GEOTECHNICAL INVESTIGATION
PROPOSED WAREHOUSE DEVELOPMENT

SWC Cajalco road and Seaton Avenue
Riverside County (Perris Area), California
for
Hillwood

SoCalGeo
SOUTHERN
CALIFORNIA
GEOTECHNICAL
A California Corporation

December 9, 2022

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Hillwood
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Ontario, California 91764

Attention: Mr. John Grace
Vice President, Development

Project No.: **22G213-3**

Subject: **Geotechnical Investigation**
Proposed Warehouse Development
SWC Cajalco Road and Seaton Avenue
Riverside County (Perris Area), California

Gentlemen:

In accordance with your request, we have conducted a geotechnical investigation for the northern site of the overall project. This report also includes feasibility borings for the southern site of the project. We are pleased to present this report summarizing the conclusions and recommendations developed from our investigation.

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Joseph Lozano Leon
Staff Engineer

REGISTERED PROFESSIONAL ENGINEER
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Principal Engineer

Distribution: (1) Addressee

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1.0 EXECUTIVE SUMMARY

Presented below is a brief summary of the conclusions and recommendations of this investigation for the northern site of the project site. Since this summary is not all inclusive, it should be read in complete context with the entire report.

Site Preparation

- Initial site preparation should include stripping of the existing native grass and weed growth, organic topsoil materials, and trees that will not remain with the proposed development. Existing debris and trash should be removed from the site.
- Demolition of the various structures in several portions of the site will be necessary in order to facilitate the construction of the proposed development. Demolition should include foundations, floor slabs, utilities and other subsurface improvements that will not remain in place with the new development.
- The near-surface soils consist of bedrock, predominately in the western area of the northern site, with younger and older native alluvium in the remainder of the sites. The younger alluvium was encountered at some of the boring locations extending to depths of 2½ to 8± feet below existing site grades. The younger alluvium and some of the older alluvium, possesses a moderate potential for hydrocollapse. Additionally, based on the existing site topography, the proposed grading is expected to create cut-fill transitions in the proposed building pad area. Therefore, remedial grading is recommended to remove some of the hard bedrock as well as a portion of the near-surface native alluvium and replace these soils as compacted structural fill soils. The recommended remedial grading will reduce potential differential settlements by creating more uniform conditions across cut/fill transitions and by removing near surface hard bedrock as well as the variable strength and collapsible near-surface alluvial soils. These materials will be replaced as compacted structural fill.
- The proposed building area should be overexcavated to a depth of at least 3 feet below existing grade and to a depth of 3 feet below the proposed building pad subgrade elevation, whichever is deeper. Within the foundation influence zones, the overexcavation should extend to a depth of at least 2 feet below proposed foundation bearing grade. The overexcavation should extend horizontally at least 5 feet beyond the building perimeter. Additional overexcavation may be necessary in portions of the building pad area in order to remove potentially collapsible, low density, younger alluvial soils. The limits of additional overexcavation should be evaluated during grading.
- After overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify additional soils that should be removed. The resulting subgrade should then be scarified to a depth of 12 inches and moisture conditioned to 2 to 4 percent above optimum. The previously excavated soils may then be replaced as compacted structural fill. Structural fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density.
- The new pavement and flatwork subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Foundation Design Recommendations

- Conventional shallow foundations, supported in newly placed compacted fill.

- 2,500 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least four (4) No. 5 rebars (2 top and 2 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

Building Floor Slab Design Recommendations

- Conventional Slabs-on-Grade: minimum 6-inch thickness.
- Modulus of Subgrade Reaction: k = 100 psi/in.
- Minimum slab reinforcement: No. 3 bars at 16 inches on-center, in both directions, due to the presence of potentially expansive soils at the site.
- The actual thickness and reinforcement of the floor slab should be determined by the structural engineer.

Pavement Design Recommendations

ASPHALT PAVEMENTS (R=40)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	4	6	7	8	10
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R=40)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 22P192, dated April 20, 2022, and our Change Order No. 22G213-CO dated November 8, 2022. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations, building floor slab, and parking lot pavements along with site preparation recommendations and construction considerations for the northern portion of the overall proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

At the request of the client, visual site reconnaissance, limited subsurface exploration, limited field and laboratory testing, and geotechnical engineering analysis was also performed to determine the geotechnical feasibility for the southern portion of the overall proposed development. It should be noted that additional subsurface exploration, laboratory testing and engineering analysis will be necessary to provide a design-level geotechnical investigation with specific foundations, floor slabs, and grading recommendations for the southern portion of the proposed development.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The project consists of two sites, identified as the northern and southern sites. The northern site of the project is located at the southwest corner of Cajalco Road and Seaton Avenue in an unincorporated portion of Riverside County near Perris, California. The northern site is bounded to the north by Cajalco Road, to the west by the Decker Road easement, to the south by vacant lots, and to the east by Seaton Avenue. The southern site is located approximately 1,320 feet west of Seaton Avenue and 160 feet south from the northern site. The southern site is also located in an unincorporated portion of Riverside County near Perris, California. The southern site is bounded to the north by vacant lots, and to the west, south and east by single-family residence (SFR) properties. The general locations of the sites are illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

Northern Site

The northern site consists of thirteen (13) rectangular-shaped parcels, which total 50± acres in size. The site is currently developed with several SFR properties, vacant lots, and one commercial/industrial building. The SFRs range from 1,200 to 2,000± ft² in size and are of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. The SFR properties also include several wooden barns and canopies. The industrial building is approximately 1,750 ft² in size located in the eastern-central area of the site. Ground surface cover surrounding the SFRs consists of exposed soil, medium-sized trees, and limited areas of moderate-condition Portland Cement concrete (PCC) pavements. The empty lots consist of exposed soil with occasional small to medium-sized trees. Ground surface surrounding the existing commercial/industrial building consists of open graded gravel and asphaltic concrete (AC) pavements. Isolated areas of tonalitic bedrock outcrops are exposed throughout the site.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth, and visual observations made at the time of the subsurface investigation, the northern site topography slopes gently toward the east at a gradient of less than 2± percent.

Southern Site

The southern site consists of five (5) rectangular-shaped parcels, which total 15.5± acres in size. The site is currently developed with SFR properties and vacant lots. The SFRs range from 800 to 1,400± ft² in size and are of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. The SFR properties also include several wooden barns, canopies and animal pens. Ground surface cover surrounding the SFRs consists of exposed soil, medium-sized trees, and limited areas of moderate-condition

Portland Cement concrete (PCC) pavements. Tonalitic bedrock outcrops are exposed extensively on the eastern and southern portions of the site.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth, and visual observations made at the time of the subsurface investigation, the southern site topography slopes toward the east at a gradient of up 5± percent.

3.2 Proposed Development

Based on the site plan provided by the client, the northern site will be developed with one warehouse, 1,000,710± ft² in size, located in the east-central area of the site. The building will be constructed with dock-high doors along portions of the north and south building walls. The building is expected to be surrounded by AC pavements in the parking and drive lane areas, PCC pavements in the loading dock areas, and concrete flatwork with limited areas of landscaped planters throughout. In addition, the new development may include a future green space/park main the western portion of the site, and a trail area along the south property line.

Detailed structural information has not been provided. We assume that the new building will be a single-story structure of tilt-up concrete construction, typically supported on a conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 6 kips per linear foot, respectively.

No significant amounts of below-grade construction, such as crawl spaces or new basements, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills up to 15 to 20± feet are expected to be necessary to achieve the proposed site grades.

No site plan for the southern site was available at the time of this report. Based on information provided by the client, the southern site may be developed as a community park. The community park may include relatively light structures of CMU block construction, ranging from 1,000 to 5,000± ft^2 in size. The boundaries for the northern and southern sites of the proposed development are indicated on the Boring Location Plan, included as Plate 2 in Appendix A of this report. It should be noted that the design-level investigation is only for the northern site.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of a total of sixteen (16) borings (identified as Boring Nos. B-1 through B-16) advanced to depths of 10 to 30± feet below the existing site grades. Two (2) of the borings were attempted to be drilled to a depth of 50± feet as part of the liquefaction evaluation, but very dense bedrock was encountered at shallow depths. Boring Nos. B-1 through B-11 were performed as part of the design-level investigation for the northern site. Boring Nos. B-12 through B-16 were performed for the southern site. All of the borings were logged during drilling by a member of our staff.

The borings were advanced with hollow-stem augers, by a conventional truck-mounted drilling rig. Representative bulk and relatively undisturbed soil samples were taken during drilling. Relatively undisturbed soil samples were taken with a split barrel "California Sampler" containing a series of one inch long, 2.416± inch diameter brass rings. This sampling method is described in ASTM Test Method D-3550. In-situ samples were also taken using a 1.4± inch inside diameter split spoon sampler, in general accordance with ASTM D-1586. Both of these samplers are driven into the ground with successive blows of a 140-pound weight falling 30 inches. The blow counts obtained during driving are recorded for further analysis. Bulk samples were collected in plastic bags to retain their original moisture content. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory.

The approximate locations of the borings are indicated on the Boring Location Plan, included as Plate 2 in Appendix A of this report. The Boring Logs, which illustrate the conditions encountered at the boring locations, as well as the results of some of the laboratory testing, are included in Appendix B.

4.2 Geotechnical Conditions

Younger Alluvium

Younger alluvium was encountered at the ground surface of Boring Nos. B-8, and B-12 through B-15, extending to depths ranging from 2½ to 8± feet below existing site grades. The younger alluvium consists of loose to medium dense silty sands and sandy silts with varying clay and fine gravel content.

Older Alluvium

Older alluvium was encountered at the ground surface or beneath the younger alluvium at Boring Nos. B-3 through B-11 and B-15, extending to depths ranging from the ground surface to 20 feet below existing site grades. The older alluvium consists of medium dense to very dense silty sands, medium dense sands, and medium dense to very dense sandy silts. Varying quantities of clay were occasionally encountered in the older alluvium.

Bedrock

Val Verde Tonalite (Kvt) bedrock was encountered at the ground surface or beneath the alluvium at each boring locations except for Boring Nos. B-4 and B-6, extending to depths ranging from the ground surface to at least the maximum depth explored of 30± feet below existing site grades. The bedrock consists of fine to coarse-grained Tonalite which is phaneritic, friable, weathered, and weakly cemented.

Groundwater

Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 30± feet at the time of the subsurface exploration.

Recent water level data was obtained from the California State Water Resources Control Board, GeoTracker, website, https://geotracker.waterboards.ca.gov/. One monitoring wells on record is located 1.78± miles west of the site. Water level readings within this monitoring wells indicate a high groundwater level of 4½± feet below the ground surface in February 2010.

4.3 Geologic Conditions

Regional geologic conditions were obtained from the Geologic Map of the Steele Peak 7.5' Quadrangle, Riverside County, California, by Douglas M. Morton published by the California Department of Mines and Geology and United States Air Force, 2001. This map indicates that the site is predominantly underlain by early Pleistocene (Map Symbol Qvof) old alluvial valley deposits in the eastern portion and some Val Verde tonalite (Map Symbol Kvt) formation in the western portion of the site. Morton describes the older alluvium deposits as predominantly composed of moderately indurated, slightly dissected, sandy alluvium, containing lesser silt, and clay-bearing alluvium. Morton describes this formation as gray-weathering, relatively homogeneous, massive to well-foliated, medium to coarse grained, hypautomorphic granular biotite-hornblende tonalite. A portion of this map indicating the location of the subject site is included as Plate 3 in Appendix A.

Older alluvium and bedrock materials were encountered at most of the boring locations. The geologic conditions encountered at the site are consistent with the mapped geologic conditions.

5.0 LABORATORY TESTING

The soil samples recovered from the subsurface exploration were returned to our laboratory for further testing to determine selected physical and engineering properties of the soils. The tests are briefly discussed below. It should be noted that the test results are specific to the actual samples tested, and variations could be expected at other locations and depths.

Classification

All recovered soil samples were classified using the Unified Soil Classification System (USCS), in accordance with ASTM D-2488. The field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown on the Boring Logs and are periodically referenced throughout this report.

Density and Moisture Content

The density has been determined for selected relatively undisturbed ring samples. These densities were determined in general accordance with the method presented in ASTM D-2937. The results are recorded as dry unit weight in pounds per cubic foot. The moisture contents are determined in accordance with ASTM D-2216, and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Consolidation

Selected soil samples were tested to determine their consolidation potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-7 in Appendix C of this report.

Maximum Dry Density and Optimum Moisture Content

Representative bulk samples were tested to determine their maximum dry densities and optimum moisture contents. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557. These tests are generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil type or soil mixes may be necessary at a later date. The results of the testing are plotted on Plates C-8 and C-9 in Appendix C of this report.

Expansion Index

The expansion potential of the on-site soils was determined in general accordance with ASTM D-4829. The testing apparatus is designed to accept a 4-inch diameter, 1-in high, remolded sample. The sample is initially remolded to 50± 1 percent saturation and then loaded with a surcharge equivalent to 144 pounds per square foot. The sample is then inundated with water, and allowed to swell against the surcharge. The resultant swell or consolidation is recorded after a 24-hour period. The results of the EI testing are as follows:

Sample Identification	Expansion Index	Expansive Potential
B-3 @ 0 to 5 feet	6	Very Low
B-6 @ 0 to 5 feet	32	Low
B-13 @ 0 to 5 feet	32	Low

Soluble Sulfates

Representative samples of the near-surface soils were submitted to a subcontracted analytical laboratory for determination of soluble sulfate content. Soluble sulfates are naturally present in soils, and if the concentration is high enough, can result in degradation of concrete which comes into contact with these soils. The results of the soluble sulfate testing are presented below, and are discussed further in a subsequent section of this report.

Sample Identification	Soluble Sulfates (%)	Severity
B-3 @ 0 to 5 feet	0.009	Not Applicable (S0)
B-6 @ 0 to 5 feet	0.011	Not Applicable (S0)
B-13 @ 0 to 5 feet	0.007	Not Applicable (S0)

Corrosivity Testing

Representative bulk samples of the near-surface soils were submitted to a subcontracted corrosion engineering laboratory for determination of electrical resistivity, pH, and chloride concentrations. The resistivity of the soils is a measure of their potential to attack buried metal improvements such as utility lines. The results of some of these tests are presented below.

Sample Identification	Saturated Resistivity (ohm-cm)	pH	Chlorides (mg/kg)	Nitrates (mg/kg)	Sulfides (mg/kg)	Redox Potential (mV)
B-3 @ 0 to 5 feet	5,561	7.6	42.0	36.9	0.87	149
B-6 @ 0 to 5 feet	8,040	9.4	41.6	0.4	1.17	139
B-13 @ 0 to 5 feet	4,616	7.6	19.3	85.1	1.17	170

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our review, field exploration, laboratory testing and geotechnical analysis, the northern site of the overall proposed development is considered feasible from a geotechnical standpoint. Based on the preliminary nature of the geotechnical investigation performed within the southern site, further geotechnical investigation will be required prior to construction of the proposed development in this portion of the project site. The recommendations contained in this report should be taken into the design, construction, and grading considerations.

The recommendations are contingent upon all grading and foundation construction activities being monitored by the geotechnical engineer of record. The recommendations are provided with the assumption that an adequate program of client consultation, construction monitoring, and testing will be performed during the final design and construction phases to verify compliance with these recommendations. Maintaining Southern California Geotechnical, Inc., (SCG) as the geotechnical consultant from the beginning to the end of the project will provide continuity of services. The geotechnical engineering firm providing testing and observation services shall assume the responsibility of Geotechnical Engineer of Record.

The Grading Guide Specifications, included as Appendix D, should be considered part of this report, and should be incorporated into the project specifications. The contractor and/or owner of the development should bring to the attention of the geotechnical engineer any conditions that differ from those stated in this report, or which may be detrimental for the development.

6.1 Seismic Design Considerations

The subject site is located in an area which is subject to strong ground motions due to earthquakes. The performance of a site specific seismic hazards analysis was beyond the scope of this investigation. However, numerous faults capable of producing significant ground motions are located near the subject site. Due to economic considerations, it is not generally considered reasonable to design a structure that is not susceptible to earthquake damage. Therefore, significant damage to structures may be unavoidable during large earthquakes. The proposed structure should, however, be designed to resist structural collapse and thereby provide reasonable protection from serious injury, catastrophic property damage and loss of life.

Faulting and Seismicity

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. In addition, our review of the Riverside County RCIT GIS website indicates that the site is not located within a Riverside County fault zone. Furthermore, SCG did not identify any evidence of faulting during the geotechnical investigation. Therefore, the possibility of significant fault rupture on the site is considered to be low Therefore, the possibility of significant fault rupture on the site is considered to be low.

The potential for other geologic hazards such as seismically induced settlement, lateral spreading, tsunamis, inundation, seiches, flooding, and subsidence affecting the site is considered low.

Seismic Design Parameters

The 2019/2022 California Building Code (CBC) provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site. The proposed development is expected to be designed in accordance with the requirements of the 2022 edition of the California Building Code (CBC), which will be adopted on January 1, 2023.

The 2019/2022 CBC Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool, a web-based software application available at the website www.seismicmaps.org. This software application calculates seismic design parameters in accordance with several building code reference documents, including ASCE 7-16, upon which the 2019/2022 CBC is based. The application utilizes a database of risk-targeted maximum considered earthquake (MCE_R) site accelerations at 0.01-degree intervals for each of the code documents. The tables below were created using data obtained from the application. The output generated from this program is included as Plate E-1 in Appendix E of this report.

2019/2022 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	1.500
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.557
Site Class	---	C
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.800
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	0.803
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.200
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.536

Liquefaction

Liquefaction is the loss of strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. The primary factors which influence the potential for liquefaction include groundwater table elevation, soil type and plasticity characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. The depth within which the occurrence of liquefaction may impact surface improvements is generally identified as the upper 50 feet below the existing ground surface. Liquefaction potential is greater in saturated, loose, poorly graded fine sands with a mean (d_{50}) grain size in the range of 0.075 to 0.2 mm (Seed and Idriss, 1971). Non-sensitive clayey (cohesive) soils which possess a plasticity index of at least 18 (Bray and Sancio, 2006) are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table.

The Riverside County GIS website indicates that the subject site is located within a zone of low to moderate liquefaction susceptibility. However, the subsurface conditions encountered at the boring locations are not considered to be conducive to liquefaction. These conditions include near-surface soils consisting of older alluvium, relatively shallow, very dense tonalite bedrock, and the lack of a static groundwater table within the upper 30± feet. Based on these factors, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The near-surface soils at the boring locations consist of loose to medium dense younger alluvium and medium dense to very dense older alluvium underlain by very dense tonalite bedrock. The younger alluvial soils are present within the upper 2½ to 8± feet and typically possess a significant potential for collapse. Additionally, based on the present site topography, it is expected that some cut/fill transitions will be created during grading for the proposed structure. We expect that geologic contacts between the on-site soils and bedrock will be exposed during remedial grading within the proposed building area. Remedial grading is considered warranted within the proposed building area in order to remove the near-surface younger, some older alluvium, and the hard bedrock. These materials can be replaced as compacted structural fill. The recommended remedial grading will reduce potential differential settlements by creating more uniform conditions across cut/fill transitions and by replacing near-surface variable strength soils (as well as near-surface bedrock materials) as compacted fill. It should be noted that the recommendations presented herein are only for northern site of the overall project.

We recommend that a supplemental geotechnical investigation be performed within the southern site of the overall development, in order to more completely characterize the subsurface conditions and confirm the suitability of the design recommendations provided in this report.

Settlement

The recommended remedial grading will remove the potentially collapsible native younger alluvium, as well as a portion of the near-surface older alluvium and near-surface bedrock, and replace these soils as compacted structural fill. The native soils that will remain in place below the recommended depth of overexcavation possess more favorable consolidation/collapse characteristics and will not be subject to significant load increases from the foundations of the new structure. Provided that the recommended remedial grading is completed, the post-construction static settlement of the proposed structure is expected to be within tolerable limits.

