943.747	1295.866
14	988.257	1318.645
15	1031.629	1343.522
16	1073.764	1370.441
17	1114.567	1399.340
18	1153.943	1430.154
19	1191.805	1462.811
20	1228.064	1497.239
21	1262.640	1533.357
22	1295.451	1571.085
23	1326.425	1610.336
24	1355.491	1651.020
25	1382.581	1693.045
26	1407.635	1736.319
27	1430.596	1780.731
28	1451.410	1826.193
29	1470.031	1872.596
30	1472.974	1881.080

Circle Center At X = 489.077 ; Y = 2238.923 ; and Radius = 1046.958

Factor of Safety

*** 1.465 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	366.908	1200.000
2	416.664	1195.065
3	466.600	1192.544
4	516.600	1192.443
5	566.546	1194.762
6	616.322	1199.496
7	665.809	1206.635
8	714.894	1216.160
9	763.459	1228.050
10	811.393	1242.277
11	858.581	1258.807
12	904.914	1277.603
13	950.283	1298.619
14	994.581	1321.806
15	1037.705	1347.111
16	1079.553	1374.473
17	1120.028	1403.829
18	1159.035	1435.110
19	1196.482	1468.242
20	1232.281	1503.148
21	1266.348	1539.746
22	1298.604	1577.950
23	1328.973	1617.671
24	1357.384	1658.815
25	1383.769	1701.286
26	1408.068	1744.985
27	1430.223	1789.808
28	1450.183	1835.651
29	1467.900	1882.407
30	1468.281	1883.583

Circle Center At X = 493.700 ; Y = 2224.761 ; and Radius = 1032.575

Factor of Safety

*** 1.467 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.687	1200.000
2	411.386	1194.526
3	461.304	1191.662
4	511.304	1191.414
5	561.247	1193.785

8	810.999	1198.766
7	660.421	1206.345
8	709.379	1216.501
9	757.738	1229.206
10	805.365	1244.426
11	852.131	1262.117
12	897.906	1282.232
13	942.565	1304.717
14	985.986	1329.508
15	1028.050	1356.538
16	1068.641	1385.733
17	1107.649	1417.013
18	1144.965	1450.292
19	1180.488	1485.479
20	1214.120	1522.478
21	1245.769	1561.186
22	1275.349	1601.498
23	1302.777	1643.303
24	1327.980	1686.487
25	1350.888	1730.930
26	1371.437	1776.512
27	1389.572	1823.108
28	1405.243	1870.588
29	1416.348	1911.281

Circle Center At X = 491.027 ; Y = 2145.998 ; and Radius = 954.799

Factor of Safety

*** 1.470 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	386.587	1200.000
2	436.372	1195.368
3	486.331	1193.355
4	536.328	1193.967
5	586.223	1197.201
6	635.880	1203.049
7	685.161	1211.494
8	733.932	1222.514
9	782.057	1236.078
10	829.404	1252.148
11	875.843	1270.680
12	921.245	1291.624
13	965.486	1314.922
14	1008.443	1340.509
15	1049.998	1368.314
16	1090.037	1398.262
17	1128.449	1430.270
18	1165.129	1464.249
19	1199.976	1500.106
20	1232.893	1537.742
21	1263.789	1577.053
22	1292.581	1617.932
23	1319.187	1660.265
24	1343.536	1703.936
25	1365.559	1748.825
26	1385.197	1794.807
27	1402.394	1841.756
28	1417.105	1889.543
29	1421.831	1908.357

Circle Center At X = 499.685 ; Y = 2145.798 ; and Radius = 952.536

Factor of Safety

*** 1.472 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	385.382	1200.000
2	435.178	1195.488

3	485.144	1193.651
4	535.137	1194.495
5	585.013	1198.017
6	634.628	1204.208
7	683.840	1213.049
8	732.508	1224.516
9	780.491	1238.574
10	827.651	1255.184
11	873.853	1274.299
12	918.964	1295.862
13	962.855	1319.812
14	1005.399	1346.081
15	1046.474	1374.592
16	1085.961	1405.263
17	1123.747	1438.007
18	1159.724	1472.730
19	1193.789	1509.331
20	1225.842	1547.705
21	1255.792	1587.742
22	1283.554	1629.327
23	1309.046	1672.340
24	1332.196	1716.658
25	1352.938	1762.153
26	1371.211	1808.694
27	1386.963	1856.148
28	1400.149	1904.378
29	1403.166	1918.311

Circle Center At X = 494.406 ; Y = 2126.088 ; and Radius = 932.484

Factor of Safety

*** 1.475 ***

Failure Surface Specified By 30 Coordinate Points

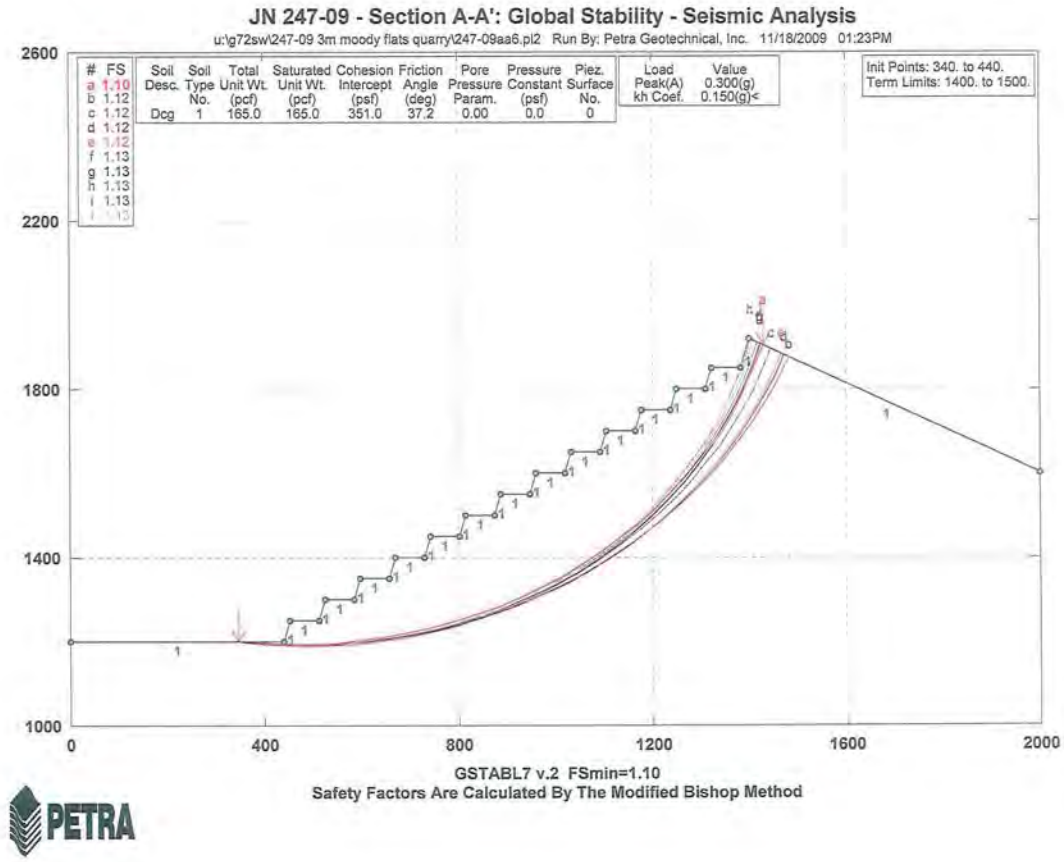
Point No.	X-Surf (ft)	Y-Surf (ft)
1	341.606	1200.000
2	391.169	1193.402
3	441.007	1189.381
4	490.987	1187.949
5	540.973	1189.110
6	590.832	1192.859
7	640.430	1199.188
8	689.633	1208.078
9	738.310	1219.507
10	786.328	1233.444
11	833.560	1249.850
12	879.878	1268.683
13	925.157	1289.891
14	969.277	1313.417
15	1012.117	1339.198
16	1053.564	1367.165
17	1093.506	1397.242
18	1131.835	1429.350
19	1168.449	1463.400
20	1203.248	1499.303
21	1236.140	1536.961
22	1267.036	1576.273
23	1295.853	1617.134
24	1322.514	1659.433
25	1346.946	1703.057
26	1369.084	1747.889
27	1388.869	1793.808
28	1406.248	1840.690
29	1421.173	1888.411
30	1425.756	1906.264

Circle Center At X = 493.734 ; Y = 2151.720 ; and Radius = 963.802

Factor of Safety

*** 1.477 ***

Failure Surface Specified By 29 Coordinate Points



Point No.	X-Surf (ft)	Y-Surf (ft)
1	371.727	1200.000
2	421.440	1194.651
3	471.368	1191.963
4	521.368	1191.946
5	571.298	1194.599
6	621.014	1199.915
7	670.376	1207.878
8	719.242	1218.465
9	767.473	1231.647
10	814.932	1247.386
11	861.482	1265.637
12	906.991	1286.347
13	951.329	1309.458
14	994.370	1334.904
15	1035.990	1362.612
16	1076.072	1392.503
17	1114.500	1424.492
18	1151.165	1458.487
19	1185.963	1494.392
20	1218.793	1532.103
21	1249.562	1571.514
22	1278.184	1612.512
23	1304.575	1654.980
24	1328.660	1698.797
25	1350.371	1743.837
26	1369.646	1789.972
27	1386.430	1837.071
28	1400.675	1884.999
29	1408.043	1915.710

Circle Center At X = 496.687 ; Y = 2127.594 ; and Radius = 935.973

Factor of Safety
*** 1.479 ***

**** END OF GSTABL7 OUTPUT ****

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                        *** GSTABL7 ***
                  ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
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*************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
     Modified Bishop, Simplified Janbu, or GLE Method of Slices.
     (Includes Spencer & Morgenstern-Price Type Analysis)
     Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
     Nonlinear Undrained Shear Strength, Curved Phi Envelope,
     Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
     Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*************************************************************************
Analysis Run Date:          11/18/2009
Time of Run:                01:23PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        e:\247-09\247-09aa6.
Output Filename:            e:\247-09\247-09aa6.OUT
Unit System:                English
Plotted Output Filename:    e:\247-09\247-09aa6.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section A-A':
                      Global Stability - Seismic Analysis
BOUNDARY COORDINATES
   29 Top   Boundaries
   29 Total Boundaries
Boundary    X-Left     Y-Left    X-Right    Y-Right    Soil Type
  No.         (ft)       (ft)       (ft)       (ft)    Below Bnd
    1         0.00    1200.00     440.00    1200.00        1
    2       440.00    1200.00     452.50    1250.00        1
    3       452.50    1250.00     512.50    1250.00        1
    4       512.50    1250.00     525.00    1300.00        1
    5       525.00    1300.00     585.00    1300.00        1
    6       585.00    1300.00     597.50    1350.00        1
    7       597.50    1350.00     657.50    1350.00        1
    8       657.50    1350.00     670.00    1400.00        1
    9       670.00    1400.00     730.00    1400.00        1
   10       730.00    1400.00     742.00    1450.00        1
   11       742.00    1450.00     802.50    1450.00        1
   12       802.50    1450.00     815.00    1500.00        1
   13       815.00    1500.00     875.00    1500.00        1
   14       875.00    1500.00     887.50    1550.00        1
   15       887.50    1550.00     947.50    1550.00        1
   16       947.50    1550.00     960.00    1600.00        1
   17       960.00    1600.00    1020.00    1600.00        1
   18      1020.00    1600.00    1032.50    1650.00        1
   19      1032.50    1650.00    1092.50    1650.00        1
   20      1092.50    1650.00    1105.00    1700.00        1
   21      1105.00    1700.00    1165.00    1700.00        1
   22      1165.00    1700.00    1177.50    1750.00        1
   23      1177.50    1750.00    1237.50    1750.00        1
   24      1237.50    1750.00    1250.00    1800.00        1
   25      1250.00    1800.00    1310.00    1800.00        1
   26      1310.00    1800.00    1322.50    1850.00        1
   27      1322.50    1850.00    1382.50    1850.00        1
   28      1382.50    1850.00    1400.00    1920.00        1
   29      1400.00    1920.00    2000.00    1600.00        1
 User Specified Y-Origin =      1000.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)    (deg)   Param.   (psf)     No.
   1   165.0    165.0     351.0     37.2    0.00      0.0       0
 Specified Peak Ground Acceleration Coefficient (A) =  0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =  0.150(g)
```



```
 Specified Vertical Earthquake Coefficient (kv) =  0.000(g)
 Specified Seismic Pore-Pressure Factor =  0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
  500 Trial Surfaces Have Been Generated.
    2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
 Along The Ground Surface Between  X = 340.00(ft)
                                and  X = 440.00(ft)
 Each Surface Terminates Between   X =1400.00(ft)
                                and  X =1500.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =     0.00(ft)
 50.00(ft) Line Segments Define Each Trial Failure Surface.
 Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =  500
      Number of Trial Surfaces With Valid FS =  500
      Statistical Data On All Valid FS Values:
         FS Max =  1.611   FS Min =  1.103   FS Ave =  1.353
         Standard Deviation =  0.133   Coefficient of Variation =  9.82 %
      Failure Surface Specified By 30 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1        348.434    1200.000
          2        398.214    1195.316
          3        448.165    1193.111
          4        498.165    1193.390
          5        548.088    1196.152
          6        597.813    1201.391
          7        647.216    1209.093
          8        696.176    1219.240
          9        744.571    1231.806
         10        792.282    1246.760
         11        839.192    1264.067
         12        885.183    1283.682
         13        930.144    1305.557
         14        973.963    1329.639
         15       1016.531    1355.868
         16       1057.744    1384.179
         17       1097.499    1414.502
         18       1135.699    1446.762
         19       1172.250    1480.880
         20       1207.061    1516.772
         21       1240.046    1554.349
         22       1271.123    1593.518
         23       1300.217    1634.182
         24       1327.254    1676.241
         25       1352.169    1719.591
         26       1374.900    1764.125
         27       1395.391    1809.734
         28       1413.590    1856.304
         29       1429.454    1903.720
         30       1429.593    1904.217
      Circle Center At X =  467.562 ; Y =  2199.148 ; and Radius =  1006.224
          Factor of Safety
          ***  1.103  ***
          Individual data on the   57  slices
                        Water  Water   Tie     Tie      Earthquake
                        Force  Force   Force   Force      Force    Surcharge
 Slice  Width  Weight    Top    Bot    Norm    Tan      Hor    Ver     Load
 No.    (ft)   (lbs)    (lbs)  (lbs)   (lbs)  (lbs)    (lbs)  (lbs)   (lbs)
  1     49.8  19234.9     0.0    0.0      0.      0.   2885.2    0.0     0.0
  2     41.8  38652.2     0.0    0.0      0.      0.   5797.8    0.0     0.0
  3      8.2  31040.4     0.0    0.0      0.      0.   4656.1    0.0     0.0
  4      4.3  34478.9     0.0    0.0      0.      0.   5171.8    0.0     0.0
```

5	45.7	427497.0	0.0	0.0	0.	0.	64124.6	0.0	0.0
6	14.3	132964.3	0.0	0.0	0.	0.	19944.6	0.0	0.0
7	12.5	165971.8	0.0	0.0	0.	0.	24895.8	0.0	0.0
8	23.1	398048.6	0.0	0.0	0.	0.	59707.3	0.0	0.0
9	36.9	620638.1	0.0	0.0	0.	0.	93095.7	0.0	0.0
10	12.5	256370.4	0.0	0.0	0.	0.	38455.6	0.0	0.0
11	0.3	7677.0	0.0	0.0	0.	0.	1151.5	0.0	0.0
12	49.4	1180001.2	0.0	0.0	0.	0.	*******	0.0	0.0
13	10.3	237285.8	0.0	0.0	0.	0.	35592.9	0.0	0.0
14	12.5	335116.5	0.0	0.0	0.	0.	50267.5	0.0	0.0
15	26.2	792422.0	0.0	0.0	0.	0.	*******	0.0	0.0
16	33.8	984313.7	0.0	0.0	0.	0.	*******	0.0	0.0
17	12.0	386931.2	0.0	0.0	0.	0.	58039.7	0.0	0.0
18	2.6	92702.3	0.0	0.0	0.	0.	13905.3	0.0	0.0
19	47.7	1658837.2	0.0	0.0	0.	0.	*******	0.0	0.0
20	10.2	339472.5	0.0	0.0	0.	0.	50920.9	0.0	0.0
21	12.5	458213.6	0.0	0.0	0.	0.	68732.0	0.0	0.0
22	24.2	959567.1	0.0	0.0	0.	0.	*******	0.0	0.0
23	35.8	1348869.4	0.0	0.0	0.	0.	*******	0.0	0.0
24	10.2	401341.8	0.0	0.0	0.	0.	60201.3	0.0	0.0
25	2.3	99810.3	0.0	0.0	0.	0.	14971.6	0.0	0.0
26	42.6	1792963.1	0.0	0.0	0.	0.	*******	0.0	0.0
27	17.4	686359.1	0.0	0.0	0.	0.	*******	0.0	0.0
28	12.5	528968.6	0.0	0.0	0.	0.	79345.3	0.0	0.0
29	14.0	631707.1	0.0	0.0	0.	0.	94756.1	0.0	0.0
30	42.6	1806838.9	0.0	0.0	0.	0.	*******	0.0	0.0
31	3.5	139060.3	0.0	0.0	0.	0.	20859.1	0.0	0.0
32	12.5	541315.1	0.0	0.0	0.	0.	81197.3	0.0	0.0
33	25.2	1143314.6	0.0	0.0	0.	0.	*******	0.0	0.0
34	34.8	1448417.1	0.0	0.0	0.	0.	*******	0.0	0.0
35	5.0	204077.9	0.0	0.0	0.	0.	30611.7	0.0	0.0
36	7.5	330852.7	0.0	0.0	0.	0.	49627.9	0.0	0.0
37	30.7	1348416.6	0.0	0.0	0.	0.	*******	0.0	0.0
38	29.3	1158185.5	0.0	0.0	0.	0.	*******	0.0	0.0
39	7.2	283515.2	0.0	0.0	0.	0.	42527.3	0.0	0.0
40	5.2	221684.6	0.0	0.0	0.	0.	33252.7	0.0	0.0
41	29.6	1211901.1	0.0	0.0	0.	0.	*******	0.0	0.0
42	30.4	1084302.9	0.0	0.0	0.	0.	*******	0.0	0.0
43	2.5	84923.2	0.0	0.0	0.	0.	12738.5	0.0	0.0
44	10.0	360475.0	0.0	0.0	0.	0.	54071.3	0.0	0.0
45	21.1	766047.6	0.0	0.0	0.	0.	*******	0.0	0.0
46	29.1	893601.6	0.0	0.0	0.	0.	*******	0.0	0.0
47	9.8	255391.6	0.0	0.0	0.	0.	38308.7	0.0	0.0
48	12.5	342121.5	0.0	0.0	0.	0.	51318.2	0.0	0.0
49	4.8	139203.5	0.0	0.0	0.	0.	20880.5	0.0	0.0
50	24.9	625215.4	0.0	0.0	0.	0.	93782.3	0.0	0.0
51	22.7	405595.5	0.0	0.0	0.	0.	60839.3	0.0	0.0
52	7.6	97080.3	0.0	0.0	0.	0.	14562.0	0.0	0.0
53	12.9	170993.6	0.0	0.0	0.	0.	25649.0	0.0	0.0
54	4.6	72366.1	0.0	0.0	0.	0.	10854.9	0.0	0.0
55	13.6	173696.0	0.0	0.0	0.	0.	26054.4	0.0	0.0
56	15.9	74624.9	0.0	0.0	0.	0.	11193.7	0.0	0.0
57	0.1	6.6	0.0	0.0	0.	0.	1.0	0.0	0.0

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.811	1200.000
2	392.555	1194.949
3	442.480	1192.203
4	492.478	1191.767
5	542.443	1193.643
6	592.268	1197.827
7	641.846	1204.309
8	691.071	1213.076
9	739.838	1224.110
10	788.044	1237.385
11	835.584	1252.875
12	882.357	1270.546
13	928.264	1290.360
14	973.205	1312.275
15	1017.086	1336.243
16	1059.811	1362.215
17	1101.291	1390.134
18	1141.435	1419.940
19	1180.159	1451.570
20	1217.380	1484.956
21	1253.017	1520.028
22	1286.995	1556.709
23	1319.241	1594.921
24	1349.686	1634.583
25	1378.266	1675.610
26	1404.918	1717.915
27	1429.586	1761.406
28	1452.218	1805.990
29	1472.764	1851.574
30	1482.452	1876.025

Circle Center At X = 477.038 ; Y = 2272.335 ; and Radius = 1080.703

Factor of Safety

*** 1.115 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	350.040	1200.000
2	399.745	1194.573
3	449.657	1191.618
4	499.655	1191.143
5	549.615	1193.150
6	599.414	1197.634
7	648.928	1204.583
8	698.037	1213.979
9	746.620	1225.802
10	794.555	1240.020
11	841.727	1256.599
12	888.017	1275.498
13	933.313	1296.671
14	977.503	1320.065
15	1020.477	1345.623
16	1062.130	1373.282
17	1102.360	1402.973
18	1141.067	1434.624
19	1178.155	1468.157
20	1213.534	1503.488
21	1247.117	1540.532
22	1278.820	1579.196
23	1308.566	1619.388
24	1336.281	1661.001
25	1361.896	1703.941
26	1385.350	1748.099
27	1406.584	1793.366
28	1425.545	1839.632
29	1442.188	1886.781
30	1444.945	1896.029

Circle Center At X = 484.304 ; Y = 2197.990 ; and Radius = 1006.981

Factor of Safety

*** 1.118 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	359.679	1200.000
2	409.430	1195.013
3	459.362	1192.406
4	509.361	1192.185
5	559.314	1194.351
6	609.107	1198.898

7	658.626	1205.816
8	707.758	1215.090
9	756.392	1226.698
10	804.417	1240.614
11	851.722	1256.806
12	898.201	1275.238
13	943.747	1295.866
14	988.257	1318.645
15	1031.629	1343.522
16	1073.764	1370.441
17	1114.567	1399.340
18	1153.943	1430.154
19	1191.805	1462.811
20	1228.064	1497.239
21	1262.640	1533.357
22	1295.451	1571.085
23	1326.425	1610.336
24	1355.491	1651.020
25	1382.581	1693.045
26	1407.635	1736.315
27	1430.596	1780.731
28	1451.410	1826.193
29	1470.031	1872.596
30	1472.974	1881.080

Circle Center At X = 489.077 ; Y = 2238.923 ; and Radius = 1046.950

Factor of Safety

*** 1.122 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	366.908	1200.000
2	416.664	1195.065
3	466.600	1192.544
4	516.600	1192.443
5	566.546	1194.762
6	616.322	1199.496
7	665.809	1206.635
8	714.894	1216.160
9	763.459	1228.050
10	811.393	1242.277
11	858.581	1258.807
12	904.914	1277.603
13	950.283	1298.619
14	994.581	1321.806
15	1037.705	1347.111
16	1079.553	1374.473
17	1120.028	1403.829
18	1159.035	1435.110
19	1196.482	1468.242
20	1232.281	1503.148
21	1266.348	1539.746
22	1298.604	1577.950
23	1328.973	1617.671
24	1357.384	1658.815
25	1383.769	1701.286
26	1408.068	1744.985
27	1430.223	1789.808
28	1450.183	1835.651
29	1467.900	1882.407
30	1468.281	1883.583

Circle Center At X = 493.700 ; Y = 2224.761 ; and Radius = 1032.575

Factor of Safety

*** 1.124 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.687	1200.000

2	411.386	1194.526
3	461.304	1191.662
4	511.304	1191.414
5	561.247	1193.785
6	610.999	1198.766
7	660.421	1206.345
8	709.379	1216.501
9	757.738	1229.206
10	805.365	1244.426
11	852.131	1262.117
12	897.906	1282.232
13	942.565	1304.717
14	985.986	1329.508
15	1028.050	1356.538
16	1068.641	1385.733
17	1107.649	1417.013
18	1144.965	1450.292
19	1180.488	1485.479
20	1214.120	1522.478
21	1245.769	1561.186
22	1275.349	1601.498
23	1302.777	1643.303
24	1327.980	1686.487
25	1350.888	1730.930
26	1371.437	1776.512
27	1389.572	1823.108
28	1405.243	1870.588
29	1416.348	1911.281

Circle Center At X = 491.027 ; Y = 2145.998 ; and Radius = 954.799

Factor of Safety

*** 1.128 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	386.587	1200.000
2	436.372	1195.368
3	486.331	1193.355
4	536.328	1193.967
5	586.223	1197.201
6	635.880	1203.049
7	685.161	1211.494
8	733.932	1222.514
9	782.057	1236.078
10	829.404	1252.148
11	875.843	1270.680
12	921.245	1291.624
13	965.486	1314.922
14	1008.443	1340.509
15	1049.998	1368.314
16	1090.037	1398.262
17	1128.449	1430.270
18	1165.129	1464.249
19	1199.976	1500.106
20	1232.893	1537.742
21	1263.789	1577.053
22	1292.581	1617.932
23	1319.187	1660.265
24	1343.536	1703.936
25	1365.559	1748.825
26	1385.197	1794.807
27	1402.394	1841.756
28	1417.105	1889.543
29	1421.831	1908.357

Circle Center At X = 499.685 ; Y = 2145.798 ; and Radius = 952.536

Factor of Safety

*** 1.131 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	385.382	1200.000
2	435.178	1195.488
3	485.144	1193.651
4	535.137	1194.495
5	585.013	1198.017
6	634.628	1204.208
7	683.840	1213.049
8	732.508	1224.516
9	780.491	1238.574
10	827.651	1255.184
11	873.853	1274.299
12	918.964	1295.862
13	962.855	1319.812
14	1005.399	1346.081
15	1046.474	1374.592
16	1085.961	1405.263
17	1123.747	1438.007
18	1159.724	1472.730
19	1193.789	1509.331
20	1225.842	1547.705
21	1255.792	1587.742
22	1283.554	1629.327
23	1309.046	1672.340
24	1332.196	1716.658
25	1352.938	1762.153
26	1371.211	1808.694
27	1386.963	1856.148
28	1400.149	1904.378
29	1403.166	1918.311

Circle Center At X = 494.406 ; Y = 2126.086 ; and Radius = 932.484

Factor of Safety

*** 1.131 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	341.606	1200.000
2	391.169	1193.402
3	441.007	1189.381
4	490.987	1187.949
5	540.973	1189.110
6	590.832	1192.859
7	640.430	1199.198
8	689.633	1208.078
9	738.310	1219.507
10	786.328	1233.444
11	833.560	1249.850
12	879.878	1268.683
13	925.157	1289.891
14	969.277	1313.417
15	1012.117	1339.198
16	1053.564	1367.165
17	1093.506	1397.242
18	1131.835	1429.350
19	1168.449	1463.400
20	1203.248	1499.303
21	1236.140	1536.961
22	1267.036	1576.273
23	1295.853	1617.134
24	1322.514	1659.433
25	1346.946	1703.057
26	1369.084	1747.889
27	1388.869	1793.808
28	1406.248	1840.690
29	1421.173	1888.411
30	1425.756	1906.264

Circle Center At X = 493.734 ; Y = 2151.720 ; and Radius = 963.802

Factor of Safety

*** 1.133 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	371.727	1200.000
2	421.440	1194.651
3	471.368	1191.963
4	521.368	1191.946
5	571.298	1194.599
6	621.014	1199.915
7	670.376	1207.878
8	719.242	1218.465
9	767.473	1231.647
10	814.932	1247.386
11	861.482	1265.637
12	906.991	1286.347
13	951.329	1309.458
14	994.370	1334.904
15	1035.990	1362.612
16	1076.072	1392.503
17	1114.500	1424.492
18	1151.165	1458.487
19	1185.963	1494.392
20	1218.793	1532.103
21	1249.562	1571.514
22	1278.184	1612.512
23	1304.575	1654.980
24	1328.660	1698.797
25	1350.371	1743.837
26	1369.646	1789.972
27	1386.430	1837.071
28	1400.675	1884.999
29	1408.043	1915.710

Circle Center At X = 496.687 ; Y = 2127.594 ; and Radius = 935.973

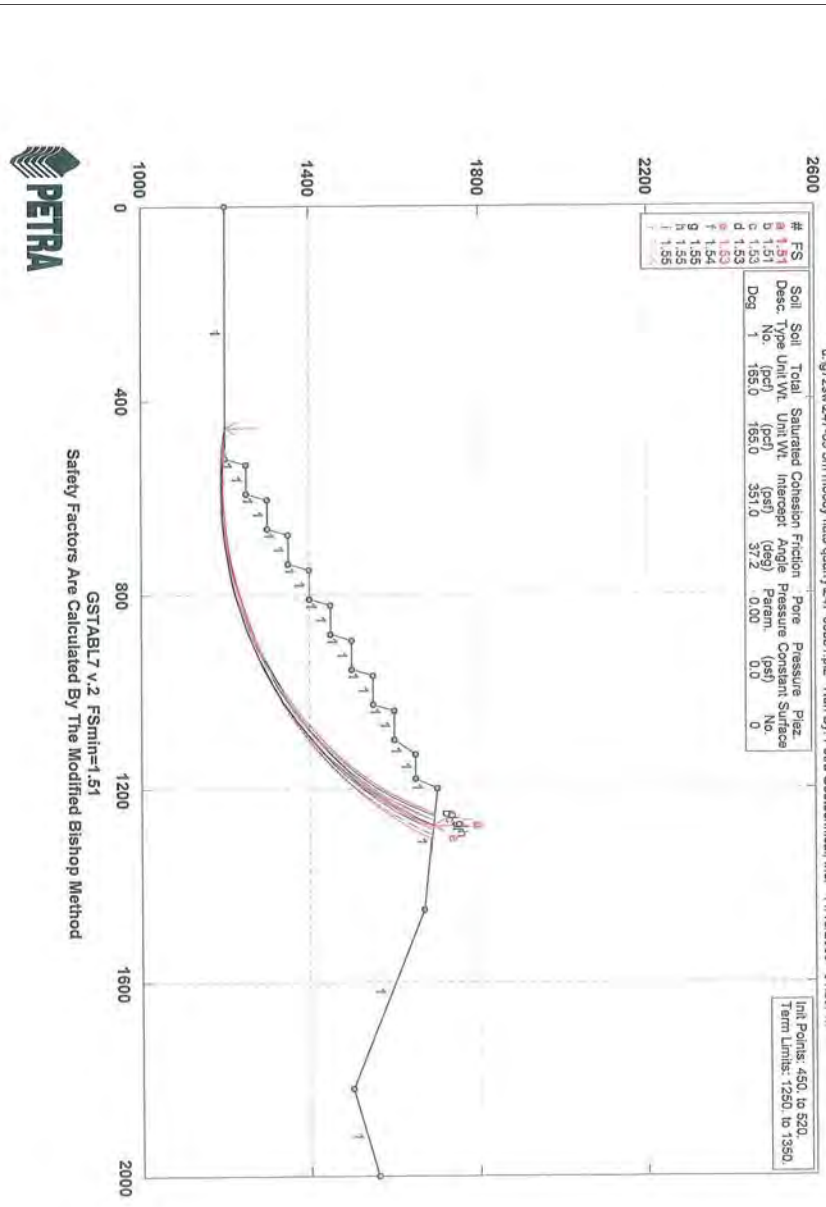
Factor of Safety

*** 1.134 ***

**** END OF GSTABL7 OUTPUT ****

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************

Analysis Run Date:          11/18/2009
Time of Run:                01:29PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        e:\247-09\247-09bbl.
Output Filename:            e:\247-09\247-09bbl.OUT
Unit System:                English
Plotted Output Filename:    e:\247-09\247-09bbl.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section B-B':
                      Global Stability - Static Analysis
BOUNDARY COORDINATES
   23 Top   Boundaries
   23 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right    Soil Type
  No.          (ft)        (ft)        (ft)        (ft)   Below Bnd
   1           0.00     1200.00      520.00     1200.00        1
   2         520.00     1200.00      532.50     1250.00        1
   3         532.50     1250.00      592.50     1250.00        1
   4         592.50     1250.00      605.00     1300.00        1
   5         605.00     1300.00      665.00     1300.00        1
   6         665.00     1300.00      677.50     1350.00        1
   7         677.50     1350.00      737.50     1350.00        1
   8         737.50     1350.00      750.00     1400.00        1
   9         750.00     1400.00      810.00     1400.00        1
  10         810.00     1400.00      822.50     1450.00        1
  11         822.50     1450.00      882.50     1450.00        1
  12         882.50     1450.00      895.00     1500.00        1
  13         895.00     1500.00      955.00     1500.00        1
  14         955.00     1500.00      967.50     1550.00        1
  15         967.50     1550.00     1027.50     1550.00        1
  16        1027.50     1550.00     1040.00     1600.00        1
  17        1040.00     1600.00     1100.00     1600.00        1
  18        1100.00     1600.00     1130.00     1650.00        1
  19        1130.00     1650.00     1180.00     1650.00        1
  20        1180.00     1650.00     1200.00     1700.00        1
  21        1200.00     1700.00     1450.00     1670.00        1
  22        1450.00     1670.00     1820.00     1500.00        1
  23        1820.00     1500.00     2000.00     1560.00        1
User Specified Y-Origin =          1000.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
Soil  Total   Saturated  Cohesion  Friction   Pore     Pressure   Piez.
Type Unit Wt. Unit Wt.  Intercept   Angle  Pressure Constant Surface
 No.  (pcf)     (pcf)      (psf)     (deg)   Param.    (psf)     No.
  1   165.0     165.0      351.0     37.2    0.00      0.0       0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X = 450.00(ft)
                             and  X = 520.00(ft)
Each Surface Terminates Between   X =1250.00(ft)
                             and  X =1350.00(ft)
```



Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 500
Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 2.354 FS Min = 1.505 FS Ave = 1.888
Standard Deviation = 0.198 Coefficient of Variation = 10.48 %
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	456.466	1200.000
2	506.246	1195.316
3	556.224	1193.848
4	606.194	1195.600
5	655.947	1200.566
6	705.276	1208.725
7	753.978	1220.044
8	801.850	1234.476
9	848.694	1251.959
10	894.315	1272.423
11	938.523	1295.782
12	981.135	1321.938
13	1021.975	1350.785
14	1060.873	1382.201
15	1097.667	1416.056
16	1132.205	1452.211
17	1164.343	1490.514
18	1193.948	1530.807
19	1220.897	1572.923
20	1245.079	1616.686
21	1266.393	1661.916
22	1277.742	1690.671

Circle Center At X = 554.201 ; Y = 1969.067 ; and Radius = 775.253
Factor of Safety
*** 1.505 ***
Individual data on the 41 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	49.8	19234.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	13.8	11088.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	12.5	62435.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	23.7	218446.4	0.0	0.0	0.	0.	0.0	0.0	0.0
5	36.3	332290.9	0.0	0.0	0.	0.	0.0	0.0	0.0
6	12.5	164301.1	0.0	0.0	0.	0.	0.0	0.0	0.0
7	1.2	20568.3	0.0	0.0	0.	0.	0.0	0.0	0.0
8	49.8	836657.3	0.0	0.0	0.	0.	0.0	0.0	0.0
9	9.1	147418.1	0.0	0.0	0.	0.	0.0	0.0	0.0
10	12.5	251424.3	0.0	0.0	0.	0.	0.0	0.0	0.0
11	27.8	658000.4	0.0	0.0	0.	0.	0.0	0.0	0.0
12	32.2	731235.4	0.0	0.0	0.	0.	0.0	0.0	0.0
13	12.5	324499.1	0.0	0.0	0.	0.	0.0	0.0	0.0
14	4.0	118427.2	0.0	0.0	0.	0.	0.0	0.0	0.0
15	47.9	1364456.2	0.0	0.0	0.	0.	0.0	0.0	0.0
16	8.1	220534.5	0.0	0.0	0.	0.	0.0	0.0	0.0
17	12.5	381871.7	0.0	0.0	0.	0.	0.0	0.0	0.0
18	26.2	877057.9	0.0	0.0	0.	0.	0.0	0.0	0.0
19	33.8	1062379.1	0.0	0.0	0.	0.	0.0	0.0	0.0
20	11.8	397395.0	0.0	0.0	0.	0.	0.0	0.0	0.0
21	0.7	25564.6	0.0	0.0	0.	0.	0.0	0.0	0.0
22	43.5	1549115.9	0.0	0.0	0.	0.	0.0	0.0	0.0

23	16.5	541468.1	0.0	0.0	0.	0.	0.0	0.0	0.0
24	12.5	443989.6	0.0	0.0	0.	0.	0.0	0.0	0.0
25	13.6	522511.8	0.0	0.0	0.	0.	0.0	0.0	0.0
26	40.8	1439618.4	0.0	0.0	0.	0.	0.0	0.0	0.0
27	5.5	179572.5	0.0	0.0	0.	0.	0.0	0.0	0.0
28	12.5	442829.2	0.0	0.0	0.	0.	0.0	0.0	0.0
29	20.9	779133.0	0.0	0.0	0.	0.	0.0	0.0	0.0
30	36.8	1219494.9	0.0	0.0	0.	0.	0.0	0.0	0.0
31	2.3	70342.0	0.0	0.0	0.	0.	0.0	0.0	0.0
32	30.0	944456.8	0.0	0.0	0.	0.	0.0	0.0	0.0
33	2.2	72371.2	0.0	0.0	0.	0.	0.0	0.0	0.0
34	32.1	947280.7	0.0	0.0	0.	0.	0.0	0.0	0.0
35	15.7	384494.7	0.0	0.0	0.	0.	0.0	0.0	0.0
36	13.9	336286.7	0.0	0.0	0.	0.	0.0	0.0	0.0
37	6.1	156673.5	0.0	0.0	0.	0.	0.0	0.0	0.0
38	20.9	490153.2	0.0	0.0	0.	0.	0.0	0.0	0.0
39	24.2	403932.4	0.0	0.0	0.	0.	0.0	0.0	0.0
40	21.3	189940.4	0.0	0.0	0.	0.	0.0	0.0	0.0
41	11.3	28200.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	454.779	1200.000
2	504.443	1194.212
3	554.388	1191.864
4	604.376	1192.968
5	654.168	1197.518
6	703.528	1205.493
7	752.220	1216.855
8	800.012	1231.549
9	846.677	1249.506
10	891.991	1270.640
11	935.739	1294.849
12	977.712	1322.020
13	1017.710	1352.022
14	1055.543	1384.712
15	1091.031	1419.935
16	1124.004	1457.522
17	1154.304	1497.295
18	1181.788	1539.064
19	1206.325	1582.629
20	1227.797	1627.784
21	1246.103	1674.312
22	1252.234	1693.732

Circle Center At X = 563.579 ; Y = 1915.145 ; and Radius = 723.373
Factor of Safety
*** 1.514 ***
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	466.305	1200.000
2	516.005	1194.526
3	565.962	1192.457
4	615.944	1193.803
5	665.717	1198.557
6	715.050	1206.697
7	763.713	1218.186
8	811.477	1232.968
9	858.122	1250.977
10	903.428	1272.127
11	947.185	1296.320
12	989.189	1323.443
13	1029.244	1353.370
14	1067.163	1385.961
15	1102.769	1421.064
16	1135.896	1458.516
17	1166.389	1498.143

