APPENDIX 4D

Geotechnical Report (Rancho Bonito)

PRELIMINARY GEOTECHNICAL INTERPRETIVE REPORT

PROPOSED RANCHO BONITO TOWN HOME COMMUNITY AND SHOPPING CENTER, ASSESSOR'S PARCEL NUMBER 360-350-006, LOT NUMBER 1 OF PARCEL MAP NUMBER 13523, LOCATED ON THE SOUTH SIDE OF GARBANI ROAD BETWEEN SHERMAN AND HAUN ROAD, CITY OF MENIFEE, RIVERSIDE COUNTY, CALIFORNIA

PROJECT NO. 151015-10A

ISSUED: FEBRUARY 4, 2016

EARTH STRATA GEOTECHNICAL SERVICES, INC.

February 4, 2016

Project No. 151015-10A

SHERMAN & GARBANI, LLC
31103 Rancho Viejo Road
Suite 535
San Juan Capistrano, CA 92675

Subject: **Preliminary Geotechnical Interpretive Report, Proposed Rancho Bonito Town Home Community and Shopping Center, Assessor's Parcel Number 360-350-006, Lot Number 1 of Parcel Map Number 13523, Located on the South Side of Garbani Road Between Sherman Road and Haun Road, City of Menifee, Riverside County, California**

Earth Strata Geotechnical Services is pleased to present our preliminary geotechnical interpretive report for the proposed Rancho Bonito Town Home Community and Shopping Center, Assessor's Parcel Number 360-350-006, Lot Number 1 of Parcel Map Number 13523, located on the south side of Garbani Road between Sherman Road and Haun Road in the City of Menifee in Riverside County, California. This work was performed in accordance with the scope of work described in our proposal, dated November 2, 2015. The purpose of this study is to evaluate the nature, distribution, engineering properties, and geologic strata underlying the site with respect to the proposed development.

Earth Strata appreciates the opportunity to offer our consultation and advice on this project. In the event that you have any questions, please do not hesitate to contact the undersigned at your earliest convenience.

Respectfully submitted,

EARTH STRATA GEOTECHNICAL SERVICES

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INTRODUCTION

Earth Strata is pleased to present our preliminary geotechnical interpretive report for the proposed development. The purpose of this study was to evaluate the nature, distribution, engineering properties, and geologic strata underlying the site with respect to the proposed development, and then provide preliminary grading and foundation design recommendations based on the plans you provided. The general location of the subject property is indicated on the Vicinity Map, Figure 1. The plans you provided were used as the base map to show geologic conditions within the subject site, see Geotechnical Map, Plate 1.

SITE DESCRIPTION

The subject property is located on the south side of Garbani Road between Sherman Road and Haun Road in the City of Menifee, Riverside County, California. The approximate location of the site is shown on the Vicinity Map, Figure 1.

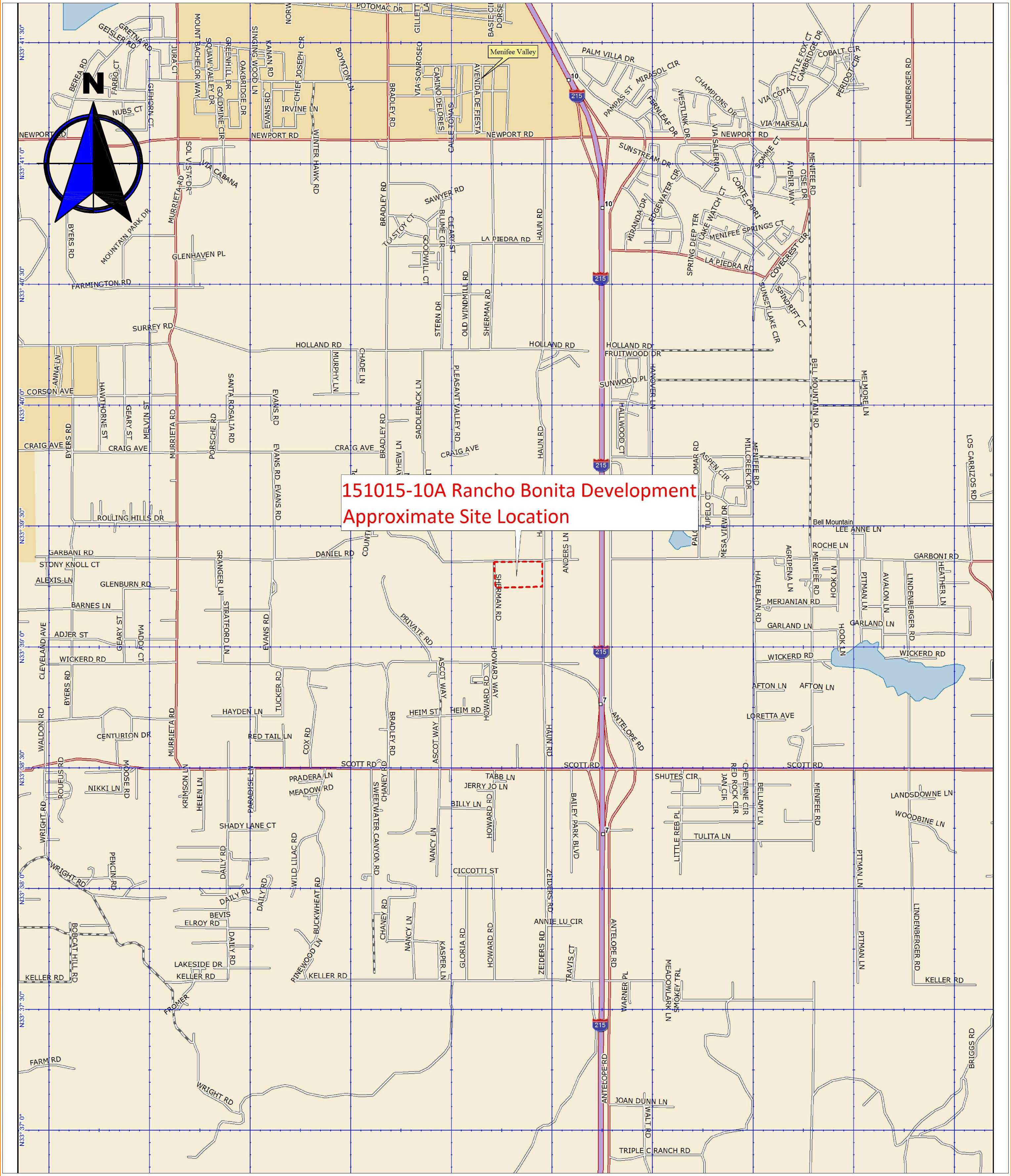
The subject property is comprised of approximately 17.94 acres of undeveloped land. The site has not been graded. Topographic relief at the subject property is relatively low with the terrain being generally flat. Drainage within the subject property generally flows to the north.

The site is currently bordered by undeveloped land. Most of the vegetation on the site consists of sparse to moderate amounts of annual weeds/grasses.

PROPOSED DEVELOPMENT AND GRADING

The proposed residential development is expected to consist of concrete, wood or steel framed one- and/or two-story structures utilizing slab on grade construction with associated streets, landscape areas, and utilities. The current development plans include forty-eight (48) residential buildings and two (2) commercial buildings with a pool and clubhouse positioned throughout the site.

Formal plans have not been prepared and await the conclusions and recommendations of this report.



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RANCHO BONITA DEVELOPMENT		151015-10A
VICINITY MAP	SCALE 1:40,625	
	FEB 2016	FIGURE 1

FIELD EXPLORATION AND LABORATORY TESTING

Field Exploration

Subsurface exploration within the subject site was performed on December 28, 2015 for the exploratory excavations. A truck mounted hollow-stem-auger drill rig was utilized to drill eight (8) borings throughout the site to a maximum depth of 9 feet. An underground utilities clearance was obtained from Underground Service Alert of Southern California, prior to the subsurface exploration.

Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions may have been reconciled to reflect laboratory test results with regard to ASTM D 2487.

Associated with the subsurface exploration was the collection of bulk (disturbed) samples and relatively undisturbed samples of earth materials for laboratory testing and analysis. The relatively undisturbed samples were obtained with a 3 inch outside diameter modified California split-spoon sampler lined with 1 inch high brass rings. Samples obtained using a hollow stem auger drill rig, were mechanically driven with successive 30 inch drops of a 140-pound automatic trip safety hammer. The blow count per one foot increment was recorded in the boring logs. The central portions of the driven samples were placed in sealed containers and transported to our laboratory for testing and analysis. The approximate exploratory locations are shown on Plate 1 and descriptive logs are presented in Appendix B.

Laboratory Testing

Maximum dry density/optimum moisture content, 200-wash, expansion potential, R-value, pH, resistivity, sulfate content, chloride content, and in-situ density/moisture content were determined for selected undisturbed and bulk samples of earth materials, considered representative of those encountered. An evaluation of the test data is reflected throughout the Conclusions and Recommendations section of this report. A brief description of laboratory test criteria and summaries of test data are presented in Appendix C.

FINDINGS

Regional Geology

Regionally, the site is located in the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges are characterized by northwest trending steep mountain ranges separated by sediment filled elongated valleys. The dominant structural geologic features reflect the northwest trend of the province. Associated with and subparallel to the San Andreas Fault are the San Jacinto Fault, Newport-Inglewood, and the Whittier-Elsinore Fault. The Santa Ana Mountains abut the west side of the Elsinore Fault while the Perris Block forms the other side of the fault zone to the east. The Perris Block is bounded to the east by the San Jacinto Fault. The northern perimeter of the Los Angeles basin forms part of a northerly dipping blind thrust fault at the boundary between the Peninsular Ranges Province and the Transverse Range Province.

The mountainous regions within the Peninsular Ranges Province are comprised of Pre-Cretaceous, metasedimentary, and metavolcanic rocks along with Cretaceous plutonic rocks of the Southern California Batholith. The low lying areas are primarily comprised of Tertiary and Quaternary non-marine alluvial sediments consisting of alluvial deposits, sandstones, claystones, siltstones, conglomerates, and occasional volcanic units. A map illustrating the regional geology is presented on the Regional Geologic Map, Figure 2.

Local Geology

The earth materials on the site are primarily comprised of artificial fill, Quaternary alluvial materials, and bedrock. A general description of the dominant earth materials observed on the site is provided below:

- Quaternary Very Old Alluvial Channel Deposits (map symbol Qvoa): Quaternary very old alluvial deposits were encountered to a maximum explored depth. These alluvial deposits consist predominately of interlayered reddish brown to yellowish brown, fine to coarse grained silty sand. These deposits were generally noted to be in a slightly moist to moist, medium dense to very dense state.

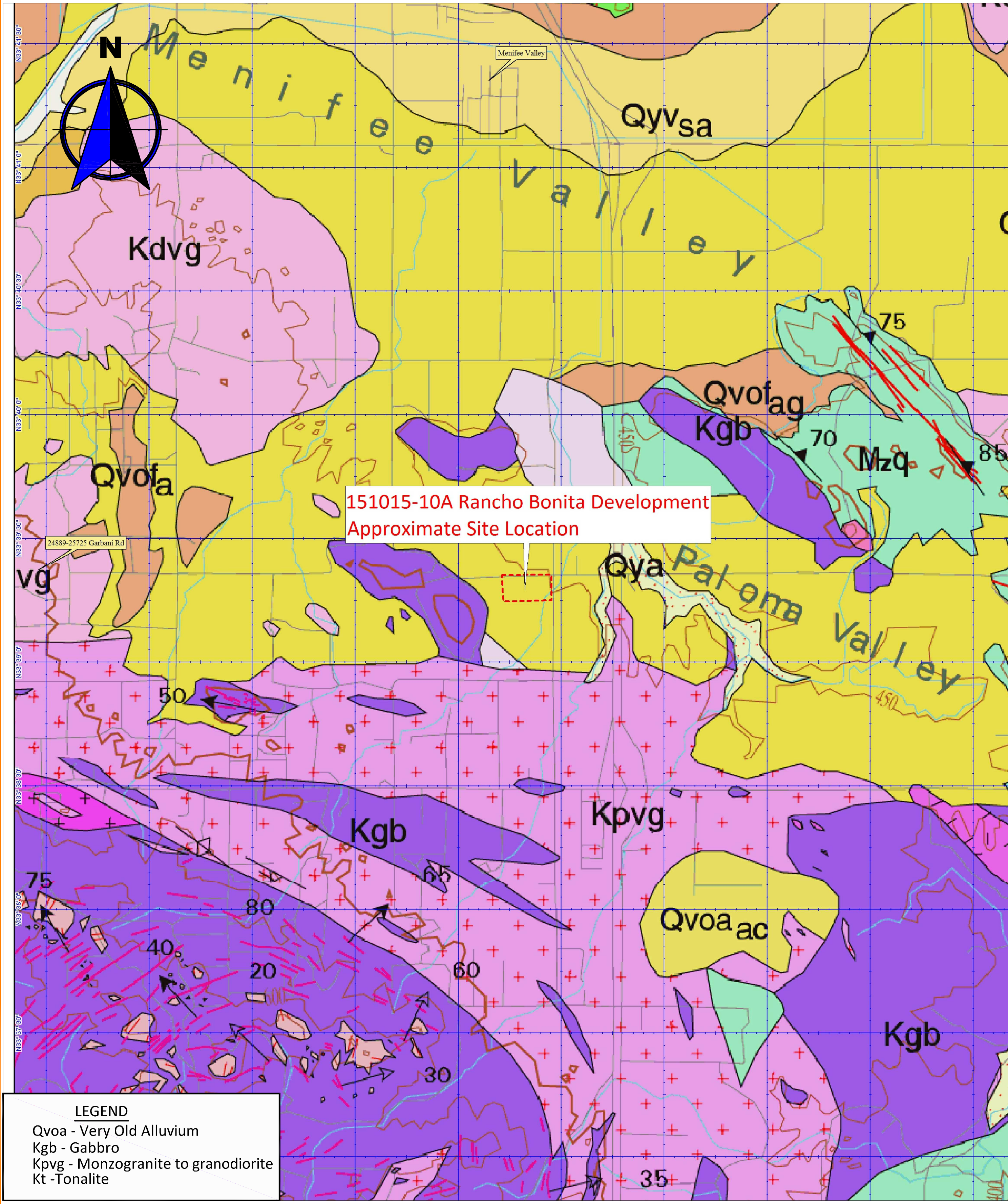
- Cretaceous Gabbro (map symbol Kgb): Cretaceous age plutonic rock consisting of gabbro was mapped within the western portion of the site. The gabbro was observed to be dark gray to olive gray, fine to coarse grained, and in a moderately hard to very hard state. Typically, the upper 1 to 3 feet of this unit is more weathered and not as hard.

- Cretaceous Monzogranitic Rock (map symbol Kpvg): Cretaceous age monzogranitic rocks composed of a wide variety of compositions make up this unit. Rock types typically include monzogranite, granodiorite, tonalite and gabbro, with the most common being tonalite (Morton, 2004). This rock unit was mapped within the eastern portion of the site. These granitic rocks were observed to be yellowish brown to reddish brown, medium to coarse-grained, and in a moderately hard to very hard state. Typically, the upper 1 to 3 feet of this unit is more weathered and not as hard.

Faulting

The project is located in a seismically active region and as a result, significant ground shaking will likely impact the site within the design life of the proposed project. The geologic structure of the entire southern California area is dominated by northwest-trending faults associated with the San Andreas Fault system, which accommodates for most of the right lateral movement associated with the relative motion between the Pacific and North American tectonic plates. Known active faults within this system include the Newport-Inglewood, Whittier-Elsinore, San Jacinto and San Andreas Faults.

No active faults are known to project through the site and the site is not located within an Alquist-Priolo Earthquake Fault Zone, established by the State of California to restrict the construction of new habitable structures across identifiable traces of known active faults. An active fault is defined by the State of California as having surface displacement within the past 11,000 years or during the Holocene geologic time period. Based on our mapping of the subject site, review of current and historical aerial imagery, lack of lineaments indicative of active faulting, and the data compiled during the preparation of this



LEGEND
Qvoa - Very Old Alluvium
Kgb - Gabbro
Kpvg - Monzogranite to granodiorite
Kt -Tonalite

REFERNCES: Morton, D.M., Hauser, Rachel M., and Ruppert, Kelly R., 2004, Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California, Version 2.0: U.S. Geological Survey Open-File Report 99-0172.
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RANCHO BONITA DEVELOPMENT		151015-10A
REGIONAL GEOLOGIC MAP	SCALE 1:40,625	
	FEB 2016	FIGURE 2

report, it is our interpretation that the potential for surface rupture to adversely impact the proposed structures is very low to remote.

Based on our review of regional geologic maps and applicable computer programs (USGS 2008 Interactive Deaggregation, Caltrans ARS online, and USGS Earthquake Hazard Programs), the Elsinore Fault with an approximate source to site distance of 9.4 kilometers is the closest known active fault anticipated to produce the highest ground accelerations, with an anticipated maximum modal magnitude of 6.87. A list of faults as well as a list of significant historical seismic events within a 100km radius of the subject site is included in Appendix D.

Landslides

Landslide debris was not observed during our subsurface exploration and no ancient landslides are known to exist on the site. No landslides are known to exist, or have been mapped, in the vicinity of the site. Geologic mapping of the site conducted during our investigation, and review of aerial imagery of the site, reveal no geomorphic expressions indicative of landsliding. The materials encountered in the pad areas were found to be very hard and no oversteepened slopes exist on the site or are proposed.

CONCLUSIONS AND RECOMMENDATIONS

General

From geotechnical and engineering geologic points of view, the subject property is considered suitable for the proposed development, provided the following conclusions and recommendations are incorporated into the plans and are implemented during construction.

Earthwork

Earthwork and Grading

The provisions of the 2013 California Building Code (CBC), including Appendix J Grading, should be applied to all earthwork and grading operations, as well as in accordance with all applicable grading codes and requirements of the appropriate reviewing agency. Unless specifically revised or amended herein, grading operations should also be performed in accordance with applicable provisions of our General Earthwork and Grading Specifications within the last appendix of this report.

Clearing and Grubbing

Vegetation including trees, grasses, weeds, brush, shrubs, or any other debris should be stripped from the areas to be graded and properly disposed of offsite. In addition, laborers should be utilized to remove any roots, branches, or other deleterious materials during grading operations.

Earth-Strata should be notified at the appropriate times to provide observation and testing services during Clearing and Grubbing operations. Any buried structures or unanticipated conditions should be brought to our immediate attention.

Excavation Characteristics

Based on the results of our exploration and experience with similar projects in similar settings, the near surface earth materials, will be readily excavated with conventional earth moving equipment. Excavation difficulty is a function of the degree of weathering and amount of fracturing within the bedrock. Bedrock generally becomes harder and more difficult to excavate with increasing depth.

Groundwater

Groundwater was not observed during our subsurface exploration and is not expected to be a factor during grading as the recommended removal depths are less than the maximum depth explored across the site. Localized ponded water is possible but is not expected to be a factor during grading.

Ground Preparation For Fill Areas

For each area to receive compacted fill, the removal of low density, compressible earth materials, such as topsoil, upper alluvial materials, and undocumented artificial fill, should continue until firm competent bedrock is encountered. Removal excavations are subject to verification by the project engineer, geologist or their representative. Prior to placing compacted fills, the exposed bottom in each removal area should be scarified to a depth of 6 inches or more, watered or air dried as necessary to achieve near optimum moisture conditions and then compacted to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557.

The intent of remedial grading is to diminish the potential for hydro-consolidation, slope instability, and/or settlement. Remedial grading should extend beyond the perimeter of the proposed structures a horizontal distance equal to the depth of excavation or a minimum of 5 feet, whichever is greater. For cursory purposes the anticipated removal depths are shown on the enclosed Geotechnical Map, Plate 1. In general, the anticipated removal depths should vary from 3 to 5 feet below existing grade.