Expansion

Laboratory testing performed on representative samples of the near surface soils indicates that these materials possess a very low to low expansion potential (EI = 6 to 32). Based on the presence of expansive soils at this site, care should be given to proper moisture conditioning of all building pad subgrade soils to a moisture content of 2 to 4 percent above the ASTM D-1557 optimum during site grading. In addition to adequately moisture conditioning the subgrade soils and fill soils during grading, special care must be taken to maintaining moisture content of these soils at 2 to 4 percent above the optimum moisture content. This will require the contractor to frequently moisture condition these soils throughout the grading process, unless grading occurs during a period of relatively wet weather. Civil and structural design considerations are presented in Section 6.4 of this report. It is recommended that additional expansion index testing be conducted at the completion of rough grading to evaluate the expansion potential of the as-graded building pad.

Soluble Sulfates

The results of the soluble sulfate testing indicate that the selected samples of the on-site soils correspond to Class S0 with respect to the American Concrete Institute (ACI) Publication 318-05 Building Code Requirements for Structural Concrete and Commentary, Section 4.3. Therefore, specialized concrete mix designs are not considered to be necessary, with regard to sulfate protection purposes. It is, however, recommended that additional soluble sulfate testing be conducted at the completion of rough grading to verify the soluble sulfate concentrations of the soils which are present at pad grade within the building area.

Corrosion Potential

The results of laboratory testing indicate that the tested samples of the on-site soils possess saturated resistivity values of 4,616, 5,561 and 8,040 ohm-cm, and pH values of 7.6, 7.8 and 8.1. The soils possess redox potentials of 139, 149 and 170 mV and sulfide concentrations of 0.87 and 1.17 mg/kg. These test results have been evaluated in accordance with guidelines published by the Ductile Iron Pipe Research Association (DIPRA). The DIPRA guidelines consist of a point system by which characteristics of the soils are used to quantify the corrosivity characteristics of the site. Resistivity, pH, sulfide concentration, redox potential, and moisture content are the five factors that enter into the evaluation procedure. Based on these factors, and utilizing the DIPRA procedure, the on-site soils are considered to be mildly to moderately corrosive to ductile iron pipe. Therefore, polyethylene protection may be required for cast iron or ductile iron pipes.

Based on American Concrete Institute (ACI) Publication 318 Building Code Requirements for Structural Concrete and Commentary, reinforced concrete that is exposed to external sources of chlorides requires corrosion protection for the steel reinforcement contained within the concrete. The ACI318-14 indicates that Exposure Classes C1 and C2 are assigned to non-prestressed and prestressed concrete members, depending on the degree of exposure to external sources of moisture and chlorides in service. Furthermore, ACI318-14, Table 19.3.1.1, indicates that Exposure Class C1 pertains to concrete exposed to moisture but not an external source of chlorides. ACI 318 defines concrete exposed to moisture and an external source of chlorides as "severe" or exposure category C2. ACI 318 does not clearly define a specific chloride concentration at which contact with the adjacent soil will constitute a "C2" or severe exposure. However, the Caltrans Memo to Designers 10-5, Protection of Reinforcement Against Corrosion Due to Chlorides, Acids and Sulfates, dated June 2010, indicates that soils possessing chloride concentrations greater than 500 mg/kg are considered to be corrosive to reinforced concrete. The results of the laboratory testing indicate chloride concentrations ranging from 19.3 to 42.0 mg/kg. Although the soils contain some chlorides, we do not expect that the chloride concentrations of the tested soils are high enough to constitute a "severe" or C2 chloride exposure. Therefore, a chloride exposure category of C1 is considered appropriate for this site.

Nitrates present in soil can be corrosive to copper tubing at concentrations greater than 50 mg/kg. The tested samples possess nitrate concentrations ranging from 0.4 to 85.1 mg/kg. **Based on these test results, the on-site soils are considered to be corrosive to copper pipe**

Since SCG does not practice in the area of corrosion engineering, we recommend that the client contact a corrosion engineer to provide a more thorough evaluation of these test results.

Shrinkage/Subsidence

Removal and recompaction of the near-surface alluvial soils is estimated to result in an average shrinkage of 5 to 15 percent. Where very dense/hard older alluvium or bedrock is excavated and replaced as fill, bulking of 1 to 5 percent should be expected. It should be noted that these shrinkage and bulking estimates are based on dry density testing performed on small-diameter samples taken at the boring locations. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test-pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be 0.1 feet. This estimate may be used for grading in areas that are underlain by native alluvial soils.

These estimates are based on previous experience and the subsurface conditions encountered at the boring locations. The actual amount of subsidence is expected to be variable and will be dependent on the type of machinery used, repetitions of use, and dynamic effects, all of which are difficult to assess precisely.

Grading and Foundation Plan Review

It is recommended that we be provided with copies of the grading and foundation plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

6.3 Site Grading Recommendations

The grading recommendations presented below are based on the subsurface conditions encountered at the boring locations and our understanding of the proposed development. We recommend that all grading activities be completed in accordance with the Grading Guide Specifications included as Appendix D of this report, unless superseded by site-specific recommendations presented below.

Site Stripping and Demolition

Initial site preparation should include stripping of any surficial vegetation and organic soils. Based on conditions encountered at the time of the subsurface exploration, stripping of native grass and weed growth is expected to be necessary. These materials should be disposed of offsite. Removal of trees should include the associated root masses. Initial site stripping should also remove the minor amounts of trash and debris that are present on the subject site. The actual extent of site stripping should be evaluated in the field by the geotechnical engineer, based on the organic content and stability of the materials encountered.

Demolition of the existing single-family residential structures and industrial building at the site will be necessary in order to facilitate the construction of the proposed development. Demolition should include foundations, floor slabs, tanks, utilities and any other subsurface improvements that will not remain in place with the new development. Demolition debris should be disposed of off-site in accordance with any applicable regulations. Alternatively, concrete and asphalt debris may be crushed to a maximum 2-inch particle size, mixed with the on-site sandy soils, and reused as compacted structural fill.

Treatment of Existing Soils: Building Pad

Remedial grading should be performed within the proposed building pad area in order to remove the existing potentially compressible/collapsible native younger alluvium, near-surface older alluvium and hard bedrock. In general, it is recommended that the overexcavation extend to a depth of at least 3 feet below existing grade, and to a depth of at least 3 feet below proposed grade, whichever is greater. Within the influence zones of the new foundations, the overexcavation should extend to a depth of at least 2 feet below proposed foundation bearing grade.

Boring No. B-8 encountered potentially collapsible younger alluvial soils extending to a depth of at least 3± feet below grade. Boring Nos. B-12 through B-15 (located in the southern site) also encountered younger alluvium, extending to depths of 2½ to 8± feet from the ground surface. Based on the depths and locations where potentially collapsible younger alluvium was encountered, most of the younger alluvium in the building pad area is anticipated to be removed during remedial grading. **However, additional overexcavation may be necessary. The extent of potentially collapsible soils should be evaluated at the time of site grading**.

The overexcavation areas should extend at least 5 feet beyond the building and foundation perimeters, and to an extent equal to the depth of fill placed below the foundation bearing grade, whichever is greater. If the proposed structure incorporates any exterior columns (such as for a canopy or overhang) the area of overexcavation should also encompass these areas.

Following completion of the overexcavation, the subgrade soils within the overexcavation areas should be evaluated by the geotechnical engineer to confirm their suitability to serve as the structural fill subgrade, as well as to support the foundation loads of the new structure. This evaluation should include proofrolling and probing to identify soft, loose or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if additional fill materials or loose, porous, overly moist, or low density native soils are encountered at the base of the overexcavation.

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of at least 12 inches and moisture conditioned to achieve a moisture content of 2 to 4 percent above optimum moisture content. The subgrade soils should then be recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

The building pad area may then be raised to grade with previously excavated soils or imported, very low expansive structural fill. Structural fill soils present within the proposed building area should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density.

It should be noted that the grading recommendations presented in this report are only applicable to the northern site of the overall project. The remedial grading recommendations for the southern site are likely to be similar. We recommend that a supplemental geotechnical investigation be performed within the southern site, in order to more completely characterize the subsurface conditions and confirm the suitability of the design recommendations provided in this report.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of any proposed retaining walls and site walls should be overexcavated to a depth of 2 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pad. Younger alluvial soils, if encountered, within the wall foundation areas should be removed to a depth sufficient to expose firm and unyielding native older alluvium or bedrock. Erection pads used to construct the walls are considered to be part of the foundation system with respect to these remedial grading recommendations. The overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning, and recompacting the upper 12 inches of exposed subgrade soils, as discussed for the building area. The previously excavated soils may then be replaced as compacted structural fill.

If the full lateral recommended remedial grading cannot be completed for the proposed retaining walls and site walls located along property lines, the foundations for those walls should be designed using a reduced allowable bearing pressure. Furthermore, the contractor should take necessary precautions to protect the adjacent improvements during rough grading. Specialized grading techniques, such as A-B-C slot cuts, will likely be required during remedial grading. The geotechnical engineer of record should be contacted if additional recommendations, such as shoring design recommendations, are required during grading.

Treatment of Existing Soils: Parking and Drive Areas

Based on economic considerations, overexcavation of the existing near-surface existing soils in the new parking and drive areas is not considered warranted, with the exception of areas where lower strength or unstable soils are identified by the geotechnical engineer during grading. Subgrade preparation in the new parking and drive areas should initially consist of removal of all soils disturbed during stripping and demolition operations.

The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. Any such materials should be removed to a level of firm and unyielding soil. The exposed subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 2 to 4 percent above the optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength surficial soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

The grading recommendations presented above for the proposed parking and drive areas assume that the owner and/or developer can tolerate minor amounts of settlement within the proposed parking areas. The grading recommendations presented above do not completely mitigate the extent of the low strength and potentially collapsible alluvium in the parking areas. As such, settlement and associated pavement distress could occur. Typically, repair of such distressed areas involves significantly lower costs than completely mitigating these soils at the time of construction. If the owner cannot tolerate the risk of such settlements, the parking and drive areas should be overexcavated to a depth of 2 feet below proposed pavement subgrade elevation, with the resulting soils replaced as compacted structural fill.

<u>Treatment of Existing Soils: Flatwork Areas</u>

Subgrade preparation in the new flatwork areas should initially consist of removal of all soils disturbed during stripping operations. The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned or air dried to 2 to 4 percent above optimum, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength alluvial soils throughout the subject site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

As noted previously, the subject site is underlain by low expansive soils. Support of new flatwork on low expansive soils carries additional risk with respect to flatwork movement and potential distress. This report provides recommendations for moisture conditioning and additional steel reinforcement in the flatwork areas in order to minimize the potential effects of the expansive soils. However, if additional protection is desired, the client should consider the placement of a 2-foot-thick layer of non-expansive soil beneath all flatwork.

<u>Fill Placement</u>

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 2 to 4 percent above the optimum moisture content, and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer. Excavated bedrock materials with particle sizes of less than 6 inches may be used in fills. Larger rock materials should be disposed of off-site or placed in accordance with the recommendations for placement of oversized materials contained in the Grading Guide Specifications in Appendix D of this report.
- All grading and fill placement activities should be completed in accordance with the requirements of the 2019/2022 CBC and the grading code of the county of Riverside.
- All fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Fill soils should be well mixed.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Imported Structural Fill

All imported structural fill should consist of very low expansive (EI < 20), well graded soils possessing at least 10 percent fines (that portion of the sample passing the No. 200 sieve). Additional specifications for structural fill are presented in the Grading Guide Specifications, included as Appendix D.

Utility Trench Backfill

In general, all utility trench backfill should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. As an alternative, a clean sand (minimum Sand Equivalent of 30) may be placed within trenches and compacted in place (jetting or flooding is not recommended). Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the county of Riverside. All utility trench backfills should be witnessed by the geotechnical engineer. The trench backfill soils should be compaction tested where possible; probed and visually evaluated elsewhere.

Utility trenches which parallel a footing, and extending below a 1h:1v (horizontal to vertical) plane projected from the outside edge of the footing should be backfilled with structural fill soils, compacted to at least 90 percent of the ASTM D-1557 standard. Pea gravel backfill should not be used for these trenches.

Any soils used to backfill voids around subsurface utility structures, such as manholes or vaults, should be placed as compacted structural fill. If it is not practical to place compacted fill in these areas, then such void spaces may be backfilled with lean concrete slurry. Uncompacted pea gravel or sand is not recommended for backfilling these voids since these materials have a potential to settle and thereby cause distress of pavements placed around these subterranean structures.

6.4 Construction Considerations

Excavation Considerations

The near-surface soils generally consist of moderate strength sandy silts and silty sands with varying clay content. These materials may be subject to minor to moderate caving within shallow excavations. Where caving does occur, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, the inclination of temporary slopes should not exceed 2h:1v. Temporary excavations into older alluvium or clayey soils may be laid back at a 1.5h:1v, at the discretion of the geotechnical engineer at the time of grading. Deeper excavations may require some form of external stabilization such as shoring or bracing. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. All excavation activities on this site should be conducted in accordance with Cal-OSHA regulations.

As discussed in Section 4 of this report, very dense bedrock was encountered at most of the boring locations at or near the ground surface. Based on conditions encountered at the boring locations, conventional grading equipment may be suitable to excavate these soils to the depths recommended in this report. However, large track mounted excavators, large track mounted dozers equipped with a ripping shank, or similar equipment may be required for excavation in areas with bedrock, especially in areas where excavations exceed more than 3 to 5± feet into the bedrock. We recommend a geophysical survey be performed, such as seismic lines, to further evaluate the estimated rippability and expected excavation characteristics of the bedrock.

Moisture Sensitive Subgrade Soils

Some of the near-surface soils possess appreciable silt and clay content and may become unstable if exposed to significant moisture infiltration or disturbance by construction traffic. In addition, based on their granular content, some of the on-site soils will also be susceptible to erosion. The site should, therefore, be graded to prevent ponding of surface water and to prevent water from running into excavations.

If the construction schedule dictates that site grading will occur during a period of wet weather, allowances should be made for costs and delays associated with drying the on-site soils or import of a drier, less moisture sensitive fill material. Grading during wet or cool weather may also increase the depth of overexcavation in the pad area as well as the need for a stabilization layer.

Expansive Soils

The near-surface soils within the subject site have been determined to possess a low expansion potential. Therefore, care should be given to proper moisture conditioning of all subgrade soils to a moisture content of 2 to 4 percent above the Modified Proctor optimum during site grading. All imported fill soils should have very low expansive (EI < 20) characteristics. **In addition to adequately moisture conditioning the subgrade soils and fill soils during grading, special care must be taken to maintain the moisture content of these soils at 2 to 4 percent above the Modified Proctor optimum. This will require the contractor to frequently moisture condition these soils throughout the grading process, unless grading occurs during a period of relatively wet weather**.

Due to the presence of expansive soils at this site, provisions should be made to limit the potential for surface water to penetrate the soils immediately adjacent to the new structure. These provisions should include directing surface runoff into rain gutters and area drains, reducing the extent of landscaped areas around the structure, and sloping the ground surface away from the building. Where possible, it is recommended that landscaped planters not be located immediately adjacent to the proposed building. If landscaped planters around the building are necessary, it is recommended that drought tolerant plants or a drip irrigation system be utilized, to minimize the potential for deep moisture penetration around the structure. Presented below is a list of additional soil moisture control recommendations that should be considered by the owner, developer, and civil engineer:

- Ponding and areas of low flow gradients in unpaved walkways, grass and planter areas should be avoided. In general, minimum drainage gradients of 2 percent should be maintained in unpaved areas.
- Bare soil within five feet of proposed structure should be sloped at a minimum five percent gradient away from the structure (about three inches of fall in five feet), or the same area could be paved with a minimum surface gradient of one percent. Pavement is preferable.
- Decorative gravel ground cover tends to provide a reservoir for surface water and may hide areas of ponding or poor drainage. Decorative gravel is, therefore, not recommended and should not be utilized for landscaping unless equipped with a subsurface drainage system designed by a licensed landscape architect.

- Positive drainage devices, such as graded swales, paved ditches, and catch basins should be installed at appropriate locations within the area of proposed development.
- Concrete walks and flatwork should not obstruct the free flow of surface water to the appropriate drainage devices.
- Area drains should be recessed below grade to allow free flow of water into the drain. Concrete or brick flatwork joints should be sealed with mortar or flexible mastic.
- Gutter and downspout systems should be installed to capture all discharge from roof areas. Downspouts should discharge directly into a pipe or paved surface system to be conveyed off-site.
- Enclosed planters adjoining, or in close proximity to the proposed structure, should be sealed at the bottom and provided with subsurface collection systems and outlet pipes.
- Depressed planters should be raised with soil to promote runoff (minimum drainage gradient two percent or five percent, see above), and/or equipped with area drains to eliminate ponding.
- Drainage outfall locations should be selected to avoid erosion of slopes and/or properly armored to prevent erosion of graded surfaces. No drainage should be directed over or towards adjoining slopes.
- All drainage devices should be maintained on a regular basis, including frequent observations during the rainy season to keep the drains free of leaves, soil and other debris.
- Landscape irrigation should conform to the recommendations of the landscape architect and should be performed judiciously to preclude either soaking or excessive drying of the foundation soils. This should entail regular watering during the drier portions of the year and little or no irrigation during the rainy season. Automatic sprinkler systems should, therefore, be switched to manual operation during the rainy season. Good irrigation practice typically requires frequent application of limited quantities of water that are sufficient to sustain plant growth, but do not excessively wet the soils. Ponding and/or run-off of irrigation water are indications of excessive watering.

Other provisions, as determined by the landscape architect or civil engineer, may also be appropriate.

Groundwater

The static groundwater table is considered to exist at a depth greater than 30± feet or more below existing grade. Therefore, groundwater is not expected to impact the grading or foundation construction activities.

6.5 Foundation Design and Construction

Based on the preceding grading recommendations, it is assumed that the new building pad will be underlain by newly placed structural fill soils extending to a depth of at least 2 feet below foundation bearing grade, underlain by 1± foot of additional soil that has been densified and moisture conditioned in place. Based on this subsurface profile, the proposed structure may be supported on shallow foundations.

The foundation design parameters presented below pertain to the northern site only. These parameters will likely be similar for the southern site of the proposed development. However, these parameters should be confirmed during the subsequent design-level geotechnical investigation for the remaining portions of the overall project.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 lbs/ft^2.

- Maximum, net allowable soil bearing pressure: 1,500 lbs/ft^2 if the full recommended lateral extent of remedial grading cannot be achieved.

- Minimum wall/column footing width: 14 inches/24 inches.

- Minimum longitudinal steel reinforcement within strip footings: Four (4) No. 5 rebars (2 top and 2 bottom).

- Minimum foundation embedment: 12 inches into suitable structural fill soils, and at least 18 inches below adjacent exterior grade. Interior column footings may be placed immediately beneath the floor slab.

- It is recommended that the perimeter building foundations be continuous across all exterior doorways. Any flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

The allowable bearing pressures presented above may be increased by 1/3 when considering short duration wind or seismic loads. The minimum steel reinforcement recommended above is based on geotechnical considerations; additional reinforcement may be necessary for structural considerations. The actual design of the foundations should be determined by the structural engineer.

<u>Foundation Construction</u>

The foundation subgrade soils should be evaluated at the time of overexcavation, as discussed in Section 6.3 of this report. It is further recommended that the foundation subgrade soils be evaluated by the geotechnical engineer immediately prior to steel or concrete placement. Soils suitable for direct foundation support should consist of newly placed structural fill, compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Any unsuitable materials should be removed to a depth of suitable bearing compacted structural fill or suitable native alluvium (where reduced bearing pressures are utilized), with the resulting excavations backfilled with compacted fill soils. As an alternative, lean concrete slurry (500 to 1,500 psi) may be used to backfill such isolated overexcavations.

