Grover Hollingsworth and Associates, Inc.

GEOLOGIC AND SOILS ENGINEERING EXPLORATION

Proposed Private Street 1437 for Access to 1830 N. Blue Heights Drive
PT NE ¼ Sec 7, T1S, R14W (ARB 23)
1830 N. Blue Heights Drive
Los Angeles, California
for
A AND T DEVELOPMENT, LLC

April 20, 2017 GH17563-G

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INTRODUCTION

The following report summarizes findings of our geologic and soils engineering exploration performed on the subject property and adjacent private street. The purpose of the exploration was to evaluate the nature, distribution, engineering properties, relative stability, and geologic structure of the earth materials underlying the property with respect to future improvement of the existing private street to provide legal access to 1830 N. Blue Heights Drive.

It is the intent of this report to aid in the design and completion of the proposed project and to reduce certain risks associated with construction projects. This report is prepared for the use of the client and authorized agents and should not be considered transferable. Prior to use by others, the site and this report should be reviewed by Grover-Hollingsworth and Associates, Inc. Following review, additional work may be required to update this report.

EXPLORATION

The scope of our exploration was based on the Private Street Plan prepared by Harvey Goodman and preliminary development information provided by Steve Byrne and Gaspar Obando. The exploration was limited to the area of the proposed private street, as shown on the enclosed Geologic Map and cross sections.

Field exploration was initially conducted in association with the planned residence at 1830 N. Blue Heights Drive. That exploration was conducted on February 15 and 16, 2016, and consisted of excavating five test pits to depths of 4½ to 8½ feet. Additional field exploration was conducted on January 17 and March 24, 2017, with the aid of a limited-access, hollow-stem auger drill, hand auger and hand labor. The recent exploration included drilling three borings, excavating one test pit, and excavating two hand-auger borings to depths of 2½ to 30½ feet and obtaining samples. Downhole observation of the earth materials encountered in the test pit was performed by the project geologist. Excavation spoils and samples from the hollow-stem auger and hand-auger borings were visually logged by the project geologist. Excavations were backfilled and tamped but should not be considered compacted. Bedrock exposures adjacent to and within the property were mapped where possible.

Office tasks included laboratory testing, engineering analysis, review of the 1928 and 1952 series air photos, review of City records, review of previous reports by our firm, and the preparation of this report. Borings and test pits are logged on plates A-1 through A-11. Laboratory test methodology and results are discussed in the Appendix and are presented on plates A, B, C and D. Surface geologic conditions, existing site improvements, and the locations of the test pits and borings are shown on the enclosed Geologic Map. Subsurface distribution of the earth materials, projected geologic structure and contacts, existing structures and the proposed project are shown on sections A, B and D through I, which form the basis for the enclosed slope stability, temporary stability, and retaining wall calculations.

PROPOSED PROJECT

Information concerning the proposed development was provided by the architect, Ameen Ayoub Design Studio**.** In addition, the preliminary private street plan, prepared by Harvey Goodman was reviewed prior to field exploration. That information formed the basis for the field exploration. It is currently our understanding that the proposed project consists of improving an existing road presently known as Blue Heights Drive by widening and adjusting the alignment somewhat to qualify as a new private street known as Private Street 1437. Only minor areas of new pavement are planned in the areas to be widened.

The new private street will extend east and south from Sunset Plaza Drive to and along a private property known as 1830 Blue Heights Drive. Two retaining walls with maximum heights of 4 to 5 feet are proposed along the downslope edge of Private Street 1437 where widening is required. Those walls will be supported by piles extending into bedrock to provide the foundation with the required setback from the descending slope.

The road cut above or east of Private Street 1437 near 1830 N. Blue Heights Drive is steeper than 1:1. It was initially planned to trim that cut to a 1:1 gradient, but the civil engineer indicates that would create over 11,500 cubic yards of export. Therefore, it is currently planned to trim the cut slightly to smooth the surface. A soil-nail wall will then be constructed over the trimmed cut. The client is currently in the process of purchasing the property above Blue Heights Drive where the soil-nail wall will be constructed.

A slough wall is planned north of the eastern section of the Private Street. The talus above that slough wall will be trimmed but a soil-nail wall is not planned above the slough wall.

SITE CONDITIONS

The proposed Private Street 1437 is presently paved and extends east and south from Sunset Plaza Drive to the subject property. The proposed private street is part of an existing paved road used to access numerous residential properties closer to and farther away from Sunset Plaza Drive than the property known as 1830 Blue Heights Drive. Our review of 1928 air photographs suggest that this road had been recently graded relative to the time of photography. Most of the street grading resulted in the road way being underlain by cut bedrock. However, some fill may exist underlying the existing road where the road crosses a ravine axis approximately half way between Sunset Plaza Drive and 1830 Blue Heights Drive. Very steep cut slopes exist upslope of street 1830 Blue Heights Drive. The steep cut slopes expose granite bedrock and have a maximum height of approximately 35 feet. Natural slopes continue to ascend above the cut slopes at gradients ranging from 1½:1 to 1¼:1. The total relief of the ascending slopes where steep cut slopes exist is approximately 100 to 120 feet. Descending slopes exist along much of the western and southern edges of the proposed private street with a total relief between 90 and 110 feet. Descending slope gradients typically range from 1¾:1 to 1¼:1.

Vegetation along the proposed private street is highly variable from essentially no plants on the steep cut slopes to well-maintained landscaped tree, shrubs and flowering plants associated with the adjacent developed properties near Sunset Plaza Drive. An undetermined entity has clearly made efforts to beautify the road shoulders near the ravine crossing. A drinking fountain exists along the upslope edge of the proposed private street near the ravine crossing. Numerous potted flowering plants exist along both edges of the private street near the drinking fountain. Trees, mostly eucalyptus, exist in the vicinity of the ravine on both sides of the street.

Drainage for the existing road is by sheetflow over the existing contours. Drainage is concentrated along the upslope edge of the street as most of the pavement is sloped down toward the upslope edge. Much of the upslope edge is provided with a curb or paved burn. The downslope edge of the existing road is provided with a berm along some portions that consists of earth in some locations and asphalt in other locations. Water flows along the existing road toward the north and west until reaching Sunset Plaza Drive where a surface confluence with Sunset Plaza Drive drainage occurs.

EARTH MATERIALS

Fill

Fill was observed in all of the test pits and hand-auger borings. The depth of fill where observed varies from 1/2 to 23½ feet. The deepest fills occur in the northern bend in Blue Heights Drive where the proposed private street crosses a ravine. The fill primarily consists of silty sand that is light orange-brown, brown, and light tan with white specks; dry to moist; and loose to medium dense. The upper fill contains rootlets and rodent burrows in most locations observed. The deeper fill encountered in boring B-2 contained abundant rock fragments near its contact with the natural soil.

Soil

Natural residual soil was encountered in all the borings and in all of the test pits, except TP-3, with an observed thickness of 1/2 to 5 feet. The soil consists of silty sand that is commonly light brown, brown and orange-brown; slightly moist to moist; and slightly dense to medium dense. The soil is porous and contains rootlets in most locations observed.

Bedrock

Bedrock consisting of cretaceous granite underlies the property and was encountered in all of the test pits and at outcrops in several locations on and adjacent to the site. The bedrock is typically speckled white, orange-brown, and black; moist and hard. The bedrock is generally moderately weathered and massive. The upper approximately 1 to 1½ feet of bedrock was observed to be highly weathered in test pit TP-2 and boring B-2.

GROUNDWATER

Seeps, springs, or groundwater were not encountered during our exploration.

RAIN DAMAGE

Evidence of relatively recent rain damage such as slope failures or landslides was not observed on the property, and research of City records does not indicate previous problems on the site. However, evidence of significant erosion along the downslope edge of street pavement exists in some locations where no berm or curb exist. Earth materials under the downslope edge of the pavement have eroded and portions of the street paving appear to be missing along relatively short segments of the downslope street edge.

REGIONAL GEOLOGIC SETTING

The site is situated on the southern flank of the Santa Monica Mountains. The Santa Monica Mountains and environs are located along the southern margin of the Transverse Ranges geomorphic province. The Transverse Ranges are characterized by broadly east/west-trending mountain ranges, valleys, folds, and active faults. The east/west-trending features are anomalous to California and are thought to be related to crustal compression due to a large bend in the San Andreas Fault as it passes around the southern end of the Sierra Nevada. The geologic structure of the Santa Monica Mountains is that of a large, asymmetric, south-vergent anticlinal structure. The crest of the anticline roughly follows the crest of the mountain. The south margin of the Santa Monica Mountains, and that of the Transverse Ranges, is marked by east-trending reverse, oblique slip, and left-strike-slip faults extending for over 125 miles (Dolan et al. 1997). The transverse ranges extend from the Cajon Pass to Anacapa Island, and farther off shore.

Local faults of interest forming the southern boundary of the Transverse Ranges consist of (east to west) the Raymond, Hollywood, Santa Monica, Anacapa-Dume, Malibu Coast, and others, collectively referred to as the Transverse Ranges Southern Boundary Fault System (Dolan et al. 1997). These faults accommodate left-reverse motion. Many of these faults are considered active, and are capable of producing strong ground shaking and ground surface rupture.

LOCAL GEOLOGIC STRUCTURE

The bedrock described is common to this area of the Santa Monica Mountains. The granite bedrock is generally massive and lacks significant structural trends. However, subtle foliation is present in some locations. Foliation planes mapped in the excavations and within outcrops generally dip gently moderately to toward the northeast.

Joint planes mapped most commonly dip moderately to steeply various directions. A relatively repeatable set joints dip moderately to the southwest above the curve Blue Heights Drive northeast of 1830 Blue Heights Drive. The angle of the cut slope in that area appears to be controlled by those joints.

Faults observed during our exploration also dip moderately steeply to vertically and most commonly trend east by northeast and west by northwest. These faults are not active. The faults are used to break the bedrock into areas for the purpose of kinematic analyses.

The geologic structure is favorably oriented for stability of the site and proposed project with respect to sliding along foliation. The generally massive nature of the bedrock is favorable for the gross stability of the site. Kinematic analyses suggest that most of the joint foliation and shear planes either do not intersect in an adverse fashion or have sufficient safety factors. Areas with intersecting joints with low kinematic safety factors will be stabilized with the planned soil-nail wall. Significant faults, folds, or other geologic hazards were not encountered during exploration.

SEISMIC CONSIDERATIONS

Earthquake Fault Zones

The State of California enacted the Alquist-Priolo Special Studies Act of 1972, which went into effect in early 1973. The Alquist-Priolo Act is intended to prohibit the location of most structures for human occupancy across a known active fault that intersects the ground surface, thereby mitigating fault-rupture hazard. The Alquist-Priolo Act requires that the State Geologist delineate "special studies zones" along active surficial faults. Development within these Special Studies Zones must include geologic investigation demonstrating the absence of a surface displacement threat. Special Studies Zones have been renamed Earthquake Fault Zones.

The maps depicting the Earthquake Fault Zones are issued by the California Department of Conservation, California Geological Survey (CGS). An earthquake fault which is well defined, active, or sufficiently active (active within the last 11,000 years) and breaks or nearly breaks the ground surface is subject to zoning. An Earthquake Fault Zone is ordinarily established from 200 feet to 500 feet from an identifiable recent break. Recent breaks are determined by surface and subsurface exploration by the CGS, and their review of previous work by others.

The site is not located within an Earthquake Fault Zone, and no zoned faults cross the site or are in close proximity. The nearest zoned fault is the Hollywood Fault in the Hollywood Quadrangle located approximately 3,500 feet to the southeast.

Traces of the Hollywood Fault have been mapped approximately 3000 feet of the subject property by Dibblee (see enclosed map). The Hollywood Fault is a left-lateral reverse fault which is a part of the Transverse Ranges Southern Boundary Fault System (Dolan et al. 1997) that extends approximately 65 miles from Anacapa Island to the eastern end of the Santa Monica Mountains. Although geomorphic features throughout this area have been obliterated or modified by urban development, the Hollywood Fault is expressed along the base of the Santa Monica Mountains by scarp-like features and a steep alluvial front. Dolan et al. (1997) map the Hollywood Fault as extending 8½ miles west from the eastern end of the Santa Monica Mountains to a northwest-trending feature referred to as the west Beverly Hills Lineament which is located west of the Benedict Canyon Fan (Dolan, 2000). This lineament may represent an east-dipping normal fault at a left step between the Hollywood and Santa Monica Faults or a strike-slip extension of the Newport-Inglewood Fault (Dolan et al. 2000). Dibblee (1991) maps the Hollywood Fault as extending farther to the west, to the 405 Freeway yielding a fault length of 11 miles.

Dolan and others (1997) have performed an extensive study along the eastern portion of the Hollywood Fault. Dolan maps the east portion of the Hollywood Fault and its splays in approximately the same location as Dibblee. Dolan's work included subsurface exploration, and review of logs of borings, seismic trenches, storm drain excavations, and Metro Rail tunnel excavations by others. Dolan (1997) dated charcoal samples from recent trenches and concludes that the most recent surface rupture along the Hollywood Fault occurred between 4,000 and 20,000 years ago. Further time constraints could not be made. Dolan et al. provide an approximate 4,000-year recurrence interval for moderate-size M6.6 events on the

Hollywood Fault although this estimate is not well constrained. Dolan concluded that the fault is probably active.

Dolan, Stevens and Rockwell (2000) subsequently conducted an additional detailed study for a portion of the Hollywood Fault Zone in using large-diameter bucket-auger borings placed directly adjacent to one another. The "borehole transect" located on Camino Palermo north of Franklin Avenue, consisted of drilling 11 adjacent bucket-auger borings to create a continuous subsurface profile across an approximately 12-meter-wide zone of offset alluvial sediments identified during previous borehole studies. Dolan identified five different alluvial units in the borehole transect. Radiocarbon dating of the youngest alluvial deposit (Unit 1) indicates an approximate radiocarbon age of 2,950 years before present (ybp), while the oldest deposit (Unit 5) has a radiocarbon age ranging from 18,809 to 19,789 ybp.

Data from the borehole transect revealed distinctive zone of closely spaced strands confined to a 1.8-meter-wide fault zone. Most of the fault strands consisted of 1- to 12-mm-wide zones of gray to yellow-brown staining that cut across the upper boundary of Unit 4. Up to 120 centimeters of mountain-side down separation is described along several closely-spaced fault strands. A southerly strand of the fault extended up to 40 centimeters into Unit 3, and exhibited approximately 55 centimeters of brittle, mountain side down vertical offset. The erosional contact between Units 2 and 3 was not offset by faulting. The most recent surface rupture on the Hollywood Fault is therefore thought to have occurred after development of the buried Unit 4 soil and after its burial by at least the lower parts of Unit 3, but before burial of unfaulted, upper portion of Unit 3 (approximately 6,000 to 7,000 ybp). The predominant strike of the fault and associated strands is generally north 85 degrees east, with steep northerly dips ranging from 80 degrees to vertical.

Dolan (2000) reveals that the most recent surface rupture event on the Hollywood Fault occurred between 6,000 and 11,000 ybp, and most likely between 7,000 and 9,500 ybp, thus confirming Holocene activity on the fault. Earlier surface ruptures may have occurred between 10,000 and 20,000 ybp, suggesting a relatively long recurrence interval for surface rupture events. Dolan further infers that movement on the fault occurs at either a very slow slip rate, or in infrequent large-magnitude events. Dolan speculates that the large magnitude events (if they occur) may be accompanied by movement on the Santa Monica

Fault to the west. Dolan further states that the most recent surface rupture event on the Hollywood Fault probably was not accompanied by rupture on the Santa Monica Fault.

The Hollywood Fault has recently been included in an Earthquake Fault Zone by the State in the Hollywood Quadrangle (California Geological Survey 2014). The portion of the Hollywood Fault in the Beverly Hills Quadrangle has not yet been included in an Earthquake Fault Zone, although it is our understanding that the State is considering zoning portions of the Hollywood Fault in the Beverly Hills Quadrangle.

Splays of the Benedict Canyon Fault are mapped approximately 1½ miles to the northwest of the subject property by Dibblee. The Benedict Canyon fault zone is an ancient group of faults that trend northeast through the Santa Monica Mountains, through parts of the San Fernando Valley and to the Eagle Rock Fault Zone. Weber et al. (1980) found no surface evidence suggesting recent movement along the Benedict Canyon Fault Zone during their study. The Benedict Canyon Fault is not considered to be an active fault.

Strong Ground Shaking-2016 CBC

The majority of Southern California, including all of Los Angeles and Ventura counties, falls within a zone requiring structural design to resist earthquake loads. Section 1613 of the 2016 California Building Code (CBC) which is based on the 2015 International Building Code (IBC) requires mapped risk-targeted considered earthquake (MCE_R) ground motion response acceleration. These parameters include 5-percent critical damping at 0.2 seconds (S_s) and 1.0 seconds (S_1). In addition, a Site Class and site coefficients F_a and F_v must be assigned for use in structural design relative to strong ground shaking.

The mapped spectral acceleration parameters (S_s and S_1) are determined utilizing Figure 1613.3.1(1) and 1613.3.1(2) of the 2016 CBC or the geographic location (latitude and longitude) of the site using the USGS interactive website “U.S. Seismic Design Maps” at http://earthquake.usgs.gov/designmaps/us/application.php. Site coefficients F_a and F_v can also be obtained from the USGS program or from tables 1613.3.3(1) and 1613.3.3(2) included in the 2016 CBC.

The 2016 CBC assigns a site class based on the average soil properties within the upper 100 feet of the soil profile. Site Class C is applicable for the planned retaining walls planned as part of the private street project.

Site class, spectral accelerations and seismic design coefficients have been determined for the site based on tables 1613.3.3 (1 and 2) of the 2016 CBC and the USGS interactive U.S. Seismic Design Maps website utilizing the 2010 ASCE 7 option. The required design parameters and coefficients are provided in the following table.

Site Class	Spectral Response Acceleration (0.2s) S_s (g)	Spectral Response Acceleration S_1 (g)	Site Coefficient F_a	Site Coefficient F_v
C	2.513	0.909	1.0	1.3

Design Spectral Response Acceleration (0.2s) S_{DS}	Design Spectral Response Acceleration (1.0s) S_{D1}
1.675	0.788

Peak Ground Acceleration

Analysis of the seismic forces on retaining walls requires an estimate of the peak ground acceleration (PGA) at the site. The PGA is a function of the distance of the site from a seismic source, the type and magnitude of fault movement, the shear wave velocity of the soil/rock, and the period of time under consideration. The current City of Los Angeles geotechnical guidelines allow the use of a PGA equal to 2/3 of PGA_M, where PGA_M is determined in accordance with Figure 22-7 and equation 11.8-1 of the 2010 ASCE 7. The PGA_M value can be obtained using the USGS interactive U.S. Seismic Design Maps website http://earthquake.usgs.gov/designmaps/us/application.php utilizing the 2010 ASCE 7 option and Site Soil Classification B. The PGA_M for the site determined utilizing this method is 0.976g. Based on the City of Los Angeles Guidelines a PGA = 2/3 PGA_M = 2/3 (0.976 g) = 0.651g is applicable for seismic retaining wall analysis. The horizontal seismic coefficient for retaining wall analyses is 1/2 PGA = 1/2(0.651g) = 0.326g.

The proposed structure will be subjected to moderate to strong ground shaking should one of the many active Southern California faults produce an earthquake.

Seismic Hazards

The California State Legislature passed the Seismic Hazards Mapping Act of 1990. The Seismic Hazards Mapping Act was signed into law and became effective in 1991.

The Seismic Hazards Mapping Act was prompted by damaging earthquakes in northern and southern California, and is intended to protect public safety from the effects of strong ground shaking, liquefaction, landslides, and other earthquake-related hazards. The Seismic Hazards Mapping Act requires that the State Geologist delineate the various "seismic hazards zones." The maps depicting the zones are released by the CGS. The fact that a site lies outside of a zone does not mean it is free of seismic or geologic hazards such as landslides, lateral spreading, liquefaction or rockfall. Not all of Southern California has been mapped, although, new maps are issued and existing maps are refined from time to time.

The Seismic Hazards Mapping Act requires a site investigation by a certified engineering geologist and/or civil engineer prior to development of a project sited within a hazard zone. The investigation is to include recommendations for a "minimum level of mitigation" that should reduce the risk of ground failure during an earthquake to a level that does not cause the collapse of buildings for human occupancy. The Seismic Hazards Mapping Act does not require mitigation to a level of no ground failure and/or no structural damage.

Seismic Hazard Zone delineations are based on correlation of a combination of factors, including: surface distribution of soil deposits and bedrock, slope steepness, depth to groundwater, bedding orientation with respect to slopes, bedrock shear strength, and occurrence of past seismic failure. Maps within the series are further designated as Reconnaissance, Preliminary, or Official. Official Seismic Hazard Zones Maps are the culmination of mapping, analysis, review and comment of CGS, other State agencies, and the public following review and revision of the Preliminary Review Map. The Official Maps are the most rigorous and have the highest confidence level.

The CGS has released an official map titled "Seismic Hazard Zones, Beverly Hills 7.5 Minute Quadrangle," which is included in Open File Report #98-14, dated March 25, 1999. The map delineates areas that have been subject to or are potentially subject to liquefaction; and areas where previous landsliding has occurred or conditions for potential permanent ground displacements exist as a result of earthquake-caused ground shaking. Dotted zones are for liquefaction hazard. Shaded zones are for earthquake-induced landslides.

The site is not included within a zone of potentially liquefiable soil. Liquefaction is not considered a hazard at the subject site because the property is underlain by bedrock at a relatively shallow depth.

The site is located within an area subject to potential seismic-induced slope instability. This designation has likely been made due to the presence of relatively steep slopes. The seismic stability of the slopes is addressed in the following section.

Earthquake-induced soil densification is not expected to occur on the site. Ground lurching may cause movement in near-surface earth materials or structures located near the top of a descending slope that are not properly founded in bedrock with the recommended setbacks.

SLOPE STABILITY

Static and seismic slope stability calculations were performed for the proposed soil-nail wall and natural slope above along Sections A, B, D, F, G and H. The calculations were performed using the XSTABL Computer Program by Interactive Software Designs and Slide Computer Program by Rocscience. We chose the Modified Bishop's Method for circular failures. Deep and shallow circular failure surfaces extending through the toe of the slope were analyzed. A seismic coefficient K = 0.326g was used for the soil-nail wall analyses.

We have used static and seismic bond strengths of 5,000 pounds per foot (psf) and 6,500 psf respectively for the 6-inch-diameter nails. The soil nails are assumed to start 3 feet below the top of the over-steepened slope. The soil nails are assumed to be installed perpendicular to the slope face. The nail spacing indicated is the vertical spacing, not the spacing measured along the slope face.

Section A
The stability analyses indicate that the trimmed/scaled cut slope above Blue Heights Drive does not have the required safety factor (XSATABL File 17563A8). Additional analyses indicate that the slope can be stabilized using a soil-nail system. The required vertical nail spacing is 10 feet for 14-foot-long nails (Slide files 17563g Sec A Nails and 17563g Sec A Nails Seismic).

Section B
The stability analyses indicate that the trimmed/scaled cut slope above Blue Heights Drive has the required static and seismic safety factors (XSTABL files 17563B8 and 17563B8S) without the use of soil nails.

Section D

The stability analyses indicate that the trimmed/scaled cut slope above Blue Heights Drive does not have the required safety factor (XSATABL File 17563A8). Additional analyses indicate that the slope can be stabilized using a soil-nail system. The required vertical and horizontal nail spacing is 8 feet for 26-foot-long nails (Slide files 17563g Sec D Static Nails and 17563g Sec D Nails Seismic).

Section F

The stability analyses indicate that the fill over residual soil slope below the planned private street has a static factor of safety of 1.50 or above when analyzed along circular and planar failure surfaces (XSTBL Files 17563 F1 and 17563 F2). The stability analyses indicate that the fill over residual soil slope below the planned private street has a static factor of safety of 1.50 or above when analyzed along circular and planar failure surfaces (XSTABL Files 17563F1 and 17563F2).

The stability analyses indicate that the trimmed/scaled cut slope above Blue Heights Drive does not have the required static safety factor (XSTABL File 17563F3). Additional analyses indicate that the slope can be stabilized using a soil-nail system. The required vertical and horizontal nail spacing is 8 feet for 20-foot-long nails (Slide Files 17563g Sec F Static Nails and 17563g Sec F Nails Seismic). The analyses indicate that the natural slope above the soil-nail wall has the required safety factor (XSTABL File 17563F4).

Section G

The stability analyses indicate that the overall slope has as static factor of safety in excess of 1.5 when analyzed along circular failure surfaces (XSTABL Files 17563G5 and 17563G6). The stability analyses indicate that the trimmed/scaled cut slope above Blue Heights Drive does not have the required safety factor (XSTABL File 17563G7). Additional analyses indicate that the slope can be stabilized using a soil-nail system. The required vertical and horizontal soil nail spacing, is 8 feet for 19-foot-long nails (Slide Files 17563-G Nails and 17563g Sec G Nails Seismic). Analyses indicate that the natural slope above the soil-nail wall has the required safety factor (XSTABL File 17563G8).

Section H

The stability analyses indicate that the overall slope has a static factor of safety in excess of 1.5 (XSTABL File 17563H1). Additional analyses indicate that the fill over residual soil slope below Blue Heights Drive has static and safety factors in excess of 1.5 when analyzed along circular and planar failure surfaces (XSTABL files 17563H2 and 17563H3). The stability analyses indicate that the trimmed/scaled cut slope above Blue Heights Drive does not have the required safety factor (XSTABL File 17563H4). Additional analyses indicate that the slope can be stabilized using a soil-nail system. The required vertical and horizontal soil nail spacing is 5 feet for 26-foot-long nails (Slide Files 17563g Sec H Circ Nails, 17563g Sec H Planar Nails, 17563g Sec H Circ Nails Seismic and 17563g Sec H Planar Nails Seismic). Analyses indicate that the natural slope above the soil-nail wall has the required safety factor (XSTABL File 17563H5).

KINEMATIC SLOPE STABILITY ANALYSES

We have also performed kinematic stability analyses for the steep descending street cut slope using Section A. The kinematic analysis was performed using the ROCKPACK 3 slope stability program by C.F. Watts et.al. ROCKPACK 3 for Windows includes the programs PLANE, RAPWEDGE, CMPWEDGE, and TOPPLE. These programs calculate safety factors for rock slopes using stereonet plots from STEREONET 9.8 to determine whether failures within mapped discontinuities are kinematically possible. Equations used to evaluate planar and wedge failures are based on limiting equilibrium methods developed by Hoek and Bray (1981). The equations for evaluating topple failures are based on sum of moments methods from Seegmiller (1982).

To satisfy the requirements of the City, we have depicted the mapped discontinuities exposed in the roadcut above Blue Heights Drive using the STEREONET 9.8 computer program. We have performed additional kinematic stability analyses of the cut slope above Blue Heights Drive with the proposed 1:1 trim toward the north from the segments previously analyzed and approved. We segmented the new analyses into nine (9) areas shown on the enclosed Geologic Maps 1 and 2. These areas are bounded by faults that clearly form boundaries between differing geologic structure found within the nine (9) areas.

The enclosed stereonet plots depict the structural information for the discontinuities using dip vectors as recommended in the manual. It appears that a portion of the slope in Area 1 has failed along a joint set that dips 52 degrees to the southeast. Therefore, we have back analyzed the apparent failure of the original 60 degree cut slope along that joint to determine strength parameters for the joint. For the back analysis, we used density = 140 pcf, zero (0), and an angle of internal friction (phi) = 44 degrees and determined the cohesion that yields a safety factor = 1.0. Cohesion values of 32 to 54 were determined. Strength parameters of phi = 44 degrees and c = 0 were used in the remaining analyses. We have used zero cohesion for a conservative analysis. We have conservatively assumed that the discontinuities are continuous and through-going. Our mapping suggests that, except in Area 1, the joints are not continuous for any significant distance, and that do not create evenly spaced joint sets that should be analyzed. Great circles representing each joint plane in the specific zones have been drawn on the plots.

The Markland Test Plot (enclosed herein) establishes critical zones for planar wedges and for topples. If great circles for the discontinuities intersect within the critical zones a potential for daylighted discontinuities and the potential for planar wedge and topples may be present. The stereonet plots of the great circles for the mapped joint planes have local intersections within the critical zones, revealing that there is a potential for planar wedge failures.

Area 1

The numerous analyses enclosed herein indicate that a number of the joint intersections exist for the west-facing and southwest slope in Area 1. The stability analyses suggest that the factors of safety for many of the joint intersections are less than 1. Those sets primarily contain the adverse southwest dipping joints along which the slope has failed. Other intersections reveal adequate safety factors.

Area 2

The stereonet plot for Area 2 does not reveal adverse joint intersections.

Area 3

The stereonet plot for Area 3 suggests that one intersection between a southeast dipping joint in the northern portion of the area and the southern fault with a safety factor 1.33. That joint and fault should not intersect. Analysis along the southern fault plane also suggests a safety factor of 1.33. This area will be stabilized with a soil nail wall.

Area 4

The stereonet plot for Area 4 suggests that one intersection between a southwest dipping joint and the northern fault has a safety factor less than 1.5. Those planes do not intersect as the fault is north of the joint. A planar failure along the fault has a safety factor less than 1.5. This area will be stabilized with a soil nail wall.

Area 5
The stereonet plot and analyses for Area 5 do not reveal any adverse joint intersections with safety factors less than 1.5.

Area 6
There stereonet plot for Area 6 does not reveal any adverse planes of joint intersections.

Area 7
The stereonet plot and analyses for Area 7 reveal an adverse joint intersection with a safety factor of 1.47 and an adverse plane with a safety factor of 1.04. This area will be stabilized with a soil nail wall.

Area 8
The stereonet plot and analyses for Area 8 reveal several potentially adverse planar intersections with safety factors less than 1.5. Several of these potential intersections, such as a south-dipping 49-degree joint and the southern fault; southwest-dipping 49-degree joint and a northwest-dipping 82-degree joint; and a southwest-dipping 49-degree joint and northwest-dipping 85-degree joint are too far apart to intersect. This slope will, in any event, be stabilized with a soil nail wall.

Area 9
The stereonet plot and analyses for Area 9 suggest a low safety factor for a south-dipping 50-degree joint. That joint, however, is above the 60-degree portion of the slope and is parallel to the slope face where it was mapped. A low safety factor is also indicated for a southwest-dipping 65-degree joint and a south-dipping 50-degree joint. Those joints will not intersect based on their mapped locations. The remaining joint intersections for Area 9 have adequate safety factors.

The above-described calculations are based upon shear tests of samples believed to represent the weakest material encountered during exploration. Cross sections used are thought to be the most critical for the slopes or conditions analyzed. We have broken the bedrock into two zones. The strength parameters for the upper bedrock were determined by our testing of in-situ samples. The shear strength parameters for the deeper bedrock were taken from a cut bedrock sample. All other slopes of flatter gradient or lesser height are considered stable.

ENGINEERING CONSIDERATIONS

Samples of the earth materials were obtained from the site and transported to the laboratory for further testing and analysis. The testing performed is described in the Appendix.

CONCLUSIONS AND RECOMMENDATIONS

General Findings

Based upon our exploration, it is our finding that construction of the proposed private street improvements is feasible from a geologic and soils engineering standpoint, provided our advice and recommendations are made a part of the plans and are implemented during construction.

The private street is underlain by fill in the area of the swale and granitic bedrock at a shallow depth elsewhere. The previously approved slope stability analyses indicate that the existing descending bedrock slopes have the required static and seismic safety factors when the support provided by the offsite walls is considered. Analyses included herein indicate that the fill wedge underlying the road in the area of the swale is stable with the required static safety factor. Consolidation tests indicate that the fill is not subject to significant consolidation upon loading or saturation.

The ascending slope above Blue Heights Drive does not have the required static safety factors when analyzed along circular failure surfaces in the area of the over-steepened road cut. The kinematic analysis also indicates that the existing west-facing cut slope has factors of safety less than 1.5 for shallow wedge failures. It is presently planned to stabilize the over-steepened cut with a soil nail wall.

The existing steep roadcut above Blue Heights Drive extends offsite. We understand that the owner is currently purchasing the offsite property. The talus at the toe of the west and south facing slopes above the central and southern portion of the over-steepened road cut should be removed. A slough wall should be provided at the toe of the south facing slope above the east end of the private street.

The recommended bearing material for the planned retaining walls is the underlying bedrock. Improvements may be supported by deepened foundations where foundation setback requirements necessitate deepened foundations and/or conventional footings. We recommend that existing fill be removed and recompacted in areas to receive new pavement. The fill will be laterally supported by the retaining walls.

Grading

The following guidelines may be used in preparation of the grading plan and job specifications for the retaining wall backfill and road bed preparation.

A. The areas to receive compacted fill shall be stripped of all vegetation, debris, existing fill, soil, and soft or disturbed earth materials. The excavated areas shall be observed by the soils engineer and/or geologist prior to placing compacted fill.

B. The exposed grade shall then be scarified to a depth of 6 inches, moistened to approximately equal to or slightly above optimum moisture content, and recompacted to 95 percent of the maximum density as determined by the latest version of ASTM D1557. Fill types with less than 15 percent finer than .005mm should be compacted to 95 percent of the maximum density. This higher relative compaction is required for granular soils by the City of Los Angeles Municipal Code Ordinance 171.939 enacted on April 15, 1998.

C. Fill, consisting of earth materials approved by the soils engineer, shall be placed in 6- to 8-inch thick layers, be moistened to approximately equal to or slightly above optimum moisture, and be compacted with suitable equipment. The excavated onsite materials are considered satisfactory for reuse in the controlled fills. Imported fill sources should be approved by this office prior to transporting the fill to the site. A minimum 48-hour notice is required to approve imported fill. Imported earth materials should be granular (less than 30 percent passing the #200 sieve) and should have an expansion index less than 30. Soil engineering and/or environmental reports regarding the source site(s) may be required. Rocks larger than 6 inches in diameter shall not be used in the fill.

D. The fill shall be compacted to at least 95 percent of the maximum laboratory density. The maximum density shall be determined by the latest version of ASTM D1557. The moisture content of the fill shall be approximately equal to or slightly above optimum moisture.

E. Field observation and testing shall be performed by the soils engineer during grading to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction is less than required, additional compactive effort shall be made with adjustment of the moisture content, as necessary, until the required degree of compaction is obtained. A minimum of one compaction test is required for each 2 vertical feet or 500 cubic yards of fill placed.

F. Fill slopes may be constructed at a 2:1 gradient and shall be keyed and benched into bedrock. Keyways should be a minimum of 8 feet wide and 2 feet into bedrock, as measured on the downhill side.

G. The City of Los Angeles requires that an erosion control plan be developed and approved when grading is to be performed during the "rainy season" between October 1 and April 15.

Deepened Foundations - Friction Piles

Friction piles may be used to support the planned retaining walls where slope setback requirements dictate the use of deepened foundations. Piles should be a minimum of 24 inches in diameter and a minimum of 8 feet into bedrock. The piles may be designed for skin friction values of 800, 1,000, and 1,200, for pile sections founded up to 12 feet, between 12 and 25 feet or more than 25 feet into bedrock, respectively. Retaining wall piles should be tied in one direction with a grade beam. The downslope grade beam should extend a minimum of 24 inches below the adjacent downslope grade, 12 inches into bedrock, as measured on the upslope side and should be designed for an equivalent fluid pressure of 40 pounds per cubic foot. Spoils from pile excavations should not be cast over the face of the descending slope.

Lateral Design

The existing fill, soil, and weathered bedrock on the site are subject to downhill creep where not penetrated by a grade beam. Pile shafts are subject to lateral loads due to the creep forces. Pile shafts should be designed for a lateral load of 1,000 pounds per linear foot for each foot of shaft exposed to the existing fill, soil, and weathered bedrock, unless penetrated by a grade beam.

The skin friction values indicated above are for the total of dead and frequently applied live loads and may be increased by one third for short duration loading, which includes the effects of wind or seismic forces. Piles may be assumed fixed at 4 feet into bedrock. Resistance to lateral loading may be provided by passive earth pressure within the bedrock. Passive earth pressure may be computed as equivalent fluids having densities of 500 and 1,000 pounds per cubic foot, where the piles are within 20 feet or more than 20 feet from the slope face, respectively, with a maximum earth pressure of 12,000 pounds per square foot.

For design of isolated piles, the allowable passive earth pressure may be increased by 100 percent. Piles which are spaced more than 3-pile diameters on center may be considered isolated.

Foundation Setback

All retaining wall footings along the private street should be founded to a depth which provides a minimum horizontal setback one-sixth the total slope height from the face of the descending slope to a maximum of 20 feet. All footings should be founded to a depth which provides a minimum 8-foot horizontal setback from the soil/bedrock contact or the fill/bedrock contact. The minimum horizontal setback from the face of the slope face should be 8 feet.

Foundation Settlement

Settlement of the foundation system is expected to occur on initial application of loading. The settlement is expected to be 1/4 inch or less. Long-term differential settlement is not expected to exceed 1/4 inch in 40 feet. This level of differential settlement is not expected to cause significant cracking in the planned wood-frame, stucco-and-plaster structure.

Retaining Walls

Non-restrained retaining walls along the private street supporting a level surcharge may be designed for a static equivalent fluid pressure of 35 pounds per cubic foot per the enclosed calculations. An additional seismic load is not required. Retaining walls located adjacent to a street should be designed for an additional uniform pressure of 100 pounds per square foot over the upper 10 feet of the wall to account for traffic loading.

Retaining walls should be provided with a subdrain and should be backfilled with a minimum of 12 inches of gravel adjacent to the wall to within 2 feet of the ground surface. The gravel should be separated from the earth cut by non-woven filter fabric such as Mirafi 140N. A compacted fill blanket shall be provided at the surface along with proper surface drainage devices. A drainage composite such as Miradrain® may be used in lieu of the gravel column. Any remaining void should be filled with gravel if the void is less than 18 inches. If the void is wider than 24 inches, compacted fill should be utilized or the Building official should be consulted regarding the possible use of a wider gravel column. Gravel backfill should be densified by tamping. It is our estimation that gravel backfill, when tamped has a dry density of 95 percent or greater of the maximum dry density. The gravel backfill may exceed 8 feet in depth. Tamped gravel backfill is suitable for vertical and lateral support of slopes, compacted fill, slabs and footings recommended in this report.

The onsite earth materials may be used for retaining wall backfill. Any imported fill should be approved by the soils engineer. The retaining wall backfill should be compacted to a minimum of 90 or 95 percent of the maximum density, as determined by the latest version of ASTM D1557. The higher relative compaction value is required for fill types with less than 15 percent finer than .005mm. It should be noted that the City of Los Angeles requires a compaction test for every 2 feet of backfill placed.

Footings may be sized per the **Foundation** section of this report.

When designing wall heights, special attention should be paid to the depth of the bearing material at the wall location and the slope of the upper contact of the bearing material. Walls for which the grade beams must extend into bedrock must be designed to retain the full height of the above and below grade wall/grade beam sections.

Retaining Wall Deflection

It should be noted that non-restrained retaining walls designed for active earth pressure will deflect 1/4 to 1/2 percent of their height over time in response to loading. This deflection is normal and reduces the earth pressure on the wall. Improvements constructed immediately adjacent to or incorporated with non-restrained retaining walls should be designed to accommodate this movement. Curved or angled walls which have a convex, downslope plan pattern should be provided with vertical construction joints at corners and 40 feet on center. Should wall deflection be undesirable, please contact our office for higher, at-rest earth pressures which will reduce wall deflection significantly.

Decking which caps a retaining wall should be provided with a flexible joint to allow for the normal 1/4 to 1/2 percent deflection of the retaining wall. Decking which does not cap a retaining wall should not be tied to the wall. The space between the wall and the deck will require periodic caulking to prevent moisture intrusions into the retaining wall backfill.

Temporary Excavations

Calculations indicate that temporary vertical cuts within bedrock with a sloping surcharge may be excavated up to 12 feet. Vertical excavations in excess of 12 feet should have the upper portion trimmed to 1:1 (45 degrees). The fill and soil should be trimmed to 1:1 for wall excavations.

Temporary bracing may be necessary to protect workers from raveling and shallow pop-outs during wall construction and subdrain and waterproofing installation.

The geologist should be present during grading/construction to observe temporary slopes. All excavations should be stabilized within 30 days of initial excavation. Water should not be allowed to pond on top of the excavations or to flow toward it. No vehicular surcharge should be allowed within 3 feet of the top of the cut. Temporary cuts should be covered with plastic and berms should be created to prevent water from overtopping the temporary excavation during the rainy season.

Excavation Characteristics

Hard, crystalline bedrock was encountered in the test pits and is expected to be encountered during foundation excavation. Ripping, coring, or the use of jackhammers may be necessary and should be expected. Casing may be necessary to prevent caving within the fill, soil and weathered bedrock.

Waterproofing

Retaining walls, particularly those constructed with concrete blocks, have a history of moisture seepage and leakage. Waterproofing materials, such as asphalt emulsion and Thorough-Seal, have often proved ineffective. A flexible waterproofing membrane should be utilized. Your architect or a waterproofing specialist should be consulted for an appropriate product. The waterproofing membrane should be covered with protection board to prevent puncture during backfilling. Also important is the use of a subdrain which daylights to the atmosphere. The subdrain should be covered with gravel to facilitate collection of water or connected to a drainage composite. The gravel column or drainage composite, such as Miradrain® should be extended up the rear face of the wall to within 2 feet of the ground surface. The gravel column or drainage composite is intended to reduce the amount of time that water is in contact with the waterproofing.

Certain precautions can be taken to reduce the possibility of future seepage problems. Superplasticized and water-retardant concrete may be utilized with poured walls to make pouring easier and reduce cracking and shrinkage. Care should be taken with block walls to adequately seal the joint between the poured concrete footing and the first course of block. Where possible, a poured stem should be utilized.

Soil Nail Design

Our calculations indicate that the majority of the existing non-conforming street cut slopes are not grossly or surficially stable. Soil nails are needed to supply the additional resistance needed to establish a safety factor for gross stability, and to improve the stability of the outer portion of the steep street cut slopes.

The preliminary soil nail design is provided in the following table. These design values are subject to revision by the soil-nail wall designer. The values provided assume the upper row of nails is situated 3 feet below the top of the wall and that the nails will be installed perpendicular to the cut face. The nail spacing listed is vertical rather than being measured along the wall face.

Section	Required Nail Length (ft)	Horizontal and Vertical Nail Spacing (ft)
A	14	10
D	26	8
F	20	8
G	19	8
H	26	5

These nail spacings presented above are preliminary and are provided to demonstrate that the slope can be stabilized with soil nails. The actual spacing will be determined by the soil nail engineer. Each horizontal row of soil nails should be offset from each other by 2½ to 5 feet. The gunite/shotcrete facing should be 4 inches thick and reinforced as determined by the engineer/designer. A minimum pressure of 40 pounds per square foot is applicable to the facing element. The soil nails may be installed perpendicular to the slope faces using the following parameters:

Minimum Soil Nail Length:	10 feet
Soil Nail Bar Diameter:	1 inch
Soil Nail Bar Yield Strength:	75 ksi
Grouted Hole Diameter:	6 inches
Ultimate Bond Strength:	5,000 psf static
Ultimate Bond Strength:	6,500 psf seismic
Horizontal Nail Spacing:	5 to 10 feet
Vertical Nail Spacing:	5 to 10 feet
Punching Shear:	30 kips
Plate Size:	8-inch square, 3/8 inch thick
Gunite/Shotcrete Facing Thickness:	4 inches

The length, spacing, and design parameters of the soils nails recommended above is preliminary and should be determined by the soil nail engineer/designer and installer. The plans should be reviewed by this office prior to approval.

Soil Nail Installation and Testing
The soil nails should be designed and installed in conformance with Caltrans Publication No. FHWA-SA-96-069R, *Manual for Design & Construction Monitoring of Soil Nail Walls*, revised October 1999, and *Recommended Guidelines for Permanent Soil Nails* (ASCE, Soil Nail Committee, June 26, 2001) or more recent publications. The design assumptions, calculations and drawings should be reviewed by Grover-Hollingsworth and Associates, Inc.

The soil nail diameter should be 1 inch. Centralizers shall be installed along the length of the soil nail to ensure that the soil nail will be centered in the drill hole and that minimum grout cover encapsulates the rebar. Centralizers shall be manufactured from polyvinyl chloride (PVC), polyethylene (HDPE), polypropylene (HDPP), steel or material which is non-detrimental to the pre-stressing steel. Wood spacers shall not be used. The centralizer shall support the nail in the drill hole and position the nail so the required grout cover is achieved. All centralizers shall be designed to permit grout to flow freely around the nail and up the drill hole. Position centralizers should have a maximum center-to-center spacing that does not exceed 5 feet. Centralizers should also be located within 3 feet from the top and bottom of the drill hole.

The designer of the soil nails system should evaluate corrosion and provide double corrosion protection for the nails (as required by the city). The bedrock does not have elevated sulfate and chloride minerals that would affect concrete design or corrosion. However, we recommend that the bedrock be assumed to be corrosive to ferrous metals.

The plans should contain provisions for testing the nails to verify the design assumptions and nail capacities. No less than 10 percent of the production soil-nails installed shall be proof tested to a test load of 150 percent of the calculated design capacity to verify bond stress. At least two verification nails shall be installed and tested to verify the ultimate bond stress and installation methods. Test nails shall have both bonded and unbonded portions. Verification test nails shall be tested to 200 percent of the calculated design capacity. The nails used for the verification tests shall be sacrificial and not incorporated into the production nails.

Soil Nail Wall Subdrainage

The gunite/shotcrete facing should have adequate subdrainage. Pre-fabricated drainage composite strips, such as Miradrain 6000, should be placed between the nails to the full height of the shotcrete. The drain strips are secured against the excavated face and are placed with the geotextile side against the ground. During gunite/shotcrete application, the contamination of the geotextile side with shotcrete must be avoided to prevent reducing the flow capacity of the drains. Strip drains must be spliced at the bottom and must have at least a 12 inch overlap such that the water flow is not impeded. The vertical drainage strips should be placed at the same horizontal spacing as the soil nails.

Any water collected at strip drains is to be removed by a conventional gravel and pipe subdrain at the base of the shotcrete facing. The subdrain should consist of perforated PVC pipe that is surrounded by 1 cubic foot of ¾-inch gravel per foot of pipe. The drainage geotextile must be in contact with the drain aggregate and pipe and conform to the dimensions of the trench. Additionally, weep holes can be installed through the toe of slope wall.

Soil Nail Verification Testing

Two verification test nails shall be installed. Completion of successful verification tests is required prior to the installation of production nails in those strata. The nails used for the verification tests shall be sacrificial and shall not be incorporated into the production-nail schedule.

Verification test shall be performed on sacrificial nails to the ultimate bond stress value. The test nails should be installed using the same method that is to be used for production nails, except grout for the test nails should only be placed along the bond length as specific on the plans. Verification test nails may be plain bar and need not be epoxy coated or encapsulated in HDPE sheathing.

Verification test nails should have a minimum 14-foot bonded length for testing. The maximum test load should be determined based upon the test bond length and the borehole diameter selected such that the maximum grout/ground bond stress at the maximum test load is equal to the ultimate bond stress assumed in the design for the strata in which the test nail is founded. The verification test nail bar size should be selected such that the maximum stress in the bar at the maximum test load does not exceed 0.9fy.

Verification test nails shall be incrementally loaded to twice the design load and movements recorded in accordance with the following schedule:

Load	**Load Hold**
al	1 minute
0.25 dl	1 minute
0.50 dl	1 minute
0.75 dl	1 minute
1.00 dl	1 minute
1.25 dl	1 minute
1.50 dl	60 minutes
1.75 dl	1 minute
2.00 dl	1 minute

al = alignment load
dl = nail design load

All load increments should be maintained within five percent of the intended load. The verification test nail should be monitored for creep at 1.50 dl load increments. The creep period should start as soon as the 1.5 dl test load is applied and the nail movement with respect to a fixed reference should be measured and recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50 and

60 minutes. The verification test nail should be unloaded in increments of 25 percent, with measurements of deflection at each increment.

Upon successful completion of the verification test, the nail should be loaded in 25 percent increments. Each load increment should be help until a stable reading is obtained. The nail extension at the load increment should be recorded. Load should be increased in 25 percent increments until either constant load results in continuous extension, 90 percent of the test bar yield capacity is reached, or 80 percent of the guaranteed ultimate capacity of the bar is reached. The maximum test load achieved and the corresponding bar extension should be recorded.

Soil Nail Verification Test Acceptance Criteria

For verification tests, if the creep curve indicates a creep rate of less than 0.08 inch per log cycle time, and the rate is linear or decreasing throughout the hold load, the test is successful.

Soil Nail Proof Testing

Proof tests should be performed on five percent of the permanent/production soil nails to verify the bond stress value assumed in the design. Nails should be proof tested on every lift and at different locations along the wall. Proof tests should be performed using testing equipment calibrated within 60 days of the start of testing.

Proof test nails should have a minimum of 10 feet bonded length for testing. The maximum test load should be determined based upon the test bond length and the whole diameter selected such that the maximum group/ground bond stress at the maximum test load is equal to 150 percent of the allowable bond stress assumed in the design for the strata in which the test nail is bounded.

Proof tests should be performed on production nails to 150 percent of the allowable bond stress value used in design. The proof test nails should be installed by the same method that is used for the production nails, except that grout only the bond length specified on the plans.

Securely block out the front 1 foot of the soil-nail hole with loose soil or other flexible material to avoid penetration of shotcrete in the open hole. Perform the proof test by loading the soil nail in the following increments:

al
0.25 dl
0.50 dl
0.75 dl
1.00 dl
1.50 dl
al = alignment load
dl = nail design load

All load increments should be maintained within 5 percent of the intended load. Depending on the performance, either 10-minute or 60-minute creep test should be performed at the maximum test load. The creep period should start as soon as the maximum test load is applied and the nail movement with respect to a fixed reference should be measured and recorded at 1, 2, 3, 5, 6 and 10 minutes. If the nail movement between 1 minute and 10 minutes exceeds 0.04 inches, the maximum test load should be maintained an additional 50 minutes and movements should be recorded at 20, 30, 50 and 60 minutes.

If at the proof test load the movement between 1 and 10 minutes is less than 0.04 inch, the test is successful. If the movement exceeds 0.04 inch, the proof test load may be held for an additional 50 minutes. A creep curve should be plotted for nail movement vs. log of time, between 6 and 60 minutes. If the creep curve indicates a creep rate of less than 0.08 inch per log cycle time, the test is successful.

Soil Nail Wall Construction Sequence

Any loose material on the slope face should be removed to firm bedrock and to create a relatively smooth slope face prior to installing the soil nails. The trimmed/cleaned surface should be approved by this office prior to drilling the soil nails. Verification and proof nails should be installed and tested the slope prior to installing the production nails. The nails should be installed in a top down fashion. Each row of nails should be installed prior to installing nails for the lower elevation rows. Once all of the soil nails have been installed the drainage composite panels should be attached to the face of the slope between each column of nails. The drainage composite and subdrain installation at the base of the shotcrete wall should be approved by this office. Upon approval of the subdrainage system the shotcrete facing can be placed.

Soil Nail Corrosion Protection
The design engineer should provide provisions for corrosion protection of the nails. Production nails shall be fully encapsulated using a double-grouted corrugated plastic sheath approved by the soils engineer and accepted by the Department. The bars should also be epoxy coated.

Soil Nail Wall Instrumentation and Monitoring
We do not believe that movement will occur within the stabilized slope. The soil nails will be supporting hard quartz diorite bedrock that is not subject to lateral movement and yielding. Subsurface monitoring/instrumentation is not needed for this particular slope stabilization.

It is our opinion that given the steep terrain where the soil nails supported facing will be placed, provision of a slope inclinometer above the facing is not necessary as it would be difficult to install and impractical to monitor. We believe that six sets of optical monitoring targets should be affixed to the finish facing. The sets should be equally spaced along the length of the facing. The targets in each set should be vertically aligned and be placed near the base, center, and top of the facing. The targets should be monitored on 6-month intervals for the first two (2) years with annual monitoring thereafter. If the position (vertically or horizontally) of a target changes by more than 0.03 foot (3/8 inch) from the prior reading, the geotechnical engineer should be contacted to observe the site and provide mitigation recommendations if facing movement appears to be occurring.

The condition of the facing element will be indicative of any movement within the stabilized slope. Any cracks or separations in the facing element should be reported to this office. If necessary some of the soil nails could be replaced where the distress is occurring. We do not recommend installing slope inclinometers since any movement that will occur will be will be near-surface and not deep-seated. Portions of the future structures in proximity to these slopes will be supported on friction piles bearing into the deeper bedrock below the zone of influence from near-surface slope movement.

Paving
Prior to placing paving, the existing fill and soil should be removed, moistened as required to obtain optimum moisture content, and recompacted to 95 percent of the maximum dry density, as determined by the latest version of ASTM D1557. The trench backfill below

paving, should be compacted to 95 percent of the maximum dry density. Irrigation water should be prevented from migrating under paving. The following pavement sections are recommended.

	Pavement Thickness (Inches)	Base Course (Inches)
Trucks	4	6

Base course should be crusher run base (CRB) or processed miscellaneous base (PMB).

Vegetation

All slopes should be planted with approved deep-rooted groundcover to assist in stabilization of the surface soils as soon as possible after completion of grading construction. Slopes over 15 feet in height should be provided with deep-rooted, approved shrubs on 10-foot centers. The City of Los Angeles or your landscape architect can provide a list of approved groundcover.

Drainage

To satisfy Low Impact Development (LID) requirements, drainage may be directed through sealed flow-through planter boxes or sealed rain gardens that do not allow infiltration into the subsurface. An overflow to the street should be provided. Drainage should not be allowed to pond on the street or against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope. Street drainage should be directed to Sunset Plaza Drive.

Preserving proper surface drainage is extremely important. Planters, plants, trees, or accumulations of organic matter should not be allowed to retard surface drainage. Area drains (if used) should be kept free of obstruction. Area drains should be located in topographically low areas and should not extend above the adjoining grade. Positive drainage along the backs of retaining walls should be maintained. Any other measures that will facilitate positive surface drainage should be employed.

Owners must preserve positive drainage. A licensed contractor familiar with hillside drainage control should be hired to inspect all drainage devices and to provide any necessary improvements in site drainage. It is recommended that all drainage devices be checked for performance on a regular basis and repaired as necessary. Drainage devices should be kept free of debris. The services of a sewer clean-out company should be used regularly to keep buried drains open.

Surface outlets for subdrains should be exposed and cleared at the completion of the grading/construction. Every possible effort should be made during and after development to ensure that the outlets remain unobstructed. Homeowners should be aware of the outlet locations and the need to keep them clear.

Plan Review

This report was prepared on the basis of preliminary development plans furnished. We suggest that your architect and/or engineer provide a preliminary set of plans to our office for review and comment. Should the plans differ substantially from the preliminary set, additional geotechnical work may be required. Formal plans should be reviewed by Grover-Hollingsworth and Associates, Inc. The City will require that the plans be signed by a licensed engineering geologist and/or geotechnical engineer. These individuals are not always in the office. Please arrange an appointment for plan signing.

Agency Review

All soil engineering and geologic aspects of the proposed development are subject to the review and approval of the governing agency. It should be recognized that the governing agency can dictate the manner in which the project proceeds and they could approve or deny any aspect of the proposed improvements.

Site Observation During Construction

During construction, a number of reviews by this office are recommended to verify site geotechnical conditions and conformance with the intentions of the recommendations for construction. Although not all possible geotechnical observation and testing services are required by the City of Los Angeles, the more site reviews requested, the lower the risk of future problems. The following site reviews are advised or required. Some of these site reviews will probably be required by the City. Foundation reviews should be performed prior to the placement of forms and steel reinforcement.

Pre-construction meeting .... Advised
Temporary excavations .... Required
Slope trimming/scaling .... Required

Test nail installation and testing ....Required
Production nail installation ....Required
Soil nail wall subdrainage installation ....Required
Bottom excavation for removals road bed..Required
Compaction of secondary fill...Required
Foundation excavation review for retaining walls ....Required
Subdrain and rock placement behind retaining walls...........................Required
Compaction of retaining wall backfill ....Required

Should the observations reveal any unforeseen hazard, the geologist/engineer will provide additional recommendations.

Please advise Grover-Hollingsworth and Associates at least 48 hours prior to the initial site visit or any pre-construction meeting. A 24-hour notice is required for additional site visits. Pile, soil-nail and subgrade observations should be requested prior to placement of steel and forms. Excavation bottom observations should be requested before the placement of subdrains or compacted fill. The approved plans and permits should be on the job site and available to the project consultant. The site visits during construction will be billed on an hourly basis in accordance with our most recent schedule of charges.

Construction Site Maintenance
It is the responsibility of the contractor to maintain a safe construction site. The contractor is also responsible for the safe operation of all equipment. When excavations exist on a site, the area should be fenced and warning signs posted. All excavations must be properly covered and secured. Excavation spoils should be either removed from the site or properly placed as a certified compacted fill. Fill temporarily stockpiled on the site should be placed in a stable area, away from slopes, excavations and improvements. Earth materials must not be spilled over any descending slope. Workers should not be allowed to enter any unshored trench, pile or caisson excavation over 5 feet deep. Temporary erosion control measures and protection of excavations from drainage and erosion during the rainy season is required.

Please call this office with any questions. This report and our exploration are subject to the following Notice.

NOTICE

General Conditions

In the event of any changes in the design or location of any structure, as outlined in this report, the conclusions and recommendations contained herein may not be considered valid unless the changes are reviewed by us and our conclusions and recommendations are modified or reaffirmed after such review.

The subsurface conditions, excavation characteristics, and geologic structure and contacts described herein and shown on the cross sections have been projected from excavations on the site, as indicated and should in no way be construed to reflect any variations which may occur between or away from these excavations or which may result from changes in subsurface conditions. The projection of geologic contacts is based on available data and experience and should not be considered exact.

Fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, and other factors not evident at the time of the measurements reported herein. Fluctuations also may occur across the site.

If conditions encountered during construction appear to differ from those disclosed herein, notify us immediately so we may consider the need for modifications. Compliance with the design concepts, specifications or recommendations during construction requires our review during the course of construction.

EXPLORATION WAS PERFORMED ONLY ON A PORTION OF THE SITE, IT CANNOT BE CONSIDERED AS INDICATIVE OF THE PORTIONS OF THE SITE NOT EXPLORED.

This report is issued and made for your sole use and benefit. This report is not transferable. The intent of this report is to advise our client on geotechnical matters involving the proposed improvements. It should be understood that the geotechnical consulting provided and the contents of this report are not perfect. Any errors or omissions noted by any party reviewing this report, and/or any other geotechnical aspect of the project, should be reported to this office in a timely fashion. Any liability in connection herewith shall not exceed our fee for the exploration.

Geotechnical engineering is characterized by uncertainty. Geotechnical engineering is often described as an inexact science or art. Conclusions and recommendations presented herein are partly based upon the evaluations of technical information gathered, partly on experience, and partly on professional judgment. The conclusions and recommendations presented should be considered "advice." Other consultants could arrive at different conclusions and recommendations. No warranty, expressed or implied, is made or intended in connection with the above exploration or by the furnishing of this report or by any other oral or written statement.

Respectfully submitted,

MARTIN E. LIEURANCE
Project Geologist/Engineer

ROBERT A. HOLLINGSWORTH
G.E. 2022/E.G. 1265

MEL:RAH:kew:dl:kew

Enc: References
Appendix
City of Los Angeles Approval Letter (dated December 15, 2016) (7 sheets)
Vicinity Map
Vicinity Topographic Maps (3)
Regional Geologic Map
Dibblee Geologic Map
Seismic Hazards Maps (2)
USGS Design Maps Reports (6 sheets)
Geologic Map 1 (pocket)
Geologic Map 2 (pocket)
Section Location Map (pocket)
Sections A thru I (pocket)
Private Street Map (pocket)
Plates A-1 thru A-11
Plates B-1 thru B-8
Plates C-1 thru C-6
Plate D
XSTABL Calculation Sheets (96)
Slide Calculation Sheets (72)
Kinematic Calculation Sheets (139)

xc: (1) Addressee (c/o Steve Byrne)
(1) Steve Byrne via email
(2) Ameen Ayoub
(1) Ameen Ayoub via email
(4) Pacific Crest Consultants (Attention: Penny Flinn)

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**** California Department of Conservation, Division of Mines and Geology (CDMG/DMG) is now known as California Department of Conservation, California Geological Survey (CGS)(2002)***

APPENDIX

LABORATORY TESTING

Sample Retrieval

Undisturbed samples of earth materials were obtained by driving a thin-walled steel sampler with successive blows of a drop hammer. The material was retained in brass rings of 2.41 inches inside diameter and 1.00-inch height. The samples were stored in close-fitting, water-tight containers for transportation to the laboratory.

Moisture Density

The field moisture content and dry density were determined for each of the undisturbed soil samples in accordance with ASTM D2216-10 and D2937-10. The dry density was determined in pounds per cubic foot. The moisture content was determined as a percentage of the dry soil weight. The results are presented on the A-plates.

Shear Strength

The peak and/or ultimate shear strengths of the soil, weathered bedrock and bedrock were determined by performing direct shear tests in accordance with ASTM D3080/M-11 and D5607-08. The tests were performed in a strain-controlled machine manufactured by GeoMatic. The rate of deformation was 0.01 inches per minute. Samples were sheared under varying confining pressures, as shown on the "Shear Test Diagrams," B-plates. The residual shear strengths of the soil and weathered bedrock were determined by repeatedly shearing a sample under varying confining pressures in the direct shear machine. The rate of deformation for the last test at each confining pressure was 0.01 inches per minute. The space between the shear rings was cleaned before the last cycle of shearing. The moisture conditions during testing are shown on the B-plates. The samples were artificially saturated in the laboratory and were sheared under submerged conditions.

GEOLOGY AND SOILS REPORT APPROVAL LETTER

December 14, 2016

LOG # 94559-01
SOILS/GEOLOGY FILE - 2
LAN

A and T Development LLC
c/o Pacific Crest Consultants
23622 Calabasas Road, #100
Calabassas, CA 91302

LEGAL DESCRIPTION: PT NE 1/4 SEC 7 T1S R14W (Arb. 23)
LOCATION: 1830 N. Blue Heights Drive

CURRENT REFERENCE REPORT/LETTER	REPORT No.	DATE OF DOCUMENT	PREPARED BY
Response Report	GH17563-G	11/15/2016	Grover Hollingsworth
Oversized Documents	``	``	``

PREVIOUS REFERENCE REPORT/LETTER(S)	REPORT No.	DATE OF DOCUMENT	PREPARED BY
Dept. Correction Letter	94559	09/13/2016	LADBS
Geology/Soils Report	GH17563-G	08/04/2016	Grover Hollingsworth

The Grading Division of the Department of Building and Safety has reviewed the referenced reports that provide recommendations for the proposed 4+ story single family residence, ramp/parking structural decks, bowling alley, garage, pool, decks, retaining walls, private street improvements (road widening), 1:1 slope trimming and slough/impact walls with 5 foot of freeboard. The subject property consists of a flag lot with a narrow strip of land that extends from Sunset Plaza Drive to the main portion of the subject property located on the south and west sides of Blue Heights Drive. It appears that three lots own portions of the private road that extends from Sunset Plaza Drive where private street improvements are proposed.

The subject property is located on an approximately 200 foot high south and west facing slopes between unimproved McLeod Drive and Viewmont Drive. According to the consultants, overall slope gradient is between 1.5H:1V to 1.25H:1V with slope gradients between 3H:1V and near vertical. The cross sections appear to depict slope gradients as steep as 79 degrees along the northern side of the private street cut. The earth materials at the subsurface exploration locations consist of up to 2 feet of uncertified fill underlain by up to 3 feet of natural residual soil and 1.5 feet of highly weathered granite over granite bedrock. The consultants recommend to support the proposed structures on conventional and/or drilled-pile foundations bearing on competent bedrock.

The site is located in a designated seismically induced landslide hazard zone as shown on the Seismic Hazard Zones map issued by the State of California. The above reports include an acceptable seismic slope stability analysis and the requirements of the 2014 City of Los Angeles Building Code have been satisfied.

The referenced reports are acceptable, provided the following conditions are complied with during site development:

(Note: Numbers in parenthesis ( ) refer to applicable sections of the 2014 City of LA Building Code. P/BC numbers refer the applicable Information Bulletin. Information Bulletins can be accessed on the internet at LADBS.ORG.)

1. Prior to the issuance of any permit, secure approval from the Division of Land Unit of the Department of City Planning for the proposed private street to provide safe and stable access to the subject lot. A supplemental report shall be submitted to the Grading Division of the Department containing recommendations for the proposed private street for review and approval.

2. All applicable requirements of P/BC 2014-050 shall be incorporated into the construction plans.

3. All existing uncertified fill and/or creep prone soils shall be removed and re-compacted under the supervision of the soils engineer (7011.3).

4. All graded slopes shall be designed and planted with an installed irrigation system conforming to Sections 91.7012 and 91.7013.

5. A registered grading deputy inspector approved by and responsible to the project geotechnical engineer shall be required to provide inspection for any proposed shoring, tie-backs, or drilling and installation of all deep foundations. The geologist and soil engineer shall inspect all temporary and foundation excavations to determine that they are founded in the recommended strata before calling the Department for an inspection.

6. Final plans shall include construction notes and/or details concerning safety precautions and protective fencing etc., during construction (see section 7007 of the LA City Building Code), so as to not cause falling rocks, soil or debris in any form to fall, roll, slide or flow on to adjoining downslope properties.

7. The entire site shall be brought up to the current Code standard (7005.9).

8. Secure the notarized written consent from all owners upon whose property proposed grading/construction access is to extend, in the event off-site grading and/or access for construction purposes is required (7006.6). The consent shall be included as part of the final plans.

9. Provide a notarized letter from all adjoining property owners allowing tie-back anchors on their property (7006.6).

10. The geologist and soils engineer shall review and approve the detailed plans prior to issuance of any permits. This approval shall be by signature on the plans that clearly indicates the geologist and soils engineer have reviewed the plans prepared by the design

engineer; and, that the plans include the recommendations contained in their reports (7006.1).

11. All recommendations of the reports that are in addition to or more restrictive than the conditions contained herein shall be incorporated into the plans.

12. A copy of the subject and appropriate referenced reports and this approval letter shall be attached to the District Office and field set of plans (7006.1). Submit one copy of the above reports to the Building Department Plan Checker prior to issuance of the permit.

13. A grading permit shall be obtained for all structural fill and retaining wall backfill (106.1.2).

14. All graded, brushed or bare slopes shall be planted with low-water consumption, native-type plant varieties to protect slopes against erosion (7012).

15. All new graded fill slopes shall be no steeper than 2H:1V (7011.2).

16. All new graded cut slopes shall be no steeper than 1H:1V, as recommended.

17. All man-made fill shall be compacted to a minimum 90 percent of the maximum dry density of the fill material per the latest version of ASTM D 1557. Where cohesionless soil having less than 15 percent finer than 0.005 millimeters is used for fill, it shall be compacted to a minimum of 95 percent relative compaction based on maximum dry density. Placement of gravel in lieu of compacted fill is only allowed if complying with LAMC Section 91.7011.3.

18. Existing uncertified fill shall not be used for support of footings, concrete slabs or new fill (1809.2, 7011.3).

19. Drainage in conformance with the provisions of the Code shall be maintained during and subsequent to construction (7013.12).

20. Grading shall be scheduled for completion prior to the start of the rainy season, or detailed temporary erosion control plans shall be filed in a manner satisfactory to the Grading Division of the Department and the Department of Public Works, Bureau of Engineering, B-Permit Section, for any grading work in excess of 200 cubic yards (7007.1).

    201 N. Figueroa Street 3rd Floor, LA (213) 482-7045

21. All loose foundation excavation material shall be removed prior to commencement of framing. Slopes disturbed by construction activities shall be restored (7005.3).

22. The applicant is advised that the approval of this report does not waive the requirements for excavations contained in the General Safety Orders of the California Department of Industrial Relations (3301.1).

23. Temporary excavations that remove lateral support to the public way, adjacent property, or adjacent structures shall be supported by shoring, as recommended. Note: Lateral support shall be considered to be removed when the excavation extends below a plane projected downward at an angle of 45 degrees from the bottom of a footing of an existing structure, from the edge of the public way or an adjacent property. (3307.3.1)

24. Prior to the issuance of any permit that authorizes an excavation where the excavation is to be of a greater depth than are the walls or foundation of any adjoining building or structure and located closer to the property line than the depth of the excavation, the owner of the subject site shall provide the Department with evidence that the adjacent property owner has been given a 30-day written notice of such intent to make an excavation (3307.1).

25. The soils engineer shall review and approve the shoring plans prior to issuance of the permit (3307.3.2).

26. Prior to the issuance of the permits, the soils engineer and/or the structural designer shall evaluate the surcharge loads used in the report calculations for the design of the retaining walls and shoring. If the surcharge loads used in the calculations do not conform to the actual surcharge loads, the soil engineer shall submit a supplementary report with revised recommendations to the Department for approval.

27. Unsurcharged temporary excavations exposing soil shall be trimmed back at a gradient not exceeding 1:1, as recommended.

28. Unsurcharged temporary excavation may be cut vertical up to 12 feet in competent bedrock as determined by the project geologist. For excavations over 12 feet in competent bedrock, the lower 12 feet may be cut vertically and the portion of the excavation above 12 feet shall be trimmed back at a gradient not exceeding 1:1, as recommended. The project geologist should evaluate each 5 foot vertical section for competence prior to excavation of the next 5 feet.

29. Shoring shall be designed for the lateral earth pressures specified in the section titled "Temporary Excavations" starting on page 30 of the 08/04/2016 report; all surcharge loads shall be included into the design.

30. Shoring shall be designed for a maximum lateral deflection of 1 inch, provided there are no structures within a 1:1 plane projected up from the base of the excavation. Where a structure is within a 1:1 plane projected up from the base of the excavation, shoring shall be designed for a maximum lateral deflection of ½ inch, or to a lower deflection determined by the consultant that does not present any potential hazard to the adjacent structure.

31. A shoring monitoring program shall be implemented to the satisfaction of the soils engineer.

32. All foundations shall derive entire support from competent bedrock, as recommended and approved by the geologist and soils engineer by inspection.

