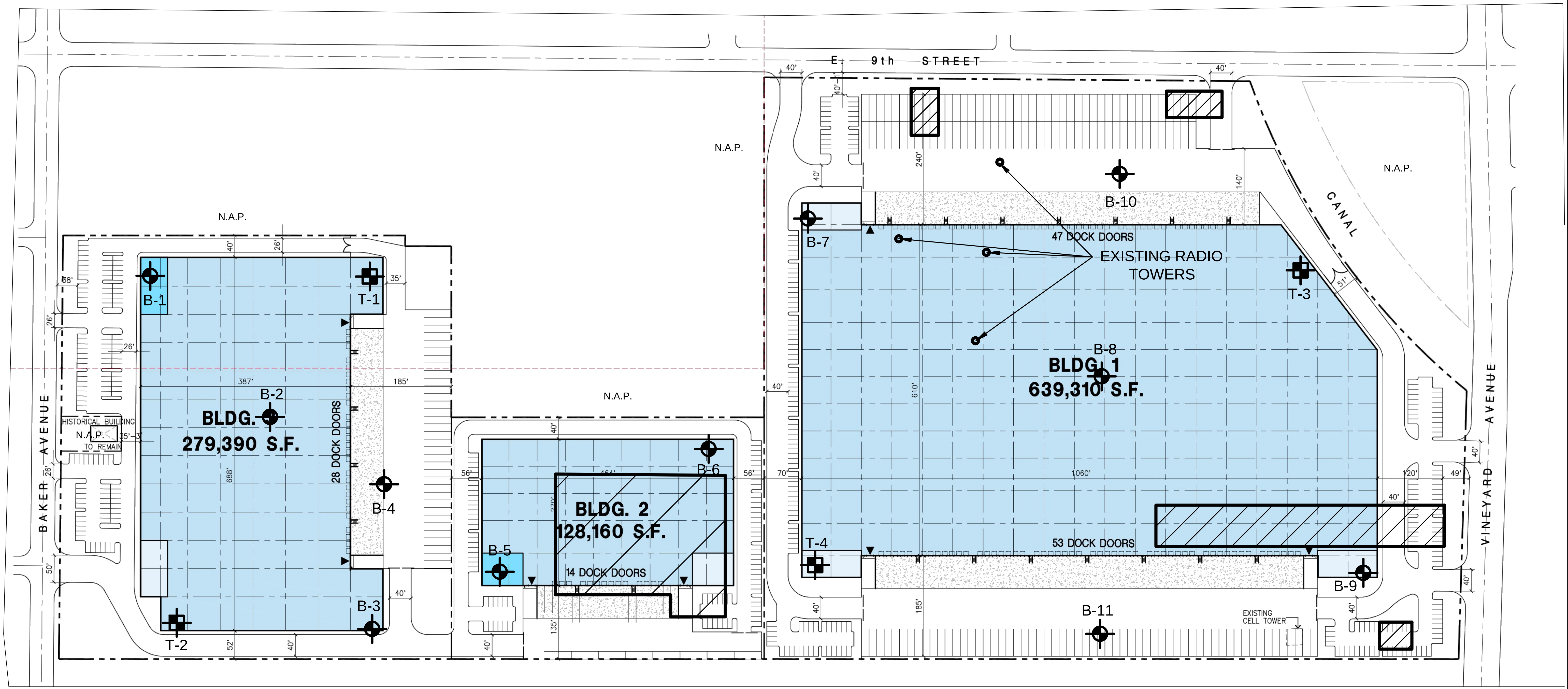
Appendix F

Bore and Trench Locations

Geotechnical Investigations

Letter Report-Response to Geotech

Infiltration Report



GEOTECHNICAL LEGEND

- APPROXIMATE BORING LOCATION
- APPROXIMATE TRENCH LOCATION
- EXISTING BUILDINGS TO BE DEMOLISHED

NORTH
SoCalGeo

NOTE: CONCEPTUAL SITE PLAN PREPARED BY HPA ARCHITECTURE.

BORING AND TRENCH LOCATION PLAN	
PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT	
RANCHO CUCAMONGA, CALIFORNIA	
SCALE: 1" = 180'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: AL CHKD: RGT	
SCG PROJECT 19G121-1	
PLATE 2	

GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

East Side of Baker Avenue, South of 9th Street
Rancho Cucamonga, California
for
Panattoni Development Company, Inc.

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

April 5, 2019

Panattoni Development Company, Inc.
20411 SW Birch Street, Suite 200
Newport Beach, California 92660

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Attention: Mr. Michael Sizemore
Development Manager

Project No.: **19G121-1**

Subject: **Geotechnical Investigation**
Proposed Commercial/Industrial Development
East Side of Baker Avenue, South of 9th Street
Rancho Cucamonga, 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.

Daniel W. Nielsen, RCE 77195
Senior Engineer

Robert G. Trazo, M.Sc., GE 2655
Principal Engineer

Distribution: (1) Addressee

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

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

Geotechnical Design Considerations

- Artificial fill soils were encountered most of the boring and trench locations, extending from the ground surface to depths of 1½ to 8± feet.
- The fill soils and near-surface alluvial soils possess varying strengths and densities. In addition, some of the existing fill soils possess a potential for hydrocollapse. The existing fill soils are considered to represent undocumented fill. These soils, in their present condition, are not considered suitable for support of the foundation loads of the new structures.
- Remedial grading will be necessary to remove the existing fill soils and a portion of the near-surface alluvial soils and replace them as compacted structural fill.

Site Preparation Recommendations

- Initial site stripping should include removal of any surficial vegetation from the site. Stripping should include any weeds, grasses, and any organic top soils.
- Demolition of existing asphalt and concrete pavements will be necessary in the northern portion of the site. Debris resultant from demolition should be disposed of off-site. Alternatively, asphalt debris may be pulverized to a maximum 2-inch particle size, well mixed with the on-site soils, and incorporated into new structural fills. It may also be crushed and made into crushed miscellaneous base (CMB), if desired.
- We recommend that remedial grading be performed within the proposed building areas in order to remove all of the artificial fill soils and a portion of the near-surface alluvium. The soils present within the proposed building areas should be overexcavated to a depth of 5 feet below existing grade and to a depth of at least 3 feet below proposed building pad subgrade elevation. The proposed foundation influence zones should also be overexcavated to a depth of at least 2 feet below proposed foundation bearing grade.
- After overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify any additional soils that should be overexcavated. The resulting soils should be scarified and moisture conditioned to 0 to 4 percent above the optimum moisture content, to a depth of at least 12 inches. 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.
- The new pavement and flatwork subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Foundation Design Recommendations

- Conventional shallow foundations, supported in newly placed compacted fill.
- 2,500 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least two (2) No. 5 rebars (1 top and 1 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

Building Floor Slab Design Recommendations

- Conventional Slabs-on-Grade: minimum 6-inch thickness.
- Modulus of Subgrade Reaction: k = 150 psi/in.
- Reinforcement is not expected to be necessary for geotechnical considerations.
- The actual thickness and reinforcement of the floor slab should be determined by the structural engineer.

Pavement Design Recommendations

ASPHALT PAVEMENTS (R=50)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	3	4	5	5	7
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R=50)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 18P368R4, dated February 26, 2019. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations, building floor slabs, and parking lot pavements along with site preparation recommendations and construction considerations for the proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located on the east side of Baker Avenue, 300± feet south of 9th Street in Rancho Cucamonga, California. The site is bounded to the north by single-family residences, commercial/industrial buildings, and 9th Street, to the west by Baker Avenue, to the south by a railroad easement, and to the east by Vineyard Avenue and a concrete lined channel. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The overall site consists of multiple irregular-shaped parcels, which total 47.03± acres in size. The south-central parcel is developed with a commercial/industrial building, approximately 71,000± ft² in size. The building appears to be a single-story structure of concrete tilt-up construction, supported on conventional shallow foundations with a concrete slab-on-grade floor. The building is surrounded by asphaltic concrete (AC) pavements, which are generally in poor condition with moderate to severe cracking throughout, and areas of crushed aggregate base (CAB) in the southern area of the parcel.

The southeastern parcel is currently occupied by the Scheu Steel Supply Company and is developed with two (2) buildings. One of the buildings is a two-story industrial building, 40,000± ft² in size, located in the east-central area of the parcel. This building is of metal-frame construction and is assumed to be supported on conventional shallow foundations with a concrete slab-on-grade floor. The second building, 2,700± ft² in size, is located in the southeastern area of the parcel and is a single-story structure of wood-frame and stucco construction. The ground surface cover surrounding the buildings consists CAB, AC pavements, and areas of exposed soil. The ground surface cover in the western portion of the parcel consists of exposed soil with moderate native grass and weed growth. An existing cell tower is located in the south-central area of the parcel. Based on our review of historic aerial photographs, the northeastern area of this parcel was previously developed with two (2) single-family residences. However, these photographs indicate that the residential structures were removed by February of 2016.

The northeastern parcel is currently developed with a small commercial/industrial building, 4,000± ft² in size. The building is located in the northern area of the parcel and is surrounded by AC pavements and exposed soils. Numerous stockpiles of green waste including plant foliage, tree trunks, branches, and wood chips are located in the central area of the parcel.

The north-central area of the site is currently developed with a 6,100± ft² two-story building of wood-frame and stucco construction, assumed to be supported on conventional shallow foundations with a concrete slab-on-grade floor. The building is surrounded by concrete pavements and exposed soil. The pavements are generally in fair condition with moderate cracking throughout. Four (4) radio towers are present to the south of the existing building. The ground surface cover surrounding the radio towers and in the remainder of this area consists of exposed soil with moderate to dense native grass and weed growth. Based on our review of historic aerial photographs, the northwestern region of this area of the site was previously developed with three (3) single-family residences. Based on the historical photographs, all three of the residential structures were removed by October of 2016. Two (2) concrete slabs measuring 1,700± and 1,800± ft² remain in this area.

The western area of the site is vacant and undeveloped. The ground surface cover in this area consists of exposed soil and moderate to dense native grass and weed growth. An AC road transects this portion of the site, which generally trends east-to-west. A historical building is present in the west-central area, which is to remain and is not a part of the site.

Detailed topographic information was not available at the time of this report. However, based on topographic information obtained from Google Earth, the site topography ranges from 1,165± feet msl in the northwestern area of the site to 1,130± feet mean sea level (msl) in the southeastern area. The site topography slopes gently downward toward the south-southeast at a gradient of approximately 1± percent.

3.2 Proposed Development

Based on a conceptual site plan (Scheme 5A) provided to our office by the client, the site will be developed with three (3) new commercial/industrial buildings. The buildings will be identified as Buildings 1 through 3. Building 1 will be located in the eastern area of the site and will be 639,310± ft² in size. Building 2 will be located in the central area of the site and will be 128,160± ft² in size. Building 3 will be located in the western area of the site and will be 279,390± ft² in size. The buildings will be constructed with dock-high doors located along a portion of at least one wall of each building. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, with concrete flatwork and landscape planters throughout.

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 foundation systems 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 3 to 5 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 4 to 5± 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 eleven (11) borings advanced to depths of 15 to 25± feet below existing site grades. In addition to the eleven borings, four (4) trenches were excavated at the site to depths of 9 to 10± feet below existing site grades. These trenches were excavated using a backhoe with a 36-inch-wide bucket. All of the borings and trenches were logged during the drilling and excavation by members of our staff.

The borings were advanced with hollow-stem augers, by a truck-mounted drilling rig. Representative bulk and undisturbed soil samples were taken during drilling. Relatively undisturbed 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. 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 (identified as Boring Nos. B-1 through B-11) and trenches (T-1 through T-4) are indicated on the Boring and Trench Location Plan, included as Plate 2 in Appendix A of this report. The Boring and Trench Logs, which illustrate the conditions encountered at the boring and trench locations, as well as the results of some of the laboratory testing, are included in Appendix B.

4.2 Geotechnical Conditions

Artificial Fill

Artificial fill soils were encountered at the ground surface at all of the boring and trench locations, except Boring No. B-5 and Trench Nos. T-2 and T-4, extending to depths of 1 to 8± feet below the existing site grades. The artificial fill soils generally consist of loose to very dense silty fine to medium sands with occasional cobbles and varying amounts of coarse sand and fine to coarse gravel. The fill soils possess a disturbed appearance and some samples contain minor debris, such as asphaltic concrete fragments and string, resulting in their classification as artificial fill.

Alluvium

Native alluvium was encountered at the ground surface at Boring No. B-5, beneath the fill soils at Trench Nos. T-1 and T-3, and beneath the fill soils at the remaining boring and trench locations, extending to at least the maximum depth explored of 25± below the existing site grades. The near-surface alluvial soils encountered at the boring locations generally consist of medium dense to very dense well-graded sands with varying fine to coarse gravel content and occasional to extensive cobbles. Occasional boulders were encountered in the exploratory trenches at depths greater than 6± feet below the ground surface. A loose fine sand stratum was encountered between depths of 3½ and 5 feet at Boring No. B-11.

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 25± feet at the time of the subsurface exploration.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the groundwater depths in this area is the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well in this database is located approximately 2,300 feet southwest from the site. Water level readings within this monitoring well indicate high groundwater levels of 326± feet (January 1989) below the ground surface.

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 and Trench Logs and are periodically referenced throughout this report.

Density and Moisture Content

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

Consolidation

Selected soil samples have been tested to determine their consolidation potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-11 in Appendix C of this report.

Maximum Dry Density and Optimum Moisture Content

A representative bulk sample was tested for its maximum dry density and optimum moisture content. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557 and are presented on Sheets C-12 and C-13 in Appendix C of this report. These tests are generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

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	< 0.001	Not Applicable (S0)
B-5 @ 0 to 5 feet	0.001	Not Applicable (S0)

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 structures 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.

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

Seismic Design Parameters

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2016 edition of the California Building

Code (CBC). The CBC provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site.

The 2016 CBC Seismic Design Parameters have been generated using U.S. Seismic Design Maps, a web-based software application developed by the United States Geological Survey. This software application, available at the USGS web site, calculates seismic design parameters in accordance with the 2016 CBC, utilizing a database of deterministic site accelerations at 0.01 degree intervals. The table below is a compilation of the data provided by the USGS application. A copy of the output generated from this program is included in Appendix E of this report. A copy of the Design Response Spectrum, as generated by the USGS application is also included in Appendix E. Based on this output, the following parameters may be utilized for the subject site:

2016 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	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}	0.900
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.000
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.600

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 Land Use Plan, General Plan, Geologic Hazard Overlays. Map FH28 indicates that the subject site is not located within an area of liquefaction susceptibility. Based on the mapping performed by the county of San Bernardino and the subsurface conditions encountered at the boring locations, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The near surface soils encountered at the boring and trench locations consist of artificial fill soils and native alluvium. The artificial fill soils, where encountered, extend to depths of 1½ to 8± feet below the existing site grades. The fill soils possess variable strengths and densities and based on the results of consolidation/collapse testing, some of the fill materials possess a significant potential for hydrocollapse when inundated with water. Based on these considerations, and a lack of documentation of the placement and compaction of these soils, the existing fill materials are considered to consist of undocumented fill, unsuitable for the support of the proposed structure. The near surface alluvium also possesses variable strengths, densities, and composition. Therefore, remedial grading is considered warranted within the proposed building areas in order to remove all of the undocumented fill soils in their entirety as well as the upper portion of the near-surface native alluvial soils and replace them as compacted fill soils.

Settlement

The recommended remedial grading will remove the existing undocumented fill soils and a portion of the near-surface native alluvial soils and replace these materials as compacted structural fill. The native soils that will remain in place below the recommended depth of overexcavation will not be subject to significant stress increases from the foundations of the new structures. Therefore, following completion of the recommended grading, post-construction settlements are expected to be within tolerable limits.

Expansion

The near-surface soils encountered at the boring locations consist of silty sands underlain by well graded sands. These materials have been visually classified as very low to non-expansive. Therefore, no design considerations related to expansive soils are considered warranted for this site.

Soluble Sulfates

The results of the soluble sulfate testing indicate that the selected samples of the on-site soils to correspond to Class S0 with respect to the American Concrete Institute (ACI) Publication 318-14 Building Code Requirements for Structural Concrete and Commentary, Section 4.3. Therefore, specialized concrete mix designs are not considered to be necessary, with regard to sulfate protection purposes. It is, however, recommended that additional soluble sulfate testing be conducted at the completion of rough grading to verify the soluble sulfate concentrations of the soils which are present at pad grade within the building areas.

Shrinkage/Subsidence

Based on the results of the laboratory testing, removal and recompaction of the loose to dense near-surface soils, extending to depths of 3 to 6± feet, is estimated to result in an average shrinkage of 5 to 12 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. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test-pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

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

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

Grading and Foundation Plan Review

Grading and foundation plans were not available at the time of this report. It is therefore recommended that we be provided with copies of the preliminary 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 from the site. Stripping should include any grass and weed growth as well as any organic top soils. The actual extent of site stripping should be determined in the field by the geotechnical engineer, based on the organic content and stability of the materials encountered.

The proposed development will require demolition of the existing buildings and pavements. Additionally, any existing improvements that will not remain in place for use with the new development should be removed in their entirety. This should include all foundations, floor slabs, utilities, and any other subsurface improvements associated with the existing structures. The existing pavements are not expected to be reused with the new development. Debris resultant from demolition should be disposed of offsite. Alternatively, concrete and asphalt debris may be pulverized to a maximum 2-inch particle size, well mixed with the on-site soils, and incorporated into new structural fills. It may also be crushed and made into crushed miscellaneous base (CMB), if desired.

Treatment of Existing Soils: Building Pads

Remedial grading should be performed within the proposed building pad areas in order to remove any soils disturbed during demolition, the existing undocumented fill soils, and the upper portion of the near-surface native alluvium. Based on conditions encountered at the boring and trench locations, we recommend that the existing soils within the proposed building areas be overexcavated to a depth of at least 5 feet below existing grade and to a depth of at least 3 feet below proposed building pad subgrade elevations, whichever is greater. **The depth of the overexcavation should also extend to a depth sufficient to remove all undocumented fill soils**. The undocumented fills extend to depths of 1½ to 8± feet and most of the boring and trench locations. Additional overexcavation should be performed within the influence zones of the new foundations, to provide for a new layer of compacted structural fill extending to a depth of at least 2 feet below proposed bearing grades.

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

Following completion of the overexcavation, the subgrade soils within the overexcavation areas should be evaluated by the geotechnical engineer to verify their suitability to serve as the structural fill subgrade, as well as to support the foundation loads of the new structures. 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 and 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 proposed retaining and non-retaining site walls should be overexcavated to a depth of at least 2 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pads. Any undocumented fill soils within any of these foundation areas should be removed in their entirety. The overexcavation areas should extend at least 5 feet beyond the foundation perimeters, and to an extent equal to the depth of fill below the new foundations. Any erection pads for tilt-up concrete walls are considered to be part of the foundation system. Therefore, these overexcavation recommendations are applicable to erection pads. 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 areas. The previously excavated soils may then be replaced as compacted structural fill.

If the recommended remedial grading can not be completed for screen walls located along property lines, such walls should be designed for a reduced allowable bearing pressure. The allowable bearing pressure will be determined based on the actual extent of remedial grading that can be accomplished.

Treatment of Existing Soils: Flatwork, Parking and Drive Areas

Based on economic considerations, overexcavation of the existing near-surface existing soils in the new flatwork, 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 flatwork, 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 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 flatwork, parking and drive areas assume that the owner and/or developer can tolerate minor amounts of settlement within the proposed flatwork, parking and drive areas. The grading recommendations presented above do not completely mitigate the extent of existing fill soils that may be present in the flatwork, parking and drive areas. As such, some 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 flatwork, 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 2016 CBC and the grading code of the city of Rancho Cucamonga.
- 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.

Selective Grading and Oversized Material Placement

The near-surface soils possess varying cobble content in the upper 6± feet below the existing site grades. At greater depths, the near surface soils possess extensive cobble content and occasional boulders. It is expected that conventional scrapers will be adequate to move the cobble-containing soils. Depending upon the depths of cuts and fills necessary to achieve the proposed site grades, site grading may require excavation of cobble-containing soils and it may be desirable to selectively grade within the proposed building pad area. The presence of particles greater than 3 inches in diameter within the upper 1 to 3 feet of the building pad subgrade will impact the utility and foundation excavations. Depending on the depths of fills required within the proposed parking areas, it may be feasible to sort the on-site soils, placing the materials greater than 3 inches in diameter within the lower depths of the fills, and limiting the upper 1 to 3 feet of soils to materials less than 3 inches in size. Oversized materials could also be placed within the lower depths of the recommended overexcavations. In order to achieve this grading, it would likely be necessary to use rock buckets and/or rock sieves to separate the oversized materials from the remaining soil. Although such selective grading will facilitate further construction activities, it is not considered mandatory and a suitable subgrade could be achieved without such extensive sorting. However, in any case it is recommended that all materials greater than 6 inches in size be excluded from the upper 1 foot of the surface of any compacted fills. The placement of any oversized materials should be performed in accordance with the grading guide specifications included in Appendix D of this report.

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. 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 the city of Rancho Cucamonga. 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 silty sands underlain by well graded sands and gravelly sands. These materials will likely be subject to minor to moderate caving within shallow excavations. Where caving does occur, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, the inclination of temporary slopes should not exceed 2h:1v. 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.

Based on the current site plan, the southern and western walls of the proposed building will be located 15± feet away for the south and west property lines, respectively. Depending upon the proposed grading in this area, it may be challenging to complete the lateral extent of overexcavation if deep cuts are required or if the proposed building location is relocated closer to either of these property lines. Because the soils are granular and prone to caving, temporary slopes should not exceed an inclination of 2h:1v, as discussed above. Depending upon the subsurface conditions encountered during remedial grading procedures, slot cutting may be necessary. The initial phase of excavation is expected to consist of a 2h:1v temporary slope. Small slot cuts may be made at the base of this inclined slope in order to remove all existing low strength, potentially collapsible soils from within the foundation influence zones and to provide the new layer of compacted structural fill beneath the proposed building foundations. The remainder of the proposed building pad area may be overexcavated using conventional grading techniques.

Groundwater

The static groundwater table is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration. 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 pads will be underlain by structural fill soils used to replace the existing fill soils and a portion of the near-surface alluvial soils. These new structural fill soils are expected to extend to depths of at least 2 feet below proposed foundation bearing grade, underlain by 1± foot of additional soil that has been scarified, moisture conditioned, and recompacted. Based on this subsurface profile, the proposed structures may be supported on conventional shallow foundations.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

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

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

- Minimum longitudinal steel reinforcement within strip footings: 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 geotechnical considerations; additional reinforcement 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 of 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 slabs and the passive earth pressure developed by footings below grade. The following friction and passive pressure may be used to resist lateral forces:

- Passive Earth Pressure: 300 lbs/ft^3
- Friction Coefficient: 0.30

These are allowable values, and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill soils. The maximum allowable passive pressure is 3,000 lbs/ft^2.

6.6 Floor Slab Design and Construction

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

- Minimum slab thickness: 6 inches.

- Modulus of Subgrade Reaction: k = 150 psi/in.

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

- Moisture condition the floor slab subgrade soils to 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 slabs should be completed by the structural engineer to verify adequate thickness and reinforcement.

6.7 Retaining Wall Design and Construction

Although not indicated on the site plan, some small (less than 6 feet in height) retaining walls may be required to facilitate the new site grades. The parameters recommended for use in the design of these walls are presented below.

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. The following parameters assume that only the on-site soils will be utilized for retaining wall backfill. The near-surface soils generally consist of silty sands. Based on their composition, the on-site soils have been assigned a friction angle of 30 degrees.

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

RETAINING WALL DESIGN PARAMETERS

Design Parameter		Soil Type
		On-site Silty Sands
Internal Friction Angle (ϕ)		30°
Unit Weight		130 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	43 lbs/ft^3
	Active Condition (2h:1v backfill)	70 lbs/ft^3
	At-Rest Condition (level backfill)	65 lbs/ft^3

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 2016 CBC, any retaining walls more than 6 feet in height must be designed for seismic lateral earth pressures. If walls 6 feet or more are required for this site, the geotechnical engineer should be contacted for supplementary seismic lateral earth pressure recommendations.

Retaining Wall Foundation Design

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

Backfill Material

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

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

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

Subsurface Drainage

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

- A weep hole drainage system typically consisting of a series of 4-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 8-foot on-center spacing. The weep holes should include a 2 cubic foot pocket of open graded gravel, surrounded by an approved geotextile fabric, at each weep hole location.

- A 4-inch diameter perforated pipe surrounded by 2 cubic feet of gravel per linear foot of drain placed behind the wall, above the retaining wall footing. The gravel layer should be wrapped in a suitable geotextile fabric to reduce the potential for migration of fines. The footing drain should be extended to daylight or tied into a storm drainage system.

6.8 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 silty sands. These soils are generally considered to possess excellent pavement support characteristics, with R-values in the range of 50 to 60. The subsequent pavement design is therefore based upon an assumed R-value of 50. 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 to verify that the pavement design recommendations presented herein are valid.

Asphaltic Concrete

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

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

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

ASPHALT PAVEMENTS (R=50)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	3	4	5	5	7
Compacted Subgrade	12	12	12	12	12

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

Portland Cement Concrete

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

PORTLAND CEMENT CONCRETE PAVEMENTS (R=50)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

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

7.0 GENERAL COMMENTS

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

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

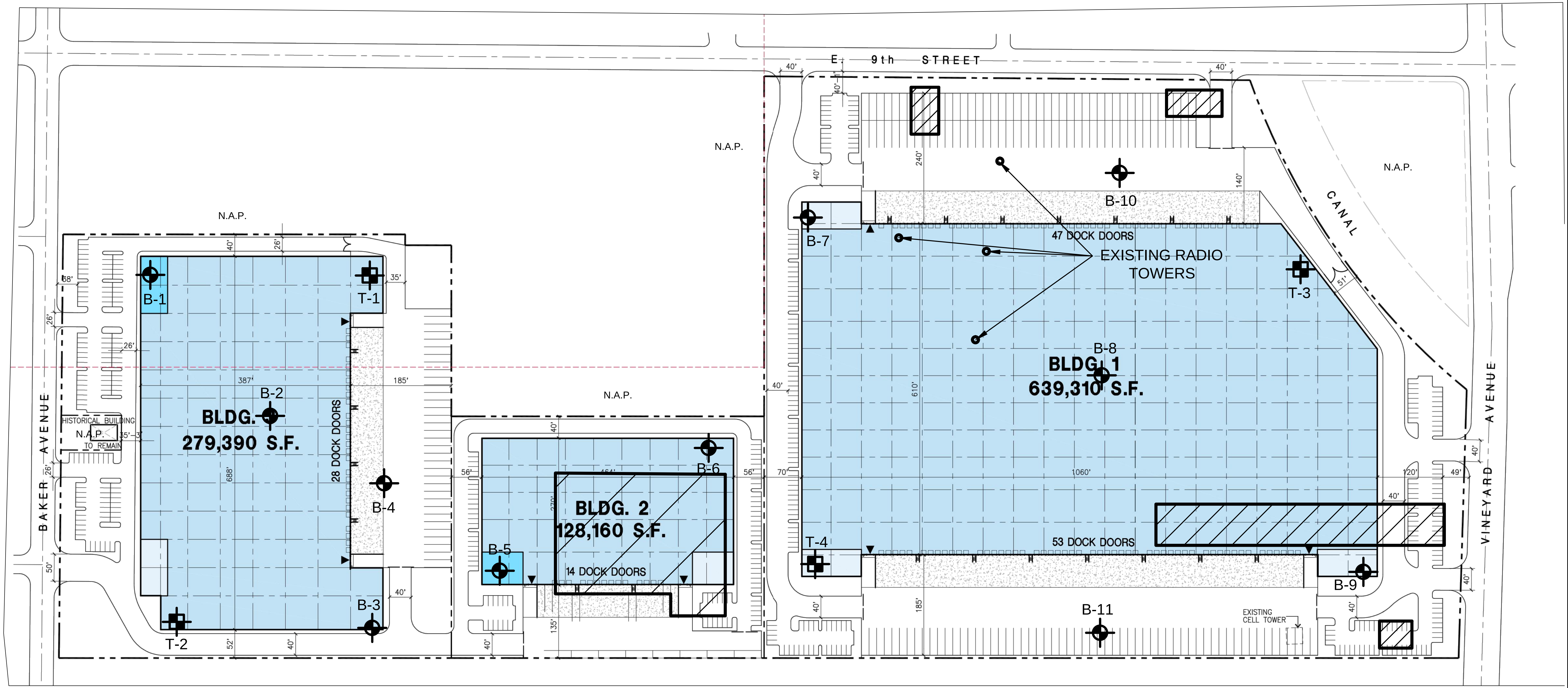
This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development.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

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

APPENDIX A

SOURCE: SAN BENARDINO COUNTY THOMAS GUIDE, 2013

SITE LOCATION MAP	
PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT	
RANCHO CUCAMONGA, CALIFORNIA	
SCALE: 1" = 2400'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: OS CHKD: RGT	
SCG PROJECT 19G121-1	
PLATE 1	



GEOTECHNICAL LEGEND

- APPROXIMATE BORING LOCATION
- APPROXIMATE TRENCH LOCATION
- EXISTING BUILDINGS TO BE DEMOLISHED

NOTE: CONCEPTUAL SITE PLAN PREPARED BY HPA ARCHITECTURE.

BORING AND TRENCH LOCATION PLAN

PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

SCALE: 1" = 180'

DRAWN: AL
CHKD: RGT

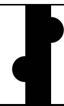
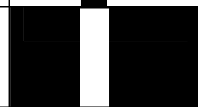
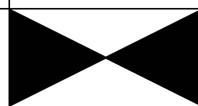
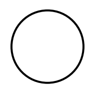
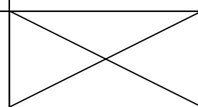
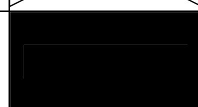
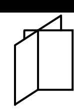
SCG PROJECT 19G121-1

PLATE 2

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX B

BORING LOG LEGEND

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

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

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

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

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

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

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

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

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

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

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

SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING NO. B-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

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

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
	X	20			FILL: Dark Brown Silty fine to medium Sand, trace coarse Sand, little fine to coarse Gravel, occasional Cobbles, medium dense-damp	113	8					
	X	49			ALLUVIUM: Brown to Light Brown fine to coarse Sand, some Cobbles, dense to very dense-dry to damp	116	8					
5	X	28				117	4					
	X	50/4"				122	2					
10	X	50/2"					3					Distrubed Sample
15	X	97/8"					2					
20	X	50/5"					2					
25	X	63					4					
					Boring Terminated at 25'							

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-2

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

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

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Gray Brown Gravel fine to coarse Sand, little Silt, occasional Cobbles, dense-damp							
	X	42					4					
	X	50/3"					4					
5					ALLUVIUM: Light Brown to Brown Gray fine to coarse Sand, extensive Cobbles, trace Silt, very dense-dry to damp							
	X	54					3					
	X	69					2					
10												
	X	50/3"					2					
15					Boring Terminated at 15'							

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
SoCalGeo
A California Corporation

BORING NO. B-3

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

WATER DEPTH: Dry
CAVE DEPTH: 10 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Dark Brown Silty fine to medium Sand, trace coarse Sand, little fine to coarse Gravel, occasional Cobbles, loose, moist							
	X	13				80	9					
					FILL: Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel, loose, moist							
	X	9				102	9					
5	X	23				109	12					
					ALLUVIUM: Brown fine to coarse Sand, extensive Cobbles, very dense-dy to damp							
	X	50/5"				115	3					
	X	42				105	2					
10												
	X	50/2"					1					
15												
	X	50/4"					2					
20					Boring Terminated at 20'							

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

WATER DEPTH: Dry
CAVE DEPTH: 8 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Dark Brown little Silty fine to coarse Sand, trace fine to coarse Gravel, very dense-moist							
	X	55					9					
					FILL: Brown Silty fine Sand to fine Sandy Silt, trace medium Sand, trace fine Gravel, dense to very dense-dry to damp							
	X	32					4					
5												
	X	50/4"					2					
					ALLUVIUM: Light Gray Brown fine to coarse Sand, some fine Gravel, extensive Cobbles, very dense-dry to damp							
	X	51					2					
10												
	X	50/3"										No Sample Recovered
15												
	X	71					1					
20												
					Boring Terminated at 20'							

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-5

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

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

SURFACE ELEVATION: --- MSL

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
	X	37			ALLUVIUM: Light Gray Brown fine to coarse Sand, little fine Gravel, trace Silt, trace Aspaltic Concrete fragments, dense-damp		3					
	X	29			Light Gray Brown fine to coarse Sand, trace Silt, some fine to coarse Gravel, medium dense to very dense-dry to damp		2					
5												
	X	48					3					
	X	39					1					
10												
	X	50/5"					1					
15												
					Boring Terminated at 15'							

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-6

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

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

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					3.5 inches Asphaltic Concrete, no discernible Aggregate Base							
	X	76			FILL: Dark Brown Silty fine Sand, trace Asphaltic Concrete fragments, very dense-moist	122	11					
					ALLUVIUM: Gray Brown fine to coarse Sand, some fine Gravel, occasional Cobbles, very dense-damp							
	X	50				104	4					
					Light Brown fine to coarse Sand, occasional to extensive Cobbles, some fine Gravel, medium to dense-dry to damp							
5	X	33				125	2					
	X	34				125	5					
	X	63				122	3					
10												
	X	48					2					
15												
	X	39					2					
20					Boring Terminated at 20'							

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-7

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

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

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
0				FILL: Dark Brown Silty fine Sand, trace fine root fibers, trace little fine Gravel, molted, occasional Cobbles, dense-damp to moist							
	X	65				8					Disturbed Sample
	X	47			101	11					
5	X	38			121	4					
	X	50/4"		Brown fine to coarse Sand, little fine Gravel, some Cobbles, very dense-damp	95	6					
	X	66		ALLUVIUM: Light Brown fine to coarse Sand, extensive Cobbles, trace to little Silt, some fine to coarse Gravel, dense to very dense-dry to damp	117	2					
10											
	X	57				2					
15											
	X	63				4					
20											
	X	50/2"				2					
25				Boring Terminated at 25'							

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-8

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

WATER DEPTH: Dry
CAVE DEPTH: 7 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Dark Brown fine to coarse Sand, molted, occasional Cobbles, trace fine root fibers, little Silt, medium dense-very moist							
		27				110	18					
		26				88	13					
					ALLUVIUM: Light Brown fine to coarse Sand, occasional Cobbles, very dense-moist							
5		77/9"				119	10					
					Light Gray to Brown fine to coarse Sand, occasional Cobbles, little fine Gravel, medium dense-damp							
		25				108	7					
		28				123	5					
10												
					Light Gray fine to coarse Sand, some fine to coarse Gravel, dense to very dense-damp							
		43					5					
15												
		50/3"					4					
20												

Boring Terminated at 20'

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-9

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

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

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					3 inches Asphaltic Concrete, no discernible Aggregate Base							
					FILL: Gray Brown fine to medium Sand, trace coarse Sand, little Silt, trace fine Gravel, medium dense-damp							
	X	17				105	5					
	X	10				100	6					
5					FILL: Dark Brown Silty fine Sand, little medium to coarse Sand, trace fine to coarse Gravel, loose, damp							
	X	10				112	7					
					ALLUVIUM: Light Gray Brown fine to coarse Sand, some fine to coarse Gravel, occasional Cobble, dense-dry to damp							
	X	55				115	3					
	X	37				118	2					
10												
	X	50/9"					2					
15												
	X	50/4"					2					
20												
					Brown Silty fine Sand, little medium to coarse Sand, trace fine Gravel, medium dense-moist							
	X	20					13					
25												

Boring Terminated at 25'

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

TEST BORING LOG

BORING NO. B-10

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/6/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

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

SURFACE ELEVATION: --- MSL

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Dark Brown fine to medium Sand, little Silt, trace fine to coarse Gravel, medium dense-moist							
	X	11					10					
					ALLUVIUM: Gray Brown fine to coarse Sand, some fine to coarse Gravel, occasional to extensive Cobbles, dense to very dense-dry to damp							
	X	35					2					
5												
	X	82/8"					3					
	X	43					4					
10												
	X	42					4					
15												
					Gray Brown to Brown fine to coarse Sand, trace Silt, trace to little fine to coarse Gravel, dense-damp							
	X	37					6					
20												

Boring Terminated at 20'

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

BORING NO. B-11

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 19G121
PROJECT: Proposed C/I Development
LOCATION: Rancho Cucamonga, California

DRILLING DATE: 3/16/19
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Anthony Luna

WATER DEPTH: Dry
CAVE DEPTH: 11 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Dark Brown fine to medium Sand, trace fine Gravel, little Silt, medium dense-damp							
	X	16					7					
	X	9			ALLUVIUM: Brown to Dark Brown fine Sand, trace medium Sand, trace fine Gravel, loose to medium dense-moist		10					
5												
	X	13					9					
	X	15			ALLUVIUM: Light Gray Brown fine couse Sand, trace to little fine Gravel, medium dense-damp		3					
10												
					Light Brown fine to course Sand, some fine to course Gravel, occasional Cobble, dense to very dense-dry to damp							
	X	33					2					
15												
	X	71/9"					2					
20					Boring Terminated at 20'							

TBL 19G121.GPJ SOCALGEO.GDT 4/8/19

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-1

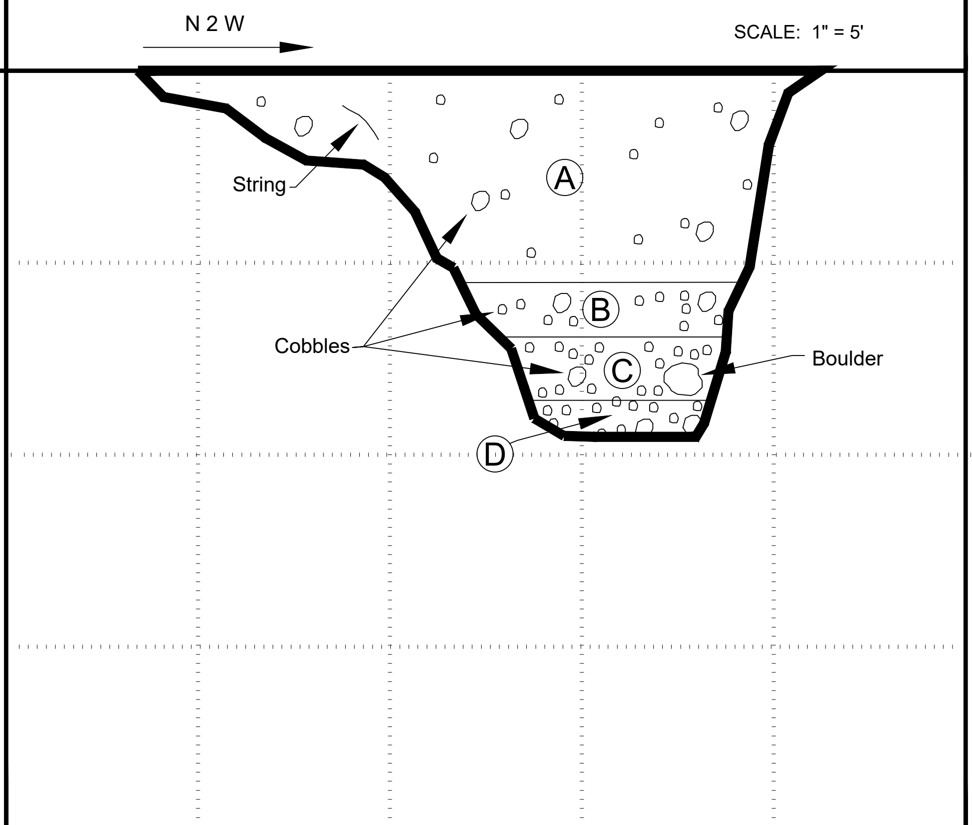
JOB NO.: 19G121-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, CA
DATE: 3-11-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: N 2 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		7	A: FILL: Brown Silty fine to medium Sand, little coarse Sand, little fine to coarse Gravel, occasional Cobbles, trace String, trace fine root fibers, medium dense - damp @ 0 to 1 foot, abundant fine root fibers
5				
	b		4	B: ALLUVIUM: Light Gray Gravelly fine to coarse Sand, occasional to extensive Cobbles, dense - damp
				C: ALLUVIUM: Gray Brown fine to coarse Sandy Gravel, extensive Cobbles, occasional Boulders, very dense - damp
	b		4	D: ALLUVIUM: Light Gray Brown Gravelly fine to coarse Sand, extensive Cobbles, trace Silt, dense - damp
10				Trench Terminated @ 9.5 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-12

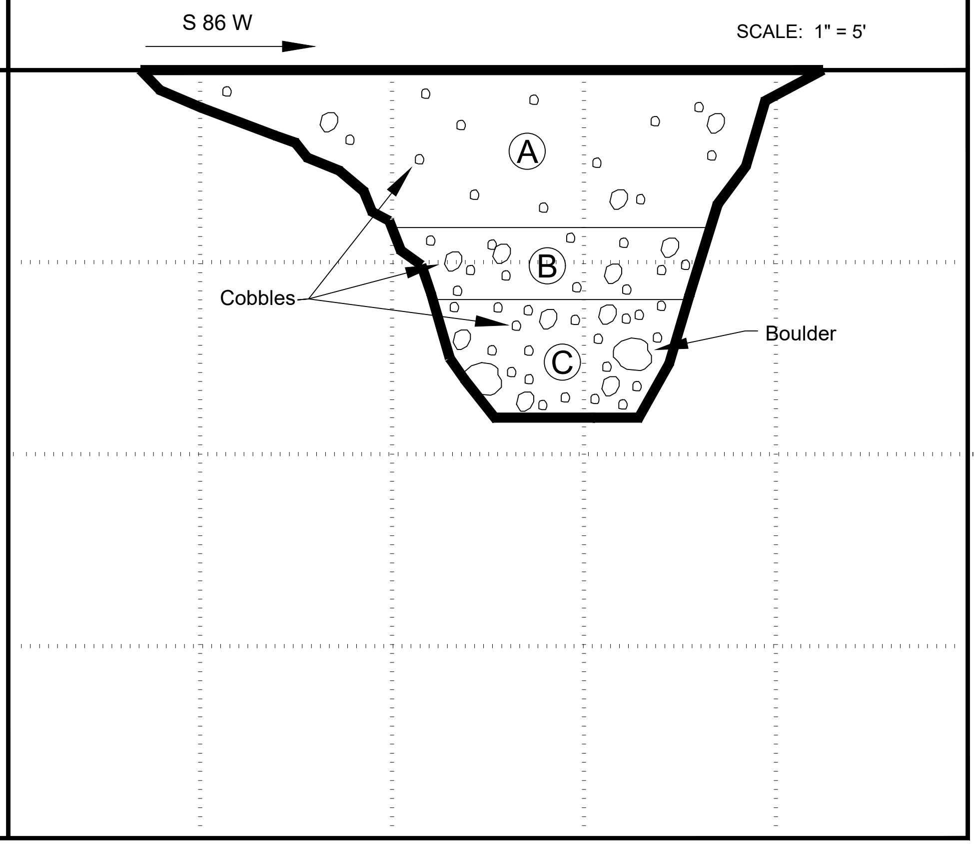
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-2

JOB NO.: 19G121-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Commercial/Industrial Development	LOGGED BY: Scott McCann	SEEPAGE DEPTH: Dry
LOCATION: Rancho Cucamonga, CA	ORIENTATION: S 86 W	READINGS TAKEN: At Completion
DATE: 3-11-2019	ELEVATION:	

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		6	A: ALLUVIUM: Brown Silty fine to medium Sand, little coarse Sand, trace to little fine to coarse Gravel, occasional Cobbles, trace fine root fibers, loose to medium dense - damp @ 0 to 1 foot, abundant fine root fibers
5	b		7	B: ALLUVIUM: Gray Brown fine to medium Sand, little coarse Sand, little fine to coarse Gravel, occasional to extensive Cobbles, little Silt, medium dense to dense - damp
				C: ALLUVIUM: Light Gray Brown Gravelly fine to coarse Sand, extensive Cobbles, occasional Boulders, trace Silt, dense to very dense - damp
	b		5	
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-13

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-3

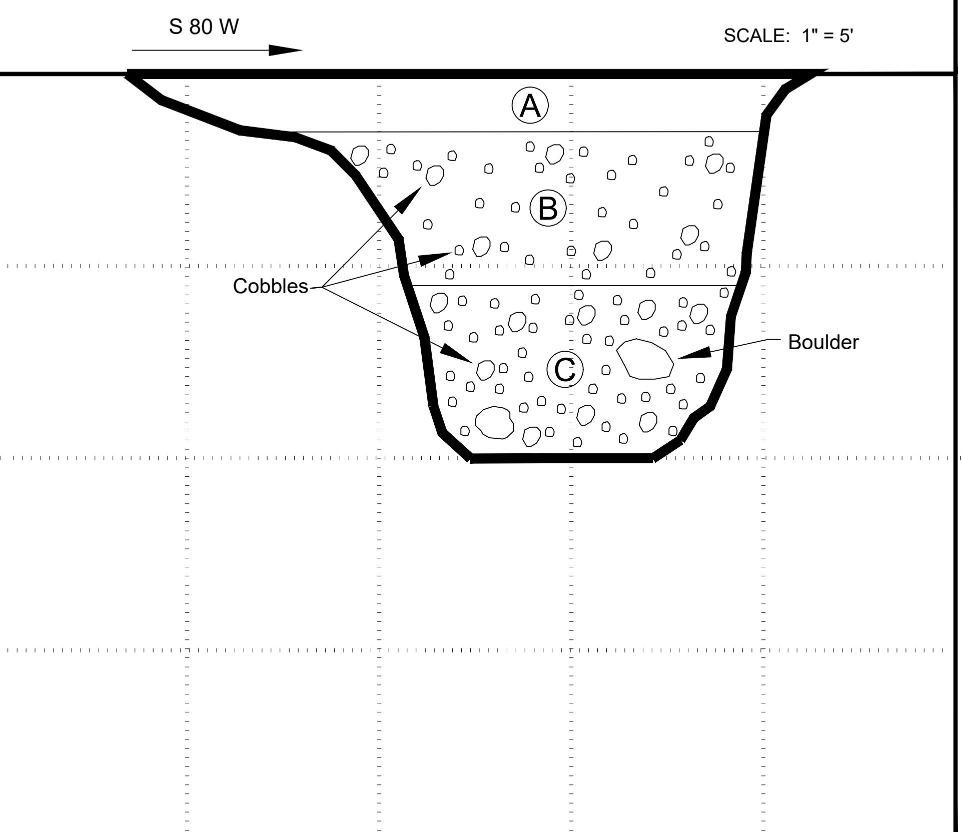
JOB NO.: 19G121-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, CA
DATE: 3-11-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: S 80 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		11	A: FILL: Gray Brown Silty fine to medium Sand, little coarse Sand, trace fine to coarse Gravel, trace fine root fibers, loose to medium dense - moist
	b		4	B: ALLUVIUM: Light Gray Gravelly fine to coarse Sand, occasional to extensive Cobbles, trace to little Iron oxide staining, dense - damp
5				
	b		6	C: ALLUVIUM: Gray Brown fine to coarse Sandy Gravel, extensive Cobbles, occasional Boulders, trace Silt, dense to very dense - damp
10	b		4	
				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-14

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-4

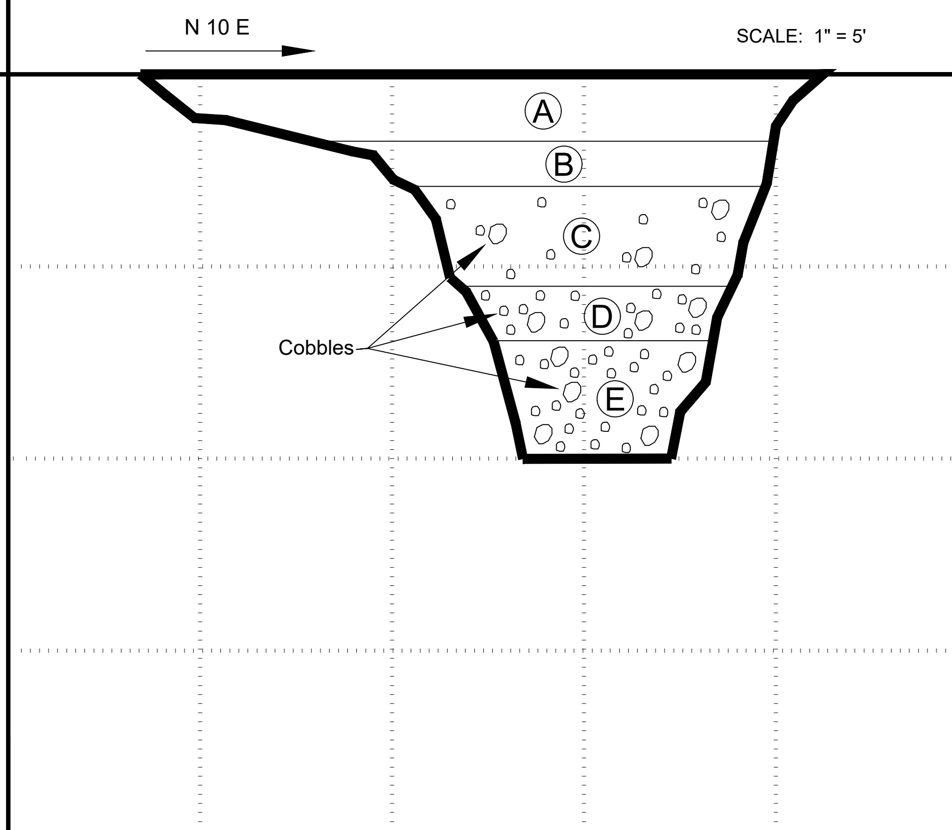
JOB NO.: 19G121-1
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, CA
DATE: 3-11-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: N 10 E
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		10	A: ALLUVIUM: Brown Silty fine Sand, little medium to coarse Sand, abundant fine root fibers to approximately 1 foot, trace fine root fibers, loose - moist
	b		5	B: ALLUVIUM: Light Gray fine to coarse Sand, little fine to coarse Gravel, medium dense - damp
	b		4	C: ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, occasional to extensive Cobbles, trace Silt, dense - damp
5				
	b		3	D: ALLUVIUM: Light Gray Brown fine to coarse Sandy Gravel, extensive Cobbles, dense to very dense - dry to damp
	b		6	E: ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, extensive Cobbles, little Silt, dense - damp
	b		8	
10				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION

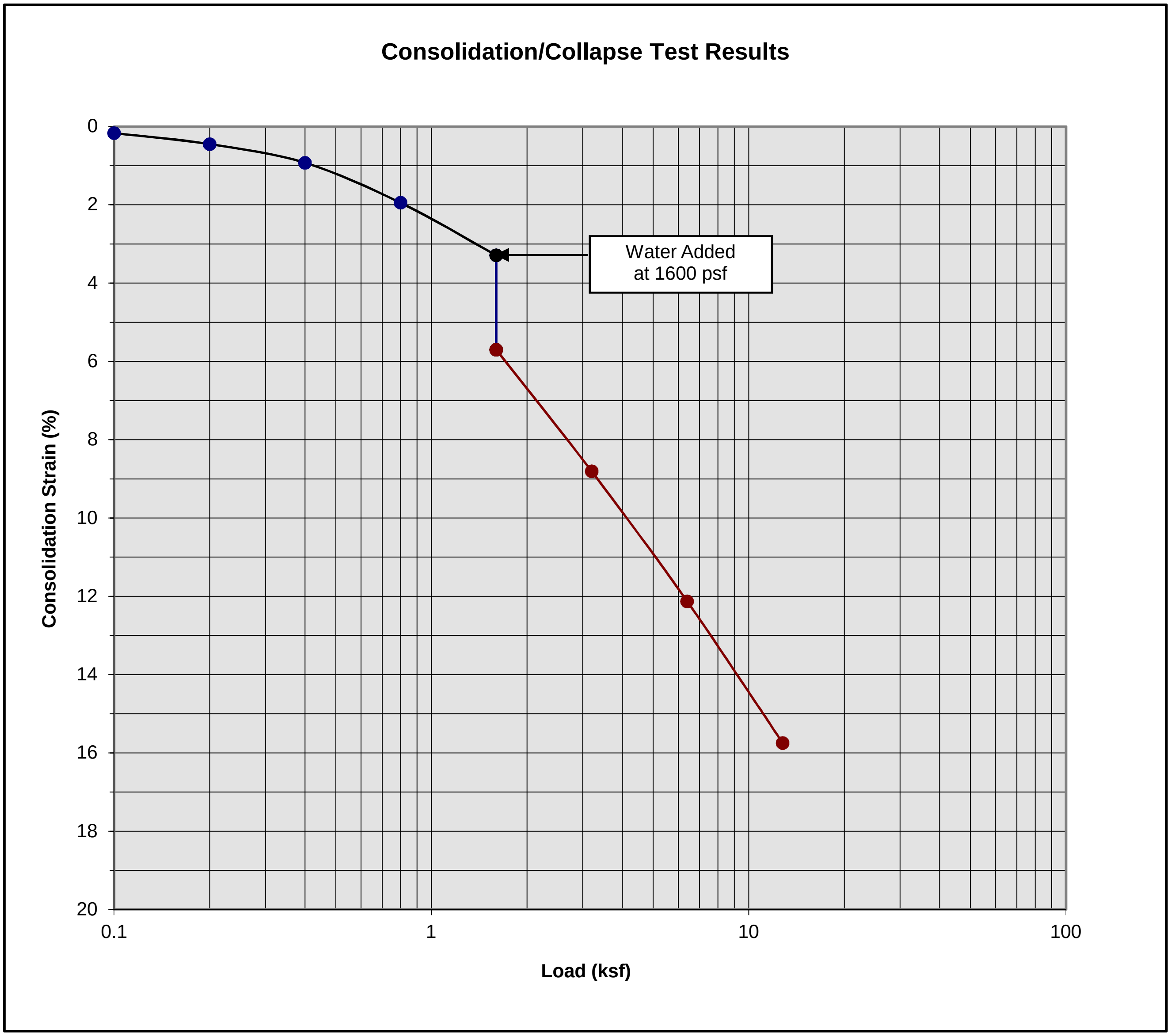


KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-15

APPENDIX C

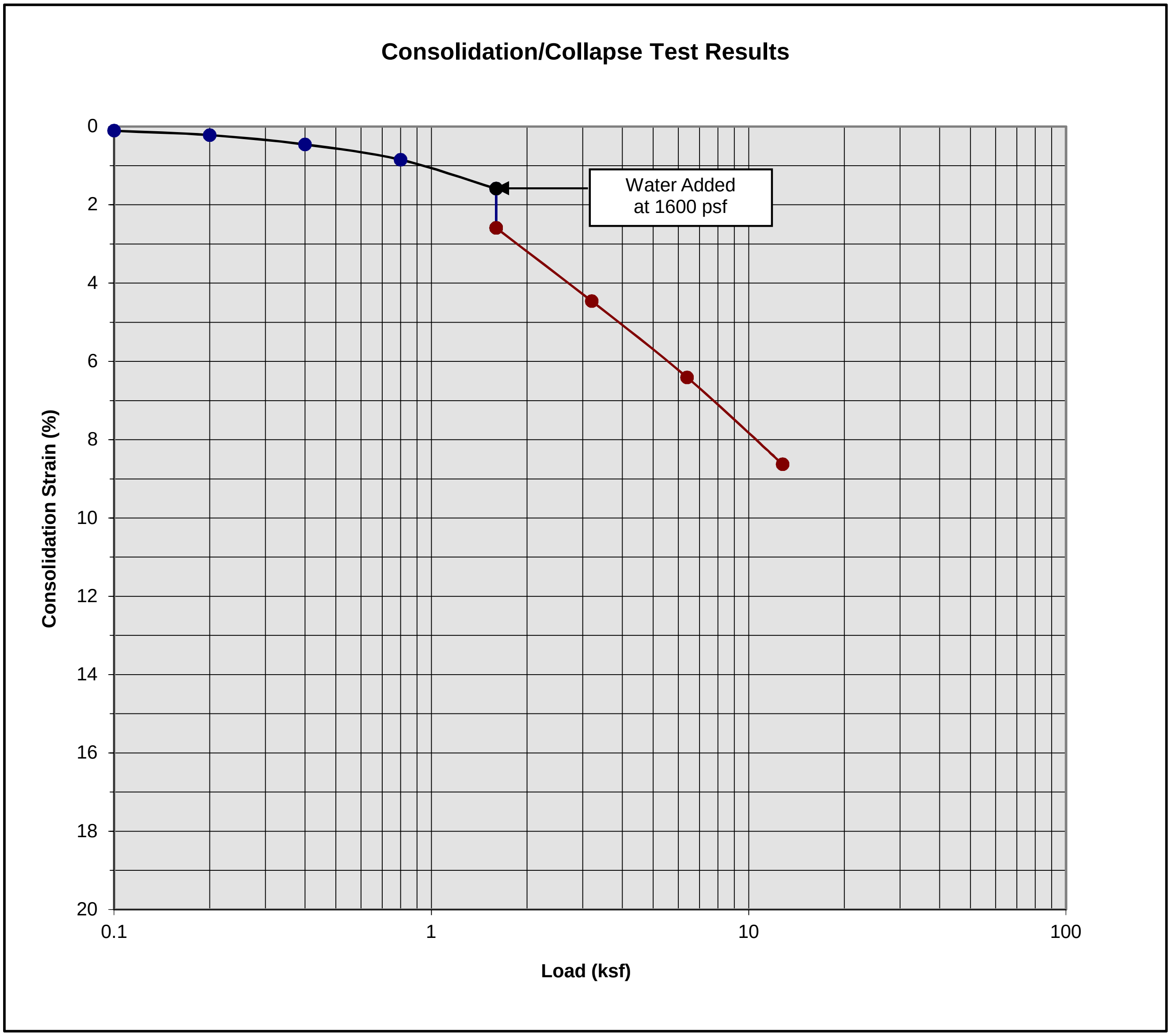


Classification: FILL: Brown Silty fine to medium Sand, trace coarse Sand

Boring Number:	B-3	Initial Moisture Content (%)	9
Sample Number:	---	Final Moisture Content (%)	23
Depth (ft)	1 to 2	Initial Dry Density (pcf)	81.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	107.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.41

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

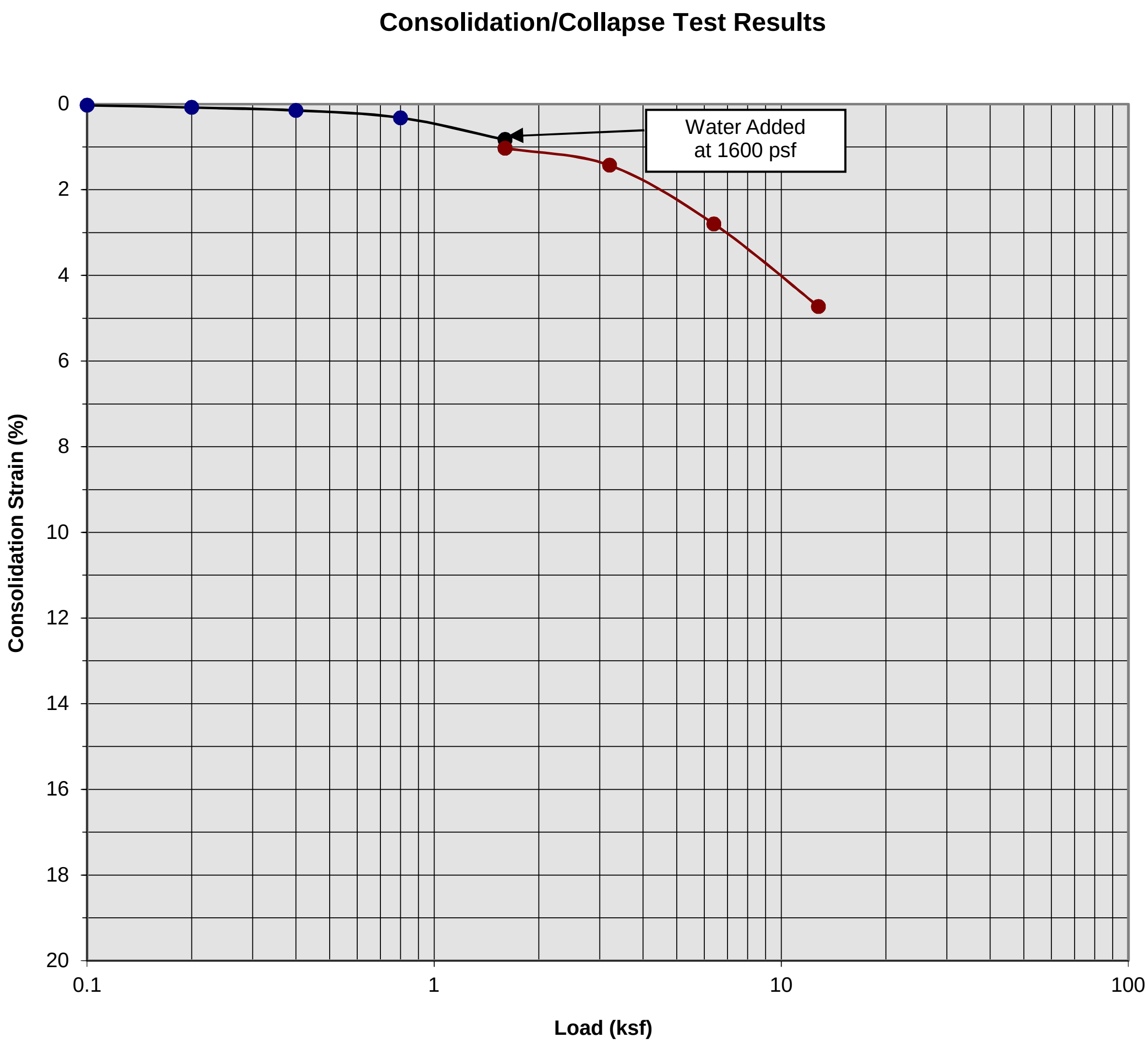


Classification: FILL: Brown Silty fine to medium Sand, trace coarse Sand

Boring Number:	B-3	Initial Moisture Content (%)	9
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	3 to 4	Initial Dry Density (pcf)	102.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	111.8
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.00

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

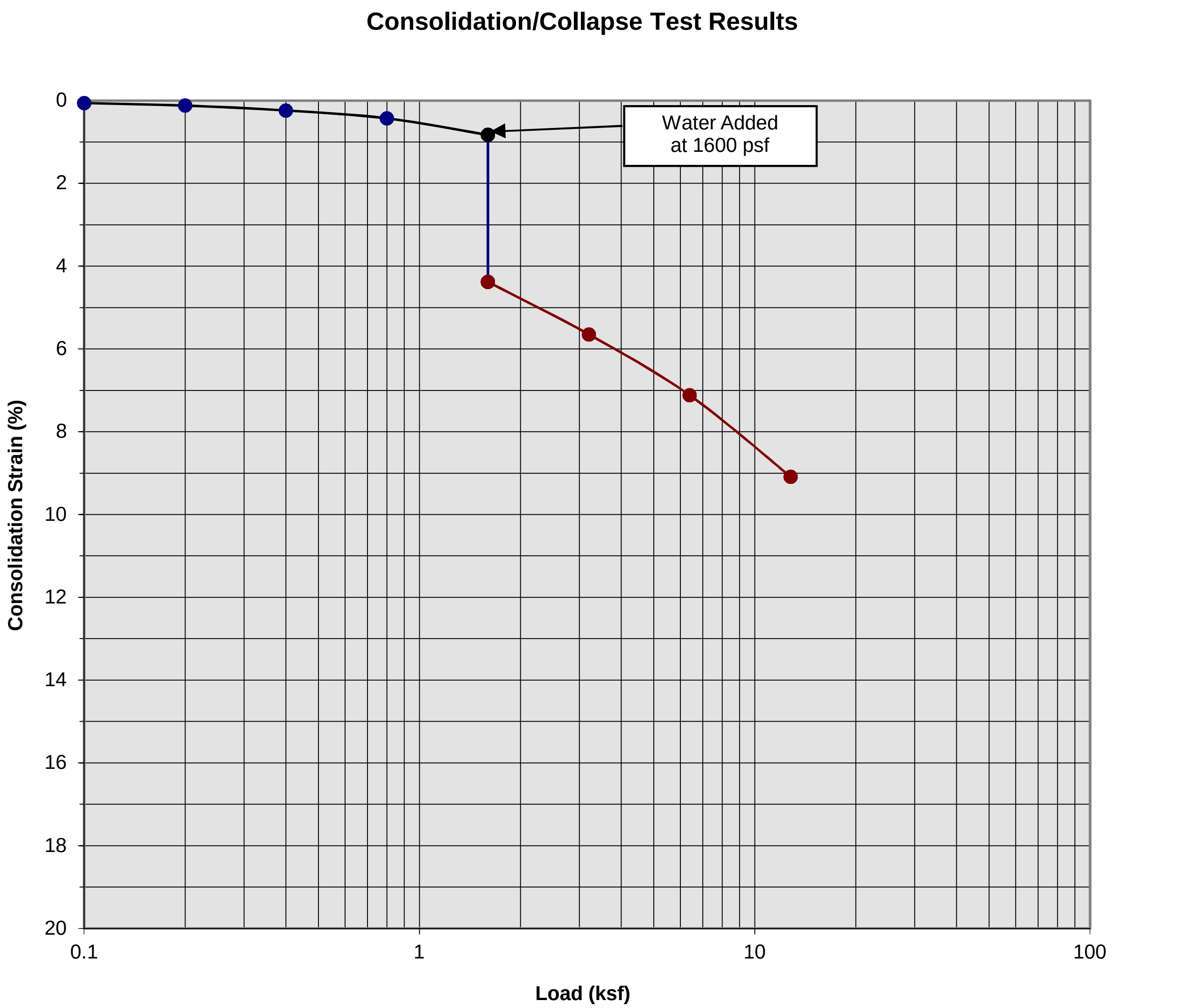


Classification: FILL: Brown Silty fine to medium Sand, trace coarse Sand

Boring Number:	B-3	Initial Moisture Content (%)	12
Sample Number:	---	Final Moisture Content (%)	15
Depth (ft)	5 to 6	Initial Dry Density (pcf)	108.4
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	113.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.20

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 3

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



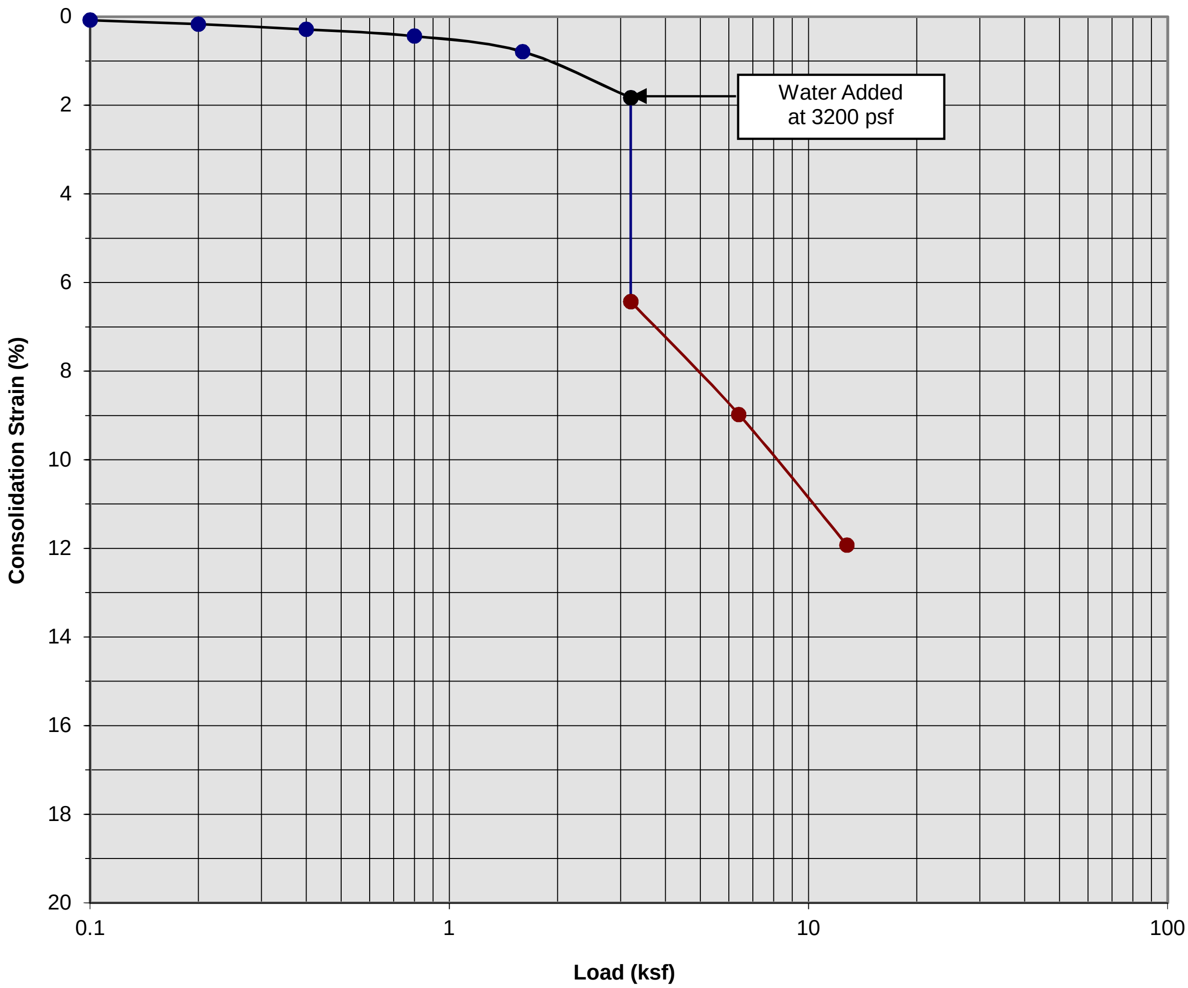
Classification: Brown fine to coarse Sand

Boring Number:	B-3	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	9 to 10	Initial Dry Density (pcf)	114.7
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	117.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	3.55

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 4

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



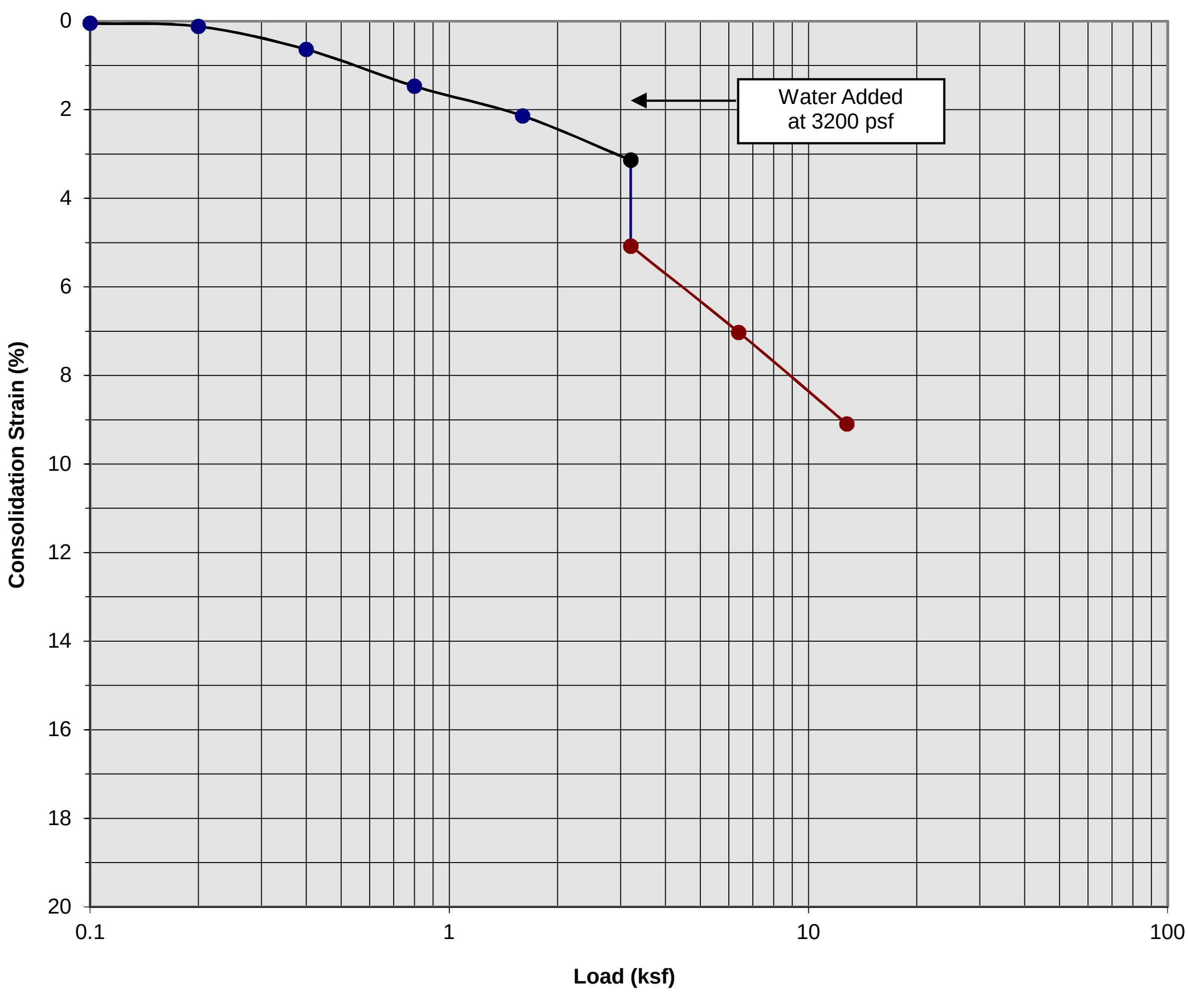
Classification: FILL: Gray Brown fine to coarse Sand

Boring Number:	B-6	Initial Moisture Content (%)	11
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	1 to 2	Initial Dry Density (pcf)	122.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	137.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.04

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 5

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

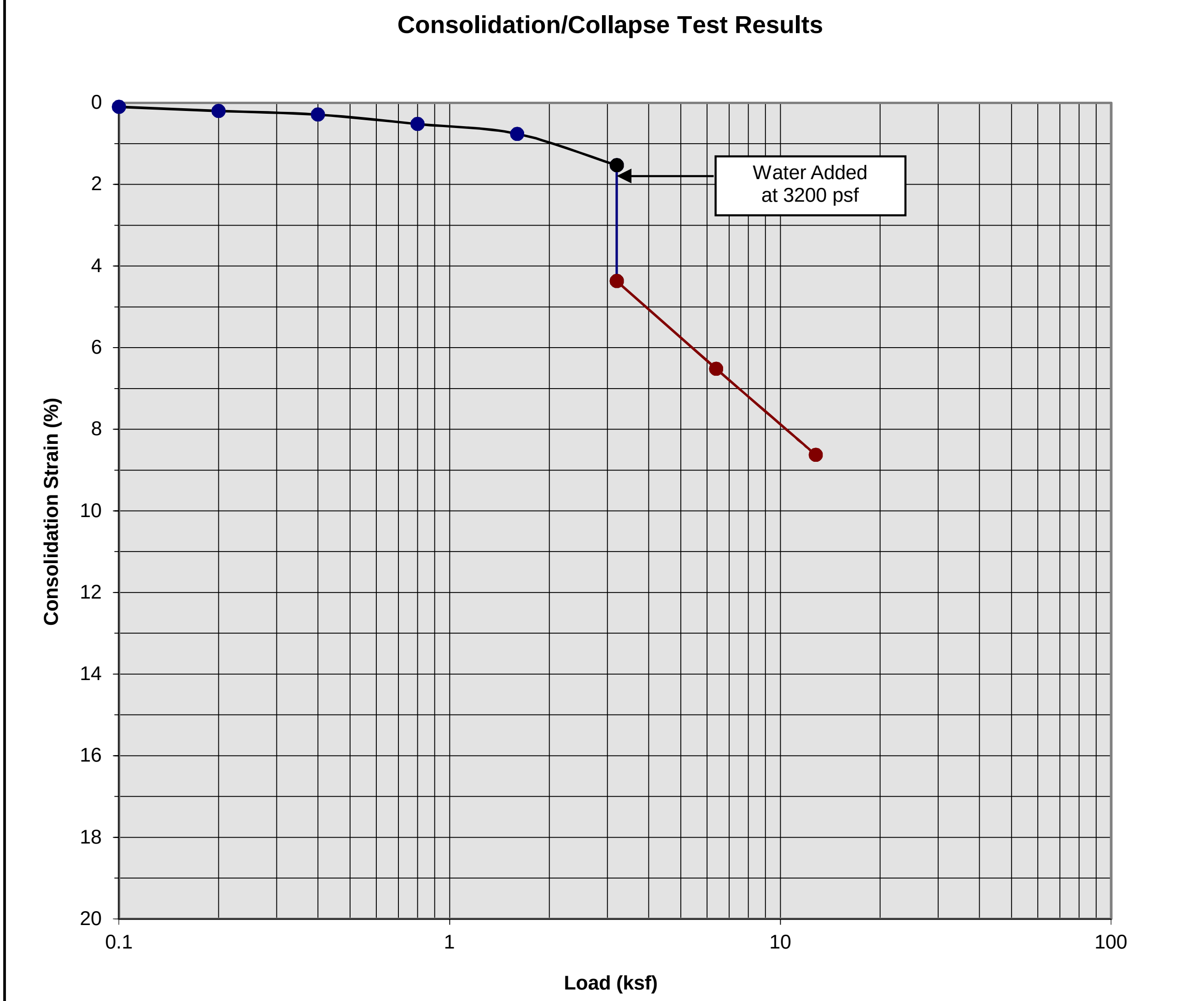


Classification: Light Brown fine to coarse Sand

Boring Number:	B-6	Initial Moisture Content (%)	3
Sample Number:	---	Final Moisture Content (%)	12
Depth (ft)	5 to 6	Initial Dry Density (pcf)	125.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	125.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.00

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 6

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL *A California Corporation*



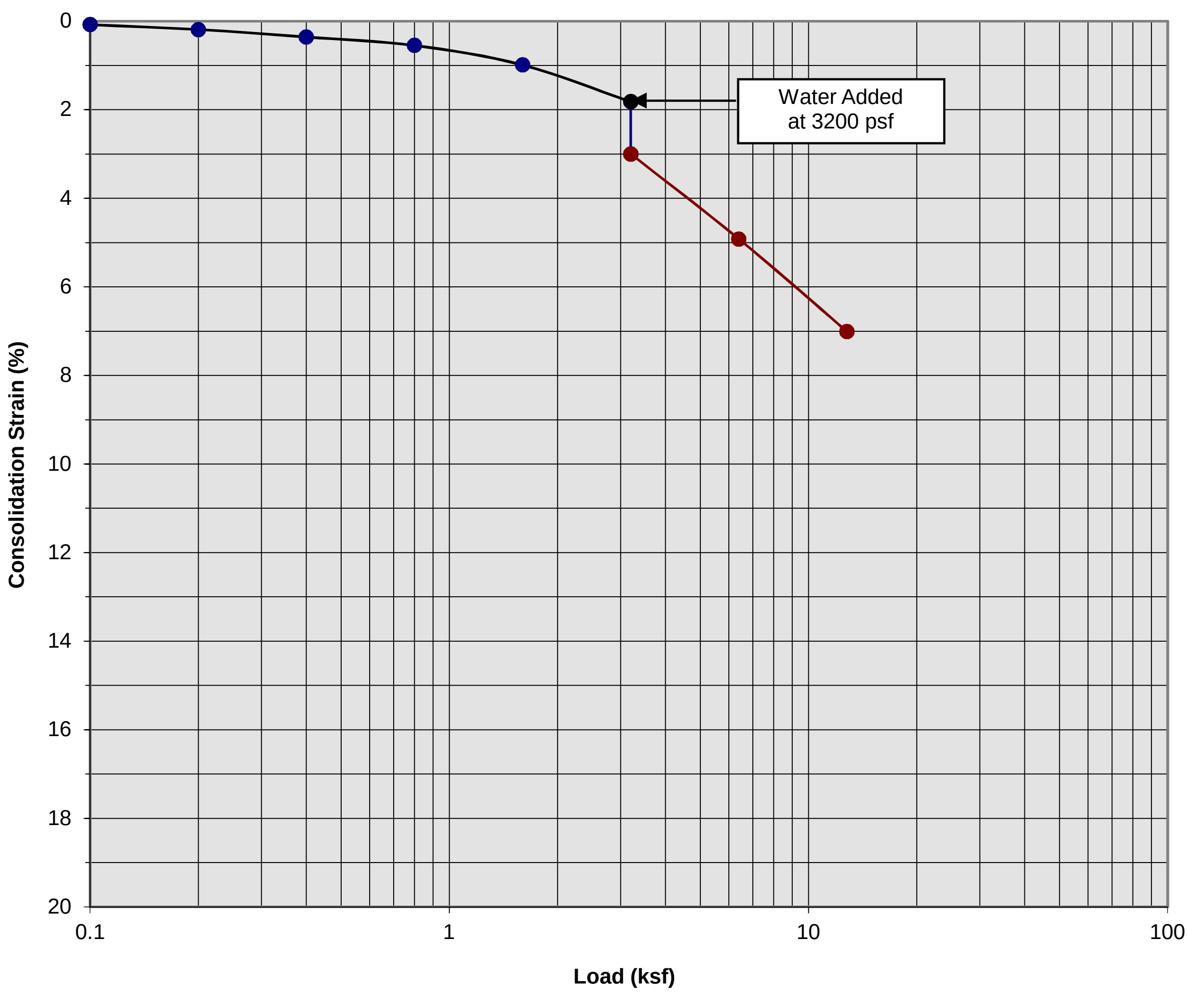
Classification: Light Brown fine to coarse Sand

Boring Number:	B-6	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	11
Depth (ft)	7 to 8	Initial Dry Density (pcf)	124.4
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	135.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.77

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 7

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



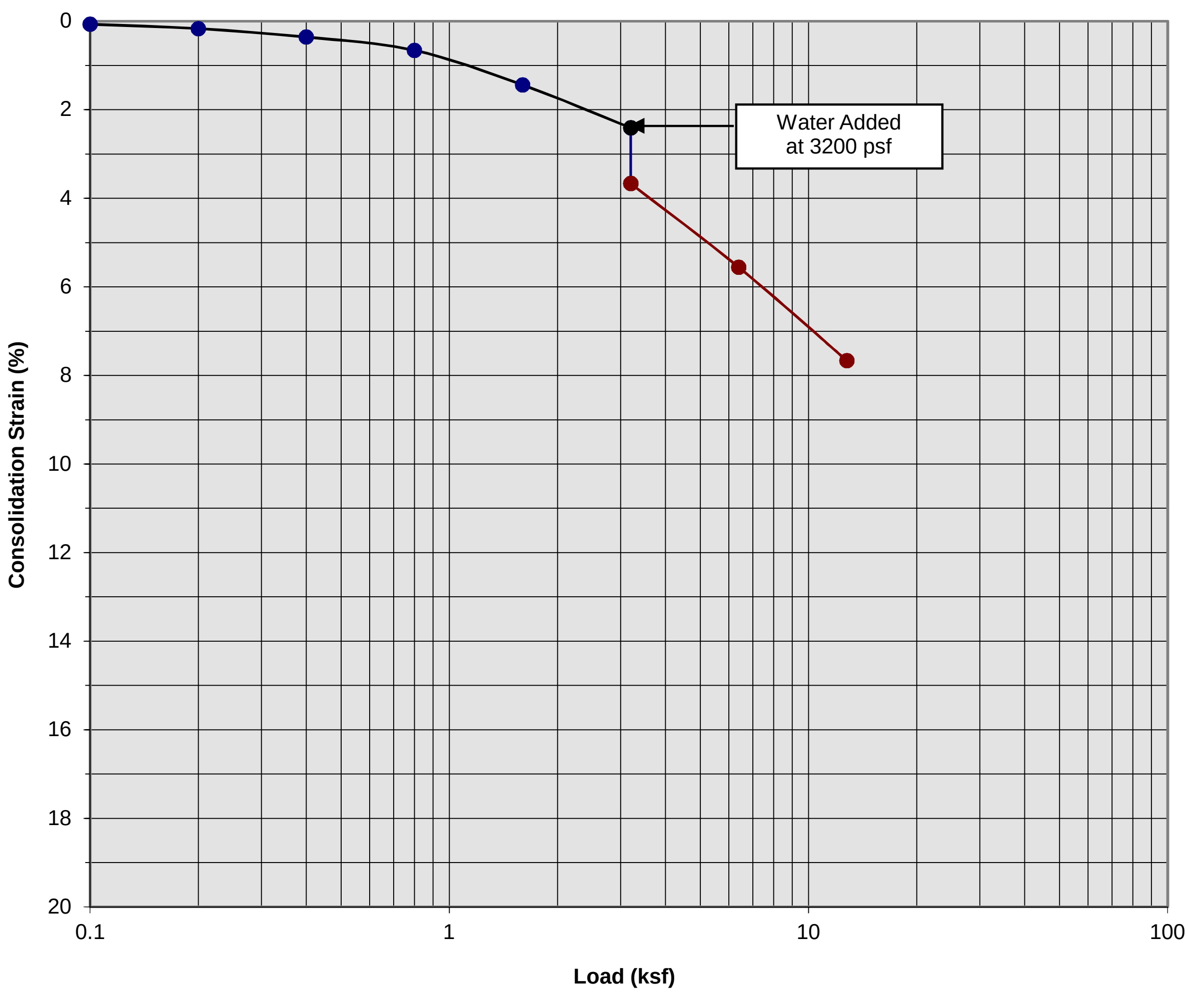
Classification: FILL: Gray Brown fine to medium Sand, trace coarse Sand

Boring Number:	B-9	Initial Moisture Content (%)	5
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	1 to 2	Initial Dry Density (pcf)	104.9
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	110.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.83

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 8

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



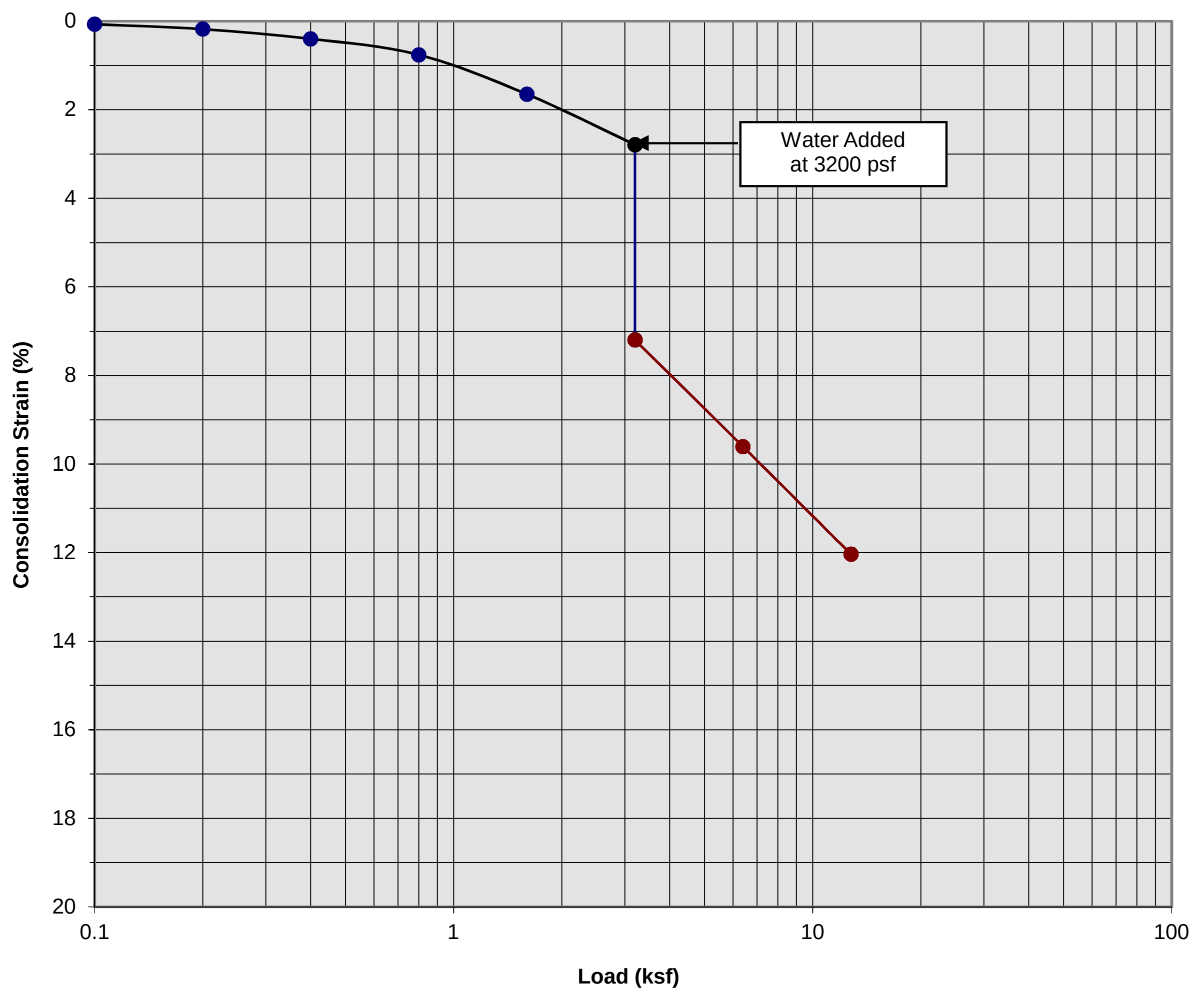
Classification: FILL: Gray Brown fine to medium Sand, trace coarse Sand

Boring Number:	B-9	Initial Moisture Content (%)	6
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	3 to 4	Initial Dry Density (pcf)	99.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	107.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.97

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 9

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

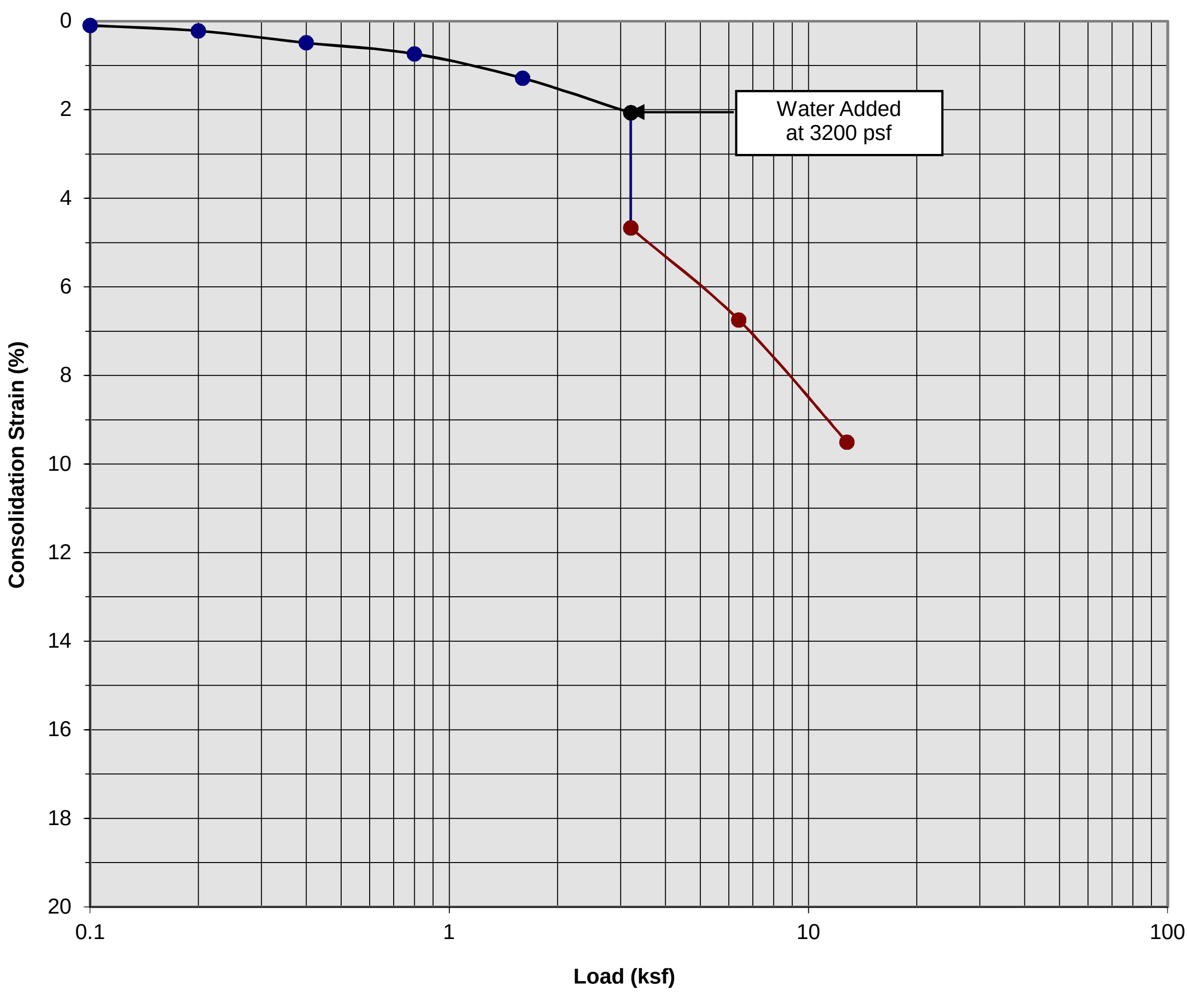
Consolidation/Collapse Test Results



Classification: FILL: Dark Brown Silty fine Sand, little medium to coarse Sand

Boring Number:	B-9	Initial Moisture Content (%)	7
Sample Number:	---	Final Moisture Content (%)	15
Depth (ft)	5 to 6	Initial Dry Density (pcf)	111.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	121.9
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.14

Consolidation/Collapse Test Results

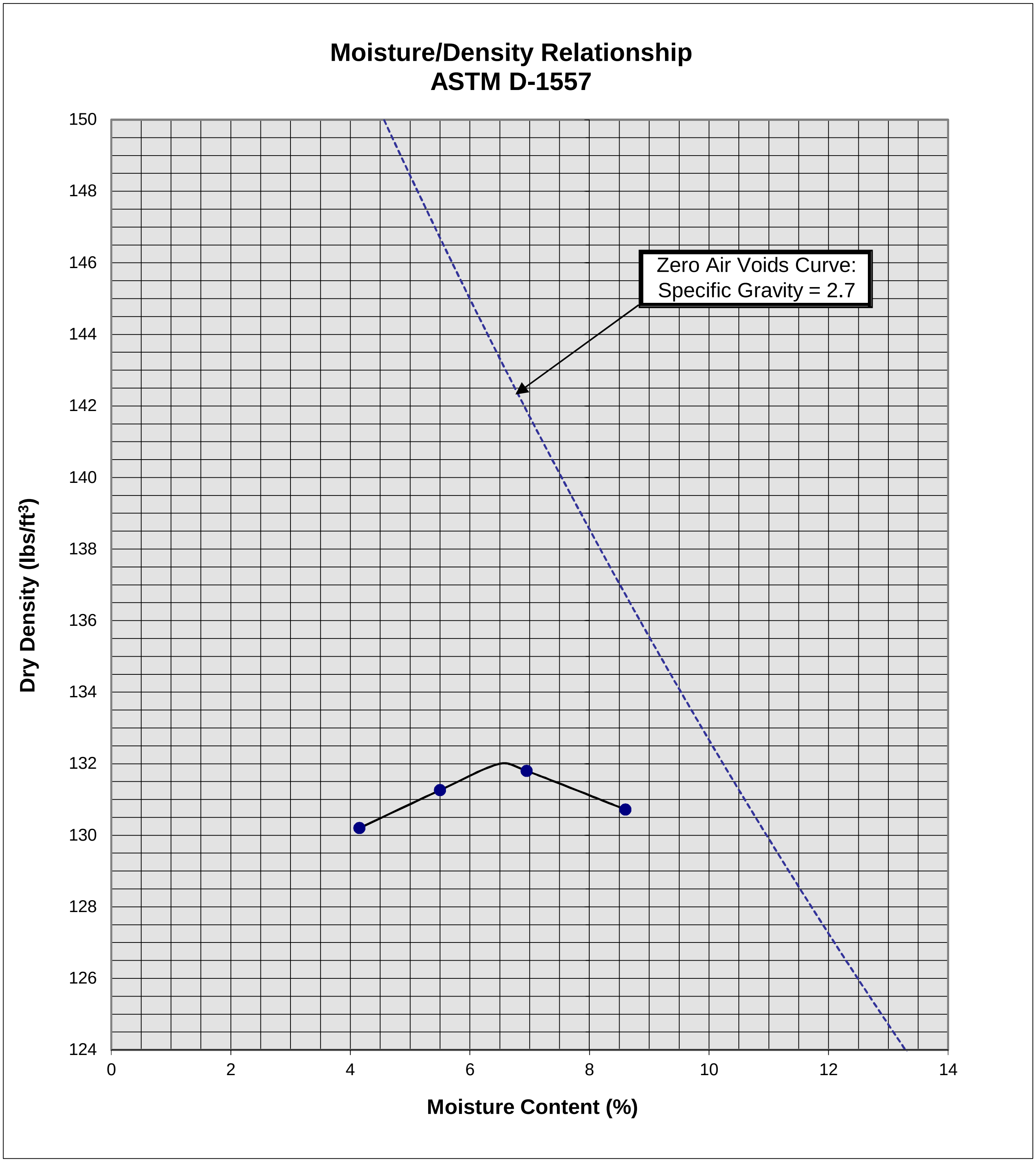


Classification: Light Gray Brown fine to coarse Sand, some fine to coarse Gravel

Boring Number:	B-9	Initial Moisture Content (%)	2
Sample Number:	---	Final Moisture Content (%)	10
Depth (ft)	7 to 8	Initial Dry Density (pcf)	115.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	122.8
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.78

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C- 11

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

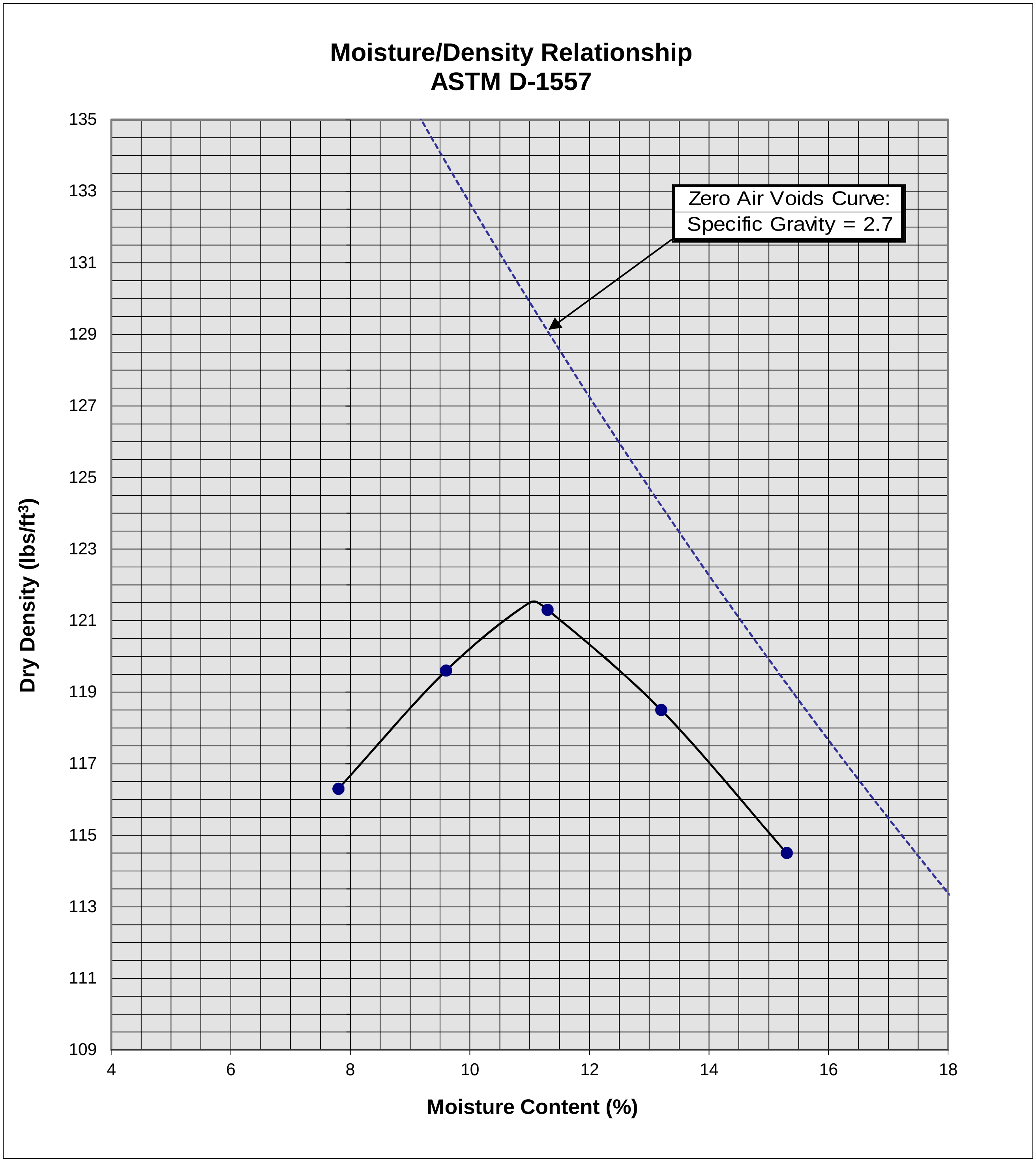


Soil ID Number	B-1 @ 0 to 5'
Optimum Moisture (%)	6.5
Maximum Dry Density (pcf)	132
Soil Classification	Brown fine to coarse Sand, little Silt, some fine to coarse Gravel

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121

PLATE C-12

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number		B-6 @ 0 to 5'
Optimum Moisture (%)		11
Maximum Dry Density (pcf)		121.5
Soil Classification	Brown Silty fine to coarse Sand, some fine Gravel	

Proposed Commercial/Industrial Building
Rancho Cucamonga, California
Project No. 19G121
PLATE C-13

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D

GRADING GUIDE SPECIFICATIONS

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

General

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

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

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

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

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

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

Site Preparation

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

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

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

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

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

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

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

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

Compacted Fills

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Foundations

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

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

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

Fill Slopes

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

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

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

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

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

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

Cut Slopes

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

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

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

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

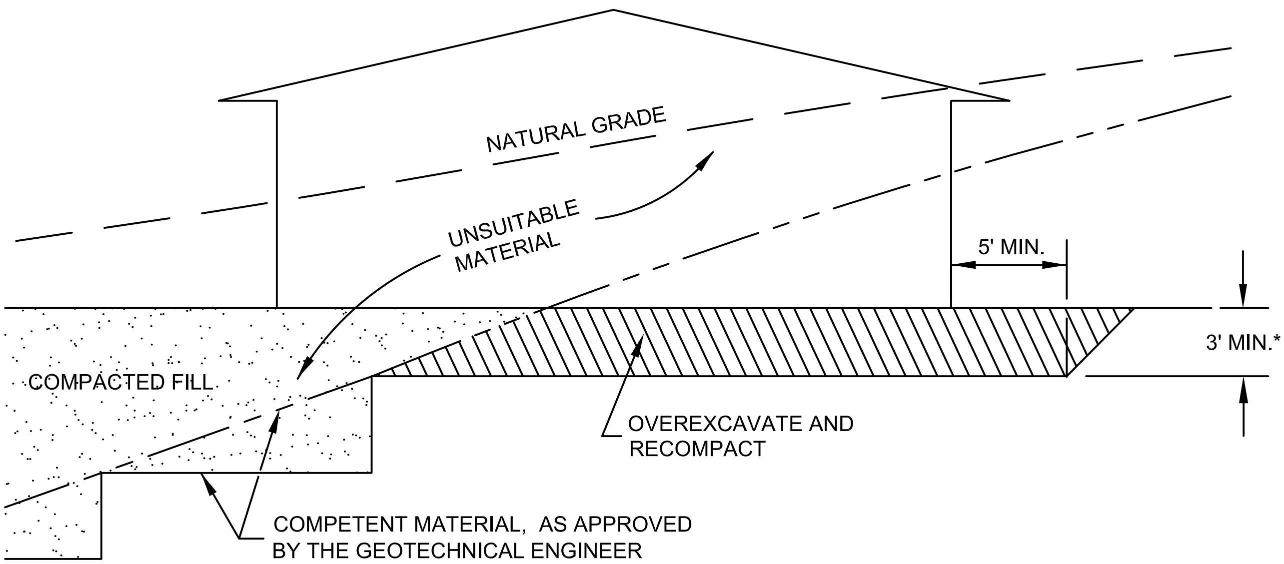
Subdrains

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

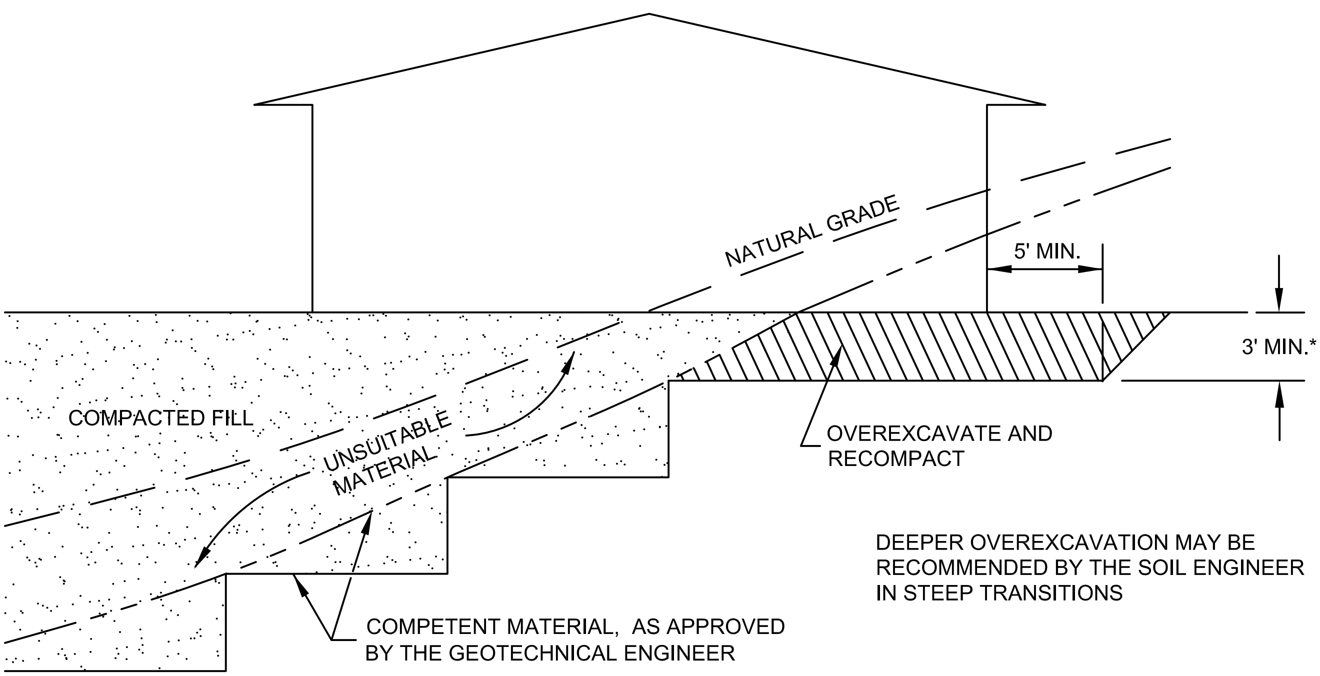
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

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

CUT LOT



CUT/FILL LOT (TRANSITION)



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

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

TRANSITION LOT DETAIL

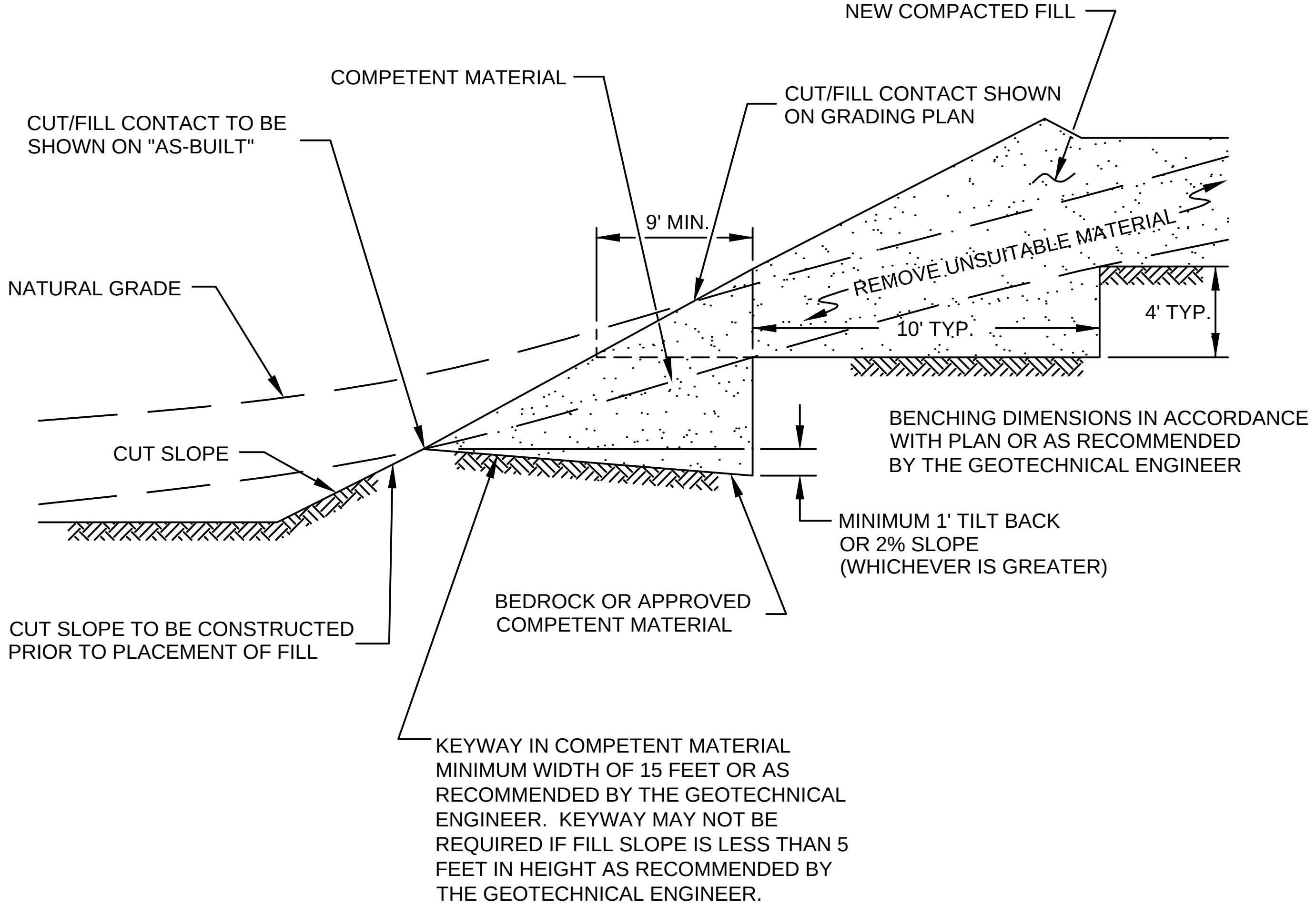
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

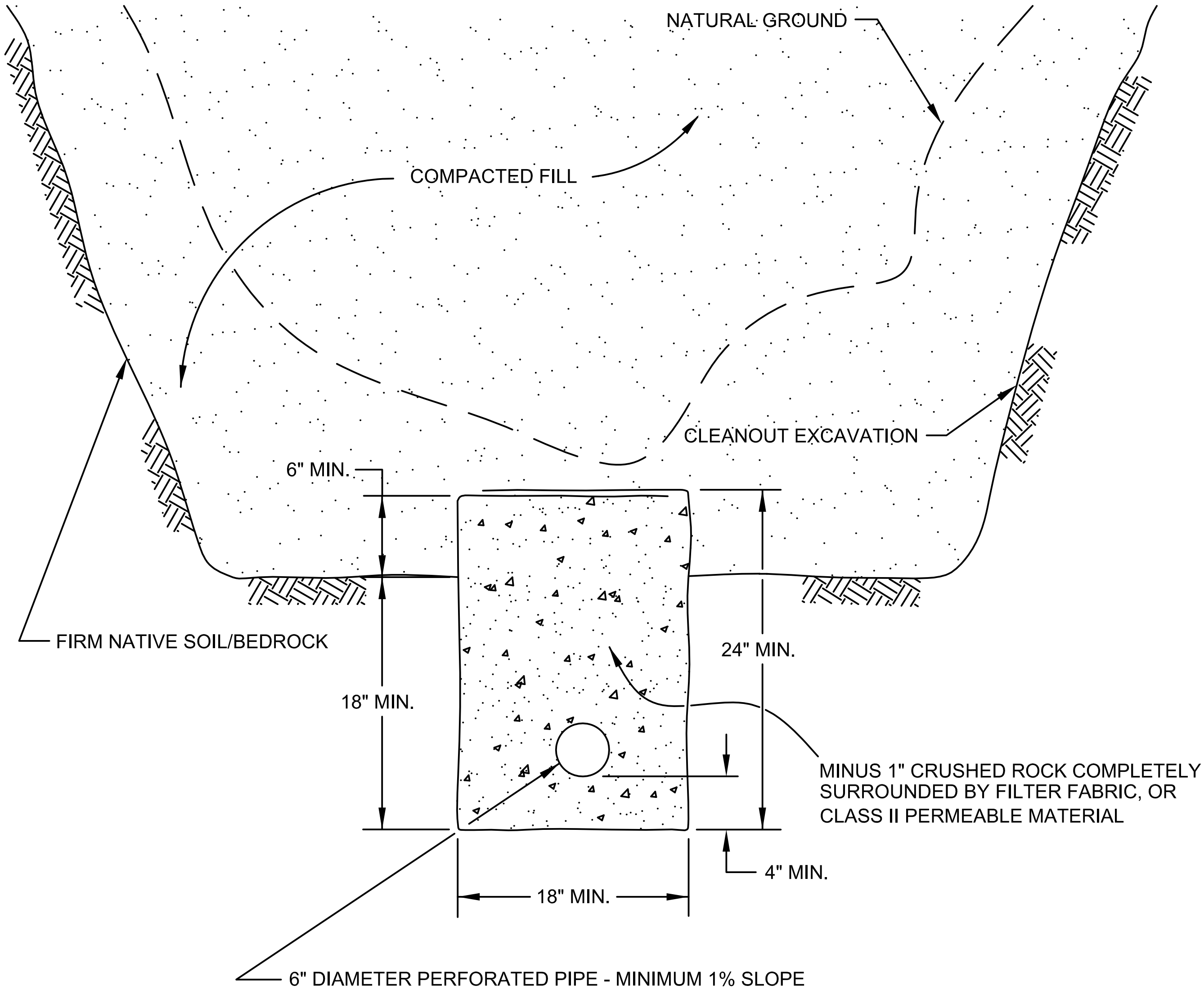
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



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

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

GRADING GUIDE SPECIFICATIONS

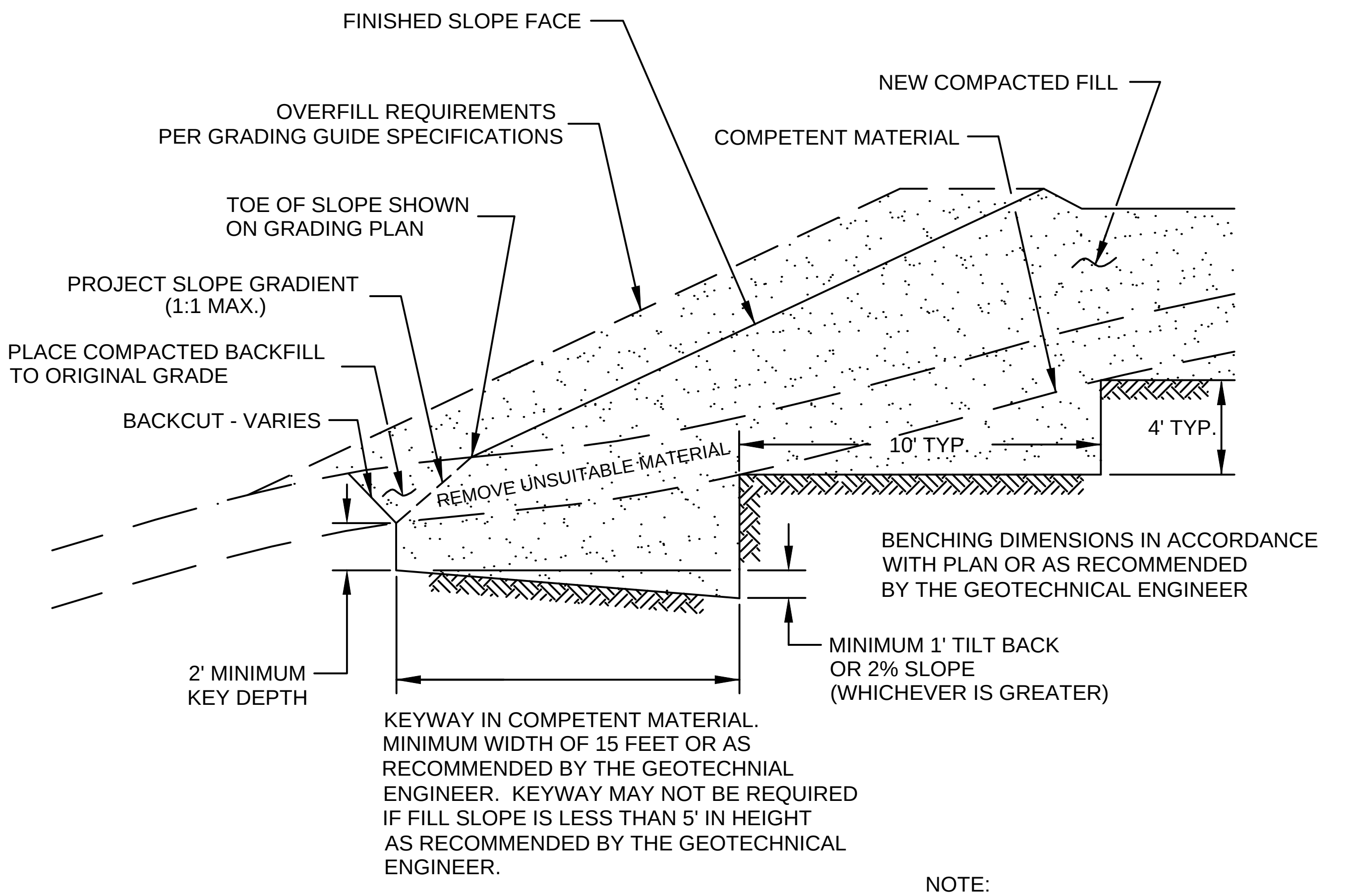
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



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

FILL ABOVE NATURAL SLOPE DETAIL

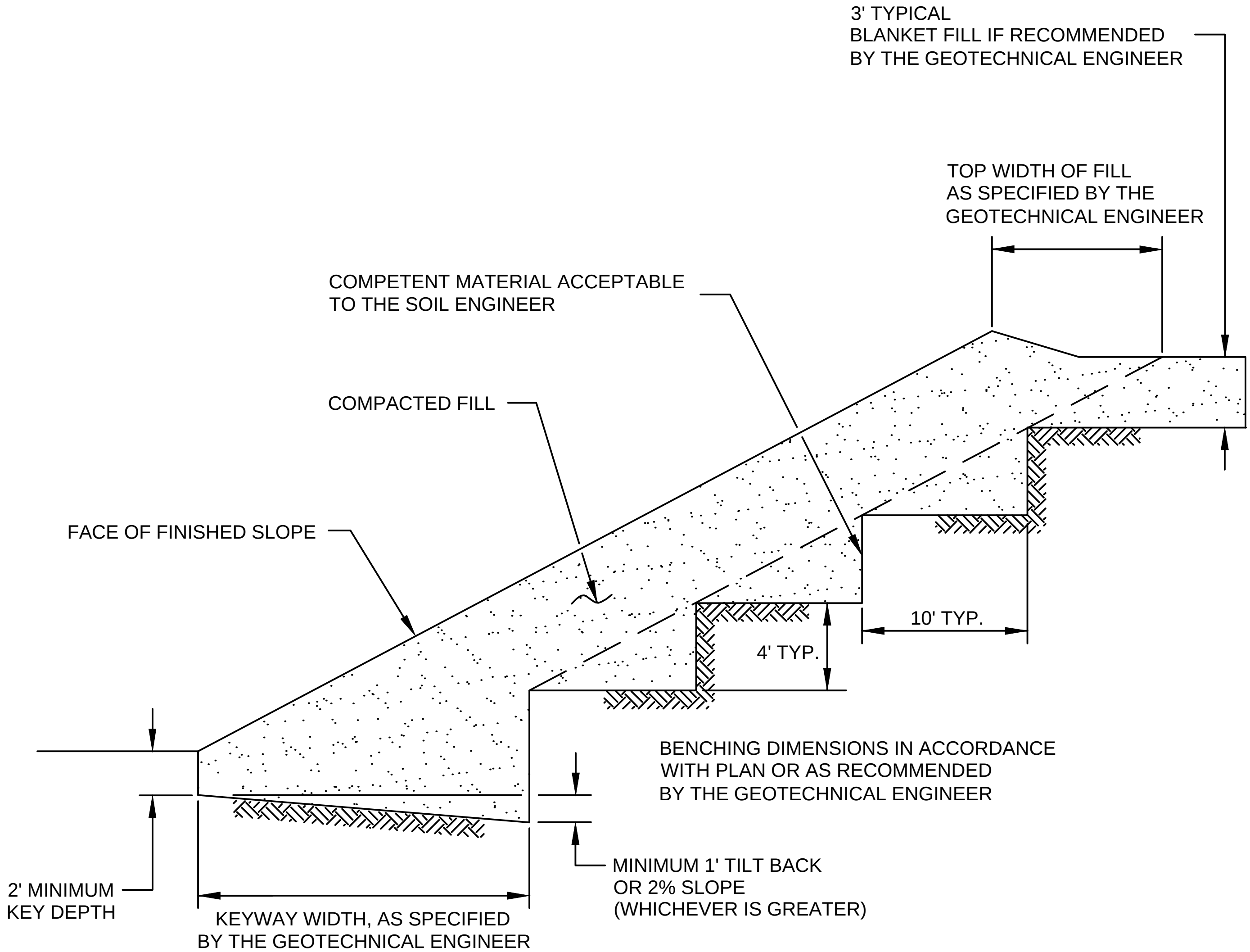
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

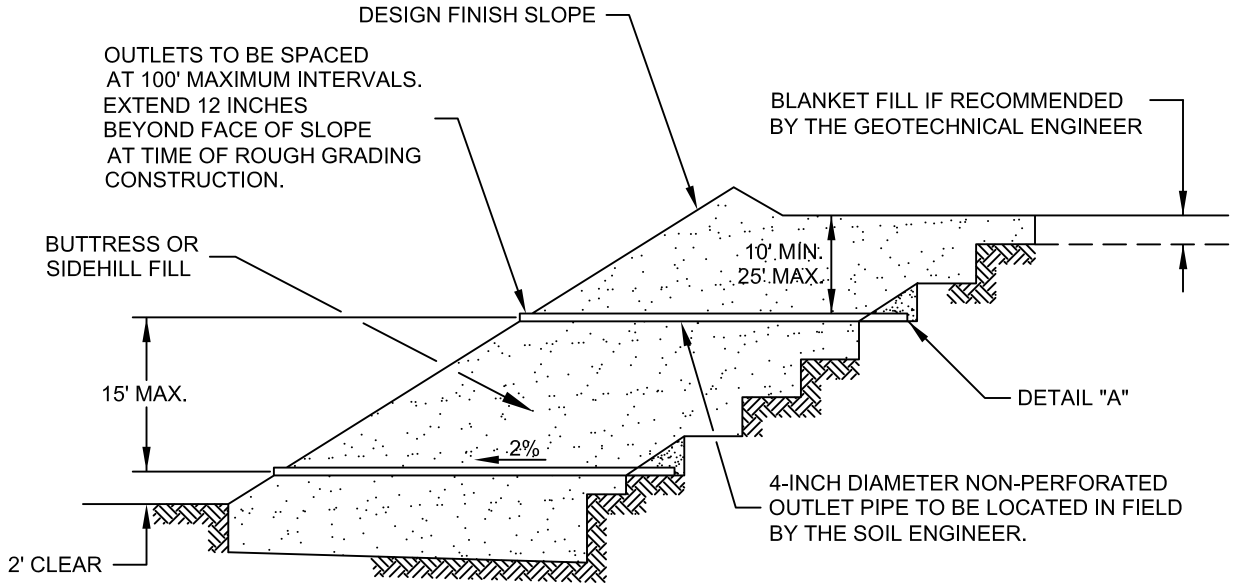
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



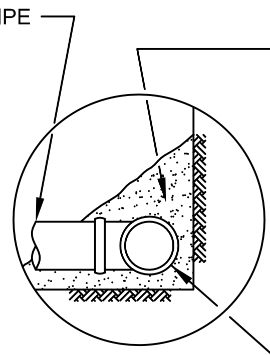
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

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

SAND EQUIVALENT = MINIMUM OF 50



DETAIL "A"

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

SLOPE FILL SUBDRAINS

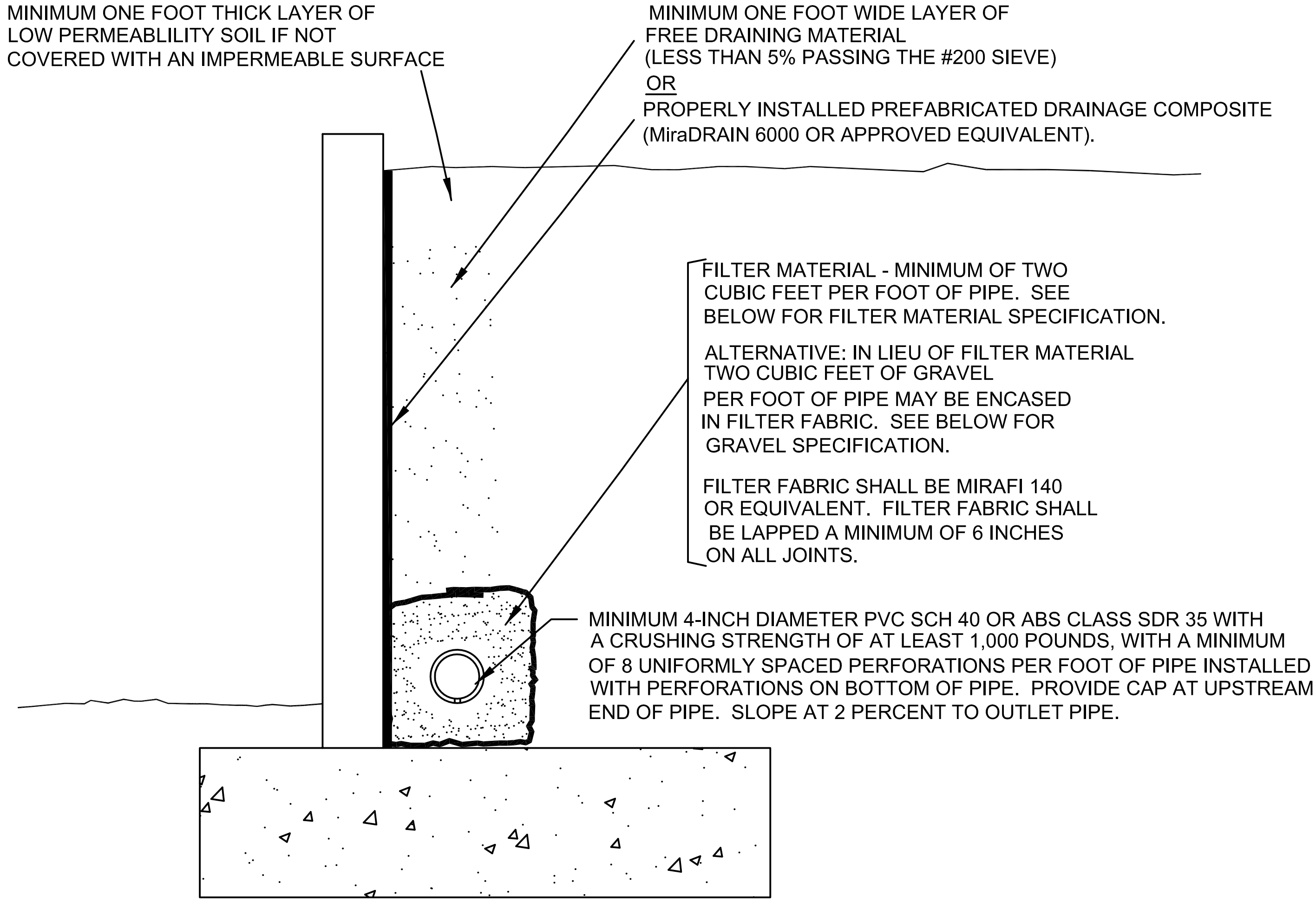
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



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

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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

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

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

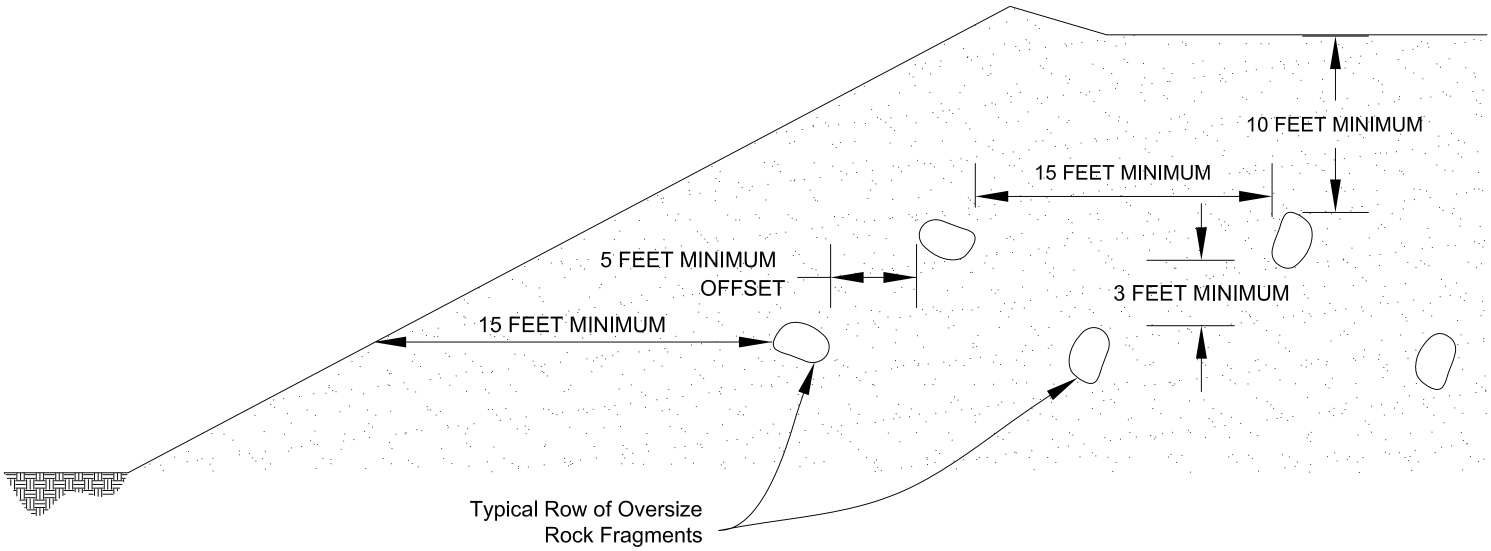
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

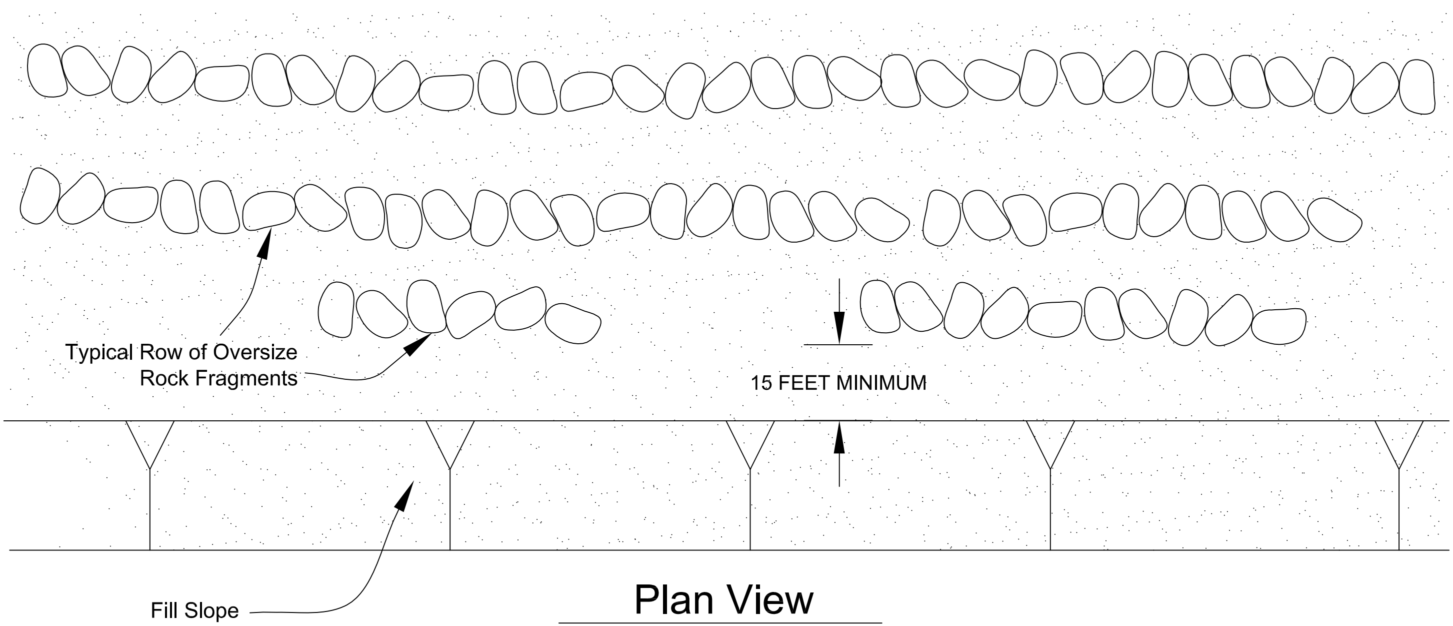
DRAWN: JAS
CHKD: GKM

PLATE D-7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

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

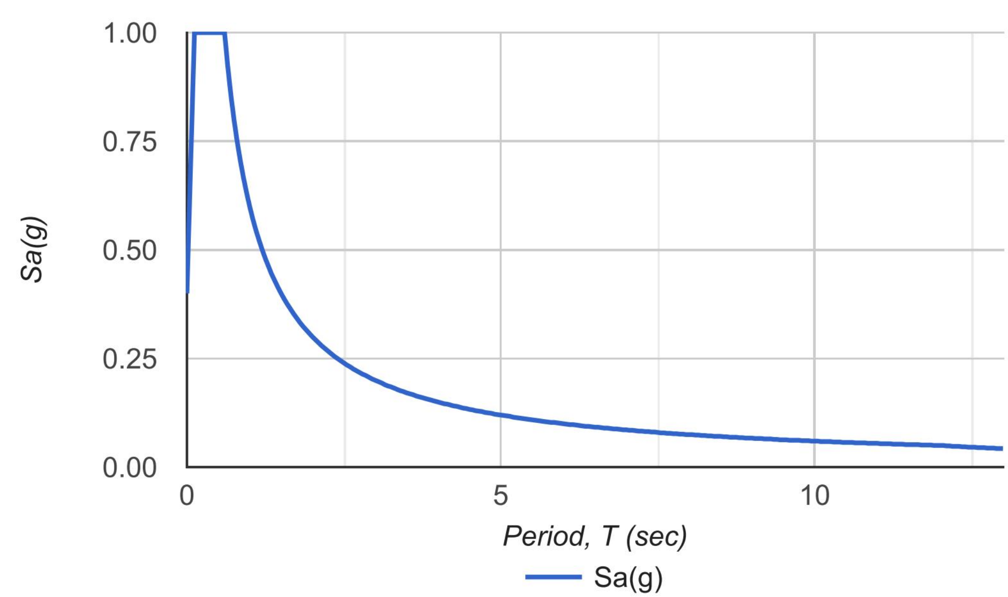
APPENDIX E

Latitude, Longitude: 34.093558, -117.615399

Date	3/13/2019, 9:47:34 AM
Design Code Reference Document	ASCE7-10
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description	Type	Value	Description
S_S	1.5	MCE_R ground motion. (for 0.2 second period)	SDC	D	Seismic design category
S_1	0.6	MCE_R ground motion. (for 1.0s period)	F_a	1	Site amplification factor at 0.2 second
S_{MS}	1.5	Site-modified spectral acceleration value	F_v	1.5	Site amplification factor at 1.0 second
S_{M1}	0.9	Site-modified spectral acceleration value	PGA	0.519	MCE_G peak ground acceleration
S_{DS}	1	Numeric seismic design value at 0.2 second SA	F_{PGA}	1	Site amplification factor at PGA
S_{D1}	0.6	Numeric seismic design value at 1.0 second SA	PGA_M	0.519	Site modified peak ground acceleration

Design Response Spectrum



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

SEISMIC DESIGN PARAMETERS

PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

DRAWN: AL
CHKD: RGT

SCG PROJECT
19G121-1

PLATE E-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

May 28, 2021

Panattoni Development Company, Inc.
20411 SW Birch Street, Suite 200
Newport Beach, California 92660

Attention: Mr. Michael Sizemore
Development Manager

Proposal No.: **19G121-6**

Subject: **Geotechnical Report Update, Infiltration Report Update, and Response to City Review Comments**
Proposed Commercial/Industrial Development
East Side of Baker Avenue, South of 9th Street
Rancho Cucamonga, California

References: 1) Geotechnical Investigation, Proposed Commercial/Industrial Development, East Side of Baker Avenue, South of 9th Street, Rancho Cucamonga, California, prepared by Southern California Geotechnical, Inc. (SCG), prepared for Panattoni Development Company, Inc., SCG Project No. 19G121-1, dated April 5, 2019.

2) Results of Infiltration Testing, Proposed Commercial/Industrial Development, Baker Avenue, South of 9th Street, Rancho Cucamonga, California, prepared by SCG, prepared for Panattoni Development Company, Inc., SCG Project No. 19G121-2, dated April 5, 2019.

Dear Mr. Sizemore:

At your request, we have prepared this report to update the geotechnical and infiltration reports, following our review of the most recent conceptual grading and drainage plans for the proposed development at the site. We have also addressed Engineering-Level review comments prepared by the city of Rancho Cucamonga, following their review of the above-referenced reports. The scope of services for this report included preparing a response to the Engineering-Level Review comments and providing updated seismic design parameters and infiltration recommendations, as necessary.

This update report should be distributed to all consultants and contractors associated with this project, along with a copy of the original geotechnical investigation and infiltration report.

Response to Engineering-Level Comments

The Engineering-Level Comments prepared by the city of the Rancho Cucamonga (RC), are reproduced below, followed by our responses. A copy of the review sheet is enclosed with this correspondence for reference purposes.

RC 1: *The geotechnical evaluation includes soil borings and trenches to identify the* *subsurface alluvium, depth of artificial fill, and if groundwater was present within 25 feet below ground surface. Artificial fill and native alluvium samples were obtained and evaluated pursuant to the 2016 California Building Code. Based on the materials sampled and evaluated, Southern California Geotechnical determined foundation design, grading recommendations, and flatwork/roadwork design. The geotechnical approach used meets the duty of care for geotechnical evaluations for a project such as the one evaluated.*

SCG: So noted.

RC 2: *The geotechnical evaluation follows the 2016 California Building. California updated its building code, and the current code is the 2019 California Building Code. The 2019 California Building Code was issued on July 1, 2019 and became effective on January 1, 2020.*

SCG: Updated seismic design parameters based on ASCE 7-16 have been provided in the subsequent *Geotechnical Report Update* section of this report.

RC 3: *The geotechnical evaluation is based on a preliminary building design. The actual plans for this project were not reviewed by Southern California Geotechnical. If the design plans differ from what was presented in the preliminary building plans evaluated by Southern California Geotechnical then the recommendations in the Geotechnical report may need to be revised.*

SCG: SCG has reviewed the most recent conceptual grading and drainage plans. Updated sections of the geotechnical and infiltration reports pertaining to this plan have been provided in the subsequent sections of this report.

RC 4: *The surface water infiltration testing report states that three chambers are to be installed on-site and used for percolation of rainwater. Southern California Geotechnical performed water infiltration testing at the base of six trenches excavated during the geotechnical evaluation. Their infiltration test method followed standard practice for infiltration testing. Based on the field data obtained, they estimate surface water percolation rates. No design plans are provided to show the dimensions of the rainwater capture, storage, and infiltration systems. Because no details specific to the rainwater capture and percolation system are provided, we are unable to provide comment on whether the rainwater percolation system is adequate in its design or capacity to properly capture and percolate expected rainwater flows.*

SCG: It is our understanding that the project civil engineer will submit updated plans addressing the requesting items.

Infiltration Report Update

Based on the currently proposed development, as indicated on the most recent conceptual grading and drainage plans, the proposed development is very similar to that proposed at the time of the original infiltration report. Therefore, the recommendations made at the time of the original report generally remain valid. However, the conceptual grading plans indicate that a proposed underground infiltration system will be located south of the proposed Building 2. Infiltration testing was not performed in this area of the site. Therefore, the following updated infiltration recommendations provide additional recommendations related to the new proposed underground infiltration system.

Updated Infiltration Design Recommendations

Six (6) infiltration tests were performed at the subject site. As noted in the above referenced infiltration report, the infiltration rates at these locations vary from 5.7 to 20.2 inches per hour. The primary factors affecting the infiltration rates are the varying relative densities and the silt content of the encountered soils, which vary at different depths and locations at the subject site. Based on the results of Infiltration Test Nos. I-1 through I-6, we recommend infiltration rates as follows:

Infiltration Test	Location	Infiltration Rate (Inches per Hour)
I-1 and I-2	East of Proposed Building 3	7.6
I-3 and I-4	North of Proposed Building 1	13.0
I-5 and I-6	South of Proposed Building 1	5.7
None	South of Proposed Building 2	5.7

The proposed infiltration system located south of the proposed Building 2 was not a part of the proposed development at the time of our original infiltration report. The area south of the proposed Building 2 was not tested for infiltration characteristics. However, borings in the vicinity of this proposed infiltration system indicated that soils consisting of medium dense to very dense fine to coarse sands with trace amounts of silt and some fine to coarse gravel are present at a depth of 3± below the existing site grades, extending to the maximum depth explored of 15± feet. These soils are consistent with soils present at our infiltration test locations. Therefore, we recommend a conservative infiltration rate of 5.7 inches per hour for the proposed basin located south of the proposed Building 2. If infiltration rates specific to this area are required, SCG should be contacted to perform additional infiltration testing in this area.

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration system to identify the soil classification at the base of the infiltration basin. It should be confirmed that the soils at the base of the proposed infiltration system corresponds with those presented in this report to ensure that the performance of the system will be consistent with the rates reported herein.

The design of the proposed storm water infiltration system should be performed by the project civil engineer, in accordance with the City of Rancho Cucamonga guidelines. However, it is recommended that the systems be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rate recommended above is based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rate.** It should be noted that the recommended infiltration rate is based on infiltration testing at six (6) discrete locations, and the overall infiltration rate of the storm water infiltration system could vary considerably.

Updated Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the city of Rancho Cucamonga guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Updated Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

Updated Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

Geotechnical Report Update

As previously stated, based on the most recent conceptual grading and drainage plans, the proposed development is very similar to that proposed at the time of the original geotechnical investigation. Therefore, the recommendations presented in the referenced geotechnical report remain valid for the project. No further subsurface exploration is considered warranted from this project. The original geotechnical report is considered valid for the currently proposed development.

Additionally, the 2019 CBC was adopted since the time of the referenced geotechnical report. This document includes updated seismic design parameters as well as an updated liquefaction analysis with respect to the 2019 CBC.

Updated Seismic Design Parameters for 2019 CBC

The 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 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 improvements at this site.

Closure

We sincerely appreciate the opportunity to be of continued 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.

Ricardo Frias, RCE 91772
Project Engineer

Robert G. Trazo, M.Sc., GE 2655
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
RICARDO FRIAS
No. 91772
CIVIL
STATE OF CALIFORNIA

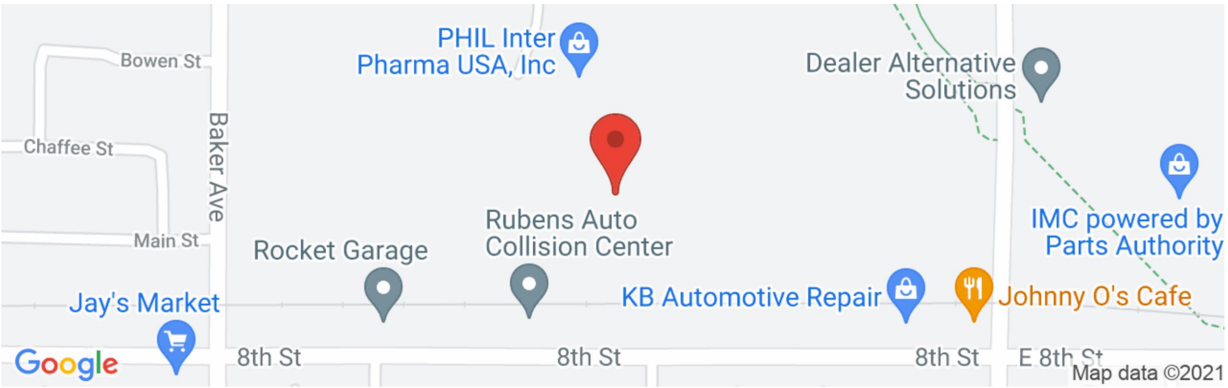
REGISTERED PROFESSIONAL ENGINEER
ROBERT TRAZO
No. 2655
GEOTECHNICAL
STATE OF CALIFORNIA

Enclosures: Plate E-1: Seismic Design Parameters – 2019 CBC
City of Rancho Cucamonga Engineering Review Sheet (2 sheets)

Distribution: (1) Addressee

OSHPD

Latitude, Longitude: 34.093558, -117.615399



Date	5/27/2021, 2:42:45 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	0.529	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.582	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	1.638	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.749	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.612	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.669	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.529	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.937	Mapped value of the risk coefficient at short periods
C_{R1}	0.914	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 DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

DRAWN: RF
CHKD: RGT

SCG PROJECT
19G121-6

PLATE E-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

April 5, 2019

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Panattoni Development Company, Inc.
20411 SW Birch Street, Suite 200
Newport Beach, California 92660

Attention: Mr. Michael Sizemore
Development Manager

Project No.: **19G121-2**

Subject: **Results of Infiltration Testing**
Proposed Commercial/Industrial Development
Baker Avenue, South of 9th Street
Rancho Cucamonga, California

Reference: Geotechnical Investigation, Proposed Commercial/Industrial Development, Baker Avenue, South of 9th Street, Rancho Cucamonga, California, prepared for Panattoni Development Company, Inc. by Southern California Geotechnical, Inc. (SCG), SCG Project No. 19G121-1, dated April 5, 2019.

Dear Mr. Sizemore:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 18P368R4, dated February 26, 2019. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Site and Project Description

The subject site is located on the east side of Baker Avenue, 300± feet south of 9th Street in Rancho Cucamonga, California. The site is bounded to the north by single-family residences, commercial/industrial buildings, and 9th Street, to the west by Baker Avenue, to the south by a railroad easement, and to the east by Vineyard Avenue and a concrete lined channel. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The overall site consists of multiple irregular-shaped parcels, which total 47.03± acres in size. The south-central parcel is developed with a commercial/industrial building, approximately 71,000± ft^2 in size. The building appears to be a single-story structure of concrete tilt-up construction. The building is surrounded by asphaltic concrete (AC) pavements, which are generally in poor condition with moderate to severe cracking throughout, and areas of crushed aggregate base (CAB) in the southern area of the parcel.

The southeastern parcel is currently occupied by the Scheu Steel Supply Company and is developed with two (2) buildings. One of the buildings is a two-story industrial building, 40,000± ft² in size, located in the east-central area of the parcel. This building is of metal-frame construction. The second building, 2,700± ft² in size, is located in the southeastern area of the parcel and is a single-story structure of wood-frame and stucco construction. The ground surface cover surrounding the buildings consists CAB, AC pavements, and areas of exposed soil. The ground surface cover in the western portion of the parcel consists of exposed soil with moderate native grass and weed growth. An existing cell tower is located in the south-central area of the parcel. Based on our review of historic aerial photographs, the northeastern area of this parcel was previously developed with two (2) single-family residences. However, based on these photographs, the residences were removed by February 2016.

The northeastern parcel is currently developed with a small commercial/industrial building, 4,000± ft² in size. The building is located in the northern area of the parcel and is surrounded by AC pavements and exposed soils. Numerous stockpiles of green waste including plant foliage, tree trunks, branches, and wood chips are located in the central area of the parcel.

The north-central area of the site is presently developed with a 6,100± ft² two-story building of wood-frame and stucco construction, assumed to be supported on conventional shallow foundations with a concrete slab-on-grade floor. The building is surrounded by concrete pavements and exposed soil. The pavements are generally in fair condition with moderate cracking throughout. Four (4) radio towers are present to the south of the existing building. The ground surface cover surrounding the radio towers and in the remainder of this parcel consists of exposed soil with moderate to dense native grass and weed growth. Based on our review of historic aerial photographs, the northwestern region of this area of the site was previously developed with three (3) single-family residences. Based on the historical photographs, all three of the residences were removed by October 2016. Two (2) concrete slabs measuring 1,700± and 1,800± ft² remain in this area.

The western area of the site is vacant and undeveloped. The ground surface cover in this area consists of exposed soil and moderate to dense native grass and weed growth. An AC road transects this portion of the site, which generally trends east-to-west. A historical building is present in the west-central area, which is to remain and is not a part of the site.

Detailed topographic information was not available at the time of this report. However, based on topographic information obtained from Google Earth, the site topography ranges from 1,165± feet msl in the northwestern area of the site to 1,130± feet mean sea level (msl) in the southeastern area. The site topography slopes gently downward toward the south-southeast at a gradient of approximately 1± percent.

Proposed Development

Based on a conceptual site plan (Scheme 5A) provided to our office by the client, the site will be developed with three (3) new commercial/industrial buildings. The buildings will be identified as

Buildings 1 through 3. Building 1 will be located in the eastern area of the site and will be 639,310± ft² in size. Building 2 will be located in the central area of the site and will be 128,160± ft² in size. Building 3 will be located in the western area of the site and will be 279,390± ft² in size. The buildings will be constructed with dock-high doors located along a portion of at least one wall of each building. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, with concrete flatwork and landscape planters throughout.

We understand that the proposed development will include on-site infiltration to dispose of storm water. Based on the current site layout and conversations with the client, the proposed infiltration systems will consist of three (3) below-grade chamber systems located to the east of proposed Building 3 and to the north and south of Building 1. The bottoms of the chamber systems will extend to depths ranging from 9 to 15± feet below the existing site grades.

Concurrent Study

SCG recently conducted a geotechnical investigation at the subject site, referenced above. As part of this study, eleven (11) borings advanced to depths of 15 to 25± feet below existing site grades. In addition to the eleven borings, four (4) trenches were excavated at the site to depths of 9 to 10± feet below existing site grades. Artificial fill soils were encountered at the ground surface at most of the boring and trench locations, extending to depths of 1½ to 8± feet below the existing site grades. The fill soils generally consist of loose to very dense silty fine sands well graded sands with varying gravel content and some cobbles. Native alluvium was encountered below the fill soils or at the ground surface at all of the boring and trench locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense well graded sands with varying gravel and cobble content, and occasional boulders.

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 25± feet at the time of the subsurface exploration. As part of our research, we reviewed readily available groundwater data in order to determine regional groundwater depths. 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/. One of the nearest monitoring wells is located approximately 1.7 miles northwest from the site. Water level readings within this monitoring well indicates a high groundwater level of 110 feet below the ground surface (November 2013).

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of six (6) backhoe-excavated trenches, extending to depths of 9 to 13± feet below existing site grades. The trenches were logged during excavation by a member of our staff. The approximate locations of the infiltration trenches (identified as I-1 through I-6) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

CAB was encountered at the ground surface at Infiltration Trench No. I-6, measuring 9 to 10± inches in thickness. Artificial fill soils were encountered below the CAB at I-6, and at the ground surface at all of the remaining infiltration trench locations, extending to depths of 2 to 6½± feet below the existing site grades. The fill soils generally consist of loose to dense silty fine sands with varying amounts of medium to coarse sands, fine to coarse gravel, and cobbles. The fill soils possess a disturbed appearance, varying densities, and trace plastic and wire at Infiltration Trench Nos. I-3 and I-6, resulting in their classification as artificial fill. Infiltration Trench No. I-3 exposed a 1± foot diameter, intact concrete pipe within the fill layer at a depth of 1± foot below the ground surface.

Native alluvium was encountered below the fill soils at all six (6) of the infiltration trench locations. The alluvial soils generally consist of medium dense to very dense silty fine sands, fine to medium sands, gravelly fine to coarse sands, and fine to coarse sandy gravel with varying cobbles, boulders, and silt content, extending to the maximum depth explored of 13± feet. The Trench Logs, which illustrate the conditions encountered at the infiltration test locations, are included with this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration systems that will be used at the subject site. As previously mentioned, the infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at all six (6) of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at each infiltration test location, the volumetric measurements were made at increments ranging from 1 to 3 minutes. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	12	Fine to coarse Sandy Gravel, extensive Cobbles, occasional Boulders	9.7
I-2	9	Fine to coarse Sandy Gravel, extensive Cobbles, occasional Boulders	7.6
I-3	13	Fine to coarse Sandy Gravel, extensive Cobbles	15.4
I-4	12	Fine to coarse Sandy Gravel, extensive Cobbles, occasional Boulders	13.0
I-5	9	Gravelly fine to coarse Sand, extensive Cobbles, little Silt	5.7
I-6	9½	Gravelly fine to coarse Sand, occasional to extensive Cobbles	20.2

Laboratory Testing

Moisture Content

The moisture contents for selected soil samples within the trenches were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Trench Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test trench has been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of the grainsize analysis are presented on Plates C-1 through C-6 of this report.

Design Recommendations

Six (6) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range from 5.7 to 20.2 inches per hour. The primary factors affecting the infiltration rates are the varying relative densities and the silt content of the encountered soils, which vary at different depths and locations at the subject site.

Based on the results of Infiltration Test Nos. I-1 and I-2, we recommend an infiltration rate of 7.6 inches per hour be used for the proposed below-grade chamber system located to the east of Building 3. Based on the results of Infiltration Test Nos. I-3 and I-4, we recommend an infiltration rate of 13.0 inches per hour be used for the proposed below-grade chamber system located to the north of Building 1. Based on the results of Infiltration Test Nos. I-5 and I-6, we recommend an infiltration rate of 5.7 inches per hour be used for the proposed chamber system located to the south of Building 1.

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each chamber system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

The design of the proposed storm water infiltration systems should be performed by the project civil engineer, in accordance with the City of Rancho Cucamonga and/or County of San Bernardino guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at six (6) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Therefore, the subgrade soils within proposed infiltration system areas should not be overexcavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

Infiltration versus Permeability

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. The infiltration rates presented herein were determined in accordance with the ASTM Test Method D-3385-03 standard and are considered valid for the time and place of the actual test. Changes in soil moisture content will affect these infiltration rates. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration areas could potentially be damaged due to saturation of subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration systems at least 25 feet from the building, it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration systems.

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, structural engineer, and/or civil engineer. The design of the infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rates contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the infiltration system. 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 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 trench locations and testing 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.

Closure

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.

Scott McCann
Staff Scientist

Daniel W. Nielsen, RCE 77915
Senior Engineer

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

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Trench Logs (6 pages)
Infiltration Test Results Spreadsheets (6 pages)
Grain Size Distribution Graphs (6 pages)

SOURCE: SAN BENARDINO COUNTY
THOMAS GUIDE, 2013

SITE LOCATION MAP

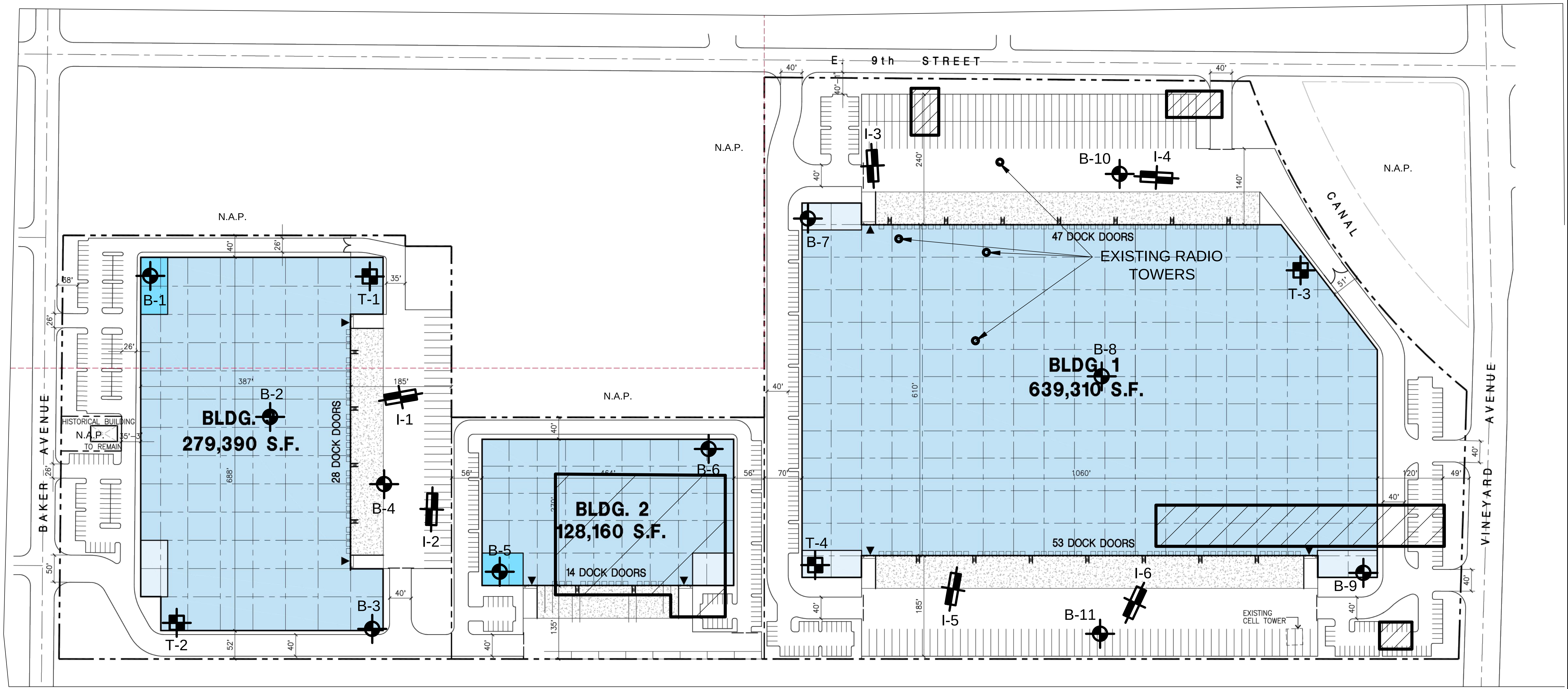
PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

SCALE: 1" = 2400'	
DRAWN: OS CHKD: RGT	
SCG PROJECT 19G121-2	
PLATE 1	

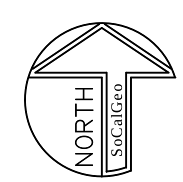
SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- APPROXIMATE BORING LOCATION FROM CONCURRENT STUDY (SCG PROJECT NO. 19G121-1)
- APPROXIMATE TRENCH LOCATION FROM CONCURRENT STUDY (SCG PROJECT NO. 19G121-1)
- EXISTING BUILDINGS TO BE DEMOLISHED



NOTE: CONCEPTUAL SITE PLAN PREPARED BY HPA ARCHITECTURE.

INFILTRATION TEST LOCATION PLAN

PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

SCALE: 1" = 180'

DRAWN: AL
CHKD: RGT

SCG PROJECT 19G121-2

PLATE 2

SOUTHERN CALIFORNIA GEOTECHNICAL

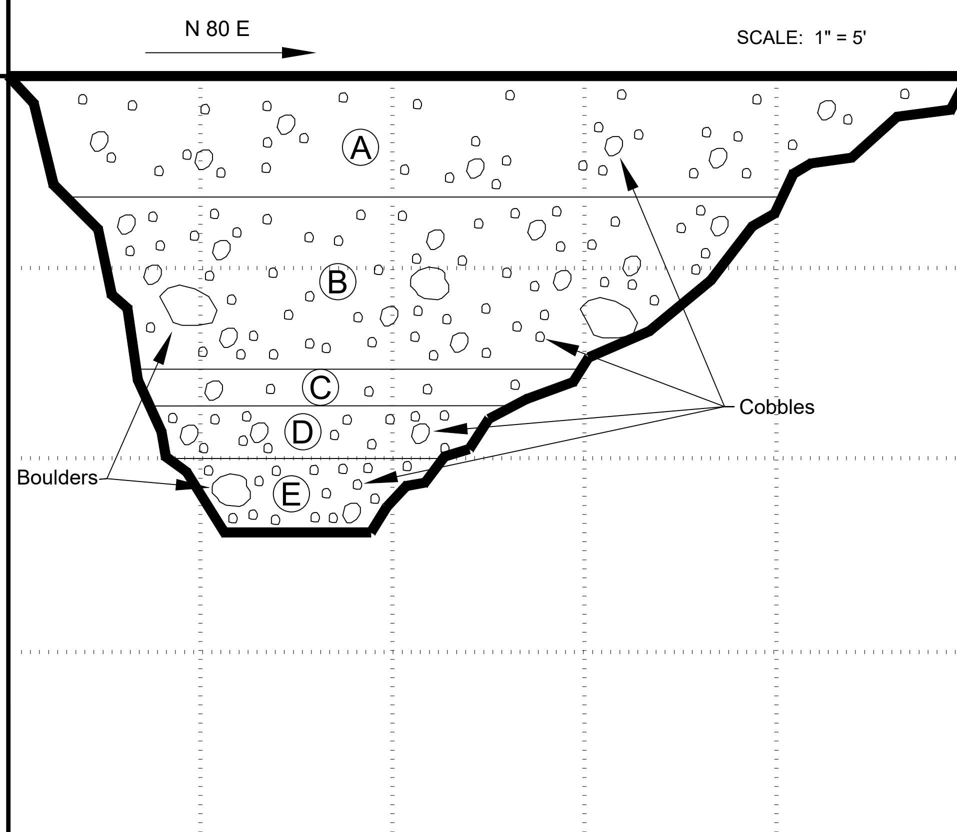
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-1

JOB NO.: 19G121-2	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Commercial/Industrial Development	LOGGED BY: Scott McCann	SEEPAGE DEPTH: Dry
LOCATION: Rancho Cucamonga, CA	ORIENTATION: N 80 E	READINGS TAKEN: At Completion
DATE: 3-7-2019	ELEVATION:	

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		4	A: FILL: Brown Silty fine to coarse Sand, little fine to coarse Gravel, occasional to extensive Cobbles, trace fine root fibers, medium dense to dense - damp @ 0 to 1 foot, abundant fine root fibers
5				B: ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, extensive Cobbles, occasional Boulders, trace Silt, dense to very dense - dry to damp
	b		5	C: ALLUVIUM: Light Brown fine to medium Sand, little coarse Sand, little fine to coarse Gravel, occasional Cobbles, medium dense - damp D: ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, extensive Cobbles, trace Silt, dense to very dense - damp
10	b		4	E: ALLUVIUM: Light Gray Brown fine to coarse Sandy Gravel, extensive Cobbles, occasional Boulders, very dense - damp
				Trench Terminated @ 12 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-1

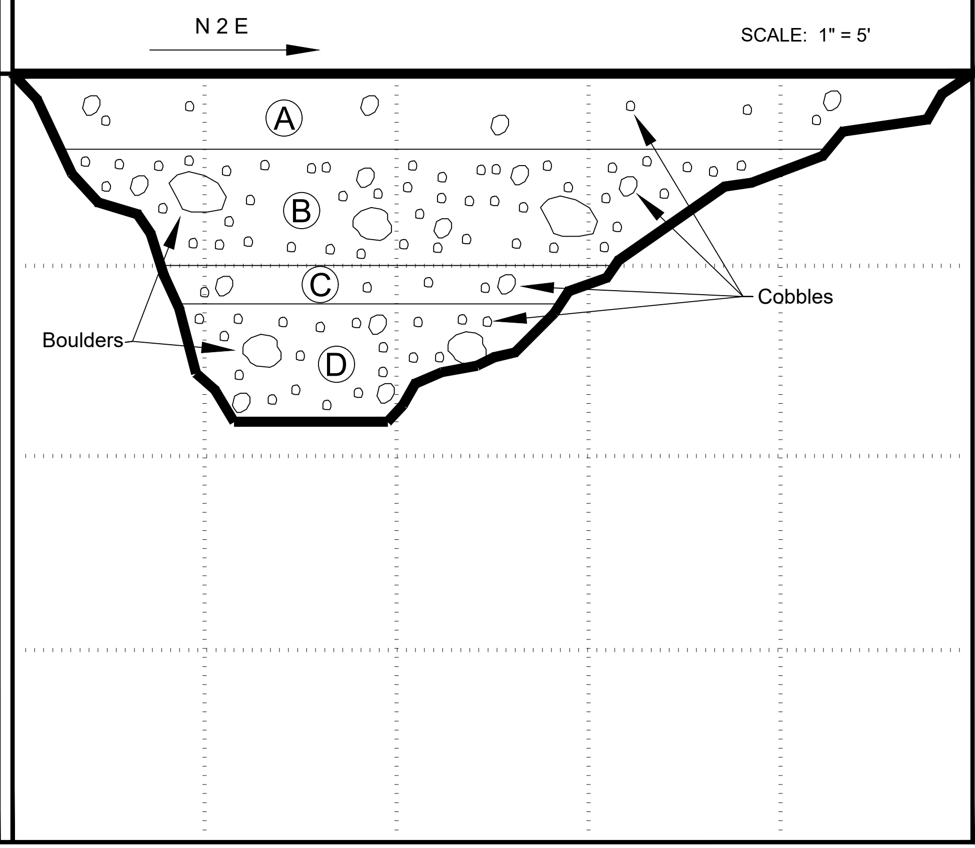
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-2

JOB NO.: 19G121-2	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Commercial/Industrial Development	LOGGED BY: Scott McCann	SEEPAGE DEPTH: Dry
LOCATION: Rancho Cucamonga, CA	ORIENTATION: N 2 E	READINGS TAKEN: At Completion
DATE: 3-7-2019	ELEVATION:	

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		13	A: FILL: Dark Brown Silty fine Sand, little medium to coarse Sand, trace to little fine to coarse Gravel, occasional Cobbles, some fine root fibers, loose to medium dense - moist
				B: ALLUVIUM: Light Gray Gravelly fine to coarse Sand, extensive Cobbles, occasional Boulders, dense to very dense - damp
5	b		13	C: ALLUVIUM: Brown fine to medium Sand, little coarse Sand, little fine Gravel, trace coarse Gravel, occasional Cobbles, little Silt, medium dense to dense - moist
	b		2	D: ALLUVIUM: Light Gray Brown fine to coarse Sandy Gravel, extensive Cobbles, occasional Boulders, very dense - dry to damp
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-2

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-3

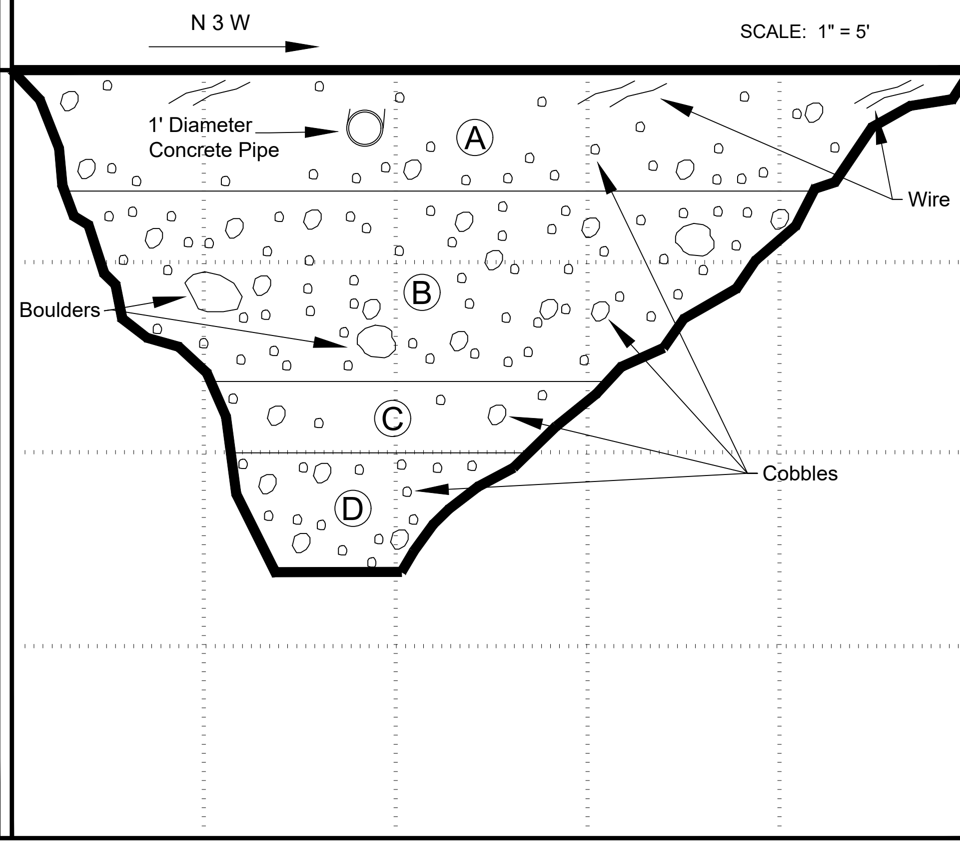
JOB NO.: 19G121-2
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, CA
DATE: 3-8-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: N 3 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		7	A: FILL: Gray Brown Silty fine to medium Sand, little coarse Sand, little to some fine to coarse Gravel, occasional to extensive Cobbles, 1' diameter intact Concrete Pipe, trace Wire, trace fine root fibers, medium dense to dense - damp
				B: ALLUVIUM: Light Gray Gravelly fine to coarse Sand, extensive Cobbles, occasional Boulders, dense to very dense - damp to moist
5				
	b		14	C: ALLUVIUM: Brown Silty fine Sand, little medium to coarse Sand, trace to little fine to coarse Gravel, occasional Cobbles, medium dense to dense - moist
10				D: ALLUVIUM: Light Gray Brown fine to coarse Sandy Gravel, extensive Cobbles, dense - damp
	b		4	
				Trench Terminated @ 13 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-4

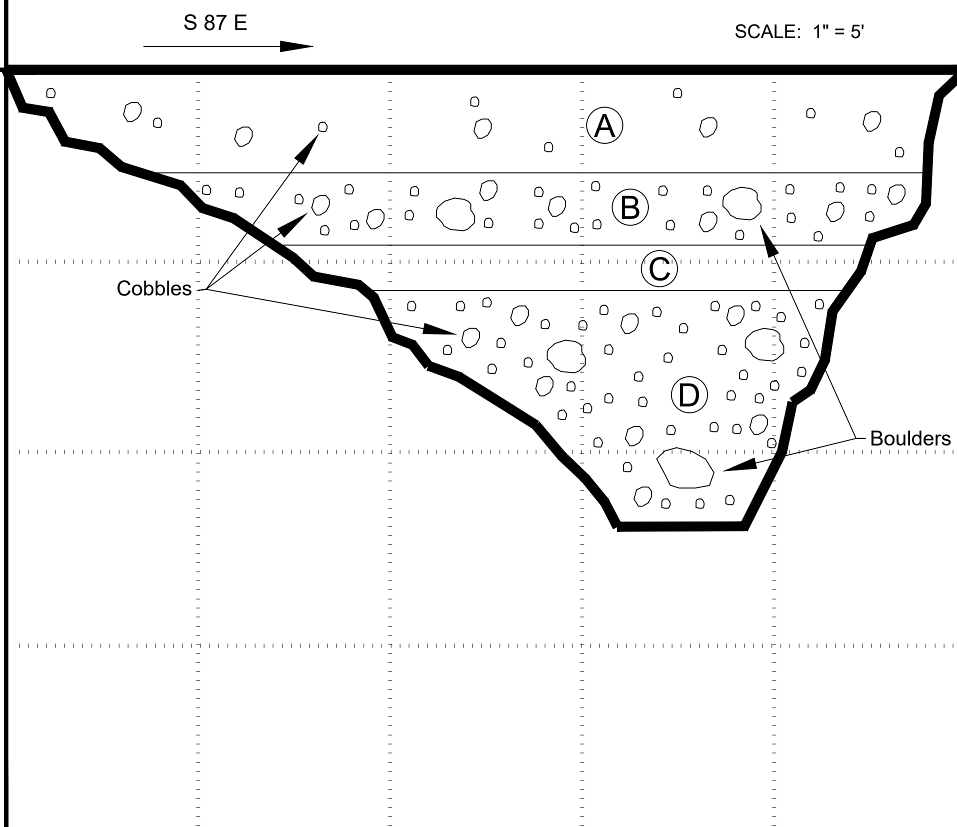
JOB NO.: 19G121-2
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, CA
DATE: 3-8-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: S 87 E
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		13	A: FILL: Brown Silty fine Sand, little medium to coarse Sand, little fine to coarse Gravel, occasional Cobbles, some fine root fibers, medium dense - moist
				B: ALLUVIUM: Light Gray Gravelly fine to coarse Sand, extensive Cobbles, occasional Boulders, dense to very dense - dry to damp
5	b		6	C: ALLUVIUM: Light Gray fine to coarse Sand, little fine Gravel, trace coarse Gravel, medium dense - damp
				D: ALLUVIUM: Light Gray Brown fine to coarse Sandy Gravel, extensive Cobbles, occasional Boulders, dense to very dense - damp
10				
	b		3	
				Trench Terminated @ 12 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-4

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-5

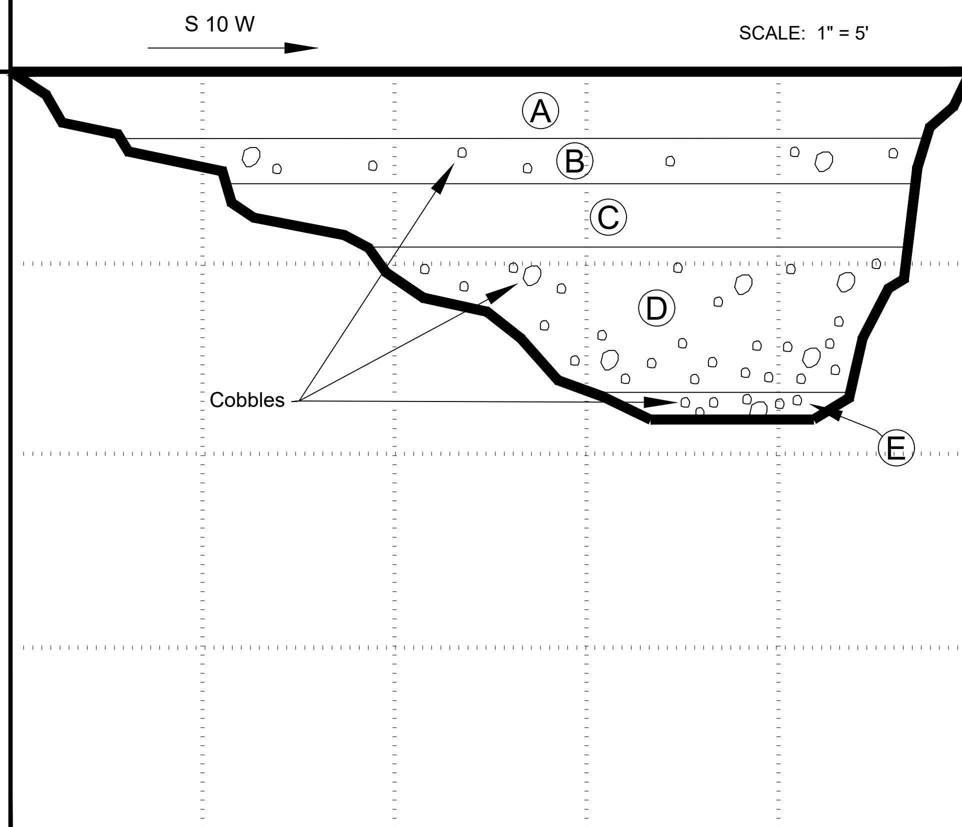
JOB NO.: 19G121-2
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, CA
DATE: 311-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: S 10 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		9	A: FILL: Brown Silty fine to medium Sand, little coarse Sand, trace fine Gravel, some fine root fibers, loose - damp to moist
				B: ALLUVIUM: Light Gray fine to coarse Sand, little fine to coarse Gravel, occasional Cobbles, loose to medium dense - damp
				C: ALLUVIUM: Brown Silty fine Sand, little medium to coarse Sand, little fine Gravel, medium dense - moist
5				D: ALLUVIUM: Light Gray Gravelly fine to coarse Sand, occasional to extensive Cobbles, dense - dry to damp
	b		9	E: ALLUVIUM: Gray Brown Gravelly fine to coarse Sand, extensive Cobbles, little Silt, dense to very dense - moist
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-5

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-6

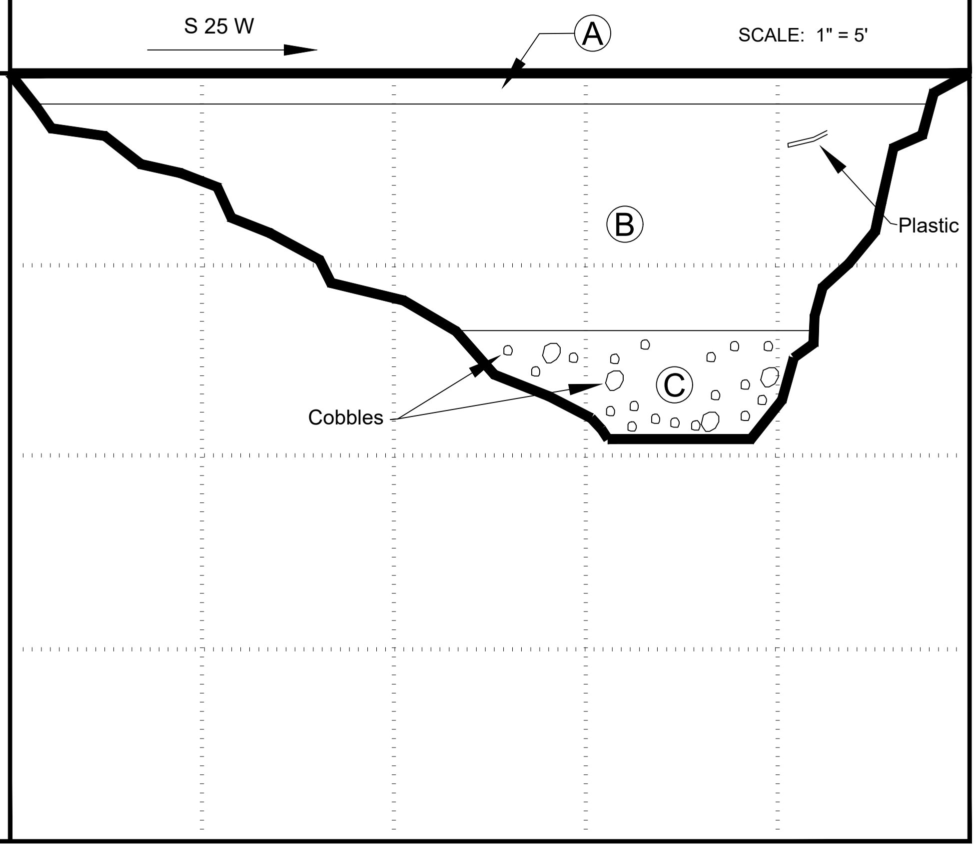
JOB NO.: 19G121-2
PROJECT: Proposed Commercial/Industrial Development
LOCATION: Rancho Cucamonga, CA
DATE: 3-11-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: S 25 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
				A: CRUSHED AGGREGATE BASE (CAB): 9 to 10 inches thick
	b		11	B: FILL: Gray Brown Silty fine to medium Sand, little coarse Sand, trace to little fine to coarse Gravel, trace Plastic, loose to medium dense - moist
5				
				C: ALLUVIUM: Light Gray Gravelly fine to coarse Sand, occasional to extensive Cobbles, dense - dry to damp
	b		3	
10				Trench Terminated @ 9.5 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Rancho Cucamonga, CA
Project Number	19G121-2
Engineer	Scott McCann

Infiltration Test No: I-1

Constants	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Flow Readings: Ring Flow (cm^3)	Flow Readings: Annular Ring (ml)	Flow Readings: Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Infiltration Rates: Annular Space* (cm/hr)	Infiltration Rates: Inner Ring* (in/hr)	Infiltration Rates: Annular Space* (in/hr)
1	Initial	12:30 PM	3	150	950	700	4700	26.04	42.94	10.25	16.91
	Final	12:33 PM	**3**	1100		5400					
2	Initial	12:34 PM	3	100	950	900	4650	26.04	42.49	10.25	16.73
	Final	12:37 PM	**7**	1050		5550					
3	Initial	12:38 PM	3	100	950	700	4500	26.04	41.12	10.25	16.19
	Final	12:41 PM	**11**	1050		5200					
4	Initial	12:42 PM	3	150	950	700	4600	26.04	42.03	10.25	16.55
	Final	12:45 PM	**15**	1100		5300					
5	Initial	12:46 PM	3	200	925	700	4600	25.36	42.03	9.98	16.55
	Final	12:49 PM	**19**	1125		5300					
6	Initial	12:50 PM	3	100	925	500	4500	25.36	41.12	9.98	16.19
	Final	12:53 PM	**23**	1025		5000					
7	Initial	12:54 PM	3	200	925	200	4500	25.36	41.12	9.98	16.19
	Final	12:57 PM	**27**	1125		4700					
8	Initial	12:58 PM	3	50	900	300	4500	24.67	41.12	9.71	16.19
	Final	1:01 PM	**31**	950		4800					

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Rancho Cucamonga, CA
Project Number	19G121-2
Engineer	Scott McCann

Infiltration Test No: I-2

Constants			
	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	10:00 AM	3	0	800	300	4900	21.93	44.77	8.63	17.63
	Final	10:03 AM	**3**	800		5200					
2	Initial	10:04 AM	3	300	750	400	4200	20.56	38.38	8.09	15.11
	Final	10:07 AM	**7**	1050		4600					
3	Initial	10:10 AM	3	150	775	800	3950	21.24	36.09	8.36	14.21
	Final	10:13 AM	**13**	925		4750					
4	Initial	10:14 AM	3	100	750	600	3750	20.56	34.26	8.09	13.49
	Final	10:17 AM	**17**	850		4350					
5	Initial	10:18 AM	3	900	725	4600	3800	19.87	34.72	7.82	13.67
	Final	10:21 AM	**21**	1625		8400					
6	Initial	10:22 AM	3	100	725	500	3750	19.87	34.26	7.82	13.49
	Final	10:25 AM	**25**	825		4250					
7	Initial	10:26 AM	3	850	700	4300	3700	19.19	33.81	7.55	13.31
	Final	10:29 AM	**29**	1550		8000					
8	Initial	10:30 AM	3	200	700	600	3700	19.19	33.81	7.55	13.31
	Final	10:33 AM	**33**	900		4300					

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Rancho Cucamonga, CA
Project Number	19G121-2
Engineer	Scott McCann

Infiltration Test No: I-3

Constants			
	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	9:40 AM	1	200	625	500	2600	51.40	71.27	20.23	28.06
	Final	9:41 AM	**1**	825		3100					
2	Initial	9:42 AM	1	150	600	900	2550	49.34	69.90	19.43	27.52
	Final	9:43 AM	**3**	750		3450					
3	Initial	9:44 AM	1	100	550	600	2500	45.23	68.53	17.81	26.98
	Final	9:45 AM	**5**	650		3100					
4	Initial	9:46 AM	1	150	550	500	2450	45.23	67.16	17.81	26.44
	Final	9:47 AM	**7**	700		2950					
5	Initial	9:48 AM	1	1250	550	3950	2400	45.23	65.79	17.81	25.90
	Final	9:49 AM	**9**	1800		6350					
6	Initial	9:50 AM	1	150	500	600	2400	41.12	65.79	16.19	25.90
	Final	9:51 AM	**11**	650		3000					
7	Initial	9:52 AM	1	200	475	600	2350	39.06	64.42	15.38	25.36
	Final	9:53 AM	**13**	675		2950					
8	Initial	9:54 AM	1	200	475	600	2400	39.06	65.79	15.38	25.90
	Final	9:55 AM	**15**	675		3000					
9	Initial	9:56 AM	1	1200	475	3800	2350	39.06	64.42	15.38	25.36
	Final	9:57 AM	**17**	1675		6150					
10	Initial	9:58 AM	1	2250	475	7100	2300	39.06	63.05	15.38	24.82
	Final	9:59 AM	**19**	2725		9400					

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Rancho Cucamonga, CA
Project Number	19G121-2
Engineer	Scott McCann

Infiltration Test No	I-4

Constants			
	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	11:45 AM	1	200	725	900	2450	59.62	67.16	23.47	26.44
	Final	11:46 AM	**1**	925		3350					
2	Initial	11:47 AM	1	300	550	1300	2300	45.23	63.05	17.81	24.82
	Final	11:48 AM	**3**	850		3600					
3	Initial	11:49 AM	1	50	450	400	2250	37.00	61.67	14.57	24.28
	Final	11:50 AM	**5**	500		2650					
4	Initial	11:51 AM	1	200	475	550	2300	39.06	63.05	15.38	24.82
	Final	11:52 AM	**7**	675		2850					
5	Initial	11:53 AM	1	200	425	200	2200	34.95	60.30	13.76	23.74
	Final	11:54 AM	**9**	625		2400					
6	Initial	11:55 AM	1	150	450	500	2200	37.00	60.30	14.57	23.74
	Final	11:56 AM	**11**	600		2700					
7	Initial	11:57 AM	1	150	400	350	2200	32.89	60.30	12.95	23.74
	Final	11:58 AM	**13**	550		2550					
8	Initial	11:59 AM	1	50	400	300	2150	32.89	58.93	12.95	23.20
	Final	12:00 PM	**15**	450		2450					

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Rancho Cucamonga, CA
Project Number	19G121-2
Engineer	Scott McCann

Infiltration Test No: I-5

Constants			
	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	8:50 AM	3	700	725	900	4600	19.87	42.03	7.82	16.55
	Final	8:53 AM	**3**	1425		5500					
2	Initial	8:54 AM	3	150	600	900	3500	16.45	31.98	6.48	12.59
	Final	8:57 AM	**7**	750		4400					
3	Initial	8:58 AM	3	50	600	800	3100	16.45	28.32	6.48	11.15
	Final	9:01 AM	**11**	650		3900					
4	Initial	9:02 AM	3	50	550	500	2900	15.08	26.50	5.94	10.43
	Final	9:05 AM	**15**	600		3400					
5	Initial	9:06 AM	3	50	550	400	3300	15.08	30.15	5.94	11.87
	Final	9:09 AM	**19**	600		3700					
6	Initial	9:10 AM	3	50	525	500	2900	14.39	26.50	5.67	10.43
	Final	9:13 AM	**23**	575		3400					
7	Initial	9:14 AM	3	200	525	1700	2800	14.39	25.58	5.67	10.07
	Final	9:17 AM	**27**	725		4500					

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Development
Project Location	Rancho Cucamonga, CA
Project Number	19G121-2
Engineer	Scott McCann

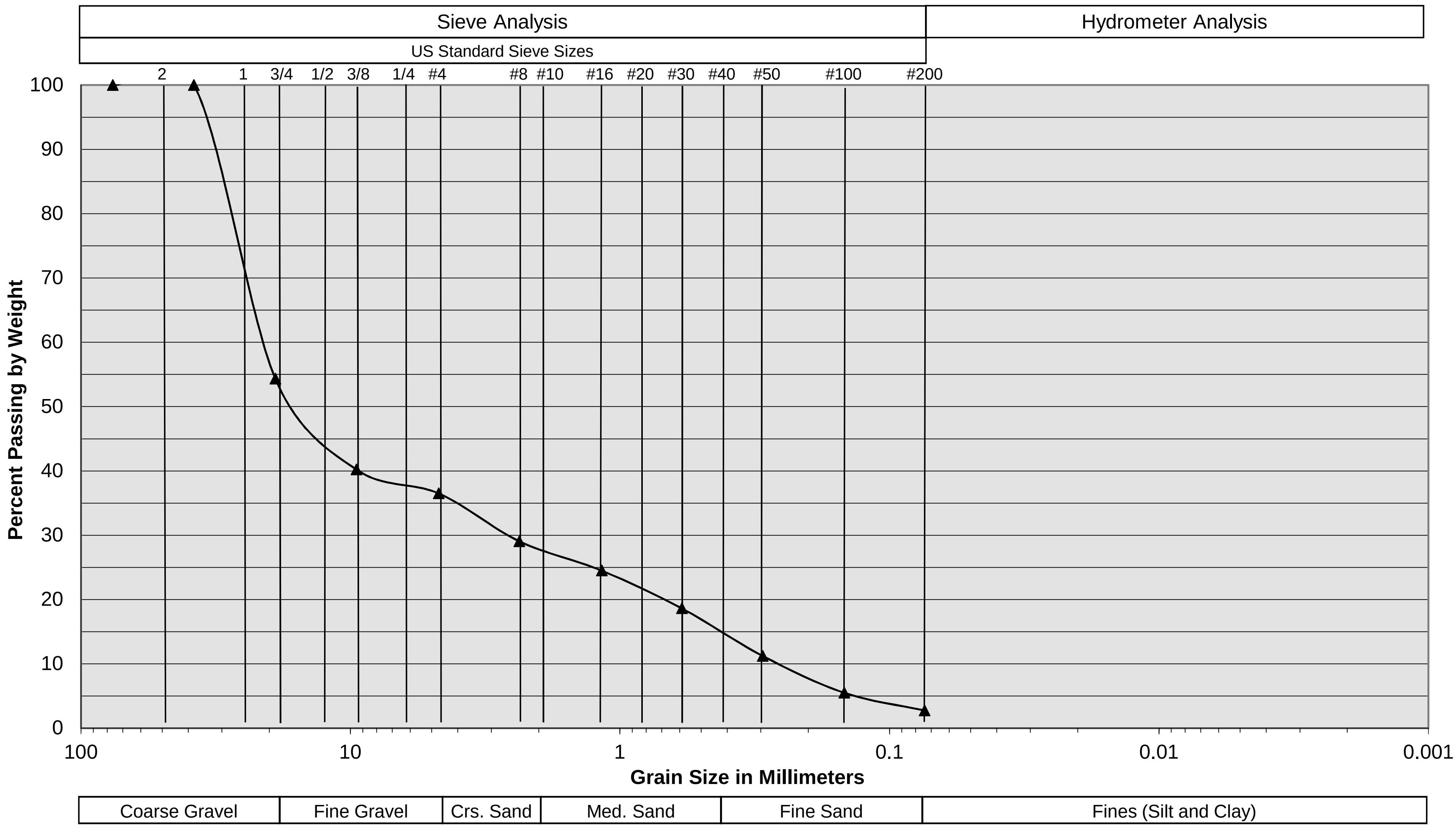
Infiltration Test No: I-6

Constants			
	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	10:40 AM	1	700	725	1800	3100	59.62	84.97	23.47	33.45
	Final	10:41 AM	**1**	1425		4900					
2	Initial	10:42 AM	1	250	650	1500	2800	53.45	76.75	21.04	30.22
	Final	10:43 AM	**3**	900		4300					
3	Initial	10:44 AM	1	350	625	1200	2800	51.40	76.75	20.23	30.22
	Final	10:45 AM	**5**	975		4000					
4	Initial	10:46 AM	1	250	650	1400	3000	53.45	82.23	21.04	32.38
	Final	10:47 AM	**7**	900		4400					
5	Initial	10:48 AM	1	300	650	1800	2800	53.45	76.75	21.04	30.22
	Final	10:49 AM	**9**	950		4600					
6	Initial	10:50 AM	1	350	650	1600	2900	53.45	79.49	21.04	31.30
	Final	10:51 AM	**11**	1000		4500					
7	Initial	10:52 AM	1	500	625	2300	2700	51.40	74.01	20.23	29.14
	Final	10:53 AM	**13**	1125		5000					

Grain Size Distribution

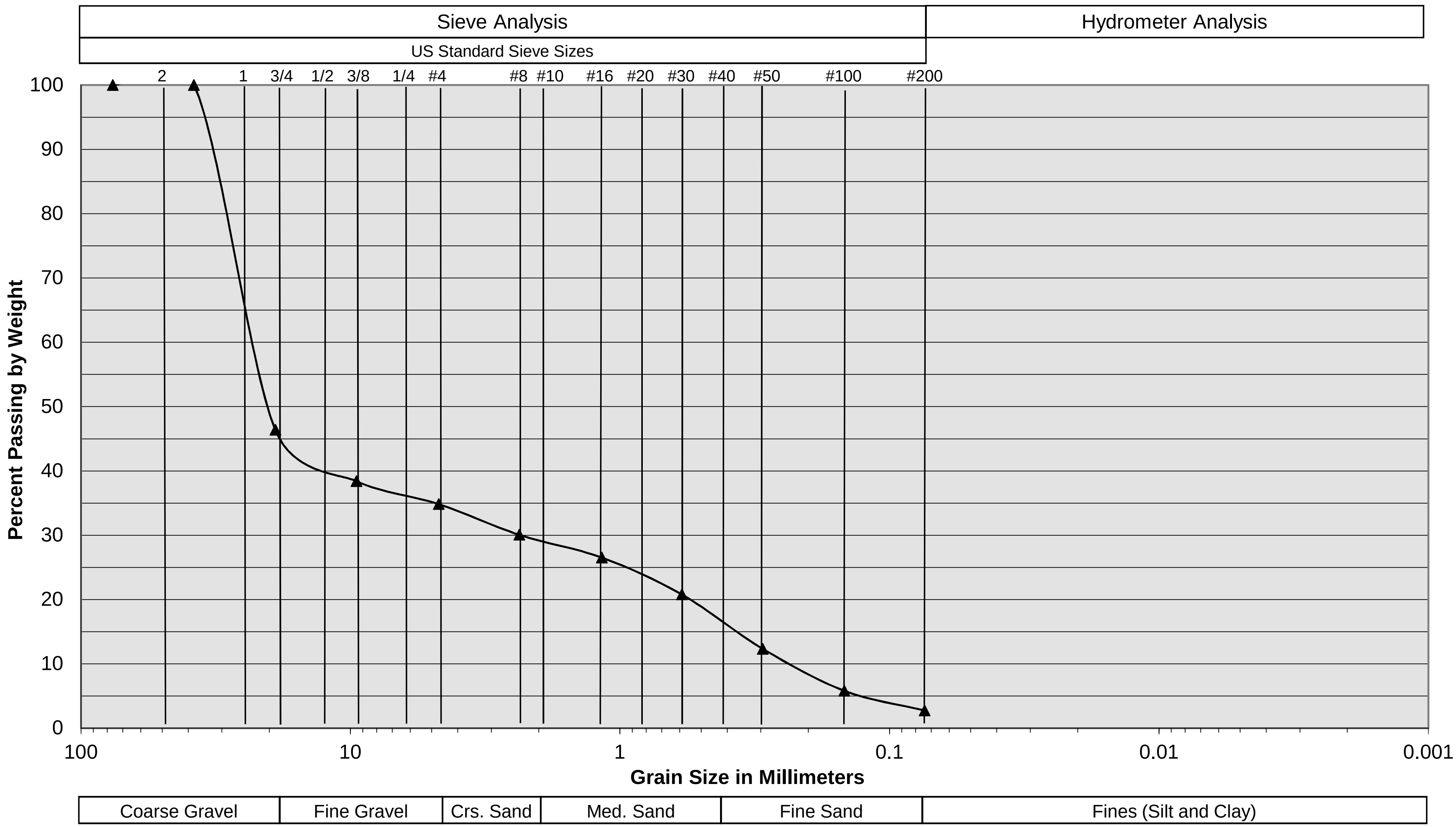


Sample Description	I-1 @ 12 feet
Soil Classification	Light Gray Brown fine to coarse Sandy Gravel

Proposed Commercial/Industrial Development
Rancho Cucamonga, CA
Project No. 19G121-2
PLATE C-1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

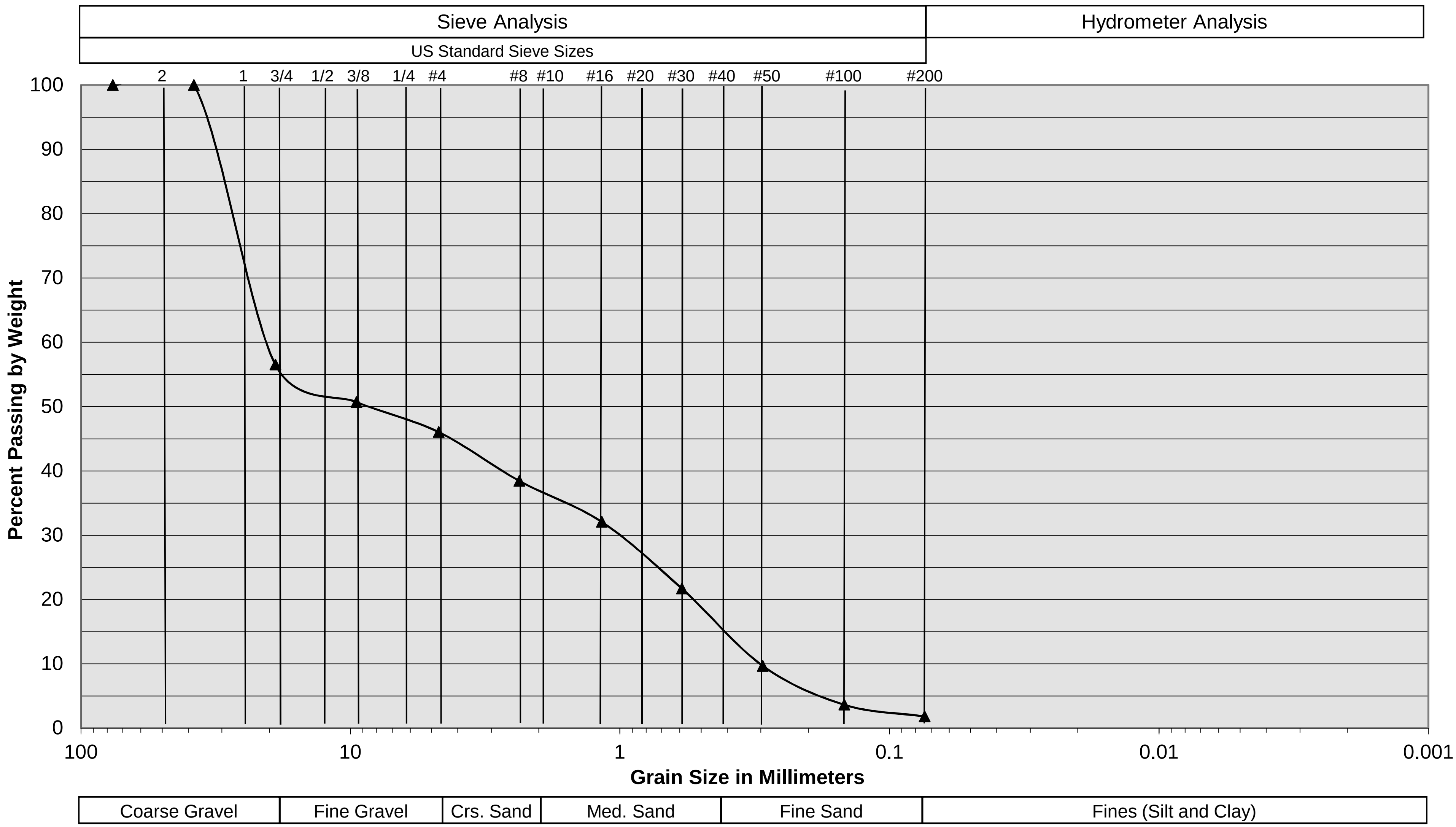


Sample Description	I-2 @ 9 feet
Soil Classification	Light Gray Brown fine to coarse Sandy Gravel

Proposed Commercial/Industrial Development
Rancho Cucamonga, CA
Project No. 19G121-2
PLATE C-2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

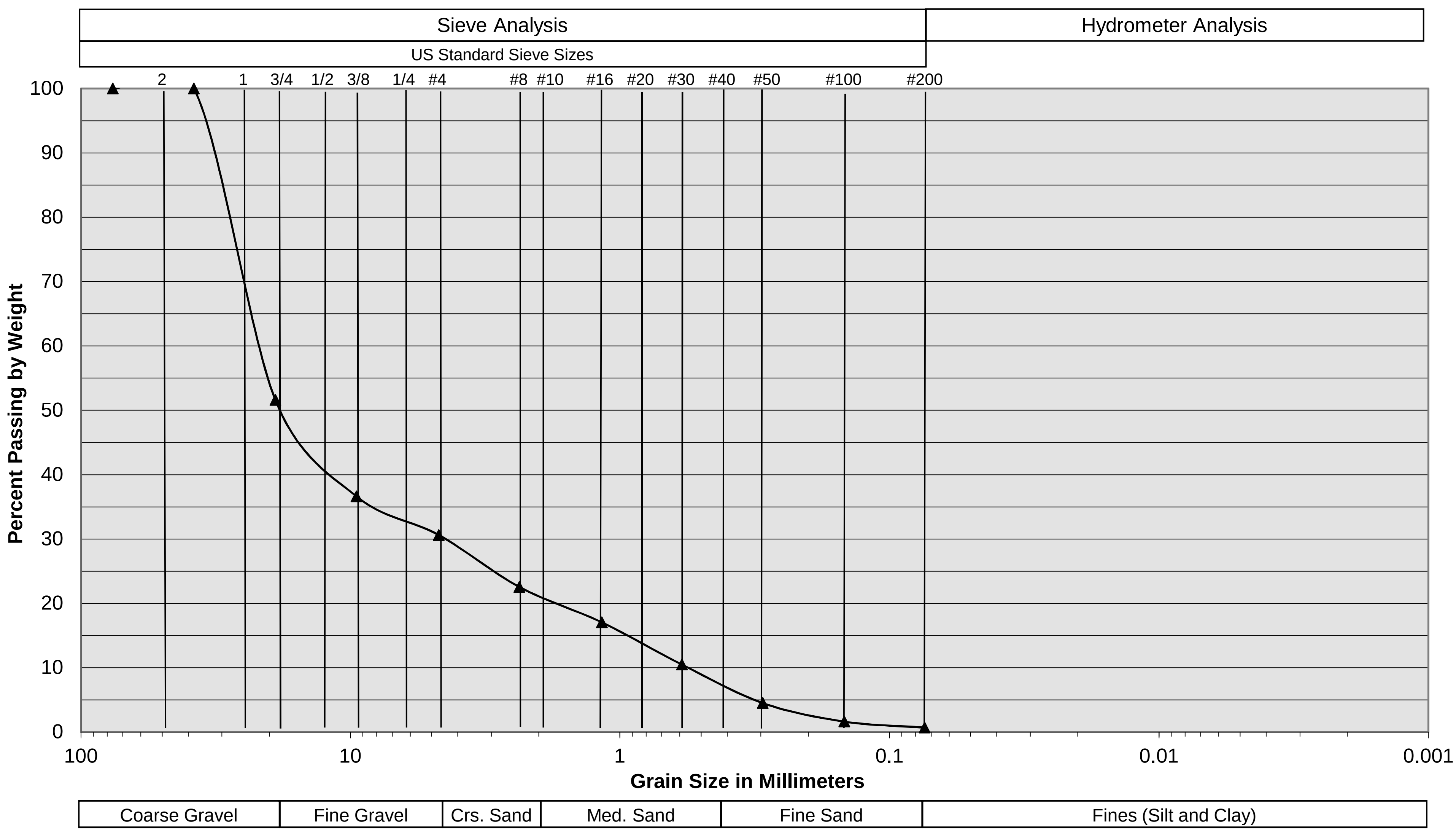


Sample Description	I-3 @ 13 feet
Soil Classification	Light Gray Brown fine to coarse Sandy Gravel

Proposed Commercial/Industrial Development
Rancho Cucamonga, CA
Project No. 19G121-2
PLATE C-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-4 @ 12 feet
Soil Classification	Light Gray Brown fine to coarse Sandy Gravel

Proposed Commercial/Industrial Development
Rancho Cucamonga, CA
Project No. 19G121-2
PLATE C-4

SOUTHERN CALIFORNIA GEOTECHNICAL
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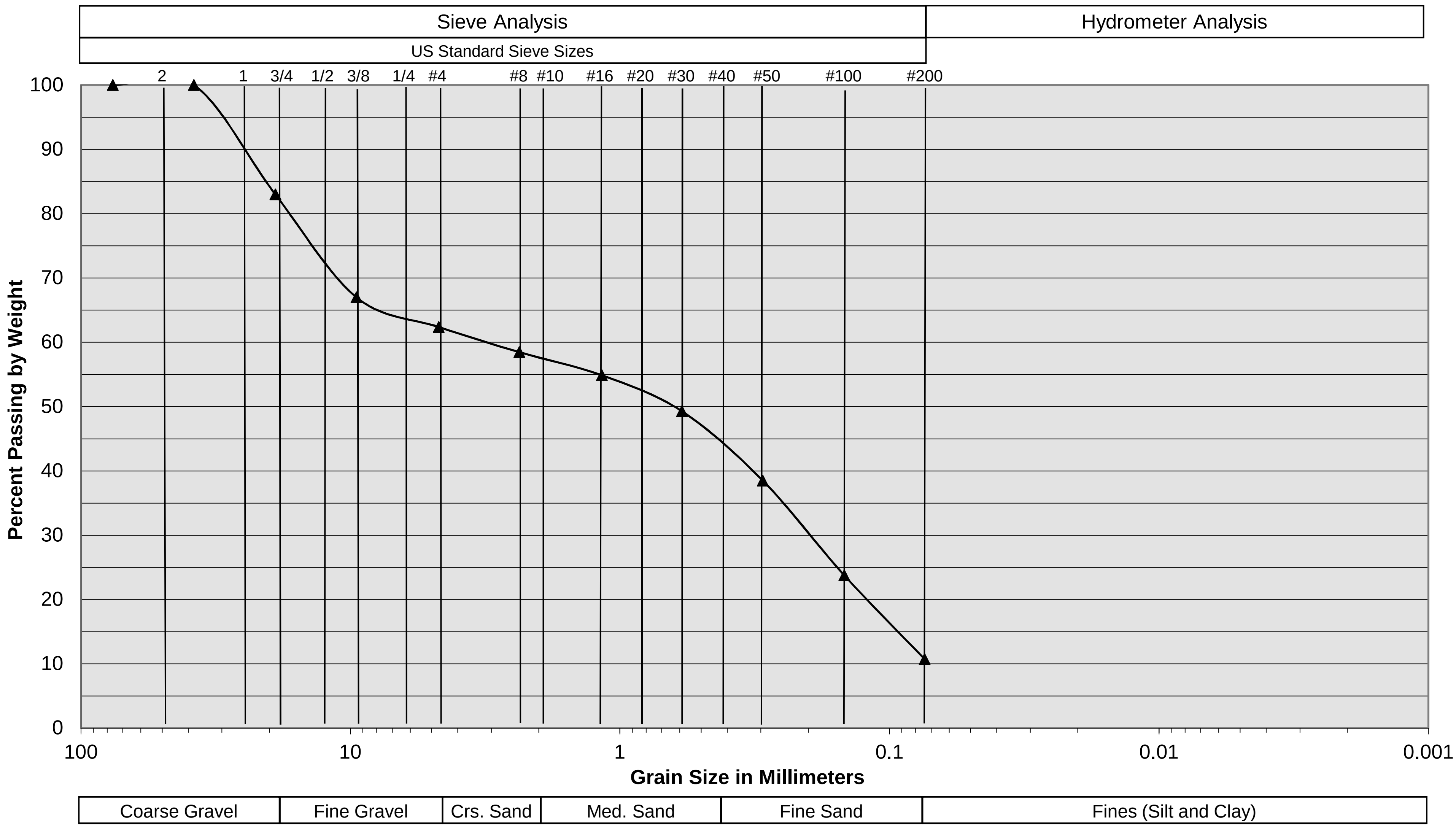
Grain Size Distribution



Sample Description	I-5 @ 9 feet
Soil Classification	Gray Brown Gravelly fine to coarse Sand, little Silt

Proposed Commercial/Industrial Development
Rancho Cucamonga, CA
Project No. 19G121-2
PLATE C-5

SOUTHERN CALIFORNIA GEOTECHNICAL
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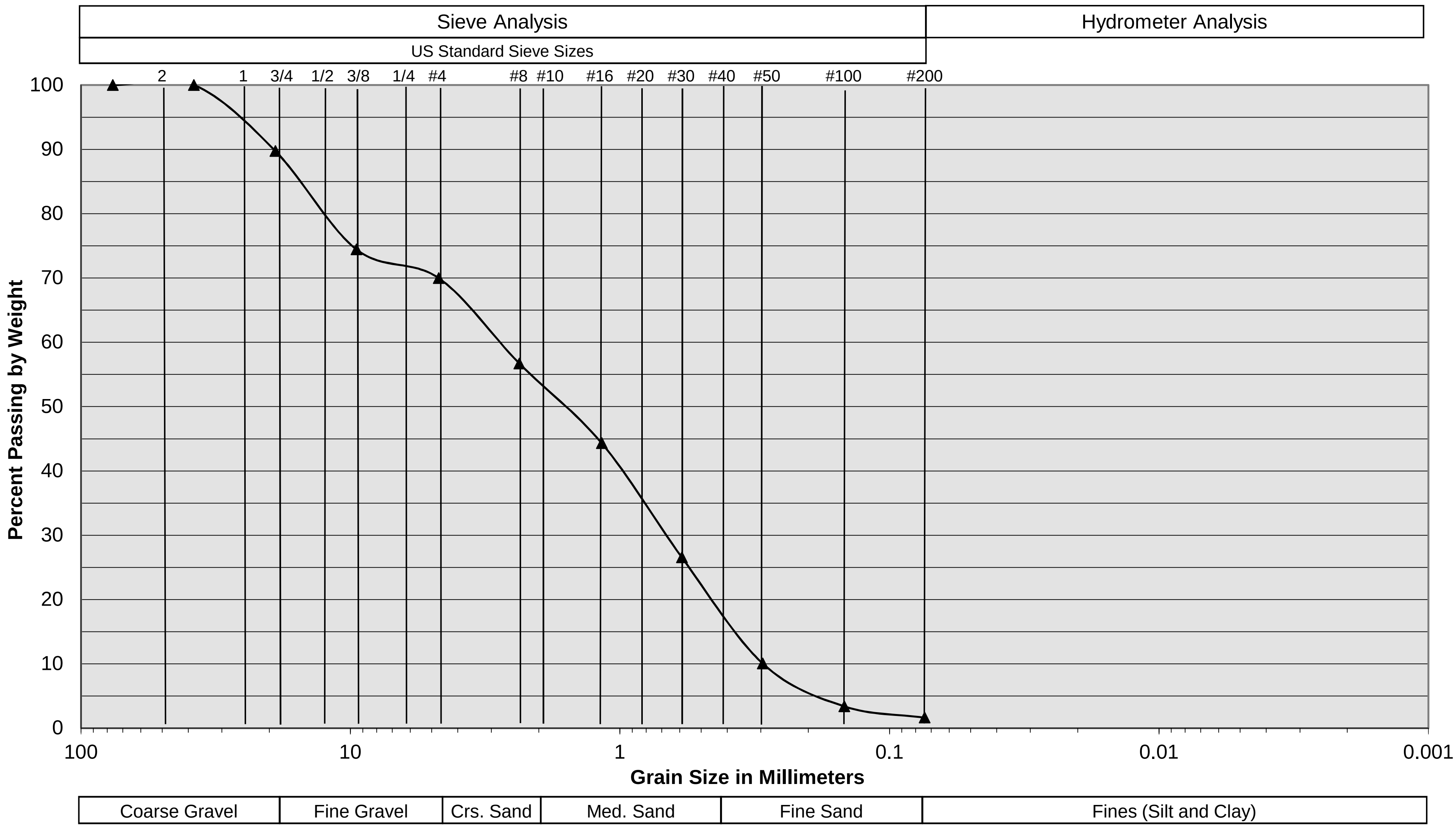
Grain Size Distribution



Sample Description	I-6 @ 9½ feet
Soil Classification	Light Gray Gravelly fine to coarse Sand

Proposed Commercial/Industrial Development
Rancho Cucamonga, CA
Project No. 19G121-2
PLATE C-6

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