18	1194.107	1539.755
19	1218.920	1583.163
20	1240.712	1628.165
21	1259.382	1674.548
22	1265.117	1692.186

Circle Center At X = 571.435 ; Y = 1923.699 ; and Radius = 731.295

Factor of Safety

*** 1.525 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	473.615	1200.000
2	523.328	1194.651
3	573.293	1192.783
4	623.267	1194.408
5	673.005	1199.516
6	722.266	1208.083
7	770.808	1220.066
8	818.396	1235.409
9	864.798	1254.034
10	909.786	1275.853
11	953.142	1300.758
12	994.654	1328.628
13	1034.120	1359.327
14	1071.347	1392.706
15	1106.154	1428.601
16	1138.371	1466.838
17	1167.842	1507.229
18	1194.421	1549.580
19	1217.980	1593.681
20	1238.404	1639.320
21	1255.593	1686.272
22	1257.563	1693.093

Circle Center At X = 575.128 ; Y = 1908.337 ; and Radius = 715.574

Factor of Safety

*** 1.528 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	466.868	1200.000
2	516.667	1195.526
3	566.648	1194.152
4	616.618	1195.883
5	666.385	1200.712
6	715.755	1208.620
7	764.540	1219.577
8	812.551	1233.540
9	859.602	1250.457
10	905.513	1270.261
11	950.106	1292.876
12	993.209	1318.215
13	1034.657	1346.181
14	1074.289	1376.665
15	1111.953	1409.550
16	1147.504	1444.710
17	1180.803	1482.008
18	1211.724	1521.300
19	1240.146	1562.437
20	1265.960	1605.257
21	1289.067	1649.598
22	1305.828	1687.301

Circle Center At X = 563.882 ; Y = 1998.822 ; and Radius = 804.692

Factor of Safety

*** 1.532 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	459.277	1200.000
2	508.899	1193.862
3	558.819	1191.037
4	608.817	1191.536
5	658.670	1195.358
6	708.160	1202.486
7	757.066	1212.888
8	805.172	1226.518
9	852.266	1243.317
10	898.139	1263.208
11	942.588	1286.105
12	985.416	1311.907
13	1026.435	1340.499
14	1065.462	1371.754
15	1102.325	1405.534
16	1136.860	1441.691
17	1168.916	1480.063
18	1198.350	1520.482
19	1225.032	1562.767
20	1248.843	1606.733
21	1269.679	1652.185
22	1284.025	1689.917

Circle Center At X = 576.415 ; Y = 1941.972 ; and Radius = 751.162

Factor of Safety

*** 1.544 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	451.406	1200.000
2	500.933	1193.139
3	550.811	1189.658
4	600.811	1189.572
5	650.702	1192.882
6	700.252	1199.573
7	749.233	1209.613
8	797.420	1222.957
9	844.589	1239.543
10	890.523	1259.294
11	935.009	1282.119
12	977.842	1307.912
13	1018.825	1336.556
14	1057.767	1367.916
15	1094.490	1401.848
16	1128.824	1438.197
17	1160.610	1476.793
18	1189.701	1517.459
19	1215.963	1560.006
20	1239.275	1604.239
21	1259.529	1649.953
22	1274.492	1691.061

Circle Center At X = 577.140 ; Y = 1924.585 ; and Radius = 735.413

Factor of Safety

*** 1.545 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	476.145	1200.000
2	525.868	1194.748
3	575.829	1192.764
4	625.812	1194.058
5	675.603	1198.624
6	724.988	1206.441
7	773.755	1217.478
8	821.694	1231.685
9	868.600	1249.002
10	914.270	1269.355
11	958.508	1292.656

12	1001.125	1318.805
13	1041.938	1347.690
14	1080.771	1379.187
15	1117.456	1413.160
16	1151.837	1449.464
17	1183.766	1487.941
18	1213.106	1528.428
19	1239.730	1570.750
20	1263.525	1614.725
21	1284.388	1660.165
22	1295.238	1688.571

Circle Center At X = 581.265 ; Y = 1954.658 ; and Radius = 761.944

Factor of Safety
*** 1.550 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	480.081	1200.000
2	529.771	1194.440
3	579.724	1192.286
4	629.708	1193.548
5	679.489	1198.221
6	728.835	1206.281
7	777.516	1217.693
8	825.303	1232.402
9	871.975	1250.339
10	917.313	1271.422
11	961.105	1295.552
12	1003.147	1322.615
13	1043.244	1352.487
14	1081.207	1385.026
15	1116.859	1420.082
16	1150.035	1457.490
17	1180.578	1497.077
18	1208.347	1538.656
19	1233.212	1582.035
20	1255.057	1627.011
21	1273.780	1673.373
22	1279.362	1690.477

Circle Center At X = 586.426 ; Y = 1923.193 ; and Radius = 730.970

Factor of Safety
*** 1.551 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	501.446	1200.000
2	551.230	1195.354
3	601.218	1194.246
4	651.158	1196.682
5	700.801	1202.650
6	749.896	1212.120
7	798.197	1225.043
8	845.461	1241.356
9	891.451	1260.976
10	935.935	1283.805
11	978.691	1309.727
12	1019.502	1338.613
13	1058.165	1370.318
14	1094.485	1404.682
15	1128.279	1441.532
16	1159.378	1480.684
17	1187.625	1521.940
18	1212.879	1565.094
19	1235.012	1609.928
20	1253.914	1656.218
21	1265.682	1692.118

Circle Center At X = 591.841 ; Y = 1899.560 ; and Radius = 705.376

Factor of Safety
*** 1.553 ***

**** END OF GSTABL7 OUTPUT ****

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                          *** GSTABL7 ***
                  ** GSTABL7 by Garry H. Gregory, P.E. **
        ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
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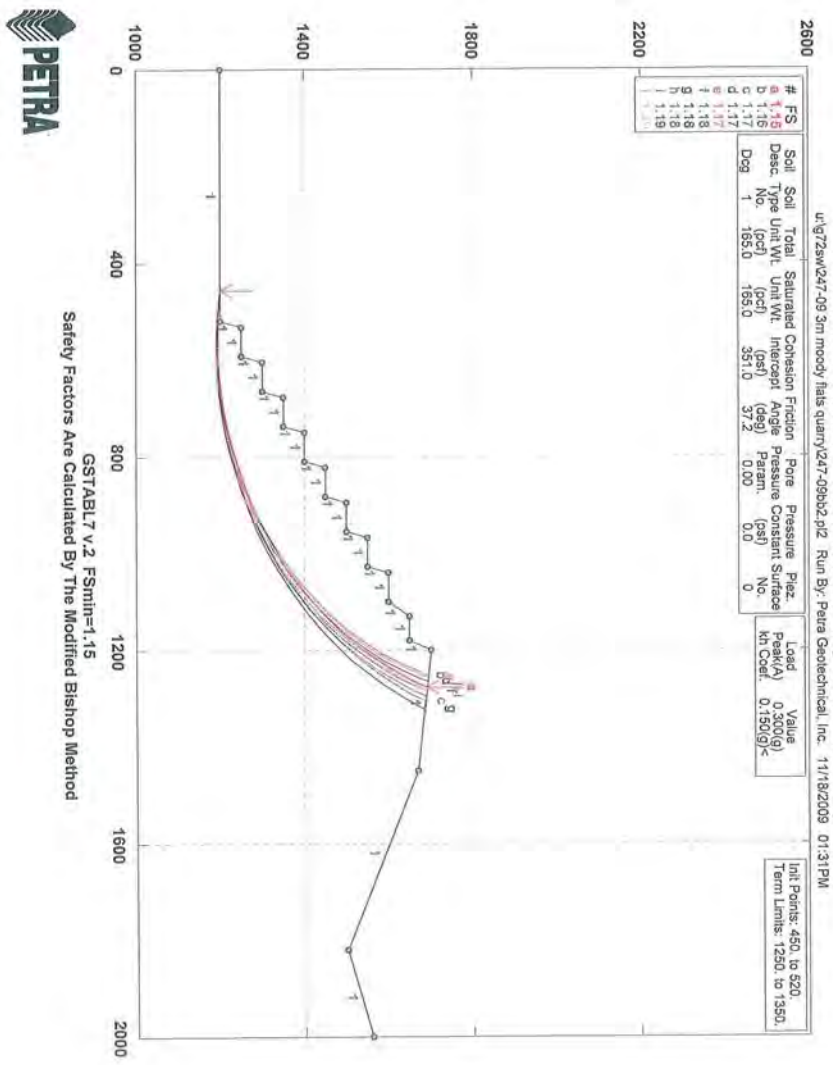
************************************************************************************
                        SLOPE STABILITY ANALYSIS SYSTEM
          Modified Bishop, Simplified Janbu, or GLE Method of Slices.
          (Includes Spencer & Morgenstern-Price Type Analysis)
          Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
          Nonlinear Undrained Shear Strength, Curved Phi Envelope,
          Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
          Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
************************************************************************************

Analysis Run Date:          11/18/2009
Time of Run:                01:31PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        e:\247-09\247-09bb2.
Output Filename:            e:\247-09\247-09bb2.OUT
Unit System:                English
Plotted Output Filename:    e:\247-09\247-09bb2.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section B-B':
                      Global Stability - Seismic Analysis
BOUNDARY COORDINATES
   23 Top   Boundaries
   23 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right    Soil Type
   No.         (ft)        (ft)        (ft)        (ft)    Below Bnd
    1         0.00     1200.00      520.00     1200.00        1
    2       520.00     1200.00      532.50     1250.00        1
    3       532.50     1250.00      592.50     1250.00        1
    4       592.50     1250.00      605.00     1300.00        1
    5       605.00     1300.00      665.00     1300.00        1
    6       665.00     1300.00      677.50     1350.00        1
    7       677.50     1350.00      737.50     1350.00        1
    8       737.50     1350.00      750.00     1400.00        1
    9       750.00     1400.00      810.00     1400.00        1
   10       810.00     1400.00      822.50     1450.00        1
   11       822.50     1450.00      882.50     1450.00        1
   12       882.50     1450.00      895.00     1500.00        1
   13       895.00     1500.00      955.00     1500.00        1
   14       955.00     1500.00      967.50     1550.00        1
   15       967.50     1550.00     1027.50     1550.00        1
   16      1027.50     1550.00     1040.00     1600.00        1
   17      1040.00     1600.00     1100.00     1600.00        1
   18      1100.00     1600.00     1130.00     1650.00        1
   19      1130.00     1650.00     1180.00     1650.00        1
   20      1180.00     1650.00     1200.00     1700.00        1
   21      1200.00     1700.00     1450.00     1670.00        1
   22      1450.00     1670.00     1820.00     1500.00        1
   23      1820.00     1500.00     2000.00     1560.00        1
User Specified Y-Origin =       1000.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
  1   165.0    165.0     351.0     37.2    0.00       0.0       0
Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
```



PETRA

Along The Ground Surface Between X = 450.00(ft)
and X = 520.00(ft)
Each Surface Terminates Between X =1250.00(ft)
and X =1350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 500
Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 1.841 FS Min = 1.150 FS Ave = 1.461
Standard Deviation = 0.162 Coefficient of Variation = 11.11 %
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	456.466	1200.000
2	506.246	1195.316
3	556.224	1193.848
4	606.194	1195.600
5	655.947	1200.566
6	705.276	1208.725
7	753.978	1220.044
8	801.850	1234.476
9	848.694	1251.959
10	894.315	1272.423
11	938.523	1295.782
12	981.135	1321.938
13	1021.975	1350.785
14	1060.873	1382.201
15	1097.667	1416.056
16	1132.205	1452.211
17	1164.343	1490.514
18	1193.948	1530.807
19	1220.897	1572.923
20	1245.079	1616.686
21	1266.393	1661.916
22	1277.742	1690.671

Circle Center At X = 554.201 ; Y = 1969.067 ; and Radius = 775.253
Factor of Safety
*** 1.150 ***
Individual data on the 41 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	49.8	19234.9	0.0	0.0	0.	0.	2885.2	0.0	0.0
2	13.8	11088.0	0.0	0.0	0.	0.	1663.2	0.0	0.0
3	12.5	62435.2	0.0	0.0	0.	0.	9365.3	0.0	0.0
4	23.7	218446.4	0.0	0.0	0.	0.	32767.0	0.0	0.0
5	36.3	332290.9	0.0	0.0	0.	0.	49843.6	0.0	0.0
6	12.5	164301.1	0.0	0.0	0.	0.	24645.2	0.0	0.0
7	1.2	20568.3	0.0	0.0	0.	0.	3085.2	0.0	0.0
8	49.8	836657.3	0.0	0.0	0.	0.	*******	0.0	0.0
9	9.1	147418.1	0.0	0.0	0.	0.	22112.7	0.0	0.0
10	12.5	251424.3	0.0	0.0	0.	0.	37713.7	0.0	0.0
11	27.8	658000.4	0.0	0.0	0.	0.	98700.1	0.0	0.0
12	32.2	731235.4	0.0	0.0	0.	0.	*******	0.0	0.0
13	12.5	324499.1	0.0	0.0	0.	0.	48674.9	0.0	0.0
14	4.0	118427.2	0.0	0.0	0.	0.	17764.1	0.0	0.0
15	47.9	1364456.2	0.0	0.0	0.	0.	*******	0.0	0.0
16	8.1	220534.5	0.0	0.0	0.	0.	33080.2	0.0	0.0
17	12.5	381871.7	0.0	0.0	0.	0.	57280.8	0.0	0.0
18	26.2	877057.9	0.0	0.0	0.	0.	*******	0.0	0.0

19	33.8	1062379.1	0.0	0.0	0.	0.	*******	0.0	0.0
20	11.8	397395.0	0.0	0.0	0.	0.	59609.3	0.0	0.0
21	0.7	25564.6	0.0	0.0	0.	0.	3834.7	0.0	0.0
22	43.5	1549115.9	0.0	0.0	0.	0.	*******	0.0	0.0
23	16.5	541468.1	0.0	0.0	0.	0.	81220.2	0.0	0.0
24	12.5	443989.6	0.0	0.0	0.	0.	66598.4	0.0	0.0
25	13.6	522511.8	0.0	0.0	0.	0.	78376.8	0.0	0.0
26	40.8	1439618.4	0.0	0.0	0.	0.	*******	0.0	0.0
27	5.5	179572.5	0.0	0.0	0.	0.	26935.9	0.0	0.0
28	12.5	442829.2	0.0	0.0	0.	0.	66424.4	0.0	0.0
29	20.9	779133.0	0.0	0.0	0.	0.	*******	0.0	0.0
30	36.8	1219494.9	0.0	0.0	0.	0.	*******	0.0	0.0
31	2.3	70342.0	0.0	0.0	0.	0.	10551.3	0.0	0.0
32	30.0	944456.6	0.0	0.0	0.	0.	*******	0.0	0.0
33	2.2	72371.2	0.0	0.0	0.	0.	10855.7	0.0	0.0
34	32.1	947280.7	0.0	0.0	0.	0.	*******	0.0	0.0
35	15.7	384494.7	0.0	0.0	0.	0.	57674.2	0.0	0.0
36	13.9	336286.7	0.0	0.0	0.	0.	50443.0	0.0	0.0
37	6.1	156673.5	0.0	0.0	0.	0.	23501.0	0.0	0.0
38	20.9	490153.2	0.0	0.0	0.	0.	73523.0	0.0	0.0
39	24.2	403932.4	0.0	0.0	0.	0.	60589.9	0.0	0.0
40	21.3	189940.4	0.0	0.0	0.	0.	28491.1	0.0	0.0
41	11.3	28200.5	0.0	0.0	0.	0.	4230.1	0.0	0.0

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	454.779	1200.000
2	504.443	1194.212
3	554.388	1191.864
4	604.376	1192.968
5	654.168	1197.518
6	703.528	1205.493
7	752.220	1216.855
8	800.012	1231.549
9	846.677	1249.506
10	891.991	1270.640
11	935.739	1294.849
12	977.712	1322.020
13	1017.710	1352.022
14	1055.543	1384.712
15	1091.031	1419.935
16	1124.004	1457.522
17	1154.304	1497.295
18	1181.788	1539.064
19	1206.325	1582.629
20	1227.797	1627.784
21	1246.103	1674.312
22	1252.234	1693.732

Circle Center At X = 563.579 ; Y = 1915.145 ; and Radius = 723.373
Factor of Safety
*** 1.161 ***
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	466.868	1200.000
2	516.667	1195.526
3	566.648	1194.152
4	616.618	1195.883
5	666.385	1200.712
6	715.755	1208.620
7	764.540	1219.577
8	812.551	1233.540
9	859.602	1250.457
10	905.513	1270.261
11	950.106	1292.876
12	993.209	1318.215
13	1034.657	1346.181

14	1074.289	1376.665
15	1111.953	1409.550
16	1147.504	1444.710
17	1180.803	1482.008
18	1211.724	1521.300
19	1240.146	1562.437
20	1265.960	1605.257
21	1289.067	1649.598
22	1305.828	1687.301

Circle Center At X = 563.882 ; Y = 1998.822 ; and Radius = 804.692

Factor of Safety

*** 1.167 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	466.305	1200.000
2	516.005	1194.526
3	565.962	1192.457
4	615.944	1193.803
5	665.717	1198.557
6	715.050	1206.697
7	763.713	1218.186
8	811.477	1232.968
9	858.122	1250.977
10	903.428	1272.127
11	947.185	1296.320
12	989.189	1323.443
13	1029.244	1353.370
14	1067.163	1385.961
15	1102.769	1421.064
16	1135.896	1458.516
17	1166.389	1498.141
18	1194.107	1539.755
19	1218.920	1583.163
20	1240.712	1628.165
21	1259.382	1674.548
22	1265.117	1692.186

Circle Center At X = 571.435 ; Y = 1923.699 ; and Radius = 731.295

Factor of Safety

*** 1.169 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	473.615	1200.000
2	523.328	1194.651
3	573.293	1192.783
4	623.267	1194.408
5	673.005	1199.516
6	722.266	1208.083
7	770.808	1220.066
8	818.396	1235.409
9	864.798	1254.034
10	909.786	1275.853
11	953.142	1300.758
12	994.654	1328.628
13	1034.120	1359.327
14	1071.347	1392.706
15	1106.154	1428.601
16	1138.371	1466.838
17	1167.842	1507.229
18	1194.421	1549.580
19	1217.980	1593.681
20	1238.404	1639.320
21	1255.593	1686.272
22	1257.563	1693.093

Circle Center At X = 575.128 ; Y = 1908.337 ; and Radius = 715.574

Factor of Safety

*** 1.172 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	459.277	1200.000
2	508.899	1193.862
3	558.819	1191.037
4	608.817	1191.536
5	658.670	1195.358
6	708.160	1202.486
7	757.066	1212.888
8	805.172	1226.518
9	852.266	1243.317
10	898.139	1263.208
11	942.588	1286.105
12	985.416	1311.907
13	1026.435	1340.499
14	1065.462	1371.754
15	1102.325	1405.534
16	1136.860	1441.691
17	1168.916	1480.063
18	1198.350	1520.482
19	1225.032	1562.767
20	1248.843	1606.733
21	1269.679	1652.185
22	1284.025	1689.917

Circle Center At X = 576.415 ; Y = 1941.972 ; and Radius = 751.162

Factor of Safety

*** 1.181 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	464.619	1200.000
2	514.369	1195.013
3	564.332	1193.073
4	614.319	1194.189
5	664.145	1198.355
6	713.624	1205.556
7	762.571	1215.765
8	810.802	1228.945
9	858.139	1245.045
10	904.404	1264.006
11	949.425	1285.758
12	993.034	1310.218
13	1035.067	1337.295
14	1075.369	1366.889
15	1113.787	1398.889
16	1150.180	1433.176
17	1184.411	1469.621
18	1216.353	1508.088
19	1245.885	1548.434
20	1272.899	1590.509
21	1297.293	1634.155
22	1318.975	1679.209
23	1321.509	1685.419

Circle Center At X = 571.079 ; Y = 2011.396 ; and Radius = 810.351

Factor of Safety

*** 1.183 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	451.406	1200.000
2	500.933	1193.139
3	550.811	1189.658
4	600.811	1189.572
5	650.702	1192.882
6	700.252	1199.573

7	749.233	1209.613
8	797.420	1222.957
9	844.589	1239.543
10	890.523	1259.294
11	935.009	1282.119
12	977.842	1307.912
13	1018.825	1336.556
14	1057.767	1367.916
15	1094.490	1401.848
16	1128.824	1438.197
17	1160.610	1476.793
18	1189.701	1517.459
19	1215.963	1560.006
20	1239.275	1604.239
21	1259.529	1649.953
22	1274.492	1691.061

Circle Center At X = 577.140 ; Y = 1924.585 ; and Radius = 735.413

Factor of Safety

*** 1.184 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	476.145	1200.000
2	525.868	1194.748
3	575.829	1192.764
4	625.812	1194.058
5	675.603	1198.624
6	724.988	1206.441
7	773.755	1217.478
8	821.694	1231.685
9	868.600	1249.002
10	914.270	1269.355
11	958.508	1292.658
12	1001.125	1318.805
13	1041.930	1347.690
14	1080.771	1379.187
15	1117.456	1413.160
16	1151.837	1449.464
17	1183.766	1487.941
18	1213.106	1528.428
19	1239.730	1570.750
20	1263.525	1614.725
21	1284.388	1660.165
22	1295.238	1688.571

Circle Center At X = 581.265 ; Y = 1954.658 ; and Radius = 761.944

Factor of Safety

*** 1.185 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	480.081	1200.000
2	529.771	1194.440
3	579.724	1192.286
4	629.708	1193.548
5	679.489	1198.221
6	728.835	1206.281
7	777.516	1217.693
8	825.303	1232.402
9	871.975	1250.339
10	917.313	1271.422
11	961.105	1295.552
12	1003.147	1322.615
13	1043.244	1352.487
14	1081.207	1385.026
15	1116.859	1420.082
16	1150.035	1457.490
17	1180.578	1497.077

18	1208.347	1538.656
19	1233.212	1582.035
20	1255.057	1627.011
21	1273.780	1673.373
22	1279.362	1690.477

Circle Center At X = 586.426 ; Y = 1923.193 ; and Radius = 730.970

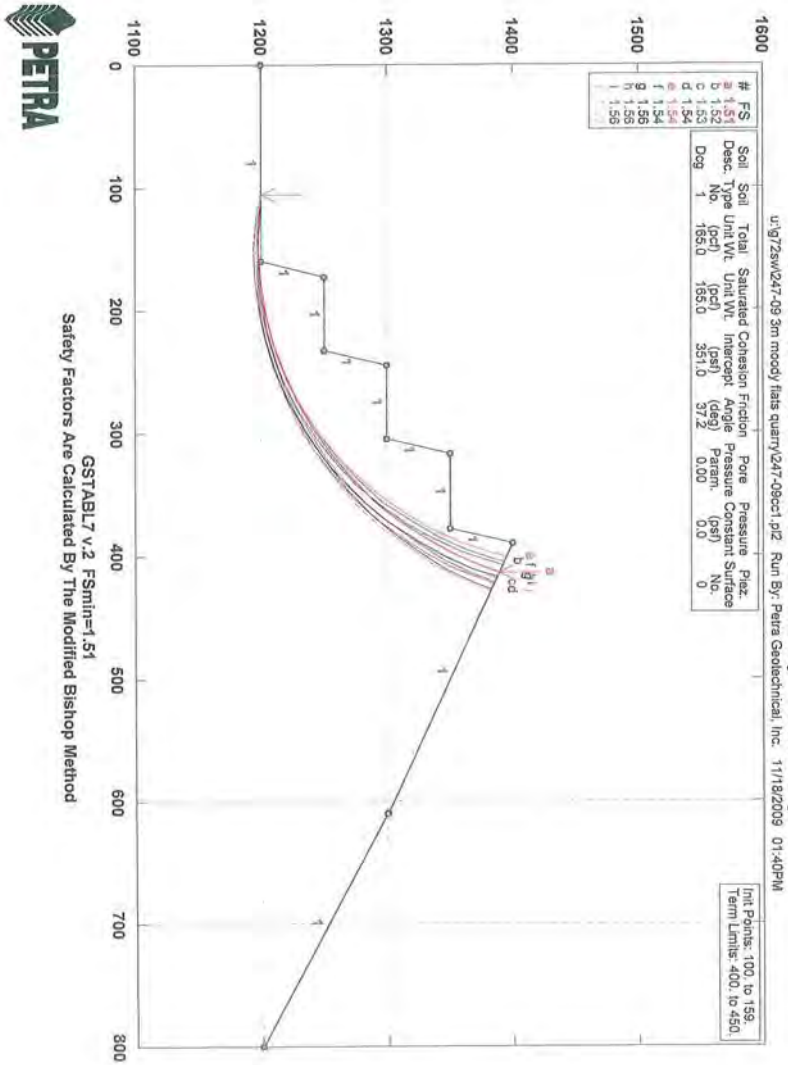
Factor of Safety

*** 1.189 ***

**** END OF GSTABL7 OUTPUT ****

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
     ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
                (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
          Modified Bishop, Simplified Janbu, or GLE Method of Slices.
          (Includes Spencer & Morgenstern-Price Type Analysis)
          Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
          Nonlinear Undrained Shear Strength, Curved Phi Envelope,
          Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
          Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************

Analysis Run Date:          11/18/2009
Time of Run:                01:40PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        e:\247-09\247-09cc1.in
Output Filename:            e:\247-09\247-09cc1.OUT
Unit System:                English
Plotted Output Filename:    e:\247-09\247-09cc1.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section C-C':
                      Global Stability - Static Analysis
BOUNDARY COORDINATES
   10 Top   Boundaries
   10 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00     1200.00      160.00     1200.00         1
    2       160.00     1200.00      172.50     1250.00         1
    3       172.50     1250.00      232.50     1250.00         1
    4       232.50     1250.00      245.00     1300.00         1
    5       245.00     1300.00      305.00     1300.00         1
    6       305.00     1300.00      317.50     1350.00         1
    7       317.50     1350.00      377.50     1350.00         1
    8       377.50     1350.00      390.00     1400.00         1
    9       390.00     1400.00      610.00     1300.00         1
   10       610.00     1300.00      800.00     1200.00         1
User Specified Y-Origin =       1100.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
Soil  Total   Saturated  Cohesion  Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept    Angle  Pressure Constant Surface
 No.   (pcf)     (pcf)     (psf)     (deg)   Param.    (psf)     No.
  1   165.0     165.0     351.0      37.2    0.00      0.0       0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
  500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X = 100.00(ft)
                            and   X = 159.00(ft)
Each Surface Terminates Between   X = 400.00(ft)
                            and   X = 450.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =       0.00(ft)
25.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =  500
      Number of Trial Surfaces With Valid FS =  500
      Statistical Data On All Valid FS Values:
         FS Max =   2.443   FS Min =   1.509   FS Ave =   1.936
         Standard Deviation =   0.213   Coefficient of Variation =   11.02 %
      Failure Surface Specified By 17 Coordinate Points
```



Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.687	1200.000
2	130.577	1197.658
3	155.576	1197.504
4	180.493	1199.540
5	205.136	1203.749
6	229.316	1210.100
7	252.847	1218.543
8	275.549	1229.015
9	297.246	1241.433
10	317.773	1255.703
11	336.972	1271.716
12	354.695	1289.349
13	370.806	1308.465
14	385.182	1328.918
15	397.711	1350.552
16	408.299	1373.199
17	414.080	1389.054

Circle Center At X = 144.829 ; Y = 1482.572 ; and Radius = 285.270

Factor of Safety

*** 1.509 ***

Individual data on the 24 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	24.9	4808.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	25.0	9977.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.4	1689.7	0.0	0.0	0.	0.	0.0	0.0	0.0
4	12.5	54911.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	8.0	66982.0	0.0	0.0	0.	0.	0.0	0.0	0.0
6	24.6	196617.6	0.0	0.0	0.	0.	0.0	0.0	0.0
7	24.2	171856.5	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.2	20659.8	0.0	0.0	0.	0.	0.0	0.0	0.0
9	12.5	126874.5	0.0	0.0	0.	0.	0.0	0.0	0.0
10	7.8	107293.7	0.0	0.0	0.	0.	0.0	0.0	0.0
11	22.7	285503.6	0.0	0.0	0.	0.	0.0	0.0	0.0
12	21.7	231904.7	0.0	0.0	0.	0.	0.0	0.0	0.0
13	7.8	71480.4	0.0	0.0	0.	0.	0.0	0.0	0.0
14	12.5	152277.6	0.0	0.0	0.	0.	0.0	0.0	0.0
15	0.3	4254.9	0.0	0.0	0.	0.	0.0	0.0	0.0
16	19.2	273348.3	0.0	0.0	0.	0.	0.0	0.0	0.0
17	17.7	203143.8	0.0	0.0	0.	0.	0.0	0.0	0.0
18	16.1	135824.0	0.0	0.0	0.	0.	0.0	0.0	0.0
19	6.7	40615.9	0.0	0.0	0.	0.	0.0	0.0	0.0
20	7.7	53120.7	0.0	0.0	0.	0.	0.0	0.0	0.0
21	4.8	45542.8	0.0	0.0	0.	0.	0.0	0.0	0.0
22	7.7	69158.7	0.0	0.0	0.	0.	0.0	0.0	0.0
23	10.6	56275.1	0.0	0.0	0.	0.	0.0	0.0	0.0
24	5.8	8815.7	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	112.321	1200.000
2	137.223	1197.785
3	162.223	1197.908
4	187.101	1200.369
5	211.641	1205.144
6	235.626	1212.194
7	258.848	1221.455
8	281.101	1232.847
9	302.192	1246.270
10	321.935	1261.606
11	340.158	1278.722
12	356.701	1297.466
13	371.418	1317.675

14	384.181	1339.171
15	394.878	1361.767
16	403.416	1385.264
17	405.428	1392.987

Circle Center At X = 148.408 ; Y = 1464.621 ; and Radius = 267.070

Factor of Safety

*** 1.518 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.634	1200.000
2	131.486	1197.283
3	156.480	1196.720
4	181.429	1198.315
5	206.148	1202.056
6	230.451	1207.916
7	254.159	1215.850
8	277.093	1225.800
9	299.084	1237.692
10	319.967	1251.436
11	339.587	1266.930
12	357.797	1284.059
13	374.461	1302.693
14	389.456	1322.699
15	402.669	1343.922
16	414.002	1366.206
17	421.816	1385.538

Circle Center At X = 150.498 ; Y = 1486.195 ; and Radius = 289.536

Factor of Safety

*** 1.532 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.454	1200.000
2	139.353	1197.763
3	164.353	1197.631
4	189.275	1199.605
5	213.942	1203.670
6	238.180	1209.797
7	261.815	1217.944
8	284.681	1228.052
9	306.614	1240.049
10	327.459	1253.851
11	347.067	1269.359
12	365.301	1286.463
13	382.029	1305.042
14	397.134	1324.963
15	410.507	1346.085
16	422.054	1368.258
17	428.085	1382.689

Circle Center At X = 153.420 ; Y = 1494.063 ; and Radius = 296.634

Factor of Safety

*** 1.537 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	104.265	1200.000
2	129.097	1197.106
3	154.092	1196.589
4	179.022	1198.455
5	203.661	1202.686
6	227.786	1209.243
7	251.177	1218.068
8	273.621	1229.080
9	294.914	1242.179
10	314.864	1257.246
11	333.288	1274.144

12	350.020	1292.720
13	364.907	1312.804
14	377.814	1334.214
15	388.624	1356.756
16	397.239	1380.225
17	401.100	1394.954

Circle Center At X = 147.008 ; Y = 1458.759 ; and Radius = 262.265

Factor of Safety

*** 1.538 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.217	1200.000
2	139.066	1197.263
3	164.064	1196.914
4	188.981	1198.955
5	213.588	1203.369
6	237.661	1210.115
7	260.979	1219.130
8	283.328	1230.333
9	304.504	1243.620
10	324.314	1258.871
11	342.575	1275.945
12	359.121	1294.687
13	373.799	1314.924
14	386.477	1336.471
15	397.036	1359.131
16	405.382	1382.697
17	407.693	1391.958

Circle Center At X = 155.211 ; Y = 1458.031 ; and Radius = 261.287

Factor of Safety

*** 1.541 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.056	1200.000
2	132.830	1196.642
3	157.807	1195.568
4	182.777	1196.787
5	207.531	1200.287
6	231.860	1206.040
7	255.559	1213.998
8	278.431	1224.093
9	300.281	1236.240
10	320.927	1250.338
11	340.194	1266.268
12	357.922	1283.896
13	373.960	1303.073
14	388.174	1323.639
15	400.445	1345.421
16	410.668	1368.234
17	417.291	1387.595

Circle Center At X = 157.020 ; Y = 1468.206 ; and Radius = 272.639

Factor of Safety

*** 1.555 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.000	1200.000
2	124.697	1196.120
3	149.644	1194.491
4	174.636	1195.126
5	199.468	1198.021
6	223.935	1203.152
7	247.838	1210.477
8	270.980	1219.934
9	293.171	1231.448

10	314.229	1244.923
11	333.981	1260.248
12	352.264	1277.298
13	368.930	1295.933
14	383.840	1316.000
15	396.873	1337.335
16	407.921	1359.761
17	416.894	1383.095
18	418.070	1387.241

Circle Center At X = 155.185 ; Y = 1470.033 ; and Radius = 275.614

Factor of Safety

*** 1.561 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.510	1200.000
2	147.380	1197.453
3	172.378	1197.181
4	197.298	1199.186
5	221.931	1203.452
6	246.073	1209.944
7	269.524	1218.607
8	292.089	1229.370
9	313.580	1242.143
10	333.818	1256.819
11	352.636	1273.278
12	369.877	1291.382
13	385.398	1310.980
14	399.070	1331.911
15	410.779	1354.000
16	420.427	1377.062
17	422.936	1385.029

Circle Center At X = 162.861 ; Y = 1471.270 ; and Radius = 274.255

Factor of Safety

*** 1.562 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	109.241	1200.000
2	134.041	1196.842
3	159.020	1195.833
4	183.994	1196.980
5	208.776	1200.274
6	233.182	1205.693
7	257.030	1213.194
8	280.143	1222.722
9	302.349	1234.206
10	323.483	1247.562
11	343.387	1262.688
12	361.913	1279.474
13	378.925	1297.794
14	394.294	1317.512
15	407.907	1338.480
16	419.662	1360.544
17	428.944	1382.298

Circle Center At X = 158.221 ; Y = 1485.675 ; and Radius = 289.843

Factor of Safety

*** 1.566 ***

**** END OF GSTABL7 OUTPUT ****

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                    *** GSTABL7 ***
          ** GSTABL7 by Barry M. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
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************************************************************************
        SLOPE STABILITY ANALYSIS SYSTEM

    Modified Bishop, Simplified Janbu, or GLE Method of Slices.
    (Includes Spencer & Morgenstern-Price Type Analysis)
    Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
    Nonlinear Undrained Shear Strength, Curved Phi Envelope,
    Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
    Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
************************************************************************
Analysis Run Date:      11/18/2009
Time of Run:            01:39PM
Run By:                 Petra Geotechnical, Inc.
Input Data Filename:    e:\247-09\247-09cc2.in
Output Filename:        e:\247-09\247-09cc2.OUT
Unit System:            English
Plotted Output Filename:  e:\247-09\247-09cc2.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section C-C':
                      Global Stability - Seismic Analysis

BOUNDARY COORDINATES
  10 Top   Boundaries
  10 Total Boundaries
Boundary   X-Left     Y-Left     X-Right    Y-Right    Soil Type
   No.       (ft)       (ft)       (ft)       (ft)    Below Bnd
    1        0.00    1200.00     160.00    1200.00        1
    2      160.00    1200.00     172.50    1250.00        1
    3      172.50    1250.00     232.50    1250.00        1
    4      232.50    1250.00     245.00    1300.00        1
    5      245.00    1300.00     305.00    1300.00        1
    6      305.00    1300.00     317.50    1350.00        1
    7      317.50    1350.00     377.50    1350.00        1
    8      377.50    1350.00     390.00    1400.00        1
    9      390.00    1400.00     610.00    1300.00        1
   10      610.00    1300.00     800.00    1200.00        1
User Specified Y-Origin =          1100.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  1 Type(s) of Soil
Soil  Total   Saturated  Cohesion  Friction  Pore     Pressure  Piez.
Type  Unit Wt. Unit Wt.  Intercept Angle     Pressure Constant  Surface
 No.  (pcf)    (pcf)     (psf)     (deg)     Param.   (psf)     No.
  1   165.0    165.0     351.0     37.2      0.00     0.0       0

