

*PRELIMINARY GEOTECHNICAL EVALUATION
TENTATIVE TRACT NO. 37620, OFF BRIGGS ROAD
MENIFEE AREA OF RIVERSIDE COUNTY, CALIFORNIA*



*WALTON CALIFORNIA, LLC
c/o David Evans and Associates, Inc.*

*November 13, 2019
J.N. 17-361*

ENGINEERS + GEOLOGISTS + ENVIRONMENTAL SCIENTISTS

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WALTON CALIFORNIA, LLC
c/o David Evans and Associates, Inc.
14297 Cajon Avenue, Suite 101
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Attention: Mr. Dean Paradise

**Subject: Preliminary Geotechnical Evaluation, Tentative Tract No. 37620, Off Briggs Road,
Menifee Area of Riverside County, California**

Dear Mr. Paradise:

Petra Geosciences, Inc. (Petra) is submitting herewith our preliminary geotechnical evaluation report for the proposed 101-lot residential development (Tentative Tract 37620) located off Briggs Road in the Menifee Area of Riverside County, California. This report presents the results of our preliminary field exploration, limited laboratory testing, engineering judgment, opinions, conclusions and recommendations pertaining to geotechnical design aspects for the proposed development.

It has been a pleasure to be of service to you on this project. Should you have questions regarding the contents of this report or should you require additional information, please contact this office.

Respectfully submitted,

PETRA GEOSCIENCES, INC.



Douglass Johnston
Senior Associate Geologist



Grayson R. Walker, GE
Principal Engineer

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**PRELIMINARY GEOTECHNICAL EVALUATION
TENTATIVE TRACT 37620, OFF BRIGGS ROAD
MENIFEE AREA OF RIVERSIDE COUNTY, CALIFORNIA**

INTRODUCTION

Petra Geosciences, Inc. (Petra) is presenting herein the results of our preliminary geotechnical evaluation of the proposed 101-lot residential development situated northeasterly of Briggs Road and Old Newport Road in the Menifee area of Riverside County, California. Our geotechnical evaluation included a review of geological maps and published geotechnical reports for the site and surrounding area, including review of historic aerial photos and online imagery, our previous field exploration, limited laboratory testing, geologic and engineering analysis, and completion of this report. This report draws, in part, from Petra's geotechnical assessment of the site reflected in a draft due diligence report (Petra, 2017a) and subsequent infiltration study (Petra, 2019). Relevant data presented in these reports is reiterated herein.

PURPOSE AND SCOPE OF SERVICES

The purposes of this evaluation were to obtain information on the near surface and subsurface geologic and soil conditions within the site to provide conclusions and recommendations for remedial grading and for preliminary design of the proposed development.

The scope of our evaluation consisted of the following:

- Reconnaissance of the site to evaluate existing conditions and geologic mapping.
- Review of available published and unpublished data, maps and geotechnical reports concerning geologic and soil conditions within and adjacent to the site which could have an impact on the proposed development, see references.
- Coordinate with the local underground utility locating service (i.e., Underground Service Alert [USA]) to obtain an underground-utility clearance, prior to commencement of the subsurface exploration.
- Geotechnical drilling, logging, and sampling of seven (7) exploratory soil borings utilizing a hollow-stem auger drill rig. Log and visually classify soil and materials encountered in our borings in accordance with the Unified Soil Classification System (USCS).
- Conduct laboratory testing of representative samples (bulk and undisturbed) obtained from the borings to determine their engineering properties.
- Engineering and geologic analysis of the research, field exploration findings and laboratory data with respect to the proposed site development.
- Preparation of this geotechnical report presenting the results of our evaluation and providing recommendations for the proposed site grading in general conformance with applicable state and local jurisdictional requirements.

SITE LOCATION AND DESCRIPTION

The project site is located northeast of the intersection of Old Newport Road and Briggs Road in the Meniffee area of Riverside County, California. Vehicular access to the subject property is off Briggs Road via an unmarked and unpaved power-line road along the western edge of the site. Site elevations range from approximately 1540 feet above mean sea level (msl) on the ridge line in the north/northeastern portions of the site to approximately 1440 feet msl near the intersection of Briggs Road and Old Newport Road. A general site location map is included as Figure 1.

At the time of our initial fieldwork in 2017, the site was essentially undeveloped and a recent reconnaissance in October 2019 indicated essentially no changes in property conditions from 2017. The lower, western portion of the property consists of relatively flat terrain, gently sloping to the southwest, mantled with native grasses/weeds in various stages of growth. A cluster of trees is located in the south-central portion of the property, in an area where an old farmhouse existed. Relatively short, large diameter concrete risers were noted in this area. Concrete slab remnants of the farmhouse are present near the trees. Trees also line the southwestern property boundary. The northern and eastern portion of the property consist of hillside terrain with abundant boulder outcrops.

Thin dry native vegetation was observed on the hillside slopes, with occasional brush in canyons. A dirt road in the southern portion of the site provides access to the top of the hillside. Another dirt road was observed along the base of the natural slopes. Steel-pole transmission lines are located along the western edge of the site, between the property and Briggs Road. Random amounts of deleterious materials such as dumped trash, garbage, tires, furniture and debris were sporadically noted around the site, including more notable concentrations around the former ranch house area and in the drainage swale just to the east. Areas of dumped debris/trash were also observed along dirt roads in the northwestern portion of the property. Small to medium sized boulders were occasionally observed near the general toe of the ascending hillsides on the north and east. The natural slopes were observed to have numerous boulder outcrops along the surface.

PROPOSED DEVELOPMENT AND GRADING

Based on the current tentative tract map, the development will consist of 101 single-family residential lots, a water quality basin and various in-tract streets, as well as widening of existing Briggs Road. Several open space park sites will be located along the eastern boundary. Appurtenant structures will likely include surface and subsurface drainage control devices, retaining and screen walls, various underground utilities and landscaping. The majority of the lots will consist of cuts and fills generally less than 10 feet from

existing grades, although these figures do not account for remedial grading. An exception to these cut/fill estimates includes the northern end and northeast corner (Lots 16-35) that may require deeper rear-yard cuts up to approximately 20 feet below existing grade, and the eastern side of the water quality basin that may need approximately 30 feet of cut to reach basin floor grade. Preliminary earthwork estimates note approximately 124,517 cubic yards of both cut and fill indicated a balance of onsite materials.

LITERATURE REVIEW

Petra researched and reviewed readily available published geologic data pertaining to regional geology, faulting and geologic hazards, as well as published geotechnical reports that pertain to the general site area (see References). The results of this review are discussed under the Findings and Conclusions section of this report.

Field Exploration

A subsurface exploration program was conducted under the supervision of an engineering geologist from Petra on October 10, 2017 and again on July 23, 2019. Subsurface exploration involved the drilling of a total of seven (7) exploratory borings to approximate depths between of 15.5 to 25.5 feet below existing site grade. Drilling was performed with a truck-mounted drill rig equipped with 8-inch outside diameter, hollow-stem augers. Earth materials encountered within the exploratory borings were classified and logged in accordance with the visual-manual procedures of the Unified Soil Classification System (USCS). The approximate locations of the exploratory borings are shown on the attached Boring Location Map, Figure 3 and descriptive logs of the borings are presented in Appendix A.

Subsurface exploration also included the collection of bulk samples and relatively undisturbed samples of soil materials for classification, laboratory testing and geotechnical engineering analyses. Bulk samples consisted of selected soil materials obtained from the exploratory borings. Relatively undisturbed samples were obtained using a 3-inch outside diameter modified California split-spoon soil sampler lined with brass rings. The soil samples were mechanically driven to a depth of 18 inches with successive 30-inch drops of a 140-pound automatic trip hammer and the number of blows required to drive the sampler for each 6-inch increment inches are noted in the boring logs in Appendix A. The driven core samples were placed in sealed containers and transported to Petra's laboratory for laboratory testing.

Standard Penetration Tests (SPT) were also performed at selected depth intervals in accordance with ASTM D1586. This method consists of mechanically driving an unlined, 2.0-inch outside diameter standard penetrometer split-barrel sampler 18 inches into the soil with successive 30-inch drops of the 140-pound automatic trip hammer. Blow counts are also noted on the exploration logs. Disturbed soil samples from

the unlined standard split-spoon samplers were placed in sealed plastic bags and transported to our laboratory for testing.

Laboratory Testing

Laboratory testing for selected samples of onsite soils materials included in-situ dry density and moisture content, expansion index and general soil corrosion potential (sulfate content, chloride content, pH/resistivity). A description of laboratory test methods and laboratory testing are presented in Appendix B and the results of in-situ moisture content and dry density tests are summarized in the boring logs presented in Appendix A.

FINDINGS

Previous Land Use

Based on historic aerial photo review, the site appears to have been developed for agricultural purposes in the form of dry farming from at least 1938 until sometime after 1978 and before 1985. During this period, what appeared to be a farmhouse and compound area was observed in the southwestern portion of the property. The buildings appeared to have been removed sometime after 1989 and before 1996.

Regional Geologic Setting

Geologically, the site lies within the northern portion of the Peninsular Ranges Geomorphic Province. The Peninsular Range region extends from the tip of Baja California to the Transverse Ranges and the Los Angeles Basin and is characterized by northwest trending mountain ranges separated by subparallel fault zones. In general, the province is underlain primarily of plutonic rock of the Southern California Batholith. These rocks formed from the cooling of molten magma deep within the earth's crust. Intense heat associated with these plutonic magma metamorphosed the ancient sedimentary rocks into which the plutons intruded. The Peninsular Range Geomorphic Province is generally characterized by alluviated basins and elevated erosion surfaces.

More specifically, the subject site lies within the western portion of the Perris Block. The Perris Block is bounded by the San Jacinto Fault Zone to the northeast, the Elsinore Fault Zone to the southwest, the Cucamonga Fault Zone to the northwest, and the Temecula Basin to the southeast. According to the Romoland 7.5' Quadrangle (Morton and Kennedy, 2003), the hillside portion of the site are underlain by granitics and other intrusive crystalline rocks (Cretaceous-age of the Peninsular Range Batholith). The vast majority of the site at the lower elevations, is mapped as being underlain by Middle to Early Pleistocene, Very Old Alluvial Fan Deposits.

Local Geology and Surface Soil Conditions

Locally, the majority of the site exhibits a thin veneer of topsoil mantling a bed of younger alluvial fan deposits, overlying older alluvial fan deposits which are underlain by bedrock at depth. The geologic structure of the bedrock is predominantly northwest-trending as evidenced by northwest-trending bedrock ridges which were observed within the site during our aerial-photograph review. Discussions of the individual geologic units are as follows:

Topsoil – Topsoil was encountered within the lower portions of the site to depths of approximately 3 feet. The unit is thickest in the southwestern portion of the site and thins to expose bedrock uphill to the north and east. The soils consist of dry and loose brown silty sand. Abundant porosity and rootlets were observed in this soil horizon.

Young Alluvial Fan Deposits (Qf) – Younger alluvial fan deposits were encountered in the borings below the topsoil horizon to depths generally ranging from approximately 6 to 12 feet below ground surface. These soils generally consisted of dry to moist, medium dense to locally dense silty fine to medium sand. This unit thins to non-existent along the northern and eastern boundary where it comes in contact with bedrock outcrops.

Older Alluvial Fan Deposits (Qof) – Old alluvial fan deposits were encountered in the borings below the younger fan deposit to depths generally ranging from approximately 12 to 20 feet below ground surface, as depicted in Figure 3. These soils generally consisted of moist, very dense clayey sands with lesser occurrences of silty sand. This unit also thins to non-existent along the northern and eastern boundary where it transitions to bedrock outcrops.

Cretaceous Granitic Bedrock (Kgr) – Bedrock, likely consisting of granodiorite, underlies the site at depth and is exposed as boulders and outcrops within the northern and eastern edges of the site. The rock has a prominent northwest-trending regional joint set which has resulted in narrow northwest-trending ridges. The upper portions appear to be rippable with heavy construction equipment.

Groundwater

Based on our review, historic groundwater levels within the general vicinity of the site may be less than 50 feet below ground surface. Groundwater was recorded at depth of approximately 16 to 27 feet between December 1992 and September 1995 in two wells north of Newport Road. In an irrigation well on Briggs Road, south of the site, groundwater was reported at a depth of 96± feet below the ground surface in 2011 and 2012. In general, groundwater depth varies within the area and, although flow direction beneath the subject site is unknown, it is believed to be toward the west-southwest. Fluctuations in temporary perched groundwater levels may occur due to variations in rainfall, regional climate, and in response to irrigation.

Faulting

Based on our review of published and unpublished geologic maps, no known active faults are located within or immediately adjacent to the site. Additionally the site does not lie within an Earthquake Fault Hazard Zone (CDMG, 1990) as defined by the State of California in the Alquist-Priolo (AP) Earthquake Fault Hazard Zoning Act. Based on our review of published and unpublished geotechnical maps and literature pertaining to site and regional geology, the closest active or potentially active faults to the site are the Murrieta Hot Springs fault located approximately 9.1 miles to the south; the Elsinore-Temecula (Wildomar) fault located approximately 9.5 miles to the southwest; the Elsinore-Glen Ivy fault located approximately 15 miles to the west; and the San Jacinto fault located approximately 10 miles to the northeast.

Based on our review of aerial photographs for the site and vicinity, photo lineaments were neither observed traversing nor projecting into the site. While fault rupture would most likely occur along previously established fault traces, fault rupture could occur at other locations; however, the potential for active fault rupture at the site is considered to be very low. Based on our site reconnaissance and geologic mapping of the surface of the site, as well as our review of published geologic maps, no faults are known to exist within or project toward the subject site. Additionally, based on review of area geologic and topographic maps, no geomorphic evidence exists to suggest that any faulting, including active faulting, is present within the subject site

Natural Slopes

Natural slopes located along the northern and eastern edges of the site are considered grossly stable, however, surface soils may be prone to downslope soil-creep and possible mudflow under heavily saturated conditions during periods of prolonged precipitation. *Additionally, boulders are prevalent throughout the ascending slope faces and occasional small to medium sized boulders were observed near the general toe of the ascending hillsides. A medium potential for rockfall may be considered along the easterly boundary with the ascending hillside and a possible high potential for rockfall may be considered along the northern and southeastern portions of the site boundaries. Further evaluation for rockfall potential and possible mitigation is warranted.*

Strong Ground Motions

The site is located in a seismically active area of southern California and will likely be subjected to very strong seismically related ground shaking during the anticipated life span of the project. Structures within the site should therefore be designed and constructed to resist the effects of strong ground motion in

accordance with the 2016 California Building Code (CBC) and the seismic parameters included in the recommendations section herein.

Secondary Seismic Effects

There are no known landslides mapped onsite or in the immediate area and no portion of the local hillside is within a California Geologic Survey (CGS) Earthquake Zones of Required Investigation (EZRI) landslide zone (CGS, 2019).

Secondary effects of seismic activity normally considered as possible hazards to a site include several types of ground failure. Various general types of ground failures, which might occur as a consequence of severe ground shaking at the site, include ground subsidence, ground lurching and lateral spreading. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, distance from faults, topography, and subsoil and groundwater conditions, in addition to other factors. Based on the relatively shallow, dense formational materials encountered, landsliding and ground lurching are considered unlikely at the site. Due to relatively shallow bedrock materials, the potential for secondary effects to seismic shaking are anticipated to be very low.

Liquefaction Potential and Seismic Flooding

Based on Riverside County maps, the site is located within a Low zone of seismically-related liquefaction hazard. In view of the very dense nature of the existing older alluvial fan soils and relatively shallow bedrock materials underlying the site, it is our opinion that the potential for liquefaction or dynamic settlement of sediments is negligible. Seismically induced flooding that might be considered a potential hazard to a site normally includes flooding due to tsunami or seiche (i.e., a wave-like oscillation of the surface of water in an enclosed basin) that may be initiated by a strong earthquake or failure of a major reservoir or retention structure upstream of the site. The potential for seiche or inundation is considered very low due to the elevation of the project above the adjacent valleys. Because of the inland location of the site, flooding due to a tsunami is considered negligible at the site.