The foundation subgrade soils should also be properly moisture conditioned to 2 to 4 percent above the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. Since it is typically not feasible to increase the moisture content of the floor slab and foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

<u>Estimated Foundation Settlements</u>

Post-construction total and differential settlements of shallow foundations designed and constructed in accordance with the previously presented recommendations are estimated to be less than 1.0 and 0.5 inches, respectively. Differential movements are expected to occur over a 30-foot span, thereby resulting in an angular distortion of less than 0.002 inches per inch.

Lateral Load Resistance

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and slabs and the passive earth pressure developed by footings below grade. The following friction and passive pressure may be used to resist lateral forces:

- Passive Earth Pressure: 250 lbs/ft^3
- Friction Coefficient: 0.25

These are allowable values, and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill soils. The maximum allowable passive pressure is 2,500 lbs/ft^2.

6.6 Floor Slab Design and Construction

Subgrades which will support the new floor slab should be prepared in accordance with the recommendations contained in the ***Site Grading Recommendations*** section of this report. Based on the anticipated grading which will occur at this site, the floor of the proposed structure may be constructed as a conventional slab-on-grade supported on newly placed structural fill (or densified existing soils), extending to a depth of at least 3 feet below finished pad grades. Based on geotechnical considerations, the floor slab may be designed as follows:

- Minimum slab thickness: 6 inches.

- Modulus of Subgrade Reaction: k = 100 psi/in.

- Minimum slab reinforcement: No. 3 bars at 16 inches on-center, in both directions, due to the presence of potentially expansive soils at the site. The actual floor slab reinforcement should be evaluated by the structural engineer, based on the imposed loading, and intended use.

- Slab underlayment: If moisture sensitive floor coverings will be used then minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire area of the proposed slab where such moisture sensitive floor coverings are anticipated. The moisture vapor barrier should meet or exceed the Class A rating as defined by ASTM E 1745-97 and have a permeance rating less than 0.01 perms as described in ASTM E 96-95 and ASTM E 154-88. A polyolefin material such as Stego® Wrap Vapor Barrier or equivalent will meet these specifications. The moisture vapor barrier should be properly constructed in accordance with all applicable manufacturer specifications. Given that a rock free subgrade is anticipated and that a capillary break is not required, sand below the barrier is not required. The need for sand and/or the amount of sand above the moisture vapor barrier should be specified by the structural engineer or concrete contractor. The selection of sand above the barrier is not a geotechnical engineering issue and hence outside our purview. Where moisture sensitive floor coverings are not anticipated, the vapor barrier may be eliminated.

- Moisture condition the floor slab subgrade soils to 2 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.

- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.

The actual design of the floor slabs should be completed by the structural engineer to verify adequate thickness and reinforcement.

6.7 Retaining Wall Design and Construction

Although not indicated on the site plan, some retaining walls may be required to facilitate the new site grades. Retaining walls are also expected to be necessary in dock-high areas of the new building. The parameters recommended for use in the design of these walls are presented below.

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. We have provided parameters assuming the use of on-site soils for retaining wall backfill. The on-site soils generally consist of silty sands and sandy silts with some minor amounts of clay. Based on their classifications, the silty sand materials are expected to possess a friction angle of at least 30 degrees when compacted to 90 percent of the ASTM-1557 maximum dry density.

If desired, SCG could provide design parameters for an alternative select backfill material behind the retaining walls. The use of select backfill material could result in lower lateral earth pressures. In order to use the design parameters for the imported select fill, this material must be placed within the entire active failure wedge. This wedge is defined as extending from the heel of the retaining wall upwards at an angle of approximately 60° from horizontal. If select backfill material behind the retaining wall is desired, SCG should be contacted for supplementary recommendations.

RETAINING WALL DESIGN PARAMETERS

Design Parameter		**Soil Type** On-Site Silty Sands and Sandy Silts
Internal Friction Angle (ϕ)		30°
Unit Weight		133 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	45 lbs/ft^3
	Active Condition (2h:1v backfill)	72 lbs/ft^3
	At-Rest Condition (level backfill)	67 lbs/ft^3

Regardless of the backfill type, the walls should be designed using a soil-footing coefficient of friction of 0.25 and an equivalent passive pressure of 250 lbs/ft^3. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

The active earth pressure may be used for the design of retaining walls that do not directly support structures or support soils that in turn support structures and which will be allowed to deflect. The at-rest earth pressure should be used for walls that will not be allowed to deflect such as those which will support foundation bearing soils, or which will support foundation loads directly.

Where the soils on the toe side of the retaining wall are not covered by a "hard" surface such as a structure or pavement, the upper 1 foot of soil should be neglected when calculating passive resistance due to the potential for the material to become disturbed or degraded during the life of the structure.

Seismic Lateral Earth Pressures

In accordance with the 2019/2022 CBC, any retaining walls more than 6 feet in height must be designed for seismic lateral earth pressures. If walls 6 feet or more are required for this site, the geotechnical engineer should be contacted for supplementary seismic lateral earth pressure recommendations.

Retaining Wall Foundation Design

The retaining wall foundations should be supported within newly placed compacted structural fill, extending to a depth of at least 2 feet below proposed foundation bearing grade. Foundations to support new retaining walls should be designed in accordance with the general Foundation Design Parameters presented in a previous section of this report.

Backfill Material

On-site soils may be used to backfill the retaining walls. However, all backfill material placed within 3 feet of the back wall face should have a particle size no greater than 3 inches. The retaining wall backfill materials should be well graded.

It is recommended that a properly installed prefabricated drainage composite such as the MiraDRAIN 6000XL (or approved equivalent), which is specifically designed for use behind retaining walls be used. If the drainage composite material is not covered by an impermeable surface, such as a structure or pavement, a 12-inch thick layer of a low permeability soil should be placed over the backfill to reduce surface water migration to the underlying soils. The drainage composite should be separated from the backfill soils by a suitable geotextile, approved by the geotechnical engineer.

Retaining wall backfill should be placed and compacted under engineering observed conditions in the necessary layer thicknesses to ensure an in-place density between 90 and 93 percent of the maximum dry density as evaluated by the Modified Proctor test (ASTM D1557). Care should be taken to avoid over-compaction of the soils behind the retaining walls, and the use of heavy compaction equipment should be avoided.

Subsurface Drainage

As previously indicated, the retaining wall design parameters are based upon drained backfill conditions. Consequently, some form of permanent drainage system will be necessary in conjunction with the appropriate backfill material. Subsurface drainage may consist of either:

- A weep hole drainage system typically consisting of a series of 2-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 10-foot on-center spacing. Alternatively, 4-inch diameter holes at an approximate 20-foot on-center spacing can be used for this type of drainage system. In addition, the weep holes should include a 2 cubic foot pocket of open graded gravel, surrounded by an approved geotextile fabric, at each weep hole location.

- A 4-inch diameter perforated pipe surrounded by 2 cubic feet of gravel per linear foot of drain placed behind the wall, above the retaining wall footing. The gravel layer should be wrapped in a suitable geotextile fabric to reduce the potential for migration of fines. The footing drain should be extended to daylight or tied into a storm drainage system. The actual design of this type of system should be designed by the civil engineer to provide a drainage system that possesses adequate capacity and slope for its intended use.

Weep holes or a footing drain will not be required for building stem walls.

6.8 Pavement Design Parameters

Site preparation in the pavement area should be completed as previously recommended in the ***Site Grading Recommendations*** section of this report. The subsequent pavement recommendations assume proper drainage and construction monitoring, and are based on either PCA or CALTRANS design parameters for a twenty (20) year design period. However, these designs also assume a routine pavement maintenance program to obtain the anticipated 20-year pavement service life.

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The on-site soils generally consist of silty sands and sandy silts with anticipated estimated R-values ranging from 40 to 50. Therefore, the subsequent pavement design is based upon an R-value of 40. Fill material imported to the site should have support characteristics equal to or greater than that of the on-site soils and be placed and compacted under engineering observed conditions. It is recommended that additional R-value testing be performed after completion of rough grading to verify the pavement support characteristics of the pavement subgrades following site grading.

Asphaltic Concrete

Presented below are the recommended thicknesses for new flexible pavement structures consisting of asphaltic concrete over a granular base. The pavement designs are based on the traffic indices (TI’s) indicated. The client and/or civil engineer should verify that these TI’s are representative of the anticipated traffic volumes. If the client and/or civil engineer evaluate that the expected traffic volume will exceed the applicable traffic index, we should be contacted for supplementary recommendations. The design traffic indices equate to the following approximate daily traffic volumes over a 20-year design life, assuming six operational traffic days per week.

Traffic Index	**No. of Heavy Trucks per Day**
4.0	0
5.0	1
6.0	3
7.0	11
8.0	35
9.0	93

For the purpose of the traffic volumes indicated above, a truck is defined as a 5-axle tractor trailer unit with one 8-kip axle and two 32-kip tandem axles. The traffic indices above allow for 1,000 automobiles per day.

ASPHALT PAVEMENTS (R=40)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	4	6	7	8	10
Compacted Subgrade	12	12	12	12	12

The aggregate base course should be compacted to at least 95 percent of the ASTM D-1557 maximum dry density. The asphaltic concrete should be compacted to at least 95 percent of the Marshall maximum density, as evaluated by ASTM D-2726. The aggregate base course may consist of crushed aggregate base (CAB) or crushed miscellaneous base (CMB), which is a recycled gravel, asphalt and concrete material. The gradation, R-Value, Sand Equivalent, and Percentage Wear of the CAB or CMB should comply with appropriate specifications contained in the current edition of the "Greenbook" Standard Specifications for Public Works Construction.

Portland Cement Concrete

The preparation of the subgrade soils within concrete pavement areas should be performed as previously described for proposed asphalt pavement areas. The minimum recommended thicknesses for the Portland Cement Concrete pavement sections are as follows:

PORTLAND CEMENT CONCRETE PAVEMENTS (R=40)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

The concrete should have a 28-day compressive strength of at least 3,000 psi. The maximum joint spacing within all of the PCC pavements is recommended to be equal to or less than 30 times the pavement thickness.

7.0 GENERAL COMMENTS

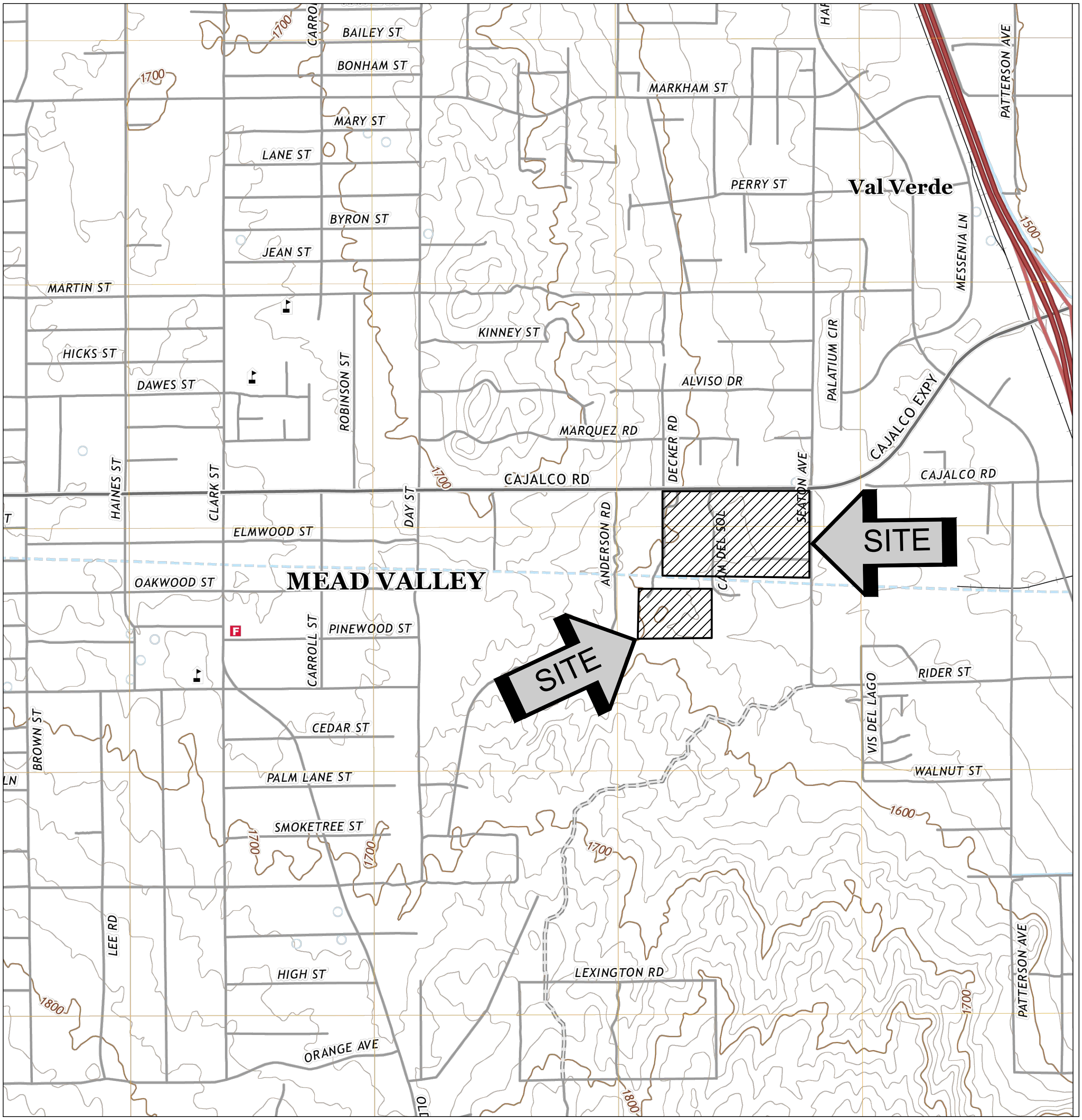
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, civil engineer, and/or structural engineer. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The client(s)' reliance upon this report is subject to the Engineering Services Agreement, incorporated into our proposal for this project.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and sample depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted.

The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

APPENDIX A



SOURCE: USGS TOPOGRAPHIC MAP OF THE STEELE PEAK QUADRANGLE, SAN BERNARDINO COUNTY, CALIFORNIA, 2021.

SITE LOCATION MAP

PROPOSED WAREHOUSE DEVELOPMENT

RIVERSIDE COUNTY (PERRIS AREA), CALIFORNIA

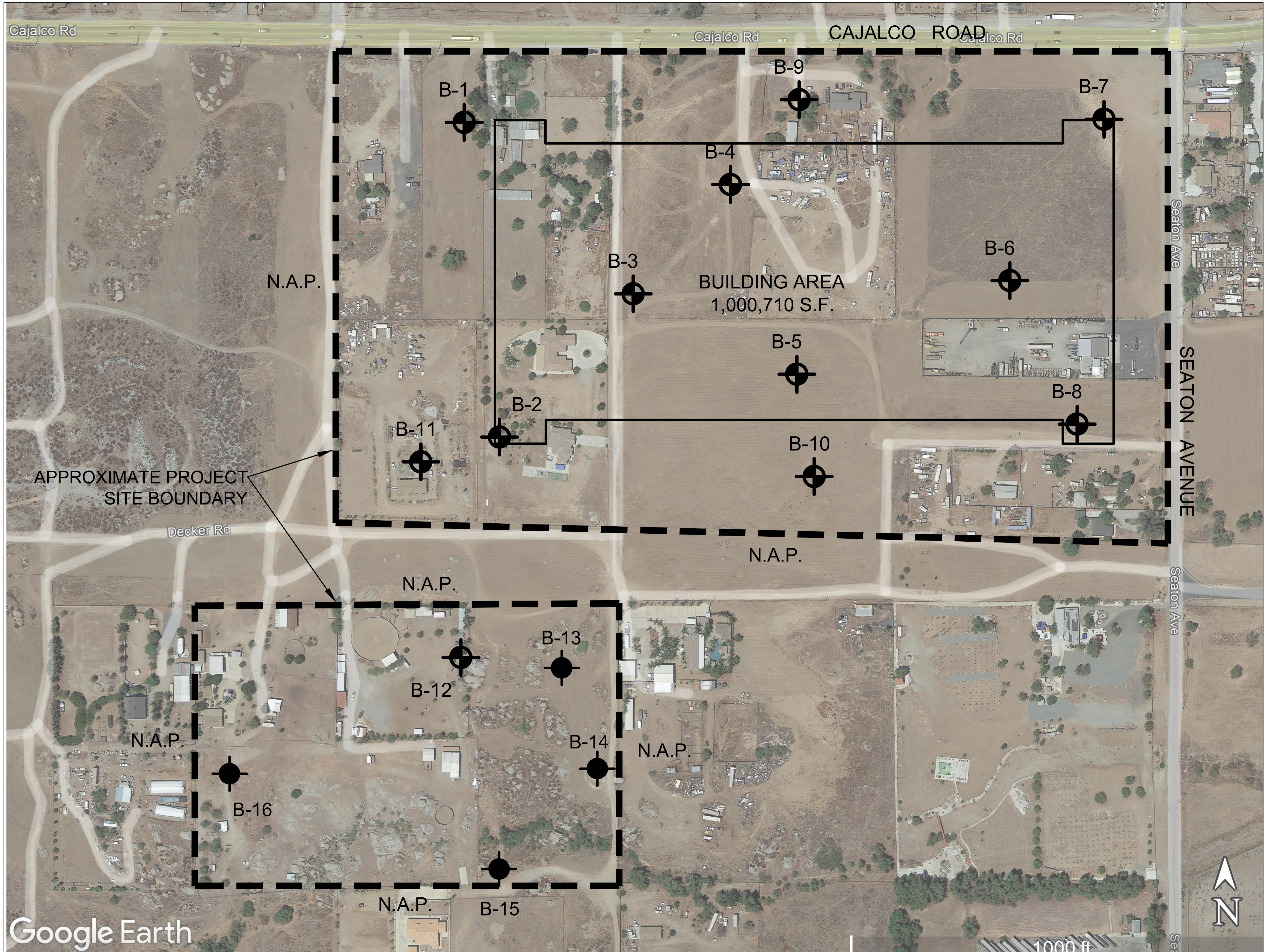
SCALE: 1" = 2000'

DRAWN: JLL
CHKD: RGT

SCG PROJECT
22G213-3

PLATE 1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



NORTH SoCalGeo

NOTE: SITE PLAN AND APPROXIMATE PROJECT LOCATION PROVIDED BY THE CLIENT.
AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH.

