The Junipers Project
Final Environmental Impact Report
SCH No. 2018041032 - Project No. 586670

Appendix H

Geotechnical Investigation

January 2021

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GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

UPDATE
GEOTECHNICAL INVESTIGATION

THE JUNIPERS
SAN DIEGO, CALIFORNIA

PREPARED FOR

LENNAR HOMES
SAN DIEGO, CALIFORNIA

NOVEMBER 30, 2018
REVISED APRIL 9, 2019
PROJECT NO. G2030-32-03

GEOCON
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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2030-32-03
November 30, 2018
Revised April 9, 2019

Lennar Homes
16465 Via Esprillo, Suite 150
San Diego, California 92127

Attention: Ms. Allegra Parisi

Subject: UPDATE GEOTECHNICAL INVESTIGATION
THE JUNIPERS
SAN DIEGO, CALIFORNIA

Dear Ms. Parisi:

In accordance with your request, and our Proposal No. LG-18413 dated November 8, 2018, we have prepared this revised update geotechnical investigation for the subject property. The accompanying report presents our findings, conclusions and recommendations relative to the geotechnical aspects of developing the property as presently proposed. This revised report was prepared to address recent modifications to the grading plan.

The results of our study indicate that the site can be developed as planned, provided the recommendations of this report are incorporated into the design and construction of the project. An update to this report should be performed once the final grading plans have been prepared.

If there are any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

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Attention: Mr. Troy Burns

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

The purpose of this update report was to evaluate minor grading plan modifications for an age-qualified housing development proposed in the Rancho Penasquitos area of San Diego, California (see *Vicinity Map*, Figure 1). This report provides updated information relative to the geotechnical engineering aspects of developing the property as presently proposed based on the conditions encountered during our investigation entitled *Geotechnical Investigation, The Junipers, San Diego, California*, prepared for 33 North Development Group, dated March 16, 2018.

The scope of our original work consisted of the following:

- Reviewing aerial photographs and readily available published and unpublished geologic literature.
- Reviewing the digital plans prepared by Hunsaker & Associates.
- Down-hole logging and sampling of twenty-eight large-diameter borings (see Appendix A).
- Performing thirteen exploratory trenches using a rubber tire backhoe to evaluate the general extent and condition of surficial deposits (see Appendix A).
- Performing laboratory tests on selected soil samples to evaluate their physical characteristics for engineering analysis (see Appendix B).
- Performing slope stability analyses along geologic cross sections A-A’ through Q-Q’ (see Appendix C).
- Preparing this report, geologic cross sections and a geologic map presenting our exploratory information and our conclusions and recommendations regarding the geotechnical aspects of developing the property as presently proposed. In addition, we have included twenty-six exploratory trench logs and laboratory test results from the LA previous study in Appendix D.

The approximate locations of the previous and recent exploratory trenches and borings are shown on the *Geologic Map*, Figure 2. *Geologic Cross-Sections* A-A′ through Q-Q′ (Figures 3 through 8) represent our interpretation of the geologic conditions across the site and served as the basis for our slope stability analysis.

2. SITE AND PROJECT DESCRIPTION

The property consists of approximately 112-gross acres of land located within the boundaries of the former Carmel Highlands golf course situated within the Rancho Penasquitos area of San Diego, California. The site is surrounded by an existing residential development to the west and north, Interstate 15 to the east and the Hotel Karlan to the south. The golf course was in operation from the 1960's until its closure in March 2015.

Topographically, the site consists of gentle to moderately sloped terrain. Vegetation primarily consists of previously maintained grass areas utilized for the golf course along with several mature trees scattered about the property. Man-made improvements consist of tennis courts, two maintenance facilities, cart paths, and golf course related features such as greens, tee boxes, and sand traps.

A 20-foot-wide SDG&E easement containing a 16-inch, 1,600 psi steel natural gas transmission main bisects the southern portion of the property and extends along the western project margin to the north. A 10-foot-wide SDG&E easement for an 8-inch, 400 psi natural gas line extends southward across the site from the 16-inch gas line and easement located along the property margin. Other underground improvements, including an 8-inch sewer main, telephone, water and other unknown "buried cables" identified on the civil plans are located within and along the project boundaries.

It is our understanding that the property will be developed to create an age-qualified (55+), active adult residential neighborhood with approximately 455 for-sale residential units and up to 81 for-rent affordable residential units. The community will consist of several interconnected neighborhoods, various private recreational common areas and usable open space for residents, a public park and a recreational walking trail loop and supporting infrastructure improvements. Bioretention basins are also proposed. In addition, associated infrastructure improvements consisting of wet and dry utilities, roadways, and sidewalks are planned throughout the project.

Based on our understanding, the grading volume estimates provided by Hunsaker & Associates consist of approximately 820,000 cubic yards of cut and fill. We understand that these estimates do not account for remedial grading or bulking and shrinking of the materials. Maximum cut and fill depths prior to remedial grading will be on the order of 36 feet and 34 feet, respectively. Cut and fill slopes are designed at 2:1 (horizontal:vertical) or flatter, with maximum heights of approximately 48 feet and 37 feet, respectively.

The locations and descriptions of the site and proposed development are based on our field investigation, site reconnaissance, a review of the available plans, and our understanding of the project. If project details vary significantly from those described, Geocon Incorporated should be consulted to provide additional recommendations and/or analysis.

3. SOIL AND GEOLOGIC CONDITIONS

The geologic units encountered on the property include undocumented fill, topsoil/colluvium, alluvium, Mission Valley Formation, granitic rock, and the Santiago Peak Volcanics. Each of the units is described below in order of increasing age. Their mapped extent (with the exception of topsoil/colluvium and granitic rock) is shown on the *Geologic Map*. For purposes of this report, the topsoil and colluvial deposits have been undifferentiated due to their similar characteristics.

3.1 Undocumented Fill ($Qudf_{1\&2}$)

In general, two types of undocumented fill soils were encountered within the project site. Fill soils associated with the development of the golf course are identified on the *Geologic Map* as $Qudf_1$ and embankments associated with the surrounding developments as $Qudf_2$.

The majority of the undocumented fill soils identified within the interior of the project ($Qudf_1$) were placed as part of the former golf course and are expected to be widespread and vary in thickness from a thin veneer to approximately 13 feet (Boring No. B-19). Only the fill deposits, estimated to be over 5 feet thick were mapped on Figure 2. The materials encountered during our study consisted of mixtures of silty to clayey sands to silty to sandy clays with minor amounts of gravel, cobble and boulder size rock fragments (Boring No. B-15).

Undocumented fills associated with existing housing developments ($Qudf_2$) encroach onto the property boundary in several locations. Proposed project grading avoids these areas.

3.2 Topsoil/Colluvium (Unmapped)

Topsoil and colluvial deposits were encountered in the majority of the exploratory borings and trenches with a maximum thickness of 8½ feet (Trench No. T-5). These deposits, in general, consist of stiff, silty to sandy, plastic clays with a medium to very high expansion potential.

3.3 Alluvium (Qal)

Alluvial soils were found within the low-lying drainage areas throughout the site and varied in thickness between 4½ and 8½ feet. These deposits primarily consist of stiff, silty, plastic clays with a medium to very high expansion potential.

3.4 Mission Valley Formation (Tmv)

The Eocene-age Mission Valley Formation was encountered throughout the project and consists of hard claystones and siltstones, and dense sandstones. The claystones and siltstones typically possess a medium to high expansion potential and low shear strength, compared to the sandstone units that have a low expansion potential and higher shear strength properties.

Proposed cut slopes exposing the weaker claystones and siltstones are prone to surficial instability, and will require stability fills. Some portions of the borings encountered weathered bedrock zones that will require deeper remedial grading in order to provide a competent surface to support proposed fills.

Bedding plane shears are relatively common within the Mission Valley Formation and are significant in that they represent inherent planes of weakness within the formation. As the term implies, these shear zones are typically parallel to the bedding and are characterized by thin seams of soft, remolded plastic clay. Several bedding plane shears were encountered during our study and will require stabilization measures discussed further herein.

As observed in several of the borings, the Mission Valley Formation often exhibits highly cemented zones which may result in excavation difficulty during grading and construction of site improvements (i.e. underground utility lines, building foundations, etc.). Although blasting is not anticipated, moderate to heavy ripping should be expected in portions of this formation to facilitate excavation. Generation of oversize materials requiring special handling and placement techniques should also be expected.

3.5 Granitic Rock (Unmapped)

Cretaceous-age granitic rock was encountered in Boring Nos. B-24 and B-25 underlying the Mission Valley Formation within the southern portion of the project. The granitic rock consisted of completely to highly weathered decomposed granite. Based on the limited extent of this unit and proposed development, excavations within the granitic rock is anticipated to be limited to the southern entrance road of the project (if encountered).

3.6 Santiago Peak Volcanics (Jsp)

The Jurassic-age Santiago Peak Volcanics was encountered along the southwestern and northeastern margins of the site. This formation consists of mildly metamorphosed volcanic and sedimentary rock that is relatively dark-colored where exposed.

This formation generally exhibits high bearing capacity characteristics. The near-surface completely weathered (saprolite) material typically possesses medium to high expansive potential. Cut slopes in fresh rock should be stable, if free from adversely oriented fractures or joints. High- and low-angle clay filled fractures can be present that may result in local instability. In the event that adverse conditions are observed, stabilization measures will be necessary. The fractured nature of the metavolcanic rock can also increase the potential for water migration and seepage conditions. Excavation conditions may vary from rippable to non-rippable requiring possible blasting.

4. GROUNDWATER/SEEPAGE

Perched groundwater and/or slight to heavy seepage was encountered in ten of the exploratory borings and one of the trench excavations. The seepage was encountered on relatively impervious strata within the bedrock. Subdrain systems will be necessary to intercept and convey seepage migrating along impervious strata. In addition, subdrains will be required in main drainages, along proposed buttress and stability fill excavations, and possibly where impervious layers daylight near the ultimate graded surface.

A static near-surface groundwater table was not observed in the excavations performed during this study. The existing perched groundwater levels in alluvial areas, however, can be expected to fluctuate seasonally and may affect remedial grading. In this regard, remedial grading may encounter wet soils and excavation and compaction difficulty, particularly if grading is planned during the winter months. It should also be noted that areas where perched water or seepage was not encountered may exhibit groundwater during rainy periods.

5. SLOPE STABILITY

Seventeen geologic cross-sections, A-A′ through Q-Q′ (Figures 3 and 8), were prepared to aid in evaluating the stability of proposed and natural slopes. Shear strength parameters for the soil and geologic materials encountered were determined from laboratory direct shear tests. Residual shear strengths were used for bedding plane shear features determined from laboratory test results, using the *Journal of Geotechnical and Geoenvironmental Engineering, Drained Shear Strength Parameters for Analysis of Landslides (Stark, Choi, McCone, 2005)* and engineering judgment.

Table 5.1 presents the soil strength parameters that were utilized in the slope stability analyses. The values were derived from laboratory test results and experience with similar soil and geologic conditions.

TABLE 5.1
SOIL STRENGTH PARAMETERS

Soil Condition	Angle of Internal Friction ϕ (degrees)	Cohesion c (psf)
Compacted Fill	26	300
Bedding Plane Shear (BPS)	10	100
Mission Valley Formation Sandstone (Tmv-SM)	38	500
Mission Valley Formation Siltstone/Claystone (Tmv-ML/CL)	24	550
Granitic Rock (Kgr)	35	500
Santiago Peak Volcanics (Jsp)	35	500

The output files and calculated factor of safety for the cross sections used for the stability analyses are presented in Appendix C (Figures C-1 through C-91) and summarized in Table 5.2.

TABLE 5.2
SLOPE STABILITY SUMMARY

Cross Section	Figure Number	Condition Analyzed	Factor of Safety	
			Static	Pseudo-Static
A-A’	C-1	Proposed Condition, block type failure	1.4	---
	C-2, C-3	Proposed Condition with Buttress, block type failure	1.6	1.1
B-B’	C-5, C-7	Proposed Condition, block type failure	1.7	1.0
	C-6, C-9	Proposed Condition, circular failure	2.6	1.9
C-C’	C-11, C-13	Proposed Condition with Buttress, block type failure	1.7	1.1
	C-12, C-15	Proposed Condition with Buttress, block type failure	1.8	1.2
D-D’	C-17, C-18	Proposed Condition with Buttress, block type failure	1.6	1.0
E-E’	C-20, C-21	Proposed Condition with Buttress, block type failure	2.0	1.1
F-F’	C-23	Proposed Condition, block type failure	1.3	---
	C-24, C-25	Proposed Condition with Buttress, block type failure	1.5	1.0
G-G’	C-27	Proposed Condition, block type failure	1.4	---
	C-28, C-29	Proposed Condition with Buttress, block type failure	1.5	1.0
H-H’	C-31	Proposed Condition, block type failure	1.3	---
	C-32, C-33	Proposed Condition with Buttress, block type failure	1.5	1.0
I-I’	C-35, C-37	Proposed Condition with Buttress, block type failure	1.7	1.2
	C-36, C-39	Proposed Condition, block type failure	2.3	1.3
J-J’	C-41, C-43	Proposed Condition, block type failure	2.2	1.5
	C-42, C-45	Proposed Condition, block type failure	2.9	1.6

TABLE 5.2 (Concluded)
SLOPE STABILITY SUMMARY

Cross Section	Figure Number	Condition Analyzed	Factor of Safety	
			Static	Pseudo-Static
K-K’	C-47, C-49	Proposed Condition, block type failure	3.0	2.2
	C-48, C-51	Proposed Condition, block type failure	5.2	3.4
L-L’	C-53, C-56	Proposed Condition, circular failure	3.1	2.3
	C-54, C-58	Proposed Condition, circular failure	2.7	1.9
	C-55, C-60	Proposed Condition, circular failure	1.6	1.2
M-M’	C-62, C-64	Proposed Condition, block type failure	1.8	1.3
	C-63, C-66	Proposed Condition, circular failure	2.2	1.5
N-N’	C-68, C-70	Proposed Condition, block type failure	1.7	1.1
	C-69, C-72	Proposed Condition, circular failure	2.0	1.4
O-O’	C-74, C-75	Proposed Condition with Buttress, block type failure	1.7	1.1
P-P’	C-77, C-78	Proposed Condition with Buttress, block type failure	1.5	1.1
Q-Q’	C-80, C-84	Proposed Condition, block type failure	2.4	1.6
	C-81, C-86	Proposed Condition, block type failure	2.8	1.9
	C-82, C-88	Proposed Condition with SD backfill, block type failure	2.5	1.7
	C-83, C-90	Proposed Condition with SD backfill, block type failure	2.2	1.5

Note – Groundwater was incorporated into the analysis and generally placed at the first occurrence of seepage.

The results of the analyses indicate that buttresses, shear key, and a stability fill will be required to achieve a static factor of safety of at least 1.5. The approximate limits of the keyway excavations are shown on the *Geologic Map* and depicted on the *Geologic Cross-Sections*. The depth and extent of remedial grading of these areas may need to be modified depending on the conditions observed during grading.

6. GEOLOGIC HAZARDS

6.1 Faulting and Seismicity

Based on our recent exploratory borings and a review of published geologic maps and reports, the site is not located on any known “active,” “potentially active” or “inactive” fault traces as defined by the California Geological Survey (CGS).

The Newport-Inglewood Fault and Rose Canyon Fault Zone, located approximately 13 miles west of the site, are the closest known active faults. The CGS considers a fault seismically active when evidence suggests seismic activity within roughly the last 11,000 years. The CGS has included portions of the Rose Canyon Fault zone within an Alquist-Priolo Earthquake Fault Zone. Based upon a review of available geologic data and published reports, the site is not located within a State of California Earthquake Fault Zone.

6.2 Seismicity-Deterministic Analysis

We used the computer program *EZ-FRISK* (Version 7.65) to determine the distance of known faults to the site and to estimate ground accelerations at the site for the maximum anticipated seismic event.

According to the results of the computer program *EZ-FRISK* (Version 7.65), 7 known active faults are located within a search radius of 50 miles from the property. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA in our analysis. The nearest known active faults are the Newport-Inglewood and Rose Canyon Fault Zones, located approximately 13 miles west of the site and are the dominant sources of potential ground motion. Table 6.2.1 lists the estimated maximum earthquake magnitudes and PGA's for the most dominant faults for the site location calculated for Site Class C as defined by Table 1613.3.2 of the 2016 California Building Code (CBC).

TABLE 6.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood	13	7.5	0.21	0.17	0.22
Rose Canyon	13	6.9	0.17	0.15	0.16
Elsinore	25	7.85	0.16	0.11	0.15
Coronado Bank	26	7.4	0.13	0.09	0.10
Palos Verdes Connected	26	7.7	0.15	0.10	0.13
Earthquake Valley	32	6.8	0.09	0.06	0.05
San Jacinto	46	7.88	0.10	0.07	0.09

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mappable Quaternary fault is proportional to the faults slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) in the analysis. Table 6.2.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2007 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.37	0.35	0.40
5% in a 50 Year Period	0.27	0.26	0.28
10% in a 50 Year Period	0.21	0.20	0.21

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site.

6.3 Geologic Hazard Category

Based on our review of the 2008 City of San Diego Seismic Safety Study Map Sheet 44, the site is located within Geologic Hazard Categories 27, 32, and 53. Category 27 (*Slide-Prone Formations*) indicates: *Otay, Sweetwater, and others*; Category 32 (*Liquefaction*) indicates: *Low Potential-fluctuating groundwater minor drainages*, and Category 53 (*Other Terrain)* indicates: *Level or sloping terrain, unfavorable geologic structure, low to moderate risk.*

6.4 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, groundwater is encountered within 50 feet of the surface, and soil densities are less than about 70 percent of the maximum dry densities. If all four criteria are met, a seismic event could result in a rapid increase in pore water pressure from the earthquake-generated ground accelerations.

The potential for liquefaction at the site is considered to be negligible due to the dense formational material encountered, remedial grading recommended, and lack of a shallow groundwater condition.

6.5 Landslides

No evidence of landslide deposits was encountered at the site during the geotechnical investigation.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 No soil or geologic conditions were encountered that, in the opinion of Geocon Incorporated, would preclude the development of the property as proposed, provided the recommendations of this report are followed.

7.1.2 The existing 16-inch, 1,600 psi natural gas main that bisects the southern portion of the property and extends along the western project margin to the north will require additional evaluation prior to grading. Slope excavations, buttressing and a stability fill are proposed east and west of the easement and minor fills are planned on the southern end of the pipe. A discussion of the proposed grading in the vicinity of the easement should occur between the appropriate parties as project development plans progress.

7.1.3 We understand that the 8-inch, 400 psi gas line and 8-inch sewer main will be removed and relocated prior to development. Potential conflicts with other existing utilities should be evaluated by the civil engineer as plans progress.

7.1.4 The site is underlain by surficial units that include undocumented fill, topsoil/colluvium, alluvium, and weathered bedrock. These deposits are unsuitable in their present condition and will require remedial grading where improvements are planned.

7.1.5 Due to the presence of weak claystones, siltstones and bedding plane shears within the Mission Valley Formation, drained buttresses, a shear key, and stability fill will be necessary to provide adequate slope stability. Areas of anticipated remedial grading, subdrain and heel drain locations and drain connection points should be shown on the 40-scale grading plans. The approximate width and elevation of the keyway excavations are shown on the *Geologic Map* and *Geologic Cross-Sections*. The anticipated dimensions will be refined as the grading plans are developed.

7.1.6 Slot cutting of buttress excavations will be necessary to provide an adequate temporary factor of safety during grading, particularly in the westernmost buttress area. Specific recommendations in this regard will be provided in our update correspondence once grading plans are developed.

7.1.7 The keyway excavations for buttresses, shear key, and stability fill, along with all cut slopes should be observed by an engineering geologist to verify that the soil and geologic conditions do not differ significantly from those anticipated. In the event that varying conditions are encountered, modifications to our recommendations (e.g. drained stability fills) may be required.

7.1.8 Excavations in the metavolcanic rock, although minor, may vary in difficulty. A rippability study should be considered as development plans progress where excavations are planned in metavolcanic rock areas.

7.1.9 A storm water infiltration feasibility study was performed in the vicinity of proposed storm water BMP devices to evaluate the feasibility of infiltrating storm water in accordance with the latest version of the City of San Diego Storm Water manual. The results of this study were provided in our document titled *Response to LDR – Geology Review Comments, The Junipers, San Diego, California,* dated July 17, 2018. As such, in accordance with the *City of San Diego Storm Water Standard Manual*, the property exhibits a "No Infiltration" condition.

7.2 Excavation and Soil Characteristics

7.2.1 Excavation of the surficial deposits (undocumented fill, topsoil/colluvium, alluvium) should be possible with light to moderate effort using conventional heavy-duty equipment. These deposits may be very moist to saturated during the winter or early spring depending on preceding precipitation. Overly wet soils will require drying or mixing with drier material prior to their use as compacted fill.

7.2.2 Excavating within the Santiago Peak Volcanics and granitic rock (if encountered), and to a lesser extent the Mission Valley Formation, will generally vary in difficulty with the depth of excavation and depending on the degree of weathering. Moderate to heavy ripping should be expected in portions of these units to facilitate excavation and even possible blasting.

7.2.3 Oversize materials (defined as material greater than 12 inches in nominal dimension) may be generated during grading that will require special handling and placement techniques. Oversize rock and/or cemented concretions generated from the Mission Valley Formation should be placed in accordance with *Recommended Grading Specifications* (Appendix E) and the requirements of the City of San Diego. Oversize rock may require breakage to acceptable sizes or exportation from the property.

7.2.4 The soils encountered in the field investigation are considered to be "non-expansive" (expansion index [EI] of 20 or less) and "expansive" (expansion index [EI] of 20 or more) as defined by 2016 California Building Code (CBC) Section 1803.5.3. The soil materials collected and tested for expansion index indicate a “very low” to “high” expansion, which are defined further in Table 7.2 below.

TABLE 7.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

<table>
<tr><th>Expansion Index (EI)</th><th>ASTM 4829
Expansion Classification</th><th>2016 CBC
Expansion Classification</th></tr>
<tr><td>0 – 20</td><td>Very Low</td><td>Non-Expansive</td></tr>
<tr><td>21 – 50</td><td>Low</td><td rowspan="4">Expansive</td></tr>
<tr><td>51 – 90</td><td>Medium</td></tr>
<tr><td>91 – 130</td><td>High</td></tr>
<tr><td>Greater Than 130</td><td>Very High</td></tr>
</table>

7.3 Corrosion

7.3.1 Previous laboratory testing was performed by LA on two select soil samples collected from the site to evaluate the percentage of water-soluble sulfate content. The test results indicate the on-site materials at the locations tested possess “S0” sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19 (see Appendix D for test results). Table 7.3 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 7.3
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0	$SO_4<0.10$	No Type Restriction	n/a	2,500
S1	$0.10 \le SO_4 < 0.20$	II	0.50	4,000
S2	$0.20 \le SO_4 \le 2.00$	V	0.45	4,500
S3	$SO_4>2.00$	V+Pozzolan or Slag	0.45	4,500

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

7.3.2 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, further evaluation by a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of underground pipes and buried metal in direct contact with the soils.

7.4 Subdrains

7.4.1 The geologic units encountered on the site have permeability characteristics and/or fracture systems that could be susceptible to groundwater transmission. Subdrains are recommended to collect subsurface water within areas of planned development. The recommended canyon subdrain locations are presented on the *Geologic Map*, however, the locations are subject to change depending on the conditions encountered in the field. *Section 7* in Appendix E provides recommendations for the subdrain.

7.4.2 The 40-scale grading plans should show the location of all proposed subdrains and their connection points. Upon completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map depicting their location and elevation.

7.5 Buttresses, Shear Keys, and Stability Fills

7.5.1 A 15-foot wide drained stability fill (shown in yellow on Figure 2) will be required on a proposed cut slope in the northwestern portion of the property which will expose claystone to obtain an acceptable factor of safety.

7.5.2 Based on the analysis performed on the east end of Cross-Section C-C′, a 15-foot-wide drained shear key is required to obtain an acceptable factor of safety for the proposed fill slope (See Figure 10 for details). In addition, a 15 to 30-foot-wide buttress (shown in red on Figure 2) is required to obtain an acceptable factor of safety for the proposed cut slope east of the gas line in the central portion of the site (See Cross-Sections C-C′ and D-D′).

7.5.3 The analyses for Cross Sections A-A′, C-C', D-D', and F-F′ through I-I′ indicate that a 15 to 55-foot-wide drained buttress (shown in red on Figure 2) will be required to obtain an acceptable factor of safety. Slot cutting of temporary excavations will be necessary during grading along portions of these slopes.

7.5.4 The removal of the material for the shear key, stability fill, and buttresses should encompass the area where a 1:1 plane is extended up and away from the designed key way bottom. Depending on the geologic conditions exposed, deeper and/or wider keyways may be necessary. In addition, in some areas, the 1:1 backcut may require modification to an approximately 2:1 backcut, as shown on Cross-Sections D-D′, E-E′ and I-I′.

7.5.5 The buttress, shear key and stability fill keyway dimensions shown on Figure 2 represent the anticipated elevation and width of the excavations at each cross section location. The dimensions do not consider positive drainage for subdrains or grading transitions between keyway widths. The actual recommended keyway dimensions, as well as subdrain geometry and connection points will be determined during development of the grading plans for the project. Typical buttress, shear key and stability fill details are shown in Figures 9 through 11, respectively. *Section 7* in Appendix E provides the cut off wall and headwall details for the heel drains, if required.

7.6 Grading

7.6.1 All grading should be performed in accordance with the attached *Recommended Grading Specifications* (Appendix E). Where the recommendations of this section conflict with Appendix E, the recommendations of this section take precedence. All earthwork should be observed and all fills tested for proper compaction by Geocon Incorporated.

7.6.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

7.6.3 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

7.6.4 All potentially compressible surficial soils (undocumented fill, topsoil/colluvium, alluvium), and weathered bedrock deposits within areas where structural improvements are planned or where discussed herein, should be removed to firm natural ground and properly compacted prior to placing additional fill and/or structural loads. Deeper than normal benching and/or stripping operations for sloping ground surfaces will be required where the thickness of potentially compressible surficial deposits exceeds 3 feet. The actual extent of unsuitable soil removals will be determined in the field during grading by the geotechnical engineer and/or engineering geologist.

7.6.5 After removal of unsuitable materials is performed, the site should then be brought to final subgrade elevations with structural fill compacted in layers. In general, soils native to the site are suitable for re-use as fill if free from vegetation, debris and other deleterious material. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of maximum dry density at or above optimum moisture content, as determined in accordance with ASTM Test Procedure D1557. Fill materials below optimum moisture content will require additional moisture conditioning prior to placing additional fill.

7.6.6 Grading operations should be managed to allow for placement of oversize material, if present, and expansive soils in the deeper fill areas and to cap the upper 3 feet of building pads with granular materials having a “very low” to “low” expansive potential.

7.6.7 Cobbles, rock fragments, and concretions greater than 6 inches in maximum dimension should not be placed within 3 feet of finish grade in building pad areas or street subgrade. Rock greater than 12 inches in maximum dimension should not be placed within 10 feet of finish pad grade or within 2 feet of the deepest utility.

7.6.8 To reduce the potential for differential settlement, it is recommended that the cut portion of cut/fill transition building pads be undercut at least 3 feet and replaced with properly compacted “very low” to “low” expansive fill soils. Where the thickness of the fill below the building pad exceeds 15 feet, the depth of the undercut should be increased to one-fifth of the maximum fill thickness.

7.6.9 Cut pads exposing rock or cemented portions of the Mission Valley Formation should be undercut at least 3 feet and replaced with properly compacted “very low” to “low” expansive soil. The base of the undercuts should be sloped towards the front of the lots.

7.6.10 Undercutting of street areas should be considered to facilitate the excavation of underground utilities where the streets are located in cut areas composed of marginally to non-rippable hard rock or cemented zones within the Mission Valley Formation. If subsurface improvements or landscape zones are planned outside these areas, consideration should be given to undercutting these areas as well. This can be evaluated during the grading operations.

7.6.11 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations in order to maintain safety and maintain the stability of adjacent existing improvements.

7.6.12 Import materials (if required), should consist of “very low” to “low” expansive (Expansion Index of 50 or less) soils. Prior to importing the material, samples from proposed borrow areas should be obtained and subjected to laboratory testing to determine whether the material conforms to the recommended criteria. At least 3 working days should be allowed for laboratory testing of the soil prior to its importation. Import materials should be free of oversize rock and construction debris.

7.7 Seismic Design Criteria

7.7.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 7.7.1. summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements should be designed using a Site Class C. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 7.7.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.7.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	C	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.919g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.359g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.032	Table 1613.3.3(1)
Site Coefficient, F_V	1.441	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.949g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.518g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.633g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.345g	Section 1613.3.4 (Eqn 16-40)

7.7.2 Table 7.7.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.7.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.343g	Figure 22-7
Site Coefficient, F_{PGA}	1.057	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.363g	Section 11.8.3 (Eqn 11.8-1)

7.7.3 Conformance to the criteria in Tables 7.7.1 and 7.7.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7.8 Foundation and Concrete Slabs-On-Grade Recommendations

7.8.1 The following foundation recommendations are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 7.8.1.

TABLE 7.8.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	$T<20$	--	$EI \leq 50$
II	$20 \leq T<50$	$10 \leq D<20$	$50<EI \leq 90$
III	$T \geq 50$	$D \geq 20$	$90<EI \leq 130$

7.8.2 Final foundation categories for each building or lot will be provided after finish pad grades have been achieved and laboratory testing of the subgrade soil has been completed.

7.8.3 Table 7.8.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 7.8.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

7.8.4 The embedment depths presented in Table 7.8.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. A typical wall/column footing detail is presented on Figure 12.

7.8.5 The concrete slabs-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III. The concrete slabs-on-grade should be underlain by 4 inches and 3 inches of clean sand for 4-inch thick and 5-inch-thick slabs, respectively. Slabs expected to receive moisture sensitive floor coverings or used to store moisture sensitive materials should be underlain by a vapor inhibitor covered with at least 2 inches of clean sand or crushed rock. If crushed rock will be used, the thickness of the vapor inhibitor should be at least 10 mil to prevent possible puncturing.

7.8.6 As a substitute, the layer of clean sand (or crushed rock) beneath the vapor inhibitor recommended in the previous section can be omitted if a vapor inhibitor that meets or exceeds the requirements of ASTM E 1745-97 (Class A), and that exhibits permeance not greater than 0.012 perm (measured in accordance with ASTM E 96-95) is used. This vapor inhibitor may be placed directly on properly compacted fill or formational materials. The vapor inhibitor should be installed in general conformance with ASTM E 1643-98 and the manufacturer’s recommendations. Two inches of clean sand should then be placed on top of the vapor inhibitor to reduce the potential for differential curing, slab curl, and cracking. Floor coverings should be installed in accordance with the manufacturer’s recommendations.

7.8.7 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC 10.5-12 *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* or *WRI/CRSI Design of Slab-on-Ground Foundations,* as required by the 2016 California Building Code (CBC Section 1808.6.2). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented in Table 7.8.3 for the particular Foundation Category designated. The parameters presented in Table 7.8.3 are based on the guidelines presented in the PTI DC 10.5 design manual.

TABLE 7.8.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI), Third Edition Design Parameters	**Foundation Category**		
	I	**II**	**III**
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

7.8.8 Foundation systems for the lots that possess a foundation Category I and a “very low” expansion potential (expansion index of 20 or less) can be designed using the method described in Section 1808 of the 2016 CBC. If post-tensioned foundations are planned, an alternative, commonly accepted design method (other than PTI DC 10.5) can be used. However, the post-tensioned foundation system should be designed with a total and differential deflection of 1 inch. Geocon Incorporated should be contacted to review the plans and provide additional information, if necessary.

7.8.9 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

7.8.10 If the structural engineer proposes a post-tensioned foundation design method other than PTI, Third Edition:

- The deflection criteria presented in Table 7.8.3 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

7.8.11 Our experience indicates post-tensioned slabs are susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. Current PTI design procedures primarily address the potential center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning reduces the ability of the system to mitigate edge lift. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

7.8.12 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints be allowed to form between the footings/grade beams and the slab during the construction of the post-tension foundation system.

7.8.13 Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces.

7.8.14 Isolated footings, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular foundation category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

7.8.15 For Foundation Category III, consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

7.8.16 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.8.17 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

7.8.18 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.8.19 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.9 Retaining Walls and Lateral Loads Recommendations

7.9.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid with a density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an Expansion Index ≤50. Geocon Incorporated should be consulted for additional recommendations if backfill materials have an EI >50.

7.9.2 Retaining walls shall be designed to ensure stability against overturning sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

7.9.3 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf (where H equals the height of the retaining wall portion of the wall in feet) should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 12H where the wall is greater than 8 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to two feet of fill soil should be added (total unit weight of soil should be taken as 130 pcf).

7.9.4 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

7.9.5 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

7.9.6 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI $\leq$50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is presented on Figure 13. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.9.7 In general, wall foundations having a minimum depth and width of one foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within three feet below the base of the wall has an Expansion Index $\leq$ 90. The recommended allowable soil bearing pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf.

7.9.8 The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is anticipated. As a minimum, wall footings should be deepened such that the bottom outside edge of the footing is at least seven feet from the face of slope when located adjacent and/or at the top of descending slopes.

7.9.9 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2016 CBC or Section 11.6 of ASCE 7-10. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 19H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.363g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.9.10 For resistance to lateral loads, a passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed formational materials. The passive pressure assumes a horizontal surface extending away from the base of the wall at least five feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance.

7.9.11 An ultimate friction coefficient of 0.35 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the passive earth pressure when determining resistance to lateral loads.

7.9.12 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 12 feet. In the event that walls higher than 12 feet are planned, Geocon Incorporated should be consulted for additional recommendations.

7.10 Slope Maintenance

7.10.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions that are both difficult to prevent and predict, be susceptible to near-surface (surficial) slope instability. The instability is typically limited to the outer 3 feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is, therefore, recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. It should be noted that although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

7.11 Storm Water Management

7.11.1 If low-impact development (LID) integrated management practices (IMP's) are being considered, Geocon should review the design and provide specific geotechnical recommendations to reduce the potential adverse impacts to both on and off-site properties.

7.11.2 If not property constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. Based on our experience with similar soil conditions, infiltration IMP's are considered infeasible due to the poor percolation characteristics of the bedrock. Down-gradient and adjacent properties/improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other impacts as a result of water infiltration.

7.11.3 Due to the site geologic conditions, a heavy duty, non-permeable liner is recommended beneath any hydro-modification areas or IMP's where water infiltration into the surficial soil is planned. If permeable pavers are planned, the design should include a subdrain to prevent subgrade saturation and pavement distress. The strength and thickness of the membrane, and construction method should be adequate to assure that the liner will not be compromised throughout the life of the system. In addition, civil engineering provisions should be implemented to assure that the capacity of the system is never exceeded resulting in over topping or malfunctioning of the device. The system should also include a long-term maintenance program or periodic cleaning to prevent clogging of the filter media or drain envelope.

7.12 Site Drainage and Moisture Protection

7.12.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.12.2 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.13 Grading and Foundation Plan Review

7.13.1 Geocon Incorporated should review the grading plans and foundation plans for the project prior to final design submittal to evaluate whether additional analyses and/or recommendations are required.

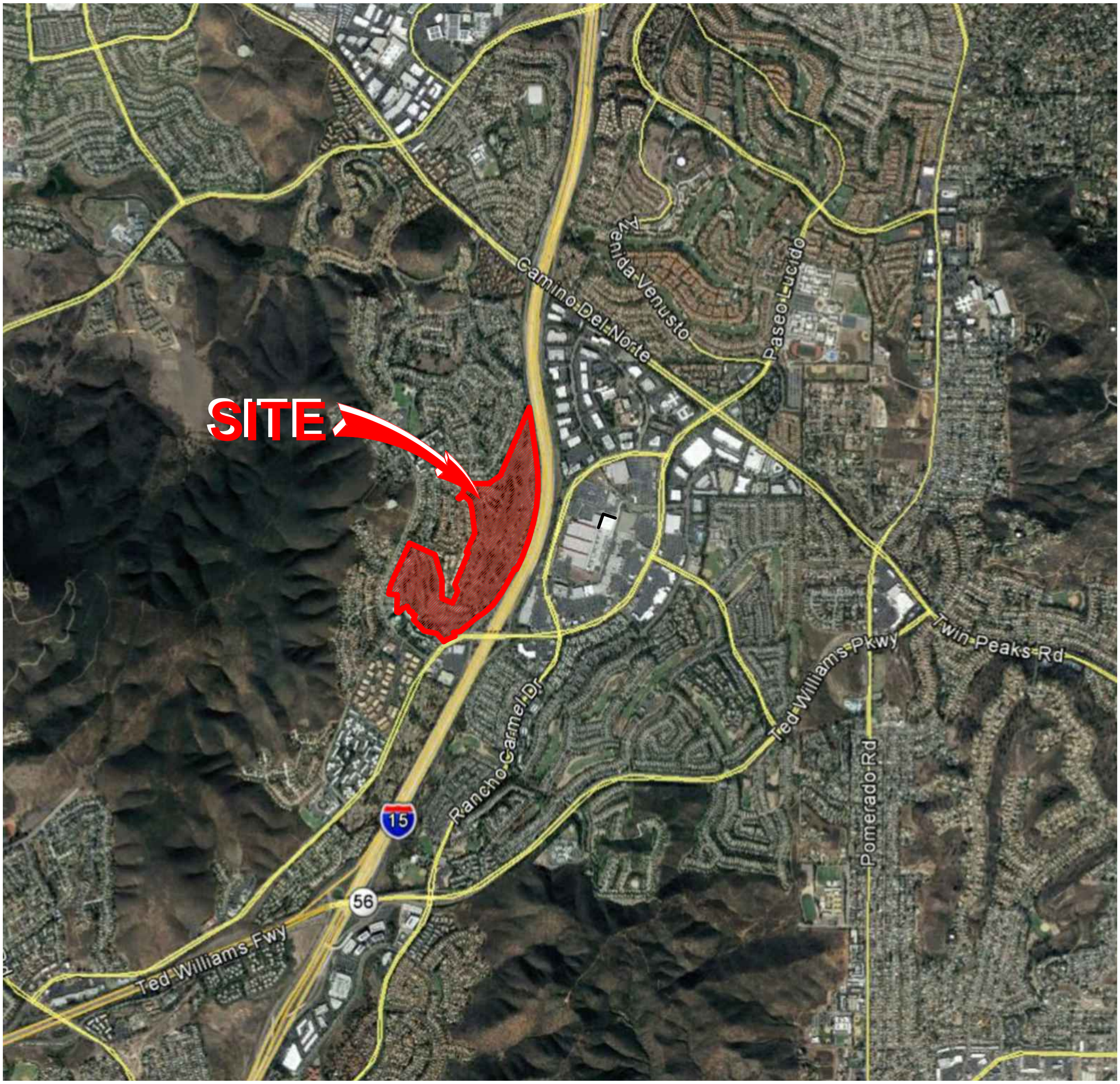
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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NO SCALE

VICINITY MAP

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THE JUNIPERS
SAN DIEGO, CALIFORNIA

TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. 1

GEOCON LEGEND

- Qudf 1 ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
- Qudf 2 ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- Qal ....ALLUVIUM
- Tmv ....MISSION VALLEY FORMATION
- Jsp ....SANTIAGO PEAK VOLCANICS
- B-25 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- T-13 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-9 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-26 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- 9' ....APPROX. THICKNESS OF SURFICIAL DEPOSITS AND WEATHERED BEDROCK REQUIRING REMEDIAL GRADING (In Feet)
- ....APPROX. LOCATION OF SUBDRAIN
- ? ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- 672' ....APPROX. ELEVATION OF BEDDING PLANE SHEAR
- -27' ....APPROX. DEPTH (In Feet) BELOW EXISTING GROUND SURFACE TO FIRST OCCURANCE OF SEEPAGE/GROUNDWATER
- Q Q' ....APPROX. LOCATION OF GEOLOGIC CROSS-SECTION
- ....PROPOSED BASE OF BUTTRESS/SHEAR KEY
- ....PROPOSED BASE OF STABILITY FILL
- 628' ....ANTICIPATED ELEVATION OF BASE OF KEYWAY (Elevations Do Not Consider Positive Flow of Heel Drains)

GEOLOGIC MAP

THE JUNIPERS
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
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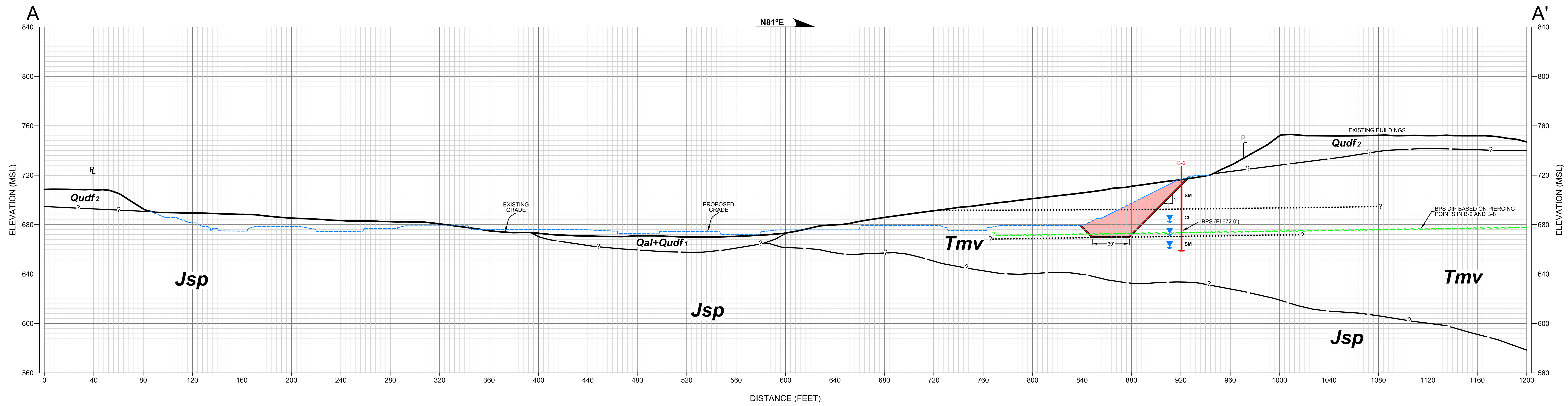
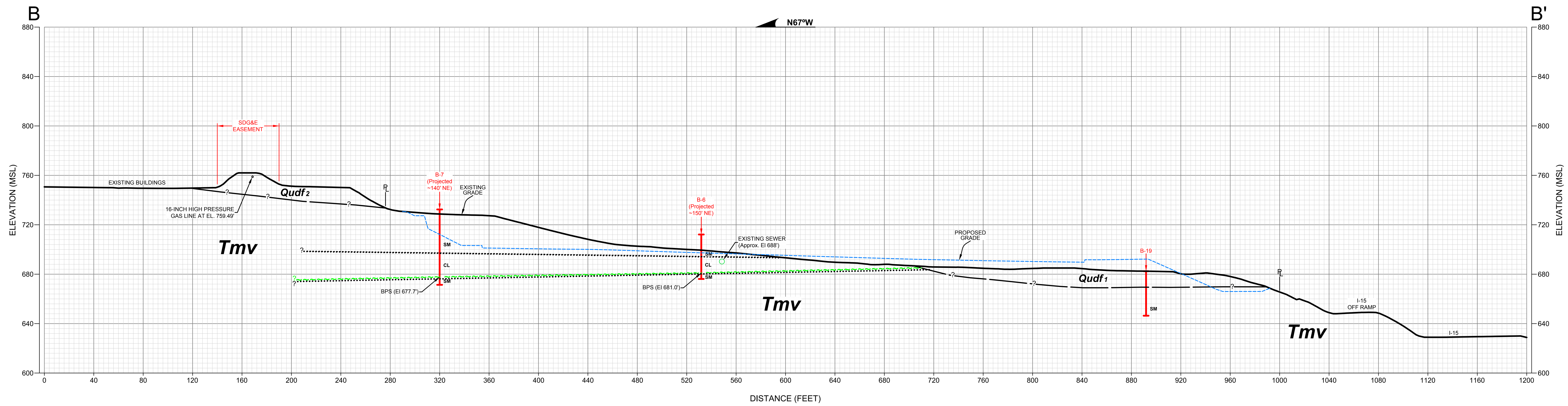
SCALE 1" = 100' | DATE 04 - 09 - 2019
PROJECT NO. G2030 - 32 - 03 | FIGURE 2
SHEET 1 OF 7

Plotted:04/08/2019 10:36AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2030-32-03 Junipers\SHEETS\G2030-32-03 GeoMap.dwg



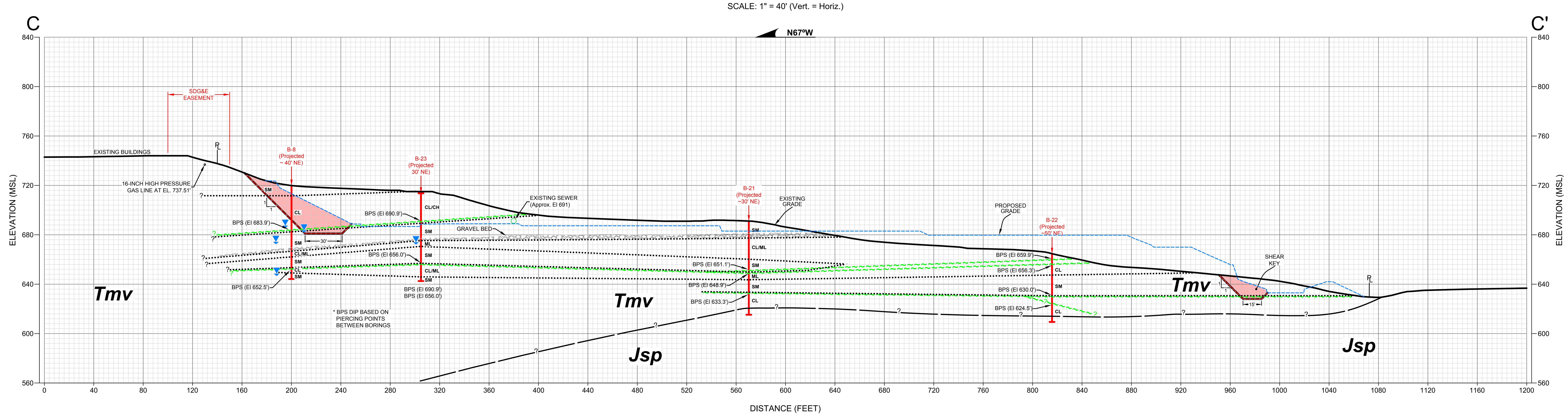
GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

- Qudf₁ ......UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE
- Qudf₂ ......UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- Qal ......ALLUVIUM
- Tmv ......MISSION VALLEY FORMATION
- Jsp ......SANTIAGO PEAK VOLCANICS
- B-23 ......APPROX. LOCATION OF LARGE DIAMETER BORING
- ......APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ......APPROX. LOCATION OF BEDDING PLANE SHEAR
- ......APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ......APPROX. LIMITS OF STABILITY FILL
- ......APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

THE JUNIPERS
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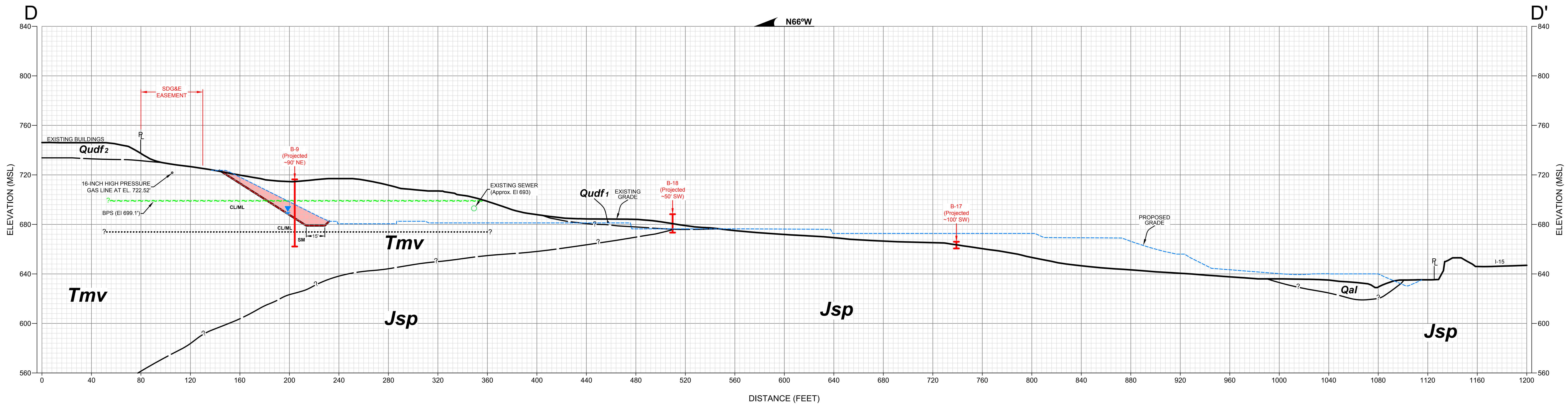
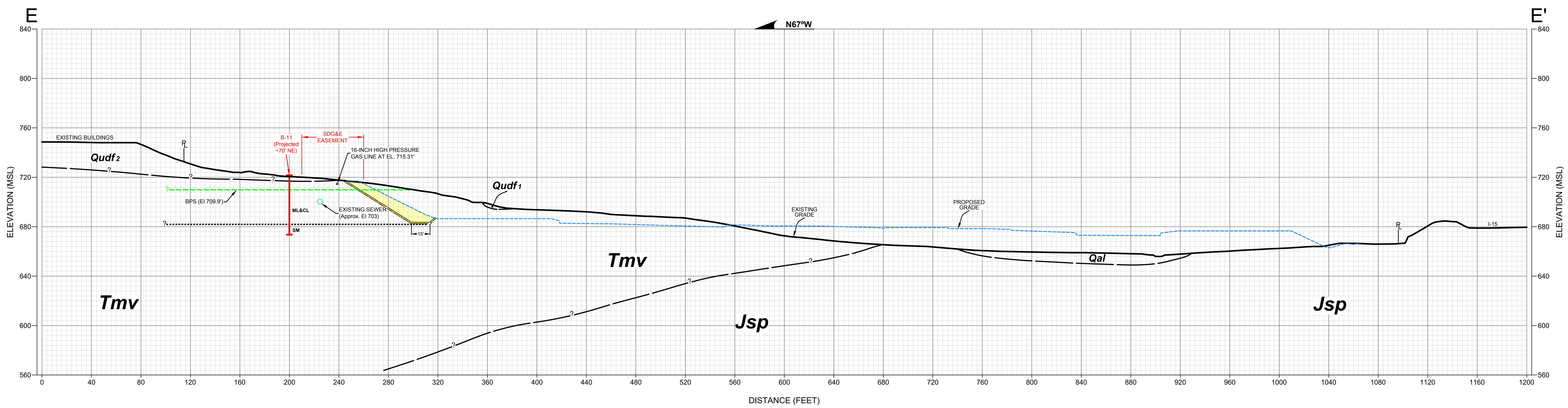
SCALE	1" = 40'	DATE	04 - 09 - 2019
PROJECT NO.	G2030 - 32 - 03	FIGURE	3
SHEET	2 OF 7		



GEOLOGIC CROSS-SECTION D-D'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION E-E'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

- Qudf 1 ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE
- Qudf 2 ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- Qal ....ALLUVIUM
- Tmv ....MISSION VALLEY FORMATION
- Jsp ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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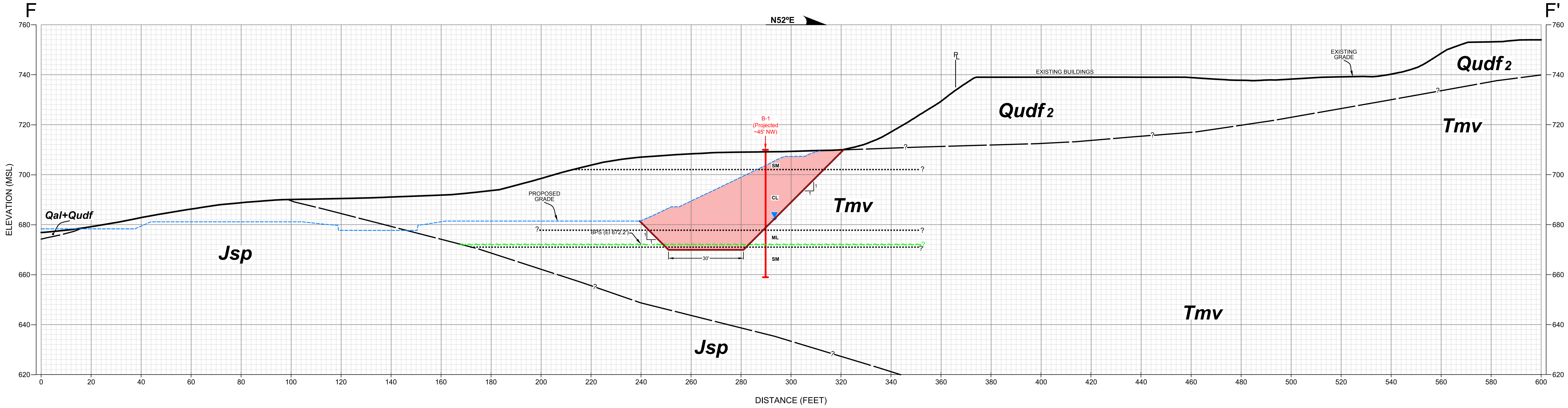
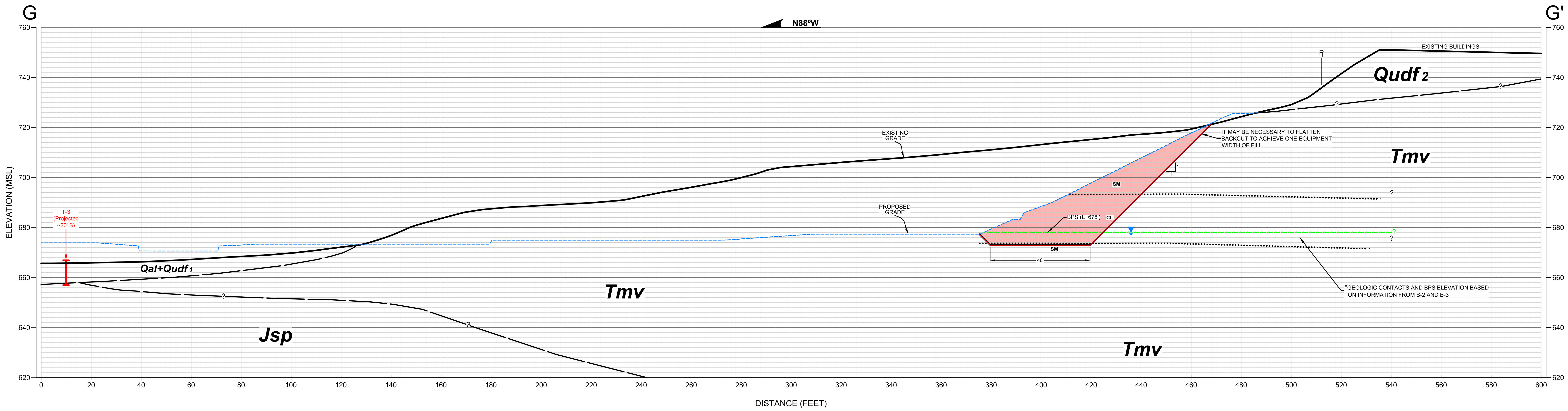
SCALE 1" = 40'	DATE 04 - 09 - 2019
PROJECT NO. G2030 - 32 - 03	FIGURE 4
SHEET 3 OF 7	



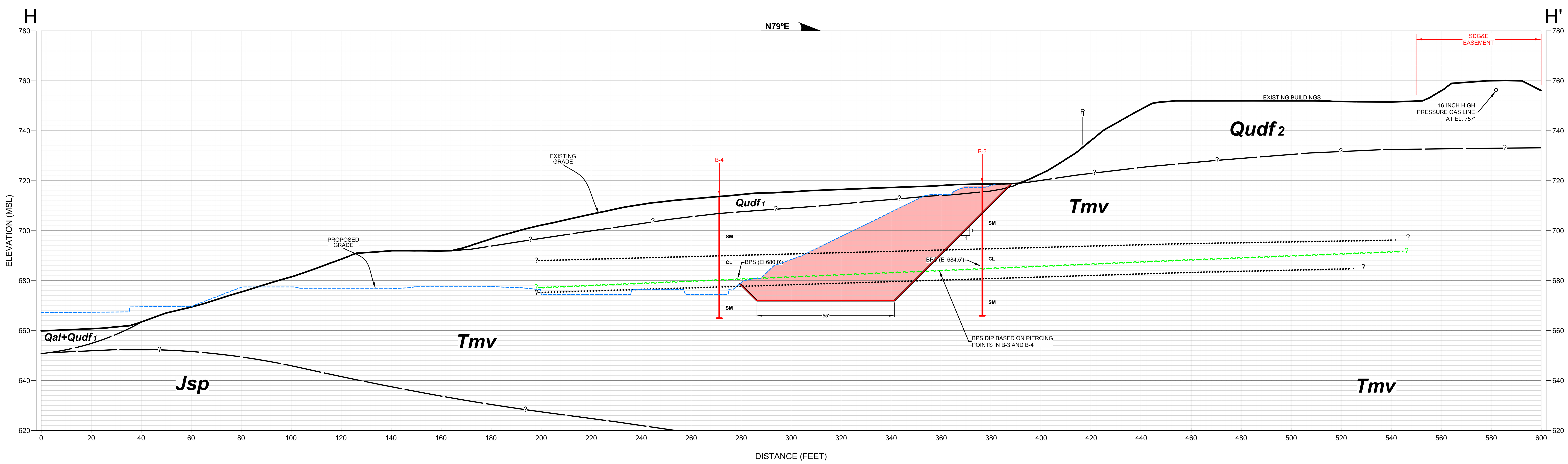
GEOLOGIC CROSS-SECTION F-F'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION G-G'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION H-H'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

