Appendix G
Preliminary Geotechnical Evaluation (2022)

PRELIMINARY GEOTECHNICAL EVALUATION

FOR

PROPOSED GUAJOME CREST DEVELOPMENT

APN 157-412-15

NORTHEAST OF ALBRIGHT STREET AND GAUJOME LAKE ROAD
OCEANSIDE CALIFORNIA 92008

PREPARED FOR

RINCON HOMES
5315 AVENIDA ENCINAS, SUITE 200
CARLSBAD, CALIFORNIA 92008

PREPARED BY

GEOTEK, INC.
1384 POINSETTIA AVENUE, SUITE A
VISTA, CALIFORNIA 92081

PROJECT NO. 3775-SD **MAY 19, 2022**

GeoTek, Inc.
1384 Poinsettia Avenue, Suite A Vista, CA 92081-8505
(760) 599-0509 Office (760) 599-0593 Fax www.geotekusa.com

May 19, 2022
Project No. 3775-SD

Rincon Homes
5315 Avenida Encinas, Suite 200
Carlsbad, California 92008

Attention: Mr. Cameron St. Clair

Subject: **Preliminary Geotechnical Evaluation**
Proposed Guajome Crest Development
Northeast of Albright Street and Guajome Lake Road
APN 157-412-15
Oceanside, California 92057

Dear Mr. St. Clair:

GeoTek, Inc. (GeoTek) is pleased to provide herein the results of a preliminary geotechnical evaluation for the subject project located in the City of Oceanside, California. This report presents the results of GeoTek's evaluation and provides preliminary geotechnical recommendations for earthwork, foundation design, and construction. Based upon review, site development appears feasible from a geotechnical viewpoint provided that the recommendations included herein are incorporated into the design and construction phases of site development.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call GeoTek.

Respectfully submitted,
GeoTek, Inc.

CERTIFIED ENGINEERING GEOLOGIST
Christopher D. Livesey
2733
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
FARHAD J. BASTANI
No. 79962
Exp.
CIVIL
STATE OF CALIFORNIA

Christopher D. Livesey
CEG 2733
Associate Vice President

Farhad Bastani
RCE 79962
Project Engineer

TABLE OF CONTENTS

TABLE OF CONTENTS

1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the geotechnical conditions of the project site. Services provided for this study included the following:

- Research and review of available geologic and geotechnical data, and general information pertinent to the site.
- Excavation of nine exploratory test pits and collection of bulk soil samples for subsequent laboratory testing.
- Excavation of three auger drilled test holes for subsequent percolation testing.
- Laboratory testing of the soil samples collected during the field investigation.
- Compilation of this geotechnical report which presents GeoTek's findings of pertinent site geotechnical conditions and geotechnical recommendations for site development.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The subject property is located east of Albright Street and north of Guajome Lake Road in the City of Oceanside, California (see Figure 1). The proposed development is limited to within the southern portion of County of San Diego Assessor's Parcel Number 157-412-15, adjacent to 2837 Guajome Lake Road (see Figure 2), herein referred to as the subject site or site. The subject site is bounded to the north by a descending slope to natural drainage where a single family dwelling and detached storage/maintenance building has been built, to the west-northwest and southeast by residential property, and to the south by Guajome Lake Road. A dirt driveway off of Guajome Lake Road provides access across the site. The site is currently vacant with a ridge that divides the property. Topography of the site gently descending from the northeast to the southwest at an approximate 4:1 (horizontal:vertical) and the north side of the ridge descends at an approximate 3:1. Elevations range from 189 feet above mean sea level (msl) at the top of the ridge to an approximate elevation of 141 msl along Guajome Lake Road. Surface drainage is directed towards the southwest and northeast on their respective ridge sides.

2.2 PROPOSED DEVELOPMENT

Based on the preliminary layout plan provided by Pasco Laret Suiter and Associates (PLSA, 2022), proposed improvements include 84 single family residences, a main road circling through the subject property connected to Guajome Lake Road, retaining walls, an open space lot, sidewalk, and two stormwater basins. Assumed improvements are considered to include two-story single family residential buildings, underground wet and dry utilities and landscaping. The building pads range in size between 2,496 and 5,664 square feet. Cuts and fills of up to 24 and 14 feet (respectively) are anticipated with an approximate 67,000 cubic yards of export material. A maximum fill slope of 50 feet is proposed in the north, although it appears to be thin veneer fill slope. A maximum cut slope of 12 feet is proposed in the east portion of the site. The slopes are proposed to be constructed at a 2:1. Retaining walls are proposed to be 5 feet max.

It is anticipated that the residential buildings will be of wood frame construction and will be supported by conventional shallow foundations (continuous and isolated pad) and a conventional slab on-grade or raised-wood floor. For the purposes of this report, it is assumed maximum column and wall loads will be approximately 25 kips and 2 kips per foot, respectively. Once actual loads are known that information should be provided to GeoTek to determine if modifications to the recommendations presented in this report are warranted.

As site planning progresses and additional or revised plans become available, they should be provided to GeoTek for review and comment. If plans vary significantly, additional geotechnical field exploration, laboratory testing and engineering analyses may be necessary to provide specific earthwork recommendations and geotechnical design parameters for actual site development plans.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

GeoTek's field study, conducted on March 29th, 2022, consisted of a site reconnaissance and excavation of nine exploratory test pits with a rubber tracked CAT 305.5E (mini) excavator. Test pits TP-1 through TP-9 were excavated to depths ranging between 6.5 to 8 feet below existing grade. Excavation of three auger borings, P-1 through P-3, to depths ranging between 4 to 5 feet below grade were performed for subsequent percolation testing. A representative from GeoTek visually logged the test pits, collected loose bulk soil samples for laboratory analysis, and transported the samples to GeoTek's laboratory. Percolation tests were performed the following day. Approximate locations of the exploratory test pits and percolation test holes are presented on the Geotechnical Map, Figure 2. A description of material encountered in the test pits is included in Appendix A.

3.2 PERCOLATION TESTING

Three percolation borings (Borings P-1 through P-3) were excavated to depths approximately 50.5 to 55 inches below the existing ground surface. The boring bottom and side walls were scarified and cleaned as feasible of potential drilling fines adhered to the boring walls. The test hole was then filled with potable water to pre-soak. Following overnight pre-soaking, the test holes were filled with water and the drop in water level was recorded every 30 minutes. The test was continued for a minimum of nine readings and the final reading was used in the calculation of the infiltration rate. The field data was converted to an infiltration rate via the Porchet method. Over the lifetime of the storm water disposal areas, the infiltration rates may be affected by silt build up and biological activities, as well as local variations in near surface soil conditions. The rates presented below do not include a factor of safety, the BMP designer should include appropriate factors of safety in their design.

INFILTRATION TEST RESULTS		
Test No.	Approximate Boring Depth (Inches)	Infiltration Rate (Inches per hour)
P-1	55	0.08
P-2	50.5	0.80
P-3	52	0.45

Copies of the percolation data sheets and infiltration conversion sheets (Porchet Method) are included in Appendix A.

3.3 LABORATORY TESTING

Laboratory testing was performed on bulk soil samples collected during the field explorations. The purpose of the laboratory testing was to evaluate their physical and chemical properties for use in engineering design and analysis. Results of the laboratory testing program, along with a brief description and relevant information regarding testing procedures, are included in Appendix B.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The subject property is located in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. It extends roughly 975 miles from the north and northeasterly adjacent the Transverse Ranges geomorphic province to the peninsula of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zones trend northwest-southeast and are found in the near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province. The Newport-Inglewood-Rose Canyon Fault zone meanders the southwest margin of the province. No faults are shown in the immediate site vicinity on the map reviewed for the area.

4.2 EARTH MATERIALS

A brief description of the earth materials encountered during the current subsurface exploration is presented in the following sections. Based on the field observations and review of published geologic maps the subject site is locally underlain by a thin layer of quaternary alluvium over Santiago Formation.

4.2.1 Hydrological Classification

The site is mapped as Los Flores Series which consists of "a member of the fine, montmorillonitic, thermic family of Natric Palexeralfs. Typically, Las Flores soils have light brownish gray, slightly and medium acid, loamy sand A horizons, grayish brown and light brownish gray, slightly acid and neutral, sandy clay B2t horizons grading to weakly consolidated siliceous marine sandstone" (UCDavis, 1997). The hydrologic classification of the Los Flores Series is a Group "D".

4.2.2 Quaternary-age Alluvium (Map Symbol Qal)

Quaternary alluvium was encountered in test pits TP-2 and TP-9 up to 2 feet deep from existing grades. The alluvium consisted of silty fine to medium sand, damp, loose, with some surficial vegetation and roots in the upper 6 inches (SM soil type based upon the Unified Soil Classification System). The alluvium was observed to be slightly porous and unconsolidated. The alluvium was observed to be confined to the natural drainage swales.

4.2.3 Quaternary-age Colluvium (Map Symbol Qcol)

Quaternary colluvium was encountered in test pits TP-1 and TP-3 through TP-8 generally 1-2 feet thick, but was observed to be 3 feet thick at location TP-6. The colluvium consisted of silty fine to medium sand, light brown to dark brown in color, damp to moist, loose, and some surficial vegetation and roots in the upper 6 inches (SM soil type based upon the Unified Soil Classification System, USCS). The colluvium was also observed to be slightly porous and unconsolidated.

4.2.4 Tertiary-age Santiago Formation (Map Symbol Tsa)

Tertiary-age Santiago Formation was encountered in all test pits, to the full depth of exploration, which ranged approximately between 1 and 8 feet below existing grades. This material consisted of fine to coarse sandstone with some gravels (SW soil type based upon USCS), light tan with orange oxidization in color, dry, an increase in density with depth, and quartz rich. The formation was found to be slightly weathered at the upper one foot but became less weathered with depth. All test pits were terminated shallow of maximum equipment reach due to refusal of advancement. Occasional pockets of siltstone (rip up clasts) were interspersed throughout the formation and observed in test pits TP-3 through TP-9.

4.3 SURFACE WATER AND GROUNDWATER

4.3.1 Surface Water

Surface water was not observed during the recent site exploration. If encountered during earthwork construction, surface water on this site will most likely be the result of precipitation. Overall site area drainage is in a southwestern direction. Provisions for surface drainage will need to be accounted for by the project civil engineer.

4.3.2 Groundwater

No groundwater was encountered during exploration of the subject site. Based on the anticipated depth of removals, groundwater is not anticipated to be a factor in site development. Localized perched groundwater may be present but is also not anticipated to be a factor in site development.

4.4 EARTHQUAKE HAZARDS

4.4.1 Surface Fault Rupture

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is not in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an *"Alquist-Priolo"* Earthquake Fault Zone or a Special Studies Zone (Bryant and Hart, 2007). No faults transecting the site were identified on the readily available geologic maps reviewed.

The nearest known active fault is the Newport Inglewood-Rose Canyon fault located about 10.4 miles to the southwest of the site.

4.4.2 Liquefaction/Seismic Settlement

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, consolidation and settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction has developed, the effects can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures.

The liquefaction potential and seismic settlement potential on this site is considered negligible due to the apparent density of the underlying formation and lack of a shallow groundwater table.

4.4.3 Other Seismic Hazards

The potential for landslides and rockfall is considered negligible. The potential for secondary seismic hazards such as seiche and tsunami is remote due to site elevation and distance from an open body of water.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Development of the site appears feasible from a geotechnical viewpoint provided that the following recommendations are incorporated in the design and construction phases of the development. The following sections present general recommendations for currently anticipated site development plans.

5.2 EARTHWORK CONSIDERATIONS

5.2.1 General

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of Oceanside, the 2019 (or current) California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix C outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix C.

5.2.2 Site Clearing and Preparation

Site preparation should start with removal of deleterious materials, vegetations, and trees/shrubs in the proposed improvement areas. These materials should be disposed of properly off site. Any existing underground improvements, utilities and trench backfill should also be removed or be further evaluated as part of site development operations.

5.2.3 Remedial Grading

Prior to placement of fill materials and in all structural areas, the upper variable, potentially compressible materials should be removed. Removals should include at a minimum all alluvium and colluvium and the upper 2 to 3 feet of weathered Santiago Formation below existing grade. Based on the explored locations, and average removal depth of 3 feet from existing grades may be anticipated, but does not include stabilization fill keys. The bottom of the removals should be observed by a GeoTek representative prior to processing the bottom for receiving placement of compacted fills. Depending on actual field conditions encountered during grading, locally deeper and/or shallower areas of removal may be necessary.

Prior to fill placement, the bottom of all removals should be scarified to a minimum depth of six (6) inches, moisture conditioned to slightly above optimum moisture content, and then compacted to at least 90% of the soil's maximum dry density as determined by ASTM D1557 test procedures. The resultant voids from remedial grading/over-excavation should be filled with materials placed in general accordance with Section 5.2.6 Engineered Fill of this report.

5.2.4 Cut/Fill Transition Lots

Grading may result in a cut/fill transition at the proposed building pad finish grades. If a geologic contact of Santiago bedrock against fills is encountered at finish pad grades, the cut portion should be over-excavated a minimum of three feet below pad grades and replaced with engineered fill.

5.2.5 Cut Lots

Lots wholly excavated in a cut condition exposing sandstone of the Santiago Formation may remain as a cut lot, however, this may pose difficult excavation during post-grading and inhibit landscape growth.

5.2.6 Engineered Fill

Onsite materials are generally considered suitable for reuse as engineered fill provided they are free from vegetation, roots, debris, and rock/concrete or hard lumps greater than six (6) inches in maximum dimension. The earthwork contractor should have the proposed excavated materials to be used as engineered fill at this project approved by the soils engineer prior to placement.

Engineered fill materials should be moisture conditioned to at or above optimum moisture content and compacted in horizontal lifts not exceeding 8 inch in loose thickness to a minimum relative compaction of 90% as determined by ASTM D1557 test procedures.

If fill is being placed on slopes steeper than 5:1 (horizontal : vertical), the fill should be properly benched into the existing slopes and a sufficient size keyway shall be constructed in accordance with grading guidelines presented in Appendix C.

5.2.7 Slope Construction

An engineering geologist should observe all cut slopes. Cut slopes should expose competent bedrock. If adverse structure or unsuitable materials are exposed and identified in the cut slopes, stabilization fills may be recommended.

Where fill is to be placed against sloping ground with gradients of 5:1 (h:v) or steeper, the sloping ground surface should be benched to provide horizontal surfaces for fill placement. A keyway should be constructed at the toe of the fill slope areas into dense natural material and in accordance with Plate G-3, Appendix C.

The base of the keyways and benches should be sloped back into the hillside at a gradient of at least two percent. The base of the benches should be evaluated by a representative of GeoTek prior to processing. Upon approval, the exposed materials should be moistened to at least the optimum moisture content and densified to a relative compaction of at least 90 percent (ASTM D1557). Details showing slope construction are presented in Appendix C.

Fill slopes should be overfilled during construction and then cut back to expose compacted soil. A suitable alternative would be to compact the slopes during construction and then roll the final slope to provide a dense, erosion resistant surface.

Back drains should be installed in the keyways in accordance with the recommendations outlined in Appendix C.

5.2.8 Excavation Characteristics

Excavations in the onsite materials can generally be accomplished with heavy-duty earthmoving or excavating equipment in good operating condition. The upper zone of the Santiago Formation is anticipated to be rippable with conventional heavy earth moving equipment in good working order. As mentioned in Section 5.2.5, lots wholly excavated in a cut condition exposing sandstone of the Santiago Formation may pose difficult excavation during post-grading and inhibit landscape growth.

5.2.9 Shrinkage and Bulking

Several factors will impact earthwork balancing on the site, including undocumented fill shrinkage, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage and bulking are largely dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage factor of 5 percent may be considered for fills generated from alluvial and colluvial sources. For excavations in the sandstone, a bulking factor of 10 percent may be considered. Subsidence should not be a factor on the subject site due to the presence of bedrock if removals are completed as recommended.

5.2.10 Trench Excavations and Backfill

Temporary excavations within the onsite materials should be stable at 1:1 inclinations for short durations during construction, and where cuts do not exceed 10 feet in height. Temporary cuts to a maximum height of 4 feet can be excavated vertically.

Trench excavations should conform to Cal-OSHA regulations. The contractor should have a competent person, per OSHA requirements, on site during construction to observe conditions and to make the appropriate recommendations.

Utility trench backfill should be compacted to at least 90% relative compaction of the maximum dry density as determined by ASTM D1557 test procedures. Under-slab trenches should also be compacted to project specifications.

Onsite materials may not be suitable for use as bedding material but should be suitable as backfill provided particles larger than 6± inches are removed.

Compaction should be achieved with a mechanical compaction device. Ponding or jetting of trench backfill is not recommended. If backfill soils have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.3 DESIGN RECOMMENDATIONS

5.3.1 Stormwater Infiltration

Many factors control infiltration of surface waters into the subsurface, such as consistency of native soils and bedrock, geologic structure, fill consistency, material density differences, and existing groundwater conditions.

The hydrological unit as mapped by the USDA is a group "D". Percolation testing and infiltration analysis indicates that the site could be considered to be classified as a hydrological group B, which consist of soils that are deeper than 40 inches to a water impermeable layer and a water table are in group B if the saturated hydraulic conductivity of all soil layers within 40 inches of the surface is between 0.57 and 1.42 inches per hour.

The percolation tests were performed in areas of natural drainage. Drainage environment characteristics should not be correlated to colluvial or Santiago Formation. Areas outside alluvial areas in drainage swales are considered to be consistent with hydrological group "D".

Discussions were performed with the BMP design team (PLSA), regarding proposed locations. No reasonable alternative design location is feasible, from the locations presented on Figure 2. GeoTek has reviewed mandatory consideration and optional considerations as recommended in the City of Oceanside BMP design Manual and are outlined as follows:

5.3.1.1 Is the BMP within 100 feet of contaminated soils.

A review of GeoTracker.com, did not present a source of uncontrolled contaminant release within 100 feet of the proposed BMP basins.