GEOTECHNICAL LEGEND

- APPROXIMATE BORING LOCATION
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G213-1)

BORING LOCATION PLAN

PROPOSED WAREHOUSE DEVELOPMENT

RIVERSIDE COUNTY (PERRIS AREA), CALIFORNIA

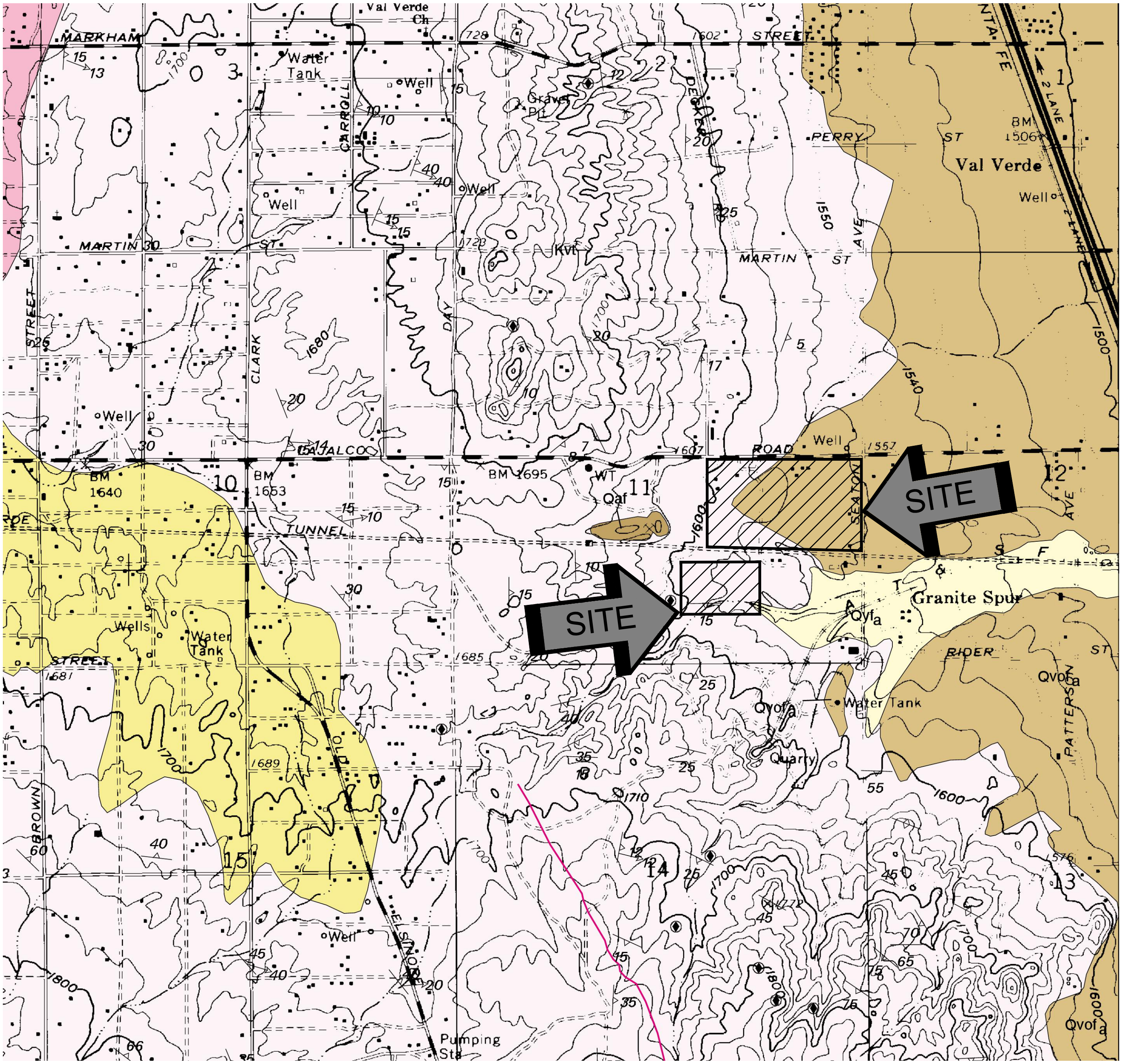
SCALE: 1" = 250'

DRAWN: JLL
CHKD: RGT

SCG PROJECT
22G213-3

PLATE 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



DESCRIPTION OF MAP UNITS

Qvof — **Very old alluvial fan deposits (early Pleistocene)**—Mostly well-dissected, well-indurated, reddish-brown sand deposits. Commonly contains duripans and locally silcretes. Covers large areas adjacent to U.S. Highway 215 in northeastern part of quadrangle and flanking drainage followed by Cajalco Road

Qyf — **Young alluvial fan deposits (Holocene and late Pleistocene)**—Gray-hued arkosic, sandy and gravel-sand deposits derived from local Peninsular Ranges batholith granitic bodies. Limited distribution along eastern and western edges of quadrangle

Kvt — **Val Verde tonalite**—Gray-weathering, relatively homogeneous, massive- to well-foliated, medium- to coarse-grained, hypautomorphic-granular biotite-hornblende tonalite; principal rock type of Val Verde pluton. Contains subequal biotite and hornblende, quartz and plagioclase. Potassium feldspar generally less than two percent of rock. Where present, foliation typically strikes northwest and dips moderately to steeply northeast. Northern part of pluton contains younger, intermittently developed, northeast-striking foliation. In central part of pluton, tonalite is mostly massive, and contains few segregational masses of mesocratic to melanocratic tonalite. Elliptical- to pancake-shaped, meso-to melanocratic inclusions are common

SOURCE: "GEOLOGIC MAP OF THE STEELE PEAK 7.5' QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA" BY D. M. MORTON.

GEOLOGIC MAP

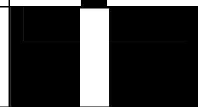
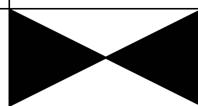
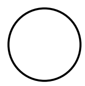
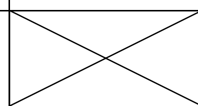
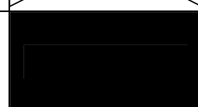
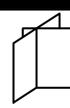
PROPOSED WAREHOUSE DEVELOPMENT

RIVERSIDE COUNTY (PERRIS AREA), CALIFORNIA

SCALE: 1" = 2000'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JLL CHKD: RGT	
SCG PROJECT 22G213-3	
PLATE 3	

APPENDIX B

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 16 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					VAL VERDE TONALITE (Kvt): Gray Brown fine to coarse-grained Tonalite, phaneritic, weathered, friable, weakly cemented, very dense-dry to damp							
	X	50/5"				108	3					
	X	50/5"				115	1					
5	X	50/5"				112	2					
	X	50/5"				113	2					
10	X	50/2"				105	2					
15	X	50/3"				128	2					
					Boring Terminated at 17' due to very dense bedrock							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

BORING NO. B-2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/20/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 19 feet
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
	X	36			VAL VERDE TONALITE (Kvt): Brown Gray fine to coarse-grained Tonalite, weathered, friable, phaneritic, weakly cemented, dense to very dense-dry		2					
	X	2			@ 3½ to 5 feet, weathered Tonalite vein, very loose-dry		2					
5												
	X	50/5"					2					
	X	50/5"			@ 8½ feet, damp		4					
10												
	X	50/3"					2					
15												
	X	50/5"					2					
20												
					Boring Terminated at 20'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 13 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					OLDER ALLUVIUM: Brown Silty fine Sand, trace Clay, trace fine root fibers, little medium to coarse Sand, medium dense-dry to damp							
	X	16				109	1					EI = 6 @ 0-5'
	X	18				116	3					
5	X	32				108	4					
					VAL VERDE TONALITE (Kvt): Brown to Gray Brown fine to coarse-grained Tonalite, phaneritic, weathered, friable, weakly cemented, very dense-dry to damp							
	X	50/5"				111	4					
	X	50/5"				95	3					
10												
	X	50/4"					1					
15					Boring Terminated at 15'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

TEST BORING LOG

PLATE B-3

BORING NO. B-4

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/20/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 18 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
	X	50/5"			OLDER ALLUVIUM: Light Brown fine Sandy Silt, trace fine Gravel, trace medium to coarse Sand, very dense-damp		4					
	X	89			Light Brown fine to medium Sandy Silt, trace Clay, trace Calcareous nodules, very dense-damp		5					
5	X	28			Brown fine Sandy Silt, trace medium Sand, micaceous, medium dense-damp		6					
	X	49			Brown fine to medium Sandy Silt, trace coarse Sand, dense-damp to wet		7					
10												
	X	50/5"			Green Gray Silty fine to coarse Sand, very dense-dry to damp		3					
15												
	X	50/5"			Green Gray fine Sandy Silt, trace medium to coarse Sand, very dense-dry		2					
20					Boring Terminated at 20'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

BORING NO. B-5

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/20/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 23 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
	X	53			OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace coarse Sand, very dense-damp		4					
5	X	80			Brown fine Sandy Silt, trace medium Sand, very dense-damp		6					
	X	34			Brown Silty fine Sand, trace medium Sand, dense-damp		6					
10	X	73			Brown Silty fine to medium Sand, very dense-damp		6					
15	X	66/11"			VAL VERDE TONALITE (Kvt): Gray fine to coarse-grained Tonalite, weathered, friable, phaneritic, weakly cemented, very dense-dry to damp		4					
20	X	50/4"					1					
25	X	50/3"					1					
					Boring Terminated at 25' due to very dense bedrock							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-6

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/20/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 13 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					OLDER ALLUVIUM: Brown fine to medium Sandy Silt, trace Clay, dense-dry to damp							
		48				114	3					EI = 32 @ 0-5'
		51			@ 3 feet, trace Calcareous veining	119	6					
5		35			Light Brown fine Sandy Silt, trace medium Sand, medium dense-damp	116	4					
		26			Gray fine to coarse Sand, trace Silt, trace Iron Oxide staining, some fine Gravel, medium dense-dry to damp	111	3					
		38			Brown Silty fine to medium Sand, medium dense-damp	120	5					
10												
		9			@ 13½ feet, loose		7					
15												

Boring Terminated at 15'

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

TEST BORING LOG

BORING NO. B-7

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/20/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 29 feet
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (SURFACE ELEVATION: --- MSL)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
0					OLDER ALLUVIUM: Brown fine Sandy Silt, trace to little medium Sand, trace Clay, trace fine root fibers, medium dense to dense-damp to wet							
	X	34					6					
	X	30					6					
5	X	21					7					
	X	29					8					
10												
	X	33					12					
15												
					VAL VERDE TONALITE (Kvt): Gray fine to coarse-grained Tonalite, phaneritic, friable, weathered, weakly cemented, very dense-dry to moist							
	X	50/5"					5					
20												
	X	50/5"					2					
25												
	X	50/5"					7					
30					Boring Terminated at 30' due to very dense bedrock							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-8

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/20/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 24 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
				YOUNGER ALLUVIUM: Brown Silty fine Sand, trace medium Sand, medium dense-dry							
	X	28			109	1					
	X	50/5"		OLDER ALLUVIUM: Brown fine Sandy Silt, trace medium to coarse Sand, moderately cemented, very dense-dry	117	1					
5	X	28		Brown Silty fine to coarse Sand, trace to little Clay, trace fine Gravel, trace Calcareous nodules, medium dense-damp		5					@ 5 feet, Disturbed Sample
	X	41		Brown fine Sandy Silt, little Calcareous nodules and veining, medium dense-damp	120	6					
10	X	25		Brown Silty fine Sand, trace to little medium Sand, micaceous, medium dense-dry to damp	109	3					
15	X	25				7					
				VAL VERDE TONALITE (Kvt): Brown Gray fine to coarse-grained Tonalite, weathered, phaneritic, friable, weakly cemented, very dense-damp to very moist							
20	X	73/11"				3					
25	X	50/5"				13					
				Boring Terminated at 25'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-9

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/20/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 18 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					OLDER ALLUVIUM: Brown fine to medium Sandy Silt, trace coarse Sand, trace Clay, very dense-damp							
	X	74/9"					6					
	X	86/10"					6					
5												
	X	77/11"					6					
	X	62/11"					2					
					VAL VERDE TONALITE (Kvt): Gray fine to coarse-grained Tonalite, weathered, phaneritic, friable, weakly cemented, very dense-dry							
10												
	X	50/5"					2					
15												
	X	50/3"					1					
20					Boring Terminated at 20'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

BORING NO. B-10

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 19 feet
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					<u>OLDER ALLUVIUM:</u> Brown fine to medium Sandy Silt, trace Clay, dense to very dense-damp							
	X	37					5					
	X	50/5"					4					
5												
					<u>VAL VERDE TONALITE (Kvt):</u> Brown Gray fin to coarse-grained Tonalite, weathered, phaneritic, friable, weakly cemented, very dense-dry to damp							
	X	90/11"					6					
	X	50/5"					3					
10												
	X	86/9"					2					
15												
	X	87/9"					4					
20												
					Boring Terminated at 20'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

BORING NO. B-11

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 14 feet
READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					OLDER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay, dense-dry							
	X	43				116	2					
					VAL VERDE TONALITE (Kvt): Gray fine to coarse-grained Tonalite, weathered, phaneritic, friable, very dense-dry to damp							
	X	50/5"				106	5					
5	X	50/5"				113	2					
	X	50/5"				105	4					
	X	50/3"				105	4					
10												
	X	50/5"					2					
15												

Boring Terminated at 15'

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-12

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 7/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 9 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					YOUNGER ALLUVIUM: Brown fine to medium Sandy Silt, medium dense-dry to damp							
	X	12					3					
					Brown Silty fine to medium Sand, trace coarse Sand, little Tonalite fragments, medium dense-dry to damp							
	X	24					3					
5					VAL VERDE TONALITE (Kvt): Gray Brown fine to coarse-grained Tonalite, weathered, phaneritic, friable, very dense-dry to damp							
	X	50/5"					4					
	X	50/3"					2					
10					Boring Terminated at 10'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-13

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 11/18/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Michelle Krizek

WATER DEPTH: Dry
CAVE DEPTH: 15 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					YOUNGER ALLUVIUM: Brown fine Sandy Silt, little Clay, trace medium to coarse Sand, trace fine root fibers, loose-damp							
		14				94	4					EI = 32 @ 0 to 5 feet
					VAL VERDE TONALITE (Kvt): Brown to Gray Brown fine to coarse-grained Tonalite, phaneritic, weathered, friable, weakly cemented, very dense-dry to damp							
		50/1"					1					@ 3 feet. Disturbed Sample
5		50/1"					1					@ 5 feet. Disturbed Sample
		50/3"				119	1					
		50/2"				114	2					
10												
		50/4"				119	1					
15												
		50/5"					3					
20					Boring Terminated at 20'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-14

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 11/18/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Michelle Krizek

WATER DEPTH: Dry
CAVE DEPTH: 13 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

FIELD RESULTS: DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS: DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					YOUNGER ALLUVIUM: Brown fine Sandy Silt, trace to little Clay, trace to little medium Sand, trace coarse Sand, medium dense-damp							
	X	17					4					
	X	10					6					
5												
					Brown to Dark Brown Silty fine to medium Sand, trace coarse Sand, trace to little fine Gravel, medium dense-damp							
	X	10					5					
					VAL VERDE TONALITE (Kvt): Brown to Gray Brown fine to coarse-grained Tonalite, phaneritic, weathered, friable, weakly cemented, very dense-dry to damp							
	X	76/11"					5					
10												
	X	50/4"					3					
15												

Boring Terminated at 15'

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

BORING NO. B-15

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 11/18/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Michelle Krizek

WATER DEPTH: Dry
CAVE DEPTH: 15 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
	X	22			YOUNGER ALLUVIUM: Brown Silty fine to medium Sand, little coarse Sand, trace to little Clay, trace fine Gravel, medium dense-damp		4					
	X	76/11"			OLDER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay, slightly cemented, medium dense to very dense-damp		5					
5												
	X	20					3					
	X	50/4"			VAL VERDE TONALITE (Kvt): Brown to Gray Brown fine to coarse-grained Tonalite, phaneritic, weathered, friable, weakly cemented, very dense-dry to damp		5					
10												
	X	50/1"										@ 13½ feet, No Sample Recovery
15												
	X	50/2"					1					
20					Boring Terminated at 20'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-16

JOB NO.: 22G213-1
PROJECT: Proposed Warehouse Development
LOCATION: Perris, California

DRILLING DATE: 11/18/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Michelle Krizek

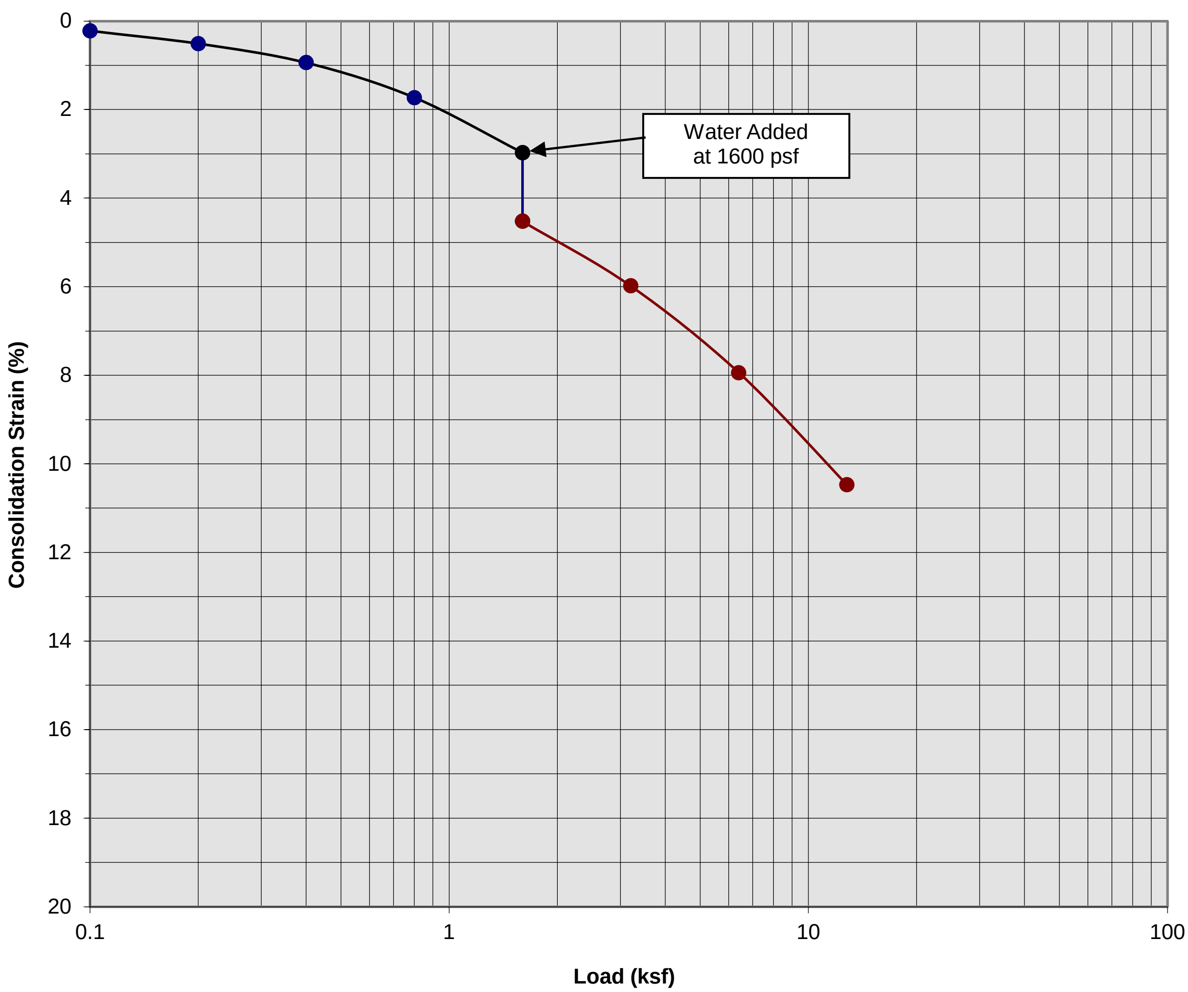
WATER DEPTH: Dry
CAVE DEPTH: 13 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					VAL VERDE TONALITE (Kvt): Brown to Gray Brown fine to coarse-grained Tonalite, phaneritic, weathered, friable, weakly cemented, very dense-damp to moist							
		35			@ 1 foot, medium dense	119	7					
		59			@ 3 feet, dense	118	5					
5		78/11"				112	5					
		50/5"				114	5					
10		50/5"				111	5					
		50/5"					6					
15					Boring Terminated at 15'							

TBL 22G213-3 FINAL.GPJ SOCALGEO.GDT 12/9/22

APPENDIX C

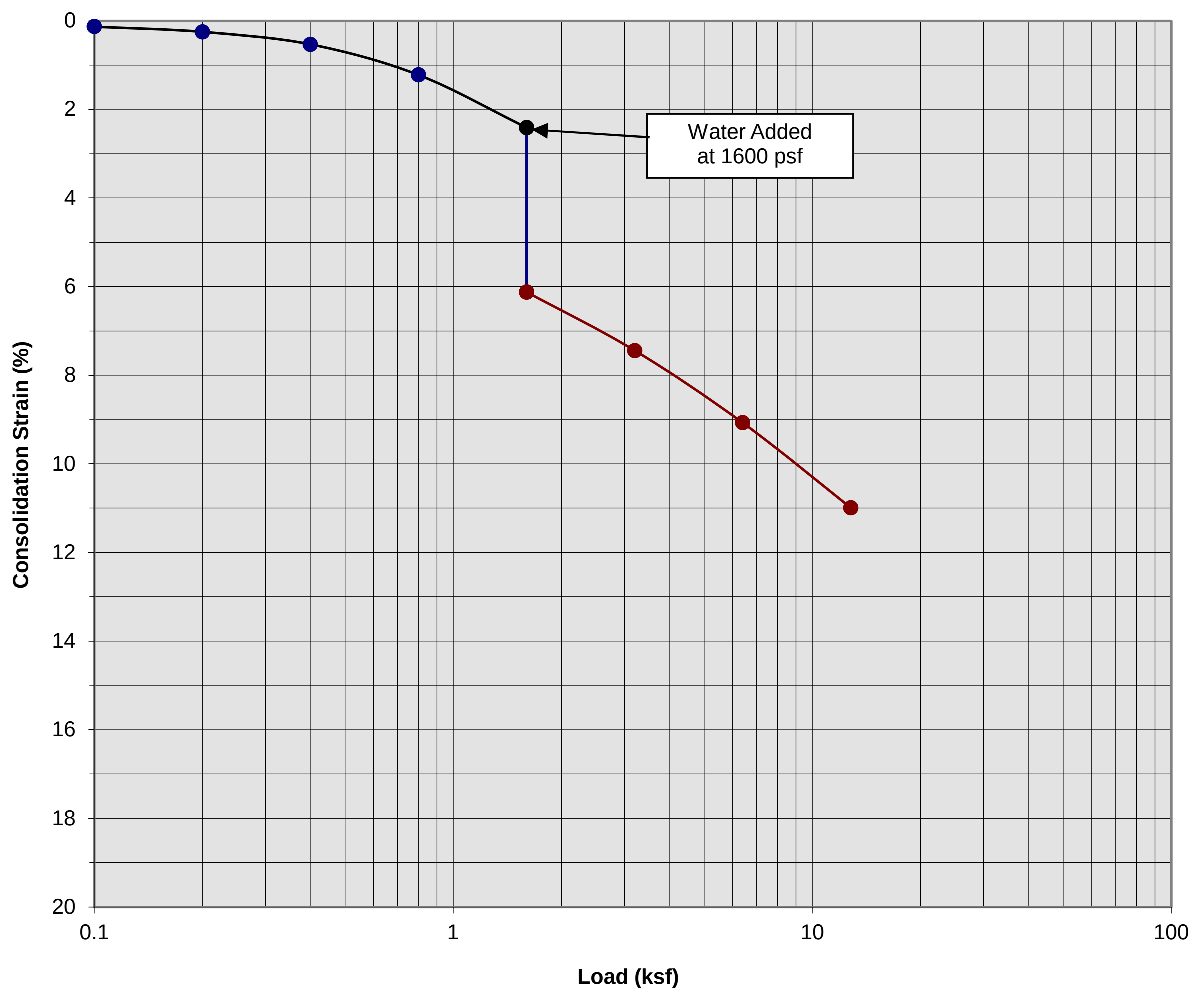
Consolidation/Collapse Test Results



Classification: Brown fine to medium Sandy Silt, trace Clay

Boring Number:	B-6	Initial Moisture Content (%)	5
Sample Number:	---	Final Moisture Content (%)	12
Depth (ft)	3 to 4	Initial Dry Density (pcf)	120.9
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	133.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.55

Consolidation/Collapse Test Results



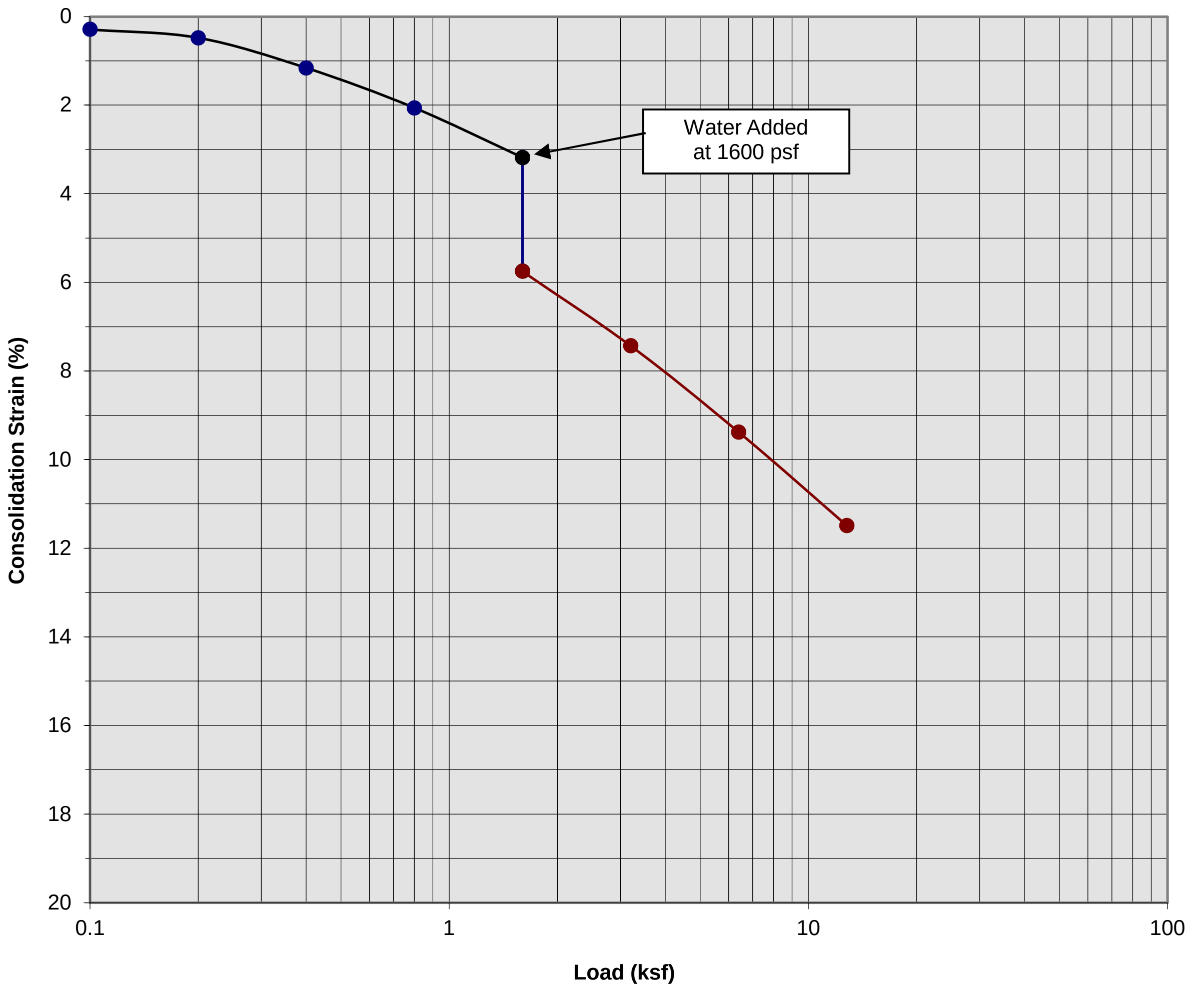
Classification: Gray fine to coarse Sand, trace Silt

Boring Number:	B-6	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	7 to 8	Initial Dry Density (pcf)	102.7
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	114.9
Specimen Thickness (in)	1.0	Percent Collapse (%)	3.71

Proposed Warehouse Development
Riverside County (Perris Area), California
Project No. 22G213-1
PLATE C- 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



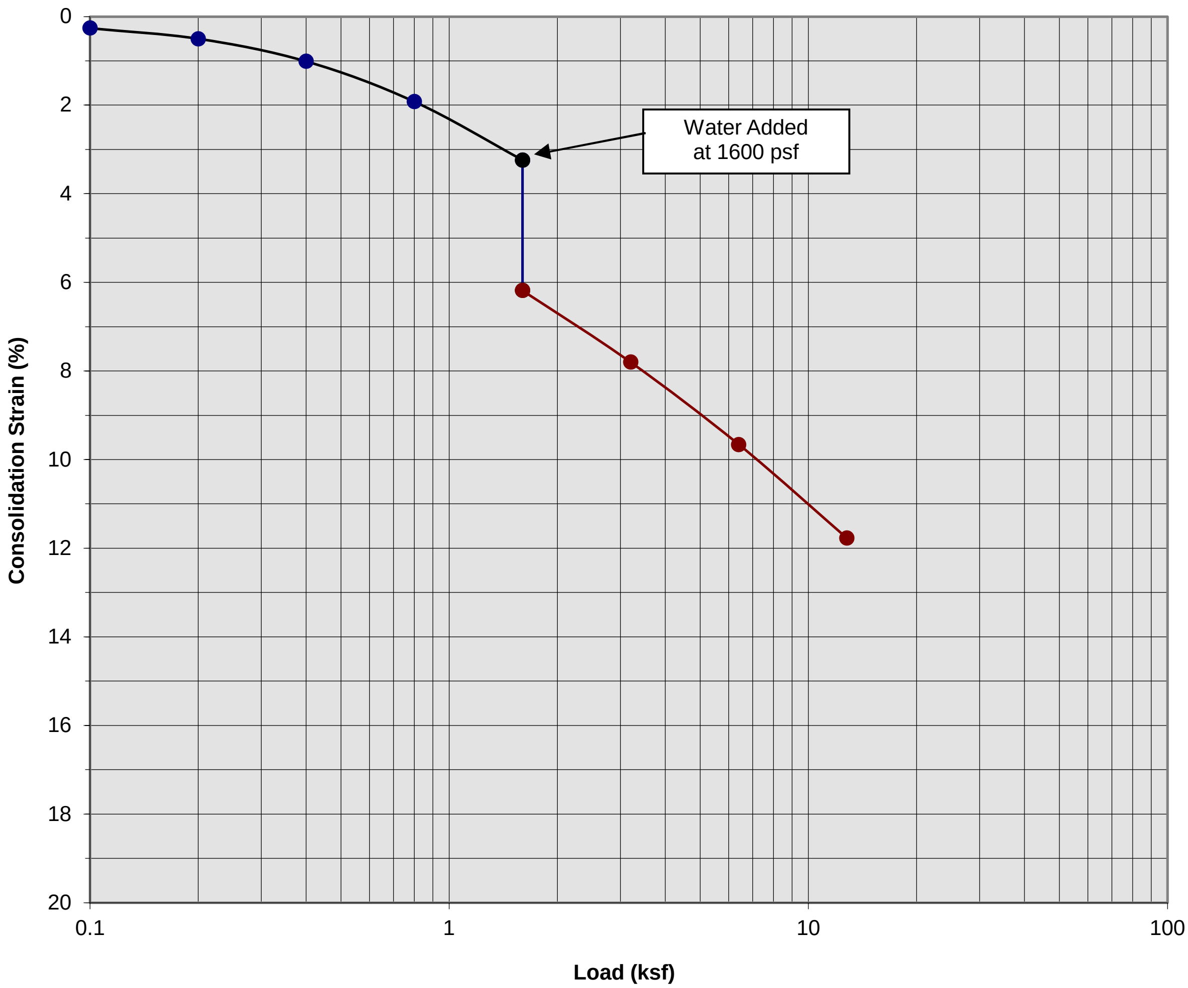
Classification: Brown fine Sandy Silt

Boring Number:	B-8	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	21
Depth (ft)	7 to 8	Initial Dry Density (pcf)	109.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	123.8
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.57

Proposed Warehouse Development
Riverside County (Perris Area), California
Project No. 22G213-1
PLATE C- 3

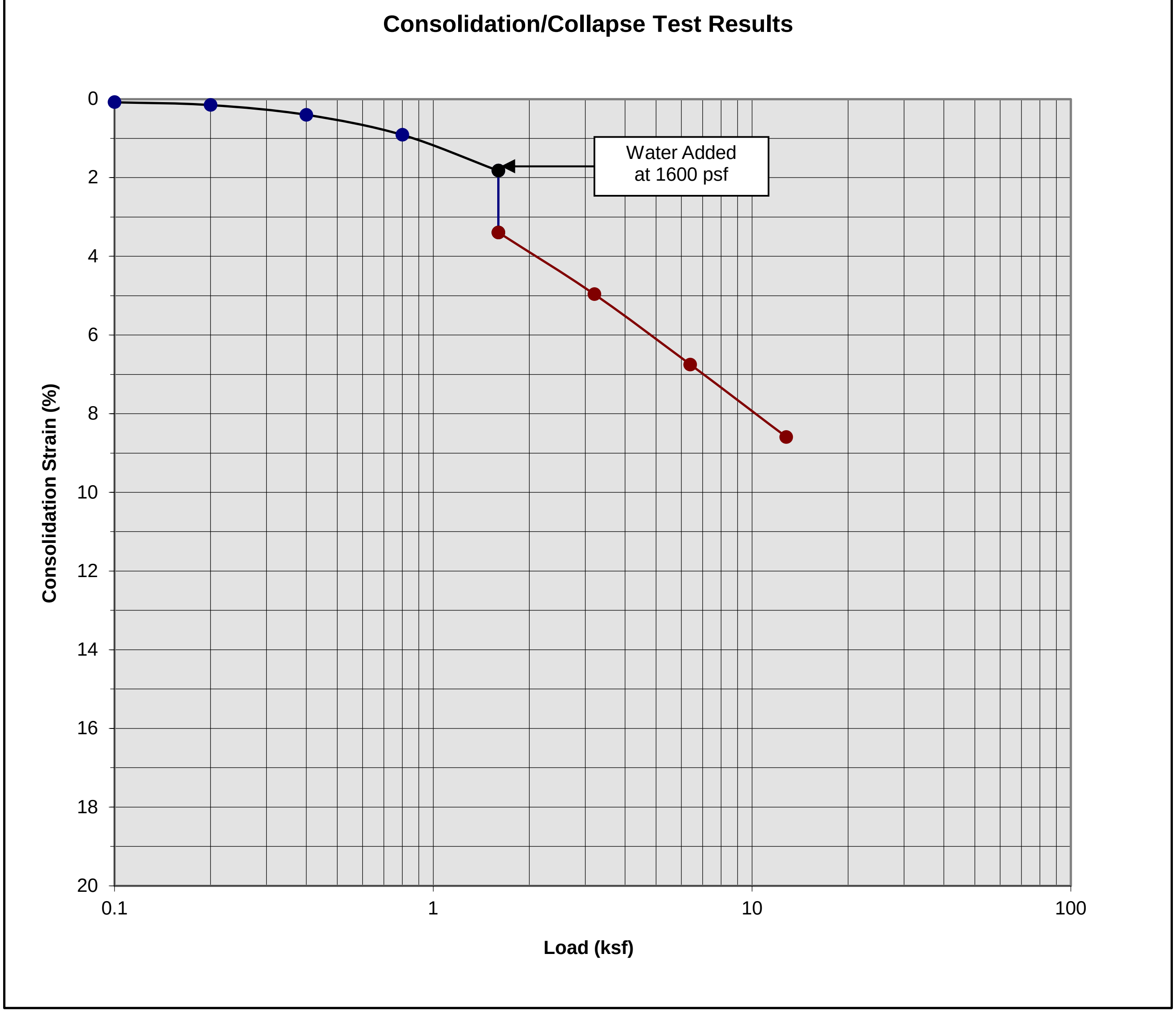
SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Brown Silty fine Sand, trace to little medium Sand

Boring Number:	B-8	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	17
Depth (ft)	9 to 10	Initial Dry Density (pcf)	100.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	113.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.94



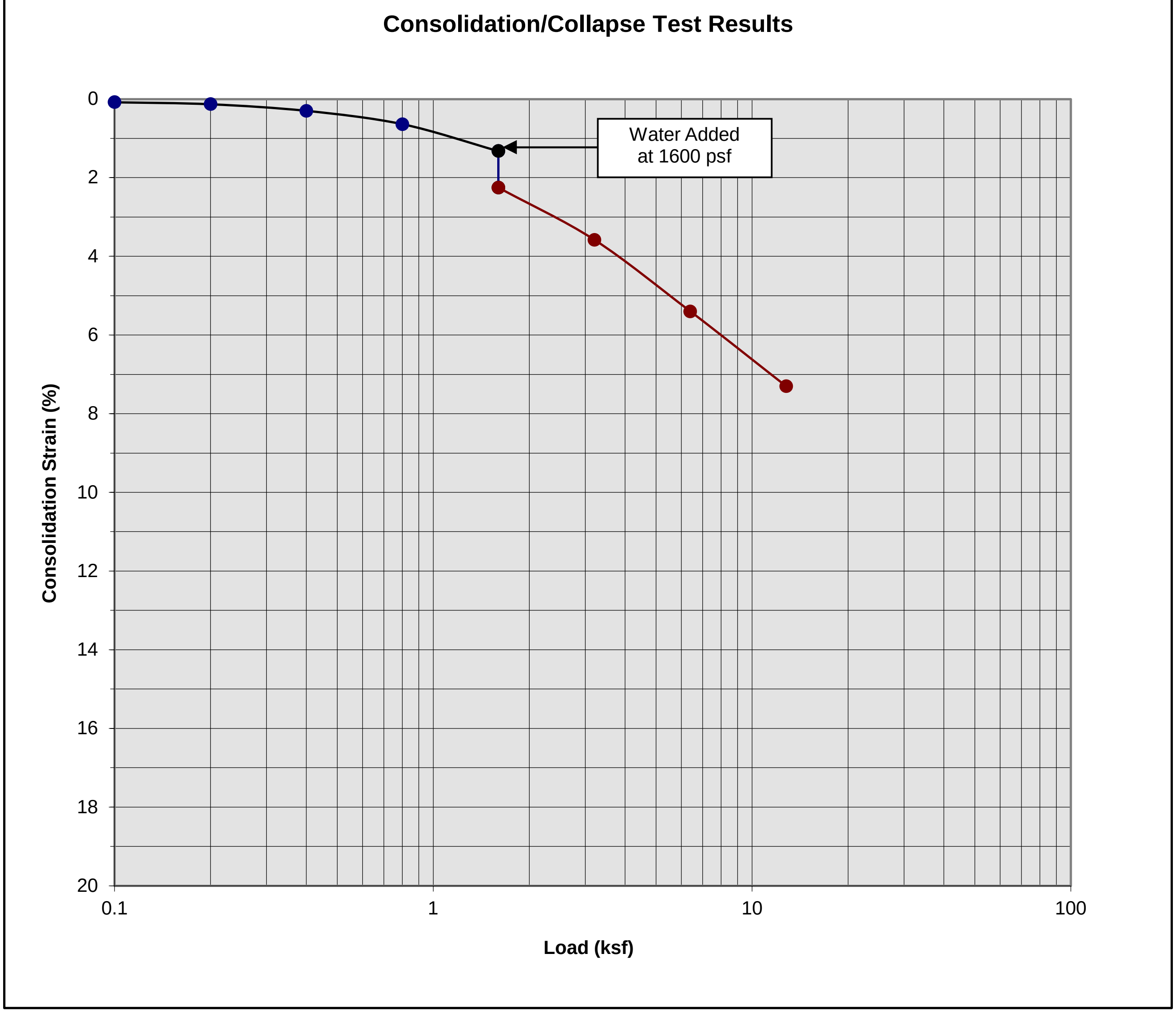
Classification: BEDROCK: Gray Brown fine to coarse-grained Tonalite