CONCLUSIONS AND RECOMMENDATIONS

Development Feasibility

From a geotechnical engineering and engineering geologic point of view, the proposed development is considered feasible, provided the following conclusions and recommendations are incorporated into the design criteria and project specifications.

Earthwork Recommendations

General Earthwork and Grading Specifications

Earthwork and grading should be performed in accordance with applicable requirements of the Grading and Excavation Code of the County of Riverside, in addition to the provisions of the 2019 CBC. Grading should be performed in accordance with applicable provisions of the attached Standard Grading Specifications (Appendix C) prepared by Petra, unless specifically revised or amended herein.

Geotechnical Observations and Testing

Prior to the start of earthwork, a meeting should be held at the site with the owner, contractor and geotechnical consultant to discuss the work schedule and geotechnical aspects of the grading. Earthwork, which in this instance will generally entail removal and re-compaction of the near surface soils, should be accomplished under full-time observation and testing of the geotechnical consultant. A representative of the project geotechnical consultant should be present onsite during all earthwork operations to document proper placement and compaction of fills, as well as to document compliance with the other recommendations presented herein.

Demolition, Clearing and Grubbing

Clearing operations should include the demolition and removal of any existing improvements as well as all trees, surface vegetation, scattered/dumped trash or any remaining debris. Any cavities created upon removal of any unknown subsurface structures should be cleared of loose soil, shaped to provide access for backfilling and compaction equipment and then backfilled with properly compacted fill.

The project geotechnical consultant should provide periodic observation and testing services during clearing and grubbing operations to document compliance with the above recommendations. In addition, should unusual or adverse soil conditions or buried structures be encountered during grading that are not described herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations.

Unsuitable Soil Removals and Bottom Processing

The existing upper surficial soils, topsoil and portions of the younger alluvial fan deposits are considered unsuitable in their current state for support of proposed fills, structures, flatwork, pavement or other improvements. These materials should be removed to underlying competent alluvial fan soils as approved by the project geotechnical consultant. Based on our initial testing, remedial soil removals should extend

to a depth of at least 4 feet below existing grades. Soil removals may also need to be locally deeper depending upon the exposed conditions encountered during grading and removal operations shall be periodically observed by a geologist or geotechnical engineer during remedial grading operations. All removal bottoms shall be approved by the geologist or engineer prior to in-situ processing for fill placement. In addition to the observation and approval of the removal bottom by the geologist or engineer, the natural soils exposed in the removal bottom excavation should be tested to verify the material exhibits no less than 85 percent in-situ relative compaction with reference to ASTM D1557 and a moisture content at or above optimum moisture. The actual depths and horizontal limits of removals and over-excavations should be evaluated during grading on the basis of observations and testing performed by the project geotechnical consultant.

Following approval of the removal bottom and prior to placing engineered fill, the exposed removal bottoms should be scarified to a minimum depth of 12 inches, moisture-conditioned to achieve at least 1 to 2 percent above optimum moisture content and compacted with a heavy construction equipment prior to placement of fill. Minimum compaction of the upper 12 inches of the removal bottom should meet or exceed 90 percent relative compaction with reference to ASTM D1557. The laboratory maximum dry density and optimum moisture content for each change in soil type should be determined in accordance with test method ASTM D1557.

Remedial Grading

Cut-Fill Transition Lots

Cut/fill transitions should be eliminated from building pad areas to reduce the detrimental effects of differential settlement. This should be accomplished by over-excavating the cut and shallow-fill portions and replacing the excavated materials as properly compacted fill. Horizontal limits of over-excavation should extend across the entire level portion of the lot. Recommended depths of over-excavation are given below.

Depth of Fill	Depth of Over-excavation
Up to 6 feet	4 feet
Greater than 6 feet	One-half of greatest fill depth placed on the "fill" portion; to 15 feet maximum

Cut Lots

Cut lots should be over-excavated to a depth of 4 feet below finish pad grade. This applies to lots constructed in either alluvial soils or bedrock. For lots constructed in bedrock, the removal bottom should be gently

sloped to the street to prevent ponding of water in the fill. A general guideline for determining the fall to the street would be approximately 1 foot from the back of the lot to the street. In areas of hard rock, all loose rock in excess of 4 inches shall be removed from the excavation prior to fill placement.

Shallow Fill Lots

Fill lots should have a minimum fill depth of 4 feet below finish pad grade. Where the depth of fill is less than 4 feet below finish pad grade, the over-excavation should be deepened in those areas to provide for the minimum fill depth of 4 feet.

Benching

Fills placed against excavated slope surfaces inclining at 5:1, (h:v), or steeper, should be placed on a series of level benches excavated into or competent bedrock. These benches should be provided at vertical intervals of approximately 3 to 4 feet. Typical benching details are shown on Plates SG-2, SG-5, SG-6, SG-7 and SG-8 (Appendix C).

General Excavation Characteristics

The existing surficial soils consisting of topsoil and alluvial fan deposits are expected to be readily excavatable with conventional earthmoving equipment and will not require ripping. If oversize rocks (i.e., 12-inches in one dimension or greater) are encountered, they should be properly incorporated in deep fills or disposed of offsite.

Based on our surface observations, highly weathered bedrock near the surface should be generally excavatable with conventional, heavy-duty earthmoving equipment however, deeper cuts into bedrock may require heavy ripping such as a D-9 dozer with a single shank or equivalent. Blasting may also be required in areas of deep cut and/or where corestones or zones of hard rock are encountered. Additionally, deeper utility excavations may be difficult to excavate. Bedrock excavations will generate oversize materials (in excess of 12 inches) that may require special handling and placement.

Temporary Excavations

Based on the physical properties of the onsite soils, temporary excavations which are constructed in natural alluvial soils exceeding 4 feet in height should be cut back to a ratio of 1:1 (h:v) or flatter for the duration of the over-excavation of unsuitable soil material and replacement as compacted fill, as well as placement of underground utilities. Temporary slopes in bedrock may be cut at 0.5:1 (h:v) unless adverse conditions are observed which would necessitate flattening of the slope. The temporary excavations should be

observed by a representative of the project geotechnical consultant for evidence of potential instability. Depending on the results of these observations, revised slope configurations may be necessary. Other factors which should be considered with respect to the stability of the temporary slopes include construction traffic and/or storage of materials on or near the tops of the slopes, construction scheduling, presence of nearby walls or structures on adjacent properties and weather conditions at the time of construction. Applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health act of 1970 and the Construction Safety Act should also be followed.

Subdrains

It is not expected that groundwater or seepage will be encountered during grading; however, localized perched groundwater could be encountered within deeper cuts in bedrock. To mitigate the potential build-up of hydrostatic pressures below compacted fills due to infiltration of surface waters, subdrains should be installed wherever seepage is encountered. Cut slopes should be closely examined for evidence of seepage and the possible need for subdrains at the toe-of-slope. Subdrains, if needed, should be constructed in accordance with the details on Plate SG-1 (Appendix C). A suitable offsite discharge point for the subdrain outlets will need to be provided during grading and the locations and elevations of installed subdrains should be surveyed by the project civil engineer prior to burial.

Suitability of Site Soils as Fill

Site soils are suitable for use in engineered fills provided they are clean from organics and/or debris and rock fragments greater than 12 inches in diameter. Fill material to be placed within the upper 4 feet of building pads should be restricted to 4 inches in rock size.

Fill Placement

Fill materials should be placed in approximately 6- to 8-inch thick loose lifts, watered or air-dried as necessary to achieve optimum moisture condition, and then compacted in-place to no less than 90 percent relative compaction. The laboratory maximum dry density and optimum moisture content for each change in soil type and/or rock content should be determined in accordance with ASTM D1557.

Shrinkage and Bulking

Volumetric changes in earth quantities occur when excavated onsite soil and bedrock materials are replaced as properly compacted fill. Following is an estimate of shrinkage and bulking factors for the various geologic units present onsite. These estimates are based on our experience with the various materials and on the estimated average degree of relative compaction achieved during grading.

- | | |
|-----------------------------|--------------------|
| • Topsoil | Shrinkage 15±% |
| • Younger Alluvial Fan (Qf) | Shrinkage 5 to 10% |
| • Older Alluvial Fan (Qof) | Shrinkage 0 to 5% |
| • Bedrock (Kgr) | Bulking 0 to 5% |

Subsidence from scarification and re-compaction of exposed bottom surfaces in over-excavated alluvial soil areas to receive fill is expected to be on the order of approximately 0.1 foot. Subsidence may be ignored in bedrock cuts.

The above estimates of shrinkage, bulking and subsidence are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occurs during the grading.

Disposal of Oversize Rock

If oversize rock (rock greater than 12 inches in dimension) is encountered, it may be disposed of onsite by placing the rock in the lower portions of the deeper fills in a manner to avoid nesting. Placement of oversize rock should be restricted from the upper 10 feet of building pads, within 15 feet of a slope face, and areas to receive deep utilities.

Where placed in deep fill areas, the oversize rock should be placed individually or in windrows and then completely covered with clean finer-grained (SE equal to or greater than 30), onsite earth materials. The finer-grained materials should be thoroughly watered and rolled to infill voids. A typical rock disposal detail is shown on Plate SG-2 (Appendix C). Oversize rock shall not be placed shallower than 10 feet from pad grade or less than 15 feet, measured horizontally, from a slope face. Petra recommends that rock no greater than 4 inches be placed in the upper 4 feet of the building pad to facilitate excavating for building foundations and utilities.

Import Soils for Grading

As we understand, import soils are not anticipated to be needed to achieve final design grades; however, if needed any import soils should be free of deleterious materials, oversize rock and any hazardous materials. The soils should also be non-expansive and essentially non-corrosive and approved by the project geotechnical consultant *prior* to being brought onsite. The geotechnical consultant should inspect the potential borrow site and conduct testing of the soil at least three days before the commencement of import operations.

Fill Slope Construction

A fill key excavated at a depth of 2 feet or more into competent bedrock is recommended at the base of all new fill slopes. The width of the fill key should equal one-half the slope height or 15 feet, whichever is greater. Typical fill-key construction details are shown on Plates SG-2, SG-5, SG-6 and SG-8 (Appendix C). To obtain proper compaction to the face of fill slopes, low-height fill slopes should be overfilled during construction and then trimmed-back to the compacted inner core. Where this procedure is not practical for higher slopes final surface compaction should be obtained by back-rolling during construction to achieve proper compaction to within 6 to 8 inches of the finish surface, followed by rolling with a cable-lowered sheepsfoot and grid roller. For achieving compaction on the existing ascending fill slopes along the western property boundary, they should be track-walked with a dozer.

The finish surface of the fill slopes should be both grossly and surficially stable to the planned heights at an inclination of 2:1 (h:v); however, based on the granular nature of the soil materials, these slopes may be somewhat erodible. Recommendations for mitigating the potential for surficial erosion is presented in the Slope Landscaping and Maintenance section below.

Cut Slope Construction and Protection

Observations during grading of individual cut slopes by the project engineering geologist to document favorable geologic conditions of the exposed slopes is recommended. The finish surface of cut slope faces should be scaled of any loose rocks and embedded rock fragments prone to raveling. If significant fractured or loose rock is exposed following grading, additional recommendations may be warranted.

Proposed development areas constructed at the base of the proposed cut slopes may be susceptible to mud flows during periods of prolonged rainfall. These lots should be protected with debris walls, debris fences, v-ditches, benches, berms, basins or other protective devices that are designed to re-direct, restrain, or retain any soil or rock from mud and/or debris flow.

Additionally, a moderate to locally high potential for rockfall exists along the northern and eastern edges of the site where the natural ascending bedrock hillsides are located. Consequently, lots located near proposed cuts slopes may need be protected with facilities designed to intercept and contain rock fall as provided by a qualified rockfall engineer. Actual locations are expected to vary depending on supplemental studies by the project rockfall engineer.

Potential for Nuisance Water at Toe of Bedrock Cut Slopes

As with any hillside development with hard bedrock cut slopes transitioning to engineered fill pads, a minor potential exists for nuisance water/seepage to randomly develop near the base of cut slopes during periods of prolonged rains or over-irrigation. If nuisance water/seepage is encountered in the future, mitigation typically involves a toe-of-slope french drain system leading to either the adjacent street or the rear yard area drain system.

Site Drainage

Positive surface drainage systems consisting of a combination of sloped concrete flatwork/asphalt pavement, sheet flow gradients, swales and surface area drains (where needed) should be provided around the building and within the planter areas to collect and direct all surface waters to an appropriate drainage facility as determined by the project civil engineer. The ground surfaces of planter and landscape areas that are located within 10 feet of building foundations should be sloped at a minimum gradient of 5 percent away from the foundations and towards the nearest area drains. The ground surface of planter and landscape areas that are located more than 10 feet away from building foundations may be sloped at a minimum gradient of 2 percent away from the foundations and towards the nearest area drains.

Concrete flatwork surfaces that are located within 10 feet of building foundations should be inclined at a minimum gradient of one percent away from the building foundations and towards the nearest area drains. Concrete flatwork surfaces that are located more than 10 feet away from building foundations may be sloped at a minimum gradient of 1 percent towards the nearest area drains. Surface waters should not be allowed to collect or pond against building foundations and within the level areas of the site. All drainage devices should be properly maintained throughout the lifetime of the development. Future changes to site improvements, or planting and watering practices, should not be allowed to cause over-saturation of site soils adjacent to the structures.

Slope Landscaping and Maintenance

Adequate slope and pad drainage facilities are essential in the design of grading for the subject site. An anticipated rainfall equivalency on the order of 60 to 100 inches per year at the site can result due to irrigation. The overall stability of the graded slopes should not be adversely affected provided drainage provisions are properly constructed and maintained thereafter and provided engineered slopes are landscaped immediately following grading with a deep-rooted, drought-tolerant and maintenance-free plant

species, as recommended by the project landscape architect. Additional comments and recommendations are presented below with respect to slope drainage, landscaping and irrigation.

A common type of slope failure in hillside areas is the surficial instability and usually involves the upper 1 to 6 feet. For a given gradient, these surficial slope failures are generally caused by a wide variety of conditions, such as overwatering, cyclic changes in moisture content and density of slope soils from both seasonal and irrigation-induced wetting and drying, soil expansiveness, time lapse between slope construction and slope planting, type and spacing of plant materials used for slope protection, rainfall intensity and/or lack of a proper maintenance program. Based on this discussion, the following recommendations are presented to mitigate potential surficial slope failures.

- Proper drainage provisions for engineered slopes should consist of concrete terrace drains, down drains and energy dissipaters (where required) constructed in accordance with the Grading Code of the County of Riverside. Provisions should also be made for construction of compacted-earth berms along the tops of engineered slopes.
- Permanent engineered slopes should be landscaped as soon as practical at the completion of grading. As noted, the landscaping should consist of a deep-rooted, drought-tolerant and maintenance-free plant species. If landscaping cannot be provided within a reasonable period of time, jute matting (or equivalent) or a spray-on product designed to seal slope surfaces should be considered as a temporary measure to inhibit surface erosion until such time permanent landscape plants have become well-established.
- Irrigation systems should be installed on the engineered slopes and a watering program then implemented which maintains a uniform, near-optimum moisture condition in the soils. Overwatering and subsequent saturation of the slope soils should be avoided. On the other hand, allowing the soils to dry-out is also detrimental to slope performance.
- Irrigation systems should be constructed at the surface only. Construction of sprinkler lines in trenches should not be allowed without prior approval from the geotechnical engineer and engineering geologist.
- A permanent slope-maintenance program should be initiated for major slopes not maintained by individual homeowners. Proper slope maintenance should include the care of drainage- and erosion-control provisions, rodent control and repair of leaking or damaged irrigation systems.

General Corrosivity Screening

As a screening level study, very limited chemical and electrical tests were performed on near surface samples of onsite soils to identify potential corrosive characteristics of these soils. The following sections present the test results and an interpretation of current codes and guidelines that are commonly used in our

industry as they relate to the adverse impact of chemical contents of the site soils and their associated moisture on various components of the proposed structures in contact with site soils.

