APPENDIX G4: UPDATED GEOTECHNICAL INVESTIGATION SITE 2

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UPDATED GEOTECHNICAL INVESTIGATION PROPOSED COMMERCIAL/INDUSTRIAL BUILDING – SITE 2

NWC of Maple Avenue and Jurupa Avenue
Bloomington, California
for
Howard Industrial Partners

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

February 25, 2021

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Michael Tunney
Vice President

Project No.: **18G108-4**

Subject: **Updated Geotechnical Investigation**
Proposed Commercial/Industrial Building – Site 2
NWC of Maple Avenue and Jurupa Avenue
Bloomington (Unincorporated San Bernardino County), 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.

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Principal Engineer

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Principal Engineer

Distribution: (1) Addressee

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1.0 EXECUTIVE SUMMARY

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

Site Preparation

- Site stripping should include the removal of the existing trees that will not be reused with the proposed development, stumps, roots, native grass and weed growth, and topsoil from the subject site. Removal of the existing trees and stumps should include all tree root masses, which may be in excess of 3 to 4± feet in diameter.
- Demolition of the existing structures will be required in order to facilitate construction of the new building. Demolition procedures should include all foundations, floor slab, utilities, septic systems and any other subsurface improvements that will not remain in place for use with the new development. Debris resultant from demolition activities should be disposed of off-site. As an alternative, concrete and asphalt debris may be crushed to a maximum 2-inch particle size, well mixed with the on-site soils, and incorporated into new structural fills.
- The near-surface soils at this site consist of artificial fill soils which extend to depths of 2½ to 5½± feet at the boring locations. No documentation regarding placement or compaction of the fill soils is available, and they are therefore considered to represent undocumented fill. These soils are not considered suitable to support the foundation loads of the new structure.
- The near-surface native alluvial soils at the site possess varying densities, loose to medium dense strengths, along with occasional, slightly collapsible layers.
- Remedial grading is recommended to be performed within the proposed building area in order to remove all of the artificial fill soils, and the upper portion of the alluvium. The existing soils within the proposed building areas should be overexcavated to a depth of 5 feet below existing grade and to a depth of at least 4 feet below proposed building pad subgrade elevation. The depth of overexcavation should also be sufficient to remove any existing fill soils encountered during grading.
- The proposed foundation influence zones should be overexcavated to a depth of 3 feet below proposed foundation bearing grade.
- Following evaluation of the subgrade by the geotechnical engineer, the exposed subgrade soils should be scarified, moisture conditioned to achieve a moisture content of 0 to 4 percent above optimum, and recompacted. The overexcavation subgrade soils should then be recompacted under the observation of the geotechnical engineer. The previously excavated soils may then be replaced as compacted structural fill.

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 two (2) No. 5 rebars (1 top and 1 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

Building Floor Slab

- Conventional Slab-on-Grade, 6 inches thick.

- Reinforcement is not considered necessary, for geotechnical considerations. The actual floor slab reinforcement should be determined by the structural engineer, based on the imposed slab loading.
- Modulus of Subgrade Reaction: 125 psi/in.

Pavements

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

PORTLAND CEMENT CONCRETE PAVEMENTS				
Materials	**Thickness (inches)**			
	Auto Parking & Drives (TI = 5.0)	Truck Traffic		
		(TI =6.0)	(TI =7.0)	(TI =8.0)
PCC	5	5	5½	6½
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 Change Order No. 18G108-CO, dated February 25, 2021. The scope of services included a visual site reconnaissance and the review of the previously prepared geotechnical report 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 site is located on the northwest corner of Maple Avenue and Jurupa Avenue in Bloomington, an unincorporated portion of San Bernardino County, California. The site is bounded to the north by two (2) single-family residences (SFR's) and a vacant lot, to the west by Locust Avenue and three (3) SFR's, to the south by Jurupa Avenue, and to the east by Maple Avenue. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The subject site consists of twenty-nine (29) individual parcels with a combined total of approximately 57.6 acres in size. The parcel APN's included for the subject site are:

0256-111-02	0256-111-29	0256-111-51
0256-111-06	0256-111-40	0256-111-52
0256-111-07	0256-111-41	0256-111-53
0256-111-08	0256-111-42	0256-111-55
0256-111-09	0256-111-43	0256-111-56
0256-111-10	0256-111-44	0256-111-58
0256-111-11	0256-111-45	0256-111-59
0256-111-18	0256-111-48	0256-111-60
0256-111-19	0256-111-49	0256-111-61
0256-111-26	0256-111-50	

The subject site is a redevelopment project that proposes development of an approximately 1,251,640 ft^2 cross-dock, warehouse/logistics facility containing 90 dock doors. Based on our site reconnaissance performed on February 23, 2021, the subject site has not significantly changed since the time of our original subsurface exploration. Across all the parcels there appears to be thirty-six (36) existing residences, six (6) commercial buildings, twenty-nine (29) existing sheds and barns, and twenty-one (21) existing container structures, trailers, and RV's. The northwestern ten (10) parcels are currently developed as SFRs. The residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, exposed soil, and turf grass. Some residences appear to also have livestock boarded within their properties.

Two (2) parcels located in the northeastern region of the site are currently developed as a nursery with one (1) industrial building that is utilized as a pallet facility and two (2) single-family residences. The industrial building is a single-story structure of wood frame and metal siding construction, assumed to be supported on conventional shallow foundations. The residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. The ground surface cover in the nursery area consists of moderate to dense vegetation including shrubs, trees, native grass, weeds, and above ground planters. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, exposed soils, and turf grass.

To the south of the nursery parcel there are four (4) parcels each currently developed with SFR's. The residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, and exposed soils. Some residences appear to also have livestock boarded within the properties.

The central region of the site consists of two (2) parcels, approximately 26.5 acres in size, which are currently developed as a palm tree farm (The Palm Market). The Palm Market consists of hundreds of palm trees in rows with below-ground irrigation systems separated by access roads. There are also various sheds, storage containers, trailers and RV's throughout the property as well as above-ground planters containing smaller palm trees. Several large stockpiles of palm tree debris and other organic matter are located primarily in the northern central portion of The Palm Market. Several of these palm debris stockpiles possess heights of 10 to 15± feet and areas ranging from 2,500 to 10,000± ft^2. Overall, the ground surface cover consists of dense vegetation separated by access roads paved with recycled crushed asphaltic concrete.

The southwestern portion of the site, adjacent to Locust Avenue, contains five (5) parcels. These parcels are currently developed as SFR's. The residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, and exposed soils.

The southcentral portion of the site, adjacent to Jurupa Avenue, contains a single parcel which is currently developed as a church facility. The church facility consists of four (4) single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. A children's playground and in-ground pool are located within the church parcel. Ground surface cover consists of asphaltic concrete, crushed concrete and exposed soils.

The southeastern portion of the site contains five (5) parcels each of which is currently developed with an SFR. The existing residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, and exposed soils. There is also a large garage that is a single-story structure of wood frame and metal siding construction, assumed to be supported on conventional shallow foundations.

Topographic information was obtained from a plan provided by the client. The highest spot elevation indicated on the site plan is 1037± feet msl, near the northwestern corner of the site. The lowest elevation indicated on the site plan is 1012± feet msl near the southeastern corner of the site. Site topography within the subject area generally slopes downward to the south at an approximate gradient of 1 percent.

3.2 Proposed Development

The site plan provided to our office by the client indicates that the new development will consist of a single commercial/industrial building. The new building will be located in the central area of the site and will be 1,251,640± ft^2 in size. Dock-high doors will be constructed in a cross-dock configuration on the east and west sides of the building. The building is expected to be surrounded by asphaltic concrete pavements for parking and drive lanes and Portland cement concrete pavements for the loading dock areas. Several landscaped planters and concrete flatwork will be included throughout the site.

Detailed structural information has not been provided. It is assumed that the new buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundations with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 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 5 to 8± feet are expected to be necessary to achieve the proposed site grades.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of fifteen (15) borings (identified as Boring Nos. B-1 through B-15), advanced to depths of 5 to 30± feet below the existing site grades. Boring Nos. B-8, B-14 and B-15 were drilled on February 5, 2018. Boring Nos. B-2, B-3, B-6, B-7, B-9, B-12 and B-13 were drilled on February 6, 2018. The remaining borings were drilled on February 7, 2018. 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

Crushed Asphaltic Concrete

Crushed asphaltic concrete drive areas were present at the ground surface at Boring Nos. B-2, B-3, B-6, B-7, B-10, B-11, B-12, and B-13. The crushed asphaltic concrete layers consist of 6 to 8± inches of asphaltic concrete, with no discernable base layer.

Artificial Fill

Fill soils were encountered at the ground surface at Boring Nos. B-1, B-4, B-5, B-8 and B-14 and beneath the crushed asphaltic concrete layer at Boring Nos. B-2, B-3, B-6, B-7, B-10, B-12, B-13. These fill soils extend to depths of 2½ to 5½± feet below existing grades, and generally consist of loose to medium dense silty fine sands and fine to coarse sands with occasional fine to coarse gravel and cobbles. Occasional samples of the fill materials possess minor debris content including wood, metal and palm roots. The fill soils possess variable strengths, a disturbed appearance and moderate debris content, resulting in their classification as fill. Soils identified as possible fill were identified at the ground surface at Boring No. B-9 and beneath the crushed asphaltic concrete layer at Boring No. B-11.

Alluvium

Native alluvial soils were encountered at all of the boring locations, except Boring No. B-13 which was terminated in artificial fill soils at a depth of 5± feet. The alluvium within the upper 3 to 12± feet generally consists of loose to medium dense gravelly fine to coarse sands, fine sandy silts, and silty fine to coarse sands with varying amounts of fine to coarse gravel and cobbles. One fine to coarse sandy gravel layer was observed at Boring No. B-3 extending from 8½ to 12± feet. At greater depths, the alluvial soils generally consist of dense to very dense gravelly fine to coarse sands, fine sandy silts, and silty fine to coarse sands with varying amounts of fine to coarse gravel and cobbles, extending to at least the maximum depth explored of 30± feet.

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 30± 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 is located approximately 1,160 feet west from the site. Water level readings within these monitoring wells indicate high groundwater levels of 176.33± feet (October 2011).

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.

Dry 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.

Soluble Sulfates

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

Sample Identification	Soluble Sulfates (%)	Sulfate Classification
B-1 @ 0 to 5 feet	0.005	Negligible
B-6 @ 0 to 5 feet	0.014	Negligible
B-11 @ 0 to 5 feet	0.004	Negligible

Maximum Dry Density and Optimum Moisture Content

Representative bulk samples were tested for their maximum dry density and optimum moisture content. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557. These tests are generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil type or soil mixes may be necessary at a later date. The results of the testing are plotted on Plate C-9 and C-10 in Appendix C of this report.

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

2019 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 2019 edition of the California Building Code (CBC), which was adopted on January 1, 2020.

The 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 7-16, upon which the 2019 CBC is based. The application utilizes a database of risk-targeted maximum considered earthquake (MCE_R) site accelerations at 0.01-degree intervals for each of the code documents. The table below was created using data obtained from the application. The output generated from this program is included as Plate E-1 in Appendix E of this report.

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 11.4.8 applies to the proposed structure at this site. However, the structural engineer should verify that this exception is applicable to the proposed structure.** 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 Spectral Acceleration at 0.2 sec Period	S_S	1.500
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.600
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.500
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	1.020
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.000
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.680

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 California Geological Survey (CGS) has not yet conducted detailed seismic hazards mapping in the area of the subject site. The general liquefaction susceptibility of the site was determined by research of the San Bernardino County Official Land Use Plan, General Plan, Geologic Hazard Overlay. Map FH29C for the Fontana Quadrangle indicates that the proposed building is not located within an area of liquefaction susceptibility. Based on the mapping performed by the county of San Bernardino and the lack of a historic high ground water table within the upper 50± feet of the ground surface, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The near surface soils at this site consist of artificial fill materials, underlain by native alluvial soils. The artificial fill soils extend to depths of 2½ to 5½± feet below the existing site grades. No reports documenting the placement and compaction of these fill soils were provided to our office. Based on the lack of any documentation and the variable densities of these materials, the existing fill materials at the site are considered to be undocumented fill soils. The near-surface alluvium also possesses loose to medium dense relative densities and are susceptible to collapse when inundated with water. Based on these conditions, remedial grading is considered warranted within the proposed building area in order to remove the artificial fill in its entirety, and the upper portion of variable strength alluvium and to replace these soils as compacted structural fill.

Settlement

The recommended remedial grading will remove the undocumented fill soils and a portion of the near surface, variable strength, alluvial soils from the proposed building pad area. These materials will be replaced 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 settlement of the proposed structure is expected to be within tolerable limits.

Soluble Sulfates

The results of the soluble sulfate testing indicate that the selected sample of the on-site soils contains negligible concentrations of soluble sulfates, in accordance with American Concrete Institute (ACI) guidelines. Therefore, specialized concrete mix designs are not considered to be necessary, with regard to sulfate protection purposes. It is, however, recommended that additional soluble sulfate testing be conducted at the completion of rough grading to verify the soluble sulfate concentrations of the soils which are present at pad grade within the building area.

Expansion

The near-surface soils generally consist of sands and silty sands. Based on their composition and lack of any appreciable plasticity, these soils are considered to be non-expansive. Therefore, no design considerations related to expansive soils are considered warranted for this site. All imported fill soils should also possess very low expansive characteristics.

Shrinkage/Subsidence

Removal and recompaction of the artificial fill and near-surface native soils is estimated to result in an average shrinkage of 15 to 20 percent. It should be noted that this shrinkage estimate is based on the results of dry density testing performed on small-diameter samples of the existing soils taken at the boring locations. Based on this analysis, it was determined that the on-site soils possess a significant amount of local variability in shrinkage for the individual soil strata (as low as -8 percent and as high as 22 percent). 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 0.15 to 0.2 feet. This estimate is based on previous experience and the subsurface conditions encountered at the test 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. Volume loss due to removal of palm trees, palm tree stumps, and root masses is roughly estimated to on the order of 5± percent in these areas.

Grading and Foundation Plan Review

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

6.3 Site Grading Recommendations

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

Site Stripping and Demolition

Initial site stripping should include removal of any surficial vegetation. Removal of the existing trees and tree stumps should include all subsurface root masses. Based on the size of the existing trees and tree stumps, these root balls may extend to depths of 3 to 4± feet. These materials should be disposed of off-site. Additionally, the existing stockpiles, roots, vegetation, grass and weed growth and organic topsoil should be stripped from the site. The actual extent of site stripping should be determined during grading by a representative of the geotechnical engineer, based on the organic content of the encountered materials.

