GEOTECHNICAL INVESTIGATION
PROPOSED LOGISTICS BUILDING

SWC Merrill Avenue and Flight Avenue
Chino, California
for
Scannell Properties

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

May 7, 2018

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Scannell Properties
c/o D & D Engineering, Inc.
8901 S. La Cienega Boulevard, Suite 106
Inglewood, California 90301

Attention: Mr. Henrik Nazarian, PE
President

Project No.: **18G132-1**

Subject: **Geotechnical Investigation**
Proposed Logistics Building
SWC Merrill Avenue and Flight Avenue
Chino, California

Reference: Geotechnical Investigation, Proposed Commercial/Industrial Development, SWC Merrill Avenue and Flight Avenue, Chino, California, performed by Southern California Geotechnical, Inc. (SCG), prepared for David Evans & Associates, SCG Project No. 16G173-1, dated August 8, 2016.

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.

Pablo Montes Jr.
Staff Engineer

Robert G. Trazo, GE 2655
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT TRAZO
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GEOTECHNICAL
STATE OF CALIFORNIA

Distribution: (1) Addressee

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1.0 EXECUTIVE SUMMARY

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

Site Preparation

- Demolition of the existing dairy farm will be required in order to allow for the new development. Demolition activities will include the removal of the single-family residence, canopy structures, pavements and any subsurface improvement which will not be remain with the new development. This should include all foundations, floor slabs, utilities, septic tanks and any other subsurface improvements associated with the existing structures. These materials should be disposed of off-site in accordance with all necessary regulations.
- Site stripping should include removal of all manure and any topsoil. Manure was observed throughout the dairy farm areas of the site, especially within the active cattle pens with thicknesses of up to 11± inches at some of the boring locations. The topsoil encountered within the agricultural field measured 6± inches thick at the boring locations. These materials should also be disposed of off-site.
- Some of the soils in the upper 12± inches in the cattle pen and agricultural filed areas possess low organic content. It may be feasible to use some of the soils in the upper 12± inches as structural fill, provided that these soils are cleaned of all apparent vegetation or highly organic material, selectively graded and thoroughly blended with the inorganic soils from greater depths at the site. The final mixture is recommended to contain less than 3 percent organic content prior to re-use as compacted structural fill.
- The near-surface soils at this site consist of loose to medium dense silty fine sands. The upper portion of these materials, extending to depths of 2½ to 3± feet, are classified as disturbed alluvium and possess varying densities and varying strengths. Additionally, artificial fill soils were encountered in isolated areas during the referenced geotechnical investigation, extending to depths of 1 to 5± feet. Any artificial fill soils and any soils disturbed during the demolition of the dairy farm structures should be removed from the proposed building areas in their entirety.
- Remedial grading is recommended to be performed within the proposed building areas. The existing soils within the proposed building areas should be overexcavated to a depth of 4 feet below existing grade and to a depth of at least 4 feet below proposed building pad subgrade elevations. The depth of overexcavation should also be sufficient to remove any existing undocumented fill soils.
- The proposed foundation influence zones should be overexcavated to a depth of 3 feet below proposed foundation bearing grade.
- After overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify any additional soils that should be overexcavated. The resulting subgrade soils should be scarified and moisture conditioned to achieve a moisture content of 0 to 4 percent above optimum moisture, to a depth of at least 12 inches. The overexcavation subgrade soils should then be recompacted under the observation of the geotechnical engineer. The previously excavated soils may then be replaced as compacted structural fill.

- The new parking and drive area subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned and recompacted.

Building Foundations

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

Building Floor Slabs

- Conventional Slab-on-Grade, 6 inches thick.
- Modulus of Subgrade Reaction: k = 100 psi/in.
- Reinforcement is not considered necessary for geotechnical considerations. The actual floor slab reinforcement should be determined by the structural engineer, based on the imposed slab loading.

Pavements

ASPHALT PAVEMENTS (R = 45)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	3	5	6	7	8
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	6½	8	9
Compacted Subgrade (95% minimum compaction)	12	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 18P114R, dated March 8, 2018. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations, building floor slab, and parking lot pavements along with site preparation recommendations and construction considerations for the proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located at the southwest corner of Merrill Avenue and Flight Avenue in Chino, California. The site is bounded to the north by Merrill Avenue, to the west by an agricultural lot, to the south by Remington Avenue, and to the east by Flight Avenue. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The overall site consists of two (2) rectangular-shaped parcels, which total 70± acres in size. The northwestern portion of the site is presently developed as a dairy farm with cattle pens and multiple canopy structures. Two (2) single-family residences, a milking barn, and other structures associated with the dairy operation located in the northern portion of the dairy farm. The buildings appear to be single-story structures of wood frame construction and the canopies appear to be of metal frame construction. We expect that these structures are supported on conventional shallow foundations. Ground surface cover generally consists of turf grass, asphaltic concrete, and concrete pavements surrounding the farm houses and the other structures, manure in the cattle pen areas, and exposed soils with sparse native grass and weed growth in the remaining areas. The southern portion of the western parcel appears to be utilized as an infiltration field for the dairy operation, with the ground surface cover consisting of exposed soil with sparse to moderate native grass and weed growth. The eastern parcel is currently being utilized for agricultural purposes. Ground surface cover generally consists of row crops with limited areas of exposed soil. Several large trees are present in the northeast corner of the eastern parcel. An existing detention basin is located at the southwest region of the property.

Topographic information was obtained from a conceptual grading plan prepared by D & D Engineering, Inc. Based on the information provided, the site topography generally slopes downward to the south at a gradient of 1± percent, with the exception of some local variations in the existing dairy farm area. The existing grades range from a topographic elevation high of 659± feet mean sea level (msl) in the northwestern region of the site, to an elevation low of 636± feet msl in the southwest region of the site. However, the bottom of the existing basin is at an elevation of 626± feet msl.

3.2 Proposed Development

The site plan provided to our office by D & D Engineering, Inc., indicates that the new development will consist of an irregular-shaped logistics building, 458,537± ft^2 in size, located in the central region of the property. The northern and southern portions of the logistics building will be constructed in a cross-dock configuration and the north and south building walls will be constructed with dock high doors. An office building, identified as the 2-story gateway building, possessing a first-floor building footprint of 4,639± ft^2 in size, will be located east of the logistics building. A pedestrian bridge will connect the 2-strory gateway building with the logistics building. The proposed development will also include a vehicle maintenance garage, 15,665± ft^2 in size, located northwest of the logistics building. Two (2) guard shacks, approximately 220± ft^2 in size, will be constructed within the southwestern access drive of the site. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lane areas and Portland cement concrete pavements in the loading dock areas. It is also anticipated that several landscape planter areas will be located throughout the site.

Detailed structural information has not been provided. Based on the site plan provided by D & D Engineering, Inc., the logistics building will be a 2-story structure, presumably of tilt-up concrete construction. The gateway building and the vehicle maintenance garage are expected to be of steel-frame construction with metal panel sidings. The proposed structures at this site are expected to be supported on conventional shallow foundations 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 120 kips and 3 to 5 kips per linear foot, respectively.

No significant amounts of below grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the conceptual grading plan prepared by D & D Engineering, Inc., cuts and fills of up to 7± feet will be necessary to achieve the proposed site grades.

3.3 Previous Studies

SCG previously performed a geotechnical investigation within the site. The borings and trench locations performed as part of the previous studies are included as part of Plate 2 of this report. The investigation is referenced below:

> Geotechnical Investigation, Proposed Commercial/Industrial Development, SWC Merrill Avenue and Flight Avenue, Chino, California, prepared by Southern California Geotechnical, Inc. (SCG), for David Evans & Associates, SCG Project No. 16G173-1, dated August 8, 2016.

The previous report provided remedial grading and foundation construction recommendations for new commercial/industrial development. The buildings which were proposed at the time of the referenced report included an irregular-shaped building, 745,478± ft^2 in size, and two (2) smaller buildings, 5,160 ft^2 and 14,029± ft^2. The previously proposed development consisted of a combined 81± acre site, which extended west from Flight Avenue toward the existing Chino Municipal Airport.

The currently proposed development is similar to that which was assumed at the time of the referenced geotechnical investigation. However, the previous report encompassed a greater area than that of the currently proposed development.

As part of the referenced geotechnical investigation, six borings were advanced to depths of 20 to 50± feet. In addition, four trenches were excavated at the site to depths of 9 to 10± feet. SCG reported that manure was encountered at one of the trench locations to a depth of 3± inches and topsoil was encountered at one of the trench locations to a depth of 4± inches. Artificial fill soils were encountered at several of the boring and trench locations extending to depths up to 5± feet. The fill soils consisted of loose to medium dense silty fine sands, fine sandy silts, and fine sands with varying amounts of silt. Native alluvial soils were encountered at the ground surface or beneath the fill soils at all of the boring and trench locations. The alluvial soils consisted of medium stiff to very stiff fine sandy clays, loose to medium dense clayey fine sands, silty fine sands, fine sandy silts, and fine sands extending to a maximum depth of 50± feet. Free water was not encountered during the drilling of any of the borings or excavation of any of the trenches. Therefore, groundwater was considered to have existed at a depth in excess of 50± feet at the time of the previous investigation.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of five (5) borings, advanced to depths of 25 to 30± feet below currently existing site grades. All of the borings were logged during drilling by a member of our staff.

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

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

4.2 Geotechnical Conditions

Manure

Manure was present at the ground surface, within the cattle pens, at Boring Nos. B-7 and B-10, with thicknesses of 10 and 11± inches below existing site grades. Topsoil was encountered at the ground surface at Boring Nos. B-8, B-9 and B-11 with a thickness of 6± inches.

Topsoil

Topsoil was encountered at Boring Nos. B-8, B-9, and B-11, which were located within the existing agricultural field. The topsoil is 6± inches and consists of very loose silty fine sands with appreciable organic content.

Artificial Fill

Artificial fill soils were encountered at the ground surface at some of the boring and trenches performed as part of the referenced geotechnical investigation. The artificial fill soils extend to depths of ¼ to 5± feet below the existing site grades. The fill soils generally consist of loose to medium dense silty fine sands, fine sandy silts, and fine sands with varying amounts of silt, medium sand, and fine gravel. The fill soils possess a disturbed appearance and some samples contain minor debris, such as PVC pipe fragments, resulting in their classification as artificial fill.

Alluvium

Native alluvium was encountered beneath the manure and/or topsoil at all of the boring locations, extending to the maximum depth explored of 30± feet below existing site grades. Some of the borings encountered disturbed alluvium, extending to depths of 2½ to 3± feet below the existing site grades. These materials are expected to have been disturbed as part of the dairy and agricultural operations and consist of loose to medium dense silty fine sands. Beneath these materials, the undisturbed alluvial soils consist of medium dense to dense silty fine sands and fine to medium sands with varying coarse sand, silt and gravel content, extending to the maximum depth explored of 30± feet. However, Boring Nos. B-7 and B-11 encountered medium dense clayey fine sand and medium stiff to very stiff sandy clay and silty clay strata, varying at depths of 6½ to 27± feet below the existing site grades.