A variety of test methods are available to quantify corrosive potential of soils for various elements of construction materials. Depending on the test procedures adopted, characteristics of the leachate that is used to extract the target chemicals from the soils and the test equipment; the results can vary appreciably for different test methods in addition to those caused by variability in soil composition. The testing procedures referred to herein are considered to be typical for our industry and have been adopted and/or approved by many public or private agencies. In drawing conclusions from the results of our chemical and electrical laboratory testing and providing mitigation guidelines to reduce the detrimental impact of corrosive site soils on various components of the structure in contact with site soils, heavy references were made to 2013 CBC and American Concrete Institute, 2011 Structural Concrete Building Code (ACI 318-11). Where relevant information was not available in these codes, references were made to guidelines developed by California Department of Transportation (Caltrans), mainly because their risk tolerance for highway bridges are considered comparable to those for residential or commercial structures and that Post Tensioning Institute (PTI), in part, accepts and uses Caltrans' relevant corrosivity criteria for post-tensioned slabs on-grade.

It should be noted that Petra does not practice corrosion engineering; therefore, the test results, opinion and engineering judgment provided herein should be considered as general guidelines only. Additional analyses would be warranted, especially, for cases where buried metallic building materials (such as copper and cast or ductile iron) in contact with site soils are planned for the project. In many cases, the project geotechnical engineer is not informed of these choices. Therefore, for conditions where such elements are considered, we recommend that the project design professionals (i.e., the architect and/or structural engineer) consider recommending a qualified corrosion engineer to conduct additional sampling and testing of near-surface soils during the final stages of site grading to provide a complete assessment of soil corrosivity. Recommendations to mitigate the detrimental effects of corrosive soils on buried metallic and other building materials that may be exposed to corrosive soils should be provided by the corrosion engineer as deemed appropriate.

Concrete in Contact with Site Soils

Soils containing soluble sulfates beyond certain threshold levels as well as acidic soils are considered to be detrimental to long-term integrity of concrete placed in contact with such soils. For the purpose of this study, soluble sulfates (SO_4) concentration in soils determined in accordance with California Test Method

No. 417. The soil soluble sulfate severity rating is adopted from ACI 318 publication. Soil acidity, as indicated by hydrogen-ion concentration (pH), was determined in accordance with California Test Method No. 643. The soil acid severity rating is adopted from The United States Department of Agriculture, Natural Resources Conservation Service classification.

The results of our very limited in-house laboratory test indicate that on-site soils contain a water-soluble sulfate content of *0.0009 percent by weight*. Based on Article 1904.1 of Section 1904 of the 2013 CBC, concrete that will be exposed to sulfates in site soil should be assigned exposure classes in accordance with the durability requirements of ACI 318.

Based on the test results and in reference to Table 4.2.1 of ACI 318-11, an exposure class of **S0** is appropriate for onsite soils. Accordingly, a severity level of **Not Applicable** for exposure to sulfate may be expected for concrete placed in contact with the onsite soil materials. As such, Table 4.3.1 of ACI 318-11 provides that no restriction for cement type or maximum water-cement ratio for the fresh concrete would be required. However, this table indicates that the concrete minimum unconfined compressive strength should not be less than 2,500 psi.

Further, the results of very limited in-house testing of representative samples indicate that soils within the subject site are slightly alkaline with a *pH of 7.5*. Based on this finding and according to Section 8.22.2 of Caltrans' 2003 Bridge Design Specifications (2003 BDS) requirements (which consider the combined effects of soluble sulfates and soil pH), a commercially available Type II Modified cement may be used.

The guidelines provided herein should be evaluated and confirmed, or modified, in its entirety by the project structural engineer and the contractor responsible for concrete placement for concrete used in exterior and interior footings, interior slabs on-ground, garage slabs, walls foundation and concrete exposed to weather such as driveways, patios, porches, walkways, ramps, steps, curbs, etc.

Metals Encased in Concrete

Soils containing a soluble chloride concentration beyond a certain threshold level are considered corrosive to metallic elements such as reinforcement bars, tendons, cables, bolts, etc. that are encased in concrete that, in turn, is in contact with such soils. For the purpose of this study, soluble chlorides (Cl) in soils were determined in accordance with California Test Method No. 422.

Based on Article 1904.1 of Section 1904 of the 2013 CBC, concrete that will be exposed to chlorides from *“deicing chemicals, salt, saltwater, brackish water, seawater or spray from these sources, where concrete*

has steel reinforcement” should be assigned exposure classes in accordance with the durability requirements of ACI 318. According to Table 4.2.1 of ACI 318-11, an exposure class of **C0** with a severity designation of **Not Applicable** is appropriate for reinforced concrete that remains dry or protected from moisture. Similarly, an exposure class of **C1** with a severity designation of **Moderate** is appropriate for reinforced concrete that is exposed to moisture but not to external sources of chlorides. And, lastly, an exposure class of **C2** with a severity designation of **Severe** is appropriate for reinforced concrete that is exposed to moisture and external sources of chlorides as enumerated above.

Based on our understanding of the project, it is our professional opinion that an exposure class of **C1** with a severity designation of **Moderate** is appropriate for a majority of reinforced concrete, to be placed at the site, that are in contact with site soils. It should be noted, however, that an exposure class of **C2** with a severity designation of **Severe** is more appropriate for reinforced concrete that is planned for pool walls and decking, should such features be considered for the project.

The results of our limited laboratory tests performed indicate that onsite soils contain a water-soluble chloride concentration of *159 parts per million (ppm)*. Article 1904.2 of Section 1904 of the 2013 CBC requires that concrete mixtures conform to the most restrictive maximum water-cementitious material ratios, maximum cementitious admixture, minimum air-entrainment and minimum specified concrete compressive strength requirements of ACI 318 based on the exposure classes assigned in Article 1904.1. No maximum water/cement ratio for the fresh concrete is prescribed by ACI 318 for class **C1** (or **Moderate** severity) exposure condition.

The guidelines provided herein should be evaluated and confirmed, or modified, in its entirety by the project structural engineer for reinforced concrete placement for concrete used in exterior and interior footings, interior slabs on-ground, garage slabs walls foundation and concrete exposed to weather such as driveways, patios, porches, walkways, ramps, steps, curbs, etc.

Metallic Elements in Contact with Site Soils

Elevated concentrations of soluble salts in soils tend to induce low level electrical currents in metallic objects in contact with such soils. This process promotes metal corrosion and can lead to distress to building metallic components that are in contact with site soils. The minimum electrical resistivity measurement provides a simple indication of relative concentration of soluble salts in the soil and, therefore, is widely used to estimate soil corrosivity with regard to metals. For the purpose of this evaluation, the minimum resistivity in soils is measured in accordance with California Test Method No. 643. The soil corrosion severity rating is adopted from the Handbook of Corrosion Engineering by Pierre R. Roberge.

The minimum electrical resistivity for onsite soils was found to be 13,000 ohm-cm based on very limited testing. The result indicates that on-site soils are **Mildly Corrosive** to ferrous metals and copper. As such, any ferrous metal or copper components of the subject buildings (such as cast iron or ductile iron piping, copper tubing, etc.) that are expected to be placed in direct contact with site soils should be protected against detrimental effects of mildly corrosive soils. It should be noted that at this time Petra is not aware of any plans to incorporate such items for the proposed buildings. Should such elements be considered for these building in the future, we recommend that a corrosion engineer to be consulted to provide appropriate recommendations for long term protection of metallic elements in contact with site soils.

GRADING PLAN REVIEW

This report has been prepared for the exclusive use of Walton California, LLC to assist the project design team in the preliminary design of the proposed tentative tract development. It is recommended that Petra be engaged to review the final-design drawings and specifications prior to construction. This is to document that the recommendations contained in this report have been properly interpreted and are incorporated into the project specifications. If Petra is not accorded the opportunity to review these documents, we can take no responsibility for misinterpretation of our recommendations.

As of the date of this report, final grading plans are not available for review. Once the project plans are available we should be retained to review our original design recommendations and their applicability to the proposed construction. If conditions are encountered during construction that appears to be different than those assumed in this report, this office should be notified immediately. Design and construction revisions may be required.

We recommend that Petra be retained to provide soil-engineering services during construction of the excavation and foundation phases of the work. This is to observe compliance with the design, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

REPORT LIMITATIONS

This report is based on the project, as described and the geotechnical data obtained from the preliminary field tests performed and our limited laboratory test data. The materials encountered on the project site and utilized in our laboratory evaluation are believed representative of the total area, however, soil materials and groundwater conditions can vary in characteristics between excavations, both laterally and vertically.

The conclusions and opinions contained in this report are based on the results of the described geotechnical evaluations and represent our professional judgment. The findings, conclusions and opinions contained in this report are to be considered tentative only and subject to confirmation by the undersigned during the construction process. Without this confirmation, this report is to be considered incomplete and Petra or the undersigned professionals assume no responsibility for its use. In addition, this report should be reviewed and updated after a period of 1 year or if the site ownership or project concept changes from that described herein.

The professional opinions contained herein have been derived in accordance with current standards of practice and no warranty is expressed or implied.

Respectfully submitted,

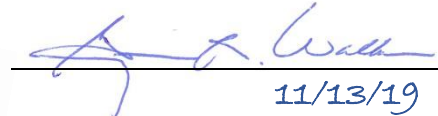
PETRA GEOSCIENCES, INC.



Douglass L. Johnston
Senior Associate Geologist
CEG 2477

DLJ/GRW/lv

Distribution: (1) Addressee (electronic copy)


11/13/19

Grayson R. Walker
Principal Engineer
GE 871



W:\2014-2019\2017\300\17-361 David Evans & Assoc. (Tentative Map 36920, Menifee)\Reports\17-361 110 Preliminary Geotechnical Evaluation (TT 37620).docx

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- _____, 2019, Infiltration Test Results, Proposed Water Quality Basin, Tentative Tract No. 37620, City of Menifee, County of Riverside, California, dated August 2.
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COSTA MESA TEMECULA VALENCIA PALM DESERT CORONA

Site Location Map

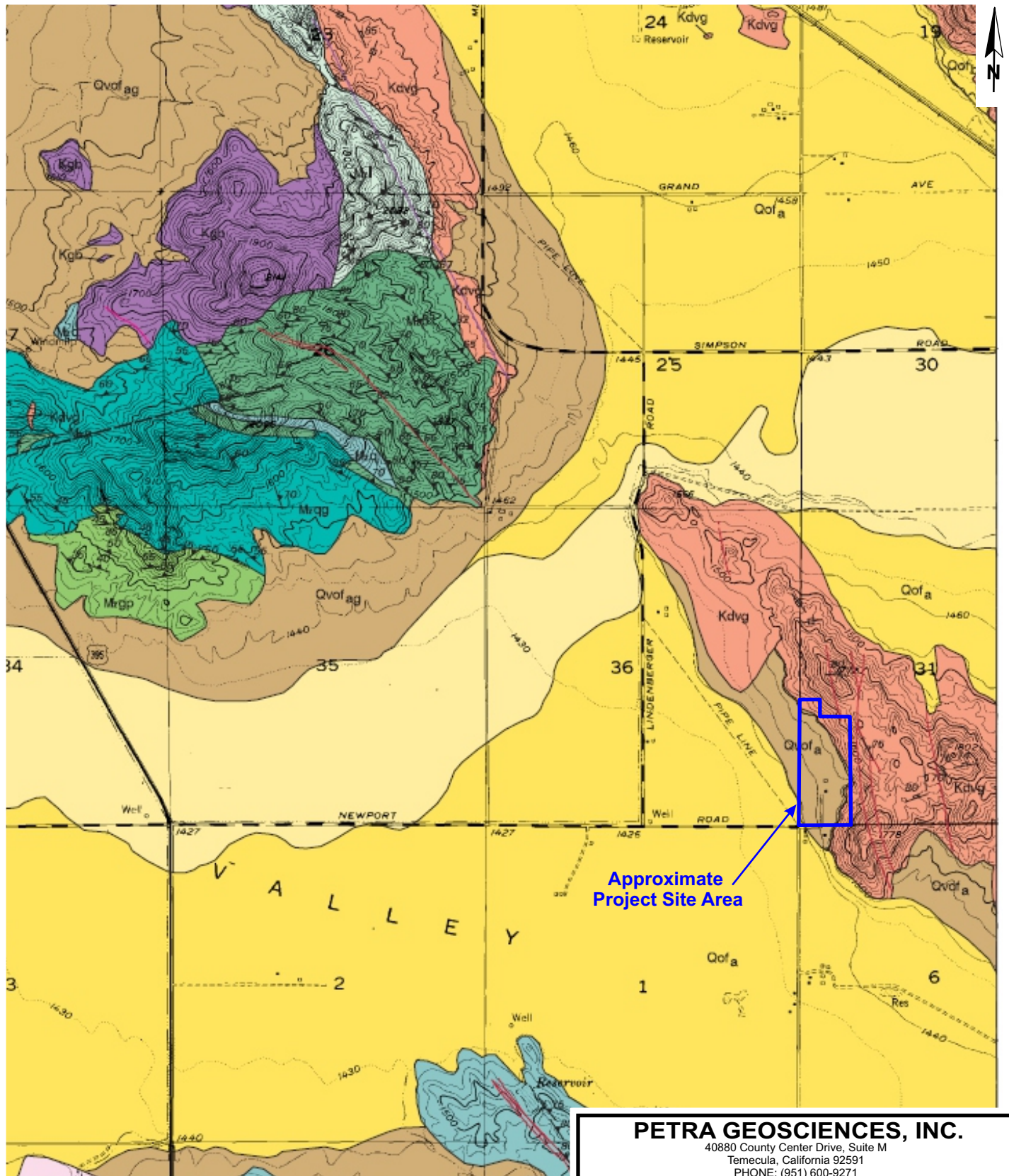
Tentative Tract 37620
Briggs Road at Old Newport Road
Riverside County, California



DATE: November 2019

J.N.: 17-361

Figure 1



Very Old Alluvial Fan Deposits

Cretaceous Granodiorite to Tonalite (Bedrock)

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 Temecula, California 92591
 PHONE: (951) 600-9271
 COSTA MESA TEMECULA SANTA CLARITA PALM DESERT

Geologic Map

Tentative Tract 37620
 Briggs Road at Old Newport Road
 Riverside County, California

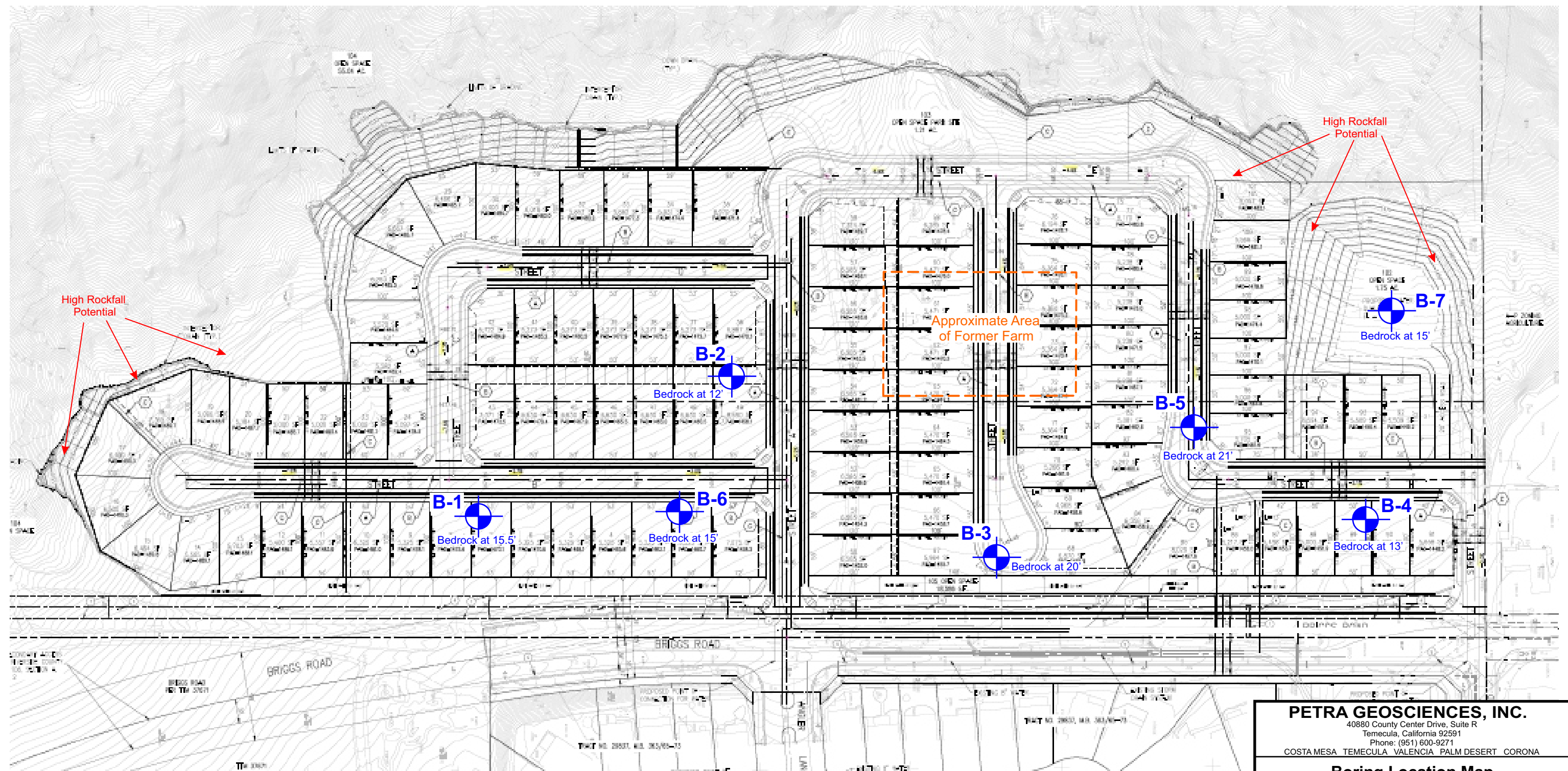


DATE: November 2019

J.N.: 17-361

Figure 2

Reference: Geologic Map of the Romoland 7.5' Quadrangle, U.S.G.S. OFR 03-102



PETRA GEOSCIENCES, INC. 40880 County Center Drive, Suite R Temecula, California 92591 Phone: (951) 600-9271 COSTA MESA TEMECULA VALENCIA PALM DESERT CORONA	
Boring Location Map	
Tentative Tract 37620 Off Briggs Road and Old Newport Road City of Menifee, California	
 PETRA GEOSCIENCES	DATE: November 2019 J.N.: 17-361

Reference: David Evans and Associates, Inc., Tentative Tract No. 37620, Schedule "A", dated September 19, 2019

Figure 3

APPENDIX A

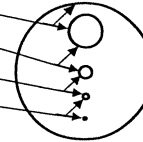
BORING LOGS

Key to Soil and Bedrock Symbols and Terms



Unified Soil Classification System						
Coarse-grained Soils 1/2 of materials is larger than #200 sieve	The No. 200 U.S. Standard Sieve is about the smallest particle visible to the naked eye	GRAVELS more than half of coarse fraction is larger than #4 sieve	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	
			Gravels with fines	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines	
		SANDS more than half of coarse fraction is smaller than #4 sieve	Clean Sands (less than 5% fines)	GM	Silty Gravels, poorly-graded gravel-sand-silt mixtures	
			Sands with fines	GC	Clayey Gravels, poorly-graded gravel-sand-clay mixtures	
		Fine-grained Soils 1/2 of materials is smaller than #200 sieve	The No. 200 U.S. Standard Sieve is about the smallest particle visible to the naked eye	SILTS & CLAYS Liquid Limit Less Than 50	SW	Well-graded sands, gravelly sands, little or no fines
					SP	Poorly-graded sands, gravelly sands, little or no fines
					SM	Silty Sands, poorly-graded sand-gravel-silt mixtures
				SILTS & CLAYS Liquid Limit Greater Than 50	SC	Clayey Sands, poorly-graded sand-gravel-clay mixtures
ML	Inorganic silts & very fine sands, silty or clayey fine sands, clayey silts with slight plasticity					
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays					
Highly Organic Soils	The No. 200 U.S. Standard Sieve is about the smallest particle visible to the naked eye		OL	Organic silts & clays of low plasticity		
			MH	Inorganic silts, micaceous or diatomaceous fine sand or silt		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic silts and clays of medium-to-high plasticity		
			PT	Peat, humus swamp soils with high organic content		

Grain Size			
Description	Sieve Size	Grain Size	Approximate Size
Boulders	>12"	>12"	Larger than basketball-sized
Cobbles	3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	coarse 3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	fine #4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	coarse #10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized
	medium #40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized
	fine #200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized to
Fines	Passing #200	<0.0029"	Flour-sized and smaller



Laboratory Test Abbreviations			
MAX	Maximum Dry Density	MA	Mechanical (Particle Size) Analysis
EXP	Expansion Potential	AT	Atterberg Limits
SO4	Soluble Sulfate Content	#200	#200 Screen Wash
RES	Resistivity	DSU	Direct Shear (Undisturbed Sample)
pH	Acidity	DSR	Direct Shear (Remolded Sample)
CON	Consolidation	HYD	Hydrometer Analysis
SW	Swell	SE	Sand Equivalent
CL	Chloride Content	OC	Organic Content
RV	R-Value	COMP	Mortar Cylinder Compression

Modifiers	
Trace	< 1 %
Few	1 - 5 %
Some	5 - 12 %
Numerous	12 - 20 %

Sampler and Symbol Descriptions	
	Approximate Depth of Seepage
	Approximate Depth of Standing Groundwater
	Modified California Split Spoon Sample
	Standard Penetration Test
	Bulk Sample
	Shelby Tube
	No Recovery in Sampler

Bedrock Hardness	
Soft	Can be crushed and granulated by hand; "soil like" and structureless
Moderately Hard	Can be grooved with fingernails; gouged easily with butter knife; crumbles under light hammer blows
Hard	Cannot break by hand; can be grooved with a sharp knife; breaks with a moderate hammer blow
Very Hard	Sharp knife leaves scratch; chips with repeated hammer blows

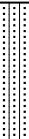
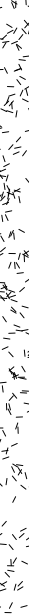
Notes:

Blows Per Foot: Number of blows required to advance sampler 1 foot (unless a lesser distance is specified). Samplers in general were driven into the soil or bedrock at the bottom of the hole with a standard (140 lb.) hammer dropping a standard 30 inches unless noted otherwise in Log Notes. Drive samples collected in bucket auger borings may be obtained by dropping non-standard weight from variable heights. When a SPT sampler is used the blow count conforms to ASTM D-1586

EXPLORATION LOG

Project: Tenative Tract 37620			Boring No.: B-1								
Location: Briggs Road, Menifee			Elevation: +/-1471								
Job No.: 17-361		Client: David Evans & Associates		Date: 10/10/17							
Drill Method: 8" Hollow Stem		Driving Weight: 140lbs/30"		Logged By: KTM							
Depth (Feet)	Lith- ology	Material Description	W A T E R	Samples		Laboratory Tests					
				Blows per 6 in.	C o r e B u l k	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests			
0		TOPSOIL <u>Silty Sand (SM)</u> : Brown, dry, loose, fine-grained sand, with few roots.							SO4, pH, CL, RES Coll.		
4		ALLUVIAL FAN DEPOSITS (Qf) <u>Silty Sand (SM)</u> : Brown, dry, medium dense, fine- to medium-grained sand.		9 9 14						2.8	111.6
				8 11 18						4.1	116.3
8		OLDER ALLUVIAL FAN DEPOSITS (Qof) <u>Silty Sand (SM)</u> : Light brown, dry, very dense, fine- to medium-grained sand. Same as above.		32 50						7.7	109.3
				14 50						5.6	113.3
12		<u>Clayey Sand (SC)</u> : Grayish-brown, moist, dense, fine- to medium-grained sand.		20 27 36						8.4	123.2
				22 50							
16		BEDROCK - Granitics (Kgr) <u>Granodiorite</u> : Bluish-gray, medium- to coarse-grained sand, hard, moderately weathered.									
20		becomes very hard.		50							
24											
		Total Depth- 25'2" No groundwater encountered Boring backfilled with cuttings and tamped.	50								
28											

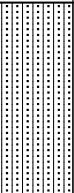
EXPLORATION LOG

Project: Tenative Tract 37620			Boring No.: B-2					
Location: Briggs Road, Menifee			Elevation: +/-1474					
Job No.: 17-361		Client: David Evans & Associates		Date: 10/10/17				
Drill Method: 8" Hollw Stem		Driving Weight: 140lbs/30"		Logged By: KTM				
Depth (Feet)	Lith- ology	Material Description	W A T E R	Samples		Laboratory Tests		
				Blows per 6 in.	C o r e B u l k	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
0		TOPSOIL <u>Silty Sand (SM)</u> : Brown, dry, loose, fine-grained sand.						
4		ALLUVIAL FAN DEPOSITS (Qf) <u>Silty Sand (SM)</u> : Light brown, dry, medium dense, fine- to medium-grained sand.	11 13 24		3.8	117.2	Coll.	
		OLDER ALLUVIAL FAN DEPOSITS (Qof) <u>Silty Sand (SM)</u> : Light brown, dry, very dense, fine- to coarse-grained sand, with trace clay.	50		6.7			
8		<u>Clayey Sand (SC)</u> : Brown, moist, very dense, fine- to medium-grained sand, with trace quartz crystals.		33 50		8.2	113.9	
		Same as above.	20 34 50		10.1	124.4		
12		BEDROCK - Granitics (Kgr) Light brown, very hard, moderately weathered.	50					
		Same as above.	50					
16								
20		Same as above.	50					
24		Same as above.	50					
		Total Depth 25'2" No groundwater encountered Boring backfilled with cuttings and tamped.						
28								

EXPLORATION LOG

Project: Tenative Tract 37620			Boring No.: B-3					
Location: Briggs Road, Menifee			Elevation: +/-1451					
Job No.: 17-361		Client: David Evans & Associates		Date: 10/10/17				
Drill Method: 8" Hollow Stem		Driving Weight: 140lbs/30"		Logged By: KTM				
Depth (Feet)	Lith- ology	Material Description	W A T E R	Samples		Laboratory Tests		
				Blows per 6 in.	C o r e B u l k	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
0		TOPSOIL <u>Silty Sand (SM)</u> : Brown, dry, loose, fine- to coarse-grained sand.						
4		ALLUVIAL FAN DEPOSITS (Qf) <u>Silty Sand (SM)</u> : Brown, dry, loose to medium dense, fine- to medium-grained sand, , Same as above.		5 7 6		3.6	113.7	Coll
		Same as above		5 11 13		4.2	107.8	
		Same as above except with trace coarse- grained sand and very dense.		24 50		4.9	113.0	
8		OLDER ALLUVIAL FAN DEPOSITS (Qof) <u>Clayey Sand (SC)</u> : Brown, dry to slightly moist, very dense, fine- to medium-grained sand, slightly cemented.		24 50		5.6	111.2	
		Same as above except moist.		12 34 50		7.7	126.8	
12								
		Same as above.		14 27 40		10.7	123.5	
16								
20		BEDROCK - Granitics (Kgr) Greenish-light brown, very hard, highly weathered, medium- to coarse-grained.		50				
24								
		No recovery.		50				
	Total Depth-25'3" No groundwater encountered Boring backfilled with cuttings.							
28								

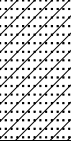
EXPLORATION LOG

Project: Tenative Tract 37620			Boring No.: B-4								
Location: Briggs Road, Menifee			Elevation: +/-1447								
Job No.: 17-361		Client: David Evans & Associates		Date: 10/10/17							
Drill Method: 8" Hollow Stem Auger		Driving Weight: 140lbs/30"		Logged By: KTM							
Depth (Feet)	Lith- ology	Material Description	W A T E R	Samples		Laboratory Tests					
				Blows per 6 in.	C o r e B u l k	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests			
0		TOPSOIL <u>Silty Sand (SM)</u> : Brown, dry, loose, fine- to medium-grained sand.							EI		
4		ALLUVIAL FAN DEPOSITS (Qf) <u>Silty Sand (SM)</u> : Light brown, dry, medium dense to dense, fine- to medium-grained sand. Same as above except with trace coarse grained sand and very dense.		7 13 32						5.0	112.0
				42 50						9.2	117.2
8		Same as above except dense.		16 41 40	6.9	122.0					
		OLDER ALLUVIAL FAN DEPOSITS (Qof) <u>Clayey Sand (SC)</u> : Brown, slightly moist, very dense, fine- to coarse-grained sand.		25 50	6.0	118.8					
12		Same as above except dense.		11 22 50							
		BEDROCK - Granitics (Kgr) Brown, to white, hard, highly weathered, medium- to coarse-grained. Same as above except moderately weathered and very hard.		50							
16											
20		Same as above except gray to white.		50							
24											
		Same as above except darker, moist, and coarse-grained.		50							
		Total Depth- 25'4" No groundwater encountered Boring backfilled with cuttings.									
28											

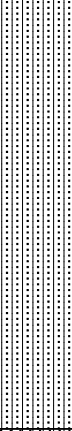
EXPLORATION LOG

Project: Tenative Tract 37620			Boring No.: B-5					
Location: Briggs Road, Menifee			Elevation: +/-1457					
Job No.: 17-361		Client: David Evans & Associates		Date: 10/10/17				
Drill Method: 8" Hollow Stem Auger		Driving Weight: 140lbs/30"		Logged By: KTM				
Depth (Feet)	Lith- ology	Material Description	W A T E R	Samples		Laboratory Tests		
				Blows per 6 in.	C o r e B u l k	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
0		TOPSOIL <u>Silty Sand (SM)</u> : Brown, dry, loose, fine-grained sand.						
		Same as above except medium-dense.		6 9 11		3.4	111.7	CON
4		ALLUVIAL FAN DEPOSITS (Qf) <u>Silty Sand (SM)</u> : Brown, dry, medium dense, fine- to medium-grained sand.		8 7 10		3.2	111.7	
		Same as above except very dense.		32 50		7.9	112.6	
8								
		OLDER ALLUVIAL FAN DEPOSITS (Qof) <u>Clayey Sand (SC)</u> : Reddish-brown, moist, very dense, fine- to medium-grained sand, with trace coarse-grained sand.		21 40 47		8.5	128.3	
12								
		becomes grayish-brown and medium-dense to dense.		16 20 31		8.4	121.7	
16								
		Same as above.		8 30 50				
20		BEDROCK - Granitics (Kgr) Brown, to white, very hard, highly weathered.						
		Total Depth-21'4" No groundwater encountered Boring backfilled with cuttings.						
24								
28								

EXPLORATION LOG

Project: Tenative Tract 37620			Boring No.: B-6						
Location: Briggs Road, Menifee			Elevation: +/-1460						
Job No.: 17-361		Client: David Evans & Associates		Date: 10/10/17					
Drill Method: 8" Hollow Stem Auger		Driving Weight: 140lbs/30"		Logged By: KTM					
Depth (Feet)	Lith- ology	Material Description	W A T E R	Samples			Laboratory Tests		
				Blows per 6 in.	C o r e	B u l k	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
0		TOPSOIL <u>Sand (SP)</u> : Brown, dry, loose, fine- to medium-grained sand, poorly graded.							
4		ALLUVIAL FAN DEPOSITS (Qf) <u>Silty Sand (SM)</u> : Grayish-brown, dry, medium dense, fine- to medium-grained sand. Becomes yellowish-brown. Becomes brown and very dense.		6 9 10			3.0	112.2	Coll.
				7 6 12			3.8	107.7	
8				39 50			5.5	118.2	
				35 50			7.4	117.5	
12		OLDER ALLUVIAL FAN DEPOSITS (Qof) <u>Clayey Sand (SC)</u> : Brown, moist, very dense, medium- to coarse-grained sand.							
16		BEDROCK - Granitics (Kgr) Brown, moist, very hard, highly weathered.			50				
		Total Depth-15'5" No groundwater encountered Boring backfilled with cuttings.							
20									
24									
28									

EXPLORATION LOG

Project: Tenative Tract 37620				Boring No.: B-7				
Location: Briggs Road, Menifee				Elevation: +/-1465				
Job No.: 17-361		Client: David Evans & Associates		Date: 07-23-19				
Drill Method: HSA		Driving Weight:		Logged By: LH				
Depth (Feet)	Lith- ology	Material Description	W A T E R	Samples		Laboratory Tests		
				Blows per 6 in.	C o r e	B u l k	Moisture Content (%)	Dry Density (pcf)
0		ALLUVIAL FAN DEPOSITS (Qf) <u>Silty Sand (SM)</u> : Reddish-brown, slightly moist, loose, fine-grained sand.						
4		same as above.	4 5 7					
8								
12								
16		OLDER ALLUVIAL FAN DEPOSITS (Qof) Reddish-brown, slightly moist, loose, fine-grained sand. same as above.						
20		14 20 18						
24								
28								
32		BEDROCK - Granitics (Kgr) <u>Granite</u> : Olive gray, slightly moist, hard, fine- to coarse-grained.						
36		50						
40								
44								
48		Total Depth-20.5' No groundwater encountered Backfilled.						
52		17 50						
56								
60								

APPENDIX B

LABORATORY TEST PROCEDURES

LABORATORY DATA SUMMARY

LABORATORY TEST PROCEDURES

Soil Classification

Soils encountered within the exploration borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (ASTM D2488). The samples were re-examined in the laboratory and the classifications reviewed and then revised where appropriate.

In-Situ Moisture and Density

Moisture content and unit dry density of in-place soil were determined in representative strata and are depicted on the Exploration Logs, Appendix A

Expansion Index

Expansion index tests were performed on selected samples of soil in accordance with ASTM D4829. The expansion potential classification was determined from 2016 CBC Section 1802.3.2 on the basis of the expansion index value. The test results and expansion potential are presented on Plate B-1.

Soil Corrosivity

Chemical analyses were performed on a selected sample to determine concentrations of soluble sulfate and chloride, as well as pH and resistivity. These tests were performed in accordance with California Test Method Nos. 417 (sulfate), 422 (chloride) and 643 (pH and resistivity). Test results are presented in Plate B-1.

LABORATORY DATA SUMMARY

Expansion Index

Sample Location	Soil Type	Expansion Index	Expansion Potential
B-4 @ 0-5	Silty SAND	2	Very Low

Per ASTM Test Method ASTM D4829

Corrosivity

Sample Location	Sulfate¹ (%)	Chloride² (mg/L)	pH³	Resistivity³ (ohm-cm)	Corrosivity Potential
B-1 @ 0-5	0.0009	159	7.5	13,000	Concrete = negligible Steel = Mild

¹ Per California Test Method CTM 417

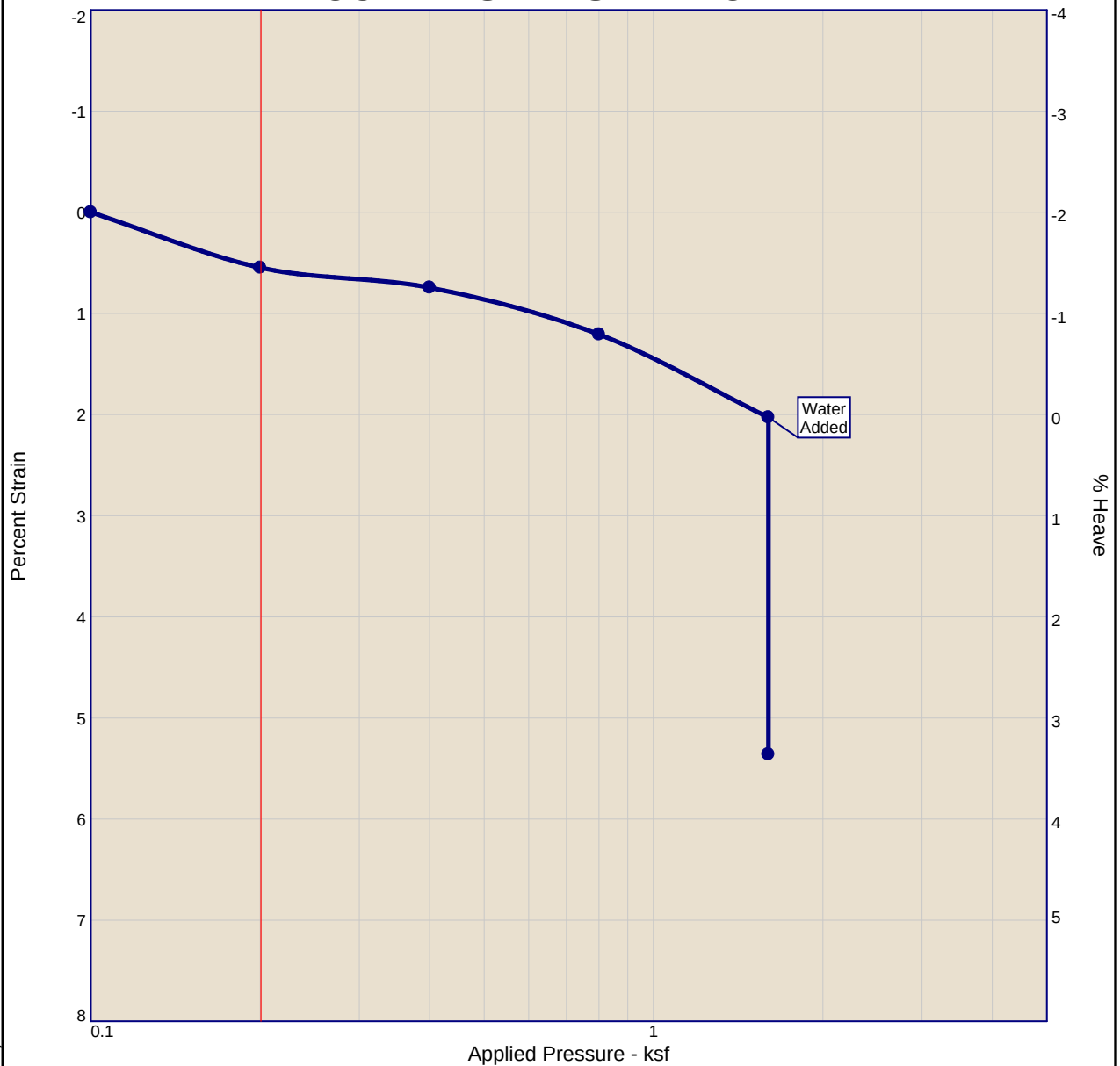
² Per California Test Method CTM 422

³ Per California Test Method CTM 643

Laboratory:

1251 West Pomona Road, Unit #103, Corona, Ca 92882 Phone #: 714.549.8921

COLLAPSE TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	e_0	Swell Press. (ksf)	Heave %	C_r
Sat.	Moist.									
	2.8 %	98.6			2.65	.30			-3.4	

MATERIAL DESCRIPTION									USCS	AASHTO
Brown, Silty fine to medium Sand									SM	

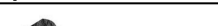
Project No. 17-361		Client: David Evans & Associates		Remarks:
Project: Tentative Map 38920, Menifee				
Source of Sample: B-1		Depth: 3		
				PLATE B-2

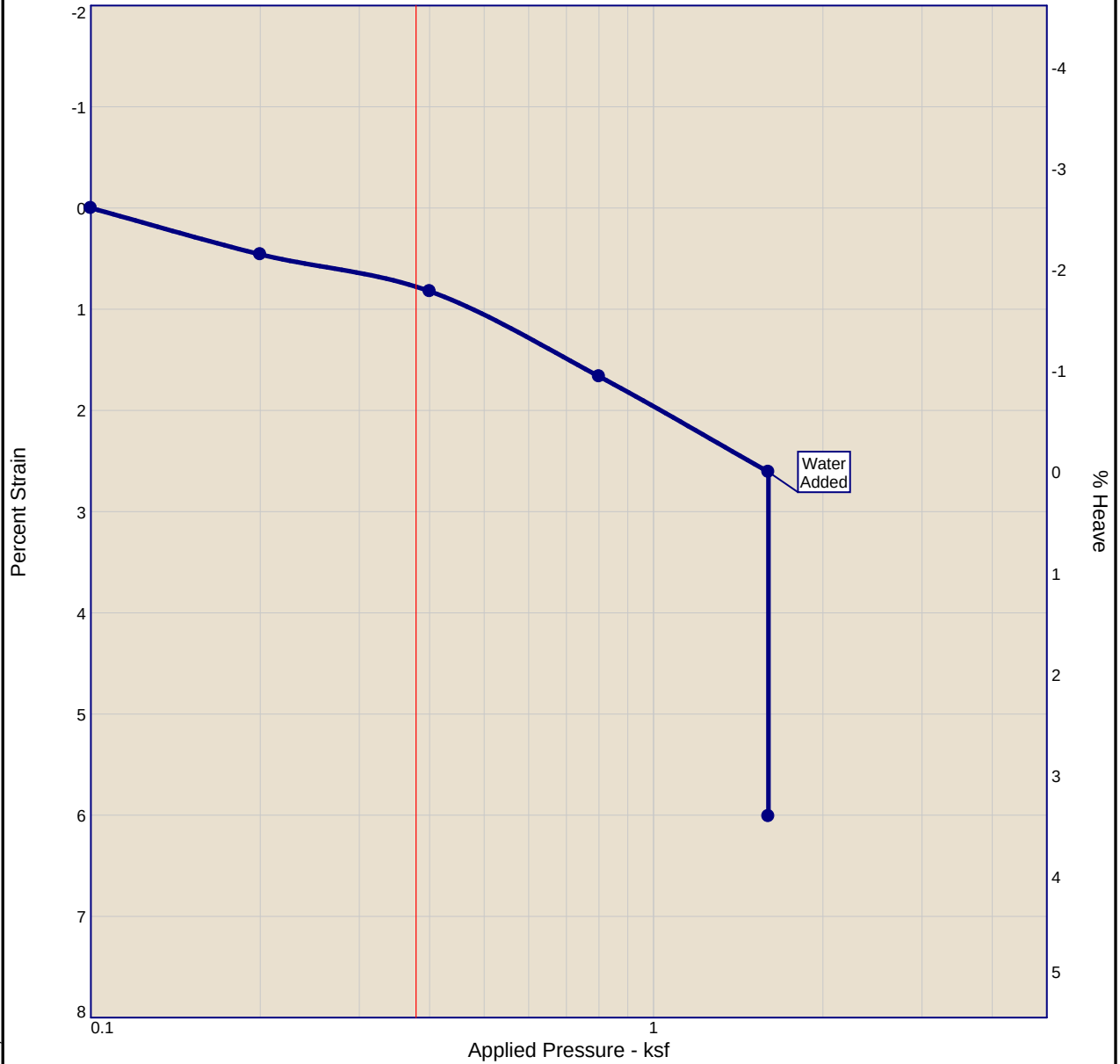


PLATE B-2

Laboratory:

1251 West Pomona Road, Unit #103, Corona, Ca 92882 Phone #: 714.549.8921

COLLAPSE TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	e_0	Swell Press. (ksf)	Heave %	C_r
Sat.	Moist.									
	3.8 %	106.4			2.65	.44			-3.5	

MATERIAL DESCRIPTION									USCS	AASHTO
Brown, Silty fine to medium Sand									SM	

Project No. 17-361		Client: David Evans & Associates		Remarks:
Project: Tentative Map 38920, Menifee				
Source of Sample: B-2		Depth: 4		
				
				PLATE B-3

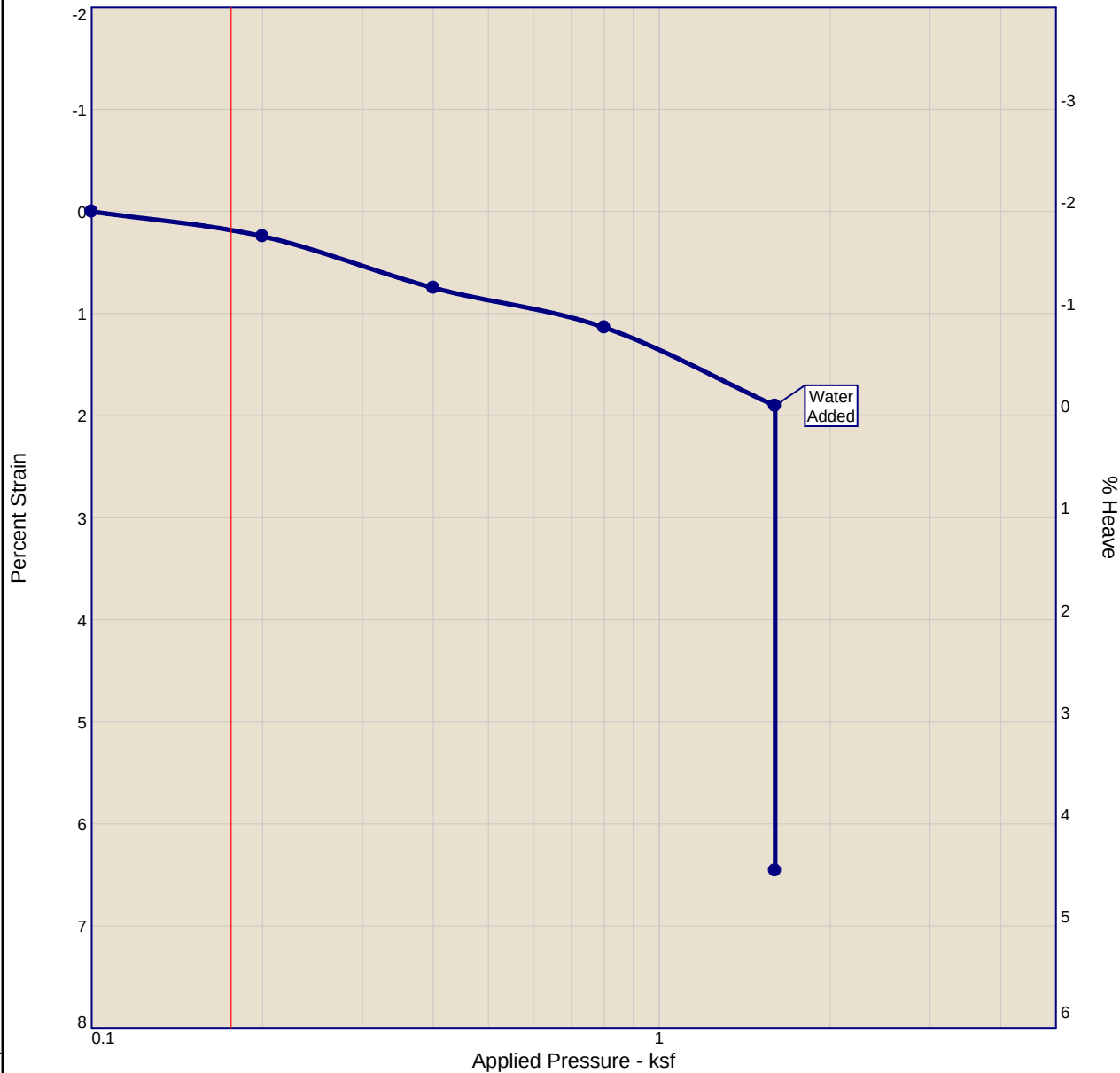


PLATE B-3

Laboratory:

1251 West Pomona Road, Unit #103, Corona, Ca 92882 Phone #: 714.549.8921

COLLAPSE TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	e_0	Swell Press. (ksf)	Heave %	C_r
Sat.	Moist.									
	3.6 %	99.9			2.65	.31			-4.6	

MATERIAL DESCRIPTION									USCS	AASHTO
Brown, Silty fine to medium Sand									SM	

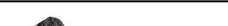
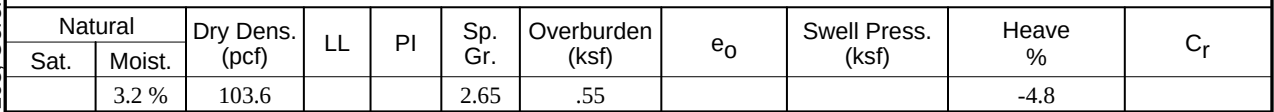
Project No. 17-361		Client: David Evans & Associates		Remarks:
Project: Tentative Map 38920, Menifee				
Source of Sample: B-3		Depth: 3		
				PLATE B-4



PLATE B-4

Laboratory:

1251 West Pomona Road, Unit #103, Corona, Ca 92882 Phone #: 714.549.8921



MATERIAL DESCRIPTION	USCS	AASHTO
Olive brown, Silty fine to medium Sand	SM	

Project No. 17-361	Client: David Evans & Associates
Project: Tentative Map 38920, Menifee	
Source of Sample: B-5	Depth: 5

Remarks:

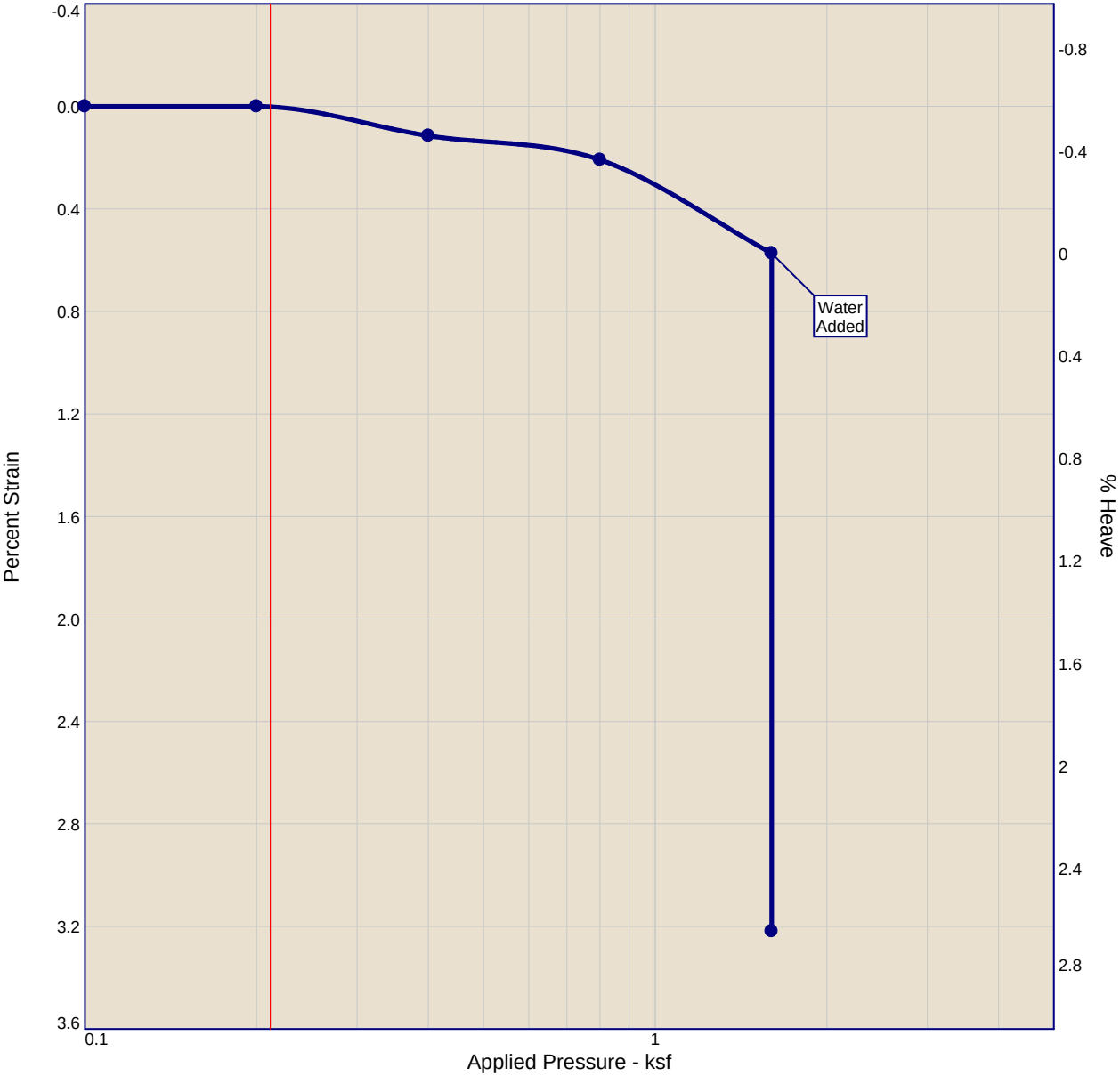
PLATE B-5



Laboratory:

1251 West Pomona Road, Unit #103, Corona, Ca 92882 Phone #: 714.549.8921

COLLAPSE TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	e ₀	Swell Press. (ksf)	Heave %	C _r
Sat.	Moist.									
	3.8 %	104.8			2.65	.54			-2.7	

MATERIAL DESCRIPTION									USCS	AASHTO
Brown, Silty fine to medium Sand									SM	

Project No. 17-361		Client: David Evans & Associates		Remarks:
Project: Tentative Map 38920, Menifee				
Source of Sample: B-6		Depth: 5		
				PLATE B-6

APPENDIX C

STANDARD GRADING SPECIFICATIONS

STANDARD GRADING SPECIFICATIONS

These specifications present the usual and minimum requirements for projects on which Petra Geosciences, Inc. (Petra) is the geotechnical consultant. No deviation from these specifications will be allowed, except where specifically superseded in the preliminary geology and soils report, or in other written communication signed by the Soils Engineer and Engineering Geologist of record (Geotechnical Consultant).

I. GENERAL

- A. The Geotechnical Consultant is the Owner's or Builder's representative on the project. For the purpose of these specifications, participation by the Geotechnical Consultant includes that observation performed by any person or persons employed by, and responsible to, the licensed Soils Engineer and Engineering Geologist signing the soils report.
- B. The contractor should prepare and submit to the Owner and Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" and the estimated quantities of daily earthwork to be performed prior to the commencement of grading. This work plan should be reviewed by the Geotechnical Consultant to schedule personnel to perform the appropriate level of observation, mapping, and compaction testing as necessary.
- C. All clearing, site preparation, or earthwork performed on the project shall be conducted by the Contractor in accordance with the recommendations presented in the geotechnical report and under the observation of the Geotechnical Consultant.
- D. It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Geotechnical Consultant and to place, spread, mix, water, and compact the fill in accordance with the specifications of the Geotechnical Consultant. The Contractor shall also remove all material considered unsatisfactory by the Geotechnical Consultant.
- E. It is the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment will be shut down to permit completion of compaction to project specifications. Sufficient watering apparatus will also be provided by the Contractor, with due consideration for the fill material, rate of placement, and time of year.
- F. After completion of grading a report will be submitted by the Geotechnical Consultant.

II. SITE PREPARATION

A. Clearing and Grubbing

- 1. All vegetation such as trees, brush, grass, roots, and deleterious material shall be disposed of offsite. This removal shall be concluded prior to placing fill.
- 2. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines, etc., are to be removed or treated in a manner prescribed by the Geotechnical Consultant.

STANDARD GRADING SPECIFICATIONS

III. FILL AREA PREPARATION

A. Remedial Removals/Overexcavations

1. Remedial removals, as well as overexcavation for remedial purposes, shall be evaluated by the Geotechnical Consultant. Remedial removal depths presented in the geotechnical report and shown on the geotechnical plans are estimates only. The actual extent of removal should be determined by the Geotechnical Consultant based on the conditions exposed during grading. All soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as determined by the Geotechnical Consultant.
2. Soil, alluvium, or bedrock materials determined by the Soils Engineer as being unsuitable for placement in compacted fills shall be removed from the site. Any material incorporated as a part of a compacted fill must be approved by the Geotechnical Consultant.
3. Should potentially hazardous materials be encountered, the Contractor should stop work in the affected area. An environmental consultant specializing in hazardous materials should be notified immediately for evaluation and handling of these materials prior to continuing work in the affected area.

B. Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide sufficient survey control for determining locations and elevations of processed areas, keys, and benches.

C. Processing

After the ground surface to receive fill has been declared satisfactory for support of fill by the Geotechnical Consultant, it shall be scarified to a minimum depth of 6 inches and until the ground surface is uniform and free from ruts, hollows, hummocks, or other uneven features which may prevent uniform compaction.

The scarified ground surface shall then be brought to optimum moisture, mixed as required, and compacted to a minimum relative compaction of 90 percent.

D. Subdrains

Subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, and/or with the recommendations of the Geotechnical Consultant. (Typical Canyon Subdrain details are given on Plate SG-1).

E. Cut/Fill & Deep Fill/Shallow Fill Transitions

In order to provide uniform bearing conditions in cut/fill and deep fill/shallow fill transition lots, the cut and shallow fill portions of the lot should be overexcavated to the depths and the horizontal limits discussed in the approved geotechnical report and replaced with compacted fill. (Typical details are given on Plate SG-7.)

STANDARD GRADING SPECIFICATIONS

IV. COMPACTED FILL MATERIAL

A. General

Materials excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Geotechnical Consultant. Material to be used for fill shall be essentially free of organic material and other deleterious substances. Roots, tree branches, and other matter missed during clearing shall be removed from the fill as recommended by the Geotechnical Consultant. Material that is spongy, subject to decay, or otherwise considered unsuitable shall not be used in the compacted fill.

Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

B. Oversize Materials

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches in diameter, shall be taken offsite or placed in accordance with the recommendations of the Geotechnical Consultant in areas designated as suitable for rock disposal (Typical details for Rock Disposal are given on Plate SG-4).

Rock fragments less than 12 inches in diameter may be utilized in the fill provided, they are not nested or placed in concentrated pockets; they are surrounded by compacted fine grained soil material and the distribution of rocks is approved by the Geotechnical Consultant.

C. Laboratory Testing

Representative samples of materials to be utilized as compacted fill shall be analyzed by the laboratory of the Geotechnical Consultant to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the Geotechnical Consultant as soon as possible.

D. Import

If importing of fill material is required for grading, proposed import material should meet the requirements of the previous section. The import source shall be given to the Geotechnical Consultant at least 2 working days prior to importing so that appropriate tests can be performed and its suitability determined.

V. FILL PLACEMENT AND COMPACTION

A. Fill Layers

Material used in the compacting process shall be evenly spread, watered, processed, and compacted in thin lifts not to exceed 6 inches in thickness to obtain a uniformly dense layer. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Consultant.

STANDARD GRADING SPECIFICATIONS

B. Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly above optimum moisture content.

C. Compaction

Each layer shall be compacted to 90 percent of the maximum density in compliance with the testing method specified by the controlling governmental agency. (In general, ASTM D 1557-02, will be used.)

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or expansive soils condition, the area to received fill compacted to less than 90 percent shall either be delineated on the grading plan or appropriate reference made to the area in the soils report.

D. Failing Areas

If the moisture content or relative density varies from that required by the Geotechnical Consultant, the Contractor shall rework the fill until it is approved by the Geotechnical Consultant.

E. Benching

All fills shall be keyed and benched through all topsoil, colluvium, alluvium or creep material, into sound bedrock or firm material where the slope receiving fill exceeds a ratio of 5 horizontal to 1 vertical, in accordance with the recommendations of the Geotechnical Consultant.

VI. SLOPES

A. Fill Slopes

The contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes, buttresses, and stabilization fills. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure that produces the required compaction.

B. Side Hill Fills

The key for side hill fills shall be a minimum of 15 feet within bedrock or firm materials, unless otherwise specified in the soils report. (See detail on Plate SG-5.)

C. Fill-Over-Cut Slopes

Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm materials, and the transition shall be stripped of all soils prior to placing fill. (see detail on Plate SG-6).

STANDARD GRADING SPECIFICATIONS

D. Landscaping

All fill slopes should be planted or protected from erosion by other methods specified in the soils report.

E. Cut Slopes

1. The Geotechnical Consultant should observe all cut slopes at vertical intervals not exceeding 10 feet.
2. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be evaluated by the Geotechnical Consultant, and recommendations shall be made to treat these problems (Typical details for stabilization of a portion of a cut slope are given in Plates SG-2 and SG-3.).
3. Cut slopes that face in the same direction as the prevailing drainage shall be protected from slope wash by a non-erodible interceptor swale placed at the top of the slope.
4. Unless otherwise specified in the soils and geological report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.
5. Drainage terraces shall be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Geotechnical Consultant.

VII. GRADING OBSERVATION

A. General

All cleanouts, processed ground to receive fill, key excavations, subdrains, and rock disposals must be observed and approved by the Geotechnical Consultant prior to placing any fill. It shall be the Contractor's responsibility to notify the Geotechnical Consultant when such areas are ready.

B. Compaction Testing

Observation of the fill placement shall be provided by the Geotechnical Consultant during the progress of grading. Location and frequency of tests shall be at the Consultants discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations may be selected to verify adequacy of compaction levels in areas that are judged to be susceptible to inadequate compaction.

C. Frequency of Compaction Testing

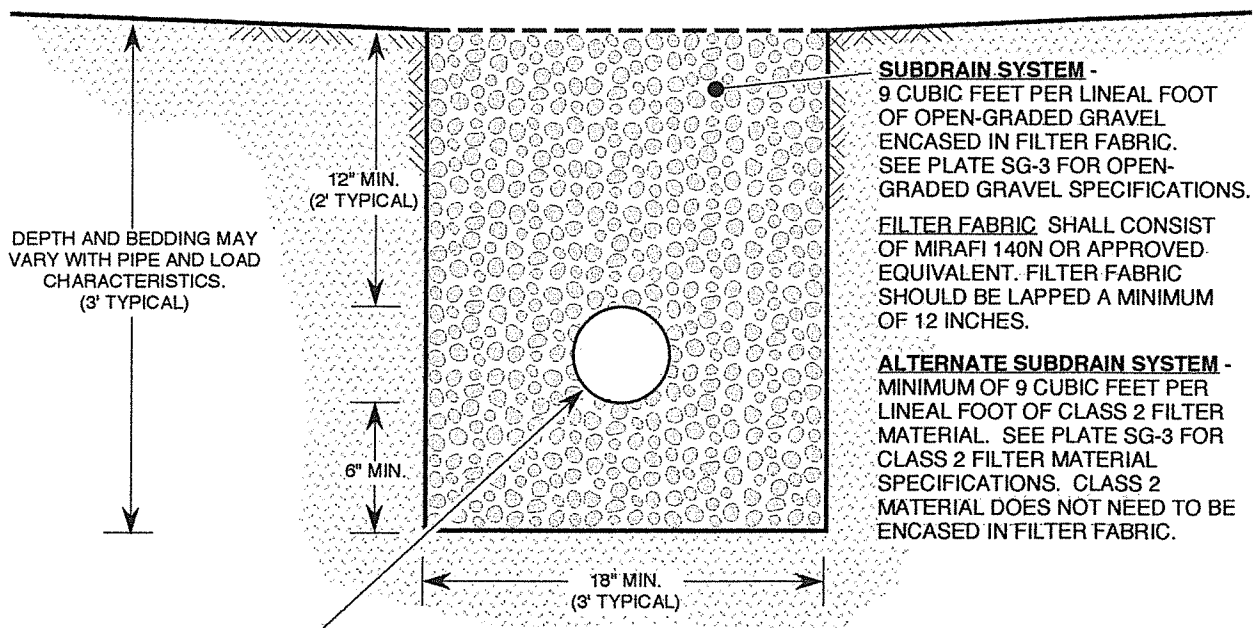
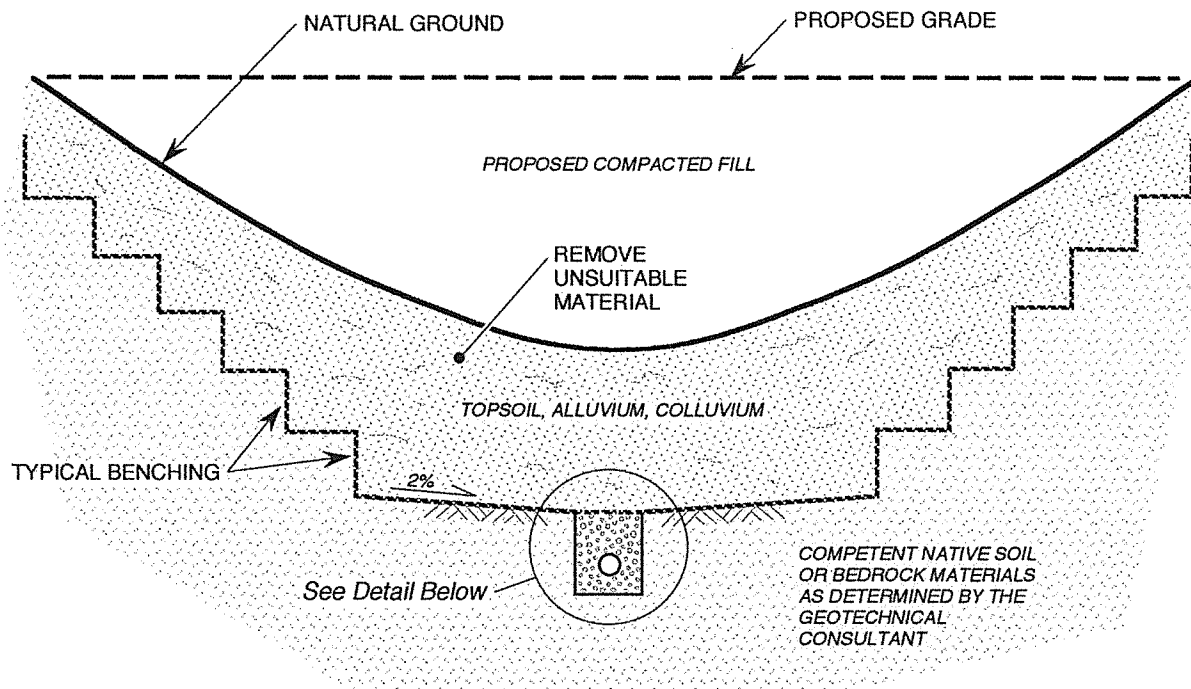
In general, density tests should be made at intervals not exceeding 2 feet of fill height or every 1000 cubic yards of fill placed. This criteria will vary depending on soil conditions and the size of the job. In any event, an adequate number of field density tests shall be made to verify that the required compaction is being achieved.

STANDARD GRADING SPECIFICATIONS

VIII. CONSTRUCTION CONSIDERATIONS

- A. Erosion control measures, when necessary, shall be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.
- B. Upon completion of grading and termination of observations by the Geotechnical Consultant, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Geotechnical Consultant.
- C. Care shall be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of permanent nature on or adjacent to the property.

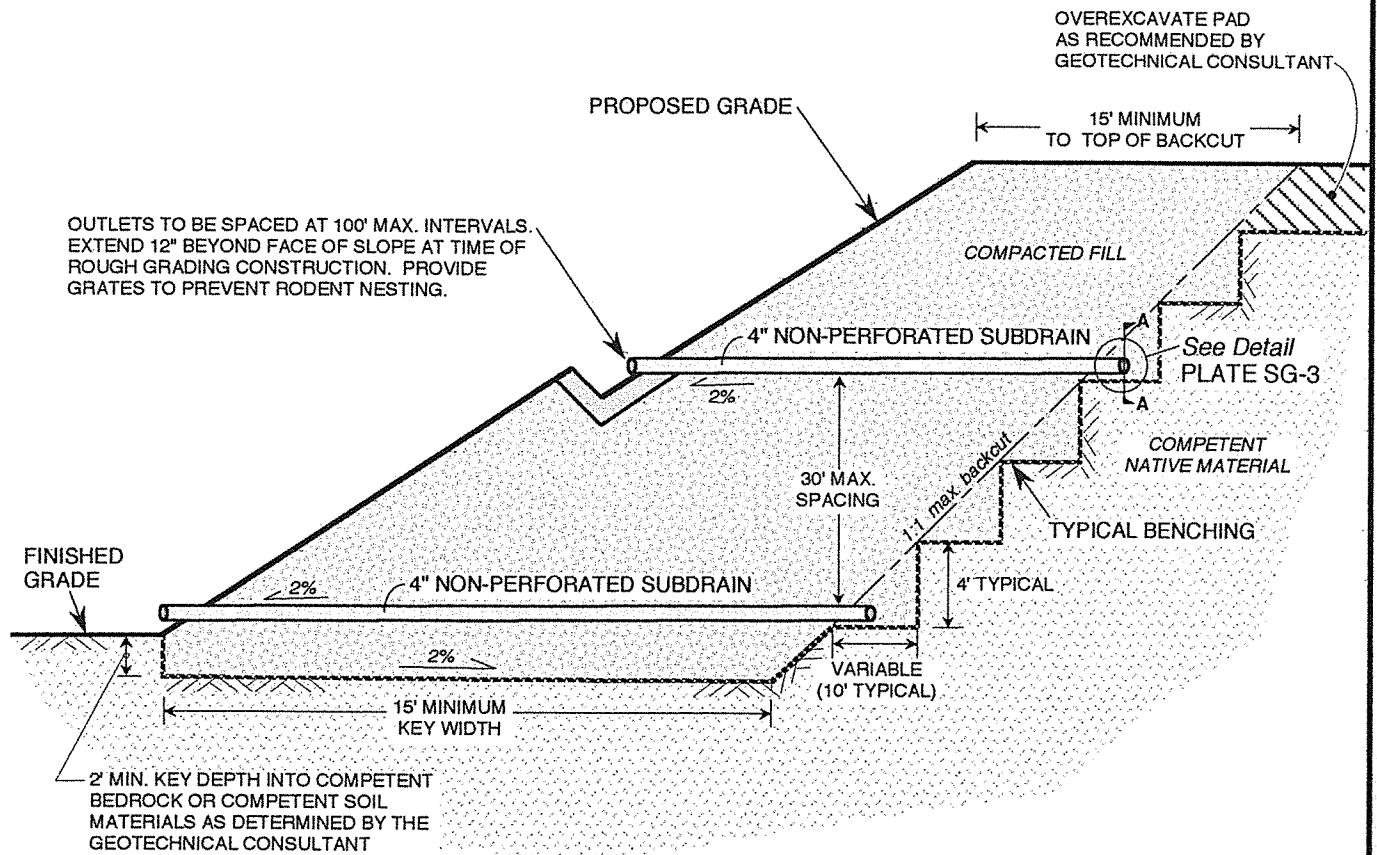
S:\BOILERS-WORK\REPORT INSERTS\STANDARD GRADING SPECS



MINIMUM 6-INCH DIAMETER PVC SCHEDULE 40, OR ABS SDR-35 WITH A MINIMUM OF EIGHT 1/4-INCH DIAMETER PERFORATIONS PER LINEAL FOOT IN BOTTOM HALF OF PIPE. PIPE TO BE LAID WITH PERFORATIONS FACING DOWN.

NOTES:

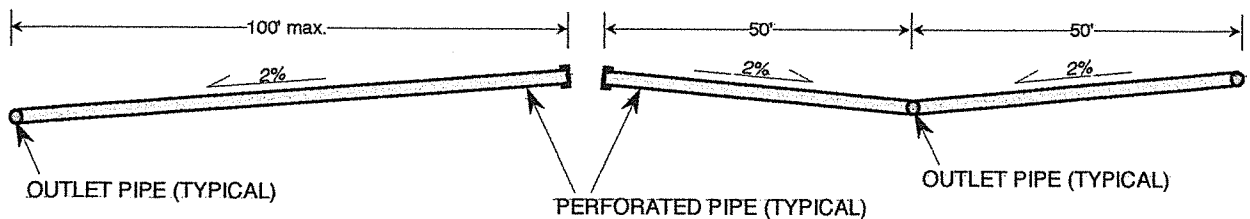
1. FOR CONTINUOUS RUNS IN EXCESS OF 500 FEET USE 8-INCH DIAMETER PIPE.
2. FINAL 20 FEET OF PIPE AT OUTLET SHALL BE NON-PERFORATED AND BACKFILLED WITH FINE-GRAINED MATERIAL.

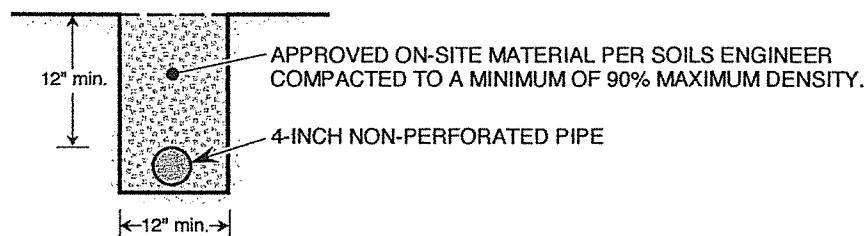
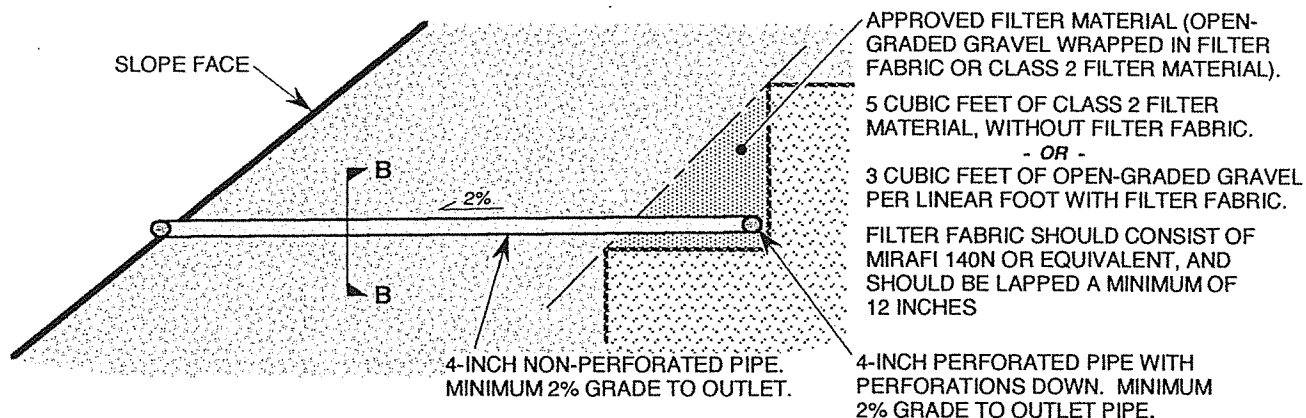


NOTES:

1. 30' MAXIMUM VERTICAL SPACING BETWEEN SUBDRAIN SYSTEMS.
2. 100' MAXIMUM HORIZONTAL DISTANCE BETWEEN NON-PERFORATED OUTLET PIPES. (See Below)
3. MINIMUM GRADIENT OF 2% FOR ALL PERFORATED AND NON-PERFORATED PIPE.

SECTION A-A (PERFORATED PIPE PROFILE)





SECTION B-B (OUTLET PIPE)

PIPE SPECIFICATIONS:

1. 4-INCH MINIMUM DIAMETER, PVC SCHEDULE 40 OR ABS SDR-35.
2. FOR PERFORATED PIPE, MINIMUM 8 PERFORATIONS PER FOOT ON BOTTOM HALF OF PIPE.

FILTER MATERIAL/FABRIC SPECIFICATIONS:

OPEN-GRADED GRAVEL ENCASED IN FILTER FABRIC.
(MIRAFI 140N OR EQUIVALENT)

ALTERNATE:

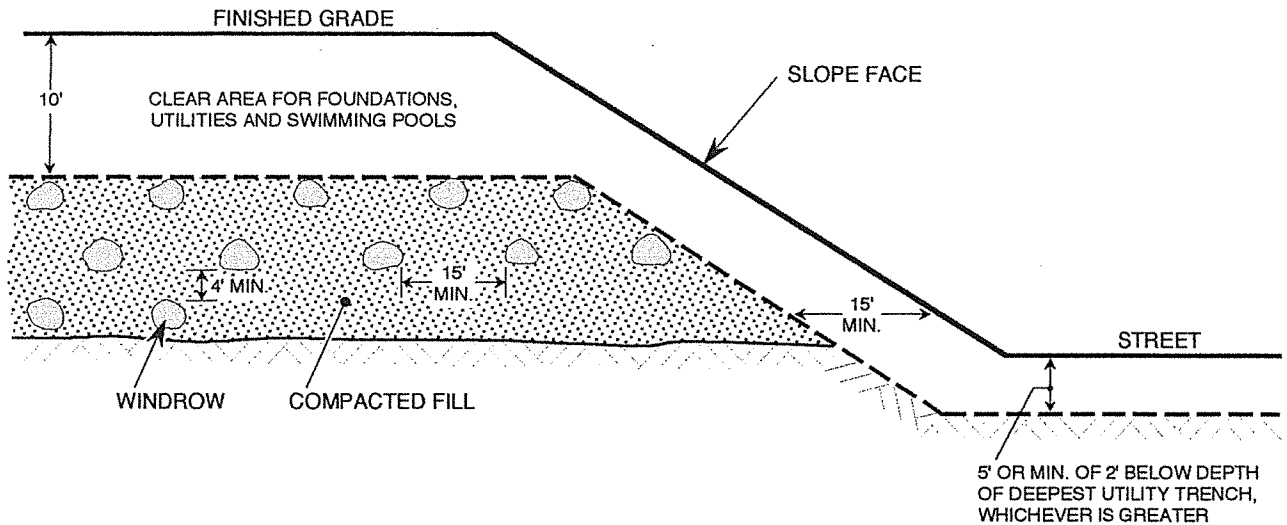
CLASS 2 PERMEABLE FILTER MATERIAL PER CALTRANS
STANDARD SPECIFICATION 68-1.025.

OPEN-GRADED GRAVEL

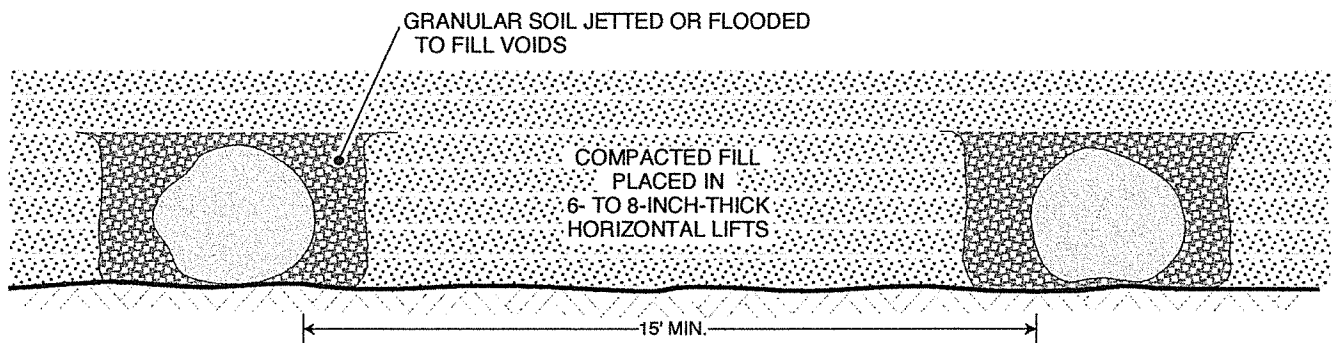
<u>SIEVE SIZE</u>	<u>PERCENT PASSING</u>
1 1/2-INCH	88 - 100
1-INCH	5 - 40
3/4-INCH	0 - 17
3/8-INCH	0 - 7
No. 200	0 - 3

CLASS 2 FILTER MATERIAL

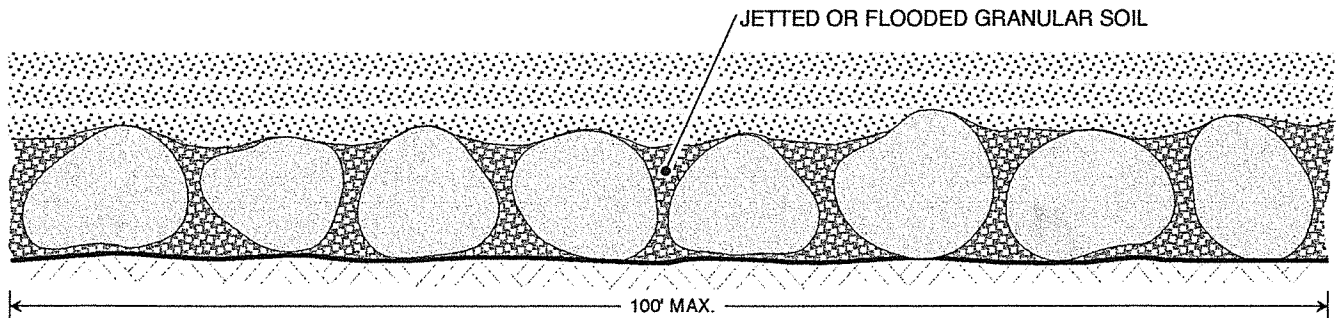
<u>SIEVE SIZE</u>	<u>PERCENT PASSING</u>
1-INCH	100
3/4-INCH	90 - 100
3/8-INCH	40 - 100
No. 4	25 - 40
No. 8	18 - 33
No. -30	5 - 15
No. -50	0 - 7
No. 200	0 - 3



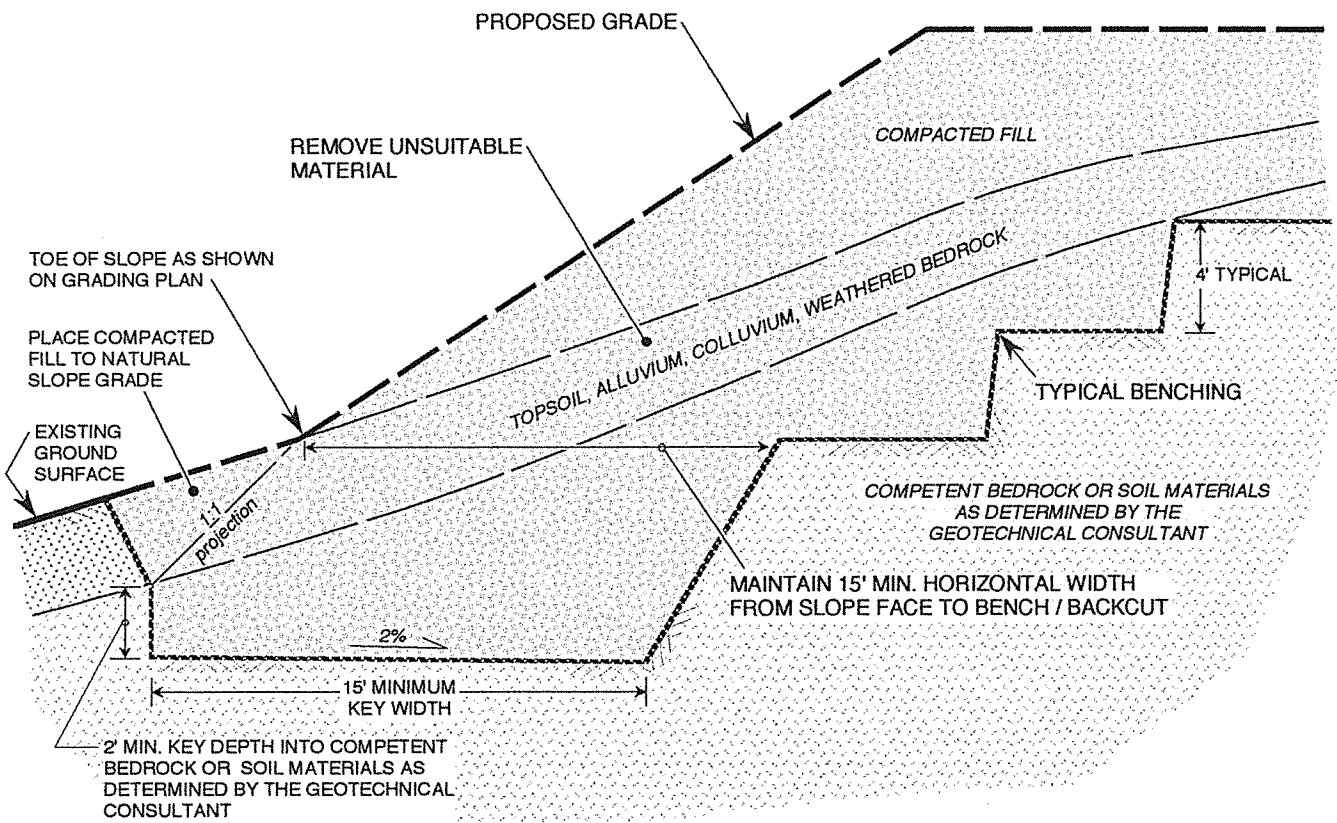
TYPICAL WINDROW DETAIL (END VIEW)



TYPICAL WINDROW DETAIL (PROFILE VIEW)

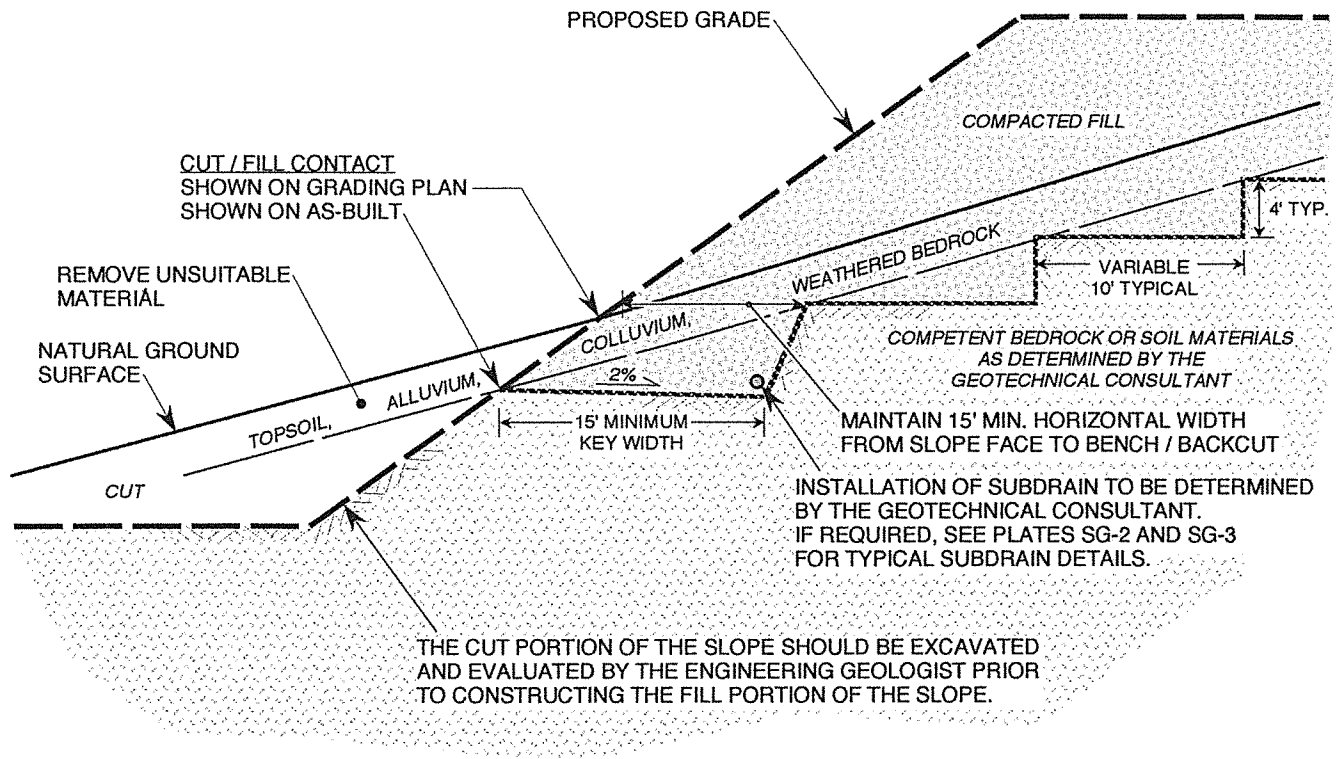


NOTE: OVERSIZE ROCK IS DEFINED AS CLASTS HAVING A MAXIMUM DIMENSION OF 12" OR LARGER

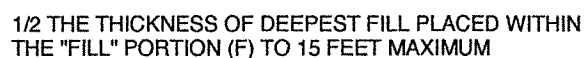


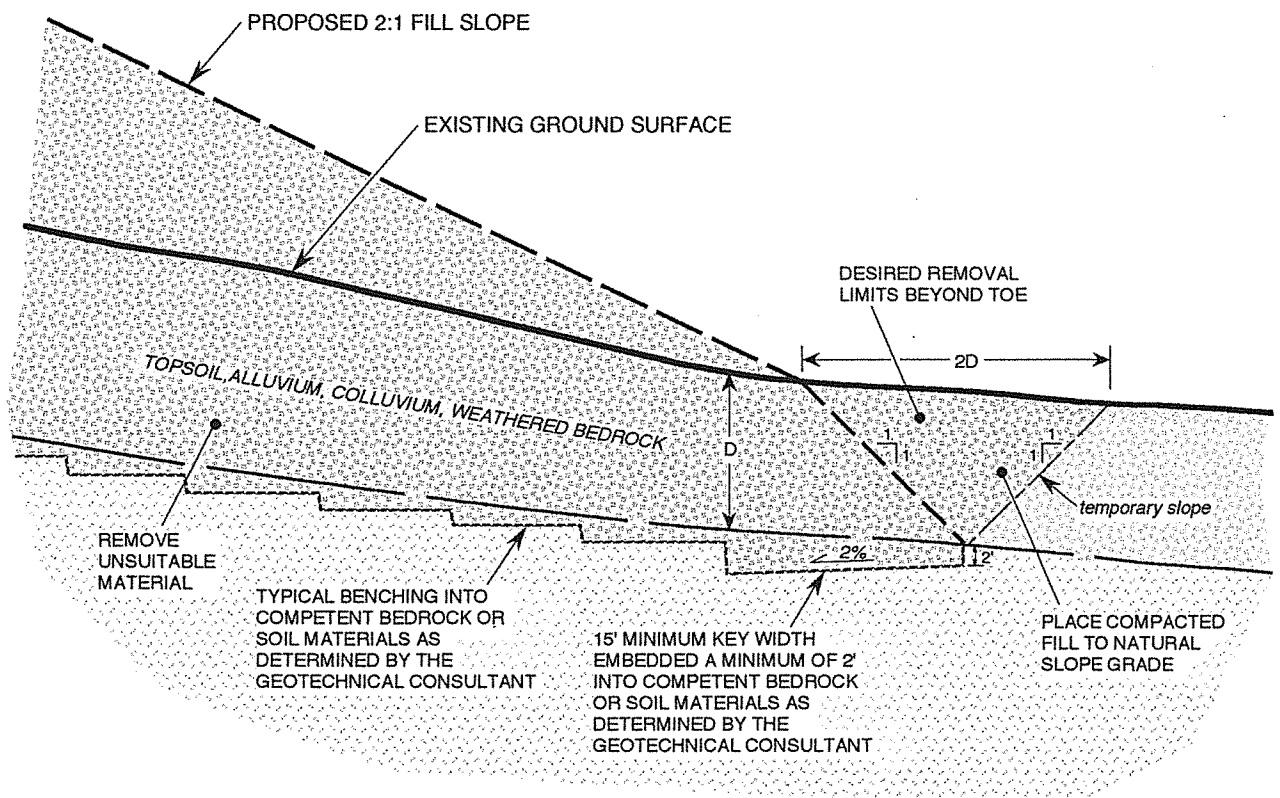
NOTES:

1. WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY; HOWEVER, FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.
2. SOILS ENGINEER TO DETERMINE IF SUBDRAIN IS REQUIRED.

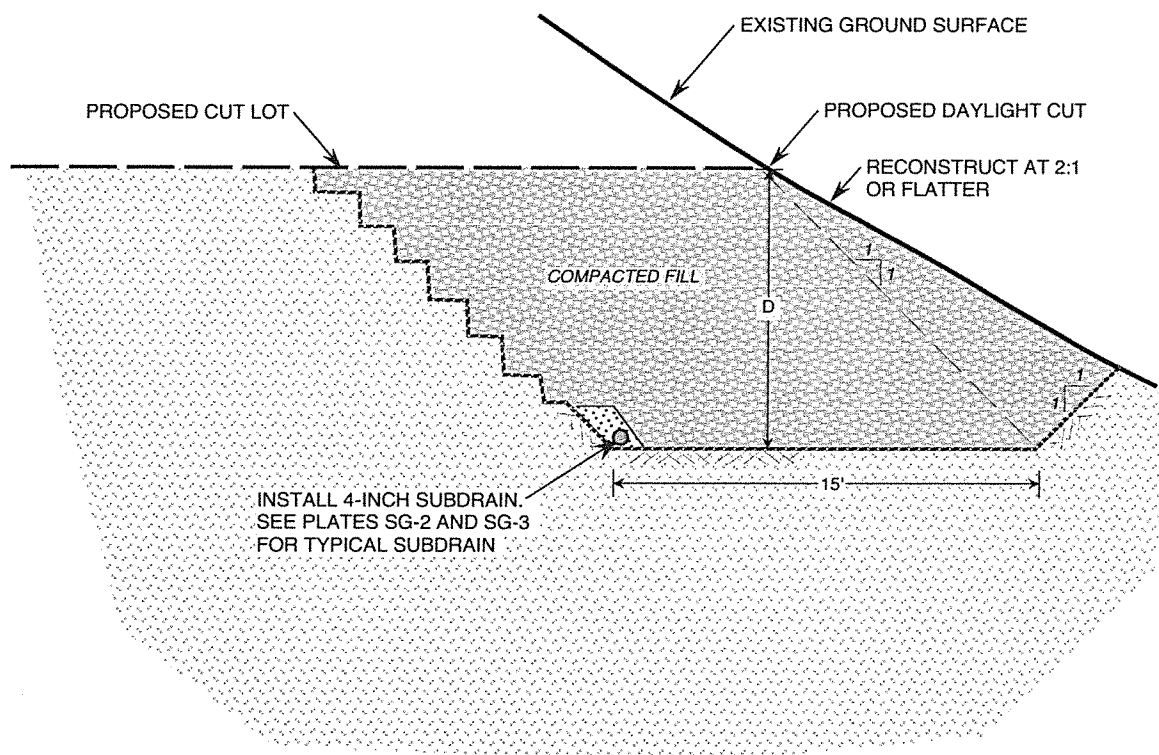


UNSUITABLE MATERIAL EXPOSED IN PORTION OF CUT PAD





D = RECOMMENDED DEPTH OF REMOVAL
PER GEOTECHNICAL REPORT



NOTE:

1. "D" SHALL BE 10 FEET MINIMUM OR AS DETERMINED BY SOILS ENGINEER.