Boring Number:	B-16	Initial Moisture Content (%)	7
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	1 to 2	Initial Dry Density (pcf)	119.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	130.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.57

Proposed Warehouse Development
Riverside County (Perris Area), California
Project No. 22G213-3
PLATE C- 5

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



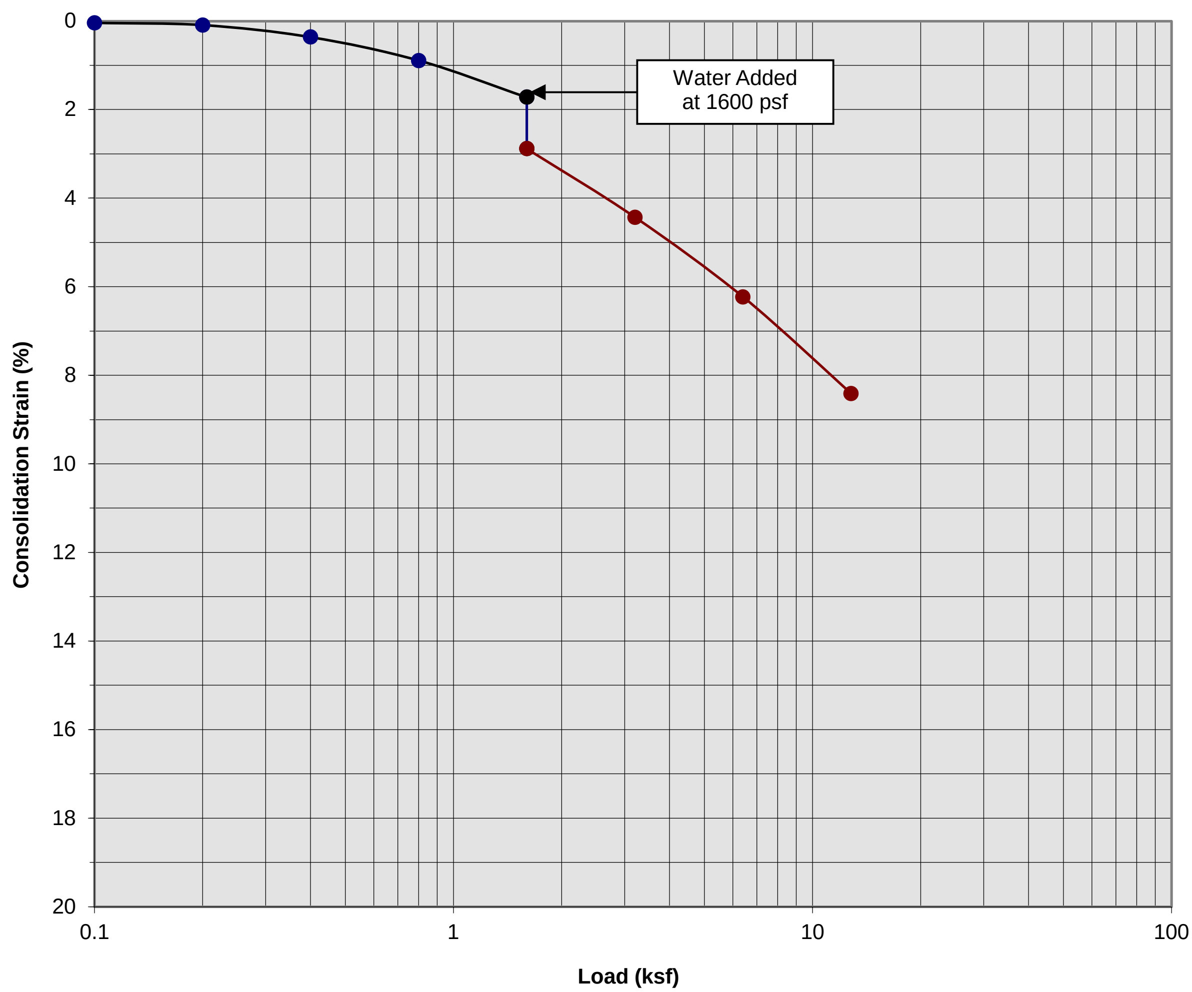
Classification: BEDROCK: Gray Brown fine to coarse-grained Tonalite

Boring Number:	B-16	Initial Moisture Content (%)	5
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	3 to 4	Initial Dry Density (pcf)	117.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	126.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.93

Proposed Warehouse Development
Riverside County (Perris Area), California
Project No. 22G213-3
PLATE C- 6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

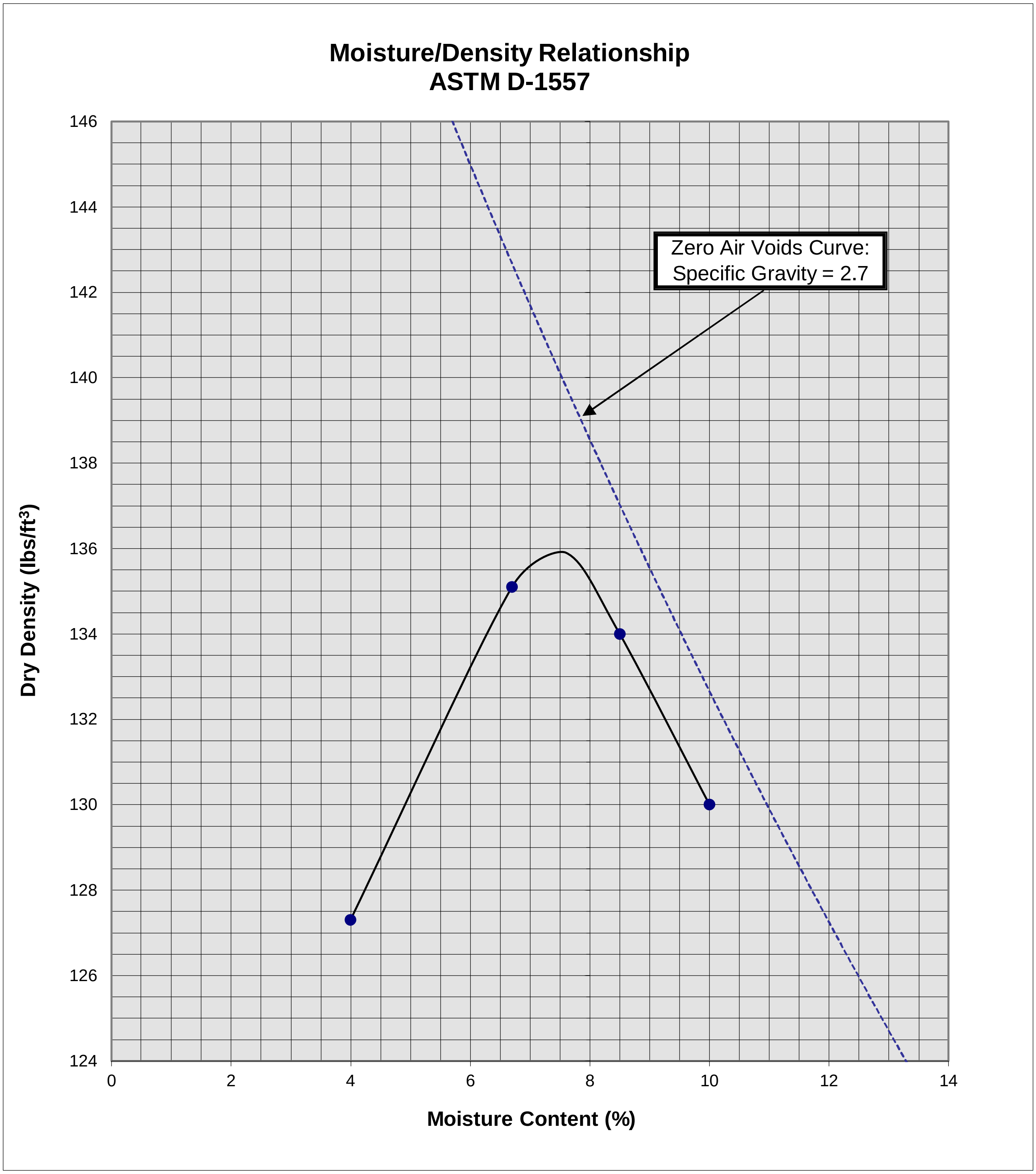


Classification: BEDROCK: Gray Brown fine to coarse-grained Tonalite

Boring Number:	B-16	Initial Moisture Content (%)	5
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	5 to 6	Initial Dry Density (pcf)	111.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	121.3
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.16

Proposed Warehouse Development
Riverside County (Perris Area), California
Project No. 22G213-3
PLATE C- 7

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

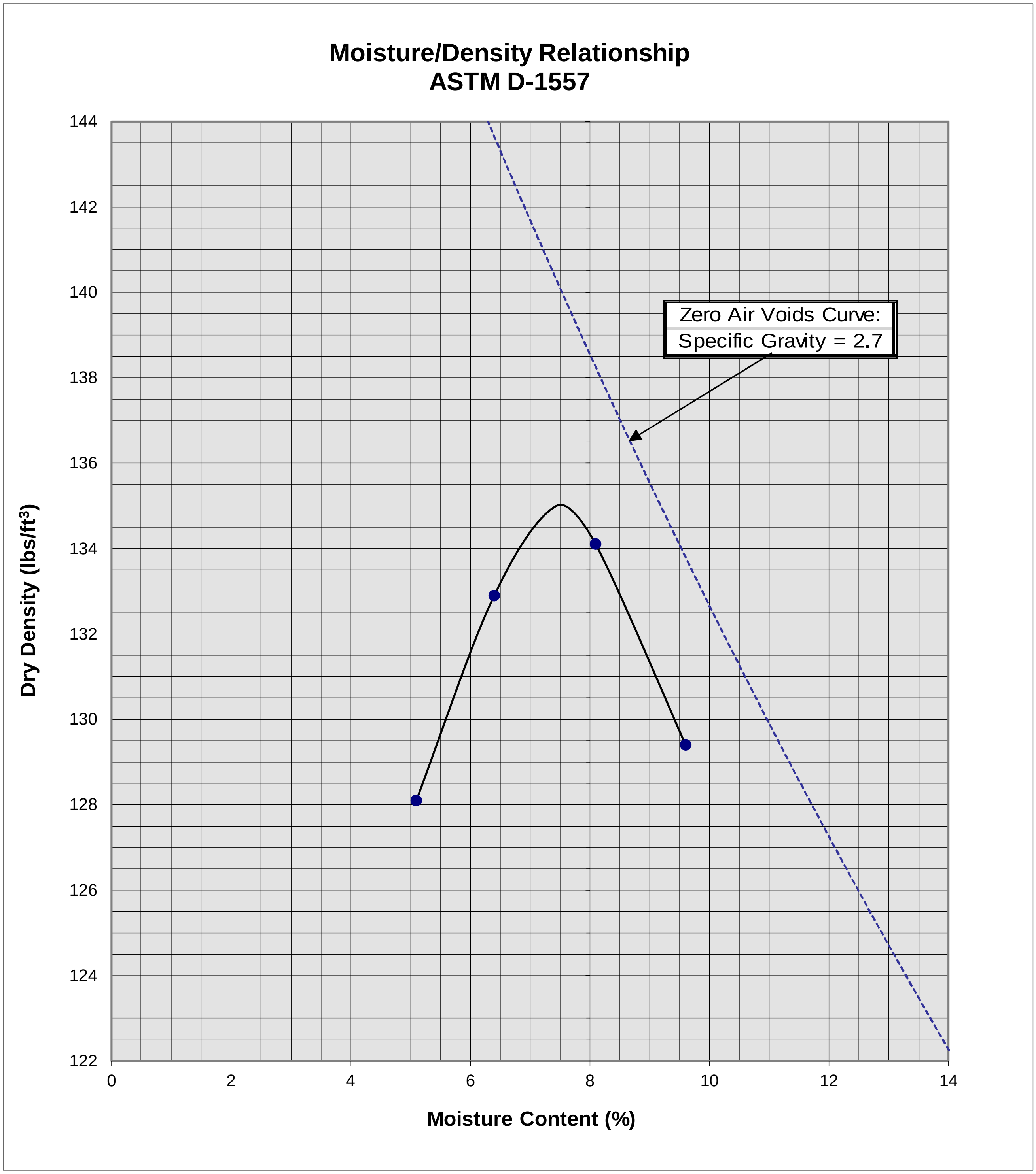


Soil ID Number	B-3 @ 0-5'
Optimum Moisture (%)	7.5
Maximum Dry Density (pcf)	136
Soil Classification	Brown Silty fine Sand, trace Clay

Proposed Warehouse Development
Riverside County (Perris Area), California
Project No. 22G213-1

PLATE C- 8

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	B-15 @ 0-5'
Optimum Moisture (%)	7.5
Maximum Dry Density (pcf)	135
Soil Classification	Brown Silty fine to medium Sand, little coarse Sand, trace to little Clay

Proposed Warehouse Development
Riverside County (Perris Area), California
Project No. 22G213-3
PLATE C- 9

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D

GRADING GUIDE SPECIFICATIONS

These grading guide specifications are intended to provide typical procedures for grading operations. They are intended to supplement the recommendations contained in the geotechnical investigation report for this project. Should the recommendations in the geotechnical investigation report conflict with the grading guide specifications, the more site specific recommendations in the geotechnical investigation report will govern.

General

- The Earthwork Contractor is responsible for the satisfactory completion of all earthwork in accordance with the plans and geotechnical reports, and in accordance with city, county, and applicable building codes.

- The Geotechnical Engineer is the representative of the Owner/Builder for the purpose of implementing the report recommendations and guidelines. These duties are not intended to relieve the Earthwork Contractor of any responsibility to perform in a workman-like manner, nor is the Geotechnical Engineer to direct the grading equipment or personnel employed by the Contractor.

- The Earthwork Contractor is required to notify the Geotechnical Engineer of the anticipated work and schedule so that testing and inspections can be provided. If necessary, work may be stopped and redone if personnel have not been scheduled in advance.

- The Earthwork Contractor is required to have suitable and sufficient equipment on the job-site to process, moisture condition, mix and compact the amount of fill being placed to the approved compaction. In addition, suitable support equipment should be available to conform with recommendations and guidelines in this report.

- Canyon cleanouts, overexcavation areas, processed ground to receive fill, key excavations, subdrains and benches should be observed by the Geotechnical Engineer prior to placement of any fill. It is the Earthwork Contractor's responsibility to notify the Geotechnical Engineer of areas that are ready for inspection.

- Excavation, filling, and subgrade preparation should be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working surface. The Geotechnical Engineer must be informed of springs or water seepage encountered during grading or foundation construction for possible revision to the recommended construction procedures and/or installation of subdrains.

Site Preparation

- The Earthwork Contractor is responsible for all clearing, grubbing, stripping and site preparation for the project in accordance with the recommendations of the Geotechnical Engineer.

- If any materials or areas are encountered by the Earthwork Contractor which are suspected of having toxic or environmentally sensitive contamination, the Geotechnical Engineer and Owner/Builder should be notified immediately.

- Major vegetation should be stripped and disposed of off-site. This includes trees, brush, heavy grasses and any materials considered unsuitable by the Geotechnical Engineer.

- Underground structures such as basements, cesspools or septic disposal systems, mining shafts, tunnels, wells and pipelines should be removed under the inspection of the Geotechnical Engineer and recommendations provided by the Geotechnical Engineer and/or city, county or state agencies. If such structures are known or found, the Geotechnical Engineer should be notified as soon as possible so that recommendations can be formulated.

- Any topsoil, slopewash, colluvium, alluvium and rock materials which are considered unsuitable by the Geotechnical Engineer should be removed prior to fill placement.

- Remaining voids created during site clearing caused by removal of trees, foundations basements, irrigation facilities, etc., should be excavated and filled with compacted fill.

- Subsequent to clearing and removals, areas to receive fill should be scarified to a depth of 10 to 12 inches, moisture conditioned and compacted

- The moisture condition of the processed ground should be at or slightly above the optimum moisture content as determined by the Geotechnical Engineer. Depending upon field conditions, this may require air drying or watering together with mixing and/or discing.

Compacted Fills

- Soil materials imported to or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable in the opinion of the Geotechnical Engineer. Unless otherwise approved by the Geotechnical Engineer, all fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated," and shall be very low to non-expansive with a maximum expansion index (EI) of 50. The top 12 inches of the compacted fill should have a maximum particle size of 3 inches, and all underlying compacted fill material a maximum 6-inch particle size, except as noted below.

- All soils should be evaluated and tested by the Geotechnical Engineer. Materials with high expansion potential, low strength, poor gradation or containing organic materials may require removal from the site or selective placement and/or mixing to the satisfaction of the Geotechnical Engineer.

- Rock fragments or rocks less than 6 inches in their largest dimensions, or as otherwise determined by the Geotechnical Engineer, may be used in compacted fill, provided the distribution and placement is satisfactory in the opinion of the Geotechnical Engineer.

- Rock fragments or rocks greater than 12 inches should be taken off-site or placed in accordance with recommendations and in areas designated as suitable by the Geotechnical Engineer. These materials should be placed in accordance with Plate D-8 of these Grading Guide Specifications and in accordance with the following recommendations:

    - Rocks 12 inches or more in diameter should be placed in rows at least 15 feet apart, 15 feet from the edge of the fill, and 10 feet or more below subgrade. Spaces should be left between each rock fragment to provide for placement and compaction of soil around the fragments.

    - Fill materials consisting of soil meeting the minimum moisture content requirements and free of oversize material should be placed between and over the rows of rock or concrete. Ample water and compactive effort should be applied to the fill materials as they are placed in order that all of the voids between each of the fragments are filled and compacted to the specified density.

- Subsequent rows of rocks should be placed such that they are not directly above a row placed in the previous lift of fill. A minimum 5-foot offset between rows is recommended.

- To facilitate future trenching, oversized material should not be placed within the range of foundation excavations, future utilities or other underground construction unless specifically approved by the soil engineer and the developer/owner representative.

- Fill materials approved by the Geotechnical Engineer should be placed in areas previously prepared to receive fill and in evenly placed, near horizontal layers at about 6 to 8 inches in loose thickness, or as otherwise determined by the Geotechnical Engineer for the project.

- Each layer should be moisture conditioned to optimum moisture content, or slightly above, as directed by the Geotechnical Engineer. After proper mixing and/or drying, to evenly distribute the moisture, the layers should be compacted to at least 90 percent of the maximum dry density in compliance with ASTM D-1557-78 unless otherwise indicated.

- Density and moisture content testing should be performed by the Geotechnical Engineer at random intervals and locations as determined by the Geotechnical Engineer. These tests are intended as an aid to the Earthwork Contractor, so he can evaluate his workmanship, equipment effectiveness and site conditions. The Earthwork Contractor is responsible for compaction as required by the Geotechnical Report(s) and governmental agencies.

- Fill areas unused for a period of time may require moisture conditioning, processing and recompaction prior to the start of additional filling. The Earthwork Contractor should notify the Geotechnical Engineer of his intent so that an evaluation can be made.

- Fill placed on ground sloping at a 5-to-1 inclination (horizontal-to-vertical) or steeper should be benched into bedrock or other suitable materials, as directed by the Geotechnical Engineer. Typical details of benching are illustrated on Plates D-2, D-4, and D-5.

- Cut/fill transition lots should have the cut portion overexcavated to a depth of at least 3 feet and rebuilt with fill (see Plate D-1), as determined by the Geotechnical Engineer.

- All cut lots should be inspected by the Geotechnical Engineer for fracturing and other bedrock conditions. If necessary, the pads should be overexcavated to a depth of 3 feet and rebuilt with a uniform, more cohesive soil type to impede moisture penetration.

- Cut portions of pad areas above buttresses or stabilizations should be overexcavated to a depth of 3 feet and rebuilt with uniform, more cohesive compacted fill to impede moisture penetration.

- Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure that excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls must be properly tested and approved by the Geotechnical Engineer with consideration of the lateral earth pressure used in the design.

Foundations

- The foundation influence zone is defined as extending one foot horizontally from the outside edge of a footing, and proceeding downward at a ½ horizontal to 1 vertical (0.5:1) inclination.

- Where overexcavation beneath a footing subgrade is necessary, it should be conducted so as to encompass the entire foundation influence zone, as described above.

- Compacted fill adjacent to exterior footings should extend at least 12 inches above foundation bearing grade. Compacted fill within the interior of structures should extend to the floor subgrade elevation.

Fill Slopes

- The placement and compaction of fill described above applies to all fill slopes. Slope compaction should be accomplished by overfilling the slope, adequately compacting the fill in even layers, including the overfilled zone and cutting the slope back to expose the compacted core

- Slope compaction may also be achieved by backrolling the slope adequately every 2 to 4 vertical feet during the filling process as well as requiring the earth moving and compaction equipment to work close to the top of the slope. Upon completion of slope construction, the slope face should be compacted with a sheepsfoot connected to a sideboom and then grid rolled. This method of slope compaction should only be used if approved by the Geotechnical Engineer.

- Sandy soils lacking in adequate cohesion may be unstable for a finished slope condition and therefore should not be placed within 15 horizontal feet of the slope face.

- All fill slopes should be keyed into bedrock or other suitable material. Fill keys should be at least 15 feet wide and inclined at 2 percent into the slope. For slopes higher than 30 feet, the fill key width should be equal to one-half the height of the slope (see Plate D-5).

- All fill keys should be cleared of loose slough material prior to geotechnical inspection and should be approved by the Geotechnical Engineer and governmental agencies prior to filling.

- The cut portion of fill over cut slopes should be made first and inspected by the Geotechnical Engineer for possible stabilization requirements. The fill portion should be adequately keyed through all surficial soils and into bedrock or suitable material. Soils should be removed from the transition zone between the cut and fill portions (see Plate D-2).

Cut Slopes

- All cut slopes should be inspected by the Geotechnical Engineer to determine the need for stabilization. The Earthwork Contractor should notify the Geotechnical Engineer when slope cutting is in progress at intervals of 10 vertical feet. Failure to notify may result in a delay in recommendations.

- Cut slopes exposing loose, cohesionless sands should be reported to the Geotechnical Engineer for possible stabilization recommendations.

- All stabilization excavations should be cleared of loose slough material prior to geotechnical inspection. Stakes should be provided by the Civil Engineer to verify the location and dimensions of the key. A typical stabilization fill detail is shown on Plate D-5.

- Stabilization key excavations should be provided with subdrains. Typical subdrain details are shown on Plates D-6.

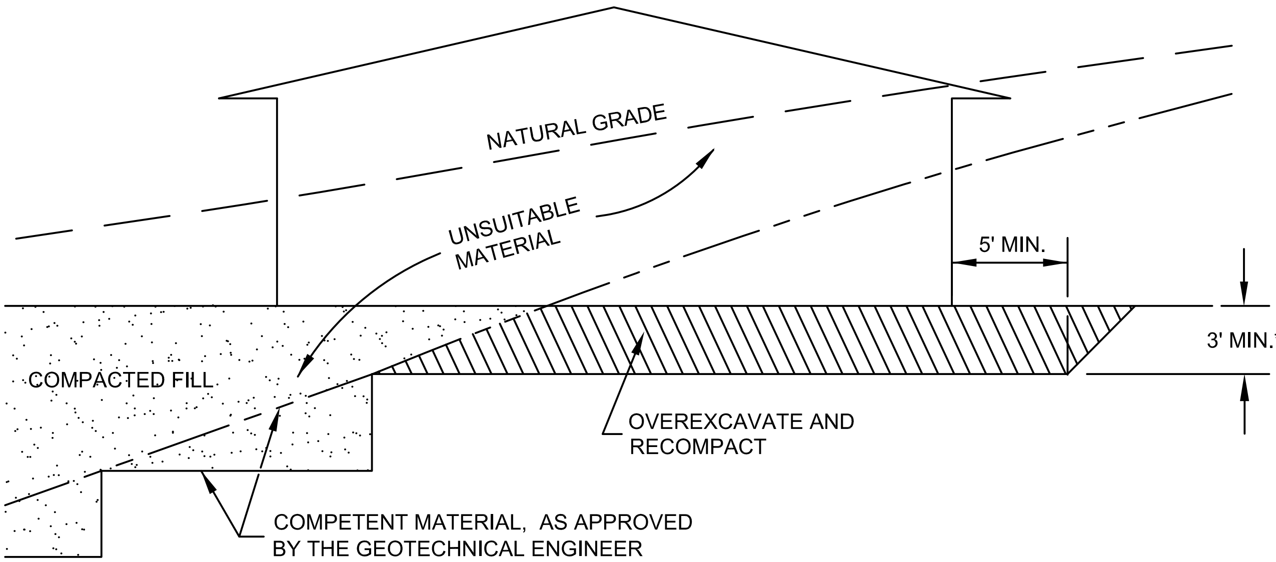
Subdrains

- Subdrains may be required in canyons and swales where fill placement is proposed. Typical subdrain details for canyons are shown on Plate D-3. Subdrains should be installed after approval of removals and before filling, as determined by the Soils Engineer.

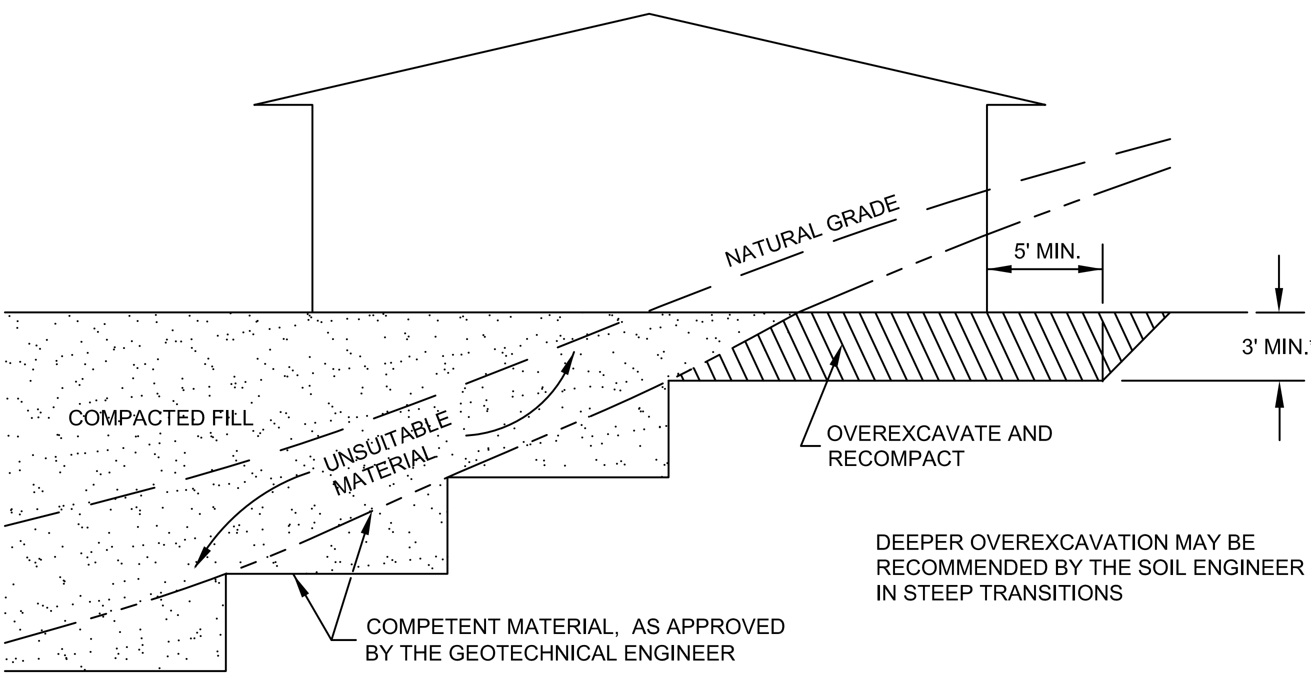
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- Filter material for subdrains should conform to CALTRANS Specification 68-1.025 or as approved by the Geotechnical Engineer for the specific site conditions. Clean ¾-inch crushed rock may be used provided it is wrapped in an acceptable filter cloth and approved by the Geotechnical Engineer. Pipe diameters should be 6 inches for runs up to 500 feet and 8 inches for the downstream continuations of longer runs. Four-inch diameter pipe may be used in buttress and stabilization fills.

CUT LOT



CUT/FILL LOT (TRANSITION)



DEEPER OVEREXCAVATION MAY BE RECOMMENDED BY THE SOIL ENGINEER IN STEEP TRANSITIONS

*SEE TEXT OF REPORT FOR SPECIFIC RECOMMENDATION.
ACTUAL DEPTH OF OVEREXCAVATION MAY BE GREATER.

TRANSITION LOT DETAIL

GRADING GUIDE SPECIFICATIONS

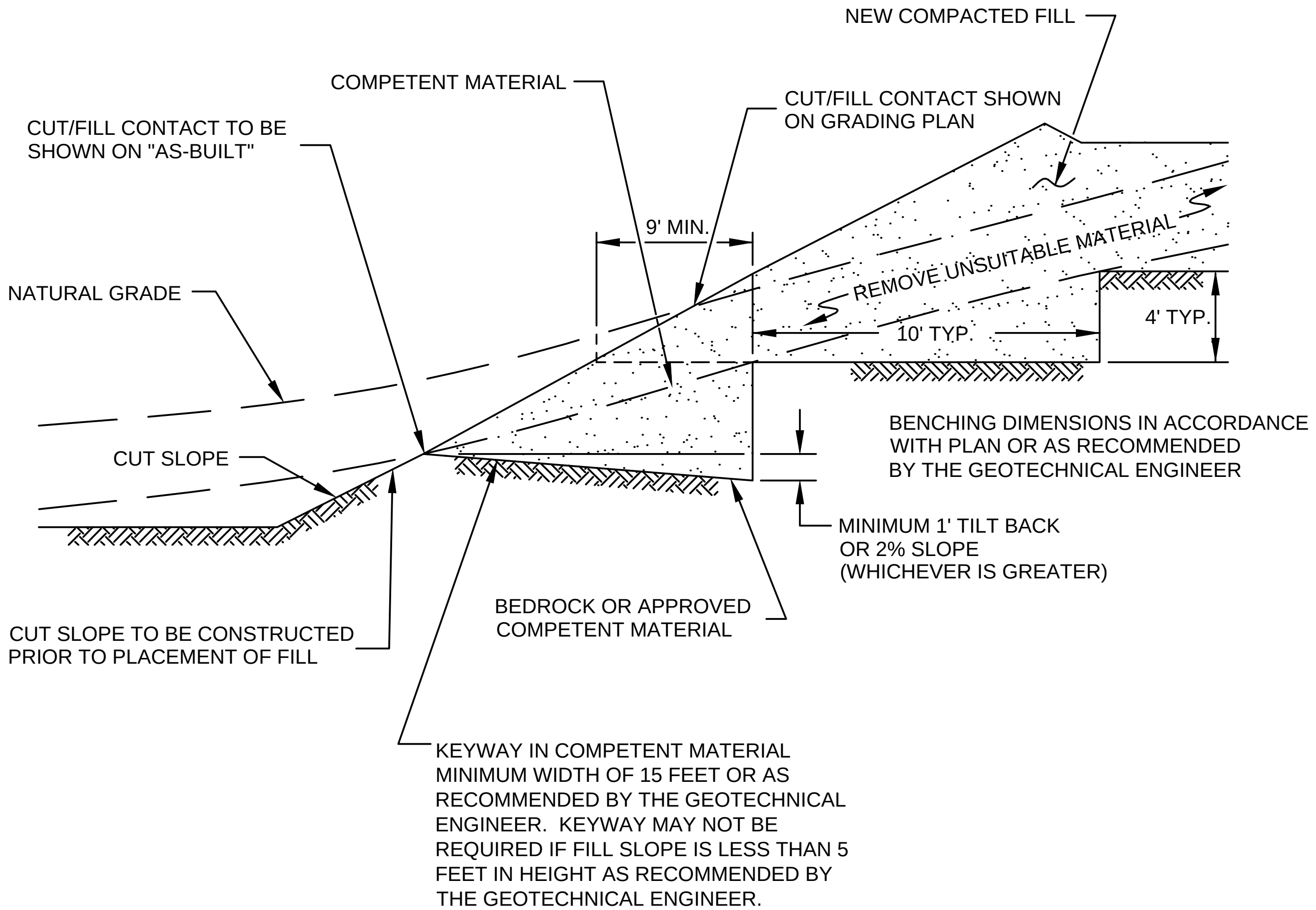
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

GRADING GUIDE SPECIFICATIONS

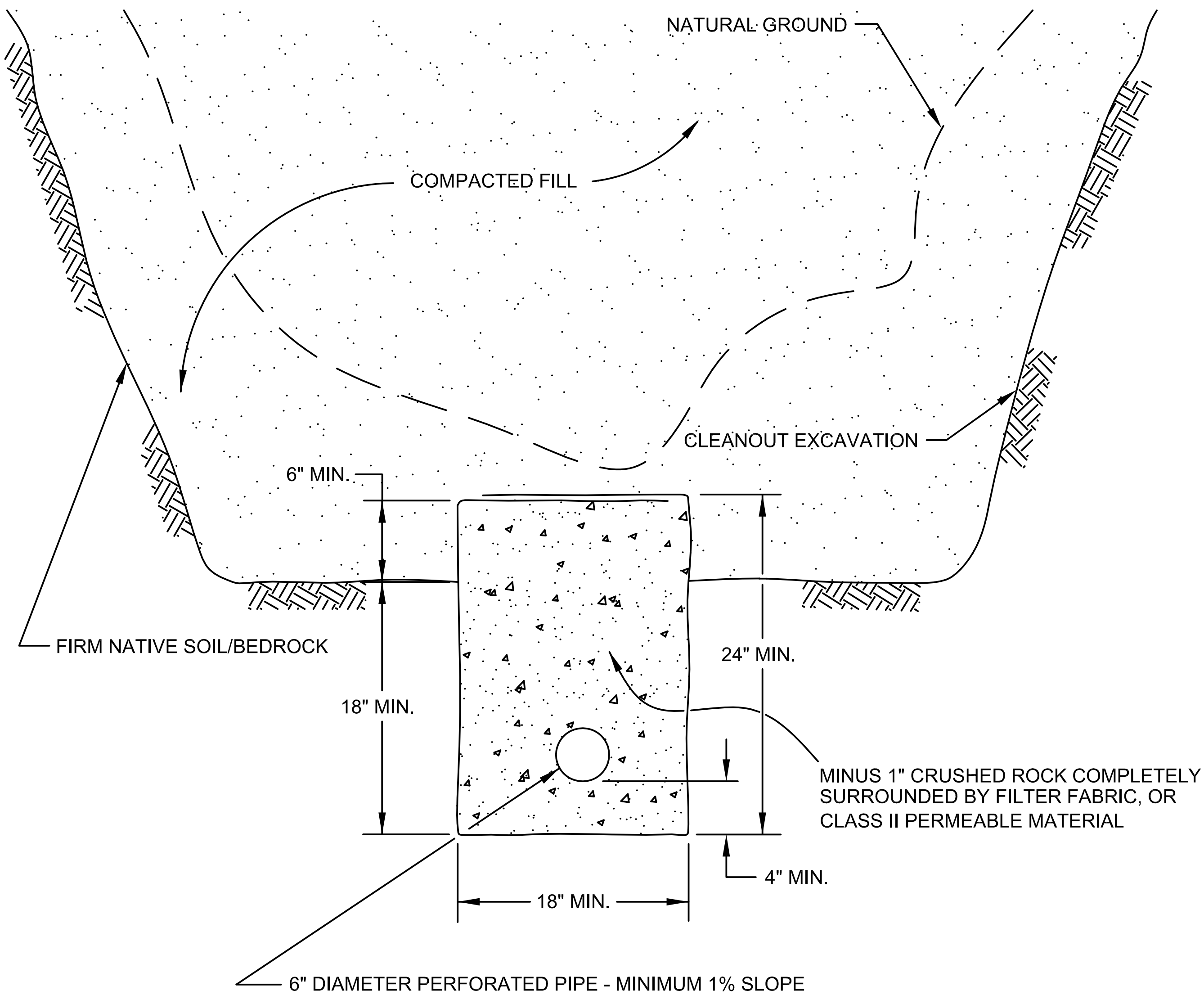
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



PIPE MATERIAL	DEPTH OF FILL OVER SUBDRAIN
ADS (CORRUGATED POLETHYLENE)	8
TRANSITE UNDERDRAIN	20
PVC OR ABS: SDR 35	35
SDR 21	100

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

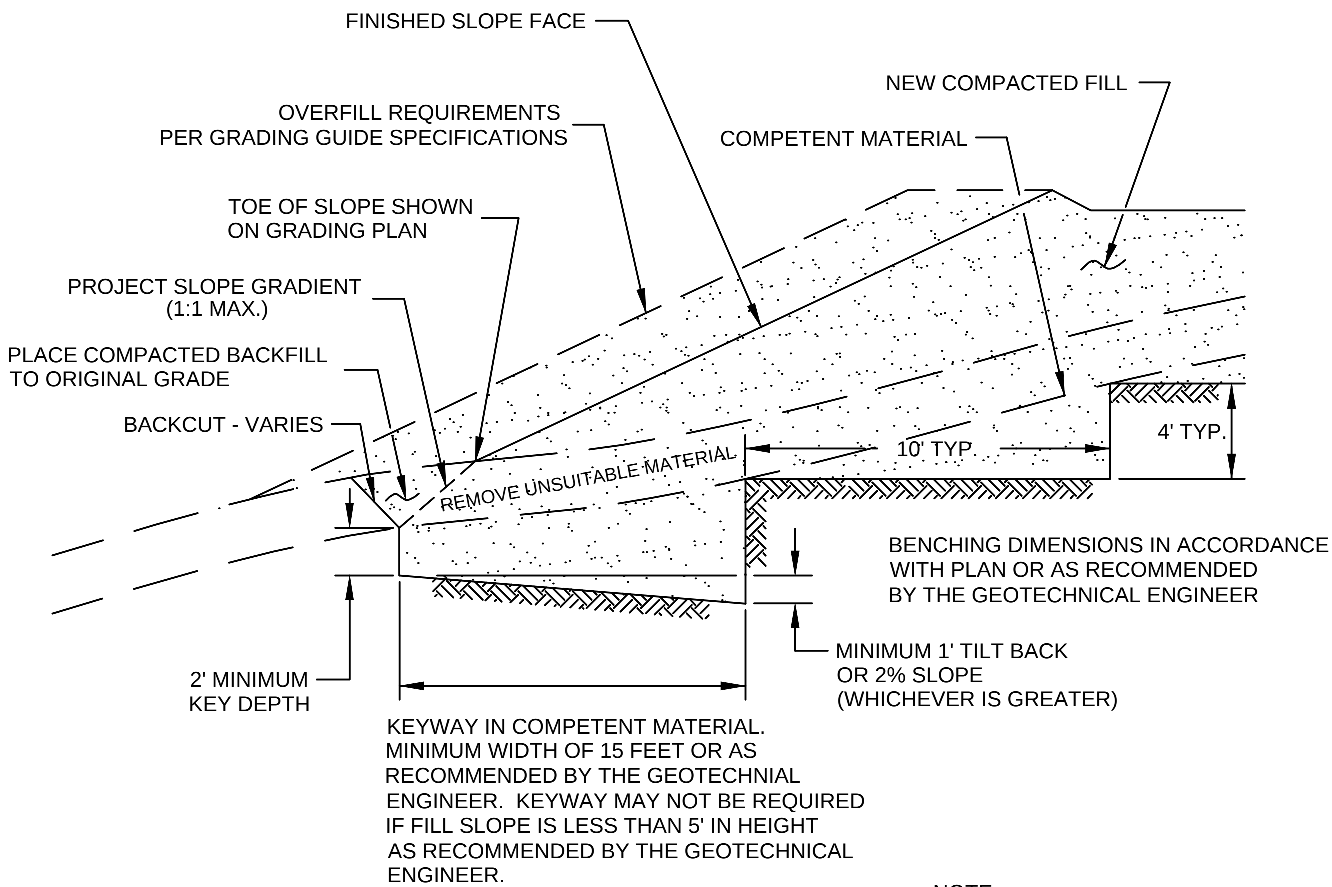
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



NOTE:
BENCHING SHALL BE REQUIRED
WHEN NATURAL SLOPES ARE
EQUAL TO OR STEEPER THAN 5:1
OR WHEN RECOMMENDED BY
THE GEOTECHNICAL ENGINEER.

FILL ABOVE NATURAL SLOPE DETAIL

GRADING GUIDE SPECIFICATIONS

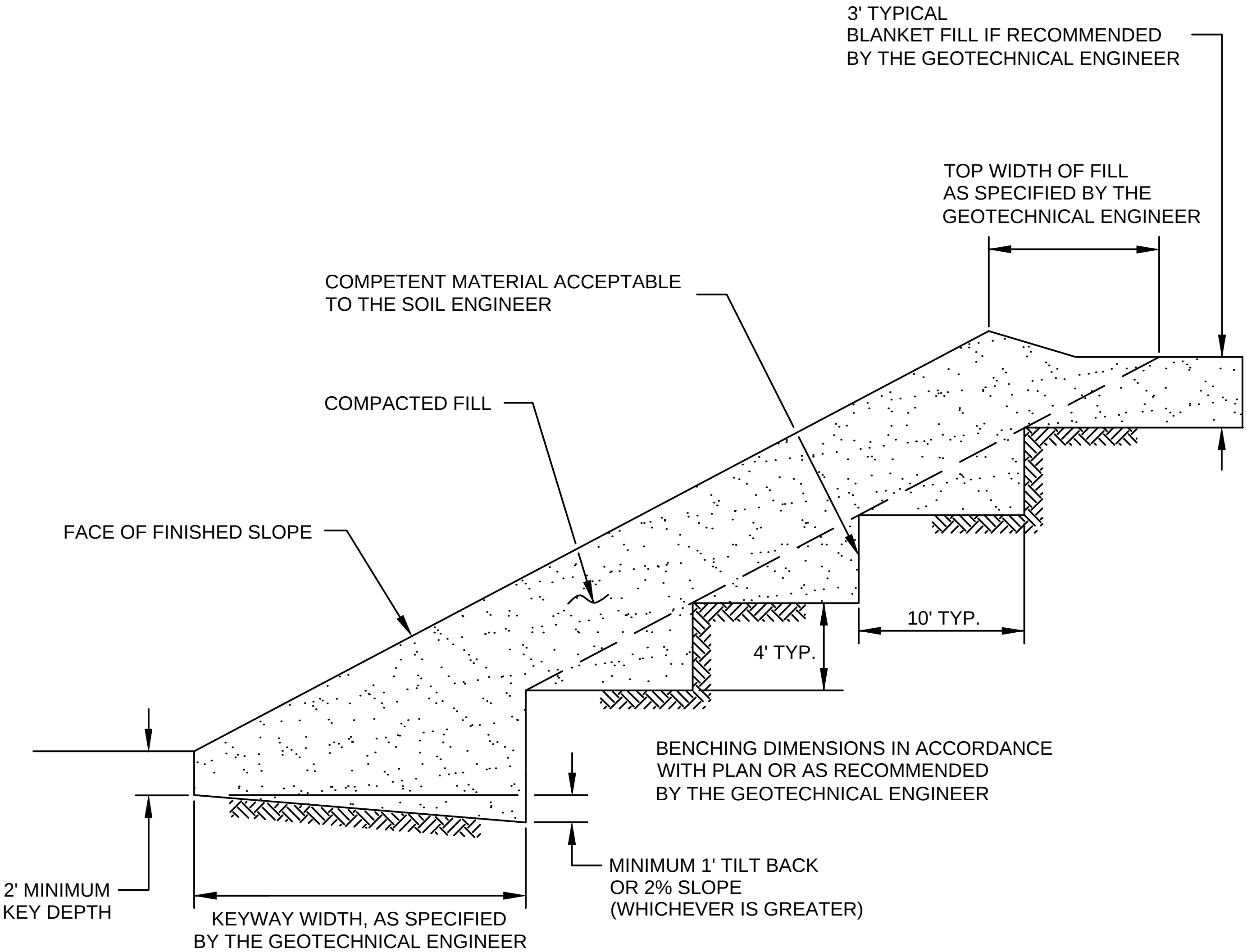
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

GRADING GUIDE SPECIFICATIONS

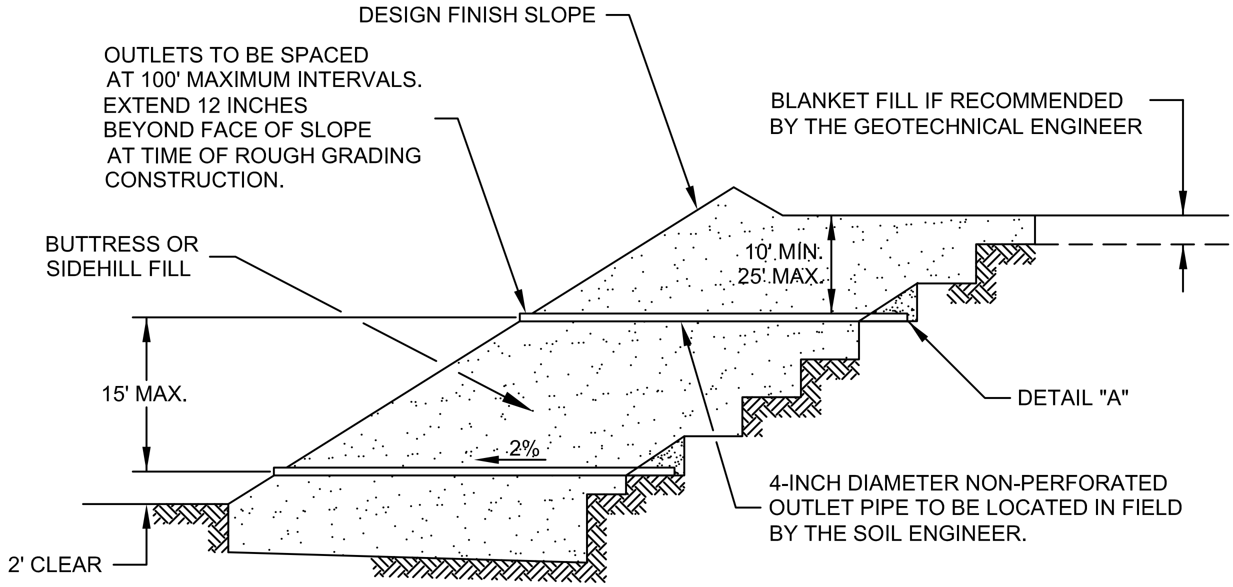
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo

SOUTHERN
CALIFORNIA
GEOTECHNICAL



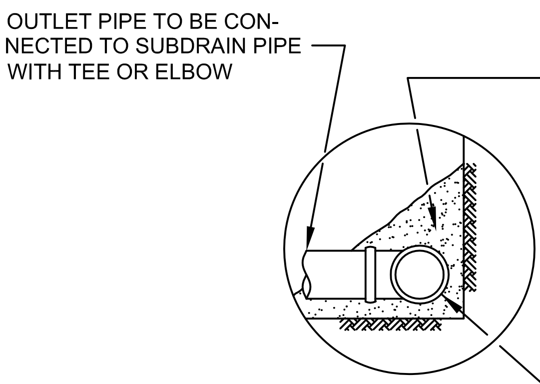
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50



FILTER MATERIAL - MINIMUM OF FIVE CUBIC FEET PER FOOT OF PIPE. SEE ABOVE FOR FILTER MATERIAL SPECIFICATION.

ALTERNATIVE: IN LIEU OF FILTER MATERIAL FIVE CUBIC FEET OF GRAVEL PER FOOT OF PIPE MAY BE ENCASED IN FILTER FABRIC. SEE ABOVE FOR GRAVEL SPECIFICATION.

FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

MINIMUM 4-INCH DIAMETER PVC SCH 40 OR ABS CLASS SDR 35 WITH A CRUSHING STRENGTH OF AT LEAST 1,000 POUNDS, WITH A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE AT 2 PERCENT TO OUTLET PIPE.

DETAIL "A"

NOTES:
1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

SLOPE FILL SUBDRAINS

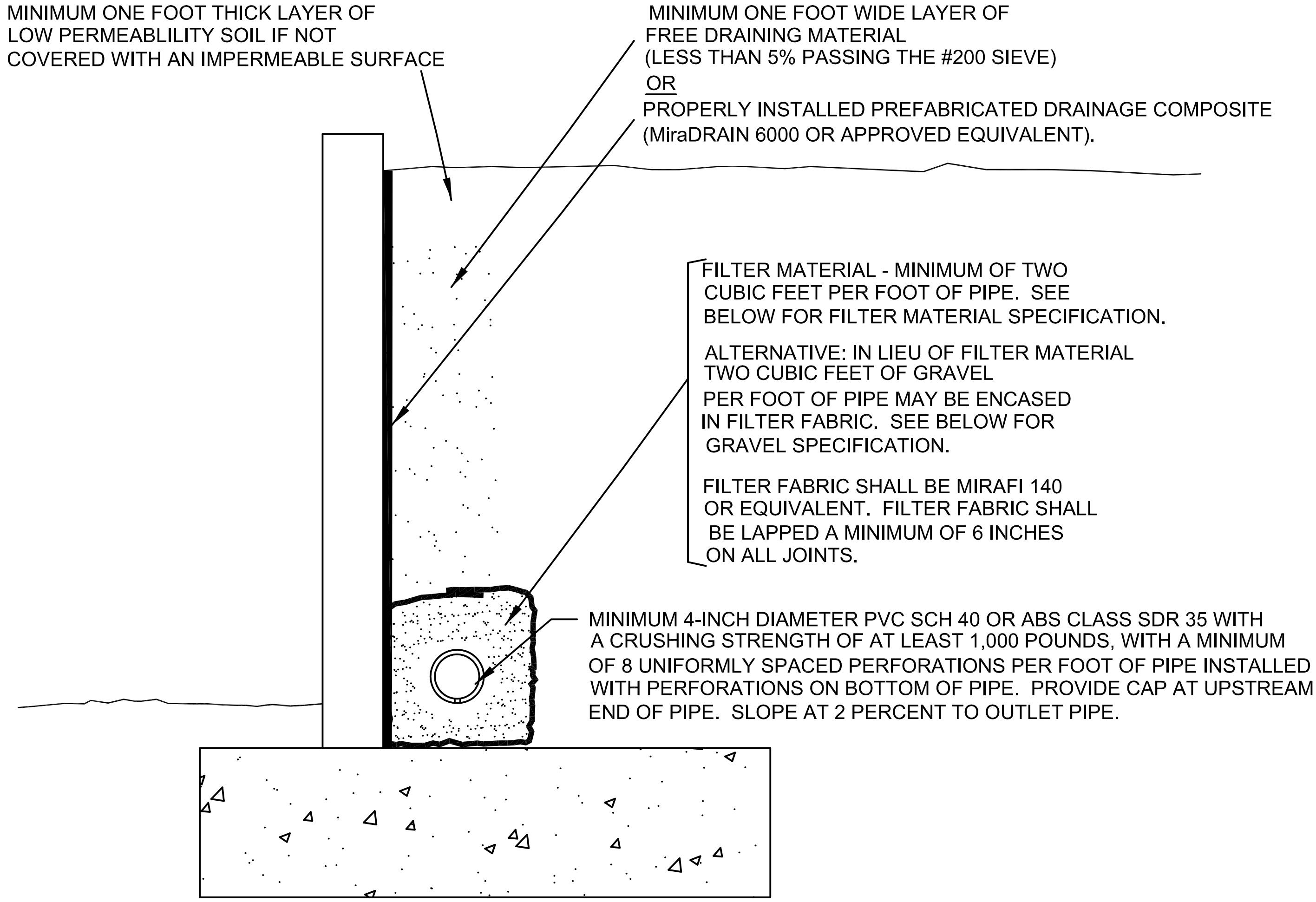
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

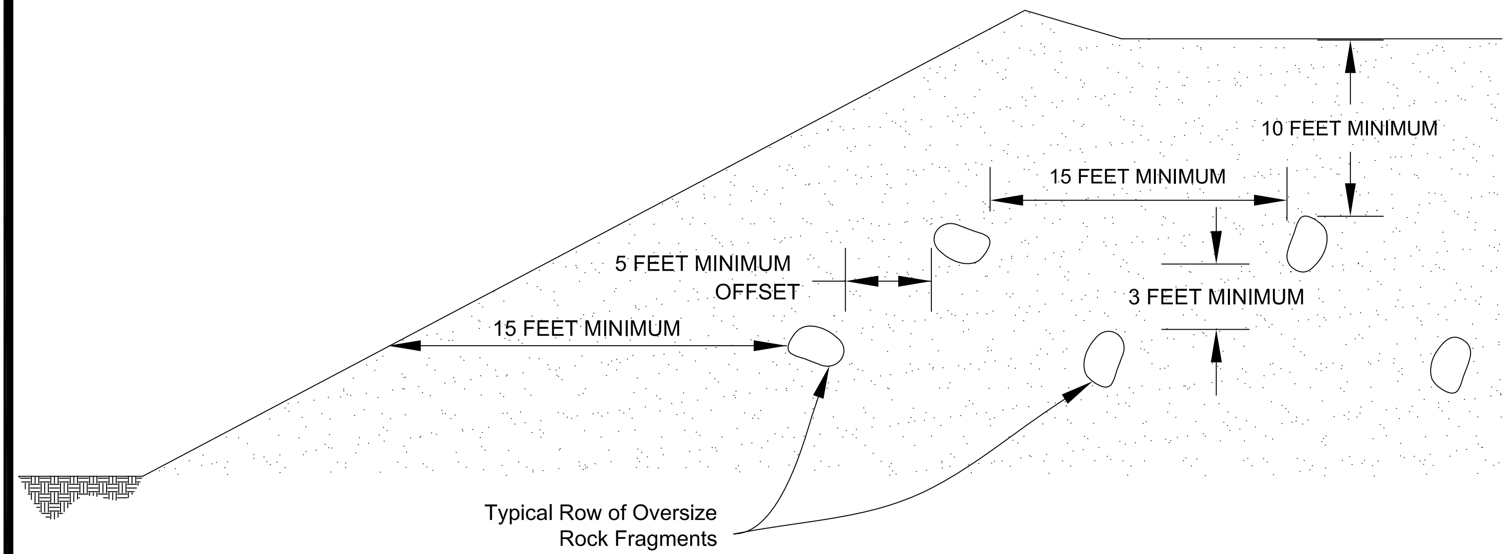
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

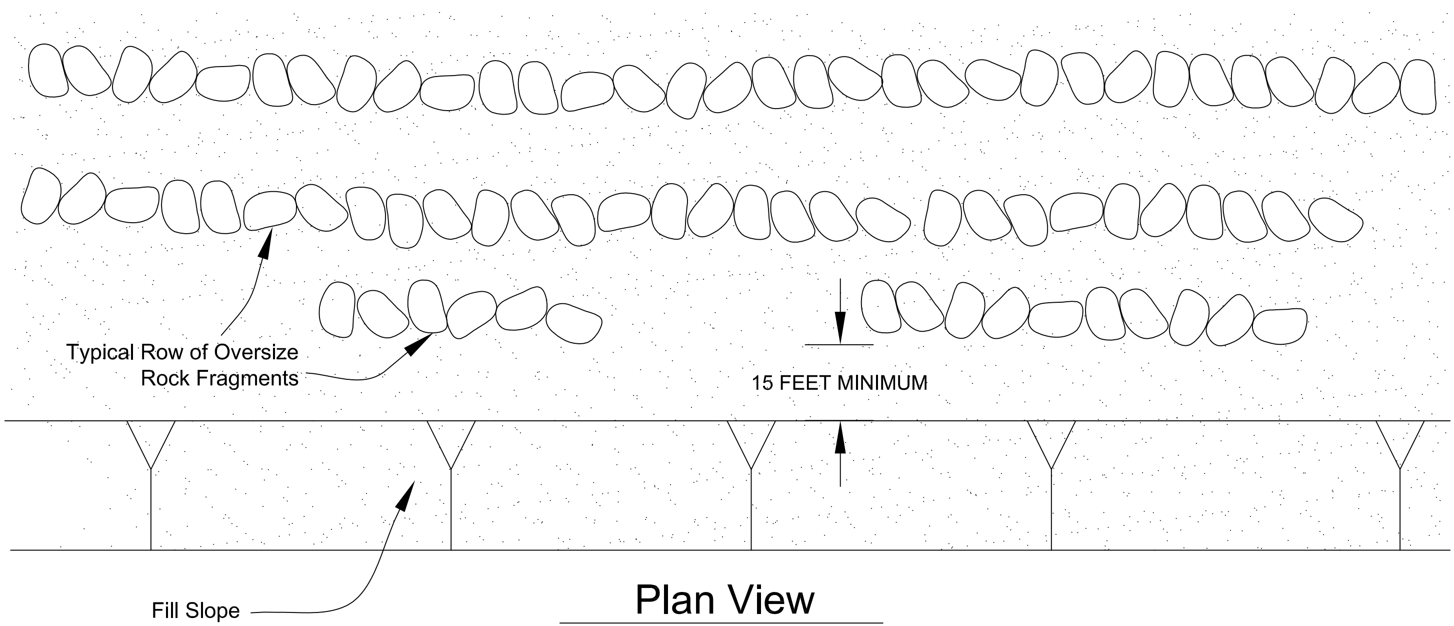
DRAWN: JAS
CHKD: GKM

PLATE D-7

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL	
GRADING GUIDE SPECIFICATIONS	
NOT TO SCALE	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: PM CHKD: GKM	
PLATE D-8	

APPENDIX E

OSHPD

Latitude, Longitude: 33.8362112, -117.26362152

Date	12/5/2022, 3:39:41 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	1.5	MCE_R ground motion. (for 0.2 second period)
S_1	0.557	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.8	Site-modified spectral acceleration value
S_{M1}	0.803	Site-modified spectral acceleration value
S_{DS}	1.2	Numeric seismic design value at 0.2 second SA
S_{D1}	0.536	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	1.443	Site amplification factor at 1.0 second
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.6	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.506	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.607	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.557	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.607	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.632	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.937	Mapped value of the risk coefficient at short periods
C_{R1}	0.917	Mapped value of the risk coefficient at a period of 1 s
C_V	1.2	Vertical coefficient

SOURCE: SEAOC/OSHPD Seismic Design Maps Tool
<https://seismicmaps.org/>

SEISMIC DESIGN PARAMETERS - 2022 CBC

PROPOSED WAREHOUSE DEVELOPMENT

RIVERSIDE COUNTY (PERRIS AREA), CALIFORNIA

DRAWN: JLL
CHKD: RGT

SCG PROJECT
22G213-3

PLATE E-1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL