PRELIMINARY GEOTECHNICAL REPORT

Ward Lake Quarry Expansion
Lassen County, California

Submitted To:

Ms. Wendy Johnston
VESTRA RESOURCES, INC.
5300 Aviation Drive
City of Redding, CA 96002

Prepared by:
Bajada Geosciences, Inc.

October 30, 2020
Project No. 2001.0107

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October 30, 2020
2001.0107

Ms. Wendy Johnston
VESTRA RESOURCES, INC.
5300 Aviation Drive
Redding, California 96048

Subject: **Preliminary Geotechnical Report**
Ward Lake Quarry Expansion
Lassen County, California

Dear Ms. Johnston:

Bajada Geosciences, Inc., is pleased to submit this preliminary geotechnical report to VESTRA Resources, Inc., for the expansion of Hat Creek Construction's Ward Lake Quarry located in Lassen County, California. This report is being submitted in accordance with our proposal dated February 25, 2020. This preliminary geotechnical report discusses field mapping and explorations performed, laboratory testing results, subsurface conditions encountered, and preliminary geotechnical analyses and recommendations associated with the study.

We appreciate the opportunity to perform this study. If you have any questions pertaining to this report, or if we may be of further service, please contact us at (530) 638-5263 at your earliest convenience.

Sincerely,
BAJADA GEOSCIENCES, INC.

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1 INTRODUCTION

BAJADA Geosciences, Inc. (BAJADA), is pleased to submit this preliminary geotechnical study to VESTRA Resources, Inc. (VESTRA), for the proposed expansion of Hat Creek Construction's (HCC) Ward Lake Quarry located in Lassen County, California. The location is shown on Plate 1 – Site Location Map. The following preliminary report discusses our understanding of the project, observations and measurements made within the proposed quarry expansion area, our analyses, and presents our preliminary opinions regarding slope stability at the proposed quarry.

1.1 PROJECT DESCRIPTION

We understand that Hat Creek Construction is proposing to expand their existing Ward Lake Quarry an additional approximately 84 acres. The proposed expansion area is located north of the existing quarry, as shown on Plate 2 – Proposed Quarry Expansion Area. The expansion area is currently fallow and has not been quarried in the past. However, we understand that portions of the expansion area have been explored by HCC using an Air-Track drill rig (an air-percussion drill rig) and we are in receipt of the logs from those explorations along with coordinates of where the explorations occurred. We understand that the materials to be extracted will be predominantly basaltic rock present on site. We also understand that proposed cut slope inclinations/bench slope widths and heights have not yet been established for the expansion area.

We understand that the quarried materials will be used as aggregate for construction and sand materials for various applications. In addition, we understand that these materials will also be used for batching of asphaltic concrete, Portland cement concrete, or other materials. It is anticipated that the materials within the quarry will be excavated using a combination of conventional ripping and hauling methods and through blasting and hauling. It is anticipated that overburden and highly weathered rock will be rippable using single- or double-shank rippers attached to bulldozers. With depth, as materials become harder and less weathered, it is anticipated that controlled blasting will be needed to excavate rock materials. Once ripped or blasted, it is anticipated that excavators will load haul trucks with excavated materials. We understand that overburden and topsoil will be stockpiled within the quarry for later use during reclamation. It is anticipated that these soils could be placed on excavated benches and slopes to help facilitate revegetation.

1.2 PROJECT LOCATION

The parcel on which the quarry expansion is to occur is located at APN 109-100-42-11. The approximate center of the proposed quarry expansion has the following latitude and longitude:

- Latitude: 40° 25' 23.7" (40.423237°)
- Longitude: -120° 24' 53.8" (-120.414953°)

It should be noted that no quarrying has been performed within the proposed expansion area; hence, there are no exposed volcanic rock faces that could be mapped and used for development of recommendations in this study. It should also be noted that drilling and geophysical explorations were not authorized as part of our scope of services for this study; however, BAJADA mapped selected available exposures within the existing quarry area and used those data in preparing this report. As such, this study should be considered preliminary in nature and should be supplemented with future studies to refine recommendations made, herein.

1.3 SCOPE OF SERVICES

Services performed for this study included:

- Reconnaissance of the site surface conditions;
- Review of pertinent, selected regional geological data;
- Observation of exposed geological conditions at the project site. Plate 3 – Geotechnical Map, presents the preliminary geological conditions mapped at the site;
- Collection of samples of surficially available on-site rock and soil materials within the existing quarry that were suitable for laboratory testing;
- Performance of laboratory testing on samples obtained from the site to estimate rock strength characteristics for use in stability analyses. Results of the laboratory testing are presented in Appendix A – Laboratory Testing;
- Performance of limit-equilibrium evaluations of the gross stability for the proposed highwall. Results of those evaluations are presented in Appendix B – Slope Stability Analyses;
- Preparation of this report, which includes:
    - A description of the proposed project;
    - A summary of our field observation and laboratory testing programs;
    - A description of site surface conditions encountered during our field investigation; and
    - Our preliminary opinion regarding slope stability.

1.4 FIELD EXPLORATION

Field exploration performed by Bajada for this study consisted of reconnaissance-level geologic mapping of the study area, field measurement of discontinuity data (fractures, joints, flow bands, bedding planes, etc.) and rock mass characteristics at selected locations within the existing quarry. Field exploration occurred on March 4, 2020.

Subsurface exploration was not authorized as part of our services.

1.5 PREVIOUS WORK PERFORMED

We know of no site specific geologic or geotechnical studies that have been performed at the site. We understand that HCC used an Air-Track drill rig to advance a number of exploratory holes on site to estimate material types and locations, and those logs were made available to us and are included in Appendix C – Air-Percussion Exploration Hole Data, of this report. Plate 4 – Air-Percussion Explorations, shows the approximate locations of where those explorations were performed.

Geological information has been previously published for the project region and is periodically referred to within this report. References for those data are presented in the References section (Section 8.0) of this report.

2 FINDINGS

2.1 SITE CONDITIONS

2.1.1 Surface Conditions

The proposed expansion site consists of a moderately inclined ridgeline that descends to the southwest and encompasses a relatively flat terrace at its base, as shown in Plate 2. The natural slopes descend at inclinations ranging from about 5 to 20 degrees. The terrace is inclined at about 0 to 5 degrees.

Both terrace and slope are fallow and covered with perennial and seasonal grasses and shrubs. Scattered, isolated trees are present locally across the site.

Drainage occurs as sheet flow to the southwest onto the terrace. Drainage on the terrace occurs as sheetflow towards the northwest into Balls Canyon, which eventually discharges into Willow Creek. Elevations within the proposed quarry expansion area range from about 4,200 to 4,540 feet (VESTRA, 2020).

2.1.2 Subsurface Conditions

Based on observations of the proposed expansion area and the highwall exposures within the active quarry, subsurface conditions consist of sedimentary soils within the terrace deposits and interlayered volcanic rock.

It is anticipated that the sediments within the terrace deposits will be a mixture of sand, silt, and clay with varying amounts of gravel. These materials were estimated to be at least 60 feet deep in explorations 69 and 70, which are shown on Plate 4.

Volcanic Rock was observed to consist of basalt, andesite, and lessor amounts of rhyolite. The basalt was observed within the existing quarry to be weak to hard (International Society of Rock Mechanics [ISRM] Grade R2 to R4), highly to slightly weathered (ISRM Grade II to IV), slightly to highly fractured, with clast shapes ranging from angular and prismatic to platy. The andesite and rhyolite were observed to be very weak to weak (ISRM Garde R1 to R2, completely to moderately weathered (ISRM Grade III to V), and were largely soil-like with cobble to boulder size spheroidally-shaped clasts of weak (ISRM Grade R2) andesite incorporated into the soil matrix. Thus, the andesite and rhyolite are considered block-in-matrix, or bimrock, layers. The volcanic rock materials were not fully penetrated by explorations shown on Plate 4 and are thought to extend deeper than the anticipated quarry excavations.

Four cross sections, A-A' through D-D', were prepared for this site and their locations are shown in plan view on Plate 3. The cross sections are presented as Plates 5.1 through 5.4 –

Geotechnical Cross Sections A-A' through D-D', respectively. Plate 6 – Fence Diagram, illustrates a pseudo three-dimensional perspective of the underlying earth materials.

2.2 GEOLOGIC CONDITIONS

2.2.1 Regional Geology

The project site is located on the margin of the Cascade Range and the Basin and Range geologic/geomorphic provinces of California. The Cascade Range province extends from the northern end of the Sierra Nevada north to the Canadian border. In the project vicinity the Cascade Range province is bounded to the west by the Klamath Mountain province, to the east by the Basin and Range province, to the south by the Sierra Nevada province, and to the north by the Cascade Range extending through Oregon and Washington.

The Cascade Range province consists of a north-northwest-trending, relatively linear belt of active and dormant strata and shield volcanoes. The regional geologic conditions are dominated by andesitic, rhyolitic and andesitic volcanic rocks mantled with surficial deposits consisting of pyroclastic rocks, lahar deposits, alluvium, and local lacustrine sediments (Hinds, 1952).

The Basin and Range province is characterized by interior drainage with lakes and playas, and the typical horst and graben structure (subparallel, fault-bounded ranges separated by down dropped basins). In these basins, moderate to extensive thicknesses of lacustrine (lake) and alluvial deposits are present. Death Valley, the lowest area in the United States (280 feet below sea level at Badwater), is one of these grabens.

2.2.2 Local Geologic Setting

As noted in Section 2.1.2, the site is underlain by Quaternary-age terrace deposits and Pleistocene-age volcanic rocks (Grose et al., 2013; Lydon et al, 1960). The terrace deposits are near-shore emergent lacustrine deposits associated with the ancestral Lake Lahontan, which covered most of the project region (Grose, et al., 2013). The volcanic rocks consist of interlayered basalt, andesite, and rhyolite tuff and flows labeled the Andesite Flows and Pyroclastics of Litchfield (Grose et al., 2013). The mapped relationships of regional geologic conditions are shown on Plate 7 – Regional Geologic Map. Local mapped geologic conditions are shown on Plate 3.

2.2.3 Groundwater

The depth to groundwater beneath the project area was estimated through searching existing groundwater databases and review of well completion logs for nearby sites. A search of regional groundwater data (DWR, 2020a) found one well located about 1.7 miles southeast of the site. Well 29N14E09D001M recorded water depths ranging from 31 to 51 feet between 1980 and 1993. No other relatively close wells on that database were found.

A search for well completion reports was performed through DWR (2020b). That search found one nearby well located about 4,000 feet southwest of the site. The well completion report for that well reported a static water level of 70.5 feet.

In addition, a search of the Geotracker database (Geotracker, 2020) did not indicate the presence of subsurface exploration or data close to the project site.

It is important to note that groundwater elevations at the proposed project location can, and most likely will, fluctuate over time. In general, the depth to groundwater varies throughout the year and from year to year. Intense and long duration precipitation or drought, modification of topography, and cultural land use changes can contribute to fluctuations in groundwater levels. Localized saturated conditions or perched groundwater conditions near the ground surface could be present during and following periods of heavy precipitation or if on-site sources contribute water.

3 GEOLOGICAL HAZARDS

3.1 FAULTING & SEISMICITY

3.1.1 Regulatory Seismic Setting

The State of California designates faults as Holocene-age or Pre-Holocene-age depending on the recency of movement that can be substantiated for a fault. Fault activity is rated as follows:

FAULT ACTIVITY RATINGS		
Fault Activity Rating	**Geologic Period of Last Rupture**	**Time Interval (Years)**
Holocene-Active	Holocene	Within last 11,000 Years[1]
Pre-Holocene	Quaternary & Older	>11,000 Years[1]
Age Undetermined	Unknown	Unknown

[1] – Holocene is defined as 11,700 years before present by the International Commission on Stratigraphy. The California State Mining and Geology Board, which administers the review and application of the Alquist-Priolo Earthquake Fault Zoning Act, currently recognizes the Holocene as 11,000 years before present.

The California Geologic Survey (CGS) evaluates the activity rating of a fault in fault evaluation reports (FERs). FERs compile available geologic and seismologic data and evaluate if a fault should be zoned as Holocene-active, pre-Holocene, or age undetermined. If an FER evaluates a fault as Holocene-active, then it is typically incorporated into a Special Studies Zone in accordance with the Alquist-Priolo Earthquake Fault Zoning Act (AP). AP Special Studies Zones require site-specific evaluation of fault location for structures for human occupancy and require a habitable structure setback if the fault is found traversing a project site.

The Holocene-active Honey Lake and Warm Springs Valley faults have been mapped in the project region, with the project site being north of the mapped trend of the Warm Springs Valley fault, as shown on Plate 8 – Regional Fault Map. Both the Honey Lake and Warm Springs faults exhibit right-lateral displacement and are significant faults within the Walker Lane fault zone (Wills, 1990). The Honey Lake fault is about 35 miles long and capable of generating a M_W 7.0 earthquake (USGS, 2020b). The Warm Springs Valley fault is about 24 miles long and capable of generating a M_W 6.8 earthquake (USGS, 2020b)

The Honey Lake fault is located about 7 miles southwest of the project site. The Warm Springs Valley fault is mapped about 13 miles south of the site. The State's fault location maps do not show the Warm Springs Valley fault projecting north of Honey Lake; however, lineations mapped from aerial photographs of the region and observed faulting within the existing quarry area project north through the quarry area and region with a trend that is coincident with the Warm Springs fault, as shown on Plate 9 – Interpreted Area Fault Map. The quarry site is not within a special studies zone associated with the AP.

3.1.2 CBC Seismic Design Recommendations

The following table presents 2019 California Building Code (CBC) criteria:

CBC SEISMIC DESIGN PARAMETERS		
California Building Code	**Parameter**	**CBC Designation**
Site Coordinates	Latitude	40.423237°
	Longitude	-120.414953°
Section 1613.5.3 Table 1613.5.3(1)	Site Coefficient, F_a	1.2
Section 1613.5.3 Table 1613.5.3(2)	Site Coefficient, F_v	1.5
Section 1613.5.1 Figure 1613.5	Site Class Designation	C
	Seismic Factor, Site Class B at 0.2 Seconds, S_s	0.808g
	Seismic Factor, Site Class B at 1.0 Seconds, S_1	0.286g
Section 1613.5.3	Site Specific Response Parameter for Site Class D at 0.2 Seconds, S_{MS}	0.970g
	Site Specific Response Parameter for Site Class D at 1.0 Seconds, S_{M1}	0.428g
Section 1613.5.4	$S_{DS}=2/3S_{MS}$	0.646g
	$S_{D1}=2/3S_{M1}$	0.286g
Per the 2019 CBC		

Because of the presence of weak to strong rock beneath the site, a Site Class C was used in the evaluation.

3.1.3 Probabilistic Estimates of Strong Ground motion

Probabilistic evaluations of horizontal strong ground motion that could affect the site were performed using attenuation evaluation methods provided by the U.S. Geological Survey (USGS, 2020a). The evaluations were performed using an estimated shear wave velocity in the upper 100 feet of the profile of 537 meters per second. Evaluations were performed for upper-bound (UBE) and design-basis (DBE) probabilistic exposures. The UBE corresponds to horizontal ground accelerations having a 10 percent probability of exceedance in a 100-year exposure period, with a statistical return period of 949 years. The DBE corresponds to horizontal ground accelerations having a 10 percent probability of exceedance in a 50-year, exposure period, with a statistical return period of 475 years. The results of these evaluations are presented in the following table:

PROBABILISTIC GROUND MOTION DATA				
Earthquake Level	**Probabilistic Estimate Exposure Period (years)**	**Probability of Exceedance (%)**	**Return Period (years)**	**Estimated Peak Horizontal Ground Acceleration (g)**
Upper-Bound Ground-Motion	100	10	949	0.296
Design-Basis Ground-Motion	50	10	475	0.215

It should be noted that although the seismic hazard models used for this study predict the probability of exceedance for various levels of acceleration in a given exposure period, the models are not able to account for the effect that the passage of time since past earthquakes has on future earthquake probability. Thus, while time may affect the incipient risk of earthquakes occurring, the UBE and DBE values are based on any 100-year and 50-year exposure period, respectively, regardless of how recently earthquakes have occurred.

3.2 LANDSLIDES

No existing, past, or incipient landslides were observed within the proposed quarry expansion area.

3.3 LIQUEFACTION AND LATERAL SPREADING

Liquefaction is described as the sudden loss of soil shear strength due to a rapid increase of soil pore water pressures caused by cyclic loading from a seismic event. In simple terms, it means that a liquefied soil acts more like a fluid than a solid when shaken during an earthquake. For liquefaction to occur, the following are needed:

- Granular soils (sand, silty sand, sandy silt, and some gravels);
- A high groundwater table; and
- A low density in the granular soils underlying the site.

If those criteria are present, then there is a potential that the soils could liquefy during a seismic event. The adverse effects of liquefaction include local and regional ground settlement, ground cracking and expulsion of water and sand, the partial or complete loss of bearing and confining forces used to support loads, amplification of seismic shaking, and lateral spreading. In general, the effects of liquefaction on the proposed project could include:

- Lateral spreading;
- Vertical settlement; and/or
- The soils surrounding lifelines can lose their strength and those lifelines can become damaged or severed.

Lateral spreading is defined as lateral earth movement of liquefied soils, or soil riding on a liquefied soil layer, down slope toward an unsupported slope face, such as a creek bank, or an inclined slope face. In general, lateral spreading has been observed on low to moderate gradient slopes but has been noted on slopes inclined as flat as one degree.

Most materials located within the proposed quarry area consist of volcanic rock materials and terrace deposits. The volcanic rock materials are not subject to liquefaction. The terrace deposits are thought to contain appreciable fines and groundwater is anticipated to be located at depths below 50 feet, per the exploratory holes advanced with the air-percussion drill rig (see Appendix C). Thus, terrace deposits are considered to have a low potential for liquefaction susceptibility.

3.4 NATURALLY OCCURRING ASBESTOS

3.4.1 Information Regarding Naturally Occurring Asbestos

Ultramafic rock, such as serpentinite, amphibolite, peridotite, dunite, pyroxenite, hornblendite, etc., can contain asbestiform minerals, which are fibrous, silica-rich crystals that can cause lung cancer, mesothelioma, asbestosis, and other health-related issues, if present. Typically, six minerals within ultramafic rocks are responsible for the primary, naturally occurring asbestiform concerns for health-related issues: chrysotile, tremolite, actinolite, anthophyllite, crocidolite, and amosite. These minerals may or may not be present in ultramafic rocks; thus, the presence of ultramafic rock does not automatically indicate that there is a health hazard. The presence of asbestiform minerals can sometimes be discerned in the field based on visual examination of rock exposures but, most often, must be confirmed using laboratory testing.

Naturally occurring asbestos can be hazardous to human health if it is disturbed, becomes airborne and is inhaled. If NOA is not disturbed and fibers are not released into the air, then it is typically not considered a health hazard. Inhalation is the primary exposure route of concern, because breathing asbestos fibers may cause them to become trapped in the lungs. Ingestion is another, albeit less common, pathway of concern, because swallowing asbestos fibers may also cause the fibers to be trapped in body tissues. Asbestos is not absorbed through the skin, so merely touching it does not pose a significant risk to human health. Asbestos fibers are not water soluble and do not move through groundwater to any appreciable extent. Based on studies of other insoluble particles of similar size, the expected migration rate of an asbestos fiber through soils by the forces of groundwater is approximately 1 to 10 centimeters (0.4 to 4 inches) per 3,000 to 40,000 years (New Hampshire DES, 2010). Thus, asbestos is not considered a groundwater contaminant.

As discussed in Section 2.1.2, the highwall should expose volcanic rocks consisting of basalt, andesite, and rhyolite, which are not rock types that typically are considered as generators of NOA. If fibrous rock, or differing rock materials, such as those mentioned above, are encountered during quarrying, we recommend that an assessment of the potential presence of NOA and its associated concentrations be performed.

3.4.2 Site Conditions

Volcanic rocks at the site are typically not considered asbestos bearing, since they do not meet the criteria noted above. Thus, testing was not performed to assess the potential presence of NOA. If such testing is desired, we would be pleased to assist in those services.

4 SLOPE STABILITY

4.1 GENERAL

The following section discusses slope stability evaluations performed for this project. Results of the stability analyses are included in Appendix B. The following section discusses methods used for stability analyses. All evaluations were performed in accordance with Blake et al. (2002) and CGS (2008), as discussed below.

4.2 DISCUSSION REGARDING FACTORS OF SAFETY

Evaluation of slope stability generally takes into consideration a number of soil and rock strength parameters, geologic conditions within the slope, hydrogeologic conditions, and surcharge and seismic loads that could affect the slope. Those parameters are typically modeled using limit-equilibrium methods (and less commonly using finite-element or finite-difference modeling) to estimate a slope inclination that meets or exceeds a target minimum factor of safety (FOS) against failure. The FOS is estimated by calculating the forces resisting slope failure divided by the forces causing slope failure. Thus, a FOS of greater than 1 implies a stable slope, a FOS of less than 1 a slope that is failing, and a FOS of 1, a slope that is creeping and/or on the verge of failure.

Conventional engineered cut or fill slopes typically utilize minimum slope stability FOS thresholds of 1.5 and 1.1 for static and pseudostatic (pseudo-earthquake forces) evaluations, respectively, for acceptable maximum slope inclinations (Blake et al., 2002, CGS, 2008). For open quarry slopes, the FOS for static conditions is often reduced to 1.25 because the risk to structures, people, and improvements is relatively low.

4.3 SURFACE SLOPE GEOMETRY

Surface topography used in our slope stability analyses is based upon topographic information collected for the proposed project (VESTRA, 2020).

4.4 SUBSURFACE PROFILE

Subsurface geological conditions for the proposed quarry expansion were estimated through observation and mapping of site conditions, review of air-percussion exploratory drill holes (see Appendix C), and observations from highwall exposures within the existing quarry. Cross sections presented as Plates 5.1 through 5.4 were developed across the site to depict anticipated subsurface conditions.

4.5 ENGINEERING PROPERTIES USED IN STABILITY ANALYSES

Soil shear strengths used in stability analyses are partially based upon direct shear data obtained from laboratory testing of a selected sample of completely weathered regolithic andesitic soil collected during this study. The shear strength obtained from that test is included in Appendix A and shown in the following tables:

DIRECT SHEAR TEST RESULTS		
Description	**Cohesion (psf)**	**Angle of Internal Friction (Ø)**
Regolithic andesitic soils	442	41.9°

Shear strength of the rock was estimated from laboratory unconfined compression tests (UCS) obtained from rock samples taken from exposures within the existing quarry during this study. Results of the unconfined compression tests are presented in Appendix A, and are as follows:

UNCONFINED COMPRESSION TEST RESULTS			
Sample	**Description**	**Compressive Strength**	
		psi	**Ksf**
1A	Basalt	6,180	889.9
2A	Andesite	5,780	832.3
2B	Andesite	5,710	822.2
3A	Basalt	10,260	1,477.4
3B	Basalt	17,200	2,476.8
	Average:	**9,026**	**1,299.7**

As noted above, the average UCS values for the rock tested from the quarry is 9,026 pounds per square inch (psi). Those intact rock strengths range from medium strong rock to very strong rock (ISRM Grade R3 to R5) with an average classification as strong rock (ISRM Grade R4).

The rock mass strength parameters were derived using the Hoek-Brown failure criterion (Marinos et al., 2005; Marinos et al., 2000). The overall strength of a rock mass is difficult to estimate because of scale issues. Methods of estimating rock mass strength based on the strength of intact rock materials and the lithology, rock mass quality and other factors are used to downgrade the measured intact rock strength to rock mass scale values. Once these strength properties have been estimated, they can be adjusted to account for the expected level of disturbance. Rock mass disturbance is typically caused by blast damage and vertical unloading, as well as strains resulting from stress changes in the quarry walls.

The Geological Strength Index (GSI) is based on the RMR rating system and was introduced by Hoek et al. (1995) to overcome issues with the RMR values for very poor-quality rock masses. For better quality rock masses (GSI>25), the value of GSI can be estimated from Bieniawski's RMR (1989) as GSI=RMR-5. This assumes a groundwater rating set to 15 (dry) and the adjustment for joint orientation set to 0 (very favorable). For this study, the GSI for basalt and andesite/ryholite have been estimated to be 60 and 55, respectively.

Hoek et al, (2002) recommends that the utilized rock mass strengths be downgraded to disturbed

values to account for rock mass disturbance associated with heavy production blasting and vertical stress relief. He indicates that a disturbance factor of 0.7 would be appropriate for a mechanical excavation where no blasting damage is expected. A value of 1.0 is assumed for conventional production blasting. A good controlled production blasting strategy is expected to be between these extremes and consistent with a disturbance factor of 0.85. For this study a disturbance factor of 1.0 was used.

The following table presents a summary of the rock mass strength parameters for the anticipated rock that will be encountered within the quarry walls.

SUMMARY OF ROCK MASS STRENGTH PARAMETERS

Basic Parameter	Symbol	Unit	Values by Sample				
			1A	2A	2B	3A	3B
Rock Type:			Basalt	Andesite	Andesite	Basalt	Basalt
Unit Weight	Γ	pcf	165	165	165	165	165
Intact Unconfined Compressive Strength (UCS)	σ_{ci}	psi	6,180	5,780	5,710	10,260	17,200
Basic Rock Mass Rating (1989)	RMR	-	55	65	65	55	55
Geologic Strength Index	GSI	-	60	60	60	55	55
Petrographic Constant for Intact Rock	m_i	-	25	25	25	25	25
Disturbed Rock Mass (Disturbance Factor D=1.0)							
Hoek-Brown Constant for Rock Mass	m_b	-	1.436	1.436	1.436	0.703	0.703
Hoek-Brown Constant	S	-	0.0013	0.0013	0.0013	0.0002	0.0002
Friction angle of Rock Mass	Ø'	degrees	48.8	48.4	48.3	46.9	50.6
Cohesion of Rock Mass	C'	psf	9,102	8,828	8,780	8,105	10,170
Compressive Strength of Rock Mass	S_{cm}	ksf	31.15	29.13	28.78	21.84	36.61
Deformation Modulus	E_m	ksf	121,216	117,228	116,514	87,829	104,427

Thus, the following ranges for the angle of internal friction (Ø) and cohesion were estimated for the rock materials using the methods of Hoek et al. (2002):

DIRECT SHEAR TEST RESULTS

Description	Range for Cohesion (psf)	Range for Angle of Internal Friction (Ø)
Basalt	9,102 to 15,314	48.8° to 55.6°
Andesite	6,364 to 6,395	42.6°

For basalt, we elected to use a cohesion (C) of 2,000 psf and Ø of 49° for the strength of those rock materials.

As previously noted, the andesite and rhyolite layers consist of soil with cobble- and boulder-size clasts interspersed within the soil mass forming a volcanic mélange, also known as bimrock. Strength evaluations of mélanges and bimrock materials, based on tests performed on groundmass, have shown the laboratory-determined strength values of the groundmass (matrix) to be lower than actual slope strength values because they do not account for the circuitous path around or through cobbles and boulders that shear planes must traverse in order for slope failure to occur (Lindquist, 1994; Medley, 2001).

A methodology for adjusting the angle of internal friction based on mélange characteristics is provided by Medley (2001). That procedure dictates that sufficient mechanical contrast has to be present between the block and matrix materials to realize an adjusted strength benefit. The following equation is used evaluate if that contrast is present:

$$\text{Contrast} = \frac{Tan(Ø)\ of\ weakest\ block}{Tan(Ø)\ of\ matrix}$$

If the contrast exceeds a value of 1.5, then appropriate conditions exist and benefit from that procedure might be realized. If the contrast is below 1.5, then failure surfaces are likely to pass through blocks and no benefit will be obtained. A Ø angle of 42.6° was obtained for the andesite block materials and a Ø angle of 41.9° was obtained for the matrix materials. The contrast ratio for those materials equates to 1.02. Thus, adjustment of strength values as described by Medley (2001) will not benefit this project.

Thus, based on the results of the aforementioned testing and evaluations, we have used the following strength values for materials anticipated to be exposed within highwall slopes:

STRENGTH VALUES USED IN EVALUATIONS

Description	Cohesion (psf)	Angle of Internal Friction (Ø)
Basalt	2,000	49°
Andesite	440	42°

4.6 HYDROGEOLOGIC CONDITIONS

As noted in Section 2.2.3, groundwater is anticipated to be located below the bottom of the proposed quarry excavation. Thus, slope stability at the site was modeled with no piezometric surface influencing the stability.

4.7 PSEUDOSTATIC LOADING CRITERIA

To estimate the appropriate horizontal ground acceleration (pseudostatic loading) to use within our model, we used methods of Blake et al (2002) and CGS (2007). Using a probabilistic horizontal

ground acceleration of 0.22g, which corresponds to a 475-year return period (10% chance of exceedance in 50 years; see Section 3.1.3), we could have reduced that value by 44 percent to obtain a pseudostatic acceleration of 0.09g and been within the standard of practice for these evaluations. However, to be conservative, we utilized a pseudo static acceleration of 0.15g within our model.

4.8 SLOPE STABILITY EVALUATIONS

BAJADA performed a number of slope stability evaluations to estimate the maximum safe slope inclination at the site. As discussed in Sections 2.1.2 and 2.2.2 and as shown on Plates 5.1 through 5.4 and Plate 6, the geologic conditions at the site consist of a layered rock and soil model. This model has competent, hard, fractured basalt flows sandwiched between weak rock and soil that contains cobble- and boulder-size clasts of harder andesite and rhyolite. Thus, the stability of the slope will not be governed by orientations and proliferations of discontinuity orientations of rock within the slope but more so by the stability of the soil interbeds.

Using this model, gross stability evaluations of slopes with varying inclinations and heights were performed. These evaluations consisted of limit-equilibrium analyses performed using the computer program SLIDE 2018 (Rocscience, 2020). Static and pseudostatic analyses results are presented in Appendix B of this report. Stability analyses evaluated the FOS values for highwall slopes ranging in height from 150 to 350 feet tall with slope angles varying from 45 to 60 degrees. The following table presents the results of those analyses:

RESULTS OF STABILITY ANALYSES

Slope Height (feet)	Slope Inclination (degrees)	Loading Condition	Factor of Safety	Acceptable FOS?
150	45	Static	1.55	Yes
		Pseudostatic	NP	NA
	50	Static	1.39	Yes
		Pseudostatic	NP	NA
	55	Static	1.26	Yes
		Pseudostatic	1.02	Yes
	60	Static	1.15	No
		Pseudostatic	NP	NA
200	45	Static	1.47	Yes
		Pseudostatic	NP	NA
	50	Static	1.31	Yes
		Pseudostatic	1.05	Yes
	55	Static	1.19	No
		Pseudostatic	NP	NA
250	45	Static	1.40	Yes
		Pseudostatic	NP	NA
	50	Static	1.25	Yes
		Pseudostatic	1.00	Yes
	55	Static	1.13	No
		Pseudostatic	NP	NA

RESULTS OF STABILITY ANALYSES				
Slope Height (feet)	**Slope Inclination (degrees)**	**Loading Condition**	**Factor of Safety**	**Acceptable FOS?**
300	45	Static	1.36	Yes
		Pseudostatic	1.07	Yes
	50	Static	1.19	No
		Pseudostatic	NP	NA
350	45	Static	1.31	Yes
		Pseudostatic	1.03	Yes
	50	Static	1.16	No
		Pseudostatic	NP	NA
NP – Not performed; NA – Not applicable				

Results of the stability analyses are presented graphically as a curve on Plate 10 – Slope Inclination Versus Height. It should be noted that the curve applies to both static (FOS ≥ 1.25) and pseudostatic (FOS ≥ 1.01) conditions.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Based on the results of our investigation, it is our opinion that the site is suitable for development of the project provided recommendations presented, herein, are utilized during expansion of the quarry. Specific comments and recommendations regarding the geotechnical aspects of project design and construction are presented in the following sections.

5.1.1 Faulting

As previously noted, the project site is located about 7 miles from the closest State-mapped Holocene-active fault. However, as shown on Plate 9, it appears that possible northerly extensions of the Holocene-active Warm Springs Valley fault may project through the quarry area. It is our opinion that there is risk associated with rupture across the project site from this fault; however, since there are no habitable structures, the potential health risks are relatively low, especially with a relatively long recurrence interval for that fault.

5.1.2 Landslides

It is our opinion that the risk of natural landslides to adversely impact the project site is low. The risks of failure of man-made slopes associated with quarrying is discussed below.

5.1.3 Liquefaction

Based on our observations and the characteristics of materials exposed in the existing quarry during the investigation, it is our opinion that liquefaction and lateral spreading pose a low risk of adversely affecting the proposed quarry expansion project site.

5.1.4 Naturally Occurring Asbestos

Based on our observations at the existing quarry site, it is our opinion that rock materials associated with NOA are not present within the proposed quarry area.

5.2 QUARRY SLOPE DESIGN

The following sections discuss the maximum recommended slope inclinations, slope heights, and bench locations for the proposed disposal stockpile.

5.2.1 Slope Inclination & Height

As noted in Section 4.8, slopes ranging in height from 150 to 350 feet were evaluated to estimate the maximum slope inclination that would provide a minimum FOS value for static and pseudostatic conditions of 1.25 and 1.0, respectively, for those heights. The results are tabulated in Section 4.8 and presented on Plate 10. We recommend that highwall slope inclinations be designed no steeper than those inclinations noted on Plate 10 for the maximum proposed highwall height within the proposed expansion area.

5.2.2 Bench Recommendations

Conventional hard rock quarries have benches separated by near vertical bench faces to create a stepped geometry from top of slope to bottom of quarry. Because this site has relatively strong basalt flows separated by relatively weak andesite and rhyolite layers, conventional benching does not appear to be a viable alternative.

Instead, we recommend that the highwall be graded at an inclination noted in Section 4.8 and that benches to capture and divert drainage and to act as catchment for dislodged rocks, be constructed at vertical intervals across the highwall face. We recommend that benches be designed and constructed at no more than 50-foot vertical intervals. The benches should be a minimum of 12 feet wide, inclined into the slope, and constructed to drain to the margins of the highwall and/or to centralized collection areas that capture and convey drainage to the bottom of the cut slope. In addition, we recommend that a V-ditch or berm be constructed along the top of the highwall to divert water away from the highwall face.

5.3 OPERATIONAL CONSIDERATIONS

5.3.1 Controlled Blasting

Blasting disturbance is one of the controlling factors for rock mass strength and overall slope stability. Slope instabilities are often triggered by the progressive deterioration (raveling) of the wall face and this process is often initiated with the detachment of small rock blocks (key blocks) bounded by the rock mass discontinuities, The preservation of rock mass integrity during mining is critical to reduce the potential of these progressive failures and is required to achieve the steepest bench face angles possible.

Controlled blasting methods will facilitate steeper final quarry slopes by reducing face damage from blasting. Typical controlled blasting strategies utilize small diameter blast holes detonated as a pre-shear line in harder, massive rock (pre-splitting) or as a post-shear (cushion) line in weak or heavily fractured rock. In all cases, it is important that blast hole lengths be staggered so the bottom of the hole does not intercept the crest on the bench below. Otherwise, highly fragmented bench crests will develop leading to increased and possibly unacceptable backbreak.

Interim quarry slopes should incorporate some "controlled blasting" to maintain safety, but the requirements in this situation are less rigorous due to shorter operating life of these walls. The initial quarry can be developed with variable slopes and blast patterns to develop optimal blasting design for final quarry walls. Trial blasts are also recommended wherever there is a substantial change in rock mass characteristics, in order to evaluate and optimize blast performance.

5.3.2 Geotechnical Monitoring

Proactive geotechnical monitoring is recommended for all stages of quarry development. The monitoring program should be implemented as a staged approach and include geotechnical and

tension crack observation and monitoring, as well as implementation of a surface displacement monitoring program.

Detailed geological mapping should be performed following creation of new benches but at a frequency no longer than quarterly to annually, depending on the rate of resource extraction and bench formation. Detailed information to be noted should include orientations, types, persistence, frequency, infilling, and condition of discontinuities exposed during mining operations. In addition, seepage volumes and relative changes in seepage volumes should be noted as those changes might indicate dilation of discontinuities and a change in the hydrogeologic environment.

Observations of tension cracks should be carried out along all newly formed benches. Detailed information to be noted should include the surveyed location, orientation, aperture, and both vertical and lateral extents of all tension cracks. The development of tension cracks should be very carefully observed. The frequency of observations should be commensurate with the rate of development of individual cracks. A map and database of tension crack information should be compiled and updated as new information becomes available. Areas of slope movement that are associated with development of tension cracks should also be monitored with survey and/or instrumentation, which can consist of time domain reflectometry (TDR), inclinometers, borehole and/or surface extensometers, tiltmeters, and piezometers.

6 FUTURE GEOTECHNICAL ASSESSMENTS

This preliminary report was prepared using limited data available from surficial rock exposures at the existing quarry site and data from the Air-Track drill holes advanced by HCC. Thus, it is preliminary in nature. Findings, conclusions, and recommendations made within this report should all be considered preliminary. Because of this, we recommend that future geotechnical assessment of the quarry be performed once rock exposures are made within the quarry highwall and/or once additional subsurface geotechnical exploration is authorized. Those future geotechnical assessments should collect additional discontinuity orientations, rock quality data, rock strength data, groundwater information, and evaluate whether recommendations made within this preliminary geotechnical report are valid or require amendment.

In addition, periodic on-going geotechnical assessment of the quarry geologic and geotechnical conditions should be performed, as discussed in Section 8.3.2 of this report.

7 CLOSURE

This preliminary report has been prepared in substantial accordance with the generally accepted geotechnical engineering and engineering geological practice, as it existed in the site area at the time our services were rendered. No other warranty, either express or implied, is made.

Preliminary conclusions contained in this report are based on the conditions encountered during our field observations and mapping, and are applicable only to those project features described herein (see Section 1.1). Subsurface exploration was not performed for completion of this study. Soil and rock deposits can vary in type, strength, and other geotechnical properties between points of observation and exploration. Additionally, groundwater and soil moisture conditions can also vary seasonally and for other reasons. Therefore, we do not and cannot have a complete knowledge of the subsurface conditions underlying the project site. The preliminary conclusions and recommendations presented in this report are based upon the findings at the points of observation, and interpolation and extrapolation of information between and beyond the points of observation, and are preliminary in nature and subject to confirmation based on the conditions revealed by construction. If conditions encountered during construction differ from those described in this report, or if the scope or nature of the proposed construction changes, we should be notified immediately to review and, if deemed necessary, conduct additional studies.

The scope of services provided by BAJADA for this project did not include the investigation and/or evaluation of toxic substances, or soil or groundwater contamination of any type. If such conditions are encountered during site development, additional studies may be required. Further, services provided by BAJADA for this project did not include the evaluation of the presence of critical environmental habitats or culturally sensitive areas.

This report may be used only by our client and their agents and only for the purposes stated herein, within a reasonable time from its issuance. Land use, site conditions, and other factors may change over time that may require additional studies. In the event significant time elapses between the issuance date of this report and full construction of the quarry, BAJADA shall be notified of such occurrence to review current conditions. Depending on that review, BAJADA may require that additional studies be conducted and that an updated or revised report is issued.

Any party other than our client who wishes to use all or any portion of this report shall notify BAJADA of such intended use. Based on the intended use as well as other site-related factors, BAJADA may require that additional studies be conducted and that an updated or revised report be issued. Failure to comply with any of the requirements outlined above by the client or any other party shall release BAJADA from any liability arising from the unauthorized use of this report.

We appreciate the opportunity to assist with this project. If you have any questions, please do not hesitate to contact our office.

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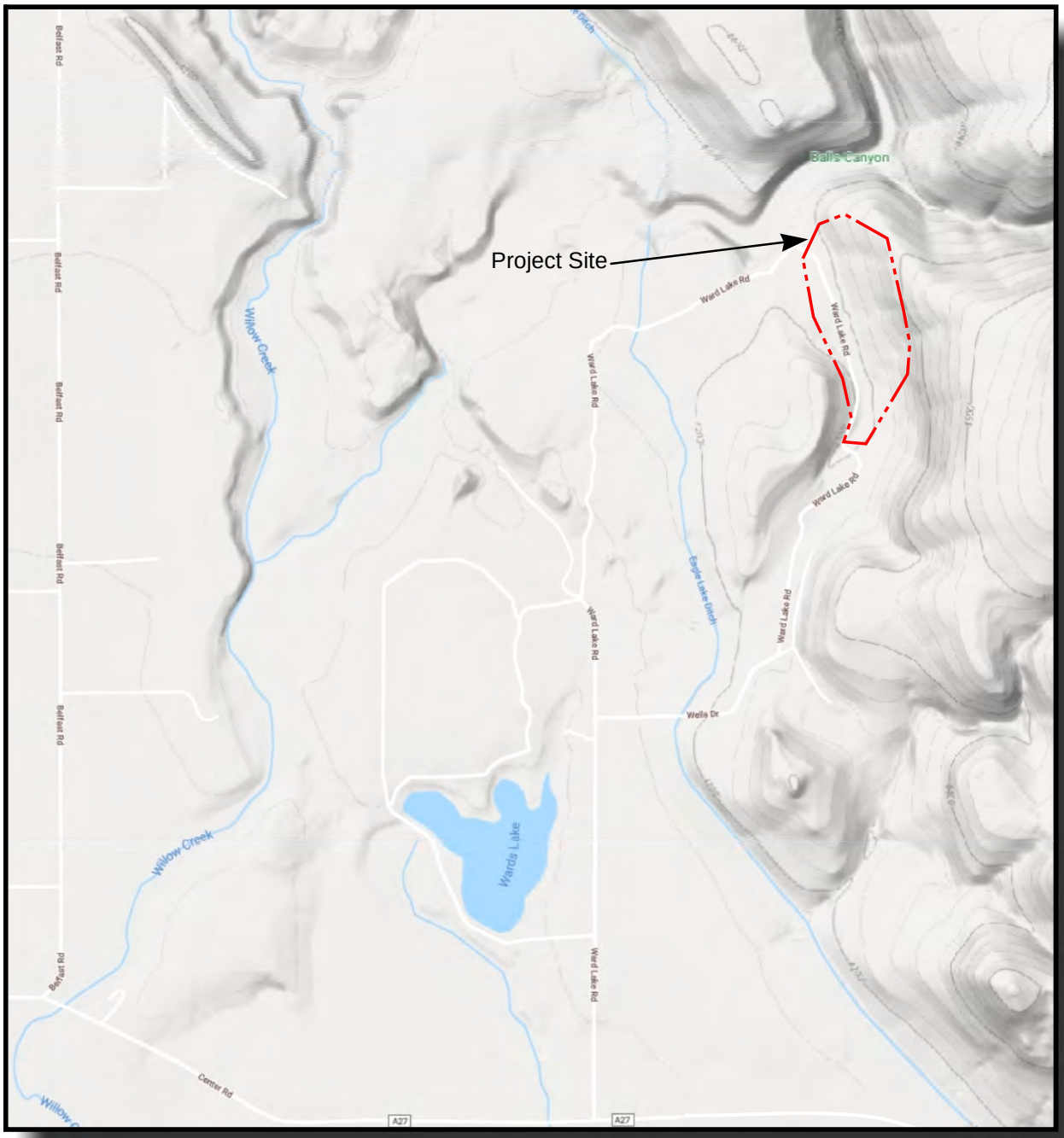

Base maps from Mapquest. Scale undetermined.

SITE LOCATION MAP

Ward Lake Quarry Expansion Preliminary Geotechnical Study Hat Creek Construction Company Lassen County, California	Plate No. 1
BAJADA Geosciences, Inc.	Project no. 2001.0107

PROPOSED QUARRY EXPANSION AREA

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 2

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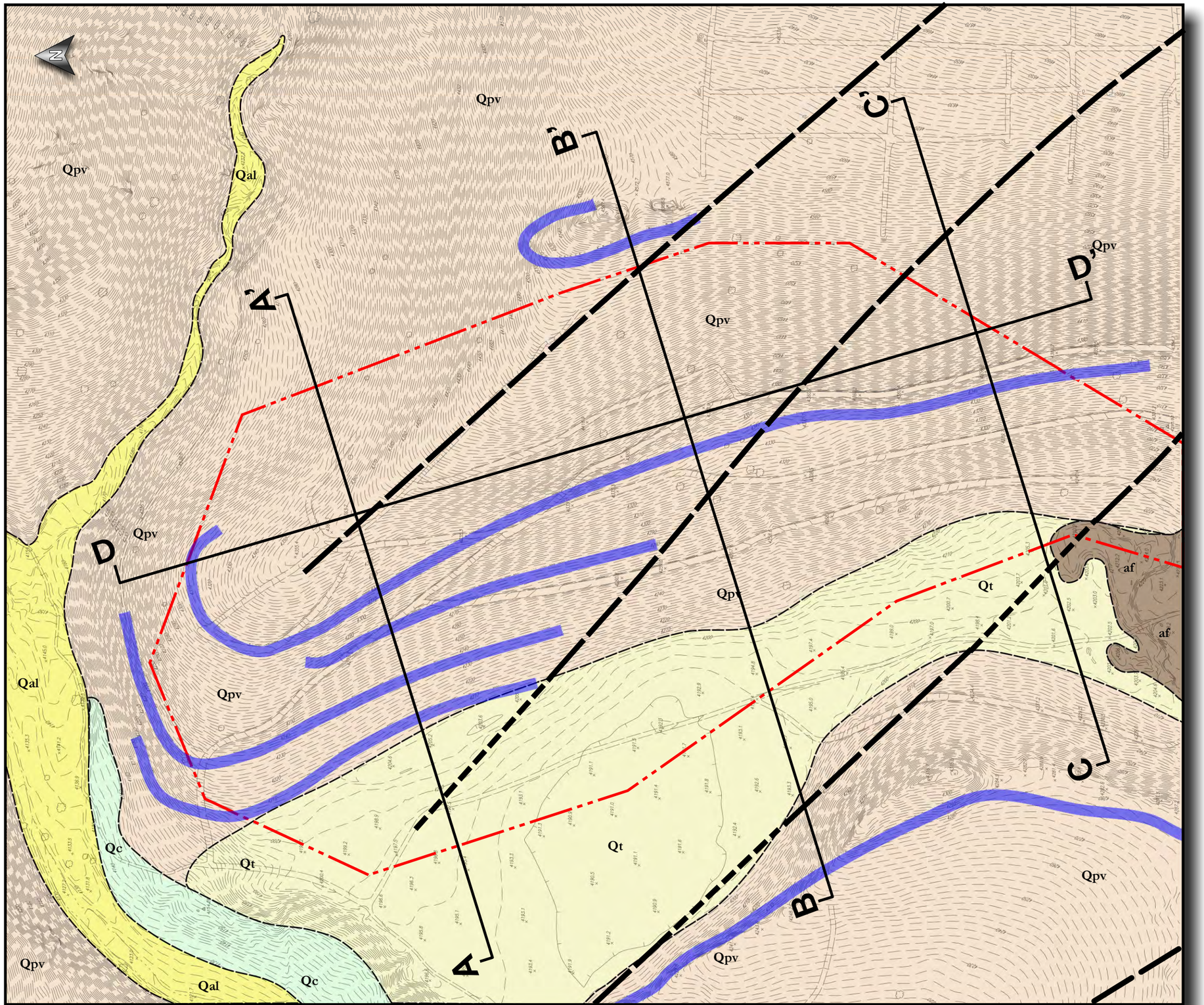
Project no. 2001.0107

Base maps from Google Maps. Scale undetermined.



af Artificial Fill/Stockpile

Qal Alluvium

Qc Colluvium

Qt Terrace Deposits

Qpv Volcanic Rock
(Basalt & Andesite, with minor Rhyolite)

Geologic Contact,
Dashed where approximate

Fault
Dashed where approximate

D D' Geotechnical Cross Section
See Plate2 5.1 through 5.4 for Sections

Approximate Limits of Quarry Expansion

Approximate Limits of Resistant Strata
Mapped From Aerial Photographs

0 150 300

Scale: 1"=300'
1:3,600
Contour Intervals: 2'

Topographic base map from VESTRA (2020)

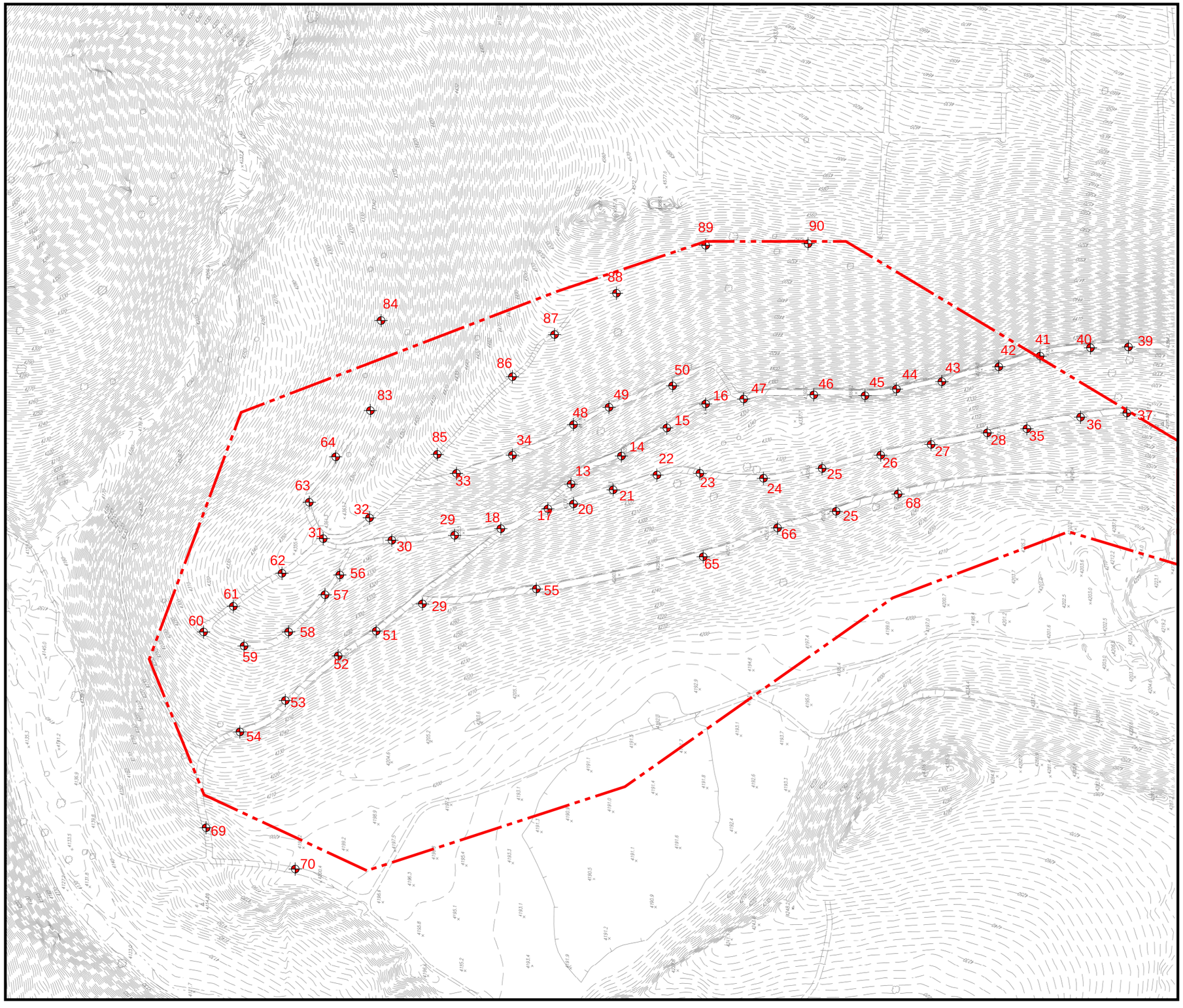
GEOTECHNICAL MAP

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 3

BAJADA Geosciences, Inc.