Demolition of the existing structures and surrounding improvements will be required at this site. Demolition of the structures should include all foundations, floor slabs, and any associated utilities. Any excavations associated with demolition should be backfilled with compacted fill soils.

All remnants of the previous structures, including foundations, floor slabs, and debris resulting from demolition activities should be properly disposed of off-site. Alternatively, concrete and asphalt debris may be re-used within the compacted fills, provided they are crushed and the maximum particle size is less than 2 inches.

Treatment of Existing Soils: Building Pad

Remedial grading should be performed within the proposed building area in order to remove the artificial fill materials, and the upper portion of the alluvial soils, and any soils disturbed during the demolition of the existing site improvements. Based on the conditions encountered at the boring locations, the existing soils within the proposed building area are also recommended to be overexcavated to a depth of at least 4 feet below the proposed building pad subgrade elevation and to a depth of at least 5 feet below existing grade, whichever is greater. The depth of the overexcavation should also extend to a depth sufficient to remove all of the artificial fill soils. At the boring locations, the existing fill soils extend to depths of 2½ to 5½± feet below the existing site grades. 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.

The overexcavation areas should extend at least 5 feet beyond the building perimeter and foundations, 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 overexcavation should also encompass these areas.

Following completion of the overexcavation, the subgrade soils within the building area 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 additional fill materials or loose, porous, 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, moisture treated to 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 previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of any proposed retaining and site walls should be overexcavated to a depth of 3 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pad. Any undocumented fill soils within any of these foundation areas should be removed in their entirety. The overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning, and recompacting the upper 12 inches of exposed subgrade soils, as discussed for the building area. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Parking and Drive Areas

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

The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. Any such materials should be removed to a level of firm and unyielding soil. The exposed subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to at least 0 to 4 percent above the optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength surficial soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

The grading recommendations presented above for the proposed parking area assume that the owner and/or developer can tolerate minor amounts of settlement within the proposed parking and drive areas. The grading recommendations presented above do not completely mitigate the extent of undocumented fill soils or low strength native alluvium in the parking and drive 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.

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 2019 CBC and the grading code of the County of San Bernardino.
- 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). It is recommended that materials in excess of 3 inches in size not be used for utility trench backfill. Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by County of San Bernardino. 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 near surface soils generally consist of sands and silty sands. These materials will likely be subject to 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.

Groundwater

The static groundwater table at this site is considered to exist at a depth greater than 30± feet. 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 used to replace existing fill and near-surface alluvial soils. These new structural fill soils are expected to extend to depths of at least 3 feet below proposed foundation bearing grades, underlain by 1± foot of additional soil that has been densified and moisture conditioned in place. Based on this subsurface profile, the proposed structure may be supported on shallow foundations.

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: Two (2) No. 5 rebars (1 top and 1 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 to at least 90 percent of the ASTM D-1557 maximum dry density. Any unsuitable materials should be removed to a depth of suitable bearing compacted structural fill, 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 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 slab 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: 325 lbs/ft^3
- Friction Coefficient: 0.32

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. The maximum allowable passive pressure is 2500 lbs/ft^2.

6.6 Floor Slab Design and Construction

Subgrades which will support the new floor slab should be prepared in accordance with the recommendations contained in the ***Site Grading Recommendations*** section of this report. Based on the anticipated grading which will occur at this site, the floor of the new structure may be constructed as a conventional slab-on-grade supported on newly placed structural fill, extending to a depth of at least 4 feet below proposed finished pad grade. Based on geotechnical considerations, the floor slab may be designed as follows:

- Minimum slab thickness: 6 inches.
- Modulus of Subgrade Reaction: k = 125 psi/in.
- Minimum slab reinforcement: Not required for geotechnical considerations. The actual floor slab reinforcement should be determined by the structural engineer, based on 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 area of the proposed slab which will incorporate such coverings. 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 Retaining Wall Design and Construction

New retaining walls are expected to be necessary in the truck court and in the dock-high areas of the building. Additionally, although not indicated on the site plan, the proposed development may require some small retaining walls (less than 5± feet in height) to facilitate the new site grades.

Retaining Wall Design Parameters

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

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

RETAINING WALL DESIGN PARAMETERS

Design Parameter		Soil Type
		On-Site Sands and Silty Sands
Internal Friction Angle (ϕ)		30°
Unit Weight		120 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	40 lbs/ft^3
	Active Condition (2h:1v backfill)	65 lbs/ft^3
	At-Rest Condition (level backfill)	60 lbs/ft^3

Regardless of the backfill type, the walls should be designed using a soil-footing coefficient of friction of 0.30 and an equivalent passive pressure of 300 lbs/ft^3. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

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

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

Seismic Lateral Earth Pressures

In accordance with the 2019 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 the proposed bearing grade. Foundations to support new retaining walls should be designed in accordance with the general Foundation Design Parameters presented in a previous section of this report.

Backfill Material

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

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

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 one cubic foot gravel pocket surrounded by a suitable geotextile 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.

6.8 Pavement Design Parameters

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

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The near-surface soils generally consist of sands and silty sands. These soils are considered to possess good pavement support characteristics with estimated R-values of 40 to 50. Since R-value testing was not included in the scope of services for this project, the subsequent pavement design is based upon an assumed R-value of 40. 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.

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

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= 40)					
Materials	**Thickness (inches)**				
	Auto Parking (TI = 4.0)	Auto Drive Lanes (TI = 5.0)	Truck Traffic		
			(TI = 6.0)	(TI = 7.0)	(TI = 8.0)
Asphalt Concrete	3	3	3½	4	5
Aggregate Base	3	4	6	7	8
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				
Materials	**Thickness (inches)**			
	Auto Parking & Drives (TI = 5.0)	Truck Traffic		
		(TI =6.0)	(TI =7.0)	(TI =8.0)
PCC	5	5	5½	6½
Compacted Subgrade (95% minimum compaction)	12	12	12	12

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

7.0 GENERAL COMMENTS

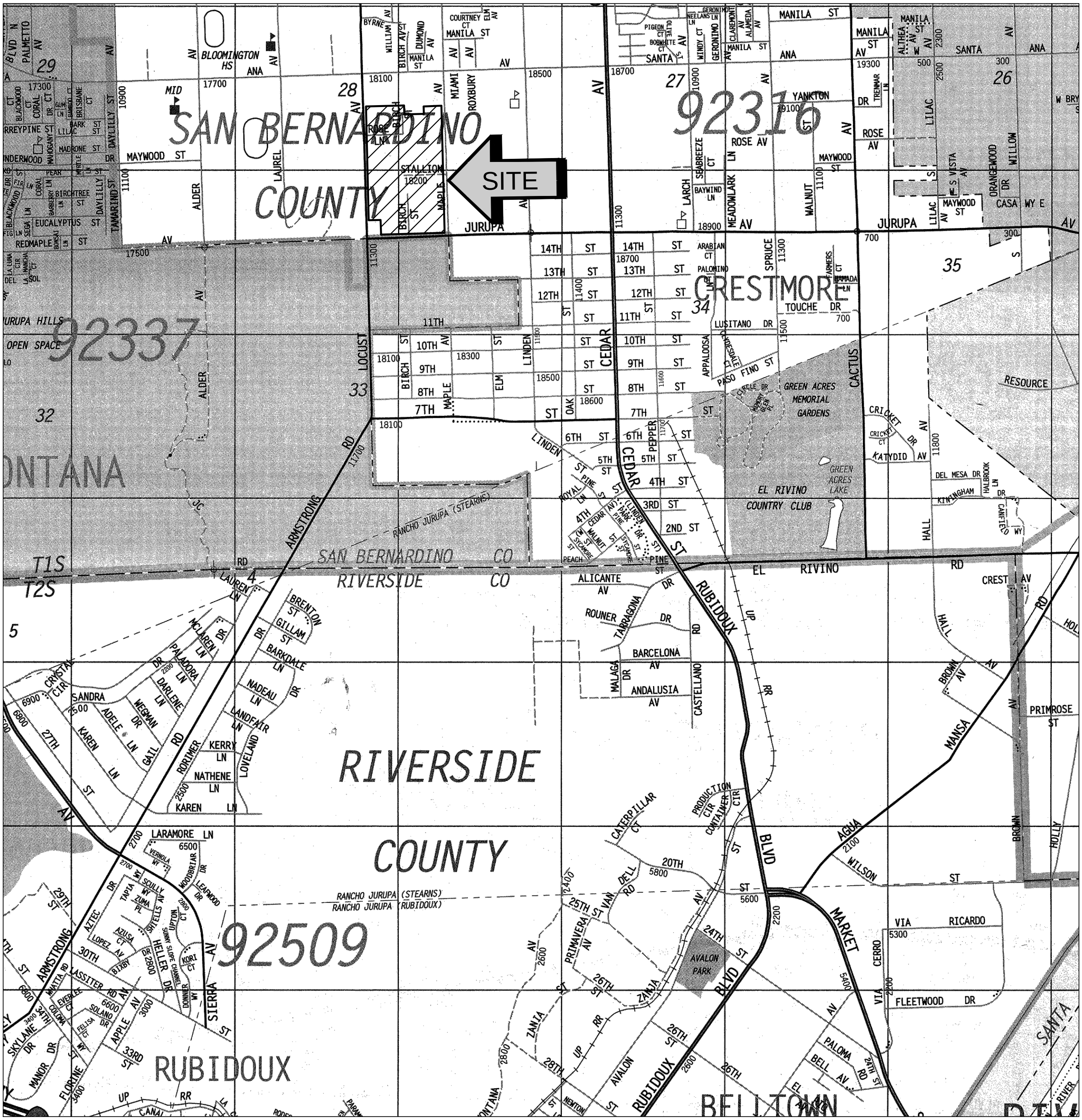
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other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

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

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

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

APPENDIX A



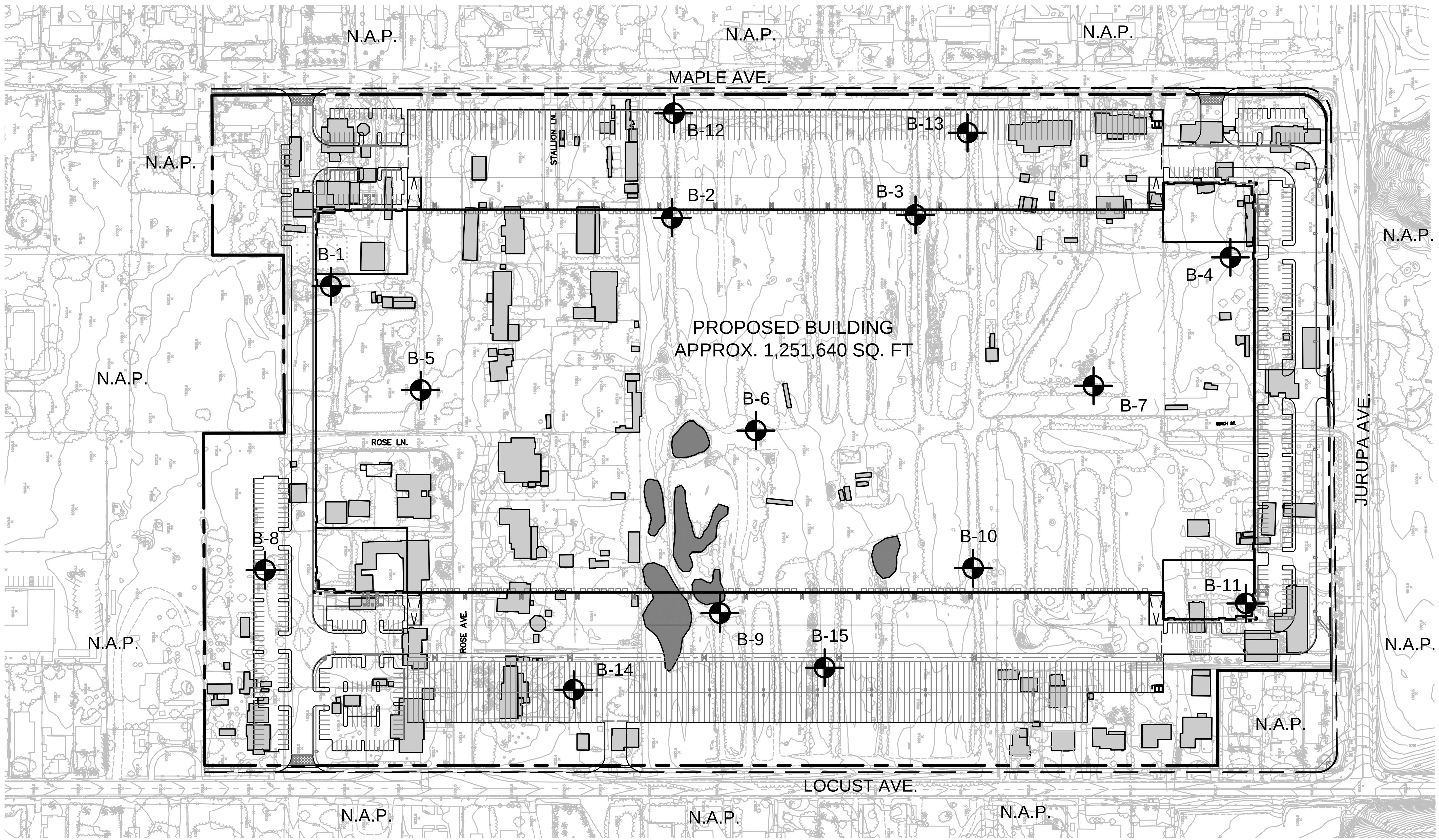
SOURCE: SAN BERNARDINO COUNTY
THOMAS GUIDE, 2013

SITE LOCATION MAP

PROPOSED COMMERCIAL/INDUSTRIAL BUILDING

BLOOMINGTON, CALIFORNIA

SCALE: 1" = 2400'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JLL CHKD: RGT	
SCG PROJECT 18G108-4	
PLATE 1	



GEOTECHNICAL LEGEND

- APPROXIMATE BORING LOCATION
- PALM DEBRIS STOCKPILES
- EXISTING STRUCTURES TO BE DEMOLISHED

NORTH
SoCalGeo

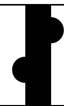
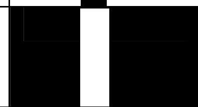
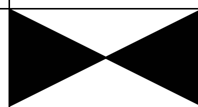
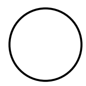
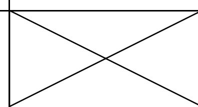
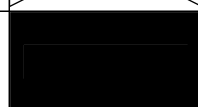
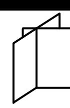
NOTE: SITE PLAN PREPARED BY AO.

