

**GEOTECHNICAL INVESTIGATION  
PROPOSED INDUSTRIAL BUILDING**

SEC Remington Avenue and Flight Avenue

Chino, California

for

Commerce Construction Co., L.P.



**SOUTHERN  
CALIFORNIA  
GEOTECHNICAL**  
*A California Corporation*



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*A California Corporation*

May 5, 2022

Commerce Construction Co., L.P.  
13191 Crossroads Parkway North, 6<sup>th</sup> Floor  
City of Industry, California 91746

Attention: Mr. Matthew Vawter  
Vice President – District Manager

Project No.: **22G145-1**

Subject: **Geotechnical Investigation**  
Proposed Industrial Building  
SEC Remington Avenue and Flight Avenue  
Chino, 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.**

A handwritten signature in blue ink, appearing to read "Robert G. Trazo".

Robert G. Trazo, GE 2655  
Principal Engineer



A handwritten signature in blue ink, appearing to read "Gregory K. Mitchell".

Gregory K. Mitchell  
Principal Engineer



Distribution: (1) Addressee

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# 1.0 EXECUTIVE SUMMARY

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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 at most of the boring and trench locations, extending from the ground surface to depths of up to 8± feet, with an average depth on the order of 5 feet.
- The near-surface alluvial soils possess variable strength, minor compressibility and collapse characteristics.
- The recommended depth of remedial grading will need to be sufficient to help reduce potential static settlements to within tolerable levels.
- Highly organic soils were encountered at the subject site. Recommendations for stripping and removal of these materials are included in this report.

## Site Preparation Recommendations

- Demolition of the existing remnants of old structures, including concrete slabs, asphalt, curbs, gutters, utilities, piping and other debris will be required in order to facilitate construction of the new development.
- Site stripping should include all vegetation, organic soils, and root masses. These materials should be disposed of offsite. Site stripping should also include removal of organic topsoil. These materials should also be disposed of off-site.
- **Based on our review of historic aerial photos, the site was previously developed as a dairy. It is recommended that organic materials (greater than 5 percent organics) and any old manure (if present) be removed during site stripping.**
- Organic testing was performed for this investigation that indicates organic contents range from 1 to 23± percent in the upper 24 inches. Based on the test results, we anticipate that the upper 12 to 18 inches of soil will need to be removed or blended. Soils possessing minor to moderate organic contents, less than 5 percent by weight, may be blended with soils with lower organic content, provided that the final mixture contains less than 3 percent organics by weight. As stated above, it is recommended that organic materials (greater than 5 percent organics) and any old manure (if present) be removed during site stripping.
- Remedial grading is recommended within the proposed building pad area to remove the undocumented fill soils in their entirety, which were observed in the borings and trenches to extend to depths of up to 8± feet. The building pad area should also be overexcavated to a depth of at least 5 feet below existing grade or 3 feet below proposed pad grade, whichever is greater. Overexcavation within the foundation areas is recommended to extend to a depth of at least 3 feet below proposed foundation bearing grade.
- After overexcavation has been completed, the subgrade soils should be evaluated by the geotechnical engineer to identify additional soils that should be overexcavated. The resulting subgrade should then be scarified to a depth of 12 inches, moisture conditioned or air dried to 0 to 4 percent above optimum, and 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.

- The new parking area 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<sup>2</sup> maximum allowable soil bearing pressure.
- Reinforcement consisting of four (4) No. 5 rebars, (2 top and 2 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

### Building Floor Slab Design Recommendations

- Conventional Slab-on-Grade: minimum 6 inches thick, from a geotechnical standpoint.
- Minimum slab reinforcement: Reinforcement is not required for geotechnical conditions. However, slab reinforcement may be required for structural design considerations.
- Modulus of Subgrade Reaction:  $k = 120$  psi/in.
- The actual thickness and reinforcement of the floor slab should be evaluated and designed by the structural engineer based on the anticipated geotechnical conditions present after grading, anticipated slab loading and intended use.

### Pavements

<b>ASPHALT PAVEMENTS (R = 36)</b>					
<b>Materials</b>	<b>Thickness (inches)</b>				
	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	5	7	8	9	11
Compacted Subgrade	12	12	12	12	12

<b>PORTLAND CEMENT CONCRETE PAVEMENTS (R = 36, f'c = 3,500 psi)</b>				
<b>Materials</b>	<b>Thickness (inches)</b>			
	Autos and Light Truck Traffic (TI = 5.0 to 6.0)	Truck Traffic		
		(TI =7.0)	(TI =8.0)	(TI =9.0)
PCC	5	5½	6½	7½
Compacted Subgrade (95% minimum compaction)	12	12	12	12

## **2.0 SCOPE OF SERVICES**

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The scope of services performed for this project was in accordance with our Proposal No. 22P139R, dated March 9, 2022. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations, building floor slab, and parking lot pavements along with site preparation recommendations and construction considerations for the 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**

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### **3.1 Site Conditions**

The site is located at the southeast corner of Remington Avenue and Flight Avenue in the city of Chino, California. The site is bounded to the north by Remington Avenue, to the west by Flight Avenue, to the south by an existing industrial development, and to the east by a dairy farm. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report

The site consists of an irregularly-shaped property, 45± acres in size. Based on our site visit, the project site is vacant with signs of previous development. Two (2) concrete slabs measuring 500± feet long and 50 to 60± feet wide trending north-to-south were observed in the north-central portion of the site. Additionally, remnants of two to three residences, consisting of concrete slabs and stone and brick chimneys, were also observed in the north central portion of the site. Otherwise, the ground surface cover consists of exposed soil with sparse native grass and weed growth. A stockpile approximately 10 to 15 feet high comprised of grass clippings and possible debris was observed in the southeast corner of the site.

Detailed topographic information was not available at the time of this report. Based on the elevations obtained from Google Earth and visual observations made at the time of the subsurface investigation, the site slopes downward to the south at a gradient of 2± percent.

### **3.2 Proposed Development**

Our office was provided with a conceptual site plan by the client. Based on this plan, the site will be developed with one (1) industrial building, 923,247± ft<sup>2</sup> in size, located in the east-central area of the site. Dock-high doors will be constructed along the north and south building walls. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. It is assumed that the new building will be a single-story structure of tilt-up concrete construction, supported on a conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

No significant amounts of below-grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 3 to 4± feet are expected to be necessary to achieve the proposed site grades. It should be noted that this estimate does not include any remedial grading recommendations which are presented in a subsequent section of this report.

## **4.0 SUBSURFACE EXPLORATION**

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### **4.1 Scope of Exploration/Sampling Methods**

The subsurface exploration conducted for this project consisted of five (5) borings (identified as Boring Nos. B-1 through B-5) advanced to depths of 10 to 31± feet below the existing site grades. Additionally, seven (7) trenches (identified as Trench Nos. T-1 through T-7) were excavated at the site using a rubber-tire backhoe, extending to depths of 10 to 14± feet.

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

The approximate locations of the borings and trenches 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 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 borings and trenches except for Boring No. B-5, extending to depths of ½ to 8± feet below the existing site grades. The fill soils generally consist of very loose to medium dense silty sands and sandy silts with occasional trace clay content as well as stiff clayey silts with varying amounts of organic material. The fill soils possess a disturbed and mottled appearance, resulting in their classification as artificial fill.

#### Alluvium

Alluvium was encountered at the ground surface at Boring No. B-5 and beneath the fill soils at all of the remaining borings and trenches, extending to at least the maximum depth explored of 30± feet below the existing site grades. The alluvium generally consists of medium dense (with occasional loose and dense) silty sands and sandy silts. Stiff to very stiff clayey silts were encountered at Boring Nos. B-1, B-2, and B-3, from as shallow as 12 to 22± feet extending down to the maximum depth explored of 31± feet.

## Groundwater

Free water was not encountered during drilling of any of the borings or excavation at any of the trenches. Based on these observations, the static groundwater table is considered to have been present at a depth of  $31\pm$  feet below the existing site grades at the time of the subsurface exploration.

As a part of our research, we reviewed available groundwater data in order to determine groundwater levels for the site. Recent water level data was obtained from the California Department of Water Resources website, <https://wdl.water.ca.gov/waterdatalibrary/>. The nearest monitoring well on record is located  $0.85\pm$  miles southwest of the site. Water level readings within this monitoring well indicate a groundwater level of  $69.5\pm$  feet below the ground surface in October 2011.

## **5.0 LABORATORY TESTING**

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

### Classification

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

### Density and Moisture Content

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

### Consolidation

Selected soil samples have been tested to determine their consolidation potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-8 in Appendix C of this report.

### Maximum Dry Density and Optimum Moisture Content

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

### Direct Shear

One direct shear test was performed on representative samples of the near-surface soils to determine its shear strength parameters in accordance with ASTM D-3080. The testing apparatus

is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. For tests on remolded soils, three samples of the same soil are prepared by remolding them to 90± percent compaction and near optimum moisture. Each of the three samples are then loaded with different normal loads and the resulting shear strength is determined for that particular normal load. The shearing of the samples is performed at a rate slow enough to permit the dissipation of excess pore water pressure. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The results of the direct shear test are presented on Plate C-10 in Appendix C of this report.

Soluble Sulfates

Representative samples of the near-surface soil 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.

<b><u>Sample Identification</u></b>	<b><u>Soluble Sulfates (%)</u></b>	<b><u>Sulfate Classification</u></b>
B-1 @ 0 to 5 feet	0.007	Not Applicable (S0)
B-2 @ 0 to 5 feet	0.030	Not Applicable (S0)

Corrosivity Testing

One representative sample of the near-surface soils was submitted to a subcontracted corrosion engineering laboratory to identify potentially corrosive characteristics with respect to common construction materials. The corrosivity testing included a determination of the electrical resistivity, pH, and chloride and nitrate concentrations of the soils, as well as other tests. The results of some of these tests are presented below.

<b><u>Sample Identification</u></b>	<b><u>Saturated Resistivity (ohm-cm)</u></b>	<b><u>pH</u></b>	<b><u>Chlorides (mg/kg)</u></b>	<b><u>Nitrates (mg/kg)</u></b>
B-1 @ 0 to 5 feet	1,407	8.0	26.5	41.3
B-2 @ 0 to 5 feet	503	8.1	518.4	37.7

R-value

R (resistance)-value testing was conducted on a representative sample of the near-surface soils obtained from the subject site. The R-value was determined in accordance with CA Test Method 301. This test provides a measure of the pavement support characteristics of the soils, and is used in the pavement thickness design procedure. The results of the R-value testing are as follow:

<b><u>Sample ID</u></b>	<b><u>R-Value</u></b>
B-1 @ 0 to 5 feet	36

Based on the results of R-value testing, the pavement sections for the proposed pavements are recommended to be designed for an R-value of 36.

## Organic Content Testing

Selected soil samples have been tested to determine their organic content, in accordance with ASTM Test Method 2974. The results of the testing are as follows:

<b><u>Sample Identification</u></b>	<b><u>Organic Content (%)</u></b>
T-1 @ 0 to 6 inches	8.9
T-1 @ 6 to 12 inches	1.7
T-1 @ 12 to 18 inches	1.3
T-1 @ 18 to 24 inches	1.8
T-2 @ 0 to 6 inches	15.1
T-2 @ 6 to 12 inches	3.1
T-2 @ 12 to 18 inches	2.8
T-2 @ 18 to 24 inches	1.4
T-3 @ 0 to 6 inches	23
T-3 @ 6 to 12 inches	16.8
T-3 @ 12 to 18 inches	4.5
T-3 @ 18 to 24 inches	3.3
T-4 @ 0 to 6 inches	9.2
T-4 @ 6 to 12 inches	4.5
T-4 @ 12 to 18 inches	3.2
T-4 @ 18 to 24 inches	1.1
T-5 @ 0 to 6 inches	12.4
T-5 @ 6 to 12 inches	4.0
T-5 @ 12 to 18 inches	1.5
T-5 @ 18 to 24 inches	2.3
T-6 @ 0 to 6 inches	17.8
T-6 @ 6 to 12 inches	6.6
T-6 @ 12 to 18 inches	3.0

**Sample Identification**

T-6 @ 18 to 24 inches

**Organic Content (%)**

1.3

## **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 SCG as the geotechnical consultant from the beginning to the end of the project will provide continuity of services. The geotechnical engineering firm providing testing and observation services shall assume the responsibility of Geotechnical Engineer of Record.

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

### **6.1 Seismic Design Considerations**

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

#### Faulting and Seismicity

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

#### Seismic Design Parameters

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](http://www.seismicmaps.org), a web-based software application available at the website [www.seismicmaps.org](http://www.seismicmaps.org). This software application calculates seismic design parameters in accordance with several building code reference documents, including ASCE 7-16, upon which the 2019 CBC is based. The application utilizes a database of risk-targeted maximum considered earthquake ( $MCE_R$ ) site accelerations at 0.01-degree intervals for each of the code documents. The table below was created using data obtained from the application. The output generated from this program is included as Plate E-1 in Appendix E of this report. Based on this output, the following parameters may be utilized for the subject site:

### 2019 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	$S_s$	1.686
Mapped Spectral Acceleration at 1.0 sec Period	$S_1$	0.602
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	$S_{MS}$	1.686
Site Modified Spectral Acceleration at 1.0 sec Period	$S_{M1}$	1.023
Design Spectral Acceleration at 0.2 sec Period	$S_{DS}$	1.124
Design Spectral Acceleration at 1.0 sec Period	$S_{D1}$	0.682

### Liquefaction

Liquefaction is the loss of the 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 grain size 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). Clayey (cohesive) soils or soils which possess clay particles ( $d < 0.005\text{mm}$ ) in excess of 20 percent (Seed and Idriss, 1982) are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table.

The Riverside County RCIT GIS website indicates that the subject site is not located within a zone of liquefaction susceptibility. Based on this mapping, liquefaction is not considered to be a design concern for this project.

## **6.2 Geotechnical Design Considerations**

### General

The near-surface soils generally consist of artificial fill underlain by alluvial soils. Documentation regarding the placement and compaction of the fill soils has not been provided. In addition, several samples of the fill soils possess unfavorable compressibility and collapse characteristics and relatively low strengths. Therefore, the existing fill soils are considered undocumented fill and, in their present condition, are not considered suitable to support the foundations loads of the new structure. Results of laboratory testing indicate that the near-surface alluvial soils are compressible when loaded and will be subject to significant hydrocollapse when inundated with water. Remedial grading will be necessary to remove all of the existing fill soils and the near-surface older alluvial soils within the proposed building pad area, and replace these materials as compacted structural fill soils.

A geotechnical concern for this project is the presence of highly organic topsoil/material. As shown in Section 5.0 of this report, on-site soil/materials with organic contents greater than 8.9 percent were encountered at all of the tested trenches to a depth of 6± inches and greater than 6.6 percent were encountered at some of the tested trenches to a depth up to 12± inches. High-organic-content material possesses a significant long-term compression potential. Therefore, from an organic content standpoint, we recommend that all highly organic material possessing an organic content greater than 5 percent be stripped off and removed from the site.

### Settlement

The recommended remedial grading will remove all of the existing fill soils and the upper portion of the native alluvial soils and replace these materials as compacted fill soils. Provided that the recommended remedial grading is completed, the post-construction static settlements of the proposed structure are expected to be less than 1.0 and 0.5 inches for total and differential settlements of shallow foundations, respectively.

### Expansion

The near-surface on-site soils observed at the subject site were comprised mainly of silty sands and sandy silts and were visually determined to be very low to non-expansive. Based on the very low expansive classification, no design considerations related to expansive soils are considered warranted for this site. It is recommended that additional expansion index testing be conducted at the completion of rough grading to confirm that very low expansion potential soils are present at the pad grade within the building areas.

### Organic Content

Laboratory testing indicates that the tested samples of near-surface soils possess organic contents ranging from 1.1 to 23 percent by weight. Based on the results of the organic content testing, the near-surface soils (not including manure, if present) are considered to possess low to moderate, with locally high to very high, organic contents. **Soils possessing low to moderate organic content (less than approximately 5 percent organics), with no appreciable manure, may be blended with the underlying relatively non-organic soils, such that**

**the final mixture contains less than 3 percent organics, by dry weight.** However, any remaining organic materials (including manure and topsoil, if present) or any vegetation that may develop before construction be removed from the site in its entirety. We would highly recommend that all manure and all soils possessing greater than 5 percent organics be stripped and removed from the site. Any additional organic materials encountered in buried fills should also be segregated and removed from the site during grading.