Wet Removals

Wet alluvial materials will probably not be encountered within the low lying areas of the site. If removals of wet alluvial materials are required, special grading equipment and procedures can greatly reduce overall costs. Careful planning by an experienced grading contractor can reduce the need for special equipment, such as swamp cats, draglines, excavators, pumps, and top loading earthmovers. Possible solutions may include the placement of imported angular rock and/or geotextile ground reinforcement. More specific recommendations can be provided based on the actual conditions encountered. Drying or mixing of wet materials with dry materials will be needed to bring the wet materials to near optimum moisture prior to placing wet materials into compacted fills.

Oversize Rock

Oversize rock is not expected to be encountered during grading. Oversize rock that is encountered (i.e., rock exceeding a maximum dimension of 12 inches) should be disposed of offsite or stockpiled onsite and crushed for future use. The disposal of oversize rock is discussed in greater detail in General Earthwork and Grading Specifications within the last appendix of this report.

Compacted Fill Placement

Compacted fill materials should be placed in 6 to 8 inch maximum (uncompacted) lifts, watered or air dried as necessary to achieve uniform near optimum moisture content and then compacted to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557.

Import Earth Materials

Should import earth materials be needed to achieve final design grades, all potential import materials should be free of deleterious/oversize materials, non-expansive, and approved by the project geotechnical consultant prior to delivery onsite.

Fill Slopes

When properly constructed, fill slopes up to 10 feet high with inclinations of 2:1 (h:v) or flatter are considered to be grossly stable. Keyways are required at the toe of all fill slopes higher than 5 feet and steeper than 5:1 (h:v). Keyways should be a minimum of 10 feet wide and 2 feet into bedrock materials, as measured on the downhill side. In order to establish keyway removals, backcuts should be cut no steeper than 1:1 or as recommended by the geotechnical engineer or engineering geologist. Compacted fill should be benched into bedrock materials.

Cut Slopes

When properly constructed, cut slopes into bedrock up to 10 feet high with inclinations of 2:1 (h:v) or flatter are considered grossly stable. Cut slopes should be observed by the engineering geologist or his representative during grading, but are anticipated to be stable.

Stabilization Fills

Currently, stabilization fills will not be required for cut slopes in the bedrock. Our engineering geologist or his representative should be called to evaluate all slopes during grading. In the event that unfavorable geologic conditions are encountered, recommendations for stabilization fills or flatter slopes will be provided.

Fill Over Cut Slopes

The fill portion of fill over cut slopes should not be constructed until the cut portion of the slope has been cut to finish grade. The earth materials and geologic structure exposed along the cut slope should be evaluated with regard to suitability for compacted fills or foundations and for stability. If the cut materials are determined to be competent, then the construction of the keyway and subdrain system may commence or additional remedial recommendations will be provided.

Temporary Backcuts

It is the responsibility of the grading contractor to follow all Cal-OSHA requirements with regard to excavation safety. Where existing developments are upslope, adequate slope stability to protect those developments must be maintained. Temporary backcuts will be required to accomplish removals of unsuitable materials and possibly, to perform canyon removals, stabilization fills, and/or keyways. Backcuts should be excavated at a gradient of 1:1 (h:v) or flatter. Flatter backcuts may be required where geologic structure or earth materials are unfavorable. It is imperative that grading schedules minimize the exposure time of the unsupported excavations. All excavations should be stabilized within 30 days of initial excavation.

Cut/Fill Transitions

Cut/fill transitions should be eliminated from all building areas where the depth of fill placed within the "fill" portion exceeds proposed footing depths. This is to diminish distress to structures resulting from excessive differential settlement. The entire foundation of each structure should be founded on a uniform bearing material. This should be accomplished by overexcavating the "cut" portion and replacing the excavated materials as properly compacted fill. Refer to the following table for recommended depths of overexcavation.

DEPTH OF FILL ("fill" portion)	DEPTH OF OVEREXCAVATION ("cut" portion)
Up to 5 feet	Equal Depth
5 to 10 feet	5 feet
Greater than 10 feet	One-half the thickness of fill placed on the "fill" portion (10 feet maximum)

Overexcavation of the "cut" portion should extend beyond the building perimeter a horizontal distance equal to the depth of overexcavation or a minimum of 5 feet, whichever is greater.

Cut Areas

Where low density surficial earth materials such as any undocumented artificial fills, topsoil, colluvium and/or alluvium are not removed in their entirety in cut areas, the entire lot should overexcavated a minimum of 3 feet below the proposed foundations and replaced with compacted fill. Final determination of areas that require overexcavation due to transition conditions should be determined in the field by a representative of Earth-Strata.

Shrinkage, Bulking and Subsidence

Volumetric changes in earth material quantities will occur when poorly consolidated earth materials are replaced with properly compacted fill. Estimates of the percent shrinkage/bulking factors for the various geologic units observed on the subject property are based on in-place densities and on the estimated average percent of relative compaction achieved during grading.

GEOLOGIC UNIT	SHRINKAGE (%)
Alluvium	10 to 15
Bedrock	0 to 5 Bulking

Subsidence from scarification and recompaction of exposed bottom surfaces is expected to be negligible to approximately 0.01 foot.

The estimates of shrinkage/bulking and subsidence are intended as an aid for project engineers in determining earthwork quantities. Since many variables can affect the accuracy of these estimates, they should be used with caution and contingency plans should be in place for balancing the project.

Geotechnical Observations

Clearing operations, removal of unsuitable materials, and general grading procedures should be observed by the project geotechnical consultant or his representative. No compacted fill should be placed without observations by the geotechnical consultant or his representative to verify the adequacy of the removals.

The project geotechnical consultant or his representative should be present to observe grading operations and to check that minimum compaction requirements and proper lift thicknesses are being met, as well as to verify compliance with the other recommendations presented herein.

Post Grading Considerations

Slope Landscaping and Maintenance

Adequate slope and building pad drainage is essential for the long term performance of the subject site. The gross stability of graded slopes should not be adversely affected, provided all drainage provisions are properly constructed and maintained. Engineered slopes should be landscaped with deep rooted, drought tolerant maintenance free plant species, as recommended by the project landscape architect.

Site Drainage

Control of site drainage is important for the performance of the proposed project. Roof gutters are recommended for the proposed structures. Pad and roof drainage should be collected and transferred to driveways, adjacent streets, storm-drain facilities, or other locations approved by the building official in non-erosive drainage devices. Drainage should not be allowed to pond on the pad or against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope. Planters located within retaining wall backfill should be sealed to prevent moisture intrusion into the backfill. Planters located next to structures should be sealed to the depth of the footings. Drainage control devices require periodic cleaning, testing and maintenance to remain effective.

At a minimum, pad drainage should be designed at the minimum gradients required by the CBC. To divert water away from foundations, the ground surface adjacent to foundations should also be graded at the minimum gradients required per the CBC.

Utility Trenches

All utility trench backfill should be compacted at near optimum moisture to a minimum of 90 percent of the maximum dry density determined by ASTM test method D 1557-00. For utility trench backfill within pavement areas the upper 6 inches of subgrade materials should be compacted to 95 percent of the maximum dry density determined by ASTM D 1557-00. This includes within the street right-of-ways, utility easements, under footings, sidewalks, driveways and building floor slabs, as well as within or adjacent to any slopes. Backfill should be placed in approximately 6 to 8 inch maximum loose lifts and then mechanically compacted with a hydro-hammer, rolling with a sheepsfoot, pneumatic tampers, or similar equipment. The utility trenches should be tested by the project geotechnical engineer or their representative to verify minimum compaction requirements are obtained.

In order to minimize the penetration of moisture below building slabs, all utility trenches should be backfilled with compacted fill, lean concrete or concrete slurry where they undercut the perimeter foundation. Utility trenches that are proposed parallel to any building footings (interior and/or exterior trenches), should not be located within a 1:1 (h:v) plane projected downward from the outside bottom edge of the footing.

SEISMIC DESIGN CONSIDERATIONS

Ground Motions

Structures are required to be designed and constructed to resist the effects of seismic ground motions as provided in the 2013 California Building Code Section 1613. The design is dependent on the site class, occupancy category I, II, III, or IV, mapped spectral accelerations for short periods (S_s), and mapped spectral acceleration for a 1-second period (S_1).

In order for structural design to comply with the 2013 CBC, the USGS "US Seismic Design Maps" online tool was used to compile spectral accelerations for the subject property based on data and maps jointly compiled by the United States Geological Survey (USGS) and the California Geological Survey (CGS). The data found in the following table is based on the Maximum Considered Earthquake (MCE) with 5% damped ground motions having a 2% probability of being exceeded in 50 years (2,475 year return period).

The seismic design coefficients were determined by a combination of the site class, mapped spectral accelerations, and occupancy category. The following seismic design coefficients should be implemented during design of the proposed structures. Summaries of the Seismic Hazard Deaggregation graphs and test data are presented in Appendix D.

2013 CBC	FACTOR
Site Location	Latitude: 33.654642° (North) Longitude: -117.178014°(West)
Site Class	D
Mapped Spectral Accelerations for short periods, S_S	1.500
Mapped Spectral Accelerations for 1-Second Period, S_1	0.609
Maximum Considered Earthquake Spectral Response Acceleration for Short Periods, S_{ms}	1.500
Maximum Considered Earthquake Spectral Response Acceleration for 1-Second Period, S_{m1}	0.913
Design Spectral Response Acceleration for Short Periods, S_{DS}	1.000
Design Spectral Response Acceleration for 1-Second Period, S_{D1}	0.609
Seismic Design Category	D
Importance Factor Based on Occupancy Category	II

We performed the probabilistic seismic hazard assessment for the site in accordance with the 2013 CBC, Section 1805.5.11 and 1803.5.12. The probabilistic seismic hazard maps and data files were jointly prepared by the United States Geological Survey (USGS) and the California Geological Survey (CGS) and can be found at the CGS Probabilistic Seismic Hazards Mapping Ground Motion Page. Actual ground shaking intensities at the site may be substantially higher or lower based on complex variables such as the near source directivity effects, depth and consistency of earth materials, topography, geologic structure, direction of fault rupture, and seismic wave reflection, refraction, and attenuation rates. The mean peak ground acceleration was calculated to be 0.561g.

Secondary Seismic Hazards

Secondary effects of seismic shaking considered as potential hazards include several types of ground failure as well as induced flooding. Different types of ground failure, which could occur as a consequence of severe ground shaking at the site, include landslides, ground lurching, shallow ground rupture, and liquefaction/lateral spreading. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, distance from faults, topography, the state of subsurface earth materials, groundwater conditions, and other factors. Based on our experience, subsurface exploration, and laboratory testing, all of the above secondary effects of seismic activity are considered unlikely.

Seismically induced flooding is normally a consequence of a tsunami (seismic sea wave), a seiche (i.e., a wave-like oscillation of surface water in an enclosed basin that may be initiated by a strong earthquake) or failure of a major reservoir or retention system up gradient of the site. Since the site is at an elevation of more than 1,000 feet above mean sea level and is located more than 20 miles inland from the nearest coastline of the Pacific Ocean, the potential for seismically induced flooding due to a tsunami is considered nonexistent. Since no enclosed bodies of water lie adjacent to or up gradient of the site, the likelihood for induced flooding due to a dam failure or a seiche overcoming the dams freeboard is considered nonexistent.

Liquefaction and Lateral Spreading

Liquefaction occurs as a result of a substantial loss of shear strength or shearing resistance in loose, saturated, cohesionless earth materials subjected to earthquake induced ground shaking. Potential impacts from liquefaction include loss of bearing capacity, liquefaction related settlement, lateral movements, and surface manifestation such as sand boils. Seismically induced settlement occurs when loose sandy soils become denser when subjected to shaking during an earthquake. The three factors determining whether a site is likely to be subject to liquefaction include seismic shaking, type and consistency of earth materials, and groundwater level. The proposed structures will be supported by compacted fill and competent bedrock. As such, the potential for earthquake induced liquefaction and lateral spreading beneath the proposed structures is considered very low to remote due to the recommended compacted fill, relatively low groundwater level, and the dense nature of the deeper onsite earth materials.

TENTATIVE FOUNDATION DESIGN RECOMMENDATIONS

General

Provided grading is performed in accordance with the recommendations of this report, shallow foundations are considered feasible for support of the proposed structures. Tentative foundation recommendations are provided herein and graphic presentations of relevant recommendations may also be included on the enclosed map.

Allowable Bearing Values

An allowable bearing value of 2,000 pounds per square foot (psf) is recommended for design of 24 inch square pad footings and 12 inch wide continuous footings founded at a minimum depth of 12 inches below the lowest adjacent final grade. This value may be increased by 20 percent for each additional 1-foot of width and/or depth to a maximum value of 3,000 psf. Recommended allowable bearing values include both dead and frequently applied live loads and may be increased by one third when designing for short duration wind or seismic forces.

Settlement

Based on the settlement characteristics of the earth materials that underlie the building sites and the anticipated loading, we estimate that the maximum total settlement of the footings will be less than approximately ¾ inch. Differential settlement is expected to be about ½ inch over a horizontal distance of approximately 20 feet, for an angular distortion ratio of 1:480. It is anticipated that the majority of the settlement will occur during construction or shortly after the initial application of loading.

The above settlement estimates are based on the assumption that the grading and construction are performed in accordance with the recommendations presented in this report and that the project geotechnical consultant will observe or test the earth material conditions in the footing excavations.

Lateral Resistance

Passive earth pressure of 250 psf per foot of depth to a maximum value of 2,500 psf may be used to establish lateral bearing resistance for footings. For areas coved with hardscape, passive earth pressure may be taken from the surface. For areas without hardscape, the first 3 feet of the soil profile must be neglected when calculating passive earth pressure. A coefficient of friction of 0.36 times the dead load forces may be used between concrete and the supporting earth materials to determine lateral sliding resistance. The above values may be increased by one-third when designing for short duration wind or seismic forces. When combining passive and friction for lateral resistance, the passive component should be reduced by one third. In no case shall the lateral sliding resistance exceed one-half the dead load for clay, sandy clay, sandy silty clay, silty clay, and clayey silt.

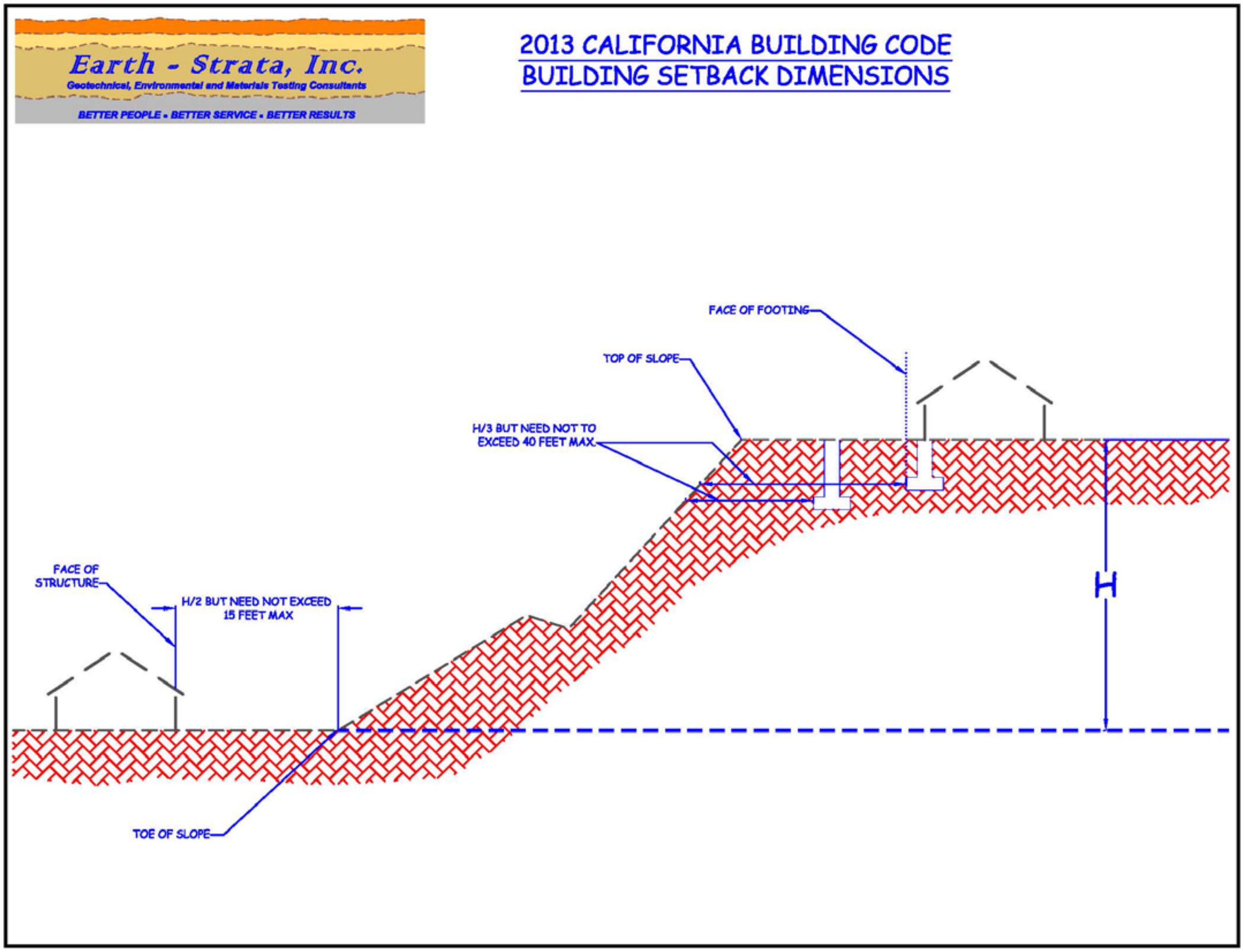
The above lateral resistance values are based on footings for an entire structure being placed directly against either compacted fill or competent bedrock.

Structural Setbacks and Building Clearance

Structural setbacks are required per the 2013 California Building Code (CBC). Additional structural setbacks are not required due to geologic or geotechnical conditions within the site. Improvements constructed in close proximity to natural or properly engineered and compacted slopes can, over time, be affected by natural processes including gravity forces, weathering, and long term secondary settlement. As a result, the CBC requires that buildings and structures be setback or footings deepened to resist the influence of these processes.

For structures that are planned near ascending and descending slopes, the footings should be embedded to satisfy the requirements presented in the CBC, Section 1808.7 as illustrated in the following Foundation Clearances From Slopes diagram.

FOUNDATION CLEARANCES FROM SLOPES



When determining the required clearance from ascending slopes with a retaining wall at the toe, the height of the slope shall be measured from the top of the wall to the top of the slope.

Foundation Observations

In accordance with the 2013 CBC and prior to the placement of forms, concrete, or steel, all foundation excavations should be observed by the geologist, engineer, or his representative to verify that they have been excavated into competent bearing materials. The excavations should be per the approved plans, moistened, cleaned of all loose materials, trimmed neat, level, and square. Any moisture softened earth materials should be removed prior to steel or concrete placement.

Earth materials from foundation excavations should not be placed in slab on grade areas unless the materials are tested for expansion potential and compacted to a minimum of 90 percent of the maximum dry density.

Expansive Soil Considerations

Preliminary laboratory test results indicate onsite earth materials exhibit an expansion potential of **VERY LOW to LOW** as classified in accordance with 2013 CBC Section 1803.5.3 and ASTM D4829-03. Additional, testing for expansive soil conditions should be conducted upon completion of rough grading. The following recommendations should be considered the very minimum requirements, for the earth materials tested. It is common practice for the project architect or structural engineer to require additional slab thickness, footing sizes, and/or reinforcement.

Very Low Expansion Potential (Expansion Index of 20 or Less)

Our laboratory test results indicate that the earth materials onsite exhibit a **VERY LOW** expansion potential as classified in accordance with 2013 CBC Section 1803.5.3 and ASTM D4829-03. Since the onsite earth materials exhibit expansion indices of 20 or less, the design of slab on ground foundations is exempt from the procedures outlined in Section 1808.6.1 or 1808.6.2.

Footings

- Exterior continuous footings may be founded at the minimum depths below the lowest adjacent final grade (i.e. 12 inch minimum depth for one-story, 18 inch minimum depth for two-story, and 24 inch minimum depth for three-story construction). Interior continuous footings for one-, two-, and three-story construction may be founded at a minimum depth of 12 inches below the lowest adjacent final grade. All continuous footings should have a minimum width of 12, 15, and 18 inches, for one-, two-, and three-story structures, respectively per Table 1809.7 of the 2013 CBC, and should be reinforced with a minimum of two (2) No. 4 bars, one (1) top and one (1) bottom.

- Exterior pad footings intended to support roof overhangs, such as second story decks, patio covers and similar construction should be a minimum of 24 inches square and founded at a minimum depth of 18 inches below the lowest adjacent final grade. No special reinforcement of the pad footings will be required.

Building Floor Slabs

- Building floor slabs should be a minimum of 4 inches thick and reinforced with a minimum of No. 3 bars spaced a maximum of 24 inches on center, each way. All floor slab reinforcement should be supported on concrete chairs or bricks to ensure the desired placement at mid-depth.

- Interior floor slabs, within living or moisture sensitive areas, should be underlain by a minimum 10-mil thick moisture/vapor barrier to help reduce the upward migration of moisture from the underlying earth materials. The moisture/vapor barrier used should meet the performance standards of an ASTM E 1745 Class A material, and be properly installed in accordance with ACI publication 318-05. It is the responsibility of the contractor to ensure that the moisture/vapor barriers are free of openings, rips, or punctures prior to placing concrete. As an option for additional moisture reduction, higher strength concrete, such as a minimum 28-day compressive strength of 5,000 pounds per square inch (psi) may be used.

Ultimately, the design of the moisture/vapor barrier system and recommendations for concrete placement and curing are the purview of the foundation engineer, taking into consideration the project requirements provided by the architect and owner.

- Garage floor slabs should be a minimum of 4 inches thick and should be reinforced in a similar manner as living area floor slabs. Garage floor slabs should be placed separately from adjacent wall footings with a positive separation maintained with ⅜ inch minimum felt expansion joint materials and quartered with weakened plane joints. A 12 inch wide turn down founded at the same depth as adjacent footings should be provided across garage entrances. The turn down should be reinforced with a minimum of two (2) No. 4 bars, one (1) top and one (1) bottom.

- The subgrade earth materials below all floor slabs should be pre-watered to promote uniform curing of the concrete and minimize the development of shrinkage cracks, prior to placing concrete. The pre-watering should be verified by Earth-Strata during construction.

Low Expansion Potential (Expansion Index of 21 to 50)

Our laboratory test results indicate that the earth materials onsite exhibit a **LOW** expansion potential as classified in accordance with 2013 CBC Section 1803.5.3 and ASTM D4829-03. Accordingly, the CBC specifies that slab on ground foundations (floor slabs) resting on earth materials with expansion indices greater than 20, require special design considerations in accordance with 2013 CBC Sections 1808.6.1 and 1808.6.2. The design procedures are based on the thickness and plasticity index of the various earth materials within the upper 15 feet of the proposed structure. For preliminary design purposes, we have assumed an effective plasticity index of 12.

Footings

- Exterior continuous footings may be founded at the minimum depths below the lowest adjacent final grade (i.e. 12 inch minimum depth for one-story, 18 inch minimum depth for two-story, and 24 inch minimum depth for three-story construction). Interior continuous footings for one-, two-, and three-story construction may be founded at a minimum depth of 12 inches below the lowest adjacent final grade. All continuous footings should have a minimum width of 12, 15, and 18 inches, for one-, two-, and three-story structures, respectively, and should be reinforced with a minimum of two (2) No. 4 bars, one (1) top and one (1) bottom.

- Exterior pad footings intended to support roof overhangs, such as second story decks, patio covers and similar construction should be a minimum of 24 inches square and founded at a minimum depth of 18 inches below the lowest adjacent final grade. The pad footings should be reinforced with a minimum of No. 4 bars spaced a maximum of 18 inches on center, each way, and should be placed near the bottom-third of the footings.

Building Floor Slabs

- The project architect or structural engineer should evaluate minimum floor slab thickness and reinforcement in accordance with 2013 CBC Section 1808.6.2 based on an assumed effective plasticity index of 12. Building floor slabs should be a minimum of 4 inches thick and reinforced with a minimum of No. 3 bars spaced a maximum of 18 inches on center, each way.

All floor slab reinforcement should be supported on concrete chairs or bricks to ensure the desired placement at mid-depth.

- Interior floor slabs, within living or moisture sensitive areas, should be underlain by a minimum 10-mil thick moisture/vapor barrier to help reduce the upward migration of moisture from the underlying earth materials. The moisture/vapor barrier used should meet the performance standards of an ASTM E 1745 Class A material, and be properly installed in accordance with ACI publication 318-05. It is the responsibility of the contractor to ensure that the moisture/vapor barriers are free of openings, rips, or punctures prior to placing concrete. As an option for additional moisture reduction, higher strength concrete, such as a minimum 28-day compressive strength of 5,000 pounds per square inch (psi) may be used. Ultimately, the design of the moisture/vapor barrier system and recommendations for concrete placement and curing are the purview of the foundation engineer, taking into consideration the project requirements provided by the architect and owner.

- Garage floor slabs should be a minimum of 4 inches thick and should be reinforced in a similar manner as living area floor slabs. Garage floor slabs should be placed separately from adjacent wall footings with a positive separation maintained with ⅜ inch minimum felt expansion joint materials and quartered with weakened plane joints. A 12 inch wide turn down founded at the same depth as adjacent footings should be provided across garage entrances. The turn down should be reinforced with a minimum of two (2) No. 4 bars, one (1) top and one (1) bottom.

- The subgrade earth materials below all floor slabs should be pre-watered to achieve a moisture content that is at least equal or slightly greater than optimum moisture content, prior to placing concrete. This moisture content should penetrate a minimum depth of 12 inches into the subgrade earth materials. The pre-watering should be verified by Earth-Strata during construction.

Post Tensioned Slab/Foundation Design Recommendations

In lieu of the proceeding foundation recommendations, post tensioned slabs may be used to support the proposed structures. We recommend that the foundation engineer design the foundation system using the Preliminary Post Tensioned Foundation Slab Design table below. These parameters have been provided in general accordance with Post Tensioned Design. Alternate designs addressing the effects of expansive earth materials are allowed per 2013 CBC Section 1808.6.2. When utilizing these parameters, the foundation engineer should design the foundation system in accordance with the allowable deflection criteria of applicable codes and per the requirements of the structural engineer/architect.

It should be noted that the post tensioned design methodology is partially based on the assumption that soil moisture changes around and underneath post tensioned slabs, are influenced only by climate conditions. Soil moisture change below slabs is the major factor in foundation damages relating to expansive soil. However, the design methodology has no consideration for presaturation, owner irrigation, or other non-climate related influences on the moisture content of subgrade earth materials. In recognition of these factors, we modified the geotechnical parameters determined from this methodology to account for reasonable irrigation practices and proper homeowner maintenance. Additionally, we recommend that prior to excavating footings, slab subgrades be presoaked to a depth of 12 inches and maintained at above optimum moisture until placing concrete. Furthermore, we recommend that the moisture content of the earth materials around the immediate perimeter and below the slab be presaturated to at least 1% above optimum moisture content just prior to placing concrete. The pre-watering should be verified and tested by Earth-Strata during construction.

The following geotechnical parameters assume that areas adjacent to the foundations, which are planted and irrigated, will be designed with proper drainage to prevent water from ponding. Water ponding near the foundation causes significant moisture change below the foundation. Our recommendations do not account for excessive irrigation and/or incorrect landscape design. Planters placed adjacent to the foundation, should be designed with an effective drainage system or liners, to prevent moisture infiltration below the foundation. Some lifting of the perimeter foundation beam should be expected even with properly constructed planters. Based on our experience monitoring sites with similar earth materials, elevated moisture contents below the foundation perimeter due to incorrect landscaping irrigation or maintenance, can result in uplift at the perimeter foundation relative to the central portion of the slab.

Future owners should be informed and educated of the importance in maintaining a consistent level of moisture within the earth materials around the structures. Future owners should also be informed of the potential negative consequences of either excessive watering, or allowing expansive earth materials to become too dry. Earth materials will shrink as they dry, followed by swelling during the rainy winter season, or when irrigation is resumed. This will cause distress to site improvements and structures.

Preliminary Post Tensioned Foundation Slab Design

PARAMETER	VALUE	
Expansion Index	Very Low[1]	Low[1]
Percent Finer than 0.002 mm in the Fraction Passing the No. 200 Sieve	< 20 percent (assumed)	< 20 percent (assumed)
Type of Clay Mineral	Montmorillonite (assumed)	Montmorillonite (assumed)
Thornthwaite Moisture Index	+20	+20
Depth to Constant Soil Suction	7 feet	7 feet
Constant Soil Suction	P.F. 3.6	P.F. 3.6
Moisture Velocity	0.7 inches/month	0.7 inches/month
Center Lift — Edge moisture variation distance, e_m Center lift, y_m	5.5 feet 1.5 inches	5.5 feet 2.0 inches
Edge Lift — Edge moisture variation distance, e_m Edge lift, y_m	2.5 feet 0.4 inches	3.0 feet 0.8 inches
Soluble Sulfate Content for Design of Concrete Mixtures in Contact with Earth Materials	Negligible	Negligible
Modulus of Subgrade Reaction, k (assuming presaturation as indicated below)	200 pci	200 pci
Minimum Perimeter Foundation Embedment	12	18
Perimeter Foundation Reinforcement	--	--
Under Slab Moisture/Vapor Barrier and Sand Layer	10-mil thick moisture/vapor barrier meeting the requirements of a ASTM E 1745 Class A material	

1. Obtained by laboratory testing.
2. Recommendations for foundation reinforcement are ultimately the purview of the foundation/structural engineer based upon the geotechnical criteria presented in this report, and structural engineering considerations.

Corrosivity

Corrosion is defined by the National Association of Corrosion Engineers (NACE) as "a deterioration of a substance or its properties because of a reaction with its environment." From a geotechnical viewpoint, the "substances" are the reinforced concrete foundations or buried metallic elements (not surrounded by concrete) and the "environment" is the prevailing earth materials in contact with them. Many factors can contribute to corrosivity, including the presence of chlorides, sulfates, salts, organic materials, different oxygen levels, poor drainage, different soil types, and moisture content. It is not considered practical or realistic to test for all of the factors which may contribute to corrosivity.

The potential for concrete exposure to chlorides is based upon the recognized Caltrans reference standard "Bridge Design Specifications", under Subsection 8.22.1 of that document, Caltrans has determined that "Corrosive water or soil contains more than 500 parts per million (ppm) of chlorides". Based on limited preliminary laboratory testing, the onsite earth materials have chloride contents *less* than 500 ppm. As such, specific requirements resulting from elevated chloride contents are not required.

Specific guidelines for concrete mix design are provided in 2013 CBC Section 1904.1 and ACI 318, Section 4.3 Table 4.3.1 when the soluble sulfate content of earth materials exceeds 0.1 percent by weight. Based on limited preliminary laboratory testing, the onsite earth materials are classified in accordance with Table 4.3.1 as having a *negligible* sulfate exposure condition. Therefore, structural concrete in contact with onsite earth materials should utilize Type I or II.

Based on our laboratory testing of resistivity, the onsite earth materials in contact with buried steel should be considered *moderately corrosive*. Additionally, pH values below 9.7 are recognized as being corrosive to most common metallic components including, copper, steel, iron, and aluminum. The pH values for the earth materials tested were *lower* than 9.7. Therefore, any steel or metallic materials that are exposed to the earth materials should be encased in concrete or other measures should be taken to provide corrosion protection.

If building slabs are to be post tensioned, the post tensioning cables should be encased in concrete and/or encapsulated in accordance with the Post Tensioning Institute Guide Specifications. Post tensioning cable end plate anchors and nuts also need to be protected if exposed. If the anchor plates and nuts are in a recess in the edge of the concrete slab, the recess should be filled in with a non-shrink, non-porous, moisture-insensitive epoxy grout so that the anchorage assembly and the end of the cable are completely encased and isolated from the soil. A standard non-shrink, non-metallic cementitious grout may be used only when the post tension anchoring assembly is polyethylene encapsulated similar to that offered by Hayes Industries, LTD or O'Strand, Inc.

The preliminary test results for corrosivity are based on limited samples, and the initiation of grading may blend various earth materials together. This blending or imported material could alter and increase the detrimental properties of the onsite earth materials. Accordingly, additional testing for chlorides and sulfates along with testing for pH and resistivity should be performed upon completion of grading. Laboratory test results are presented in Appendix C.

RETAINING WALLS

Active and At-Rest Earth Pressures

Foundations may be designed in accordance with the recommendations provided in the Tentative Foundation Design Recommendation section of this report. The following table provides the minimum recommended equivalent fluid pressures for design of retaining walls a maximum of 8 feet high. The active earth pressure should be used for design of unrestrained retaining walls, which are free to tilt slightly. The at-rest earth pressure should be used for design of retaining walls that are restrained at the top, such as basement walls, curved walls with no joints, or walls restrained at corners. For curved walls, active pressure may be used if tilting is acceptable and construction joints are provided at each angle point and at a minimum of 15 foot intervals along the curved segments.

MINIMUM STATIC EQUIVALENT FLUID PRESSURES (pcf)		
PRESSURE TYPE	BACKSLOPE CONDITION	
	LEVEL	2:1 (h:v)
Active Earth Pressure	40	63
At-Rest Earth Pressure	60	95

The retaining wall parameters provided do not account for hydrostatic pressure behind the retaining walls. Therefore, the subdrain system is a very important part of the design. All retaining walls should be designed to resist surcharge loads imposed by other nearby walls, structures, or vehicles should be added to the above earth pressures, if the additional loads are being applied within a 1.5:1 (h:v) plane projected up from the heel of the retaining wall footing. As a way of minimizing surcharge loads and the settlement potential of nearby buildings, the footings for the building can be deepened below the 1.5:1 (h:v)plane projected up from the heel of the retaining wall footing.

Upon request and under a separate scope of work, more detailed analyses can be performed to address equivalent fluid pressures with regard to stepped retaining walls, actual retaining wall heights, actual backfill inclinations, specific backfill materials, higher retaining walls requiring earthquake design motions, etc.

Subdrain System

We recommend a perforated pipe and gravel subdrain system be provided behind all proposed retaining walls to prevent the buildup of hydrostatic pressure behind the proposed retaining walls. The perforated pipe should consist of 4 inch minimum diameter Schedule 40 PVC or ABS SDR-35, placed with the perforations facing down. The pipe should be surrounded by 1 cubic foot per foot of ¾- or 1½ inch open graded gravel wrapped in filter fabric. The filter fabric should consist of Mirafi 140N or equivalent to prevent infiltration of fines and subsequent clogging of the subdrain system.

In lieu of a perforated pipe and gravel subdrain system, weep holes or open vertical masonry joints may be provided in the lowest row of block exposed to the air to prevent the buildup of hydrostatic pressure behind the proposed retaining walls. Weep holes should be a minimum of 3 inches in diameter and provided at intervals of at least every 6 feet along the wall. Open vertical masonry joints should be provided at a minimum of 32 inch intervals. A continuous gravel fill, a minimum of 1 cubic foot per foot, should be placed behind the weep holes or open masonry joints. The gravel should be wrapped in filter fabric consisting of Mirafi 140N or equivalent.

The retaining walls should be adequately coated on the backfilled side of the walls with a proven waterproofing compound by an experienced professional to inhibit infiltration of moisture through the walls.

Temporary Excavations

All excavations should be made in accordance with Cal-OSHA requirements. Earth-Strata is not responsible for job site safety.

Retaining Wall Backfill

Retaining wall backfill materials should be approved by the geotechnical engineer or his representative prior to placement as compacted fill. Retaining wall backfill should be placed in lifts no greater than 6 to 8 inches, watered or air dried as necessary to achieve near optimum moisture contents. All retaining wall backfill should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D 1557. Retaining wall backfill should be capped with a paved surface drain.

CONCRETE FLATWORK

Thickness and Joint Spacing

Concrete sidewalks and patio type slabs should be at least 3½ inches thick and provided with construction or expansion joints every 6 feet or less, to reduce the potential for excessive cracking. Concrete driveway slabs should be at least 4 inches thick and provided with construction or expansion joints every 10 feet or less.

Subgrade Preparation

In order to reduce the potential for unsightly cracking, subgrade earth materials underlying concrete flatwork should be compacted at near optimum moisture to a minimum of 90 percent of the maximum dry density determined by ASTM test method D 1557-00 and then moistened to at least optimum or slightly above optimum moisture content. This moisture should extend to a depth of at least 12 inches below subgrade and be maintained prior to placement of concrete. Pre-watering of the earth materials prior to placing concrete will promote uniform curing of the concrete and minimize the development of shrinkage cracks. The project geotechnical engineer or his representative should verify the density and moisture content of the earth materials and the depth of moisture penetration prior to placing concrete.

Cracking within concrete flatwork is often a result of factors such as the use of too high a water to cement ratio and/or inadequate steps taken to prevent moisture loss during the curing of the concrete. Concrete distress can be reduced by proper concrete mix design and proper placement and curing of the concrete. Minor cracking within concrete flatwork is normal and should be expected.

GRADING PLAN REVIEW AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **SHERMAN & GARBANI, LLC** and their authorized representative. It likely does not contain sufficient information for other parties or other uses. Earth Strata should be engaged to review the final design plans and specifications prior to construction. This is to verify that the recommendations contained in this report have been properly incorporated into the project plans and specifications. Should Earth Strata not be accorded the opportunity to review the project plans and specifications, we are not responsibility for misinterpretation of our recommendations.

We recommend that Earth Strata be retained to provide geologic and geotechnical engineering services during grading and foundation excavation phases of the work. In order to allow for design changes in the event that the subsurface conditions differ from those anticipated prior to construction.

Earth Strata should review any changes in the project and modify and approve in writing the conclusions and recommendations of this report. This report and the drawings contained within are intended for design input purposes only and are not intended to act as construction drawings or specifications. In the event that conditions encountered during grading or construction operations appear to be different than those indicated in this report, this office should be notified immediately, as revisions may be required.

REPORT LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists, practicing at the time and location this report was prepared. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Earth materials vary in type, strength, and other geotechnical properties between points of observation and exploration. Groundwater and moisture conditions can also vary due to natural processes or the works of man on this or adjacent properties. As a result, we do not and cannot have complete knowledge of the subsurface conditions beneath the subject property. No practical study can completely eliminate uncertainty with regard to the anticipated geotechnical conditions in connection with a subject property. The conclusions and recommendations within this report are based upon the findings at the points of observation and are subject to confirmation by Earth Strata based on the conditions revealed during grading and construction.

This report was prepared with the understanding that it is the responsibility of the owner or their representative, to ensure that the conclusions and recommendations contained herein are brought to the attention of the other project consultants and are incorporated into the plans and specifications. The owners' contractor should properly implement the conclusions and recommendations during grading and construction, and notify the owner if they consider any of the recommendations presented herein to be unsafe or unsuitable.

APPENDIX A

REFERENCES

APPENDIX A

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APPENDIX B

EXPLORATORY LOGS

Geotechnical Boring Log B-1

Date: December 28, 2015	**Project Name: Rancho Bonito Town Homes** **Page: 1 of 1**
Project Number: 151015-10A	**Logged By: TJ**
Drilling Company: Drilling It	**Type of Rig: CME45B**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Very Old Alluvial Channel Deposits (Qvoa):**
					SM	Silty SAND; dark brown, moist, medium dense, coarse to fine sand
	107/9"	2.5'	129.7	5.9		**Cretaceous Monzogranitic Rock (Kpvg):**
						MONZOGRANITE; reddish brown, slightly moist, very hard, fine to coarse grained
5	70/5"	5'	114.0	5.2		
						Practical refusal at 6½ Feet
						End of Boring 6½ Feet
						No Groundwater
10						
15						
20						
25						
30						

Geotechnical Boring Log B-2

Date: December 28, 2015	**Project Name: Rancho Bonito Town Homes** **Page: 1 of 1**
Project Number: 151015-10A	**Logged By: TJ**
Drilling Company: Drilling It	**Type of Rig: CME45B**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Very Old Alluvial Channel Deposits (Qvoa):**
					SM	Silty SAND; dark brown, moist, medium dense, medium to fine sand
						Some clay, loose below 3 feet
	28	2.5'	127.0	9.0		
						Cretaceous Monzogranitic Rock (Kpvg):
5	70/5"	5'	114.0	5.2		MONZOGRANITE; yellowish brown, slightly moist, very hard, fine to coarse grained
						Practical refusal at 6 feet
						End of Boring 6 Feet
						No Groundwater
10						
15						
20						
25						
30						

Geotechnical Boring Log B-3

Date: December 28, 2015	**Project Name: Rancho Bonito Town Homes** **Page: 1 of 1**
Project Number: 151015-10A	**Logged By: TJ**
Drilling Company: Drilling It	**Type of Rig: CME45B**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Very Old Alluvial Channel Deposits (Qvoa):**
					SM	Silty SAND; medium brown, moist, dense, trace clay
	96/8"	2.5	117.6	9.4		
						Cretaceous Monzogranitic Rock (Kpvg):
						MONZOGRANITE; yellowish brown, slightly moist, very hard, fine to coarse grained
5	102/8.5"	5	106.1	10.1		
						Practical refusal at 6½ Feet
						End of Boring 6½ Feet
10						
15						
20						
25						
30						

42217 Rio Nedo Road, Suite A-104, Temecula, CA 92590

Geotechnical Boring Log B-4

Date: December 28, 2015	**Project Name: Rancho Bonito Town Homes** **Page: 1 of 1**
Project Number: 151015-10A	**Logged By: TJ**
Drilling Company: Drilling It	**Type of Rig: CME45B**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Very Old Alluvial Channel Deposits (Qvoa):**
					SM	Silty SAND; light yellowish brown, moist, very dense
	128/9"	2.5'	103.3	3.7		
						Cretaceous Monzogranitic Rock (Kpvg):
						MONZOGRANITE; reddish brown, slightly moist, very hard, fine to coarse grained
5	97/8"	5'	111.3	7.2		
						Practical refusal at 6½ Feet
						End of Boring 6½ Feet
						No Groundwater
10						
15						
20						
25						
30						

Geotechnical Boring Log B-5

Date: December 28, 2015	**Project Name: Rancho Bonito Town Homes** **Page: 1 of 1**
Project Number: 151015-10A	**Logged By: TJ**
Drilling Company: Drilling It	**Type of Rig: CME45B**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Very Old Alluvial Channel Deposits (Qvoa):**
					SM	Silty SAND; reddish brown, moist, very dense, with gravel
	106/8"	2.5'	118.9	4.8		
						Cretaceous Monzogranitic Rock (Kpvg):
						MONZOGRANITE; yellowish brown, slightly moist, very hard, fine to coarse grained
5	70/5"	5'	107.0	5.2		
						End of Boring 6½ Feet
						No Groundwater
10						
15						
20						
25						
30						

42217 Rio Nedo Road, Suite A-104, Temecula, CA 92590

Geotechnical Boring Log B-6

Date: December 28, 2015	**Project Name: Rancho Bonito Town Homes** **Page: 1 of 1**
Project Number: 151015-10A	**Logged By: TJ**
Drilling Company: Drilling It	**Type of Rig: CME45B**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Very Old Alluvial Channel Deposits (Qvoa):**
					SM	Silty SAND; medium brown, moist, very dense, trace clay
	138/9"	2.5'	127.2	5.1		**Cretaceous Gabbro (Kgb):**
						GABBRO; olive gray, moist, hard, fine to medium grained
5	56	5'	120.3	6.0		
	70/5"	7.5'	113.7	4.0		
						End of Boring 9 Feet
10						No Groundwater
15						
20						
25						
30						

Geotechnical Boring Log B-7

Date: December 28, 2015	**Project Name: Rancho Bonito Town Homes** **Page: 1 of 1**
Project Number: 151015-10A	**Logged By: TJ**
Drilling Company: Drilling It	**Type of Rig: CME45B**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Very Old Alluvial Channel Deposits (Qvoa):**
					SM	Silty SAND; reddish brown, moist, very dense, with clay
	70/4"	2.5'	111.1	5.1		**Cretaceous Gabbro (Kgb):**
						GABBRO; olive gray, moist, hard, fine to medium grained
						Grayish brown below 5 feet
5	70/5"	5'	103.8	10.5		
						End of Boring at 6½ Feet
						No Groundwater
10						
15						
20						
25						
30						

Geotechnical Boring Log B-8

Date: December 28, 2015	**Project Name: Rancho Bonito Town Homes** **Page: 1 of 1**
Project Number: 151015-10A	**Logged By: TJ**
Drilling Company: Drilling It	**Type of Rig: CME45B**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Very Old Alluvial Channel Deposits (Qvoa):**
					SC	Clayey SAND; reddish brown, moist, dense
	95/10"	2.5'	116.4	8.0		
						Cretaceous Gabbro (Kgb):
						GABBRO; olive gray, moist, hard, fine to medium grained
5	70/5"	5'	102.6	6.0		Very hard below 5 feet
						End of Boring 6½ Feet
						No Groundwater
10						
15						
20						
25						
30						

APPENDIX C

LABORATORY PROCEDURES AND TEST RESULTS

APPENDIX C

Laboratory Procedures and Test Results

Laboratory testing provided quantitative and qualitative data involving the relevant engineering properties of the representative earth materials selected for testing. The representative samples were tested in general accordance with American Society for Testing and Materials (ASTM) procedures and/or California Test Methods (CTM).

Soil Classification: Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions were reconciled to reflect laboratory test results with regard to ASTM D 2487.

Moisture and Density Tests: For select samples moisture content was determined using the guidelines of ASTM D 2216 and dry density determinations were made using the guidelines of ASTM D 2937. These tests were performed on relatively undisturbed samples and the test results are presented on the exploratory logs.

Maximum Density Tests: The maximum dry density and optimum moisture content of representative samples were determined using the guidelines of ASTM D1557. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
B-1 @ 0-3 feet	Silty SAND	128.0	7.5

Expansion Index: The expansion potential of representative samples was evaluated using the guidelines of ASTM D4829. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	EXPANSION INDEX	EXPANSION POTENTIAL
B-1 @ 0-3 feet	Silty SAND	8	Very Low
B-8 @ 0 to 2.5 feet	Clayey SAND	30	Low

Minimum Resistivity and pH Tests: Minimum resistivity and pH Tests of select samples were performed using the guidelines of CTM 643. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	pH	MINIMUM RESISTIVITY (ohm-cm)
B-1 @ 0-3 feet	Silty SAND	6.9	1,900
B-8 @ 0-2.5 feet	Clayey SAND	7.2	1,600

Soluble Sulfate: The soluble sulfate content of select samples was determined using the guidelines of CTM 417. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	SULFATE CONTENT (% by weight)	SULFATE EXPOSURE
B-1 @ 0-3 feet	Silty SAND	0.001	Negligible
B-8 @ 0 to 2.5 feet	Clayey SAND	Non-Detectable	Negligible

Chloride Content: Chloride content of select samples was determined using the guidelines of CTM 422. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	CHLORIDE CONTENT (ppm)
B-1 @ 0-3 feet	Silty SAND	20
B-8 @ 0 to 2.5 feet	Clayey SAND	30

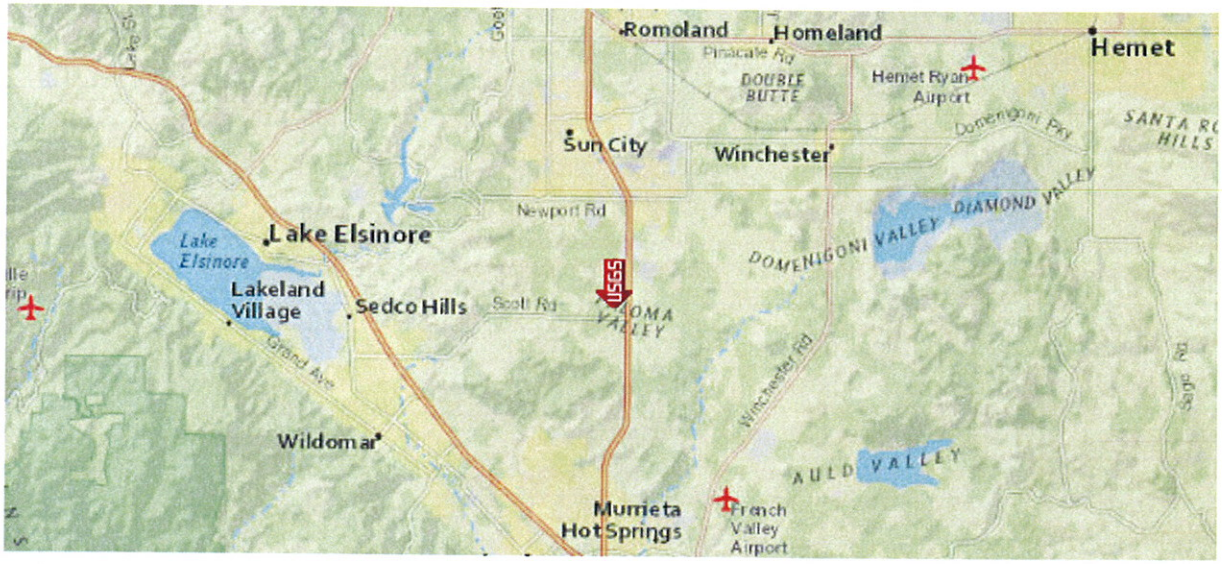
APPENDIX D

SEISMICITY

USGS Design Maps Summary Report

User–Specified Input

Report Title	MenifeeOnSherman Fri January 1, 2016 00:03:17 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	33.65464°N, 117.17801°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

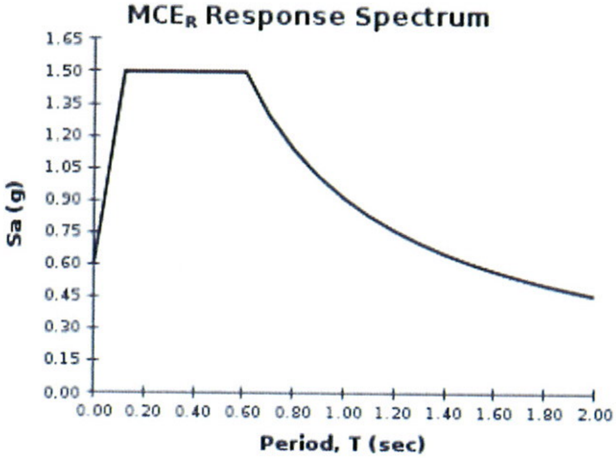


USGS–Provided Output

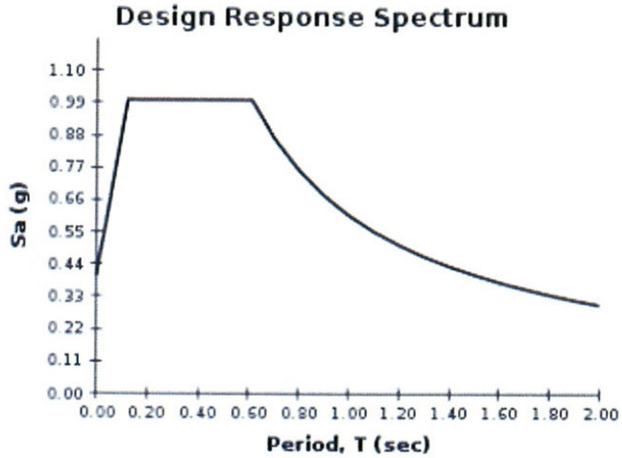
S_S = 1.500 g	S_{MS} = 1.500 g	S_{DS} = 1.000 g
S_1 = 0.609 g	S_{M1} = 0.913 g	S_{D1} = 0.609 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum



For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (33.65464°N, 117.17801°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] $S_S = 1.500$ g

From Figure 22-2 [2] $S_1 = 0.609$ g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index $PI > 20$, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\bar{s}_u < 500$ psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = D and S_S = 1.500 g, F_a = 1.000

Table 11.4-2: Site Coefficient F_V

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.609 g, F_v = 1.500

Equation (11.4-1): $S_{MS} = F_aS_S = 1.000 \times 1.500 = 1.500$ g

Equation (11.4-2): $S_{M1} = F_vS_1 = 1.500 \times 0.609 = 0.913$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

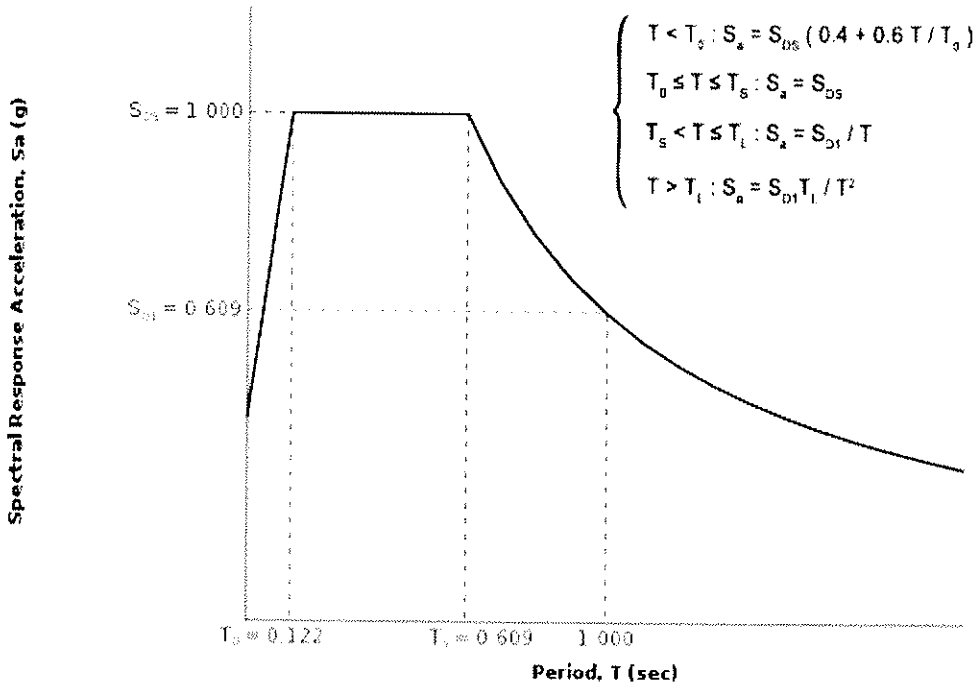
Equation (11.4-3): $S_{DS} = ⅔ S_{MS} = ⅔ \times 1.500 = 1.000$ g

Equation (11.4-4): $S_{D1} = ⅔ S_{M1} = ⅔ \times 0.913 = 0.609$ g

Section 11.4.5 — Design Response Spectrum

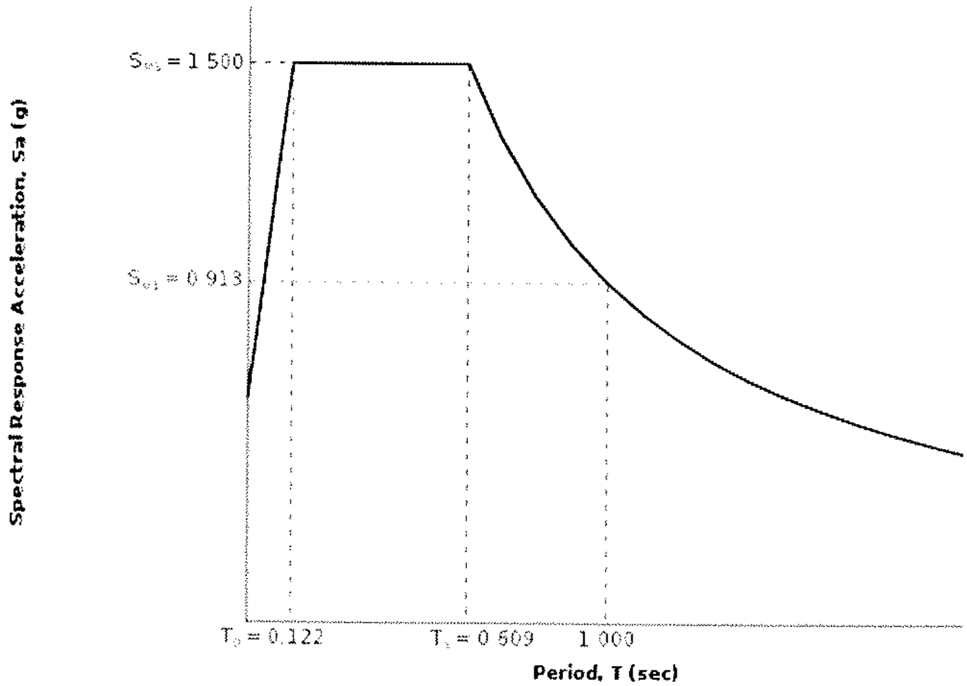
From Figure 22-12 [3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.561

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.561 = 0.561$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.561 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 1.016

From Figure 22-18 [6] C_{R1} = 1.007

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 1.000 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.609 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

*** Deaggregation of Seismic Hazard at One Period of Spectral Accel. ***
*** Data from U.S.G.S. National Seismic Hazards Mapping Project, 2008 version ***
PSHA Deaggregation. % Contributions. Site: MenifeeOnSherma long: 117.178 d W., lat: 33.655 N.
Input Vs30 (m/s) = 760.0 (some WUS atten. models use Site Class not Vs30).
NSHMP 2007-08 update. See USGS OFR 2008-1128. Analysis on DaMoYr:01/01/2016
Mean Return Period: 2475 years. 0.20 s. PSA =1.5908 g. Weight * Computed_Rate_Ex 0.404E-03
#Pr[at least one eq with median motion>=PSA in 50 yrs]=0.00000
#This deaggregation corresponds to Mean Hazard w/all GMPEs

DIST(km)	MAG(Mw)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
8.3	5.05	0.705	0.681	0.024	0.000	0.000	0.000	0.000
8.4	5.20	1.752	1.522	0.230	0.000	0.000	0.000	0.000
8.5	5.40	2.176	1.667	0.509	0.000	0.000	0.000	0.000
13.8	5.41	0.093	0.093	0.000	0.000	0.000	0.000	0.000
8.5	5.60	2.388	1.524	0.864	0.000	0.000	0.000	0.000
14.3	5.60	0.174	0.174	0.000	0.000	0.000	0.000	0.000
8.6	5.80	2.364	1.230	1.134	0.000	0.000	0.000	0.000
14.9	5.80	0.254	0.254	0.000	0.000	0.000	0.000	0.000
7.7	6.01	3.248	1.221	1.995	0.032	0.000	0.000	0.000
15.5	6.01	0.421	0.421	0.000	0.000	0.000	0.000	0.000
7.2	6.20	4.374	1.094	3.083	0.198	0.000	0.000	0.000
15.0	6.20	0.862	0.809	0.052	0.000	0.000	0.000	0.000
7.3	6.40	4.569	0.883	3.154	0.532	0.000	0.000	0.000
14.2	6.40	1.317	1.021	0.297	0.000	0.000	0.000	0.000
23.4	6.41	0.120	0.120	0.000	0.000	0.000	0.000	0.000
8.8	6.61	8.656	3.622	4.645	0.390	0.000	0.000	0.000
12.4	6.60	0.471	0.269	0.202	0.000	0.000	0.000	0.000
23.4	6.61	0.054	0.054	0.000	0.000	0.000	0.000	0.000
9.1	6.77	11.743	4.743	6.628	0.372	0.000	0.000	0.000
12.2	6.80	0.569	0.262	0.307	0.000	0.000	0.000	0.000
24.4	6.80	0.105	0.105	0.000	0.000	0.000	0.000	0.000
9.4	6.96	12.240	4.455	7.434	0.351	0.000	0.000	0.000
12.3	6.96	0.292	0.126	0.165	0.001	0.000	0.000	0.000
26.0	6.97	0.259	0.259	0.000	0.000	0.000	0.000	0.000
9.7	7.16	7.457	2.112	4.778	0.567	0.000	0.000	0.000
11.9	7.20	0.081	0.034	0.045	0.003	0.000	0.000	0.000
25.5	7.22	0.790	0.790	0.000	0.000	0.000	0.000	0.000
9.7	7.36	6.228	1.581	3.973	0.674	0.000	0.000	0.000
12.3	7.41	0.058	0.023	0.032	0.003	0.000	0.000	0.000
23.5	7.39	2.150	1.989	0.161	0.000	0.000	0.000	0.000
9.7	7.58	8.437	1.793	5.366	1.278	0.000	0.000	0.000
23.5	7.59	5.513	4.594	0.919	0.000	0.000	0.000	0.000
9.7	7.76	7.895	1.649	5.046	1.201	0.000	0.000	0.000
24.4	7.83	1.558	1.212	0.346	0.000	0.000	0.000	0.000
47.4	7.79	0.054	0.054	0.000	0.000	0.000	0.000	0.000
9.7	7.99	0.118	0.021	0.077	0.021	0.000	0.000	0.000
24.4	7.99	0.179	0.129	0.051	0.000	0.000	0.000	0.000
47.4	8.16	0.054	0.054	0.000	0.000	0.000	0.000	0.000

Summary statistics for above 0.2s PSA deaggregation, R=distance, e=epsilon:
Contribution from this GMPE(%): 100.0
Mean src-site R= 10.9 km; M= 6.87; eps0= 1.43. Mean calculated for all sources.
Modal src-site R= 9.4 km; M= 6.96; eps0= 1.42 from peak (R,M) bin
MODE R*= 9.5km; M*= 6.96; EPS.INTERVAL: 1 to 2 sigma % CONTRIB.= 7.434

Principal sources (faults, subduction, random seismicity having > 3% contribution)

Source Category:	% contr.	R(km)	M	epsilon0 (mean values).
California A-faults	71.30	11.8	7.20	1.44
CA Compr. crustal gridded	28.70	8.7	6.05	1.40

Individual fault hazard details if its contribution to mean hazard > 2%:

Fault ID	% contr.	Rcd(km)	M	epsilon0	Site-to-src azimuth(d)
Elsinore; Glen Ivy aPriori	15.95	9.5	6.80	1.52	-109.4
Elsinore;T aPriori	4.36	9.8	7.00	1.41	-140.5
Elsinore;GI+T aPriori	8.01	9.8	7.25	1.24	-140.5
Elsinore;T+J+CM aPriori	3.06	9.7	7.64	1.07	-140.4
Elsinore;GI+T+J+CM aPriori	3.19	9.7	7.72	1.05	-140.4
San Jacinto;A+C aPriori	3.49	22.8	7.50	2.07	46.4

Elsinore;GI MoBal	9.61	9.5	6.77	1.53	-109.4
Elsinore;T+J+CM MoBal	3.04	9.7	7.64	1.07	-140.4
Elsinore aflt, unsegmented	4.23	9.9	7.43	1.17	-141.0

#*********End of deaggregation corresponding to Mean Hazard w/all GMPEs *********#

PSHA Deaggregation. % Contributions. Site: MenifeeOnSherma long: 117.178 d W., lat: 33.655 N.
Input Vs30 (m/s) = 760.0 (some WUS atten. models use Site Class not Vs30).
NSHMP 2007-08 update. See USGS OFR 2008-1128. Analysis on DaMoYr:01/01/2016
Mean Return Period: 2475 years. 0.20 s. PSA =1.5908 g. Weight * Computed_Rate_Ex 0.833E-04
#Pr[at least one eq with median motion>=PSA in 50 yrs]=0.00000
#This deaggregation corresponds to Boore-Atkinson 2008

DIST(km)	MAG(Mw)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
8.0	5.41	0.026	0.026	0.000	0.000	0.000	0.000	0.000
8.2	5.61	0.066	0.066	0.000	0.000	0.000	0.000	0.000
8.3	5.81	0.122	0.122	0.000	0.000	0.000	0.000	0.000
7.3	6.02	0.315	0.304	0.011	0.000	0.000	0.000	0.000
6.9	6.20	0.560	0.509	0.051	0.000	0.000	0.000	0.000
14.8	6.21	0.052	0.052	0.000	0.000	0.000	0.000	0.000
7.1	6.40	0.678	0.524	0.154	0.000	0.000	0.000	0.000
14.2	6.41	0.128	0.128	0.000	0.000	0.000	0.000	0.000
23.5	6.42	0.011	0.011	0.000	0.000	0.000	0.000	0.000
8.7	6.58	1.247	0.885	0.362	0.000	0.000	0.000	0.000
12.5	6.61	0.071	0.069	0.002	0.000	0.000	0.000	0.000
24.4	6.64	0.016	0.016	0.000	0.000	0.000	0.000	0.000
9.3	6.76	3.519	1.897	1.622	0.000	0.000	0.000	0.000
12.4	6.80	0.103	0.098	0.006	0.000	0.000	0.000	0.000
25.2	6.79	0.052	0.052	0.000	0.000	0.000	0.000	0.000
9.5	6.96	3.079	1.449	1.624	0.006	0.000	0.000	0.000
12.4	6.97	0.053	0.045	0.008	0.000	0.000	0.000	0.000
26.2	6.97	0.144	0.144	0.000	0.000	0.000	0.000	0.000
9.7	7.16	1.943	0.675	1.247	0.021	0.000	0.000	0.000
11.9	7.20	0.022	0.011	0.012	0.000	0.000	0.000	0.000
25.7	7.21	0.286	0.286	0.000	0.000	0.000	0.000	0.000
9.7	7.36	1.518	0.499	0.982	0.036	0.000	0.000	0.000
12.2	7.41	0.015	0.007	0.008	0.000	0.000	0.000	0.000
23.7	7.39	0.728	0.703	0.026	0.000	0.000	0.000	0.000
9.7	7.57	1.960	0.548	1.259	0.153	0.000	0.000	0.000
23.4	7.59	1.370	1.270	0.100	0.000	0.000	0.000	0.000
9.7	7.75	2.047	0.539	1.315	0.194	0.000	0.000	0.000
24.4	7.82	0.343	0.316	0.026	0.000	0.000	0.000	0.000
9.7	7.94	0.060	0.018	0.039	0.003	0.000	0.000	0.000
24.4	7.98	0.034	0.029	0.004	0.000	0.000	0.000	0.000

Summary statistics for above 0.2s PSA deaggregation, R=distance, e=epsilon:
Contribution from this GMPE(%): 20.6
Mean src-site R= 11.5 km; M= 7.09; eps0= 1.61. Mean calculated for all sources.
Modal src-site R= 9.3 km; M= 6.76; eps0= 1.64 from peak (R,M) bin
MODE R*= 9.3km; M*= 6.76; EPS.INTERVAL: 1 to 2 sigma % CONTRIB.= 1.897

Principal sources (faults, subduction, random seismicity having > 3% contribution)

Source Category:	% contr.	R(km)	M	epsilon0 (mean values).
California A-faults	18.04	12.1	7.20	1.60

Individual fault hazard details if its contribution to mean hazard > 2%:

Fault ID	% contr.	Rcd(km)	M	epsilon0	Site-to-src azimuth(d)
Elsinore; Glen Ivy aPriori	3.93	9.5	6.81	1.66	-109.4
Elsinore;T aPriori	1.10	9.8	7.00	1.54	-140.5
Elsinore;GI+T aPriori	1.92	9.8	7.24	1.41	-140.5
Elsinore;T+J+CM aPriori	0.77	9.7	7.64	1.24	-140.4
Elsinore;GI+T+J+CM aPriori	0.78	9.7	7.72	1.23	-140.4
San Jacinto;A+C aPriori	0.96	22.8	7.49	2.14	46.4
Elsinore;GI MoBal	2.34	9.5	6.78	1.68	-109.4
Elsinore;T+J+CM MoBal	0.76	9.7	7.64	1.24	-140.4
Elsinore aflt, unsegmented	1.15	9.9	7.41	1.29	-141.0

#*********End of deaggregation corresponding to Boore-Atkinson 2008 *********#

PSHA Deaggregation. % Contributions. Site: MenifeeOnSherma long: 117.178 d W., lat: 33.655 N.
Input Vs30 (m/s) = 760.0 (some WUS atten. models use Site Class not Vs30).

NSHMP 2007-08 update. See USGS OFR 2008-1128. Analysis on DaMoYr:01/01/2016
Mean Return Period: 2475 years. 0.20 s. PSA =1.5908 g. Weight * Computed_Rate_Ex 0.148E-03
#Pr[at least one eq with median motion>=PSA in 50 yrs]=0.00000
#This deaggregation corresponds to Campbell-Bozorgnia 2008

DIST(km)	MAG(Mw)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
8.3	5.05	0.178	0.178	0.000	0.000	0.000	0.000	0.000
8.4	5.21	0.552	0.552	0.000	0.000	0.000	0.000	0.000
8.5	5.40	0.858	0.822	0.036	0.000	0.000	0.000	0.000
13.7	5.42	0.033	0.033	0.000	0.000	0.000	0.000	0.000
8.6	5.60	1.014	0.881	0.133	0.000	0.000	0.000	0.000
14.4	5.61	0.077	0.077	0.000	0.000	0.000	0.000	0.000
8.6	5.80	0.979	0.790	0.189	0.000	0.000	0.000	0.000
15.0	5.80	0.114	0.114	0.000	0.000	0.000	0.000	0.000
7.8	6.01	1.259	0.923	0.335	0.000	0.000	0.000	0.000
15.5	6.01	0.191	0.191	0.000	0.000	0.000	0.000	0.000
7.3	6.20	1.715	0.991	0.725	0.000	0.000	0.000	0.000
15.0	6.20	0.391	0.391	0.000	0.000	0.000	0.000	0.000
24.1	6.22	0.019	0.019	0.000	0.000	0.000	0.000	0.000
7.4	6.40	1.900	0.791	1.109	0.000	0.000	0.000	0.000
14.2	6.40	0.594	0.578	0.016	0.000	0.000	0.000	0.000
23.5	6.41	0.064	0.064	0.000	0.000	0.000	0.000	0.000
8.8	6.61	4.042	1.416	2.622	0.004	0.000	0.000	0.000
12.4	6.60	0.251	0.208	0.043	0.000	0.000	0.000	0.000
23.2	6.60	0.031	0.031	0.000	0.000	0.000	0.000	0.000
9.1	6.77	4.856	1.675	3.178	0.003	0.000	0.000	0.000
12.2	6.80	0.265	0.193	0.072	0.000	0.000	0.000	0.000
23.8	6.80	0.039	0.039	0.000	0.000	0.000	0.000	0.000
9.4	6.96	4.723	1.505	3.094	0.123	0.000	0.000	0.000
12.3	6.96	0.128	0.086	0.042	0.000	0.000	0.000	0.000
25.8	6.97	0.075	0.075	0.000	0.000	0.000	0.000	0.000
9.7	7.16	2.797	0.759	1.794	0.244	0.000	0.000	0.000
11.9	7.20	0.028	0.011	0.015	0.001	0.000	0.000	0.000
25.1	7.23	0.257	0.257	0.000	0.000	0.000	0.000	0.000
9.7	7.36	2.001	0.503	1.271	0.227	0.000	0.000	0.000
23.5	7.40	0.544	0.538	0.006	0.000	0.000	0.000	0.000
9.7	7.57	2.406	0.572	1.523	0.311	0.000	0.000	0.000
23.4	7.58	1.315	1.237	0.078	0.000	0.000	0.000	0.000
9.7	7.75	2.468	0.568	1.557	0.343	0.000	0.000	0.000
24.4	7.82	0.324	0.298	0.026	0.000	0.000	0.000	0.000
9.7	7.99	0.031	0.007	0.019	0.005	0.000	0.000	0.000
24.4	7.97	0.048	0.043	0.005	0.000	0.000	0.000	0.000

Summary statistics for above 0.2s PSA deaggregation, R=distance, e=epsilon:
Contribution from this GMPE(%): 36.6
Mean src-site R= 10.4 km; M= 6.79; eps0= 1.40. Mean calculated for all sources.
Modal src-site R= 9.1 km; M= 6.77; eps0= 1.36 from peak (R,M) bin
MODE R*= 9.0km; M*= 6.77; EPS.INTERVAL: 1 to 2 sigma % CONTRIB.= 3.178

Principal sources (faults, subduction, random seismicity having > 3% contribution)

Source Category:	% contr.	R(km)	M	epsilon0 (mean values).
California A-faults	24.95	11.1	7.13	1.41
CA Compr. crustal gridded	11.66	8.9	6.08	1.38

Individual fault hazard details if its contribution to mean hazard > 2%:

Fault ID	% contr.	Rcd(km)	M	epsilon0	Site-to-src azimuth(d)
Elsinore; Glen Ivy aPriori	6.69	9.5	6.79	1.42	-109.4
Elsinore;T aPriori	1.68	9.8	6.99	1.35	-140.5
Elsinore;GI+T aPriori	2.81	9.8	7.24	1.23	-140.5
Elsinore;T+J+CM aPriori	0.92	9.7	7.64	1.15	-140.4
Elsinore;GI+T+J+CM aPriori	0.93	9.7	7.72	1.14	-140.4
San Jacinto;A+C aPriori	0.90	22.8	7.49	2.15	46.4
Elsinore;GI MoBal	4.10	9.5	6.76	1.43	-109.4
Elsinore;T+J+CM MoBal	0.91	9.7	7.64	1.15	-140.4
Elsinore aflt, unsegmented	1.37	9.9	7.39	1.21	-141.0

#*********End of deaggregation corresponding to Campbell-Bozorgnia 2008 *********#

PSHA Deaggregation. % Contributions. Site: MenifeeOnSherma long: 117.178 d W., lat: 33.655 N.
Input Vs30 (m/s) = 760.0 (some WUS atten. models use Site Class not Vs30).

NSHMP 2007-08 update. See USGS OFR 2008-1128. Analysis on DaMoYr:01/01/2016
Mean Return Period: 2475 years. 0.20 s. PSA =1.5908 g. Weight * Computed_Rate_Ex 0.173E-03
#Pr[at least one eq with median motion>=PSA in 50 yrs]=0.00000
#This deaggregation corresponds to Chiou-Youngs 2008

DIST(km)	MAG(Mw)	ALL_EPS	EPSILON>2	1<EPS<2	0<EPS<1	-1<EPS<0	-2<EPS<-1	EPS<-2
8.3	5.05	0.527	0.527	0.000	0.000	0.000	0.000	0.000
8.4	5.20	1.192	1.174	0.019	0.000	0.000	0.000	0.000
13.5	5.21	0.029	0.029	0.000	0.000	0.000	0.000	0.000
8.5	5.40	1.292	1.182	0.110	0.000	0.000	0.000	0.000
13.8	5.41	0.060	0.060	0.000	0.000	0.000	0.000	0.000
8.5	5.60	1.308	1.124	0.184	0.000	0.000	0.000	0.000
14.3	5.60	0.096	0.096	0.000	0.000	0.000	0.000	0.000
8.6	5.80	1.262	0.999	0.264	0.000	0.000	0.000	0.000
14.9	5.80	0.139	0.139	0.000	0.000	0.000	0.000	0.000
7.8	6.01	1.675	1.049	0.626	0.000	0.000	0.000	0.000
15.5	6.01	0.220	0.220	0.000	0.000	0.000	0.000	0.000
7.3	6.20	2.099	1.050	1.049	0.000	0.000	0.000	0.000
15.0	6.20	0.419	0.419	0.000	0.000	0.000	0.000	0.000
7.3	6.40	1.992	0.793	1.199	0.000	0.000	0.000	0.000
14.2	6.40	0.596	0.583	0.013	0.000	0.000	0.000	0.000
23.3	6.41	0.045	0.045	0.000	0.000	0.000	0.000	0.000
8.6	6.61	2.855	1.342	1.512	0.001	0.000	0.000	0.000
12.2	6.60	0.149	0.139	0.011	0.000	0.000	0.000	0.000
9.0	6.78	3.898	1.645	2.248	0.005	0.000	0.000	0.000
12.0	6.80	0.200	0.163	0.037	0.000	0.000	0.000	0.000
9.4	6.97	4.602	1.597	2.899	0.106	0.000	0.000	0.000
12.1	6.96	0.110	0.078	0.032	0.000	0.000	0.000	0.000
25.7	6.98	0.039	0.039	0.000	0.000	0.000	0.000	0.000
9.7	7.17	2.645	0.639	1.698	0.308	0.000	0.000	0.000
12.0	7.21	0.031	0.012	0.018	0.001	0.000	0.000	0.000
25.5	7.23	0.242	0.242	0.000	0.000	0.000	0.000	0.000
9.7	7.36	2.598	0.553	1.641	0.405	0.000	0.000	0.000
12.5	7.41	0.025	0.009	0.015	0.002	0.000	0.000	0.000
23.4	7.39	0.912	0.784	0.129	0.000	0.000	0.000	0.000
9.7	7.58	3.536	0.613	2.231	0.692	0.000	0.000	0.000
23.5	7.58	2.427	1.804	0.623	0.000	0.000	0.000	0.000
9.7	7.76	3.882	0.590	2.505	0.786	0.000	0.000	0.000
24.2	7.79	1.246	0.836	0.411	0.000	0.000	0.000	0.000
47.4	7.78	0.039	0.039	0.000	0.000	0.000	0.000	0.000
9.7	7.98	0.061	0.008	0.040	0.013	0.000	0.000	0.000
24.4	7.99	0.112	0.071	0.042	0.000	0.000	0.000	0.000
47.4	7.98	0.043	0.043	0.000	0.000	0.000	0.000	0.000
47.4	8.16	0.047	0.047	0.000	0.000	0.000	0.000	0.000

Summary statistics for above 0.2s PSA deaggregation, R=distance, e=epsilon:
Contribution from this GMPE(%): 42.7
Mean src-site R= 11.1 km; M= 6.83; eps0= 1.37. Mean calculated for all sources.
Modal src-site R= 9.4 km; M= 6.97; eps0= 1.39 from peak (R,M) bin
MODE R*= 9.4km; M*= 6.97; EPS.INTERVAL: 1 to 2 sigma % CONTRIB.= 2.899

Principal sources (faults, subduction, random seismicity having > 3% contribution)

Source Category:	% contr.	R(km)	M	epsilon0 (mean values).
California A-faults	28.30	12.3	7.27	1.37
CA Compr. crustal gridded	14.44	8.7	5.97	1.37

Individual fault hazard details if its contribution to mean hazard > 2%:

Fault ID	% contr.	Rcd(km)	M	epsilon0	Site-to-src azimuth(d)
Elsinore; Glen Ivy aPriori	5.34	9.5	6.81	1.52	-109.4
Elsinore;T aPriori	1.58	9.8	7.01	1.37	-140.5
Elsinore;GI+T aPriori	3.28	9.8	7.25	1.15	-140.5
Elsinore;T+J+CM aPriori	1.38	9.7	7.64	0.93	-140.4
Elsinore;GI+T+J+CM aPriori	1.47	9.7	7.73	0.89	-140.4
San Jacinto;A+C aPriori	1.62	22.8	7.51	1.98	46.4
Elsinore;GI MoBal	3.18	9.5	6.78	1.55	-109.4
Elsinore;T+J+CM MoBal	1.37	9.7	7.64	0.93	-140.4
Elsinore aflt, unsegmented	1.72	9.8	7.46	1.05	-141.0

#*********End of deaggregation corresponding to Chiou-Youngs 2008 *********#

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******************* Southern California ****************************************
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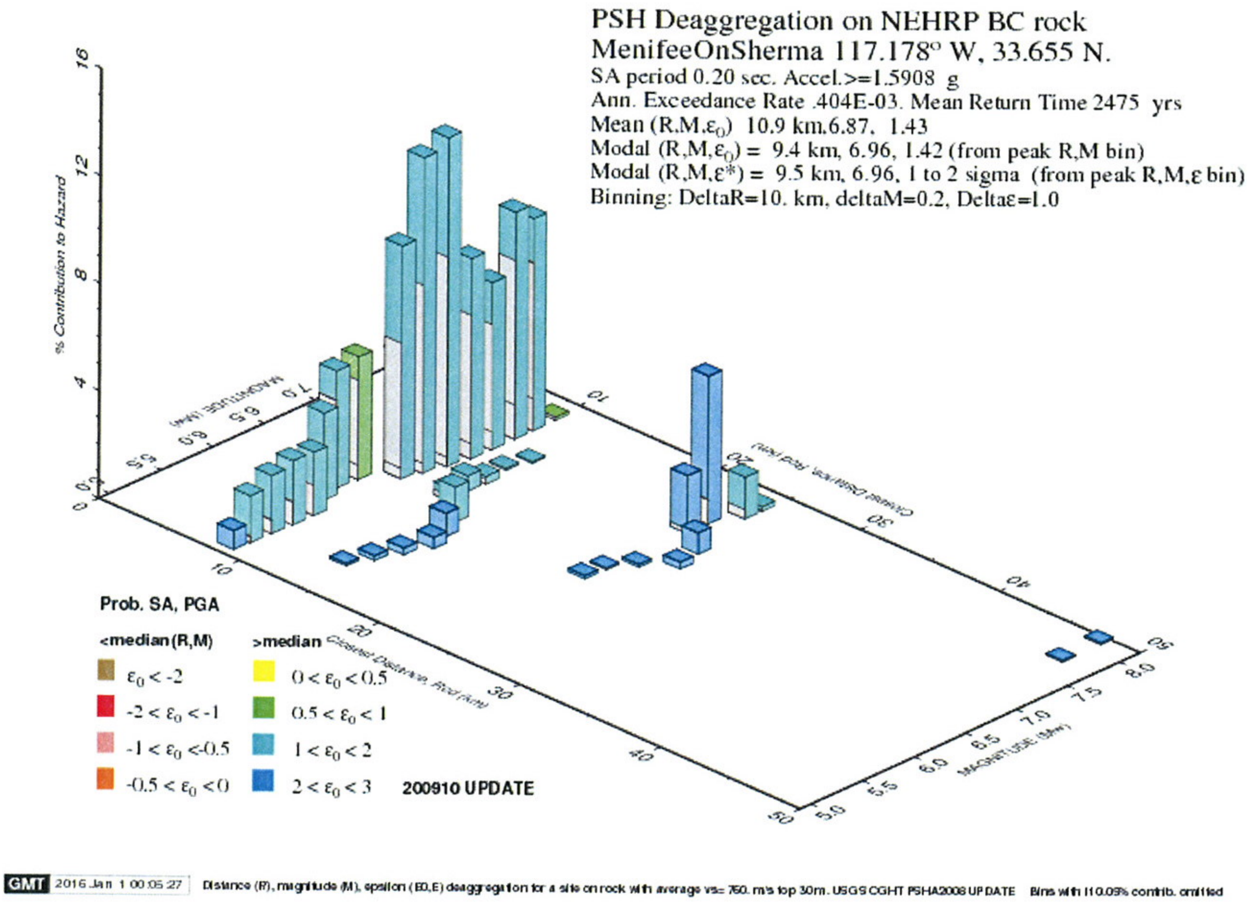
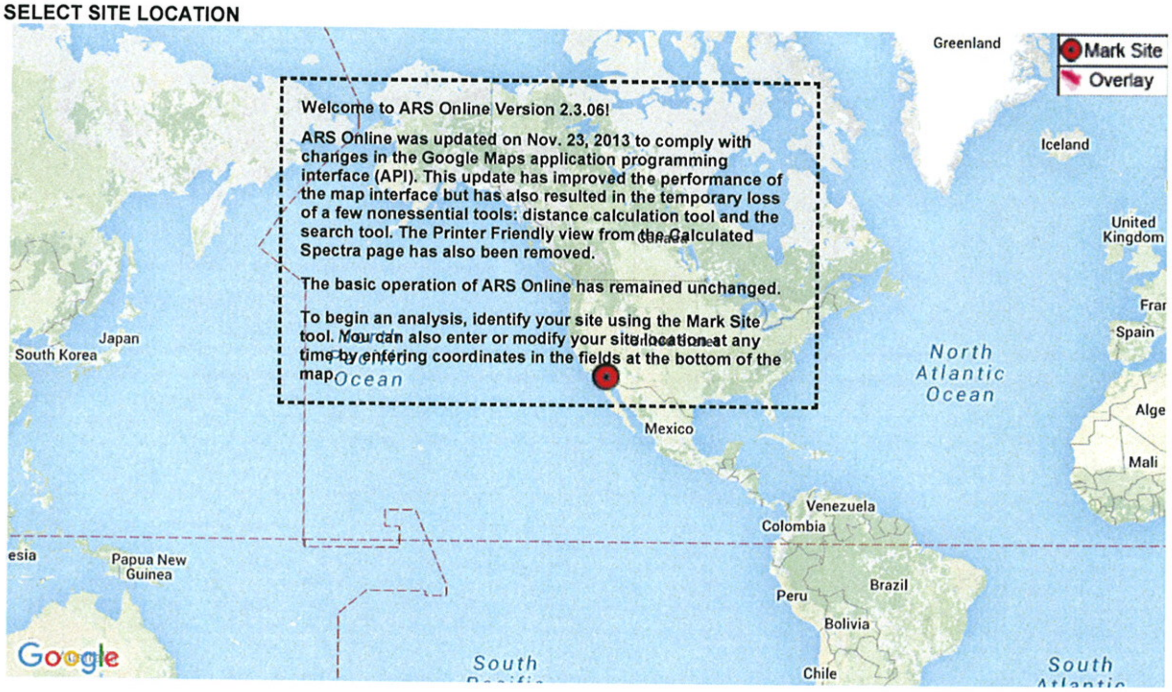

PSH Deaggregation on NEHRP BC rock
MenifeeOnSherma 117.178° W, 33.655 N.
SA period 0.20 sec. Accel.>=1.5908 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 yrs
Mean (R,M,ε0) 10.9 km,6.87, 1.43
Modal (R,M,ε0) = 9.4 km, 6.96, 1.42 (from peak R,M bin)
Modal (R,M,ε*) = 9.5 km, 6.96, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2016 Jan 1 00:05:27
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 760. m/s top 30m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

CALIFORNIA DEPARTMENT OF
TRANSPORTATION

Caltrans ARS Online (v2.3.06)

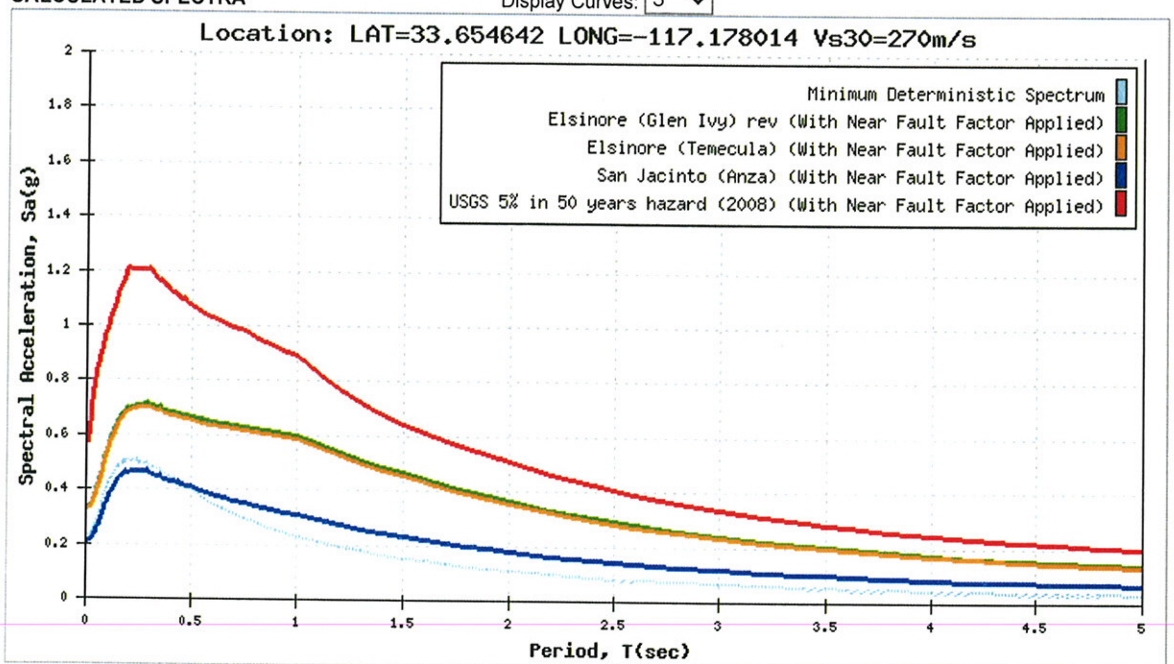
This web-based tool calculates both deterministic and probabilistic acceleration response spectra for any location in California based on criteria provided in *Appendix B of Caltrans Seismic Design Criteria.* More...

SELECT SITE LOCATION



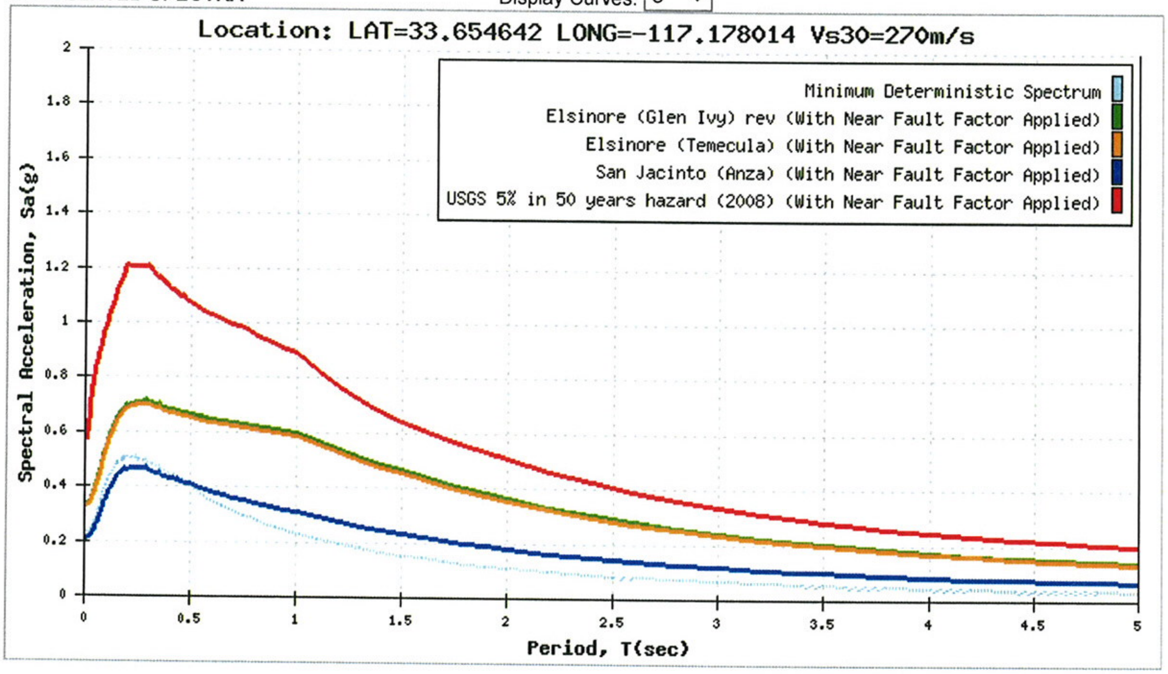
Latitude: 33.654642 **Longitude:** -117.178014 ***Vs30*:** 270 m/s Calculate

CALCULATED SPECTRA Display Curves: 3



CALCULATED SPECTRA

Display Curves: 3



Tabular Data Envelope Only Hide Near Fault Axis Scale Show Basin

Apply Near Fault Adjustment To:
NOTE: Caltrans SDC requires application of a Near Fault Adjustment factor for sites less than 25 km (Rrup) from the causative fault.

☑ Deterministic Spectrum Using

9.38 Km Elsinore (Glen Ivy) rev

9.80 Km Elsinore (Temecula)

22.33 Km San Jacinto (Anza)

☑ Probabilistic Spectrum Using

9.38 Km (Recommend Performing Deaggregation To Verify)

◉ Show Spectrum with Adjustment Only

○ Show Spectrum with and without near fault Adjustment

OK

APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

EARTH-STRATA

General Earthwork and Grading Specifications

General

Intent: These General Earthwork and Grading Specifications are intended to be the minimum requirements for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These General Earthwork and Grading Specifications should be considered a part of the recommendations contained in the geotechnical report(s) and if they are in conflict with the geotechnical report(s), the specific recommendations in the geotechnical report shall supersede these more general specifications. Observations made during earthwork operations by the project Geotechnical Consultant may result in new or revised recommendations that may supersede these specifications and/or the recommendations in the geotechnical report(s).

The Geotechnical Consultant of Record: The Owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant), prior to commencement of grading or construction. The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading or construction.

Prior to commencement of grading or construction, the Owner shall coordinate with the Geotechnical Consultant, and Earthwork Contractor (Contractor) to schedule sufficient personnel for the appropriate level of observation, mapping, and compaction testing.

During earthwork and grading operations, the Geotechnical Consultant shall observe, map, and document the subsurface conditions to confirm assumptions made during the geotechnical design phase of the project. Should the observed conditions differ significantly from the interpretive assumptions made during the design phase, the Geotechnical Consultant shall recommend appropriate changes to accommodate the observed conditions, and notify the reviewing agency where required.

The Geotechnical Consultant shall observe the moisture conditioning and processing of the excavations and fill materials. The Geotechnical Consultant should perform periodic relative density testing of fill materials to verify that the attained level of compaction is being accomplished as specified.

The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of earth materials to receive compacted fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall be provided with the approved grading plans and geotechnical report(s) for his review and acceptance of responsibilities, prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the approved grading plans and geotechnical report(s). Prior to commencement of grading, the Contractor shall prepare and submit to the Owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "equipment" of work and the estimated quantities of daily earthwork contemplated for the site. The Contractor shall inform the Owner and the Geotechnical Consultant of work schedule changes and revisions to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. No assumptions shall be made by the Contractor with regard to whether the Geotechnical Consultant is aware of all grading operations.

It is the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the earthwork operations in accordance with the applicable grading codes and agency ordinances, these specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). At the sole discretion of the Geotechnical Consultant, any unsatisfactory conditions, such as unsuitable earth materials, improper moisture conditioning, inadequate compaction, insufficient buttress keyway size, adverse weather conditions, etc., resulting in a quality of work less than required in the approved grading plans and geotechnical report(s), the Geotechnical Consultant shall reject the work and may recommend to the Owner that grading be stopped until conditions are corrected.

Preparation of Areas for Compacted Fill

Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed in a method acceptable to the Owner, Geotechnical Consultant, and governing agencies.

The Geotechnical Consultant shall evaluate the extent of these removals on a site by site basis. Earth materials to be placed as compacted fill shall not contain more than 1 percent organic materials (by volume). No compacted fill lift shall contain more than 10 percent organic matter.

Should potentially hazardous materials be encountered, the Contractor shall stop work in the affected area, and a hazardous materials specialist shall immediately be consulted to evaluate the potentially hazardous materials, prior to continuing to work in that area.

It is our understanding that the State of California defines most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) as hazardous waste. As such, indiscriminate dumping or spillage of these fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall be prohibited. The contractor is responsible for all hazardous waste related to his operations. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Owner should contract the services of a qualified environmental assessor.

Processing: Exposed earth materials that have been observed to be satisfactory for support of compacted fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Exposed earth materials that are not observed to be satisfactory shall be removed or alternative recommendations may be provided by the Geotechnical Consultant. Scarification shall continue until the exposed earth materials are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. The earth materials should be moistened or air dried to near optimum moisture content, prior to compaction.

Overexcavation: The Cut Lot Typical Detail and Cut/Fill Transition Lot Typical Detail, included herein provides a graphic illustration that depicts typical overexcavation recommendations made in the approved geotechnical report(s) and/or grading plan(s).

Keyways and Benching: Where fills are to be placed on slopes steeper than 5:1 (horizontal to vertical units), the ground shall be thoroughly benched as compacted fill is placed. Please see the three Keyway and Benching Typical Details with subtitles Cut Over Fill Slope, Fill Over Cut Slope, and Fill Slope for a graphic illustration. The lowest bench or smallest keyway shall be a minimum of 15 feet wide (or ½ the proposed slope height) and at least 2 feet into competent earth materials as advised by the Geotechnical Consultant. Typical benches shall be excavated a minimum height of 4 feet into competent earth materials or as recommended by the Geotechnical Consultant. Fill placed on slopes steeper than 5:1 should be thoroughly benched or otherwise excavated to provide a flat subgrade for the compacted fill.

Evaluation/Acceptance of Bottom Excavations: All areas to receive compacted fill (bottom excavations), including removal excavations, processed areas, keyways, and benching, shall be observed, mapped, general elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive compacted fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to placing compacted fill. A licensed surveyor shall provide the survey control for determining elevations of bottom excavations, processed areas, keyways, and benching. The Geotechnical Consultant is not responsible for erroneously located, fills, subdrain systems, or excavations.

Fill Materials

General: Earth material to be used as compacted fill should to a large extent be free of organic matter and other deleterious substances as evaluated and accepted by the Geotechnical Consultant.

Oversize: Oversize material is rock that does not break down into smaller pieces and has a maximum diameter greater than 8 inches. Oversize rock shall not be included within compacted fill unless specific methods and guidelines acceptable to the Geotechnical Consultant are followed. For examples of methods and guidelines of oversize rock placement see the enclosed Oversize Rock Disposal Detail. The inclusion of oversize materials in the compacted fill shall only be acceptable if the oversize material is completely surrounded by compacted fill or thoroughly jetted granular materials. No oversize material shall be placed within 10 vertical feet of finish grade or within 2 feet of proposed utilities or underground improvements.

Import: Should imported earth materials be required, the proposed import materials shall meet the requirements of the Geotechnical Consultant. Well graded, very low expansion potential earth materials free of organic matter and other deleterious substances are usually sought after as import materials. However, it is generally in the Owners best interest that potential import earth materials are provided to the Geotechnical Consultant to determine their suitability for the intended purpose. At least 48 hours should be allotted for the appropriate laboratory testing to be performed, prior to starting the import operations.

Fill Placement and Compaction Procedures

Fill Layers: Fill materials shall be placed in areas prepared to receive fill in nearly horizontal layers not exceeding 8 inches in loose thickness. Thicker layers may be accepted by the Geotechnical Consultant, provided field density testing indicates that the grading procedures can adequately compact the thicker layers. Each layer of fill shall be spread evenly and thoroughly mixed to obtain uniformity within the earth materials and consistent moisture throughout the fill.

Moisture Conditioning of Fill: Earth materials to be placed as compacted fill shall be watered, dried, blended, and/or mixed, as needed to obtain relatively uniform moisture contents that are at or slightly above optimum. The maximum density and optimum moisture content tests should be performed in accordance with the American Society of Testing and Materials (ASTM test method D1557-00).

Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it should be uniformly compacted to a minimum of 90 percent of maximum dry density as determined by ASTM test method D1557-00. Compaction equipment shall be adequately sized and be either specifically designed for compaction of earth materials or be proven to consistently achieve the required level of compaction.

Compaction of Fill Slopes: In addition to normal compaction procedures specified above, additional effort to obtain compaction on slopes is needed. This may be accomplished by backrolling of slopes with sheepsfoot rollers as the fill is being placed, by overbuilding the fill slopes, or by other methods producing results that are satisfactory to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill and the slope face shall be a minimum of 90 percent of maximum density per ASTM test method D1557-00.

Compaction Testing of Fill: Field tests for moisture content and relative density of the compacted fill earth materials shall be periodically performed by the Geotechnical Consultant. The location and frequency of tests shall be at the Geotechnical Consultant's discretion based on field observations. Compaction test locations will not necessarily be random. The test locations may or may not be selected to verify minimum compaction requirements in areas that are typically prone to inadequate compaction, such as close to slope faces and near benching.

Frequency of Compaction Testing: Compaction tests shall be taken at minimum intervals of every 2 vertical feet and/or per 1,000 cubic yards of compacted materials placed. Additionally, as a guideline, at least one (1) test shall be taken on slope faces for each 5,000 square feet of slope face and/or for each 10 vertical feet of slope. The Contractor shall assure that fill placement is such that the testing schedule described herein can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork operations to a safe level so that these minimum standards can be obtained.

Compaction Test Locations: The approximate elevation and horizontal coordinates of each test location shall be documented by the Geotechnical Consultant. The Contractor shall coordinate with the Surveyor to assure that sufficient grade stakes are established. This will provide the Geotechnical Consultant with sufficient accuracy to determine the approximate test locations and elevations. The Geotechnical Consultant can not be responsible for staking erroneously located by the Surveyor or Contractor. A minimum of two grade stakes should be provided at a maximum horizontal distance of 100 feet and vertical difference of less than 5 feet.

Subdrain System Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the approved grading plan, and the typical details provided herein. The Geotechnical Consultant may recommend additional subdrain systems and/or changes to the subdrain systems described herein, with regard to the extent, location, grade, or material depending on conditions encountered during grading or other factors. All subdrain systems shall be surveyed by a licensed land surveyor (except for retaining wall subdrain systems) to verify line and grade after installation and prior to burial. Adequate time should be allowed by the Contractor to complete these surveys.

Excavation

All excavations and over-excavations for remedial purposes shall be evaluated by the Geotechnical Consultant during grading operations. Remedial removal depths indicated on the geotechnical plans are estimates only. The actual removal depths and extent shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading operations. Where fill over cut slopes are planned, the cut portion of the slope shall be excavated, evaluated, and accepted by the Geotechnical Consultant prior to placement of the fill portion of the proposed slope, unless specifically addressed by the Geotechnical Consultant. Typical details for cut over fill slopes and fill over cut slopes are provided herein.

Trench Backfill

1) The Contractor shall follow all OHSA and Cal/OSHA requirements for trench excavation safety.

2) Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions in the Standard Specifications of Public Works Construction. Bedding materials shall have a Sand Equivalency more than 30 (SE>30). The bedding shall be placed to 1 foot over the conduit and thoroughly jetting to provide densification. Backfill should be compacted to a minimum of 90 percent of maximum dry density, from 1 foot above the top of the conduit to the surface.

3) Jetting of the bedding materials around the conduits shall be observed by the Geotechnical Consultant.

4) The Geotechnical Consultant shall test trench backfill for the minimum compaction requirements recommended herein. At least one test should be conducted for every 300 linear feet of trench and for each 2 vertical feet of backfill.

5) For trench backfill the lift thicknesses shall not exceed those allowed in the Standard Specifications of Public Works Construction, unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment or method.

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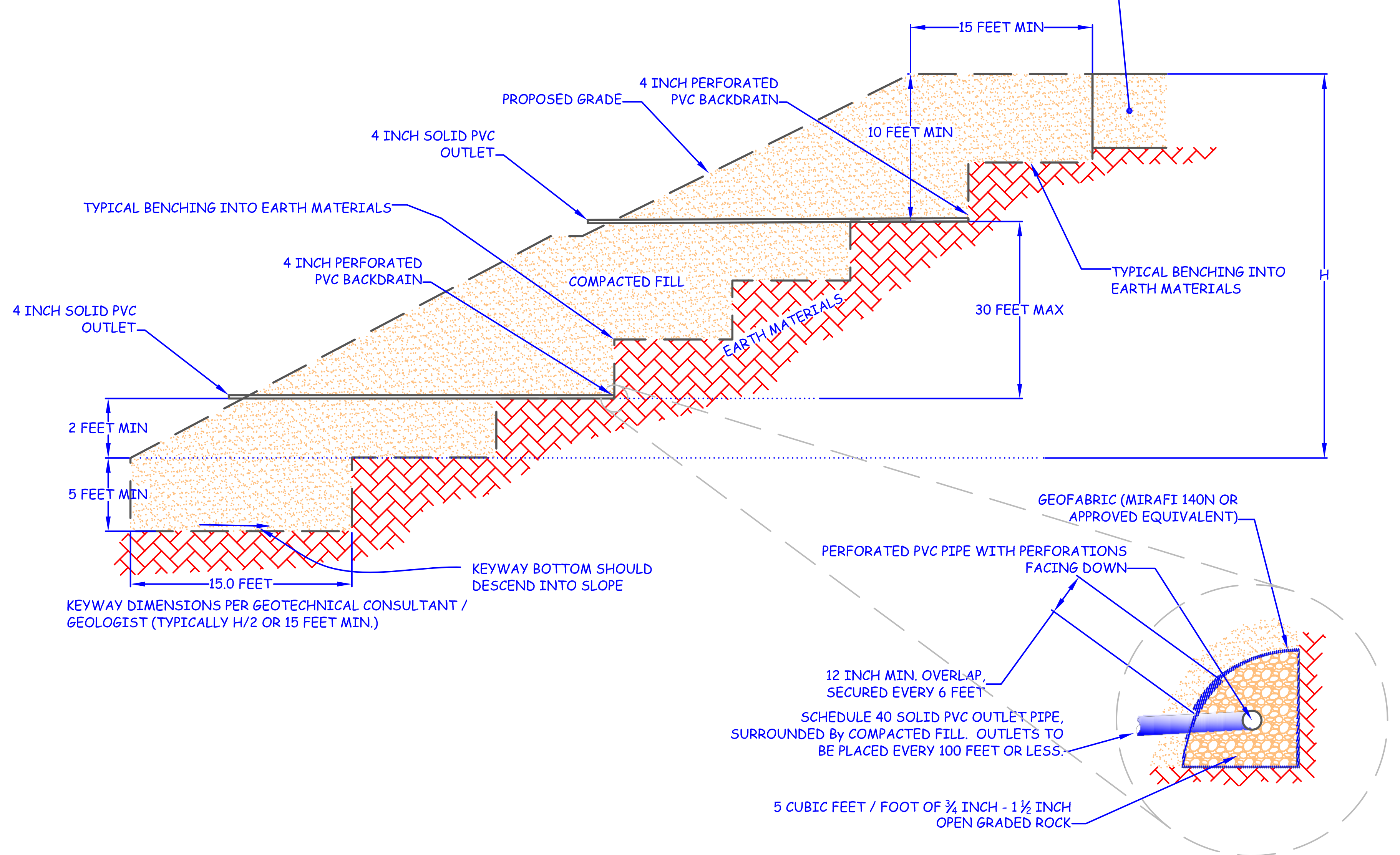
STABILIZATION FILL TYPICAL DETAIL



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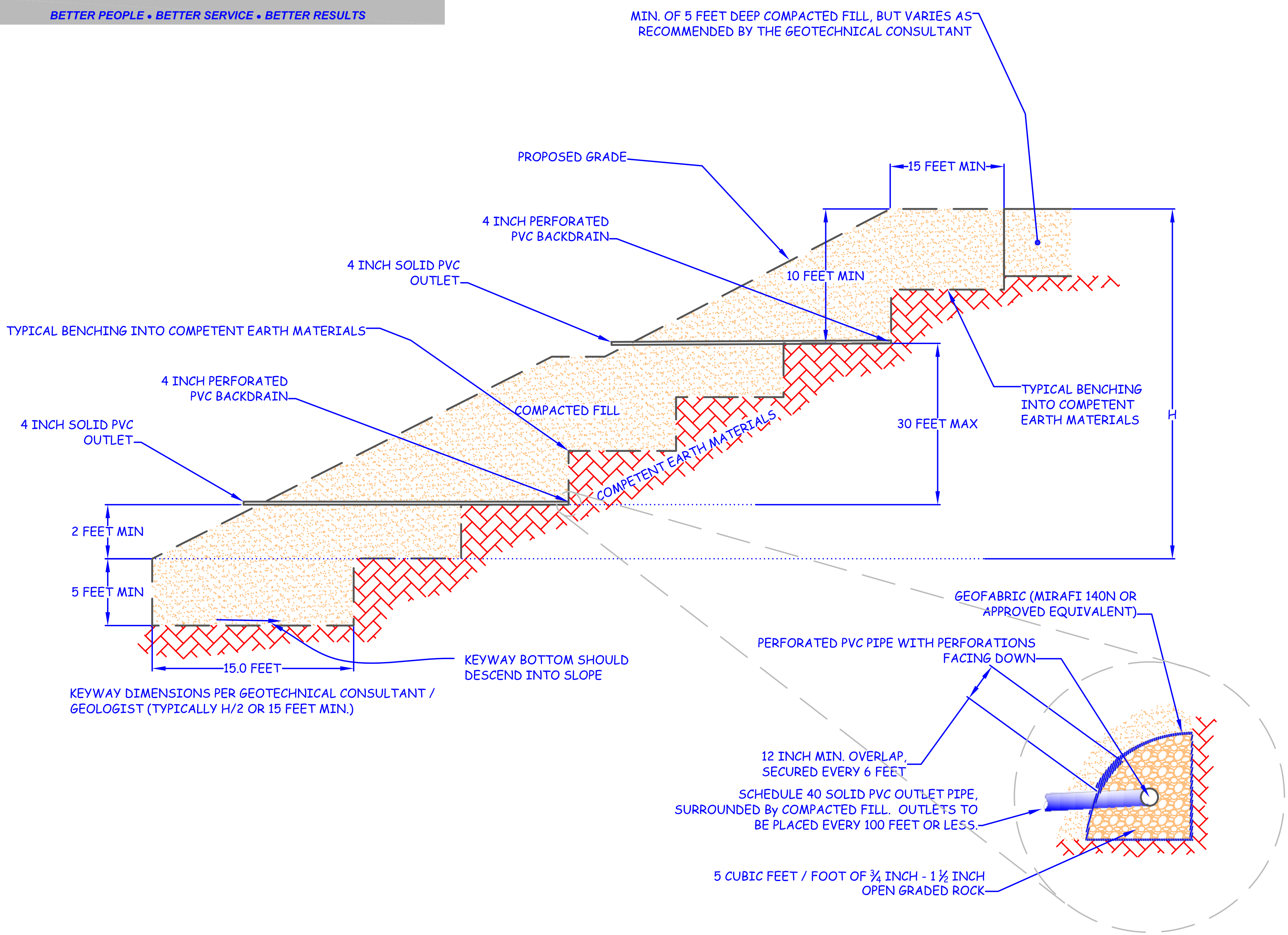
BUTTRESS TYPICAL DETAIL



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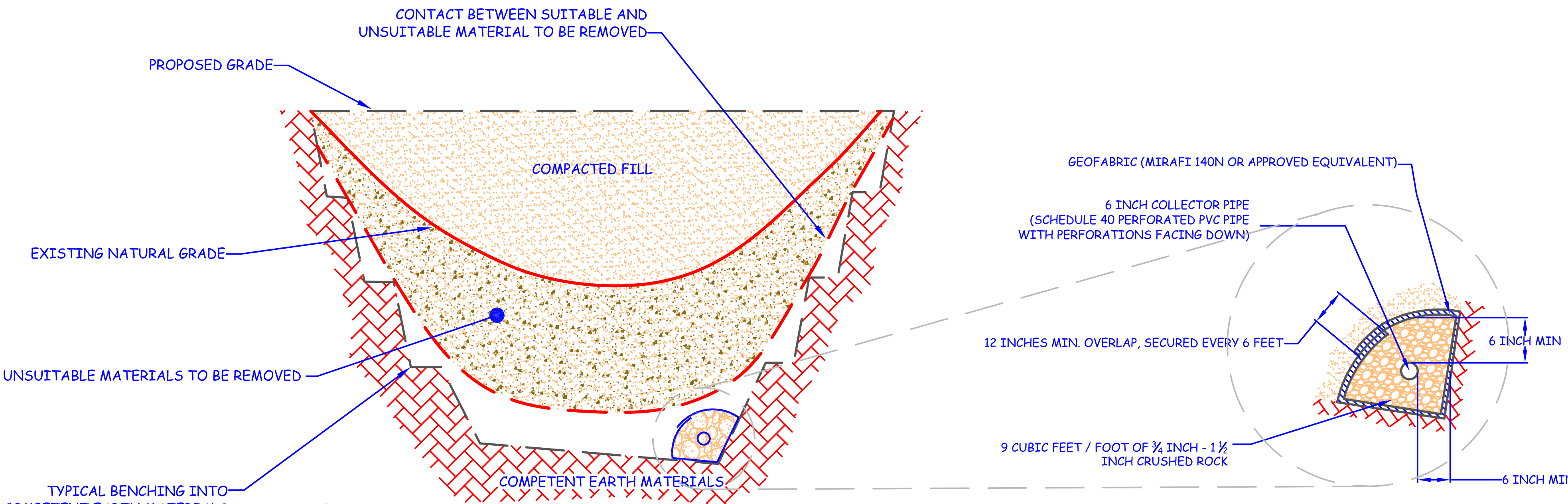
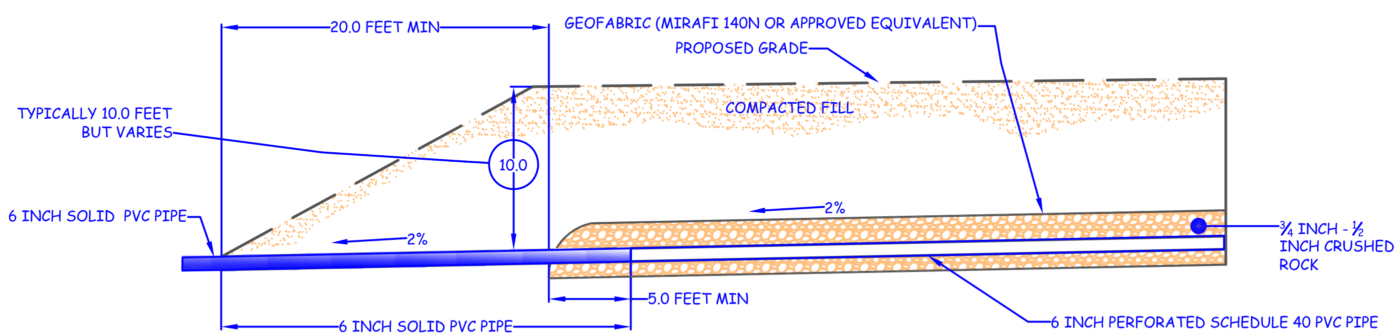
CANYON SUBDRAIN SYSTEM TYPICAL DETAIL



NOTES:
1 - CONTINUOUS RUNS IN EXCESS OF 500 FEET LONG WILL REQUIRE AN 8 INCH DIAMETER PIPE.

2 - FINAL 20 FEET OF PIPE AT OUTLET WILL BE SOLID AND BACKFILLED WITH COMPACTED FINE-GRAINED EARTH MATERIALS.

CANYON SUBDRAIN TYPICAL OUTLET



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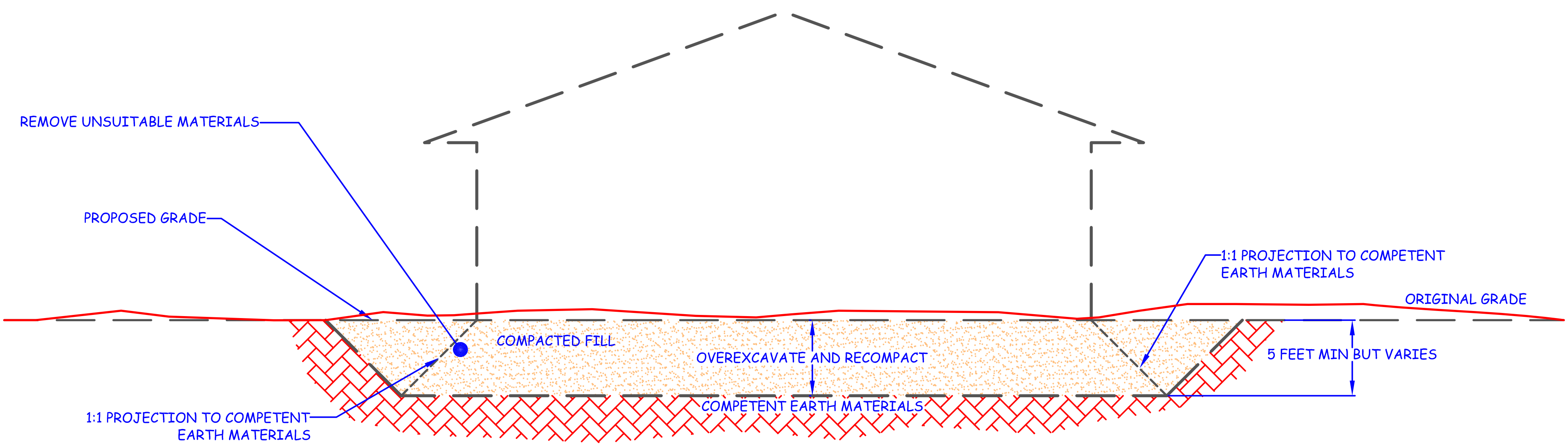
CUT LOT TYPICAL DETAIL



NOTE; REMOVAL BOTTOMS SHOULD BE GRADED WITH A MINIMUM 2% FALL TOWARDS STREET OR OTHER SUITABLE AREA (AS DETERMINED BY THE GEOTECHNICAL CONSULTANT) TO AVOID PONDING BELOW THE BUILDING

NOTE: WHERE DESIGN CUT LOTS ARE EXCAVATED ENTIRELY INTO COMPETENT EARTH MATERIALS, OVEREXCAVATION MAY STILL BY NEEDED FOR HARD-ROCK CONDITIONS OR MATERIALS WITH VARIABLE EXPANSION POTENTIALS

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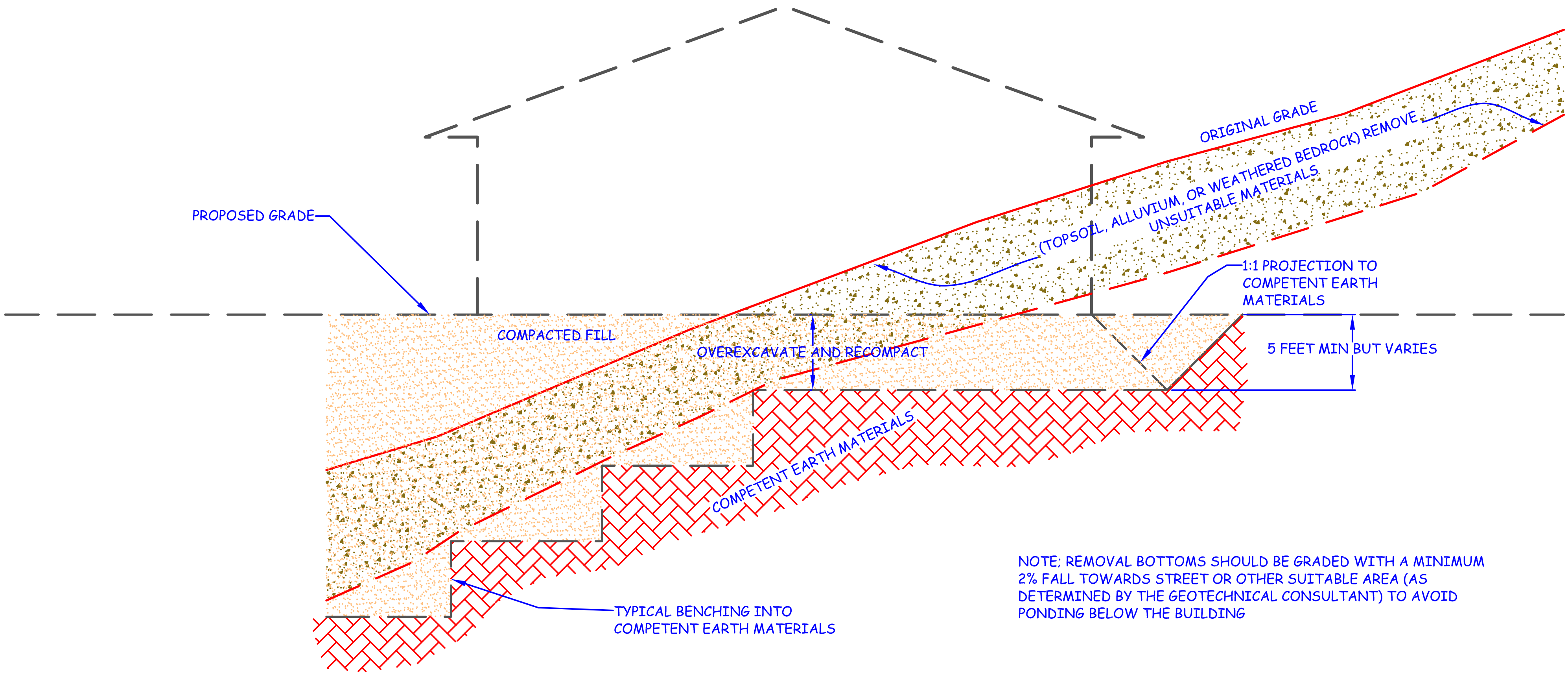
CUT / FILL TRANSITION LOT TYPICAL DETAIL



NOTE: REMOVAL BOTTOMS SHOULD BE GRADED WITH A MINIMUM 2% FALL TOWARDS STREET OR OTHER SUITABLE AREA (AS DETERMINED BY THE GEOTECHNICAL CONSULTANT) TO AVOID PONDING BELOW THE BUILDING

NOTE: WHERE DESIGN CUT LOTS ARE EXCAVATED ENTIRELY INTO COMPETENT EARTH MATERIALS, OVEREXCAVATION MAY STILL BY NEEDED FOR HARD-ROCK CONDITIONS OR MATERIALS WITH VARIABLE EXPANSION POTENTIALS

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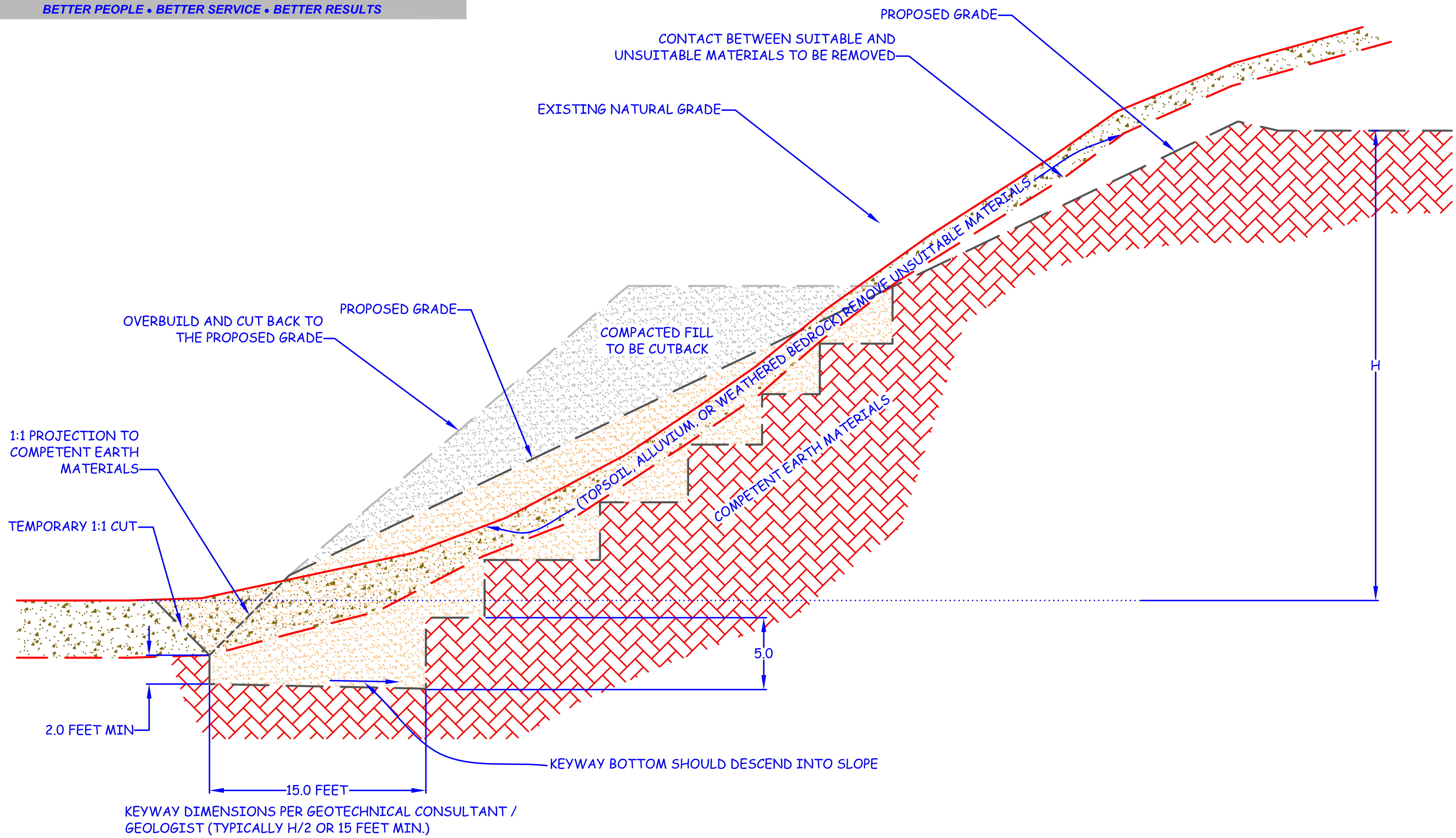
KEYWAY & BENCHING TYPICAL DETAILS
CUT OVER FILL SLOPE



NOTE:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE BENCHED INTO COMPETENT EARTH MATERIALS

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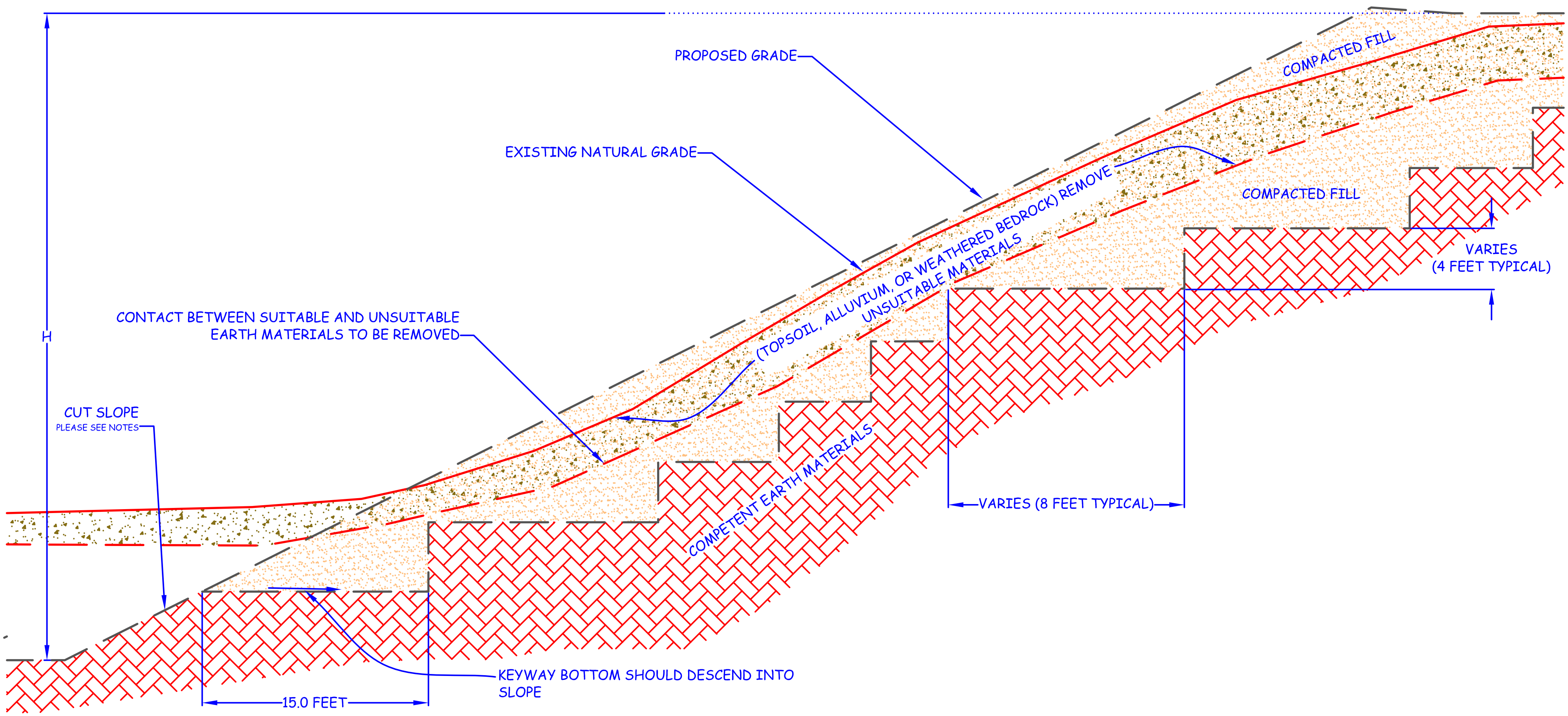
KEYWAY & BENCHING TYPICAL DETAILS
FILL OVER CUT SLOPE



KEYWAY DIMENSIONS PER GEOTECHNICAL CONSULTANT / GEOLOGIST (TYPICALLY H/2 OR 15 FEET MIN.)

NOTES:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE BENCHED INTO COMPETENT EARTH MATERIALS

THE CUT SLOPE MUST BE CONSTRUCTED FIRST

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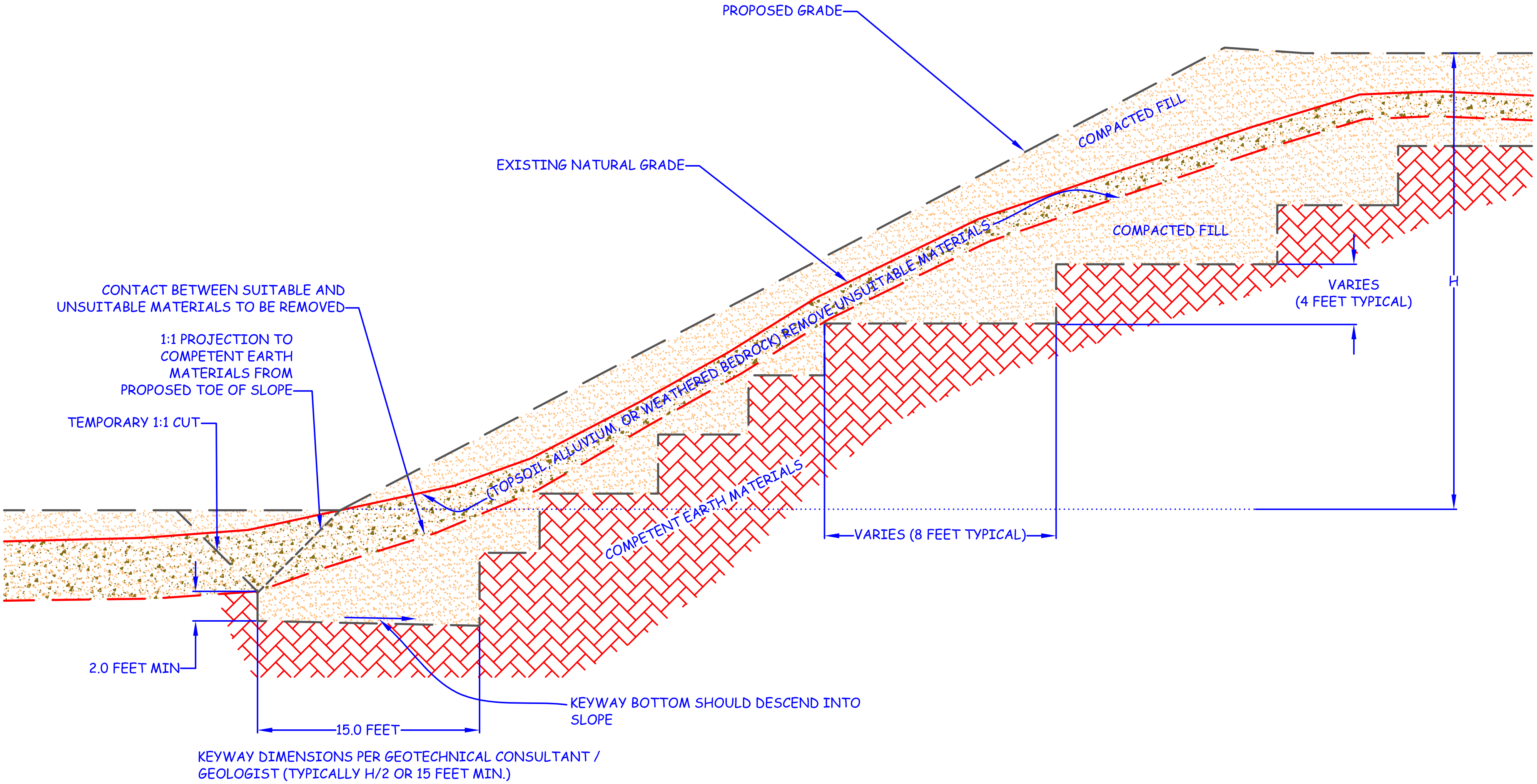
KEYWAY & BENCHING TYPICAL DETAILS
FILL SLOPE



NOTES:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE BENCHED INTO COMPETENT EARTH MATERIALS

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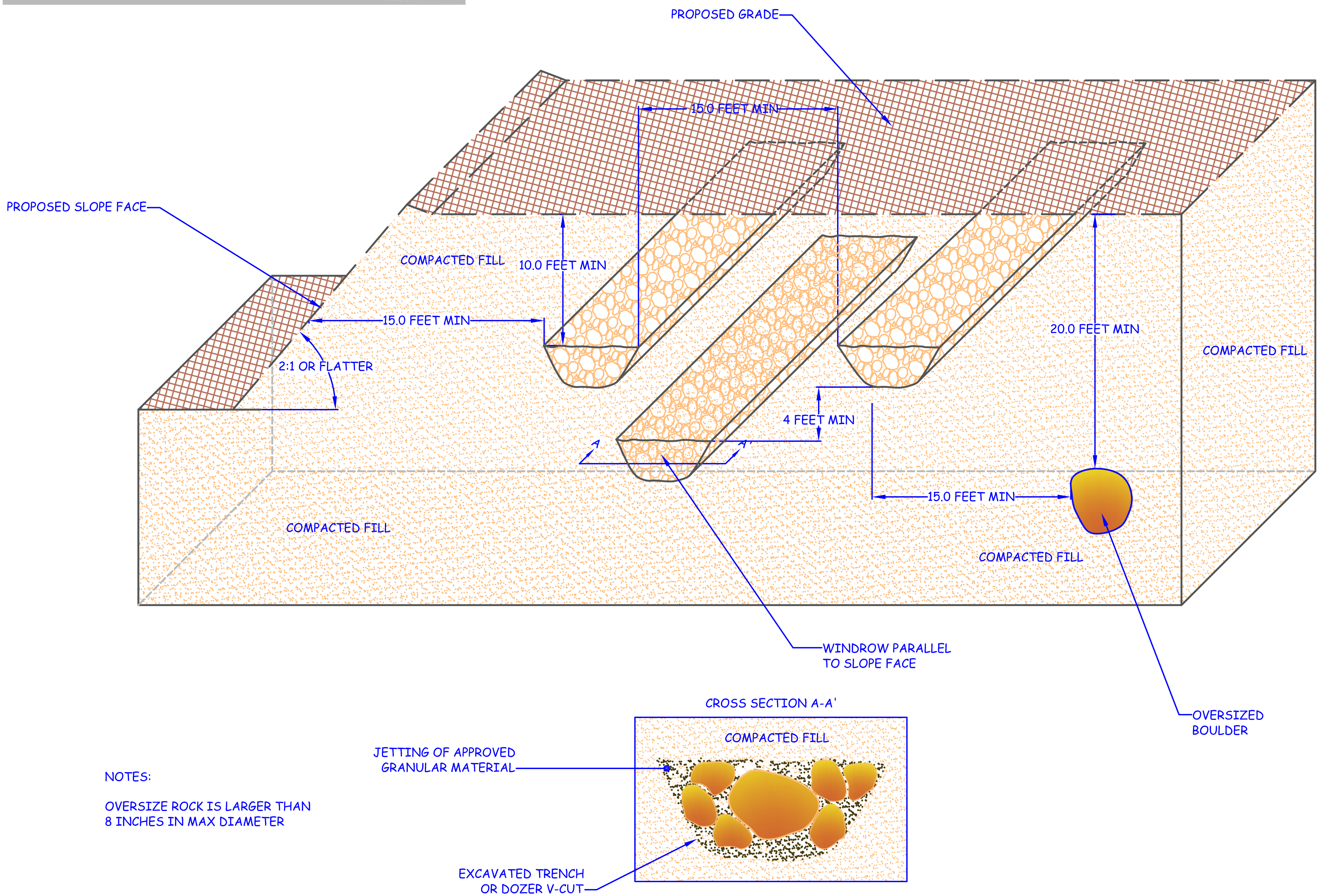
OVERSIZE ROCK TYPICAL DETAIL



NOTES:

OVERSIZE ROCK IS LARGER THAN 8 INCHES IN MAX DIAMETER

LEGEND

Locations are Approximate

Geologic Units

Qvoa - Very Old Alluvial Channel Deposits

Kgb - Gabbro (circled where buried)

Kpvg - Monzogranitic Rock (circled where buried)

Symbols

- Limits of Report
- Geologic Contact
- B-8 T.D. = 6.5' NO G.W. - Boring Location Including Total Depth and Depth to Groundwater
- 3-5' - Recommended Removal Depths
- Rock Piles

North

GEOTECHNICAL MAP

LOCATED ON THE SOUTH SIDE OF GARBANI ROAD, BETWEEN SHERMAN ROAD AND HAUN ROAD

CITY OF MENIFEE, RIVERSIDE COUNTY, CALIFORNIA

APN 360-350-006

PROJECT	RANCHO BONITA DEVELOPMENT		
CLIENT	SHERMAN AND GARBANI, LLC		
PROJECT NO.	151015-10A		
DATE	FEBRUARY 2016		
SCALE	1:120		
DWG XREFS			
REVISION			
DRAWN BY	CCS	PLATE	1 OF 1

ES-GS

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