BORING LOCATION PLAN
PROPOSED COMMERCIAL/INDUSTRIAL BUILDING
BLOOMINGTON, CALIFORNIA

SCALE: 1" = 180'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JLL CHKD: RGT	
SCG PROJECT 18G108-4	
PLATE 2	

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 18G108 | DRILLING DATE: 2/7/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 21 feet
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

SURFACE ELEVATION: 1035 feet MSL

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Brown Silty fine Sand, trace medium to coarse Sand, trace to little fine to coarse Gravel, loose-damp							
	X	6				102	5					
	X	10				107	5					
5					ALLUVIUM: Brown fine to medium Sand, trace coarse Sand, little Silt, trace to little fine Gravel, occasional Cobbles, medium dense-dry to damp							
	X	16				115	3					
					Gray Gravelly fine to coarse Sand, occasional Cobbles, medium dense to dense-dry to damp							
	X	35				125	3					
	X	50				121	2					
10												
					Gray fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-dry to damp							
	X	18					4					
15												
					Gray Brown fine to coarse Sand, trace fine Gravel, medium dense-dry to damp							
	X	25					3					
20												
					Brown fine Sandy Silt, medium dense-moist							
	X	21					15					
25												
	X	21					13					
30												
					Boring Terminated at 30'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-2

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

DRILLING DATE: 2/6/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 3 feet
READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		SURFACE ELEVATION: 1026 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	
					6 to 8 inches Crushed Asphaltic concrete							
	X	39			FILL: Brown Silty fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles, medium dense-damp		4					
	X	17			ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, occasional Cobbles, medium dense to dense-dry		2					
5												
	X	46					2					
	X	39			Gray fine to coarse Sand, little fine to coarse Gravel, dense-dry		2					
10												
	X	36					2					
15												
					Brown fine to coarse Sand, trace fine Gravel, dense-damp							
	X	36					4					
20												

Boring Terminated at 20'

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

TEST BORING LOG **PLATE B-2**

BORING NO. B-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 18G108 | DRILLING DATE: 2/6/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 3 feet
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

SURFACE ELEVATION: 1021 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 (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					6 to 8 inches Crushed Asphaltic concrete							
	X	23			FILL: Brown Silty fine Sand, trace medium to coarse Sand, fine Gravel, trace Palm roots, medium dense-damp	108	5					
	X	21			ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, trace fine root fibers, medium dense-dry to damp	114	3					
5	X	13			Gray Brown Silty fine Sand, trace medium Sand, loose-damp	107	7					
	X	40			Dark Gray Gravelly fine to coarse Sand, occasional Cobbles, medium dense-dry	118	1					
10	X	44			Dark Gray fine to coarse Sandy Gravel, extensive Cobbles, dense-dry to damp	108	3					
	X	25			Brown Silty fine to medium Sand, trace coarse Sand, fine Gravel, medium dense-damp		6					
15					Boring Terminated at 15'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

DRILLING DATE: 2/7/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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: 1012 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Brown Silty fine Sand, little medium to coarse Sand, trace to little fine to coarse Gravel, loose-dry							
	X	7					3					
					ALLUVIUM: Gray Gravelly fine to coarse Sand, occasional Cobbles, medium dense to very dense-dry to damp							
	X	14					1					
5												
	X	18					1					
	X	32					2					
10												
	X	58					2					
15												
	X	40					3					
20												
					Brown Silty fine Sand, trace medium Sand, medium dense-damp							
	X	21					7					
25												
					Boring Terminated at 25'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-5

JOB NO.: 18G108 | DRILLING DATE: 2/7/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 6 feet
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1032 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Brown Silty fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-damp							
	X	10					6					
					ALLUVIUM: Gray Gravelly fine to coarse Sand, occasional Cobbles, medium dense to dense-dry							
	X	19					2					
5												
	X	21					2					
	X	33					2					
10												
	X	32					4					
15												
					Boring Terminated at 15'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

TEST BORING LOG

BORING NO. B-6

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

DRILLING DATE: 2/6/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 6.5 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1024 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 (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					6 to 8 inches Crushed Asphaltic concrete							
		51			FILL: Dark Gray Brown Silty fine Sand, trace medium to coarse Sand, Wood/Metal fragments, dense-damp	112	6					
		33			ALLUVIUM: Brown Silty fine Sand, trace medium Sand, medium dense-damp	113	5					
5		49			Gray Gravelly fine to coarse Sand, occasional Cobbles, medium dense to dense-dry	122	2					
		28				123	1					
10		34				115	1					
15		34					1					
20		42					2					
					Brown Silty fine Sand, trace medium Sand, medium dense-damp							
25		21					8					
					Boring Terminated at 25'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-7

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

DRILLING DATE: 2/6/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 3 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1015 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					6 to 8 inches Crushed Asphaltic concrete							
	X	16			FILL: Brown Silty fine Sand, trace medium to coarse Sand, trace fine Gravel, medium dense-damp		4					
	X	13			ALLUVIUM: Gray Brown Silty fine to coarse Sand, trace fine Gravel, medium dense-dry to damp		3					
5												
	X	22			Gray fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles, medium dense-dry		2					
	X	29					2					
10												
					Gray Gravelly fine to coarse Sand, extensive Cobbles, very dense-dry							
	X	59					2					
15												
					Boring Terminated at 15'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-8

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

DRILLING DATE: 2/5/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: 1035 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
	X	22			FILL: Brown Silty fine Sand, trace medium to coarse Sand, some fine to coarse Gravel, medium dense-damp		4					
	X	24			ALLUVIUM: Light Gray Gravelly fine to coarse Sand, medium dense-dry		1					
5												
	X	20					2					
	X	11			Brown Silty fine Sand to fine Sandy Silt, trace medium to coarse Sand, trace calcareous veining, medium dense-moist		14					
10												
	X	40			Light Brown Gravelly fine to coarse Sand, extensive Cobbles, dense-damp		3					
15												
	X	21			Brown fine Sand, medium dense-damp		5					
20												
	X	22					3					
25												
					Boring Terminated at 26'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-9

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

DRILLING DATE: 2/6/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 4 feet
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (SURFACE ELEVATION: 1025 feet MSL)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					POSSIBLE FILL: Brown Silty fine Sand, trace medium to coarse Sand, trace fine Gravel, some Cobbles, medium dense-damp							
	X	23				108	4					
	X	15				103	3					
					ALLUVIUM: Gray Brown Silty fine to medium Sand, little coarse Sand, trace fine to coarse Gravel, medium dense-dry to damp							
5	X	29				117	3					
					Light Gray Gravelly fine to coarse Sand, occasional to extensive Cobbles, medium dense-dry to damp							
	X	28				122	2					
	X	32				119	2					
10												
	X	40					3					
15					Boring Terminated at 15'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-10

JOB NO.: 18G108 | DRILLING DATE: 2/7/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 5 feet
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS / LABORATORY RESULTS

SURFACE ELEVATION: 1019 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 (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					6 to 8 inches Crushed Asphaltic concrete							
	X	13			FILL: Brown Silty fine Sand, trace medium Sand, medium dense-damp		6					
	X	11					7					
5												
	X	29			ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, extensive Cobbles, medium dense to very dense-dry		2					
	X	43					2					
10												
	X	60					2					
15												
					Gray fine Sand, trace medium Sand, dense-damp							
	X	33					5					
20												

Boring Terminated at 20'

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-11

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California
DRILLING DATE: 2/7/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey
WATER DEPTH: Dry
CAVE DEPTH: 25 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1014 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 (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					6 to 8 inches Crushed Asphaltic concrete							
		6			POSSIBLE FILL: Brown Silty fine Sand, trace medium to coarse Sand, loose-damp	100	7					
		10				99	9					
5		15			ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, occasional Cobbles, medium dense-damp	110	4					
		21				114	3					
10		21			Gray Brown fine Sand, trace to little Silt, trace fine Gravel, medium dense-damp	109	4					
15		52			Gray Brown Gravelly fine to coarse Sand, occasional to extensive Cobbles, very dense-dry to damp		3					
20		86					3					
25		15			Brown fine Sandy Silt, medium dense-moist		16					
30		43			Brown fine to medium Sand, trace coarse Sand, fine Gravel, dense-damp		4					

Boring Terminated at 30'

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-12

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

DRILLING DATE: 2/6/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 3 feet
READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		SURFACE ELEVATION: 1026 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	
					6 to 8 inches Crushed Asphaltic concrete							
	X	27			FILL: Brown Silty fine Sand, trace medium Sand, fine Gravel, medium dense-damp		5					
	X	32			ALLUVIUM: Brown Gravelly fine to coarse Sand, occasional Cobbles, medium dense-dry to damp		3					
5												
					Boring Terminated at 5'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-13

JOB NO.: 18G108 | DRILLING DATE: 2/6/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 3 feet
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1020 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					6 to 8 inches Crushed Asphaltic concrete							
	X	16			FILL: Brown Silty fine Sand, trace medium Sand, fine Gravel, medium dense-damp to moist		7					
	X	8					7					
5					Boring Terminated at 5'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-14

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

DRILLING DATE: 2/5/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 3 feet
READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		SURFACE ELEVATION: 1029 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	
	X	9			FILL: Brown Silty fine Sand, trace medium to coarse Sand, fine Gravel, loose-damp		5					
	X	19			ALLUVIUM: Light Brown Gravelly fine to coarse Sand, medium dense-dry		2					
5												
					Boring Terminated at 5'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

TEST BORING LOG **PLATE B-14**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-15

JOB NO.: 18G108
PROJECT: Proposed C/I Bldg
LOCATION: San Bernardino County, California

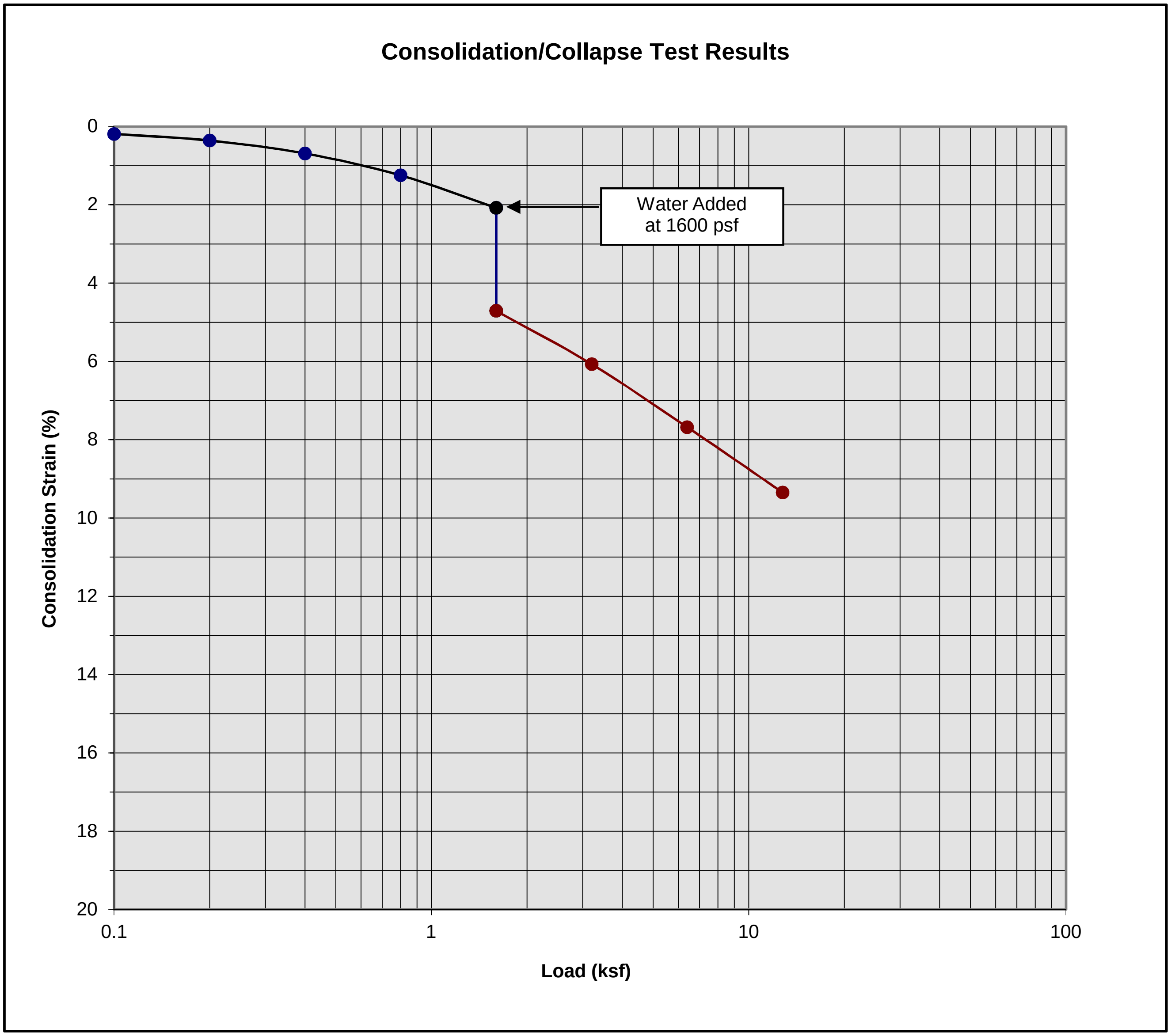
DRILLING DATE: 2/5/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1024 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
	X	27			ALLUVIUM: Brown fine Sand, trace medium to coarse Sand, trace to little Silt, fine Gravel, medium dense-dry		2					
5	X	29			Brown Gravelly fine to coarse Sand, occasional Cobbles, medium dense-dry		2					
					Boring Terminated at 5'							

