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April 15, 2015

Nichols Road Partners, LLC — Job No. 15082-8
P.O. Box 77850
Corona, California 92877
Attention: Mr. Todd Pendergrass

Dear Mr. Pendergrass:

Attached herewith is the Report of Slope Stability Investigation, prepared for the proposed expansion of Nichols Mine, located in Lake Elsinore, California.

We appreciate this opportunity to provide geotechnical services for this project. If you have questions or comments concerning this report, please contact us at your convenience.

Respectfully submitted,
CHJ CONSULTANTS

Jay J. Martin, E.G.
Vice President

JJM:lb

Distribution: Nichols Road Partners, LLC (2)

REPORT OF SLOPE STABILITY INVESTIGATION
PROPOSED NICHOLS MINE EXPANSION
LAKE ELSINORE, CALIFORNIA
PREPARED FOR
NICHOLS ROAD PARTNERS, LLC
JOB NO. 15082-8

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April 15, 2015

Nichols Road Partners, LLC
P.O. Box 77850
Corona, California 92877
Attention: Mr. Todd Pendergrass

Job No. 15082-8

Dear Mr. Pendergrass:

Attached herewith is the Report of Slope Stability Investigation, prepared for the proposed Nichols Mine expansion, located east of Interstate 15 at Nichols Road in Lake Elsinore, California.

This report was based upon a scope of services generally outlined in our proposal dated February 3, 2015, and other written and verbal communications.

We appreciate this opportunity to provide geotechnical services for this project. If you have questions or comments concerning this report, please contact us at your convenience.

Respectfully submitted,
CHJ CONSULTANTS

Jay J. Martin, E.G.
Vice President

JJM:lb

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PROPOSED NICHOLS MINE EXPANSION
LAKE ELSINORE, CALIFORNIA
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INTRODUCTION

During March of 2015, this firm conducted field investigation, laboratory testing and slope stability analysis for the proposed Nichols Mine expansion project. The purposes of this study were to explore and evaluate the engineering geologic conditions at the subject mine and to provide slope stability analysis for the mining and reclamation plan.

To orient our investigation, documents and maps were provided for our use. These include the following:

- Amended Reclamation Plan dated April 10, 2015
- Report of Preliminary Rock Slope Stability Evaluation, Nichols Road Partners, Existing Quarry North of Nichols Road, East of Interstate 15, City of Lake Elsinore, Riverside County, California, by Hilltop Geotechnical, Inc., dated March 3, 2014

The approximate location of the site is shown on the attached Index Map (Enclosure A-1). A copy of the Amended Reclamation Plan prepared by Nichols Road Partner LLC is included as Enclosure A-2.

The results of our investigation, together with our conclusions and recommendations, are presented in this report.

SCOPE OF SERVICES

The scope of services provided during this investigation included the following:

- Review of published and unpublished literature and maps including geologic mapping by Weber (1977), Morton and Weber (2003) and Morton and Miller (2006)
- Examination of aerial imagery dated 1949, 1962, 1974, 1984, 1990, 1994, 1995, 2000, 2002, 2004, 2005, 2006, 2009, 2010, 2011, 2012, 2013 and 2014
- Examination of the Amended Reclamation Plan
- Review of studies by prior consultants
- Structural geologic mapping of the quarry area
- Geologic (kinematic) evaluation of the proposed rock slopes
- Slope stability calculations (limit equilibrium) for the proposed slopes under static and seismic conditions
- Evaluation of potential geologic hazards to the project including seismic shaking hazard

PROJECT CONSIDERATIONS

This study was performed to evaluate the geotechnical slope stability of proposed mine slopes in an expansion area generally east of existing mining. According to the amended reclamation plan dated April 10, 2015, the proposed expansion will add approximately 26 acres to the existing Nichols Mine. The expansion is located on the east side of the existing mine and will entail creation of new southwest-facing reclaimed slopes of up to approximately 440 feet high. Slope benching is proposed at 25-foot-wide with 25-foot-high inter-bench verticals (faces), resulting in an overall slope ratio of 1 horizontal to 1 vertical (45 degrees). Inclusion of service benches in the taller slopes will result in overall slope angles flatter than 45 degrees.

SITE DESCRIPTION

The site is located east of Interstate 15 and north of Nichols Road in the city of Lake Elsinore, Riverside County, California. Access to the site is from Nichols Road. The site includes approximately 58 acres of mine area and 22 acres of proposed expansion area. The expansion area is generally undeveloped hillside land formed in bedrock terrain that includes surface outcrops. The expansion area is dissected by a southwest-trending ravine and smaller drainages to the southeast. Undeveloped land is located to the north and residential developments are located to the east and southeast. Previously disturbed mine area occupies the area west of the proposed expansion. A moderate to sparse growth of shrubs and annual grasses covers the site. Photograph nos. 7 and 8 (Appendix D) show the southeast portion of the expansion area and a site overview, respectively.

Site relief rises from southwest to northeast and is formed in a crystalline bedrock unit of the Perris Structural Block. Natural slopes generally slope at angles less than 30 degrees; however locally steeper slopes are present in drainages and within and near bedrock outcrops. Perris Block basement includes Cretaceous intrusive tonalite, mixed volcanics/sedimentary, and metamorphic rocks and Mesozoic metasedimentary and metamorphic rocks in the site region (Enclosure A-3). The area of the proposed expansion is mapped as tonalite by Morton and Weber (2003). Surface water was not present in canyon bottoms at the time of our site examinations.

Examination of aerial imagery indicates the site was undeveloped from 1949 until mining began between June 2006 and June 2009 with excavations along the upper portion of the existing top of slope. Since 2009, mining has created a series of progressively lower benches with associated high walls. Evidence for landslides was not observed in the aerial imagery examined. Two linear features suggesting large-scale geologic structures are visible in multiple imagery years. These consist of:

- L-1: A north-south trending tonal, topographic and vegetational lineament trending toward the existing uppermost highwall.

- L-2: A west-northwest trending weak tonal lineament traversing the south-facing expansion area slope. L-2 corresponds approximately with the contact between tonalite (Kgh) and Bedford Canyon metasediments (Jbc).

L-1 is a well-defined feature that extends approximately 1/2 mile north from the site. L-2 is a weaker feature visible in only some imagery years. Lineaments are indicated on the Geologic Map and Site Plan.

The proposed site configuration, including existing and proposed disturbance limits and top-of-slope, is depicted on Enclosure A-2.

PREVIOUS INVESTIGATIONS

A preliminary report of rock slope stability evaluation was conducted by Hilltop Geotechnical (Hilltop) for Chandler Aggregates in March 2014. Hilltop reported the following:

- Generally hard rock consisting of hypabyssal tonalite with small areas of more weathered, soft granodiorite in the eastern portion of the existing mine

- Colluvial sediments deposited along and near the base of existing slopes

- No surface water, shallow groundwater or water-bearing sediments

- Ground shaking as the primary seismic hazard to the site

- Factors of safety exceeding the required static and pseudostatic values for slope in the eastern site area based on assumed values of friction angle and cohesion tonalite

The report by Hilltop is based on mapping of surface exposures and did not include subsurface explorations or laboratory testing of rock samples.

FIELD INVESTIGATION

A certified engineering geologist conducted geologic mapping of the site on March 9, 2015. Geologic structure, including foliation, joint and fault orientations, was measured using a Brunton compass and clinometer. Structural mapping on site included rock face exposures at the east end of the quarry and in situ boulder outcrops in undeveloped portions of the proposed expansion area. The site was covered by grass and mantled by a weathered profile that includes thin soil accumulations. Field mapping focused on geologic contacts and rock fabric in proposed slope areas and on features that might affect kinematic stability of local slope faces.

Structural data were collected, recorded and utilized in stereonet software (Rocscience, 2013) analysis of kinematic (geometric) stability. These data are summarized in Appendix B. A Geologic Map and Site Plan indicating proposed mine slopes is provided as Enclosure A-2.

SITE GEOLOGY

The site is situated in an uplifted and dissected bedrock terrain in the Peninsular Ranges geomorphic province. The Peninsular Ranges include plutonic and metamorphic crystalline rocks of Cretaceous and older age. The crystalline basement rocks are locally mantled by colluvial soils and older sediments. Geologic units in the site area include metasedimentary and metavolcanic rocks coeval with the plutonic rocks of the Peninsular Ranges batholith, intrusive granitics and older alluvial fan sediments mantling uplifted flats. Ground photographs of the site and selected features are included in Appendix E.

GEOLOGIC UNITS:

As mapped by Weber (1977), Morton and Weber (2003) and Morton and Miller (2006), the site is underlain by crystalline bedrock units including metavolcanics/metasedimentary and intrusive tonalite. The nomenclature of these units varies by author and date of mapping. The bedrock is mantled by a soil residuum derived from weathering and alteration of bedrock material on flats, accumulation of colluvium on slopes, and deposition of alluvium in drainages. The units designated for this investigation are described below.

Fill (f)

Fill associated with the mine stockpiles and dirt roads is derived from local materials including surface soil and bedrock. Fill materials are considered undocumented and unsuitable for support of permanent engineered improvements. The fill is not significant to this reclamation project and was not included on the geologic map.

Young Alluvial Fan Deposits (Qyf

Young alluvial fan deposits consisting of sand, silt and gravel, including small boulders and cobbles, are present across the flat in the southern portion of the mine property. These sediments are unconsolidated.

Hypabyssal Tonalite (Kgh)

Massive, hypabyssal-textured tonalite and lesser granodiorite comprise the resource rock of the quarry and form the majority of outcrops within the site. The tonalite is light to medium gray overall and contains phenocrysts about 1 mm in size of feldspathic composition. Hand samples reveal euhedral quartz and white feldspar crysts with a dark brown euhedral mafic component. Weathered surfaces are brown to yellow brown and appear pitted where the mafic component is weathered out. Outcrops generally exhibit spheroidal weathering, typical of granitics, and plumose or conchoidal fracture on unjointed surfaces. Soils formed on the tonalite are reddish brown and locally grussy. Photograph nos. 1 through 4 show the tonalite unit and associated structure.