#### Soluble Sulfates

The result of the soluble sulfate testing indicates that the tested soil sample possesses a level of soluble sulfates that is considered to be “not applicable” (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 area.

#### Corrosion Potential

The results of laboratory testing indicate that the on-site soils possess saturated resistivity values ranging from 503 to 1,407 ohm-cm, and pH values ranging from 8.0 to 8.1. These test results have been evaluated in accordance with guidelines published by the Ductile Iron Pipe Research Association (DIPRA). The DIPRA guidelines consist of a point system by which characteristics of the soils are used to quantify the corrosivity characteristics of the site. Resistivity and pH are two of the five factors that enter into the evaluation procedure. Redox potential, relative soil moisture content and sulfides are also included. Although sulfide testing was not part of the scope of services for this project, we have evaluated the corrosivity characteristics of the on-site soils using resistivity, pH and moisture content. **Based on these factors, and utilizing the DIPRA procedure, the on-site soils are considered to be severely corrosive to ductile iron pipe. Therefore, protection will be required for cast iron or ductile iron pipes.**

Low to high concentrations of chlorides, 26.5 and 518.4 mg/kg, were detected in the samples submitted for corrosivity testing. In general, soils possessing chloride concentrations in excess of 500 parts per million (ppm) are considered to be corrosive with respect to steel reinforcement within reinforced concrete. Based on the high chloride concentration in the tested samples, the soil may be an external source of chlorides, as discussed in the American Concrete Institute (ACI) Publication 318 Building Code Requirements for Structural Concrete and Commentary. **Therefore, we recommend that the client contact a corrosion engineer to evaluate the site chloride exposure and to provide appropriate recommendations for concrete exposed to chlorides.**

Nitrates present in soil can be corrosive to copper tubing at concentrations greater than 50 mg/kg. The tested sample possesses a nitrate concentration of up to 41.3 mg/kg. Based on these test results, the on-site soils are not considered to be corrosive to copper pipe.

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

### Shrinkage/Subsidence

Removal and recompaction of the near-surface fill and alluvial soils is estimated to result in an average shrinkage of 5 to 15 percent. It should be noted that these shrinkage estimates are based on dry density testing performed on small-diameter samples taken at the boring locations. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated trenches 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.

These estimates are based on previous experience with nearby projects 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.

### Foundation and Grading Plan Review

Foundation and grading plans were not available at the time of this report. It is therefore recommended that we be provided with copies of all future foundation and grading 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, as well as any underlying topsoil or other organic materials. Based on conditions encountered at the time of the subsurface exploration, stripping of the existing grass will be necessary. 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. **We would highly recommend that all manure and all soils possessing greater than 5 percent organics be stripped and removed from the site.** Removal and export of these materials will help make the process of blending all new fill soils to less than 3 percent organics much easier.

Demolition should include removal of utilities and any other subsurface improvements that will not remain in place with the new development. Debris resultant from demolition should be disposed of off-site.

### Treatment of Existing Soils: Building Pad

Remedial grading should be performed within the proposed building area in order to remove all the existing artificial fill and near-surface alluvial soils. Based on conditions encountered at the boring locations, this will require excavation up to a depth of 8± feet. The existing materials within the proposed building pad area are also recommended to be overexcavated to a depth of 5 feet below existing grades and to a depth of 3 feet below proposed pad grades, whichever is greater. The soils within the proposed foundation influence zones should be overexcavated to a depth of at least 3 feet below proposed foundation 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 placed below the foundation bearing grade, whichever is greater. If the proposed structure incorporates any exterior columns (such as for a canopy or overhang) the area of overexcavation should also encompass these areas.

Following completion of the overexcavation, the subgrade soils within the overexcavation areas should be evaluated by the geotechnical engineer to verify their suitability to serve as the structural fill subgrade, as well as to support the foundation loads of the new structure. This evaluation should include proofrolling and probing to identify any soft, loose, or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if any artificial fill 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 conditioned to achieve a moisture content of 0 to 4 percent above optimum moisture content. The subgrade soils should then be recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

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

### Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of any proposed retaining walls and site walls should be overexcavated to a depth of 3 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pads. Any undocumented fill soils or disturbed native alluvium 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 to within 0 to 4 percent above the optimum moisture content, and recompacting the upper 12 inches of exposed subgrade soils. The previously excavated soils may then be replaced as compacted structural fill.

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

#### Treatment of Existing Soils: Flatwork and Parking 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 these areas. The grading recommendations presented above do not mitigate the extent of undocumented fill or possible compressible/collapsible native alluvium 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. Additionally, manure and highly organic soils/material possessing greater than 5 percent organics should be stripped from the site.
- All grading and fill placement activities should be completed in accordance with the requirements of the 2019 CBC and the grading code of the city of Chino.
- 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.
- Fill soils placed at depths greater than 10 feet below proposed building pad grade should be compacted to at least 95 percent of the ASTM D-1557 maximum dry density.

- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

### Imported Structural Fill

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

### Utility Trench Backfill

In general, all utility trench backfill should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the city of Chino. All utility trench backfills should be witnessed by the geotechnical engineer. The trench backfill soils should be compaction tested where possible; probed and visually evaluated elsewhere.

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

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

## **6.4 Construction Considerations**

### Moisture Sensitive Subgrade Soils

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

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

## Excavation Considerations

The near-surface soils generally consist of silty sands and sandy silts. These materials will be subject to caving within shallow excavations. Where caving occurs within shallow excavations, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, temporary excavation slopes should be made no steeper than 2h:1v. Deeper excavations may require some form of external stabilization such as shoring or bracing. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. All excavation activities on this site should be conducted in accordance with Cal-OSHA regulations.

## Groundwater

Based on the lack of free water at the boring and trench locations, the static groundwater table at this site is considered to exist at a depth in excess of 31± feet. Therefore, groundwater is not expected to significantly impact grading or foundation construction activities.

## **6.5 Foundation Design and Construction**

Based on the preceding grading recommendations, it is assumed that new building pad will be underlain by structural fill soils used to replace undocumented fill soils and an upper portion of the near-surface native alluvium. These new structural fill soils are expected to extend to a depth of at least 3 feet below proposed foundation bearing grade, underlain by 1± foot of additional soil that has been densified and moisture conditioned in place. Based on this subsurface profile, the proposed structure may be supported on conventional shallow foundations.

### Conventional Spread Footing Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 lbs/ft<sup>2</sup>.
- Maximum, net allowable soil bearing pressure: 1,500 lbs/ft<sup>2</sup> if the full recommended lateral extent of remedial grading cannot be achieved.
- Minimum wall/column footing width: 14 inches/24 inches.
- Minimum longitudinal steel reinforcement within strip footings: Four (4) No. 5 rebars (2 top and 2 bottom).
- Minimum foundation embedment: 12 inches into newly placed structural fill soils, and at least 24 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 pressure presented above may be increased by one-third 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 or suitable native alluvium (where reduced bearing pressures are utilized), with the resulting excavations backfilled with compacted fill soils. As an alternative, lean concrete slurry (500 to 1,500 psi) may be used to backfill such isolated overexcavations.

The foundation subgrade soils should also be properly moisture conditioned to 0 to 4 percent above the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. Since it is typically not feasible to increase the moisture content of the floor slab and foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

### Estimated Foundation Settlements

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

### Lateral Load Resistance

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and 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<sup>3</sup>
- 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. The maximum allowable passive pressure is 3,000 lbs/ft<sup>2</sup>.

## **6.6 Floor Slab Design and Construction**

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

- Minimum slab thickness: 6 inches.
- Modulus of Subgrade Reaction: 120 psi/in.
- Minimum slab reinforcement: Reinforcement is not required for geotechnical conditions. However, slab reinforcement may be required for structural design considerations. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading.
- Slab underlayment: If moisture sensitive floor coverings will be used then minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire slab area where such moisture sensitive floor coverings are expected. The moisture vapor barrier should meet or exceed the Class A rating as defined by ASTM E 1745-97 and have a permeance rating less than 0.01 perms as described in ASTM E 96-95 and ASTM E 154-88. A polyolefin material such as 15 mil 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 floor slab should be structurally connected to the foundations as detailed by the structural engineer.

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

## **6.7 Retaining Wall Design and Construction**

Although not indicated on the site plan, some small (less than 6 feet in height) retaining walls may be required to facilitate the new site grades and in loading dock. Retaining walls are also expected within the truck dock area of the proposed building. The parameters recommended for use in the design of these walls are presented below.

### Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. The following parameters assume that only the on-site soils will be utilized for retaining wall backfill. The near-surface soils predominantly consist of silty sands, and sandy silts. Based on the results of laboratory testing, the on-site silty sands possess a friction angle of 30 degrees when compacted to at least 90 percent of the ASTM D-1557 maximum dry density.

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

### **RETAINING WALL DESIGN PARAMETERS**

<b>Design Parameter</b>		<b>Soil Type</b>
		On-site Silty Sands
Internal Friction Angle ( $\phi$ )		30°
Unit Weight		120 lbs/ft <sup>3</sup>
Equivalent Fluid Pressure:	Active Condition (level backfill)	40 lbs/ft <sup>3</sup>
	Active Condition (2h:1v backfill)	65 lbs/ft <sup>3</sup>
	At-Rest Condition (level backfill)	60 lbs/ft <sup>3</sup>

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

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

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

### Seismic Lateral Earth Pressures

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

### Retaining Wall Foundation Design

The retaining wall foundations should be underlain by at least 3 feet of newly placed structural fill. 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 minimum 1-foot thick layer of free-draining granular material (less than 5 percent passing the No. 200 sieve) be placed against the face of the retaining walls. This material should extend from the top of the retaining wall footing to within 1 foot of the ground surface on the back side of the retaining wall. This material should be approved by the geotechnical engineer. In lieu of the 1-foot thick layer of free-draining material, a properly installed prefabricated drainage composite such as the MiraDRAIN 6000XL (or approved equivalent), which is specifically designed for use behind retaining walls, may be used. If the layer of free-draining material is not covered by an impermeable surface, such as a structure or pavement, a 12-inch thick layer of a low permeability soil should be placed over the backfill to reduce surface water migration to the underlying soils. The layer of free draining granular material should be separated from the backfill soils by a suitable geotextile, approved by the geotechnical engineer.

All retaining wall backfill should be placed and compacted under engineering controlled conditions in the necessary layer thicknesses to ensure an in-place density between 90 and 93 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557-91). Care should be taken to avoid over-compaction of the soils behind the retaining walls, and the use of heavy compaction equipment should be avoided.

### Subsurface Drainage

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

- A weep hole drainage system typically consisting of a series of 2-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 10-foot on-center spacing. Alternatively, 4-inch diameter holes at an approximate 20-foot on-center spacing can be used for this type of drainage system. In addition, the weep holes should include a 2 cubic foot pocket of open graded gravel, surrounded by an approved geotextile fabric, at each weep hole location.
- A 4-inch diameter perforated pipe surrounded by 2 cubic feet of gravel per linear foot of drain placed behind the wall, above the retaining wall footing. The gravel layer should be wrapped in a suitable geotextile fabric to reduce the potential for migration of fines. The footing drain should be extended to daylight or tied into a storm drainage system. The actual design of this type of system should be determined by the civil engineer to verify that the drainage system possesses the adequate capacity and slope for its intended use.

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

## **6.8 Pavement Design Parameters**

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

### Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The on-site soils generally consist of sands and silty sands. These soils are generally considered to possess good pavement support characteristics. Based on the R-value testing performed as part of our scope for this project, the subsequent pavement designs are based upon an R-value of 36. 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 the completion of rough grading to verify the R-value of the as-graded parking subgrade.

The pavement recommendations presented below are based on the existing subgrade soils. We have also included options for pavement sections with an increase in the 28-day compressive strength of concrete and a daily truck traffic volume of one truck in per dock door and one truck out per dock door.

### 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 = 36)					
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	5	7	8	9	11
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 batch plant-reported maximum density. 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 = 36, f'c = 3,500 psi)				
Materials	Thickness (inches)			
	Autos and Light Truck Traffic (TI = 5.0 to 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	7½
Compacted Subgrade (95% minimum compaction)	12	12	12	12

As directed by the client, the concrete should have a 28-day compressive strength of at least 3,500 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.

Alternative Portland Cement Concrete Pavement Design: Compressive Strength Increase

At the direction of the client, we are providing an alternative PCC pavement design which is based on the number of truck doors for the proposed building, and with the understanding that the project will not exceed one truck in and out per dock door. Based on the site plan provided to our office, the proposed building will be constructed with 60 truck dock doors along the northern building wall and 72 truck doors along the southern building wall. Therefore, the following pavement design is based on the understanding that the site will not exceed 264 heavy-truck loads per day, which is equivalent to 2,413,382 EALs (equivalent axle loads) for a six-day work-week and a 20-year life-design for the project, equivalent to a TI of 9.5. It should be noted that the EALs for this project were based on a conversion of 2.93 EAL per truck for the PCC areas. If a different conversion factor is required by the tenant/owner, SCG should be contacted to provide revised pavement design recommendations.

The Portland cement concrete pavement design table below has been generated using the Pavement Designer, a web-based software application available at the website [www.pavementdesigner.org](http://www.pavementdesigner.org). This software application calculates PCC sections in accordance with the American Concrete Institute (ACI) 330. Traffic spectrum "D" was utilized in the design of the pavements. The percent of slabs that are cracked at the end of the design life was assumed to be 5 percent, but a reliability percentage of 90 percent was provided by the client. As previously discussed, the client requested that the number of heavy trucks per day utilized in our design be based on the number of dock doors for each building, and one truck in per dock door and one truck out per dock door. **If different values should be used, or if the number of dock doors changes for the proposed building**, SCG should be contacted to provide a new pavement design. The table below was created using data obtained from the application.

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 PCC pavement sections for the proposed are as follows:

<b>PORTLAND CEMENT CONCRETE PAVEMENTS (R = 36, f<sub>c</sub> = 3500 psi)</b>	
<b>Materials</b>	Thickness (inches)
PCC	7
Compacted Subgrade (95% minimum compaction)	12

As directed by the client, the concrete should have a 28-day compressive strength of at least 3,500 psi. The maximum joint spacing within all of the PCC pavements is recommended to be equal to or less than 30 times the pavement thickness. The actual joint spacing and reinforcing of the Portland cement concrete pavements should be determined by the structural engineer.