Groundwater

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

As part of our research, we reviewed available groundwater data in order to determine regional groundwater depths. Recent water level data was obtained from the California State Water Resources Control Board, GeoTracker, website, http://geotracker.waterboards.ca.gov/. Monitoring wells, located approximately within a one-mile radius from the site, indicate historic high groundwater levels ranging from 56 to 83± feet below ground surface.

5.0 LABORATORY TESTING

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

Classification

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

Dry Density and Moisture Content

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

Consolidation

Selected soil samples have been tested to determine their consolidation potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-4 in Appendix C of this report.

Maximum Dry Density and Optimum Moisture Content

A representative bulk sample has been tested for its maximum dry density and optimum moisture content. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557 and are presented on Plate C-5 in Appendix C of this report. This test is generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

Soluble Sulfates

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

Sample Identification	Soluble Sulfates (%)	Severity	Class
B-7 @ 0 to 5 feet	0.056	Not Applicable	S0
B-11 @ 0 to 5 feet	0.003	Not Applicable	S0

Corrosivity Testing

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

Sample Identification	Resistivity (ohm-cm)	pH	Chlorides (mg/kg)
B-7 @ 0 to 5 feet	304	8.3	695
B-11 @ 0 to 5 feet	2,760	7.9	26

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:

Sample Identification	Organic Content
B-7 @ 1-2 feet	1.3%
B-7 @ 3-4 feet	0.7%
B-8 @ 1-2½ feet	3.8%
B-8 @ 3½ -5 feet	1.2%
B-8 @ 6-7½ feet	1.4%
B-9 @ 1-2 feet	7.7%
B-9 @ 3-4 feet	0.7%
B-11 @ 1-2 feet	6.7%
B-11 @ 3-4 feet	0.9%

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our review, field exploration, laboratory testing and geotechnical analysis, the proposed development is considered feasible from a geotechnical standpoint. The recommendations contained in this report should be taken into the design, construction, and grading considerations.

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

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

6.1 Seismic Design Considerations

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

Faulting and Seismicity

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Furthermore, SCG did not identify any evidence of faulting during the geotechnical investigation. Therefore, the possibility of significant fault rupture on the site is considered to be low.

Seismic Design Parameters

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2016 edition of the California Building Code (CBC). The CBC provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site.

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

2016 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	1.500
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.600
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.500
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	0.900
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.000
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.600

Liquefaction

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

The Seismic Hazards Map for the Corona North, California 7.5 Minute Quadrangle, published by the California Geological Survey (CGS) indicates that the subject site is not located within a designated liquefaction hazard zone. In addition, the subsurface conditions encountered at the subject site are not considered to be conducive to liquefaction. Based on the mapping performed by the CGS, and the subsurface conditions encountered at the boring locations, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The active cattle pen areas are covered with manure at the ground surface, with thicknesses of about 10 to 11± inches at the boring locations. The existing topsoil within the existing agricultural field is approximately 6± inches thick and possess appreciable organic content. All of the manure and any organic topsoil should be removed and exported from the site. Additionally, some of the soils in the upper 12± inches, located beneath the manure and topsoil, possess organic contents greater than 3 percent. It may be feasible to use these soils in fills, provided that they are cleaned of highly organic materials and can be blended with the underlying soils in order to reduce the organic content to less than 3 percent throughout.

The near-surface soils at this site consist of disturbed alluvial soils, extending to depths of 2½ to 3± feet below existing site grades. These materials possess varying densities and varying strengths. Results of laboratory testing indicate these soils to possess a minor potential for consolidation/collapse. In addition, the referenced geotechnical investigation encountered artificial fill soils, extending to depths of up to 5± feet. Neither the artifical fill soils nor the near-surface alluvium is considered suitable to support the foundations loads of the new buildings, in their present condition. Therefore, remedial grading is considered warranted within the proposed building areas in order to remove and replace a portion of the near surface soils as compacted structural fill.

Settlement

The proposed remedial grading will remove the upper portion of the varying strength near-surface alluvium, and any artificial fill materials, and replace these materials as compacted structural fill. The alluvium that will remain in place below the newly placed layer of structural fill will not be subject to significant load increases by the foundations of the new structures. Therefore, provided that the recommended remedial grading is completed, the post-construction static settlements of the proposed structures are expected to be within tolerable limits.

Expansion

The near surface soils generally consist of sands and silty sands. These materials have been visually classified as very low to non-expansive. Based on these test results, 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 verify the expansion potential of the as-graded building pad.

Soluble Sulfates

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

Corrosion Potential

The results of laboratory testing indicate that the on-site soils possess resistivity values of 304 and 2,760 ohm-cm, and pH values of 7.9 and 8.3. 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. Sulfides, and redox potential are factors that are also used in the evaluation procedure. 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, it is expected that polyethylene encasement will be required for iron pipes.** Since SCG does not practice in the area of corrosion engineering, the client may also wish to contact a corrosion engineer to provide a more thorough evaluation.

Based on American Concrete Institute (ACI) Publication 318 Building Code Requirements for Structural Concrete and Commentary, reinforced concrete that is exposed to external sources of chlorides requires corrosion protection for the steel reinforcement contained within the concrete. ACI 318 defines concrete exposed to moisture and an external source of chlorides as "severe" or exposure category C2. For exposure category C2, ACI 318 prescribes the use of concrete with a compressive strength of 5,000 psi and a maximum water cement ratio of 0.4. ACI 318 does not clearly define a specific chloride concentration at which contact with the adjacent soil will constitute a "C2" or severe exposure. However, the Caltrans Memo to Designers 10-5, Protection of Reinforcement Against Corrosion Due to Chlorides, Acids and Sulfates, dated June 2010, indicates that soils possessing chloride concentrations greater than 500 mg/kg are considered to be corrosive to reinforced concrete. Additionally, based on our conversations with a representative from HDR, Inc., we understand that soils possessing concentrations of 350 mg/kg can also constitute a potentially corrosive chloride exposure for steel within reinforced concrete.

Based on our interpretation of the results of the corrosivity testing and our understanding of the criteria for a "severe" (C2) chloride exposure, soils that can constitute a potentially corrosive exposure are present at one of the boring locations within the site.

Since SCG does not practice in the area of corrosion engineering, the client should consult with a corrosion engineer to further provide the chloride exposure category for this site with respect to the requirements of ACI 318-14. In accordance with the requirements of ACI 318 for severe or C2 chloride exposure, any reinforced concrete in contact with the on-site soils will require a minimum compressive strength of 5,000 lb/in^2 and a maximum water cement ratio of 0.40. Measures to protect steel reinforcement are expected to consist of the use of higher strength concrete and/or a low water-to-cement ratio as described above. However, as an alternative, it may be feasible to blend the on-site soils in order to achieve acceptable chloride contents. The client may also wish to consider additional soil sampling and laboratory testing to determine the extent of the areas of high chloride contents. These results should be reviewed by a corrosion engineer and the geotechnical engineer to provide the appropriate mitigation measures.

Organic Content

Laboratory testing indicates that the tested samples of near surface soils possess organic contents ranging from 1 to 8± percent by weight. The results of laboratory testing performed for the previous, referenced geotechnical investigation, also identified manure at the ground surface and organic content ranging from 0.5 to 15.4 percent. Based on the organic content testing, the near-surface soils are considered to possess low to moderate organic contents. The soils possessing the higher organic contents are generally located in the upper 1-foot of the ground surface.

It is recommended that all manure and any organic topsoil be removed during site stripping. Following removal of the manure and topsoil materials, it is expected that grubbing and segregating of the top 12± inches in the cattle pens and within the agricultural field will be performed prior to grading. Therefore, subsequent to the stripping of any organic materials at the site, the remaining soils are expected to possess organic contents of less than 3± percent. Any additional organic materials encountered in buried fills should also be segregated during grading.

In general, organic soils and manure should be disposed of off-site. It is feasible to use some of the soils in the upper 12± in structural fills, provided that these soils are cleaned of all apparent vegetation or highly organic material and thoroughly blended with the inorganic soils from greater depths at the site. Based on our experience with similar projects in the vicinity of the project site, a final mixture containing less than 3 percent organic content is acceptable for the project site. It is recommended that additional organic testing be conducted during rough grading of the proposed building pads in order to verify that the organic content of the blended on-site soils are within the acceptable limits.

The city of Chino requires that a methane assessment be performed for sites with soils possessing organic contents in excess of 2 percent. Therefore, it is likely that such an assessment will be required for this site.

Shrinkage/Subsidence

Based on the results of the laboratory testing, removal and recompaction of the loose to medium dense near-surface soils, extending to depths of 2½ to 3± feet, is estimated to result in an average shrinkage of 7 to 12 percent. The native medium dense silty sands that will remain in place, at depths greater than 3± feet, will likely possess an average shrinkage of 5 to 9 percent. However, the estimated shrinkage of the individual soil layers at the site is highly variable, locally ranging from a minimum shrinkage value of 1 percent to a maximum shrinkage of 22 percent at varying sample depths and locations. It should be noted that this shrinkage estimate is based on the results of dry density testing performed on small-diameter samples of the existing soils taken at the boring locations. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test-pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

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

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

Grading and Foundation Plan Review

This report was prepared in consideration of the conceptual grading plan provided by D & D Engineering, Inc. However, foundation plans were not available at the time of this report. It is therefore recommended that we be provided with copies of the precise grading and foundation plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

6.3 Site Grading Recommendations

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

Site Stripping and Demolition

The existing dairy including and existing structures will be demolished in order to allow the construction of the new development. This should include all foundations, slabs, septic systems, utilities, and any other subsurface improvements associated with the previously demolished dairy farm and horse ranch structures. Debris resultant from demolition should be disposed of offsite in accordance with any applicable regulations. Alternatively, concrete and asphalt debris may be crushed to a maximum 2-inch particle size, well mixed with the on-site soils, and incorporated into new structural fills, if desired.

Initial site stripping should include removal of any surficial vegetation from the site. Stripping should include all the organic topsoil within the dairy and agricultural fields, along with the existing trees within the site. Root balls associated with the trees should be removed in their entirety, and the resultant excavations should be backfilled with compacted structural fill soils. These materials should be disposed of off-site. All manure at the site, at the ground surface or buried, that is encountered during site grading should also be removed from the site. Within the active cattle pens, the manure is up to 11± inches thick. The actual extent of stripping should be determined in the field by a representative of the geotechnical engineer, based on the organic content and the stability of the encountered materials.

Treatment of Existing Soils: Building Pads

Remedial grading should be performed within the building pad areas to remove a portion of the near-surface native alluvium, any soils disturbed during demolition activities, and any artificial fill soils that are encountered during grading. Based on conditions encountered at the time of the referenced geotechnical investigation, artificial fill soils extend to depths of up to 5± feet in localized areas. To provide uniform support characteristics for the proposed structures, it is also recommended that the existing soils within the proposed building areas be overexcavated to a depth of at least 4 feet below the proposed building pad subgrade elevation, and to a depth of at least 4 feet below existing grade. Within the influence zones of any new foundations, the overexcavation should extend to a depth of 3 feet below proposed foundation bearing grade. Additionally, any artificial fill soils or disturbed soils, which are expected to be encountered in isolated areas, should be removed from the building pad areas in their entirety.

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

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

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of at least 12 inches, moisture treated to 0 to 4 percent above optimum moisture content, and compacted. The moisture conditioning of the overexcavation subgrade soils should be verified by the geotechnical engineer. The subgrade soils should then be recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of proposed retaining and non-retaining site walls should be overexcavated to a depth of at least 3 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pad. Any undocumented fill soils within any of these foundation areas should be removed in their entirety. The overexcavation 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. Please note that erection pads are considered to be part of the foundation system. These overexcavation recommendations apply to erection pads also. The overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning, and recompacting the upper 12 inches of exposed subgrade soils, as discussed for the building areas. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Parking and Drive Areas

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

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

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

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 0 to 4 percent above the optimum moisture content, and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer.
- All grading and fill placement activities should be completed in accordance with the requirements of the 2016 CBC and the grading code of the city of 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.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Imported Structural Fill

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

Utility Trench Backfill

In general, all utility trench backfill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. As an alternative, a clean sand (minimum Sand Equivalent of 30) may be placed within trenches and compacted in place (jetting or flooding is not recommended). It is recommended that materials in excess of 3 inches in size not be used for utility trench backfill. Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by 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 plane projected from the outside edge of the footing should be backfilled with structural fill soils, compacted to at least 90 percent of the ASTM D-1557 standard. Pea gravel backfill should not be used for these trenches.

6.4 Construction Considerations

Excavation Considerations

The near surface soils generally consist of very loose to medium dense silty sands and fine sands. These soils may be susceptible to caving within shallow excavations. Where caving occurs within shallow excavations, flattened excavation slopes may be sufficient to provide excavation stability. Temporary slopes should not exceed inclinations of 2h:1v. Steeper excavations may require some form of external stabilization such as shoring or bracing. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. All excavation activities on this site should be conducted in accordance with Cal-OSHA regulations.

Moisture Sensitive Subgrade Soils

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

Groundwater

The static groundwater table at this site is considered to be present at a depth in excess of 30± feet. Therefore, groundwater is not expected to impact grading or foundation construction activities.

6.5 Foundation Design and Construction

Based on the preceding grading recommendations, it is assumed that the new building pads will be underlain by structural fill soils extending to depths 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 structures may be supported on conventional shallow foundations.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 lbs/ft^2.
- Minimum wall/column footing width: 14 inches/24 inches.
- Minimum longitudinal steel reinforcement within strip footings: Two (2) No. 5 rebars (1 top and 1 bottom).
- Minimum foundation embedment: 12 inches into suitable structural fill soils, and at least 18 inches below adjacent exterior grade. Interior column footings may be placed immediately beneath the floor slab.
- It is recommended that the perimeter building foundations be continuous across all exterior doorways. Any flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

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

Foundation Construction

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

The foundation subgrade soils should also be properly moisture conditioned to 0 to 4 percent 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 60-foot span, thereby resulting in an angular distortion of less than 0.002 inches per inch.

Lateral Load Resistance

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

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

These are allowable values, and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill. The maximum allowable passive pressure is 2500 lbs/ft^2.

6.6 Floor Slab Design and Construction

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

- Minimum slab thickness: 6 inches.

- Minimum slab reinforcement: Not required for geotechnical considerations. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading.

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

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

- Moisture condition the floor slab subgrade soils to 0 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.

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

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

6.7 Retaining Wall Design and Construction

Although not indicated on the site plan, the proposed development may require some small retaining walls to facilitate the new site grades and in loading docks. Retaining walls are also expected within the truck dock areas of the proposed building.

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. We have provided parameters assuming the use of on-site sands and silty sands for retaining wall backfill. Based on their classifications, the on-site soils are expected to possess a friction angle of at least 30 degrees when compacted to 90 percent of the ASTM-1557 maximum dry density. **The clayey sand and sandy clay soils encountered at depths greater than 5 feet may possess higher expansion potentials and should not be used as retaining wall backfill material.**

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

RETAINING WALL DESIGN PARAMETERS

Design Parameter		Soil Type
		On-Site Sands and Silty Sands
Internal Friction Angle (ϕ)		30°
Unit Weight		120 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	40 lbs/ft^3
	Active Condition (2h:1v backfill)	64 lbs/ft^3
	At-Rest Condition (level backfill)	60 lbs/ft^3

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

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

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

Retaining Wall Foundation Design

The foundation subgrade soils for the new retaining should be prepared in accordance with the grading recommendations presented in Section 6.3 of this report. The foundations should be designed in accordance with the general Foundation Design Parameters presented in a previous section of this report.

Seismic Lateral Earth Pressures

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

Backfill Material

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

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

All retaining wall backfill should be placed and compacted under engineering controlled conditions in the necessary layer thicknesses to ensure an in-place density between 90 and 93 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557-91). 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 4-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 8-foot on-center spacing. The weep holes should include a one cubic foot gravel pocket surrounded by a suitable geotextile at each weep hole location.

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

6.8 Pavement Design Parameters

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

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The near-surface soils generally consist of fine sands and silty fine sands. These soils are considered to possess good pavement support characteristics with estimated R-values ranging from 40 to 50. The subsequent pavement design is based upon a design R-value of 45. Any fill material imported to the site should have support characteristics equal to or greater than that of the on-site soils and be placed and compacted under engineering controlled conditions. It is recommended that R-value testing be performed after completion of rough grading. Depending upon the results of the R-value testing, it may be feasible to use thinner pavement sections in some areas of the site.

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 = 45)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	3	5	6	7	8
Compacted Subgrade	12	12	12	12	12

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

Portland Cement Concrete

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

PORTLAND CEMENT CONCRETE PAVEMENTS				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	6½	8	9
Compacted Subgrade (95% minimum compaction)	12	12	12	12

The concrete should have a 28-day compressive strength of at least 3,000 psi. Reinforcing within all pavements should be designed by the 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. The actual joint spacing and reinforcing of the Portland cement concrete pavements should be determined by the structural engineer.

7.0 GENERAL COMMENTS

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

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

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

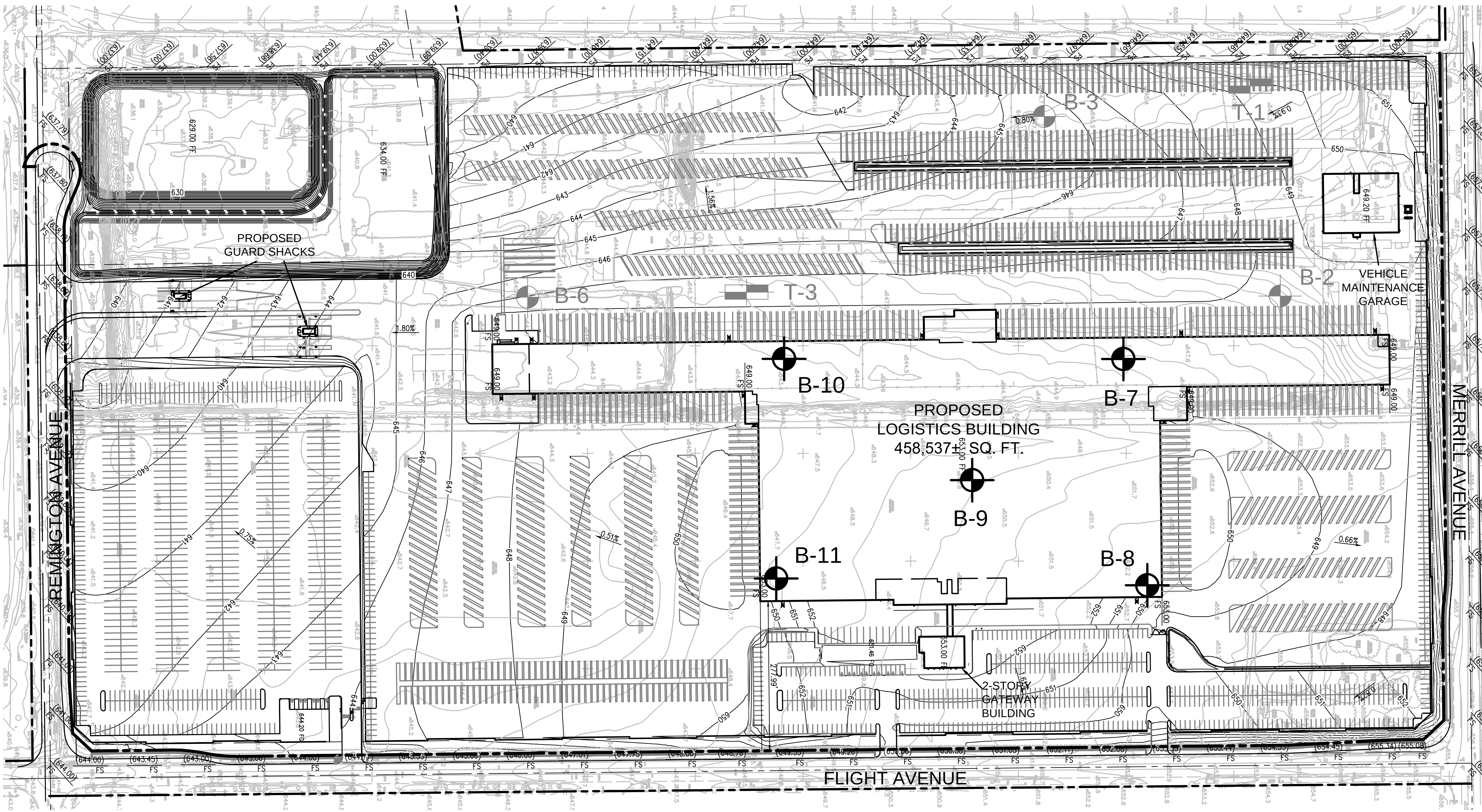
The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

APPENDIX A

SOURCE: SAN BERNARDINO COUNTY THOMAS GUIDE, 2013

SITE LOCATION MAP
PROPOSED LOGISTICS BUILDING
CHINO, CALIFORNIA

SCALE: 1" = 2400'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JLH CHKD: RGT	
SCG PROJECT 18G132-1	
PLATE 1	



GEOTECHNICAL LEGEND

- APPROXIMATE BORING LOCATION
- APPROXIMATE BORING LOCATION FROM PREVIOUS STUDY (SCG PROJECT NO. 16G173-1)
- APPROXIMATE TRENCH LOCATION FROM PREVIOUS STUDY (SCG PROJECT NO. 16G173-1)

NORTH

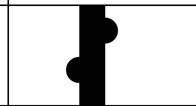
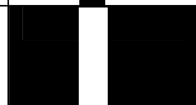
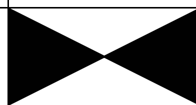
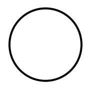
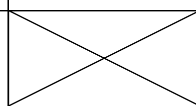
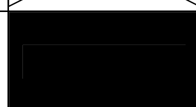
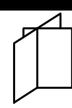
NOTE: SITE PLAN PREPARED BY D&D ENGINEERING, INC.