Intermixed Estelle Mountain Volcanics and SedimentaryRocks (Ksv)

Intermixed volcanic and sedimentary rocks that include foliated and folded quartzite, schist, argillite and shale with colors varying from brown to black crop out in the northwest portion of the quarry area. This area lies outside the area of the proposed expansion and was not included in mapping for the current investigation.

Metasedimentary Rocks (Jbc)

Described as a wide variety of low -to high-metamorphic grade metamorphic rocks by Morton and Weber (2001), these rocks form poorly exposed outcrops in the southeastern portion of the expansion area. This unit is mapped as Bedford Canyon metasediments (Jb) by Weber (1977) and referred to herein as Bedford Canyon (Jbc). Jbc rocks are typically brown to dark gray in color with some whitish zones, exhibit foliation in outcrop, and erode to form a dark brown residual soil that contains abundant angular rock chips. The contact with the granitic (Kgh) unit is poorly exposed with most areas suggesting Kgh-derived, rounded terrace deposits resting on Jbc. The contact shown on Enclosure A-2 is based on field mapping of the most elevated occurrence of Jbc clasts as float on hill slopes adjacent to granitic outcrops and by examination of color aerial imagery dated 2010 that reveals a sub-linear tonal contact. It appears that some granitic (Kgh) outcrops on the lower slopes are boulders that have rolled down onto the Jbc surface—giving the appearance of original location. Photograph nos. 5 and 6 show the Jbc unit in outcrop and as resistant boulders, respectively.

An outcrop labeled Mzu is mapped by Morton and Weber (2001) south of Nichols Road and appears to be the same unit as Jbc on site. The Jbc unit is not defined in previous mapping north of Nichols Road; therefore, our field observation of its occurrence in the southeast portion of the site is the first documented.

GEOLOGIC STRUCTURE:

The tonalite unit (Kgh) exhibits a west-tilted columnar fabric formed by subparallel east to northeast dipping joints. Very steep to vertical mine slope exposures do not indicate topple features associated with this fabric; therefore, excavation and scaling operations appear to mitigate the potential for topple failure. West-dipping joints of moderate continuity were observed in quarry and native outcrop exposures. These features form daylighted faces in quarry cuts. Field observation of the area at the south end of lineament L-1 revealed a broad bench-like landform in the Kgh unit. Similar features are present in the native slopes above the mine and are interpreted to be the expression of preferential weathering along north-south oriented, steeply dipping joints.

Bedford Canyon metasediments (Jbc) are closely fractured and exhibit a northeast-dipping foliation. Bedford Canyon rocks form few outcrops and are typically mantled with colluvium that includes abundant tonalite clasts. Careful examination of surface float for Jbc "chips" can reveal the extent of the Jbc unit beneath the colluvial cover. Lineament L-2 corresponds approximately with the contact between the tonalite (Kgh) and Bedford Canyon metasediments (Jbc). We estimate a steeply east-dipping contact between the Kgh and Jbc units based on poorly-exposed outcrop relations.

FAULTING AND SEISMICITY

Regional seismic sources and historic earthquakes were assessed to determine ground motion conditions for evaluation of potential seismic effects on stability of proposed finished slopes. We calculated deterministic peak ground accelerations for the regional seismic sources. These data are presented in the following sections:

REGIONAL FAULTS:

The tectonics of Southern California are dominated by the interaction of the North American and Pacific tectonic plates, which slide past each other in transform motion. Although some motion may be accommodated by rotation of crustal blocks such as the western Transverse Ranges (Dickinson, 1996), the San Andreas fault zone is the major surface expression of the tectonic boundary and accommodates most transform slip between the Pacific and North American Plates. Some slip is accommodated by other northwest-trending strike-slip faults related to the San Andreas system, such as the San Jacinto and the Elsinore faults. Local compressional or extensional strain resulting from the transform motion along this boundary is accommodated by left-lateral, normal, and reverse faults such as the Cucamonga fault.

Elsinore Fault Zone

The Glen Ivy North segment of the Elsinore fault zone is the nearest major active fault, about 1.8 miles southwest of the site. The Elsinore fault zone is typified by multiple en echelon and diverging faults. To the north, it splays into the Whittier and Chino faults. The Elsinore is primarily a strike-slip fault zone; however, transtentional features such as the graben of the Elsinore and Temecula Valleys also occur. Most Elsinore fault traces are demonstrably active (Holocene) as documented by Saul (1978), Rockwell and others (1986), and Wills (1988).

The southern segment of the northwest-trending Chino-Central Avenue fault, a northern splay of the Elsinore fault zone, is approximately 22 miles northwest of the site and is assigned a 6.8 magnitude by Petersen and others (2008).

The west- to northwest-trending Whittier fault is approximately 23 miles northwest of the site. The Whittier fault exhibits almost pure right-lateral strike slip (Rockwell and others, 1986). Evidence for activity includes offset of Holocene sediments (Hannan and Lung, 1979) and historic microseismicity (Yerkes, 1985). The Working Group on California Earthquake Probabilities (1995) tentatively assigned a 5 percent probability of a major earthquake on the Whittier fault for the 30-year interval from 1994 to 2024.

San Jacinto Fault Zone

The San Jacinto fault zone is a system of northwest-trending, right-lateral, strike-slip faults. The San Jacinto Valley segment is approximately 18-1/2 miles northeast of the site. More large historic earthquakes have occurred on the San Jacinto fault than any other fault in Southern California (Working Group on California Earthquake Probabilities, 1988).

Based on the data of Matti and others (1992), a portion of the San Jacinto fault may accommodate most of the slip between the Pacific and the North American Plates. Matti and others (1992) suggest this motion is transferred to the San Andreas fault in the Cajon Pass region by "stepping over" to parallel fault strands that include the Glen Helen fault.

San Andreas Fault Zone

The San Andreas fault zone is located along the southwest margin of the San Bernardino Mountains, approximately 30 miles north-northeast of the site. The mountain front in the San Bernardino area approximately marks the active trace of the San Andreas fault, here characterized by youthful fault scarps, vegetation lineaments, springs and offset drainages. The Working Group on California Earthquake Probabilities (1995) tentatively assigned a 28 percent probability to a major earthquake occurring on the San Bernardino Mountains segment of the San Andreas fault between 1994 and 2024.

Blind Thrust Faults

The San Joaquin Hills Thrust (SJHT) fault is an inferred blind thrust beneath the San Joaquin Hills in coastal Orange County, southern California. The vertical surface projection of the San Joaquin Hills blind thrust is approximately 26 miles west-southwest of the site. The SJHT is southwest dipping and presumably gave rise to uplift of the San Joaquin Hills. Measurement of uplifted back-bay shorelines and fossil dating suggests an uplift rate of 0.24 meter per 1,000 years and an average earthquake recurrence of 2,500 years on the SJHT (Grant and others, 1999). The SJHT has a postulated potential to produce earthquakes with magnitudes up to Mw 7.3. A latest large event may have occurred in 1769 A.D. based on radiocarbon dating of uplifted marsh sediments (Grant and others, 2002).

The Puente Hills Blind-Thrust (PHBT) is a system of buried thrust fault ramps that extend from beneath Los Angeles to the Puente Hills of eastern Los Angeles County and Orange County. The PHBT is identified in the subsurface by seismic reflection profiles, petroleum well data and precisely located seismicity and at the surface by a series of contractional folds. Fault segments of the PHBT are the Los Angeles, Santa Fe Springs and Coyote Hills (Shaw and Shearer, 1999). This buried fault system is capable of producing estimated earthquakes of Mw 6.5 to 6.6 on individual segments or an Mw 7.1 earthquake as a group (Shaw and others, 2002). A study utilizing borehole data collected from sediments overlying the central segment of the PHBT indicates that subtle folding locally extends to the near surface and that four fault slip events occurred in the past 11,000 years (Dolan and others, 2003).

LOCAL FAULTS:

No active faults were identified within the site area during our review of published and unpublished literature and maps, stereoscopic aerial photographs or field mapping. Accordingly, ground fault rupture in the quarry area is not anticipated.

Weber (1977) mapped a postulated north-west trending fault at the contact between bedrock and alluvium along the base of site slopes. Examination of exposures along this trend did not indicate a fault at the mapped location. The occurrence of the Mzu unit north and south of Nichols Road suggests continuity (unfaulted) bedrock. The potential for fault rupture within the quarry is considered low.

REGIONAL SEISMICITY:

A map of recorded earthquake epicenters is included as Enclosure A-4 (Epi Software, 2000). The epicenters and magnitudes are based on data from the California Institute of Technology - Southern California Earthquake Data Center catalog. This enclosure presents circles as epicenters of earthquakes with magnitude equal to or greater than magnitude 4.0 recorded from 1932 through 2012.

From a ground shaking standpoint the most significant fault for the site is the Elsinore, about 1.8 miles to the southwest. The potential for ground shaking generated by the Elsinore Fault and other regional faults is discussed in a following section.

GROUND-SHAKING HAZARD

The ground shaking hazard at the site was evaluated from a deterministic standpoint for use as a guide to formulate an appropriate seismic coefficient for use in slope stability analyses.

A deterministic evaluation of seismic hazard was performed for the Elsinore fault and other regional faults using the attenuation relations of Boore and Atkinson (2008), Campbell and Bozorgnia (2008) and Chiou and Youngs (2008). These data are summarized in the following table.