33. Foundations adjacent to a descending slope steeper than 3:1 (horizontal to vertical) in gradient shall be a minimum distance of one-third the vertical height of the slope but need not exceed 40 feet measured horizontally from the footing bottom to the face of the slope (1808.7.2); for pools the foundation setback shall be one-sixth the slope height to a maximum of 20 feet (1808.7.3). Where the slope is steeper than 1:1, the required setback shall be measured from an imaginary plane 45 degrees to the horizontal, projected upward from the toe of the slope.

34. Buildings adjacent to ascending slopes steeper than 3H:1V in gradient shall be setback from the toe of the slope a level distance measured perpendicular to slope contours equal to one-half the vertical height of the slope, but need not exceed 15 feet (1808.7.1); for pools

the setback shall be one-fourth the vertical height of the slope, but need not exceed 7.5 feet (1808.7.3). Where the slope is steeper than 1:1, the toe of the slope shall be assumed to be at the intersection of a horizontal plane drawn from the top of the foundation and a plane drawn tangent to the slope at an angle of 45 degrees to the horizontal.

35. Pile caisson and/or isolated foundation ties are required by LAMC Sections 91.1809.13 and/or 91.1810.3.13. Exceptions and modification to this requirement are provided in Information Bulletin P/BC 2014-030.

36. Pile and/or caisson shafts shall be designed for a lateral load of 1000 pounds per linear foot of shaft exposed to fill, soil and weathered bedrock per P/BC 2014-050.

37. The design passive pressure shall be neglected for a portion of the pile with a horizontal setback distance less than five feet from fill, soil or weathered bedrock.

38. Existing uncertified fill shall not be used for lateral support of deep foundations (1810.2.1).

39. Slabs on uncertified fill shall be designed as a structural slab (7011.3).

40. Slabs placed on approved compacted fill shall be at least 4 inches thick and shall be reinforced with ½-inch diameter (#4) reinforcing bars spaced a maximum of 16 inches on center each way.

41. The seismic design shall be based on a Site Class C, as recommended. All other seismic design parameters shall be reviewed by LADBS building plan check.

42. Retaining walls shall be designed for the lateral earth pressures specified in the section titled "Retaining Walls" starting on page 28 of the 08/04/2016 report. All surcharge loads shall be included into the design.

43. Slough walls shall be provided with a minimum freeboard of 5 feet, as recommended.

44. All retaining walls shall be provided with a standard surface backdrain system and all drainage shall be conducted in a non-erosive device to the street in an acceptable manner (7013.11).

45. With the exception of retaining walls designed for hydrostatic pressure, all retaining walls shall be provided with a subdrain system to prevent possible hydrostatic pressure behind the wall. Prior to issuance of any permit, the retaining wall subdrain system recommended in the soils report shall be incorporated into the foundation plan which shall be reviewed and approved by the soils engineer of record (1805.4).

46. Installation of the subdrain system shall be inspected and approved by the soils engineer of record and the City grading/building inspector (108.9).

47. Basement walls and floors shall be waterproofed/damp-proofed with an LA City approved "Below-grade" waterproofing/damp-proofing material with a research report number (104.2.6).

48. Prefabricated drainage composites (Miradrain, Geotextiles) may be only used in addition to traditionally accepted methods of draining retained earth.

49. The proposed swimming pool shall be designed for a freestanding condition. The portion of the pool wall within a horizontal distance of 7 feet from the top of the slope shall be capable of supporting the water in the pool without soil support (1808.7.3).

50. The structure shall be connected to the public sewer system per P/BC 2014-027.

51. A sump pump with either a bedrock-supported back-up dispersal wall or natural gas/propane powered generator are required and are not a part of this approval.

    Note: Approval will be considered upon submittal to the Grading Division of a Request for Modification by the applicant that includes the following: a map showing the final location of the sump pump; and, as applicable for dispersal walls, the proposed location and length of the bedrock-supported back-up dispersal wall and a professional opinion from the consultants that drainage from the dispersal wall will not contribute to any instability, erosion or nuisance conditions on the descending slope. (P/BC 2014-103)

52. All roof, pad and deck drainage shall be conducted to the street in an acceptable manner; water shall not be dispersed on to descending slopes without specific approval from the Grading Division and the consulting geologist and soils engineer (7013.10).

53. An on-site storm water infiltration system at the subject site shall not be implemented, as recommended.

54. All concentrated drainage shall be conducted in an approved device and disposed of in a manner approved by the LADBS (7013.10).

55. Sprinkler plans for irrigation shall be submitted and approved by the Mechanical Plan Check Section (7012.3.1).

56. Any recommendations prepared by the geologist and/or the soils engineer for correction of geological hazards found during grading shall be submitted to the Grading Division of the Department for approval prior to use in the field (7008.2, 7008.3).

57. The geologist and soils engineer shall inspect all excavations to determine that conditions anticipated in the report have been encountered and to provide recommendations for the correction of hazards found during grading (7008 & 1705.6).

58. All friction pile or caisson drilling and installation shall be performed under the inspection and approval of the geologist and soils engineer. The geologist shall indicate the distance that friction piles or caissons penetrate into competent bedrock in a written field memorandum. (1803.5.5, 1704.9)

59. Prior to pouring concrete, a representative of the consulting soils engineer shall inspect and approve the footing excavations. The representative shall post a notice on the job site for the LADBS Inspector and the Contractor stating that the work inspected meets the conditions of the report. No concrete shall be poured until the LADBS Inspector has also inspected and approved the footing excavations. A written certification to this effect shall be filed with the Grading Division of the Department upon completion of the work. (108.9 & 7008.2)

60. Prior to excavation an initial inspection shall be called with the LADBS Inspector. During the initial inspection, the sequence of construction; shoring; pile installation; protection fences; and, dust and traffic control will be scheduled (108.9.1).

61. Installation of shoring, underpinning, slot cutting excavations and/or pile installation shall be performed under the inspection and approval of the soils engineer and deputy grading inspector (1705.6).

62. The installation and testing of tie-back anchors shall comply with the recommendations included in the report or the standard sheets titled "Requirement for Tie-back Earth Anchors", whichever is more restrictive. [Research Report #23835]

63. Prior to the placing of compacted fill, a representative of the soils engineer shall inspect and approve the bottom excavations. The representative shall post a notice on the job site for the LADBS Inspector and the Contractor stating that the soil inspected meets the conditions of the report. No fill shall be placed until the LADBS Inspector has also inspected and approved the bottom excavations. A written certification to this effect shall be included in the final compaction report filed with the Grading Division of the Department. All fill shall be placed under the inspection and approval of the soils engineer. A compaction report together with the approved soil report and Department approval letter shall be submitted to the Grading Division of the Department upon completion of the compaction. In addition, an Engineer's Certificate of Compliance with the legal description as indicated in the grading permit and the permit number shall be included (7011.3)..

64. No footing/slab shall be poured until the compaction report is submitted and approved by the Grading Division of the Department.

CASEY LEE JENSEN
Engineering Geologist Associate II

DAN L. STOICA
Geotechnical Engineer I

CLJ/DLS:clj/dls
Log No. 94559-01
213-482-0480

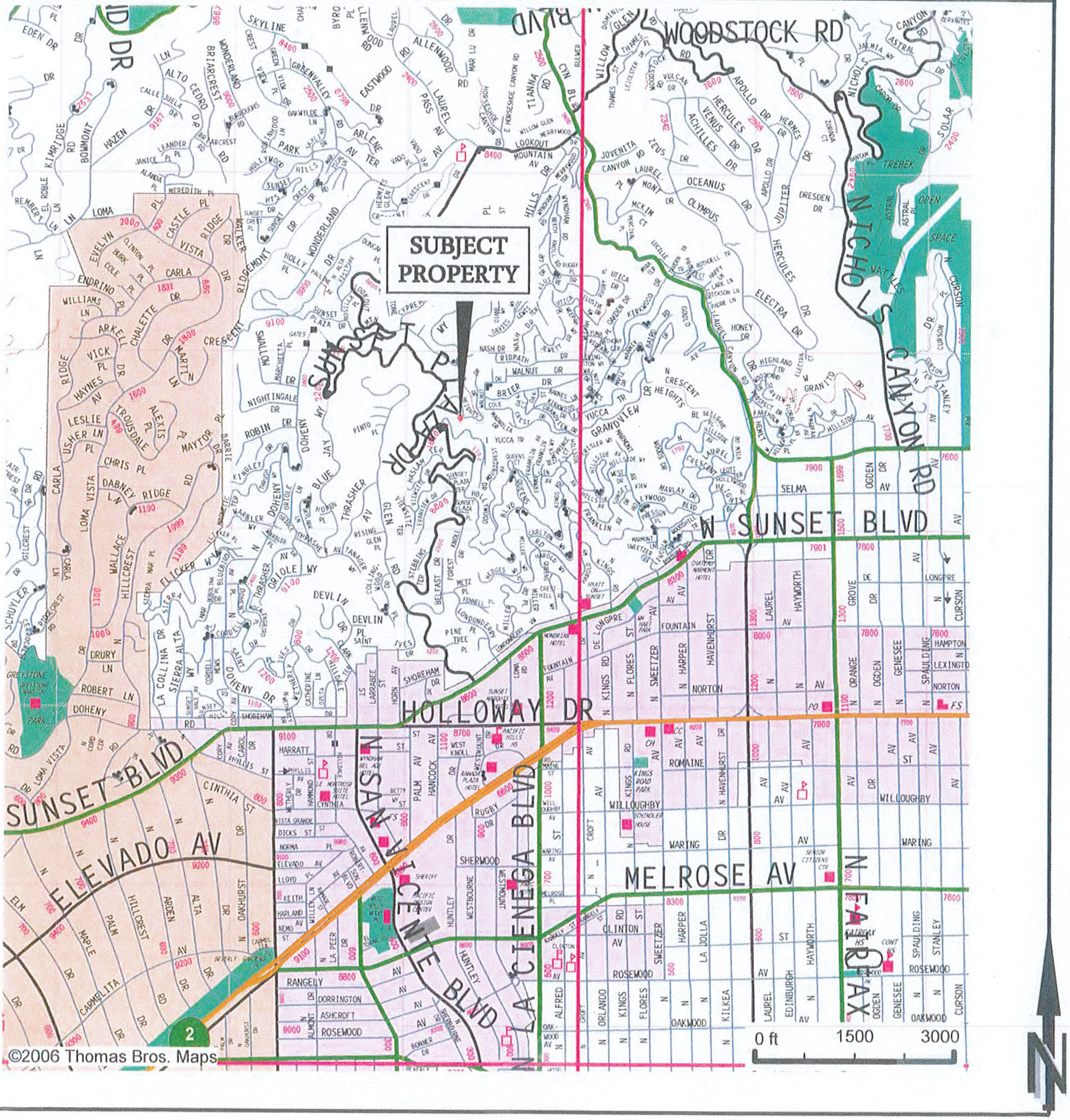
cc: Penny Flinn, Pacific Crest Consultants, Applicant
Grover Hollingsworth, Project Consultant
LA District Office

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

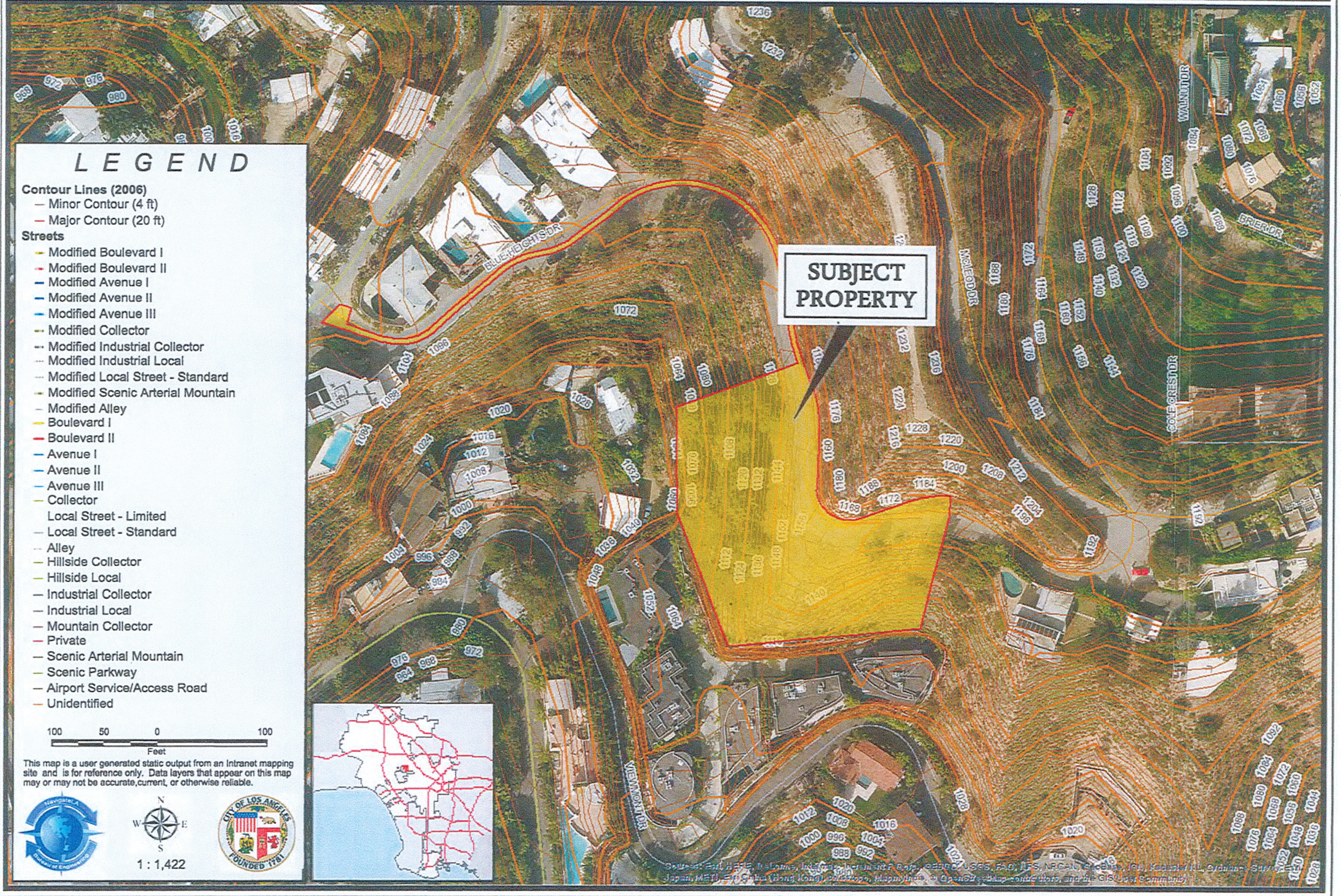
BY **ML** DATE **8/16** CLIENT **A AND T DEVELOPMENT, LLC**

REFERENCE **THOMAS BROS. MAPS 2006 PAGE 592** GH **17563-G**

SUBJECT **VICINITY MAP**



Blue Heights Drive APN 5558-015-019

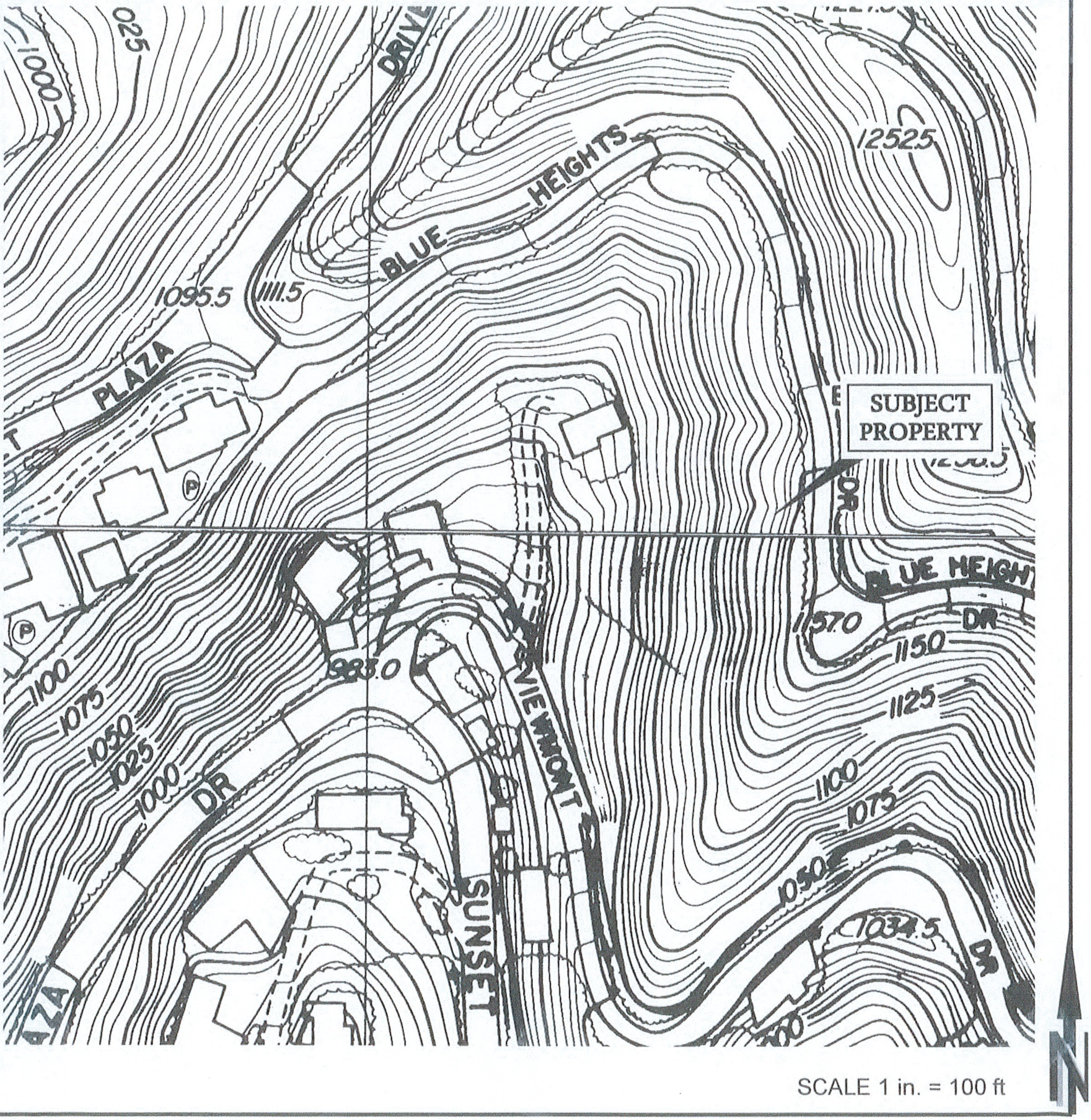


Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

BY **ML** DATE **8/16** CLIENT **A AND T DEVELOPMENT, LLC**

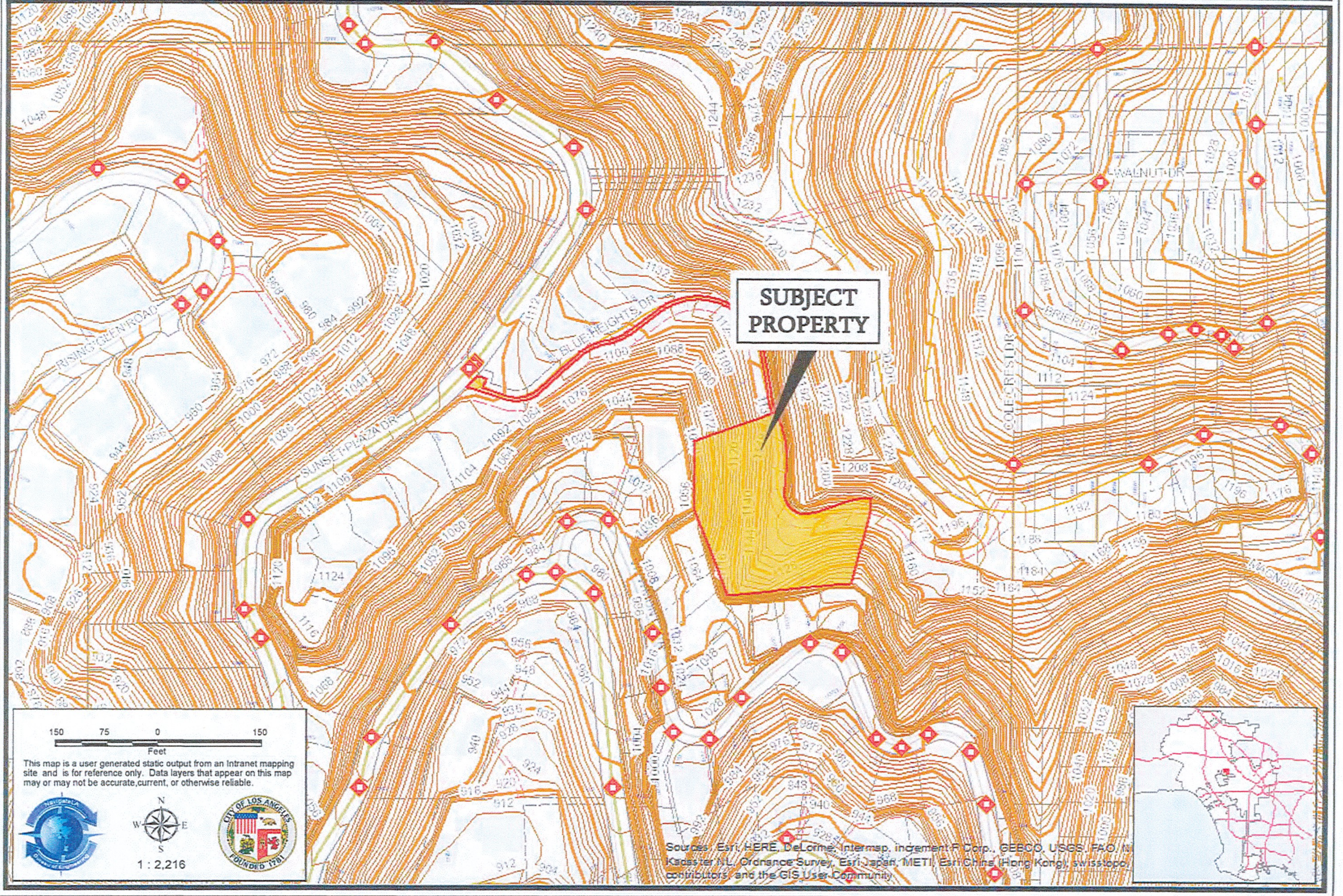
REFERENCE **PAGE 177/178/199/200, 1960 SERIES, SANTA MONICA MOUNTAIN / TOPOGRAPHIC MAPS** GH **17563-G**

SUBJECT **VICINITY TOPOGRAPHIC MAP**



SCALE 1 in. = 100 ft

Contour Lines



Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

BY **ML** DATE **8/16** CLIENT **A AND T DEVELOPMENT, LLC**

REFERENCE **PAGE 177/178/199/200, 1980 AEG, SANTA MONICA MOUNTAINS GEOLOGIC MAPS** GH **17563-G**

SUBJECT **REGIONAL GEOLOGIC MAP**

SCALE 1 in. = 400 ft.

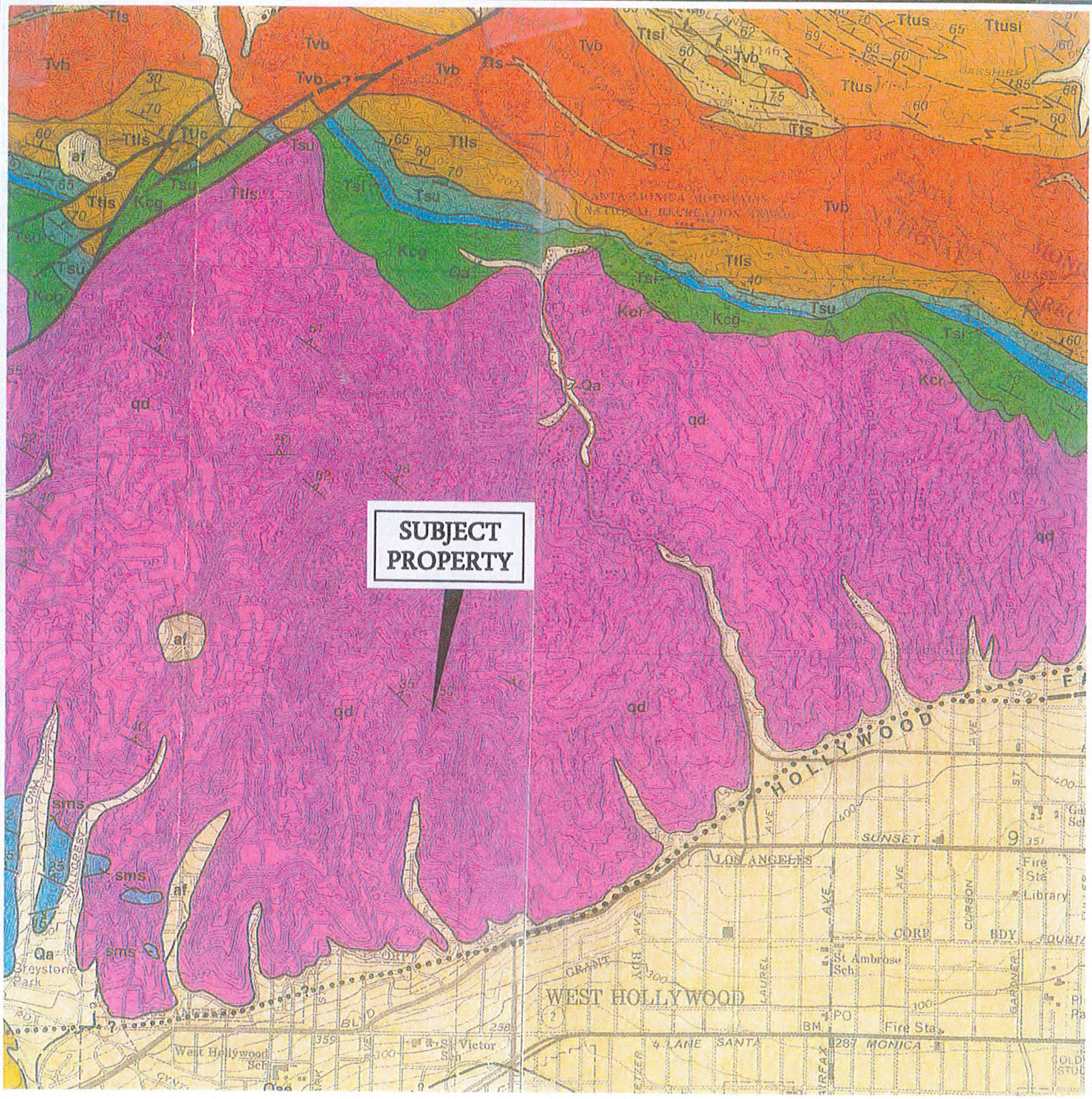
Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

BY **ML** DATE **8/16** CLIENT **A AND T DEVELOPMENT, LLC**

REFERENCE **GEO. MAP OF THE BEVERLY HILLS/ VAN NUYS QUAD, DIBBLEE, 1991**

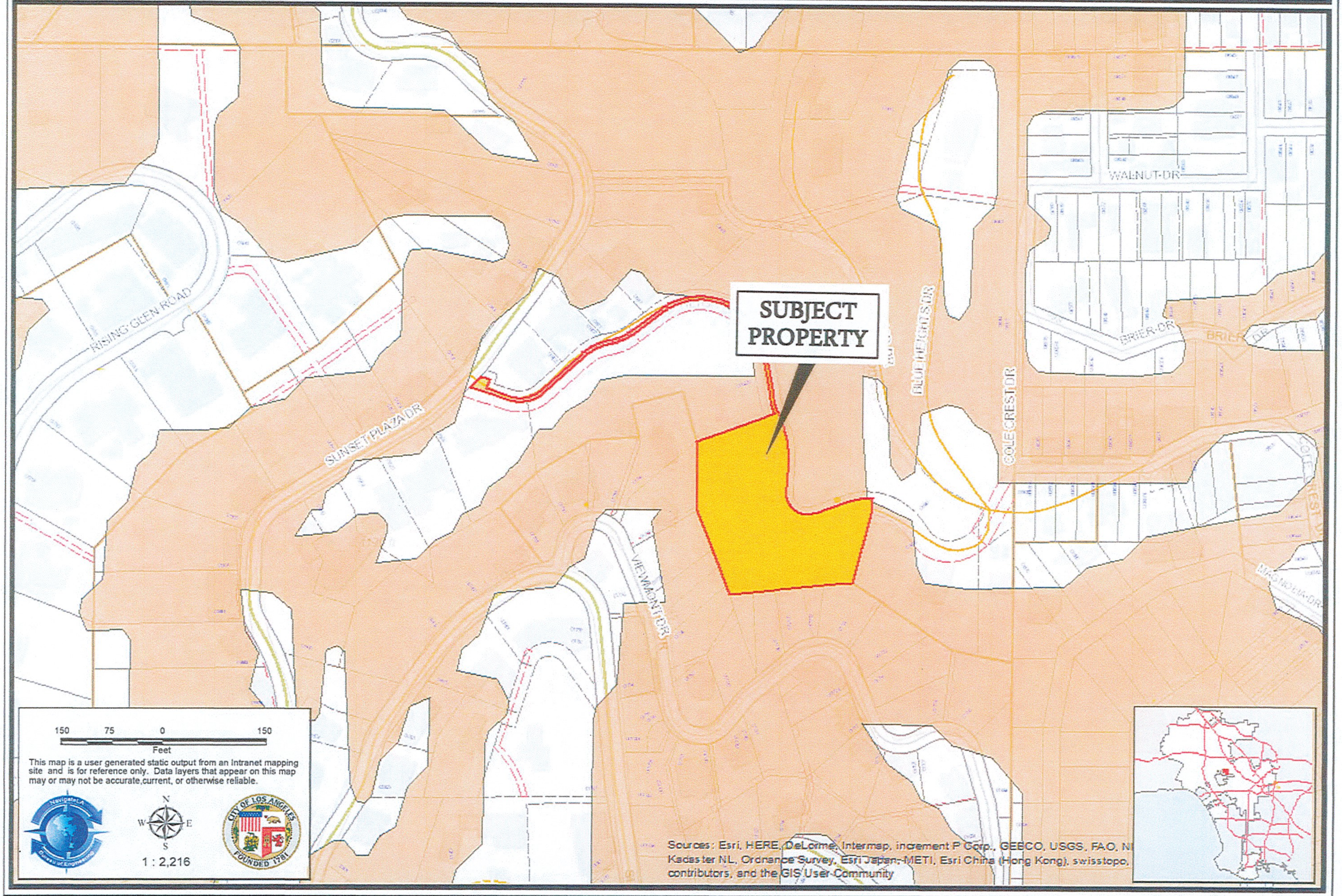
GH **17563-G**

SUBJECT **DIBBLEE GEOLOGIC MAP**



SCALE 1:24000

Landslide/Liquefaction



Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

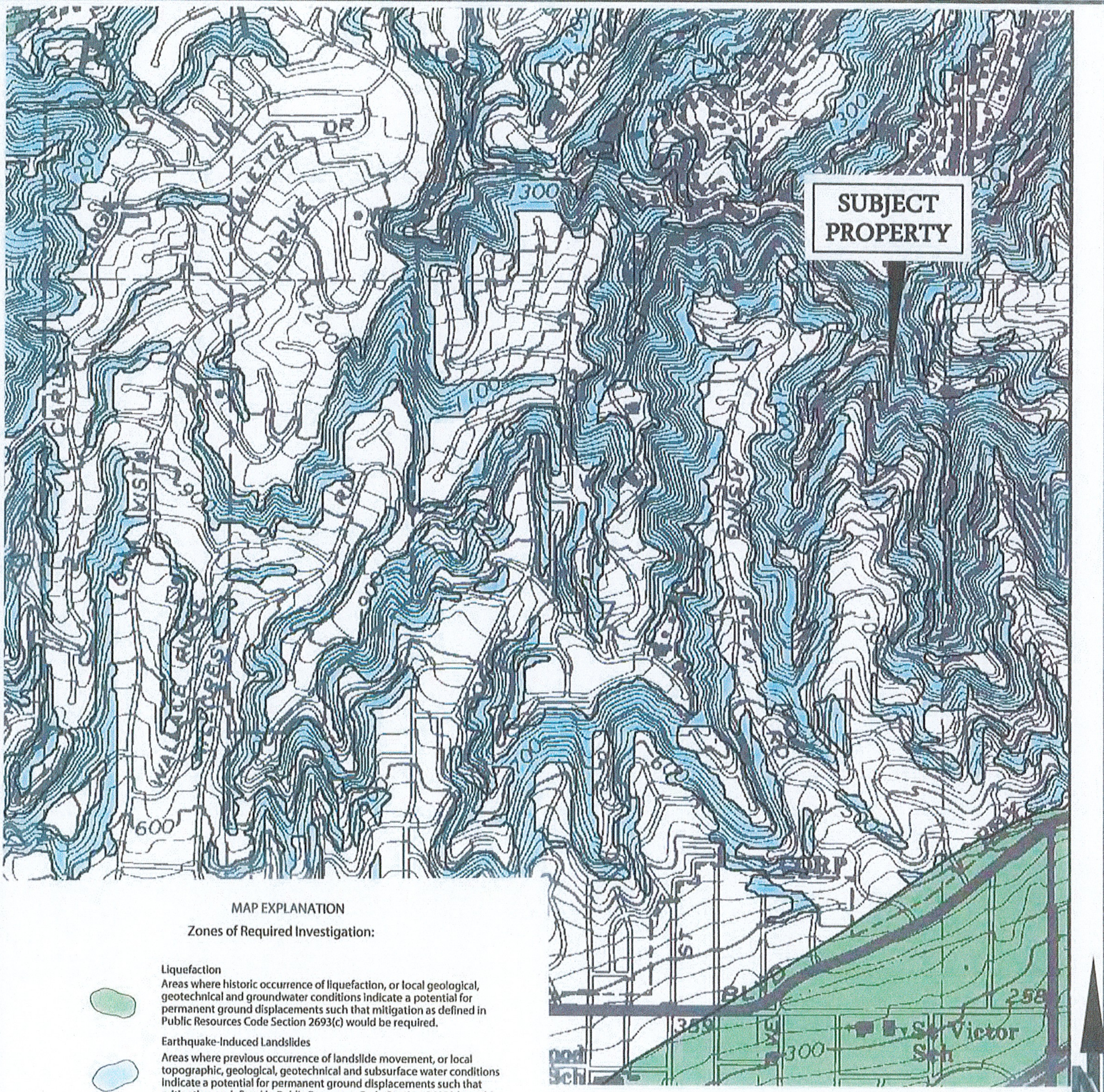
BY **ML** DATE **8/16** CLIENT **A AND T DEVELOPMENT, LLC**

REFERENCE **STATE OF CALIFORNIA SEISMIC HAZARD ZONES OFFICIAL MAPS**

BEVERLY HILLS QUAD

GH **17563-G**

SUBJECT **SEISMIC HAZARD MAP**



MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

SCALE 1:12000

USGS Design Maps Summary Report

User–Specified Input

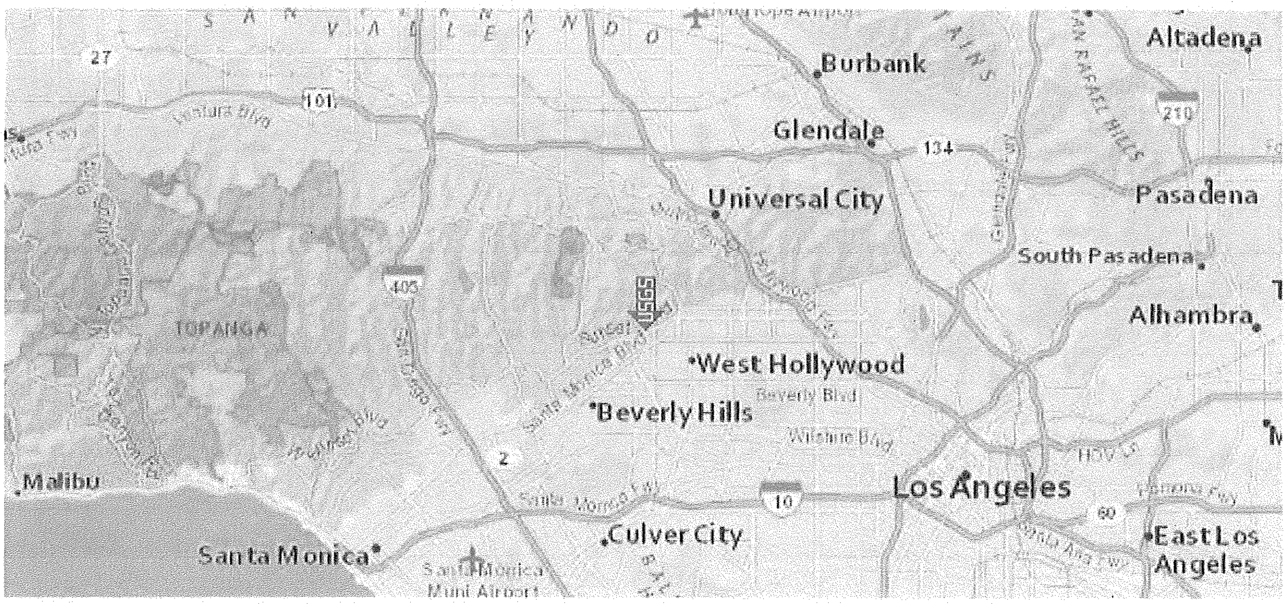
Report Title BLUE HEIGHTS DRIVE
Tue March 8, 2016 18:44:08 UTC

Building Code Reference Document ASCE 7-10 Standard
(which utilizes USGS hazard data available in 2008)

Site Coordinates 34.10304°N, 118.38004°W

Site Soil Classification Site Class C – "Very Dense Soil and Soft Rock"

Risk Category I/II/III

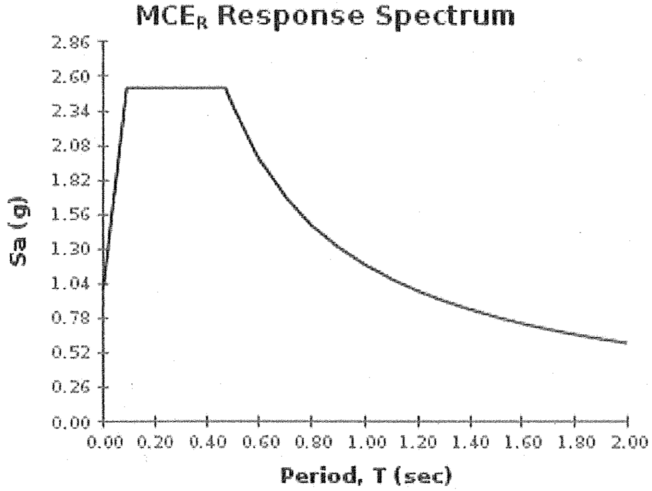


USGS–Provided Output

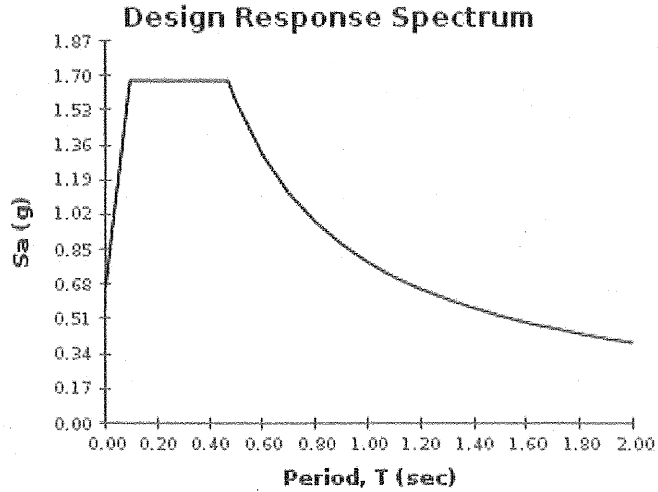
$S_S =$	2.513 g	$S_{MS} =$	2.513 g	$S_{DS} =$	1.675 g
$S_1 =$	0.909 g	$S_{M1} =$	1.181 g	$S_{D1} =$	0.788 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum



For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (34.10304°N, 118.38004°W)

Site Class C – "Very Dense Soil and Soft Rock", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] $S_S = 2.513$ g

From Figure 22-2 [2] $S_1 = 0.909$ g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_S$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index $PI > 20$, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\bar{s}_u < 500$ psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	$\boxed{1.0}$
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = C and S_S = 2.513 g, F_a = 1.000

Table 11.4-2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	$\boxed{1.3}$
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.909 g, F_v = 1.300

Equation (11.4-1): $S_{MS} = F_aS_S = 1.000 \times 2.513 = 2.513$ g

Equation (11.4-2): $S_{M1} = F_vS_1 = 1.300 \times 0.909 = 1.181$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

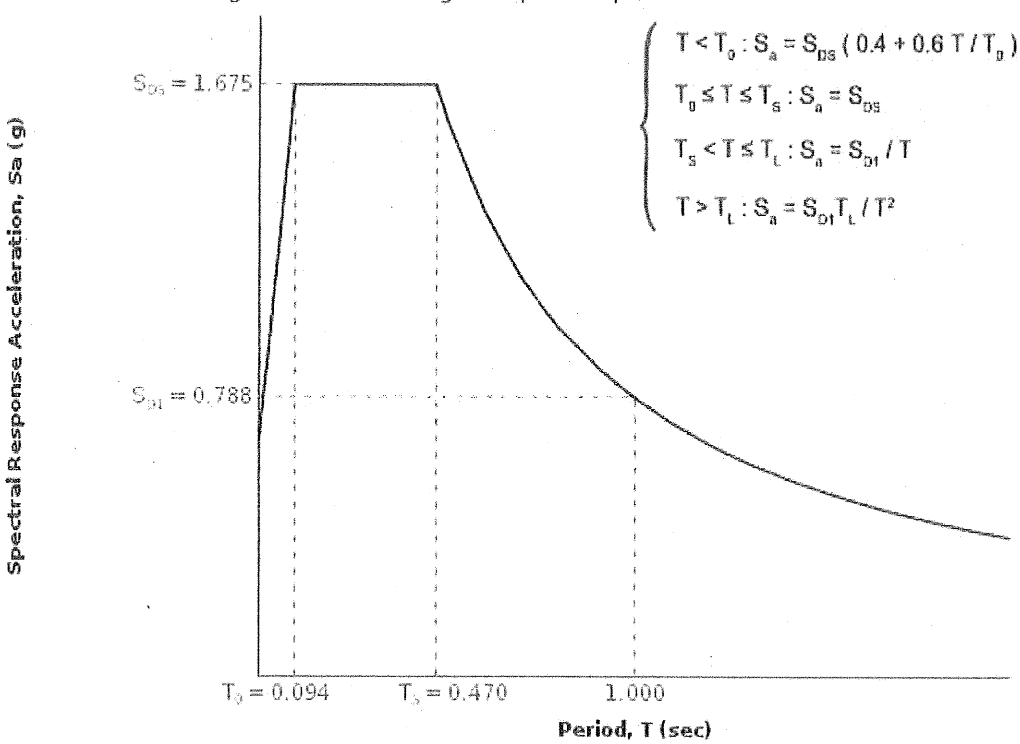
Equation (11.4-3): $S_{DS} = ⅔\ S_{MS} = ⅔ \times 2.513 = 1.675$ g

Equation (11.4-4): $S_{D1} = ⅔\ S_{M1} = ⅔ \times 1.181 = 0.788$ g

Section 11.4.5 — Design Response Spectrum

From Figure 22-12 [3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.976

Equation (11.8-1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.976 = 0.976$ g

Table 11.8-1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of PGA

For Site Class = C and PGA = 0.976 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] $C_{RS} = 0.939$

From Figure 22-18 [6] $C_{R1} = 0.937$

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 1.675 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.788 g, Seismic Design Category = D

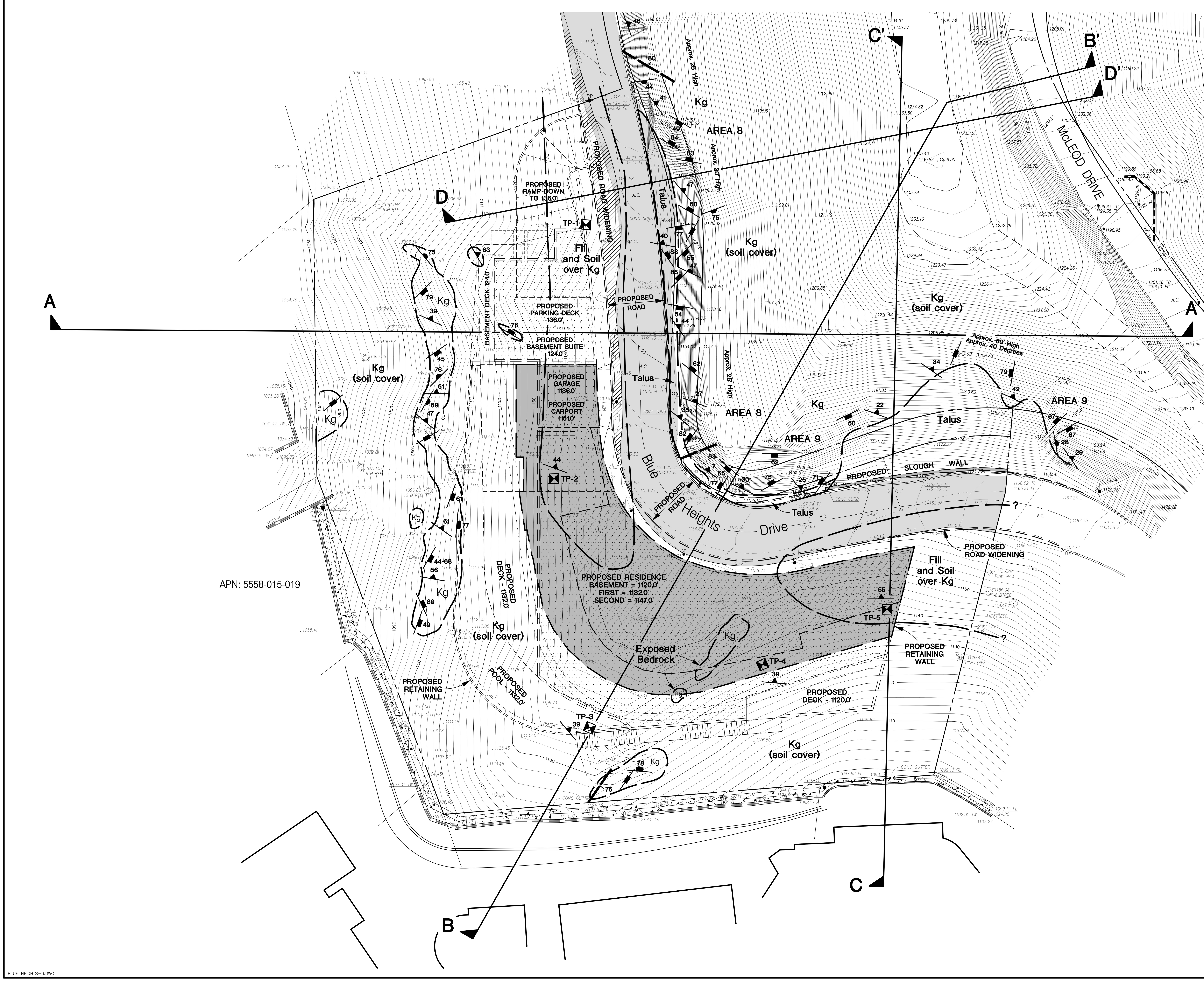
Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = E

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf



LEGEND

TP-1	NUMBER AND APPROXIMATE LOCATION OF TEST PIT BY GROVER-HOLLINGSWORTH
45	STRIKE AND DIP OF FOLIATION PLANE
32	STRIKE AND DIP OF JOINT PLANE
	STRIKE OF VERTICAL JOINT PLANE
18	STRIKE AND DIP OF VEIN
Kg	CRETACEOUS GRANITE
80	APPROXIMATE LOCATION OF FAULT AND DIP
	APPROXIMATE GEOLOGIC CONTACT
	EXTENTS OF PROPOSED BASEMENT
	EXTENTS OF PROPOSED FIRST FLOOR
	EXTENTS OF PROPOSED SECOND FLOOR
	PROPOSED PRIVATE STREET NO. 1437

NOTE ON TOPOGRAPHY

CONTOURS UPSLOPE OF BLUE HEIGHTS DRIVE ARE DISPLAYED AT 1 FOOT INTERVALS

CONTOURS DOWNSLOPE OF BLUE HEIGHTS DRIVE ARE DISPLAYED AT 2 FOOT INTERVALS

NORTH

10 0 10 20 30 40 50

SCALE 1" = 16'

1830 N. Blue Heights Drive
Los Angeles, California
GEOLOGIC MAP 1

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

REV. 04-2017

BY MEL DATE 07-2016 CLIENT A&T DEVELOPMENT, LLC

REF. SURVEY BY M&G GH 17563-G

CIVIL ENGINEERING SUBJECT GEOLOGIC MAP 1

N. Blue Heights Drive
Los Angeles, California
GEOLOGIC MAP 2

Grover-Hollingsworth and Associates, Inc. Geotechnical Consultants			
REV. 04-2017			
BY MEL	DATE 03-2017	CLIENT	A&T DEVELOPMENT, LLC
REF.	SURVEY BY M&G	GH	17563-G
	CIVIL ENGINEERING	SUBJECT	GEOLOGIC MAP 2

BLUE HEIGHTS ROAD EXTEN-2.DWG

NOTE:

THIS EXHIBIT SHOWS THE LOCATION OF THE SECTIONS CREATED BY GROVER-HOLLINGSWORTH FOR BLUE HEIGHTS DRIVE PROJECTS, OVERLAID ON THE LA COUNTY GIS-NET3 AREA MAP.

THE CONTOURS ON THIS MAP WERE USED ONLY WHEN A SITE SURVEY WAS UNAVAILABLE FOR THE AREA IN QUESTION.

NORTH

40 0 40 80

SCALE 1" = 40'

Blue Heights Drive
Los Angeles, California

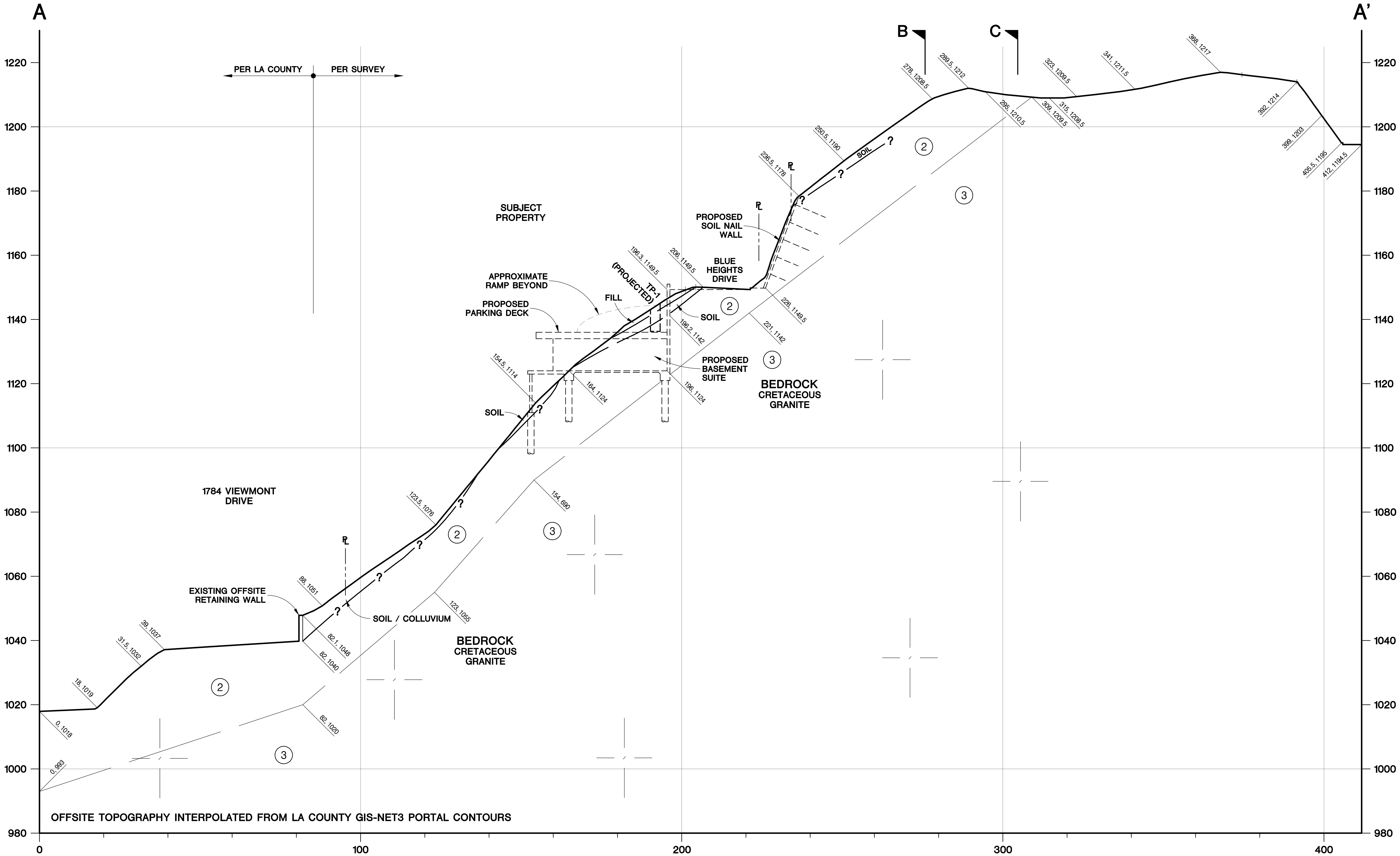
SECTION LOCATION MAP

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

BY MEL/RAH DATE 04-2017 CLIENT A & T DEVELOPMENT

REF. MAP FROM LA COUNTY GIS-NET3 SITE GH 17563-G

SUBJECT SECTION LOCATION MAP



SECTION A-A'

1830 N. Blue Heights Drive
Los Angeles, California

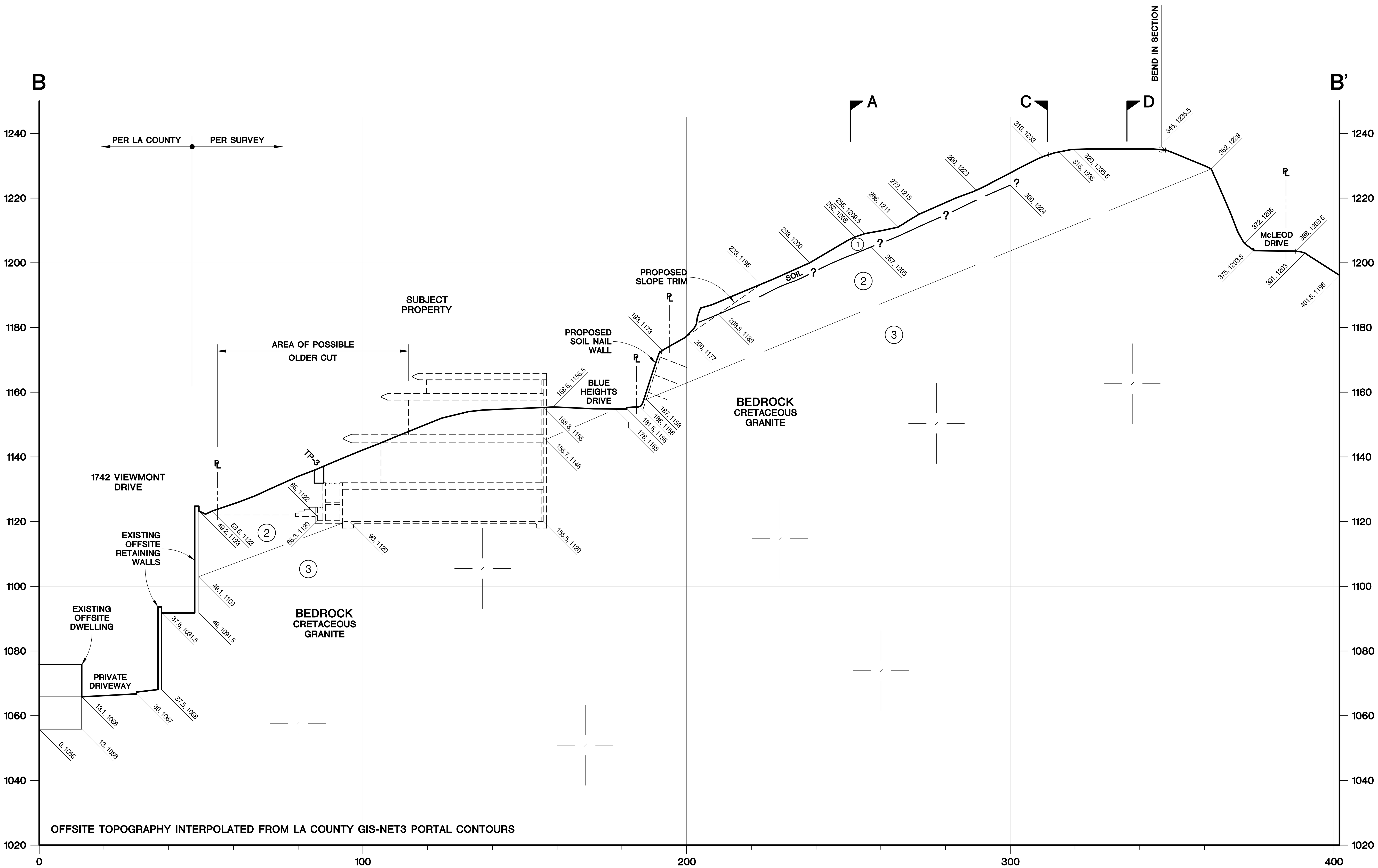
GEOLOGIC SECTION A

10 0 10 20 30 40 50
SCALE 1" = 16'

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants
REV. 04-2017

BY MEL	DATE 07-2016	CLIENT	A&T DEVELOPMENT, LLC
REF. GEOLOGIC MAP		GH	17563-G
		SUBJECT	GEOLOGIC SECTION A

BLUE HEIGHTS-6.DWG



SECTION B-B'

1830 N. Blue Heights Drive
Los Angeles, California

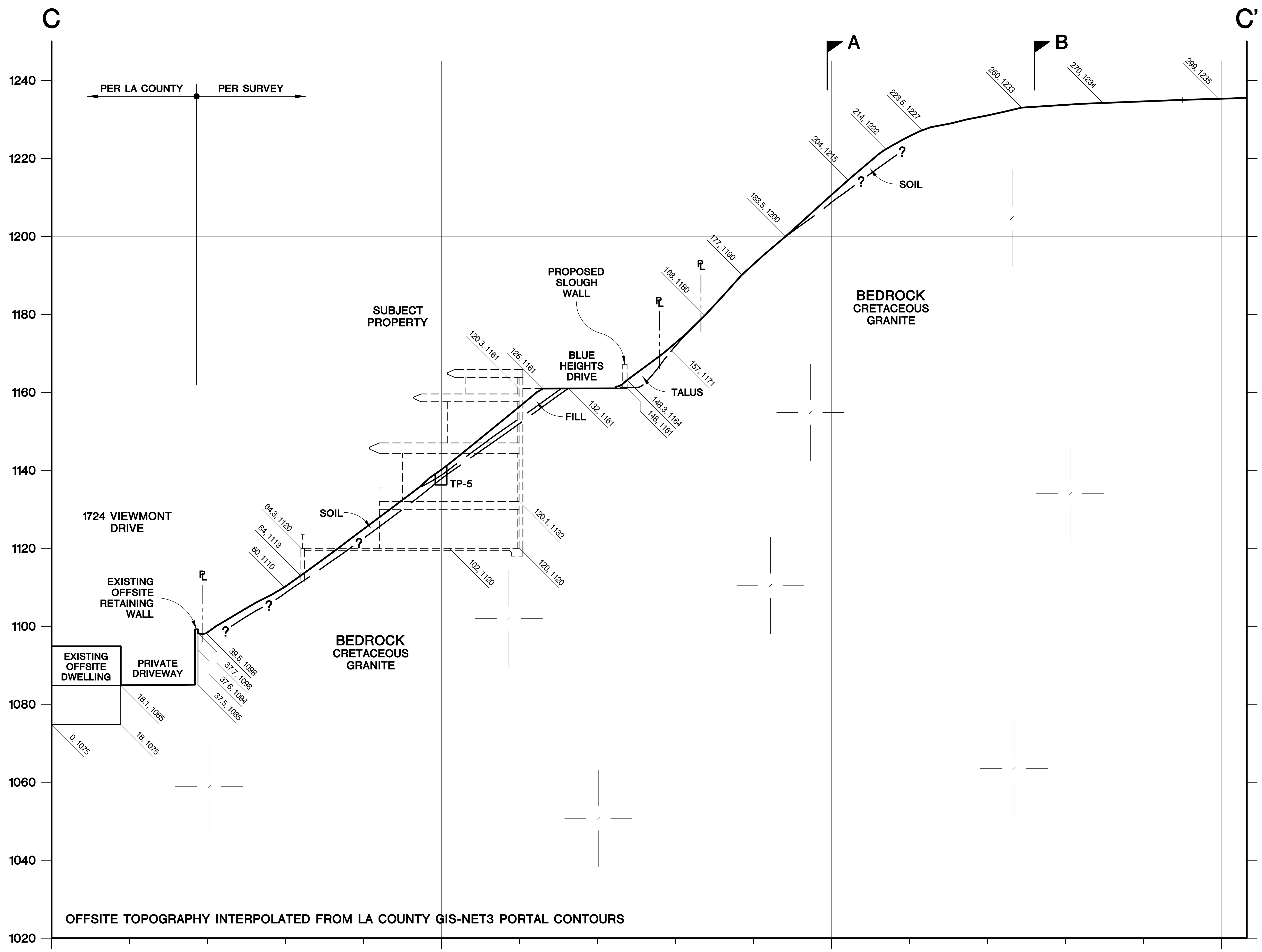
GEOLOGIC SECTION B

10 0 10 20 30 40 50
SCALE 1" = 16'

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants
REV. 04-2017

BY MEL DATE 07-2016 CLIENT A&T DEVELOPMENT, LLC
REF. GEOLOGIC MAP GH 17563-G
SUBJECT GEOLOGIC SECTION B

BLUE HEIGHTS-6.DWG



SECTION C-C'

1830 N. Blue Heights Drive
Los Angeles, California

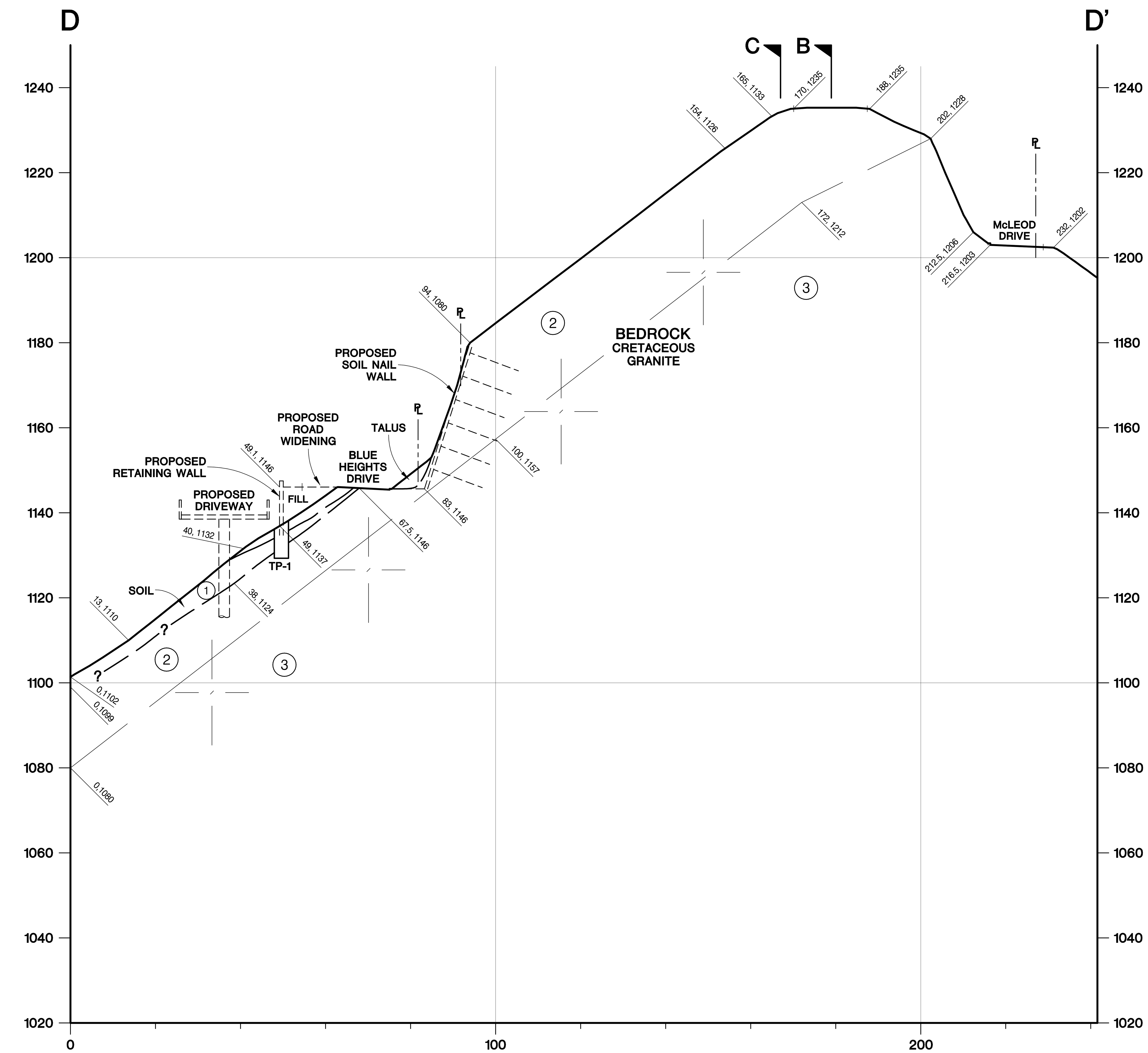
GEOLOGIC SECTION C

SCALE 1" = 16'

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants
REV. 04-2017

BY MEL DATE 07-2016 CLIENT A&T DEVELOPMENT, LLC
REF. GEOLOGIC MAP GH 17563-G
SUBJECT GEOLOGIC SECTION C

BLUE HEIGHTS-6.DWG



SECTION D-D'

1830 N. Blue Heights Drive
Los Angeles, California
GEOLOGIC SECTION D

10 0 10 20 30 40 50

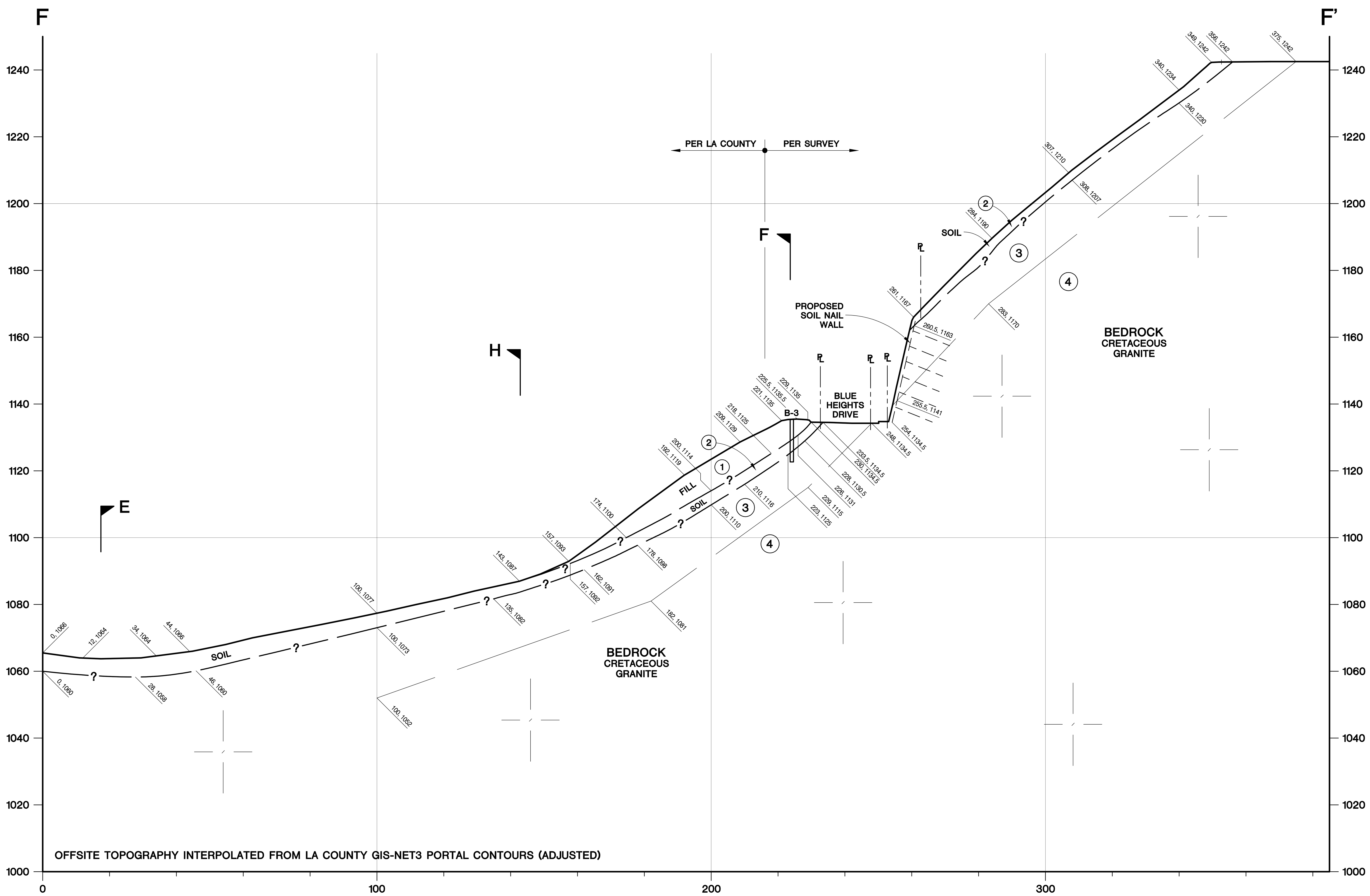
SCALE 1" = 16'

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

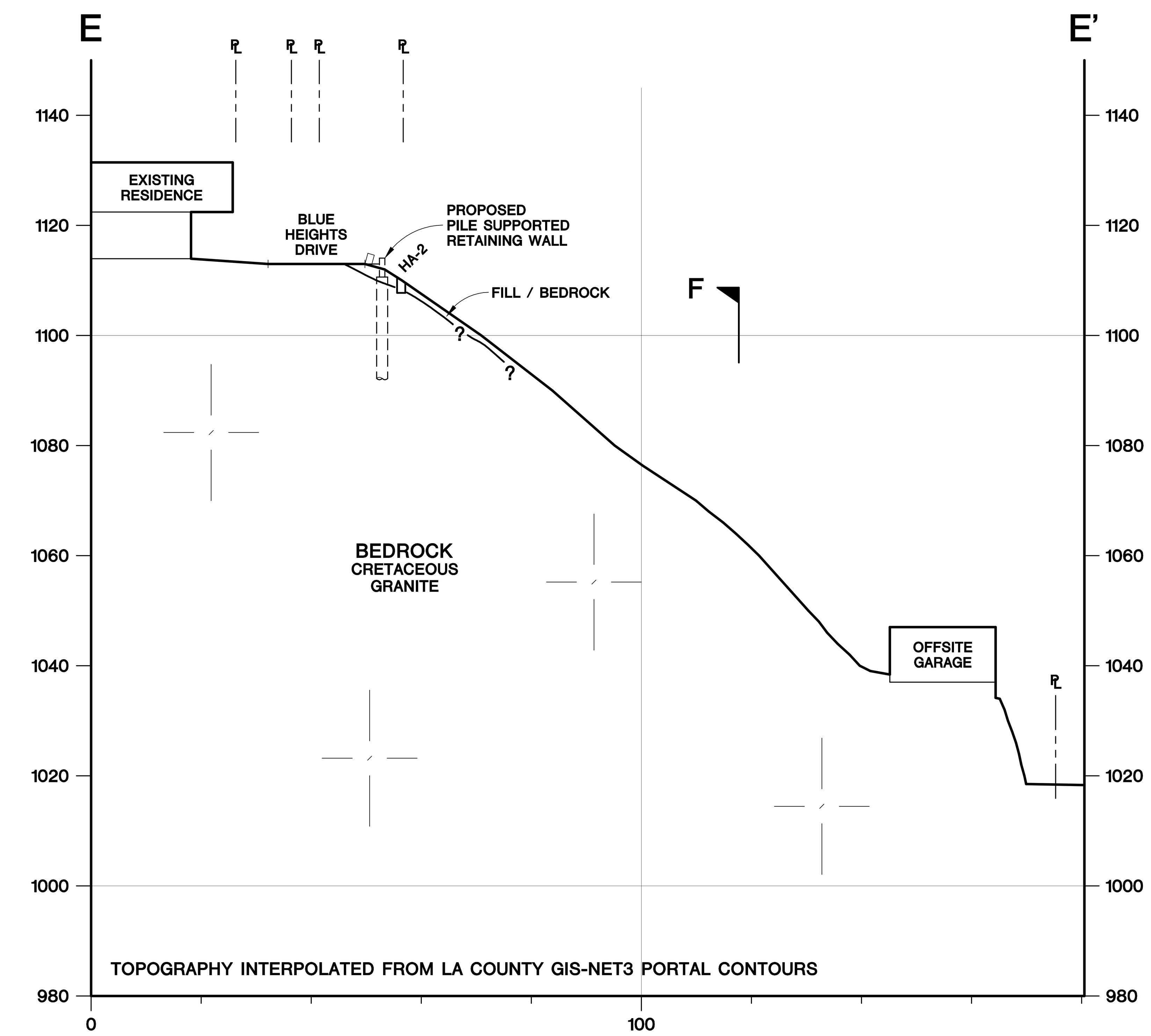
REV. 04-2017

BY	MEL	DATE	07-2016
CLIENT	A&T DEVELOPMENT, LLC		
REF.	GEOLOGIC MAP	GH	17563-G
SUBJECT	GEOLOGIC SECTION D		

BLUE HEIGHTS-6.DWG



SECTION F-F'



SECTION E-E'

10 0 10 20 30 40 50

SCALE 1" = 16'

N. Blue Heights Drive
Los Angeles, California

GEOLOGIC SECTIONS E, F

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

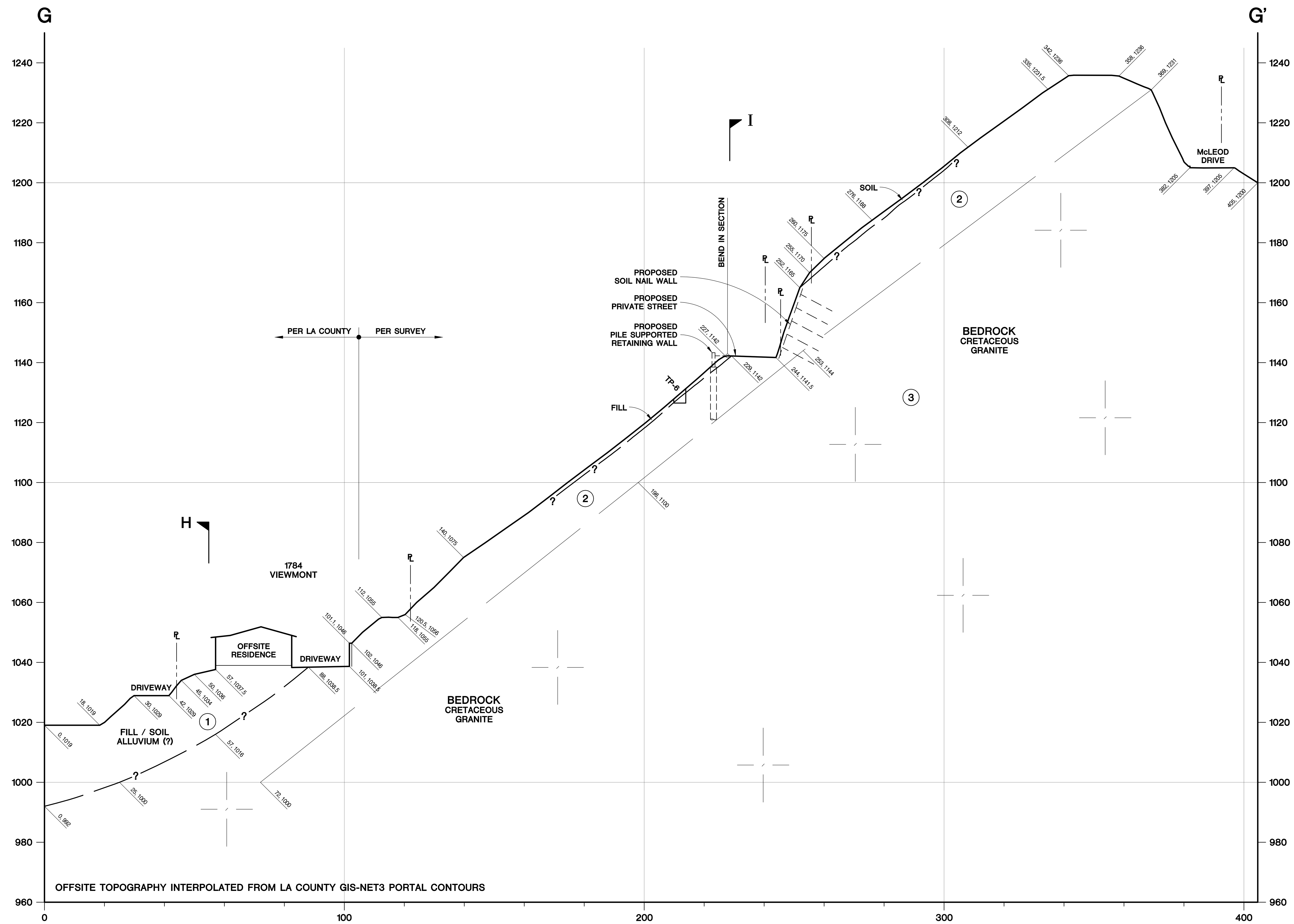
REV. 04-2017

BY MEL DATE 03-2017 CLIENT A&T DEVELOPMENT, LLC

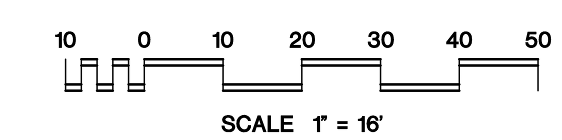
REF. GEOLOGIC MAP 2 GH 17563-G

SUBJECT GEOLOGIC SECTIONS E,F

BLUE HEIGHTS ROAD EXTEN-2.DWG



SECTION G-G'

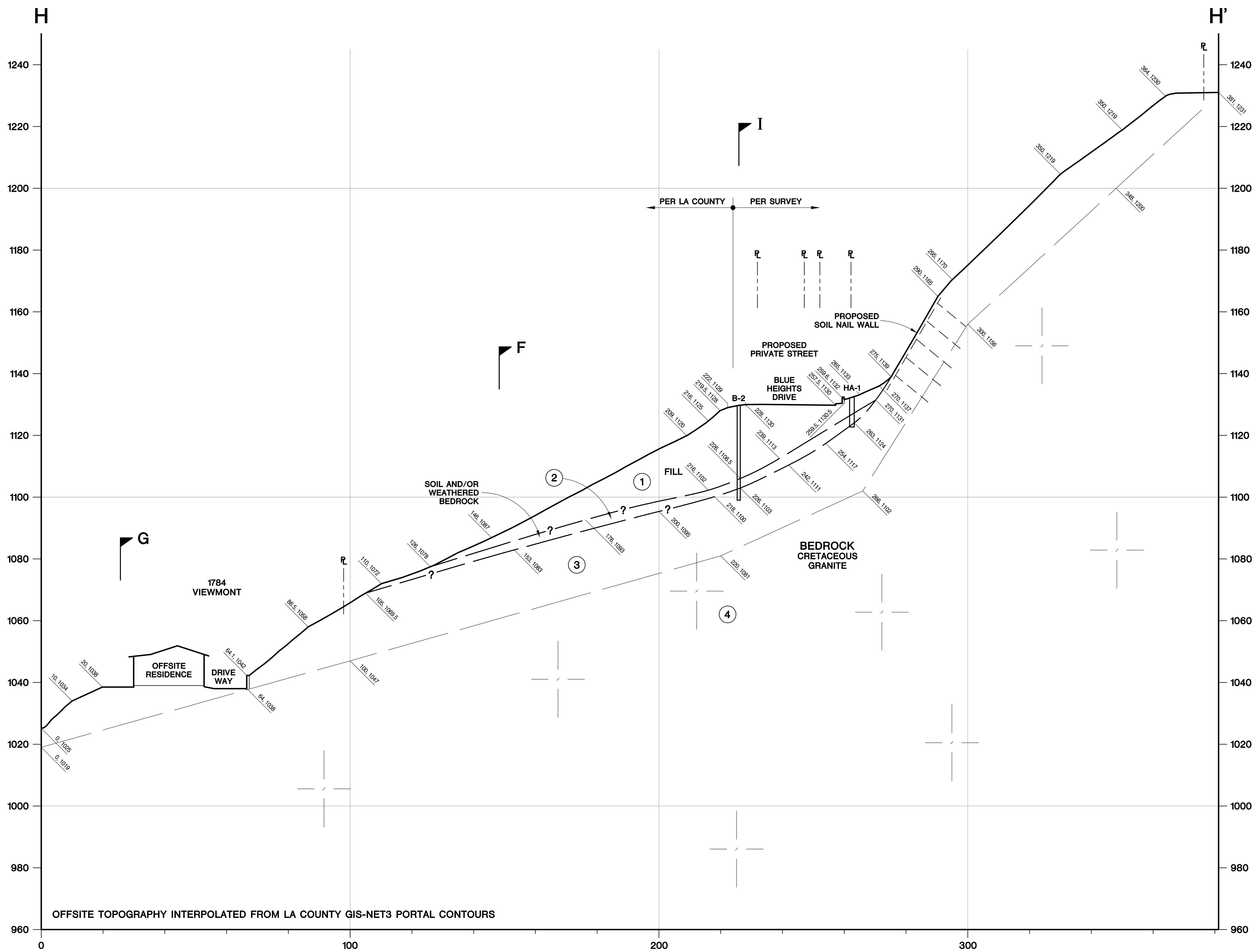


N. Blue Heights Drive
Los Angeles, California

GEOLOGIC SECTION G

Grover-Hollingsworth and Associates, Inc. Geotechnical Consultants	
REV. 04-2017	
BY MEL DATE 03-2017	CLIENT A&T DEVELOPMENT, LLC
REF. GEOLOGIC MAP 2	GH 17563-G
	SUBJECT GEOLOGIC SECTION G

BLUE HEIGHTS ROAD EXTEN-2.DWG



SECTION H-H'

SCALE 1" = 16'

N. Blue Heights Drive
Los Angeles, California

GEOLOGIC SECTION H

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

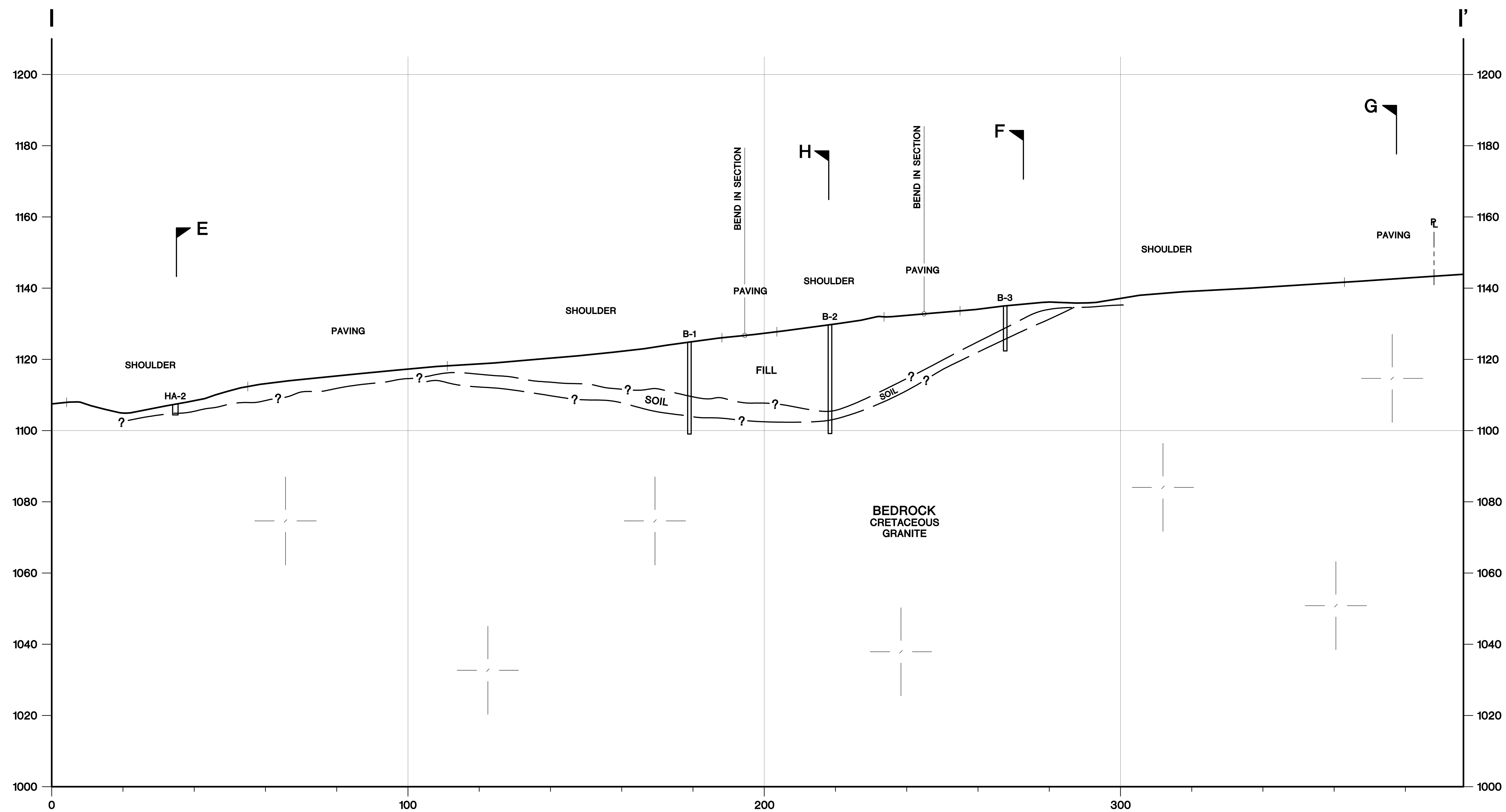
REV. 04-2017

BY MEL DATE 03-2017 CLIENT A&T DEVELOPMENT, LLC

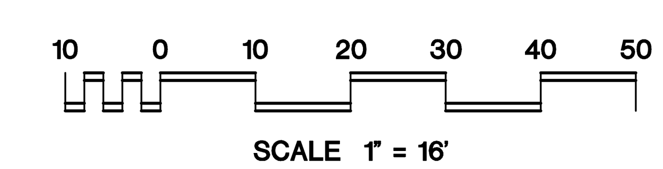
REF. GEOLOGIC MAP 2 GH 17563-G

SUBJECT GEOLOGIC SECTION H

BLUE HEIGHTS ROAD EXTEN-2.DWG



SECTION I-I'



N. Blue Heights Drive
Los Angeles, California

GEOLOGIC SECTION I

Grover-Hollingsworth and Associates, Inc.
Geotechnical Consultants

REV. 04-2017

BY MEL DATE 03-2017 CLIENT A&T DEVELOPMENT, LLC

REF. GEOLOGIC MAP 2 GH 17563-G

SUBJECT GEOLOGIC SECTION I

BLUE HEIGHTS ROAD EXTEN-2.DWG

PRIVATE STREET MAP NO. 1437

IN THE CITY OF LOS ANGELES,
COUNTY OF LOS ANGELES,
STATE OF CALIFORNIA

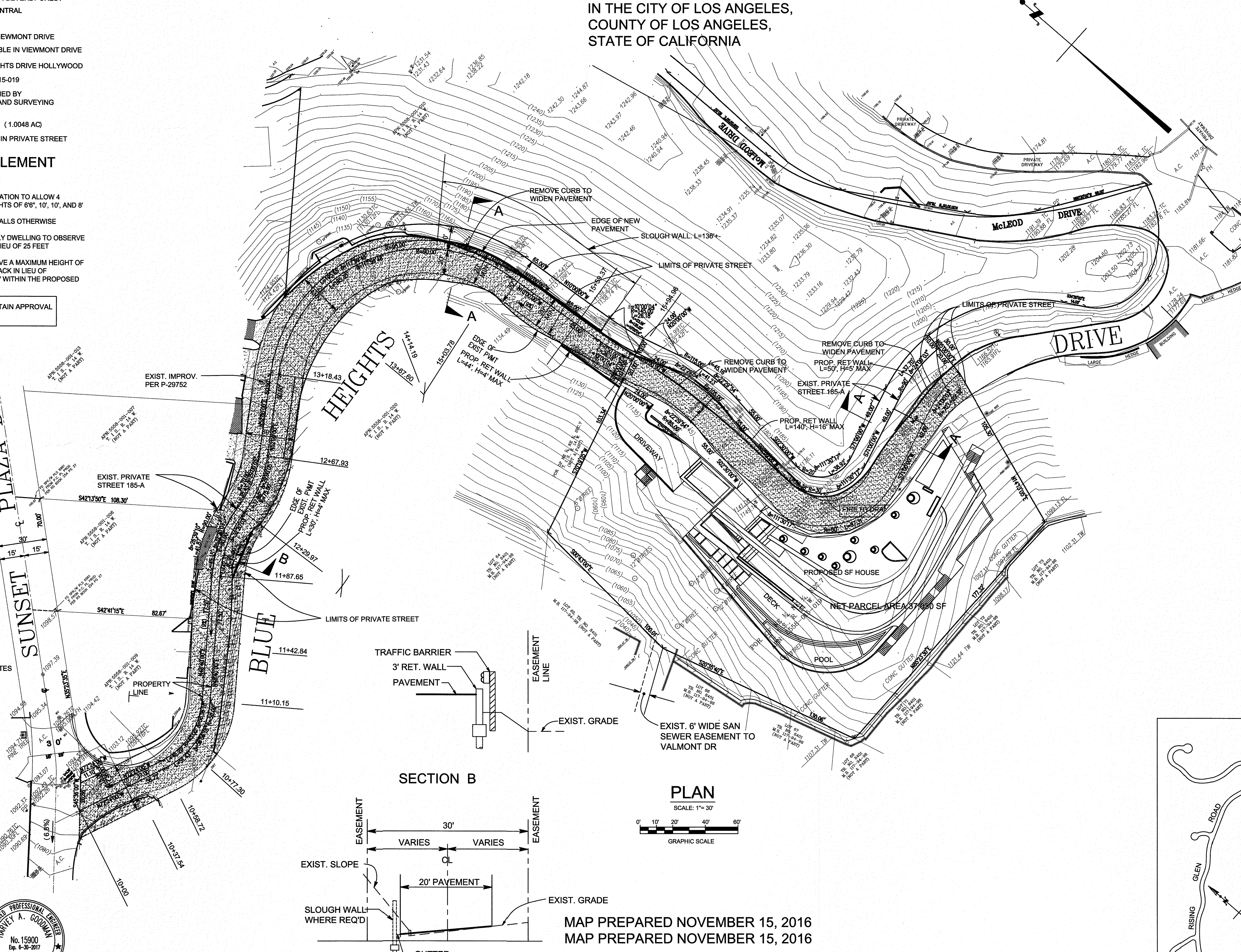
NOTES:

1. EXISTING ZONE RE11-1
2. COMMUNITY PLAN - HOLLYWOOD
3. NEIGHBORHOOD COUNCIL- BEL AIR-BEVERLY CREST
4. AREA PLANNING COMMISSION- CENTRAL
5. COUNCIL DISTRICT- CD-4
6. SANITARY SEWER AVAILABLE IN VIEWMONT DRIVE
7. WATERLINE CONNECTION AVAILABLE IN VIEWMONT DRIVE
9. SITE ADDRESS: 1830 N. BLUE HEIGHTS DRIVE HOLLYWOOD
10. ASSESSOR'S PARCEL NO. 5558-015-019
11. TOPOGRAPHIC SURVEY FURNISHED BY M & G CIVIL ENGINEERING AND LAND SURVEYING APRIL, 4, 2016
12. TOTAL LAND AREA 43767.5 SQ FT (1.0048 AC)
13. NO EXISTING STRUCTURES WITHIN PRIVATE STREET OR ON PARCEL.

ADDITIONAL ENTITLEMENT REQUESTS:

1. ZONING ADMINISTRATOR'S DETERMINATION TO ALLOW 4 RETAINING WALLS WITH MAXIMUM HEIGHTS OF 6'6", 10', 10', AND 8' RESPECTIVELY IN LIEU OF TWO 10-FOOT RETAINING WALLS OTHERWISE ALLOWED.
2. ALLOW THE PROPOSED SINGLE-FAMILY DWELLING TO OBSERVE A FRONT-YARD SETBACK OF 5 FEET IN LIEU OF 25 FEET OTHERWISE ALLOWED.
3. ALLOW A DRIVEWAY RAMP TO OBSERVE A MAXIMUM HEIGHT OF 1716 FEET WITHIN THE SIDE YARD SETBACK IN LIEU OF 6 FEET OTHERWISE ALLOWED, AND 8'5" WITHIN THE PROPOSED FRONT YARD SETBACK IN LIEU OF 3'6".

THE PURPOSE OF THIS MAP IS TO OBTAIN APPROVAL OF THE PRIVATE STREET MAPS)



OWNER

A & T DEVELOPMENT, LLC, A CALIFORNIA LIMITED LIABILITY COMPANY
6423 WILSHIRE BOULEVARD
LOS ANGELES CA 90048

ATTN: MR. STEVE BYRNE

TEL: (310) 388-6900

GEOTECHNICAL ENGINEER
GROVER HOLLINGSWORTH AND ASSOCIATES
31129 VIA COLINAS
SUITE 707
WESTLAKE VILLAGE CA 91362
(818) 889-0844
ATTN: ROBERT HOLLINGSWORTH

LEGEND

INDICATES ASPHALT PAVEMENT

SECTION B

TYPICAL SECTION
SECTION A-A

PLAN
SCALE: 1"= 30'
GRAPHIC SCALE

MAP PREPARED NOVEMBER 15, 2016
MAP PREPARED NOVEMBER 15, 2016
MAP PREPARED UPDATED
DECEMBER 22, 2016
MAP UPDATED APR 14, 2017

CIVIL ENGINEER

MAP PREPARED BY:
HARVEY A. GOODMAN
CIVIL ENGINEER
834-17TH STREET
SUITE 5
SANTA MONICA CA 90403
(310) 829-1037

harvey@harveygoodman.com

REGISTERED PROFESSIONAL ENGINEER
HARVEY A. GOODMAN
No. 15900
Exp. 6-30-2017
CIVIL
STATE OF CALIFORNIA

EASEMENT LEGAL DESCRIPTION

PARCEL 1

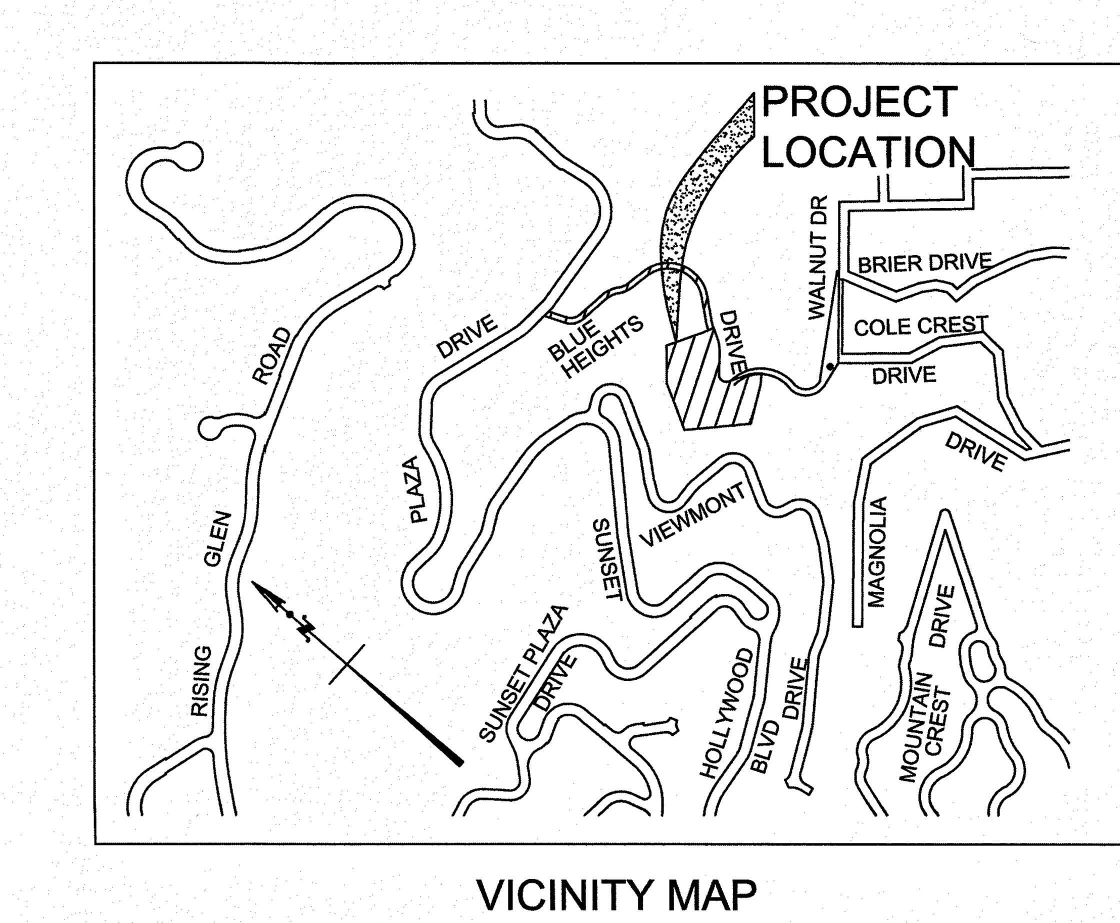
THAT PORTION OF THE NORTHEAST QUARTER OF SECTION 7, TOWNSHIP 1 SOUTH, RANGE 14 WEST, S.B.B. AND M., IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT THE POINT DESIGNATED AS POINT "A" IN A DEED RECORDED ON JANUARY 7, 2016 AS INSTRUMENT NO. 20160016333 OF OFFICIAL RECORDS, RECORDS OF LOS ANGELES COUNTY, THENCE NORTH 70°00'00" EAST A DISTANCE OF 10 FEET, THENCE SOUTH 20°00'00" EAST A DISTANCE OF 24.00 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE WEST HAVING A RADIUS OF 115.00 FEET, THENCE SOUTHERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 22°29'54" AN ARC DISTANCE OF 45.16 FEET, THENCE SOUTH 02°30'00" WEST A DISTANCE OF 55.00 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE NORTHEAST HAVING A RADIUS OF 20.00 FEET, THENCE SOUTHERLY AND EASTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 111°30'17" AN ARC DISTANCE OF 38.92 FEET, THENCE NORTH 71°00'00" EAST A DISTANCE OF 49.00 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE SOUTH HAVING A RADIUS OF 100.00 FEET, THENCE EASTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 24°00'03" AN ARC DISTANCE OF 41.89 FEET, THENCE SOUTH 05°00'00" WEST A DISTANCE OF 30.00 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE SOUTH, THROUGH WHICH A RADIAL BEARS NORTH 05°00'00" EAST, THENCE WESTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 24°00'03" AN ARC DISTANCE OF 29.32 FEET, THENCE SOUTH 71°00'00" WEST A DISTANCE OF 49.00 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE NORTHEAST HAVING A RADIUS OF 50.00 FEET, THENCE WESTERLY AND NORTHERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 111°30'17" AN ARC DISTANCE OF 97.31 FEET, THENCE NORTH 02°30'00" EAST A DISTANCE OF 55.00 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE TO THE WEST HAVING A RADIUS OF 85.00 FEET, THENCE NORTHERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 22°29'54" AN ARC DISTANCE OF 33.38 FEET, THENCE NORTH 20°00'00" WEST A DISTANCE OF 24.00 FEET, THENCE NORTH 70°00'00" EAST A DISTANCE OF 20.00 FEET TO POINT "A" AND THE POINT OF BEGINNING.

Parcel 2:

Rights of way an an easement for road purposes over those portions of the Northeast one-quarter of Section 7, Township 1 South, Range 14 West, San Bernardino Meridian, City of Los Angeles, which were reserved for road and public utility purposes in the deed to :

(a) Frank Hufnagel, recorded on April 21, 1937 as instrument no. 403, in Book 14840 Page 384; (b) Leda P. Wormley, recorded on April 23, 1937 as instrument no. 435, in Book 14961 Page 4; (c) Cecil V. Greene and Elaine Green recorded on April 27, 1937 as instrument no. 210 in Book 14934 Page 143 and on April 27, 1937 as instrument no. 226, in Book 14880 Page 308; (d) John E. Hudson, recorded on May 22, 1937 as instrument no. 299, in Book 14995 Page 157; (e) Anna D. Ritter, recorded on June 15, 1937 as instrument no. 447, in Book 15084 Page 23; (f) Cecil V. Greene and Elaine Green, recorded on November 16, 1937 as instrument no. 103 in Book 15323 Page 262; and (g) Vallejo Gentner, recorded on March 26, 1952 as instrument no. 2615, in Book 30564 Page 95, all of Official Records, in the office of the county recorder of said county, and over the Northerly 15.00 feet of that portion of the Northeast one-quarter of said Section 7, described in the deed to George E. Buzza, recorded on March 11, 1937 as instrument no. 757, in Book 14773 Page 280, of said Official Records.



VICINITY MAP
SCALE: 1"=400'

LOG OF TEST PIT TP-1

Date Drilled: 2/16/16 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Hand Labor Driving Weight and Drop: Hand Sampler

Surface Elevation(ft): Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, light tan with white specks, dry to slightly moist, loose to slightly dense; contains rootlets and scattered gravel.						
		Contact dips moderately west.						
		SOIL: Silty Sand, brown, moist, slightly dense, porous; contains roots in some locations.	■			5.7	104.1	R
			■			4.2	121.9	R
		Contact irregular with an overall moderate dip west.						
5		BEDROCK: Granite, speckled white, orange-brown, black, moist, hard, moderately weathered, massive.						
			■			2.6	131	R
			■			2.5	126.4	R
		End at 8-1/2'. No Water. Caving in upper 2'. Fill to 2'.						

LOG OF TEST PIT TP-2

Date Drilled: 2/16/16 | Logged by: M. Lieurance | Project Manager: R. Hollingsworth

Equipment: Hand Labor | Driving Weight and Drop: Hand Sampler

Surface Elevation(ft): | Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, light orange-brown, slightly moist, slightly dense; contains rootlets and rodent burrows. Contact dips moderately west.						
		SOIL: Silty Sand, light brown, moist, slightly dense; contains roots in some locations. Contact approximately parallel with slope surface.						
		WEATHERED BEDROCK: Granite, speckled orange-brown and white, slightly moist, slightly hard, very friable, weathered; contains near vertical soil fingers. Contact gradational.				7.3	109.8	R
		BEDROCK: Granite, speckled orange-brown and white, moist, hard, morderately weathered. Foliation: N70W, 44N				6.2	119.1	R
5						7.5	120.1	R
		END at 6-1/2'. No Water. No Caving. Fill to 1'.						

GEO5 17563LOG.GPJ 3/15/16

LOG OF TEST PIT TP-3

Date Drilled: 2/16/16 | Logged by: M. Lieurance | Project Manager: R. Hollingsworth

Equipment: Hand Labor | Driving Weight and Drop: Hand Sampler

Surface Elevation(ft): | Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, light orange-brown, dry, slightly dense; contains rootlets. Contact slopes gently south.						
		BEDROCK: Granite, speckled orange-brown and white, moist, hard, morderately weathered. Foliation: N40W, 49NE						
			■			4.5	115.2	R
			■			5.4	118.8	R
5		END at 4-1/2'. No Water. No Caving. Fill to 1/2'.						

GEO5 17563LOG.GPJ 3/15/16

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development, Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-3

LOG OF TEST PIT TP-4

Date Drilled: 2/16/16
Logged by: M. Lieurance
Project Manager: R. Hollingsworth

Equipment: Hand Labor
Driving Weight and Drop: Hand Sampler

Surface Elevation(ft):
Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, light orange-brown, slightly moist, slightly dense; contains rootlets and rodent burrows.						
		SOIL: Silty Sand, brown, moist, slightly dense; contains gravel and roots in some locations.						
		Contact dips moderately south.	■			5.0	108.8	R
		WEATHERED BEDROCK: Granite fragments in Silty Sand matrix, speckled black and white, slightly moist, dense.						
		BEDROCK: Granite, speckled white, orange-brown, black, moist, hard, moderately weathered.						
		Foliation: N85W, 39N	■			4.6	116.9	R
5								
			■			3.3	120.6	R
		END at 6-1/2'. No Water. No Caving. Fill to 1-1/2'.						

GEO5 17563LOG.GPJ 3/15/16

Grover Hollingsworth and Associates, Inc.

Project Name:
A + T Development
Vacant Lot along Blue Heights Drive, Los Angeles

Project No.
GH17563-G

Plate
A-4

LOG OF TEST PIT TP-5

Date Drilled: 2/16/16 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Hand Labor Driving Weight and Drop: Hand Sampler

Surface Elevation(ft): Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, light tan with white specks, dry to slightly moist, loose to slightly dense; contains rootlets and scattered gravel.						
		Contact dips moderately south.						
		SOIL: Silty Sand, light brown, moist, slightly dense; contains roots in some locations.						
		Contact dips moderately south.						
		BEDROCK: Granite, speckled white, orange-brown, black, moist, hard, moderately weathered.	■			3.2	127.5	R
		Foliation: EW, 55N.						
			■			3.5	124.6	R
5		END at 5'. No Water. No Caving. Fill to 1-1/2'.						

GEO5 17563LOG.GPJ 3/15/16

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development, Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-5

LOG OF TEST PIT TP-6

Date Drilled: 1/17/17 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Hand Labor Driving Weight and Drop: Hand Sampler

Surface Elevation(ft): Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, tan, brown, light orange-brown, moist, slightly dense, contains rootlets Contact dips steeply west						
		BEDROCK: Granite, speckled black, white and orange-brown, moist, hard, moderately weathered Foliation: N55W, 29NE						
			■			5.7	Dist.	R
			■			4.7	128.8	R
5		End at 4 1/2 feet No Water No Caving Fill to 1 foot						

GEO5 17563LOG.GPJ 3/1/17

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development, Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-6

LOG OF TEST PIT HA-1

Date Drilled: 1/17/17 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Hand Labor Driving Weight and Drop: Hand Sampler

Surface Elevation(ft): Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, brown to orange-brown, moist, slightly dense to medium dense						
			■			8.6	108.2	R
5		SOIL(?): Silty Sand, orange-brown with white stringers, moist, medium dense	■			6.3	108.2	R
		BEDROCK: Granite, orange-brown, moist, moderately hard to hard, moderately weathered, Sample attempted, no recovery.						
		End at 8 1/2 feet No Water; No Caving; Fill to 5'						

GEO5 17563LOG.GPJ 3/1/17

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-7

LOG OF TEST PIT HA-2

Date Drilled: 1/17/17 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Hand Labor Driving Weight and Drop: Hand Sampler

Surface Elevation(ft): Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, light brown to brown, moist, slightly dense						
		BEDROCK: Granite, speckled black, gray, white, moist, hard, moderately weathered	■			3.3	120.6	R
		End at 2 1/2 feet No Water No Caving Fill to 2 feet						
5								

GEO5 17563LOG.GPJ 1/19/17

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development, Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-8

LOG OF BOREHOLE B-1

Date Drilled: 3/24/17 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Limited Access Hollow Stem Drill Rig Driving Weight and Drop: 140 pounds/30 inches

Surface Elevation(ft): Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, brown, moist, slightly dense to medium dense, contains granite rock fragments in some locations						
			■		5	4.9	102.7	R
5			■		6	6.9	103.1	R
			■		6	6.0	100.6	R
		Light brown, slightly moist, slightly dense to medium dense						
10		Sample at 10' disturbed	■		8	2.2		R
		Sample at 12-1/2' disturbed	■		8	3.9		R

GEO2 17563LOG.GPJ 4/19/17

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development, Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-9a

LOG OF BOREHOLE B-1

Date Drilled: 3/24/17 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Limited Access Hollow Stem Drill Rig Driving Weight and Drop: 140 pounds/30 inches

Surface Elevation(ft): Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
			■		12	3.0	106.9	R
		SOIL: Silty Sand, light brown to orange-brown, slightly moist to moist, slightly dense to medium dense						
			■		12	2.8	105.0	R
20			■		10	3.5	100.6	R
		BEDROCK: Granite, speckled black, white and orange-brown, moist, hard, moderately weathered, massive						
			■		100 for 11"	3.5	119.4	R
25			■		100 for 10"	4.1	123.2	R
		End at 26' No Water; No Caving Fill to 15'						

GEO2 17563LOG.GPJ 4/19/17

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development, Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-9b

LOG OF BOREHOLE B-2

Date Drilled: 3/24/17 | Logged by: M. Lieurance | Project Manager: R. Hollingsworth

Equipment: Limited Access Hollow Stem Drill Rig | Driving Weight and Drop: 140 pounds/30 inches

Surface Elevation(ft): | Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, brown with white specks, moist, slightly dense to medium dense, medium to coarse grained						
					7	6.7	108.0	R
5					8	6.5	104.4	R
		Silty sand, brown, moist, slightly dense to medium dense, fine to medium grained			6	6.7	104.9	R
10					5	6.1	101.1	R
		Silty Sand, light gray-brown with white specks, slightly moist, loose to slightly dense, coarse grained Sample at 12-1/2' disturbed			9	2.0		R

GEO2 17563LOG.GPJ 4/19/17

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development, Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-10a

LOG OF BOREHOLE B-2

Date Drilled: 3/24/17 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Limited Access Hollow Stem Drill Rig Driving Weight and Drop: 140 pounds/30 inches

Surface Elevation(ft): Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		Sample at 15' disturbed			10	2.3		R
					11	1.9	108.4	R
20		No sample recovery at 20'			7			R
		Numerous rock fragments in sample from 22-1/2' suggesting bottom of fill			17	3.6	113.6	R
		SOIL: Silty Sand, brown, slightly moist to moist, medium dense						
25		Tip of sampler appears to be hightly weathered bedrock			27	3.8	110.3	R
		HIGHLY WEATHERED BEDROCK: Silty Sand, orange-brown with white specks, moist, dense						
		BEDROCK: Granite, speckled orange-brown, brown and white, moist, hard, moderately weathered, massive Sample at 27-1/2' slightly disturbed			100 for 9"	6.9	115.9	R

GEO2 17563LOG.GPJ 4/19/17

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development
Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-10b

LOG OF BOREHOLE B-2

Date Drilled: 3/24/17
Logged by: M. Lieurance
Project Manager: R. Hollingsworth
Equipment: Limited Access Hollow Stem Drill Rig
Driving Weight and Drop: 140 pounds/30 inches
Surface Elevation(ft):
Depth to Water(ft):

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
					100 for 7"	11.9	106.1	R
		End at 30-1/2' No Water; No Caving Fill to 24'						
35								
40								

GEO2 17563LOG.GPJ 4/19/17

Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development
Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-10c

LOG OF BOREHOLE B-3

Date Drilled: 3/24/17 Logged by: M. Lieurance Project Manager: R. Hollingsworth

Equipment: Limited Access Hollow Stem Drill Rig Driving Weight and Drop: 140 pounds/30 inches

Surface Elevation(ft): ______ Depth to Water(ft): ______

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FOOT (Equiv. SPT)	MOISTURE (%)	DRY UNIT WT. (pcf)	SAMPLE TYPE
		FILL: Silty Sand, brown, moist, slightly dense to medium dense, contains granite rock fragments in some locations						
			■		9	6.8	104.4	R
5			■		11	6.1	106.3	R
		SOIL: Silty Sand, light brown, slightly moist, medium dense						
			■		12	2.4	105.1	R
		BEDROCK: Granite, speckled black and white, slightly moist, moderately hard to hard, moderately weathered, massive						
10			■		53	2.8	119.9	R
			■		100 for 9"	1.5	125.1	R
		End at 13-1/4' No Water; No Caving Fill to 6'						

GEO2 17563LOG.GPJ 3/29/17

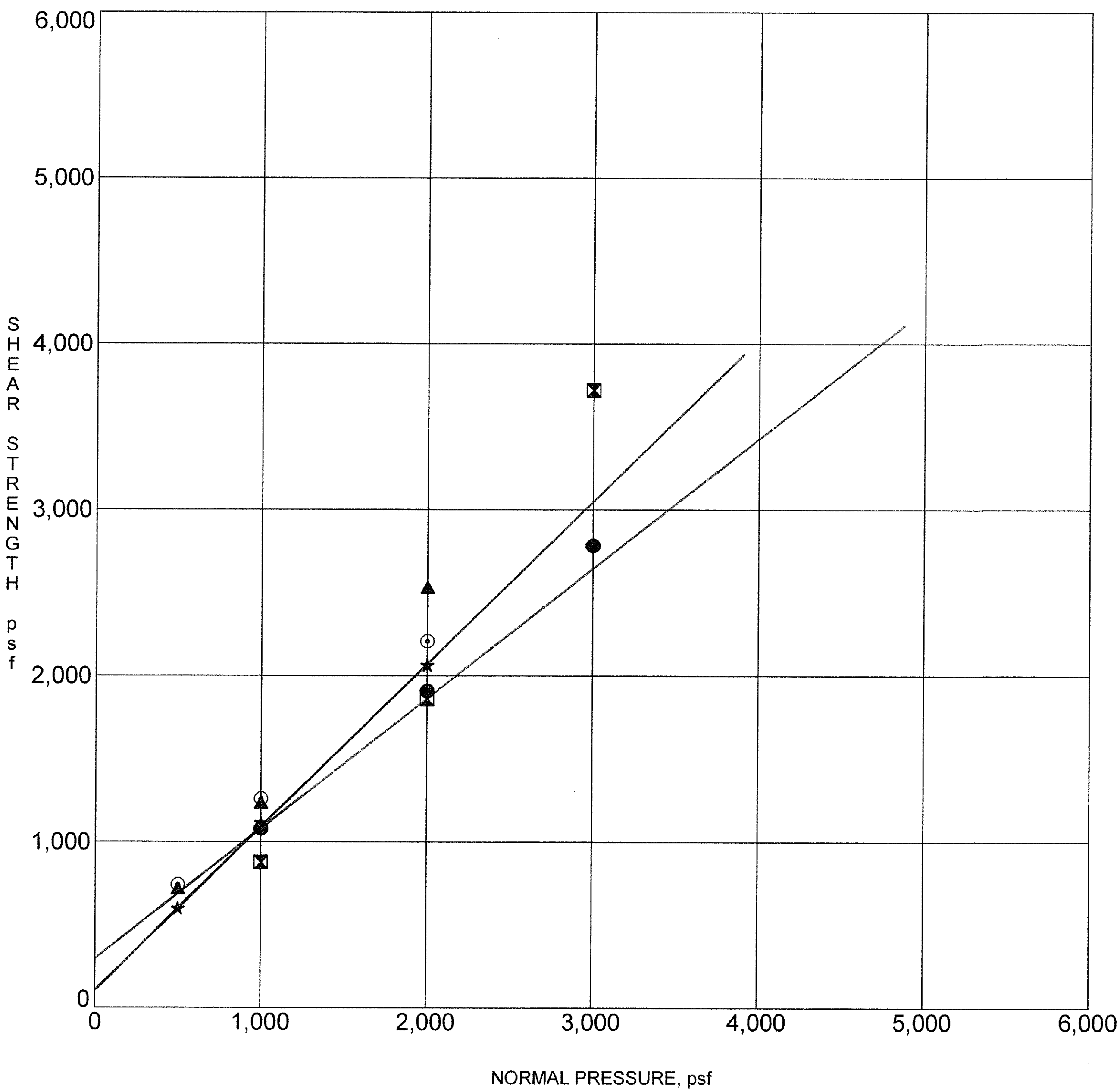
Grover Hollingsworth and Associates, Inc.

Project Name: A + T Development, Vacant Lot along Blue Heights Drive, Los Angeles

Project No. GH17563-G

Plate A-11

SHEAR TEST DIAGRAM



***NOTE-PEAK STRENGTH VALUES**

	Specimen Identification		Soil Type/Classification	Cohesion	Friction Angle	DD	MC%
●	**B-1**	**20.0**	**SOIL**	**300**	**38**	**100.6**	**19.1**
⊠	**B-2**	**25.0**	**SOIL**			**110.3**	**17.2**
▲	**HA-1**	**5.0**	**SOIL**			**108.2**	**18.4**
★	**TP-1**	**2.0**	**SOIL**	**110**	**44**	**104.1**	**18.2**
⊙	**TP-4**	**2.0**	**SOIL**			**108.8**	**19.9**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

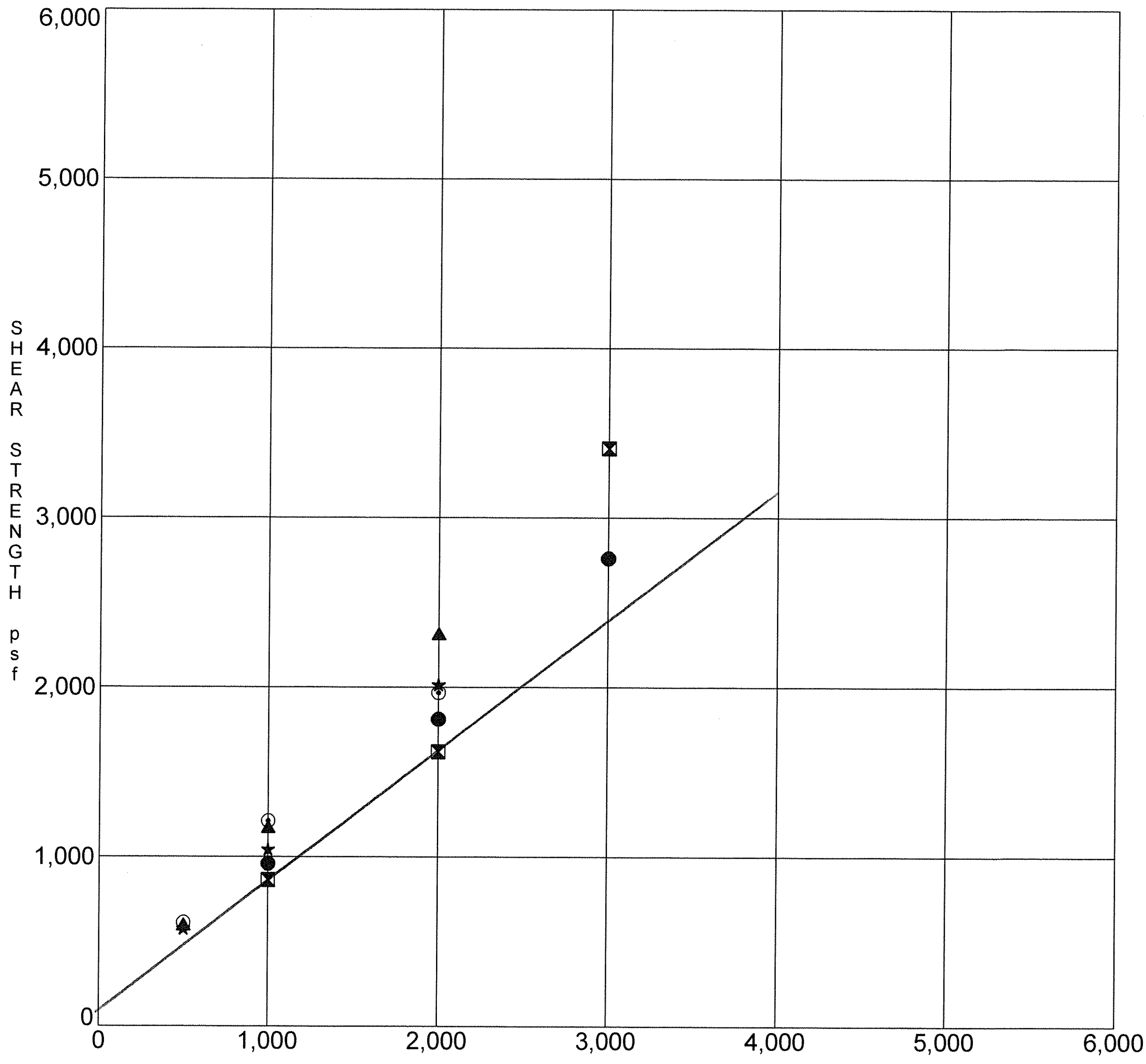
JOB NO. **17563-G**

DATE **02/16**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE B-1

SHEAR TEST DIAGRAM



***NOTE-ULTIMATE STRENGTH VALUES**

	Specimen Identification		Soil Type/Classification	Cohesion	Friction Angle	DD	MC%
●	**B-1**	**20.0**	**SOIL**			**100.6**	**19.1**
⊠	**B-2**	**25.0**	**SOIL**	**110**	**37**	**110.3**	**17.2**
▲	**HA-1**	**5.0**	**SOIL**			**108.2**	**18.4**
★	**TP-1**	**2.0**	**SOIL**			**104.1**	**18.2**
⊙	**TP-4**	**2.0**	**SOIL**			**108.8**	**19.9**

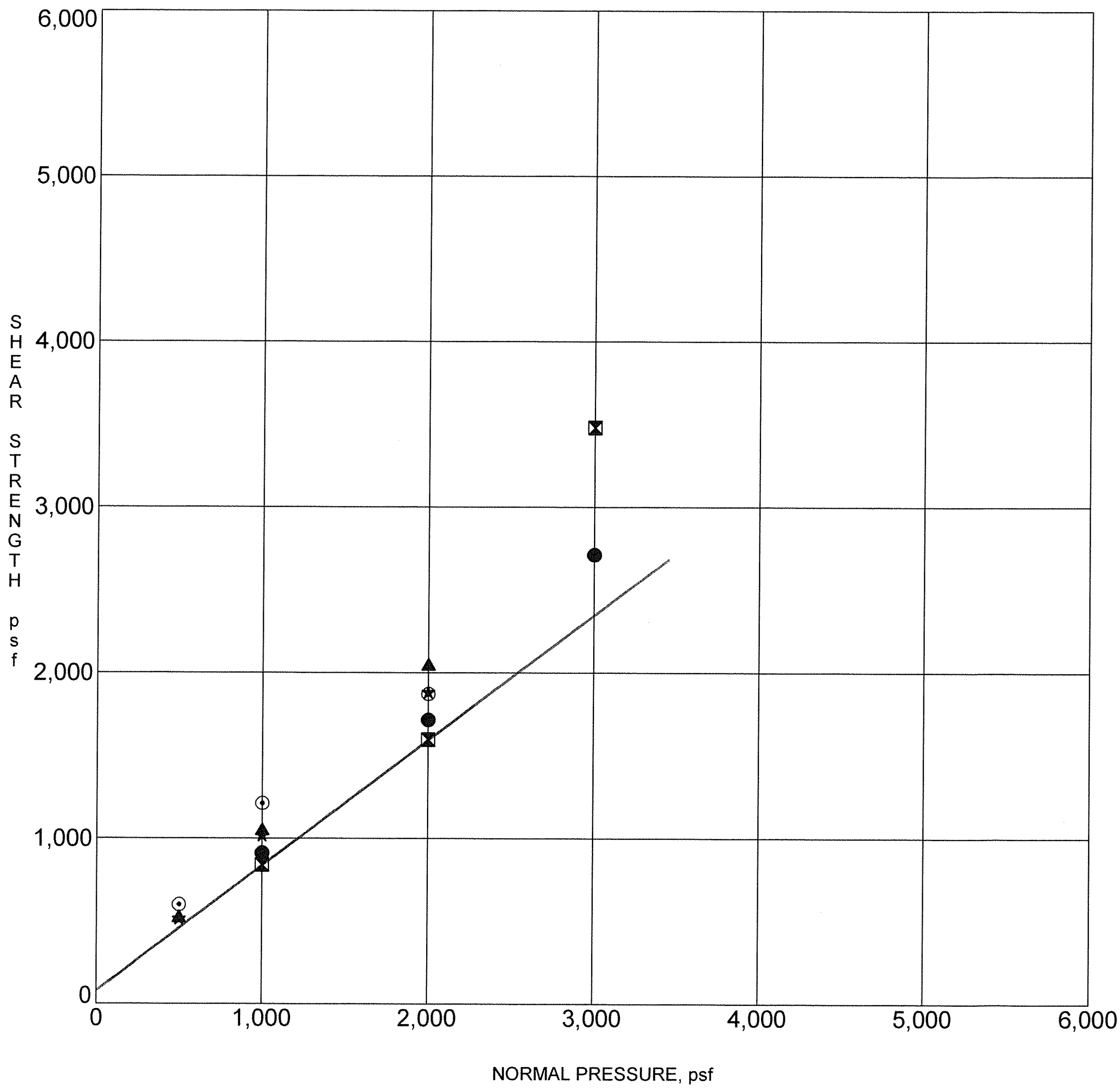
PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

JOB NO. **17563-G**
DATE **02/16**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE B-2

SHEAR TEST DIAGRAM



***NOTE-RESIDUAL STRENGTH VALUES**

Specimen Identification			Soil Type/Classification	Cohesion	Friction Angle	DD	MC%
●	**B-1**	**20.0**	**SOIL**			**100.6**	**19.1**
⊠	**B-2**	**25.0**	**SOIL**	**85**	**37**	**110.3**	**17.2**
▲	**HA-1**	**5.0**	**SOIL**			**108.2**	**18.4**
★	**TP-1**	**2.0**	**SOIL**			**104.1**	**18.2**
⊙	**TP-4**	**2.0**	**SOIL**			**108.8**	**19.9**

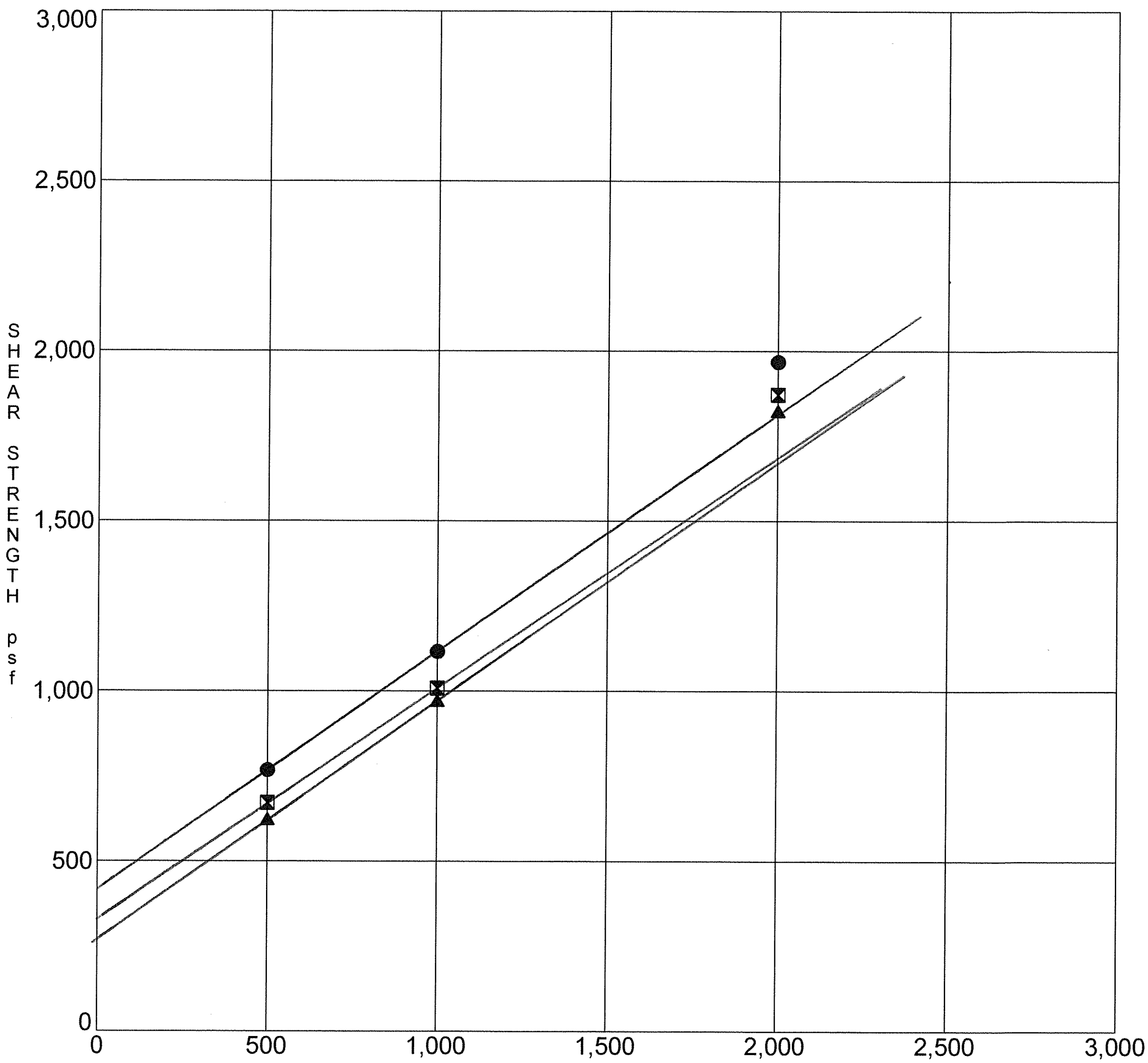
PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

JOB NO. **17563-G**
DATE **02/16**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE B-3

SHEAR TEST DIAGRAM



***NOTE-RESIDUAL STRENGTH VALUES**

Specimen Identification			Soil Type/Classification	Cohesion	Friction Angle	DD	MC%
●	**TP-2**	**2.0**	**WEATH BDRK (pk)**	**410**	**35**	**109.8**	**19.7**
⧗	**TP-2**	**2.0**	**WEATH BDRK (ult)**	**340**	**33**	**109.8**	**19.7**
▲	**TP-2**	**2.0**	**WEATH BDRK (res)**	**270**	**34**	**109.8**	**19.7**

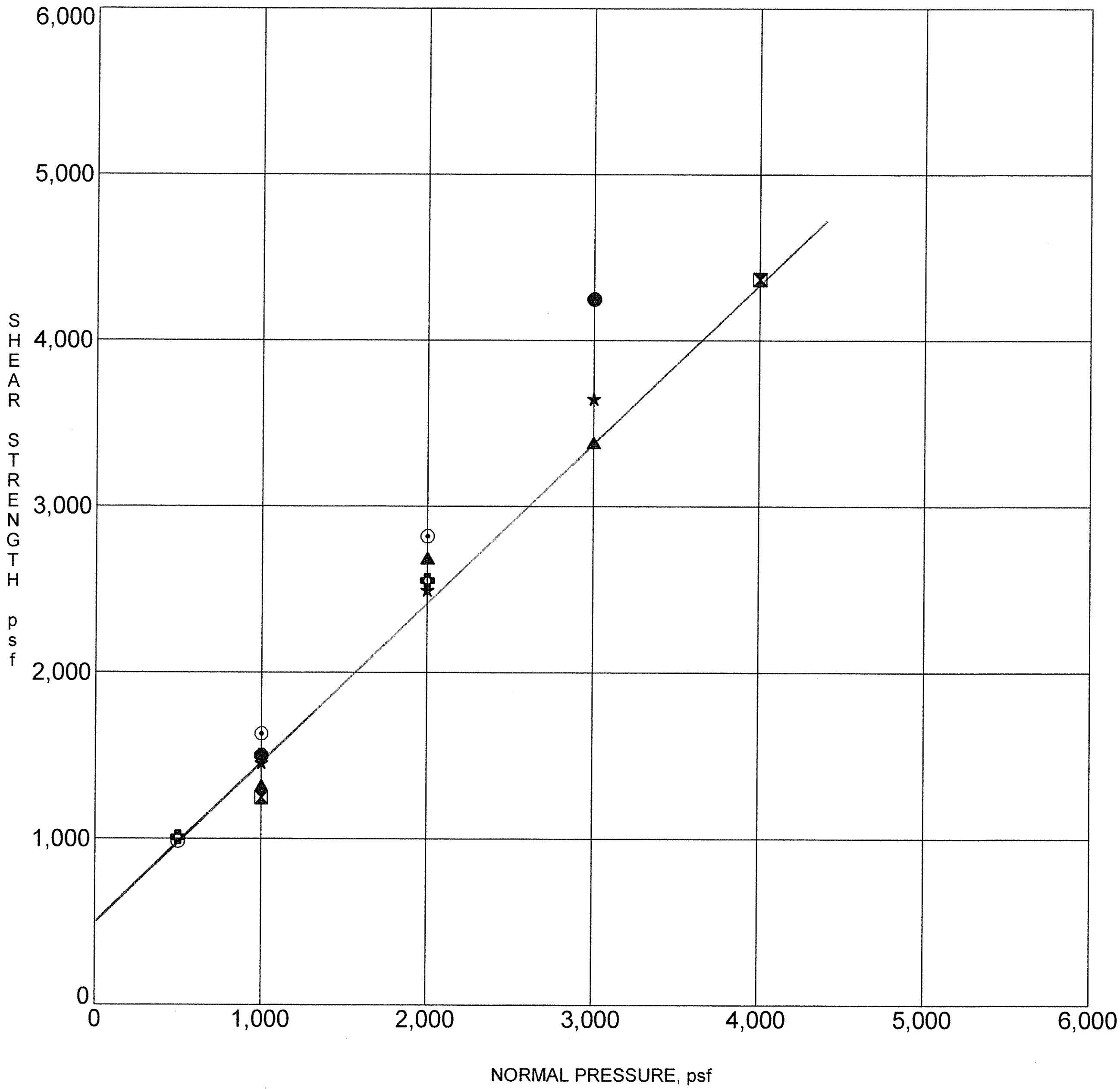
PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

JOB NO. **17563-G**
DATE **02/16**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE B-4

SHEAR TEST DIAGRAM



***NOTE-PEAK STRENGTH VALUES**

Specimen Identification			Soil Type/Classification	Cohesion	Friction Angle	DD	MC%
●	**B-1**	**25.0**	**BEDROCK**			**123.2**	**17.2**
⧗	**B-2**	**27.5**	**BEDROCK**			**115.9**	**20.9**
▲	**B-3**	**10.0**	**BEDROCK**			**119.9**	**18.8**
★	**TP-1**	**8.0**	**BEDROCK**			**126.4**	**19.6**
⊙	**TP-3**	**2.0**	**BEDROCK**			**115.2**	**24.9**
✿	**TP-4**	**4.0**	**BEDROCK**	**510**	**44**	**116.9**	**18.3**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

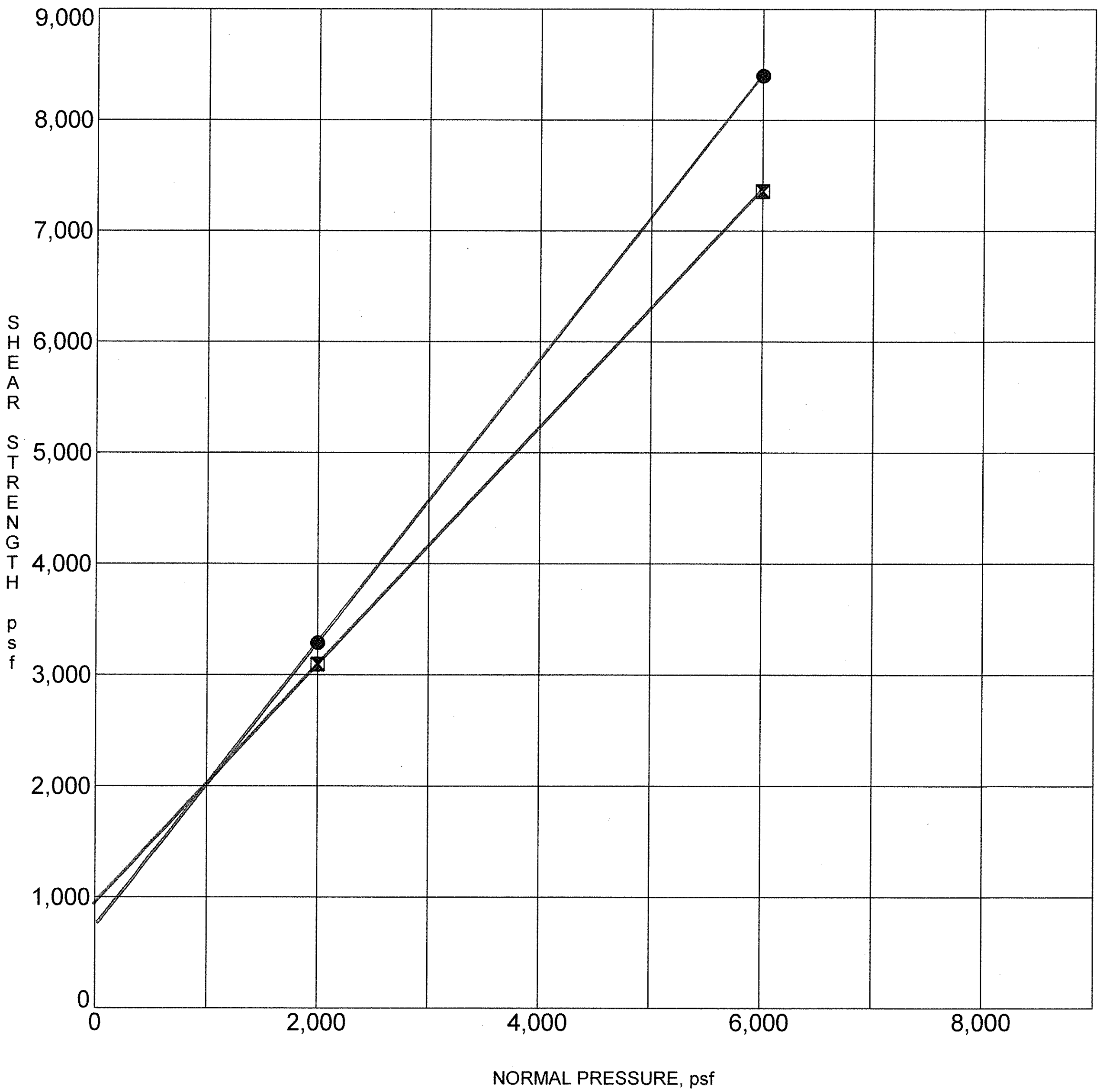
JOB NO. **17563-G**

DATE **02/16**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE B-5

SHEAR TEST DIAGRAM



***NOTE-PEAK AND ULTIMATE STRENGTH VALUES**

	Specimen Identification		Soil Type/Classification	Cohesion	Friction Angle	DD	MC%
●	**TP-1**	**7.0**	**BEDROCK (cut) pk**	**750**	**52**	**139.6**	**8.1**
⊠	**TP-1**	**7.0**	**BEDROCK (cut) ult**	**990**	**46**	**139.6**	**8.1**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

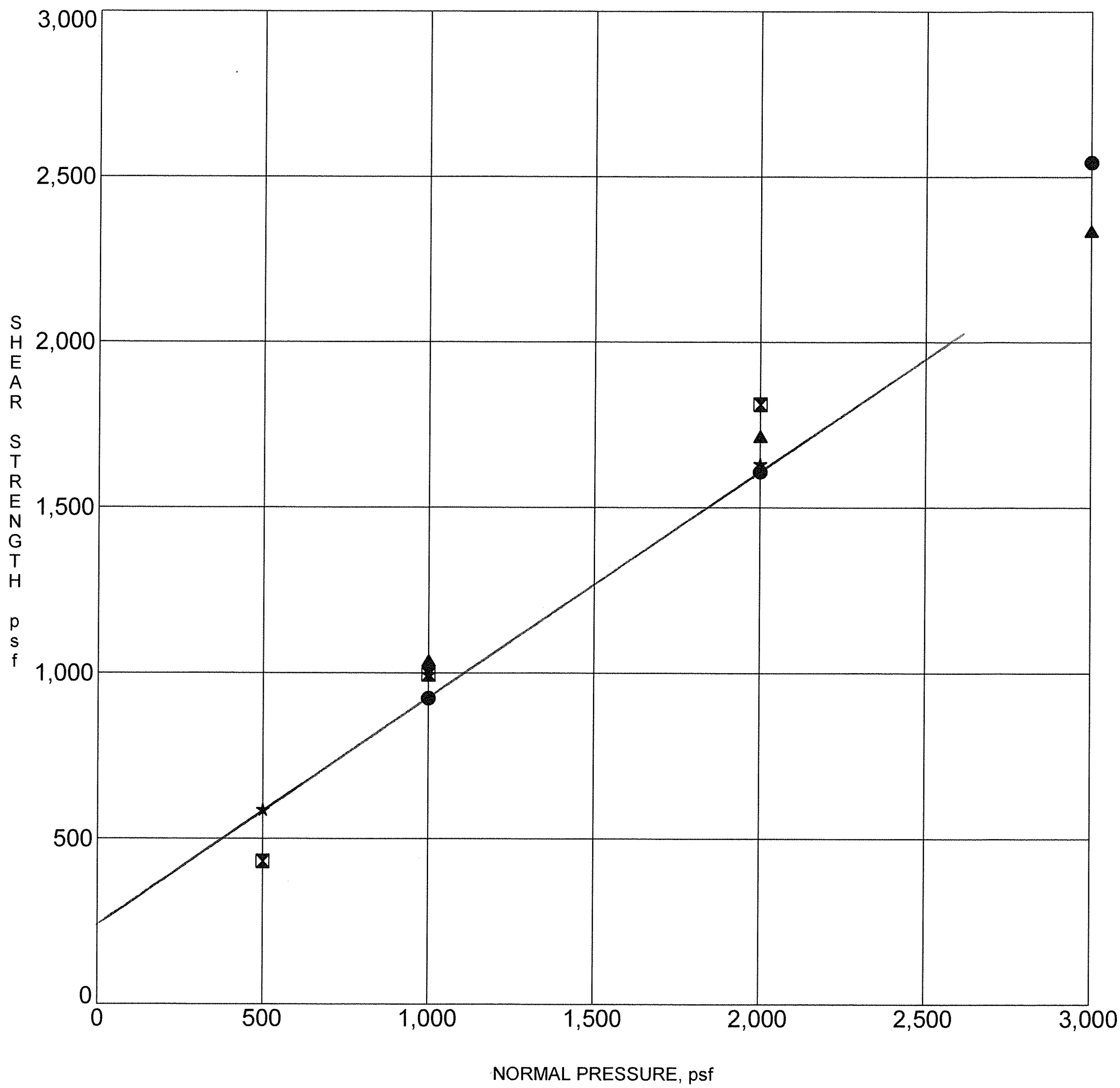
JOB NO. **17563-G**

DATE **03/16**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE B-6

SHEAR TEST DIAGRAM



***NOTE-PEAK STRENGTH VALUES**

	Specimen Identification		Soil Type/Classification	Cohesion	Friction Angle	DD	MC%
●	**B-1**	**7.5**	**FILL**	**240**	**35**	**100.6**	**17.2**
⊠	**B-2**	**10.0**	**FILL**			**101.1**	**20.2**
▲	**B-2**	**17.5**	**FILL**			**108.4**	**18.8**
★	**HA-1**	**2.0**	**FILL**	**240**	**35**	**108.2**	**19.1**

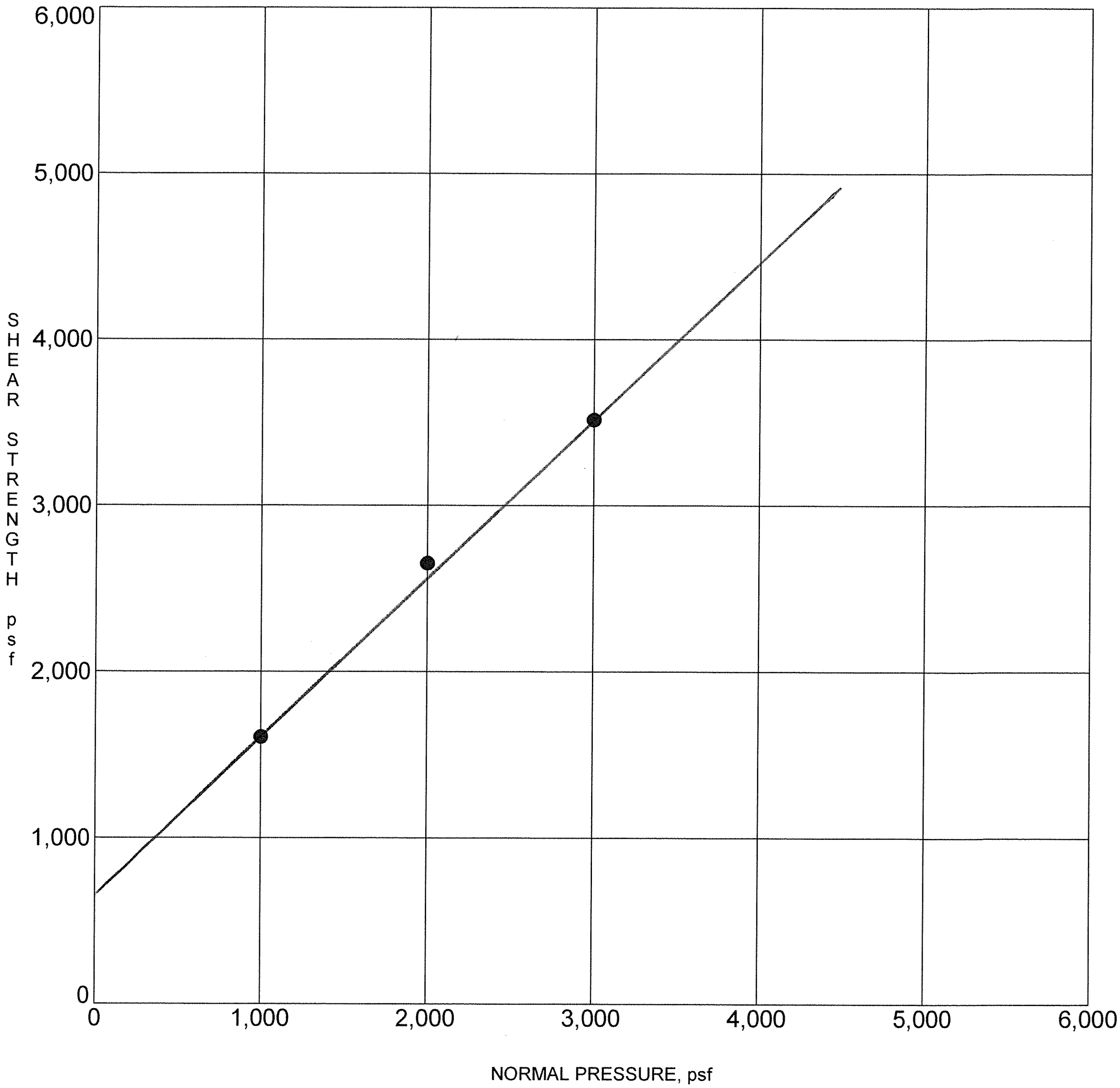
PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

JOB NO. **17563-G**
DATE **1/17**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE B-7

SHEAR TEST DIAGRAM



***NOTE: PEAK STRENGTH VALUES**

	Specimen Identification		Soil Type/Classification	Cohesion	Friction Angle	DD	MC%
●	**B-1**	**3.0**	**FUTURE COMPACTED FILL**	**650**	**43**	**123.3**	**16.9**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

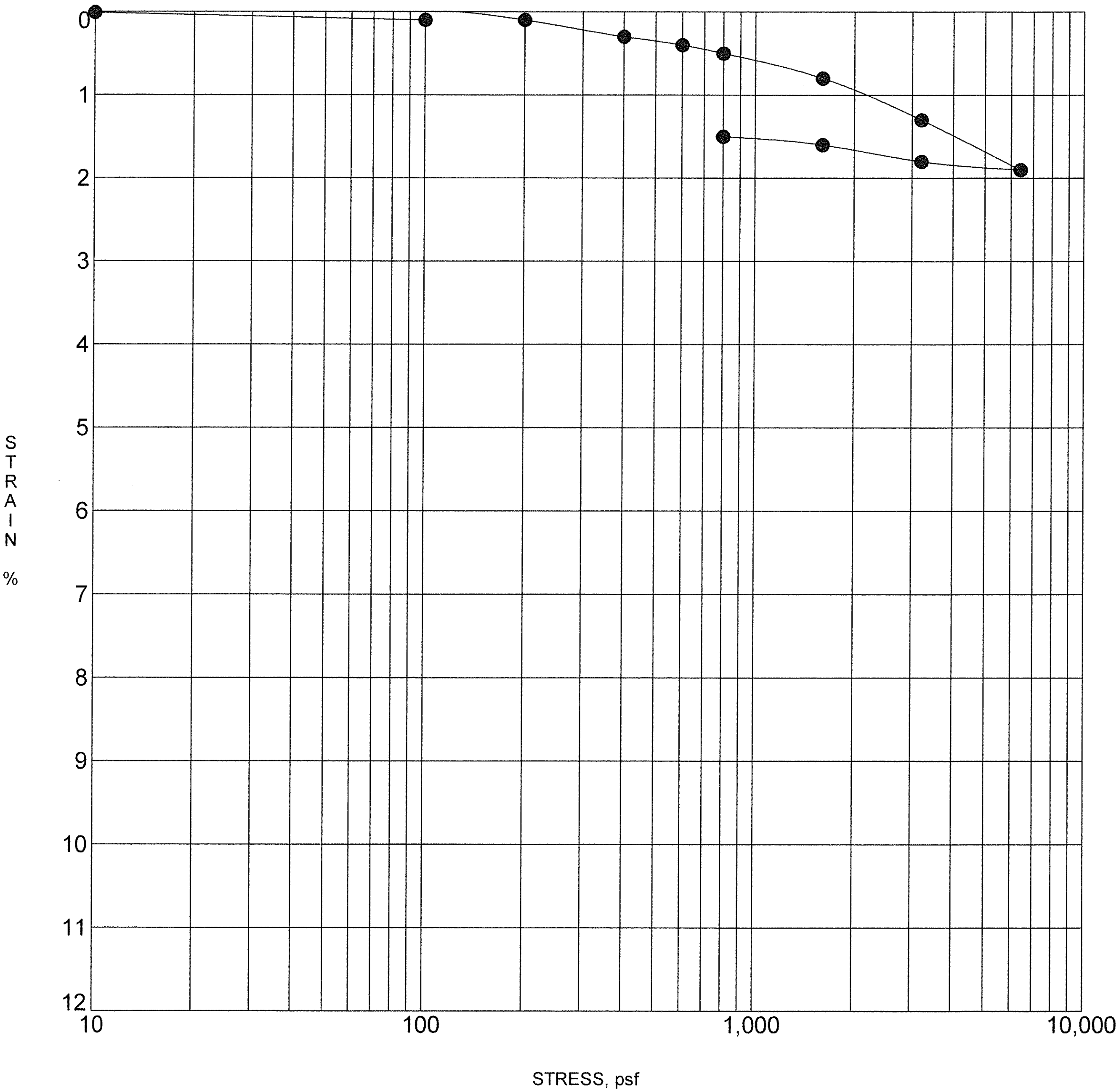
JOB NO. **17563-G**

DATE **4/17**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE B-8

CONSOLIDATION TEST



***NOTE: WATER ADDED AT 600 PSF.**

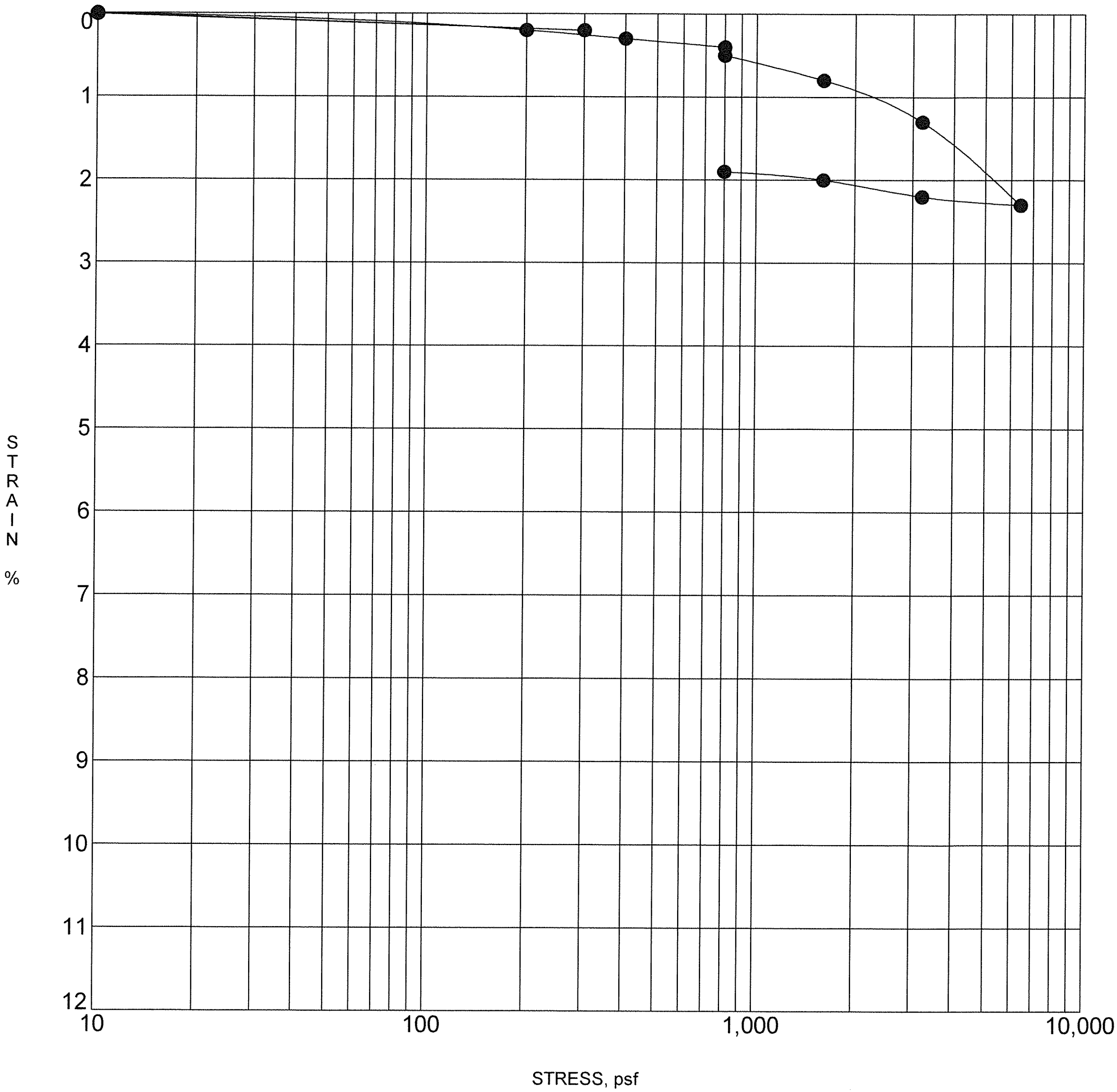
	Specimen Identification		Soil Type/Classification	DD	MC%
●	**HA-1**	**2.0**	**FILL**	**108.2**	**8.6**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles** JOB NO. **17563-G**
DATE **1/17**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE C-1

CONSOLIDATION TEST



***NOTE: WATER ADDED AT 800PSF**

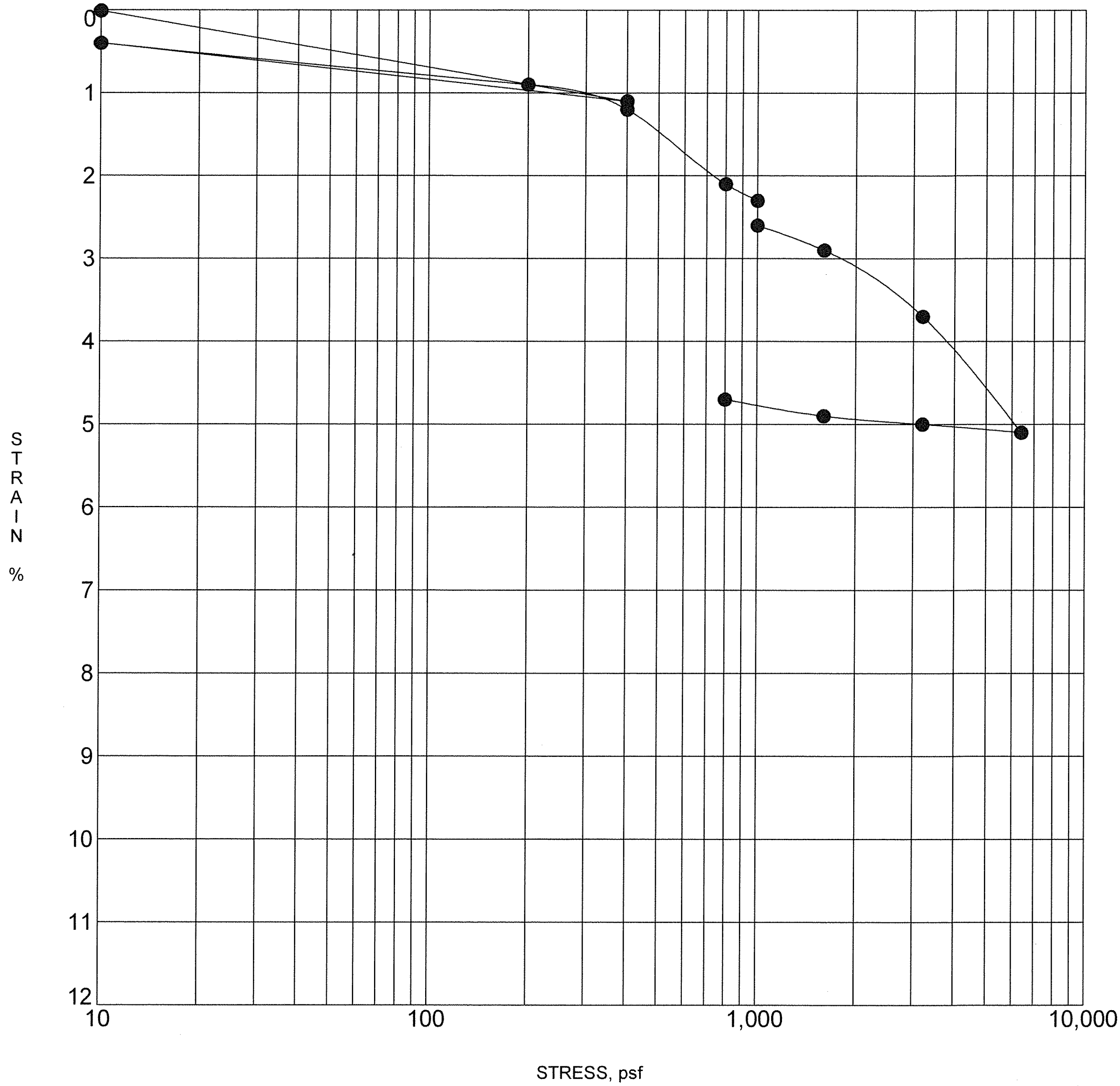
	Specimen Identification		Soil Type/Classification	DD	MC%
●	**B-1**	**5.0**	**FILL**	**103.1**	**6.9**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles** JOB NO. **17563-G**
DATE **4/17**

Grover-Hollingsworth and Associates
Westlake Village, CA 91362

PLATE C-2

CONSOLIDATION TEST



***NOTE: WATER ADDED AT 1000PSF**

Specimen Identification		Soil Type/Classification	DD	MC%
● B-2	7.5	FILL	104.9	6.7

PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

JOB NO. **17563-G**

DATE **4/17**

Grover-Hollingsworth and Associates
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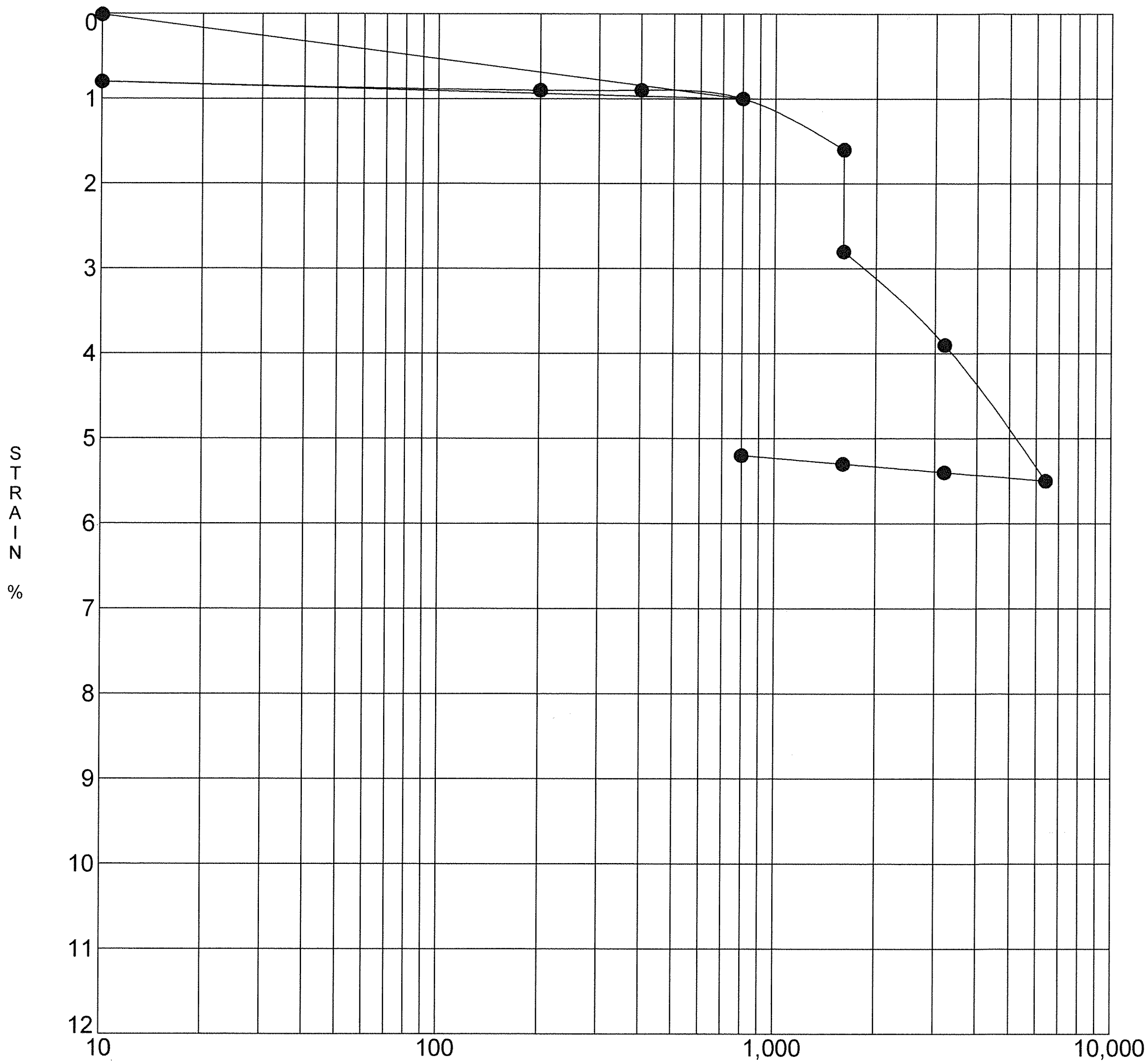
PLATE C-3

CONSOLIDATION TEST



***NOTE: WATER ADDED AT 1600PSF**

	Specimen Identification		Soil Type/Classification	DD	MC%
●	**B-1**	**15.0**	**FILL**	**106.9**	**3.0**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

JOB NO. **17563-G**
DATE **4/17**

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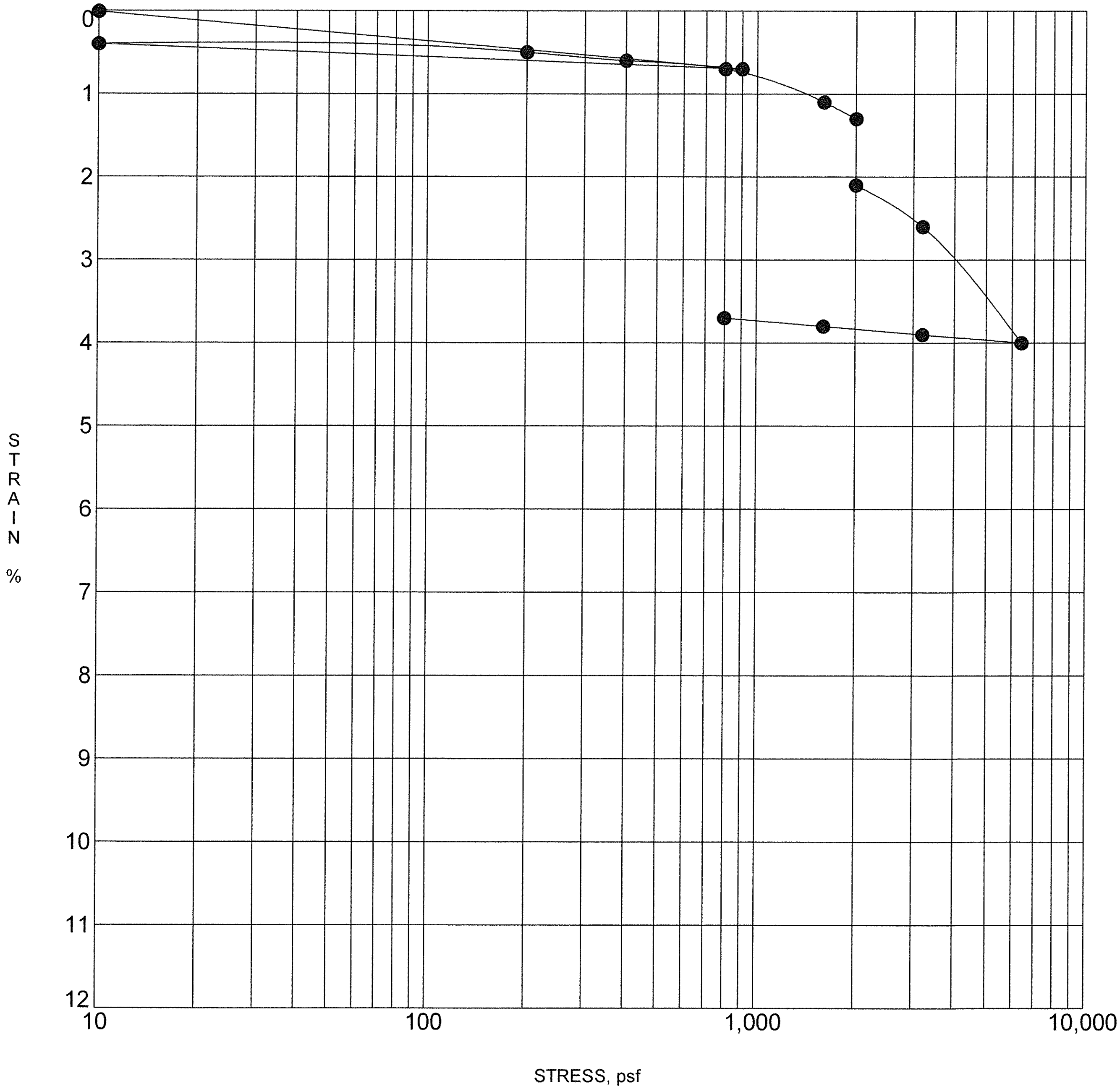
PLATE C-4

CONSOLIDATION TEST



***NOTE: WATER ADDED AT 2000PSF**

	Specimen Identification		Soil Type/Classification	DD	MC%
●	**B-2**	**17.5**	**FILL**	**108.4**	**1.9**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles**

JOB NO. **17563-G**
DATE **4/17**

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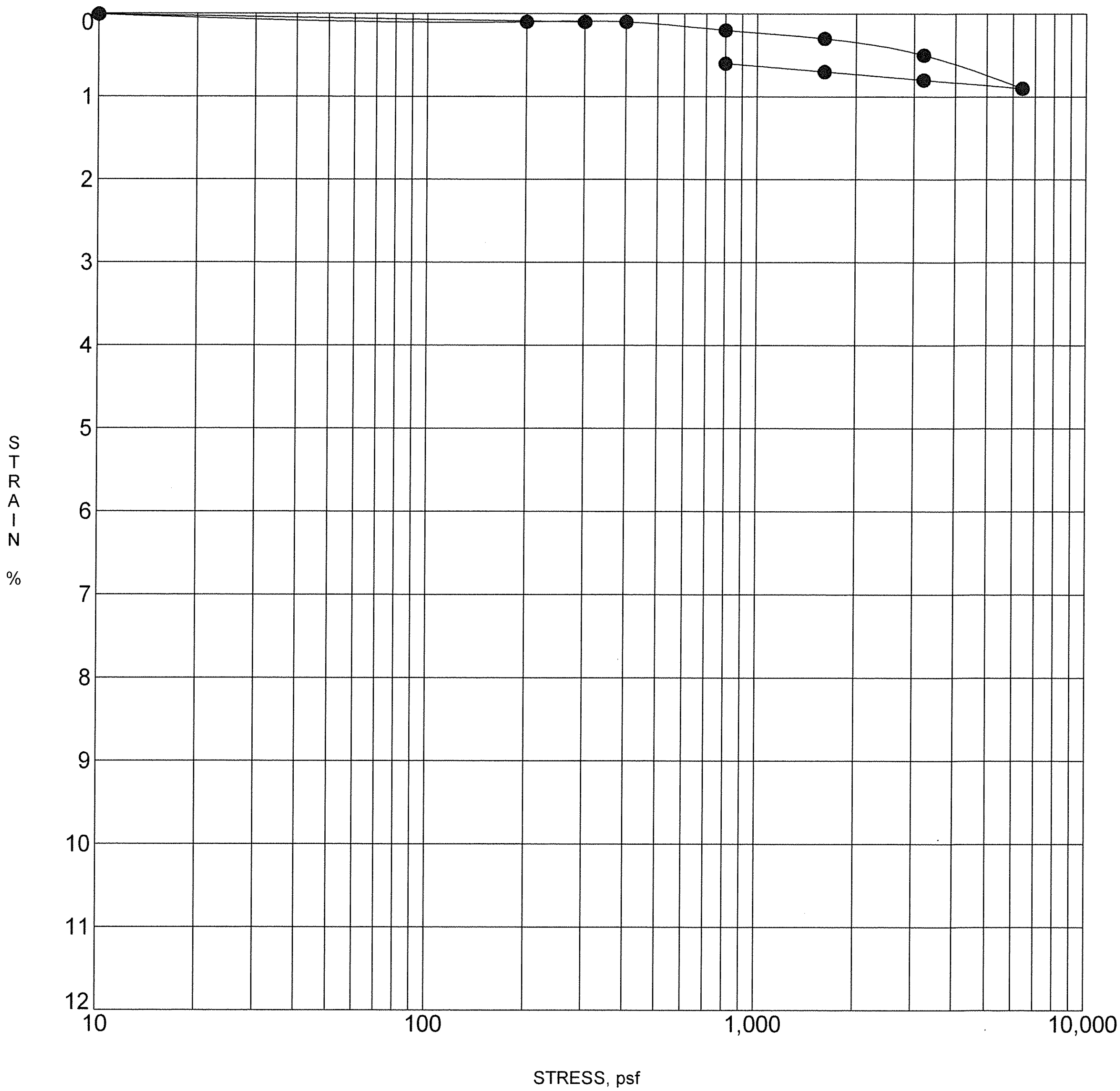
PLATE C-5

CONSOLIDATION TEST



***NOTE: WATER ADDED AT 800 PSF.**

	Specimen Identification		Soil Type/Classification	DD	MC%
●	**HA-1**	**5.0**	**SOIL**	**108.2**	**6.3**

PROJECT **A and T Development - Blue Heights Drive, Los Angeles**
JOB NO. **17563-G**
DATE **1/17**

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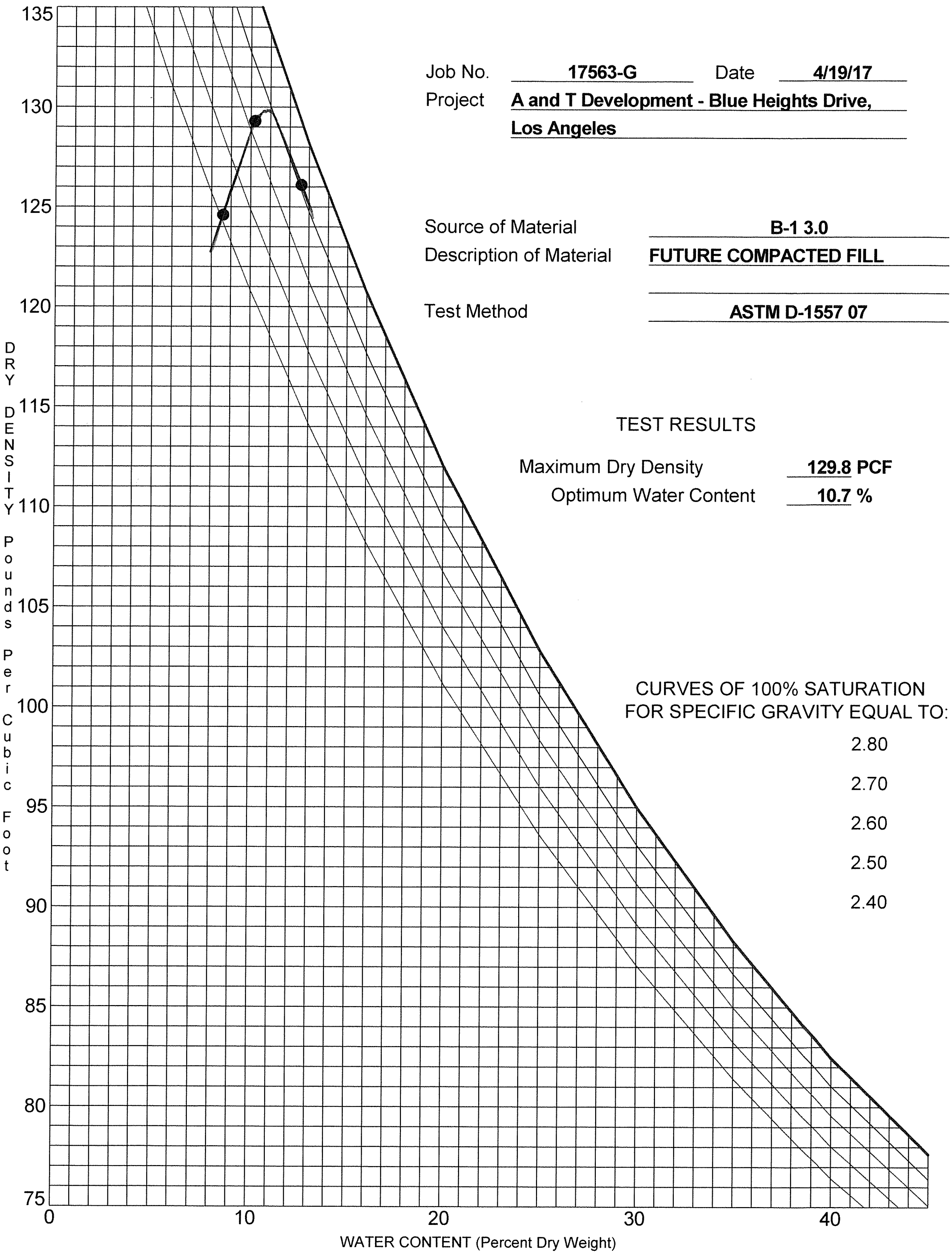
PLATE C-6



Job No.	**17563-G**
Date	**4/19/17**
Project	**A and T Development - Blue Heights Drive, Los Angeles**
Source of Material	**B-1 3.0**
Description of Material	**FUTURE COMPACTED FILL**
Test Method	**ASTM D-1557 07**

TEST RESULTS

Maximum Dry Density	**129.8** PCF
Optimum Water Content	**10.7** %

MOISTURE-DENSITY RELATIONSHIP

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Westlake Village, CA 91362

PLATE D

♠

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*****************************************
*               X S T A B L             *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
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Problem Description : A&T A CUT ABOVE ROAD STATIC

SEGMENT BOUNDARY COORDINATES
----

25 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1018.0	18.0	1019.0	2
2	18.0	1019.0	31.5	1032.0	2
3	31.5	1032.0	39.0	1037.0	2
4	39.0	1037.0	82.0	1040.0	2
5	82.0	1040.0	82.1	1048.0	1
6	82.1	1048.0	88.0	1051.0	1
7	88.0	1051.0	123.5	1076.0	1
8	123.5	1076.0	154.5	1114.0	2
9	154.5	1114.0	164.0	1124.0	2
10	164.0	1124.0	196.0	1124.0	2
11	196.0	1124.0	196.2	1142.0	2
12	196.2	1142.0	196.3	1149.5	1
13	196.3	1149.5	206.0	1149.5	1
14	206.0	1149.5	226.0	1149.5	2
15	226.0	1149.5	236.5	1178.0	2
16	236.5	1178.0	250.5	1190.0	2
17	250.5	1190.0	278.0	1208.5	2
18	278.0	1208.5	289.5	1212.0	2
19	289.5	1212.0	295.0	1210.5	2
20	295.0	1210.5	309.0	1209.5	2
21	309.0	1209.5	315.0	1208.5	3
22	315.0	1208.5	341.0	1211.5	3
23	341.0	1211.5	368.0	1217.0	3
24	368.0	1217.0	392.0	1214.0	3
25	392.0	1214.0	399.0	1203.0	3

9 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	82.0	1040.0	123.5	1076.0	2
2	196.2	1140.0	206.0	1149.5	2
3	.0	993.0	82.0	1020.0	3
4	82.0	1020.0	123.0	1055.0	3
5	123.0	1055.0	154.0	1092.0	3
6	154.0	1092.0	196.1	1122.0	3
7	196.1	1122.0	221.0	1142.0	3
8	221.0	1142.0	233.0	1154.0	3
9	233.0	1154.0	315.0	1208.5	3

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 8.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----

ISOTROPIC Soil Parameters

----

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	120.0	85.0	37.00	.000	.0	0
2	140.0	140.0	510.0	44.00	.000	.0	0
3	145.0	145.0	900.0	45.00	.000	.0	0

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

400 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 1 points equally spaced along the ground surface between x = 226.0 ft
and x = 226.0 ft

```
Each surface terminates between    x =    240.0 ft
                              and    x =    390.0 ft
```

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1140.0 ft

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

7.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

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

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

The most critical circular failure surface is specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	226.00	1149.50
2	231.33	1154.03
3	236.31	1158.96
4	240.90	1164.24
5	245.07	1169.86

6	248.81	1175.78
7	252.10	1181.96
8	252.79	1183.54
9	252.79	1191.54

**** Simplified BISHOP FOS = 1.389 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A&T A CUT ABOVE ROAD STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.389	168.73	1222.26	92.60	226.00	252.79	4.814E+06
2.	1.390	171.40	1222.56	91.21	226.00	254.22	5.140E+06
3.	1.392	163.26	1224.04	97.43	226.00	251.46	4.652E+06
4.	1.394	186.53	1207.72	70.33	226.00	252.43	3.793E+06
5.	1.395	178.14	1218.16	83.70	226.00	254.89	4.974E+06
6.	1.395	173.96	1212.27	81.54	226.00	249.11	3.499E+06
7.	1.395	159.57	1235.41	108.60	226.00	256.12	6.531E+06
8.	1.395	150.78	1241.39	118.75	226.00	255.39	6.801E+06
9.	1.396	179.23	1207.07	74.18	226.00	248.22	3.061E+06
10.	1.398	166.43	1217.95	90.74	226.00	249.18	3.844E+06

* * * END OF FILE * * *

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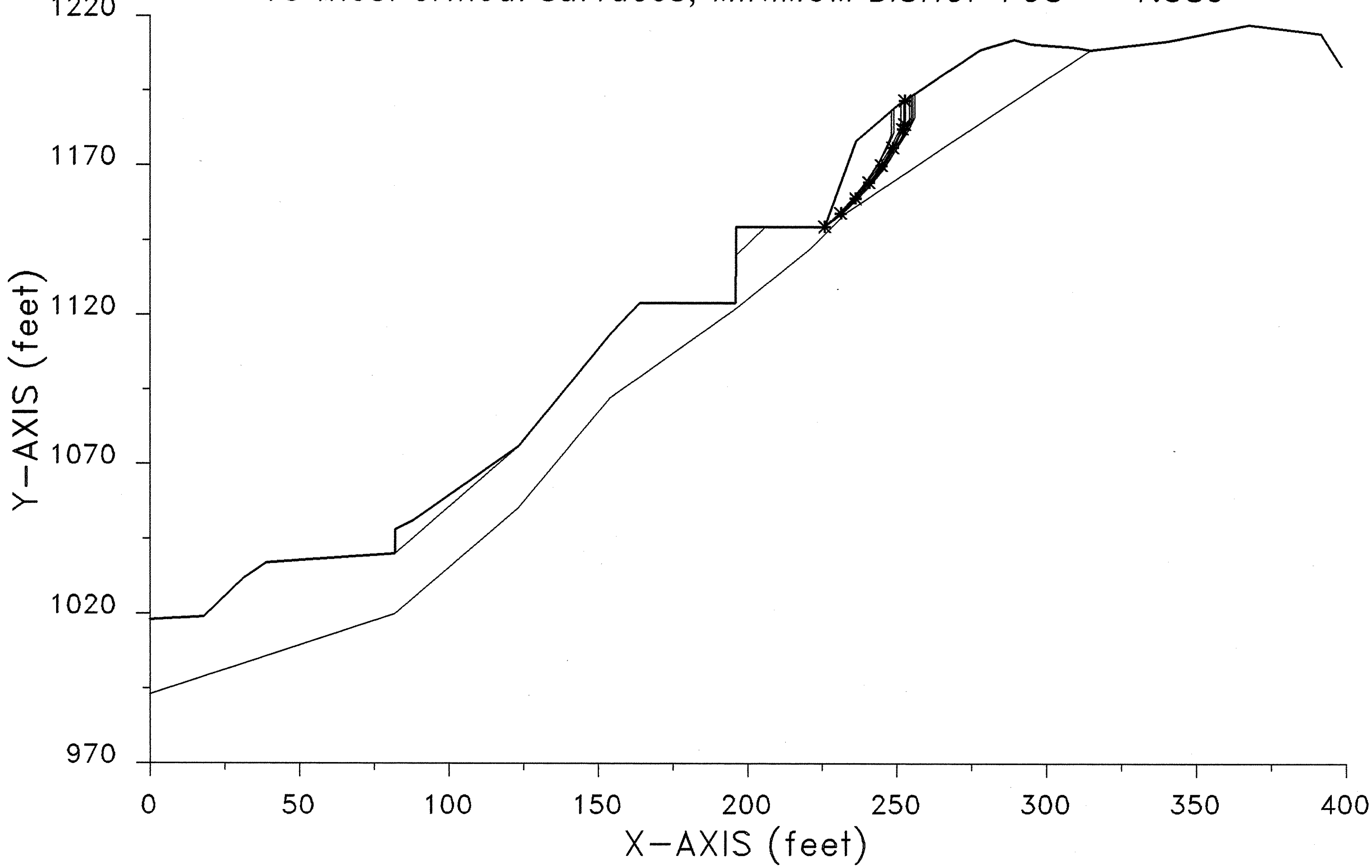
A&T A CUT ABOVE ROAD STATIC

10 most critical surfaces, MINIMUM BISHOP FOS = 1.389



♠

XSTABL File: 17563B8 4-06-17 17:08

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****************************************
*              X S T A B L             *
*                                      *
*       Slope Stability Analysis       *
*             using the                *
*          Method of Slices            *
*                                      *
*        Copyright (C) 1992 - 99       *
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*       Moscow, ID 83843, U.S.A.       *
*                                      *
*         All Rights Reserved          *
*                                      *
*  Ver. 5.203               96 - 1710  *
****************************************
```

Problem Description : A&T SEC B CUT ABOVE ROAD STATIC

SEGMENT BOUNDARY COORDINATES

----

37 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1056.0	13.0	1056.0	3
2	13.0	1056.0	13.1	1066.0	3
3	13.1	1066.0	30.0	1067.0	3
4	30.0	1067.0	37.0	1068.0	3
5	37.0	1068.0	37.1	1091.5	3
6	37.1	1091.5	49.0	1091.5	3
7	49.0	1091.5	49.1	1103.0	3
8	49.1	1103.0	49.3	1123.0	2
9	49.3	1123.0	53.5	1123.0	2
10	53.5	1123.0	82.0	1122.0	2
11	82.0	1122.0	82.3	1120.0	2
12	82.3	1120.0	96.0	1120.0	2
13	96.0	1120.0	155.5	1120.0	3
14	155.5	1120.0	155.7	1146.0	3
15	155.7	1146.0	155.8	1155.0	2
16	155.8	1155.0	158.5	1155.5	2
17	158.5	1155.5	178.0	1155.0	2
18	178.0	1155.0	181.5	1155.0	3
19	181.5	1155.0	186.0	1156.0	3
20	186.0	1156.0	187.0	1158.0	3
21	187.0	1158.0	193.0	1173.0	2
22	193.0	1173.0	200.0	1177.0	2
23	200.0	1177.0	208.5	1183.0	2
24	208.5	1183.0	223.0	1195.0	1
25	223.0	1195.0	252.0	1208.0	1
26	252.0	1208.0	255.0	1209.5	1

27	255.0	1209.5	266.0	1211.0	1
28	266.0	1211.0	272.0	1215.0	1
29	272.0	1215.0	290.0	1223.0	1
30	290.0	1223.0	310.0	1233.0	1
31	310.0	1233.0	315.0	1235.0	1
32	315.0	1235.0	320.0	1235.5	1
33	320.0	1235.5	345.0	1235.5	2
34	345.0	1235.5	362.0	1229.0	2
35	362.0	1229.0	372.0	1206.0	3
36	372.0	1206.0	375.0	1203.5	3
37	375.0	1203.5	391.0	1203.0	3

6 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	208.5	1183.0	257.0	1205.0	2
2	257.0	1205.0	300.0	1224.0	2
3	300.0	1224.0	320.0	1235.5	2
4	49.1	1103.0	96.0	1120.0	3
5	155.7	1146.0	181.5	1155.0	3
6	187.0	1158.0	362.0	1229.0	2

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 6.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----
ISOTROPIC Soil Parameters
----

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Constant (psf)	Water Surface No.
1	120.0	120.0	85.0	37.00	.000	.0	0
2	140.0	140.0	510.0	44.00	.000	.0	0
3	145.0	145.0	900.0	45.00	.000	.0	0

BOUNDARY LOADS
----

1 load(s) specified

Load No.	x-left (ft)	x-right (ft)	Intensity (psf)	Direction (deg)
1	88.0	155.0	500.0	.0

NOTE - Intensity is specified as a uniformly distributed force acting on a HORIZONTALLY projected surface.

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

800 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 2 points equally spaced along the ground surface between x = 186.0 ft
and x = 187.0 ft

Each surface terminates between x = 210.0 ft
and x = 330.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1150.0 ft

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

8.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

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

cases, this effect can only be eliminated by reducing the "c" value.
****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

The most critical circular failure surface
is specified by 9 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	186.00	1156.00
2	193.11	1159.67
3	199.88	1163.93
4	206.27	1168.75
5	212.22	1174.09
6	217.69	1179.93
7	222.65	1186.21
8	225.11	1189.95
9	225.11	1195.95

****   Simplified BISHOP FOS =   1.951   ****

The following is a summary of the TEN most critical surfaces

Problem Description : A&T SEC B CUT ABOVE ROAD STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.951	146.60	1241.14	93.82	186.00	225.11	6.640E+06
2.	1.954	144.16	1241.99	95.63	186.00	223.95	6.402E+06
3.	1.956	146.78	1237.68	90.61	186.00	223.16	5.926E+06
4.	1.960	150.33	1231.01	83.06	186.00	220.91	5.067E+06
5.	1.964	131.20	1271.51	127.85	186.00	232.08	1.106E+07
6.	1.965	135.99	1266.40	121.20	186.00	232.57	1.079E+07
7.	1.966	156.08	1220.35	70.97	186.00	216.89	3.811E+06
8.	1.966	154.35	1209.84	62.45	186.00	206.36	1.997E+06
9.	1.967	153.74	1218.61	70.43	186.00	212.98	3.165E+06
10.	1.967	153.96	1216.84	68.76	186.00	211.61	2.904E+06

* * *   END OF FILE   * * *

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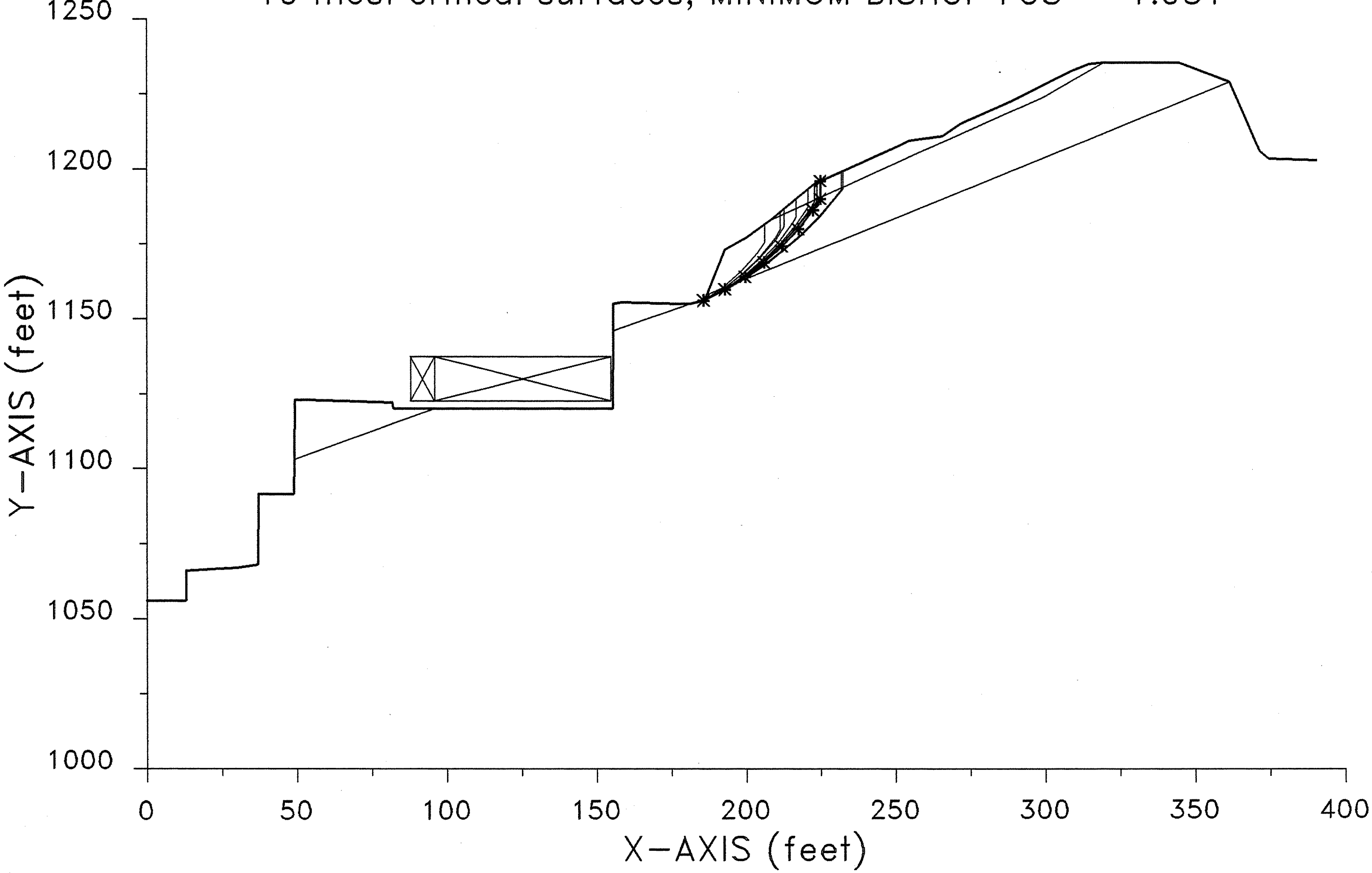
A&T SEC B CUT ABOVE ROAD STATIC

10 most critical surfaces, MINIMUM BISHOP FOS = 1.951



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****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*               using the               *
*           Method of Slices            *
*                                       *
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*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.203                96 — 1710  *
****************************************
```

Problem Description : A&T SEC B CUT ABOVE ROAD SEISMIC

SEGMENT BOUNDARY COORDINATES
----

37 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1056.0	13.0	1056.0	3
2	13.0	1056.0	13.1	1066.0	3
3	13.1	1066.0	30.0	1067.0	3
4	30.0	1067.0	37.0	1068.0	3
5	37.0	1068.0	37.1	1091.5	3
6	37.1	1091.5	49.0	1091.5	3
7	49.0	1091.5	49.1	1103.0	3
8	49.1	1103.0	49.3	1123.0	2
9	49.3	1123.0	53.5	1123.0	2
10	53.5	1123.0	82.0	1122.0	2
11	82.0	1122.0	82.3	1120.0	2
12	82.3	1120.0	96.0	1120.0	2
13	96.0	1120.0	155.5	1120.0	3
14	155.5	1120.0	155.7	1146.0	3
15	155.7	1146.0	155.8	1155.0	2
16	155.8	1155.0	158.5	1155.5	2
17	158.5	1155.5	178.0	1155.0	2
18	178.0	1155.0	181.5	1155.0	3
19	181.5	1155.0	186.0	1156.0	3
20	186.0	1156.0	187.0	1158.0	3
21	187.0	1158.0	193.0	1173.0	2
22	193.0	1173.0	200.0	1177.0	2
23	200.0	1177.0	208.5	1183.0	2
24	208.5	1183.0	223.0	1195.0	1
25	223.0	1195.0	252.0	1208.0	1
26	252.0	1208.0	255.0	1209.5	1

27	255.0	1209.5	266.0	1211.0	1
28	266.0	1211.0	272.0	1215.0	1
29	272.0	1215.0	290.0	1223.0	1
30	290.0	1223.0	310.0	1233.0	1
31	310.0	1233.0	315.0	1235.0	1
32	315.0	1235.0	320.0	1235.5	1
33	320.0	1235.5	345.0	1235.5	2
34	345.0	1235.5	362.0	1229.0	2
35	362.0	1229.0	372.0	1206.0	3
36	372.0	1206.0	375.0	1203.5	3
37	375.0	1203.5	391.0	1203.0	3

6 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	208.5	1183.0	257.0	1205.0	2
2	257.0	1205.0	300.0	1224.0	2
3	300.0	1224.0	320.0	1235.5	2
4	49.1	1103.0	96.0	1120.0	3
5	155.7	1146.0	181.5	1155.0	3
6	187.0	1158.0	362.0	1229.0	2

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 6.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----

ISOTROPIC Soil Parameters

----

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	120.0	85.0	37.00	.000	.0	0
2	140.0	140.0	510.0	44.00	.000	.0	0
3	145.0	145.0	900.0	45.00	.000	.0	0

A horizontal earthquake loading coefficient of .326 has been assigned

A vertical earthquake loading coefficient
of .000 has been assigned

BOUNDARY LOADS
----

1 load(s) specified

Load No.	x-left (ft)	x-right (ft)	Intensity (psf)	Direction (deg)
1	88.0	155.0	500.0	.0

NOTE - Intensity is specified as a uniformly distributed force acting on a HORIZONTALLY projected surface.

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

800 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 2 points equally spaced along the ground surface between x = 186.0 ft
and x = 187.0 ft

Each surface terminates between x = 210.0 ft
and x = 330.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1150.0 ft

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

8.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

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

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

Factors of safety have been calculated by the :

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

The most critical circular failure surface
is specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	186.00	1156.00
2	193.19	1159.50
3	200.19	1163.38
4	206.97	1167.63
5	213.51	1172.23
6	219.81	1177.17
7	225.83	1182.44
8	231.56	1188.02
9	236.98	1193.90
10	238.79	1196.08
11	238.79	1202.08

****   Simplified BISHOP FOS =   1.194   ****

The following is a summary of the TEN most critical surfaces

Problem Description : A&T SEC B CUT ABOVE ROAD SEISMIC

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.194	123.77	1292.96	150.43	186.00	238.79	1.330E+07
2.	1.194	120.35	1288.81	148.15	186.00	234.12	1.131E+07
3.	1.196	108.30	1307.19	169.98	186.00	235.73	1.332E+07
4.	1.196	131.20	1271.51	127.85	186.00	232.08	9.384E+06

5.	1.196	135.99	1266.40	121.20	186.00	232.57	9.164E+06
6.	1.197	114.77	1312.83	172.25	186.00	243.19	1.681E+07
7.	1.199	105.84	1303.47	167.85	186.00	232.29	1.179E+07
8.	1.200	88.21	1348.27	215.71	186.00	242.84	2.003E+07
9.	1.200	144.76	1260.06	111.94	186.00	235.57	9.575E+06
10.	1.203	87.07	1360.14	226.85	186.00	247.82	2.379E+07

* * * END OF FILE * * *

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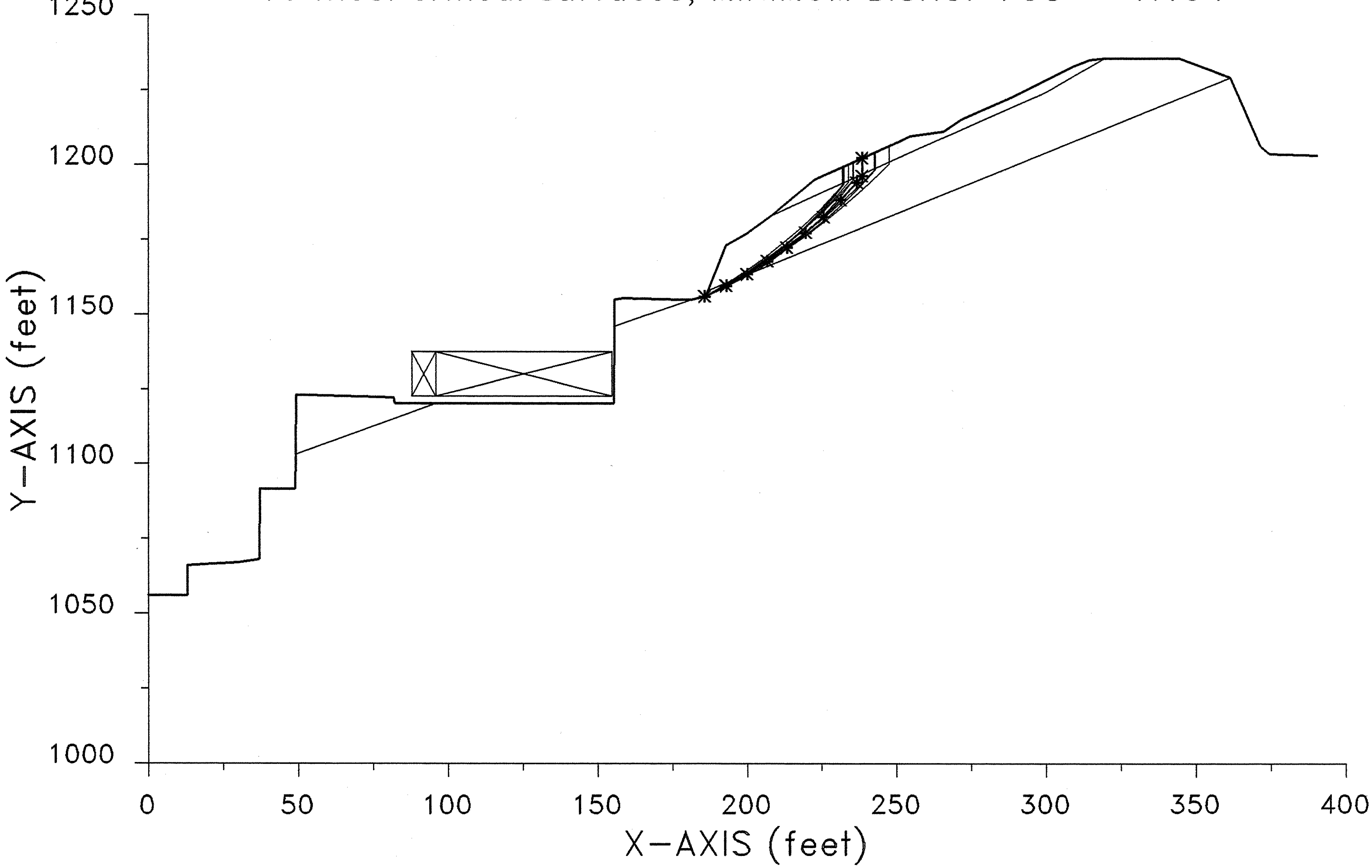
A&T SEC B CUT ABOVE ROAD SEISMIC

10 most critical surfaces, MINIMUM BISHOP FOS = 1.194



♠

XSTABL File: 17563D3   4-07-17   9:21

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*             using the                 *
*          Method of Slices             *
*                                       *
*        Copyright (C) 1992 - 99        *
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*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.203                96 – 1710  *
*****************************************
```

Problem Description : A & T SEC D CUT ABOVE ROAD STATIC

SEGMENT BOUNDARY COORDINATES

----

15 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1102.0	13.0	1110.0	1
2	13.0	1110.0	40.0	1132.0	1
3	40.0	1132.0	49.0	1137.0	1
4	49.0	1137.0	49.1	1146.0	1
5	49.1	1146.0	67.5	1146.0	1
6	67.5	1146.0	83.0	1146.0	2
7	83.0	1146.0	94.0	1180.0	2
8	94.0	1180.0	154.0	1226.0	2
9	154.0	1226.0	165.0	1233.0	2
10	165.0	1233.0	170.0	1235.0	2
11	170.0	1235.0	188.0	1235.0	2
12	188.0	1235.0	202.0	1228.0	2
13	202.0	1228.0	212.5	1206.0	3
14	212.5	1206.0	216.5	1203.0	3
15	216.5	1203.0	232.0	1202.0	3

5 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1099.0	38.0	1124.0	2
2	38.0	1124.0	67.5	1146.0	2
3	.0	1080.0	100.0	1157.0	3
4	100.0	1157.0	172.0	1212.0	3

5	172.0	1212.0	202.0	1228.0	3

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 10.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

ISOTROPIC Soil Parameters

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	120.0	85.0	37.00	.000	.0	0
2	140.0	140.0	510.0	44.00	.000	.0	0
3	145.0	145.0	900.0	45.00	.000	.0	0

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

400 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 1 points equally spaced along the ground surface between x = 83.0 ft
and x = 83.0 ft

Each surface terminates between x = 110.0 ft
and x = 200.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1140.0 ft

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

9.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

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

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

The most critical circular failure surface is specified by 7 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	83.00	1146.00
2	89.33	1152.40
3	95.13	1159.28
4	100.37	1166.60
5	105.00	1174.31
6	108.32	1180.97
7	108.32	1190.97

**** Simplified BISHOP FOS = 1.251 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A & T SEC D CUT ABOVE ROAD STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.251	6.01	1228.54	112.88	83.00	108.32	5.862E+06
2.	1.252	22.33	1217.13	93.49	83.00	108.58	5.062E+06
3.	1.253	-1.56	1229.82	119.06	83.00	106.18	5.447E+06
4.	1.254	-4.90	1237.70	127.03	83.00	108.98	6.737E+06
5.	1.259	31.33	1212.29	84.05	83.00	109.73	4.941E+06
6.	1.259	26.82	1216.81	90.39	83.00	110.43	5.448E+06
7.	1.260	-32.30	1256.38	159.62	83.00	108.36	8.018E+06
8.	1.260	14.35	1228.28	107.15	83.00	111.62	6.676E+06
9.	1.262	-34.75	1255.30	160.66	83.00	107.15	7.559E+06
10.	1.263	-20.61	1240.85	140.47	83.00	105.25	5.983E+06

* * * END OF FILE * * *

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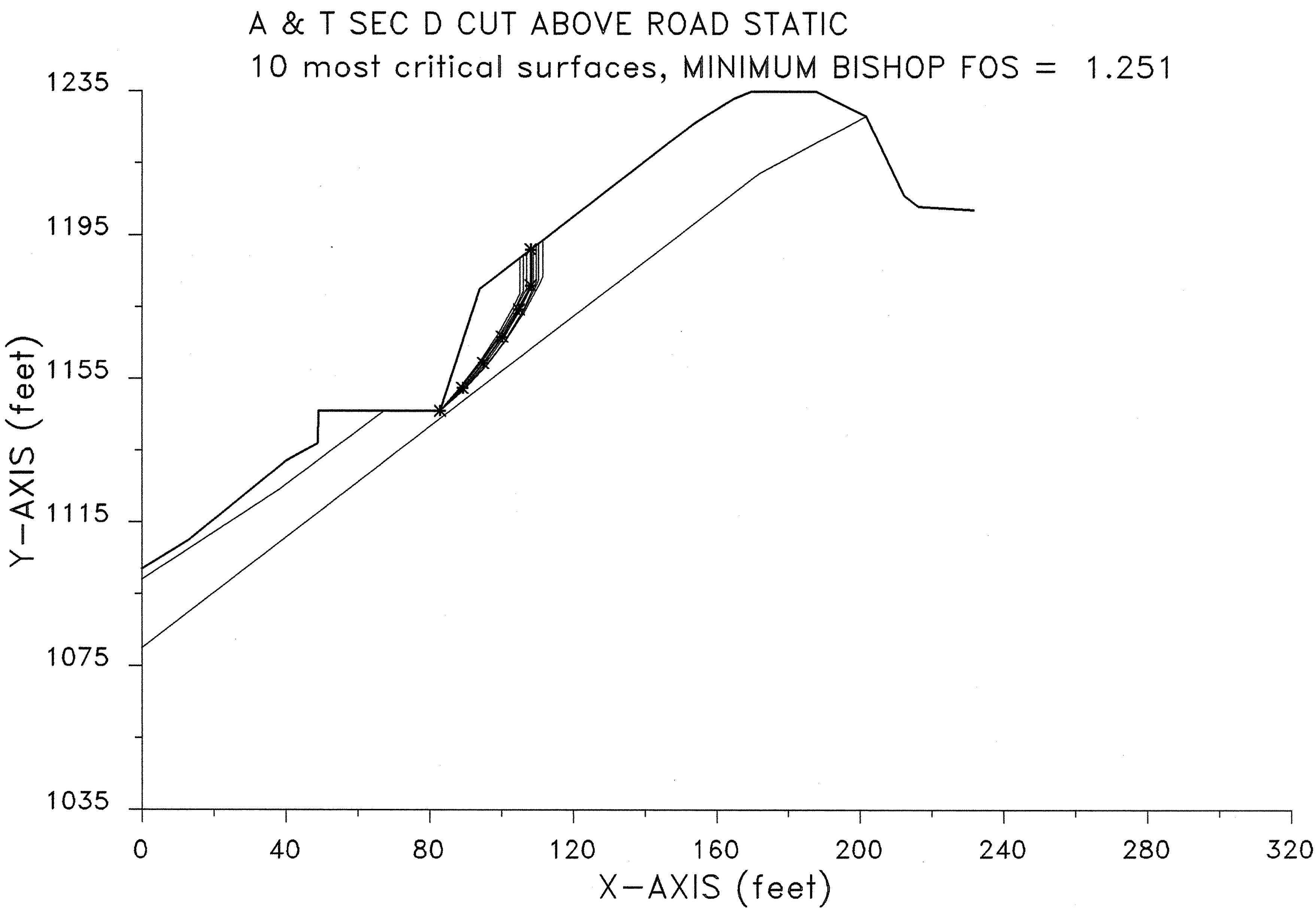

XSTABL File: 17563F1   4-06-17   14:17

```
*****************************************
*               X S T A B L             *
*                                       *
*       Slope Stability Analysis        *
*             using the                 *
*          Method of Slices             *
*                                       *
*        Copyright (C) 1992 - 99        *
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*       Moscow, ID 83843, U.S.A.        *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.203                96 - 1710  *
*****************************************
```

Problem Description : A & T SECTION F FILL SLOPE STATIC

SEGMENT BOUNDARY COORDINATES
----

25 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1066.0	12.0	1064.0	2
2	12.0	1064.0	34.0	1064.0	2
3	34.0	1064.0	44.0	1066.0	2
4	44.0	1066.0	100.0	1077.0	2
5	100.0	1077.0	143.0	1087.0	2
6	143.0	1087.0	157.0	1093.0	2
7	157.0	1093.0	192.0	1119.0	1
8	192.0	1119.0	209.0	1129.0	1
9	209.0	1129.0	221.0	1135.0	1
10	221.0	1135.0	225.5	1135.5	1
11	225.5	1135.5	229.0	1135.0	1
12	229.0	1135.0	230.0	1134.5	1
13	230.0	1134.5	233.5	1134.5	2
14	233.5	1134.5	248.0	1134.5	3
15	248.0	1134.5	254.0	1134.5	4
16	254.0	1134.5	255.5	1141.0	4
17	255.5	1141.0	260.5	1163.0	3
18	260.5	1163.0	261.0	1167.0	2
19	261.0	1167.0	284.0	1190.0	2
20	284.0	1190.0	307.0	1210.0	2
21	307.0	1210.0	340.0	1234.0	2
22	340.0	1234.0	349.0	1242.0	2
23	349.0	1242.0	356.0	1242.0	2
24	356.0	1242.0	375.0	1242.0	3
25	375.0	1242.0	400.0	1242.0	4

25 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	143.0	1087.0	157.0	1092.0	2
2	157.0	1092.0	174.0	1100.0	2
3	174.0	1100.0	200.0	1114.0	2
4	200.0	1114.0	218.0	1125.0	2
5	218.0	1125.0	226.0	1131.0	2
6	226.0	1131.0	230.0	1134.5	2
7	.0	1060.0	28.0	1058.0	3
8	28.0	1058.0	46.0	1060.0	3
9	46.0	1060.0	100.0	1073.0	3
10	100.0	1073.0	135.0	1082.0	3
11	135.0	1082.0	162.0	1091.0	3
12	162.0	1091.0	178.0	1098.0	3
13	178.0	1098.0	200.0	1110.0	3
14	200.0	1110.0	210.0	1116.0	3
15	210.0	1116.0	223.0	1125.0	3
16	223.0	1125.0	228.0	1130.5	3
17	228.0	1130.5	233.5	1134.5	3
18	260.5	1163.0	308.0	1207.0	3
19	308.0	1207.0	340.0	1230.0	3
20	340.0	1230.0	356.0	1242.0	3
21	100.0	1052.0	182.0	1081.0	4
22	182.0	1081.0	229.0	1115.0	4
23	229.0	1115.0	248.0	1134.5	4
24	255.5	1141.0	283.0	1170.0	4
25	283.0	1170.0	375.0	1242.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface	=	4.00	(feet)
Maximum depth of water in crack	=	.00	(feet)
Unit weight of water in crack	=	62.40	(pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----

ISOTROPIC Soil Parameters

----

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0

3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.0	0

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

800 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 2 points equally spaced along the ground surface between x = 143.0 ft
and x = 157.0 ft

Each surface terminates between x = 200.0 ft
and x = 245.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1060.0 ft

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

5.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

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

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

The most critical circular failure surface
is specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	143.00	1087.00
2	147.93	1087.82
3	152.82	1088.88
4	157.65	1090.16
5	162.42	1091.66
6	167.11	1093.39
7	171.72	1095.33
8	176.23	1097.49
9	180.64	1099.85
10	184.93	1102.42
11	189.10	1105.18
12	193.13	1108.14
13	197.02	1111.28
14	200.76	1114.60
15	204.34	1118.09
16	207.75	1121.74
17	210.99	1125.55
18	211.55	1126.28
19	211.55	1130.28

****   Simplified BISHOP FOS =   1.500   ****

The following is a summary of the TEN most critical surfaces

Problem Description : A & T SECTION F FILL SLOPE STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.500	127.82	1193.03	107.11	143.00	211.55	5.376E+06
2.	1.510	115.98	1220.07	135.78	143.00	216.42	7.042E+06
3.	1.520	133.00	1174.84	88.41	143.00	203.79	3.669E+06
4.	1.525	148.32	1166.42	73.93	157.00	209.79	3.292E+06
5.	1.528	107.45	1237.28	154.43	143.00	218.05	7.892E+06
6.	1.531	122.06	1231.62	142.95	157.00	223.88	8.043E+06
7.	1.534	150.64	1159.85	67.16	157.00	207.42	2.853E+06
8.	1.536	126.71	1214.22	124.95	157.00	218.95	6.136E+06
9.	1.537	66.03	1332.38	257.17	143.00	226.42	1.437E+07
10.	1.539	135.32	1191.28	100.64	157.00	212.54	4.309E+06

* * *   END OF FILE   * * *

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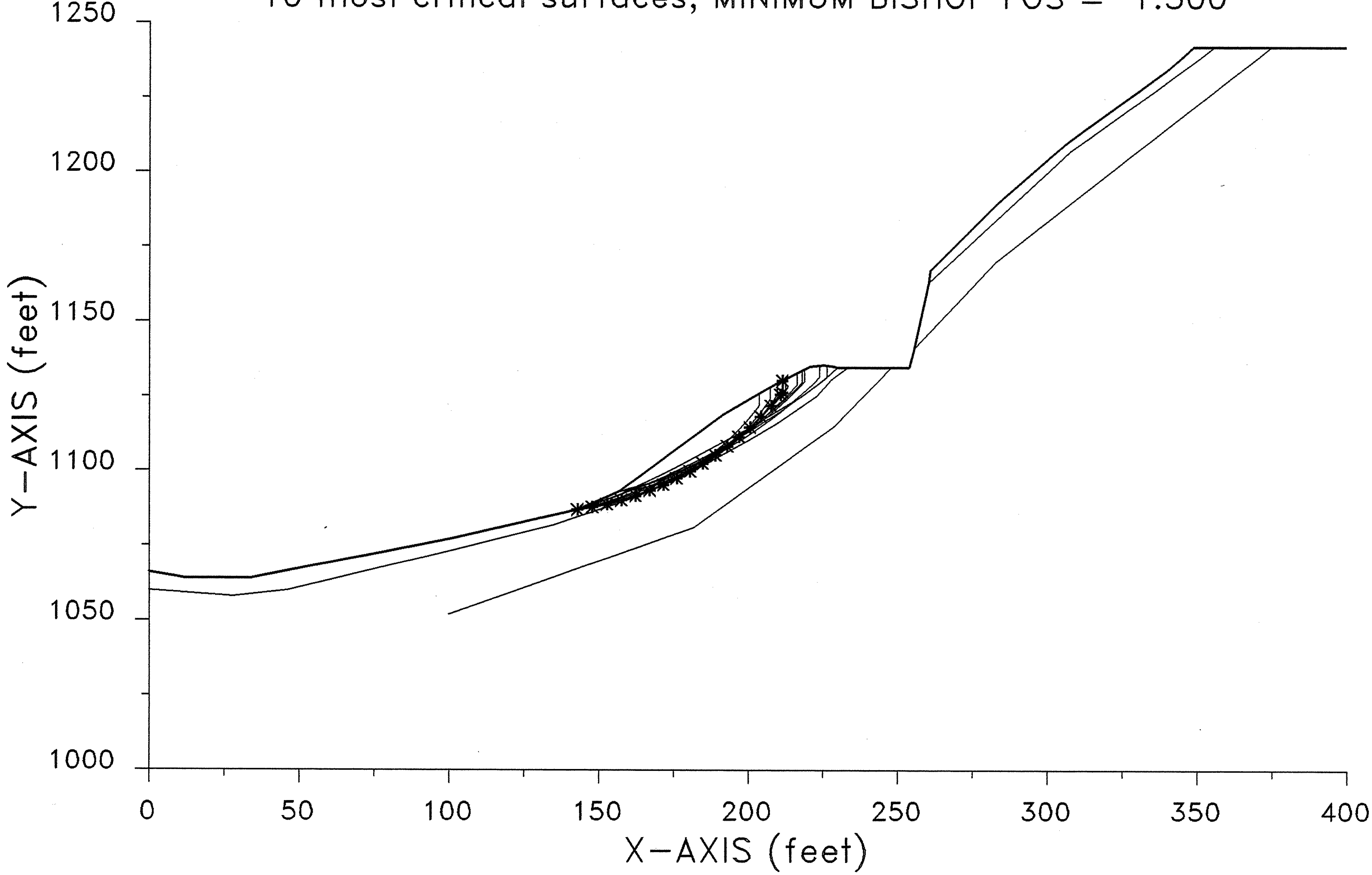
A & T SECTION F FILL SLOPE STATIC
10 most critical surfaces, MINIMUM BISHOP FOS = 1.500



♠

XSTABL File: 17563F2   4-06-17   14:24

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****************************************
*               X S T A B L            *
*                                      *
*        Slope Stability Analysis      *
*              using the               *
*           Method of Slices           *
*                                      *
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*        Moscow, ID 83843, U.S.A.      *
*                                      *
*          All Rights Reserved         *
*                                      *
*  Ver. 5.203               96 — 1710  *
****************************************
```

Problem Description : A & T SEC F FILL SLOPE PLANAR STATIC

SEGMENT BOUNDARY COORDINATES
----

25 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1066.0	12.0	1064.0	2
2	12.0	1064.0	34.0	1064.0	2
3	34.0	1064.0	44.0	1066.0	2
4	44.0	1066.0	100.0	1077.0	2
5	100.0	1077.0	143.0	1087.0	2
6	143.0	1087.0	157.0	1093.0	2
7	157.0	1093.0	192.0	1119.0	1
8	192.0	1119.0	209.0	1129.0	1
9	209.0	1129.0	221.0	1135.0	1
10	221.0	1135.0	225.5	1135.5	1
11	225.5	1135.5	229.0	1135.0	1
12	229.0	1135.0	230.0	1134.5	1
13	230.0	1134.5	233.5	1134.5	2
14	233.5	1134.5	248.0	1134.5	3
15	248.0	1134.5	254.0	1134.5	4
16	254.0	1134.5	255.5	1141.0	4
17	255.5	1141.0	260.5	1163.0	3
18	260.5	1163.0	261.0	1167.0	2
19	261.0	1167.0	284.0	1190.0	2
20	284.0	1190.0	307.0	1210.0	2
21	307.0	1210.0	340.0	1234.0	2
22	340.0	1234.0	349.0	1242.0	2
23	349.0	1242.0	356.0	1242.0	2
24	356.0	1242.0	375.0	1242.0	3
25	375.0	1242.0	400.0	1242.0	4

25 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	143.0	1087.0	157.0	1092.0	2
2	157.0	1092.0	174.0	1100.0	2
3	174.0	1100.0	200.0	1114.0	2
4	200.0	1114.0	218.0	1125.0	2
5	218.0	1125.0	226.0	1131.0	2
6	226.0	1131.0	230.0	1134.5	2
7	.0	1060.0	28.0	1058.0	3
8	28.0	1058.0	46.0	1060.0	3
9	46.0	1060.0	100.0	1073.0	3
10	100.0	1073.0	135.0	1082.0	3
11	135.0	1082.0	162.0	1091.0	3
12	162.0	1091.0	178.0	1098.0	3
13	178.0	1098.0	200.0	1110.0	3
14	200.0	1110.0	210.0	1116.0	3
15	210.0	1116.0	223.0	1125.0	3
16	223.0	1125.0	228.0	1130.5	3
17	228.0	1130.5	233.5	1134.5	3
18	260.5	1163.0	308.0	1207.0	3
19	308.0	1207.0	340.0	1230.0	3
20	340.0	1230.0	356.0	1242.0	3
21	100.0	1052.0	182.0	1081.0	4
22	182.0	1081.0	229.0	1115.0	4
23	229.0	1115.0	248.0	1134.5	4
24	255.5	1141.0	283.0	1170.0	4
25	283.0	1170.0	375.0	1242.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 4.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----

ISOTROPIC Soil Parameters

----

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0

3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.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.

1000 trial surfaces will be generated and analyzed.

5 boxes specified for generation of central block base

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

Length of line segments for active and passive portions of sliding block is 36.0 ft

Box no.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Width (ft)
1	143.0	1087.0	157.0	1093.0	.0
2	160.0	1091.0	164.0	1092.0	4.0
3	170.0	1096.0	185.0	1102.0	4.0
4	200.0	1112.0	220.0	1123.0	4.0
5	227.0	1131.0	231.0	1131.0	4.0

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

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

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

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

Failure surface No. 1 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	152.69	1091.15
2	162.16	1092.69
3	175.94	1097.46
4	202.93	1113.99
5	226.71	1131.33
6	226.71	1135.33

** Corrected JANBU FOS = 1.502 ** (Fo factor = 1.034)

Failure surface No. 2 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	150.61	1090.26
2	160.90	1090.78
3	183.71	1102.30
4	209.96	1118.92
5	226.86	1131.31
6	226.86	1135.31

** Corrected JANBU FOS = 1.507 ** (Fo factor = 1.033)

Failure surface No. 3 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	155.10	1092.19
2	160.74	1090.86
3	182.69	1100.57
4	214.71	1120.10
5	226.81	1131.31
6	226.81	1135.31

** Corrected JANBU FOS = 1.510 ** (Fo factor = 1.037)

Failure surface No. 4 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	153.30	1091.42
2	160.45	1090.60
3	172.43	1096.51
4	215.48	1122.12
5	226.58	1131.35
6	226.58	1135.35

** Corrected JANBU FOS = 1.511 ** (Fo factor = 1.030)

Failure surface No. 5 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	152.71	1091.16
2	160.91	1092.49
3	183.19	1101.88
4	204.08	1113.99
5	226.61	1131.34
6	226.61	1135.34

** Corrected JANBU FOS = 1.514 ** (Fo factor = 1.035)

Failure surface No. 6 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	148.10	1089.19
2	161.87	1091.33
3	175.33	1097.62
4	211.66	1119.99
5	227.05	1131.28
6	227.05	1135.28

** Corrected JANBU FOS = 1.515 ** (Fo factor = 1.032)

Failure surface No. 7 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	154.71	1092.02
2	163.11	1092.06
3	174.22	1097.61
4	211.38	1119.40
5	227.06	1131.28
6	227.06	1135.28

** Corrected JANBU FOS = 1.516 ** (Fo factor = 1.030)

Failure surface No. 8 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	148.29	1089.27
2	160.16	1091.82
3	179.00	1098.91
4	205.54	1115.79
5	227.11	1131.27
6	227.11	1135.27

** Corrected JANBU FOS = 1.518 ** (Fo factor = 1.035)

Failure surface No. 9 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	148.35	1089.29
2	162.42	1091.27
3	182.55	1102.11
4	219.24	1124.47
5	226.51	1131.36
6	226.51	1135.36

** Corrected JANBU FOS = 1.518 ** (Fo factor = 1.031)

Failure surface No.10 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	144.34	1087.58
2	161.78	1091.21
3	182.00	1100.50
4	201.01	1111.55
5	227.38	1131.23
6	227.38	1135.23

** Corrected JANBU FOS = 1.518 ** (Fo factor = 1.035)

The following is a summary of the TEN most critical surfaces

Problem Description : A & T SEC F FILL SLOPE PLANAR STATIC

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	1.502	1.034	152.69	226.71	5.920E+04
2.	1.507	1.033	150.61	226.86	6.010E+04
3.	1.510	1.037	155.10	226.81	6.532E+04
4.	1.511	1.030	153.30	226.58	5.886E+04
5.	1.514	1.035	152.71	226.61	5.912E+04
6.	1.515	1.032	148.10	227.05	6.045E+04
7.	1.516	1.030	154.71	227.06	5.841E+04
8.	1.518	1.035	148.29	227.11	6.100E+04
9.	1.518	1.031	148.35	226.51	6.067E+04
10.	1.518	1.035	144.34	227.38	6.600E+04

* * * END OF FILE * * *

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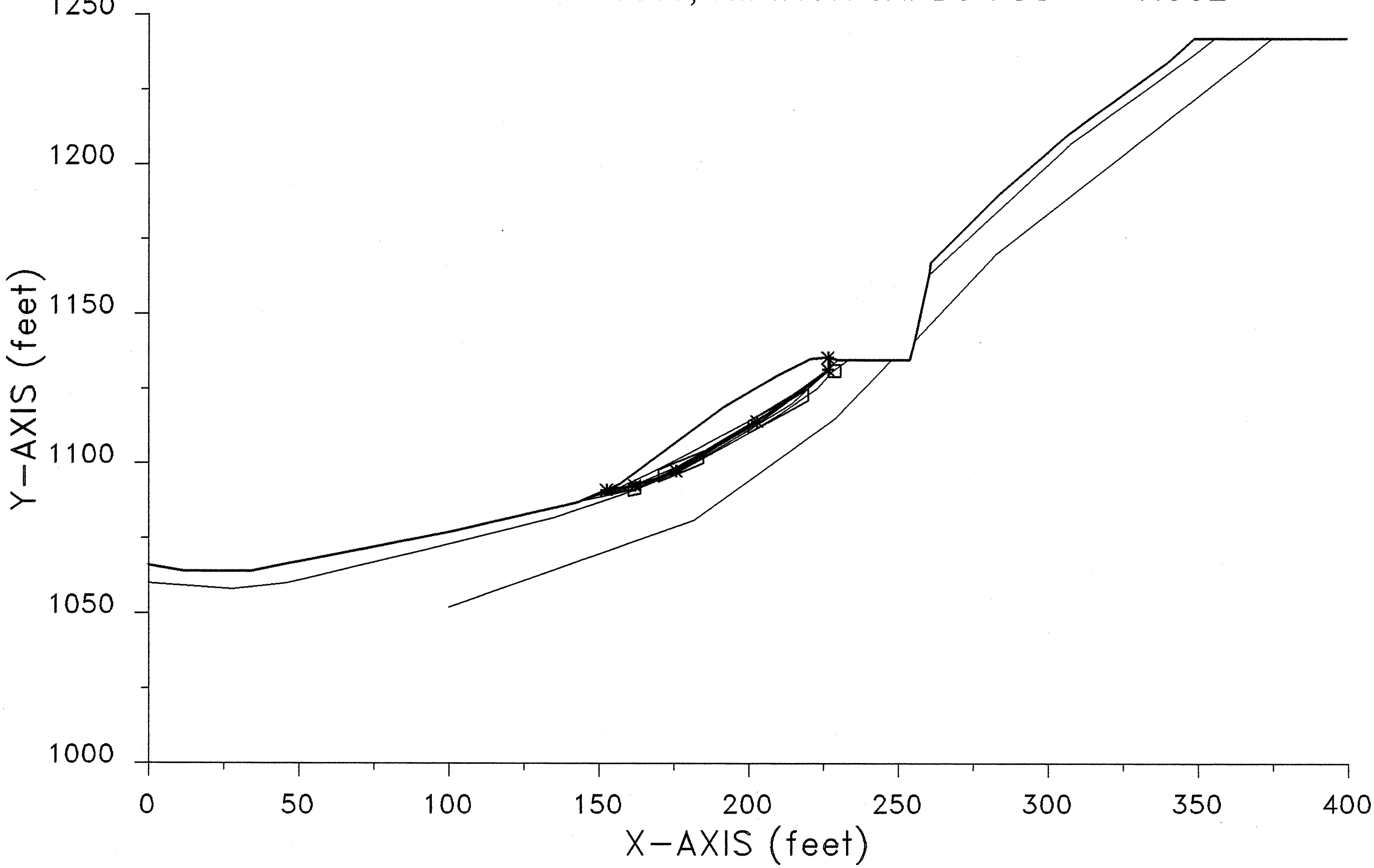
A & T SEC F FILL SLOPE PLANAR STATIC
10 most critical surfaces, MINIMUM JANBU FOS = 1.502



♠

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*****************************************
*             X S T A B L               *
*                                       *
*       Slope Stability Analysis        *
*              using the                *
*           Method of Slices            *
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*  Ver. 5.203                96 — 1710  *
*****************************************
```

Problem Description : A & T SEC F CUT ABOVE ROAD STATIC

SEGMENT BOUNDARY COORDINATES
----

25 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1066.0	12.0	1064.0	2
2	12.0	1064.0	34.0	1064.0	2
3	34.0	1064.0	44.0	1066.0	2
4	44.0	1066.0	100.0	1077.0	2
5	100.0	1077.0	143.0	1087.0	2
6	143.0	1087.0	157.0	1093.0	2
7	157.0	1093.0	192.0	1119.0	1
8	192.0	1119.0	209.0	1129.0	1
9	209.0	1129.0	221.0	1135.0	1
10	221.0	1135.0	225.5	1135.5	1
11	225.5	1135.5	229.0	1135.0	1
12	229.0	1135.0	230.0	1134.5	1
13	230.0	1134.5	233.5	1134.5	2
14	233.5	1134.5	248.0	1134.5	3
15	248.0	1134.5	254.0	1134.5	4
16	254.0	1134.5	255.5	1141.0	4
17	255.5	1141.0	260.5	1163.0	3
18	260.5	1163.0	261.0	1167.0	2
19	261.0	1167.0	284.0	1190.0	2
20	284.0	1190.0	307.0	1210.0	2
21	307.0	1210.0	340.0	1234.0	2
22	340.0	1234.0	349.0	1242.0	2
23	349.0	1242.0	356.0	1242.0	2
24	356.0	1242.0	375.0	1242.0	3
25	375.0	1242.0	400.0	1242.0	4

25 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	143.0	1087.0	157.0	1092.0	2
2	157.0	1092.0	174.0	1100.0	2
3	174.0	1100.0	200.0	1114.0	2
4	200.0	1114.0	218.0	1125.0	2
5	218.0	1125.0	226.0	1131.0	2
6	226.0	1131.0	230.0	1134.5	2
7	.0	1060.0	28.0	1058.0	3
8	28.0	1058.0	46.0	1060.0	3
9	46.0	1060.0	100.0	1073.0	3
10	100.0	1073.0	135.0	1082.0	3
11	135.0	1082.0	162.0	1091.0	3
12	162.0	1091.0	178.0	1098.0	3
13	178.0	1098.0	200.0	1110.0	3
14	200.0	1110.0	210.0	1116.0	3
15	210.0	1116.0	223.0	1125.0	3
16	223.0	1125.0	228.0	1130.5	3
17	228.0	1130.5	233.5	1134.5	3
18	260.5	1163.0	308.0	1207.0	3
19	308.0	1207.0	340.0	1230.0	3
20	340.0	1230.0	356.0	1242.0	3
21	100.0	1052.0	182.0	1081.0	4
22	182.0	1081.0	229.0	1115.0	4
23	229.0	1115.0	248.0	1134.5	4
24	255.5	1141.0	283.0	1170.0	4
25	283.0	1170.0	375.0	1242.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface	=	8.00	(feet)
Maximum depth of water in crack	=	.00	(feet)
Unit weight of water in crack	=	62.40	(pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

ISOTROPIC Soil Parameters

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0

3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.0	0

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

400 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 1 points equally spaced along the ground surface between x = 254.0 ft
and x = 254.0 ft

Each surface terminates between x = 270.0 ft
and x = 400.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1130.0 ft

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

11.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

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

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

The most critical circular failure surface
is specified by 8 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	254.00	1134.50
2	260.18	1143.60
3	266.34	1152.71
4	272.47	1161.85
5	278.57	1171.00
6	284.65	1180.17
7	288.33	1185.76
8	288.33	1193.76

**** Simplified BISHOP FOS =   1.368 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A & T SEC F CUT ABOVE ROAD STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.368	-2800.37	3217.25	3696.89	254.00	288.33	2.803E+08
2.	1.368	-32.07	1351.96	359.34	254.00	284.94	2.617E+07
3.	1.369	-732.76	1795.98	1187.96	254.00	284.48	7.955E+07
4.	1.369	-78.91	1370.99	408.35	254.00	282.03	2.607E+07
5.	1.370	-107.39	1384.39	439.37	254.00	280.98	2.669E+07
6.	1.371	-53.30	1351.40	376.14	254.00	280.93	2.306E+07
7.	1.371	-407.45	1571.77	792.92	254.00	281.80	4.840E+07
8.	1.371	-357.82	1595.52	766.07	254.00	290.80	6.588E+07
9.	1.372	-258.80	1475.74	615.96	254.00	280.89	3.658E+07
10.	1.372	-77.01	1362.64	402.01	254.00	280.11	2.366E+07

* * * END OF FILE * * *

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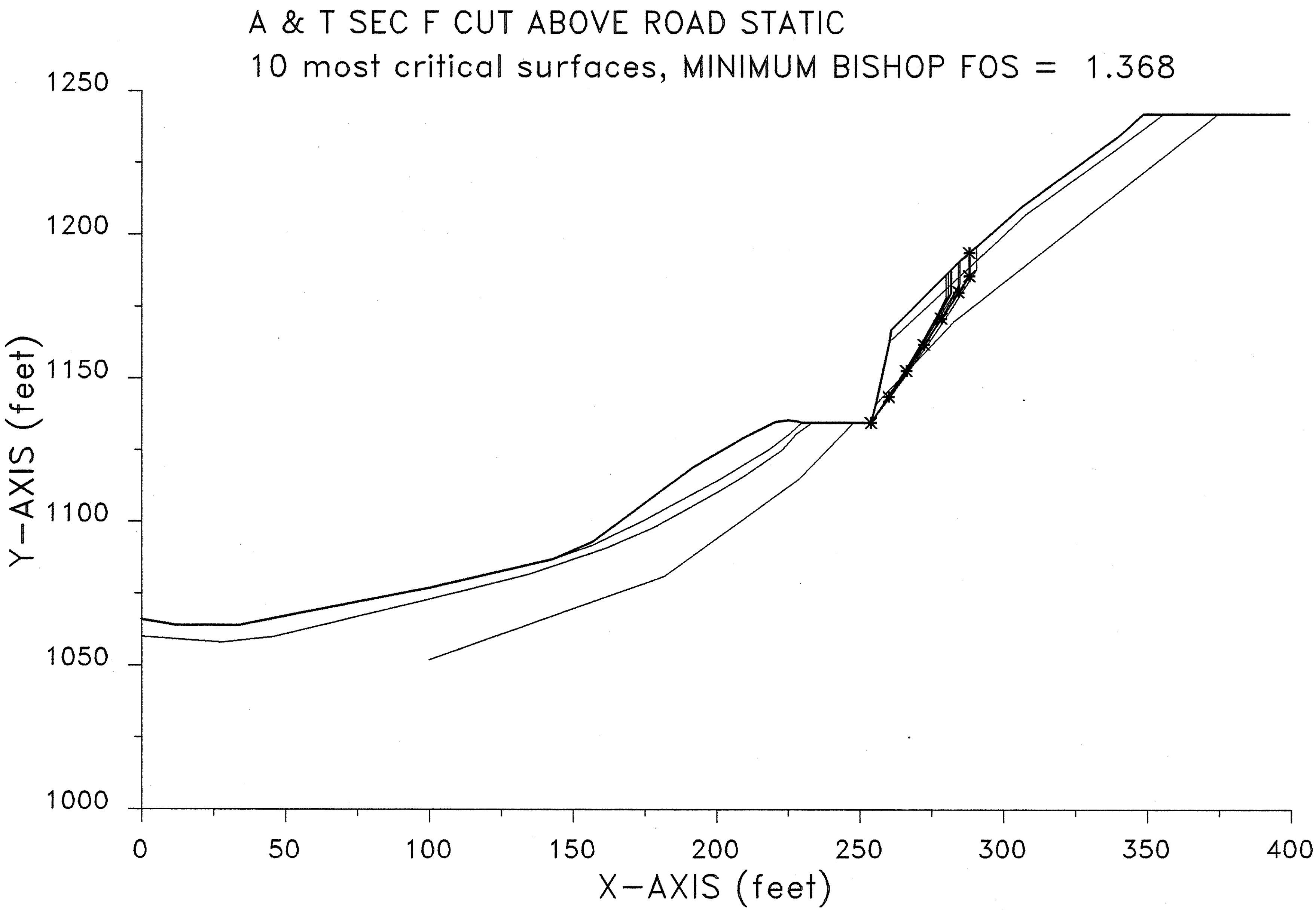

♠

XSTABL File: 17563F4   4-06-17   14:29

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****************************************
*            X S T A B L               *
*                                      *
*      Slope Stability Analysis        *
*            using the                 *
*         Method of Slices             *
*                                      *
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*      Moscow, ID 83843, U.S.A.        *
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*                                      *
*  Ver. 5.203              96 – 1710   *
****************************************
```

Problem Description : A & T SEC F ABOVE ROAD CUT STATIC

SEGMENT BOUNDARY COORDINATES
----

25 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1066.0	12.0	1064.0	2
2	12.0	1064.0	34.0	1064.0	2
3	34.0	1064.0	44.0	1066.0	2
4	44.0	1066.0	100.0	1077.0	2
5	100.0	1077.0	143.0	1087.0	2
6	143.0	1087.0	157.0	1093.0	2
7	157.0	1093.0	192.0	1119.0	1
8	192.0	1119.0	209.0	1129.0	1
9	209.0	1129.0	221.0	1135.0	1
10	221.0	1135.0	225.5	1135.5	1
11	225.5	1135.5	229.0	1135.0	1
12	229.0	1135.0	230.0	1134.5	1
13	230.0	1134.5	233.5	1134.5	2
14	233.5	1134.5	248.0	1134.5	3
15	248.0	1134.5	254.0	1134.5	4
16	254.0	1134.5	255.5	1141.0	4
17	255.5	1141.0	260.5	1163.0	3
18	260.5	1163.0	261.0	1167.0	2
19	261.0	1167.0	284.0	1190.0	2
20	284.0	1190.0	307.0	1210.0	2
21	307.0	1210.0	340.0	1234.0	2
22	340.0	1234.0	349.0	1242.0	2
23	349.0	1242.0	356.0	1242.0	2
24	356.0	1242.0	375.0	1242.0	3
25	375.0	1242.0	400.0	1242.0	4

25 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	143.0	1087.0	157.0	1092.0	2
2	157.0	1092.0	174.0	1100.0	2
3	174.0	1100.0	200.0	1114.0	2
4	200.0	1114.0	218.0	1125.0	2
5	218.0	1125.0	226.0	1131.0	2
6	226.0	1131.0	230.0	1134.5	2
7	.0	1060.0	28.0	1058.0	3
8	28.0	1058.0	46.0	1060.0	3
9	46.0	1060.0	100.0	1073.0	3
10	100.0	1073.0	135.0	1082.0	3
11	135.0	1082.0	162.0	1091.0	3
12	162.0	1091.0	178.0	1098.0	3
13	178.0	1098.0	200.0	1110.0	3
14	200.0	1110.0	210.0	1116.0	3
15	210.0	1116.0	223.0	1125.0	3
16	223.0	1125.0	228.0	1130.5	3
17	228.0	1130.5	233.5	1134.5	3
18	260.5	1163.0	308.0	1207.0	3
19	308.0	1207.0	340.0	1230.0	3
20	340.0	1230.0	356.0	1242.0	3
21	100.0	1052.0	182.0	1081.0	4
22	182.0	1081.0	229.0	1115.0	4
23	229.0	1115.0	248.0	1134.5	4
24	255.5	1141.0	283.0	1170.0	4
25	283.0	1170.0	375.0	1242.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface	=	8.00	(feet)
Maximum depth of water in crack	=	.00	(feet)
Unit weight of water in crack	=	62.40	(pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----
ISOTROPIC Soil Parameters
----

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0

3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.0	0

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

400 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 1 points equally spaced along the ground surface between x = 261.0 ft
and x = 261.0 ft

Each surface terminates between x = 300.0 ft
and x = 400.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1160.0 ft

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

8.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

Lower angular limit := -45.0 degrees
Upper angular limit := 30.0 degrees

Factors of safety have been calculated by the :

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

The most critical circular failure surface is specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	261.00	1167.00
2	268.48	1169.83

3	275.83	1172.98
4	283.04	1176.46
5	290.08	1180.26
6	296.95	1184.37
7	303.62	1188.77
8	310.10	1193.47
9	316.36	1198.45
10	322.39	1203.71
11	328.18	1209.23
12	333.72	1215.00
13	339.00	1221.01
14	344.01	1227.25
15	348.74	1233.70
16	348.84	1233.86
17	348.84	1241.86

**** Simplified BISHOP FOS = 1.871 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A & T SEC F ABOVE ROAD CUT STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.871	201.12	1336.83	180.08	261.00	348.84	3.169E+07
2.	1.895	206.95	1321.66	163.83	261.00	339.78	2.500E+07
3.	1.901	207.81	1318.24	160.32	261.00	337.73	2.343E+07
4.	1.905	212.63	1309.09	150.09	261.00	335.19	2.114E+07
5.	1.908	193.93	1339.74	185.30	261.00	340.54	2.729E+07
6.	1.920	111.99	1487.30	353.26	261.00	358.21	6.877E+07
7.	1.921	239.11	1265.83	101.22	261.00	327.77	1.397E+07
8.	1.921	172.57	1371.33	222.65	261.00	344.76	3.311E+07
9.	1.925	241.57	1262.07	97.04	261.00	327.30	1.352E+07
10.	1.925	234.30	1270.22	106.62	261.00	325.83	1.345E+07

* * * END OF FILE * * *

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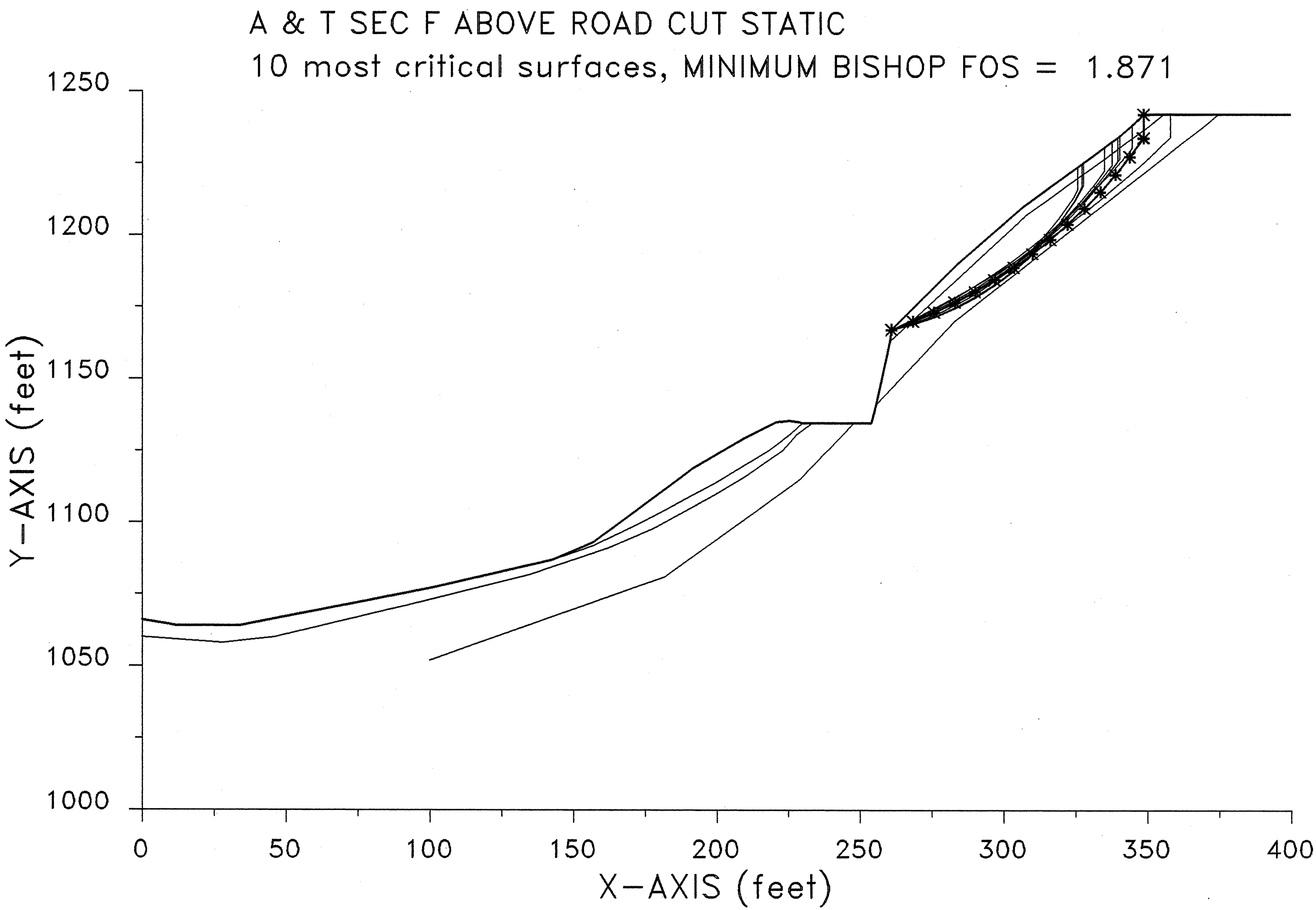

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*                                       *
*       Slope Stability Analysis        *
*             using the                 *
*          Method of Slices             *
*                                       *
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*        Moscow, ID 83843, U.S.A.       *
*                                       *
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*                                       *
*  Ver. 5.203                96 — 1710  *
****************************************
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Problem Description : A&T SECTION G TOE CIRCULAR STATIC

SEGMENT BOUNDARY COORDINATES

28 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1019.0	18.0	1019.0	1
2	18.0	1019.0	30.0	1029.0	1
3	30.0	1029.0	42.0	1029.0	1
4	42.0	1029.0	45.0	1034.0	1
5	45.0	1034.0	50.0	1036.0	1
6	50.0	1036.0	57.0	1037.5	1
7	57.0	1037.5	88.0	1038.5	1
8	88.0	1038.5	101.0	1038.5	2
9	101.0	1038.5	101.1	1046.0	2
10	101.1	1046.0	102.0	1046.0	2
11	102.0	1046.0	112.0	1055.0	2
12	112.0	1055.0	118.0	1055.0	2
13	118.0	1055.0	120.5	1056.0	2
14	120.5	1056.0	140.0	1075.0	2
15	140.0	1075.0	227.0	1142.0	2
16	227.0	1142.0	229.0	1142.0	2
17	229.0	1142.0	244.0	1141.5	2
18	244.0	1141.5	252.0	1165.0	2
19	252.0	1165.0	255.0	1170.0	2
20	255.0	1170.0	276.0	1188.0	2
21	276.0	1188.0	308.0	1212.0	2
22	308.0	1212.0	335.0	1231.5	2
23	335.0	1231.5	342.0	1236.0	2
24	342.0	1236.0	358.0	1236.0	2
25	358.0	1236.0	369.0	1231.0	2
26	369.0	1231.0	382.0	1205.0	3

27	382.0	1205.0	397.0	1205.0	3
28	397.0	1205.0	400.0	1203.0	3

6 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	992.0	25.0	1000.0	2
2	25.0	1000.0	57.0	1016.0	2
3	57.0	1016.0	88.0	1038.5	2
4	72.0	1000.0	198.0	1100.0	3
5	198.0	1100.0	253.0	1144.0	3
6	253.0	1144.0	369.0	1231.0	3

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 15.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----
ISOTROPIC Soil Parameters
----

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Constant (psf)	Water Surface No.
1	120.0	120.0	85.0	37.00	.000	.0	0
2	140.0	140.0	510.0	44.00	.000	.0	0
3	145.0	145.0	900.0	45.00	.000	.0	0

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

1000 trial surfaces will be generated and analyzed.

500 Surfaces initiate from each of 2 points equally spaced along the ground surface between x = 18.0 ft
and x = 42.0 ft

Each surface terminates between x = 240.0 ft
and x = 350.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1000.0 ft

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

22.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

Lower angular limit := -45.0 degrees
Upper angular limit := 10.0 degrees

Factors of safety have been calculated by the :

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

The most critical circular failure surface is specified by 19 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	42.00	1029.00
2	63.87	1031.35
3	85.57	1034.97
4	107.03	1039.86
5	128.16	1045.98
6	148.89	1053.33
7	169.17	1061.87
8	188.91	1071.58
9	208.05	1082.43
10	226.52	1094.38
11	244.27	1107.38
12	261.22	1121.39
13	277.34	1136.37
14	292.55	1152.27
15	306.80	1169.02
16	320.06	1186.58
17	332.27	1204.88
18	341.53	1220.70
19	341.53	1235.70

**** Simplified BISHOP FOS = 1.821 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A&T SECTION G TOE CIRCULAR STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.821	12.67	1404.88	377.02	42.00	341.53	5.062E+08
2.	1.823	15.44	1400.36	372.31	42.00	341.38	5.071E+08
3.	1.826	14.44	1398.97	370.99	42.00	338.60	4.899E+08
4.	1.829	13.84	1397.38	369.45	42.00	336.24	4.755E+08
5.	1.829	20.62	1390.82	362.45	42.00	340.04	5.027E+08
6.	1.830	14.55	1396.01	368.04	42.00	336.01	4.746E+08
7.	1.830	21.20	1389.50	361.10	42.00	339.65	5.008E+08
8.	1.830	24.88	1387.02	358.43	42.00	342.53	5.220E+08
9.	1.831	18.66	1391.16	362.91	42.00	337.48	4.861E+08
10.	1.832	15.90	1393.22	365.16	42.00	335.41	4.719E+08

* * * END OF FILE * * *

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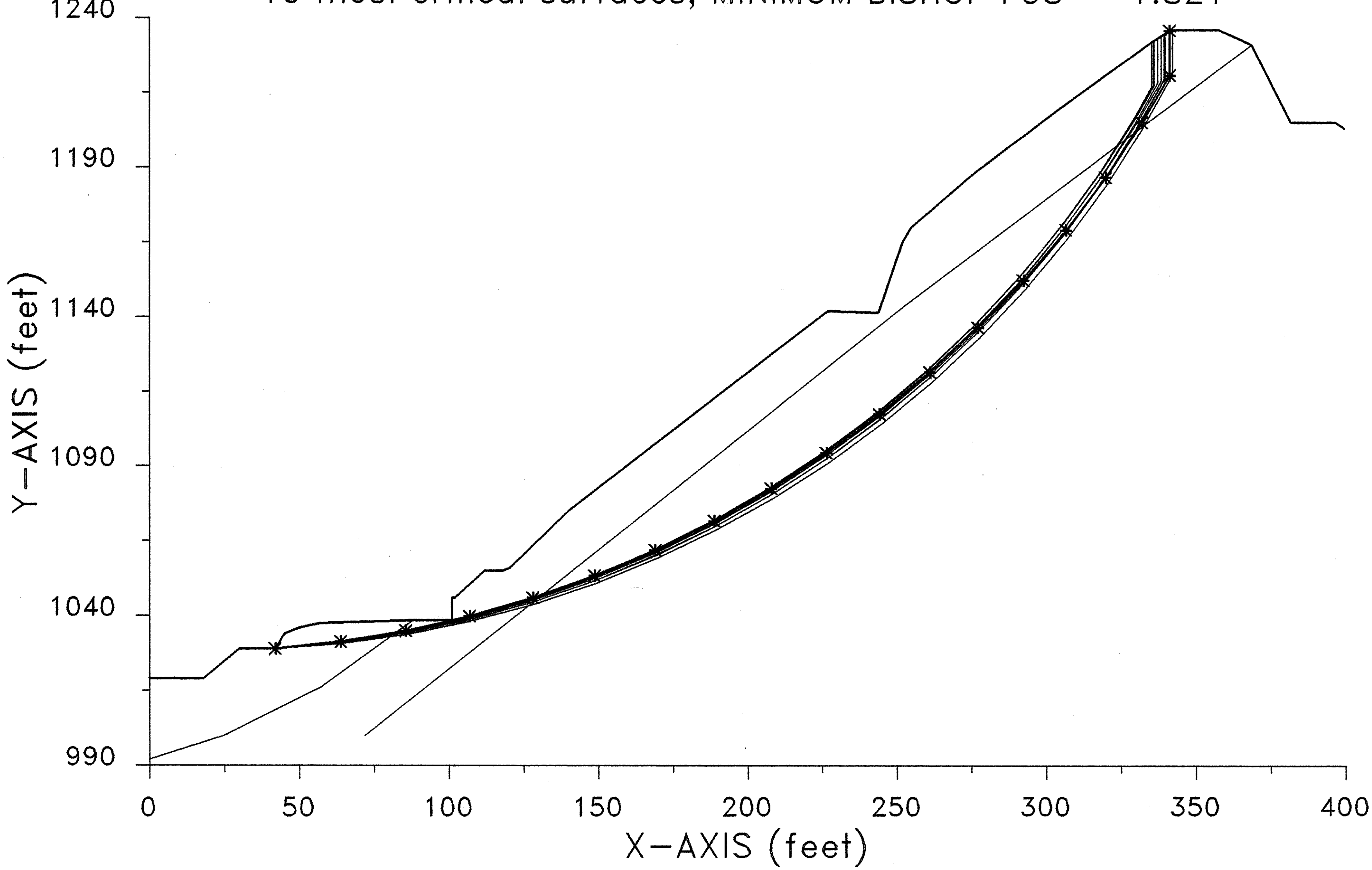
A&T SECTION G TOE CIRCULAR STATIC

10 most critical surfaces, MINIMUM BISHOP FOS = 1.821



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****************************************
*              X S T A B L             *
*                                      *
*       Slope Stability Analysis       *
*              using the               *
*           Method of Slices           *
*                                      *
*        Copyright (C) 1992 - 99       *
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*       Moscow, ID 83843, U.S.A.       *
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****************************************
```

Problem Description : A&T SEC G LOWER CIRCULAR STATIC

SEGMENT BOUNDARY COORDINATES

----

28 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1019.0	18.0	1019.0	1
2	18.0	1019.0	30.0	1029.0	1
3	30.0	1029.0	42.0	1029.0	1
4	42.0	1029.0	45.0	1034.0	1
5	45.0	1034.0	50.0	1036.0	1
6	50.0	1036.0	57.0	1037.5	1
7	57.0	1037.5	88.0	1038.5	1
8	88.0	1038.5	101.0	1038.5	2
9	101.0	1038.5	101.1	1046.0	2
10	101.1	1046.0	102.0	1046.0	2
11	102.0	1046.0	112.0	1055.0	2
12	112.0	1055.0	118.0	1055.0	2
13	118.0	1055.0	120.5	1056.0	2
14	120.5	1056.0	140.0	1075.0	2
15	140.0	1075.0	227.0	1142.0	2
16	227.0	1142.0	229.0	1142.0	2
17	229.0	1142.0	244.0	1141.5	2
18	244.0	1141.5	252.0	1165.0	2
19	252.0	1165.0	255.0	1170.0	2
20	255.0	1170.0	276.0	1188.0	2
21	276.0	1188.0	308.0	1212.0	2
22	308.0	1212.0	335.0	1231.5	2
23	335.0	1231.5	342.0	1236.0	2
24	342.0	1236.0	358.0	1236.0	2
25	358.0	1236.0	369.0	1231.0	2
26	369.0	1231.0	382.0	1205.0	3

27	382.0	1205.0	397.0	1205.0	3
28	397.0	1205.0	400.0	1203.0	3

6 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	992.0	25.0	1000.0	2
2	25.0	1000.0	57.0	1016.0	2
3	57.0	1016.0	88.0	1038.5	2
4	72.0	1000.0	198.0	1100.0	3
5	198.0	1100.0	253.0	1144.0	3
6	253.0	1144.0	369.0	1231.0	3

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 15.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----

ISOTROPIC Soil Parameters

----

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Constant (psf)	Water Surface No.
1	120.0	120.0	85.0	37.00	.000	.0	0
2	140.0	140.0	510.0	44.00	.000	.0	0
3	145.0	145.0	900.0	45.00	.000	.0	0

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

1000 trial surfaces will be generated and analyzed.

500 Surfaces initiate from each of 2 points equally spaced along the ground surface between x = 101.0 ft
and x = 120.5 ft

Each surface terminates between x = 240.0 ft
and x = 350.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1000.0 ft

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

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

Factors of safety have been calculated by the :

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

The most critical circular failure surface is specified by 15 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	101.00	1038.50
2	118.42	1048.32
3	135.60	1058.56
4	152.53	1069.21
5	169.20	1080.26
6	185.60	1091.71
7	201.72	1103.55
8	217.55	1115.77
9	233.09	1128.37
10	248.31	1141.33
11	263.22	1154.66
12	277.81	1168.35
13	292.06	1182.38
14	301.52	1192.14
15	301.52	1207.14

**** Simplified BISHOP FOS = 1.728 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A&T SEC G LOWER CIRCULAR STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.728	-299.54	1769.20	833.28	101.00	301.52	3.921E+08
2.	1.733	-264.04	1777.44	817.53	120.50	320.65	3.803E+08
3.	1.735	-245.07	1748.72	783.26	120.50	317.67	3.583E+08
4.	1.735	-344.57	1831.09	909.25	101.00	304.48	4.268E+08
5.	1.740	-284.51	1805.44	851.88	120.50	321.25	3.927E+08
6.	1.745	-221.58	1714.05	741.65	120.50	314.81	3.375E+08
7.	1.746	-490.75	2034.90	1158.87	101.00	315.08	5.584E+08
8.	1.749	-528.51	2087.48	1223.37	101.00	317.62	5.942E+08
9.	1.751	-256.96	1702.36	754.22	101.00	291.39	3.294E+08
10.	1.753	-488.70	2029.56	1153.23	101.00	312.89	5.445E+08

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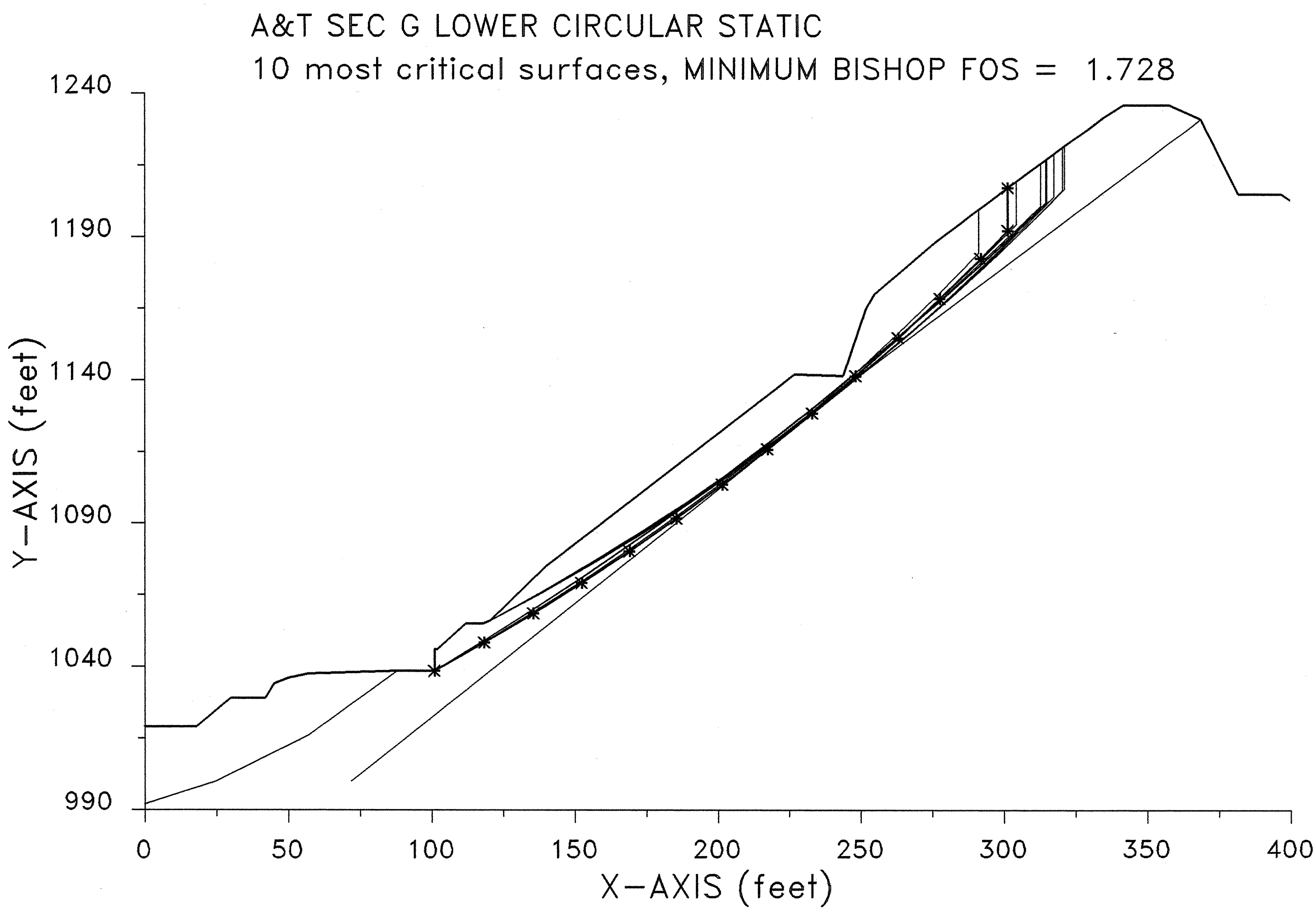

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****************************************
*              X S T A B L             *
*                                      *
*       Slope Stability Analysis       *
*              using the               *
*           Method of Slices           *
*                                      *
*        Copyright (C) 1992 - 99       *
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*       Moscow, ID 83843, U.S.A.       *
*                                      *
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*                                      *
*  Ver. 5.203               96 - 1710  *
****************************************
```

Problem Description : A&T SEC G CUT ABOVE ROAD STATIC

SEGMENT BOUNDARY COORDINATES

28 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1019.0	18.0	1019.0	1
2	18.0	1019.0	30.0	1029.0	1
3	30.0	1029.0	42.0	1029.0	1
4	42.0	1029.0	45.0	1034.0	1
5	45.0	1034.0	50.0	1036.0	1
6	50.0	1036.0	57.0	1037.5	1
7	57.0	1037.5	88.0	1038.5	1
8	88.0	1038.5	101.0	1038.5	2
9	101.0	1038.5	101.1	1046.0	2
10	101.1	1046.0	102.0	1046.0	2
11	102.0	1046.0	112.0	1055.0	2
12	112.0	1055.0	118.0	1055.0	2
13	118.0	1055.0	120.5	1056.0	2
14	120.5	1056.0	140.0	1075.0	2
15	140.0	1075.0	227.0	1142.0	2
16	227.0	1142.0	229.0	1142.0	2
17	229.0	1142.0	244.0	1141.5	2
18	244.0	1141.5	252.0	1165.0	2
19	252.0	1165.0	255.0	1170.0	2
20	255.0	1170.0	276.0	1188.0	2
21	276.0	1188.0	308.0	1212.0	2
22	308.0	1212.0	335.0	1231.5	2
23	335.0	1231.5	342.0	1236.0	2
24	342.0	1236.0	358.0	1236.0	2
25	358.0	1236.0	369.0	1231.0	2
26	369.0	1231.0	382.0	1205.0	3

27	382.0	1205.0	397.0	1205.0	3
28	397.0	1205.0	400.0	1203.0	3

6 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	992.0	25.0	1000.0	2
2	25.0	1000.0	57.0	1016.0	2
3	57.0	1016.0	88.0	1038.5	2
4	72.0	1000.0	198.0	1100.0	3
5	198.0	1100.0	253.0	1144.0	3
6	253.0	1144.0	369.0	1231.0	3

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 10.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----
ISOTROPIC Soil Parameters
----

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	120.0	85.0	37.00	.000	.0	0
2	140.0	140.0	510.0	44.00	.000	.0	0
3	145.0	145.0	900.0	45.00	.000	.0	0

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

500 trial surfaces will be generated and analyzed.

500 Surfaces initiate from each of 1 points equally spaced along the ground surface between x = 244.0 ft
and x = 244.0 ft

Each surface terminates between x = 260.0 ft
and x = 350.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1100.0 ft

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

10.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

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

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

The most critical circular failure surface is specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	244.00	1141.50
2	251.44	1148.18
3	258.08	1155.66
4	263.81	1163.85
5	267.56	1170.77

6	267.56	1180.77

**** Simplified BISHOP FOS = 1.393 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A&T SEC G CUT ABOVE ROAD STATIC

	FOS (BISHOP)	Circle x-coord (ft)	Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.393	189.32	1209.93	87.59	244.00	267.56	3.991E+06
2.	1.395	181.60	1219.63	99.99	244.00	269.87	5.080E+06
3.	1.395	186.21	1215.88	94.19	244.00	269.91	4.834E+06
4.	1.395	193.35	1203.31	79.92	244.00	265.24	3.206E+06
5.	1.395	186.53	1208.79	88.50	244.00	265.35	3.527E+06
6.	1.395	180.97	1213.97	96.04	244.00	265.85	3.912E+06
7.	1.397	168.10	1226.72	114.13	244.00	267.38	4.993E+06
8.	1.397	200.76	1201.80	74.20	244.00	268.45	3.644E+06
9.	1.397	172.52	1230.80	114.38	244.00	272.03	6.388E+06
10.	1.399	205.17	1194.33	65.56	244.00	265.40	2.741E+06

* * * END OF FILE * * *

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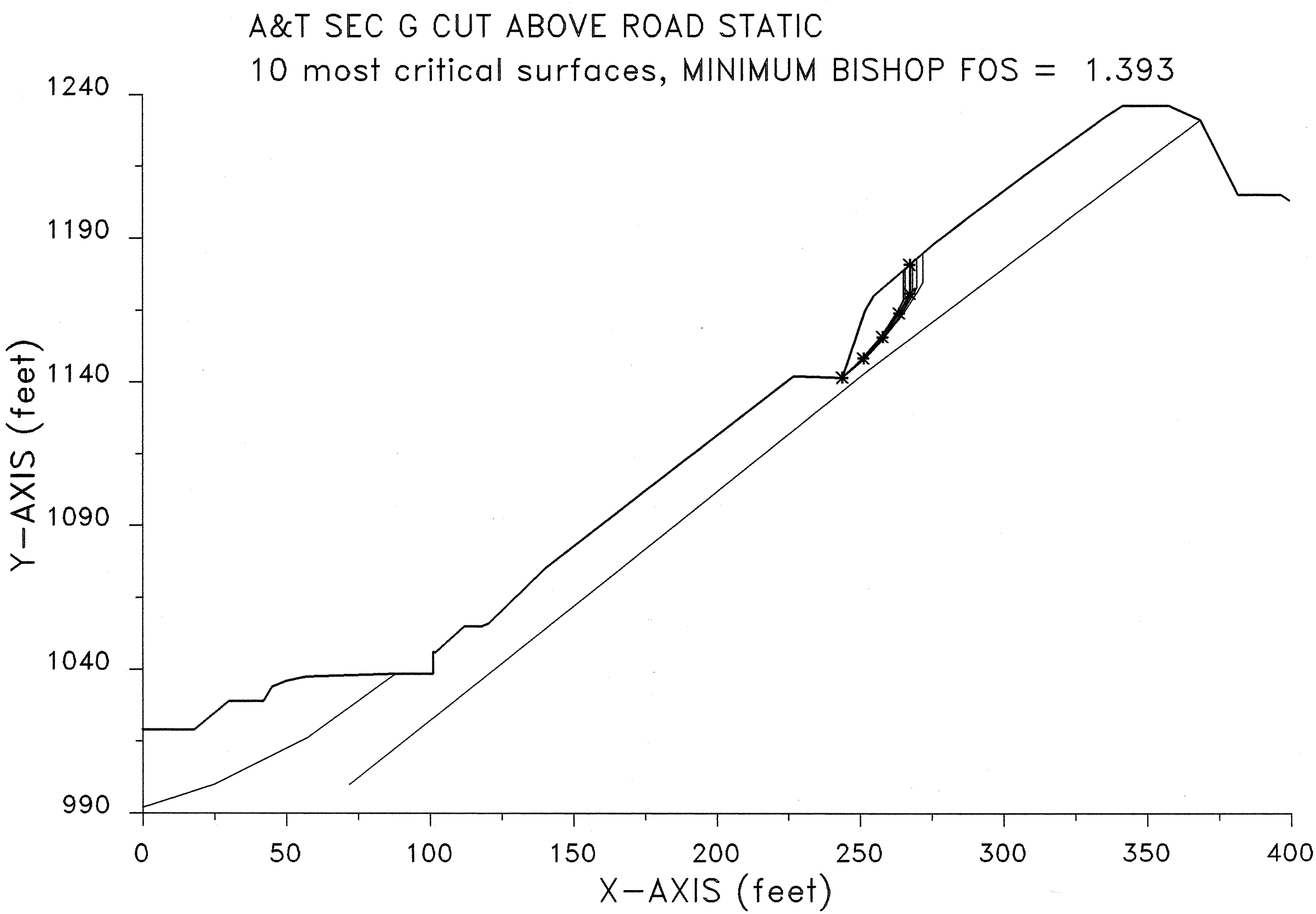

♠

XSTABL File: 17563G8   4-07-17   10:02

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****************************************
*              X S T A B L             *
*                                      *
*       Slope Stability Analysis       *
*              using the               *
*           Method of Slices           *
*                                      *
*        Copyright (C) 1992 - 99       *
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*        Moscow, ID 83843, U.S.A.      *
*                                      *
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*                                      *
*  Ver. 5.203               96 — 1710  *
****************************************
```

Problem Description : A&T SEC G ABOVE SOILNAIL WALL STATIC

SEGMENT BOUNDARY COORDINATES
----

28 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1019.0	18.0	1019.0	1
2	18.0	1019.0	30.0	1029.0	1
3	30.0	1029.0	42.0	1029.0	1
4	42.0	1029.0	45.0	1034.0	1
5	45.0	1034.0	50.0	1036.0	1
6	50.0	1036.0	57.0	1037.5	1
7	57.0	1037.5	88.0	1038.5	1
8	88.0	1038.5	101.0	1038.5	2
9	101.0	1038.5	101.1	1046.0	2
10	101.1	1046.0	102.0	1046.0	2
11	102.0	1046.0	112.0	1055.0	2
12	112.0	1055.0	118.0	1055.0	2
13	118.0	1055.0	120.5	1056.0	2
14	120.5	1056.0	140.0	1075.0	2
15	140.0	1075.0	227.0	1142.0	2
16	227.0	1142.0	229.0	1142.0	2
17	229.0	1142.0	244.0	1141.5	2
18	244.0	1141.5	252.0	1165.0	2
19	252.0	1165.0	255.0	1170.0	2
20	255.0	1170.0	276.0	1188.0	2
21	276.0	1188.0	308.0	1212.0	2
22	308.0	1212.0	335.0	1231.5	2
23	335.0	1231.5	342.0	1236.0	2
24	342.0	1236.0	358.0	1236.0	2
25	358.0	1236.0	369.0	1231.0	2
26	369.0	1231.0	382.0	1205.0	3

27	382.0	1205.0	397.0	1205.0	3
28	397.0	1205.0	400.0	1203.0	3

6 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	992.0	25.0	1000.0	2
2	25.0	1000.0	57.0	1016.0	2
3	57.0	1016.0	88.0	1038.5	2
4	72.0	1000.0	198.0	1100.0	3
5	198.0	1100.0	253.0	1144.0	3
6	253.0	1144.0	369.0	1231.0	3

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 10.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----
ISOTROPIC Soil Parameters
----

3 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	120.0	85.0	37.00	.000	.0	0
2	140.0	140.0	510.0	44.00	.000	.0	0
3	145.0	145.0	900.0	45.00	.000	.0	0

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

1000 trial surfaces will be generated and analyzed.

500 Surfaces initiate from each of 2 points equally spaced along the ground surface between x = 252.0 ft
and x = 255.0 ft

```
Each surface terminates between    x =     280.0 ft
                             and    x =     350.0 ft


Unless further limitations were imposed, the minimum elevation
at which a surface extends is   y =    1150.0 ft


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

    8.0 ft line segments define each trial failure surface.


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

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

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


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

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


    Factors of safety have been calculated by the :

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


      The most critical circular failure surface
      is specified by 17 coordinate points

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

             1          252.00       1165.00
             2          259.73       1167.06
             3          267.34       1169.52
             4          274.83       1172.35
             5          282.15       1175.56
```

6	289.31	1179.13
7	296.28	1183.06
8	303.04	1187.34
9	309.57	1191.96
10	315.86	1196.90
11	321.90	1202.15
12	327.66	1207.70
13	333.13	1213.54
14	338.30	1219.64
15	343.16	1226.00
16	343.16	1226.00
17	343.16	1236.00

**** Simplified BISHOP FOS = 1.996 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A&T SEC G ABOVE SOILNAIL WALL STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.996	215.08	1318.80	158.16	252.00	343.16	3.558E+07
2.	1.997	216.43	1315.33	154.48	252.00	342.46	3.432E+07
3.	1.997	207.79	1328.94	169.79	252.00	342.80	3.658E+07
4.	1.999	223.26	1306.14	144.04	252.00	342.94	3.366E+07
5.	2.000	205.05	1331.48	172.97	252.00	342.10	3.611E+07
6.	2.001	203.98	1332.73	174.47	252.00	341.93	3.610E+07
7.	2.006	228.81	1298.09	135.09	252.00	343.03	3.278E+07
8.	2.006	202.98	1332.81	174.82	252.00	340.64	3.516E+07
9.	2.006	228.72	1299.77	136.77	252.00	343.84	3.387E+07
10.	2.011	231.15	1296.84	133.47	252.00	344.22	3.393E+07

* * * END OF FILE * * *

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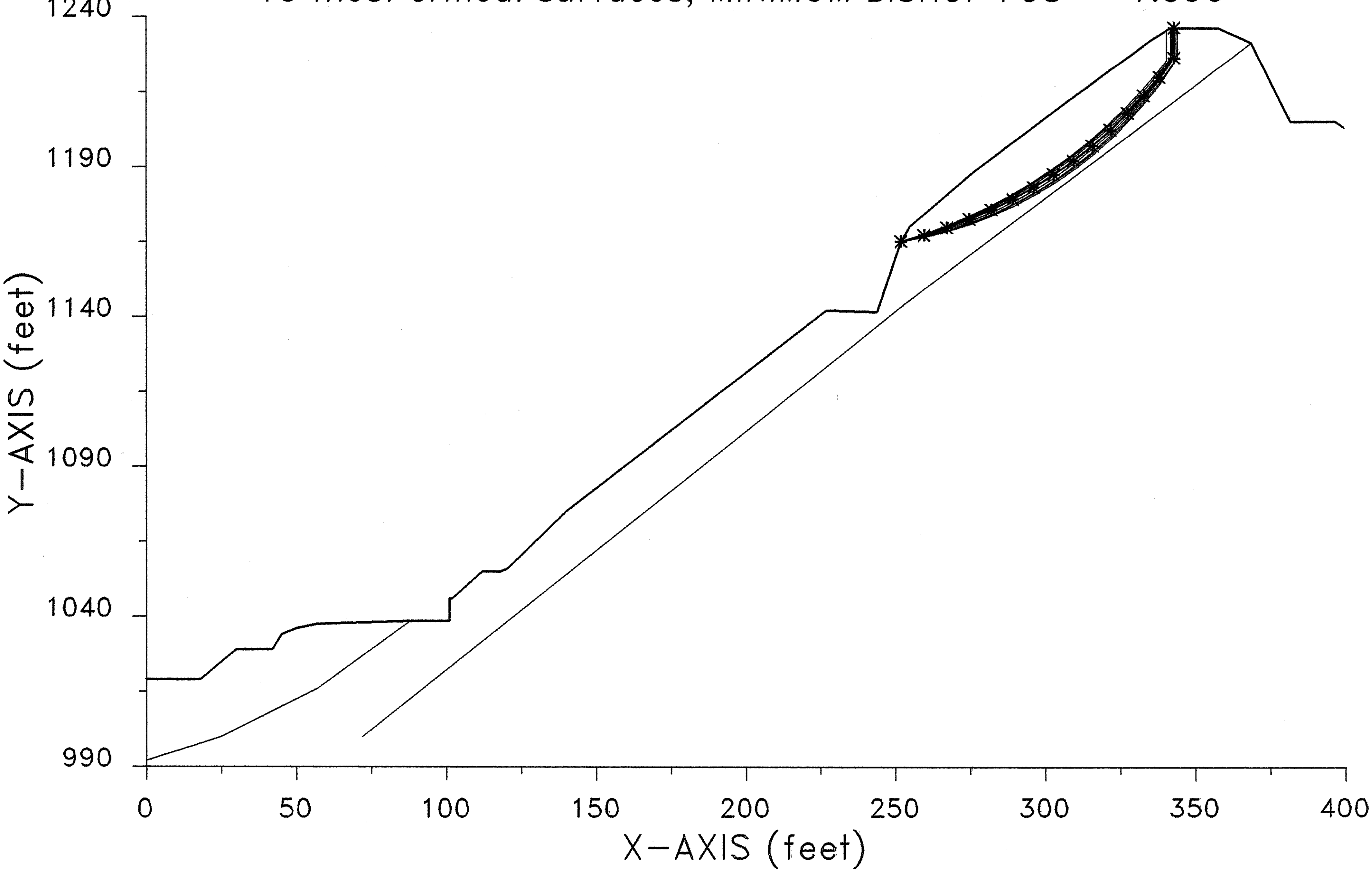
A&T SEC G ABOVE SOILNAIL WALL STATIC
10 most critical surfaces, MINIMUM BISHOP FOS = 1.996



♠

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```
****************************************
*              X S T A B L             *
*                                      *
*       Slope Stability Analysis       *
*             using the                *
*          Method of Slices            *
*                                      *
*        Copyright (C) 1992 - 99       *
*   Interactive Software Designs, Inc. *
*        Moscow, ID 83843, U.S.A.      *
*                                      *
*         All Rights Reserved          *
*                                      *
*  Ver. 5.203              96 – 1710   *
****************************************
```

Problem Description : A & T SECTION H TOE STATIC

SEGMENT BOUNDARY COORDINATES
----

27 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1025.0	10.0	1034.0	3
2	10.0	1034.0	20.0	1038.0	3
3	20.0	1038.0	64.0	1038.0	3
4	64.0	1038.0	64.1	1042.0	3
5	64.1	1042.0	86.5	1058.0	3
6	86.5	1058.0	105.0	1069.5	3
7	105.0	1069.5	110.0	1072.0	2
8	110.0	1072.0	126.0	1078.0	2
9	126.0	1078.0	146.0	1087.0	1
10	146.0	1087.0	209.0	1120.0	1
11	209.0	1120.0	216.0	1125.0	1
12	216.0	1125.0	219.5	1128.0	1
13	219.5	1128.0	222.0	1129.0	1
14	222.0	1129.0	228.0	1130.0	1
15	228.0	1130.0	257.5	1130.0	1
16	257.5	1130.0	259.5	1130.5	1
17	259.5	1130.5	259.6	1132.0	1
18	259.6	1132.0	265.0	1133.0	1
19	265.0	1133.0	270.0	1136.0	1
20	270.0	1136.0	275.0	1139.0	1
21	275.0	1139.0	290.0	1165.0	3
22	290.0	1165.0	295.0	1170.0	3
23	295.0	1170.0	330.0	1205.0	3
24	330.0	1205.0	350.0	1219.0	3
25	350.0	1219.0	364.0	1230.0	3
26	364.0	1230.0	381.0	1231.0	3

27	381.0	1231.0	400.0	1231.0	4

20 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	126.0	1078.0	176.0	1093.0	2
2	176.0	1093.0	216.0	1102.0	2
3	216.0	1102.0	226.0	1106.5	2
4	226.0	1106.5	239.0	1113.0	2
5	239.0	1113.0	270.0	1131.0	2
6	270.0	1131.0	275.0	1139.0	3
7	105.0	1069.5	153.0	1083.0	3
8	153.0	1083.0	200.0	1095.0	3
9	200.0	1095.0	218.0	1100.0	3
10	218.0	1100.0	226.0	1103.0	3
11	226.0	1103.0	242.0	1111.0	3
12	242.0	1111.0	254.0	1117.0	3
13	254.0	1117.0	263.0	1124.0	3
14	263.0	1124.0	270.0	1131.0	3
15	.0	1019.0	100.0	1047.0	4
16	100.0	1047.0	220.0	1081.0	4
17	220.0	1081.0	266.0	1102.0	4
18	266.0	1102.0	300.0	1156.0	4
19	300.0	1156.0	348.0	1200.0	4
20	348.0	1200.0	381.0	1231.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 8.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----
ISOTROPIC Soil Parameters
----

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0
3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.0	0

ANISOTROPIC STRENGTH PARAMETERS
specified for 2 Soil Unit(s)

Soil Unit 3 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	510.0	44.00
2	58.00	.0	44.00
3	90.00	510.0	44.00

Soil Unit 4 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	900.0	45.00
2	58.00	.0	45.00
3	90.00	900.0	45.00

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

800 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 2 points equally spaced along the ground surface between x = .0 ft
and x = 64.0 ft

Each surface terminates between x = 250.0 ft
and x = 400.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1000.0 ft

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

21.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

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

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

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

Point No.	x-surf (ft)	y-surf (ft)
1	64.00	1038.00
2	84.29	1043.41
3	104.39	1049.49
4	124.28	1056.23
5	143.94	1063.63
6	163.34	1071.67
7	182.46	1080.34
8	201.29	1089.65
9	219.80	1099.57
10	237.97	1110.09
11	255.78	1121.21
12	273.22	1132.92
13	290.26	1145.19
14	306.88	1158.02
15	323.07	1171.40
16	338.81	1185.30
17	354.09	1199.71
18	368.87	1214.62

19	376.40	1222.73
20	376.40	1230.73

**** Simplified BISHOP FOS = 2.123 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A & T SECTION H TOE STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	2.123	-89.57	1654.52	635.36	64.00	376.40	5.675E+08
2.	2.132	-98.07	1664.04	646.67	64.00	374.41	5.425E+08
3.	2.134	-175.86	1843.45	840.41	64.00	390.99	8.060E+08
4.	2.135	-168.28	1826.91	822.39	64.00	389.96	7.858E+08
5.	2.135	-158.74	1810.84	804.30	64.00	390.18	7.868E+08
6.	2.139	-104.98	1690.26	673.79	64.00	380.35	6.254E+08
7.	2.140	-153.41	1805.39	797.59	64.00	391.53	8.092E+08
8.	2.145	-173.39	1832.63	829.33	64.00	388.87	7.728E+08
9.	2.147	-193.72	1872.40	873.30	64.00	390.15	8.022E+08
10.	2.148	-194.37	1872.99	874.05	64.00	389.97	7.995E+08

* * * END OF FILE * * *

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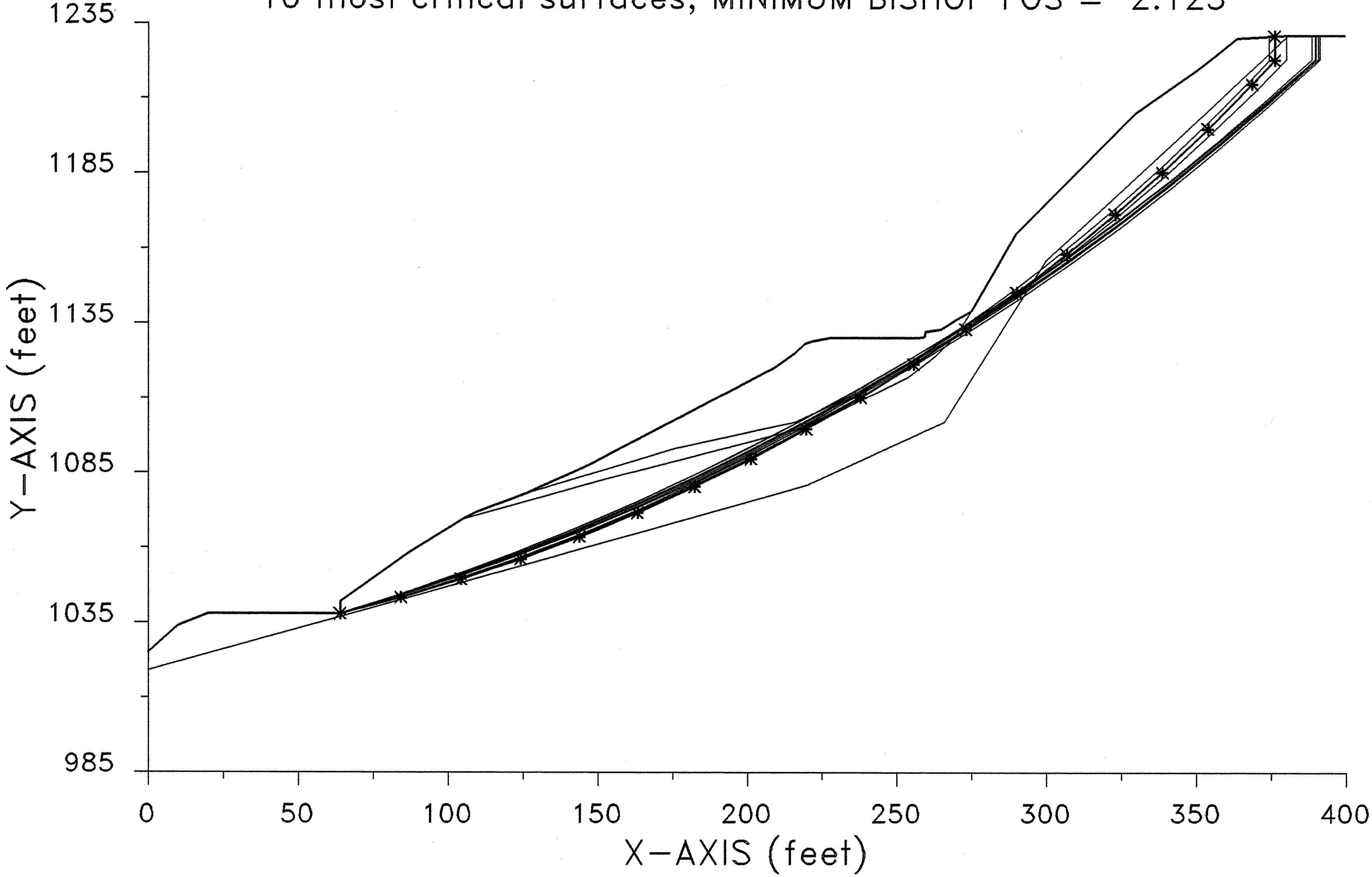
A & T SECTION H TOE STATIC

10 most critical surfaces, MINIMUM BISHOP FOS = 2.123



XSTABL File: 17563H2   4-06-17   14:44

```
****************************************
*              X S T A B L             *
*                                      *
*        Slope Stability Analysis      *
*               using the              *
*           Method of Slices           *
*                                      *
*        Copyright (C) 1992 - 99       *
*   Interactive Software Designs, Inc. *
*       Moscow, ID 83843, U.S.A.       *
*                                      *
*          All Rights Reserved         *
*                                      *
*  Ver. 5.203              96 - 1710   *
****************************************
```

Problem Description : A & T SEC H FILL SLOPE STATIC

SEGMENT BOUNDARY COORDINATES

27 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1025.0	10.0	1034.0	3
2	10.0	1034.0	20.0	1038.0	3
3	20.0	1038.0	64.0	1038.0	3
4	64.0	1038.0	64.1	1042.0	3
5	64.1	1042.0	86.5	1058.0	3
6	86.5	1058.0	105.0	1069.5	3
7	105.0	1069.5	110.0	1072.0	2
8	110.0	1072.0	126.0	1078.0	2
9	126.0	1078.0	146.0	1087.0	1
10	146.0	1087.0	209.0	1120.0	1
11	209.0	1120.0	216.0	1125.0	1
12	216.0	1125.0	219.5	1128.0	1
13	219.5	1128.0	222.0	1129.0	1
14	222.0	1129.0	228.0	1130.0	1
15	228.0	1130.0	257.5	1130.0	1
16	257.5	1130.0	259.5	1130.5	1
17	259.5	1130.5	259.6	1132.0	1
18	259.6	1132.0	265.0	1133.0	1
19	265.0	1133.0	270.0	1136.0	1
20	270.0	1136.0	275.0	1139.0	1
21	275.0	1139.0	290.0	1165.0	3
22	290.0	1165.0	295.0	1170.0	3
23	295.0	1170.0	330.0	1205.0	3
24	330.0	1205.0	350.0	1219.0	3
25	350.0	1219.0	364.0	1230.0	3
26	364.0	1230.0	381.0	1231.0	3

27	381.0	1231.0	400.0	1231.0	4

20 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	126.0	1078.0	176.0	1093.0	2
2	176.0	1093.0	216.0	1102.0	2
3	216.0	1102.0	226.0	1106.5	2
4	226.0	1106.5	239.0	1113.0	2
5	239.0	1113.0	270.0	1131.0	2
6	270.0	1131.0	275.0	1139.0	3
7	105.0	1069.5	153.0	1083.0	3
8	153.0	1083.0	200.0	1095.0	3
9	200.0	1095.0	218.0	1100.0	3
10	218.0	1100.0	226.0	1103.0	3
11	226.0	1103.0	242.0	1111.0	3
12	242.0	1111.0	254.0	1117.0	3
13	254.0	1117.0	263.0	1124.0	3
14	263.0	1124.0	270.0	1131.0	3
15	.0	1019.0	100.0	1047.0	4
16	100.0	1047.0	220.0	1081.0	4
17	220.0	1081.0	266.0	1102.0	4
18	266.0	1102.0	300.0	1156.0	4
19	300.0	1156.0	348.0	1200.0	4
20	348.0	1200.0	381.0	1231.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 5.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----
ISOTROPIC Soil Parameters
----

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0
3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.0	0

ANISOTROPIC STRENGTH PARAMETERS
specified for 2 Soil Unit(s)

Soil Unit 3 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	510.0	44.00
2	58.00	.0	44.00
3	90.00	510.0	44.00

Soil Unit 4 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	900.0	45.00
2	58.00	.0	45.00
3	90.00	900.0	45.00

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

1200 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 3 points equally spaced along the ground surface between x = 126.0 ft
and x = 146.0 ft

Each surface terminates between x = 200.0 ft
and x = 250.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1050.0 ft

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

6.0 ft line segments define each trial failure surface.

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

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

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


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

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


    Factors of safety have been calculated by the :

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


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

Point No.	x-surf (ft)	y-surf (ft)
1	136.00	1082.50
2	142.00	1082.72
3	147.98	1083.22
4	153.92	1084.00
5	159.83	1085.07
6	165.67	1086.42
7	171.45	1088.05
8	177.14	1089.95
9	182.73	1092.12
10	188.22	1094.56
11	193.58	1097.25
12	198.80	1100.20
13	203.88	1103.39
14	208.80	1106.82
15	213.56	1110.49
16	218.13	1114.37
17	222.51	1118.47
18	226.69	1122.78

19	228.65	1125.00
20	228.65	1130.00

**** Simplified BISHOP FOS = 1.856 ****

The following is a summary of the TEN most critical surfaces

Problem Description : A & T SEC H FILL SLOPE STATIC

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.856	134.49	1208.13	125.64	136.00	228.65	1.276E+07
2.	1.859	132.14	1214.92	132.47	136.00	229.37	1.337E+07
3.	1.861	105.52	1249.65	172.87	126.00	224.68	1.467E+07
4.	1.865	95.12	1287.90	212.16	126.00	231.02	2.040E+07
5.	1.868	100.37	1290.14	213.68	126.00	235.95	2.453E+07
6.	1.872	94.94	1280.94	205.30	126.00	228.49	1.811E+07
7.	1.873	93.45	1299.08	223.47	126.00	233.55	2.302E+07
8.	1.877	125.19	1227.92	145.82	136.00	228.46	1.335E+07
9.	1.880	89.64	1300.29	225.24	126.00	231.03	2.101E+07
10.	1.881	95.62	1303.03	227.07	126.00	236.53	2.580E+07

* * * END OF FILE * * *

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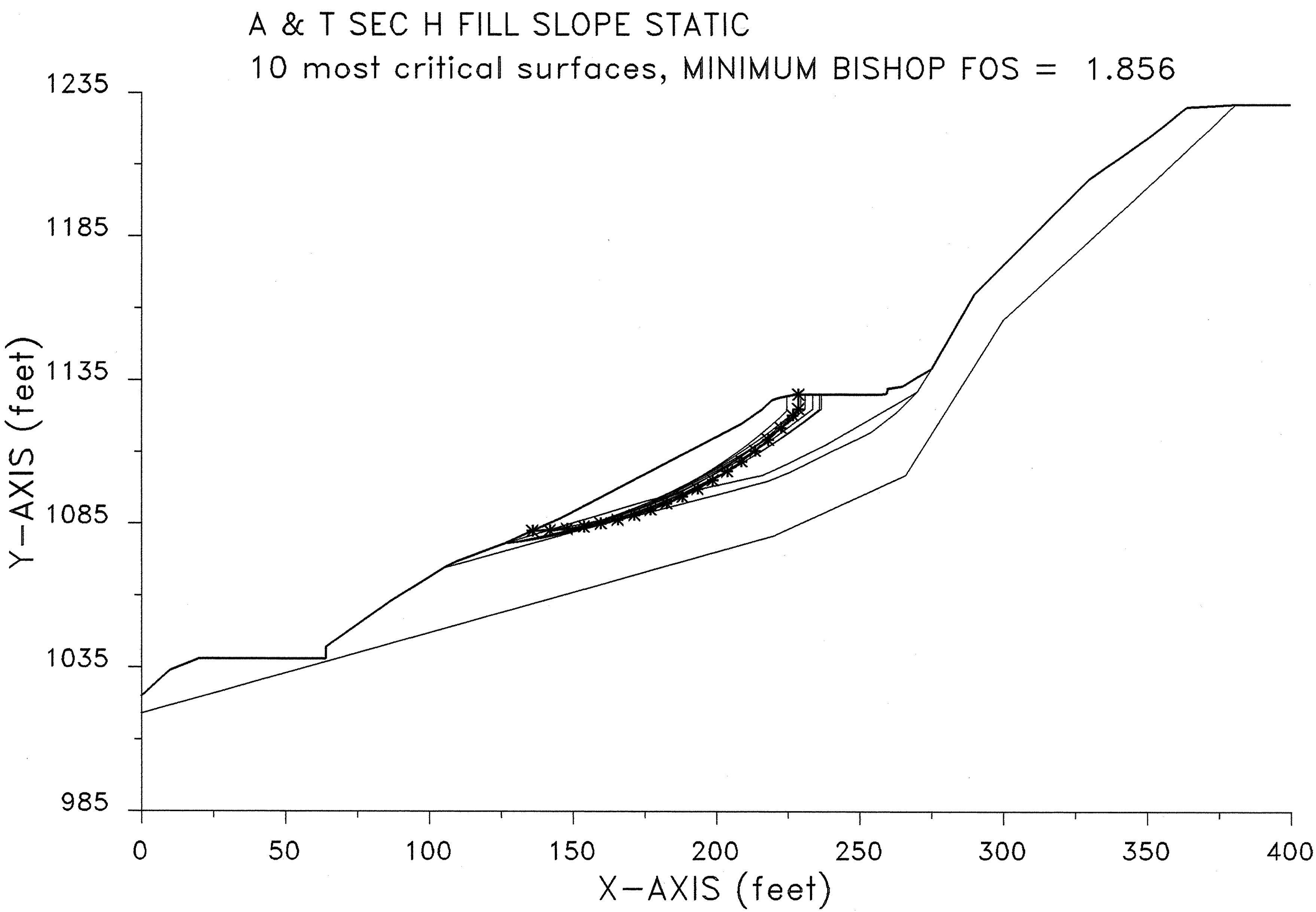

♠

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****************************************
*              X S T A B L             *
*                                      *
*      Slope Stability Analysis        *
*             using the                *
*          Method of Slices            *
*                                      *
*       Copyright (C) 1992 - 99        *
*  Interactive Software Designs, Inc.  *
*      Moscow, ID 83843, U.S.A.        *
*                                      *
*         All Rights Reserved          *
*                                      *
*  Ver. 5.203               96 – 1710  *
****************************************
```

Problem Description : A & T SEC H FILL SLOPE PLANAR STATIC

SEGMENT BOUNDARY COORDINATES

27 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1025.0	10.0	1034.0	3
2	10.0	1034.0	20.0	1038.0	3
3	20.0	1038.0	64.0	1038.0	3
4	64.0	1038.0	64.1	1042.0	3
5	64.1	1042.0	86.5	1058.0	3
6	86.5	1058.0	105.0	1069.5	3
7	105.0	1069.5	110.0	1072.0	2
8	110.0	1072.0	126.0	1078.0	2
9	126.0	1078.0	146.0	1087.0	1
10	146.0	1087.0	209.0	1120.0	1
11	209.0	1120.0	216.0	1125.0	1
12	216.0	1125.0	219.5	1128.0	1
13	219.5	1128.0	222.0	1129.0	1
14	222.0	1129.0	228.0	1130.0	1
15	228.0	1130.0	257.5	1130.0	1
16	257.5	1130.0	259.5	1130.5	1
17	259.5	1130.5	259.6	1132.0	1
18	259.6	1132.0	265.0	1133.0	1
19	265.0	1133.0	270.0	1136.0	1
20	270.0	1136.0	275.0	1139.0	1
21	275.0	1139.0	290.0	1165.0	3
22	290.0	1165.0	295.0	1170.0	3
23	295.0	1170.0	330.0	1205.0	3
24	330.0	1205.0	350.0	1219.0	3
25	350.0	1219.0	364.0	1230.0	3
26	364.0	1230.0	381.0	1231.0	3

27	381.0	1231.0	400.0	1231.0	4

20 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	126.0	1078.0	176.0	1093.0	2
2	176.0	1093.0	216.0	1102.0	2
3	216.0	1102.0	226.0	1106.5	2
4	226.0	1106.5	239.0	1113.0	2
5	239.0	1113.0	270.0	1131.0	2
6	270.0	1131.0	275.0	1139.0	3
7	105.0	1069.5	153.0	1083.0	3
8	153.0	1083.0	200.0	1095.0	3
9	200.0	1095.0	218.0	1100.0	3
10	218.0	1100.0	226.0	1103.0	3
11	226.0	1103.0	242.0	1111.0	3
12	242.0	1111.0	254.0	1117.0	3
13	254.0	1117.0	263.0	1124.0	3
14	263.0	1124.0	270.0	1131.0	3
15	.0	1019.0	100.0	1047.0	4
16	100.0	1047.0	220.0	1081.0	4
17	220.0	1081.0	266.0	1102.0	4
18	266.0	1102.0	300.0	1156.0	4
19	300.0	1156.0	348.0	1200.0	4
20	348.0	1200.0	381.0	1231.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 5.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----

ISOTROPIC Soil Parameters

----

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0
3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.0	0

ANISOTROPIC STRENGTH PARAMETERS
specified for 2 Soil Unit(s)

Soil Unit 3 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	510.0	44.00
2	58.00	.0	44.00
3	90.00	510.0	44.00

Soil Unit 4 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	900.0	45.00
2	58.00	.0	45.00
3	90.00	900.0	45.00

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

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

1000 trial surfaces will be generated and analyzed.

5 boxes specified for generation of central block base

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

Length of line segments for active and passive portions of sliding block is 42.0 ft

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

1	126.0	1078.0	146.0	1087.0	.0
2	150.0	1085.0	170.0	1089.0	4.0
3	190.0	1094.0	216.0	1100.0	4.0
4	225.0	1105.0	240.0	1110.0	4.0
5	255.0	1120.0	265.0	1128.0	4.0

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

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

Factors of safety have been calculated by the :

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

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

Failure surface No. 1 specified by 8 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	129.23	1079.45
2	166.32	1087.12
3	211.06	1098.88
4	225.49	1107.03
5	262.07	1125.61
6	262.61	1126.71
7	263.10	1127.65
8	263.10	1132.65

** Corrected JANBU FOS = 2.230 ** (Fo factor = 1.037)

Failure surface No. 2 specified by 7 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	129.30	1079.48
2	160.92	1085.92
3	199.83	1095.73
4	228.25	1107.42
5	264.51	1126.17
6	265.60	1128.36
7	265.60	1133.36

** Corrected JANBU FOS = 2.237 ** (Fo factor = 1.033)

Failure surface No. 3 specified by 8 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	126.43	1078.19
2	158.61	1086.05
3	214.89	1099.91
4	227.35	1106.60
5	264.19	1126.83
6	264.74	1127.95
7	264.74	1127.95
8	264.74	1132.95

** Corrected JANBU FOS = 2.238 ** (Fo factor = 1.037)

Failure surface No. 4 specified by 8 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	131.13	1080.31
2	161.36	1085.46
3	207.27	1098.62
4	226.50	1107.06
5	262.65	1125.29
6	263.66	1127.32
7	263.91	1127.80
8	263.91	1132.80

** Corrected JANBU FOS = 2.240 ** (Fo factor = 1.034)

Failure surface No. 5 specified by 8 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	131.79	1080.60
2	156.47	1084.94
3	202.35	1096.84
4	229.49	1107.63
5	261.86	1125.80
6	262.20	1126.47
7	262.78	1127.59
8	262.78	1132.59

** Corrected JANBU FOS = 2.242 ** (Fo factor = 1.035)

Failure surface No. 6 specified by 8 coordinate points

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

1	127.48	1078.66
2	166.05	1087.16
3	198.19	1094.96
4	227.51	1107.50
5	257.49	1122.93
6	258.05	1124.06
7	258.69	1125.30
8	258.69	1130.30

** Corrected JANBU FOS = 2.244 ** (Fo factor = 1.034)

Failure surface No. 7 specified by 7 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	129.45	1079.55
2	167.00	1086.94
3	209.67	1097.66
4	226.70	1105.52
5	259.77	1125.74
6	260.52	1127.17
7	260.52	1132.17

** Corrected JANBU FOS = 2.245 ** (Fo factor = 1.040)

Failure surface No. 8 specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	130.62	1080.08
2	163.82	1086.74
3	211.43	1098.29
4	232.79	1109.35
5	257.52	1125.01
6	257.52	1130.01

** Corrected JANBU FOS = 2.245 ** (Fo factor = 1.040)

Failure surface No. 9 specified by 7 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	131.72	1080.57
2	161.86	1086.15
3	213.57	1099.98
4	226.73	1107.25
5	259.42	1125.25
6	260.41	1127.15
7	260.41	1132.15

** Corrected JANBU FOS = 2.246 ** (Fo factor = 1.039)

Failure surface No.10 specified by 8 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	126.89	1078.40
2	165.55	1086.47
3	191.89	1093.60
4	227.28	1107.31
5	260.71	1122.98
6	262.55	1126.68
7	263.06	1127.64
8	263.06	1132.64

** Corrected JANBU FOS = 2.247 ** (Fo factor = 1.032)

The following is a summary of the TEN most critical surfaces

Problem Description : A & T SEC H FILL SLOPE PLANAR STATIC

	Modified JANBU FOS	Correction Factor	Initial x-coord (ft)	Terminal x-coord (ft)	Available Strength (lb)
1.	2.230	1.037	129.23	263.10	1.767E+05
2.	2.237	1.033	129.30	265.60	1.786E+05
3.	2.238	1.037	126.43	264.74	1.774E+05
4.	2.240	1.034	131.13	263.91	1.766E+05
5.	2.242	1.035	131.79	262.78	1.744E+05
6.	2.244	1.034	127.48	258.69	1.738E+05
7.	2.245	1.040	129.45	260.52	1.822E+05
8.	2.245	1.040	130.62	257.52	1.755E+05
9.	2.246	1.039	131.72	260.41	1.735E+05
10.	2.247	1.032	126.89	263.06	1.788E+05

* * * END OF FILE * * *

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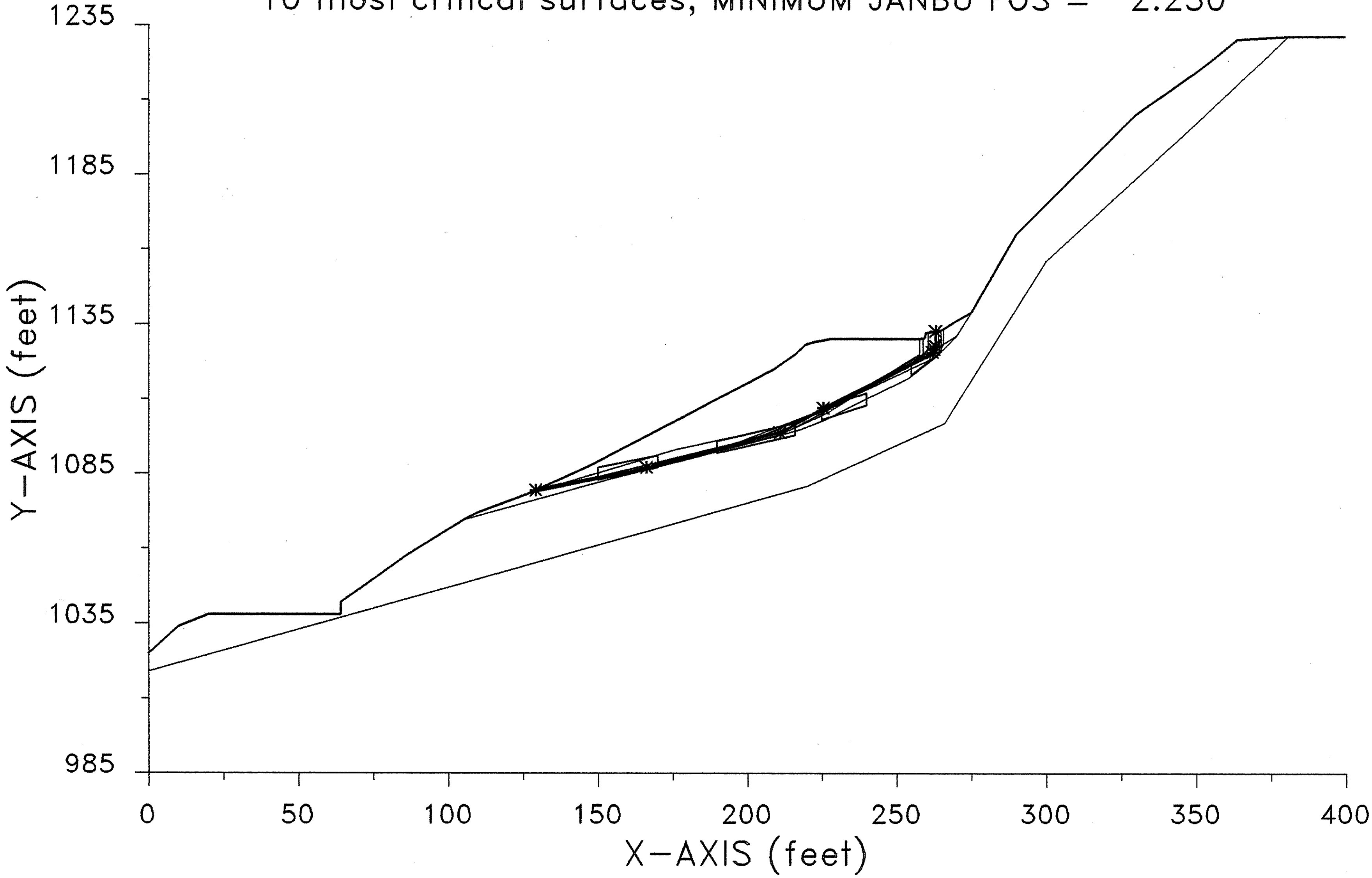
A & T SEC H FILL SLOPE PLANAR STATIC
10 most critical surfaces, MINIMUM JANBU FOS = 2.230



♠

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```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*              using the                *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 - 99        *
*    Interactive Software Designs, Inc. *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.203                96 – 1710  *
*****************************************
```

Problem Description : A & T SEC H CUT ABOVE STREET STATIC

SEGMENT BOUNDARY COORDINATES

----

27 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1025.0	10.0	1034.0	3
2	10.0	1034.0	20.0	1038.0	3
3	20.0	1038.0	64.0	1038.0	3
4	64.0	1038.0	64.1	1042.0	3
5	64.1	1042.0	86.5	1058.0	3
6	86.5	1058.0	105.0	1069.5	3
7	105.0	1069.5	110.0	1072.0	2
8	110.0	1072.0	126.0	1078.0	2
9	126.0	1078.0	146.0	1087.0	1
10	146.0	1087.0	209.0	1120.0	1
11	209.0	1120.0	216.0	1125.0	1
12	216.0	1125.0	219.5	1128.0	1
13	219.5	1128.0	222.0	1129.0	1
14	222.0	1129.0	228.0	1130.0	1
15	228.0	1130.0	257.5	1130.0	1
16	257.5	1130.0	259.5	1130.5	1
17	259.5	1130.5	259.6	1132.0	1
18	259.6	1132.0	265.0	1133.0	1
19	265.0	1133.0	270.0	1136.0	1
20	270.0	1136.0	275.0	1139.0	1
21	275.0	1139.0	290.0	1165.0	3
22	290.0	1165.0	295.0	1170.0	3
23	295.0	1170.0	330.0	1205.0	3
24	330.0	1205.0	350.0	1219.0	3
25	350.0	1219.0	364.0	1230.0	3
26	364.0	1230.0	381.0	1231.0	3

27	381.0	1231.0	400.0	1231.0	4

20 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	126.0	1078.0	176.0	1093.0	2
2	176.0	1093.0	216.0	1102.0	2
3	216.0	1102.0	226.0	1106.5	2
4	226.0	1106.5	239.0	1113.0	2
5	239.0	1113.0	270.0	1131.0	2
6	270.0	1131.0	275.0	1139.0	3
7	105.0	1069.5	153.0	1083.0	3
8	153.0	1083.0	200.0	1095.0	3
9	200.0	1095.0	218.0	1100.0	3
10	218.0	1100.0	226.0	1103.0	3
11	226.0	1103.0	242.0	1111.0	3
12	242.0	1111.0	254.0	1117.0	3
13	254.0	1117.0	263.0	1124.0	3
14	263.0	1124.0	270.0	1131.0	3
15	.0	1019.0	100.0	1047.0	4
16	100.0	1047.0	220.0	1081.0	4
17	220.0	1081.0	266.0	1102.0	4
18	266.0	1102.0	300.0	1156.0	4
19	300.0	1156.0	348.0	1200.0	4
20	348.0	1200.0	381.0	1231.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 5.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

ISOTROPIC Soil Parameters

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0
3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.0	0

ANISOTROPIC STRENGTH PARAMETERS
specified for 2 Soil Unit(s)

Soil Unit 3 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	510.0	44.00
2	58.00	.0	44.00
3	90.00	510.0	44.00

Soil Unit 4 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	900.0	45.00
2	58.00	.0	45.00
3	90.00	900.0	45.00

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

1200 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 3 points equally spaced along the ground surface between x = 259.5 ft
and x = 275.0 ft

Each surface terminates between x = 300.0 ft
and x = 400.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1120.0 ft

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

11.0 ft line segments define each trial failure surface.

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

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

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


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

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


    Factors of safety have been calculated by the :

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


      The most critical circular failure surface
      is specified by  6 coordinate points

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

             1         275.00      1139.00
             2         281.40      1147.95
             3         287.72      1156.95
             4         293.96      1166.01
             5         300.12      1175.12
             6         300.13      1175.13

    ****  Simplified BISHOP FOS =    .669  ****


    The following is a summary of the TEN most critical surfaces

    Problem Description : A & T SEC H CUT ABOVE STREET STATIC
```

	FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	.669	-744.60	1874.96	1257.46	275.00	300.13	5.899E+06
2.	.677	-1757.19	2592.24	2498.34	275.00	300.85	1.214E+07
3.	.677	-7033.93	6291.77	8942.67	275.00	300.82	4.186E+07
4.	.678	-3656.09	3927.37	4819.59	275.00	300.95	2.311E+07
5.	.687	-280.28	1554.24	693.37	275.00	289.60	2.079E+06
6.	.691	-2954.76	3470.27	3983.23	275.00	289.78	1.168E+07
7.	.692	-1575.55	2485.71	2288.70	275.00	289.59	6.671E+06
8.	.694	-3052.53	3549.49	4108.88	275.00	289.55	1.188E+07
9.	.695	-2379.34	3069.02	3281.84	275.00	289.42	9.434E+06
10.	.696	66.43	1311.35	270.56	275.00	291.93	1.279E+06

* * * END OF FILE * * *

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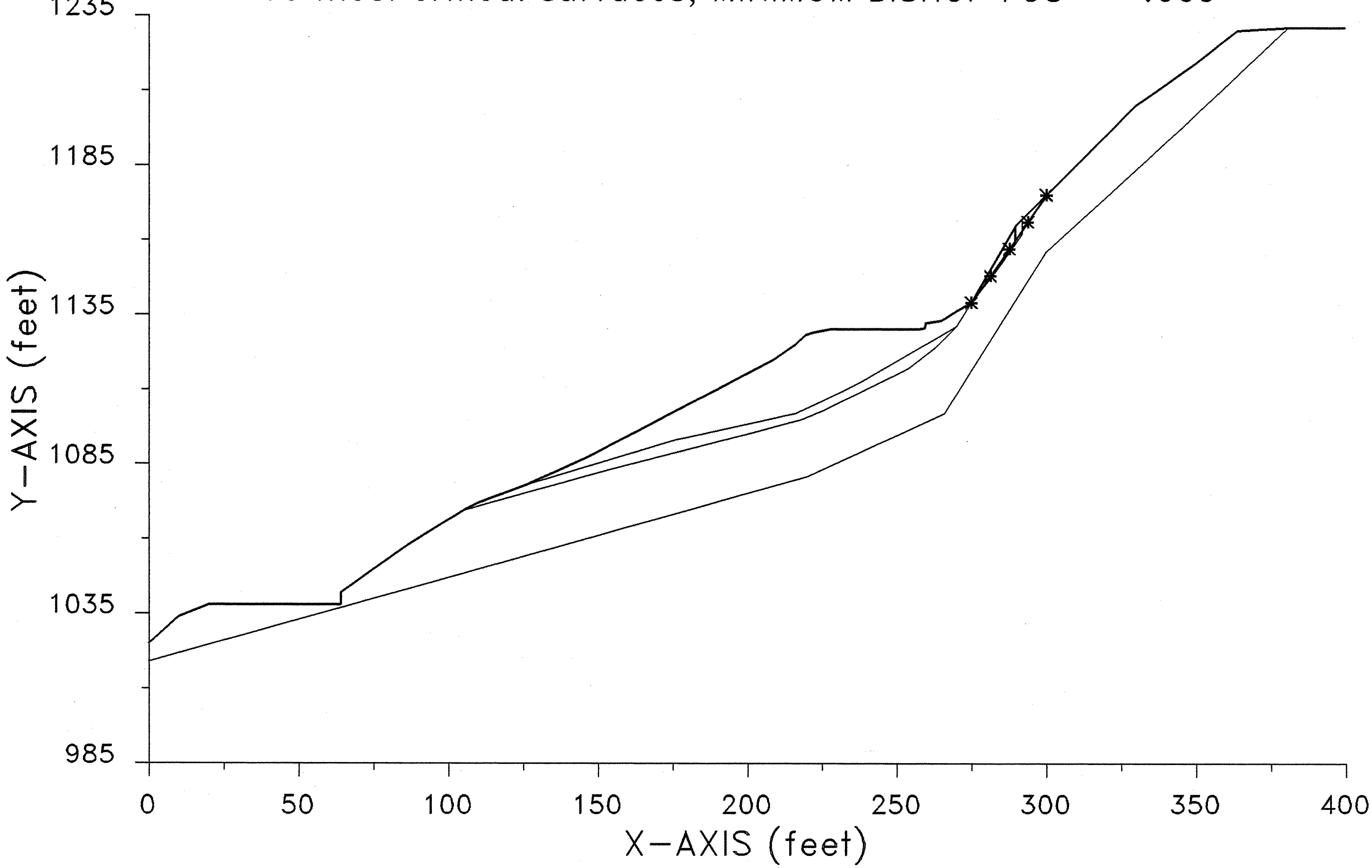
A & T SEC H CUT ABOVE STREET STATIC

10 most critical surfaces, MINIMUM BISHOP FOS =   .669



♠

XSTABL File: 17563H5   4-06-17   14:50

```
******************************************
*                X S T A B L              *
*                                         *
*       Slope Stability Analysis          *
*              using the                  *
*           Method of Slices              *
*                                         *
*        Copyright (C) 1992 - 99          *
*   Interactive Software Designs, Inc.    *
*        Moscow, ID 83843, U.S.A.         *
*                                         *
*          All Rights Reserved            *
*                                         *
*  Ver. 5.203                 96 — 1710   *
******************************************
```

Problem Description : A & T SEC H ABOVE STREET CUT STATIC

SEGMENT BOUNDARY COORDINATES

---

27 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	1025.0	10.0	1034.0	3
2	10.0	1034.0	20.0	1038.0	3
3	20.0	1038.0	64.0	1038.0	3
4	64.0	1038.0	64.1	1042.0	3
5	64.1	1042.0	86.5	1058.0	3
6	86.5	1058.0	105.0	1069.5	3
7	105.0	1069.5	110.0	1072.0	2
8	110.0	1072.0	126.0	1078.0	2
9	126.0	1078.0	146.0	1087.0	1
10	146.0	1087.0	209.0	1120.0	1
11	209.0	1120.0	216.0	1125.0	1
12	216.0	1125.0	219.5	1128.0	1
13	219.5	1128.0	222.0	1129.0	1
14	222.0	1129.0	228.0	1130.0	1
15	228.0	1130.0	257.5	1130.0	1
16	257.5	1130.0	259.5	1130.5	1
17	259.5	1130.5	259.6	1132.0	1
18	259.6	1132.0	265.0	1133.0	1
19	265.0	1133.0	270.0	1136.0	1
20	270.0	1136.0	275.0	1139.0	1
21	275.0	1139.0	290.0	1165.0	3
22	290.0	1165.0	295.0	1170.0	3
23	295.0	1170.0	330.0	1205.0	3
24	330.0	1205.0	350.0	1219.0	3
25	350.0	1219.0	364.0	1230.0	3
26	364.0	1230.0	381.0	1231.0	3

27	381.0	1231.0	400.0	1231.0	4

20 SUBSURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	126.0	1078.0	176.0	1093.0	2
2	176.0	1093.0	216.0	1102.0	2
3	216.0	1102.0	226.0	1106.5	2
4	226.0	1106.5	239.0	1113.0	2
5	239.0	1113.0	270.0	1131.0	2
6	270.0	1131.0	275.0	1139.0	3
7	105.0	1069.5	153.0	1083.0	3
8	153.0	1083.0	200.0	1095.0	3
9	200.0	1095.0	218.0	1100.0	3
10	218.0	1100.0	226.0	1103.0	3
11	226.0	1103.0	242.0	1111.0	3
12	242.0	1111.0	254.0	1117.0	3
13	254.0	1117.0	263.0	1124.0	3
14	263.0	1124.0	270.0	1131.0	3
15	.0	1019.0	100.0	1047.0	4
16	100.0	1047.0	220.0	1081.0	4
17	220.0	1081.0	266.0	1102.0	4
18	266.0	1102.0	300.0	1156.0	4
19	300.0	1156.0	348.0	1200.0	4
20	348.0	1200.0	381.0	1231.0	4

A CRACKED ZONE HAS BEEN SPECIFIED

Depth of crack below ground surface = 5.00 (feet)
Maximum depth of water in crack = .00 (feet)
Unit weight of water in crack = 62.40 (pcf)

Failure surfaces will have a vertical side equal to the specified depth of crack and be affected by a hydrostatic force according to the specified depth of water in the crack

----

ISOTROPIC Soil Parameters

----

4 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	130.0	130.0	240.0	35.00	.000	.0	0
2	120.0	120.0	85.0	37.00	.000	.0	0
3	140.0	140.0	510.0	44.00	.000	.0	0
4	145.0	145.0	900.0	45.00	.000	.0	0

ANISOTROPIC STRENGTH PARAMETERS
specified for 2 Soil Unit(s)

Soil Unit 3 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	510.0	44.00
2	58.00	.0	44.00
3	90.00	510.0	44.00

Soil Unit 4 is ANISOTROPIC

Number of direction ranges specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	c-value (psf)	ϕ-value (degrees)
1	45.00	900.0	45.00
2	58.00	.0	45.00
3	90.00	900.0	45.00

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

800 trial surfaces will be generated and analyzed.

400 Surfaces initiate from each of 2 points equally spaced along the ground surface between x = 290.0 ft
and x = 295.0 ft

Each surface terminates between x = 320.0 ft
and x = 400.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = 1160.0 ft

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

7.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

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

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

****

-- WARNING -- WARNING -- WARNING -- WARNING -- (# 48)

****

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

****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

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

The most critical circular failure surface is specified by 17 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	290.00	1165.00
2	296.57	1167.40
3	303.02	1170.13
4	309.33	1173.17
5	315.47	1176.52
6	321.44	1180.17
7	327.23	1184.11
8	332.81	1188.34
9	338.18	1192.83
10	343.32	1197.58
11	348.22	1202.58
12	352.86	1207.82
13	357.24	1213.28
14	361.35	1218.95
15	365.17	1224.81
16	365.32	1225.08
17	365.32	1230.08

**** Simplified BISHOP FOS = 1.696 ****

The following is a summary of the TEN most critical surfaces

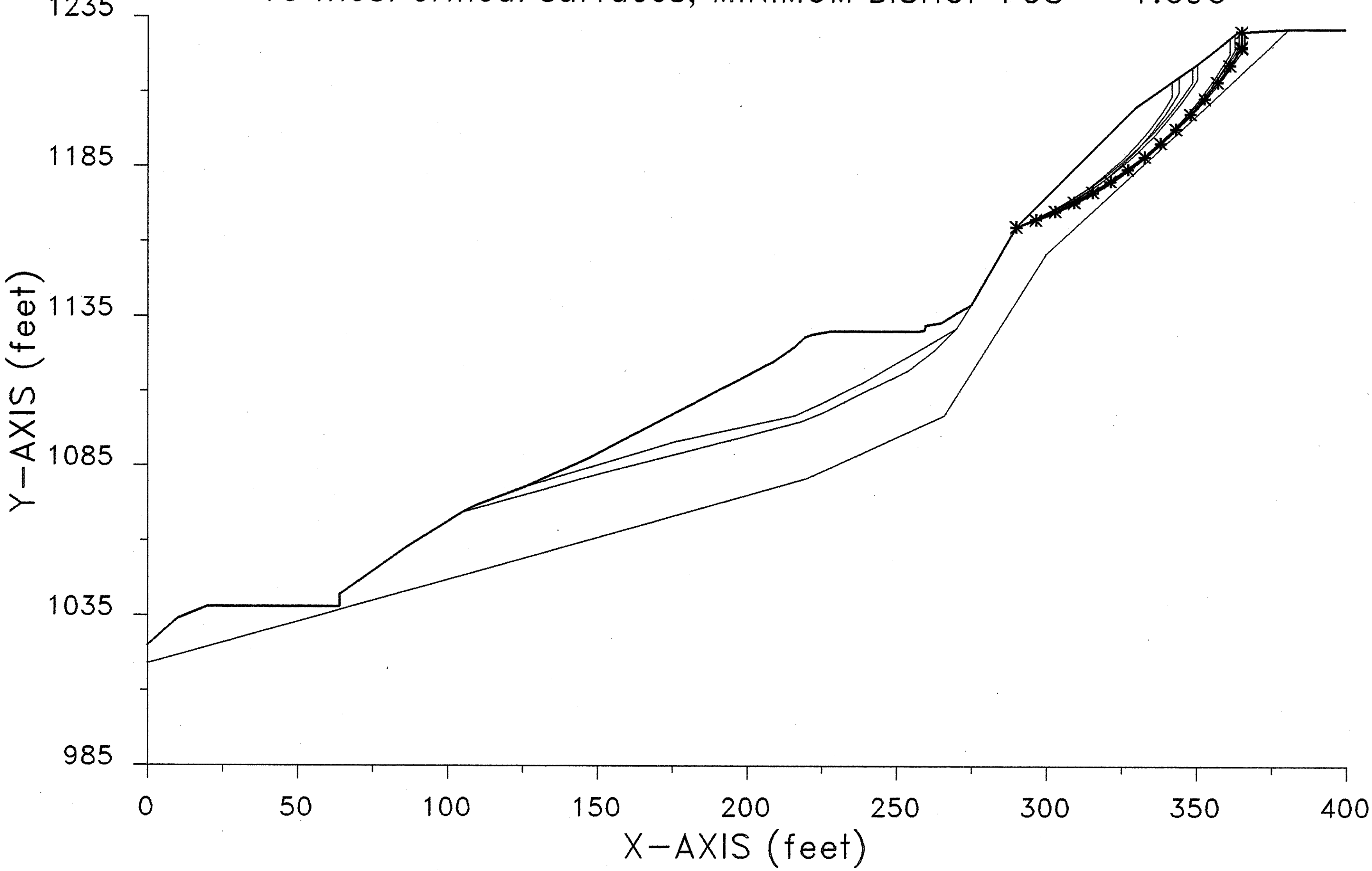
Problem Description : A & T SEC H ABOVE STREET CUT STATIC

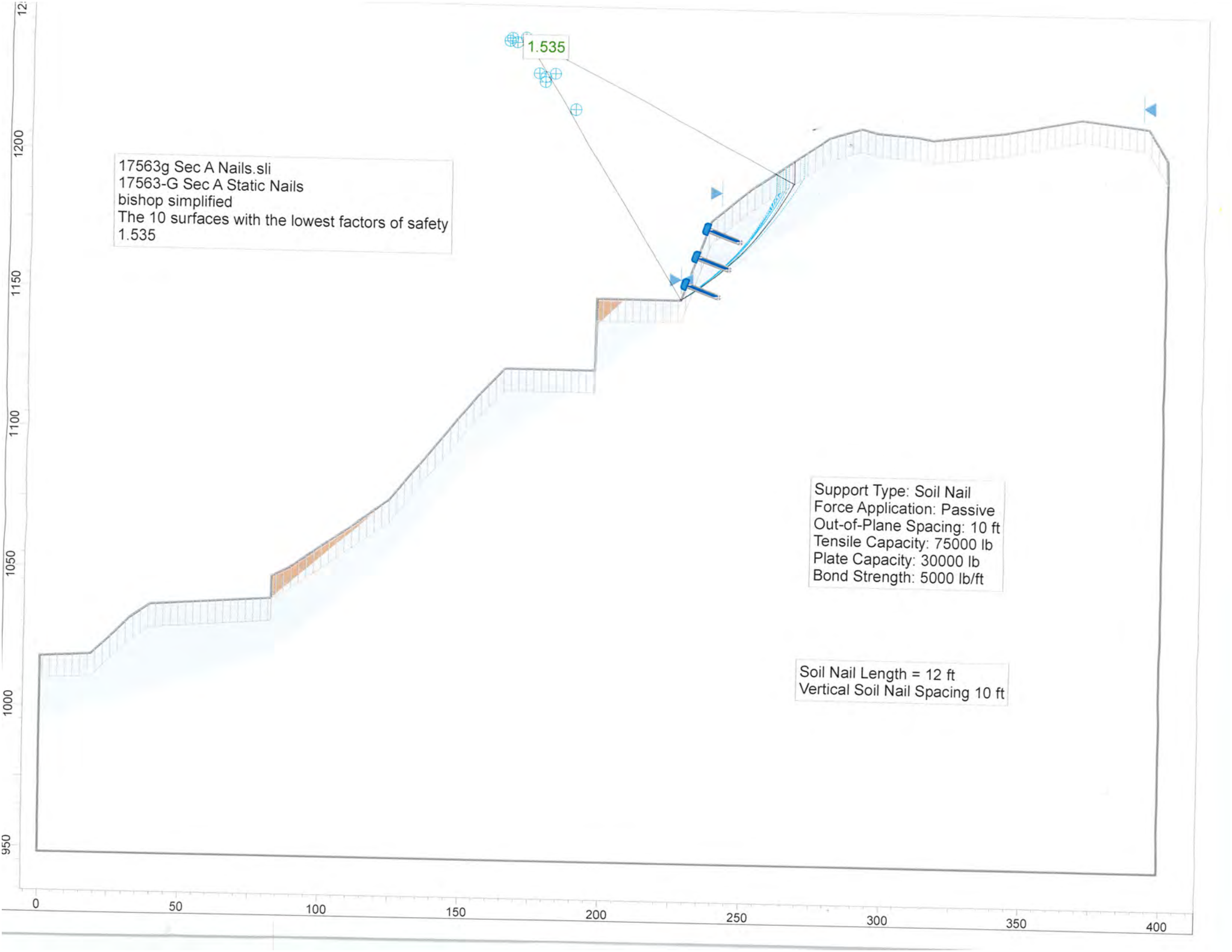
	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.696	244.67	1299.10	141.56	290.00	365.32	1.943E+07
2.	1.701	244.51	1297.30	139.90	290.00	364.27	1.849E+07
3.	1.723	259.62	1257.01	96.89	290.00	344.28	7.937E+06
4.	1.730	249.24	1276.68	118.89	290.00	350.40	1.118E+07
5.	1.732	238.15	1308.95	153.00	290.00	366.13	2.132E+07
6.	1.734	242.40	1303.96	146.89	290.00	366.32	2.111E+07
7.	1.737	254.82	1282.96	123.10	290.00	362.91	1.711E+07
8.	1.738	252.56	1284.01	124.76	290.00	361.24	1.636E+07
9.	1.738	243.27	1281.94	125.93	290.00	348.73	1.082E+07
10.	1.741	253.14	1262.10	103.86	290.00	342.01	7.468E+06

* * * END OF FILE * * *

17563H5 4-06-17 14:50

A & T SEC H ABOVE STREET CUT STATIC
10 most critical surfaces, MINIMUM BISHOP FOS = 1.696





17563g Sec A Nails.sli
17563-G Sec A Static Nails
bishop simplified
The 10 surfaces with the lowest factors of safety
1.535
1.535
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft
Soil Nail Length = 12 ft
Vertical Soil Nail Spacing 10 ft
950
1000
1050
1100
1150
1200
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec A Nails.sli

Project Settings

Project Title: 17563-G Sec A Static Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

Material Properties

Material: Soil
Strength Type: Mohr-Coulomb

Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 140 lb/ft3
Cohesion: 510 psf
Friction Angle: 44 degrees
Water Surface: None
Ru value: 0

Material: Deeper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 900 psf
Friction Angle: 45 degrees
Water Surface: None
Ru value: 0

Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.535020
Center: 169.401, 1241.844
Radius: 108.309
Left Slip Surface Endpoint: 226.000, 1149.500
Right Slip Surface Endpoint: 265.663, 1192.201
Left Slope Intercept: 226.000 1149.500
Right Slope Intercept: 265.663 1200.201
Resisting Moment=1.04776e+007 lb-ft
Driving Moment=6.82575e+006 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 3777
Number of Invalid Surfaces: 1223

Error Codes:
Error Code -101 reported for 1212 surfaces
Error Code -113 reported for 11 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

82.000	1040.000
123.500	1076.000

Material Boundary

196.200	1140.000
206.000	1149.500

Material Boundary

0.000	993.000
82.000	1020.000
123.000	1055.000
154.000	1092.000
196.100	1122.000
196.200	1122.080
221.000	1142.000
233.000	1154.000
309.000	1204.512
315.000	1208.500

Material Boundary

82.000	1020.000
82.000	1040.000

Material Boundary

196.200	1122.080
196.200	1140.000
196.200	1142.000

Material Boundary

309.000	1204.512
309.000	1209.500

External Boundary

399.000	1203.000

392.000	1214.000
368.000	1217.000
341.000	1211.500
315.000	1208.500
309.000	1209.500
295.000	1210.500
289.500	1212.000
278.000	1208.500
250.500	1190.000
236.500	1178.000
226.000	1149.500
206.000	1149.500
196.300	1149.500
196.200	1142.000
196.000	1124.000
164.000	1124.000
154.500	1114.000
123.500	1076.000
88.000	1051.000
82.100	1048.000
82.000	1040.000
39.000	1037.000
31.500	1032.000
18.000	1019.000
0.000	1018.000
0.000	993.000
0.000	948.200
399.000	948.200

Tension Crack

0.000	1010.000
18.000	1011.000
31.500	1024.000
39.000	1029.000
82.000	1032.000
82.100	1040.000
88.000	1043.000
123.500	1068.000
154.500	1106.000
164.000	1116.000
196.000	1116.000
196.200	1134.000
196.300	1141.500
206.000	1141.500
226.000	1141.500
236.500	1170.000
250.500	1182.000
278.000	1200.500
289.500	1204.000
295.000	1202.500
309.000	1201.500

315.000	1200.500
341.000	1203.500
368.000	1209.000
392.000	1206.000
399.000	1195.000

<u>Support</u>

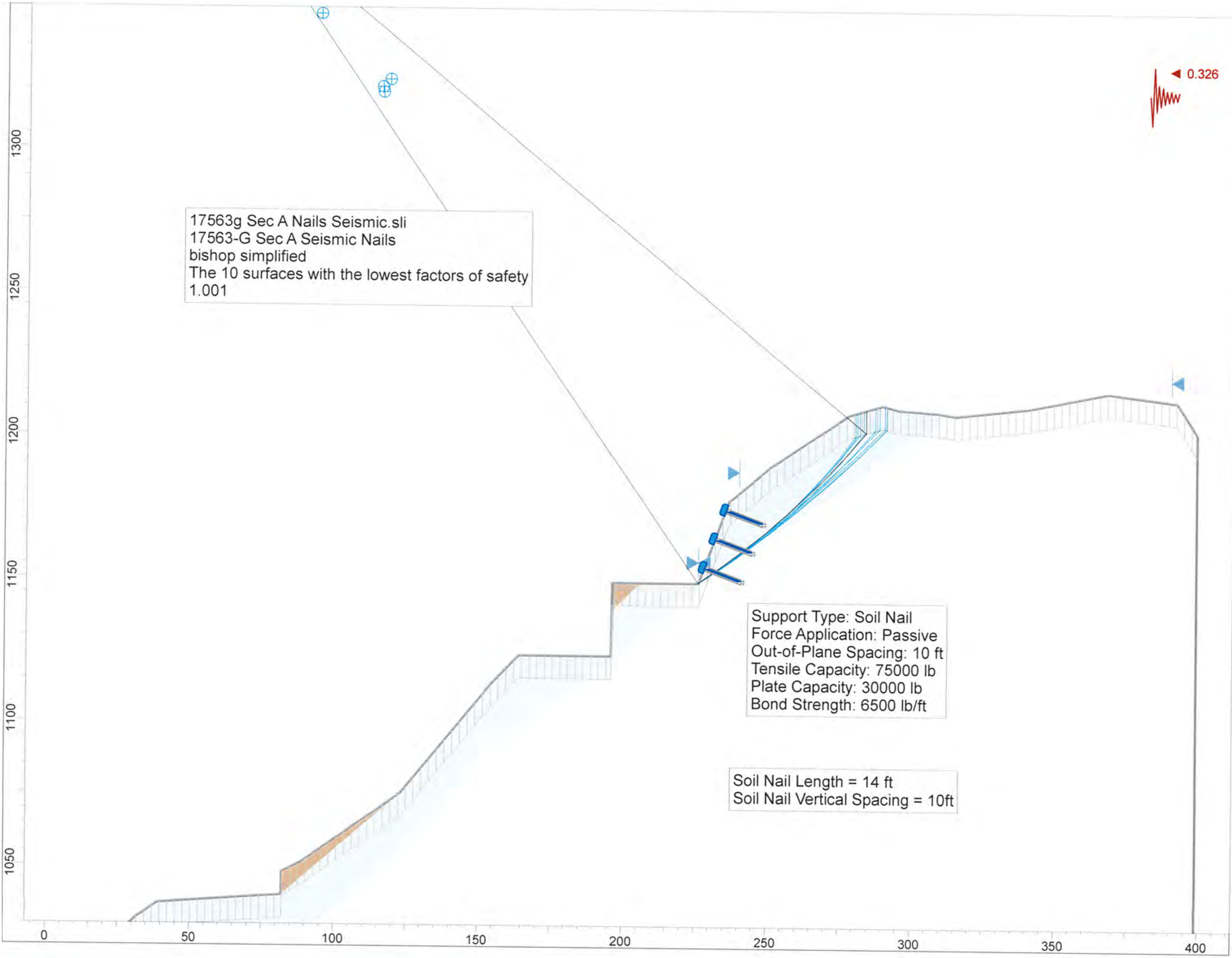
228.019	1154.979
239.279	1150.831

<u>Support</u>

231.703	1164.979
242.963	1160.831

<u>Support</u>

235.387	1174.979
246.647	1170.831


0.326
17563g Sec A Nails Seismic.sli
17563-G Sec A Seismic Nails
bishop simplified
The 10 surfaces with the lowest factors of safety
1.001
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft
Soil Nail Length = 14 ft
Soil Nail Vertical Spacing = 10ft
1300
1250
1200
1150
1100
1050
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec A Nails Seismic.sli

Project Settings

Project Title: 17563-G Sec A Seismic Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.326

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

Material Properties

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 140 lb/ft3
Cohesion: 510 psf
Friction Angle: 44 degrees
Water Surface: None
Ru value: 0

Material: Deeper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 900 psf
Friction Angle: 45 degrees
Water Surface: None
Ru value: 0

Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.000880
Center: 67.139, 1381.901
Radius: 281.508
Left Slip Surface Endpoint: 226.000, 1149.500
Right Slip Surface Endpoint: 283.911, 1202.299
Left Slope Intercept: 226.000 1149.500
Right Slope Intercept: 283.911 1210.299
Resisting Moment=3.43213e+007 lb-ft
Driving Moment=3.4291e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 3777
Number of Invalid Surfaces: 1223
Error Codes:
Error Code -101 reported for 1212 surfaces
Error Code -113 reported for 11 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

82.000	1040.000
123.500	1076.000

Material Boundary

196.200	1140.000
206.000	1149.500

Material Boundary

0.000	993.000
82.000	1020.000
123.000	1055.000
154.000	1092.000
196.100	1122.000
196.200	1122.080
221.000	1142.000
233.000	1154.000
309.000	1204.512
315.000	1208.500

Material Boundary

82.000	1020.000
82.000	1040.000

Material Boundary

196.200	1122.080
196.200	1140.000
196.200	1142.000

Material Boundary

309.000	1204.512

309.000	1209.500

External Boundary

399.000	1203.000
392.000	1214.000
368.000	1217.000
341.000	1211.500
315.000	1208.500
309.000	1209.500
295.000	1210.500
289.500	1212.000
278.000	1208.500
250.500	1190.000
236.500	1178.000
226.000	1149.500
206.000	1149.500
196.300	1149.500
196.200	1142.000
196.000	1124.000
164.000	1124.000
154.500	1114.000
123.500	1076.000
88.000	1051.000
82.100	1048.000
82.000	1040.000
39.000	1037.000
31.500	1032.000
18.000	1019.000
0.000	1018.000
0.000	993.000
0.000	948.200
399.000	948.200

Tension Crack

0.000	1010.000
18.000	1011.000
31.500	1024.000
39.000	1029.000
82.000	1032.000
82.100	1040.000
88.000	1043.000
123.500	1068.000
154.500	1106.000
164.000	1116.000
196.000	1116.000
196.200	1134.000
196.300	1141.500
206.000	1141.500
226.000	1141.500
236.500	1170.000
250.500	1182.000

278.000	1200.500
289.500	1204.000
295.000	1202.500
309.000	1201.500
315.000	1200.500
341.000	1203.500
368.000	1209.000
392.000	1206.000
399.000	1195.000

Support

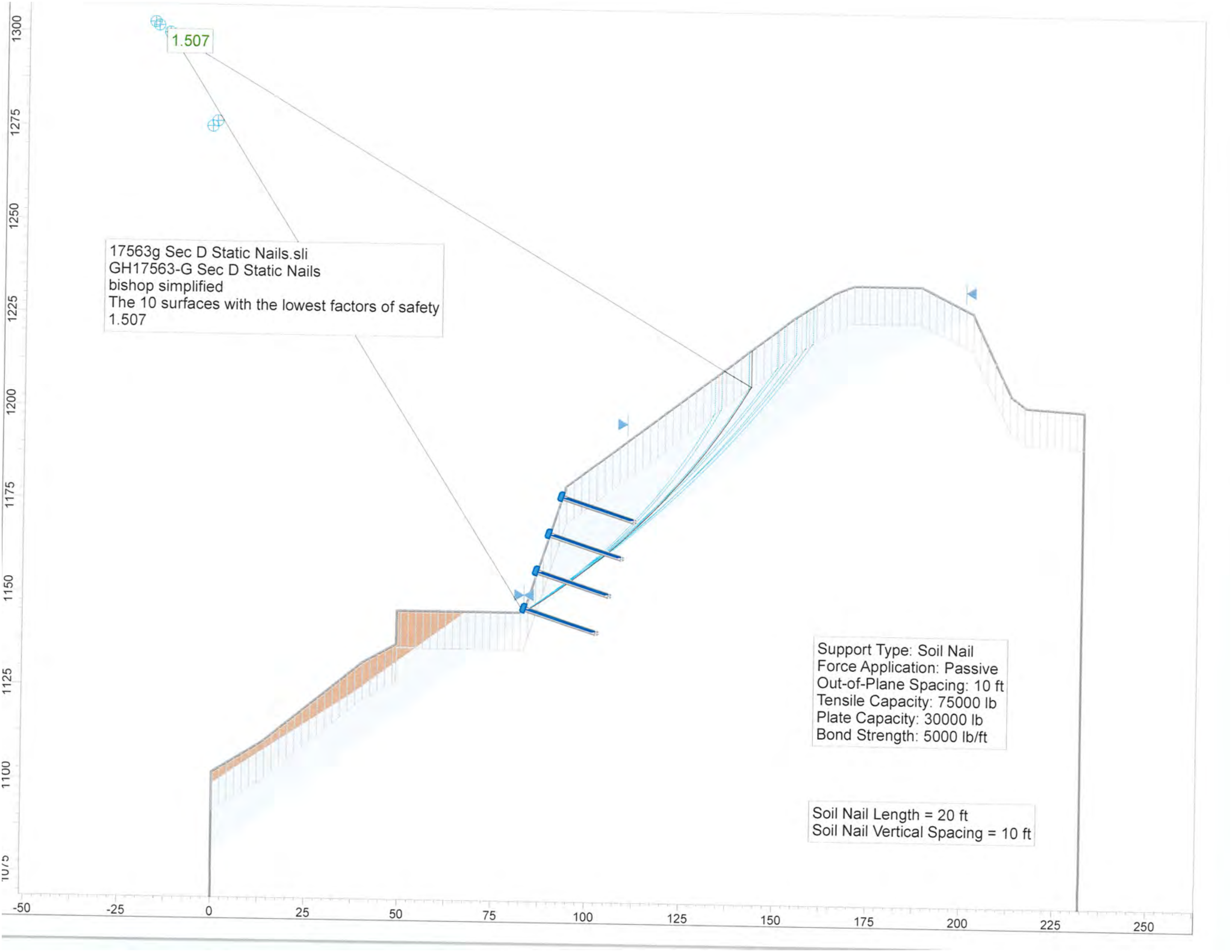
228.019	1154.979
241.156	1150.140

Support

231.703	1164.979
244.840	1160.140

Support

235.387	1174.979
248.524	1170.140



1.507
17563g Sec D Static Nails.sli
GH17563-G Sec D Static Nails
bishop simplified
The 10 surfaces with the lowest factors of safety
1.507
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft
Soil Nail Length = 20 ft
Soil Nail Vertical Spacing = 10 ft
1300
1275
1250
1225
1200
1175
1150
1125
1100
-50
-25
0
25
50
75
100
125
150
175
200
225
250

Slide Analysis Information

Document Name

File Name: 17563g Sec D Static Nails.sli

Project Settings

Project Title: GH17563-G Sec D Static Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

Material Properties

Material: Soil
Strength Type: Mohr-Coulomb

Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 140 lb/ft3
Cohesion: 510 psf
Friction Angle: 44 degrees
Water Surface: None
Ru value: 0

Material: Deeper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 900 psf
Friction Angle: 45 degrees
Water Surface: None
Ru value: 0

Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.507490
Center: -13.561, 1299.966
Radius: 181.740
Left Slip Surface Endpoint: 83.000, 1146.000
Right Slip Surface Endpoint: 142.886, 1207.480
Left Slope Intercept: 83.000 1146.000
Right Slope Intercept: 142.886 1217.480
Resisting Moment=3.24263e+007 lb-ft
Driving Moment=2.15101e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2063
Number of Invalid Surfaces: 2937

Error Codes:
Error Code -101 reported for 2794 surfaces
Error Code -113 reported for 143 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

0.000	1099.000
38.000	1124.000
67.500	1146.000

Material Boundary

0.000	1080.000
100.000	1157.000
172.000	1212.000
202.000	1228.000

External Boundary

232.000	1202.000
216.500	1203.000
212.500	1206.000
202.000	1228.000
188.000	1235.000
170.000	1235.000
165.000	1233.000
154.000	1226.000
94.000	1180.000
83.000	1146.000
67.500	1146.000
49.100	1146.000
49.000	1137.000
40.000	1132.000
13.000	1110.000
0.000	1102.000
0.000	1099.000
0.000	1080.000
0.000	1049.000
232.000	1049.000

Tension Crack

0.000	1092.000

13.000	1100.000
40.000	1122.000
49.000	1127.000
49.100	1136.000
67.500	1136.000
83.000	1136.000
94.000	1170.000
154.000	1216.000
165.000	1223.000
170.000	1225.000
188.000	1225.000
202.000	1218.000
212.500	1196.000
216.500	1193.000
232.000	1192.000

Support

83.336	1147.038
102.365	1140.882

Support

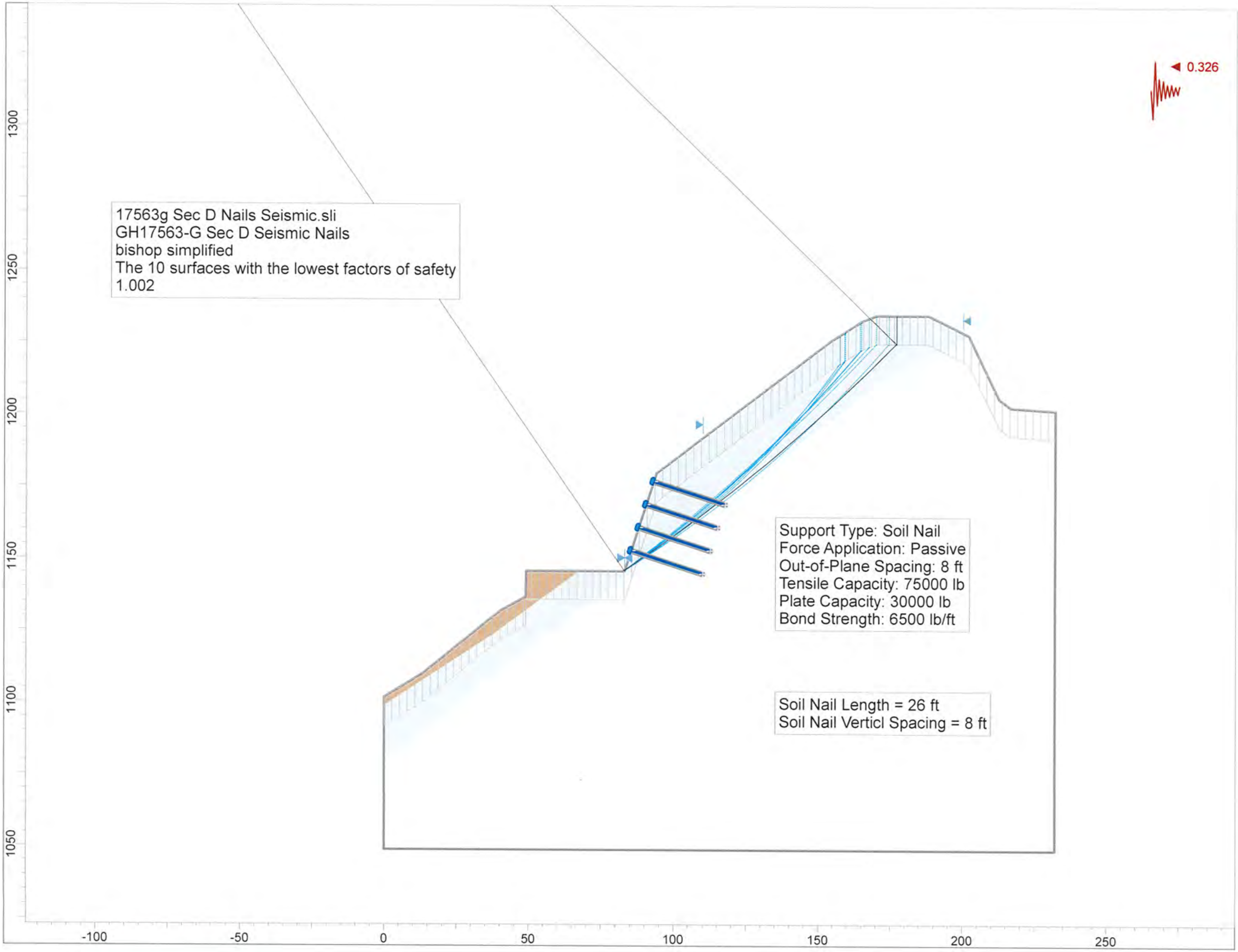
86.571	1157.038
105.600	1150.882

Support

89.806	1167.038
108.835	1160.882

Support

93.042	1177.038
112.071	1170.882



0.326
17563g Sec D Nails Seismic.sli
GH17563-G Sec D Seismic Nails
bishop simplified
The 10 surfaces with the lowest factors of safety
1.002
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 8 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft
Soil Nail Length = 26 ft
Soil Nail Verticl Spacing = 8 ft
1300
1250
1200
1150
1100
1050
-100
-50
0
50
100
150
200
250

Slide Analysis Information

Document Name

File Name: 17563g Sec D Nails Seismic.sli

Project Settings

Project Title: GH17563-G Sec D Seismic Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.326

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

Material Properties

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 140 lb/ft3
Cohesion: 510 psf
Friction Angle: 44 degrees
Water Surface: None
Ru value: 0

Material: Deeper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 900 psf
Friction Angle: 45 degrees
Water Surface: None
Ru value: 0

Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 8 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.002180
Center: -270.954, 1662.507
Radius: 626.149
Left Slip Surface Endpoint: 83.000, 1146.000
Right Slip Surface Endpoint: 176.986, 1225.000
Left Slope Intercept: 83.000 1146.000
Right Slope Intercept: 176.986 1235.000
Resisting Moment=1.64603e+008 lb-ft
Driving Moment=1.64246e+008 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2063
Number of Invalid Surfaces: 2937
Error Codes:
Error Code -101 reported for 2794 surfaces
Error Code -113 reported for 143 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

0.000	1099.000
38.000	1124.000
67.500	1146.000

Material Boundary

0.000	1080.000
100.000	1157.000
172.000	1212.000
202.000	1228.000

External Boundary

232.000	1202.000
216.500	1203.000
212.500	1206.000
202.000	1228.000
188.000	1235.000
170.000	1235.000
165.000	1233.000
154.000	1226.000
94.000	1180.000
83.000	1146.000
67.500	1146.000
49.100	1146.000
49.000	1137.000
40.000	1132.000
13.000	1110.000
0.000	1102.000
0.000	1099.000
0.000	1080.000
0.000	1049.000

232.000	1049.000

Tension Crack

0.000	1092.000
13.000	1100.000
40.000	1122.000
49.000	1127.000
49.100	1136.000
67.500	1136.000
83.000	1136.000
94.000	1170.000
154.000	1216.000
165.000	1223.000
170.000	1225.000
188.000	1225.000
202.000	1218.000
212.500	1196.000
216.500	1193.000
232.000	1192.000

Support

85.277	1153.038
110.015	1145.035

Support

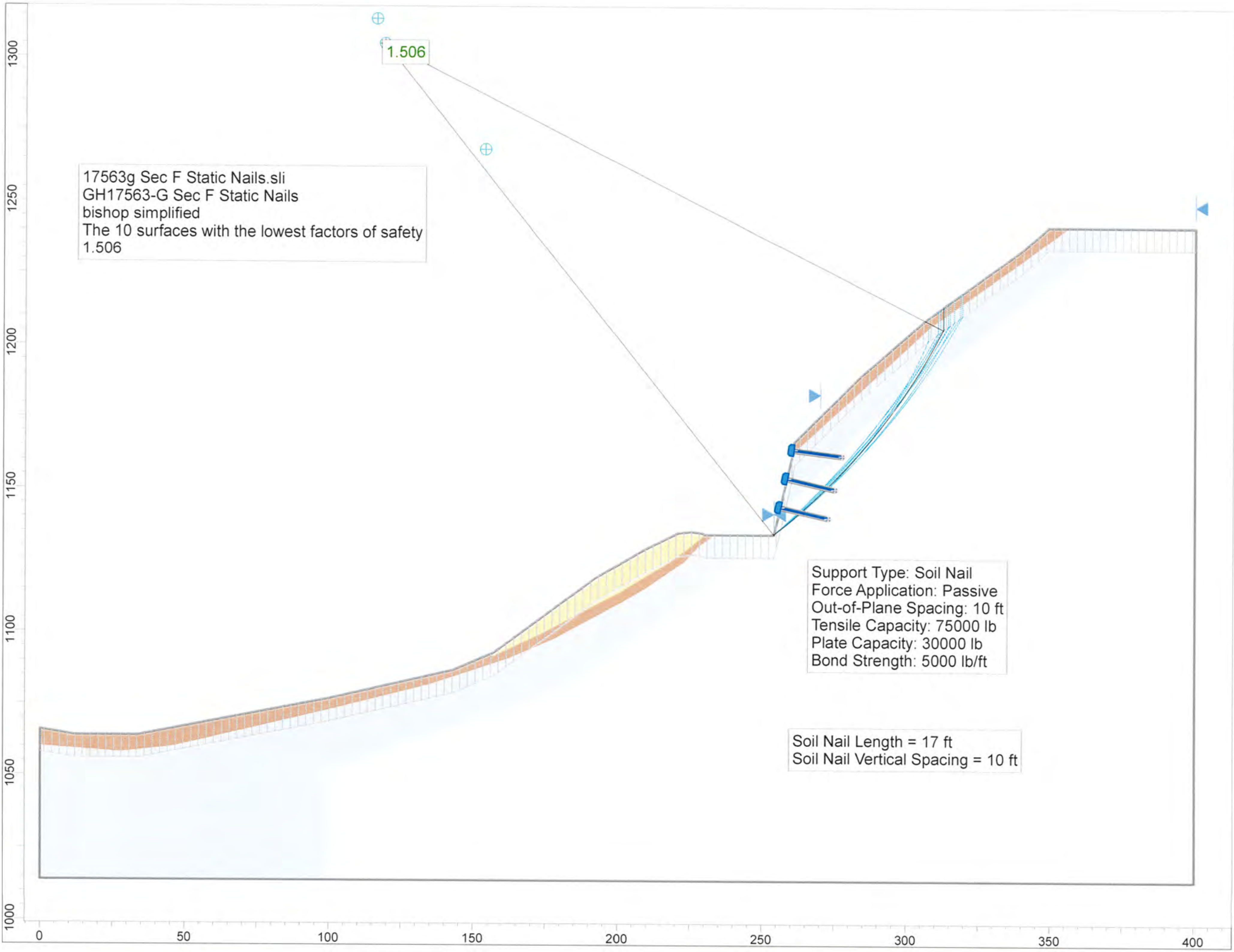
87.865	1161.038
112.603	1153.035

Support

90.453	1169.038
115.191	1161.035

Support

93.042	1177.038
117.779	1169.035


1.506
17563g Sec F Static Nails.sli
GH17563-G Sec F Static Nails
bishop simplified
The 10 surfaces with the lowest factors of safety
1.506
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft
Soil Nail Length = 17 ft
Soil Nail Vertical Spacing = 10 ft
1300
1250
1200
1150
1100
1050
1000
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec F Static Nails.sli

Project Settings

Project Title: GH17563-G Sec F Static Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

Material Properties

Material: Fill
Strength Type: Mohr-Coulomb

Unit Weight: 130 lb/ft3
Cohesion: 240 psf
Friction Angle: 35 degrees
Water Surface: None
Ru value: 0

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 140 lb/ft3
Cohesion: 510 psf
Friction Angle: 44 degrees
Water Surface: None
Ru value: 0

Material: Deeper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 900 psf
Friction Angle: 45 degrees
Water Surface: None
Ru value: 0

Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.506460
Center: 118.962, 1304.739
Radius: 217.294
Left Slip Surface Endpoint: 254.000, 1134.500
Right Slip Surface Endpoint: 312.542, 1206.030
Left Slope Intercept: 254.000 1134.500
Right Slope Intercept: 312.542 1214.030

Resisting Moment=4.27428e+007 lb-ft
Driving Moment=2.8373e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2382
Number of Invalid Surfaces: 2618
Error Codes:
Error Code -101 reported for 2526 surfaces
Error Code -103 reported for 87 surfaces
Error Code -113 reported for 5 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

143.000	1087.000
157.000	1092.000
174.000	1100.000
200.000	1114.000
218.000	1125.000
226.000	1131.000
230.000	1134.500

Material Boundary

0.000	1060.000
28.000	1058.000
46.000	1060.000
100.000	1073.000
135.000	1082.000
162.000	1091.000
178.000	1098.000
200.000	1110.000

210.000	1116.000
223.000	1125.000
228.000	1130.500
233.500	1134.500

Material Boundary

260.500	1163.000
308.000	1207.000
340.000	1230.000
356.000	1242.000

Material Boundary

100.000	1052.000
182.000	1081.000
229.000	1115.000
248.000	1134.500

Material Boundary

255.500	1141.000
283.000	1170.000
375.000	1242.000

Material Boundary

157.000	1092.000
157.000	1093.000

Material Boundary

100.000	1014.000
100.000	1052.000

External Boundary

400.000	1242.000
375.000	1242.000
356.000	1242.000
349.000	1242.000
340.000	1234.000
307.000	1210.000
284.000	1190.000
261.000	1167.000
260.500	1163.000
255.500	1141.000
254.000	1134.500
248.000	1134.500
233.500	1134.500
230.000	1134.500
229.000	1135.000
225.500	1135.500
221.000	1135.000
209.000	1129.000
192.000	1119.000

157.000	1093.000
143.000	1087.000
100.000	1077.000
44.000	1066.000
34.000	1064.000
12.000	1064.000
0.000	1066.000
0.000	1060.000
0.000	1014.000
100.000	1014.000
400.000	1014.000

Tension Crack

0.000	1058.000
12.000	1056.000
34.000	1056.000
44.000	1058.000
100.000	1069.000
143.000	1079.000
157.000	1085.000
192.000	1111.000
209.000	1121.000
221.000	1127.000
225.500	1127.500
229.000	1127.000
230.000	1126.500
233.500	1126.500
248.000	1126.500
254.000	1126.500
255.500	1133.000
260.500	1155.000
261.000	1159.000
284.000	1182.000
307.000	1202.000
340.000	1226.000
349.000	1234.000
356.000	1234.000
375.000	1234.000
400.000	1234.000

Support

260.632	1164.060
277.501	1161.951

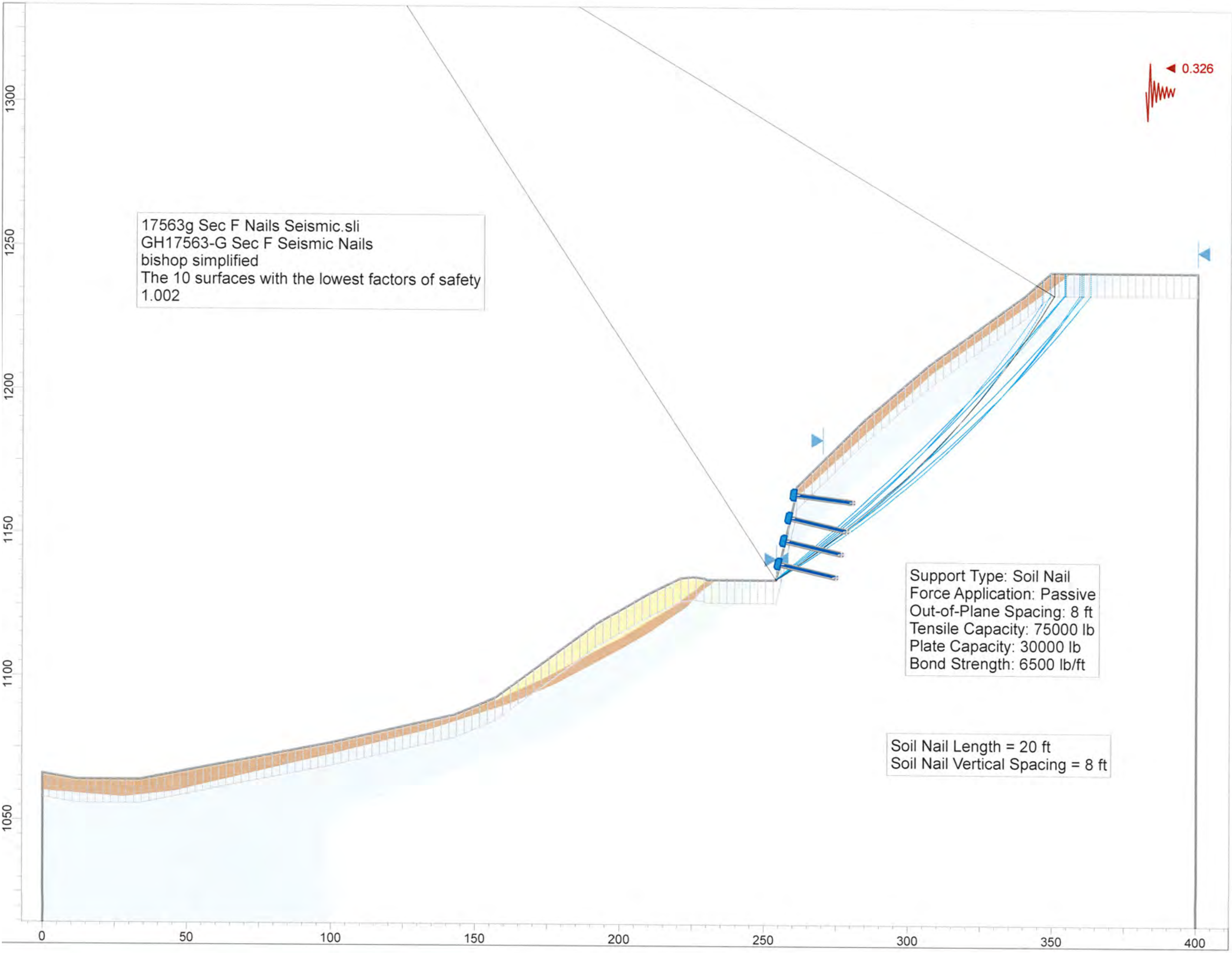
Support

256.195	1144.060
272.773	1140.292

Support

258.468	1154.060

275.045 1150.292


17563g Sec F Nails Seismic.sli
GH17563-G Sec F Seismic Nails
bishop simplified
The 10 surfaces with the lowest factors of safety
1.002
0.326
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 8 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft
Soil Nail Length = 20 ft
Soil Nail Vertical Spacing = 8 ft
1300
1250
1200
1150
1100
1050
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec F Nails Seismic.sli

Project Settings

Project Title: GH17563-G Sec F Seismic Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.326

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 130 lb/ft3
Cohesion: 240 psf
Friction Angle: 35 degrees
Water Surface: None
Ru value: 0

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 140 lb/ft3
Cohesion: 510 psf
Friction Angle: 44 degrees
Water Surface: None
Ru value: 0

Material: Deeper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 900 psf
Friction Angle: 45 degrees
Water Surface: None
Ru value: 0

Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 8 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.001880
Center: 87.148, 1392.179
Radius: 306.982

Left Slip Surface Endpoint: 254.000, 1134.500
Right Slip Surface Endpoint: 350.240, 1234.000
Left Slope Intercept: 254.000 1134.500
Right Slope Intercept: 350.240 1242.000
Resisting Moment=9.74483e+007 lb-ft
Driving Moment=9.72659e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2382
Number of Invalid Surfaces: 2618
Error Codes:
Error Code -101 reported for 2526 surfaces
Error Code -103 reported for 87 surfaces
Error Code -113 reported for 5 surfaces

Error Codes

The following errors were encountered during the computation:

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

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

143.000	1087.000
157.000	1092.000
174.000	1100.000
200.000	1114.000
218.000	1125.000
226.000	1131.000
230.000	1134.500

Material Boundary

0.000	1060.000
28.000	1058.000
46.000	1060.000
100.000	1073.000
135.000	1082.000

162.000	1091.000
178.000	1098.000
200.000	1110.000
210.000	1116.000
223.000	1125.000
228.000	1130.500
233.500	1134.500

Material Boundary

260.500	1163.000
308.000	1207.000
340.000	1230.000
356.000	1242.000

Material Boundary

100.000	1052.000
182.000	1081.000
229.000	1115.000
248.000	1134.500

Material Boundary

255.500	1141.000
283.000	1170.000
375.000	1242.000

Material Boundary

157.000	1092.000
157.000	1093.000

Material Boundary

100.000	1014.000
100.000	1052.000

External Boundary

400.000	1242.000
375.000	1242.000
356.000	1242.000
349.000	1242.000
340.000	1234.000
307.000	1210.000
284.000	1190.000
261.000	1167.000
260.500	1163.000
255.500	1141.000
254.000	1134.500
248.000	1134.500
233.500	1134.500
230.000	1134.500
229.000	1135.000
225.500	1135.500
221.000	1135.000

209.000	1129.000
192.000	1119.000
157.000	1093.000
143.000	1087.000
100.000	1077.000
44.000	1066.000
34.000	1064.000
12.000	1064.000
0.000	1066.000
0.000	1060.000
0.000	1014.000
100.000	1014.000
400.000	1014.000

Tension Crack

0.000	1058.000
12.000	1056.000
34.000	1056.000
44.000	1058.000
100.000	1069.000
143.000	1079.000
157.000	1085.000
192.000	1111.000
209.000	1121.000
221.000	1127.000
225.500	1127.500
229.000	1127.000
230.000	1126.500
233.500	1126.500
248.000	1126.500
254.000	1126.500
255.500	1133.000
260.500	1155.000
261.000	1159.000
284.000	1182.000
307.000	1202.000
340.000	1226.000
349.000	1234.000
356.000	1234.000
375.000	1234.000
400.000	1234.000

Support

260.632	1164.060
280.478	1161.579

Support

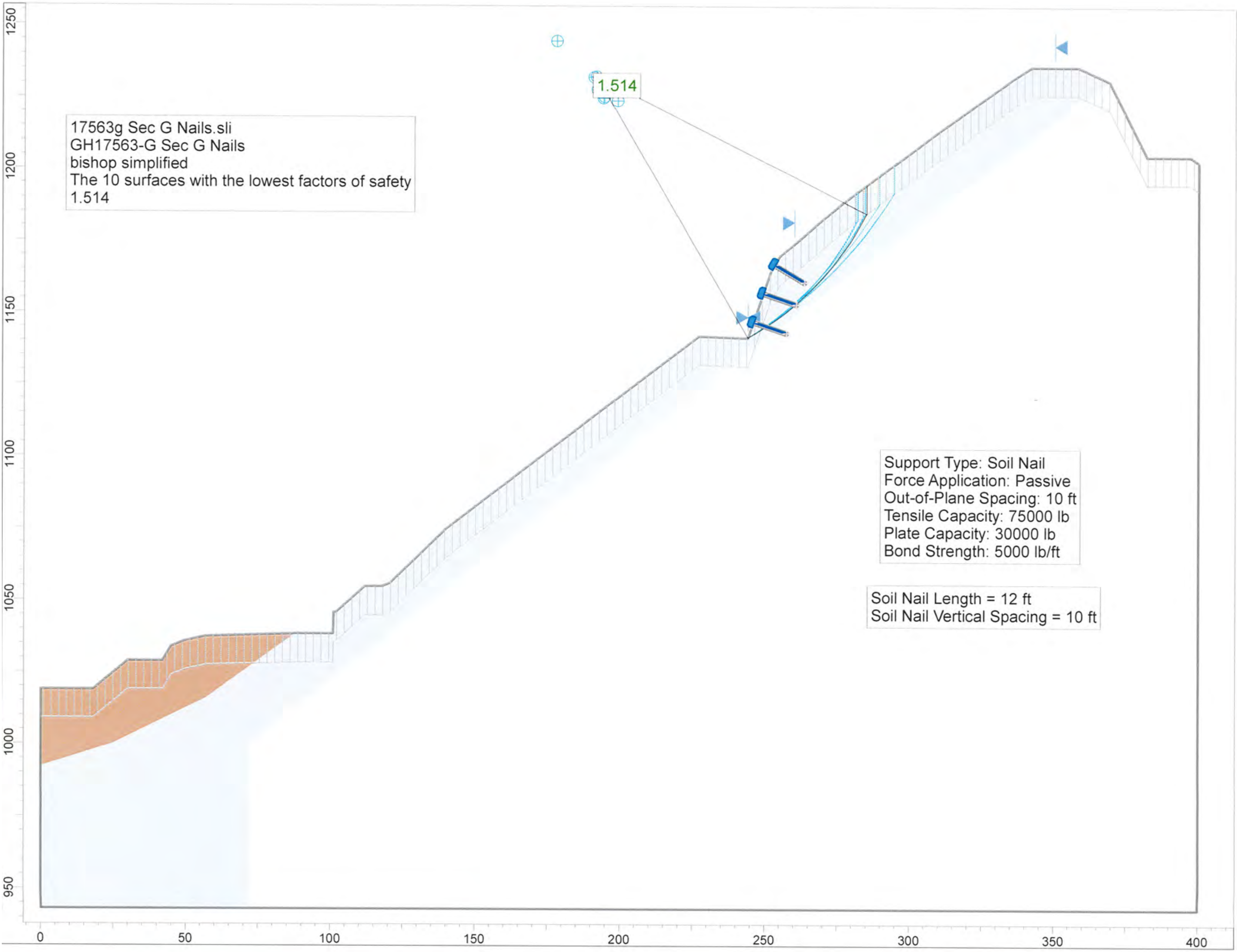
257.105	1148.060
276.607	1143.628

Support

258.923	1156.060
278.425	1151.628

Support

255.283	1140.060
274.771	1135.563



17563g Sec G Nails.sli
GH17563-G Sec G Nails
bishop simplified
The 10 surfaces with the lowest factors of safety
1.514
1.514
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft
Soil Nail Length = 12 ft
Soil Nail Vertical Spacing = 10 ft
1250
1200
1150
1100
1050
1000
950
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec G Nails.sli

Project Settings

Project Title: GH17563-G Sec G Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

Material Properties

Material: Soil
Strength Type: Mohr-Coulomb

Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 140 lb/ft3
Cohesion: 510 psf
Friction Angle: 44 degrees
Water Surface: None
Ru value: 0

Material: Deeper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 900 psf
Friction Angle: 45 degrees
Water Surface: None
Ru value: 0

Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 10 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.514250
Center: 191.647, 1232.246
Radius: 104.764
Left Slip Surface Endpoint: 244.000, 1141.500
Right Slip Surface Endpoint: 285.043, 1184.783
Left Slope Intercept: 244.000 1141.500
Right Slope Intercept: 285.043 1194.783
Resisting Moment=1.08578e+007 lb-ft
Driving Moment=7.17041e+006 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2447
Number of Invalid Surfaces: 2553

Error Codes:
Error Code -101 reported for 2318 surfaces
Error Code -113 reported for 235 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

0.000	992.000
25.000	1000.000
57.000	1016.000
88.000	1038.500

Material Boundary

72.000	1000.000
198.000	1100.000
253.000	1144.000
369.000	1231.000

Material Boundary

72.000	943.200
72.000	1000.000

External Boundary

400.000	1203.000
397.000	1205.000
382.000	1205.000
369.000	1231.000
358.000	1236.000
342.000	1236.000
335.000	1231.500
308.000	1212.000
276.000	1188.000
255.000	1170.000
252.000	1165.000
244.000	1141.500
229.000	1142.000
227.000	1142.000
140.000	1075.000
120.500	1056.000
118.000	1055.000
112.000	1055.000

102.000	1046.000
101.100	1046.000
101.000	1038.500
88.000	1038.500
57.000	1037.500
50.000	1036.000
45.000	1034.000
42.000	1029.000
30.000	1029.000
18.000	1019.000
0.000	1019.000
0.000	992.000
0.000	943.200
72.000	943.200
400.000	943.200

Tension Crack

0.000	1009.000
18.000	1009.000
30.000	1019.000
42.000	1019.000
45.000	1024.000
50.000	1026.000
57.000	1027.500
88.000	1028.500
101.000	1028.500
101.100	1036.000
102.000	1036.000
112.000	1045.000
118.000	1045.000
120.500	1046.000
140.000	1065.000
227.000	1132.000
229.000	1132.000
244.000	1131.500
252.000	1155.000
255.000	1160.000
276.000	1178.000
308.000	1202.000
335.000	1221.500
342.000	1226.000
358.000	1226.000
369.000	1221.000
382.000	1195.000
397.000	1195.000
400.000	1193.000

Support

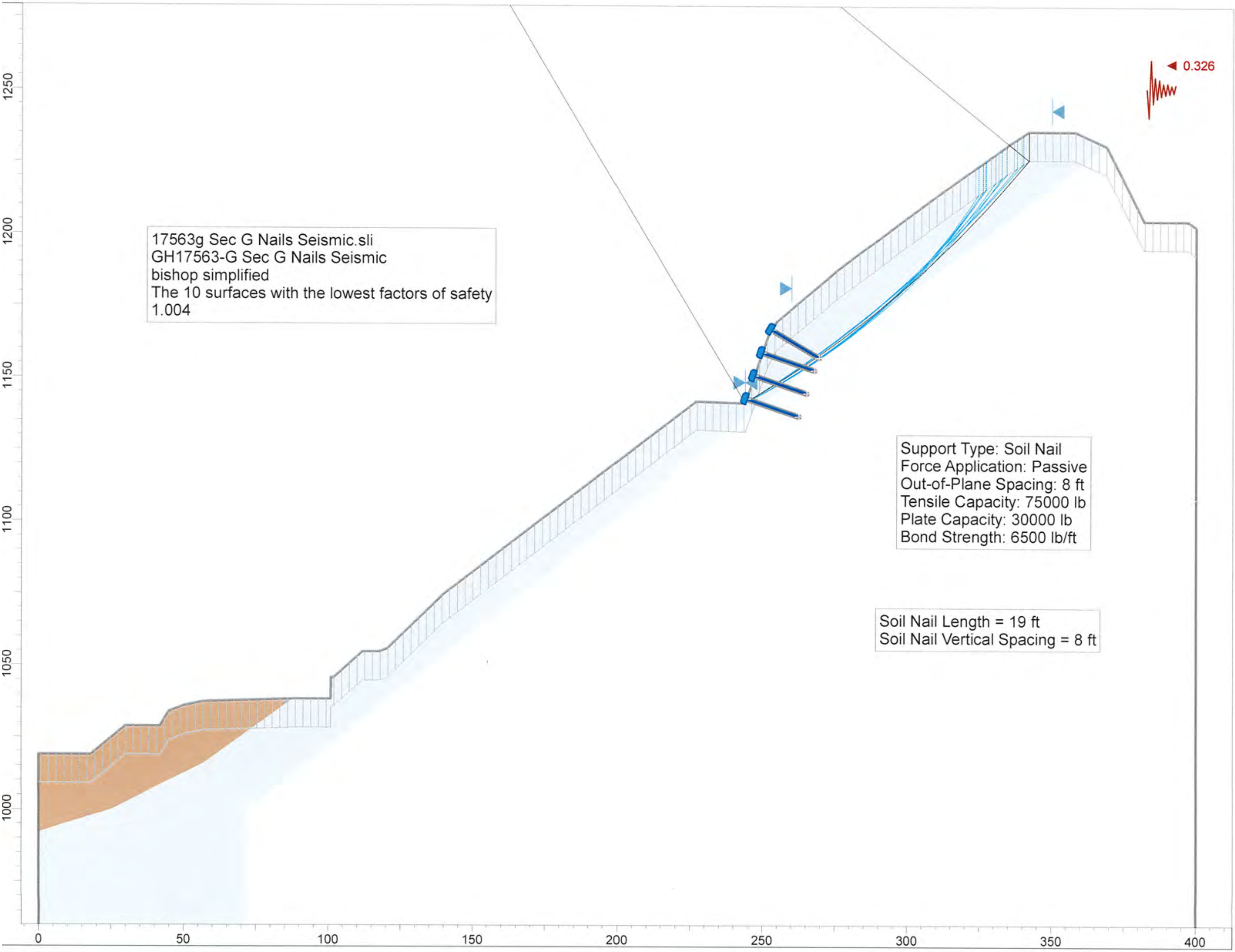
253.214	1167.024
263.504	1160.850

Support

245.880	1147.024
257.240	1143.157

Support

249.285	1157.024
260.645	1153.157


17563g Sec G Nails Seismic.sli
GH17563-G Sec G Nails Seismic
bishop simplified
The 10 surfaces with the lowest factors of safety
1.004
0.326
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 8 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft
Soil Nail Length = 19 ft
Soil Nail Vertical Spacing = 8 ft
1250
1200
1150
1100
1050
1000
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec G Nails Seismic.sli

Project Settings

Project Title: GH17563-G Sec G Nails Seismic
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

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

Loading

Seismic Load Coefficient (Horizontal): 0.326

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

Material Properties

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 140 lb/ft3
Cohesion: 510 psf
Friction Angle: 44 degrees
Water Surface: None
Ru value: 0

Material: Deeper Bedrock
Strength Type: Mohr-Coulomb
Unit Weight: 145 lb/ft3
Cohesion: 900 psf
Friction Angle: 45 degrees
Water Surface: None
Ru value: 0

Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 8 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.003690
Center: 57.511, 1457.017
Radius: 366.510
Left Slip Surface Endpoint: 244.000, 1141.500
Right Slip Surface Endpoint: 342.046, 1226.000
Left Slope Intercept: 244.000 1141.500
Right Slope Intercept: 342.046 1236.000
Resisting Moment=9.06041e+007 lb-ft
Driving Moment=9.02711e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 2447
Number of Invalid Surfaces: 2553
Error Codes:
Error Code -101 reported for 2318 surfaces
Error Code -113 reported for 235 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

0.000	992.000
25.000	1000.000
57.000	1016.000
88.000	1038.500

Material Boundary

72.000	1000.000
198.000	1100.000
253.000	1144.000
369.000	1231.000

Material Boundary

72.000	943.200
72.000	1000.000

External Boundary

400.000	1203.000
397.000	1205.000
382.000	1205.000
369.000	1231.000
358.000	1236.000
342.000	1236.000
335.000	1231.500
308.000	1212.000
276.000	1188.000
255.000	1170.000
252.000	1165.000
244.000	1141.500
229.000	1142.000
227.000	1142.000

140.000	1075.000
120.500	1056.000
118.000	1055.000
112.000	1055.000
102.000	1046.000
101.100	1046.000
101.000	1038.500
88.000	1038.500
57.000	1037.500
50.000	1036.000
45.000	1034.000
42.000	1029.000
30.000	1029.000
18.000	1019.000
0.000	1019.000
0.000	992.000
0.000	943.200
72.000	943.200
400.000	943.200

Tension Crack

0.000	1009.000
18.000	1009.000
30.000	1019.000
42.000	1019.000
45.000	1024.000
50.000	1026.000
57.000	1027.500
88.000	1028.500
101.000	1028.500
101.100	1036.000
102.000	1036.000
112.000	1045.000
118.000	1045.000
120.500	1046.000
140.000	1065.000
227.000	1132.000
229.000	1132.000
244.000	1131.500
252.000	1155.000
255.000	1160.000
276.000	1178.000
308.000	1202.000
335.000	1221.500
342.000	1226.000
358.000	1226.000
369.000	1221.000
382.000	1195.000
397.000	1195.000
400.000	1193.000

Support

253.214	1167.024
269.507	1157.248

Support

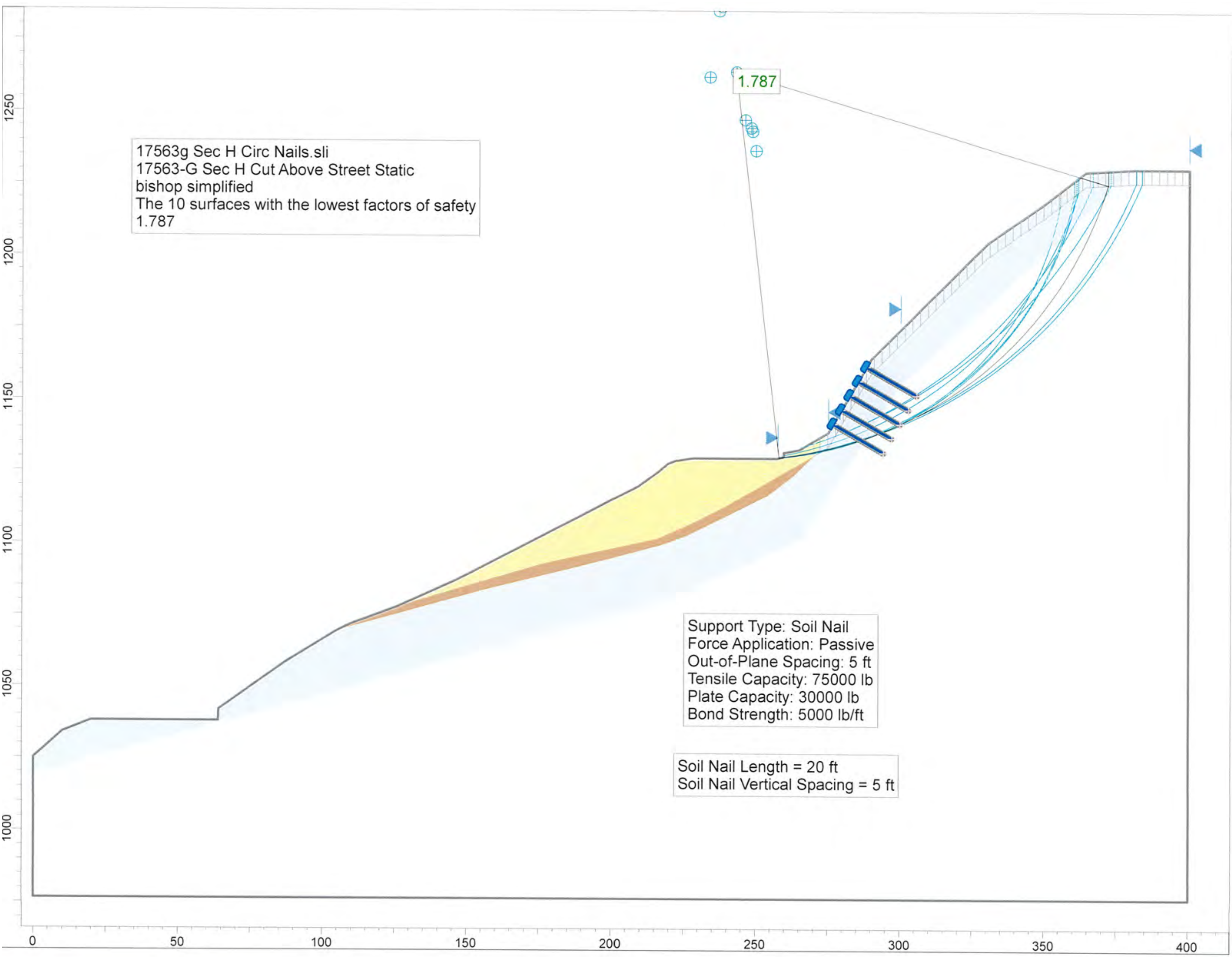
244.519	1143.024
262.505	1136.901

Support

247.242	1151.024
265.229	1144.901

Support

249.966	1159.024
267.952	1152.901


17563g Sec H Circ Nails.sli
17563-G Sec H Cut Above Street Static
bishop simplified
The 10 surfaces with the lowest factors of safety
1.787
1.787
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 5 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft
Soil Nail Length = 20 ft
Soil Nail Vertical Spacing = 5 ft
1250
1200
1150
1100
1050
1000
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec H Circ Nails.sli

Project Settings

Project Title: 17563-G Sec H Cut Above Street Static
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: Not Defined
Lower Angle: Not Defined
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: 1125
Minimum Depth: Not Defined

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

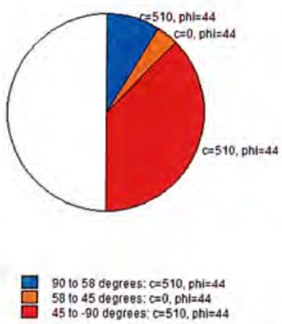
Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 130 lb/ft3
Cohesion: 240 psf
Friction Angle: 35 degrees
Water Surface: None

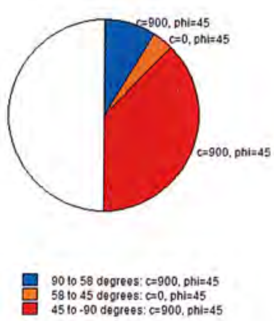
Ru value: 0

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Anisotropic function
Unit Weight: 140 lb/ft3
Water Surface: None
Ru value: 0



Material: Deeper Bedrock
Strength Type: Anisotropic function
Unit Weight: 145 lb/ft3
Water Surface: None
Ru value: 0



Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 5 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.787420
Center: 242.817, 1263.911
Radius: 134.655
Left Slip Surface Endpoint: 257.922, 1130.105
Right Slip Surface Endpoint: 371.866, 1225.463
Left Slope Intercept: 257.922 1130.105
Right Slope Intercept: 371.866 1230.463
Resisting Moment=6.55025e+007 lb-ft
Driving Moment=3.66464e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4984
Number of Invalid Surfaces: 16
Error Codes:
Error Code -103 reported for 7 surfaces
Error Code -113 reported for 9 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Tension Crack

270.000	1131.000
275.000	1134.000
290.000	1160.000
295.000	1165.000
330.000	1200.000
350.000	1214.000
364.000	1225.000
381.000	1226.000
400.000	1226.000

Material Boundary

126.000	1078.000
176.000	1093.000
216.000	1102.000
226.000	1106.500

239.000	1113.000
270.000	1131.000
275.000	1139.000

Material Boundary

105.000	1069.500
153.000	1083.000
200.000	1095.000
218.000	1100.000
226.000	1103.000
242.000	1111.000
254.000	1117.000
263.000	1124.000
270.000	1131.000

Material Boundary

0.000	1019.000
100.000	1047.000
220.000	1081.000
266.000	1102.000
300.000	1156.000
348.000	1200.000
381.000	1231.000

External Boundary

400.000	1231.000
381.000	1231.000
364.000	1230.000
350.000	1219.000
330.000	1205.000
295.000	1170.000
290.000	1165.000
275.000	1139.000
270.000	1136.000
265.000	1133.000
259.600	1132.000
259.500	1130.500
257.500	1130.000
228.000	1130.000
222.000	1129.000
219.500	1128.000
216.000	1125.000
209.000	1120.000
146.000	1087.000
126.000	1078.000
110.000	1072.000
105.000	1069.500
86.500	1058.000
64.100	1042.000
64.000	1038.000
20.000	1038.000
10.000	1034.000
0.000	1025.000
0.000	1019.000
0.000	976.600
400.000	976.600

Support

276.714	1141.971
294.038	1131.977

Support

279.599	1146.971
296.923	1136.977

Support

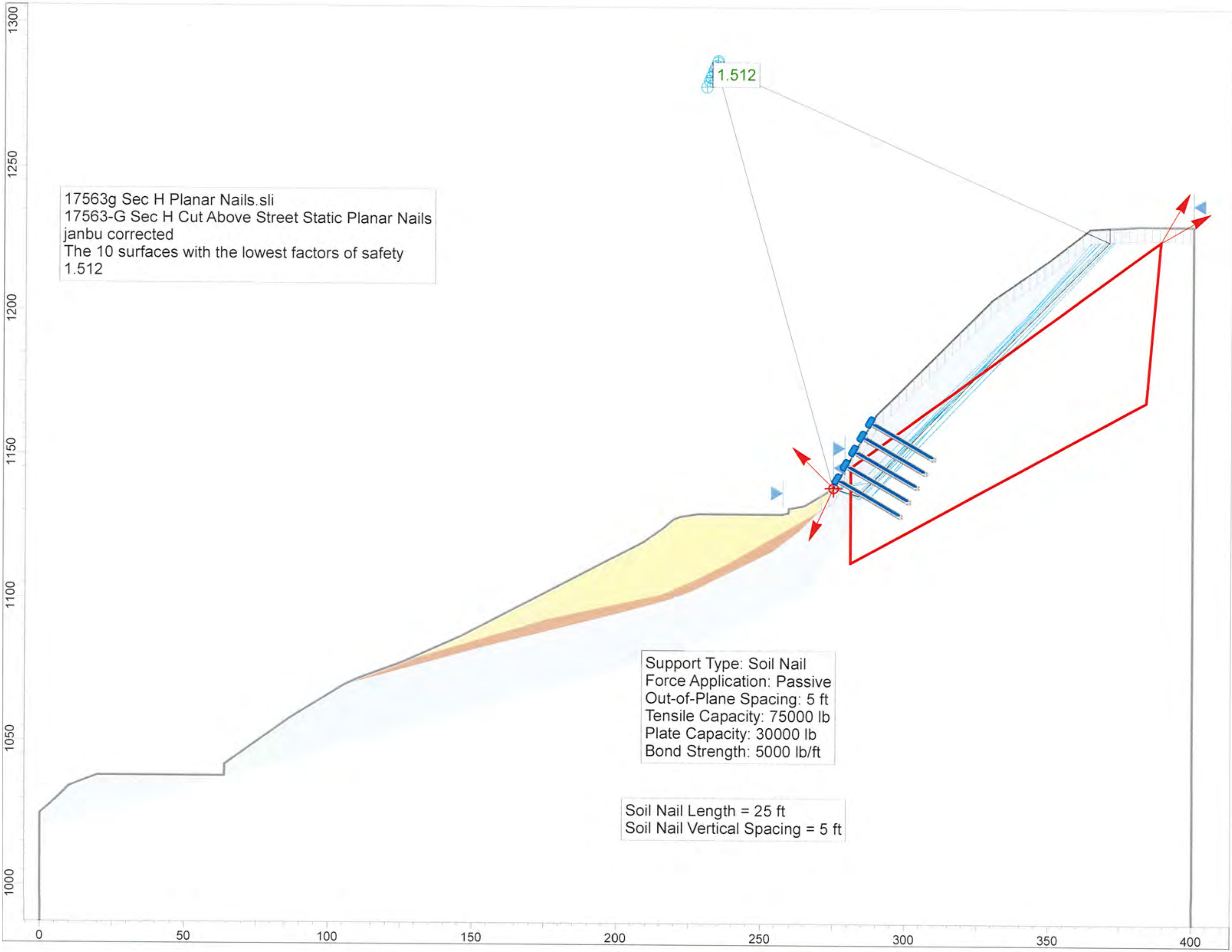
282.483	1151.971
299.807	1141.977

Support

285.368	1156.971
302.692	1146.977

Support

288.253	1161.971
305.576	1151.977


1.512
17563g Sec H Planar Nails.sli
17563-G Sec H Cut Above Street Static Planar Nails
janbu corrected
The 10 surfaces with the lowest factors of safety
1.512
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 5 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 5000 lb/ft
Soil Nail Length = 25 ft
Soil Nail Vertical Spacing = 5 ft
1300
1250
1200
1150
1100
1050
1000
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec H Planar Nails.sli

Project Settings

Project Title: 17563-G Sec H Cut Above Street Static Planar Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Janbu corrected

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 245
Right Projection Angle (Start Angle): 30
Right Projection Angle (End Angle): 60
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

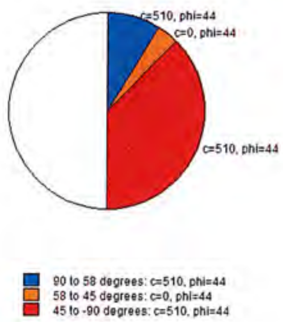
Material Properties

Material: Fill
Strength Type: Mohr-Coulomb
Unit Weight: 130 lb/ft3
Cohesion: 240 psf
Friction Angle: 35 degrees

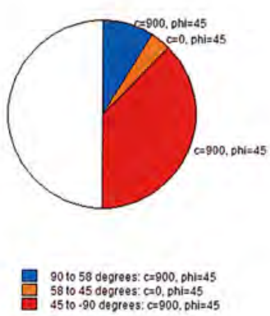
Water Surface: None
Ru value: 0

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Anisotropic function
Unit Weight: 140 lb/ft3
Water Surface: None
Ru value: 0



Material: Deeper Bedrock
Strength Type: Anisotropic function
Unit Weight: 145 lb/ft3
Water Surface: None
Ru value: 0



Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 5 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb

Bond Strength: 5000 lb/ft

Global Minimums

Method: janbu corrected
FS: 1.511770
Axis Location: 233.771, 1285.798
Left Slip Surface Endpoint: 275.000, 1139.000
Right Slip Surface Endpoint: 370.760, 1225.398
Left Slope Intercept: 275.000 1139.000
Right Slope Intercept: 370.760 1230.398
Resisting Horizontal Force=228608 lb
Driving Horizontal Force=151219 lb

Valid / Invalid Surfaces

Method: janbu corrected
Number of Valid Surfaces: 4420
Number of Invalid Surfaces: 580
Error Codes:
Error Code -108 reported for 116 surfaces
Error Code -111 reported for 86 surfaces
Error Code -112 reported for 76 surfaces
Error Code -1000 reported for 302 surfaces

Error Codes

The following errors were encountered during the computation:

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

-111 = safety factor equation did not converge

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

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

List of All Coordinates

Material Boundary

126.000	1078.000
176.000	1093.000
216.000	1102.000
226.000	1106.500
239.000	1113.000

270.000	1131.000
275.000	1139.000

Material Boundary

105.000	1069.500
153.000	1083.000
200.000	1095.000
218.000	1100.000
226.000	1103.000
242.000	1111.000
254.000	1117.000
263.000	1124.000
270.000	1131.000

Material Boundary

0.000	1019.000
100.000	1047.000
220.000	1081.000
266.000	1102.000
300.000	1156.000
348.000	1200.000
381.000	1231.000

External Boundary

400.000	1231.000
381.000	1231.000
364.000	1230.000
350.000	1219.000
330.000	1205.000
295.000	1170.000
290.000	1165.000
275.000	1139.000
270.000	1136.000
265.000	1133.000
259.600	1132.000
259.500	1130.500
257.500	1130.000
228.000	1130.000
222.000	1129.000
219.500	1128.000
216.000	1125.000
209.000	1120.000
146.000	1087.000
126.000	1078.000
110.000	1072.000
105.000	1069.500
86.500	1058.000
64.100	1042.000
64.000	1038.000
20.000	1038.000
10.000	1034.000
0.000	1025.000
0.000	1019.000
0.000	976.600
400.000	976.600

Tension Crack

270.000	1131.000
275.000	1134.000
290.000	1160.000
295.000	1165.000
330.000	1200.000
350.000	1214.000
364.000	1225.000
381.000	1226.000
400.000	1226.000

Focus/Block Search Window

280.971	1146.288
280.971	1113.034
383.590	1169.409
388.527	1225.525

Focus/Block Search Point

275.000	1139.000

Support

276.714	1141.971
298.369	1129.478

Support

279.599	1146.971
301.253	1134.478

Support

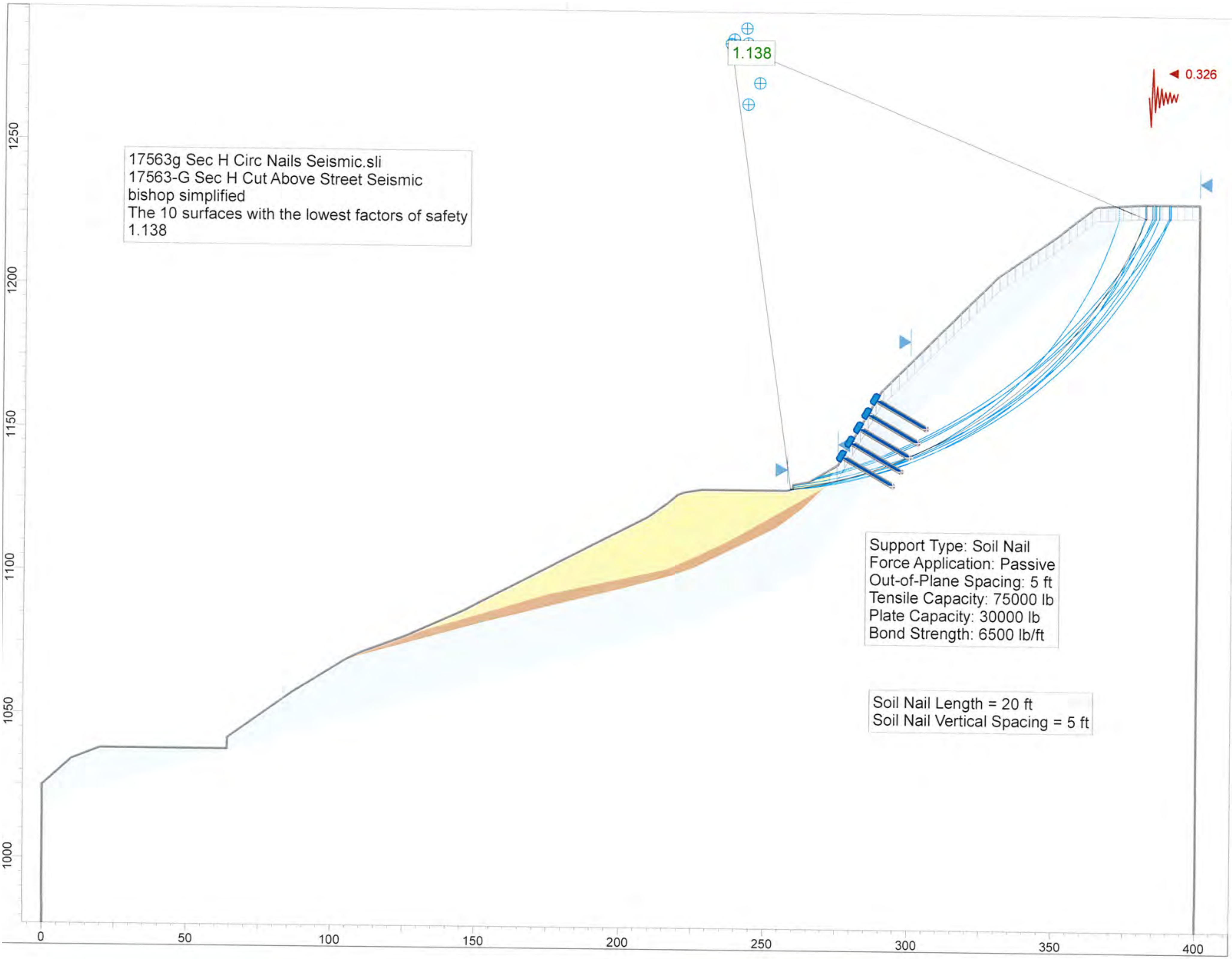
282.483	1151.971
304.138	1139.478

Support

285.368	1156.971
307.023	1144.478

Support

288.253	1161.971
309.907	1149.478


17563g Sec H Circ Nails Seismic.sli
17563-G Sec H Cut Above Street Seismic
bishop simplified
The 10 surfaces with the lowest factors of safety
1.138
1.138
0.326
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 5 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft
Soil Nail Length = 20 ft
Soil Nail Vertical Spacing = 5 ft
1250
1200
1150
1100
1050
1000
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec H Circ Nails Seismic.sli

Project Settings

Project Title: 17563-G Sec H Cut Above Street Seismic
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Bishop simplified

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

Surface Options

Surface Type: Circular
Search Method: Slope Search
Number of Surfaces: 5000
Upper Angle: Not Defined
Lower Angle: Not Defined
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: 1125
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.326

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

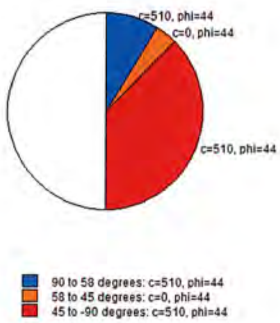
Material Properties

Material: Fill
Strength Type: Mohr-Coulomb

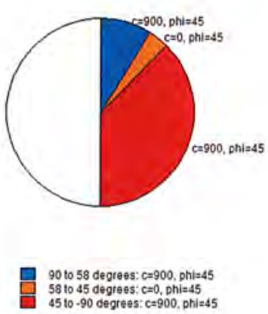
Unit Weight: 130 lb/ft3
Cohesion: 240 psf
Friction Angle: 35 degrees
Water Surface: None
Ru value: 0

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Anisotropic function
Unit Weight: 140 lb/ft3
Water Surface: None
Ru value: 0



Material: Deeper Bedrock
Strength Type: Anisotropic function
Unit Weight: 145 lb/ft3
Water Surface: None
Ru value: 0



Support Properties

Support: Soil Nails
Soil Nails
Support Type: Soil Nail
Force Application: Passive

Out-of-Plane Spacing: 5 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft

Global Minimums

Method: bishop simplified
FS: 1.138190
Center: 236.813, 1285.034
Radius: 156.275
Left Slip Surface Endpoint: 258.695, 1130.299
Right Slip Surface Endpoint: 381.509, 1226.000
Left Slope Intercept: 258.695 1130.299
Right Slope Intercept: 381.509 1231.000
Resisting Moment=7.35111e+007 lb-ft
Driving Moment=6.45857e+007 lb-ft

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4984
Number of Invalid Surfaces: 16
Error Codes:
Error Code -103 reported for 7 surfaces
Error Code -113 reported for 9 surfaces

Error Codes

The following errors were encountered during the computation:

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

-113 = Surface intersects outside slope limits.

List of All Coordinates

Material Boundary

126.000	1078.000
176.000	1093.000
216.000	1102.000
226.000	1106.500
239.000	1113.000
270.000	1131.000
275.000	1139.000

Material Boundary

105.000	1069.500
153.000	1083.000

200.000	1095.000
218.000	1100.000
226.000	1103.000
242.000	1111.000
254.000	1117.000
263.000	1124.000
270.000	1131.000

Material Boundary

0.000	1019.000
100.000	1047.000
220.000	1081.000
266.000	1102.000
300.000	1156.000
348.000	1200.000
381.000	1231.000

External Boundary

400.000	1231.000
381.000	1231.000
364.000	1230.000
350.000	1219.000
330.000	1205.000
295.000	1170.000
290.000	1165.000
275.000	1139.000
270.000	1136.000
265.000	1133.000
259.600	1132.000
259.500	1130.500
257.500	1130.000
228.000	1130.000
222.000	1129.000
219.500	1128.000
216.000	1125.000
209.000	1120.000
146.000	1087.000
126.000	1078.000
110.000	1072.000
105.000	1069.500
86.500	1058.000
64.100	1042.000
64.000	1038.000
20.000	1038.000
10.000	1034.000
0.000	1025.000
0.000	1019.000
0.000	976.600
400.000	976.600

Tension Crack

270.000	1131.000
275.000	1134.000
290.000	1160.000
295.000	1165.000
330.000	1200.000

350.000	1214.000
364.000	1225.000
381.000	1226.000
400.000	1226.000

<u>Support</u>

276.714	1141.971
294.038	1131.977

<u>Support</u>

279.599	1146.971
296.923	1136.977

<u>Support</u>

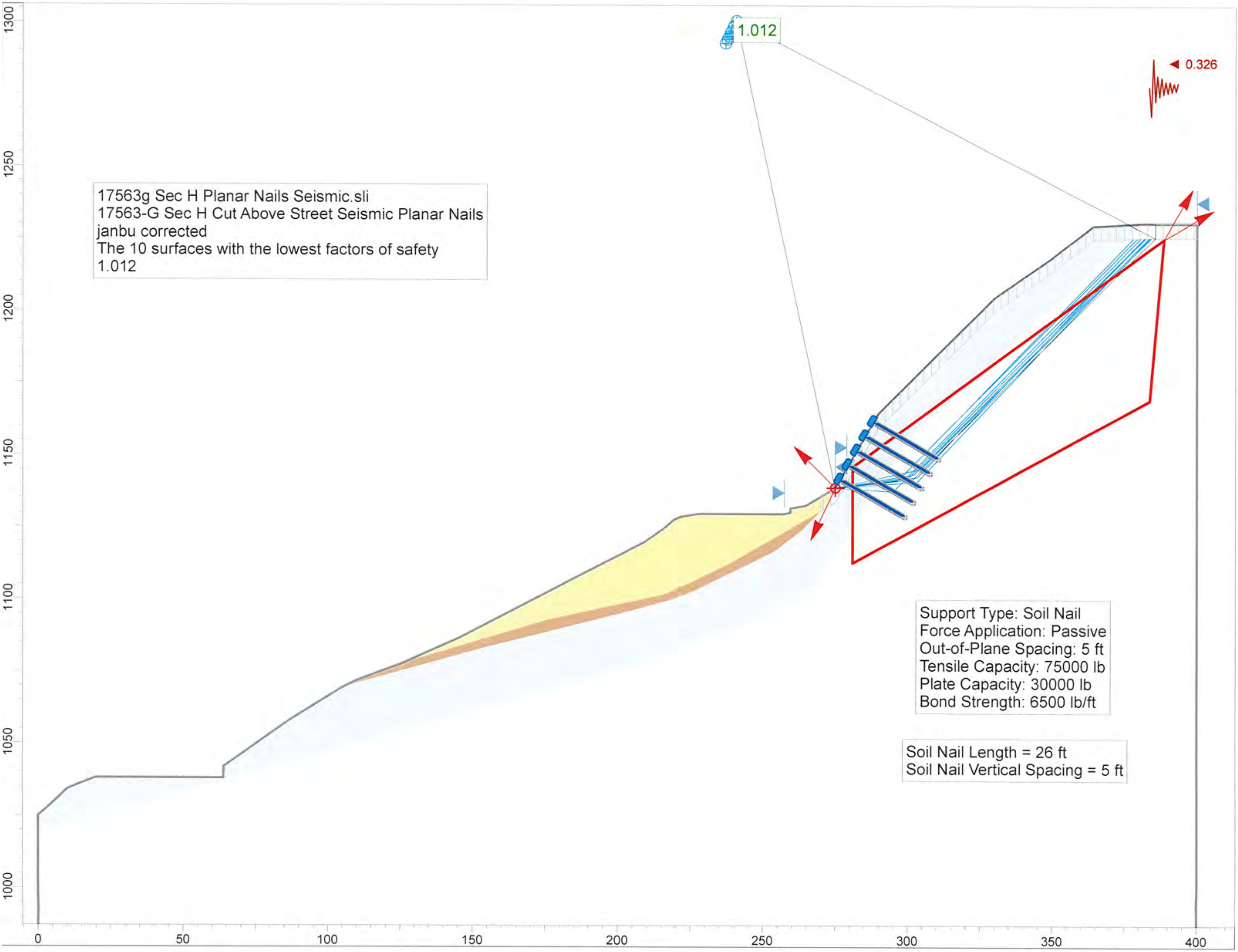
282.483	1151.971
299.807	1141.977

<u>Support</u>

285.368	1156.971
302.692	1146.977

<u>Support</u>

288.253	1161.971
305.576	1151.977



17563g Sec H Planar Nails Seismic.sli
17563-G Sec H Cut Above Street Seismic Planar Nails
janbu corrected
The 10 surfaces with the lowest factors of safety
1.012
1.012
0.326
Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 5 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft
Soil Nail Length = 26 ft
Soil Nail Vertical Spacing = 5 ft
1300
1250
1200
1150
1100
1050
1000
0
50
100
150
200
250
300
350
400

Slide Analysis Information

Document Name

File Name: 17563g Sec H Planar Nails Seismic.sli

Project Settings

Project Title: 17563-G Sec H Cut Above Street Seismic Planar Nails
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 9.81 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: On
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: rand

Analysis Methods

Analysis Methods used:
Janbu corrected

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

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 245
Right Projection Angle (Start Angle): 30
Right Projection Angle (End Angle): 60
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.326

Tension Crack

Tension crackWater level: filled with water to a depth of 0 ft

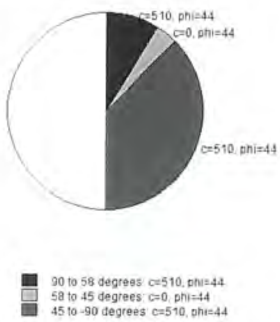
Material Properties

Material: Fill

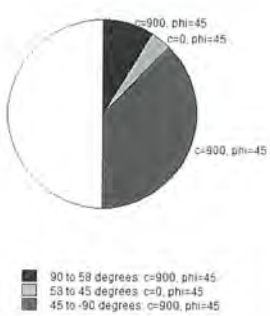
Strength Type: Mohr-Coulomb
Unit Weight: 130 lb/ft3
Cohesion: 240 psf
Friction Angle: 35 degrees
Water Surface: None
Ru value: 0

Material: Soil
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 85 psf
Friction Angle: 37 degrees
Water Surface: None
Ru value: 0

Material: Upper Bedrock
Strength Type: Anisotropic function
Unit Weight: 140 lb/ft3
Water Surface: None
Ru value: 0



Material: Deeper Bedrock
Strength Type: Anisotropic function
Unit Weight: 145 lb/ft3
Water Surface: None
Ru value: 0



Support Properties

Support: Soil Nails
Soil Nails

Support Type: Soil Nail
Force Application: Passive
Out-of-Plane Spacing: 5 ft
Tensile Capacity: 75000 lb
Plate Capacity: 30000 lb
Bond Strength: 6500 lb/ft

Global Minimums

Method: janbu corrected
FS: 1.011980
Axis Location: 240.823, 1300.645
Left Slip Surface Endpoint: 275.000, 1139.000
Right Slip Surface Endpoint: 385.651, 1226.000
Left Slope Intercept: 275.000 1139.000
Right Slope Intercept: 385.651 1231.000
Resisting Horizontal Force=309790 lb
Driving Horizontal Force=306122 lb

Valid / Invalid Surfaces

Method: janbu corrected
Number of Valid Surfaces: 4385
Number of Invalid Surfaces: 615
Error Codes:
Error Code -108 reported for 47 surfaces
Error Code -111 reported for 127 surfaces
Error Code -112 reported for 139 surfaces
Error Code -1000 reported for 302 surfaces

Error Codes

The following errors were encountered during the computation:

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

-111 = safety factor equation did not converge

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

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

List of All Coordinates

Material Boundary

126.000	1078.000
176.000	1093.000
216.000	1102.000
226.000	1106.500
239.000	1113.000
270.000	1131.000
275.000	1139.000

Material Boundary

105.000	1069.500
153.000	1083.000
200.000	1095.000
218.000	1100.000
226.000	1103.000
242.000	1111.000
254.000	1117.000
263.000	1124.000
270.000	1131.000

Material Boundary

0.000	1019.000
100.000	1047.000
220.000	1081.000
266.000	1102.000
300.000	1156.000
348.000	1200.000
381.000	1231.000

External Boundary

400.000	1231.000
381.000	1231.000
364.000	1230.000
350.000	1219.000
330.000	1205.000
295.000	1170.000
290.000	1165.000
275.000	1139.000
270.000	1136.000
265.000	1133.000
259.600	1132.000
259.500	1130.500
257.500	1130.000
228.000	1130.000
222.000	1129.000
219.500	1128.000
216.000	1125.000
209.000	1120.000
146.000	1087.000
126.000	1078.000
110.000	1072.000
105.000	1069.500
86.500	1058.000
64.100	1042.000
64.000	1038.000
20.000	1038.000
10.000	1034.000

0.000	1025.000
0.000	1019.000
0.000	976.600
400.000	976.600

Tension Crack

270.000	1131.000
275.000	1134.000
290.000	1160.000
295.000	1165.000
330.000	1200.000
350.000	1214.000
364.000	1225.000
381.000	1226.000
400.000	1226.000

Focus/Block Search Window

280.971	1146.288
280.971	1113.034
383.590	1169.409
388.527	1225.525

Focus/Block Search Point

275.000	1139.000

Support

276.714	1141.971
299.235	1128.979

Support

279.599	1146.971
302.120	1133.979

Support

282.483	1151.971
305.004	1138.979

Support

285.368	1156.971
307.889	1143.979

Support

288.253	1161.971
310.774	1148.979

MAPPED ATTITUDES

OF

AREAS 1 through 9

MAPPED ATTITUDE		DIP DIRECTION	DIP
1	J	180	65
2	J	190	80
3	Fo	45	24
4	J	210	41
5	Fa	10	58
6	J	95	61
7	Fo	350	33
8	J	185	58
9	Fo	30	22
10	J	120	65
11	J	20	70
12	J	190	44
13	J	100	66
14	Fa	120	43
15	Fa	205	36
16	Fo	70	44
17	J	135	72
18	Fo	55	38
19	V	120	45
20	J	330	69
21	Fo	30	35
22	V	120	55
23	J	150	65
24	J	320	87
25	V	190	24
26	Fo	15	19
27	J	90	35

MAPPED ATTITUDE		DIP DIRECTION	DIP
28	Fo	15	19
29	J	330	90
30	Fo	80	44
31	J	150	79
32	V	335	75
33	Fa	340	70
34	Fa	310	71
35	Fo	60	48
36	J	70	63
37	Fo	45	25
38	J	210	52
39	J	35	61
40	J	150	67
41	Fo	35	38
42	J	240	19
43	J	325	75
44	Fo	15	33
45	J	170	58
46	J	160	84
47	J	120	78
48	J	130	30
49	Fa	160	40
50	Fa	130	79
51	J	160	79
52	Fo	55	23
53	J	25	61
54	Fo	50	23

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Mapped Attitudes**

MAPPED ATTITUDES

OF

AREAS 1 through 9 (continued)

MAPPED ATTITUDE		DIP DIRECTION	DIP
54	Fo	50	23
55	Fo	30	21
56	J	170	43
57	J	310	56
58	J	135	78
59	Fo	15	22
60	Fo	20	30
61	J	115	70
62	Fo	65	46
63	Fa	30	80
64	V	165	44
65	Fo	50	41
66	J	35	54
67	J	215	49
68	J	5	83
69	Fo	45	47
70	V	155	75
71	J	25	60
72	J	165	77
73	Fo	5	40
74	J	50	88
75	J	35	90
76	V	25	47
77	J	310	85
78	Fo	50	44
79	J	185	54
80	V	15	27

MAPPED ATTITUDE		DIP DIRECTION	DIP
81	Fo	40	35
82	J	300	82
83	Fa	155	83
84	J	140	55
85	J	35	62
86	Fo	30	7
87	J	215	65
88	J	300	77
89	Fo	25	30
90	J	180	62
91	J	325	75
92	Fo	45	25
93	J	300	71
94	J	155	50
95	Fo	20	22
96	Fo	30	34
97	J	25	90
98	J	280	79
99	Fo	25	42
100	J	310	67
101	J	145	67
102	V	80	28
103	Fo	55	29

Joint=J

Foliation=Fo

Fault=Fa

Vein=V

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Mapped Attitudes**

MAPPED ATTITUDES

OF

AREA 1

MAPPED ATTITUDE		DIP DIRECTION	DIP
1	J	180	65
2	J	190	80
3	Fo	45	24
4	J	210	41
5	Fa	10	58
36	J	70	63
37	Fo	45	25
38	J	210	52
39	J	35	61
40	J	150	67
41	Fo	35	38
42	J	240	19
43	J	325	75

MAPPED ATTITUDE		DIP DIRECTION	DIP
44	Fo	15	33
45	J	170	58
46	J	160	84
47	J	120	78
48	J	130	30
49	Fa	160	40
50	Fa	130	79
51	J	160	79
52	Fo	55	23
53	53	53	61
54	54	54	23

Joint=J
Foliation=Fo
Fault=Fa
Vein=V

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT **A&T Development**
	LOCATION	GH **17563-G**
	Blue Heights Drive	SUBJECT **Mapped Attitudes Area 1**

Plane Failure Analysis Input Data

(H) Height = 15 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 52 °
(CO) Cohesive Strength of Failure Surface = 32 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 140 lb(f)/ft ³
(GW) Density of Water = 0 lb(f)/ft ³
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 19.04 ft ²
(W) Weight of Slice = 3211.98 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 3.06 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 1

Plane Failure Analysis Input Data

(H) Height = 20 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 52 °
(CO) Cohesive Strength of Failure Surface = 44 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 140 lb(f)/ft ³
(GW) Density of Water = 0 lb(f)/ft ³
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 25.38 ft ²
(W) Weight of Slice = 5710.19 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 4.08 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 1

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 52 °
(CO) Cohesive Strength of Failure Surface = 54 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 140 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

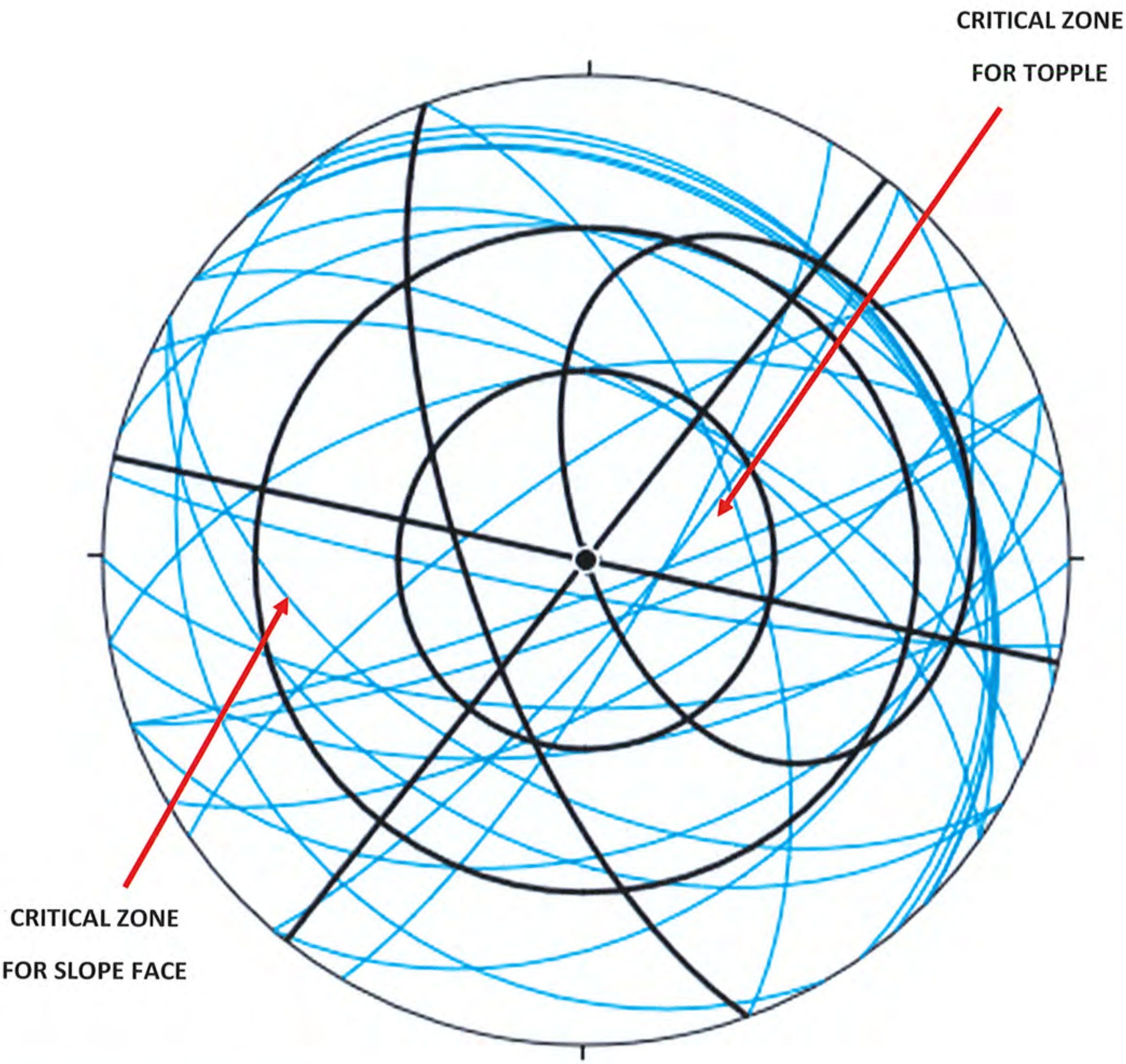
Plane Failure Analysis Output Data

(A) Contact Area = 31.73 ft ^{2}
(W) Weight of Slice = 8922.17 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 5.1 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 1

GREAT CIRCLE PLOT

OF

AREA 1A



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
250	70

Grover-Hollingsworth and Associates, Inc.

BY **AJL**	DATE **4/2017**	CLIENT	**A&T Development**
LOCATION		GH	**17563-G**
Blue Heights Drive		SUBJECT	**Great Circle Plot Area 1a**

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 80 °
(E1) Dip Direction = 190 °
Plane 2 : (D2) Dip Value = 75 °
(E2) Dip Direction = 325 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.98
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 67 °
(E2) Dip Direction = 150 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.01
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