Project no. 2001.0107



Exploratory Air-Percussion Hole
90

Approximate Limits of Quarry Expansion

0 150 300

Scale: 1”=300’
1:3,600
Contour Intervals: 2’

AIR-PERCUSSION EXPLORATIONS

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No.
4

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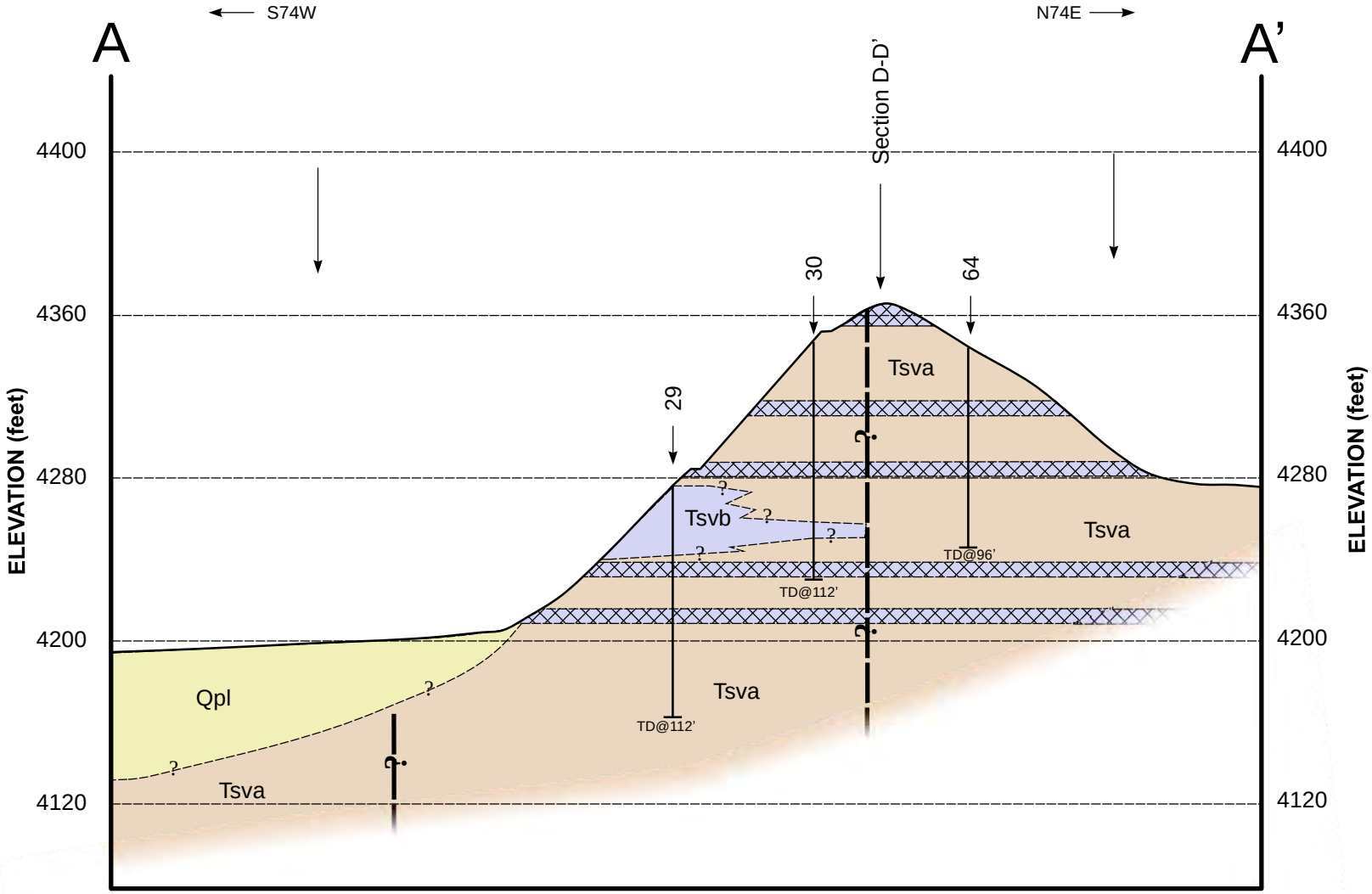
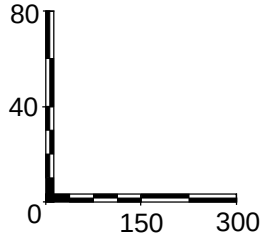


Scale:
Horizontal:1"=300'
Vertical: 1"=80'
Vertical Exaggeration 3.75x



See Plate 5.4 for Legend

See Plate 3 for cross section location

GEOTECHNICAL SECTION A-A'

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No.
5.1

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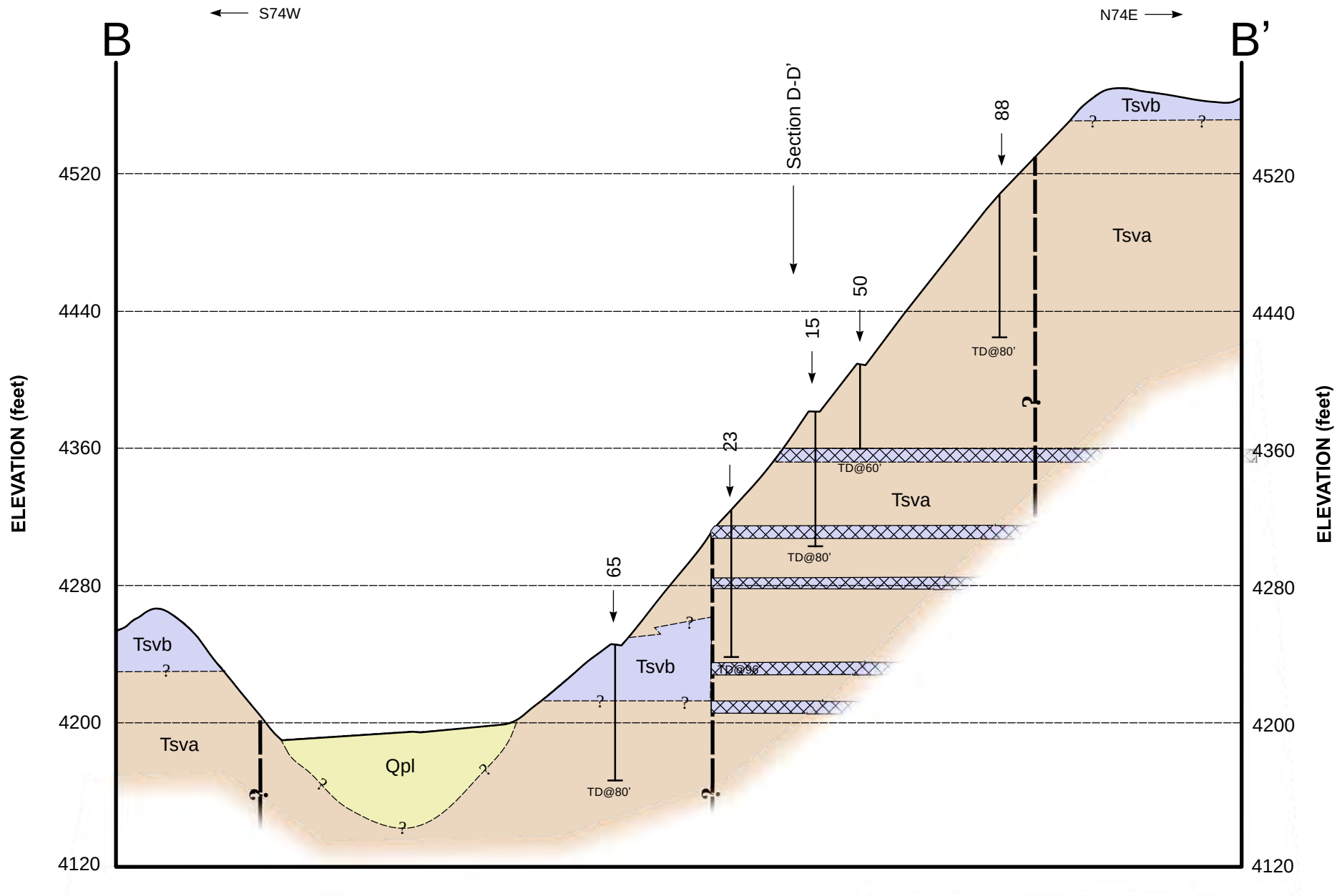

Scale:
Horizontal:1"=300'
Vertical: 1"=80'
Vertical Exaggeration 3.75x

80
40
0
150
300

See Plate 5.4 for Legend

See Plate 3 for cross section location

GEOTECHNICAL SECTION B-B'

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No.
5.2

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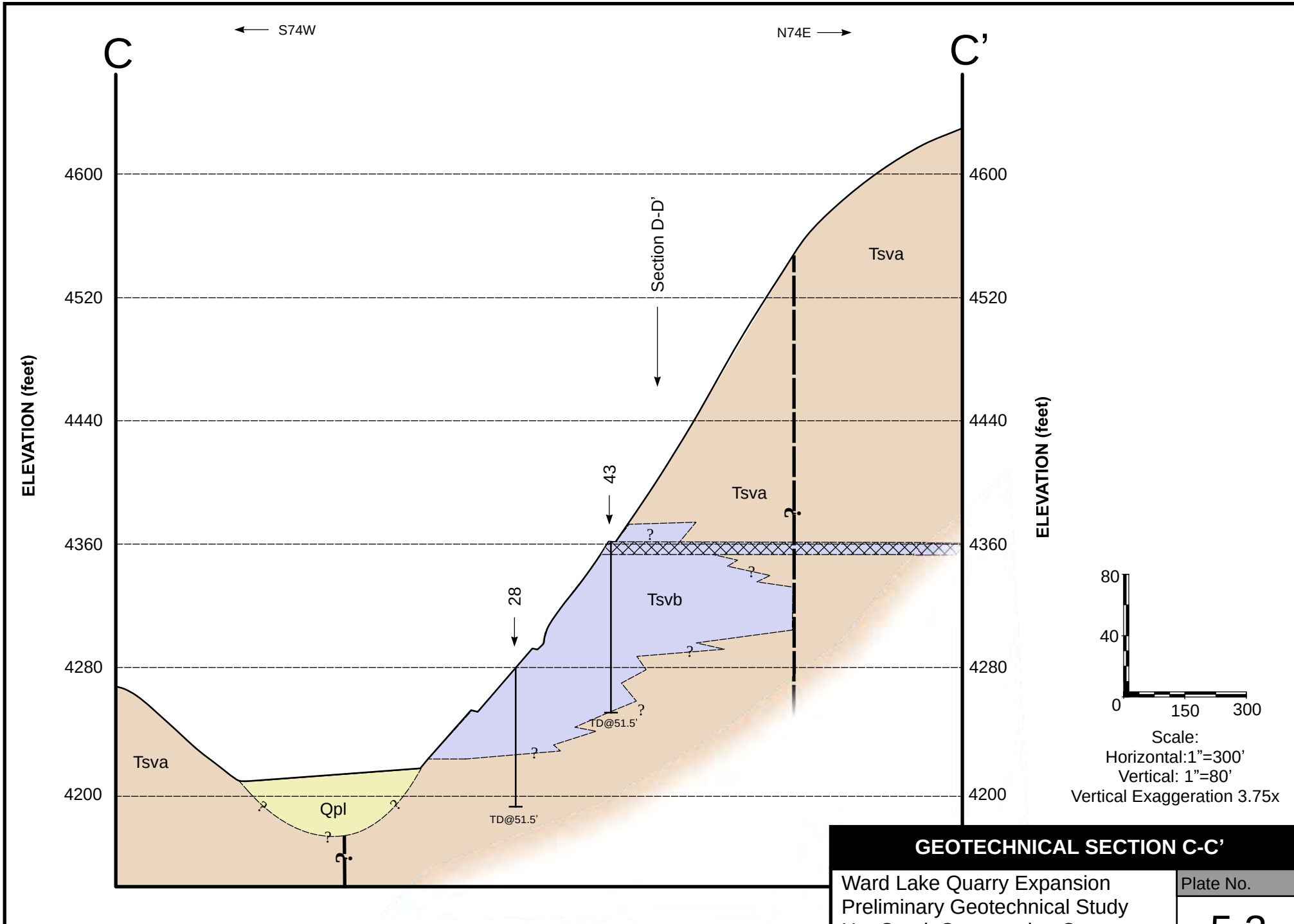

See Plate 5.4 for Legend

See Plate 3 for cross section location

GEOTECHNICAL SECTION C-C'

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 5.3

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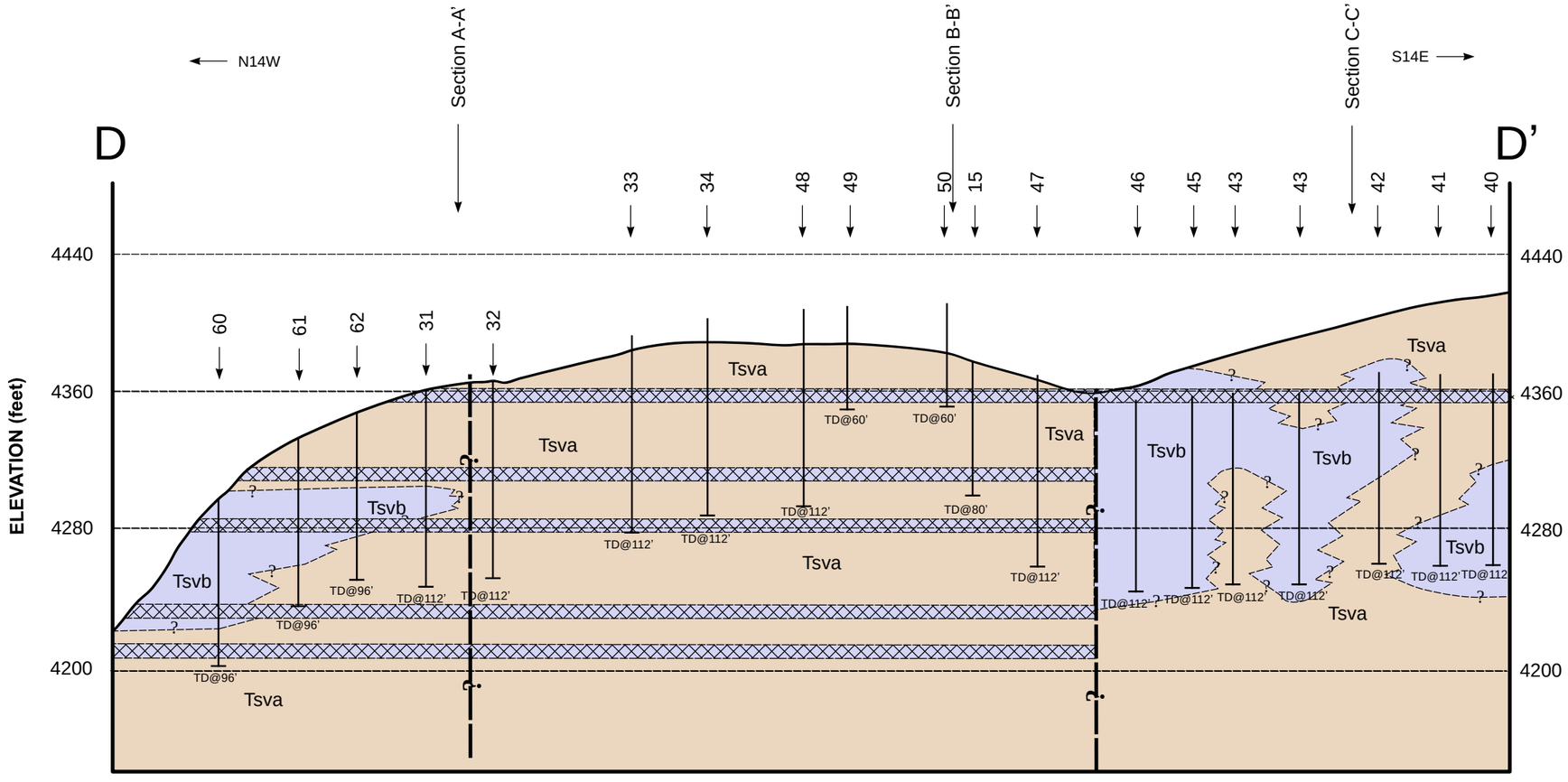
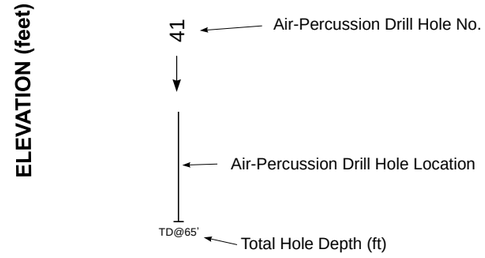
Project no. 2001.0107





Mapped Based on HCC Air-Track Drill Hole Data

- Qpl — Terrace Deposits
- Tsvb — Basalt
- Tsva — Andesite & Rhyolite
- Stratification Line of Resistant Layer Visible on Aerial Photographs
- Geologic Contact, dashed and queried where uncertain
- Fault, dashed and queried where uncertain

80 40 0 150 300

Scale:
Horizontal:1”=300’
Vertical: 1”=80’
Vertical Exaggeration 3.75x

See Plate 3 for cross section location

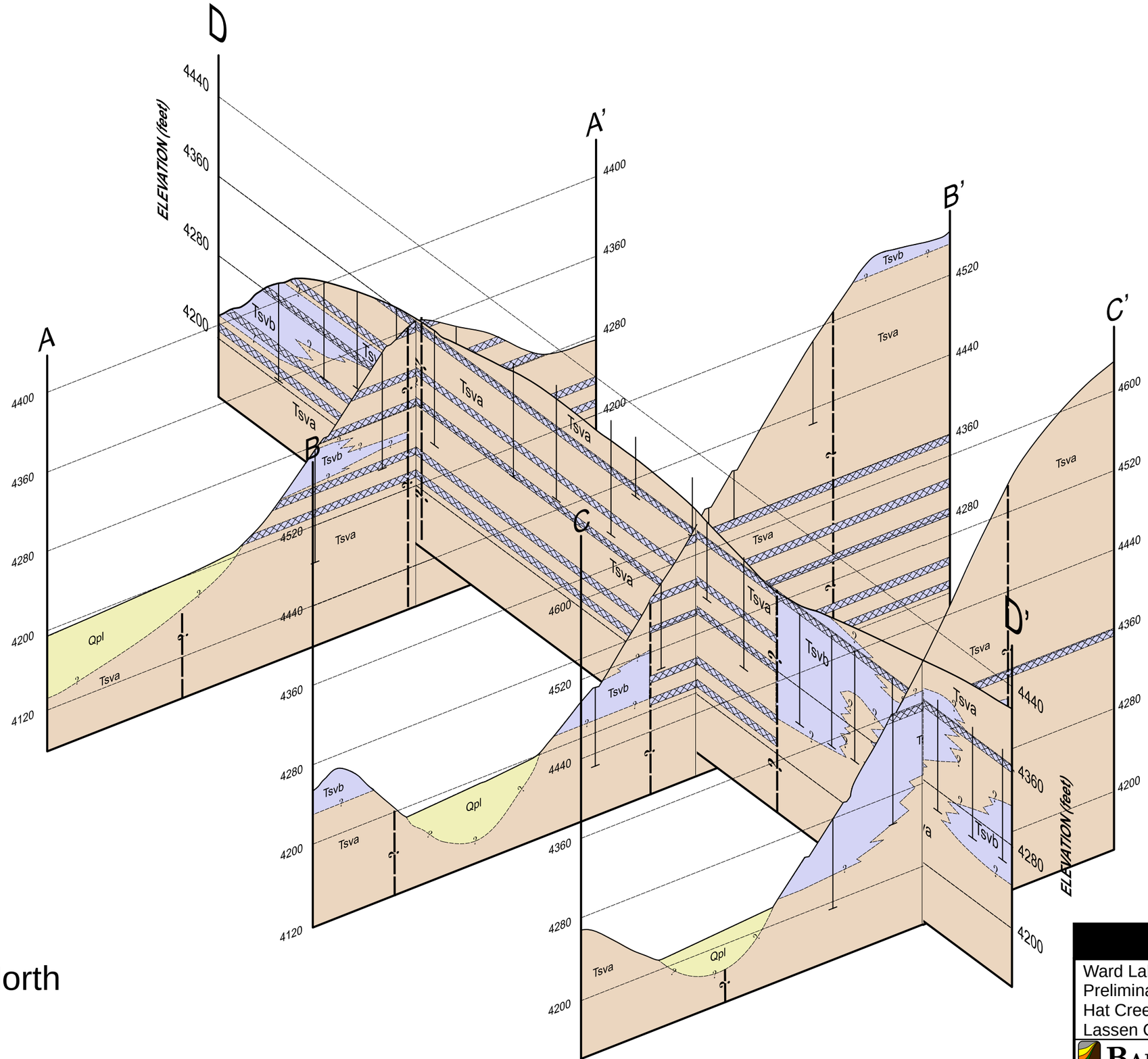
GEOTECHNICAL SECTION D-D’

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 5.4

BAJADA Geosciences, Inc.

Project no. 2001.0107



Looking North

Scale undetermined

FENCE DIAGRAM

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 6

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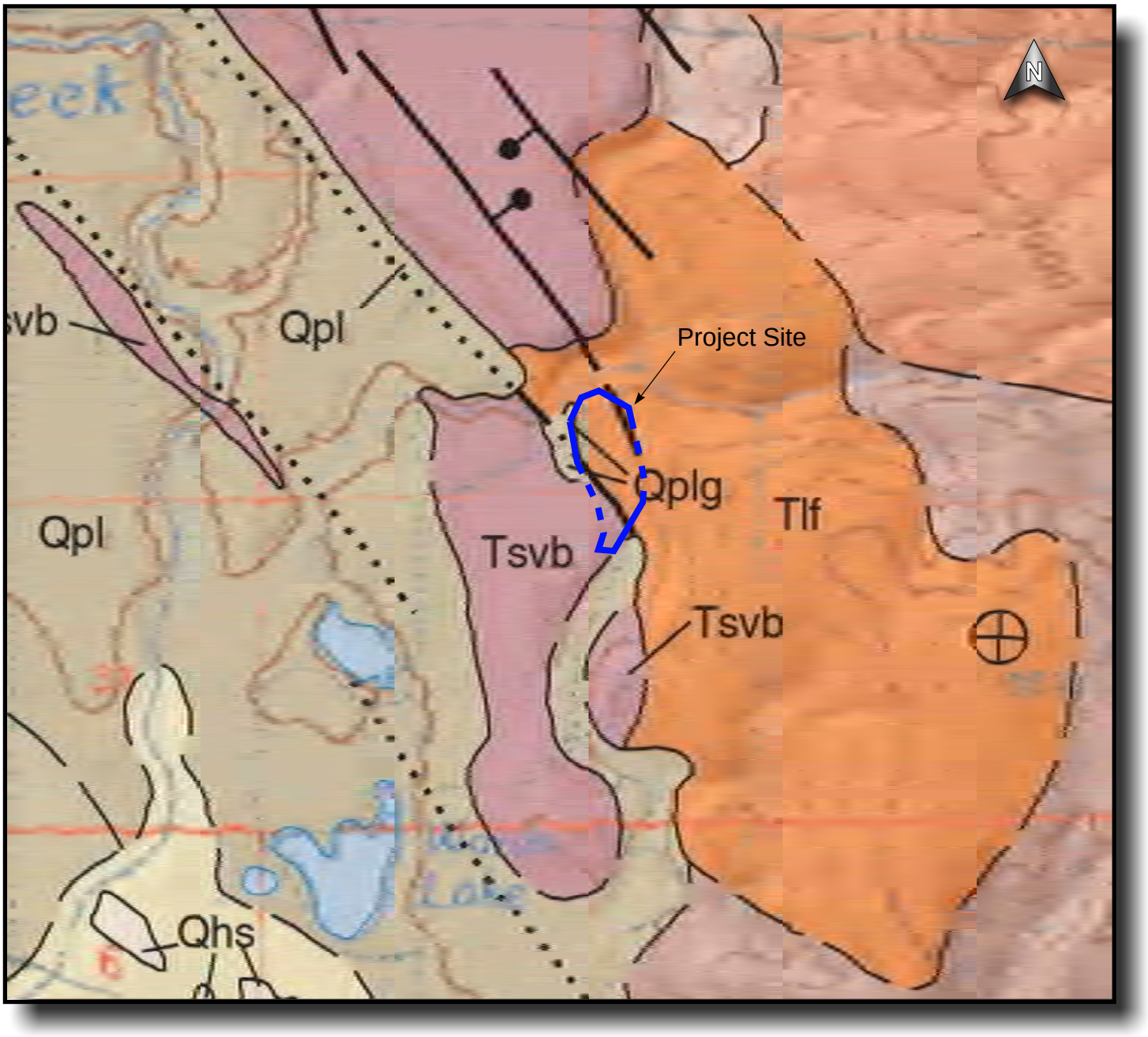
Project no. 2001.0107



Qpl	Near-shore deposits of Lake Lahontan
Tsvb	Basalt of Secret Valley
Tlf	Andesite flows and pyroclastics of Litchfield
Tsma	Two-pyroxene andesite flows of Shaffer Mountain

Base map from Gross et al. (2013). Scale undetermined.

REGIONAL GEOLOGIC MAP

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 7

BAJADA Geosciences, Inc.

Project no. 2001.0107

Active	
Historic Displacement (last 200 years)	Holocene Displacement (last 11,700 years)
Potentially Active	**Inactive**
Late Quaternary Displacement (last 700,000 years)	Quaternary Fault (last 1.6 million years)

Map from USGS Interactive Fault Map

REGIONAL FAULT MAP

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 8

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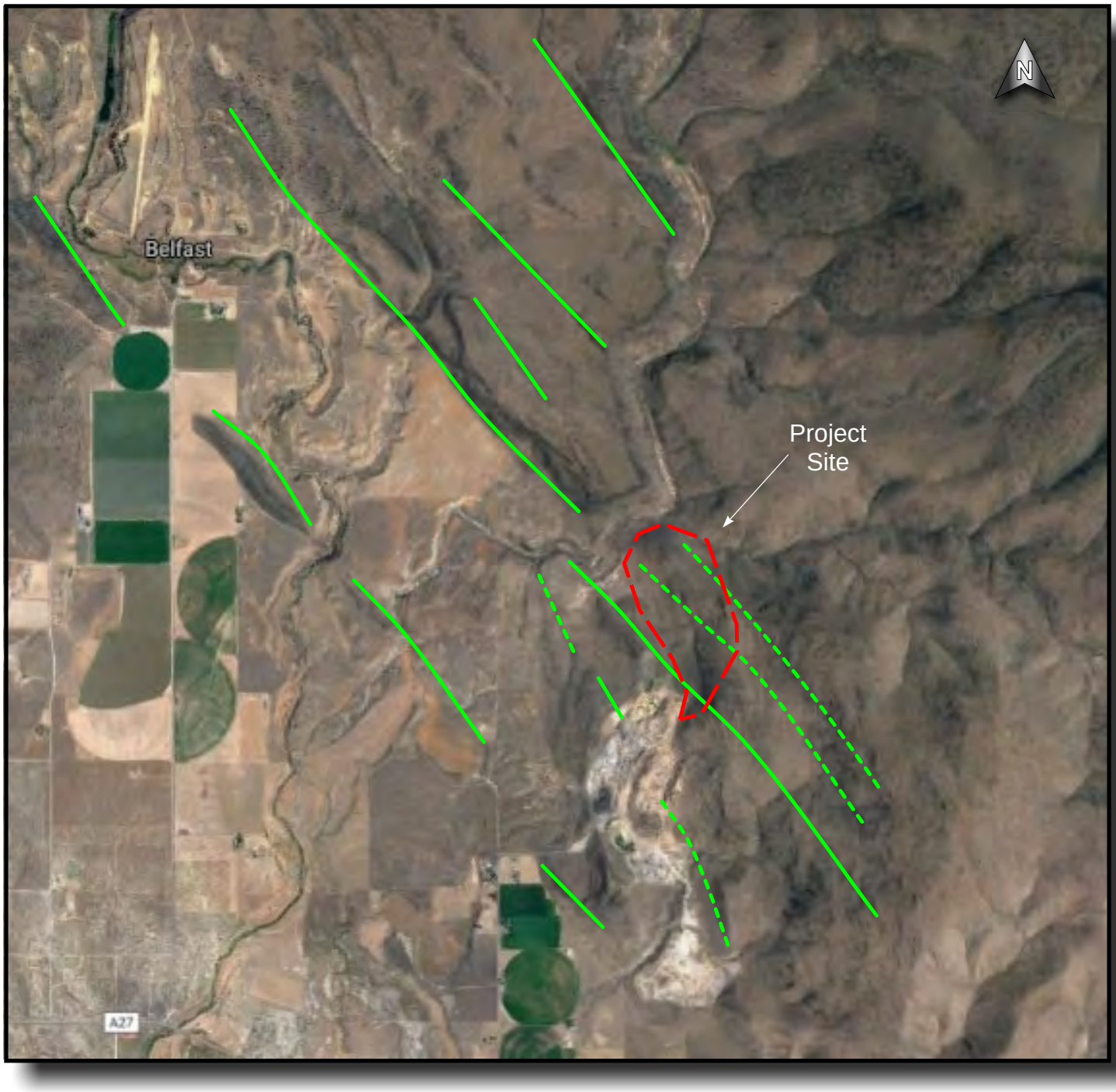

Relatively distinct lineation probably indicative of a fault

Relatively distinct lineation possibly indicative of a fault

Base maps from Mapquest. Scale undetermined.

INTERPRETED AREA FAULT MAP

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 9

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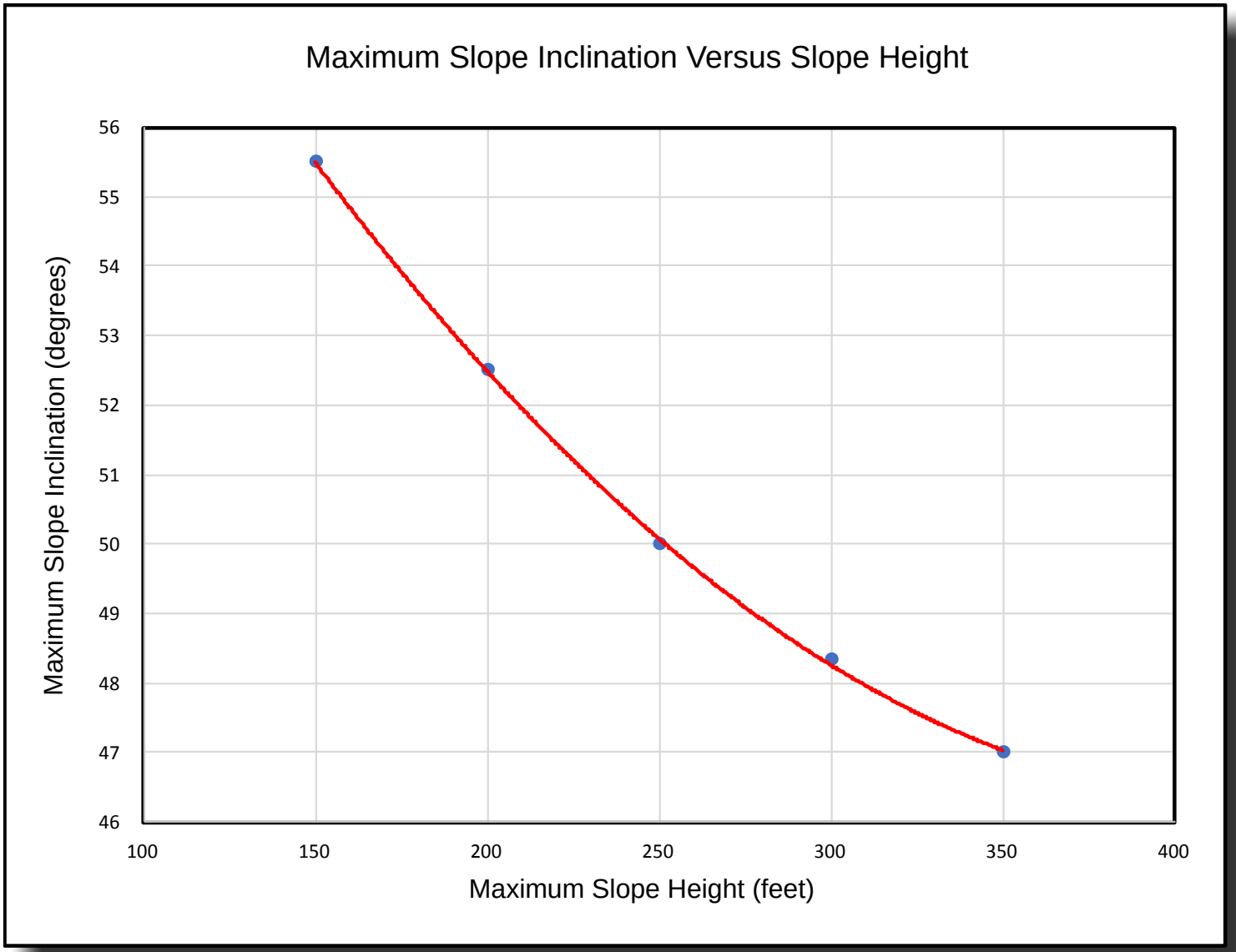


Note: curve satisfies both static (FOS ≥ 1.25) and pseudostatic (FOS ≥ 1.01) conditions.

SLOPE INCLINATION VERSUS HEIGHT

Ward Lake Quarry Expansion
Preliminary Geotechnical Study
Hat Creek Construction Company
Lassen County, California

Plate No. 10

BAJADA Geosciences, Inc.

Project no. 2001.0107

APPENDIX A

Laboratory Testing

APPENDIX A
LABORATORY TESTING

Laboratory Analyses

Laboratory tests were performed on selected bulk soil samples to estimate engineering characteristics of the various earth materials encountered. Testing was performed under procedures described in one of the following references:

- ASTM Standards for Soil Testing, latest revision;
- Lambe, T. William, Soil Testing for Engineers, Wiley, New York, 1951;
- Laboratory Soils Testing, U.S. Army, Office of the Chief of Engineers, Engineering Manual No. 1110-2-1906, November 30, 1970.

Uniaxial Unconfined Compression Test

Uniaxial unconfined compression tests were performed on five rock samples obtained during field evaluations in accordance with standard test method ASTM D7012. The results of the tests are attached as the plate labeled Rock Core Compressive Strength Data.

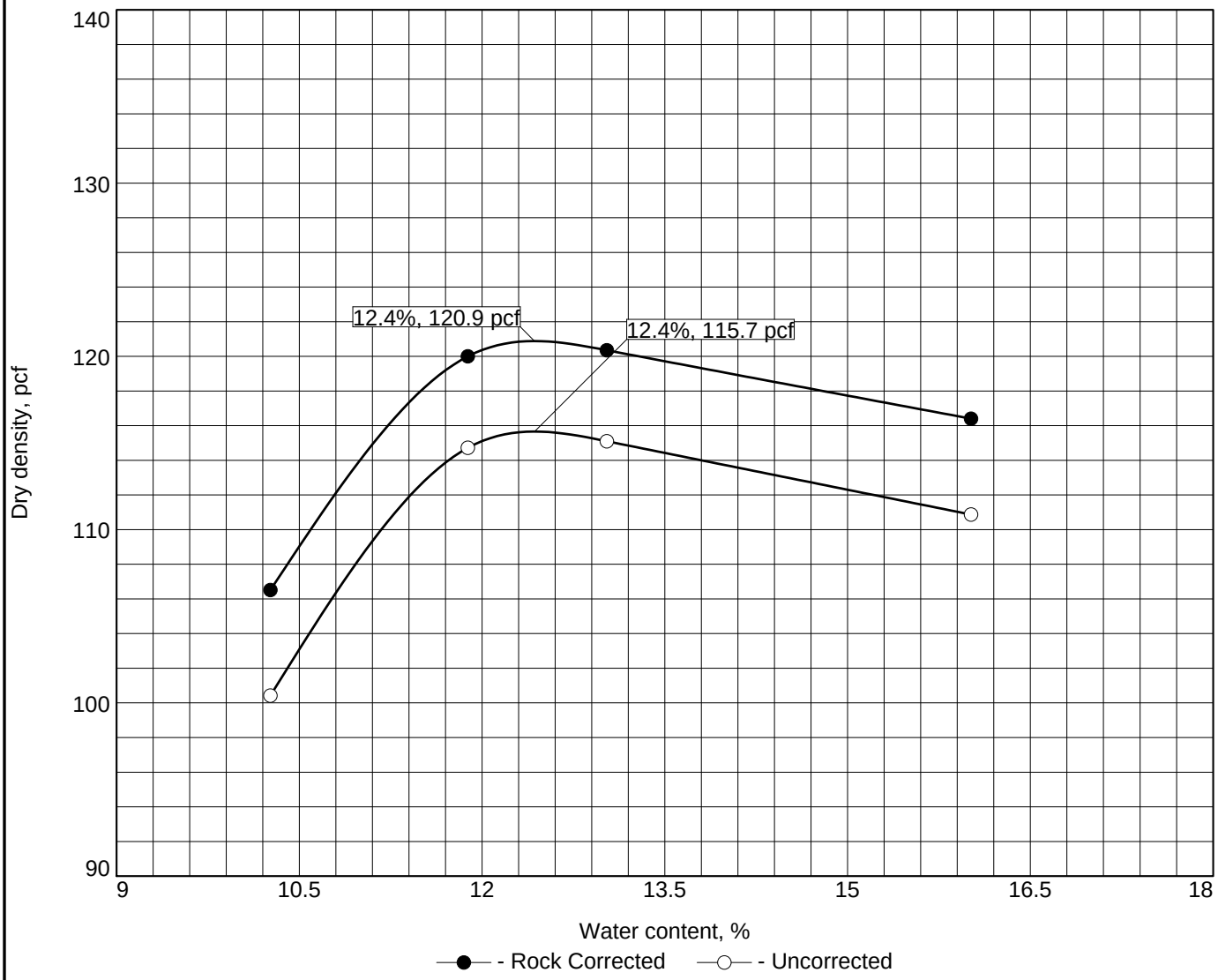
Direct Shear Tests

Direct shear tests were performed on one selected soil samples in accordance with standard test method ASTM D3080. The sample was remolded to 90-percent relative compaction at near optimum moisture content and tested. Results of that test is presented on the attached plate labeled *Consolidated Drained Direct Shear*.

Maximum Density & Optimum Moisture Content

Maximum density and optimum moisture content were evaluated on one selected bulk soil sample in accordance with standard test method ASTM D1557. Results of those tests are presented on the attached plate labeled *Compaction Test Report*.

COMPACTION TEST REPORT



Test specification: ASTM D1557-12 Method C (with uncorrected) Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
---	CL			2.60			15	

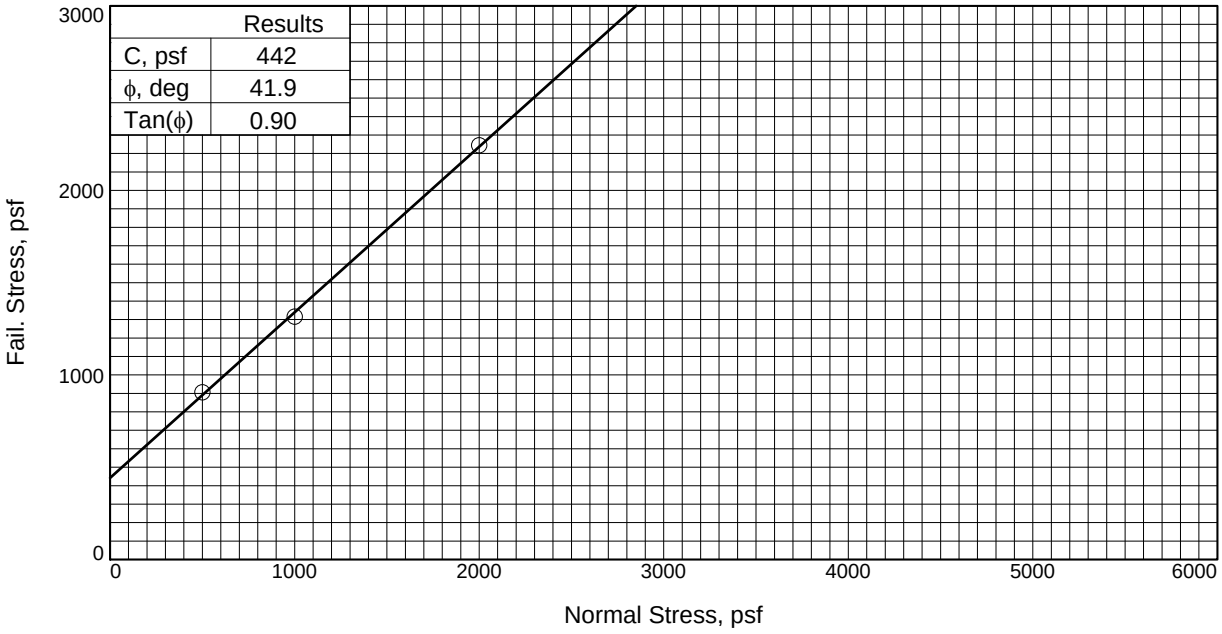
ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 120.9 pcf Optimum moisture = 12.4 %	Light Red Sandy Clay with Gravel (visual)

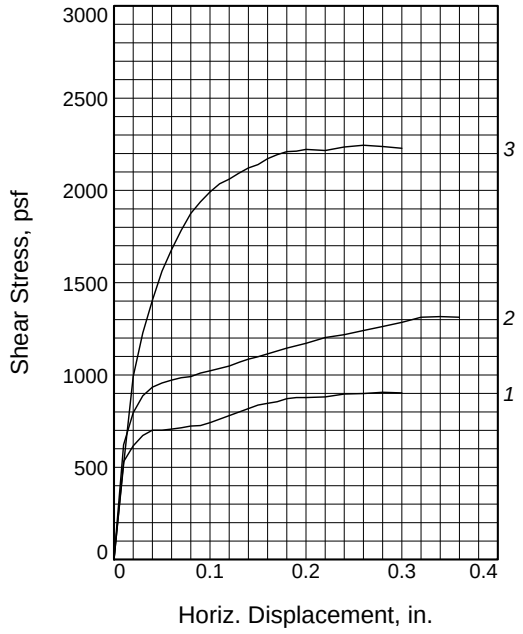
Project No. 3237 **Client:** BAJADA Geosciences, Inc.
Project: Ward Lake Quarry Expansion #2001.0107
Lassen County, California
○ **Location:** B1 **Sample Number:** 1

Remarks:
Curve #1
03/20/2020

Figure 0300-001

Tested By: Jack Bianchin





Sample No.		1	2	3
Initial	Water Content, %	12.4	12.4	12.4
	Dry Density, pcf	104.1	104.1	104.1
	Saturation, %	56.0	56.0	56.0
	Void Ratio	0.5892	0.5892	0.5892
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	24.7	25.7	26.0
	Dry Density, pcf	103.2	98.5	92.9
	Saturation, %	108.6	100.1	88.5
	Void Ratio	0.6034	0.6798	0.7799
	Diameter, in.	2.41	2.41	2.41
	Height, in.	1.01	1.06	1.12
Normal Stress, psf		500	1000	2000
Fail. Stress, psf		906	1316	2244
Displacement, in.		0.28	0.34	0.26
Ult. Stress, psf				
Displacement, in.				
Strain rate, in./min.		0.002	0.002	0.002

Sample Type: remold
Description: Light Red Sandy Clay with Gravel (visual)

Specific Gravity= 2.65
Remarks: Material tested in accordance with ASTM D3080.
Sample remolded to 90% of maximum uncorrected at optimum moisture.
Figure 0300-002

Client: BAJADA Geosciences, Inc.

Project: Ward Lake Quarry Expansion #2001.0107
Lassen County, California
Location: B1
Sample Number: 1 **Depth:** ---
Proj. No.: 3237 **Date Sampled:** 03/11/20

Tested By: Cindy Gooden

Materials Testing, Inc.

8798 Airport Road
Redding, California 96002
(530) 222-1116, fax 222-1611

865 Cotting Lane, Suite A
Vacaville, California 95688
(707) 447-4025, fax 447-4143

Client:	BAJADA Geosciences, Inc.	Date:	03/26/2020
	28301 Inwood Road	Client No:	3237-041
	Shingletown, CA 96088	Report No:	0100-003
Project:	Ward Lake Quarry Expansion #2001.0107	Page:	1 of 2
Location:	Lassen County, California		

ROCK CORE COMPRESSIVE STRENGTH DATA
(ASTM D7012 Method C)

Identification	1-A	2-A	2-B
Material	Basalt	Basalt	Basalt
Date Cut	03/19/20	03/20/20	03/20/20
Date Trimmed	03/19/20	03/23/20	03/23/20
Date Tested	03/24/20	03/24/20	03/24/20
Age in Days	5	5	5
Average Diameter, in	2.0	2.0	2.0
Average X-Section Area, in^2	3.14	3.14	3.14
As Received Length, in	5.5	9.3	9.8
L/D Factor	2.0	2.0	2.0
Maximum Load, lbs.	19,400	18,160	17,930
Compressive Strength, psi	**6,180**	**5,780**	**5,710**
Fracture Pattern, Type	Columnar	Columnar	Columnar

Notes: Specimens prepared in accordance with ASTM D4543.

Tested by Allante Blocker.

Materials Testing, Inc.

8798 Airport Road
Redding, California 96002
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(707) 447-4025, fax 447-4143

Client:	BAJADA Geosciences, Inc.	Revised:	03/26/2020
	28301 Inwood Road	Client No:	3237-041
	Shingletown, CA 96088	Report No:	0100-003
Project:	Ward Lake Quarry Expansion #2001.0107	Page:	2 of 2
Location:	Lassen County, California		

ROCK CORE COMPRESSIVE STRENGTH DATA
(ASTM D7012 Method C)

Identification	3-A	3-B	
Material	Andesite	Andesite	
Date Cut	03/20/20	03/20/20	
Date Trimmed	03/23/20	03/24/20	
Date Tested	03/24/20		
Age in Days	5	4	
Average Diameter, in	2.0	2.0	
Average X-Section Area, in^2	3.14	3.14	
As Received Length, in	7.5	4.3	
L/D Factor	1.5*	1.0*	
Maximum Load, lbs.	32,210	54,020	
Compressive Strength, psi	**10,260**	**17,200**	
Fracture Pattern, Type	Columnar	Shear	

Notes: Specimens prepared in accordance with ASTM D4543.
*Specimens do not meet minimum L/D requirements

Tested by Allante Blocker.

APPENDIX B

Slope Stability Analyses

APPENDIX B
SLOPE STABILITY ANALYSES

METHODS OF ANALYSIS

Computer-aided slope stability analyses were performed using the computer program SLIDE 2018. SLIDE 2018 was developed by Rocscience, Inc. (2020) and offers a wide variety of limit-equilibrium procedures. Those include the Modified Bishop, the Simplified and Corrected Janbu, Corps of Engineers #1 and #2, GLE/Morgenstern-Price, Lowe-Karafiath, and the Spencer methods. Those limit-equilibrium procedures are all "method of slices", but they differ from the Ordinary Method of Slices (Fellenius method – also included within SLIDE 2018) in:

1. The simplifying assumptions that have been made achieve static determinacy; and
2. The particular conditions of equilibrium that are satisfied.

SLIDE 2018 allows the use of any or all of the methods listed above because they better satisfy limit equilibrium conditions. A summary of the equilibrium conditions satisfied by each of these procedures and the type of failure surface for which each is useful is presented in the following table.

EQUILIBRIUM CONDITIONS SATISFIED BY PROCEDURES

Procedure of Analysis	Overall			Individual Slices			
	Moment	Vertical Force	Horizontal Force	Moment	Vertical Force	Horizontal Force	Slip Surface
Ordinary Method of Slices (Fellenius)	Yes	No	No	No	No	No	Circular Arc
Modified Bishop	Yes	(Yes)[1]	No	No	Yes	No	General Shape[2]
Simplified Janbu	No	(Yes)[1]	(Yes)[1]	No	Yes	Yes	General Shape
Spencer	Yes	(Yes)[1]	(Yes)[1]	Yes	Yes	Yes	General Shape

Per Wright (1969); (Yes)[1] - Parentheses indicate that this condition of equilibrium is implicitly satisfied as a result of the direct consideration of other equilibrium conditions; [2] – The original presentation of this procedure was for circular surfaces only.

Ordinary Method of Slices. From the above table, it is apparent that for circular failures, the Ordinary Method of Slices (Fellenius method) satisfies overall moment equilibrium, but does not satisfy individual slice moment equilibrium, or horizontal or vertical force equilibrium. Sherard et al. (1963), have suggested that the Fellenius method of slices might also be applied to non-circular surfaces; however, for noncircular surfaces that method would not, in general, satisfy any of the equilibrium conditions (Wright, 1969).

The Ordinary Method of Slices has been widely used by practicing engineers for many years because

of its simplicity, but it has long been known to grossly underestimate (and in some cases overestimate) the factor of safety. Lambe and Whitman (1969) report that in some cases the Ordinary Method of Slices may underestimate the factor of safety by about 10 to 15 percent, but in other problems (particularly for noncircular slip surfaces) the error may be as much as 60 percent. With the development of high-speed computers, this approximate method has largely been replaced by more accurate methods that better satisfy equilibrium conditions. The Ordinary Method of Slices remains an acceptable method for performing hand-calculated estimates of slope stability for conditions where accurate solutions are not required.

Modified Bishop Method. The Modified Bishop Method assumes that the normal and weight forces act through a point on the center of the base of each slice and that there are no interslice shear forces. The resulting equation can be demonstrated to satisfy vertical force equilibrium as well as overall moment equilibrium for circular shear surfaces. The Modified Bishop Method is relatively simple to perform on a calculator, although the necessary iterations make it more suitable for use on a computer system. In spite of the necessary iterations, the Modified Bishop Method typically converges rapidly, therefore, it requires little computer time to perform.

Fredlund and Krahn (1977) have shown that the Modified Bishop Method typically estimates factors of safety that are typically within a few percent of those obtained from more rigorous methods that satisfy complete moment and force equilibrium.

Simplified Janbu Method. Although the simplifying assumption made in the Simplified Janbu Method is the same as that made for the Modified Bishop Method, the conditions of equilibrium that are satisfied are not the same. The Simplified Janbu Method satisfies vertical and horizontal force equilibrium for individual slices and for the overall shear surface while assuming that there are no interslice shear forces. An advantage of the Simplified Janbu Method is its suitability for the analysis of noncircular failure surfaces. While retaining a rapid computational speed, the Simplified Janbu Method yields factors of safety that are closer to those obtained by more rigorous methods (such as the Spencer Method) than those obtained from the Ordinary Method of Slices.

Spencer Method. The Spencer Method assumes that the normal forces are located at the center of the base of each slice and that all side forces are parallel. The result is an equation that satisfies complete moment and force equilibrium. Although the Spencer Method was directly applicable to a circular shear surface, the procedure may be readily extended to slip surfaces of a general shape (Wright, 1969).

Because of the complexity of the procedure, the Spencer Method is suitable only for computer-aided slope stability analyses. Although the Spencer Method typically yields a relatively accurate estimate of the factor of safety for a slope, its solution requires several iterations. Consequently, considerable time is needed to perform the analyses on a personal computer. Therefore, the Spencer Method is

commonly used to refine the factor of safety for a critical failure plane that has been located by a search, which has used a more time-efficient method of analysis such as the Modified Bishop Method or Simplified Janbu procedure.

ANALYSES PERFORMED

Introduction. Analyses were performed to calculate the stability of the earth materials exposed in the slope. It is necessary to know the: 1) surface and subsurface geometry, 2) soil properties (unit weight and shear strength of the soil materials present), and 3) phreatic water level (groundwater) conditions.

Surface and Subsurface Geometry. Data for the surface geometry of the project area was derived from information presented by VESTRA (2020). Subsurface profiles were derived from air-percussion drilling performed by HCC at the site and interpretation of aerial photographs.

Engineering Properties. A summary and discussion of soil and rock mass strength values is presented in the text of the report.

Piezometric Water Level. The elevations of groundwater beneath the site are discussed in the text of the report.

Results of Analyses. The following table presents the conditions evaluated and results of the stability evaluations:

RESULTS OF STABILITY ANALYSES		
Slope Condition Evaluated	**Factor of Safety**	**File Name**
150-foot tall slope inclined at 55 degrees under static and dry conditions	1.26	150',dry,static,55deg
150-foot tall slope inclined at 55 degrees under pseudostatic and dry conditions	1.02	150',dry,PS,55deg
200-foot tall slope inclined at 50 degrees under static and dry conditions	1.31	200',dry,static,50deg
200-foot tall slope inclined at 50 degrees under pseudostatic and dry conditions	1.05	200',dry,PS,50deg
250-foot tall slope inclined at 50 degrees under static and dry conditions	1.25	250',dry,static,50deg
250-foot tall slope inclined at 50 degrees under pseudostatic and dry conditions	1.00	250',dry,PS,50deg
300-foot tall slope inclined at 45 degrees under static and dry conditions	1.36	300',dry,static,45deg
300-foot tall slope inclined at 45 degrees under pseudostatic and dry conditions	1.07	300',dry,PS,45deg
350-foot tall slope inclined at 45 degrees under static and dry conditions	1.31	350',dry,static,45deg
350-foot tall slope inclined at 45 degrees under pseudostatic and dry conditions	1.03	350',dry,PS,45deg

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Janbu, N., Bjerrum, L., and Kjaernsli, B. (1956), Veiledning ved losning av fundamenterings-oppgaver-2. Stabilitetsberegning for fyllinger, skjaeringer og naturlige skraninger. (Soil Mechanics Applies to Some Engineering Problems – Chapter 2. Stability Calculations for Embankments, Cuts, and Natural Slopes), Publication 16, Norwegian Geotechnical Institute, Oslo, pp. 17-26.

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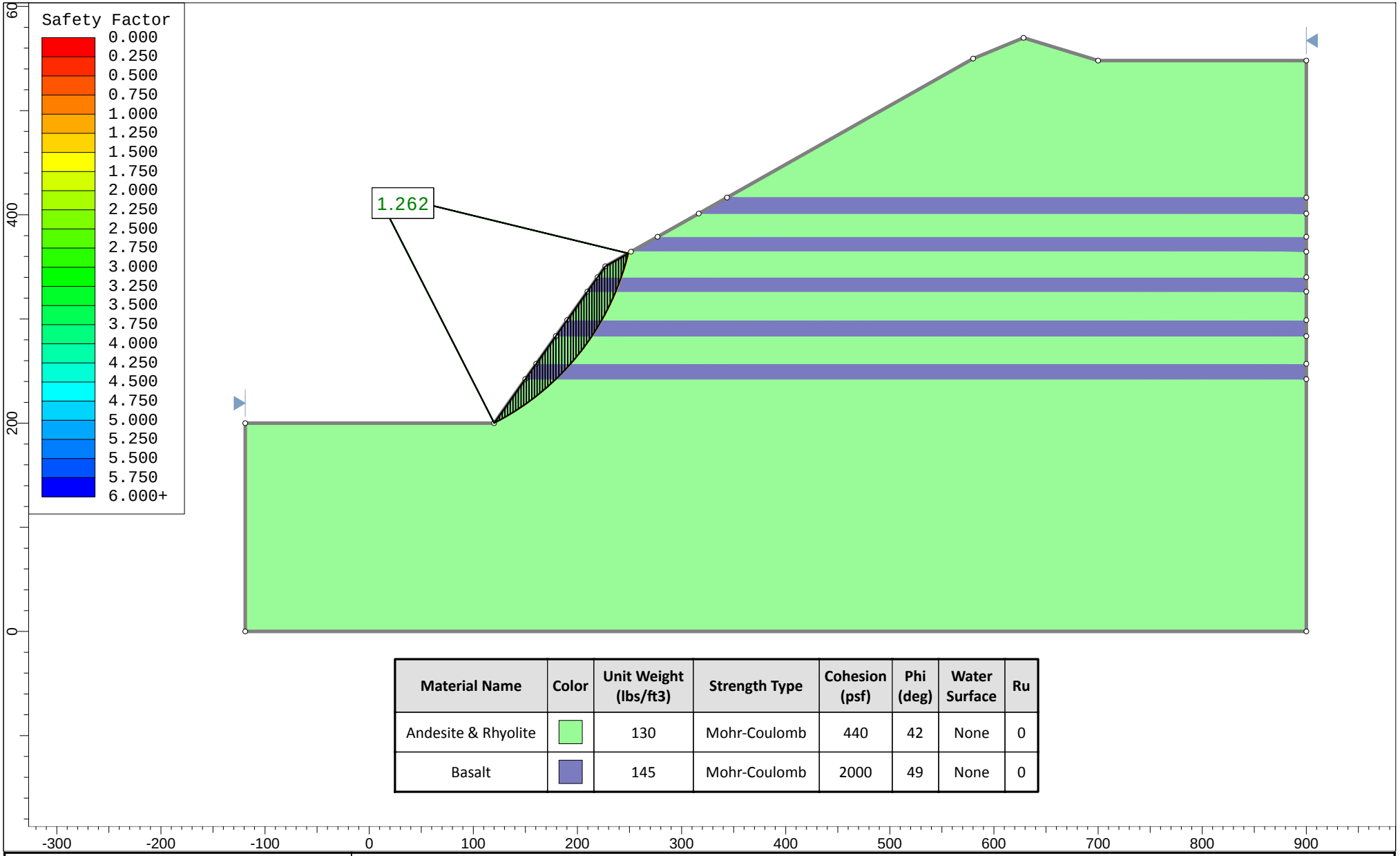
Wright, S. (1969), A Study of Slope Stability and the Undrained Shear Strength of Clay Shales, Ph.D. Thesis, University of California, Berkley.



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion			
Analysis Description	150' Slope, dry, static, 55 degree gross slope inclination			
Drawn By	J.Bianchin	Scale	1:1528	Company: Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM			File Name: 150',dry,ststic,55deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:04.239s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20

Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.261800
Center:	6.882, 421.822
Radius:	248.957
Left Slip Surface Endpoint:	120.054, 200.076
Right Slip Surface Endpoint:	248.789, 362.997
Resisting Moment:	1.32112e+08 lb-ft
Driving Moment:	1.04701e+08 lb-ft
Resisting Horizontal Force:	336914 lb
Driving Horizontal Force:	267010 lb
Total Slice Area:	4164.8 ft2
Surface Horizontal Width:	128.735 ft
Surface Average Height:	32.3517 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	9484
Number of Invalid Surfaces:	0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.2618

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base	Base Material	Base Cohesion [psf]	Base Friction Angle	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress	Pore Pressure [psf]	Effective Normal Stress	Base Vertical Stress	Effective Vertical Stress

			[degrees]			[degrees]			[psf]		[psf]	[psf]	[psf]
1	2.57465	384.809	27.3719	Andesite & Rhyolite	440	42	494.77	624.301	204.687	0	204.687	460.843	460.843
2	2.57465	1148.01	28.0412	Andesite & Rhyolite	440	42	660.517	833.44	436.961	0	436.961	788.773	788.773
3	2.57465	1898.24	28.7147	Andesite & Rhyolite	440	42	817.242	1031.2	656.591	0	656.591	1104.29	1104.29
4	2.57465	2635.26	29.3925	Andesite & Rhyolite	440	42	965.204	1217.89	863.939	0	863.939	1407.64	1407.64
5	2.57465	3358.8	30.0749	Andesite & Rhyolite	440	42	1104.65	1393.84	1059.35	0	1059.35	1699.04	1699.04
6	2.57465	4068.58	30.7621	Andesite & Rhyolite	440	42	1235.8	1559.33	1243.14	0	1243.14	1978.72	1978.72
7	2.57465	4764.32	31.4542	Andesite & Rhyolite	440	42	1358.88	1714.63	1415.62	0	1415.62	2246.85	2246.85
8	2.57465	5445.7	32.1514	Andesite & Rhyolite	440	42	1474.09	1860.01	1577.08	0	1577.08	2503.62	2503.62
9	2.57465	6112.39	32.854	Andesite & Rhyolite	440	42	1581.63	1995.7	1727.78	0	1727.78	2749.18	2749.18
10	2.57465	6764.04	33.5623	Andesite & Rhyolite	440	42	1681.68	2121.94	1867.98	0	1867.98	2983.69	2983.69
11	2.57465	7400.28	34.2763	Andesite & Rhyolite	440	42	1774.41	2238.95	1997.94	0	1997.94	3207.28	3207.28
12	2.57465	8032.01	34.9965	Andesite & Rhyolite	440	42	1862.09	2349.58	2120.8	0	2120.8	3424.48	3424.48
13	2.57465	8751.36	35.7231	Andesite & Rhyolite	440	42	1961.65	2475.21	2260.33	0	2260.33	3671.12	3671.12
14	2.57465	9479.21	36.4564	Andesite & Rhyolite	440	42	2058.05	2596.85	2395.43	0	2395.43	3915.89	3915.89
15	2.57465	10189.9	37.1967	Andesite & Rhyolite	440	42	2146.76	2708.78	2519.74	0	2519.74	4149.02	4149.02
16	2.57465	10875.4	37.9443	Andesite & Rhyolite	440	42	2226.59	2809.51	2631.61	0	2631.61	4367.73	4367.73
17	2.57465	11441.5	38.6997	Andesite & Rhyolite	440	42	2281.94	2879.35	2709.18	0	2709.18	4537.33	4537.33
18	2.57465	11957.4	39.463	Andesite & Rhyolite	440	42	2325.49	2934.3	2770.2	0	2770.2	4684.67	4684.67
19	2.57465	12453.8	40.2349	Andesite & Rhyolite	440	42	2362.76	2981.33	2822.43	0	2822.43	4821.59	4821.59
20	2.57465	12930.3	41.0156	Andesite & Rhyolite	440	42	2393.83	3020.54	2865.98	0	2865.98	4948.05	4948.05
21	2.57465	13386	41.8058	Andesite & Rhyolite	440	42	2418.79	3052.03	2900.95	0	2900.95	5064.04	5064.04
22	2.57465	13820.1	42.6057	Andesite & Rhyolite	440	42	2437.71	3075.9	2927.45	0	2927.45	5169.49	5169.49
23	2.57465	14232	43.4161	Andesite & Rhyolite	440	42	2450.64	3092.22	2945.59	0	2945.59	5264.36	5264.36
24	2.838	16168.3	44.2802	Basalt	2000	49	4134.73	5217.2	2796.66	0	2796.66	6828.78	6828.78
25	2.838	16658.5	45.1998	Basalt	2000	49	4121.14	5200.06	2781.78	0	2781.78	6931.77	6931.77
26	2.838	17110.6	46.1345	Basalt	2000	49	4097.88	5170.71	2756.25	0	2756.25	7019.72	7019.72
27	2.838	17519.8	47.0854	Basalt	2000	49	4064.62	5128.74	2719.77	0	2719.77	7091.59	7091.59
28	2.838	17775.7	48.0536	Basalt	2000	49	4005.56	5054.21	2654.99	0	2654.99	7112	7112
29	2.55083	16167.3	48.9895	Andesite & Rhyolite	440	42	2394.45	3021.32	2866.86	0	2866.86	5620.34	5620.34
30	2.55083	16372.2	49.8925	Andesite & Rhyolite	440	42	2363.77	2982.6	2823.84	0	2823.84	5630.15	5630.15
31	2.55083	16544.6	50.8127	Andesite & Rhyolite	440	42	2327.38	2936.69	2772.86	0	2772.86	5627.8	5627.8
32	2.55083	16682.7	51.7514	Andesite & Rhyolite	440	42	2285.26	2883.54	2713.82	0	2713.82	5612.8	5612.8
33	2.55083	16784.2	52.71	Andesite & Rhyolite	440	42	2237.38	2823.13	2646.75	0	2646.75	5584.8	5584.8
34	2.55083	16846.6	53.6902	Andesite & Rhyolite	440	42	2183.71	2755.41	2571.51	0	2571.51	5543.22	5543.22
35	2.55083	16901.3	54.6938	Andesite & Rhyolite	440	42	2127.9	2684.98	2493.31	0	2493.31	5497.96	5497.96

36	2.55083	17008.7	55.7229	Andesite & Rhyolite	440	42	2076.18	2619.72	2420.82	0	2420.82	5467	5467
37	2.37625	15839.8	56.7427	Basalt	2000	49	3336.5	4209.99	1921.11	0	1921.11	7008.7	7008.7
38	2.37625	15721.8	57.7538	Basalt	2000	49	3232.03	4078.17	1806.53	0	1806.53	6929.73	6929.73
39	2.37625	15520.5	58.7941	Basalt	2000	49	3117.21	3933.3	1680.59	0	1680.59	6826.52	6826.52
40	2.37625	15179.5	59.8665	Basalt	2000	49	2986.34	3768.17	1537.04	0	1537.04	6681.83	6681.83
41	2.68205	16735.8	61.0488	Andesite & Rhyolite	440	42	1659.32	2093.73	1836.65	0	1836.65	4836.16	4836.16
42	2.68205	16087.1	62.3515	Andesite & Rhyolite	440	42	1535.37	1937.33	1662.96	0	1662.96	4593.8	4593.8
43	2.68205	14798.1	63.7135	Andesite & Rhyolite	440	42	1366.55	1724.31	1426.38	0	1426.38	4193.02	4193.02
44	2.68205	13370.1	65.1447	Andesite & Rhyolite	440	42	1196.38	1509.59	1187.9	0	1187.9	3770.55	3770.55
45	2.68205	11805.3	66.6579	Andesite & Rhyolite	440	42	1027.42	1296.4	951.125	0	951.125	3331.95	3331.95
46	2.62094	9739.19	68.2508	Basalt	2000	49	1808.56	2282.05	245.18	0	245.18	4778.57	4778.57
47	2.62094	7630.83	69.9443	Basalt	2000	49	1585.44	2000.5	0.437103	0	0.437103	4343.24	4343.24
48	2.25481	4798.48	71.6479	Andesite & Rhyolite	440	42	537.271	677.929	264.247	0	264.247	1883.86	1883.86
49	2.25481	3068.37	73.3791	Andesite & Rhyolite	440	42	418.567	528.148	97.898	0	97.898	1500.09	1500.09
50	2.25481	1073.94	75.3095	Andesite & Rhyolite	440	42	267.435	337.45	-113.894	0	-113.894	906.195	906.195

Query 1 (spencer) - Safety Factor: 1.2618

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.57465	384.809	27.3719	Andesite & Rhyolite	440	42	494.77	624.301	204.687	0	204.687	460.843	460.843
2	2.57465	1148.01	28.0412	Andesite & Rhyolite	440	42	660.517	833.44	436.961	0	436.961	788.773	788.773
3	2.57465	1898.24	28.7147	Andesite & Rhyolite	440	42	817.242	1031.2	656.591	0	656.591	1104.29	1104.29
4	2.57465	2635.26	29.3925	Andesite & Rhyolite	440	42	965.204	1217.89	863.939	0	863.939	1407.64	1407.64
5	2.57465	3358.8	30.0749	Andesite & Rhyolite	440	42	1104.65	1393.84	1059.35	0	1059.35	1699.04	1699.04
6	2.57465	4068.58	30.7621	Andesite & Rhyolite	440	42	1235.8	1559.33	1243.14	0	1243.14	1978.72	1978.72
7	2.57465	4764.32	31.4542	Andesite & Rhyolite	440	42	1358.88	1714.63	1415.62	0	1415.62	2246.85	2246.85
8	2.57465	5445.7	32.1514	Andesite & Rhyolite	440	42	1474.09	1860.01	1577.08	0	1577.08	2503.62	2503.62
9	2.57465	6112.39	32.854	Andesite & Rhyolite	440	42	1581.63	1995.7	1727.78	0	1727.78	2749.18	2749.18
10	2.57465	6764.04	33.5623	Andesite & Rhyolite	440	42	1681.68	2121.94	1867.98	0	1867.98	2983.69	2983.69
11	2.57465	7400.28	34.2763	Andesite & Rhyolite	440	42	1774.41	2238.95	1997.94	0	1997.94	3207.28	3207.28
12	2.57465	8032.01	34.9965	Andesite & Rhyolite	440	42	1862.09	2349.58	2120.8	0	2120.8	3424.48	3424.48
13	2.57465	8751.36	35.7231	Andesite & Rhyolite	440	42	1961.65	2475.21	2260.33	0	2260.33	3671.12	3671.12
14	2.57465	9479.21	36.4564	Andesite & Rhyolite	440	42	2058.05	2596.85	2395.43	0	2395.43	3915.89	3915.89
15	2.57465	10189.9	37.1967	Andesite & Rhyolite	440	42	2146.76	2708.78	2519.74	0	2519.74	4149.02	4149.02
16	2.57465	10875.4	37.9443	Andesite & Rhyolite	440	42	2226.59	2809.51	2631.61	0	2631.61	4367.73	4367.73
17	2.57465	11441.5	38.6997	Andesite & Rhyolite	440	42	2281.94	2879.35	2709.18	0	2709.18	4537.33	4537.33
18	2.57465	11957.4	39.463	Andesite & Rhyolite	440	42	2325.49	2934.3	2770.2	0	2770.2	4684.67	4684.67

19	2.57465	12453.8	40.2349	Andesite & Rhyolite	440	42	2362.76	2981.33	2822.43	0	2822.43	4821.59	4821.59
20	2.57465	12930.3	41.0156	Andesite & Rhyolite	440	42	2393.83	3020.54	2865.98	0	2865.98	4948.05	4948.05
21	2.57465	13386	41.8058	Andesite & Rhyolite	440	42	2418.79	3052.03	2900.95	0	2900.95	5064.04	5064.04
22	2.57465	13820.1	42.6057	Andesite & Rhyolite	440	42	2437.71	3075.9	2927.45	0	2927.45	5169.49	5169.49
23	2.57465	14232	43.4161	Andesite & Rhyolite	440	42	2450.64	3092.22	2945.59	0	2945.59	5264.36	5264.36
24	2.838	16168.3	44.2802	Basalt	2000	49	4134.73	5217.2	2796.66	0	2796.66	6828.78	6828.78
25	2.838	16658.5	45.1998	Basalt	2000	49	4121.14	5200.06	2781.78	0	2781.78	6931.77	6931.77
26	2.838	17110.6	46.1345	Basalt	2000	49	4097.88	5170.71	2756.25	0	2756.25	7019.72	7019.72
27	2.838	17519.8	47.0854	Basalt	2000	49	4064.62	5128.74	2719.77	0	2719.77	7091.59	7091.59
28	2.838	17775.7	48.0536	Basalt	2000	49	4005.56	5054.21	2654.99	0	2654.99	7112	7112
29	2.55083	16167.3	48.9895	Andesite & Rhyolite	440	42	2394.45	3021.32	2866.86	0	2866.86	5620.34	5620.34
30	2.55083	16372.2	49.8925	Andesite & Rhyolite	440	42	2363.77	2982.6	2823.84	0	2823.84	5630.15	5630.15
31	2.55083	16544.6	50.8127	Andesite & Rhyolite	440	42	2327.38	2936.69	2772.86	0	2772.86	5627.8	5627.8
32	2.55083	16682.7	51.7514	Andesite & Rhyolite	440	42	2285.26	2883.54	2713.82	0	2713.82	5612.8	5612.8
33	2.55083	16784.2	52.71	Andesite & Rhyolite	440	42	2237.38	2823.13	2646.75	0	2646.75	5584.8	5584.8
34	2.55083	16846.6	53.6902	Andesite & Rhyolite	440	42	2183.71	2755.41	2571.51	0	2571.51	5543.22	5543.22
35	2.55083	16901.3	54.6938	Andesite & Rhyolite	440	42	2127.9	2684.98	2493.31	0	2493.31	5497.96	5497.96
36	2.55083	17008.7	55.7229	Andesite & Rhyolite	440	42	2076.18	2619.72	2420.82	0	2420.82	5467	5467
37	2.37625	15839.8	56.7427	Basalt	2000	49	3336.5	4209.99	1921.11	0	1921.11	7008.7	7008.7
38	2.37625	15721.8	57.7538	Basalt	2000	49	3232.03	4078.17	1806.53	0	1806.53	6929.73	6929.73
39	2.37625	15520.5	58.7941	Basalt	2000	49	3117.21	3933.3	1680.59	0	1680.59	6826.52	6826.52
40	2.37625	15179.5	59.8665	Basalt	2000	49	2986.34	3768.17	1537.04	0	1537.04	6681.83	6681.83
41	2.68205	16735.8	61.0488	Andesite & Rhyolite	440	42	1659.32	2093.73	1836.65	0	1836.65	4836.16	4836.16
42	2.68205	16087.1	62.3515	Andesite & Rhyolite	440	42	1535.37	1937.33	1662.96	0	1662.96	4593.8	4593.8
43	2.68205	14798.1	63.7135	Andesite & Rhyolite	440	42	1366.55	1724.31	1426.38	0	1426.38	4193.02	4193.02
44	2.68205	13370.1	65.1447	Andesite & Rhyolite	440	42	1196.38	1509.59	1187.9	0	1187.9	3770.55	3770.55
45	2.68205	11805.3	66.6579	Andesite & Rhyolite	440	42	1027.42	1296.4	951.125	0	951.125	3331.95	3331.95
46	2.62094	9739.19	68.2508	Basalt	2000	49	1808.56	2282.05	245.18	0	245.18	4778.57	4778.57
47	2.62094	7630.83	69.9443	Basalt	2000	49	1585.44	2000.5	0.437103	0	0.437103	4343.24	4343.24
48	2.25481	4798.48	71.6479	Andesite & Rhyolite	440	42	537.271	677.929	264.247	0	264.247	1883.86	1883.86
49	2.25481	3068.37	73.3791	Andesite & Rhyolite	440	42	418.567	528.148	97.898	0	97.898	1500.09	1500.09
50	2.25481	1073.94	75.3095	Andesite & Rhyolite	440	42	267.435	337.45	-113.894	0	-113.894	906.195	906.195

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.2618

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	120.054	200.076	0	0	0
2	122.628	201.408	1003.28	802.628	38.6599
3	125.203	202.78	2107.69	1686.15	38.6598

4	127.777	204.19	3289.47	2631.57	38.6597
5	130.352	205.641	4525.98	3620.79	38.6599
6	132.927	207.132	5795.67	4636.53	38.6598
7	135.501	208.664	7077.97	5662.38	38.6598
8	138.076	210.239	8353.35	6682.68	38.6598
9	140.651	211.857	9603.19	7682.55	38.6598
10	143.225	213.52	10809.8	8647.86	38.6599
11	145.8	215.228	11956.5	9565.17	38.6597
12	148.375	216.983	13027.2	10421.8	38.6599
13	150.949	218.785	14007.1	11205.7	38.6599
14	153.524	220.637	14881.3	11905	38.6597
15	156.099	222.539	15633.1	12506.5	38.6599
16	158.673	224.493	16246.5	12997.2	38.6598
17	161.248	226.501	16706.4	13365.1	38.6598
18	163.823	228.563	17003.9	13603.1	38.6598
19	166.397	230.683	17130.2	13704.2	38.6599
20	168.972	232.861	17075.8	13660.7	38.6599
21	171.546	235.101	16832.2	13465.7	38.6597
22	174.121	237.403	16391.5	13113.2	38.6598
23	176.696	239.771	15746.7	12597.3	38.6597
24	179.27	242.207	14891.7	11913.4	38.6599
25	182.108	244.975	18907	15125.6	38.6598
26	184.946	247.833	22673.7	18138.9	38.6597
27	187.784	250.785	26185.8	20948.7	38.6599
28	190.622	253.838	29439.7	23551.7	38.6597
29	193.46	256.996	32443.6	25954.9	38.6598
30	196.011	259.929	30153	24122.4	38.6598
31	198.562	262.957	27641.5	22113.2	38.6598
32	201.113	266.086	24912.5	19930	38.6598
33	203.664	269.322	21970.6	17576.5	38.6598
34	206.215	272.672	18822.3	15057.8	38.6597
35	208.765	276.143	15476	12380.8	38.6598
36	211.316	279.745	11933.1	9546.46	38.6597
37	213.867	283.488	8178.34	6542.67	38.6598
38	216.243	287.111	9159.89	7327.91	38.6598
39	218.62	290.878	10049	8039.24	38.6599
40	220.996	294.8	10877	8701.59	38.6598
41	223.372	298.894	11693.7	9354.94	38.6597
42	226.054	303.742	7247.35	5797.88	38.6598
43	228.736	308.862	2858.76	2287	38.6597
44	231.418	314.292	-1214.69	-971.751	38.6598
45	234.1	320.082	-4877.94	-3902.35	38.6598
46	236.782	326.297	-8028.76	-6423.01	38.6598
47	239.403	332.867	-4890.94	-3912.75	38.6598
48	242.024	340.046	-731.348	-585.079	38.6598
49	244.279	346.843	-1313.88	-1051.1	38.6597
50	246.534	354.397	-1107.89	-886.31	38.6597
51	248.789	362.997	0	0	0

Query 1 (spencer) - Safety Factor: 1.2618

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	120.054	200.076	0	0	0
2	122.628	201.408	1003.28	802.628	38.6599
3	125.203	202.78	2107.69	1686.15	38.6598
4	127.777	204.19	3289.47	2631.57	38.6597
5	130.352	205.641	4525.98	3620.79	38.6599
6	132.927	207.132	5795.67	4636.53	38.6598
7	135.501	208.664	7077.97	5662.38	38.6598
8	138.076	210.239	8353.35	6682.68	38.6598
9	140.651	211.857	9603.19	7682.55	38.6598
10	143.225	213.52	10809.8	8647.86	38.6599

11	145.8	215.228	11956.5	9565.17	38.6597
12	148.375	216.983	13027.2	10421.8	38.6599
13	150.949	218.785	14007.1	11205.7	38.6599
14	153.524	220.637	14881.3	11905	38.6597
15	156.099	222.539	15633.1	12506.5	38.6599
16	158.673	224.493	16246.5	12997.2	38.6598
17	161.248	226.501	16706.4	13365.1	38.6598
18	163.823	228.563	17003.9	13603.1	38.6598
19	166.397	230.683	17130.2	13704.2	38.6599
20	168.972	232.861	17075.8	13660.7	38.6599
21	171.546	235.101	16832.2	13465.7	38.6597
22	174.121	237.403	16391.5	13113.2	38.6598
23	176.696	239.771	15746.7	12597.3	38.6597
24	179.27	242.207	14891.7	11913.4	38.6599
25	182.108	244.975	18907	15125.6	38.6598
26	184.946	247.833	22673.7	18138.9	38.6597
27	187.784	250.785	26185.8	20948.7	38.6599
28	190.622	253.838	29439.7	23551.7	38.6597
29	193.46	256.996	32443.6	25954.9	38.6598
30	196.011	259.929	30153	24122.4	38.6598
31	198.562	262.957	27641.5	22113.2	38.6598
32	201.113	266.086	24912.5	19930	38.6598
33	203.664	269.322	21970.6	17576.5	38.6598
34	206.215	272.672	18822.3	15057.8	38.6597
35	208.765	276.143	15476	12380.8	38.6598
36	211.316	279.745	11933.1	9546.46	38.6597
37	213.867	283.488	8178.34	6542.67	38.6598
38	216.243	287.111	9159.89	7327.91	38.6598
39	218.62	290.878	10049	8039.24	38.6599
40	220.996	294.8	10877	8701.59	38.6598
41	223.372	298.894	11693.7	9354.94	38.6597
42	226.054	303.742	7247.35	5797.88	38.6598
43	228.736	308.862	2858.76	2287	38.6597
44	231.418	314.292	-1214.69	-971.751	38.6598
45	234.1	320.082	-4877.94	-3902.35	38.6598
46	236.782	326.297	-8028.76	-6423.01	38.6598
47	239.403	332.867	-4890.94	-3912.75	38.6598
48	242.024	340.046	-731.348	-585.079	38.6598
49	244.279	346.843	-1313.88	-1051.1	38.6597
50	246.534	354.397	-1107.89	-886.31	38.6597
51	248.789	362.997	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046
900	364.52
900	378.882
900	401.213
900	416.559
900	548
700	548

628.434	569.928
580	550
343.655	416.559
316.475	401.213
276.924	378.882
251.485	364.52
226.69	350.52
219.266	340.046
209.52	326.297
190.097	298.894
179.177	283.488
160.399	256.996
149.917	242.207
120	200
-119.082	200

Material Boundary

X	Y
149.917	242.207
900	242.207

Material Boundary

X	Y
160.399	256.996
900	256.996

Material Boundary

X	Y
179.177	283.488
900	283.488

Material Boundary

X	Y
190.097	298.894
900	298.894

Material Boundary

X	Y
209.52	326.297
900	326.297

Material Boundary

X	Y
219.266	340.046
900	340.046

Material Boundary

X	Y
251.485	364.52
900	364.52

Material Boundary

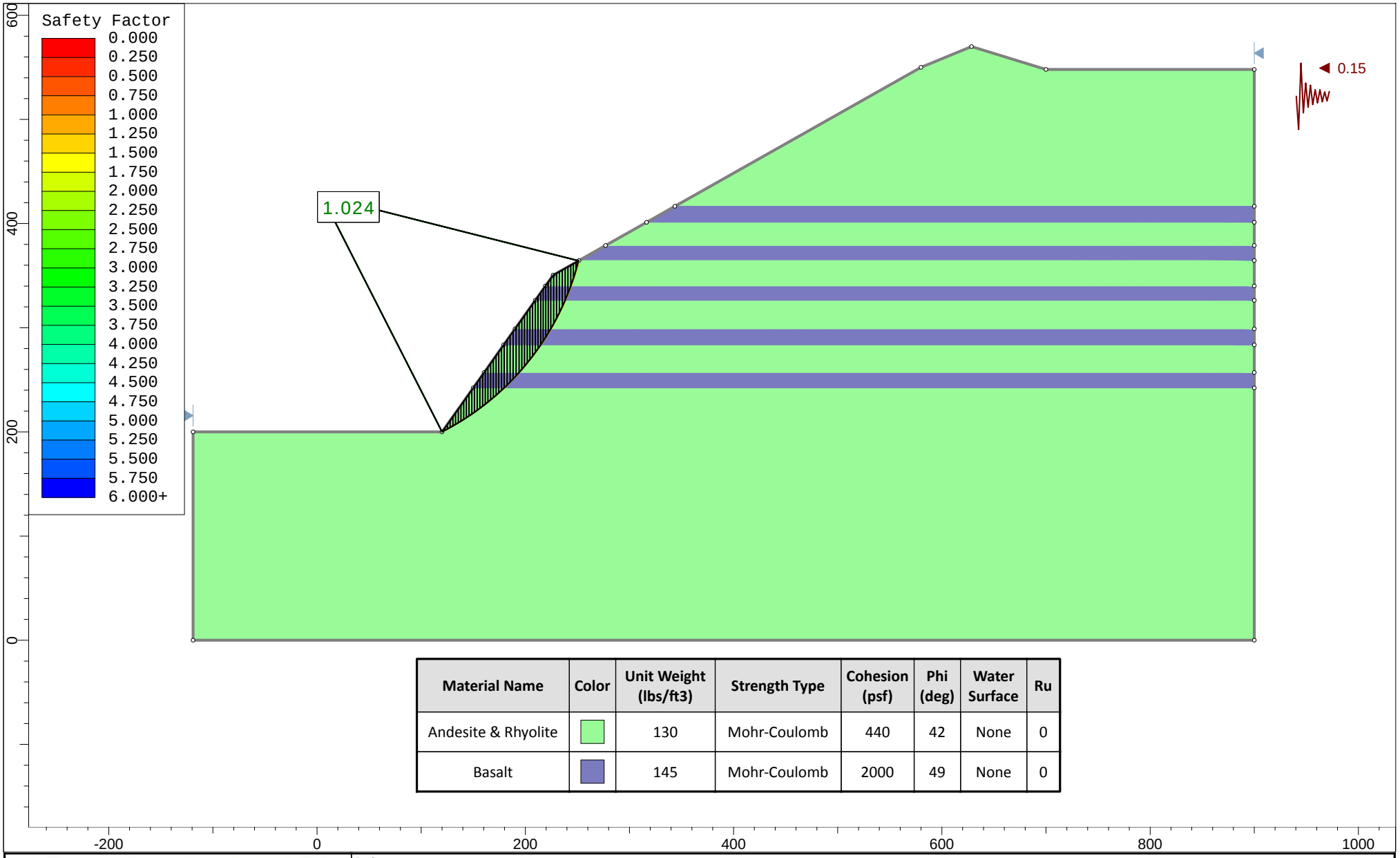
X	Y
276.924	378.882
900	378.882

Material Boundary

X	Y
316.475	401.213
900	401.213

Material Boundary

X	Y
343.655	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion			
Analysis Description	150' Slope, dry, pseudostatic, 55 degree gross slope inclination			
Drawn By	J.Bianchin	Scale	1:1528	Company: Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM			File Name: 150',dry,PS,55deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:03.724s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search

Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.023530
Center:	4.554, 426.537
Radius:	254.248
Left Slip Surface Endpoint:	120.011, 200.015
Right Slip Surface Endpoint:	251.063, 364.281
Resisting Moment:	1.25701e+08 lb-ft
Driving Moment:	1.22812e+08 lb-ft
Resisting Horizontal Force:	321801 lb
Driving Horizontal Force:	314404 lb
Total Slice Area:	4311.47 ft2
Surface Horizontal Width:	131.052 ft
Surface Average Height:	32.8989 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	10990
Number of Invalid Surfaces:	0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.02353

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.59379	390.893	27.3366	Andesite & Rhyolite	440	42	1151.69	1178.79	820.51	0	820.51	1415.88	1415.88
2	2.59379	1166.26	27.9966	Andesite & Rhyolite	440	42	1350.59	1382.37	1046.61	0	1046.61	1764.63	1764.63
3	2.59379	1928.66	28.6607	Andesite & Rhyolite	440	42	1526.58	1562.5	1246.66	0	1246.66	2081.08	2081.08
4	2.59379	2677.85	29.329	Andesite & Rhyolite	440	42	1681.59	1721.16	1422.87	0	1422.87	2367.66	2367.66
5	2.59379	3413.57	30.0017	Andesite & Rhyolite	440	42	1817.47	1860.23	1577.32	0	1577.32	2626.71	2626.71
6	2.59379	4135.55	30.679	Andesite & Rhyolite	440	42	1935.85	1981.4	1711.9	0	1711.9	2860.37	2860.37
7	2.59379	4843.51	31.3611	Andesite & Rhyolite	440	42	2038.32	2086.28	1828.38	0	1828.38	3070.67	3070.67
8	2.59379	5537.13	32.0482	Andesite & Rhyolite	440	42	2126.28	2176.31	1928.37	0	1928.37	3259.5	3259.5
9	2.59379	6216.09	32.7405	Andesite & Rhyolite	440	42	2201.04	2252.83	2013.35	0	2013.35	3428.59	3428.59
10	2.59379	6880.06	33.4381	Andesite & Rhyolite	440	42	2263.81	2317.08	2084.71	0	2084.71	3579.58	3579.58
11	2.59379	7528.66	34.1415	Andesite & Rhyolite	440	42	2315.7	2370.19	2143.69	0	2143.69	3713.99	3713.99
12	2.59379	8177.27	34.8508	Andesite & Rhyolite	440	42	2360.73	2416.28	2194.88	0	2194.88	3838.73	3838.73
13	2.59379	8916.38	35.5662	Andesite & Rhyolite	440	42	2416.27	2473.12	2258.01	0	2258.01	3985.73	3985.73
14	2.59379	9658.88	36.2881	Andesite & Rhyolite	440	42	2465.42	2523.43	2313.88	0	2313.88	4124.12	4124.12
15	2.59379	10384.3	37.0167	Andesite & Rhyolite	440	42	2505.24	2564.19	2359.15	0	2359.15	4248.12	4248.12
16	2.59379	11079.2	37.7523	Andesite & Rhyolite	440	42	2534.4	2594.03	2392.29	0	2392.29	4354.79	4354.79
17	2.59379	11649.9	38.4954	Andesite & Rhyolite	440	42	2539.18	2598.93	2397.73	0	2397.73	4417.16	4417.16
18	2.59379	12178.8	39.2462	Andesite & Rhyolite	440	42	2534.71	2594.35	2392.65	0	2392.65	4463.32	4463.32
19	2.59379	12688.4	40.0051	Andesite & Rhyolite	440	42	2525.23	2584.65	2381.88	0	2381.88	4501.18	4501.18
20	2.59379	13178.2	40.7726	Andesite & Rhyolite	440	42	2511.11	2570.2	2365.82	0	2365.82	4531.27	4531.27
21	2.59379	13647.5	41.5491	Andesite & Rhyolite	440	42	2492.66	2551.31	2344.85	0	2344.85	4553.98	4553.98
22	2.59379	14095.4	42.3349	Andesite & Rhyolite	440	42	2470.13	2528.25	2319.24	0	2319.24	4569.64	4569.64
23	2.59379	14523.8	43.1308	Andesite & Rhyolite	440	42	2444.03	2501.54	2289.57	0	2289.57	4579.12	4579.12
24	2.8708	16597.8	43.9808	Basalt	2000	49	5713.38	5847.82	3344.85	0	3344.85	8858.5	8858.5
25	2.8708	17112	44.8869	Basalt	2000	49	5567.34	5698.34	3214.91	0	3214.91	8760.31	8760.31
26	2.8708	17588.2	45.8075	Basalt	2000	49	5419.29	5546.81	3083.2	0	3083.2	8657.45	8657.45
27	2.8708	18012.8	46.7436	Basalt	2000	49	5268.17	5392.13	2948.72	0	2948.72	8547.7	8547.7
28	2.8708	18267.6	47.6963	Basalt	2000	49	5099.73	5219.73	2798.87	0	2798.87	8402.67	8402.67
29	2.59009	16691.1	48.6183	Andesite & Rhyolite	440	42	2181.89	2233.23	1991.58	0	1991.58	4468.05	4468.05
30	2.59009	16915.9	49.5093	Andesite & Rhyolite	440	42	2126.77	2176.81	1928.93	0	1928.93	4419.87	4419.87
31	2.59009	17108.1	50.4167	Andesite & Rhyolite	440	42	2067.28	2115.92	1861.3	0	1861.3	4361.7	4361.7
32	2.59009	17266	51.342	Andesite & Rhyolite	440	42	2003.16	2050.29	1788.41	0	1788.41	4292.51	4292.51
33	2.59009	17387.4	52.2863	Andesite &	440	42	1934.1	1979.61	1709.91	0	1709.91	4211.1	4211.1

				Rhyolite									
34	2.59009	17469.9	53.2511	Andesite & Rhyolite	440	42	1859.79	1903.55	1625.44	0	1625.44	4116.1	4116.1
35	2.59009	17584.2	54.2383	Andesite & Rhyolite	440	42	1785.17	1827.18	1540.62	0	1540.62	4019.32	4019.32
36	2.59009	17722.5	55.2497	Andesite & Rhyolite	440	42	1708.57	1748.77	1453.53	0	1453.53	3916.39	3916.39
37	2.42425	16605.1	56.2534	Basalt	2000	49	3867.07	3958.06	1702.11	0	1702.11	7490.34	7490.34
38	2.42425	16506	57.2501	Basalt	2000	49	3735.02	3822.91	1584.63	0	1584.63	7391.4	7391.4
39	2.42425	16278.9	58.2745	Basalt	2000	49	3595.82	3680.43	1460.78	0	1460.78	7277.11	7277.11
40	2.42425	15949.1	59.3295	Basalt	2000	49	3453.3	3534.56	1333.97	0	1333.97	7156.81	7156.81
41	2.75373	17723.3	60.495	Andesite & Rhyolite	440	42	1191.76	1219.8	866.056	0	866.056	2972.05	2972.05
42	2.75373	16768.8	61.7812	Andesite & Rhyolite	440	42	1044.23	1068.8	698.352	0	698.352	2644.3	2644.3
43	2.75373	15434.3	63.1238	Andesite & Rhyolite	440	42	893.452	914.475	526.958	0	526.958	2289.87	2289.87
44	2.75373	13983.5	64.5318	Andesite & Rhyolite	440	42	754.077	771.82	368.523	0	368.523	1951.74	1951.74
45	2.75373	12397.3	66.0168	Andesite & Rhyolite	440	42	632.306	647.184	230.101	0	230.101	1651.4	1651.4
46	2.71541	10381.4	67.5825	Basalt	2000	49	2498.43	2557.22	484.383	0	484.383	6540.78	6540.78
47	2.71541	8215.86	69.2484	Basalt	2000	49	2411.11	2467.84	406.687	0	406.687	6770.16	6770.16
48	2.4746	5519.02	70.967	Andesite & Rhyolite	440	42	506.529	518.448	87.125	0	87.125	1555.44	1555.44
49	2.4746	3531.74	72.7631	Andesite & Rhyolite	440	42	594.045	608.023	186.609	0	186.609	2101.29	2101.29
50	2.4746	1236.78	74.7652	Andesite & Rhyolite	440	42	760.234	778.122	375.523	0	375.523	3166.95	3166.95