Table 1: Summary of Regional Seismic Sources

Fault (segments)	Magnitude	Distance (km)	Peak Ground Acceleration (g)
Elsinore (W+GI)	7.3	2.9	0.48
San Jacinto (SBV+SJV)	7.4	30	0.16
San Andreas (SM+NSB+SSB)	7.6	48	0.12
San Joaquin Hills	7.1	42	0.11
Puente Hills	7.1	53	0.09

W=Whittier, GI=Glen Ivy, SBV=San Bernardino Valley, SJV=San Jacinto Valley, SM=South Mojave, NSB=North San Bernardino, SSB=South San Bernardino

We utilized Kh = 0.2 to model the psuedostatic condition for slope stability calculations, consistent with conservative application of methods described by Seed (1979). Seed (1979) considered the size of the sliding mass and earthquake magnitude in selection of Kh. For large slopes, Seed suggested Kh = 0.15 for sites near faults capable of generating magnitude 8.5 earthquakes. The closest fault to the site, the Elsinore fault, is assigned a characteristic magnitude of 7.3 for the Whittier and Glen Ivy segments. Based on the method of Seed (1979) and the seismic setting of the site, our selection of Kh = 0.20 is conservative and appropriate for evaluation of existing site slopes.

GROUNDWATER

The site is located in Section 25 of Township 5 South, Range 5 West northeast of the Elsinore Groundwater Basin (DWR, 2006). The nearest water well is approximately 1.8 miles south of the site and is situated in valley sediments. The proposed expansion area is underlain at shallow depth by crystalline bedrock that does not form a groundwater table. We observed no seepage, springs or other evidence for a groundwater table within the quarry boundary during geologic mapping.

Based on the presence of non-liquefiable bedrock, the potential for liquefaction and other shallow groundwater-related hazards within the expansion area is considered to be very low. The quarry bottom may be exposed to periodic ponding of surface water after locally heavy precipitation. However, such ponding is anticipated to be shallow and short-lived—lasting only as long as evaporation/infiltration occurs; therefore, this transient water is not considered in slope stability calculations. Groundwater is not anticipated to significantly affect the stability of the proposed slopes; therefore, our evaluation considered dry conditions in the slope stability calculations.

SLOPE STABILITY

The term "landslide", as used in this report, refers to deep-seated slope failures that involve mine pit-scale features that have the potential to reduce the long-term stability of finished quarry reclamation slopes. Landslides in rock are typically related to structure in the parent material. Surficial failures refer to shallow failures that affect limited inter-bench zones and may result in localized raveling of rock material. No evidence for existing deep-seated landslides with the potential to affect the mine slopes was observed during our site reconnaissance or on the aerial photographs examined.

Surficial failures, typically involving the soil mantle, were observed locally in steeper canyon slopes as soil/debris flows. These surficial failures are considered a slope management/maintenance issue where located in the area of improvements and can be mitigated with the proposed grading and drainage improvements.

The susceptibility of a geologic unit to landsliding is dependent upon various factors, primarily: 1) the presence and orientation of weak structures, such as fractures, faults or clay beds; 2) the height and steepness of the natural or cut slope; 3) the presence and quantity of groundwater and 4) the occurrence of strong seismic shaking. Primary influences on the stability of final mine slopes is anticipated to be interaction between slope geometry and geologic structure including joints, foliation and bedrock contacts.

GEOLOGIC STRUCTURE:

Geologic mapping included measurement of the orientation of bedrock structures (discontinuities) in outcrop exposures during field mapping. The orientations of discontinuities were recorded in tabular format (Appendix B - Table B-1). Structural data were grouped according to the anticipated area of influence for proposed slopes.

Bedrock discontinuities consist of steeply- and moderately-dipping joints. Unit contacts consist of indistinct zones between Kgh and Jbc units. Flat-lying contacts are defined where colluvium and alluvium rest on the various bedrock units. The interface between the soil mantle and underlying parent bedrock unit is commonly inclined on drainage margins creating a potential for surficial debris flows. Based on these observations and the results of our investigation, deep-seated landsliding is not anticipated in the proposed slopes. Further analyses of the proposed slopes are presented in the following section as kinematic analysis and slope stability calculations.

SLOPE STABILITY EVALUATION

We evaluated the kinematic (geometrically feasible failure modes) and global slope stability of the proposed slopes for representative material types. Structural data were plotted and evaluated using stereonet plotting software. Rock strength properties for global stability calculations were modeled using Hoek Brown criteria and the ultimate mining depths (highest slopes) anticipated in the mine. Discussion and summary of these analyses are presented below. Slope stability data and calculations are presented in Appendices B and C. Inclusion of service benches on portions of the taller slopes (not included in the slope profiles analyzed) will produce flatter (and more stable) overall slope angles.

KINEMATIC ANALYSIS:

Kinematic analysis involves the evaluation of geometrically feasible failure modes in bedrock based on the orientation of structural discontinuities including joints, faults, shear zones, bedding and foliation. Kinematic analysis does not consider mass or force as in a limit-equilibrium analysis. Structurally controlled kinematic failure modes include planar, wedge and topple failures. Topple potential was evident in the native slopes; therefore, kinematic analysis of this mode was included. Circular failure of highly fractured rock masses is considered in a global stability analysis.

Planar sliding requires a releasing surface—a joint or tension crack—to allow sliding to occur. Kinematic analysis does not consider the geometry of releasing surfaces or the presence of bonded contacts along the sliding plane; therefore actual conditions are typically more stable than indicated by kinematic results. The potential for sliding or wedge failure suggested by stereonet analysis should be considered a conservative estimate of probability subject to mitigation by mining practices such as scaling and adjustment of slope face angles to the geometry and conditions encountered during mining.

Stereonet analysis (Rocscience, 2013) for selected representative slope aspects was performed utilizing the data compiled from examination of geologic structures within the site (Appendix B - Table B-1). Rock slopes for the proposed configuration were evaluated for slope dip azimuths oriented at 220 and 202 degrees (southwest facing) representing the major proposed slope aspects. A slope face angle of 70 degrees and friction angle of 34 degrees were used based on the concept plan and allowance for raveling of vertical slopes to approximately 70 degrees, and estimate of the friction angle. Planar sliding analysis considers dip vectors of measured data points. Wedge sliding analysis generates dip vectors for the intersections of all data points; therefore, wedge analysis generates a larger number of vectors to evaluate. Topple analysis identifies the potential for columns to form slong steeply dipping joint systems and to tilt out of the excavated face on low-angle separation surfaces. The stereonet data plots are presented in Appendix C. Tables 2.1 and 2.2 summarize the results of kinematic evaluation.

Table 2.1: Summary of Kinematic Evaluation			
Aspect	**Percentage Critical Points**		**Project Area**
	Planar	**Wedge**	
220 (all)	11.7	22	Northwestern expansion
220 (set)	70	--	
202 (all)	15	26	Southeastern expansion
202 (set)	90	--	

Table 2.2: Summary of Kinematic Evaluation			
Aspect	**Percentage Critical Points**		**Project Area**
	Direct Toppling	**Oblique Toppling**	
220 (intersection)	7.9	5.5	Northwestern expansion
220 (base plane—all)	11.7	--	
220 (set 1)	70	--	
202 (intersection)	8.9	4.9	Southeastern expansion
202 (base plane—all)	16.7	--	
202 (set 1)	90	--	
202 (set 5)	25	--	

The stereonet evaluation provides results as a percentage of points in a data set with a geometrically feasible orientation to undergo a particular failure mode. In general, the percentage value relates to probability of a particular failure mode for planar or wedge sliding. Probabilities below 5 percent suggest low failure potential, 5 percent to 20 percent a low to moderate potential, and values above 20 percent a moderate or higher potential. The results of the kinematic evaluation for the proposed southwest-facing slopes suggest a low to moderate potential for planar failure and moderate to high potential for wedge failures to form in the maximum 70-degree slope faces. Flatter slope angles are expected to exhibit similar or lesser potential for sliding. Observations of existing quarry faces indicate that scaling of loose blocks during excavation provides a suitable mitigation of potential rock fall from planar or wedge structures. Inclusion of safety benches can also help to mitigate rockfall hazard. Scaling and inclusion of safety benches can effectively mitigate planar and wedge related rock fall in the final reclaimed slope face.

Toppling potential is geometrically more complex as it requires a low-angle sliding/detachment surface as a base for separation and a system of subparallel, steeply-dipping, column-forming joints that project up and out of the slope face. Field observations suggest a high potential for topple failure of columnar blocks in native outcrops. Native outcrops exhibit an abundance of southwest-leaning columns (Appendix D, Photograph nos. 2 and 4) within the expansion area formed by a system of steep, northeast dipping joints cut by low-angle, west- and southwest-dipping, planar joints (set 1). In existing quarry exposures, topple potential is removed/mitigated by scaling of loose blocks during excavation. Scaling and inclusion of safety benches will effectively mitigate topple-related rock fall in the final reclaimed slope face.

GLOBAL STABILITY CALCULATIONS:

The global stability of proposed slopes, as depicted on the Revised Reclamation Plan, was analyzed using Spencer's method under both static and seismic conditions for rotational and composite failure surfaces using the SLIDE computer program, version 6.032 (Rocscience, Inc., 2014). Selection of the slope configurations for the analysis of excavated slopes, which depicts the tallest anticipated continuous excavated slopes proposed, is based on a most-conservative analysis approach. The whole rock strength of the tonalite unit (Kgh) was determined in part by unconfined compressive strength tests using samples collected from the site. Whole rock strength of the Bedford Canyon unit is based on back calculation of strengths for Bedford Canyon rock material for a site located approximately 8 miles to the north.

Representative cross sections of the proposed rock slopes derived from the reclamation plan were modeled as follows:

- 480-foot-high 1:1 cut slope in Kgh (Section A)
- 110-foot-high 1:1 cut slope in Jbc/Kgh (Section B)

The seismic stability calculations were performed using a lateral pseudostatic coefficient "k" of 0.20, consistent with the seismic conditions of the site region. Groundwater was not considered in the global stability evaluation due to the lack of seepage or groundwater anticipated in the generally arid site environment.