Specified Peak Ground Acceleration Coefficient (A) =  0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =  0.150(g)
Specified Vertical Earthquake Coefficient (kv) =  0.000(g)
Specified Seismic Pore-Pressure Factor =  0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
  500 Trial Surfaces Have Been Generated.
  2 Surface(s) Initiate(s) From Each Of  250 Points Equally Spaced
Along The Ground Surface Between  X = 100.00(ft)
                     and  X = 159.00(ft)
Each Surface Terminates Between  X = 410.00(ft)
                     and  X = 450.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =        0.00(ft)
20.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
   Failure Surfaces Evaluated. They Are
   Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted =  500
Number of Trial Surfaces With Valid FS =  500
```

Statistical Data On All Valid FS Values:
FS Max = 1.908 FS Min = 1.158 FS Ave = 1.511
Standard Deviation = 0.178 Coefficient of Variation = 11.78 %

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.924	1200.000
2	125.836	1198.126
3	145.828	1197.588
4	165.812	1198.388
5	185.698	1200.522
6	205.397	1203.981
7	224.820	1208.749
8	243.881	1214.805
9	262.495	1222.121
10	280.578	1230.666
11	298.049	1240.401
12	314.830	1251.282
13	330.846	1263.260
14	346.026	1276.283
15	360.300	1290.291
16	373.607	1305.222
17	385.885	1321.009
18	397.081	1337.582
19	407.143	1354.867
20	416.027	1372.785
21	421.399	1385.728

Circle Center At X = 143.872 ; Y = 1496.563 ; and Radius = 298.981

Factor of Safety
*** 1.158 ***

Individual data on the 28 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	19.9	3077.7	0.0	0.0	0.	0.	461.7	0.0	0.0
2	20.0	7068.0	0.0	0.0	0.	0.	1060.2	0.0	0.0
3	14.2	4976.0	0.0	0.0	0.	0.	746.4	0.0	0.0
4	5.8	12806.5	0.0	0.0	0.	0.	1921.0	0.0	0.0
5	6.7	41796.0	0.0	0.0	0.	0.	6269.4	0.0	0.0
6	13.2	109290.9	0.0	0.0	0.	0.	16393.6	0.0	0.0
7	19.7	155195.6	0.0	0.0	0.	0.	23279.3	0.0	0.0
8	19.4	139843.7	0.0	0.0	0.	0.	20976.6	0.0	0.0
9	7.7	50725.5	0.0	0.0	0.	0.	7608.8	0.0	0.0
10	11.4	112236.5	0.0	0.0	0.	0.	16835.5	0.0	0.0
11	1.1	15270.8	0.0	0.0	0.	0.	2290.6	0.0	0.0
12	17.5	234735.7	0.0	0.0	0.	0.	35210.4	0.0	0.0
13	18.1	219615.6	0.0	0.0	0.	0.	32942.3	0.0	0.0
14	17.5	185838.8	0.0	0.0	0.	0.	27875.8	0.0	0.0
15	7.0	65772.4	0.0	0.0	0.	0.	9865.9	0.0	0.0
16	9.8	116074.1	0.0	0.0	0.	0.	17411.1	0.0	0.0
17	2.7	40699.0	0.0	0.0	0.	0.	6104.8	0.0	0.0
18	13.3	202000.1	0.0	0.0	0.	0.	30300.0	0.0	0.0
19	15.2	200941.7	0.0	0.0	0.	0.	30141.3	0.0	0.0
20	14.3	157133.6	0.0	0.0	0.	0.	23570.0	0.0	0.0
21	13.3	114703.8	0.0	0.0	0.	0.	17205.6	0.0	0.0
22	3.9	27156.5	0.0	0.0	0.	0.	4073.5	0.0	0.0
23	8.4	70771.5	0.0	0.0	0.	0.	10615.7	0.0	0.0
24	4.1	45974.9	0.0	0.0	0.	0.	6896.2	0.0	0.0
25	7.1	77165.6	0.0	0.0	0.	0.	11574.8	0.0	0.0
26	10.1	80142.8	0.0	0.0	0.	0.	12021.4	0.0	0.0
27	8.9	38645.5	0.0	0.0	0.	0.	5796.8	0.0	0.0
28	5.4	6817.7	0.0	0.0	0.	0.	1022.7	0.0	0.0

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.506	1200.000

2	133.427	1198.228
3	153.424	1197.877
4	173.395	1198.950
5	193.240	1201.440
6	212.857	1205.335
7	232.147	1210.616
8	251.013	1217.255
9	269.359	1225.220
10	287.092	1234.469
11	304.122	1244.955
12	320.363	1256.626
13	335.733	1269.423
14	350.155	1283.281
15	363.553	1298.129
16	375.862	1313.893
17	387.019	1330.492
18	396.967	1347.843
19	405.655	1365.857
20	413.041	1384.443
21	414.450	1388.887

Circle Center At X = 148.349 ; Y = 1478.858 ; and Radius = 281.027

Factor of Safety
*** 1.165 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.422	1200.000
2	121.232	1197.256
3	141.187	1195.903
4	161.187	1195.948
5	181.135	1197.390
6	200.933	1200.224
7	220.485	1204.434
8	239.694	1210.001
9	258.468	1216.896
10	276.714	1225.087
11	294.342	1234.534
12	311.268	1245.189
13	327.407	1257.001
14	342.681	1269.912
15	357.015	1283.859
16	370.340	1298.775
17	382.589	1314.584
18	393.704	1331.212
19	403.629	1348.575
20	412.316	1366.590
21	419.723	1385.168
22	420.092	1386.322

Circle Center At X = 150.559 ; Y = 1481.633 ; and Radius = 285.888

Factor of Safety
*** 1.184 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.638	1200.000
2	135.558	1198.211
3	155.552	1197.728
4	175.535	1198.555
5	195.421	1200.687
6	215.125	1204.115
7	234.563	1208.825
8	253.651	1214.796
9	272.307	1222.004
10	290.452	1230.416
11	308.007	1239.997
12	324.899	1250.706
13	341.053	1262.497

14	356.402	1275.320
15	370.878	1289.120
16	384.422	1303.836
17	396.973	1319.407
18	408.479	1335.766
19	418.890	1352.843
20	428.162	1370.564
21	432.615	1380.629

Circle Center At X = 152.923 ; Y = 1503.284 ; and Radius = 305.567

Factor of Safety

*** 1.185 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.401	1200.000
2	135.281	1197.811
3	155.268	1197.077
4	175.255	1197.803
5	195.135	1199.986
6	214.804	1203.613
7	234.155	1208.665
8	253.086	1215.115
9	271.497	1222.929
10	289.288	1232.065
11	306.365	1242.475
12	322.638	1254.103
13	338.019	1266.886
14	352.427	1280.758
15	365.784	1295.644
16	378.020	1311.464
17	389.069	1328.135
18	398.872	1345.567
19	407.378	1363.668
20	414.541	1382.342
21	416.268	1388.060

Circle Center At X = 155.316 ; Y = 1471.065 ; and Radius = 273.988

Factor of Safety

*** 1.186 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	107.345	1200.000
2	127.197	1197.572
3	147.168	1196.493
4	167.166	1196.768
5	187.100	1198.396
6	206.878	1201.368
7	226.409	1205.672
8	245.605	1211.288
9	264.376	1218.189
10	282.638	1226.345
11	300.306	1235.718
12	317.299	1246.265
13	333.539	1257.938
14	348.952	1270.682
15	363.468	1284.441
16	377.020	1299.150
17	389.545	1314.742
18	400.986	1331.146
19	411.292	1348.286
20	420.414	1366.085
21	427.636	1382.893

Circle Center At X = 153.109 ; Y = 1491.842 ; and Radius = 295.409

Factor of Safety

*** 1.188 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

No.	(ft)	(ft)
1	102.369	1200.000
2	122.259	1197.905
3	142.239	1197.005
4	162.237	1197.304
5	182.181	1198.801
6	201.999	1201.491
7	221.621	1205.364
8	240.975	1210.406
9	259.992	1216.598
10	278.604	1223.919
11	296.744	1232.342
12	314.346	1241.837
13	331.348	1252.370
14	347.687	1263.903
15	363.307	1276.395
16	378.149	1289.800
17	392.162	1304.070
18	405.294	1319.155
19	417.499	1334.999
20	428.732	1351.547
21	438.953	1368.737
22	442.720	1376.036

Circle Center At X = 147.315 ; Y = 1530.139 ; and Radius = 333.188

Factor of Safety

*** 1.195 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	109.004	1200.000
2	128.823	1197.314
3	148.782	1196.032
4	168.781	1196.161
5	188.722	1197.700
6	208.504	1200.642
7	228.030	1204.971
8	247.202	1210.667
9	265.924	1217.701
10	284.104	1226.037
11	301.651	1235.635
12	318.477	1246.446
13	334.499	1258.417
14	349.636	1271.488
15	363.814	1285.594
16	376.962	1300.665
17	389.015	1316.626
18	399.911	1333.396
19	409.598	1350.894
20	418.027	1369.031
21	423.954	1384.566

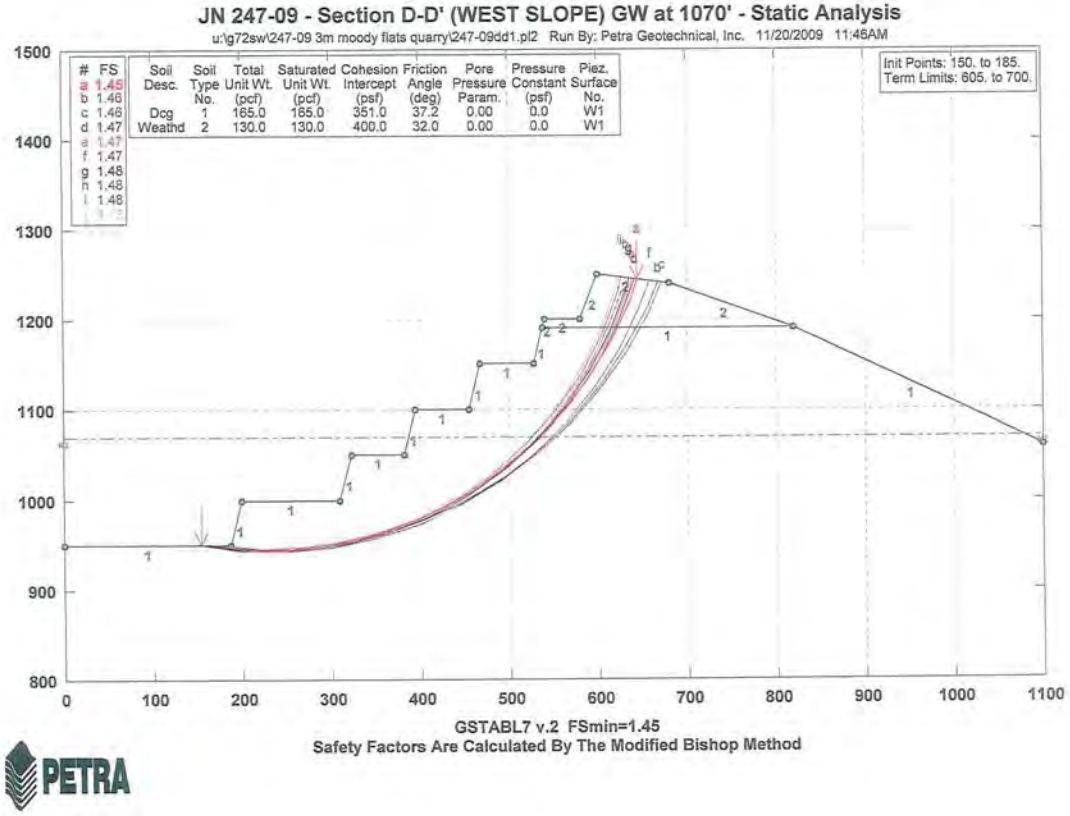
Circle Center At X = 156.954 ; Y = 1479.333 ; and Radius = 283.410

Factor of Safety

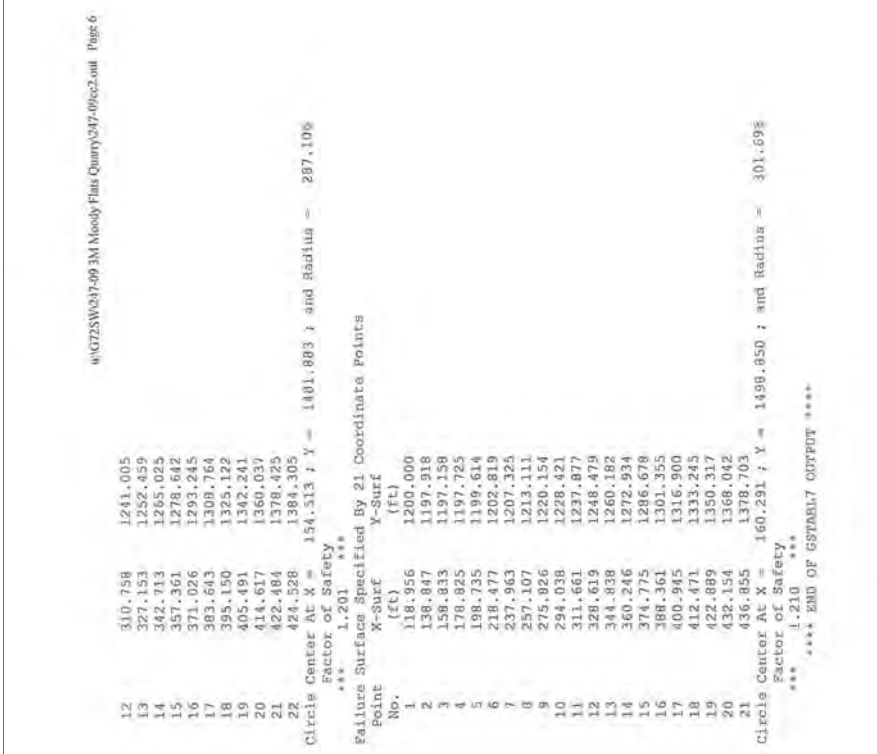
*** 1.198 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.000	1200.000
2	119.758	1196.896
3	139.683	1195.173
4	159.681	1194.840
5	179.652	1195.899
6	199.502	1198.344
7	219.134	1202.164
8	238.453	1207.339
9	257.365	1213.846
10	275.779	1221.652
11	293.605	1230.720



PETRA



u:\G72SW\247-09 3M Moody Flats Quarry\247-09cc2.out Page 6

```
    12      310.758     1241.005
    13      327.153     1252.459
    14      342.713     1265.025
    15      357.361     1278.642
    16      371.026     1293.245
    17      383.643     1308.764
    18      395.150     1325.122
    19      405.491     1342.241
    20      414.617     1360.037
    21      422.484     1378.425
    22      424.528     1384.305
 Circle Center At X =   154.513 ; Y =   1401.883 ; and Radius =   287.109
    Factor of Safety
       *** 1.201 ***
 Failure Surface Specified By 21 Coordinate Points
   Point       X-Surf      Y-Surf
    No.         (ft)        (ft)
     1        118.956    1200.000
     2        138.847    1197.918
     3        158.833    1197.158
     4        178.825    1197.725
     5        198.735    1199.614
     6        218.477    1202.819
     7        237.963    1207.325
     8        257.107    1213.111
     9        275.926    1220.154
    10        294.038    1228.421
    11        311.661    1237.877
    12        328.619    1248.479
    13        344.838    1260.182
    14        360.246    1272.934
    15        374.775    1286.678
    16        388.361    1301.355
    17        400.945    1316.900
    18        412.471    1333.245
    19        422.889    1350.317
    20        432.154    1368.042
    21        436.855    1378.703
 Circle Center At X =   160.291 ; Y =   1498.850 ; and Radius =   301.695
    Factor of Safety
       *** 1.210 ***
       **** END OF GSTABL7 OUTPUT ****
```

```
                              ***  GSTABL7  ***
                     ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
                 (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                        SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                11:46AM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd1.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd1.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd1.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section D-D' (WEST SLOPE)
                      GW at 1070' - Static Analysis
BOUNDARY COORDINATES
   16 Top   Boundaries
   17 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00      950.00      187.50      950.00         1
    2       187.50      950.00      200.00     1000.00         1
    3       200.00     1000.00      310.00     1000.00         1
    4       310.00     1000.00      322.50     1050.00         1
    5       322.50     1050.00      382.50     1050.00         1
    6       382.50     1050.00      395.00     1100.00         1
    7       395.00     1100.00      455.00     1100.00         1
    8       455.00     1100.00      467.50     1150.00         1
    9       467.50     1150.00      527.50     1150.00         1
   10       527.50     1150.00      537.50     1190.00         1
   11       537.50     1190.00      540.00     1200.00         2
   12       540.00     1200.00      580.00     1200.00         2
   13       580.00     1200.00      600.00     1250.00         2
   14       600.00     1250.00      680.00     1240.00         2
   15       680.00     1240.00      820.00     1190.00         2
   16       820.00     1190.00     1100.00     1060.00         1
   17       537.50     1190.00      820.00     1190.00         1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
   1   165.0    165.0     351.0     37.2    0.00      0.0       1
   2   130.0    130.0     400.0     32.0    0.00      0.0       1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1         0.00      1070.00
     2      1100.00      1070.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
  500 Trial Surfaces Have Been Generated.
    2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
 Along The Ground Surface Between  X = 150.00(ft)
```



```
                                and  X = 185.00(ft)
 Each Surface Terminates Between   X = 605.00(ft)
                                and  X = 700.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 50.00(ft) Line Segments Define Each Trial Failure Surface.
 Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =  500
      Number of Trial Surfaces With Valid FS =  500
      Statistical Data On All Valid FS Values:
         FS Max =  2.211   FS Min =  1.453   FS Ave =  1.738
         Standard Deviation =  0.167   Coefficient of Variation =  9.62 %
      Failure Surface Specified By 14 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1        153.655     950.000
          2        203.359     944.572
          3        253.359     944.784
          4        303.016     950.631
          5        351.697     962.039
          6        398.781     978.864
          7        443.668    1000.890
          8        485.786    1027.836
          9        524.597    1059.359
         10        559.606    1095.057
         11        590.367    1134.475
         12        616.488    1177.109
         13        637.635    1222.417
         14        645.002    1244.375
      Circle Center At X =  226.754 ; Y =  1385.235 ; and Radius =  441.331
           Factor of Safety
           ***  1.453  ***
           Individual data on the  28 slices
                                Water  Water   Tie     Tie     Earthquake
                                Force  Force   Force   Force     Force   Surcharge
Slice  Width   Weight    Top     Bot    Norm    Tan     Hor     Ver     Load
 No.    (ft)    (lbs)    (lbs)   (lbs)  (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1    33.8   10319.6  *******  *******   0.      0.      0.0     0.0     0.0
  2    12.5   60592.6  *******  97591.7   0.      0.      0.0     0.0     0.0
  3     3.4   30620.1  14673.0  26409.0   0.      0.      0.0     0.0     0.0
  4    50.0  456402.6  *******  *******   0.      0.      0.0     0.0     0.0
  5    49.7  428455.8  *******  *******   0.      0.      0.0     0.0     0.0
  6     7.0   55950.6  30507.5  53066.8   0.      0.      0.0     0.0     0.0
  7    12.5  146989.9  *******  93146.0   0.      0.      0.0     0.0     0.0
  8    29.2  440229.2  36437.5  *******   0.      0.      0.0     0.0     0.0
  9    30.8  419092.4  38442.5  *******   0.      0.      0.0     0.0     0.0
 10    12.5  205673.8      0.0  78457.1   0.      0.      0.0     0.0     0.0
 11     3.8   75996.1      0.0  23003.5   0.      0.      0.0     0.0     0.0
 12    44.9  815616.4      0.0  *******   0.      0.      0.0     0.0     0.0
 13    11.3  178532.0      0.0  54970.6   0.      0.      0.0     0.0     0.0
 14    12.5  232777.6      0.0  53578.8   0.      0.      0.0     0.0     0.0
 15    18.3  386239.7      0.0  65038.7   0.      0.      0.0     0.0     0.0
 16    38.8  681380.7      0.0  82375.7   0.      0.      0.0     0.0     0.0
 17     2.9   42709.6      0.0   2370.1   0.      0.      0.0     0.0     0.0
 18     7.5  122924.2      0.0   2577.9   0.      0.      0.0     0.0     0.0
 19     2.5   46336.7      0.0      0.0   0.      0.      0.0     0.0     0.0
 20     2.5   49561.4      0.0      0.0   0.      0.      0.0     0.0     0.0
 21    19.6  364966.1      0.0      0.0   0.      0.      0.0     0.0     0.0
 22    20.4  302025.2      0.0      0.0   0.      0.      0.0     0.0     0.0
 23    10.4  137287.4      0.0      0.0   0.      0.      0.0     0.0     0.0
 24     9.6  135813.6      0.0      0.0   0.      0.      0.0     0.0     0.0
 25    16.5  198075.7      0.0      0.0   0.      0.      0.0     0.0     0.0
 26     6.0   51423.0      0.0      0.0   0.      0.      0.0     0.0     0.0
 27    15.1   78743.5      0.0      0.0   0.      0.      0.0     0.0     0.0
```

28 7.4 10955.5 0.0 0.0 0. 0. 0.0 0.0 0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	159.980	950.000
2	209.736	945.065
3	259.734	945.438
4	309.411	951.116
5	358.204	962.034
6	405.564	978.060
7	450.953	999.039
8	493.861	1024.709
9	533.802	1054.787
10	570.325	1088.935
11	603.017	1126.766
12	631.510	1167.854
13	655.481	1211.733
14	667.852	1241.518

Circle Center At X = 231.462 ; Y = 1413.624 ; and Radius = 469.102

Factor of Safety

*** 1.461 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	157.169	950.000
2	206.919	945.013
3	256.919	945.227
4	306.625	950.640
5	355.499	961.193
6	403.010	976.772
7	448.643	997.207
8	491.904	1022.277
9	532.323	1051.711
10	569.461	1085.188
11	602.916	1122.346
12	632.326	1162.783
13	657.370	1206.058
14	672.941	1240.882

Circle Center At X = 230.043 ; Y = 1423.491 ; and Radius = 479.066

Factor of Safety

*** 1.463 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	171.928	950.000
2	221.714	945.374
3	271.698	946.629
4	321.188	953.748
5	369.500	966.633
6	415.963	985.104
7	459.934	1008.907
8	500.803	1037.711
9	538.006	1071.117
10	571.026	1108.663
11	599.406	1149.828
12	622.753	1194.042
13	640.743	1240.694
14	641.787	1244.777

Circle Center At X = 236.158 ; Y = 1369.474 ; and Radius = 424.363

Factor of Safety

*** 1.466 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	166.868	950.000
2	216.601	944.845
3	266.596	945.602

4	316.150	952.259
5	364.572	964.724
6	411.182	982.821
7	455.327	1006.299
8	496.390	1034.827
9	533.795	1068.006
10	567.019	1105.371
11	595.595	1146.400
12	619.125	1190.518
13	637.279	1237.106
14	639.342	1245.082

Circle Center At X = 235.382 ; Y = 1366.092 ; and Radius = 421.695

Factor of Safety

*** 1.468 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.201	950.000
2	204.800	943.684
3	254.795	942.935
4	304.561	947.762
5	353.480	958.105
6	400.941	973.835
7	446.353	994.757
8	489.151	1020.610
9	528.801	1051.071
10	564.809	1085.761
11	596.727	1124.248
12	624.157	1166.052
13	646.757	1210.653
14	658.708	1242.661

Circle Center At X = 236.693 ; Y = 1389.256 ; and Radius = 446.751

Factor of Safety

*** 1.472 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	162.089	950.000
2	211.743	944.133
3	261.743	944.276
4	311.363	950.427
5	359.884	962.498
6	406.603	980.313
7	450.842	1003.613
8	491.960	1032.062
9	529.360	1065.246
10	562.502	1102.685
11	590.903	1143.835
12	614.153	1188.101
13	631.914	1234.840
14	634.596	1245.675

Circle Center At X = 235.750 ; Y = 1357.672 ; and Radius = 414.273

Factor of Safety

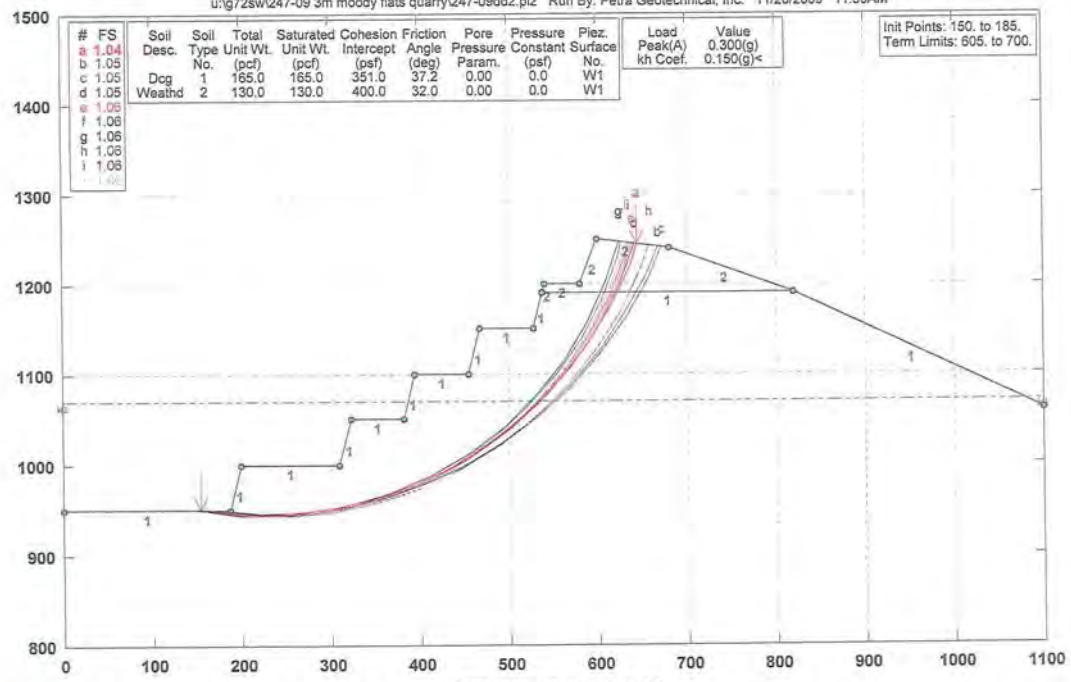
*** 1.476 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	164.900	950.000
2	214.590	944.440
3	264.587	944.936
4	314.157	951.482
5	362.570	963.980
6	409.113	982.247
7	453.103	1006.015
8	493.892	1034.933
9	530.881	1068.576
10	563.524	1106.450

JN 247-09 - Section D-D' (WEST SLOPE) GW at 1070' - Seismic Analysis

u:\g72sw\247-09 3m moody flats quarry\247-09dd2.pl2 Run By: Petra Geotechnical, Inc. 11/20/2009 11:50AM



GSTABL7 v.2 FSmin=1.04

Safety Factors Are Calculated By The Modified Bishop Method

PETRA


```
  11       591.342    1147.996
  12       613.926    1192.605
  13       630.944    1239.620
  14       632.399    1245.950
Circle Center At X =   235.637 ; Y =  1355.478 ; and Radius =   411.602
     Factor of Safety
        ***   1.477   ***
Failure Surface Specified By 14 Coordinate Points
   Point      X-Surf       Y-Surf
    No.         (ft)         (ft)
     1        150.562      950.000
     2        200.125      943.402
     3        250.122      942.844
     4        299.819      948.336
     5        348.488      959.797
     6        395.414      977.057
     7        439.909      999.865
     8        481.320     1027.885
     9        519.040     1060.707
    10        552.514     1097.848
    11        581.252     1138.764
    12        604.832     1182.855
    13        622.908     1229.473
    14        627.256     1246.593
Circle Center At X =   229.945 ; Y =  1353.788 ; and Radius =   411.510
     Factor of Safety
        ***   1.478   ***
Failure Surface Specified By 13 Coordinate Points
   Point      X-Surf       Y-Surf
    No.         (ft)         (ft)
     1        167.570      950.000
     2        217.330      945.097
     3        267.314      946.353
     4        316.764      953.749
     5        364.928      967.173
     6        411.075      986.420
     7        454.503     1011.199
     8        494.553     1041.132
     9        530.616     1075.766
    10        562.144     1114.573
    11        588.658     1156.964
    12        609.756     1202.295
    13        624.180     1246.978
Circle Center At X =   232.151 ; Y =  1350.460 ; and Radius =   405.634
     Factor of Safety
        ***   1.478   ***
        **** END OF GSTABL7 OUTPUT ****
```

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                11:50AM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd2.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd2.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd2.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section D-D' (WEST SLOPE)
                      GW at 1070' - Seismic Analysis
BOUNDARY COORDINATES
   16 Top   Boundaries
   17 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00      950.00      187.50      950.00          1
    2       187.50      950.00      200.00     1000.00          1
    3       200.00     1000.00      310.00     1000.00          1
    4       310.00     1000.00      322.50     1050.00          1
    5       322.50     1050.00      382.50     1050.00          1
    6       382.50     1050.00      395.00     1100.00          1
    7       395.00     1100.00      455.00     1100.00          1
    8       455.00     1100.00      467.50     1150.00          1
    9       467.50     1150.00      527.50     1150.00          1
   10       527.50     1150.00      537.50     1190.00          1
   11       537.50     1190.00      540.00     1200.00          2
   12       540.00     1200.00      580.00     1200.00          2
   13       580.00     1200.00      600.00     1250.00          2
   14       600.00     1250.00      680.00     1240.00          2
   15       680.00     1240.00      820.00     1190.00          2
   16       820.00     1190.00     1100.00     1060.00          1
   17       537.50     1190.00      820.00     1190.00          1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.
  1   165.0    165.0     351.0      37.2    0.00       0.0      1
  2   130.0    130.0     400.0      32.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00     1070.00
    2       1100.00     1070.00
Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
A Critical Failure Surface Searching Method, Using A Random
```



```
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X =  150.00(ft)
                             and  X =  185.00(ft)
Each Surface Terminates Between  X =  605.00(ft)
                             and  X =  700.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
     Failure Surfaces Evaluated. They Are
     Ordered - Most Critical First.
     * * Safety Factors Are Calculated By The Modified Bishop Method * *
     Total Number of Trial Surfaces Attempted =   500
     Number of Trial Surfaces With Valid FS =   500
     Statistical Data On All Valid FS Values:
       FS Max =   1.643   FS Min =   1.043   FS Ave =   1.270
       Standard Deviation =   0.133   Coefficient of Variation =   10.46 %
     Failure Surface Specified By 14 Coordinate Points
       Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
         1        153.655     950.000
         2        203.359     944.572
         3        253.359     944.784
         4        303.016     950.631
         5        351.697     962.039
         6        398.781     978.864
         7        443.668    1000.890
         8        485.786    1027.836
         9        524.597    1059.359
        10        559.606    1095.057
        11        590.367    1134.475
        12        616.488    1177.109
        13        637.635    1222.417
        14        645.002    1244.375
     Circle Center At X =   226.754 ; Y =  1385.235 ; and Radius =   441.331
          Factor of Safety
            ***   1.043   ***
          Individual data on the   28  slices
                          Water     Water     Tie       Tie       Earthquake          Surcharge
                          Force     Force     Force     Force       Force             Load
Slice  Width   Weight      Top       Bot      Norm      Tan       Hor      Ver       (lbs)
 No.    (ft)    (lbs)     (lbs)     (lbs)     (lbs)     (lbs)     (lbs)    (lbs)
  1    33.8   10319.6  ******* *******      0.        0.      1547.9     0.0        0.0
  2    12.5   60592.6  ******* 97591.7      0.        0.      9088.9     0.0        0.0
  3     3.4   30620.1 14673.0 26409.0      0.        0.      4593.0     0.0        0.0
  4    50.0  456402.6  ******* *******      0.        0.     68460.4     0.0        0.0
  5    49.7  428455.8  ******* *******      0.        0.     64268.4     0.0        0.0
  6     7.0   55950.6 30507.5 53066.8      0.        0.      8392.6     0.0        0.0
  7    12.5  146989.9  ******* 93146.0      0.        0.     22048.5     0.0        0.0
  8    29.2  440229.2 36437.5  *******      0.        0.     66034.4     0.0        0.0
  9    30.8  419092.4 38442.5  *******      0.        0.     62863.9     0.0        0.0
 10    12.5  205673.8     0.0 78457.1      0.        0.     30851.1     0.0        0.0
 11     3.8   75996.1     0.0 23003.5      0.        0.     11399.4     0.0        0.0
 12    44.9  815616.4     0.0  *******     0.        0.    *******      0.0        0.0
 13    11.3  178532.0     0.0 54970.6      0.        0.     26779.8     0.0        0.0
 14    12.5  232777.6     0.0 53578.8      0.        0.     34916.6     0.0        0.0
 15    18.3  386239.7     0.0 65038.7      0.        0.     57936.0     0.0        0.0
 16    38.8  681380.7     0.0 82375.7      0.        0.    *******      0.0        0.0
 17     2.9   42709.6     0.0  2370.1      0.        0.      6406.4     0.0        0.0
 18     7.5  122924.2     0.0  2577.9      0.        0.     18438.6     0.0        0.0
 19     2.5   46336.7     0.0     0.0      0.        0.      6950.5     0.0        0.0
 20     2.5   49561.4     0.0     0.0      0.        0.      7434.2     0.0        0.0
 21    19.6  364966.1     0.0     0.0      0.        0.     54744.9     0.0        0.0
 22    20.4  302025.2     0.0     0.0      0.        0.     45303.8     0.0        0.0
 23    10.4  137287.4     0.0     0.0      0.        0.     20593.1     0.0        0.0
```

24	9.6	135813.6	0.0	0.0	0.	0.	20372.0	0.0	0.0
25	16.5	198075.7	0.0	0.0	0.	0.	29711.4	0.0	0.0
26	6.0	51423.0	0.0	0.0	0.	0.	7713.5	0.0	0.0
27	15.1	78743.5	0.0	0.0	0.	0.	11811.5	0.0	0.0
28	7.4	10955.5	0.0	0.0	0.	0.	1643.3	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	159.980	950.000
2	209.736	945.065
3	259.734	945.438
4	309.411	951.116
5	358.204	962.034
6	405.564	978.068
7	450.953	999.039
8	493.861	1024.709
9	533.802	1054.787
10	570.325	1088.935
11	603.017	1126.766
12	631.510	1167.854
13	655.481	1211.733
14	667.852	1241.518

Circle Center At X = 231.462 ; Y = 1413.624 ; and Radius = 469.102

Factor of Safety
*** 1.050 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	157.169	950.000
2	206.919	945.013
3	256.919	945.227
4	306.625	950.640
5	355.499	961.193
6	403.010	976.772
7	448.643	997.207
8	491.904	1022.277
9	532.323	1051.711
10	569.461	1085.188
11	602.916	1122.346
12	632.326	1162.783
13	657.370	1206.058
14	672.941	1240.882

Circle Center At X = 230.043 ; Y = 1423.491 ; and Radius = 479.066

Factor of Safety
*** 1.051 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	171.928	950.000
2	221.714	945.374
3	271.698	946.629
4	321.188	953.748
5	369.500	966.633
6	415.963	985.104
7	459.934	1008.907
8	500.803	1037.711
9	538.006	1071.117
10	571.026	1108.663
11	599.406	1149.828
12	622.753	1194.042
13	640.743	1240.694
14	641.787	1244.777

Circle Center At X = 236.158 ; Y = 1369.474 ; and Radius = 424.363

Factor of Safety
*** 1.054 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf	Y-Surf

No.	(ft)	(ft)
1	166.868	950.000
2	216.601	944.845
3	266.596	945.602
4	316.150	952.259
5	364.572	964.724
6	411.182	982.821
7	455.327	1006.299
8	496.390	1034.827
9	533.795	1068.006
10	567.019	1105.371
11	595.595	1146.400
12	619.125	1190.518
13	637.279	1237.106
14	639.342	1245.082

Circle Center At X = 235.382 ; Y = 1366.092 ; and Radius = 421.693

Factor of Safety
*** 1.055 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.562	950.000
2	200.125	943.402
3	250.122	942.844
4	299.819	948.336
5	348.488	959.797
6	395.414	977.057
7	439.909	999.865
8	481.320	1027.885
9	519.040	1060.707
10	552.514	1097.848
11	581.252	1138.764
12	604.832	1182.855
13	622.908	1229.473
14	627.256	1246.593

Circle Center At X = 229.945 ; Y = 1353.788 ; and Radius = 411.518

Factor of Safety
*** 1.058 ***

Failure Surface Specified By 13 Coordinate Points

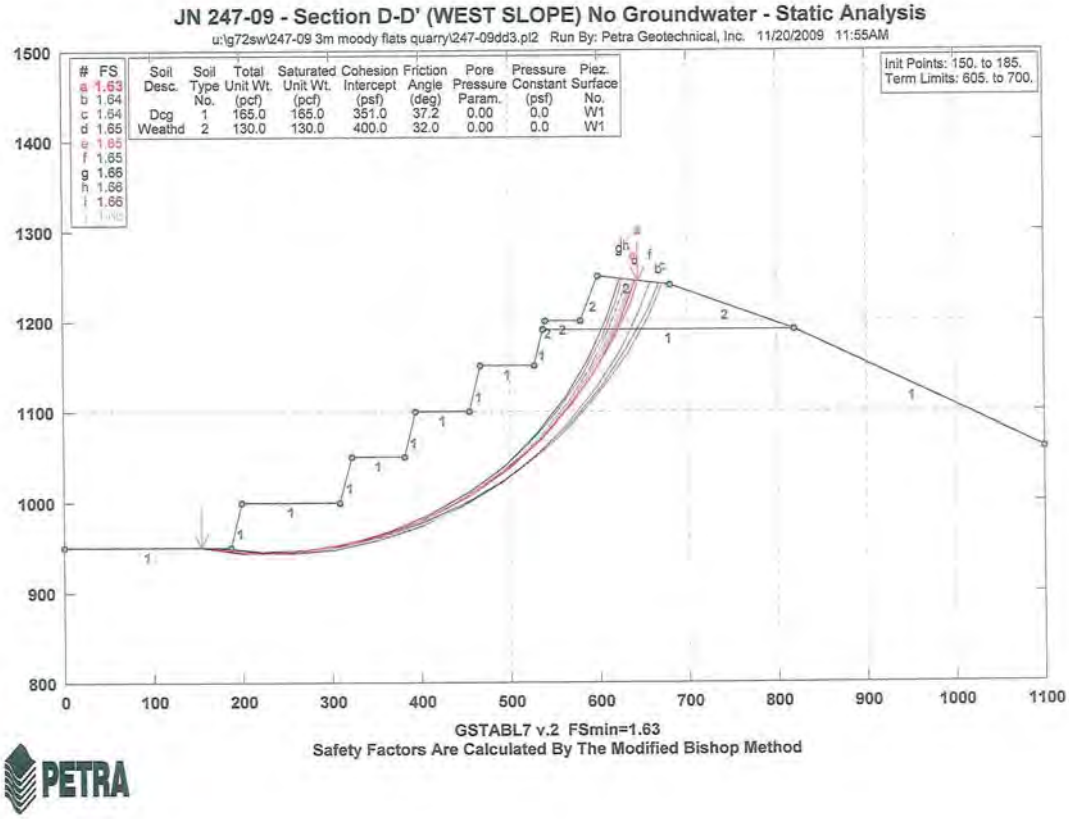
Point No.	X-Surf (ft)	Y-Surf (ft)
1	167.570	950.000
2	217.330	945.097
3	267.314	946.353
4	316.764	953.749
5	364.928	967.173
6	411.075	986.420
7	454.503	1011.199
8	494.553	1041.132
9	530.616	1075.766
10	562.144	1114.573
11	588.658	1156.964
12	609.756	1202.295
13	624.180	1246.978

Circle Center At X = 232.151 ; Y = 1350.460 ; and Radius = 405.634

Factor of Safety
*** 1.058 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.201	950.000
2	204.800	943.684
3	254.795	942.935
4	304.561	947.762
5	353.480	958.105
6	400.941	973.835
7	446.353	994.757



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     8      489.151     1020.610
     9      528.801     1051.071
    10      564.809     1085.761
    11      596.727     1124.248
    12      624.157     1166.052
    13      646.757     1210.653
    14      658.708     1242.661
Circle Center At X =   236.693 ; Y =   1389.256 ; and Radius =   446.751
   Factor of Safety
      *** 1.059 ***
Failure Surface Specified By 14 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1        162.089      950.000
    2        211.743      944.133
    3        261.743      944.276
    4        311.363      950.427
    5        359.884      962.498
    6        406.603      980.313
    7        450.842     1003.613
    8        491.960     1032.062
    9        529.360     1065.246
   10        562.502     1102.685
   11        590.903     1143.835
   12        614.153     1188.101
   13        631.914     1234.840
   14        634.596     1245.675
Circle Center At X =   235.750 ; Y =   1357.672 ; and Radius =   414.271
   Factor of Safety
      *** 1.060 ***
Failure Surface Specified By 14 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1        164.900      950.000
    2        214.590      944.440
    3        264.587      944.936
    4        314.157      951.482
    5        362.570      963.980
    6        409.113      982.247
    7        453.103     1006.015
    8        493.892     1034.933
    9        530.881     1068.576
   10        563.524     1106.450
   11        591.342     1147.996
   12        613.926     1192.605
   13        630.944     1239.620
   14        632.399     1245.950
Circle Center At X =   235.637 ; Y =   1355.478 ; and Radius =   411.602
   Factor of Safety
      *** 1.060 ***
          **** END OF GSTABL7 OUTPUT ****
```

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                        *** GSTABL7 ***
                  ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                11:55AM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd3.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd3.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd3.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section D-D' (WEST SLOPE)
                      No Groundwater - Static Analysis

BOUNDARY COORDINATES
   16 Top   Boundaries
   17 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
  No.          (ft)        (ft)        (ft)        (ft)     Below Bnd
   1           0.00      950.00      187.50      950.00         1
   2         187.50      950.00      200.00     1000.00         1
   3         200.00     1000.00      310.00     1000.00         1
   4         310.00     1000.00      322.50     1050.00         1
   5         322.50     1050.00      382.50     1050.00         1
   6         382.50     1050.00      395.00     1100.00         1
   7         395.00     1100.00      455.00     1100.00         1
   8         455.00     1100.00      467.50     1150.00         1
   9         467.50     1150.00      527.50     1150.00         1
  10         527.50     1150.00      537.50     1190.00         1
  11         537.50     1190.00      540.00     1200.00         2
  12         540.00     1200.00      580.00     1200.00         2
  13         580.00     1200.00      600.00     1250.00         2
  14         600.00     1250.00      680.00     1240.00         2
  15         680.00     1240.00      820.00     1190.00         2
  16         820.00     1190.00     1100.00     1060.00         1
  17         537.50     1190.00      820.00     1190.00         1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
   1   165.0    165.0     351.0     37.2    0.00      0.0       1
   2   130.0    130.0     400.0     32.0    0.00      0.0       1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00     1070.00
     2       1100.00     1070.00
 WATER SURFACE DATA HAS BEEN SUPPRESSED
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
  500 Trial Surfaces Have Been Generated.
    2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
```



