PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED MORENO VALLEY TRADE CENTER
PEN19-0193

SWC Eucalyptus Avenue and Redlands Boulevard
Moreno Valley, California
for
Hillwood

SoCalGeo
SOUTHERN
CALIFORNIA
GEOTECHNICAL
A California Corporation

November 5, 2019

Hillwood
901 Via Piemonte, Suite 175
Ontario, California 91764

Attention: Ms. Kathy Hoffer
Vice President

Project No.: **19G210-1R**

Subject: **Preliminary Geotechnical Investigation**
PEN19-0193
Proposed Moreno Valley Trade Center
SWC Eucalyptus Avenue and Redlands Boulevard
Moreno Valley, California

Gentlemen:

In accordance with your request, we have conducted a geotechnical investigation at the subject site. 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.

REGISTERED PROFESSIONAL ENGINEER
DANIEL W. NIELSEN
No. 77915
CIVIL
STATE OF CALIFORNIA

Daniel W. Nielsen
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT TRAZO
No. 2655
GEOTECHNICAL
STATE OF CALIFORNIA

Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

22885 Savi Ranch Parkway ▾ Suite E ▾ Yorba Linda ▾ California ▾ 92887
voice: (714) 685-1115 ▾ fax: (714) 685-1118 ▾ www.socalgeo.com

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

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

Geotechnical Design Considerations

- The subject site is located within a mapped area of moderate liquefaction susceptibility. However, recent and historic ground water level data from wells located within 1,500 feet of the subject site indicate that static groundwater levels are greater than 100± feet below the ground surface.
- The subsurface conditions encountered at this site are not considered to be conducive to liquefaction based on the lack of a static groundwater table within the upper 50± feet below site grades. Therefore, liquefaction is not considered to be a design concern for this project.
- The near-surface soils encountered at the boring locations consist of native alluvium. These soils possess variable strengths, compositions, and densities. The results of laboratory testing indicate that soils present within the upper 6 to 10± feet possess potential for collapse when wetted.
- Remedial grading is recommended to remove the upper portion of the near-surface, collapsible, variable strength, native alluvium and replace these soils as compacted structural fill. The recommended remedial grading will reduce potential differential settlements by replacing collapsible/compressible soils as compacted structural fill.

Site Preparation

- Initial site preparation should include stripping of the existing native grass and weed growth.
- Demolition of the existing structures located within the existing nursery in the southeast portion of the site and any subsurface remnants of former development in the northeastern portion of the site will be necessary in order to facilitate the proposed development at the site. Demolition should include all foundations, floor slabs, utilities and any other subsurface improvements that will not remain in place with the new development.
- The proposed building area should be overexcavated to a depth of at least 6 feet below existing grade and to a depth of 6 feet below proposed building pad subgrade elevation. Within the foundation influence zones, the overexcavation should extend to a depth of at least 3 feet below proposed foundation bearing grade. However, additional overexcavation to depths of up to 10± feet is expected to be necessary in localized areas based on the presence of loose collapsible soils. The overexcavation should extend horizontally at least 5 feet beyond the building and foundation perimeters.
- After the overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify any additional soils that should be removed. Resulting subgrade should then be scarified to a depth of 12 inches and moisture conditioned to 0 to 4 percent above optimum. The previously excavated soils may then be replaced as compacted structural fill. All 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.

Building Foundations
- 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
- Conventional Slab-on-Grade, 6 inches thick.
- Modulus of Subgrade Reaction: k = 100 psi/in.
- Minimum slab reinforcement: Not required for geotechnical considerations. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading.

Pavements

ASPHALT PAVEMENTS (R = 25)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	6
Aggregate Base	7	9	11	12	14
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R = 25)				
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	7	8½
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. 19P367, dated September 19, 2019. 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 proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located at the southwest corner of Eucalyptus Avenue and Redlands Boulevard in Moreno Valley, California. The site is bounded to the north by Eucalyptus Avenue, to the west by a drainage channel, to the south by Encilia Avenue, and to the east by Redlands Boulevard. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report. It should be noted that several of the street names shown on the Site Location Map have changed since the base map was published in 2013, including the streets labeled Fir Street and Eucalyptus Avenue.

The subject site consists of several contiguous rectangular-shaped parcels which total 72.62± acres in size. The majority of the subject site is vacant and undeveloped with the exception of the southeastern parcels which are developed as a nursery. The ground surface cover outside of the nursery consists of moderate to heavy native grass and weed growth with several medium sized trees located within the central portion of the site. The nursery contains several greenhouses, single family residences, concrete driveways, and numerous rows of plants, shrubs, and trees.

As a part of our research we reviewed readily available historical aerials photographs of the subject site from the internet. Aerial photographs taken between 1966 and 1978, inclusive, indicate that the eastern portion of the site was utilized for farming and contained several small structures from 1966 to 1978. Photographs taken in 1996 and later indicate that only a small area in the north central portion of the site and the southeastern corner of the subject site remained developed with several small structures and crops. Between the times of the 2014 and 2016 photographs, the buildings in the north central portion of the subject site were demolished and the crops were removed, leaving the existing nursery in the southeastern corner as the only developed area within the subject site. The western portion of the site was undeveloped in all of the available photographs.

Topographic information for the subject site was obtained from a conceptual grading plan prepared by Thienes Engineering, Inc. The survey indicates that the overall site topography generally slopes from the northwest downward to the southeast at an estimated gradient of around 1.6 percent. The maximum site elevation is 1752± feet mean sea level (msl) located in the northwestern region of the subject site, and the minimum site elevation is 1708± feet msl in the southeast corner of the subject site.

3.2 Proposed Development

Based on the site plan provided to our office, the site will be developed with one warehouse, 1,332,380± ft² in size, located in the central area of the site. Dock-high doors will be constructed along the northern and southern building walls. The building will be surrounded by asphaltic concrete pavements for parking and drive lanes and Portland cement concrete pavements for the loading dock areas. Several landscape planters and concrete flatwork will be included throughout the site.

Detailed structural information has not been provided. It is assumed that the new building will be a single-story structure of tilt-up concrete construction. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 3 to 6 kips per linear foot, respectively.

No significant amounts of below grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 10 to 15± feet are expected to be necessary to achieve the proposed site grades.

3.3 Previous Study

Prior to the preparation of our report, SCG was provided with the following previous reports for the subject site. Findings and conclusions from the reports are as follows:

> Preliminary Geotechnical Investigation, Proposed Industrial Development, SWC Redlands Boulevard and Eucalyptus Avenue, Moreno Valley, CA, prepared by LOR Geotechnical Group, dated April 8, 2019 (Project No. 23513.1)

The subsurface exploration conducted for this project consisted of excavating five (5) test trenches to a depth of 10± feet below the ground surface and drilling fourteen (14) 8-inch–diameter borings advanced to depths of 26.5 to 51.5± feet below the ground surface.

The subsurface conditions encountered within this investigation generally consisted of fill soils underlain by native alluvial soils. The fill layer was noted to be about 2 feet in thickness on all of the boring logs and consisted of loose silty sand to sandy silt. The alluvium generally consisted of sandy silt to silty sand and included occasional well grade sands. At depths of 25 feet and greater, occasional sandy clay layers were encountered. Four (4) double ring infiltration tests were performed within the site. Infiltration rates ranged from 1.6 to 2.6 inches per hour. Groundwater was not encountered at any of the site excavations. No active or potentially active faults were documented within the subject site. Infiltration of water into the upper 7 to 12 feet was not recommended based on the hydro-collapse potential of the on-site soils.

The laboratory testing program for included several standard geotechnical tests. The results of many of these tests are discussed herein. Grain size analyses tests were performed on collected samples throughout the site at depths ranging from 0 to 3 feet below ground surface. The results of the grain size analysis indicate that the near-surface soils predominantly consist of silty sands and sandy silts. Three (3) direct shear tests were performed on sandy silts and silty sands at depths of 1 to 4 feet below existing subgrade. The reported direct shear test results (ultimate cohesion and internal friction angle, respectively) were: 250 lbs/ft^2 and 28 degrees, 150 lbs/ft^{2}and 29 degrees, and 300 lbs/ft^2 and 27 degrees. Three (3) Modified Proctor tests were performed. The two (2) R-value tests performed at the site indicated R-values of 61 and 6. Three (3) Expansion Index (EI) tests were performed at depths of 1 to 4 feet below ground surface yielded values of 12 & 15 for sandy silts and 0 for a silty sand. Soluble sulfate content testing indicated sulfate concentrations of less than 0 .005 percent by weight.

The report recommends the removal and recompaction of existing on-site soils based on the unsuitability of the existing soils, in their current state, for the support the proposed structures. A compacted fill mat was recommended for construction beneath footings and slabs.

Recommendations for the design and construction of shallow foundations and concrete slabs-on-grade were provided in the report. Foundations were recommended to be designed for a maximum allowable soil bearing pressures ranging from 1,500 to 3,000 lbs/ft^2, depending upon the depth of embedment and footing width.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of seventeen (17) borings (identified as Boring Nos. B-1 through B-17) advanced to depths of 10 to 50± feet below the existing site grades. 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

Alluvium

Native alluvium was encountered beneath the ground surface at all of the boring locations, extending to at least the maximum depth explored of 50± feet below existing site grades. The majority of the native alluvial soils encountered at the boring locations consist of loose to medium dense fine sandy silts and silty fine sands with varying clay, medium to coarse sand and fine gravel content. Some loose to medium dense well graded sands and clayey sands were also encountered, as well as medium stiff to hard silty clay, clayey silt, and fine sand clay strata. At depths greater than 30± feet, occasional dense sands, silty sands, and clayey sands were encountered.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the lack of any 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 50± feet at the time of the subsurface exploration.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the groundwater depths in this area is the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well in this database is located approximately 1,200 feet northwest of the site. Water level readings within this monitoring well indicate groundwater levels of 196.8± feet (April 2016) below the ground surface. A nearby monitoring well, located approximately 1,500 feet south of the site, provides a historical groundwater level of 104.2± feet (February 1959).

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. 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 have been 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-8 in Appendix C of this report.

Maximum Dry Density and Optimum Moisture Content

Representative bulk samples have been 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, and are presented on Plate C-9 and C-10 in Appendix C of this report. 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 types or soil mixes may be necessary at a later date.

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-inch 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-1 @ 0 to 5 feet	8	Very Low
B-7 @ 0 to 5 feet	16	Very Low
B-11 @ 0to 5 feet	0	Very Low (non-expansive)

Soluble Sulfates

Representative samples of the near-surface soils have been 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 (%)	Sulfate Classification
B-1 @ 0 to 5 feet	0.012	Negligible
B-7 @ 0 to 5 feet	0.023	Negligible
B-11 @ 0 to 5 feet	<0.001	Negligible

Corrosivity Testing

Representative bulk samples of the near-surface soils were submitted to a subcontracted analytical 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 the resistivity and pH testing are presented below:

Sample Identification	Resistivity (ohm-cm)	pH	Chlorides (mg/kg)
B-1 @ 0 to 5 feet	1,080	7.4	47
B-7 @ 0 to 5 feet	960	7.8	83
B-11 @ 0 to 5 feet	5,600	7.7	1.5

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our review, field exploration, laboratory testing and geotechnical analysis, the proposed development is considered feasible from a geotechnical standpoint. 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. 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.

Seismic Design Parameters

The 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.

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2016 edition of the California Building Code (CBC). However, it is also possible that the proposed development may be designed using the 2019 CBC, which will be adopted on January 1, 2020. Therefore, this report provides design parameters for both the 2016 CBC and the 2019 CBC. Other design consultants should verify the version of the code under which the proposed development will be submitted.

The 2016 and 2019 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 7-10 and ASCE 7-16, upon which the 2016 CBC and 2019 CBC are based, respectively. 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 Plates E-1A (2016 CBC) and E-1B (2019 CBC) in Appendix E of this report. Based on this output, the following parameters may be utilized for the subject site:

2016 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	2.291
Mapped Spectral Acceleration at 1.0 sec Period	S_1	1.046
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	2.291
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	1.568
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.528
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	1.046

The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than 0.2. However, Section 11.4.8 of ASCE 7-16 also indicates an exception to the requirement for a site-specific ground motion hazard analysis for certain structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) indicates that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." **Based on our understanding of the proposed development, the seismic design parameters presented below were calculated assuming that the exception in Section 11.8.4 applies to the proposed structures at this site. However, the structural engineer should verify that this exception is applicable to the proposed structures.** Based on the exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped MCE_R Acceleration at 0.2 sec Period	S_S	2.195
Mapped MCE_R Acceleration at 1.0 sec Period	S_1	0.886
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	2.195
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	1.506
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.463
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	1.004

It should be noted that the site coefficient F_v and the parameters S_{M1} and S_{D1} were not included in the SEAOC/OSHPD Seismic Design Maps Tool output for the 2019 CBC. We calculated these parameters-based on Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC using the value of S_1 obtained from the Seismic Design Maps Tool, assuming that a site-specific ground motion hazards analysis is not required for the proposed building at this site

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 moderate liquefaction susceptibility. However, water level data available for wells located near the subject site indicates that the depth to groundwater table is more than 100 feet below the ground surface and groundwater was not encountered at any of the boring locations, which extended to depths of up to 50± feet. Based on the lack of a static groundwater table within the upper 50± feet, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The subsurface conditions encountered at the boring locations generally consist of variable strength native alluvium. The results of laboratory testing indicate that the near-surface alluvium (within the upper 6 to 10± feet) possesses a potential for moderate collapse when exposed to moisture infiltration as well as consolidation when exposed to load increases in the range of those that will be exerted by the new foundations. Based on these conditions, remedial grading will be necessary within the proposed building area to provide a subgrade suitable for support of the new foundations and floor slab.

Settlement

The recommended remedial grading will remove the potentially compressible/collapsible near-surface native alluvium, and replace these materials as compacted structural fill. The native soils that will remain in place below the recommended depth of overexcavation 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 settlements of the proposed structure are 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 expansion potential (EI = 0 to 16). Based on these test results, no design considerations related to expansive soils are considered warranted for this project.

Shrinkage/Subsidence

Removal and recompaction of the near-surface native fill soils is estimated to result in an average shrinkage of 6 to 11 percent. It should be noted that the potential shrinkage estimate is 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 0.10 feet.

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

Demolition of the existing structures located in the existing nursery in the southeast portion of the site will be necessary in order to facilitate the construction of the proposed development. Demolition should include all foundations, floor slabs, utilities and any other subsurface improvements that will not remain in place with the new development. Any subsurface remnants of the former structures located in the northern portion of the site should also be demolished. 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 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 alluvium. It is recommended that the overexcavation extend to a depth of at least 6 feet below existing grade and to a depth of at least 6 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 3 feet below proposed foundation bearing grade. However, we expect that additional overexcavation will be required in localized areas where loose or porous soils are encountered. We expect that localized overexcavation to depths of up to 10 feet below existing site grades may be necessary in some areas.

The overexcavation areas should extend at least 5 feet beyond the building perimeter, and to an extent equal to the depth of fill below the new foundations. 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 verify 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 any soft, loose or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if undocumented 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 0 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, structural fill. All 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.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of proposed retaining and non-retaining site walls should be overexcavated to a depth of at least 3 feet below foundation bearing grade and replaced as compacted structural fill. The overexcavation should also extend to a depth of at least 3 feet below the bottom of any erection pads used to construct tilt-up concrete walls, because erection pads are considered to be part of the foundation system. Any undocumented fill soils should also be removed from the retaining wall areas. In both cases, 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. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Parking Areas

Based on economic considerations, overexcavation of the surficial alluvial soils in the new parking 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 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 to 0 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 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 existing collapsible and compressible 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.

Treatment of Existing Soils: Flatwork Areas

Subgrade preparation in the new flatwork 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. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 0 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 site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 0 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. All grading and fill placement activities should be completed in accordance with the requirements of the CBC and the grading code of the city of Moreno Valley.
- 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 soils 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 city of Moreno Valley. 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 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.