Laboratory tests of rock samples collected from the site surface included unconfined compressive strength (UCS) and density. The test results are summarized below. The rock strength was modeled utilizing the Generalized Hoek-Brown criteria (Hoek, 2000 and Hoek, Carranza-Torres & Corkum, 2002) and the program's built-in parameter calculator with the following input values:

Table 3.1: Tonalite (Kgh) - Rock Strength Parameters

	Value	**Description**
Unit Weight (pcf*)	167	Measured
Intact UCS[1] (psf**)	2.67×10^6	Measured by UCS test
Geological Strength Index	45	Very blocky with fair surface conditions
Intact Rock Constant (mi***)	29	Granodiorite
Disturbance Factor	1	Production blasting

1 Uniaxial Compressive Strength test result
* pcf = pounds per cubic foot
** psf = pounds per square foot
*** mi = unitless constant

Table 3.2: Bedford Canyon (Jbc) - Strength Parameters		
	Value	**Description**
Unit Weight (pcf*)	162	Measured by laboratory testing
Intact UCS[1] (psf**)	3.96×10^5	Estimated by back-calculation
Geological Strength Index	40	Blocky/Disturbed/Seamy with fair surface conditions
Intact Rock Constant (mi***)	7	Phyllites
Disturbance Factor	1	Production blasting

[1] Uniaxial Compressive Strength test result
* pcf = pounds per cubic foot
** psf = pounds per square foot
*** mi = unitless constant

The results of the global slope stability analyses are summarized below in Table 4. Details of stability calculations including material type boundaries, strength parameters utilized and the minimum factor of safety and critical slip surface are included in Enclosures C-1.1 through C-3.2.

Table 4: Summary of Slope Stability Results			
Cross Section	**Slope Configuration**	**Static F.S.**	**Seismic F.S. (Kh=0.20)**
Section A	480-foot high 1:1 cut	2.51	1.86
Section B	110-foot high 1:1 cut	1.63	1.25

As indicated by calculation, sufficient static factors of safety in excess of 1.5 and seismic factors of safety in excess of 1.1 were indicated for the modeled proposed rock slope configurations and satisfy Office of Mine Reclamation (OMR) criteria and slope construction standards for building code compliant developments. The global rock slope configurations appear suitably stable for excavation/reclamation of the proposed slopes according to regulatory and building code requirements.

CONCLUSIONS

On the basis of our field investigation and slope stability analyses, it is the opinion of this firm that the proposed slope excavations and reclamation are feasible from geotechnical engineering and engineering geologic standpoints, provided the recommendations contained in this report are implemented during mining.

In general, it appears that the whole rock strength in the proposed slope areas is sufficient to accommodate the proposed overall slope angles.

Based on our analyses, the proposed overall approximate 45-degree mine and cut-slopes up to approximately 480 feet in height are suitably stable against gross failure for the anticipated long-term conditions, including the effects of seismic shaking.

Surficial soils are anticipated to be removed from slope areas during site development.

Subsequent to blasting of the final rock slope walls, excavation operations may include the use of a scaling chain or mechanical equipment to assist in removal of loose or precarious blocks during collection of the resource. Adherence to the slope benching plan and consideration of newly exposed adverse structural features, if discovered during future work, will result in stable slopes after completion of reclamation.

Evidence of active faulting was not observed on the site during this investigation. A postulated fault is mapped in the southeastern portion of the expansion area; however, no evidence of this feature was observed during field mapping, and outcrops suggest continuity across the trend of the mapped feature. The potential for liquefaction and other shallow groundwater hazards within the reclamation areas is considered to be low.

Moderate to severe seismic shaking of the site can be expected to occur during the lifetime of the proposed mining and reclamation. This potential has been considered in our analyses and evaluation of slope stability.

Raveling processes during and after quarry operation, with time, will result in deposition of talus on benches. Talus left on the benches can facilitate revegetation and lend a more natural appearance to the reclaimed slopes. It is anticipated that rock fragments will be angular and relatively resistant to rolling. Therefore, significant rockfall hazard is not anticipated for properly excavated and scaled rock slopes.

RECOMMENDATIONS

Annual slope inspection during excavation of rock slopes, consistent with State requirements, should be included in the development plan to address the potential for unknown or newly exposed discontinuities. Preparation of the final benched slope faces should include scaling to ensure removal of loose or potentially unstable blocks. If raveling or instability is evident, the bench width should be increased to provide a suitable buffer to daylighted or unstable features and a sufficient surface area to mitigate rockfall. Based on the dip angle of planar, wedge and topple structures identified in kinematic evaluation, it is anticipated that these features can be mitigated by the proposed benching scheme. Adjustments may be made to prevent daylighted slip planes or unstable wedges.

Overall final cut slopes in the rock materials should be no steeper than design angles up to the maximum proposed height. Contacts between geologic units may influence the geometry of finished slopes.

Unstable, rounded boulders on slopes steeper than approximately 1-1/2(h) to 1(v) should be removed or stabilized where accessible. Areas below loose rock, if left in place during mining, should be restricted from access and indicated by means of signage or fencing.

Finished slopes above areas proposed for development with commercial or residential uses should be carefully scaled of all loose blocks during excavation and include sufficient benching to mitigate potential rockfall. A v-ditch, dry moat or physical barrier (wall, fence) of sufficient strength/capacity to mitigate rockfall should be constructed along the base of slopes steeper than 1-1/2(h) to 1(v) in areas adjacent to commercial or residential development. Based on the proposed bench configuration for the slopes, a 25-foot wide fenced area at the base of the slope is expected to provide catchment for rockfall.

Geotechnical evaluation and design, management of mine bench geometry based on encountered conditions, or use of mechanical support systems can reduce or mitigate hazards in mining; however, monitoring of slope conditions for failure warning signs is the most important means for protecting mine workers (Girard and McHugh, 2000) as it can prevent exposure of personnel to potentially hazardous conditions. As is typical for any surface mining location, we recommend periodic observation of mine benches for indications of potential instability above working areas during mine operations.

Slopes should be protected with berms or drainage improvements as necessary to prevent slope erosion in the areas where natural slopes drain onto the reclaimed slopes.

LIMITATIONS

CHJ Consultants has striven to perform our services within the limits prescribed by our client, and in a manner consistent with the usual thoroughness and competence of reputable geotechnical engineers and engineering geologists practicing under similar circumstances. No other representation, express or implied, and no warranty or guarantee is included or intended by virtue of the services performed or reports, opinion, documents, or otherwise supplied.

This report reflects the testing conducted on the site as the site existed during the study, which is the subject of this report. However, changes in the conditions of a property can occur with the passage of time, due to natural processes or the works of man on this or adjacent properties. Changes in applicable or appropriate standards may also occur whether as a result of legislation, application, or the broadening of knowledge. Therefore, this report is indicative of only those conditions tested at the time of the subject study, and the findings of this report may be invalidated fully or partially by changes outside of the control of CHJ Consultants. This report is therefore subject to review and should not be relied upon after a period of one year.

The conclusions and recommendations in this report are based upon observations performed and data collected at separate locations, and interpolation between these locations, carried out for the project and the scope of services described. It is assumed and expected that the conditions between locations observed and/or sampled are similar to those encountered at the individual locations where observation and sampling was performed. However, conditions between these locations may vary significantly. Should conditions that appear different than those described herein be encountered in the field by the client, any firm performing services for the client or the client's assign, this firm should be contacted immediately in order that we might evaluate their effect.

If this report or portions thereof are provided to contractors or included in specifications, it should be understood by all parties that they are provided for information only and should be used as such.

The report and its contents resulting from this study are not intended or represented to be suitable for reuse on extensions or modifications of the project, or for use on any other project.

CLOSURE

We appreciate this opportunity to be of service and trust this report provides the information desired at this time. Should questions arise, please do not hesitate to contact this office.

Respectfully submitted,
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Riverside County Flood Control District, black and white aerial imagery dated January 20, 1984, photograph nos. 928 and 929.

Riverside County Flood Control District, black and white aerial imagery dated December 25, 1990, photograph nos. 12-14 and 12-15.

Riverside County Flood Control District, black and white aerial imagery dated January 30, 1995, photograph no. 12-14.

Riverside County Flood Control District, black and white aerial imagery dated March 18, 2000, photograph nos. 12-14 and 12-15.

Riverside County Flood Control District, black and white aerial imagery dated July 27, 2005, photograph nos. 12-12 and 12-13.

Riverside County Flood Control District, black and white aerial imagery dated March 29, 2010, photograph nos. 12-13 and 12-14.

APPENDIX A

MAPS

-N-

INDEX MAP

FOR: NICHOLS ROAD PARTNERS, LLC	SLOPE STABILITY INVESTIGATION PROPOSED NICHOLS MINE EXPANSION LAKE ELSINORE, CALIFORNIA	ENCLOSURE "A-1"
DATE: MARCH 2015		JOB NUMBER 15082-8

SCALE: 1" = 2000'

CHJ Consultants

GEOLOGIC UNITS:

Qyf - Young alluvial fan deposits (Holocene and late Pleistocene) and disturbed areas including resource stockpile, fill and roadway

Kgh - hypabyssal tonalite

Ksv - Intermixed Estelle Mountain volcanics of Herzig (1991) and Mesozoic sedimentary rocks (Mesozoic)

Jbc - Bedford Canyon Metasedimentary rocks, undifferentiated (Mesozoic)

Mzp - Phyllite (Mesozoic)-Fissile black phyllite

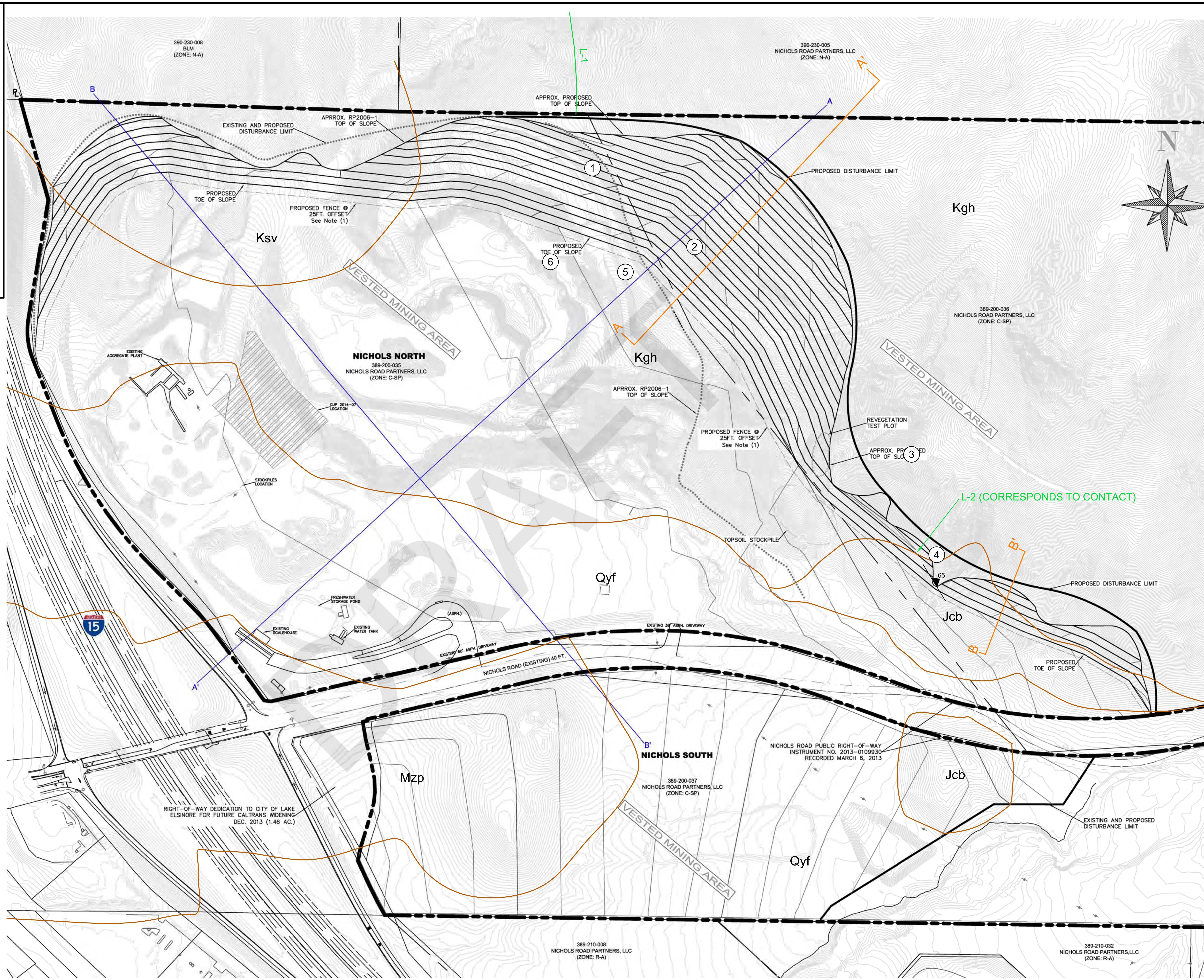
geologic contact

65 strike and dip of foliation

6 Mapping reference location

B B' Slope Stability Section

L-2 Aerial Photographic Lineament



N

SCALE: 1" = 200'

0 200 400

Base Map:

Amended Reclamation Plan
Lake Elsinore, Ca.
Nichols Road Partners, LLC
April 10, 2015

GEOLOGIC MAP AND SITE PLAN

FOR: NICHOLS ROAD PARTNERS, LLC

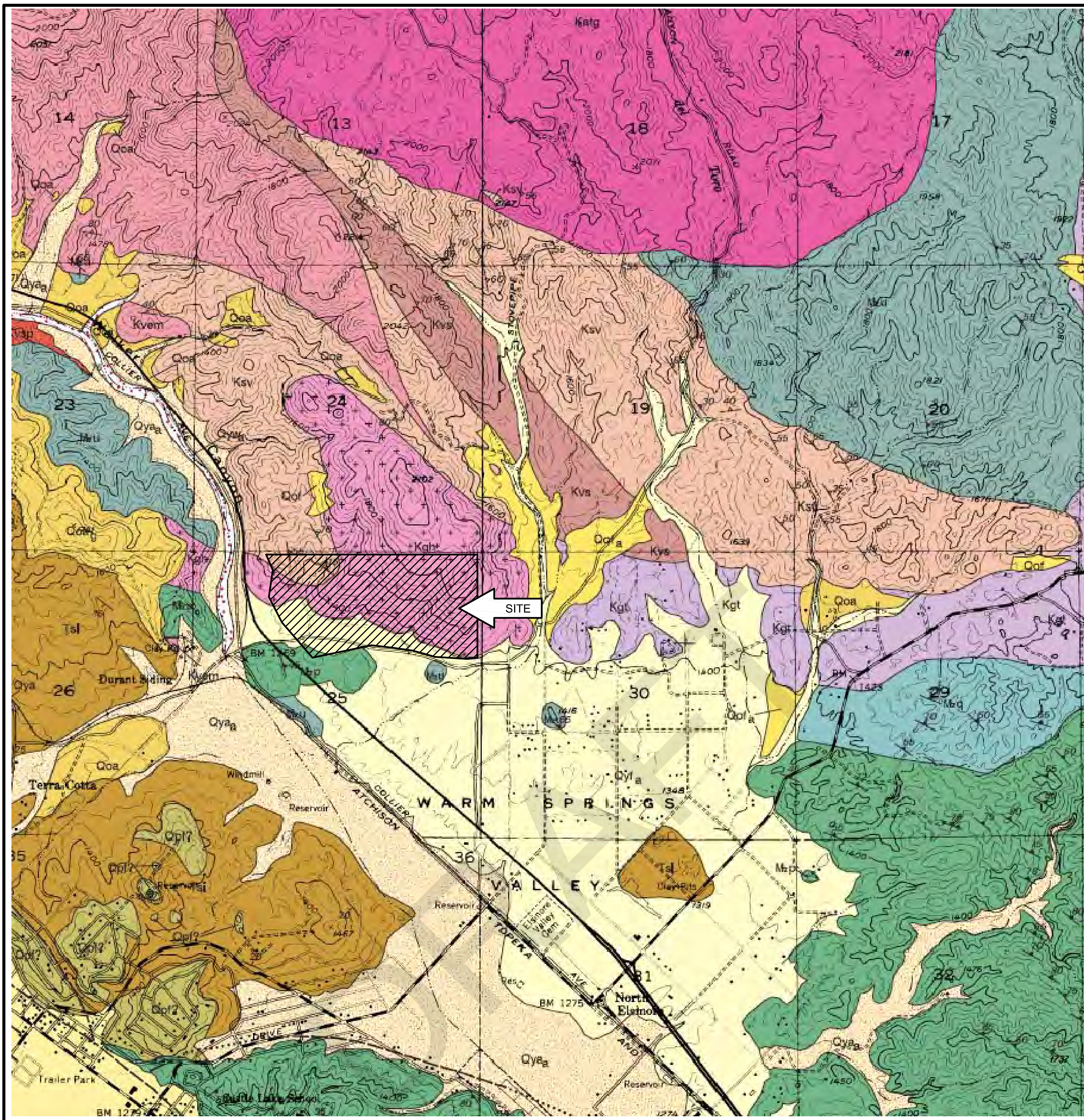
DATE: APRIL 2015

SLOPE STABILITY INVESTIGATION
PROPOSED NICHOLS MINE EXPANSION
LAKE ELSINORE, CALIFORNIA

ENCLOSURE "A-2"

JOB NUMBER 15082-8

CHJ Consultants



(Base Map: Morton and Weber, 2003)

GEOLOGIC UNITS:

Qyw young alluvial wash deposits

Qya young axial-channel deposits (Holocene and late Pleistocene)

Qyf young alluvial-fan deposits (Holocene and late Pleistocene)

Qoa old alluvial channel deposits

Qof old alluvial-fan deposits (late to middle Pleistocene)

Tsi Silverado Formation – nonmarine and marine sandstone, siltstone and conglomerate

Kgt massive textured tonalite

Kgh hypabyssal tonalite

Kvs Intermixed Estelle Mountain volcanics of Herzig (1991) and Cretaceous(?) sedimentary rocks (Cretaceous?)

Ksv Intermixed Estelle Mountain volcanics of Herzig (1991) and Mesozoic sedimentary rocks (Mesozoic)

Mzu Metasedimentary rocks, undifferentiated (Mesozoic)

Mzp Phyllite (Mesozoic)—Fissile black phyllite

geologic contact

70 strike and dip of foliation

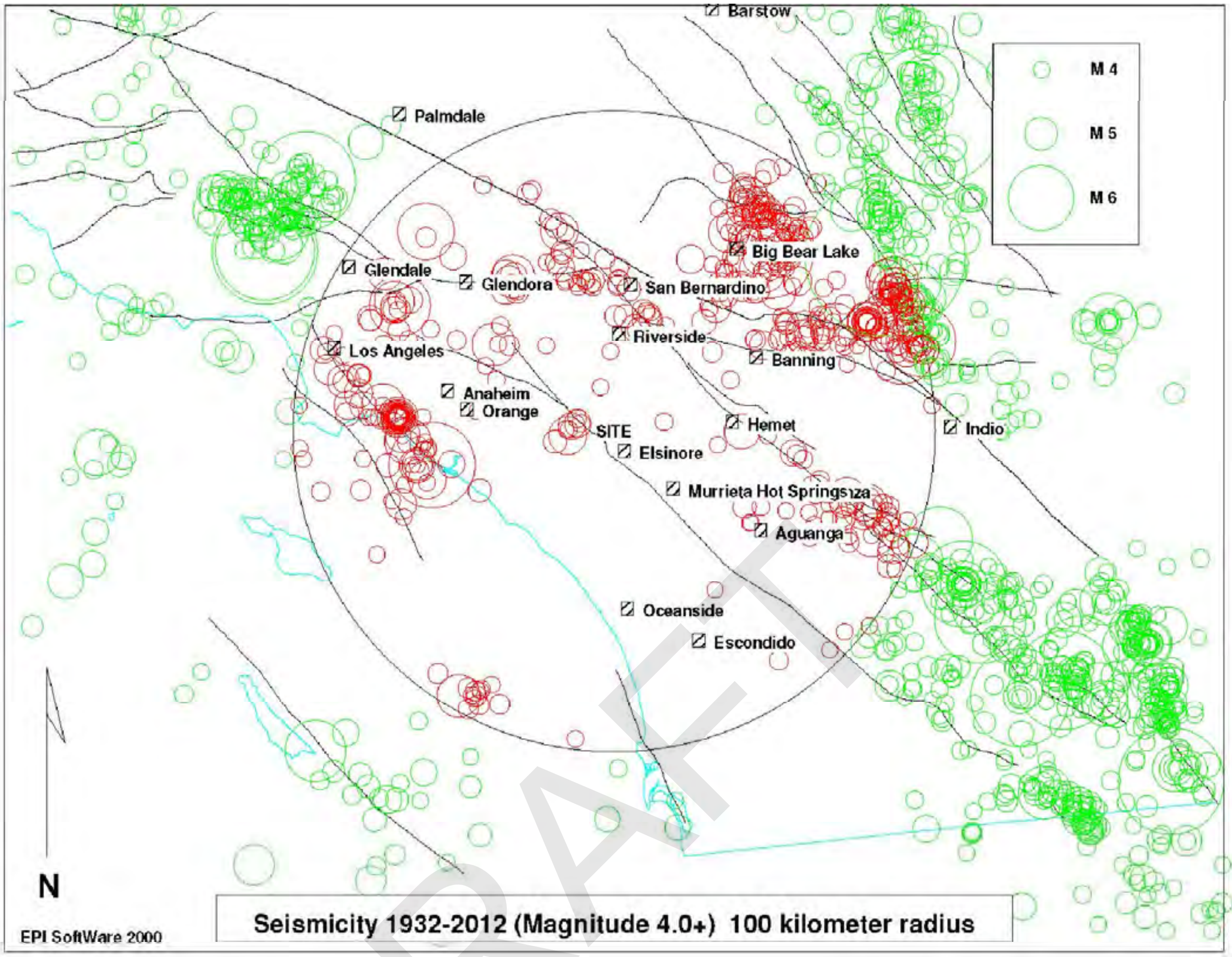
– N –

SCALE: 1" = 2000'

GEOLOGIC INDEX MAP

FOR: NICHOLS ROAD PARTNERS, LLC	SLOPE STABILITY INVESTIGATION PROPOSED NICHOLS MINE EXPANSION LAKE ELSINORE, CALIFORNIA	ENCLOSURE "A-3"
DATE: MARCH 2015		JOB NUMBER 15082-8

CHJ Consultants



SITE LOCATION: 33.7102 LAT. -117.3546 LONG.

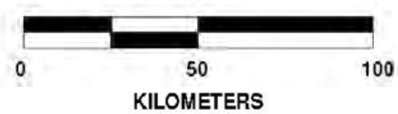
MINIMUM LOCATION QUALITY: C

TOTAL # OF EVENTS ON PLOT: 1479

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 580

MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

4.0- 4.9 : 528
5.0- 5.9 : 48
6.0- 6.9 : 4
7.0- 7.9 : 0
8.0- 8.9 : 0



CLOSEST EVENT: 4.1 ON TUESDAY, OCTOBER 26, 1954 LOCATED APPROX. 11 KILOMETERS WEST OF THE SITE

LARGEST 5 EVENTS:

6.4 ON SUNDAY, JUNE 28, 1992 LOCATED APPROX. 73 KILOMETERS NORTHEAST OF THE SITE
6.4 ON SATURDAY, MARCH 11, 1933 LOCATED APPROX. 57 KILOMETERS WEST OF THE SITE
6.1 ON THURSDAY, APRIL 23, 1992 LOCATED APPROX. 99 KILOMETERS EAST OF THE SITE
6.0 ON SATURDAY, DECEMBER 04, 1948 LOCATED APPROX. 92 KILOMETERS EAST OF THE SITE
5.9 ON THURSDAY, OCTOBER 01, 1987 LOCATED APPROX. 77 KILOMETERS NORTHWEST OF THE SITE

EARTHQUAKE EPICENTER MAP		
FOR: NICHOLS ROAD PARTNERS, LLC	SLOPE STABILITY INVESTIGATION PROPOSED NICHOLS MINE EXPANSION LAKE ELSINORE, CALIFORNIA	ENCLOSURE "A-4"
DATE: MARCH 2015		JOB NUMBER 15082-8

CHJ Consultants

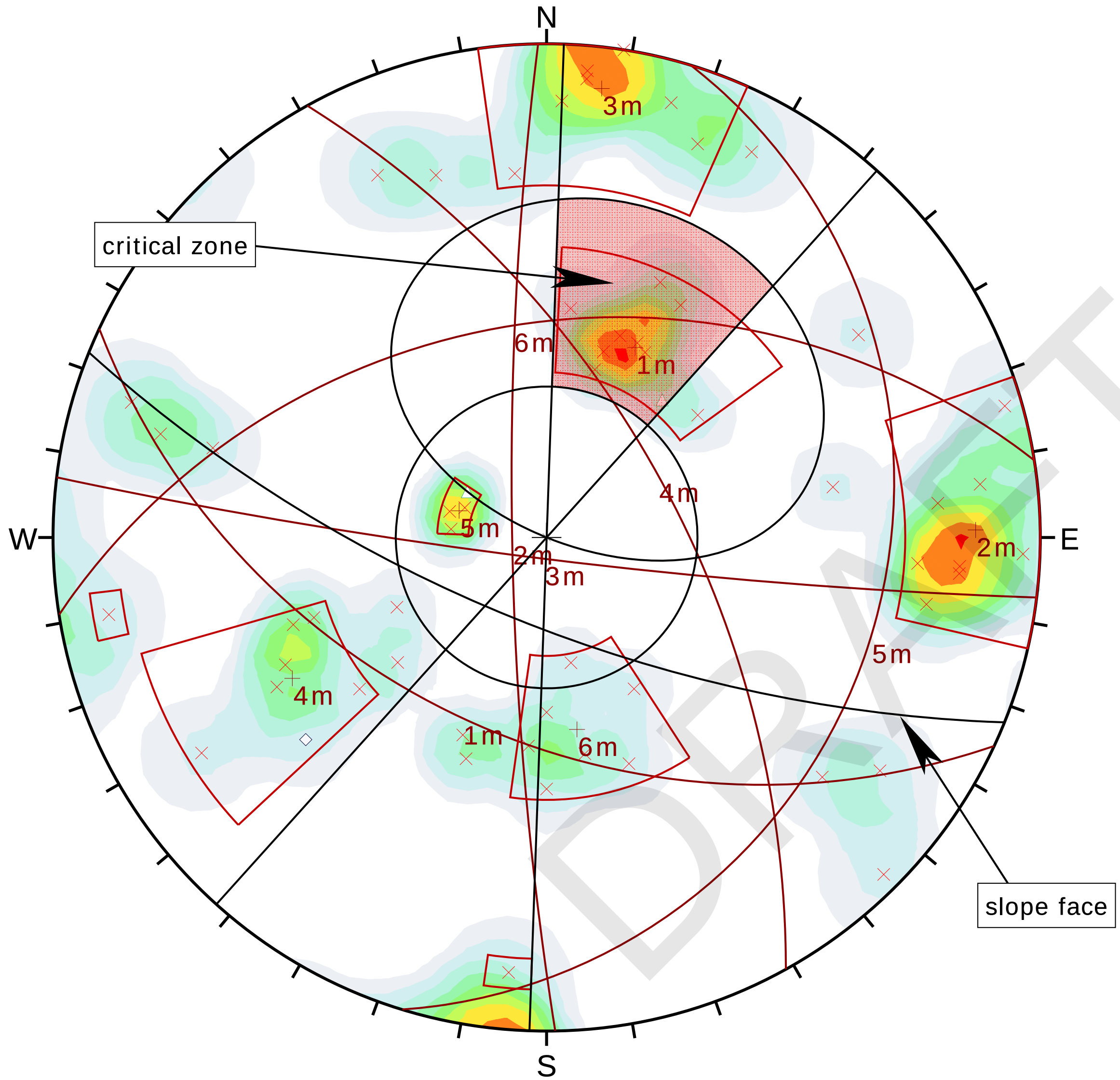
APPENDIX B

KINEMATIC EVALUATION

Table B-1: Discontinuity Data – Nichols Road Quarry									
Discontinuity No.	**Dip**	**Dip Direction**	**Set**	**Type**	**Location**	**Geologic Unit**	**Continuity**	**Roughness**	**Notes**
1	21	120	5	s	1	kgh	2	2	shear
2	39	330	6	j	2	kgh	2	3	
3	78	155		j	2	kgh	2	3	12-18" spacing
4	46	5	6	j	2	kgh	1	4	
5	29	349	6	j	2	kgh	1	3	
6	88	315		j	2	kgh	2	2	6" spacing
7	22	95	5	j	2	kgh	2	3	
8	80	274	2	j	2	kgh	3	2	
9	52	51	4	j	2	kgh	1	3	
10	61	64	4	j	2	kgh	4	3	topple
11	53	71	4	j	2	kgh	3	2	topple
12	57	210	1	j	2	kgh	2	2	topple
13	39	360	6	j	2	kgh	4	3	topple
14	37	65		j	2	kgh	3	3	
15	70	105		j	2	kgh	4	2	topple
16	61	260		j	2	kgh	5	2	
17	52	340	6	j	2	kgh	4	3	
18	39	196	1	j	2	kgh	3	2	
19	83	108		j	2	kgh	2	1	
20	43	197	1	j	2	kgh	5	2	face
21	54	360	6	j	2	kgh	3	3	
22	78	105		j	2	kgh	3	3	
23	73	311		j	2	kgh	3	3	
24	57	71	4	j	2	kgh	3	3	
25	79	305		j	3	kgh	2	3	
26	83	182	3	j	3	kgh	2	3	
27	74	274	2	j	3	kgh	5	2	
28	48	350	6	j	3	kgh	3	3	
29	65	50	4	f	4	Jbc	4	3	
30	43	50		j	4	Jbc	4	3	
31	40	220	1	s	5	kgh	3	1	shears in cut face
32	73	175	3	j	6	kgh	3	2	
33	75	163		j	6	kgh	4	2	
34	47	200	1	j	6	kgh	3	2	
35	88	272	2	j	6	kgh	4	2	
36	23	105	5	j	6	kgh	4	2	
37	64	61	4	j	6	kgh	3	3	topple
38	74	237		j	6	kgh	5	3	face
39	50	186	1	j	6	kgh	5	3	face
40	47	205	1	j	6	kgh	5	2	face
41	80	275	2	j	6	kgh	4	2	
42	83	5	3	j	6	kgh	2	1	
43	43	231	1	j	6	kgh	5	1	face
44	20	110	5	j	6	kgh	5	2	
45	86	185	3	j	6	kgh	2	1	
46	77	265	2	j	6	kgh	2	2	
47	83	263	2	j	6	kgh	4	2	
48	87	185	3	j	6	kgh	3	2	
49	59	204	1	j	6	kgh	3	2	face
50	90	189	3	j	6	kgh	2	3	
51	47	23		j	6	kgh	2	3	
52	76	280	2	j	6	kgh	3	1	

Table B-1: Discontinuity Data – Nichols Road Quarry									
Discontinuity No.	**Dip**	**Dip Direction**	**Set**	**Type**	**Location**	**Geologic Unit**	**Continuity**	**Roughness**	**Notes**
53	88	254	2	j	6	kgh	2	2	
54	46	208	1	j	6	kgh	3	2	face
55	84	80	2	j	6	kgh	2	2	
56	79	58	4	j	6	kgh	2	3	
57	83	208		j	6	kgh	2	2	
58	85	196	3	j	6	kgh	5	2	
59	51	20		j	6	kgh	4	3	
60	81	201	3	j	6	kgh	3	2	

* C1 - discontinuous (less than 3 ft.); C2 - slightly continuous (3 to 10 feet); C3 - moderately continuous (10 to 30 feet); C4 - highly continuous (30 to 100 feet); C5 - very continuous (greater than 100 feet).
Based on Department of the Interior - Bureau of Reclamation, Engineering Geology Field Manual (2nd edition 1998)



Symbol	TYPE	Quantity
◇	f	1
×	j	57
△	s	2

Color	Density Concentrations
	0.00 - 0.80
	0.80 - 1.60
	1.60 - 2.40
	2.40 - 3.20
	3.20 - 4.00
	4.00 - 4.80
	4.80 - 5.60
	5.60 - 6.40
	6.40 - 7.20
	7.20 - 8.00

Maximum Density	7.48%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

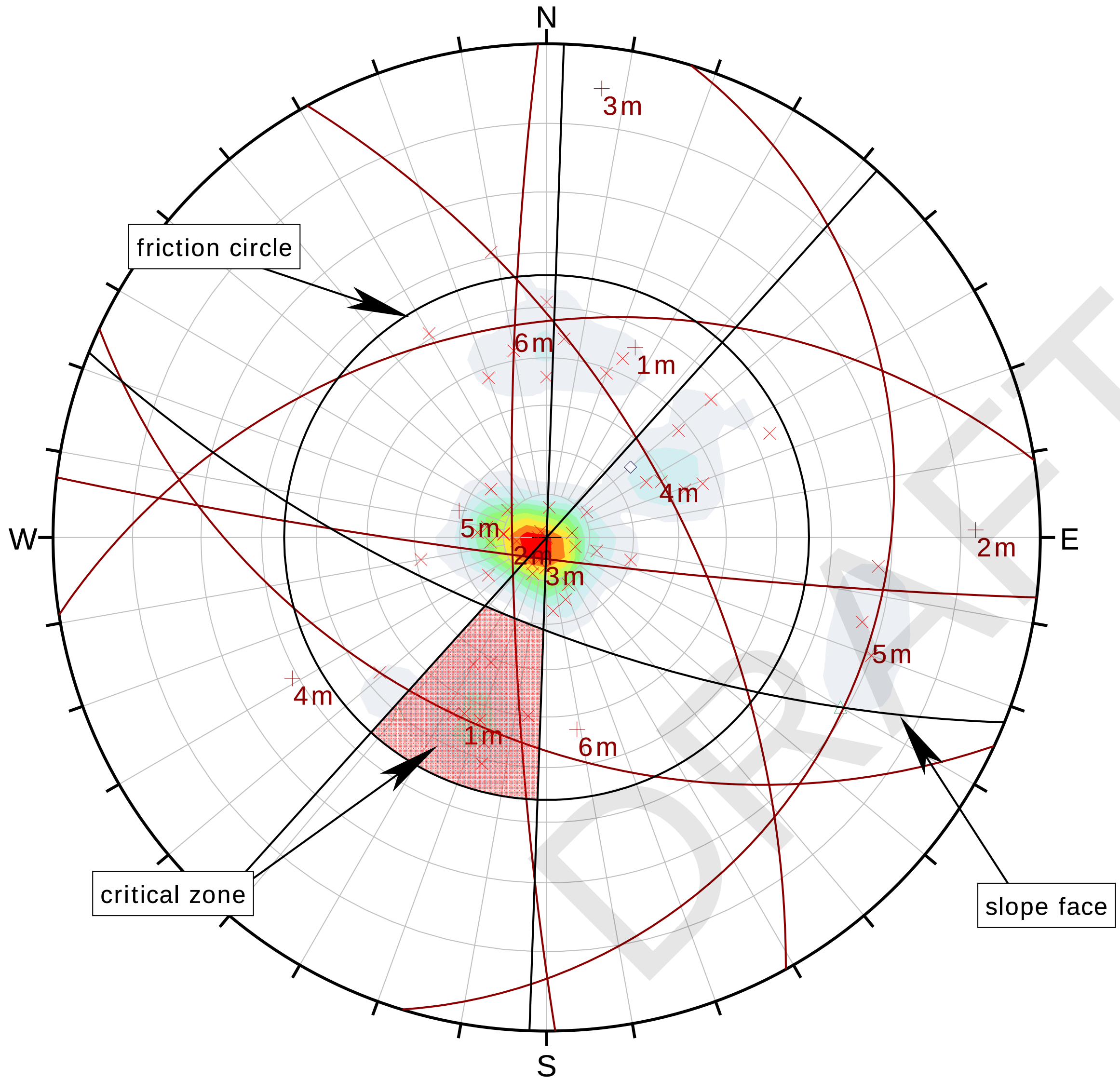
Kinematic Analysis	Planar Sliding
Slope Dip	70
Slope Dip Direction	202
Friction Angle	34°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	9	60	15.00%
Planar Sliding (Set 1)	9	10	90.00%

Plot Mode	Pole Vectors
Vector Count	60 (60 Entries)
Hemisphere	Lower
Projection	Equal Angle

Project	Nichols Road
Analysis Description	Planar Sliding - Pole Vectors
Drawn By	CHJ
Author	JMc
File Name	plan 202_70 poles Nichols.dips6
Date	3/18/2015
Enclosure	B-2.1

DIPS 6.008



Symbol	TYPE	Quantity
◇	f	1
×	j	57
△	s	2

Color	Density Concentrations
	0.00 - 2.10
	2.10 - 4.20
	4.20 - 6.30
	6.30 - 8.40
	8.40 - 10.50
	10.50 - 12.60
	12.60 - 14.70
	14.70 - 16.80
	16.80 - 18.90
	18.90 - 21.00

Maximum Density	20.34%
Contour Data	Dip Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

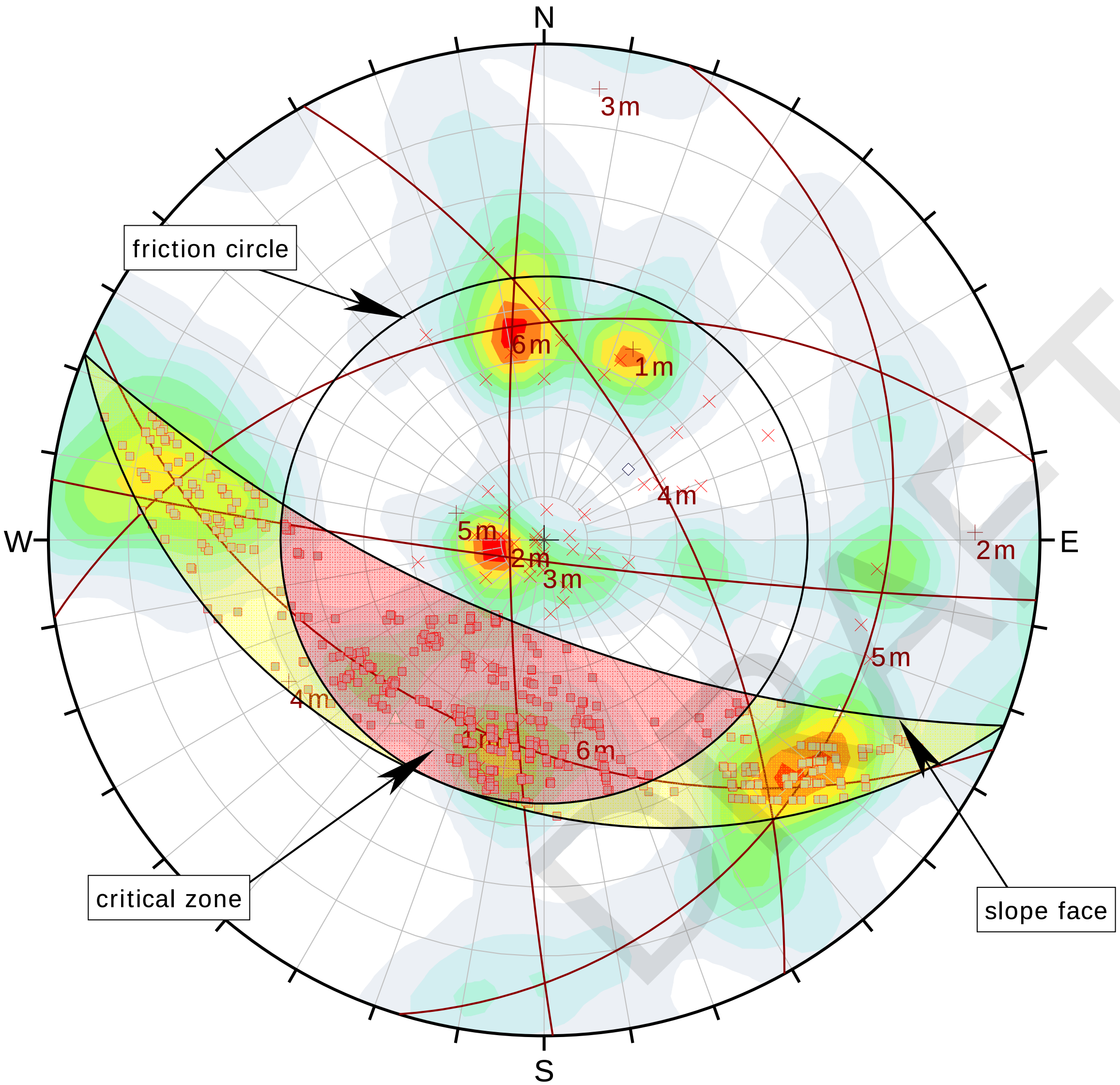
Kinematic Analysis	Planar Sliding
Slope Dip	70
Slope Dip Direction	202
Friction Angle	34°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	9	60	15.00%
Planar Sliding (Set 1)	9	10	90.00%

Plot Mode	Dip Vectors
Vector Count	60 (60 Entries)
Hemisphere	Lower
Projection	Equal Angle

Project	Nichols Road			
Analysis Description	Planar Sliding - Dip Vectors			
Drawn By	CHJ	*Author*	JMc	
File Name	plan 202_70 vectors Nichols.dips6	*Date*	3/18/2015	*Enclosure* B-2.2

DIPS 6.008



Symbol	TYPE	Quantity
◇	f	1
×	j	57
△	s	2
Symbol	**Feature**	
▪	Critical Intersection	

Color	Density Concentrations
	0.00 - 0.45
	0.45 - 0.90
	0.90 - 1.35
	1.35 - 1.80
	1.80 - 2.25
	2.25 - 2.70
	2.70 - 3.15
	3.15 - 3.60
	3.60 - 4.05
	4.05 - 4.50
Maximum Density	4.25%
Contour Data	Intersections
Contour Distribution	Fisher
Counting Circle Size	1.0%

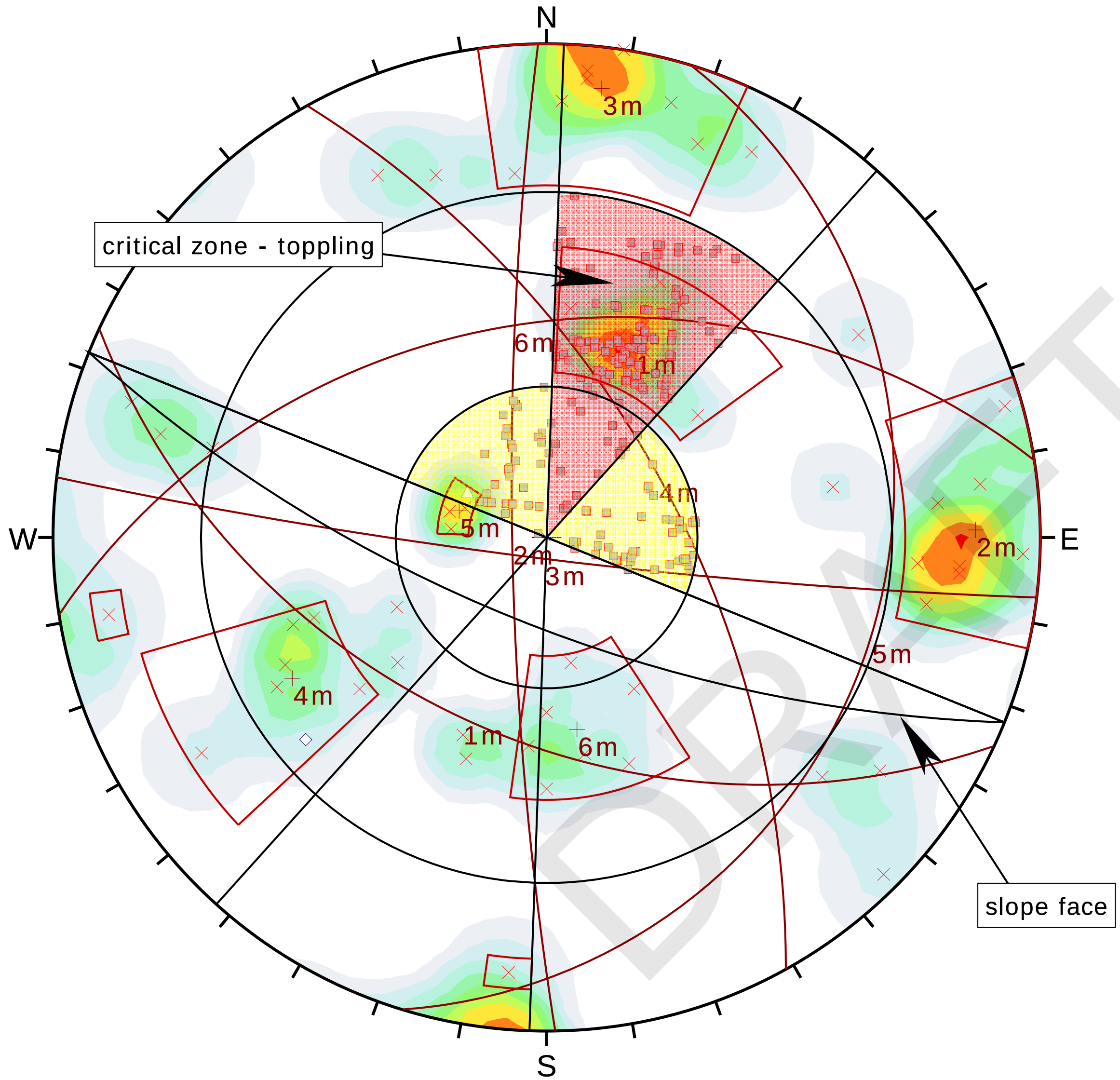
Kinematic Analysis	Wedge Sliding
Slope Dip	70
Slope Dip Direction	202
Friction Angle	34°

	Critical	Total	%
Wedge Sliding	466	1770	26.33%

Plot Mode	Dip Vectors
Vector Count	60 (60 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	1770
Hemisphere	Lower
Projection	Equal Angle

Project	Nichols Road
Analysis Description	Wedge Sliding - Dip Vectors
Drawn By	CHJ
Author	JMc
File Name	wedge 202_70 vectors Nichols.dips6
Date	3/18/2015
Enclosure	B-2.3

DIPS 6.008



Symbol	TYPE	Quantity
◇	f	1
×	j	57
△	s	2
Symbol	**Feature**	
■	Critical Intersection	

Color	Density Concentrations
	0.00 - 0.80
	0.80 - 1.60
	1.60 - 2.40
	2.40 - 3.20
	3.20 - 4.00
	4.00 - 4.80
	4.80 - 5.60
	5.60 - 6.40
	6.40 - 7.20
	7.20 - 8.00
Maximum Density	7.48%
Contour Data	Pole Vectors
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Direct Toppling
Slope Dip	70
Slope Dip Direction	202
Friction Angle	34°
Lateral Limits	20°

	Critical	Total	%
Direct Toppling (Intersection)	159	1770	8.98%
Oblique Toppling (Intersection)	86	1770	4.86%
Base Plane (All)	10	60	16.67%
Base Plane (Set 1)	9	10	90.00%
Base Plane (Set 5)	1	4	25.00%

Plot Mode	Pole Vectors
Vector Count	60 (60 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	1770
Hemisphere	Lower
Projection	Equal Angle

Project	Nichols Road
Analysis Description	Topple - Pole Vectors
Drawn By	CHJ
Author	JMc
File Name	topple 202_70 poles Nichols.dips6
Date	3/18/2015
Enclosure	B-2.4

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