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 Along The Ground Surface Between  X =  150.00(ft)
                              and  X =  185.00(ft)
 Each Surface Terminates Between   X =  605.00(ft)
                              and  X =  700.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 50.00(ft) Line Segments Define Each Trial Failure Surface.
 Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =  500
      Number of Trial Surfaces With Valid FS =  500
      Statistical Data On All Valid FS Values:
        FS Max =  2.611   FS Min =  1.627   FS Ave =  2.001
        Standard Deviation =  0.218   Coefficient of Variation =  10.90 %
      Failure Surface Specified By 14 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1        153.655     950.000
          2        203.359     944.572
          3        253.359     944.784
          4        303.016     950.631
          5        351.697     962.039
          6        398.781     978.864
          7        443.668    1000.890
          8        485.786    1027.836
          9        524.597    1059.359
         10        559.606    1095.057
         11        590.367    1134.475
         12        616.488    1177.109
         13        637.635    1222.417
         14        645.002    1244.375
      Circle Center At X =   226.754 ; Y =  1385.235 ; and Radius =   441.331
           Factor of Safety
          ***   1.627   ***
        Individual data on the   27  slices
                          Water  Water   Tie     Tie     Earthquake
                          Force  Force   Force   Force     Force    Surcharge
Slice  Width   Weight     Top    Bot     Norm    Tan       Hor      Ver     Load
 No.    (ft)    (lbs)    (lbs)  (lbs)   (lbs)   (lbs)     (lbs)    (lbs)   (lbs)
  1    33.8   10319.6     0.0    0.0      0.      0.        0.0      0.0     0.0
  2    12.5   60592.6     0.0    0.0      0.      0.        0.0      0.0     0.0
  3     3.4   30620.1     0.0    0.0      0.      0.        0.0      0.0     0.0
  4    50.0  456402.6     0.0    0.0      0.      0.        0.0      0.0     0.0
  5    49.7  428455.8     0.0    0.0      0.      0.        0.0      0.0     0.0
  6     7.0   55950.6     0.0    0.0      0.      0.        0.0      0.0     0.0
  7    12.5  146989.9     0.0    0.0      0.      0.        0.0      0.0     0.0
  8    29.2  440229.2     0.0    0.0      0.      0.        0.0      0.0     0.0
  9    30.8  419092.4     0.0    0.0      0.      0.        0.0      0.0     0.0
 10    12.5  205673.8     0.0    0.0      0.      0.        0.0      0.0     0.0
 11     3.8   75996.1     0.0    0.0      0.      0.        0.0      0.0     0.0
 12    44.9  815616.4     0.0    0.0      0.      0.        0.0      0.0     0.0
 13    11.3  178532.0     0.0    0.0      0.      0.        0.0      0.0     0.0
 14    12.5  232777.6     0.0    0.0      0.      0.        0.0      0.0     0.0
 15    18.3  386239.7     0.0    0.0      0.      0.        0.0      0.0     0.0
 16    38.8  681380.7     0.0    0.0      0.      0.        0.0      0.0     0.0
 17     2.9   42709.6     0.0    0.0      0.      0.        0.0      0.0     0.0
 18    10.0  169260.8     0.0    0.0      0.      0.        0.0      0.0     0.0
 19     2.5   49561.4     0.0    0.0      0.      0.        0.0      0.0     0.0
 20    19.6  364966.1     0.0    0.0      0.      0.        0.0      0.0     0.0
 21    20.4  302025.2     0.0    0.0      0.      0.        0.0      0.0     0.0
 22    10.4  137287.4     0.0    0.0      0.      0.        0.0      0.0     0.0
 23     9.6  135813.6     0.0    0.0      0.      0.        0.0      0.0     0.0
 24    16.5  198075.7     0.0    0.0      0.      0.        0.0      0.0     0.0
 25     6.0   51423.0     0.0    0.0      0.      0.        0.0      0.0     0.0
 26    15.1   78743.5     0.0    0.0      0.      0.        0.0      0.0     0.0
```

27 7.4 10955.5 0.0 0.0 0. 0. 0.0 0.0 0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	159.980	950.000
2	209.736	945.065
3	259.734	945.438
4	309.411	951.116
5	358.204	962.034
6	405.564	978.068
7	450.953	999.039
8	493.861	1024.709
9	533.802	1054.787
10	570.325	1088.935
11	603.017	1126.766
12	631.510	1167.854
13	655.481	1211.733
14	667.852	1241.518

Circle Center At X = 231.462 ; Y = 1413.624 ; and Radius = 469.102

Factor of Safety

*** 1.635 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	157.169	950.000
2	206.919	945.013
3	256.919	945.227
4	306.625	950.640
5	355.499	961.193
6	403.010	976.772
7	448.643	997.207
8	491.904	1022.277
9	532.323	1051.711
10	569.461	1085.188
11	602.916	1122.346
12	632.326	1162.783
13	657.370	1206.058
14	672.941	1240.882

Circle Center At X = 230.043 ; Y = 1423.491 ; and Radius = 479.068

Factor of Safety

*** 1.636 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	171.928	950.000
2	221.714	945.374
3	271.698	946.629
4	321.188	953.748
5	369.500	966.633
6	415.963	985.104
7	459.934	1008.907
8	500.803	1037.711
9	538.006	1071.117
10	571.026	1108.663
11	599.406	1149.820
12	622.753	1194.042
13	640.743	1240.694
14	641.787	1244.777

Circle Center At X = 236.158 ; Y = 1369.474 ; and Radius = 424.363

Factor of Safety

*** 1.645 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	166.868	950.000
2	216.601	944.845
3	266.596	945.602

4	316.150	952.259
5	364.572	964.724
6	411.182	982.821
7	455.327	1006.299
8	496.390	1034.827
9	533.795	1068.006
10	567.019	1105.371
11	595.595	1146.400
12	619.125	1190.518
13	637.279	1237.106
14	639.342	1245.082

Circle Center At X = 235.382 ; Y = 1366.092 ; and Radius = 421.693

Factor of Safety

*** 1.647 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.201	950.000
2	204.800	943.684
3	254.795	942.935
4	304.561	947.762
5	353.480	958.109
6	400.941	973.835
7	446.353	994.757
8	489.151	1020.610
9	528.801	1051.071
10	564.809	1085.761
11	596.727	1124.248
12	624.157	1166.052
13	646.757	1210.653
14	658.708	1242.661

Circle Center At X = 236.693 ; Y = 1389.256 ; and Radius = 446.751

Factor of Safety

*** 1.654 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	167.570	950.000
2	217.330	945.097
3	267.314	946.353
4	316.764	953.749
5	364.928	967.173
6	411.075	986.420
7	454.503	1011.199
8	494.553	1041.132
9	530.616	1075.766
10	562.144	1114.573
11	588.658	1156.964
12	609.756	1202.295
13	624.180	1246.978

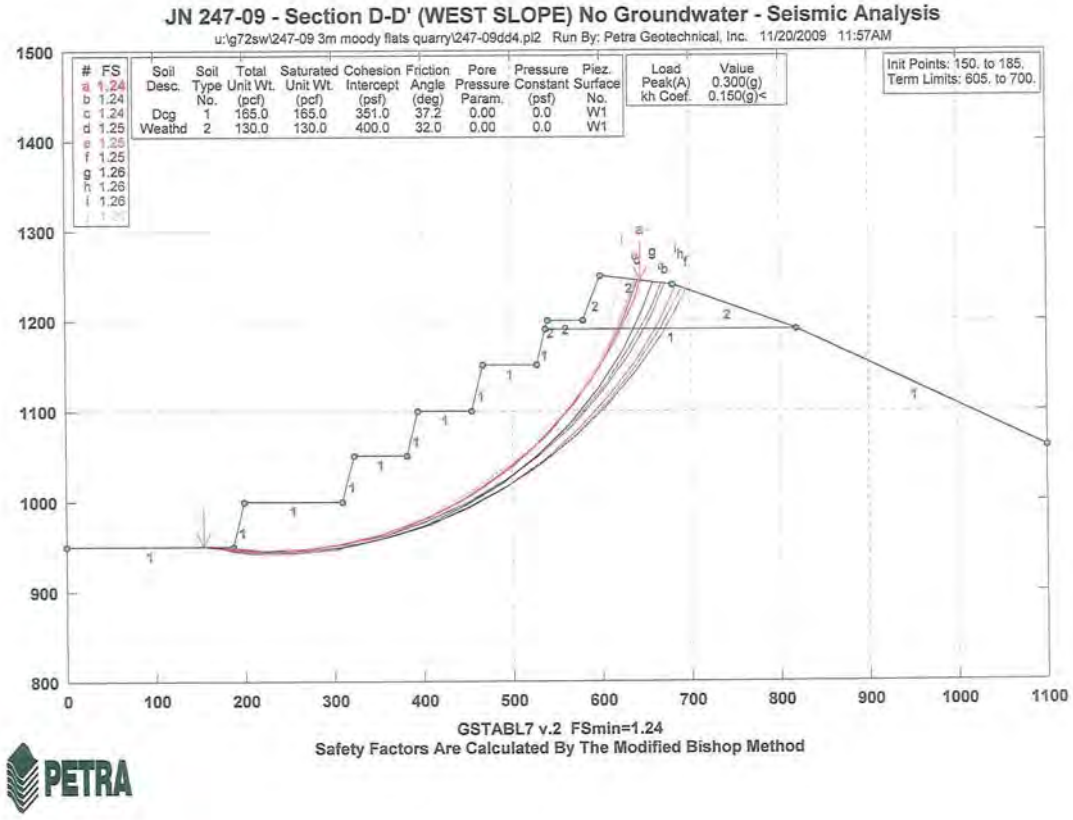
Circle Center At X = 232.151 ; Y = 1350.460 ; and Radius = 405.634

Factor of Safety

*** 1.655 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	164.900	950.000
2	214.590	944.440
3	264.587	944.936
4	314.157	951.482
5	362.570	963.980
6	409.113	982.247
7	453.103	1006.015
8	493.892	1034.933
9	530.881	1068.576
10	563.524	1106.450
11	591.342	1147.996




```
    12        613.926     1192.605
    13        630.944     1239.620
    14        632.399     1245.950
 Circle Center At X =   235.637 ; Y =   1355.478 ; and Radius =   411.602
      Factor of Safety
         ***     1.657     ***
 Failure Surface Specified By 14 Coordinate Points
   Point       X-Surf      Y-Surf
    No.         (ft)        (ft)
     1        150.562     950.000
     2        200.125     943.402
     3        250.122     942.844
     4        299.819     948.336
     5        348.488     959.797
     6        395.414     977.057
     7        439.909     999.865
     8        481.320     1027.885
     9        519.040     1060.707
    10        552.514     1097.848
    11        581.252     1138.764
    12        604.832     1182.855
    13        622.908     1229.473
    14        627.256     1246.593
 Circle Center At X =   229.945 ; Y =   1353.788 ; and Radius =   411.518
      Factor of Safety
         ***     1.657     ***
 Failure Surface Specified By 14 Coordinate Points
   Point       X-Surf      Y-Surf
    No.         (ft)        (ft)
     1        162.089     950.000
     2        211.743     944.133
     3        261.743     944.276
     4        311.363     950.427
     5        359.884     962.498
     6        406.603     980.313
     7        450.842     1003.613
     8        491.960     1032.062
     9        529.360     1065.246
    10        562.502     1102.685
    11        590.903     1143.835
    12        614.153     1188.101
    13        631.914     1234.840
    14        634.596     1245.675
 Circle Center At X =   235.750 ; Y =   1357.672 ; and Radius =   414.271
      Factor of Safety
         ***     1.657     ***
          **** END OF GSTABL7 OUTPUT ****
```

```
                              ***  GSTABL7  ***
                     ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
                 (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                        SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                11:57AM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd4.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd4.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09dd4.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section D-D' (WEST SLOPE)
                      No Groundwater - Seismic Analysis
BOUNDARY COORDINATES
   16 Top   Boundaries
   17 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1          0.00      950.00      187.50      950.00         1
    2        187.50      950.00      200.00     1000.00         1
    3        200.00     1000.00      310.00     1000.00         1
    4        310.00     1000.00      322.50     1050.00         1
    5        322.50     1050.00      382.50     1050.00         1
    6        382.50     1050.00      395.00     1100.00         1
    7        395.00     1100.00      455.00     1100.00         1
    8        455.00     1100.00      467.50     1150.00         1
    9        467.50     1150.00      527.50     1150.00         1
   10        527.50     1150.00      537.50     1190.00         1
   11        537.50     1190.00      540.00     1200.00         2
   12        540.00     1200.00      580.00     1200.00         2
   13        580.00     1200.00      600.00     1250.00         2
   14        600.00     1250.00      680.00     1240.00         2
   15        680.00     1240.00      820.00     1190.00         2
   16        820.00     1190.00     1100.00     1060.00         1
   17        537.50     1190.00      820.00     1190.00         1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.   (pcf)    (pcf)     (psf)     (deg)   Param.   (psf)     No.
  1   165.0    165.0     351.0      37.2    0.00      0.0      1
  2   130.0    130.0     400.0      32.0    0.00      0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00     1070.00
    2       1100.00     1070.00
WATER SURFACE DATA HAS BEEN SUPPRESSED
Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
```



```
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X =  150.00(ft)
                             and  X =  185.00(ft)
Each Surface Terminates Between  X =  605.00(ft)
                             and  X =  700.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =    0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
     Failure Surfaces Evaluated. They Are
     Ordered - Most Critical First.
     * * Safety Factors Are Calculated By The Modified Bishop Method * *
     Total Number of Trial Surfaces Attempted =  500
     Number of Trial Surfaces With Valid FS =  500
     Statistical Data On All Valid FS Values:
       FS Max =  2.025   FS Min =  1.237   FS Ave =  1.534
       Standard Deviation =  0.176   Coefficient of Variation =  11.46 %
     Failure Surface Specified By 14 Coordinate Points
       Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
         1        153.655     950.000
         2        203.359     944.572
         3        253.359     944.784
         4        303.016     950.631
         5        351.697     962.039
         6        398.781     978.864
         7        443.668    1000.890
         8        485.786    1027.836
         9        524.597    1059.359
        10        559.606    1095.057
        11        590.367    1134.475
        12        616.488    1177.109
        13        637.635    1222.417
        14        645.002    1244.375
     Circle Center At X =  226.754 ; Y =  1385.235 ; and Radius =  441.331
       Factor of Safety
          ***  1.237  ***
     Individual data on the  27  slices
                          Water  Water   Tie    Tie     Earthquake
                          Force  Force   Force  Force       Force    Surcharge
Slice  Width   Weight     Top    Bot     Norm   Tan     Hor     Ver     Load
 No.    (ft)    (lbs)     (lbs)  (lbs)   (lbs)  (lbs)   (lbs)   (lbs)   (lbs)
  1    33.8   10319.6     0.0    0.0      0.     0.    1547.9    0.0     0.0
  2    12.5   60592.6     0.0    0.0      0.     0.    9088.9    0.0     0.0
  3     3.4   30620.1     0.0    0.0      0.     0.    4593.0    0.0     0.0
  4    50.0  456402.6     0.0    0.0      0.     0.   68460.4    0.0     0.0
  5    49.7  428455.8     0.0    0.0      0.     0.   64268.4    0.0     0.0
  6     7.0   55950.6     0.0    0.0      0.     0.    8392.6    0.0     0.0
  7    12.5  146989.9     0.0    0.0      0.     0.   22048.5    0.0     0.0
  8    29.2  440229.2     0.0    0.0      0.     0.   66034.4    0.0     0.0
  9    30.8  419092.4     0.0    0.0      0.     0.   62863.9    0.0     0.0
 10    12.5  205673.8     0.0    0.0      0.     0.   30851.1    0.0     0.0
 11     3.8   75996.1     0.0    0.0      0.     0.   11399.4    0.0     0.0
 12    44.9  815616.4     0.0    0.0      0.     0.  ********    0.0     0.0
 13    11.3  178532.0     0.0    0.0      0.     0.   26779.8    0.0     0.0
 14    12.5  232777.6     0.0    0.0      0.     0.   34916.6    0.0     0.0
 15    18.3  386239.7     0.0    0.0      0.     0.   57936.0    0.0     0.0
 16    38.8  681380.7     0.0    0.0      0.     0.  ********    0.0     0.0
 17     2.9   42709.6     0.0    0.0      0.     0.    6406.4    0.0     0.0
 18    10.0  169260.8     0.0    0.0      0.     0.   25389.1    0.0     0.0
 19     2.5   49561.4     0.0    0.0      0.     0.    7434.2    0.0     0.0
 20    19.6  364966.1     0.0    0.0      0.     0.   54744.9    0.0     0.0
 21    20.4  302025.2     0.0    0.0      0.     0.   45303.8    0.0     0.0
 22    10.4  137287.4     0.0    0.0      0.     0.   20593.1    0.0     0.0
```

23	9.6	135813.6	0.0	0.0	0.	0. 20372.0	0.0	0.0
24	16.5	198075.7	0.0	0.0	0.	0. 29711.4	0.0	0.0
25	6.0	51423.0	0.0	0.0	0.	0. 7713.5	0.0	0.0
26	15.1	78743.5	0.0	0.0	0.	0. 11811.5	0.0	0.0
27	7.4	10955.5	0.0	0.0	0.	0. 1643.3	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	157.169	950.000
2	206.919	945.013
3	256.919	945.227
4	306.625	950.640
5	355.499	961.193
6	403.010	976.772
7	448.643	997.207
8	491.904	1022.277
9	532.323	1051.711
10	569.461	1085.188
11	602.916	1122.346
12	632.326	1162.783
13	657.370	1206.058
14	672.941	1240.882

Circle Center At X = 230.043 ; Y = 1423.491 ; and Radius = 479.066

Factor of Safety

*** 1.239 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	159.980	950.000
2	209.736	945.065
3	259.734	945.438
4	309.411	951.116
5	358.204	962.034
6	405.564	978.068
7	450.953	999.039
8	493.861	1024.709
9	533.802	1054.787
10	570.325	1088.935
11	603.017	1126.766
12	631.510	1167.854
13	655.481	1211.733
14	667.852	1241.518

Circle Center At X = 231.462 ; Y = 1413.624 ; and Radius = 469.102

Factor of Safety

*** 1.240 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	171.928	950.000
2	221.714	945.374
3	271.698	946.629
4	321.188	953.748
5	369.500	966.633
6	415.963	985.104
7	459.934	1008.907
8	500.803	1037.711
9	538.006	1071.117
10	571.026	1108.663
11	599.406	1149.828
12	622.753	1194.042
13	640.743	1240.694
14	641.787	1244.777

Circle Center At X = 236.158 ; Y = 1369.474 ; and Radius = 424.361

Factor of Safety

*** 1.251 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

Point No.	X-Surf (ft)	Y-Surf (ft)
1	166.868	950.000
2	216.601	944.845
3	266.596	945.602
4	316.150	952.259
5	364.572	964.724
6	411.182	982.821
7	455.327	1006.299
8	496.390	1034.927
9	533.795	1068.006
10	567.019	1105.371
11	595.595	1146.400
12	619.125	1190.518
13	637.279	1237.106
14	639.342	1245.082

Circle Center At X = 235.382 ; Y = 1366.092 ; and Radius = 421.695

Factor of Safety

*** 1.253 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.546	950.000
2	201.266	944.711
3	251.264	944.242
4	301.074	948.596
5	350.232	957.734
6	398.279	971.569
7	444.769	989.973
8	489.267	1012.775
9	531.359	1039.762
10	570.652	1070.682
11	606.780	1105.247
12	639.407	1143.135
13	668.227	1183.993
14	692.974	1227.440
15	696.035	1234.273

Circle Center At X = 231.121 ; Y = 1461.730 ; and Radius = 517.880

Factor of Safety

*** 1.254 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.201	950.000
2	204.800	943.684
3	254.795	942.935
4	304.561	947.762
5	353.460	958.105
6	400.941	973.835
7	446.353	994.757
8	489.151	1020.610
9	528.801	1051.071
10	564.809	1085.761
11	596.727	1124.248
12	624.157	1166.052
13	646.757	1210.653
14	658.708	1242.661

Circle Center At X = 236.693 ; Y = 1389.256 ; and Radius = 446.751

Factor of Safety

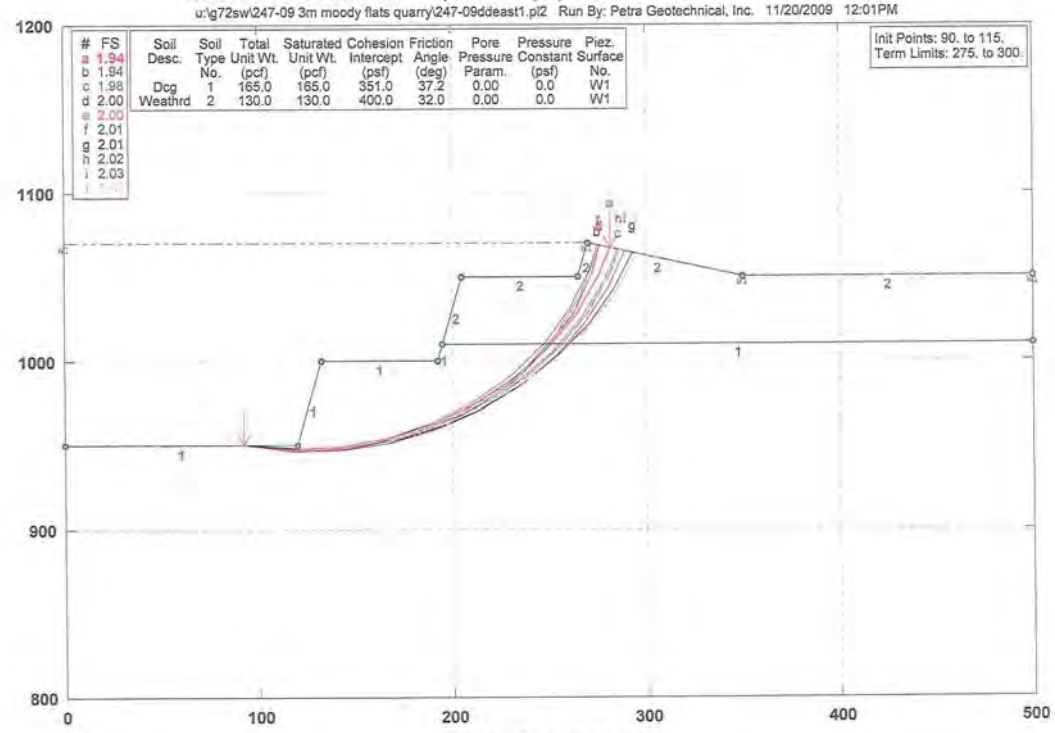
*** 1.256 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.201	950.000
2	204.899	944.511
3	254.896	944.006
4	304.695	948.490
5	353.798	957.918

JN 247-09 - Section D--D' (East Slope) GW at Elev, 1070 - Static Analysis

u:\g72sw\247-09 3m moody flats quarry\247-09ddeast1.pl2 Run By: Petra Geotechnical, Inc. 11/20/2009 12:01PM



GSTABL7 v.2 FSmin=1.94

Safety Factors Are Calculated By The Modified Bishop Method

PETRA

u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddd.out Page 5

```
6          401.716      972.196
7          447.971      991.182
8          492.101     1014.687
9          533.668     1042.476
10         572.256     1074.272
11         607.480     1109.758
12         638.989     1148.581
13         666.469     1190.352
14         689.647     1234.655
15         690.314     1236.316
Circle Center At X =   234.949 ; Y =  1444.315 ; and Radius =   500.706
     Factor of Safety
     ***   1.257   ***
Failure Surface Specified By 14 Coordinate Points
 Point      X-Surf       Y-Surf
  No.        (ft)         (ft)
   1        160.261      950.000
   2        209.967      944.586
   3        259.966      944.293
   4        309.732      949.124
   5        358.742      959.028
   6        406.479      973.900
   7        452.441      993.585
   8        496.144     1017.874
   9        537.130     1046.513
  10        574.965     1079.201
  11        609.253     1115.592
  12        639.633     1155.305
  13        665.784     1197.921
  14        685.117     1238.173
Circle Center At X =   237.905 ; Y =  1430.638 ; and Radius =   486.869
     Factor of Safety
     ***   1.258   ***
Failure Surface Specified By 13 Coordinate Points
 Point      X-Surf       Y-Surf
  No.        (ft)         (ft)
   1        167.570      950.000
   2        217.330      945.097
   3        267.314      946.353
   4        316.764      953.749
   5        364.928      967.173
   6        411.075      986.420
   7        454.503     1011.199
   8        494.553     1041.132
   9        530.616     1075.766
  10        562.144     1114.573
  11        588.658     1156.964
  12        609.756     1202.295
  13        624.180     1246.978
Circle Center At X =   232.151 ; Y =  1350.460 ; and Radius =   405.638
     Factor of Safety
     ***   1.259   ***
     **** END OF GSTABL7 OUTPUT ****
```

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:01PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeastl.
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeastl.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeastl.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section D--D' (East Slope)
                      GW at Elev, 1070 - Static Analysis
BOUNDARY COORDINATES
    9 Top   Boundaries
   10 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right    Soil Type
  No.          (ft)        (ft)        (ft)        (ft)    Below Bnd
   1           0.00      950.00      120.00      950.00        1
   2         120.00      950.00      132.50     1000.00        1
   3         132.50     1000.00      192.50     1000.00        1
   4         192.50     1000.00      195.00     1010.00        1
   5         195.00     1010.00      205.00     1050.00        2
   6         205.00     1050.00      265.00     1050.00        2
   7         265.00     1050.00      270.00     1070.00        2
   8         270.00     1070.00      350.00     1050.00        2
   9         350.00     1050.00      500.00     1050.00        2
  10         195.00     1010.00      500.00     1010.00        1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 2 Type(s) of Soil
Soil  Total  Saturated  Cohesion  Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.   (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
  1   165.0    165.0     351.0      37.2    0.00      0.0       1
  2   130.0    130.0     400.0      32.0    0.00      0.0       1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  4 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
  No.          (ft)        (ft)
   1          0.00      1070.00
   2        270.00      1070.00
   3        350.00      1050.00
   4        500.00      1050.00
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X =  90.00(ft)
                              and  X = 115.00(ft)
Each Surface Terminates Between   X = 275.00(ft)
                              and  X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
```



```
25.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
     Failure Surfaces Evaluated. They Are
     Ordered - Most Critical First.
     * * Safety Factors Are Calculated By The Modified Bishop Method * *
     Total Number of Trial Surfaces Attempted =  500
     Number of Trial Surfaces With Valid FS =  500
     Statistical Data On All Valid FS Values:
        FS Max =  3.143   FS Min =  1.936   FS Ave =  2.432
        Standard Deviation =  0.244   Coefficient of Variation =  10.01 %
     Failure Surface Specified By 11 Coordinate Points
       Point      X-Surf      Y-Surf
       No.          (ft)        (ft)
        1          92.209     950.000
        2         117.099     947.658
        3         142.062     949.011
        4         166.554     954.028
        5         190.038     962.601
        6         212.002     974.542
        7         231.966     989.589
        8         249.494    1007.416
        9         264.203    1027.631
       10         275.771    1049.793
       11         281.747    1067.063
     Circle Center At X =   120.455 ; Y =  1116.765 ; and Radius =  169.140
          Factor of Safety
            ***   1.936   ***
          Individual data on the   18  slices
                              Water  Water   Tie    Tie     Earthquake        Surcharge
                              Force  Force   Force  Force     Force           Load
Slice  Width   Weight   Top    Bot    Norm   Tan    Hor     Ver     Load
 No.    (ft)    (lbs)   (lbs)  (lbs)  (lbs)  (lbs)  (lbs)   (lbs)   (lbs)
  1    24.9    4809.0 ******* *******    0.     0.     0.0     0.0     0.0
  2     2.9    1083.4 21723.2 22165.4    0.     0.     0.0     0.0     0.0
  3    12.5   55370.0 ******* 95179.3    0.     0.     0.0     0.0     0.0
  4     9.6   80858.7 41768.2 72453.6    0.     0.     0.0     0.0     0.0
  5    24.5  195913.5 ******* *******    0.     0.     0.0     0.0     0.0
  6    23.5  161527.2 ******* *******    0.     0.     0.0     0.0     0.0
  7     2.5   14921.6 10754.6 18664.2    0.     0.     0.0     0.0     0.0
  8     2.5   16657.2 41808.3 18711.8    0.     0.     0.0     0.0     0.0
  9    10.0   95272.4 ******* 72433.8    0.     0.     0.0     0.0     0.0
 10     7.0   79574.7  8738.4 48419.3    0.     0.     0.0     0.0     0.0
 11    20.0  195831.1 24915.1 *******    0.     0.     0.0     0.0     0.0
 12    17.5  124396.9 21874.8 *******    0.     0.     0.0     0.0     0.0
 13     1.9   10179.0  2346.7 12223.7    0.     0.     0.0     0.0     0.0
 14    12.8   52006.2 16009.8 69640.0    0.     0.     0.0     0.0     0.0
 15     0.8    2239.6   995.1  4473.8    0.     0.     0.0     0.0     0.0
 16     5.0   16933.9 12864.1 24308.3    0.     0.     0.0     0.0     0.0
 17     5.8   18765.6     0.0 18893.4    0.     0.     0.0     0.0     0.0
 18     6.0    7288.7     0.0 10384.1    0.     0.     0.0     0.0     0.0
     Failure Surface Specified By 11 Coordinate Points
       Point      X-Surf      Y-Surf
       No.          (ft)        (ft)
        1          91.707     950.000
        2         116.575     947.435
        3         141.539     948.777
        4         165.989     953.993
        5         189.327     962.955
        6         210.984     975.444
        7         230.430     991.156
        8         247.190    1009.706
        9         260.854    1030.641
       10         271.089    1053.450
       11         275.231    1068.692
     Circle Center At X =   120.499 ; Y =  1107.324 ; and Radius =  159.937
          Factor of Safety
            ***   1.937   ***
```

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.711	950.000
2	117.563	947.286
3	142.545	948.240
4	167.118	952.841
5	190.753	960.989
6	212.940	972.510
7	233.201	987.155
8	251.101	1004.608
9	266.252	1024.494
10	278.329	1046.383
11	285.681	1066.080

Circle Center At X = 123.574 ; Y = 1117.489 ; and Radius = 170.308

Factor of Safety

*** 1.976 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.213	950.000
2	117.949	946.374
3	142.944	946.853
4	167.523	951.423
5	191.019	959.961
6	212.798	972.237
7	232.270	987.917
8	248.907	1006.577
9	262.260	1027.712
10	271.967	1050.751
11	276.187	1068.453

Circle Center At X = 127.546 ; Y = 1098.034 ; and Radius = 151.964

Factor of Safety

*** 1.997 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.032	950.000
2	122.861	947.075
3	147.832	948.261
4	172.272	953.526
5	195.517	962.728
6	216.939	975.616
7	235.957	991.843
8	252.057	1010.969
9	264.803	1032.475
10	273.849	1055.781
11	276.476	1068.381

Circle Center At X = 128.162 ; Y = 1098.924 ; and Radius = 151.941

Factor of Safety

*** 1.997 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.546	950.000
2	126.444	947.741
3	151.374	949.614
4	175.655	955.566
5	198.624	965.435
6	219.655	978.953
7	238.172	995.748
8	253.671	1015.365
9	265.728	1037.265
10	274.014	1060.852
11	275.373	1068.657

Circle Center At X = 127.617 ; Y = 1099.030 ; and Radius = 151.293

Factor of Safety

*** 2.011 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.920	950.000
2	119.795	947.506
3	144.775	948.504
4	169.373	952.973
5	193.107	960.826
6	215.516	971.910
7	236.161	986.008
8	254.640	1002.846
9	270.592	1022.096
10	283.706	1043.380
11	292.853	1064.287

Circle Center At X = 125.163 ; Y = 1126.382 ; and Radius = 178.956

Factor of Safety

*** 2.013 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.835	950.000
2	123.716	947.561
3	148.681	948.884
4	173.165	953.940
5	196.612	962.614
6	218.491	974.709
7	238.306	989.952
8	255.609	1007.997
9	270.007	1028.435
10	281.173	1050.802
11	286.075	1065.981

Circle Center At X = 127.434 ; Y = 1113.583 ; and Radius = 166.064

Factor of Safety

*** 2.024 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	93.715	950.000
2	118.515	946.842
3	143.509	947.358
4	168.158	951.537
5	191.925	959.289
6	214.298	970.445
7	234.791	984.764
8	252.960	1001.936
9	268.412	1021.589
10	280.813	1043.297
11	289.337	1065.166

Circle Center At X = 127.515 ; Y = 1116.469 ; and Radius = 169.866

Factor of Safety

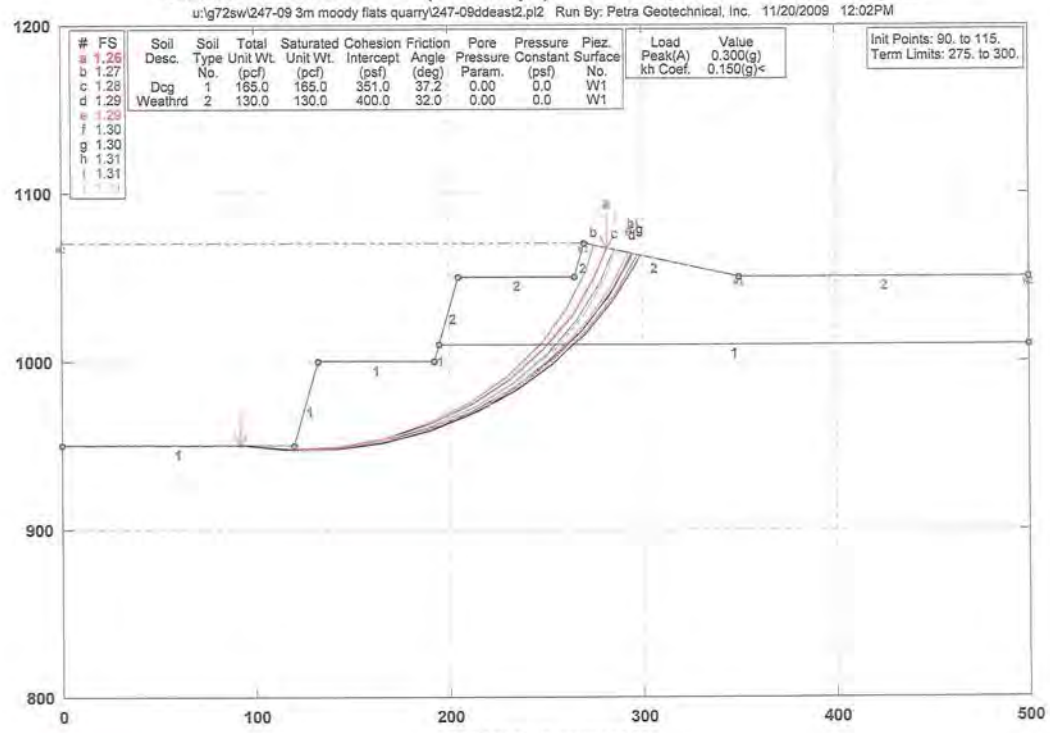
*** 2.025 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.703	950.000
2	115.575	947.474
3	140.562	948.281
4	165.219	952.405
5	189.109	959.772
6	211.806	970.253
7	232.906	983.661
8	252.035	999.757
9	268.853	1018.255
10	283.059	1038.827
11	294.402	1061.105
12	295.303	1063.674

JN 247-09 - Section D--D' (East Slope) GW at Elev, 1070 - Seismic Analysis

u:\g72sw\247-09 3m moody flats quarry\247-09ddeast2.pl2 Run By: Petra Geotechnical, Inc. 11/20/2009 12:02PM



GSTABL7 v.2 FSmin=1.26

Safety Factors Are Calculated By The Modified Bishop Method

PETRA

u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast1.out Page 5

```
Circle Center At X =   122.099 ; Y =  1134.455 ; and Radius =   187.108
      Factor of Safety
      ***    2.025   ***
          **** END OF GSTABL7 OUTPUT ****
```

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1995; Current Version 2.004, June 2003 **
                 (All Rights Reserved-Unauthorized Use Prohibited)
*************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:07PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast2.
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast2.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast2.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section D--D' (East Slope)
                      GW at Elev, 1070 - Seismic Analysis
```

BOUNDARY COORDINATES

9 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	950.00	120.00	950.00	1
2	120.00	950.00	132.50	1000.00	1
3	132.50	1000.00	192.50	1000.00	1
4	192.50	1000.00	195.00	1010.00	1
5	195.00	1010.00	205.00	1050.00	2
6	205.00	1050.00	265.00	1050.00	2
7	265.00	1050.00	270.00	1070.00	2
8	270.00	1070.00	350.00	1050.00	2
9	350.00	1050.00	500.00	1050.00	2
10	195.00	1010.00	500.00	1010.00	1

```
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
```

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	165.0	165.0	351.0	37.2	0.00	0.0	1
2	130.0	130.0	400.0	32.0	0.00	0.0	1

```
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  4 Coordinate Points
Pore Pressure Inclination Factor =  0.50
```

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	1070.00
2	270.00	1070.00
3	350.00	1050.00
4	500.00	1050.00

```
Specified Peak Ground Acceleration Coefficient (A) =  0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =  0.150(g)
Specified Vertical Earthquake Coefficient (kv) =  0.000(g)
Specified Seismic Pore-Pressure Factor =  0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of  250 Points Equally Spaced
Along The Ground Surface Between  X =  90.00(ft)
                                  and  X = 115.00(ft)
```



```
Each Surface Terminates Between   X = 275.00(ft)
                                  and  X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =       0.00(ft)
25.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
     Failure Surfaces Evaluated. They Are
     Ordered - Most Critical First.
     * * Safety Factors Are Calculated By The Modified Bishop Method * *
     Total Number of Trial Surfaces Attempted =  500
     Number of Trial Surfaces With Valid FS =  500
     Statistical Data On All Valid FS Values:
        FS Max =  2.034   FS Min =  1.260   FS Ave =  1.572
        Standard Deviation =  0.160   Coefficient of Variation =  10.19 %
     Failure Surface Specified By 11 Coordinate Points
```

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.209	950.000
2	117.099	947.658
3	142.062	949.011
4	166.554	954.028
5	190.038	962.601
6	212.002	974.542
7	231.966	989.589
8	249.494	1007.416
9	264.203	1027.631
10	275.771	1049.793
11	281.747	1067.063

```
     Circle Center At X =  120.455 ; Y =  1116.765 ; and Radius =  169.140
          Factor of Safety
          ***  1.260  ***
          Individual data on the  18  slices
```

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Force Ver (lbs)	Surcharge Load (lbs)
1	24.9	4809.0	*******	*******	0.	0.	721.3	0.0	0.0
2	2.9	1083.4	21723.2	22165.4	0.	0.	162.5	0.0	0.0
3	12.5	55370.0	*******	95179.3	0.	0.	8305.5	0.0	0.0
4	9.6	80858.7	41768.2	72453.6	0.	0.	12128.8	0.0	0.0
5	24.5	195913.5	*******	*******	0.	0.	29387.0	0.0	0.0
6	23.5	161527.2	*******	*******	0.	0.	24229.1	0.0	0.0
7	2.5	14921.6	10754.6	18664.2	0.	0.	2238.2	0.0	0.0
8	2.5	16657.2	41808.3	18711.8	0.	0.	2498.6	0.0	0.0
9	10.0	95272.4	*******	72433.8	0.	0.	14290.9	0.0	0.0
10	7.0	79574.7	8738.4	48419.3	0.	0.	11936.2	0.0	0.0
11	20.0	195831.1	24915.1	*******	0.	0.	29374.7	0.0	0.0
12	17.5	124396.9	21874.8	*******	0.	0.	18659.5	0.0	0.0
13	1.9	10179.0	2346.7	12223.7	0.	0.	1526.9	0.0	0.0
14	12.8	52006.2	16009.8	69640.0	0.	0.	7800.9	0.0	0.0
15	0.8	2239.6	995.1	4473.8	0.	0.	335.9	0.0	0.0
16	5.0	16933.9	12864.1	24308.3	0.	0.	2540.1	0.0	0.0
17	5.8	18765.6	0.0	18893.4	0.	0.	2814.8	0.0	0.0
18	6.0	7288.7	0.0	10384.1	0.	0.	1093.3	0.0	0.0

```
          Failure Surface Specified By 11 Coordinate Points
```

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.707	950.000
2	116.575	947.435
3	141.539	948.777
4	165.989	953.993
5	189.327	962.955
6	210.984	975.444
7	230.430	991.156
8	247.190	1009.706
9	260.854	1030.641
10	271.089	1053.450

```
   11        275.231     1068.692
Circle Center At X =   120.499 ; Y =  1107.324 ; and Radius =   159.937
      Factor of Safety
     ***    1.269   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         92.711     950.000
    2        117.563     947.286
    3        142.545     948.240
    4        167.118     952.841
    5        190.753     960.989
    6        212.940     972.510
    7        233.201     987.155
    8        251.101    1004.608
    9        266.252    1024.494
   10        278.329    1046.383
   11        285.681    1066.080
Circle Center At X =   123.574 ; Y =  1117.489 ; and Radius =   170.308
      Factor of Safety
     ***    1.281   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         90.703     950.000
    2        115.575     947.474
    3        140.562     948.281
    4        165.219     952.405
    5        189.109     959.772
    6        211.806     970.253
    7        232.906     983.661
    8        252.035     999.757
    9        268.853    1018.255
   10        283.059    1038.827
   11        294.402    1061.105
   12        295.303    1063.674
Circle Center At X =   122.099 ; Y =  1134.455 ; and Radius =   187.108
      Factor of Safety
     ***    1.289   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         94.920     950.000
    2        119.795     947.506
    3        144.775     948.504
    4        169.373     952.973
    5        193.107     960.826
    6        215.516     971.910
    7        236.161     986.008
    8        254.640    1002.846
    9        270.592    1022.096
   10        283.706    1043.380
   11        292.853    1064.287
Circle Center At X =   125.163 ; Y =  1126.382 ; and Radius =   178.956
      Factor of Safety
     ***    1.290   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         96.125     950.000
    2        121.006     947.567
    3        145.984     948.604
    4        170.578     953.092
    5        194.313     960.944
    6        216.732     972.008
    7        237.401     986.071
    8        255.923    1002.862
```



```
    9        271.941     1022.057
   10        285.144     1043.286
   11        294.298     1063.926
Circle Center At X =   126.043 ; Y =  1127.521 ; and Radius =   180.025
      Factor of Safety
     ***    1.298   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         91.205     950.000
    2        116.067     947.378
    3        141.059     948.027
    4        165.751     951.935
    5        189.721     959.037
    6        212.558     969.210
    7        233.869     982.280
    8        253.290     998.022
    9        270.488    1016.167
   10        285.167    1036.404
   11        297.076    1058.385
   12        298.768    1062.808
Circle Center At X =   123.713 ; Y =  1137.545 ; and Radius =   190.342
      Factor of Safety
     ***    1.302   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         92.008     950.000
    2        116.831     947.029
    3        141.826     947.528
    4        166.510     951.488
    5        190.407     958.832
    6        213.055     969.419
    7        234.016     983.044
    8        252.885     999.444
    9        269.298    1018.302
   10        282.938    1039.253
   11        293.540    1061.893
   12        294.176    1063.956
Circle Center At X =   125.794 ; Y =  1126.371 ; and Radius =   179.578
      Factor of Safety
     ***    1.306   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         93.615     950.000
    2        118.463     947.256
    3        143.455     947.899
    4        168.130     951.919
    5        192.034     959.241
    6        214.726     969.731
    7        235.791     983.195
    8        254.840     999.386
    9        271.522    1018.006
   10        285.531    1038.712
   11        296.608    1061.124
   12        297.296    1063.176
Circle Center At X =   126.276 ; Y =  1131.090 ; and Radius =   184.019
      Factor of Safety
     ***    1.306   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         98.835     950.000
    2        123.716     947.561
    3        148.681     948.884
    4        173.165     953.940
```

JN 247-09 - Section D--D' (East Slope) No Groundwtaer - Static Analysis

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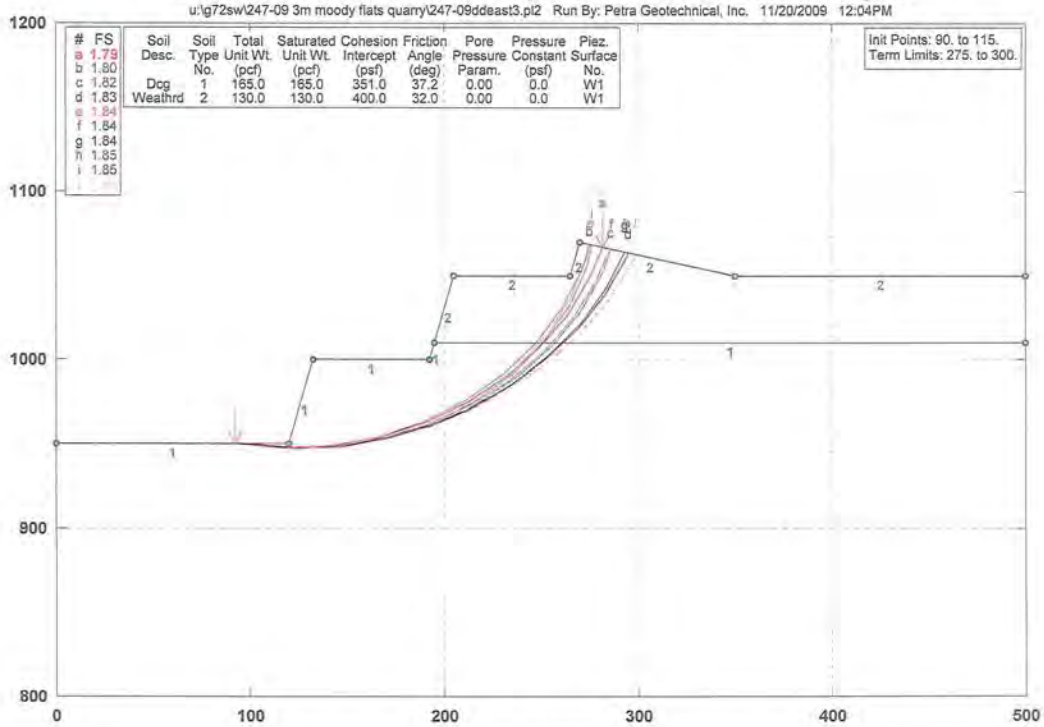

GSTABL7 v.2 FSmin=1.79

Safety Factors Are Calculated By The Modified Bishop Method

PETRA

u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast2.out Page 5

```
  5      196.612      962.614
  6      218.491      974.709
  7      238.306      989.952
  8      255.609     1007.997
  9      270.007     1028.435
 10      281.173     1050.802
 11      286.075     1065.981
Circle Center At X =   127.434 ; Y =  1113.583 ; and Radius =   166.064
     Factor of Safety
        ***   1.307   ***
          **** END OF GSTABL7 OUTPUT ****
```

```
                        *** GSTABL7 ***
                   ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
             (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
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Analysis Run Date:          11/20/2009
Time of Run:                12:04PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast3.
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast3.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast3.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section D--D' (East Slope)
                      No Groundwtaer - Static Analysis
BOUNDARY COORDINATES
    9 Top   Boundaries
   10 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
  No.          (ft)        (ft)        (ft)        (ft)     Below Bnd
   1           0.00      950.00      120.00      950.00         1
   2         120.00      950.00      132.50     1000.00         1
   3         132.50     1000.00      192.50     1000.00         1
   4         192.50     1000.00      195.00     1010.00         1
   5         195.00     1010.00      205.00     1050.00         2
   6         205.00     1050.00      265.00     1050.00         2
   7         265.00     1050.00      270.00     1070.00         2
   8         270.00     1070.00      350.00     1050.00         2
   9         350.00     1050.00      500.00     1050.00         2
  10         195.00     1010.00      500.00     1010.00         1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.   (psf)     No.
  1   165.0    165.0     351.0     37.2    0.00      0.0      1
  2   130.0    130.0     400.0     32.0    0.00      0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  4 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
  No.          (ft)        (ft)
   1           0.00     1070.00
   2         270.00     1070.00
   3         350.00     1050.00
   4         500.00     1050.00
WATER SURFACE DATA HAS BEEN SUPPRESSED
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X =  90.00(ft)
                              and  X = 115.00(ft)
Each Surface Terminates Between   X = 275.00(ft)
                              and  X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
```



```
At Which A Surface Extends Is  Y =      0.00(ft)
25.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
     Failure Surfaces Evaluated. They Are
     Ordered - Most Critical First.
     * * Safety Factors Are Calculated By The Modified Bishop Method * *
     Total Number of Trial Surfaces Attempted =  500
     Number of Trial Surfaces With Valid FS =  500
     Statistical Data On All Valid FS Values:
        FS Max =  2.904   FS Min =  1.791   FS Ave =  2.226
        Standard Deviation =  0.225   Coefficient of Variation =  10.12 %
     Failure Surface Specified By 11 Coordinate Points
       Point      X-Surf      Y-Surf
       No.          (ft)        (ft)
        1          92.209     950.000
        2         117.099     947.658
        3         142.062     949.011
        4         166.554     954.028
        5         190.038     962.601
        6         212.002     974.542
        7         231.966     989.589
        8         249.494    1007.416
        9         264.203    1027.631
       10         275.771    1049.793
       11         281.747    1067.063
     Circle Center At X =  120.455 ; Y =  1116.765 ; and Radius =  169.140
          Factor of Safety
             ***  1.791  ***
          Individual data on the   18  slices
                              Water  Water   Tie     Tie     Earthquake
                              Force  Force   Force   Force       Force    Surcharge
Slice  Width   Weight   Top    Bot    Norm    Tan     Hor     Ver      Load
 No.    (ft)    (lbs)   (lbs)  (lbs)  (lbs)   (lbs)   (lbs)   (lbs)    (lbs)
  1    24.9    4809.0    0.0    0.0     0.      0.      0.0     0.0      0.0
  2     2.9    1083.4    0.0    0.0     0.      0.      0.0     0.0      0.0
  3    12.5   55370.0    0.0    0.0     0.      0.      0.0     0.0      0.0
  4     9.6   80858.7    0.0    0.0     0.      0.      0.0     0.0      0.0
  5    24.5  195913.5    0.0    0.0     0.      0.      0.0     0.0      0.0
  6    23.5  161527.2    0.0    0.0     0.      0.      0.0     0.0      0.0
  7     2.5   14921.6    0.0    0.0     0.      0.      0.0     0.0      0.0
  8     2.5   16657.2    0.0    0.0     0.      0.      0.0     0.0      0.0
  9    10.0   95272.4    0.0    0.0     0.      0.      0.0     0.0      0.0
 10     7.0   79574.7    0.0    0.0     0.      0.      0.0     0.0      0.0
 11    20.0  195831.1    0.0    0.0     0.      0.      0.0     0.0      0.0
 12    17.5  124396.9    0.0    0.0     0.      0.      0.0     0.0      0.0
 13     1.9   10179.0    0.0    0.0     0.      0.      0.0     0.0      0.0
 14    12.8   52006.2    0.0    0.0     0.      0.      0.0     0.0      0.0
 15     0.8    2239.6    0.0    0.0     0.      0.      0.0     0.0      0.0
 16     5.0   16933.9    0.0    0.0     0.      0.      0.0     0.0      0.0
 17     5.8   18765.6    0.0    0.0     0.      0.      0.0     0.0      0.0
 18     6.0    7288.7    0.0    0.0     0.      0.      0.0     0.0      0.0
     Failure Surface Specified By 11 Coordinate Points
       Point      X-Surf      Y-Surf
       No.          (ft)        (ft)
        1          91.707     950.000
        2         116.575     947.435
        3         141.539     948.777
        4         165.989     953.993
        5         189.327     962.955
        6         210.984     975.444
        7         230.430     991.156
        8         247.190    1009.706
        9         260.854    1030.641
       10         271.089    1053.450
       11         275.231    1068.692
     Circle Center At X =  120.499 ; Y =  1107.324 ; and Radius =  159.937
          Factor of Safety
```

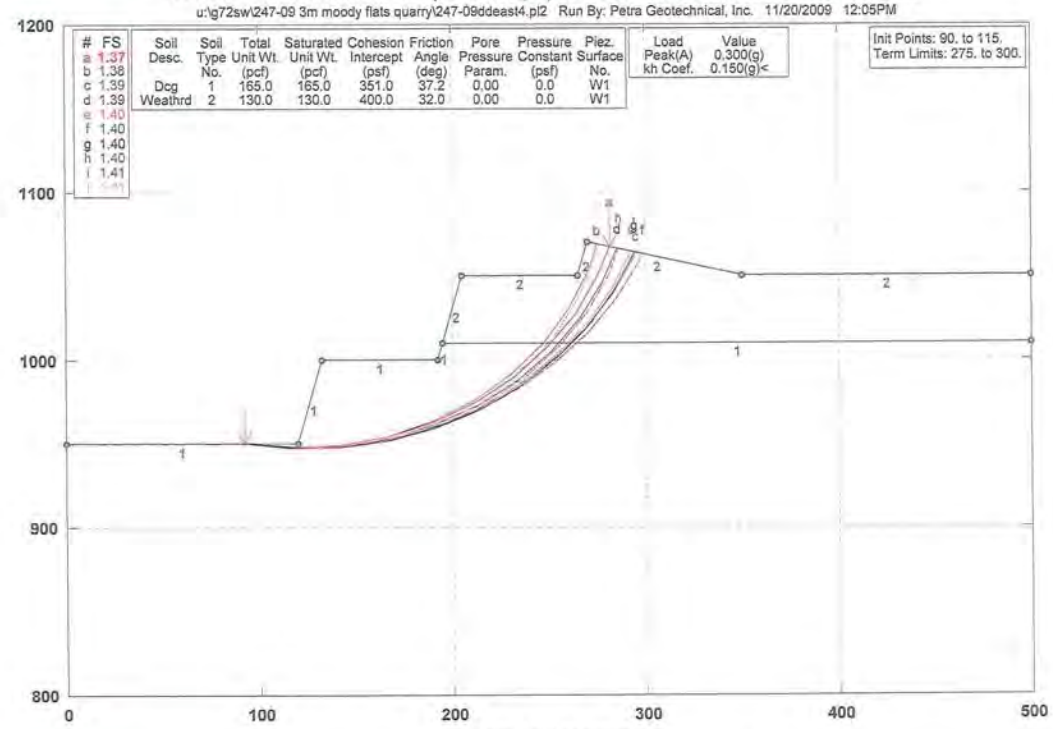
```
      ***    1.795   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         92.711      950.000
    2        117.563      947.286
    3        142.545      948.240
    4        167.118      952.841
    5        190.753      960.989
    6        212.940      972.510
    7        233.201      987.155
    8        251.101     1004.608
    9        266.252     1024.494
   10        278.329     1046.383
   11        285.681     1066.080
Circle Center At X =   123.574 ; Y =  1117.489 ; and Radius =   170.308
      Factor of Safety
      ***    1.821   ***
Failure Surface Specified By 12 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         90.703      950.000
    2        115.575      947.474
    3        140.562      948.281
    4        165.219      952.405
    5        189.109      959.772
    6        211.806      970.253
    7        232.906      983.661
    8        252.035      999.757
    9        268.853     1018.255
   10        283.059     1038.827
   11        294.402     1061.105
   12        295.303     1063.674
Circle Center At X =   122.099 ; Y =  1134.455 ; and Radius =   187.108
      Factor of Safety
      ***    1.832   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1        101.546      950.000
    2        126.444      947.741
    3        151.374      949.614
    4        175.655      955.566
    5        198.624      965.435
    6        219.655      978.953
    7        238.172      995.748
    8        253.671     1015.365
    9        265.728     1037.265
   10        274.014     1060.852
   11        275.373     1068.657
Circle Center At X =   127.617 ; Y =  1099.030 ; and Radius =   151.293
      Factor of Safety
      ***    1.835   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         98.835      950.000
    2        123.716      947.561
    3        148.681      948.884
    4        173.165      953.940
    5        196.612      962.614
    6        218.491      974.709
    7        238.306      989.952
    8        255.609     1007.997
    9        270.007     1028.435
   10        281.173     1050.802
   11        286.075     1065.981
```



```
Circle Center At X =   127.434 ; Y =  1113.583 ; and Radius =   166.064
      Factor of Safety
      ***    1.839   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         94.920      950.000
    2        119.795      947.506
    3        144.775      948.504
    4        169.373      952.973
    5        193.107      960.826
    6        215.516      971.910
    7        236.161      986.008
    8        254.640     1002.846
    9        270.592     1022.096
   10        283.706     1043.380
   11        292.053     1064.287
Circle Center At X =   125.163 ; Y =  1126.382 ; and Radius =   178.956
      Factor of Safety
      ***    1.840   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         96.125      950.000
    2        121.006      947.567
    3        145.984      948.604
    4        170.578      953.092
    5        194.313      960.944
    6        216.732      972.008
    7        237.401      986.071
    8        255.923     1002.862
    9        271.941     1022.057
   10        285.144     1043.286
   11        294.298     1063.926
Circle Center At X =   126.043 ; Y =  1127.521 ; and Radius =   180.025
      Factor of Safety
      ***    1.848   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         98.032      950.000
    2        122.861      947.075
    3        147.832      948.261
    4        172.272      953.526
    5        195.517      962.728
    6        216.939      975.616
    7        235.957      991.843
    8        252.057     1010.969
    9        264.803     1032.475
   10        273.849     1055.781
   11        276.476     1068.381
Circle Center At X =   128.162 ; Y =  1098.924 ; and Radius =   151.941
      Factor of Safety
      ***    1.849   ***
Failure Surface Specified By 12 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         91.205      950.000
    2        116.067      947.378
    3        141.059      948.027
    4        165.751      951.935
    5        189.721      959.037
    6        212.558      969.210
    7        233.869      982.280
    8        253.290      998.022
    9        270.488     1016.167
   10        285.167     1036.404
```

JN 247-09 - Section D--D' (East Slope) No Groundwater - Seismic Analysis

u:\g72sw\247-09 3m moody flats quarry\247-09ddeast4.pl2 Run By: Petra Geotechnical, Inc. 11/20/2009 12:05PM



GSTABL7 v.2 FSmin=1.37

Safety Factors Are Calculated By The Modified Bishop Method

PETRA


```
     11       297.076    1058.385
     12       298.768    1062.808
 Circle Center At X =   123.713 ; Y =   1137.545 ; and Radius =   190.342
     Factor of Safety
 ***    1.856   ***
 ***** END OF GSTABL7 OUTPUT *****
```

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:05PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast4.
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast4.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09ddeast4.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section D--D' (East Slope)
                      No Groundwater - Seismic Analysis

BOUNDARY COORDINATES
    9 Top   Boundaries
   10 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1          0.00      950.00      120.00      950.00         1
    2        120.00      950.00      132.50     1000.00         1
    3        132.50     1000.00      192.50     1000.00         1
    4        192.50     1000.00      195.00     1010.00         1
    5        195.00     1010.00      205.00     1050.00         2
    6        205.00     1050.00      265.00     1050.00         2
    7        265.00     1050.00      270.00     1070.00         2
    8        270.00     1070.00      350.00     1050.00         2
    9        350.00     1050.00      500.00     1050.00         2
   10        195.00     1010.00      500.00     1010.00         1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)    (deg)   Param.   (psf)     No.
   1   165.0    165.0     351.0     37.2    0.00      0.0      1
   2   130.0    130.0     400.0     32.0    0.00      0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  4 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00     1070.00
     2        270.00     1070.00
     3        350.00     1050.00
     4        500.00     1050.00
 WATER SURFACE DATA HAS BEEN SUPPRESSED
 Specified Peak Ground Acceleration Coefficient (A) =  0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =  0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =  0.000(g)
 Specified Seismic Pore-Pressure Factor =  0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
  500 Trial Surfaces Have Been Generated.
    2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
 Along The Ground Surface Between  X =  90.00(ft)
```



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                          and  X =  115.00(ft)
 Each Surface Terminates Between  X =  275.00(ft)
                          and  X =  300.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 25.00(ft) Line Segments Define Each Trial Failure Surface.
 Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =  500
      Number of Trial Surfaces With Valid FS =  500
      Statistical Data On All Valid FS Values:
        FS Max =  2.217   FS Min =  1.369   FS Ave =  1.700
        Standard Deviation =  0.175   Coefficient of Variation =  10.29 %
      Failure Surface Specified By 11 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1         92.209     950.000
          2        117.099     947.658
          3        142.062     949.011
          4        166.554     954.028
          5        190.038     962.601
          6        212.002     974.542
          7        231.966     989.589
          8        249.494    1007.416
          9        264.203    1027.631
         10        275.771    1049.793
         11        281.747    1067.063
      Circle Center At X =  120.455 ; Y =  1116.765 ; and Radius =  169.140
           Factor of Safety
            ***  1.369  ***
          Individual data on the  18  slices
                              Water  Water   Tie     Tie     Earthquake
                              Force  Force   Force   Force     Force     Surcharge
 Slice  Width   Weight   Top    Bot    Norm    Tan     Hor      Ver       Load
 No.    (ft)    (lbs)   (lbs)  (lbs)   (lbs)   (lbs)   (lbs)    (lbs)     (lbs)
  1     24.9    4809.0    0.0    0.0      0.      0.    721.3      0.0       0.0
  2      2.9    1083.4    0.0    0.0      0.      0.    162.5      0.0       0.0
  3     12.5   55370.0    0.0    0.0      0.      0.   8305.5      0.0       0.0
  4      9.6   80858.7    0.0    0.0      0.      0.  12128.8      0.0       0.0
  5     24.5  195913.5    0.0    0.0      0.      0.  29387.0      0.0       0.0
  6     23.5  161527.2    0.0    0.0      0.      0.  24229.1      0.0       0.0
  7      2.5   14921.6    0.0    0.0      0.      0.   2238.2      0.0       0.0
  8      2.5   16657.2    0.0    0.0      0.      0.   2498.6      0.0       0.0
  9     10.0   95272.4    0.0    0.0      0.      0.  14290.9      0.0       0.0
 10      7.0   79574.7    0.0    0.0      0.      0.  11936.2      0.0       0.0
 11     20.0  195831.1    0.0    0.0      0.      0.  29374.7      0.0       0.0
 12     17.5  124396.9    0.0    0.0      0.      0.  18659.5      0.0       0.0
 13      1.9   10179.0    0.0    0.0      0.      0.   1526.9      0.0       0.0
 14     12.8   52006.2    0.0    0.0      0.      0.   7800.9      0.0       0.0
 15      0.8    2239.6    0.0    0.0      0.      0.    335.9      0.0       0.0
 16      5.0   16933.9    0.0    0.0      0.      0.   2540.1      0.0       0.0
 17      5.8   18765.6    0.0    0.0      0.      0.   2814.8      0.0       0.0
 18      6.0    7288.7    0.0    0.0      0.      0.   1093.3      0.0       0.0
      Failure Surface Specified By 11 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1         91.707     950.000
          2        116.575     947.435
          3        141.539     948.777
          4        165.989     953.993
          5        189.327     962.955
          6        210.984     975.444
          7        230.430     991.156
          8        247.190    1009.706
          9        260.854    1030.641
```

10	271.089	1053.450
11	275.231	1068.692

Circle Center At X = 120.499 ; Y = 1107.324 ; and Radius = 159.937

Factor of Safety

*** 1.376 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.703	950.000
2	115.575	947.474
3	140.562	948.281
4	165.219	952.405
5	189.109	959.772
6	211.806	970.253
7	232.906	983.661
8	252.035	999.757
9	268.853	1018.255
10	283.059	1038.827
11	294.402	1061.105
12	295.303	1063.674

Circle Center At X = 122.099 ; Y = 1134.455 ; and Radius = 187.108

Factor of Safety

*** 1.387 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.711	950.000
2	117.563	947.286
3	142.545	948.240
4	167.118	952.841
5	190.753	960.989
6	212.940	972.510
7	233.201	987.155
8	251.101	1004.608
9	266.252	1024.494
10	278.329	1046.383
11	285.681	1066.080

Circle Center At X = 123.574 ; Y = 1117.489 ; and Radius = 170.308

Factor of Safety

*** 1.389 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.920	950.000
2	119.795	947.506
3	144.775	948.504
4	169.373	952.973
5	193.107	960.826
6	215.516	971.910
7	236.161	986.008
8	254.640	1002.846
9	270.592	1022.096
10	283.706	1043.380
11	292.853	1064.287

Circle Center At X = 125.163 ; Y = 1126.382 ; and Radius = 178.956

Factor of Safety

*** 1.397 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.205	950.000
2	116.067	947.378
3	141.059	948.027
4	165.751	951.935
5	189.721	959.037
6	212.558	969.210
7	233.869	982.280

8	253.290	998.022
9	270.488	1016.167
10	285.167	1036.404
11	297.076	1058.385
12	298.768	1062.808

Circle Center At X = 123.713 ; Y = 1137.545 ; and Radius = 190.342

Factor of Safety

*** 1.401 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.125	950.000
2	121.006	947.567
3	145.984	948.604
4	170.578	953.092
5	194.313	960.944
6	216.732	972.008
7	237.401	986.071
8	255.923	1002.862
9	271.941	1022.057
10	285.144	1043.286
11	294.298	1063.926

Circle Center At X = 126.043 ; Y = 1127.521 ; and Radius = 180.025

Factor of Safety

*** 1.401 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	98.835	950.000
2	123.716	947.561
3	148.681	948.884
4	173.165	953.940
5	196.612	962.614
6	218.491	974.709
7	238.306	989.952
8	255.609	1007.997
9	270.007	1028.435
10	281.173	1050.802
11	286.075	1065.981

Circle Center At X = 127.434 ; Y = 1113.583 ; and Radius = 166.061

Factor of Safety

*** 1.404 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.008	950.000
2	116.831	947.029
3	141.826	947.528
4	166.510	951.488
5	190.407	958.832
6	213.055	969.419
7	234.016	983.044
8	252.885	999.444
9	269.298	1018.302
10	282.938	1039.253
11	293.540	1061.893
12	294.176	1063.956

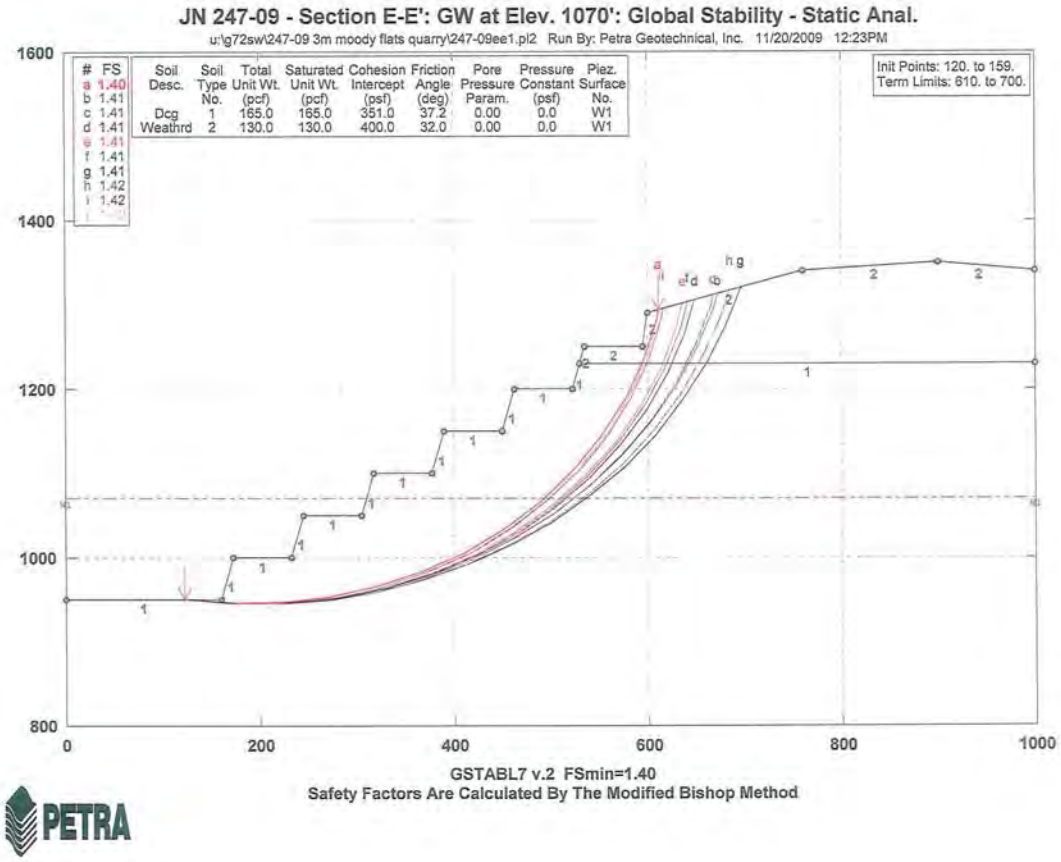
Circle Center At X = 125.794 ; Y = 1126.371 ; and Radius = 179.578

Factor of Safety

*** 1.409 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.546	950.000
2	126.444	947.741
3	151.374	949.614
4	175.655	955.566




```
      5      198.624      965.435
      6      219.655      978.953
      7      238.172      995.748
      8      253.671     1015.365
      9      265.728     1037.265
     10      274.014     1060.952
     11      275.373     1068.657
 Circle Center At X =   127.617 ; Y =  1099.030 ; and Radius =   151.293
    Factor of Safety
    ***  1.410  ***
         **** END OF GSTABL7 OUTPUT ****
```

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:23PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee1.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee1.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee1.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section E-E': GW at Elev.
                      1070': Global Stability - Static Anal.
BOUNDARY COORDINATES
   18 Top   Boundaries
   19 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1          0.00      950.00      160.00      950.00         1
    2        160.00      950.00      172.50     1000.00         1
    3        172.50     1000.00      232.50     1000.00         1
    4        232.50     1000.00      245.00     1050.00         1
    5        245.00     1050.00      305.00     1050.00         1
    6        305.00     1050.00      317.50     1100.00         1
    7        317.50     1100.00      377.50     1100.00         1
    8        377.50     1100.00      390.00     1150.00         1
    9        390.00     1150.00      450.00     1150.00         1
   10        450.00     1150.00      462.50     1200.00         1
   11        462.50     1200.00      522.50     1200.00         1
   12        522.50     1200.00      530.00     1230.00         1
   13        530.00     1230.00      535.00     1250.00         2
   14        535.00     1250.00      595.00     1250.00         2
   15        595.00     1250.00      600.00     1290.00         2
   16        600.00     1290.00      760.00     1340.00         2
   17        760.00     1340.00      900.00     1350.00         2
   18        900.00     1350.00     1000.00     1340.00         2
   19        530.00     1230.00     1000.00     1230.00         1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 2 Type(s) of Soil
Soil  Total   Saturated  Cohesion  Friction   Pore     Pressure   Piez.
Type Unit Wt. Unit Wt.  Intercept   Angle  Pressure Constant Surface
 No.  (pcf)     (pcf)      (psf)     (deg)   Param.    (psf)     No.
  1   165.0     165.0      351.0     37.2    0.00       0.0       1
  2   130.0     130.0      400.0     32.0    0.00       0.0       1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00     1070.00
    2       1000.00     1070.00
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
```



```
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X =  120.00(ft)
                             and  X =  159.00(ft)
Each Surface Terminates Between  X =  610.00(ft)
                             and  X =  700.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
     Failure Surfaces Evaluated. They Are
     Ordered - Most Critical First.
     * * Safety Factors Are Calculated By The Modified Bishop Method * *
     Total Number of Trial Surfaces Attempted =  500
     Number of Trial Surfaces With Valid FS =  500
     Statistical Data On All Valid FS Values:
        FS Max =  1.806   FS Min =  1.404   FS Ave =  1.565
        Standard Deviation =  0.089   Coefficient of Variation =  5.70 %
     Failure Surface Specified By 15 Coordinate Points
       Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
         1        122.036     950.000
         2        171.777     944.918
         3        221.772     945.654
         4        271.342     952.198
         5        319.814     964.462
         6        366.532     982.279
         7        410.861    1005.407
         8        452.200    1033.533
         9        489.989    1066.276
        10        523.714    1103.189
        11        552.917    1143.774
        12        577.204    1187.480
        13        596.244    1233.713
        14        609.779    1281.846
        15        611.653    1293.641
     Circle Center At X =   190.466 ; Y =  1373.785 ; and Radius =  429.278
          Factor of Safety
        ***   1.404   ***
        Individual data on the   31  slices
                              Water   Water    Tie     Tie     Earthquake
                              Force   Force   Force   Force      Force     Surcharge
Slice  Width    Weight        Top     Bot     Norm    Tan      Hor     Ver     Load
No.    (ft)     (lbs)        (lbs)   (lbs)   (lbs)   (lbs)    (lbs)   (lbs)   (lbs)
 1     38.0    12148.8  ******* *******      0.      0.       0.0     0.0     0.0
 2     11.8    54478.2  ******* 91956.3      0.      0.       0.0     0.0     0.0
 3      0.7     6396.5 13287.0   5642.2      0.      0.       0.0     0.0     0.0
 4     49.3   444773.7  ******* *******      0.      0.       0.0     0.0     0.0
 5     10.7    94947.8 46861.0 83486.8       0.      0.       0.0     0.0     0.0
 6     12.5   159028.1  ******* 96068.0      0.      0.       0.0     0.0     0.0
 7     26.3   432639.6 32874.3  *******      0.      0.       0.0     0.0     0.0
 8     33.7   519508.1 42005.7  *******      0.      0.       0.0     0.0     0.0
 9     12.5   232453.3     0.0  86656.7      0.      0.       0.0     0.0     0.0
10      2.3    51867.5     0.0  15764.6      0.      0.       0.0     0.0     0.0
11     46.7   976115.4     0.0  *******      0.      0.       0.0     0.0     0.0
12     11.0   207861.9     0.0  65507.2      0.      0.       0.0     0.0     0.0
13     12.5   275833.8     0.0  69271.9      0.      0.       0.0     0.0     0.0
14     20.9   516436.2     0.0  *******      0.      0.       0.0     0.0     0.0
15     39.1   847778.8     0.0  *******      0.      0.       0.0     0.0     0.0
16      2.2    44156.0     0.0   6180.5      0.      0.       0.0     0.0     0.0
17     10.3   240307.5     0.0  27216.1      0.      0.       0.0     0.0     0.0
18     27.5   660542.5     0.0  35481.9      0.      0.       0.0     0.0     0.0
19      3.4    74033.7     0.0    586.2      0.      0.       0.0     0.0     0.0
20     29.1   547864.3     0.0      0.0      0.      0.       0.0     0.0     0.0
21      1.2    20005.2     0.0      0.0      0.      0.       0.0     0.0     0.0
22      6.3   113962.5     0.0      0.0      0.      0.       0.0     0.0     0.0
23      5.0   101045.0     0.0      0.0      0.      0.       0.0     0.0     0.0
24     17.9   338307.5     0.0      0.0      0.      0.       0.0     0.0     0.0
```

25	24.3	321105.5	0.0	0.0	0.	0.	0.0	0.0	0.0
26	17.5	106954.6	0.0	0.0	0.	0.	0.0	0.0	0.0
27	0.3	728.7	0.0	0.0	0.	0.	0.0	0.0	0.0
28	1.2	3682.1	0.0	0.0	0.	0.	0.0	0.0	0.0
29	3.8	16887.3	0.0	0.0	0.	0.	0.0	0.0	0.0
30	9.8	34411.1	0.0	0.0	0.	0.	0.0	0.0	0.0
31	1.9	1365.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.735	950.000
2	176.525	945.424
3	226.523	945.920
4	276.212	951.481
5	325.082	962.051
6	372.629	977.521
7	418.363	997.730
8	461.812	1022.472
9	502.529	1051.491
10	540.095	1084.488
11	574.123	1121.123
12	604.261	1161.019
13	630.199	1203.765
14	651.671	1248.920
15	668.455	1296.019
16	672.543	1312.670

Circle Center At X = 196.898 ; Y = 1436.454 ; and Radius = 491.480

Factor of Safety

*** 1.405 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	129.397	950.000
2	179.176	945.299
3	229.174	945.767
4	278.856	951.399
5	327.689	962.135
6	375.152	977.860
7	420.736	998.405
8	463.953	1023.550
9	504.341	1053.027
10	541.466	1086.519
11	574.931	1123.668
12	604.378	1164.077
13	629.492	1207.312
14	650.004	1252.911
15	665.694	1300.385
16	668.080	1311.275

Circle Center At X = 199.853 ; Y = 1427.188 ; and Radius = 482.361

Factor of Safety

*** 1.410 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.904	950.000
2	181.665	945.121
3	231.662	945.689
4	281.299	951.698
5	329.988	963.076
6	377.148	979.687
7	422.219	1001.334
8	464.665	1027.760
9	503.981	1058.651
10	539.700	1093.639
11	571.397	1132.308
12	598.695	1174.198
13	621.270	1218.812

14	638.853	1265.618
15	648.999	1305.312

Circle Center At X = 201.460 ; Y = 1403.221 ; and Radius = 458.527

Factor of Safety

*** 1.413 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.277	950.000
2	181.027	945.007
3	231.023	945.616
4	280.637	951.817
5	329.245	963.535
6	376.235	980.620
7	421.018	1002.858
8	463.029	1029.970
9	501.740	1061.615
10	536.666	1097.395
11	567.366	1136.860
12	593.456	1179.514
13	614.605	1224.821
14	630.550	1272.210
15	636.871	1301.522

Circle Center At X = 200.608 ; Y = 1390.493 ; and Radius = 445.916

Factor of Safety

*** 1.413 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	135.193	950.000
2	184.977	945.360
3	234.969	946.277
4	284.549	952.740
5	333.105	964.669
6	380.037	981.916
7	424.762	1004.268
8	466.729	1031.449
9	505.418	1063.122
10	540.351	1098.895
11	571.095	1138.326
12	597.270	1180.927
13	618.552	1226.171
14	634.679	1273.499
15	641.156	1302.861

Circle Center At X = 201.739 ; Y = 1394.608 ; and Radius = 449.560

Factor of Safety

*** 1.414 ***

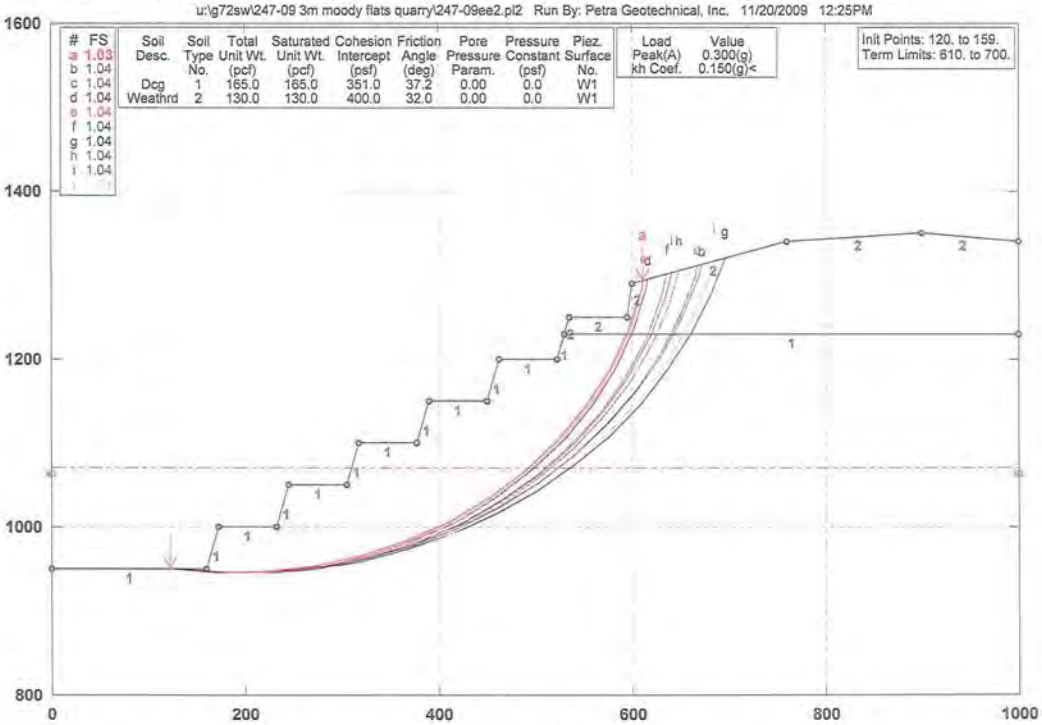
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.410	950.000
2	171.164	945.054
3	221.164	944.922
4	270.945	949.603
5	320.043	959.056
6	368.003	973.191
7	414.380	991.878
8	458.742	1014.943
9	500.678	1042.172
10	539.797	1073.312
11	575.737	1108.073
12	608.163	1146.133
13	636.774	1187.138
14	661.305	1230.706
15	681.527	1276.434
16	695.958	1319.987

Circle Center At X = 197.609 ; Y = 1462.769 ; and Radius = 516.400

JN 247-09 - Section E-E': GW at Elev. 1070': Global Stability - Seismic Anal.

u:\g72sw\247-09 3m moody flats quarry\247-09ee2.pl2 Run By: Petra Geotechnical, Inc. 11/20/2009 12:25PM



GSTABL7 v.2 FSmin=1.03

Safety Factors Are Calculated By The Modified Bishop Method

PETRA

u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee1.out Page 5

Factor of Safety
*** 1.414 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.663	950.000
2	172.388	944.770
3	222.388	944.504
4	272.166	949.204
5	321.232	958.825
6	369.100	973.270
7	415.297	992.397
8	459.365	1016.018
9	500.871	1043.898
10	539.403	1075.762
11	574.580	1111.295
12	606.054	1150.145
13	633.515	1191.929
14	656.690	1236.234
15	675.352	1282.621
16	685.245	1316.639

Circle Center At X = 200.259 ; Y = 1445.876 ; and Radius = 501.910

Factor of Safety
*** 1.416 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.964	950.000
2	180.712	944.984
3	230.704	945.849
4	280.248	952.584
5	328.658	965.095
6	375.261	983.209
7	419.413	1006.674
8	460.501	1035.166
9	497.955	1068.290
10	531.257	1105.586
11	559.944	1146.537
12	583.620	1190.577
13	601.956	1237.094
14	614.697	1285.443
15	616.045	1295.014

Circle Center At X = 198.372 ; Y = 1369.304 ; and Radius = 424.688

Factor of Safety
*** 1.416 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	135.506	950.000
2	185.302	945.483
3	235.281	946.908
4	284.739	954.255
5	332.974	967.420
6	379.306	986.218
7	423.080	1010.381
8	463.676	1039.570
9	500.520	1073.370
10	533.092	1111.305
11	560.932	1152.838
12	583.645	1197.381
13	600.911	1244.306
14	612.485	1292.948
15	612.599	1293.937

Circle Center At X = 198.328 ; Y = 1365.796 ; and Radius = 420.515

Factor of Safety
*** 1.417 ***

**** END OF GSTABL7 OUTPUT ****

```
                              *** GSTABL7 ***
                        ** GSTABL7 by Garry H. Gregory, P.E. **
      ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
                    (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                        SLOPE STABILITY ANALYSIS SYSTEM
          Modified Bishop, Simplified Janbu, or GLE Method of Slices.
          (Includes Spencer & Morgenstern-Price Type Analysis)
          Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
          Nonlinear Undrained Shear Strength, Curved Phi Envelope,
          Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
          Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:25PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee2.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee2.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee2.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section E-E': GW at Elev.
                      1070': Global Stability - Seismic Anal.
BOUNDARY COORDINATES
   18 Top   Boundaries
   19 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
  No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
   1          0.00      950.00      160.00      950.00         1
   2        160.00      950.00      172.50     1000.00         1
   3        172.50     1000.00      232.50     1000.00         1
   4        232.50     1000.00      245.00     1050.00         1
   5        245.00     1050.00      305.00     1050.00         1
   6        305.00     1050.00      317.50     1100.00         1
   7        317.50     1100.00      377.50     1100.00         1
   8        377.50     1100.00      390.00     1150.00         1
   9        390.00     1150.00      450.00     1150.00         1
  10        450.00     1150.00      462.50     1200.00         1
  11        462.50     1200.00      522.50     1200.00         1
  12        522.50     1200.00      530.00     1230.00         1
  13        530.00     1230.00      535.00     1250.00         2
  14        535.00     1250.00      595.00     1250.00         2
  15        595.00     1250.00      600.00     1290.00         2
  16        600.00     1290.00      760.00     1340.00         2
  17        760.00     1340.00      900.00     1350.00         2
  18        900.00     1350.00     1000.00     1340.00         2
  19        530.00     1230.00     1000.00     1230.00         1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.
   1   165.0    165.0     351.0     37.2    0.00       0.0      1
   2   130.0    130.0     400.0     32.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  2 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00     1070.00
     2       1000.00     1070.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
```



```
 Specified Seismic Pore-Pressure Factor =   0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
  500 Trial Surfaces Have Been Generated.
    2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
 Along The Ground Surface Between  X = 120.00(ft)
                                and  X = 159.00(ft)
 Each Surface Terminates Between   X = 610.00(ft)
                                and  X = 700.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =      0.00(ft)
 50.00(ft) Line Segments Define Each Trial Failure Surface.
 Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =   500
      Number of Trial Surfaces With Valid FS =   500
      Statistical Data On All Valid FS Values:
        FS Max =   1.364   FS Min =   1.029   FS Ave =   1.166
        Standard Deviation =   0.073   Coefficient of Variation =   6.30 %
      Failure Surface Specified By 15 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1        122.036     950.000
          2        171.777     944.918
          3        221.772     945.654
          4        271.342     952.198
          5        319.814     964.462
          6        366.532     982.279
          7        410.861    1005.407
          8        452.200    1033.533
          9        489.989    1066.276
         10        523.714    1103.189
         11        552.917    1143.774
         12        577.204    1187.480
         13        596.244    1233.713
         14        609.779    1281.846
         15        611.653    1293.641
      Circle Center At X =   190.466 ; Y =  1373.785 ; and Radius =   429.274
           Factor of Safety
            ***   1.029   ***
           Individual data on the   31  slices
                                Water     Water      Tie       Tie      Earthquake
                                Force     Force      Force     Force        Force    Surcharge
 Slice  Width    Weight         Top       Bot        Norm      Tan          Hor      Ver      Load
 No.    (ft)     (lbs)         (lbs)     (lbs)      (lbs)     (lbs)        (lbs)    (lbs)    (lbs)
   1     38.0    12148.8  *******   *******          0.        0.         1822.3     0.0      0.0
   2     11.8    54478.2  *******   91956.3          0.        0.         8171.7     0.0      0.0
   3      0.7     6396.5  13287.0    5642.2          0.        0.          959.5     0.0      0.0
   4     49.3   444773.7  *******   *******          0.        0.        66716.1     0.0      0.0
   5     10.7    94947.8  46961.0   83486.8          0.        0.        14242.2     0.0      0.0
   6     12.5   159028.1  *******   96068.0          0.        0.        23854.2     0.0      0.0
   7     26.3   432639.6  32874.3   *******          0.        0.        64895.9     0.0      0.0
   8     33.7   519508.1  42005.7   *******          0.        0.        77926.2     0.0      0.0
   9     12.5   232453.3      0.0   86656.7          0.        0.        34868.0     0.0      0.0
  10      2.3    51867.5      0.0   15764.6          0.        0.         7780.1     0.0      0.0
  11     46.7   976115.4      0.0   *******          0.        0.   *********        0.0      0.0
  12     11.0   207861.9      0.0   65507.2          0.        0.        31179.3     0.0      0.0
  13     12.5   275833.8      0.0   69271.9          0.        0.        41375.1     0.0      0.0
  14     20.9   516436.2      0.0   *******          0.        0.        77465.4     0.0      0.0
  15     39.1   847778.8      0.0   *******          0.        0.   *********        0.0      0.0
  16      2.2    44156.0      0.0    6180.5          0.        0.         6623.4     0.0      0.0
  17     10.3   240307.5      0.0   27216.1          0.        0.        36046.1     0.0      0.0
  18     27.5   660542.5      0.0   35481.9          0.        0.        99081.4     0.0      0.0
  19      3.4    74033.7      0.0     586.2          0.        0.        11105.1     0.0      0.0
  20     29.1   547864.3      0.0       0.0          0.        0.        82179.6     0.0      0.0
```

21	1.2	20005.2	0.0	0.0	0.	0.	3000.8	0.0	0.0
22	6.3	113962.5	0.0	0.0	0.	0.	17094.4	0.0	0.0
23	5.0	101045.0	0.0	0.0	0.	0.	15156.7	0.0	0.0
24	17.9	338307.5	0.0	0.0	0.	0.	50746.1	0.0	0.0
25	24.3	321105.5	0.0	0.0	0.	0.	48165.8	0.0	0.0
26	17.5	106954.6	0.0	0.0	0.	0.	16043.2	0.0	0.0
27	0.3	728.7	0.0	0.0	0.	0.	109.3	0.0	0.0
28	1.2	3682.1	0.0	0.0	0.	0.	552.3	0.0	0.0
29	3.8	16887.3	0.0	0.0	0.	0.	2533.1	0.0	0.0
30	9.8	34411.1	0.0	0.0	0.	0.	5161.7	0.0	0.0
31	1.9	1365.5	0.0	0.0	0.	0.	204.8	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.735	950.000
2	176.525	945.424
3	226.523	945.920
4	276.212	951.481
5	325.082	962.051
6	372.629	977.521
7	418.363	997.730
8	461.812	1022.472
9	502.529	1051.491
10	540.095	1084.488
11	574.123	1121.123
12	604.261	1161.019
13	630.199	1203.765
14	651.671	1248.920
15	668.455	1296.019
16	672.543	1312.670

Circle Center At X = 196.898 ; Y = 1436.454 ; and Radius = 491.488

Factor of Safety

*** 1.035 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	129.397	950.000
2	179.176	945.299
3	229.174	945.767
4	278.856	951.399
5	327.689	962.135
6	375.152	977.860
7	420.736	998.405
8	463.953	1023.550
9	504.341	1053.027
10	541.466	1086.519
11	574.931	1123.668
12	604.378	1164.077
13	629.492	1207.312
14	650.004	1252.911
15	665.694	1300.385
16	668.080	1311.275

Circle Center At X = 199.853 ; Y = 1427.188 ; and Radius = 482.361

Factor of Safety

*** 1.039 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.964	950.000
2	180.712	944.984
3	230.704	945.849
4	280.248	952.584
5	328.658	965.095
6	375.261	983.209
7	419.413	1006.674
8	460.501	1035.166
9	497.955	1068.290

10	531.257	1105.586
11	559.944	1146.537
12	583.620	1190.577
13	601.956	1237.094
14	614.697	1285.443
15	616.045	1295.014

Circle Center At X = 198.372 ; Y = 1369.304 ; and Radius = 424.688

Factor of Safety

*** 1.040 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	135.506	950.000
2	185.302	945.483
3	235.281	946.908
4	284.739	954.255
5	332.974	967.420
6	379.306	986.218
7	423.080	1010.381
8	463.676	1039.570
9	500.520	1073.370
10	533.092	1111.305
11	560.932	1152.838
12	583.645	1197.381
13	600.911	1244.306
14	612.485	1292.948
15	612.599	1293.937

Circle Center At X = 198.328 ; Y = 1365.796 ; and Radius = 420.515

Factor of Safety

*** 1.041 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.277	950.000
2	181.027	945.007
3	231.023	945.616
4	280.637	951.817
5	329.245	963.535
6	376.235	980.620
7	421.018	1002.858
8	463.029	1029.970
9	501.740	1061.615
10	536.666	1097.395
11	567.366	1136.860
12	593.456	1179.514
13	614.605	1224.821
14	630.550	1272.210
15	636.871	1301.522

Circle Center At X = 200.608 ; Y = 1390.493 ; and Radius = 445.916

Factor of Safety

*** 1.041 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.410	950.000
2	171.164	945.054
3	221.164	944.922
4	270.945	949.603
5	320.043	959.056
6	368.003	973.191
7	414.380	991.878
8	458.742	1014.943
9	500.678	1042.172
10	539.797	1073.312
11	575.737	1108.073
12	608.163	1146.133
13	636.774	1187.138

14	661.305	1230.706
15	681.527	1276.434
16	695.958	1319.987

Circle Center At X = 197.609 ; Y = 1462.769 ; and Radius = 518.400

Factor of Safety

*** 1.041 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.904	950.000
2	181.665	945.121
3	231.662	945.689
4	281.299	951.698
5	329.988	963.076
6	377.148	979.687
7	422.219	1001.334
8	464.665	1027.760
9	503.981	1058.651
10	539.700	1093.639
11	571.397	1132.308
12	598.695	1174.198
13	621.270	1218.812
14	638.853	1265.618
15	648.999	1305.312

Circle Center At X = 201.460 ; Y = 1403.221 ; and Radius = 458.527

Factor of Safety

*** 1.041 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	135.193	950.000
2	184.977	945.360
3	234.969	946.277
4	284.549	952.740
5	333.105	964.669
6	380.037	981.916
7	424.762	1004.268
8	466.729	1031.449
9	505.418	1063.122
10	540.351	1098.895
11	571.095	1138.326
12	597.270	1180.927
13	618.552	1226.171
14	634.679	1273.499
15	641.156	1302.861

Circle Center At X = 201.739 ; Y = 1394.608 ; and Radius = 449.580

Factor of Safety

*** 1.041 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.663	950.000
2	172.388	944.770
3	222.388	944.504
4	272.166	949.204
5	321.232	958.825
6	369.100	973.270
7	415.297	992.397
8	459.365	1016.018
9	500.871	1043.898
10	539.403	1075.762
11	574.580	1111.295
12	606.054	1150.145
13	633.515	1191.929
14	656.690	1236.234
15	675.352	1282.621
16	685.245	1316.639

Circle Center At X = 200.259 ; Y = 1445.876 ; and Radius = 501.910

Factor of Safety

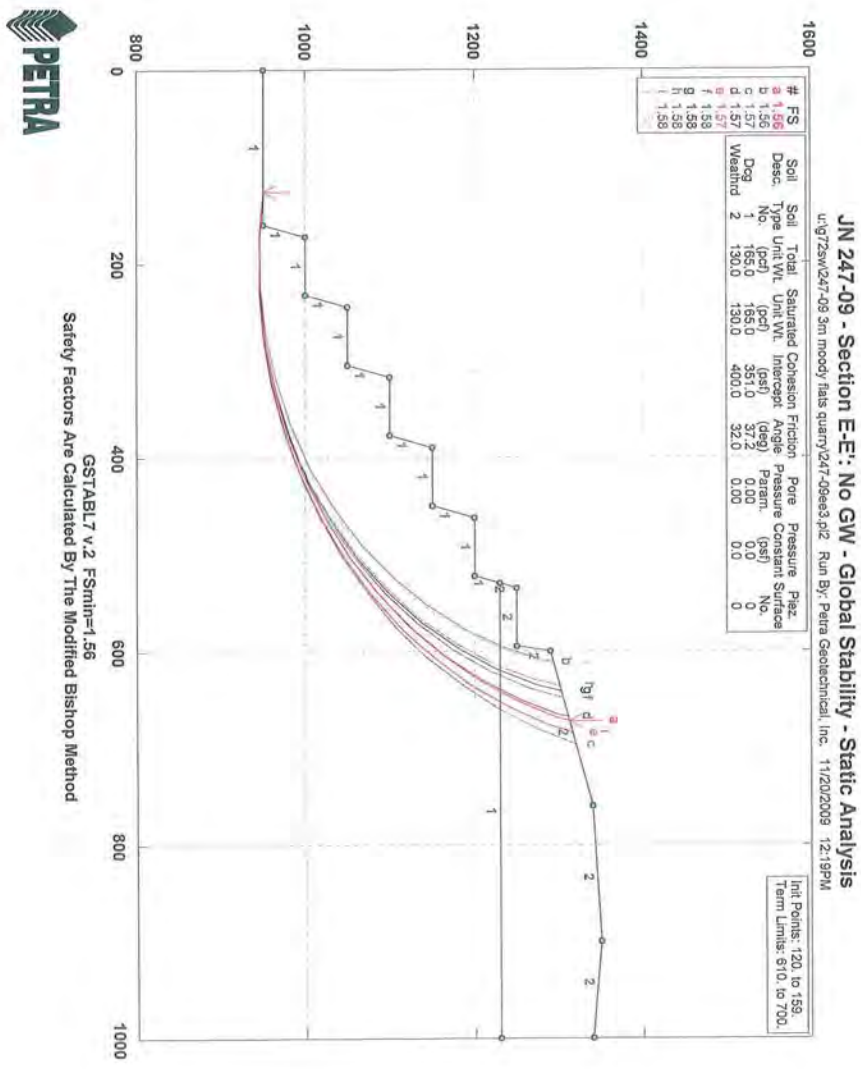
*** 1.043 ***

**** END OF GSTABL7 OUTPUT ****

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
                  (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                        SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************

Analysis Run Date:          11/20/2009
Time of Run:                12:19PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee3.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee3.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee3.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section E-E': No GW -
                      Global Stability - Static Analysis

BOUNDARY COORDINATES
   18 Top   Boundaries
   19 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1          0.00      950.00      160.00      950.00         1
    2        160.00      950.00      172.50     1000.00         1
    3        172.50     1000.00      232.50     1000.00         1
    4        232.50     1000.00      245.00     1050.00         1
    5        245.00     1050.00      305.00     1050.00         1
    6        305.00     1050.00      317.50     1100.00         1
    7        317.50     1100.00      377.50     1100.00         1
    8        377.50     1100.00      390.00     1150.00         1
    9        390.00     1150.00      450.00     1150.00         1
   10        450.00     1150.00      462.50     1200.00         1
   11        462.50     1200.00      522.50     1200.00         1
   12        522.50     1200.00      530.00     1230.00         1
   13        530.00     1230.00      535.00     1250.00         2
   14        535.00     1250.00      595.00     1250.00         2
   15        595.00     1250.00      600.00     1290.00         2
   16        600.00     1290.00      760.00     1340.00         2
   17        760.00     1340.00      900.00     1350.00         2
   18        900.00     1350.00     1000.00     1340.00         2
   19        530.00     1230.00     1000.00     1230.00         1
User Specified Y-Origin =          900.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
Soil  Total  Saturated  Cohesion  Friction   Pore   Pressure  Piez.
Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.
  1   165.0    165.0     351.0     37.2     0.00      0.0       0
  2   130.0    130.0     400.0     32.0     0.00      0.0       0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X = 120.00(ft)
                              and  X = 159.00(ft)
Each Surface Terminates Between   X = 610.00(ft)
                              and  X = 700.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =       0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
```



Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 500
Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 2.088 FS Min = 1.561 FS Ave = 1.774
Standard Deviation = 0.118 Coefficient of Variation = 6.63 %
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.735	950.000
2	176.525	945.424
3	226.523	945.920
4	276.212	951.481
5	325.082	962.051
6	372.629	977.521
7	418.363	997.730
8	461.812	1022.472
9	502.529	1051.491
10	540.095	1084.488
11	574.123	1121.123
12	604.261	1161.019
13	630.199	1203.765
14	651.671	1248.920
15	668.455	1296.019
16	672.543	1312.670

Circle Center At X = 196.898 ; Y = 1436.454 ; and Radius = 491.488
Factor of Safety
*** 1.561 ***
Individual data on the 31 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	33.3	8389.2	0.0	0.0	0.	0.	0.0	0.0	0.0
2	12.5	59052.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.0	36122.4	0.0	0.0	0.	0.	0.0	0.0	0.0
4	50.0	448182.0	0.0	0.0	0.	0.	0.0	0.0	0.0
5	6.0	53008.0	0.0	0.0	0.	0.	0.0	0.0	0.0
6	12.5	160280.2	0.0	0.0	0.	0.	0.0	0.0	0.0
7	31.2	516370.7	0.0	0.0	0.	0.	0.0	0.0	0.0
8	28.8	453173.3	0.0	0.0	0.	0.	0.0	0.0	0.0
9	12.5	239127.6	0.0	0.0	0.	0.	0.0	0.0	0.0
10	7.6	173612.5	0.0	0.0	0.	0.	0.0	0.0	0.0
11	47.5	1021558.6	0.0	0.0	0.	0.	0.0	0.0	0.0
12	4.9	97571.2	0.0	0.0	0.	0.	0.0	0.0	0.0
13	12.5	294040.7	0.0	0.0	0.	0.	0.0	0.0	0.0
14	28.4	741927.9	0.0	0.0	0.	0.	0.0	0.0	0.0
15	31.6	747849.1	0.0	0.0	0.	0.	0.0	0.0	0.0
16	11.8	301148.9	0.0	0.0	0.	0.	0.0	0.0	0.0
17	0.7	19966.8	0.0	0.0	0.	0.	0.0	0.0	0.0
18	40.0	1075094.0	0.0	0.0	0.	0.	0.0	0.0	0.0
19	20.0	460457.2	0.0	0.0	0.	0.	0.0	0.0	0.0
20	7.5	176558.1	0.0	0.0	0.	0.	0.0	0.0	0.0
21	5.0	132051.3	0.0	0.0	0.	0.	0.0	0.0	0.0
22	5.1	137463.9	0.0	0.0	0.	0.	0.0	0.0	0.0
23	34.0	802604.5	0.0	0.0	0.	0.	0.0	0.0	0.0
24	20.9	381734.7	0.0	0.0	0.	0.	0.0	0.0	0.0
25	5.0	90292.5	0.0	0.0	0.	0.	0.0	0.0	0.0
26	4.3	84081.3	0.0	0.0	0.	0.	0.0	0.0	0.0
27	25.9	424231.4	0.0	0.0	0.	0.	0.0	0.0	0.0
28	12.5	142772.0	0.0	0.0	0.	0.	0.0	0.0	0.0
29	9.0	76350.7	0.0	0.0	0.	0.	0.0	0.0	0.0
30	16.8	79202.0	0.0	0.0	0.	0.	0.0	0.0	0.0
31	4.1	4085.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.036	950.000
2	171.777	944.918
3	221.772	945.654
4	271.342	952.198
5	319.814	964.462
6	366.532	982.279
7	410.861	1005.407
8	452.200	1033.533
9	489.989	1066.276
10	523.714	1103.189
11	552.917	1143.774
12	577.204	1187.480
13	596.244	1233.713
14	609.779	1281.846
15	611.653	1293.641

Circle Center At X = 190.466 ; Y = 1373.705 ; and Radius = 429.274
Factor of Safety
*** 1.563 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.410	950.000
2	171.164	945.054
3	221.164	944.922
4	270.945	949.603
5	320.043	959.056
6	368.003	973.191
7	414.380	991.878
8	458.742	1014.943
9	500.678	1042.172
10	539.797	1073.312
11	575.737	1108.073
12	608.163	1146.133
13	636.774	1187.138
14	661.305	1230.706
15	681.527	1276.434
16	695.958	1319.987

Circle Center At X = 197.609 ; Y = 1462.769 ; and Radius = 518.400
Factor of Safety
*** 1.568 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	129.397	950.000
2	179.176	945.299
3	229.174	945.767
4	278.856	951.399
5	327.689	962.135
6	375.152	977.860
7	420.736	998.405
8	463.953	1023.550
9	504.341	1053.027
10	541.466	1086.519
11	574.931	1123.668
12	604.378	1164.077
13	629.492	1207.312
14	650.004	1252.911
15	665.694	1300.385
16	668.080	1311.275

Circle Center At X = 199.853 ; Y = 1427.188 ; and Radius = 482.361
Factor of Safety
*** 1.569 ***
Failure Surface Specified By 16 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	122.663	950.000
2	172.388	944.770
3	222.388	944.504
4	272.166	949.204
5	321.232	958.825
6	369.100	973.270
7	415.297	992.397
8	459.365	1016.018
9	500.871	1043.898
10	539.403	1075.762
11	574.580	1111.295
12	606.054	1150.145
13	633.515	1191.929
14	656.690	1236.234
15	675.352	1282.621
16	685.245	1316.639

Circle Center At X = 200.259 ; Y = 1445.876 ; and Radius = 501.910

Factor of Safety

*** 1.573 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.904	950.000
2	181.665	945.121
3	231.662	945.689
4	281.299	951.698
5	329.988	963.076
6	377.148	979.687
7	422.219	1001.334
8	464.665	1027.760
9	503.981	1058.651
10	539.700	1093.639
11	571.397	1132.308
12	598.695	1174.198
13	621.270	1218.812
14	638.853	1265.618
15	648.999	1305.312

Circle Center At X = 201.460 ; Y = 1403.221 ; and Radius = 458.527

Factor of Safety

*** 1.575 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	135.193	950.000
2	184.977	945.360
3	234.969	946.277
4	284.549	952.740
5	333.105	964.669
6	380.037	981.916
7	424.762	1004.268
8	466.729	1031.449
9	505.418	1063.122
10	540.351	1098.895
11	571.095	1138.326
12	597.270	1180.927
13	618.552	1226.171
14	634.679	1273.499
15	641.156	1302.861

Circle Center At X = 201.739 ; Y = 1394.608 ; and Radius = 449.560

Factor of Safety

*** 1.576 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	131.277	950.000
2	181.027	945.007

3	231.023	945.616
4	280.637	951.817
5	329.245	963.535
6	376.235	980.620
7	421.018	1002.858
8	463.029	1029.970
9	501.740	1061.615
10	536.666	1097.395
11	567.366	1136.860
12	593.456	1179.514
13	614.605	1224.821
14	630.550	1272.210
15	636.871	1301.522

Circle Center At X = 200.608 ; Y = 1390.493 ; and Radius = 445.916

Factor of Safety

*** 1.577 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	129.711	950.000
2	179.470	945.097
3	229.470	945.212
4	279.206	950.345
5	328.175	960.442
6	375.885	975.403
7	421.852	995.076
8	465.613	1019.262
9	506.726	1047.718
10	544.775	1080.156
11	579.378	1116.248
12	610.184	1155.631
13	636.882	1197.906
14	659.203	1242.647
15	676.921	1289.403
16	684.123	1316.288

Circle Center At X = 203.577 ; Y = 1440.919 ; and Radius = 496.445

Factor of Safety

*** 1.579 ***

Failure Surface Specified By 15 Coordinate Points

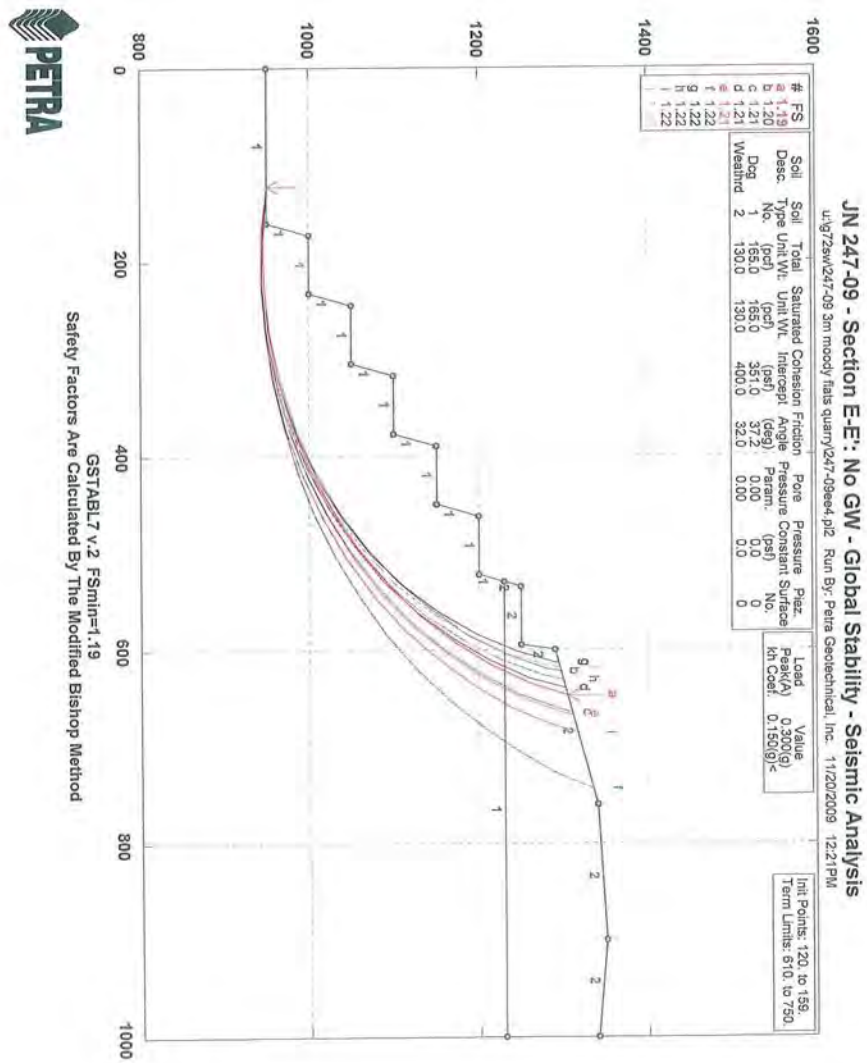
Point No.	X-Surf (ft)	Y-Surf (ft)
1	135.506	950.000
2	185.302	945.483
3	235.281	946.908
4	284.739	954.255
5	332.974	967.420
6	379.306	986.218
7	423.080	1010.381
8	463.676	1039.570
9	500.520	1073.370
10	533.092	1111.305
11	560.932	1152.838
12	583.645	1197.381
13	600.911	1244.306
14	612.485	1292.948
15	612.599	1293.937

Circle Center At X = 198.328 ; Y = 1365.796 ; and Radius = 420.514

Factor of Safety

*** 1.580 ***

**** END OF GSTABL7 OUTPUT ****