TBL 18G108.GPJ SOCALGEO.GDT 2/27/18

APPENDIX C



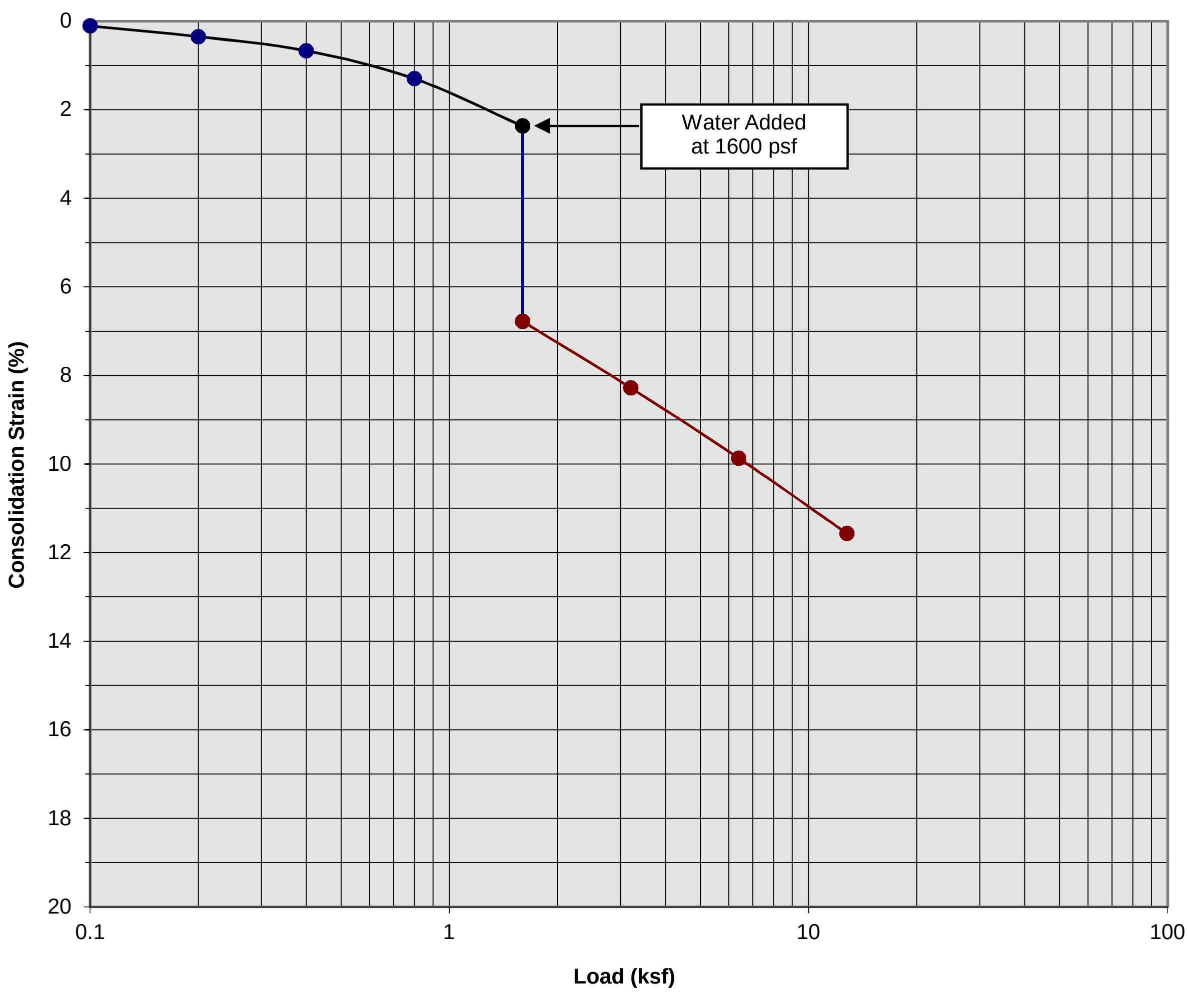
Classification: FILL: Brown Silty fine Sand, trace medium to coarse Sand

Boring Number:	B-1	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	1 to 2	Initial Dry Density (pcf)	101.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	111.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.63

Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108
PLATE C- 1

SOCALGEO SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

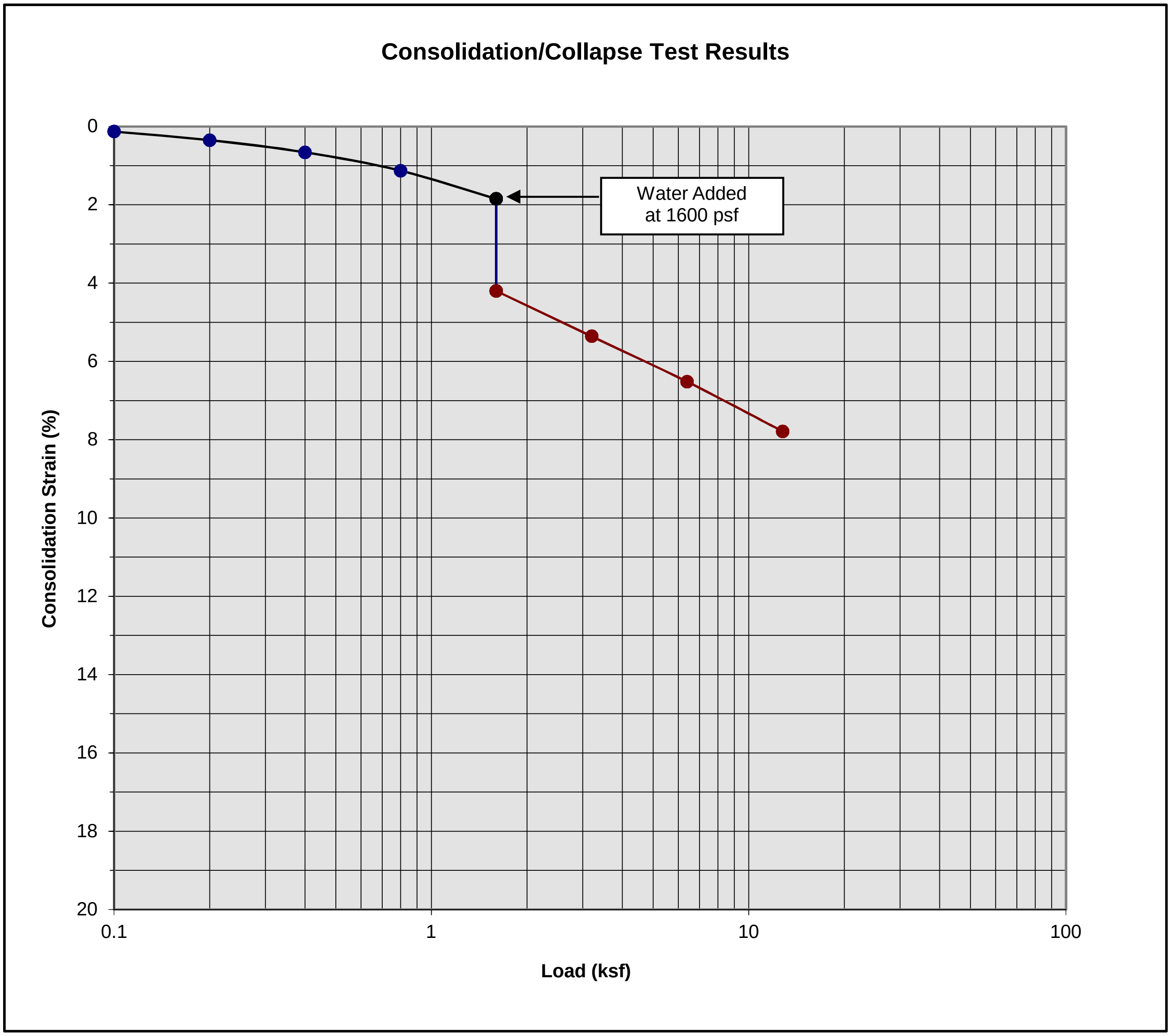


Classification: FILL: Brown Silty fine Sand, trace medium to coarse Sand

Boring Number:	B-1	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	3 to 4	Initial Dry Density (pcf)	106.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	121.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	4.41

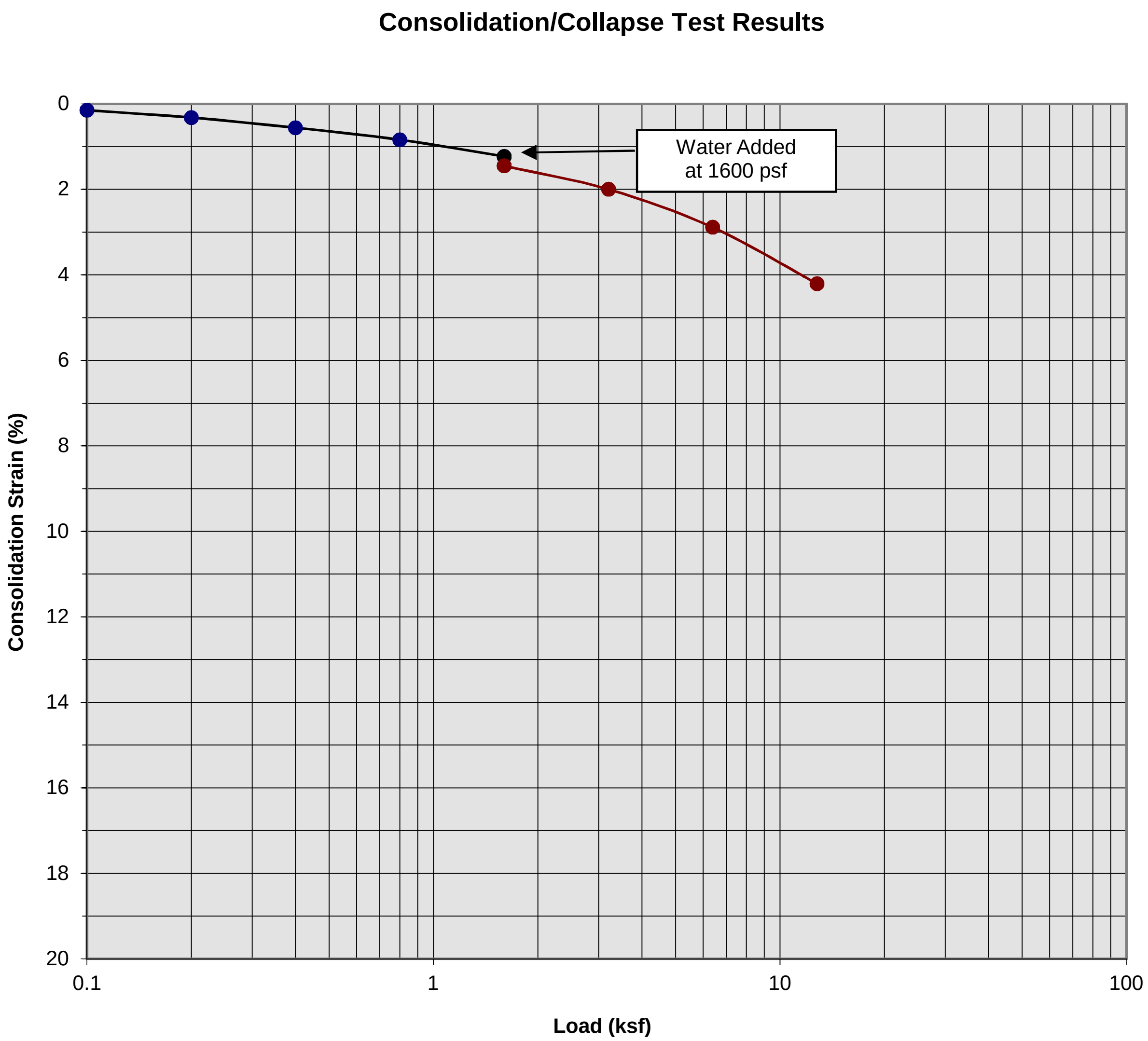
Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108
PLATE C- 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Classification: Brown fine to medium Sand, trace coarse Sand, little Silt

Boring Number:	B-1	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	12
Depth (ft)	5 to 6	Initial Dry Density (pcf)	114.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	123.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.35



Classification: Gray Gravelly fine to coarse Sand, occasional Cobbles

Boring Number:	B-1	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	11
Depth (ft)	7 to 8	Initial Dry Density (pcf)	126.3
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	131.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.22

Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108
PLATE C- 4

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
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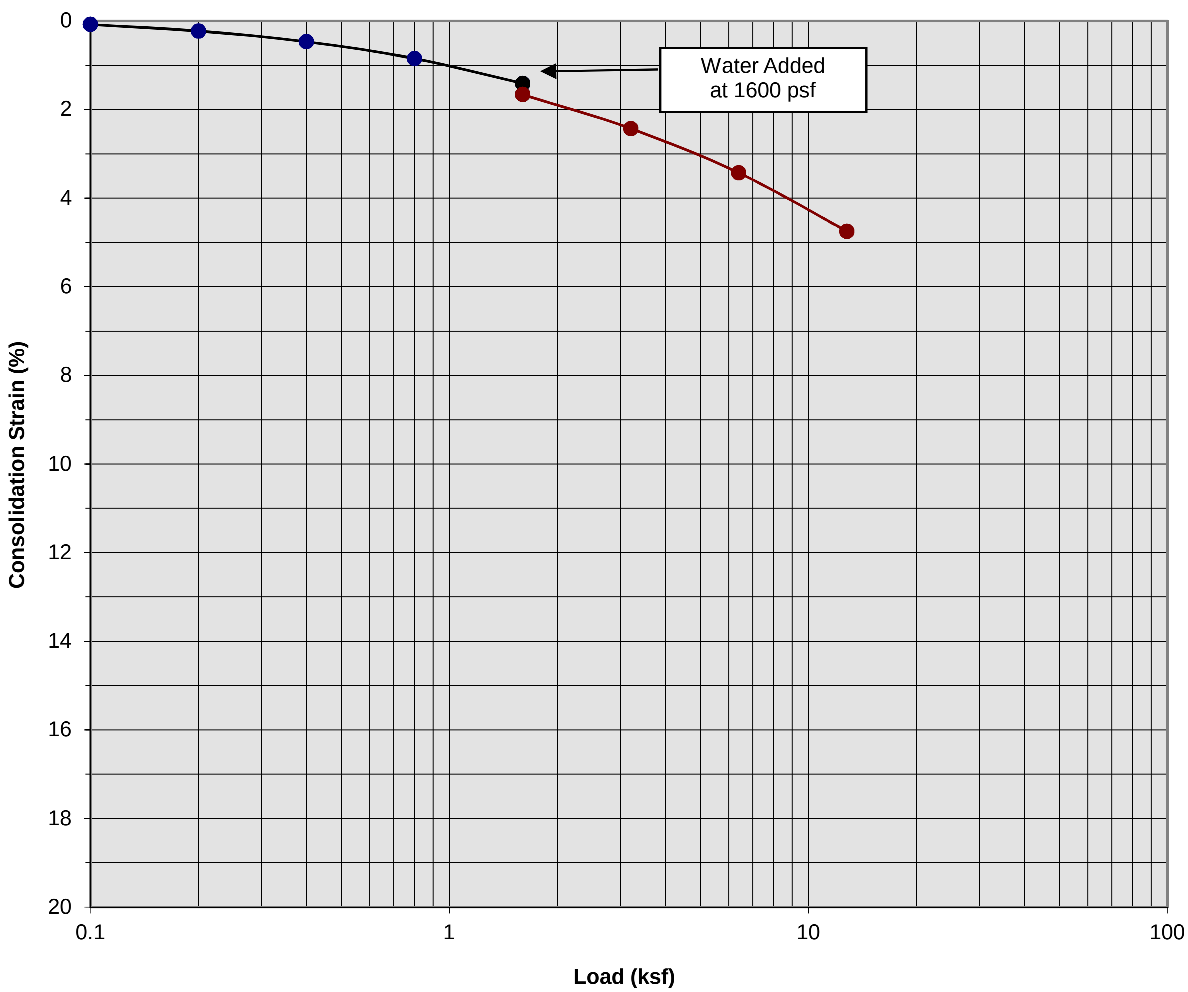
Consolidation/Collapse Test Results

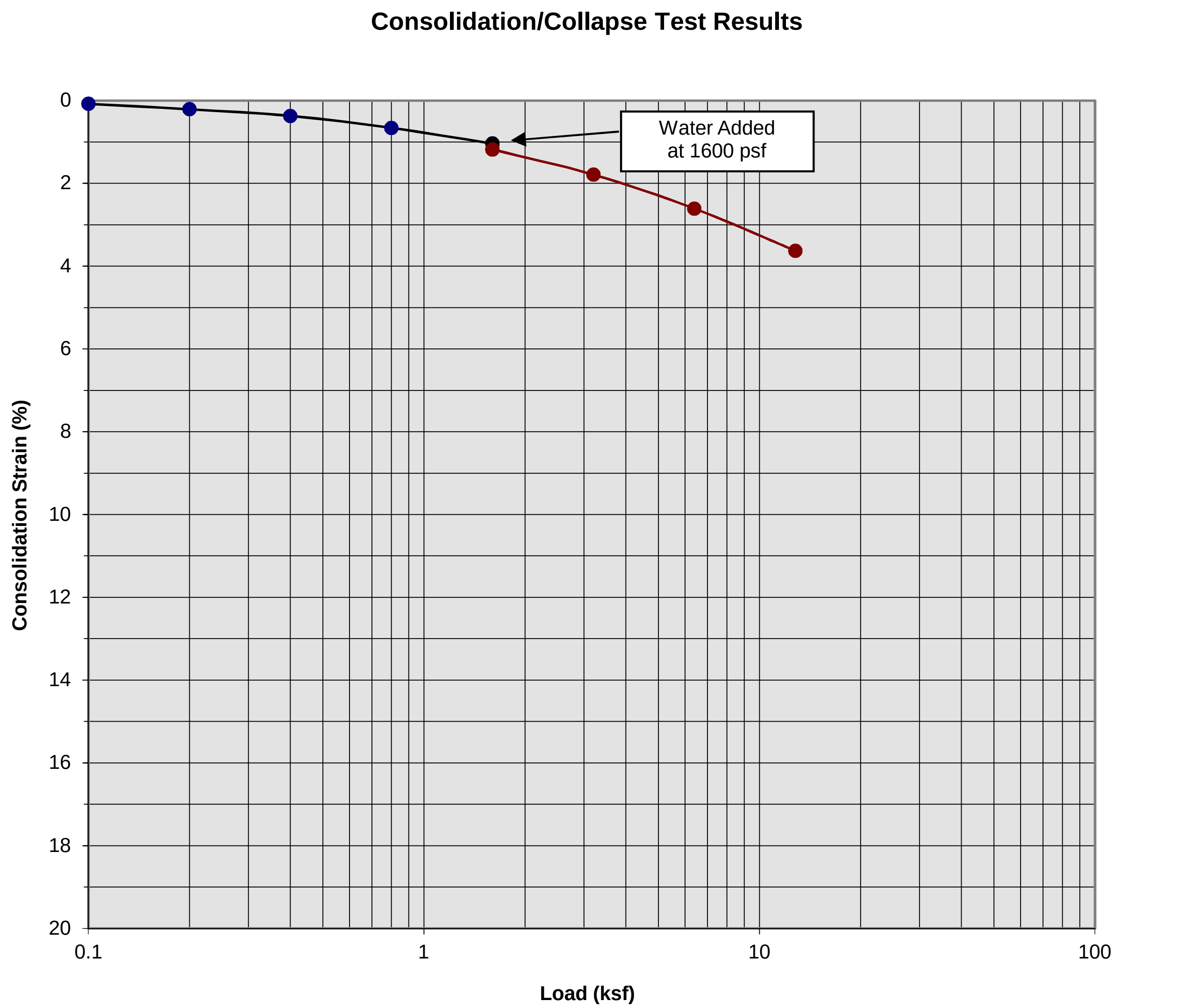


Classification: POSSIBLE FILL: Brown Silty fine Sand, trace medium to coarse Sand

Boring Number:	B-11	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	3 to 4	Initial Dry Density (pcf)	99.9
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	104.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.25

Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108
PLATE C- 5

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



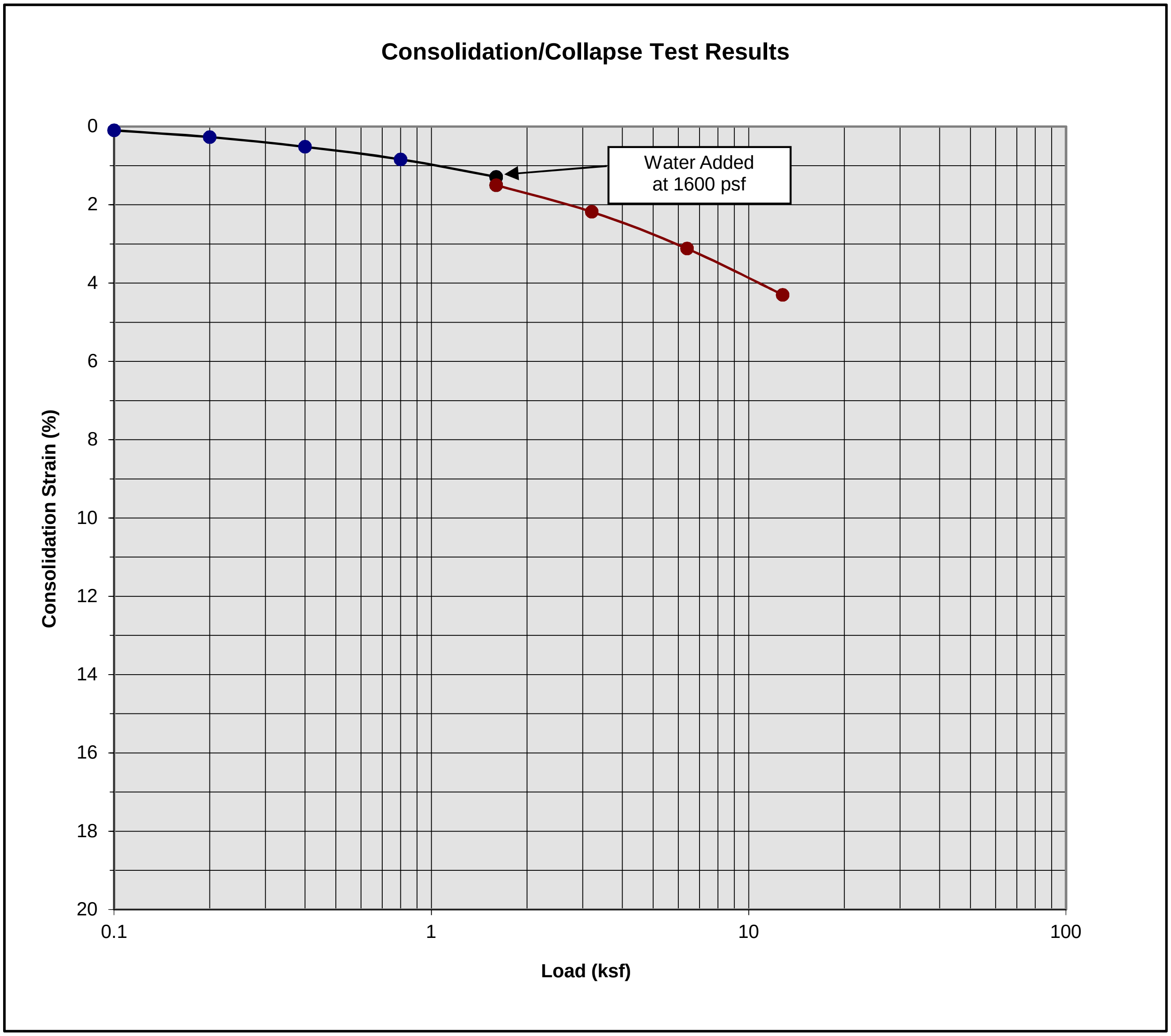
Classification: Gray Brown Gravelly fine to coarse Sand, occasional Cobbles

Boring Number:	B-11
Sample Number:	---
Depth (ft)	5 to 6
Specimen Diameter (in)	2.4
Specimen Thickness (in)	1.0

Initial Moisture Content (%)	4
Final Moisture Content (%)	23
Initial Dry Density (pcf)	109.8
Final Dry Density (pcf)	114.3
Percent Collapse (%)	0.14

Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108
PLATE C- 6

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

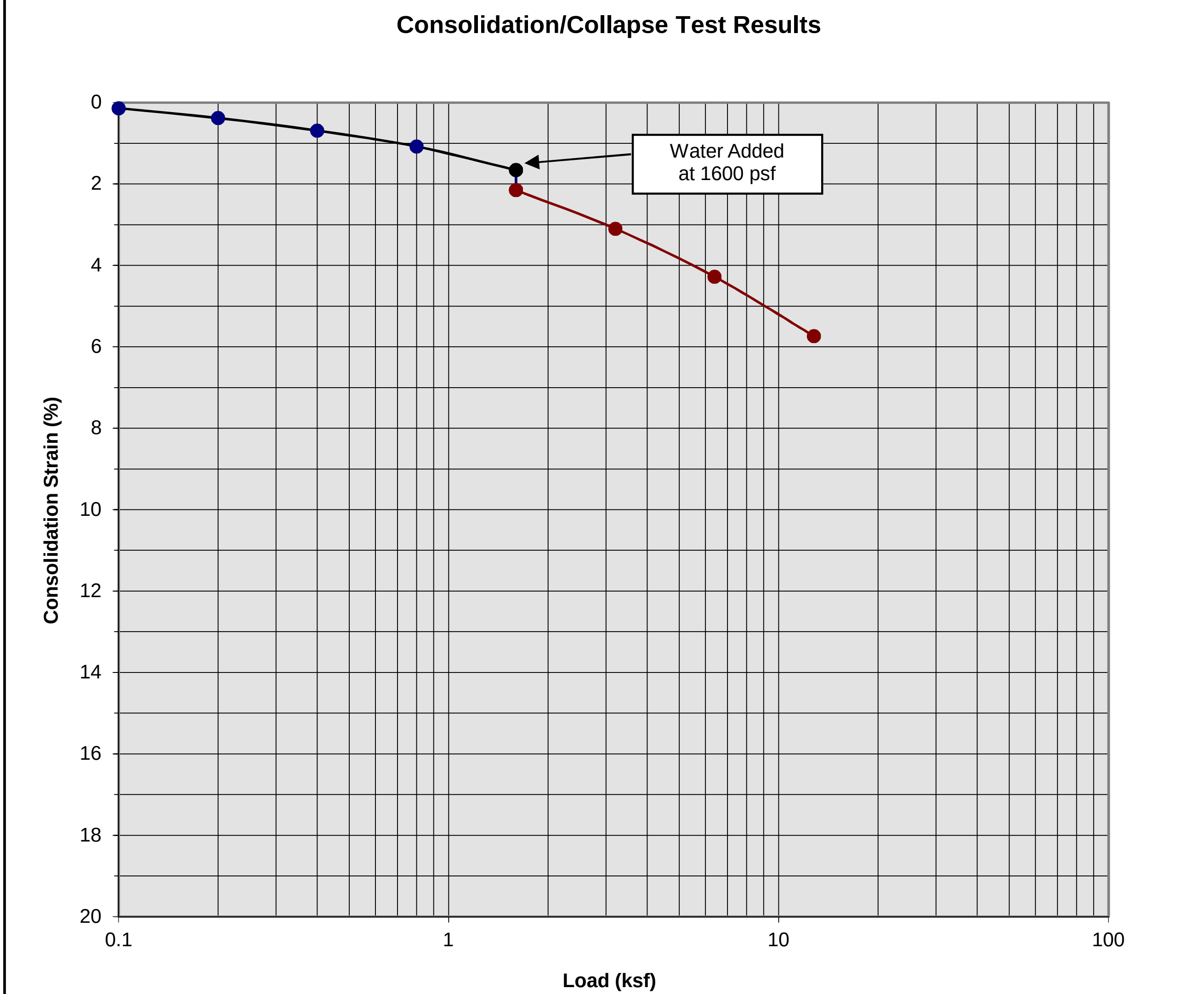


Classification: Gray Brown Gravelly fine to coarse Sand, occasional Cobbles

Boring Number:	B-11	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	7 to 8	Initial Dry Density (pcf)	113.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	118.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.21

Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108
PLATE C- 7

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

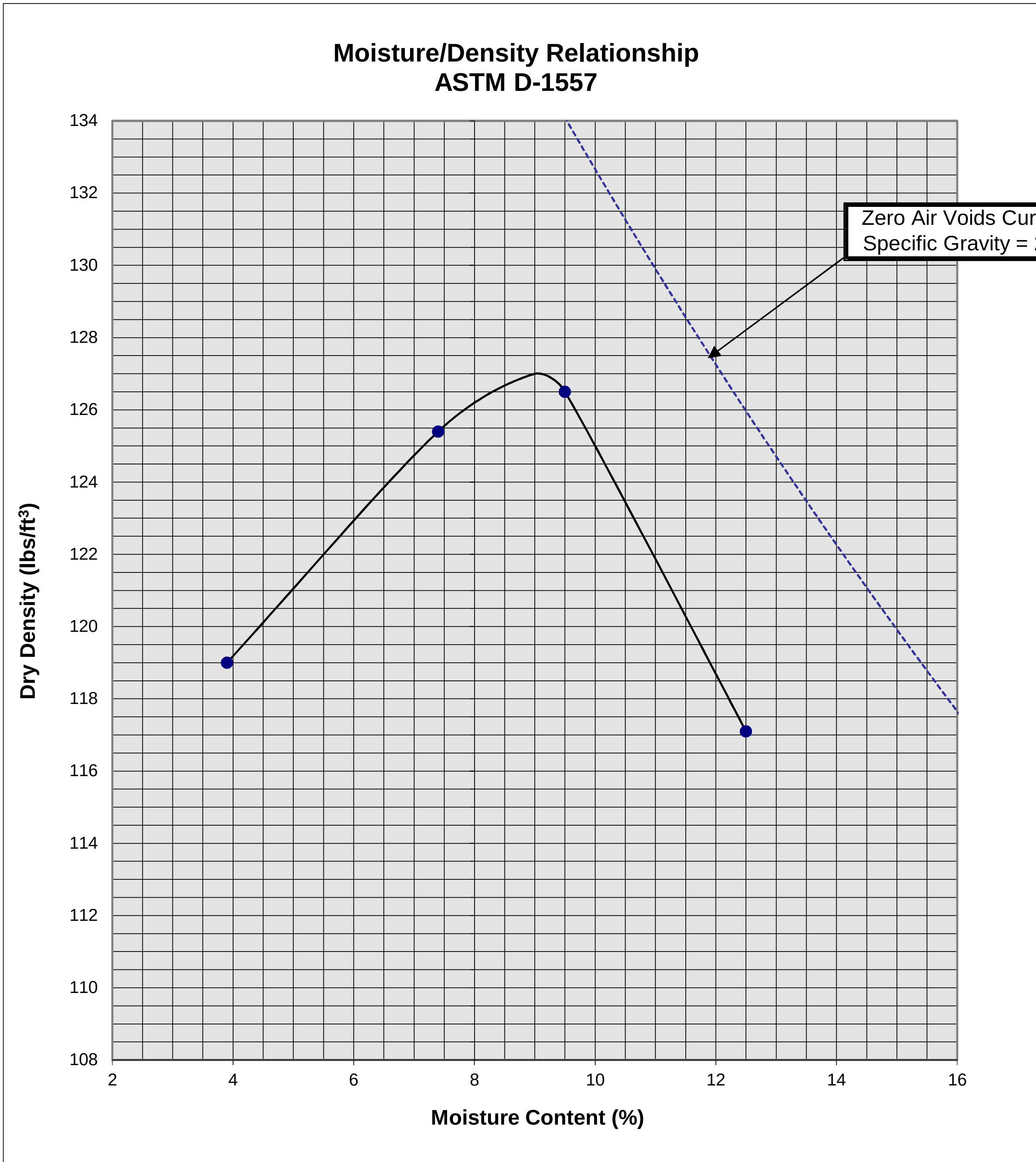


Classification: Gray Brown fine Sand, trace to little Silt, trace fine Gravel

Boring Number:	B-11	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	9 to 10	Initial Dry Density (pcf)	109.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	116.8
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.49

Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108
PLATE C- 8

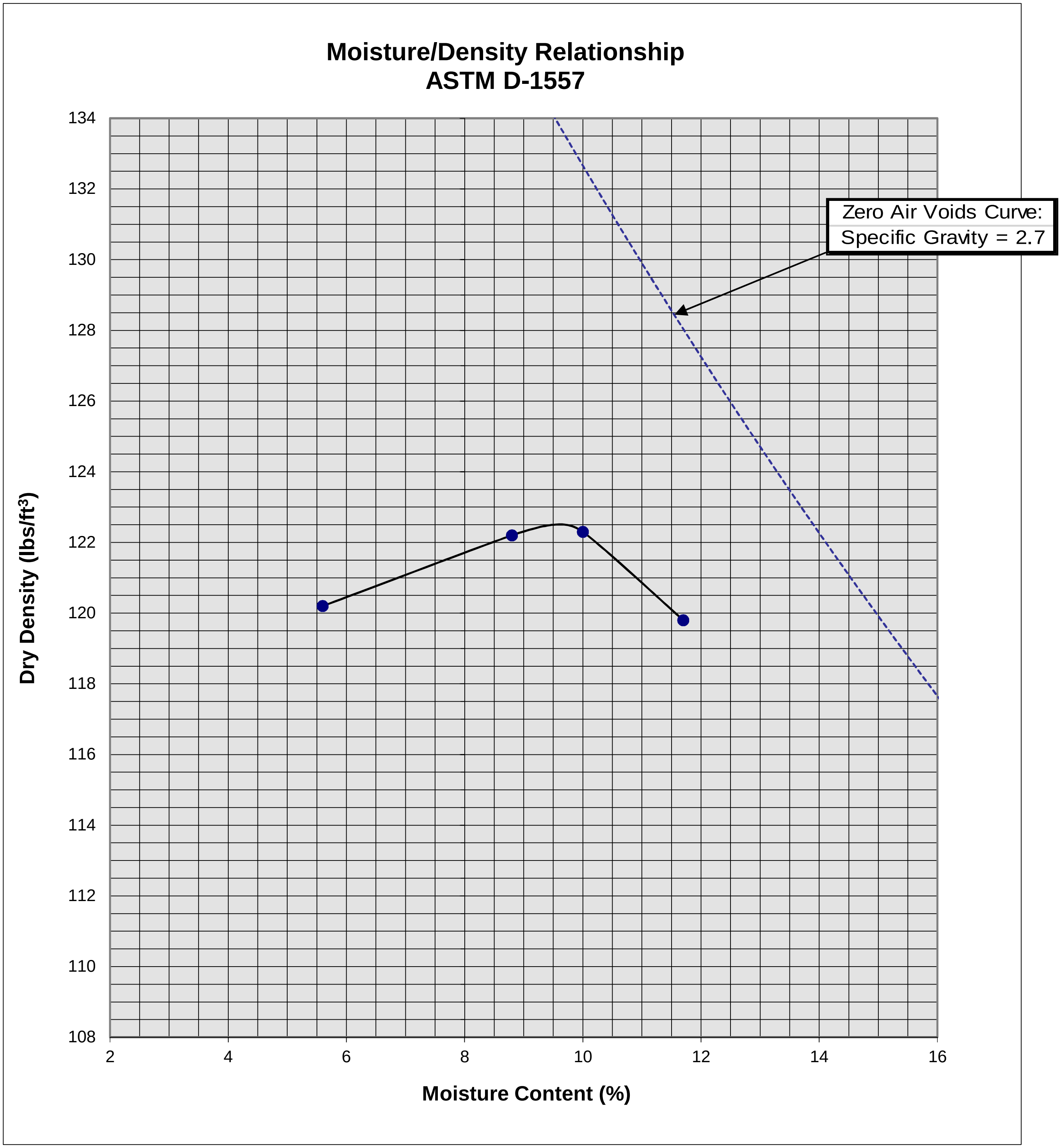
SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	B-1 @ 0 to 5'
Optimum Moisture (%)	9
Maximum Dry Density (pcf)	127
Soil Classification	Gray Brown Silty fine Sand, trace fine Gravel

Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108
PLATE C-9

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	B-11 @ 0 to 5'
Optimum Moisture (%)	9.5
Maximum Dry Density (pcf)	122.5
Soil Classification	COLOR Silty fine Sand, trace fine Gravel, trace medium Sand

Proposed C/I Bldg
San Bernardino County, California
Project No. 18G108

PLATE C-10

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

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.

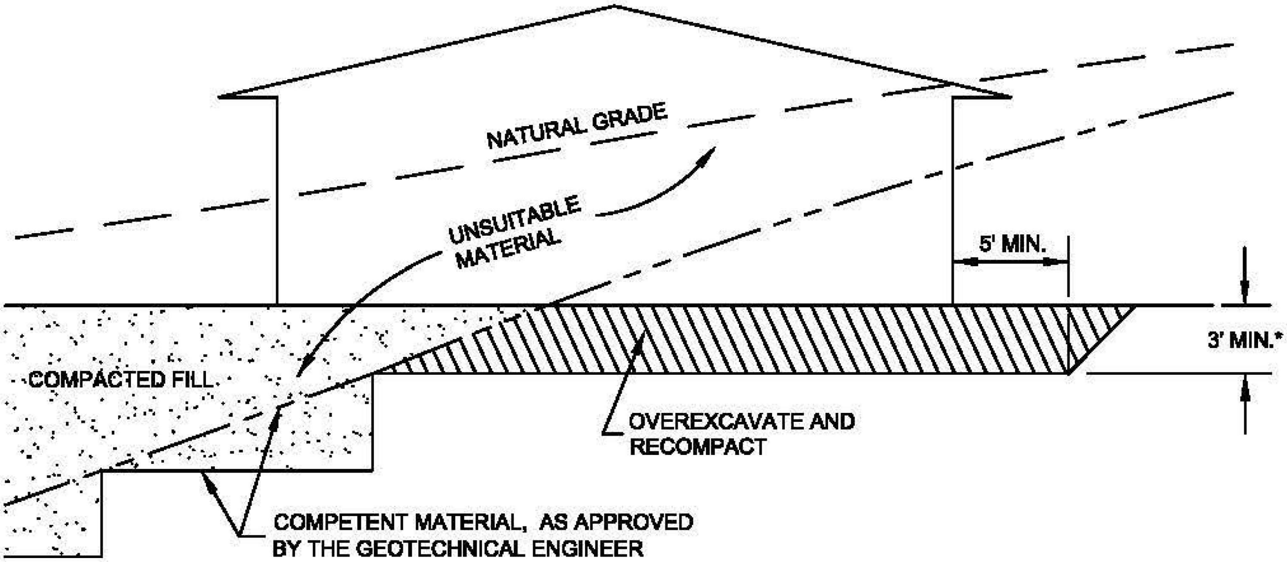
Subdrains

- 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.

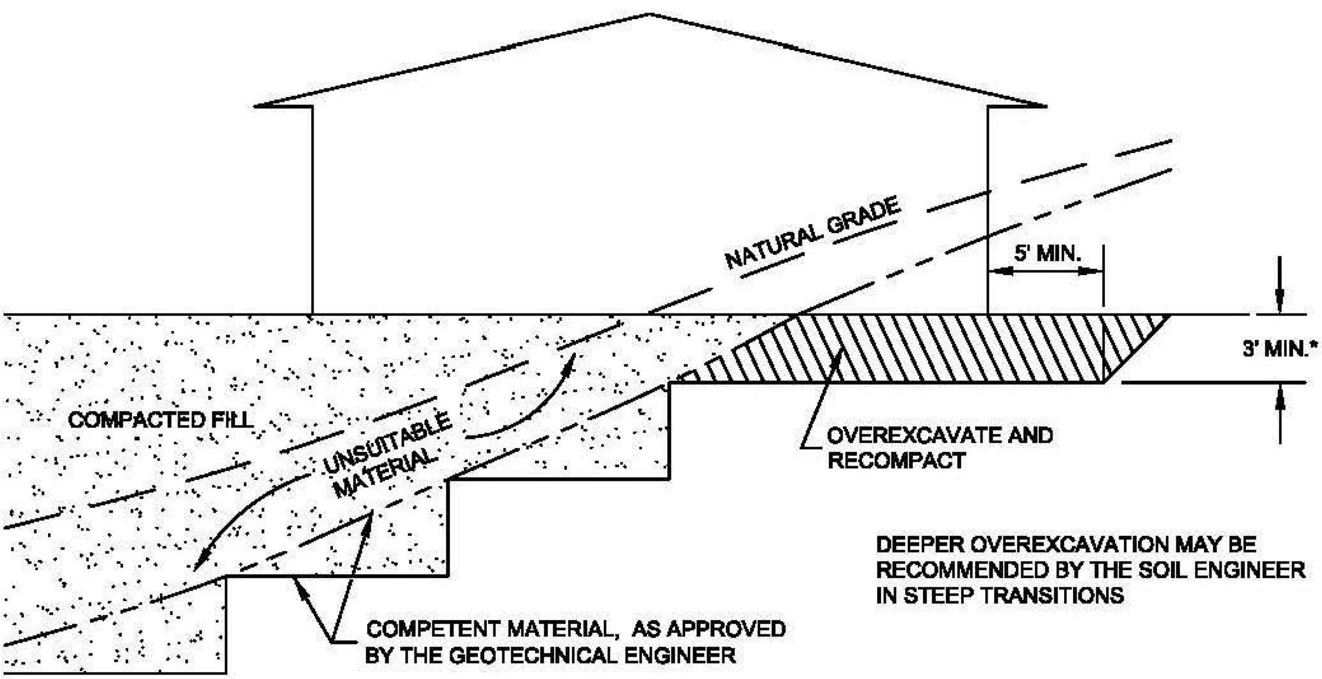
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- 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

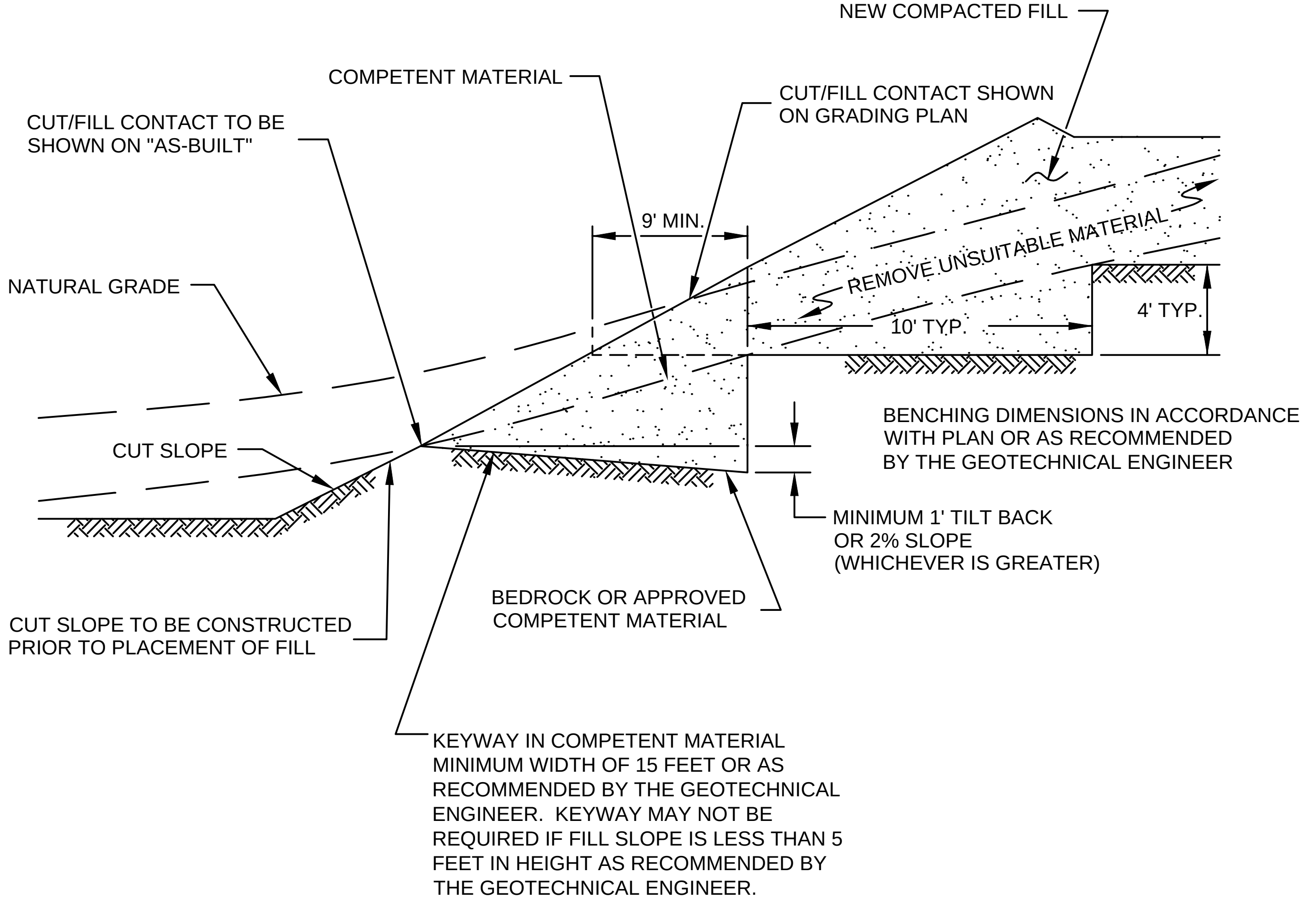
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

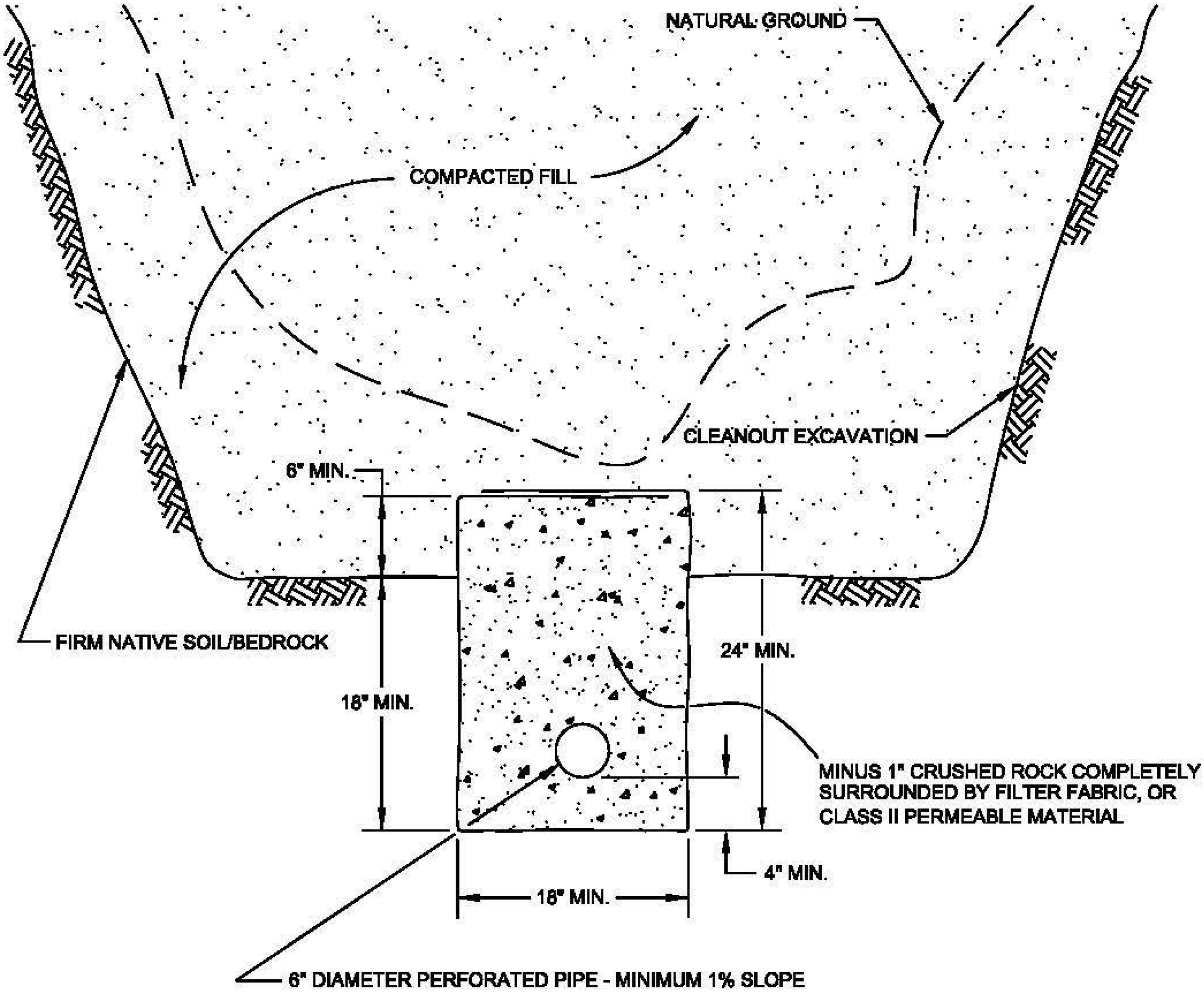
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

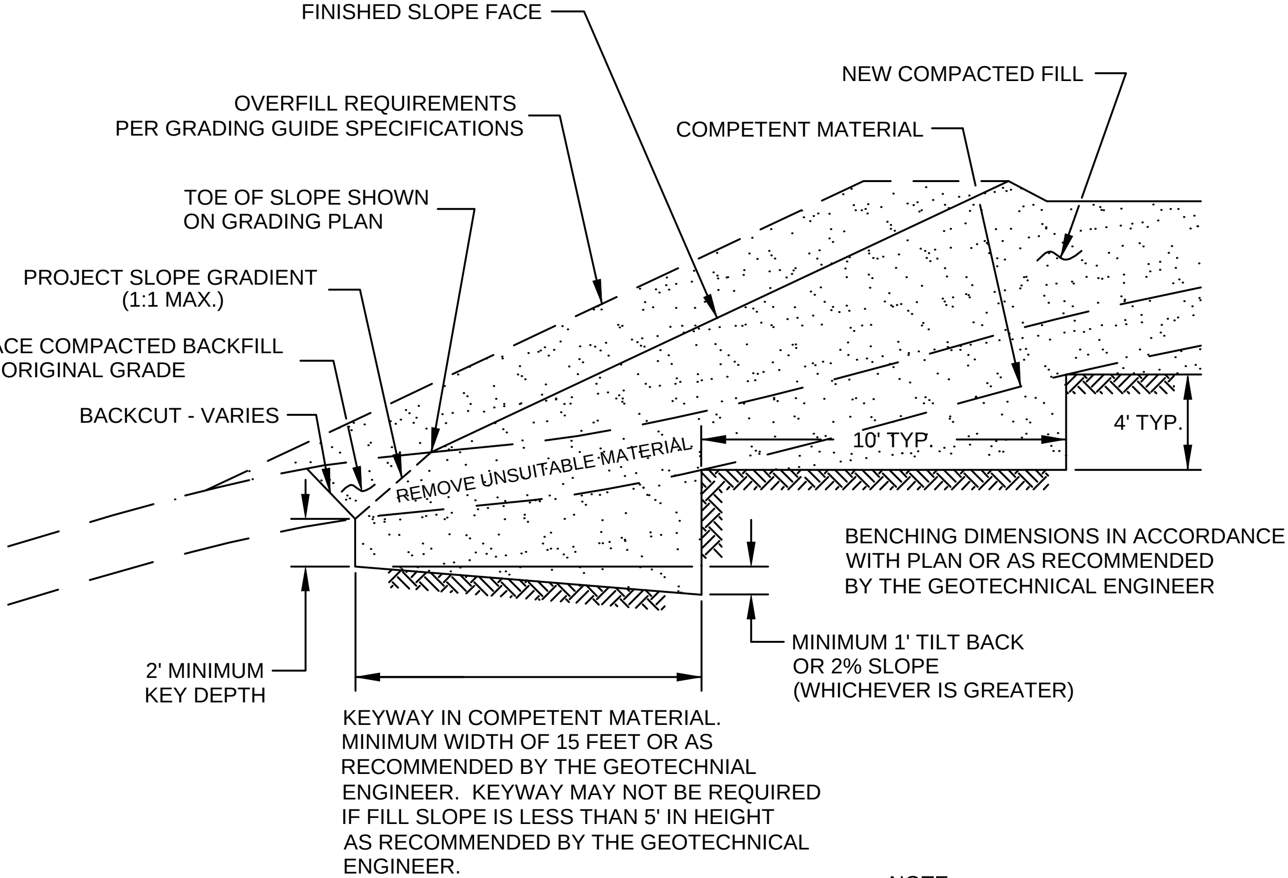
SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



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	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JAS CHKD: GKM	
PLATE D-3	



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

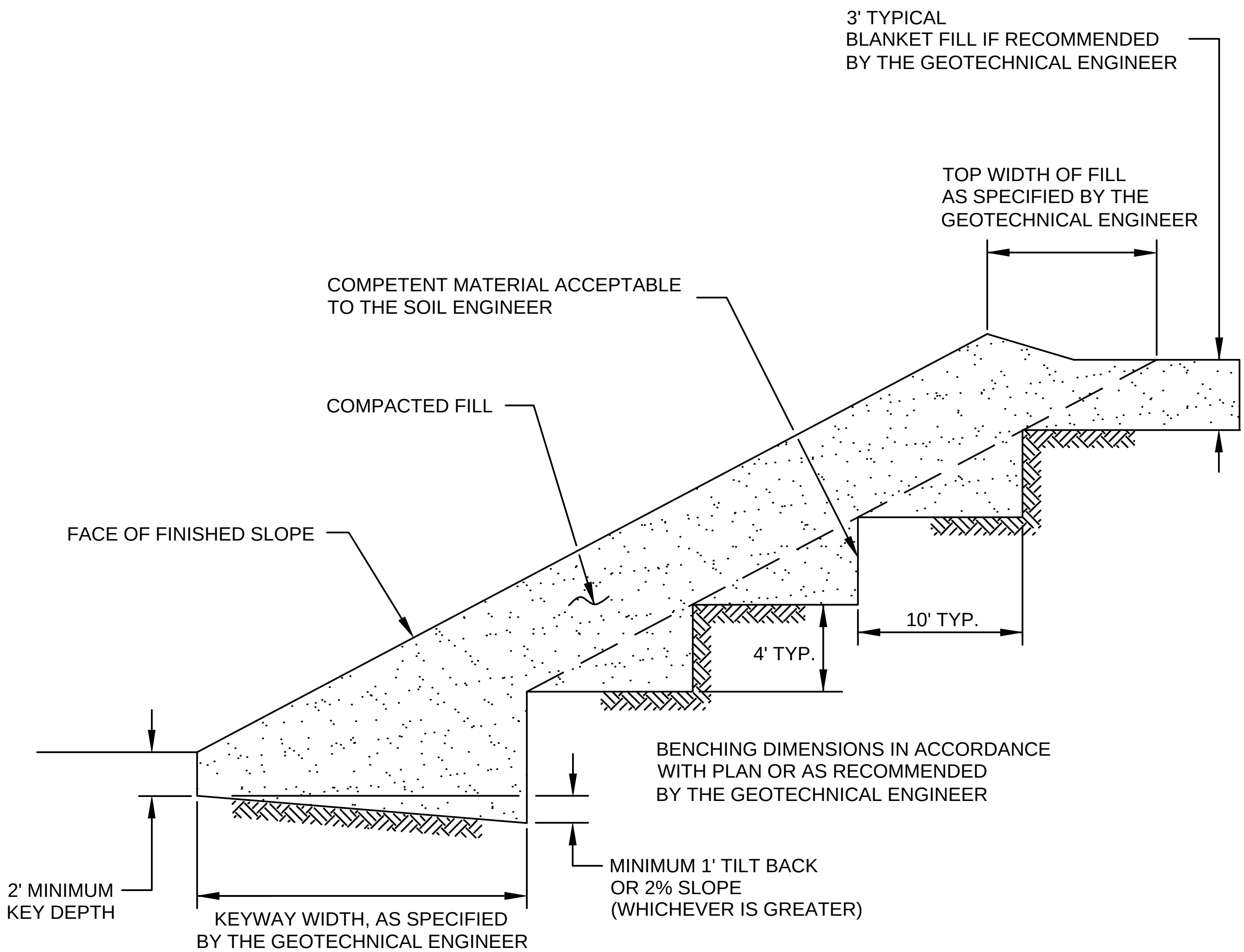
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

GRADING GUIDE SPECIFICATIONS

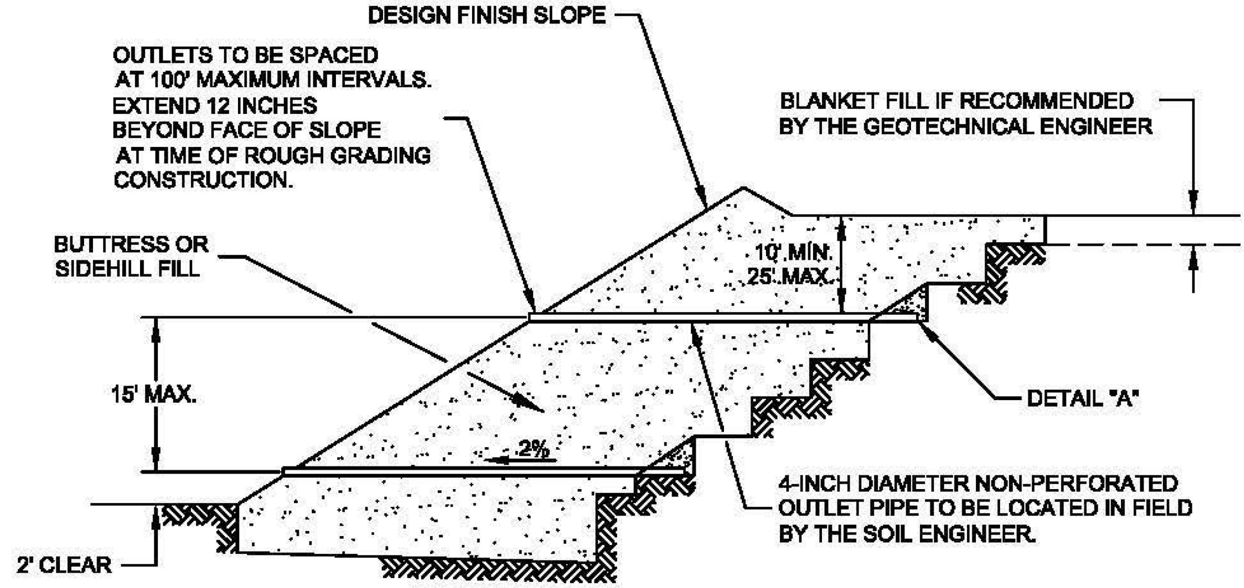
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



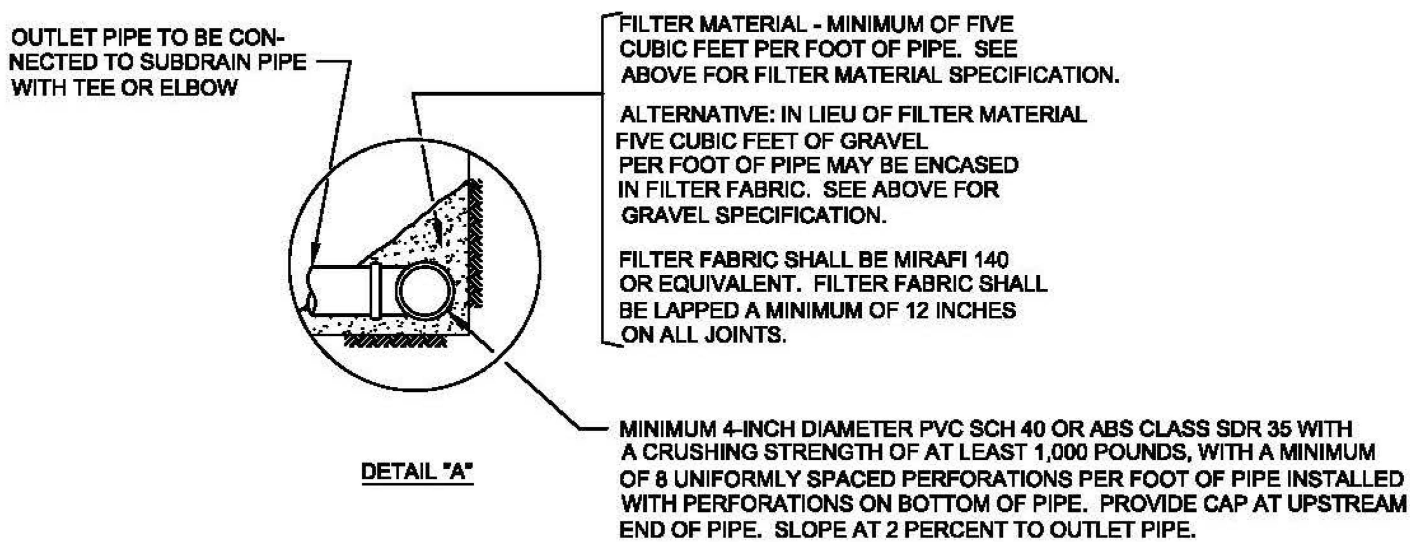
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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

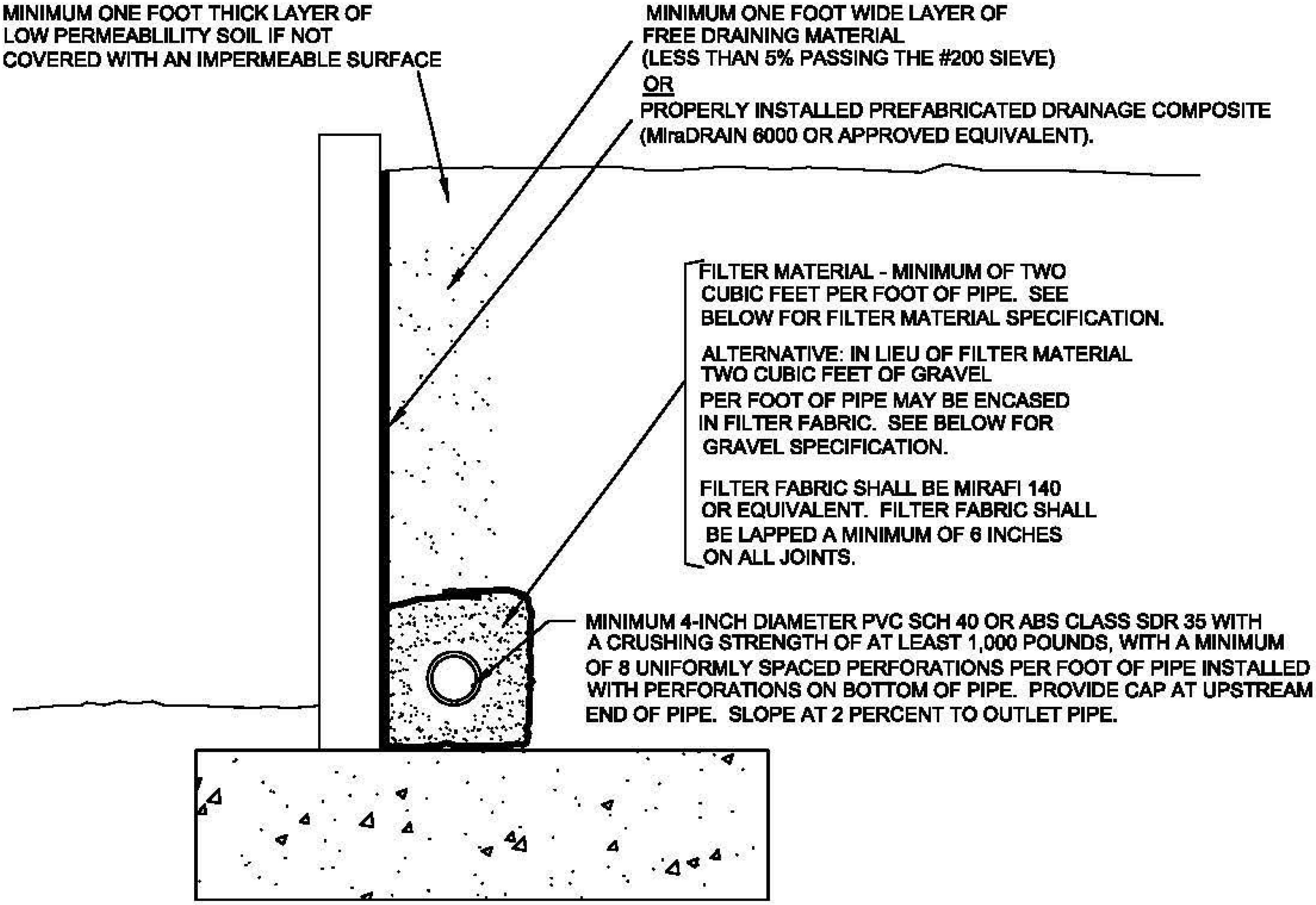
GRADING GUIDE SPECIFICATIONS

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

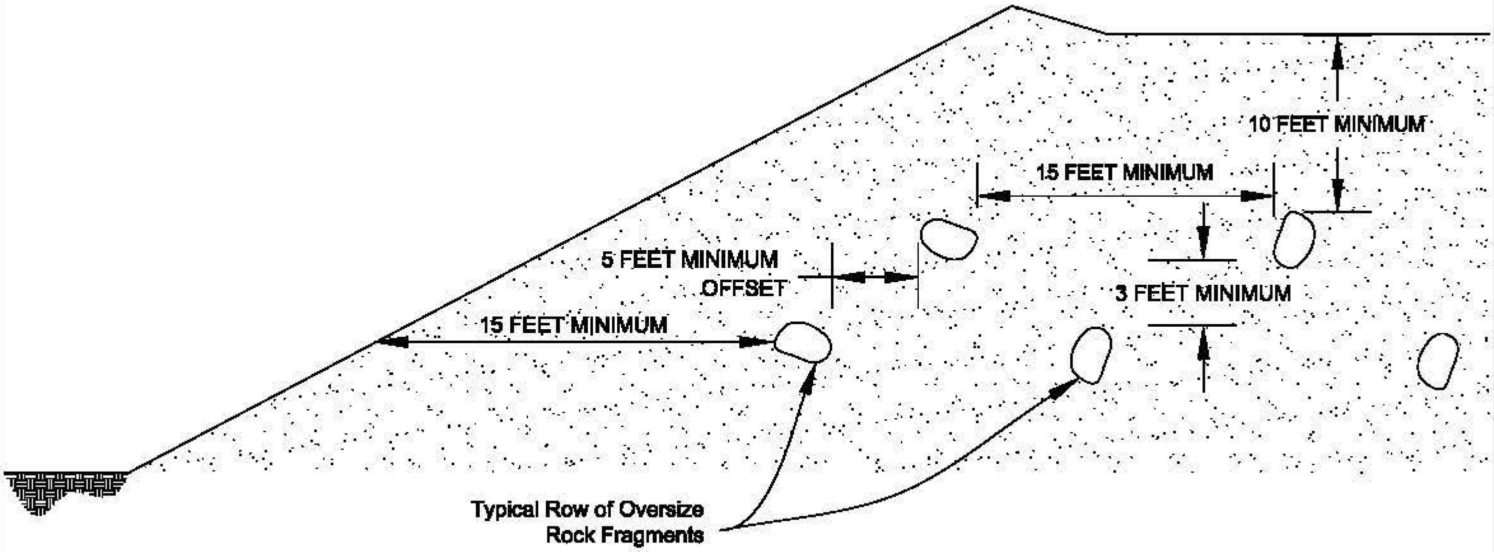
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

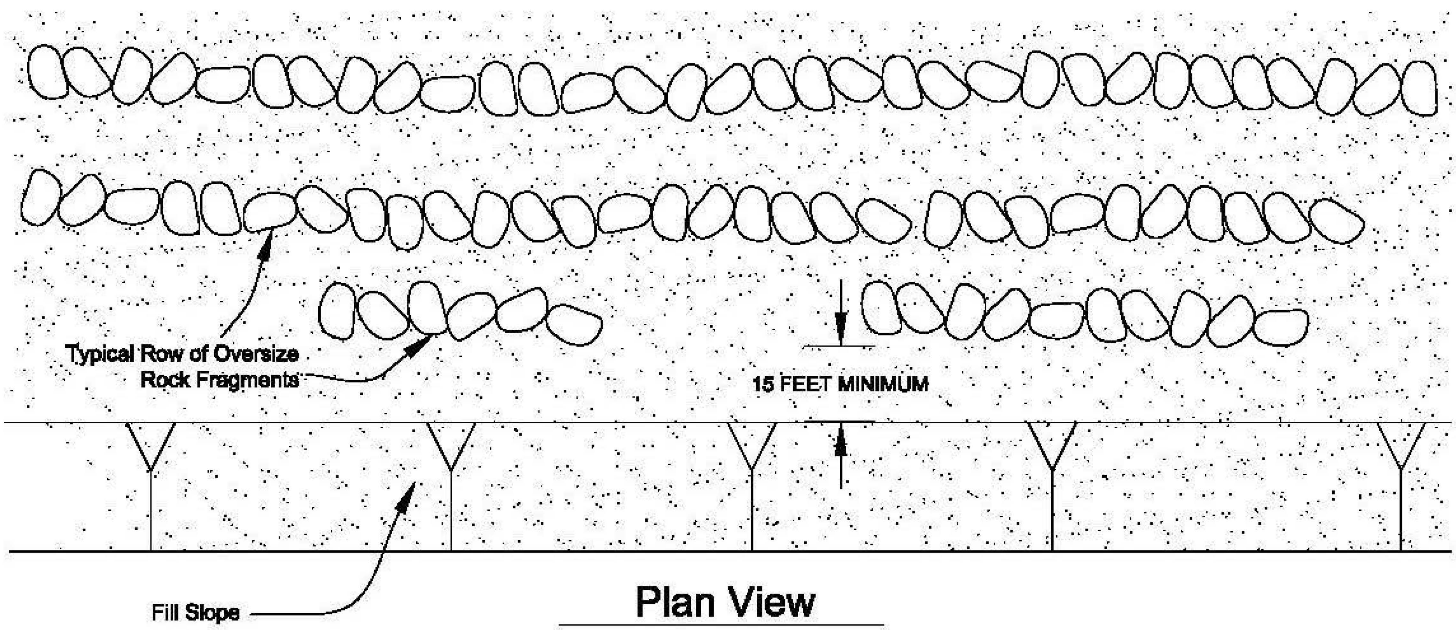
DRAWN: JAS
CHKD: GKM

PLATE D-7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
CHKD: GKM

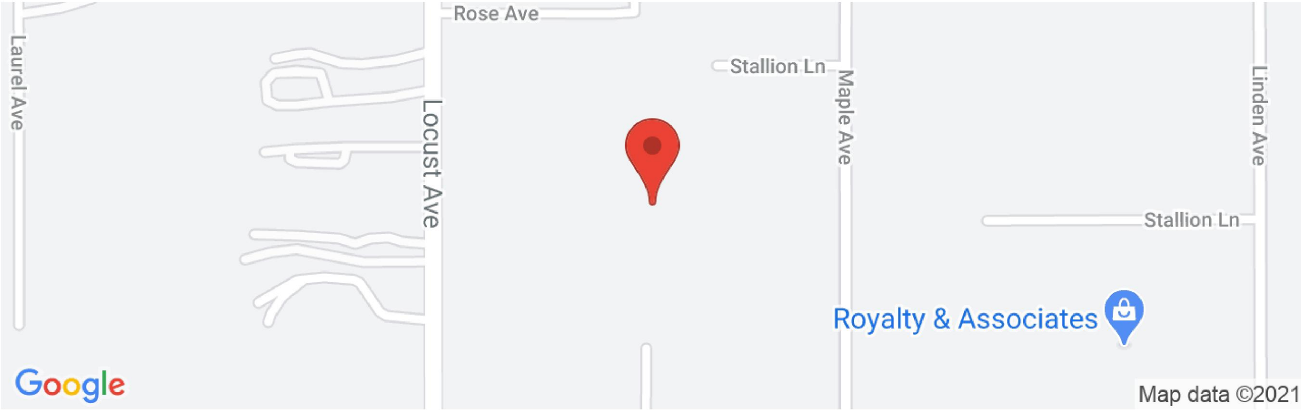
PLATE D-8

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX E

Latitude, Longitude: 34.0515, -117.40714



Date	2/23/2021, 1:15:12 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.5	MCE_R ground motion. (for 0.2 second period)
S_1	0.6	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.5	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1	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	0.616	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.678	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	1.892	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.03	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.716	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.79	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.616	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.932	Mapped value of the risk coefficient at short periods
C_{R1}	0.906	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 COMMERCIAL/INDUSTRIAL BUILDING

BLOOMINGTON, CALIFORNIA

DRAWN: JLL
CHKD: RGT

SCG PROJECT
18G108-4

PLATE E-1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL