March 12, 2020
File: 2980.001rpt.doc

Mr. Jeff Butler
255 North Sierra Street #1906
Reno, Nevada 89501

Re: Geotechnical Investigation – New Vineyard Development
Wild Horse Valley Road (APN 033-190-006)
Napa, California

Introduction

This letter summarizes the results of our Phase 1 Geotechnical Investigation for your planned new vineyard development along Wild Horse Valley Road (APN 033-190-006) in rural eastern Napa, California. A Site Location Map is presented on Figure 1. Our work has been performed in accordance with our Agreement for Professional Engineering Services dated February 4, 2020. The purpose of our Phase 1 services is to evaluate site geologic conditions and provide geotechnical recommendations and criteria for use in design and construction of the project. Secondarily, this report is intended to satisfy the guidelines presented in Attachment F of the Napa County Planning Department's Erosion-Control Permit Application package, entitled "Guidelines for Preparing Landslide Hazard Evaluations" (January 2017).

The scope of our Phase 1 services is outlined in our proposal letter dated February 3, 2020 and includes review of readily-available regional geologic mapping and geotechnical background data, subsurface exploration with a half-day of exploratory test pits, laboratory testing of recovered samples, geologic hazards evaluation, and development of recommendations and criteria for site grading, drainage, and other geotechnical items. Issuance of this letter completes our Phase 1 scope of services. Future phases of work could include supplemental investigation/consultation, geotechnical plan review, and/or observation and testing during construction.

Project Description

The proposed vineyard development includes a single vineyard block, encompassing a total of about 7.4-acres (and the majority of the parcel), which is sited east of Wild Horse Valley Road. The development area generally consists of moderately-steep, northeast-facing slopes.

Although no project details have been provided, we anticipate that project grading will be relatively minimal, limited generally to thin cuts and fills to create level avenues and soil ripping where new vines will be planted.

Regional Geology

Napa County lies within the Coast Ranges geomorphic province of California, a region characterized by active seismicity, steep, young topography, and abundant landsliding and erosion owing partly to its relatively high annual rainfall. The regional basement rock consists of sedimentary, igneous, and metamorphic rock of the Jurassic-Cretaceous age (65-190 million years ago) Franciscan Complex and marine sedimentary strata of the Great Valley Sequence, which is of similar age. Within central and northern California, the Franciscan and Great Valley rocks are locally overlain by a variety of late Cretaceous and Tertiary-age sedimentary and volcanic rocks which have been deformed by episodes of folding and faulting. The youngest geologic units in the region are Quaternary-age (last 1.8 million years) sedimentary deposits. These unconsolidated deposits partially fill many of the valleys of the region.

As shown on Figure 3, regional geologic mapping[1] indicates the site is underlain by the debris of a massive landslide, which extends from the ridgeline just west of the site (near the mapped trace of the active Green Valley Fault) down to the floor of Pleasant Valley, approximately 1.5-miles to the northeast (near the mapped trace of the potentially-active Cordelia Fault). The slide covers about 1,200 vertical feet of elevation and encompasses an area of approximately three square miles.

The main trace of the active Green Valley Fault is shown trending north-northeast, and passing approximately one mile west of the site. Several northwest-trending "splay" or secondary faults are shown projecting seast of the main trace, one of which is plotted extending through Sonoma Volcanics bedrock and passing just through the southwest corner of the property before becoming concealed beneath the slide debris.

<u>Site Reconnaissance and Geologic Mapping</u>

Site reconnaissance and geologic mapping was performed on February 4, 2020 by Mike Jewett, CEG (undersigned). Approximately four hours were spent walking the site for observation of conditions and geologic mapping, as well as for logging of subsurface test pits as described in a subsequent section of this report. Our geologic map of the site is shown on Figure 2, and the results of our mapping and reconnaissance are summarized in the following paragraphs.

The site is located generally along the southern crest of the Howell Mountains, with the southern parcel boundary lying coincident with the Napa-Solano County Line. The parcel is irregularly-shaped and elongated in the east-west direction, and consists primarily of northeast and east-facing slopes with a prominent level area in the central part of the site. Wild Horse Valley Road extends into the northeast corner and curves gently to the east, following the southern parcel boundary, before crossing into Solano County (and becoming Twin Sisters Road). Upslope of the parcel, adjoining lands to the south (in Solano County) are developed with existing vineyard and a small reservoir which lie in a broad, prominent depression bounded by steeper slopes to the east and west.

Surface elevations within the development area generally range from about +1,525 at the northeastern edge of the planned vineyard to a maximum of about +1,635-feet along the west-central edge. Natural slopes in the eastern and western parts of the site are typically inclined between about 3:1 (H:V) and 4:1, while grades in the central part of the site are generally level to gently-sloping. The proposed vineyard areas are currently undeveloped, and vegetation consists primarily of low grasses and other ground cover.

During our reconnaissance, we observed that surface soils and cut slope exposures along Wild Horse Valley Road in the western part of the site consist primarily of medium-stiff clays with occasional fragments of weathered volcanic rock. Soils in the eastern part of the parcel, including the level area north of the reservoir and the banks of the deeply-incised stream channel at the southeast corner of the parcel, contained significantly more gravel-size fragments of weathered

[1] Bezore, S.P., Sowers, J.M., and Witter, R.C. (2004), "Geologic Map of the Mt. George 7.5-Minute Quadrangle, Napa and Solano Counties, California: A Digital Database, Version 1.0", California Department of Conservation, California Geological Survey, Map Scale 1:24,000.

volcanic ash tuff rock. We did not observe any apparent in-situ bedrock outcrops within or near the development area, although the steeper slopes northeast of the site appear to be underlain by an assortment of welded lava flow rocks.

During our reconnaissance, we noted that topographic features and surface geologic conditions appear generally consistent with regional mapping. Specifically, we generally concur with the limits of the large landslide shown on Figure 3, and previous work by the author nearby to the northwest generally reflected the bedrock conditions and fault locations shown in that area. Although we interpret the site as being located near the head of a very large and likely ancient landslide, we did not observe any evidence during our reconnaissance of apparent smaller-scale historic or incipient (developing) instability or landsliding. Significant erosion and downcutting was noted in the drainage at the southeast corner of the site, but evidence of significant or unusual erosion was not observed elsewhere. Note that areas shown as map unit "Tvt" on Figure 2 are intended to represent a zone of relatively shallow rock material which may be entrained within the larger slide debris field.

<u>Subsurface Exploration and Laboratory Testing</u>

Subsurface conditions were explored at the site on February 4 with four test pits excavated at the approximate locations shown on Figure 2. Test pits were excavated to maximum depths between 42- and 66-inches, using a wheeled Deere 710G backhoe equipped with a 24-inch bucket and "rock" teeth. Soil and rock materials encountered were logged by our Geologist, and samples were collected at select locations for laboratory testing. Brief discussions of the terms and methodology used in classifying earth materials are shown on the Soil and Rock Classification Charts, Figures A-1 and A-2, respectively. Exploratory Test Pit Logs are shown on Figures A-3 through A-6.

Disturbed samples of soil and rock materials were collected from select test pits, and laboratory testing included determination of in-situ moisture content in general accordance with applicable ASTM standards. Moisture content test results are presented on the test pit logs, Figures A-3 through A-6. The subsurface exploration and laboratory testing program are discussed in further detail in Appendix A.

<u>Subsurface Conditions</u>

Subsurface conditions encountered in our test pits were generally consistent with regional and site-specific mapping discussed above. In general, the site appears to be underlain by landslide debris associated with ancient large-scale landsliding. On a more local scale, areas shown as map unit "Tvt" on Figure 2 are underlain at relatively shallow depth by weathered volcanic ash tuff rock, while areas shown as "Qols" are underlain by thicker clayey soil deposits.

Standing groundwater was measured at a depth of about 4.5-feet in Test Pit 1, and minor free water was encountered at a depth of about 2.5-feet in Test Pit 2. No groundwater was observed in Test Pits 3 and 4. However, since pits were not left open for an extended period of time, a stabilized depth to groundwater may not have been observed. Based on experience with similar sites in similar geologic environments, locally shallow or "perched" groundwater is common in areas of large-scale landsliding. We judge relatively shallow groundwater should generally be expected in the lower-lying part of the site and may exist elsewhere given our observations (taken during a notably dry "rainy season") and the location of the reservoir immediately upslope to the south.

Geologic Hazards Evaluation

We have considered a variety of geologic hazards which could affect the site. We judge that the primary hazards to be considered during project design include strong seismic shaking, fault surface rupture, slope instability, and erosion. Other hazards, such as settlement, flooding, liquefaction, and others are judged relatively insignificant with regard to the proposed work and are not discussed in detail. A brief summary of the significant hazards along with corresponding mitigation measures are presented below.

STRONG SEISMIC GROUND SHAKING

The site will likely experience seismic ground shaking similar to other areas in the seismically active San Francisco Bay Area. Earthquakes along several active faults in the region, as shown on Figure 4, could cause moderate to strong ground shaking at the site. Estimates of peak ground accelerations are based on either deterministic or probabilistic methods.

Deterministic methods use empirical relations developed from data collected during previous earthquakes to provide estimates of median peak ground accelerations. A summary of the active faults that could most significantly affect the site, their maximum credible magnitude, closest distance to the project area, and probable peak accelerations is provided in Table A.

TABLE A
DETERMINISTIC HAZARD ANALYSIS
ESTIMATED SEISMIC GROUND MOTIONS
Butler Vineyard
Napa, California

Fault	Moment Magnitude for Characteristic Earthquake [1]	Closest Estimated Distance (kilometers) [1]	Median Peak Ground Acceleration (g) [2,3]	84th Percentile Ground Acceleration (g) [2,3]
Green Valley	6.8	1.5	0.52	0.93
Cordelia	6.5	2.6	0.46	0.82
Great Valley	6.7	14.1	0.25	0.44

(1) Values determined using Caltrans ARS Online (2020) (web-based seismic acceleration spectra calculator tool), http://dap3.dot.ca.gov/ARS_Online/, accessed November 14, 2019.

(2) Values determined using Vs^{30} = 560 m/s for Site Class “C” (“Very Dense Soil and Soft Rock” Conditions) in accordance with the 2019 CBC and 2016 ASCE-7, which are applicable to most portions of the project site. Note actual ground accelerations may be higher or lower depending on the exact location and underlying geologic conditions.

(3) Values determined using Pacific Earthquake Engineering Research Center (PEER) NGA-West2 Excel Spreadsheet, http://peer.berkeley.edu/ngawest2/databases/.

(4) Distance to fault based on field mapping as shown on Figure 2.

The potential for strong seismic shaking at the project site is high. The Green Valley and Cordelia faults are the closest and most likely sources of significant future earthquakes. The most significant adverse impact resulting of strong seismic shaking with respect to the planned vineyard project is an increased risk of slope instability and subsequent damage to planted areas and associated improvements and structures.

Evaluation: *The risk of strong seismic shaking is high.*
Recommendations: *New structures (if planned) should be designed in accordance with the latest edition of the California Building Code. There is a low risk of seismically-induced instability, and we judge the proposed vineyard development will have no net effect on the likelihood of such an event. As such, no special engineering measures are recommended.*

SLOPE INSTABILITY

Regional geologic mapping (as shown on Figure 3) indicates that the site is underlain by the debris fields of a massive landslide which extends from the crest of the ridge down to the bottom of Wooden Valley, some 1.5-miles northeast of the site. During our site reconnaissance, we noted that topographic and site geologic conditions are generally consistent with massive landsliding. We note that the eastern part of the site, despite being mapped regionally as being underlain by slide debris, exposed variably-weathered bedrock at or near the surface, and as such the mapped slide (if it exists) is likely a very large bedrock block slide.

As discussed above, we did not observe any evidence of recent or incipient (developing) instability within the planned vineyard areas. The site appears underlain by variable soil and rock materials, and some risk of deep-seated or "global" landsliding may exist; however, we judge that the proposed grading and vineyard development will have a negligible effect on and will not increase the risk of such "global" instability.

We judge the risk of more localized instability at the site is high given the locally thick soils and variable bedrock/groundwater conditions. Steeper slopes in the eastern and northwestern parts of the site, which are underlain by thicker and/or loose and permeable soils, are judged to present a "moderate" risk of instability.

Evaluation: *Less than significant with mitigation.*
Recommendations: *Soil ripping should be limited in depth depending on the slope inclination and should be performed in no more than two directions to avoid complete degradation of soil structure and strength. Careful attention should be paid to design of finished grades to avoid diverting surface water from natural drainage paths and avoid areas of concentrated surface water runoff. New surface and subsurface drainage improvements should be considered on steeper slopes, especially in the northeast part of the site. More detailed recommendations for site grading, ripping, and drainage are provided in the Conclusions and Recommendations section of this report.*

EROSION

Surface soils in the western part of the site generally consist of stiff clays, which may be prone to erosion in steeply-sloping areas. The eastern part of the site is underlain by loose silty gravels which will be prone to erosion even on more moderate slopes. We anticipate the deeply-incised drainage at the southeast corner of the parcel is reflective of an ancient landslide (side) scarp, and note the channel also serves as the outfall for the reservoir to the south. As such, we judge such extreme erosion is not reflective of overall site conditions. However, we judge there is a moderate to high risk of erosion at the site, particularly on descending slopes in the northeast corner where looser, more permeable soils are present.

Evaluation: *The risk of damage due to erosion is moderate to high.*

Recommendations: *Careful attention should be paid to design of finished grades to avoid diverting surface water from natural drainage paths and avoid areas of concentrated surface water runoff. New surface and subsurface drainage improvements should be considered on steeper slopes, especially in the northeast part of the site. Erosion control measures implemented during and after construction should conform to the recommendations of the latest edition of the California Stormwater Quality Association (CASQA) Best Management Practices Handbook for New Development or similar standards. All disturbed areas should be seeded as soon as practical, and the site should be closely monitored throughout the winter months for signs of erosion or adverse drainage patterns. Additional discussion and recommendations for site drainage and erosion control are provided in the Conclusions and Recommendations section of this report.*

Conclusions and Recommendations

Based on our subsurface exploration, laboratory testing, and review of site geologic conditions, we judge that the proposed vineyard development is feasible from a geotechnical perspective. Primary geotechnical considerations for the project will include limiting soil ripping depth on steeper slopes and providing new drainage improvements to maintain or improve stability in areas prone to such hazards. Recommendations and criteria to address these and other geotechnical concerns are presented in the following sections.

Site Grading

Site grading within proposed vineyard blocks will be generally limited to “ripping” to facilitate new vine growth, and we understand no significant new cut or fill slopes are planned. Large rocks that remain following ripping (if encountered) may also be removed. We anticipate that thin local excavations and fills up to about one foot high could be needed to better “blend” site grades. Site grading should be performed in accordance with the following recommendations.

1. Surface Preparation – Clear all over-size debris, grass, brush, roots, and other organic matter from areas where grading is planned. Any construction debris or abandoned utilities should be removed from the site. All excavations for removal of boulders, or root balls, or other materials should be backfilled with compacted fill in accordance with subsequent sections in this report.

2. Excavations – Subsurface conditions at the site will generally include at least two feet of clayey to gravelly soil, which in the eastern part of the site overlies variably-weathered volcanic bedrock. Based on our exploration, we anticipate that while most of the onsite excavations can likely be accomplished with “traditional” equipment, such as medium-size dozers and excavators, it is possible that portions of the development area (particularly in

the eastern part of the site) will encounter harder or less-weathered rock that may heavier equipment (such as large dozers) or special techniques (jackhammers or hoe-rams) to excavate.

3. Fill Materials – Soil and rock mixtures generated from excavations in onsite soils may be suitable for re-use as new fill, provided it can be processed to meet the specifications presented below. Cobbles and boulders larger than about 18-inches should be removed and stockpiled for rip-rap armor or other use. All fill material should consist of soil and rock mixtures that: (1) are free of organic material, and (2) have a maximum particle size of 18-inches.

4. Fill Compaction and Soil Ripping – Given the ultimate intended (vineyard) land use and limited fill thickness, we judge that relatively cursory compaction operations are sufficient for the majority of the work. To limit the potential for future erosion and slope instability, we recommend that, following rough grading, finish grading should include track-walking disturbed slopes in an upslope-downslope direction. Soil ripping should be performed in no more than two directions to avoid complete obliteration of soil structure in sloping areas.. To reduce the risk of instability, we recommend soil ripping be limited to a depth of about 24-inches where slopes exceed 5:1, and a depth of about 36-inches in other areas. If sufficient water is available, a cover crop should be planted immediately following soil ripping; alternatively, erosion-control mats or jute netting may be used to limit erosion in steeper areas.

Geotechnical Site Drainage

Based on our observations, and although the site appears to generally drain well currently, we judge there may be increased risks of erosion and shallow instability following soil sipping and vineyard development, particularly where shallow groundwater may coincide with sloping areas and loose, erodible soils.

The risks of erosion and instability may be reduced via construction of new subsurface drainage improvements. Specifically, slopes west of Wild Horse Valley Road which are underlain by clayey soils and slopes in the northeast corner of the parcel underlain by loose, gravelly material should be provided with new “herringbone” or terrace subdrains to improve stability. In these areas, perforated subdrains should be provided at maximum 25-foot vertical intervals and discharged via solid pipe to an area unlikely to result in significant erosion, ideally into an established drainage channel. New subdrains should be excavated generally as deep as practical, and ideally at least a few inches into competent bedrock. A typical detail for herringbone drain construction is shown on Figure 5.

As plans are being developed, we will consult with the Civil Engineer regarding surface and subsurface drainage but, in general, drainage discharge ideally would be directed into the established channel at the southeast corner of the site. A plan illustrating conceptual subdrain layout is shown on Figure 6.

Supplemental Services

Supplemental services are anticipated to include geotechnical consultation and plan review during preparation of project construction and erosion-control plans. If significant new structures or fill slopes are incorporated into the plans, we should be consulted to provide supplemental recommendations. We should also be present intermittently during construction of new improvements to determine whether the work is performed in accordance with the intent of our recommendations.

We trust that this letter contains the information you require at this time; please call us if there are any questions or if we can be of further assistance.

Yours very truly,
MILLER PACIFIC ENGINEERING GROUP

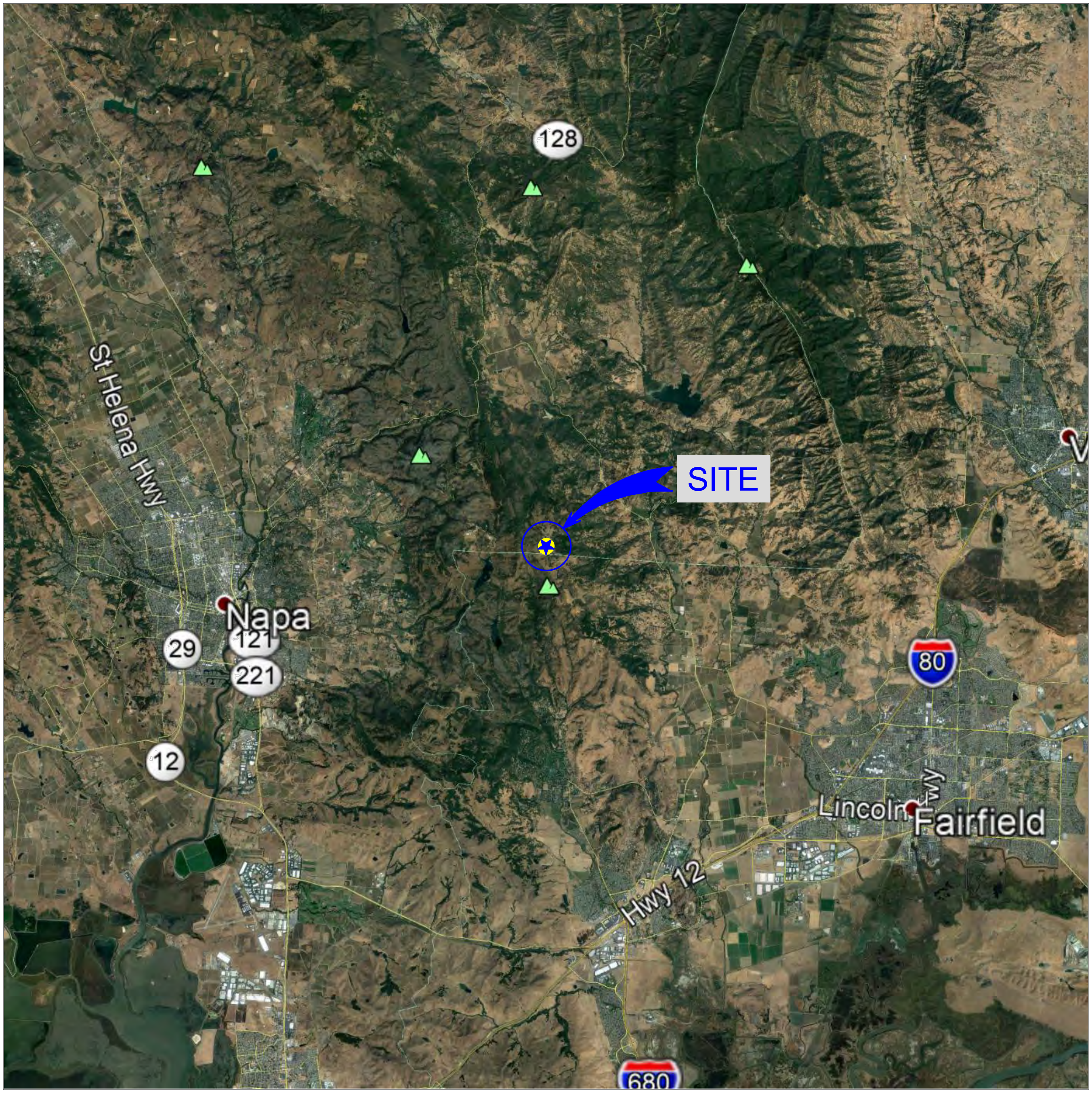
REVIEWED BY:

Mike Jewett
Engineering Geologist No. 2610
(Expires 1/31/21)

Michael Morisoli
Geotechnical Engineer No. 2541
(Expires 12/31/20)

Attachments: Figures 1-6, Appendix A

Cc: Omar Reveles, Acme Engineering



SITE COORDINATES
LAT. 38.3161°
LON. -122.1692°

SITE LOCATION
N.T.S.

NORTH

REFERENCE: Google Earth, 2020

MPEG MILLER PACIFIC ENGINEERING GROUP

FILENAME: 2980.001Figures.dwg

504 Redwood Blvd.
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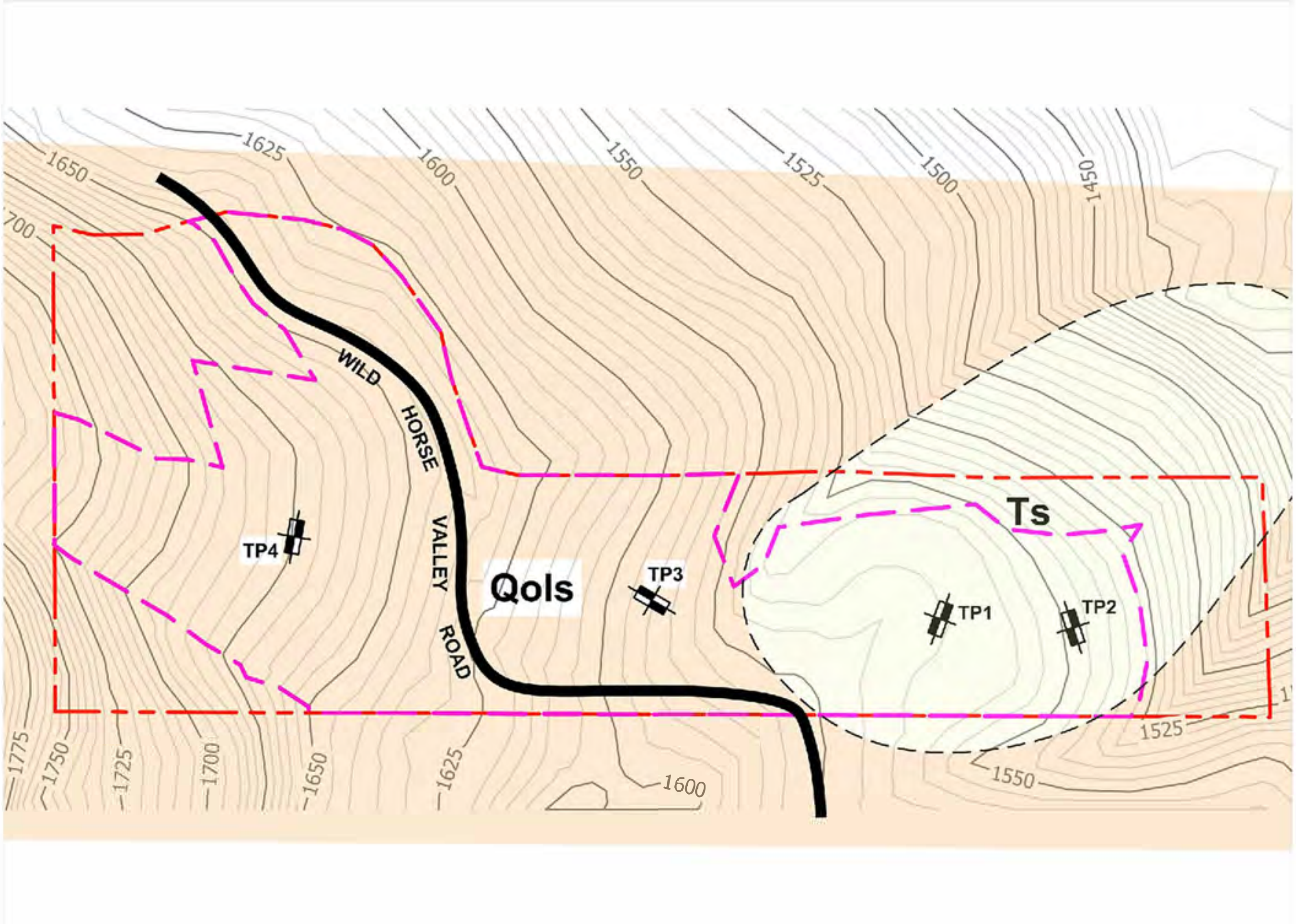
SITE LOCATION MAP

Butler Vineyard Development
APN 033-190-006
Napa, California

Project No. 2980.001 Date: 3/5/2020

Drawn MFJ
Checked

1
FIGURE



SITE PLAN AND GEOLOGIC MAP

SCALE

0 100 200 400 FEET

NORTH

Qols LANDSLIDE DEBRIS (HOLOCENE-PLEISTOCENE?)
Displaced, variably intact masses of soil and bedrock. Interpreted as ancient, likely seismically-induced landslide resulting of earthquakes and related processes in the Green Valley and/or Cordelia Fault Zones.

Tvt ASH TUFF (TERTIARY)
Densely-welded ash-lapilli tuff, typically buff to light gray, varies from moderately to completely weathered. Within map area, unit likely represents displaced bedrock mass within larger (ancient) landslide debris field.

- Geologic contact, dashed where approximate
- Approximate proposed vineyard boundary
- Approximate parcel boundary
- Test pit by Miller Pacific (2020)

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SITE PLAN AND GEOLOGIC MAP

Butler Vineyard Development
APN 033-190-006
Napa, California

Project No. 2980.001 Date: 3/5/2020

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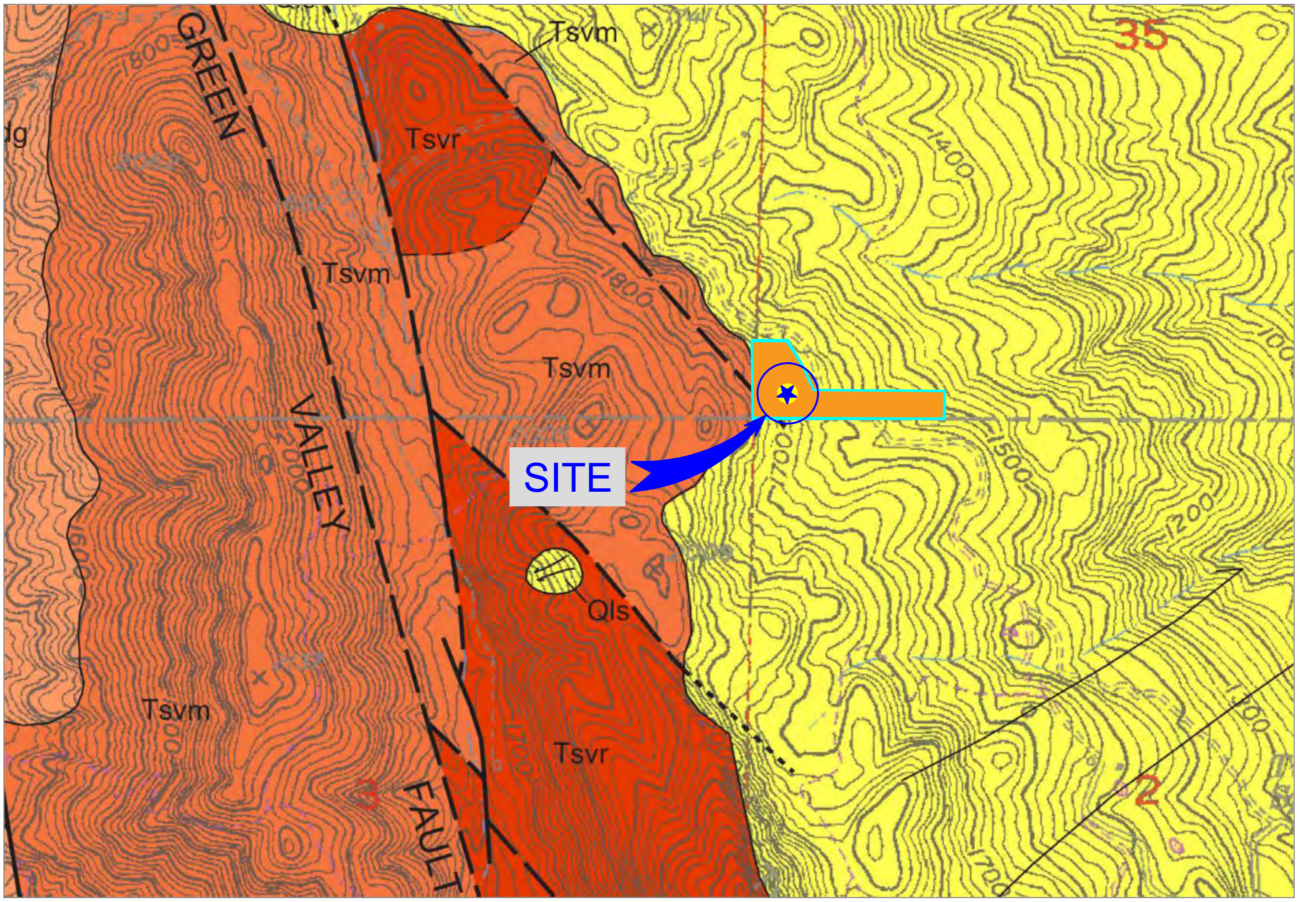
2
FIGURE



REGIONAL GEOLOGIC MAP

NORTH

LEGEND:

Qls	**Landslide Deposits (Holocene and Pleistocene) -** Includes debris flows and block slides.
Tsvr	**Rhyolite Ash Flow Tuff -** Black vitrophyre with angular lithic clasts overlying welded tuff with flattened pumice lapilli and unwelded pumice lapilli tuff.
Tsvdg	**Dacite of Mt. George -** Flows, domes, and shallow intrusion of gray and tan porphyritic dacite that is typically strongly flow banded.
Tsvm	**Mafic Flows and Breccias -** Basalt, basaltic andesite, and andesite flows and breccias, interbedded with volcanic agglomerate and tuff.
———	**Geologic Contact -** Solid where accurately located, dashed where approximate, and dotted where concealed.
— — —	**Fault -** Solid where accurately located, dashed where approximate, and dotted where concealed.
———	**Approximate Parcel Boundary**

Reference: Bezore, Stephen P., et al, (2004), "Geologic Map of the Mt. George 7.5' Quadrangle, Napa and Solano Counties, California: A Digital Database," California Department of Conservation, California Geological Survey, Scale 1:24,000.

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REGIONAL GEOLOGIC MAP

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Project No. 2890.001 Date: 3/5/2020

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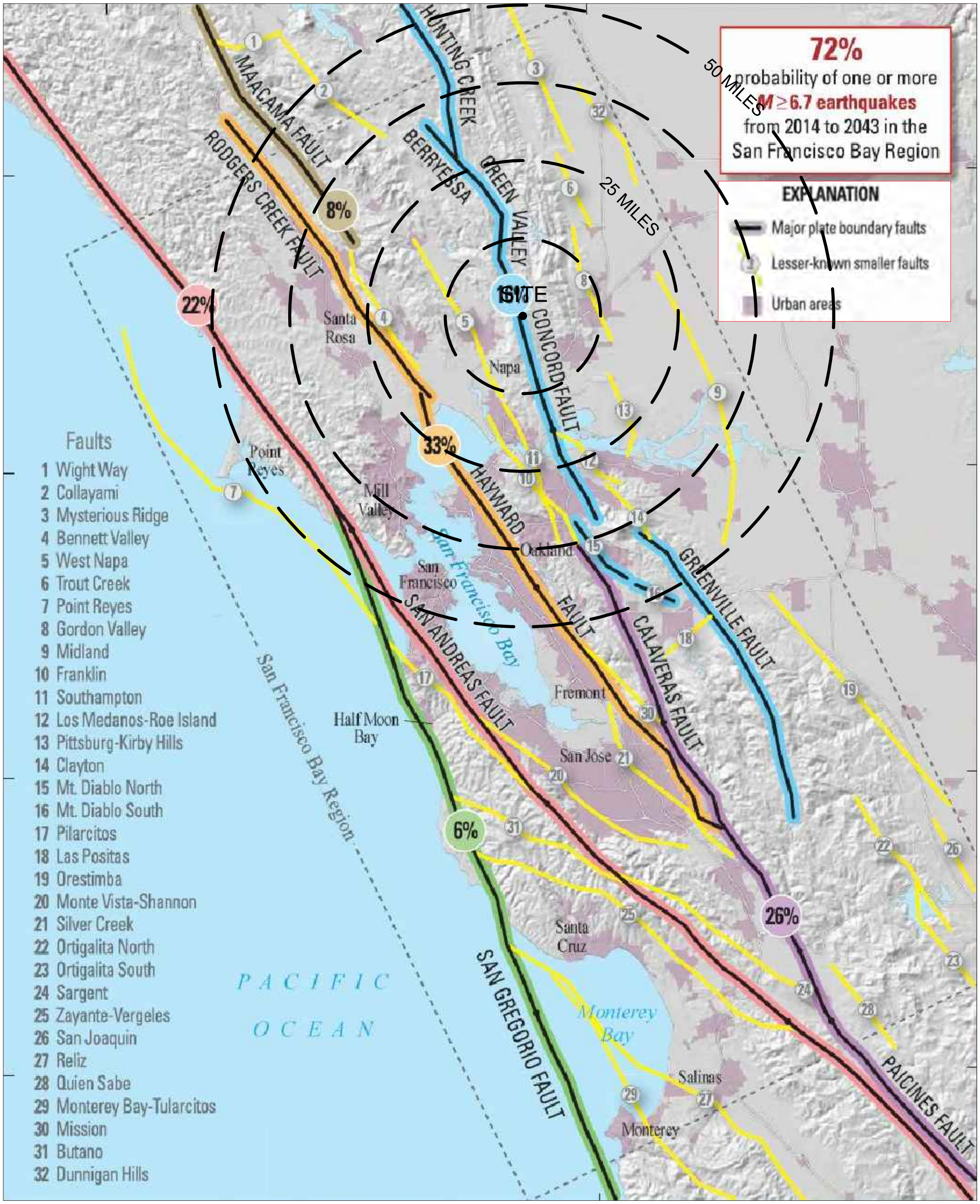
3
FIGURE



SITE COORDINATES
LAT. 38.3161°
LON. -122.1692°

SCALE
0 12.5 25 50 MILES

NORTH

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ACTIVE FAULT MAP

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Project No. 2890.001 Date: 11/15/2019

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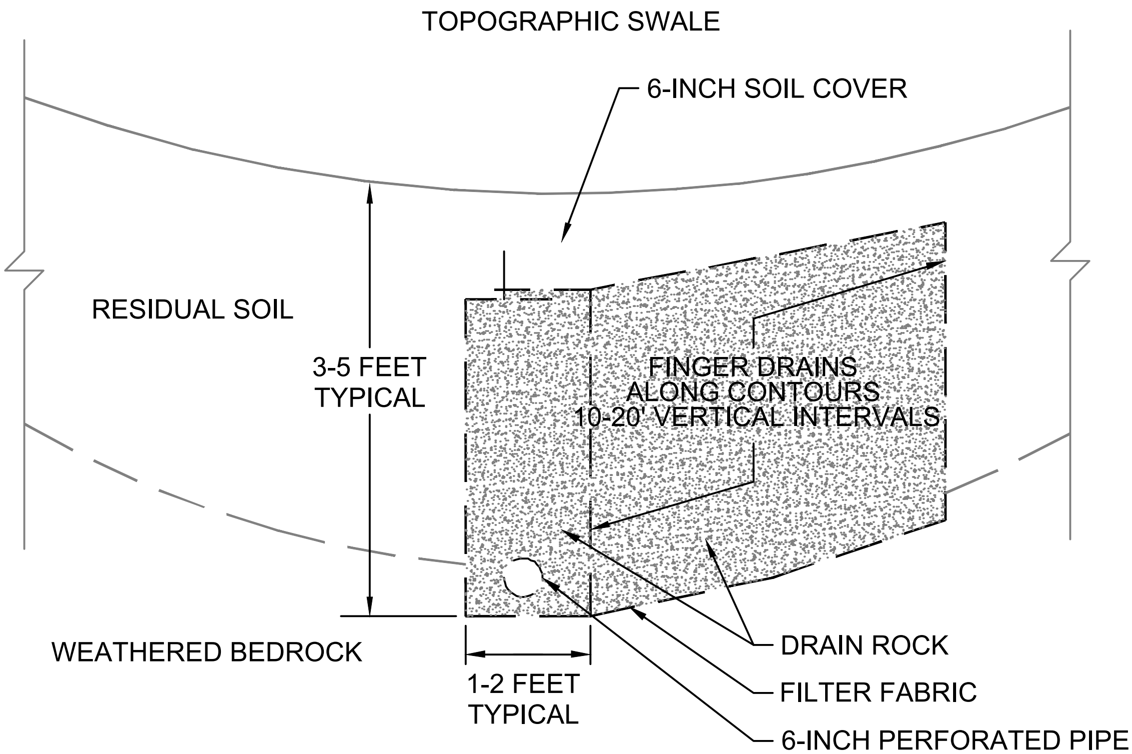
4
FIGURE



NOTES:

(1) PIPE TO BE 6-INCH DIAMETER, PERFORATIONS DOWN, S=0.02 MIN., WITH TIGHT PIPE TO GRAVITY DISCHARGE

(2) FILTER FABRIC TO BE MIRAFI 140N

(3) PERMEABLE MATERIAL TO BE CALTRANS CLASS 1A OR 1B

(4) USE SWEEPS FOR ALL SUBDRAIN BENDS/ELBOWS

TYPICAL DETAIL TRENCH SUBDRAIN

(NO SCALE)

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TYPICAL HERRINGBONE SUBDRAIN CONSTRUCTION

Butler Vineyard Development
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Napa, California

Project No. 2980.001 Date: 3/10/2020

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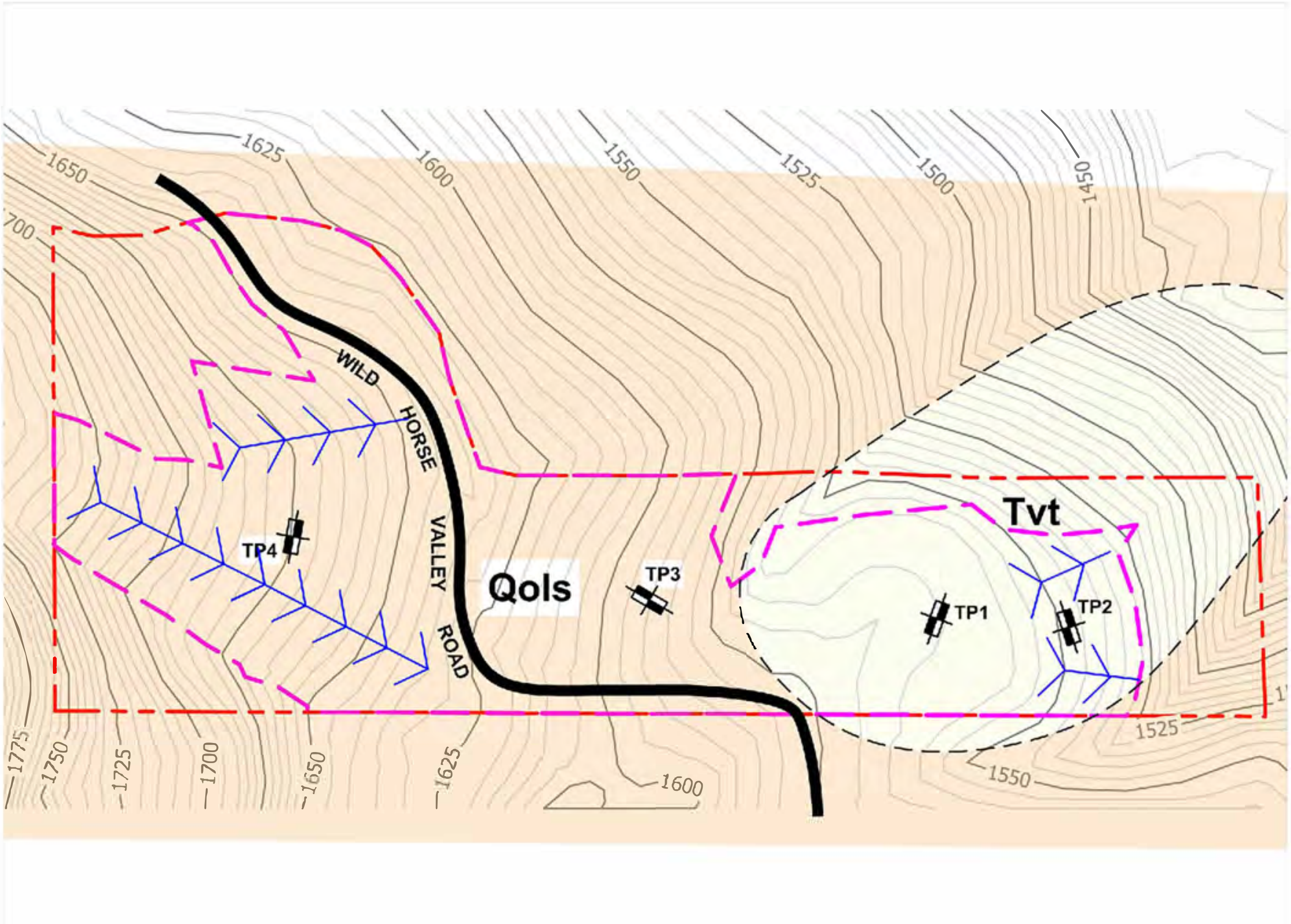
5
FIGURE



CONCEPTUAL SUBDRAIN PLAN

SCALE

0 100 200 400 FEET

NORTH

Qols LANDSLIDE DEBRIS (HOLOCENE-PLEISTOCENE?)
Displaced, variably intact masses of soil and bedrock. Interpreted as ancient, likely seismically-induced landslide resulting of earthquakes and related processes in the Green Valley and/or Cordelia Fault Zones.

Tvt ASH TUFF (TERTIARY)
Densely-welded ash-lapilli tuff, typically buff to light gray, varies from moderately to completely weathered. Within map area, unit likely represents displaced bedrock mass within larger (ancient) landslide debris field.

- Conceptual Subdrain Location/Alignment
- Geologic contact, dashed where approximate
- Approximate proposed vineyard boundary
- Approximate parcel boundary
- Test pit by Miller Pacific (2020)

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CONCEPTUAL SUBDRAIN LAYOUT PLAN

Butler Vineyard Development
APN 033-190-006
Napa, California

Project No. 2980.001 Date: 3/5/2020

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6
FIGURE

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APPENDIX A

SUBSURFACE EXPLORATION AND LABORATORY TESTING

A. Soil and Rock Classification Systems

We explored subsurface conditions at the site with four exploratory test pits excavated on February 4, 2020. Test pits were excavated to depths between about 42- and 66-inches below the ground surface by use of a Deere 710G backhoe equipped with a 24-inch bucket.

The soils encountered were logged and identified by our field geologist in general accordance with ASTM Standard D 2487, "Field Identification and Description of Soils (Visual-Manual Procedure)." This standard is briefly explained on Figure A-1, Soil Classification Chart and Key to Log Symbols and Figure A-2, Rock Classification Chart. The exploratory test pit logs are presented on Figures A-3 through A-6.

B. Laboratory Testing

We conducted laboratory tests on selected “grab” samples to verify field identifications and to evaluate engineering properties. Samples were examined in the field, sealed to prevent moisture loss, and carefully transported to our laboratory. The following laboratory tests were conducted in in general accordance with the ASTM standard test method cited:

- Laboratory Determination of Water (Moisture Content) of Soil, Rock, and Soil-Aggregate Mixtures, ASTM D 2216;

Moisture content test results are shown on the exploratory test pit logs, Figures A-3 through A-6. The exploratory test pit logs, description of soils encountered and the laboratory test data reflect conditions only at the location of the excavation at the time they were excavated or retrieved. Conditions may differ at other locations and may change with the passage of time due to a variety of causes including natural weathering, climate, and changes in surface and subsurface drainage.

MAJOR DIVISIONS		SYMBOL	DESCRIPTION
COARSE GRAINED SOILS over 50% sand and gravel	CLEAN GRAVEL	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
	GRAVEL with fines	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	CLEAN SAND	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
	SAND with fines	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS over 50% silt and clay	SILT AND CLAY liquid limit <50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	SILT AND CLAY liquid limit >50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS		PT	Peat, muck, and other highly organic soils
ROCK			Undifferentiated as to type or composition

KEY TO BORING AND TEST PIT SYMBOLS

CLASSIFICATION TESTS

PI	PLASTICITY INDEX
LL	LIQUID LIMIT
SA	SIEVE ANALYSIS
HYD	HYDROMETER ANALYSIS
P200	PERCENT PASSING NO. 200 SIEVE
P4	PERCENT PASSING NO. 4 SIEVE

SAMPLER TYPE

- MODIFIED CALIFORNIA
- HAND SAMPLER
- STANDARD PENETRATION TEST
- ROCK CORE
- THIN-WALLED / FIXED PISTON
- X DISTURBED OR BULK SAMPLE

NOTE: Test boring and test pit logs are an interpretation of conditions encountered at the excavation location during the time of exploration. Subsurface rock, soil or water conditions may vary in different locations within the project site and with the passage of time. Boundaries between differing soil or rock descriptions are approximate and may indicate a gradual transition.

STRENGTH TESTS

TV	FIELD TORVANE (UNDRAINED SHEAR)
UC	LABORATORY UNCONFINED COMPRESSION
TXCU	CONSOLIDATED UNDRAINED TRIAXIAL
TXUU	UNCONSOLIDATED UNDRAINED TRIAXIAL
	UC, CU, UU = 1/2 Deviator Stress

SAMPLER DRIVING RESISTANCE

Modified California and Standard Penetration Test samplers are driven 18 inches with a 140-pound hammer falling 30 inches per blow. Blows for the initial 6-inch drive seat the sampler. Blows for the final 12-inch drive are recorded onto the logs. Sampler refusal is defined as 50 blows during a 6-inch drive. Examples of blow records are as follows:

25	sampler driven 12 inches with 25 blows after initial 6-inch drive
85/7"	sampler driven 7 inches with 85 blows after initial 6-inch drive
50/3"	sampler driven 3 inches with 50 blows during initial 6-inch drive or beginning of final 12-inch drive

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SOIL CLASSIFICATION CHART

Butler Vineyard Development
APN 033-190-006
Napa, California

Project No. 2980.001 Date: 3/9/2020

Drawn MFJ
Checked

A-1
FIGURE

FRACTURING AND BEDDING

Fracture Classification	Spacing	Bedding Classification
Crushed	less than 3/4 inch	Laminated
Intensely fractured	3/4 to 2-1/2 inches	Very thinly bedded
Closely fractured	2-1/2 to 8 inches	Thinly bedded
Moderately fractured	8 to 24 inches	Medium bedded
Widely fractured	2 to 6 feet	Thickly bedded
Very widely fractured	greater than 6 feet	Very thickly bedded

HARDNESS

Low	Carved or gouged with a knife
Moderate	Easily scratched with a knife, friable
Hard	Difficult to scratch, knife scratch leaves dust trace
Very hard	Rock scratches metal

STRENGTH

Friable	Crumbles by rubbing with fingers
Weak	Crumbles under light hammer blows
Moderate	Indentations <1/8 inch with moderate blow with pick end of rock hammer
Strong	Withstands few heavy hammer blows, yields large fragments
Very strong	Withstands many heavy hammer blows, yields dust, small fragments

WEATHERING

Complete	Minerals decomposed to soil, but fabric and structure preserved
High	Rock decomposition, thorough discoloration, all fractures are extensively coated with clay, oxides or carbonates
Moderate	Fracture surfaces coated with weathering minerals, moderate or localized discoloration
Slight	A few stained fractures, slight discoloration, no mineral decomposition, no affect on cementation
Fresh	Rock unaffected by weathering, no change with depth, rings under hammer impact

NOTE: Test boring and test pit logs are an interpretation of conditions encountered at the location and time of exploration. Subsurface rock, soil and water conditions may differ in other locations and with the passage of time.

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ROCK CLASSIFICATION CHART

Butler Vineyard Development
APN 033-190-006
Napa, California

Project No. 2980.001 Date: 3/9/2020

Drawn MFJ
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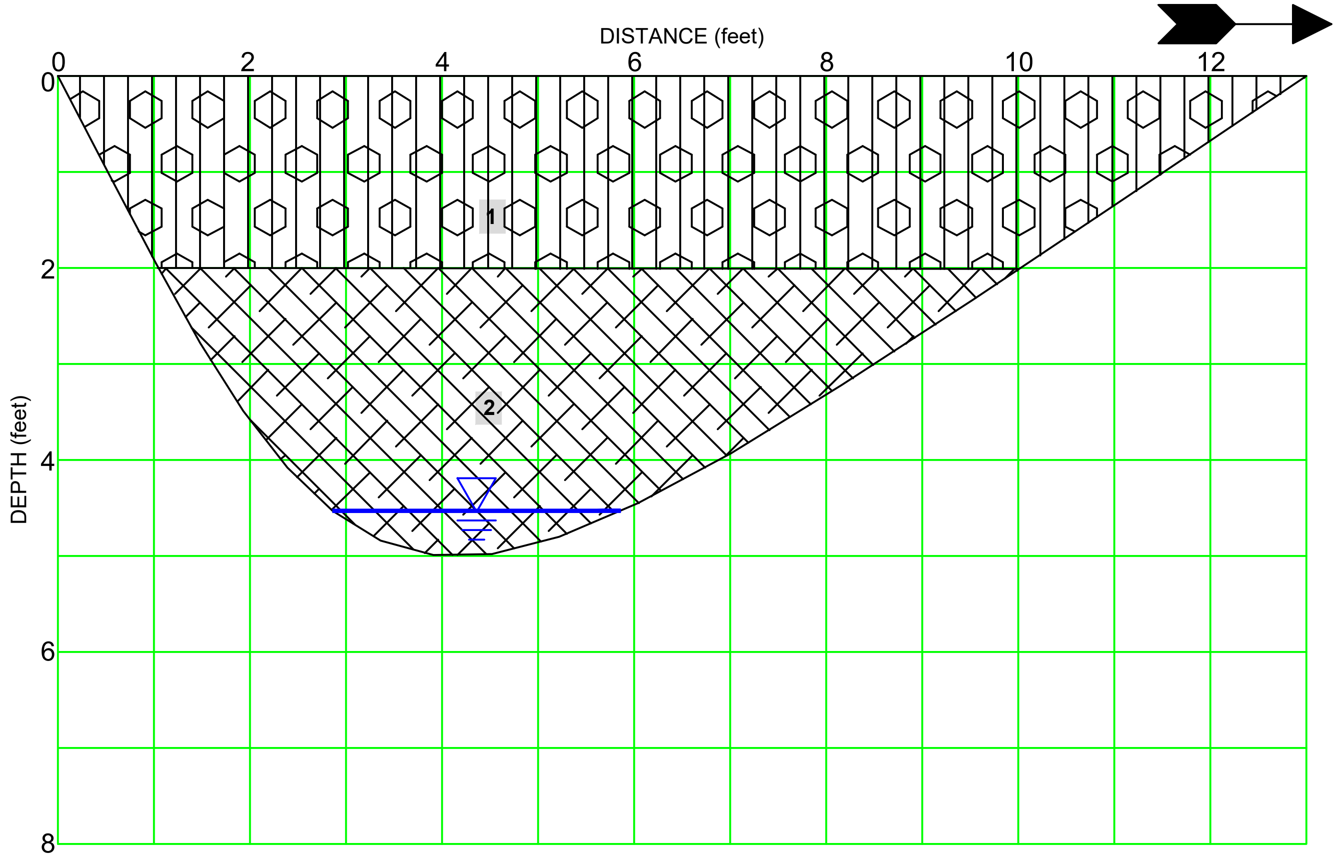
A-2
FIGURE

EQUIPMENT: Case 710G wheeled backhoe with 24-inch bucket
DATE: 2/4/2020
ELEVATION[1]: +/-1,565-feet

TEST PIT 1

N20°E



Sample Depth	Moisture Content		
0-24"	18.2%		
24-36"	23.3%		

Layer	Description
1	SILTY GRAVEL-GRAVELLY SILT (GM/ML)) Dark gray, loose, moist, +/-50% medium-plasticity silt, +/-50% volcanic cobbles to 4-inches [COLLUVIUMLANDSLIDE DEBRIS]
2	DEVITRIFIED ASH TUFF Light gray, mottled red, yellow, and orange, typically completely weathered and crushed with local zones/inclusions of moderately weathered, hard rock [BEDROCK/LANDSLIDE DEBRIS]
	Groundwater measured at 54" approximately 30 minutes after excavation. Easy excavation noted at 60".

NOTES: (1) REFERENCE: Acme Engineering (2019)

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TEST PIT LOG

Butler Vineyard Development
APN 033-190-006
Napa, California

Project No. 2980.001 Date: 3/9/2020

Drawn MFJ
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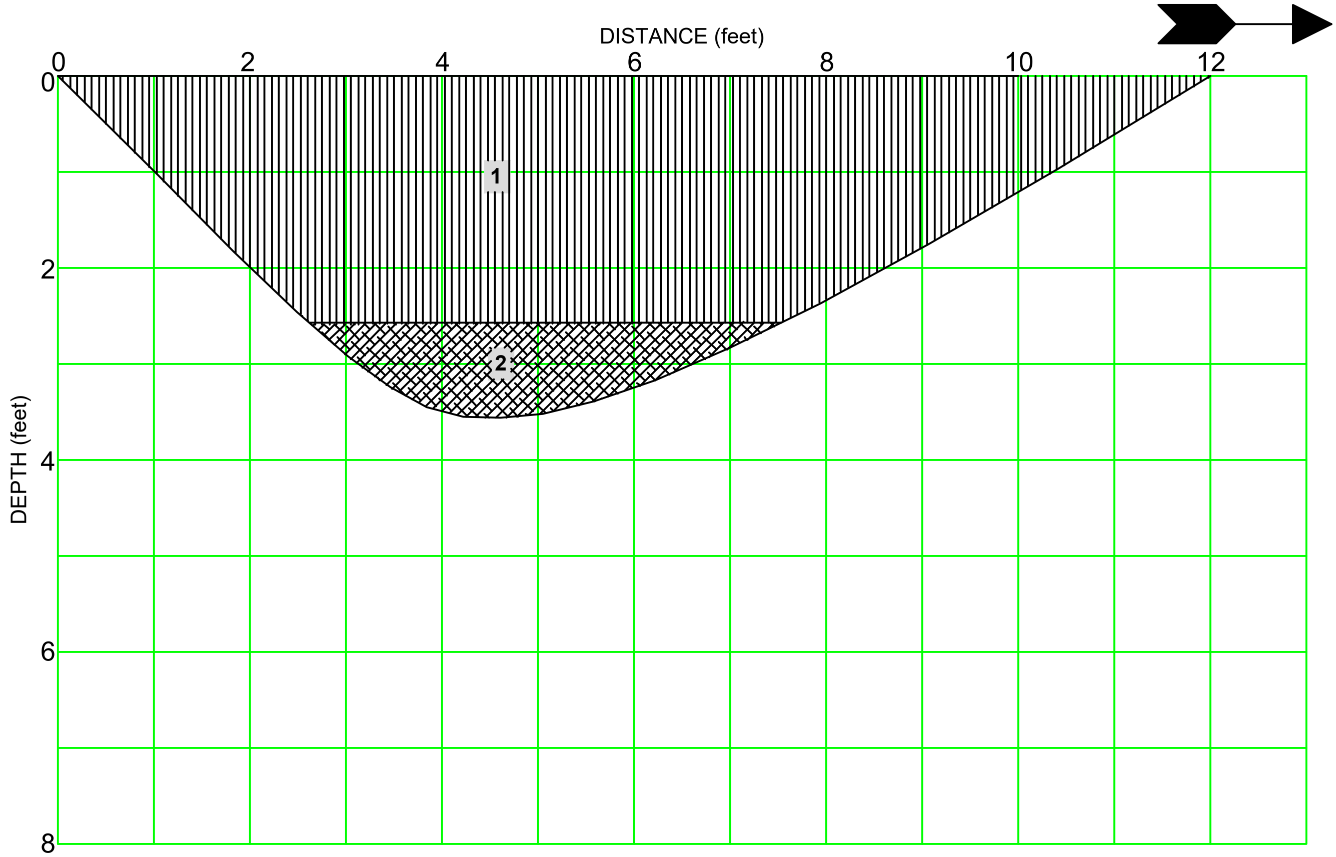
A-3
FIGURE

EQUIPMENT: Deere 710G wheeled backhoe with 24-inch bucket
DATE: 2/4/19
ELEVATION[1]: +/-1,547-feet

TEST PIT 2

S18°E



Sample Depth	Moisture Content		
0-24"	24.8%		
30-36"	27.8%		

Layer	Description
1	SILT WITH SAND (ML) Dark gray, moist, soft, medium-plasticity, +/-15-30% fine sand [COLLUVIUM/LANDSLIDE DEBRIS]
2	DEVITRIFIED ASH TUFF Light gray, mottled red, yellow, and orange, typically completely weathered and crushed with local zones/inclusions of moderately weathered, hard rock [BEDROCK/LANDSLIDE DEBRIS] Grades wet at 36". Easy excavation noted at 42".

NOTES: (1) REFERENCE: Acme Engineering (2019)

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TEST PIT LOG

Butler Vineyard Development
APN 033-190-006
Napa, California

Project No. 2980.001 Date: 3/9/2020

Drawn MFJ
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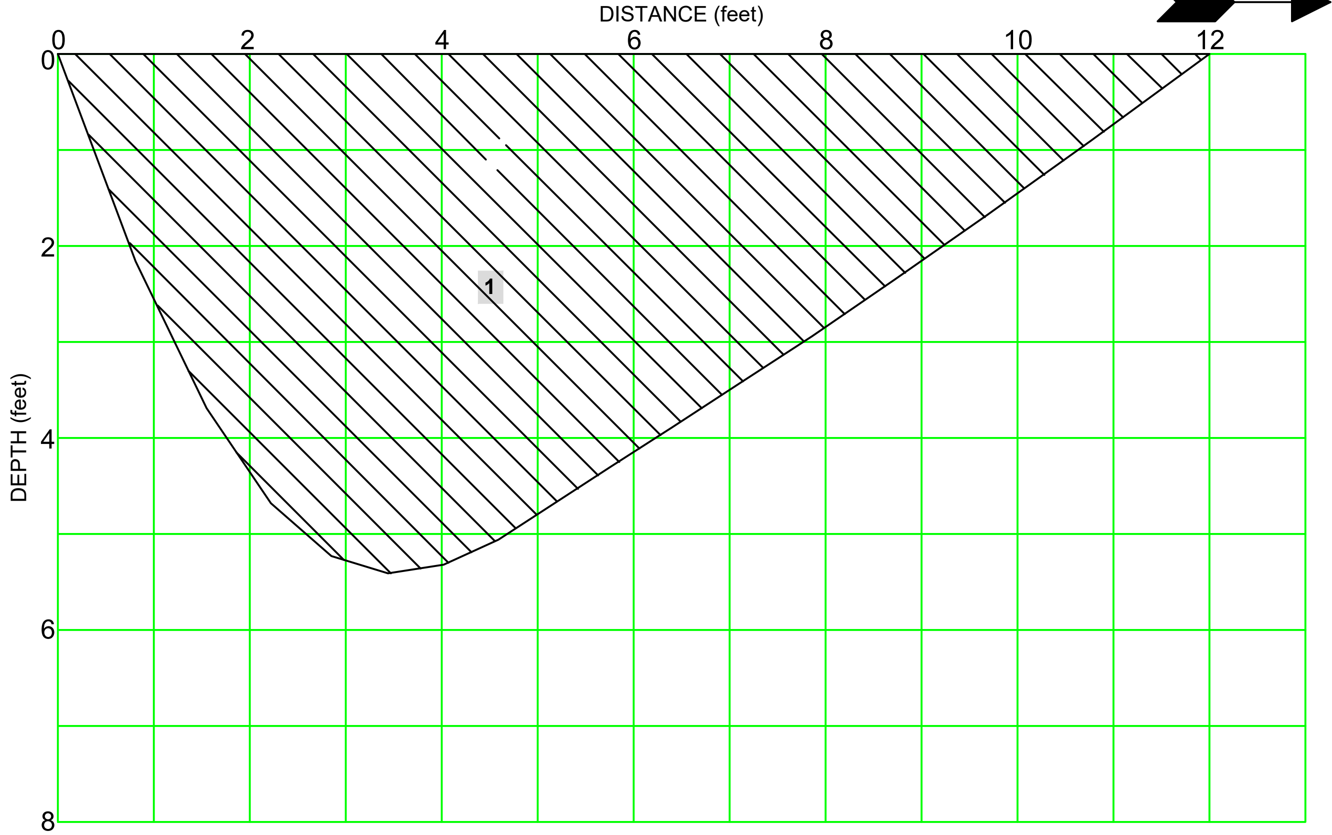
A-4
FIGURE

EQUIPMENT: Deere 710G wheeled backhoe with 24-inch bucket
DATE: 2/4/19
ELEVATION[1]: +/-1,591-feet

TEST PIT 3

N80°W



Sample Depth	Moisture Content		
0-54"	23.0%		

Layer	Description
1	CLAY (CL) Medium gray, moist, medium stiff, trace subrounded sand [COLLUVIUM/LANDSLIDE DEBRIS]

NOTES: (1) REFERENCE: Acme Engineering (2019)

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TEST PIT LOG

Butler Vineyard Development
APN 033-190-006
Napa, California

Project No. 2980.001 Date: 3/9/2020

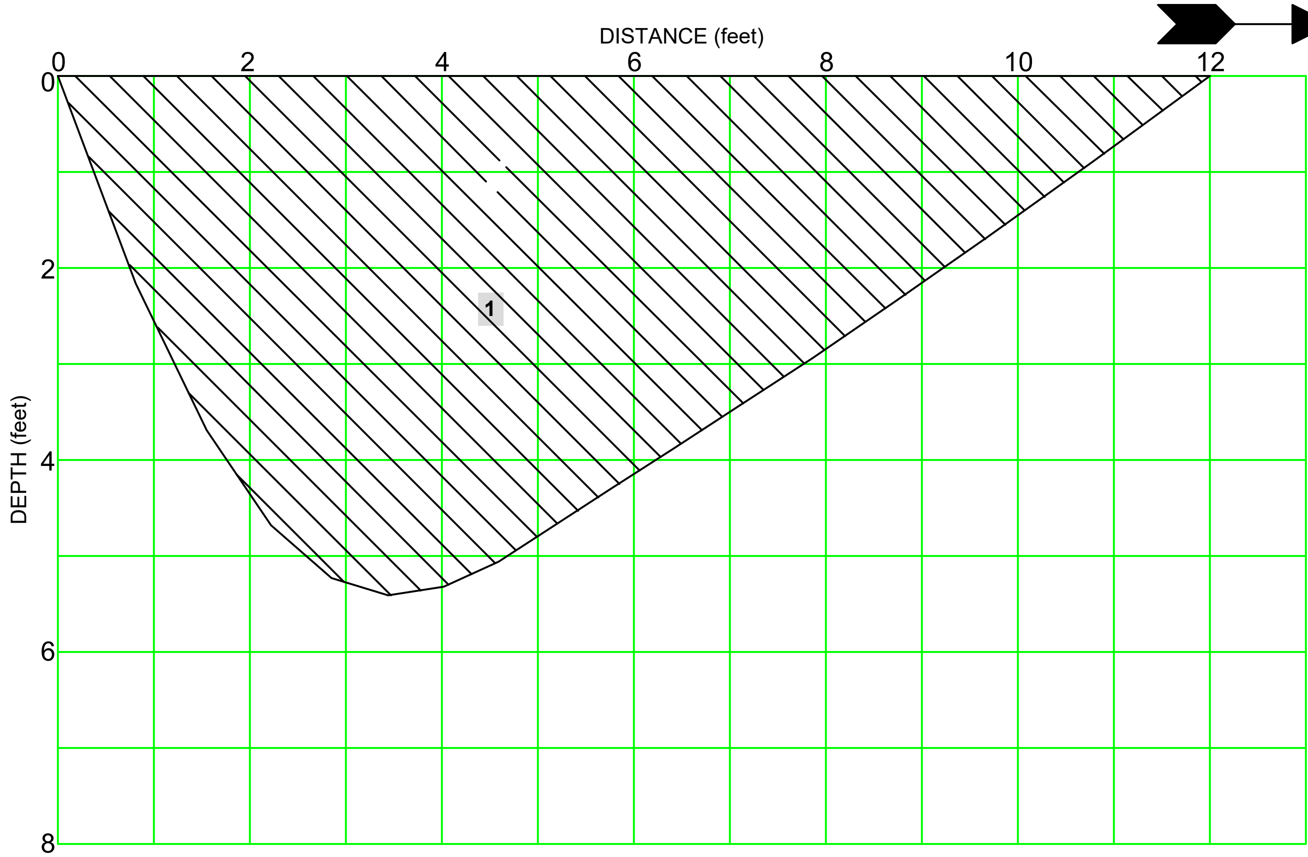
Drawn MFJ
Checked

A-5
FIGURE

EQUIPMENT: Deere 710G wheeled backhoe with 24-inch bucket
DATE: 2/4/19
ELEVATION[1]: +/-1,698-feet

TEST PIT 4

S30°W



Sample Depth	Moisture Content		
0-29"	20.2%		
29-36"	22.2%		

Layer	Description
1	CLAY (CL) Medium gray, moist, medium stiff, medium plasticity, +/-15% fine subrounded sand [COLLUVIUM/LANDSLIDE DEBRIS] Grades stiff, with orange mottling and trace volcanic gravels at 29".

NOTES: (1) REFERENCE: Acme Engineering (2019)

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TEST PIT LOG

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Napa, California

Project No. 2980.001 Date: 3/9/2020

Drawn MFJ
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ENGINEERING GROUP

November 19, 2020
File: 2980.001altr.doc

Mr. Jeff Butler
255 North Sierra Street #1906
Reno, Nevada 89501

Re: Geotechnical Plan Review
New Vineyard Development
Wild Horse Valley Road (APN 033-190-006)
Napa, California

Introduction

As requested, this letter summarizes our geotechnical review of project plans[1] for development of new vineyard on your property off Wild Horse Valley Road (APN 033-190-006) in rural western Napa County, California. We previously performed a Geotechnical Investigation for the project, which is summarized in our report dated March 12, 2020. The purpose of our current services is to review the project plans and determine whether the intent of our geotechnical recommendations has been sufficiently incorporated.

Conclusions

Based on our review, it is our opinion that the intent of our recommendations has been suitably incorporated in the plans. During construction, we should be present intermittently to observe subdrain construction in Block A and determine whether the Contractor's work is in substantial conformance to the plans and specifications.

We trust that this letter contains the information you require at this time; please call us if there are any questions or if we can be of further assistance.

Yours very truly,
MILLER PACIFIC ENGINEERING GROUP

REVIEWED BY:

Mike Jewett
Engineering Geologist No. 2610
(Expires 1/31/21)

Michael Morisoli
Geotechnical Engineer No. 2541
(Expires 12/31/20)

Cc: Omar Reveles, Acme Engineering

[1] Acme Engineering (2020), "New Vineyard Development Erosion-Control Plan, Lands of Butler", Project No. 180901-0121, Sheets 1 through 4, dated November 19, 2020.

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