```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
          (All Rights Reserved-Unauthorized Use Prohibited)
*****************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
     Modified Bishop, Simplified Janbu, or GLE Method of Slices.
     (Includes Spencer & Morgenstern-Price Type Analysis)
     Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
     Nonlinear Undrained Shear Strength, Curved Phi Envelope,
     Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
     Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*****************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:21PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee4.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee4.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09ee4.PLT
PROBLEM DESCRIPTION:  JN 247-09 - Section E-E': No GW -
                      Global Stability - Seismic Analysis
BOUNDARY COORDINATES
   18 Top   Boundaries
   19 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
  No.        (ft)        (ft)        (ft)        (ft)       Below Bnd
   1          0.00      950.00      160.00      950.00         1
   2        160.00      950.00      172.50     1000.00         1
   3        172.50     1000.00      232.50     1000.00         1
   4        232.50     1000.00      245.00     1050.00         1
   5        245.00     1050.00      305.00     1050.00         1
   6        305.00     1050.00      317.50     1100.00         1
   7        317.50     1100.00      377.50     1100.00         1
   8        377.50     1100.00      390.00     1150.00         1
   9        390.00     1150.00      450.00     1150.00         1
  10        450.00     1150.00      462.50     1200.00         1
  11        462.50     1200.00      522.50     1200.00         1
  12        522.50     1200.00      530.00     1230.00         1
  13        530.00     1230.00      535.00     1250.00         2
  14        535.00     1250.00      595.00     1250.00         2
  15        595.00     1250.00      600.00     1290.00         2
  16        600.00     1290.00      760.00     1340.00         2
  17        760.00     1340.00      900.00     1350.00         2
  18        900.00     1350.00     1000.00     1340.00         2
  19        530.00     1230.00     1000.00     1230.00         1
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   165.0    165.0     351.0     37.2     0.00      0.0       0
  2   130.0    130.0     400.0     32.0     0.00      0.0       0
Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X = 120.00(ft)
                              and  X = 159.00(ft)
Each Surface Terminates Between   X = 610.00(ft)
```

and X = 750.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 500
Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 1.699 FS Min = 1.194 FS Ave = 1.417
Standard Deviation = 0.114 Coefficient of Variation = 8.03 %
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.036	950.000
2	171.806	945.209
3	221.803	945.747
4	271.459	951.607
5	320.207	962.723
6	367.495	978.968
7	412.783	1000.158
8	455.556	1026.051
9	495.328	1056.353
10	531.646	1090.719
11	564.096	1128.757
12	592.311	1170.036
13	615.968	1214.086
14	634.798	1260.404
15	647.554	1304.861

Circle Center At X = 191.770 ; Y = 1413.527 ; and Radius = 468.744
Factor of Safety
*** 1.194 ***
Individual data on the 30 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	38.0	11445.3	0.0	0.0	0.	0.	1716.8	0.0	0.0
2	11.8	54221.9	0.0	0.0	0.	0.	8133.3	0.0	0.0
3	0.7	6114.2	0.0	0.0	0.	0.	917.1	0.0	0.0
4	49.3	443506.2	0.0	0.0	0.	0.	66525.9	0.0	0.0
5	10.7	94641.2	0.0	0.0	0.	0.	14196.2	0.0	0.0
6	12.5	159334.2	0.0	0.0	0.	0.	23900.1	0.0	0.0
7	26.5	436365.6	0.0	0.0	0.	0.	65454.8	0.0	0.0
8	33.5	523374.6	0.0	0.0	0.	0.	78506.2	0.0	0.0
9	12.5	235783.5	0.0	0.0	0.	0.	35367.5	0.0	0.0
10	2.7	61458.8	0.0	0.0	0.	0.	9218.8	0.0	0.0
11	47.3	1007713.6	0.0	0.0	0.	0.	*******	0.0	0.0
12	10.0	195946.3	0.0	0.0	0.	0.	29391.9	0.0	0.0
13	12.5	285503.3	0.0	0.0	0.	0.	42825.5	0.0	0.0
14	22.8	583307.9	0.0	0.0	0.	0.	87496.2	0.0	0.0
15	37.2	850985.1	0.0	0.0	0.	0.	*******	0.0	0.0
16	5.6	125350.5	0.0	0.0	0.	0.	18802.6	0.0	0.0
17	6.9	180366.7	0.0	0.0	0.	0.	27055.0	0.0	0.0
18	32.8	845807.6	0.0	0.0	0.	0.	*******	0.0	0.0
19	27.2	586395.0	0.0	0.0	0.	0.	87959.2	0.0	0.0
20	7.5	160116.1	0.0	0.0	0.	0.	24017.4	0.0	0.0
21	1.6	38731.5	0.0	0.0	0.	0.	5809.7	0.0	0.0
22	3.4	81798.8	0.0	0.0	0.	0.	12269.8	0.0	0.0
23	29.1	643576.2	0.0	0.0	0.	0.	96536.4	0.0	0.0
24	28.2	448596.6	0.0	0.0	0.	0.	67289.5	0.0	0.0
25	2.7	32488.1	0.0	0.0	0.	0.	4873.2	0.0	0.0
26	5.0	67498.8	0.0	0.0	0.	0.	10124.8	0.0	0.0
27	16.0	210826.3	0.0	0.0	0.	0.	31623.9	0.0	0.0
28	6.5	64007.1	0.0	0.0	0.	0.	9601.1	0.0	0.0

29	12.4	86355.1	0.0	0.0	0.	0.	12953.3	0.0	0.0
30	12.8	33554.5	0.0	0.0	0.	0.	5033.2	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.422	950.000
2	176.225	945.571
3	226.210	946.791
4	275.738	953.645
5	324.176	966.045
6	370.905	983.833
7	415.328	1006.781
8	456.876	1034.597
9	495.020	1066.924
10	529.271	1103.350
11	559.193	1143.409
12	584.401	1186.589
13	604.576	1232.339
14	619.457	1280.073
15	622.716	1297.099

Circle Center At X = 190.442 ; Y = 1387.637 ; and Radius = 442.298
Factor of Safety
*** 1.197 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.446	950.000
2	173.150	944.572
3	223.150	944.362
4	272.898	949.372
5	321.852	959.546
6	369.477	974.774
7	415.252	994.890
8	458.677	1019.673
9	499.279	1048.854
10	536.614	1082.112
11	570.273	1119.086
12	599.890	1159.371
13	625.140	1202.527
14	645.748	1248.082
15	661.489	1295.540
16	664.705	1310.220

Circle Center At X = 200.379 ; Y = 1421.155 ; and Radius = 477.394
Factor of Safety
*** 1.210 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.626	950.000
2	170.283	944.146
3	220.281	943.813
4	270.011	949.007
5	318.862	959.663
6	366.237	975.651
7	411.556	996.774
8	454.263	1022.776
9	493.837	1053.336
10	529.792	1088.082
11	561.688	1126.587
12	589.134	1168.380
13	611.796	1212.950
14	629.394	1259.751
15	640.286	1302.589

Circle Center At X = 198.281 ; Y = 1395.154 ; and Radius = 451.876
Factor of Safety
*** 1.213 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	132.060	950.000
2	181.822	945.121
3	231.820	945.467
4	281.509	951.035
5	330.345	961.764
6	377.792	977.535
7	423.332	998.178
8	466.467	1023.464
9	506.723	1053.119
10	543.662	1086.817
11	576.877	1124.190
12	606.007	1164.829
13	630.732	1208.287
14	650.781	1254.092
15	665.935	1301.740
16	667.888	1311.215

Circle Center At X = 203.691 ; Y = 1421.775 ; and Radius = 477.102

Factor of Safety

*** 1.214 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.410	950.000
2	171.175	945.165
3	221.173	944.698
4	271.020	948.604
5	320.335	956.853
6	368.740	969.382
7	415.865	986.094
8	461.348	1006.861
9	504.841	1031.525
10	546.012	1059.897
11	584.545	1091.760
12	620.144	1126.869
13	652.539	1164.956
14	681.480	1205.729
15	706.745	1248.876
16	728.142	1294.066
17	743.211	1334.753

Circle Center At X = 201.499 ; Y = 1515.763 ; and Radius = 571.404

Factor of Safety

*** 1.215 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	135.663	950.000
2	185.459	945.488
3	235.439	946.903
4	284.900	954.226
5	333.145	967.353
6	379.498	986.101
7	423.304	1010.205
8	463.948	1039.326
9	500.859	1073.054
10	533.516	1110.916
11	561.461	1152.378
12	584.300	1196.857
13	601.713	1243.727
14	613.453	1292.329
15	613.684	1294.276

Circle Center At X = 198.538 ; Y = 1366.835 ; and Radius = 421.551

Factor of Safety

*** 1.218 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

No.	(ft)	(ft)
1	132.060	950.000
2	181.786	944.767
3	231.783	945.252
4	281.398	951.448
5	329.979	963.275
6	376.890	980.576
7	421.517	1003.126
8	463.273	1030.629
9	501.612	1062.724
10	536.032	1098.990
11	566.081	1138.954
12	591.366	1182.089
13	611.554	1227.832
14	626.382	1275.583
15	630.927	1299.665

Circle Center At X = 202.556 ; Y = 1381.016 ; and Radius = 436.743

Factor of Safety

*** 1.223 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	128.614	950.000
2	178.310	944.490
3	228.308	944.030
4	278.096	948.622
5	327.166	958.222
6	375.015	972.729
7	421.154	991.996
8	465.110	1015.826
9	506.434	1043.975
10	544.702	1076.154
11	579.524	1112.035
12	610.543	1151.251
13	637.441	1193.399
14	659.943	1238.049
15	677.820	1284.744
16	686.567	1317.052

Circle Center At X = 208.068 ; Y = 1436.819 ; and Radius = 493.260

Factor of Safety

*** 1.224 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.964	950.000
2	180.677	944.651
3	230.674	945.184
4	280.262	951.592
5	328.752	963.787
6	375.472	981.598
7	419.773	1004.780
8	461.041	1033.010
9	498.704	1065.897
10	532.238	1102.984
11	561.178	1143.757
12	585.124	1187.650
13	603.742	1234.054
14	616.775	1282.326
15	618.764	1295.864

Circle Center At X = 201.157 ; Y = 1368.643 ; and Radius = 424.487

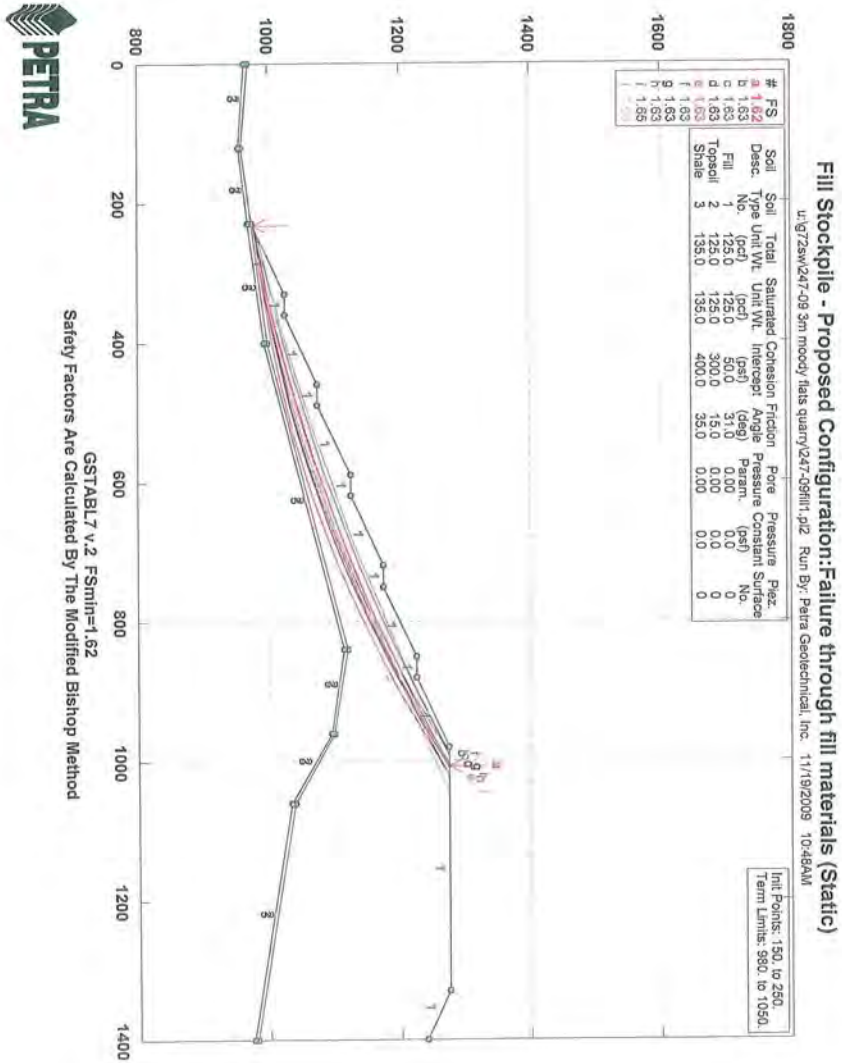
Factor of Safety

*** 1.225 ***

**** END OF GSTABL7 OUTPUT ****

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
    ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
                  (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
        Modified Bishop, Simplified Janbu, or GLE Method of Slices.
        (Includes Spencer & Morgenstern-Price Type Analysis)
        Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
        Nonlinear Undrained Shear Strength, Curved Phi Envelope,
        Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
        Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/19/2009
Time of Run:                10:48AM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        e:\247-09\247-09fill1.in
Output Filename:            e:\247-09\247-09fill1.OUT
Unit System:                English
Plotted Output Filename:    e:\247-09\247-09fill1.PLT
PROBLEM DESCRIPTION:  Fill Stockpile - Proposed Configuration:
                      Failure through fill materials (Static)

BOUNDARY COORDINATES
   15 Top   Boundaries
   27 Total Boundaries
Boundary     X-Left      Y-Left      X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1          0.00      970.00      120.00      960.00          2
    2        120.00      960.00      230.00      975.00          2
    3        230.00      975.00      330.00     1025.00          1
    4        330.00     1025.00      360.00     1025.00          1
    5        360.00     1025.00      460.00     1075.00          1
    6        460.00     1075.00      490.00     1075.00          1
    7        490.00     1075.00      590.00     1125.00          1
    8        590.00     1125.00      620.00     1125.00          1
    9        620.00     1125.00      720.00     1175.00          1
   10        720.00     1175.00      750.00     1175.00          1
   11        750.00     1175.00      850.00     1225.00          1
   12        850.00     1225.00      880.00     1225.00          1
   13        880.00     1225.00      980.00     1275.00          1
   14        980.00     1275.00     1330.00     1275.00          1
   15       1330.00     1275.00     1400.00     1240.00          1
   16        230.00      975.00      400.00     1000.00          2
   17        400.00     1000.00      840.00     1120.00          2
   18        840.00     1120.00      960.00     1100.00          2
   19        960.00     1100.00     1060.00     1040.00          2
   20       1060.00     1040.00     1400.00      980.00          2
   21          0.00      965.00      120.00      955.00          3
   22        120.00      955.00      230.00      970.00          3
   23        230.00      970.00      400.00      995.00          3
   24        400.00      995.00      840.00     1115.00          3
   25        840.00     1115.00      960.00     1095.00          3
   26        960.00     1095.00     1060.00     1035.00          3
   27       1060.00     1035.00     1400.00      975.00          3
 User Specified Y-Origin =        800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)    No.
   1  125.0    125.0      50.0      31.0    0.00      0.0      0
   2  125.0    125.0     300.0      15.0    0.00      0.0      0
   3  135.0    135.0     400.0      35.0    0.00      0.0      0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
```



PETRA

GSTABL7 v.2 FSmin=1.62
Safety Factors Are Calculated By The Modified Bishop Method

```
 500 Trial Surfaces Have Been Generated.
   2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
Along The Ground Surface Between  X = 150.00(ft)
                            and   X = 250.00(ft)
Each Surface Terminates Between   X = 980.00(ft)
                            and   X =1050.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
50.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =   500
      Number of Trial Surfaces With Valid FS =  500
      Statistical Data On All Valid FS Values:
         FS Max =  3.697   FS Min =  1.620   FS Ave =  2.029
         Standard Deviation =   0.565   Coefficient of Variation =   19.99 %
      Failure Surface Specified By 18 Coordinate Points
        Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
          1       232.732     976.366
          2       281.642     986.747
          3       330.334     998.111
          4       378.787    1010.453
          5       426.981    1023.768
          6       474.898    1038.050
          7       522.518    1053.294
          8       569.820    1069.494
          9       616.788    1086.642
         10       663.400    1104.733
         11       709.639    1123.759
         12       755.486    1143.711
         13       800.921    1164.582
         14       845.927    1186.364
         15       890.486    1209.048
         16       934.579    1232.624
         17       978.188    1257.082
         18      1008.679    1275.000
      Circle Center At X =  -257.453 ; Y =  3407.423 ; and Radius =  2479.983
            Factor of Safety
           ***    1.620   ***
           Individual data on the   28  slices
                          Water  Water    Tie     Tie     Earthquake
                          Force  Force    Force   Force     Force   Surcharge
Slice  Width   Weight     Top    Bot      Norm    Tan     Hor     Ver     Load
 No.    (ft)    (lbs)    (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1    48.9   43022.4     0.0    0.0       0.      0.      0.0     0.0     0.0
  2    48.4  124039.0     0.0    0.0       0.      0.      0.0     0.0     0.0
  3     0.3    1123.7     0.0    0.0       0.      0.      0.0     0.0     0.0
  4    29.7   85700.1     0.0    0.0       0.      0.      0.0     0.0     0.0
  5    18.8   50809.1     0.0    0.0       0.      0.      0.0     0.0     0.0
  6    48.2  176702.7     0.0    0.0       0.      0.      0.0     0.0     0.0
  7    33.0  157072.8     0.0    0.0       0.      0.      0.0     0.0     0.0
  8    14.9   72944.7     0.0    0.0       0.      0.      0.0     0.0     0.0
  9    15.1   65188.9     0.0    0.0       0.      0.      0.0     0.0     0.0
 10    32.5  142426.9     0.0    0.0       0.      0.      0.0     0.0     0.0
 11    47.3  246510.2     0.0    0.0       0.      0.      0.0     0.0     0.0
 12    20.2  117993.0     0.0    0.0       0.      0.      0.0     0.0     0.0
 13    26.8  144814.5     0.0    0.0       0.      0.      0.0     0.0     0.0
 14     3.2   15151.3     0.0    0.0       0.      0.      0.0     0.0     0.0
 15    43.4  214500.4     0.0    0.0       0.      0.      0.0     0.0     0.0
 16    46.2  254395.0     0.0    0.0       0.      0.      0.0     0.0     0.0
 17    10.4   60088.3     0.0    0.0       0.      0.      0.0     0.0     0.0
 18    30.0  150766.8     0.0    0.0       0.      0.      0.0     0.0     0.0
 19     5.5   23214.4     0.0    0.0       0.      0.      0.0     0.0     0.0
 20    45.4  198526.1     0.0    0.0       0.      0.      0.0     0.0     0.0
```



```
 21    45.0  203872.4     0.0    0.0       0.      0.      0.0     0.0     0.0
 22     4.1   18622.4     0.0    0.0       0.      0.      0.0     0.0     0.0
 23    30.0  108474.4     0.0    0.0       0.      0.      0.0     0.0     0.0
 24    10.5   27844.1     0.0    0.0       0.      0.      0.0     0.0     0.0
 25    44.1  112605.1     0.0    0.0       0.      0.      0.0     0.0     0.0
 26    43.6   99967.4     0.0    0.0       0.      0.      0.0     0.0     0.0
 27     1.8    3835.1     0.0    0.0       0.      0.      0.0     0.0     0.0
 28    28.7   30208.3     0.0    0.0       0.      0.      0.0     0.0     0.0
      Failure Surface Specified By 17 Coordinate Points
        Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
          1       249.600     984.800
          2       298.256     996.315
          3       346.687    1008.740
          4       394.877    1022.072
          5       442.808    1036.305
          6       490.465    1051.434
          7       537.829    1067.454
          8       584.884    1084.360
          9       631.614    1102.145
         10       678.002    1120.804
         11       724.032    1140.329
         12       769.688    1160.713
         13       814.954    1181.951
         14       859.813    1204.033
         15       904.250    1226.953
         16       948.250    1250.703
         17       991.313    1275.000
      Circle Center At X =  -340.048 ; Y =  3584.871 ; and Radius =  2666.093
            Factor of Safety
           ***    1.627   ***
      Failure Surface Specified By 18 Coordinate Points
        Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
          1       246.387     983.193
          2       294.697     996.082
          3       342.813    1009.679
          4       390.723    1023.981
          5       438.419    1038.987
          6       485.888    1054.692
          7       533.122    1071.092
          8       580.109    1088.185
          9       626.841    1105.967
         10       673.306    1124.434
         11       719.494    1143.582
         12       765.396    1163.406
         13       811.002    1183.903
         14       856.301    1205.068
         15       901.285    1226.897
         16       945.942    1249.384
         17       990.265    1272.525
         18       994.840    1275.000
      Circle Center At X =  -605.582 ; Y =  4274.158 ; and Radius =  3399.456
            Factor of Safety
           ***    1.629   ***
      Failure Surface Specified By 18 Coordinate Points
        Point      X-Surf      Y-Surf
        No.         (ft)        (ft)
          1       240.363     980.181
          2       289.725     988.143
          3       338.857     997.416
          4       387.725    1007.994
          5       436.295    1019.870
          6       484.530    1033.035
          7       532.398    1047.479
          8       579.865    1063.193
          9       626.896    1080.166
```

10	673.459	1098.385
11	719.520	1117.837
12	765.046	1138.509
13	810.006	1160.386
14	854.369	1183.452
15	898.099	1207.691
16	941.170	1233.087
17	983.549	1259.620
18	1006.719	1275.000

Circle Center At X = -33.063 ; Y = 2834.376 ; and Radius = 1874.247

Factor of Safety

*** 1.630 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	234.338	977.169
2	283.334	987.140
3	332.121	998.086
4	380.680	1010.003
5	428.992	1022.886
6	477.037	1036.730
7	524.797	1051.529
8	572.252	1067.277
9	619.384	1083.969
10	666.173	1101.598
11	712.601	1120.156
12	758.651	1139.636
13	804.302	1160.030
14	849.538	1181.331
15	894.340	1203.530
16	938.690	1226.618
17	982.572	1250.585
18	1025.227	1275.000

Circle Center At X = -241.044 ; Y = 3438.561 ; and Radius = 2506.878

Factor of Safety

*** 1.631 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	247.592	983.796
2	296.945	991.808
3	346.054	1001.206
4	394.879	1011.982
5	443.381	1024.129
6	491.522	1037.636
7	539.264	1052.492
8	586.569	1068.687
9	633.399	1086.206
10	679.718	1105.036
11	725.488	1125.163
12	770.674	1146.570
13	915.239	1169.241
14	859.148	1193.157
15	902.367	1218.299
16	944.861	1244.648
17	986.596	1272.182
18	990.617	1275.000

Circle Center At X = -12.018 ; Y = 2739.746 ; and Radius = 1775.037

Factor of Safety

*** 1.631 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	243.174	981.587
2	292.592	989.195
3	341.783	998.152
4	390.711	1008.449

5	439.339	1020.080
6	487.632	1033.036
7	535.552	1047.307
8	583.064	1062.882
9	630.133	1079.751
10	676.723	1097.899
11	722.799	1117.314
12	768.328	1137.982
13	813.275	1159.886
14	857.606	1183.011
15	901.288	1207.338
16	944.290	1232.851
17	986.577	1259.529
18	1009.676	1275.000

Circle Center At X = -9.627 ; Y = 2789.894 ; and Radius = 1825.894

Factor of Safety

*** 1.633 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	240.764	980.382
2	289.614	991.046
3	338.262	1002.595
4	386.692	1015.024
5	434.889	1028.330
6	482.837	1042.509
7	530.519	1057.556
8	577.920	1073.465
9	625.025	1090.232
10	671.818	1107.851
11	718.284	1126.316
12	764.406	1145.621
13	810.171	1165.760
14	855.563	1186.726
15	900.567	1208.513
16	945.168	1231.112
17	989.352	1254.518
18	1026.378	1275.000

Circle Center At X = -321.752 ; Y = 3675.108 ; and Radius = 2752.817

Factor of Safety

*** 1.633 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	239.158	979.579
2	288.771	985.784
3	338.178	993.465
4	387.333	1002.615
5	436.195	1013.226
6	484.718	1025.288
7	532.860	1038.790
8	580.579	1053.721
9	627.831	1070.067
10	674.576	1087.814
11	720.771	1106.946
12	766.375	1127.446
13	811.348	1149.295
14	855.651	1172.475
15	899.242	1196.965
16	942.085	1222.743
17	984.141	1249.786
18	1020.896	1275.000

Circle Center At X = 56.004 ; Y = 2646.259 ; and Radius = 1676.713

Factor of Safety

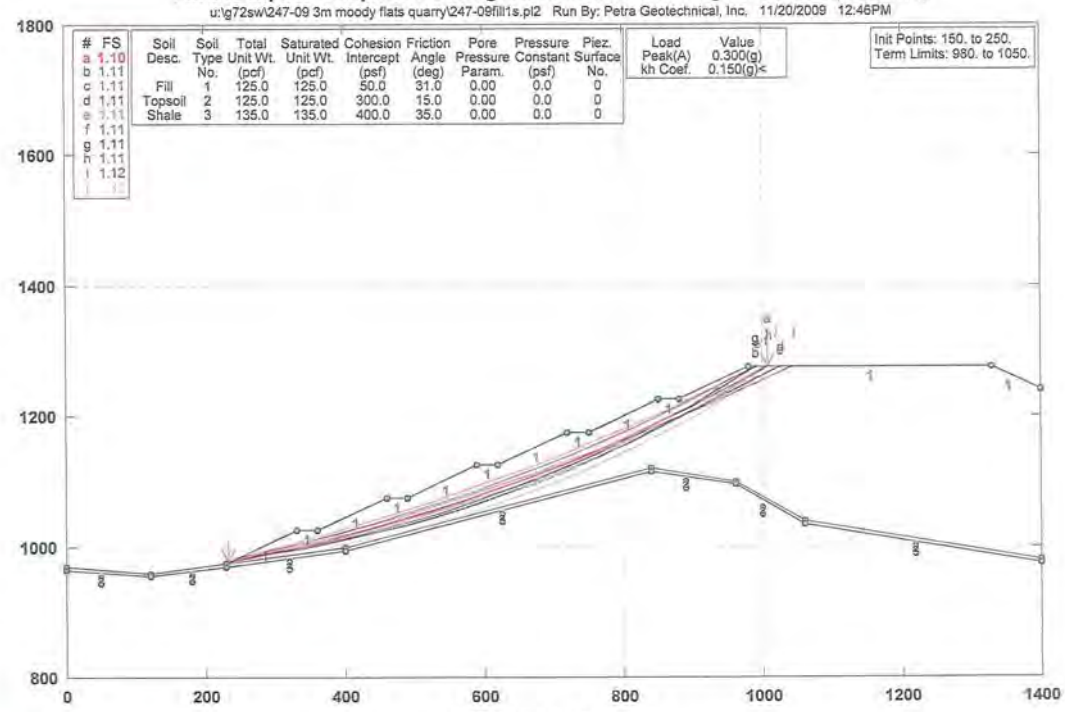
*** 1.645 ***

Failure Surface Specified By 19 Coordinate Points

Point	X-Surf	Y-Surf

Fill Stockpile - Proposed Configuration:Failure through fill mass (Seismic)

u:\g72sw\247-09 3m moody flats quarry\247-09fill1s.pl2 Run By: Petra Geotechnical, Inc. 11/20/2009 12:46PM



GSTABL7 v.2 FSmin=1.10

Safety Factors Are Calculated By The Modified Bishop Method

PETRA

u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill1.out Page 6

No.	(ft)	(ft)
1	242.371	981.185
2	290.921	993.139
3	339.304	1005.749
4	387.514	1019.011
5	435.539	1032.924
6	483.372	1047.484
7	531.004	1062.690
8	578.425	1078.538
9	625.629	1095.026
10	672.605	1112.151
11	719.345	1129.908
12	765.841	1148.297
13	812.084	1167.311
14	858.066	1186.950
15	903.779	1207.208
16	949.213	1228.082
17	994.361	1249.568
18	1039.214	1271.663
19	1045.764	1275.000

Circle Center At X = -617.666 ; Y = 4578.653 ; and Radius = 3698.843

Factor of Safety

*** 1.656 ***

**** END OF GSTABL7 OUTPUT ****

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:46PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill1s.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill1s.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill1s.PLT
PROBLEM DESCRIPTION:  Fill Stockpile - Proposed Configuration:
                      Failure through fill mass (Seismic)
BOUNDARY COORDINATES
   15 Top   Boundaries
   27 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
  No.          (ft)        (ft)        (ft)        (ft)     Below Bnd
   1           0.00      970.00      120.00      960.00          2
   2         120.00      960.00      230.00      975.00          2
   3         230.00      975.00      330.00     1025.00          1
   4         330.00     1025.00      360.00     1025.00          1
   5         360.00     1025.00      460.00     1075.00          1
   6         460.00     1075.00      490.00     1075.00          1
   7         490.00     1075.00      590.00     1125.00          1
   8         590.00     1125.00      620.00     1125.00          1
   9         620.00     1125.00      720.00     1175.00          1
  10         720.00     1175.00      750.00     1175.00          1
  11         750.00     1175.00      850.00     1225.00          1
  12         850.00     1225.00      880.00     1225.00          1
  13         880.00     1225.00      980.00     1275.00          1
  14         980.00     1275.00     1330.00     1275.00          1
  15        1330.00     1275.00     1400.00     1240.00          1
  16         230.00      975.00      400.00     1000.00          2
  17         400.00     1000.00      840.00     1120.00          2
  18         840.00     1120.00      960.00     1100.00          2
  19         960.00     1100.00     1060.00     1040.00          2
  20        1060.00     1040.00     1400.00      980.00          2
  21           0.00      965.00      120.00      955.00          3
  22         120.00      955.00      230.00      970.00          3
  23         230.00      970.00      400.00      995.00          3
  24         400.00      995.00      840.00     1115.00          3
  25         840.00     1115.00      960.00     1095.00          3
  26         960.00     1095.00     1060.00     1035.00          3
  27        1060.00     1035.00     1400.00      975.00          3
 User Specified Y-Origin =        800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.
   1   125.0    125.0      50.0      31.0    0.00      0.0       0
   2   125.0    125.0     300.0      15.0    0.00      0.0       0
   3   135.0    135.0     400.0      35.0    0.00      0.0       0
 Specified Peak Ground Acceleration Coefficient (A) =   0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
```



```
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
  500 Trial Surfaces Have Been Generated.
    2 Surface(s) Initiate(s) From Each Of   250 Points Equally Spaced
 Along The Ground Surface Between  X =  150.00(ft)
                                and  X =  250.00(ft)
 Each Surface Terminates Between   X =  980.00(ft)
                                and  X = 1050.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =        0.00(ft)
 50.00(ft) Line Segments Define Each Trial Failure Surface.
 Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =   500
      Number of Trial Surfaces With Valid FS =   500
      Statistical Data On All Valid FS Values:
        FS Max =   2.585   FS Min =   1.103   FS Ave =   1.962
        Standard Deviation =   0.403   Coefficient of Variation =   20.55 %
      Failure Surface Specified By 18 Coordinate Points
        Point      X-Surf      Y-Surf
         No.         (ft)        (ft)
          1        232.732     976.366
          2        281.642     986.747
          3        330.334     998.111
          4        378.787    1010.453
          5        426.981    1023.768
          6        474.898    1038.050
          7        522.518    1053.294
          8        569.820    1069.494
          9        616.788    1086.642
         10        663.400    1104.733
         11        709.639    1123.759
         12        755.486    1143.711
         13        800.921    1164.582
         14        845.927    1186.364
         15        890.486    1209.048
         16        934.579    1232.624
         17        978.188    1257.082
         18       1008.679    1275.000
      Circle Center At X =  -257.453 ; Y =  3407.423 ; and Radius =  2479.983
          Factor of Safety
              ***   1.103   ***
          Individual data on the   28 slices
                          Water    Water     Tie      Tie      Earthquake
                          Force    Force     Force    Force      Force     Surcharge
 Slice  Width   Weight     Top      Bot       Norm     Tan      Hor    Ver     Load
 No.    (ft)    (lbs)     (lbs)    (lbs)     (lbs)    (lbs)    (lbs)  (lbs)   (lbs)
  1     48.9   43022.4     0.0      0.0        0.       0.     6453.4   0.0     0.0
  2     48.4  124039.0     0.0      0.0        0.       0.    18605.9   0.0     0.0
  3      0.3    1123.7     0.0      0.0        0.       0.      168.6   0.0     0.0
  4     29.7   85700.1     0.0      0.0        0.       0.    12855.0   0.0     0.0
  5     18.8   50809.1     0.0      0.0        0.       0.     7621.4   0.0     0.0
  6     48.2  176702.7     0.0      0.0        0.       0.    26505.4   0.0     0.0
  7     33.0  157072.8     0.0      0.0        0.       0.    23560.9   0.0     0.0
  8     14.9   72944.7     0.0      0.0        0.       0.    10941.7   0.0     0.0
  9     15.1   65188.9     0.0      0.0        0.       0.     9778.3   0.0     0.0
 10     32.5  142426.9     0.0      0.0        0.       0.    21364.0   0.0     0.0
 11     47.3  246510.2     0.0      0.0        0.       0.    36976.5   0.0     0.0
 12     20.2  117993.0     0.0      0.0        0.       0.    17698.9   0.0     0.0
 13     26.8  144814.5     0.0      0.0        0.       0.    21722.2   0.0     0.0
 14      3.2   15151.3     0.0      0.0        0.       0.     2272.7   0.0     0.0
 15     43.4  214500.4     0.0      0.0        0.       0.    32175.1   0.0     0.0
 16     46.2  254395.0     0.0      0.0        0.       0.    38159.3   0.0     0.0
```

17	10.4	60088.3	0.0	0.0	0.	0. 9013.2	0.0	0.0
18	30.0	150766.8	0.0	0.0	0.	0. 22615.0	0.0	0.0
19	5.5	23214.4	0.0	0.0	0.	0. 3482.2	0.0	0.0
20	45.4	198526.1	0.0	0.0	0.	0. 29778.9	0.0	0.0
21	45.0	203872.4	0.0	0.0	0.	0. 30580.9	0.0	0.0
22	4.1	18622.4	0.0	0.0	0.	0. 2793.4	0.0	0.0
23	30.0	108474.4	0.0	0.0	0.	0. 16271.2	0.0	0.0
24	10.5	27844.1	0.0	0.0	0.	0. 4176.6	0.0	0.0
25	44.1	112605.1	0.0	0.0	0.	0. 16890.8	0.0	0.0
26	43.6	99967.4	0.0	0.0	0.	0. 14995.1	0.0	0.0
27	1.8	3835.1	0.0	0.0	0.	0. 575.3	0.0	0.0
28	28.7	30208.3	0.0	0.0	0.	0. 4531.3	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	249.600	984.800
2	298.256	996.315
3	346.687	1008.740
4	394.877	1022.072
5	442.808	1036.305
6	490.465	1051.434
7	537.829	1067.454
8	584.884	1084.360
9	631.614	1102.145
10	678.002	1120.804
11	724.032	1140.329
12	769.688	1160.713
13	814.954	1181.951
14	859.813	1204.033
15	904.250	1226.953
16	948.250	1250.703
17	991.313	1275.000

Circle Center At X = -340.048 ; Y = 3584.871 ; and Radius = 2666.093

Factor of Safety

*** 1.108 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	234.338	977.169
2	283.334	987.140
3	332.121	998.086
4	380.680	1010.003
5	428.992	1022.886
6	477.037	1036.730
7	524.797	1051.529
8	572.252	1067.277
9	619.384	1083.969
10	666.173	1101.598
11	712.601	1120.156
12	758.651	1139.636
13	804.302	1160.030
14	849.538	1181.331
15	894.340	1203.530
16	938.690	1226.618
17	982.572	1250.585
18	1025.227	1275.000

Circle Center At X = -241.044 ; Y = 3438.561 ; and Radius = 2506.878

Factor of Safety

*** 1.108 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	240.764	980.382
2	289.614	991.046
3	338.262	1002.595
4	386.692	1015.024
5	434.889	1028.330

6	482.837	1042.509
7	530.519	1057.556
8	577.920	1073.465
9	625.025	1090.232
10	671.818	1107.851
11	718.284	1126.316
12	764.406	1145.621
13	810.171	1165.760
14	855.563	1186.726
15	900.567	1208.513
16	945.168	1231.112
17	989.352	1254.518
18	1026.378	1275.000

Circle Center At X = -321.752 ; Y = 3675.108 ; and Radius = 2752.812

Factor of Safety

*** 1.109 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	246.387	983.193
2	294.697	996.082
3	342.813	1009.679
4	390.723	1023.981
5	438.419	1038.987
6	485.888	1054.692
7	533.122	1071.092
8	580.109	1088.185
9	626.841	1105.967
10	673.306	1124.434
11	719.494	1143.582
12	765.396	1163.406
13	811.002	1183.903
14	856.301	1205.068
15	901.285	1226.897
16	945.942	1249.384
17	990.265	1272.525
18	994.840	1275.000

Circle Center At X = -605.582 ; Y = 4274.158 ; and Radius = 3399.456

Factor of Safety

*** 1.109 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	240.363	980.181
2	289.725	988.143
3	338.857	997.416
4	387.725	1007.994
5	436.295	1019.870
6	484.530	1033.035
7	532.398	1047.479
8	579.865	1063.193
9	626.896	1080.166
10	673.459	1098.385
11	719.520	1117.837
12	765.046	1138.509
13	810.006	1160.386
14	854.368	1183.452
15	898.099	1207.691
16	941.170	1233.087
17	983.549	1259.620
18	1006.719	1275.000

Circle Center At X = -33.063 ; Y = 2834.376 ; and Radius = 1974.249

Factor of Safety

*** 1.110 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	247.592	983.796
2	296.945	991.808
3	346.054	1001.206
4	394.879	1011.982
5	443.381	1024.129
6	491.522	1037.636
7	539.264	1052.492
8	586.569	1068.687
9	633.399	1086.206
10	679.718	1105.036
11	725.488	1125.163
12	770.674	1146.570
13	815.239	1169.241
14	859.148	1193.157
15	902.367	1218.299
16	944.861	1244.648
17	986.596	1272.182
18	990.617	1275.000

Circle Center At X = -12.018 ; Y = 2739.746 ; and Radius = 1775.037

Factor of Safety

*** 1.111 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	243.174	981.587
2	292.592	989.195
3	341.783	998.152
4	390.711	1008.449
5	439.339	1020.080
6	487.632	1033.036
7	535.552	1047.307
8	583.064	1062.882
9	630.133	1079.751
10	676.723	1097.899
11	722.799	1117.314
12	768.328	1137.982
13	813.275	1159.886
14	857.606	1183.011
15	901.288	1207.338
16	944.290	1232.851
17	986.577	1259.529
18	1009.676	1275.000

Circle Center At X = -9.627 ; Y = 2789.894 ; and Radius = 1825.892

Factor of Safety

*** 1.112 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	242.371	981.185
2	290.921	993.139
3	339.304	1005.749
4	387.514	1019.011
5	435.539	1032.924
6	483.372	1047.484
7	531.004	1062.690
8	578.425	1078.538
9	625.629	1095.026
10	672.605	1112.151
11	719.345	1129.908
12	765.841	1148.297
13	812.084	1167.311
14	858.066	1186.950
15	903.779	1207.208
16	949.213	1228.082
17	994.361	1249.568
18	1039.214	1271.663
19	1045.764	1275.000

Circle Center At X = -617.666 ; Y = 4578.653 ; and Radius = 3698.843

Factor of Safety

*** 1.120 ***

Failure Surface Specified By 18 Coordinate Points

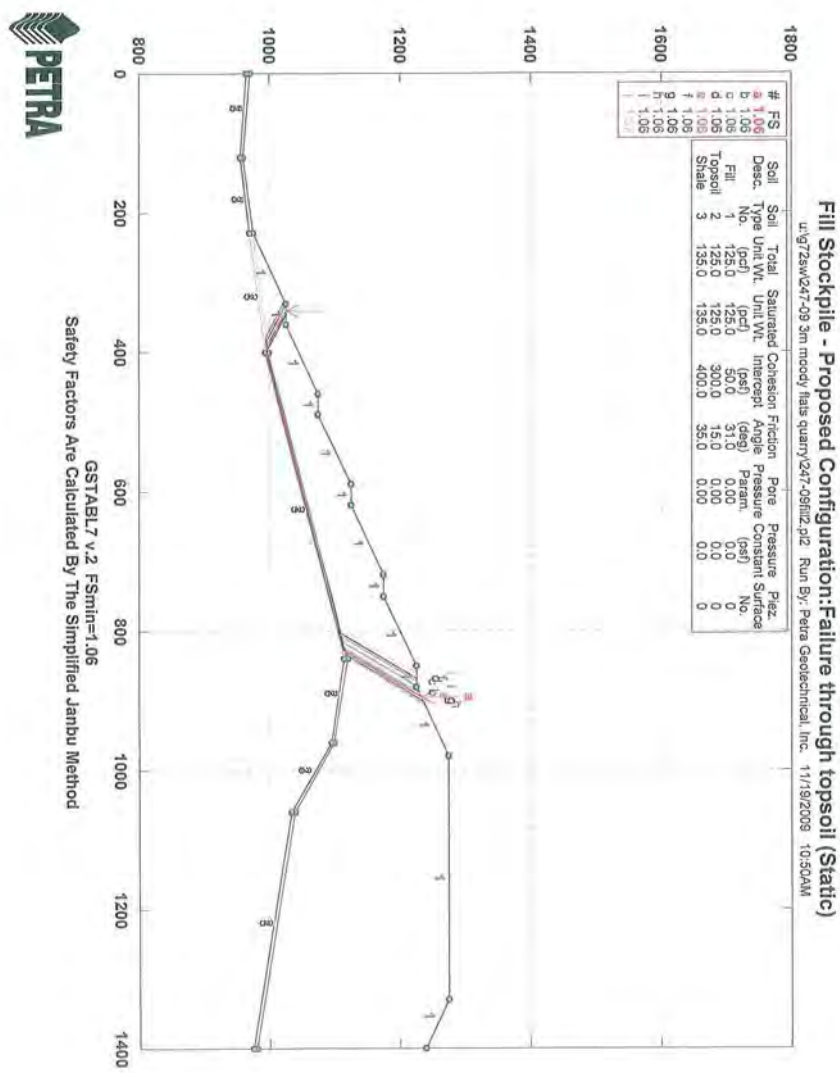
Point No.	X-Surf (ft)	Y-Surf (ft)
1	239.158	979.579
2	288.771	985.784
3	338.178	993.465
4	387.333	1002.615
5	436.195	1013.226
6	484.718	1025.288
7	532.860	1038.790
8	580.579	1053.721
9	627.831	1070.067
10	674.576	1087.814
11	720.771	1106.946
12	766.375	1127.446
13	811.348	1149.295
14	855.651	1172.475
15	899.242	1196.965
16	942.085	1222.743
17	984.141	1249.786
18	1020.896	1275.000

Circle Center At X = 56.004 ; Y = 2646.259 ; and Radius = 1676.713

Factor of Safety

*** 1.120 ***

**** END OF GSTABL7 OUTPUT ****



PETRA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                    ***  GSTABL7  ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/19/2009
Time of Run:                10:50AM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        e:\247-09\247-09fill2.in
Output Filename:            e:\247-09\247-09fill2.OUT
Unit System:                English
Plotted Output Filename:    e:\247-09\247-09fill2.PLT
PROBLEM DESCRIPTION:  Fill Stockpile - Proposed Configuration:
                       Failure through topsoil (Static)
BOUNDARY COORDINATES
   15 Top   Boundaries
   27 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
  No.         (ft)        (ft)        (ft)        (ft)      Below Bnd
   1          0.00      970.00      120.00      960.00         2
   2        120.00      960.00      230.00      975.00         2
   3        230.00      975.00      330.00     1025.00         1
   4        330.00     1025.00      360.00     1025.00         1
   5        360.00     1025.00      460.00     1075.00         1
   6        460.00     1075.00      490.00     1075.00         1
   7        490.00     1075.00      590.00     1125.00         1
   8        590.00     1125.00      620.00     1125.00         1
   9        620.00     1125.00      720.00     1175.00         1
  10        720.00     1175.00      750.00     1175.00         1
  11        750.00     1175.00      850.00     1225.00         1
  12        850.00     1225.00      880.00     1225.00         1
  13        880.00     1225.00      980.00     1275.00         1
  14        980.00     1275.00     1330.00     1275.00         1
  15       1330.00     1275.00     1400.00     1240.00         1
  16        230.00      975.00      400.00     1000.00         2
  17        400.00     1000.00      840.00     1120.00         2
  18        840.00     1120.00      960.00     1100.00         2
  19        960.00     1100.00     1060.00     1040.00         2
  20       1060.00     1040.00     1400.00      980.00         2
  21          0.00      965.00      120.00      955.00         3
  22        120.00      955.00      230.00      970.00         3
  23        230.00      970.00      400.00      995.00         3
  24        400.00      995.00      840.00     1115.00         3
  25        840.00     1115.00      960.00     1095.00         3
  26        960.00     1095.00     1060.00     1035.00         3
  27       1060.00     1035.00     1400.00      975.00         3
User Specified Y-Origin =        800.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.   (psf)     No.
  1   125.0    125.0      50.0      31.0    0.00      0.0      0
  2   125.0    125.0     300.0      15.0    0.00      0.0      0
  3   135.0    135.0     400.0      35.0    0.00      0.0      0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
```

Specified.
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.
500 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	230.00	972.50	400.00	997.50	5.00
2	600.00	1054.50	840.00	1117.50	5.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 500
Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 1.982 FS Min = 1.057 FS Ave = 1.476
Standard Deviation = 0.235 Coefficient of Variation = 15.94 %
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	341.945	1025.000
2	345.476	1023.003
3	388.994	998.381
4	393.723	994.753
5	826.333	1111.959
6	830.519	1117.414
7	855.140	1160.932
8	879.761	1204.450
9	895.880	1232.940

Factor of Safety
*** 1.057 ***
Individual data on the 18 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.5	440.8	0.0	0.0	0.	0.	0.0	0.0	0.0
2	14.5	11085.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	29.0	93015.6	0.0	0.0	0.	0.	0.0	0.0	0.0
4	4.7	26075.1	0.0	0.0	0.	0.	0.0	0.0	0.0
5	6.3	37529.4	0.0	0.0	0.	0.	0.0	0.0	0.0
6	60.0	415639.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	30.0	218350.8	0.0	0.0	0.	0.	0.0	0.0	0.0
8	100.0	820207.2	0.0	0.0	0.	0.	0.0	0.0	0.0
9	30.0	273773.3	0.0	0.0	0.	0.	0.0	0.0	0.0
10	100.0	1004949.9	0.0	0.0	0.	0.	0.0	0.0	0.0
11	30.0	329196.2	0.0	0.0	0.	0.	0.0	0.0	0.0
12	76.3	882262.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	4.2	52076.9	0.0	0.0	0.	0.	0.0	0.0	0.0
14	19.5	208201.0	0.0	0.0	0.	0.	0.0	0.0	0.0
15	5.1	44083.4	0.0	0.0	0.	0.	0.0	0.0	0.0
16	24.6	130211.9	0.0	0.0	0.	0.	0.0	0.0	0.0
17	0.2	606.9	0.0	0.0	0.	0.	0.0	0.0	0.0
18	15.9	19977.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	333.200	1025.000
2	338.534	1021.982
3	382.052	997.361
4	386.418	994.011
5	823.521	1113.584
6	825.385	1116.014
7	850.006	1159.532

8	874.628	1201.050
9	889.826	1229.913

Factor of Safety
*** 1.059 ***
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	343.993	1025.000
2	347.101	1023.242
3	390.619	998.620
4	394.387	995.729
5	804.771	1106.084
6	808.951	1111.532
7	833.572	1155.050
8	858.193	1198.568
9	873.148	1225.000

Factor of Safety
*** 1.059 ***
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.156	1025.000
2	349.611	1023.611
3	393.129	998.990
4	398.205	995.095
5	800.786	1105.053
6	804.913	1110.431
7	829.534	1153.949
8	854.155	1197.466
9	869.733	1225.000

Factor of Safety
*** 1.061 ***
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.037	1025.000
2	336.024	1021.613
3	379.542	996.991
4	382.599	994.645
5	827.505	1114.615
6	829.423	1117.115
7	854.045	1160.633
8	878.666	1204.151
9	894.588	1232.294

Factor of Safety
*** 1.061 ***
Failure Surface Specified By 9 Coordinate Points

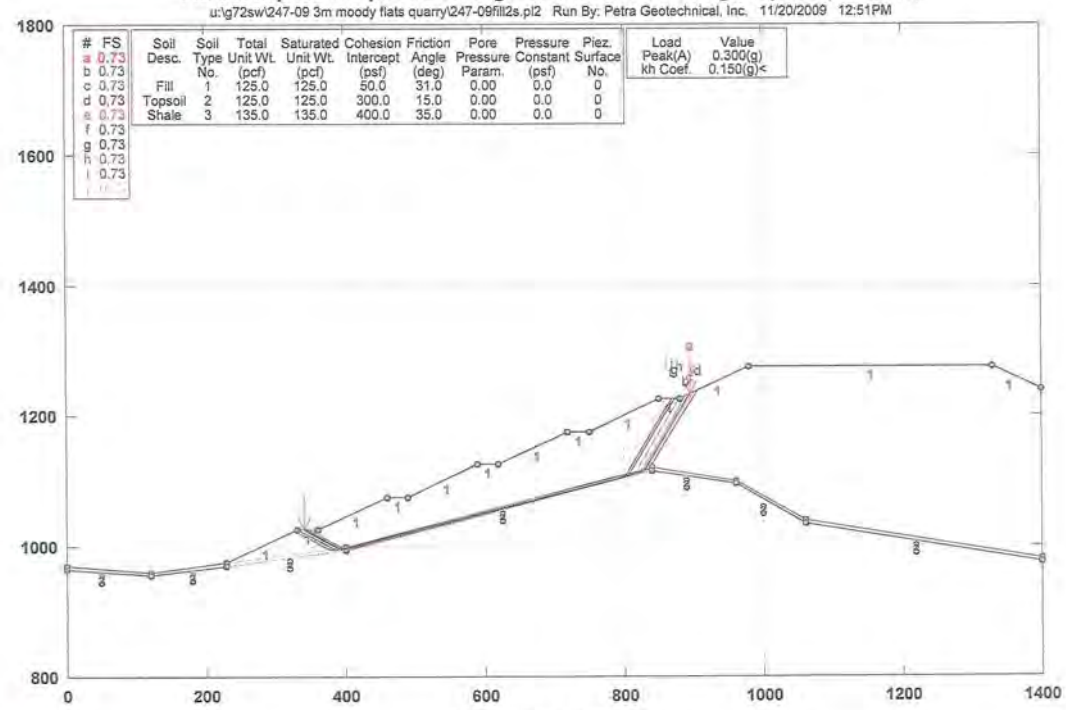
Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.143	1024.071
2	333.218	1021.200
3	376.736	996.579
4	379.777	994.245
5	799.146	1104.334
6	803.535	1110.055
7	828.157	1153.573
8	852.778	1197.091
9	868.568	1225.000

Factor of Safety
*** 1.062 ***
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.529	1025.000
2	349.907	1023.654
3	393.425	999.033
4	397.209	996.130

Fill Stockpile - Proposed Configuration:Failure through topsoil (Seismic)

u:\g72sw\247-09 3m moody flats quarry\247-09fill2s.pl2 Run By: Petra Geotechnical, Inc. 11/20/2009 12:51PM



GSTABL7 v.2 FSmin=0.73

Safety Factors Are Calculated By The Simplified Janbu Method

PETRA

u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill2.out Page 4

5	833.130	1116.365
6	834.839	1118.592
7	859.460	1162.110
8	884.081	1205.628
9	900.975	1235.487

Factor of Safety
*** 1.062 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	344.366	1025.000
2	347.397	1023.285
3	390.915	998.664
4	393.391	996.765
5	837.114	1117.396
6	838.877	1119.694
7	863.498	1163.212
8	888.119	1206.729
9	905.737	1237.869

Factor of Safety
*** 1.063 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	346.414	1025.000
2	349.023	1023.524
3	392.540	998.903
4	394.055	997.741
5	815.552	1111.521
6	817.309	1113.812
7	841.930	1157.329
8	866.551	1200.847
9	880.302	1225.151

Factor of Safety
*** 1.064 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.179	1022.589
2	328.786	1020.548
3	372.304	995.927
4	376.291	992.868
5	792.349	1104.928
6	794.364	1107.554
7	818.985	1151.072
8	843.606	1194.589
9	860.811	1225.000

Factor of Safety
*** 1.068 ***

**** END OF GSTABL7 OUTPUT ****

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
            (All Rights Reserved-Unauthorized Use Prohibited)
************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:51PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill2s.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill2s.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill2s.PLT
PROBLEM DESCRIPTION:  Fill Stockpile - Proposed Configuration:
                      Failure through topsoil (Seismic)

BOUNDARY COORDINATES
   15 Top   Boundaries
   27 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right    Soil Type
   No.        (ft)        (ft)        (ft)        (ft)    Below Bnd
    1         0.00      970.00      120.00      960.00        2
    2       120.00      960.00      230.00      975.00        2
    3       230.00      975.00      330.00     1025.00        1
    4       330.00     1025.00      360.00     1025.00        1
    5       360.00     1025.00      460.00     1075.00        1
    6       460.00     1075.00      490.00     1075.00        1
    7       490.00     1075.00      590.00     1125.00        1
    8       590.00     1125.00      620.00     1125.00        1
    9       620.00     1125.00      720.00     1175.00        1
   10       720.00     1175.00      750.00     1175.00        1
   11       750.00     1175.00      850.00     1225.00        1
   12       850.00     1225.00      880.00     1225.00        1
   13       880.00     1225.00      980.00     1275.00        1
   14       980.00     1275.00     1330.00     1275.00        1
   15      1330.00     1275.00     1400.00     1240.00        1
   16       230.00      975.00      400.00     1000.00        2
   17       400.00     1000.00      840.00     1120.00        2
   18       840.00     1120.00      960.00     1100.00        2
   19       960.00     1100.00     1060.00     1040.00        2
   20      1060.00     1040.00     1400.00      980.00        2
   21         0.00      965.00      120.00      955.00        3
   22       120.00      955.00      230.00      970.00        3
   23       230.00      970.00      400.00      995.00        3
   24       400.00      995.00      840.00     1115.00        3
   25       840.00     1115.00      960.00     1095.00        3
   26       960.00     1095.00     1060.00     1035.00        3
   27      1060.00     1035.00     1400.00      975.00        3
 User Specified Y-Origin =        800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
 Soil  Total  Saturated  Cohesion  Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.
   1  125.0    125.0      50.0      31.0     0.00      0.0       0
   2  125.0    125.0     300.0      15.0     0.00      0.0       0
   3  135.0    135.0     400.0      35.0     0.00      0.0       0
 Specified Peak Ground Acceleration Coefficient (A) =  0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =  0.150(g)
```



```
 Specified Vertical Earthquake Coefficient (kv) =  0.000(g)
 Specified Seismic Pore-Pressure Factor =  0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.
 The Active And Passive Portions Of The Sliding Surfaces
 Are Generated According To The Rankine Theory.
  500 Trial Surfaces Have Been Generated.
 2 Boxes Specified For Generation Of Central Block Base
 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  50.0
 Box       X-Left      Y-Left     X-Right     Y-Right      Height
 No.        (ft)        (ft)        (ft)        (ft)        (ft)
  1       230.00      972.50      400.00      997.50       5.00
  2       600.00     1054.50      840.00     1117.50       5.00
 Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated, They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Simplified Janbu Method * *
      Total Number of Trial Surfaces Attempted =  500
      Number of Trial Surfaces With Valid FS =  500
      Statistical Data On All Valid FS Values:
        FS Max =  1.333   FS Min =  0.725   FS Ave =  1.001
        Standard Deviation =  0.157   Coefficient of Variation =  15.70 %
      Failure Surface Specified By  9 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1       341.945    1025.000
          2       345.476    1023.003
          3       388.994     998.381
          4       393.723     994.753
          5       826.333    1111.959
          6       830.519    1117.414
          7       855.140    1160.932
          8       879.761    1204.450
          9       895.880    1232.940
        Factor of Safety
         ***   0.725   ***
        Individual data on the   18  slices
                            Water  Water   Tie     Tie     Earthquake          Surcharge
                            Force  Force   Force   Force     Force             Load
 Slice  Width    Weight      Top    Bot     Norm    Tan      Hor      Ver       Load
 No.    (ft)     (lbs)      (lbs)  (lbs)   (lbs)   (lbs)    (lbs)    (lbs)     (lbs)
   1     3.5     440.8       0.0    0.0      0.      0.       66.1     0.0       0.0
   2    14.5   11085.7       0.0    0.0      0.      0.     1662.9     0.0       0.0
   3    29.0   93015.6       0.0    0.0      0.      0.    13952.3     0.0       0.0
   4     4.7   26075.1       0.0    0.0      0.      0.     3911.3     0.0       0.0
   5     6.3   37529.4       0.0    0.0      0.      0.     5629.4     0.0       0.0
   6    60.0  415639.8       0.0    0.0      0.      0.    62346.0     0.0       0.0
   7    30.0  218350.8       0.0    0.0      0.      0.    32752.6     0.0       0.0
   8   100.0  820207.2       0.0    0.0      0.      0.   ********     0.0       0.0
   9    30.0  273773.3       0.0    0.0      0.      0.    41066.0     0.0       0.0
  10   100.0 1004949.9       0.0    0.0      0.      0.   ********     0.0       0.0
  11    30.0  329196.2       0.0    0.0      0.      0.    49379.4     0.0       0.0
  12    76.3  882262.6       0.0    0.0      0.      0.   ********     0.0       0.0
  13     4.2   52076.9       0.0    0.0      0.      0.     7811.5     0.0       0.0
  14    19.5  208201.0       0.0    0.0      0.      0.    31230.2     0.0       0.0
  15     5.1   44083.4       0.0    0.0      0.      0.     6612.5     0.0       0.0
  16    24.6  130211.9       0.0    0.0      0.      0.    19531.8     0.0       0.0
  17     0.2     606.9       0.0    0.0      0.      0.       91.0     0.0       0.0
  18    15.9   19977.4       0.0    0.0      0.      0.     2996.6     0.0       0.0
        Failure Surface Specified By  9 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1       333.200    1025.000
            2       338.534    1021.982
            3       382.052     997.361
```

4	386.418	994.011
5	823.521	1113.584
6	825.385	1116.014
7	850.006	1159.532
8	874.628	1203.050
9	889.826	1229.913

Factor of Safety
*** 0.725 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.037	1025.000
2	336.024	1021.613
3	379.542	996.991
4	382.599	994.645
5	827.505	1114.615
6	829.423	1117.115
7	854.045	1160.633
8	878.666	1204.151
9	894.588	1232.294

Factor of Safety
*** 0.726 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	344.366	1025.000
2	347.397	1023.285
3	390.915	998.664
4	393.391	996.765
5	837.114	1117.396
6	838.877	1119.694
7	863.498	1163.212
8	888.119	1206.729
9	905.737	1237.869

Factor of Safety
*** 0.727 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.529	1025.000
2	349.907	1023.654
3	393.425	999.033
4	397.209	996.130
5	833.130	1116.365
6	834.839	1118.592
7	859.460	1162.110
8	884.081	1205.628
9	900.975	1235.487

Factor of Safety
*** 0.728 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.143	1024.071
2	333.218	1021.200
3	376.736	996.579
4	379.777	994.245
5	799.146	1104.334
6	803.535	1110.055
7	828.157	1153.573
8	852.778	1197.091
9	868.568	1225.000

Factor of Safety
*** 0.729 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	343.993	1025.000
2	347.101	1023.242
3	390.619	998.620
4	394.387	995.729
5	804.771	1106.084
6	808.951	1111.532
7	833.572	1155.050
8	858.193	1198.568
9	873.148	1225.000

Factor of Safety
*** 0.729 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	346.414	1025.000
2	349.023	1023.524
3	392.540	998.903
4	394.055	997.741
5	815.552	1111.521
6	817.309	1113.812
7	841.930	1157.329
8	866.551	1200.847
9	880.302	1225.151

Factor of Safety
*** 0.731 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.156	1025.000
2	349.611	1023.611
3	393.129	998.990
4	398.205	995.095
5	800.786	1105.053
6	804.913	1110.431
7	829.534	1153.949
8	854.155	1197.466
9	869.733	1225.000

Factor of Safety
*** 0.732 ***

Failure Surface Specified By 9 Coordinate Points

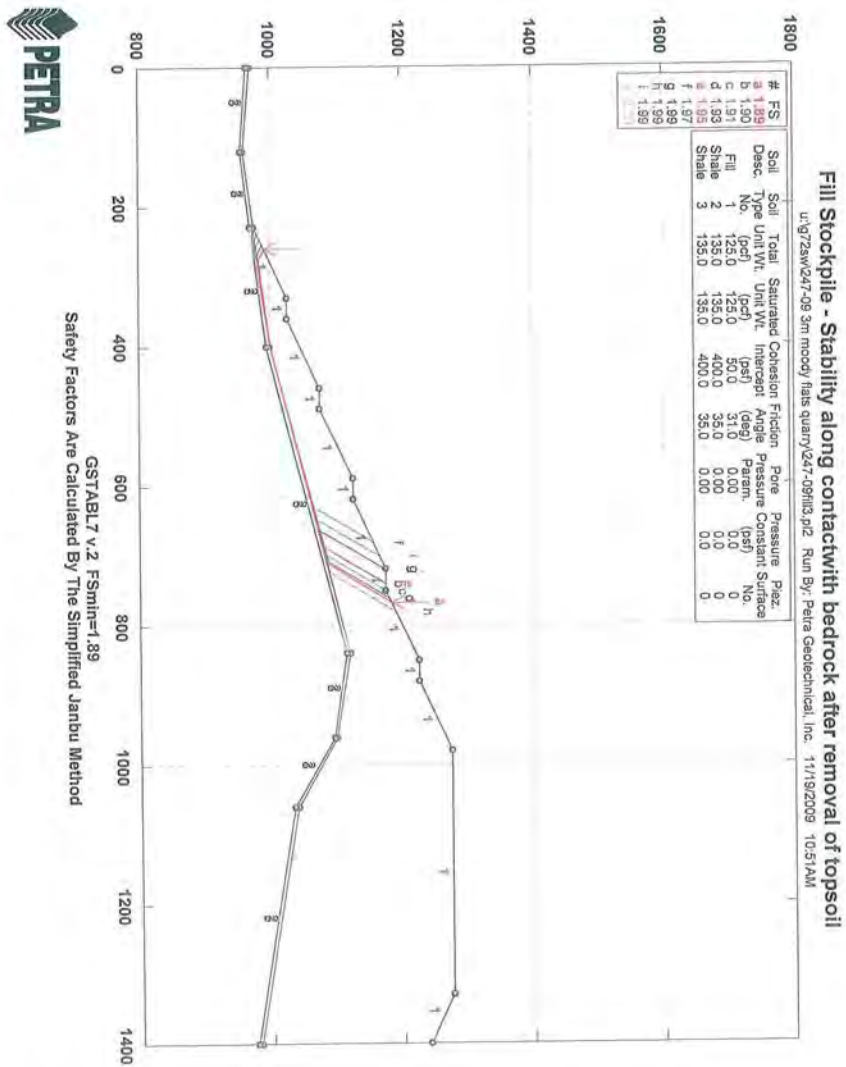
Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.179	1022.589
2	328.786	1020.548
3	372.304	995.927
4	376.291	992.868
5	792.349	1104.928
6	794.364	1107.554
7	818.985	1151.072
8	843.606	1194.589
9	860.811	1225.000

Factor of Safety
*** 0.733 ***

**** END OF GSTABL7 OUTPUT ****

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
                (All Rights Reserved-Unauthorized Use Prohibited)
************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
        Modified Bishop, Simplified Janbu, or GLE Method of Slices.
        (Includes Spencer & Morgenstern-Price Type Analysis)
        Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
        Nonlinear Undrained Shear Strength, Curved Phi Envelope,
        Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
        Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
************************************************************************
Analysis Run Date:          11/19/2009
Time of Run:                10:51AM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        e:\247-09\247-09fill3.in
Output Filename:            e:\247-09\247-09fill3.OUT
Unit System:                English
Plotted Output Filename:    e:\247-09\247-09fill3.PLT
PROBLEM DESCRIPTION:  Fill Stockpile - Stability along contact
                      with bedrock after removal of topsoil

BOUNDARY COORDINATES
   15 Top   Boundaries
   27 Total Boundaries
Boundary     X-Left      Y-Left      X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00      970.00      120.00      960.00         2
    2       120.00      960.00      230.00      975.00         2
    3       230.00      975.00      330.00     1025.00         1
    4       330.00     1025.00      360.00     1025.00         1
    5       360.00     1025.00      460.00     1075.00         1
    6       460.00     1075.00      490.00     1075.00         1
    7       490.00     1075.00      590.00     1125.00         1
    8       590.00     1125.00      620.00     1125.00         1
    9       620.00     1125.00      720.00     1175.00         1
   10       720.00     1175.00      750.00     1175.00         1
   11       750.00     1175.00      850.00     1225.00         1
   12       850.00     1225.00      880.00     1225.00         1
   13       880.00     1225.00      980.00     1275.00         1
   14       980.00     1275.00     1330.00     1275.00         1
   15      1330.00     1275.00     1400.00     1240.00         1
   16       230.00      975.00      400.00     1000.00         2
   17       400.00     1000.00      840.00     1120.00         2
   18       840.00     1120.00      960.00     1100.00         2
   19       960.00     1100.00     1060.00     1040.00         2
   20      1060.00     1040.00     1400.00      980.00         2
   21         0.00      965.00      120.00      955.00         3
   22       120.00      955.00      230.00      970.00         3
   23       230.00      970.00      400.00      995.00         3
   24       400.00      995.00      840.00     1115.00         3
   25       840.00     1115.00      960.00     1095.00         3
   26       960.00     1095.00     1060.00     1035.00         3
   27      1060.00     1035.00     1400.00      975.00         3
 User Specified Y-Origin =          800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
 Soil  Total  Saturated  Cohesion  Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.
   1   125.0    125.0      50.0      31.0     0.00      0.0       0
   2   135.0    135.0     400.0      35.0     0.00      0.0       0
   3   135.0    135.0     400.0      35.0     0.00      0.0       0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
```



Specified.
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.
500 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	230.00	972.50	280.00	980.00	5.00
2	400.00	997.50	400.00	997.50	5.00
3	600.00	1054.50	840.00	1117.50	5.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 500
Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 2.281 FS Min = 1.894 FS Ave = 2.069
Standard Deviation = 0.087 Coefficient of Variation = 4.20 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	261.496	990.748
2	277.091	981.925
3	277.617	981.651
4	400.000	999.887
5	713.013	1086.600
6	737.634	1130.117
7	762.255	1173.635
8	768.166	1184.083

Factor of Safety
*** 1.894 ***
Individual data on the 16 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	15.6	16199.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.5	1110.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	52.4	172694.9	0.0	0.0	0.	0.	0.0	0.0	0.0
4	30.0	124970.9	0.0	0.0	0.	0.	0.0	0.0	0.0
5	40.0	190524.2	0.0	0.0	0.	0.	0.0	0.0	0.0
6	26.2	157354.1	0.0	0.0	0.	0.	0.0	0.0	0.0
7	33.8	231174.9	0.0	0.0	0.	0.	0.0	0.0	0.0
8	30.0	203759.1	0.0	0.0	0.	0.	0.0	0.0	0.0
9	100.0	766615.3	0.0	0.0	0.	0.	0.0	0.0	0.0
10	30.0	256209.4	0.0	0.0	0.	0.	0.0	0.0	0.0
11	93.0	866610.8	0.0	0.0	0.	0.	0.0	0.0	0.0
12	7.0	70291.0	0.0	0.0	0.	0.	0.0	0.0	0.0
13	17.6	133282.3	0.0	0.0	0.	0.	0.0	0.0	0.0
14	12.4	52485.2	0.0	0.0	0.	0.	0.0	0.0	0.0
15	12.3	23374.6	0.0	0.0	0.	0.	0.0	0.0	0.0
16	5.9	2767.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	255.598	987.799
2	268.272	980.628
3	269.951	979.755
4	400.000	999.570
5	687.466	1079.693
6	712.087	1123.211
7	736.708	1166.729
8	741.388	1175.000

Factor of Safety

*** 1.904 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	240.963	980.481
2	246.391	977.410
3	248.027	976.559
4	400.000	999.936
5	698.481	1081.662
6	723.103	1125.180
7	747.724	1168.698
8	751.798	1175.899

Factor of Safety
*** 1.906 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	256.548	988.274
2	269.693	980.837
3	273.881	978.657
4	400.000	999.621
5	708.208	1085.209
6	732.829	1128.727
7	757.450	1172.245
8	762.563	1181.282

Factor of Safety
*** 1.933 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	228.545	974.802
2	230.253	973.912
3	400.000	999.487
4	688.169	1079.287
5	712.790	1122.805
6	737.411	1166.323
7	742.321	1175.000

Factor of Safety
*** 1.954 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	247.676	983.838
2	256.428	978.886
3	261.894	976.041
4	400.000	999.682
5	630.044	1064.537
6	654.665	1108.055
7	679.286	1151.573
8	681.709	1155.854

Factor of Safety
*** 1.967 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.843	976.922
2	235.746	975.845
3	240.971	973.125
4	400.000	998.322
5	662.739	1073.146
6	687.360	1116.664
7	711.982	1160.182
8	720.365	1175.000

Factor of Safety
*** 1.991 ***
Failure Surface Specified By 8 Coordinate Points

Point	X-Surf	Y-Surf

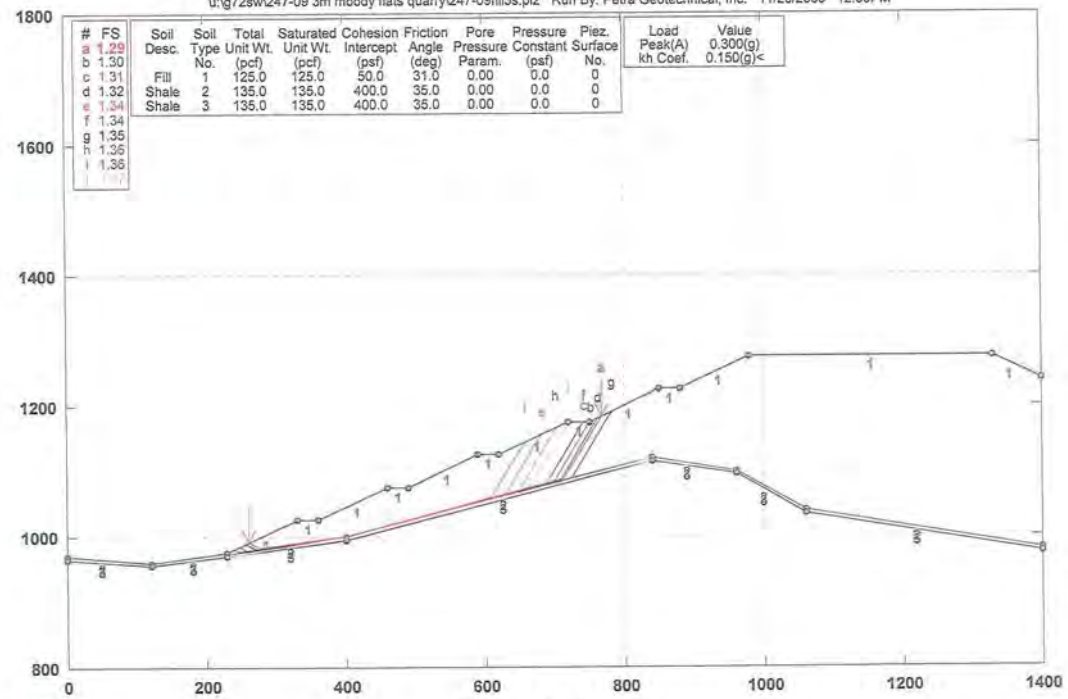
Stockpile - Stability along bedrock contact after removal of topsoil (Seismic)

u:\g72sw\247-09 3m moody flats quarry\247-09fill3s.pl2 Run By: Petra Geotechnical, Inc. 11/20/2009 12:56PM

#	FS
a	1.29
b	1.30
c	1.31
d	1.32
e	1.34
f	1.34
g	1.35
h	1.36
i	1.36

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Fill	1	125.0	125.0	50.0	31.0	0.00	0.0	0
Shale	2	135.0	135.0	400.0	35.0	0.00	0.0	0
Shale	3	135.0	135.0	400.0	35.0	0.00	0.0	0

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.29

Safety Factors Are Calculated By The Simplified Janbu Method

PETRA


```
 No.      (ft)      (ft)
  1      257.560   988.780
  2      271.206   981.060
  3      274.077   979.565
  4      400.000   999.406
  5      724.146  1089.334
  6      748.767  1132.852
  7      773.388  1176.370
  8      781.533  1190.767
      Factor of Safety
         ***  1.992  ***
 Failure Surface Specified By  8 Coordinate Points
  Point     X-Surf     Y-Surf
   No.       (ft)       (ft)
    1       255.722    987.861
    2       268.457    980.655
    3       272.392    978.607
    4       400.000    999.384
    5       646.685   1068.256
    6       671.306   1111.774
    7       695.927   1155.292
    8       701.980   1165.990
      Factor of Safety
         ***  1.994  ***
 Failure Surface Specified By  8 Coordinate Points
  Point     X-Surf     Y-Surf
   No.       (ft)       (ft)
    1       256.524    988.262
    2       269.656    980.832
    3       273.393    978.887
    4       400.000    997.658
    5       668.364   1074.896
    6       692.985   1118.414
    7       717.607   1161.932
    8       725.000   1175.000
      Factor of Safety
         ***  1.998  ***
         **** END OF GSTABL7 OUTPUT ****
```

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
          (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:          11/20/2009
Time of Run:                12:56PM
Run By:                     Petra Geotechnical, Inc.
Input Data Filename:        u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill3s.in
Output Filename:            u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill3s.OUT
Unit System:                English
Plotted Output Filename:    u:\G72SW\247-09 3M Moody Flats Quarry\247-09fill3s.PLT
PROBLEM DESCRIPTION:  Stockpile - Stability along bedrock cont
                      act after removal of topsoil (Seismic)
BOUNDARY COORDINATES
   15 Top   Boundaries
   27 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
    1          0.00      970.00      120.00      960.00        2
    2        120.00      960.00      230.00      975.00        2
    3        230.00      975.00      330.00     1025.00        1
    4        330.00     1025.00      360.00     1025.00        1
    5        360.00     1025.00      460.00     1075.00        1
    6        460.00     1075.00      490.00     1075.00        1
    7        490.00     1075.00      590.00     1125.00        1
    8        590.00     1125.00      620.00     1125.00        1
    9        620.00     1125.00      720.00     1175.00        1
   10        720.00     1175.00      750.00     1175.00        1
   11        750.00     1175.00      850.00     1225.00        1
   12        850.00     1225.00      880.00     1225.00        1
   13        880.00     1225.00      980.00     1275.00        1
   14        980.00     1275.00     1330.00     1275.00        1
   15       1330.00     1275.00     1400.00     1240.00        1
   16        230.00      975.00      400.00     1000.00        2
   17        400.00     1000.00      840.00     1120.00        2
   18        840.00     1120.00      960.00     1100.00        2
   19        960.00     1100.00     1060.00     1040.00        2
   20       1060.00     1040.00     1400.00      980.00        2
   21          0.00      965.00      120.00      955.00        3
   22        120.00      955.00      230.00      970.00        3
   23        230.00      970.00      400.00      995.00        3
   24        400.00      995.00      840.00     1115.00        3
   25        840.00     1115.00      960.00     1095.00        3
   26        960.00     1095.00     1060.00     1035.00        3
   27       1060.00     1035.00     1400.00      975.00        3
 User Specified Y-Origin =        800.00(ft)
 Default X-Plus Value = 0.00(ft)
 Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  3 Type(s) of Soil
 Soil  Total  Saturated  Cohesion  Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
   1   125.0    125.0      50.0      31.0     0.00      0.0      0
   2   135.0    135.0     400.0      35.0     0.00      0.0      0
   3   135.0    135.0     400.0      35.0     0.00      0.0      0
 Specified Peak Ground Acceleration Coefficient (A) =  0.300(g)
 Specified Horizontal Earthquake Coefficient (kh) =  0.150(g)
```



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 Specified Vertical Earthquake Coefficient (kv) =  0.000(g)
 Specified Seismic Pore-Pressure Factor =  0.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.
 The Active And Passive Portions Of The Sliding Surfaces
 Are Generated According To The Rankine Theory.
  500 Trial Surfaces Have Been Generated.
 3 Boxes Specified For Generation Of Central Block Base
 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  50.0
 Box       X-Left      Y-Left     X-Right     Y-Right      Height
 No.        (ft)        (ft)        (ft)        (ft)        (ft)
  1        230.00      972.50      280.00      980.00       5.00
  2        400.00      997.50      400.00      997.50       5.00
  3        600.00     1054.50      840.00     1117.50       5.00
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Evaluated. They Are
       Ordered - Most Critical First.
       * * Safety Factors Are Calculated By The Simplified Janbu Method * *
       Total Number of Trial Surfaces Attempted =  500
       Number of Trial Surfaces With Valid FS =  500
       Statistical Data On All Valid FS Values:
         FS Max =  1.546   FS Min =  1.287   FS Ave =  1.414
         Standard Deviation =  0.058   Coefficient of Variation =  4.10 %
       Failure Surface Specified By  8 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1        261.496     990.748
           2        277.091     981.925
           3        277.617     981.651
           4        400.000     999.887
           5        713.013    1086.600
           6        737.634    1130.117
           7        762.255    1173.635
           8        768.166    1184.083
             Factor of Safety
              ***  1.287  ***
           Individual data on the  16 slices
                      Water  Water   Tie     Tie     Earthquake
                      Force  Force   Force   Force     Force    Surcharge
 Slice  Width  Weight  Top    Bot     Norm    Tan      Hor      Ver     Load
 No.    (ft)   (lbs)   (lbs)  (lbs)   (lbs)   (lbs)    (lbs)    (lbs)   (lbs)
  1     15.6   16199.3   0.0    0.0      0.      0.    2429.9     0.0     0.0
  2      0.5    1110.6   0.0    0.0      0.      0.     166.6     0.0     0.0
  3     52.4  172694.9   0.0    0.0      0.      0.   25904.2     0.0     0.0
  4     30.0  124970.9   0.0    0.0      0.      0.   18745.6     0.0     0.0
  5     40.0  190524.2   0.0    0.0      0.      0.   28578.6     0.0     0.0
  6     26.2  157354.1   0.0    0.0      0.      0.   23603.1     0.0     0.0
  7     33.8  231174.9   0.0    0.0      0.      0.   34676.2     0.0     0.0
  8     30.0  203759.1   0.0    0.0      0.      0.   30563.9     0.0     0.0
  9    100.0  766615.3   0.0    0.0      0.      0.  *******      0.0     0.0
 10     30.0  256209.4   0.0    0.0      0.      0.   38431.4     0.0     0.0
 11     93.0  866610.8   0.0    0.0      0.      0.  *******      0.0     0.0
 12      7.0   70291.0   0.0    0.0      0.      0.   10543.6     0.0     0.0
 13     17.6  133282.3   0.0    0.0      0.      0.   19992.3     0.0     0.0
 14     12.4   52485.2   0.0    0.0      0.      0.    7872.8     0.0     0.0
 15     12.3   23374.6   0.0    0.0      0.      0.    3506.2     0.0     0.0
 16      5.9    2767.9   0.0    0.0      0.      0.     415.2     0.0     0.0
       Failure Surface Specified By  8 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1        240.963     980.481
           2        246.391     977.410
           3        248.027     976.559
           4        400.000     999.936
           5        698.481    1081.662
```

Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.
500 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	230.00	972.50	280.00	980.00	5.00
2	400.00	997.50	400.00	997.50	5.00
3	600.00	1054.50	840.00	1117.50	5.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 500
Number of Trial Surfaces With Valid FS = 500
Statistical Data On All Valid FS Values:
FS Max = 1.546 FS Min = 1.287 FS Ave = 1.414
Standard Deviation = 0.058 Coefficient of Variation = 4.10 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	261.496	990.748
2	277.091	981.925
3	277.617	981.651
4	400.000	999.887
5	713.013	1086.600
6	737.634	1130.117
7	762.255	1173.635
8	768.166	1184.083

Factor of Safety
*** 1.287 ***
Individual data on the 16 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	15.6	16199.3	0.0	0.0	0.	0.	2429.9	0.0	0.0
2	0.5	1110.6	0.0	0.0	0.	0.	166.6	0.0	0.0
3	52.4	172694.9	0.0	0.0	0.	0.	25904.2	0.0	0.0
4	30.0	124970.9	0.0	0.0	0.	0.	18745.6	0.0	0.0
5	40.0	190524.2	0.0	0.0	0.	0.	28578.6	0.0	0.0
6	26.2	157354.1	0.0	0.0	0.	0.	23603.1	0.0	0.0
7	33.8	231174.9	0.0	0.0	0.	0.	34676.2	0.0	0.0
8	30.0	203759.1	0.0	0.0	0.	0.	30563.9	0.0	0.0
9	100.0	766615.3	0.0	0.0	0.	0.	*******	0.0	0.0
10	30.0	256209.4	0.0	0.0	0.	0.	38431.4	0.0	0.0
11	93.0	866610.8	0.0	0.0	0.	0.	*******	0.0	0.0
12	7.0	70291.0	0.0	0.0	0.	0.	10543.6	0.0	0.0
13	17.6	133282.3	0.0	0.0	0.	0.	19992.3	0.0	0.0
14	12.4	52485.2	0.0	0.0	0.	0.	7872.8	0.0	0.0
15	12.3	23374.6	0.0	0.0	0.	0.	3506.2	0.0	0.0
16	5.9	2767.9	0.0	0.0	0.	0.	415.2	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	240.963	980.481
2	246.391	977.410
3	248.027	976.559
4	400.000	999.936
5	698.481	1081.662

6	723.103	1125.180
7	747.724	1168.698
8	751.798	1175.899

Factor of Safety
*** 1.301 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	255.598	987.799
2	268.272	980.628
3	269.951	979.755
4	400.000	999.570
5	687.466	1079.693
6	712.087	1123.211
7	736.708	1166.729
8	741.388	1175.000

Factor of Safety
*** 1.305 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	256.548	988.274
2	269.693	980.837
3	273.881	978.657
4	400.000	999.621
5	708.208	1085.209
6	732.829	1128.727
7	757.450	1172.245
8	762.563	1181.282

Factor of Safety
*** 1.317 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	247.676	983.838
2	256.428	978.886
3	261.894	976.041
4	400.000	999.682
5	630.044	1064.537
6	654.665	1108.055
7	679.286	1151.573
8	681.709	1155.854

Factor of Safety
*** 1.337 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	228.545	974.802
2	230.253	973.912
3	400.000	999.487
4	688.169	1079.287
5	712.790	1122.805
6	737.411	1166.323
7	742.321	1175.000

Factor of Safety
*** 1.340 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	257.560	988.780
2	271.206	981.060
3	274.077	979.565
4	400.000	999.406
5	724.146	1089.334
6	748.767	1132.852
7	773.388	1176.370
8	781.533	1190.767

```
      Factor of Safety
     ***    1.351   ***
Failure Surface Specified By  8 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1        255.722      987.861
    2        268.457      980.655
    3        272.392      978.607
    4        400.000      999.384
    5        646.685     1068.256
    6        671.306     1111.774
    7        695.927     1155.292
    8        701.980     1165.990
      Factor of Safety
     ***    1.362   ***
Failure Surface Specified By  7 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1        246.726      983.363
    2        255.007      978.677
    3        257.963      977.139
    4        400.000      999.631
    5        609.302     1059.021
    6        633.923     1102.539
    7        657.136     1143.568
      Factor of Safety
     ***    1.362   ***
Failure Surface Specified By  8 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1        233.843      976.922
    2        235.746      975.845
    3        240.971      973.125
    4        400.000      998.322
    5        662.739     1073.146
    6        687.360     1116.664
    7        711.982     1160.182
    8        720.365     1175.000
      Factor of Safety
     ***    1.366   ***
         **** END OF GSTABL7 OUTPUT ****
```