6.4 Construction Considerations

Excavation Considerations

The majority of the near-surface soils consist of low to moderate strength silty sands and sandy silts. These materials will likely be subject to minor caving within shallow excavations. Where caving occurs within shallow excavations, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, the inclination of temporary slopes should not exceed 2h:1v. 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.

Moisture Sensitive Subgrade Soils

Most 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.

Groundwater

The static groundwater table is considered to exist at a depth in excess of 50± feet 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 structural fill soils extending to depths of at least 3 feet below foundation bearing grade. Based on this subsurface profile, the proposed structure may be supported on conventional shallow foundations.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 lbs/ft^2.
- 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 standard geotechnical practice. Additional rigidity may be necessary for structural considerations. The actual design of the foundations should be determined by the structural engineer.

Foundation Construction

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 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, 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 0 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.

Estimated Foundation Settlements

Post-construction total and differential static 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: 240 lbs/ft^3
- Friction Coefficient: 0.28

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 new floor slabs 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, extending to a depth of at least 6 feet below finished pad grade. Based on geotechnical considerations, the floor slab may be designed as follows:

- Minimum slab thickness: 6 inches.
- Modulus of Subgrade Reaction: 100 lbs/in^3.
- Minimum slab reinforcement: Not required for geotechnical considerations. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading.
- 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 slab area where such moisture sensitive floor coverings are expected. 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 0 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 slab should be completed by the structural engineer to verify adequate thickness and reinforcement.

6.7 Exterior Flatwork Design and Construction

Subgrades which will support new exterior slabs-on-grade for sidewalks, patios, and other concrete flatwork, should be prepared in accordance with the recommendations contained in the ***Grading Recommendations*** section of this report. Based on geotechnical considerations, exterior slabs on grade may be designed as follows:

- Minimum slab thickness: 4½ inches.
- Minimum slab reinforcement: No. 3 bars at 18 inches on center, in both directions.
- The flatwork at building entry areas should be structurally connected to the perimeter foundation that is recommended to span across the door opening. This recommendation is designed to reduce the potential for differential movement at this joint.
- Moisture condition the slab subgrade soils to at least 0 to 4 percent of optimum moisture content, to a depth of at least 12 inches. Adequate moisture conditioning should be verified by the geotechnical engineer 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.
- Control joints should be provided at a maximum spacing of 8 feet on center in two directions for slabs and at 6 feet on center for sidewalks. Control joints are intended to direct cracking. Minor cracking of exterior concrete slabs on grade should be expected.

Expansion or felt joints should be used at the interface of exterior slabs on grade and any fixed structures to permit relative movement.

6.8 Retaining Wall Design and Construction

Although not indicated on the site plan, some small (less than 6 feet in height) retaining walls may be required to facilitate the new site grades and in the loading dock areas. 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. The following parameters assume that only the on-site soils will be utilized for retaining wall backfill. The majority of the near-surface soils generally consist of silty sands and sandy silts with occasional silty clays, clayey silts, sandy clays, and well-graded sands. Based on their composition, the on-site soils have been assigned a friction angle of 28 degrees. **Silty clays and clayey silts may possess lower strengths and/or higher expansion potentials and are not recommended for use as retaining wall backfill.**

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

<table>
<tr><th colspan="2" rowspan="2">Design Parameter</th><th>Soil Type</th></tr>
<tr><th>On-site Soils</th></tr>
<tr><td colspan="2">Internal Friction Angle (ϕ)</td><td>28°</td></tr>
<tr><td colspan="2">Unit Weight</td><td>125 lbs/ft^3</td></tr>
<tr><td rowspan="3">Equivalent Fluid Pressure:</td><td>Active Condition (level backfill)</td><td>45 lbs/ft^3</td></tr>
<tr><td>Active Condition (2h:1v backfill)</td><td>79 lbs/ft^3</td></tr>
<tr><td>At-Rest Condition (level backfill)</td><td>67 lbs/ft^3</td></tr>
</table>

The walls should be designed using a soil-footing coefficient of friction of 0.28 and an equivalent passive pressure of 240 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 2016 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 3 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. 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 minimum 1 foot thick layer of free-draining granular material (less than 5 percent passing the No. 200 sieve) be placed against the face of the retaining walls. This material should extend from the top of the retaining wall footing to within 1 foot of the ground surface on the back side of the retaining wall. This material should be approved by the geotechnical engineer. In lieu of the 1 foot thick layer of free-draining material, a properly installed prefabricated drainage composite such as the MiraDRAIN 6000XL (or approved equivalent), which is specifically designed for use behind retaining walls, may be used. If the layer of free-draining 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 layer of free draining granular material should be separated from the backfill soils by a suitable geotextile, approved by the geotechnical engineer.

All retaining wall backfill should be placed and compacted under engineering controlled conditions in the necessary layer thicknesses to ensure an in-place density between 90 and 93 percent of the maximum dry density as determined 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 4-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 8-foot on-center spacing. 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.

6.9 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 majority of the near-surface soils generally consist of silty sands and sandy silts with some interbedded clayey sands, sandy clays, clayey silts, and silty clays. The results of R-value testing performed for the referenced previous study indicate that tested samples of the near-surface soils possess R-values of 6 and 61. Based on the soil classifications, we expect that the majority of the near-surface soils possess R-values ranging between 25 and 35. The subsequent pavement design is therefore based upon an assumed R-value of 25. Any 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 controlled conditions. It is recommended that R-value testing be performed after completion of rough grading. Depending upon the results of the R-value testing, it may be feasible to use thinner pavement sections in some areas of the site.

R-value testing should be performed in proposed street improvement areas and/or new public street areas at the time of the post-entitlement geotechnical report.

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 determine 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. All of the traffic indices allow for 1,000 automobiles per day.

ASPHALT PAVEMENTS (R = 25)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	6
Aggregate Base	7	9	11	12	14
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 determined 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 = 25)				
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	7	8½
Compacted Subgrade (95% minimum compaction)	12	12	12	12

The concrete should have a 28-day compressive strength of at least 3,000 psi. Any reinforcement within the PCC pavements should be determined by the project structural engineer. 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

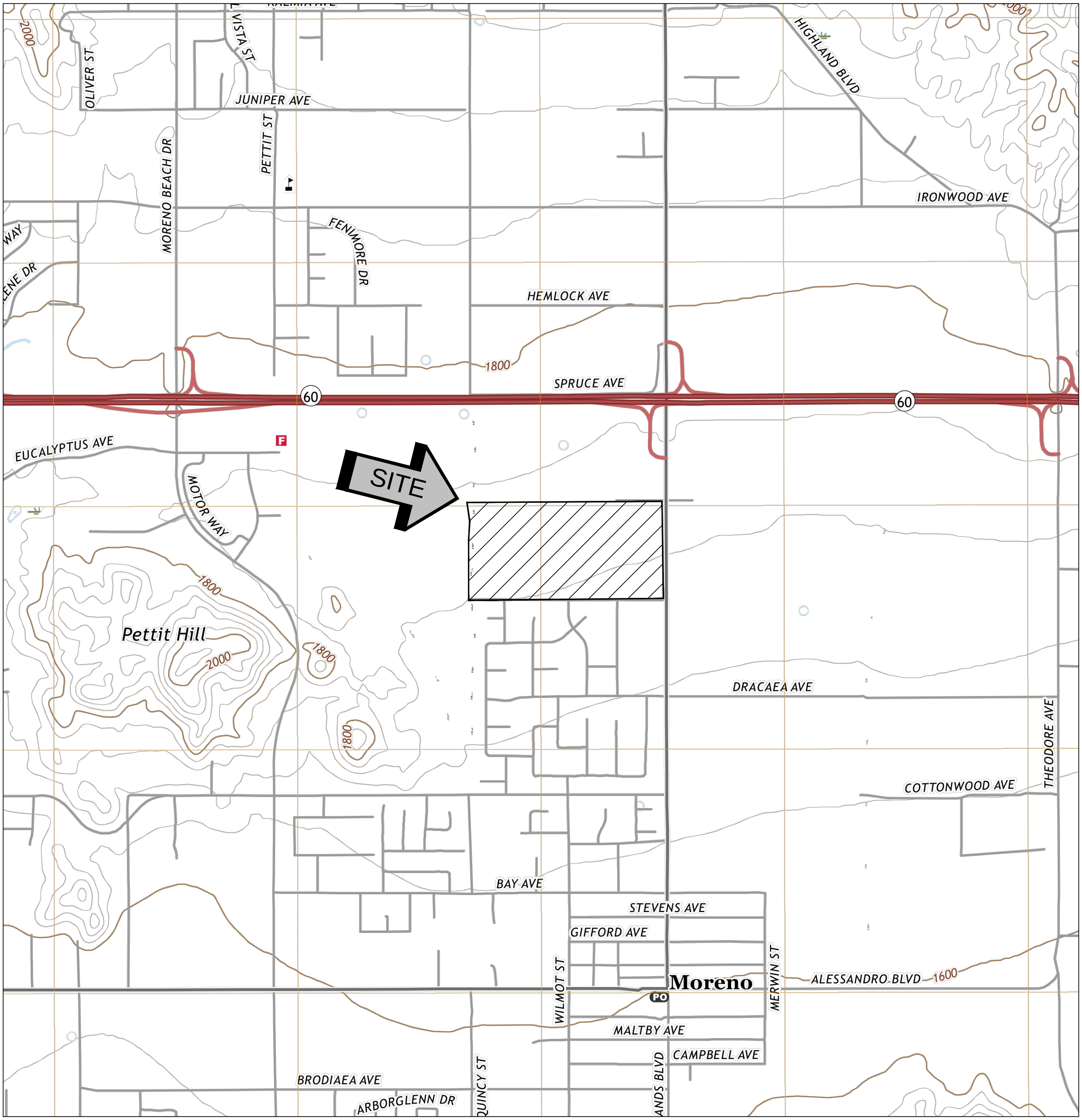
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other 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 SUNNYMEAD QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2018

SITE LOCATION MAP

PROPOSED MORENO VALLEY TRADE CENTER

MORENO VALLEY, CALIFORNIA

SCALE: 1" = 2000'

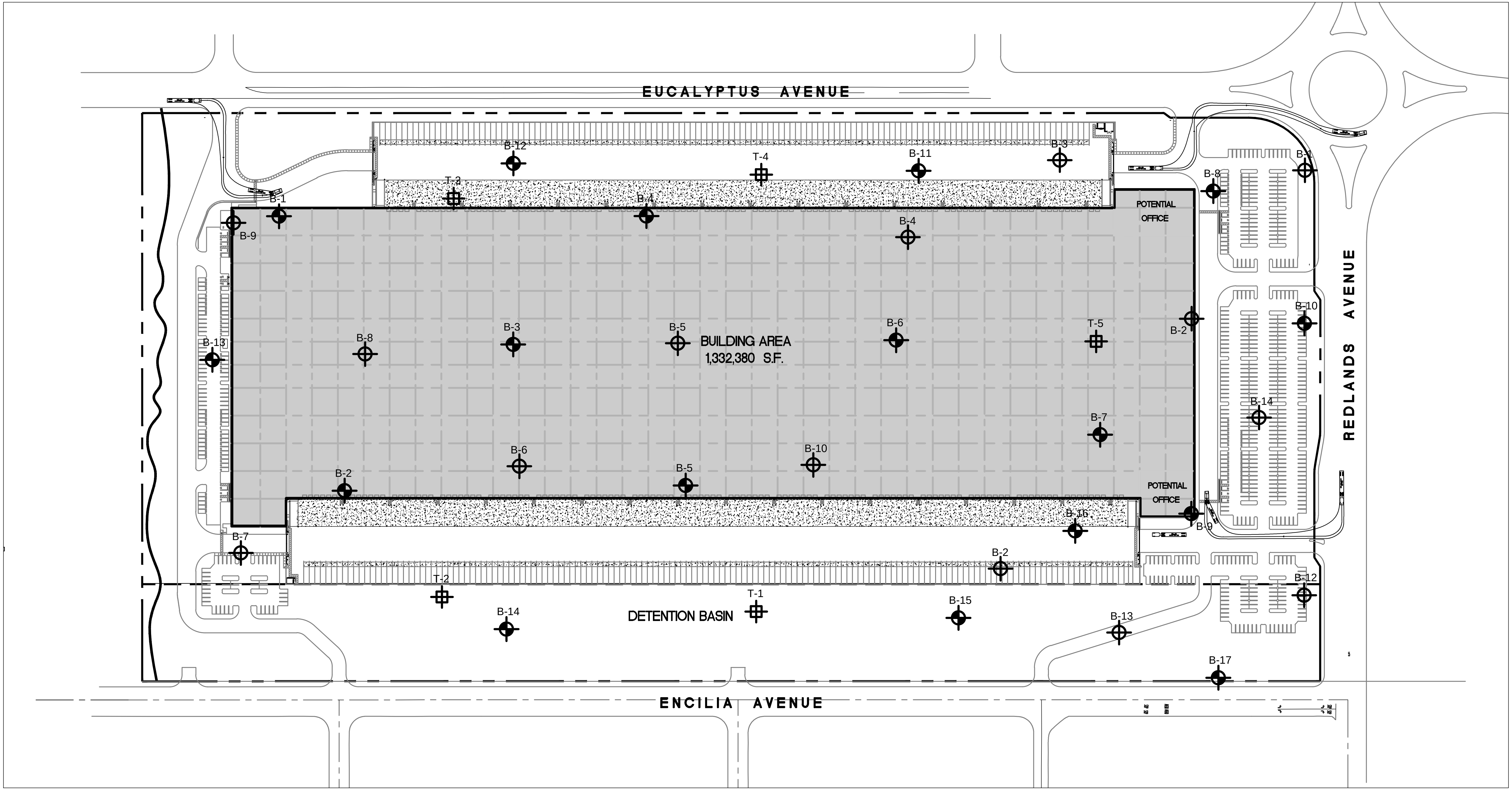
DRAWN: JLL
CHKD: RGT

SCG PROJECT
19G210-1R

PLATE 1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

APPROXIMATE BORING LOCATION

PREVIOUS BORING LOCATION
(LOR GEOTECHNICAL GROUP PROJECT NO. 23513.1)

PREVIOUS TRENCH LOCATION
(LOR GEOTECHNICAL GROUP PROJECT NO. 23513.1)

NORTH
SoCalGeo

NOTE: SITE PLAN PREPARED BY HPA, INC.

BORING LOCATION PLAN

PROPOSED MORENO VALLEY TRADE CENTER

MORENO VALLEY, CALIFORNIA

SCALE: 1" = 200'

DRAWN: RNK
CHKD: RGT

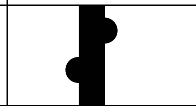
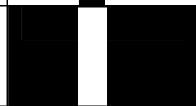
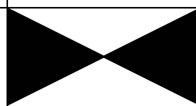
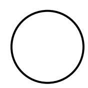
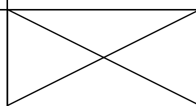
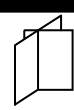
SCG PROJECT
19G210-1R

PLATE 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX B

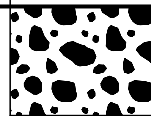
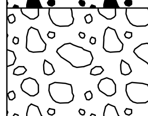
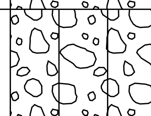
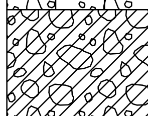
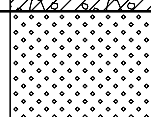
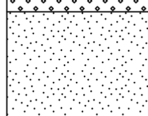
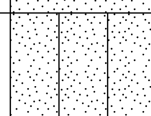
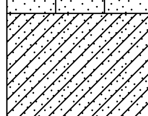
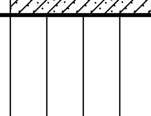
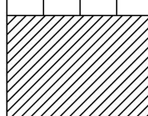
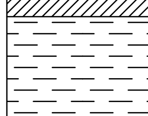
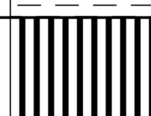
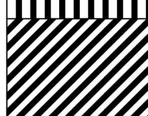
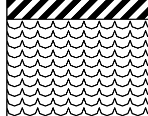
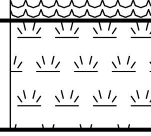
BORING LOG LEGEND

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

JOB NO.: 19G210-1	DRILLING DATE: 10/11/19	WATER DEPTH: Dry
PROJECT: Moreno Valley Trade Center	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 42 feet
LOCATION: Moreno Valley, California	LOGGED BY: Ross Kovtun	READING TAKEN: At Completion

SURFACE ELEVATION: 1747 feet 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
					ALLUVIUM: Light Gray Brown fine Sandy Silt, trace medium Sand, trace Clay, trace fine root fibers, loose-damp							
	X	8				90	5					EI = 8 @ 0 to 5 feet
					Light Gray Brown to Light Brown Silty fine to medium Sand, trace fine Gravel, trace Clay, loose to medium dense-damp							
	X	6				89	3					
5												
	X	7				91	5					
	X	10				92	5					
10												
					Light Gray Brown fine Sand, trace to little Silt, trace medium Sand, medium dense-damp							
	X	10					4					
15												
	X	13					3					
20												
					Brown Silty Clay, trace fine Sand, trace calcareous veins, very stiff to hard-moist							
	X	22	4.5+				14					
25												
	X	16	2.5				12					
30												
					Light Gray Brown fine Sandy Clay, trace Silt, trace calcareous veins, very stiff to hard, damp							
	X	30	3.0				6					

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/11/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 42 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (Continued)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					Light Gray Silty fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-damp							
	X	20					3					
40												
					Light Gray Silty fine Sand with thinly interbedded Light Brown Silty Clay lenses, trace calcareous veins, medium dense to very stiff-moist to very moist							
	X	25					15					
45												
					Brown fine Sandy Clay, little calcareous veins, hard-moist							
	X	24	4.5+				15					
50												
					Boring Terminated at 50'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-2

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/9/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 17 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1733 feet 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
					ALLUVIUM: Light Gray Brown fine to medium Sandy Silt, trace Clay, trace coarse sand, trace fine root fibers, loose-dry to damp							
	X	11				112	2					
	X	9				110	3					
					Light Gray Brown fine Sandy Silt, trace Clay, trace medium to coarse Sand, loose to medium dense-damp							
5	X	9				103	6					
	X	22				111	4					
	X	20				108	3					
10												
					Light Gray Brown to Brown Silty fine Sand, trace medium to coarse Sand, medium dense-damp							
	X	10					5					
15												
	X	11					4					
20												
	X	21					4					
25					Boring Terminated at 25'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/9/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 36 feet
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: 1738 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					ALLUVIUM: Light Gray Brown fine Sandy Silt to Silty fine Sand, trace medium to coarse Sand, trace fine root fibers, loose-damp							
	X	6					4					
					Light Brown Silty fine Sand, trace fine root fibers, loose-damp							
	X	6					6					
5												
	X	7					6					
					Light Gray Brown fine to medium Sand, trace coarse Sand, medium dense-dry							
	X	10					2					
10												
	X	10					2					
15												
					Light Gray Brown fine Sand, trace to little Silt, trace medium Sand, trace fine Gravel, medium dense-damp							
	X	12					6					
20												
	X	13					6					
25												
					Brown fine Sandy Clay, trace Silt, trace medium Sand, trace calcareous veins, very stiff-moist							
	X	20	4.5+				14					
30												
					Brown Clayey fine to medium Sand, trace Silt, little coarse Sand, trace fine Gravel, medium dense-damp							
	X	17					8					

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/9/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 36 feet
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (Continued)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					Light Gray Brown fine Sandy Clay, trace Silt, trace medium Sand, little calcareous veins and nodules, very stiff-moist							
					Light Gray Brown fine Sandy Clay, trace Silt, trace medium Sand, little calcareous veins and nodules, very stiff-moist							
	X	28	4.5+				14					
40												
					Light Gray Silty fine Sand, trace medium to coarse Sand, dense-damp							
	X	37					5					
45												
					Light Gray Brown fine Sandy Silt, trace calcareous veins, medium dense-very moist							
	X	25					13					
50												

Boring Terminated at 50'

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/10/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

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: 1741.5 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					ALLUVIUM: Light Gray fine Sandy Silt, trace medium Sand, trace fine root fibers, trace calcareous veins, loose-damp							
		9				97	5					
		11				92	5					
5		15			@5 to 6 feet, loose to medium dense, very moist	98	13					
					Light Gray fine Sandy Silt to Sitly fine Sand, trace medium to coarse Sand, trace calcareous nodules, medium dense-damp							
		16				108	3					
10		15				105	4					
15		10					7					
					Light Gray Silty fine Sand, medium dense-damp							
20		10					6					
					Brown Clayey fine Sand, trace medium Sand, medium dense-moist							
25		12					11					
					Boring Terminated at 25'							

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-5

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/9/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 17 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1729 feet 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
					ALLUVIUM: Light Gray Brown fine Sandy Silt, trace medium to coarse Sand, trace fine root fibers, loose-damp							
		13				108	4					
					Light Gray Brown Silty fine Sand, loose to medium dense-dry to damp							
		12				106	3					
5		16				105	2					
		18				101	2					
					Light Gray Brown fine Sandy Silt, little Clay, trace medium to coarse Sand, loose-damp							
		14				103	5					
10												
					Light Brown Silty fine Sand, medium dense-damp							
		12					5					
15												
		14					6					
20												
					Brown Clayey fine Sand, trace medium Sand, trace calcareous veins, dense-damp							
		31					7					
25												

Boring Terminated at 25'

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-6

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/9/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 41 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1730 feet 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
					ALLUVIUM: Light Gray Brown to Brown fine Sandy Silt, trace medium Sand, trace fine root fibers, loose-damp							
	X	8					5					
	X	8					5					
5												
	X	9					4					
					Light Gray Brown Silty fine Sand, trace medium Sand, medium dense-dry to damp							
	X	12					3					
10												
	X	14					3					
15												
					Light Brown fine Sandy Silt, little Clay, trace calcareous veins, medium dense-damp to moist							
	X	10					6					
20												
	X	11					9					
25												
					Brown Silty fine to medium Sand, trace Clay, medium dense-damp							
	X	14					5					
30												
					Brown Clayey fine Sand to fine Sandy Clay, trace calcareous veins, medium dense to very stiff to hard-moist to very moist							
	X	16	2.5				16					

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-6

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/9/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 41 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (Continued)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
	X	22	4.5+				14					
40												
	X	34					13					
45												
					Gray Brown to Brown fine Sandy Silt, little Clay, trace calcareous veins, dense-moist							
	X	30					10					
50												
					Boring Terminated at 50'							

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-7

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/11/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

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: 1721.5 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					ALLUVIUM: Gray Brown fine Sandy Silt, little Clay, trace medium Sand, trace calcareous nodules, medium dense-damp							
		15				97	7					EI = 16 @ 0-5'
					Light Gray Brown Silty fine Sand to fine Sandy Silt, trace Clay, loose to medium dense-damp							
		8				104	6					
5		16				106	4					
		12				109	4					
					Light Gray Brown Silty fine Sand, trace Clay, trace medium to coarse Sand, loose-damp							
		12				105	5					
10												
					Brown Silty Clay to Clayey Silt, little fine Sand, trace calcareous veins, stiff-very moist							
		10	2.0				15					
15												
					Light Gray fine Sandy Silt, medium dense-damp							
		13					6					
20												
					Boring Terminated at 20'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-8

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/10/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

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

SURFACE ELEVATION: 1733 feet 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
					ALLUVIUM: Light Gray Silt, little fine Sand, loose-damp							
		13				92	4					
					Light Gray Brown fine Sandy Silt, trace Clay, trace fine root fibers, loose to medium dense-moist							
		14				102	9					
5		16				91	8					
					Gray Brown Silty fine to coarse Sand, trace Clay, medium dense-damp to moist							
		19				101	8					
		17				112	3					
10												
					Light Brown fine Sandy Silt to Silty fine Sand, trace Clay, trace medium Sand, medium dense-moist							
		10					8					
15												
		10					7					
20												
					Brown fine Sandy Clay, trace medium Sand, trace calcareous veins, very stiff-moist							
		17	3.0				12					
25												
					Boring Terminated at 25'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-9

JOB NO.: 19G210-1	DRILLING DATE: 10/11/19	WATER DEPTH: Dry
PROJECT: Moreno Valley Trade Center	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 43 feet
LOCATION: Moreno Valley, California	LOGGED BY: Ross Kovtun	READING TAKEN: At Completion

SURFACE ELEVATION: 1718 feet MSL

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					ALLUVIUM: Light Gray Brown fine Sandy Silt, little Clay, trace calcareous veins, loose to medium dense-moist							
	X	10					8					
	X	4					8					
5					Light Gray Brown Silty fine Sand, trace Clay, trace medium to coarse Sand, loose to medium dense-damp							
	X	7					5					
	X	10					5					
10												
					Gray Brown fine Sandy Silt, medium dense-moist							
	X	10					10					
15												
					Gray Brown Silty fine Sand, little Clay, trace medium Sand, medium dense-moist							
	X	10					10					
20												
					Dark Brown to Brown fine Sandy Clay, trace calcareous veins and nodules, stiff to very stiff-moist to very moist							
	X	10	3.0				15					
25												
	X	14	4.5				13					
30												
					Light Gray Silty fine Sand, little medium to coarse Sand, medium dense-damp							
	X	22					5					

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-9

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/11/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 43 feet
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION (Continued)	LABORATORY RESULTS							
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					Light Gray Silty fine Sand, little medium to coarse Sand, medium dense-damp							
40	X	17					6					
					Light Brown to Brown Clayey fine Sand, trace medium Sand, trace calcareous veins, very stiff-damp to moist							
45	X	20					10					
50	X	16					8					
					Boring Terminated at 50'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-10

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/10/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 6 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1727 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					ALLUVIUM: Light Gray fine Sandy Silt to Silty fine Sand, loose-moist							
	X	4					8					
					Light Gray Brown fine Sandy Clay, trace fine Sand, medium stiff-damp							
	X	6	2.0				9					
5												
					Light Brown fine Sandy Silt, trace Clay, trace calcareous veins, loose to medium dense-moist							
	X	7					10					
	X	10					8					
10												
					Boring Terminated at 10'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-11

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/10/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 6 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1738 feet 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
					ALLUVIUM: Light Gray Brown fine Sandy Silt to Silty fine Sand, trace medium Sand, trace fine root fibers, loose-dry to damp							
	X	8					3					EI = 0 @ 0-5'
	X	7					3					
5												
	X	11			Light Brown Silty fine Sand, little medium to coarse Sand, trace fine Gravel, medium dense-dry to damp		3					
	X	12			Light Gray fine to medium Sand, little coarse Sand, trace fine Gravel, medium dense-dry to damp		3					
10												

Boring Terminated at 10'

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-12

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/10/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 5 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1746.5 feet 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
	X	7			ALLUVIUM: Light Gray Brown fine Sandy Silt to Silty fine Sand, trace coarse Sand, trace fine root fibers, loose to medium dense-damp		4					
	X	7					4					
5												
	X	8					4					
	X	10					5					
10					Boring Terminated at 10'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-13

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/11/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 6 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1741.5 feet 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
					ALLUVIUM: Light Gray Brown fine Sandy Silt, little Clay, trace medium Sand, trace calcareous veins, loose-damp to moist							
	X	10				95	5					
	X	9				91	11					
5					Light Brown fine Sandy Silt to Silty fine Sand, trace medium Sand, loose-damp							
	X	11				101	6					
	X	12				107	4					
					Light Gray Brown Silty fine Sand, trace Clay, trace medium Sand, loose-damp							
	X	13				106	4					
					Light Gray Brown fine to medium Sand, little Silt, trace coarse Sand, loose-damp							
10												

Boring Terminated at 10'

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-14

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/9/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

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

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: 1726.5 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					ALLUVIUM: Gray Brown Silty fine to medium Sand, trace fine Gravel, very loose-damp							
	X	3					4					
					Gray Brown fine Sandy Silt to Silty fine Sand, trace Clay, trace medium Sand, trace fine root fibers, trace calcareous veins, loose to medium dense-moist							
	X	6					11					
5												
	X	7					11					
	X	10					8					
10												
					Light Gray Brown fine Sand, trace Silt, trace medium to coarse Sand, medium dense-damp							
	X	10					3					
15												
					Light Gray Brown fine to medium Sand, medium dense-dry							
	X	15					2					
20												
					Boring Terminated at 20'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-15

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/10/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

WATER DEPTH: Dry
CAVE DEPTH: 12 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1715.5 feet 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
					ALLUVIUM: Light Gray Brown fine Sandy Silt, trace Clay, trace medium Sand, trace calcareous veins and nodules, loose-damp							
	X	5					6					
	X	7					7					
5												
					Light Gray Brown Silty fine Sand, trace medium to coarse Sand, loose-dry to damp							
	X	6					3					
					Light Brown fine to medium Sand, trace to little Silt, little fine Gravel, medium dense-damp							
	X	10					3					
10												
					Light Gray Silty fine Sand, trace medium to coarse Sand, medium dense-damp							
	X	11					4					
15												
					Light Gray Brown fine Sandy Silt, little Clay, trace calcareous nodules, medium stiff-moist							
	X	13					11					
20												
					Boring Terminated at 20'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-16

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/11/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

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: 1718 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					ALLUVIUM: Gray Brown fine Sandy Silt to Silty fine Sand, trace medium Sand, trace fine root fibers, loose-damp							
	X	5					5					
	X	8					4					
5												
	X	6					5					
					Light Gray Brown fine to medium Sand, trace coarse Sand, trace fine Gravel, trace fine root fibers, medium dense-damp							
	X	11					3					
10												
					Gray Brown fine Sandy Silt, trace medium to coarse Sand, trace calcareous veins and nodules, medium dense-dry to damp							
	X	10					3					
15												
	X	17					8					
20												
					Boring Terminated at 20'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-17

JOB NO.: 19G210-1
PROJECT: Moreno Valley Trade Center
LOCATION: Moreno Valley, California

DRILLING DATE: 10/11/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ross Kovtun

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

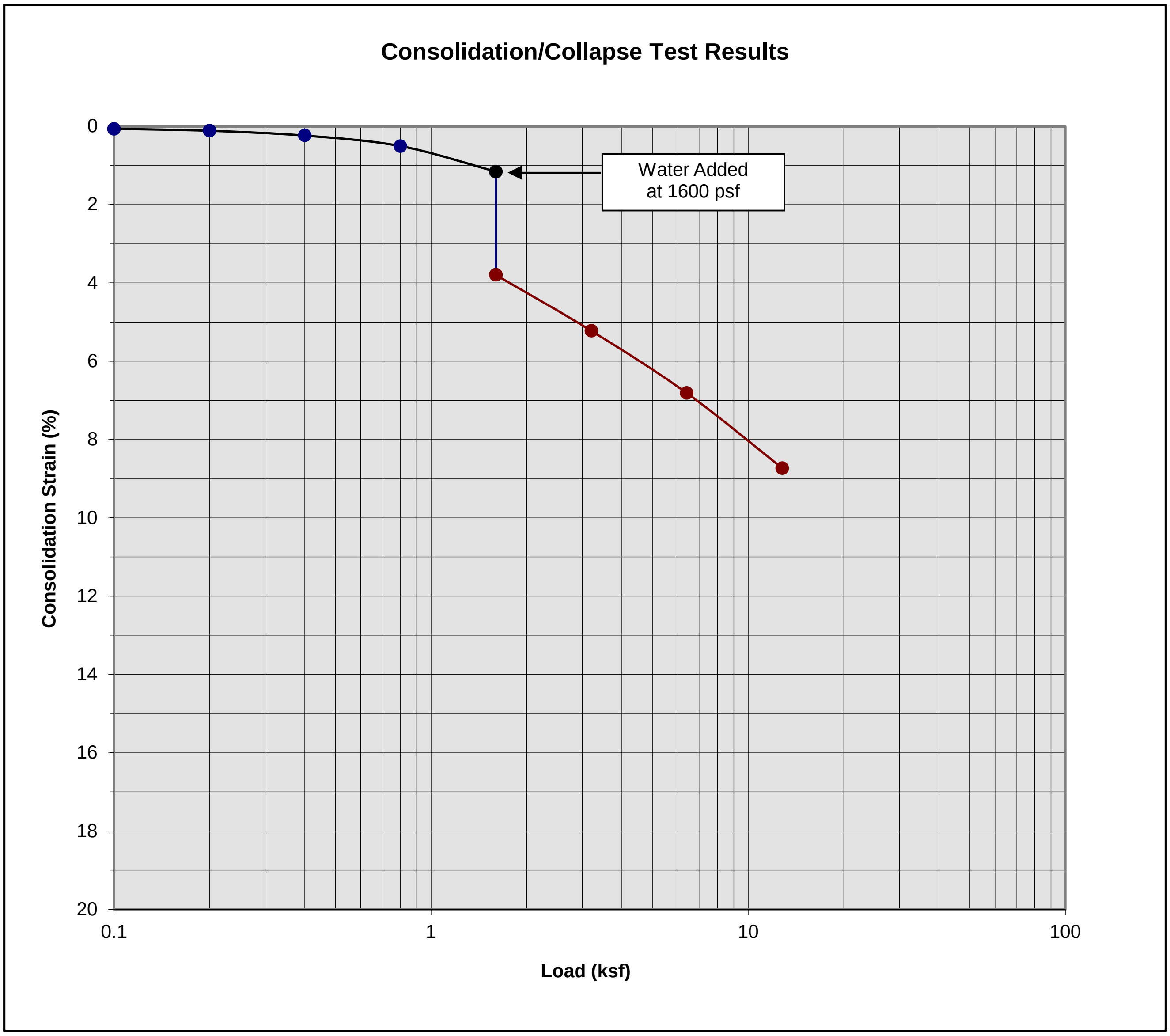
SURFACE ELEVATION: 1709 feet MSL

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
	X	10			ALLUVIUM: Dark Brown fine Sandy Silt, trace Clay, trace medium Sand, trace fine root fibers, trace calcareous veins, stiff-damp		4					
5	X	6			Brown Silty fine Sand, trace medium Sand, trace fine root fibers, loose-damp		6					
	X	6			Light Gray Brown fine Sandy Silt to Silty fine Sand, trace Clay, trace medium Sand, loose to medium dense-dry to damp		6					
10	X	10					2					
					Light Gray fine to medium Sand, little coarse Sand, medium dense-dry							
	X	10					2					
15		10			Gray Brown fine Sandy Silt, trace Clay, trace calcareous veins and nodules, medium dense-moist to very moist		11					
	X	10			Light Gray Brown Silty fine Sand, medium dense-damp		6					
20					Boring Terminated at 20'							

TBL 19G210.GPJ SOCALGEO.GDT 12/2/20

TEST BORING LOG

APPENDIX C



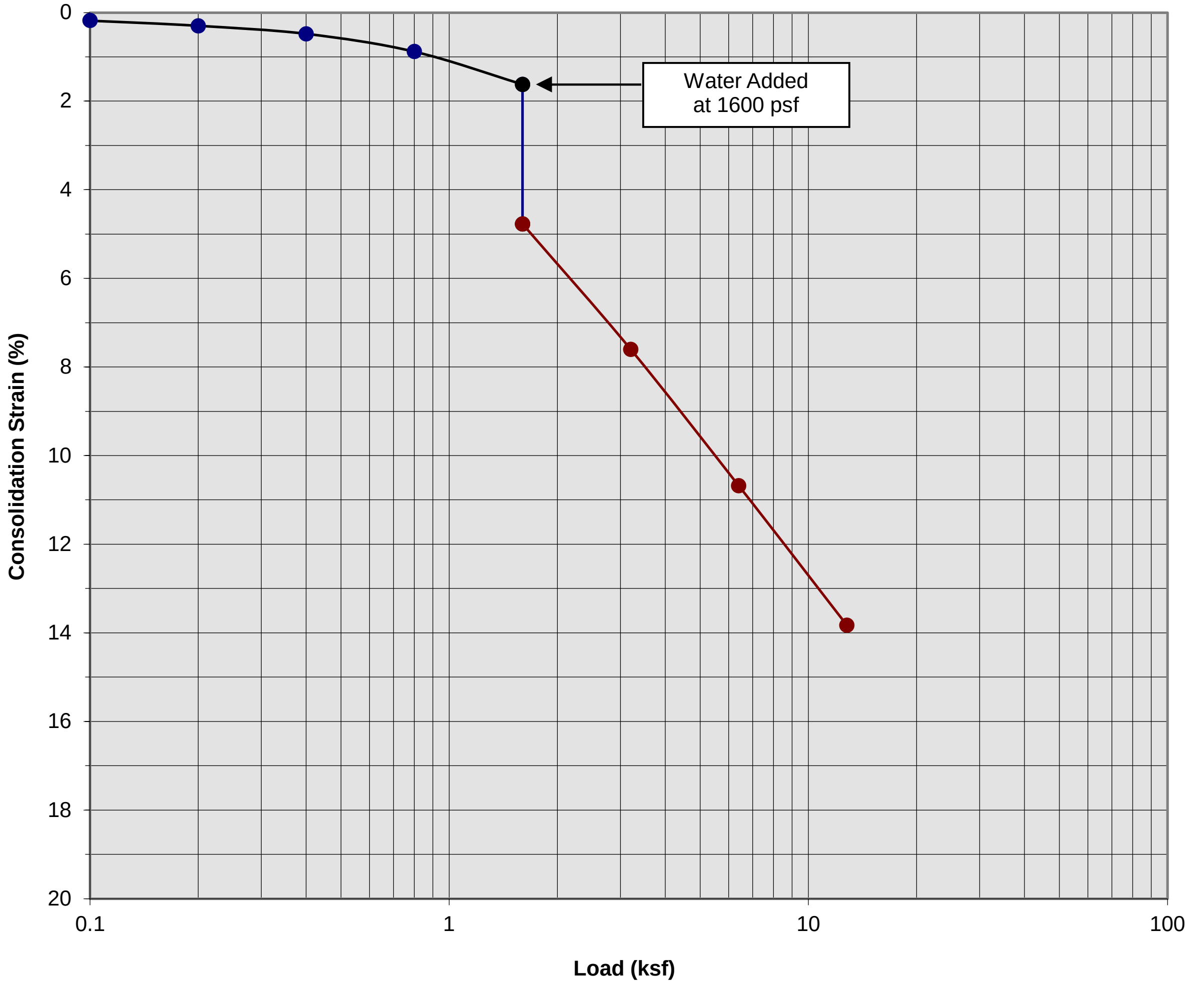
Classification: Light Gray Brown fine to medium Sandy Silt

Boring Number:	B-2	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	17
Depth (ft)	3 to 4	Initial Dry Density (pcf)	109.7
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	120.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.64

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C- 1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

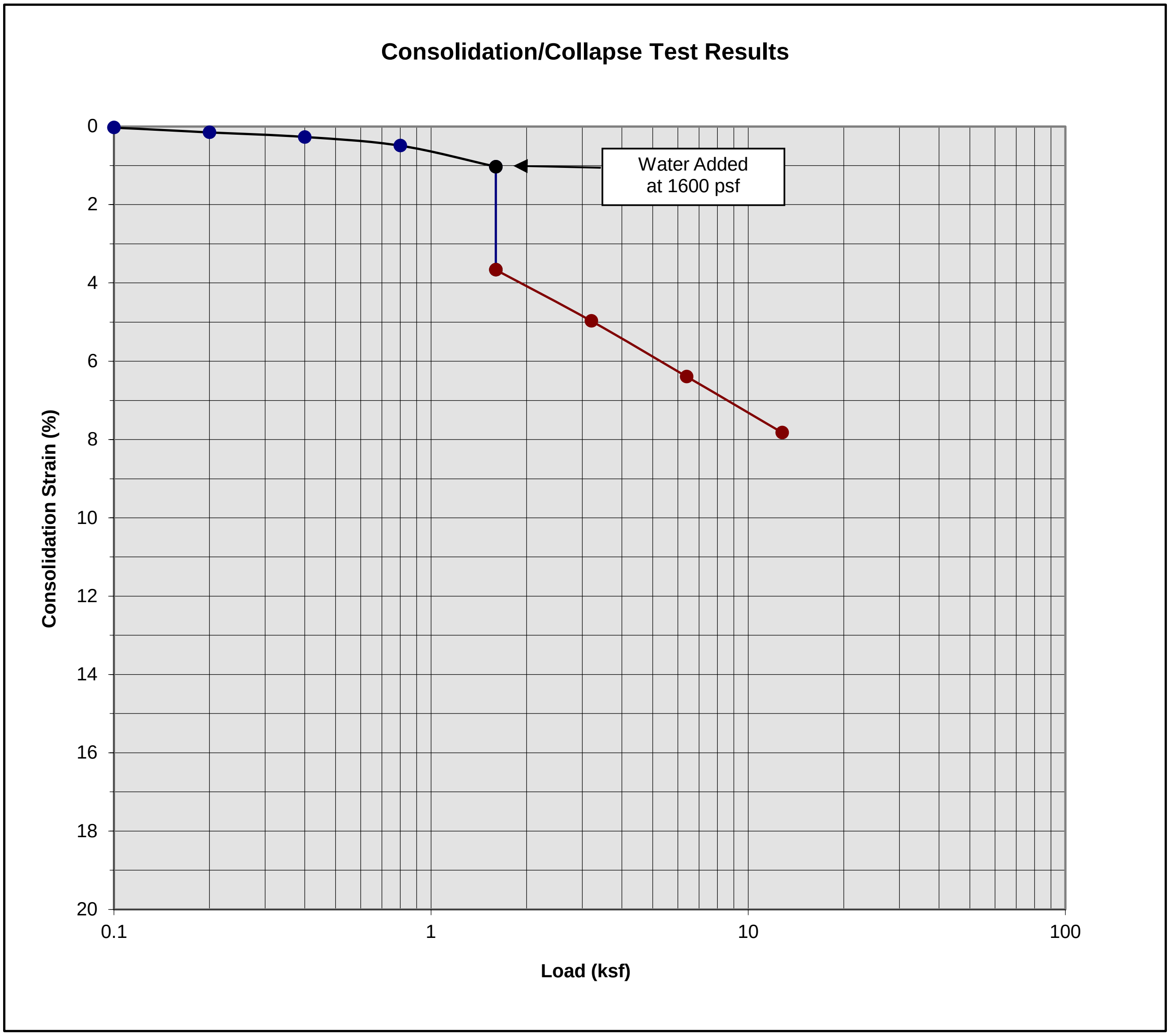


Classification: Light Gray Silt, trace Clay, trace fine to medium Sand

Boring Number:	B-2	Initial Moisture Content (%)	6
Sample Number:	---	Final Moisture Content (%)	21
Depth (ft)	5 to 6	Initial Dry Density (pcf)	103.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	120.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	3.15

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C- 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



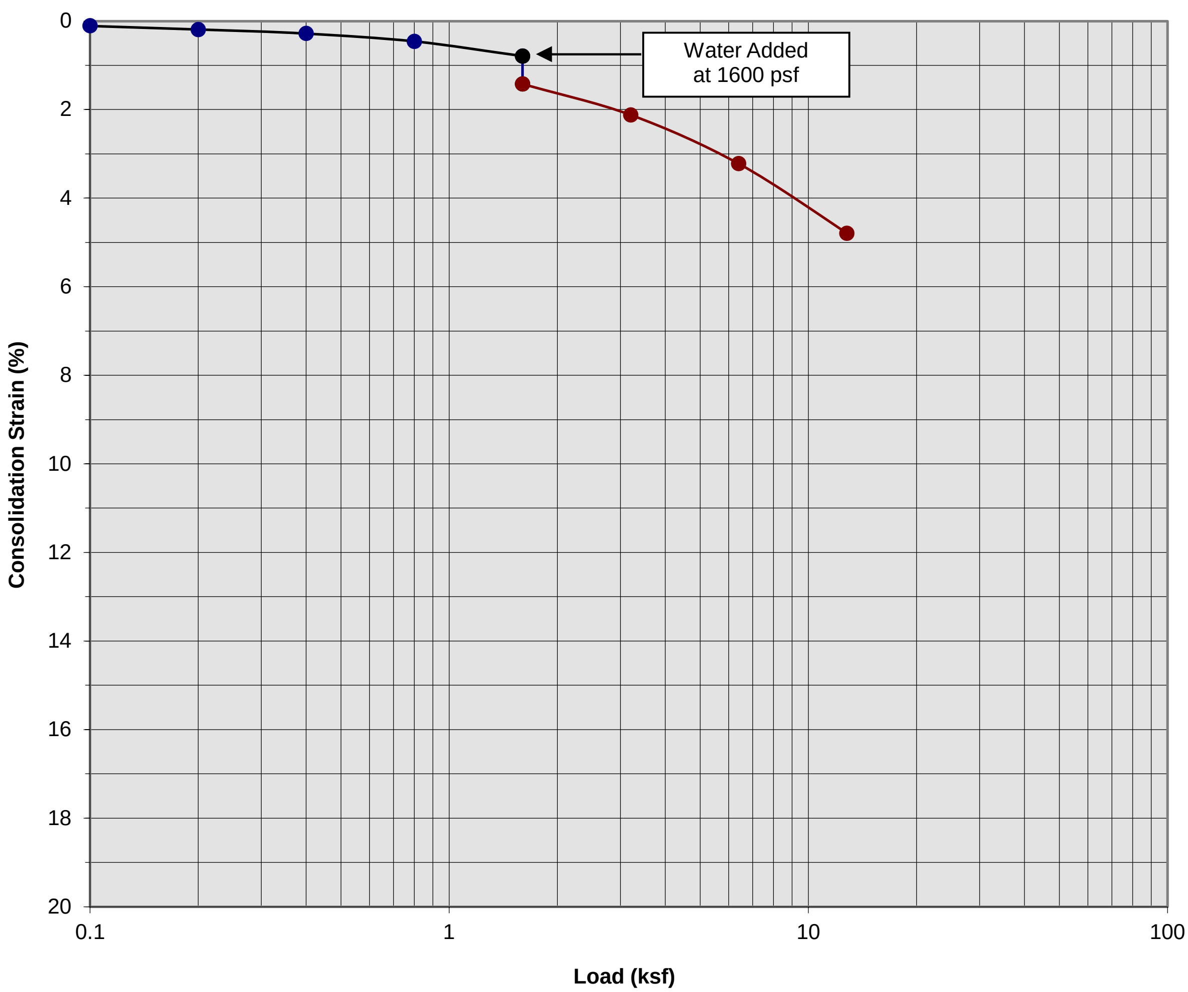
Classification: Light Gray fine Sandy Silt, trace Clay, trace fine to medium Sand

Boring Number:	B-2	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	7 to 8	Initial Dry Density (pcf)	110.9
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	120.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.63

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C- 3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



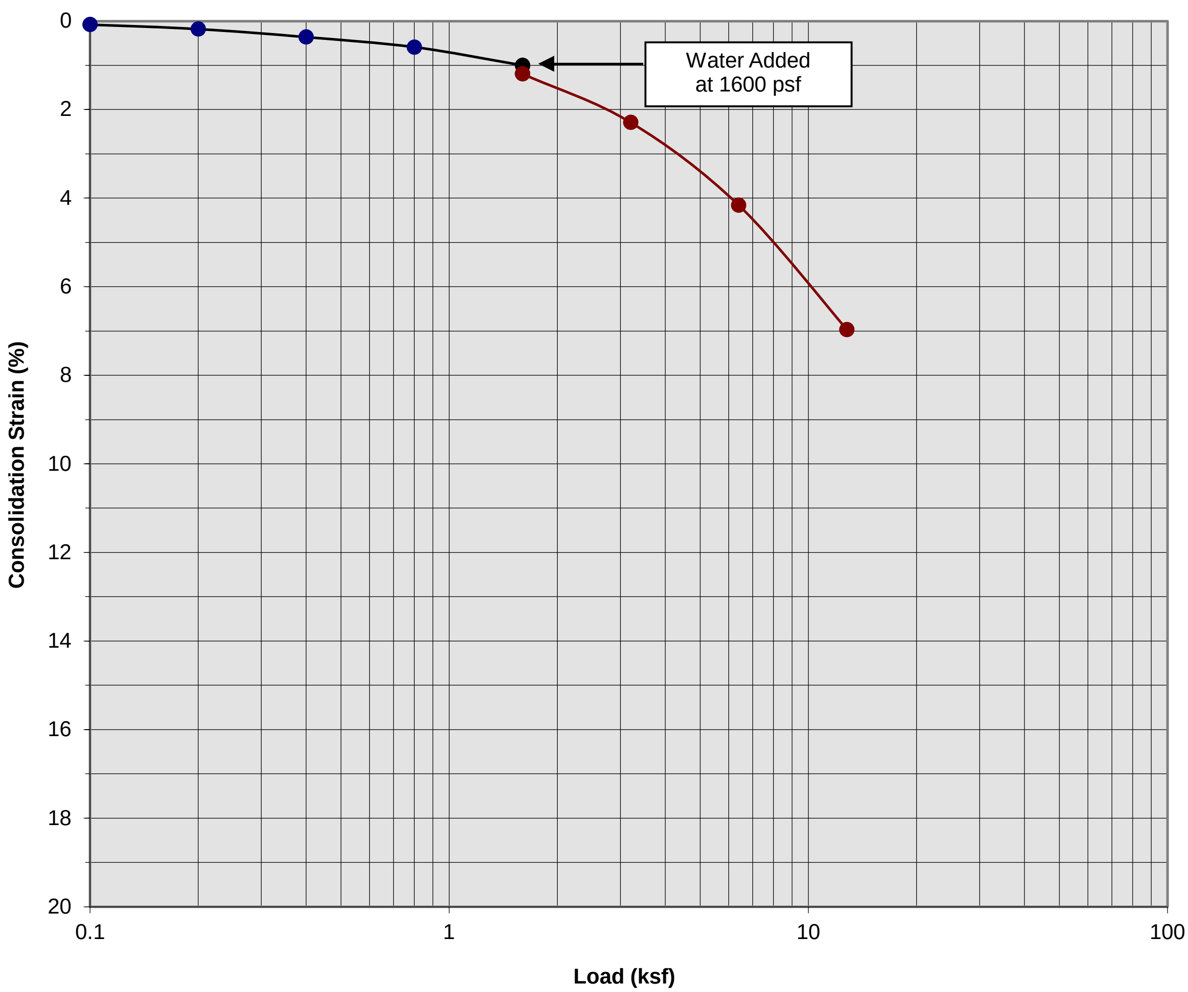
Classification: Light Gray fine Sandy Silt, trace Clay, trace fine to medium Sand

Boring Number:	B-2	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	9 to 10	Initial Dry Density (pcf)	108.3
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	113.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.63

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C- 4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



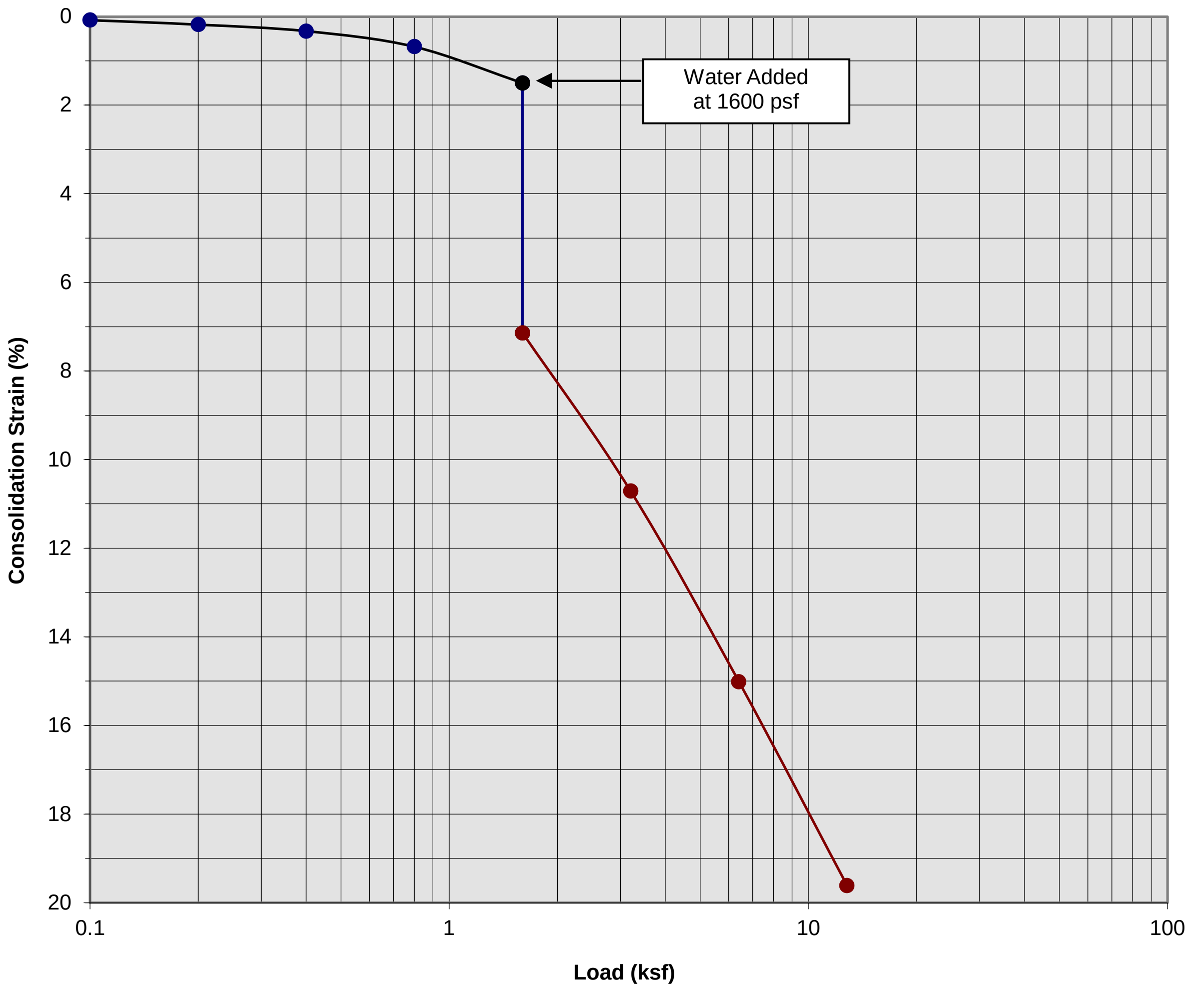
Classification: Light Gray Brown fine Sandy Silt, trace Clay

Boring Number:	B-8	Initial Moisture Content (%)	9
Sample Number:	---	Final Moisture Content (%)	17
Depth (ft)	3 to 4	Initial Dry Density (pcf)	102.7
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	110.7
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.19

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C- 5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Light Gray Brown fine Sandy Silt, trace Clay

Boring Number:	B-8	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	21
Depth (ft)	5 to 6	Initial Dry Density (pcf)	91.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	114.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	5.64

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C- 6

SOUTHERN CALIFORNIA GEOTECHNICAL
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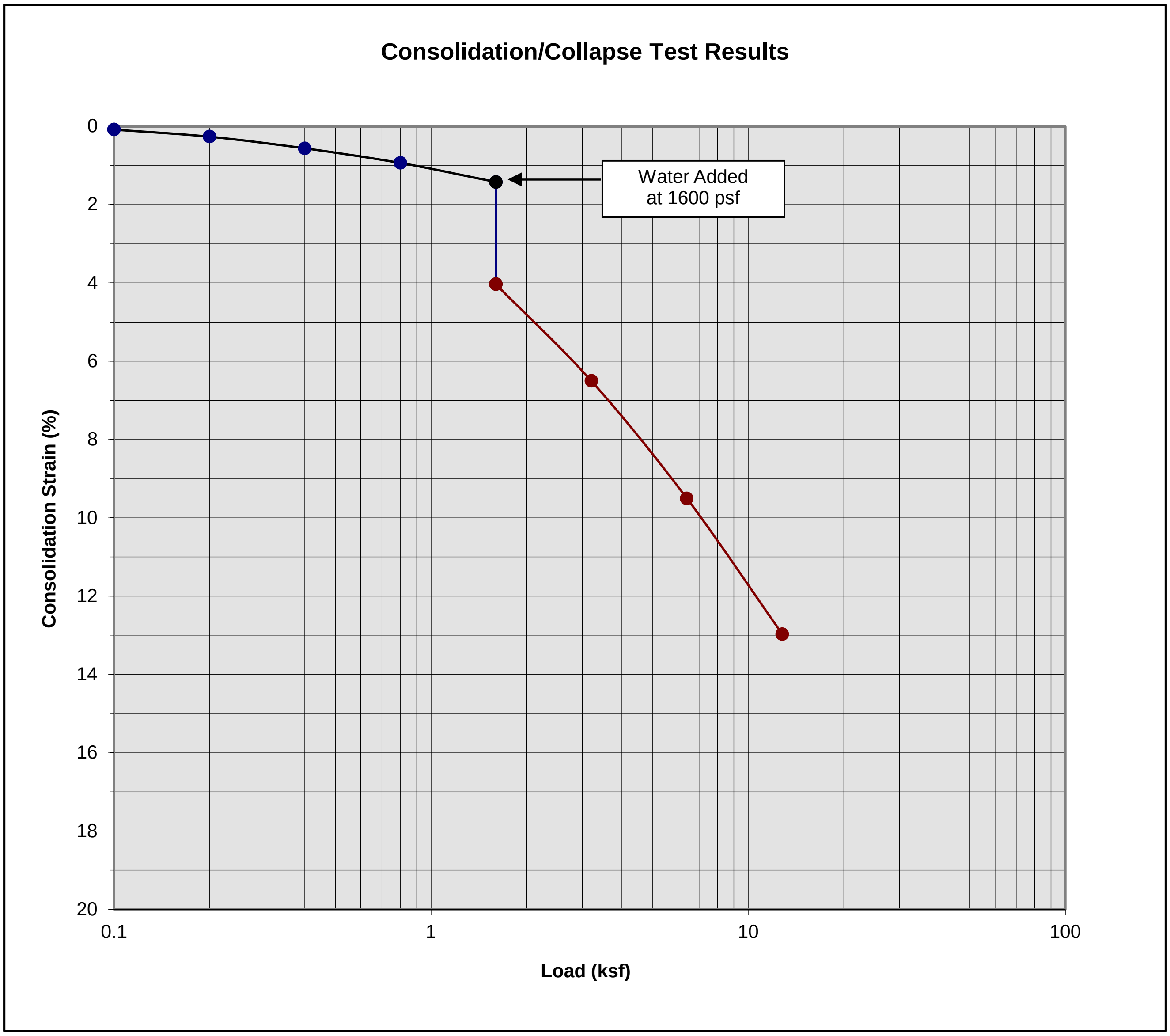
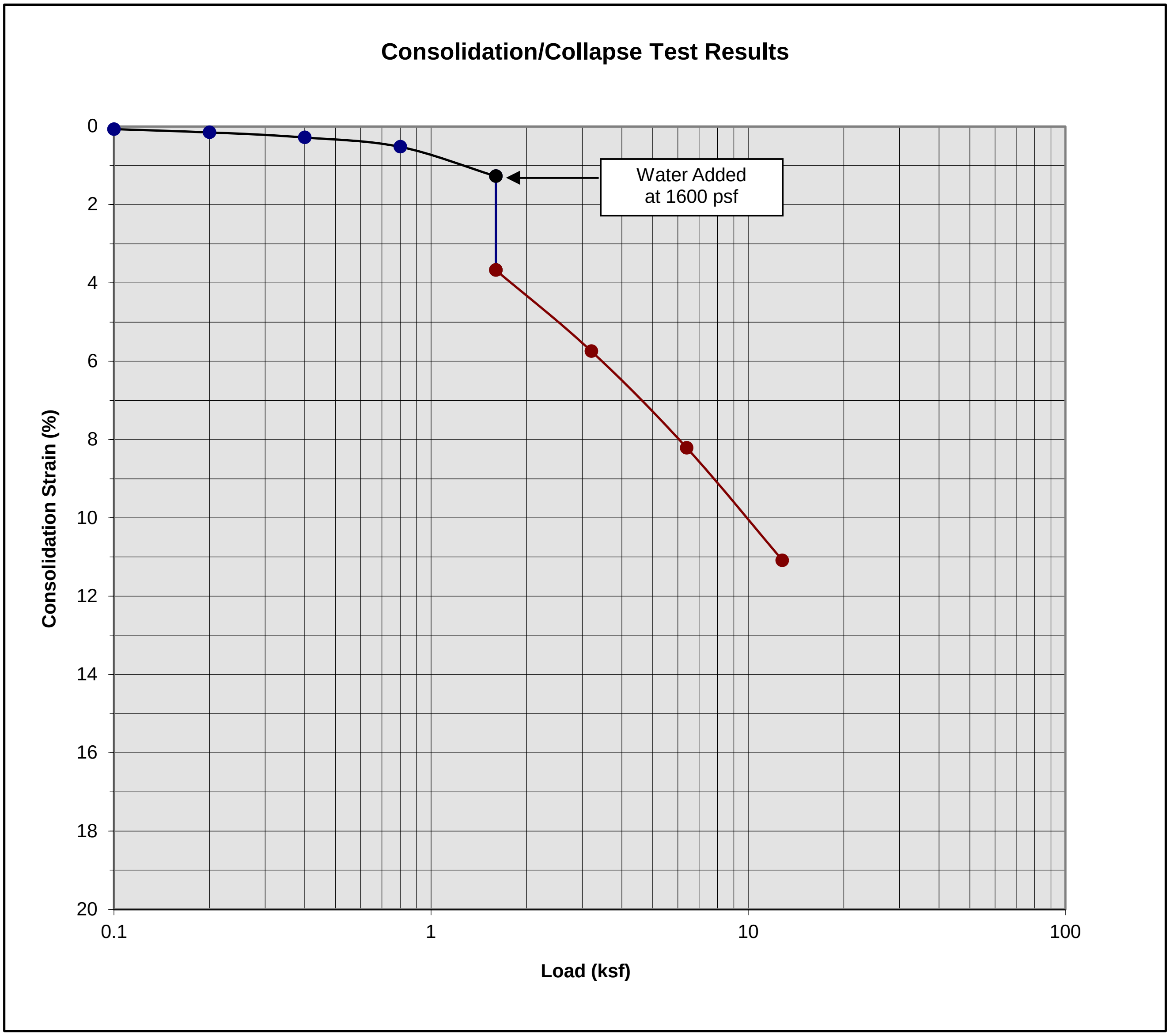


Classification: Gray Brown Silty fine to medium Sand, trace Clay

Boring Number:	B-8	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	17
Depth (ft)	7 to 8	Initial Dry Density (pcf)	101.3
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	116.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.61

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C- 7

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

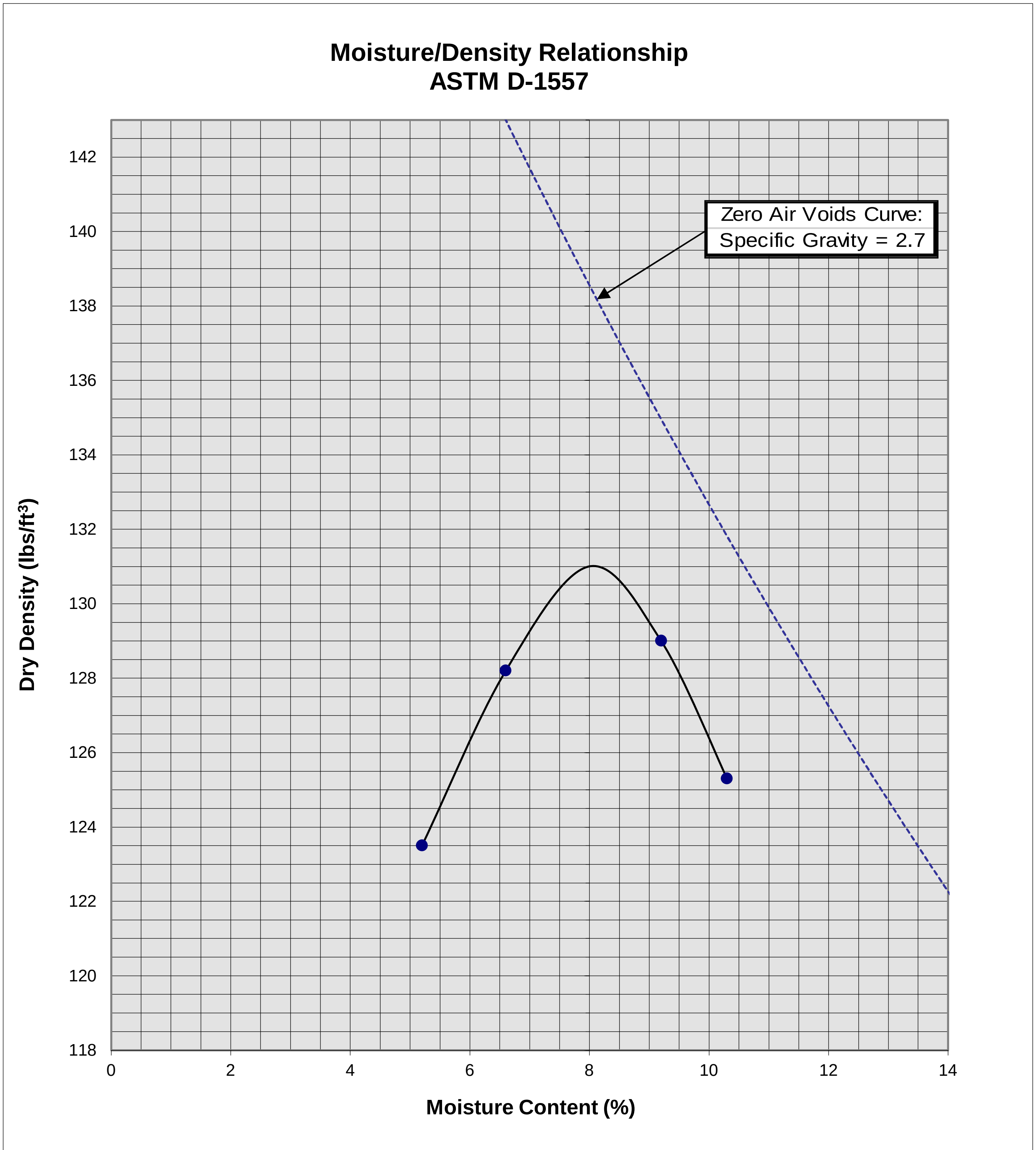


Classification: Gray Brown Silty fine to medium Sand, trace Clay

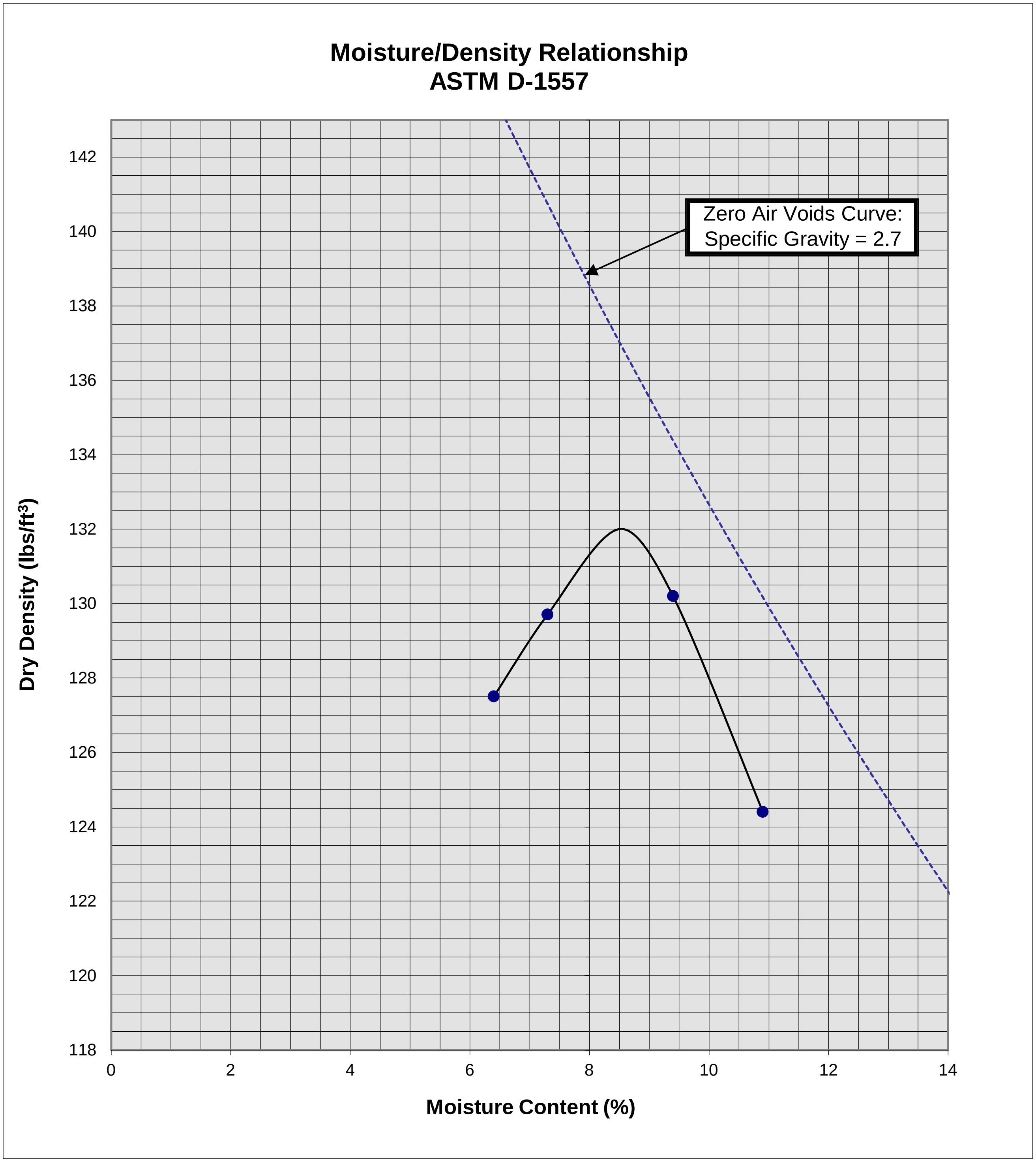
Boring Number:	B-8	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	9 to 10	Initial Dry Density (pcf)	112.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	126.3
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.40

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C- 8

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number		B-7 @ 0 to 5'
Optimum Moisture (%)		8
Maximum Dry Density (pcf)		131
Soil Classification	Light Brown fine Sandy Silt, trace medium to coarse Sand, trace Clay	



Soil ID Number	B-11 @ 0 to 5'
Optimum Moisture (%)	8.5
Maximum Dry Density (pcf)	132
Soil Classification	Gray Brown Silty fine Sand to fine Sandy Silt, trace medium Sand

Proposed Moreno Valley Trade Center
Moreno Valley, California
Project No. 19G210-1
PLATE C-10

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.

<u>Compacted Fills</u>

- 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.

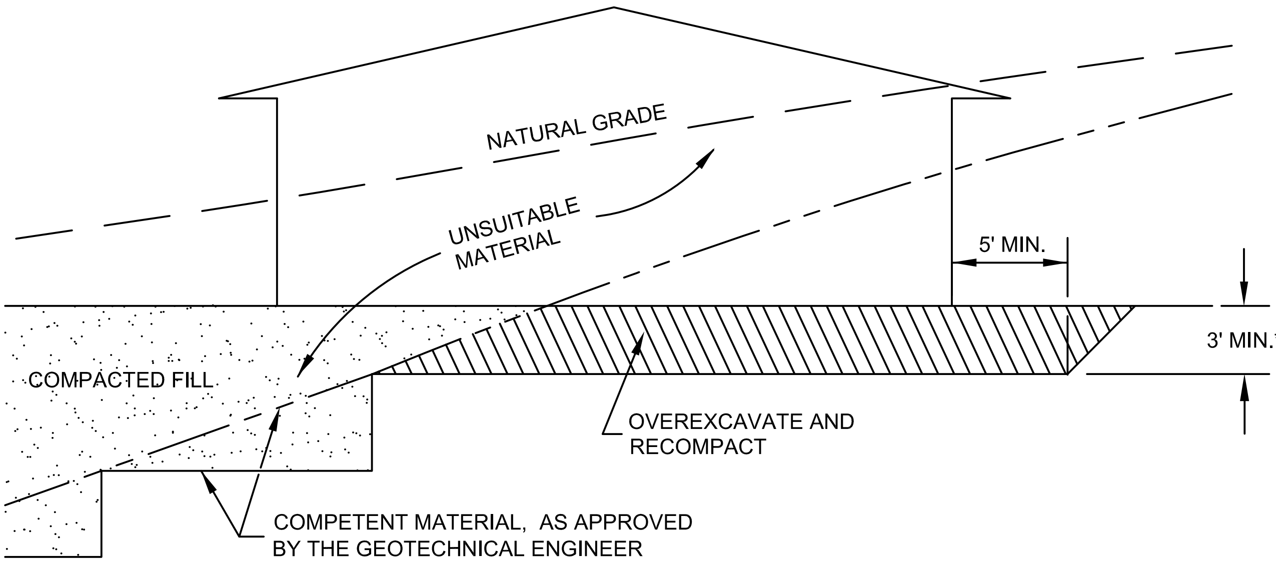
Subdrains

- 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.

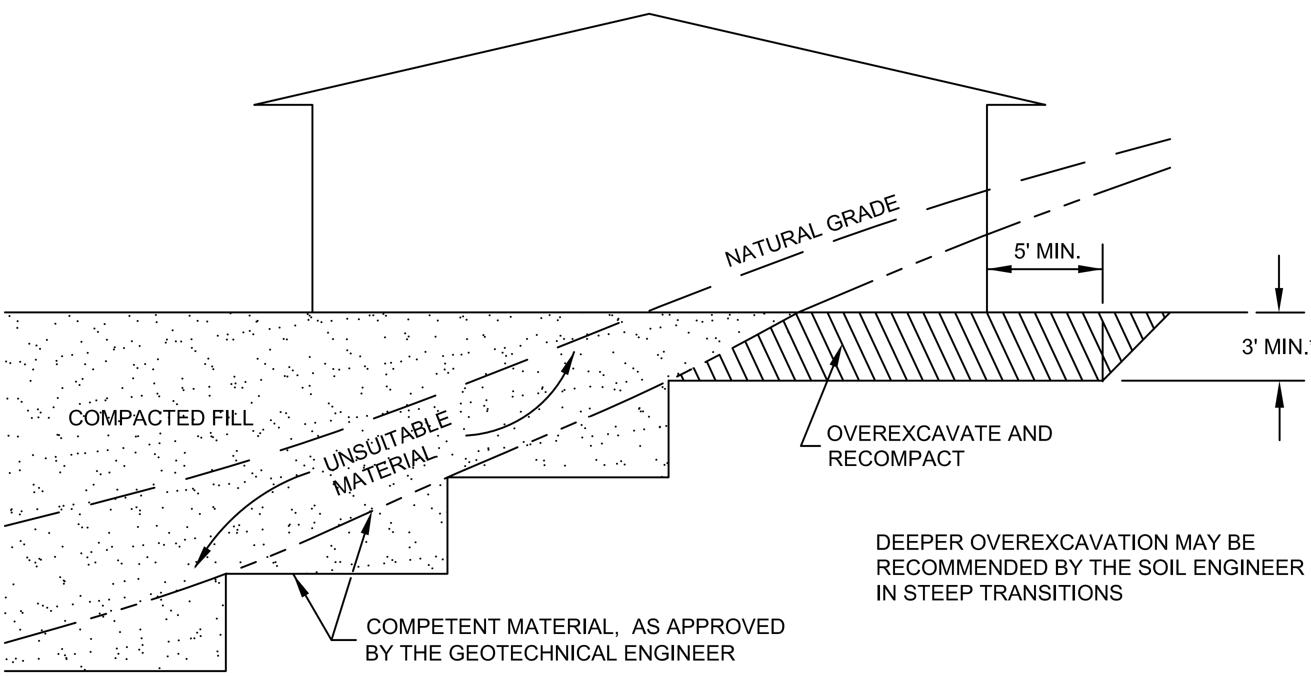
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- 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)



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

TRANSITION LOT DETAIL

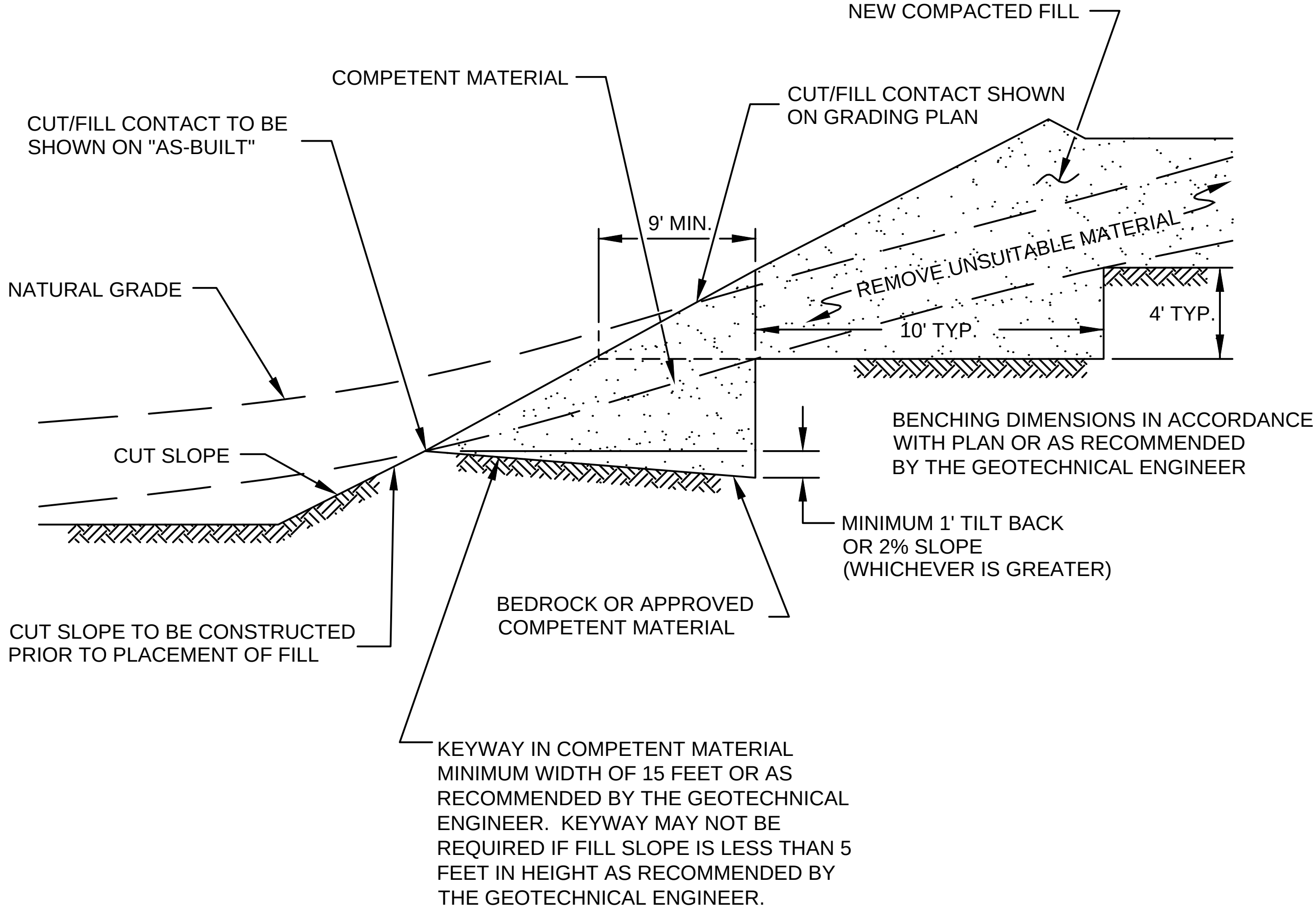
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