- **Qudf 1** ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
- **Qudf 2** ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- **Qal** ....ALLUVIUM
- **Tmv** ....MISSION VALLEY FORMATION
- **Kgr** ....GRANITIC ROCK
- **Jsp** ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- T-3 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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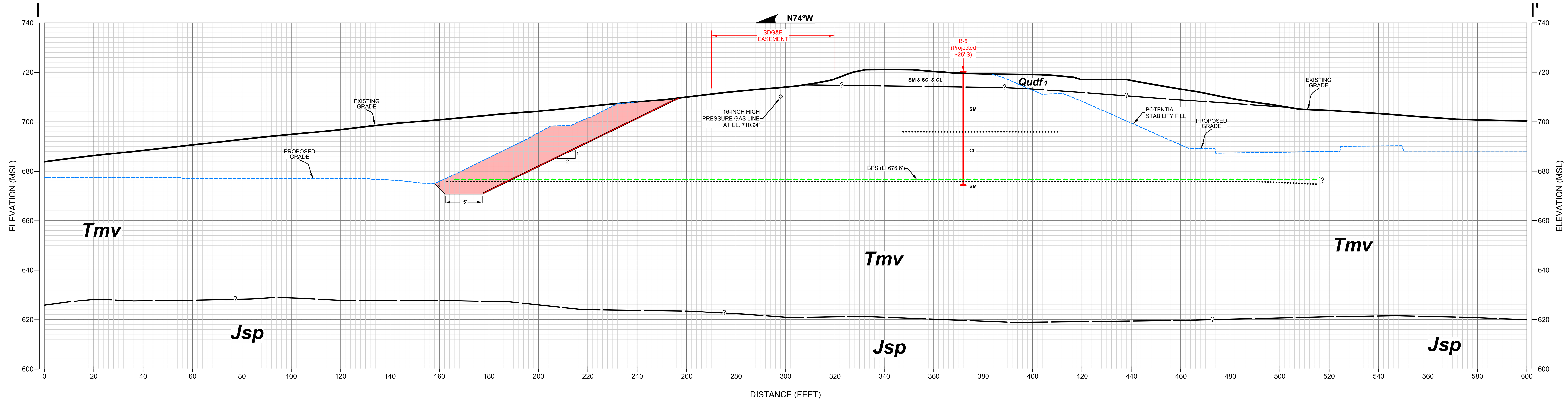
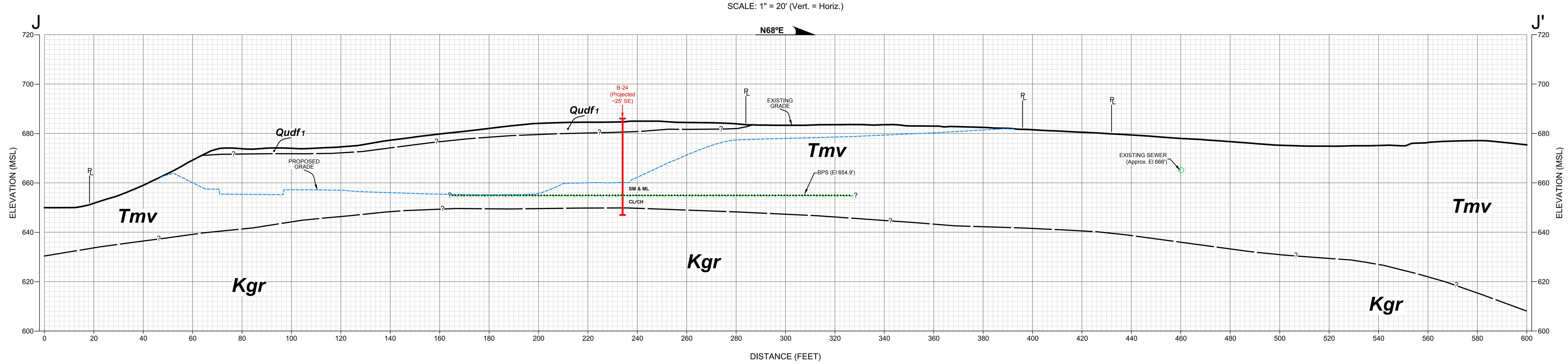
SCALE 1" = 20'	DATE 04 - 09 - 2019	
PROJECT NO. G2030 - 32 - 03		FIGURE 5
SHEET 4 OF 7		

Plotted:04/08/2019 10:36AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2030-32-03 Junipers\SOURCE\SECTION\Profiles-Proposed&ExistingSurface8_20scale.dwg



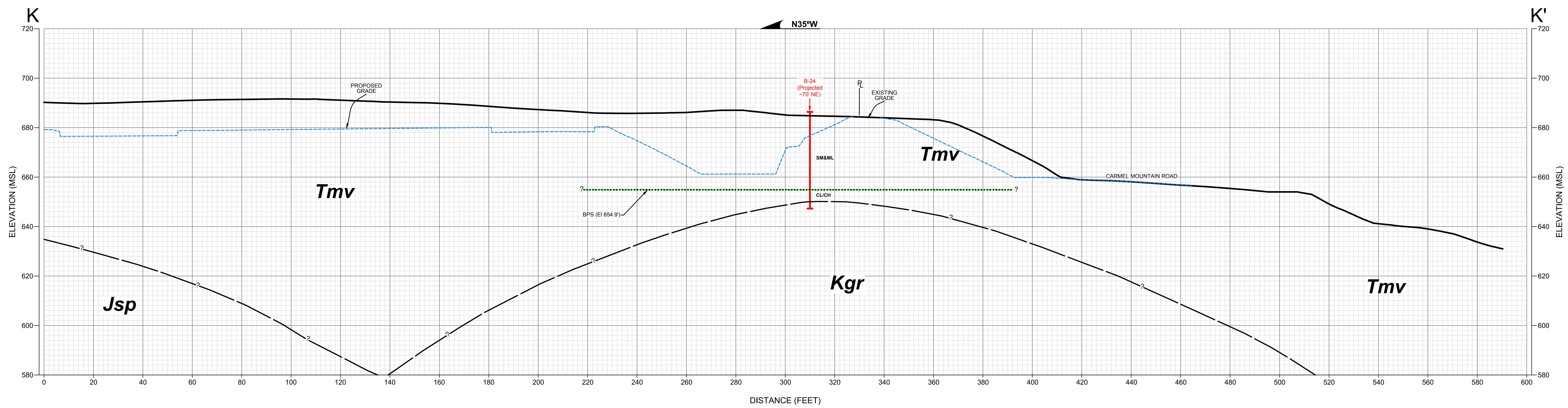
GEOLOGIC CROSS-SECTION I-I'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION J-J'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION K-K'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

- **Qudf1** ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
- **Qudf2** ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- **Qal** ....ALLUVIUM
- **Tmv** ....MISSION VALLEY FORMATION
- **Kgr** ....GRANITIC ROCK
- **Jsp** ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- T-3 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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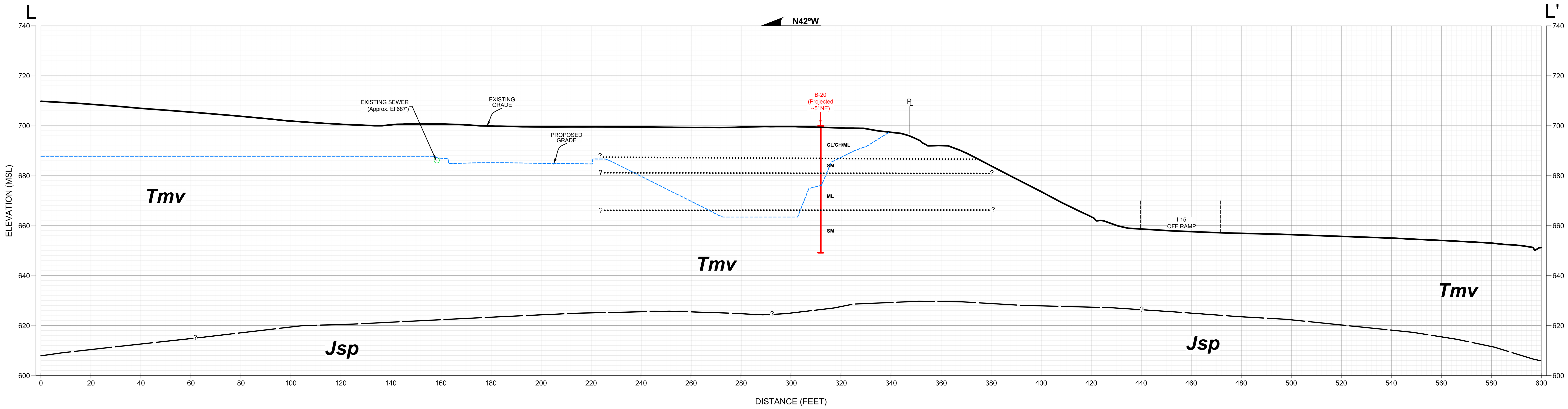
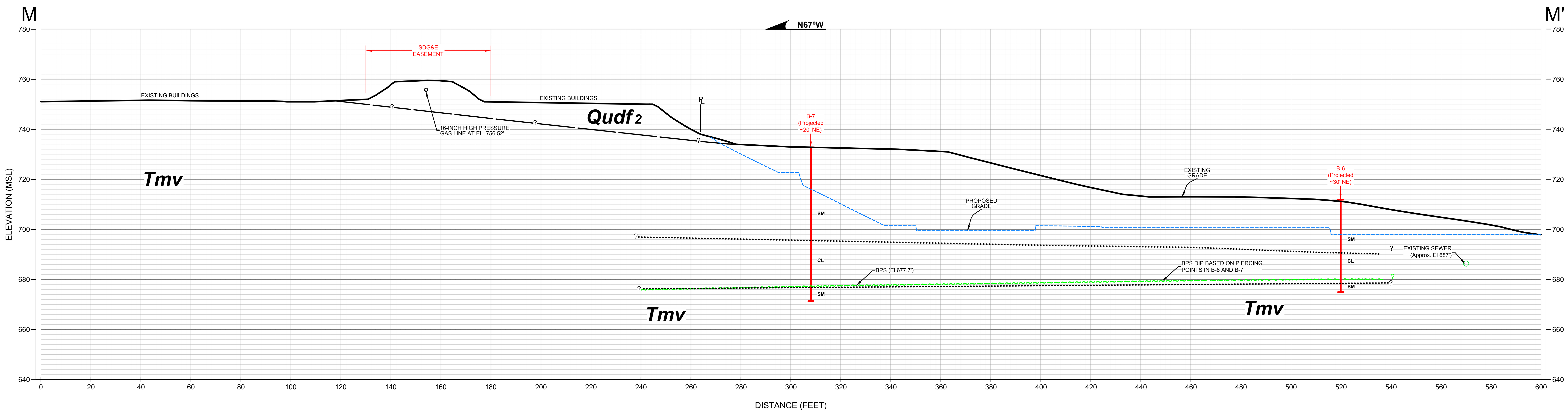
SCALE 1" = 20'	DATE 04 - 09 - 2019	
PROJECT NO. G2030 - 32 - 03		FIGURE 6
SHEET 5 OF 7		



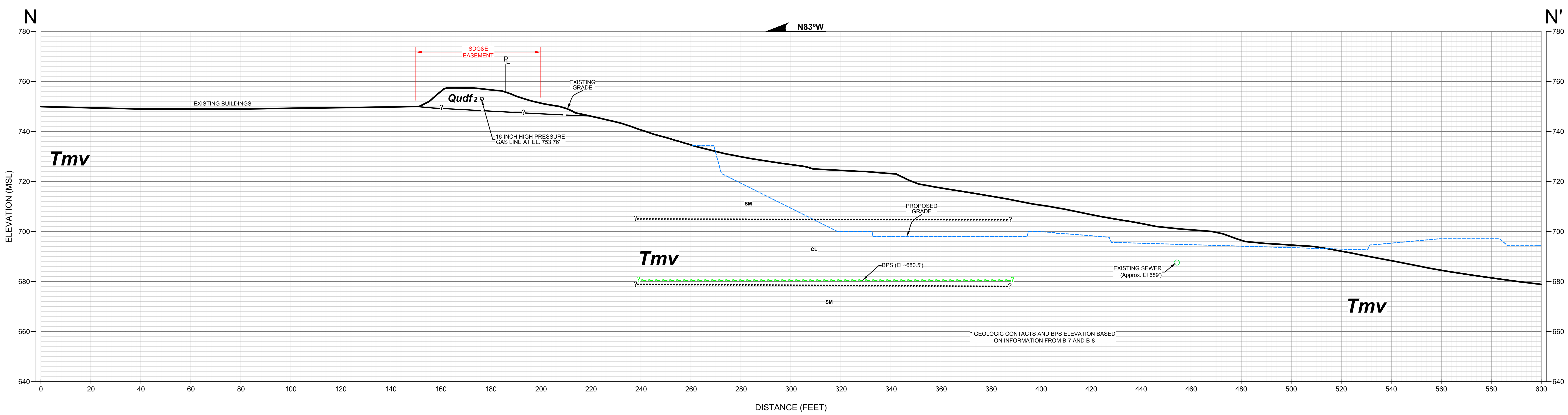
GEOLOGIC CROSS-SECTION L-L'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION M-M'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION N-N'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

- **Qudf1** ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
- **Qudf2** ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- **Qal** ....ALLUVIUM
- **Tmv** ....MISSION VALLEY FORMATION
- **Kgr** ....GRANITIC ROCK
- **Jsp** ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- T-3 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ? ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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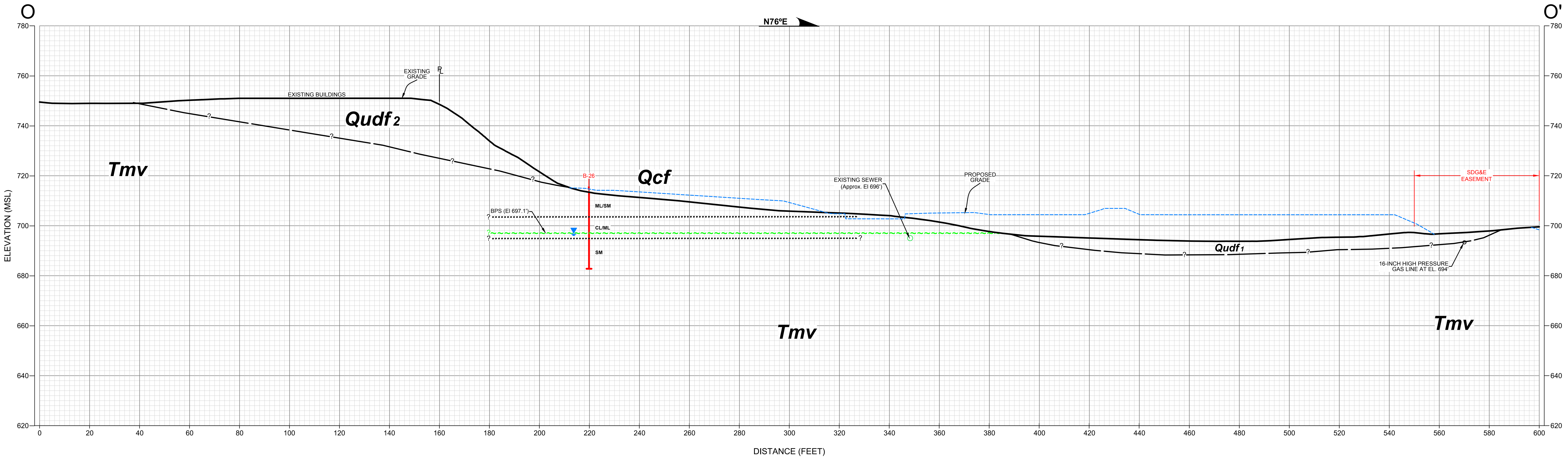
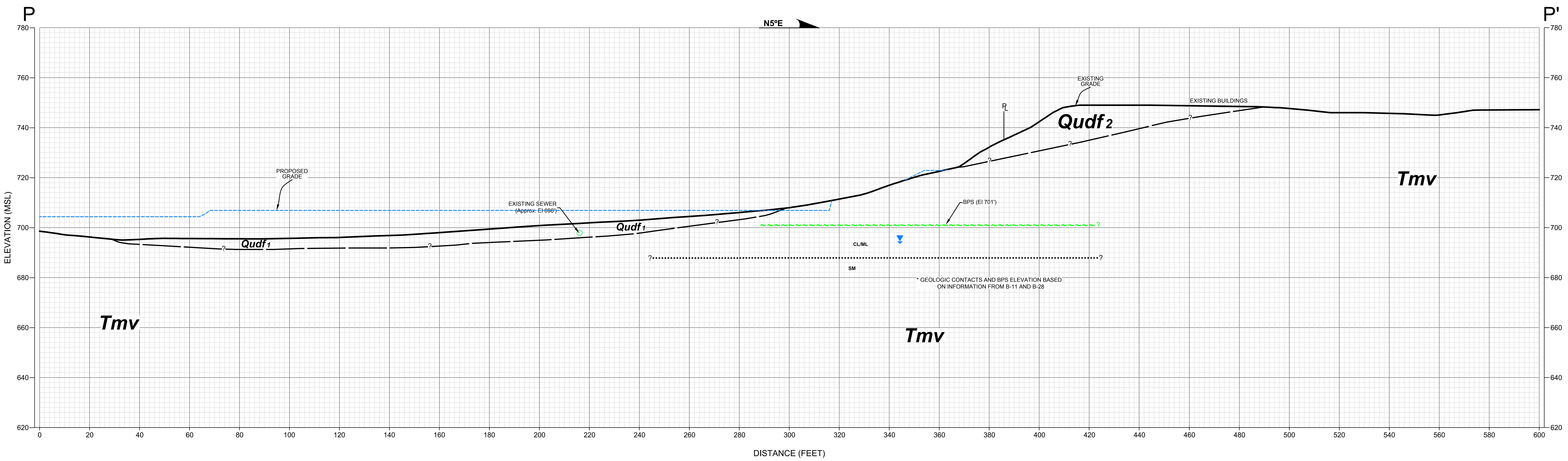
SCALE 1" = 20'	DATE 04 - 09 - 2019	
PROJECT NO. G2030 - 32 - 03		FIGURE 7
SHEET 6 OF 7		



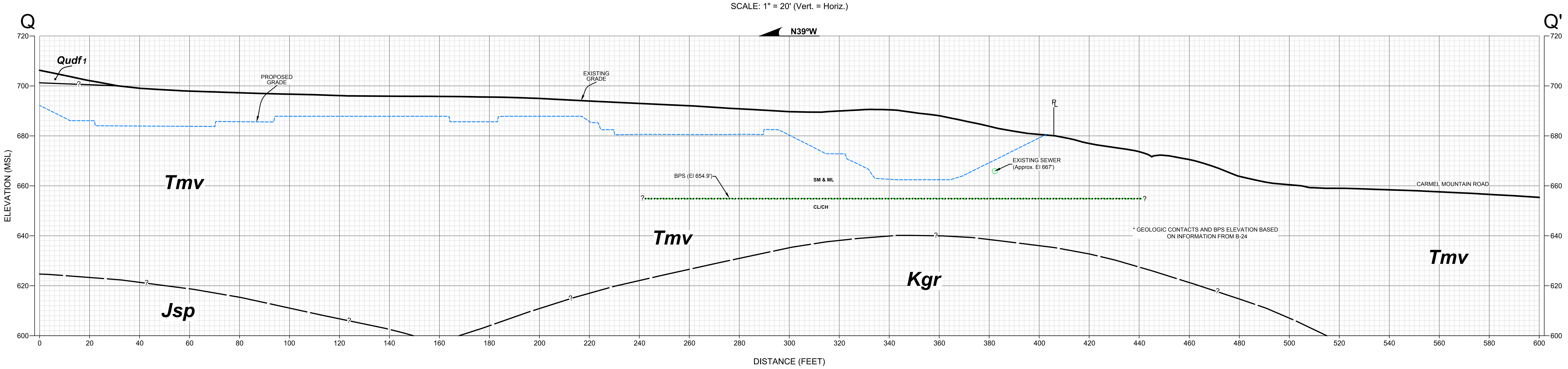
GEOLOGIC CROSS-SECTION O-O'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION P-P'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION Q-Q'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

- **Qudf 1** ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
- **Qudf 2** ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- **Qal** ....ALLUVIUM
- **Tmv** ....MISSION VALLEY FORMATION
- **Kgr** ....GRANITIC ROCK
- **Jsp** ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- T-3 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ? ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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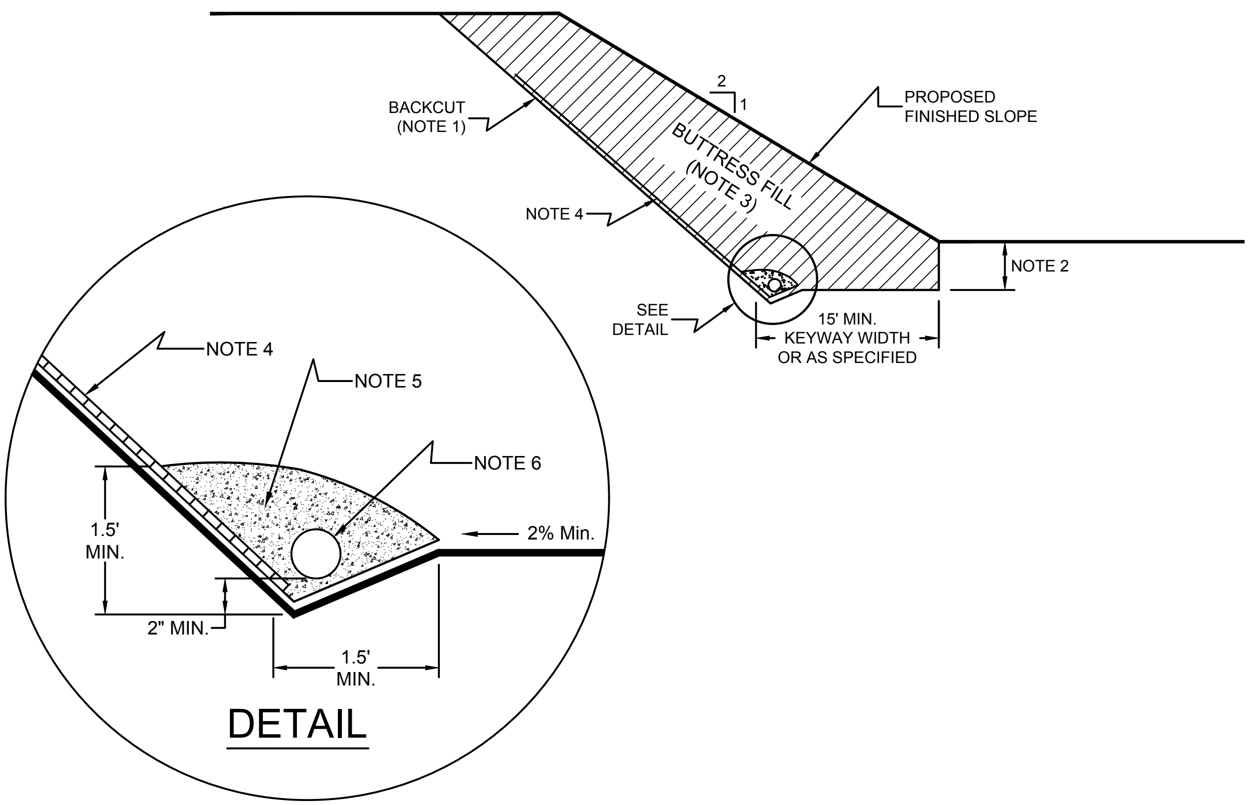
SCALE 1" = 20'	DATE 04 - 09 - 2019
PROJECT NO. G2030 - 32 - 03	FIGURE 8
SHEET 7 OF 7	



NOTES:

1.....EXCAVATE BACKCUT IN ACCORDANCE WITH GEOTECHNICAL CONSULTANTS RECOMMENDATION TO ACHIEVE REQUIRED KEY WIDTH.

2.....BASE OF BUTTRESS KEY TO EXPOSE DENSE, FORMATIONAL MATERIAL SLOPING A MINIMUM 2% INTO SLOPE. FORECUT MAY BE SLOPED PER GEOTECHNICAL ENGINEERS RECOMMENDATIONS.

3.....BUTTRESS FILL TO BE COMPOSED OF PROPERLY COMPACTED, GRANULAR SOIL WITH MINIMUM SHEAR STRENGTH AS SPECIFIED.

4.....CHIMNEY DRAINS TO BE APPROVED, PREFABRICATED DOUBLE SIDED CHIMNEY DRAIN PANELS (MIRADRAIN, TENSAR, OR EQUIVALENT) SPACED APPROXIMATELY 30 FEET CENTER TO CENTER. ADDITIONAL DRAINS WILL BE REQUIRED WHERE AREAS OF SEEPAGE ARE ENCOUNTERED.

5.....DRAIN MATERIAL (9 CUBIC FEET) TO BE 3/4-INCH, OPEN-GRADED, CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC .

6.....COLLECTOR PIPE TO BE 6-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

TYPICAL BUTTRESS FILL DETAIL

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THE JUNIPERS
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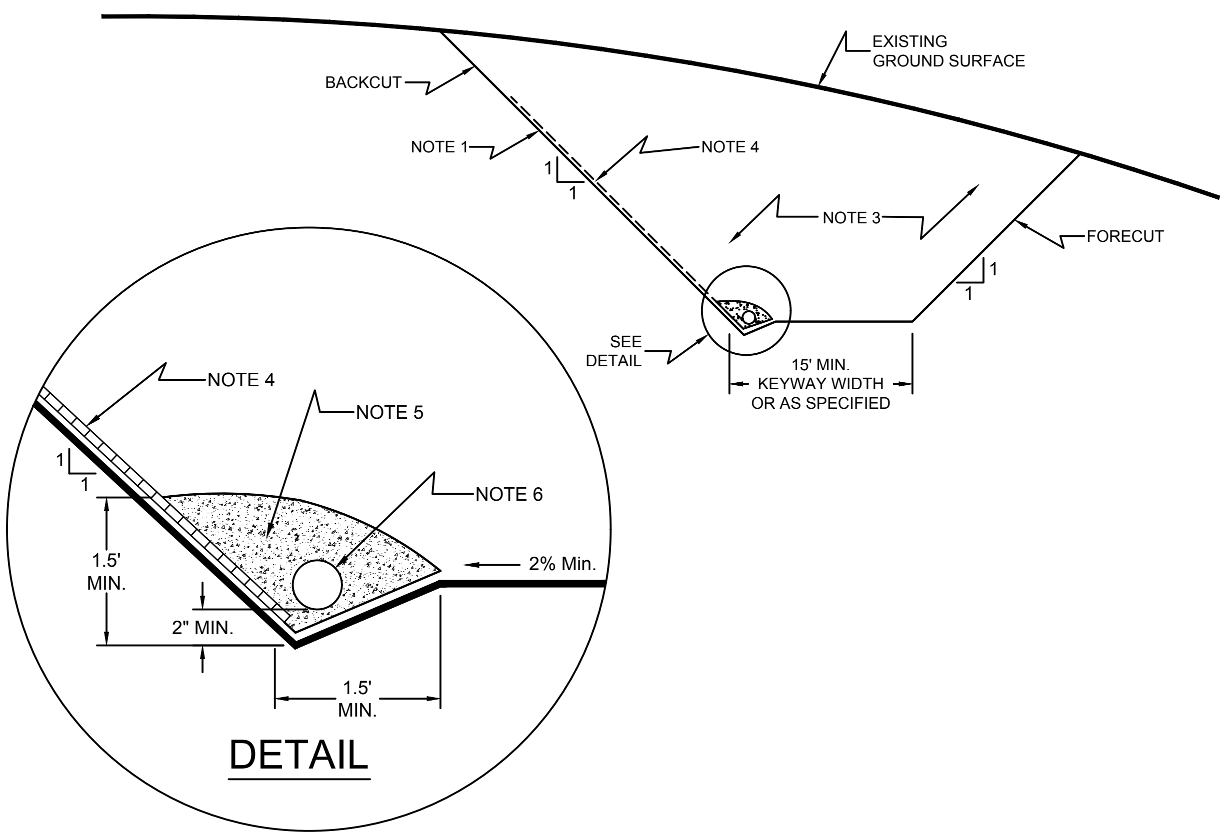
TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. 9



NOTES:

1.....EXCAVATE BACKCUT IN ACCORDANCE WITH GEOTECHNICAL CONSULTANTS RECOMMENDATION TO ACHIEVE REQUIRED KEY WIDTH.

2.....BASE OF SHEAR KEY TO EXPOSE DENSE, FORMATIONAL MATERIAL SLOPING A MINIMUM 2% INTO SLOPE.

3.....COMPACTED FILL TO BE COMPOSED OF PROPERLY COMPACTED, GRANULAR SOIL WITH MINIMUM SHEAR STRENGTH AS SPECIFIED.

4.....CHIMNEY DRAINS TO BE APPROVED, PREFABRICATED DOUBLE SIDED CHIMNEY DRAIN PANELS (MIRADRAIN, TENSAR, OR EQUIVALENT) SPACED APPROXIMATELY 30 FEET CENTER TO CENTER. ADDITIONAL DRAINS WILL BE REQUIRED WHERE AREAS OF SEEPAGE ARE ENCOUNTERED. HEIGHT OF CHIMNEY DRAINS TO BE DETERMINED BY GEOTECHNICAL ENGINEER.

5.....DRAIN MATERIAL (9 CUBIC FEET) TO BE 3/4-INCH, OPEN-GRADED, GRAVEL SURROUNDED BY MIRAFI 140N OR EQUIVALENT FILTER FABRIC.

6.....COLLECTOR PIPE TO BE 6-INCH MINIMUM DIAMETER, SCHEDULE 40 PVC, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO SUITABLE TIGHT LINE OUTLET.

NO SCALE

TYPICAL SHEAR KEY DETAIL

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THE JUNIPERS
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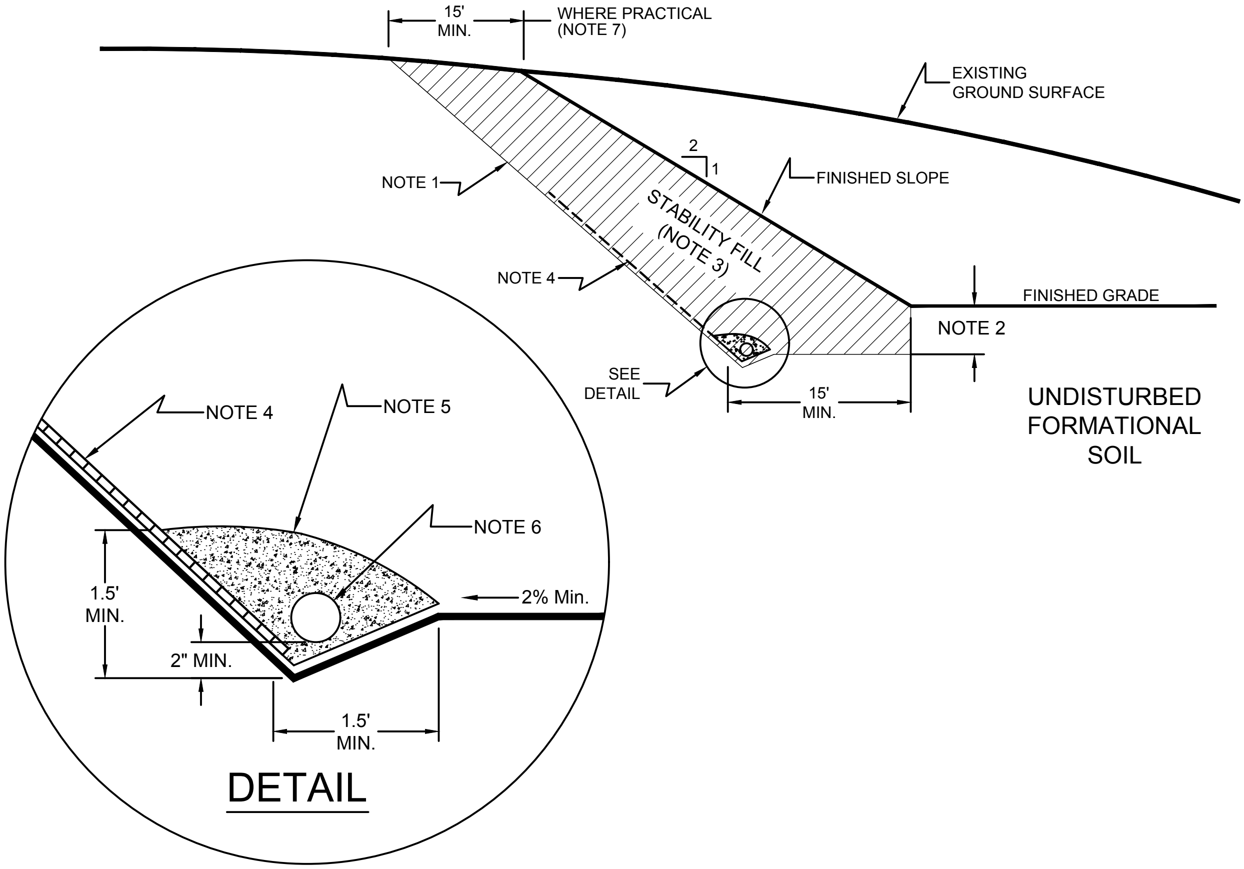
TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. 10



NOTES:

1.....EXCAVATE BACKCUT IN ACCORDANCE WITH GEOTECHNICAL CONSULTANTS RECOMMENDATION.

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO DENSE, FORMATIONAL SOILS SLOPING A MINIMUM 2% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED, GRANULAR SOIL WITH MINIMUM SHEAR STRENGTH AS SPECIFIED.

4.....CHIMNEY DRAINS TO BE APPROVED, PREFABRICATED DOUBLE SIDED CHIMNEY DRAIN PANELS (MIRADRAIN, TENSAR, OR EQUIVALENT) SPACED APPROXIMATELY 30 FEET CENTER TO CENTER. ADDITIONAL DRAINS WILL BE REQUIRED WHERE AREAS OF SEEPAGE ARE ENCOUNTERED.

5.....DRAIN MATERIAL (9 CUBIC FEET) TO BE 3/4-INCH, OPEN-GRADED, CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC .

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

TYPICAL STABILITY FILL DETAIL

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THE JUNIPERS
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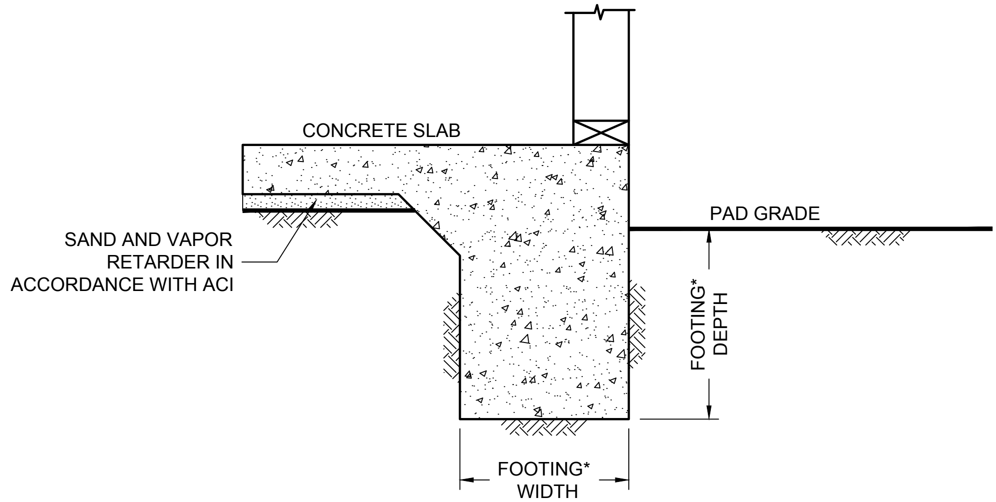
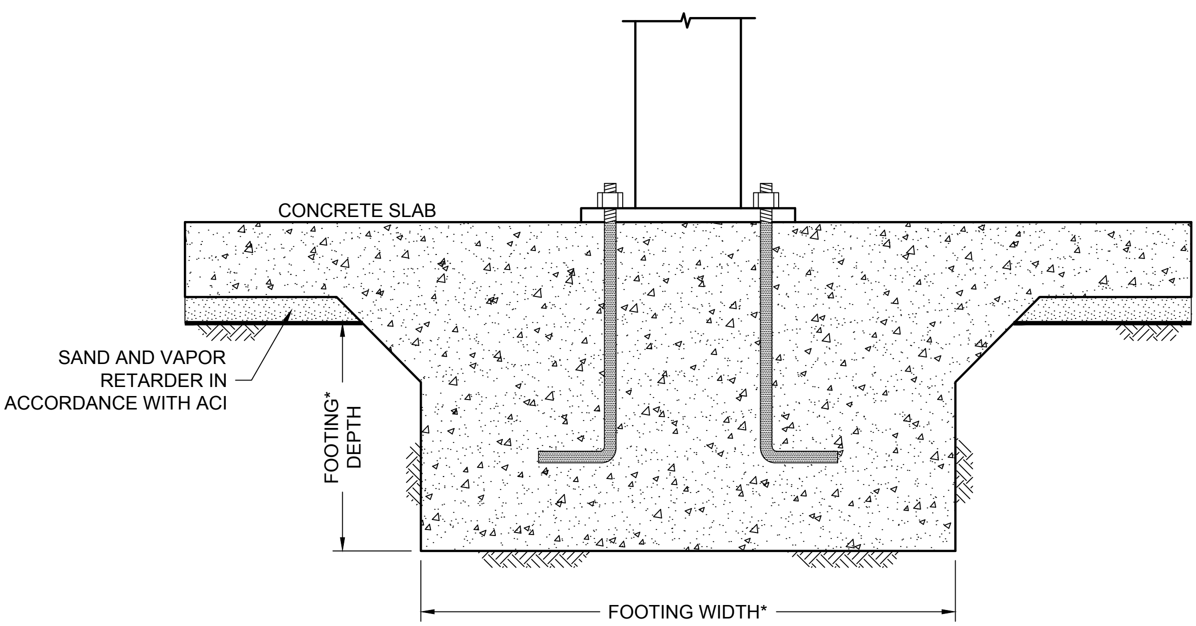
TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. 11

Plotted:04/08/2019 3:54PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2030-32-03 Junipers\DETAILS\Typical Stability Fill Detail-2.dwg





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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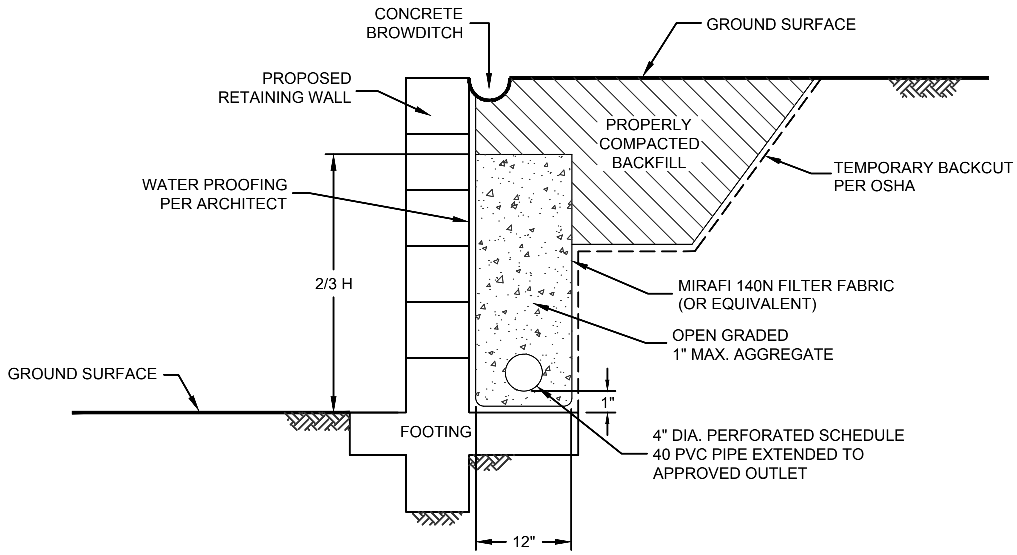
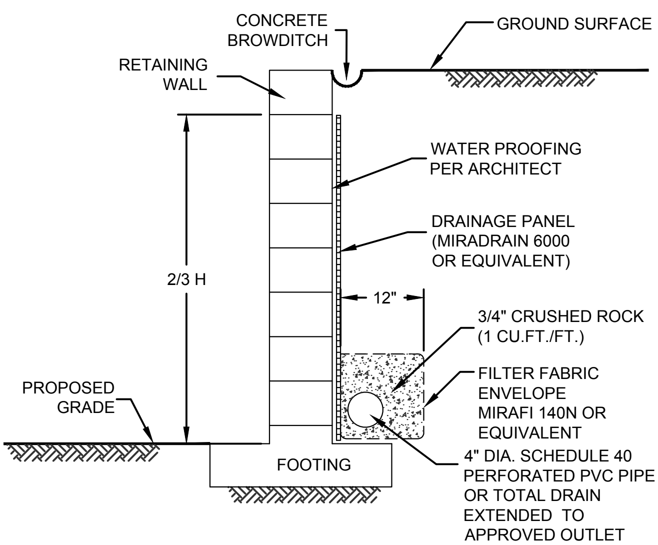
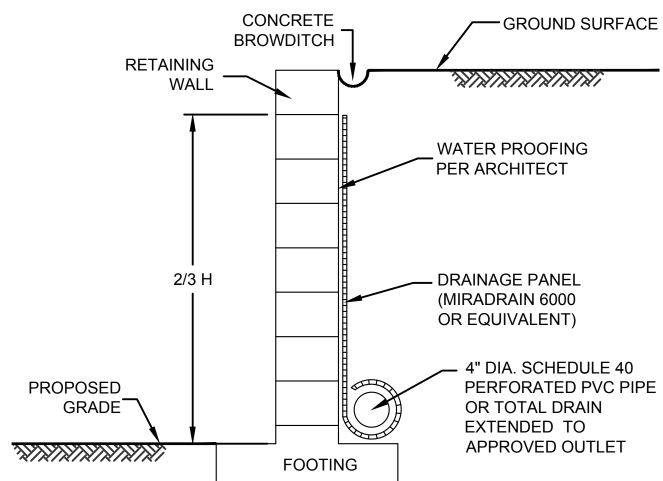
TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. 12







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. 13

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

Our field investigation was performed between January 25 and September 22, 2017, and July 2, 2018, and consisted of a site reconnaissance, and the excavation of twenty-eight large-diameter borings and thirteen exploratory trenches. The approximate locations of the exploratory borings and trenches are shown on the *Geologic Map*, Figure 2, including the twenty-six exploratory trenches performed by Leighton and Associates, Inc. in August 2014 (see Appendix D for Leighton's trench logs).

The twenty-eight large-diameter borings were performed by Dave's Drilling and advanced to a maximum depth of 75½ feet below existing grade using an EasyBore 120 truck-mounted drill rig equipped with a 30-inch-diameter bucket auger. Relatively undisturbed samples were obtained by driving a 3-inch, O.D., split-tube sampler into the "undisturbed" soil mass with the drill rig kelly bar. The sampler was equipped with 1-inch by 2⅜-inch brass sampler rings to facilitate removal and testing. Bulk samples were also obtained. In general, a dip and dip direction convention was used to present the orientation of bedding and structural features measured in the borings. The logs of the large-diameter borings depicting the soil and geologic conditions encountered and the depth at which samples were obtained are presented on Figures A-1 through A-28.

The exploratory trenches were advanced by Hillside Excavating to depths of 8 to 17 feet using a John Deere 410 rubber-tire backhoe equipped with a 24-inch-wide bucket. Bulk samples were also collected. Logs of the backhoe trenches depicting the soil and geologic conditions encountered are presented on Figures A-29 through A-41.

The soils encountered in the excavations were visually classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual Manual Procedure D 2488).

PROJECT NO. G2030-32-03

BORING B 1

ELEV. (MSL.) 710' DATE COMPLETED 01-25-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/SC&CL	**UNDOCUMENTED FILL (Qudf)** Medium dense/stiff, moist, dark brown and gray, Silty/Clayey, fine to medium SAND and fine to medium, Sandy/Silty CLAY; roots present down to 3 feet			
2								
4					-6-inch diameter asbestos pipe encountered at 3.5 feet -Irregular high angle contact from 1.5 to 4 feet			
				SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, light brown, Silty, fine SANDSTONE with abundant calcium carbonate veins and pods			
	B1-1					5	113.9	11.0
6	B1-2				-4 to 6-inch thick gravel bed at 6 feet -Undulating contact with 4 to 6-inch thick calcium carbonate bed along trace			
8				CL	Hard, damp to moist, dark green, Silty CLAYSTONE; waxy in areas with calcium carbonate veins and pods			
10	B1-3				-Becomes mottled dark green and maroon below 10 feet	4	109.9	18.4
12	B1-4							
14								
	B1-5					3		
16								
18								
20	B1-6					3	106.8	19.4
22								
					-1/4 to 1/2-inch wide, clay filled fracture from 23 to 27 feet (60°, S80°W) with soft clay seams along trace			
24								
	B1-7				-Becomes slightly fissured and weak from 25 to 27 feet	2	110.2	18.4
26								
			▼		-Moderate seepage at base of fracture at 27 feet			
28								
					-Becomes reddish brown below 29 feet			

Figure A-1,
Log of Boring B 1, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. G2030-32-03

BORING B 1

ELEV. (MSL.) 710'   DATE COMPLETED 01-25-2017

EQUIPMENT 30" BUCKET AUGER   BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1-8			CL		6	110.0	18.7
32				ML	-Gradational contact Hard, damp, gray, fine, Sandy/Clayey SILTSTONE			
34								
36	B1-9				-1-foot thick, brown, silty claystone bed at 35 feet	8	110.1	19.5
38	B1-10				-**BEDDING PLANE SHEAR at 37.8 feet (5°, S35°E);** 1/4 to 1/2-inch thick, soft, moist, gray-green, moderately to highly remolded and moderately developed plastic clay gouge			
40	B1-11			SM	Very dense, damp, gray, Silty, fine SANDSTONE	10		
42					-1-foot thick, silty claystone bed at 42 feet			
44								
46	B1-12				-Slow, difficult drilling below 46 feet	8		
48								
50	B1-13					12		

BORING TERMINATED AT 51 FEET

Figure A-1,
Log of Boring B 1, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. G2030-32-03

BORING B 2

ELEV. (MSL.) **716'** DATE COMPLETED **01-25-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B2-1			CL/CH	**COLLUVIUM** Stiff, moist to very moist, very dark brown, Silty CLAY			
2								
4								
	B2-2			SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, brown, Silty, fine to medium SANDSTONE	3	110.8	10.3
6					-Becomes light brown below 6 feet			
8					-Abundant calcium carbonate veins and pods present from 8.5 to 21.5 feet			
10	B2-3					4		
12					-6-inch thick calcium carbonate bed present at 11 feet -Becomes gray and fine grained below 11.5 feet			
14								
	B2-4					3	112.3	13.8
16								
18								
20	B2-5				-Becomes fine to medium below 20 feet	3		
22					-3 to 4-inch thick, gravel bed present at 21.7 feet -Becomes orange brown below 22 feet -Irregular contact (10-20°, S45°E)			
				CL	Hard, moist, mottled dark green and maroon, Silty CLAYSTONE; waxy in areas			
24								
	B2-6					5	109.5	19.2
26								
28					-Becomes weak, waxy and moderately fissured below 29.5 feet			

Figure A-2,
Log of Boring B 2, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. G2030-32-03

BORING B 2

ELEV. (MSL.) 716' DATE COMPLETED 01-25-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-7			CL		2	105.2	20.4
32					-1/4-inch wide, high angle fractures present from 31-35 feet with soft clay films along trace			
34			▽		-Spot seeps at 34 feet			
36	B2-8				-Slight seepage at 36 feet	4		
38					-Seepage increases with depth			
40	B2-9					4	109.4	19.5
42								
44	B2-10		▼		-Heavy seepage above bedding plane shear at 44 feet -**BEDDING PLANE SHEAR at 44 feet (3°, S20°W);** paper thin to 1/4-inch thick, soft, moist, dark green, poorly to moderately remolded and moderately developed plastic clay gouge			
46	B2-11			SM	Very dense, damp, light gray, Silty, fine SANDSTONE	12		
48								
50	B2-12				-Becomes brown below 50 feet	12		
52					-2-foot thick, gravel bed at 51.5 feet (approx. 20% gravel and cobble size rock fragments up to 8-inches)			
54			▼		-Standing water at 54 feet			
56	B2-13				-Slow difficult drilling below 55 feet	15/10"		

REFUSAL AT 57 FEET

Figure A-2,
Log of Boring B 2, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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BORING B 3

ELEV. (MSL.) **719'** DATE COMPLETED **01-26-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM&SC	**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, dark brown and brown, Silty and Clayey, fine to medium SAND			
2				CL/CH	Stiff, very moist, very dark brown, Silty CLAY -Becomes mixed with brown sand above contact			
4				SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, orange brown and gray, Silty, fine to medium SANDSTONE -High angle calcium carbonate veins present from 4 to 9.8 feet -Horizontal oxide staining along bedding below 5 feet			
	B3-1					4	113.3	16.1
6								
8								
10	B3-2				-14-inch thick, calcium carbonate bed at 9.8 feet -Becomes gray below 11 feet	3	113.0	15.8
12					-Orange staining present below 12 feet			
14					-10-inch thick concretion at 14 feet -Becomes very dense and fine grained below 14.5 feet			
	B3-3					4	107.5	20.4
16								
18								
20	B3-4				1-foot thick, fine, sandy siltstone bed with yellow oxidation at 19.5 feet -Becomes gray with yellow oxidation below 20.5 feet	3	111.5	16.7
22								
24								
	B3-5				-Becomes orange with well defined bedding at 25.4 feet (4°, N5°W) -Scoured, slightly undulating contact with paper thin, soft clay along surface	3		
26				CL	Hard, moist, dark green, Silty CLAYSTONE; waxy; 6-inch cemented zone present just below contact at 26.5 feet			
28					-Becomes mottled dark green and maroon below 27.5 feet			

Figure A-3,
Log of Boring B 3, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 3

ELEV. (MSL.) **719'** DATE COMPLETED **01-26-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B3-6			CL		8	113.4	16.6
32								
34								
	B3-7				**-BEDDING PLANE SHEAR at 34.5 feet (4°, S40°E);** 1/8 to 1-inch thick, soft, most, grayish green, moderately to highly remolded and well developed plastic clay gouge	10/8"		
36								
					-14-inch thick, dark gray, fine, sandy/clayey siltstone bed at 36.8 feet			
38					-Continuous planar feature/fracture with paper thin clay film along surface at 37 feet			
					-Gradational contact			
				SM	Very dense, damp, gray, Silty, fine SANDSTONE			
40	B3-8				-Becomes light brown and fine to medium below 40 feet	10/10"		
					-Trace gravel present at 41.5 feet			
42								
					-16-inch thick, concretion at 43 feet			
44								
46					-Trace gravel present at 46 feet			
					-Random concretion present below 47 feet			
48								
50	B3-9					12		
52					-Gravel bed at 52 feet (approx. 20% gravel and cobble size rock fragments up to 8-inches)			
					-Auger and ripper used for 1.5 hours			
					REFUSAL AT 53 FEET			

Figure A-3,
Log of Boring B 3, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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BORING B 4

ELEV. (MSL.) **713'** DATE COMPLETED **01-26-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**UNDOCUMENTED FILL (Qudf)** Stiff, moist to very moist, very dark brown, Silty CLAY			
4					-Some brown, clayey sand present at 3.5 feet			
5	B4-1			SC	Medium dense, damp, dark brown, Clayey, fine to medium SAND; poor recovery of sample at 5 feet	1		
8				SM	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Medium dense, damp, gray and white, Silty, fine to medium SAND/SANDSTONE with abundant calcium carbonate replacement			
10	B4-2					2		
11				SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, gray, Silty, fine SANDSTONE with calcium carbonate present to 13.5 feet; slightly fractured from 11-14 feet			
14					-Becomes orange brown below 14.5 feet			
15	B4-3					3	108.3	17.8
16					-Horizontal bedding present below 16 feet; some 1/4-inch offsets observed along calcium carbonate filled fractures			
18					-Becomes gray with yellow oxidation from 18.5 to 20 feet			
20	B4-4				-Becomes orange brown below 20 feet	3		
21					-Dark green claystone rip-ups present below 21 feet			
23				CL	-Undulating scoured contact at 23 feet			
24					Hard, moist, dark green, Silty CLAYSTONE; waxy with some concretions at 24 feet			
25	B4-5				-Becomes mottled dark green and maroon below 25 feet	3	109.6	19.5

Figure A-4,
Log of Boring B 4, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 4 ELEV. (MSL.) 713' DATE COMPLETED 01-26-2017 EQUIPMENT 30" BUCKET AUGER BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B4-6			CL		5		
32								
34	B4-7				-**BEDDING PLANE SHEAR at 33 feet (3°, N65°W);** 1/4 to 1-inch thick, soft, grayish green, moderately to highly remolded and well developed plastic clay gouge -Grades into fine sandy/clayey siltstone below bedding plane shear -Gradational contact			
36	B4-8			SM	Very dense, damp, gray, Silty, fine SANDSTONE	8/10"		
38								
40	B4-9				-Slow difficult drilling below 40 feet -Random concretions present below 41 feet	10/10"		
42					-Auger used below 43 feet			
44								
46					-Auger and ripper used below 47 feet			
48								
					REFUSAL AT 48.5 FEET			

Figure A-4,
Log of Boring B 4, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 5

ELEV. (MSL.) 720.5' DATE COMPLETED 01-27-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SP	**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, light brown, fine to coarse SAND (manufactured)			
2				SM&SC&CL	-2-inch thick, 3/4-inch gravel bed at contact Medium dense/stiff, moist, dark brown, orange brown and light brown, Silty to Clayey, fine to medium SAND and Sandy to Silty CLAY			
4								
	B5-1					1		
6				SM	-Sharp contact **MISSION VALLEY FORMATION (Tmv)** Dense, damp, light brown with orange oxidation, Silty, fine to medium SANDSTONE -Horizontal bedding present below			
8								
10	B5-2				-2-inch thick, gravel bed present at 10.5 feet -Becomes light brown below 11 feet	7	127.4	9.9
12								
14								
	B5-3					6	120.3	11.3
16								
18								
20	B5-4					6		
22								
24					-Becomes orange brown with green claystone rip-up clasts and trace gravel below 23 feet			
	B5-5			CL	Hard, moist, dark green, Silty CLAYSTONE; waxy; 6-inch cemented zone present below contact at 25 feet	4	103.8	22.5
26								
28	B5-6				-Becomes mottled dark green and maroon below 29 feet			

Figure A-5,
Log of Boring B 5, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 5

ELEV. (MSL.) **720.5'** DATE COMPLETED **01-27-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B5-7			CL	-Becomes very hard below 30 feet	8	112.6	16.7
36	B5-8					10/10"		
40	B5-9					10		
44				SM	**-BEDDING PLANE SHEAR at 43.9 feet (horizontal);** 1/4-inch thick, soft, moist, dark green, moderately to highly remolded and well developed plastic clay gouge; grades into siltstone bed below bedding plane shear			
46					Very dense, damp, brown, Silty, fine to medium SANDSTONE; cemented; auger used for 45 minutes			
					REFUSAL AT 46 FEET			

Figure A-5,
Log of Boring B 5, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

BORING B 6

ELEV. (MSL.) 712' DATE COMPLETED 01-27-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, very moist, very dark brown, Silty/Sandy CLAY			
2				SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, orange brown, Silty, fine to medium SANDSTONE			
4					-Becomes light brown with calcium carbonate pods and veins below 4 feet			
	B6-1					5/10"	122.8	11.1
6					-Horizontal oxide staining present below			
8								
10	B6-2					5		
12								
14	B6-3							
16								
18					-Becomes orange brown with trace gravel and dark green claystone rip-up clasts below 17.2 feet			
					-Slightly scoured and undulating contact			
20	B6-4			CL	Hard, moist, dark green, Silty CLAYSTONE; waxy; 6-inch cemented zone/concretions present just below contact	6/10"		
22					-Becomes mottled dark green and maroon below 22 feet			
24								
	B6-5					6/8"	113.3	16.7
26								
28								

Figure A-6,
Log of Boring B 6, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 6

ELEV. (MSL.) 712' DATE COMPLETED 01-27-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				CL				
	B6-6 B6-7				**-BEDDING PLANE SHEAR ZONE from 30.5 to 31.8 (main surface - 10-25°, N30°W)**; zone of multiple anastomosing remolded surfaces with irregular thickness; paper thin to 1/4-inch thick, soft, moist, dark green, poorly remolded and moderately developed plastic clay gouge; grades into gray siltstone bed below bedding plane shear	10	108.8	18.9
32								
				SM	Very dense, damp, gray, Silty, fine to medium SANDSTONE			
34								
	B6-6					8/8"		
36								

BORING TERMINATED AT 37 FEET

Figure A-6,
Log of Boring B 6, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2030-32-03

BORING B 7

ELEV. (MSL.) **732.5** DATE COMPLETED **01-27-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TOPSOIL** Stiff, very moist, very dark brown, highly plastic CLAY			
				SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, gray, Silty, fine to medium SANDSTONE with orange oxidation; horizontal bedding present throughout			
2	B7-1							
4								
6	B7-2					5/8"	121.9	11.4
8								
10	B7-3					6/10"		
12								
14								
16	B7-4				-Becomes orange brown below 15 feet	6/10"	117.0	14.9
18					-16-inch thick, concretion at 17 feet			
20	B7-5					6	111.4	16.5
22					-Becomes light brown with orange oxidation below 21 feet			
24					-Becomes orange brown below 24 feet			
26								
28								
30	B7-6				-Becomes moist and orange to yellowish brown below 29.5 feet -Maroon rip-up clasts present from 29.5 to 31 feet	8		
32								
34								

Figure A-7,
Log of Boring B 7, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 7

ELEV. (MSL.) **732.5** DATE COMPLETED **01-27-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
36				SM				
				CL	-Dark green claystone rip-ups present above contact; becomes very moist to wet above contact			
38					Hard, moist, dark green, Silty CLAYSTONE; waxy; 4 to 6-inch thick, cemented zone present at 37 feet			
40	B7-7					8/8"	118.4	14.9
42					-Becomes mottled dark green and maroon below 41 feet			
44								
46	B7-8					10/8"	114.5	18.4
48								
50								
52								
54								
	B7-9			ML	Hard, damp, gray, fine, Sandy SILTSTONE	~~15/8"~~		
56				SM	-**BEDDING PLANE SHEAR at 54.8 (4-6°, N80°W);** 1/8 to 1/4-inch thick, soft, moist, green, moderately remolded and well developed plastic clay gouge -Gradational contact			
58					Very dense, damp, gray, Silty, fine to coarse SANDSTONE			
60	B7-10					12/8"		

BORING TERMINATED AT 61 FEET

Figure A-7,
Log of Boring B 7, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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PROJECT NO. G2030-32-03

BORING B 8

ELEV. (MSL.) 720' DATE COMPLETED 01-30-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**TOPSOIL** Stiff, moist, very dark brown, Silty CLAY			
1–4				SM	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Medium dense, damp, gray and white, Silty, fine to medium SAND/SANDSTONE with abundant calcium carbonate			
4–9	B8-1			SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, gray, Silty, fine to medium SANDSTONE with high angle calcium carbonate veins	4	117.7	12.3
					-Slightly undulating contact			
9	B8-2			CL	Hard, moist, dark green, Silty CLAYSTONE; waxy -Becomes mottled dark green and maroon below 10 feet	3	107.7	19.7
15	B8-3					3	113.4	17.1
17					-1/4 to 1/2-inch wide clay filled fracture with poorly remolded clay gouge along trace from 17 to 20 feet (70-75°, due South)			
20	B8-4					3		
25	B8-5					6		

Figure A-8,
Log of Boring B 8, Page 1 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 8

ELEV. (MSL.) 720' DATE COMPLETED 01-30-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B8-6	CL		6	113.7	16.9
32			-Slight seepage at 32 feet that increases with depth			
34			-High angle fractures with 1/8-inch of aperture from 34 to 35 feet			
36	B8-7	ML	Hard, moist, gray, fine, Sandy/Clayey SILTSTONE	10		
			-Heavy seepage at 36 feet			
			-BEDDING PLANE SHEAR at 36.1 feet (approx. horizontal); paper thin to 1/4-inch thick, soft, moist, green and poorly remolded, poorly developed plastic clay gouge			
38		SM	Very dense, damp, gray, Silty, fine to medium SANDSTONE			
40	B8-8			8		
42			-2-inch thick, gravel bed at 41 feet			
44						
46	B8-9		-1.5-foot thick, gravel bed at 45 feet (approx. 30-40% gravel and cobble size rock fragments up to 8-inches); very heavy seepage within gravel bed	7	115.6	13.5
48						
50	B8-10			10		
52			-1-foot thick, gravel bed at 51.5 feet (approx. 30-40% gravel, cobble and boulder size rock fragments up to 14-inches)			
54		CL/ML	Hard, moist, mottled pale green and maroon, Silty CLAYSTONE/Clayey SILTSTONE			
56	B8-11			15/6"	118.3	13.7
			-Cemented zone along contact			
58		SM	Very dense, damp to moist, gray, Silty, fine to medium SANDSTONE			

Figure A-8,
Log of Boring B 8, Page 2 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 8

ELEV. (MSL.) 720' DATE COMPLETED 01-30-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B8-12			SM		15/10"		
62								
64								
	B8-13					15/10"	116.6	13.8
66								
				CL	Hard, moist, green, Silty CLAYSTONE with numerous concretions -**BEDDING PLANE SHEAR at 67.5 feet (approx. horizontal);** 1/2 to 1-inch thick, soft, moist, green, moderately remolded and well developed plastic clay gouge			
68	B8-14							
70	B8-15			SM	Very dense, damp, blue green, Silty, fine SANDSTONE	15/8"		
72			▼		-Standing water at 72 feet			
					-Becomes light brown to gray below 73 feet			
74					-Very hard drilling below 74 feet; auger used			
	B8-16					15/8"		

BORING TERMINATED AT 75.5 FEET

Figure A-8,
Log of Boring B 8, Page 3 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G2030-32-03

BORING B 9

ELEV. (MSL.) **716.5** DATE COMPLETED **01-30-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SP	**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, brown, fine to medium SAND (manufactured)			
2				CL/CH	**TOPSOIL** Stiff, very moist, very dark brown, Silty CLAY			
4				CL	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, moist, dark green, Silty CLAY/CLAYSTONE; moderately weathered and fractured with calcium carbonate veins throughout			
	B9-1					2		
6				CL	**MISSION VALLEY FORMATION (Tmv)** Hard, moist, mottled dark green and maroon, Silty CLAYSTONE, with calcium carbonate veins			
8								
10	B9-2					3	109.6	19.2
12	B9-3							
14								
	B9-4				-Becomes more plastic below 15 feet	2	111.1	18.6
16								
18	B9-5				**-BEDDING PLANE SHEAR at 17.4 feet (8°, N40°W);** paper thin to 1/4-inch thick, soft, moist, green, poorly remolded in areas and poorly developed plastic clay gouge; bedding plane shear contained within 4-inch thick, weak claystone bed; very competent below bedding plane shear			
				ML				
20	B9-6				Hard, moist, brown, fine, Sandy SILTSTONE	5	114.6	16.4
				SM	Very dense, damp, gray, Silty, fine SANDSTONE			
22								
24								
				CL	Hard, damp, green, Silty CLAYSTONE; concretions present 6-inches below contact	5		
26			▽		-Slight seepage at 26.5 feet			
				ML	Hard, moist, mottled dark green and maroon, fine, Sandy/Clayey SILTSTONE			
28								

Figure A-9,
Log of Boring B 9, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 9

ELEV. (MSL.) **716.5** DATE COMPLETED **01-30-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B9-7			ML	-Concretions present from 30 to 32 feet	8		
32				SM	Very dense, damp, gray, Silty, fine SANDSTONE			
34								
					-Sampler destroyed; no recovery	10/10"		
36					-Concretions present above contact			
				ML	Hard, moist, mottled dark green and maroon, fine, Sandy/Clayey SILTSTONE			
38								
40	B9-8					10/8"	121.1	14.1
42				SM	Very dense, damp, light gray, Silty, fine SANDSTONE			
44					-Several concretions present below 44 feet			
	B9-9					10/8"		
46								
48								
50	B9-10				-Sample bounced, poor recovery	6/2"		
52								
54					-Auger used for 1-hour			
					REFUSAL AT 54 FEET			

Figure A-9,
Log of Boring B 9, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 10

ELEV. (MSL.) **726'** DATE COMPLETED **01-31-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**COLLUVIUM** Stiff, moist, very dark brown, Silty CLAY			
4				SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, brown to light brown, Silty, fine to medium SANDSTONE			
	B10-1					3	111.6	9.9
					-Calcium carbonate bed along contact			
8	B10-2			CL	Hard, damp to moist, dark green, Silty CLAYSTONE with moderate calcium carbonate veins and pods from 7.5 to 10.5 feet			
10	B10-3				-Becomes mottled marron and dark green below 10 feet	3	109.2	19.3
	B10-4					3	118.8	15.4
20	B10-5					4		
					-Gradational contact			
				ML	Hard, damp, mottled dark green and maroon, fine, Sandy/Clayey SILTSTONE			
	B10-6					6	124.2	12.7
28			∇		-Minor seepage at 28 feet			
					-Cemented at 29 feet			

Figure A-10,
Log of Boring B 10, Page 1 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 10

ELEV. (MSL.) **726'** DATE COMPLETED **01-31-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B10-7 B10-8		ML	**-BEDDING PLANE SHEAR at 29.6 feet (3°, S80°W);** 1/4 to 1¼-inch thick, soft, moist, green, highly remolded and well developed plastic clay gouge; bedding plane shear present within 4-inch dark green claystone bed	10/10"		
33			SM	Very dense, damp, light brown, Silty, fine to medium SANDSTONE with orange oxidation lenses			
35	B10-9				10	122.0	13.4
40	B10-10			-Trace gravel present at 40 feet	10		
44				-Becomes gray below 44 feet			
45	B10-11				10		
48				-Wet sidewalls at 48 feet			
50		▽		-20 to 30% gravel present from 50 to 54.5 feet, shoe destroyed on gravel; no recovery -Moderate seepage at 51 feet	10/10"		
54.5			CL/ML	Hard, moist, mottled dark green and maroon, Silty CLAYSTONE/Clayey SILTSTONE; random concretion present throughout -Sample heavily disturbed due to concretion at 55 feet	10/6"		
59			SM	Very dense, damp, gray, Silty, fine to medium SANDSTONE			

Figure A-10,
Log of Boring B 10, Page 2 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

BORING B 10

ELEV. (MSL.) **726'** DATE COMPLETED **01-31-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B10-13			SM		10/10"		
62								
64								
	B10-14					12/10"		
66								
68								
70	B10-15				-Becomes pale green below 70 feet	15/10"		
					BORING TERMINATED AT 71 FEET			

Figure A-10,
Log of Boring B 10, Page 3 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G2030-32-03

BORING B 11

ELEV. (MSL.) 722' DATE COMPLETED 01-31-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**UNDOCUMENTED FILL (Qudf)** Stiff, moist, brown, Silty CLAY			
2					-Some light brown sand lenses present below 2 feet			
4								
6	B11-1			ML	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, damp, brown, fine, Sandy SILTSTONE/SILT; fractured with abundant calcium carbonate replacement throughout	1		
8								
10	B11-2			ML/CL	**MISSION VALLEY FORMATION (Tmv)** Hard, moist, brown, Clayey SILTSTONE/Silty CLAYSTONE; moderate calcium carbonate veins from 9 to 12 feet	3	108.2	17.5
12	B11-3			CL	Hard, moist, mottled dark green and maroon, Silty CLAYSTONE; waxy -**BEDDING PLANE SHEAR at 12.1 feet (4°, N50°W);** 1/4-3/4 inch thick, stiff, moist, green, poorly remolded in areas and moderately developed plastic clay gouge			
14								
16	B11-4					5/8"		
18				ML	Hard, damp, mottled dark green and maroon, Clayey, fine, Sandy SILTSTONE			
20	B11-5				-Becomes blue green from 19.5 to 21 feet	8/10"	112.6	16.1
22					-Becomes brown below 21.5 feet			
24					-Alternates between brown and mottled dark green and maroon below 24 feet			
26	B11-6					8/10"	123.6	13.2
28								

Figure A-11,
Log of Boring B 11, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 11

ELEV. (MSL.) **722'** DATE COMPLETED **01-31-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B11-7			ML		12/8"		
35	B11-8					10/10"	117.5	16.2
40	B11-9			SM	-Gradational contact Very dense, damp, gray, Silty, fine SANDSTONE	10/10"		
44					-Very slow difficult drilling below 44 feet; core barrel and auger used			
48					-1-hour drilled with core barrel and auger at 48 feet REFUSAL AT 48 FEET			

Figure A-11,
Log of Boring B 11, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 12

ELEV. (MSL.) 701' DATE COMPLETED 01-31/02-01-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**COLLUVIUM** Stiff, moist, very dark brown, Silty CLAY			
	B12-1							
4				ML	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, damp, green, Clayey SILT/SILTSTONE with abundant calcium carbonate replacement; concretions present below 5 feet			
	B12-2					5		
					-Gradational contact			
				ML	**MISSION VALLEY FORMATION (Tmv)** Hard, damp, brown with some green mottling, fine, Sandy/Clayey SILTSTONE			
10	B12-3					5/10"	114.9	16.6
	B12-4				-Poor recovery	5/10"		
16				SM	Very dense, damp, gray, Silty, fine SANDSTONE with some high angle caliche veins			
20	B12-5					5/10"		
22				ML	Hard, damp, brown, fine, Sandy/Clayey SILTSTONE			
24					-6-inch thick, blue green lens at 23.5 feet			
					-Becomes reddish brown below 24.5 feet			
	B12-6					5/10"	112.7	17.2
27					-Becomes brown below 27 feet			

Figure A-12, Log of Boring B 12, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 12

ELEV. (MSL.) **701'** DATE COMPLETED **01-31/02-01-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B12-7			ML		10/10"		
33				SM	Very dense, damp, gray, Silty, fine SANDSTONE			
35	B12-8					12/10"	114.1	16.7
40	B12-9					8/8"		
41					-2-foot thick, brown, clayey siltstone bed at 41 feet			
45					-Random concretions present from 45 to 47 feet			
50	B12-10					8/10"		
51					BORING TERMINATED AT 51 FEET			

Figure A-12,
Log of Boring B 12, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2030-32-03

BORING B 13

ELEV. (MSL.) 686' DATE COMPLETED 02-01-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**UNDOCUMENTED FILL (Qudf)** Stiff, moist, very dark brown, Silty CLAY with mixtures of white to light brown, silty sand and calcium carbonate			
2								
4								
6	B13-1				-Poor recovery at 5 feet	2		
8				CL/CH	**COLLUVIUM** Stiff, moist, dark brown, Silty CLAY			
10	B13-2					2		
12				SM	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Medium dense, damp, gray, Silty, fine to medium SAND/SANDSTONE with abundant calcium carbonate throughout			
14								
16				SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, gray, Silty, fine to medium SANDSTONE with some calcium carbonate			
18	B13-3			ML	Hard, moist, brown, fine, Sandy/Clayey SILTSTONE with moderate calcium carbonate from 16.5 to 19 feet	4	103.6	21.5
20	B13-4					5/10"		
22				SM	Very dense, damp, gray, Silty, fine, SANDSTONE with some calcium carbonate stringers			
24								
26	B13-5					4	112.8	16.7
28					-Concretion at 27 feet; 4-inch thick brown claystone bed at 27.3 feet			
30	B13-6					8/6"		
					BORING TERMINATED AT 30.5 FEET			

Figure A-13,
Log of Boring B 13, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2030-32-03

BORING B 14

ELEV. (MSL.) **702.5'** DATE COMPLETED **02-01-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**UNDOCUMENTED FILL (Qudf)** Stiff, moist, very dark brown, Silty CLAY with some light brown silty sand mixed in			
5.5	B14-1					1		
7				CL/CH	**TOPSOIL** Stiff, moist, very dark brown, Silty CLAY			
9				ML	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff to hard, damp, dark green, fine, Sandy SILT/SILTSTONE with abundant calcium carbonate replacement			
10.5	B14-2					3		
12				ML	**MISSION VALLEY FORMATION (Tmv)** Hard, damp, dark green to brown, fine, Sandy/Clayey SILTSTONE with calcium carbonate veins -1.5-foot thick, mottled, dark green and maroon, silty claystone bed at 14.5 feet -Becomes fine, sandy siltstone and mottled dark green and maroon below 16 feet			
15.5	B14-3					5	112.7	14.1
20	B14-4			SM	-Gradational contact Very dense, damp, gray, Silty, fine SANDSTONE	5		
22.5				ML/SM	Hard/very dense, damp, mottled dark green and maroon, fine, Sandy SILTSTONE/Silty, fine SANDSTONE			
25.5	B14-5					5	117.1	15.3
30.5	B14-6					8		
31					BORING TERMINATED AT 31 FEET			

Figure A-14,
Log of Boring B 14, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G2030-32-03

BORING B 15

ELEV. (MSL.) **689'** DATE COMPLETED **02-01-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM&SC	**UNDOCUMENTED FILL (Qudf)** Loose, moist, brown, Clayey to Silty, fine to coarse SAND with 10-20% gravel, cobble and boulder size rock fragments up to 6-inches			
5					-Boulders up to 24-inches present below 5 feet; no recovery on sample at 5 feet	2		
9					-Wet at contact			
9				CL/CH	**COLLUVIUM** Stiff, moist, very dark brown to black, Silty CLAY			
10	B15-1					PUSH		
12	B15-2							
15	B15-3			CL	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, moist, dark green, Silty, CLAY/CLAYSTONE with abundant calcium carbonate throughout	1	100.7	22.9
17.5				CL	**MISSION VALLEY FORMATION (Tmv)** Hard, moist, dark green, Silty CLAYSTONE with calcium carbonate -Becomes brown below 19 feet			
20	B15-4			ML	Hard, damp, brown, fine, Sandy SILTSTONE	3		
23					-Becomes pale green below 23 feet			
25	B15-5					3	114.1	17.7
29				SM	Very dense, damp, gray, Silty, fine SANDSTONE			
30	B15-6					8		
					BORING TERMINATED AT 31 FEET			

G2030-32-03.GPJ

Figure A-15,
Log of Boring B 15, Page 1 of 1

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 16

ELEV. (MSL.) **661'** DATE COMPLETED **02-01-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, brown, Silty CLAY			
2					**SANTIAGO PEAK VOLCANICS (Jsp)** Moderately weathered, dark gray to brown, moderately weak to moderately strong METAVOLCANIC ROCK			
4								
6								
8								
10			▽		-Seepage observed at bottom of boring BORING TERMINATED AT 10 FEET			

Figure A-16,
Log of Boring B 16, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 17

ELEV. (MSL.) **666.5** DATE COMPLETED **02-02-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH&SC	**UNDOCUMENTED FILL (Qudf)** Stiff/loose, moist, dark brown and light brown, mixture of Sandy/Silty CLAY and Clayey, fine to medium SAND			
2				CH	**TOPSOIL** Stiff, moist, brown, Silty CLAY			
4	B17-1				**SANTIAGO PEAK VOLCANICS (Jsp)** Moderately weathered, dark gray and brown, moderately weak to moderately strong METAVOLCANIC ROCK	4/5"		
					BORING TERMINATED AT 5.5 FEET			

Figure A-17,
Log of Boring B 17, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 18

ELEV. (MSL.) **689'** DATE COMPLETED **02-02-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL&SC&SM	**UNDOCUMENTED FILL (Qudf)** Stiff/loose, dry to moist, very dark brown and orange to gray, mixtures of Silty/Sandy CLAY and Silty/Clayey, fine to medium SAND			
2								
4								
	B18-1					3		
6								
8								
				CL/CH	**COLLUVIUM** Stiff, moist, very dark brown, Silty CLAY			
10	B18-2					2		
12								
					SANTIAGO PEAK VOLCANICS (Jsp) Moderately weathered, dark gray to brown, moderately weak METAVOLCANIC ROCK			
14								
					BORING TERMINATED AT 15 FEET			

Figure A-18,
Log of Boring B 18, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 19

ELEV. (MSL.) **682.5'** DATE COMPLETED **02-02-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2				SP	**UNDOCUMENTED FILL (Qudf)** Medium dense, moist to wet, brown, fine to coarse SAND (manufactured)			
2 – 13	B19-1 (5 ft) B19-2 (10 ft)			SM&SC	Medium dense, dry to moist, gray and orange, Silty to Clayey, fine to medium SAND with some mixtures of dark brown clay	5 2		
13 – 16	B19-3 (15 ft)			CL/CH	**COLLUVIUM** Stiff, very moist, black, Silty CLAY	2		
16 – 18				CL	Stiff, moist, dark brown, fine to coarse, Sandy CLAY with 5-10% gravel and cobble size rock fragments up to 4-inches			
18 – 22	B19-4 (20 ft)			SM	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Medium dense, damp, light gray, Silty, fine to medium SAND/SANDSTONE with abundant calcium carbonate replacement	3	112.7	14.2
22 – 30	B19-5 (23 ft) B19-6 (25 ft)			SM	**MISSION VALLEY FORMATION (Tmv)** Dense to very dense, damp, light gray, Silty, fine to medium SANDSTONE with some high angle calcium carbonate veins	8/10"		

Figure A-19,
Log of Boring B 19, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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BORING B 19

ELEV. (MSL.) 682.5' DATE COMPLETED 02-02-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B19-7			SM		8	114.2	14.9
32								
34								
	B19-8				-Sample disturbed	10/10"		
36					BORING TERMINATED AT 36 FEET			

Figure A-19,
Log of Boring B 19, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 20

ELEV. (MSL.) 700' DATE COMPLETED 02-02-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL&SC&SM	**UNDOCUMENTED FILL (Qudf)** Stiff/medium dense, moist, mixtures of dark brown, Silty CLAY and brown, Silty to Clayey, fine to medium SAND			
5.5	B20-1			CL/CH	**COLLUVIUM** Stiff, moist, very dark brown, Silty CLAY -Becomes sandier below 5.5 feet	PUSH		
8				CL	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, damp, mottled dark green and maroon, Silty CLAY/CLAYSTONE with abundant calcium carbonate replacement			
10.5	B20-2			CL/ML	**MISSION VALLEY FORMATION (Tmv)** Hard, moist, mottled dark green and maroon, Silty CLAYSTONE/Clayey SILTSTONE	4	111.8	17.3
15.5	B20-3			SM	Very dense, damp, light gray, Silty, fine to medium SANDSTONE	7	122.5	10.1
20.5	B20-4			ML	-6 to 7-inch thick, gravel bed at 18.5 feet (approx. 40-50% gravel and cobble size rock fragments up to 4-inches) -4 to 6-inch thick, calcium carbonate bed at contact Hard, damp, dark green, fine, Sandy/Clayey SILTSTONE -Becomes fine, sandy siltstone below 21 feet	8/10"		
24					-Becomes brown and orange below 24 feet			
25.5	B20-5					8/8"		
26					-Concretions present below 26 feet			
28					-Very slow difficult drilling below 28 feet; auger, ripper and core barrel used			
29					-Becomes green and brown below 29 feet			

Figure A-20,
Log of Boring B 20, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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BORING B 20

ELEV. (MSL.) **700'** DATE COMPLETED **02-02-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B20-6			ML	-Becomes fine, sandy to clayey siltstone below 30.5 feet	8		
32								
34				SM	Very dense, damp, light gray, Silty, fine to medium SANDSTONE; numerous concretions and cemented zones throughout; core barrel, rippers and auger used			
36								
38					-Cemented from 37.5 to 41.5 feet			
40								
42								
44								
46					-Becomes moist below 45 feet			
48								
50	B20-7					8		
					BORING TERMINATED AT 51 FEET			

Figure A-20,
Log of Boring B 20, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 21

ELEV. (MSL.) **690'** DATE COMPLETED **02-04-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM&CL&CH	**UNDOCUMENTED FILL (Qudf)** Loose/stiff, moist, mixture of light brown, Silty, fine to medium SAND and dark brown, Silty CLAY			
2				CL/CH	**TOPSOIL** Stiff, moist, dark brown, Silty CLAY			
4				SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, gray, Silty, fine to medium SANDSTONE with abundant calcium carbonate down to 8 feet			
6	B21-1					7		
8								
10	B21-2			GM	Dense, damp, gray and orange, fine to medium, Sandy CONGLOMERATE with 50% gravel and cobble size rock fragments up to 10-inches	8/8"		
12				CL/ML	-Calcium carbonate along undulating contact Hard, damp to moist, mottled dark green and maroon, Silty CLAYSTONE/Clayey SILTSTONE with random concretions throughout			
14								
16					-No recovery at 15 feet	6		
18	B21-3				-4-inch thick concretion at 16.7 feet	5	108.4	19.1
20	B21-4				-4 to 6-inch thick concretion at 19.4 feet	5		
22								
24				SM	-Gradational contact Very dense, damp, gray, fine to medium SANDSTONE			
26	B21-5				-Orange oxidation along slightly undulating bedding (3°, S30°W) at 24.9 feet	8/8"	132.1	9.0
28				CL/ML	-Scoured undulating contact (6-10°, S60°W) Hard, moist, mottled dark green and maroon, Silty CLAYSTONE/Clayey SILTSTONE			
				SM	-Slightly undulating and scoured contact (3°, S30°W)			

Figure A-21,
Log of Boring B 21, Page 1 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 21

ELEV. (MSL.) 690' DATE COMPLETED 02-04-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B21-6			SM	Very dense, damp, gray, Silty, fine SANDSTONE	8	114.3	15.7
	B21-7							
32								
34					-Becomes fine to medium below 33 feet			
36	B21-8					8/10"		
38	B21-9							
40	B21-10				**-BEDDING PLANE SHEAR at 38.9 feet (12°, S55°W);** paper thin to 1/2-inch thick, soft, moist, brown, moderately remolded and well developed plastic clay gouge; bedding plane shear present within 8-inch claystone;siltstone bed			
				ML	-6-inch thick cemented zone along contact	8	114.2	17.7
42					Hard, moist, gray, fine, Sandy SILTSTONE			
44					**-BEDDING PLANE SHEAR at 41.1 feet (5°, S60°W)**; 1/4 to 1/2-inch thick, soft, grayish green, moderately remolded and well developed plastic clay gouge			
	B21-11				-Becomes brown and pale green with random concretions from 43 to 45.5 feet	8/10"		
46				SM	Very dense, damp, gray, Silty, fine SANDSTONE			
48								
50	B21-12				-14-inch thick, reddish gray, fine, sandy siltstone bed at 50.5 feet	8/10"	113.9	16.4
52								
54					-Becomes fine to medium below 53 feet			
56	B21-13					10/8"		
	B21-14				-Wet sidewalls and concretion along contact			
				CL	Hard, moist, mottled dark green and maroon, Silty CLAYSTONE; weak, waxy and slightly fissured, multiple high angle clay filled fractures			
58					**-BEDDING PLANE SHEAR at 56.7 feet (4°, N30°W);** 1/4 to 1-inch thick, soft, moist, gary, highly remolded and well developed plastic clay gouge			
					-SHEAR from 58 to 60 feet (35°, S30°W); paper thin to 1/4-inch thick,			

Figure A-21,
Log of Boring B 21, Page 2 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 21

ELEV. (MSL.) **690'** DATE COMPLETED **02-04-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B21-15			CL	moderately remolded plastic clay gouge along trace	8/10"		
62					**-SHEAR at 62.1 feet (20°, N60°W);** 1/4-inch thick, moderately remolded plastic clay gouge along trace			
64					**-SHEAR at 64.5 feet (25°, N20°W);** 1/8 to 1/4-inch thick, moderately remolded plastic clay gouge along trace			
	B21-16					10		
66								
68					**SANTIAGO PEAK VOLCANICS (Jsp)** Completely weathered, dark gray-green, weak METAVOLCANIC ROCK (Saprolite); with remnant rock fragments present within matrix			
70	B21-17					12/8"		
72					-Becomes highly weathered and dark gray below 73 feet			
74					BORING TERMINATED AT 74 FEET			

Figure A-21,
Log of Boring B 21, Page 3 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 22

ELEV. (MSL.) 665' DATE COMPLETED 02-04-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**UNDOCUMENTED FILL (Qudf)** Stiff, moist, dark brown, Silty/Sandy CLAY			
2				ML/SM	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Medium dense, damp, gray, fine, Sandy SILT/SILTSTONE/Silty, fine SAND/SANDSTONE with abundant calcium carbonate veins and some minor fracturing with roots along trace			
4								
6	B22-1			CL	**MISSION VALLEY FORMATION (Tmv)** Hard, moist, mottled green and maroon, Silty CLAYSTONE **-BEDDING PLANE SHEAR at 5.1 feet (8°, due North);** 1/4 to 1/2-inch thick, stiff, moist, green, poorly remolded in areas and poorly developed; majority of bedding plane shear replaced with calcium carbonate	1	104.7	21.4
8					**-BEDDING PLANE SHEAR at 8.7 feet (undulating; approx. horizontal);** 1/4 to 1/2-inch thick, stiff, moist, green, poorly remolded in areas and poorly developed; majority of bedding plane shear replaced with calcium carbonate			
10	B22-2					2		
12								
14								
16	B22-3					3	109.6	19.6
18				SM	Very dense, damp, gray, Silty, fine SANDSTONE			
20	B22-4				-Stress relief fracture from 19 to 25 feet (80-90°, N70°E) with hairline to 1-inch of aperture	4	109.6	18.8
22								
24								
26	B22-5					6/10"	119.3	13.5
28					-1.5-foot thick, mottled dark green and maroon siltstone/claystone bed at 26.5 feet			

Figure A-22,
Log of Boring B 22, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 22

ELEV. (MSL.) **665'** DATE COMPLETED **02-04-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B22-6			SM		5/6"		
34				CL	-Slightly undulating contact (10°, S75°W)			
35	B22-7				Hard, moist, mottled green and maroon, Silty CLAYSTONE; waxy **-BEDDING PLANE SHEAR at 35 feet (4°, S30°E);** 1/4 to 1-inch thick, soft, moist, gray, highly remolded and well developed plastic clay gouge; discontinuous anastomosing bedding plane shear present below main bedding plane shear	5	111.2	18.6
36	B22-8							
38					**-SHEAR at 38.3 feet (23°, N15°W);** 1/4-inch thick, moderately remolded plastic clay gouge along trace			
40	B22-9				**-BEDDING PLANE SHEAR at 40.5 feet (13°, S45°E);** 1/8 to 1/12-inch thick, soft, moist, gray green, poorly remolded and well developed plastic clay gouge	10		
45	B22-10					8/8"		
50					**SANTIAGO PEAK VOLCANICS (Jsp)** Completely weathered, dark gray-green, weak METAVOLCANIC ROCK (Saprolite); with remnant rock fabric and fragments			
54					-Becomes highly weathered and dark gray below 54 feet			
55					BORING TERMINATED AT 55 FEET			

Figure A-22,
Log of Boring B 22, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

BORING B 23

ELEV. (MSL.) **713'** DATE COMPLETED **02-06-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL&SM	**UNDOCUMENTED FILL (Qudf)** Stiff/loose, moist, mixtures of dark brown, Silty CLAY and light brown, Silty, fine to medium SAND			
3				CL/CH	**COLLUVIUM** Stiff, moist, dark brown, Silty CLAY			
5	B23-1					1		
7.5				CL	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, moist, mottled dark green and maroon, Silty CLAY/CLAYSTONE with abundant calcium carbonate replacement			
10	B23-2			CL	**MISSION VALLEY FORMATION (Tmv)** Hard, moist, mottled dark green maroon, Silty CLAYSTONE with some high angle clay filled fractures from 10 to 16 feet	4	110.2	20.0
12	B23-3							
16	B23-4					3	103.4	21.4
19					-1/4 to 1/2-inch wide, clay filled fracture from 19 to 21.2 feet (55, N35°W) with poorly remolded clay gouge along trace			
20	B23-5				-Irregular undulating contact at 20.5 feet with some stiff clay partially replaced with calcium carbonate; no remolding present	2	109.0	18.9
22					**BEDDING PLANE SHEAR at 22.1 feet (5°, N35°W);** paper thin to 1/4-inch thick, soft, moist, green, poorly remolded and moderately developed plastic clay gouge			
24.5				SM	Very dense, damp, gray, Silty, fine to medium SANDSTONE			
25	B23-6					6	121.3	12.7

Figure A-23,
Log of Boring B 23, Page 1 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

BORING B 23

ELEV. (MSL.) **713'** DATE COMPLETED **02-06-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B23-7			SM		8/10"		
32								
34								
36						8		
			∇		-4 to 6-inch thick, gravel bed at 36.5 feet (5-10% gravel and cobble size rock fragments up to 6-inches) -Slight seepage along scoured undulating contact at 37.5 feet			
38				ML	Hard, moist, mottled, fine, Sandy/Clayey SILTSTONE -Becomes brown with concretions present from 39 to 41 feet			
40	B23-8					8/8"		
42								
				SM	Very dense, damp, gray, Silty, fine SANDSTONE			
44								
	B23-9					8/10"		
46								
48								
					-Cemented from 49 to 50 feet			
50	B23-10					8		
52								
	B23-11							
54								
	B23-12					10/8"		
56					-Cemented along contact			
	B23-13			CL	Hard, moist, green, Silty CLAYSTONE; waxy -**BEDDING PLANE SHEAR at 57 feet (10°, S30°W);** 1 to 3-inch thick, moist, green, highly remodeled and well developed plastic clay gouge			
58								

Figure A-23,
Log of Boring B 23, Page 2 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 23

ELEV. (MSL.) 713' DATE COMPLETED 02-06-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B23-14			CL		10/8"		
				CL/ML	Hard, moist, mottled, dark green and maroon, Silty CLAYSTONE/Clayey SILTSTONE			
62								
64								
	B23-15					12/8"		
66								
				SM	-Gradational contact			
68					Very dense, damp, blue green, Silty, fine SANDSTONE; cemented; slow drilling below 68 feet			
	B23-16					15/8"		
70					BORING TERMINATED AT 70 FEET			

Figure A-23,
Log of Boring B 23, Page 3 of 3

G2030-32-03.GPJ

SAMPLE SYMBOLS ... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED) ... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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BORING B 24

ELEV. (MSL.) 686' DATE COMPLETED 02-06-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		CL	**UNDOCUMENTED FILL (Qudf)** Stiff, moist, dark brown, Silty/Sandy CLAY with some light brown, silty sand beds			
5	B24-1			4		
5.5		SM	**MISSION VALLEY FORMATION (Tmv)** Dense, damp, light gray to light brown, Silty, fine to medium SANDSTONE			
10	B24-2			5	113.6	14.2
11		ML	-Scoured undulating contact with 2-3-inch thick, gravel bed Hard, damp to moist, green, fine, Sandy SILTSTONE -Concretion at 13 feet			
14		SM	-Gradational contact Very dense, damp, pale green, Silty, fine SANDSTONE			
15	B24-3			7		
18		ML	-Gradational contact Hard, damp to moist, pale green, fine, Sandy SILTSTONE			
20	B24-4		-Becomes mottled pale green and maroon below 20 feet	8	116.9	15.8
24		SM	Very dense, damp, gray and orange, Silty, fine SANDSTONE			
25	B24-5		-Becomes orange and fine to medium from 25 to 28.5 feet	6		

Figure A-24,
Log of Boring B 24, Page 1 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G2030-32-03

BORING B 24

ELEV. (MSL.) **686'** DATE COMPLETED **02-06-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				SM	-Cemented along contact			
32	B24-6			CL/CH	Hard, moist, pale green, Silty CLAYSTONE; weak and waxy	3	86.6	37.8
	B24-7				**-BEDDING PLANE SHEAR at 31.1 feet (highly undulatory);** 2 to 4-inch thick zone of soft, green moist, pale green, highly remolded and well developed plastic clay gouge			
34								
36	B24-8				**GRANITIC ROCK (Kgr)** Highly weathered, pale green to gray, weak GRANITIC ROCK	8/10"		
38					-Becomes moderately weak at 39 feet			

BORING TERMINATED AT 39 FEET

Figure A-24,
Log of Boring B 24, Page 2 of 2

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

GEOCON

BORING B 25

ELEV. (MSL.) **678'** DATE COMPLETED **02-06-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SP	**UNDOCUMENTED FILL (Qudf)** Medium dense, moist, brown, fine to medium SAND (manufactured)			
2								
4				SM	-2 to 3-inch thick, 3/4-inch gravel layer at contact Loose, damp, light brown, Silty, fine to medium SAND with some dark brown clay beds			
6	B25-1					PUSH		
8								
10	B25-2			CL	**COLLUVIUM** Stiff, damp, dark brown, Silty/Sandy CLAY	2		
12								
14					-Trace gravel present at 13 feet			
16	B25-3			ML	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Stiff, damp, dark green and white, fine, Sandy SILT/SILTSTONE with abundant calcium carbonate replacement	2	107.1	14.1
18				CL/CH	**MISSION VALLEY FORMATION (Tmv)** Very stiff, moist, pale green, Silty CLAYSTONE; weak and waxy			
20	B25-4 B25-5 B25-6					2	89.7	31.6
22								
24					**GRANITIC ROCK (Kgr)** Completely to highly weathered, yellowish-green, weak GRANITIC ROCK			
26					-Becomes highly weathered below 26 feet			
					BORING TERMINATED AT 27 FEET			

Figure A-25,
Log of Boring B 25, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2030-32-03

BORING B 26

ELEV. (MSL.) **713'** DATE COMPLETED **09-22-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**TOPSOIL** Stiff, moist, very dark brown, Silty CLAY			
2				ML	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, damp to moist, mottled brown and green, Clayey SILT/SILTSTONE; fractured with abundant calcium carbonate replacement			
4				ML	**MISSION VALLEY FORMATION (Tmv)** Hard, damp to moist, brown, Clayey/Sandy SILTSTONE with moderate calcium carbonate			
6				SM/ML	Dense/hard, damp, gray, Silty, fine SANDSTONE/fine, Sandy SILTSTONE with moderate calcium carbonate			
8								
10				CL/ML	Hard, moist, brown and dark green, Silty, CLAYSTONE/Clayey SILTSTONE; waxy in areas with calcium carbonate			
12					-10-inch thick, gray sandstone bed at 11.8 feet -Paper thin, undulating clay seam with moist clay films present at 12.8 feet; no apparent remolding; several calcium carbonate pods present below			
14				CL	Hard, moist to wet, brown and gray, Silty CLAYSTONE; moderate seepage at 15.5 feet			
16			▽		**-POORLY DEVELOPED BEDDING PLANE SHEAR at 15.9 feet (5º, S35ºW)**; paper thin to 1-inch thick, soft, wet, green, very poorly remolded, calcium carbonate replaced in majority of bed; several rootlets terminate along BPS			
18				SM	Dense, damp to moist, gray, Silty, fine to medium SANDSTONE; massive			
20								
22								
24								
26								
28								
30					BORING TERMINATED AT 30 FEET			

Figure A-26,
Log of Boring B 26, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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GEOCON

BORING B 27

ELEV. (MSL.) 729' DATE COMPLETED 09-22-2017

EQUIPMENT 30" BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**COLLUVIUM (Qcol)** Stiff, moist, very dark brown, Silty CLAY			
4				ML	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, damp, gray-brown, fine, Sandy SILT/SILTSTONE with abundant calcium carbonate replacement -Becomes less weathered and more competent below 7 feet			
10				ML	**MISSION VALLEY FORMATION (Tmv)** Hard, damp, brown with some green mottling, fine, Sandy/Clayey SILTSTONE -Some calcium carbonate pods present from 12.5 to 14 feet -**WEAK ZONE** from 14.2 to 14.8 feet; 2 to 6-inch thick, zone of weak waxy fissured clay with continuous 1/4-1/2-inch thick, calcium carbonate lens dipping 4º, S20ºE; no apparent continuous remolding			
18				SM	Dense, damp, gray, Silty, fine to medium SANDSTONE; massive -Becomes moist below 22 feet -Becomes wet below 24 feet -Slight to moderate seepage at 25 feet			
25			▽					
30					BORING TERMINATED AT 30 FEET			

Figure A-27,
Log of Boring B 27, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. G2030-32-03

BORING B 28

ELEV. (MSL.) **713.5'** DATE COMPLETED **09-22-2017**

EQUIPMENT **30" BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 7.5				CL&SC/SM	**UNDOCUMENTED FILL (Qudf)** Medium dense/stiff, damp to moist, interbedded dark brown, gray and white, Silty, CLAY to Clayey/Silty SAND beds			
7.5 – 9.5				ML	**MISSION VALLEY FORMATION (Tmv)** Hard, damp, mottled dark green and maroon, Clayey/fine, Sandy SILTSTONE with calcium carbonate			
9.5 – 11.5				SM	Dense, damp, gray, Silty, fine SANDSTONE			
11.5 – 22			▽ (15 ft)	CL	Hard, moist, mottled dark green and maroon, Silty, CLAYSTONE; waxy in areas with some calcium carbonate -Slight seepage at 15 feet that increases with depth -**POORLY DEVELOPED BEDDING PLANE SHEAR at 18.8 feet (7º, due South)**; paper thin, continuous, soft, wet, green, very poorly developed, poorly remolded in areas, plastic clay gouge			
22 – 30				SM	Dense, moist, gray, Silty, fine SANDSTONE; massive -Becomes fine to medium below 24 feet			
30					BORING TERMINATED AT 30 FEET			

Figure A-28,
Log of Boring B 28, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

TRENCH T 1

ELEV. (MSL.) **679'** DATE COMPLETED **02-08-2016**

EQUIPMENT **RUBBER TIRE BCKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, brownish gray, fine to medium SAND (manufactured)			
2								
4				CL	**ALLUVIUM (Qal)** Stiff, moist, brown, Silty CLAY			
6								
8								
					SANTIAGO PEAK VOLCANICS (Jsp) Highly weathered, dark gray and brown, weak METAVOLCANIC ROCK			
					TRENCH TERMINATED AT 9 FEET			

Figure A-29,
Log of Trench T 1, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2030-32-03

TRENCH T 2

ELEV. (MSL.) 674' DATE COMPLETED 02-08-2016

EQUIPMENT RUBBER TIRE BCKHOE BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/SC/CL	**UNDOCUMENTED FILL (Qudf)** Loose/stiff, moist, brown to dark brown, mixtures of Silty to Clayey, fine to medium SAND and Silty to Sandy CLAY			
2								
				CL	**ALLUVIUM (Qal)** Stiff, moist, brown, Silty CLAY			
4				SM	Medium dense, moist, brown, Silty, fine to medium SAND			
6								
					SANTIAGO PEAK VOLCANICS (Jsp) Highly weathered, dark gray to brown, weak to moderately weak METAVOLCANIC ROCK			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-30,
Log of Trench T 2, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

TRENCH T 3

ELEV. (MSL.) **667'** DATE COMPLETED **02-08-2016**

EQUIPMENT **RUBBER TIRE BCKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**UNDOCUMENTED FILL (Qudf)** Stiff, moist, brown to dark brown, Silty and Sandy CLAY			
2				CL/CH	**ALLUVIUM (Qal)** Stiff, moist, very dark brown to black, Silty CLAY with trace gravel			
4	T3-1							
6								
8					-Becomes brown below 8 feet			
					SANTIAGO PEAK VOLCANICS (Jsp) Highly weathered, dark gray and brown, weak to moderately weak, METAVOLCANIC ROCK			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-31,
Log of Trench T 3, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TRENCH T 4

ELEV. (MSL.) 657' DATE COMPLETED 02-08-2016

EQUIPMENT RUBBER TIRE BCKHOE BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM&SC	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, gray, orange and brown, Silty and Clayey, fine to medium SAND			
2								
				CL	Stiff, moist, gray and brown, Sandy and Silty CLAY			
4								
				CL/CH	**ALLUVIUM (Qal)** Stiff, moist, very dark brown to black, Silty CLAY			
6								
8								
					SANTIAGO PEAK VOLCANICS (Jsp) Highly weathered, dark gray and brown, weak to moderately weak METAVOLCANIC ROCK			
10								
					TRENCH TERMINATED AT 11 FEET			

Figure A-32,
Log of Trench T 4, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2030-32-03

TRENCH T 5

ELEV. (MSL.) **680'** DATE COMPLETED **02-08-2016**

EQUIPMENT **RUBBER TIRE BCKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 6.5				SM&SC	**UNDOCUMENTED FILL (Qudf)** Loose to medium dense, moist, brown, Silty and Clayey, fine to medium SAND with 5-10% gravel, cobble and boulder size rock fragments up to 20-inches -24-inch concretion present at 4 feet			
6.5 – 15				CL/CH	**COLLUVIUM** Stiff, moist, dark brown, Silty CLAY -Becomes dark grayish brown, sandy clay below 10.5 feet			
15 – 17				ML	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, moist, gray and white, fine, Sandy/Clayey SILT/SILTSTONE with abundant calcium carbonate			
					TRENCH TERMINATED AT 17 FEET			

Figure A-33,
Log of Trench T 5, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TRENCH T 6

ELEV. (MSL.) **655'** DATE COMPLETED **02-08-2016**

EQUIPMENT **RUBBER TIRE BCKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/SC	**UNDOCUMENTED FILL (Qudf)** Loose, wet, brown, Silty to Clayey, fine to medium SAND; heavy caving in upper 4 feet			
2			▼	CL	Stiff, wet, green and brown, Silty to Sandy CLAY; heavy seepage at 3 feet			
4				CL	**ALLUVIUM (Qal)** Stiff, moist to wet, dark brown Silty/Sandy CLAY			
6								
8								
					SANTIAGO PEAK VOLCANICS (Jsp) Highly weathered, dark gray and brown, weak METAVOLCANIC ROCK			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-34,
Log of Trench T 6, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS		
... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TRENCH T 7

ELEV. (MSL.) 671.5' DATE COMPLETED 02-08-2016

EQUIPMENT RUBBER TIRE BCKHOE BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**ALLUVIUM (Qal)** Stiff, very moist, to moist, very dark brown, Silty CLAY			
2	T7-1							
4								
6					-Becomes dark brown and sandy below 6 feet			
8					**SANTIAGO PEAK VOLCANICS (Jsp)** Completely weathered, gray and maroon weak METAVOLCANIC ROCK (Saprolite) with remnant rock fragments present within matrix			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-35,
Log of Trench T 7, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 8 ELEV. (MSL.) 686' DATE COMPLETED 02-08-2016 EQUIPMENT RUBBER TIRE BCKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL/CH	**ALLUVIUM (Qal)** Stiff, moist to very moist, very dark brown, Silty CLAY			
2								
4				ML	**WEATHERED MISSION VALLEY FORMATION (Tmv)** Very stiff, damp to moist, gray and white, fine, Sandy SILT/SILTSTONE with abundant calcium carbonate			
6								
				ML	**MISSION VALLEY FORMATION (Tmv)** Hard, moist, gray, fine, Sandy SILTSTONE			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-36,
Log of Trench T 8, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

TRENCH T 9

ELEV. (MSL.) **683.5'** DATE COMPLETED **02-08-2016**

EQUIPMENT **RUBBER TIRE BCKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/CH	**ALLUVIUM (Qal)** Stiff, very moist, very dark brown, Silty CLAY			
2								
4								
					-Becomes brown and sandy below 5 feet			
6								
8								
					SANTIAGO PEAK VOLCANICS (Jsp) Highly weathered, brown and dark gray, weak, METAVOLCANIC ROCK			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-37,
Log of Trench T 9, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 10 ELEV. (MSL.) 694' DATE COMPLETED 07-02-2018 EQUIPMENT 410G BACKHOE W/24' BUCKET BY: J. PAGNILLO	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					6" Loose **TOPSOIL/MULCH**			
					METAVOLCANIC ROCK (Jsp) Slightly weathered to fresh, bluish gray, very strong, METAVOLCANIC ROCK, slightly fractured			
					REFUSAL AT 1 FOOT Groundwater not encountered			

Figure A-38,
Log of Trench T 10, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TRENCH T 11

ELEV. (MSL.) 694' DATE COMPLETED 07-02-2018

EQUIPMENT 410G BACKHOE W/24' BUCKET BY: J. PAGNILLO

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					6" Loose **TOPSOIL/MULCH**			
0.5–7 (2, 4, 6)					**UNDOCUMENTED FILL (Qudf)** Dense to very dense, damp, brown, Sandy, fine to very coarse/Clayey GRAVEL/COBBLE (soil-rock fill), angular rock fragments up to 12", some boulders up to 36"			
7–8.5 (8)					**METAVOLCANIC ROCK (Jsp)** Moderately weathered, brownish gray, moderately weak, METAVOLCANIC ROCK; intensely fractured, excavates to angular rock fragments up to 8" with sand			

TRENCH TERMINATED AT 8.5 FEET
Groundwater not encountered

Figure A-39,
Log of Trench T 11, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2030-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 12 ELEV. (MSL.) 684' DATE COMPLETED 07-02-2018 EQUIPMENT 410G BACKHOE W/24' BUCKET BY: J. PAGNILLO	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					12" Loose **TOPSOIL/MULCH**			
2					**METAVOLCANIC ROCK (Jsp)** Moderately weathered, brownish gray, mederately weak METAVOLCANIC ROCK, intensely fractured, excavates to angular rock fragments up to 6" with sand			
4					-Becomes strong and less weathered, difficult digging at 4 feet			
6					-Very difficult digging below 6 feet			
					PRACTICAL REFUSAL AT 7.5 FEET Groundwater not encountered			

Figure A-40,
Log of Trench T 12, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2030-32-03

TRENCH T 13

ELEV. (MSL.) **690'** DATE COMPLETED **07-02-2018**

EQUIPMENT **410G BACKHOE W/24' BUCKET** BY: **J. PAGNILLO**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					3" Loose **TOPSOIL/MULCH**			
2					**METAVOLCANIC ROCK (Jsp)** Fresh, bluish gray, very strong, METAVOLCANIC ROCK, moderately fractured, excavates to angular rock generally 3-6" size with sand; some fractures up to 15"			
					REFUSAL AT 2.5 FEET Groundwater not encountered			

Figure A-41,
Log of Trench T 13, Page 1 of 1

G2030-32-03.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected relatively undisturbed ring and bulk samples were tested for their in-place dry density and moisture content, maximum dry density and optimum moisture content, Atterberg Limits, expansion index and shear strength characteristics.

The results of our laboratory tests are summarized on Tables B-I through B-IV. A composite graph depicting the direct shear test results for the Mission Valley Formation (peak and ultimate), bedding plane shear (residual), and compacted fill (remolded samples) is presented on Figures B-1 through B-4. The results of the dry density and moisture content tests are presented on the boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS

Sample No.	Geologic Unit Symbol (USCS Soil Type)	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B1-2*	Tmv (SM)	99.9	19.0	425	23
B1-4*	Tmv (CL)	103.7	17.1	450 [340]	23 [24]
B1-6	Tmv (CL)	106.8	19.4	935 [415]	28 [26]
B2-4	Tmv (SM)	112.3	13.8	240	42
B2-7	Tmv (CL)	105.2	20.4	820 [845]	25 [16]
B3-3	Tmv (SM)	107.5	20.4	565	45
B3-6	Tmv (CL)	113.4	16.6	2,000 [235]	28 [28]
B5-3	Tmv (SM)	120.3	11.3	330	44
B5-7	Tmv (CL)	112.6	16.7	860 [330]	25 [23]
B6-3*	Tmv (SM)	109.1	11.7	335	30
B7-1 & B10-2 (50/50 mix)*	Tmv (SC/CL)	102.6	16.8	300 [510]	30 [23]
B7-5	Tmv (SM)	111.4	16.5	1,525	34
B7-8	Tmv (CL)	114.5	18.4	565 [445]	19 [18]
B8-1	Tmv (SM)	117.7	12.3	960	27
B8-3	Tmv (CL)	113.4	17.1	1,060 [1,045]	30 [29]
B9-3*	Tmv (CL)	103.0	16.1	375 [315]	24 [24]
B9-4	Tmv (CL)	111.1	18.6	1,075 [410]	24 [22]

TABLE B-I (Concluded)
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS

Sample No.	Geologic Unit Symbol (USCS Soil Type)	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B10-3	Tmv (CL)	109.2	19.3	635 [485]	30 [30]
B11-5	Tmv (ML)	112.6	16.1	930 [720]	26 [18]
B12-3	Tmv (ML)	114.9	16.6	1,450 [855]	18 [21]
B19-5*	Tmv (SM)	106.5	14.3	440	28
B21-6	Tmv (SM)	114.3	12.6	375	36
B22-4	Tmv (SM)	109.6	18.8	150	45
B22-7	Tmv (CL)	111.2	18.6	125 [200]	41 [33]
B23-4	Tmv (CL)	103.4	21.4	795 [420]	27 [28]
B24-6**	Tmv (CH/MH)	86.6	37.8	160 [140]	13 [15]
B25-5	Tmv (CL)	89.7	31.6	1,690 [800]	18 [23]
T7-1	Qal (CL/CH)	104.8	14.8	615 [415]	11 [13]

*Sample was remolded to 90 percent relative compaction at near optimum moisture content.
**Residual Shear
[ ] Denotes Ultimate Shear Strength for siltstone and claystone materials.

TABLE B-II
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS

Sample No.	Description (Geologic Unit)	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B1-2	Gray, Silty, fine SAND with some clay (Tmv)	113.9	16.3
B1-4	Olive, Silty CLAY (Tmv)	115.6	16.4
B6-3	Light brown, Silty, fine to medium SAND (Tmv)	121.8	11.7
B9-3	Light brown, Silty CLAY (Tmv)	115.4	15.6
B19-5	Light brown, Silty, fine to medium SAND (Tmv)	120.2	12.5
B7-1 & B10-2 (Mix)	Light gray, fine to medium, Sandy CLAY (Tmv)	115.0	15.5
T7-1	Dark brown, Silty CLAY with some sand (Qal)	118.3	13.1

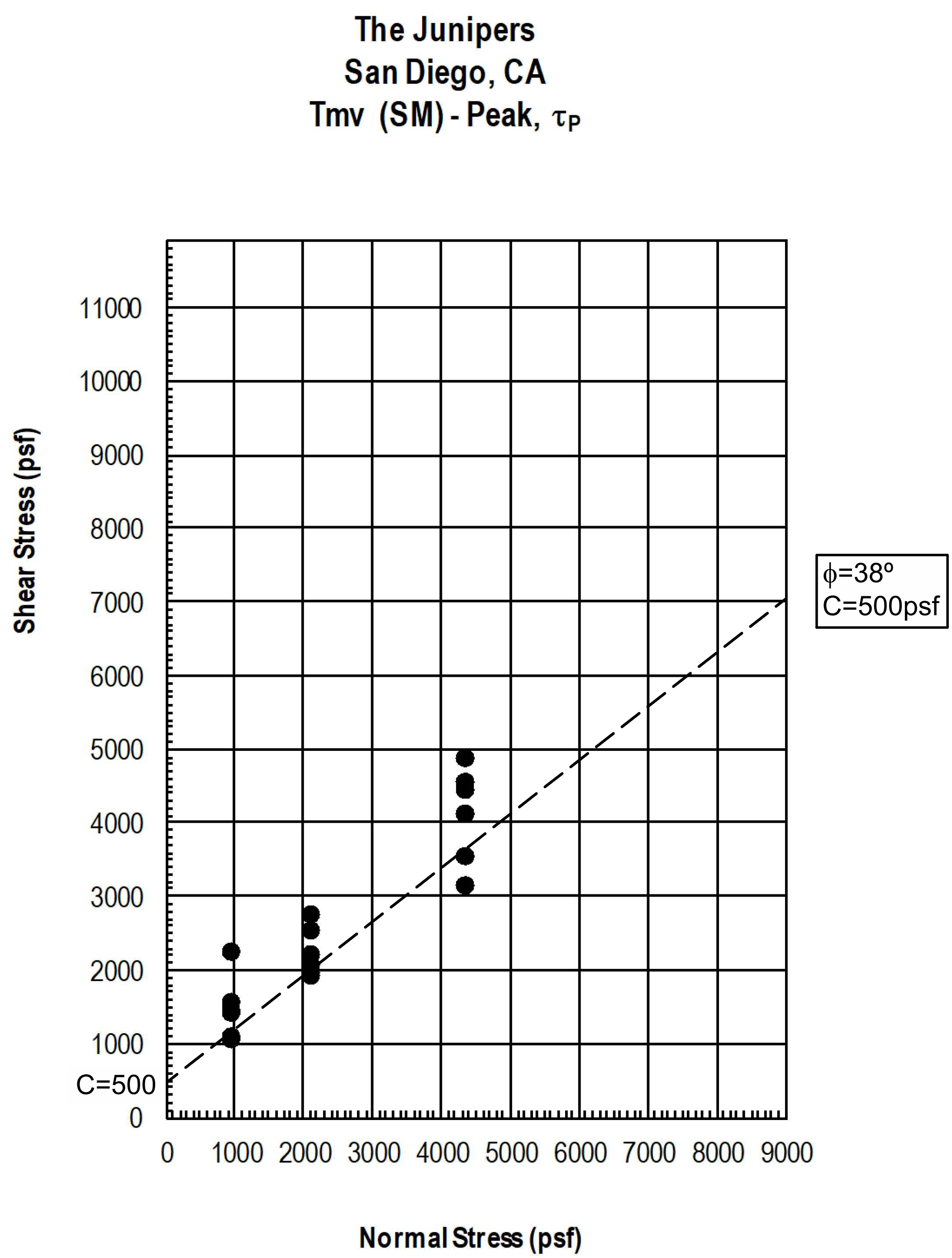
TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Geologic Unit (USCS Soil Type)	Moisture Content (%)		Dry Density (pcf)	Expansion Index
		Before Test	After Test		
B1-4	Tmv (CL)	13.1	27.2	99.6	71
B6-3	Tmv (SM)	10.1	17.3	108.6	10
B9-3	Tmv (CL)	12.7	28.1	99.1	79
B7-1 & B10-2 (Mix)	Tmv (SM & CL)	11.3	26.5	104.9	82
T7-1	Qal (CL/CH)	12.3	29.3	101.4	107

TABLE B-IV
SUMMARY OF LABORATORY PLASTICITY INDEX TEST RESULTS

Sample No.	Geologic Unit	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Unified Soil Classification (Group Symbol)
B1-10	Tmv- BPS*	62	23	39	CH
B10-7	Tmv- BPS*	66	37	39	CH
B21-14	Tmv- BPS*	60	20	40	CH
B24-6	Tmv- Fissured CL	87	31	56	CH
B24-7	Tmv- BPS*	97	30	67	CH

*BPS- Bedding Plane Shear



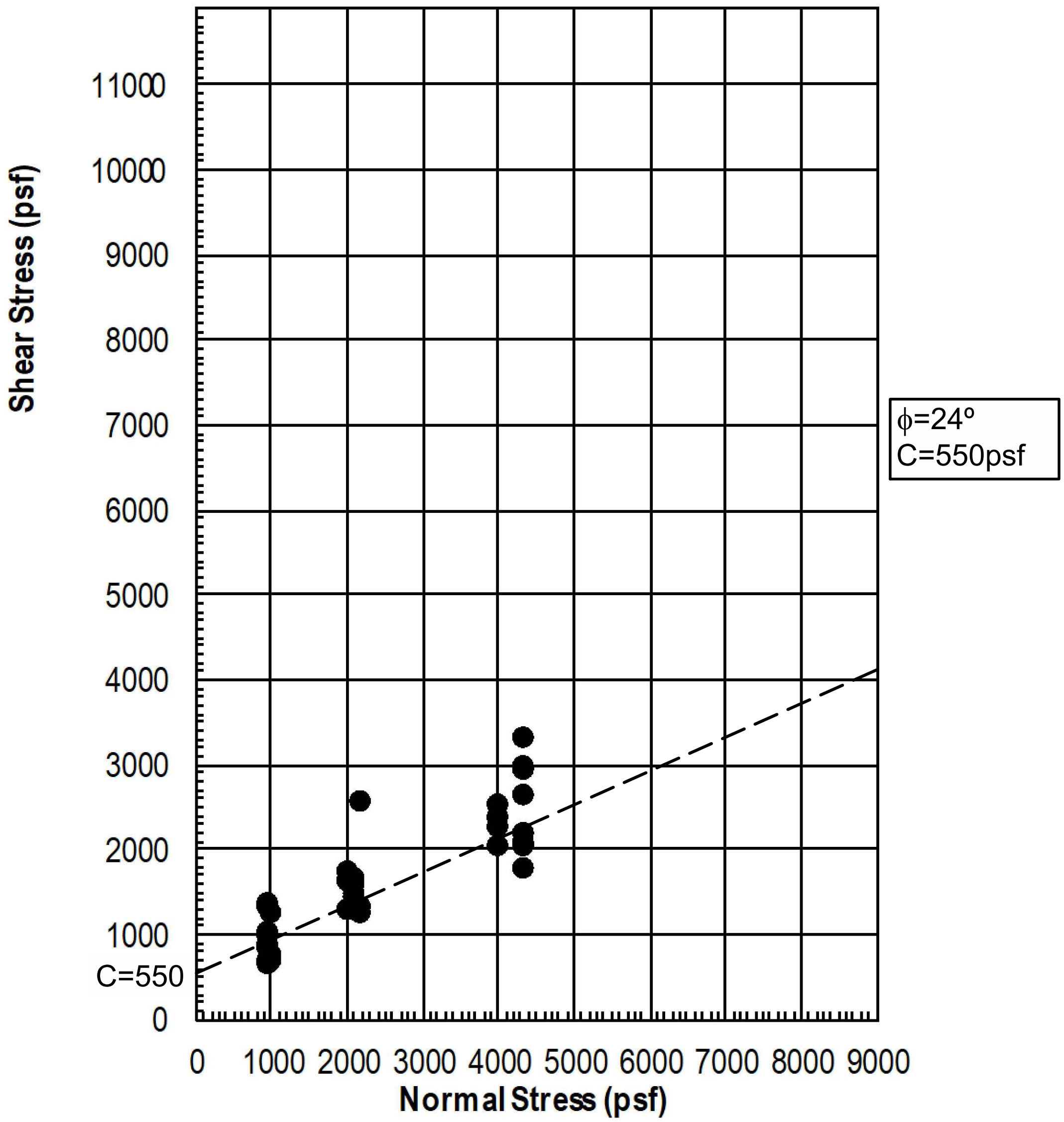
COMPOSITE DIRECT SHEAR TEST RESULTS

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

THE JUNIPERS
SAN DIEGO, CALIFORNIA

TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. B-1

The Junipers
San Diego, CA
Tmv(ML-CL) - Ultimate



COMPOSITE DIRECT SHEAR TEST RESULTS

GEOCON INCORPORATED

GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974

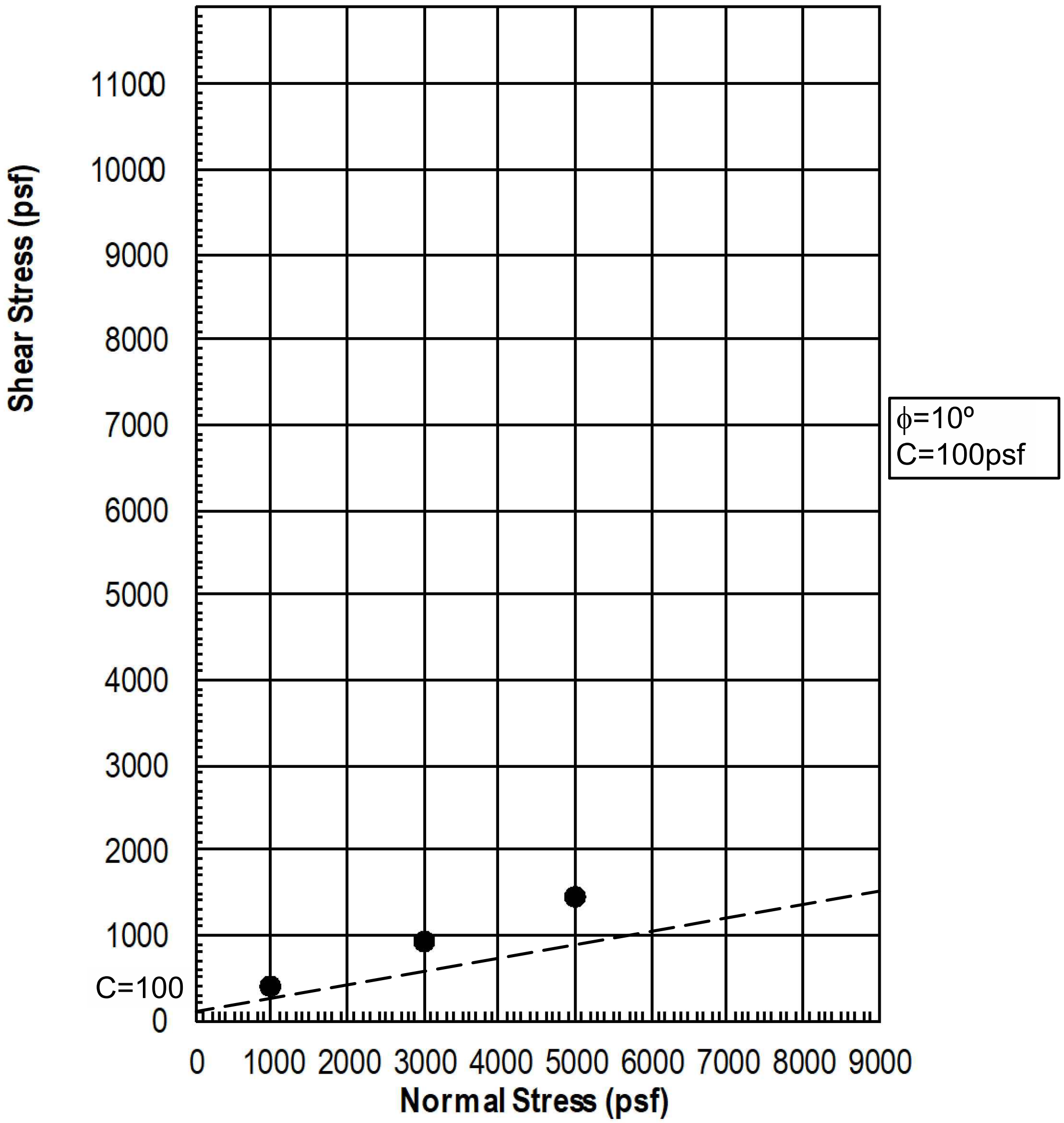
PHONE 858 558-6900 - FAX 858 558-6159

THE JUNIPERS

SAN DIEGO, CALIFORNIA

TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. B-2

The Junipers
San Diego, CA
BPS - Residual



COMPOSITE DIRECT SHEAR TEST RESULTS

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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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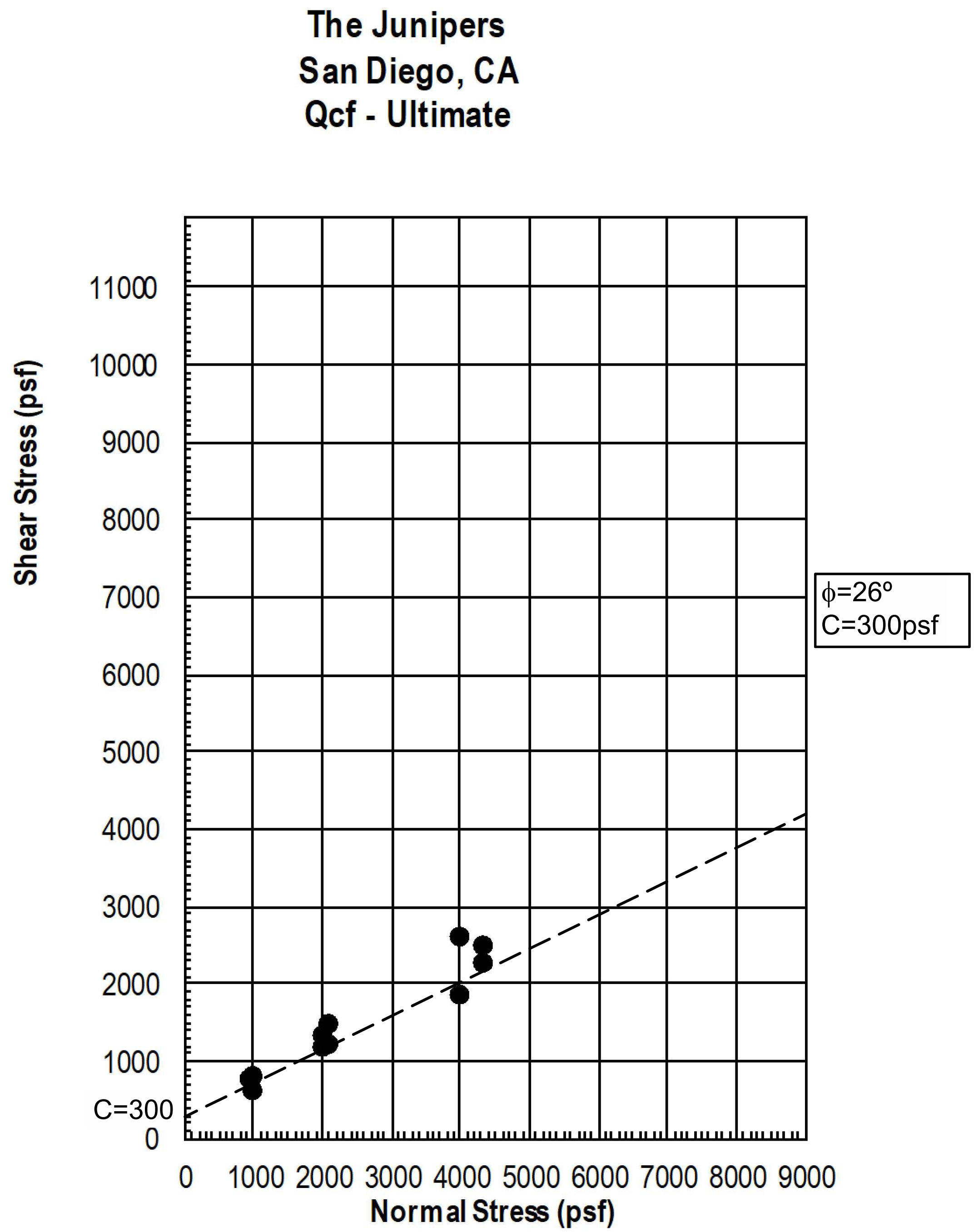
THE JUNIPERS
SAN DIEGO, CALIFORNIA

TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. B-3



COMPOSITE DIRECT SHEAR TEST RESULTS

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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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THE JUNIPERS
SAN DIEGO, CALIFORNIA

TR / RA		DSK/GTYPD	DATE 04 - 09 - 2019	PROJECT NO. G2030 - 32 - 03	FIG. B-4

APPENDIX C

APPENDIX C

SLOPE STABILITY ANALYSES

The slope stability analyses utilized the computer software program *Geostudio 2018* to calculate the factor of safety with respect to deep-seated instability. This program uses conventional slope stability equations and a two-dimensional, limit-equilibrium method. For our analyses, Spencer's Method with a block-failure mode was used to analyze the slope stability along assumed continuous weak clay beds. Circular failure surfaces were also utilized to evaluate cut and fill slopes. Shear strength parameters were assigned using average shear strength parameters for sandstone, siltstone, and claystone. Residual shear strengths were used for bedding plane shears and were determined from the *Empirical Correlation Between Drained Residual Friction Angle of Fine-Grained Soil and Ball-Milled Liquid Limit* (Stark and McCone, 2001).

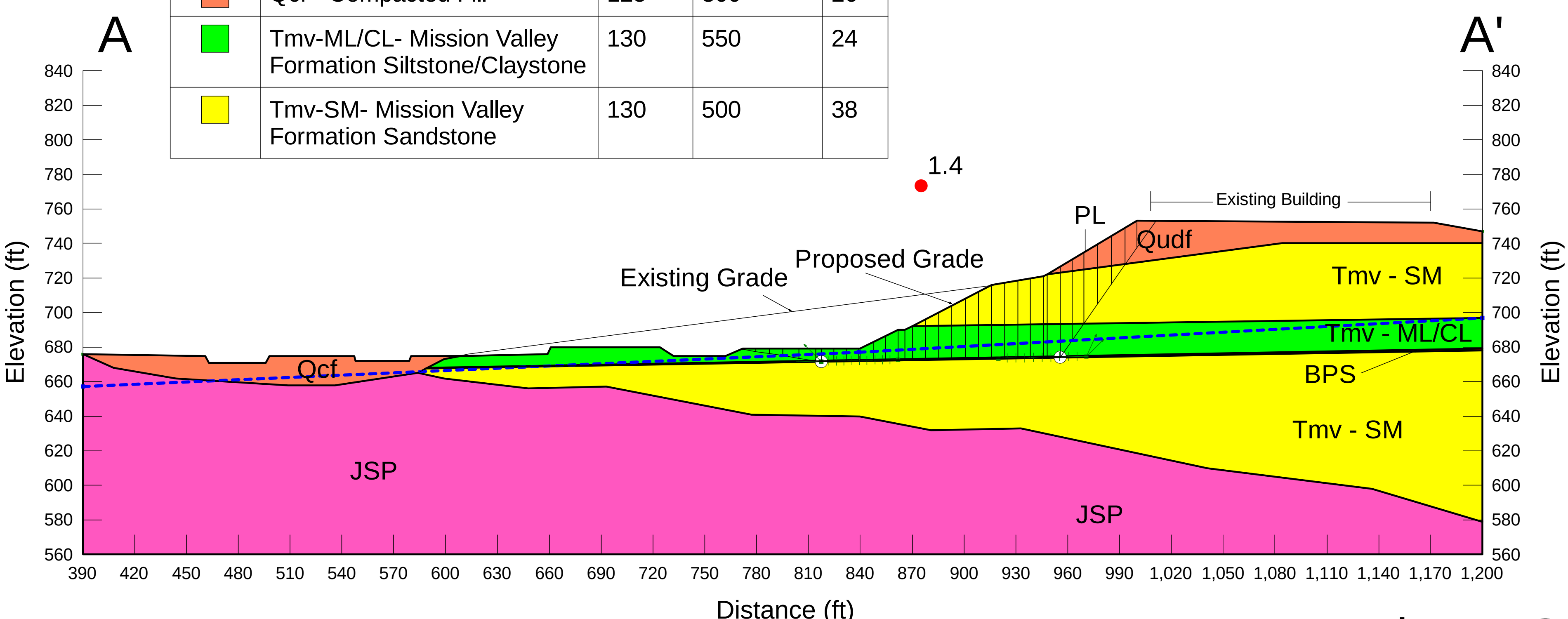
Based on our experience, we have observed that bedding plane shears can undulate with orientations varying up to 15 degrees over tens of feet, however, when averaged over a greater distance they are generally horizontal or dipping only a few degrees. Therefore, projection or modeling the orientation of these features on the *Geologic Cross Sections* was based on piercing points and/or graphical methods (i.e., 3-point solutions) between the exploratory borings in lieu of projection along strike measured in the borings. In addition, to be conservative, bedding plane shears that dipped into slope were conservatively modeled flat, and those dipping out of slope were modeled out of slope in our slope stability analysis.

The Junipers
Project No. G2030-32-03
Section A-A'
Name: AA-Case 1.gsz
Date: 03/05/2018 Time: 02:54:49 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	BPS - Bedding Plane Shear	120	100	10
	Jsp - Santiago Peak Volcanics	130	500	35
	Qcf - Compacted Fill	125	300	26
	Tmv-ML/CL- Mission Valley Formation Siltstone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38



X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\

Figure C-1

The Junipers
Project No. G2030-32-03
Section A-A'
Name: AA-Case 2.gsz
Date: 03/05/2018 Time: 03:21:44 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(pink)	Jsp - Santiago Peak Volcanics	130	500	35
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

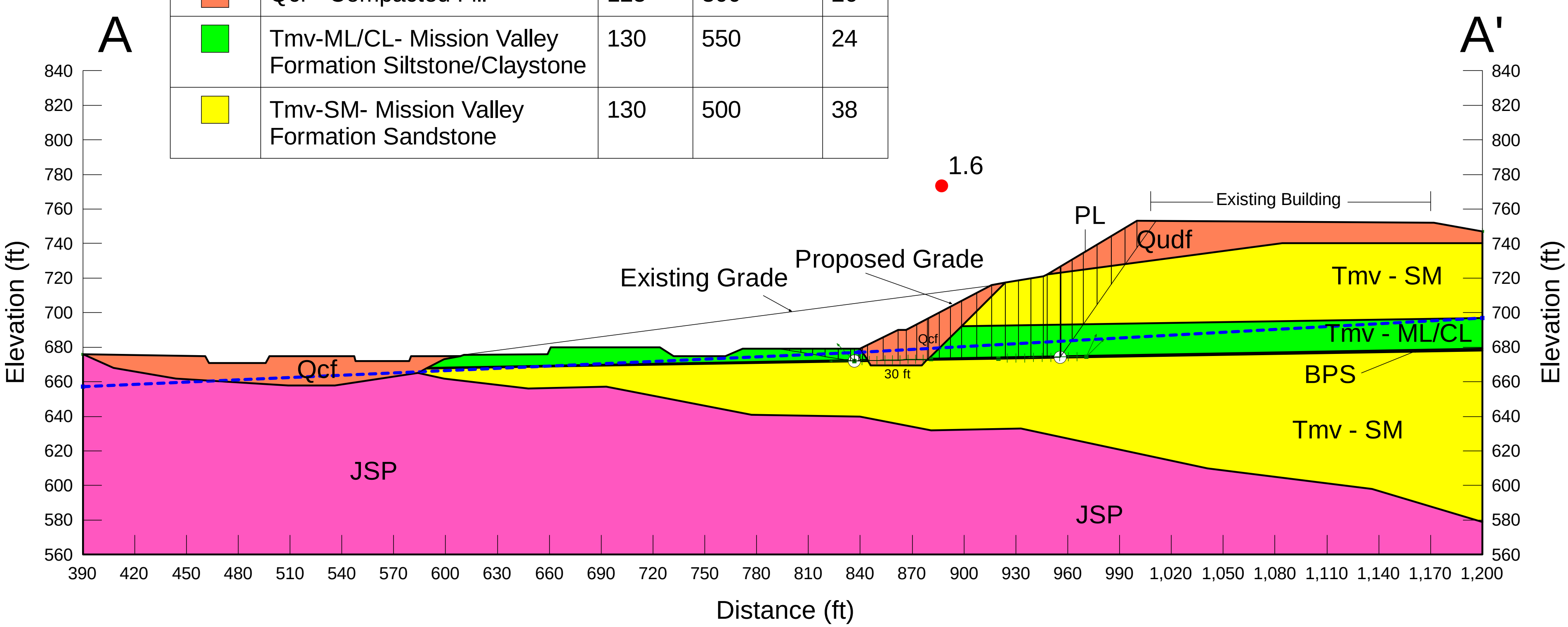


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Figure C-2

The Junipers
Project No. G2030-32-03
Section A-A'
Name: AA-Case 2s.gsz
Date: 03/05/2018 Time: 03:24:27 PM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(pink)	Jsp - Santiago Peak Volcanics	130	500	35
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

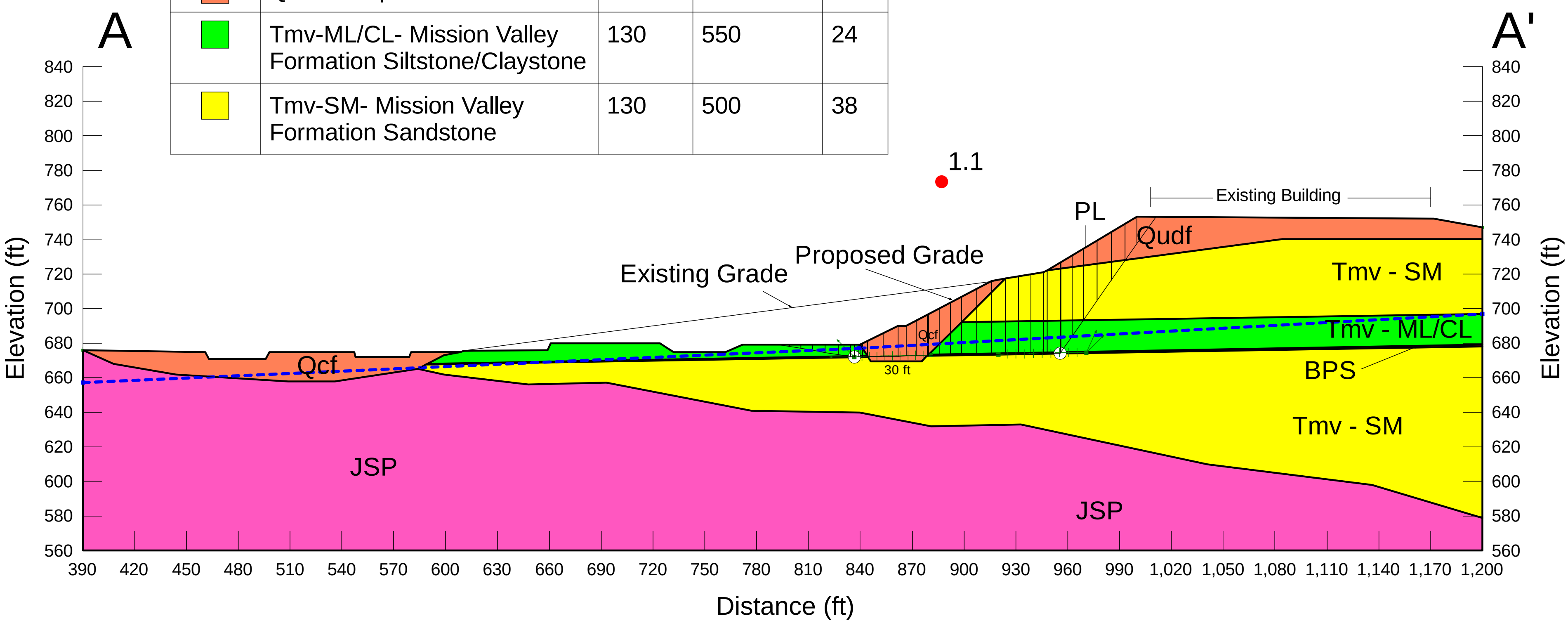

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Figure C-3

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	AA-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.10

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA

Estimated Displacement, u (cm) NA

FIGURE C-4

The Junipers
Project No. G2030-32-03
Section B-B'
Name: BB-Case 1.gsz
Date: 03/06/2018 Time: 01:54:31 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(salmon)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

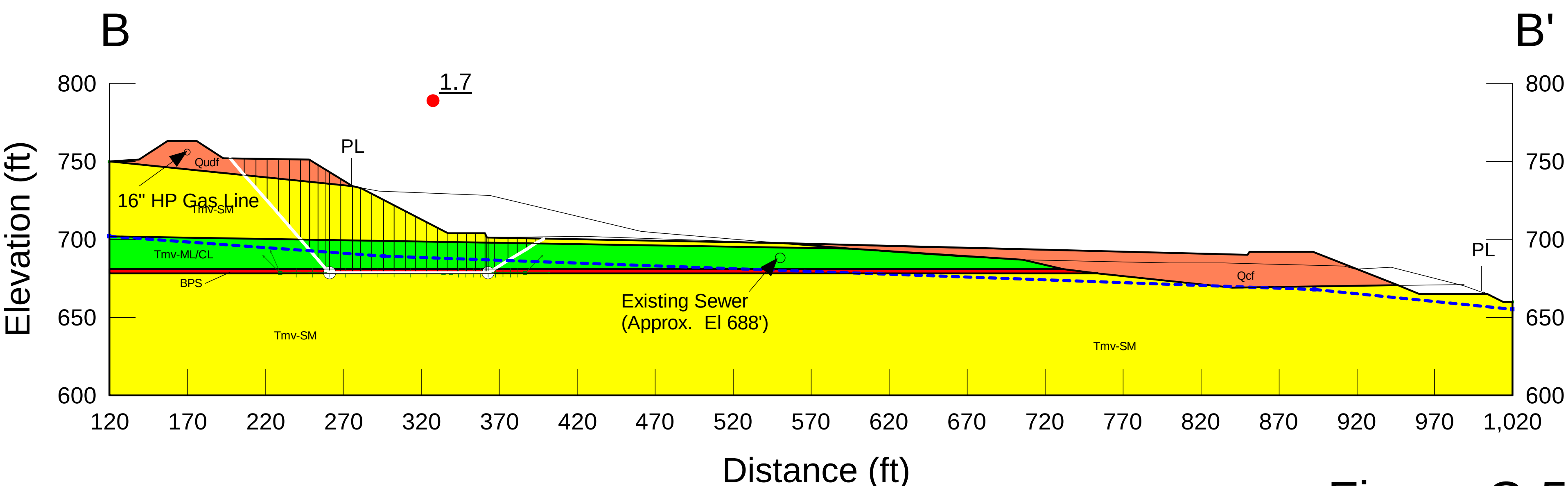

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Figure C-5

The Junipers
Project No. G2030-32-03
Section B-B'
Name: BB-Case 2.gsz
Date: 03/06/2018 Time: 01:01:34 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

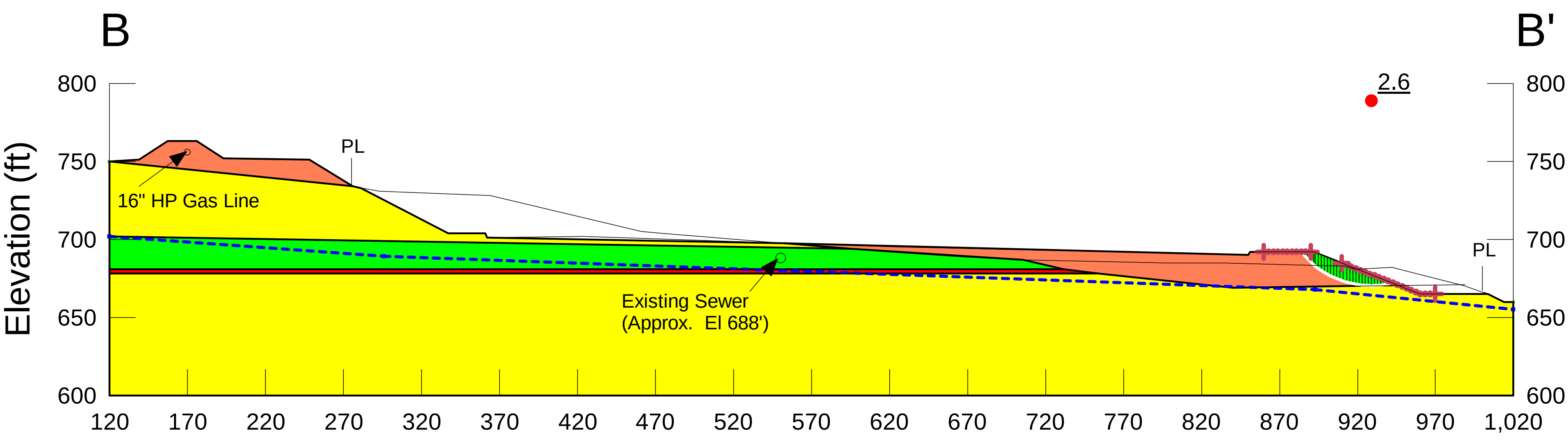

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Figure C-6

The Junipers
Project No. G2030-32-03
Section B-B'
Name: BB-Case 1s.gsz
Date: 03/06/2018 Time: 02:10:11 PM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

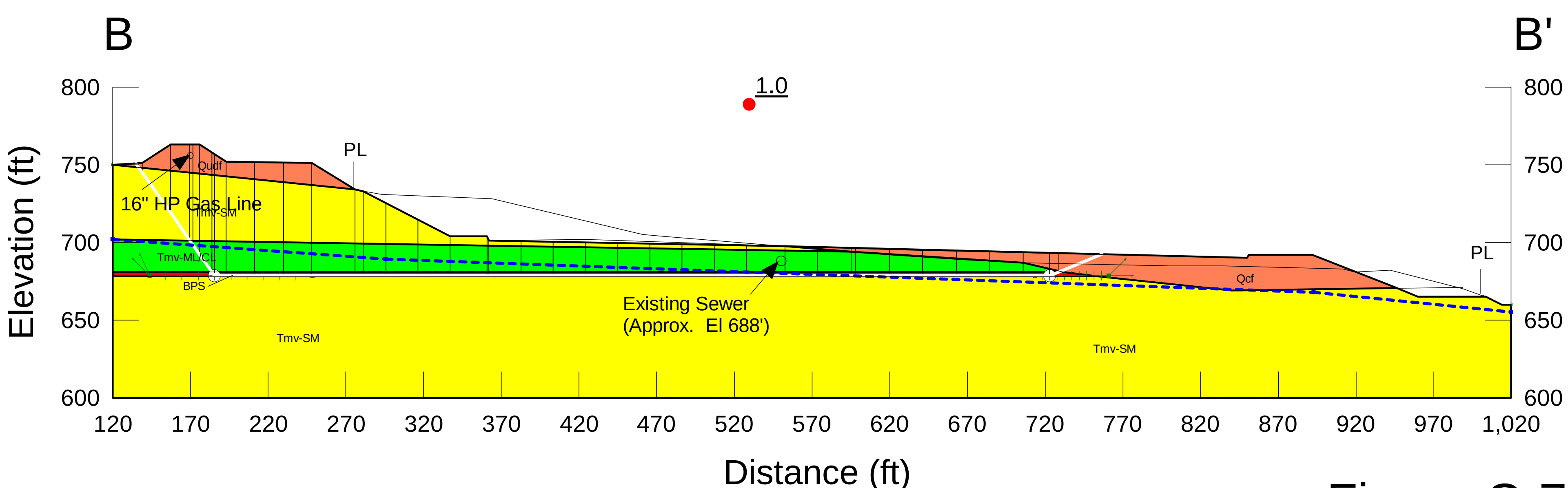

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Figure C-7

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	BB-Case1s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.00

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-8

The Junipers
Project No. G2030-32-03
Section B-B'
Name: BB-Case 2s.gsz
Date: 03/06/2018 Time: 02:12:29 PM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

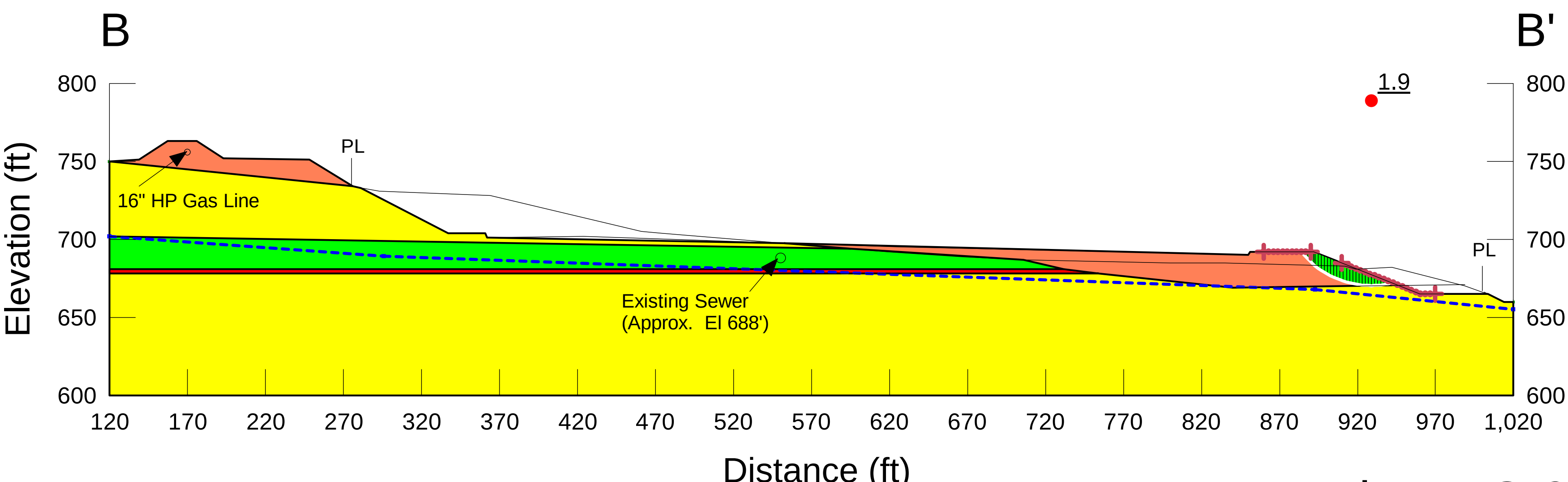

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Figure C-9

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	BB-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.90

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA

Estimated Displacement, u (cm) NA

FIGURE C-10

The Junipers
Project No. G2030-32-03
Section C-C'
Name: CC-Case8.gsz
Date: 12/10/2018 Time: 12:35:38 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	BPS - Bedding Plane Shear	120	100	10
	Jsp- Santiago Peak Volcanics	130	500	35
	Qcf - Compacted Fill	125	300	26
	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

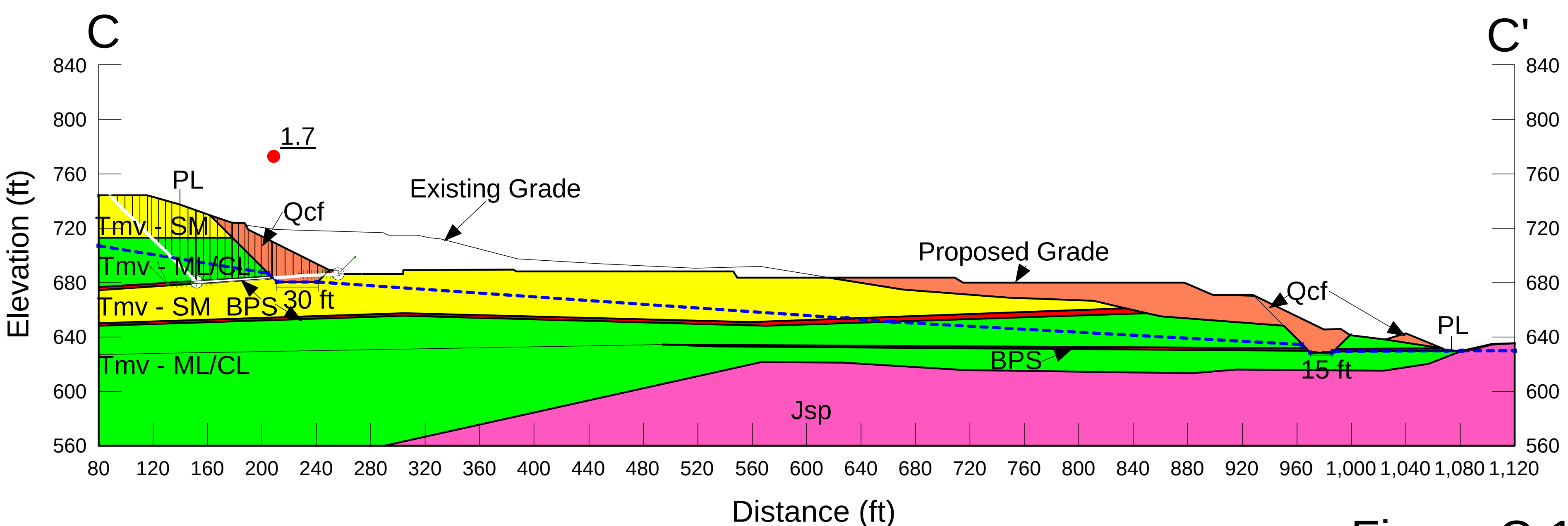

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Figure C-11

The Junipers
Project No. G2030-32-03
Section C-C'
Name: CC-Case9.gsz
Date: 12/10/2018 Time: 01:09:19 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp- Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

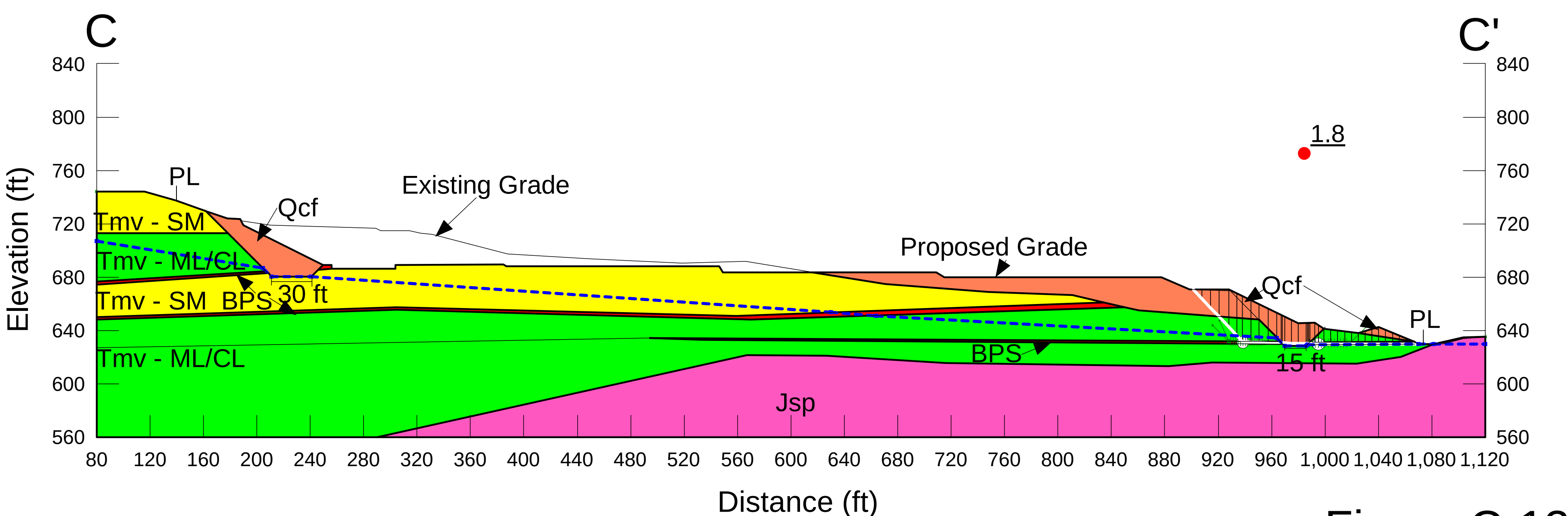

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Figure C-12

The Junipers
Project No. G2030-32-03
Section C-C'
Name: CC-Case8s.gsz
Date: 12/10/2018 Time: 12:56:19 PM

Proposed Condition

Seismic Analysis
keq=0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(pink)	Jsp- Santiago Peak Volcanics	130	500	35
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

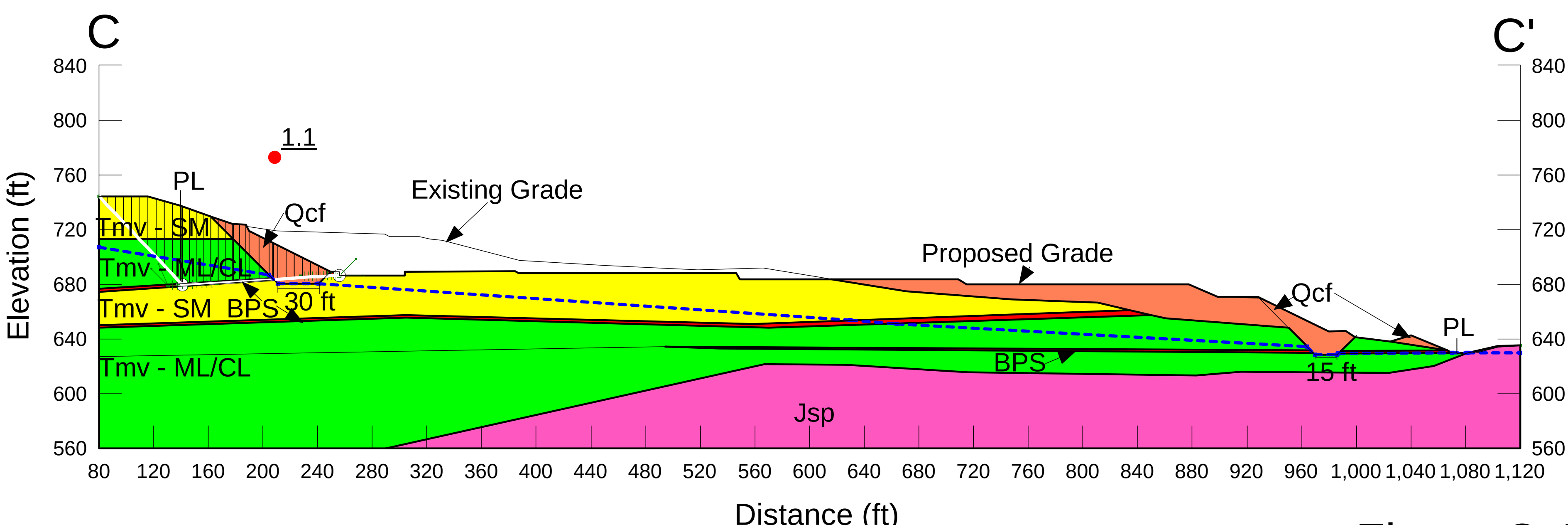

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Figure C-13

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	12/10/18		
Filename	CC-Case8s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA$_r$/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA$_r$)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.10

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA$_r$/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-14

The Junipers
Project No. G2030-32-03
Section C-C'
Name: CC-Case9s.gsz
Date: 12/10/2018 Time: 01:14:13 PM

Proposed Condition

Seismic Analysis
keq=0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(pink)	Jsp- Santiago Peak Volcanics	130	500	35
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

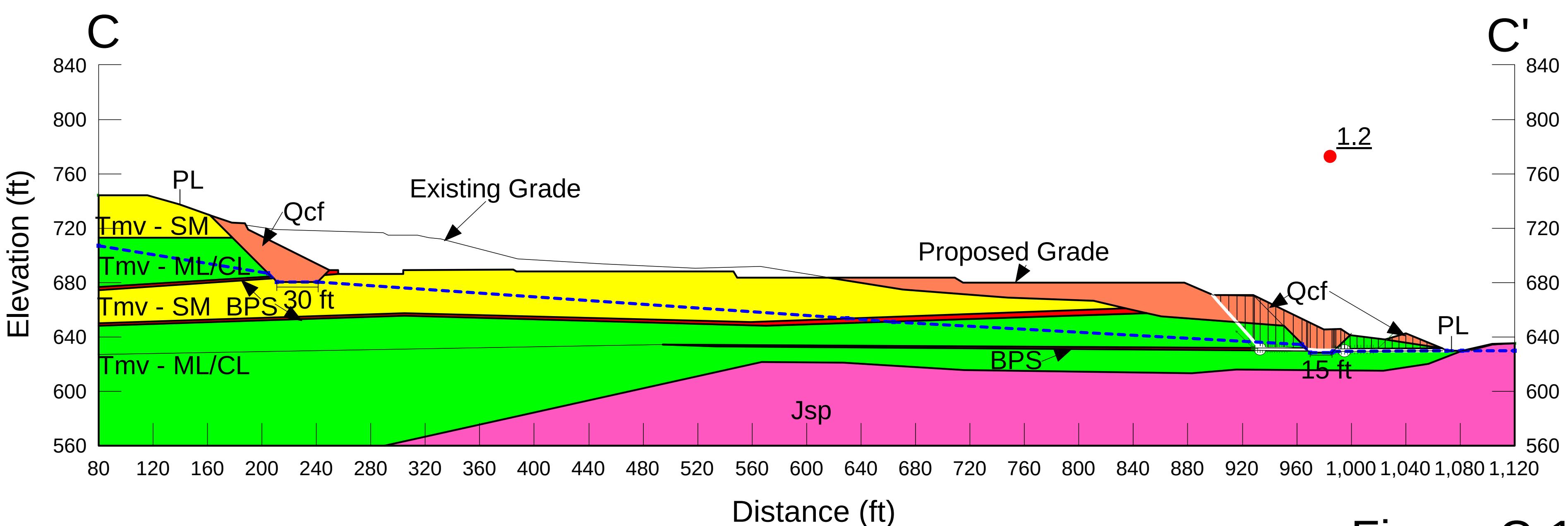

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Figure C-15

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	12/10/18		
Filename	CC-Case9s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\vert_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g	
k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.20

Passes Initial Screening Analysis

Approximation of Seismic Demand	
Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-16

The Junipers
Project No. G2030-32-03
Section D-D'
Name: DD-Case2.gsz
Date: 12/10/2018 Time: 01:46:14 PM

Proposed Condition with Stability Fill

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp- Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

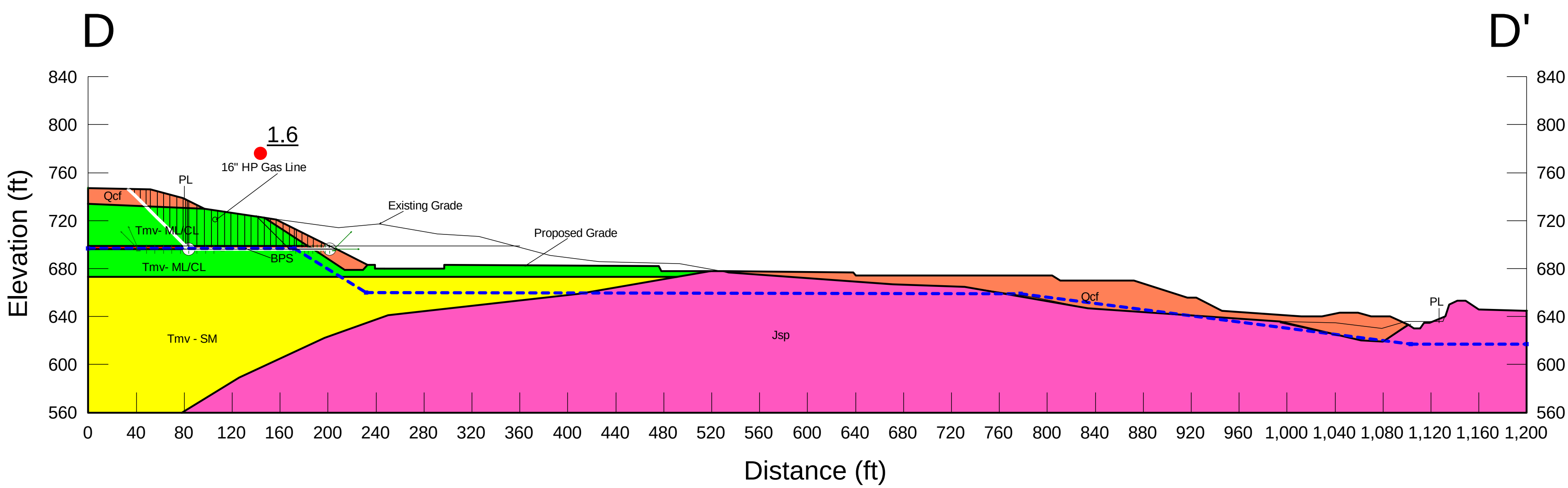

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Figure C-17

The Junipers
Project No. G2030-32-03
Section D-D'
Name: DD-Case2s.gsz
Date: 12/10/2018 Time: 02:48:54 PM

Proposed Condition with Stability Fill

Seismic Analysis
keq=0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp- Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

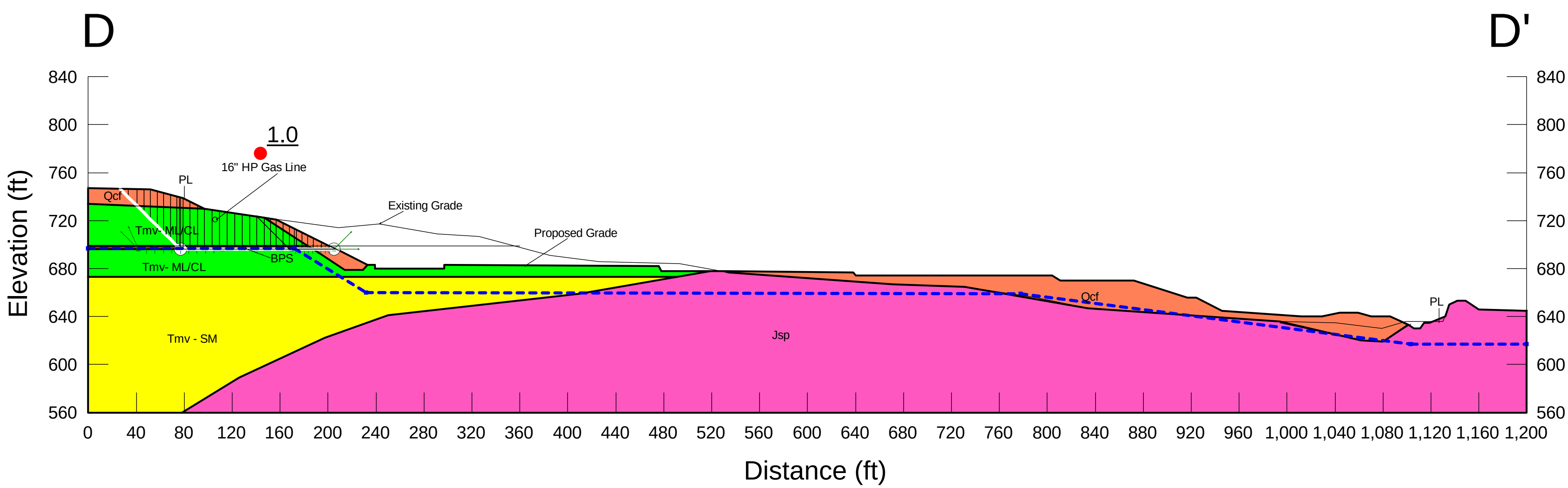

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Figure C-18

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	12/10/18		
Filename	DD-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.00

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-19

The Junipers
Project No. G2030-32-03
Section E-E'
Name: EE-Case1.gsz
Date: 03/09/2018 Time: 08:08:19 AM

Proposed Condition with Stability Fill

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp- Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

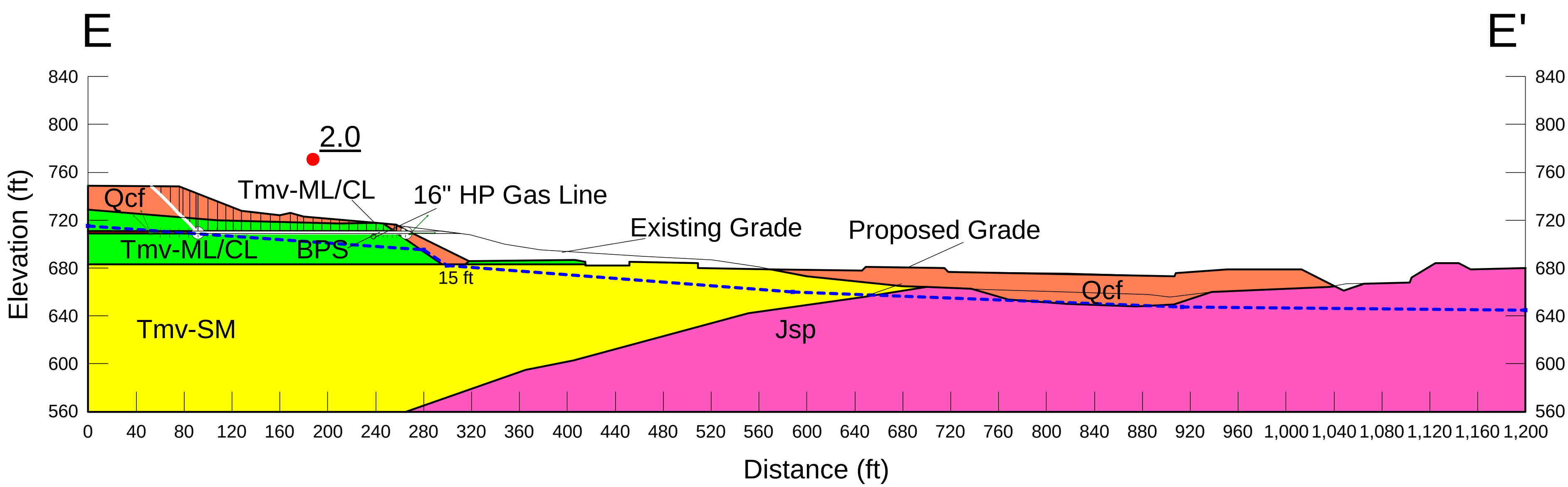

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Figure C-20

The Junipers
Project No. G2030-32-03
Section E-E'
Name: EE-Case1s.gsz
Date: 03/09/2018 Time: 08:32:34 AM

Proposed Condition with Stability Fill

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	BPS - Bedding Plane Shear	120	100	10
	Jsp- Santiago Peak Volcanics	130	500	35
	Qcf - Compacted Fill	125	300	26
	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

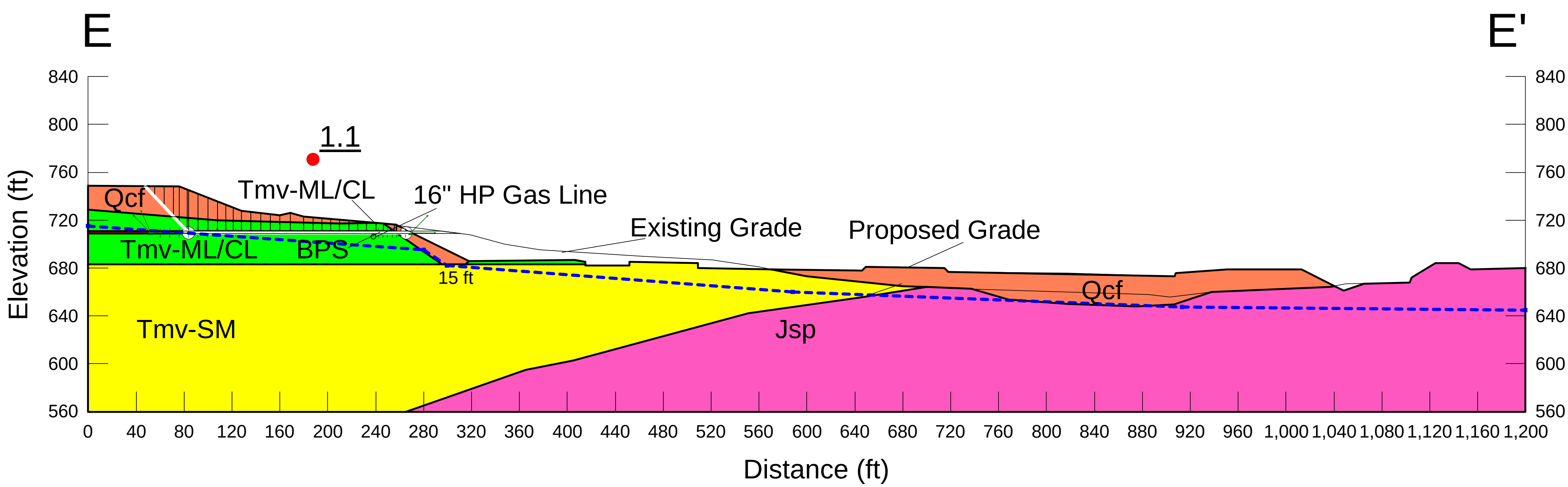

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Figure C-21

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	DD-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\vert_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.10

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-22

The Junipers
Project No. G2030-32-03
Section F-F'
Name: FF-Case1.gsz
Date: 03/09/2018 Time: 09:09:38 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(pink)	Jsp- Santiago Peak Volcanics	130	500	35
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

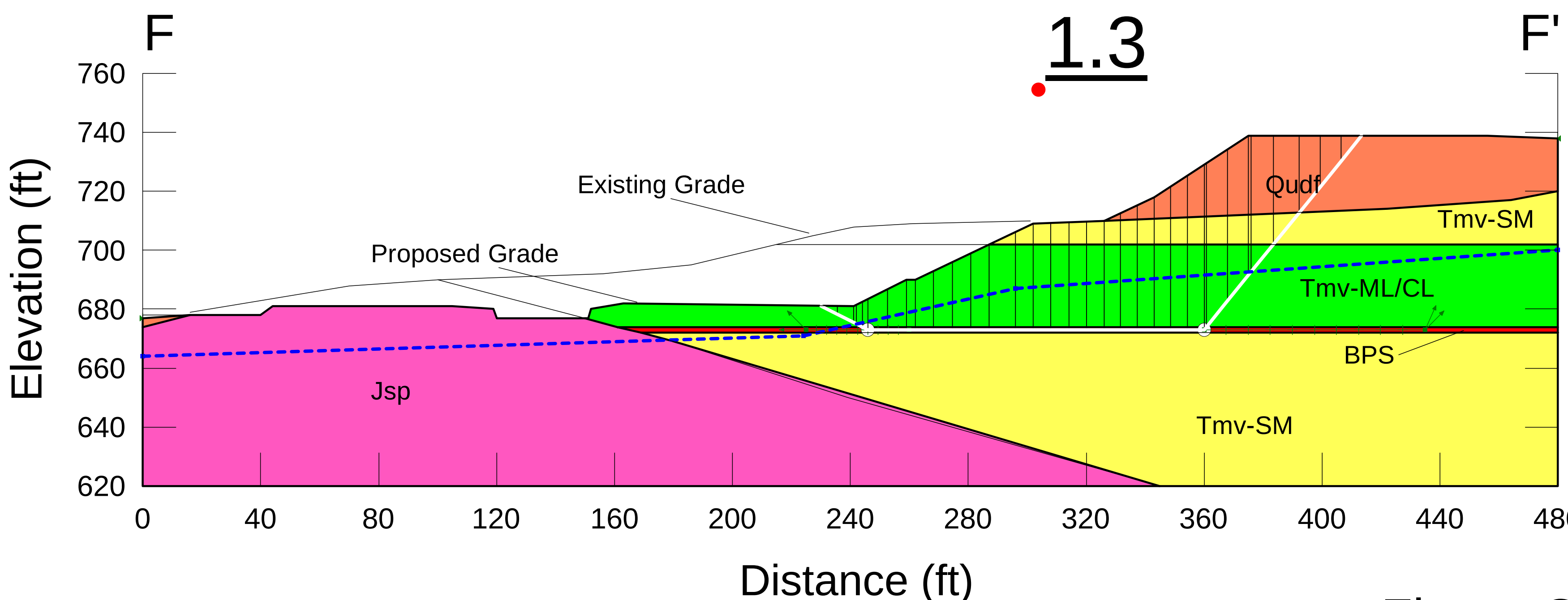

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Figure C-23

The Junipers
Project No. G2030-32-03
Section F-F'
Name: FF-Case2.gsz
Date: 03/09/2018 Time: 08:57:38 AM

Proposed Condition with Buttress

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	BPS - Bedding Plane Shear	120	100	10
	Jsp- Santiago Peak Volcanics	130	500	35
	Qcf - Compacted Fill	125	300	26
	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

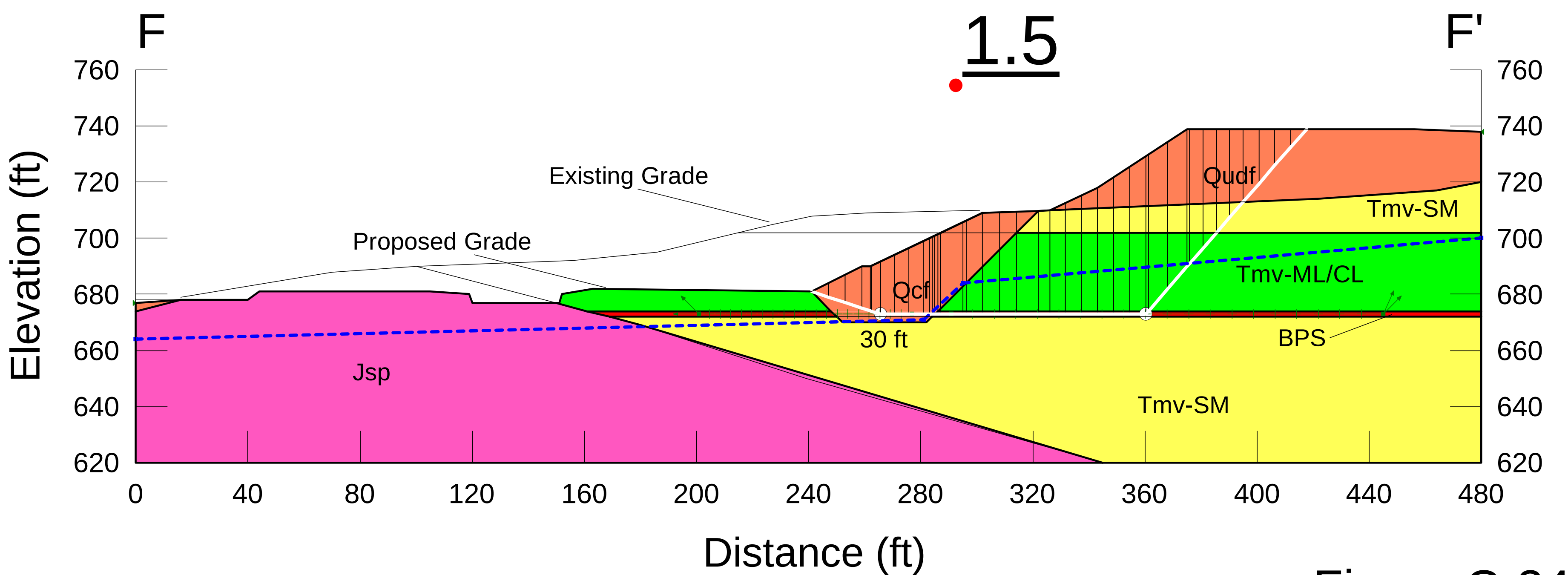

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Figure C-24

The Junipers
Project No. G2030-32-03
Section F-F'
Name: FF-Case2s.gsz
Date: 03/09/2018 Time: 09:03:38 AM

Proposed Condition with Buttress

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp- Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

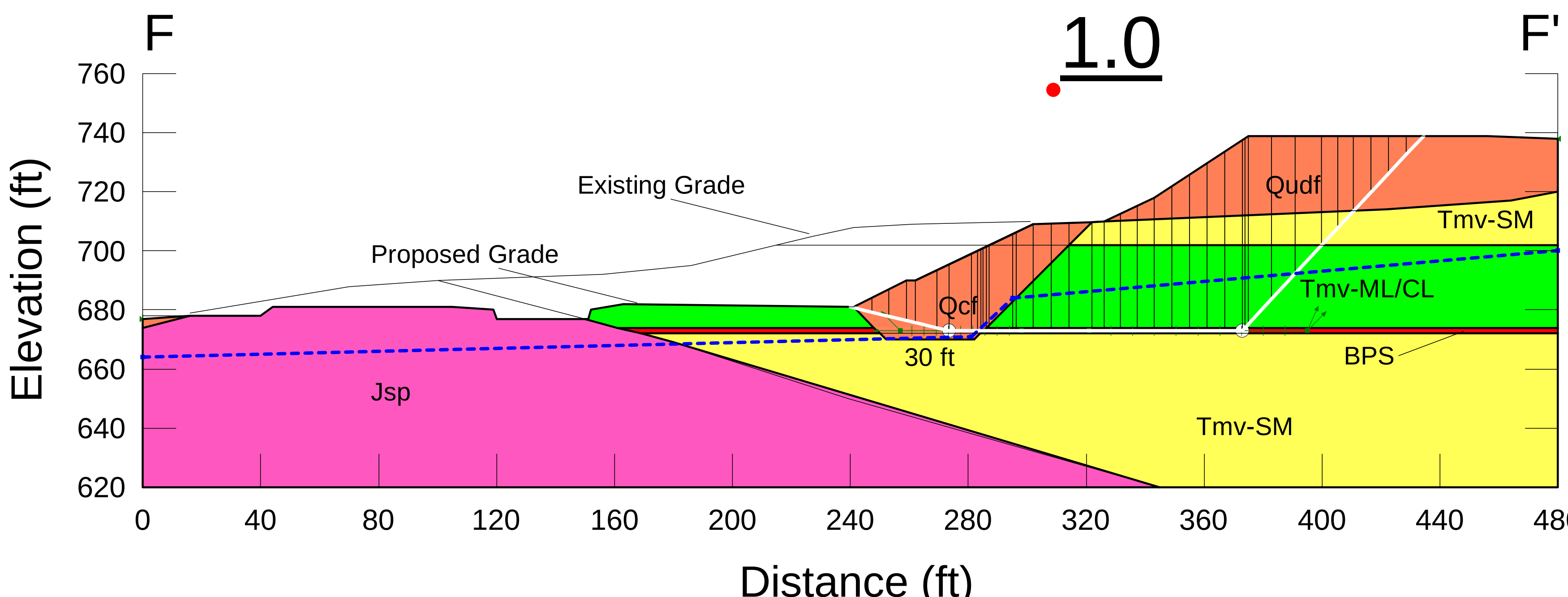

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Figure C-25

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	FF-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g	
k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.03

Passes Initial Screening Analysis

Approximation of Seismic Demand	
Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-26

The Junipers
Project No. G2030-32-03
Section G-G'
Name: GG-Case1.gsz
Date: 03/09/2018 Time: 09:38:10 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp- Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

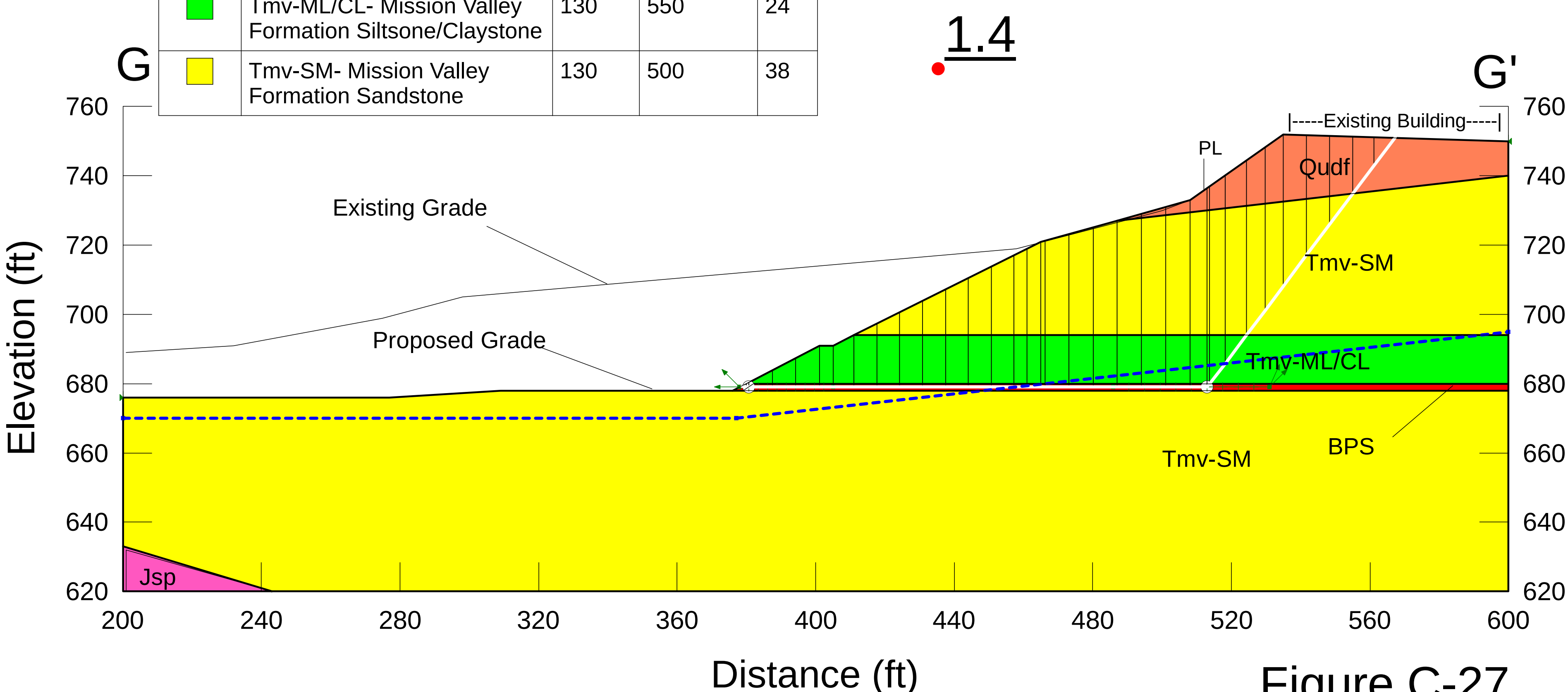

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Figure C-27

The Junipers
Project No. G2030-32-03
Section G-G'
Name: GG-Case2.gsz
Date: 03/09/2018 Time: 09:33:55 AM

Proposed Condition with Buttress

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	BPS - Bedding Plane Shear	120	100	10
	Jsp- Santiago Peak Volcanics	130	500	35
	Qcf - Compacted Fill	125	300	26
	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

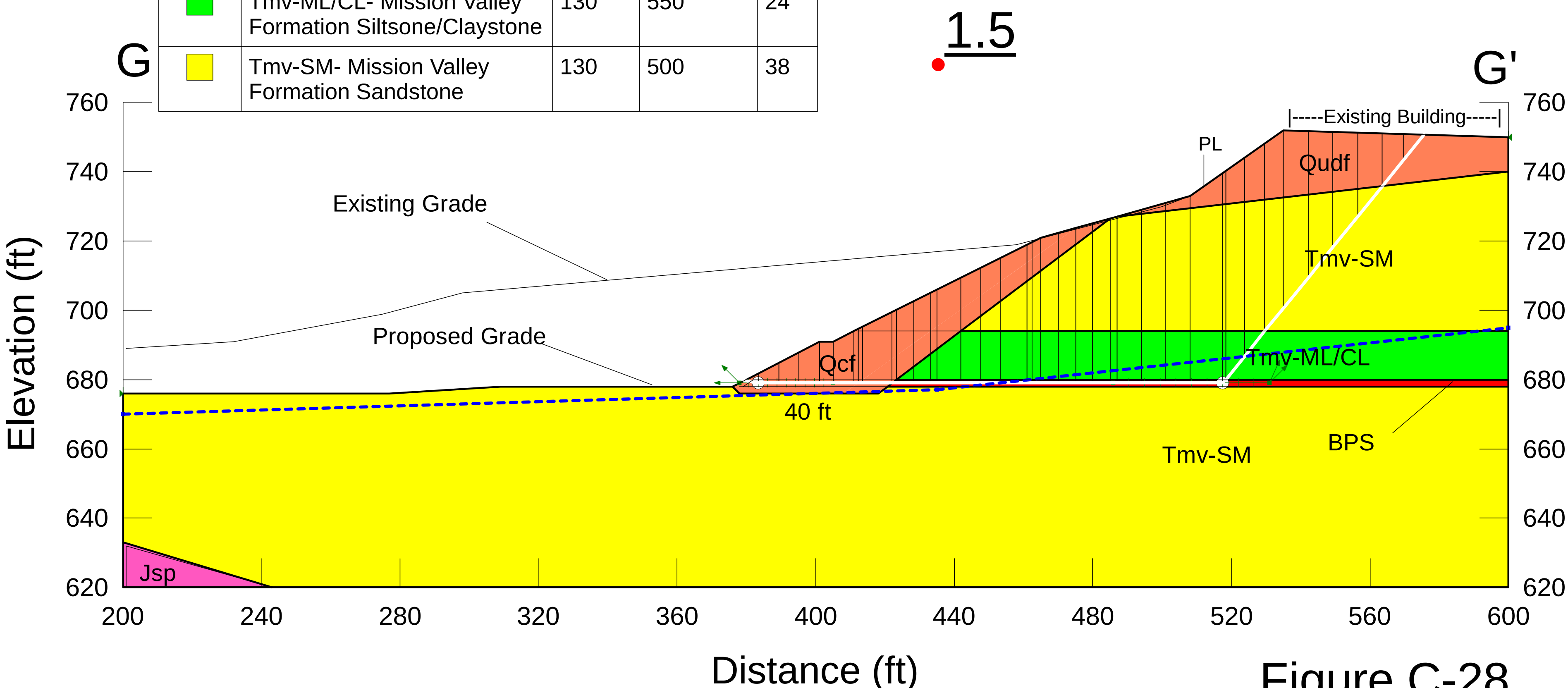

Figure C-28

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The Junipers
Project No. G2030-32-03
Section G-G'
Name: GG-Case2s.gsz
Date: 03/09/2018 Time: 09:36:02 AM

Proposed Condition with Buttress

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp- Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

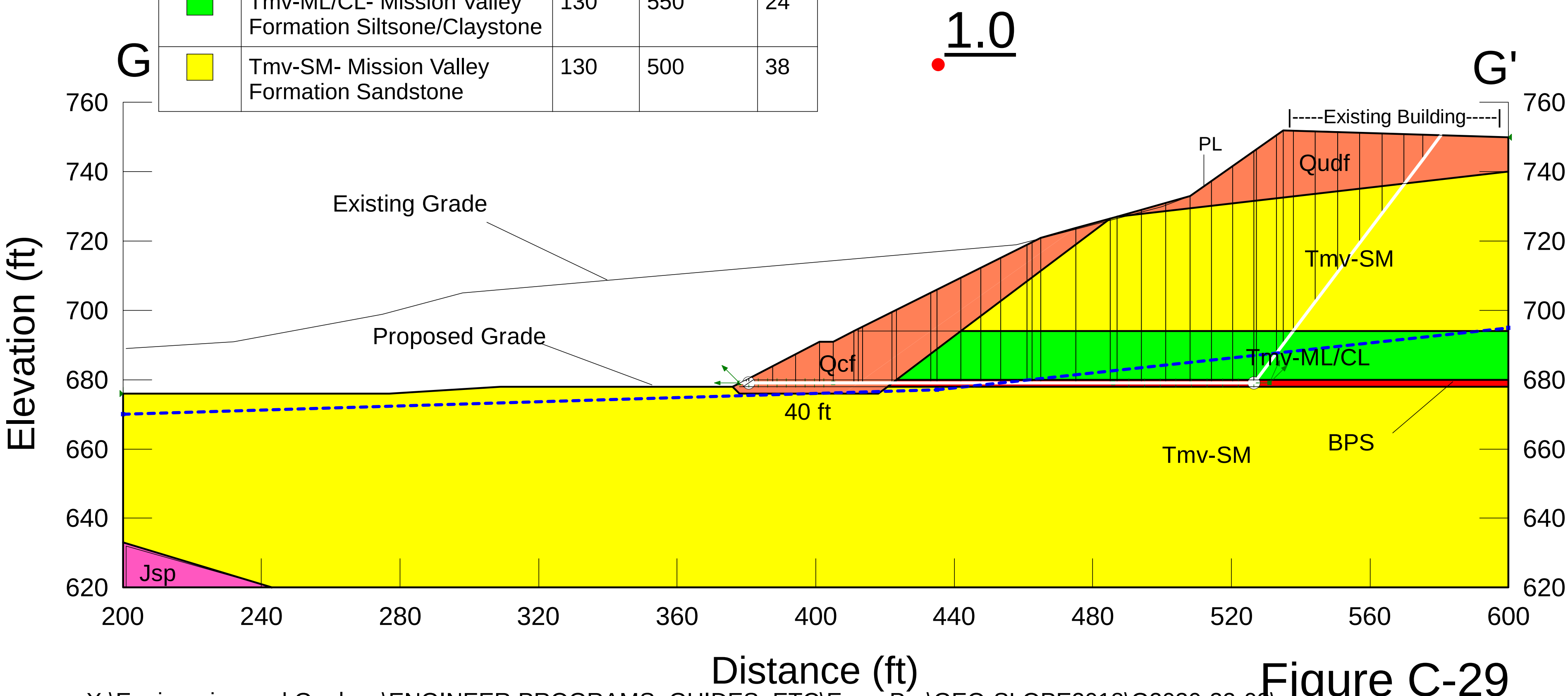

Figure C-29

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GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	GG-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g		Approximation of Seismic Demand	
k_y/MHA	NA	Period of Sliding Mass, $T_s = 4H/V_s$, sec	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036	T_s/T_m	NA
k_{EQ} = feq(MHA_r)/g	0.135	MHEA/(MHA*NRF)	NA
Factor of Safety in Slope Analysis Using k_{EQ}	1.00	NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
Passes Initial Screening Analysis		MHEA/g	NA
		k_y/MHEA = k_y/k_{max}	NA
		Normalized Displacement, Normu	NA
		Estimated Displacement, u (cm)	**NA**

FIGURE C-30

The Junipers
Project No. G2030-32-03
Section K-K'
Name: KK-Case1.gsz
Date: 04/03/2019 Time: 08:37:37 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr- Granitic Rock	130	500	35
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

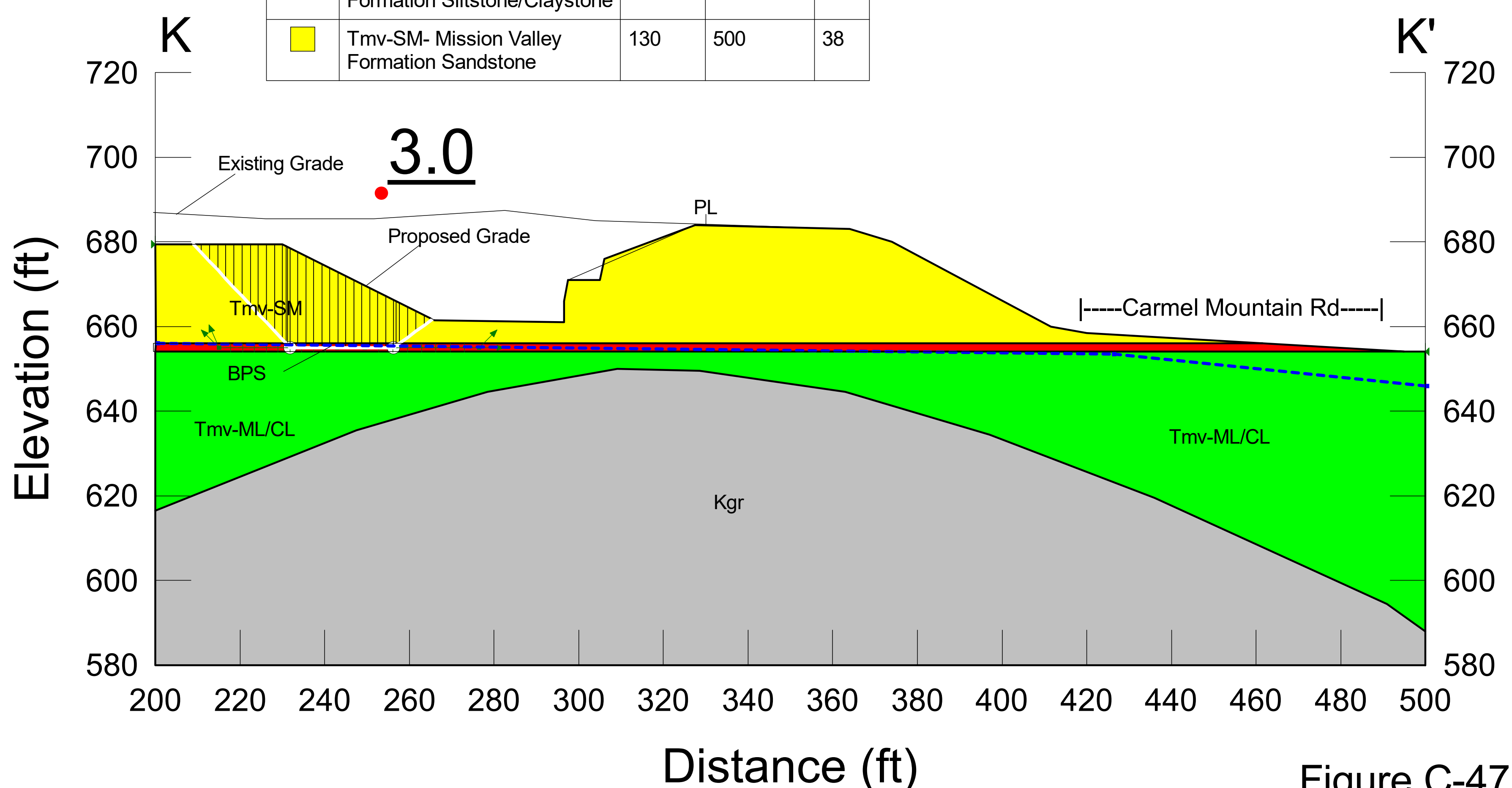

Figure C-47

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The Junipers
Project No. G2030-32-03
Section K-K'
Name: KK-Case0.gsz
Date: 04/01/2019 Time: 11:11:01 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr- Granitic Rock	130	500	35
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

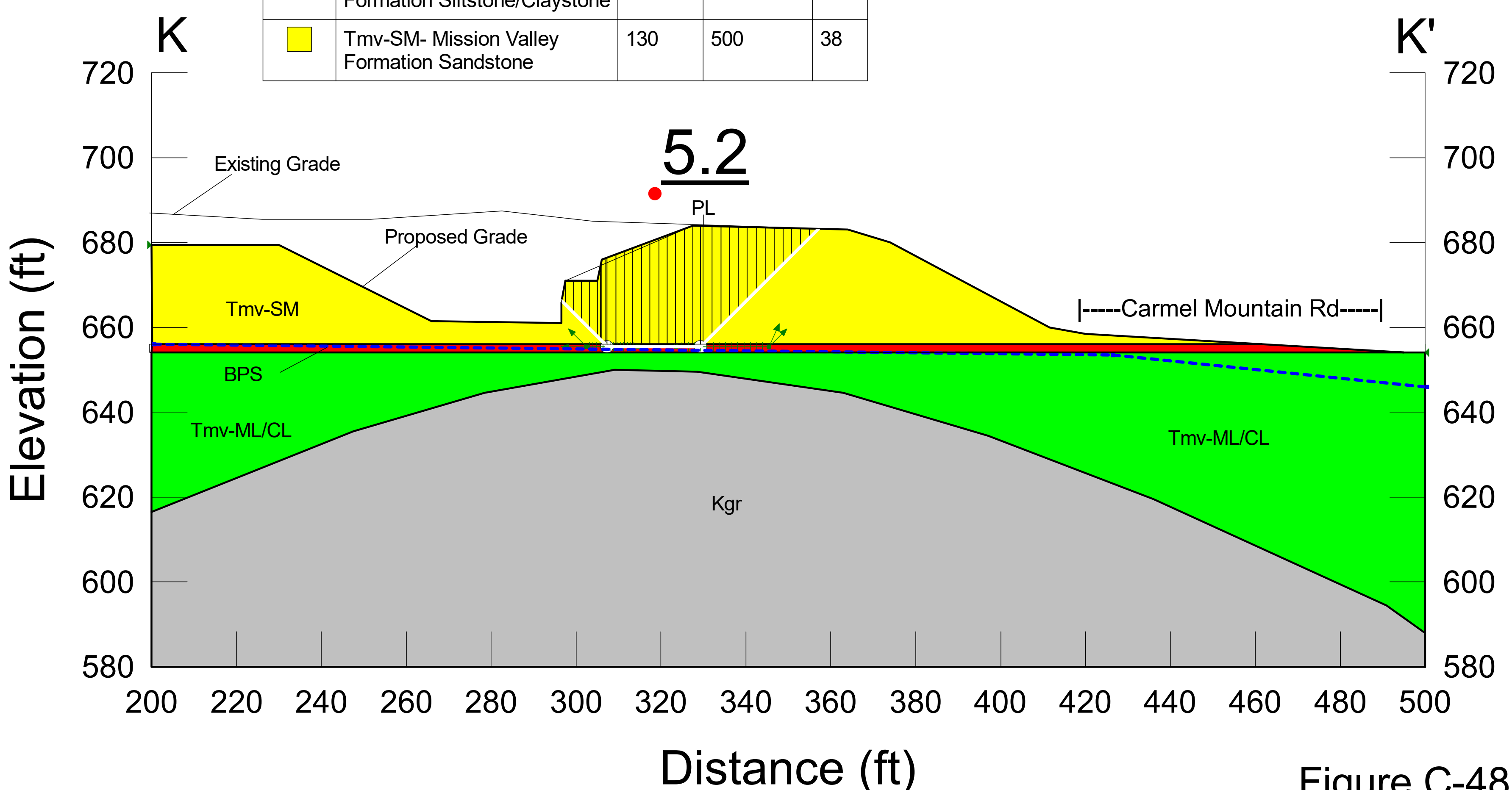

Figure C-48

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The Junipers
Project No. G2030-32-03
Section K-K'
Name: KK-Case1s.gsz
Date: 04/03/2019 Time: 08:42:02 AM

Proposed Condition

Seismic Analysis
keq =0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr- Granitic Rock	130	500	35
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

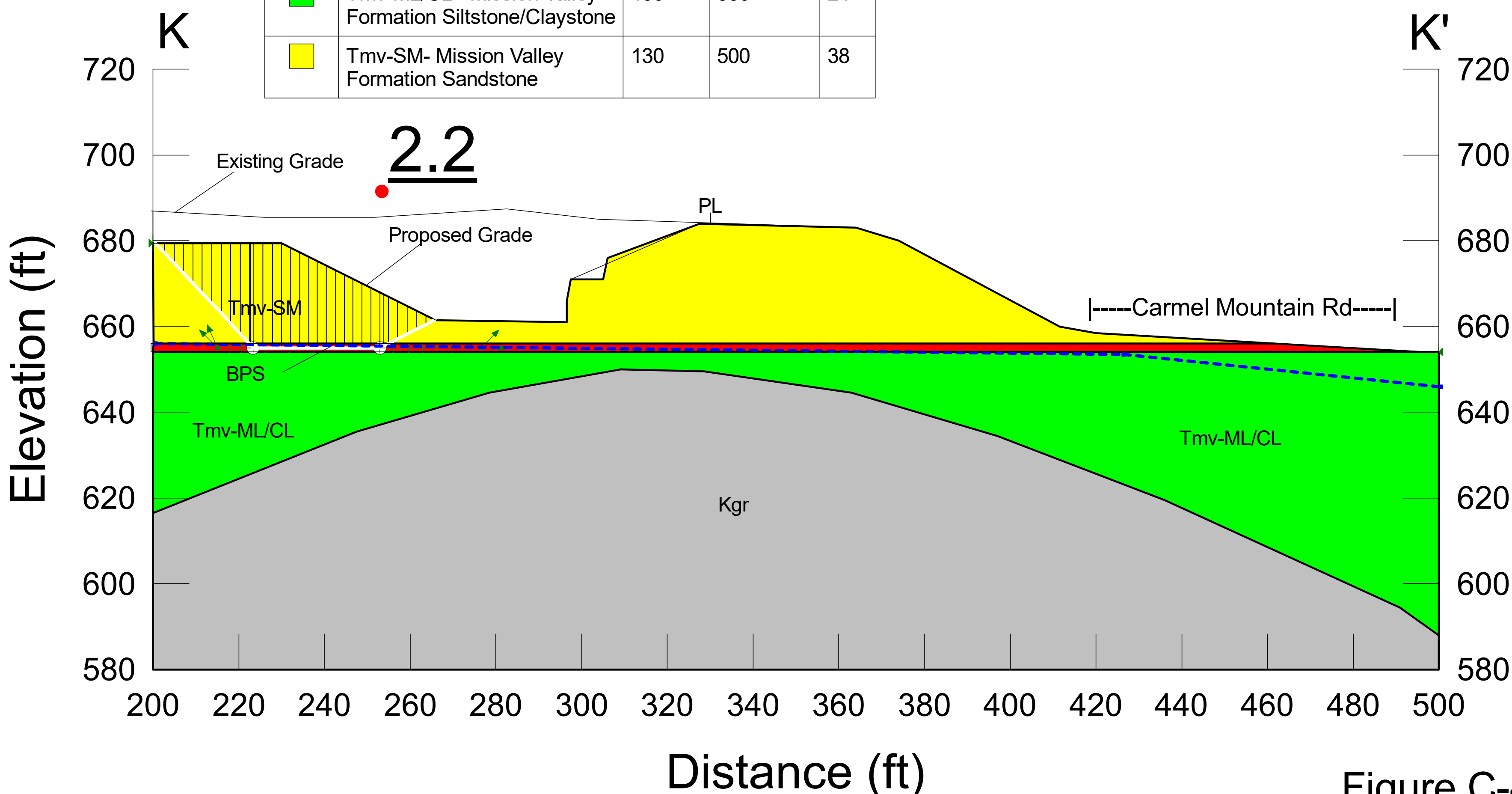

Figure C-49

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GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	KK-Case1s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g	
k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	2.20

Passes Initial Screening Analysis

Approximation of Seismic Demand	
Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-50

The Junipers
Project No. G2030-32-03
Section K-K'
Name: KK-Case0s.gsz
Date: 04/01/2019 Time: 11:11:57 AM

Proposed Condition

Seismic Analysis

Keq=0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr- Granitic Rock	130	500	35
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

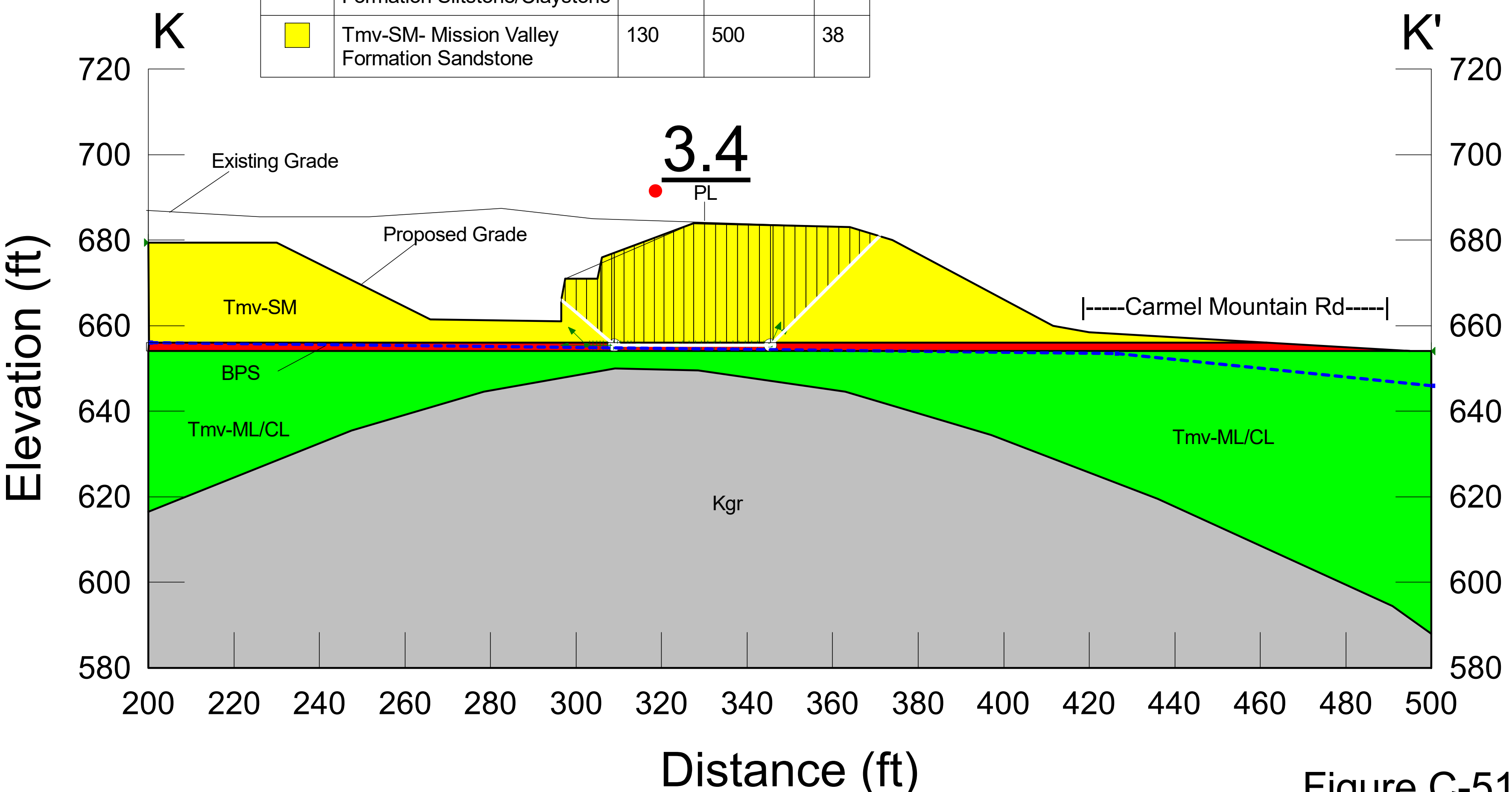

Figure C-51

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The Junipers
Project No. G2030-32-03
Section L-L'
Name: LL-Case2.gsz
Date: 04/03/2019 Time: 09:08:48 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Jsp - Santiago Peak Volcanics	130	500	35
	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

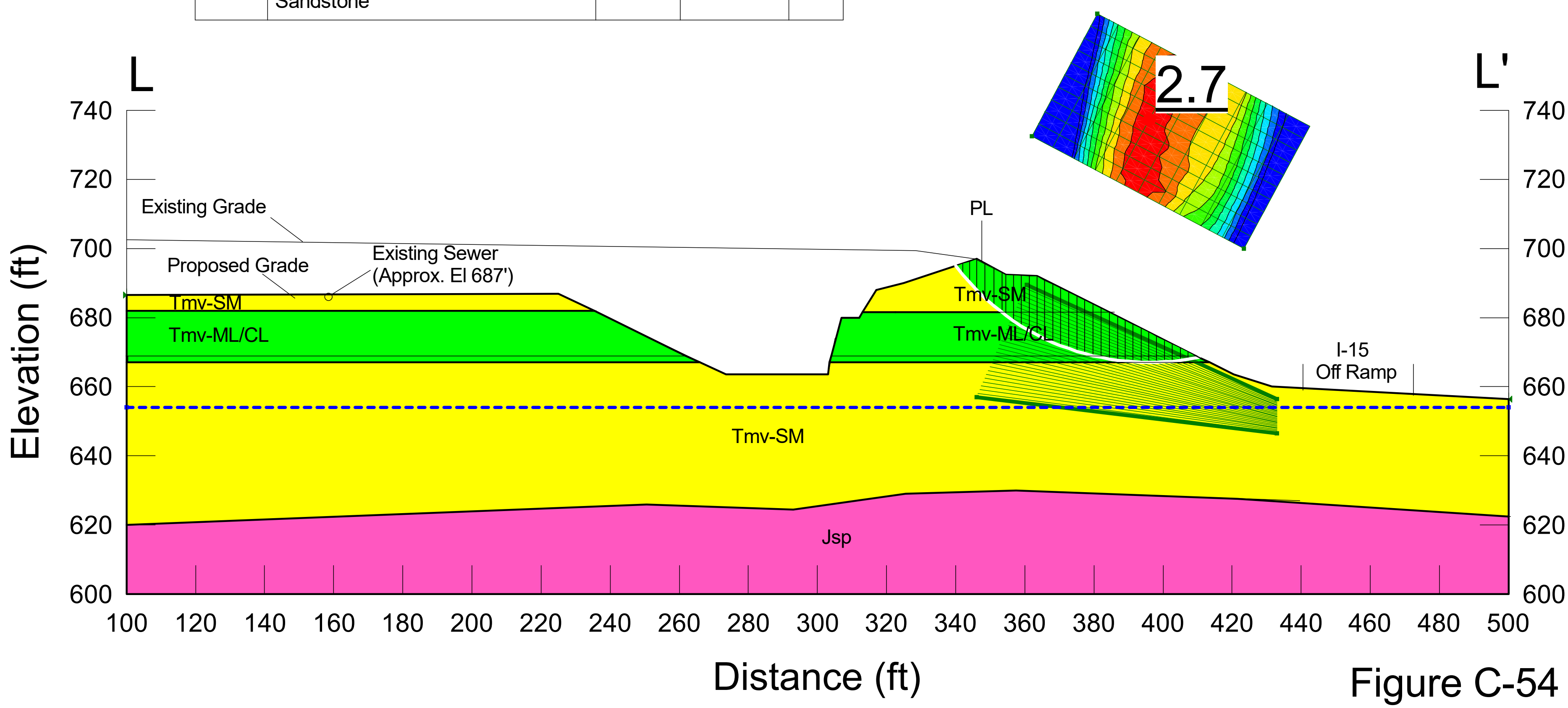

Figure C-54

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The Junipers
Project No. G2030-32-03
Section L-L'
Name: LL-Case0.gsz
Date: 04/01/2019 Time: 09:32:24 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Jsp - Santiago Peak Volcanics	130	500	35
	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

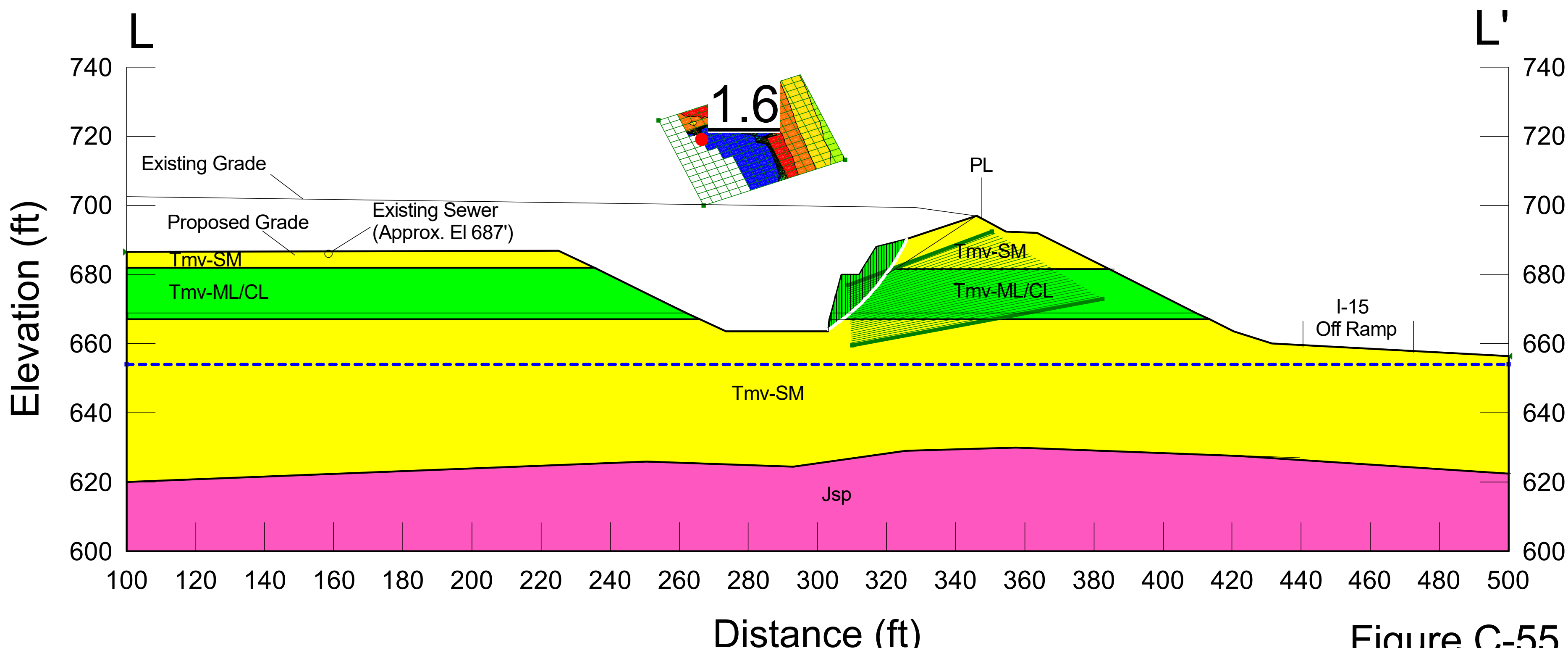

Figure C-55

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The Junipers
Project No. G2030-32-03
Section L-L'
Name: LL-Case1s.gsz
Date: 04/03/2019 Time: 09:01:54 AM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Jsp - Santiago Peak Volcanics	130	500	35
	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

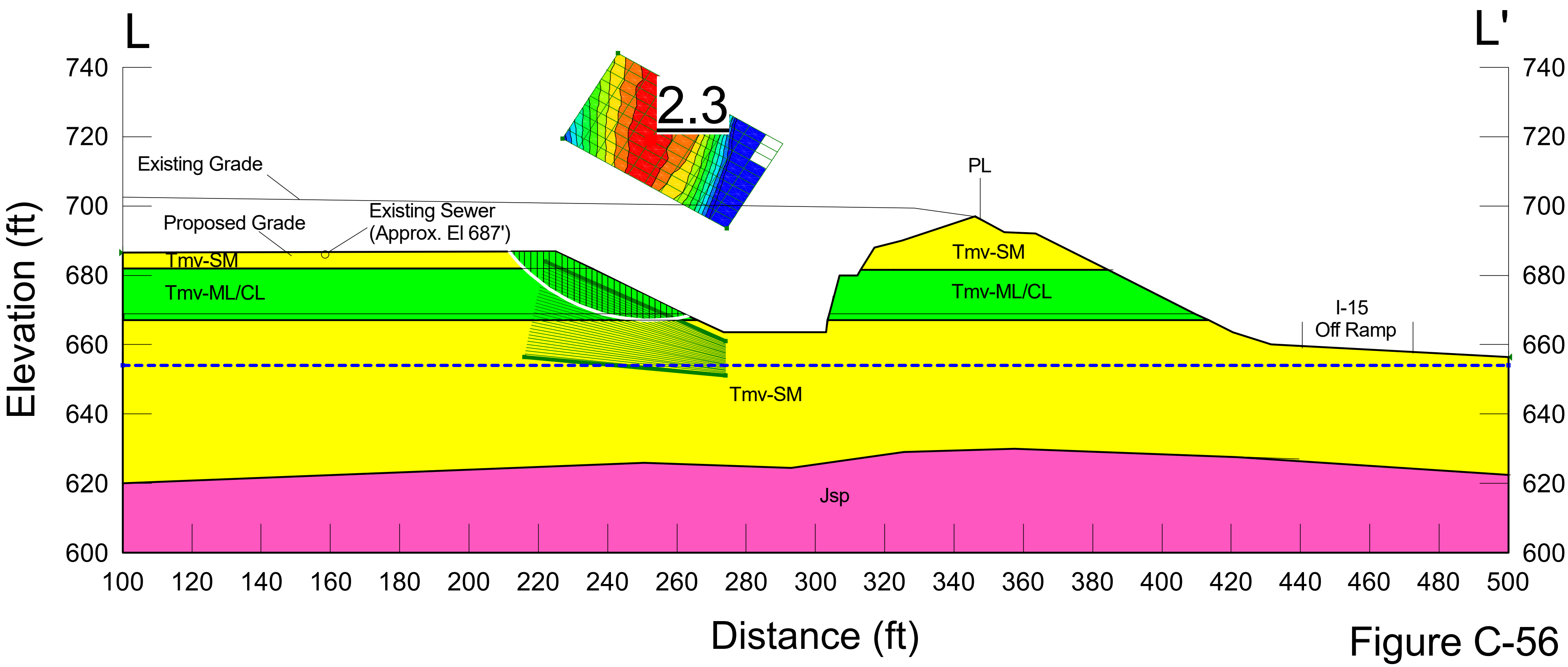

Figure C-56

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GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	LL-Case1s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	2.30

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-57

The Junipers
Project No. G2030-32-03
Section L-L'
Name: LL-Case2s.gsz
Date: 04/03/2019 Time: 09:10:29 AM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Jsp - Santiago Peak Volcanics	130	500	35
	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

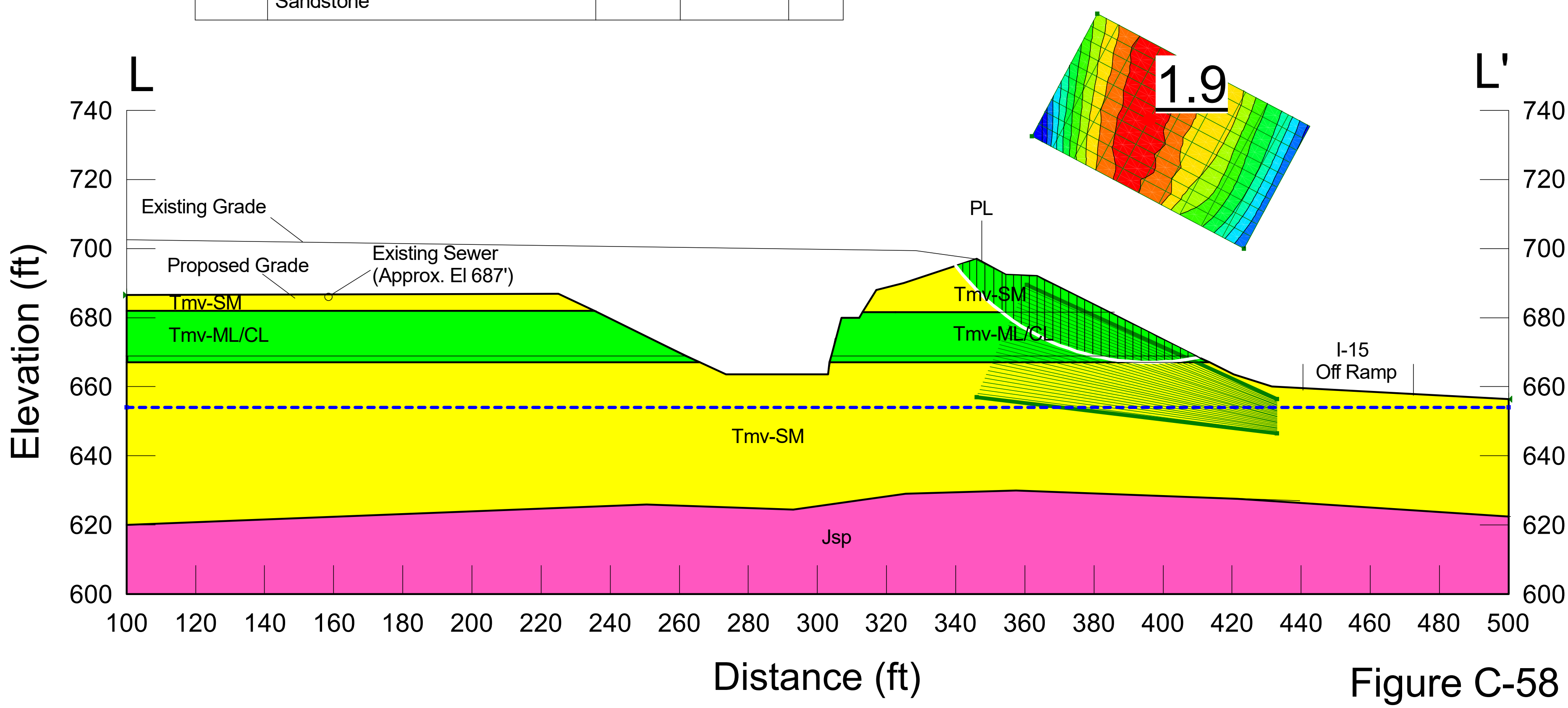

Figure C-58

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Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	LL-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.90

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-59

The Junipers
Project No. G2030-32-03
Section L-L'
Name: LL-Case0s.gsz
Date: 04/01/2019 Time: 10:23:52 AM

Proposed Condition

Seismic Analysis

Keq=0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(pink)	Jsp - Santiago Peak Volcanics	130	500	35
(green)	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

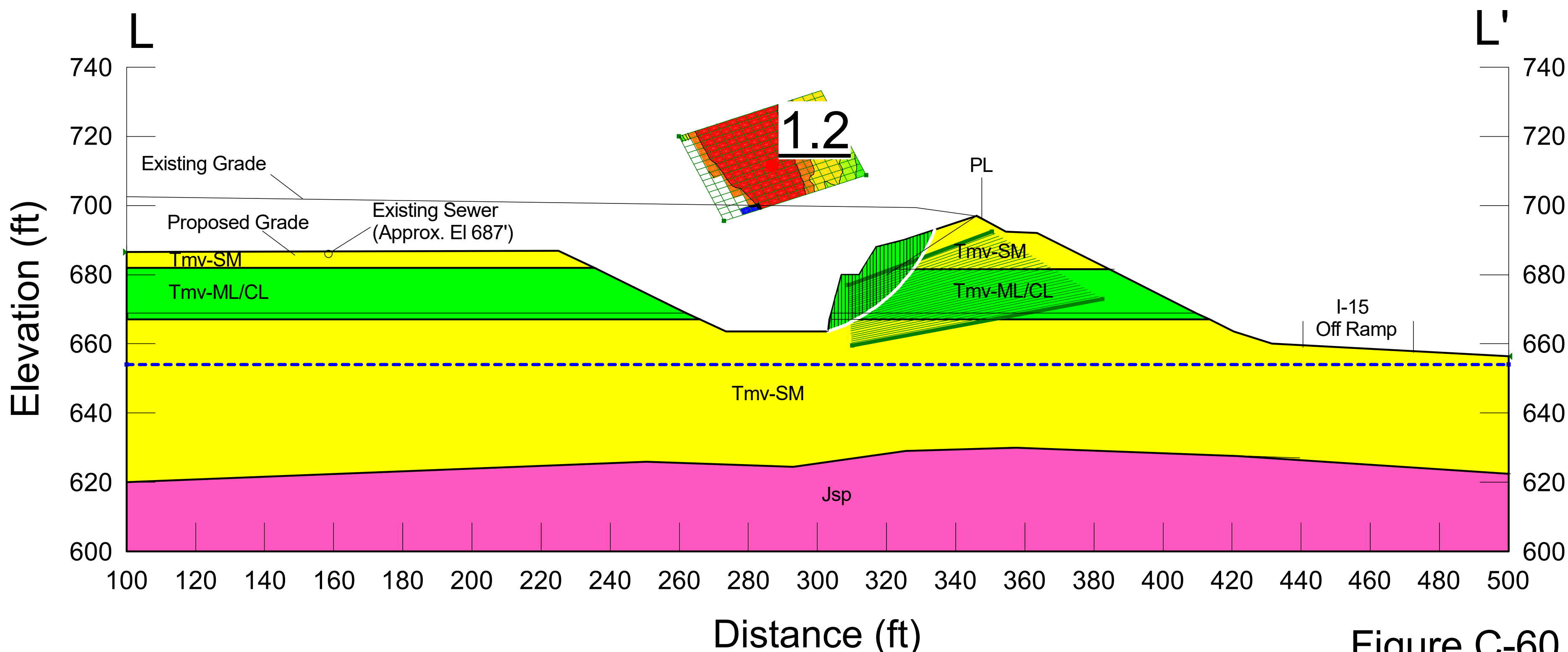

Figure C-60

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Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	LL-Case3s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.60

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-61

The Junipers
Project No. G2030-32-03
Section M-M'
Name: MM-Case1.gsz
Date: 03/12/2018 Time: 10:21:34 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

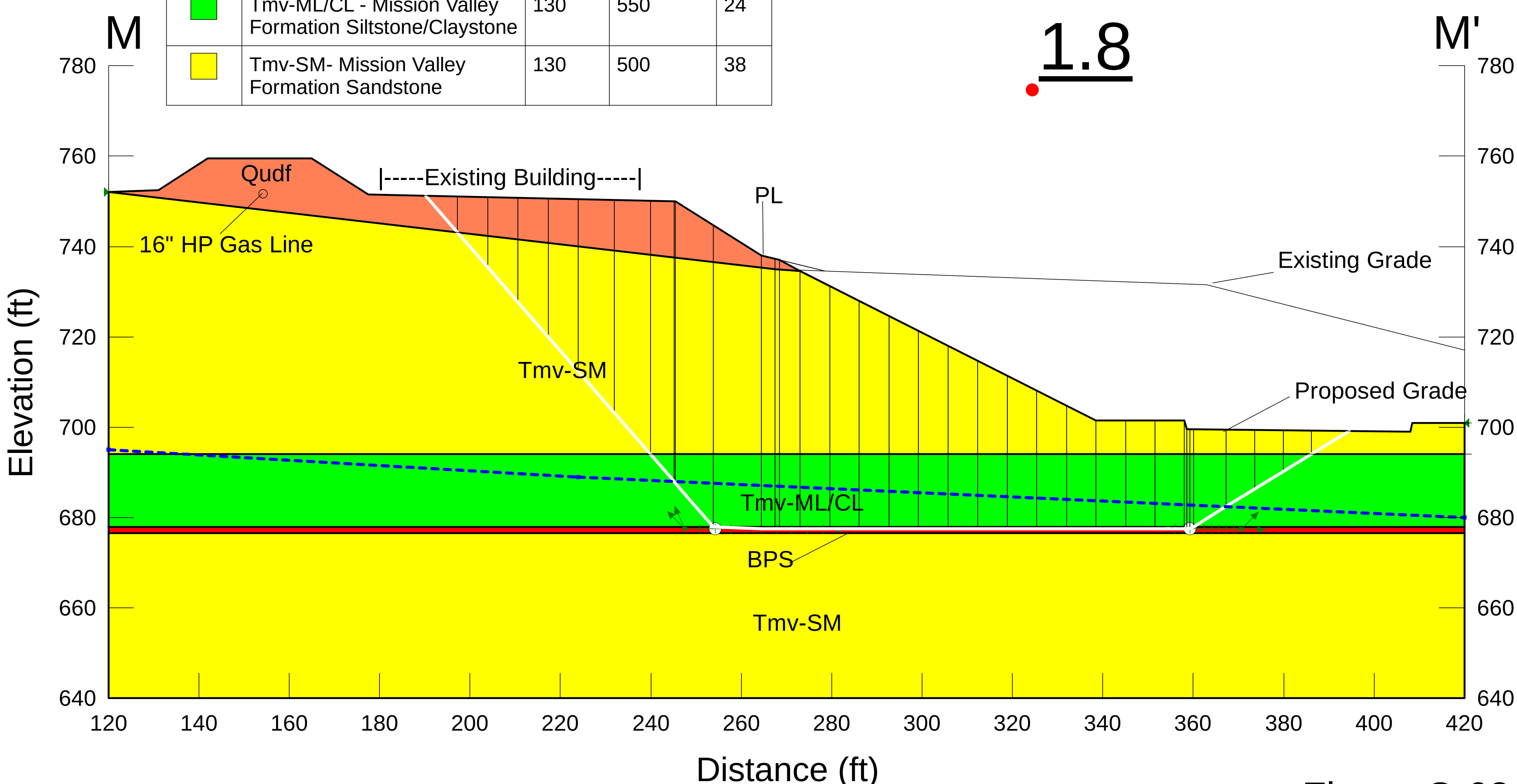

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Figure C-62

The Junipers
Project No. G2030-32-03
Section M-M'
Name: MM-Case2.gsz
Date: 03/12/2018 Time: 11:03:05 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(salmon)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

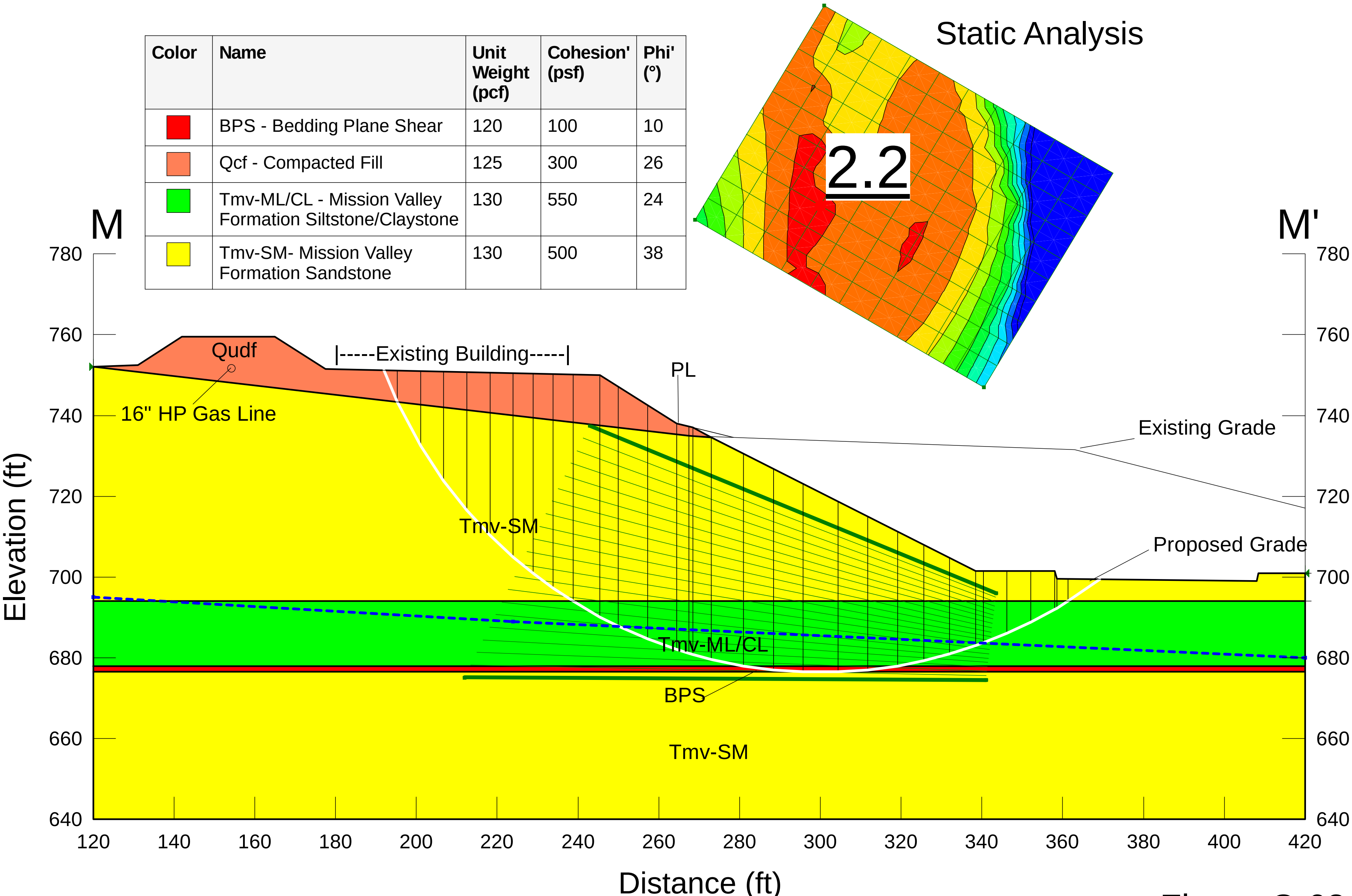

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Figure C-63

The Junipers
Project No. G2030-32-03
Section M-M'
Name: MM-Case1s.gsz
Date: 03/12/2018 Time: 11:07:15 AM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Salmon	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

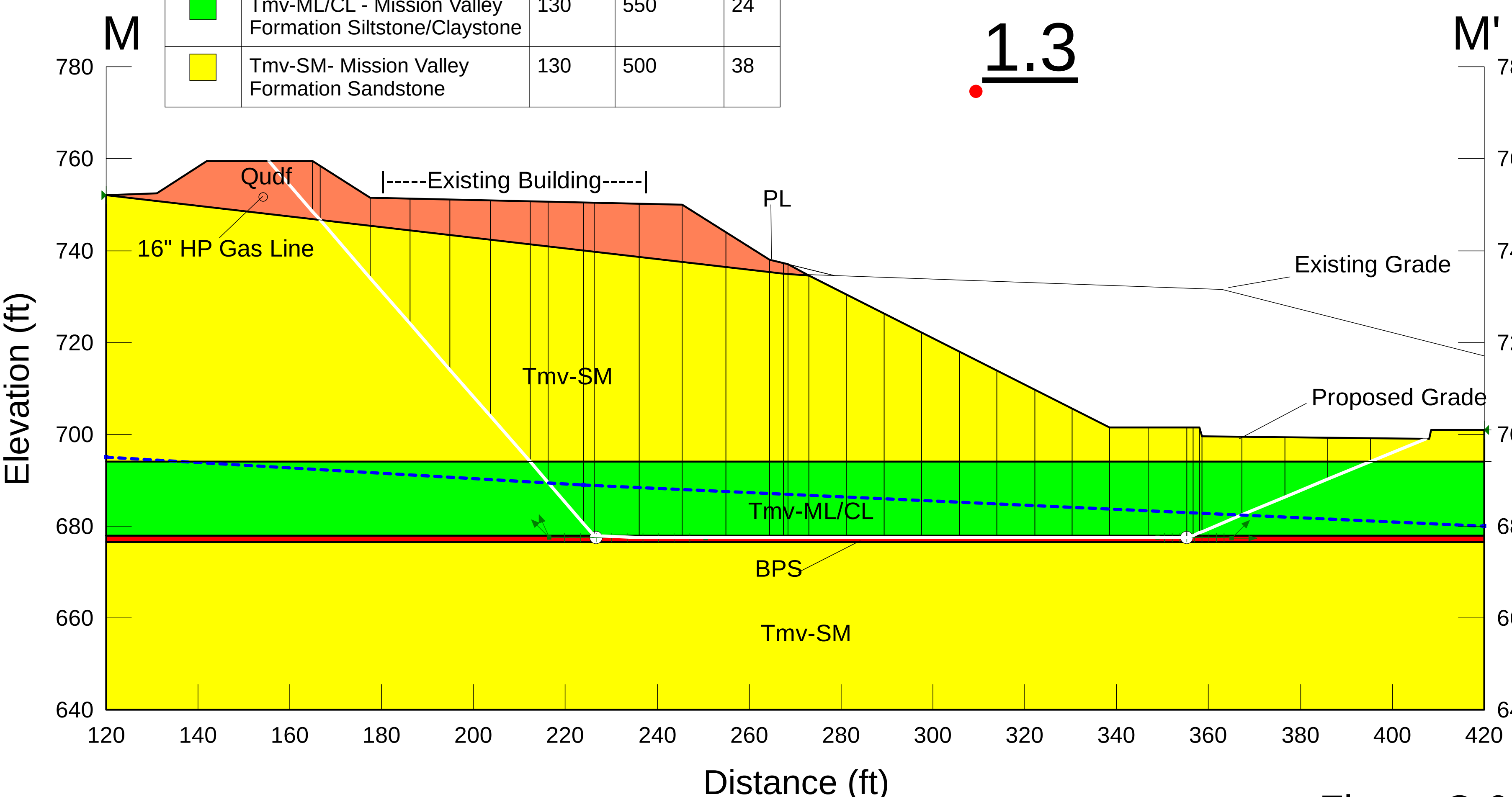

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Figure C-64

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	MM-Case1		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.30

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-65

The Junipers
Project No. G2030-32-03
Section M-M'
Name: MM-Case2s.gsz
Date: 03/12/2018 Time: 11:08:50 AM

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Salmon	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

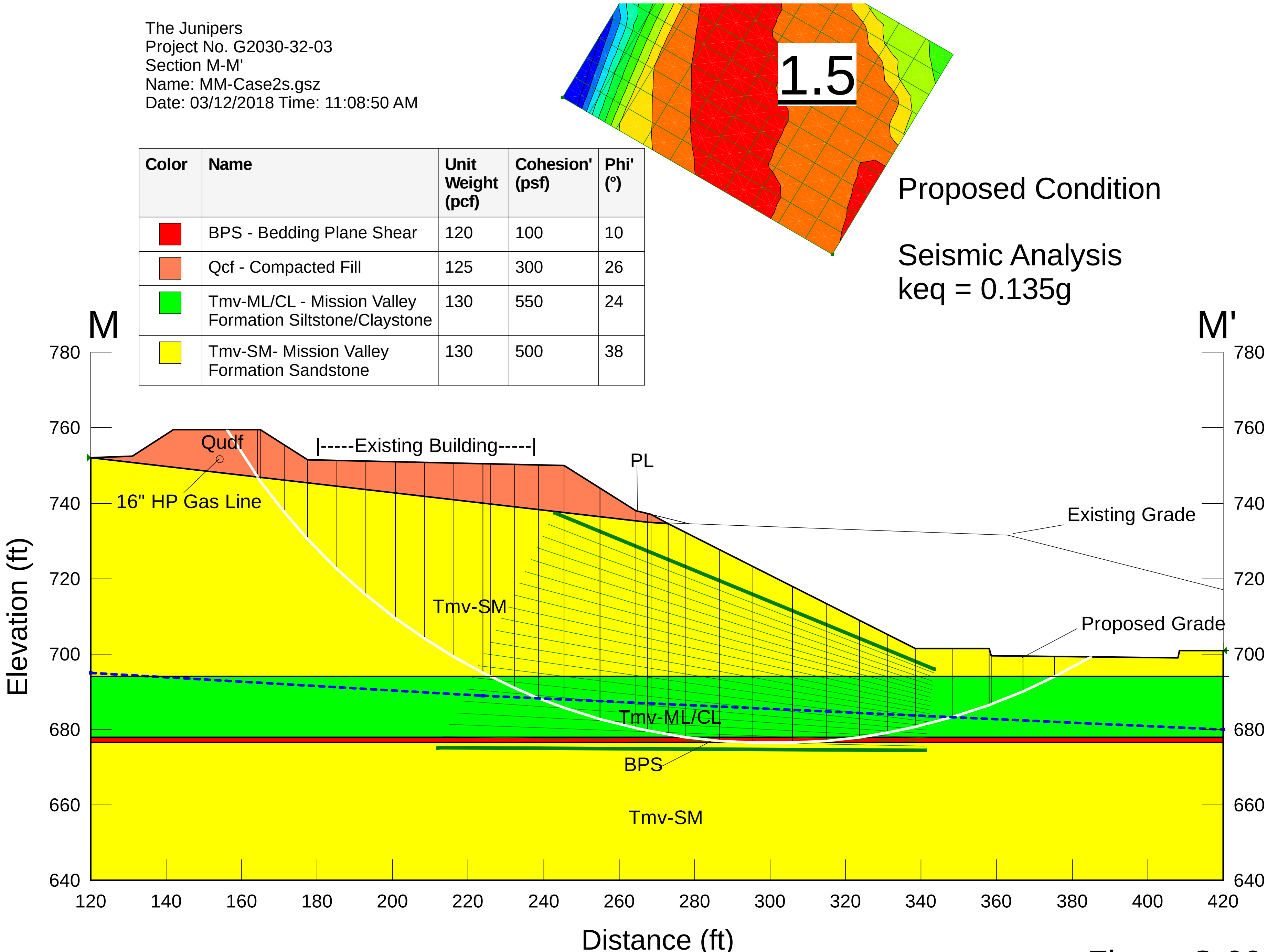

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Figure C-66

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	MM-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = $k_{max}g$	
k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.50

Passes Initial Screening Analysis

Approximation of Seismic Demand	
Period of Sliding Mass, $T_s = 4H/V_s$, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-67

The Junipers
Project No. G2030-32-03
Section N-N'
Name: NN-Case1.gsz
Date: 03/12/2018 Time: 11:17:46 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

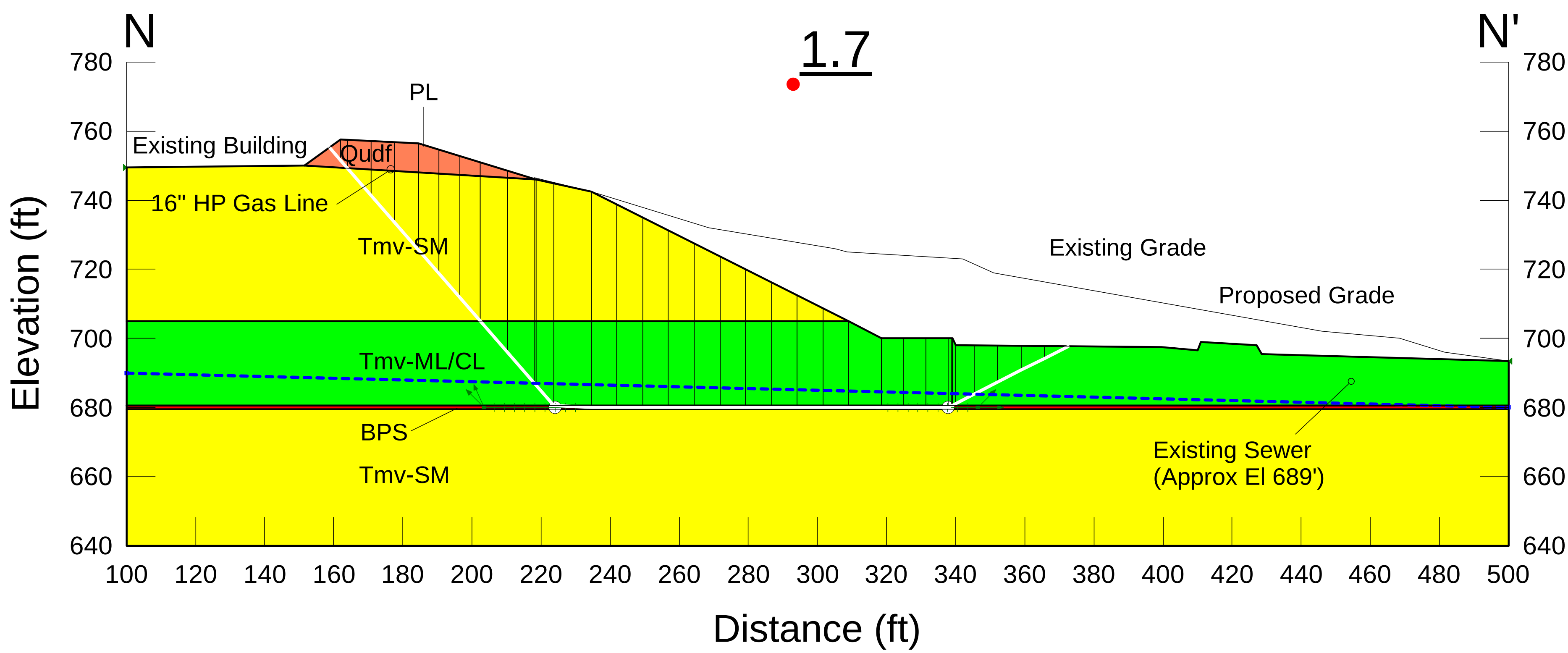

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Figure C-68

The Junipers
Project No. G2030-32-03
Section N-N'
Name: NN-Case2.gsz
Date: 03/12/2018 Time: 11:19:52 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

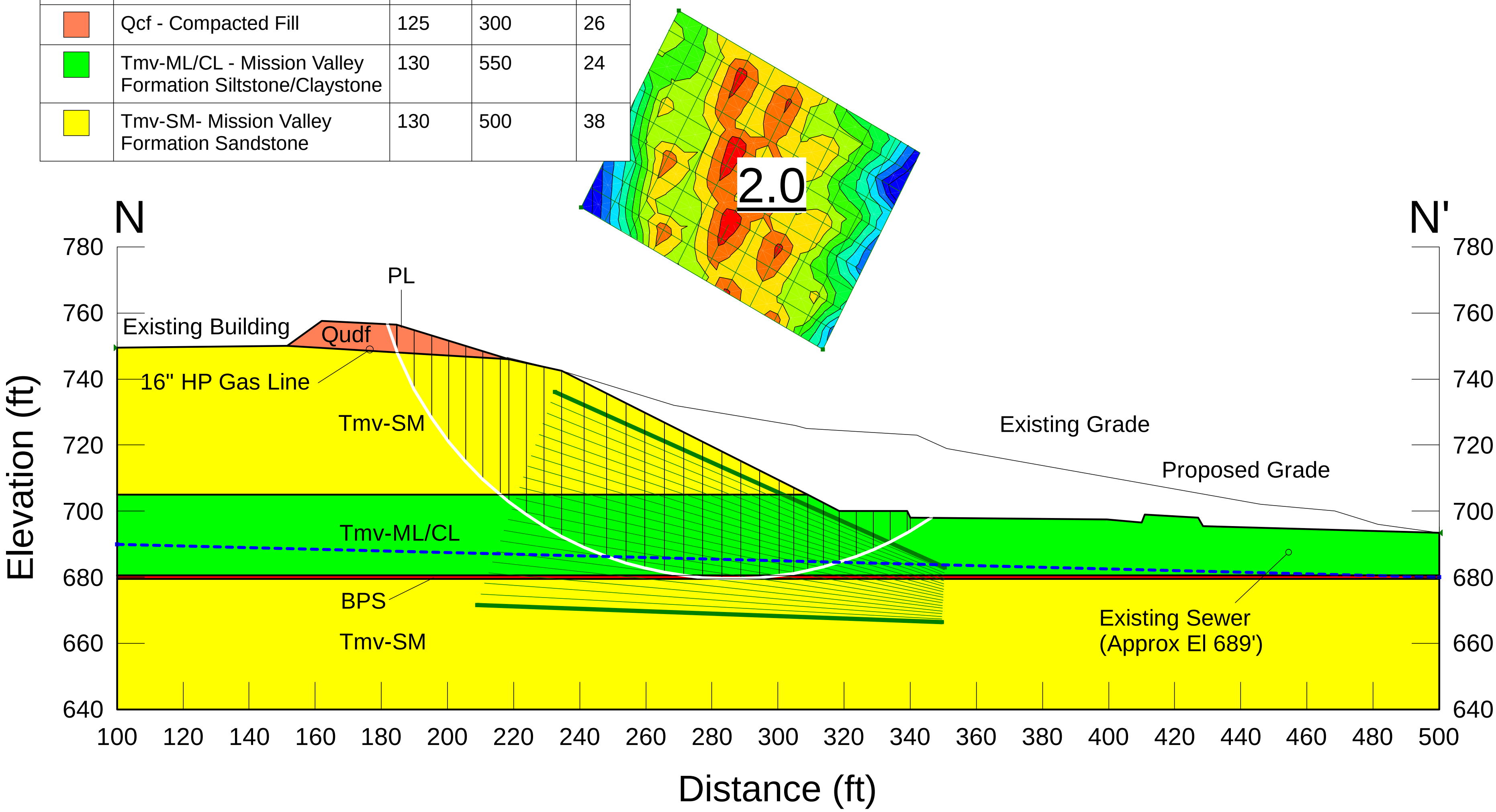

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Figure C-69

The Junipers
Project No. G2030-32-03
Section N-N'
Name: NN-Case1s.gsz
Date: 03/12/2018 Time: 11:23:34 AM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

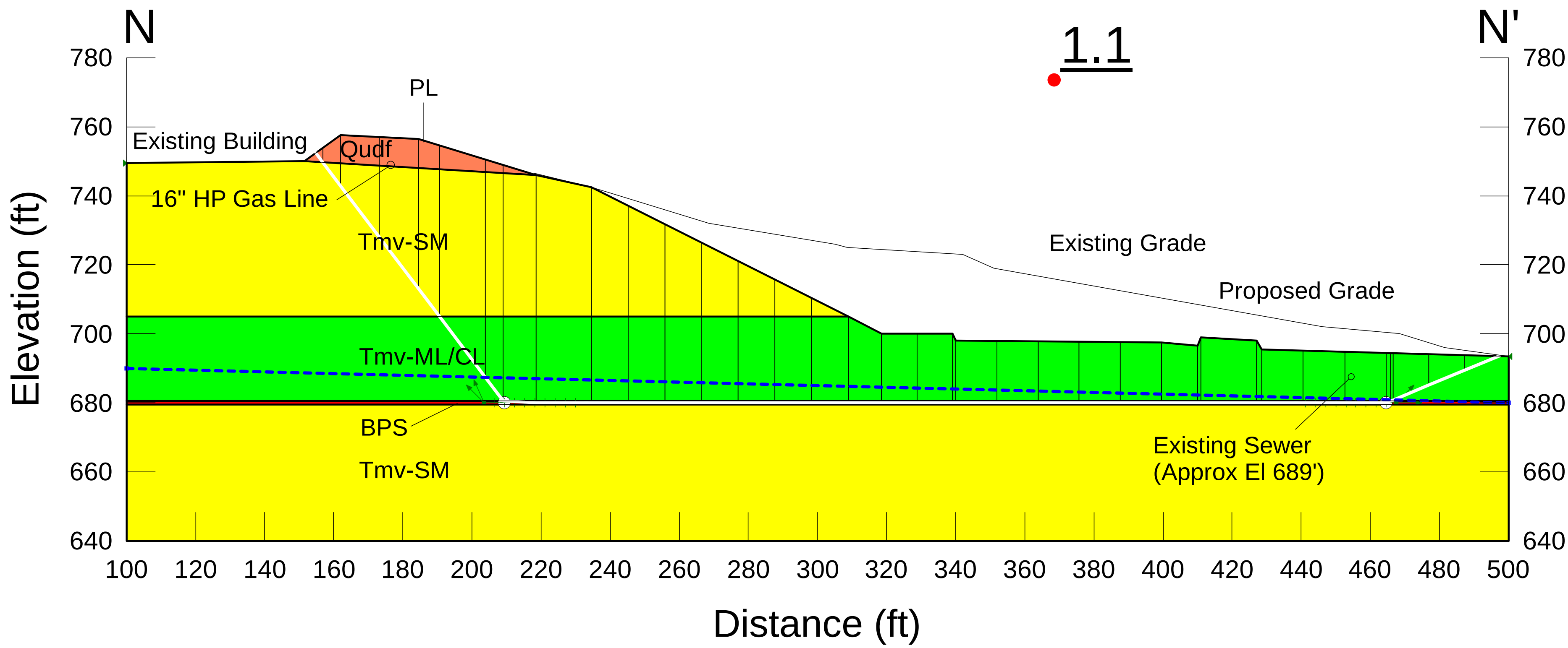

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Figure C-70

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	NN-Case1s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.10

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA

Estimated Displacement, u (cm) NA

FIGURE C-71

The Junipers
Project No. G2030-32-03
Section N-N'
Name: NN-Case2s.gsz
Date: 03/12/2018 Time: 11:25:06 AM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	BPS - Bedding Plane Shear	120	100	10
	Qcf - Compacted Fill	125	300	26
	Tmv-ML/CL - Mission Valley Formation Siltstone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

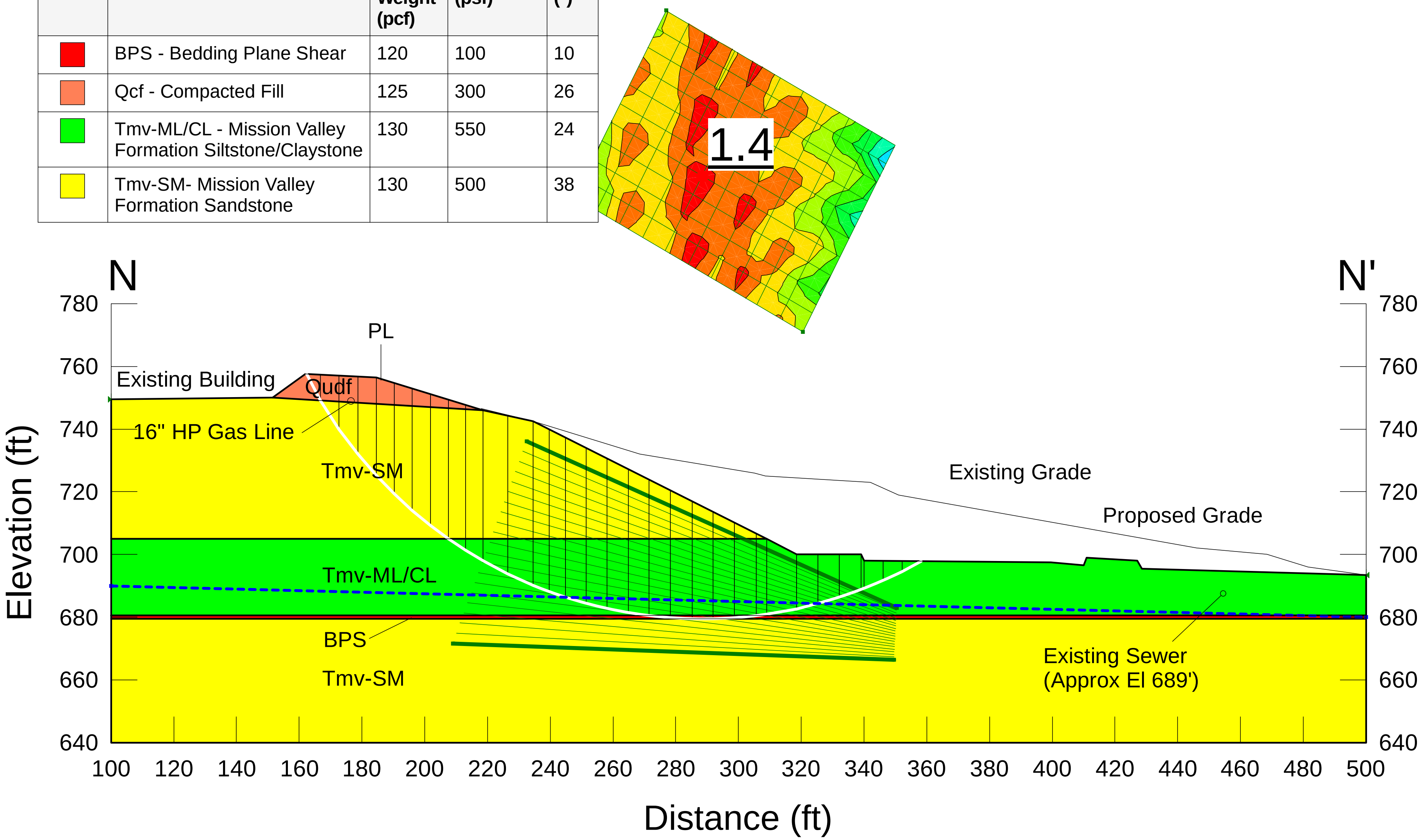

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Figure C-72

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	03/12/18		
Filename	NN-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.40

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-73

The Junipers
Project No. G2030-32-03
Section O-O'
Name: OO-Case0.gsz
Date: 04/02/2019 Time: 07:51:01 AM

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

Proposed Condition

Static Analysis

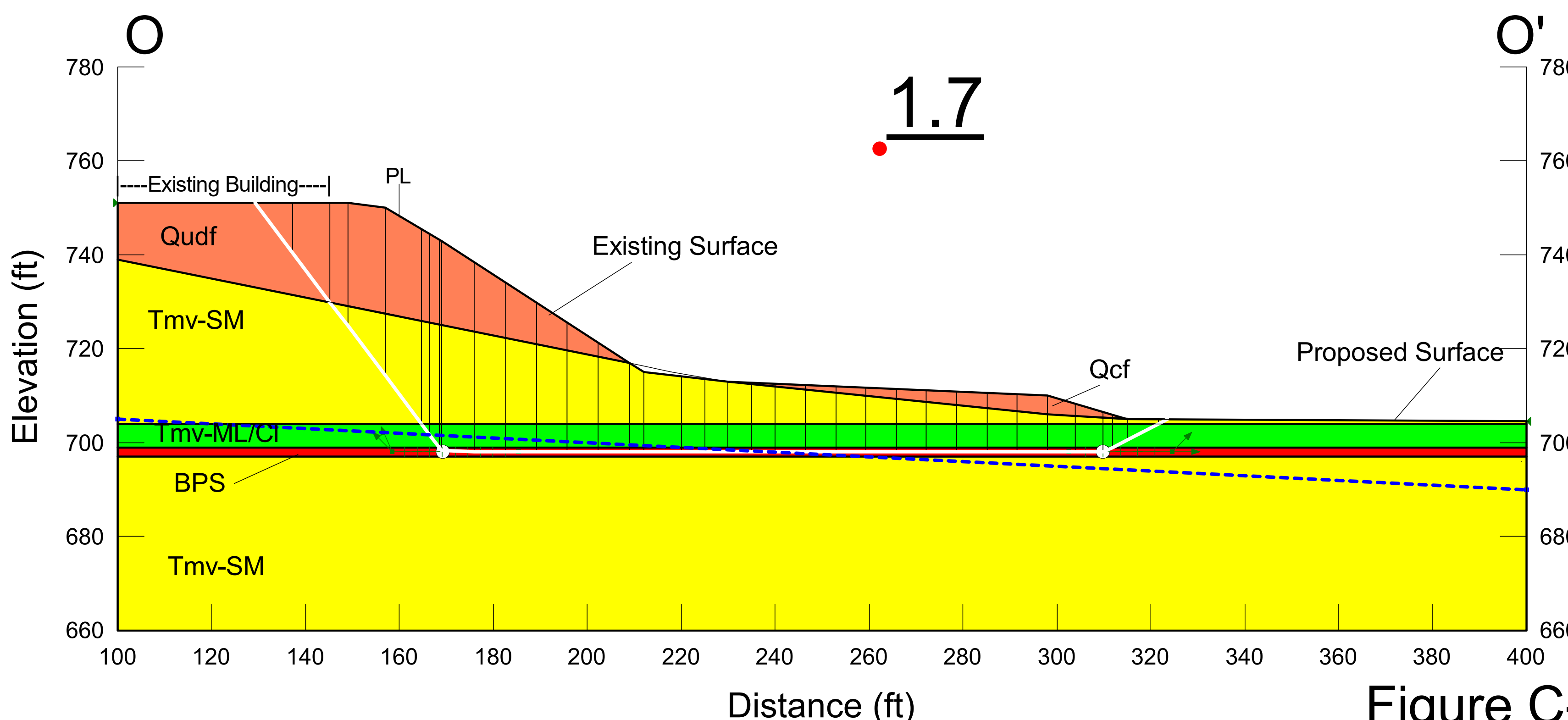

Figure C-74

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The Junipers
Project No. G2030-32-03
Section O-O'
Name: OO-Case0s.gsz
Date: 04/02/2019 Time: 07:53:31 AM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

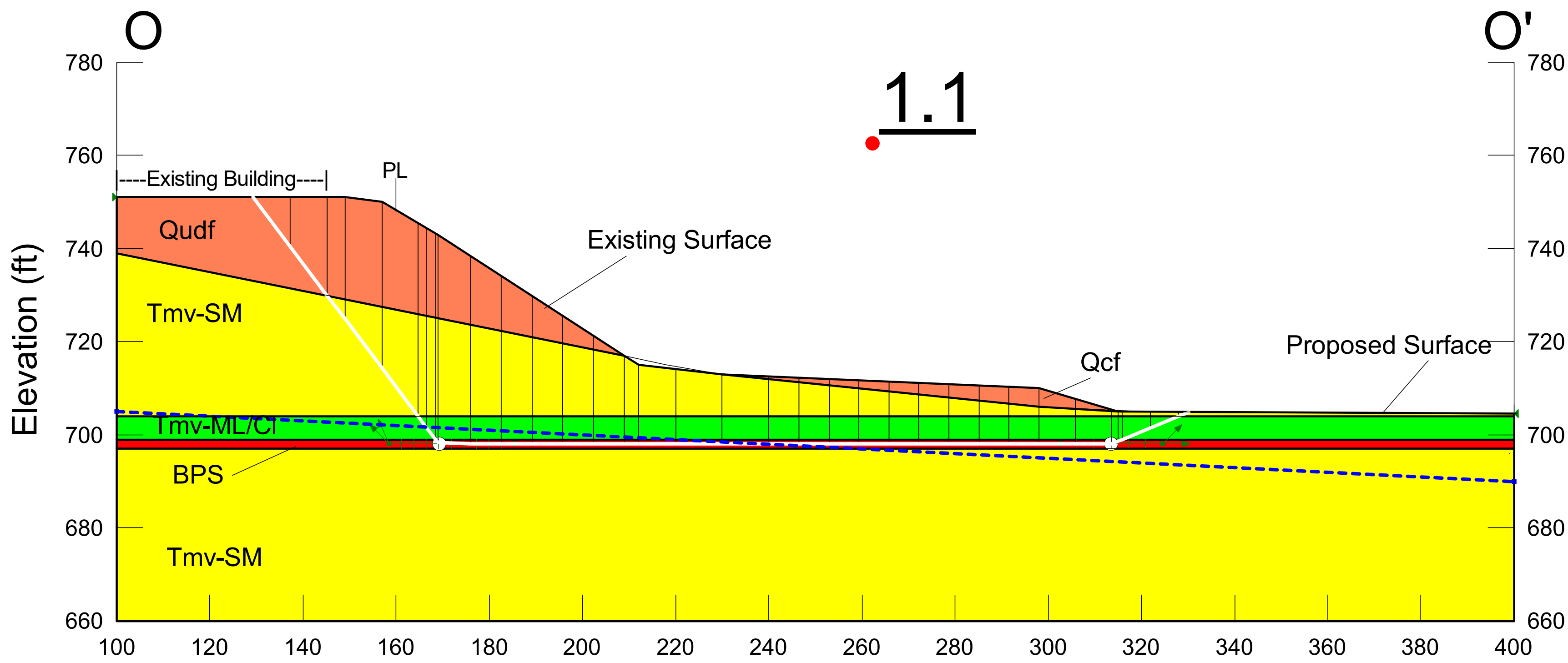

Figure C-75

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GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	OO-Case0s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g	
k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.10

Passes Initial Screening Analysis

Approximation of Seismic Demand	
Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-76

The Junipers
Project No. G2030-32-03
Section P-P'
Name: PP-Case0.gsz
Date: 04/05/2019 Time: 10:20:09 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	BPS - Bedding Plane Shear	120	100	10
	Qcf - Compacted Fill	125	300	26
	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

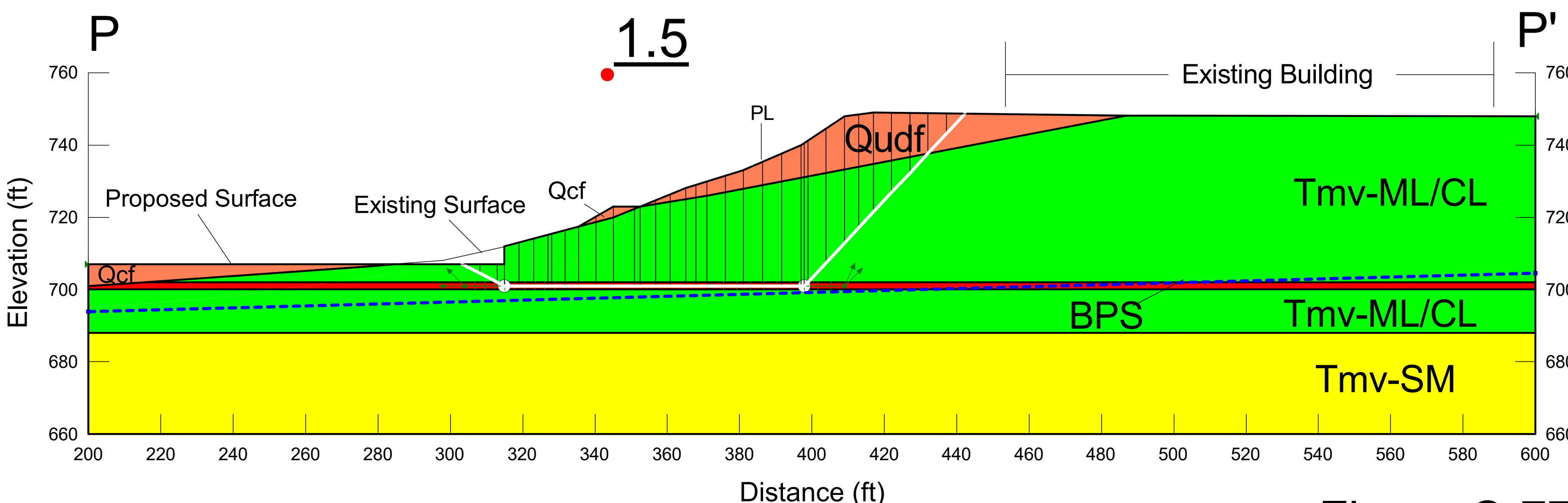


Figure C-77

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

The Junipers
Project No. G2030-32-03
Section P-P'
Name: PP-Case0s.gsz
Date: 04/05/2019 Time: 10:22:55 AM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

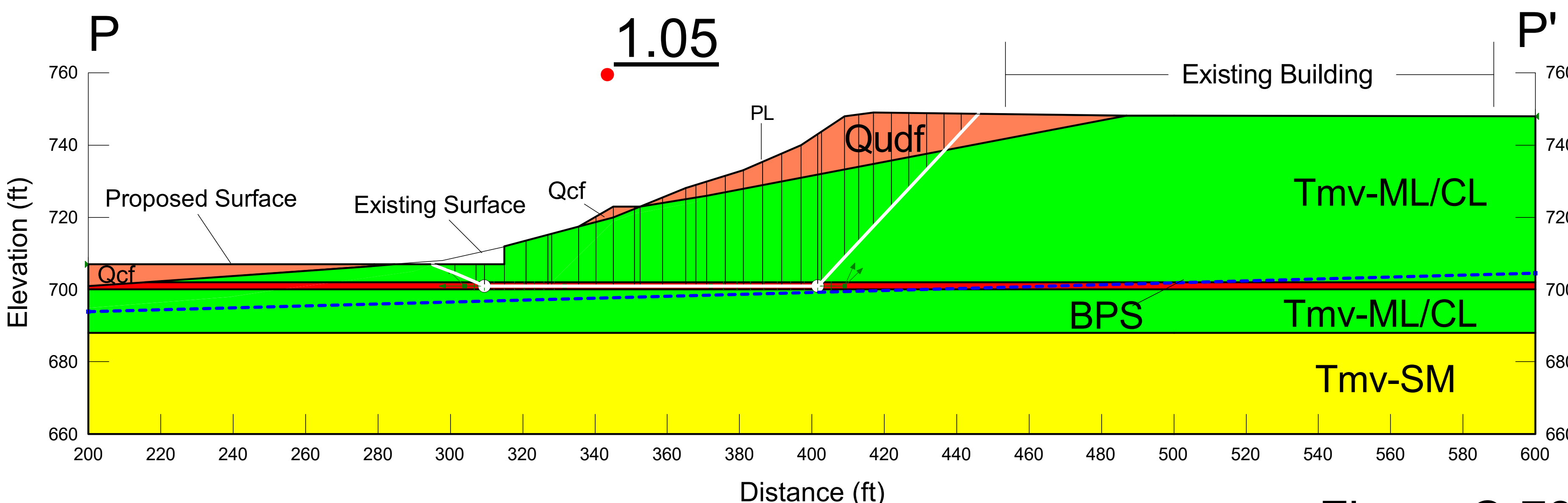


Figure C-78

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	PP-Case0s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\vert_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g		Approximation of Seismic Demand	
k_y/MHA	NA	Period of Sliding Mass, $T_s = 4H/V_s$, sec	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036	T_s/T_m	NA
k_{EQ} = feq(MHA_r)/g	0.135	MHEA/(MHA*NRF)	NA
Factor of Safety in Slope Analysis Using k_{EQ}	1.05	NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
Passes Initial Screening Analysis		MHEA/g	NA
		k_y/MHEA = k_y/k_{max}	NA
		Normalized Displacement, Normu	NA
		Estimated Displacement, u (cm)	**NA**

FIGURE C-79

The Junipers
Project No. G2030-32-03
Section Q-Q'
Name: QQ-Case0.gsz
Date: 04/02/2019 Time: 01:56:38 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr-Granitic Rock	130	500	35
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

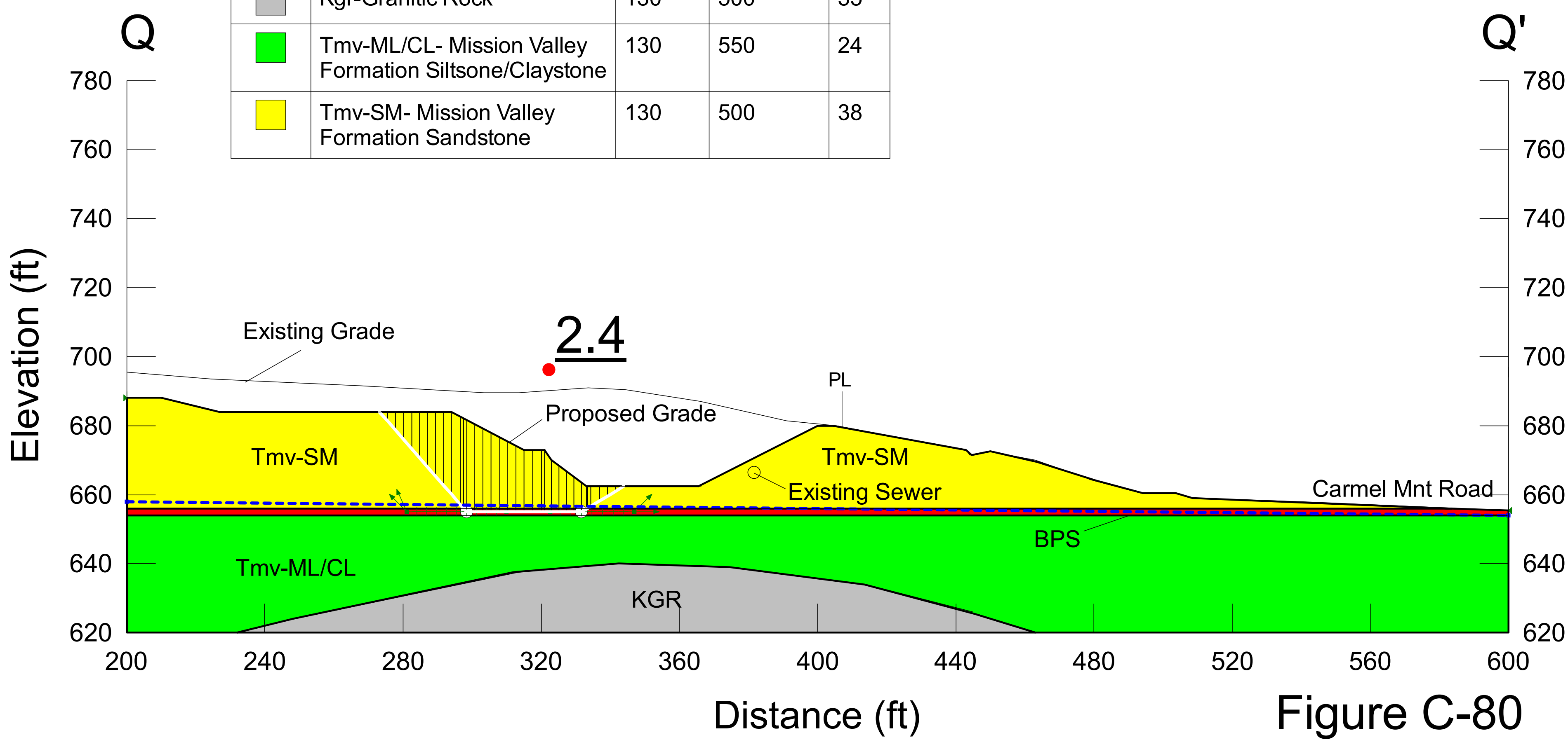


Figure C-80

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

The Junipers
Project No. G2030-32-03
Section Q-Q'
Name: QQ-Case2.gsz
Date: 04/02/2019 Time: 02:08:58 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Grey	Kgr-Granitic Rock	130	500	35
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

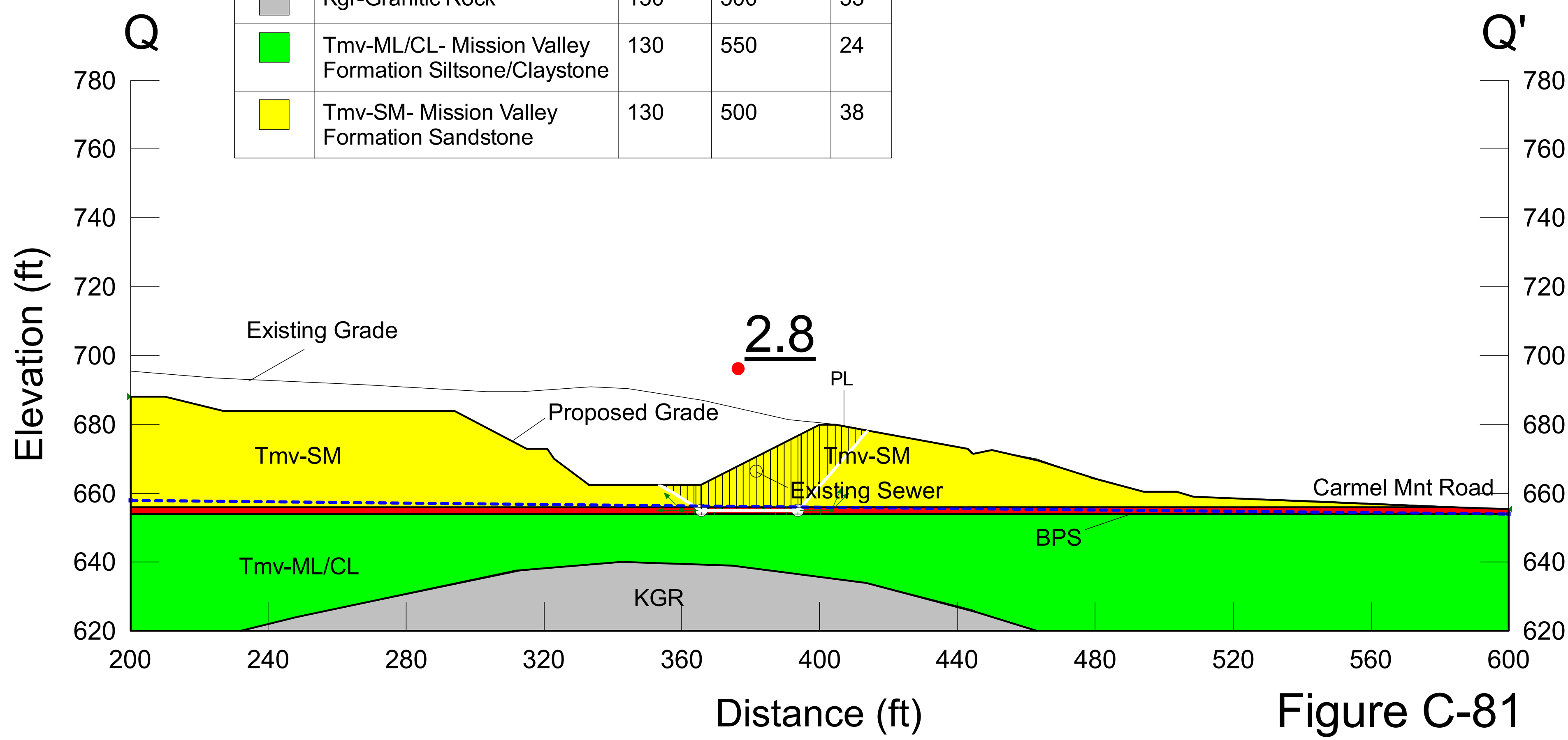


Figure C-81

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

The Junipers
Project No. G2030-32-03
Section Q-Q'
Name: QQ-Case3.gsz
Date: 04/03/2019 Time: 07:30:18 AM

Proposed Condition
with utility trench added

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr-Granitic Rock	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

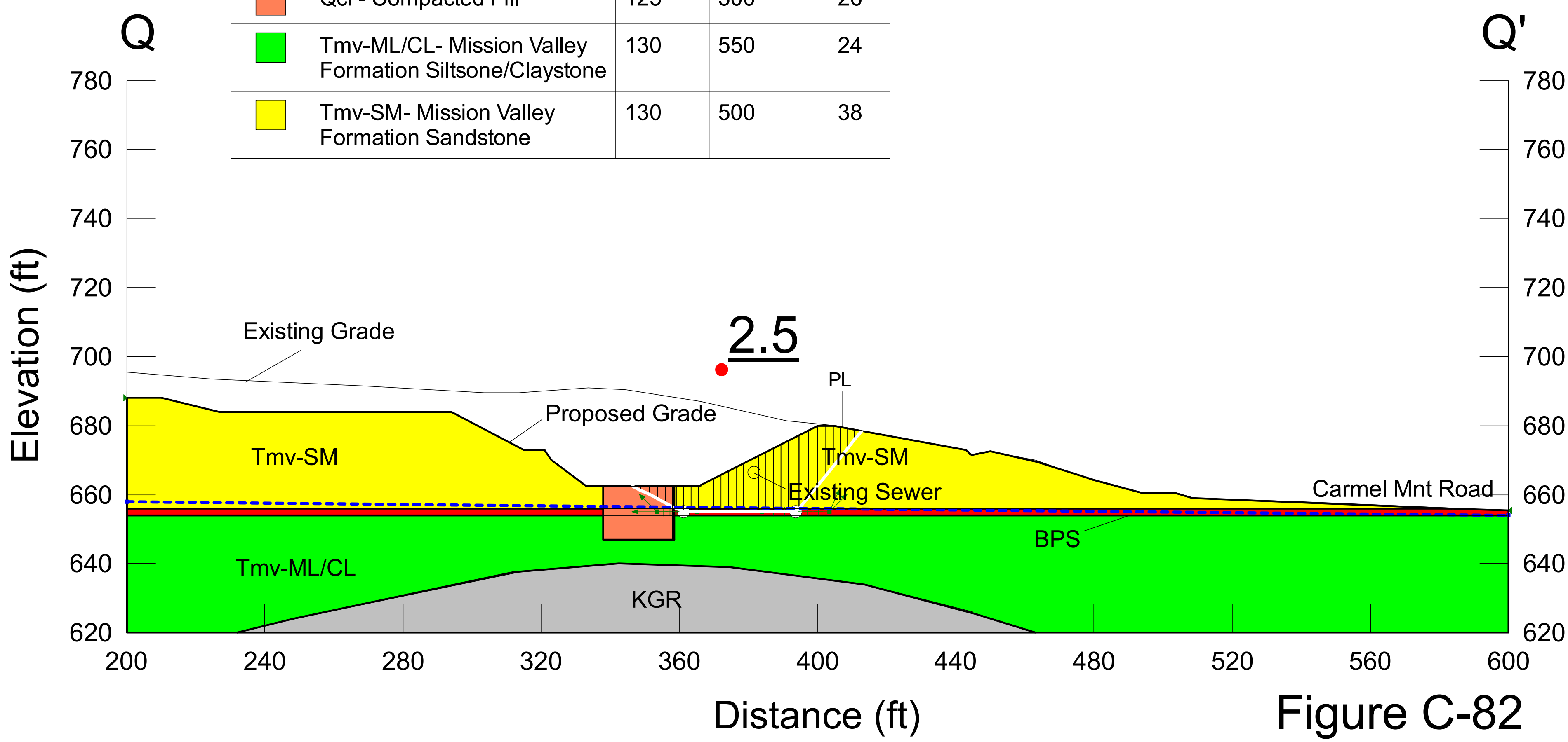


Figure C-82

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

The Junipers
Project No. G2030-32-03
Section Q-Q'
Name: QQ-Case4.gsz
Date: 04/03/2019 Time: 07:36:01 AM

Proposed Condition with utility trench added

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr-Granitic Rock	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

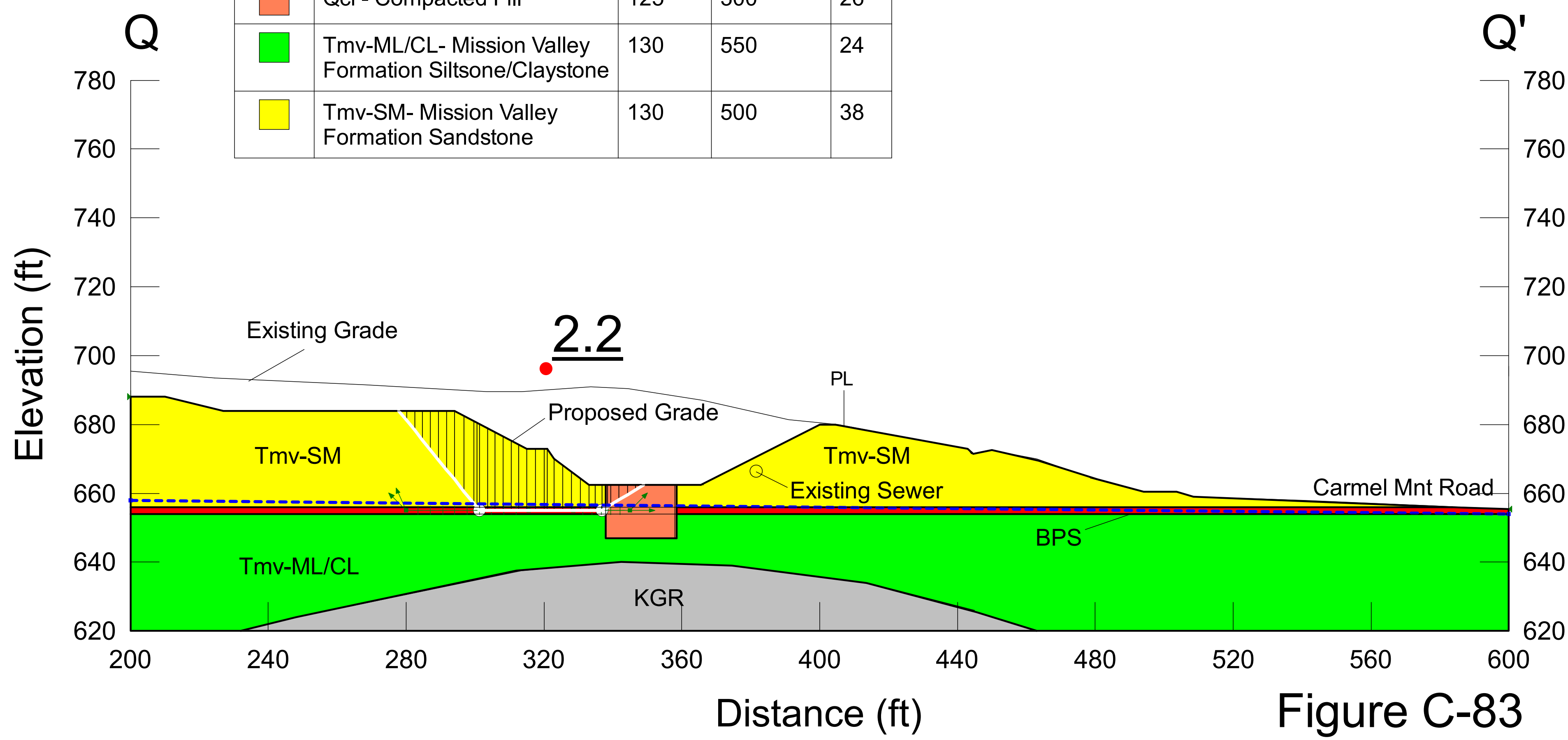


Figure C-83

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

The Junipers
Project No. G2030-32-03
Section Q-Q'
Name: QQ-Case0s.gsz
Date: 04/02/2019 Time: 02:02:26 PM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr-Granitic Rock	130	500	35
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

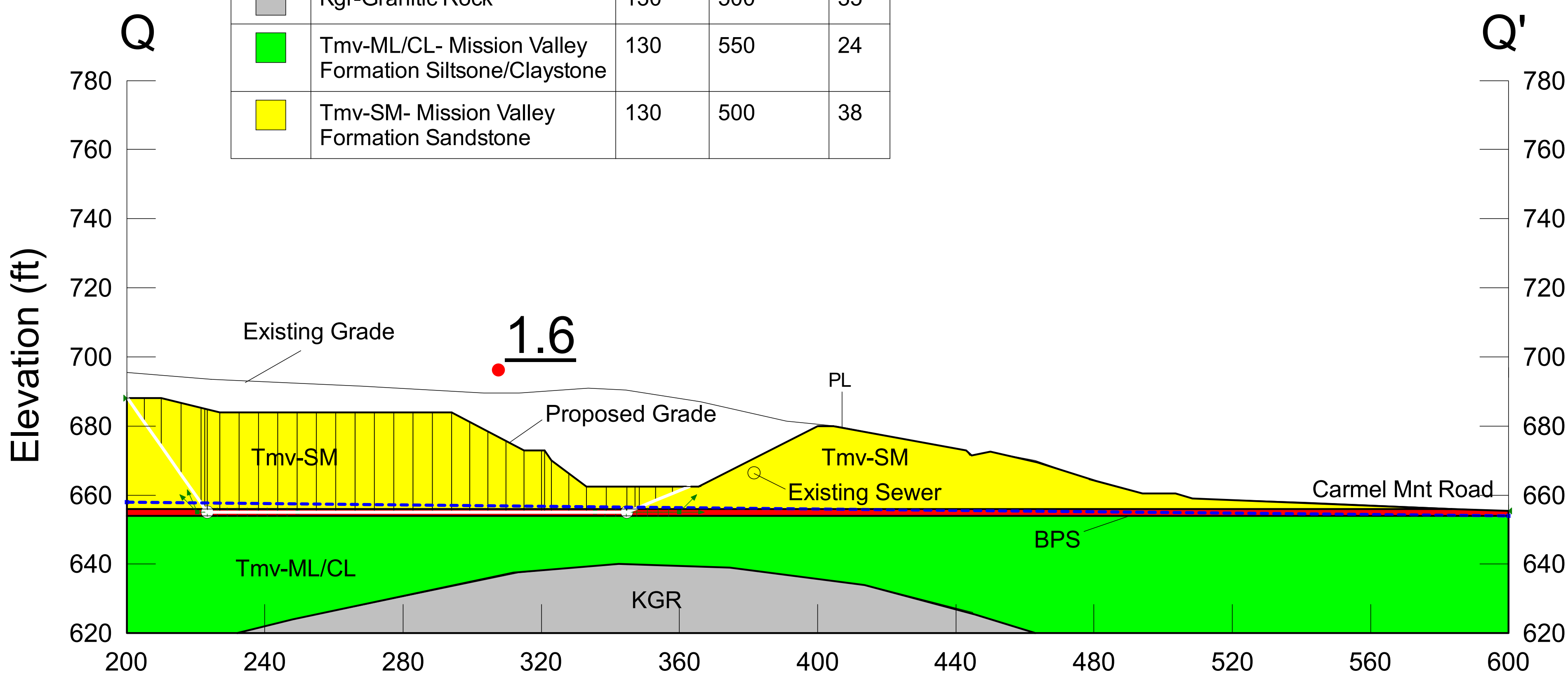


Figure C-84

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	QQ-Case0s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.60

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-85

The Junipers
Project No. G2030-32-03
Section Q-Q'
Name: QQ-Case2s.gsz
Date: 04/02/2019 Time: 02:51:36 PM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr-Granitic Rock	130	500	35
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

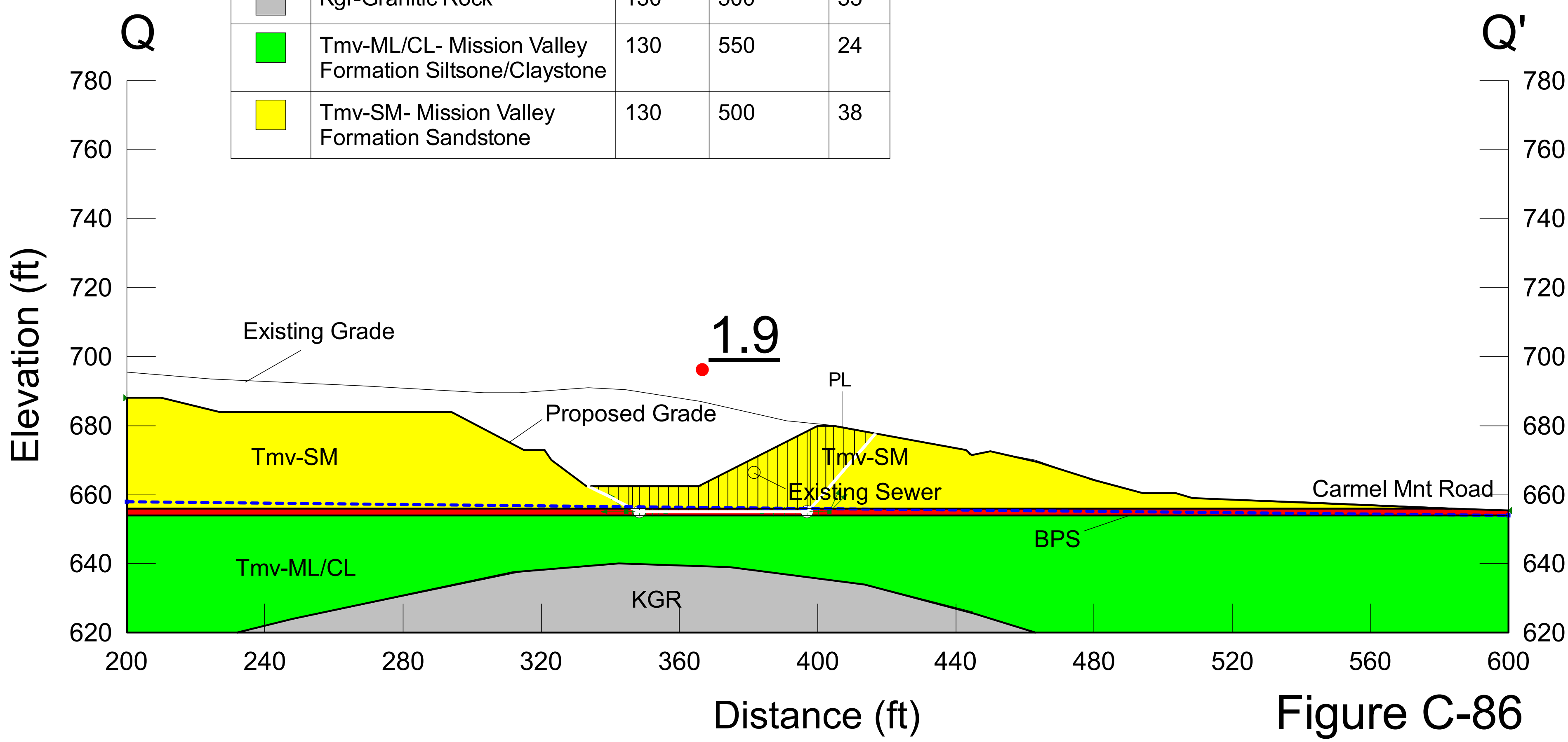


Figure C-86

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	QQ-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g	
k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.90

Passes Initial Screening Analysis

Approximation of Seismic Demand	
Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-87

The Junipers
Project No. G2030-32-03
Section Q-Q'
Name: QQ-Case3s.gsz
Date: 04/03/2019 Time: 07:32:30 AM

Proposed Condition
with utility trench added

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr-Granitic Rock	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

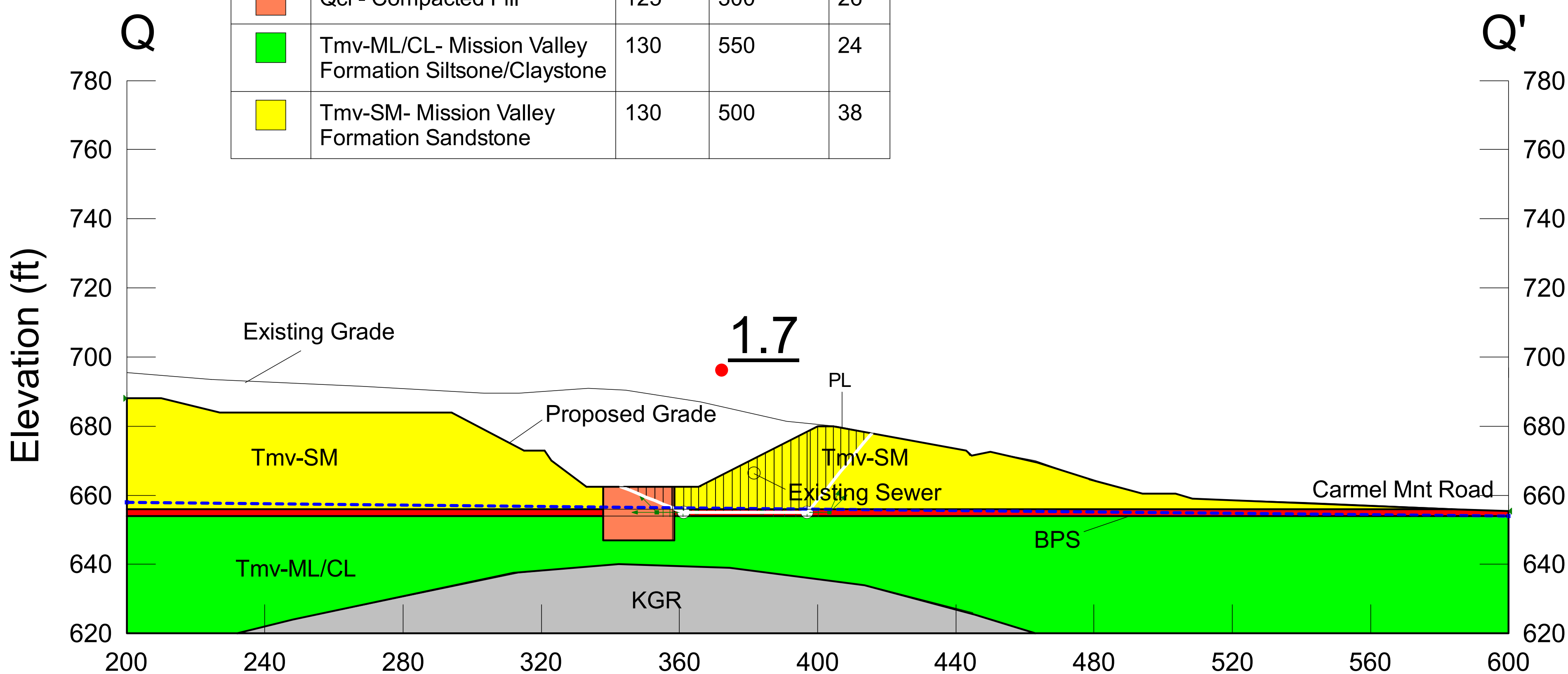


Figure C-88

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	QQ-Case3s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g	
k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.70

Passes Initial Screening Analysis

Approximation of Seismic Demand	
Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-89

The Junipers
Project No. G2030-32-03
Section Q-Q'
Name: QQ-Case4s.gsz
Date: 04/03/2019 Time: 07:37:43 AM

Proposed Condition
with utility trench added

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Gray	Kgr-Granitic Rock	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltsone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

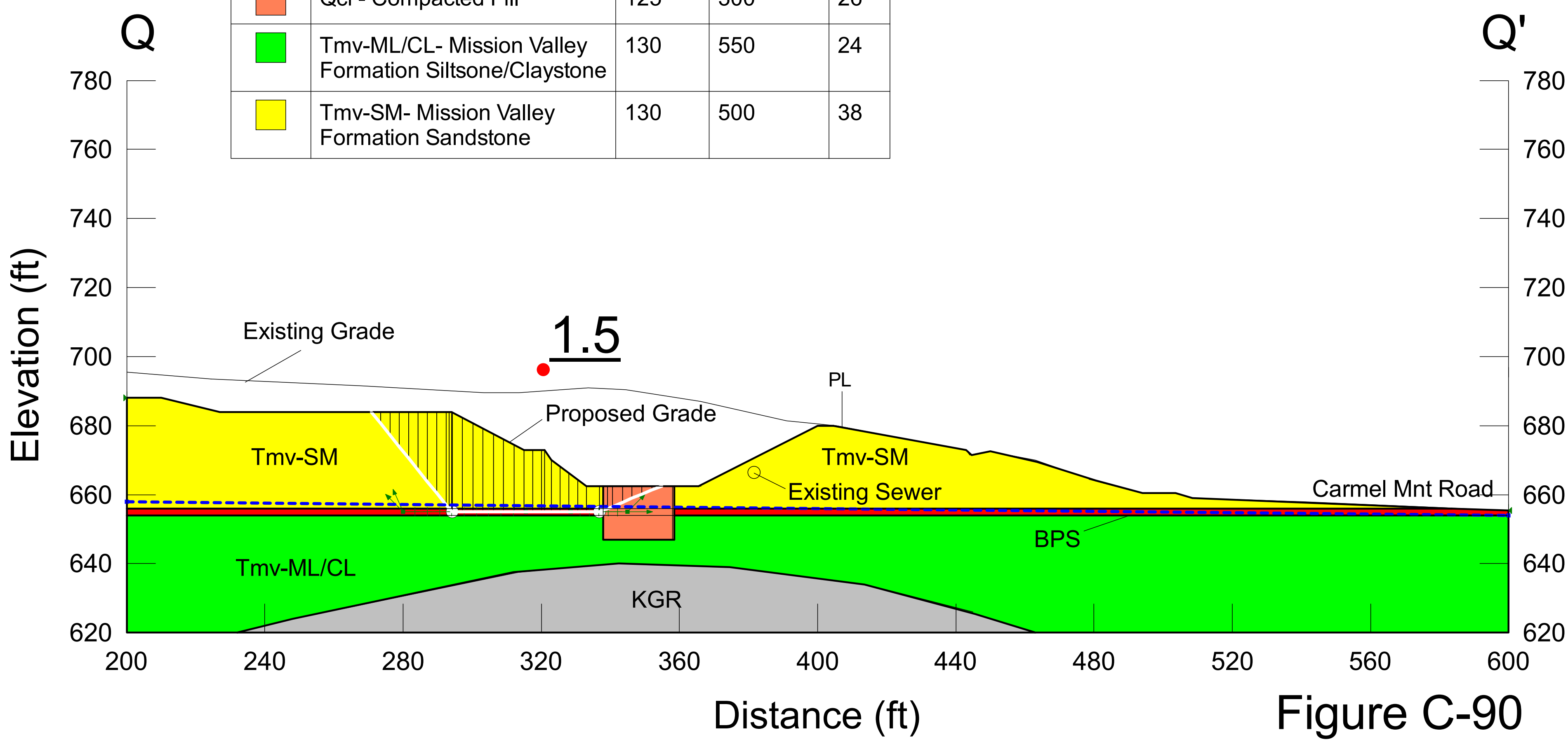


Figure C-90

X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2030-32-03\20190329 Updated Slope Stab\

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	04/03/19		
Filename	QQ-Case4s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5-95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g	
k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*D_{5-95})))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.50

Passes Initial Screening Analysis

Approximation of Seismic Demand	
Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE C-91

APPENDIX D

APPENDIX D

PREVIOUSLY REPORTED
TRENCH LOGS AND LABORATORY TESTING
PERFORMED BY LEIGHTON AND ASSOCIATES, INC.

FOR

THE JUNIPERS
SAN DIEGO, CALIFORNIA

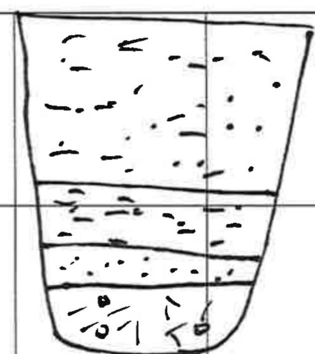
PROJECT NO. G2030-32-03

LOG OF TRENCH: TP-1

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES			
Project Number: 10799.001	Elevation: 691 Feet				
Equipment: Backhoe	Location/Grid:				

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-4': Silty SAND with clay to silty sandy CLAY, light brown, slightly moist to moist, loose to medium dense, 18" topsoil		SM	B-1 @ 4'-6'		
	COLLUVIUM	Qcol				
	@ 4'-6': Silty sandy clay, dark brown, moist, medium stiff		CL			
	@ 6'-6.5': SAND with SILT, light gray, slightly moist, medium dense, fine-grained sand		SM			
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 6.5'-8.5': Weathered sandy VOLCANIC ROCK, orange-brown, damp, medium dense to dense, excavates to sand with 2" to 10" rock					

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



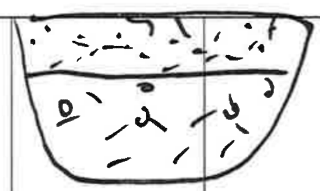
Total Depth = 8.5 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-2

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES			
Project Number: 10799.001	Elevation: 686 Feet				
Equipment: Backhoe	Location/Grid:				

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-2': Silty SAND with clay, brown, slightly moist to moist, loose to medium dense		SC			
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 2'-4': Weathered sandy VOLCANIC ROCK, light brown to green, medium dense to dense, excavates to SAND with 2" to 8" rock					

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



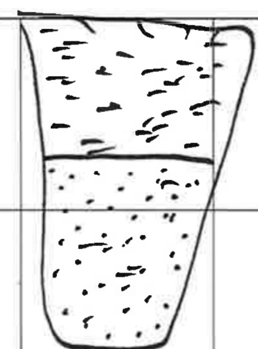
Total Depth = 4 Feet
No Ground Water Encountered
Backfilled: 8/20/14
with native soil

LOG OF TRENCH: TP-3

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES			
Project Number: 10799.001	Elevation: 704 Feet				
Equipment: Backhoe	Location/Grid:				

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	COLLUVIUM	Qcol				
	@ 0-3.5': Silty sandy CLAY, dark brown, moist, soft to medium stiff, 10" topsoil		CL	B-1 @ 5'-7'		
	MISSION VALLEY FORMATION	Tmv				
	@ 3.5'-8': Silty SAND with trace gravel, light brown to white, slightly moist to moist, medium dense to dense		SM			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:

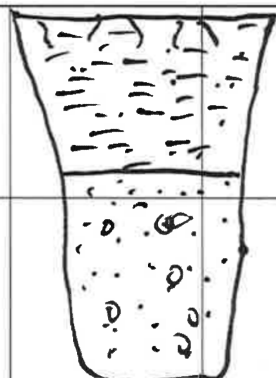


Total Depth = 8 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-4

Project Name: Lewis/Carmel Highlands	Logged by: BCP		ENGINEERING PROPERTIES			
Project Number: 10799.001	Elevation: 706 Feet					
Equipment: Backhoe	Location/Grid:					
GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	COLLUVIUM	Qcol				
	@ 0-4': Silty sandy CLAY, dark brown, moist to damp, soft to medium stiff, 18" topsoil		CL			
	MISSION VALLEY FORMATION	Tmv				
	@ 4'-10': Sandy SILTSTONE, light brown to white, slightly moist to moist, medium dense to dense		ML			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



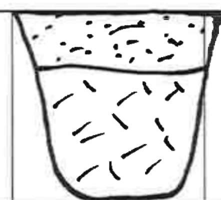
Total Depth = 10 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-5

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 689 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-2': Silty SAND with CLAY, brown to dark brown, slightly moist, loose to medium dense		SM			
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 2'-5': Weathered sandy VOLCANIC ROCK, light brown to gray, dense to very dense, excavates to SAND with 2" to 8" angular rock					

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



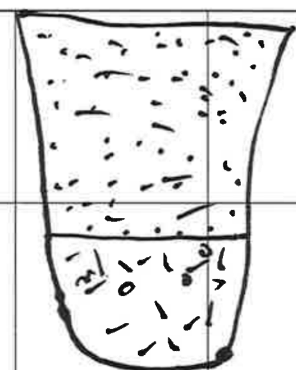
Total Depth = 5 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-6

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 656 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-6': Silty clayey SAND, dark brown, moist to damp, loose to medium dense, top 10" topsoil		SC	B-1 @ 5'-6'		
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 6'-10': Weathered sandy volcanic rock, light brown, moist, medium dense to dense, excavates to SAND with 1" to 8" rock					

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



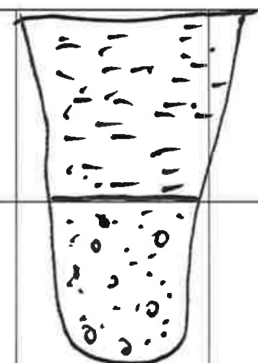
Total Depth = 10 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-7

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 721 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	COLLUVIUM	Qcol				
	@ 0-5': Silty sandy CLAY, dark brown, moist, soft to medium stiff, 16" topsoil		SC			
	MISSION VALLEY FORMATION	Tmv				
	@ 5'-9': Sandy SILTSTONE, white, dry to damp, medium dense to dense		ML			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



Total Depth = 9 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-8

Project Name: Lewis/Carmel Highlands

Logged by: BCP

Project Number: 10799.001

Elevation: 686 Feet

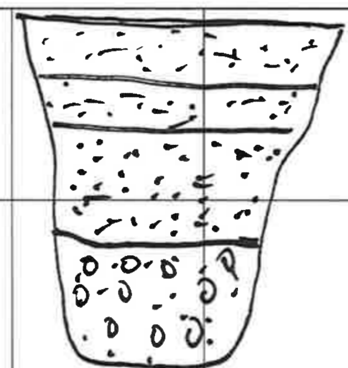
Equipment: Backhoe

Location/Grid:

ENGINEERING PROPERTIES

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0'-2': Silty clayey SAND, greenish gray, slightly moist, loose to medium dense		SC			
	COLLUVIUM					
	@ 2'-3': Silty SAND with clay, dark brown, damp to moist, loose to medium dense	Qcol	SM			
	MISSION VALLEY FORMATION					
	@ 3'-6.5': Silty SAND, light brown to tan, damp, medium dense to dense, massive, weathered	Tmv	SM			
	@ 6.5'-9': Cobble layer, silty SANDSTONE with GRAVEL to sandy conglomerate, damp, dense to very dense, 2" to 4" cobbles		GP	B-1 @ 5'-6.5'		

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



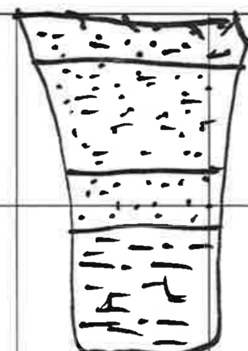
Total Depth = 9 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-9

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 680 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL	Qcol				
	@ 0'-1': Silty clayey SAND, dark brown, slightly moist to moist, loose		SC	B-1 @ 8'		
	MISSION VALLEY FORMATION	Tmv				
	@ 1'-4': Silty SAND with clay, white, dry to slightly moist, medium dense, weathered		SM			
	@ 4'-6.5': Silty SANDSTONE, white, dry, medium dense to dense		SM			
	@ 6.5'-8.5': Sandy SILTSTONE, gray, dry to slightly moist, stiff to very stiff, blocky		ML			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



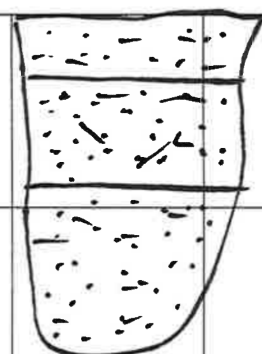
Total Depth = 8.5 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-10

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES			
Project Number: 10799.001	Elevation: 722 Feet				
Equipment: Backhoe	Location/Grid:				

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL	Qcol				
	@ 0-2': Silty clayey SAND, dark brown, dry to damp, loose		SC	B-1 @ 2'-4'		
	MISSION VALLEY FORMATION	Tmv				
	@ 2'-4': Silty SANDSTONE, trace clay, light brown to white, damp to slightly moist, medium dense to dense, blocky, carbonaceous, weathered		SM			
	@ 4'-8': Silty SANDSTONE, trace clay, light brown to light brown, slightly moist, dense to very dense, blocky, less calcium carbonate blebs					

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: 1:1 TREND: East



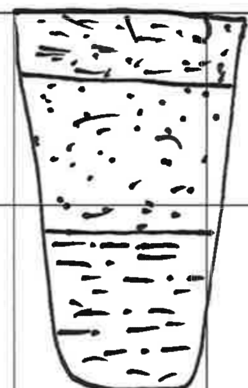
Total Depth = 8 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-11

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES			
Project Number: 10799.001	Elevation: 672 Feet				
Equipment: Backhoe	Location/Grid:				

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL	Qcol				
	@ 0-2': Silty clayey SAND, dark brown, loose to medium dense, dry to slightly moist		SC			
	MISSION VALLEY FORMATION	Tmv				
	@ 2'-6': Silty SAND with clay, white, dry, medium dense to dense, carbonaceous, weathered 2'-4'		SM			
	@ 6'-10': Sandy SILTSTONE, light gray to white, dry, stiff to very stiff, less calcium-carbonate blebs		ML			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:

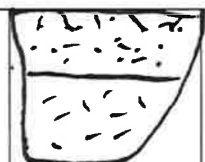


Total Depth = 10 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-12

Project Name: Lewis/Carmel Highlands		Logged by: BCP		ENGINEERING PROPERTIES			
Project Number: 10799.001		Elevation: 636 Feet					
Equipment: Backhoe		Location/Grid:					
GEOLOGIC ATTITUDES	DATE: 8/21/14	DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL		Topsoil				
	@ 0-2': Silty SAND with clay, orange-brown, dry, loose to dense, 8" topsoil			SM			
	JURASSIC SANTIAGO PEAK VOLCANICS		Jsp				
	@ 2'-4': Weathered VOLCANIC ROCK, orange-brown, dry to damp, very dense						
	Practical Refusal at 4'						

GRAPHICAL REPRESENTATION: SCALE: 1"-5' SURFACE SLOPE: TREND:



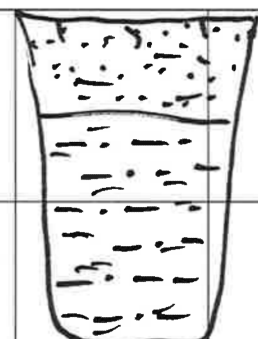
Total Depth = 4 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-13

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES			
Project Number: 10799.001	Elevation: 721 Feet				
Equipment: Backhoe	Location/Grid:				

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	COLLUVIUM	Qcol				
	@ 0-3': Silty clayey SAND, dark brown, damp to slightly moist, loose to medium dense, blocky		SC			
	MISSION VALLEY FORMATION	Tmv				
	@ 3'-8': Sandy SILTSTONE, light gray to off-white, dry to damp, stiff, blocky, carbonaceous, weathered 3'-4'		ML			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



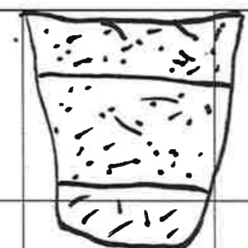
Total Depth = 8 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-14

Project Name: Lewis/Carmel Highlands		Logged by: BCP	ENGINEERING PROPERTIES			
Project Number: 10799.001		Elevation: 661 Feet				
Equipment: Backhoe		Location/Grid:				

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL	Qcol				
	@ 0-1.5': Silty SAND with clay, dark brown, dry to damp, loose		SM			
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 1.5'-4': Silty SAND with clay, orange-brown, dry to damp, medium dense to dense, weathered		SM			
	@ 4'-6': Weathered VOLCANIC ROCK, orange-brown, dry to damp, dense to very dense, excavates to sand with 2"-8" rock					

GRAPHICAL REPRESENTATION: SCALE: 1"-5' SURFACE SLOPE: TREND:



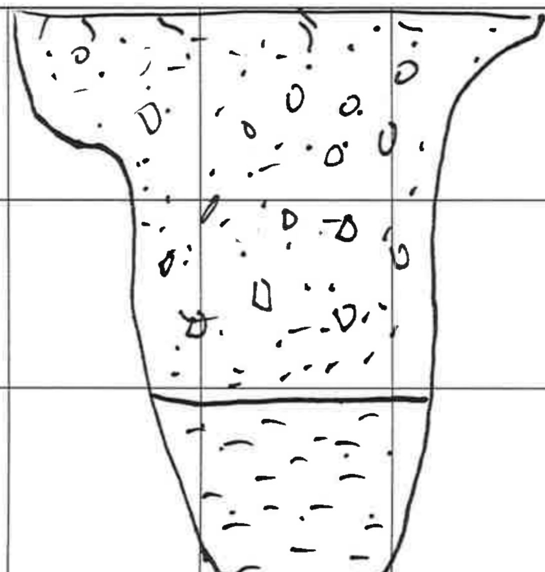
Total Depth = 6 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-15

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 690	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-10': Gravelly silty SAND, light brown, dry to damp, medium dense to dense, 4-6" topsoil		GM	B-1 @ 2'-4'		
	COLLUVIUM	Qcol				
	@ 10'-15+': Sandy CLAY, dark brown, moist, medium stiff		CL	B-2 @ 12'-13'		

GRAPHICAL REPRESENTATION: SCALE: 1"-5' SURFACE SLOPE: TREND:



Total Depth = 15 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-16

Project Name: Lewis/Carmel Highlands	Logged by: BCP				
Project Number: 10799.002	Elevation: 675 Feet				
Equipment: Backhoe	Location/Grid:				

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moisture (%)	Density (pcf)
	TOPSOIL	Topsoil				
	@ 0-1.5': Silty SAND, orange-brown, loose to medium dense, slightly moist		SM			
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 1.5'-8': Weathered VOLCANIC ROCK, orange-brown, dry to damp, dense to very dense, excavates to sand with 2" to 8" rock, weathered to 4'					
	Practical refusal at 8' below ground surface (bgs)					

GRAPHICAL REPRESENTATION: SCALE: 1"-5' SURFACE SLOPE: TREND:

Total Depth = 8 Feet
No Ground Water Encountered
Backfilled: 8/21/14

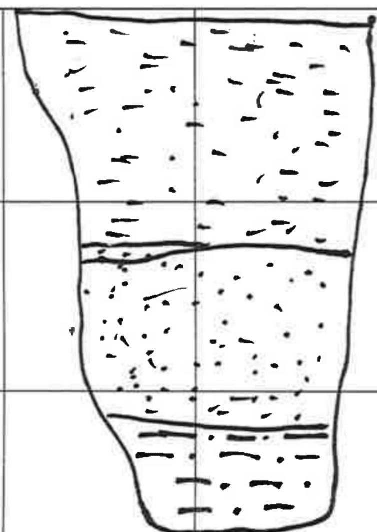
LOG OF TRENCH: TP-17

Project Name: Lewis/Carmel Highlands
Logged by: BCP
Project Number: 10799.001
Elevation: 686 Feet
Equipment: Backhoe
Location/Grid:

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ALLUVIUM	Qal				
	@ 0-7': Sandy CLAY with SILT, dark brown, damp to slightly moist, soft to medium stiff, 10" topsoil		SC	B-1 @ 2'-4'		
	MISSION VALLEY FORMATION	Tmv				
	@ 7'-11': Silty SAND, light gray to white, slightly moist, medium dense to dense, weathered 7'-9'		SM			
	@ 11'-14': Sandy SILTSTONE, light brown to gray, tray clay, stiff, blocky		ML			

ENGINEERING PROPERTIES

GRAPHICAL REPRESENTATION: SCALE: 1"-5' SURFACE SLOPE: TREND:



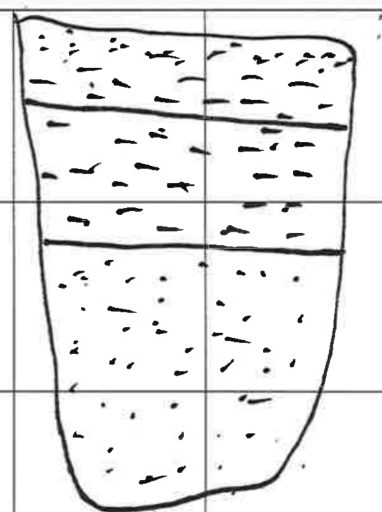
Total Depth = 14 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-18

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 700 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-1': 2" topsoil 10" poorly-graded SAND with SILT (former sand trap)		SP			
	@ 1'-3': Sandy CLAY, brown, slightly moist to moist, medium stiff		CL			
	ALLUVIUM	Qal				
	@ 3'-6': Silty sandy CLAY, dark brown, moist, medium stiff		CL			
	MISSION VALLEY FORMATION	Tmv				
	@ 6'-12': Silty SANDSTONE, light brown, damp to slightly moist, dense, slightly blocky, carbonaceous, weathered 6'-8'		SM			

GRAPHICAL REPRESENTATION: SCALE: 1"-5' SURFACE SLOPE: TREND:



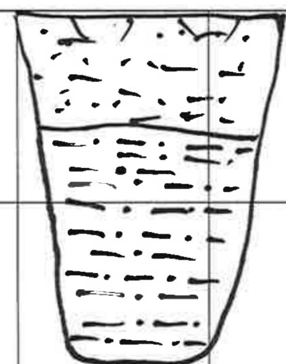
Total Depth = 12 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-19

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 725 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	COLLUVIUM	Qcol				
	@ 0-3.5': Silty clayey SAND, dark brown, damp to slightly moist, loose to medium dense, blocky		SC			
	MISSION VALLEY FORMATION	Tmv				
	@ 3.5'-9.5': Sandy SILTSTONE, light gray to white, dry to damp, stiff, blocky		ML			

GRAPHICAL REPRESENTATION: SCALE: 1"-5' SURFACE SLOPE: TREND:



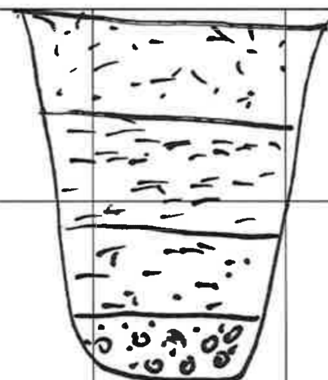
Total Depth = 15 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-20

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 634 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-3': Silty SAND with CLAY, orangish-brown, loose to medium dense, slightly moist		SM	B-1 @ 3'-5.5'		
	ALLUVIUM	Qal				
	@ 3'-5.5': CLAY, dark brown to black, slightly moist to moist, soft to medium stiff, organic rich, rootlets		CL			
	@ 5.5'-8': Clayey SAND, brown, moist to wet, medium dense to dense		SC			
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 8'-9': Gravelly SAND, brown, wet, very dense Groundwater at 8'		SM			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



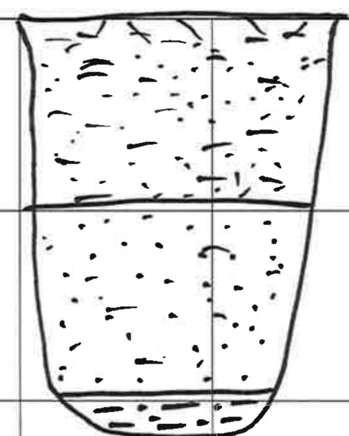
Total Depth = 9 Feet
Perched groundwater encountered at 8 feet below ground surface
Backfilled: 8/20/14

LOG OF TRENCH: TP-21

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 631 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ALLUVIUM	Qal				
	@ 0-5': Clayey SAND with silt, dark brown, slightly moist to moist, medium dense to dense		SC			
	TERTIARY MISSION VALLEY FORMATION	Tmv				
	@ 5'-10': Silty SAND with clay, gray to white, slightly moist to moist, medium dense to dense, calcareous, weathered at 5'-8'		SM			
	@ 10'-11': Silty SANDSTONE with clay, gray to white, slightly moist to moist, medium dense to dense					

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:

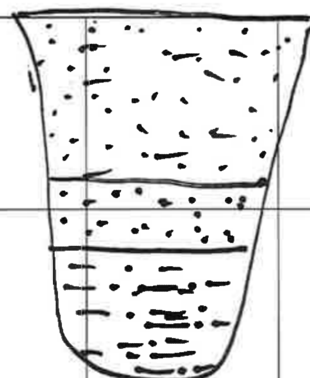


Total Depth = 11 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-22

Project Name: Lewis/Carmel Highlands	Logged by: BCP		ENGINEERING PROPERTIES			
Project Number: 10799.001	Elevation: 725 Feet					
Equipment: Backhoe	Location/Grid:					
GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	COLLUVIUM	Qcol				
	@ 0-4': Silty clayey SAND, dark brown, dry, loose to medium dense, 10" topsoil		SC			
	MISSION VALLEY FORMATION	Tmv		B-1 @ 6.5'		
	@ 4'-5.5': Silty SAND, light brown to tan, damp, dense to very dense, traces of clay, weathered		SM			
	@ 5.5'-9.5': Sandy SILTSTONE, light gray to white, dry to damp, stiff to very stiff, blocky		ML			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



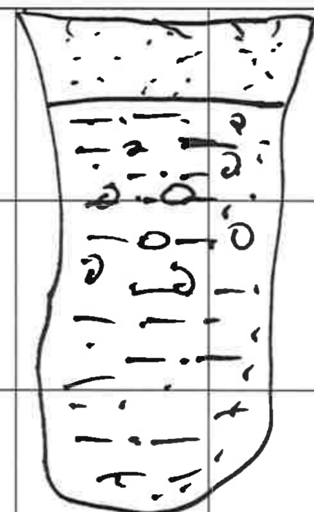
Total Depth = 9.5 Feet
No Ground Water Encountered
Backfilled: 8/21/14

LOG OF TRENCH: TP-23

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 685 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-3': Silty SAND with clay, dark brown, dry to damp, loose to medium dense		SM	B-1 @ 13'-14'		
	TERTIARY MISSION VALLEY FORMATION	Tmv				
	@ 3'-14': Sandy SILTSTONE, grayish-brown to light brown, dry to moist, medium stiff to stiff		ML			

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



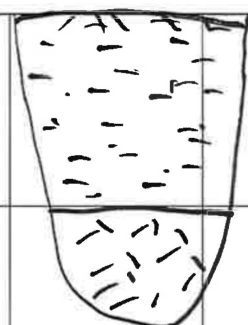
Total Depth = 14 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-24

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 680 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	COLLUVIUM	Qcol				
	@ 0-5': Silty sandy CLAY, dark brown, moist to damp, medium stiff to stiff, 10" topsoil		CL	B-1 @ 5'-6'		
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 5'-7.5': Weathered VOLCANIC ROCK, dry to damp, medium dense to dense, excavates to sand with 1" to 6" rock					

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



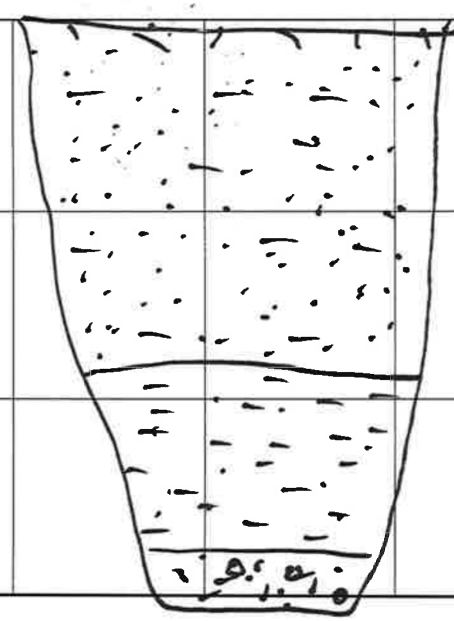
Total Depth = 7.5 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-25

Project Name: Lewis/Carmel Highlands	Logged by: BCP	ENGINEERING PROPERTIES
Project Number: 10799.001	Elevation: 649 Feet	
Equipment: Backhoe	Location/Grid:	

GEOLOGIC ATTITUDES	DATE: 8/20/14 DESCRIPTION:	GEOLOGIC UNIT	USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-9.5': Clayey SAND, gray-green, moist to damp, loose to medium, top 10" soil and grass		SM	B-1 @ 3'-5'		
	COLLUVIUM	Qcol				
	@ 9.5'-14': Silty CLAY with sand, dark brown, moist, loose to medium dense		CL	B-2 @ 8'-10'		
	SANTIAGO PEAK VOLCANICS	Jsp				
	@ 14'-15.5': Weathered sandy VOLCANIC ROCK, orange-brown, damp to moist, medium dense; excavates to sand with rock 2" to 10"					

GRAPHICAL REPRESENTATION: SCALE: 1"-5' SURFACE SLOPE: TREND:



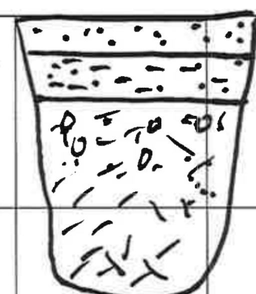
Total Depth = 15.5 Feet
No Ground Water Encountered
Backfilled: 8/20/14

LOG OF TRENCH: TP-26

Project Name: Lewis/Carmel Highlands
Logged by: BCP
Project Number: 10799.001
Elevation: 649 Feet
Equipment: Backhoe
Location/Grid:

GEOLOGIC ATTITUDES	DATE: 8/21/14 DESCRIPTION:	GEOLOGIC UNIT	ENGINEERING PROPERTIES USCS	Sample No.	Moisture (%)	Density (pcf)
	ARTIFICIAL FILL	Afu				
	@ 0-1': 6" poorly-graded SAND, light brown, dry to damp, loose, 6" topsoil		SP			
	ALLUVIUM	Qal				
	@ 1'-2': Clayey SAND, dark brown, slightly moist, medium dense		SC			
	JURASSIC SANTIAGO PEAK VOLCANICS	Jsp				
	@ 2'-7.5': Weathered VOLCANIC ROCK, orange-brown, damp to slightly moist, dense to very dense, excavates to sand with 2" to 8" rock					
	Practical refusal at 7.5'					

GRAPHICAL REPRESENTATION: SCALE: 1"=5' SURFACE SLOPE: TREND:



Total Depth = 7.5 Feet
No Ground Water Encountered
Backfilled: 8/21/14

APPENDIX C

Laboratory Testing Procedures and Test Results

Chloride Content: Chloride content was tested in accordance with DOT Test Method No. 422. The results are presented below:

Sample Location	Chloride Content, ppm
TP-1 @ 4 to 6 feet	196
TP-9 @ 8 feet	87

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with California Test Method 643. The results are presented in the table below:

Sample Location	pH	Minimum Resistivity (ohms-cm)
TP-1 @ 4 to 6 feet	7.41	410
TP-9 @ 8 feet	7.91	562

Soluble Sulfates: The soluble contents of selected samples were determined by standard geochemical methods. The test results are presented in the table below:

Sample Location	Sulfate Content (%)
TP-1 @ 4 to 6 feet	0.0627
TP-9 @ 8 feet	0.0301

APPENDIX C (Continued)

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Text, ASTM Test Method 4829. Specimens are molded under a given compactive energy to approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Description	Expansion Index	Expansion Potential
TP-1 @ 4 to 6 Feet	Silty Clayey SAND with gravel	109	High
TP-6 @ 5 to 6 Feet	Brown Sandy CLAY	83	Medium
TP-9 @ 8 Feet	Brown Sandy CLAY	97	High

Particle Size Analysis: Particle size analysis was performed by mechanical sieving methods according to ASTM D 422. A plot of the sieve results are provided on the figure in this appendix.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical soils were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the table below:

Sample Number	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
TP-22	Gray brown Sandy Clay with Gravel	112.5	15.0
TP-25	Gray brown Sandy Clay	116.0	12.5

APPENDIX E

APPENDIX E

RECOMMENDED GRADING SPECIFICATIONS

FOR

THE JUNIPERS
SAN DIEGO, CALIFORNIA

PROJECT NO. G2030-32-03

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

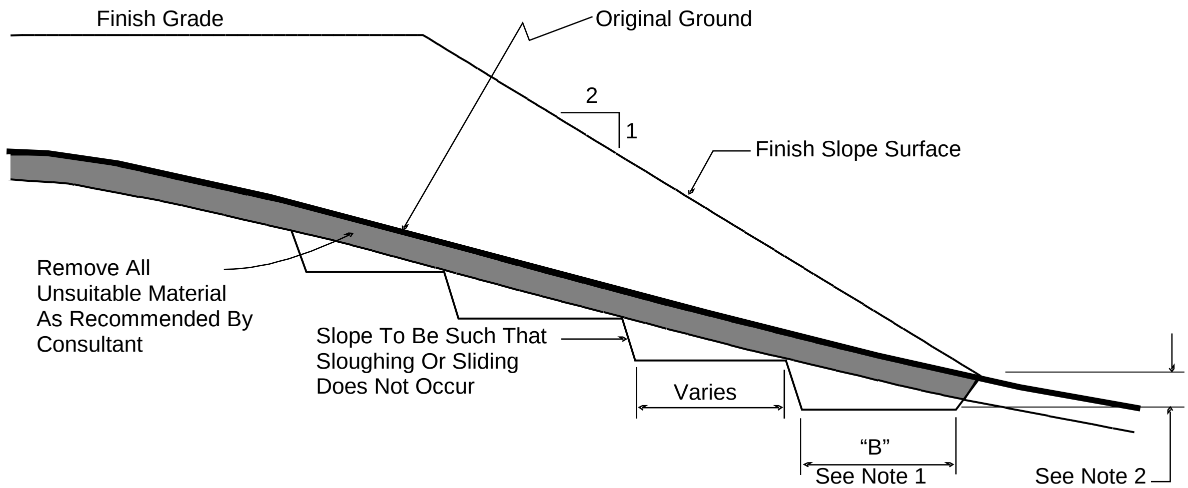
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

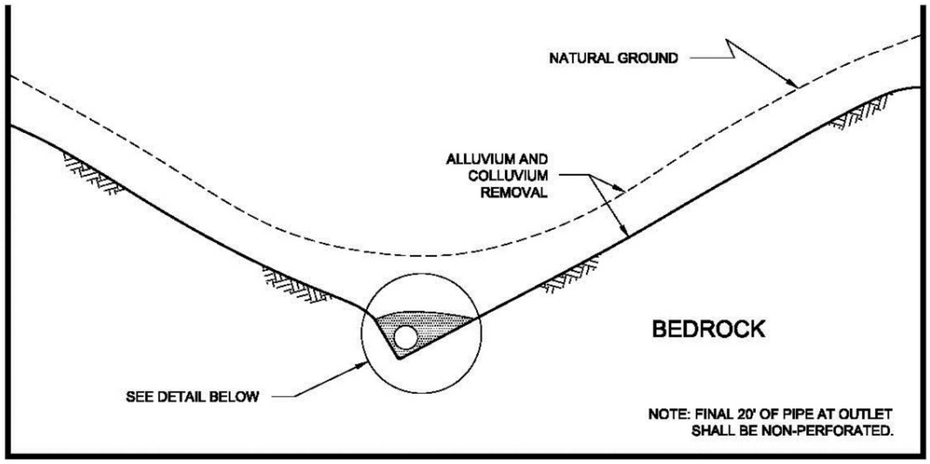
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

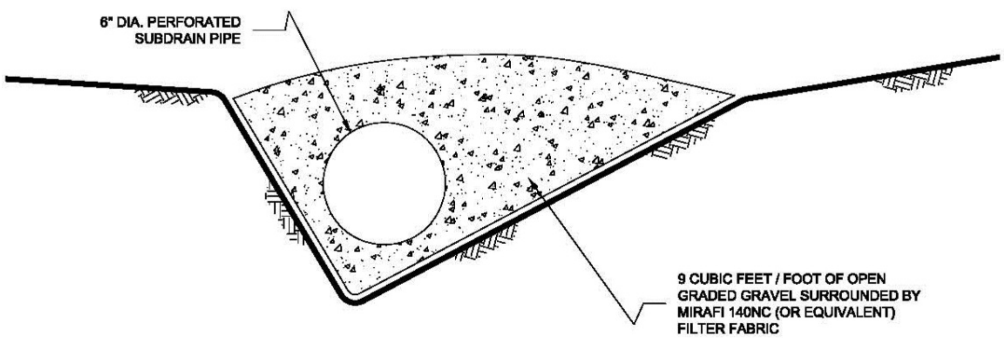
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

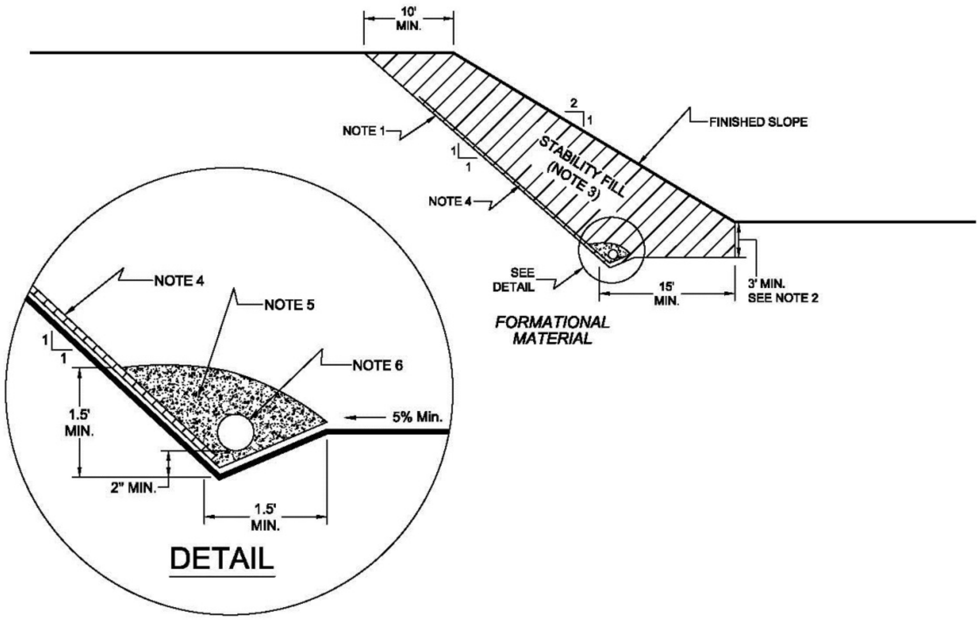
1......6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

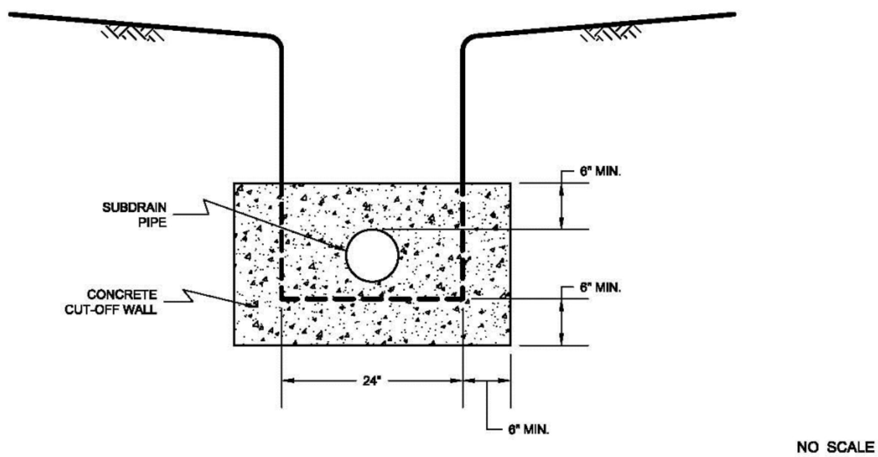
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

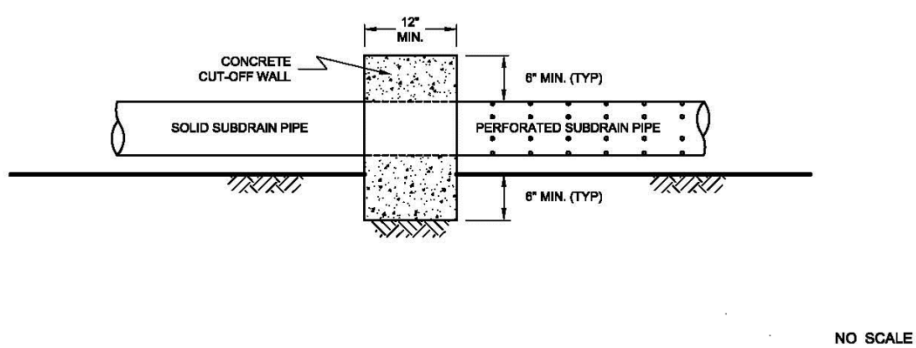
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL

FRONT VIEW

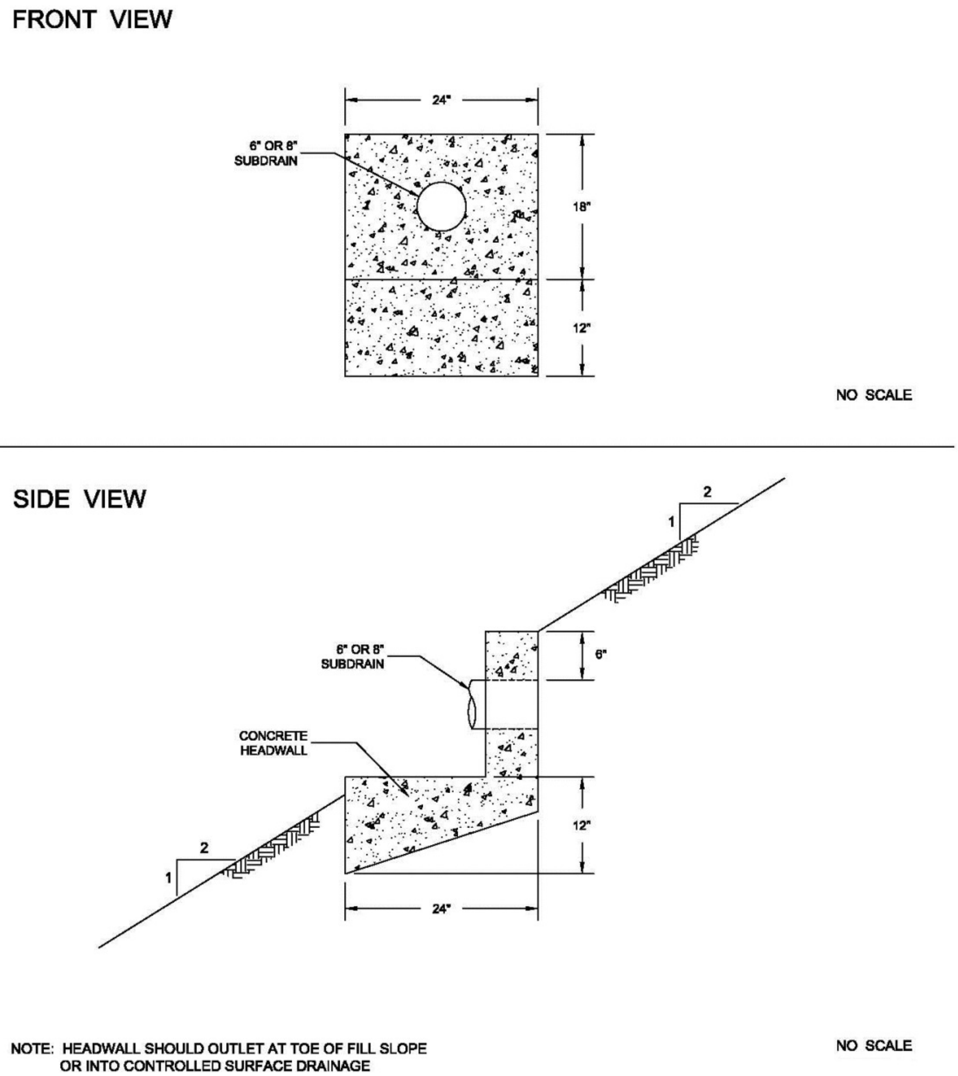


SIDE VIEW



7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

TYPICAL HEADWALL DETAIL



7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. Anderson, J. G., *Synthesis of Seismicity and Geologic Data in California,* U. S. Geologic Survey Open-File Report 84-424, 1984, pp. 1-186.

2. Boore, D. M., and G. M Atkinson (2008), *Ground-Motion Prediction for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods Between 0.01 and 10.0 S*, Earthquake Spectra, Volume 24, Issue 1, pages 99-138, February 2008.

3. California Department of Conservation, Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California,* Open File Report 96-08, 1996.

4. California Department of Water Resources, Water Data Library. http://www.water.ca.gov/waterdatalibrary.

5. California Geological Survey, *Seismic Shaking Hazards in California,* Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years. http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

6. Campbell, K. W. and Y. Bozorgnia, *NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10 s*, Preprint of version submitted for publication in the NGA Special Volume of Earthquake Spectra, Volume 24, Issue 1, pages 139-171, February 2008.

7. Chiou, Brian S. J. and Robert R. Youngs, *A NGA Model for the Average Horizontal Component of Peak Ground Motion and Response Spectra*, preprint for article to be published in NGA Special Edition for Earthquake Spectra, Spring 2008.

8. City of San Diego, *Seismic Safety Study, Geologic Hazards and Faults,* 2008 edition, Map Sheet 44.

9. Jennings, C. W., 1994, California Division of Mines and Geology, *Fault Activity Map of California and Adjacent Areas*, California Geologic Data Map Series Map No. 6.

10. Kennedy, M. P. and S. S. Tan, *Geologic Map of the Oceanside 30'x60' Quadrangle, California*, USGS Regional Map Series, Scale 1:100,000, 2005.

11. Leighton and Associates, Inc., *Preliminary Geotechnical Investigation, Carmel Highlands, San Diego, California*, dated September 8, 2014.

12. Risk Engineering, *EZ-FRISK*, 2017.

13. Unpublished reports and maps on file with Geocon Incorporated.

14. USGS computer program, *Seismic Hazard Curves and Uniform Hazard Response Spectra.*

15. United States Department of Agriculture, *1953 Stereoscopic Aerial Photographs, Flight AXN-14M*, Photos Nos. 84 and 85 (scale 1:20,000).

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GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

RESPONSE TO LDR-GEOLOGY REVIEW COMMENTS

THE JUNIPERS
SAN DIEGO, CALIFORNIA

PREPARED FOR

LENNAR HOMES
SAN DIEGO, CALIFORNIA

JULY 12, 2019
PROJECT NO. G2030-32-03

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2030-32-03
July 12, 2019

Lennar Homes
16465 Via Esprillo, Suite 150
San Diego, California 92127

Attention: Ms. Allegra Parisi

Subject: RESPONSE TO LDR-GEOLOGY REVIEW COMMENTS
THE JUNIPERS
SAN DIEGO, CALIFORNIA

References:
1. *Update Geotechnical Investigation, The Junipers, San Diego, California,* prepared by Geocon Incorporated, dated November 30, 2018, revised April 9, 2019 (Project No. G2030-32-03).
2. *Development Plans: The Junipers, City of San Diego, California,* prepared by Hunsaker & Associates, dated May 15, 2019.

Dear Ms. Parisi:

This correspondence has been prepared to respond to comments contained in the City of San Diego *Cycle 38, LDR-Geology* review comments dated June 12, 2019, closed on July 2, 2019. The geotechnical review comments followed by our responses are presented below.

Comment 23: *LDR-Geology has received a new Geotechnical Report and revisions/ modifications to the site grading is generating additional review comments. Please submit an addendum geotechnical report or update letter that specifically addresses the following:*

Response: The referenced revised report was prepared to address minor modifications to the grading plans. This letter serves as the requested addendum to the geotechnical report. The following information should be used in design and construction of the project. The recommendations presented in the referenced reports remain applicable unless superseded herein.

Comment 24: *Update the geologic map to include the recommended limits of remedial grading and provide the geologic structure (attitudes).*

Response: The geologic map has been updated to include the recommended limits of remedial grading and the geologic structure (Figure 2, map pocket).

Comment 25: *Update the geologic cross sections and provide the geologic structure.*

Response: The geologic cross-sections have been updated to include the geologic structure (Figures 3 through 8, map pocket).

Comment 26: *Community members residing in homes along Del Diablo Drive that are adjacent to the existing eastern slope have raised concerns about proposed grading and development. Please provide additional cross sections and accompanying slope stability analyses between existing cross sections C-C' to D-D' and between D-D' and O-O'.*

Response: As requested, two additional cross-sections and the accompanying slope stability analyses have been performed. The locations of Cross-Sections R-R' and S-S' are shown on the Geologic Map, Figure 2, and are presented as Figure 9. The output files and calculated factor of safety for each section is presented on Figures 10 through 16.

The computer program SLOPE/W distributed by Geo-Slope International was utilized to perform the slope stability analyses. This program uses conventional slope stability equations and a two-dimensional limit-equilibrium method to calculate the factor of safety against deep-seated failure. For our analysis, Spencer's Method was used. Spencer's Method satisfies both moment and force equilibrium.

In accordance with Special Publication 117A guidelines, site-specific seismic slope stability analyses are required for sites located within mapped hazard zones. Seismic Hazard Zone maps published by CDMG, including landslide hazard zones, have not been published for San Diego County due to the relatively low seismic risk compared with other jurisdictions in Southern California. Therefore, it is our opinion that seismic slope stability analyses are not required in San Diego County. However, seismic slope stability analyses on the most critical failure surfaces have been performed in accordance with *Recommended Procedures for Implementation of DMG Special Publication 117: Guidelines for Analyzing and*

Mitigating Landslide Hazards in California, prepared by the Southern California Earthquake Center (SCEC), dated June 2002 and *Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California (2008).*

The seismic slope stability analysis was performed using a ground motion of 0.19g, corresponding to a 10 percent probability of exceedance in 50 years for a rock site. A modal magnitude and modal distance of 7.7 and 34 kilometers, respectively, was used in the analysis.

Using the parameters discussed herein, an equivalent site acceleration, k_{EQ}, of 0.135g was calculated to perform the screening analysis. The screening analysis was performed using an acceleration of 0.135g resulting in a factor of safety of 1.0 or greater. A slope is considered acceptable by the screening analysis if the calculated factor of safety is greater than 1.0 using k_{EQ}; therefore, the most critical failure surfaces depicted on Cross-Sections R-R' and S-S' passes the screening analysis for the seismic slope stability.

Based on the results of the slope stability analyses, a minimum static and pseudo-static factor of safety of 1.5 and 1.0, respectively, was achieved and the buttressed and graded slopes are considered grossly and surficially stable.

Comment 27: *The project's geotechnical consultant must provide a professional opinion that the site will have a factor-of-safety of 1.5 or greater, for both gross and surficial stability following project completion.*

Response: Based on the results of the slope stability analyses, a minimum static factor of safety of 1.5 was achieved and the slopes are considered grossly and surficially stable.

Comment 28: *Provide a professional opinion that the site will have a factor of safety of at least 1.25 for static short-term stability for temporary cuts.*

Response: Based on the results of the two dimensional slope stability analyses along Cross-Sections A-A' and D-D', a minimum static factor of safety of 1.25 was achieved considering the temporary backcut condition in buttress areas. Results of the temporary condition in other areas yielded factors of safety below 1.25. For this reason, we recommended a slot cutting technique during buttress construction as stated in section 7.1.6 of the referenced April 9, 2019, geotechnical report.

Section 7.1.6 states "Slot cutting of buttress excavations will be necessary to provide an adequate temporary factor of safety during grading, particularly in the westernmost buttress area. Specific recommendations in this regard will be provided in our update correspondence once grading plans are developed."

The anticipated areas that will require a slot cutting construction technique are shown on Figure 2. Based on the discussion above, it is our opinion that the temporary buttress backcuts will possess a factor of safety of at least 1.25 for static short-term stability.

Comment 29: *The slope stability analyses in Appendix C uses a seismic coefficient of 0.135. The standard of practice is generally 0.15. Provide a discussion pertaining to the seismic coefficient.*

Response: Seismic slope stability analyses were performed in accordance with *Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California (2008) and Recommended Procedures for Implementation of DMG Special Publication 117: Guidelines for Analyzing and Mitigating Landslide Hazards in California,* prepared by the Southern California Earthquake Center (SCEC), dated June 2002. The objectives of these guidelines is to assist in the evaluation and mitigation of earthquake-related hazards for projects within designated zones or required investigations; and to promote uniform and effective statewide implementation of the evaluation and mitigation elements of the Seismic Hazards Mapping Act. The methods, procedures, and references contained therein are those that the State Mining and Geology Board, the Seismic Hazards Mapping Act Advisory Committee, and it's working groups believe are currently representative of quality practice. If other methods are used, they should be justified with appropriate data and documentation (SP117A).

These well recognized guidelines for analyzing static and pseudo-static slope stability provide procedures for estimating the appropriate ground motions and corresponding horizontal accelerations to be used in the pseudo-static slope stability analysis. <u>These guidelines were prepared in part to address the erroneous use of 0.15g as the horizontal pseudo-static acceleration</u>.

As such, a screening level analysis was established to address seismic slope stability that accounts for anticipated seismicity at the site. According to SP117A, the screening level analysis should be used to determine if more rigorous analyses are warranted, such as Newmark's sliding block analysis. If the screening level analysis indicates a pseudo-static factor of safety of 1.0 or greater, the slope is considered acceptable.

According to the guidelines, the appropriate horizontal acceleration should be based on a probabilistic ground motion corresponding to a 475-year hazard level, or 10 percent probability of exceedance in 475 years. Based on a deaggregation analysis, a modal magnitude and distance of 7.7 and 34.4 km, respectively, was computed, corresponding to a site modified peak ground acceleration of 0.19g. Using these parameters, a horizontal pseudo-static coefficient of 0.135 was computed for a displacement threshold of 5cm or less.

Based on the discussion above, it is our opinion that a seismic coefficient of 0.135 is appropriate for use in our slope stability analysis.

Comment 30: *The seismic slope stability analyses for cross sections D-D', F-F', and G-G' indicate a factor of safety of 1.0. The Seed (1979) procedure calls for k = 0.15 and the FS greater than or equal to 1.15. Please provide additional information on the procedure that indicates a pseudo-static factor of safety to 1.0 is acceptable.*

Response: Please refer to response to Comment 29. The 1979 Seed procedure was updated as documented in SP117A.

Seed's 1979 article (the 19th Rankine Lecture) provided a guideline of using a pseudo-static coefficient of 0.10 for magnitude 6.5 earthquakes, and 0.15 for magnitude 8.25 earthquakes, with an acceptable factor of safety of 1.15. The significant limitations of this procedure were addressed in SP117 and SP117A. To address these limitations and provide a more site specific analysis, Blake and others (2002) and Stewart and others (2003) used the simplified design procedures developed by Bray and others (1998) to develop a "screen analysis procedure", based on the pseudo-static approach that accounts for the anticipated seismicity at the site and allows for different levels of acceptable displacements.

Comment 31: *Please provide a professional opinion that detrimental slope movement will not occur if a seismic event impacts that site.*

Response: Based on the results of the slope stability analyses, a minimum static and pseudo-static factor of safety of 1.5 and 1.0, respectively, was achieved for the site conditions and the slopes are considered grossly and surficially stable. As such, it is our opinion that detrimental slope movement should not occur provided the recommendations presented in the referenced report are followed during design and construction.

Comment 32: *Based on the current development plans, the project's geotechnical consultant must provide an updated conclusion regarding if the proposed development will destabilize or result in settlement of adjacent property or the city Right-of-Way.*

Response: Based on the results of our geotechnical study, a minimum static and pseudo-static factor of safety of 1.5 and 1.0, respectively, was achieved and the slopes are considered grossly and surficially stable. As such, it is our opinion that the proposed development will not destabilize or result in settlement of adjacent properties or the City Right-of-Way provided the recommendations presented in the referenced report are followed during design and construction.

Comment 33: *Section 7.1.2 indicates that a discussion of the proposed grading in vicinity of the existing 16-inch gas main should occur between parties and that an additional evaluation is required. Provide the additional evaluation and recommendations at this time.*

Response: Section 7.1.2 states *"A discussion of the proposed grading in the vicinity of the easement should occur between the appropriate parties as project development plans progress."* We understand that these discussions have occurred and that SDG&E has reviewed the grading plans along their easement. It is also understood that no additional evaluation has been deemed necessary at this time. We expect discussions with representatives of SDG&E, and possibly their geotechnical consultant will occur as grading plans progress.

Comment 34: *Section 7.1.2 indicates that an 8-inch gas and 8-inch sewer line will be removed and relocated. Clarify if conflicts exist and provide recommendations as necessary.*

Response: The grading plans show an existing 8-inch gas line and 8-inch sewer main to be removed and relocated. We are not aware of any conflicts. These improvements should be removed and the resulting trenches properly backfilled in accordance with the recommendations presented in the referenced report.

If there are any questions regarding this correspondence, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Trevor E. Myers
RCE 63773

David B. Evans
CEG 1860

TEM:DBE:dmc

(e-mail) Addressee
(2/del) Hunsaker & Associates San Diego, Inc.
Attention: Mr. Troy Burns

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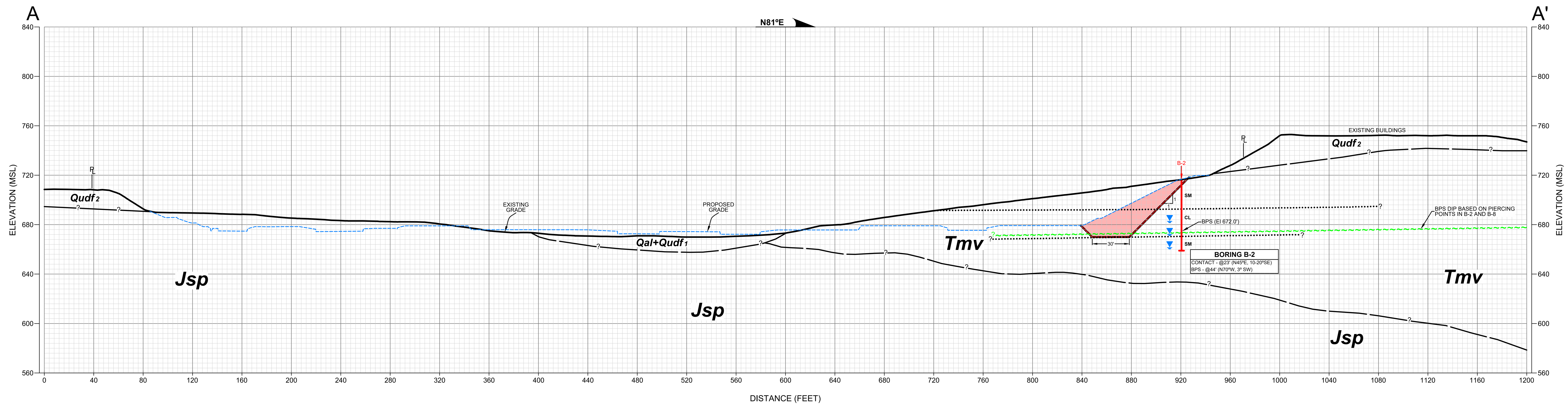

GEOLOGIC CROSS-SECTION A-A'

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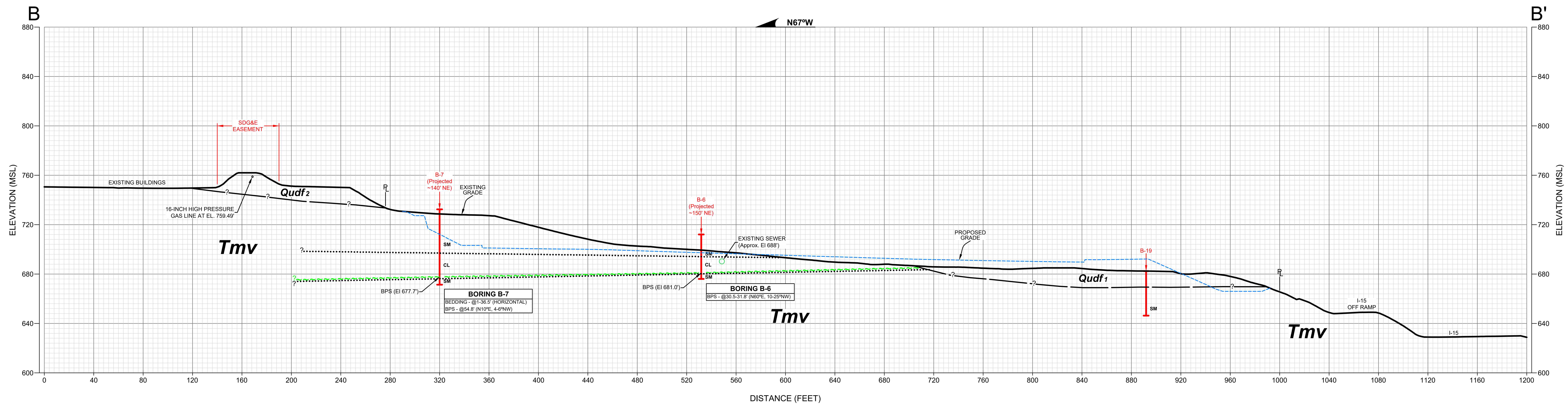

GEOLOGIC CROSS-SECTION B-B'

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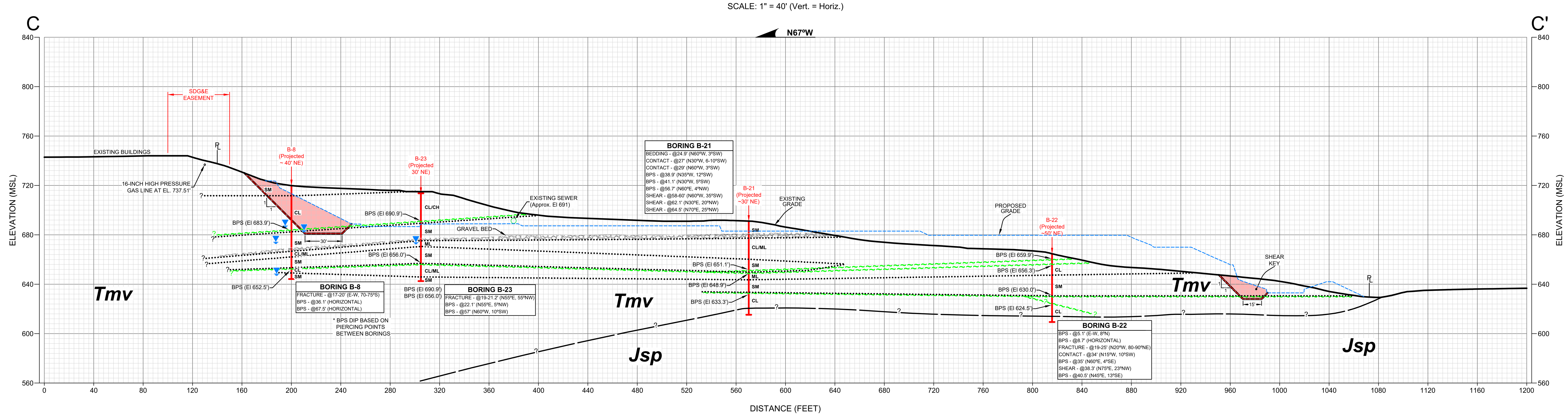

GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

Qudf 1 ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE
Qudf 2 ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
Qal ....ALLUVIUM
Tmv ....MISSION VALLEY FORMATION
Jsp ....SANTIAGO PEAK VOLCANICS
B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
........APPROX. LOCATION OF BEDDING PLANE SHEAR
........APPROX. LIMITS OF BUTTRESS/SHEAR KEY
........APPROX. LIMITS OF STABILITY FILL
........APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

THE JUNIPERS
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 40'	DATE 07 - 12 - 2019
PROJECT NO. G2030 - 32 - 03	FIGURE 3
SHEET 2 OF 8	

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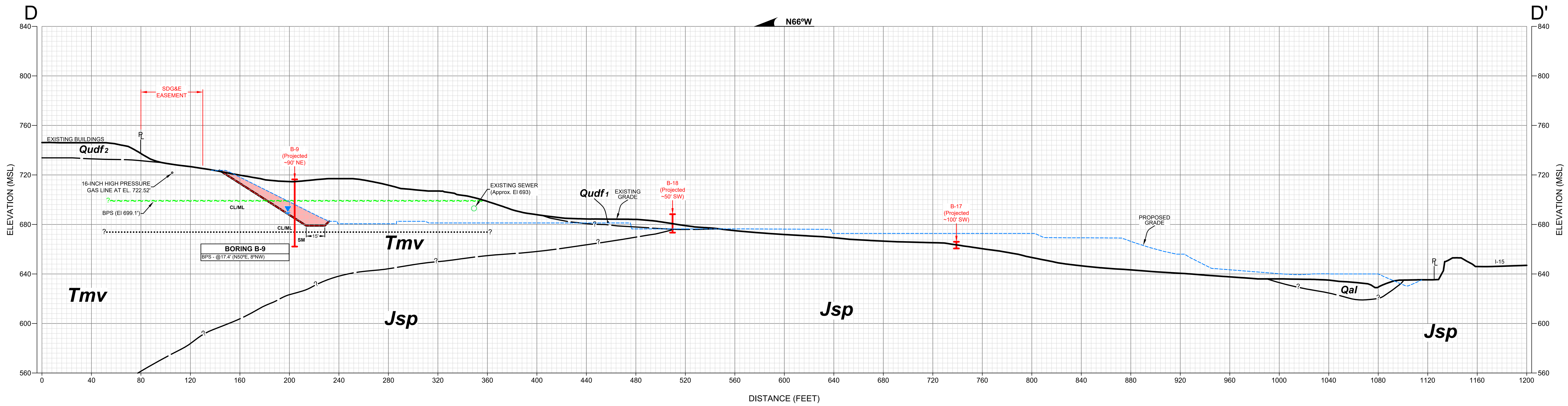

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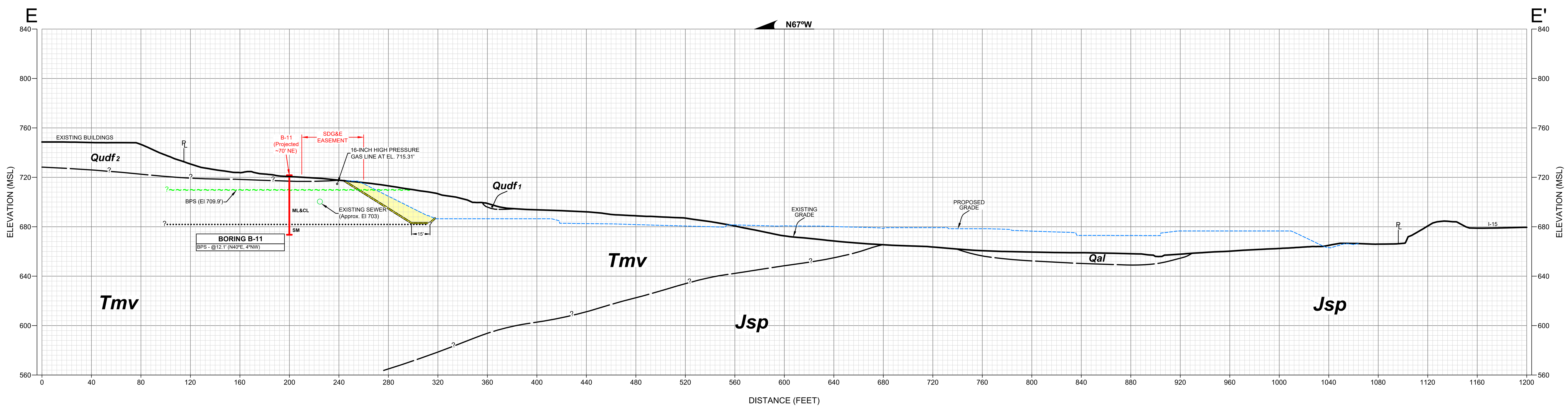

GEOLOGIC CROSS-SECTION E-E'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

- Qudf1 ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE
- Qudf2 ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- Qal ....ALLUVIUM
- Tmv ....MISSION VALLEY FORMATION
- Jsp ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- ?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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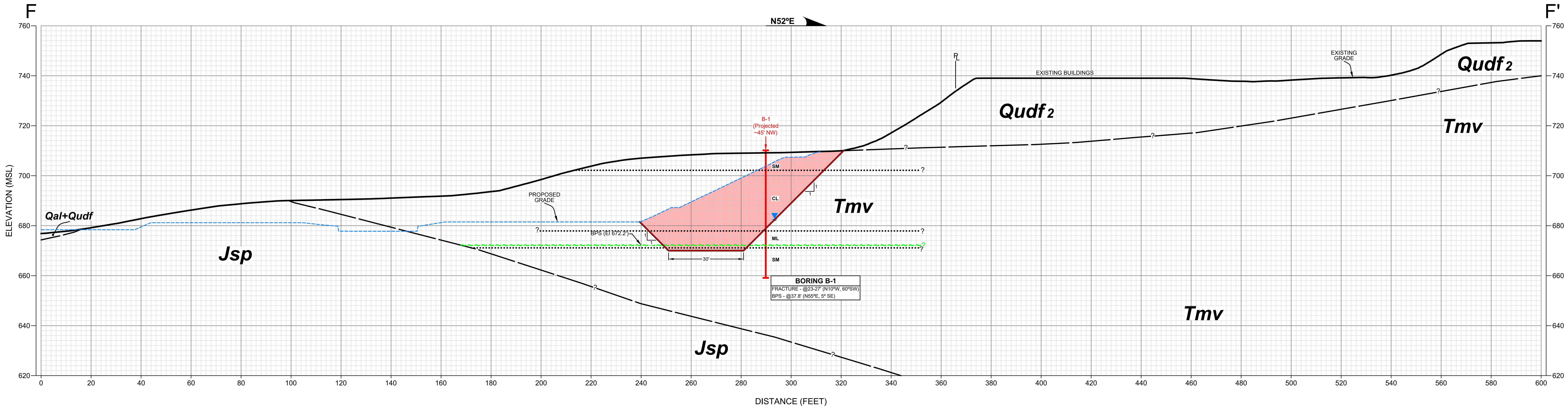
SCALE 1" = 40'	DATE 07 - 12 - 2019	
PROJECT NO. G2030 - 32 - 03		FIGURE 4
SHEET 3 OF 8		



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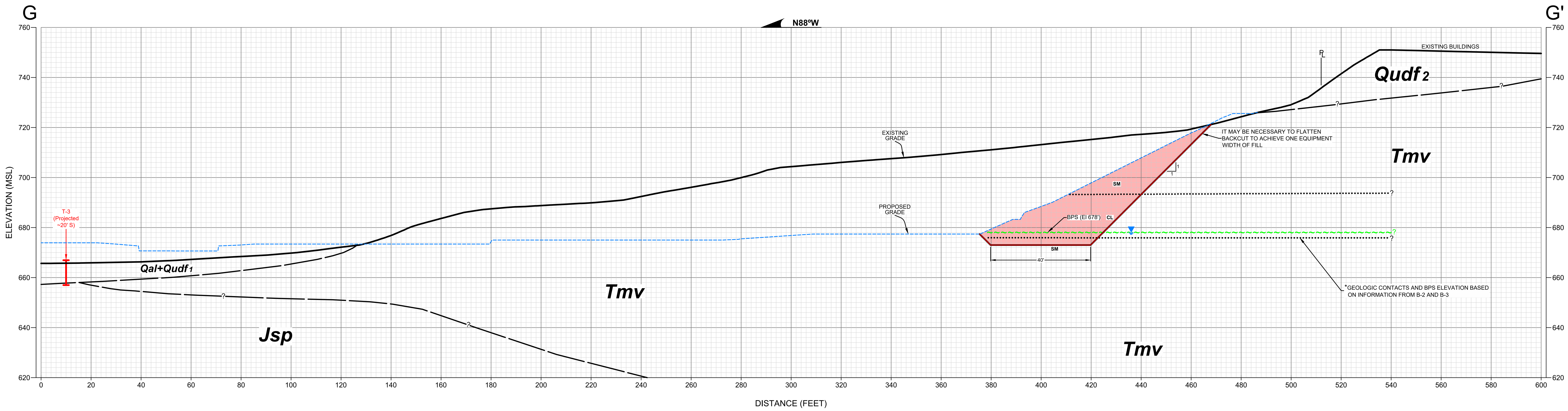

GEOLOGIC CROSS-SECTION G-G'

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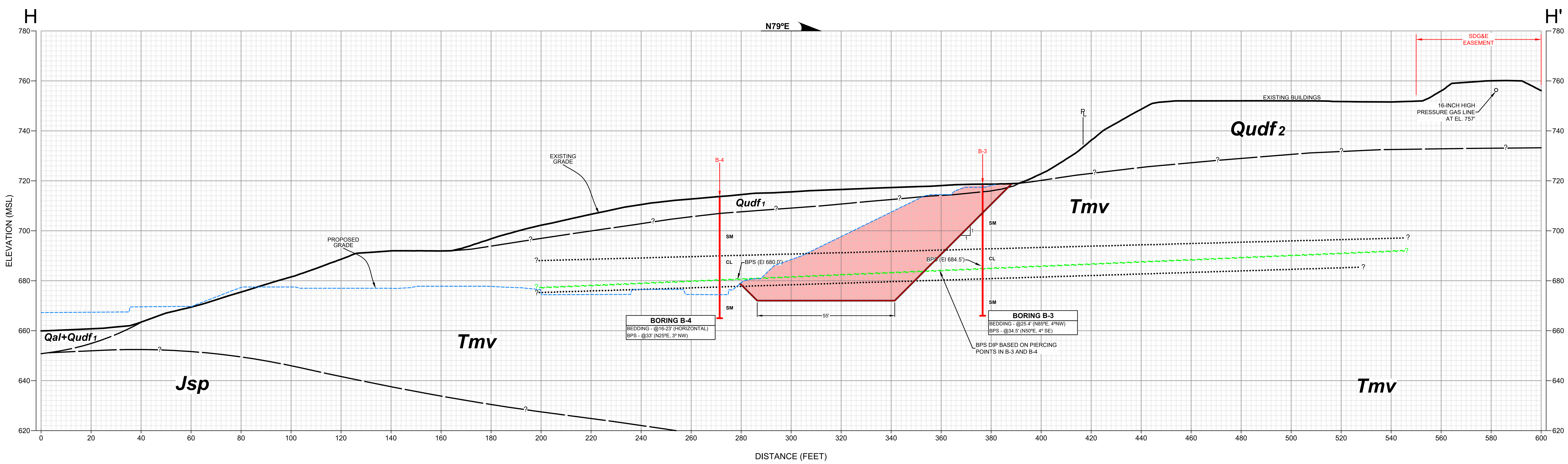

GEOLOGIC CROSS-SECTION H-H'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

- **Qudf 1** ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
- **Qudf 2** ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- **Qal** ....ALLUVIUM
- **Tmv** ....MISSION VALLEY FORMATION
- **Kgr** ....GRANITIC ROCK
- **Jsp** ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- T-3 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

THE JUNIPERS
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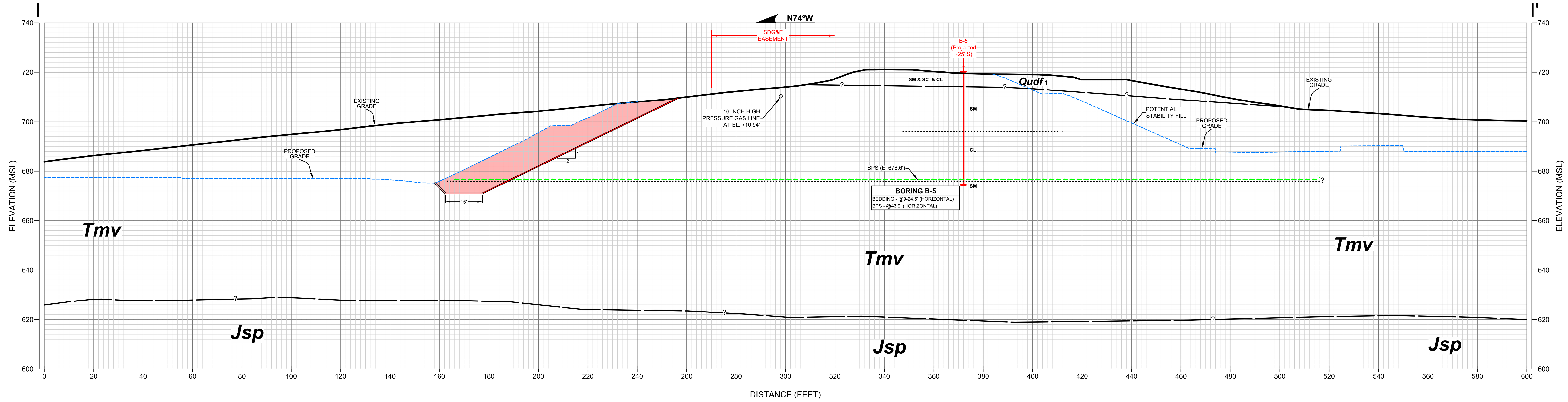
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 20'	DATE 07 - 12 - 2019	
PROJECT NO. G2030 - 32 - 03		FIGURE 5
SHEET 4 OF 8		



GEOLOGIC CROSS-SECTION I-I'

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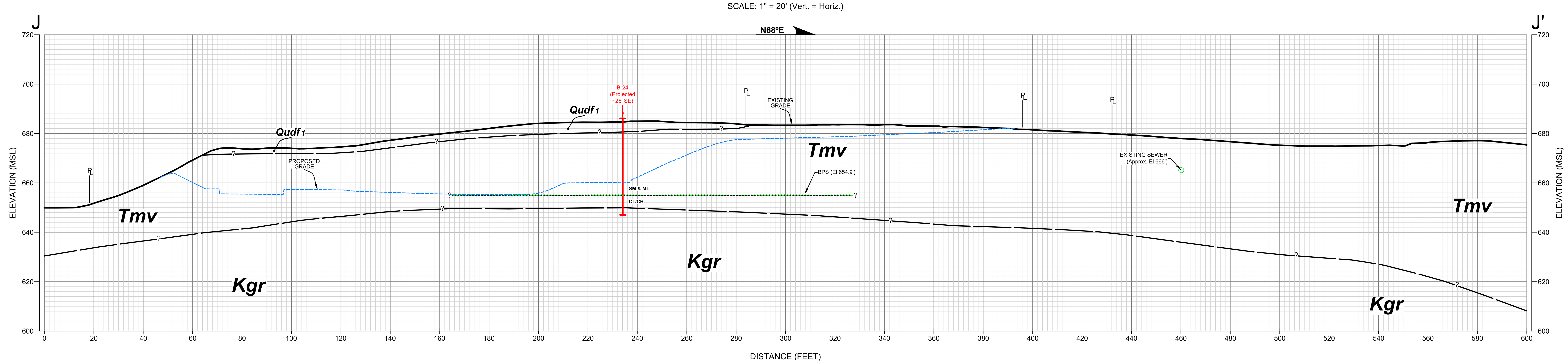

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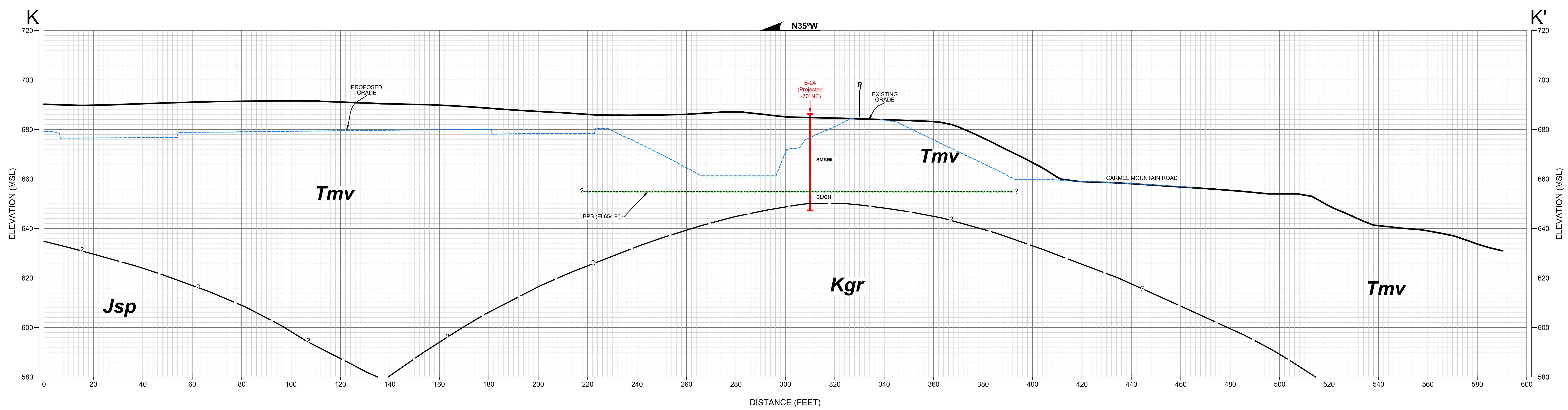

GEOLOGIC CROSS-SECTION K-K'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

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- **Qudf2** ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
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- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
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- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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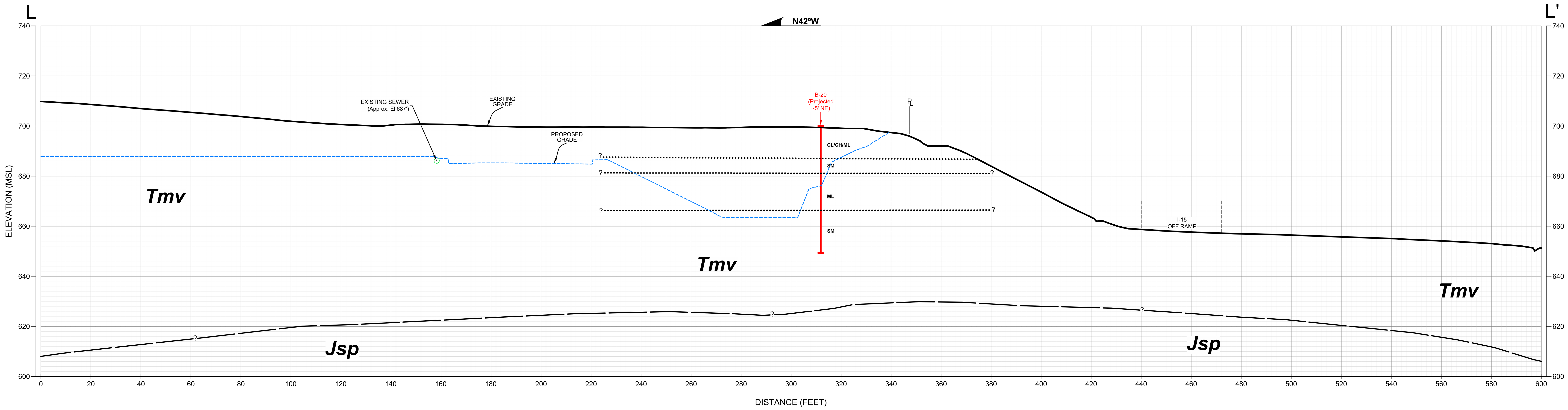
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 20'	DATE 07 - 12 - 2019
PROJECT NO. G2030 - 32 - 03	FIGURE 6
SHEET 5 OF 8	



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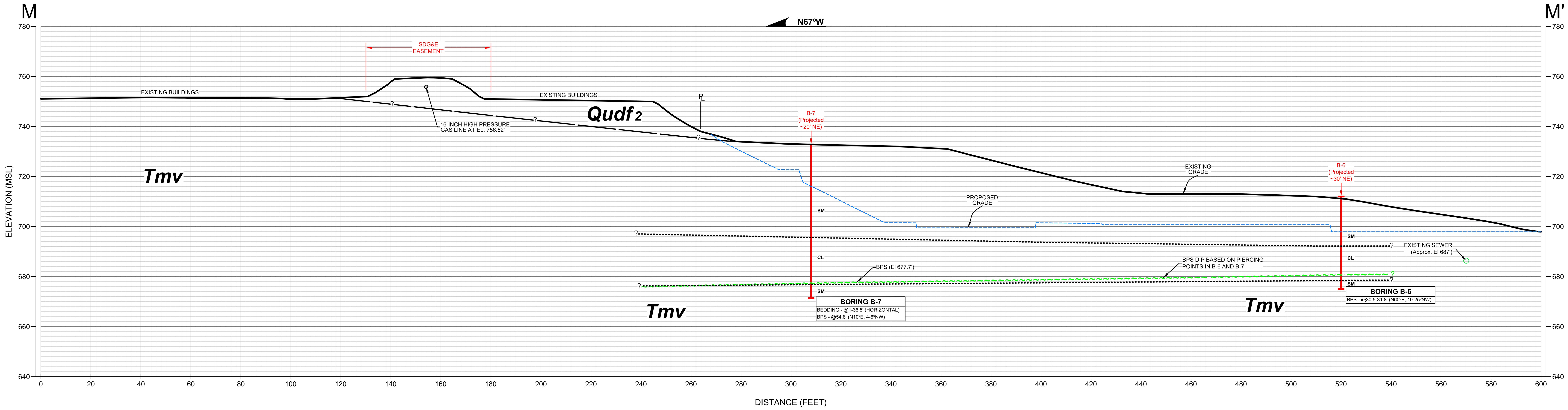

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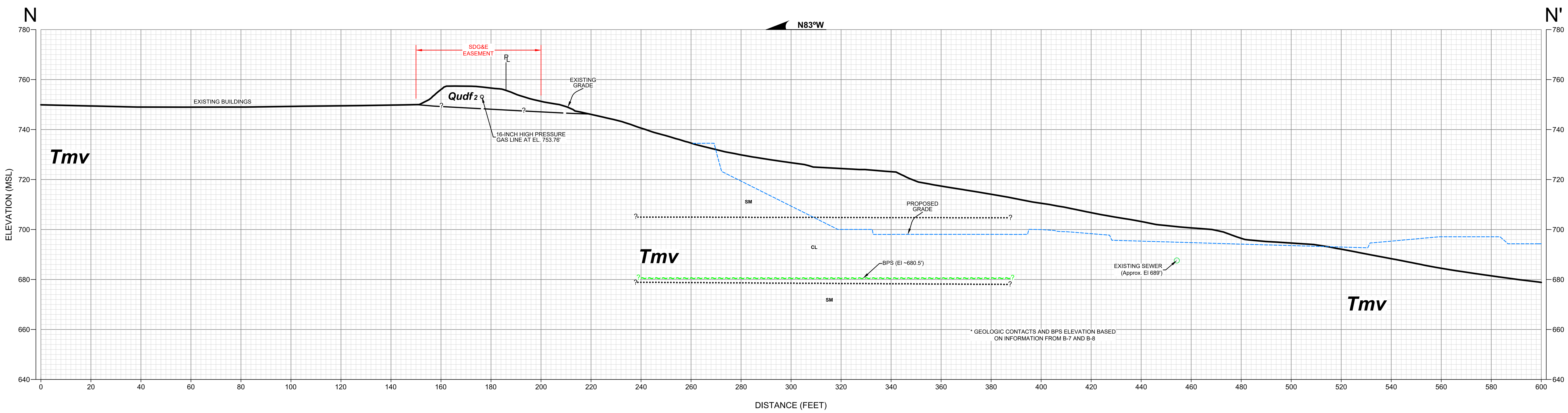

GEOLOGIC CROSS-SECTION N-N'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

- **Qudf 1** ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
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- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

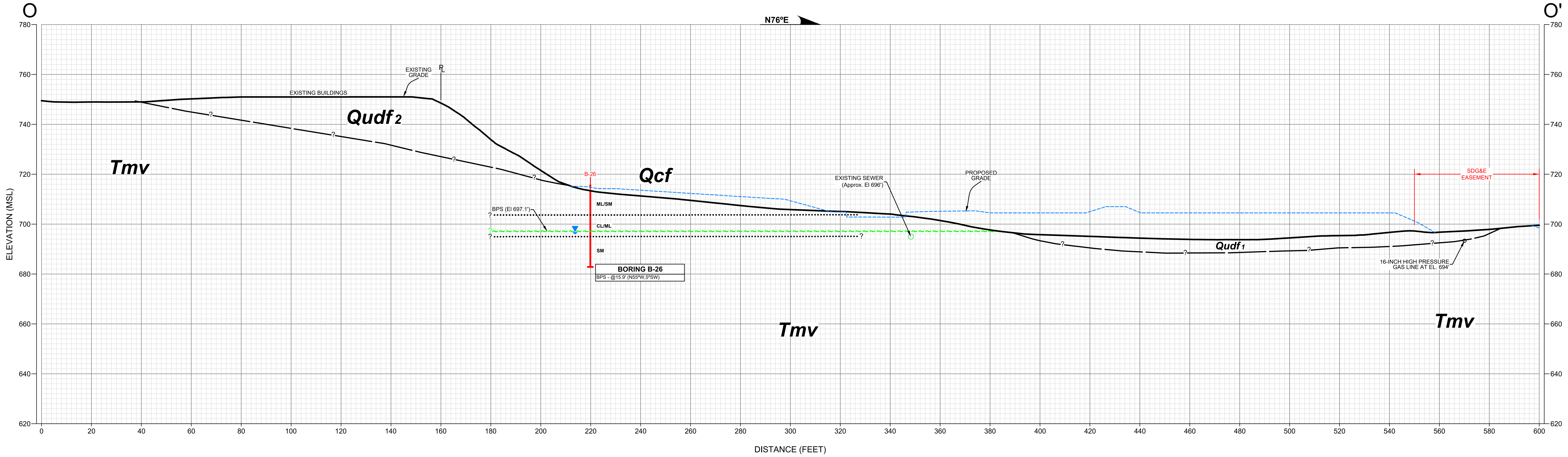
NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

THE JUNIPERS
SAN DIEGO, CALIFORNIA

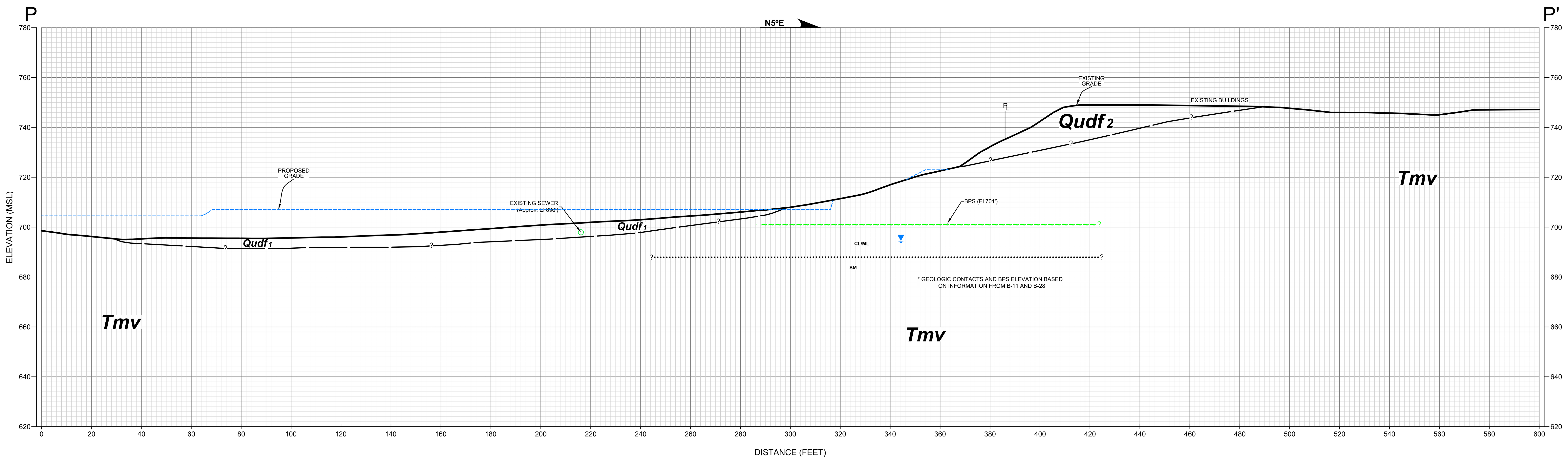
GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 20'	DATE 07 - 12 - 2019	
PROJECT NO. G2030 - 32 - 03		FIGURE 7
SHEET 6 OF 8		



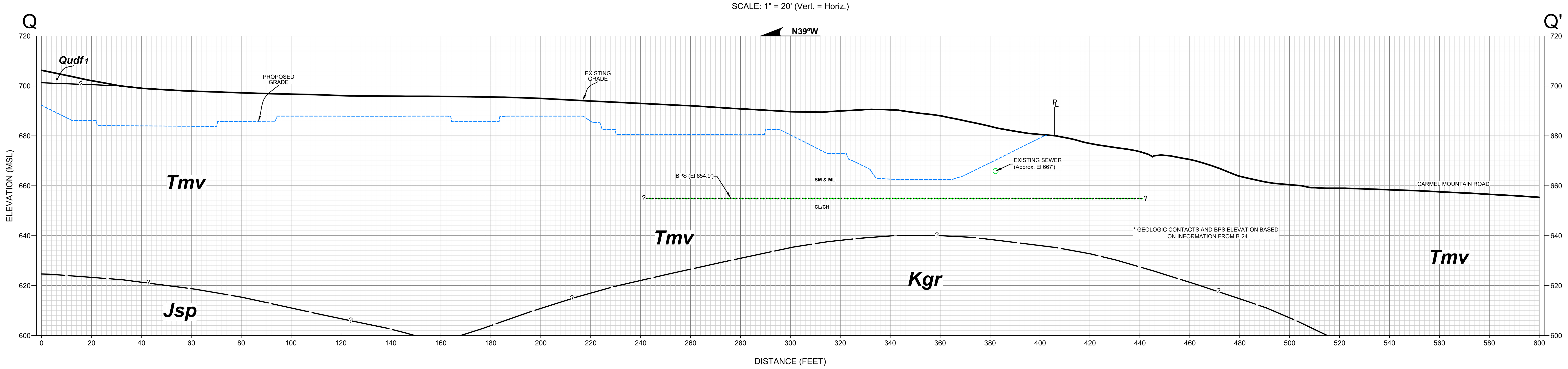
GEOLOGIC CROSS-SECTION O-O'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION P-P'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION Q-Q'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

- **Qudf 1** ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
- **Qudf 2** ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- **Qal** ....ALLUVIUM
- **Tmv** ....MISSION VALLEY FORMATION
- **Kgr** ....GRANITIC ROCK
- **Jsp** ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- T-3 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ? ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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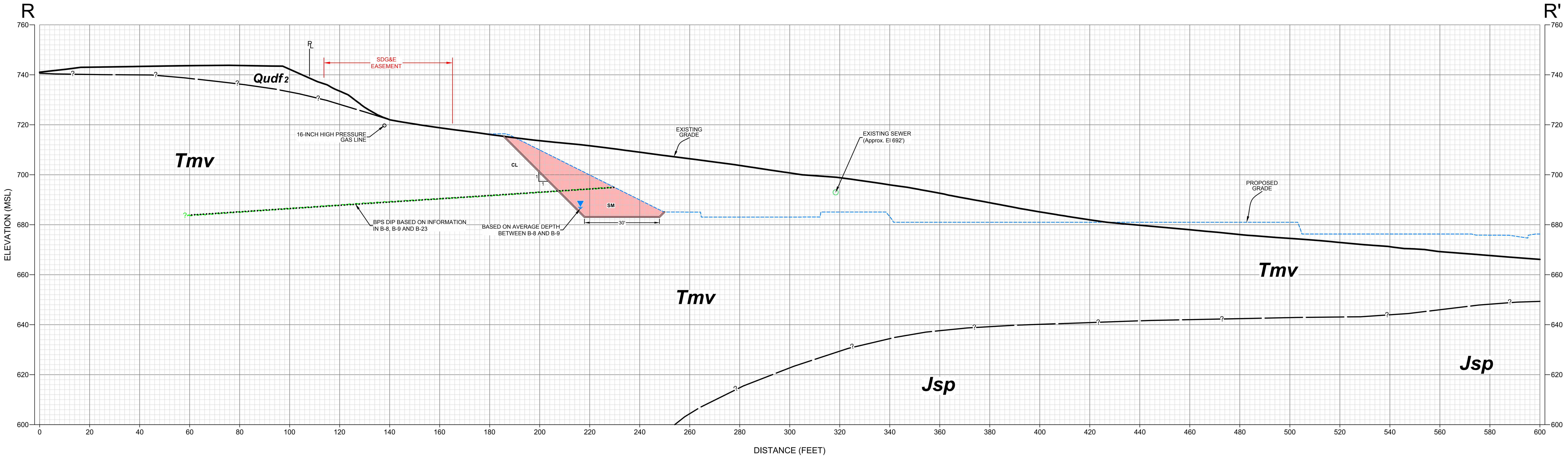
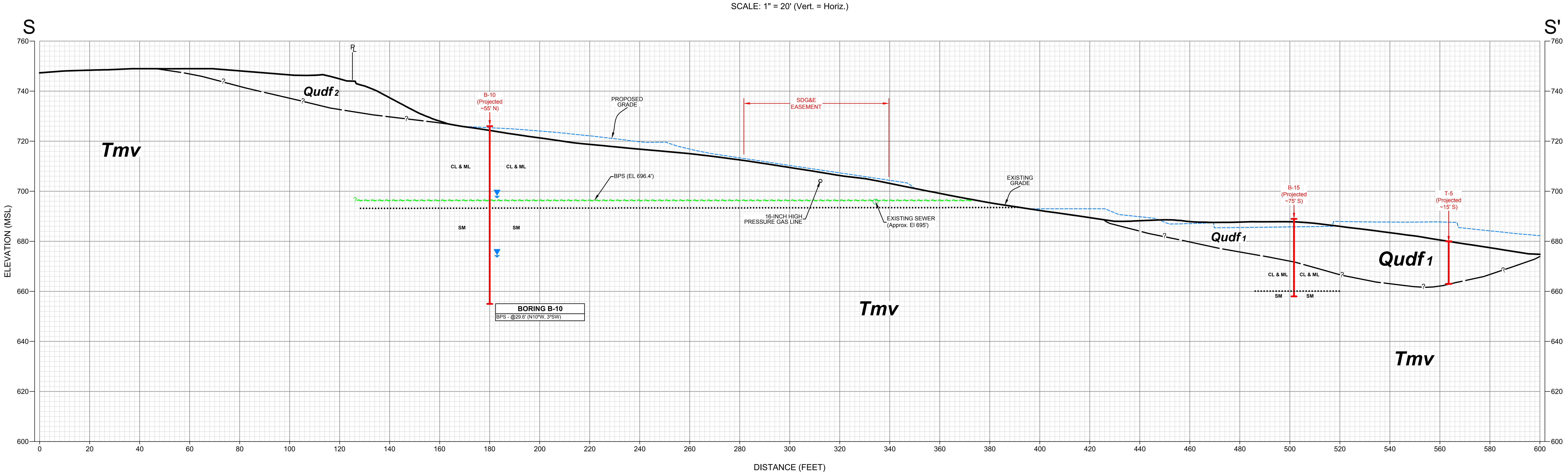
SCALE 1" = 20'	DATE 07 - 12 - 2019	
PROJECT NO. G2030 - 32 - 03		FIGURE 8
SHEET 7 OF 8		

Plotted:07/12/2019 7:10AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G2030-32-03 Junipers\SOURCE\SECTION\Profiles-Proposed&ExistingSurface8_20scale.dwg



GEOLOGIC CROSS-SECTION R-R'

SCALE: 1" = 20' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION S-S'

SCALE: 1" = 20' (Vert. = Horiz.)

GEOCON LEGEND

- **Qudf 1** ........UNDOCUMENTED FILL ASSOCIATED WITH GOLF COURSE (In General, Fills Over 5 Feet Thick Were Mapped)
- **Qudf 2** ........UNDOCUMENTED FILL ASSOCIATED WITH ADJACENT HOUSING DEVELOPMENT
- **Qal** ....ALLUVIUM
- **Tmv** ....MISSION VALLEY FORMATION
- **Kgr** ....GRANITIC ROCK
- **Jsp** ....SANTIAGO PEAK VOLCANICS
- B-23 ....APPROX. LOCATION OF LARGE DIAMETER BORING
- T-3 ....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-8 ....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY LEIGHTON (Aug 2014)
- ?........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- ....APPROX. LOCATION OF BEDDING PLANE SHEAR
- ....APPROX. LIMITS OF BUTTRESS/SHEAR KEY
- ....APPROX. LIMITS OF STABILITY FILL
- ....APPROX. DEPTH BELOW EXISTING GROUND SURFACE TO SEEPAGE/GROUNDWATER

NOTE: GAS LINE LOCATIONS PROVIDED BY HUNSAKER AND ASSOCIATES.

GEOLOGIC CROSS - SECTIONS

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SCALE	1" = 20'
DATE	07 - 12 - 2019
PROJECT NO.	G2030 - 32 - 03
SHEET	8 OF 8
FIGURE	9

The Junipers
Project No. G2030-32-03
Section R-R'
Name: RR-Case1.gsz
Date: 07/09/2019 Time: 03:21:15 PM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp - Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

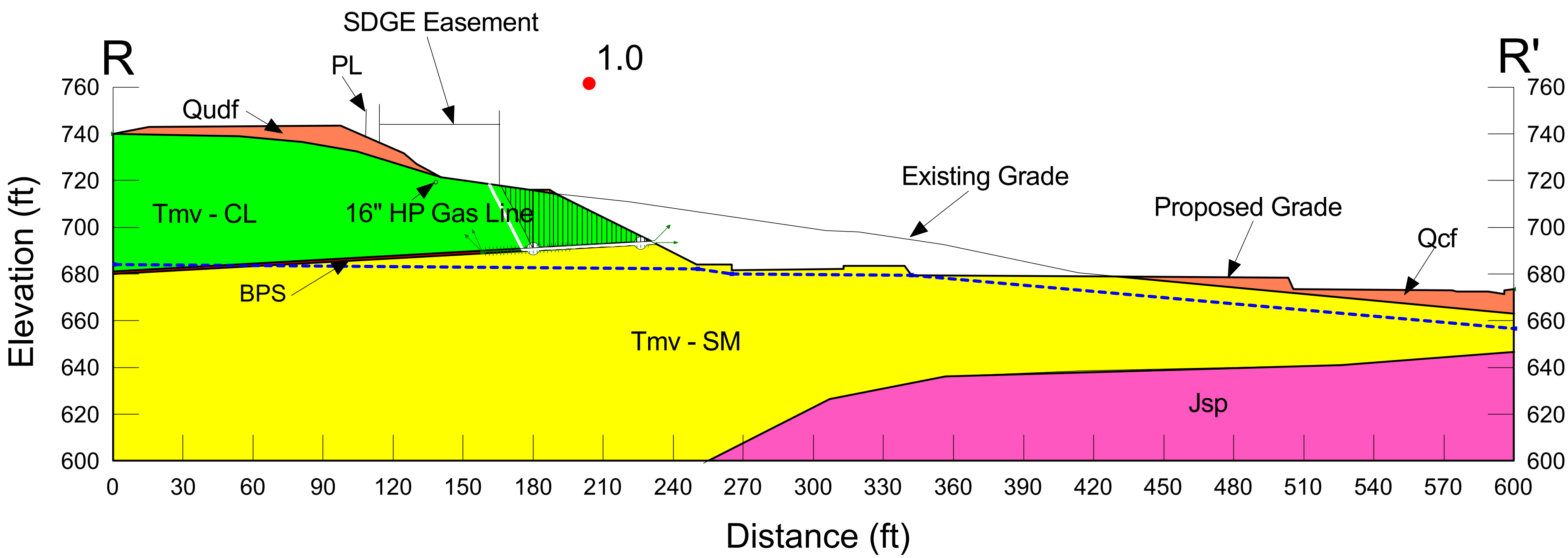

Figure 10

The Junipers
Project No. G2030-32-03
Section R-R'
Name: RR-Case2.gsz
Date: 07/09/2019 Time: 03:28:02 PM

Proposed Condition With Buttress Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Pink	Jsp - Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

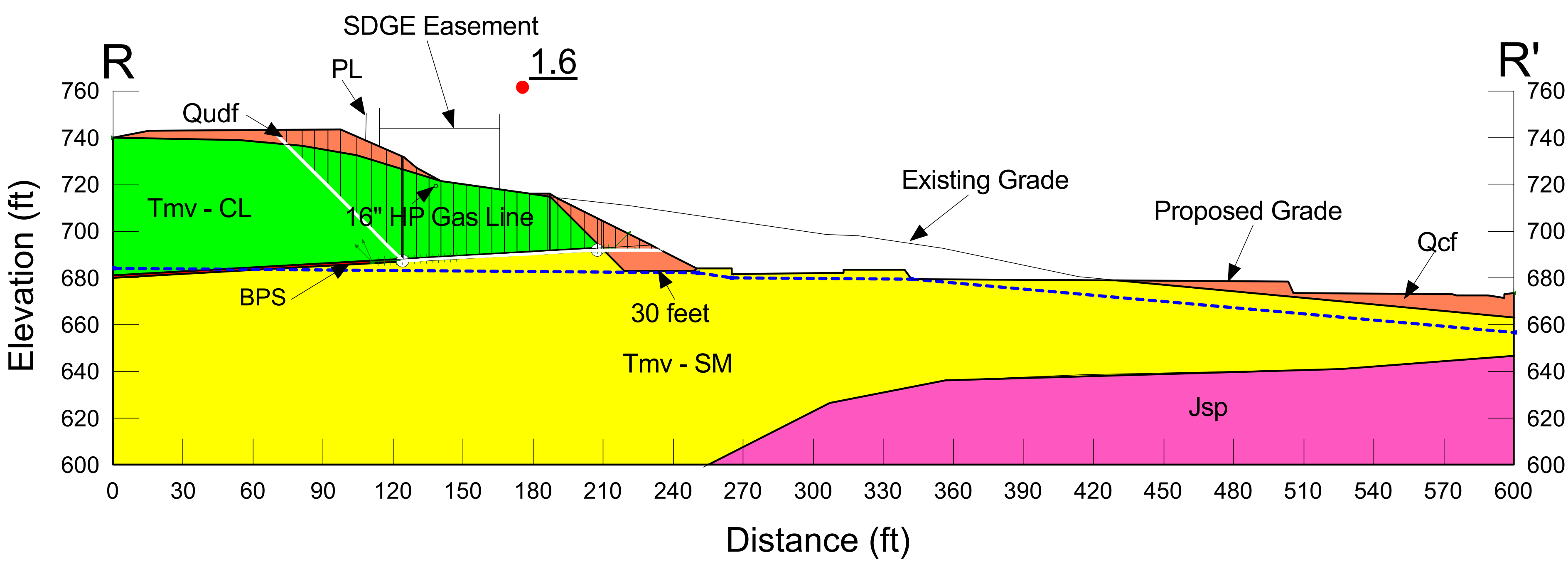

Figure 11

The Junipers
Project No. G2030-32-03
Section R-R'
Name: RR-Case2s.gsz
Date: 07/09/2019 Time: 03:30:59 PM

Proposed Condition With Buttress Seismic Analysis Keq=0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Red	BPS - Bedding Plane Shear	120	100	10
Magenta	Jsp - Santiago Peak Volcanics	130	500	35
Orange	Qcf - Compacted Fill	125	300	26
Green	Tmv-ML/CL- Mission Valley Formation Siltstone/Claystone	130	550	24
Yellow	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

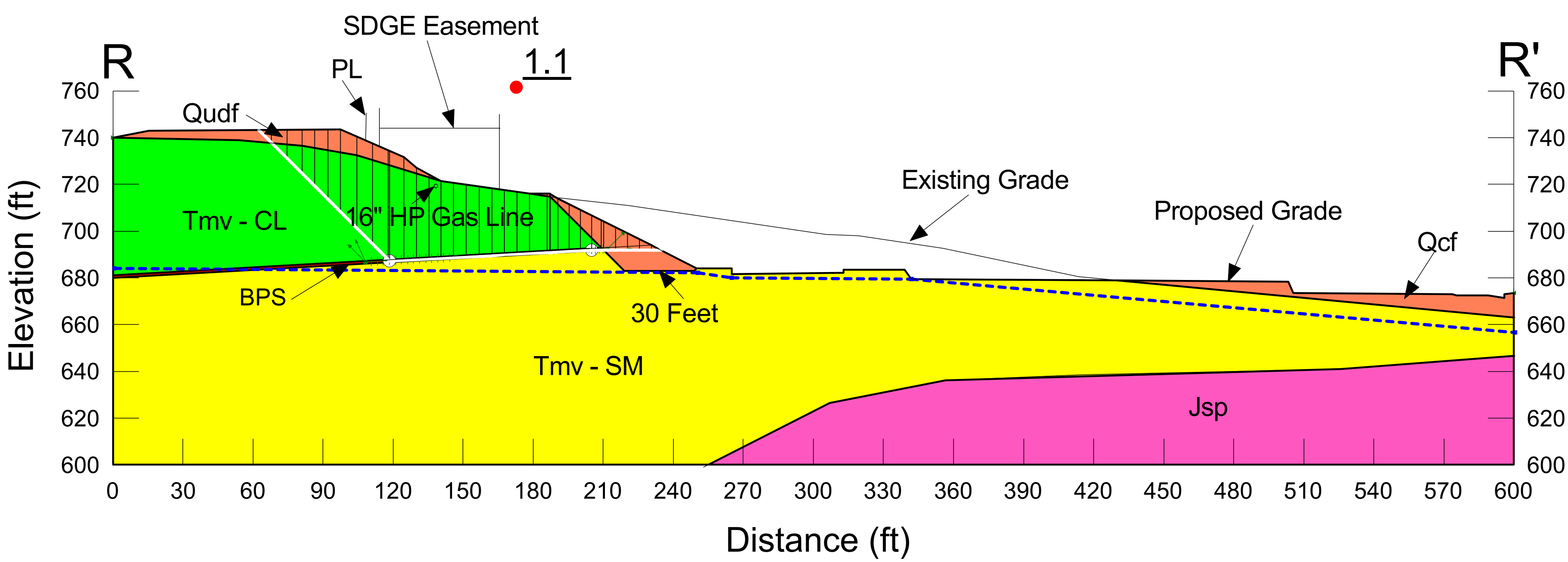

Figure 12

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	07/09/19		
Filename	RR-Case2s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.10

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA

Estimated Displacement, u (cm) NA

FIGURE 13

The Junipers
Project No. G2030-32-03
Section S-S'
Name: SS-Case1.gsz
Date: 07/09/2019 Time: 11:26:51 AM

Proposed Condition

Static Analysis

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(salmon)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

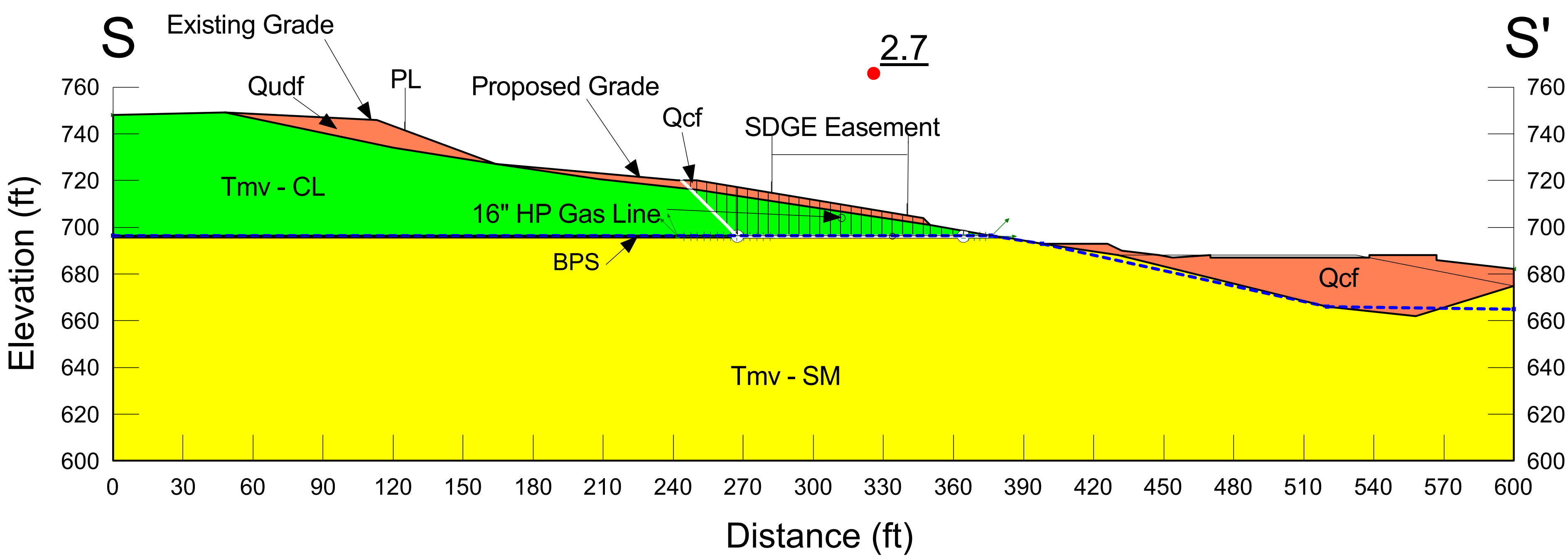

Figure 14

The Junipers
Project No. G2030-32-03
Section S-S'
Name: SS-Case1s.gsz
Date: 07/09/2019 Time: 03:39:34 PM

Proposed Condition

Seismic Analysis
keq = 0.135g

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
(red)	BPS - Bedding Plane Shear	120	100	10
(orange)	Qcf - Compacted Fill	125	300	26
(green)	Tmv-ML/CL- Mission Valley Formation Siltstone/Claystone	130	550	24
(yellow)	Tmv-SM- Mission Valley Formation Sandstone	130	500	38

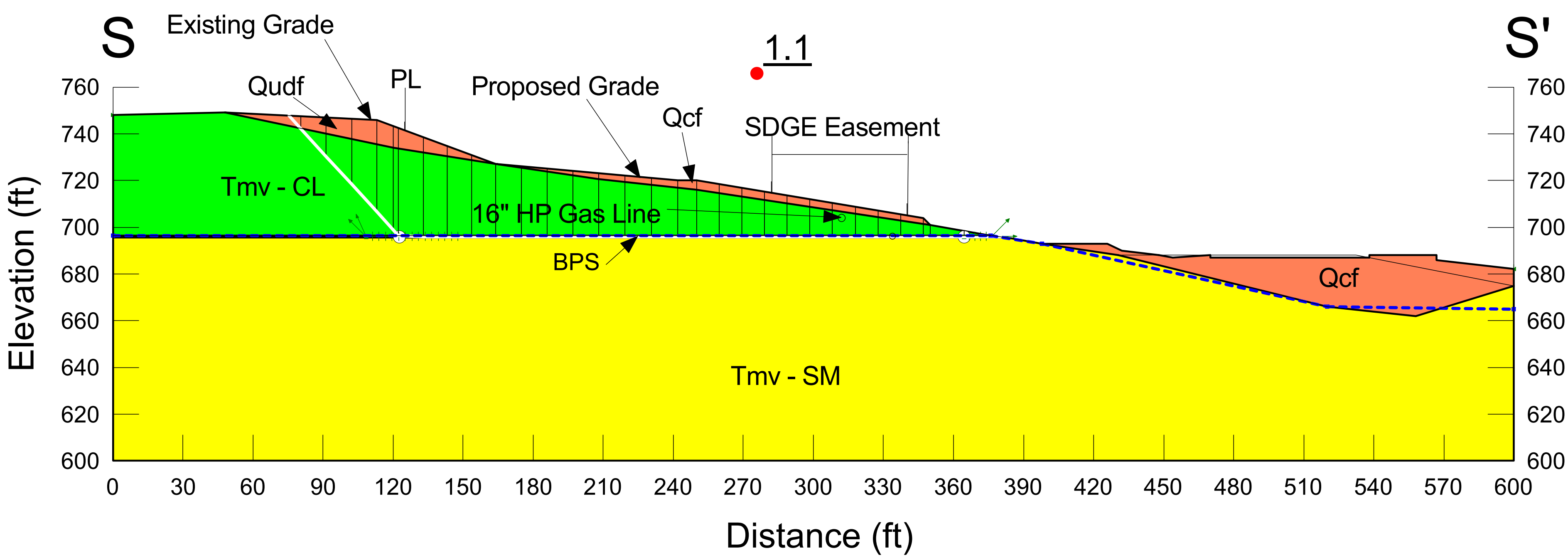

Figure 15

GEOCON

Seismic Slope Stability Evaluation

Input Data in Shaded Areas

Project	The Junipers	Computed By	TEM
Project Number	G2030-32-03		
Date	07/09/19		
Filename	SS-Case1s		

Peak Ground Acceleration (Firm Rock), MHA_r, g	0.19	10% in 50 years
Modal Magnitude, M	7.7	
Modal Distance, r, km	34.4	
Site Condition, S (0 for rock, 1 for soil)	1	
Yield Acceleration, k_y/g	NA	<-- Enter Value or NA for Screening Analysis
Shear Wave Velocity, V_s (ft/sec)	NA	<--
Max Vertical Distance, H (Feet)	NA	<--
Is Slide X-Area > 25,000ft^2 (Y/N)	N	<-- Use "N" for Buttress Fills
Correction for horizontal incoherence	1.0	
Duration, $D_{5\text{-}95}\|_{med}$, sec	29.206	
Coefficient, C_1	0.5190	
Coefficient, C_2	0.0837	
Coefficient, C_3	0.0019	
Standard Error, ε_T	0.437	
Mean Square Period, T_m, sec	0.689	

Initial Screening with MHEA = MHA = k_{max}g

k_y/MHA	NA
f_{EQ}(u=5cm) = (NRF/3.477)*(1.87-log(u/((MHA_r/g)*NRF*$D_{5\text{-}95}$)))	0.7036
k_{EQ} = feq(MHA_r)/g	0.135
Factor of Safety in Slope Analysis Using k_{EQ}	1.10

Passes Initial Screening Analysis

Approximation of Seismic Demand

Period of Sliding Mass, T_s = 4H/V_s, sec	NA
T_s/T_m	NA
MHEA/(MHA*NRF)	NA
NRF = 0.6225+0.9196EXP(-2.25*MHA_r/g)	1.22
MHEA/g	NA
k_y/MHEA = k_y/k_{max}	NA
Normalized Displacement, Normu	NA
Estimated Displacement, u (cm)	**NA**

FIGURE 16