BORING LOCATION PLAN
PROPOSED LOGISTICS BUILDING
CHINO, CALIFORNIA
SCALE: 1" = 180'
DRAWN: PM CHKD: RGT
SCG PROJECT 18G132-1
PLATE 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX B

BORING LOG LEGEND

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

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

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

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

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

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

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

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

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

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

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

SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-7

JOB NO.: 18G132
PROJECT: Proposed Logistics Building
LOCATION: Chino, California

DRILLING DATE: 4/17/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 22 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 646.5 feet MSL

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					11± inches Manure							
	X	41			ALLUVIUM: Light Brown Silty fine Sand, little medium Sand, medium dense-damp	112	7				1	
	X	32			Light Gray Brown fine Sand, trace Iron oxide staining, medium dense-dry to damp	107	4				1	
5	X	30			Light Gray Brown fine to medium Sand, little coarse Sand, medium dense-dry to damp	122	2					
					Brown Silty fine Sand, little Clay, trace calcareous veining and nodules, medium dense-moist							
	X	52	3.5		Brown Clayey fine Sand to fine Sandy Clay, little medium Sand, dense to very stiff-moist to very moist	111	17					
10	X	36	3.0			104	17					
	X	18	3.0		Light Gray Brown Silty Clay, little fine to medium Sand, trace Organic content, abundant calcareous veining and nodules, stiff-very moist		15					
15												
	X	21			Gray Brown Silty fine Sand to fine Sandy Silt, little Clay, trace calcareous veining, medium dense-moist		15					
20												
	X	20			Brown Silty fine Sand, trace medium Sand, medium dense-moist		14					
25					Boring Terminated at 25'							

TBL 18G132.GPJ SOCALGEO.GDT 5/7/18

BORING NO.
B-8

JOB NO.: 18G132
PROJECT: Proposed Logistics Building
LOCATION: Chino, California

DRILLING DATE: 4/17/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

SURFACE ELEVATION: 652.5 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					TOPSOIL: Dark Brown Silty fine Sand, some fine root fibers, loose-damp to moist							
	X	7			DISTURBED ALLUVIUM: Dark Brown Silty fine Sand, trace fine root fibers, loose-moist to very moist		19				4	
	X	7			ALLUVIUM: Gray Brown Silty fine Sand, trace to little Clay, trace fine root fibers, loose to medium dense-moist		15				1	
5	X	15					16				1	
	X	16					14					
10												
					Light Gray Brown fine to medium Sand, trace Silt, trace fine Gravel, trace to little Iron oxide staining, dense-damp							
	X	28					5					
15												
	X	38					5					
20												
	X	33					8					
25												
	X	34					5					
30					Boring Terminated at 30'							

TBL 18G132.GPJ SOCALGEO.GDT 5/7/18

BORING NO. B-9

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 18G132
PROJECT: Proposed Logistics Building
LOCATION: Chino, California

DRILLING DATE: 4/17/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

SURFACE ELEVATION: 650 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					TOPSOIL: Dark Brown Silty fine Sand, some fine root fibers, loose-damp to moist							
	X	11			DISTURBED ALLUVIUM: Dark Brown Silty fine Sand, some roots, loose-very moist	79	34				8	
	X	24			ALLUVIUM: Gray Brown Silty fine Sand, medium dense-moist	113	13				1	
5	X	25			Light Gray Brown Silty fine Sand to fine Sandy Silt, trace Clay, little Iron oxide staining, medium dense-moist to very moist	109	13					
	X	30				114	19					
10	X	26			Gray Brown fine Sand, trace medium to coarse Sand, trace fine to coarse Gravel, occasional Cobbles, little Silt, medium dense-moist	105	9					
					Light Gray Brown fine to medium Sand, trace coarse Sand, medium dense-damp							
15	X	21					5					
20	X	13					5					
					Gray fine Sand, medium dense-damp							
25	X	22					8					

Boring Terminated at 25'

TBL 18G132.GPJ SOCALGEO.GDT 5/7/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-10

JOB NO.: 18G132
PROJECT: Proposed Logistics Building
LOCATION: Chino, California

DRILLING DATE: 4/17/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 644 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
0					10± inches Manure							
	X	20			ALLUVIUM: Light Brown Silty fine Sand, little Iron oxide staining, little calcareous veining, medium dense-damp to moist		9					
5	X	16					8					
	X	15			Gray Brown fine Sand, trace Silt, medium dense-damp to moist		9					
10	X	16					5					
15	X	26			Light Brown fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, medium dense-dry to damp		2					
20	X	36			Gray Brown fine Sand, dense-damp		4					
25	X	36			Light Gray Brown fine to medium Sand, trace coarse Sand, trace fine to coarse Gravel, dense-damp		4					
					Boring Terminated at 25'							

TBL 18G132.GPJ SOCALGEO.GDT 5/7/18

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-11

JOB NO.: 18G132
PROJECT: Proposed Logistics Building
LOCATION: Chino, California

DRILLING DATE: 4/17/18
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

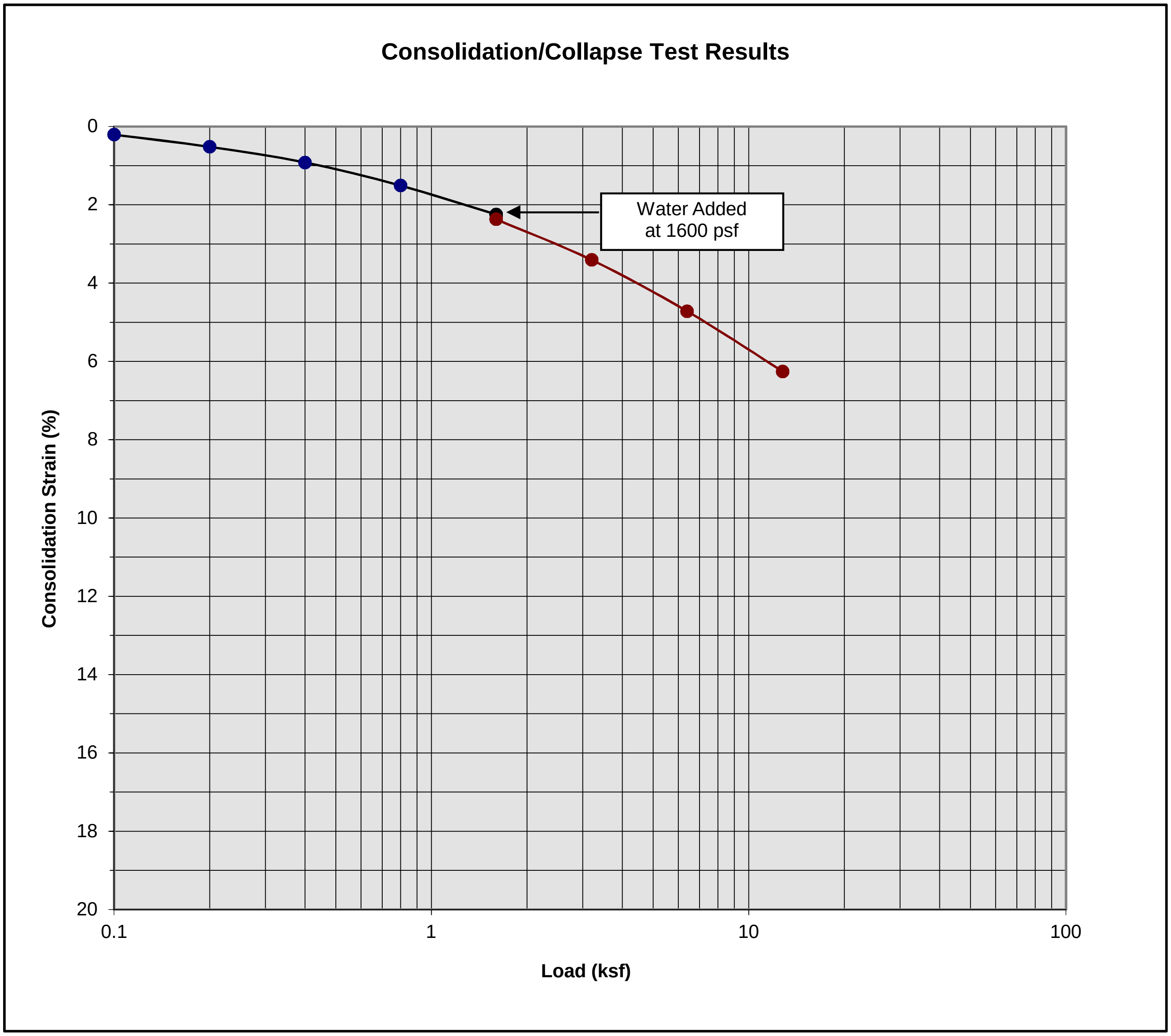
WATER DEPTH: Dry
CAVE DEPTH: 21 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 648 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					TOPSOIL: Dark Brown Silty fine Sand, some fine root fibers, loose-damp to moist							
		11			DISTURBED ALLUVIUM: Dark Brown Silty fine Sand, trace Organic content, little fine root fibers, loose-moist	92	24				7	
		16			ALLUVIUM: Light Gray Brown Silty fine Sand, trace fine root fibers, medium dense-damp to moist	102	9				1	
5		21				106	10					
		15			Brown Silty fine Sand to fine Sandy Silt, trace Clay, little Iron oxide staining, medium dense-moist	109	16					
10		24			Light Gray Brown Silty fine Sand, little Iron oxide staining, medium dense-moist	109	12					
		8	2.5		Light Gray Brown Silty Clay, trace fine to coarse Sand, abundant calcareous nodules, medium stiff to stiff-very moist		22					
15												
20		22	3.0		Brown fine Sandy Clay, trace medium Sand, little Iron oxide staining, little calcareous veining, very stiff-moist		17					
25		17	3.0				18					
30		27			Brown fine to coarse Sand, trace Clay, little fine Gravel, medium dense-damp to moist		7					
					Boring Terminated at 30'							

TBL 18G132.GPJ SOCALGEO.GDT 5/7/18

APPENDIX C



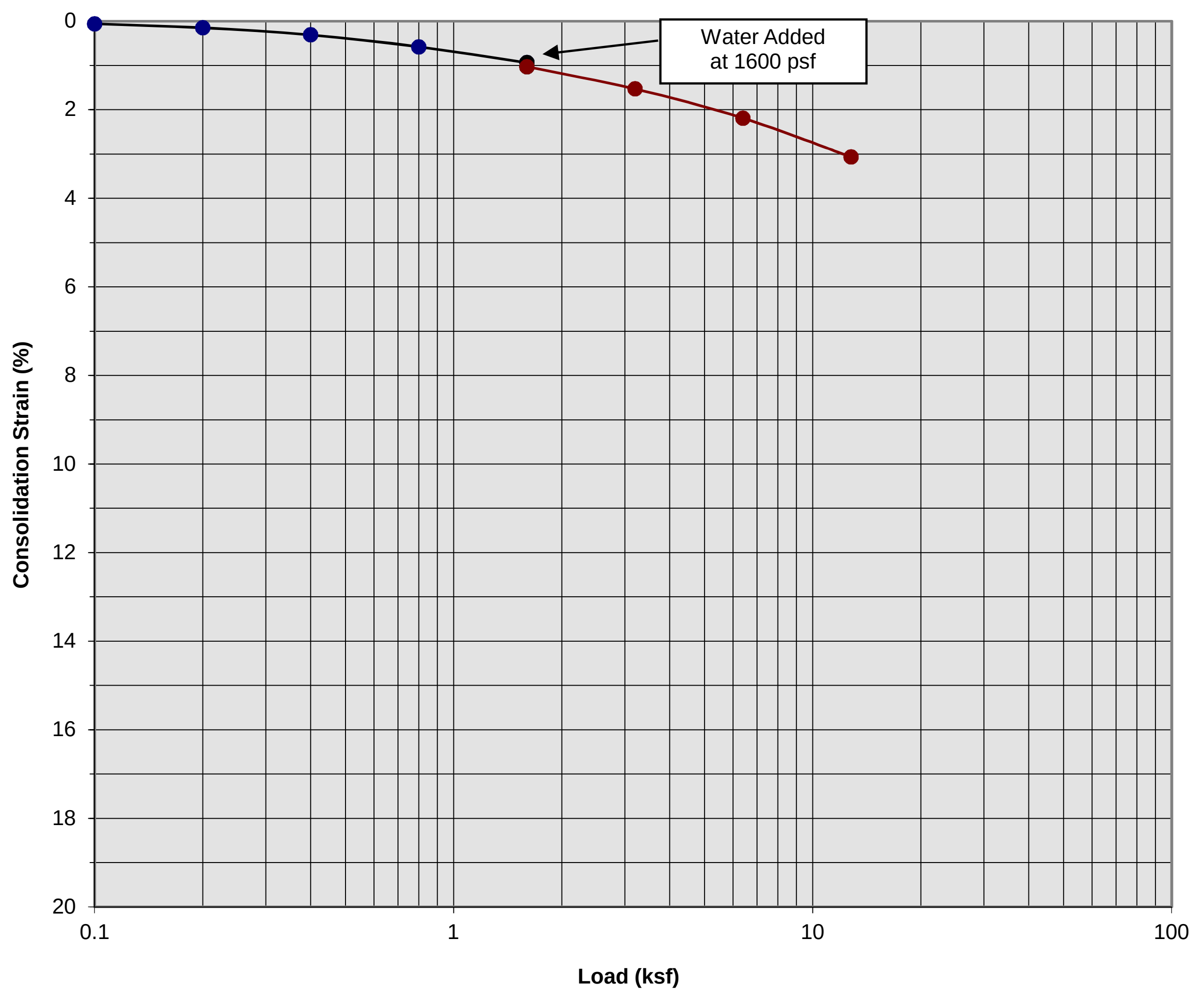
Classification: Dark Brown Silty fine Sand, trace Organic content

Boring Number:	B-11	Initial Moisture Content (%)	24
Sample Number:	---	Final Moisture Content (%)	23
Depth (ft)	1 to 2	Initial Dry Density (pcf)	92.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	98.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.12

Proposed Logistics Building
Chino, California
Project No. 18G132
PLATE C- 1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

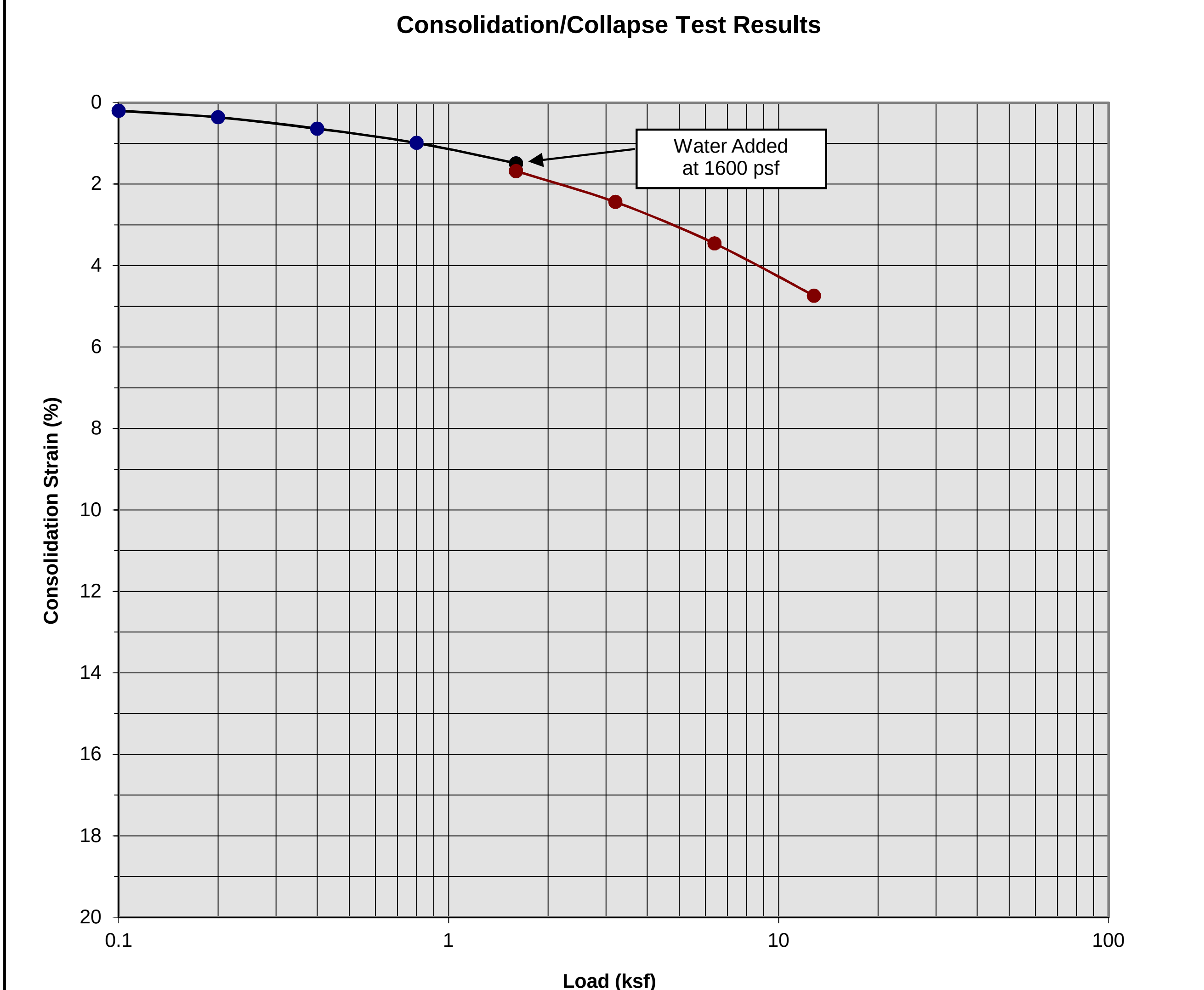


Classification: Light Gray Brown Silty fine Sand

Boring Number:	B-11	Initial Moisture Content (%)	9
Sample Number:	---	Final Moisture Content (%)	20
Depth (ft)	3 to 4	Initial Dry Density (pcf)	102.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	105.3
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.09

Proposed Logistics Building
Chino, California
Project No. 18G132
PLATE C- 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL *A California Corporation*



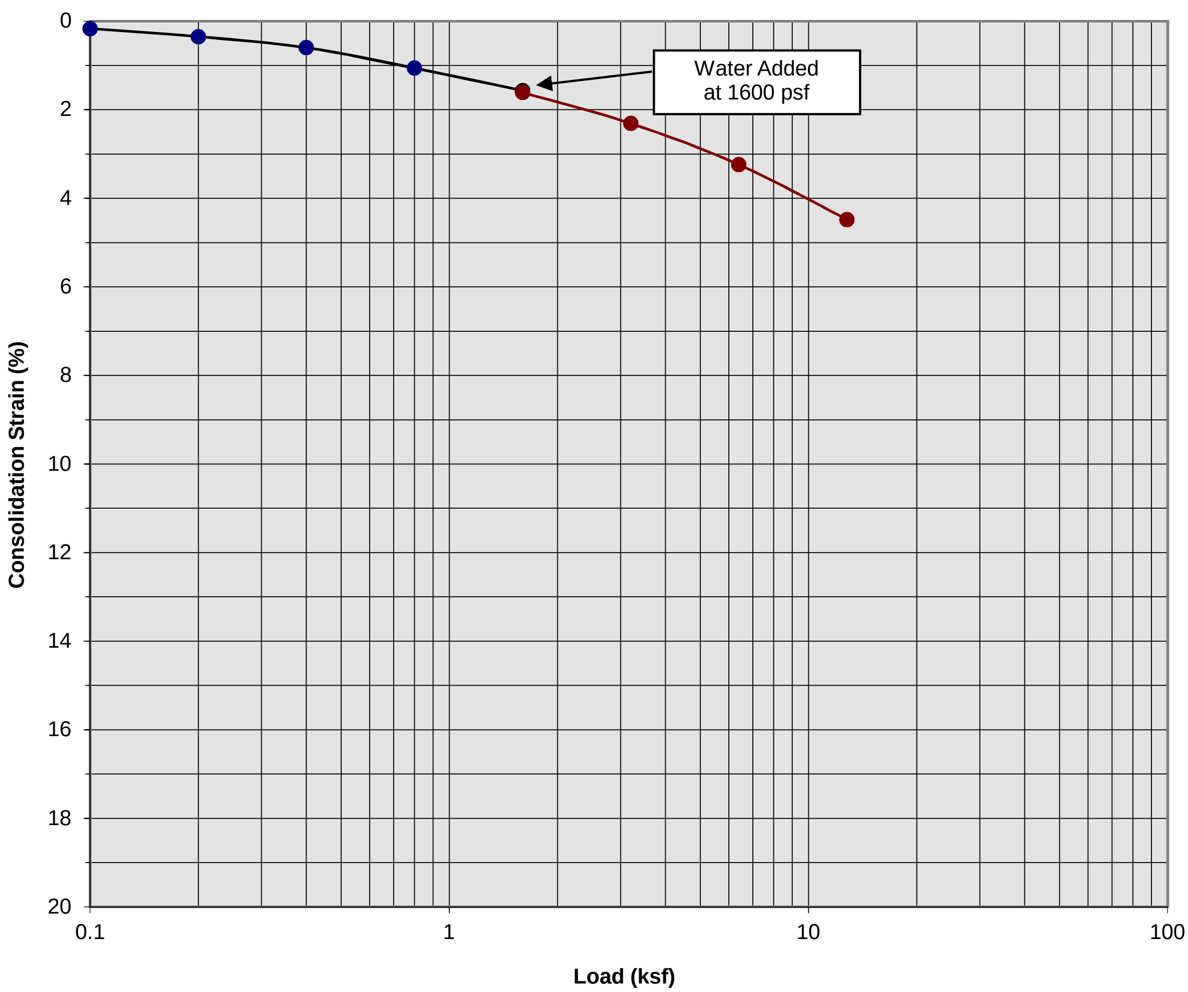
Classification: Light Gray Brown Silty fine Sand

Boring Number:	B-11	Initial Moisture Content (%)	10
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	5 to 6	Initial Dry Density (pcf)	106.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	111.3
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.19

Proposed Logistics Building
Chino, California
Project No. 18G132
PLATE C- 3

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

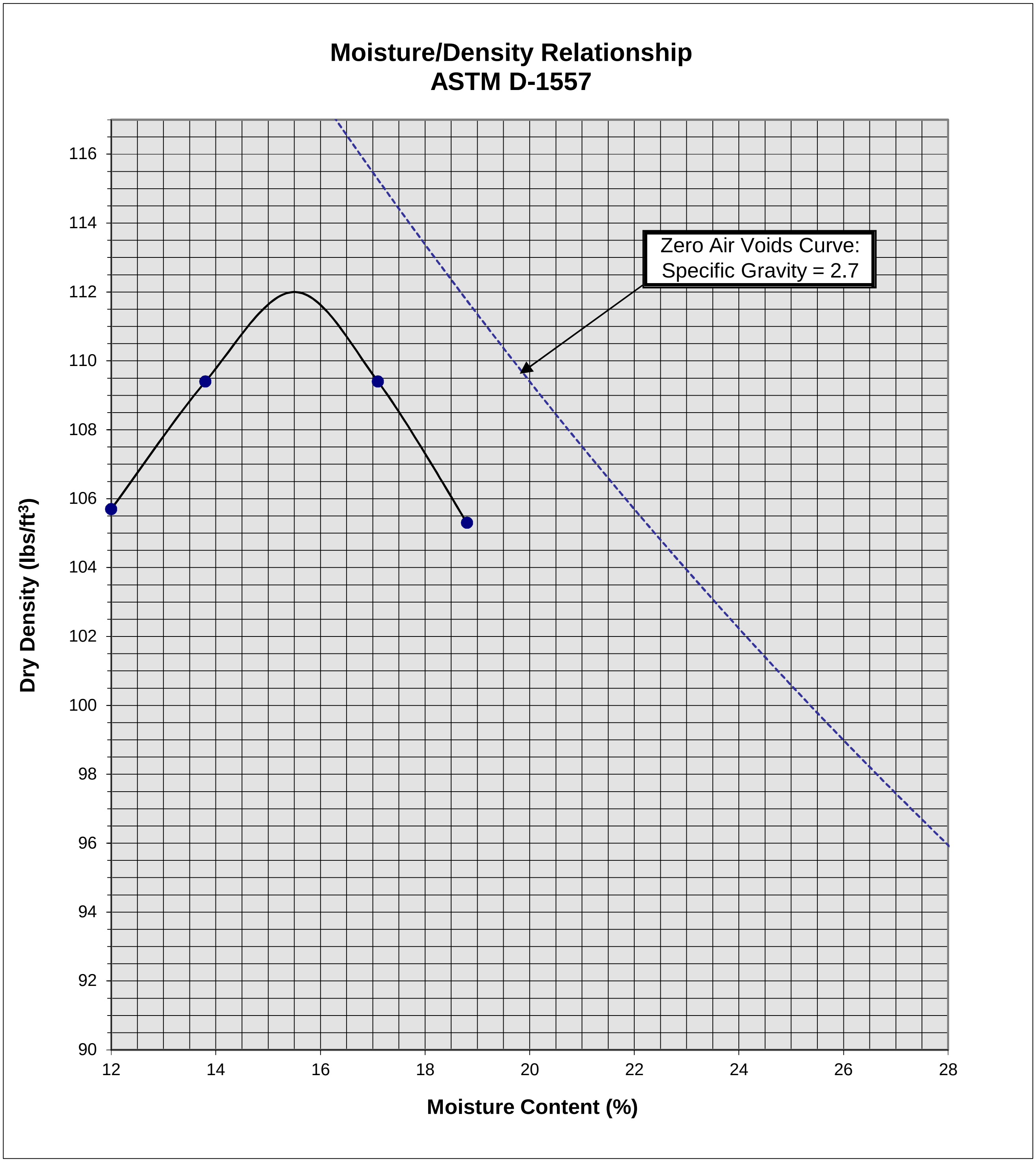


Classification: Brown Silty fine Sand to fine Sandy Silt, trace Clay

Boring Number:	B-11	Initial Moisture Content (%)	16
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	7 to 8	Initial Dry Density (pcf)	109.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	114.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.04

Proposed Logistics Building
Chino, California
Project No. 18G132
PLATE C- 4

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	B-9 @ 0 to 5'
Optimum Moisture (%)	15.5
Maximum Dry Density (pcf)	112
Soil Classification	Dark Brown Silty fine Sand, little organic content

Proposed Logistics Building
Chino, California
Project No. 18G132
PLATE C-5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D

GRADING GUIDE SPECIFICATIONS

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

General

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

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

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

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

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

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

Site Preparation

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

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

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

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

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

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

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

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

Compacted Fills

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Foundations

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

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

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

Fill Slopes

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

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

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

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

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

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

Cut Slopes

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

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

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

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

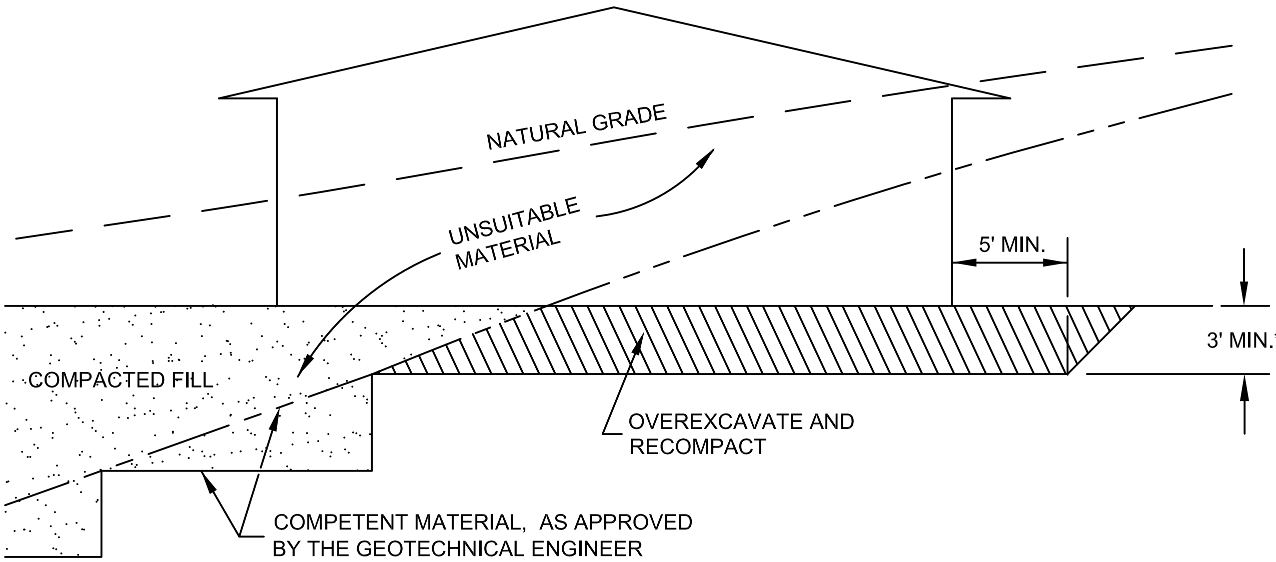
Subdrains

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

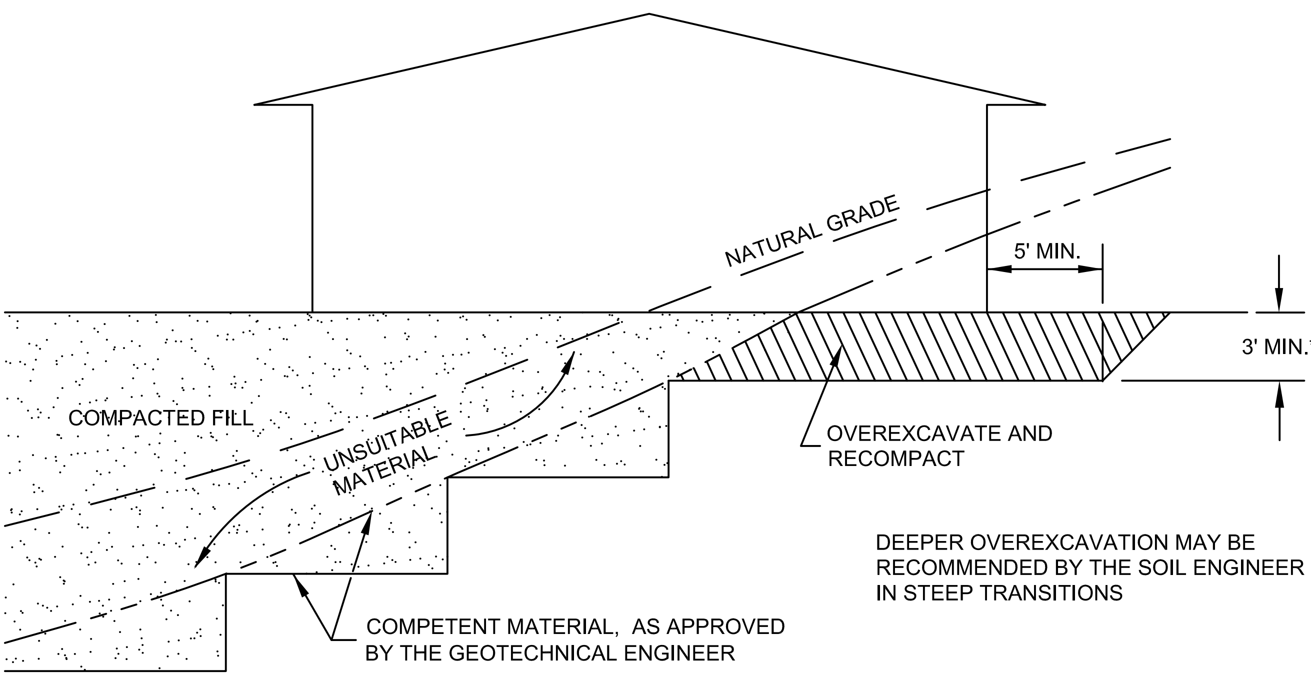
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

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

CUT LOT



CUT/FILL LOT (TRANSITION)



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

TRANSITION LOT DETAIL

GRADING GUIDE SPECIFICATIONS

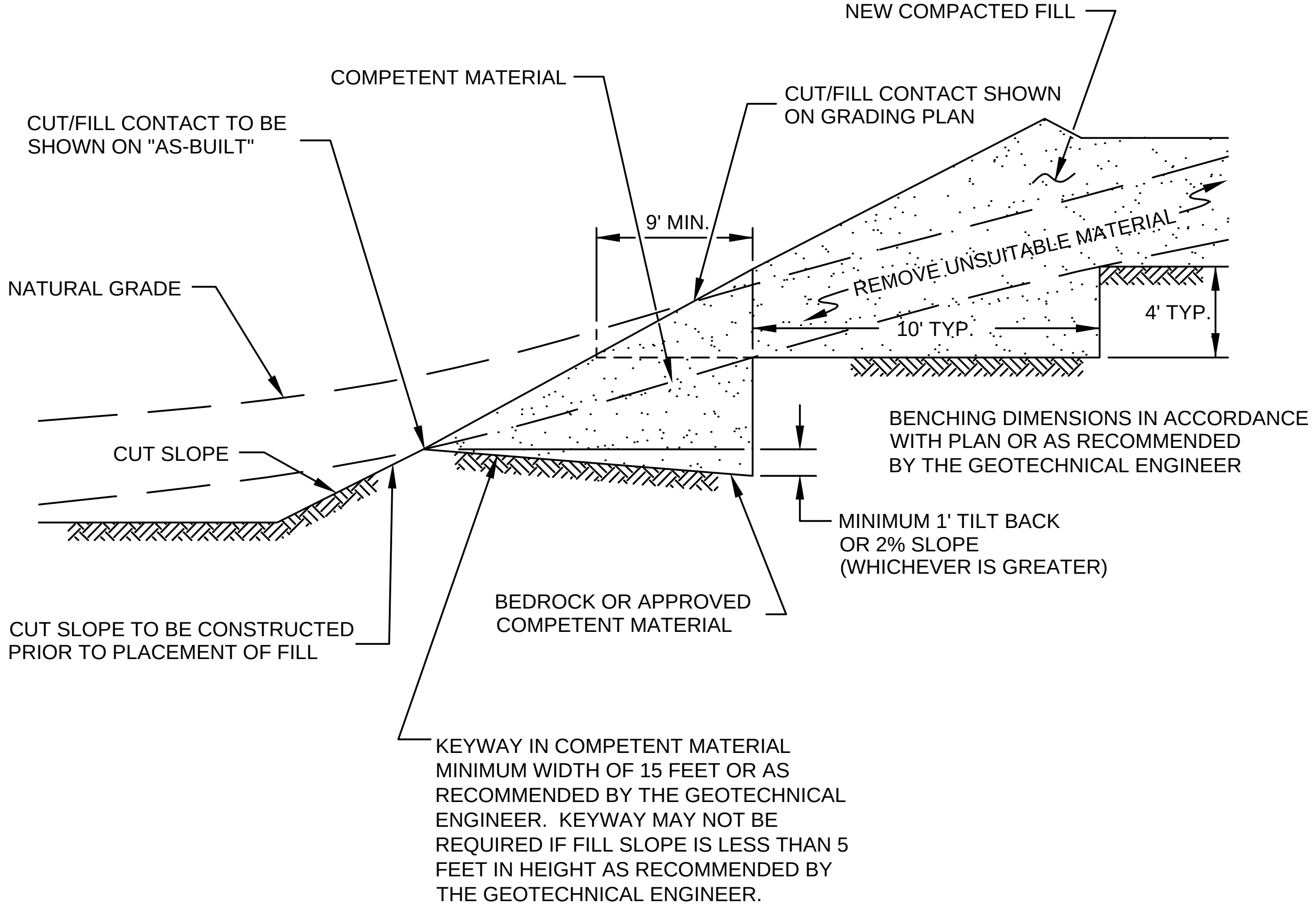
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

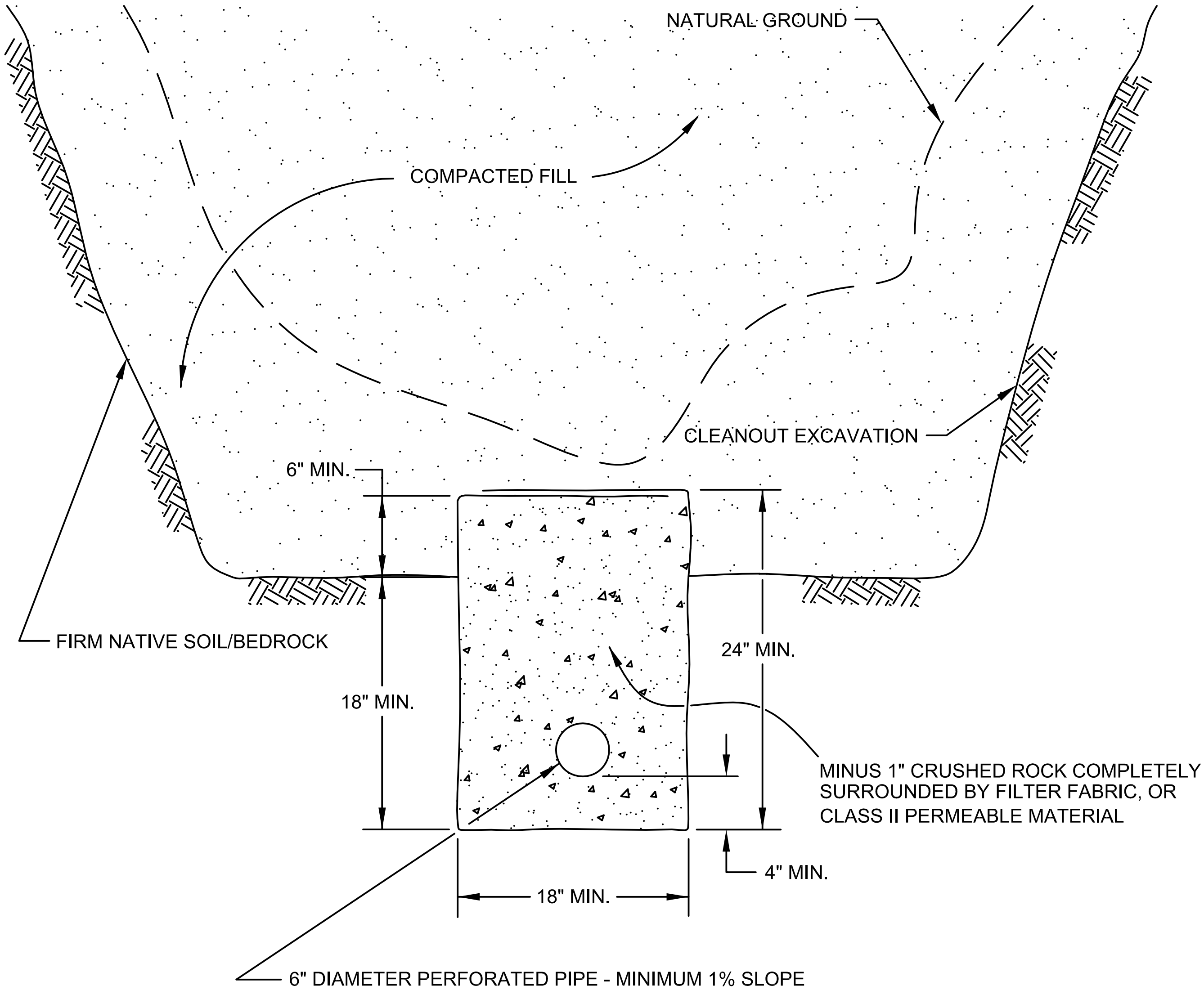
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



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

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

GRADING GUIDE SPECIFICATIONS

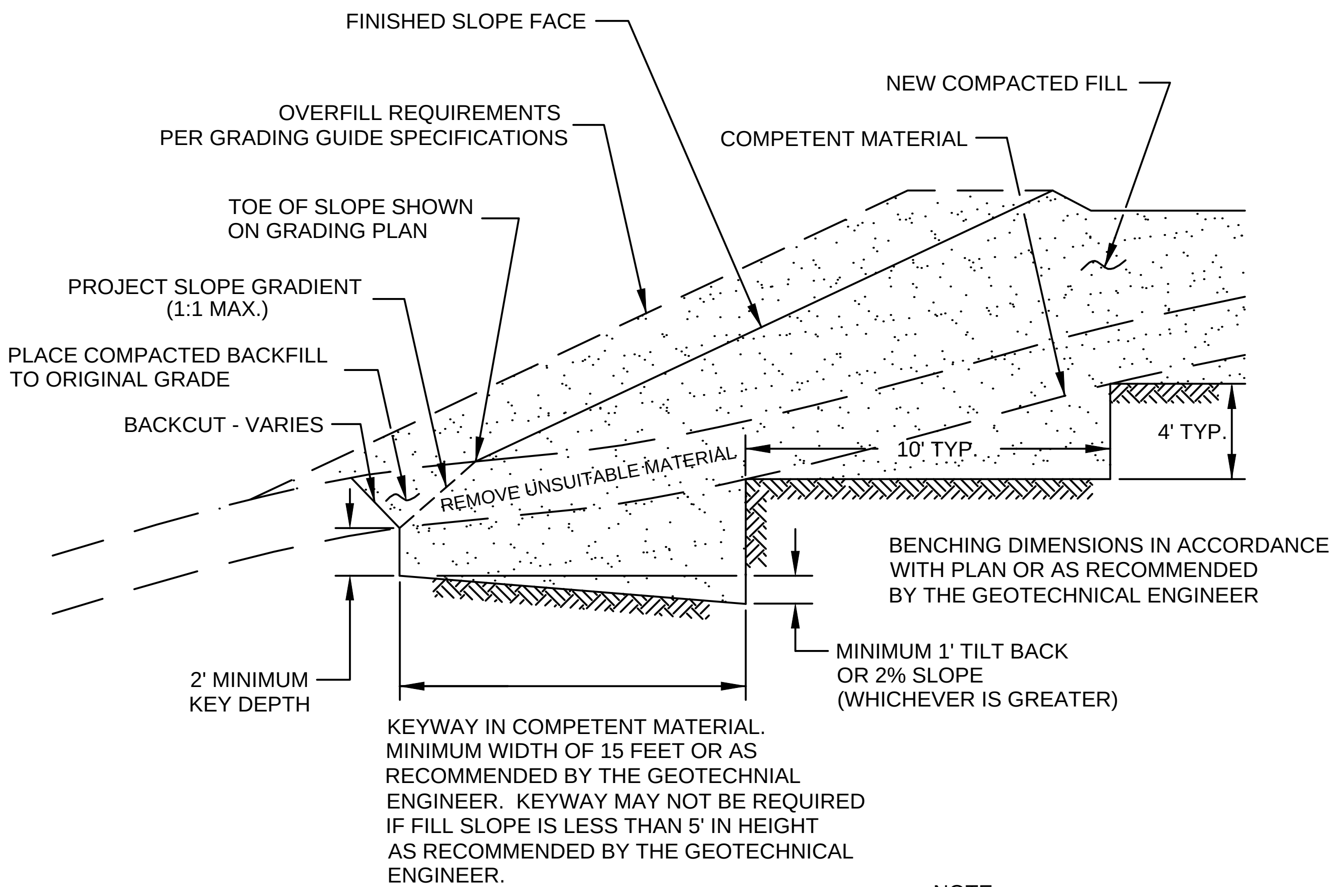
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