## **7.0 GENERAL COMMENTS**

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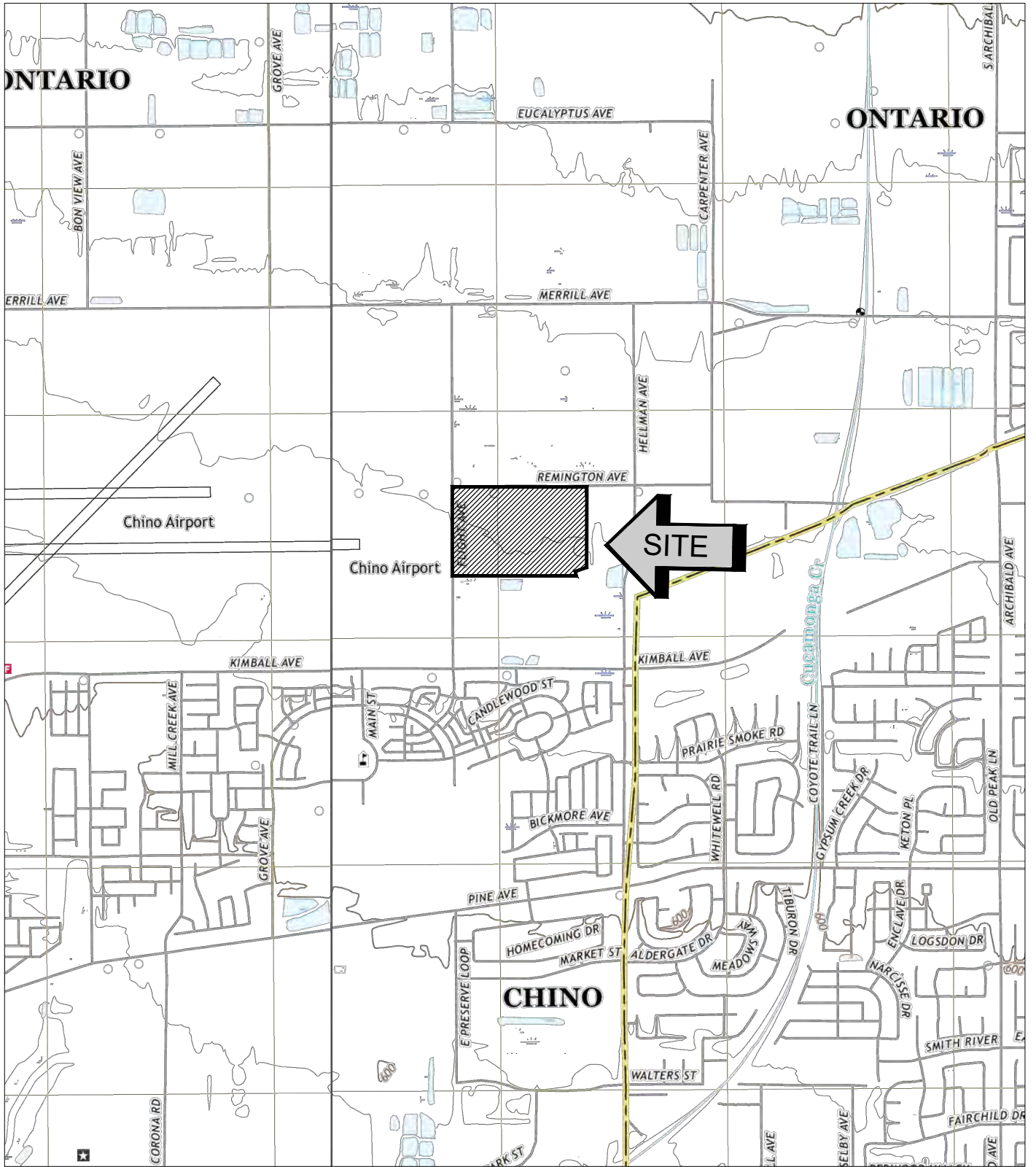
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other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

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

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

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

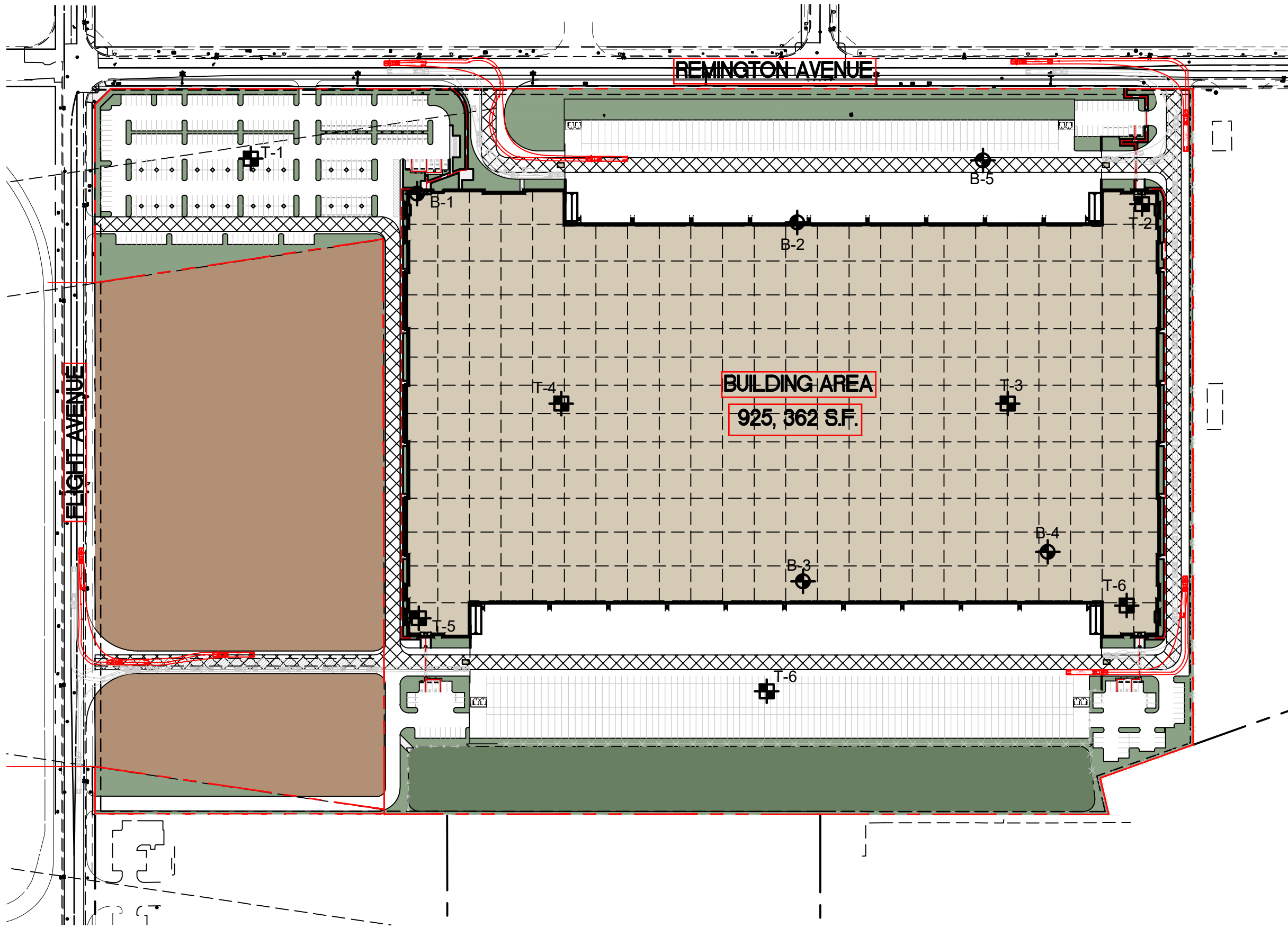
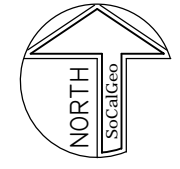
# APPENDIX A





SOURCE: USGS TOPOGRAPHIC MAPS OF THE CORONA NORTH & PRADO DAM QUADRANGLES, SAN BERNARDINO COUNTY, CALIFORNIA, 2022.



<b>SITE LOCATION MAP</b>	
PROPOSED INDUSTRIAL BUILDING	
CHINO, CALIFORNIA	
SCALE: 1" = 2000'	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: MD	
CHKD: RGT	
SCG PROJECT 22G145-1	
PLATE 1	



**GEOTECHNICAL LEGEND**


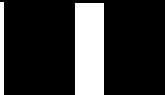



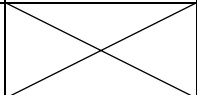
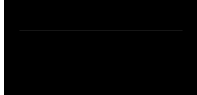

-  APPROXIMATE BORING LOCATION
-  APPROXIMATE TRENCH LOCATION

NOTE: CONCEPTUAL SITE PLAN PREPARED BY COMMERCE CONSTRUCTION CO., L.P.  
AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH.

<b>BORING AND TRENCH LOCATION PLAN</b>	
PROPOSED INDUSTRIAL BUILDING	
CHINO, CALIFORNIA	
SCALE: 1" = 180'	
DRAWN: MD	
CHKD: RGT	
SCG PROJECT 22G145-1	
<b>PLATE 2</b>	<b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>

# 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<sup>3</sup>.
- MOISTURE CONTENT:** Moisture content of a soil sample, expressed as a percentage of the dry weight.
- LIQUID LIMIT:** The moisture content above which a soil behaves as a liquid.
- PLASTIC LIMIT:** The moisture content above which a soil behaves as a plastic.
- PASSING #200 SIEVE:** The percentage of the sample finer than the #200 standard sieve.
- UNCONFINED SHEAR:** The shear strength of a cohesive soil sample, as measured in the unconfined state.

# SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



JOB NO.: 22G145-1	DRILLING DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 25 feet
LOCATION: Chino, California	LOGGED BY: Ryan Bremer	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
SURFACE ELEVATION: --- MSL												
					<u>FILL</u> : Brown Silty fine Sand, loose to medium dense-damp	96	3					
					@ 3 feet, trace fine Root Fibers	90	8					
5		10				94	9					
					<u>ALLUVIUM</u> : Light Gray Brown Silty fine Sand, little Calcareous veining, medium dense-damp	104	3					
10		27			Light Gray Brown fine Sandy Silt, little Calcareous nodules/veining, medium dense-damp	103	6					
					@ 13½ feet, very moist		17					
15		15										
					Brown Silty fine Sand, little Iron Oxide staining, medium dense-moist		13					
20		18										
					Light Brown Clayey Silt, trace to little fine Sand, medium stiff to very stiff-very moist		21					
25		15	2.5									
					@ 28½ feet, little Iron Oxide staining		22					
30		11	2.0									
						88	29					
					Boring Terminated at 31'							

TBL\_22G145-1 (BORINGS).GPJ\_SOCALGEO.GDT\_5/5/22



JOB NO.: 22G145-1	DRILLING DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 17 feet
LOCATION: Chino, California	LOGGED BY: Ryan Bremer	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
	X	24		[Symbol]	FILL: Gray Brown Silty fine Sand, little Organic Material, mottled, medium dense-damp	96	8				
	X	16		[Symbol]	@ 3 feet, no mottling, trace Iron Oxide staining	101	7				
5	X	21		[Symbol]	<u>ALLUVIUM</u> : Gray Brown fine Sandy Silt, medium dense-moist	110	15				
	X	19		[Symbol]	Light Brown Silty fine Sand, medium dense-damp	106	9				
10	X	18		[Symbol]	Light Brown Gray fine Sandy Silt, trace Calcareous nodules, medium dense-moist to very moist	99	12				
15	X	15		[Symbol]	@ 13½ feet, trace Clay, little Calcareous veining		20				
20	X	17	4.0	[Symbol]	Brown Clayey Silt, mottled, some Calcareous nodules/veining, very stiff-moist to very moist		18				
Boring Terminated at 20'											

TBL\_22G145-1 (BORINGS).GPJ\_SOCALGEO.GDT 5/5/22



JOB NO.: 22G145-1	DRILLING DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 20 feet
LOCATION: Chino, California	LOGGED BY: Ryan Bremer	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
		9		FILL: Brown Silty fine Sand, trace fine Root Fibers, loose-damp		7					
		14		ALLUVIUM: Light Brown Silty fine Sand to fine Sandy Silt, medium dense-damp		7					
5		19		Light Brown Silt, trace fine Sand, medium dense-damp		3					
		31		@ 8½ feet, little fine Sand, dense		4					
10				Light Gray Brown Clayey Silt, trace fine Sand, trace to little Calcareous nodules/veining, stiff-very moist		19					
15		15									
		14		@ 18½ feet, little fine Sand		25					
20		18		Brown Silty fine Sand, trace Iron Oxide staining, medium dense-very moist		28					
25				Boring Terminated at 25'							

TBL\_22G145-1 (BORINGS).GPJ\_SOCALGEO.GDT\_5/5/22



JOB NO.: 22G145-1      DRILLING DATE: 3/30/22      WATER DEPTH: Dry  
 PROJECT: Proposed Industrial Building      DRILLING METHOD: Hollow Stem Auger      CAVE DEPTH: 26 feet  
 LOCATION: Chino, California      LOGGED BY: Ryan Bremer      READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
SURFACE ELEVATION: --- MSL												
					FILL: Brown Clayey Silt, little to some fine Sand, mottled, stiff-moist	85	15					
					FILL: Brown Silty fine Sand, medium dense-damp							
5		14				105	7					
		22										
		19				109	7					
		27			ALLUVIUM: Light Brown Silt, little fine Sand, trace fine Root Fibers, trace porosity, medium dense-damp	103	4					
10		30				103	3					
		19			Light Brown fine Sandy Silt, trace Iron Oxide veining, medium dense-damp to moist		8					
15		16			@ 18½ feet, trace Clay, some Calcareous veining		14					
		20			Brown Silty fine Sand to fine Sandy Silt, trace medium to coarse Sand, medium dense-damp		7					
25		20										
		24			Brown fine Sandy Silt, little calcareous veining, medium dense-moist		15					
30												
Boring Terminated at 30'												

TBL\_22G145-1 (BORINGS).GPJ\_SOCALGEO.GDT\_5/5/22



JOB NO.: 22G145-1	DRILLING DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 8 feet
LOCATION: Chino, California	LOGGED BY: Ryan Bremer	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
					<b>ALLUVIUM:</b> Brown Silty fine Sand, medium dense-damp  @ 6 feet, trace Iron Oxide veining  Brown Silty fine Sand to fine Sandy Silt, medium dense-moist		7				
5	X	10					7				
	X	12					7				
	X	14					8				
	X	17					12				
10					Boring Terminated at 10'						

TBL\_22G145-1 (BORINGS).GPJ\_SOCALGEO.GDT\_ 5/5/22



JOB NO.: 22G145-1	EXCAVATION DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: N/A
LOCATION: Chino, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
				FILL: Light Brown Silty fine Sand, trace fine Root Fibers, highly Organic, very loose-dry to moist FILL: Brown Silty fine Sand, trace fine Root fibers, loose to medium dense-damp FILL: Dark Brown Silty fine Sand, trace fine Root Fibers, loose to medium dense-damp to moist		12 4 6 10				8.9 1.7 1.3 1.8	
5				ALLUVIUM: Gray Brown fine Sandy Silt, occasional fine Root Fibers, Calcareous veins, porous, medium dense-damp		7 6					
				Light Gray fine Sandy Silt, trace fine Gravel, porous, loose to medium dense-damp		4 5					
10				Trench Terminated at 11'							

TBL\_22G145-1 (TRENCHES).GPJ\_SOCALGEO.GDT 5/4/22





JOB NO.: 22G145-1	EXCAVATION DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: N/A
LOCATION: Chino, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
				FILL: Dark Brown Silty fine Sand, trace fine Root Fibers, highly Organic, loose-very moist FILL: Brown Silty fine Sand, trace to little Clay, trace fine Root Fibers, highly Organic, loose-very moist FILL: Brown fine Sandy Silt, trace to little Clay, trace to little Clay, trace fine Root Fibers, Iron Oxide staining, trace fine Gravel, trace coarse Sand, loose-very moist FILL: Dark Brown fine Sandy Silt, loose to medium dense-moist ALLUVIUM: Gray Silty fine Sand, poorly cemented, loose to medium dense-damp to moist		40 37 26 29				23 16.8 4.5 3.3	
5						11 4					
10						14					
Trench Terminated at 11'											

TBL\_22G145-1 (TRENCHES).GPJ\_SOCALGEO.GDT: 5/4/22



JOB NO.: 22G145-1	EXCAVATION DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: N/A
LOCATION: Chino, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
					FILL: Brown fine Sand, little Silt, trace fine Root Fibers, highly Organic, very loose-dry to moist FILL: Brown Silty fine Sand, trace Clay, trace fine Root Fibers, some Organics, loose-dry to moist FILL: Light Brown Silty fine Sand to fine Sand, little to some Silt, loose-damp ALLUVIUM: Dark Brown fine Sandy Silt, poorly cemented, loose to medium dense-very moist Brown fine Sand, little to some Silt, loose to medium dense, damp to moist	10 10 12 5	9.2 4.5 3.2 1.1				
5						17					
10						9					
						11					
Trench Terminated at 11'											

TBL\_22G145-1 (TRENCHES).GPJ\_SOCALGEO.GDT\_5/4/22



JOB NO.: 22G145-1	EXCAVATION DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: N/A
LOCATION: Chino, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
	[Hand icon]			[Graphic Log Pattern]	FILL: Brown fine Sand, trace to little Silt, highly Organic, very loose-dry to damp	9				12.4	
	[Hand icon]			[Graphic Log Pattern]	ALLUVIUM: Gray Brown Silty fine Sand, trace fine Root Fibers, loose to medium dense-dry to damp	5				4.0	
5	[Hand icon]			[Graphic Log Pattern]		4				1.5	
10	[Hand icon]			[Graphic Log Pattern]	ALLUVIUM: Gray fine Sandy Silt to Silty fine Sand, occasional fine Root Fibers, fairly cemented, medium dense to dense-damp	9				2.3	
					Trench Terminated at 11'						