5.3.1.2 Is the BMP within 100 feet of industrial activities lacking source control.

A review of GeoTracker.com, did not present a source of uncontrolled contaminant release within 100 feet of the proposed BMP basins.

5.3.1.3 Is the BMP within 100 feet of well/groundwater basin

A review of Geotracker.com and California Water Resources Board interactive well and groundwater maps did not identify well or groundwater data information on or nearby the site. Groundwater was not encountered in during GeoTek's field exploration.

5.3.1.4 Is the BMP within 50 feet of septic tanks/leach fields.

Based on a review of the site and historical aerial and satellite imagery, septic tanks/leach fields are not anticipated to be within 50 feet of the BMPs nor on site.

5.3.1.5 Is the BMP within 10 feet of structures/tanks/walls

Based on the proposed development, the BMP is not located within 10 feet of structures/tanks/walls. It is common for basins to require retaining walls, if progressive design includes walls within 10 feet of the basin, a no infiltration is recommended.

5.3.1.6 Is the BMP within 10 feet of sewer utilities.

The proposed BMP is within 10 feet of a street. Sewer utilities have not yet been design, but ar not always along the center of a street's alignment.

5.3.1.7 Is the BMP within 10 feet of groundwater.

Groundwater was not encountered in during GeoTek's field exploration. Near the proposed BMPs to depths explored of 6.5 feet below existing groundsurface. Considering the grades at the proposed basin are elevated and a typical five foot bottom of basin, no groundwater is anticipated to be present within ten feet of the BMP.

5.3.1.8 Is the BMP within hydric soils

Hydric soils are environments where low oxygen soil environment exists due to long term saturation of soils. Sloping topography of the site does not provide an environment that promotes hydric soils.

5.3.1.9 Is the BMP within highly liquefiable soils and has connectivity to structures.

Santiago formational soils are within the near surface and are not susceptible to liquefaction.

5.3.1.10 Is the BMP within 1.5 times the height of adjacent steep slopes (≥25%).

The BMP is located within 1.5 times the height of an adjacent steep slope.

5.3.1.11 Has City staff assigned "Restricted" infiltration category.

GeoTek is not aware that City staff have assigned a restricted infiltration category to the site.

5.3.1.12 Is the BMP within fill depths of $\geq$5 feet (existing or proposed).

In the areas of the BMPs remedial grading quantities of approximately three feet plus design fills of seven feet for a fill column of ten feet. Anticipating a bottom of basin depth of five feet, there is still approximately five feet of structural fills underneath the BMP.

GeoTek does not recommend full or partial infiltration. Concentrated infiltration of surface waters has the potential to change the soil strength and unit weight which can result in an increase of seepage forces to the fill slopes within the subject site. These adverse effects can increase risk of slope instability. We recommend filtration of stormwater in lieu of infiltration.

5.3.2 Foundation Design Criteria

Preliminary foundation design criteria, in general conformance with the 2019 CBC, are presented herein. These are typical design criteria and are not intended to supersede the design by the structural engineer. The preliminary recommendations presented below.

Based on visual classification of materials encountered onsite and as verified by laboratory testing, site soils are anticipated to exhibit a "very low" (EI < 20) expansion index per ASTM D4829. Additional laboratory testing should be performed at the time of supplemental geotechnical evaluations and upon completion of site grading to verify the expansion potential and plasticity index of the subgrade soils. The following criteria for design of foundations are preliminary. Additional laboratory testing of the samples obtained during grading should be performed and final recommendations should be based on as-graded soil conditions.

DESIGN PARAMETERS FOR CONVENTIONALLY REINFORCED SHALLOW FOUNDATIONS		
DESIGN PARAMETER	DESIGN PARAMETERS FOR TYPICAL 2-STORY FOUNDATION	DESIGN PARAMETERS FOR TYPICAL 2-STORY FOUNDATION
Expansion Potential	"Very Low" Expansion Potential (EI ≤ 20)	"Low" Expansion Potential (21 ≤ EI ≤ 50)
Foundation Embedment Depth or Minimum Perimeter Beam Depth (inches below lowest adjacent finished grade)	18 - Inches	24 - Inches
Minimum Foundation Width for continuous / perimeter footings*	15 - Inches	15 - Inches
Minimum Foundation Width for isolated / column footings*	24 – Inches (Square)	24 – Inches (Square)
Minimum Slab Thickness (actual)	4 inches	4 inches
Minimum Slab Reinforcing	6" x 6" – W.1.4/W1.4 welded wire fabric, or No. 3 rebar 18" on-center, each way, placed in the middle one-third of the slab thickness	No. 3 rebar 18" on-center, each way, placed in the middle one-third of the slab thickness
Minimum Footing Reinforcement	Two No. 4 reinforcing bars, one top and one bottom	Two No. 4 reinforcing bars, one top and one bottom
Pre-saturation of Subgrade Soil (percent of optimum moisture content)	Minimum 100% to a depth of 12 inches	Minimum 110% to a depth of 12 inches

*Code minimums per Table 1809.7 of the 2019 CBC should be complied with.

It should be noted that the above recommendations are based on soil support characteristics only. The structural engineer should design the slab and beam reinforcement based on actual loading conditions.

The following recommendations should be implemented into the design:

- An allowable bearing capacity of 2,000 pounds per square foot (psf) may be considered for design of continuous and perimeter footings that meet the depth and width requirements in the table above. This value may be increased by 300 psf for each additional 12 inches in depth and 300 psf for each additional 12 inches in width to a maximum value of 3,000 psf. Additionally, an increase of one-third may be applied when considering short-term live loads (e.g., seismic and wind loads). It may be possible to utilize a higher allowable soil bearing pressure for foundations directly supported by bedrock. The determination of an allowable soil bearing pressure on bedrock should be determined once foundation loads and elevations are known.

- Structural foundations may be designed in accordance with 2019 CBC, and to withstand a total settlement of 1 inch and maximum differential settlement of one-half of the total settlement over a horizontal distance of 40 feet. Seismically induced settlement is considered to be minimal.

- The passive earth pressure may preliminarily be computed as an equivalent fluid having a density of 350 psf per foot of depth, to a maximum earth pressure of 2,000 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.35 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

- A grade beam should be utilized across large entrances. The beam should be a minimum of 12 inches wide and be at the same elevation as the bottom of the adjoining footings.

5.3.3 Under Slab Moisture Membrane

A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2019 California Green Building Standards Code (CALGreen) Section 4.505.2 and the 2019 CBC Section 1907.1

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g., stake penetrations, tears, punctures from walking on the vapor retarder placed atop the underlying aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture that thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6-mil vapor retarder membrane, it is GeoTek's opinion that a minimum 10 mil membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e., thickness, composition, strength, and permeability) to achieve the desired performance level.

Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarder systems should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek does not practice in the field of moisture vapor transmission evaluation/migration since that practice is not a geotechnical discipline. Therefore, GeoTek recommends that a qualified person, such as the flooring contractor, structural engineer, architect, and/or other experts specializing in moisture control within the building be consulted to evaluate the general and specific moisture and vapor transmission paths and associated potential impact on the proposed construction. That person (or persons) should provide recommendations relative to the slab moisture and vapor retarder systems and for migration of potential adverse impact of moisture vapor transmission on various components of the structures, as deemed appropriate. In addition, the recommendations in this report and GeoTek's services in general are not intended to address mold prevention; since GeoTek, along with geotechnical consultants in general, do not practice in the area of mold prevention. If specific recommendations addressing potential mold issues are desired, then a professional mold prevention consultant should be contacted.

5.3.4 Miscellaneous Foundation Recommendations

- To reduce moisture penetration beneath the slab on grade areas, utility trenches should be backfilled with engineered fill, lean concrete, or concrete slurry where they intercept the perimeter footing or thickened slab edge.

- Spoils from the footing excavations should not be placed in the slab-on-grade areas unless properly moisture-conditioned, compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

5.3.5 Foundation Setbacks

Where applicable, the following setbacks should apply to all foundations. Any improvements not conforming to these setbacks may be subject to lateral movements and/or differential settlements:

- The outside bottom edge of all footings should be set back a minimum of H/3 (where H is the slope height) from the face of any descending slope. The setback should be at least 7 feet and need not exceed 40 feet.

- The bottom of all footings for structures near retaining walls should be deepened so as to extend below a 1:1 projection upward from the bottom inside edge of the wall stem. This applies to the existing retaining walls along the perimeter if they are to remain.

- The bottom of any existing foundations for structures should be deepened to extend below a 1:1 projection upward from the bottom of the nearest excavation.

5.3.6 Seismic Design Parameters

The site is located at approximately 33.24404557 degrees west latitude and -117.26580712 degrees north longitude. Site spectral accelerations (Ss and S1), for 0.2 and 1.0 second periods for a risk targeted two (2) percent probability of exceedance in 50 years (MCER) were determined using the web interface provided by SEAOC/OSHPD (https://seismicmaps.org) to access the USGS Seismic Design Parameters. Due to the very apparent density of the underlying sandstone, a Site Class "C" is considered appropriate for this site. The results, based on ASCE 7-16 and the 2019 CBC, are presented in the following table:

SITE SEISMIC PARAMETERS	
Mapped 0.2 sec Period Spectral Acceleration, S_S	0.924g
Mapped 1.0 sec Period Spectral Acceleration, S_1	0.341g
Site Coefficient for Site Class "C", F_a	1.2
Site Coefficient for Site Class "C", F_v	1.5
Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration for 0.2 Second, S_{MS}	1.109g
Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration for 1.0 Second, S_{M1}	0.512g
5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, S_{DS}	0.739g
5% Damped Design Spectral Response Acceleration Parameter at 1 second, S_{D1}	0.341g
Site Modified Peak Ground Acceleration (PGA_M)	0.478g
Seismic Design Category	D

5.3.7 Soil Sulfate Content and Corrosivity

Sulfate content test results indicate water soluble sulfate is less than 0.1 percent by weight, which is considered "S0" as per Table 19.3.1.1 of ACI 318-14. Based upon the test results, no special recommendations for concrete are required for this project due to soil sulfate exposure.

The soil resistivity at this site was tested by others on two samples collected from TP-6 and TP-7 during the field investigation. The results of the testing indicate that the on-site soils are considered "mildly corrosive" and "corrosive" (15,410 and 4,154 ohm-cm for TP-6 and TP-7 respectively) (Roberge, 2000) to buried ferrous metal in accordance with current standards used by corrosion engineers. It is recommended that a corrosion engineer be consulted to provide recommendations for the protection of buried ferrous metal at this site.

5.3.8 Preliminary Pavement Design

Traffic indices have not been provided during this stage of site planning. In addition, site conditions have not been graded to a final design to evaluate specific pavement subgrade conditions. Therefore, the minimum structural sections based on the City of Oceanside's Engineers Design and Processing Manual's Streets-Design Criteria (Oceanside, 2017) are presented below.

PRELIMINARY ASPHALT PAVEMENT STRUCTURAL SECTION FOR ON-SITE STREETS		
Design Criteria	Asphaltic Concrete (AC) Thickness (inches)	Aggregate Base (AB) Thickness (inches)
Local Street	3.0	6.0
Local Street	4.0	5.0

As noted in the Design and Processing Manual document, actual structural pavement design is to be determined by the geotechnical engineer's testing (R-Value) of the subgrade. Thus, the actual R-Value of the subgrade soils can only be determined at the completion of grading for street subgrades and the above values are subject to change based laboratory testing of the as-graded soils near subgrade elevations.

Asphalt concrete and aggregate base should conform to current Caltrans Standard Specifications Section 39 and 26-1.02, respectively. As an alternative, asphalt concrete can conform to Section 203-6 of the current Standard Specifications for Public Work (Green Book). Crushed aggregate base or crushed miscellaneous base can conform to Section 200-2.2 and 200-2.4 of the Green Book, respectively. Pavement base should be compacted to at least 95 percent of the ASTM D1557 laboratory maximum dry density as determined by ASTM D 1557 test procedures

All pavement installation, including preparation and compaction of subgrade, compaction of base material, placement and rolling of asphaltic concrete, should be done in accordance with the City of Oceanside specifications, and under the observation and testing of GeoTek and a City Inspector where required. Jurisdictional minimum compaction requirements in excess of the aforementioned minimums may govern.

5.3.9 Portland Cement Concrete (PCC)

As an option, Portland Cement concrete (PCC) pavements could also be used at the site for the pavement areas. Based on the traffic loading provided, the following recommended minimum PCC pavement section is provided for these areas:

6 Inches Portland Cement Concrete (PCC) over
6 Inches Aggregate Base (AB) over
12-inches compacted subgrade to 95% per ASTM D 1557

For the PCC options, it is recommended concrete having a minimum 28-day flexural strength of 650 psi be used. A maximum joint spacing of 15 feet is also recommended.

5.4 RETAINING WALL DESIGN AND CONSTRUCTION

5.4.1 General Design Criteria

Preliminary grading plans are not yet available. If retaining walls are added at a later date, the recommendations presented herein may apply to typical masonry or concrete vertical retaining walls to a maximum height of 6 feet. The 2019 CBC only requires the additional earthquake induced lateral force be considered on retaining walls in excess of six (6) feet in height. Therefore, additional review and recommendations should be requested for higher walls.

Retaining wall foundations embedded a minimum of 18 inches into engineered fill or dense formational materials should be designed using an allowable bearing capacity of 2,000 psf. This value may be increased by 300 psf for each additional 12 inches in depth and 300 psf for each additional 12 inches in width to a maximum value of 3,000 psf. An increase of one-third may be applied when considering short-term live loads (e.g., seismic and wind loads). The passive earth pressure may be computed as an equivalent fluid having a density of 350 psf per foot of depth, to a maximum earth pressure of 3,500 psf. A coefficient of friction between soil and concrete of 0.35 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

An equivalent fluid pressure approach may be used to compute the horizontal active pressure against the wall. The appropriate fluid unit weights are given in the table below for specific slope gradients of retained materials utilizing imported select materials.

Surface Slope of Retained Materials (H:V)	Equivalent Fluid Pressure (PCF) Select Backfill*
Level	40
2:1	65

*Select backfill should consist of approved materials with an EI≤20 and should be provided throughout the active zone.

The above equivalent fluid weights do not include other superimposed loading conditions such as expansive soil, vehicular traffic, structures, seismic conditions or adverse geologic conditions.

5.4.2 Restrained Retaining Walls

Any retaining wall that will be restrained prior to placing backfill or walls that have male or reentrant corners should be designed for at-rest soil conditions using an equivalent fluid pressure of 65 pcf (select backfill), plus any applicable surcharge loading. For areas having male or reentrant corners, the restrained wall design should extend a minimum distance equal to twice the height of the wall laterally from the corner, or as otherwise determined by the structural engineer.

5.4.3 Wall Backfill and Drainage

Wall backfill should include a minimum one (1) foot wide section of ¾ to 1-inch clean crushed rock (or approved equivalent). The rock should be placed immediately adjacent to the back of wall and extend up from the backdrain to within approximately 12 inches of finish grade. The upper 12 inches should consist of compacted onsite materials. If the walls are designed using the "select" backfill design parameters, then the "select" materials shall be placed within the active zone as defined by a 1:1 (H:V) projection from the back of the retaining wall footing up to the retained surface behind the wall. Presence of other materials might necessitate revision to the parameters provided and modification of wall designs.

The backfill materials should be placed in lifts no greater than 8-inches in thickness and compacted to a minimum of 90% of the maximum dry density as determined in accordance with ASTM Test Method D 1557. Proper surface drainage needs to be provided and maintained. Water should not be allowed to pond behind retaining walls. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.

Retaining walls should be provided with an adequate pipe and gravel back drain system to reduce the potential for hydrostatic pressures to develop. A 4-inch diameter perforated collector pipe (Schedule 40 PVC, or approved equivalent) in a minimum of one (1) cubic foot per lineal foot of 3/8 to one (1) inch clean crushed rock or equivalent, wrapped in filter fabric should be placed near the bottom of the backfill and be directed (via a solid outlet pipe) to an appropriate disposal area.

As an alternative to the drain, rock and fabric, a pre-manufactured wall drainage product (example: Mira Drain 6000 or approved equivalent) may be used behind the retaining wall. The wall drainage product should extend from the base of the wall to within two (2) feet of the ground surface. The subdrain should be placed in direct contact with the wall drainage product.

Drain outlets should be maintained over the life of the project and should not be obstructed or plugged by adjacent improvements.

6. CONCRETE FLATWORK

6.1 GENERAL CONCRETE FLATWORK

6.1.1 Exterior Concrete Slabs and Sidewalks

Exterior concrete slabs, sidewalks and driveways should be designed using a four-inch minimum thickness. Some shrinkage and cracking of the concrete should be anticipated because of typical mix designs and curing practices typically utilized in construction.

Sidewalks and driveways may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria would apply, if more restrictive than the recommendations presented in this report.

Subgrade soils should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs, sidewalks, driveways, etc. should be pre-saturated to a minimum of 100 percent (for "very low" expansivity) of the optimum moisture content to a depth of 12 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with the City of Oceanside specifications, and under the observation and testing of GeoTek, Inc. and a City inspector, if necessary.

6.1.2 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than 1/8 inch in width. Most cracks in concrete, while unsightly, do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek, Inc. suggests that control joints be placed in two directions and located a distance apart approximately equal to 24 to 36 times the slab thickness.

7. POST CONSTRUCTION CONSIDERATIONS

7.1 LANDSCAPE MAINTENANCE AND PLANTING

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. The soils should be maintained in a solid to semi-solid state as defined by the materials Atterberg Limits. Care should be taken when adding soil amendments to avoid excessive watering. Leaching as a method of soil preparation prior to planting is not recommended. An abatement program to control ground-burrowing rodents should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundation. This type of landscaping should be avoided. If used, then extreme care should be exercised with regard to the irrigation and drainage in these areas. Waterproofing of the foundation and/or subdrains may be warranted and advisable. GeoTek could discuss these issues, if desired, when plans are made available.

7.2 DRAINAGE

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings. Site drainage should conform to Section 1804.4 of the 2019 CBC. Roof gutters and downspouts should discharge onto paved surfaces sloping away from the structure or into a closed pipe system which outfalls to the street gutter pan or directly to the storm drain system. Pad drainage should be directed toward approved areas and not be blocked by other improvements.

7.3 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

GeoTek recommends that site grading, specifications, retaining wall/shoring plans and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. Additional recommendations may be necessary based on these reviews. It is also recommended that GeoTek representatives be present during site grading and foundation construction to check for proper implementation of the geotechnical recommendations. The owner/developer should have GeoTek's representative perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement and collect soil samples for laboratory testing when necessary.
- Observe the fill for uniformity during placement, including utility trenches.
- Observe and test the fill for field density and relative compaction.
- Observe and probe foundation excavations to confirm suitability of bearing materials.

If requested, a construction observation and compaction report can be provided by GeoTek, which can comply with the requirements of the governmental agencies having jurisdiction over the project. GeoTek recommends that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

8. LIMITATIONS

The scope of this evaluation is limited to the area explored that is shown on the Geotechnical Map (Figure 2). This evaluation does not and should in no way be construed to encompass any areas beyond the specific area of proposed construction as indicated to us by the client. The scope is based on GeoTek's understanding of the project and the client's needs, GeoTek's proposal (Proposal No. P-0900321-SD) dated October 20th, 2021, and geotechnical engineering standards normally used on similar projects in this region.

The materials observed on the project site appear to be representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops, or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

Since GeoTek's recommendations are based on the site conditions observed and encountered, and laboratory testing, GeoTek's conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

9. SELECTED REFERENCES

American Society of Civil Engineers (ASCE), 2016, "Minimum Design Loads for Buildings and Other Structures," ASCE/SEI 7-16.

ASTM International (ASTM), "ASTM Volumes 4.08 and 4.09 Soil and Rock."

Bryant, W.A., and Hart, E.W., 2007, "Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps," California Geological Survey: Special Publication 42.

California Code of Regulations, Title 24, 2019 "California Building Code," 2 volumes.

California Geological Survey (CGS, formerly referred to as the California Division of Mines and Geology), 1977, "Geologic Map of California."

_____, 1998, "Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada," International Conference of Building Officials.

City of Oceanside, 2016, "City of Oceanside BMP Design Manual"

City of Oceanside, 2017, "Engineers Design and Processing Manual," Chapter 2, Section 3.8.

GeoTek, Inc., In-house proprietary information.

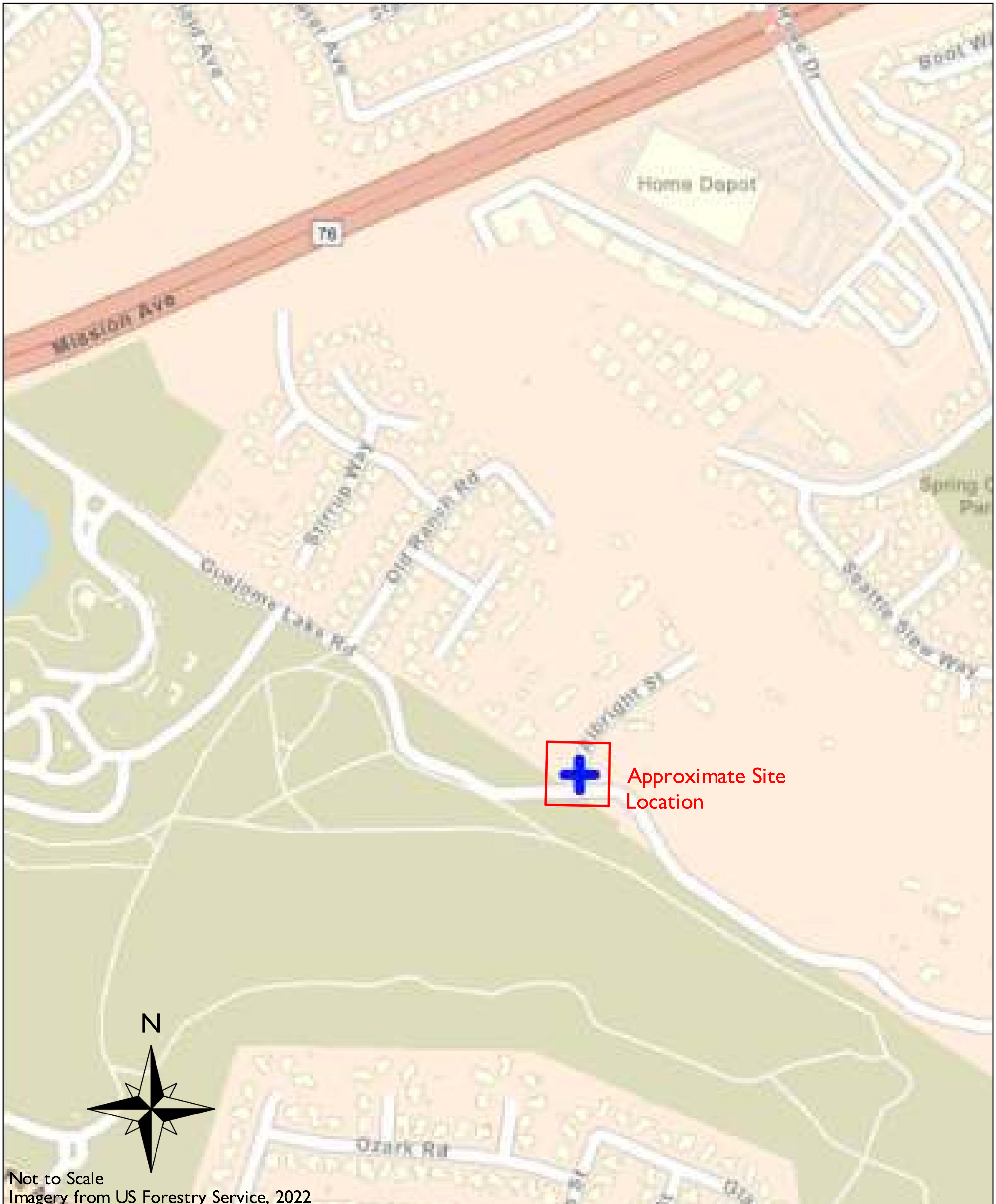
Kennedy, M.P., and Tan, S.S., 2007, "Geologic Map of the Oceanside 30x60-minute Quadrangle, California," California Geological Survey, Regional Geologic Map No. 2, map scale 1:100,000.

Pasco Laret Suiter and Associates, 2022, "Preliminary Lot Layout, Guajome Lake Road," PLSA 3775, one sheet, dated March 17, 2022.

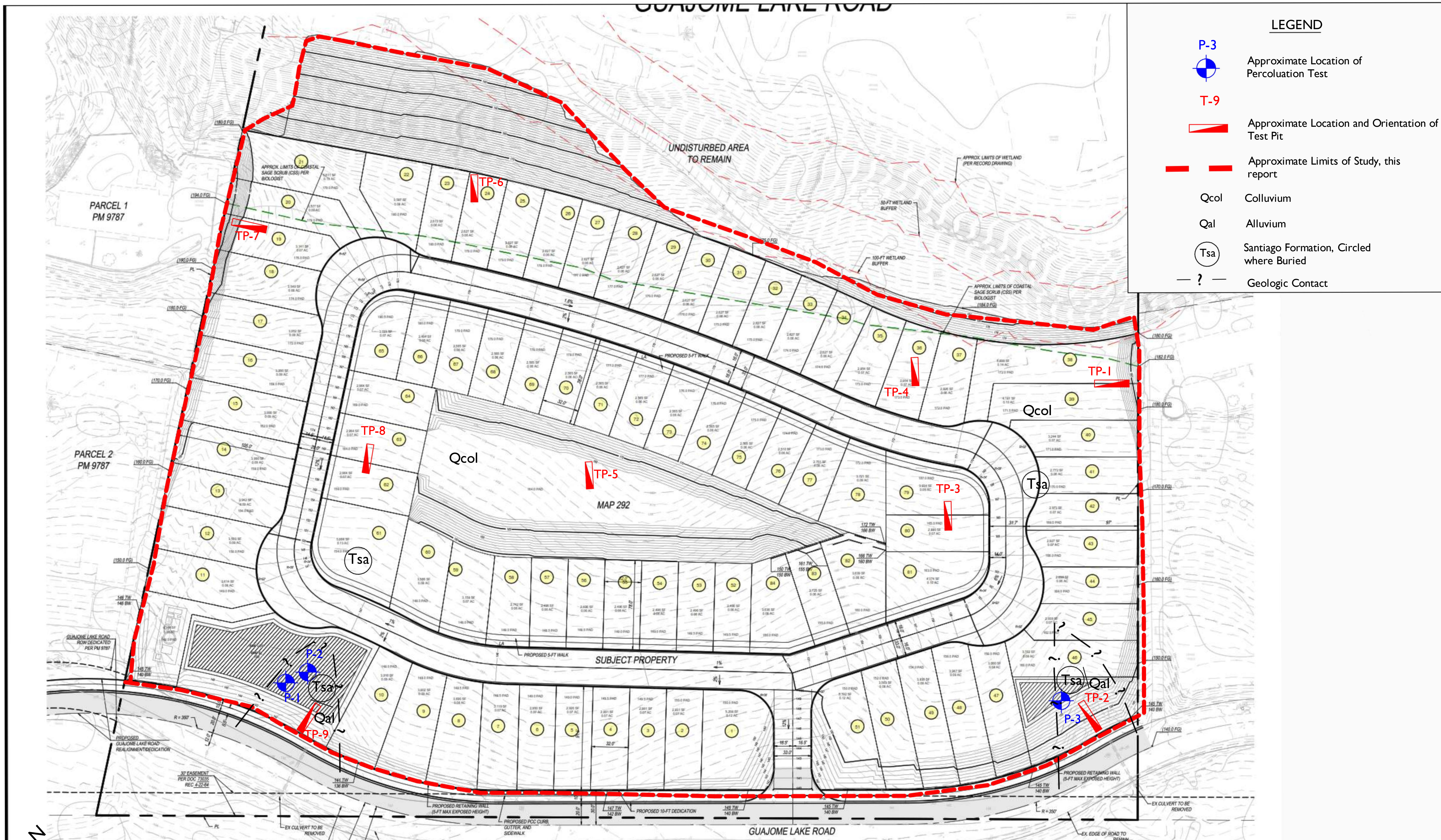
Structural Engineers Association of California/California Office of Statewide Health Planning and Development (SEOC/OSHPD), 2019, Seismic Design Maps web interface, https://seismicmaps.org

Terzaghi, K. and Peck, R., 1967, "Soil Mechanics in Engineering Practice", second edition.

University of California Davis, 1997, Soil Web Interactive Map, SoilWeb: An Online Soil Survey Browser | California Soil Resource Lab (ucdavis.edu), accessed May 5, 2022



Rincon Homes APN 157-412-15 NE of Albright St & Guajome Lake Rd Oceanside, California	Figure 1 Site Location	GEOTEK 1384 Poinsettia Avenue, Suite A Vista, California 92081
PN: 3775-SD / DATE: April 2022		



Plan adapted from "Preliminiary Lot Layout" by Pasco Laret Suiter

Rincon Homes
APN 157-412-15
NE of Albright St & Guajome Lake Rd
Oceanside, California

PN: 3775-SD | DATE: April 2022

Figure 2
Geotechnical Map

GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081

APPENDIX A

LOGS OF EXPLORATION

AND

INFILTRATION WORKSHEETS

A - FIELD TESTING AND SAMPLING PROCEDURES

Bulk Samples (Large)
These samples are normally large bags of earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

B – BORING/TRENCH LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of borings/trenches:

SOILS

USCS	Unified Soil Classification System
f-c	Fine to coarse
f-m	Fine to medium

GEOLOGIC

B: Attitudes	Bedding: strike/dip
J: Attitudes	Joint: strike/dip
C: Contact line	
………..	Dashed line denotes USCS material change
———	Solid Line denotes unit / formational change
━━━	Thick solid line denotes end of boring/trench

(Additional denotations and symbols are provided on the log of borings/trenches)

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	176 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-1

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)		Others
				SM	**Colluvium (Qcol)** Silty fine to medium SAND, brown, loose, damp, roots				
					Santiago Formation (Tsa) Fine to coarse SANDSTONE, yellow to light tan with orange oxidation, dry, subangular grains with some fine gravels, quartz rich				
	Large Bulk		BB-1						AL,SA
5					Fine to coarse SANDSTONE begins turning more yellow with more frequent gravels and quartz, operator stuggles to excavate, bucket has new teeth				
					HOLE TERMINATED AT 8 FEET No groundwater encountered Backfilled with soil cuttings				
10									
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing:
AL = Atterberg Limits
EI = Expansion Index
SA = Sieve Analy
RV = R-Value Test
SR = Sulfate/Resisitivity Test
SH = Shear Test
CO = Consolida
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	143 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-2

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)		Others
				SM	**Alluvium (Qal)** Silty fine to medium SAND, light brown to brown, damp, roots Silty fine to medium SAND, light brown, dry, roots				
5					**Santiago Formation (Tsa)** Fine to coarse SANDSTONE, light yellow to whilte, scattered gray sandstones, dry, assorted fine gravels and quartz Density increasing with depth				
10					**HOLE TERMINATED AT 6.5 FEET** No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing:
AL = Atterberg Limits
EI = Expansion Index
SA = Sieve Analy
RV = R-Value Test
SR = Sulfate/Resisitivity Test
SH = Shear Test
CO = Consolida
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	166 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-3

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)		Others
				SM	**Colluvium (Qcol)** Silty fine to medium SAND, light brown to brown, moist, roots				
					Santiago Formation (Tsa) Fine to coarse SANDSTONE, light yellow to white with orange oxidation with interspersed gray siltstones, dry, gravels and quartz rich				
5									
					HOLE TERMINATED AT 8 FEET No groundwater encountered Backfilled with soil cuttings				
10									
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing:
AL = Atterberg Limits EI = Expansion Index SA = Sieve Analy RV = R-Value Test
SR = Sulfate/Resisitivity Test SH = Shear Test CO = Consolida MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	160 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-4

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)		Others
				SM	**Colluvium (Qcol)** Silty fine to medium SAND, brown to light brown, damp, roots				
5				SW	**Tertiary Santiago Formation (Tsa)** Fine to coarse SANDSTONE, light yellow to orange, dry, angular grains, evidence of fluvial paleochannel and rip-up clasts from 1 foot to 3 feet tall thaleg incised channel embankment SANDSTONE continues, gray and brown siltstones scattered throughout				
10					**HOLE TERMINATED AT 8 FEET** No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing:
AL = Atterberg Limits
EI = Expansion Index
SA = Sieve Analy
RV = R-Value Test
SR = Sulfate/Resisitivity Test
SH = Shear Test
CO = Consolida
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	173 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-5

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)		Others
				SM	**Colluvium (Qcol)** Sitly fine to medium SAND, light brown to brown, damp at 6 inches, dry below, roots				
					Tertiary Santiago Formation (Tsa) Fine to coarse SANDSTONE, light yellow to white, dry, brown siltstone SANDSTONE with gravels, guartes rich				
5									
					HOLE TERMINATED AT 8 FEET No groundwater encountered Backfilled with soil cuttings				
10									
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing:
AL = Atterberg Limits
SR = Sulfate/Resisitivity Test
EI = Expansion Index
SH = Shear Test
SA = Sieve Analy
CO = Consolida
RV = R-Value Test
MD = Maximum Density

GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	181 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-6

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing	Laboratory Testing: Others
				SM	**Colluvium (Qcol)** Silty fine to medium SAND, brown to dark brown, moist at 6 inches, damp below, roots				
5	Large Bulk		BB-1		**Santiago Formation (Tsa)** Fine to coarse SANDSTONE, white to light yellow, damp, small amounts of quartz Fine to coarse SANDSTONE, damp, micaceous, interspersed with gray siltstones.				AL,SA,SR
10					**HOLE TERMINATED AT 7 FEET** No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing:
AL = Atterberg Limits
SR = Sulfate/Resisitivity Test
EI = Expansion Index
SH = Shear Test
SA = Sieve Analy
CO = Consolida
RV = R-Value Test
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	179 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-7

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)		Others
				SM	**Colluvium (Qcol)** Silty fine to medium SAND, dark brown, moist, roots				
	Large Bulk		BB-1		**Tertiary Santiago Formation (Tsa)** Fine to coarse SANDSTONE, white to light gray, damp, micaceous Intersparsed orange SANDSTONE to total depth Fine to coarse SANDSTONE, white, scattered orange sandstone with some gray siltstone along rest of test pit, subrounded				MD,EI,DS,SR
5									
					HOLE TERMINATED AT 7.5 FEET No groundwater encountered Backfilled with soil cuttings				
10									
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing:
AL = Atterberg Limits
SR = Sulfate/Resisitivity Test
EI = Expansion Index
SH = Shear Test
SA = Sieve Analy
CO = Consolida
RV = R-Value Test
MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	168 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-8

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)		Others
				SM	**Colluvium (Qcol)** Silty fine to medium SAND, brown, damp, loose, some roots				
5					**Santiago Formation (Tsa)** Medium to coarse SANDSTONE, light brown to brown, damp, medium dense, interspersed gray cobbles and quartz Fine to coarse SANDSTONE, light yellow to light tan, dry, interspersed siltstones and quartz density increasing with depth				
10					**HOLE TERMINATED AT 7.5 FEET** No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analy; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolida; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	Rincon Homes	**DRILLER:**	Luna Construction	**LOGGED BY:**	MRF
PROJECT NAME:	Guajome Crest	**DRILL METHOD:**	Test Pit	**OPERATOR:**	Sal
PROJECT NO.:	3775-SD	**HAMMER:**	-	**RIG TYPE:**	CAT 305.5E (mini) excavator
LOCATION:	Oceanside, CA	**ELEVATION:**	149 ft	**DATE:**	3/29/2022

TEST PIT NO.: TP-9

Depth (ft)	SAMPLES: Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)		Others
				SM	**Alluvium (Qal)** Silty fine to medium SAND, brown to dark brown, moist until 6 inches, loose, some roots				
5					**Santiago Formation (Tsa)** Fine to coarse SANDSTONE, orange to red contact, dipping NE Fine to coarse SANDSTONE, light yellow to light tan, damp, medium dense, scattered orange sandstone, small amounts of quartz and gravels, interspersed gray siltstone Density increasing with depth				
10					**HOLE TERMINATED AT 7.5 FEET** No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing:
AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analy; RV = R-Value Test
SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolida; MD = Maximum Density

PERCOLATION DATA SHEET

Project: Guajome Crest **Job No.:** 3775-SD.