Query 1 (spencer) - Safety Factor: 1.02353

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.59379	390.893	27.3366	Andesite & Rhyolite	440	42	1151.69	1178.79	820.51	0	820.51	1415.88	1415.88
2	2.59379	1166.26	27.9966	Andesite & Rhyolite	440	42	1350.59	1382.37	1046.61	0	1046.61	1764.63	1764.63
3	2.59379	1928.66	28.6607	Andesite & Rhyolite	440	42	1526.58	1562.5	1246.66	0	1246.66	2081.08	2081.08
4	2.59379	2677.85	29.329	Andesite & Rhyolite	440	42	1681.59	1721.16	1422.87	0	1422.87	2367.66	2367.66
5	2.59379	3413.57	30.0017	Andesite & Rhyolite	440	42	1817.47	1860.23	1577.32	0	1577.32	2626.71	2626.71
6	2.59379	4135.55	30.679	Andesite & Rhyolite	440	42	1935.85	1981.4	1711.9	0	1711.9	2860.37	2860.37
7	2.59379	4843.51	31.3611	Andesite & Rhyolite	440	42	2038.32	2086.28	1828.38	0	1828.38	3070.67	3070.67
8	2.59379	5537.13	32.0482	Andesite & Rhyolite	440	42	2126.28	2176.31	1928.37	0	1928.37	3259.5	3259.5
9	2.59379	6216.09	32.7405	Andesite & Rhyolite	440	42	2201.04	2252.83	2013.35	0	2013.35	3428.59	3428.59
10	2.59379	6880.06	33.4381	Andesite & Rhyolite	440	42	2263.81	2317.08	2084.71	0	2084.71	3579.58	3579.58
11	2.59379	7528.66	34.1415	Andesite & Rhyolite	440	42	2315.7	2370.19	2143.69	0	2143.69	3713.99	3713.99
12	2.59379	8177.27	34.8508	Andesite & Rhyolite	440	42	2360.73	2416.28	2194.88	0	2194.88	3838.73	3838.73
13	2.59379	8916.38	35.5662	Andesite & Rhyolite	440	42	2416.27	2473.12	2258.01	0	2258.01	3985.73	3985.73
14	2.59379	9658.88	36.2881	Andesite & Rhyolite	440	42	2465.42	2523.43	2313.88	0	2313.88	4124.12	4124.12
15	2.59379	10384.3	37.0167	Andesite & Rhyolite	440	42	2505.24	2564.19	2359.15	0	2359.15	4248.12	4248.12

16	2.59379	11079.2	37.7523	Andesite & Rhyolite	440	42	2534.4	2594.03	2392.29	0	2392.29	4354.79	4354.79
17	2.59379	11649.9	38.4954	Andesite & Rhyolite	440	42	2539.18	2598.93	2397.73	0	2397.73	4417.16	4417.16
18	2.59379	12178.8	39.2462	Andesite & Rhyolite	440	42	2534.71	2594.35	2392.65	0	2392.65	4463.32	4463.32
19	2.59379	12688.4	40.0051	Andesite & Rhyolite	440	42	2525.23	2584.65	2381.88	0	2381.88	4501.18	4501.18
20	2.59379	13178.2	40.7726	Andesite & Rhyolite	440	42	2511.11	2570.2	2365.82	0	2365.82	4531.27	4531.27
21	2.59379	13647.5	41.5491	Andesite & Rhyolite	440	42	2492.66	2551.31	2344.85	0	2344.85	4553.98	4553.98
22	2.59379	14095.4	42.3349	Andesite & Rhyolite	440	42	2470.13	2528.25	2319.24	0	2319.24	4569.64	4569.64
23	2.59379	14523.8	43.1308	Andesite & Rhyolite	440	42	2444.03	2501.54	2289.57	0	2289.57	4579.12	4579.12
24	2.8708	16597.8	43.9808	Basalt	2000	49	5713.38	5847.82	3344.85	0	3344.85	8858.5	8858.5
25	2.8708	17112	44.8869	Basalt	2000	49	5567.34	5698.34	3214.91	0	3214.91	8760.31	8760.31
26	2.8708	17588.2	45.8075	Basalt	2000	49	5419.29	5546.81	3083.2	0	3083.2	8657.45	8657.45
27	2.8708	18012.8	46.7436	Basalt	2000	49	5268.17	5392.13	2948.72	0	2948.72	8547.7	8547.7
28	2.8708	18267.6	47.6963	Basalt	2000	49	5099.73	5219.73	2798.87	0	2798.87	8402.67	8402.67
29	2.59009	16691.1	48.6183	Andesite & Rhyolite	440	42	2181.89	2233.23	1991.58	0	1991.58	4468.05	4468.05
30	2.59009	16915.9	49.5093	Andesite & Rhyolite	440	42	2126.77	2176.81	1928.93	0	1928.93	4419.87	4419.87
31	2.59009	17108.1	50.4167	Andesite & Rhyolite	440	42	2067.28	2115.92	1861.3	0	1861.3	4361.7	4361.7
32	2.59009	17266	51.342	Andesite & Rhyolite	440	42	2003.16	2050.29	1788.41	0	1788.41	4292.51	4292.51
33	2.59009	17387.4	52.2863	Andesite & Rhyolite	440	42	1934.1	1979.61	1709.91	0	1709.91	4211.1	4211.1
34	2.59009	17469.9	53.2511	Andesite & Rhyolite	440	42	1859.79	1903.55	1625.44	0	1625.44	4116.1	4116.1
35	2.59009	17584.2	54.2383	Andesite & Rhyolite	440	42	1785.17	1827.18	1540.62	0	1540.62	4019.32	4019.32
36	2.59009	17722.5	55.2497	Andesite & Rhyolite	440	42	1708.57	1748.77	1453.53	0	1453.53	3916.39	3916.39
37	2.42425	16605.1	56.2534	Basalt	2000	49	3867.07	3958.06	1702.11	0	1702.11	7490.34	7490.34
38	2.42425	16506	57.2501	Basalt	2000	49	3735.02	3822.91	1584.63	0	1584.63	7391.4	7391.4
39	2.42425	16278.9	58.2745	Basalt	2000	49	3595.82	3680.43	1460.78	0	1460.78	7277.11	7277.11
40	2.42425	15949.1	59.3295	Basalt	2000	49	3453.3	3534.56	1333.97	0	1333.97	7156.81	7156.81
41	2.75373	17723.3	60.495	Andesite & Rhyolite	440	42	1191.76	1219.8	866.056	0	866.056	2972.05	2972.05
42	2.75373	16768.8	61.7812	Andesite & Rhyolite	440	42	1044.23	1068.8	698.352	0	698.352	2644.3	2644.3
43	2.75373	15434.3	63.1238	Andesite & Rhyolite	440	42	893.452	914.475	526.958	0	526.958	2289.87	2289.87
44	2.75373	13983.5	64.5318	Andesite & Rhyolite	440	42	754.077	771.82	368.523	0	368.523	1951.74	1951.74
45	2.75373	12397.3	66.0168	Andesite & Rhyolite	440	42	632.306	647.184	230.101	0	230.101	1651.4	1651.4
46	2.71541	10381.4	67.5825	Basalt	2000	49	2498.43	2557.22	484.383	0	484.383	6540.78	6540.78
47	2.71541	8215.86	69.2484	Basalt	2000	49	2411.11	2467.84	406.687	0	406.687	6770.16	6770.16
48	2.4746	5519.02	70.967	Andesite & Rhyolite	440	42	506.529	518.448	87.125	0	87.125	1555.44	1555.44
49	2.4746	3531.74	72.7631	Andesite & Rhyolite	440	42	594.045	608.023	186.609	0	186.609	2101.29	2101.29
50	2.4746	1236.78	74.7652	Andesite & Rhyolite	440	42	760.234	778.122	375.523	0	375.523	3166.95	3166.95

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.02353

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	120.011	200.015	0	0	0
2	122.605	201.356	1829.63	3476.29	62.2414
3	125.198	202.735	3716.03	7060.46	62.2415
4	127.792	204.153	5620.5	10678.9	62.2413
5	130.386	205.61	7508.73	14266.6	62.2415
6	132.98	207.108	9350.46	17765.9	62.2415
7	135.574	208.647	11119.1	21126.2	62.2414
8	138.167	210.227	12791.3	24303.4	62.2414
9	140.761	211.851	14346.7	27258.8	62.2415
10	143.355	213.519	15767.8	29958.9	62.2415
11	145.949	215.232	17039.4	32374.9	62.2415
12	148.543	216.991	18148.5	34482.2	62.2415
13	151.136	218.797	19083.4	36258.4	62.2414
14	153.73	220.651	19827.9	37673	62.2415
15	156.324	222.556	20369.6	38702.3	62.2415
16	158.918	224.512	20698.8	39327.6	62.2414
17	161.511	226.52	20808.3	39535.8	62.2415
18	164.105	228.583	20703.4	39336.5	62.2415
19	166.699	230.702	20383.9	38729.4	62.2415
20	169.293	232.879	19848.2	37711.6	62.2415
21	171.887	235.116	19095.6	36281.7	62.2415
22	174.48	237.414	18126.3	34440	62.2415
23	177.074	239.777	16941.1	32188.1	62.2415
24	179.668	242.207	15541.1	29528.1	62.2415
25	182.539	244.978	20193.3	38367.2	62.2414
26	185.41	247.837	24422.6	46403	62.2415
27	188.28	250.79	28244.1	53663.7	62.2414
28	191.151	253.841	31675.3	60183.1	62.2415
29	194.022	256.996	34752.2	66029.2	62.2415
30	196.612	259.935	32047.3	60889.9	62.2415
31	199.202	262.969	29169.1	55421.2	62.2414
32	201.792	266.102	26128.5	49644.1	62.2414
33	204.382	269.34	22938.5	43583.1	62.2414
34	206.972	272.689	19614.5	37267.6	62.2415
35	209.563	276.158	16174.8	30732.2	62.2415
36	212.153	279.754	12622.3	23982.3	62.2414
37	214.743	283.488	8964.19	17032	62.2415
38	217.167	287.116	9675.62	18383.7	62.2415
39	219.591	290.885	10285.6	19542.7	62.2415
40	222.015	294.806	10836.4	20589.1	62.2414
41	224.44	298.894	11366.2	21595.7	62.2414
42	227.193	303.76	7776.37	14775.1	62.2415
43	229.947	308.892	4554.03	8652.66	62.2415
44	232.701	314.326	1836.97	3490.25	62.2415
45	235.455	320.107	-313.838	-596.293	62.2415
46	238.208	326.297	-1855.82	-3526.06	62.2415
47	240.924	332.879	185.577	352.596	62.2414
48	243.639	340.046	2588.41	4917.98	62.2415
49	246.114	347.219	2389.54	4540.13	62.2415
50	248.588	355.195	1842.02	3499.84	62.2415
51	251.063	364.281	0	0	0

Query 1 (spencer) - Safety Factor: 1.02353

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	120.011	200.015	0	0	0
2	122.605	201.356	1829.63	3476.29	62.2414
3	125.198	202.735	3716.03	7060.46	62.2415

4	127.792	204.153	5620.5	10678.9	62.2413
5	130.386	205.61	7508.73	14266.6	62.2415
6	132.98	207.108	9350.46	17765.9	62.2415
7	135.574	208.647	11119.1	21126.2	62.2414
8	138.167	210.227	12791.3	24303.4	62.2414
9	140.761	211.851	14346.7	27258.8	62.2415
10	143.355	213.519	15767.8	29958.9	62.2415
11	145.949	215.232	17039.4	32374.9	62.2415
12	148.543	216.991	18148.5	34482.2	62.2415
13	151.136	218.797	19083.4	36258.4	62.2414
14	153.73	220.651	19827.9	37673	62.2415
15	156.324	222.556	20369.6	38702.3	62.2415
16	158.918	224.512	20698.8	39327.6	62.2414
17	161.511	226.52	20808.3	39535.8	62.2415
18	164.105	228.583	20703.4	39336.5	62.2415
19	166.699	230.702	20383.9	38729.4	62.2415
20	169.293	232.879	19848.2	37711.6	62.2415
21	171.887	235.116	19095.6	36281.7	62.2415
22	174.48	237.414	18126.3	34440	62.2415
23	177.074	239.777	16941.1	32188.1	62.2415
24	179.668	242.207	15541.1	29528.1	62.2415
25	182.539	244.978	20193.3	38367.2	62.2414
26	185.41	247.837	24422.6	46403	62.2415
27	188.28	250.79	28244.1	53663.7	62.2414
28	191.151	253.841	31675.3	60183.1	62.2415
29	194.022	256.996	34752.2	66029.2	62.2415
30	196.612	259.935	32047.3	60889.9	62.2415
31	199.202	262.969	29169.1	55421.2	62.2414
32	201.792	266.102	26128.5	49644.1	62.2414
33	204.382	269.34	22938.5	43583.1	62.2414
34	206.972	272.689	19614.5	37267.6	62.2415
35	209.563	276.158	16174.8	30732.2	62.2415
36	212.153	279.754	12622.3	23982.3	62.2414
37	214.743	283.488	8964.19	17032	62.2415
38	217.167	287.116	9675.62	18383.7	62.2415
39	219.591	290.885	10285.6	19542.7	62.2415
40	222.015	294.806	10836.4	20589.1	62.2414
41	224.44	298.894	11366.2	21595.7	62.2414
42	227.193	303.76	7776.37	14775.1	62.2415
43	229.947	308.892	4554.03	8652.66	62.2415
44	232.701	314.326	1836.97	3490.25	62.2415
45	235.455	320.107	-313.838	-596.293	62.2415
46	238.208	326.297	-1855.82	-3526.06	62.2415
47	240.924	332.879	185.577	352.596	62.2414
48	243.639	340.046	2588.41	4917.98	62.2415
49	246.114	347.219	2389.54	4540.13	62.2415
50	248.588	355.195	1842.02	3499.84	62.2415
51	251.063	364.281	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894

900	326.297
900	340.046
900	364.52
900	378.882
900	401.213
900	416.559
900	548
700	548
628.434	569.928
580	550
343.655	416.559
316.475	401.213
276.924	378.882
251.485	364.52
226.69	350.52
219.266	340.046
209.52	326.297
190.097	298.894
179.177	283.488
160.399	256.996
149.917	242.207
120	200
-119.082	200

Material Boundary

X	Y
149.917	242.207
900	242.207

Material Boundary

X	Y
160.399	256.996
900	256.996

Material Boundary

X	Y
179.177	283.488
900	283.488

Material Boundary

X	Y
190.097	298.894
900	298.894

Material Boundary

X	Y
209.52	326.297
900	326.297

Material Boundary

X	Y
219.266	340.046
900	340.046

Material Boundary

X	Y
251.485	364.52
900	364.52

Material Boundary

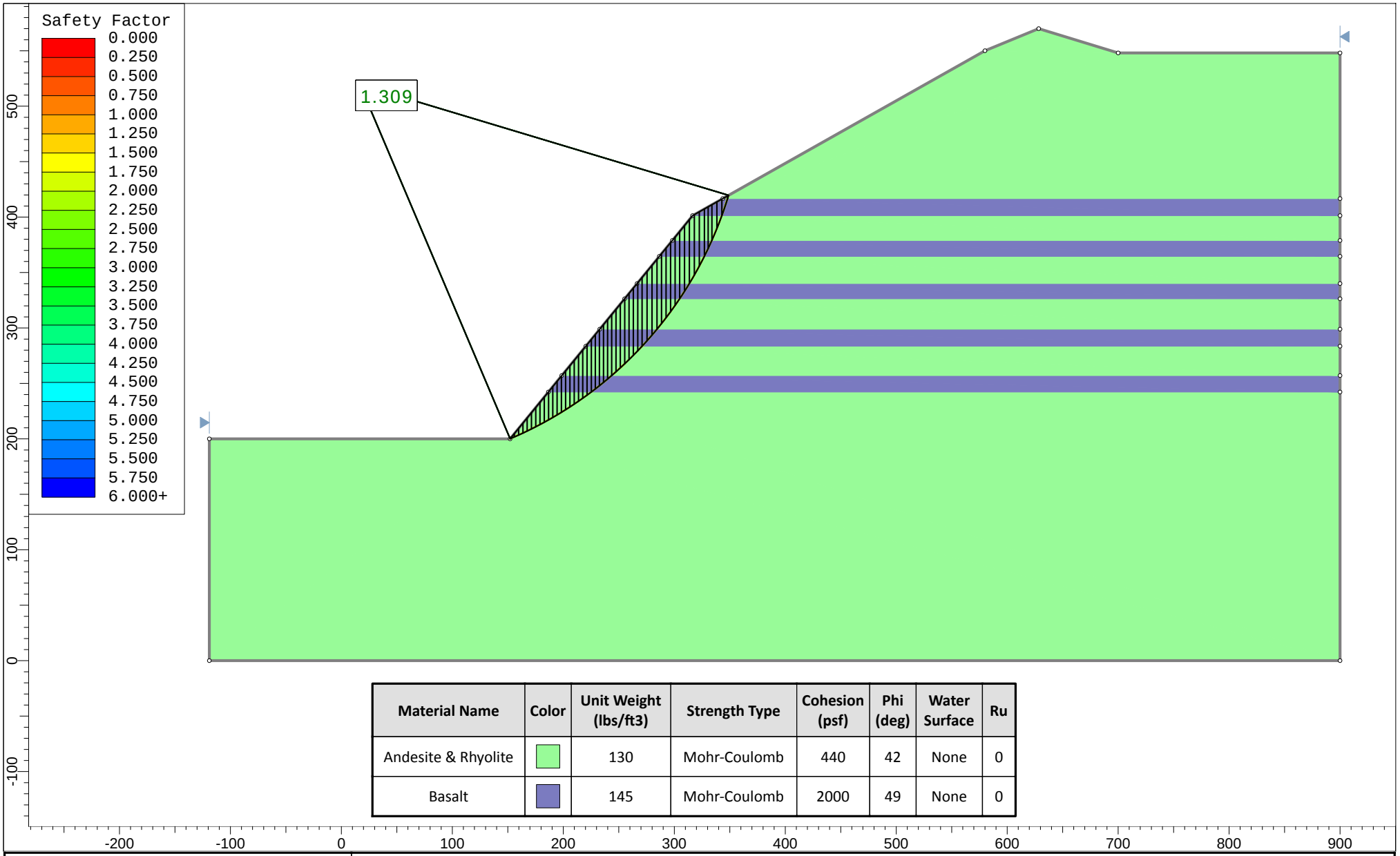
X	Y
276.924	378.882
900	378.882

Material Boundary

X	Y
316.475	401.213
900	401.213

Material Boundary

X	Y
343.655	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion		
Analysis Description	200' Slope, dry, static, 50 degree gross slope inclination		
Drawn By	J.Bianchin	Scale 1:1434	Company Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM		File Name 200',dry,ststic,50deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version: 8.032

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used	
	Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10

Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.309350
Center:	16.553, 519.622
Radius:	347.122
Left Slip Surface Endpoint:	152.020, 200.025
Right Slip Surface Endpoint:	348.934, 419.540
Resisting Moment:	3.61389e+08 lb-ft
Driving Moment:	2.76007e+08 lb-ft
Resisting Horizontal Force:	708486 lb
Driving Horizontal Force:	541099 lb
Total Slice Area:	8280.15 ft2
Surface Horizontal Width:	196.914 ft
Surface Average Height:	42.0495 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	11154
Number of Invalid Surfaces:	0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.30935

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]

1	3.85174	764.093	23.3167	Andesite & Rhyolite	440	42	545.969	714.865	305.268	0	305.268	540.588	540.588
2	3.85174	2278.35	24.0108	Andesite & Rhyolite	440	42	784.04	1026.58	651.466	0	651.466	1000.72	1000.72
3	3.85174	3764.53	24.7088	Andesite & Rhyolite	440	42	1008.29	1320.2	977.56	0	977.56	1441.51	1441.51
4	3.85174	5222.16	25.4106	Andesite & Rhyolite	440	42	1219.14	1596.28	1284.18	0	1284.18	1863.35	1863.35
5	3.85174	6650.74	26.1166	Andesite & Rhyolite	440	42	1417.02	1855.37	1571.93	0	1571.93	2266.62	2266.62
6	3.85174	8049.75	26.8268	Andesite & Rhyolite	440	42	1602.31	2097.98	1841.37	0	1841.37	2651.7	2651.7
7	3.85174	9418.64	27.5416	Andesite & Rhyolite	440	42	1775.39	2324.61	2093.07	0	2093.07	3018.92	3018.92
8	3.85174	10756.8	28.261	Andesite & Rhyolite	440	42	1936.63	2535.73	2327.55	0	2327.55	3368.62	3368.62
9	3.85174	12064	28.9853	Andesite & Rhyolite	440	42	2086.42	2731.86	2545.37	0	2545.37	3701.2	3701.2
10	3.85174	13487.7	29.7147	Andesite & Rhyolite	440	42	2245.54	2940.2	2776.76	0	2776.76	4058.36	4058.36
11	3.85174	15002.2	30.4495	Andesite & Rhyolite	440	42	2409.69	3155.13	3015.45	0	3015.45	4432.01	4432.01
12	3.85174	16483.2	31.1898	Andesite & Rhyolite	440	42	2561.82	3354.32	3236.69	0	3236.69	4787.56	4787.56
13	3.85174	17817.4	31.936	Andesite & Rhyolite	440	42	2687.64	3519.06	3419.64	0	3419.64	5094.89	5094.89
14	3.85174	18958.1	32.6883	Andesite & Rhyolite	440	42	2782.49	3643.25	3557.57	0	3557.57	5343.09	5343.09
15	3.85174	20061.8	33.447	Andesite & Rhyolite	440	42	2867.51	3754.57	3681.21	0	3681.21	5575.35	5575.35
16	3.85174	21128.6	34.2124	Andesite & Rhyolite	440	42	2943.1	3853.55	3791.13	0	3791.13	5792.18	5792.18
17	3.85174	22157.5	34.9848	Andesite & Rhyolite	440	42	3009.51	3940.5	3887.7	0	3887.7	5993.79	5993.79
18	3.85174	23158.8	35.7645	Andesite & Rhyolite	440	42	3068.27	4017.44	3973.16	0	3973.16	6183.17	6183.17
19	3.85174	24311.9	36.552	Andesite & Rhyolite	440	42	3140.27	4111.71	4077.83	0	4077.83	6405.92	6405.92
20	3.66655	24164.2	37.3283	Basalt	2000	49	5279.51	6912.72	4270.56	0	4270.56	8296.59	8296.59
21	3.66655	25041.6	38.0933	Basalt	2000	49	5307.31	6949.12	4302.21	0	4302.21	8462.67	8462.67
22	3.66655	25772.9	38.8664	Basalt	2000	49	5309	6951.34	4304.14	0	4304.14	8582.83	8582.83
23	3.66655	26318.5	39.6481	Basalt	2000	49	5280.51	6914.03	4271.7	0	4271.7	8647.59	8647.59
24	3.66655	26818.3	40.4387	Basalt	2000	49	5243.1	6865.05	4229.14	0	4229.14	8697.47	8697.47
25	3.92095	29279.5	41.2668	Andesite & Rhyolite	440	42	3239.87	4242.13	4222.7	0	4222.7	7065.67	7065.67
26	3.92095	29943.6	42.1337	Andesite & Rhyolite	440	42	3234.31	4234.85	4214.61	0	4214.61	7140.49	7140.49
27	3.92095	30552.4	43.0126	Andesite & Rhyolite	440	42	3221.16	4217.62	4195.46	0	4195.46	7200.56	7200.56
28	3.92095	31248.8	43.9043	Andesite & Rhyolite	440	42	3214.01	4208.27	4185.09	0	4185.09	7278.47	7278.47
29	3.92095	32021.5	44.8095	Andesite & Rhyolite	440	42	3211.29	4204.7	4181.11	0	4181.11	7371.12	7371.12
30	3.92095	32727.7	45.7292	Andesite & Rhyolite	440	42	3199.86	4189.74	4164.5	0	4164.5	7446.87	7446.87
31	3.92095	33190.6	46.6643	Andesite & Rhyolite	440	42	3164.93	4144	4113.71	0	4113.71	7468.06	7468.06
32	4.49179	38207.6	47.6865	Basalt	2000	49	4835.09	6330.83	3764.73	0	3764.73	9075.92	9075.92
33	4.49179	38138.6	48.8	Basalt	2000	49	4688.99	6139.53	3598.44	0	3598.44	8954.63	8954.63
34	4.49179	37937	49.9388	Basalt	2000	49	4532.62	5934.78	3420.45	0	3420.45	8810.51	8810.51
35	4.07983	34358.9	51.0504	Andesite & Rhyolite	440	42	2818.99	3691.05	3610.66	0	3610.66	7098.1	7098.1
36	4.07983	34544	52.1346	Andesite & Rhyolite	440	42	2755.63	3608.08	3518.5	0	3518.5	7062.67	7062.67
37	4.07983	34656.4	53.2459	Andesite & Rhyolite	440	42	2686.53	3517.61	3418.03	0	3418.03	7015.19	7015.19

38	4.07983	34589.9	54.3868	Andesite & Rhyolite	440	42	2604.9	3410.72	3299.32	0	3299.32	6936.03	6936.03
39	4.07983	34170.2	55.5604	Andesite & Rhyolite	440	42	2500.32	3273.8	3147.26	0	3147.26	6793.48	6793.48
40	4.3793	35804.4	56.8162	Basalt	2000	49	3681.46	4820.32	2451.66	0	2451.66	8081	8081
41	4.3793	34489.2	58.1617	Basalt	2000	49	3458.35	4528.19	2197.72	0	2197.72	7767.14	7767.14
42	4.49348	33923.1	59.5792	Andesite & Rhyolite	440	42	2055.9	2691.89	2500.98	0	2500.98	6002.27	6002.27
43	4.49348	31281.1	61.0785	Andesite & Rhyolite	440	42	1841.75	2411.5	2189.58	0	2189.58	5522.95	5522.95
44	4.49348	28021.1	62.6527	Andesite & Rhyolite	440	42	1607.07	2104.22	1848.31	0	1848.31	4955.65	4955.65
45	3.38384	18572	64.0993	Basalt	2000	49	2339.34	3063.01	924.057	0	924.057	5741.58	5741.58
46	3.38384	15985.8	65.4098	Basalt	2000	49	2075.48	2717.54	623.745	0	623.745	5159.04	5159.04
47	4.49572	17178.6	67.0318	Andesite & Rhyolite	440	42	955.454	1251.02	900.732	0	900.732	3155.12	3155.12
48	4.49572	12307.7	69.0189	Andesite & Rhyolite	440	42	702.696	920.075	533.177	0	533.177	2365.57	2365.57
49	5.1669	6422.28	71.3917	Basalt	2000	49	1079.2	1413.05	-510.228	0	-510.228	2695	2695
50	0.912136	146.191	72.9854	Andesite & Rhyolite	440	42	0	0	-551.133	0	-551.133	-551.133	-551.133

Query 1 (spencer) - Safety Factor: 1.30935

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.85174	764.093	23.3167	Andesite & Rhyolite	440	42	545.969	714.865	305.268	0	305.268	540.588	540.588
2	3.85174	2278.35	24.0108	Andesite & Rhyolite	440	42	784.04	1026.58	651.466	0	651.466	1000.72	1000.72
3	3.85174	3764.53	24.7088	Andesite & Rhyolite	440	42	1008.29	1320.2	977.56	0	977.56	1441.51	1441.51
4	3.85174	5222.16	25.4106	Andesite & Rhyolite	440	42	1219.14	1596.28	1284.18	0	1284.18	1863.35	1863.35
5	3.85174	6650.74	26.1166	Andesite & Rhyolite	440	42	1417.02	1855.37	1571.93	0	1571.93	2266.62	2266.62
6	3.85174	8049.75	26.8268	Andesite & Rhyolite	440	42	1602.31	2097.98	1841.37	0	1841.37	2651.7	2651.7
7	3.85174	9418.64	27.5416	Andesite & Rhyolite	440	42	1775.39	2324.61	2093.07	0	2093.07	3018.92	3018.92
8	3.85174	10756.8	28.261	Andesite & Rhyolite	440	42	1936.63	2535.73	2327.55	0	2327.55	3368.62	3368.62
9	3.85174	12064	28.9853	Andesite & Rhyolite	440	42	2086.42	2731.86	2545.37	0	2545.37	3701.2	3701.2
10	3.85174	13487.7	29.7147	Andesite & Rhyolite	440	42	2245.54	2940.2	2776.76	0	2776.76	4058.36	4058.36
11	3.85174	15002.2	30.4495	Andesite & Rhyolite	440	42	2409.69	3155.13	3015.45	0	3015.45	4432.01	4432.01
12	3.85174	16483.2	31.1898	Andesite & Rhyolite	440	42	2561.82	3354.32	3236.69	0	3236.69	4787.56	4787.56
13	3.85174	17817.4	31.936	Andesite & Rhyolite	440	42	2687.64	3519.06	3419.64	0	3419.64	5094.89	5094.89
14	3.85174	18958.1	32.6883	Andesite & Rhyolite	440	42	2782.49	3643.25	3557.57	0	3557.57	5343.09	5343.09
15	3.85174	20061.8	33.447	Andesite & Rhyolite	440	42	2867.51	3754.57	3681.21	0	3681.21	5575.35	5575.35
16	3.85174	21128.6	34.2124	Andesite & Rhyolite	440	42	2943.1	3853.55	3791.13	0	3791.13	5792.18	5792.18
17	3.85174	22157.5	34.9848	Andesite & Rhyolite	440	42	3009.51	3940.5	3887.7	0	3887.7	5993.79	5993.79
18	3.85174	23158.8	35.7645	Andesite & Rhyolite	440	42	3068.27	4017.44	3973.16	0	3973.16	6183.17	6183.17
19	3.85174	24311.9	36.552	Andesite & Rhyolite	440	42	3140.27	4111.71	4077.83	0	4077.83	6405.92	6405.92
20	3.66655	24164.2	37.3283	Basalt	2000	49	5279.51	6912.72	4270.56	0	4270.56	8296.59	8296.59

21	3.66655	25041.6	38.0933	Basalt	2000	49	5307.31	6949.12	4302.21	0	4302.21	8462.67	8462.67
22	3.66655	25772.9	38.8664	Basalt	2000	49	5309	6951.34	4304.14	0	4304.14	8582.83	8582.83
23	3.66655	26318.5	39.6481	Basalt	2000	49	5280.51	6914.03	4271.7	0	4271.7	8647.59	8647.59
24	3.66655	26818.3	40.4387	Basalt	2000	49	5243.1	6865.05	4229.14	0	4229.14	8697.47	8697.47
25	3.92095	29279.5	41.2668	Andesite & Rhyolite	440	42	3239.87	4242.13	4222.7	0	4222.7	7065.67	7065.67
26	3.92095	29943.6	42.1337	Andesite & Rhyolite	440	42	3234.31	4234.85	4214.61	0	4214.61	7140.49	7140.49
27	3.92095	30552.4	43.0126	Andesite & Rhyolite	440	42	3221.16	4217.62	4195.46	0	4195.46	7200.56	7200.56
28	3.92095	31248.8	43.9043	Andesite & Rhyolite	440	42	3214.01	4208.27	4185.09	0	4185.09	7278.47	7278.47
29	3.92095	32021.5	44.8095	Andesite & Rhyolite	440	42	3211.29	4204.7	4181.11	0	4181.11	7371.12	7371.12
30	3.92095	32727.7	45.7292	Andesite & Rhyolite	440	42	3199.86	4189.74	4164.5	0	4164.5	7446.87	7446.87
31	3.92095	33190.6	46.6643	Andesite & Rhyolite	440	42	3164.93	4144	4113.71	0	4113.71	7468.06	7468.06
32	4.49179	38207.6	47.6865	Basalt	2000	49	4835.09	6330.83	3764.73	0	3764.73	9075.92	9075.92
33	4.49179	38138.6	48.8	Basalt	2000	49	4688.99	6139.53	3598.44	0	3598.44	8954.63	8954.63
34	4.49179	37937	49.9388	Basalt	2000	49	4532.62	5934.78	3420.45	0	3420.45	8810.51	8810.51
35	4.07983	34358.9	51.0504	Andesite & Rhyolite	440	42	2818.99	3691.05	3610.66	0	3610.66	7098.1	7098.1
36	4.07983	34544	52.1346	Andesite & Rhyolite	440	42	2755.63	3608.08	3518.5	0	3518.5	7062.67	7062.67
37	4.07983	34656.4	53.2459	Andesite & Rhyolite	440	42	2686.53	3517.61	3418.03	0	3418.03	7015.19	7015.19
38	4.07983	34589.9	54.3868	Andesite & Rhyolite	440	42	2604.9	3410.72	3299.32	0	3299.32	6936.03	6936.03
39	4.07983	34170.2	55.5604	Andesite & Rhyolite	440	42	2500.32	3273.8	3147.26	0	3147.26	6793.48	6793.48
40	4.3793	35804.4	56.8162	Basalt	2000	49	3681.46	4820.32	2451.66	0	2451.66	8081	8081
41	4.3793	34489.2	58.1617	Basalt	2000	49	3458.35	4528.19	2197.72	0	2197.72	7767.14	7767.14
42	4.49348	33923.1	59.5792	Andesite & Rhyolite	440	42	2055.9	2691.89	2500.98	0	2500.98	6002.27	6002.27
43	4.49348	31281.1	61.0785	Andesite & Rhyolite	440	42	1841.75	2411.5	2189.58	0	2189.58	5522.95	5522.95
44	4.49348	28021.1	62.6527	Andesite & Rhyolite	440	42	1607.07	2104.22	1848.31	0	1848.31	4955.65	4955.65
45	3.38384	18572	64.0993	Basalt	2000	49	2339.34	3063.01	924.057	0	924.057	5741.58	5741.58
46	3.38384	15985.8	65.4098	Basalt	2000	49	2075.48	2717.54	623.745	0	623.745	5159.04	5159.04
47	4.49572	17178.6	67.0318	Andesite & Rhyolite	440	42	955.454	1251.02	900.732	0	900.732	3155.12	3155.12
48	4.49572	12307.7	69.0189	Andesite & Rhyolite	440	42	702.696	920.075	533.177	0	533.177	2365.57	2365.57
49	5.1669	6422.28	71.3917	Basalt	2000	49	1079.2	1413.05	-510.228	0	-510.228	2695	2695
50	0.912136	146.191	72.9854	Andesite & Rhyolite	440	42	0	0	-551.133	0	-551.133	-551.133	-551.133

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.30935

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	152.02	200.025	0	0	0
2	155.872	201.685	1589.57	1340.3	40.1371
3	159.724	203.4	3482.29	2936.21	40.137
4	163.575	205.173	5621.27	4739.76	40.137
5	167.427	207.003	7952.6	6705.5	40.137
6	171.279	208.891	10425.2	8790.37	40.1371
7	175.13	210.839	12990.8	10953.6	40.137
8	178.982	212.847	15603.5	13156.6	40.137

9	182.834	214.918	18220.3	15363	40.1369
10	186.686	217.052	20800.3	17538.5	40.1371
11	190.537	219.25	23318.4	19661.7	40.137
12	194.389	221.514	25743.1	21706.2	40.1371
13	198.241	223.846	28032.6	23636.6	40.137
14	202.093	226.247	30142.2	25415.5	40.1371
15	205.944	228.719	32033.1	27009.8	40.1371
16	209.796	231.263	33677.4	28396.3	40.1371
17	213.648	233.882	35049.6	29553.3	40.1371
18	217.5	236.577	36126	30460.9	40.1371
19	221.351	239.352	36884.4	31100.4	40.1371
20	225.203	242.207	37297.6	31448.8	40.1371
21	228.87	245.003	44654.2	37651.7	40.137
22	232.536	247.877	51687.3	43581.9	40.137
23	236.203	250.832	58373.5	49219.6	40.1371
24	239.869	253.871	64695.1	54549.8	40.137
25	243.536	256.996	70644.1	59566	40.1371
26	247.457	260.436	68779.2	57993.5	40.137
27	251.378	263.983	66471.8	56048	40.1371
28	255.299	267.641	63715.5	53723.9	40.1371
29	259.22	271.415	60484.6	50999.6	40.137
30	263.141	275.31	56751.2	47851.7	40.137
31	267.062	279.332	52508.7	44274.5	40.1371
32	270.983	283.488	47784.4	40291.1	40.1371
33	275.474	288.422	50859.3	42883.7	40.137
34	279.966	293.553	53392.1	45019.4	40.1371
35	284.458	298.894	55417.7	46727.3	40.137
36	288.538	303.941	48658.9	41028.4	40.137
37	292.618	309.189	41403.6	34910.8	40.137
38	296.697	314.651	33658.1	28380	40.1371
39	300.777	320.347	25460	21467.4	40.137
40	304.857	326.297	16904	14253.2	40.1371
41	309.236	332.993	16558.5	13961.9	40.1371
42	313.616	340.046	16156.8	13623.2	40.1371
43	318.109	347.699	6227.13	5250.62	40.1371
44	322.603	355.831	-3330.01	-2807.81	40.137
45	327.096	364.52	-12189.9	-10278.3	40.137
46	330.48	371.488	-10738	-9054.13	40.1371
47	333.864	378.882	-8348.99	-7039.74	40.1371
48	338.36	389.49	-13621.6	-11485.5	40.137
49	342.855	401.213	-16722.9	-14100.5	40.1371
50	348.022	416.559	-3334.41	-2811.52	40.137
51	348.934	419.54	0	0	0

Query 1 (spencer) - Safety Factor: 1.30935

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	152.02	200.025	0	0	0
2	155.872	201.685	1589.57	1340.3	40.1371
3	159.724	203.4	3482.29	2936.21	40.137
4	163.575	205.173	5621.27	4739.76	40.137
5	167.427	207.003	7952.6	6705.5	40.137
6	171.279	208.891	10425.2	8790.37	40.1371
7	175.13	210.839	12990.8	10953.6	40.137
8	178.982	212.847	15603.5	13156.6	40.137
9	182.834	214.918	18220.3	15363	40.1369
10	186.686	217.052	20800.3	17538.5	40.1371
11	190.537	219.25	23318.4	19661.7	40.137
12	194.389	221.514	25743.1	21706.2	40.1371
13	198.241	223.846	28032.6	23636.6	40.137
14	202.093	226.247	30142.2	25415.5	40.1371
15	205.944	228.719	32033.1	27009.8	40.1371

16	209.796	231.263	33677.4	28396.3	40.1371
17	213.648	233.882	35049.6	29553.3	40.1371
18	217.5	236.577	36126	30460.9	40.1371
19	221.351	239.352	36884.4	31100.4	40.1371
20	225.203	242.207	37297.6	31448.8	40.1371
21	228.87	245.003	44654.2	37651.7	40.137
22	232.536	247.877	51687.3	43581.9	40.137
23	236.203	250.832	58373.5	49219.6	40.1371
24	239.869	253.871	64695.1	54549.8	40.137
25	243.536	256.996	70644.1	59566	40.1371
26	247.457	260.436	68779.2	57993.5	40.137
27	251.378	263.983	66471.8	56048	40.1371
28	255.299	267.641	63715.5	53723.9	40.1371
29	259.22	271.415	60484.6	50999.6	40.137
30	263.141	275.31	56751.2	47851.7	40.137
31	267.062	279.332	52508.7	44274.5	40.1371
32	270.983	283.488	47784.4	40291.1	40.1371
33	275.474	288.422	50859.3	42883.7	40.137
34	279.966	293.553	53392.1	45019.4	40.1371
35	284.458	298.894	55417.7	46727.3	40.137
36	288.538	303.941	48658.9	41028.4	40.137
37	292.618	309.189	41403.6	34910.8	40.137
38	296.697	314.651	33658.1	28380	40.1371
39	300.777	320.347	25460	21467.4	40.137
40	304.857	326.297	16904	14253.2	40.1371
41	309.236	332.993	16558.5	13961.9	40.1371
42	313.616	340.046	16156.8	13623.2	40.1371
43	318.109	347.699	6227.13	5250.62	40.1371
44	322.603	355.831	-3330.01	-2807.81	40.137
45	327.096	364.52	-12189.9	-10278.3	40.137
46	330.48	371.488	-10738	-9054.13	40.1371
47	333.864	378.882	-8348.99	-7039.74	40.1371
48	338.36	389.49	-13621.6	-11485.5	40.137
49	342.855	401.213	-16722.9	-14100.5	40.1371
50	348.022	416.559	-3334.41	-2811.52	40.137
51	348.934	419.54	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046
900	364.52
900	378.882
900	401.213
900	416.559
900	548
700	548
628.434	569.928
580	550
343.655	416.559
316.475	401.213
298.222	378.882

286.481	364.52
266.476	340.046
255.237	326.297
232.838	298.894
220.244	283.488
198.589	256.996
186.501	242.207
152	200
-119.082	200

Material Boundary

X	Y
186.501	242.207
900	242.207

Material Boundary

X	Y
198.589	256.996
900	256.996

Material Boundary

X	Y
220.244	283.488
900	283.488

Material Boundary

X	Y
232.838	298.894
900	298.894

Material Boundary

X	Y
255.237	326.297
900	326.297

Material Boundary

X	Y
266.476	340.046
900	340.046

Material Boundary

X	Y
286.481	364.52
900	364.52

Material Boundary

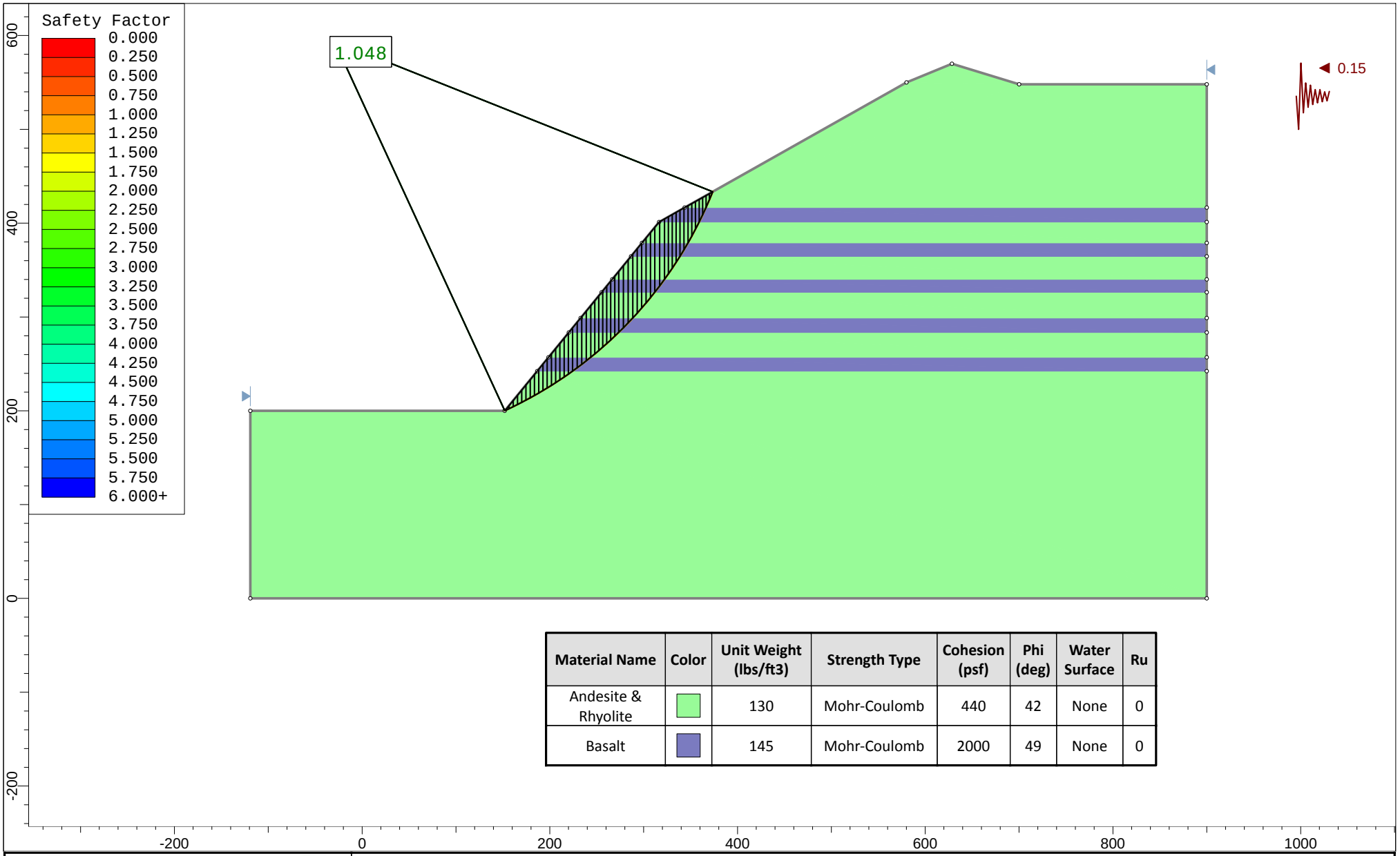
X	Y
298.222	378.882
900	378.882

Material Boundary

X	Y
316.475	401.213
900	401.213

Material Boundary

X	Y
343.655	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion		
Analysis Description	200' Slope, dry, pseudostatic, 50 degree gross slope inclination		
Drawn By	J.Bianchin	*Scale* 1:1695	*Company* Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM		*File Name* 200',dry,PS,50deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:04.56s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search

Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.047750
Center:	-29.731, 594.421
Radius:	434.259
Left Slip Surface Endpoint:	152.022, 200.027
Right Slip Surface Endpoint:	373.598, 433.465
Resisting Moment:	4.7909e+08 lb-ft
Driving Moment:	4.57258e+08 lb-ft
Resisting Horizontal Force:	781962 lb
Driving Horizontal Force:	746328 lb
Total Slice Area:	9774 ft2
Surface Horizontal Width:	221.576 ft
Surface Average Height:	44.1112 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	9810
Number of Invalid Surfaces:	0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.04775

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.51672	1001.89	25.0711	Andesite & Rhyolite	440	42	1003.6	1051.52	679.163	0	679.163	1148.67	1148.67
2	4.51672	2986.96	25.7308	Andesite & Rhyolite	440	42	1328.11	1391.53	1056.78	0	1056.78	1696.84	1696.84
3	4.51672	4934.29	26.3942	Andesite & Rhyolite	440	42	1623.45	1700.97	1400.45	0	1400.45	2206.13	2206.13
4	4.51672	6843.24	27.0615	Andesite & Rhyolite	440	42	1891.21	1981.52	1712.03	0	1712.03	2678.21	2678.21
5	4.51672	8713.12	27.7327	Andesite & Rhyolite	440	42	2132.95	2234.8	1993.34	0	1993.34	3114.72	3114.72
6	4.51672	10543.2	28.4081	Andesite & Rhyolite	440	42	2350.13	2462.35	2246.04	0	2246.04	3517.18	3517.18
7	4.51672	12332.8	29.0878	Andesite & Rhyolite	440	42	2544.14	2665.62	2471.81	0	2471.81	3887.15	3887.15
8	4.51672	14106.1	29.7721	Andesite & Rhyolite	440	42	2719.87	2849.74	2676.29	0	2676.29	4232.21	4232.21
9	4.51672	16111.3	30.461	Andesite & Rhyolite	440	42	2912.03	3051.08	2899.9	0	2899.9	4612.55	4612.55
10	4.51672	18148.6	31.1549	Andesite & Rhyolite	440	42	3091.92	3239.56	3109.24	0	3109.24	4978.45	4978.45
11	4.51672	20052.8	31.8539	Andesite & Rhyolite	440	42	3239.04	3393.7	3280.41	0	3280.41	5292.92	5292.92
12	4.51672	21644.7	32.5582	Andesite & Rhyolite	440	42	3334.07	3493.27	3391	0	3391	5519.8	5519.8
13	4.51672	23172.5	33.2681	Andesite & Rhyolite	440	42	3411	3573.88	3480.53	0	3480.53	5718.43	5718.43
14	4.51672	24653.1	33.9838	Andesite & Rhyolite	440	42	3473.16	3639	3552.86	0	3552.86	5894.1	5894.1
15	4.51672	26085.3	34.7056	Andesite & Rhyolite	440	42	3521.5	3689.65	3609.09	0	3609.09	6048.01	6048.01
16	4.51672	27618	35.4338	Andesite & Rhyolite	440	42	3572.88	3743.49	3668.89	0	3668.89	6211.18	6211.18
17	4.83462	31319.5	36.1947	Basalt	2000	49	7617.23	7980.95	5199.15	0	5199.15	10773	10773
18	4.83462	32937.7	36.9892	Basalt	2000	49	7587.21	7949.5	5171.82	0	5171.82	10887	10887
19	4.83462	34191	37.7921	Basalt	2000	49	7498.59	7856.65	5091.11	0	5091.11	10906	10906
20	4.83462	35241.2	38.6038	Basalt	2000	49	7378.36	7730.68	4981.6	0	4981.6	10872.5	10872.5
21	4.25623	31944.5	39.3752	Andesite & Rhyolite	440	42	3569.89	3740.35	3665.42	0	3665.42	6595.17	6595.17
22	4.25623	32867.4	40.1055	Andesite & Rhyolite	440	42	3545.43	3714.72	3636.95	0	3636.95	6623.06	6623.06
23	4.25623	33751.1	40.8438	Andesite & Rhyolite	440	42	3515.67	3683.54	3602.31	0	3602.31	6641.65	6641.65
24	4.25623	34813.5	41.5904	Andesite & Rhyolite	440	42	3499.59	3666.7	3583.61	0	3583.61	6689.64	6689.64
25	4.25623	35908.7	42.3457	Andesite & Rhyolite	440	42	3484.06	3650.42	3565.54	0	3565.54	6740.87	6740.87
26	4.25623	36880.3	43.1102	Andesite & Rhyolite	440	42	3456.75	3621.81	3533.75	0	3533.75	6769.68	6769.68
27	4.25623	37549.1	43.8844	Andesite & Rhyolite	440	42	3405.17	3567.77	3473.74	0	3473.74	6748.83	6748.83
28	5.01251	44776.7	44.7395	Basalt	2000	49	6465.09	6773.8	4149.81	0	4149.81	10556.4	10556.4
29	5.01251	45102.3	45.6784	Basalt	2000	49	6251.17	6549.66	3954.96	0	3954.96	10355.9	10355.9
30	5.01251	45340.3	46.6332	Basalt	2000	49	6035.5	6323.7	3758.54	0	3758.54	10148.3	10148.3
31	4.68199	42937.2	47.5726	Andesite & Rhyolite	440	42	3074.99	3221.82	3089.53	0	3089.53	6453.84	6453.84
32	4.68199	43656.4	48.4965	Andesite & Rhyolite	440	42	3023.08	3167.43	3029.12	0	3029.12	6445.67	6445.67
33	4.68199	44101.6	49.4376	Andesite & Rhyolite	440	42	2957.87	3099.11	2953.24	0	2953.24	6408.84	6408.84
34	4.68199	44202.5	50.3971	Andesite &	440	42	2877.17	3014.55	2859.33	0	2859.33	6336.87	6336.87

				Rhyolite									
35	4.68199	44183.2	51.3765	Andesite & Rhyolite	440	42	2794.68	2928.13	2763.35	0	2763.35	6261.25	6261.25
36	5.17897	48420.8	52.4317	Basalt	2000	49	4924.52	5159.67	2746.66	0	2746.66	9148.61	9148.61
37	5.17897	46272.9	53.5674	Basalt	2000	49	4604.96	4824.85	2455.61	0	2455.61	8694.19	8694.19
38	4.11319	34674.5	54.6112	Andesite & Rhyolite	440	42	2338.81	2450.49	2232.87	0	2232.87	5525.27	5525.27
39	4.11319	32907.9	55.5596	Andesite & Rhyolite	440	42	2192.6	2297.3	2062.74	0	2062.74	5260.11	5260.11
40	4.11319	31025.9	56.5314	Andesite & Rhyolite	440	42	2046.96	2144.7	1893.26	0	1893.26	4989.56	4989.56
41	4.11319	29019.4	57.5289	Andesite & Rhyolite	440	42	1901.07	1991.85	1723.51	0	1723.51	4710.92	4710.92
42	4.29149	27765.3	58.5773	Basalt	2000	49	3285.44	3442.32	1253.79	0	1253.79	6631.42	6631.42
43	4.29149	24749.2	59.6812	Basalt	2000	49	3006.79	3150.36	999.995	0	999.995	6141.62	6141.62
44	3.97251	20168.9	60.7789	Andesite & Rhyolite	440	42	1385.32	1451.47	1123.35	0	1123.35	3599.94	3599.94
45	3.97251	17574.6	61.8716	Andesite & Rhyolite	440	42	1225.33	1283.84	937.18	0	937.18	3229.28	3229.28
46	3.97251	14800.6	63.0048	Andesite & Rhyolite	440	42	1058.39	1108.92	742.915	0	742.915	2820.54	2820.54
47	3.62662	10718.6	64.1305	Basalt	2000	49	2026.2	2122.95	106.88	0	106.88	4285.33	4285.33
48	3.62662	7649.13	65.2503	Basalt	2000	49	1777.23	1862.1	-119.878	0	-119.878	3735.29	3735.29
49	3.58231	4549.85	66.4124	Andesite & Rhyolite	440	42	490.183	513.589	81.7289	0	81.7289	1204.37	1204.37
50	3.58231	1555.2	67.6238	Andesite & Rhyolite	440	42	567.3	594.389	171.467	0	171.467	1549.46	1549.46

Query 1 (spencer) - Safety Factor: 1.04775

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.51672	1001.89	25.0711	Andesite & Rhyolite	440	42	1003.6	1051.52	679.163	0	679.163	1148.67	1148.67
2	4.51672	2986.96	25.7308	Andesite & Rhyolite	440	42	1328.11	1391.53	1056.78	0	1056.78	1696.84	1696.84
3	4.51672	4934.29	26.3942	Andesite & Rhyolite	440	42	1623.45	1700.97	1400.45	0	1400.45	2206.13	2206.13
4	4.51672	6843.24	27.0615	Andesite & Rhyolite	440	42	1891.21	1981.52	1712.03	0	1712.03	2678.21	2678.21
5	4.51672	8713.12	27.7327	Andesite & Rhyolite	440	42	2132.95	2234.8	1993.34	0	1993.34	3114.72	3114.72
6	4.51672	10543.2	28.4081	Andesite & Rhyolite	440	42	2350.13	2462.35	2246.04	0	2246.04	3517.18	3517.18
7	4.51672	12332.8	29.0878	Andesite & Rhyolite	440	42	2544.14	2665.62	2471.81	0	2471.81	3887.15	3887.15
8	4.51672	14106.1	29.7721	Andesite & Rhyolite	440	42	2719.87	2849.74	2676.29	0	2676.29	4232.21	4232.21
9	4.51672	16111.3	30.461	Andesite & Rhyolite	440	42	2912.03	3051.08	2899.9	0	2899.9	4612.55	4612.55
10	4.51672	18148.6	31.1549	Andesite & Rhyolite	440	42	3091.92	3239.56	3109.24	0	3109.24	4978.45	4978.45
11	4.51672	20052.8	31.8539	Andesite & Rhyolite	440	42	3239.04	3393.7	3280.41	0	3280.41	5292.92	5292.92
12	4.51672	21644.7	32.5582	Andesite & Rhyolite	440	42	3334.07	3493.27	3391	0	3391	5519.8	5519.8
13	4.51672	23172.5	33.2681	Andesite & Rhyolite	440	42	3411	3573.88	3480.53	0	3480.53	5718.43	5718.43
14	4.51672	24653.1	33.9838	Andesite & Rhyolite	440	42	3473.16	3639	3552.86	0	3552.86	5894.1	5894.1
15	4.51672	26085.3	34.7056	Andesite & Rhyolite	440	42	3521.5	3689.65	3609.09	0	3609.09	6048.01	6048.01
16	4.51672	27618	35.4338	Andesite & Rhyolite	440	42	3572.88	3743.49	3668.89	0	3668.89	6211.18	6211.18

17	4.83462	31319.5	36.1947	Basalt	2000	49	7617.23	7980.95	5199.15	0	5199.15	10773	10773
18	4.83462	32937.7	36.9892	Basalt	2000	49	7587.21	7949.5	5171.82	0	5171.82	10887	10887
19	4.83462	34191	37.7921	Basalt	2000	49	7498.59	7856.65	5091.11	0	5091.11	10906	10906
20	4.83462	35241.2	38.6038	Basalt	2000	49	7378.36	7730.68	4981.6	0	4981.6	10872.5	10872.5
21	4.25623	31944.5	39.3752	Andesite & Rhyolite	440	42	3569.89	3740.35	3665.42	0	3665.42	6595.17	6595.17
22	4.25623	32867.4	40.1055	Andesite & Rhyolite	440	42	3545.43	3714.72	3636.95	0	3636.95	6623.06	6623.06
23	4.25623	33751.1	40.8438	Andesite & Rhyolite	440	42	3515.67	3683.54	3602.31	0	3602.31	6641.65	6641.65
24	4.25623	34813.5	41.5904	Andesite & Rhyolite	440	42	3499.59	3666.7	3583.61	0	3583.61	6689.64	6689.64
25	4.25623	35908.7	42.3457	Andesite & Rhyolite	440	42	3484.06	3650.42	3565.54	0	3565.54	6740.87	6740.87
26	4.25623	36880.3	43.1102	Andesite & Rhyolite	440	42	3456.75	3621.81	3533.75	0	3533.75	6769.68	6769.68
27	4.25623	37549.1	43.8844	Andesite & Rhyolite	440	42	3405.17	3567.77	3473.74	0	3473.74	6748.83	6748.83
28	5.01251	44776.7	44.7395	Basalt	2000	49	6465.09	6773.8	4149.81	0	4149.81	10556.4	10556.4
29	5.01251	45102.3	45.6784	Basalt	2000	49	6251.17	6549.66	3954.96	0	3954.96	10355.9	10355.9
30	5.01251	45340.3	46.6332	Basalt	2000	49	6035.5	6323.7	3758.54	0	3758.54	10148.3	10148.3
31	4.68199	42937.2	47.5726	Andesite & Rhyolite	440	42	3074.99	3221.82	3089.53	0	3089.53	6453.84	6453.84
32	4.68199	43656.4	48.4965	Andesite & Rhyolite	440	42	3023.08	3167.43	3029.12	0	3029.12	6445.67	6445.67
33	4.68199	44101.6	49.4376	Andesite & Rhyolite	440	42	2957.87	3099.11	2953.24	0	2953.24	6408.84	6408.84
34	4.68199	44202.5	50.3971	Andesite & Rhyolite	440	42	2877.17	3014.55	2859.33	0	2859.33	6336.87	6336.87
35	4.68199	44183.2	51.3765	Andesite & Rhyolite	440	42	2794.68	2928.13	2763.35	0	2763.35	6261.25	6261.25
36	5.17897	48420.8	52.4317	Basalt	2000	49	4924.52	5159.67	2746.66	0	2746.66	9148.61	9148.61
37	5.17897	46272.9	53.5674	Basalt	2000	49	4604.96	4824.85	2455.61	0	2455.61	8694.19	8694.19
38	4.11319	34674.5	54.6112	Andesite & Rhyolite	440	42	2338.81	2450.49	2232.87	0	2232.87	5525.27	5525.27
39	4.11319	32907.9	55.5596	Andesite & Rhyolite	440	42	2192.6	2297.3	2062.74	0	2062.74	5260.11	5260.11
40	4.11319	31025.9	56.5314	Andesite & Rhyolite	440	42	2046.96	2144.7	1893.26	0	1893.26	4989.56	4989.56
41	4.11319	29019.4	57.5289	Andesite & Rhyolite	440	42	1901.07	1991.85	1723.51	0	1723.51	4710.92	4710.92
42	4.29149	27765.3	58.5773	Basalt	2000	49	3285.44	3442.32	1253.79	0	1253.79	6631.42	6631.42
43	4.29149	24749.2	59.6812	Basalt	2000	49	3006.79	3150.36	999.995	0	999.995	6141.62	6141.62
44	3.97251	20168.9	60.7789	Andesite & Rhyolite	440	42	1385.32	1451.47	1123.35	0	1123.35	3599.94	3599.94
45	3.97251	17574.6	61.8716	Andesite & Rhyolite	440	42	1225.33	1283.84	937.18	0	937.18	3229.28	3229.28
46	3.97251	14800.6	63.0048	Andesite & Rhyolite	440	42	1058.39	1108.92	742.915	0	742.915	2820.54	2820.54
47	3.62662	10718.6	64.1305	Basalt	2000	49	2026.2	2122.95	106.88	0	106.88	4285.33	4285.33
48	3.62662	7649.13	65.2503	Basalt	2000	49	1777.23	1862.1	-119.878	0	-119.878	3735.29	3735.29
49	3.58231	4549.85	66.4124	Andesite & Rhyolite	440	42	490.183	513.589	81.7289	0	81.7289	1204.37	1204.37
50	3.58231	1555.2	67.6238	Andesite & Rhyolite	440	42	567.3	594.389	171.467	0	171.467	1549.46	1549.46

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.04775

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	152.022	200.027	0	0	0

2	156.539	202.14	2934.44	4702.02	58.0325
3	161.055	204.317	6167.34	9882.28	58.0325
4	165.572	206.558	9599.38	15381.6	58.0325
5	170.089	208.866	13139.7	21054.4	58.0324
6	174.606	211.24	16705.2	26767.8	58.0326
7	179.122	213.683	20220.7	32400.8	58.0325
8	183.639	216.196	23617.6	37843.8	58.0325
9	188.156	218.78	26835.8	43000.5	58.0325
10	192.672	221.436	29830.4	47798.9	58.0325
11	197.189	224.167	32542.9	52145.3	58.0325
12	201.706	226.973	34916.2	55948.2	58.0325
13	206.223	229.857	36905.4	59135.6	58.0325
14	210.739	232.82	38477.3	61654.4	58.0325
15	215.256	235.865	39603.7	63459.2	58.0325
16	219.773	238.993	40260.3	64511.4	58.0325
17	224.289	242.207	40417.1	64762.6	58.0325
18	229.124	245.745	54045.4	86600	58.0325
19	233.959	249.387	66845.1	107110	58.0326
20	238.793	253.136	78777.1	126229	58.0325
21	243.628	256.996	89830.1	143940	58.0325
22	247.884	260.489	87385.1	140022	58.0325
23	252.14	264.073	84463.7	135341	58.0325
24	256.397	267.753	81066.1	129897	58.0325
25	260.653	271.531	77158.5	123635	58.0324
26	264.909	275.41	72727	116535	58.0326
27	269.165	279.394	67785.2	108616	58.0325
28	273.422	283.488	62383.7	99961	58.0325
29	278.434	288.455	67366.8	107946	58.0326
30	283.447	293.587	71545.1	114641	58.0326
31	288.459	298.894	74963.6	120118	58.0324
32	293.141	304.017	67052.1	107441	58.0324
33	297.823	309.308	58588.3	93879.4	58.0325
34	302.505	314.778	49627.8	79521.4	58.0325
35	307.187	320.437	40248.3	64492.1	58.0325
36	311.869	326.297	30473.9	48830.1	58.0325
37	317.048	333.03	30148.1	48308.1	58.0326
38	322.227	340.046	29757.8	47682.6	58.0325
39	326.34	345.836	21219.8	34001.7	58.0325
40	330.453	351.834	12903.6	20676.1	58.0324
41	334.567	358.056	4865.32	7795.97	58.0325
42	338.68	364.52	-2830.9	-4536.11	58.0325
43	342.971	371.544	-1744.28	-2794.96	58.0325
44	347.263	378.882	71.0074	113.779	58.0325
45	351.235	385.984	-5444.94	-8724.74	58.0325
46	355.208	393.415	-10191.8	-16330.9	58.0325
47	359.18	401.213	-14013	-22453.8	58.0325
48	362.807	408.692	-9093.21	-14570.6	58.0326
49	366.433	416.559	-2870.89	-4600.19	58.0325
50	370.016	424.763	-2473.02	-3962.66	58.0325
51	373.598	433.465	0	0	0

Query 1 (spencer) - Safety Factor: 1.04775

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	152.022	200.027	0	0	0
2	156.539	202.14	2934.44	4702.02	58.0325
3	161.055	204.317	6167.34	9882.28	58.0325
4	165.572	206.558	9599.38	15381.6	58.0325
5	170.089	208.866	13139.7	21054.4	58.0324
6	174.606	211.24	16705.2	26767.8	58.0326
7	179.122	213.683	20220.7	32400.8	58.0325

8	183.639	216.196	23617.6	37843.8	58.0325
9	188.156	218.78	26835.8	43000.5	58.0325
10	192.672	221.436	29830.4	47798.9	58.0325
11	197.189	224.167	32542.9	52145.3	58.0325
12	201.706	226.973	34916.2	55948.2	58.0325
13	206.223	229.857	36905.4	59135.6	58.0325
14	210.739	232.82	38477.3	61654.4	58.0325
15	215.256	235.865	39603.7	63459.2	58.0325
16	219.773	238.993	40260.3	64511.4	58.0325
17	224.289	242.207	40417.1	64762.6	58.0325
18	229.124	245.745	54045.4	86600	58.0325
19	233.959	249.387	66845.1	107110	58.0326
20	238.793	253.136	78777.1	126229	58.0325
21	243.628	256.996	89830.1	143940	58.0325
22	247.884	260.489	87385.1	140022	58.0325
23	252.14	264.073	84463.7	135341	58.0325
24	256.397	267.753	81066.1	129897	58.0325
25	260.653	271.531	77158.5	123635	58.0324
26	264.909	275.41	72727	116535	58.0326
27	269.165	279.394	67785.2	108616	58.0325
28	273.422	283.488	62383.7	99961	58.0325
29	278.434	288.455	67366.8	107946	58.0326
30	283.447	293.587	71545.1	114641	58.0326
31	288.459	298.894	74963.6	120118	58.0324
32	293.141	304.017	67052.1	107441	58.0324
33	297.823	309.308	58588.3	93879.4	58.0325
34	302.505	314.778	49627.8	79521.4	58.0325
35	307.187	320.437	40248.3	64492.1	58.0325
36	311.869	326.297	30473.9	48830.1	58.0325
37	317.048	333.03	30148.1	48308.1	58.0326
38	322.227	340.046	29757.8	47682.6	58.0325
39	326.34	345.836	21219.8	34001.7	58.0325
40	330.453	351.834	12903.6	20676.1	58.0324
41	334.567	358.056	4865.32	7795.97	58.0325
42	338.68	364.52	-2830.9	-4536.11	58.0325
43	342.971	371.544	-1744.28	-2794.96	58.0325
44	347.263	378.882	71.0074	113.779	58.0325
45	351.235	385.984	-5444.94	-8724.74	58.0325
46	355.208	393.415	-10191.8	-16330.9	58.0325
47	359.18	401.213	-14013	-22453.8	58.0325
48	362.807	408.692	-9093.21	-14570.6	58.0326
49	366.433	416.559	-2870.89	-4600.19	58.0325
50	370.016	424.763	-2473.02	-3962.66	58.0325
51	373.598	433.465	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046
900	364.52
900	378.882

900	401.213
900	416.559
900	548
700	548
628.434	569.928
580	550
343.655	416.559
316.475	401.213
298.222	378.882
286.481	364.52
266.476	340.046
255.237	326.297
232.838	298.894
220.244	283.488
198.589	256.996
186.501	242.207
152	200
-119.082	200

Material Boundary

X	Y
186.501	242.207
900	242.207

Material Boundary

X	Y
198.589	256.996
900	256.996

Material Boundary

X	Y
220.244	283.488
900	283.488

Material Boundary

X	Y
232.838	298.894
900	298.894

Material Boundary

X	Y
255.237	326.297
900	326.297

Material Boundary

X	Y
266.476	340.046
900	340.046

Material Boundary

X	Y
286.481	364.52

900	364.52

Material Boundary

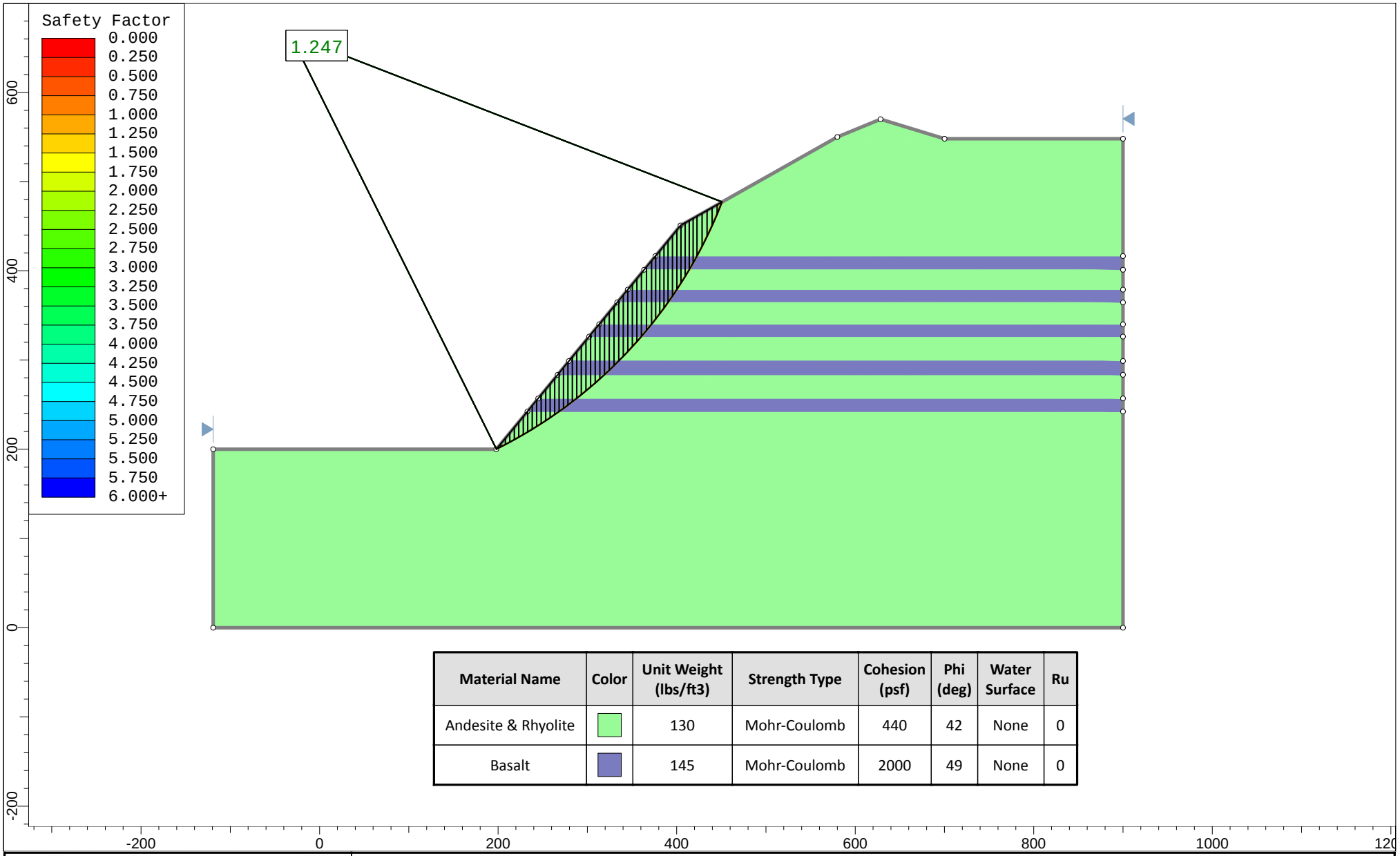
X	Y
298.222	378.882
900	378.882

Material Boundary

X	Y
316.475	401.213
900	401.213

Material Boundary

X	Y
343.655	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion				
Analysis Description	250' Slope, dry, static, 50 degree gross slope inclination				
Drawn By	J.Bianchin	Scale	1:1782	Company	Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM			File Name	250',dry,static,50deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:03.640s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search

Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.247020
Center:	-32.840, 664.766
Radius:	518.888
Left Slip Surface Endpoint:	198.075, 200.091
Right Slip Surface Endpoint:	450.934, 477.129
Resisting Moment:	7.46699e+08 lb-ft
Driving Moment:	5.98788e+08 lb-ft
Resisting Horizontal Force:	990284 lb
Driving Horizontal Force:	794122 lb
Total Slice Area:	11952.6 ft2
Surface Horizontal Width:	252.859 ft
Surface Average Height:	47.2699 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	10048
Number of Invalid Surfaces:	0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.24702

Slice	Width	Weight	Angle	Base	Base	Base	Shear	Shear	Base	Pore	Effective	Base	Effective

Number	[ft]	[lbs]	of Slice Base [degrees]	Material	Cohesion [psf]	Friction Angle [degrees]	Stress [psf]	Strength [psf]	Normal Stress [psf]	Pressure [psf]	Normal Stress [psf]	Vertical Stress [psf]	Vertical Stress [psf]
1	5.01649	1164.19	26.7346	Andesite & Rhyolite	440	42	590.871	736.828	329.66	0	329.66	627.284	627.284
2	5.01649	3470.18	27.3566	Andesite & Rhyolite	440	42	864.239	1077.72	708.264	0	708.264	1155.41	1155.41
3	5.01649	5731.02	27.982	Andesite & Rhyolite	440	42	1121.67	1398.75	1064.8	0	1064.8	1660.75	1660.75
4	5.01649	7945.93	28.6111	Andesite & Rhyolite	440	42	1363.71	1700.57	1400	0	1400	2143.86	2143.86
5	5.01649	10114.1	29.244	Andesite & Rhyolite	440	42	1590.83	1983.8	1714.56	0	1714.56	2605.25	2605.25
6	5.01649	12234.6	29.8809	Andesite & Rhyolite	440	42	1803.53	2249.04	2009.14	0	2009.14	3045.41	3045.41
7	5.01649	14308.6	30.5218	Andesite & Rhyolite	440	42	2002.47	2497.12	2284.67	0	2284.67	3465.25	3465.25
8	5.01649	16601	31.167	Andesite & Rhyolite	440	42	2216.93	2764.55	2581.68	0	2581.68	3922.55	3922.55
9	5.01649	19031.8	31.8166	Andesite & Rhyolite	440	42	2437.23	3039.28	2886.8	0	2886.8	4398.93	4398.93
10	5.01649	21309	32.4709	Andesite & Rhyolite	440	42	2632.28	3282.5	3156.92	0	3156.92	4831.99	4831.99
11	5.01649	23202.2	33.1299	Andesite & Rhyolite	440	42	2779.59	3466.21	3360.94	0	3360.94	5175	5175
12	5.01649	25016.1	33.7939	Andesite & Rhyolite	440	42	2912.25	3631.63	3544.66	0	3544.66	5493.79	5493.79
13	5.01649	26774.9	34.4631	Andesite & Rhyolite	440	42	3033.21	3782.47	3712.19	0	3712.19	5793.98	5793.98
14	5.01649	28501.1	35.1377	Andesite & Rhyolite	440	42	3145.09	3921.99	3867.14	0	3867.14	6080.64	6080.64
15	4.93515	29856.3	35.8124	Basalt	2000	49	5589.57	6970.3	4320.63	0	4320.63	8353.78	8353.78
16	4.93515	31568.5	36.4873	Basalt	2000	49	5695.75	7102.72	4435.73	0	4435.73	8648.41	8648.41
17	4.93515	33088.3	37.1681	Basalt	2000	49	5771.09	7196.66	4517.39	0	4517.39	8892.82	8892.82
18	4.93515	34238.4	37.8551	Basalt	2000	49	5796.35	7228.16	4544.78	0	4544.78	9049.82	9049.82
19	5.17792	37230.2	38.5658	Andesite & Rhyolite	440	42	3531.05	4403.29	4401.69	0	4401.69	7217.04	7217.04
20	5.17792	38650.5	39.3009	Andesite & Rhyolite	440	42	3579.63	4463.87	4468.96	0	4468.96	7398.94	7398.94
21	5.17792	40021.1	40.0437	Andesite & Rhyolite	440	42	3619.95	4514.15	4524.8	0	4524.8	7567.01	7567.01
22	5.17792	41665.4	40.7948	Andesite & Rhyolite	440	42	3678.01	4586.55	4605.21	0	4605.21	7779.39	7779.39
23	5.17792	43337	41.5544	Andesite & Rhyolite	440	42	3733.23	4655.41	4681.69	0	4681.69	7990.89	7990.89
24	5.17792	44623.3	42.3231	Andesite & Rhyolite	440	42	3754.04	4681.36	4710.51	0	4710.51	8129.19	8129.19
25	5.32993	46796.1	43.1128	Basalt	2000	49	5919	7381.11	4677.73	0	4677.73	10219.1	10219.1
26	5.32993	47372.8	43.9245	Basalt	2000	49	5838.4	7280.6	4590.36	0	4590.36	10213.6	10213.6
27	5.32993	47864	44.7474	Basalt	2000	49	5749.16	7169.32	4493.62	0	4493.62	10192.3	10192.3
28	5.07091	46427.1	45.5616	Andesite & Rhyolite	440	42	3628.64	4524.99	4536.84	0	4536.84	8237.32	8237.32
29	5.07091	47501.2	46.3672	Andesite & Rhyolite	440	42	3622.68	4517.56	4528.59	0	4528.59	8328.42	8328.42
30	5.07091	48235.1	47.1849	Andesite & Rhyolite	440	42	3590.34	4477.22	4483.79	0	4483.79	8358.95	8358.95
31	5.07091	48636.8	48.0153	Andesite & Rhyolite	440	42	3533.7	4406.6	4405.36	0	4405.36	8332.05	8332.05
32	5.07091	48929.2	48.8594	Andesite & Rhyolite	440	42	3468.64	4325.46	4315.25	0	4315.25	8285.74	8285.74
33	5.71298	55101.4	49.7734	Basalt	2000	49	5263.94	6564.24	3967.63	0	3967.63	10190.8	10190.8
34	5.71298	55071.6	50.7604	Basalt	2000	49	5118	6382.25	3809.44	0	3809.44	10075.9	10075.9
35	4.61856	44629.5	51.6702	Andesite & Rhyolite	440	42	3200.1	3990.59	3943.34	0	3943.34	7991.04	7991.04
36	4.61856	44607	52.5002	Andesite &	440	42	3120.05	3890.77	3832.46	0	3832.46	7898.63	7898.63

				Rhyolite									
37	4.61856	44307.2	53.3462	Andesite & Rhyolite	440	42	3022.4	3768.99	3697.22	0	3697.22	7758.92	7758.92
38	4.61856	43891.2	54.2094	Andesite & Rhyolite	440	42	2918.01	3638.82	3552.65	0	3552.65	7599.98	7599.98
39	4.91603	45860.7	55.12	Basalt	2000	49	4418.33	5509.74	3050.97	0	3050.97	9389.22	9389.22
40	4.91603	44560.1	56.0811	Basalt	2000	49	4213.23	5253.98	2828.64	0	2828.64	9094.11	9094.11
41	4.64749	41000.5	57.0391	Andesite & Rhyolite	440	42	2494.13	3110.23	2965.59	0	2965.59	6811.96	6811.96
42	4.64749	38919.7	57.9948	Andesite & Rhyolite	440	42	2307.83	2877.91	2707.57	0	2707.57	6400.13	6400.13
43	4.64749	35924.3	58.9768	Andesite & Rhyolite	440	42	2082.36	2596.74	2395.3	0	2395.3	5857.76	5857.76
44	4.35017	30505.5	59.9544	Basalt	2000	49	3194.74	3983.91	1724.59	0	1724.59	7247.9	7247.9
45	4.35017	27054.6	60.9284	Basalt	2000	49	2897.2	3612.87	1402.05	0	1402.05	6613.37	6613.37
46	5.62013	29945.6	62.0855	Andesite & Rhyolite	440	42	1372.76	1711.86	1412.54	0	1412.54	4003.65	4003.65
47	5.62013	24281.3	63.4423	Andesite & Rhyolite	440	42	1113.71	1388.81	1053.76	0	1053.76	3281.89	3281.89
48	5.62013	18115.9	64.8669	Andesite & Rhyolite	440	42	862.066	1075.01	705.254	0	705.254	2542.81	2542.81
49	5.62013	11364.9	66.3717	Andesite & Rhyolite	440	42	621.11	774.536	371.54	0	371.54	1791.29	1791.29
50	5.62013	3915.56	67.9733	Andesite & Rhyolite	440	42	365.279	455.51	17.2257	0	17.2257	920.11	920.11

Query 1 (spencer) - Safety Factor: 1.24702

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	5.01649	1164.19	26.7346	Andesite & Rhyolite	440	42	590.871	736.828	329.66	0	329.66	627.284	627.284
2	5.01649	3470.18	27.3566	Andesite & Rhyolite	440	42	864.239	1077.72	708.264	0	708.264	1155.41	1155.41
3	5.01649	5731.02	27.982	Andesite & Rhyolite	440	42	1121.67	1398.75	1064.8	0	1064.8	1660.75	1660.75
4	5.01649	7945.93	28.6111	Andesite & Rhyolite	440	42	1363.71	1700.57	1400	0	1400	2143.86	2143.86
5	5.01649	10114.1	29.244	Andesite & Rhyolite	440	42	1590.83	1983.8	1714.56	0	1714.56	2605.25	2605.25
6	5.01649	12234.6	29.8809	Andesite & Rhyolite	440	42	1803.53	2249.04	2009.14	0	2009.14	3045.41	3045.41
7	5.01649	14308.6	30.5218	Andesite & Rhyolite	440	42	2002.47	2497.12	2284.67	0	2284.67	3465.25	3465.25
8	5.01649	16601	31.167	Andesite & Rhyolite	440	42	2216.93	2764.55	2581.68	0	2581.68	3922.55	3922.55
9	5.01649	19031.8	31.8166	Andesite & Rhyolite	440	42	2437.23	3039.28	2886.8	0	2886.8	4398.93	4398.93
10	5.01649	21309	32.4709	Andesite & Rhyolite	440	42	2632.28	3282.5	3156.92	0	3156.92	4831.99	4831.99
11	5.01649	23202.2	33.1299	Andesite & Rhyolite	440	42	2779.59	3466.21	3360.94	0	3360.94	5175	5175
12	5.01649	25016.1	33.7939	Andesite & Rhyolite	440	42	2912.25	3631.63	3544.66	0	3544.66	5493.79	5493.79
13	5.01649	26774.9	34.4631	Andesite & Rhyolite	440	42	3033.21	3782.47	3712.19	0	3712.19	5793.98	5793.98
14	5.01649	28501.1	35.1377	Andesite & Rhyolite	440	42	3145.09	3921.99	3867.14	0	3867.14	6080.64	6080.64
15	4.93515	29856.3	35.8124	Basalt	2000	49	5589.57	6970.3	4320.63	0	4320.63	8353.78	8353.78
16	4.93515	31568.5	36.4873	Basalt	2000	49	5695.75	7102.72	4435.73	0	4435.73	8648.41	8648.41
17	4.93515	33088.3	37.1681	Basalt	2000	49	5771.09	7196.66	4517.39	0	4517.39	8892.82	8892.82
18	4.93515	34238.4	37.8551	Basalt	2000	49	5796.35	7228.16	4544.78	0	4544.78	9049.82	9049.82
19	5.17792	37230.2	38.5658	Andesite & Rhyolite	440	42	3531.05	4403.29	4401.69	0	4401.69	7217.04	7217.04

20	5.17792	38650.5	39.3009	Andesite & Rhyolite	440	42	3579.63	4463.87	4468.96	0	4468.96	7398.94	7398.94
21	5.17792	40021.1	40.0437	Andesite & Rhyolite	440	42	3619.95	4514.15	4524.8	0	4524.8	7567.01	7567.01
22	5.17792	41665.4	40.7948	Andesite & Rhyolite	440	42	3678.01	4586.55	4605.21	0	4605.21	7779.39	7779.39
23	5.17792	43337	41.5544	Andesite & Rhyolite	440	42	3733.23	4655.41	4681.69	0	4681.69	7990.89	7990.89
24	5.17792	44623.3	42.3231	Andesite & Rhyolite	440	42	3754.04	4681.36	4710.51	0	4710.51	8129.19	8129.19
25	5.32993	46796.1	43.1128	Basalt	2000	49	5919	7381.11	4677.73	0	4677.73	10219.1	10219.1
26	5.32993	47372.8	43.9245	Basalt	2000	49	5838.4	7280.6	4590.36	0	4590.36	10213.6	10213.6
27	5.32993	47864	44.7474	Basalt	2000	49	5749.16	7169.32	4493.62	0	4493.62	10192.3	10192.3
28	5.07091	46427.1	45.5616	Andesite & Rhyolite	440	42	3628.64	4524.99	4536.84	0	4536.84	8237.32	8237.32
29	5.07091	47501.2	46.3672	Andesite & Rhyolite	440	42	3622.68	4517.56	4528.59	0	4528.59	8328.42	8328.42
30	5.07091	48235.1	47.1849	Andesite & Rhyolite	440	42	3590.34	4477.22	4483.79	0	4483.79	8358.95	8358.95
31	5.07091	48636.8	48.0153	Andesite & Rhyolite	440	42	3533.7	4406.6	4405.36	0	4405.36	8332.05	8332.05
32	5.07091	48929.2	48.8594	Andesite & Rhyolite	440	42	3468.64	4325.46	4315.25	0	4315.25	8285.74	8285.74
33	5.71298	55101.4	49.7734	Basalt	2000	49	5263.94	6564.24	3967.63	0	3967.63	10190.8	10190.8
34	5.71298	55071.6	50.7604	Basalt	2000	49	5118	6382.25	3809.44	0	3809.44	10075.9	10075.9
35	4.61856	44629.5	51.6702	Andesite & Rhyolite	440	42	3200.1	3990.59	3943.34	0	3943.34	7991.04	7991.04
36	4.61856	44607	52.5002	Andesite & Rhyolite	440	42	3120.05	3890.77	3832.46	0	3832.46	7898.63	7898.63
37	4.61856	44307.2	53.3462	Andesite & Rhyolite	440	42	3022.4	3768.99	3697.22	0	3697.22	7758.92	7758.92
38	4.61856	43891.2	54.2094	Andesite & Rhyolite	440	42	2918.01	3638.82	3552.65	0	3552.65	7599.98	7599.98
39	4.91603	45860.7	55.12	Basalt	2000	49	4418.33	5509.74	3050.97	0	3050.97	9389.22	9389.22
40	4.91603	44560.1	56.0811	Basalt	2000	49	4213.23	5253.98	2828.64	0	2828.64	9094.11	9094.11
41	4.64749	41000.5	57.0391	Andesite & Rhyolite	440	42	2494.13	3110.23	2965.59	0	2965.59	6811.96	6811.96
42	4.64749	38919.7	57.9948	Andesite & Rhyolite	440	42	2307.83	2877.91	2707.57	0	2707.57	6400.13	6400.13
43	4.64749	35924.3	58.9768	Andesite & Rhyolite	440	42	2082.36	2596.74	2395.3	0	2395.3	5857.76	5857.76
44	4.35017	30505.5	59.9544	Basalt	2000	49	3194.74	3983.91	1724.59	0	1724.59	7247.9	7247.9
45	4.35017	27054.6	60.9284	Basalt	2000	49	2897.2	3612.87	1402.05	0	1402.05	6613.37	6613.37
46	5.62013	29945.6	62.0855	Andesite & Rhyolite	440	42	1372.76	1711.86	1412.54	0	1412.54	4003.65	4003.65
47	5.62013	24281.3	63.4423	Andesite & Rhyolite	440	42	1113.71	1388.81	1053.76	0	1053.76	3281.89	3281.89
48	5.62013	18115.9	64.8669	Andesite & Rhyolite	440	42	862.066	1075.01	705.254	0	705.254	2542.81	2542.81
49	5.62013	11364.9	66.3717	Andesite & Rhyolite	440	42	621.11	774.536	371.54	0	371.54	1791.29	1791.29
50	5.62013	3915.56	67.9733	Andesite & Rhyolite	440	42	365.279	455.51	17.2257	0	17.2257	920.11	920.11

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.24702

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	198.075	200.091	0	0	0
2	203.091	202.618	2139.62	1990.74	42.9357
3	208.108	205.213	4649.26	4325.74	42.9356

4	213.124	207.878	7454.29	6935.59	42.9356
5	218.141	210.615	10484.1	9754.55	42.9355
6	223.157	213.424	13671.8	12720.4	42.9355
7	228.174	216.306	16954.1	15774.3	42.9355
8	233.19	219.263	20271.4	18860.8	42.9356
9	238.207	222.298	23591.4	21949.8	42.9356
10	243.223	225.41	26868.1	24998.5	42.9356
11	248.24	228.602	30033.1	27943.3	42.9356
12	253.256	231.876	33013.5	30716.2	42.9355
13	258.273	235.234	35763.6	33275	42.9356
14	263.289	238.677	38242.4	35581.3	42.9356
15	268.306	242.207	40411.9	37599.8	42.9355
16	273.241	245.768	52691	49024.5	42.9356
17	278.176	249.418	64690.3	60188.8	42.9356
18	283.111	253.16	76350.9	71038	42.9356
19	288.046	256.996	87606.6	81510.5	42.9356
20	293.224	261.124	87770.6	81663.1	42.9356
21	298.402	265.362	87418.6	81335.5	42.9355
22	303.58	269.714	86526.5	80505.5	42.9356
23	308.758	274.182	85046.7	79128.7	42.9356
24	313.936	278.772	82944.5	77172.8	42.9356
25	319.114	283.488	80226.8	74644.2	42.9356
26	324.444	288.478	88523.9	82364	42.9356
27	329.774	293.611	96167.1	89475.3	42.9356
28	335.104	298.894	103157	95979.2	42.9357
29	340.175	304.065	98149.4	91319.7	42.9356
30	345.245	309.384	92485.5	86049.9	42.9356
31	350.316	314.858	86203.5	80205	42.9356
32	355.387	320.492	79350.6	73829	42.9356
33	360.458	326.297	71942.1	66936	42.9356
34	366.171	333.051	75303.9	70063.8	42.9355
35	371.884	340.046	77980.2	72554	42.9356
36	376.503	345.888	69766.2	64911.5	42.9356
37	381.121	351.907	61149.9	56894.8	42.9356
38	385.74	358.114	52201.5	48569.1	42.9356
39	390.358	364.52	42959	39969.7	42.9356
40	395.274	371.572	43226	40218.1	42.9356
41	400.19	378.882	43318.8	40304.4	42.9355
42	404.838	386.05	33688.5	31344.3	42.9356
43	409.485	393.486	24311.3	22619.6	42.9356
44	414.133	401.213	15506.8	14427.8	42.9357
45	418.483	408.734	16474	15327.7	42.9357
46	422.833	416.559	18142.8	16880.3	42.9355
47	428.453	427.167	10895.7	10137.5	42.9355
48	434.074	438.411	5324.5	4954	42.9356
49	439.694	450.391	1734.64	1613.93	42.9355
50	445.314	463.237	462.34	430.168	42.9356
51	450.934	477.129	0	0	0

Query 1 (spencer) - Safety Factor: 1.24702

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	198.075	200.091	0	0	0
2	203.091	202.618	2139.62	1990.74	42.9357
3	208.108	205.213	4649.26	4325.74	42.9356
4	213.124	207.878	7454.29	6935.59	42.9356
5	218.141	210.615	10484.1	9754.55	42.9355
6	223.157	213.424	13671.8	12720.4	42.9355
7	228.174	216.306	16954.1	15774.3	42.9355
8	233.19	219.263	20271.4	18860.8	42.9356
9	238.207	222.298	23591.4	21949.8	42.9356

10	243.223	225.41	26868.1	24998.5	42.9356
11	248.24	228.602	30033.1	27943.3	42.9356
12	253.256	231.876	33013.5	30716.2	42.9355
13	258.273	235.234	35763.6	33275	42.9356
14	263.289	238.677	38242.4	35581.3	42.9356
15	268.306	242.207	40411.9	37599.8	42.9355
16	273.241	245.768	52691	49024.5	42.9356
17	278.176	249.418	64690.3	60188.8	42.9356
18	283.111	253.16	76350.9	71038	42.9356
19	288.046	256.996	87606.6	81510.5	42.9356
20	293.224	261.124	87770.6	81663.1	42.9356
21	298.402	265.362	87418.6	81335.5	42.9355
22	303.58	269.714	86526.5	80505.5	42.9356
23	308.758	274.182	85046.7	79128.7	42.9356
24	313.936	278.772	82944.5	77172.8	42.9356
25	319.114	283.488	80226.8	74644.2	42.9356
26	324.444	288.478	88523.9	82364	42.9356
27	329.774	293.611	96167.1	89475.3	42.9356
28	335.104	298.894	103157	95979.2	42.9357
29	340.175	304.065	98149.4	91319.7	42.9356
30	345.245	309.384	92485.5	86049.9	42.9356
31	350.316	314.858	86203.5	80205	42.9356
32	355.387	320.492	79350.6	73829	42.9356
33	360.458	326.297	71942.1	66936	42.9356
34	366.171	333.051	75303.9	70063.8	42.9355
35	371.884	340.046	77980.2	72554	42.9356
36	376.503	345.888	69766.2	64911.5	42.9356
37	381.121	351.907	61149.9	56894.8	42.9356
38	385.74	358.114	52201.5	48569.1	42.9356
39	390.358	364.52	42959	39969.7	42.9356
40	395.274	371.572	43226	40218.1	42.9356
41	400.19	378.882	43318.8	40304.4	42.9355
42	404.838	386.05	33688.5	31344.3	42.9356
43	409.485	393.486	24311.3	22619.6	42.9356
44	414.133	401.213	15506.8	14427.8	42.9357
45	418.483	408.734	16474	15327.7	42.9357
46	422.833	416.559	18142.8	16880.3	42.9355
47	428.453	427.167	10895.7	10137.5	42.9355
48	434.074	438.411	5324.5	4954	42.9356
49	439.694	450.391	1734.64	1613.93	42.9355
50	445.314	463.237	462.34	430.168	42.9356
51	450.934	477.129	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046
900	364.52
900	378.882
900	401.213
900	416.559

900	548
700	548
628.434	569.928
580	550
404.388	450.849
376.176	416.559
363.55	401.213
345.177	378.882
333.36	364.52
313.224	340.046
301.912	326.297
279.366	298.894
266.69	283.488
244.894	256.996
232.726	242.207
198	200
-119.082	200

Material Boundary

X	Y
232.726	242.207
900	242.207

Material Boundary

X	Y
244.894	256.996
900	256.996

Material Boundary

X	Y
266.69	283.488
900	283.488

Material Boundary

X	Y
279.366	298.894
900	298.894

Material Boundary

X	Y
301.912	326.297
900	326.297

Material Boundary

X	Y
313.224	340.046
900	340.046

Material Boundary

X	Y
333.36	364.52
900	364.52

Material Boundary

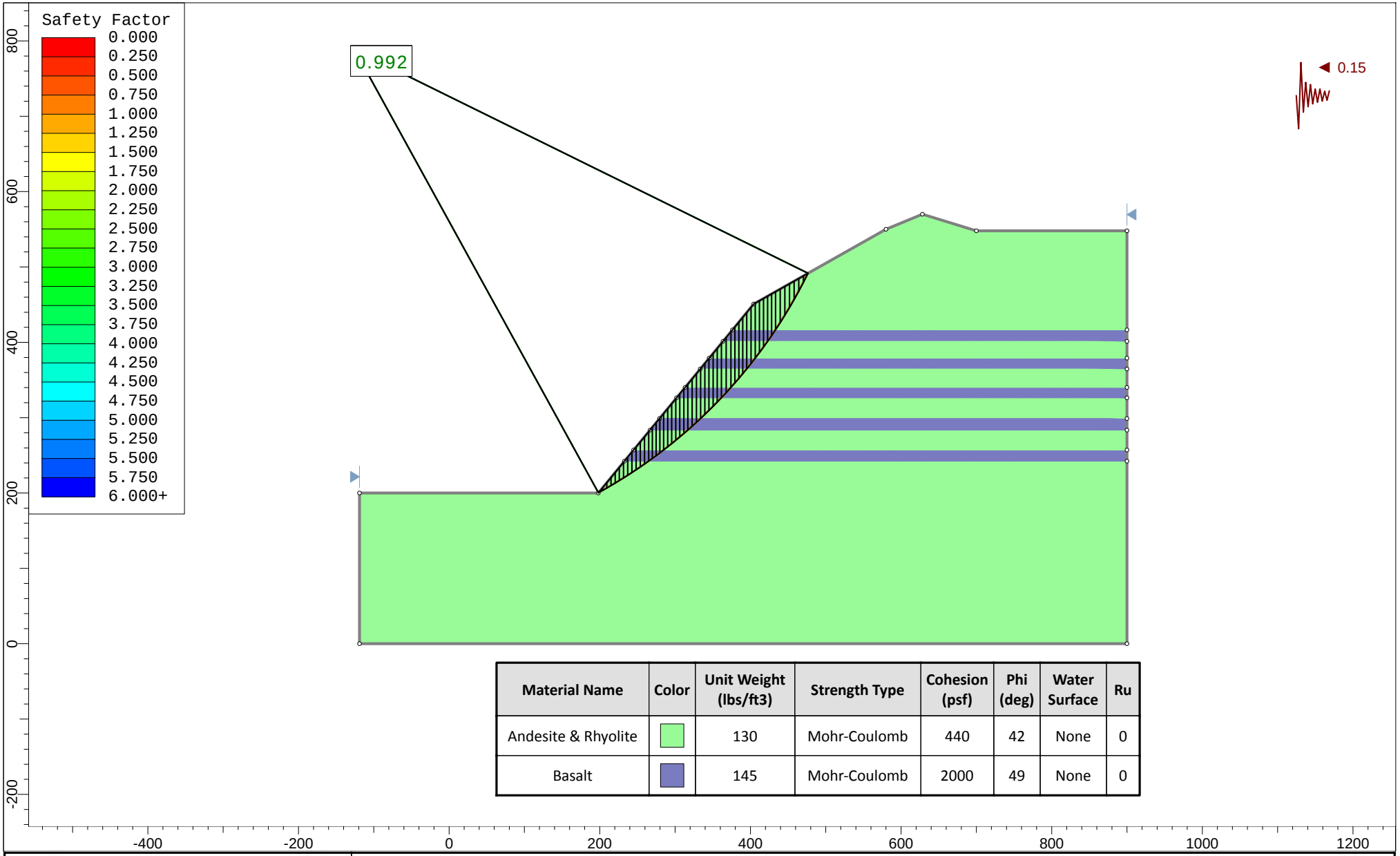
X	Y
345.177	378.882
900	378.882

Material Boundary

X	Y
363.55	401.213
900	401.213

Material Boundary

X	Y
376.176	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion			
Analysis Description	250' Slope, dry, pseudostatic, 50 degree gross slope inclination			
Drawn By	J.Bianchin	Scale	1:2113	Company: Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM			File Name: 250',dry,PS,50deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:04.779s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search

Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	0.992364
Center:	-125.329, 787.995
Radius:	670.922
Left Slip Surface Endpoint:	198.183, 200.223
Right Slip Surface Endpoint:	476.577, 491.607
Resisting Moment:	9.53963e+08 lb-ft
Driving Moment:	9.61304e+08 lb-ft
Resisting Horizontal Force:	1.00795e+06 lb
Driving Horizontal Force:	1.01571e+06 lb
Total Slice Area:	13200.6 ft2
Surface Horizontal Width:	278.394 ft
Surface Average Height:	47.417 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	10392
Number of Invalid Surfaces:	0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 0.992364

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	5.55693	1322.38	29.1001	Andesite & Rhyolite	440	42	940.106	932.927	547.45	0	547.45	1070.71	1070.71
2	5.55693	3942.02	29.6446	Andesite & Rhyolite	440	42	1253.95	1244.38	893.353	0	893.353	1606.99	1606.99
3	5.55693	6511	30.1922	Andesite & Rhyolite	440	42	1544.44	1532.65	1213.51	0	1213.51	2112.12	2112.12
4	5.55693	9028.49	30.7428	Andesite & Rhyolite	440	42	1812.6	1798.76	1509.05	0	1509.05	2587.13	2587.13
5	5.55693	11493.6	31.2965	Andesite & Rhyolite	440	42	2059.39	2043.66	1781.04	0	1781.04	3033	3033
6	5.55693	13905.4	31.8536	Andesite & Rhyolite	440	42	2285.75	2268.3	2030.53	0	2030.53	3450.72	3450.72
7	5.55693	16435.9	32.414	Andesite & Rhyolite	440	42	2511.54	2492.36	2279.38	0	2279.38	3874.11	3874.11
8	5.55693	19288	32.9779	Andesite & Rhyolite	440	42	2757.79	2736.73	2550.78	0	2550.78	4340.19	4340.19
9	5.55693	21997.5	33.5454	Andesite & Rhyolite	440	42	2974.18	2951.47	2789.28	0	2789.28	4761.24	4761.24
10	5.55693	24232.4	34.1167	Andesite & Rhyolite	440	42	3129.01	3105.12	2959.91	0	2959.91	5079.74	5079.74
11	5.55693	26362.3	34.6919	Andesite & Rhyolite	440	42	3262.95	3238.03	3107.52	0	3107.52	5366.21	5366.21
12	5.55693	28432.3	35.2711	Andesite & Rhyolite	440	42	3381.54	3355.72	3238.24	0	3238.24	5629.95	5629.95
13	4.97447	27115.6	35.8237	Basalt	2000	49	7375.86	7319.54	4624.2	0	4624.2	9948.48	9948.48
14	4.97447	28831	36.3494	Basalt	2000	49	7474.93	7417.85	4709.67	0	4709.67	10210.5	10210.5
15	4.97447	30524.2	36.8787	Basalt	2000	49	7559.98	7502.25	4783.03	0	4783.03	10454.8	10454.8
16	4.97447	31904.7	37.4116	Basalt	2000	49	7591.06	7533.09	4809.84	0	4809.84	10616.1	10616.1
17	5.364	35844.9	37.9696	Andesite & Rhyolite	440	42	3752.28	3723.63	3646.84	0	3646.84	6575.24	6575.24
18	5.364	37441.1	38.553	Andesite & Rhyolite	440	42	3796.77	3767.78	3695.88	0	3695.88	6721.7	6721.7
19	5.364	38974.7	39.1412	Andesite & Rhyolite	440	42	3831.03	3801.78	3733.64	0	3733.64	6851.61	6851.61
20	5.364	40613.4	39.7343	Andesite & Rhyolite	440	42	3869.2	3839.65	3775.7	0	3775.7	6991.88	6991.88
21	5.364	42531.6	40.3326	Andesite & Rhyolite	440	42	3924.44	3894.47	3836.57	0	3836.57	7168.58	7168.58
22	5.364	44265.9	40.9363	Andesite & Rhyolite	440	42	3959.98	3929.74	3875.75	0	3875.75	7310.38	7310.38
23	5.66	47893	41.5624	Basalt	2000	49	7578.69	7520.82	4799.17	0	4799.17	11519	11519
24	5.66	48788.6	42.2117	Basalt	2000	49	7465.92	7408.91	4701.9	0	4701.9	11474.4	11474.4
25	5.66	49590.6	42.8678	Basalt	2000	49	7343.23	7287.16	4596.06	0	4596.06	11412.1	11412.1
26	5.50805	49479.1	43.5219	Andesite & Rhyolite	440	42	3834.44	3805.16	3737.39	0	3737.39	7378.93	7378.93
27	5.50805	51037.1	44.1742	Andesite & Rhyolite	440	42	3837.52	3808.22	3740.78	0	3740.78	7469.25	7469.25
28	5.50805	52253.6	44.8337	Andesite & Rhyolite	440	42	3816.38	3787.24	3717.48	0	3717.48	7511.78	7511.78
29	5.50805	53080.4	45.5009	Andesite & Rhyolite	440	42	3770.03	3741.24	3666.39	0	3666.39	7502.93	7502.93
30	5.50805	53812.6	46.1761	Andesite & Rhyolite	440	42	3718.06	3689.67	3609.13	0	3609.13	7483.06	7483.06
31	6.34038	62563.5	46.9121	Basalt	2000	49	6721.31	6669.99	4059.56	0	4059.56	11245.2	11245.2
32	6.34038	63288.7	47.7108	Basalt	2000	49	6558.56	6508.48	3919.16	0	3919.16	11129.6	11129.6
33	5.22788	52773.2	48.4497	Andesite & Rhyolite	440	42	3518.02	3491.16	3388.66	0	3388.66	7358.03	7358.03
34	5.22788	53071.8	49.1274	Andesite & Rhyolite	440	42	3451.64	3425.28	3315.49	0	3315.49	7304.01	7304.01
35	5.22788	53234.1	49.8144	Andesite &	440	42	3379.52	3353.71	3236.01	0	3236.01	7237.17	7237.17

				Rhyolite									
36	5.22788	53293.3	50.5114	Andesite & Rhyolite	440	42	3303.99	3278.76	3152.77	0	3152.77	7162.45	7162.45
37	5.68283	57568.7	51.2501	Basalt	2000	49	5766.79	5722.75	3236.14	0	3236.14	10421.4	10421.4
38	5.68283	56578.1	52.0322	Basalt	2000	49	5539.14	5496.84	3039.75	0	3039.75	10137.8	10137.8
39	5.48567	51931.6	52.8142	Andesite & Rhyolite	440	42	2881.67	2859.67	2687.32	0	2687.32	6485.74	6485.74
40	5.48567	48909.3	53.5964	Andesite & Rhyolite	440	42	2676.09	2655.66	2460.74	0	2460.74	6090.03	6090.03
41	5.48567	45733.8	54.3934	Andesite & Rhyolite	440	42	2472.58	2453.7	2236.44	0	2236.44	5689.27	5689.27
42	5.25568	40391.1	55.1889	Basalt	2000	49	4264.35	4231.79	1940.06	0	1940.06	8073.12	8073.12
43	5.25568	36571.2	55.9831	Basalt	2000	49	3941.73	3911.63	1661.75	0	1661.75	7501.9	7501.9
44	6.16894	38240.2	56.8662	Andesite & Rhyolite	440	42	1821.03	1807.12	1518.34	0	1518.34	4308.18	4308.18
45	6.16894	33309.1	57.843	Andesite & Rhyolite	440	42	1597.11	1584.91	1271.55	0	1271.55	3811.94	3811.94
46	6.16894	28075.7	58.8471	Andesite & Rhyolite	440	42	1372	1361.52	1023.45	0	1023.45	3293.1	3293.1
47	6.16894	22512.9	59.8812	Andesite & Rhyolite	440	42	1144.44	1135.7	772.651	0	772.651	2745.42	2745.42
48	6.16894	16589	60.9486	Andesite & Rhyolite	440	42	912.947	905.976	517.519	0	517.519	2161.04	2161.04
49	6.16894	10266.5	62.0532	Andesite & Rhyolite	440	42	675.775	670.615	256.124	0	256.124	1529.92	1529.92
50	6.16894	3500.22	63.1994	Andesite & Rhyolite	440	42	422.891	419.662	-22.5879	0	-22.5879	814.574	814.574

Query 1 (spencer) - Safety Factor: 0.992364

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	5.55693	1322.38	29.1001	Andesite & Rhyolite	440	42	940.106	932.927	547.45	0	547.45	1070.71	1070.71
2	5.55693	3942.02	29.6446	Andesite & Rhyolite	440	42	1253.95	1244.38	893.353	0	893.353	1606.99	1606.99
3	5.55693	6511	30.1922	Andesite & Rhyolite	440	42	1544.44	1532.65	1213.51	0	1213.51	2112.12	2112.12
4	5.55693	9028.49	30.7428	Andesite & Rhyolite	440	42	1812.6	1798.76	1509.05	0	1509.05	2587.13	2587.13
5	5.55693	11493.6	31.2965	Andesite & Rhyolite	440	42	2059.39	2043.66	1781.04	0	1781.04	3033	3033
6	5.55693	13905.4	31.8536	Andesite & Rhyolite	440	42	2285.75	2268.3	2030.53	0	2030.53	3450.72	3450.72
7	5.55693	16435.9	32.414	Andesite & Rhyolite	440	42	2511.54	2492.36	2279.38	0	2279.38	3874.11	3874.11
8	5.55693	19288	32.9779	Andesite & Rhyolite	440	42	2757.79	2736.73	2550.78	0	2550.78	4340.19	4340.19
9	5.55693	21997.5	33.5454	Andesite & Rhyolite	440	42	2974.18	2951.47	2789.28	0	2789.28	4761.24	4761.24
10	5.55693	24232.4	34.1167	Andesite & Rhyolite	440	42	3129.01	3105.12	2959.91	0	2959.91	5079.74	5079.74
11	5.55693	26362.3	34.6919	Andesite & Rhyolite	440	42	3262.95	3238.03	3107.52	0	3107.52	5366.21	5366.21
12	5.55693	28432.3	35.2711	Andesite & Rhyolite	440	42	3381.54	3355.72	3238.24	0	3238.24	5629.95	5629.95
13	4.97447	27115.6	35.8237	Basalt	2000	49	7375.86	7319.54	4624.2	0	4624.2	9948.48	9948.48
14	4.97447	28831	36.3494	Basalt	2000	49	7474.93	7417.85	4709.67	0	4709.67	10210.5	10210.5
15	4.97447	30524.2	36.8787	Basalt	2000	49	7559.98	7502.25	4783.03	0	4783.03	10454.8	10454.8
16	4.97447	31904.7	37.4116	Basalt	2000	49	7591.06	7533.09	4809.84	0	4809.84	10616.1	10616.1
17	5.364	35844.9	37.9696	Andesite & Rhyolite	440	42	3752.28	3723.63	3646.84	0	3646.84	6575.24	6575.24
18	5.364	37441.1	38.553	Andesite & Rhyolite	440	42	3796.77	3767.78	3695.88	0	3695.88	6721.7	6721.7

19	5.364	38974.7	39.1412	Andesite & Rhyolite	440	42	3831.03	3801.78	3733.64	0	3733.64	6851.61	6851.61
20	5.364	40613.4	39.7343	Andesite & Rhyolite	440	42	3869.2	3839.65	3775.7	0	3775.7	6991.88	6991.88
21	5.364	42531.6	40.3326	Andesite & Rhyolite	440	42	3924.44	3894.47	3836.57	0	3836.57	7168.58	7168.58
22	5.364	44265.9	40.9363	Andesite & Rhyolite	440	42	3959.98	3929.74	3875.75	0	3875.75	7310.38	7310.38
23	5.66	47893	41.5624	Basalt	2000	49	7578.69	7520.82	4799.17	0	4799.17	11519	11519
24	5.66	48788.6	42.2117	Basalt	2000	49	7465.92	7408.91	4701.9	0	4701.9	11474.4	11474.4
25	5.66	49590.6	42.8678	Basalt	2000	49	7343.23	7287.16	4596.06	0	4596.06	11412.1	11412.1
26	5.50805	49479.1	43.5219	Andesite & Rhyolite	440	42	3834.44	3805.16	3737.39	0	3737.39	7378.93	7378.93
27	5.50805	51037.1	44.1742	Andesite & Rhyolite	440	42	3837.52	3808.22	3740.78	0	3740.78	7469.25	7469.25
28	5.50805	52253.6	44.8337	Andesite & Rhyolite	440	42	3816.38	3787.24	3717.48	0	3717.48	7511.78	7511.78
29	5.50805	53080.4	45.5009	Andesite & Rhyolite	440	42	3770.03	3741.24	3666.39	0	3666.39	7502.93	7502.93
30	5.50805	53812.6	46.1761	Andesite & Rhyolite	440	42	3718.06	3689.67	3609.13	0	3609.13	7483.06	7483.06
31	6.34038	62563.5	46.9121	Basalt	2000	49	6721.31	6669.99	4059.56	0	4059.56	11245.2	11245.2
32	6.34038	63288.7	47.7108	Basalt	2000	49	6558.56	6508.48	3919.16	0	3919.16	11129.6	11129.6
33	5.22788	52773.2	48.4497	Andesite & Rhyolite	440	42	3518.02	3491.16	3388.66	0	3388.66	7358.03	7358.03
34	5.22788	53071.8	49.1274	Andesite & Rhyolite	440	42	3451.64	3425.28	3315.49	0	3315.49	7304.01	7304.01
35	5.22788	53234.1	49.8144	Andesite & Rhyolite	440	42	3379.52	3353.71	3236.01	0	3236.01	7237.17	7237.17
36	5.22788	53293.3	50.5114	Andesite & Rhyolite	440	42	3303.99	3278.76	3152.77	0	3152.77	7162.45	7162.45
37	5.68283	57568.7	51.2501	Basalt	2000	49	5766.79	5722.75	3236.14	0	3236.14	10421.4	10421.4
38	5.68283	56578.1	52.0322	Basalt	2000	49	5539.14	5496.84	3039.75	0	3039.75	10137.8	10137.8
39	5.48567	51931.6	52.8142	Andesite & Rhyolite	440	42	2881.67	2859.67	2687.32	0	2687.32	6485.74	6485.74
40	5.48567	48909.3	53.5964	Andesite & Rhyolite	440	42	2676.09	2655.66	2460.74	0	2460.74	6090.03	6090.03
41	5.48567	45733.8	54.3934	Andesite & Rhyolite	440	42	2472.58	2453.7	2236.44	0	2236.44	5689.27	5689.27
42	5.25568	40391.1	55.1889	Basalt	2000	49	4264.35	4231.79	1940.06	0	1940.06	8073.12	8073.12
43	5.25568	36571.2	55.9831	Basalt	2000	49	3941.73	3911.63	1661.75	0	1661.75	7501.9	7501.9
44	6.16894	38240.2	56.8662	Andesite & Rhyolite	440	42	1821.03	1807.12	1518.34	0	1518.34	4308.18	4308.18
45	6.16894	33309.1	57.843	Andesite & Rhyolite	440	42	1597.11	1584.91	1271.55	0	1271.55	3811.94	3811.94
46	6.16894	28075.7	58.8471	Andesite & Rhyolite	440	42	1372	1361.52	1023.45	0	1023.45	3293.1	3293.1
47	6.16894	22512.9	59.8812	Andesite & Rhyolite	440	42	1144.44	1135.7	772.651	0	772.651	2745.42	2745.42
48	6.16894	16589	60.9486	Andesite & Rhyolite	440	42	912.947	905.976	517.519	0	517.519	2161.04	2161.04
49	6.16894	10266.5	62.0532	Andesite & Rhyolite	440	42	675.775	670.615	256.124	0	256.124	1529.92	1529.92
50	6.16894	3500.22	63.1994	Andesite & Rhyolite	440	42	422.891	419.662	-22.5879	0	-22.5879	814.574	814.574

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 0.992364

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	198.183	200.223	0	0	0

2	203.74	203.315	3333.94	4993.49	56.2707
3	209.297	206.478	6887.45	10315.8	56.2705
4	214.854	209.711	10572	15834.5	56.2707
5	220.411	213.016	14305.4	21426.3	56.2707
6	225.968	216.394	18011.7	26977.4	56.2706
7	231.525	219.847	21620.4	32382.6	56.2708
8	237.082	223.376	25072.7	37553.3	56.2707
9	242.638	226.981	28311.3	42404	56.2707
10	248.195	230.666	31266.8	46830.6	56.2706
11	253.752	234.43	33881.2	50746.5	56.2707
12	259.309	238.277	36110.3	54085.1	56.2707
13	264.866	242.207	37914.3	56787.1	56.2707
14	269.841	245.798	53943.3	80794.9	56.2707
15	274.815	249.459	69571.9	104203	56.2707
16	279.79	253.191	84760	126951	56.2706
17	284.764	256.996	99445.3	148947	56.2707
18	290.128	261.182	98934.8	148182	56.2707
19	295.492	265.457	97890.9	146619	56.2707
20	300.856	269.822	96300.5	144236	56.2706
21	306.22	274.281	94133.8	140991	56.2706
22	311.584	278.835	91337.8	136803	56.2706
23	316.948	283.488	87913.6	131675	56.2707
24	322.608	288.506	99551.9	149106	56.2706
25	328.268	293.64	110361	165297	56.2708
26	333.928	298.894	120351	180259	56.2707
27	339.436	304.125	114505	171503	56.2707
28	344.944	309.477	107974	161720	56.2705
29	350.452	314.953	100805	150983	56.2706
30	355.96	320.558	93062.8	139387	56.2706
31	361.468	326.297	84763.2	126956	56.2706
32	367.809	333.075	90489	135532	56.2706
33	374.149	340.046	95271.9	142696	56.2707
34	379.377	345.945	85764.5	128456	56.2707
35	384.605	351.986	75824.3	113568	56.2707
36	389.833	358.175	65482.5	98078	56.2707
37	395.061	364.52	54763.4	82023.2	56.2706
38	400.743	371.6	55994.7	83867.4	56.2706
39	406.426	378.882	56858.7	85161.5	56.2707
40	411.912	386.113	45449.7	68073.4	56.2707
41	417.398	393.553	34490.5	51659.1	56.2707
42	422.883	401.213	24065.8	36045.1	56.2706
43	428.139	408.772	25760.8	38583.9	56.2707
44	433.395	416.559	28057.3	42023.6	56.2707
45	439.564	426.01	19208.5	28770	56.2707
46	445.732	435.822	11590.2	17359.6	56.2708
47	451.901	446.027	5400.58	8088.85	56.2707
48	458.07	456.661	869.215	1301.89	56.2707
49	464.239	467.767	-1733.01	-2595.66	56.2707
50	470.408	479.395	-2081.25	-3117.25	56.2707
51	476.577	491.607	0	0	0

Query 1 (spencer) - Safety Factor: 0.992364

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	198.183	200.223	0	0	0
2	203.74	203.315	3333.94	4993.49	56.2707
3	209.297	206.478	6887.45	10315.8	56.2705
4	214.854	209.711	10572	15834.5	56.2707
5	220.411	213.016	14305.4	21426.3	56.2707
6	225.968	216.394	18011.7	26977.4	56.2706
7	231.525	219.847	21620.4	32382.6	56.2708

8	237.082	223.376	25072.7	37553.3	56.2707
9	242.638	226.981	28311.3	42404	56.2707
10	248.195	230.666	31266.8	46830.6	56.2706
11	253.752	234.43	33881.2	50746.5	56.2707
12	259.309	238.277	36110.3	54085.1	56.2707
13	264.866	242.207	37914.3	56787.1	56.2707
14	269.841	245.798	53943.3	80794.9	56.2707
15	274.815	249.459	69571.9	104203	56.2707
16	279.79	253.191	84760	126951	56.2706
17	284.764	256.996	99445.3	148947	56.2707
18	290.128	261.182	98934.8	148182	56.2707
19	295.492	265.457	97890.9	146619	56.2707
20	300.856	269.822	96300.5	144236	56.2706
21	306.22	274.281	94133.8	140991	56.2706
22	311.584	278.835	91337.8	136803	56.2706
23	316.948	283.488	87913.6	131675	56.2707
24	322.608	288.506	99551.9	149106	56.2706
25	328.268	293.64	110361	165297	56.2708
26	333.928	298.894	120351	180259	56.2707
27	339.436	304.125	114505	171503	56.2707
28	344.944	309.477	107974	161720	56.2705
29	350.452	314.953	100805	150983	56.2706
30	355.96	320.558	93062.8	139387	56.2706
31	361.468	326.297	84763.2	126956	56.2706
32	367.809	333.075	90489	135532	56.2706
33	374.149	340.046	95271.9	142696	56.2707
34	379.377	345.945	85764.5	128456	56.2707
35	384.605	351.986	75824.3	113568	56.2707
36	389.833	358.175	65482.5	98078	56.2707
37	395.061	364.52	54763.4	82023.2	56.2706
38	400.743	371.6	55994.7	83867.4	56.2706
39	406.426	378.882	56858.7	85161.5	56.2707
40	411.912	386.113	45449.7	68073.4	56.2707
41	417.398	393.553	34490.5	51659.1	56.2707
42	422.883	401.213	24065.8	36045.1	56.2706
43	428.139	408.772	25760.8	38583.9	56.2707
44	433.395	416.559	28057.3	42023.6	56.2707
45	439.564	426.01	19208.5	28770	56.2707
46	445.732	435.822	11590.2	17359.6	56.2708
47	451.901	446.027	5400.58	8088.85	56.2707
48	458.07	456.661	869.215	1301.89	56.2707
49	464.239	467.767	-1733.01	-2595.66	56.2707
50	470.408	479.395	-2081.25	-3117.25	56.2707
51	476.577	491.607	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046
900	364.52
900	378.882

900	401.213
900	416.559
900	548
700	548
628.434	569.928
580	550
404.388	450.849
376.176	416.559
363.55	401.213
345.177	378.882
333.36	364.52
313.224	340.046
301.912	326.297
279.366	298.894
266.69	283.488
244.894	256.996
232.726	242.207
198	200
-119.082	200

Material Boundary

X	Y
232.726	242.207
900	242.207

Material Boundary

X	Y
244.894	256.996
900	256.996

Material Boundary

X	Y
266.69	283.488
900	283.488

Material Boundary

X	Y
279.366	298.894
900	298.894

Material Boundary

X	Y
301.912	326.297
900	326.297

Material Boundary

X	Y
313.224	340.046
900	340.046

Material Boundary

X	Y

333.36	364.52
900	364.52

Material Boundary

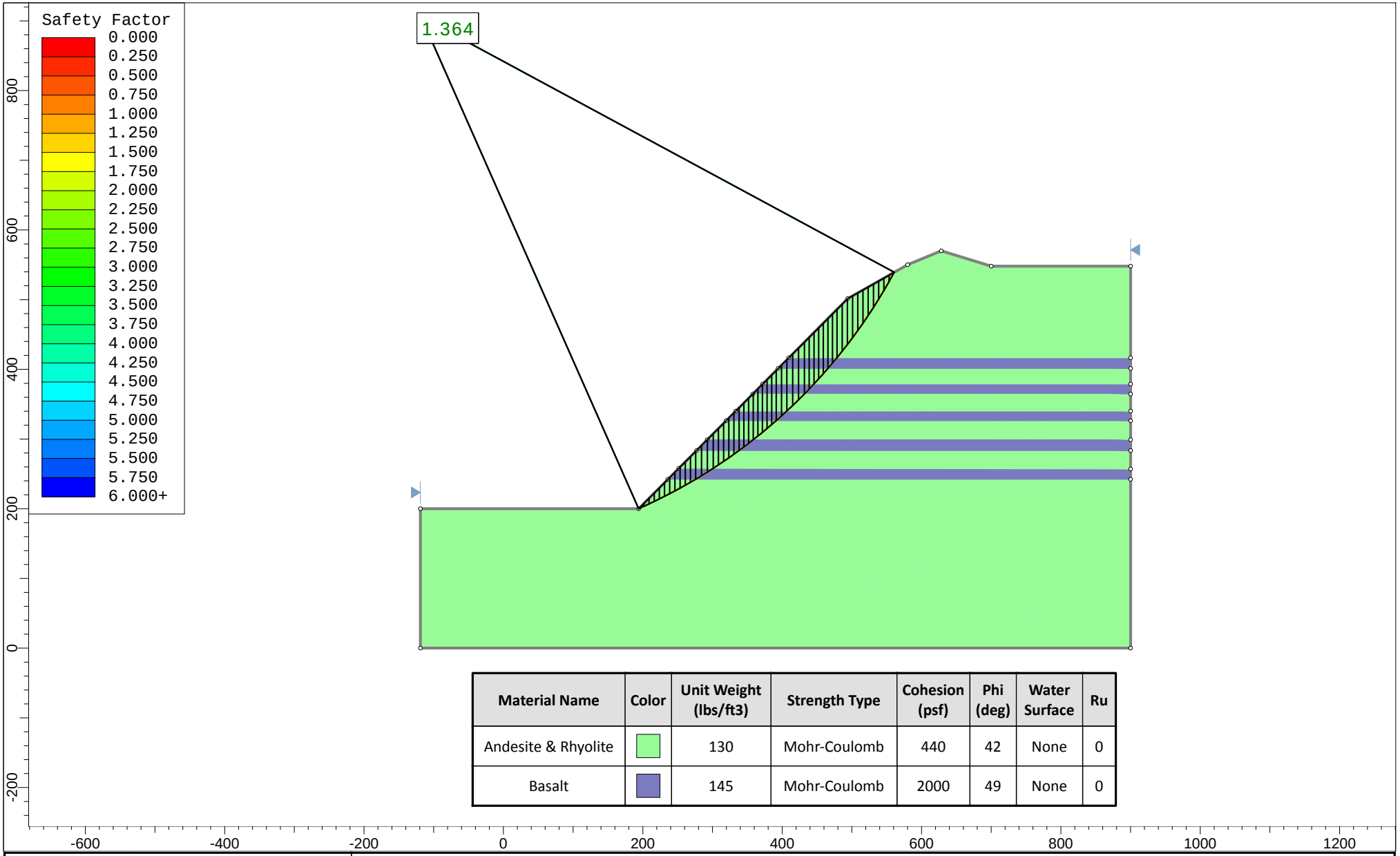
X	Y
345.177	378.882
900	378.882

Material Boundary

X	Y
363.55	401.213
900	401.213

Material Boundary

X	Y
376.176	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion			
Analysis Description	300' Slope, dry, static, 45 degree gross slope inclination			
Drawn By	J.Bianchin	*Scale*	1:2284	*Company* Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM			*File Name* 300',dry,static,45deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:04.322s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search

Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.363560
Center:	-117.962, 905.410
Radius:	771.306
Left Slip Surface Endpoint:	194.014, 200.014
Right Slip Surface Endpoint:	560.859, 539.193
Resisting Moment:	1.71566e+09 lb-ft
Driving Moment:	1.25822e+09 lb-ft
Resisting Horizontal Force:	1.65724e+06 lb
Driving Horizontal Force:	1.21538e+06 lb
Total Slice Area:	18331.1 ft2
Surface Horizontal Width:	366.845 ft
Surface Average Height:	49.9696 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	9873
Number of Invalid Surfaces:	0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.36356

Slice	Width	Weight	Angle	Base	Base	Base	Shear	Shear	Base	Pore	Effective	Base	Effective

Number	[ft]	[lbs]	of Slice Base [degrees]	Material	Cohesion [psf]	Friction Angle [degrees]	Stress [psf]	Strength [psf]	Normal Stress [psf]	Pressure [psf]	Normal Stress [psf]	Vertical Stress [psf]	Vertical Stress [psf]
1	7.43814	2000.16	24.1611	Andesite & Rhyolite	440	42	550.387	750.486	344.829	0	344.829	591.734	591.734
2	7.43814	5954.49	24.7682	Andesite & Rhyolite	440	42	851.709	1161.36	801.147	0	801.147	1194.12	1194.12
3	7.43814	9816.16	25.3782	Andesite & Rhyolite	440	42	1135.92	1548.9	1231.55	0	1231.55	1770.4	1770.4
4	7.43814	13583.8	25.9914	Andesite & Rhyolite	440	42	1403.53	1913.8	1636.82	0	1636.82	2321.1	2321.1
5	7.43814	17255.9	26.6077	Andesite & Rhyolite	440	42	1655.01	2256.71	2017.66	0	2017.66	2846.71	2846.71
6	7.43814	20883.3	27.2274	Andesite & Rhyolite	440	42	1894.63	2583.44	2380.54	0	2380.54	3355.39	3355.39
7	7.43814	25019.8	27.8506	Andesite & Rhyolite	440	42	2162.38	2948.53	2786.01	0	2786.01	3928.54	3928.54
8	7.43814	29204.2	28.4773	Andesite & Rhyolite	440	42	2424.18	3305.51	3182.48	0	3182.48	4497.46	4497.46
9	7.43814	32713.8	29.1078	Andesite & Rhyolite	440	42	2630.04	3586.22	3494.24	0	3494.24	4958.57	4958.57
10	7.43814	35882.4	29.7422	Andesite & Rhyolite	440	42	2805.22	3825.08	3759.52	0	3759.52	5362.32	5362.32
11	7.43814	38945	30.3806	Andesite & Rhyolite	440	42	2966.72	4045.3	4004.09	0	4004.09	5743.31	5743.31
12	8.42757	47753.6	31.0663	Basalt	2000	49	5313.63	7245.45	4559.8	0	4559.8	7760.93	7760.93
13	8.42757	51792.7	31.8001	Basalt	2000	49	5515.73	7521.03	4799.36	0	4799.36	8219.27	8219.27
14	8.42757	55092.3	32.5397	Basalt	2000	49	5652.53	7707.56	4961.51	0	4961.51	8568.07	8568.07
15	7.4259	50988.3	33.2408	Andesite & Rhyolite	440	42	3521.14	4801.29	4843.7	0	4843.7	7151.45	7151.45
16	7.4259	53433.4	33.9028	Andesite & Rhyolite	440	42	3614.26	4928.26	4984.71	0	4984.71	7413.65	7413.65
17	7.4259	55860.8	34.5701	Andesite & Rhyolite	440	42	3701.84	5047.68	5117.35	0	5117.35	7668.22	7668.22
18	7.4259	58787.9	35.2428	Andesite & Rhyolite	440	42	3814.57	5201.4	5288.08	0	5288.08	7983.23	7983.23
19	7.4259	61514.4	35.9211	Andesite & Rhyolite	440	42	3910.27	5331.89	5433	0	5433	8265.76	8265.76
20	6.76382	57517	36.5745	Basalt	2000	49	6177.15	8422.92	5583.36	0	5583.36	10166.6	10166.6
21	6.76382	58514.1	37.2027	Basalt	2000	49	6157.5	8396.12	5560.07	0	5560.07	10234.3	10234.3
22	6.76382	59400.8	37.8362	Basalt	2000	49	6127.5	8355.22	5524.5	0	5524.5	10283.7	10283.7
23	6.59051	59276.1	38.467	Andesite & Rhyolite	440	42	3961.43	5401.65	5510.47	0	5510.47	8657.81	8657.81
24	6.59051	61067.2	39.095	Andesite & Rhyolite	440	42	4008.93	5466.41	5582.4	0	5582.4	8839.78	8839.78
25	6.59051	62458	39.7287	Andesite & Rhyolite	440	42	4029.48	5494.44	5613.53	0	5613.53	8962.28	8962.28
26	6.59051	63385.9	40.3683	Andesite & Rhyolite	440	42	4020.61	5482.34	5600.09	0	5600.09	9018.05	9018.05
27	6.59051	64204	41.014	Andesite & Rhyolite	440	42	4003.9	5459.56	5574.78	0	5574.78	9057.04	9057.04
28	7.60811	74773.6	41.717	Basalt	2000	49	6045.12	8242.88	5426.85	0	5426.85	10816.1	10816.1
29	7.60811	75565.6	42.4787	Basalt	2000	49	5976.63	8149.5	5345.68	0	5345.68	10818.2	10818.2
30	8.39873	84416	43.2904	Andesite & Rhyolite	440	42	3893.49	5309.01	5407.58	0	5407.58	9075.39	9075.39
31	8.39873	84919.2	44.1538	Andesite & Rhyolite	440	42	3830.66	5223.33	5312.43	0	5312.43	9031.57	9031.57
32	8.39873	85091.8	45.0299	Andesite & Rhyolite	440	42	3753.51	5118.13	5195.59	0	5195.59	8953.02	8953.02
33	6.88424	69319	45.8384	Basalt	2000	49	5542.13	7557.03	4830.65	0	4830.65	10537.4	10537.4
34	6.88424	68341	46.5774	Basalt	2000	49	5379.95	7335.88	4638.41	0	4638.41	10323	10323
35	6.68715	65633.4	47.3157	Andesite & Rhyolite	440	42	3437.66	4687.46	4717.29	0	4717.29	8444.7	8444.7
36	6.68715	65088.7	48.0537	Andesite & Rhyolite	440	42	3346.42	4563.05	4579.11	0	4579.11	8302.7	8302.7

37	6.68715	64375.1	48.8023	Andesite & Rhyolite	440	42	3248.18	4429.09	4430.33	0	4430.33	8141	8141
38	6.45559	60937.9	49.549	Basalt	2000	49	4800.62	6545.93	3951.72	0	3951.72	9582.26	9582.26
39	6.45559	59199.3	50.2939	Basalt	2000	49	4610.58	6286.8	3726.46	0	3726.46	9278.72	9278.72
40	7.47418	66625.4	51.1114	Andesite & Rhyolite	440	42	2847.11	3882.2	3822.95	0	3822.95	7352.85	7352.85
41	7.47418	64772.1	52.0045	Andesite & Rhyolite	440	42	2708.37	3693.02	3612.84	0	3612.84	7079.96	7079.96
42	7.47418	61194.4	52.9159	Andesite & Rhyolite	440	42	2509.71	3422.14	3312.01	0	3312.01	6632.35	6632.35
43	7.47418	55526	53.8468	Andesite & Rhyolite	440	42	2243.49	3059.14	2908.85	0	2908.85	5979.46	5979.46
44	7.47418	49509.2	54.799	Andesite & Rhyolite	440	42	1976.17	2694.62	2504.01	0	2504.01	5305.3	5305.3
45	7.47418	43124.4	55.7742	Andesite & Rhyolite	440	42	1708.39	2329.49	2098.5	0	2098.5	4609.88	4609.88
46	7.47418	36343.3	56.7744	Andesite & Rhyolite	440	42	1440.75	1964.55	1693.18	0	1693.18	3892.73	3892.73
47	7.47418	29133.5	57.802	Andesite & Rhyolite	440	42	1173.93	1600.73	1289.12	0	1289.12	3153.45	3153.45
48	7.47418	21457.4	58.8598	Andesite & Rhyolite	440	42	908.824	1239.24	887.644	0	887.644	2391.83	2391.83
49	7.47418	13270.9	59.9511	Andesite & Rhyolite	440	42	646.486	881.522	490.36	0	490.36	1607.9	1607.9
50	7.47418	4522.07	61.0795	Andesite & Rhyolite	440	42	375.69	512.275	80.2701	0	80.2701	760.256	760.256

Query 1 (spencer) - Safety Factor: 1.36356

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	7.43814	2000.16	24.1611	Andesite & Rhyolite	440	42	550.387	750.486	344.829	0	344.829	591.734	591.734
2	7.43814	5954.49	24.7682	Andesite & Rhyolite	440	42	851.709	1161.36	801.147	0	801.147	1194.12	1194.12
3	7.43814	9816.16	25.3782	Andesite & Rhyolite	440	42	1135.92	1548.9	1231.55	0	1231.55	1770.4	1770.4
4	7.43814	13583.8	25.9914	Andesite & Rhyolite	440	42	1403.53	1913.8	1636.82	0	1636.82	2321.1	2321.1
5	7.43814	17255.9	26.6077	Andesite & Rhyolite	440	42	1655.01	2256.71	2017.66	0	2017.66	2846.71	2846.71
6	7.43814	20883.3	27.2274	Andesite & Rhyolite	440	42	1894.63	2583.44	2380.54	0	2380.54	3355.39	3355.39
7	7.43814	25019.8	27.8506	Andesite & Rhyolite	440	42	2162.38	2948.53	2786.01	0	2786.01	3928.54	3928.54
8	7.43814	29204.2	28.4773	Andesite & Rhyolite	440	42	2424.18	3305.51	3182.48	0	3182.48	4497.46	4497.46
9	7.43814	32713.8	29.1078	Andesite & Rhyolite	440	42	2630.04	3586.22	3494.24	0	3494.24	4958.57	4958.57
10	7.43814	35882.4	29.7422	Andesite & Rhyolite	440	42	2805.22	3825.08	3759.52	0	3759.52	5362.32	5362.32
11	7.43814	38945	30.3806	Andesite & Rhyolite	440	42	2966.72	4045.3	4004.09	0	4004.09	5743.31	5743.31
12	8.42757	47753.6	31.0663	Basalt	2000	49	5313.63	7245.45	4559.8	0	4559.8	7760.93	7760.93
13	8.42757	51792.7	31.8001	Basalt	2000	49	5515.73	7521.03	4799.36	0	4799.36	8219.27	8219.27
14	8.42757	55092.3	32.5397	Basalt	2000	49	5652.53	7707.56	4961.51	0	4961.51	8568.07	8568.07
15	7.4259	50988.3	33.2408	Andesite & Rhyolite	440	42	3521.14	4801.29	4843.7	0	4843.7	7151.45	7151.45
16	7.4259	53433.4	33.9028	Andesite & Rhyolite	440	42	3614.26	4928.26	4984.71	0	4984.71	7413.65	7413.65
17	7.4259	55860.8	34.5701	Andesite & Rhyolite	440	42	3701.84	5047.68	5117.35	0	5117.35	7668.22	7668.22
18	7.4259	58787.9	35.2428	Andesite & Rhyolite	440	42	3814.57	5201.4	5288.08	0	5288.08	7983.23	7983.23

19	7.4259	61514.4	35.9211	Andesite & Rhyolite	440	42	3910.27	5331.89	5433	0	5433	8265.76	8265.76
20	6.76382	57517	36.5745	Basalt	2000	49	6177.15	8422.92	5583.36	0	5583.36	10166.6	10166.6
21	6.76382	58514.1	37.2027	Basalt	2000	49	6157.5	8396.12	5560.07	0	5560.07	10234.3	10234.3
22	6.76382	59400.8	37.8362	Basalt	2000	49	6127.5	8355.22	5524.5	0	5524.5	10283.7	10283.7
23	6.59051	59276.1	38.467	Andesite & Rhyolite	440	42	3961.43	5401.65	5510.47	0	5510.47	8657.81	8657.81
24	6.59051	61067.2	39.095	Andesite & Rhyolite	440	42	4008.93	5466.41	5582.4	0	5582.4	8839.78	8839.78
25	6.59051	62458	39.7287	Andesite & Rhyolite	440	42	4029.48	5494.44	5613.53	0	5613.53	8962.28	8962.28
26	6.59051	63385.9	40.3683	Andesite & Rhyolite	440	42	4020.61	5482.34	5600.09	0	5600.09	9018.05	9018.05
27	6.59051	64204	41.014	Andesite & Rhyolite	440	42	4003.9	5459.56	5574.78	0	5574.78	9057.04	9057.04
28	7.60811	74773.6	41.717	Basalt	2000	49	6045.12	8242.88	5426.85	0	5426.85	10816.1	10816.1
29	7.60811	75565.6	42.4787	Basalt	2000	49	5976.63	8149.5	5345.68	0	5345.68	10818.2	10818.2
30	8.39873	84416	43.2904	Andesite & Rhyolite	440	42	3893.49	5309.01	5407.58	0	5407.58	9075.39	9075.39
31	8.39873	84919.2	44.1538	Andesite & Rhyolite	440	42	3830.66	5223.33	5312.43	0	5312.43	9031.57	9031.57
32	8.39873	85091.8	45.0299	Andesite & Rhyolite	440	42	3753.51	5118.13	5195.59	0	5195.59	8953.02	8953.02
33	6.88424	69319	45.8384	Basalt	2000	49	5542.13	7557.03	4830.65	0	4830.65	10537.4	10537.4
34	6.88424	68341	46.5774	Basalt	2000	49	5379.95	7335.88	4638.41	0	4638.41	10323	10323
35	6.68715	65633.4	47.3157	Andesite & Rhyolite	440	42	3437.66	4687.46	4717.29	0	4717.29	8444.7	8444.7
36	6.68715	65088.7	48.0537	Andesite & Rhyolite	440	42	3346.42	4563.05	4579.11	0	4579.11	8302.7	8302.7
37	6.68715	64375.1	48.8023	Andesite & Rhyolite	440	42	3248.18	4429.09	4430.33	0	4430.33	8141	8141
38	6.45559	60937.9	49.549	Basalt	2000	49	4800.62	6545.93	3951.72	0	3951.72	9582.26	9582.26
39	6.45559	59199.3	50.2939	Basalt	2000	49	4610.58	6286.8	3726.46	0	3726.46	9278.72	9278.72
40	7.47418	66625.4	51.1114	Andesite & Rhyolite	440	42	2847.11	3882.2	3822.95	0	3822.95	7352.85	7352.85
41	7.47418	64772.1	52.0045	Andesite & Rhyolite	440	42	2708.37	3693.02	3612.84	0	3612.84	7079.96	7079.96
42	7.47418	61194.4	52.9159	Andesite & Rhyolite	440	42	2509.71	3422.14	3312.01	0	3312.01	6632.35	6632.35
43	7.47418	55526	53.8468	Andesite & Rhyolite	440	42	2243.49	3059.14	2908.85	0	2908.85	5979.46	5979.46
44	7.47418	49509.2	54.799	Andesite & Rhyolite	440	42	1976.17	2694.62	2504.01	0	2504.01	5305.3	5305.3
45	7.47418	43124.4	55.7742	Andesite & Rhyolite	440	42	1708.39	2329.49	2098.5	0	2098.5	4609.88	4609.88
46	7.47418	36343.3	56.7744	Andesite & Rhyolite	440	42	1440.75	1964.55	1693.18	0	1693.18	3892.73	3892.73
47	7.47418	29133.5	57.802	Andesite & Rhyolite	440	42	1173.93	1600.73	1289.12	0	1289.12	3153.45	3153.45
48	7.47418	21457.4	58.8598	Andesite & Rhyolite	440	42	908.824	1239.24	887.644	0	887.644	2391.83	2391.83
49	7.47418	13270.9	59.9511	Andesite & Rhyolite	440	42	646.486	881.522	490.36	0	490.36	1607.9	1607.9
50	7.47418	4522.07	61.0795	Andesite & Rhyolite	440	42	375.69	512.275	80.2701	0	80.2701	760.256	760.256

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.36356

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	194.014	200.014	0	0	0

2	201.452	203.351	2949.33	2407.8	39.2278
3	208.89	206.783	6544.44	5342.81	39.2278
4	216.328	210.311	10660.7	8703.29	39.2279
5	223.766	213.937	15180.1	12392.9	39.2279
6	231.204	217.663	19990.8	16320.3	39.2279
7	238.643	221.491	24993.6	20404.5	39.2278
8	246.081	225.421	30152.4	24616.1	39.2278
9	253.519	229.455	35370.1	28875.7	39.2278
10	260.957	233.597	40491	33056.4	39.2278
11	268.395	237.847	45410	37072.3	39.2279
12	275.833	242.207	50049.7	40860	39.2278
13	284.261	247.284	71746.9	58573.4	39.2278
14	292.688	252.51	93222.1	76105.5	39.2278
15	301.116	257.887	114251	93273.5	39.2279
16	308.542	262.754	116864	95406.4	39.2278
17	315.968	267.744	118867	97041.4	39.2277
18	323.394	272.861	120211	98139.1	39.2279
19	330.82	278.108	120835	98648.4	39.2278
20	338.246	283.488	120688	98528.4	39.2278
21	345.009	288.506	134511	109813	39.2277
22	351.773	293.641	147673	120558	39.2277
23	358.537	298.894	160157	130751	39.2279
24	365.128	304.13	157451	128541	39.2278
25	371.718	309.485	154017	125738	39.2279
26	378.309	314.962	149867	122350	39.2279
27	384.899	320.565	145029	118400	39.2278
28	391.49	326.297	139502	113888	39.2278
29	399.098	333.08	148754	121441	39.2278
30	406.706	340.046	157053	128216	39.2277
31	415.105	347.958	147017	120023	39.2278
32	423.503	356.112	135919	110963	39.2279
33	431.902	364.52	123809	101076	39.2277
34	438.786	371.608	127776	104315	39.2278
35	445.67	378.882	131127	107051	39.2279
36	452.358	386.133	119946	97922.5	39.2278
37	459.045	393.574	108285	88402.5	39.2278
38	465.732	401.213	96193.6	78531.4	39.2278
39	472.188	408.785	97309.6	79442.5	39.2278
40	478.643	416.559	98148	80127	39.2278
41	486.117	425.826	84033.6	68604.1	39.2278
42	493.591	435.394	69738.6	56933.8	39.2278
43	501.066	445.282	55774.4	45533.6	39.2278
44	508.54	455.512	42810.9	34950.4	39.2279
45	516.014	466.107	31073.3	25367.9	39.2278
46	523.488	477.094	20804.4	16984.5	39.2278
47	530.962	488.505	12268.7	10016	39.2277
48	538.437	500.374	5754.38	4697.81	39.2278
49	545.911	512.745	1576.66	1287.17	39.2279
50	553.385	525.665	80.2719	65.5331	39.2278
51	560.859	539.193	0	0	0

Query 1 (spencer) - Safety Factor: 1.36356

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	194.014	200.014	0	0	0
2	201.452	203.351	2949.33	2407.8	39.2278
3	208.89	206.783	6544.44	5342.81	39.2278
4	216.328	210.311	10660.7	8703.29	39.2279
5	223.766	213.937	15180.1	12392.9	39.2279
6	231.204	217.663	19990.8	16320.3	39.2279
7	238.643	221.491	24993.6	20404.5	39.2278

8	246.081	225.421	30152.4	24616.1	39.2278
9	253.519	229.455	35370.1	28875.7	39.2278
10	260.957	233.597	40491	33056.4	39.2278
11	268.395	237.847	45410	37072.3	39.2279
12	275.833	242.207	50049.7	40860	39.2278
13	284.261	247.284	71746.9	58573.4	39.2278
14	292.688	252.51	93222.1	76105.5	39.2278
15	301.116	257.887	114251	93273.5	39.2279
16	308.542	262.754	116864	95406.4	39.2278
17	315.968	267.744	118867	97041.4	39.2277
18	323.394	272.861	120211	98139.1	39.2279
19	330.82	278.108	120835	98648.4	39.2278
20	338.246	283.488	120688	98528.4	39.2278
21	345.009	288.506	134511	109813	39.2277
22	351.773	293.641	147673	120558	39.2277
23	358.537	298.894	160157	130751	39.2279
24	365.128	304.13	157451	128541	39.2278
25	371.718	309.485	154017	125738	39.2279
26	378.309	314.962	149867	122350	39.2279
27	384.899	320.565	145029	118400	39.2278
28	391.49	326.297	139502	113888	39.2278
29	399.098	333.08	148754	121441	39.2278
30	406.706	340.046	157053	128216	39.2277
31	415.105	347.958	147017	120023	39.2278
32	423.503	356.112	135919	110963	39.2279
33	431.902	364.52	123809	101076	39.2277
34	438.786	371.608	127776	104315	39.2278
35	445.67	378.882	131127	107051	39.2279
36	452.358	386.133	119946	97922.5	39.2278
37	459.045	393.574	108285	88402.5	39.2278
38	465.732	401.213	96193.6	78531.4	39.2278
39	472.188	408.785	97309.6	79442.5	39.2278
40	478.643	416.559	98148	80127	39.2278
41	486.117	425.826	84033.6	68604.1	39.2278
42	493.591	435.394	69738.6	56933.8	39.2278
43	501.066	445.282	55774.4	45533.6	39.2278
44	508.54	455.512	42810.9	34950.4	39.2279
45	516.014	466.107	31073.3	25367.9	39.2278
46	523.488	477.094	20804.4	16984.5	39.2278
47	530.962	488.505	12268.7	10016	39.2277
48	538.437	500.374	5754.38	4697.81	39.2278
49	545.911	512.745	1576.66	1287.17	39.2279
50	553.385	525.665	80.2719	65.5331	39.2278
51	560.859	539.193	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046
900	364.52
900	378.882

900	401.213
900	416.559
900	548
700	548
628.434	569.928
580	550
494.015	501.453
409.526	416.559
394.254	401.213
372.029	378.882
357.735	364.52
333.378	340.046
319.695	326.297
292.423	298.894
277.089	283.488
251.684	257.96
236.006	242.207
194	200
-119.082	200

Material Boundary

X	Y
236.006	242.207
900	242.207

Material Boundary

X	Y
251.684	257.96
900	256.996

Material Boundary

X	Y
277.089	283.488
900	283.488

Material Boundary

X	Y
292.423	298.894
900	298.894

Material Boundary

X	Y
319.695	326.297
900	326.297

Material Boundary

X	Y
333.378	340.046
900	340.046

Material Boundary

X	Y

357.735	364.52
900	364.52

Material Boundary

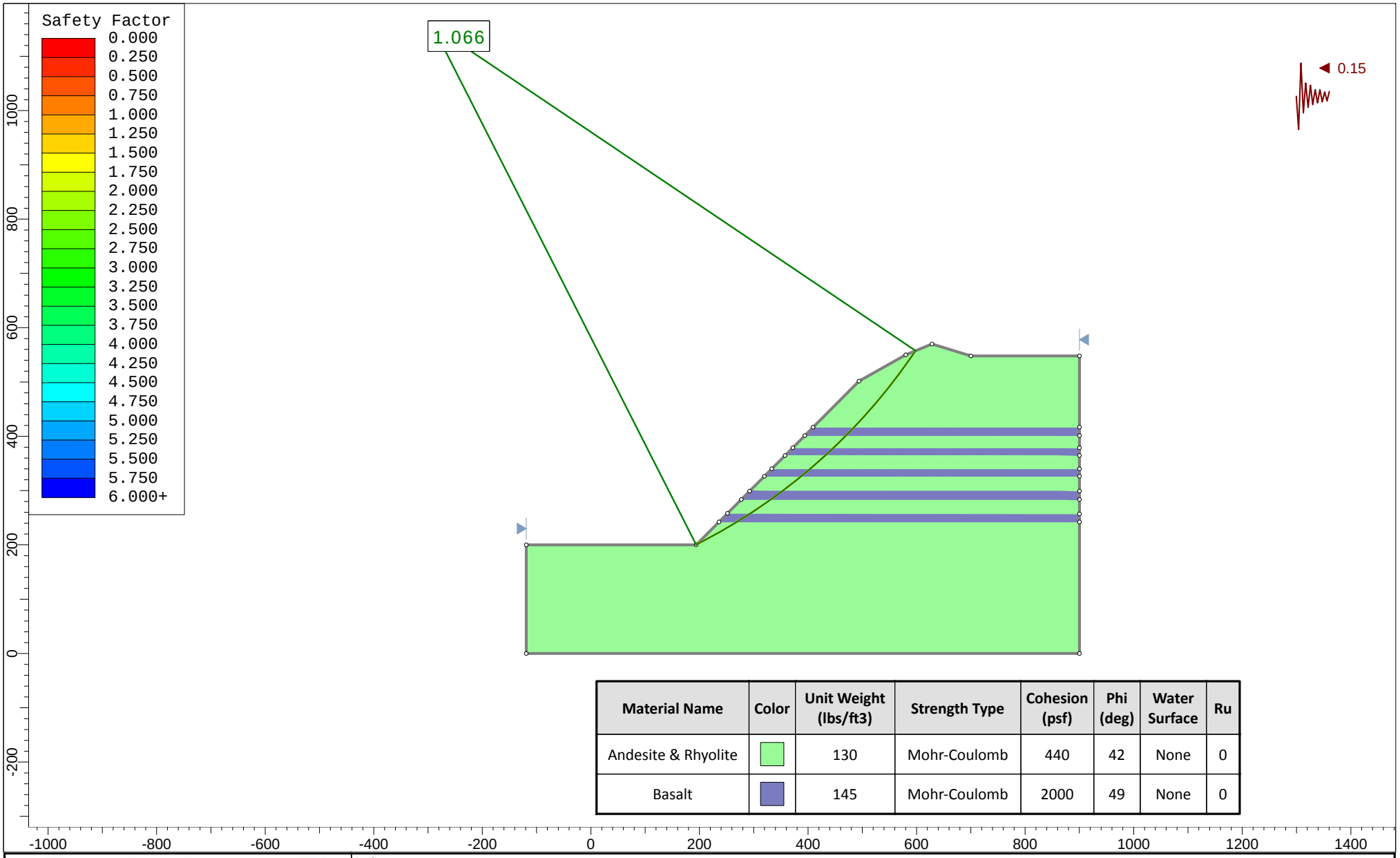
X	Y
372.029	378.882
900	378.882

Material Boundary

X	Y
394.254	401.213
900	401.213

Material Boundary

X	Y
409.526	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion			
Analysis Description	300' Slope, dry, pseudostatic, 45 degree gross slope inclination			
Drawn By	J.Bianchin	Scale	1:2932	Company: Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM			File Name: 300',dry,PS,45deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:03.410s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search

Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.066260
Center:	-292.281, 1157.200
Radius:	1073.614
Left Slip Surface Endpoint:	194.057, 200.057
Right Slip Surface Endpoint:	598.229, 557.500
Resisting Moment:	2.32086e+09 lb-ft
Driving Moment:	2.17663e+09 lb-ft
Resisting Horizontal Force:	1.64096e+06 lb
Driving Horizontal Force:	1.53898e+06 lb
Total Slice Area:	19844.8 ft2
Surface Horizontal Width:	404.172 ft
Surface Average Height:	49.0998 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 10694
Number of Invalid Surfaces: 0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.06626

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	8.36654	2234.73	27.1867	Andesite & Rhyolite	440	42	758.603	808.868	409.669	0	409.669	799.316	799.316
2	8.36654	6653.45	27.6898	Andesite & Rhyolite	440	42	1091.27	1163.58	803.615	0	803.615	1376.3	1376.3
3	8.36654	10970	28.1952	Andesite & Rhyolite	440	42	1403.53	1496.53	1173.4	0	1173.4	1925.81	1925.81
4	8.36654	15183	28.7031	Andesite & Rhyolite	440	42	1696.04	1808.42	1519.79	0	1519.79	2448.46	2448.46
5	8.36654	19290.9	29.2134	Andesite & Rhyolite	440	42	1969.44	2099.94	1843.54	0	1843.54	2944.83	2944.83
6	8.36654	23805	29.7263	Andesite & Rhyolite	440	42	2261.09	2410.91	2188.92	0	2188.92	3480	3480
7	8.36654	28746.2	30.2418	Andesite & Rhyolite	440	42	2571.09	2741.45	2556.01	0	2556.01	4054.93	4054.93
8	8.36654	32944	30.76	Andesite & Rhyolite	440	42	2817.31	3003.99	2847.6	0	2847.6	4524.39	4524.39
9	8.36654	36613.5	31.281	Andesite & Rhyolite	440	42	3017.57	3217.51	3084.74	0	3084.74	4918.07	4918.07
10	8.26496	39345.6	31.8017	Basalt	2000	49	6212.18	6623.8	4019.41	0	4019.41	7871.38	7871.38
11	8.26496	42641.3	32.3222	Basalt	2000	49	6406.5	6830.99	4199.51	0	4199.51	8253	8253
12	8.26496	46238.9	32.8457	Basalt	2000	49	6616.74	7055.17	4394.4	0	4394.4	8666.07	8666.07
13	7.4974	44649.8	33.3477	Andesite & Rhyolite	440	42	3648.28	3890.02	3831.63	0	3831.63	6232.46	6232.46
14	7.4974	47139.3	33.828	Andesite & Rhyolite	440	42	3761.67	4010.92	3965.9	0	3965.9	6486.79	6486.79
15	7.4974	49539.8	34.311	Andesite & Rhyolite	440	42	3863.96	4119.99	4087.04	0	4087.04	6723.95	6723.95
16	7.4974	51998.6	34.7968	Andesite & Rhyolite	440	42	3965.39	4228.14	4207.15	0	4207.15	6962.85	6962.85
17	7.4974	54993.4	35.2856	Andesite & Rhyolite	440	42	4097.06	4368.53	4363.07	0	4363.07	7262.4	7262.4
18	7.01003	53634.4	35.7612	Basalt	2000	49	7356.4	7843.83	5079.96	0	5079.96	10378	10378
19	7.01003	54900.5	36.2235	Basalt	2000	49	7358.35	7845.91	5081.77	0	5081.77	10471.9	10471.9
20	7.01003	56055.2	36.6887	Basalt	2000	49	7347.55	7834.4	5071.77	0	5071.77	10546.2	10546.2
21	8.73487	71857.4	37.2146	Andesite & Rhyolite	440	42	4251.56	4533.27	4546.03	0	4546.03	7774.85	7774.85
22	8.73487	75166.6	37.8023	Andesite & Rhyolite	440	42	4339.74	4627.29	4650.45	0	4650.45	8016.97	8016.97
23	8.73487	78152.8	38.3947	Andesite & Rhyolite	440	42	4406.04	4697.98	4728.97	0	4728.97	8220.48	8220.48
24	8.73487	80201.2	38.9919	Andesite & Rhyolite	440	42	4421.32	4714.28	4747.07	0	4747.07	8326.35	8326.35
25	8.23224	76882.5	39.5768	Basalt	2000	49	7426.15	7918.21	5144.62	0	5144.62	11283	11283
26	8.23224	78217.4	40.1492	Basalt	2000	49	7373.67	7862.25	5095.97	0	5095.97	11316	11316
27	9.24561	90064.7	40.7623	Andesite & Rhyolite	440	42	4400.02	4691.57	4721.85	0	4721.85	8514.8	8514.8
28	9.24561	91763.6	41.417	Andesite & Rhyolite	440	42	4380.54	4670.79	4698.77	0	4698.77	8563.04	8563.04
29	9.24561	93011.3	42.0784	Andesite & Rhyolite	440	42	4340.45	4628.05	4651.31	0	4651.31	8570.23	8570.23
30	7.7084	77925.8	42.6906	Basalt	2000	49	7076.74	7545.65	4820.76	0	4820.76	11348.8	11348.8
31	7.7084	77660.6	43.2528	Basalt	2000	49	6928.93	7388.04	4683.75	0	4683.75	11202.5	11202.5
32	7.60461	76615.3	43.8165	Andesite & Rhyolite	440	42	4111.81	4384.26	4380.54	0	4380.54	8325.9	8325.9
33	7.60461	76883.8	44.3816	Andesite & Rhyolite	440	42	4051.74	4320.21	4309.41	0	4309.41	8274.62	8274.62
34	7.60461	77006.3	44.9523	Andesite & Rhyolite	440	42	3985.42	4249.49	4230.87	0	4230.87	8209.65	8209.65
35	7.45891	75080.5	45.5231	Basalt	2000	49	6425.24	6850.98	4216.9	0	4216.9	10760.5	10760.5
36	7.45891	74049.2	46.0942	Basalt	2000	49	6246.17	6660.04	4050.91	0	4050.91	10540.3	10540.3

37	8.09086	79479.5	46.6959	Andesite & Rhyolite	440	42	3674.64	3918.12	3862.85	0	3862.85	7761.72	7761.72
38	8.09086	77447.9	47.3292	Andesite & Rhyolite	440	42	3522.27	3755.66	3682.42	0	3682.42	7503.38	7503.38
39	8.09086	72942.9	47.9702	Andesite & Rhyolite	440	42	3276.82	3493.94	3391.74	0	3391.74	7027.22	7027.22
40	8.09086	68197.3	48.6193	Andesite & Rhyolite	440	42	3030.26	3231.05	3099.78	0	3099.78	6539.27	6539.27
41	8.09086	63229.5	49.2768	Andesite & Rhyolite	440	42	2783.72	2968.17	2807.81	0	2807.81	6041.54	6041.54
42	8.09086	58030.7	49.9432	Andesite & Rhyolite	440	42	2537.18	2705.29	2515.86	0	2515.86	5533.47	5533.47
43	8.09086	52591.1	50.6189	Andesite & Rhyolite	440	42	2290.61	2442.39	2223.89	0	2223.89	5014.41	5014.41
44	8.09086	46900.3	51.3045	Andesite & Rhyolite	440	42	2044.02	2179.46	1931.87	0	1931.87	4483.64	4483.64
45	8.09086	40946.8	52.0005	Andesite & Rhyolite	440	42	1797.37	1916.46	1639.77	0	1639.77	3940.34	3940.34
46	8.09086	34718.2	52.7076	Andesite & Rhyolite	440	42	1550.58	1653.32	1347.53	0	1347.53	3383.51	3383.51
47	8.09086	28201.1	53.4262	Andesite & Rhyolite	440	42	1303.61	1389.98	1055.06	0	1055.06	2812.05	2812.05
48	8.09086	21338.8	54.1572	Andesite & Rhyolite	440	42	1055	1124.9	760.667	0	760.667	2221.16	2221.16
49	8.09086	13258.9	54.9014	Andesite & Rhyolite	440	42	777.492	829.009	432.038	0	432.038	1538.36	1538.36
50	8.09086	4477.48	55.6596	Andesite & Rhyolite	440	42	400.633	427.179	-14.2394	0	-14.2394	572.178	572.178

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.06626

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	194.057	200.057	0	0	0
2	202.423	204.354	4266.44	4648.67	47.455
3	210.79	208.745	8892.17	9688.81	47.455
4	219.156	213.23	13754.7	14987	47.4551
5	227.523	217.811	18739	20417.9	47.4551
6	235.889	222.49	23737.5	25864.1	47.455
7	244.256	227.267	28672.7	31241.5	47.455
8	252.622	232.145	33456.4	36453.7	47.455
9	260.989	237.124	37962.9	41364	47.455
10	269.355	242.207	42098.1	45869.6	47.455
11	277.62	247.332	67064.3	73072.6	47.455
12	285.885	252.561	91784.1	100007	47.455
13	294.15	257.897	116220	126632	47.455
14	301.648	262.831	118036	128611	47.4551
15	309.145	267.855	119310	129998	47.4548
16	316.643	272.972	120007	130758	47.4549
17	324.14	278.182	120088	130847	47.4551
18	331.637	283.488	119482	130186	47.4549
19	338.647	288.536	137482	149799	47.455
20	345.657	293.671	154859	168733	47.4551
21	352.667	298.894	171591	186964	47.455
22	361.402	305.528	167882	182923	47.4551
23	370.137	312.304	163094	177705	47.4549
24	378.872	319.226	157216	171301	47.455
25	387.607	326.297	150331	163799	47.455
26	395.839	333.102	165072	179861	47.4551
27	404.071	340.046	178799	194818	47.4551

28	413.317	348.016	168435	183525	47.455
29	422.563	356.172	156946	171006	47.4549
30	431.808	364.52	144393	157329	47.455
31	439.517	371.63	153107	166823	47.4549
32	447.225	378.882	161030	175457	47.4551
33	454.83	386.179	148918	162259	47.4549
34	462.434	393.621	136200	148402	47.455
35	470.039	401.213	122909	133920	47.4549
36	477.498	408.81	127654	139091	47.4551
37	484.957	416.559	131857	143670	47.455
38	493.047	425.144	116576	127020	47.455
39	501.138	433.921	101205	110272	47.455
40	509.229	442.897	86394.4	94134.4	47.455
41	517.32	452.081	72274.4	78749.4	47.455
42	525.411	461.479	58976.7	64260.4	47.455
43	533.502	471.102	46639.6	50818	47.455
44	541.593	480.959	35408.6	38580.8	47.455
45	549.683	491.06	25438	27717	47.455
46	557.774	501.416	16891.7	18405	47.455
47	565.865	512.039	9943.95	10834.8	47.4549
48	573.956	522.944	4781.23	5209.58	47.455
49	582.047	534.145	1616.89	1761.75	47.4551
50	590.138	545.657	959.837	1045.83	47.4551
51	598.229	557.5	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046
900	364.52
900	378.882
900	401.213
900	416.559
900	548
700	548
628.434	569.928
580	550
494.015	501.453
409.526	416.559
394.254	401.213
372.029	378.882
357.735	364.52
333.378	340.046
319.695	326.297
292.423	298.894
277.089	283.488
251.684	257.96
236.006	242.207
194	200
-119.082	200

Material Boundary

X	Y
236.006	242.207
900	242.207

Material Boundary

X	Y
251.684	257.96
900	256.996

Material Boundary

X	Y
277.089	283.488
900	283.488

Material Boundary

X	Y
292.423	298.894
900	298.894

Material Boundary

X	Y
319.695	326.297
900	326.297

Material Boundary

X	Y
333.378	340.046
900	340.046

Material Boundary

X	Y
357.735	364.52
900	364.52

Material Boundary

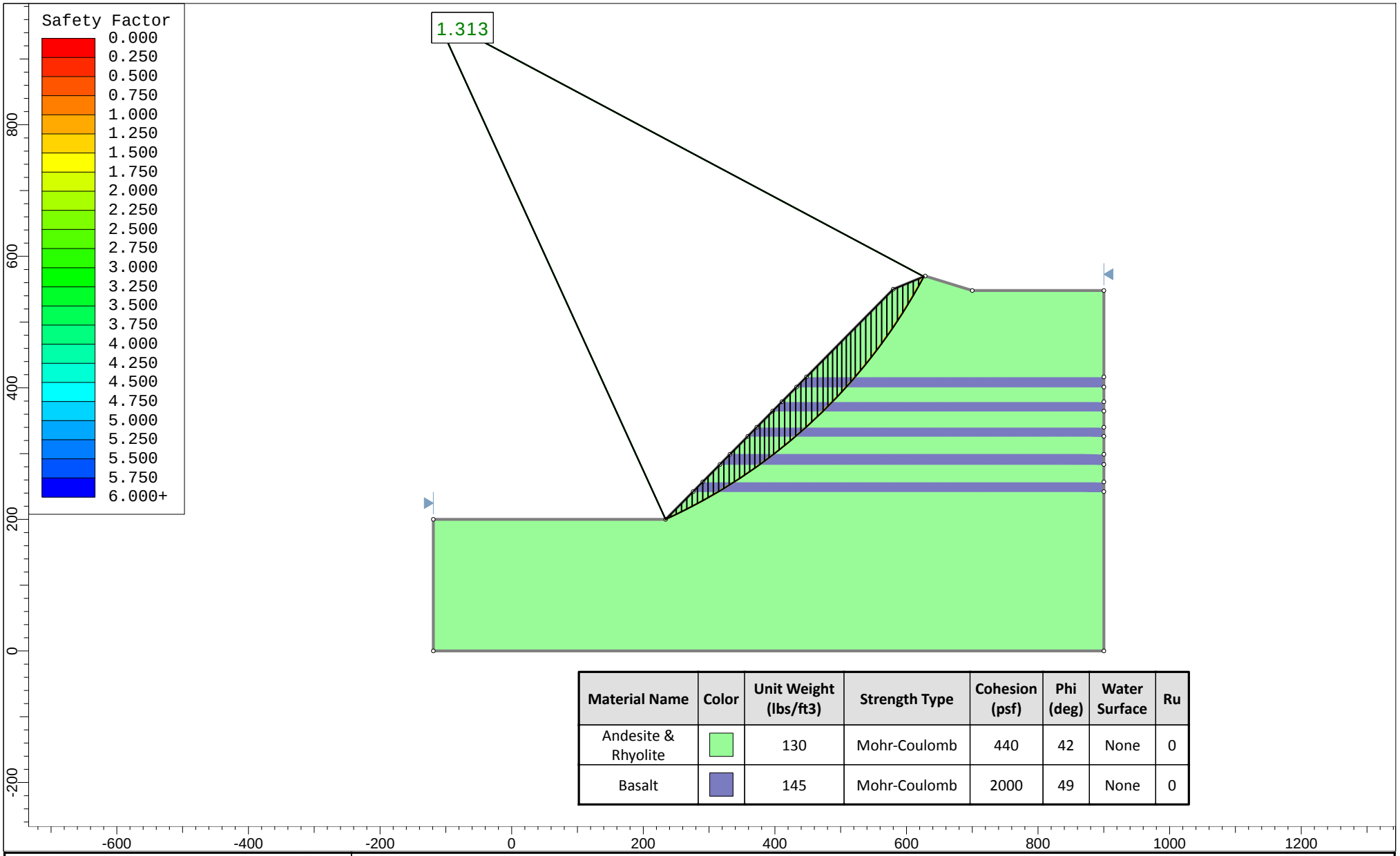
X	Y
372.029	378.882
900	378.882

Material Boundary

X	Y
394.254	401.213
900	401.213

Material Boundary

X	Y
409.526	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion		
Analysis Description	350' Slope, dry, static, 45 degree gross slope inclination		
Drawn By	J.Bianchin	Scale 1:2418	Company Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM		File Name 350',dry,static,45deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:04.332s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search

Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.313020
Center:	-114.959, 964.180
Radius:	840.074
Left Slip Surface Endpoint:	234.022, 200.023
Right Slip Surface Endpoint:	626.414, 569.097
Resisting Moment:	2.06244e+09 lb-ft
Driving Moment:	1.57076e+09 lb-ft
Resisting Horizontal Force:	1.81601e+06 lb
Driving Horizontal Force:	1.38308e+06 lb
Total Slice Area:	20824.1 ft2
Surface Horizontal Width:	392.392 ft
Surface Average Height:	53.0696 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	9485
Number of Invalid Surfaces:	0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.31302

Slice	Width	Weight	Angle	Base	Base	Base	Shear	Shear	Base	Pore	Effective	Base	Effective

Number	[ft]	[lbs]	of Slice Base [degrees]	Material	Cohesion [psf]	Friction Angle [degrees]	Stress [psf]	Strength [psf]	Normal Stress [psf]	Pressure [psf]	Normal Stress [psf]	Vertical Stress [psf]	Vertical Stress [psf]
1	8.05296	2311.96	24.8482	Andesite & Rhyolite	440	42	582.428	764.739	360.659	0	360.659	630.374	630.374
2	8.05296	6881.4	25.455	Andesite & Rhyolite	440	42	913.31	1199.19	843.17	0	843.17	1277.92	1277.92
3	8.05296	11341	26.0649	Andesite & Rhyolite	440	42	1224.92	1608.35	1297.59	0	1297.59	1896.74	1896.74
4	8.05296	15689.2	26.6779	Andesite & Rhyolite	440	42	1517.86	1992.98	1724.76	0	1724.76	2487.43	2487.43
5	8.05296	19924	27.2943	Andesite & Rhyolite	440	42	1792.66	2353.8	2125.49	0	2125.49	3050.52	3050.52
6	8.05296	24375.7	27.9141	Andesite & Rhyolite	440	42	2072.76	2721.57	2533.94	0	2533.94	3632.06	3632.06
7	8.05296	29346.5	28.5375	Andesite & Rhyolite	440	42	2378.14	3122.55	2979.27	0	2979.27	4272.51	4272.51
8	8.05296	33715.9	29.1646	Andesite & Rhyolite	440	42	2632.5	3456.53	3350.2	0	3350.2	4819.32	4819.32
9	8.05296	37477.8	29.7955	Andesite & Rhyolite	440	42	2837.74	3726.01	3649.48	0	3649.48	5274.38	5274.38
10	8.05296	41116	30.4305	Andesite & Rhyolite	440	42	3027.25	3974.84	3925.83	0	3925.83	5704.07	5704.07
11	7.97887	44187.3	31.0666	Basalt	2000	49	5479.99	7195.34	4516.25	0	4516.25	7817.64	7817.64
12	7.97887	47863.6	31.7041	Basalt	2000	49	5691.9	7473.58	4758.11	0	4758.11	8274.06	8274.06
13	7.97887	51084.3	32.346	Basalt	2000	49	5856.54	7689.76	4946.03	0	4946.03	8654.97	8654.97
14	7.77516	52447	32.9841	Andesite & Rhyolite	440	42	3634.93	4772.73	4811.98	0	4811.98	7171.1	7171.1
15	7.77516	55233.9	33.6186	Andesite & Rhyolite	440	42	3748.28	4921.57	4977.29	0	4977.29	7469.4	7469.4
16	7.77516	57961.3	34.2578	Andesite & Rhyolite	440	42	3853	5059.06	5129.98	0	5129.98	7754.16	7754.16
17	7.77516	61234.8	34.9019	Andesite & Rhyolite	440	42	3985.19	5232.64	5322.76	0	5322.76	8103.07	8103.07
18	7.77516	64368.7	35.5511	Andesite & Rhyolite	440	42	4103.33	5387.76	5495.05	0	5495.05	8427.46	8427.46
19	6.87601	58614.3	36.1675	Basalt	2000	49	6520.68	8561.78	5704.07	0	5704.07	10470.8	10470.8
20	6.87601	59766.3	36.7506	Basalt	2000	49	6515.47	8554.94	5698.12	0	5698.12	10563.6	10563.6
21	6.87601	60823	37.3382	Basalt	2000	49	6500.43	8535.2	5680.96	0	5680.96	10639.8	10639.8
22	8.42543	76891.2	37.9977	Andesite & Rhyolite	440	42	4218.98	5539.61	5663.7	0	5663.7	8959.65	8959.65
23	8.42543	79876.3	38.7306	Andesite & Rhyolite	440	42	4289.55	5632.27	5766.6	0	5766.6	9206.95	9206.95
24	8.42543	81859.1	39.4711	Andesite & Rhyolite	440	42	4306.41	5654.4	5791.19	0	5791.19	9337.47	9337.47
25	8.42543	83492.4	40.2196	Andesite & Rhyolite	440	42	4303.45	5650.52	5786.87	0	5786.87	9426.09	9426.09
26	7.82334	78741.5	40.9491	Basalt	2000	49	6522.8	8564.57	5706.49	0	5706.49	11366.5	11366.5
27	7.82334	79909.2	41.6595	Basalt	2000	49	6475.02	8501.83	5651.95	0	5651.95	11412.8	11412.8
28	8.67662	89797.2	42.4174	Andesite & Rhyolite	440	42	4236.26	5562.3	5688.9	0	5688.9	9559.49	9559.49
29	8.67662	90631.2	43.2242	Andesite & Rhyolite	440	42	4185.3	5495.38	5614.57	0	5614.57	9548.15	9548.15
30	8.67662	91199.6	44.0419	Andesite & Rhyolite	440	42	4121.96	5412.21	5522.19	0	5522.19	9508.55	9508.55
31	7.14528	74964.5	44.7969	Basalt	2000	49	6086.19	7991.29	5208.14	0	5208.14	11251.3	11251.3
32	7.14528	74237.9	45.4879	Basalt	2000	49	5932.04	7788.89	5032.21	0	5032.21	11066.1	11066.1
33	6.97079	71930.7	46.1788	Andesite & Rhyolite	440	42	3833.7	5033.73	5101.86	0	5101.86	9096.64	9096.64
34	6.97079	71657.9	46.8698	Andesite & Rhyolite	440	42	3751.57	4925.88	4982.07	0	4982.07	8986.84	8986.84
35	6.97079	71220.9	47.5698	Andesite & Rhyolite	440	42	3662.06	4808.36	4851.55	0	4851.55	8857.78	8857.78
36	6.75987	68103.7	48.2685	Basalt	2000	49	5385.78	7071.64	4408.71	0	4408.71	10446.9	10446.9
37	6.75987	66592	48.966	Basalt	2000	49	5199.52	6827.08	4196.12	0	4196.12	10170.3	10170.3

38	8.02465	77390.9	49.7405	Andesite & Rhyolite	440	42	3277.15	4302.96	4290.25	0	4290.25	8160.08	8160.08
39	8.02465	75821.5	50.5951	Andesite & Rhyolite	440	42	3142.32	4125.93	4093.65	0	4093.65	7918.5	7918.5
40	8.02465	73939.2	51.4654	Andesite & Rhyolite	440	42	2998.42	3936.99	3883.8	0	3883.8	7648.67	7648.67
41	8.02465	71725.8	52.3527	Andesite & Rhyolite	440	42	2845.62	3736.35	3660.97	0	3660.97	7349.78	7349.78
42	8.02465	69161	53.2582	Andesite & Rhyolite	440	42	2684.11	3524.29	3425.45	0	3425.45	7020.99	7020.99
43	8.02465	66222.1	54.1833	Andesite & Rhyolite	440	42	2514.12	3301.09	3177.57	0	3177.57	6661.34	6661.34
44	8.02465	62883.6	55.1296	Andesite & Rhyolite	440	42	2335.91	3067.1	2917.7	0	2917.7	6269.84	6269.84
45	8.02465	57572.8	56.0989	Andesite & Rhyolite	440	42	2101.05	2758.72	2575.2	0	2575.2	5701.76	5701.76
46	8.02465	48437.3	57.0933	Andesite & Rhyolite	440	42	1759.25	2309.93	2076.77	0	2076.77	4795.45	4795.45
47	8.02465	38684.7	58.1151	Andesite & Rhyolite	440	42	1417.55	1861.27	1578.48	0	1578.48	3857.2	3857.2
48	8.02465	28388.2	59.1671	Andesite & Rhyolite	440	42	1080.68	1418.96	1087.24	0	1087.24	2897.74	2897.74
49	8.02465	17496	60.2525	Andesite & Rhyolite	440	42	749.937	984.682	604.931	0	604.931	1917.18	1917.18
50	8.02465	5947.02	61.3753	Andesite & Rhyolite	440	42	409.373	537.515	108.301	0	108.301	858.375	858.375

Query 1 (spencer) - Safety Factor: 1.31302

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	8.05296	2311.96	24.8482	Andesite & Rhyolite	440	42	582.428	764.739	360.659	0	360.659	630.374	630.374
2	8.05296	6881.4	25.455	Andesite & Rhyolite	440	42	913.31	1199.19	843.17	0	843.17	1277.92	1277.92
3	8.05296	11341	26.0649	Andesite & Rhyolite	440	42	1224.92	1608.35	1297.59	0	1297.59	1896.74	1896.74
4	8.05296	15689.2	26.6779	Andesite & Rhyolite	440	42	1517.86	1992.98	1724.76	0	1724.76	2487.43	2487.43
5	8.05296	19924	27.2943	Andesite & Rhyolite	440	42	1792.66	2353.8	2125.49	0	2125.49	3050.52	3050.52
6	8.05296	24375.7	27.9141	Andesite & Rhyolite	440	42	2072.76	2721.57	2533.94	0	2533.94	3632.06	3632.06
7	8.05296	29346.5	28.5375	Andesite & Rhyolite	440	42	2378.14	3122.55	2979.27	0	2979.27	4272.51	4272.51
8	8.05296	33715.9	29.1646	Andesite & Rhyolite	440	42	2632.5	3456.53	3350.2	0	3350.2	4819.32	4819.32
9	8.05296	37477.8	29.7955	Andesite & Rhyolite	440	42	2837.74	3726.01	3649.48	0	3649.48	5274.38	5274.38
10	8.05296	41116	30.4305	Andesite & Rhyolite	440	42	3027.25	3974.84	3925.83	0	3925.83	5704.07	5704.07
11	7.97887	44187.3	31.0666	Basalt	2000	49	5479.99	7195.34	4516.25	0	4516.25	7817.64	7817.64
12	7.97887	47863.6	31.7041	Basalt	2000	49	5691.9	7473.58	4758.11	0	4758.11	8274.06	8274.06
13	7.97887	51084.3	32.346	Basalt	2000	49	5856.54	7689.76	4946.03	0	4946.03	8654.97	8654.97
14	7.77516	52447	32.9841	Andesite & Rhyolite	440	42	3634.93	4772.73	4811.98	0	4811.98	7171.1	7171.1
15	7.77516	55233.9	33.6186	Andesite & Rhyolite	440	42	3748.28	4921.57	4977.29	0	4977.29	7469.4	7469.4
16	7.77516	57961.3	34.2578	Andesite & Rhyolite	440	42	3853	5059.06	5129.98	0	5129.98	7754.16	7754.16
17	7.77516	61234.8	34.9019	Andesite & Rhyolite	440	42	3985.19	5232.64	5322.76	0	5322.76	8103.07	8103.07
18	7.77516	64368.7	35.5511	Andesite & Rhyolite	440	42	4103.33	5387.76	5495.05	0	5495.05	8427.46	8427.46

19	6.87601	58614.3	36.1675	Basalt	2000	49	6520.68	8561.78	5704.07	0	5704.07	10470.8	10470.8
20	6.87601	59766.3	36.7506	Basalt	2000	49	6515.47	8554.94	5698.12	0	5698.12	10563.6	10563.6
21	6.87601	60823	37.3382	Basalt	2000	49	6500.43	8535.2	5680.96	0	5680.96	10639.8	10639.8
22	8.42543	76891.2	37.9977	Andesite & Rhyolite	440	42	4218.98	5539.61	5663.7	0	5663.7	8959.65	8959.65
23	8.42543	79876.3	38.7306	Andesite & Rhyolite	440	42	4289.55	5632.27	5766.6	0	5766.6	9206.95	9206.95
24	8.42543	81859.1	39.4711	Andesite & Rhyolite	440	42	4306.41	5654.4	5791.19	0	5791.19	9337.47	9337.47
25	8.42543	83492.4	40.2196	Andesite & Rhyolite	440	42	4303.45	5650.52	5786.87	0	5786.87	9426.09	9426.09
26	7.82334	78741.5	40.9491	Basalt	2000	49	6522.8	8564.57	5706.49	0	5706.49	11366.5	11366.5
27	7.82334	79909.2	41.6595	Basalt	2000	49	6475.02	8501.83	5651.95	0	5651.95	11412.8	11412.8
28	8.67662	89797.2	42.4174	Andesite & Rhyolite	440	42	4236.26	5562.3	5688.9	0	5688.9	9559.49	9559.49
29	8.67662	90631.2	43.2242	Andesite & Rhyolite	440	42	4185.3	5495.38	5614.57	0	5614.57	9548.15	9548.15
30	8.67662	91199.6	44.0419	Andesite & Rhyolite	440	42	4121.96	5412.21	5522.19	0	5522.19	9508.55	9508.55
31	7.14528	74964.5	44.7969	Basalt	2000	49	6086.19	7991.29	5208.14	0	5208.14	11251.3	11251.3
32	7.14528	74237.9	45.4879	Basalt	2000	49	5932.04	7788.89	5032.21	0	5032.21	11066.1	11066.1
33	6.97079	71930.7	46.1788	Andesite & Rhyolite	440	42	3833.7	5033.73	5101.86	0	5101.86	9096.64	9096.64
34	6.97079	71657.9	46.8698	Andesite & Rhyolite	440	42	3751.57	4925.88	4982.07	0	4982.07	8986.84	8986.84
35	6.97079	71220.9	47.5698	Andesite & Rhyolite	440	42	3662.06	4808.36	4851.55	0	4851.55	8857.78	8857.78
36	6.75987	68103.7	48.2685	Basalt	2000	49	5385.78	7071.64	4408.71	0	4408.71	10446.9	10446.9
37	6.75987	66592	48.966	Basalt	2000	49	5199.52	6827.08	4196.12	0	4196.12	10170.3	10170.3
38	8.02465	77390.9	49.7405	Andesite & Rhyolite	440	42	3277.15	4302.96	4290.25	0	4290.25	8160.08	8160.08
39	8.02465	75821.5	50.5951	Andesite & Rhyolite	440	42	3142.32	4125.93	4093.65	0	4093.65	7918.5	7918.5
40	8.02465	73939.2	51.4654	Andesite & Rhyolite	440	42	2998.42	3936.99	3883.8	0	3883.8	7648.67	7648.67
41	8.02465	71725.8	52.3527	Andesite & Rhyolite	440	42	2845.62	3736.35	3660.97	0	3660.97	7349.78	7349.78
42	8.02465	69161	53.2582	Andesite & Rhyolite	440	42	2684.11	3524.29	3425.45	0	3425.45	7020.99	7020.99
43	8.02465	66222.1	54.1833	Andesite & Rhyolite	440	42	2514.12	3301.09	3177.57	0	3177.57	6661.34	6661.34
44	8.02465	62883.6	55.1296	Andesite & Rhyolite	440	42	2335.91	3067.1	2917.7	0	2917.7	6269.84	6269.84
45	8.02465	57572.8	56.0989	Andesite & Rhyolite	440	42	2101.05	2758.72	2575.2	0	2575.2	5701.76	5701.76
46	8.02465	48437.3	57.0933	Andesite & Rhyolite	440	42	1759.25	2309.93	2076.77	0	2076.77	4795.45	4795.45
47	8.02465	38684.7	58.1151	Andesite & Rhyolite	440	42	1417.55	1861.27	1578.48	0	1578.48	3857.2	3857.2
48	8.02465	28388.2	59.1671	Andesite & Rhyolite	440	42	1080.68	1418.96	1087.24	0	1087.24	2897.74	2897.74
49	8.02465	17496	60.2525	Andesite & Rhyolite	440	42	749.937	984.682	604.931	0	604.931	1917.18	1917.18
50	8.02465	5947.02	61.3753	Andesite & Rhyolite	440	42	409.373	537.515	108.301	0	108.301	858.375	858.375

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.31302

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	234.022	200.023	0	0	0

2	242.075	203.752	3353.05	2773.14	39.5924
3	250.128	207.585	7487.93	6192.9	39.5925
4	258.181	211.524	12257.4	10137.5	39.5925
5	266.234	215.571	17521.9	14491.5	39.5925
6	274.287	219.726	23149.7	19146	39.5925
7	282.34	223.992	29058.4	24032.8	39.5925
8	290.393	228.372	35194.3	29107.5	39.5925
9	298.446	232.866	41372.6	34217.3	39.5925
10	306.499	237.477	47434.4	39230.7	39.5925
11	314.552	242.207	53282.3	44067.1	39.5924
12	322.531	247.014	75370	62334.8	39.5925
13	330.51	251.943	97409	80562.2	39.5925
14	338.489	256.996	119223	98603.2	39.5924
15	346.264	262.042	123249	101933	39.5924
16	354.039	267.211	126711	104797	39.5926
17	361.814	272.507	129553	107147	39.5925
18	369.589	277.931	131717	108936	39.5923
19	377.364	283.488	133141	110114	39.5924
20	384.24	288.514	149380	123544	39.5923
21	391.117	293.649	164996	136460	39.5925
22	397.993	298.894	179968	148843	39.5925
23	406.418	305.476	178295	147459	39.5925
24	414.843	312.234	175529	145171	39.5924
25	423.269	319.172	171691	141997	39.5924
26	431.694	326.297	166778	137934	39.5925
27	439.518	333.086	179154	148169	39.5924
28	447.341	340.046	190554	157598	39.5925
29	456.018	347.974	182272	150748	39.5924
30	464.694	356.128	172860	142964	39.5925
31	473.371	364.52	162346	134269	39.5926
32	480.516	371.614	168955	139734	39.5924
33	487.661	378.882	174837	144599	39.5925
34	494.632	386.146	164547	136089	39.5925
35	501.603	393.587	153669	127092	39.5925
36	508.574	401.213	142241	117640	39.5923
37	515.334	408.792	145296	120167	39.5924
38	522.093	416.559	147911	122330	39.5925
39	530.118	426.035	133598	110492	39.5924
40	538.143	435.803	118870	98311.9	39.5926
41	546.167	445.879	103839	85879.9	39.5924
42	554.192	456.281	88628.5	73300.3	39.5925
43	562.217	467.031	73381.2	60690	39.5925
44	570.241	478.15	58256.1	48180.8	39.5925
45	578.266	489.666	43432.6	35921	39.5925
46	586.291	501.607	29569.1	24455.1	39.5924
47	594.315	514.008	17955.8	14850.3	39.5924
48	602.34	526.908	8988.01	7433.54	39.5925
49	610.365	540.352	3057.67	2528.85	39.5925
50	618.389	554.394	591.369	489.092	39.5925
51	626.414	569.097	0	0	0

Query 1 (spencer) - Safety Factor: 1.31302

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	234.022	200.023	0	0	0
2	242.075	203.752	3353.05	2773.14	39.5924
3	250.128	207.585	7487.93	6192.9	39.5925
4	258.181	211.524	12257.4	10137.5	39.5925
5	266.234	215.571	17521.9	14491.5	39.5925
6	274.287	219.726	23149.7	19146	39.5925
7	282.34	223.992	29058.4	24032.8	39.5925

8	290.393	228.372	35194.3	29107.5	39.5925
9	298.446	232.866	41372.6	34217.3	39.5925
10	306.499	237.477	47434.4	39230.7	39.5925
11	314.552	242.207	53282.3	44067.1	39.5924
12	322.531	247.014	75370	62334.8	39.5925
13	330.51	251.943	97409	80562.2	39.5925
14	338.489	256.996	119223	98603.2	39.5924
15	346.264	262.042	123249	101933	39.5924
16	354.039	267.211	126711	104797	39.5926
17	361.814	272.507	129553	107147	39.5925
18	369.589	277.931	131717	108936	39.5923
19	377.364	283.488	133141	110114	39.5924
20	384.24	288.514	149380	123544	39.5923
21	391.117	293.649	164996	136460	39.5925
22	397.993	298.894	179968	148843	39.5925
23	406.418	305.476	178295	147459	39.5925
24	414.843	312.234	175529	145171	39.5924
25	423.269	319.172	171691	141997	39.5924
26	431.694	326.297	166778	137934	39.5925
27	439.518	333.086	179154	148169	39.5924
28	447.341	340.046	190554	157598	39.5925
29	456.018	347.974	182272	150748	39.5924
30	464.694	356.128	172860	142964	39.5925
31	473.371	364.52	162346	134269	39.5926
32	480.516	371.614	168955	139734	39.5924
33	487.661	378.882	174837	144599	39.5925
34	494.632	386.146	164547	136089	39.5925
35	501.603	393.587	153669	127092	39.5925
36	508.574	401.213	142241	117640	39.5923
37	515.334	408.792	145296	120167	39.5924
38	522.093	416.559	147911	122330	39.5925
39	530.118	426.035	133598	110492	39.5924
40	538.143	435.803	118870	98311.9	39.5926
41	546.167	445.879	103839	85879.9	39.5924
42	554.192	456.281	88628.5	73300.3	39.5925
43	562.217	467.031	73381.2	60690	39.5925
44	570.241	478.15	58256.1	48180.8	39.5925
45	578.266	489.666	43432.6	35921	39.5925
46	586.291	501.607	29569.1	24455.1	39.5924
47	594.315	514.008	17955.8	14850.3	39.5924
48	602.34	526.908	8988.01	7433.54	39.5925
49	610.365	540.352	3057.67	2528.85	39.5925
50	618.389	554.394	591.369	489.092	39.5925
51	626.414	569.097	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046
900	364.52
900	378.882

900	401.213
900	416.559
900	548
700	548
628.434	569.928
580	550
448.084	416.559
432.914	401.213
410.838	378.882
396.639	364.52
372.445	340.046
358.854	326.297
331.764	298.894
316.534	283.488
290.344	256.996
275.725	242.207
234	200
-119.082	200

Material Boundary

X	Y
275.725	242.207
900	242.207

Material Boundary

X	Y
290.344	256.996
900	256.996

Material Boundary

X	Y
316.534	283.488
900	283.488

Material Boundary

X	Y
331.764	298.894
900	298.894

Material Boundary

X	Y
358.854	326.297
900	326.297

Material Boundary

X	Y
372.445	340.046
900	340.046

Material Boundary

X	Y
396.639	364.52

900	364.52

Material Boundary

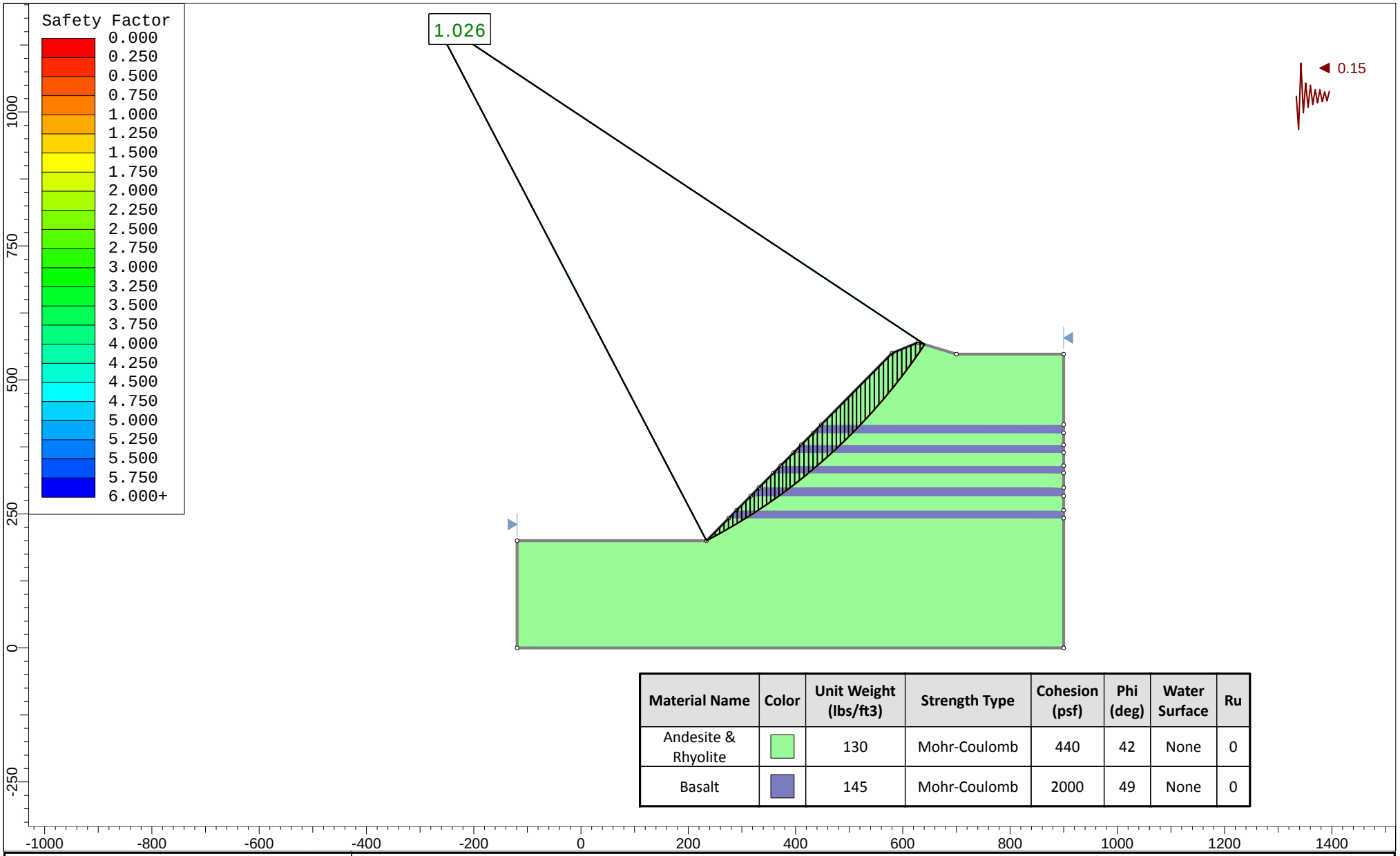
X	Y
410.838	378.882
900	378.882

Material Boundary

X	Y
432.914	401.213
900	401.213

Material Boundary

X	Y
448.084	416.559
900	416.559



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Andesite & Rhyolite		130	Mohr-Coulomb	440	42	None	0
Basalt		145	Mohr-Coulomb	2000	49	None	0

BAJADA Geosciences, Inc.

SLIDEINTERPRET 8.032

Project	Ward Lake Quarry Expansion		
Analysis Description	350' Slope, dry, pseudostatic, 45 degree gross slope inclination		
Drawn By	J.Bianchin	Scale 1:2967	Company Bajada Geosciences, Inc.
Date	4/3/2020, 2:25:57 PM		File Name 350',dry,PS,45deg.slim

Slide Analysis Information

Ward Lake Quarry Expansion

Project Summary

Slide Modeler Version:	8.032
Compute Time:	00h:00m:03.384s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search

Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Andesite & Rhyolite	Basalt
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	145
Cohesion [psf]	440	2000
Friction Angle [°]	42	49
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.025820
Center:	-275.555, 1175.072
Radius:	1100.177
Left Slip Surface Endpoint:	234.022, 200.023
Right Slip Surface Endpoint:	640.747, 566.155
Resisting Moment:	2.4147e+09 lb-ft
Driving Moment:	2.35391e+09 lb-ft
Resisting Horizontal Force:	1.64514e+06 lb
Driving Horizontal Force:	1.60373e+06 lb
Total Slice Area:	20696 ft2
Surface Horizontal Width:	406.725 ft
Surface Average Height:	50.8846 ft

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9884
Number of Invalid Surfaces: 0

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.02582

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	8.18328	2104.91	27.8333	Andesite & Rhyolite	440	42	783.573	803.805	404.046	0	404.046	817.76	817.76
2	8.18328	6267.6	28.3163	Andesite & Rhyolite	440	42	1114.22	1142.99	780.749	0	780.749	1381.11	1381.11
3	8.18328	10335.4	28.8016	Andesite & Rhyolite	440	42	1424.9	1461.69	1134.7	0	1134.7	1918.09	1918.09
4	8.18328	14306.9	29.289	Andesite & Rhyolite	440	42	1716.24	1760.55	1466.63	0	1466.63	2429.3	2429.3
5	8.18328	18180.8	29.7789	Andesite & Rhyolite	440	42	1988.86	2040.21	1777.21	0	1777.21	2915.27	2915.27
6	8.18328	22370.8	30.2711	Andesite & Rhyolite	440	42	2274.76	2333.49	2102.94	0	2102.94	3430.66	3430.66
7	8.18328	27049.6	30.7658	Andesite & Rhyolite	440	42	2585.73	2652.49	2457.22	0	2457.22	3996.53	3996.53
8	8.18328	31017.6	31.2631	Andesite & Rhyolite	440	42	2832.53	2905.67	2738.4	0	2738.4	4458.11	4458.11
9	8.18328	34486.1	31.763	Andesite & Rhyolite	440	42	3033.5	3111.82	2967.36	0	2967.36	4845.5	4845.5
10	7.67082	35105	32.2498	Basalt	2000	49	6311.33	6474.29	3889.44	0	3889.44	7871.56	7871.56
11	7.67082	37728.5	32.7234	Basalt	2000	49	6478.88	6646.16	4038.85	0	4038.85	8201.95	8201.95
12	7.67082	40815.7	33.1995	Basalt	2000	49	6683.63	6856.2	4221.43	0	4221.43	8594.99	8594.99
13	7.66569	43746.4	33.6781	Andesite & Rhyolite	440	42	3658.15	3752.6	3679.01	0	3679.01	6116.67	6116.67
14	7.66569	46345.6	34.1592	Andesite & Rhyolite	440	42	3780.22	3877.83	3818.09	0	3818.09	6383.2	6383.2
15	7.66569	48842.1	34.6431	Andesite & Rhyolite	440	42	3889.68	3990.11	3942.8	0	3942.8	6630.43	6630.43
16	7.66569	51290.2	35.1298	Andesite & Rhyolite	440	42	3990.68	4093.72	4057.86	0	4057.86	6865.66	6865.66
17	7.66569	54282.4	35.6194	Andesite & Rhyolite	440	42	4122.78	4229.23	4208.36	0	4208.36	7162.1	7162.1
18	6.93042	51389.5	36.0882	Basalt	2000	49	7488.7	7682.06	4939.34	0	4939.34	10397.8	10397.8
19	6.93042	52676.8	36.5362	Basalt	2000	49	7497.75	7691.34	4947.41	0	4947.41	10502.8	10502.8
20	6.93042	53790	36.9867	Basalt	2000	49	7487.4	7680.72	4938.18	0	4938.18	10577.6	10577.6
21	8.6551	69059.3	37.4967	Andesite & Rhyolite	440	42	4294.11	4404.98	4403.56	0	4403.56	7698.14	7698.14
22	8.6551	72143.2	38.067	Andesite & Rhyolite	440	42	4377.51	4490.54	4498.57	0	4498.57	7926.92	7926.92
23	8.6551	75240.1	38.6418	Andesite & Rhyolite	440	42	4456.11	4571.17	4588.13	0	4588.13	8150.72	8150.72
24	8.6551	77329.2	39.2213	Andesite & Rhyolite	440	42	4477.43	4593.04	4612.42	0	4612.42	8266.9	8266.9
25	8.17285	74277.5	39.7892	Basalt	2000	49	7579.17	7774.86	5020.01	0	5020.01	11332.3	11332.3
26	8.17285	75382.9	40.3454	Basalt	2000	49	7512.91	7706.89	4960.93	0	4960.93	11342.6	11342.6
27	9.19337	87083.9	40.9415	Andesite & Rhyolite	440	42	4452.3	4567.26	4583.79	0	4583.79	8446.14	8446.14
28	9.19337	88964.6	41.5784	Andesite & Rhyolite	440	42	4442.75	4557.46	4572.9	0	4572.9	8514.37	8514.37
29	9.19337	90220	42.2217	Andesite & Rhyolite	440	42	4403.7	4517.4	4528.41	0	4528.41	8524.48	8524.48
30	7.67626	75725.3	42.8175	Basalt	2000	49	7237.24	7424.11	4715.11	0	4715.11	11421	11421
31	7.67626	75480.8	43.3649	Basalt	2000	49	7087.67	7270.67	4581.73	0	4581.73	11276	11276
32	7.58265	74584	43.914	Andesite & Rhyolite	440	42	4173.79	4281.56	4266.49	0	4266.49	8284.98	8284.98
33	7.58265	74878.6	44.4647	Andesite & Rhyolite	440	42	4113.95	4220.17	4198.3	0	4198.3	8236.09	8236.09
34	7.58265	75031.5	45.0207	Andesite & Rhyolite	440	42	4047.71	4152.22	4122.84	0	4122.84	8173.48	8173.48
35	7.44672	73270.3	45.5771	Basalt	2000	49	6580.93	6750.85	4129.85	0	4129.85	10844.7	10844.7
36	7.44672	72277.7	46.1339	Basalt	2000	49	6399.14	6564.37	3967.74	0	3967.74	10625.3	10625.3

37	8.52881	81924.6	46.7378	Andesite & Rhyolite	440	42	3730.93	3827.26	3761.93	0	3761.93	7726.33	7726.33
38	8.52881	81326.2	47.3899	Andesite & Rhyolite	440	42	3630.86	3724.61	3647.93	0	3647.93	7595.06	7595.06
39	8.52881	80491.4	48.0502	Andesite & Rhyolite	440	42	3523.8	3614.78	3525.96	0	3525.96	7446.43	7446.43
40	8.52881	79411.1	48.719	Andesite & Rhyolite	440	42	3409.95	3497.99	3396.24	0	3396.24	7280.3	7280.3
41	8.52881	78075.3	49.3969	Andesite & Rhyolite	440	42	3289.5	3374.43	3259.01	0	3259.01	7096.51	7096.51
42	8.52881	76473.5	50.0842	Andesite & Rhyolite	440	42	3162.61	3244.27	3114.46	0	3114.46	6894.78	6894.78
43	8.52881	74551.3	50.7816	Andesite & Rhyolite	440	42	3027.97	3106.15	2961.06	0	2961.06	6671.28	6671.28
44	8.52881	68891	51.4895	Andesite & Rhyolite	440	42	2768.58	2840.06	2665.53	0	2665.53	6144.8	6144.8
45	8.52881	60742.6	52.2086	Andesite & Rhyolite	440	42	2435.15	2498.03	2285.68	0	2285.68	5426.03	5426.03
46	8.52881	52275.2	52.9395	Andesite & Rhyolite	440	42	2104.55	2158.89	1909.02	0	1909.02	4695.72	4695.72
47	8.52881	43472.7	53.683	Andesite & Rhyolite	440	42	1776.64	1822.51	1535.43	0	1535.43	3952.53	3952.53
48	8.52881	34317	54.4399	Andesite & Rhyolite	440	42	1451.29	1488.76	1164.76	0	1164.76	3194.88	3194.88
49	8.52881	24119.8	55.211	Andesite & Rhyolite	440	42	1107.88	1136.48	773.522	0	773.522	2368.2	2368.2
50	8.52881	8457.78	55.9974	Andesite & Rhyolite	440	42	475.811	488.096	53.4164	0	53.4164	758.766	758.766

Query 1 (spencer) - Safety Factor: 1.02582

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	8.18328	2104.91	27.8333	Andesite & Rhyolite	440	42	783.573	803.805	404.046	0	404.046	817.76	817.76
2	8.18328	6267.6	28.3163	Andesite & Rhyolite	440	42	1114.22	1142.99	780.749	0	780.749	1381.11	1381.11
3	8.18328	10335.4	28.8016	Andesite & Rhyolite	440	42	1424.9	1461.69	1134.7	0	1134.7	1918.09	1918.09
4	8.18328	14306.9	29.289	Andesite & Rhyolite	440	42	1716.24	1760.55	1466.63	0	1466.63	2429.3	2429.3
5	8.18328	18180.8	29.7789	Andesite & Rhyolite	440	42	1988.86	2040.21	1777.21	0	1777.21	2915.27	2915.27
6	8.18328	22370.8	30.2711	Andesite & Rhyolite	440	42	2274.76	2333.49	2102.94	0	2102.94	3430.66	3430.66
7	8.18328	27049.6	30.7658	Andesite & Rhyolite	440	42	2585.73	2652.49	2457.22	0	2457.22	3996.53	3996.53
8	8.18328	31017.6	31.2631	Andesite & Rhyolite	440	42	2832.53	2905.67	2738.4	0	2738.4	4458.11	4458.11
9	8.18328	34486.1	31.763	Andesite & Rhyolite	440	42	3033.5	3111.82	2967.36	0	2967.36	4845.5	4845.5
10	7.67082	35105	32.2498	Basalt	2000	49	6311.33	6474.29	3889.44	0	3889.44	7871.56	7871.56
11	7.67082	37728.5	32.7234	Basalt	2000	49	6478.88	6646.16	4038.85	0	4038.85	8201.95	8201.95
12	7.67082	40815.7	33.1995	Basalt	2000	49	6683.63	6856.2	4221.43	0	4221.43	8594.99	8594.99
13	7.66569	43746.4	33.6781	Andesite & Rhyolite	440	42	3658.15	3752.6	3679.01	0	3679.01	6116.67	6116.67
14	7.66569	46345.6	34.1592	Andesite & Rhyolite	440	42	3780.22	3877.83	3818.09	0	3818.09	6383.2	6383.2
15	7.66569	48842.1	34.6431	Andesite & Rhyolite	440	42	3889.68	3990.11	3942.8	0	3942.8	6630.43	6630.43
16	7.66569	51290.2	35.1298	Andesite & Rhyolite	440	42	3990.68	4093.72	4057.86	0	4057.86	6865.66	6865.66
17	7.66569	54282.4	35.6194	Andesite & Rhyolite	440	42	4122.78	4229.23	4208.36	0	4208.36	7162.1	7162.1

18	6.93042	51389.5	36.0882	Basalt	2000	49	7488.7	7682.06	4939.34	0	4939.34	10397.8	10397.8
19	6.93042	52676.8	36.5362	Basalt	2000	49	7497.75	7691.34	4947.41	0	4947.41	10502.8	10502.8
20	6.93042	53790	36.9867	Basalt	2000	49	7487.4	7680.72	4938.18	0	4938.18	10577.6	10577.6
21	8.6551	69059.3	37.4967	Andesite & Rhyolite	440	42	4294.11	4404.98	4403.56	0	4403.56	7698.14	7698.14
22	8.6551	72143.2	38.067	Andesite & Rhyolite	440	42	4377.51	4490.54	4498.57	0	4498.57	7926.92	7926.92
23	8.6551	75240.1	38.6418	Andesite & Rhyolite	440	42	4456.11	4571.17	4588.13	0	4588.13	8150.72	8150.72
24	8.6551	77329.2	39.2213	Andesite & Rhyolite	440	42	4477.43	4593.04	4612.42	0	4612.42	8266.9	8266.9
25	8.17285	74277.5	39.7892	Basalt	2000	49	7579.17	7774.86	5020.01	0	5020.01	11332.3	11332.3
26	8.17285	75382.9	40.3454	Basalt	2000	49	7512.91	7706.89	4960.93	0	4960.93	11342.6	11342.6
27	9.19337	87083.9	40.9415	Andesite & Rhyolite	440	42	4452.3	4567.26	4583.79	0	4583.79	8446.14	8446.14
28	9.19337	88964.6	41.5784	Andesite & Rhyolite	440	42	4442.75	4557.46	4572.9	0	4572.9	8514.37	8514.37
29	9.19337	90220	42.2217	Andesite & Rhyolite	440	42	4403.7	4517.4	4528.41	0	4528.41	8524.48	8524.48
30	7.67626	75725.3	42.8175	Basalt	2000	49	7237.24	7424.11	4715.11	0	4715.11	11421	11421
31	7.67626	75480.8	43.3649	Basalt	2000	49	7087.67	7270.67	4581.73	0	4581.73	11276	11276
32	7.58265	74584	43.914	Andesite & Rhyolite	440	42	4173.79	4281.56	4266.49	0	4266.49	8284.98	8284.98
33	7.58265	74878.6	44.4647	Andesite & Rhyolite	440	42	4113.95	4220.17	4198.3	0	4198.3	8236.09	8236.09
34	7.58265	75031.5	45.0207	Andesite & Rhyolite	440	42	4047.71	4152.22	4122.84	0	4122.84	8173.48	8173.48
35	7.44672	73270.3	45.5771	Basalt	2000	49	6580.93	6750.85	4129.85	0	4129.85	10844.7	10844.7
36	7.44672	72277.7	46.1339	Basalt	2000	49	6399.14	6564.37	3967.74	0	3967.74	10625.3	10625.3
37	8.52881	81924.6	46.7378	Andesite & Rhyolite	440	42	3730.93	3827.26	3761.93	0	3761.93	7726.33	7726.33
38	8.52881	81326.2	47.3899	Andesite & Rhyolite	440	42	3630.86	3724.61	3647.93	0	3647.93	7595.06	7595.06
39	8.52881	80491.4	48.0502	Andesite & Rhyolite	440	42	3523.8	3614.78	3525.96	0	3525.96	7446.43	7446.43
40	8.52881	79411.1	48.719	Andesite & Rhyolite	440	42	3409.95	3497.99	3396.24	0	3396.24	7280.3	7280.3
41	8.52881	78075.3	49.3969	Andesite & Rhyolite	440	42	3289.5	3374.43	3259.01	0	3259.01	7096.51	7096.51
42	8.52881	76473.5	50.0842	Andesite & Rhyolite	440	42	3162.61	3244.27	3114.46	0	3114.46	6894.78	6894.78
43	8.52881	74551.3	50.7816	Andesite & Rhyolite	440	42	3027.97	3106.15	2961.06	0	2961.06	6671.28	6671.28
44	8.52881	68891	51.4895	Andesite & Rhyolite	440	42	2768.58	2840.06	2665.53	0	2665.53	6144.8	6144.8
45	8.52881	60742.6	52.2086	Andesite & Rhyolite	440	42	2435.15	2498.03	2285.68	0	2285.68	5426.03	5426.03
46	8.52881	52275.2	52.9395	Andesite & Rhyolite	440	42	2104.55	2158.89	1909.02	0	1909.02	4695.72	4695.72
47	8.52881	43472.7	53.683	Andesite & Rhyolite	440	42	1776.64	1822.51	1535.43	0	1535.43	3952.53	3952.53
48	8.52881	34317	54.4399	Andesite & Rhyolite	440	42	1451.29	1488.76	1164.76	0	1164.76	3194.88	3194.88
49	8.52881	24119.8	55.211	Andesite & Rhyolite	440	42	1107.88	1136.48	773.522	0	773.522	2368.2	2368.2
50	8.52881	8457.78	55.9974	Andesite & Rhyolite	440	42	475.811	488.096	53.4164	0	53.4164	758.766	758.766

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.02582

Slice Number	X coordinate	Y coordinate - Bottom	Interslice Normal Force	Interslice Shear Force	Interslice Force Angle

	[ft]	[ft]	[lbs]	[lbs]	[degrees]
1	234.022	200.023	0	0	0
2	242.206	204.343	4371.59	4809.32	47.7297
3	250.389	208.753	9136.59	10051.4	47.7296
4	258.572	213.252	14179.5	15599.3	47.7297
5	266.755	217.842	19391.5	21333.2	47.7297
6	274.939	222.524	24670.8	27141.1	47.7297
7	283.122	227.301	29946.3	32944.8	47.7297
8	291.305	232.172	35146.8	38666.1	47.7297
9	299.489	237.141	40143.8	44163.5	47.7297
10	307.672	242.207	44841.4	49331.4	47.7297
11	315.343	247.047	69321.8	76263.1	47.7297
12	323.014	251.976	93615.1	102989	47.7297
13	330.684	256.996	117739	129528	47.7296
14	338.35	262.104	120517	132585	47.7298
15	346.016	267.305	122777	135071	47.7298
16	353.681	272.602	124481	136946	47.7298
17	361.347	277.996	125593	138168	47.7296
18	369.013	283.488	126045	138666	47.7297
19	375.943	288.539	145454	160018	47.7296
20	382.874	293.674	164279	180728	47.7296
21	389.804	298.894	182493	200766	47.7297
22	398.459	305.535	180179	198221	47.7298
23	407.114	312.313	176876	194586	47.7296
24	415.769	319.233	172535	189811	47.7297
25	424.424	326.297	167231	183976	47.7297
26	432.597	333.104	184064	202495	47.7298
27	440.77	340.046	199919	219937	47.7297
28	449.964	348.021	191364	210526	47.7298
29	459.157	356.177	181700	199893	47.7296
30	468.35	364.52	171005	188128	47.7297
31	476.027	371.632	181846	200054	47.7296
32	483.703	378.882	191889	211103	47.7297
33	491.285	386.183	181305	199459	47.7297
34	498.868	393.625	170125	187159	47.7296
35	506.451	401.213	158377	174236	47.7298
36	513.897	408.812	165173	181712	47.7297
37	521.344	416.559	171399	188562	47.7298
38	529.873	425.622	156942	172657	47.7297
39	538.402	434.893	141988	156205	47.7296
40	546.931	444.382	126609	139286	47.7296
41	555.459	454.097	110881	121984	47.7298
42	563.988	464.046	94890.6	104392	47.7297
43	572.517	474.241	78729.9	86613.2	47.7297
44	581.046	484.692	62511.7	68771	47.7297
45	589.575	495.41	47297.9	52033.9	47.7297
46	598.103	506.408	33883.7	37276.5	47.7297
47	606.632	517.702	22491	24743	47.7297
48	615.161	529.305	13355.8	14693.2	47.7298
49	623.69	541.236	6730.15	7404.05	47.7297
50	632.219	553.512	3095.76	3405.74	47.7297
51	640.747	566.155	0	0	0

Query 1 (spencer) - Safety Factor: 1.02582

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	234.022	200.023	0	0	0
2	242.206	204.343	4371.59	4809.32	47.7297
3	250.389	208.753	9136.59	10051.4	47.7296
4	258.572	213.252	14179.5	15599.3	47.7297
5	266.755	217.842	19391.5	21333.2	47.7297

6	274.939	222.524	24670.8	27141.1	47.7297
7	283.122	227.301	29946.3	32944.8	47.7297
8	291.305	232.172	35146.8	38666.1	47.7297
9	299.489	237.141	40143.8	44163.5	47.7297
10	307.672	242.207	44841.4	49331.4	47.7297
11	315.343	247.047	69321.8	76263.1	47.7297
12	323.014	251.976	93615.1	102989	47.7297
13	330.684	256.996	117739	129528	47.7296
14	338.35	262.104	120517	132585	47.7298
15	346.016	267.305	122777	135071	47.7298
16	353.681	272.602	124481	136946	47.7298
17	361.347	277.996	125593	138168	47.7296
18	369.013	283.488	126045	138666	47.7297
19	375.943	288.539	145454	160018	47.7296
20	382.874	293.674	164279	180728	47.7296
21	389.804	298.894	182493	200766	47.7297
22	398.459	305.535	180179	198221	47.7298
23	407.114	312.313	176876	194586	47.7296
24	415.769	319.233	172535	189811	47.7297
25	424.424	326.297	167231	183976	47.7297
26	432.597	333.104	184064	202495	47.7298
27	440.77	340.046	199919	219937	47.7297
28	449.964	348.021	191364	210526	47.7298
29	459.157	356.177	181700	199893	47.7296
30	468.35	364.52	171005	188128	47.7297
31	476.027	371.632	181846	200054	47.7296
32	483.703	378.882	191889	211103	47.7297
33	491.285	386.183	181305	199459	47.7297
34	498.868	393.625	170125	187159	47.7296
35	506.451	401.213	158377	174236	47.7298
36	513.897	408.812	165173	181712	47.7297
37	521.344	416.559	171399	188562	47.7298
38	529.873	425.622	156942	172657	47.7297
39	538.402	434.893	141988	156205	47.7296
40	546.931	444.382	126609	139286	47.7296
41	555.459	454.097	110881	121984	47.7298
42	563.988	464.046	94890.6	104392	47.7297
43	572.517	474.241	78729.9	86613.2	47.7297
44	581.046	484.692	62511.7	68771	47.7297
45	589.575	495.41	47297.9	52033.9	47.7297
46	598.103	506.408	33883.7	37276.5	47.7297
47	606.632	517.702	22491	24743	47.7297
48	615.161	529.305	13355.8	14693.2	47.7298
49	623.69	541.236	6730.15	7404.05	47.7297
50	632.219	553.512	3095.76	3405.74	47.7297
51	640.747	566.155	0	0	0

Entity Information

External Boundary

X	Y
-119.082	0
900	0
900	242.207
900	256.996
900	283.488
900	298.894
900	326.297
900	340.046

900	364.52
900	378.882
900	401.213
900	416.559
900	548
700	548
628.434	569.928
580	550
448.084	416.559
432.914	401.213
410.838	378.882
396.639	364.52
372.445	340.046
358.854	326.297
331.764	298.894
316.534	283.488
290.344	256.996
275.725	242.207
234	200
-119.082	200

Material Boundary

X	Y
275.725	242.207
900	242.207

Material Boundary

X	Y
290.344	256.996
900	256.996

Material Boundary

X	Y
316.534	283.488
900	283.488

Material Boundary

X	Y
331.764	298.894
900	298.894

Material Boundary

X	Y
358.854	326.297
900	326.297

Material Boundary

X	Y
372.445	340.046
900	340.046

Material Boundary

X	Y
396.639	364.52
900	364.52

Material Boundary

X	Y
410.838	378.882
900	378.882

Material Boundary

X	Y
432.914	401.213
900	401.213

Material Boundary

X	Y
448.084	416.559
900	416.559

APPENDIX C

Air-Percussion Explorations

APPENDIX C
AIR-PERCUSSION EXPLORATIONS

Exploration at the project site was performed by Hat Creek Construction using air-percussion (Air-Track) methods. The drilling was performed between February 10 and February 24, 2020 by Precision Blasting out of Carson City, Nevada. A total of 90 air-percussion holes were advanced in the study area. A Bajada representative was not involved with development of the exploration plan nor was present on-site during drilling. Logs of the air-percussion drill holes were provided to Bajada after the exploration program was completed.

The logs of those air-percussion drill holes are attached to this appendix.

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Drill Log

Date 2/10/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2157

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
1	112	4		X	Fill 4' soft red tan 6ft/min 4'-80' tan soft clay rock/ boulder mix 4.8-5.8ft/min 80'-112'
					TEST DRILLING
					East side of primary crusher lower road north end

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/11/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2160.1

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
2	112	0		X	Soft red 6.4 ft/min 0'-14' brown rock 3.8 ft/min 14'-26' soft red/tan boulder mix 5.8ft/min
					26'-90' soft brown rock 4.2 ft/min 90'-112'
					TEST DRILL
					East side crusher primary lower road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/11/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2160.8

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
3	112	0		X	Tan/red boulder mix 4ft/min 0'-18' tan/brown boulder mix 4ft-7ft/min 18'-112'
					Test Drill
					East side primary lower beach mid point

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/11/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2161.5

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
4	112	4		X	4ft clay/rock fill soft brown rock boulder mix 5ft/min 4'-90' tan rock 7ft/min 90'-112'
					Test drilling
					East side primary south side lower road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/11/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2162.3

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
5	112	0		X	Soft brown rock 5ft/min 0'-38' 8ft/min 38'-100' soft tan rock 8ft/min 100'-112'
					Test drill
					East primary south side lower bench

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/11/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2163

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
6	112	8		X	8ft dirt super soft brownish red rock 9ft/min 8'-77' soft tan rock 7ft/min 77'-112'
					Test drill
					East primary 2nd bench north

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/11/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2163.8

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
7	112	0		X	Brown clay rock mix 3ft-7ft/ min 0'-38' soft brown rock 7ft/min 38'-112'
					Test drill
					East primary 2nd road midway

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/11/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 5.5 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2165

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
8	112	0		X	Soft brown rock 8ft/min 0'-36' tan boulder mix 4ft-7ft/ min 36'-112'
					East primary perpendicular to 2nd road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2167

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
9	80	5		X	Clay rock mix 7ft/min 5'-40' soft tan boulder mix 8ft/min 40'-80'
					Test drill
					Location 3 south side pit mid bench north end

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/11/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2167.5

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
10	112	4		X	Clay rock mix 6ft/min 4'-38' soft tan boulder mix 9ft/min 38ft'-80' gray rock 3ft/min 80'-90'
					Rock clay mix 90'-112'
					Test drill
					Location 3 mid bench north side

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2169

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1.5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
11	96	3		X	0-8' soft dirt 7ft/min 8'-10' boulder 10'-48 Red/tan clay rock mix 6.5ft/min
					Tan clay mix 7ft/min 48'-96'

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2170

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
12	112	4		X	Tan dirt 8ft/min 0-32' tan boulder mix 4.8-6ft/min 32'-90' soft white sand 12ft/min 09'-96'
					Test drill
					North boundary near blm before fence next to lone tree

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2172

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 2 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
13	112	3		X	Red tan clay boulder mix 6ft/min 0-14' light grey rock 2-4ft/min 14'-33' tan rock 4-5ft/min 33
					Grey tan mix rock 3.5-4.5ft-min 43'-60' grey rock 1.2-3ft/min 60'-90'
					Tan rock clay mix 4-5ft/min 90'-102' tan grey rock mix 1.8-3ft/min 102'-112'
					Test drill
					New property upper road at y north end

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-153 Hour Meter 2173

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
14	112	2		X	Fill 2' grey rock1.9-3ft/min 2'-12' tan rock 5ft/min 12'-17' grey rock 1.5-2.8ft/min 17'-24'
					Grey tan mix 3.4-4.8ft/min 24'-34' grey rock 1.8-2.9ft/min 34'-46'
					4-6 ft/min tan clay rock mix 46'-72 grey rock 1.4-4ft/min 72'-112'
					Test hole
					New pit Upper road across from east tree

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2174

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
15	80	8		X	Clay dirt 8' red tan soft clay 7ft/min 8'-80'

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2175

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
16	50	3		X	Dirt 3' red clay 3'-50'
					Test holes
					New pit upper road

Number of Holes 1
Total Footage 50
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2176

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
17	112	0		X	Fractured rock dirt mix 2.8-4.8ft/min 0-20' clay dirt rock mix 4-8ft/min 20'-84'
					Red rock clay boulder mix 9ft/min 84'-112'
					Test holes
					North end y where top and bottom road meet new pit

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2177

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
18	112	9		X	Rock dirt mix 2-4.5ft/min 9'-54' red rock dirt 7ft/min 54'-73' rock clay mix 73'-112'
					Test holes
					New pit bottom road north of y just before heading down hill toward river.

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/12/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2178

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
19	100	4		X	Dirt grey rock 4'-64' dirt clay mix 64'-80' tan rock mix 80'-100'

Number of Holes 1
Total Footage 100
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2179

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
20	112	0		X	Broken rock dirt mix 2-3.5ft/min 0-10' grey rock light dirt mix 2-4ft/min 10'-41'
					Dirt fractured grey/red rock mix 8-10ft/ min 41'-59' clay dirt boulder mix 5-9ft/min 59'-100'
					Soft dirt boulder mix 8-12ft/min 100'-112'
					Test hole
					New property lower road just before y intersection with upper road north end

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2181

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 2 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
21	112	2		X	Fractured rock dirt mix 2.5-5ft/min 2'-103' tan rock dirt mix 6-9ft/min 103'-112'
					Test hole
					New property lower road north end 2nd hole south of y

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2182

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
22	96	4			Red rock clay dirt mix 8ft/min 4'-16' dirt rock mix 4-6ft/min 16'-84' clay 84'-96'
					Test hole
					New pit lower road next to west tree

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2183

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
23	92	5		X	Fill 5' grey rock dirt mix 1.3-3ft/min 5'-32' Dirt seam 11'-15' fractured rock dirt mix 4-6ft/min
					Clay boulder mix 59'-92
					Test hole
					New pit lower road close to wash on east side of mountain

Number of Holes 1
Total Footage 92
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2184

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
24	96	5		X	Dirt/clay 5' fractured rock dirt clay mix 4-6ft/min 5'-65' clay boulder mix 6-10ft/min 65'-96'
					Boulder 88'-92'
					Test hole
					New pit bottom road midway point

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2185

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
25	112	3		X	3' fill soft tan rock clay mix 8ft/min 3'-16' grey rock dirt mix 2-4ft/min 16'-37'
					Clay 37'-42' tan rock mix 3-4.6ft/min 42'-87' clay boulder mix 4-7ft/min87'-112'
					Test hole
					Lower road south end near hole to east

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2186

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
26	105	6		X	Fill/dirt 6' clay dirt boulder mix 5-8ft/min 6'-92' dirt clay mix 92'-105'

Number of Holes 1
Total Footage 105
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2187

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
27	112	4			Dirt rock mix 4.5-7ft/min 4'- 80' clay 80'-96' dirt boulder mix 4-6ft/min 96'-112'
					Clay seam 107'-112'
					Test hole
					New pit lower bench south end almost to old pit

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/13/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2188

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
28	90	7		X	Light tan rock boulder clay mix 6-9ft/min 7'-90' Boulders every 5-8ft about 3-5ft in size
					Test hole
					New pit lower road near lone small tree to west

Number of Holes 1
Total Footage 90
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/14/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2189

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
29	112	3		X	Grey rock dirt mix 1.5-3ft/min 3'-34' clay red rock mix 5-7ft/min 34'-42'
					Dirt tan rock mix 3.5-7ft/min 42'-80' dirt soft 12ft/min 80'-112'
					Test hole
					New pit north end y heading east entrance

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/14/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2191

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1.5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
30	112	4		X	Dirt clay boulder mix 4-9ft/min 4'-87" boulder 87-92' tan rock clay dirt mix 6-9ft/min 92'-112
					Test hole
					New pit north road midway to corner

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/14/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2192

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
31	112	2		X	Grey rock dirt mix 2-4.5 2'-77' dirt tan rock 5-7ft/min 77'-80'
					Grey rock dirt mix 1.2-2..5ft/min 80'-102' soft tan grey rock dirt mix 5-9ft/min 102'-112'
					Test hole
					New pit farthest north top of hill next to intersection

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/14/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2193

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
32	112	3		X	Tan rock clay dirt mix 6.5-8ft/min 3'-112
					Test hole
					New pit middle road north end

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/14/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2193

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
33	112	3		X	Dirt tan rock boulder mix 6-8ft/min 3'-96' grey rock dirt mix 2-4ft/min 96'-112'
					Test hole
					New pit middle road north end knob

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/14/2020 Job Name Hat Creek Ward Lake 161-330 Driller Brandon Longe

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2195

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 2.5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
34	112	1		X	Dirt clay boulder mix 6-9ft/min 1'-23' broken rock clay mix 2.8-5ft/min 23'-67'
					Red tan rock boulder mix6-7ft/min 67'-100' red rock 4-6ft/min 100'-112'
					Test hole
					New property middle road on ridge north end

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/17/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2197.5

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
35	112	5		X	Brown rock 1.7-3.2ft/min 6'-34' soft tan 4ft/min 34'-50' brown rock 2.2-3.4ft/min 50'-63'
					Soft tan 4.5ft/min 63'-112'
					New land north of primary south lower road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/17/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2198.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
36	112	3		X	Rock clay mix 4ft/min 3'-17' soft tan 5ft/min 17'-78' brown rock 2.2-3.1ft/min 78'-
					North primary south on lower road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/17/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2199

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
37	112	4		X	Brown rock 2.3-3.7ft/min 4'-40' soft brown 4-6.5ft/min 40'-80ft/min brown rock 1.9-3.4ft/min
					80'-112'
					North primary last hole lower road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/17/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2200.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 2 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
38	112	5		X	Rock clay mix 3-5ft/min 5'-22' soft brown 6ft/min 22'-112'
					New land upper road last hole to the south

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/17/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2201.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1.25 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
39	112	4		X	Clay rock mix 3.5ft/min 4'-20' brown rock gray boulder mix 2.8-4.8ft/min 20'-112'
					New land upper road south side

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/17/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2202.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
40	112	3		X	Clay 3ft/min 3'-15' soft brown rock 4-6ft/min 15'-47' brown rock w/ gray 1.5-3.7ft/min
					47'-101' soft brown 4-6ft/min 101'-112'

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/17/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill D65-151 Hour Meter 2203.6

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1.25 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
41	112	0		X	Brown rock 2.3-4.7ft/min 0'-37' soft clumpy brown 37'-46' brown rock 3.4-4ft/min 46'-80'
					Hard gray rock 1.2-2.4 ft/min 80'-112'
					New land upper road south side

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/18/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2206

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
42	112	4		X	Brown rock w/ gray boulders 1.7-3.5ft/min 4'-59' soft brown rock 5ft/min 59'-66' clumpy brov
					New land south side upper road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/18/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2207

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
43	112	7		X	Rock clay mix 3.7ft/min 7'-19' brown rock w/ gray boulders2.6-3.5ft/min 19'-112'
					New land middle upper road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/18/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2208

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
44	112	0		X	Brown rock w/ gray boulders 1.8-5.5ft/min 0-45' rock clay mix 45'-88' brown rock 2-3.5ft/mir
					88'-101' clay 101'-112'
					New land middle upper bench

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/18/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2209.2

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1.25 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
45	112	7		X	Gray rock 1.8-3.2ft/min 7'-61' brown rock 2.7-4.2ft/min 61'-112'
					New land middle upper road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/18/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2210.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1.5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
46	112	0		X	Gray rock .7-2.1ft/min 0-89' brown rock 2.3-3.1ft/min 89'-
					New land upper bench north side

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/18/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2211.5

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
47	112	12		X	Clay rock mix 2.5ft/min 12-39' brown rock w/ gray boulders 1.2-3.9ft/min 39'-55'
					Clay rock mix 2.7-4.5ft/min 55'-75' wet clay 75'-80'
					New land north upper road

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/19/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2215.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
48	112	4		X	Light brown 6ft/min 4'-31' brown rock 3.2-4.5ft/min 31'-52' soft brown boulder mix6ft/min
					52'-112'
					New land upper road east

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/19/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2216

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
49	60	0		X	Soft brown boulder mix 6ft/min 0-21' rock clay mix 1ft/min 21'-60'
					New land east upper road

Number of Holes 1
Total Footage 60
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/19/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2216.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
50	60	0		X	Soft brown boulder mix 2.2-5.7ft/min 0-49' clay rock mix 1.3-2.4ft/min 49'-60'

Number of Holes 1
Total Footage 60
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/19/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2217.5

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
51	48	48		X	Dirt and boulders
					New land road northwest towards river

Number of Holes 1
Total Footage 48
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/19/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2218.2

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
52	112	21		X	Soft brown rock clay mix 5.2-7.1ft/min 21'-112'
					New land northwest road towards river

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/19/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2219

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
53	112	4		X	Brown rock w/ gray boulders 3.1-5ft/min 4'-20' gray rock .8-2.3ft/min 20'-80' brown rock
					2.1-3.2ft/min 80'-112'

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/19/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 6.75 Drill 65 Lite-152 Hour Meter 2220

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
54	112	3		X	Brown rock 3-4.5ft/min 3'-30' gray rock .7ft/min 30'-67' brown rock 2.7-4ft/min 67'-112'
					New land northwest road towards river

Number of Holes 1
Total Footage 112
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2225

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
55	96	13		X	Brown rock w/ gray boulders 2-4.7ft/min 13'-49' brown sandy rock 4.3-6.1ft/min 49'-96'
					New land lower road

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2225.5

Type: Hammer ☒ Rotary ☐ Drilling Hrs. 1 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
56	80	7		X	Brown sandy rock 2-4ft/min 7'-31' gray rock 2.1-5.2ft/min 31'-96'

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2227

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
57	96	0		X	Brown rock with gray boulders 3.1-4.8ft/min 0-96ft

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2227.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
58	96	7		X	Soft brown rock w/ gray boulders 5.8-8.2ft/min 7'-76' brown rock 2.9-5ft/min 76'-96'
					New land horseshoe road

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2228

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
59	96	0		X	Brown rock w/ gray boulders 4.3-6.1ft/min 0'-66' brown clay 66'-71' brown rock
					4.1-6.3ft/min 71'-96'
					New land horseshoe road

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2228.6

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
60	96	5		X	Gray rock 3.5ft/min 5'-55'' brown rock 2.1-5.2ft/min 55'-64' gray rock 2.7-3.8ft/min 64'-78'
					Super soft brown 7-11ft/min 78'-96'
					New land horseshoe road

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2229.1

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
61	96	0		X	Brown/gray rock 2.7-5ft/min 0-43' clay 43'-59' brown rock w/gray boulders 3.5-6.4ft/min
					59'-73' super soft brown 9ft/min 73'-96'
					New land horseshoe road

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2229.6

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
62	96	0		X	Soft brown 6.5-11ft/min 0-96'
					New land horseshoe road

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill D65-151 Hour Meter 2230.2

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
63	96	41		X	Soft brown 7ft/min 41'-96'
					New land northeast road

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/20/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2230.9

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
64	96	0		X	Gray/brown rock 3.5-5ft/min 0-96'
					New land northeast road

Number of Holes 1
Total Footage 96
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2232.8

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
65	80	4		X	Fractured gray rock 3-5ft/min 4'-31' brown rock w/clay 4.4-6.7ft/min 31'-80'
					New land lowest road

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2233.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
66	80	7		X	Gray rock 3.2-4ft/min 7'-27' soft brown w/ boulders 3.4-8ft/min 27'-80'
					New land lowest road

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2234

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
67	80	5			Wet brown clay 5'-39' soft brown with gray boulders 7-12ft/min 39'-54' wet clay 54'-80'

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2234.6

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
68	80	12		X	Soft brown w/ brown boulders 5.7-7.6ft/min 12'-72' red 12ft/min 72'-80'
					New land lowest road

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2235.8

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
69	60	0		X	Soft brown w/ boulders7ft-9ft/min 0-60'
					New land floor

Number of Holes 1
Total Footage 60
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2236

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .25 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
70	60	60		X	Dirt

Number of Holes 1
Total Footage 60
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2236.3

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .25 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
71	60	60		X	Dirt w/ boulders 12ft/min 0-60'

Number of Holes 1
Total Footage 60
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 00 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2236.7

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
72	60	60		X	Dirt
					New land floor

Number of Holes 1
Total Footage 60
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/21/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2237.2

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
73	40	40		X	Dirt w/ dark brown clay couldn't drill deeper
					New land floor

Number of Holes 1
Total Footage 40
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2238.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
74	64	41		X	Soft brown 11ft/min 41'-64'
					West side new land

Number of Holes 1
Total Footage 64
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2238.8

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .25 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
75	64	21		X	Gray rock 3.1-4.4ft/min 21'-38' soft brown rock 6-9ft/min 38'-40' reddish brown 7-12ft/min
					40'-64'
					West side new land

Number of Holes 1
Total Footage 64
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 0 Drill 65 Lite-152 Hour Meter 2239

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .25 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
76	65	10		X	Soft brown w/ gray boulder 5-8ft/min 10'-64'
					New land west side

Number of Holes 1
Total Footage 65
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2239.6

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
77	64	8			Powdery gray rock 3.5-4.9ft/min 8'-21' brown rock 4-5.2ft/min 21'-37' soft reddish brown
					6.8-8.9ft/min 37'-64'
					New land west side

Number of Holes 1
Total Footage 64
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2240.3

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
78	64	0		X	Soft brown w/ boulder 7ft/min 0-54' reddish brown 9ft/min 54'-64'

Number of Holes 1
Total Footage 64
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2240.7

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
79	64	0		X	Soft brown w/ boulders 5.9-7.8ft/min 0-30' brown rock w/ clay 3.7-6ft/min 30'-80'
					West side lower road

Number of Holes 1
Total Footage 64
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2241.2

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
80	80	5		X	Fractured Brown rock w/ clay 4-6.3ft/min 5'-80'
					West side lower road

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2241.6

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
81	80	0		X	Brown rock 4.7-6.2ft/min 0-60' brown rock with clay 3.6-5.2ft/min 60'-80'
					Lower road west side

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2242

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
82	64	0		X	Soft brown7-9ft/min 0-64'
					Lower road west side

Number of Holes 1
Total Footage 64
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2243

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .75 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
83	80	0		X	Gray/brown rock 3.2-5.4 ft/min 0-55' soft brown 8ft/min 55'-80'
					New land north east road

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2243.4

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
84	60	0		X	Soft brown 8ft/min 0-35' sand 17ft/min 35'-60'
					New land northeast road

Number of Holes 1
Total Footage 60
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2244

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
85	64	0		X	Super soft brown 11-17ft/min 0-64'
					New land highest road

Number of Holes 1
Total Footage 64
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2244.3

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .25 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
86	64	0		X	Soft brown with gray boulders 5.9-7.6ft/min 0-64'
					New land highest road

Number of Holes 1
Total Footage 64
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2244.6

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
87	80	0		X	Soft brown with boulders 5.9-9.8ft/min 0-
					New land highest road

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2245.3

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
89	80	5		X	Soft brown w/ boulders 4.7-10ft/min 5'-80'
					New land highest road

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2245.3

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
89	80	5		X	Soft brown w/ boulders 4.7-10ft/min 5'-80'
					New land highest road

Number of Holes 1
Total Footage 80
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00

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Drill Log

Date 2/24/2020 Job Name Hat Creek Ward Lake 161-330 Driller Carter Nuckolls

Shot # 0 Burden 0 Spacing 0 Sub-Drill 0 Bit Size 5.5 Drill 65 Lite-152 Hour Meter 2245.7

Type: Hammer ☒ Rotary ☐ Drilling Hrs. .5 (*Drilling Hrs. = Pre-op, Drilling, Watering, Fueling, Post-op*)

Standby Hrs. _____ Standby Approved by _____ Hammer #_____ Chuck Tender Name _____ Hrs. _____

Hole	Depth	Overburden	Water in Hole		Comments – seams, voids, material change, soft, hard, etc.
			Yes	No	
90	50	10		X	Soft brown w/ clay 2.9-11.7ft/min 10'-41' wet brown clay 41'-50'
					New land highest road

Number of Holes 1
Total Footage 50
Total Yardage 00.00
Total Yardage Minus Sub-Drill 00.00