TBL\_22G145-1 (TRENCHES).GPJ\_SOCALGEO.GDT 5/4/22



JOB NO.: 22G145-1	EXCAVATION DATE: 3/30/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: N/A
LOCATION: Chino, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
0				FILL: Dark Brown Silty fine Sand, highly Organic, trace fine Root Fibers, highly Organic, loose-dry to moist FILL: Gray Brown Silty fine Sand, trace fine Root Fibers, some Organics, loose-dry to damp FILL: Gray Brown fine Sand, little Silt, loose to medium dense-damp	13	9				17.8	
5				ALLUVIUM: Gray Silty fine Sand, medium dense-damp  Gray Silty fine Sand, slightly porous, medium dense to dense-damp	5	5				6.6	
10					7					3.0	
					5					1.3	
Trench Terminated at 11'											

TBL\_22G145-1 (TRENCHES).GPJ\_SOCALGEO.GDT 5/4/22



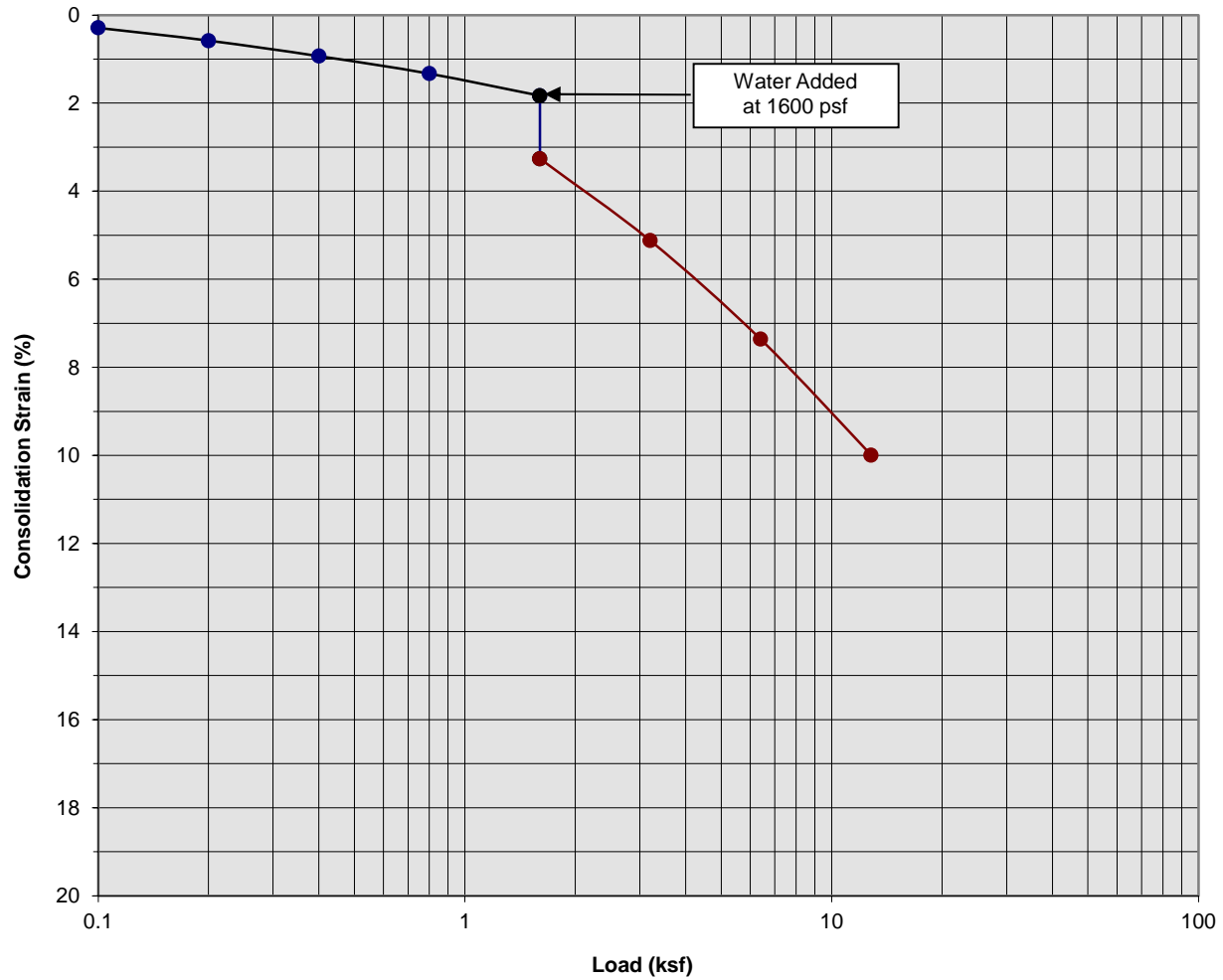
JOB NO.: 22G145-1	EXCAVATION DATE: 4/6/22	WATER DEPTH: Dry
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: N/A
LOCATION: Chino, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS				DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)		GRAPHIC LOG	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	
SURFACE ELEVATION: --- MSL											
	☞			[Pattern: Dotted]	FILL: Light Brown fine Sandy Silt, trace Clay, trace fine Root Fibers, some fragments of crushed Gravel, loose to medium dense-dry to very moist		16				
5	☞			[Pattern: Dotted]	FILL: Gray Brown fine Sand, trace to little Silt trace fine Root Fibers, highly Organic, loose to medium dense-damp		4				
5	☞			[Pattern: Dotted]	ALLUVIUM: Light Brown Silty fine Sand, loose to medium dense-damp		5				
10				[Pattern: Dotted]	Gray fine Sandy Silt, medium dense-damp						
10	☞			[Pattern: Dotted]			10				
Trench Terminated at 14'											

TBL\_22G145-1 (TRENCHES).GPJ\_SOCALGEO.GDT\_5/4/22

# A P P E N D I X C

### Consolidation/Collapse Test Results



Classification: FILL: Brown Silty fine Sand

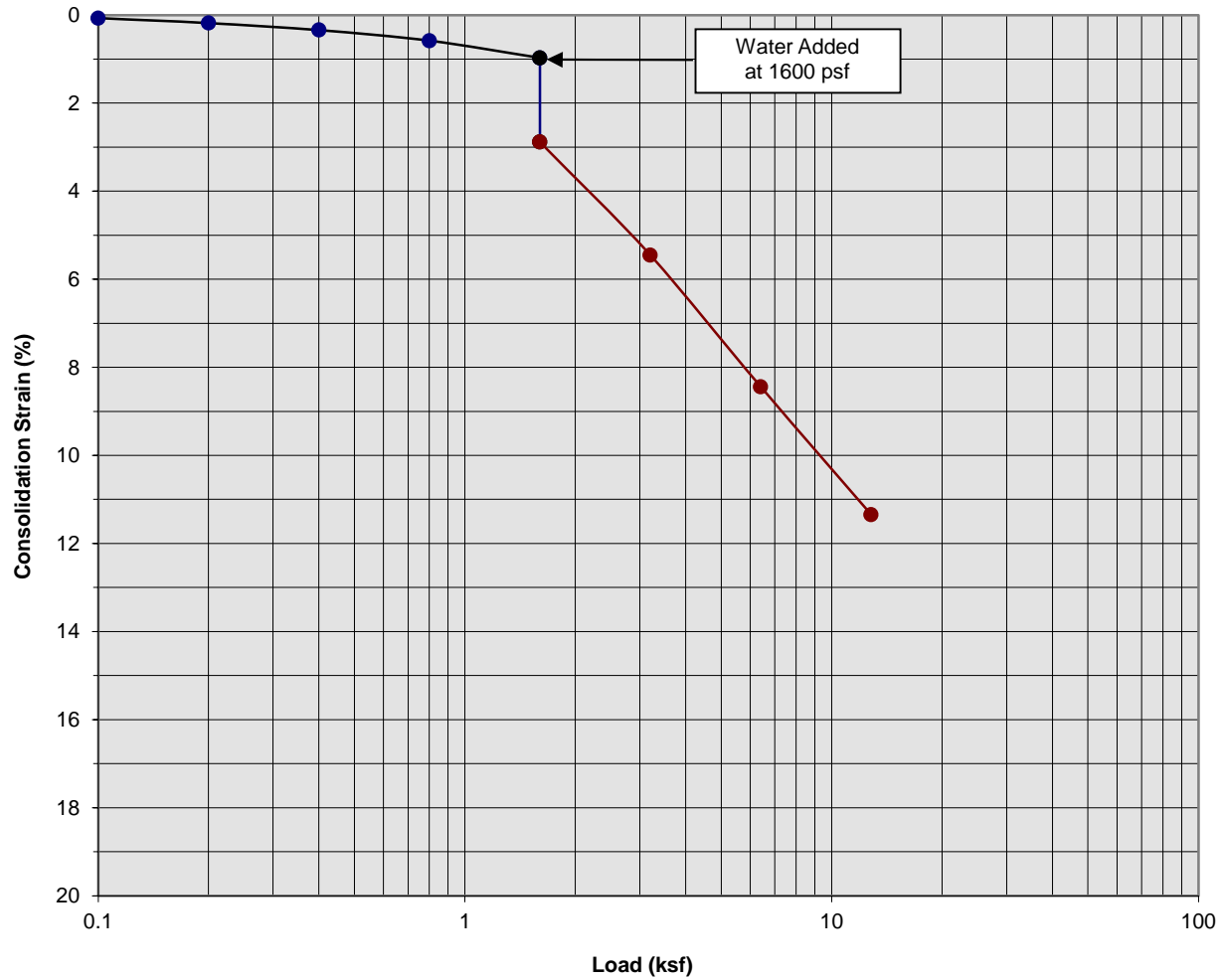
Boring Number:	B-1	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	24
Depth (ft)	3 to 4	Initial Dry Density (pcf)	90.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	101.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.43

Proposed Industrial Building  
 Chino, California  
 Project No. 22G145-1  
**PLATE C- 1**



**SOUTHERN  
 CALIFORNIA  
 GEOTECHNICAL**  
A California Corporation

### Consolidation/Collapse Test Results



Classification: FILL: Brown Silty fine Sand

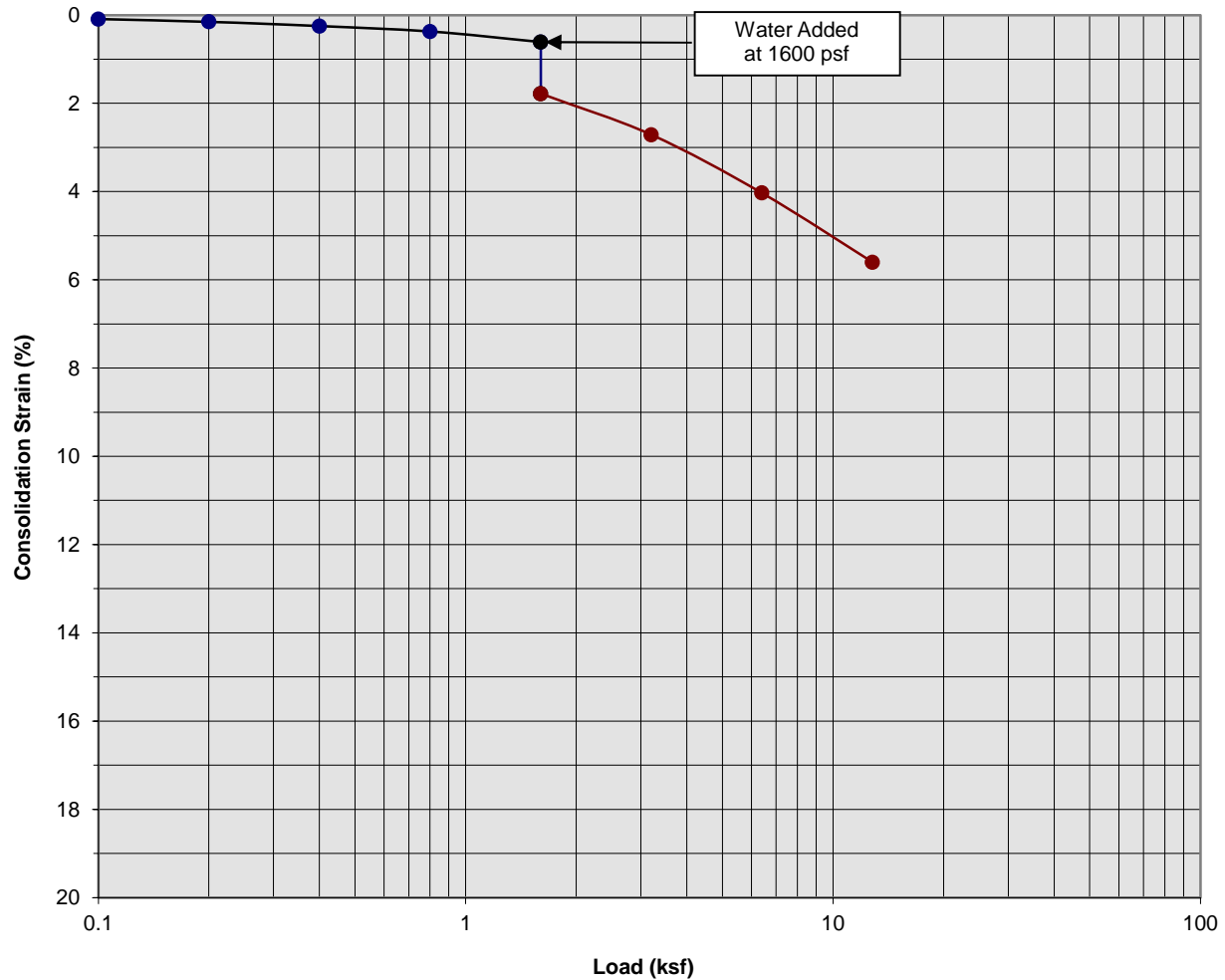
Boring Number:	B-1	Initial Moisture Content (%)	9
Sample Number:	---	Final Moisture Content (%)	25
Depth (ft)	5 to 6	Initial Dry Density (pcf)	94.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	106.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.91

Proposed Industrial Building  
 Chino, California  
 Project No. 22G145-1  
**PLATE C- 2**



**SOUTHERN  
 CALIFORNIA  
 GEOTECHNICAL**  
A California Corporation

### Consolidation/Collapse Test Results



Classification: Light Gray Brown Silty fine Sand

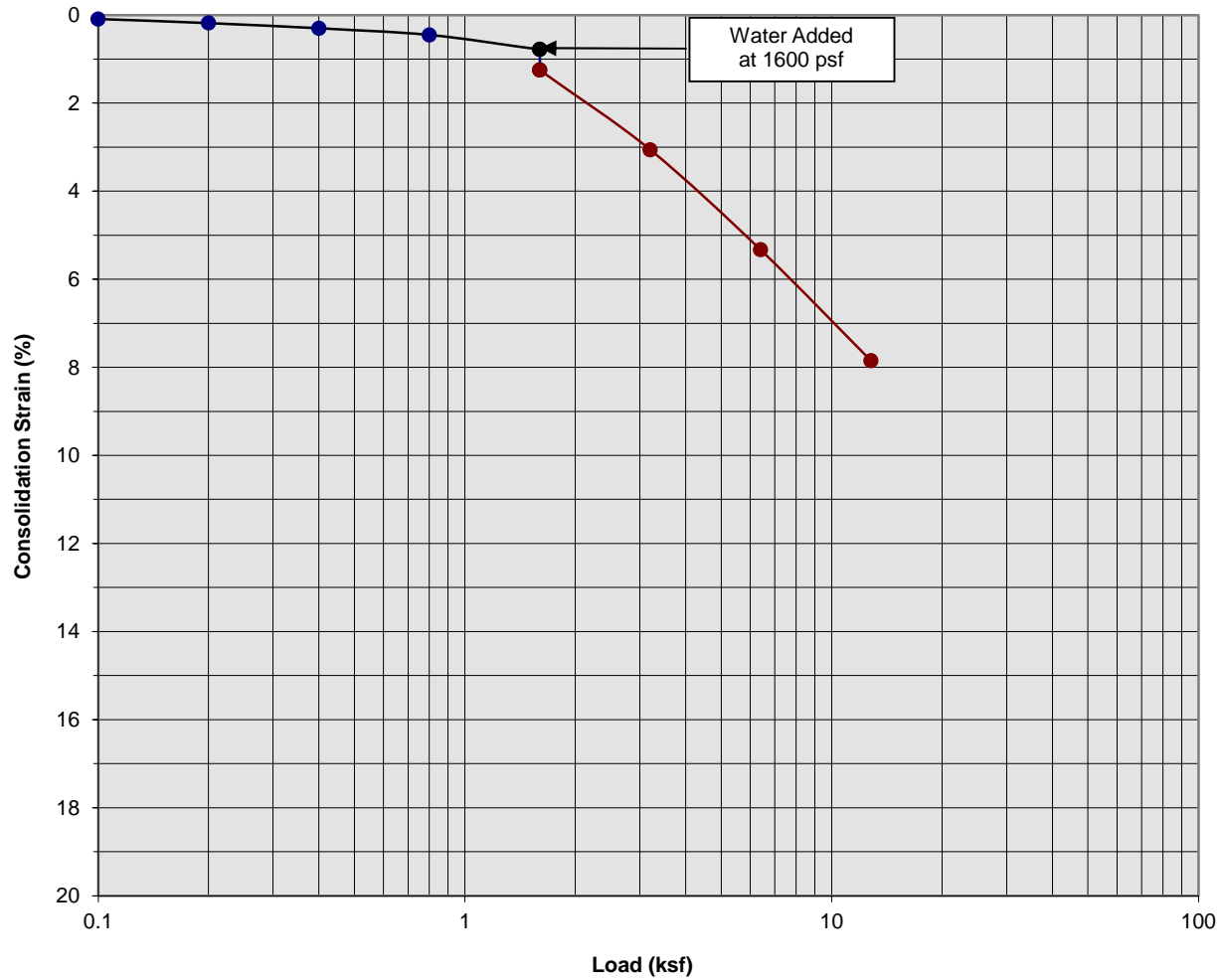
Boring Number:	B-1	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	20
Depth (ft)	7 to 8	Initial Dry Density (pcf)	103.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	110.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.17