Test Hole No.: P-1 **Tested By:** MRF, **Date:** 3/30/22.

Depth of Hole As Drilled: 55" **Before Test:** 55" **After Test:** 55"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ In Water Level (Inches)		Comments
1	8:30	30	55	18	21	3		Wet hole upon arrival
2	9:00	30	55	18	22	4		
3	9:30	30	55	18	22	4		
4	10:00	30	55	18	21	3		
5	10:30	30	55	18	21	3		
6	11:00	30	55	18	21	3		
7	11:30	30	55	18	20	2		
8	12:00	30	55	18	20.5	2.5		
9	12:30	30	55	18	20	2		
10	13:00	30	55	18	20	2		
11	13:30	30	55	18	20	2		
12	14:00	30	55	18	20	2		
13	14:30	30	55	18	19	1		

Client:	**Rincon**
Project:	**Guajome Crest**
Project No:	**3775-SD**
Date:	**4/4/2022**

Boring No. **P-1**

Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	19.00
Test Hole Radius, r =	3.00
Initial Depth to Water, D_O =	18
Total Test Hole Depth, D_T =	55

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	37.00
$H_F = D_T - D_F$ =	36.00
$\Delta H = \Delta D = H_O - H_F$ =	1.00
Havg = $(H_O+H_F)/2$ =	36.50

I_t = 0.08 **Inches per Hour**

GEOTEK

PERCOLATION DATA SHEET

Project: Guajome Crest **Job No.:** 3775-SD.

Test Hole No.: P-2 **Tested By:** MRF, **Date:** 3/30/22.

Depth of Hole As Drilled: 50.5" **Before Test:** 50.5" **After Test:** 50.5"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ In Water Level (Inches)		Comments
1	8:30	30	50.5	18	25	7		Dry hole upon arrival
2	9:00	30	50.5	18	26	8		
3	9:30	30	50.5	18	27	9		
4	10:00	30	50.5	18	27	9		
5	10:30	30	50.5	18	26	8		
6	11:00	30	50.5	18	26	8		
7	11:30	30	50.5	18	25	7		
8	12:00	30	50.5	18	24.5	6.5		
9	12:30	30	50.5	18	25	7		
10	13:00	30	50.5	18	26	8		
11	13:30	30	50.5	18	26	8		
12	14:00	30	50.5	18	26	8		
13	14:30	30	50.5	18	26	8		

Client:	**Rincon**
Project:	**Guajome Crest**
Project No:	**3775-SD**
Date:	**4/4/2022**

Boring No. **P-2**

Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	26.00
Test Hole Radius, r =	3.00
Initial Depth to Water, D_O =	18
Total Test Hole Depth, D_T =	50.5

Equation - $$I_t = \frac{\Delta H\ (60r)}{\Delta t\ (r+2H_{avg})}$$

$H_O = D_T - D_O$ =	32.50
$H_F = D_T - D_F$ =	24.50
$\Delta H = \Delta D = H_O - H_F$ =	8.00
Havg = $(H_O+H_F)/2$ =	28.50

I_t = 0.80 **Inches per Hour**

GEOTEK

PERCOLATION DATA SHEET

Project: Guajome Crest **Job No.:** 3775-SD.

Test Hole No.: P-3 **Tested By:** MRF, **Date:** 3/30/22.

Depth of Hole As Drilled: 52" **Before Test:** 52" **After Test:** 52"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ In Water Level (Inches)		Comments
1	8:30	30	52	18	22.5	4.5		Dry upon arrival
2	9:00	30	52	18	23	5		
3	9:30	30	52	18	22	4		
4	10:00	30	52	18	21	3		
5	10:30	30	52	18	22	4		
6	11:00	30	52	18	22	4		
7	11:30	30	52	18	22	4		
8	12:00	30	52	18	21.5	3.5		
9	12:30	30	52	18	21	3		
10	13:00	30	52	18	21	3		
11	13:30	30	52	18	21	3		
12	14:00	30	52	18	22	4		
13	14:30	30	52	18	23	5		

Client: Rincon
Project: Guajome Crest
Project No: 3775-SD
Date: 4/4/2022

Boring No. **P-3**

Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	23.00
Test Hole Radius, r =	3.00
Initial Depth to Water, D_O =	18
Total Test Hole Depth, D_T =	52

Equation - $$I_t = \frac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$$

$H_O = D_T - D_O$ =	34.00
$H_F = D_T - D_F$ =	29.00
$\Delta H = \Delta D = H_O - H_F$ =	5.00
$H_{avg} = (H_O+H_F)/2$ =	31.50

I_t = 0.45 **Inches per Hour**

GEOTEK

Infiltration Restrictions		Form 4	
Retention is required at the project site to the maximum extent practicable. Complete this form to summarize applicable infiltration restrictions. Supporting documentation must be provided in the Attachments.			
Restriction Element		**Applicable?**	
Mandatory Considerations	BMP is within 100 feet of contaminated soils	☐ Yes	☒ No
	BMP is within 100 feet of industrial activities lacking source control	☐ Yes	☒ No
	BMP is within 100 feet of well/groundwater basin	☐ Yes	☒ No
	BMP is within 50 feet of septic tanks/leach fields	☐ Yes	☒ No
	BMP is within 10 feet of structures/tanks/walls	☐ Yes	☒ No
	BMP is within 10 feet of sewer utilities	☐ Yes	☒ No
	BMP is within 10 feet of groundwater table	☐ Yes	☒ No
	BMP is within hydric soils	☐ Yes	☒ No
	BMP is within highly liquefiable soils and has connectivity to structures	☐ Yes	☒ No
	BMP is within 1.5 times the height of adjacent steep slopes (≥25%)	☒ Yes	☐ No
	City staff has assigned "Restricted" Infiltration Category	☐ Yes	☒ No
Optional Considerations	BMP is within predominantly Type D soil	☐ Yes	☐ No
	BMP is within 10 feet of property line	☐ Yes	☐ No
	BMP is within fill depths of ≥5 feet (existing or proposed)	☒ Yes	☐ No
	BMP is within 10 feet of underground utilities	☐ Yes	☐ No
	BMP is within 250 feet of ephemeral stream	☐ Yes	☐ No
	Other (provide detailed geotechnical support in Attachment 6)	☐ Yes	☐ No
Result	**Unrestricted** – No restriction elements are applicable	☐	
	Restricted – One or more restriction elements are applicable	☒	

Table D.2-4: Factor of Safety and Design Infiltration Rate Worksheet

<table>
<tr><th colspan="3">Factor of Safety and Design Infiltration Rate Worksheet</th><th colspan="3">Worksheet D.5-1</th></tr>
<tr><th colspan="2">Factor Category</th><th>Factor Description</th><th>Assigned Weight (w)</th><th>Factor Value (v)</th><th>Product (p)
p = w x v</th></tr>
<tr><td rowspan="5">A</td><td rowspan="5">Suitability Assessment</td><td>Soil assessment methods</td><td>0.25</td><td rowspan="4">Refer to Table D.2-5</td><td>0.5</td></tr>
<tr><td>Predominant soil texture</td><td>0.25</td><td>0.25</td></tr>
<tr><td>Site soil variability</td><td>0.25</td><td>0.5</td></tr>
<tr><td>Depth to groundwater / impervious layer</td><td>0.25</td><td>0.25</td></tr>
<tr><td colspan="3">Suitability Assessment Safety Factor, $S_A = \Sigma p$</td><td>1.5</td></tr>
<tr><td rowspan="4">B</td><td rowspan="4">Design</td><td>Level of pretreatment/ expected sediment loads</td><td>0.5</td><td rowspan="3">Refer to Table D.2-5</td><td></td></tr>
<tr><td>Redundancy/resiliency</td><td>0.25</td><td></td></tr>
<tr><td>Compaction during construction</td><td>0.25</td><td></td></tr>
<tr><td colspan="3">Design Safety Factor, $S_B = \Sigma p$</td><td></td></tr>
<tr><td colspan="5">Safety Factor, $S_{total} = S_A \times S_B$</td><td></td></tr>
</table>

D.2 Determination of Design Infiltration Rates

This section is only applicable if the determination of design infiltration rates is performed by a licensed engineer practicing in geotechnical engineering. The guidance in this section identifies methods for identifying observed infiltration rates, corrected infiltration rates, safety factors, and design infiltration rates for use in structural BMP design. Upon completion of this section, the Geotechnical Engineer must recommend a design infiltration rate for each DMA and provide adequate support/discussion in the geotechnical report.

Table D.2-1: Elements for Determination of Design Infiltration Rates

Parameter	Value	Unit
Initial Infiltration Rate (Section D.2.1)	**0.44**	in/hr
Corrected Infiltratino Rate (Section D.2.2)	**0.44**	in/hr
Safety Factor (Section D.2.3)	**1.5**	unitless
Design Infiltration Rate (Corrected Infiltration rate/Safety Factor)	**0.29**	in/hr

D.2.1 Initial Infiltration Rate

For purposes of this manual, the initial infiltration rate is the infiltration rate that has been identified based on the initial testing methods. Some of the acceptable methods for determining initial infiltration ates are presented in Table D.2-2 below, though other testing methods may be acceptable as evaluated by the geotechnical engineer. The geotechnical engineer should use professional discretion when selecting a testing method as it may ultimately impact the types of BMPs that are permitted.

Table D.2-2: Comparision of Infiltration Rate Estimation and Testing Methods

Test	Suitability at Planning Level Screening Phase	Suitability at BMP Design Phase
NRCS Soil Survey Maps	Yes, but mapped soil types must be confirmed with site observations. Regional soil maps are known to contain inaccuracies at the scale of typical development sites.	No, unless a strong correlation is developed between soil types and infiltration rates in the direct vicinity of the site and an elevated factor of safety is used.
Grain Size Analysis	Not preferred. Should only be used if a strong correlation has been developed between grain size analysis and measured infiltration rates testing results of site soils.	No

APPENDIX B

RESULTS OF LABORATORY TESTING

SUMMARY OF LABORATORY TESTING

Identification and Classification

Soils were identified visually in general accordance with the standard practice for description and identification of soils (ASTM D 2488). The soil identifications and classifications are shown on the Logs of Exploration in Appendix A.

Moisture Density Modified Proctor

Laboratory testing was performed on one sample collected during the subsurface exploration for compaction characteristics. The laboratory maximum dry density and optimum moisture content for the soil was determined in general accordance with ASTM Test Method D 1557 procedures. The test results are graphically presented in Appendix B.

Expansion Index Test

Expansion Index testing was performed on one sample collected during the subsurface exploration from test pit TP-7. The expansion index was determined in general accordance with ASTM Test Method D 4829 procedures. The test results are presented in Appendix B.

Full Corrosion Suite

A full corrosion series was performed in general accordance with several ASTM Test Methods on two representative samples collected during the subsurface exploration. The samples were obtained from Test Pit TP-6 and TP-7 and tested by Project X Engineering.

Atterberg Limits

Atterberg limits testing were performed on two (2) sandy samples collected from the site. The tests were performed in general accordance with ASTM D 4318. The test results are presented in Appendix B.

Percent of Soil Passing No 200 Sieve

The amount of soil finer than No. 200 sieve was determined for two sandy samples collected from the site. The tests were performed in general accordance with ASTM D 1140. The test results are presented in Appendix B.

Direct Shear

Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D 3080 procedures. The rate of deformation is approximately 0.025 inches per minute. The samples were sheared under varying confining loads to determine the coulomb shear strength parameters, angle of internal friction and cohesion. One test was performed on a bulk sample that was remolded to approximately 90 percent of the maximum dry density as determined by ASTM D 1557. The results of the testing are graphically presented in Appendix B.

GEOTEK

-200 WASH

Date:	4/4/2022		
W.O.:	3775-SD	sample ID	TP-1 BB-1
Client:	Rincon Homes	depth	3-5 ft
Project:	Guajome Crest		

Sieve Size	Particle Diameter		Wt. Retained	Wt. Passing	% Passing	Specs
	in.	mm.				
#200	0.0029	0.074	177.2	10.9	5.8%	

Dry Weight 188.1

Soak Time 10 Minutes

GEOTEK

-200 WASH

Date: 4/4/2022

W.O.: 3775-SD   sample ID TP-6 BB-1

Client: Rincon Homes   depth 3-5 ft

Project: Guajome Crest

Sieve Size	Particle Diameter		Wt. Retained	Wt. Passing	% Passing	Specs
	in.	mm.				
#200	0.0029	0.074	192.1	26.8	12.2%	

Dry Weight 218.9

Soak Time 10 Minutes

GEOTEK

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	Guajome Crest	***Tested/ Checked By:***	***CH*** Lab No 3942
Project Number:	3775-SD	***Date Tested:***	4/4/2022
Project Location:	Oceanside, CA	***Sample Source:***	TP-7 BB-1
		Sample Description:	Whtie Gray Fine Sand w/ Silt

Ring Id 12 Ring Dia. " 4" Ring I 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	**773.1**
B	Weight of ring	371
C	Net weight of sample	402.1
D	Wet Density, lb / ft3 (C*0.3016)	121.3
E	Dry Density, lb / ft3 (D/1.F)	**107.5**

SATURATION DETERMINATION

	Wet Weight of sample & tare	**207.8**
	Dry Weight of sample & tare	**184.8**
	Tare	**4.8**
F	Initial Moisture Content, %	**12.8**
G	(E*F)	1374.0
H	(E/167.232)	0.64
I	(1.-H)	0.36
J	(62.4*I)	22.3
K	(G/J)= **L** % Saturation	**61.7**

READINGS

DATE	TIME	READING	
4/4/2022	10:00	164	Initial
4/4/2022	10:10	161	10 min/Dry
4/4/2022	10:11	161	1 min/Wet
4/4/2022	10:16	161	5 min/Wet
4/4/2022	13:16	161	Random
4/4/2022	13:26	161	Final

FINAL MOISTURE

Weight of wet sample & tare	Wt. of dry sample & tare	Tare	% Moisture
130.7	109.3	4.8	20.5%

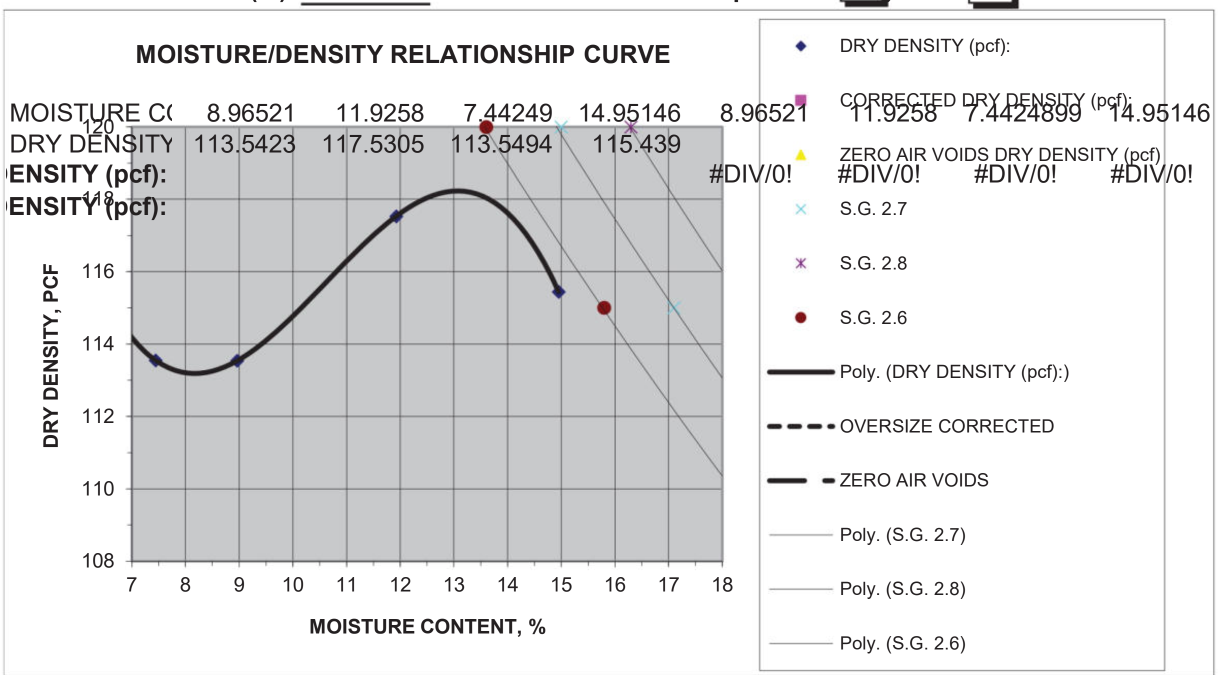
EXPANSION INDEX = 2

MOISTURE/DENSITY RELATIONSHIP

Client:	Rincon Homes	**Job No.:**	3775-SD
Project:	Guajome Crest	**Lab No.:**	3942
Location:	Oceanside, CA		
Material Type:	White Gray Fine Sand w/Silt		
Material Supplier:	-		
Material Source:	-		
Sample Location:	TP-7 BB-1		
	-		
Sampled By:	MRF	**Date Sampled:**	3/29/2022
Received By:	MRF	**Date Received:**	3/29/2022
Tested By:	CH	**Date Tested:**	4/4/2022
Reviewed By:	-	**Date Reviewed:**	-

Test Procedure: ASTM D1557 **Method:** A

Oversized Material (%): 0.0 **Correction Required:** ☐ yes ☒ no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	118.2	**@ Optimum Moisture, %**	13.0
Corrected Maximum Dry Density, pcf		**@ Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

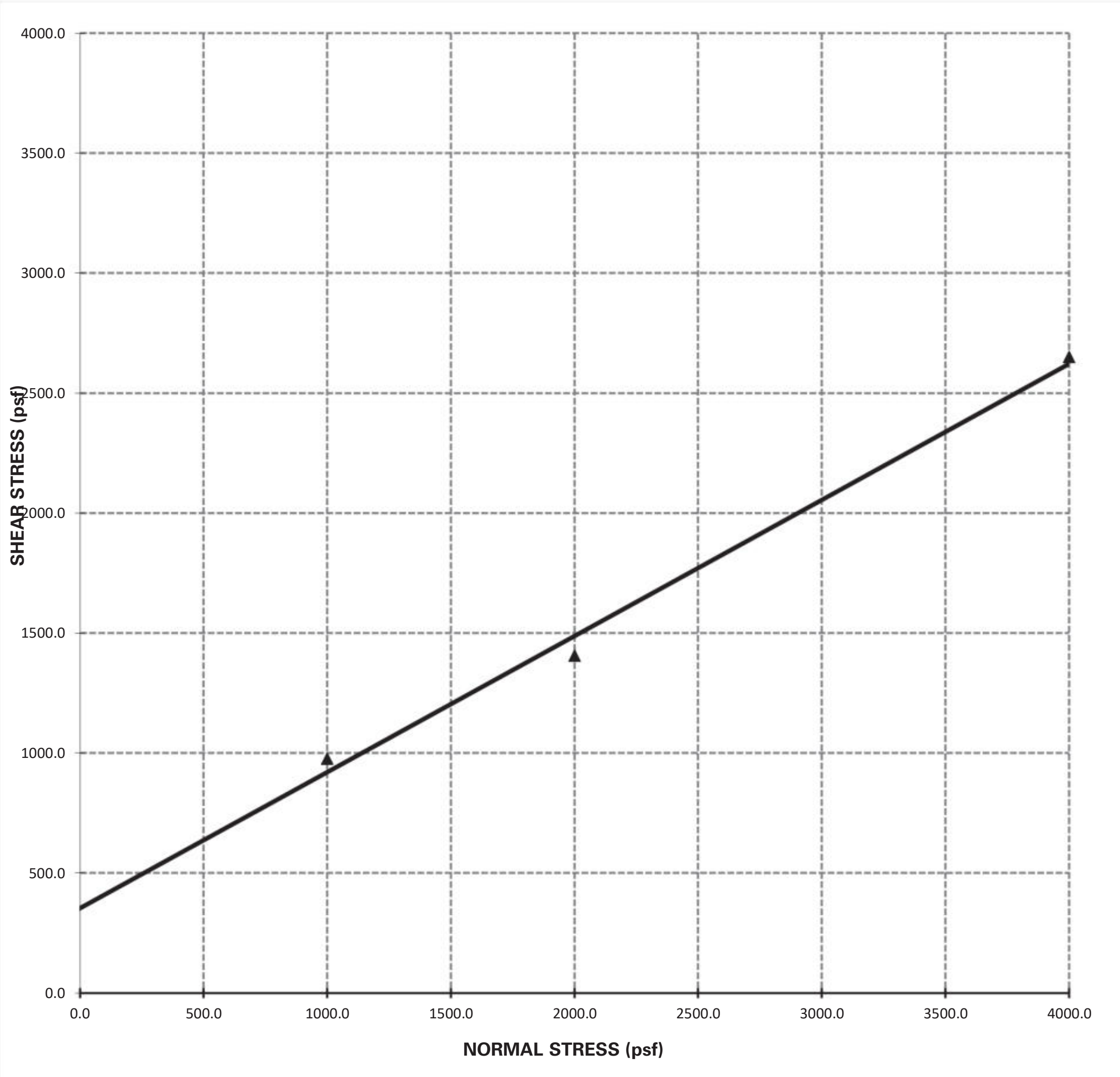
Classification:

Unified Soils Classification:

AASHTO Soils Classification:

DIRECT SHEAR TEST

Project Name:	Guajome Crest	***Sample Location:***	TP-7 @ 2-4 feet
Project Number:	3775-SD	***Date Tested:***	4/22/2022



Shear Strength: Φ = **30 °** **C = 354 psf**

Notes: 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.

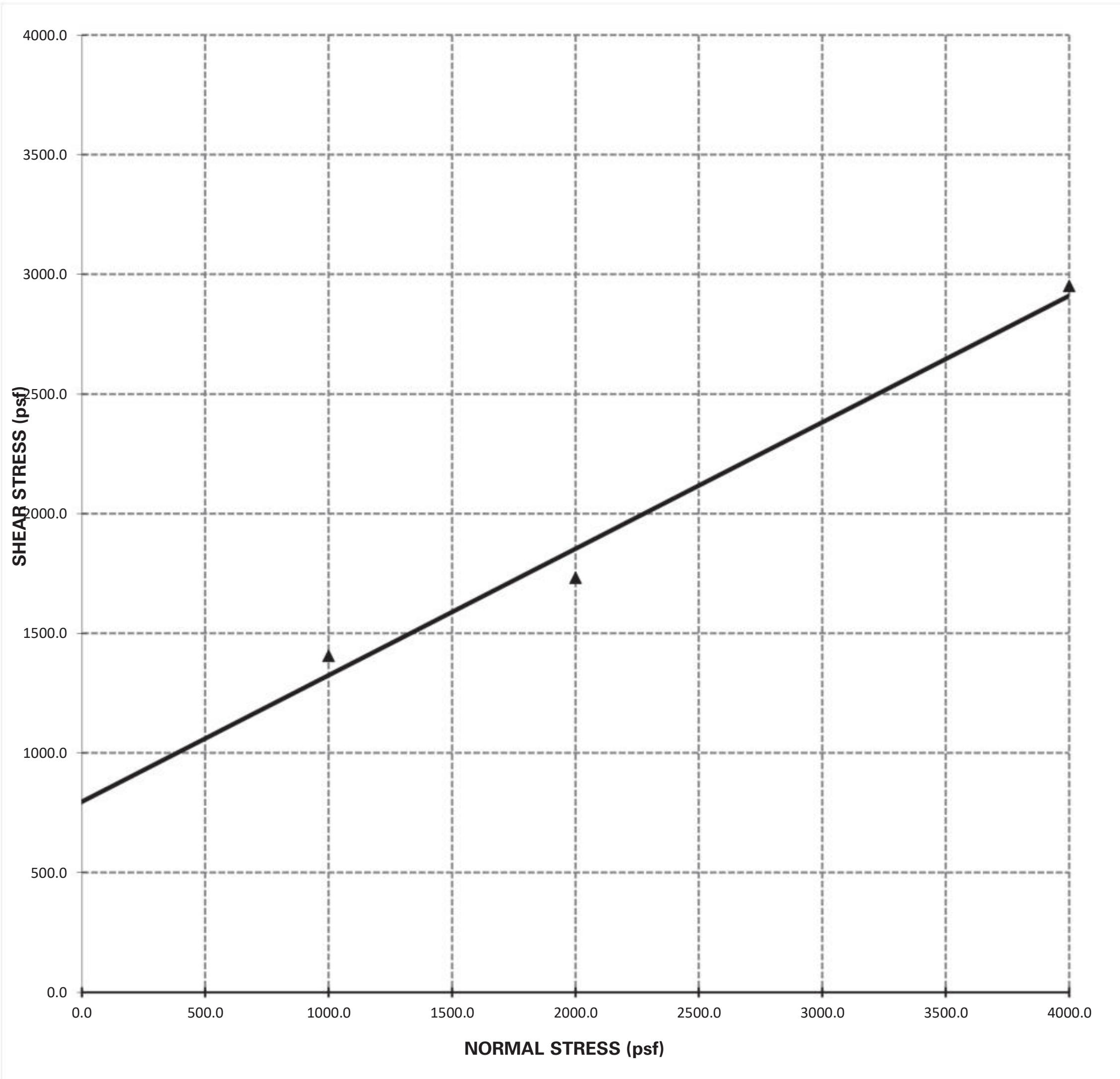
2 - The above reflect direct shear strength at saturated conditions.

3 - The tests were run at a shear rate of 0.35 in/min.

DIRECT SHEAR TEST

Project Name: Guajome Crest
Sample Location: TP-7 @ 2-4 feet
Project Number: 3775-SD
Date Tested: 4/22/2022

PEAK VALUE



Shear Strength:	Φ =	28 °	C =	796 psf

Notes: 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.

2 - The above reflect direct shear strength at saturated conditions.

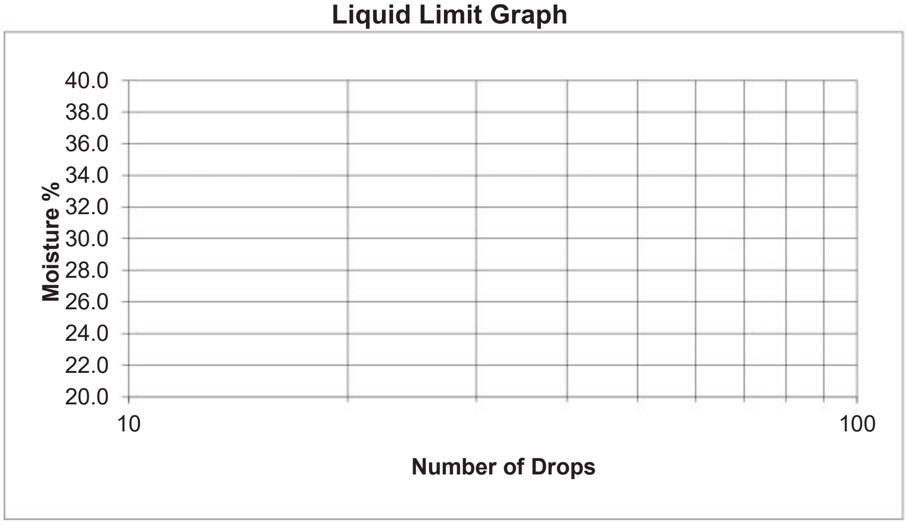
3 - The tests were run at a shear rate of 0.01 in/min.

ATTERBERG LIMITS DATA

Field Classification	Light Gray Silty M-C Sand	Job No.	3775-SD
Sample Number	TP-1 BB-1	Client	Rincon Homes
Sample Type		Project	Guajome Crest
Location	Oceanside, CA		
Tested by:	CH		

	Plastic Limit		Liquid Limit			
Number of Blows			0	0	0	0
Determination	1	2	1	2	3	4
Dish						
Wt. of Dish + Wet Soil	0.00	0.00	0.00	0.00	0.00	0
Wt. of Dish + Dry Soil	0.00	0.00	0.00	0.00	0.00	0
Wt. of Moisture	0.00	0.00	0.00	0.00	0.00	0.00
Wt. of Dish	0.85	0.85	0.86	0.86	0.86	0.86
Wt. of Dry Soil	-0.85	-0.85	-0.86	-0.86	-0.86	-0.86
Moisture Content %	0.0	0.0	0.0	0.0	0.0	0.0

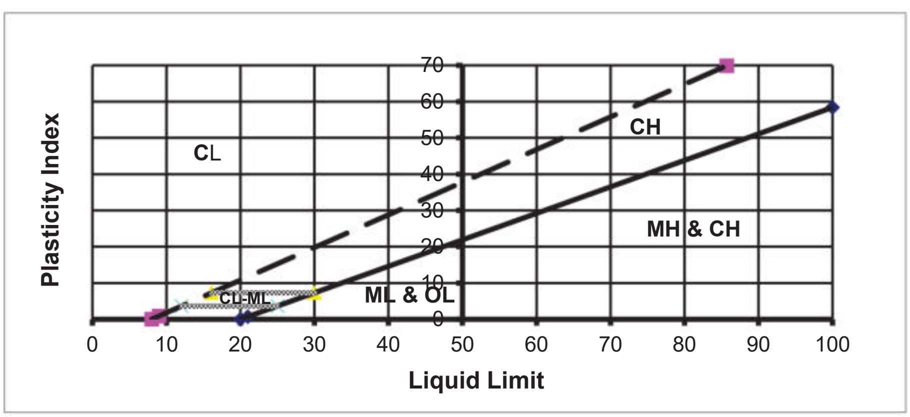
Liquid Limit Graph



Liquid Limit
0

Plastic Limit
0

Plasticity Index
NON-PLASTIC



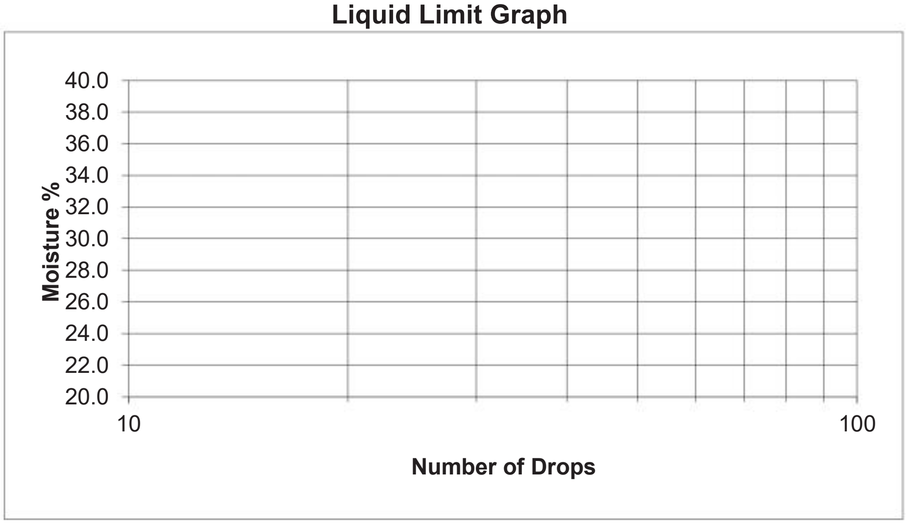
GEOTEK

ATTERBERG LIMITS DATA

Field Classification	Tan Silty M-C Sand	Job No.	3775-SD
Sample Number	TP-6 BB-1	Client	Rincon Homes
Sample Type		Project	Guajome Crest
Location	Oceanside, CA		
Tested by:	CH		

	Plastic Limit		Liquid Limit			
Number of Blows			0	0	0	0
Determination	1	2	1	2	3	4
Dish						
Wt. of Dish + Wet Soil	0.00	0.00	0.00	0.00	0.00	0
Wt. of Dish + Dry Soil	0.00	0.00	0.00	0.00	0.00	0
Wt. of Moisture	0.00	0.00	0.00	0.00	0.00	0.00
Wt. of Dish	0.85	0.85	0.86	0.86	0.86	0.86
Wt. of Dry Soil	-0.85	-0.85	-0.86	-0.86	-0.86	-0.86
Moisture Content %	0.0	0.0	0.0	0.0	0.0	0.0

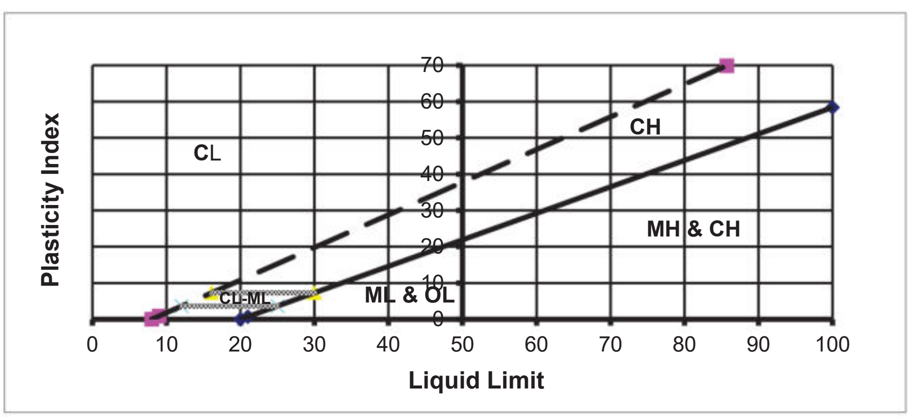
Liquid Limit Graph



Liquid Limit
0

Plastic Limit
0

Plasticity Index
Non-plastic



Results Only Soil Testing for Guajame Crest

April 18, 2022

Prepared for:

Chris Livesey
GeoTek, Inc.
1384 Poinsettia Ave, Suite A
Vista, CA, 92081
clivesey@geotekusa.com

Project X Job#: S220414L
Client Job or PO#: 3775-SD

Respectfully Submitted,

Eduardo Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

REGISTERED PROFESSIONAL ENGINEER
EDUARDO HERNANDEZ
No. M37102
MECHANICAL
STATE OF CALIFORNIA

Soil Analysis Lab Results

Client: GeoTek, Inc.
Job Name: Guajame Crest
Client Job Number: 3775-SD
Project X Job Number: S220414L
April 18, 2022

	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51	ASTM G200	SM 4500-D	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327
Bore# / Description	**Depth**	**Sulfates** SO_4^{2-}		**Chlorides** Cl^-		**Resistivity** As Rec'd	Minimum	**pH**	**Redox**	**Sulfide** S^{2-}	**Nitrate** NO_3^-	**Ammonium** NH_4^+	**Lithium** Li^+	**Sodium** Na^+	**Potassium** K^+	**Magnesium** Mg^{2+}	**Calcium** Ca^{2+}	**Fluoride** F_2^{--}	**Phosphate** PO_4^{3-}
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(Ohm-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
TP-6 BB-1	3-5	4.5	0.0005	3.2	0.0003	54,940	15,410	7.8	102	0.42	0.1	1.7	ND	73.9	11.7	13.9	2.0	1.1	1.7
TP-7 BB-1	2-4	17.7	0.0018	9.2	0.0009	16,080	4,154	9.2	108	0.33	1.1	8.0	0.01	94.9	4.5	4.8	0.5	1.7	2.6

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract
PPM = mg/kg (soil) = mg/L (Liquid)

Project X Corrosion Engineering

Lab Request Sheet Chain of Custody
Phone: (213) 928-7213 · Fax (951) 226-1720 · www.projectxcorrosion.com
Ship Samples To: 29990 Technology Dr, Suite 13, Murrieta, CA 92563

Project X Job Number: S220414L GEOTEK 3775-SD Guajame 2 Full

IMPORTANT: Please complete Project and Sample Identification Data as you would like it to appear in report & include this form with samples.

Company Name:	GeoTek, Inc.	Contact Name:	Chris Livesey	Phone No:	949-338-9233
Mailing Address:	1384 Poinsetta Ave, Ste A, Vista, CA 92081	Contact Email:	clivesey@geotekusa.com		
Accounting Contact:	Accounts Payable	Invoice Email:	ap@geotekusa.com; lwhite@geotekusa.com		
Client Project No:	3775-SD	Project Name:	Guajome Crest		
P.O. #:	Vista				

	3-5 Day Standard	3 Day	24 Hr RUSH
(Business Days) Turn Around Time:	✓		

Results By: ☐ Phone ☐ Fax ☑ Email

Date & Received by :

Special Instructions:

ANALYSIS REQUESTED (Please circle)

				Default Method
Soil Resistivity	Full Corrosion Series / Geo Quad	Caltrans CTM643	AASHTO T288	ASTM G187
pH	Full Corrosion Series / Geo Quad	Caltrans CTM643	AASHTO T289	ASTM G51
Sulfate	Full Corrosion Series / Geo Quad	Caltrans CTM417	AASHTO T290	ASTM D4327
Chloride	Full Corrosion Series / Geo Quad	Caltrans CTM422	AASHTO T291	ASTM D4327
Redox Potential	Full Corrosion Series		SM 2580B	ASTM G200
Sulfide	Full Corrosion Series			SM 4500-S2
Ammonia	Full Corrosion Series		SM 4500-NH3	ASTM D6919
Nitrate	Full Corrosion Series		SM 4500-NO3	ASTM D4327
Flouride	Full Corrosion Series			ASTM D4327
Phosphate	Full Corrosion Series			ASTM D4327
Lithium	Full Corrosion Series			ASTM D6919
Sodium	Full Corrosion Series			ASTM D6919
Potassium	Full Corrosion Series			ASTM D6919
Magnesium	Full Corrosion Series			ASTM D6919
Calcium	Full Corrosion Series			ASTM D6919
BiCarbonate	Full Corrosion Series			SM 2320B
Full Corrosion Series				
Soil Corrosivity Evaluation Report	Reports (*Req: Min. 3 Samples, site map, and groundwater info)			
Water Corrosivity Mini Report	Reports (*Req: Min. 3 Samples, site map, and groundwater info)			
Moisture Content				ASTM D2216
Total Alkalinity				SM 2320B
Thermal Resistivity				
Metallurgical Analysis				
Langelier Index				
Puckorius Index				
XRF Elemental Analysis				
Water Hardness				

	#	SAMPLE ID - BORE #	DESCRIPTION	DEPTH (ft)	DATE COLLECTED	Soil Resistivity	pH	Sulfate	Chloride	Redox Potential	Sulfide	Ammonia	Nitrate	Flouride	Phosphate	Lithium	Sodium	Potassium	Magnesium	Calcium	BiCarbonate	Full Corrosion Series	Soil Corrosivity Evaluation Report	Water Corrosivity Mini Report	Moisture Content	Total Alkalinity	Thermal Resistivity	Metallurgical Analysis	Langelier Index	Puckorius Index	XRF Elemental Analysis	Water Hardness
193	1	TP-6 BB-1		3-5'																		✓										
194	2	TP-7 BB-1		2-4'																		✓										
	3																															
	4																															
	5																															
	6																															
	7																															
	8																															
	9																															
	10																															
	11																															
	12																															
	13																															
	14																															
	15																															

APPENDIX C

GENERAL EARTHWORK GRADING GUIDELINES

GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, the California Building Code, CBC (2019) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor’s overall level of efforts during grading. The contractor’s personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor’s responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.
4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.
5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.

6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
7. Procedures for testing of fill slopes are as follows:
   a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
   b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative. Typical procedures are similar to those indicated on Plate G-4.

Treatment of Existing Ground

1. Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed (see Plates G-1, G-2 and G-3) unless otherwise specifically indicated in the text of this report.
2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Subdrainage

1. Subdrainage systems should be provided in canyon bottoms prior to placing fill, and behind buttress and stabilization fills and in other areas indicated in the report. Subdrains should conform to schematic diagrams G-1 and G-5, and be acceptable to our representative.
2. For canyon subdrains, runs less than 500 feet may use six-inch pipe. Typically, runs in excess of 500 feet should have the lower end as eight-inch minimum.
3. Filter material should be clean, 1/2 to 1-inch gravel wrapped in a suitable filter fabric. Class 2 permeable filter material per California Department of Transportation Standards tested by this office to verify its suitability, may be used without filter fabric. A sample of the material should be provided to the Soils Engineer by the contractor at least two working days before it is delivered to the site. The filter should be clean with a wide range of sizes.
4. Approximate delineation of anticipated subdrain locations may be offered at 40-scale plan review stage. During grading, this office would evaluate the necessity of placing additional drains.
5. All subdrainage systems should be observed by our representative during construction and prior to covering with compacted fill.
6. Subdrains should outlet into storm drains where possible. Outlets should be located and protected. The need for backflow preventers should be assessed during construction.
7. Consideration should be given to having subdrains located by the project surveyors.

Fill Placement

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
   a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
   b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
   a) They are not placed in concentrated pockets;
   b) There is a sufficient percentage of fine-grained material to surround the rocks;
   c) The distribution of the rocks is observed by, and acceptable to, our representative.
5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal (see Plate G-4). On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If

significant oversize materials are encountered during construction, these guidelines should be requested.

6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. 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.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

Keyways, Buttress and Stabilization Fills

Keyways are needed to provide support for fill slope and various corrective procedures.

1. Side-hill fills should have an equipment-width key at their toe excavated through all surficial soil and into competent material and tilted back into the hill (Plates G-2, G-3). As the fill is elevated, it should be benched through surficial soil and slopewash, and into competent bedrock or other material deemed suitable by our representatives (See Plates G-1, G-2, and G-3).
2. Fill over cut slopes should be constructed in the following manner:
   a) All surficial soils and weathered rock materials should be removed at the cut-fill interface.
   b) A key at least one and one-half (1.5) equipment width wide (or as needed for compaction), and tipped at least one (1) foot into slope, should be excavated into competent materials and observed by our representative.
   c) The cut portion of the slope should be excavated prior to fill placement to evaluate if stabilization is necessary. The contractor should be responsible for any additional earthwork created by placing fill prior to cut excavation. (see Plate G-3 for schematic details.)
3. Daylight cut lots above descending natural slopes may require removal and replacement of the outer portion of the lot. A schematic diagram for this condition is presented on Plate G-2.

4. A basal key is needed for fill slopes extending over natural slopes. A schematic diagram for this condition is presented on Plate G-2.
5. All fill slopes should be provided with a key unless within the body of a larger overall fill mass. Please refer to Plate G-3 for specific guidelines.

Anticipated buttress and stabilization fills are discussed in the text of the report. The need to stabilize other proposed cut slopes will be evaluated during construction. Plate G-5 shows a schematic of buttress construction.

1. All backcuts should be excavated at gradients of 1:1 or flatter. The backcut configuration should be determined based on the design, exposed conditions, and need to maintain a minimum fill width and provide working room for the equipment.
2. On longer slopes, backcuts and keyways should be excavated in maximum 250 feet long segments. The specific configurations will be determined during construction.
3. All keys should be a minimum of two (2) feet deep at the toe and slope toward the heel at least one foot or two (2%) percent, whichever is greater.
4. Subdrains are to be placed for all stabilization slopes exceeding 10 feet in height. Lower slopes are subject to review. Drains may be required. Guidelines for subdrains are presented on Plate G-5.
5. Benching of backcuts during fill placement is required.

Lot Capping

1. When practical, the upper three (3) feet of material placed below finish grade should be comprised of the least expansive material available. Preferably, highly and very highly expansive materials should not be used. We will attempt to offer advice based on visual evaluations of the materials during grading, but it must be realized that laboratory testing is needed to evaluate the expansive potential of soil. Minimally, this testing takes two (2) to four (4) days to complete.
2. Transition lots (cut and fill) both per plan and those created by remedial grading (e.g. lots above stabilization fills, along daylight lines, above natural slopes, etc.) should be capped with a minimum three foot thick compacted fill blanket.
3. Cut pads should be observed by our representative(s) to evaluate the need for overexcavation and replacement with fill. This may be necessary to reduce water infiltration into highly fractured bedrock or other permeable zones, and/or due to differing expansive potential of materials beneath a structure. The overexcavation should be at least three feet. Deeper overexcavation may be recommended in some cases.

ROCK PLACEMENT AND ROCK FILL GUIDELINES

If large quantities of oversize material would be generated during grading, it's likely that such materials may require special handling for burial. Although alternatives may be developed in the field, the following methods of rock disposal are recommended on a preliminary basis.

Limited Larger Rock

When materials encountered are principally soil with limited quantities of larger rock fragments or boulders, placement in windrows is recommended. The following procedures should be applied:

1. Oversize rock (greater than 8 inches) should be placed in windrows.
   a) Windrows are rows of single file rocks placed to avoid nesting or clusters of rock.

b) Each adjacent rock should be approximately the same size (within ~one foot in diameter).

c) The maximum rock size allowed in windrows is four feet

2. A minimum vertical distance of three feet between lifts should be maintained. Also, the windrows should be offset from lift to lift. Rock windrows should not be closer than 15 feet to the face of fill slopes and sufficient space must be maintained for proper slope construction (see Plate G-4).

3. Rocks greater than eight inches in diameter should not be placed within seven feet of the finished subgrade for a roadway or pads and should be held below the depth of the lowest utility. This will allow easier trenching for utility lines.

4. Rocks greater than four feet in diameter should be broken down, if possible, or they may be placed in a dozer trench. Each trench should be excavated into the compacted fill a minimum of one foot deeper than the largest diameter of rock.

   a) The rock should be placed in the trench and granular fill materials (SE>30) should be flooded into the trench to fill voids around the rock.

   b) The over size rock trenches should be no closer together than 15 feet from any slope face.

   c) Trenches at higher elevation should be staggered and there should be a minimum of four feet of compacted fill between the top of the one trench and the bottom of the next higher trench.

   d) It would be necessary to verify 90 percent relative compaction in these pits. A 24 to 72 hour delay to allow for water dissipation should be anticipated prior to additional fill placement.

Structural Rock Fills

If the materials generated for placement in structural fills contains a significant percentage of material more than six (6) inches in one dimension, then placement using conventional soil fill methods with isolated windrows would not be feasible. In such cases the following could be considered:

1. Mixes of large rock or boulders may be placed as rock fill. They should be below the depth of all utilities both on pads and in roadways and below any proposed swimming pools or other excavations. If these fills are placed within seven (7) feet of finished grade, they may affect foundation design.

2. Rock fills are required to be placed in horizontal layers that should **not exceed two feet in thickness, or the maximum rock size present, which ever is less**. All rocks exceeding two feet should be broken down to a smaller size, windrowed (see above), or disposed of in non-structural fill areas. Localized larger rock up to 3 feet in largest dimension may be placed in rock fill as follows:

   a) individual rocks are placed in a given lift so as to be roughly 50% exposed above the typical surface of the fill ,

   b) loaded rock trucks or alternate compactors are worked around the rock on all sides to the satisfaction of the soil engineer,

   c) the portion of the rock above grade is covered with a second lift.

3. Material placed in each lift should be well graded. No unfilled spaces (voids) should be permitted in the rock fill.

Compaction Procedures

Compaction of rock fills is largely procedural. The following procedures have been found to generally produce satisfactory compaction.

1. Provisions for routing of construction traffic over the fill should be implemented.
    a) Placement should be by rock trucks crossing the lift being placed and dumping at its edge.
    b) The trucks should be routed so that each pass across the fill is via a different path and that all areas are uniformly traversed.
    c) The dumped piles should be knocked down and spread by a large dozer (D-8 or larger suggested). (Water should be applied before and during spreading.)
2. Rock fill should be generously watered (sluiced)
    a) Water should be applied by water trucks to the:
        i) dump piles,
        ii) front face of the lift being placed and,
        iii) surface of the fill prior to compaction.
    b) No material should be placed without adequate water.
    c) The number of water trucks and water supply should be sufficient to provide constant water.
    d) Rock fill placement should be suspended when water trucks are unavailable:
        i) for more than 5 minutes straight, or,
        ii) for more than 10 minutes/hour.
3. In addition to the truck pattern and at the discretion of the soil engineer, large, rubber tired compactors may be required.
    a) The need for this equipment will depend largely on the ability of the operators to provide complete and uniform coverage by wheel rolling with the trucks.
    b) Other large compactors will also be considered by the soil engineer provided that required compaction is achieved.
4. Placement and compaction of the rock fill is largely procedural. Observation by trenching should be made to check:
    a) the general segregation of rock size,
    b) for any unfilled spaces between the large blocks, and
    c) the matrix compaction and moisture content.
5. Test fills may be required to evaluate relative compaction of finer grained zones or as deemed appropriate by the soil engineer.
    a) A lift should be constructed by the methods proposed, as proposed
6. Frequency of the test trenching is to be at the discretion of the soil engineer. Control areas may be used to evaluate the contractor's procedures.
7. A minimum horizontal distance of 15 feet should be maintained from the face of the rock fill and any finish slope face. At least the outer 15 feet should be built of conventional fill materials.

Piping Potential and Filter Blankets

Where conventional fill is placed over rock fill, the potential for piping (migration) of the fine grained material from the conventional fill into rock fills will need to be addressed.

The potential for particle migration is related to the grain size comparisons of the materials present and in contact with each other. Provided that 15 percent of the finer soil is larger than the effective pore size of the coarse soil, then particle migration is substantially mitigated. This can be accomplished with a well-graded matrix material for the rock fill and a zone of fill similar to the matrix above it. The specific gradation of the fill materials placed during grading must be known to evaluate the need for any type of filter that may be necessary to cap the rock fills. This, unfortunately, can only be accurately determined during construction.

In the event that poorly graded matrix is used in the rock fills, properly graded filter blankets 2 to 3 feet thick separating rock fills and conventional fill may be needed. As an alternative, use of two layers of filter fabric (Mirafi 700 x or equivalent) could be employed on top of the rock fill. In order to mitigate excess puncturing, the surface of the rock fill should be well broken down and smoothed prior to placing the filter fabric. The first layer of the fabric may then be placed and covered with relatively permeable fill material (with respect to overlying material) 1 to 2 feet thick. The relative permeable material should be compacted to fill standards. The second layer of fabric should be placed and conventional fill placement continued.

Subdrainage

Rock fill areas should be tied to a subdrainage system. If conventional fill is placed that separates the rock from the main canyon subdrain, then a secondary system should be installed. A system consisting of an adequately graded base (3 to 4 percent to the lower side) with a collector system and outlets may suffice.

Additionally, at approximately every 25 foot vertical interval, a collector system with outlets should be placed at the interface of the rock fill and the conventional fill blanketing a fill slope.

Monitoring

Depending upon the depth of the rock fill and other factors, monitoring for settlement of the fill areas may be needed following completion of grading. Typically, if rock fill depths exceed 40 feet, monitoring would be recommend prior to construction of any settlement sensitive improvements. Delays of 3 to 6 months or longer can be expected prior to the start of construction.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractor's responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.

2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
   a) shallow (12 + inches) under slab interior trenches and,
   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.
3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractor's procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractor's attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

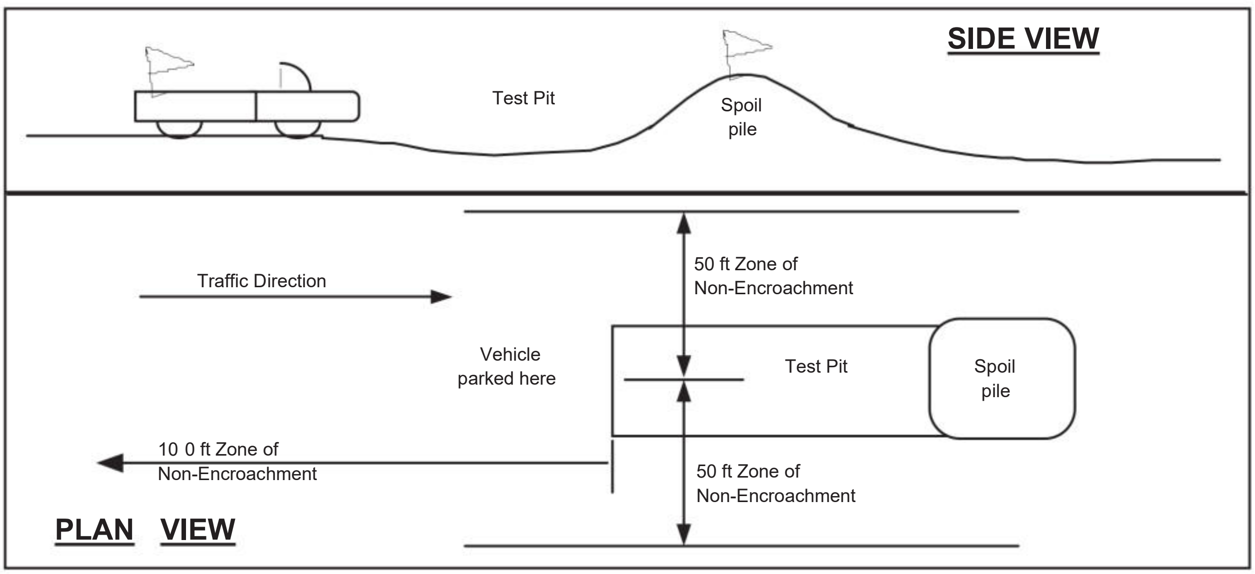
Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN



Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;
1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractor’s representative will then be contacted in an effort to affect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

Procedures

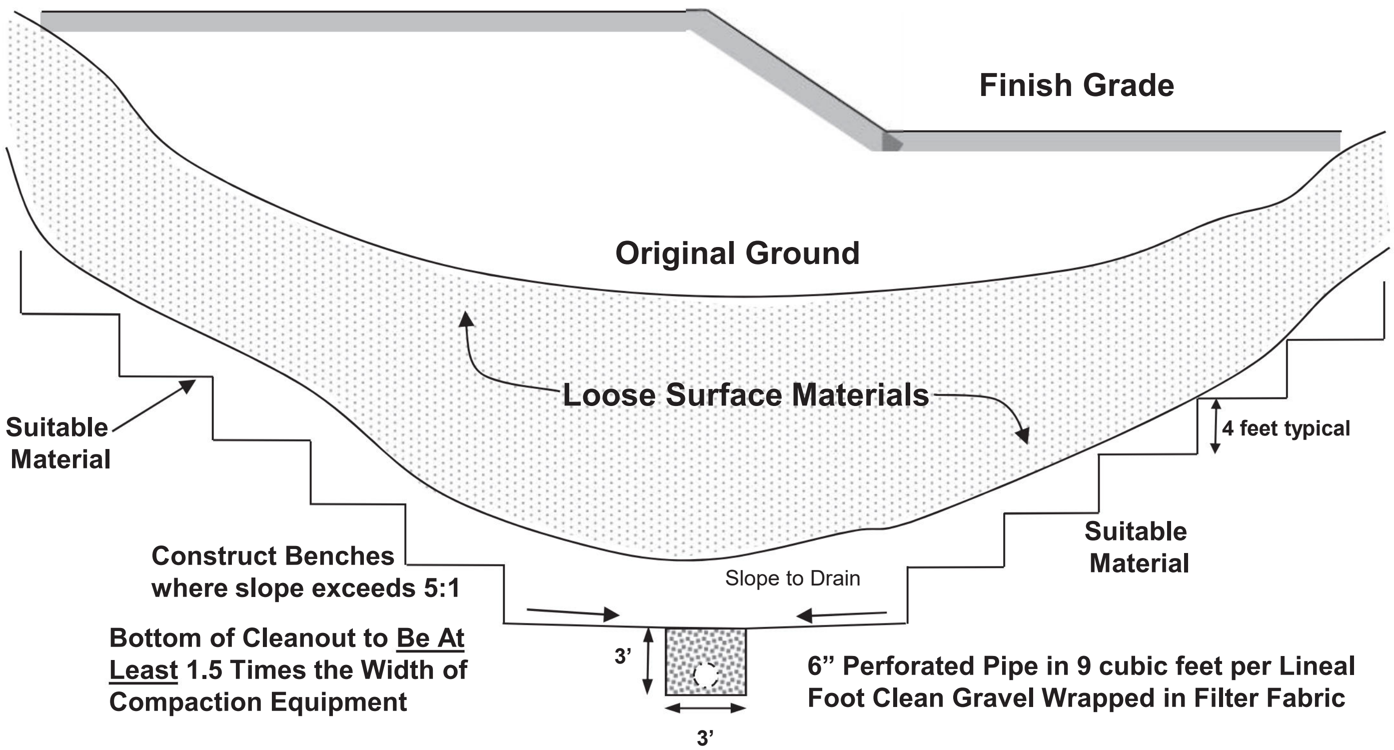
In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor’s representative will then be contacted in an effort to affect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

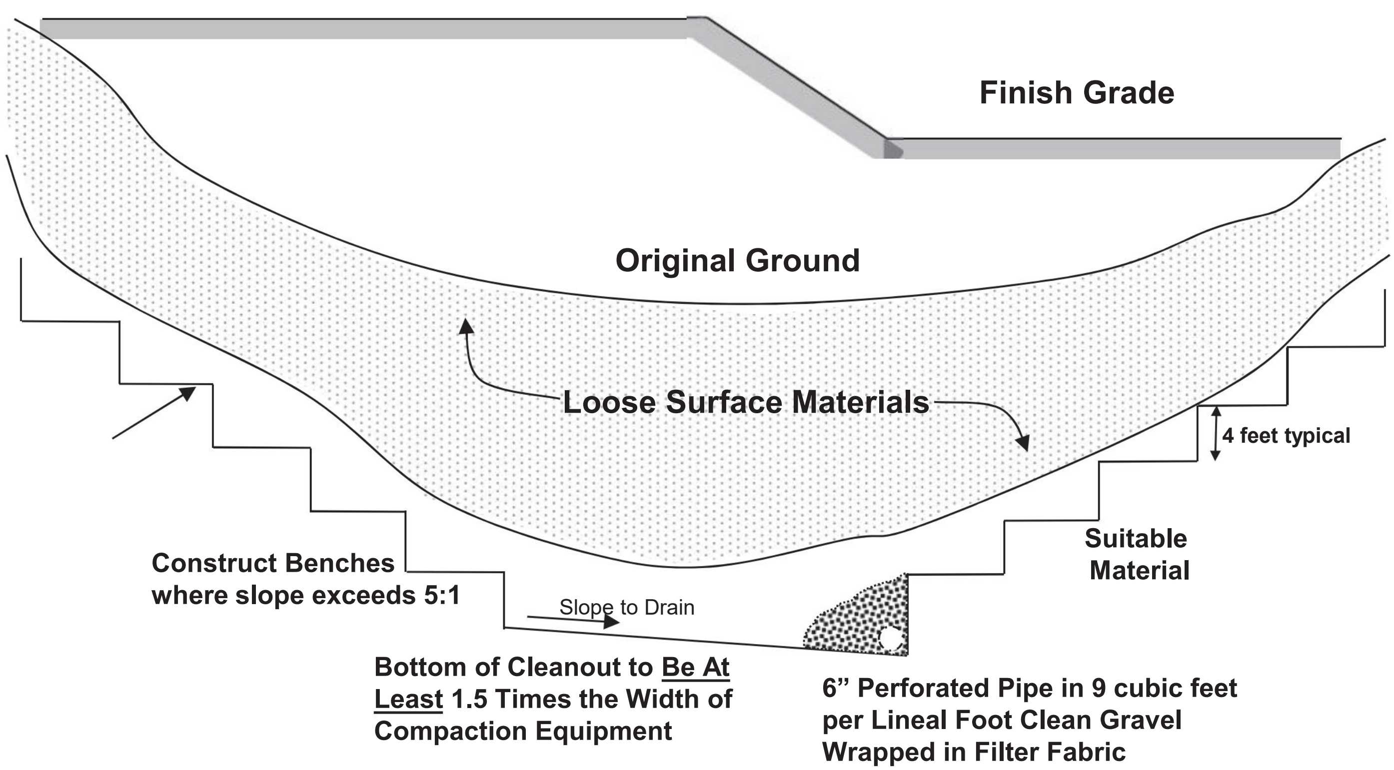
In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technician’s attention and notify our project manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

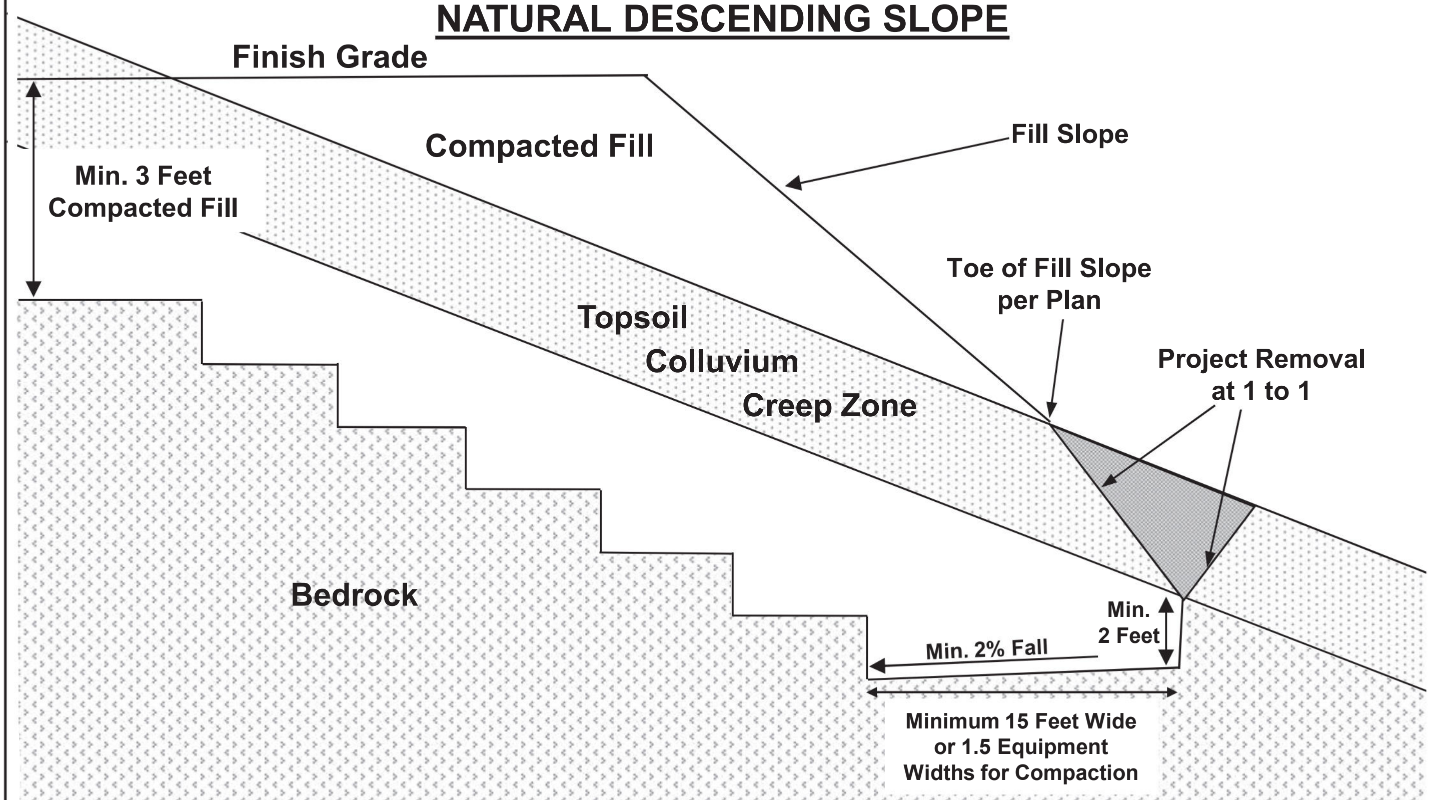
ALTERNATES



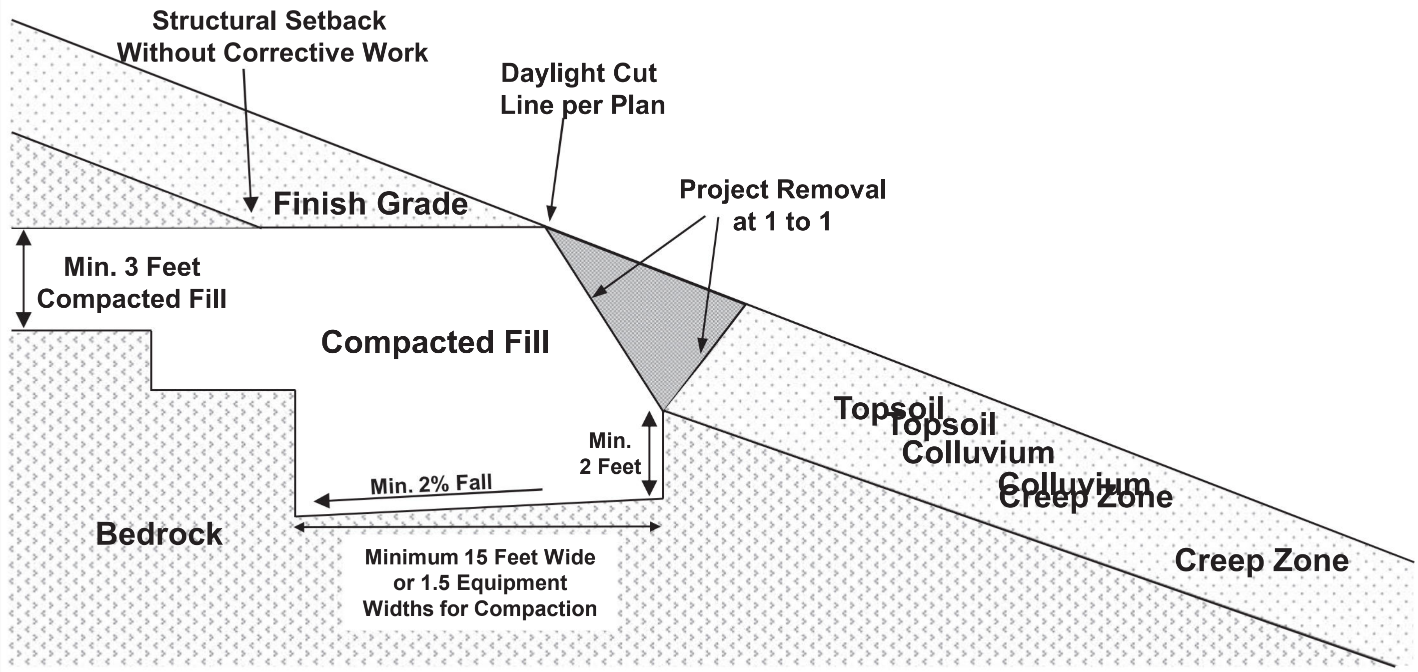


GEOTEK	1384 Poinsettia Avenue, Suite A Vista, California 92083	TYPICAL CANYON CLEANOUT	STANDARD GRADING GUIDELINES PLATE G-1

TYPICAL FILL SLOPE OVER NATURAL DESCENDING SLOPE



DAYLIGHT CUT AREA OVER NATURAL DESCENDING SLOPE



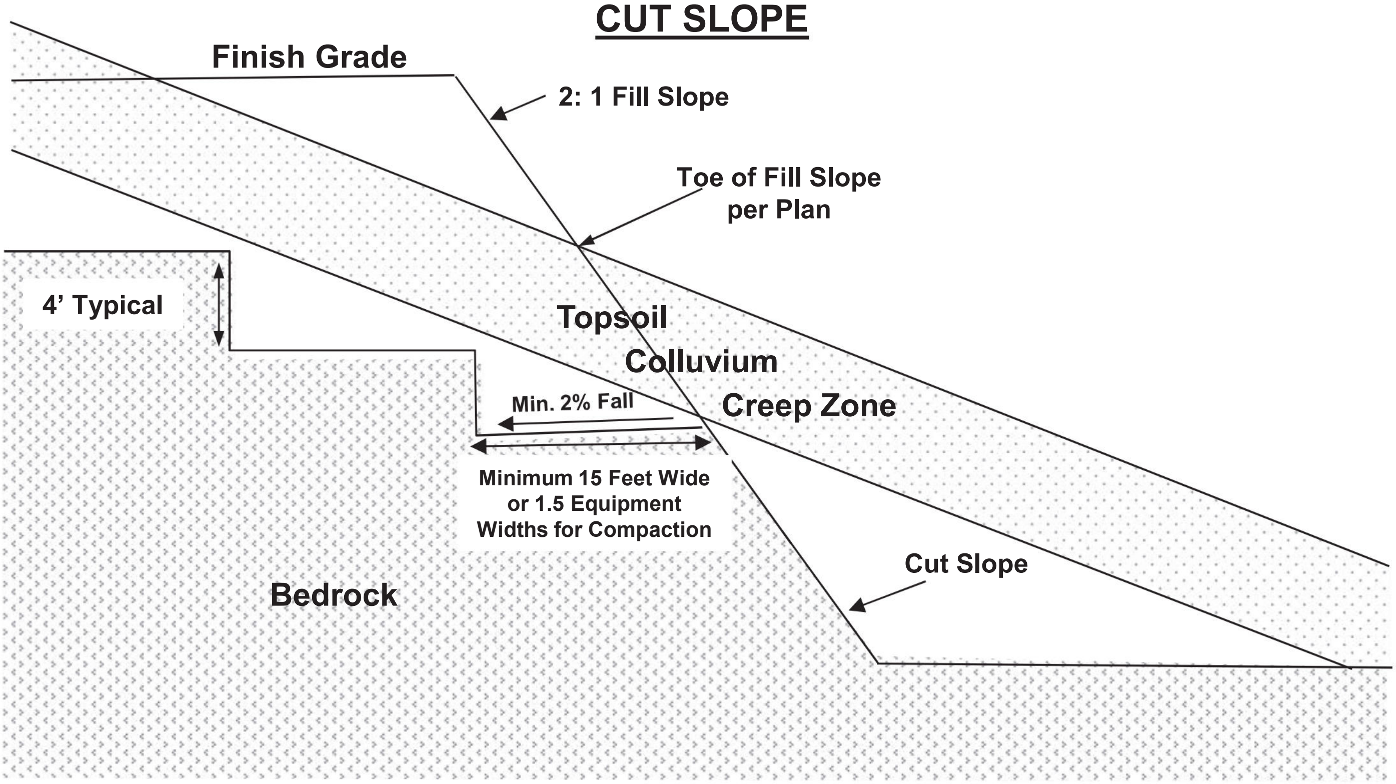
GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081-8505

TREATMENT ABOVE NATURAL SLOPES

STANDARD GRADING GUIDELINES

PLATE G-2

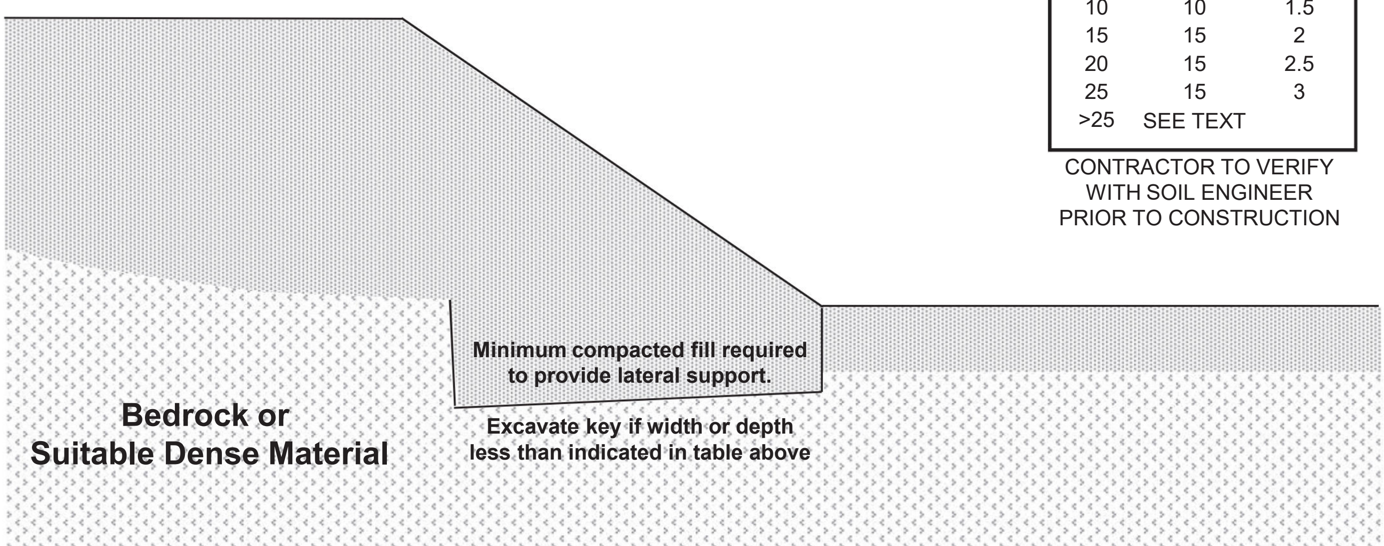
TYPICAL FILL SLOPE OVER CUT SLOPE



TYPICAL FILL SLOPE

SLOPE HEIGHT	MIN. KEY WIDTH	MIN. KEY DEPTH
5	7	1
10	10	1.5
15	15	2
20	15	2.5
25	15	3
>25	SEE TEXT	

CONTRACTOR TO VERIFY WITH SOIL ENGINEER PRIOR TO CONSTRUCTION



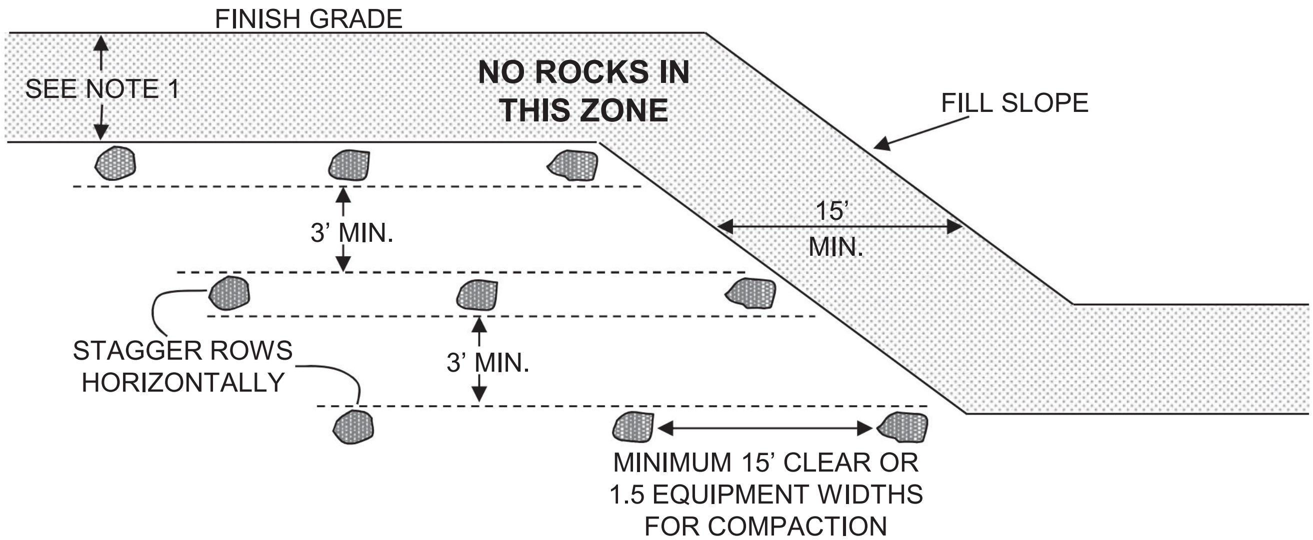
GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081-8505

COMMON FILL SLOPE KEYS

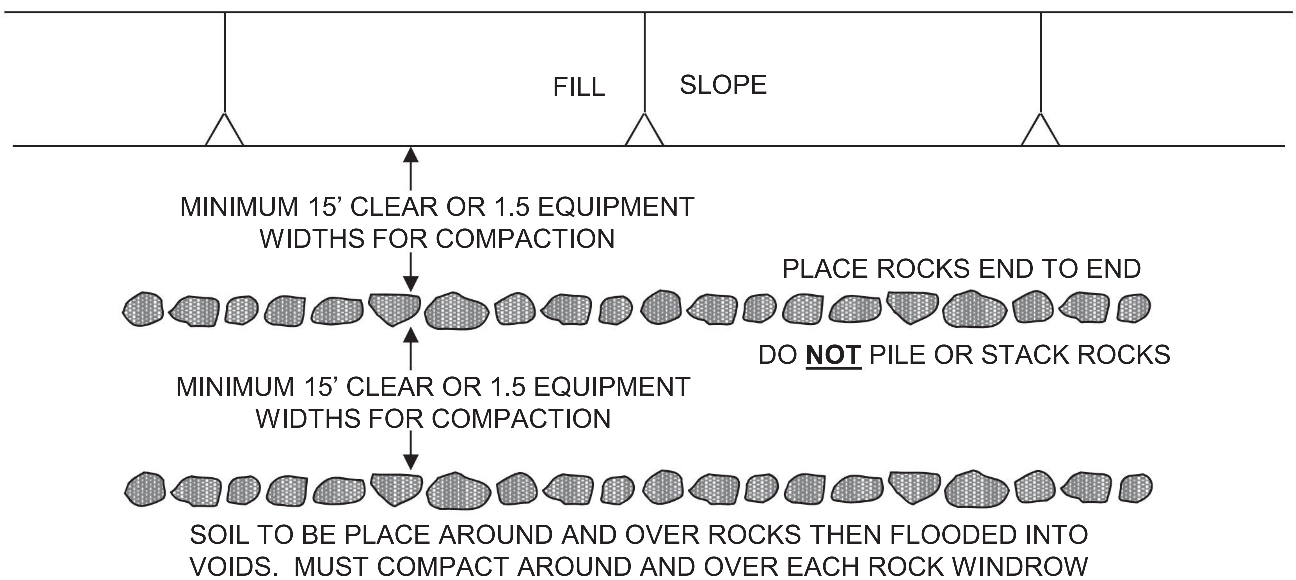
STANDARD GRADING GUIDELINES

PLATE G-3

CROSS SECTIONAL VIEW



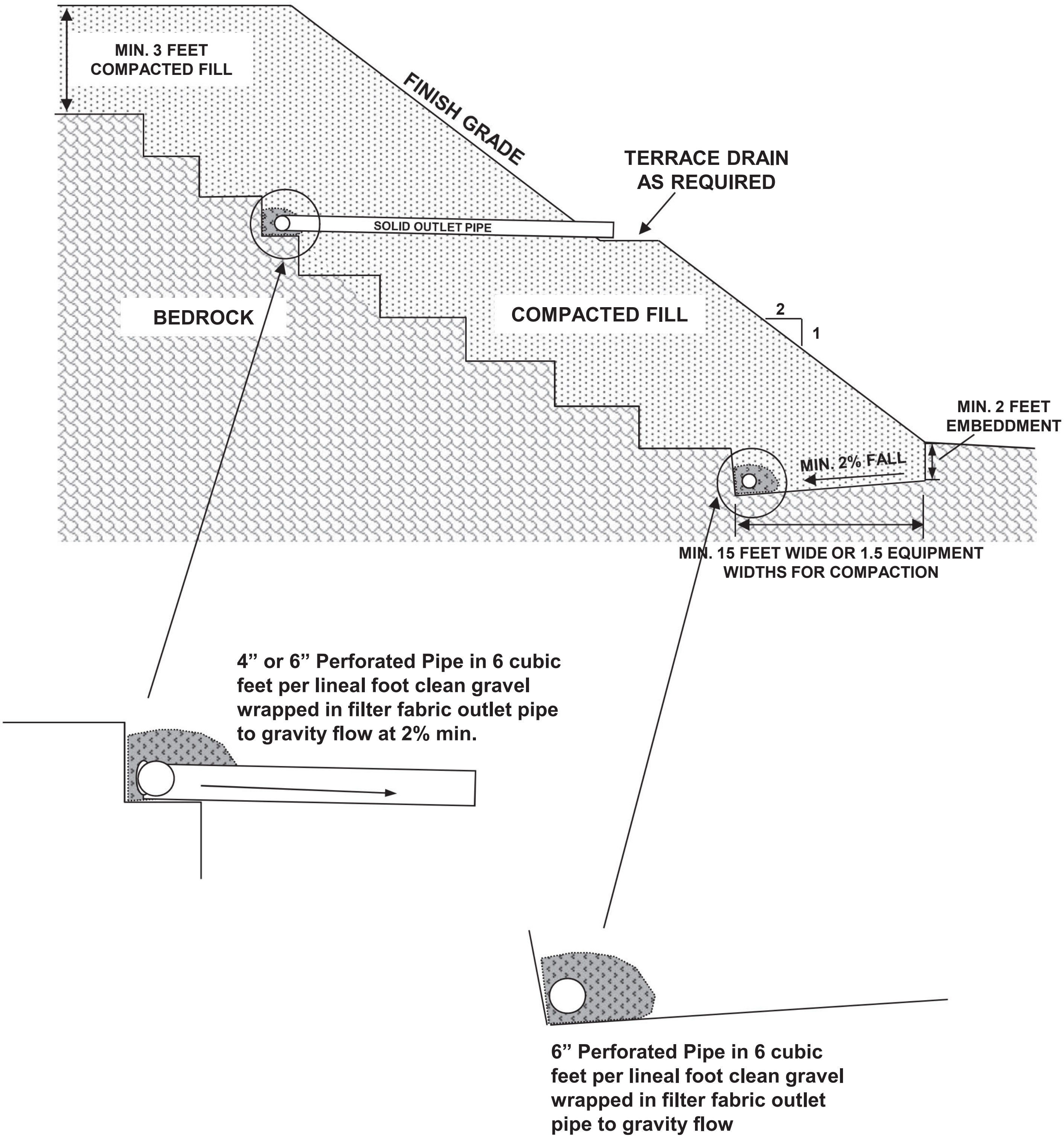
PLAN VIEW



NOTES:

1) SOIL FILL OVER WINDROW SHOULE BE 7 FEET OR PER JURISDUICTIONAL STANDARDS AND SUFFICIENT FOR FUTURE EXCAVATIONS TO AVOID ROCKS
2) MAXIMUM ROCK SIZE IN WINDROWS IS 4 FEET MINIMUM DIAMETER
3) SOIL AROUND WINDROWS TO BE SANDY MATERIAL SUBJECT TO SOIL ENGINEER ACCEPTANCE
4) SPACING AND CLEARANCES MUST BE SUFFICIENT TO ALLOW FOR PROPER COMPACTION
5) INDIVDUAL LARGE ROCKS MAY BE BURIED IN PITS.

GEOTEK 1384 Poinsettia Avenue, Suite A Vista, California 92081-8505	**ROCK BURIAL DETAILS**	**STANDARD GRADING GUIDELINES** **PLATE G-4**



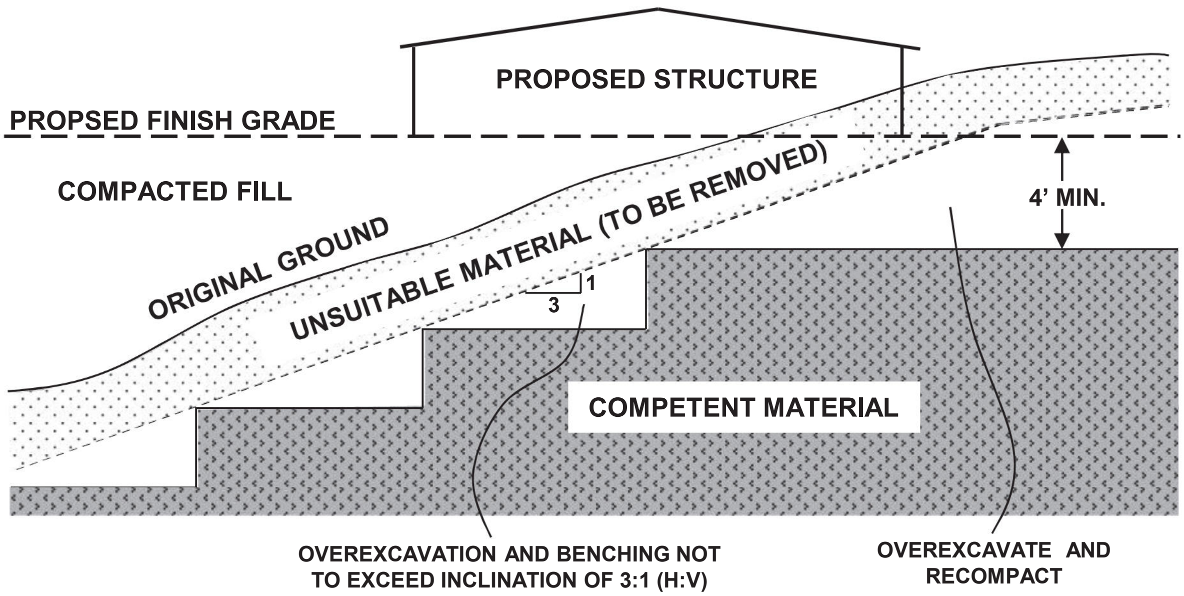
GEOTEK

1384 Poinsettia Avenue, Suite A
Vista, California 92083

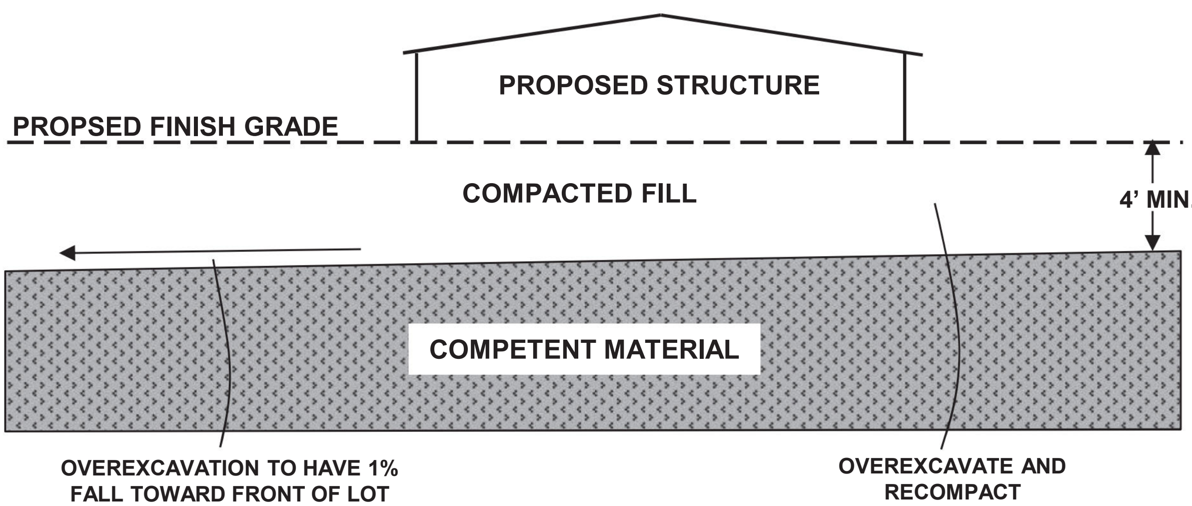
Typical Buttress and Stabilization Fill

PLATE G-5

TRANSITION LOT



UNDERCUT LOT



Notes:
1. Removed/overexcavated soils should be recompacted in accordance with recommendations included in the text of the report.
2. Location of cut/fill transition should verified in the field during site grading.

GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081-8505

TRANSITION & UNDERCUT LOTS

STANDARD GRADING GUIDELINES

PLATE G-6