GRADING GUIDE SPECIFICATIONS

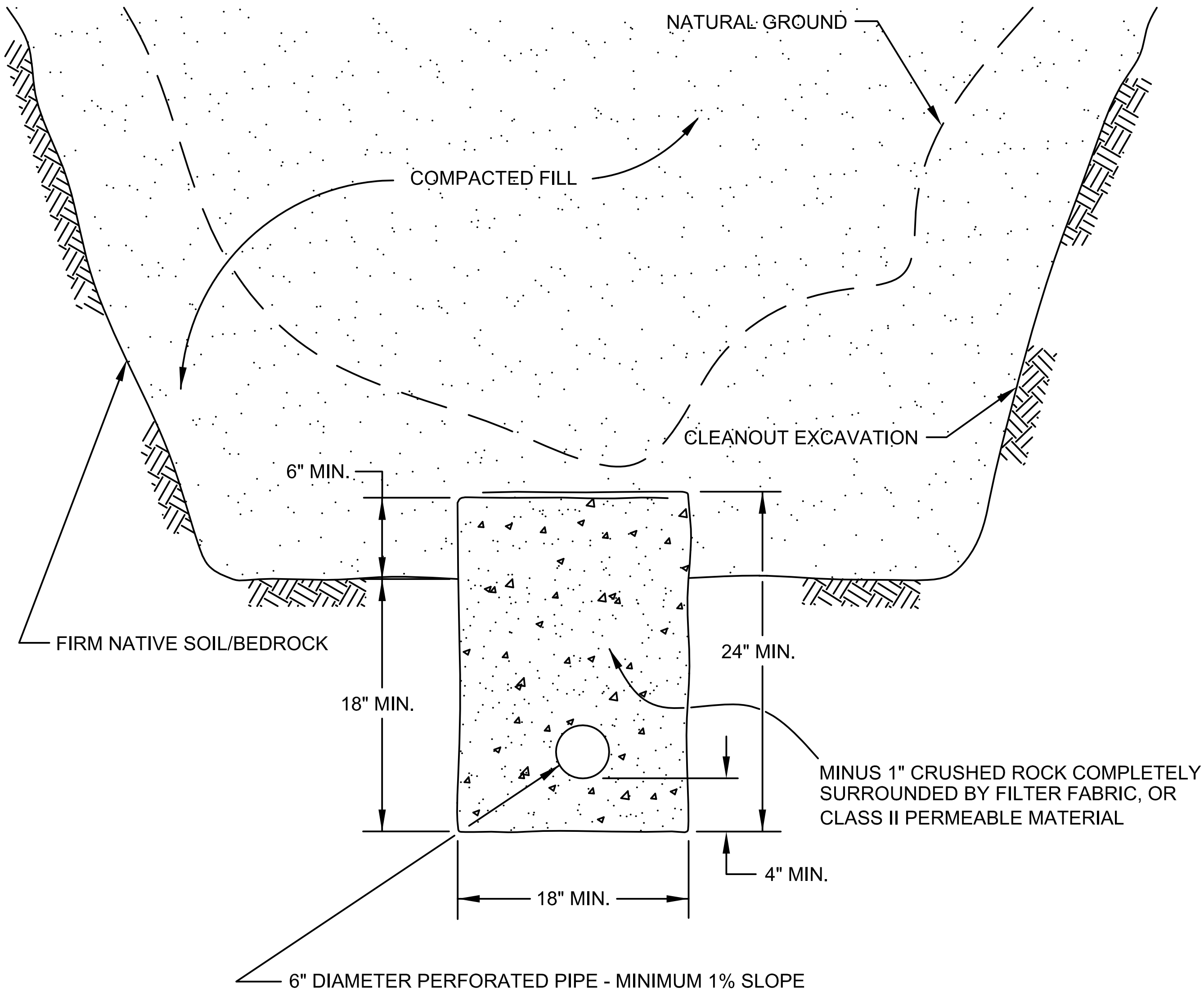
NOT TO SCALE

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

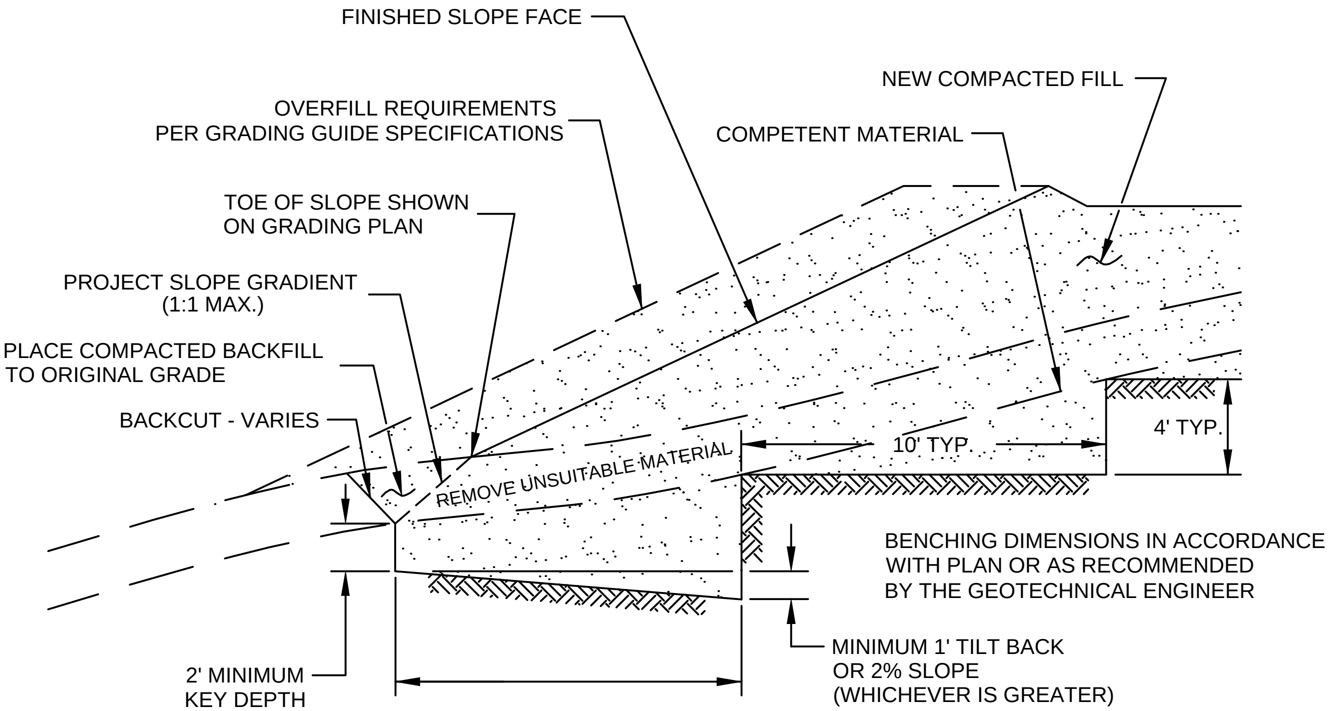
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



KEYWAY IN COMPETENT MATERIAL. MINIMUM WIDTH OF 15 FEET OR AS RECOMMENDED BY THE GEOTECHNIAL ENGINEER. KEYWAY MAY NOT BE REQUIRED IF FILL SLOPE IS LESS THAN 5' IN HEIGHT AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.

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

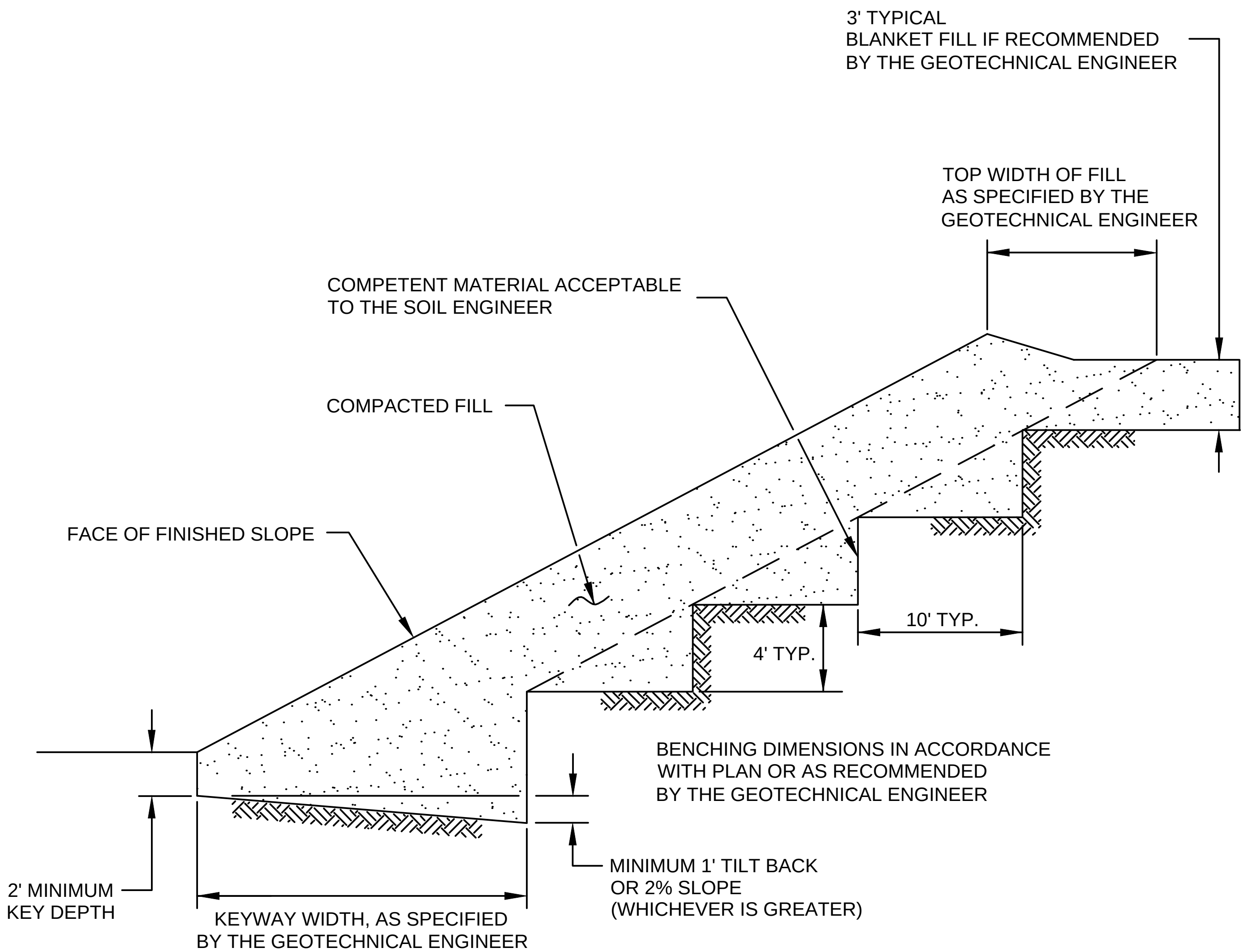
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

GRADING GUIDE SPECIFICATIONS

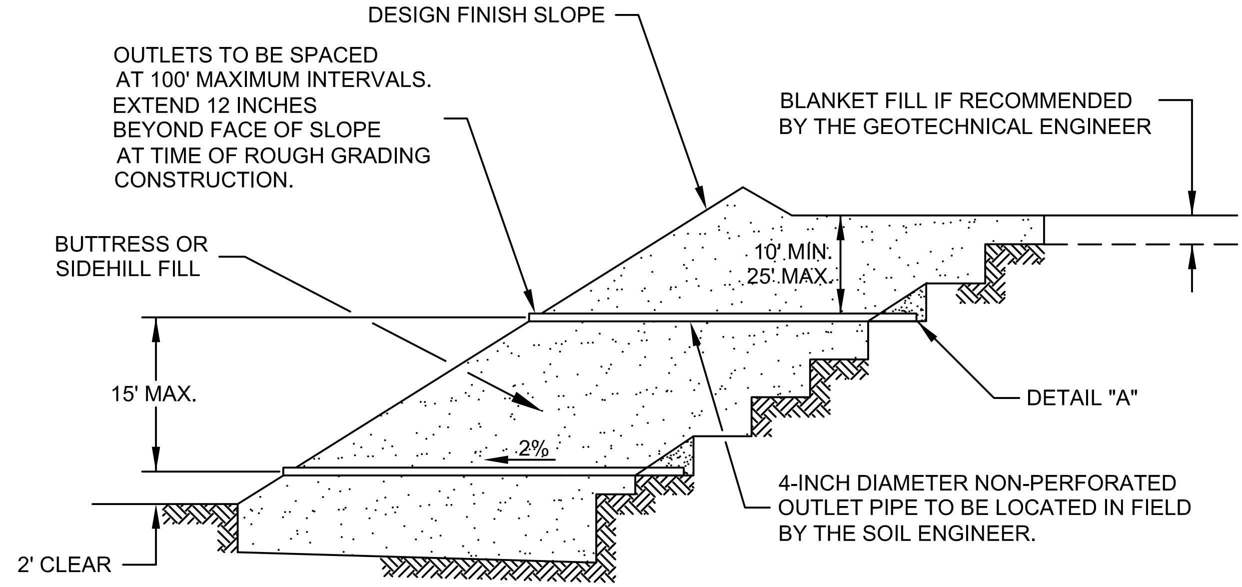
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



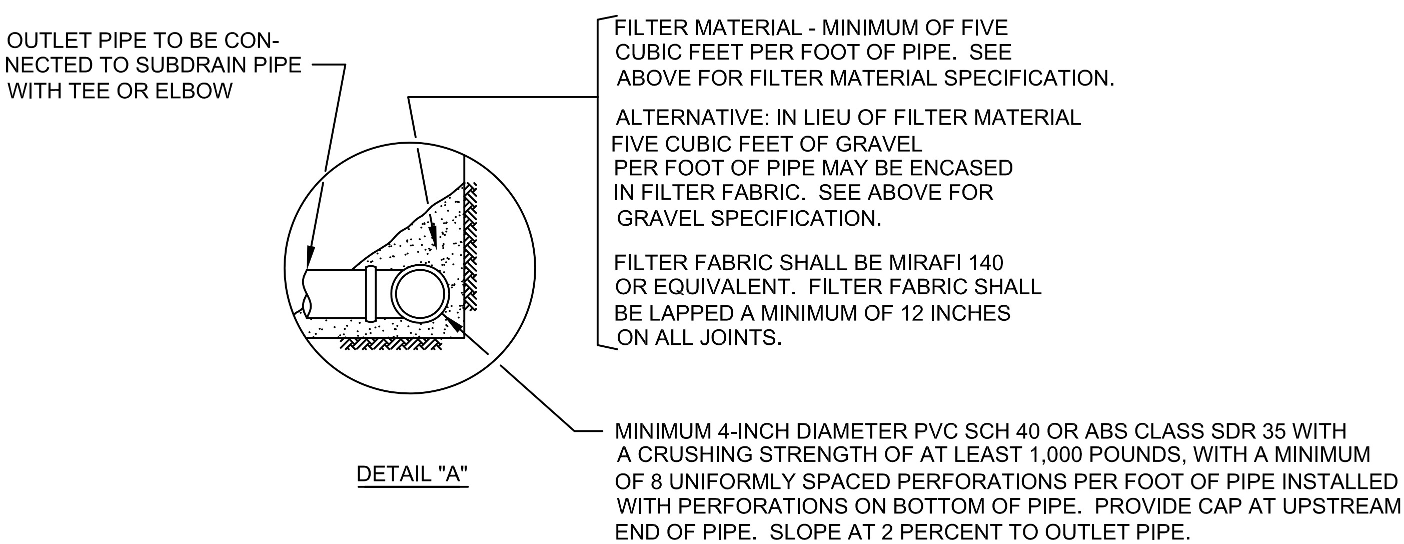
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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



DETAIL "A"

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

SLOPE FILL SUBDRAINS

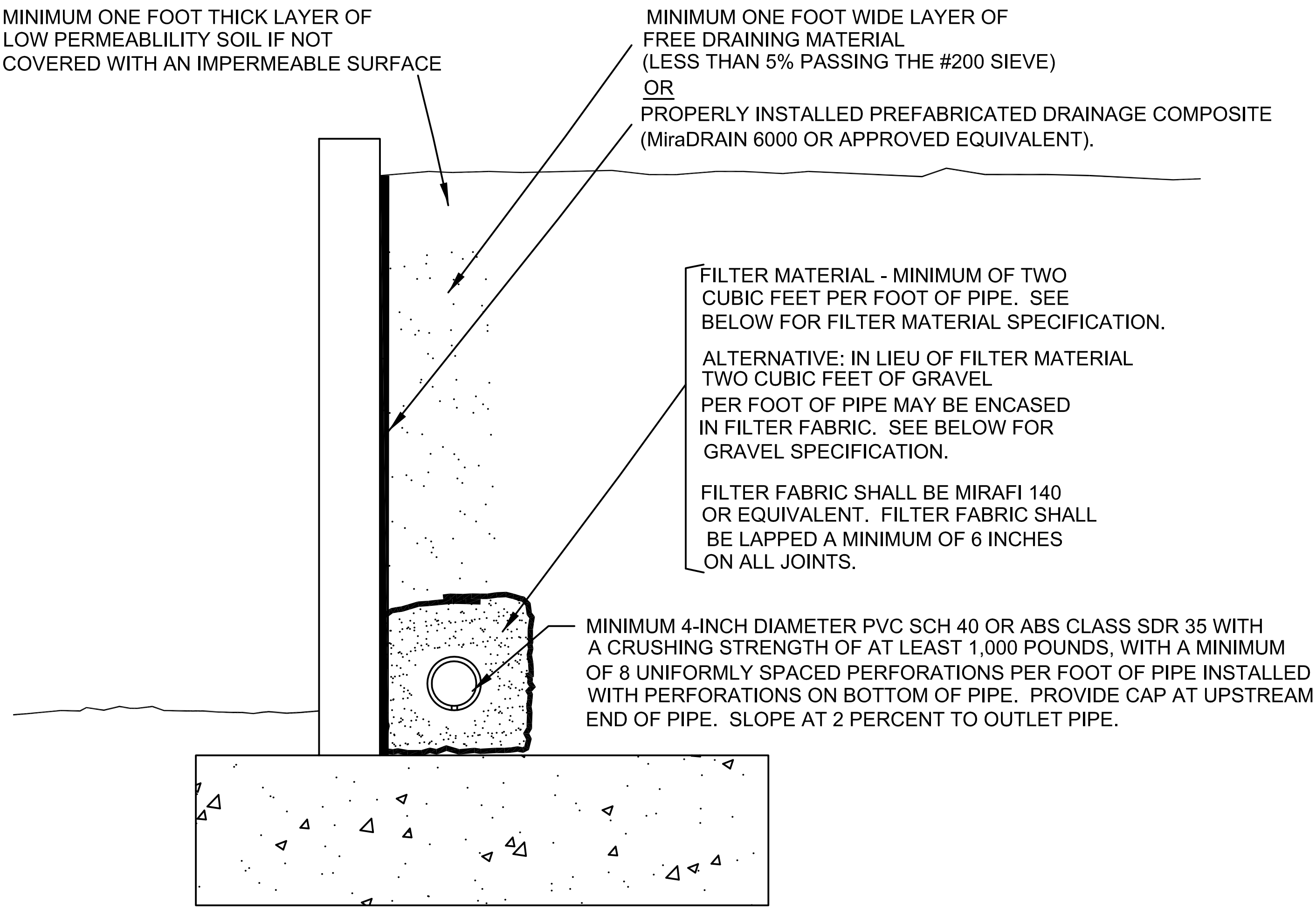
GRADING GUIDE SPECIFICATIONS

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

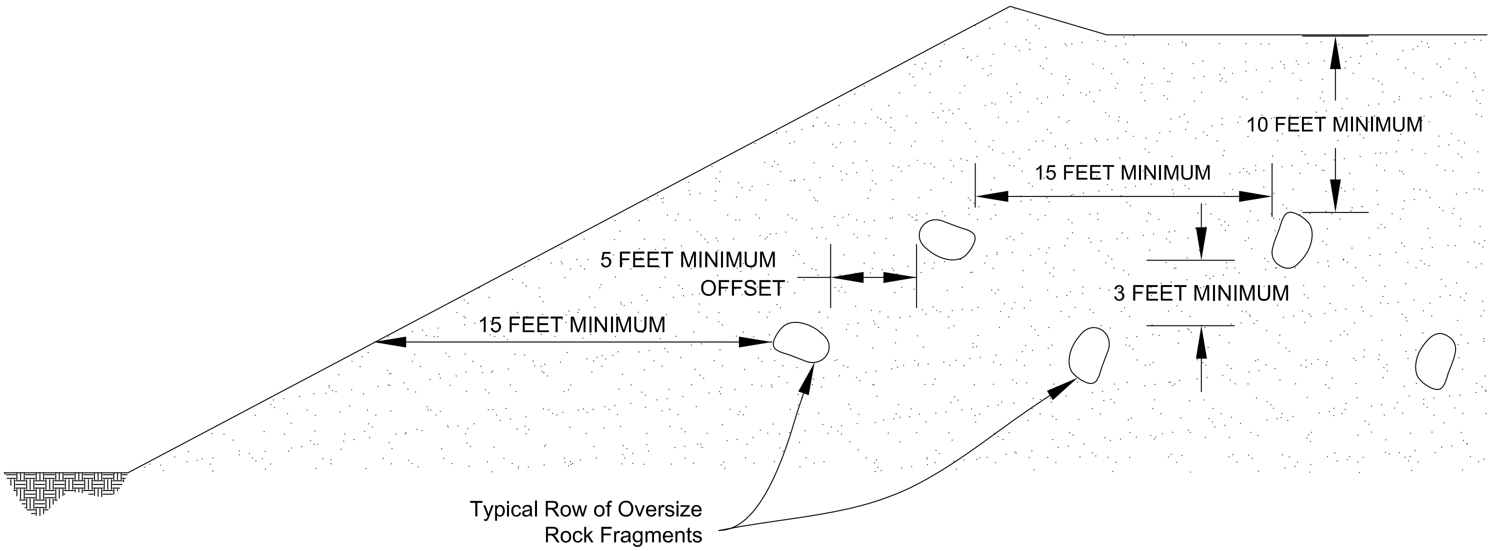
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

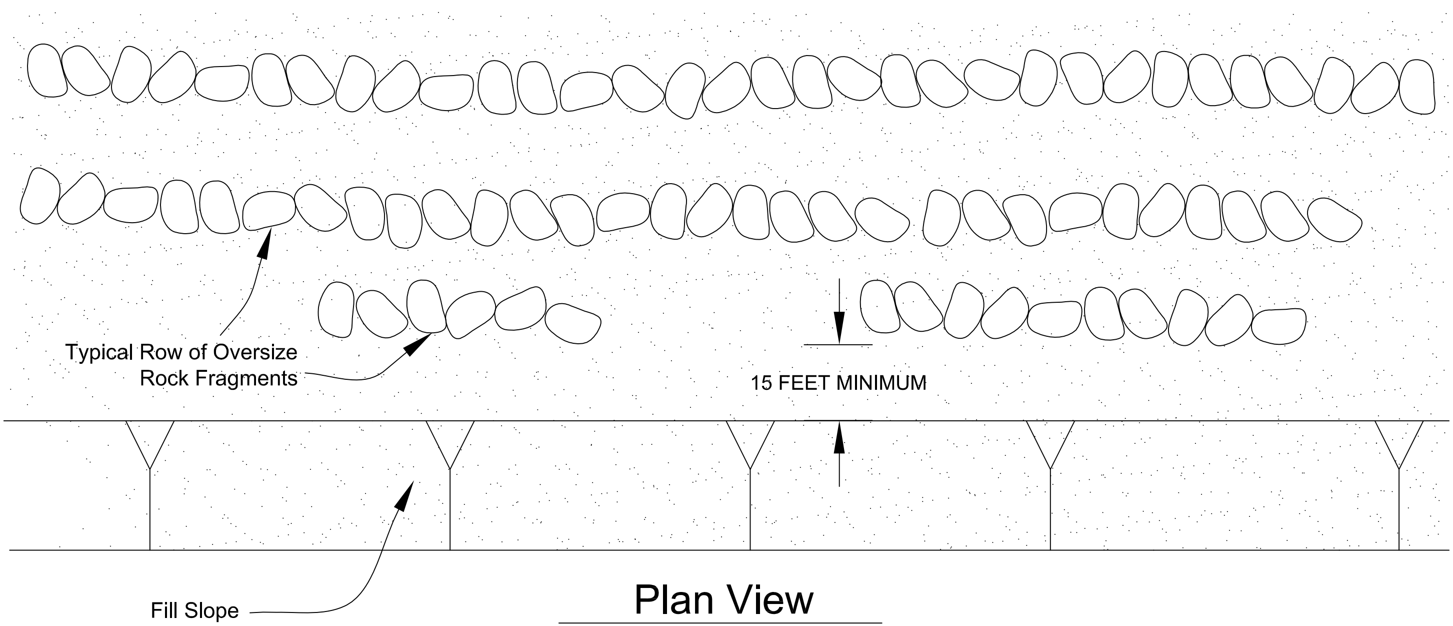
DRAWN: JAS
CHKD: GKM

PLATE D-7

SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

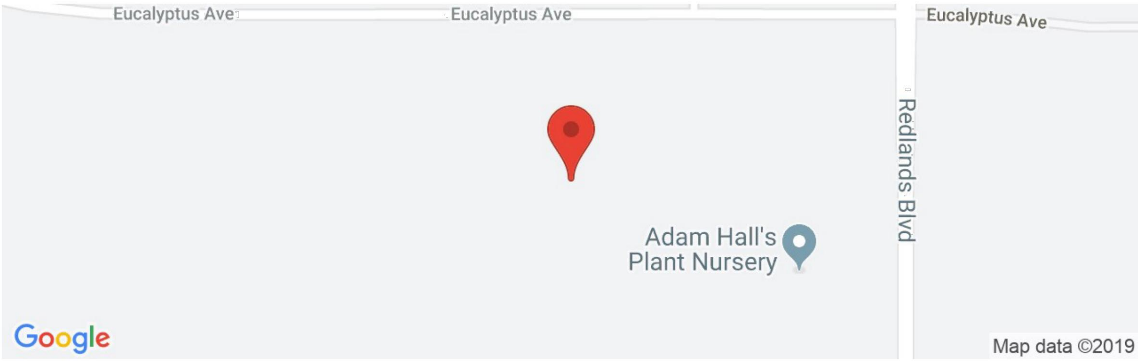
DRAWN: PM
CHKD: GKM

PLATE D-8

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX E

Latitude, Longitude: 33.93388569, -117.16079320

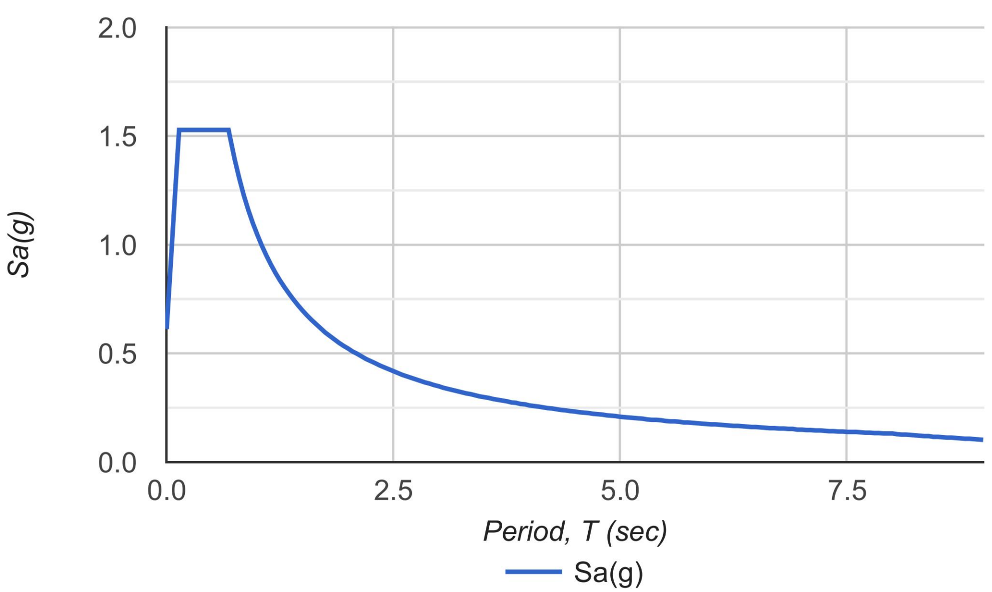


Date	10/17/2019, 2:36:40 PM
Design Code Reference Document	ASCE7-10
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.291	MCE_R ground motion. (for 0.2 second period)
S_1	1.046	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.291	Site-modified spectral acceleration value
S_{M1}	1.568	Site-modified spectral acceleration value
S_{DS}	1.528	Numeric seismic design value at 0.2 second SA
S_{D1}	1.046	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	E	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.882	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.882	Site modified peak ground acceleration

Design Response Spectrum



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

SEISMIC DESIGN PARAMETERS - 2016 CBC
PROPOSED MORENO VALLEY TRADE CENTER
MORENO VALLEY, CALIFORNIA
DRAWN: JLL CHKD: RGT
SCG PROJECT 19G210-1R
PLATE E-1A

SOUTHERN CALIFORNIA GEOTECHNICAL

Latitude, Longitude: 33.93388569, -117.16079320

Date	10/17/2019, 2:37:21 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.195	MCE_R ground motion. (for 0.2 second period)
S_1	0.886	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.195	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.463	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.958	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	1.054	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.195	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.433	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.273	Factored deterministic acceleration value. (0.2 second)
S1RT	0.886	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	1.004	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.908	Factored deterministic acceleration value. (1.0 second)
PGAd	0.958	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.902	Mapped value of the risk coefficient at short periods
C_{R1}	0.883	Mapped value of the risk coefficient at a period of 1 s

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

SEISMIC DESIGN PARAMETERS - 2019 CBC

PROPOSED MORENO VALLEY TRADE CENTER

MORENO VALLEY, CALIFORNIA

DRAWN: JLL
CHKD: RGT

SCG PROJECT
19G210-1R

PLATE E-1B

SOUTHERN CALIFORNIA GEOTECHNICAL