Proposed Industrial Building  
 Chino, California  
 Project No. 22G145-1  
**PLATE C- 3**



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 CALIFORNIA  
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### Consolidation/Collapse Test Results



Classification: Light Gray fine Sandy Silt

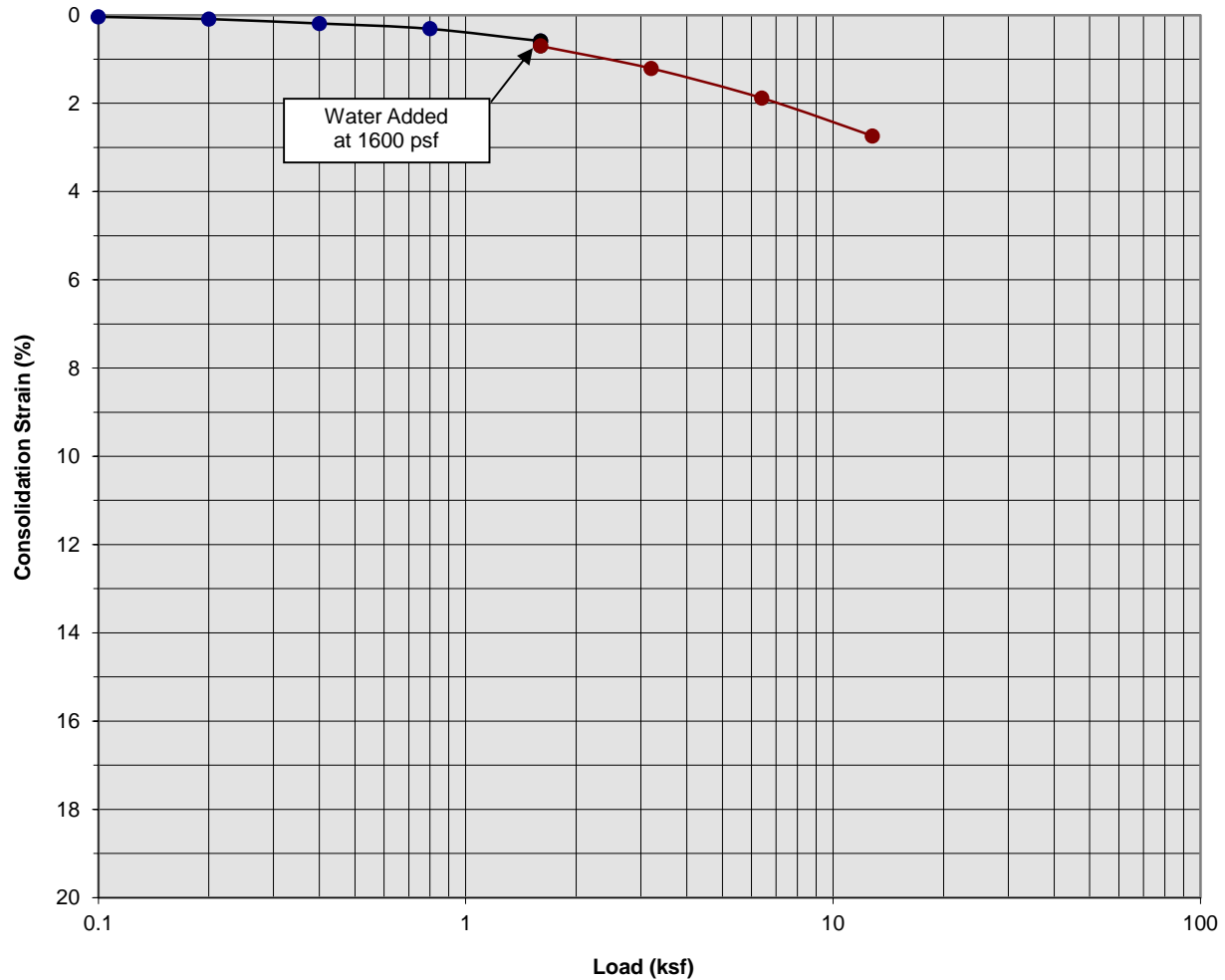
Boring Number:	B-1	Initial Moisture Content (%)	6
Sample Number:	---	Final Moisture Content (%)	20
Depth (ft)	9 to 10	Initial Dry Density (pcf)	103.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	112.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.47

Proposed Industrial Building  
 Chino, California  
 Project No. 22G145-1  
**PLATE C- 4**



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### Consolidation/Collapse Test Results



Classification: FILL: Gray Brown Silty fine Sand

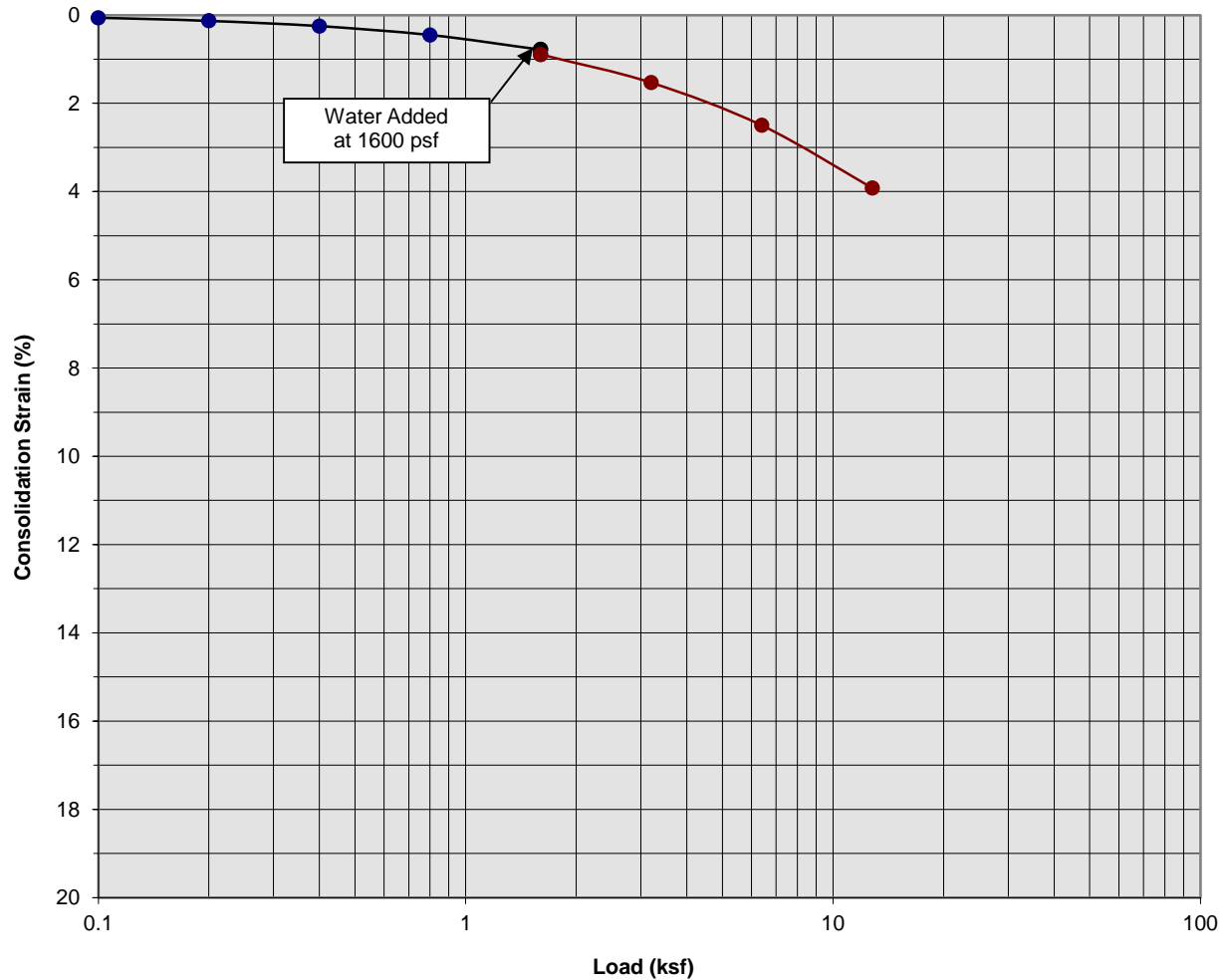
Boring Number:	B-2	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	3 to 4	Initial Dry Density (pcf)	101.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	103.9
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.11

Proposed Industrial Building  
 Chino, California  
 Project No. 22G145-1  
**PLATE C- 5**



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### Consolidation/Collapse Test Results



Classification: Gray Brown fine Sandy Silt

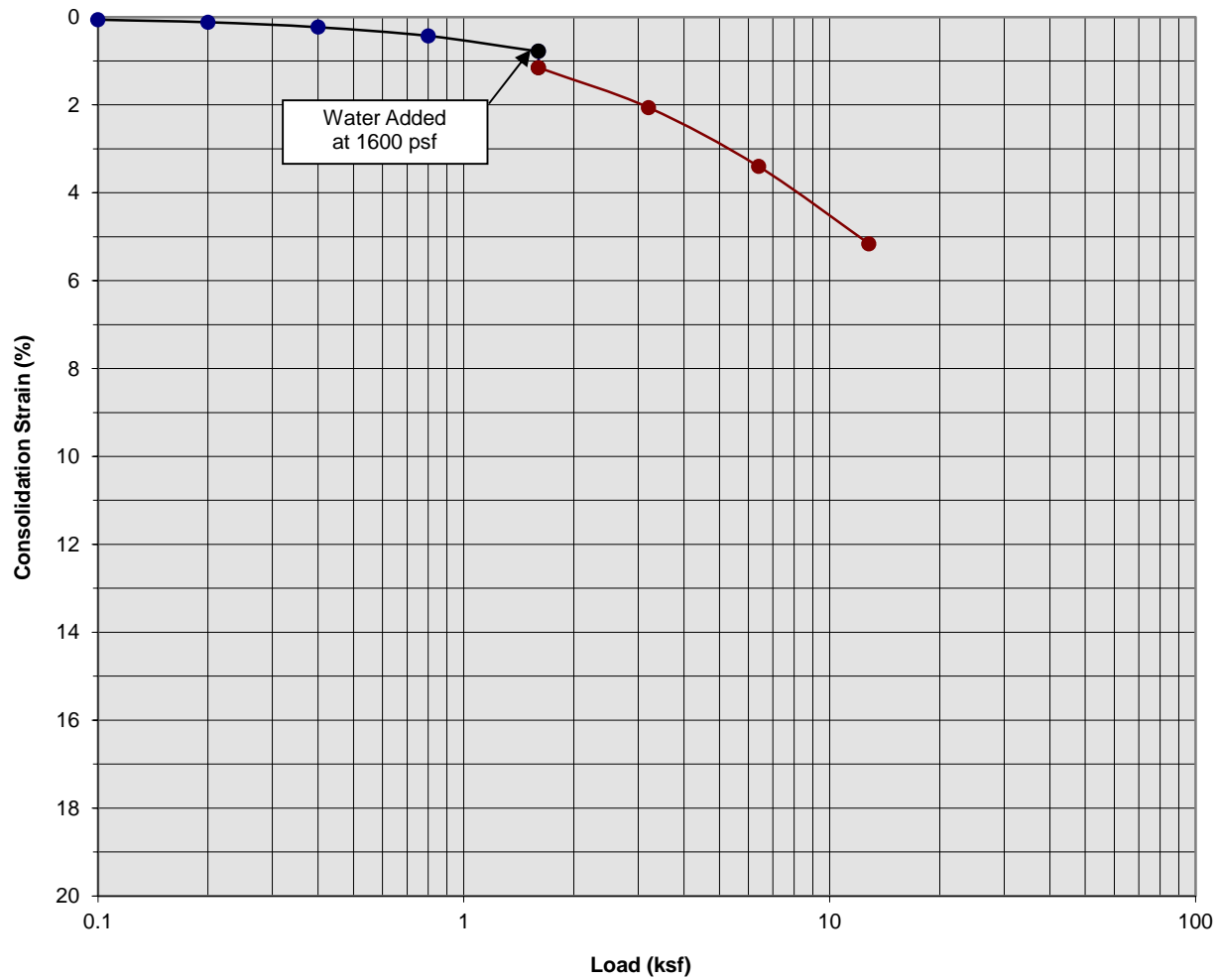
Boring Number:	B-2	Initial Moisture Content (%)	15
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	5 to 6	Initial Dry Density (pcf)	110.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	113.3
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.11

Proposed Industrial Building  
 Chino, California  
 Project No. 22G145-1  
**PLATE C- 6**



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### Consolidation/Collapse Test Results



Classification: Light Brown Silty fine Sand

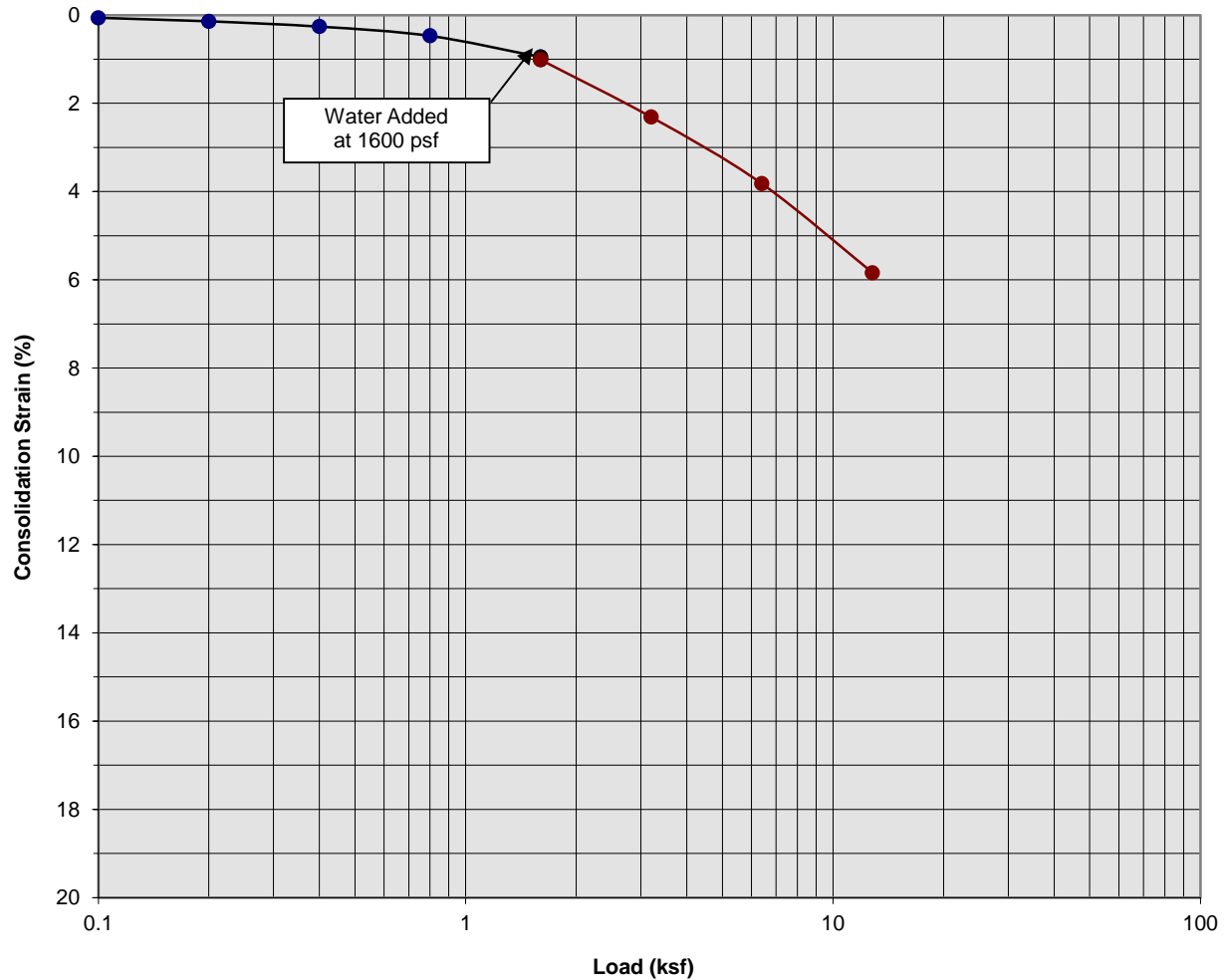
Boring Number:	B-2	Initial Moisture Content (%)	9
Sample Number:	---	Final Moisture Content (%)	20
Depth (ft)	7 to 8	Initial Dry Density (pcf)	106.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	111.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.37

Proposed Industrial Building  
 Chino, California  
 Project No. 22G145-1  
**PLATE C- 7**



**SOUTHERN CALIFORNIA GEOTECHNICAL**  
*A California Corporation*

### Consolidation/Collapse Test Results



Classification: Light Brown Gray fine Sandy Silt

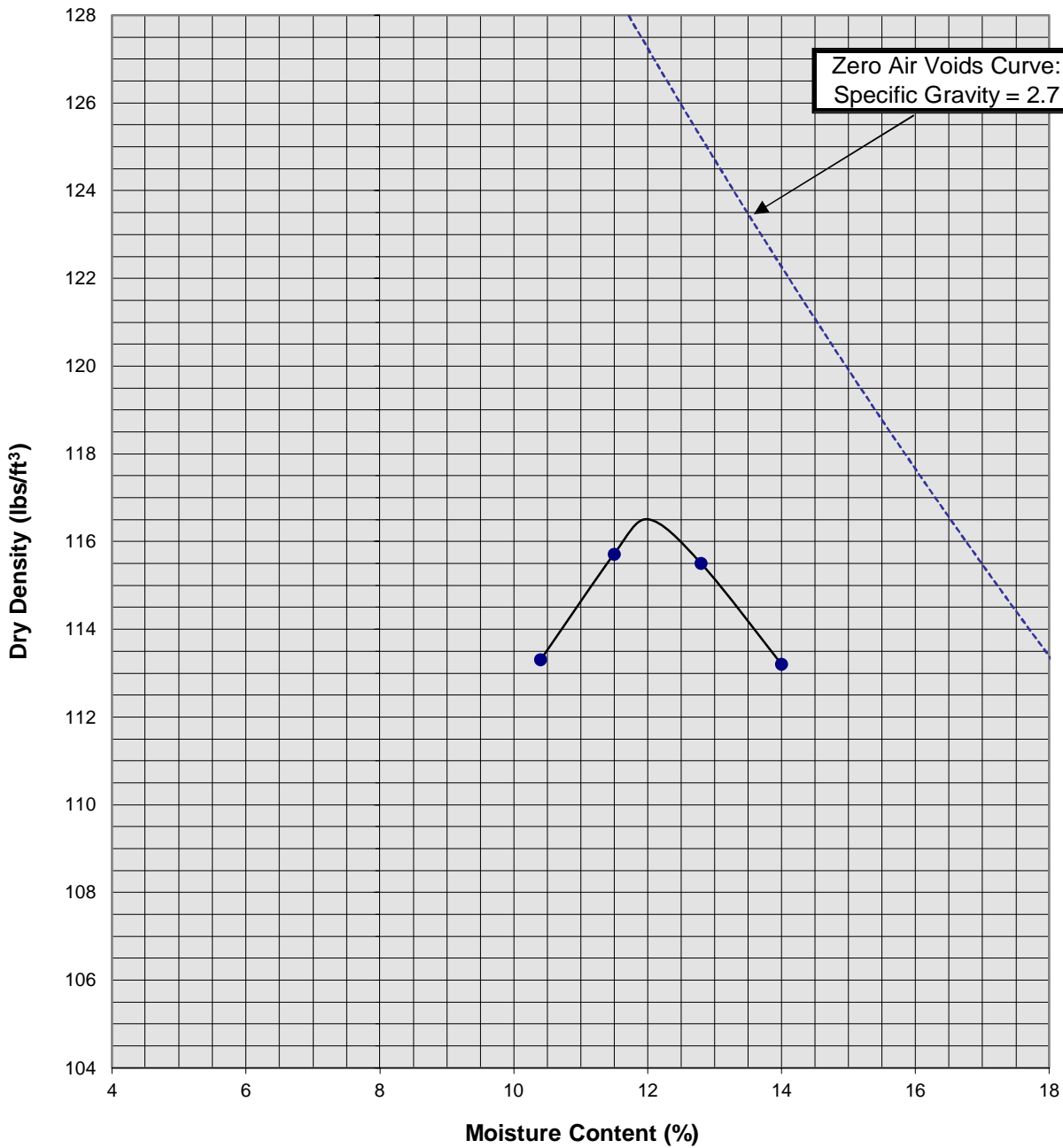
Boring Number:	B-2	Initial Moisture Content (%)	12
Sample Number:	---	Final Moisture Content (%)	23
Depth (ft)	9 to 10	Initial Dry Density (pcf)	99.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	105.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.06

Proposed Industrial Building  
 Chino, California  
 Project No. 22G145-1  
**PLATE C- 8**



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### Moisture/Density Relationship ASTM D-1557



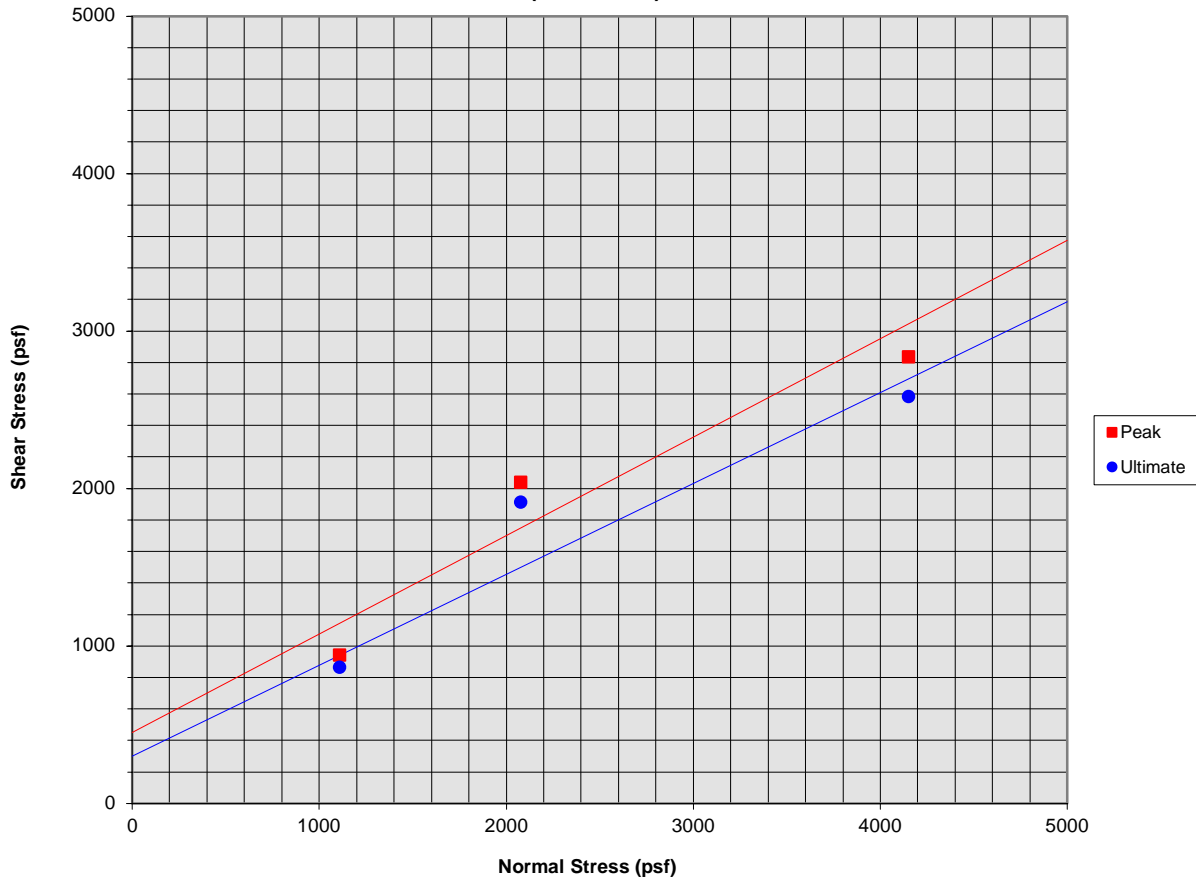
Soil ID Number	B-1 @ 0 - 5'
Optimum Moisture (%)	12
Maximum Dry Density (pcf)	116.5
Soil Classification	Brown Silty fine Sand

Proposed Industrial Building  
Chino, California  
Project No. 22G145-1  
**PLATE C-9**



**SOUTHERN CALIFORNIA GEOTECHNICAL**  
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**Direct Shear Test Results  
(Remolded)**



Sample Description: B-1 @ 0 to 5'  
Classification: Brown Silty fine Sand

Sample Data

Remolded Moisture Content	11.5
Final Moisture Content	20.0
Remolded Dry Density	105.0
Percent Compaction	90.0
Final Dry Density	---
Specimen Diameter (in)	2.4
Specimen Thickness (in)	1.0

Test Results

	Peak	Ultimate
$\phi$ (°)	32.0	30.0
C (psf)	450	300

Proposed Industrial Building  
Chino, California  
Project No. 22G145-1

**PLATE C- 10**



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# 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

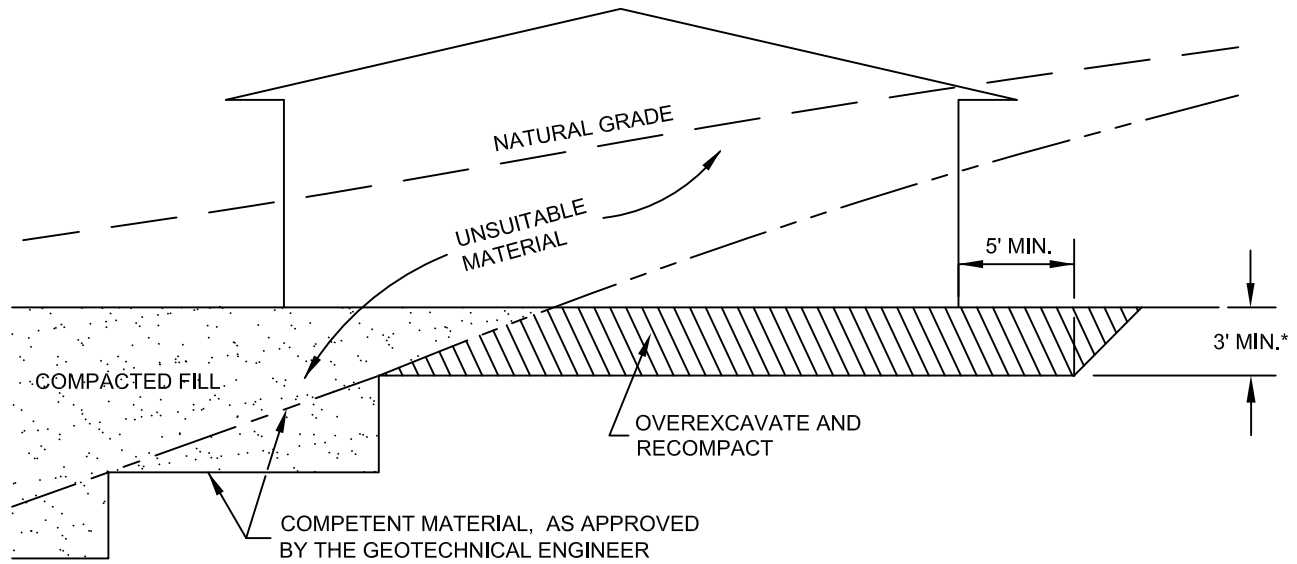
- All cut slopes should be inspected by the Geotechnical Engineer to determine the need for stabilization. The Earthwork Contractor should notify the Geotechnical Engineer when slope cutting is in progress at intervals of 10 vertical feet. Failure to notify may result in a delay in recommendations.
-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

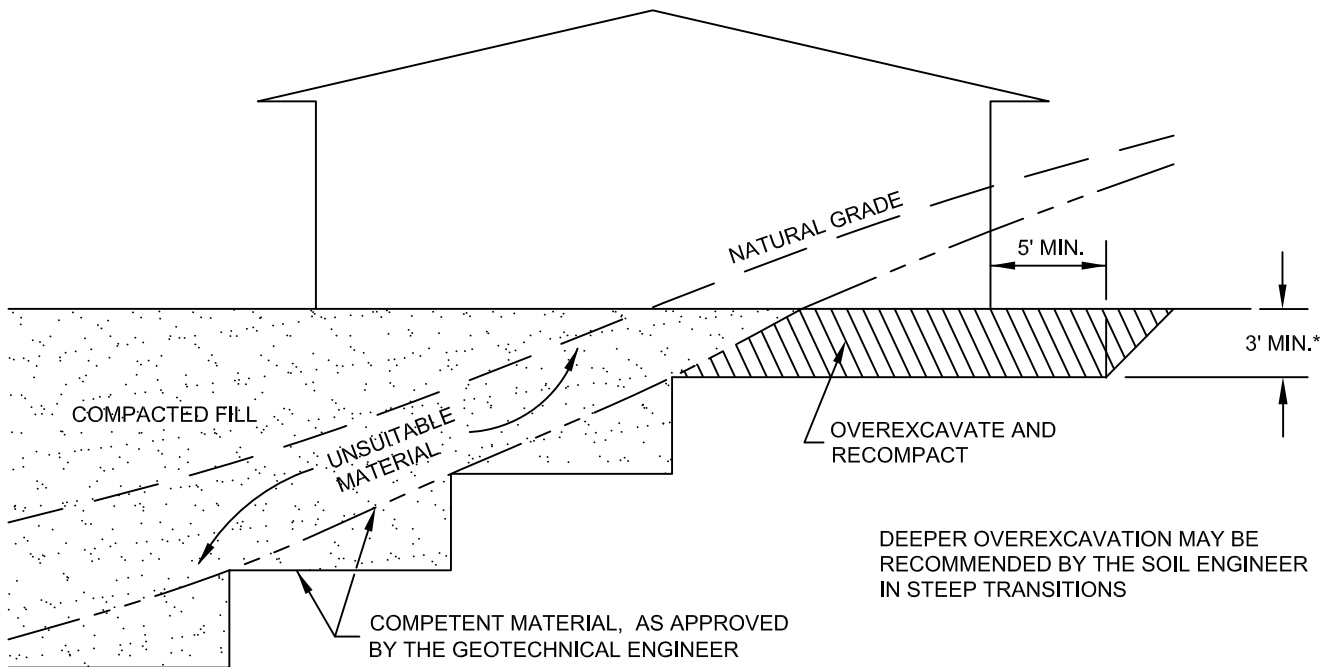
#### Subdrains

- 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  $\frac{3}{4}$ -inch crushed rock may be used provided it is wrapped in an acceptable filter cloth and approved by the Geotechnical Engineer. Pipe diameters should be 6 inches for runs up to 500 feet and 8 inches for the downstream continuations of longer runs. Four-inch diameter pipe may be used in buttress and stabilization fills.


CUT LOT

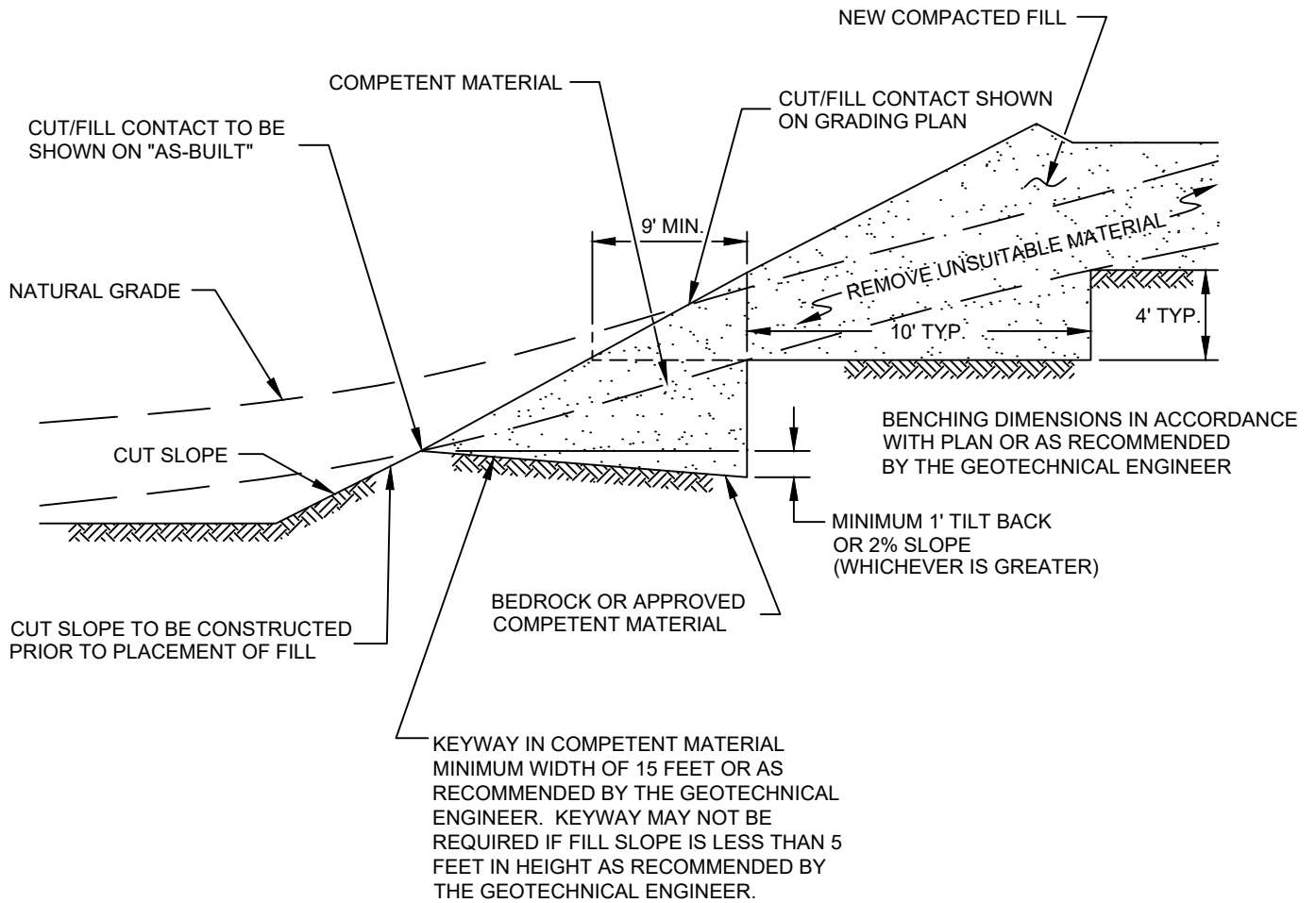



CUT/FILL LOT (TRANSITION)

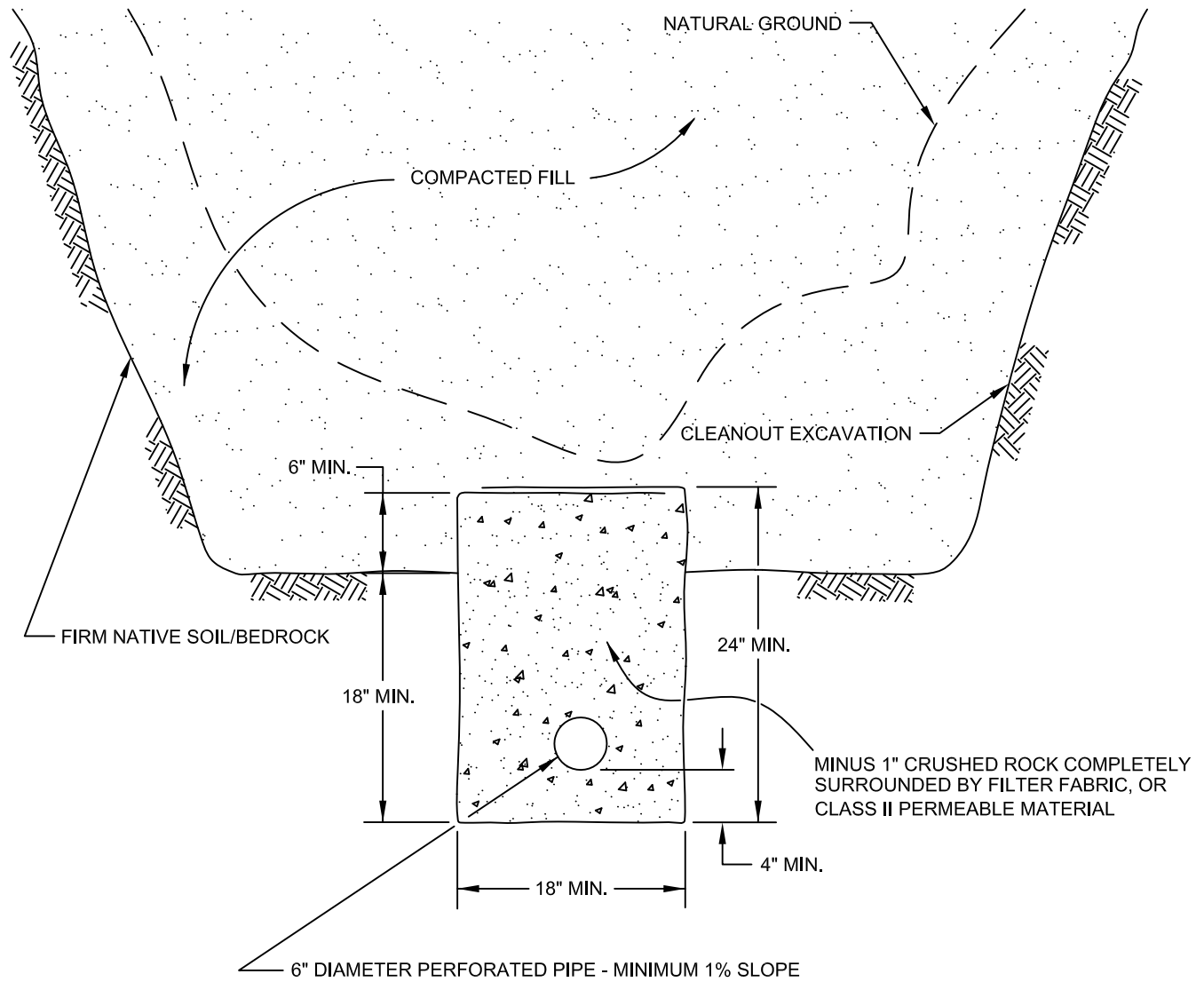


\*SEE TEXT OF REPORT FOR SPECIFIC RECOMMENDATION.  
ACTUAL DEPTH OF OVEREXCAVATION MAY BE GREATER.

<b>TRANSITION LOT DETAIL</b>	
<b>GRADING GUIDE SPECIFICATIONS</b>	
NOT TO SCALE	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: JAS CHKD: GKM	
<b>PLATE D-1</b>	




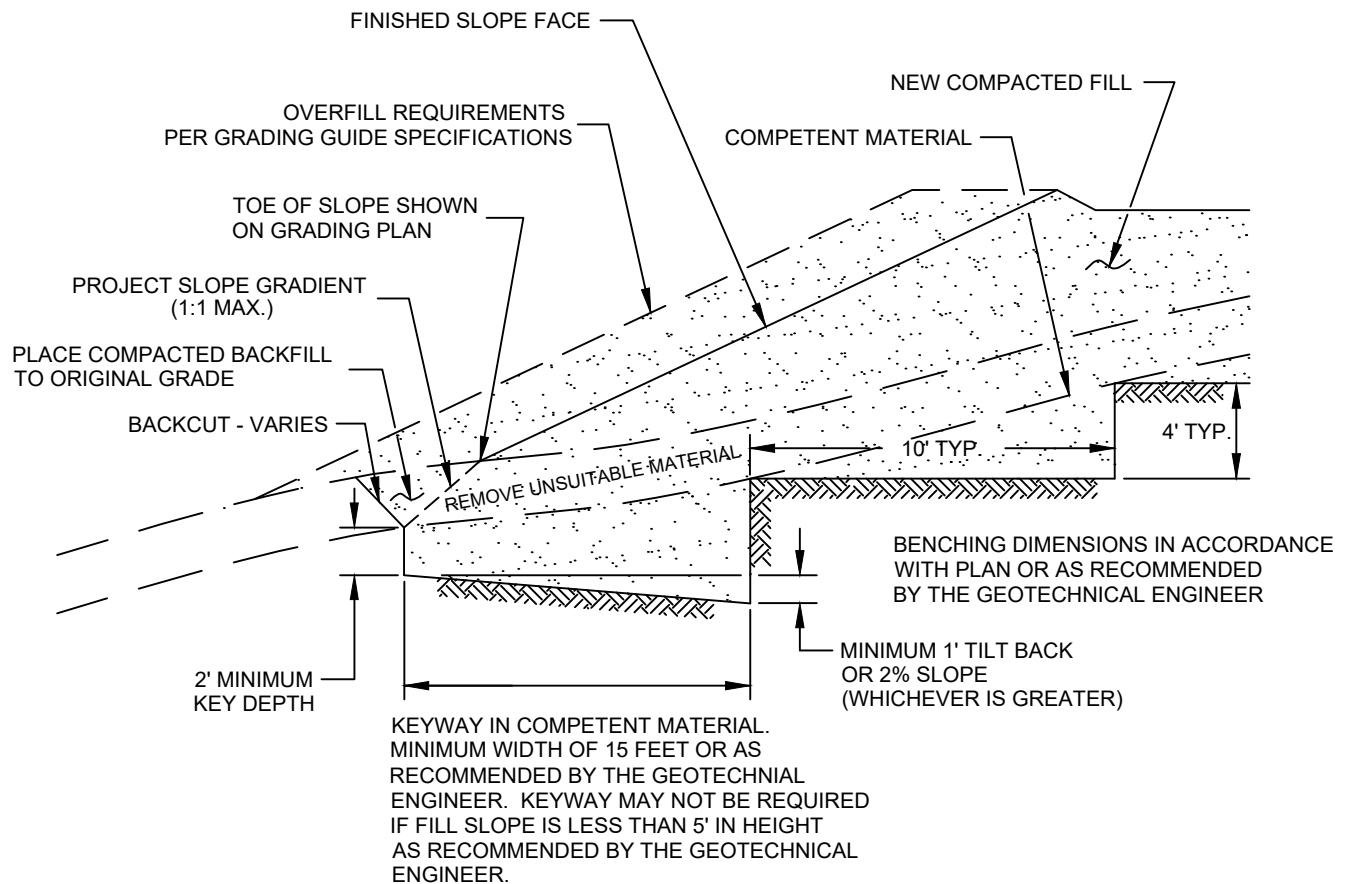
<b>FILL ABOVE CUT SLOPE DETAIL</b>	
<b>GRADING GUIDE SPECIFICATIONS</b>	
NOT TO SCALE	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: JAS CHKD: GKM	
<b>PLATE D-2</b>	




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

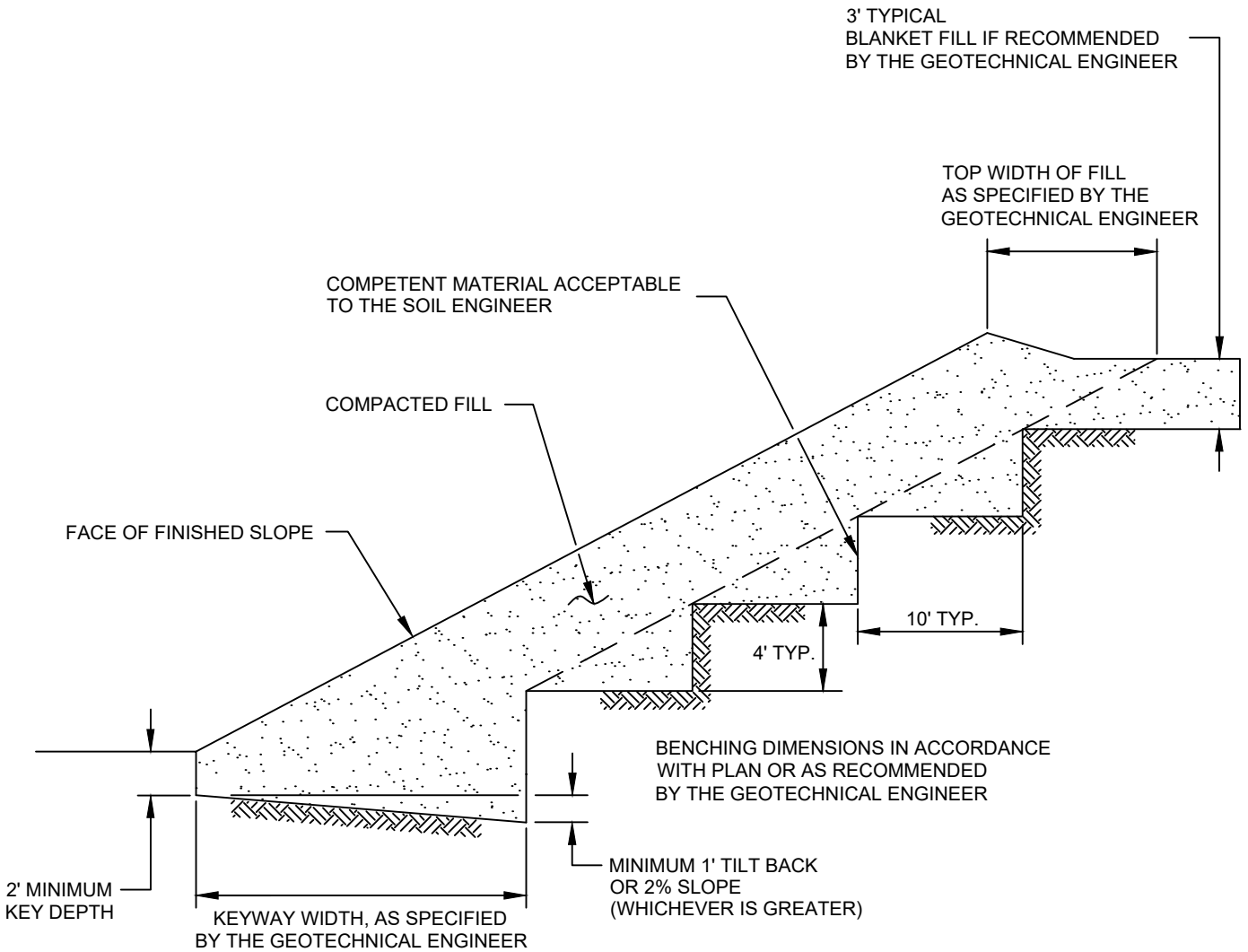
**SCHEMATIC ONLY  
NOT TO SCALE**


<b>CANYON SUBDRAIN DETAIL</b>	
<b>GRADING GUIDE SPECIFICATIONS</b>	
NOT TO SCALE	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: JAS CHKD: GKM	
<b>PLATE D-3</b>	

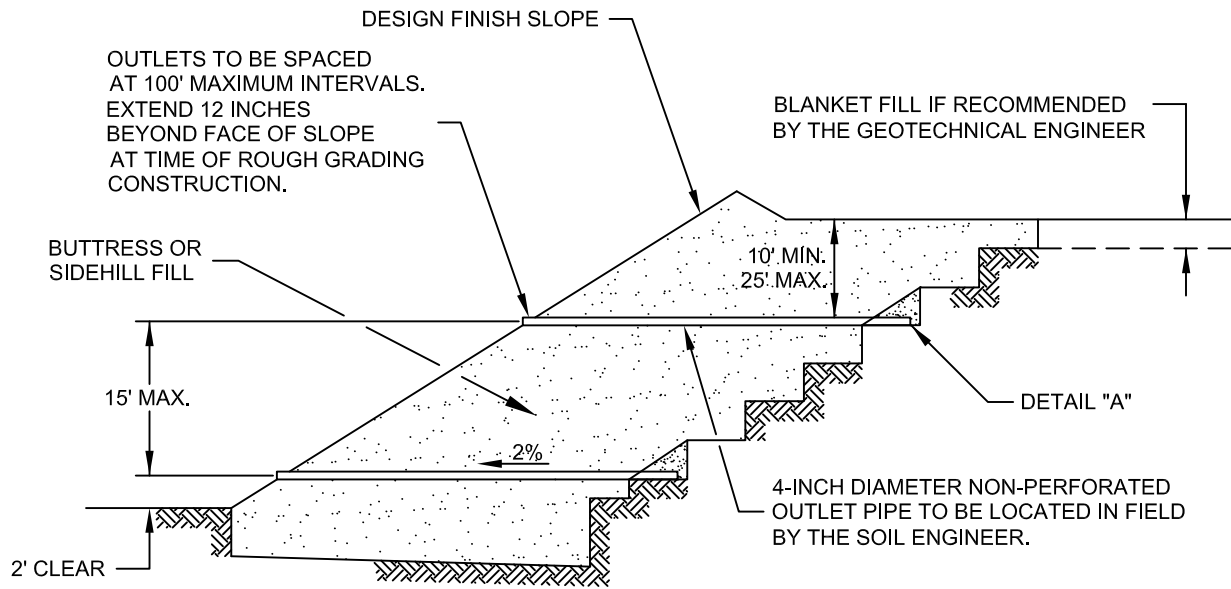


NOTE:  
 BENCHING SHALL BE REQUIRED  
 WHEN NATURAL SLOPES ARE  
 EQUAL TO OR STEEPER THAN 5:1  
 OR WHEN RECOMMENDED BY  
 THE GEOTECHNICAL ENGINEER.

<b>FILL ABOVE NATURAL SLOPE DETAIL</b>	
GRADING GUIDE SPECIFICATIONS	
NOT TO SCALE	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: JAS CHKD: GKM	
<b>PLATE D-4</b>	



<b>STABILIZATION FILL DETAIL</b>	
GRADING GUIDE SPECIFICATIONS	
NOT TO SCALE	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: JAS CHKD: GKM	
<b>PLATE D-5</b>	



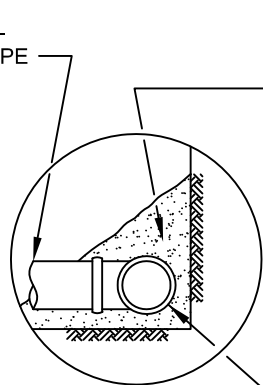
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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	

OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW



DETAIL "A"

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


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

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

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

NOTES:

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

SLOPE FILL SUBDRAINS	
GRADING GUIDE SPECIFICATIONS	
NOT TO SCALE	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: JAS CHKD: GKM	
PLATE D-6	

MINIMUM ONE FOOT THICK LAYER OF LOW PERMEABILITY SOIL IF NOT COVERED WITH AN IMPERMEABLE SURFACE

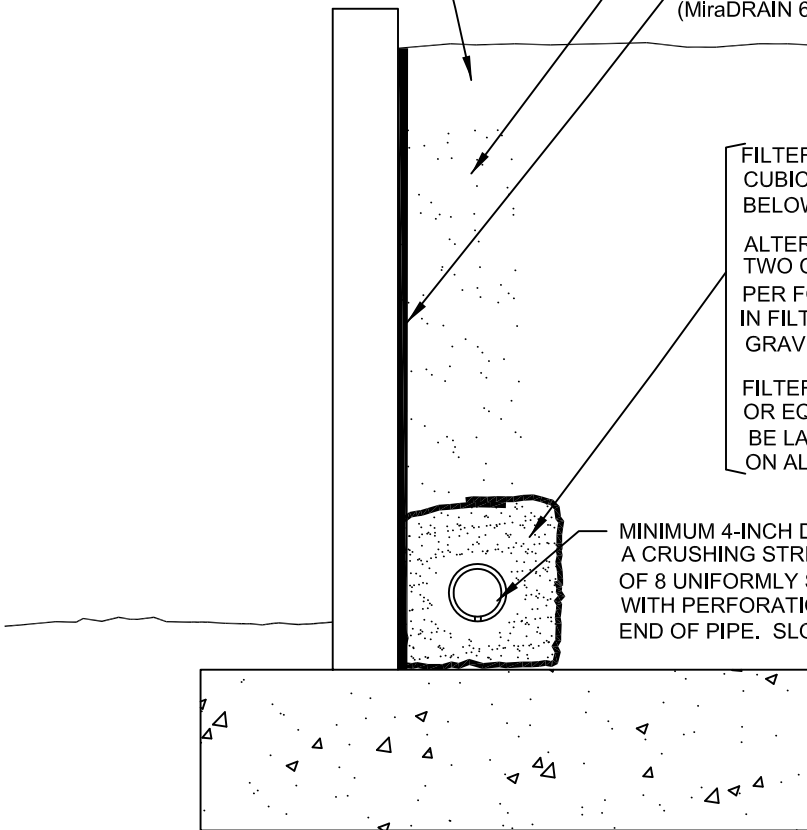
MINIMUM ONE FOOT WIDE LAYER OF FREE DRAINING MATERIAL (LESS THAN 5% PASSING THE #200 SIEVE) OR PROPERLY INSTALLED PREFABRICATED DRAINAGE COMPOSITE (MiraDRAIN 6000 OR APPROVED EQUIVALENT).

FILTER MATERIAL - MINIMUM OF TWO CUBIC FEET PER FOOT OF PIPE. SEE BELOW FOR FILTER MATERIAL SPECIFICATION.

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

FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 6 INCHES ON ALL JOINTS.

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




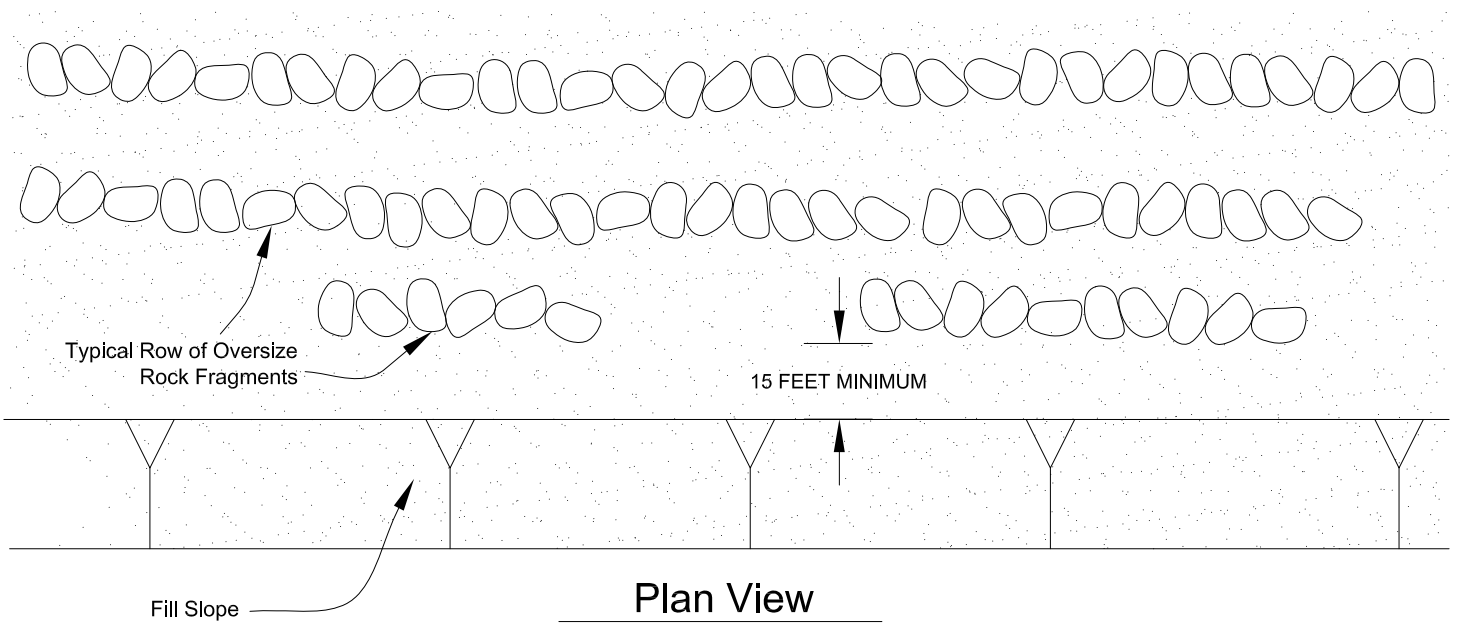
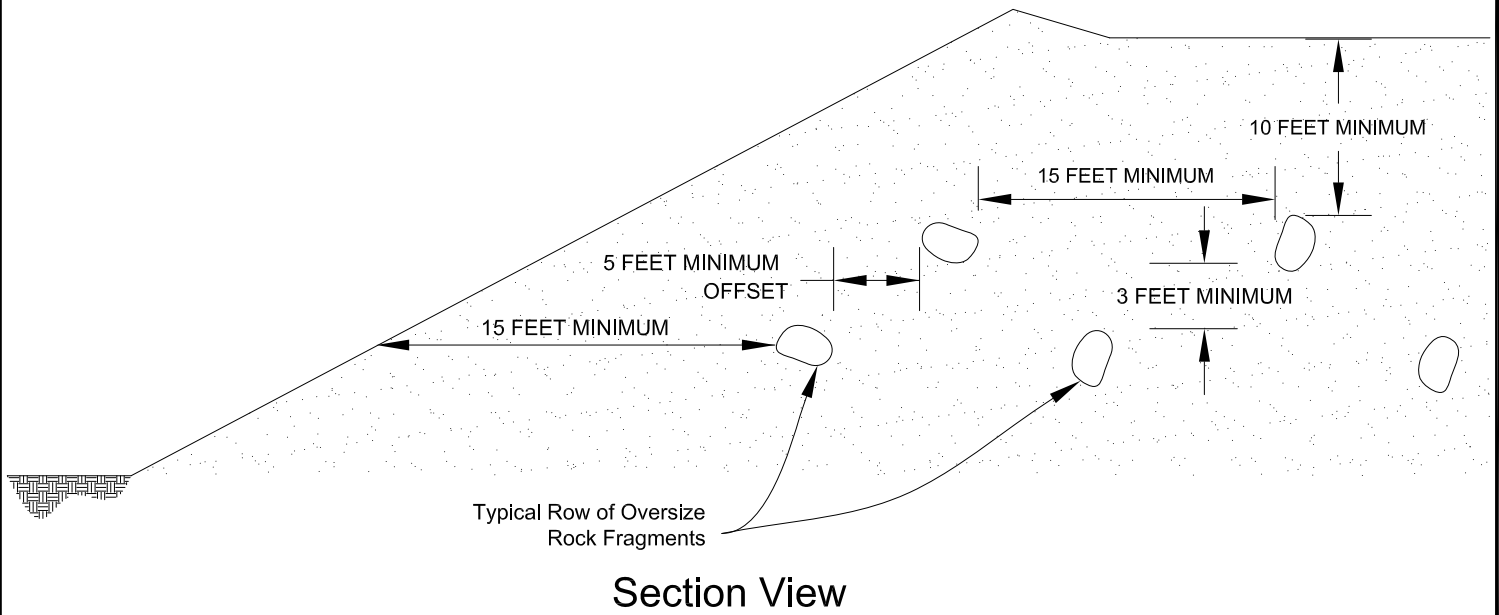
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: JAS CHKD: GKM	
PLATE D-7	



**PLACEMENT OF OVERSIZED MATERIAL  
GRADING GUIDE SPECIFICATIONS**

NOT TO SCALE

DRAWN: PM  
CHKD: GKM

PLATE D-8

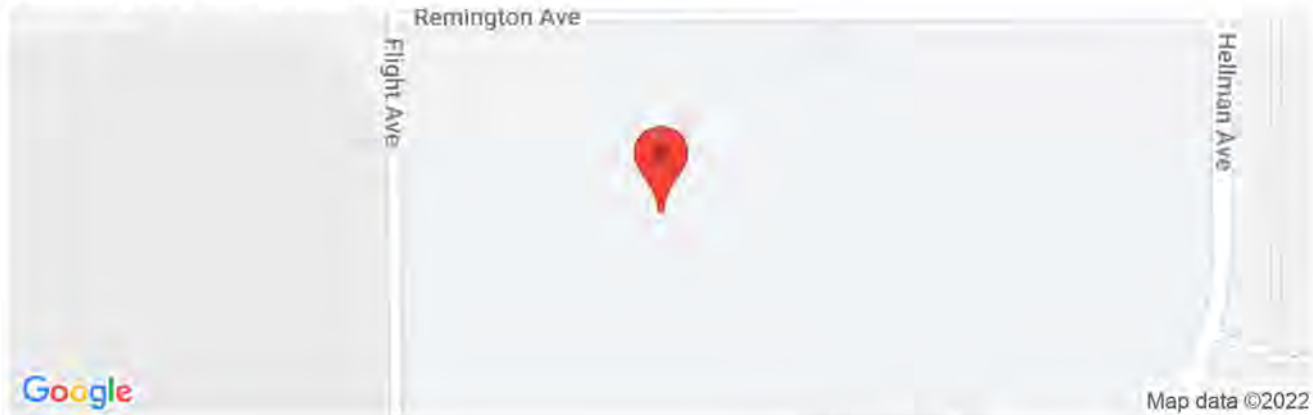


**SOUTHERN  
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# APPENDIX E



Latitude, Longitude: 33.974269, -117.616412



Map data ©2022

Date	4/18/2022, 2:28:23 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
$S_S$	1.686	$MCE_R$ ground motion. (for 0.2 second period)
$S_1$	0.602	$MCE_R$ ground motion. (for 1.0s period)
$S_{MS}$	1.686	Site-modified spectral acceleration value
$S_{M1}$	null -See Section 11.4.8	Site-modified spectral acceleration value
$S_{DS}$	1.124	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	0.7	$MCE_G$ peak ground acceleration
$F_{PGA}$	1.1	Site amplification factor at PGA
$PGA_M$	0.77	Site modified peak ground acceleration
$T_L$	8	Long-period transition period in seconds
$SsRT$	1.686	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	1.804	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$SsD$	1.951	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.602	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	0.657	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
$S1D$	0.641	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.797	Factored deterministic acceleration value. (Peak Ground Acceleration)
$C_{RS}$	0.934	Mapped value of the risk coefficient at short periods
$C_{R1}$	0.917	Mapped value of the risk coefficient at a period of 1 s

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



<b>SEISMIC DESIGN PARAMETERS - 2019 CBC</b>	
PROPOSED INDUSTRIAL BUILDING	
CHINO, CALIFORNIA	
DRAWN: OS CHKD: RGT SCG PROJECT 22G145-1	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
<b>PLATE E-1</b>	