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January 31, 2023

No.18G-0502-1

Discovery Village LLC
2646 Dupont Dr.
Suite 60 #520
Irvine, CA 92612

Attention: Mr. Derek Hicks

Subject: Geotechnical Review of Tentative Tract Map
Lots 1-8, Tentative Tract Map 38228
Murrieta, California

Dear Mr. Hicks:

In accordance with your request, we have completed a geotechnical review of Lots 1-8, Tentative Tract Map 38228. The review relied upon field work, laboratory testing and engineering analyses completed as a part of the referenced geotechnical investigation of the property completed by our firm in 2019. The Geologic Map, Plate 1 and Geologic Cross Sections, Plate 2 included in this report were prepared utilizing the latest Rough Grading Tentative Tract Map prepared by David Evans and Associates. The findings of the geotechnical review are presented in the accompanying report.

We appreciate this opportunity to be of continued service to you. If you have any questions regarding this report, please do not hesitate to contact us at your convenience.

Respectfully submitted,

RMA GeoScience

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GEOTECHNICAL REVIEW OF TENTATIVE TRACT MAP
Lots 1-8, Tentative Tract Map 38228
MURRIETA, CALIFORNIA

For

Discovery Village LLC
2646 Dupont Dr.
Suite 60 #520
Irvine, CA 92612

January 31, 2023

Project No. 18G-0502-0

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1.0 Introduction

1.01 Purpose

A geotechnical investigation was completed for the subject site by this office in February of 2019. Since that investigation, a Tentative Tract Map has been prepared for the planned development. The grading concept addressed in our previous report is very similar to the current planned Tentative Tract Map. The purpose of this investigation is to summarize geotechnical and geologic conditions at the site, to assess their potential impact on the proposed development, and to develop geotechnical and engineering geologic design parameters.

1.02 Scope of the Investigation

The general scope of this investigation included the following:

- Preparation of a new Geologic Map and Cross Sections
- Provide the latest 2019 Seismic Design Parameters
- Geotechnical evaluation of the Lots 1-8, Tentative Tract Map 38228.
- Preparation of this report presenting our findings, conclusions, and recommendations

Our scope of work did not include a preliminary site assessment for the potential of hazardous materials onsite

1.03 Site Location and Description

The property consists of an irregularly shaped 55.8 acre parcel of land located between Baxter Road, Whitewood Road, approximately 500 feet north of Somers Road, and east of Antelope Road and the Interstate 215 freeway, in the city of Murrieta, California (Figure 1). The site is characterized by low lying knobby hills (typically topped with granitic outcrops) with a general slope towards the east. An intermittent or ephemeral creek cuts through the northern one fourth of the site and drains from west to east. The creek area has been designated as an Army Corp of Engineers (ACOE) and California Department of Fish and Game (CDFW) Jurisdiction Area. The elevation differential is 78 feet over a distance of 2,400 feet. The site is currently vegetated by native grasses and chaparral. Past grading modifications have been made on site associated with the construction of three debris basins and possible import of fill materials located between borings B4 and B5 (Plate 1). Artificial fill has been placed along Whitewood Road and Baker Road as part of the roadway development.

Its central geographic position is 33.610381° north latitude and -117.166056° west longitude.

1.04 Planned Development

According to the Rough Grading Plan, prepared by David Evans and Associates Inc., the proposed project will involve conventional cut-fill grading to develop the 55.8 acre mass grading project. The site will be graded into 8 large acreage pads with .73% to 2.00% drainage towards the streets. The creek area under Army Corp of Engineers (ACOE) and California Department of Fish and Game (CDFW) Jurisdiction will remain natural. The earthwork quantities are expected to be 132,874 cubic yards of cut and 287,151 yards of fill. Cut and fill slopes up to a maximum height of 15 feet are planned at gradients of 2:1 or less. The 1”-100 scale rough grading plan was utilized as a base map to prepare the enclosed Geologic Map, Plate 1 at a scale of 1”=100. Building pad locations have not been provided at this time.

1.05 Previous Studies

Consolidated Geoscience, Inc. (February 27, 2006)(under ownership of RMA GeoScience) completed a Geotechnical Investigation for a portion of the project located east of the debris basins and within the areas of the hollow stem auger borings. The locations of the exploratory borings are indicated on the geologic map and the logs of the borings are included herein. Based on our field mapping and information obtained from our test pit excavations we believe only a thin layer of topsoil of a few inches to feet covers the bedrock in the boring locations. This is substantiated by the high blow counts. Within boring B5, we believe bedrock is likely at a depth of 10 feet; where the subsurface water is perched on. These logs are included in Appendix A.

RMA Geoscience completed a Geotechnical Investigation of the subject site prior to its current tentative map phase in February of 2019. The investigation included 18 test pits, sampling and laboratory testing of collected samples. The previous investigation also included slope stability analysis. A Copy of this report is included in appendix E.

1.05 Historic Uses

Readily available historic aerial photographs, topographic maps, and the Riverside County Assessor online Parcel Report were used to determine past property use. The Riverside County Assessor website listed the site use as farmland or grazing. Since the first aerial photograph dated 1938 the property has been used as grassland or grazing and only the knobby areas with bedrock outcrops are vegetated by chaparral. The time period between January 2007 and June 2009, three debris basins were constructed. In a March 2011 aerial photograph, two scrappers, a skip loader, and a dump truck are shown located on site. The dump truck appears to be dumping some darker fill materials and the skip loader appears to be spreading fill material within the artificial fill area depicted on the Geologic Map (Plate 1), between boring B4, test pit TP8, and Cross Section 2-2’ adjacent to Whitewood Road.

1.06 Investigation Methods and Limitation

Our investigation consisted of office research, review of previous field exploration (RMA, 2019), review of previous laboratory testing (RMA, 2019), review of the compiled data, and preparation of this report. It has been performed in a manner consistent with generally accepted engineering and geologic principles and practices, and has incorporated applicable requirements of California Buildings Code. Definitions of technical terms and symbols used in this report include those of the ASTM International, the California Building Code, and commonly used geologic nomenclature.

Technical supporting data are presented in the attached appendices. Appendix A presents a description of the methods and equipment used in performing our 2019 field exploration and logs of our previous subsurface exploration. Appendix B presents a description of our previous laboratory testing and the test results. Appendix C presents our previous stability analyses of existing and proposed slopes. Standard grading specifications and references are presented in Appendices D . A copy of RMA Geoscience’s 2019 report for the subject site is included as Appendix E. Our references are included in Appendix F.

2.00 Findings

2.01 Geologic Setting

The site is located within the Peninsular Range geomorphic province that is characterized by a series of mountain ranges separated by long valleys. The Peninsular Range has been divided into three fault bounded blocks with the site located within the central block or the Perris Block. The Perris Block bedrock consists of an eroded grouping of Cretaceous and older granitic rocks of the Southern California Batholith and metasedimentary basement rocks. The Perris Block is divided into three blocks and the site is situated within the Central Perris Block. It is bound on the west by the Elsinore Fault and on the east by the San Jacinto Fault zone of the Southern California. The site rocks are also known as belonging to western zone, one of the five batholith zones of the Peninsular Ranges batholith. Within the western zone, plutons were emplaced passively into Mesozoic oceanic crust in an early extensional subduction phase between 108 to 126 million years ago in a back-arc setting (Morton et al, 2014). The site vicinity rocks are part of the Paloma Valley ring complex, one of a number of plutons from the Cretaceous batholith period (Morton and Baird, 1976). The ring complex is considered relatively unique in Southern California, in that only two other ring dike complexes have been noted within the region.

The oldest ring dike was emplaced in the San Marcos Gabbro country rock by assimilation and stoping followed by two later episodes of inner dikes (Morton and Baird, 1976). The San Marcos Gabbro (Kgb) consists of hornblende gabbro that is typically massive, medium to coarse grained, with plagioclase. The oldest ring dike of the Paloma Valley ring complex (Kpvg) is comprised of light color, medium grained biotite monzogranite and less abundant hornblende-biotite granodiorite. Gabbro (Kgb) xenoliths ranging from very small granule size to large boulder blocks and larger are common within the oldest ring dike (Kpvg) (Kennedy and Morton, 2003). A younger ring dike set is divided into an inner and outer zone pegmatite dikes. The inner dikes are concentrated primarily within the central part of the ring complex consisting of pegmatitiD-textured perthite, sodic plagioclase, quartz, biotite, and or muscovite. These dikes cut across both the gabbro country rocks and the oldest ring dike. The outer zone pegmatites include coarse grained granite (Kennedy and Morton, 2003).

The earth materials encountered in our investigation are shown on the Geologic Map (Plate 1) and described below.

2.02 Earth Materials

Artificial Fill (af)

There are three episodes of artificial fill that exists on site: roadway fill located beneath portions of Whitewood Road and Baxter Road; limited amounts of fill along the sides of the debris basins; and imported fill between boring B4 and Cross Section 2-2'. The maximum roadway fill is up to 18 feet thick in the creek bottom along Whitewood Road. Baxter Road fill is on the order of a few feet up to 5 feet. The debris basin fills have depths ranging up to five feet. Previous visual observation showed these fills to consist of gravely sand with abundant silt and cobble rock fragments (RMA, 2019). The imported fill located between borings B4 and Cross Section 2-2' near Whitewood Road appears to have an approximate thickness on the order of 5 to 10 feet maximum. Possible origins for this fill material are likely from neighboring grading projects.

Alluvium (Qal)

Limited alluvium is located within the creek bottom and in the southeastern portion of the site as shown on the Geologic Map, Plate 1. The creek area is an ACOE and CDFW Jurisdiction Area, therefore this area has notbeen explored.

Paloma Valley Ring Complex (Kpvg)

The oldest dike of the Paloma Valley Ring Complex is exposed on the western portion of the site as shown on the Geologic Map, Plate 1. Previous investigations remark that within the test pits excavations it was very weathered and consists of massive, medium grained monzogranite in a dry and very dense condition. It tends to be lighter in color and bedrock outcrops showed cobble sized moderate to dark gray xenoliths of the older San Marcos Gabbro. Excavation effort with a backhoe found it difficult to dig at depths of 2 to 7 feet.

San Marcos Gabbro (Kgb)

The San Marcos Gabbro is exposed on the eastern portion of the site as depicted on the Geologic Map, Plate 1. The contact between the gabbro (Kgb) and the monzogranite trends from the southwest to the northeast. The gabbro is very weathered in outcrop form and less weathered on the cuts make within the debris basins. The rock is comprised of very weathered to weathered massive, coarse grained gabbro with biotite. Excavation depths with a backhole ranged from 1 to 6 feet before digging became difficult.

2.03 Expansive Soil

Soil classification and expansion index indicates that near surface soils has a very low expansion potential. Expansion testing was performed in accordance with ASTM D4829 for the subject site in 2019. The results indicated that earth materials underlying the site have an expansion classification of 0. (RMA, 2019) Results of our previous expansion test and other soil index tests run in 2019 are presented in Appendix B.

2.04 Surface and Groundwater Conditions

Groundwater has not been encountered in the test pit excavation logs reviewed by this office. Within the 6 hollow stem auger borings (B1 through B6) drilled in October 2005, two borings contained water. Boring B2 is located close to the tributary of the creek cutting west to east across the site and water was found at 15 feet. The second boring to have water was B5 located within the southeastern low of the site at a depth of 10 feet near what RMA GeoScience interoperates as the bedrock contact. As the other borings with varying depths did not encounter water, the water within borings B2 and B5 can be classified as subsurface water and not groundwater. Review of the Historic Groundwater High Maps does not show any groundwater within the site or site vicinity (RE.

2.05 Landslides

The site is relatively flat and there are no known landslides within or immediately adjacent to the site. The property has not been mapped within a seismic hazard zone. The potential for landsliding at the site is judged to be low.

2.06 Faulting

The site does not lie within an AP Fault Zone. The closest fault is the Elsinore Fault Zone, Glen Ivy section at approximately 3.9 miles to the southwest.

The region of the subject site has experienced shaking from several earthquakes recorded back to 1827. The nearest large historic earthquake took place in San Jacinto and occurred in 1918 the epicenter of which is 13.6 miles to the northeast of the site. Historic earthquakes with magnitudes of greater than or equal to 6.0 and have been located within approximately 50 miles of the site, are summarized in the table below.

Large Historic Earthquakes

Event	Date	Magnitude	Distance (mi)
San Jacinto	4/21/1918	6.8	13.6
Glen Ivy Hot Springs	5/15/1910	6.0	14.8
San Jacinto and Hemit	12/25/1899	6.4	16.2
33.9 lat 117.2 long	12/19/1880	6.0	20.1
San Bernardino Region	7/23/1923	6.25	27.3
San Bernardino Region	12/16/1858	7.0	33.0
San Bernardino Region	9/20/1907	6.0	40.9
San Diego Region	11/22/1800	6.5	42.8
Landers Earthquake	6/28/1992	6.7	45.3
Long Beach Earthquake	3/11/1933	6.3	46.0

3.00 Conclusions and Recommendations

3.01 General Conclusion

Based on specific data and information contained in this report, our understanding of the project and our general experience in engineering geology and geotechnical engineering, it is our professional judgment that the proposed development is geotechnically feasible provided the recommendations presented below are fully implemented during design and construction.

3.02 Existing Fill

There is existing artificial fill material that was placed to construct Whitewood Road and Baxter Road, the debris basins, and possible import soil as shown on the Geologic Map, Plate 1. A record search should be performed to evaluate if the fill soils are certified for the road ways. Fill slopes up to 13 feet are planned to be tied into the Whitewood Road fill. Any debris basin fills can be removed and used as fill soils. It appears that most if not all the imported soil will be removed in the planned grading.

3.03 General Earthwork and Grading

It is recommended that all earthwork and grading be performed in accordance with the 2019 California Building

Code and all applicable governmental agency requirements. In the event of conflicts between this report and the 2019 California Building Code, this report shall govern.

3.04 Removals and Overexcavation

All vegetation, trash, and debris should be cleared from the grading area and removed from the site. Prior to placement of compacted fills, all undocumented fills (af) and loose, porous, or compressible alluvial soils will need to be removed down to competent ground in areas planned for foundation support. In areas of future streets, we recommend removal of all undocumented fills (af), topsoil and alluvium (Qal). Removal and requirements will also apply to cut areas, if the depth of cut is not sufficient to reach competent ground. Removed and/or over-excavated soils may be moisture-conditioned and recompacted as engineered fill, except for soils containing detrimental amounts of organic material or chemical contamination. Estimated depths of removals are based on the following:

- All undocumented fills (af) and loose, porous, or compressible topsoil, and alluvial soils will need to be removed down to competent ground. It is expected that competent ground (bedrock) will be encountered below existing artificial fill (af) and alluvium. Provided competent materials are exposed, these cut surfaces should be scarified to a minimum depth of 6 inches, moisture conditioned and compacted to a minimum of 90% relative compaction (ASTM D1557) provided that footing overexcavation requirements are met.

No building pad locations have been provided at this time. In addition to the above requirements, in areas were the planned foundation transitions from cut to fill, over-excavation will also need to meet the following criteria for the building pads, concrete flatwork and pavement areas:

- All building pad areas shall be undercut to a minimum depth of 3 feet below the bottom of the deepest footing, and the exposed subgrade scarified to a minimum depth of 6 inches, moisture conditioned, and compacted as necessary to produce soils compacted to a minimum of 90% relative compaction (ASTM: D1557). Building pad areas shall be defined as the building footprint including the area extending from the outer edge of the footings for a distance of 5 feet.

- All concrete flatwork shall be underlain by a minimum of 12 inches of soil compacted to a minimum of 90% relative compaction (ASTM: D1557).

The exposed soils beneath all over-excavations should be scarified an additional 12 inches, moisture conditioned and compacted to a minimum of 90% relative compaction (ASTM: D1557).

The above recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. Hence, overexcavation depths must be verified, and adjusted if necessary, at the time of grading. The overexcavated materials may be moisture-conditioned and re-compacted as engineered fill.

3.05 Earthwork Shrinkage and Subsidence

Shrinkage is the decrease in volume of soil upon removal and recompaction expressed as a percentage of the original in-place volume. Subsidence occurs as fill (elevated building pad, embankment, etc.) is placed over natural ground. These factors account for changes in soil volumes that will occur during grading. Our estimates are as follows:

- Shrinkage factor = 5% - 10% for soil removed and replaced as compacted fill
- Subsidence factor = approximately 1 percent of the height of fill that is placed

These estimates do not include losses due to removal of existing structures, improvements or over-sized materials (boulders, concrete or other similar materials greater than 12 inches in maximum dimension). Removal and exporting of these materials is may have an impact earthwork balance and should be considered in design, planning and cost estimating.

The degree to which fill soils are compacted and variations in the insitu density of existing soils will influence earth volume changes. Consequently, some adjustments in grades near the completion of grading could be required to balance the earthwork.

3.06 Earthwork Recommendations

All earthworks should be performed in accordance with this section and the General Earthwork and Grading Specifications outlined in Appendix D. Recommendations contained in Appendix D are general specifications for typical grading projects and may not be entirely applicable to this project.

3.07 Excavation Characteristics and Rock Disposal

Our 2019 investigation showed that exploratory test pits were advanced with difficulty within the granitic bedrock. . Visual observations of soils exposed in our exploratory borings indicate that soils will be rippable with conventional grading equipment. No caving was experienced in any of the borings excavated in our study. Although the bedrock is anticipated to rip with conventional heavy duty grading equipment, the possibility that hard cemented layers within the bedrock can not be completely ruled out.

3.08 Seismic Design Parameters

Mapped Spectral Accelerations were obtained by using the online ATC Calculator (ASCE 7-16 Standard) and a site class C was used for the project site. The parameters generated for the subject site are presented in the following table:

2019 California Building Code (CBC) Seismic Parameters

Parameter	Value
Site Location	Latitude = 33.610381 degrees Longitude = -117.166056 degrees

Site Class	Site Class = C Very Dense Soil or Soft Rock
Mapped Spectral Accelerations	S_s (0.2- second period) = 1.431g S_1 (1-second period) = 0.533g
Site Coefficients (Site Class C)	F_a = 1.2 F_v = 1.467
Maximum Considered Earthquake Spectral Accelerations (Site Class C)	S_{MS} (0.2- second period) = 1.718g S_{M1} (1-second period) = 0.782g
Design Earthquake Spectral Accelerations (Site Class C)	S_{DS} (0.2- second period) = 1.145g S_{D1} (1-second period) = 0.521g

For Risk Category II structures with mapped spectral response acceleration parameter at 1-s period (S_1) is less than 0.75, the Seismic Design Category is D (ASCE 7-16 Section 11.6).

Peak earthquake ground acceleration adjusted for site class effects (PGA_M) has been determined in accordance with ASCE 7-16 Section 11.8.3 as follows: $PGA_M = F_{PGA} \times PGA = 1.2 \times 0.617g = 0.741g$.

3.09 Liquefaction and Secondary Earthquake Hazards

Potential secondary seismic hazards that can affect land development projects include liquefaction, tsunamis, seiches, seismically induced settlement, seismically induced flooding and seismically induced landsliding.

Liquefaction

Liquefaction is a phenomenon where earthquake-induced ground vibrations increase the pore pressure in saturated, granular soils until it is equal to the confining, overburden pressure. When this occurs, the soil can completely loose its shear strength and enter a liquefied state. The possibility of liquefaction is dependent upon grain size, relative density, confining pressure, saturation of the soils, and intensity and duration of ground shaking. In order for liquefaction to occur, three criteria must be met: underlying loose, coarse-grained (sandy) soils, a groundwater depth of less than about 50 feet, and a potential for seismic shaking from nearby large-magnitude earthquake.

The site is not located in an area of known liquefaction hazards. The site is underlain by bedrock at shallow depths. Groundwater was not encountered in any of Consolidated GeoScience borings, drilled to a maximum depth of 30 feet although subsurface water was encountered in a couple of borings in our 2019 report. Therefore, the risk of liquefaction occurring during a design seismic event is considered negligible.

Tsunamis and Seiches

Tsunamis are sea waves that are generated in response to large-magnitude earthquakes. When these waves reach shorelines, they sometimes produce coastal flooding. Seiches are the oscillation of large bodies of standing water, such as lakes, that can occur in response to ground shaking. Tsunamis and seiches do not pose hazards due to the inland location of the site and lack of nearby bodies of standing water.

Seismically Induced Settlement

Seismically induced settlement occurs most frequently in areas underlain by loose, granular sediments. Damage as a result of seismically induced settlement is most dramatic when differential settlement occurs in areas with large variations in the thickness of underlying sediments. Settlement caused by ground shaking is often non-uniformly distributed, which can result in differential settlement. Since the site is underlain by very dense granitic bedrock, seismically induced settlement is not considered a design concern during a design seismic event.

Seismically Induced Flooding

The site is not located within a potential dam inundation area. Consequently seismically induced flooding at the site is unlikely (County of Riverside, 2015).

3.10 Subdrains

Groundwater and surface water were not encountered during the course of our previous investigation(RMA,2019); however subsurface water was encountered in some of the boring excavations drilled in 2005 (B2 and B5) with B2 located adjacent to the existing creek. Fill is planned within these areas. As the existing topography drains towards the creek currently, a subdrain will not be necessary. The planned fill slopes should be keyed into competent bedrock material with appropriate backdrains and outlets.

3.11 Fill and Cut Slopes

All fill and cut slopes should be constructed at inclinations of 2 horizontal to 1 vertical or flatter. Fill slopes constructed at inclinations of 2 horizontal to 1 vertical or flatter are expected to be grossly and surficially stable.
All graded slopes will be grossly stable at the maximum gradient of 2:1 (H:V) and the referenced conditions above.

The gross static and seismic stability analyses for generic maximum height cut and fill slopes are summarized below. The details of our slope stability analyses are presented in Appendix C.

Condition	Static FOS	Seismic FOS
Cut Slope	2.635	1.656
Fill Slope	1.922	1.197

Given these factors of safety, we believe that all graded slopes will be grossly stable at the maximum gradient of 2:1 (H:V) and the referenced conditions above. If the grading plans change, the geotechnical engineer should be notified for subsequent calculations.

3.12 Temporary Slopes and Excavations

Excavation of utility trenches will require either temporary sloped excavations or shoring. Temporary excavations in existing alluvial soils may be safely made at an inclination of 1:1 or flatter. If vertical sidewalls are required, the use of cantilevered or braced shoring is recommended.
Vehicles, equipment, materials, etc. should be set back away from the edge of temporary excavations a minimum distance of 10 feet from the top edge of the excavation. Surface waters should be diverted away from temporary excavations and prevented from draining over the top of the excavation and down the slope face. During periods of heavy rain, the slope face should be protected with sandbags to prevent drainage over the

edge of the slope, and a visqueen liner placed on the slope face to prevent erosion of the slope face.

Periodic observations of the excavations should be made by the geotechnical consultant to verify that the soil conditions have not varied from those anticipated and to monitor the overall condition of the temporary excavations over time. If at any time during construction conditions are encountered which differ from those anticipated, the geotechnical consultant should be contacted and allowed to analyze the field conditions prior to commencing work within the excavation.

Cal/OSHA construction safety orders should be observed during all underground work.

3.13 Import Soils

Any imported soils should be such that the physical and chemical properties of the soils are similar to soils already on the site. The soils should be granular, non-corrosive and have a very low expansion potential (an expansion index of less than 20). The soils should also be free of deleterious material and organics, and not contain rock particles or fragments in excess of 8 inches in diameter. Fill material shall be sampled and reviewed by the geotechnical consultant prior to import to the site.

3.14 Cement Type and Corrosion Potential

Soluble sulfate tests indicate that water-soluble sulfate in the soil will have a negligible effect on concrete. Our recommendations for concrete exposed to sulfate-containing soils are presented in the table below.

RECOMMENDATIONS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOILS

Sulfate Exposure	Water Soluble Sulfate (SO_4) in Soil (% by Weight)	Sulfate (SO_4) in Water (ppm)	Cement Type (ASTM C150)	Maximum Water-Cement Ratio (by Weight)	Minimum Compressive Strength (psi)
Negligible	0.00 - 0.10	0-150	--	--	2,500
Moderate	0.10 - 0.20	150-1,500	II	0.50	4,000
Severe	0.20 - 2.00	1,500-10,000	V	0.45	4,500
Very Severe	Over 2.00	Over 10,000	V plus pozzolan or slag	0.45	4,500

Use of alternate combinations of cementitious materials may be permitted if the combinations meet design recommendations contained in American Concrete Institute guideline ACI 318-11.

The soils were also tested for soil reactivity (pH) and electrical resistivity (ohm-cm). The test results indicate that the on-site soils have a soil reactivity of 6.9 and an electrical resistivity of 1,511 ohm-cm. A neutral or non-corrosive soil has a value ranging from 5.5 to 8.4. Generally, soils that could be considered moderately corrosive to ferrous metals have resistivity values of about 3,000 ohm-cm to 10,000 ohm-cm. Soils with resistivity values less than 3,000 ohm-cm can be considered corrosive and soils with resistivity values less than 1,000 ohm-cm can be considered extremely corrosive.

Based on our analysis, it appears that the underlying onsite soils are corrosive to ferrous metals. Protection of buried pipes utilizing coatings on all underground pipes; clean backfills and a cathodic protection system can be effective in controlling corrosion. A qualified corrosion engineer should be consulted to further assess the corrosive properties of the soil.

3.15 Utility Trench Backfill

All pipes should be bedded in a sand, gravel or crushed aggregate imported material complying with the requirements of the Standard Specifications for Public Works Construction Section 306-1.2.1. Crushed rock products that do not contain appreciable fines should not be utilized as pipe bedding and/or backfill. Based on limited testing onsite soils have a sand equivalent value greater than 30. Therefore, onsite soils might be suitable for use as pipe bedding provided the soils are screened to remove cobbles and boulders. Additional testing of onsite soils at the time of construction would need to be performed if use of these soils for bedding is proposed. Bedding materials should be compacted to at least 90% relative compaction (ASTM D1557) by mechanical methods. The geotechnical consultant should review and approve of proposed bedding materials prior to use.

The on-site soils are expected to be suitable as trench backfill provided they are screened of organic matter, cobbles and boulders in accordance with the current edition of the Standard Specifications for Public Works Construction. Backfill soils should be compacted to at least 90% relative compaction (ASTM D1557) by mechanical methods.

All utility trench backfill within street right of way, utility easements, under or adjacent to sidewalks, driveways, or building pads should be observed and tested by the geotechnical consultant to verify proper compaction. Trenches excavated adjacent to foundations should not extend within the footing influence zone defined as the area within a line projected at a 1:1 drawn from the bottom edge of the footing. Trenches crossing perpendicular to foundations should be excavated and backfilled prior to the construction of the foundations. The excavations should be backfilled in the presence of the geotechnical engineer and tested to verify adequate compaction beneath the proposed footing.

Cal/OSHA construction safety orders should be observed during all underground work.

3.16 Drainage and Moisture Proofing

Surface drainage should be directed away from the proposed structure into suitable drainage devices. Neither excess irrigation nor rainwater should be allowed to collect or pond against building foundations or within low-lying or level areas of the lot. Surface waters should be diverted away from the tops of slopes and prevented from draining over the top of slopes and down the slope face.

Walls and portions thereof that retain soil and enclose interior spaces and floors below grade should be waterproofed and dampproofed in accordance with the California Building Code 2019.

Retaining structures should be drained to prevent the accumulation of subsurface water behind the walls. Backdrains should be installed behind all retaining walls exceeding 3 feet in height. A typical detail for retaining wall back drains is presented in Appendix C. All backdrains should outlet to suitable drainage devices. Retaining walls less than 3 feet in height should be provided with backdrains or weep holes. Dampproofing and/or waterproofing should also be provided on all retaining walls exceeding 3 feet in height.

3.17 Plan Review

Once formal foundation plans are prepared for the subject property, this office should review the plans from a geotechnical viewpoint, comment on changes from the plan used during preparation of this report and revise the recommendations of this report where necessary.

3.18 Geotechnical Observation and Testing During Rough Grading

The geotechnical engineer should be contacted to provide observation and testing during the following stages of grading:

- During the clearing and grubbing of the site.
- During the demolition of any existing structures, buried utilities or other existing improvements.
- During excavation and overexcavation of compressible soils.
- During all phases of grading including ground preparation and filling operations.
- When any unusual conditions are encountered during grading.

A final geotechnical report summarizing conditions encountered during grading should be submitted upon completion of the rough grading operations.

3.19 Post-Grading Geotechnical Observation and Testing

After the completion of grading the geotechnical engineer should be contacted to provide additional observation and testing during the following construction activities:

- During trenching and backfilling operations of buried improvements and utilities to verify proper backfill and compaction of the utility trenches.
- After excavation and prior to placement of reinforcing steel or concrete within footing trenches to verify that footings are properly founded in competent materials.
- During fine or precise grading involving the placement of any fills underlying driveways, sidewalks, walkways, or other miscellaneous concrete flatwork to verify proper placement, mixing and compaction of fills.
- When any unusual conditions are encountered during construction.

4.0 Closure

The findings, conclusions and recommendations in this report were prepared in accordance with generally accepted engineering and geologic principles and practices. No other warranty, either expressed or implied, is made. This report has been prepared for Discovery Village LLC to be used solely for design purposes. Anyone using this report for any other purpose must draw their own conclusions regarding required construction procedures and subsurface conditions.

The geotechnical and geologic consultant should be retained during the earthwork and foundation phases of construction to monitor compliance with the design concepts and recommendations and to provide additional recommendations as needed. Should subsurface conditions be encountered during construction that are different from those described in this report, this office should be notified immediately so that our recommendations may be re-evaluated.

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FIGURES AND PLATES

Source: Google Earth Images

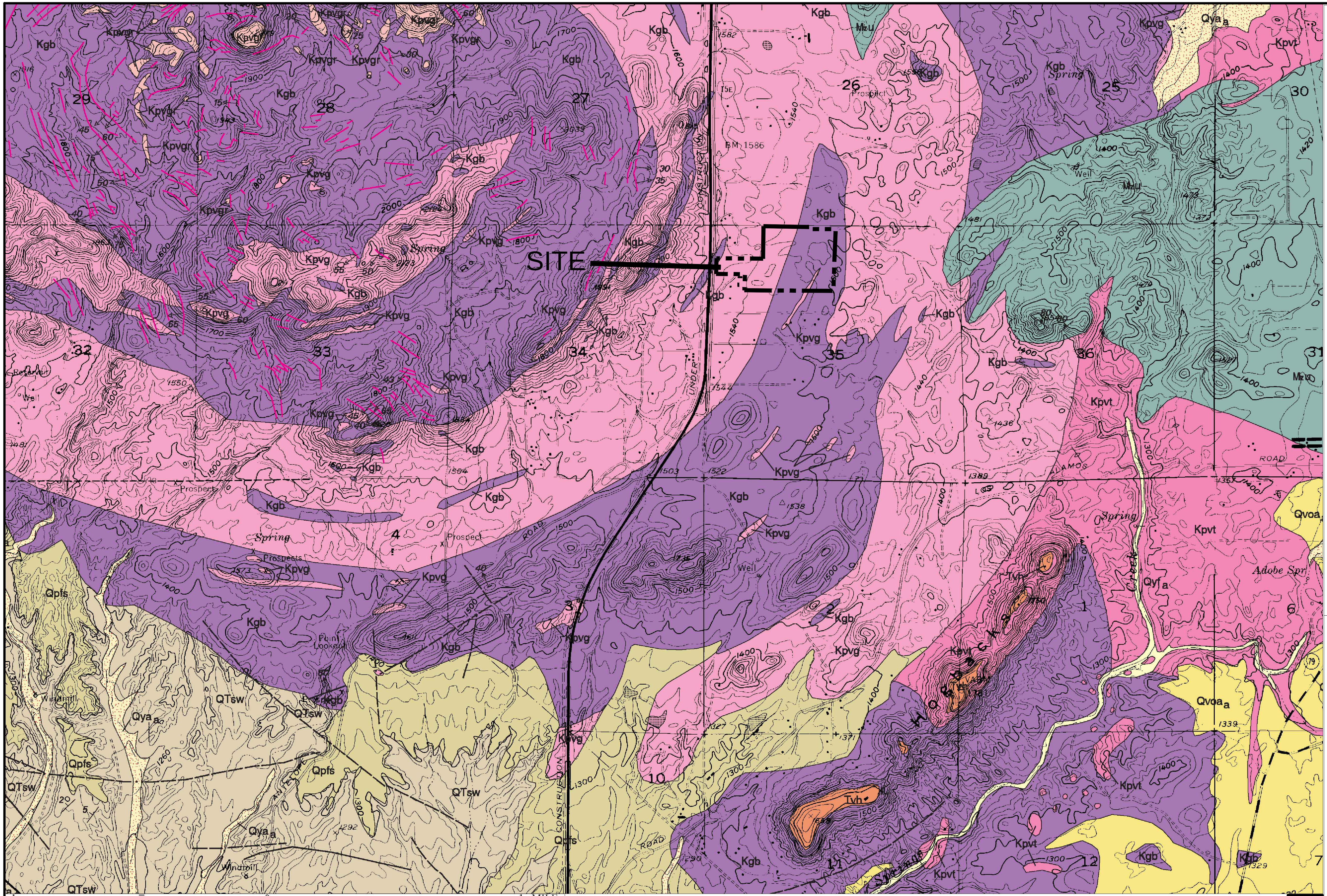
Site Vicinity Location Map

Murrieta Mass Grading 56 Acres, APN 392-290-049-6
South of Baxter Road, West of Whitewood Road, and East of Interstate 215
and Antelope Road
Murrieta, CA

RMA GeoScience

Figure 1

RMA Job No:	18G-0502
Report Date:	12/2018
Prepared By:	mbk



Qyf **Qya** **Qyv** **Qyls**

YOUNG SURFICIAL DEPOSITS—Sedimentary units that are slightly consolidated to cemented and slightly to moderately dissected. Alluvial fan deposits (Qyf series) typically have high coarse:fine clast ratios. Younger surficial units have upper surfaces that are capped by slight to moderately developed pedogenic-soil profiles (A/C to A/AC/$B_{cambric}C_{ox}$ profiles). Includes:

Qyf **Young alluvial fan deposits (Holocene and latest Pleistocene)**-Unconsolidated deposits of alluvial fans and headward drainages of fans. Consists predominately of gravel, sand, and silt

Qya **Young alluvial channel deposits (Holocene and latest Pleistocene)**-Fluvial deposits along canyon floors. Consists of unconsolidated sand, silt, and clay-bearing alluvium

Qyv **Young alluvial valley deposits (Holocene and late Pleistocene)**-Fluvial deposits along valley floors. Consists of unconsolidated sand, silt, and clay-bearing alluvium

Qyls **Young landslide (Holocene and latest Pleistocene)**-Highly fragmented to largely coherent landslide deposits. Unconsolidated to consolidated. Most mapped landslides contain scarp area as well as slide deposit. Many landslides in part reactivated during late Holocene

OLD SURFICIAL DEPOSITS—Sedimentary units that are moderately consolidated and slightly to moderately dissected. Older surficial deposits have upper surfaces that are capped by moderately to well-developed pedogenic soils (A/AB/B/C_{ox} profiles and Bt horizons as much as 1 to 2 m thick and maximum hues in the range of 10YR 5/4 and 6/4 through 7.5YR 6/4 to 4/4 and mature Bt horizons reaching 5YR 5/6). Includes:

Qoa **Old alluvial channel deposits (late to middle Pleistocene)**-Fluvial sediments deposited on canyon floors. Consists of moderately indurated, commonly slightly dissected gravel, sand, silt, and clay-bearing alluvium. Locally capped by thin, discontinuous alluvial deposits of Holocene age

VERY OLD SURFICIAL DEPOSITS—Sediments that are slightly to well consolidated to indurated, and moderately to well dissected. Upper surfaces are capped by moderate to well developed pedogenic soils (A/AB/B/C_{ox} profiles having Bt horizons as much as 2 to 3 m thick and maximum hues in the range 7.5YR 6/4 and 4/4 to 2.5YR 5/6)

Qvoa **Very old alluvial channel deposits (middle to early Pleistocene)**-Fluvial sediments deposited on canyon floors. Consists of moderately to well-indurated, reddish-brown, mostly very dissected gravel, sand, silt, and clay-bearing alluvium. In places, includes thin, discontinuous alluvial deposits of Holocene age

Pauba Formation (Pleistocene)-Siltstone, sandstone, and conglomerate. Named by Mann (1955) for exposures of in Rancho Pauba area about 3.2 km southeast of Temecula. Vertebrate fauna from Pauba Formation are of late Irvingtonian and early Rancholabrean ages (Reynolds and Reynolds, 1990a; 1990b). Includes two informal members:

Qpfs **Sandstone member**-Brown, moderately well-indurated, cross-bedded sandstone containing sparse cobble- to boulder-conglomerate beds

Qpff **Fanglomerate member**-Grayish-brown, well indurated, poorly sorted fanglomerate and mudstone; occurs along the east flank of the Santa Ana Mountains

Sandstone and conglomerate of Wildomar area (Pleistocene and late Pliocene)-Unnamed sandstone and conglomerate unit unconformably overlain by the Pauba Formation (Kennedy, 1977). Lower part yields vertebrate fauna of late Blancan age, 2 to 3 Ma; upper part yields fauna of Irvingtonian age, less than 0.85 Ma (Reynolds and Reynolds, 1990a, 1990b; Reynolds and others, 1990). At Chaney Hill in Murrieta area, unit contains 0.7 Ma Bishop ash (Merriam and Bischoff, 1975). Estimated maximum thickness is 75 m. Subdivided into sandstone unit and conglomerate unit:

QTsw **Sandstone unit**-Primarily friable, pale yellowish-green, medium grained, caliche-rich sandstone

QTcw **Conglomerate unit**-Primarily cobble-and-boulder conglomerate. Conglomerate clasts are locally derived

Tvsr **Santa Rosa basalt of Mann (1955) (Miocene)**-Remnants of basalt flows

Kpvg **Monzogranite to granodiorite**-Pale gray, massive, medium-grained hypidiomorphic-granular biotite monzogranite, and less abundant hornblende-biotite granodiorite forming older ring dike. Plagioclase is An_{20} to An_{35}, subhedral, tabular crystals. Contains included small to large stoped blocks of gabbro

Kpvt **Tonalite**-Foliated biotite-hornblende tonalite. In eastern part of complex grades into tonalite

Generic Cretaceous granitic rocks of the Peninsular Ranges batholith

Kgd **Granodiorite, undifferentiated (Cretaceous)**-Biotite and hornblende-biotite granodiorite, undifferentiated. Most is massive and medium-grained. Restricted to small exposure along east edge of quadrangle

Kt **Tonalite, undifferentiated (Cretaceous)**-Gray, medium-grained biotite-hornblende tonalite, typically foliated. Restricted to single area flanking Tucalota Creek along east edge of quadrangle

Kgb **Gabbro (Cretaceous)**-Mainly hornblende gabbro. Includes Virginia quartz-norite and gabbro of Dudley (1935), and San Marcos gabbro of Larsen (1948). Typically brown-weathering, medium-to very coarse-grained hornblende gabbro; very large poikilitic hornblende crystals are common, and very locally gabbro is pegmatitic. Much is quite heterogeneous in composition and texture. Includes noritic and dioritic composition rocks. Abundant stoped blocks of gabbro are included in the Paloma ring complex

Khg **Heterogeneous granitic rocks (Cretaceous)**-A wide variety of heterogeneous granitic rocks. Rocks in Santa Ana Mountains, 5 km northwest of Murrieta, include a mixture of monzogranite, granodiorite, tonalite, and gabbro. Tonalite composition rock is most abundant rock type

Mzu **Metasedimentary rocks, undifferentiated (Mesozoic)**-Wide variety of low-to medium-metamorphic grade metasedimentary rocks. Within the Santa Ana Mountains rocks are of low grade, greenschist or lower grade. Most of the eastern occurrences include biotite schist

Regional Geologic Map

Murrieta Mass Grading 56 Acres, APN 392-290-049-6
South of Baxter Road, West of Whitwood Road, and East of Interstate 215
and Antelope Road
Murrieta, CA

RMA GeoScience

Figure 2

RMA Job No:	18G-0502
Report Date:	12/2018
Prepared By:	mbk

CALIFORNIA GEOLOGICAL SURVEY
JOHN G. PARRISH, PH.D., STATE GEOLOGIST

THE RESOURCES AGENCY - MIKE CHRISMAN, SECRETARY
DEPARTMENT OF CONSERVATION - BRIDGETT LUTHER, DIRECTOR

Murrieta Quadrangle Plate 1.2
SEISMIC HAZARD ZONE REPORT 115

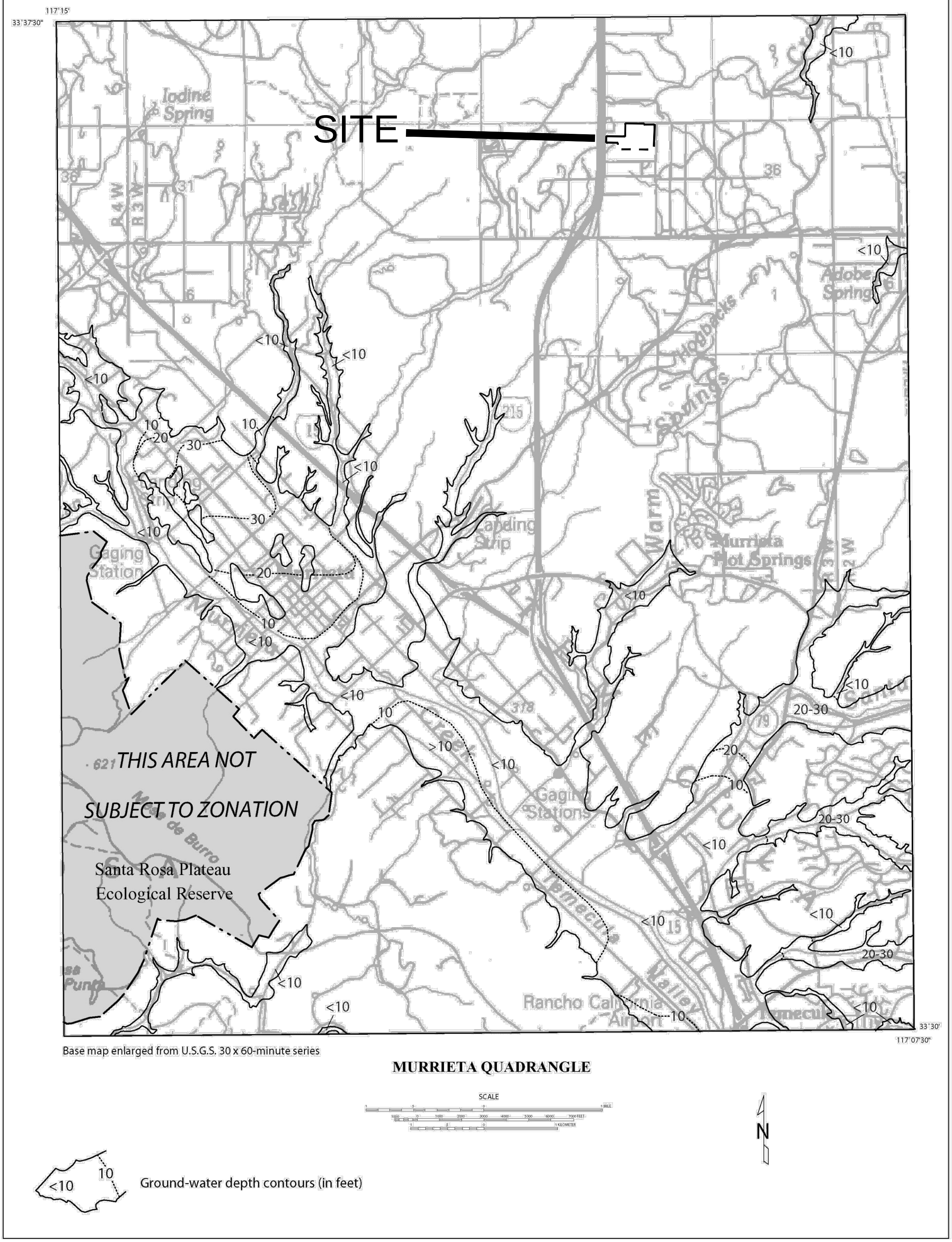


Plate 1.2 Depth to Historically High Ground-Water Levels in Quaternary Alluvial Deposites, Murrieta 7.5-Minute Quadrangle, California.

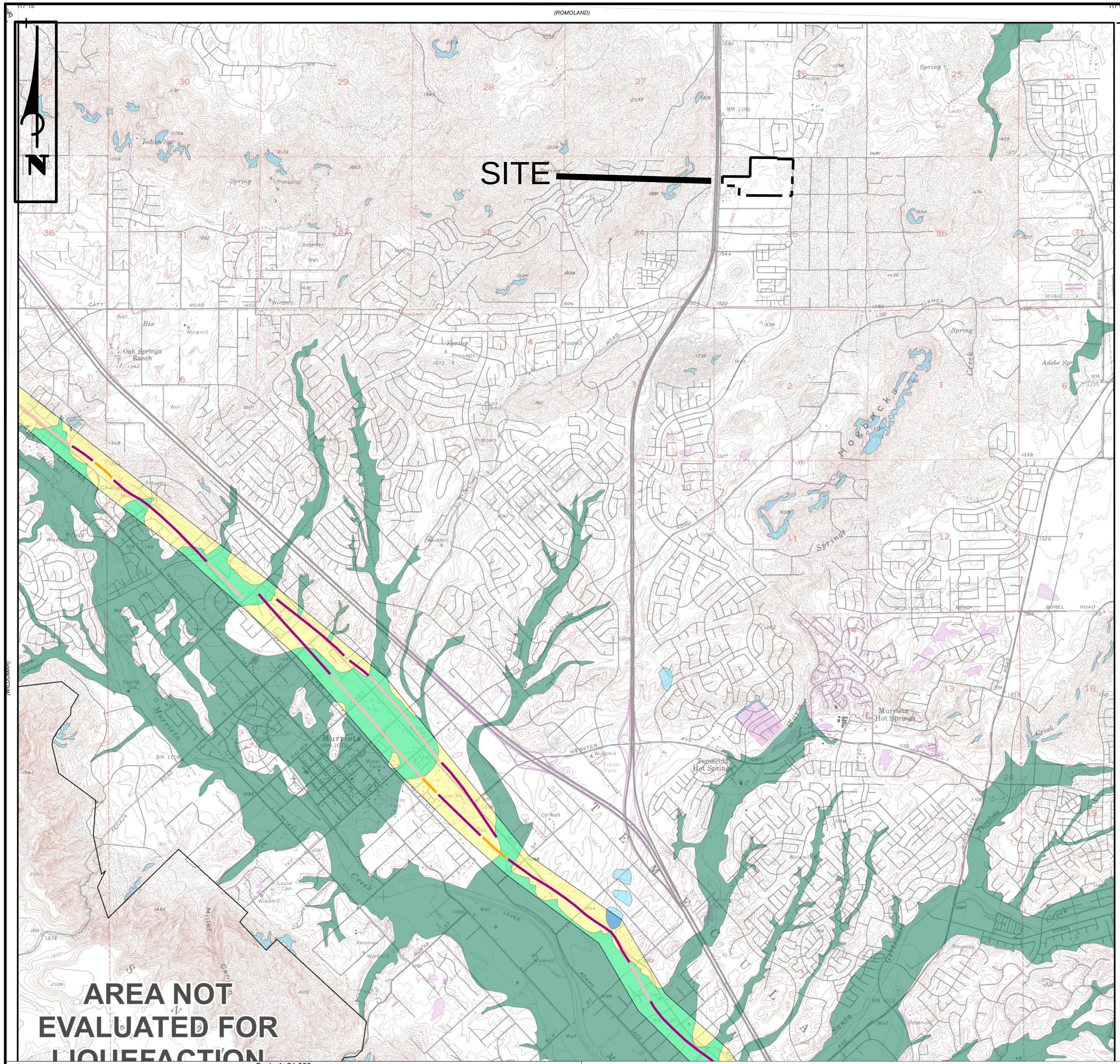
Figure 3

Historic Groundwater High Map

Murrieta Mass Grading 56 Acres, APN 392-290-049-6
South of Baxter Road, West of Whitewood Road, and East of Interstate 215 and Antelope Road
Murrieta, CA

RMA GeoScience

RMA Job No:	18G-0502
Report Date:	2/2019
Prepared By:	mbk



Earthquake Zones of Required Investigation Murrieta Quadrangle

California Geological Survey

This Map Shows Both Alquist-Priolo Earthquake Fault Zones And Seismic Hazard Zones Issued For The Murrieta Quadrangle

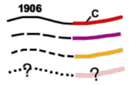
This map shows the location of Alquist-Priolo (AP) Earthquake Fault Zones and Seismic Hazard Zones, collectively referred to here as Earthquake Zones of Required Investigation. The Geographic Information System (GIS) digital files of these regulatory zones released by the California Geological Survey (CGS) are the "Official Maps." GIS files are available at the CGS website http://maps.conservation.ca.gov/cgs/informationwarehouse/. These zones will assist cities and counties in fulfilling their responsibilities for protecting the public from the effects of surface fault rupture and earthquake-triggered ground failure as required by the AP Earthquake Fault Zoning Act (Public Resources Code Sections 2621-2630) and the Seismic Hazards Mapping Act (Public Resources Code Sections 2690-2699.6). For information regarding the general approach and recommended methods for preparing these zones, see CGS Special Publication 42, *Earthquake Fault Zones, a Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California*, Appendix C, and CGS Special Publication 118, *Recommended Criteria for Delineating Seismic Hazard Zones in California*.

For information regarding the scope and recommended methods to be used in conducting required site investigations refer to CGS Special Publication 42, and CGS Special Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*. For a general description of the AP and Seismic Hazards Mapping acts, the zonation programs, and related information, please refer to the website at www.conservation.ca.gov/cgs/.

MAP EXPLANATION

EARTHQUAKE FAULT ZONES

🟨 **Earthquake Fault Zones**
Zone boundaries are delineated by straight-line segments; the boundaries define the zone encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as described in Public Resources Code Section 2621.5(a) would be required.



Active Fault Traces
Faults considered to have been active during Holocene time and to have potential for surface rupture: Solid Line in Black or Red where Accurately Located; Long Dash in Black or Solid Line in Purple where Approximately Located; Short Dash in Black or Solid Line in Orange where Inferred; Dotted Line in Black or Solid Line in Rose where Concealed; Query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by fault creep.

SEISMIC HAZARD ZONES

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

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

OVERLAPPING EARTHQUAKE FAULT AND SEISMIC HAZARD ZONES

🟩 **Overlap of Earthquake Fault Zone and Liquefaction Zone**
Areas that are covered by both Earthquake Fault Zone and Liquefaction Zone.

🟦 **Overlap of Earthquake Fault Zone and Earthquake-Induced Landslide Zone**
Areas that are covered by both Earthquake Fault Zone and Earthquake-Induced Landslide Zone.

Note: Mitigation methods differ for each zone –
AP Act only allows avoidance; Seismic Hazard Mapping Act allows mitigation by engineering/geotechnical design as well as avoidance.

ADDITIONAL INFORMATION

For additional information on the zones of required investigation presented on this map, the data and methodology used to prepare them, and additional references consulted, please refer to the following:

The Ground Cracks in Wolf and Temecula Valleys, in the Murrieta Quadrangle, Riverside County, California.
California Geological Survey, Fault Evaluation Report FER-195.
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/FER/195/

The Elsinore Fault Zone, in the Murrieta, Wildomar, Bachelor Mtn., Temecula, and Pechanga Quadrangles,
Riverside County, California. California Geological Survey, Fault Evaluation Report FER-076.
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/FER/076/

For more information on the Alquist-Priolo Earthquake Fault Zoning Act please refer to:
http://www.conservation.ca.gov/cgs/rghm/ap/Pages/main.aspx

Seismic Hazard Zone Report for the Murrieta 7.5-minute Quadrangle, Riverside County, California.
California Geological Survey, Seismic Hazard Zone Report 115.
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/SHZR/SHZR_115_Murrieta.pdf

For more information on the Seismic Hazards Mapping Act please refer to:
http://www.conservation.ca.gov/cgs/shzp/Pages/SHMPpgminfo.aspx

Click the link below to learn how to take greater advantage of the GeoPDF format
of this map after downloading.
http://gmw.conservation.ca.gov/SHP/EZRIM/Docs/TerragoUserGuide.pdf

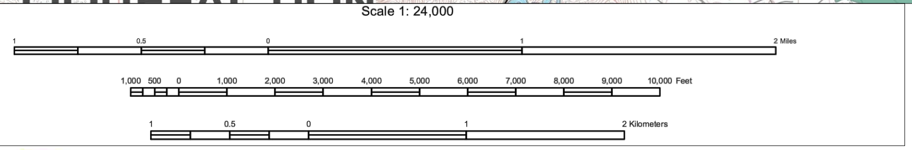
MURRIETA QUADRANGLE

EARTHQUAKE FAULT ZONES

Delineated in compliance with Chapter 7.5,

SEISMIC HAZARD ZONES

Delineated in compliance with Chapter 7.8,



Earthquake Zones of Required Investigation

Murrieta Mass Grading 56 Acres, APN 392-290-049-6
South of Baxter Road, West of Whitwood Road, and East of Interstate 215 and Antelope Road
Murrieta, CA

Figure 4

RMA Job No:	18G-0502
Report Date:	2/2019
Prepared By:	mbk

RMA GeoScience

Geologic Map
Discovery Village
Tentative Tract Map Number 38228
Murrieta, CA

Plate 1

RMA Job No:	18G-0502-0
Report Date:	1/2023
Prepared By:	MAS

RMA GeoScience

Plot Date: 11/18/2022 12:03 PM By: Justin Brown
Save Date: 11/16/2022 5:19 PM By: Ser File: P:\AARGMDISV0001\0400CADD\EC\SHEETS\EC\Preliminary\TTMEC-TM-ARGMDISV0001.dwg

Underground Service Alert
Call: TOLL FREE
1-800
422-4133
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
DESCRIPTON: SURVEY DISK, SET IN TOP OF CONCRETE MONUMENT
LOCATION:
RECORDED:
ELEVATION: EL=1520.01 FEET DATUM: NAVD88

APPROVED FOR SIGNATURE
MONTE BOWERS DATE
BUREAU VERITAS
RCE NO. 26493

SEAL:

SCALE
HORIZONTAL
AS NOTED
VERTICAL
AS NOTED

DAVID EVANS AND ASSOCIATES INC.
41951 Remington Ave, Ste 220
Temecula, CA 92590
Phone: 951.294.9300

PREPARED BY DATE
JUSTIN A. BROWN
RCE NO. 85617 EXP. DATE: 09/30/2022

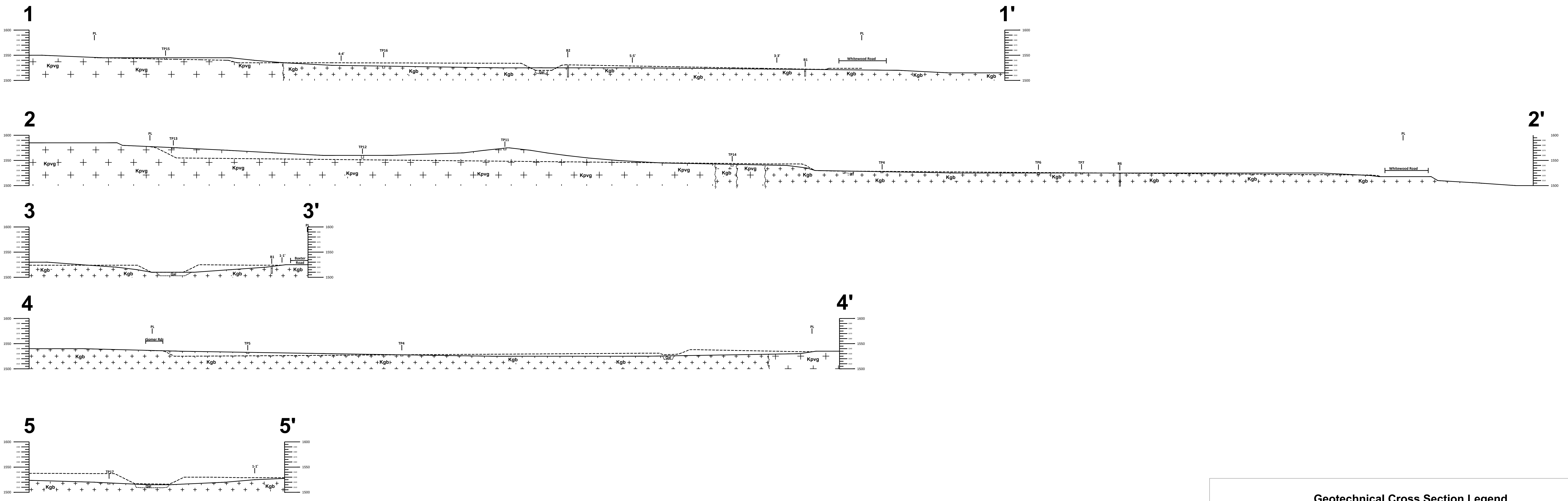
DATE INITIAL
ENGINEER OF WORK
REVISION DESCRIPTION
SHT. NO.
DATE INITIAL
CITY APPROVAL

SHEET 2
CITY OF MURRIETA
ENGINEERING DEPARTMENT
SHEETS 3

ROUGH GRADING
TENTATIVE TRACT MAP NO. 38228

APPROVED
ROBERT K. MOEHLING DATE
DIRECTOR OF PUBLIC WORKS / CITY ENGINEER RCE 63056

DWN BY:
CHKD BY:
FIELD BK:
PROJECT NO.
ARGMDISV0001
DRAWING NO.



Geotechnical Cross Section Legend

af	Artificial Fill
Qal	Alluvium
Kpvg	Paloma Valley Ring Complex (Kpvg) Monzogranite
Kgb	San Marcos Gabbro (Hornblende)
B6	Approximate Boring Location RMA
TP18	Approximate Test Pit Location RMA
5-5'	Geologic Cross Section Intersection
?------------	Geologic Contact (Queried Where Uncertain)
– – – – –	Proposed Grade
————	Existing Grade

Cross Sections

Discovery Village
Tentative Tract Map Number 38228
Murrieta, CA

Plate 2

RMA Job No:	18G-0502-0
Report Date:	1/2023
Prepared By:	MAS

APPENDIX A

PREVIOUS FIELD INVESTIGATIONS
RMA Geoscience 2019

TEST PIT LOGS AND
CONSOLIDATED GEOSCIENCE'S BORING LOGS

RMA GeoScience

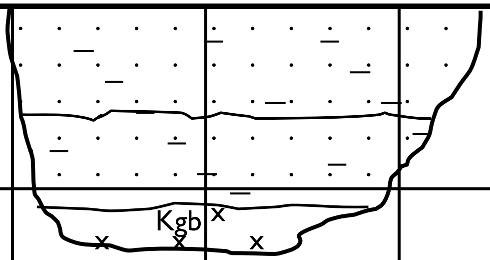
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1513'

Test Pit Number: 1 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0-3	**Topsoil:** Light orange brown fine to medium Silty SAND with coarse graines and Gravel, porous, roots, dry and very loose in upper 6", loose to medium dense and slightly moist below 6".
ML	3-5.5'	Moderate gray brown fine Sandy SILT Clay coatings along root pathways, porous, mottled texture, slightly moist, medium dense
	5.5- 6.5'	**San Marcos Gabbro(Kgb):** Very weathered, moderate gray brown, massive, medium grained, GABBRO with biotite, fractures lined with clay, slightly very dense, hard digging at 6.5'.
		Total Depth 6.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



@ 0-3' Bulk Bag

@ 3-5' Bulk Bag LL-28, PL-26, PI-2

@ 5.5-6.5' Bulk Bag

Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading

Project Number: 18G-0502-0

Equipment: Case 580 Backhoe

Logged By: mbk Elevation: 1526'

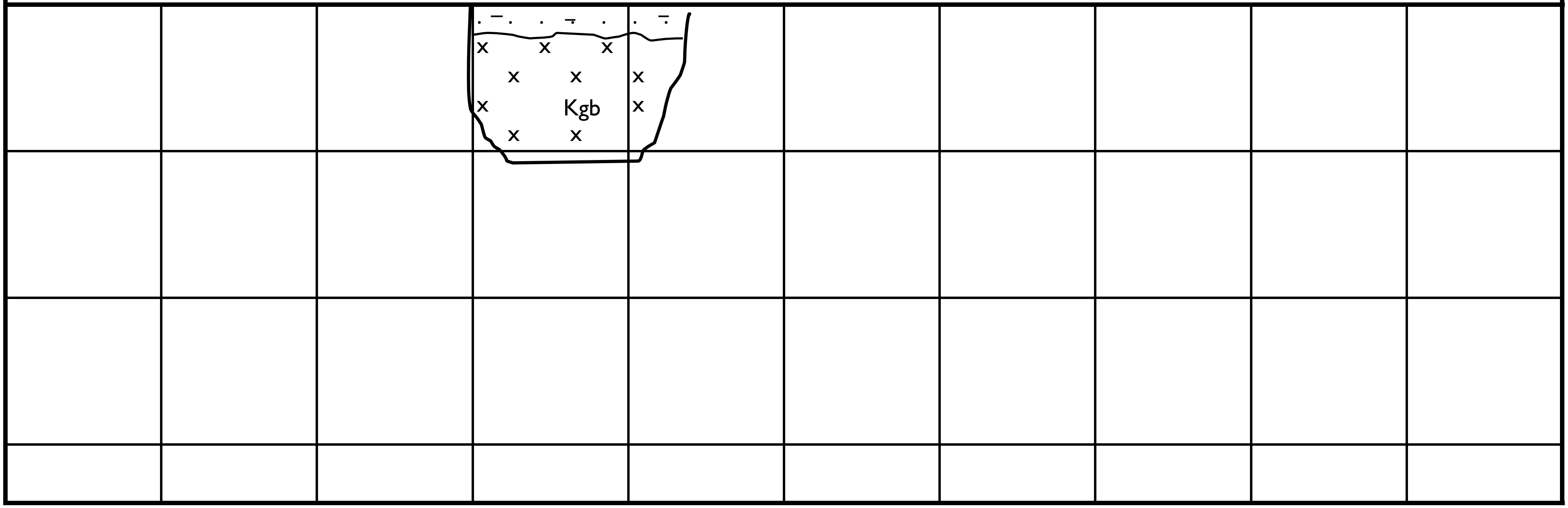
Test Pit Number: 2 Date: Nov. 28, 2018

Location: Southwest corner of Baxter Road and Whitewood

Notes:

USCS	Feet (ft)	Material Description
SM	0-1	**Topsoil:** Light orange brown fine Silty SAND with medium and coarse graines and minor Gravel and Cobbles, slightly loose and dry in upper 3", slightly and loose to medium dense below 6", roots, porous.
	1-5.5'	**San Marcos Gabbro (Kgb):** Very weathered, orange brown to moderate gray brown, massive, coarse grained, GABBRO with biotite, slightly moist, dense to very dense, hard digging at 5.5'. @ 2.5' Less weathered, light orange gray @ 5', root, harder digging, light gray with orange iron oxide staining. Total Depth 5.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



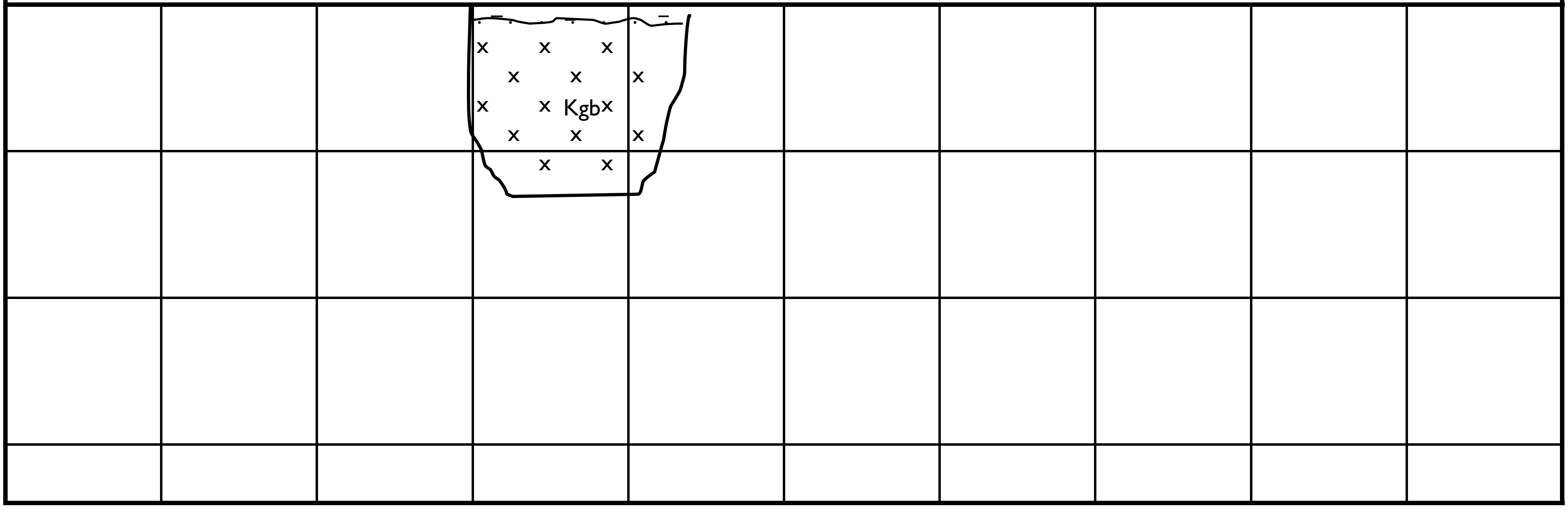
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1532'

Test Pit Number: 3 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 3"-6"	**Topsoil:** Light orange brown fine Silty SAND with medium and coarse graines and very minor Gravel and Cobbles, slightly loose and dry in upper 2", and loose to medium dense below 2", roots, porous.
	3"-6" to 6.5'	**San Marcos Gabbro (Kgb):** Very weathered, moderate orange-red brown, massive, coarse grained, GABBRO with biotite, slightly moist, dense to very dense.. @ 4.5' Less weathered, light orange gray. @ 5.5', very hard digging, light gray with orange iron oxide staining. Total Depth 5.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



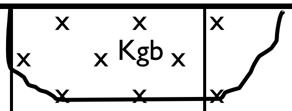
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1526.5'

Test Pit Number: 4 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
	0 to 2.5'	**San Marcos Gabbro (Kgb):** Very weathered, light ornage gray, massive, coarse grained, GABBRO with biotite, slightly moist, very dense. @ 2.5' very hard digging. Total Depth 2.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



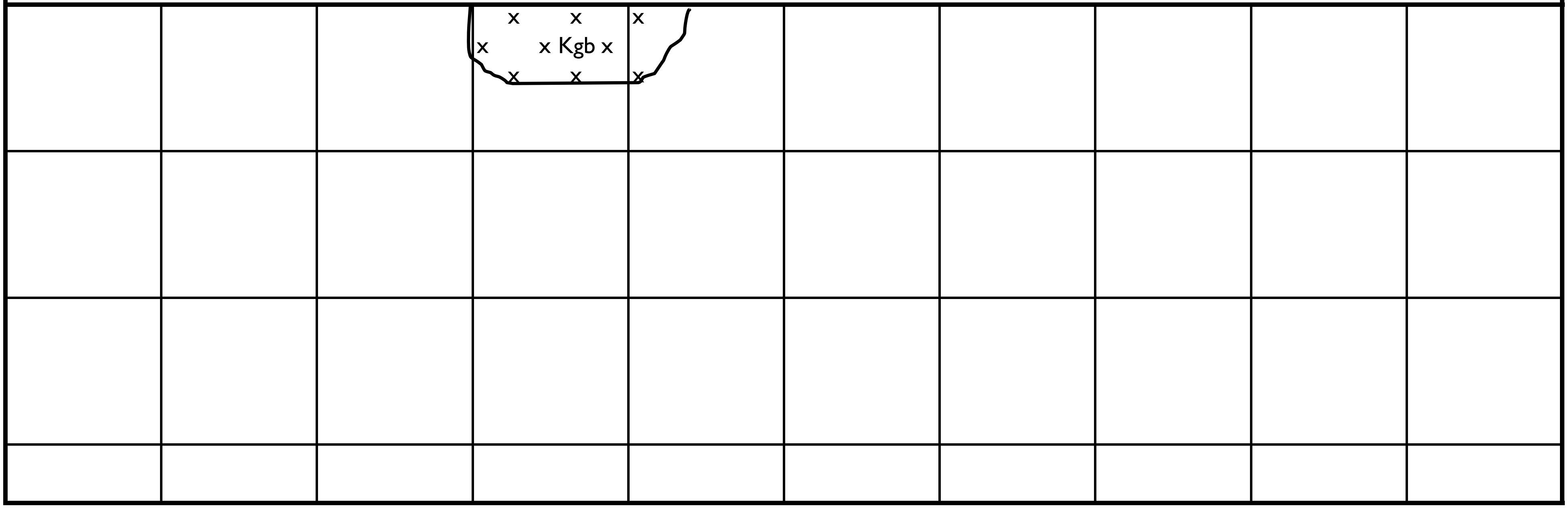
RMA GeoScience

Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1531.5'
Test Pit Number: 5 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
	0-1	**Artifical Fill (af):** Light orange brown fine Silty SAND with medium and coarse graines, dry and slightly loose in upper 3", slightly moist and meduim dense dense below.
	1 to 2.5'	**San Marcos Gabbro (Kgb):** Very weathered, orange gray, massive, coarse grained, GABBRO with biotite, slightly moist, very dense. Very hard digging at 2.5'.
		Total Depth 2.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



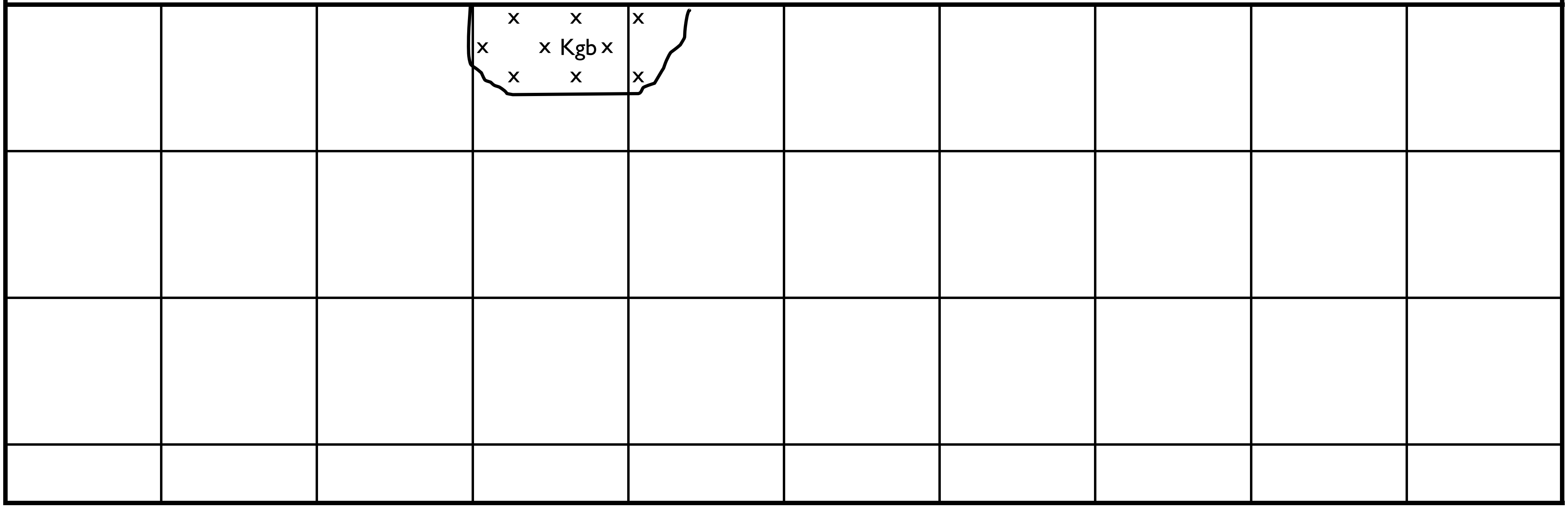
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1524.5'

Test Pit Number: 6 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
	0-3'	**San Marcos Gabbro (Kgb):** Very weathered, orange gray, massive, coarse grained, GABBRO with biotite, dry to slightly moist, dense to very dense. Very hard digging at 3' Total Depth 3' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



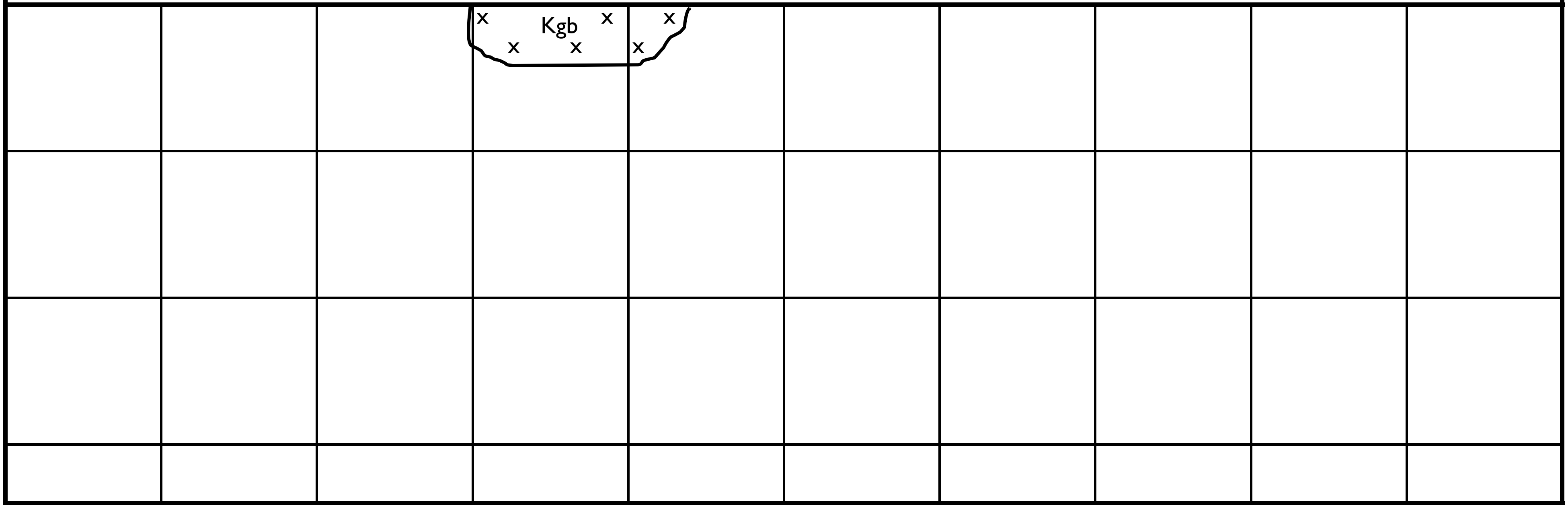
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1522.5'

Test Pit Number: 7 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0-2"	**Artificial fill (af):** Light orange gray fine to coarse Silty SAND, roots, dry, medium dense.
	2" to 2'	**San Marcos Gabbro (Kgb):** Very weathered, light to medium orange gray, massive, coarse grained, GABBRO with biotite, dry to slightly moist, dense to dense.
		Total Depth 2' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



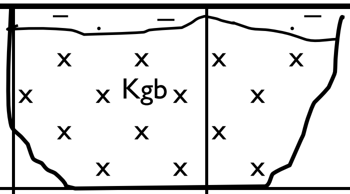
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1519'

Test Pit Number: 8 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 6"-1'	**Artificial fill (af):** Light orange gray fine Silty SAND with medium and coarse grains and Gravel, roots, dry, medium dense.
	6"-1' to 5	**San Marcos Gabbro (Kgb):** Very weathered, moderate orange gray, massive, coarse grained, GABBRO with biotite, dry to slightly moist, dense to very dense. Harder digging at 4".
		Total Depth 5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



@ 1-5' Bulk Bag

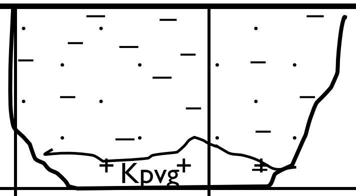
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1537.5'

Test Pit Number: 9 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 4'	**Topsoil:** Moderate orange brown fine Silty SAND with some medium and coarse grains, roots, porous, dry in top 2", slightly moist and medium dense below.
	4 to 5.5'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly moist, very dense
		Total Depth 5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



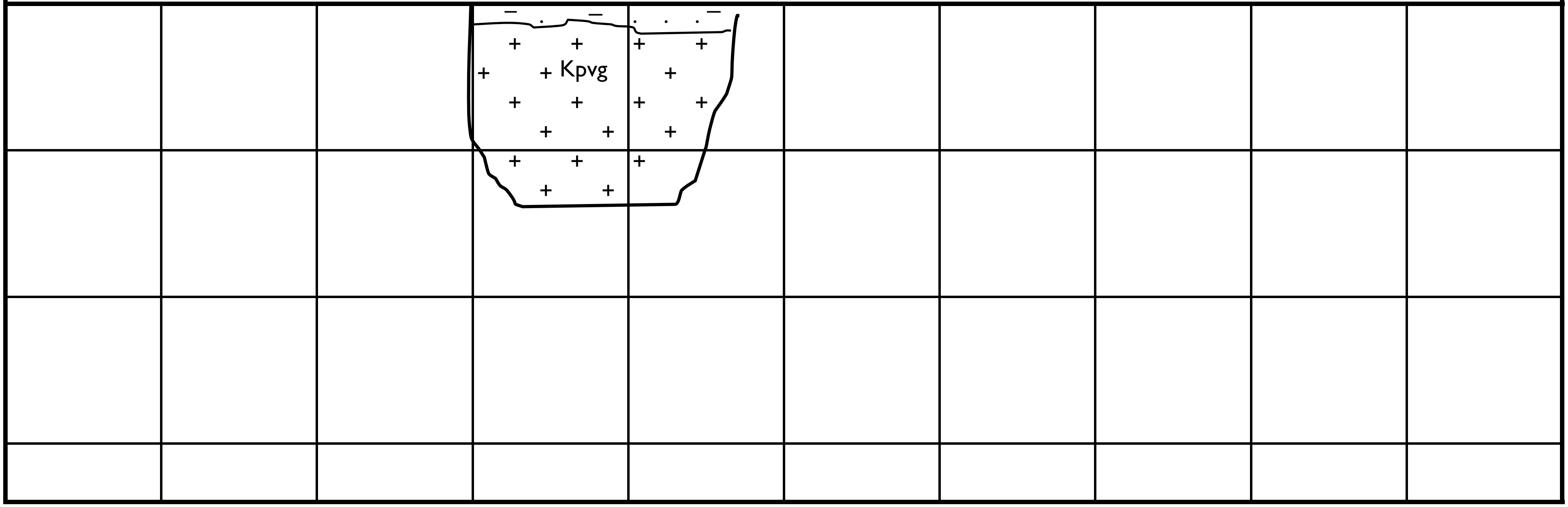
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1553'

Test Pit Number: 10 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 9"-1'	**Topsoil:** Light orange brown fine Silty SAND with medium and coarse grains, roots, porous, dry in top 2", slightly moist and medium dense below.
	9"-1' to 7'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly moist, very dense
		Total Depth 7' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



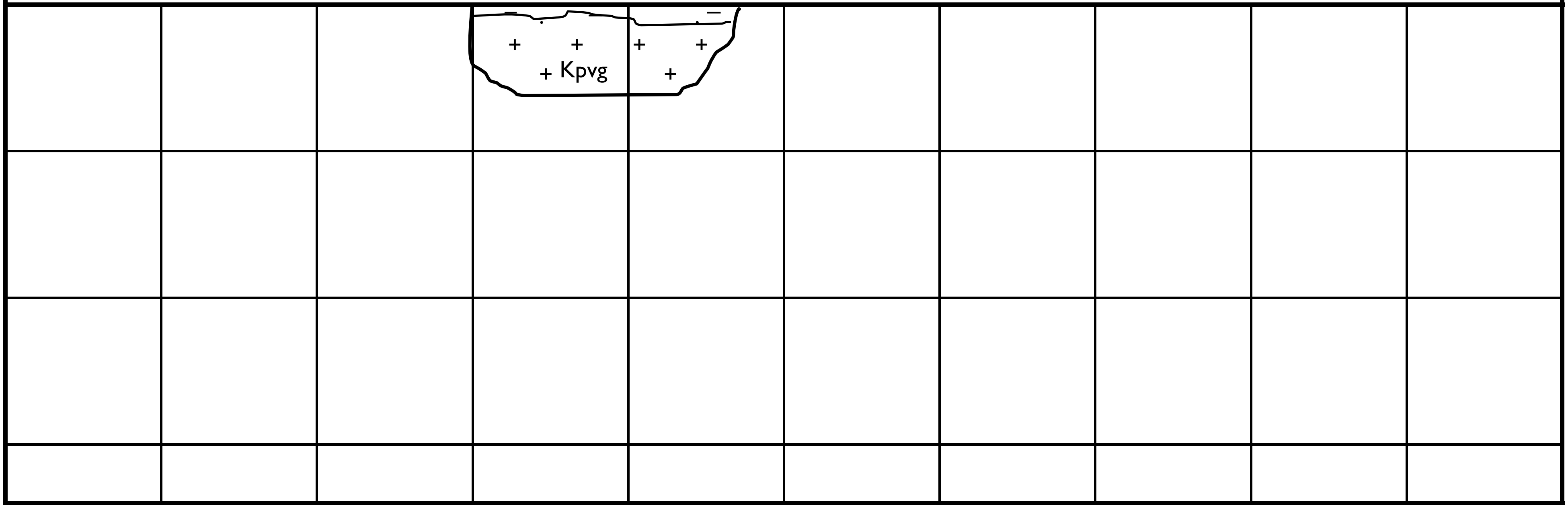
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1570.5'

Test Pit Number: 11 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 3"-6"	**Topsoil:** Light orange brown fine to coarse Silty SAND with trace Gravel, roots, porous, dry, slightly loose. dense below.
	3-6" to 3'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly moist, very dense.
		Total Depth 3' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



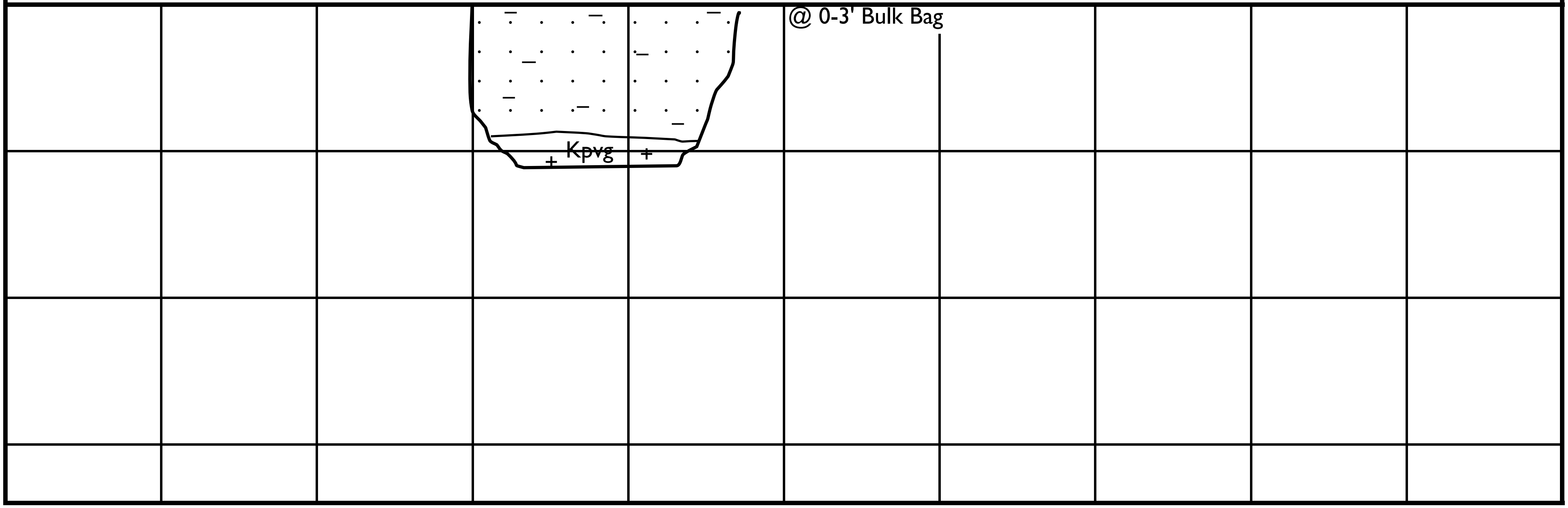
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1558.5'

Test Pit Number: 12 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 4.5'	**Topsoil:** Moderate orange brown fine Silty SAND with minor mediun to coarse sand grains, trace Gravel, roots to 2', porous, dry and loose to 3", slighlty moist and medium dense below.
	4.5' to 5.5	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly moist, very dense.
		Total Depth 5.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet

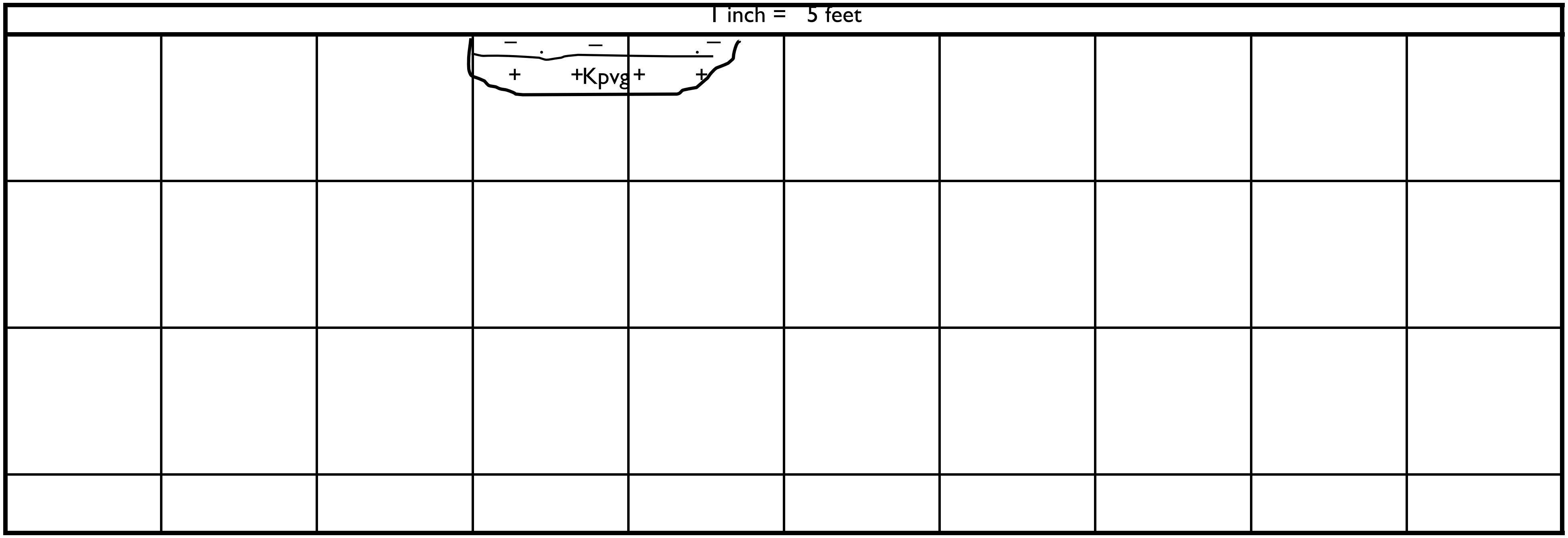


Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1582'

Test Pit Number: 13 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 9"	**Topsoil:** Light orange brown fine to coarse Silty SAND with trace Gravel, roots, porous, dry, slightly loose. dense below.
	9" to 2'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light to light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly very dense. Total Depth 2' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

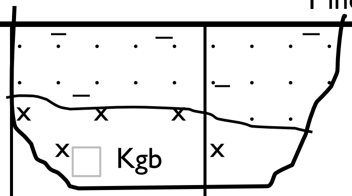


Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1539'

Test Pit Number: 14 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 2-3'	**Topsoil:** Moderate orange brown fine Silty SAND with minor mediun to coarse sand grains, trace Gravel, roots to 2', porous, dry and loose to 3", slighlty moist, and medium dense below.
	2-3' to 5'	**San Marcos Gabbro (Kgb):** Very weathered, moderate gray, massive, coarse grained, GABBRO with Biotite, closed fractures filled with soil, dry to very dense. Very hard digging at 5 feet.
		Total Depth 5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



Bag 0-3'

RMA GeoScience

Log of Exploratory Test Pit

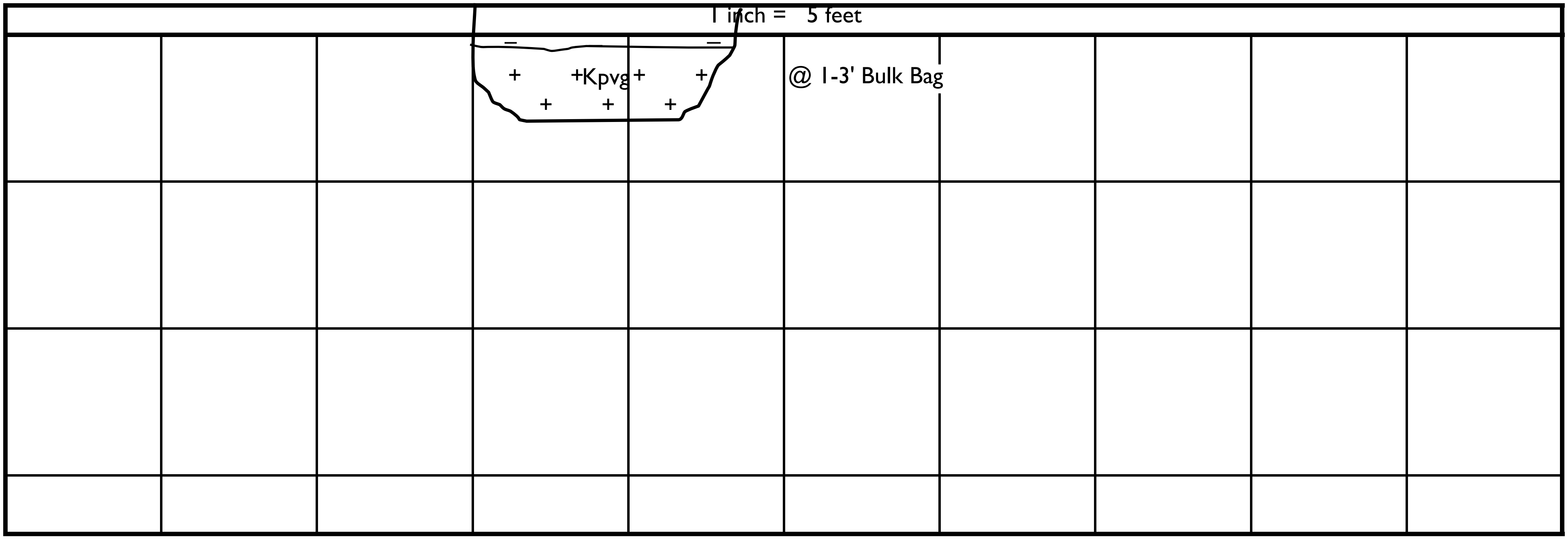
Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1547'

Test Pit Number: 15 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 4"	**Topsoil:** Light orange brown fine to medium Silty SAND with sparce Gravel, roots, porous, dry to sligthly moist, loose to medum dense.
	4" to 3'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light to light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly very dense

Total Depth 3'
No Groundwater Encountered
No Caving
Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



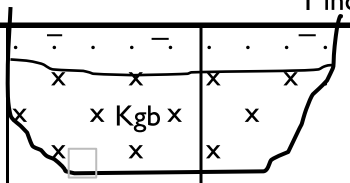
RMA GeoScience

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1519.5'

Test Pit Number: 16 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 1-1.5'	**Topsoil:** Moderate orange brown fine Silty SAND with sparce Gravel, porous, roots and dry in upper 4", slightly moist and medium dense below.
	1-1.5' to 4'	**San Marcos Gabbro (Kgb):** Very weathered, moderate gray, massive, coarse grained, GABBRO with Biotite, orange iron oxide staining, dry to slightly very dense. Very hard digging at 4 feet.
		Total Depth 4' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet

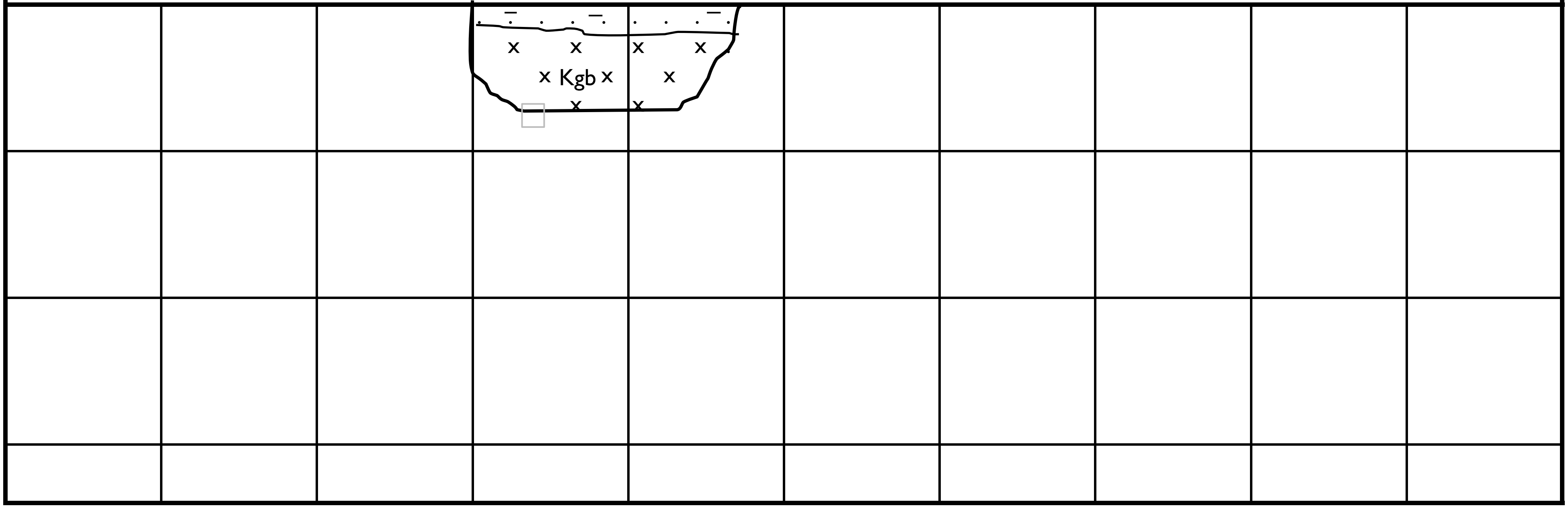


Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1519.5'

Test Pit Number: 17 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 9"-1'	**Topsoil:** Light orange brown fine Silty SAND with sparce Gravel and Cobbles, porous, roots and dry in upper 2", slightly moist and medium dense below.
	9"-1' to 3.5'	**San Marcos Gabbro (Kgb):** Very weathered, moderate gray, massive, coarse grained, GABBRO with Biotite, orange iron oxide staining, dry to slightly very dense. Hard digging, stopped at 4 feet.
		Total Depth 3.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



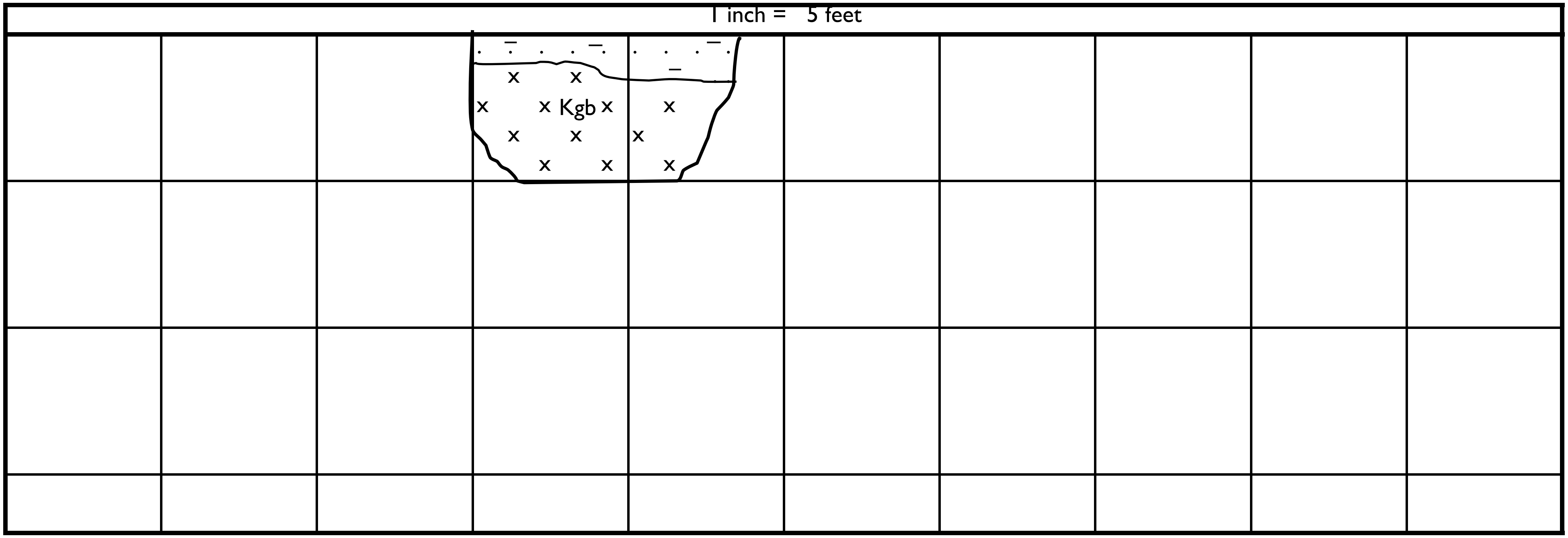
RMA GeoScience

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1518'

Test Pit Number: 18 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 1-1.5'	**Topsoil:** Moderate orange brown fine Silty SAND with sparce Gravel, porous, roots and dry in upper 2", slightly moist and medium dense below.
	1'-1.5' to 5'	**San Marcos Gabbro (Kgb):** Very weathered, light to moderate gray, massive, coarse grained, GABBRO with Biotite, orange iron oxide staining, dry to very dense. Hard digging 4 to 5'
		Total Depth 5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-1**
Boring Location:
Drill Type: Hollow Stem Auger

■ Thin Wall Tube
☒ 2.5" Ring Sample
⧄ Bulk Sample
◫ Standard Split Spoon Sample
▽ Static Water Table

Depth in Feet	Soil Type	Sample Type: Undisturbed	Sample Type: Bulk	SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear: φ°	Direct Shear: C psf	Other Tests
	ML		☒	ALLUVIUM (Qal): Sandy silt, orange-brown, moist, 5% gravel, dense.				7	25			
		☒		@ 2' Sandy silt, tan, moist, dense.	85/11"	3.5	114.4					
5												
	SM	◫		@ 6' Silty sand with gravel, grey-brown, moist, very dense.	71/10"	2.8						
			☒									
10	SM	☒		@ 10' Silty sand with gravel, grey-brown, moist, very dense.	50/4"	5.3	127.4					
	Bdrx	◫		GRANODIORITE (Kgd): Bedrock No recovery	50/3"	1.7						
15												
				TOTAL DEPTH @ 14 feet NO GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
20												
25												
30												
35												

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-2**
Boring Location:
Drill Type: Hollow Stem Auger

■ Thin Wall Tube
☒ 2.5" Ring Sample
⧄ Bulk Sample
◫ Standard Split Spoon Sample
▽ Static Water Table

Depth in Feet	Soil Type	Sample Type		SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear		Other Tests
		Undisturbed	Bulk							φ °	C psf	
	ML			@ 0' Alluvium (Qal): Sandy silt, orange-brown, moist, loose.								
	ML	☒		@ 2' Sandy silt, yellow-brown, moist, dense.	80/10"	2.8	127.7					
5												
	SM	◫		@ 6' Silty sand, brown, moist.	40	3.3						
10	SM	☒		@ 10' Silty sand, grey-brown, moist, dense.	50/5"	3.8	120.6					
15	SM	☒	☒	@ 15' Silty sand w/ gravel, grey-brown, moist, dense. @ 16' Groundwater encountered ▽	50/6"	5.4	120.9					
20		◫		@ 20' Gravel with silt. Refusal due to gravel.	50/4"	11.1						
25												
30												
35												

TOTAL DEPTH @ 23 feet
GROUNDWATER ENCOUNTERED
NO CAVING EXPERIENCED

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-3**
Boring Location:
Drill Type: Hollow Stem Auger

■ Thin Wall Tube
☒ 2.5" Ring Sample
⧄ Bulk Sample
◫ Standard Split Spoon Sample
▽ Static Water Table

Depth in Feet	Soil Type	Sample Type		SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear		Other Tests
		Undisturbed	Bulk							φ°	C psf	
	ML		⧄	@ 0' Alluvium (Qal): Sandy silt, orange				0	16			
	ML	☒		@ 3' Sandy silt, yellow-brown, moist, dense.	88/10"	4.4	128.5					
5												
	SM	☒		@ 7' Silty sand, grey-brown, moist, dense looks like weathered granite.	50/4"	2.3	129.9					
10	SM	☒		@ 10' Silty sand with gravel, grey-brown, moist, dense, sample has broken gravel weathered	50/3"	2.6	123.8					
15	SM	◫		@ 15' Silty sand w/ gravel, grey-brown, moist, dense.	50/3"	1.8						
20	SM	☒	⧄	@ 20' Silty sand w/ gravel, grey-brown, moist, very dense slow drilling	50/2"	2.2	116.8					
25	SM	◫		@ 25' Silty sand w/ gravel, grey-brown, moist, dense	50/4"	1.5						
30		☒		@ 30' Gravel, rings show bedrock, End of Boring	50/4"	1.9	120					
35												

TOTAL DEPTH @ 30 feet
NO GROUNDWATER ENCOUNTERED
NO CAVING EXPERIENCED

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-4**
Boring Location: See Plot Plan
Drill Type: Hollow Stem Auger Drill Rig

■ Thin Wall Tube
☒ 2.5" Ring Sample
⧄ Bulk Sample
◫ Standard Split Spoon Sample
∇ Static Water Table

Depth in Feet	Soil Type	Sample Type		SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear		Other Tests
		Undisturbed	Bulk							φ °	C psf	
	ML			@ 0' ALLUVIUM (Qal): Sandy silt, orange-brown, moist, dense.								
	ML	☒		@ 3' Sandy silt, yellow-brown, moist, dense.	50/4"	3.1	120.9					
5	SM	☒		@ 5' Silty sand.	50/3"	1.5	109.2					
	Bdrx			Granodiorite (Kgd) Bedrock Refusal								
10				TOTAL DEPTH @ 7 feet NO GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
15												
20												
25												
30												
35												

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-5**
Boring Location: See Plot Plan
Drill Type: Hollow Stem Auger Drill Rig

■ Thin Wall Tube
☒ 2.5" Ring Sample
▨ Bulk Sample
◫ Standard Split Spoon Sample
▽ Static Water Table

Depth in Feet	Soil Type	Sample Type		SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear		Other Tests
		Undisturbed	Bulk							φ°	C psf	
	SM			Alluvium (Qal): Silty sand, orange-brown, dense								
	SM	☒		@ 3' Silty sand, yellow-brown, moist, very dense.	50/3"	1.8	111.0					
5	ML	☒		@ 5' Sandy silt, with gravel, grey-brown, moist, dense.	50/4"	3.6	104.2					
				Water @ 10 feet ▽								
10	SM	◫		@ 10' Silty sand with large amounts of gravel grey-brown, very dense, moist.	50/7"	1.7						
15	SM	☒		@ 15' Silty sand with gravel, grey-brown, wet, very dense. @ 16' Refusal due to gravel.	50/2"	7.1	132.1					
20				TOTAL DEPTH @ 16 feet GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
25												
30												
35												

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-6**
Boring Location: See Plot Plan
Drill Type: Hollow Stem Auger Drill Rig

■ Thin Wall Tube
☒ 2.5" Ring Sample
◩ Bulk Sample
◫ Standard Split Spoon Sample
▽ Static Water Table

Depth in Feet	Soil Type	Sample Type		SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear		Other Tests
		Undisturbed	Bulk							φ °	C psf	
	ML			@ 0' ALLUVIUM (Qal): Sandy silt, orange-brown, very dense.								
	ML	☒		@ 3' Sandy silt, orange-brown, moist, very dense.	70/6"	5.8	108.2					
5	ML	☒		@ 5' Sandy silt, yellow-brown, moist, dense.	80/9"	3.2	120.2					
10	ML	☒		@ 10' Sandy silt, brown, moist, dense.	508/3"	5.5	115.4					
15	ML	☒		@ 15' Sandy silt, brown, moist, dense.	50/4"	3.6	110.7					
				@ 18' Hitting gravel- slow drilling								
20	SM	☒		@ 20' Silty sand, grey-brown, moist, dense, with gravel.	50/3"	3.5	111.2					
25	SM	◫		@ 25' Silty sand with gravel, grey-brown, No recovery	50/3"							
				Refusal @ 28' due to gravel.								
30				TOTAL DEPTH @ 28 feet NO GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
35												

APPENDIX B

PREVIOUS LABORATORY TESTS
RMA 2019

APPENDIX B

B-1.00 LABORATORY TESTS

B-1.01 Maximum Density

Maximum density - optimum moisture relationships for the major soil types encountered during the field exploration were performed in the laboratory using the standard procedures of ASTM D1557.

B-1.02 Expansion Tests

Expansion index tests were performed on representative samples of the major soil types encountered by the test methods outlined in ASTM D4829.

B-1.04 Atterberg Limits

The liquid limit, plastic limit, and the plasticity index of the major soil types encountered in the test pits were determined using the standard test methods of ASTM D4318.

B-1.05 Particle-Size/Sieve Analysis

Particle size analysis was performed on a representative sample of the on-site soils in accordance with the standard test methods of the ASTM D422.

B-1.06 Soluble Sulfates and Chlorides

Tests were performed on a representative sample encountered during the investigation using the California Test Methods 417 and 422.

B-1.07 Soil Reactivity (pH) and Electrical Conductivity (Ec)

Near-surface soil samples were tested for soil reactivity (pH) and minimum electrical resistivity using California Test Method 643 (see Table B1). The pH measurement determines the degree of acidity or alkalinity in the soils. The minimum resistivity is used as an indicator of how corrosive the soil is relative to buried metallic items.

B-1.08 Direct Shear

A direct shear test was performed on representative samples of the major soil types encountered in the test pit using the standard test method of ASTM D3080 (consolidated and drained). Tests were performed on a remolded sample. The remolded sample was tested at 90 percent relative compaction.

Shear test was performed on a direct shear machine of the strain-controlled type. To simulate possible adverse field conditions, the samples were saturated prior to shearing. Several samples were sheared at varying normal loads and the results plotted to establish the angle of the internal friction and cohesion of the tested samples.

B-1.09 Test Results

Test results for all laboratory tests performed on the subject project are presented in this appendix.

MAXIMUM DENSITY - OPTIMUM MOISTURE

(Test Method: ASTM D1557)

Sample Number	Optimum Moisture (Percent)	Maximum Density (lbs/ft^3)
TP1 @ 0-3 feet	10.4	128.9
TP14 @ 0-3 feet	7.0	130.3
TP15 @ 1-3 feet	7.1	129.7

EXPANSION TEST

Test Method: ASTM D4829

Sample Number	Expansion Index	Expansion Classification
TP1 @ 3-5 feet	0	Very Low

ATTERBERG LIMITS TEST RESULTS

Test Method: ASTM D4318

Sample Location	Liquid Limit	Plastic Limit	Plasticity Index
TP1 @3-5 feet	28	26	2

SOLUBLE SULFATES

(Test Method: Hach DR3 - Calcium Phosphate Extractable)

Sample Number	Soluble Sulfate (ppm)	Chloride Content (ppm)
TP1 @ 3-5 feet	55	40

SOIL REACTIVITY (pH) AND ELECTRICAL CONDUCTIVITY

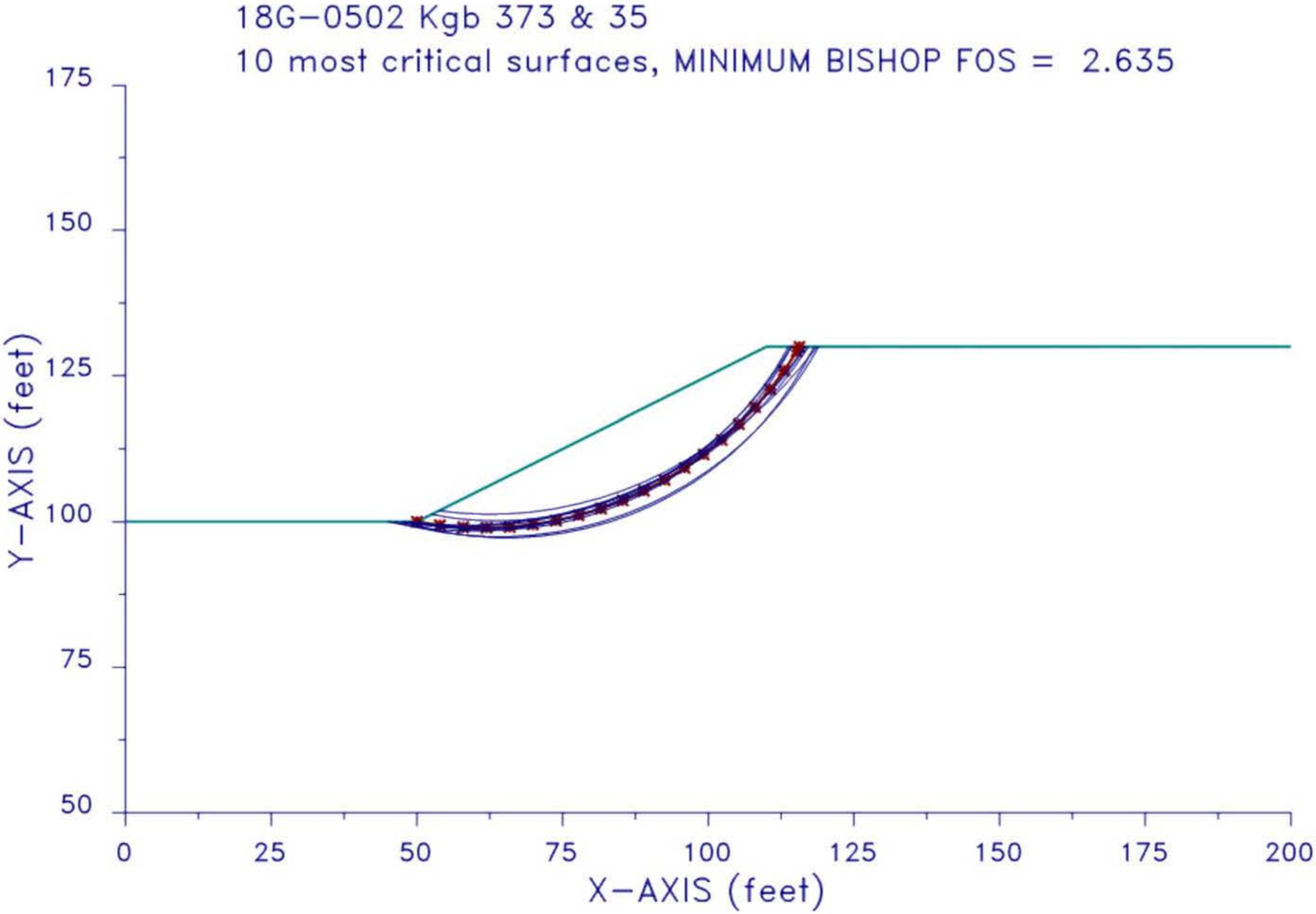
(Test Method: ASTM D4972)

Sample Number	pH	Resistivity (Ohm-cm)
TP1 @ 3-5 feet	6.9	1,511

APPENDIX C

SLOPE STABILITY ANALYSIS RESULTS

KGBCIR1 2-06-19 13:22



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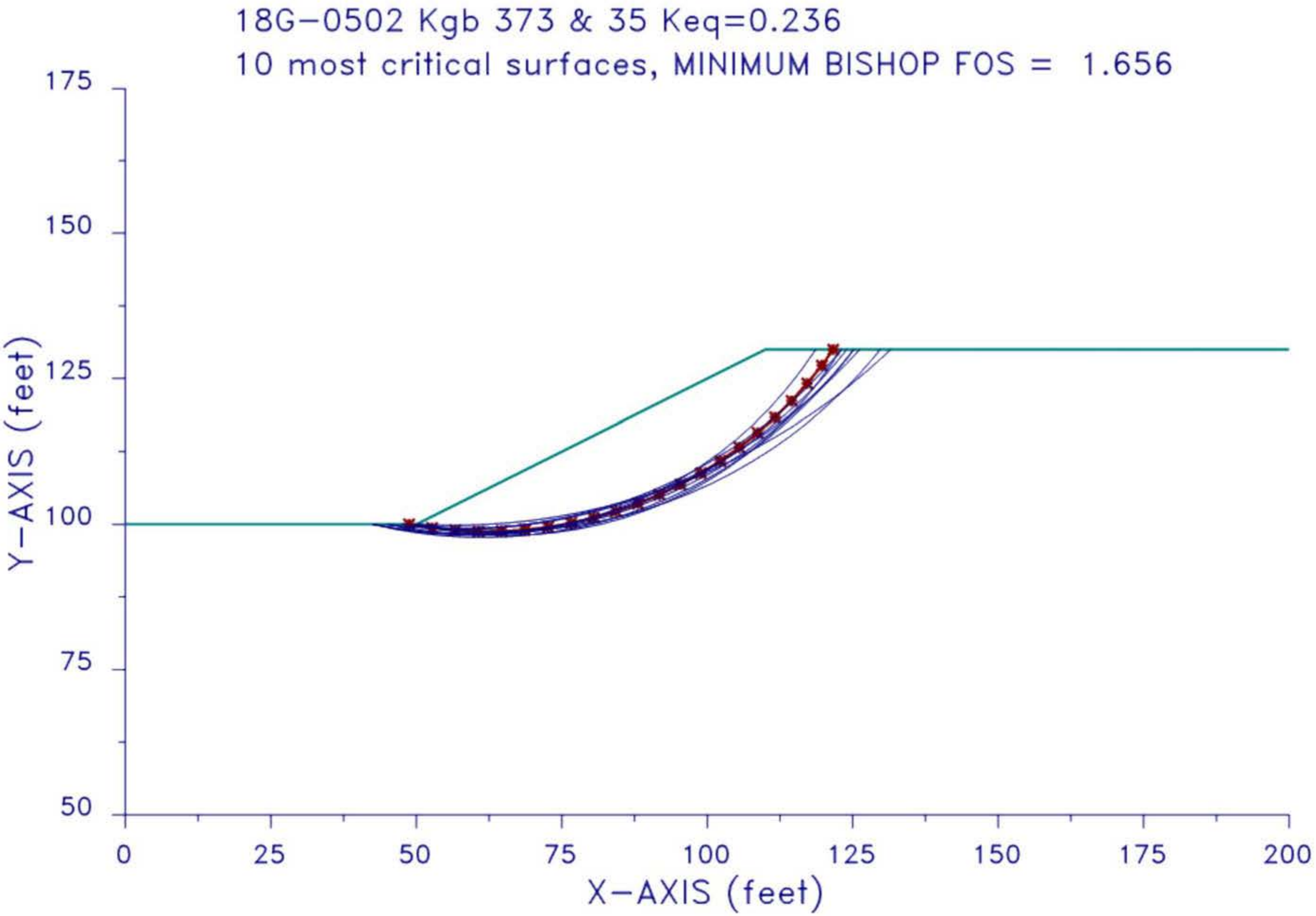
18G-0502 Kgb 373 & 35 Keq=0.236
10 most critical surfaces, MINIMUM BISHOP FOS = 1.656

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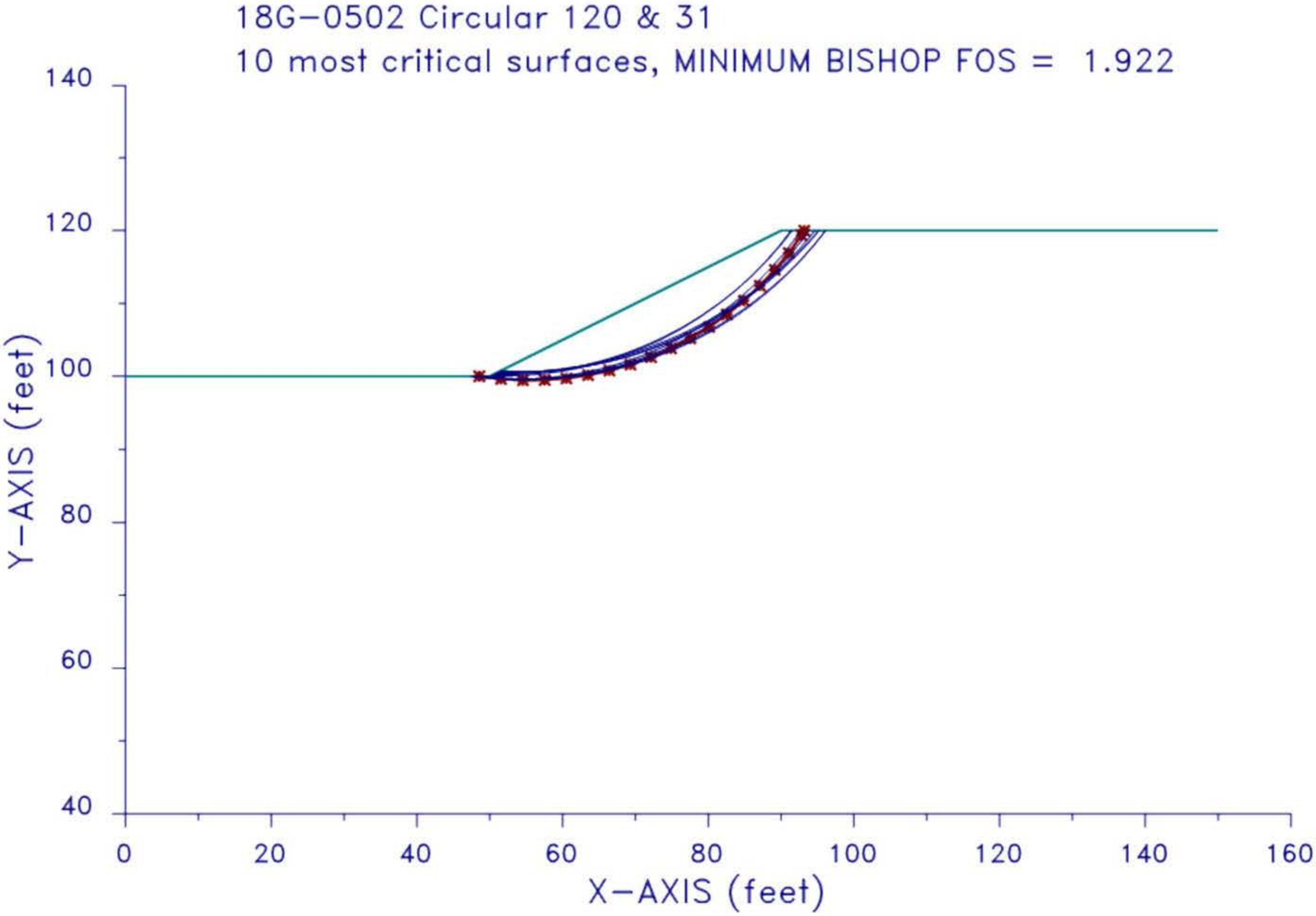
18G-0502 Circular 120 & 31
10 most critical surfaces, MINIMUM BISHOP FOS = 1.922

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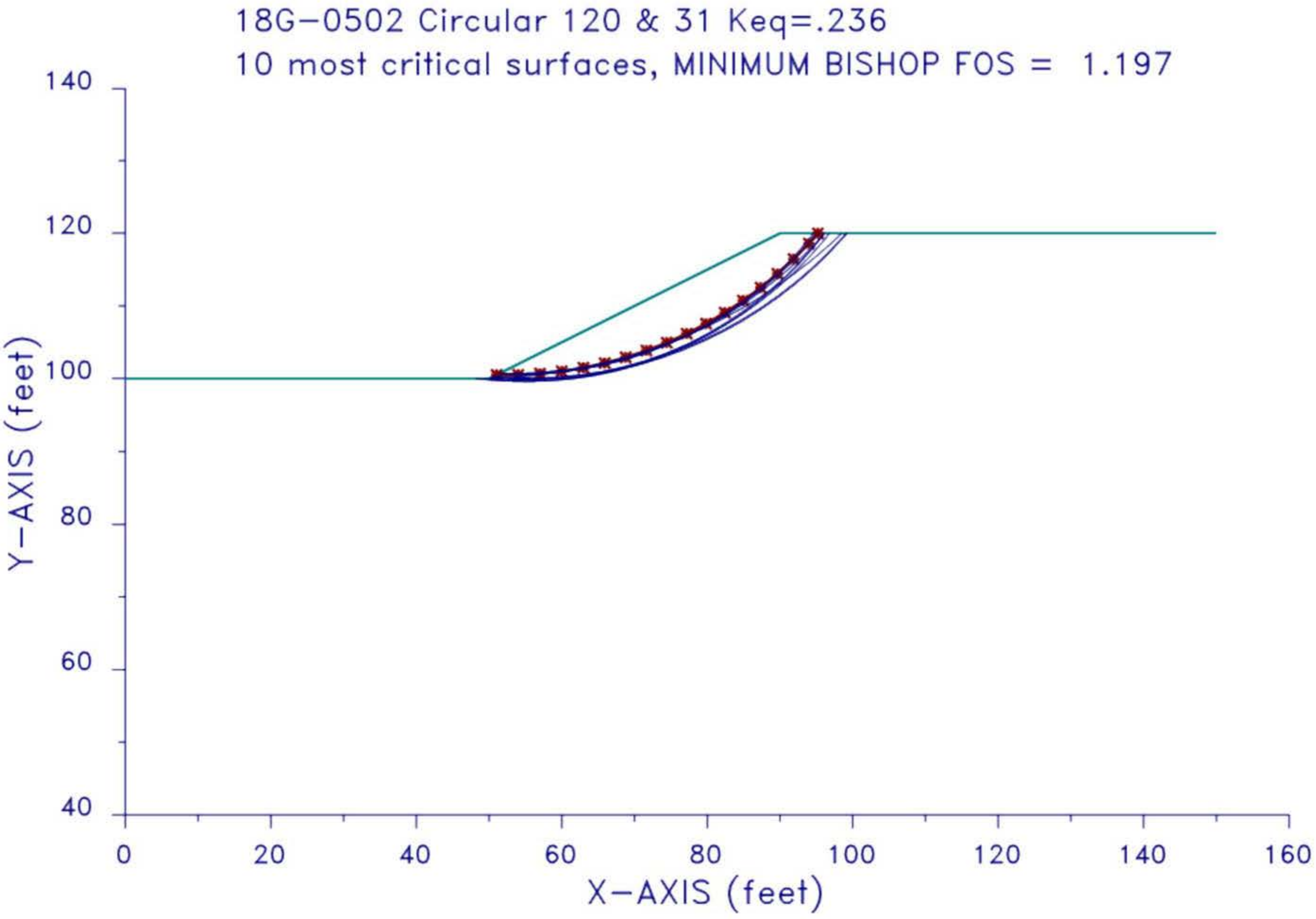

APPENDIX D

GENERAL EARTHWORKS AND GRADING SPECIFICATIONS

APPENDIX D

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

D-1.00 GENERAL DESCRIPTION

D-1.01 Introduction

These specifications present our general recommendations for earthwork and grading as shown on the approved grading plans for the subject project. These specifications shall cover all clearing and grubbing, removal of existing structures, preparation of land to be filled, filling of the land, spreading, compaction and control of the fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades and slopes as shown on the approved plans.

The recommendations contained in the geotechnical report of which these general specifications are a part of shall supersede the provisions contained hereinafter in case of conflict.

D-1.02 Laboratory Standard and Field Test Methods

The laboratory standard used to establish the maximum density and optimum moisture shall be ASTM D1557.

The insitu density of earth materials (field compaction tests) shall be determined by the sand cone method (ASTM D1556), direct transmission nuclear method (ASTM D6938) or other test methods as considered appropriate by the geotechnical consultant.

Relative compaction is defined, for purposes of these specifications, as the ratio of the in-place density to the maximum density as determined in the previously mentioned laboratory standard.

D-2.00 CLEARING

D-2.01 Surface Clearing

All structures marked for removal, timber, logs, trees, brush and other rubbish shall be removed and disposed of off the site. Any trees to be removed shall be pulled in such a manner so as to remove as much of the root system as possible.

D-2.02 Subsurface Removals

A thorough search should be made for possible underground storage tanks and/or septic tanks and cesspools. If found, tanks should be removed and cesspools pumped dry.

Any concrete irrigation lines shall be crushed in place and all metal underground lines shall be removed from the site.

D-2.03 Backfill of Cavities

All cavities created or exposed during clearing and grubbing operations or by previous use of the site shall be cleared of deleterious material and backfilled with native soils or other materials approved by the soil engineer. Said backfill shall be compacted to a minimum of 90% relative compaction.

D-3.00 ORIGINAL GROUND PREPARATION

D-3.01 Stripping of Vegetation

After the site has been properly cleared, all vegetation and topsoil containing the root systems of former vegetation shall be stripped from areas to be graded. Materials removed in this stripping process may be used as fill in areas designated by the soil engineer, provided the vegetation is mixed with a sufficient amount of soil to assure that no appreciable settlement or other detriment will occur due to decaying of the organic matter. Soil materials containing more than 3% organics shall not be used as structural fill.

D-3.02 Removals of Non-Engineered Fills

Any non-engineered fills encountered during grading shall be completely removed and the underlying ground shall be prepared in accordance to the recommendations for original ground preparation contained in this section. After cleansing of any organic matter the fill material may be used for engineered fill.

D-3.03 Over excavation of Fill Areas

The existing ground in all areas determined to be satisfactory for the support of fills shall be scarified to a minimum depth of 6 inches. Scarification shall continue until the soils are broken down and free from lumps or clods and until the scarified zone is uniform. The moisture content of the scarified zone shall be adjusted to within 2% of optimum moisture. The scarified zone shall then be uniformly compacted to 90% relative compaction.

Where fill material is to be placed on ground with slopes steeper than 5:1 (H:V) the sloping ground shall be benched. The lowermost bench shall be a minimum of 15 feet wide, shall be a minimum of 2 feet deep, and shall expose firm material as determined by the geotechnical consultant. Other benches shall be excavated to firm material as determined by the geotechnical consultant and shall have a minimum width of 4 feet.

Existing ground that is determined to be unsatisfactory for the support of fills shall be overexcavated in accordance to the recommendations contained in the geotechnical report of which these general specifications are a part.

D-4.00 FILL MATERIALS

D-4.01 General

Materials for the fill shall be free from vegetable matter and other deleterious substances, shall not contain rocks or lumps of a greater dimension than is recommended by the geotechnical consultant, and shall be approved by the geotechnical consultant. Soils of poor gradation, expansion, or strength properties shall be placed in areas designated by the geotechnical consultant or shall be mixed with other soils providing satisfactory fill material.

D-4.02 Oversize Material

Oversize material, rock or other irreducible material with a maximum dimension greater than 8 inches shall not be placed in fills, unless the location, materials, and disposal methods are specifically approved by the geotechnical consultant. Oversize material shall be placed in such a manner that nesting of oversize material does not occur and in such a manner that the oversize material is completely surrounded by fill material compacted to a minimum of 90% relative compaction. Oversize material shall not be placed within 10 feet of finished grade without the approval of the geotechnical consultant.

D-4.03 Import

Material imported to the site shall conform to the requirements of Section 4.01 of these specifications. Potential import material shall be approved by the geotechnical consultant prior to importation to the subject site.

D-5.00 PLACING AND SPREADING OF FILL

D-5.01 Fill Lifts

The selected fill material shall be placed in nearly horizontal layers which when compacted will not exceed approximately 6 inches in thickness. Thicker lifts may be placed if testing indicates the compaction procedures are such that the required compaction is being achieved and the geotechnical consultant approves their use.
Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to insure uniformity of material in each layer.

D-5.02 Fill Moisture

When the moisture content of the fill material is below that recommended by the soils engineer, water shall then be added until he moisture content is as specified to assure thorough bonding during the compacting process.

When the moisture content of the fill material is above that recommended by the soils engineer, the fill material shall be aerated by blading or other satisfactory methods until the moisture content is as specified.

D-5.03 Fill Compaction

After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to not less than 90% relative compaction. Compaction shall be by sheepsfoot rollers, multiple-wheel pneumatic tired rollers, or other types approved by the soil engineer.

Rolling shall be accomplished while the fill material is at the specified moisture content. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to insure that the desired density has been obtained.

D-5.04 Fill Slopes

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compacting of the slopes may be done progressively in increments of 3 to 4 feet in fill height. At the completion of grading, the slope face shall be compacted to a minimum of 90% relative compaction. This may require track rolling or rolling with a grid roller attached to a tractor mounted side boom.

Slopes may be over filled and cut back in such a manner that the exposed slope faces are compacted to a minimum of 90% relative compaction.

The fill operation shall be continued in six inch (6") compacted layers, or as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

D-5.05 Compaction Testing

Field density tests shall be made by the geotechnical consultant of the compaction of each layer of fill. Density tests shall be made at locations selected by the geotechnical consultant.

Frequency of field density tests shall be not less than one test for each 2.0 feet of fill height and at least every one thousand cubic yards of fill. Where fill slopes exceed four feet in height their finished faces shall be tested at a frequency of one test for each 1000 square feet of slope face.

Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density reading shall be taken in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required density, the particular layer or portion shall be reworked until the required density has been obtained.

D-6.00 SUBDRAINS

D-6.01 Subdrain Material

Subdrains shall be constructed of a minimum 8-inch diameter pipe encased in a suitable filter material. The subdrain pipe shall be Schedule 40 Acrylonitrile Butadiene Styrene (ABS) or Schedule 40 Polyvinyl Chloride Plastic (PVC) pipe or approved equivalent. Subdrain pipe shall be installed with perforations down. Filter material shall consist of 3/4" to 1 1/2" clean gravel wrapped in an envelope of filter fabric consisting of Mirafi 140N or approved equivalent.

D-6.02 Subdrain Installation

Subdrain systems, if required, shall be installed in approved ground to conform the approximate alignment and details shown on the plans or herein. The subdrain locations shall not be changed or modified without the approval of the geotechnical consultant. The geotechnical consultant may recommend and direct changes in the subdrain line, grade or material upon approval by the design civil engineer and the appropriate governmental agencies.

D-7.00 EXCAVATIONS

D-7.01 General

Excavations and cut slopes shall be examined by the geotechnical consultant. If determined necessary by the geotechnical consultant, further excavation or overexcavation and refilling of overexcavated areas shall be performed, and/or remedial grading of cut slopes shall be performed.

D-7.02 Fill-Over-Cut Slopes

Where fill-over-cut slopes are to be graded the cut portion of the slope shall be made and approved by the geotechnical consultant prior to placement of materials for construction of the fill portion of the slope.

D-8.00 TRENCH BACKFILL

D-.01 General

Trench backfill within street right of ways shall be compacted to 90% relative compaction as determined by the ASTM D1557 test method. Backfill may be jetted as a means of initial compaction; however, mechanical compaction will be required to obtain the required percentage of relative compaction. If trenches are jetted, there must be a suitable delay for drainage of excess water before mechanical compaction is applied.

D-9.00 SEASONAL LIMITS

D-9.01 General

No fill material shall be placed, spread or rolled while it is frozen or thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the soils engineer indicate that the moisture content and density of the fill are as previously specified.

D-10.00 SUPERVISION

D-10.01 Prior to Grading

The site shall be observed by the geotechnical consultant upon completion of clearing and grubbing, prior to the preparation of any original ground for preparation of fill.

The supervisor of the grading contractor and the field representative of the geotechnical consultant shall have a meeting and discuss the geotechnical aspects of the earthwork prior to commencement of grading.

D-10.02 During Grading

Site preparation of all areas to receive fill shall be tested and approved by the geotechnical consultant prior to the placement of any fill.

The geotechnical consultant or his representative shall observe the fill and compaction operations so that he can provide an opinion regarding the conformance of the work to the recommendations contained in this report.

APPENDIX E

REFERENCES

REFERENCES

1. California Building Standards Commission, 2019 California Building Code.

2. California Department of Conservation Division of Mines and Geology, 2008. Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117.

3. California Geologic Survey, 1990 and 2018, Earthquake Zones of Required Investigation Map, Murrieta Quadrangle, Scale 1:24,000.

4. California Geologic Survey, 2018, Seismic Hazard Zone Report For The Murrieta 7.5-Minute Quadrangle, Riverside County, California, Seismic Hazard Zone Report 115.

5. County of Riverside, 2015, County of Riverside Environmental Impact Report No. 521, Section 4.11 Flood and Dam Inundation Hazards, Public Review Draft.

6. Kennedy, M.P. and Morton, D.M., 2003, Preliminary Geologic Map of the Murrieta 7.5' Quadrangle, Riverside County, California, Version 1.0, USGS OF-2003-189, Scale 1:24,000.

7. Morton, D.M. and Baird, A.K.,1976, Petrology of the Paloma Valley Ring Complex, Southern California Batholith *in* U.S. Geological Survey, Jour. Research, Vol. 4, No. 1 p. 83-89, 1976.

8. Morton et al., 2014, Framework and Petrogenesis of the Northern Peninsular Ranges Batholith, Southern California *in* Geological Society of America Memoirs, March 2014.

9. NETR Online, Historic Aerial Photographs, 1938, 1967, 1978, 1996, 2002, 2005, 2009, 2012, 2014 and Historic Topographic Maps, 1943, 1955, 1962, 1971, 1975, 1979, 1986, 2012, 2015: http://www.historicaerials.com.

10. Riverside County Map My County Online Website: http://www.gis.countyofriverside.us/Html5Viewer/?viewer=MMC_Public.

11. RMA Geoscience, Preliminary Geotechnical Investigation, Murrieta 56, APN 392-290-049-6, South of Baxter Road, West of Whitewood Road and East of Interstate 215 and Antelope Road Murrieta California, Project Number 18G-0502-0, February 7th 2019

12. University of Santa Barbara Aerial Photography Library: axm-1938a, 32-12, axm-1953b, 2k-64, http://www.mil.library.ucsb.edu/ap_indexes/FrameFinder/.

APPENDIX F

RMAGEOSCIENCE
PRELIMINARY GEOTECHNICAL INVESTIGATION
MURRIETA 56, APN 392-290-049-6
DATED FEBRUARY 7TH, 2019

RMA GeoScience
Every *Project* **Matters**|www.rmacompanies.com

February 7, 2019 No.18G-0502-0

Jupiter Land Holdings LLC
2392 Morse Avenue
Irvine, CA 92614

Attention: Mr. Derek Hicks

Subject: Preliminary Geotechnical Investigation
Murrieta 56, APN 392-290-049-6
South of Baxter Road, West of Whitewood road and
East of Interstate 215 and antelope Road
Murrieta, California

Dear Mr. Hicks:

In accordance with your request, a preliminary geotechnical investigation has been completed for the above referenced property. The report addresses the engineering geotechnical conditions at the subject site. The results of the investigation are presented in the accompanying report, which includes a description of site conditions, results of our field exploration and laboratory testing, slope stability analysis, conclusions, and recommendations.

We appreciate this opportunity to be of continued service to you. If you have any questions regarding this report, please do not hesitate to contact us at your convenience.

Respectfully submitted,

RMA GeoScience

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RMA GeoScience
Every Project Matters | www.rmacompanies.com

GEOTECHNICAL INVESTIGATION
FOR
MURRIETA 56, APN 392-290-049-6
SOUTH OF BAXTER ROAD, WEST OF WHITEWOOD ROAD AND
EAST OF INTERSTATE 215 AND ANTELOPE ROAD
MURRIETA, CALIFORNIA

For

Jupiter Land Holdings LLC
2392 Morse Avenue
Irvine, CA 92614

February 7, 2019

Project No. 18G-0502-0

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<u>FIGURES AND PLATES</u>

APPENDICES

1.0 Introduction

1.01 Purpose

A geotechnical investigation has been completed at the subject site, Murrieta 56, APN 392-290-049-6. The purpose of the investigation was to summarize geotechnical and geologic conditions at the site, to assess their potential impact on the proposed development, and to develop geotechnical and engineering geologic design parameters.

1.02 Scope of the Investigation

The general scope of this investigation included the following:

- Review of published and unpublished geologic, seismic, groundwater and geotechnical literature
- Examination of aerial photographs and topographic maps
- Contacting of underground service alert to locate onsite utility lines
- Logging, sampling and backfilling of exploratory test pits excavated with a backhoe
- Laboratory testing of representative soil samples
- Geotechnical evaluation of the compiled data including slope stability analysis
- Preparation of this report presenting our findings, conclusions, and recommendations

Our scope of work did not include a preliminary site assessment for the potential of hazardous materials onsite

1.03 Site Location and Description

The property consists of an irregularly shaped 55.8 acre parcel of land located between Baxter Road, Whitewood Road, approximately 500 feet north of Somers Road, and east of Antelope Road and the Interstate 215 freeway, in the city of Murrieta, California (Figure 1). The site is characterized by low lying knobby hills (typically topped with granitic outcrops) with a general slope towards the east. An intermittent or ephemeral creek cuts through the northern one fourth of the site and drains from west to east. The creek area has been designated as an Army Corp of Engineers (ACOE) and California Department of Fish and Game (CDFW) Jurisdiction Area. Two Archeological Sensitive Areas have been identified adjacent to Whitewood Road within the creek area. The elevation differential is 78 feet over a distance of 2,400 feet. The site is currently vegetated by native grasses and chaparral. Past grading modifications have been made on site associated with the construction of three debris basins and possible import of fill materials located between borings B4 and B5 (Plate 1). Artificial fill has been placed along Whitewood Road and Baker Road as part of the roadway development.

Its central geographic position is 33.610381° north latitude and -117.166056° west longitude.

1.04 Planned Development

According to the Mass Grading Plan, prepared by David Evans and Associates Inc., the proposed project will involve conventional cut-fill grading to develop the 55.8 acre mass grading project. Cut slopes up to a maximum height of 30 feet and fill slopes up to a maximum height of 20 feet are planned at gradients of 2:1 or less. The planned maximum cut is 25 feet on the western side of the site and maximum fill depth is 18 feet near the creek area on the northern portion of the lot. The mass grading plan was utilized as a base map to prepare the enclosed Geologic Map, Plate 1 at a scale of 1”=100. Building pad locations have not been provided at this time.

1.05 Previous Studies

Consolidated Geoscience, Inc. (February 27, 2006)(under ownership of RMA GeoScience) completed a Geotechnical Investigation for a portion of the project located east of the debris basins and within the areas of the hollow stem auger borings. The locations of the exploratory borings are indicated on the geologic map and the logs of the borings are included herein. Based on our field mapping and information obtained from our test pit excavations we believe only a thin layer of topsoil of a few inches to feet covers the bedrock in the boring locations. This is substantiated by the high blow counts. Within boring B5, we believe bedrock is likely at a depth of 10 feet; where the subsurface water is perched on. These logs are included in Appendix A.

1.05 Historic Uses

Readily available historic aerial photographs, topographic maps, and the Riverside County Assessor online Parcel Report were used to determine past property use. The Riverside County Assessor website listed the site use as farmland or grazing. Since the first aerial photograph dated 1938 the property has been used as grassland or grazing and only the knobby areas with bedrock outcrops are vegetated by chaparral. The time period between January 2007 and June 2009, three debris basins were constructed. In a March 2011 aerial photograph, two scrappers, a skip loader, and a dump truck are shown located on site. The dump truck appears to be dumping some darker fill materials and the skip loader appears to be spreading fill material within the artificial fill area depicted on the Geologic Map (Plate 1), between boring B4, test pit TP8, and Cross Section 2-2’ adjacent to Whitewood Road.

1.06 Investigation Methods and Limitation

Our investigation consisted of office research, field exploration, laboratory testing, review of the compiled data, and preparation of this report. It has been performed in a manner consistent with generally accepted engineering and geologic principles and practices, and has incorporated applicable requirements of California Buildings Code. Definitions of technical terms and symbols used in this report include those of the ASTM International, the California Building Code, and commonly used geologic nomenclature.

Technical supporting data are presented in the attached appendices. Appendix A presents a description of the methods and equipment used in performing the field exploration and logs of our subsurface exploration. Appendix B presents a description of our laboratory testing and the test results. Appendix C presents stability analyses of existing and proposed slopes. Standard grading specifications and references are presented in Appendices D and E.

2.00 Findings

2.01 Geologic Setting

The site is located within the Peninsular Range geomorphic province that is characterized by a series of mountain ranges separated by long valleys. The Peninsular Range has been divided into three fault bounded blocks with the site located within the central block or the Perris Block. The Perris Block bedrock consists of an eroded grouping of Cretaceous and older granitic rocks of the Southern California Batholith and metasedimentary basement rocks. The Perris Block is divided into three blocks and the site is situated within the Central Perris Block. It is bound on the west by the Elsinore Fault and on the east by the San Jacinto Fault zone of the Southern California. The site rocks are also known as belonging to western zone, one of the five batholith zones of the Peninsular Ranges batholith. Within the western zone, plutons were emplaced passively into Mesozoic oceanic crust in an early extensional subduction phase between 108 to 126 million years ago in a back-arc setting (Morton et al, 2014). The site vicinity rocks are part of the Paloma Valley ring complex, one of a number of plutons from the Cretaceous batholith period (Morton and Baird, 1976). The ring complex is considered relatively unique in Southern California, in that only two other ring dike complexes have been noted within the region.

The oldest ring dike was emplaced in the San Marcos Gabbro country rock by assimilation and stoping followed by two later episodes of inner dikes (Morton and Baird, 1976). The San Marcos Gabbro (Kgb) consists of hornblende gabbro that is typically massive, medium to coarse grained, with plagioclase. The oldest ring dike of the Paloma Valley ring complex (Kpvg) is comprised of light color, medium grained biotite monzogranite and less abundant hornblende-biotite granodiorite. Gabbro (Kgb) xenoliths ranging from very small granule size to large boulder blocks and larger are common within the oldest ring dike (Kpvg) (Kennedy and Morton, 2003). A younger ring dike set is divided into an inner and outer zone pegmatite dikes. The inner dikes are concentrated primarily within the central part of the ring complex consisting of pegmatitiD-textured perthite, sodic plagioclase, quartz, biotite, and or muscovite. These dikes cut across both the gabbro country rocks and the oldest ring dike. The outer zone pegmatites include coarse grained granite (Kennedy and Morton, 2003).

The earth materials encountered in our investigation are shown on the Geologic Map (Plate 1) and described below.

2.02 Earth Materials

Artificial Fill (af)

There are three episodes of artificial fill that exists on site: roadway fill located beneath portions of Whitewood Road and Baxter Road; limited amounts of fill along the sides of the debris basins; and imported fill between boring B4 and Cross Section 2-2’. The maximum roadway fill is up to 18 feet thick in the creek bottom along Whitewood Road. Baxter Road fill is on the order of a few feet up to 5 feet. The debris basin fills have depths ranging up to five feet. Visual observation showed these fills to consist of gravely sand with abundant silt and cobble rock fragments. The imported fill located between borings B4 and Cross Section 2-2’ near Whitewood Road appears to have an approximate thickness on the order of 5 to 10 feet maximum. Possible origins for this fill material are likely from neighboring grading projects.

Alluvium (Qal)

Limited alluvium is located within the creek bottom and in the southeastern portion of the site as shown on the Geologic Map, Plate 1. The creek area is an ACOE and CDFW Jurisdiction Area, therefore we did not explore this area. Planned grading appears to be limited outside of this area.

Paloma Valley Ring Complex (Kpvg)

The oldest dike of the Paloma Valley Ring Complex is exposed on the western portion of the site as shown on the

Geologic Map, Plate 1. Within the test pits excavations it was very weathered and consists of massive, medium grained monzogranite in a dry and very dense condition. It tends to be lighter in color and bedrock outcrops showed cobble sized moderate to dark gray xenoliths of the older San Marcos Gabbro. Excavation effort with a backhoe found it difficult to dig at depths of 2 to 7 feet.

San Marcos Gabbro (Kgb)

The San Marcos Gabbro is exposed on the eastern portion of the site as depicted on the Geologic Map, Plate 1. The contact between the gabbro (Kgb) and the monzogranite trends from the southwest to the northeast. The gabbro is very weathered in outcrop form and less weathered on the cuts make within the debris basins. The rock is comprised of very weathered to weathered massive, coarse grained gabbro with biotite. Excavation depths with a backhole ranged from 1 to 6 feet before digging became difficult.

2.03 Expansive Soil

Soil classification and expansion index indicates that near surface soils has a very low expansion potential. Expansion testing performed in accordance with ASTM D4829 indicates that earth materials underlying the site have an expansion classification of 0. Results of expansion test and other soil index tests are presented in Appendix B.

2.04 Surface and Groundwater Conditions

Groundwater was not encountered in the test pit excavations. Within the 6 hollow stem auger borings (B1 through B6) drilled in October 2005, two borings contained water. Boring B2 feet is located close to the tributary of the creek cutting west to east across the site and water was found at 15 feet. The second boring to have water was B5 located within the southeastern low of the site at a depth of 10 feet near what RMA GeoScience interoperates as the bedrock contact. As the other borings with varying depths did not encounter water, the water within borings B2 and B5 can be classified as subsurface water and not groundwater. The Historic Groundwater High Map, Figure 3 does not show any groundwater within the site or site vicinity.

2.05 Landslides

The site is relatively flat and there are no known landslides within or immediately adjacent to the site. The property has not been mapped within a seismic hazard zone Figure 4. The potential for landsliding at the site is judged to be low.

2.06 Faulting

The site does not lie within an AP Fault Zone. The closest fault is the Elsinore Fault Zone, Glen Ivy section at approximately 3.9 miles to the southwest.

The region of the subject site has experienced shaking from several earthquakes recorded back to 1827. The nearest large historic earthquake took place in San Jacinto and occurred in 1918 the epicenter of which is 13.6 miles to the northeast of the site. Historic earthquakes with magnitudes of greater than or equal to 6.0 and have been located within approximately 50 miles of the site, are summarized in the table below.

Large Historic Earthquakes

<table>
<tr><th colspan="2">Event</th><th>Date</th><th>Magnitude</th><th>Distance (mi)</th></tr>
<tr><td colspan="2">San Jacinto</td><td>4/21/1918</td><td>6.8</td><td>13.6</td></tr>
<tr><td colspan="2">Glen Ivy Hot Springs</td><td>5/15/1910</td><td>6.0</td><td>14.8</td></tr>
<tr><td colspan="2">San Jacinto and Hemit</td><td>12/25/1899</td><td>6.4</td><td>16.2</td></tr>
<tr><td>33.9 lat</td><td>117.2 long</td><td>12/19/1880</td><td>6.0</td><td>20.1</td></tr>
<tr><td colspan="2">San Bernardino Region</td><td>7/23/1923</td><td>6.25</td><td>27.3</td></tr>
<tr><td colspan="2">San Bernardino Region</td><td>12/16/1858</td><td>7.0</td><td>33.0</td></tr>
<tr><td colspan="2">San Bernardino Region</td><td>9/20/1907</td><td>6.0</td><td>40.9</td></tr>
<tr><td colspan="2">San Diego Region</td><td>11/22/1800</td><td>6.5</td><td>42.8</td></tr>
<tr><td colspan="2">Landers Earthquake</td><td>6/28/1992</td><td>6.7</td><td>45.3</td></tr>
<tr><td colspan="2">Long Beach Earthquake</td><td>3/11/1933</td><td>6.3</td><td>46.0</td></tr>
</table>

3.00 Conclusions and Recommendations

3.01 General Conclusion

Based on specific data and information contained in this report, our understanding of the project and our general experience in engineering geology and geotechnical engineering, it is our professional judgment that the proposed development is geotechnically feasible provided the recommendations presented below are fully implemented during design and construction.

3.02 Existing Fill

There is existing artificial fill material that were placed to construct Whitewood Road and Baxter Road, the debris basins, and possible import soil as shown on the Geologic Map, Plate 1. A record search should be performed to evaluate if the fill soils are certified for the road ways. Fill slopes up to 13 feet are planned to be tied into the Whitewood Road fill. Any debris basin fills can be removed and used as fill soils. It appears that most if not all the imported soil will be removed in the planned grading.

3.03 General Earthwork and Grading

It is recommended that all earthwork and grading be performed in accordance with Appendix J of the 2016 California Building Code and all applicable governmental agency requirements. In the event of conflicts between this report and Appendix J, this report shall govern.

3.04 Removals and Overexcavation

All vegetation, trash, and debris should be cleared from the grading area and removed from the site. Prior to placement of compacted fills, all undocumented fills (af) and loose, porous, or compressible alluvial soils will need to be removed down to competent ground in areas planned for foundation support. In areas of future streets, we recommend removal of all undocumented fills (af), topsoil and alluvium (Qal). Removal and requirements will also apply to cut areas, if the depth of cut is not sufficient to reach competent ground. Removed and/or over-excavated soils may be moisture-conditioned and recompacted as engineered fill, except for soils containing detrimental amounts of organic material or chemical contamination. Estimated depths of removals are based on the following:

- All undocumented fills (af) and loose, porous, or compressible topsoil, and alluvial soils will need to be removed down to competent ground. It is expected that competent ground (bedrock) will be encountered below existing artificial fill (af) and alluvium. Provided competent materials are exposed, these cut surfaces should be scarified to a minimum depth of 6 inches, moisture conditioned and compacted to a minimum of 90% relative compaction (ASTM D1557) provided that footing overexcavation requirements are met.

No building pad locations have been provided at this time. In addition to the above requirements, in areas were the planned foundation transitions from cut to fill, over-excavation will also need to meet the following criteria for the building pads, concrete flatwork and pavement areas:

- All building pad areas shall be undercut to a minimum depth of 3 feet below the bottom of the deepest footing, and the exposed subgrade scarified to a minimum depth of 6 inches, moisture conditioned, and compacted as necessary to produce soils compacted to a minimum of 90% relative compaction (ASTM: D1557). Building pad areas shall be defined as the building footprint including the area extending from the outer edge of the footings for a distance of 5 feet.

- All concrete flatwork shall be underlain by a minimum of 12 inches of soil compacted to a minimum of 90% relative compaction (ASTM: D1557).

The exposed soils beneath all over-excavations should be scarified an additional 12 inches, moisture conditioned and compacted to a minimum of 90% relative compaction (ASTM: D1557).

The above recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. Hence, overexcavation depths must be verified, and adjusted if necessary, at the time of grading. The overexcavated materials may be moisture-conditioned and re-compacted as engineered fill.

3.05 Earthwork Shrinkage and Subsidence

Shrinkage is the decrease in volume of soil upon removal and recompaction expressed as a percentage of the original in-place volume. Subsidence occurs as fill (elevated building pad, embankment, etc.) is placed over natural ground. These factors account for changes in soil volumes that will occur during grading. Our estimates are as follows:

- Shrinkage factor = 5% - 10% for soil removed and replaced as compacted fill
- Subsidence factor = approximately 1 percent of the height of fill that is placed

These estimates do not include losses due to removal of existing structures, improvements or over-sized materials (boulders, concrete or other similar materials greater than 12 inches in maximum dimension).

Removal and exporting of these materials is may have an impact earthwork balance and should be considered in design, planning and cost estimating.

The degree to which fill soils are compacted and variations in the insitu density of existing soils will influence earth volume changes. Consequently, some adjustments in grades near the completion of grading could be required to balance the earthwork.

3.06 Earthwork Recommendations

All earthworks should be performed in accordance with this section and the General Earthwork and Grading Specifications outlined in Appendix D. Recommendations contained in Appendix D are general specifications for typical grading projects and may not be entirely applicable to this project.

3.07 Excavation Characteristics and Rock Disposal

Our exploratory test pits were advanced with difficulty within the granitic bedrock. . Visual observations of soils exposed in our exploratory borings indicate that soils will be rippable with conventional grading equipment. No caving was experienced in any of the borings excavated in our study. Although the bedrock is anticipated to rip with conventional heavy duty grading equipment, the possibility that hard cemented layers within the bedrock can not be completely ruled out.

3.08 Seismic Design Parameters

Seismic design parameters have been developed in accordance with Section 1613 of the 2016 California Building Code (CBC) using the online U.S. Geological Survey Seismic Design Maps Calculator (ASCE 7-10 Standard) and a site location based on latitude and longitude. The calculator generates probabilistic and deterministic maximum considered earthquake spectral parameters represented by a 5-percent damped acceleration response spectrum having a 2-percent probability of exceedance in 50 years. The deterministic response accelerations are calculated as 150 percent of the largest median 5-percent damped spectral response acceleration computed on active faults within a region, where the deterministic values govern. The calculator does not, however, produce separate probabilistic and deterministic results. The parameters generated for the subject site are presented below:

2016 California Building Code (CBC) Seismic Parameters

Parameter	Value
Site Location	Latitude = 33.610381 degrees Longitude = -117.166056 degrees
Site Class	Site Class = C Soil Profile Name = Rock
Mapped Spectral Accelerations (Site Class B)	S_s (0.2- second period) = 1.717g S_1 (1-second period) = 0.711g
Site Coefficients (Site Class C)	F_a = 1.0 F_v = 1.3
Maximum Considered Earthquake Spectral Accelerations (Site Class C)	S_{MS} (0.2- second period) = 1.717g S_{M1} (1-second period) = 0.924g
Design Earthquake	S_{DS} (0.2- second period) = 0.144g

Spectral Accelerations (Site Class C)	S_{D1} (1-second period) = 0.616g

For Risk Category II the Seismic Design Category is D (CBC Table 1604.5 and Section 1613.5.6). Consequently, as required for Seismic Design Categories D through F by CBC Section 1803.5.12, lateral pressures for earthquake ground motions, liquefaction and soil strength loss have been evaluated.

Peak earthquake ground acceleration adjusted for site class effects (PGAM) has been determined in accordance with ASCE 7-10 Section 11.8.3 as follows: $PGA_M = F_{PGA} \times PGA = 1.000 \times 0.669g = 0.669g$.

3.09 Liquefaction and Secondary Earthquake Hazards

Potential secondary seismic hazards that can affect land development projects include liquefaction, tsunamis, seiches, seismically induced settlement, seismically induced flooding and seismically induced landsliding.

Liquefaction

Liquefaction is a phenomenon where earthquake-induced ground vibrations increase the pore pressure in saturated, granular soils until it is equal to the confining, overburden pressure. When this occurs, the soil can completely loose its shear strength and enter a liquefied state. The possibility of liquefaction is dependent upon grain size, relative density, confining pressure, saturation of the soils, and intensity and duration of ground shaking. In order for liquefaction to occur, three criteria must be met: underlying loose, coarse-grained (sandy) soils, a groundwater depth of less than about 50 feet, and a potential for seismic shaking from nearby large-magnitude earthquake.

The site is not located in an area of known liquefaction hazards. The site is underlain by bedrock at shallow depths. Groundwater was not encountered in any of Consolidated GeoScience borings, drilled to a maximum depth of 30 feet although subsurface water was encountered a couple of borings. Therefore, the risk of liquefaction occurring during a design seismic event is considered negligible.

Tsunamis and Seiches

Tsunamis are sea waves that are generated in response to large-magnitude earthquakes. When these waves reach shorelines, they sometimes produce coastal flooding. Seiches are the oscillation of large bodies of standing water, such as lakes, that can occur in response to ground shaking. Tsunamis and seiches do not pose hazards due to the inland location of the site and lack of nearby bodies of standing water.

Seismically Induced Settlement

Seismically induced settlement occurs most frequently in areas underlain by loose, granular sediments. Damage as a result of seismically induced settlement is most dramatic when differential settlement occurs in areas with large variations in the thickness of underlying sediments. Settlement caused by ground shaking is often non-uniformly distributed, which can result in differential settlement. Since the site is underlain by very dense granitic bedrock, seismically induced settlement is not considered a design concern during a design seismic event.

Seismically Induced Flooding

The site is not located within a potential dam inundation area. Consequently seismically induced flooding at the site is unlikely (County of Riverside, 2015).

3.10 Subdrains

Groundwater and surface water were not encountered during the course of our investigation; however subsurface water was encountered in some of the boring excavations drilled in 2005 (B2 and B5) with B2 located adjacent to the existing creek. Fill is planned within these areas. As the existing topography drains towards the creek currently, a subdrain will not be necessary. The planned fill slopes should be keyed into competent bedrock material with appropriate backdrains and outlets.

3.11 Fill and Cut Slopes

All fill and cut slopes should be constructed at inclinations of 2 horizontal to 1 vertical or flatter. Fill slopes constructed at inclinations of 2 horizontal to 1 vertical or flatter are expected to be grossly and surficially stable. The fill strength utilized is based on a remolded direct shear test as report herein and the bedrock strength was obtained from the Seismic Hazard Zone Report for the Murrieta Quadrangle(CGS, 2018). This is provided that fill slopes are properly keyed and compacted, as indicated in Appendix D.

The gross static stability analyses for generic maximum height cut and fill slopes are summarized below. The critical circles are shown on the attached slope stability analyses, Appendix C.

Cut Slope	
	Gross Static
Friction Angle (°)	35
Cohesion (psf)	372
Unit Weight, γ (pcf)	125
Horizontal Seismic Factor	0.236
Vertical Seismic Factor	0.000
Slope Height (ft)	30
Slope Gradient (H:V)	2:1
Static Factor of Safety	2.635
Seismic Factor of Safety	1.656

Fill Slope	
	Gross Static
Friction Angle (°)	31
Cohesion (psf)	120
Unit Weight, γ (pcf)	125
Horizontal Seismic Factor	0.236
Vertical Seismic Factor	0.000
Slope Height (ft)	20
Slope Gradient (H:V)	2:1
Static Factor of Safety	1.922
Seismic Factor of Safety	1.197

Given these factors of safety, we believe that all graded slopes will be grossly stable at the maximum gradient of 2:1 (H:V) and the referenced conditions above. If the grading plans change, the geotechnical engineer should be notified for subsequent calculations.

3.12 Temporary Slopes and Excavations

Excavation of utility trenches will require either temporary sloped excavations or shoring. Temporary excavations in existing alluvial soils may be safely made at an inclination of 1:1 or flatter. If vertical sidewalls are required, the use of cantilevered or braced shoring is recommended.

Vehicles, equipment, materials, etc. should be set back away from the edge of temporary excavations a minimum distance of 10 feet from the top edge of the excavation. Surface waters should be diverted away from temporary excavations and prevented from draining over the top of the excavation and down the slope face. During periods of heavy rain, the slope face should be protected with sandbags to prevent drainage over the edge of the slope, and a visqueen liner placed on the slope face to prevent erosion of the slope face.

Periodic observations of the excavations should be made by the geotechnical consultant to verify that the soil conditions have not varied from those anticipated and to monitor the overall condition of the temporary excavations over time. If at any time during construction conditions are encountered which differ from those anticipated, the geotechnical consultant should be contacted and allowed to analyze the field conditions prior to commencing work within the excavation.

Cal/OSHA construction safety orders should be observed during all underground work.

3.13 Import Soils

Any imported soils should be such that the physical and chemical properties of the soils are similar to soils already on the site. The soils should be granular, non-corrosive and have a very low expansion potential (an expansion index of less than 20). The soils should also be free of deleterious material and organics, and not contain rock particles or fragments in excess of 8 inches in diameter. Fill material shall be sampled and reviewed by the geotechnical consultant prior to import to the site.

3.14 Cement Type and Corrosion Potential

Soluble sulfate tests indicate that water-soluble sulfate in the soil will have a negligible effect on concrete. Our recommendations for concrete exposed to sulfate-containing soils are presented in the table below.

RECOMMENDATIONS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOILS

Sulfate Exposure	Water Soluble Sulfate (SO_4) in Soil (% by Weight)	Sulfate (SO_4) in Water (ppm)	Cement Type (ASTM C150)	Maximum Water-Cement Ratio (by Weight)	Minimum Compressive Strength (psi)
Negligible	0.00 - 0.10	0-150	--	--	2,500

Moderate	0.10 - 0.20	150-1,500	II	0.50	4,000
Severe	0.20 - 2.00	1,500-10,000	V	0.45	4,500
Very Severe	Over 2.00	Over 10,000	V plus pozzolan or slag	0.45	4,500

Use of alternate combinations of cementitious materials may be permitted if the combinations meet design recommendations contained in American Concrete Institute guideline ACI 318-11.

The soils were also tested for soil reactivity (pH) and electrical resistivity (ohm-cm). The test results indicate that the on-site soils have a soil reactivity of 6.9 and an electrical resistivity of 1,511 ohm-cm. A neutral or non-corrosive soil has a value ranging from 5.5 to 8.4. Generally, soils that could be considered moderately corrosive to ferrous metals have resistivity values of about 3,000 ohm-cm to 10,000 ohm-cm. Soils with resistivity values less than 3,000 ohm-cm can be considered corrosive and soils with resistivity values less than 1,000 ohm-cm can be considered extremely corrosive.

Based on our analysis, it appears that the underlying onsite soils are corrosive to ferrous metals. Protection of buried pipes utilizing coatings on all underground pipes; clean backfills and a cathodic protection system can be effective in controlling corrosion. A qualified corrosion engineer should be consulted to further assess the corrosive properties of the soil.

3.15 Utility Trench Backfill

All pipes should be bedded in a sand, gravel or crushed aggregate imported material complying with the requirements of the Standard Specifications for Public Works Construction Section 306-1.2.1. Crushed rock products that do not contain appreciable fines should not be utilized as pipe bedding and/or backfill. Based on limited testing onsite soils have a sand equivalent value greater than 30. Therefore, onsite soils might be suitable for use as pipe bedding provided the soils are screened to remove cobbles and boulders. Additional testing of onsite soils at the time of construction would need to be performed if use of these soils for bedding is proposed. Bedding materials should be compacted to at least 90% relative compaction (ASTM D1557) by mechanical methods. The geotechnical consultant should review and approve of proposed bedding materials prior to use.

The on-site soils are expected to be suitable as trench backfill provided they are screened of organic matter, cobbles and boulders in accordance with the current edition of the Standard Specifications for Public Works Construction. Backfill soils should be compacted to at least 90% relative compaction (ASTM D1557) by mechanical methods.

All utility trench backfill within street right of way, utility easements, under or adjacent to sidewalks, driveways, or building pads should be observed and tested by the geotechnical consultant to verify proper compaction. Trenches excavated adjacent to foundations should not extend within the footing influence zone defined as the area within a line projected at a 1:1 drawn from the bottom edge of the footing. Trenches crossing perpendicular to foundations should be excavated and backfilled prior to the construction of the foundations. The excavations should be backfilled in the presence of the geotechnical engineer and tested to verify adequate compaction beneath the proposed footing.

Cal/OSHA construction safety orders should be observed during all underground work.

3.16 Drainage and Moisture Proofing

Surface drainage should be directed away from the proposed structure into suitable drainage devices. Neither excess irrigation nor rainwater should be allowed to collect or pond against building foundations or within low-lying or level areas of the lot. Surface waters should be diverted away from the tops of slopes and prevented from draining over the top of slopes and down the slope face.

Walls and portions thereof that retain soil and enclose interior spaces and floors below grade should be waterproofed and dampproofed in accordance with CBC Section 1805.

Retaining structures should be drained to prevent the accumulation of subsurface water behind the walls. Backdrains should be installed behind all retaining walls exceeding 3 feet in height. A typical detail for retaining wall back drains is presented in Appendix C. All backdrains should outlet to suitable drainage devices. Retaining walls less than 3 feet in height should be provided with backdrains or weep holes. Dampproofing and/or waterproofing should also be provided on all retaining walls exceeding 3 feet in height.

3.17 Plan Review

Once formal foundation plans are prepared for the subject property, this office should review the plans from a geotechnical viewpoint, comment on changes from the plan used during preparation of this report and revise the recommendations of this report where necessary.

3.18 Geotechnical Observation and Testing During Rough Grading

The geotechnical engineer should be contacted to provide observation and testing during the following stages of grading:

- During the clearing and grubbing of the site.
- During the demolition of any existing structures, buried utilities or other existing improvements.
- During excavation and overexcavation of compressible soils.
- During all phases of grading including ground preparation and filling operations.
- When any unusual conditions are encountered during grading.

A final geotechnical report summarizing conditions encountered during grading should be submitted upon completion of the rough grading operations.

3.19 Post-Grading Geotechnical Observation and Testing

After the completion of grading the geotechnical engineer should be contacted to provide additional observation and testing during the following construction activities:

- During trenching and backfilling operations of buried improvements and utilities to verify proper backfill and compaction of the utility trenches.

- After excavation and prior to placement of reinforcing steel or concrete within footing trenches to verify that footings are properly founded in competent materials.
- During fine or precise grading involving the placement of any fills underlying driveways, sidewalks, walkways, or other miscellaneous concrete flatwork to verify proper placement, mixing and compaction of fills.
- When any unusual conditions are encountered during construction.

4.0 Closure

The findings, conclusions and recommendations in this report were prepared in accordance with generally accepted engineering and geologic principles and practices. No other warranty, either expressed or implied, is made. This report has been prepared for Jupiter Land Holdings LLC to be used solely for design purposes. Anyone using this report for any other purpose must draw their own conclusions regarding required construction procedures and subsurface conditions.

The geotechnical and geologic consultant should be retained during the earthwork and foundation phases of construction to monitor compliance with the design concepts and recommendations and to provide additional recommendations as needed. Should subsurface conditions be encountered during construction that are different from those described in this report, this office should be notified immediately so that our recommendations may be re-evaluated.

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FIGURES AND PLATES

Source: Google Earth Images

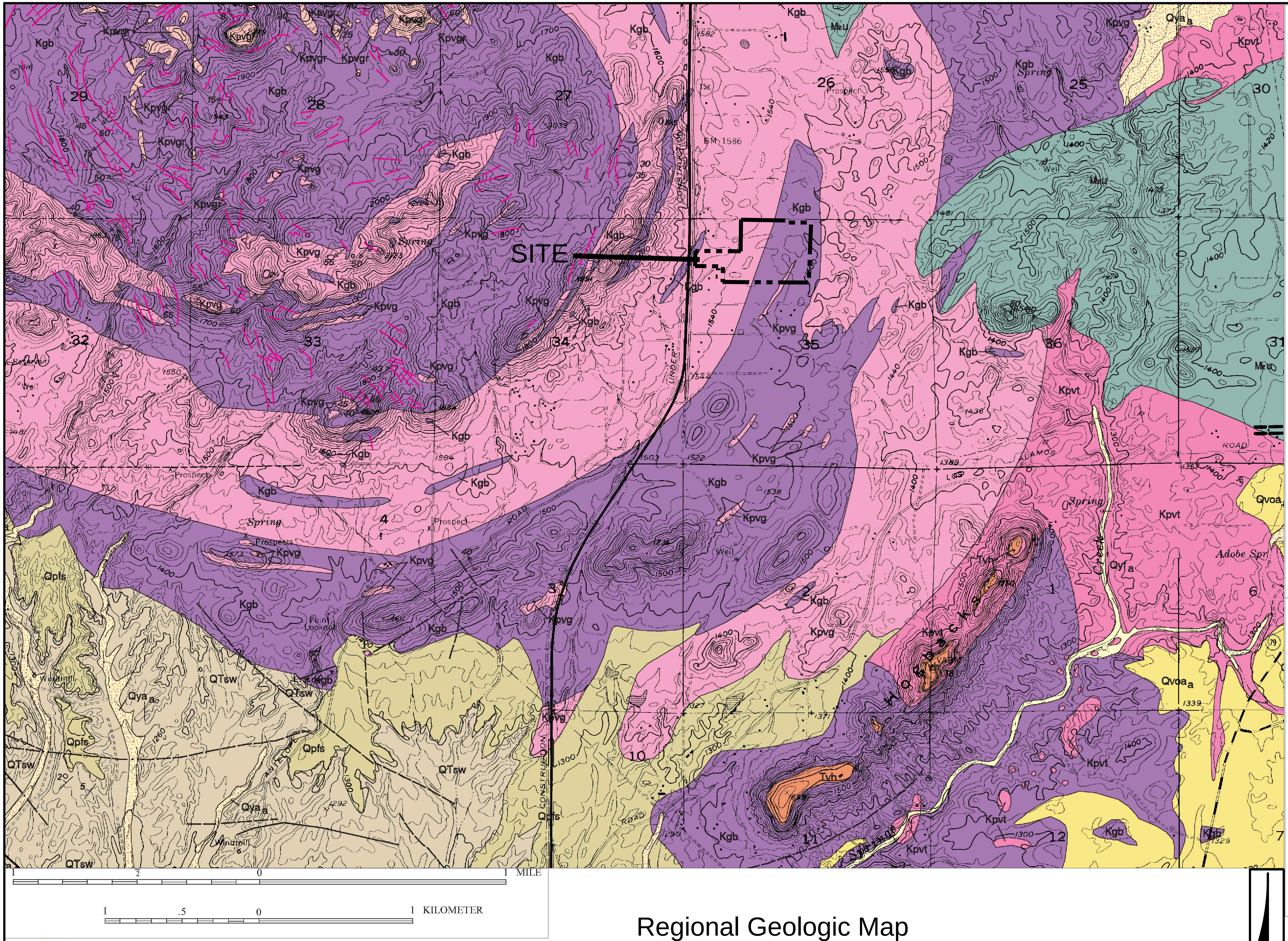
Site Vicinity Location Map

Murrieta Mass Grading 56 Acres, APN 392-290-049-6
South of Baxter Road, West of Whitewood Road, and East of Interstate 215
and Antelope Road
Murrieta, CA

RMA GeoScience

Figure 1

RMA Job No:	18G-0502
Report Date:	12/2018
Prepared By:	mbk



YOUNG SURFICIAL DEPOSITS—Sedimentary units that are slightly consolidated to cemented and slightly to moderately dissected. Alluvial fan deposits (Qyf series) typically have high coarse:fine clast ratios. Younger surficial units have upper surfaces that are capped by slight to moderately developed pedogenic-soil profiles (A/C to A/AC/$B_{cambric}C_{ox}$ profiles). Includes:

Qyf **Young alluvial fan deposits (Holocene and latest Pleistocene)**-Unconsolidated deposits of alluvial fans and headward drainages of fans. Consists predominately of gravel, sand, and silt

Qya **Young alluvial channel deposits (Holocene and latest Pleistocene)**-Fluvial deposits along canyon floors. Consists of unconsolidated sand, silt, and clay-bearing alluvium

Qyv **Young alluvial valley deposits (Holocene and late Pleistocene)**-Fluvial deposits along valley floors. Consists of unconsolidated sand, silt, and clay-bearing alluvium

Qyls **Young landslide (Holocene and latest Pleistocene)**-Highly fragmented to largely coherent landslide deposits. Unconsolidated to consolidated. Most mapped landslides contain scarp area as well as slide deposit. Many landslides in part reactivated during late Holocene

OLD SURFICIAL DEPOSITS—Sedimentary units that are moderately consolidated and slightly to moderately dissected. Older surficial deposits have upper surfaces that are capped by moderately to well-developed pedogenic soils (A/AB/B/C_{ox} profiles and Bt horizons as much as 1 to 2 m thick and maximum hues in the range of 10YR 5/4 and 6/4 through 7.5YR 6/4 to 4/4 and mature Bt horizons reaching 5YR 5/6). Includes:

Qoa **Old alluvial channel deposits (late to middle Pleistocene)**-Fluvial sediments deposited on canyon floors. Consists of moderately indurated, commonly slightly dissected gravel, sand, silt, and clay-bearing alluvium. Locally capped by thin, discontinuous alluvial deposits of Holocene age

VERY OLD SURFICIAL DEPOSITS—Sediments that are slightly to well consolidated to indurated, and moderately to well dissected. Upper surfaces are capped by moderate to well developed pedogenic soils (A/AB/B/C_{ox} profiles having Bt horizons as much as 2 to 3 m thick and maximum hues in the range 7.5YR 6/4 and 4/4 to 2.5YR 5/6)

Qvoa **Very old alluvial channel deposits (middle to early Pleistocene)**-Fluvial sediments deposited on canyon floors. Consists of moderately to well-indurated, reddish-brown, mostly very dissected gravel, sand, silt, and clay-bearing alluvium. In places, includes thin, discontinuous alluvial deposits of Holocene age

Pauba Formation (Pleistocene)-Siltstone, sandstone, and conglomerate. Named by Mann (1955) for exposures of in Rancho Pauba area about 3.2 km southeast of Temecula. Vertebrate fauna from Pauba Formation are of late Irvingtonian and early Rancholabrean ages (Reynolds and Reynolds, 1990a; 1990b). Includes two informal members:

Qpfs **Sandstone member**-Brown, moderately well-indurated, cross-bedded sandstone containing sparse cobble- to boulder-conglomerate beds

Qpff **Fanglomerate member**-Grayish-brown, well indurated, poorly sorted fanglomerate and mudstone; occurs along the east flank of the Santa Ana Mountains

Sandstone and conglomerate of Wildomar area (Pleistocene and late Pliocene)-Unnamed sandstone and conglomerate unit unconformably overlain by the Pauba Formation (Kennedy, 1977). Lower part yields vertebrate fauna of late Blancan age, 2 to 3 Ma; upper part yields fauna of Irvingtonian age, less than 0.85 Ma (Reynolds and Reynolds, 1990a, 1990b; Reynolds and others, 1990). At Chaney Hill in Murrieta area, unit contains 0.7 Ma Bishop ash (Merriam and Bischoff, 1975). Estimated maximum thickness is 75 m. Subdivided into sandstone unit and conglomerate unit:

QTsw **Sandstone unit**-Primarily friable, pale yellowish-green, medium grained, caliche-rich sandstone

QTcw **Conglomerate unit**-Primarily cobble-and-boulder conglomerate. Conglomerate clasts are locally derived

Tvsr **Santa Rosa basalt of Mann (1955) (Miocene)**-Remnants of basalt flows

Kpvg **Monzogranite to granodiorite**-Pale gray, massive, medium-grained hypidiomorphic-granular biotite monzogranite, and less abundant hornblende-biotite granodiorite forming older ring dike. Plagioclase is An_{20} to An_{35}, subhedral, tabular crystals. Contains included small to large stoped blocks of gabbro

Kpvt **Tonalite**-Foliated biotite-hornblende tonalite. In eastern part of complex grades into tonalite

Generic Cretaceous granitic rocks of the Peninsular Ranges batholith

Kgd **Granodiorite, undifferentiated (Cretaceous)**-Biotite and hornblende-biotite granodiorite, undifferentiated. Most is massive and medium-grained. Restricted to small exposure along east edge of quadrangle

Kt **Tonalite, undifferentiated (Cretaceous)**-Gray, medium-grained biotite-hornblende tonalite, typically foliated. Restricted to single area flanking Tucalota Creek along east edge of quadrangle

Kgb **Gabbro (Cretaceous)**-Mainly hornblende gabbro. Includes Virginia quartz-norite and gabbro of Dudley (1935), and San Marcos gabbro of Larsen (1948). Typically brown-weathering, medium-to very coarse-grained hornblende gabbro; very large poikilitic hornblende crystals are common, and very locally gabbro is pegmatitic. Much is quite heterogeneous in composition and texture. Includes noritic and dioritic composition rocks. Abundant stoped blocks of gabbro are included in the Paloma ring complex

Khg **Heterogeneous granitic rocks (Cretaceous)**-A wide variety of heterogeneous granitic rocks. Rocks in Santa Ana Mountains, 5 km northwest of Murrieta, include a mixture of monzogranite, granodiorite, tonalite, and gabbro. Tonalite composition rock is most abundant rock type

Mzu **Metasedimentary rocks, undifferentiated (Mesozoic)**-Wide variety of low-to medium-metamorphic grade metasedimentary rocks. Within the Santa Ana Mountains rocks are of low grade, greenschist or lower grade. Most of the eastern occurrences include biotite schist

Regional Geologic Map

Murrieta Mass Grading 56 Acres, APN 392-290-049-6
South of Baxter Road, West of Whitwood Road, and East of Interstate 215
and Antelope Road
Murrieta, CA

N

RMA GeoScience

Figure 2

RMA Job No:	18G-0502
Report Date:	12/2018
Prepared By:	mbk

CALIFORNIA GEOLOGICAL SURVEY
JOHN G. PARRISH, PH.D., STATE GEOLOGIST

THE RESOURCES AGENCY - MIKE CHRISMAN, SECRETARY
DEPARTMENT OF CONSERVATION - BRIDGETT LUTHER, DIRECTOR

Murrieta Quadrangle Plate 1.2
SEISMIC HAZARD ZONE REPORT 115

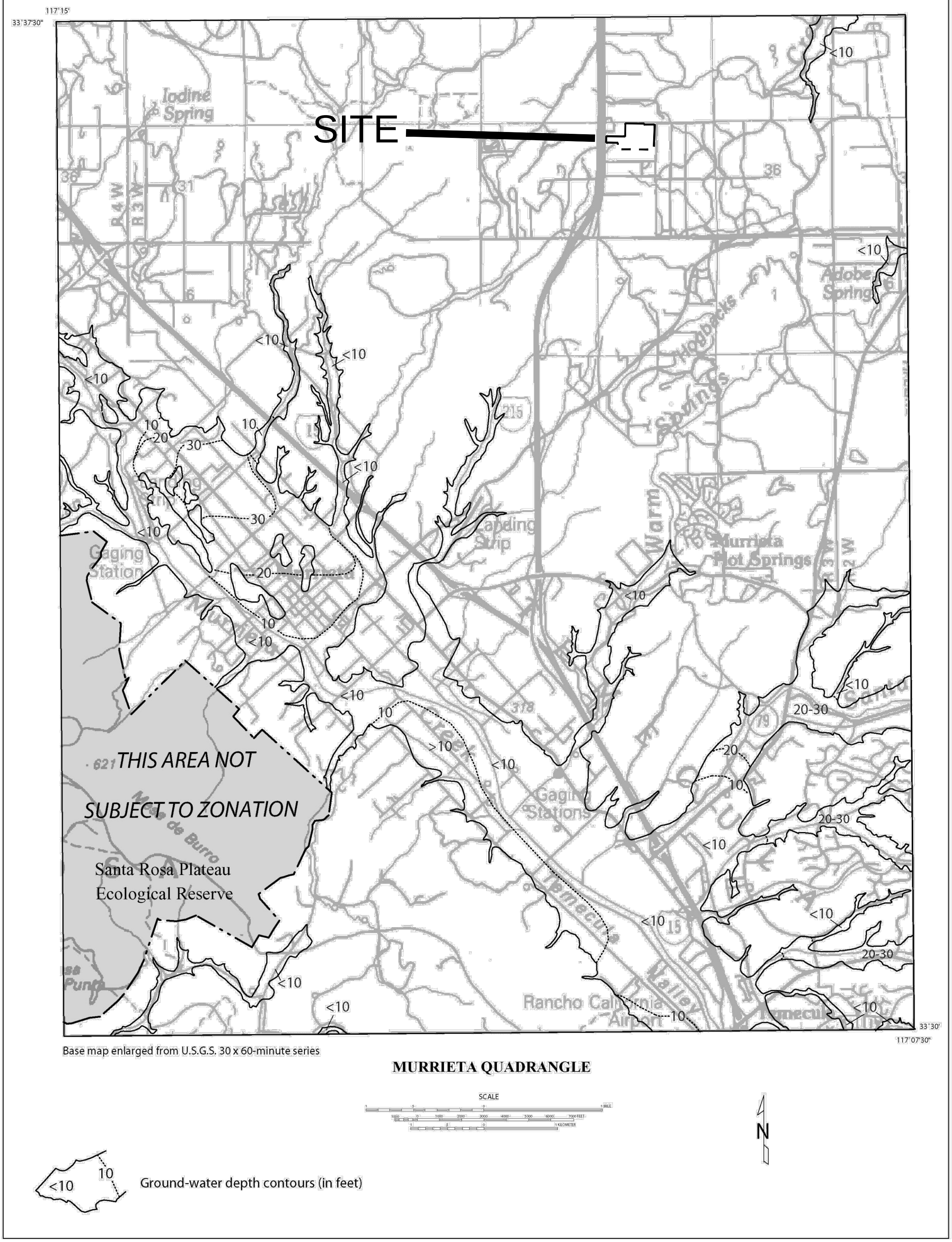


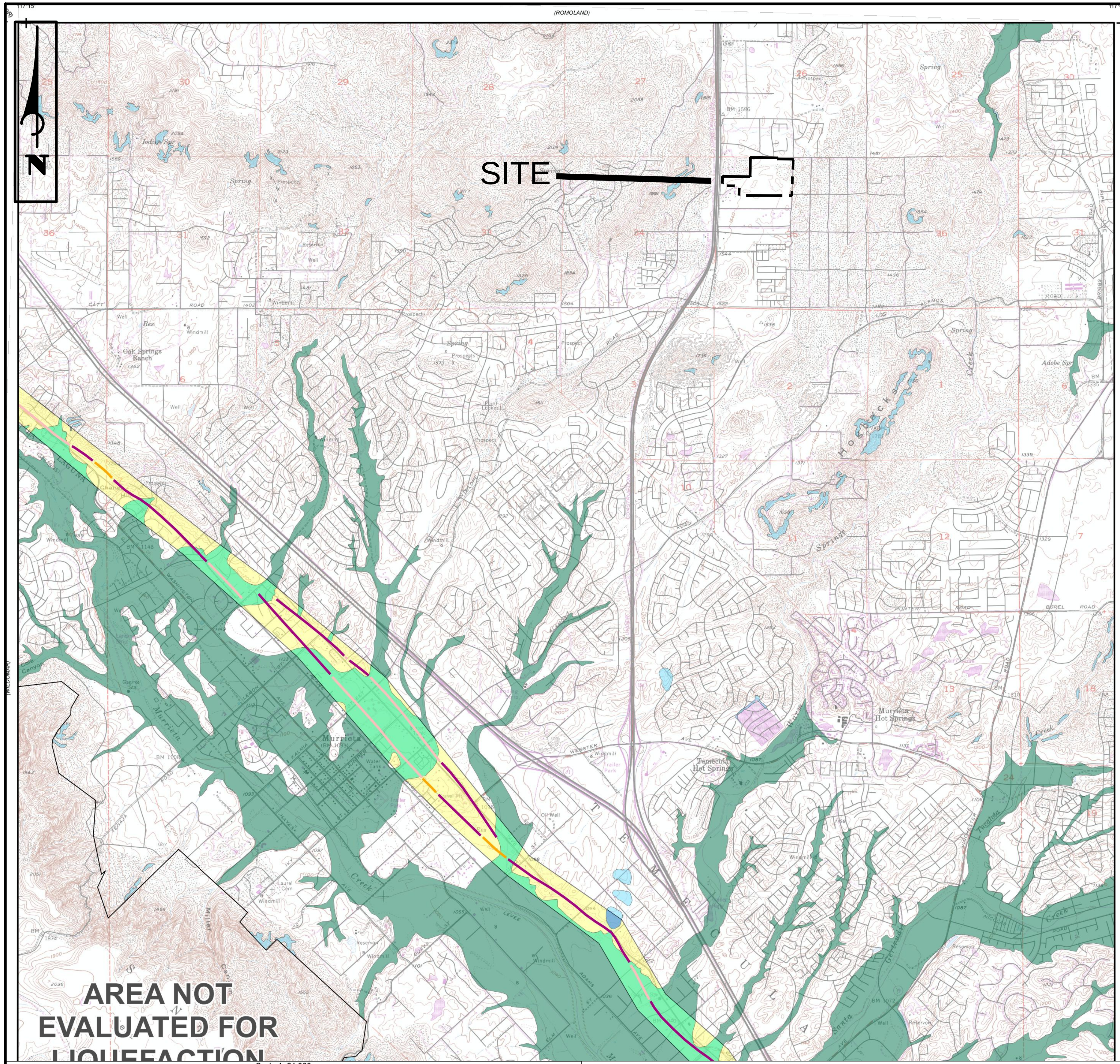
Plate 1.2 Depth to Historically High Ground-Water Levels in Quaternary Alluvial Deposites, Murrieta 7.5-Minute Quadrangle, California.

Figure 3

Historic Groundwater High Map

Murrieta Mass Grading 56 Acres, APN 392-290-049-6
South of Baxter Road, West of Whitewood Road, and East of Interstate 215 and Antelope Road
Murrieta, CA

RMA Job No:	18G-0502
Report Date:	2/2019
Prepared By:	mbk



Earthquake Zones of Required Investigation Murrieta Quadrangle

California Geological Survey

This Map Shows Both Alquist-Priolo Earthquake Fault Zones And Seismic Hazard Zones Issued For The Murrieta Quadrangle

This map shows the location of Alquist-Priolo (AP) Earthquake Fault Zones and Seismic Hazard Zones, collectively referred to here as Earthquake Zones of Required Investigation. The Geographic Information System (GIS) digital files of these regulatory zones released by the California Geological Survey (CGS) are the "Official Maps." GIS files are available at the CGS website http://maps.conservation.ca.gov/cgs/informationwarehouse/. These zones will assist cities and counties in fulfilling their responsibilities for protecting the public from the effects of surface fault rupture and earthquake-triggered ground failure as required by the AP Earthquake Fault Zoning Act (Public Resources Code Sections 2621-2630) and the Seismic Hazards Mapping Act (Public Resources Code Sections 2690-2699.6). For information regarding the general approach and recommended methods for preparing these zones, see CGS Special Publication 42, *Earthquake Fault Zones, a Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California*, Appendix C, and CGS Special Publication 118, *Recommended Criteria for Delineating Seismic Hazard Zones in California*.

For information regarding the scope and recommended methods to be used in conducting required site investigations refer to CGS Special Publication 42, and CGS Special Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*. For a general description of the AP and Seismic Hazards Mapping acts, the zonation programs, and related information, please refer to the website at www.conservation.ca.gov/cgs/.

MAP EXPLANATION

EARTHQUAKE FAULT ZONES

🟨 **Earthquake Fault Zones**
Zone boundaries are delineated by straight-line segments; the boundaries define the zone encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as described in Public Resources Code Section 2621.5(a) would be required.

1906 C ? ?
Active Fault Traces
Faults considered to have been active during Holocene time and to have potential for surface rupture: Solid Line in Black or Red where Accurately Located; Long Dash in Black or Solid Line in Purple where Approximately Located; Short Dash in Black or Solid Line in Orange where Inferred; Dotted Line in Black or Solid Line in Rose where Concealed; Query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by fault creep.

SEISMIC HAZARD ZONES

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

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

OVERLAPPING EARTHQUAKE FAULT AND SEISMIC HAZARD ZONES

🟩 **Overlap of Earthquake Fault Zone and Liquefaction Zone**
Areas that are covered by both Earthquake Fault Zone and Liquefaction Zone.

🟦 **Overlap of Earthquake Fault Zone and Earthquake-Induced Landslide Zone**
Areas that are covered by both Earthquake Fault Zone and Earthquake-Induced Landslide Zone.

Note: Mitigation methods differ for each zone –
AP Act only allows avoidance; Seismic Hazard Mapping Act allows mitigation by engineering/geotechnical design as well as avoidance.

ADDITIONAL INFORMATION

For additional information on the zones of required investigation presented on this map, the data and methodology used to prepare them, and additional references consulted, please refer to the following:

The Ground Cracks in Wolf and Temecula Valleys, in the Murrieta Quadrangle, Riverside County, California. California Geological Survey, Fault Evaluation Report FER-195.
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/FER/195/

The Elsinore Fault Zone, in the Murrieta, Wildomar, Bachelor Mtn., Temecula, and Pechanga Quadrangles, Riverside County, California. California Geological Survey, Fault Evaluation Report FER-076.
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/FER/076/

For more information on the Alquist-Priolo Earthquake Fault Zoning Act please refer to:
http://www.conservation.ca.gov/cgs/rghm/ap/Pages/main.aspx

Seismic Hazard Zone Report for the Murrieta 7.5-minute Quadrangle, Riverside County, California. California Geological Survey, Seismic Hazard Zone Report 115.
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/SHZR/SHZR_115_Murrieta.pdf

For more information on the Seismic Hazards Mapping Act please refer to:
http://www.conservation.ca.gov/cgs/shzp/Pages/SHMPpgminfo.aspx

Click the link below to learn how to take greater advantage of the GeoPDF format of this map after downloading.
http://gmw.conservation.ca.gov/SHP/EZRIM/Docs/TerragoUserGuide.pdf

MURRIETA QUADRANGLE

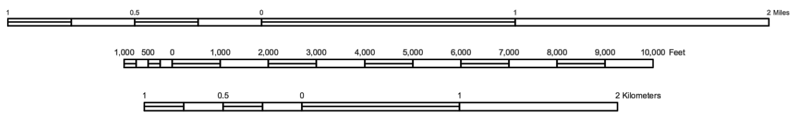
EARTHQUAKE FAULT ZONES

Delineated in compliance with Chapter 7.5,
Division 2 of the California Public Resources Code

SEISMIC HAZARD ZONES

Delineated in compliance with Chapter 7.8,
Division 2 of the California Public Resources Code

Scale 1: 24,000



RMA GeoScience

Earthquake Zones of Required Investigation

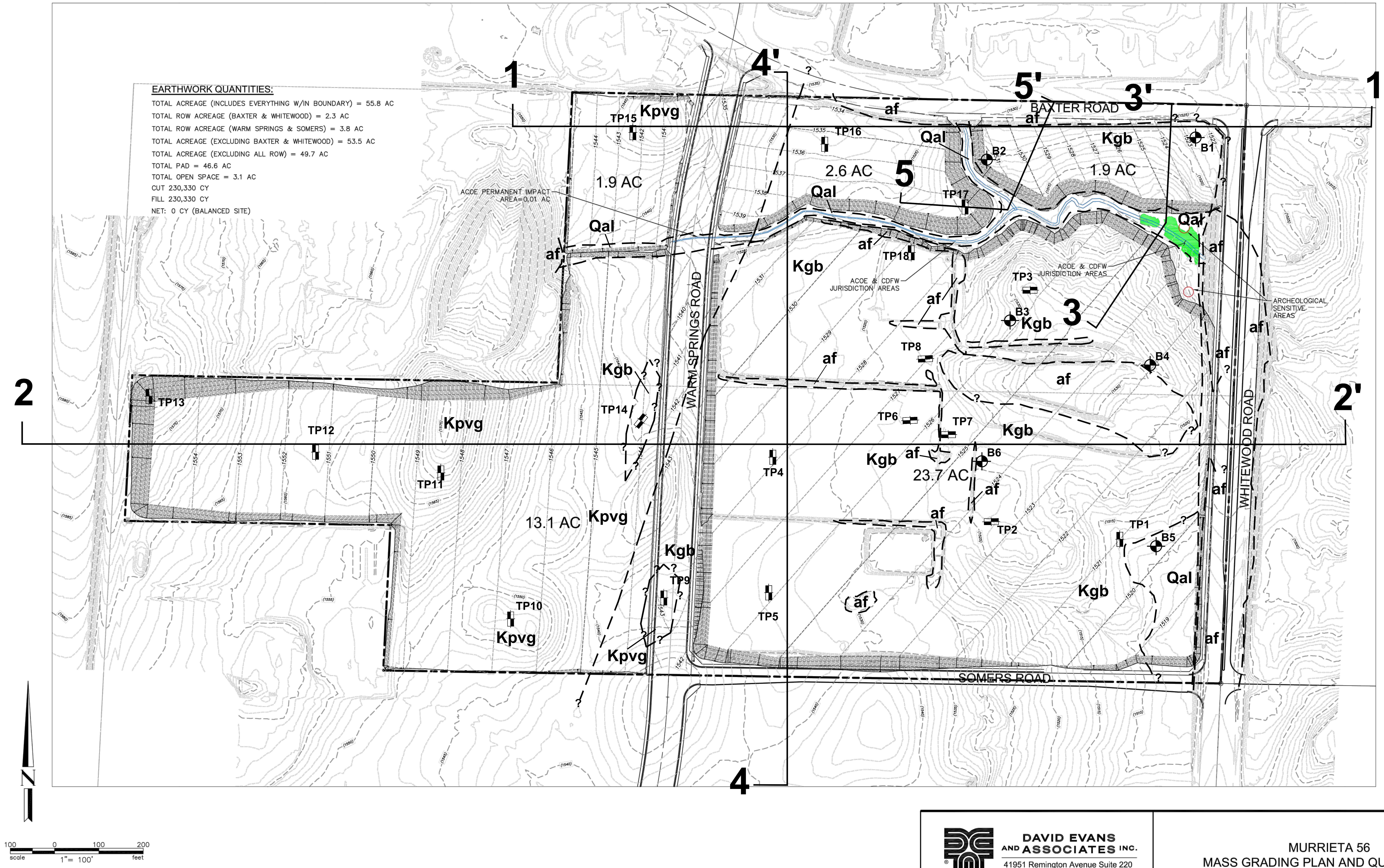
Murrieta Mass Grading 56 Acres, APN 392-290-049-6
South of Baxter Road, West of Whitwood Road, and East of Interstate 215 and Antelope Road
Murrieta, CA

Figure 4

RMA Job No:	18G-0502
Report Date:	2/2019
Prepared By:	mbk

Geotechnical Map Legend

af	Artificial Fill
Qal	Alluvium
Kpvg	Paloma Valley Ring Complex (Kpvg)
Kgb	San Marcos Gabbro (Hornblende)
⊕ B6	Approximate Boring Location RMA
TP18 ▨	Approximate Test Pit Location RMA
1 —— 1'	Geologic Cross Section



EARTHWORK QUANTITIES:

TOTAL ACREAGE (INCLUDES EVERYTHING W/IN BOUNDARY) = 55.8 AC
TOTAL ROW ACREAGE (BAXTER & WHITEWOOD) = 2.3 AC
TOTAL ROW ACREAGE (WARM SPRINGS & SOMERS) = 3.8 AC
TOTAL ACREAGE (EXCLUDING BAXTER & WHITEWOOD) = 53.5 AC
TOTAL ACREAGE (EXCLUDING ALL ROW) = 49.7 AC
TOTAL PAD = 46.6 AC
TOTAL OPEN SPACE = 3.1 AC
CUT 230,330 CY
FILL 230,330 CY
NET: 0 CY (BALANCED SITE)

DAVID EVANS
AND ASSOCIATES INC.
41951 Remington Avenue Suite 220
Temecula California 92590-2553
Phone: 951.294.9300

MURRIETA 56
MASS GRADING PLAN AND QUANTITIES

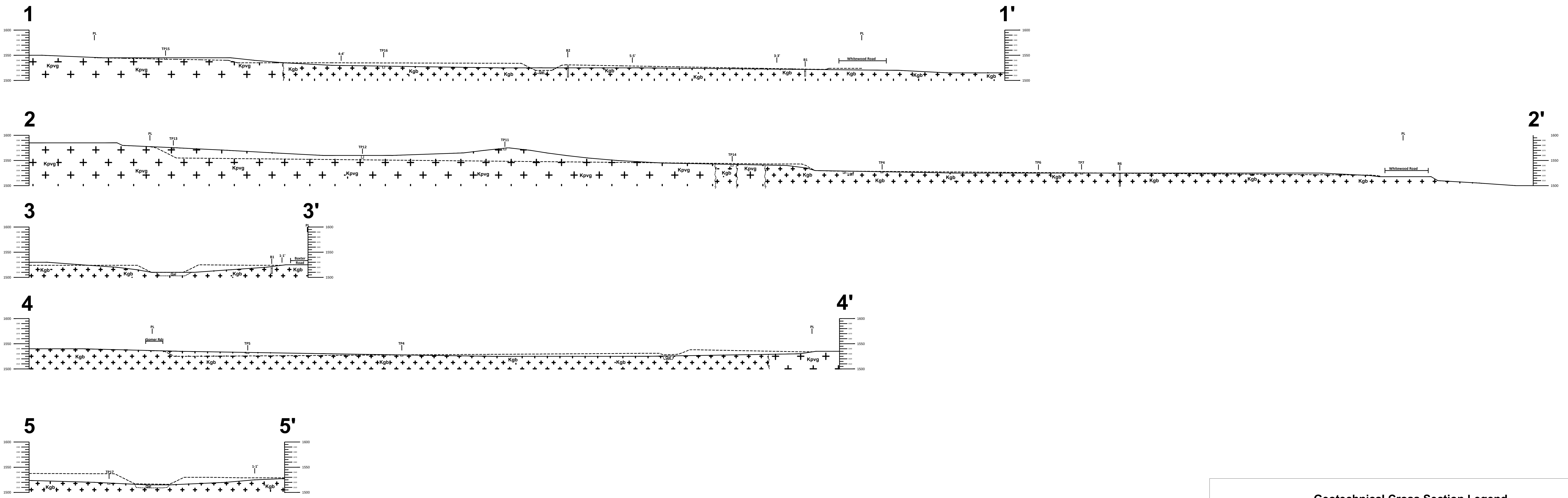
Geologic Map

Murrieta 56, APN 392-290-049-6
South of Baxter Road, West of Whitewood Road
and East of Interstate 215 and Antelope Road
Murrieta, CA

RMA GeoScience

Plate 1

RMA Job No:	18G-0502-0
Report Date:	2/2019
Prepared By:	MRM



Geotechnical Cross Section Legend

af	**Artificial Fill**
Qal	**Alluvium**
Kpvg	**Paloma Valley Ring Complex (Kpvg) Monzogranite**
Kgb	**San Marcos Gabbro (Hornblende)**
⊕ B6	**Approximate Boring Location RMA**
TP18 ▯	**Approximate Test Pit Location RMA**
5-5' |	**Geologic Cross Section Intersection**
?------------	**Geologic Contact (Queried Where Uncertain)**
— — — —	**Proposed Grade**
———	**Existing Grade**

RMA GeoScience

Cross Sections

Murrieta 56, APN 392-290-049-6
South of Baxter Road, West of Whitewood Road
and East of Interstate 215 and Antelope Road
Murrieta, CA

Plate 2

RMA Job No:	18G-0502-0
Report Date:	2/2019
Prepared By:	MRM

APPENDIX A

FIELD INVESTIGATION

APPENDIX A

FIELD INVESTIGATION

A-1.00 FIELD EXPLORATION

A-1.01 Number of Test Pits

Our subsurface investigation consisted of excavating 18 test drilled with a hollow stem drill rig.

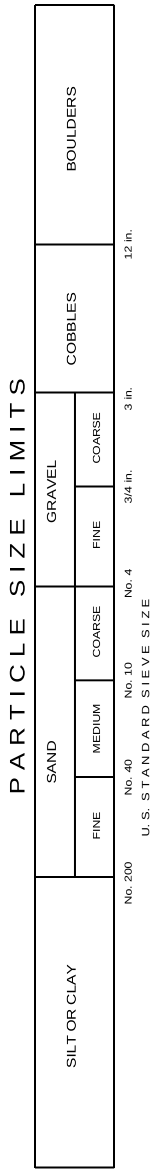
A-1.02 Location of Test Pits

A map showing the approximate locations of the test pits is presented as Plate 1.

A-1.03 Test Pit Logging

Logs of borings were prepared by one of our staff and are attached in this appendix. The logs contain factual information and interpretation of subsurface conditions between samples. The strata indicated on these logs represent the approximate boundary between earth units and the transition may be gradual. The logs show subsurface conditions at the dates and locations indicated, and may not be representative of subsurface conditions at other locations and times.

Identification of the soils encountered during the subsurface exploration was made using the field identification procedure of the Unified Soils Classification System (ASTM D2488). A legend indicating the symbols and definitions used in this classification system and a legend defining the terms used in describing the relative compaction, consistency or firmness of the soil are attached in this appendix. Bag samples of the major earth units were obtained for laboratory inspection and testing, and the in-place density of the various strata encountered in the exploration was determined



MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size.	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravel, gravel-sand mixtures. little or no fines.
			GP	Poorly graded gravel or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 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, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatamaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

UNIFIED SOIL CLASSIFICATION SYSTEM

I. SOIL STRENGTH/DENSITY

BASED ON STANDARD PENETRATION TESTS

Compactness of sand		Consistency of clay	
Penetration Resistance N (blows/Ft)	Compactness	Penetration Resistance N (blows/ft)	Consistency
0-4	Very Loose	<2	Very Soft
4-10	Loose	2-4	Soft
10-30	Medium Dense	4-8	Medium Stiff
30-50	Dense	8-15	Stiff
>50	Very Dense	15-30	Very Stiff
		>30	Hard

N = Number of blows of 140 lb. weight falling 30 in. to drive 2-in OD sampler 1 ft.

BASED ON RELATIVE COMPACTION

Compactness of sand		Consistency of clay	
% Compaction	Compactness	% Compaction	Consistency
<75	Loose	<80	Soft
75-83	Medium Dense	80-85	Medium Stiff
83-90	Dense	85-90	Stiff
>90	Very Dense	>90	Very Stiff

II. SOIL MOISTURE

Moisture of sands		Moisture of clays	
% Moisture	Description	% Moisture	Description
<5%	Dry	<12%	Dry
5-12%	Moist	12-20%	Moist
>12%	Very Moist	>20%	Very Moist, wet

TEST PIT LOGS AND
CONSOLIDATED GEOSCIENCE'S BORING LOGS

Log of Exploratory Test Pit

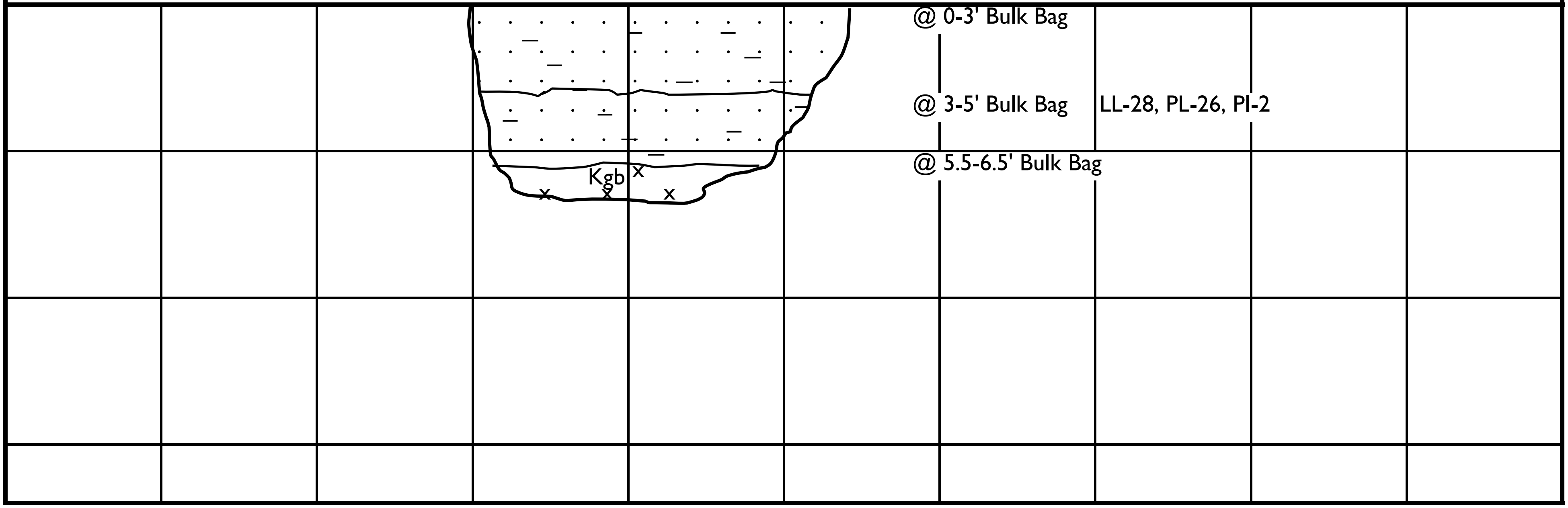
Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1513'

Test Pit Number: 1 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0-3	**Topsoil:** Light orange brown fine to medium Silty SAND with coarse graines and Gravel, porous, roots, dry and very loose in upper 6", loose to medium dense and slightly moist below 6".
ML	3-5.5'	Moderate gray brown fine Sandy SILT Clay coatings along root pathways, porous, mottled texture, slightly moist, medium dense
	5.5- 6.5'	**San Marcos Gabbro(Kgb):** Very weathered, moderate gray brown, massive, medium grained, GABBRO with biotite, fractures lined with clay, slightly very dense, hard digging at 6.5'.

Total Depth 6.5'
No Groundwater Encountered
No Caving
Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



@ 0-3' Bulk Bag
@ 3-5' Bulk Bag LL-28, PL-26, PI-2
@ 5.5-6.5' Bulk Bag

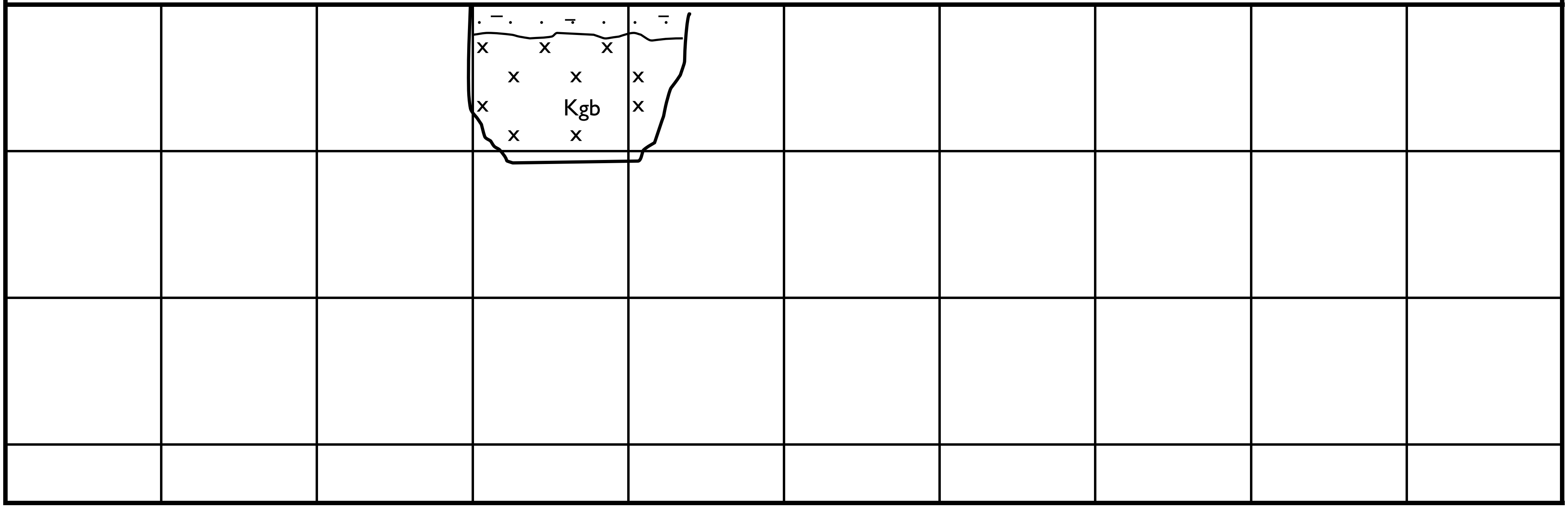
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1526'

Test Pit Number: 2 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0-1	**Topsoil:** Light orange brown fine Silty SAND with medium and coarse graines and minor Gravel and Cobbles, slightly loose and dry in upper 3", slightly and loose to medium dense below 6", roots, porous.
	1-5.5'	**San Marcos Gabbro (Kgb):** Very weathered, orange brown to moderate gray brown, massive, coarse grained, GABBRO with biotite, slightly moist, dense to very dense, hard digging at 5.5'. @ 2.5' Less weathered, light orange gray @ 5', root, harder digging, light gray with orange iron oxide staining.
		Total Depth 5.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



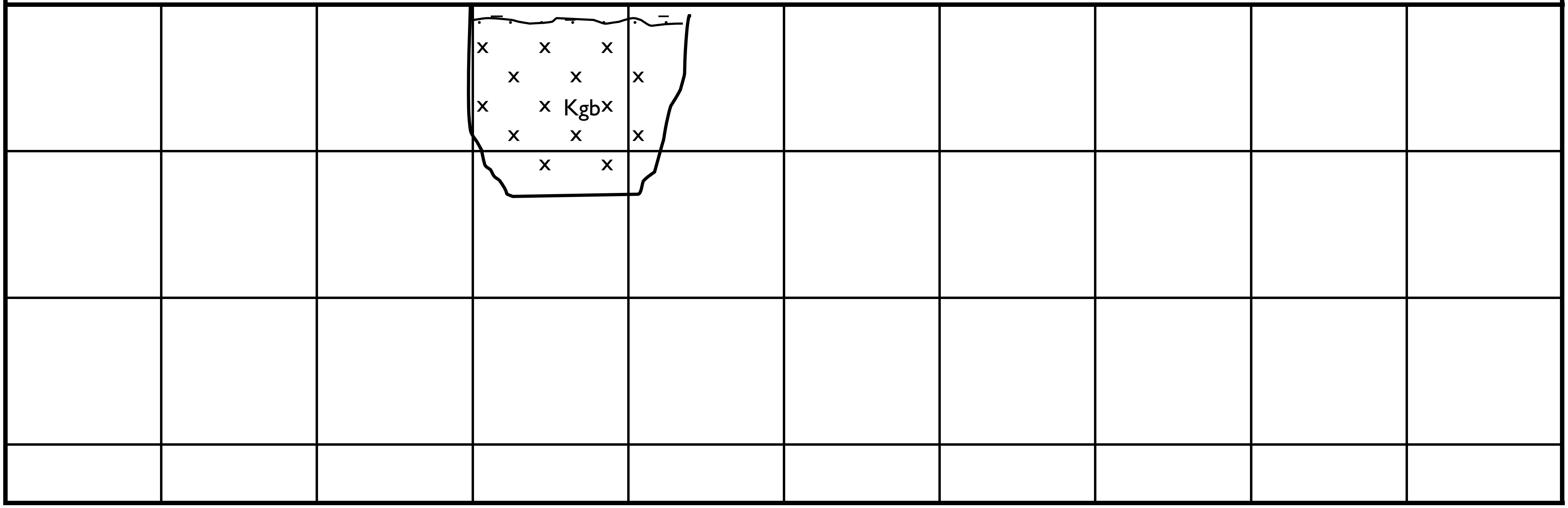
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1532'

Test Pit Number: 3 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 3"-6"	**Topsoil:** Light orange brown fine Silty SAND with medium and coarse graines and very minor Gravel and Cobbles, slightly loose and dry in upper 2", and loose to medium dense below 2", roots, porous.
	3"-6" to 6.5'	**San Marcos Gabbro (Kgb):** Very weathered, moderate orange-red brown, massive, coarse grained, GABBRO with biotite, slightly moist, dense to very dense.. @ 4.5' Less weathered, light orange gray. @ 5.5', very hard digging, light gray with orange iron oxide staining. Total Depth 5.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



RMA GeoScience

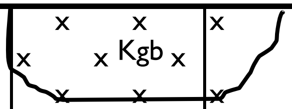
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1526.5'

Test Pit Number: 4 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
	0 to 2.5'	**<u>San Marcos Gabbro (Kgb):</u>** Very weathered, light ornage gray, massive, coarse grained, GABBRO with biotite, slightly moist, very dense. @ 2.5' very hard digging. Total Depth 2.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



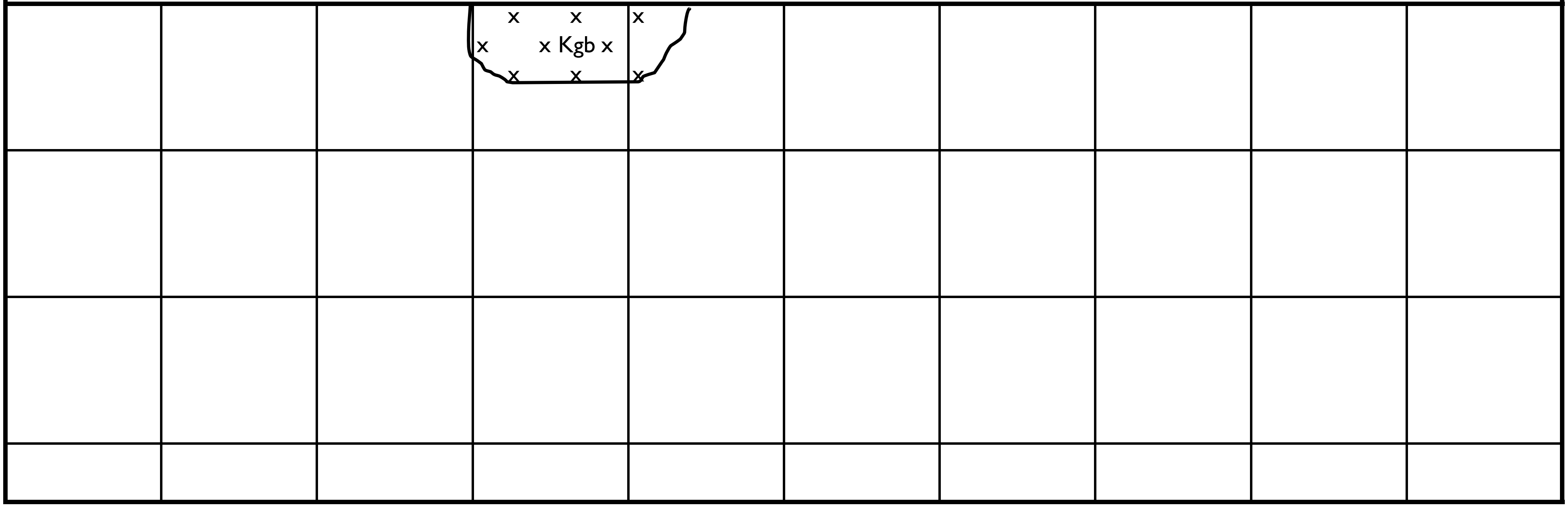
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1531.5'

Test Pit Number: 5 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
	0-1	**Artifical Fill (af):** Light orange brown fine Silty SAND with medium and coarse graines, dry and slightly loose in upper 3", slightly moist and meduim dense dense below.
	1 to 2.5'	**San Marcos Gabbro (Kgb):** Very weathered, orange gray, massive, coarse grained, GABBRO with biotite, slightly moist, very dense. Very hard digging at 2.5'.
		Total Depth 2.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



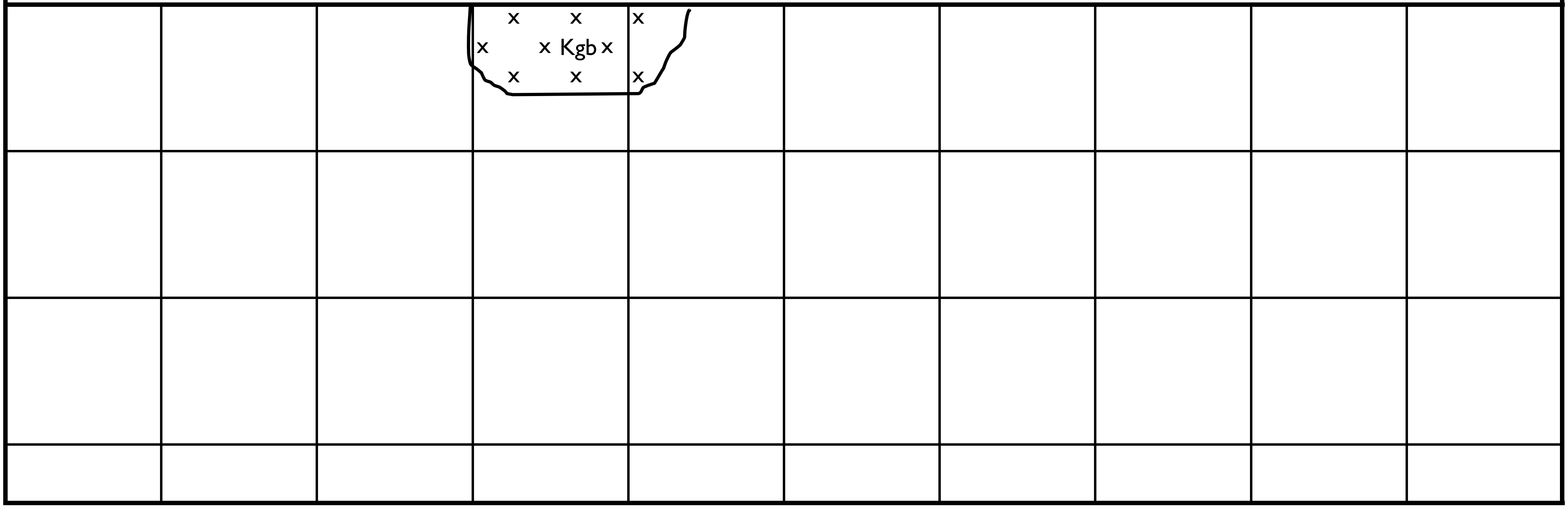
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1524.5'

Test Pit Number: 6 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
	0-3'	**San Marcos Gabbro (Kgb):** Very weathered, orange gray, massive, coarse grained, GABBRO with biotite, dry to slightly moist, dense to very dense. Very hard digging at 3' Total Depth 3' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



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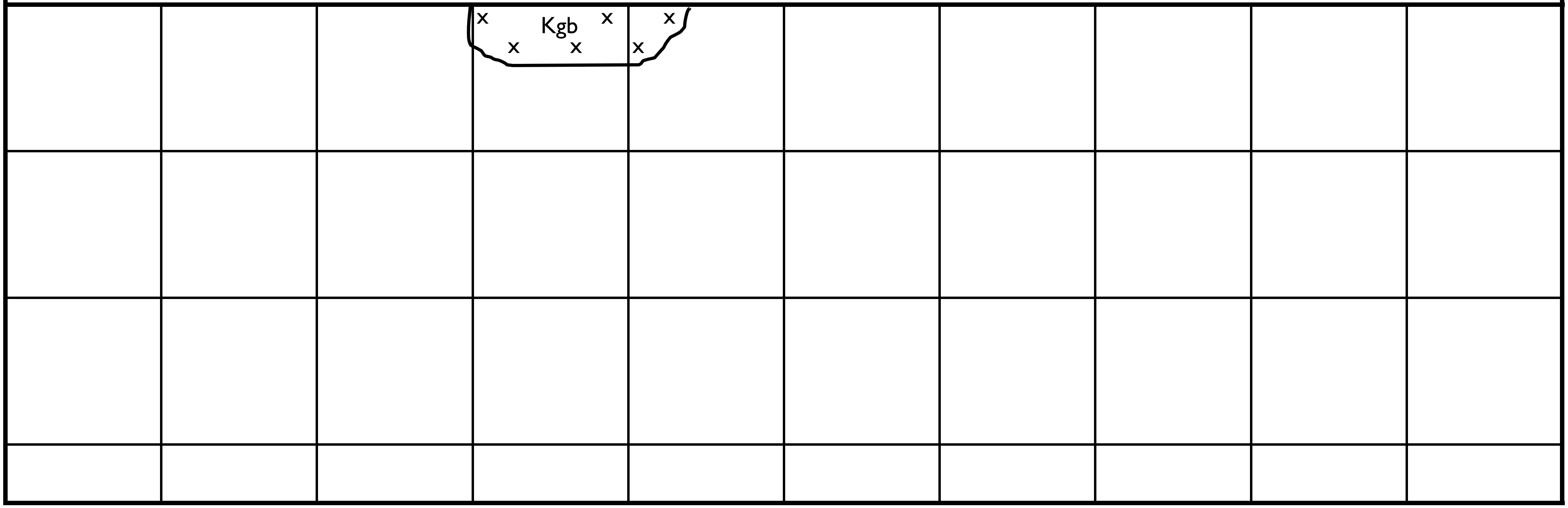
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1522.5'

Test Pit Number: 7 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0-2"	**Artificial fill (af):** Light orange gray fine to coarse Silty SAND, roots, dry, medium dense.
	2" to 2'	**San Marcos Gabbro (Kgb):** Very weathered, light to medium orange gray, massive, coarse grained, GABBRO with biotite, dry to slightly moist, dense to dense.
		Total Depth 2' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



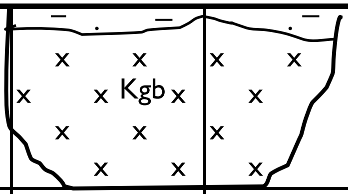
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1519'

Test Pit Number: 8 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 6"-1'	**Artificial fill (af):** Light orange gray fine Silty SAND with medium and coarse grains and Gravel, roots, dry, medium dense.
	6"-1' to 5	**San Marcos Gabbro (Kgb):** Very weathered, moderate orange gray, massive, coarse grained, GABBRO with biotite, dry to slightly moist, dense to very dense. Harder digging at 4".
		Total Depth 5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



@ 1-5' Bulk Bag

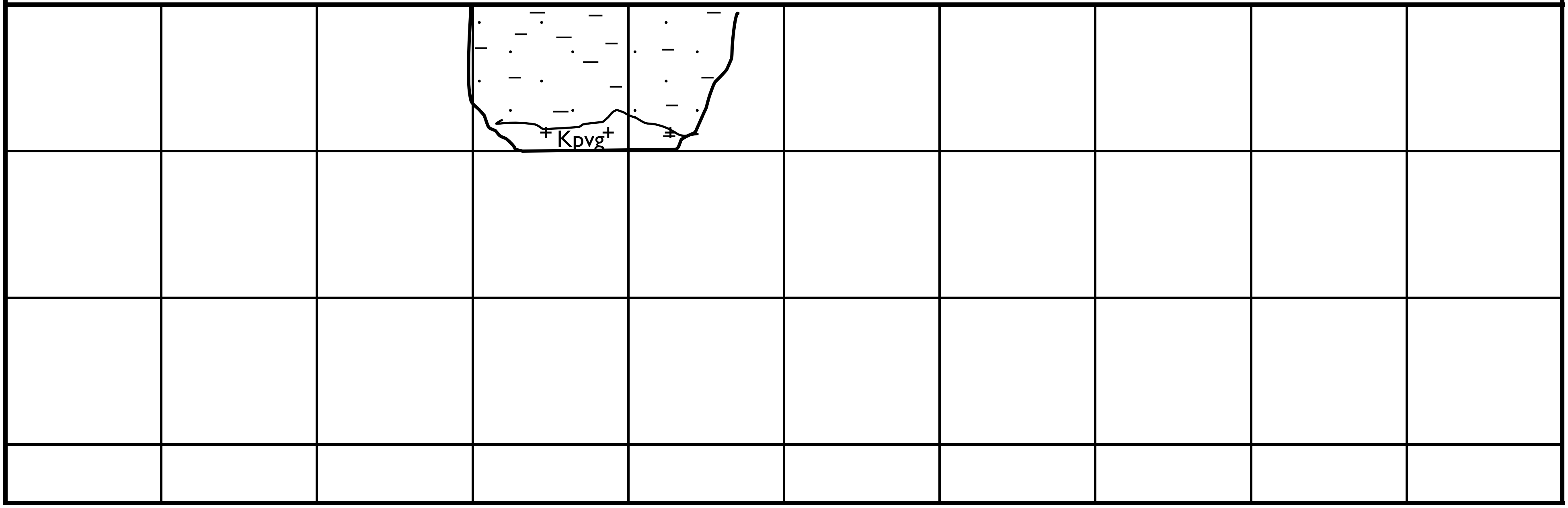
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1537.5'

Test Pit Number: 9 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 4'	**Topsoil:** Moderate orange brown fine Silty SAND with some medium and coarse grains, roots, porous, dry in top 2", slightly moist and medium dense below.
	4 to 5.5'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly moist, very dense
		Total Depth 5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



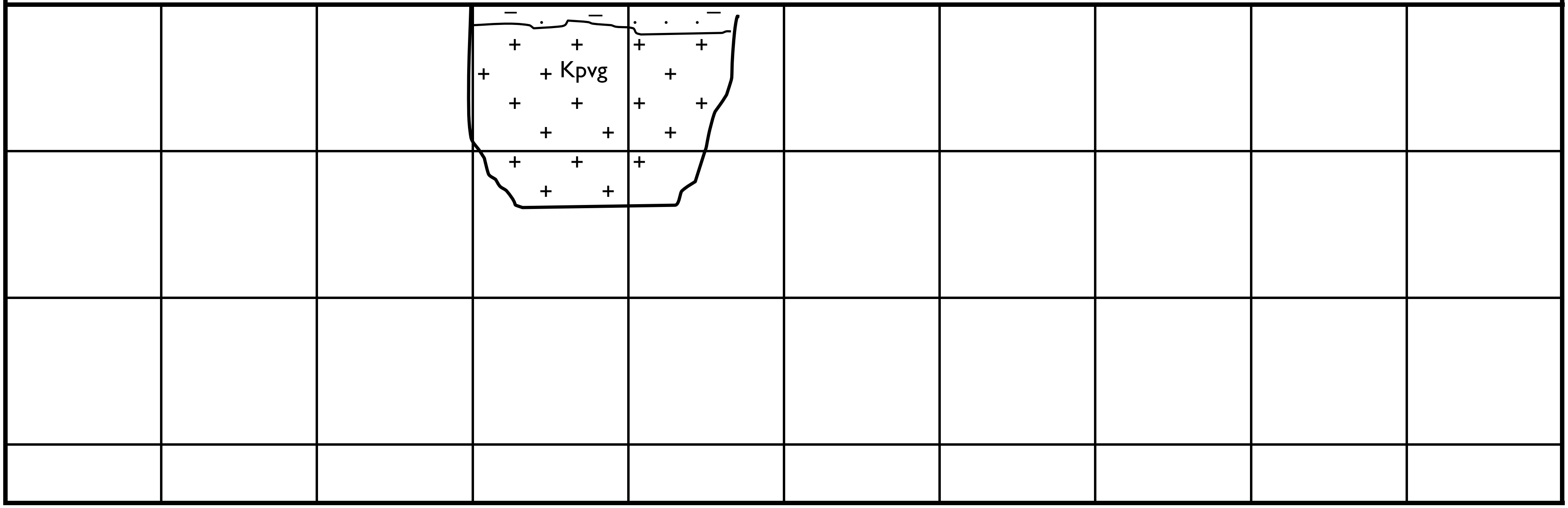
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1553'

Test Pit Number: 10 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 9"-1'	**Topsoil:** Light orange brown fine Silty SAND with medium and coarse grains, roots, porous, dry in top 2", slightly moist and medium dense below.
	9"-1' to 7'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly moist, very dense Total Depth 7' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



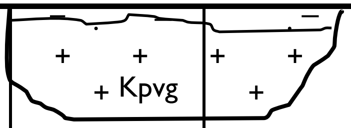
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1570.5'

Test Pit Number: 11 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 3"-6"	**Topsoil:** Light orange brown fine to coarse Silty SAND with trace Gravel, roots, porous, dry, slightly loose. dense below.
	3-6" to 3'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly moist, very dense. Total Depth 3' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



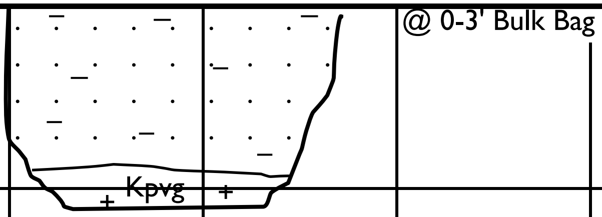
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1558.5'

Test Pit Number: 12 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 4.5'	**Topsoil:** Moderate orange brown fine Silty SAND with minor mediun to coarse sand grains, trace Gravel, roots to 2', porous, dry and loose to 3", slighlty moist and medium dense below.
	4.5' to 5.5	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly moist, very dense.
		Total Depth 5.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



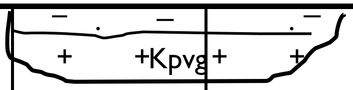
Log of Exploratory Test Pit

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1582'

Test Pit Number: 13 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 9"	**Topsoil:** Light orange brown fine to coarse Silty SAND with trace Gravel, roots, porous, dry, slightly loose. dense below.
	9" to 2'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light to light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly very dense.
		Total Depth 2' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet

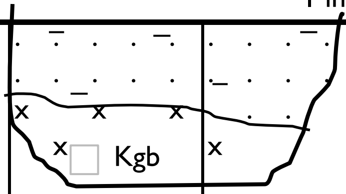


Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1539'

Test Pit Number: 14 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 2-3'	**Topsoil:** Moderate orange brown fine Silty SAND with minor mediun to coarse sand grains, trace Gravel, roots to 2', porous, dry and loose to 3", slighlty moist, and medium dense below.
	2-3' to 5'	**San Marcos Gabbro (Kgb):** Very weathered, moderate gray, massive, coarse grained, GABBRO with Biotite, closed fractures filled with soil, dry to very dense. Very hard digging at 5 feet.
		Total Depth 5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



Bag 0-3'

Log of Exploratory Test Pit

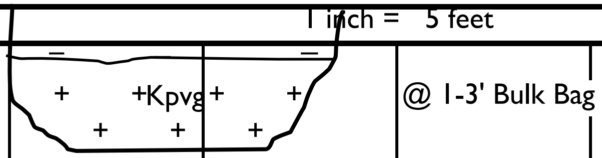
Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1547'

Test Pit Number: 15 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 4"	**Topsoil:** Light orange brown fine to medium Silty SAND with sparce Gravel, roots, porous, dry to sligthly moist, loose to medum dense.
	4" to 3'	**Paloma Valley Ring Complex (Kpvg):** Very weathered, very light to light orange gray, massive, medium grained, MONZOGRANITE, dry to slightly very dense

Total Depth 3'
No Groundwater Encountered
No Caving
Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet

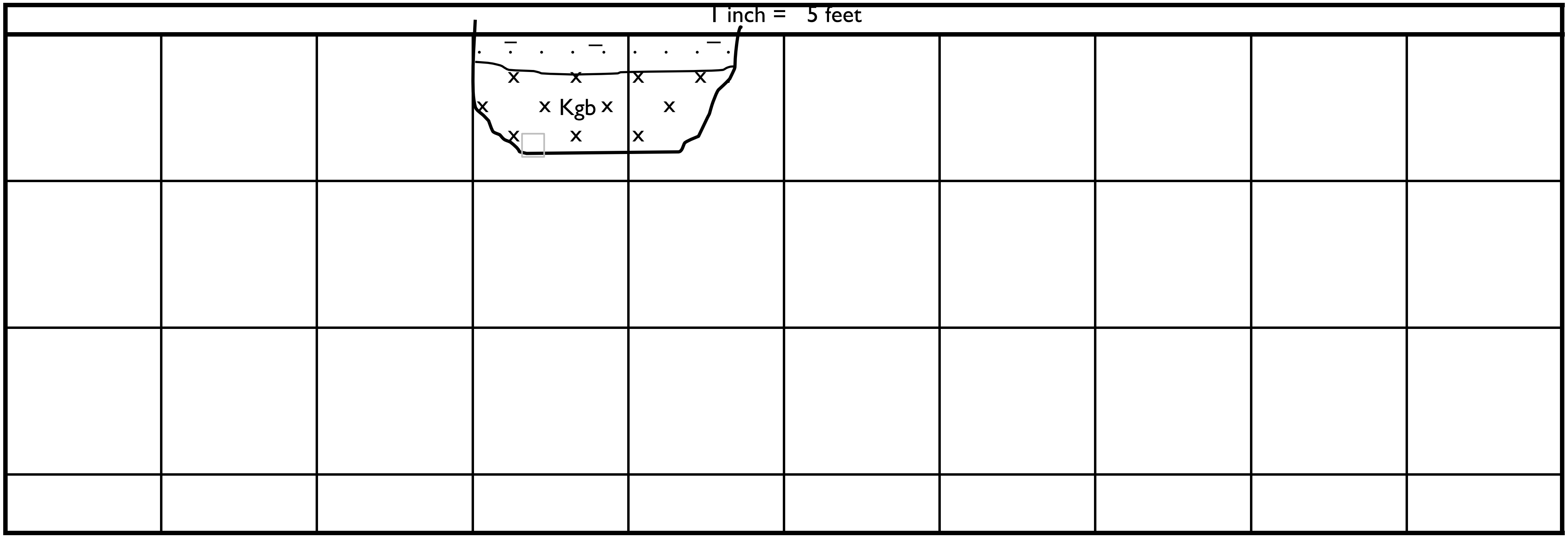


Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1519.5'

Test Pit Number: 16 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 1-1.5'	**Topsoil:** Moderate orange brown fine Silty SAND with sparce Gravel, porous, roots and dry in upper 4", slightly moist and medium dense below.
	1-1.5' to 4'	**San Marcos Gabbro (Kgb):** Very weathered, moderate gray, massive, coarse grained, GABBRO with Biotite, orange iron oxide staining, dry to slightly very dense. Very hard digging at 4 feet.
		Total Depth 4' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



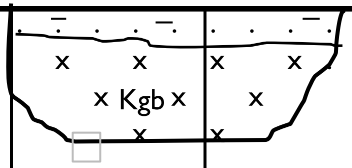
RMA GeoScience

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1519.5'

Test Pit Number: 17 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 9"-1'	**Topsoil:** Light orange brown fine Silty SAND with sparce Gravel and Cobbles, porous, roots and dry in upper 2", slightly moist and medium dense below.
	9"-1' to 3.5'	**San Marcos Gabbro (Kgb):** Very weathered, moderate gray, massive, coarse grained, GABBRO with Biotite, orange iron oxide staining, dry to slightly very dense. Hard digging, stopped at 4 feet. Total Depth 3.5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



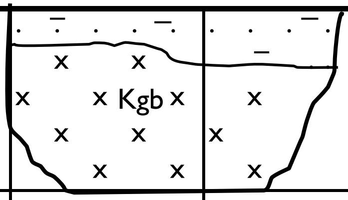
RMA GeoScience

Project Name: Murrieta 56 Mass Grading
Project Number: 18G-0502-0
Equipment: Case 580 Backhoe
Logged By: mbk Elevation: 1518'

Test Pit Number: 18 Date: Nov. 28, 2018
Location: Southwest corner of Baxter Road and Whitewood
Notes:

USCS	Feet (ft)	Material Description
SM	0 to 1-1.5'	**Topsoil:** Moderate orange brown fine Silty SAND with sparce Gravel, porous, roots and dry in upper 2", slightly moist and medium dense below.
	1'-1.5' to 5'	**San Marcos Gabbro (Kgb):** Very weathered, light to moderate gray, massive, coarse grained, GABBRO with Biotite, orange iron oxide staining, dry to very dense. Hard digging 4 to 5'
		Total Depth 5' No Groundwater Encountered No Caving Backfilled and Wheel Rolled Nov. 28, 2018

1 inch = 5 feet



LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-1**
Boring Location:
Drill Type: Hollow Stem Auger

■ Thin Wall Tube
☒ 2.5" Ring Sample
⧄ Bulk Sample
◫ Standard Split Spoon Sample
⊻ Static Water Table

Depth in Feet	Soil Type	Sample Type: Undisturbed	Sample Type: Bulk	SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear: φ°	Direct Shear: C psf	Other Tests
	ML		⧄	ALLUVIUM (Qal): Sandy silt, orange-brown, moist, 5% gravel, dense.				7	25			
		☒		@ 2' Sandy silt, tan, moist, dense.	85/11"	3.5	114.4					
5												
	SM	◫		@ 6' Silty sand with gravel, grey-brown, moist, very dense.	71/10"	2.8						
			⧄									
10	SM	☒		@ 10' Silty sand with gravel, grey-brown, moist, very dense.	50/4"	5.3	127.4					
	Bdrx	◫		GRANODIORITE (Kgd): Bedrock No recovery	50/3"	1.7						
15												
				TOTAL DEPTH @ 14 feet NO GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
20												
25												
30												
35												

LOG OF EXPLORATORY BORING

Job Number: 05-051-41

Project: SunCal Companies, Murrieta
Meadowlark School Site

Date Started: 10/26/2005

Date Completed: 10/26/2005

Boring No: **B-2**

Boring Location:

Drill Type: Hollow Stem Auger

■ Thin Wall Tube ☒ 2.5" Ring Sample

⧄ Bulk Sample ◫ Standard Split Spoon Sample ▽ Static Water Table

Depth in Feet	Soil Type	Sample Type		SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear		Other Tests
		Undisturbed	Bulk							φ °	C psf	
	ML			@ 0' Alluvium (Qal): Sandy silt, orange-brown, moist, loose.								
	ML	☒		@ 2' Sandy silt, yellow-brown, moist, dense.	80/10"	2.8	127.7					
5												
	SM	◫		@ 6' Silty sand, brown, moist.	40	3.3						
10	SM	☒		@ 10' Silty sand, grey-brown, moist, dense.	50/5"	3.8	120.6					
15	SM	☒	⧄	@ 15' Silty sand w/ gravel, grey-brown, moist, dense. @ 16' Groundwater encountered ▽	50/6"	5.4	120.9					
20		◫		@ 20' Gravel with silt. Refusal due to gravel.	50/4"	11.1						
				TOTAL DEPTH @ 23 feet GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
25												
30												
35												

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-3**
Boring Location:
Drill Type: Hollow Stem Auger

■ Thin Wall Tube
☒ 2.5" Ring Sample
⧄ Bulk Sample
◫ Standard Split Spoon Sample
▽ Static Water Table

Depth in Feet	Soil Type	Sample Type: Undisturbed	Sample Type: Bulk	SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear φ°	Direct Shear C psf	Other Tests
	ML		⧄	@ 0' Alluvium (Qal): Sandy silt, orange				0	16			
	ML	☒		@ 3' Sandy silt, yellow-brown, moist, dense.	88/10"	4.4	128.5					
5												
	SM	☒		@ 7' Silty sand, grey-brown, moist, dense looks like weathered granite.	50/4"	2.3	129.9					
10	SM	☒		@ 10' Silty sand with gravel, grey-brown, moist, dense, sample has broken gravel weathered	50/3"	2.6	123.8					
15	SM	◫		@ 15' Silty sand w/ gravel, grey-brown, moist, dense.	50/3"	1.8						
20	SM	☒	⧄	@ 20' Silty sand w/ gravel, grey-brown, moist, very dense slow drilling	50/2"	2.2	116.8					
25	SM	◫		@ 25' Silty sand w/ gravel, grey-brown, moist, dense	50/4"	1.5						
30		☒		@ 30' Gravel, rings show bedrock, End of Boring	50/4"	1.9	120					
35				TOTAL DEPTH @ 30 feet NO GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-4**
Boring Location: See Plot Plan
Drill Type: Hollow Stem Auger Drill Rig

▇ Thin Wall Tube
☒ 2.5" Ring Sample
▨ Bulk Sample
◫ Standard Split Spoon Sample
∇ Static Water Table

Depth in Feet	Soil Type	Sample Type		SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear		Other Tests
		Undisturbed	Bulk							φ °	C psf	
	ML			@ 0' ALLUVIUM (Qal): Sandy silt, orange-brown, moist, dense.								
	ML	☒		@ 3' Sandy silt, yellow-brown, moist, dense.	50/4"	3.1	120.9					
5	SM	☒		@ 5' Silty sand.	50/3"	1.5	109.2					
	Bdrx			Granodiorite (Kgd) Bedrock Refusal								
10				TOTAL DEPTH @ 7 feet NO GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
15												
20												
25												
30												
35												

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-5**
Boring Location: See Plot Plan
Drill Type: Hollow Stem Auger Drill Rig

■ Thin Wall Tube
☒ 2.5" Ring Sample
▨ Bulk Sample
◫ Standard Split Spoon Sample
▽ Static Water Table

Depth in Feet	Soil Type	Sample Type		SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear		Other Tests
		Undisturbed	Bulk							φ°	C psf	
	SM			Alluvium (Qal): Silty sand, orange-brown, dense								
	SM	☒		@ 3' Silty sand, yellow-brown, moist, very dense.	50/3"	1.8	111.0					
5	ML	☒		@ 5' Sandy silt, with gravel, grey-brown, moist, dense.	50/4"	3.6	104.2					
				Water @ 10 feet ▽								
10	SM	◫		@ 10' Silty sand with large amounts of gravel grey-brown, very dense, moist.	50/7"	1.7						
15	SM	☒		@ 15' Silty sand with gravel, grey-brown, wet, very dense. @ 16' Refusal due to gravel.	50/2"	7.1	132.1					
20				TOTAL DEPTH @ 16 feet GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
25												
30												
35												

LOG OF EXPLORATORY BORING

Sheet 1 of 1

Job Number: 05-051-41
Project: SunCal Companies, Murrieta
Meadowlark School Site
Date Started: 10/26/2005
Date Completed: 10/26/2005

Boring No: **B-6**
Boring Location: See Plot Plan
Drill Type: Hollow Stem Auger Drill Rig

■ Thin Wall Tube
☒ 2.5" Ring Sample
⧄ Bulk Sample
◫ Standard Split Spoon Sample
▽ Static Water Table

Depth in Feet	Soil Type	Sample Type: Undisturbed	Sample Type: Bulk	SOIL DESCRIPTION	Blows/foot	Moisture Content, %	Dry Density, pcf	Expansion Index	Soluble Sulfate, %	Direct Shear: φ °	Direct Shear: C psf	Other Tests
	ML			@ 0' ALLUVIUM (Qal): Sandy silt, orange-brown, very dense.								
	ML	☒		@ 3' Sandy silt, orange-brown, moist, very dense.	70/6"	5.8	108.2					
5	ML	☒		@ 5' Sandy silt, yellow-brown, moist, dense.	80/9"	3.2	120.2					
10	ML	☒		@ 10' Sandy silt, brown, moist, dense.	508/3"	5.5	115.4					
15	ML	☒		@ 15' Sandy silt, brown, moist, dense.	50/4"	3.6	110.7					
				@ 18' Hitting gravel- slow drilling								
20	SM	☒		@ 20' Silty sand, grey-brown, moist, dense, with gravel.	50/3"	3.5	111.2					
25	SM	◫		@ 25' Silty sand with gravel, grey-brown, No recovery	50/3"							
				Refusal @ 28' due to gravel.								
30				TOTAL DEPTH @ 28 feet NO GROUNDWATER ENCOUNTERED NO CAVING EXPERIENCED								
35												

APPENDIX B

LABORATORY TESTS

APPENDIX B

B-1.00 LABORATORY TESTS

B-1.01 Maximum Density

Maximum density - optimum moisture relationships for the major soil types encountered during the field exploration were performed in the laboratory using the standard procedures of ASTM D1557.

B-1.02 Expansion Tests

Expansion index tests were performed on representative samples of the major soil types encountered by the test methods outlined in ASTM D4829.

B-1.04 Atterberg Limits

The liquid limit, plastic limit, and the plasticity index of the major soil types encountered in the test pits were determined using the standard test methods of ASTM D4318.

B-1.05 Particle-Size/Sieve Analysis

Particle size analysis was performed on a representative sample of the on-site soils in accordance with the standard test methods of the ASTM D422.

B-1.06 Soluble Sulfates and Chlorides

Tests were performed on a representative sample encountered during the investigation using the California Test Methods 417 and 422.

B-1.07 Soil Reactivity (pH) and Electrical Conductivity (Ec)

Near-surface soil samples were tested for soil reactivity (pH) and minimum electrical resistivity using California Test Method 643 (see Table B1). The pH measurement determines the degree of acidity or alkalinity in the soils. The minimum resistivity is used as an indicator of how corrosive the soil is relative to buried metallic items.

B-1.08 Direct Shear

A direct shear test was performed on representative samples of the major soil types encountered in the test pit using the standard test method of ASTM D3080 (consolidated and drained). Tests were performed on a remolded sample. The remolded sample was tested at 90 percent relative compaction.

Shear test was performed on a direct shear machine of the strain-controlled type. To simulate possible adverse field conditions, the samples were saturated prior to shearing. Several samples were sheared at varying normal loads and the results plotted to establish the angle of the internal friction and cohesion of the tested samples.

B-1.09 Test Results

Test results for all laboratory tests performed on the subject project are presented in this appendix.

MAXIMUM DENSITY - OPTIMUM MOISTURE

(Test Method: ASTM D1557)

Sample Number	Optimum Moisture (Percent)	Maximum Density (lbs/ft^3)
TP1 @ 0-3 feet	10.4	128.9
TP14 @ 0-3 feet	7.0	130.3
TP15 @ 1-3 feet	7.1	129.7

EXPANSION TEST

Test Method: ASTM D4829

Sample Number	Expansion Index	Expansion Classification
TP1 @ 3-5 feet	0	Very Low

ATTERBERG LIMITS TEST RESULTS

Test Method: ASTM D4318

Sample Location	Liquid Limit	Plastic Limit	Plasticity Index
TP1 @3-5 feet	28	26	2

SOLUBLE SULFATES

(Test Method: Hach DR3 - Calcium Phosphate Extractable)

Sample Number	Soluble Sulfate (ppm)	Chloride Content (ppm)
TP1 @ 3-5 feet	55	40

SOIL REACTIVITY (pH) AND ELECTRICAL CONDUCTIVITY

(Test Method: ASTM D4972)

Sample Number	pH	Resistivity (Ohm-cm)
TP1 @ 3-5 feet	6.9	1,511

APPENDIX D

GENERAL EARTHWORKS AND GRADING SPECIFICATIONS

APPENDIX D

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

D-1.00 GENERAL DESCRIPTION

D-1.01 Introduction

These specifications present our general recommendations for earthwork and grading as shown on the approved grading plans for the subject project. These specifications shall cover all clearing and grubbing, removal of existing structures, preparation of land to be filled, filling of the land, spreading, compaction and control of the fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades and slopes as shown on the approved plans.

The recommendations contained in the geotechnical report of which these general specifications are a part of shall supersede the provisions contained hereinafter in case of conflict.

D-1.02 Laboratory Standard and Field Test Methods

The laboratory standard used to establish the maximum density and optimum moisture shall be ASTM D1557.

The insitu density of earth materials (field compaction tests) shall be determined by the sand cone method (ASTM D1556), direct transmission nuclear method (ASTM D6938) or other test methods as considered appropriate by the geotechnical consultant.

Relative compaction is defined, for purposes of these specifications, as the ratio of the in-place density to the maximum density as determined in the previously mentioned laboratory standard.

D-2.00 CLEARING

D-2.01 Surface Clearing

All structures marked for removal, timber, logs, trees, brush and other rubbish shall be removed and disposed of off the site. Any trees to be removed shall be pulled in such a manner so as to remove as much of the root system as possible.

D-2.02 Subsurface Removals

A thorough search should be made for possible underground storage tanks and/or septic tanks and cesspools. If found, tanks should be removed and cesspools pumped dry.

Any concrete irrigation lines shall be crushed in place and all metal underground lines shall be removed from the site.

D-2.03 Backfill of Cavities

All cavities created or exposed during clearing and grubbing operations or by previous use of the site shall be cleared of deleterious material and backfilled with native soils or other materials approved by the soil engineer. Said backfill shall be compacted to a minimum of 90% relative compaction.

D-3.00 ORIGINAL GROUND PREPARATION

D-3.01 Stripping of Vegetation

After the site has been properly cleared, all vegetation and topsoil containing the root systems of former vegetation shall be stripped from areas to be graded. Materials removed in this stripping process may be used as fill in areas designated by the soil engineer, provided the vegetation is mixed with a sufficient amount of soil to assure that no appreciable settlement or other detriment will occur due to decaying of the organic matter. Soil materials containing more than 3% organics shall not be used as structural fill.

D-3.02 Removals of Non-Engineered Fills

Any non-engineered fills encountered during grading shall be completely removed and the underlying ground shall be prepared in accordance to the recommendations for original ground preparation contained in this section. After cleansing of any organic matter the fill material may be used for engineered fill.

D-3.03 Over excavation of Fill Areas

The existing ground in all areas determined to be satisfactory for the support of fills shall be scarified to a minimum depth of 6 inches. Scarification shall continue until the soils are broken down and free from lumps or clods and until the scarified zone is uniform. The moisture content of the scarified zone shall be adjusted to within 2% of optimum moisture. The scarified zone shall then be uniformly compacted to 90% relative compaction.

Where fill material is to be placed on ground with slopes steeper than 5:1 (H:V) the sloping ground shall be benched. The lowermost bench shall be a minimum of 15 feet wide, shall be a minimum of 2 feet deep, and shall expose firm material as determined by the geotechnical consultant. Other benches shall be excavated to firm material as determined by the geotechnical consultant and shall have a minimum width of 4 feet.

Existing ground that is determined to be unsatisfactory for the support of fills shall be overexcavated in accordance to the recommendations contained in the geotechnical report of which these general specifications are a part.

D-4.00 FILL MATERIALS

D-4.01 General

Materials for the fill shall be free from vegetable matter and other deleterious substances, shall not contain rocks or lumps of a greater dimension than is recommended by the geotechnical consultant, and shall be approved by the geotechnical consultant. Soils of poor gradation, expansion, or strength properties shall be placed in areas designated by the geotechnical consultant or shall be mixed with other soils providing satisfactory fill material.

D-4.02 Oversize Material

Oversize material, rock or other irreducible material with a maximum dimension greater than 8 inches shall not be placed in fills, unless the location, materials, and disposal methods are specifically approved by the geotechnical consultant. Oversize material shall be placed in such a manner that nesting of oversize material does not occur and in such a manner that the oversize material is completely surrounded by fill material compacted to a minimum of 90% relative compaction. Oversize material shall not be placed within 10 feet of finished grade without the approval of the geotechnical consultant.

D-4.03 Import

Material imported to the site shall conform to the requirements of Section 4.01 of these specifications. Potential import material shall be approved by the geotechnical consultant prior to importation to the subject site.

D-5.00 PLACING AND SPREADING OF FILL

D-5.01 Fill Lifts

The selected fill material shall be placed in nearly horizontal layers which when compacted will not exceed approximately 6 inches in thickness. Thicker lifts may be placed if testing indicates the compaction procedures are such that the required compaction is being achieved and the geotechnical consultant approves their use.
Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to insure uniformity of material in each layer.

D-5.02 Fill Moisture

When the moisture content of the fill material is below that recommended by the soils engineer, water shall then be added until he moisture content is as specified to assure thorough bonding during the compacting process.

When the moisture content of the fill material is above that recommended by the soils engineer, the fill material shall be aerated by blading or other satisfactory methods until the moisture content is as specified.

D-5.03 Fill Compaction

After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to not less than 90% relative compaction. Compaction shall be by sheepsfoot rollers, multiple-wheel pneumatic tired rollers, or other types approved by the soil engineer.

Rolling shall be accomplished while the fill material is at the specified moisture content. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to insure that the desired density has been obtained.

D-5.04 Fill Slopes

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compacting of the slopes may be done progressively in increments of 3 to 4 feet in fill height. At the completion of grading, the slope face shall be compacted to a minimum of 90% relative compaction. This may require track rolling or rolling with a grid roller attached to a tractor mounted side boom.

Slopes may be over filled and cut back in such a manner that the exposed slope faces are compacted to a minimum of 90% relative compaction.

The fill operation shall be continued in six inch (6") compacted layers, or as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

D-5.05 Compaction Testing

Field density tests shall be made by the geotechnical consultant of the compaction of each layer of fill. Density tests shall be made at locations selected by the geotechnical consultant.

Frequency of field density tests shall be not less than one test for each 2.0 feet of fill height and at least every one thousand cubic yards of fill. Where fill slopes exceed four feet in height their finished faces shall be tested at a frequency of one test for each 1000 square feet of slope face.

Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density reading shall be taken in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required density, the particular layer or portion shall be reworked until the required density has been obtained.

D-6.00 SUBDRAINS

D-6.01 Subdrain Material

Subdrains shall be constructed of a minimum 8-inch diameter pipe encased in a suitable filter material. The subdrain pipe shall be Schedule 40 Acrylonitrile Butadiene Styrene (ABS) or Schedule 40 Polyvinyl Chloride Plastic (PVC) pipe or approved equivalent. Subdrain pipe shall be installed with perforations down. Filter material shall consist of 3/4" to 1 1/2" clean gravel wrapped in an envelope of filter fabric consisting of Mirafi 140N or approved equivalent.

D-6.02 Subdrain Installation

Subdrain systems, if required, shall be installed in approved ground to conform the approximate alignment and details shown on the plans or herein. The subdrain locations shall not be changed or modified without the approval of the geotechnical consultant. The geotechnical consultant may recommend and direct changes in the subdrain line, grade or material upon approval by the design civil engineer and the appropriate governmental agencies.

D-7.00 EXCAVATIONS

D-7.01 General

Excavations and cut slopes shall be examined by the geotechnical consultant. If determined necessary by the geotechnical consultant, further excavation or overexcavation and refilling of overexcavated areas shall be performed, and/or remedial grading of cut slopes shall be performed.

D-7.02 Fill-Over-Cut Slopes

Where fill-over-cut slopes are to be graded the cut portion of the slope shall be made and approved by the geotechnical consultant prior to placement of materials for construction of the fill portion of the slope.

D-8.00 TRENCH BACKFILL

D-.01 General

Trench backfill within street right of ways shall be compacted to 90% relative compaction as determined by the ASTM D1557 test method. Backfill may be jetted as a means of initial compaction; however, mechanical compaction will be required to obtain the required percentage of relative compaction. If trenches are jetted, there must be a suitable delay for drainage of excess water before mechanical compaction is applied.

D-9.00 SEASONAL LIMITS

D-9.01 General

No fill material shall be placed, spread or rolled while it is frozen or thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the soils engineer indicate that the moisture content and density of the fill are as previously specified.

D-10.00 SUPERVISION

D-10.01 Prior to Grading

The site shall be observed by the geotechnical consultant upon completion of clearing and grubbing, prior to the preparation of any original ground for preparation of fill.

The supervisor of the grading contractor and the field representative of the geotechnical consultant shall have a meeting and discuss the geotechnical aspects of the earthwork prior to commencement of grading.

D-10.02 During Grading

Site preparation of all areas to receive fill shall be tested and approved by the geotechnical consultant prior to the placement of any fill.

The geotechnical consultant or his representative shall observe the fill and compaction operations so that he can provide an opinion regarding the conformance of the work to the recommendations contained in this report.

APPENDIX E

REFERENCES

REFERENCES

1. California Building Standards Commission, 2016 California Building Code.

2. California Department of Conservation Division of Mines and Geology, 2008. Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117.

3. California Geologic Survey, 1990 and 2018, Earthquake Zones of Required Investigation Map, Murrieta Quadrangle, Scale 1:24,000.

4. California Geologic Survey, 2018, Seismic Hazard Zone Report For The Murrieta 7.5-Minute Quadrangle, Riverside County, California, Seismic Hazard Zone Report 115.

5. County of Riverside, 2015, County of Riverside Environmental Impact Report No. 521, Section 4.11 Flood and Dam Inundation Hazards, Public Review Draft.

6. Kennedy, M.P. and Morton, D.M., 2003, Preliminary Geologic Map of the Murrieta 7.5' Quadrangle, Riverside County, California, Version 1.0, USGS OF-2003-189, Scale 1:24,000.

7. Morton, D.M. and Baird, A.K.,1976, Petrology of the Paloma Valley Ring Complex, Southern California Batholith *in* U.S. Geological Survey, Jour. Research, Vol. 4, No. 1 p. 83-89, 1976.

8. Morton et al., 2014, Framework and Petrogenesis of the Northern Peninsular Ranges Batholith, Southern California *in* Geological Society of America Memoirs, March 2014.

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10. Riverside County Map My County Online Website: http://www.gis.countyofriverside.us/Html5Viewer/?viewer=MMC_Public.

11. University of Santa Barbara Aerial Photography Library: axm-1938a, 32-12, axm-1953b, 2k-64, http://www.mil.library.ucsb.edu/ap_indexes/FrameFinder/.