```
Plane 1 :  (D1) Dip Value = 41 °
           (E1) Dip Direction = 210 °
Plane 2 :  (D2) Dip Value = 78 °
           (E2) Dip Direction = 120 °
Plane 3 :  (D3) Dip Value = 70 °
           (E3) Dip Direction = 250 °
Plane 4 :  (D4) Dip Value = 70 °
           (E4) Dip Direction = 250 °

Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
           (P1) Friction Angle = 36 °
Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
           (P2) Friction Angle = 36 °
```

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 40 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 67 °
(E2) Dip Direction = 150 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :	(D1) Dip Value = 52 °
	(E1) Dip Direction = 210 °
Plane 2 :	(D2) Dip Value = 58 °
	(E2) Dip Direction = 170 °
Plane 3 :	(D3) Dip Value = 70 °
	(E3) Dip Direction = 250 °
Plane 4 :	(D4) Dip Value = 70 °
	(E4) Dip Direction = 250 °

Plane 1 :	(C1) Cohesion = 0 lb(f)/ft ^{2}
	(P1) Friction Angle = 36 °
Plane 2 :	(C2) Cohesion = 0 lb(f)/ft ^{2}
	(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 75 °
(E2) Dip Direction = 325 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.08
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.07
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 78 °
(E2) Dip Direction = 120 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :	(D1) Dip Value = 52 °
	(E1) Dip Direction = 210 °
Plane 2 :	(D2) Dip Value = 79 °
	(E2) Dip Direction = 130 °
Plane 3 :	(D3) Dip Value = 70 °
	(E3) Dip Direction = 250 °
Plane 4 :	(D4) Dip Value = 70 °
	(E4) Dip Direction = 250 °

Plane 1 :	(C1) Cohesion = 0 lb(f)/ft ^{2}
	(P1) Friction Angle = 36 °
Plane 2 :	(C2) Cohesion = 0 lb(f)/ft ^{2}
	(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

```
        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 65 °
                   (E1) Dip Direction = 180 °
        Plane 2 :  (D2) Dip Value = 52 °
                   (E2) Dip Direction = 210 °
        Plane 3 :  (D3) Dip Value = 70 °
                   (E3) Dip Direction = 250 °
        Plane 4 :  (D4) Dip Value = 70 °
                   (E4) Dip Direction = 250 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 36 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 36 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
        (F) Factor of Safety = 1.55
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

```
        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 65 °
                   (E1) Dip Direction = 180 °
        Plane 2 :  (D2) Dip Value = 41 °
                   (E2) Dip Direction = 210 °
        Plane 3 :  (D3) Dip Value = 70 °
                   (E3) Dip Direction = 250 °
        Plane 4 :  (D4) Dip Value = 70 °
                   (E4) Dip Direction = 250 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 36 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 36 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
        (F) Factor of Safety = 2.7
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

```
Rapid Wedge Failure Analysis Input Data

        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 65 °
                   (E1) Dip Direction = 180 °
        Plane 2 :  (D2) Dip Value = 75 °
                   (E2) Dip Direction = 325 °
        Plane 3 :  (D3) Dip Value = 70 °
                   (E3) Dip Direction = 250 °
        Plane 4 :  (D4) Dip Value = 70 °
                   (E4) Dip Direction = 250 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 36 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 36 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

        (F) Factor of Safety = 2
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

```
Plane 1 :  (D1) Dip Value = 65 °
           (E1) Dip Direction = 180 °
Plane 2 :  (D2) Dip Value = 84 °
           (E2) Dip Direction = 160 °
Plane 3 :  (D3) Dip Value = 70 °
           (E3) Dip Direction = 250 °
Plane 4 :  (D4) Dip Value = 70 °
           (E4) Dip Direction = 250 °


Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
           (P1) Friction Angle = 36 °
Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
           (P2) Friction Angle = 36 °
```

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 3.12
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 65 °
(E1) Dip Direction = 180 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.65
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 84 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.63
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.56
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 67 °
(E1) Dip Direction = 150 °
Plane 2 : (D2) Dip Value = 58 °
(E2) Dip Direction = 170 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.17
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 67 °
(E1) Dip Direction = 150 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.36
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 75 °
(E1) Dip Direction = 325 °
Plane 2 : (D2) Dip Value = 84 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 4.65
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 58 °
(E1) Dip Direction = 170 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.58
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 75 °
(E2) Dip Direction = 325 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.83
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :	(D1) Dip Value = 52 °
	(E1) Dip Direction = 210 °
Plane 2 :	(D2) Dip Value = 84 °
	(E2) Dip Direction = 160 °
Plane 3 :	(D3) Dip Value = 70 °
	(E3) Dip Direction = 250 °
Plane 4 :	(D4) Dip Value = 70 °
	(E4) Dip Direction = 250 °

Plane 1 :	(C1) Cohesion = 0 lb(f)/ft ²
	(P1) Friction Angle = 44 °
Plane 2 :	(C2) Cohesion = 0 lb(f)/ft ²
	(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.57
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 58 °
(E2) Dip Direction = 170 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 250 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 250 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

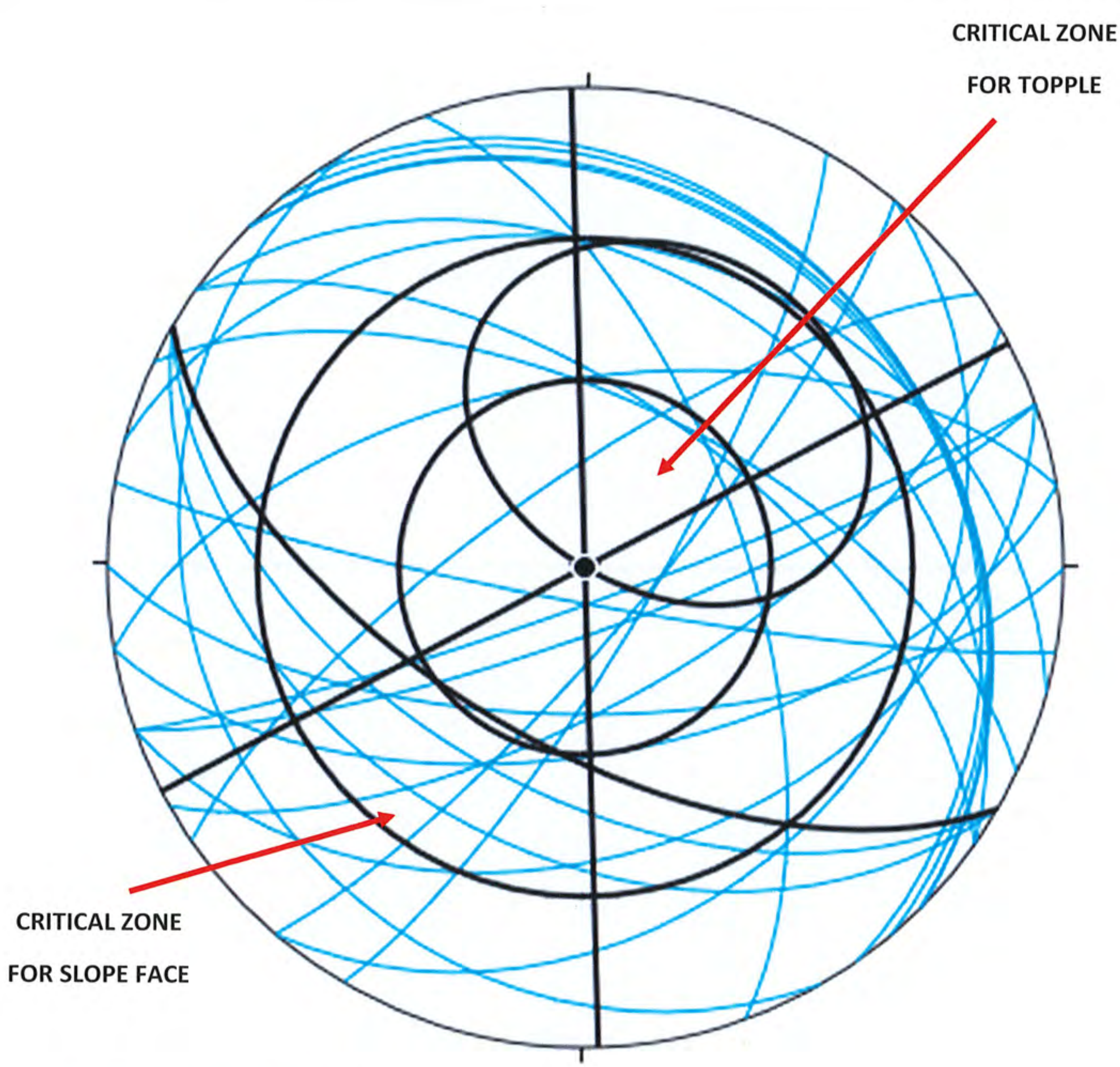
The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.97
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

GREAT CIRCLE PLOT
OF
AREA 1B



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
210	60

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT **A&T Development**
	LOCATION	GH **17563-G**
	Blue Heights Drive	SUBJECT **Great Circle Plot Area 1b**

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 84 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 58 °
(E1) Dip Direction = 170 °
Plane 2 : (D2) Dip Value = 78 °
(E2) Dip Direction = 120 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.79
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :	(D1) Dip Value = 41 °
	(E1) Dip Direction = 210 °
Plane 2 :	(D2) Dip Value = 78 °
	(E2) Dip Direction = 120 °
Plane 3 :	(D3) Dip Value = 60 °
	(E3) Dip Direction = 210 °
Plane 4 :	(D4) Dip Value = 60 °
	(E4) Dip Direction = 210 °

Plane 1 :	(C1) Cohesion = 0 lb(f)/ft ²
	(P1) Friction Angle = 36 °
Plane 2 :	(C2) Cohesion = 0 lb(f)/ft ²
	(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.93
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 40 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.98
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :	(D1) Dip Value = 52 °
	(E1) Dip Direction = 210 °
Plane 2 :	(D2) Dip Value = 58 °
	(E2) Dip Direction = 170 °
Plane 3 :	(D3) Dip Value = 60 °
	(E3) Dip Direction = 210 °
Plane 4 :	(D4) Dip Value = 60 °
	(E4) Dip Direction = 210 °

Plane 1 :	(C1) Cohesion = 0 lb(f)/ft ^{2}
	(P1) Friction Angle = 36 °
Plane 2 :	(C2) Cohesion = 0 lb(f)/ft ^{2}
	(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :	(D1) Dip Value = 52 °
	(E1) Dip Direction = 210 °
Plane 2 :	(D2) Dip Value = 84 °
	(E2) Dip Direction = 160 °
Plane 3 :	(D3) Dip Value = 60 °
	(E3) Dip Direction = 210 °
Plane 4 :	(D4) Dip Value = 60 °
	(E4) Dip Direction = 210 °

Plane 1 :	(C1) Cohesion = 0 lb(f)/ft ^{2}
	(P1) Friction Angle = 36 °
Plane 2 :	(C2) Cohesion = 0 lb(f)/ft ^{2}
	(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 40 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.87
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 78 °
(E2) Dip Direction = 120 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 58 °
(E1) Dip Direction = 170 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.58
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

```
Plane 1 :  (D1) Dip Value = 41 °
           (E1) Dip Direction = 210 °
Plane 2 :  (D2) Dip Value = 75 °
           (E2) Dip Direction = 325 °
Plane 3 :  (D3) Dip Value = 60 °
           (E3) Dip Direction = 210 °
Plane 4 :  (D4) Dip Value = 60 °
           (E4) Dip Direction = 210 °

Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
           (P1) Friction Angle = 44 °
Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
           (P2) Friction Angle = 44 °
```

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.83
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

```
Rapid Wedge Failure Analysis Input Data

        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 41 °
                   (E1) Dip Direction = 210 °
        Plane 2 :  (D2) Dip Value = 58 °
                   (E2) Dip Direction = 170 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 210 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 210 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 44 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 44 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

        (F) Factor of Safety = 1.97
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 75 °
(E1) Dip Direction = 325 °
Plane 2 : (D2) Dip Value = 65 °
(E2) Dip Direction = 180 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

```
        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 84 °
                   (E1) Dip Direction = 160 °
        Plane 2 :  (D2) Dip Value = 65 °
                   (E2) Dip Direction = 180 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 210 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 210 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 36 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 36 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
        (F) Factor of Safety = 3.12
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 79 °
(E1) Dip Direction = 160 °
Plane 2 : (D2) Dip Value = 65 °
(E2) Dip Direction = 180 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.65
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 67 °
(E1) Dip Direction = 150 °
Plane 2 : (D2) Dip Value = 58 °
(E2) Dip Direction = 170 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.17
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 67 °
(E1) Dip Direction = 150 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.36
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 75 °
(E1) Dip Direction = 325 °
Plane 2 : (D2) Dip Value = 84 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 210 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 210 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

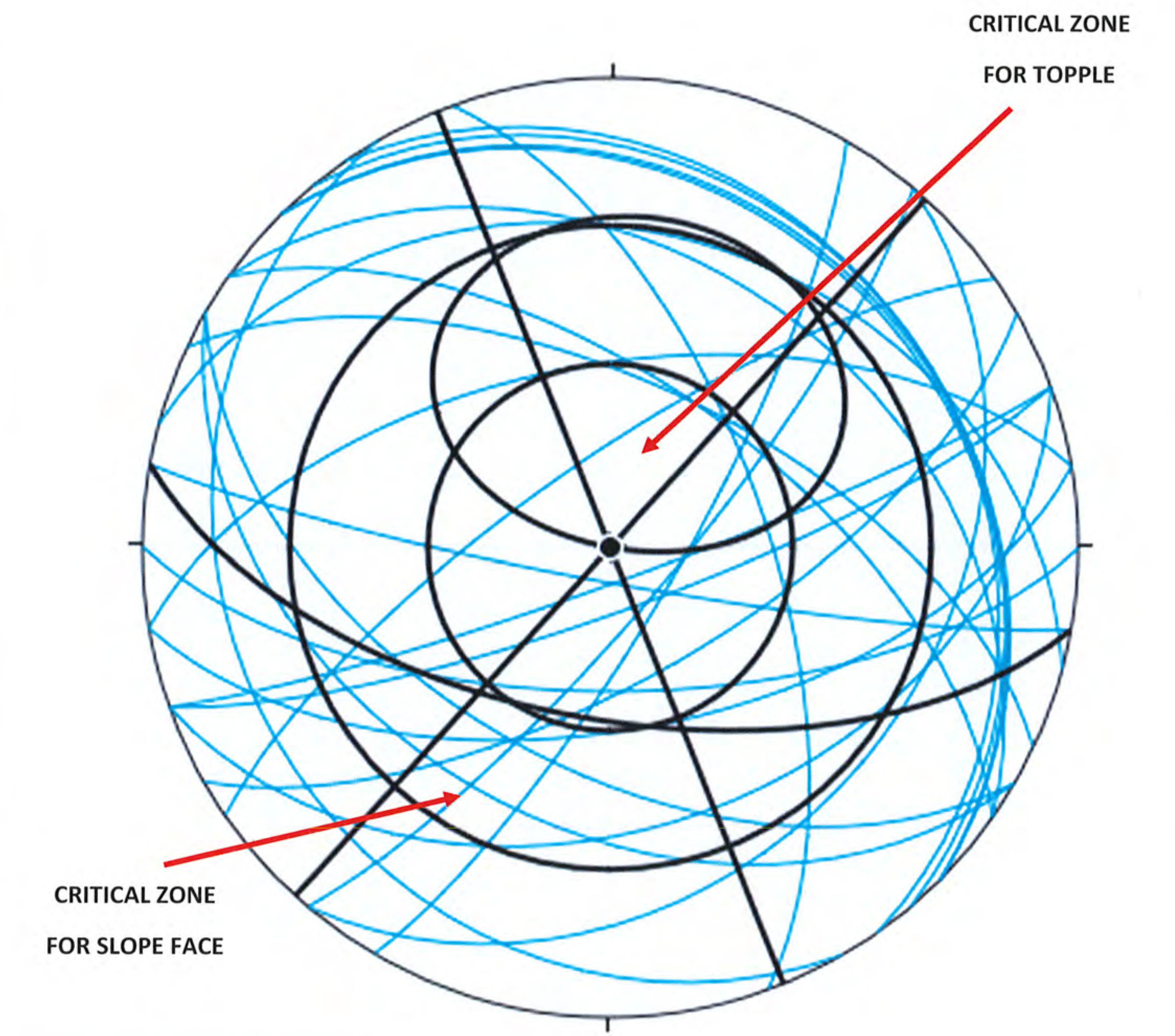
(F) Factor of Safety = 4.65
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

GREAT CIRCLE PLOT

OF

AREA 1C



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
190	60

Grover-Hollingsworth and Associates, Inc.

BY **AJL**	DATE **4/2017**	CLIENT	**A&T Development**
LOCATION		GH	**17563-G**
Blue Heights Drive		SUBJECT	**Great Circle Plot Area 1c**

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 52 °
(CO) Cohesive Strength of Failure Surface = 0 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 135 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 31.73 ft ^{2}
(W) Weight of Slice = 8603.52 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 5.1 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 0.75

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 40 °
(CO) Cohesive Strength of Failure Surface = 0 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 135 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 38.89 ft ^{2}
(W) Weight of Slice = 25920.14 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 15.36 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 1.15

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 41 °
(CO) Cohesive Strength of Failure Surface = 0 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 135 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 38.11 ft ^{2}
(W) Weight of Slice = 24174.2 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 14.33 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 1.11

```
Rapid Wedge Failure Analysis Input Data

        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 63 °
                   (E1) Dip Direction = 70 °
        Plane 2 :  (D2) Dip Value = 40 °
                   (E2) Dip Direction = 160 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 190 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 190 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 36 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 36 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of

Rapid Wedge Failure Analysis Output Data

        (F) Factor of Safety = 0.87
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON PLANE 2 ONLY.
```

Don't work w/ 42 or 36

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

```
Plane 1 :  (D1) Dip Value = 52 °
           (E1) Dip Direction = 210 °
Plane 2 :  (D2) Dip Value = 67 °
           (E2) Dip Direction = 150 °
Plane 3 :  (D3) Dip Value = 60 °
           (E3) Dip Direction = 190 °
Plane 4 :  (D4) Dip Value = 60 °
           (E4) Dip Direction = 190 °


Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
           (P1) Friction Angle = 36 °
Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
           (P2) Friction Angle = 36 °
```

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.58
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 58 °
(E2) Dip Direction = 170 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 78 °
(E2) Dip Direction = 120 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.68
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :	(D1) Dip Value = 52 °
	(E1) Dip Direction = 210 °
Plane 2 :	(D2) Dip Value = 40 °
	(E2) Dip Direction = 160 °
Plane 3 :	(D3) Dip Value = 60 °
	(E3) Dip Direction = 190 °
Plane 4 :	(D4) Dip Value = 60 °
	(E4) Dip Direction = 190 °

Plane 1 :	(C1) Cohesion = 0 lb(f)/ft ^{2}
	(P1) Friction Angle = 36 °
Plane 2 :	(C2) Cohesion = 0 lb(f)/ft ^{2}
	(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.87
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.59
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 52 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

```
        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 58 °
                   (E1) Dip Direction = 170 °
        Plane 2 :  (D2) Dip Value = 78 °
                   (E2) Dip Direction = 120 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 190 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 190 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 36 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 36 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
        (F) Factor of Safety = 0.79
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 40 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.98
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 78 °
(E2) Dip Direction = 120 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.93
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 67 °
(E2) Dip Direction = 150 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 58 °
(E2) Dip Direction = 170 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON PLANE 1 ONLY.

```
Rapid Wedge Failure Analysis Input Data

        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 41 °
                   (E1) Dip Direction = 210 °
        Plane 2 :  (D2) Dip Value = 84 °
                   (E2) Dip Direction = 160 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 190 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 190 °

        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 36 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 36 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

        (F) Factor of Safety = 0.84
        Water Pressure = 0 lb(f)/ft ²

        THERE IS CONTACT ON PLANE 1 ONLY.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 41 °
(E1) Dip Direction = 210 °
Plane 2 : (D2) Dip Value = 75 °
(E2) Dip Direction = 325 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 1 ONLY.

Rapid Wedge Failure Analysis Input Data

```
        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 41 °
                   (E1) Dip Direction = 210 °
        Plane 2 :  (D2) Dip Value = 79 °
                   (E2) Dip Direction = 130 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 190 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 190 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 36 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 36 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
        (F) Factor of Safety = 0.84
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON PLANE 1 ONLY.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 65 °
(E1) Dip Direction = 180 °
Plane 2 : (D2) Dip Value = 52 °
(E2) Dip Direction = 210 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.57
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 2 ONLY.

```
Rapid Wedge Failure Analysis Input Data

        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 58 °
                   (E1) Dip Direction = 170 °
        Plane 2 :  (D2) Dip Value = 78 °
                   (E2) Dip Direction = 120 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 190 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 190 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 44 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 44 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

        (F) Factor of Safety = 1.05
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 65 °
(E1) Dip Direction = 180 °
Plane 2 : (D2) Dip Value = 75 °
(E2) Dip Direction = 325 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 65 °
(E1) Dip Direction = 180 °
Plane 2 : (D2) Dip Value = 84 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 3.12
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 65 °
(E1) Dip Direction = 180 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.65
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 67 °
(E1) Dip Direction = 150 °
Plane 2 : (D2) Dip Value = 58 °
(E2) Dip Direction = 170 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.17
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 67 °
(E1) Dip Direction = 150 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.36
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 75 °
(E1) Dip Direction = 325 °
Plane 2 : (D2) Dip Value = 84 °
(E2) Dip Direction = 160 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 36 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 36 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 4.65
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 58 °
(E1) Dip Direction = 170 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 130 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 190 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 190 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.58
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

MAPPED ATTITUDES

OF

AREA 2

MAPPED ATTITUDE		DIP DIRECTION	DIP
5	Fa	350	58
6	J	95	61
7	Fo	350	33
8	J	185	58
9	Fo	30	22
10	J	120	65

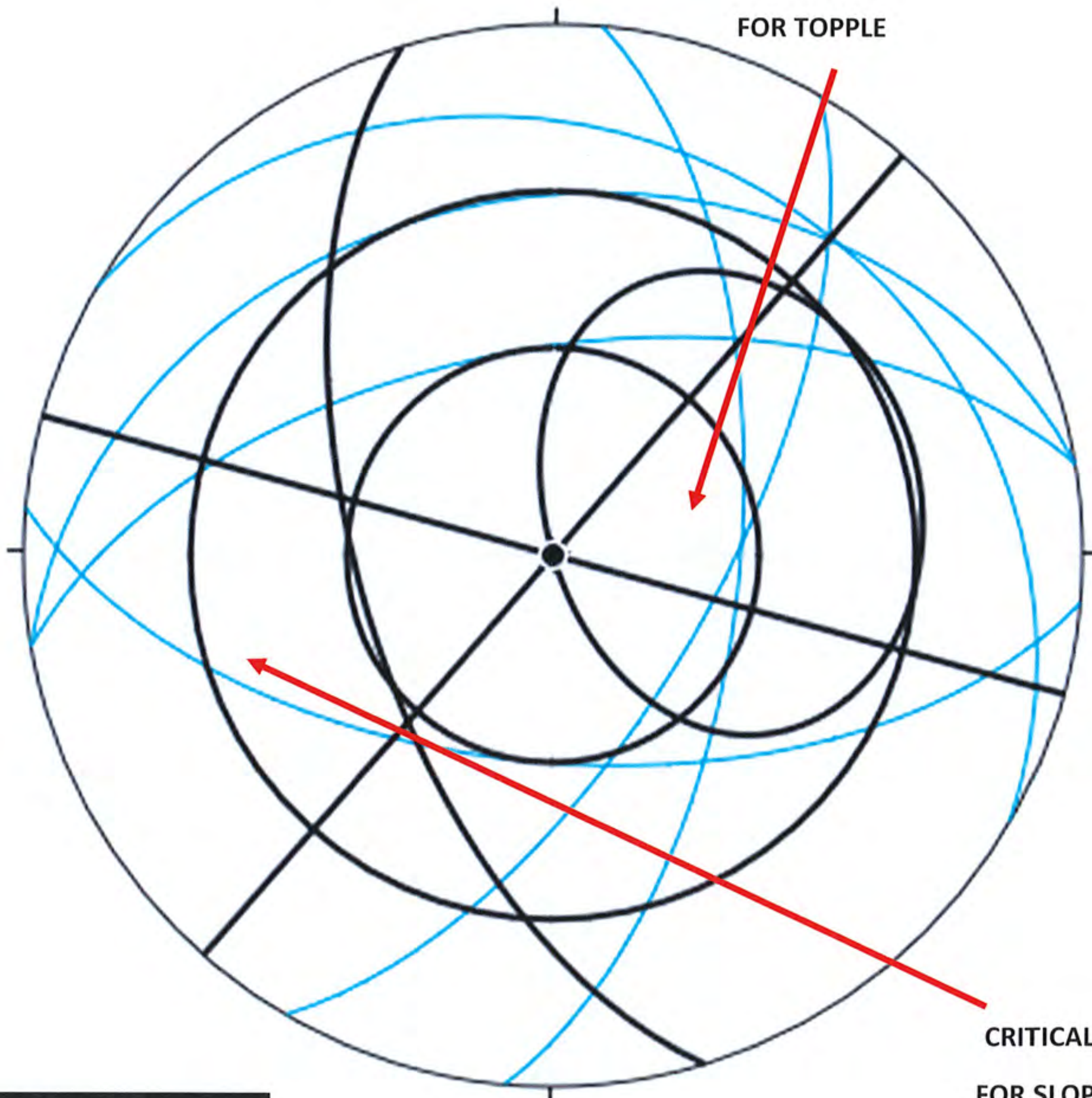
Joint=J

Foliation=Fo

Fault=Fa

Vein=V

GREAT CIRCLE PLOT
OF
AREA 2



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
253	60

Grover-Hollingsworth and Associates, Inc.	BY **AJL**	DATE **4/2017**		CLIENT	**A&T Development**
	LOCATION			GH	**17563-G**
	Blue Heights Drive			SUBJECT	**Great Circle Plot Area 2**

MAPPED ATTITUDES

OF

AREA 3

MAPPED ATTITUDE		DIP DIRECTION	DIP
9	Fo	30	22
10	J	120	65
11	J	20	70
12	J	190	44
13	J	100	66
14	Fa	120	43
15	Fa	205	36
16	Fo	70	44

Joint=J

Foliation=Fo

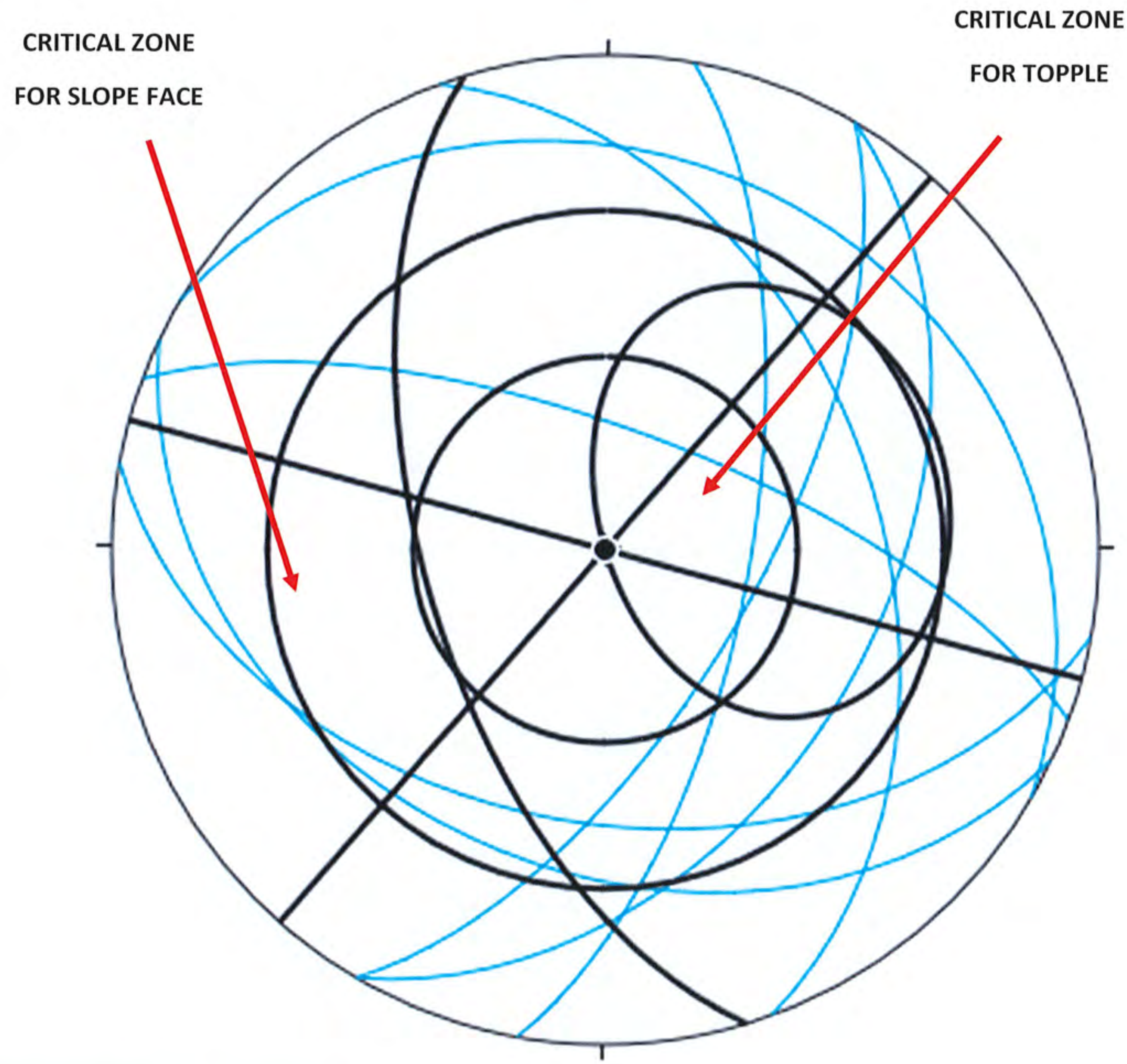
Fault=Fa

Vein=V

Grover-Hollingsworth and Associates, Inc.

BY **AJL**	DATE **4/2017**	CLIENT	**A&T Development**
LOCATION		GH	**17563-G**
Blue Heights Drive		SUBJECT	**Mapped Attitudes Area 3**

GREAT CIRCLE PLOT
OF
AREA 3



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
253	60

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Great Circle Plot Area 3**

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 36 °
(CO) Cohesive Strength of Failure Surface = 0 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 135 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 42.53 ft ^{2}
(W) Weight of Slice = 33709.15 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 19.98 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 1.33

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 65 °
(E1) Dip Direction = 120 °
Plane 2 : (D2) Dip Value = 36 °
(E2) Dip Direction = 205 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 253 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 253 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.33
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON PLANE 2 ONLY.

MAPPED ATTITUDES

OF

AREA 4

MAPPED ATTITUDE		DIP DIRECTION	DIP
15	Fa	205	36
17	J	135	72
18	Fo	55	38
19	V	120	45
20	J	330	69
21	Fo	30	35
22	V	120	55
23	J	150	65
24	J	320	87
25	V	190	24
26	Fo	15	19
27	J	90	35
28	Fo	15	19

Joint=J

Foliation=Fo

Fault=Fa

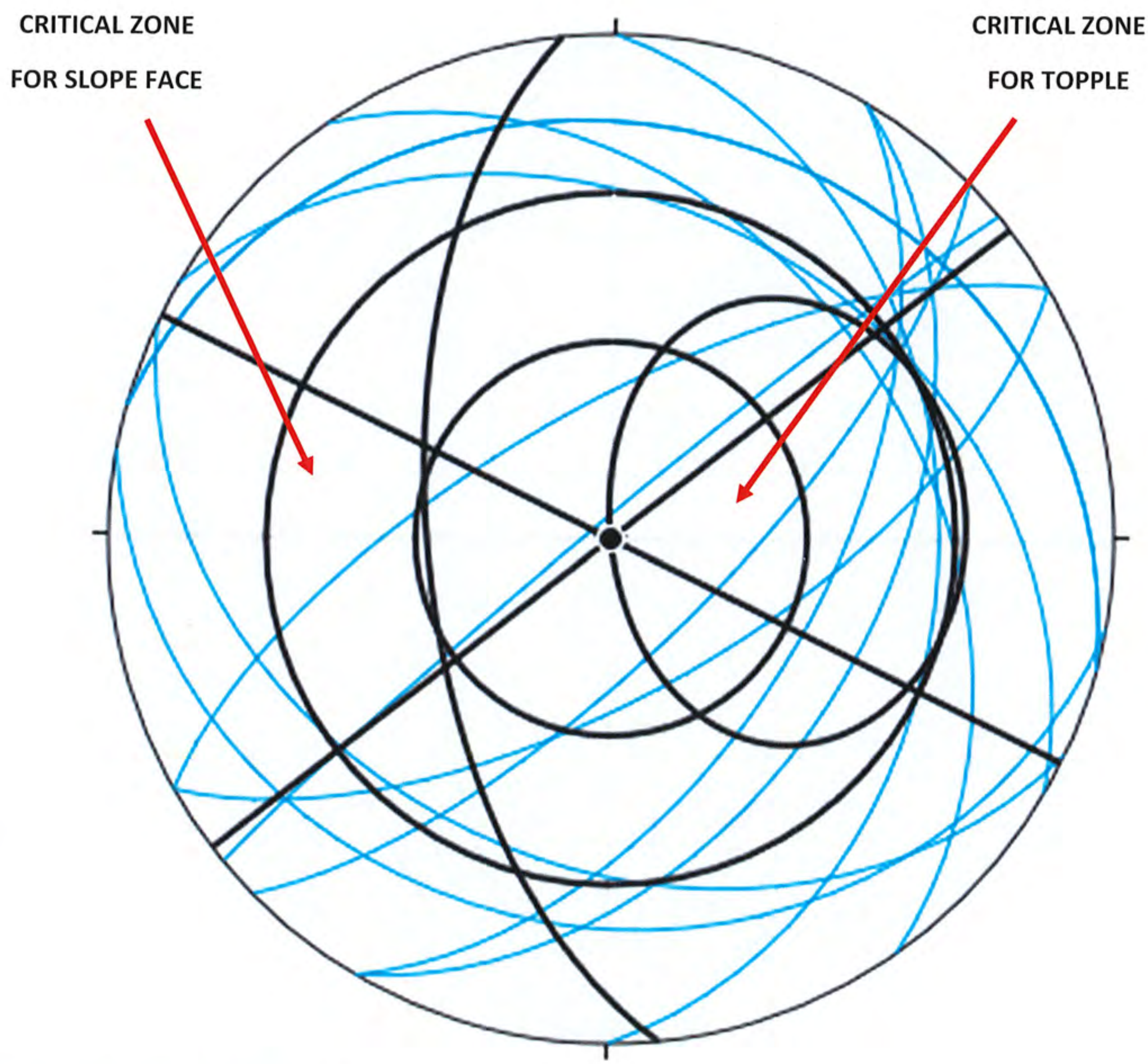
Vein=V

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Mapped Attitudes Area 4**

GREAT CIRCLE PLOT

OF

AREA 4



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
264	60

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017** LOCATION **Blue Heights Drive**	CLIENT **A&T Development** GH **17563-G** SUBJECT **Great Circle Plot Area 4**

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 36 °
(CO) Cohesive Strength of Failure Surface = 0 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 135 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 42.53 ft ^{2}
(W) Weight of Slice = 33709.15 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 19.98 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 1.33

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 72 °
(E1) Dip Direction = 135 °
Plane 2 : (D2) Dip Value = 36 °
(E2) Dip Direction = 205 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 264 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 264 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.48
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

```
Rapid Wedge Failure Analysis Input Data

        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 87 °
                   (E1) Dip Direction = 320 °
        Plane 2 :  (D2) Dip Value = 36 °
                   (E2) Dip Direction = 205 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 264 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 264 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 44 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 44 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

        (F) Factor of Safety = 1.93
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

```
(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :  (D1) Dip Value = 65 °
           (E1) Dip Direction = 150 °
Plane 2 :  (D2) Dip Value = 36 °
           (E2) Dip Direction = 205 °
Plane 3 :  (D3) Dip Value = 60 °
           (E3) Dip Direction = 264 °
Plane 4 :  (D4) Dip Value = 60 °
           (E4) Dip Direction = 264 °


Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
           (P1) Friction Angle = 44 °
Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
           (P2) Friction Angle = 44 °

 Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
(F) Factor of Safety = 1.85
Water Pressure = 0 lb(f)/ft ²


THERE IS CONTACT ON BOTH PLANES.
```

MAPPED ATTITUDES

OF

AREA 5

MAPPED ATTITUDE		DIP DIRECTION	DIP
26	Fo	15	19
27	J	90	35
28	Fo	15	19
29	J	330	90
30	Fo	80	44
31	J	150	79
32	V	335	75
33	Fa	340	70
34	Fa	310	71
35	Fo	60	48

Joint=J

Foliation=Fo

Fault=Fa

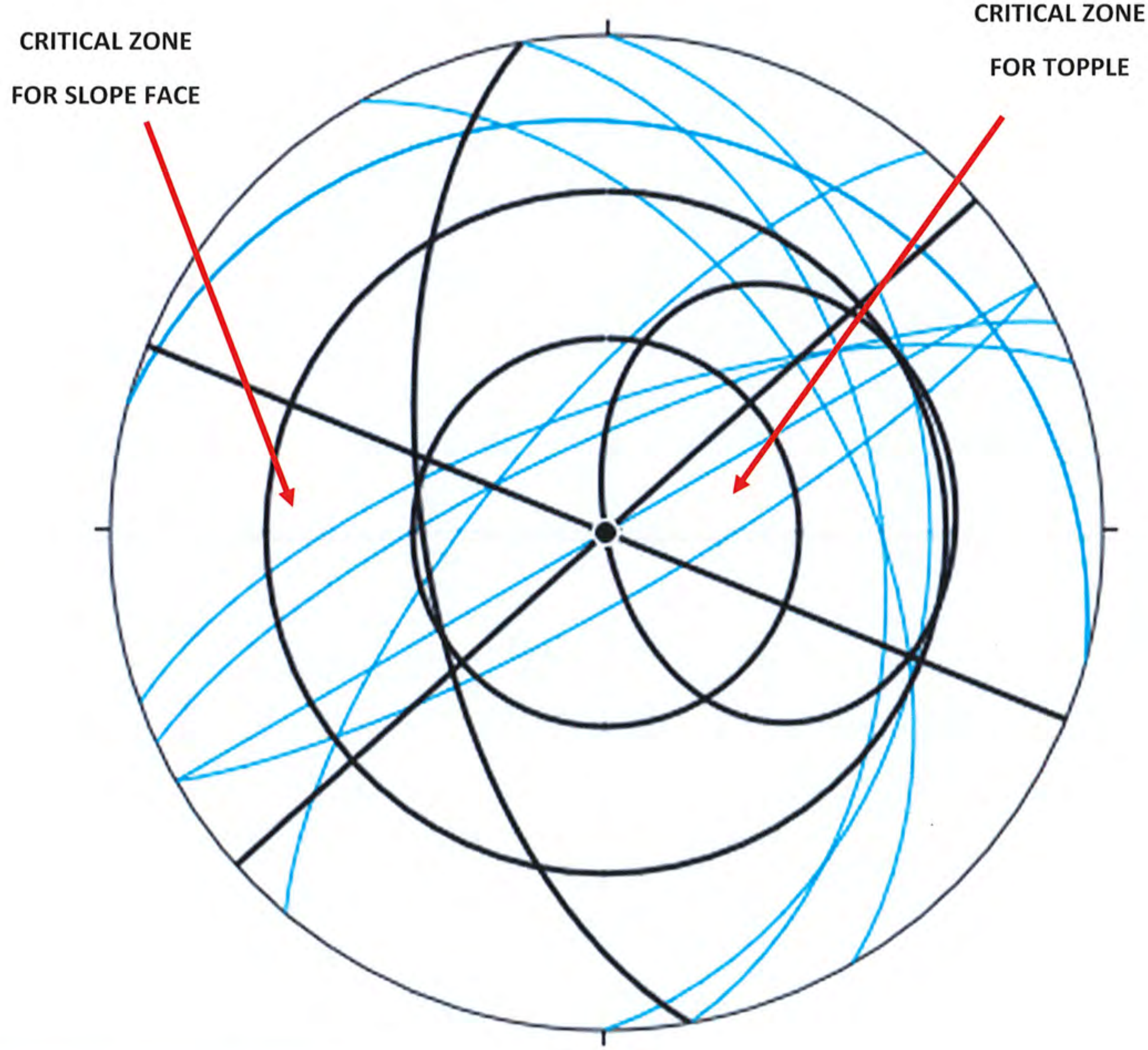
Vein=V

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Mapped Attitudes Area 5**

GREAT CIRCLE PLOT

OF

AREA 5



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
260	60

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	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Great Circle Plot Area 5**

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 79 °
(E1) Dip Direction = 150 °
Plane 2 : (D2) Dip Value = 71 °
(E2) Dip Direction = 310 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 260 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 260 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 4.85
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

```
        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 90 °
                   (E1) Dip Direction = 330 °
        Plane 2 :  (D2) Dip Value = 71 °
                   (E2) Dip Direction = 310 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 260 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 260 °

        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 44 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 44 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
        (F) Factor of Safety = 4
        Water Pressure = 0 lb(f)/ft ²

        THERE IS CONTACT ON BOTH PLANES.
```

MAPPED ATTITUDES

OF

AREA 6

MAPPED ATTITUDE		DIP DIRECTION	DIP
49	Fa	160	40
50	Fa	130	79
55	Fo	30	21

Joint=J

Foliation=Fo

Fault=Fa

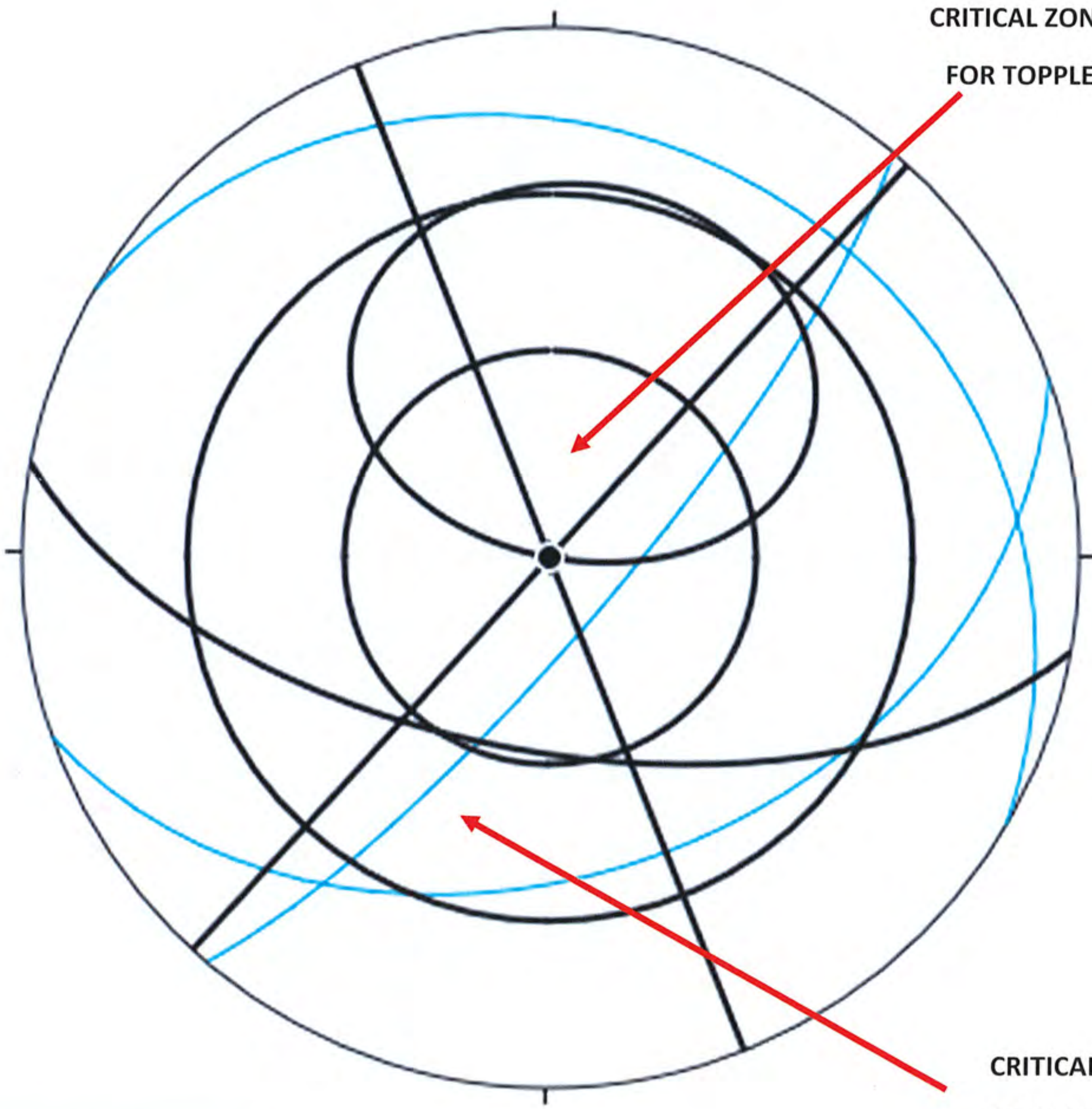
Vein=V

Grover-Hollingsworth and Associates, Inc.	BY **AJL**	DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION		GH	**17563-G**
	Blue Heights Drive		SUBJECT	**Mapped Attitudes Area 6**

GREAT CIRCLE PLOT

OF

AREA 6



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
190	60

Grover-Hollingsworth and Associates, Inc.

BY **AJL**	DATE **4/2017**	CLIENT	**A&T Development**
LOCATION		GH	**17563-G**
Blue Heights Drive		SUBJECT	**Great Circle Plot Area 6**

MAPPED ATTITUDES

OF

AREA 7

MAPPED ATTITUDE		DIP DIRECTION	DIP
56	J	170	43
57	J	310	56
58	J	135	78
59	Fo	15	22
60	Fo	20	30
61	J	115	70

Joint=J

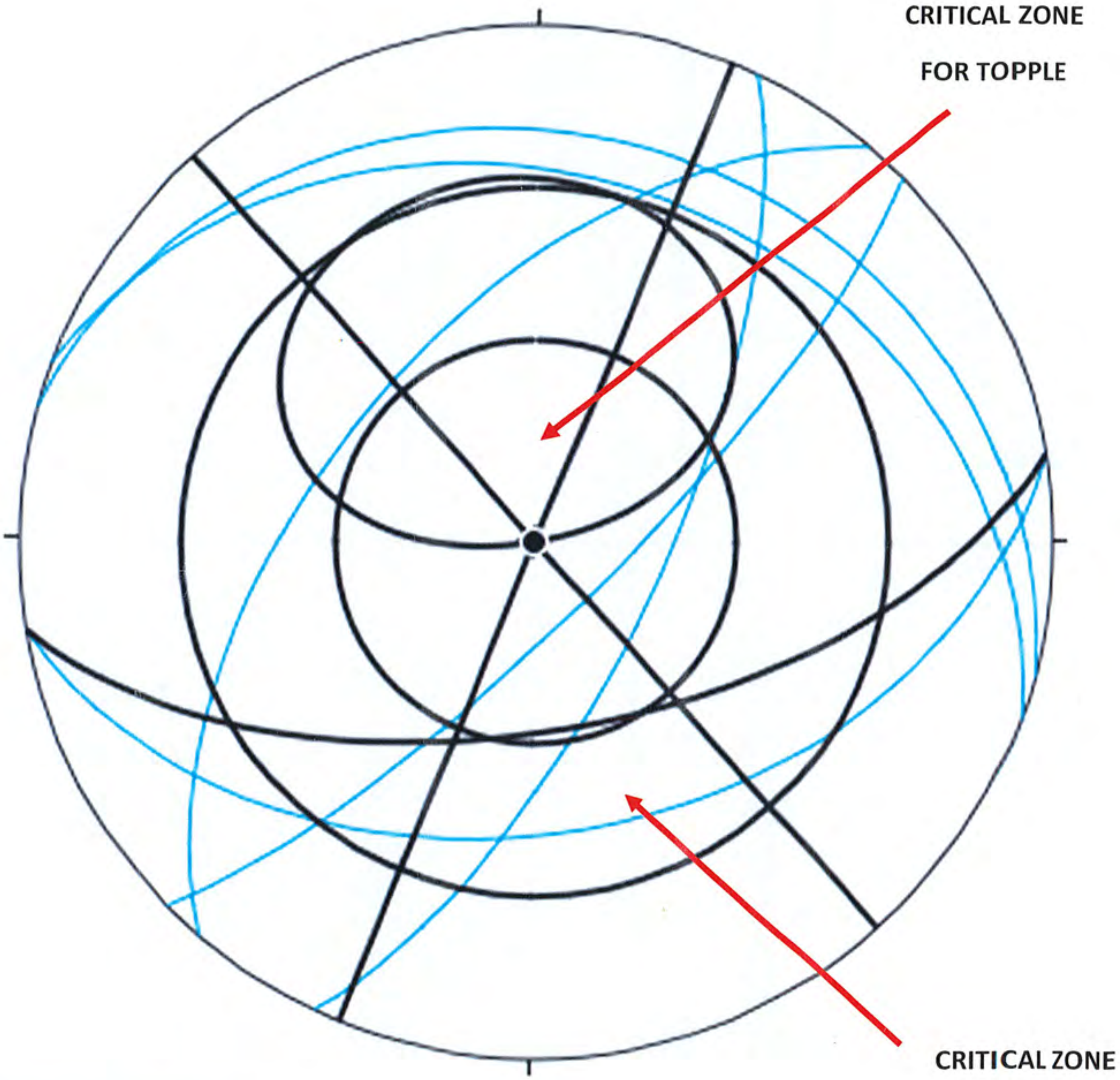
Foliation=Fo

Fault=Fa

Vein=V

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Mapped Attitudes Area 7**

GREAT CIRCLE PLOT
OF
AREA 7



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
170	60

Grover-Hollingsworth and Associates, Inc.

BY **AJL** DATE **4/2017** CLIENT **A&T Development**
LOCATION GH **17563-G**
Blue Heights Drive SUBJECT **Great Circle Plot Area 7**

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 43 °
(E1) Dip Direction = 170 °
Plane 2 : (D2) Dip Value = 70 °
(E2) Dip Direction = 115 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 170 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 170 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.47
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 43 °
(CO) Cohesive Strength of Failure Surface = 0 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 135 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 36.66 ft ^{2}
(W) Weight of Slice = 20883.59 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 12.38 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 1.04

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 43 °
(E1) Dip Direction = 170 °
Plane 2 : (D2) Dip Value = 78 °
(E2) Dip Direction = 135 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 170 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 170 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 3.14
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

MAPPED ATTITUDES

OF

AREA 8

MAPPED ATTITUDE		DIP DIRECTION	DIP
62	Fo	65	46
63	Fa	30	80
64	V	165	44
65	Fo	50	41
66	J	35	54
67	J	215	49
68	J	5	83
69	Fo	45	47
70	V	155	75
71	J	25	60
72	J	165	77
73	Fo	5	40
74	J	50	88
75	J	35	90
76	V	25	47
77	J	310	85
78	Fo	50	44
79	J	185	54
80	V	15	27
81	Fo	40	35
82	J	300	82
83	Fa	155	83
84	J	140	55
85	J	35	62

Joint=J
Foliation=Fo
Fault=Fa
Vein=V

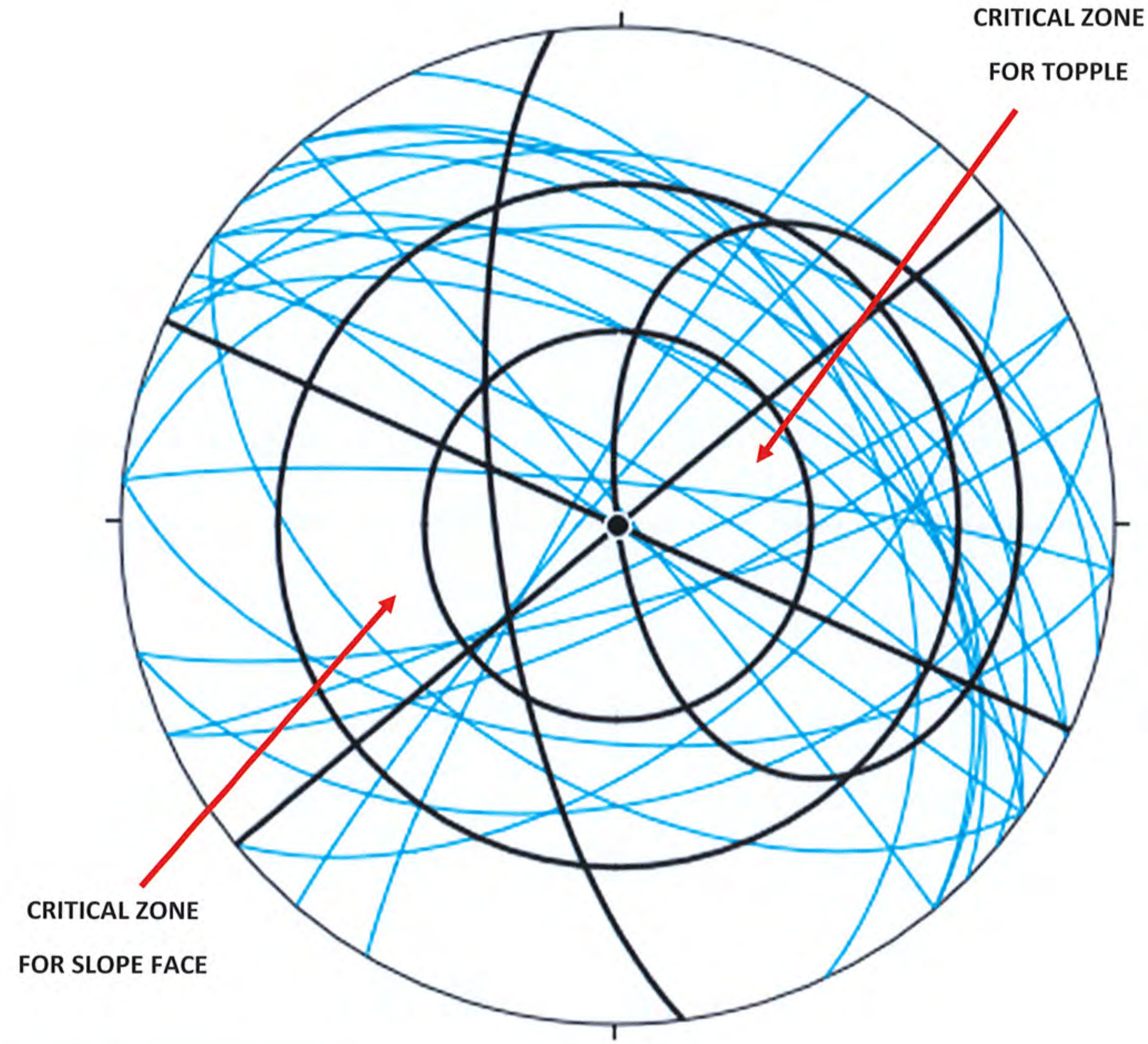
Grover-Hollingsworth and Associates, Inc.

BY **AJL** DATE **4/2017** CLIENT **A&T Development**
LOCATION GH **17563-G**
Blue Heights Drive SUBJECT **Mapped Attitudes Area 8**

GREAT CIRCLE PLOT

OF

AREA 8



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
262	70

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Great Circle Plot Area 8**

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 :	(D1) Dip Value = 49 °
	(E1) Dip Direction = 215 °
Plane 2 :	(D2) Dip Value = 83 °
	(E2) Dip Direction = 155 °
Plane 3 :	(D3) Dip Value = 70 °
	(E3) Dip Direction = 262 °
Plane 4 :	(D4) Dip Value = 70 °
	(E4) Dip Direction = 262 °

Plane 1 :	(C1) Cohesion = 0 lb(f)/ft ^{2}
	(P1) Friction Angle = 44 °
Plane 2 :	(C2) Cohesion = 0 lb(f)/ft ^{2}
	(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.3
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 54 °
(E1) Dip Direction = 35 °
Plane 2 : (D2) Dip Value = 40 °
(E2) Dip Direction = 5 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.7
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON PLANE 1 ONLY.

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 70 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 49 °
(CO) Cohesive Strength of Failure Surface = 0 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 135 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 33.13 ft ^{2}
(W) Weight of Slice = 21318.04 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 12.63 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 0.84

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 49 °
(E1) Dip Direction = 215 °
Plane 2 : (D2) Dip Value = 82 °
(E2) Dip Direction = 300 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.88
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 49 °
(E1) Dip Direction = 215 °
Plane 2 : (D2) Dip Value = 75 °
(E2) Dip Direction = 155 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.1
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 49 °
(E1) Dip Direction = 215 °
Plane 2 : (D2) Dip Value = 85 °
(E2) Dip Direction = 310 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 0.97
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 49 °
(E1) Dip Direction = 215 °
Plane 2 : (D2) Dip Value = 54 °
(E2) Dip Direction = 185 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.02
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 82 °
(E1) Dip Direction = 300 °
Plane 2 : (D2) Dip Value = 83 °
(E2) Dip Direction = 155 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.3
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

```
Rapid Wedge Failure Analysis Input Data

        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 77 °
                   (E1) Dip Direction = 165 °
        Plane 2 :  (D2) Dip Value = 82 °
                   (E2) Dip Direction = 300 °
        Plane 3 :  (D3) Dip Value = 70 °
                   (E3) Dip Direction = 262 °
        Plane 4 :  (D4) Dip Value = 70 °
                   (E4) Dip Direction = 262 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 44 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 44 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

        (F) Factor of Safety = 1.12
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

```
Plane 1 :  (D1) Dip Value = 54 °
           (E1) Dip Direction = 185 °
Plane 2 :  (D2) Dip Value = 82 °
           (E2) Dip Direction = 300 °
Plane 3 :  (D3) Dip Value = 70 °
           (E3) Dip Direction = 262 °
Plane 4 :  (D4) Dip Value = 70 °
           (E4) Dip Direction = 262 °

Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
           (P1) Friction Angle = 44 °
Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
           (P2) Friction Angle = 44 °
```

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.26
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 54 °
(E1) Dip Direction = 185 °
Plane 2 : (D2) Dip Value = 83 °
(E2) Dip Direction = 155 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 3.09
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 85 °
(E1) Dip Direction = 310 °
Plane 2 : (D2) Dip Value = 83 °
(E2) Dip Direction = 155 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.96
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 85 °
(E1) Dip Direction = 310 °
Plane 2 : (D2) Dip Value = 54 °
(E2) Dip Direction = 185 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.53
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 77 °
(E1) Dip Direction = 165 °
Plane 2 : (D2) Dip Value = 83 °
(E2) Dip Direction = 155 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 5.87
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 77 °
(E1) Dip Direction = 165 °
Plane 2 : (D2) Dip Value = 54 °
(E2) Dip Direction = 185 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 4.99
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 77 °
(E1) Dip Direction = 165 °
Plane 2 : (D2) Dip Value = 85 °
(E2) Dip Direction = 310 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.52
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 60 °
(E1) Dip Direction = 25 °
Plane 2 : (D2) Dip Value = 88 °
(E2) Dip Direction = 50 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 3.7
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 75 °
(E1) Dip Direction = 155 °
Plane 2 : (D2) Dip Value = 82 °
(E2) Dip Direction = 300 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.84
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

```
Rapid Wedge Failure Analysis Input Data

        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 75 °
                   (E1) Dip Direction = 155 °
        Plane 2 :  (D2) Dip Value = 54 °
                   (E2) Dip Direction = 185 °
        Plane 3 :  (D3) Dip Value = 70 °
                   (E3) Dip Direction = 262 °
        Plane 4 :  (D4) Dip Value = 70 °
                   (E4) Dip Direction = 262 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 44 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 44 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

        (F) Factor of Safety = 2.66
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 75 °
(E1) Dip Direction = 155 °
Plane 2 : (D2) Dip Value = 85 °
(E2) Dip Direction = 310 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.88
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 49 °
(E1) Dip Direction = 215 °
Plane 2 : (D2) Dip Value = 77 °
(E2) Dip Direction = 165 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.53
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 54 °
(E1) Dip Direction = 35 °
Plane 2 : (D2) Dip Value = 47 °
(E2) Dip Direction = 25 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 9.73
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

```
        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 44 °
                   (E1) Dip Direction = 165 °
        Plane 2 :  (D2) Dip Value = 62 °
                   (E2) Dip Direction = 35 °
        Plane 3 :  (D3) Dip Value = 70 °
                   (E3) Dip Direction = 262 °
        Plane 4 :  (D4) Dip Value = 70 °
                   (E4) Dip Direction = 262 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 44 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 44 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
        (F) Factor of Safety = 2.59
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 44 °
(E1) Dip Direction = 165 °
Plane 2 : (D2) Dip Value = 82 °
(E2) Dip Direction = 300 °
Plane 3 : (D3) Dip Value = 70 °
(E3) Dip Direction = 262 °
Plane 4 : (D4) Dip Value = 70 °
(E4) Dip Direction = 262 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 2.56
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

MAPPED ATTITUDES

OF

AREA 9

MAPPED ATTITUDE		DIP DIRECTION	DIP
83	Fa	155	83
86	Fo	30	7
87	J	215	65
88	J	300	77
89	Fo	25	30
90	J	180	62
91	J	325	75
92	Fo	45	25
93	J	300	71
94	J	155	50
95	Fo	20	22
96	Fo	30	34
97	J	25	90
98	J	280	79
99	Fo	25	42
100	J	310	67
101	J	145	67
102	V	80	28
103	Fo	55	29

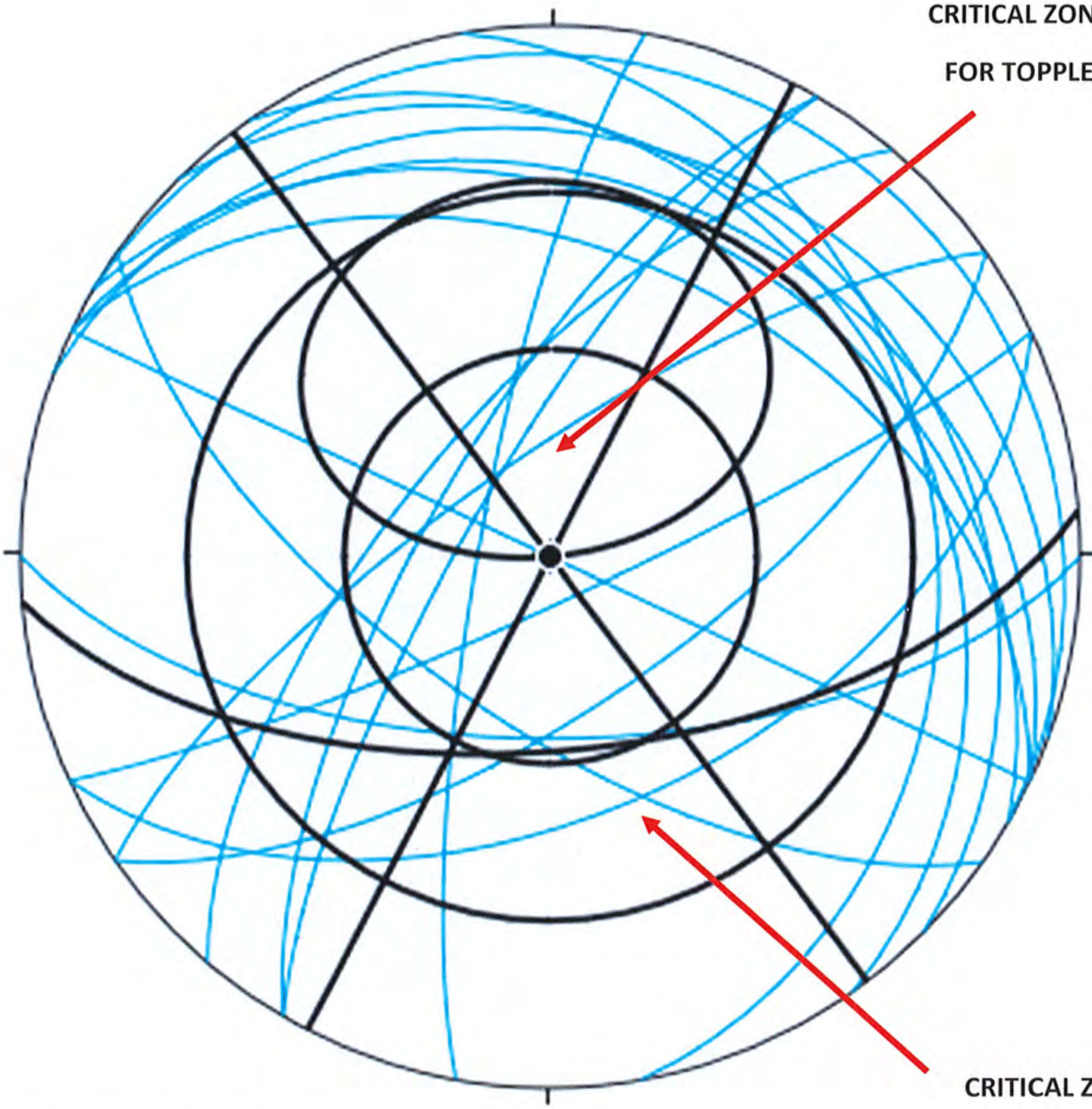
Joint=J
Foliation=Fo
Fault=Fa
Vein=V

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT	**A&T Development**
	LOCATION	GH	**17563-G**
	Blue Heights Drive	SUBJECT	**Mapped Attitudes Area 9**

GREAT CIRCLE PLOT

OF

AREA 9



SLOPE FACE	
DIP DIRECTION	DIP ANGLE
175	60

Grover-Hollingsworth and Associates, Inc.	BY **AJL** DATE **4/2017**	CLIENT **A&T Development**
	LOCATION	GH **17563-G**
	Blue Heights Drive	SUBJECT **Great Circle Plot Area 9**

Plane Failure Analysis Input Data

(H) Height = 25 ft
(SF) Inclination of Slope Face = 60 °
(SS) Inclination of Upper Slope = 0 °
(SP) Inclination of Failure Plane = 50 °
(CO) Cohesive Strength of Failure Surface = 0 lb(f)
(PH) Friction Angle of Failure Surface = 44 °
(GR) Density of Rock = 135 lb(f)/ft ^{3}
(GW) Density of Water = 0 lb(f)/ft ^{3}
(AB) Starting Rock Bolt Angle = 0 °
(AR) Ending Rock Bolt Angle = 0 °
(AA) Bolt Angle Increment = 0 °
(T1) Starting Bolt Tension = 0 lb(f)
(T2) Ending Bolt Tension = 0 lb(f)
(T3) Bolt Tension Increment = 0 lb(f)
(AC) Horizontal Acceleration = 0 G
(TZ) Amount of Discontinuity = 0 decimal%
(VSUR) Vertical Surcharge = 0 lb(f)
(HSUR) Horizontal Surcharge = 0 lb(f)

No Tension Crack

Plane Failure Analysis Output Data

(A) Contact Area = 32.64 ft ^{2}
(W) Weight of Slice = 11042.55 lb(f)
(U) Water Force Normal to Failure Plane = 0 lb(f)
(V) Horizontal Water Force on Tension Crack = 0 lb(f)
(B) Horizontal Distance of Tension Crack from Crest = 6.54 ft
(TH) Bolt Angle = 0 °
(T) Tension = 0 lb(f)
(F) Factor of Safety = 0.81

Rapid Wedge Failure Analysis Input Data

```
        (GR) Density of Rock = 135 lb(f)/ft ³
        (H) Height of Crest Above Intersection = 25 ft

        Plane 1 :  (D1) Dip Value = 65 °
                   (E1) Dip Direction = 215 °
        Plane 2 :  (D2) Dip Value = 50 °
                   (E2) Dip Direction = 155 °
        Plane 3 :  (D3) Dip Value = 60 °
                   (E3) Dip Direction = 175 °
        Plane 4 :  (D4) Dip Value = 60 °
                   (E4) Dip Direction = 175 °


        Plane 1 :  (C1) Cohesion = 0 lb(f)/ft ²
                   (P1) Friction Angle = 44 °
        Plane 2 :  (C2) Cohesion = 0 lb(f)/ft ²
                   (P2) Friction Angle = 44 °

         Water Pressure : Dry Slope

        The slope face DOES NOT hang over the toe of the slope.
```

Rapid Wedge Failure Analysis Output Data

```
        (F) Factor of Safety = 0.83
        Water Pressure = 0 lb(f)/ft ²


        THERE IS CONTACT ON BOTH PLANES.
```

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ³
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 62 °
(E1) Dip Direction = 180 °
Plane 2 : (D2) Dip Value = 90 °
(E2) Dip Direction = 25 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 175 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 175 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ²
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ²
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 3.65
Water Pressure = 0 lb(f)/ft ²

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 77 °
(E1) Dip Direction = 300 °
Plane 2 : (D2) Dip Value = 67 °
(E2) Dip Direction = 145 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 175 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 175 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 3.93
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.

Rapid Wedge Failure Analysis Input Data

(GR) Density of Rock = 135 lb(f)/ft ^{3}
(H) Height of Crest Above Intersection = 25 ft

Plane 1 : (D1) Dip Value = 50 °
(E1) Dip Direction = 155 °
Plane 2 : (D2) Dip Value = 79 °
(E2) Dip Direction = 280 °
Plane 3 : (D3) Dip Value = 60 °
(E3) Dip Direction = 175 °
Plane 4 : (D4) Dip Value = 60 °
(E4) Dip Direction = 175 °

Plane 1 : (C1) Cohesion = 0 lb(f)/ft ^{2}
(P1) Friction Angle = 44 °
Plane 2 : (C2) Cohesion = 0 lb(f)/ft ^{2}
(P2) Friction Angle = 44 °

Water Pressure : Dry Slope

The slope face DOES NOT hang over the toe of the slope.

Rapid Wedge Failure Analysis Output Data

(F) Factor of Safety = 1.8
Water Pressure = 0 lb(f)/ft ^{2}

THERE IS CONTACT ON BOTH PLANES.