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

FILL ABOVE NATURAL SLOPE DETAIL

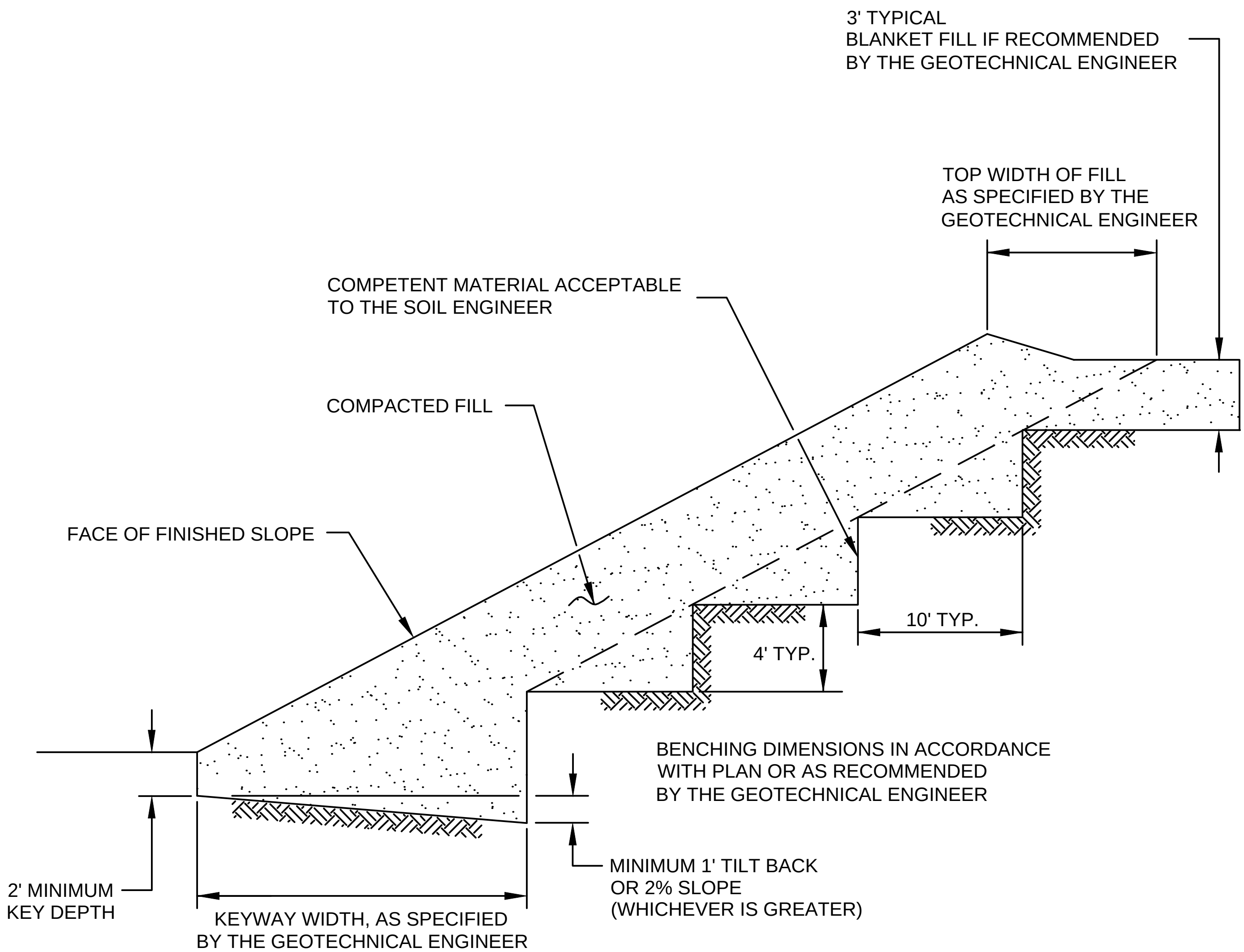
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

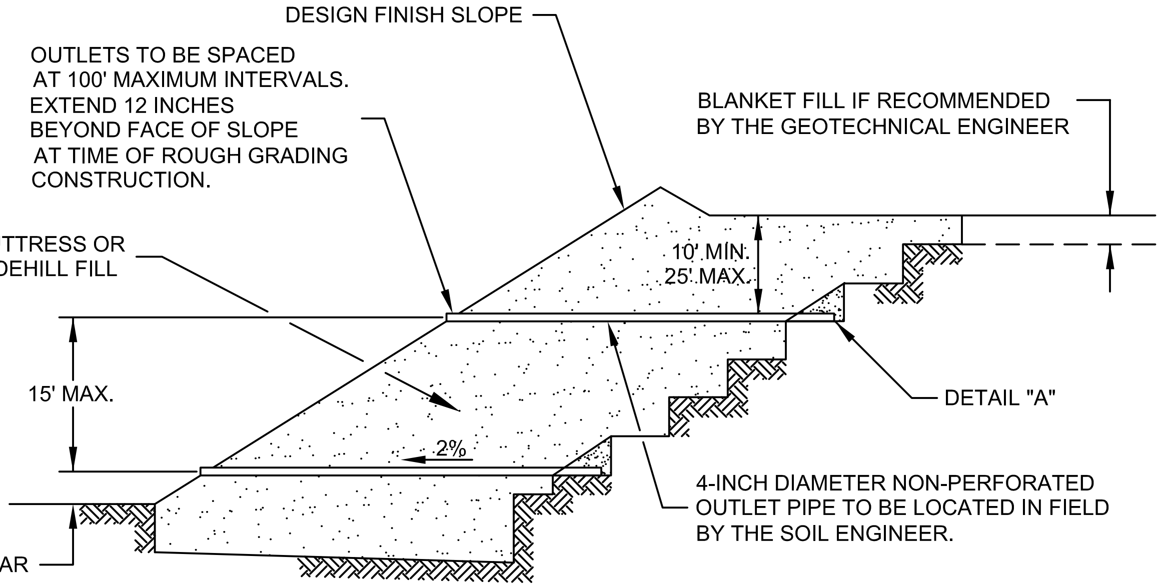
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



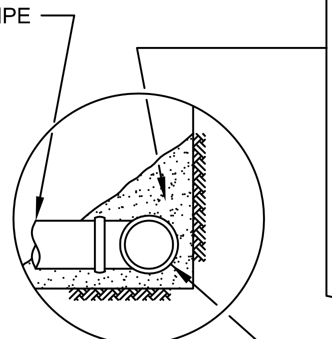
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

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

SAND EQUIVALENT = MINIMUM OF 50



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

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

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

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

DETAIL "A"

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

SLOPE FILL SUBDRAINS

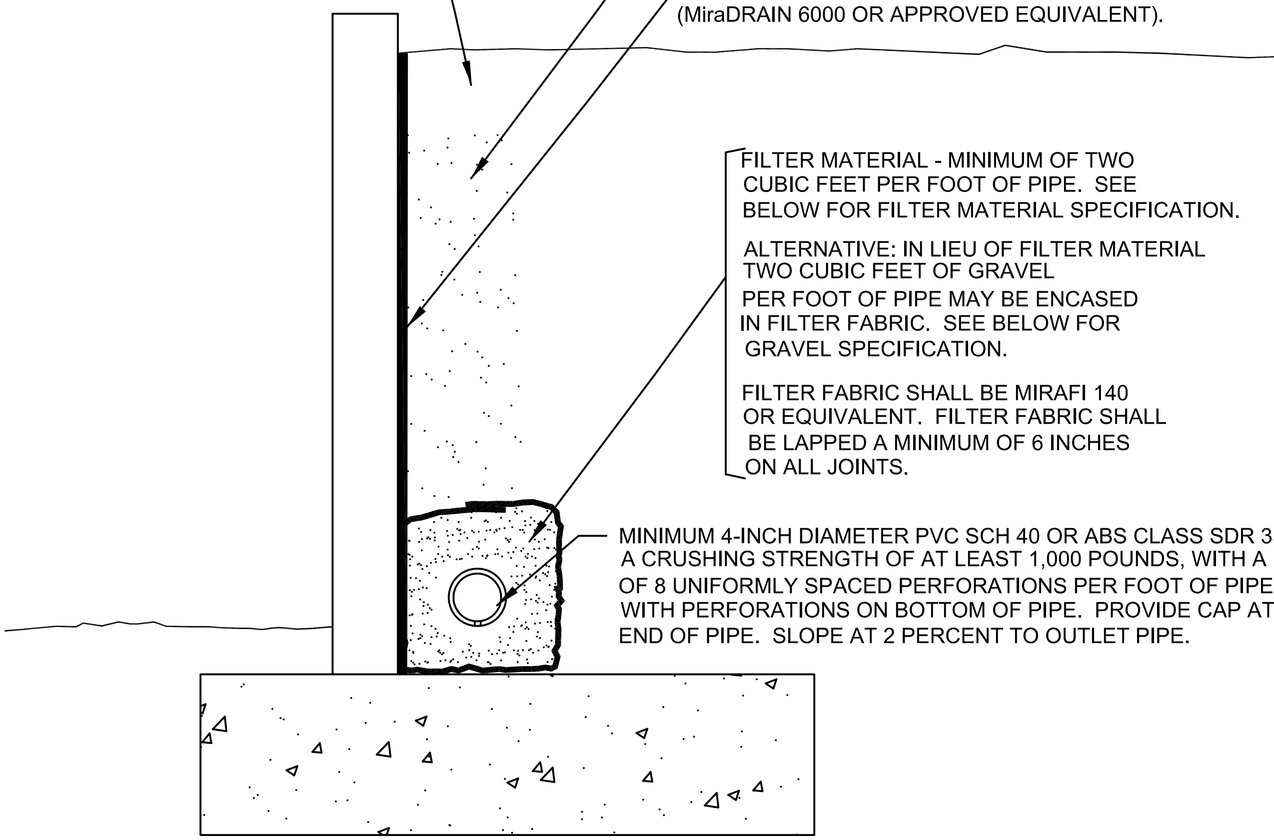
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



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

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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

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

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

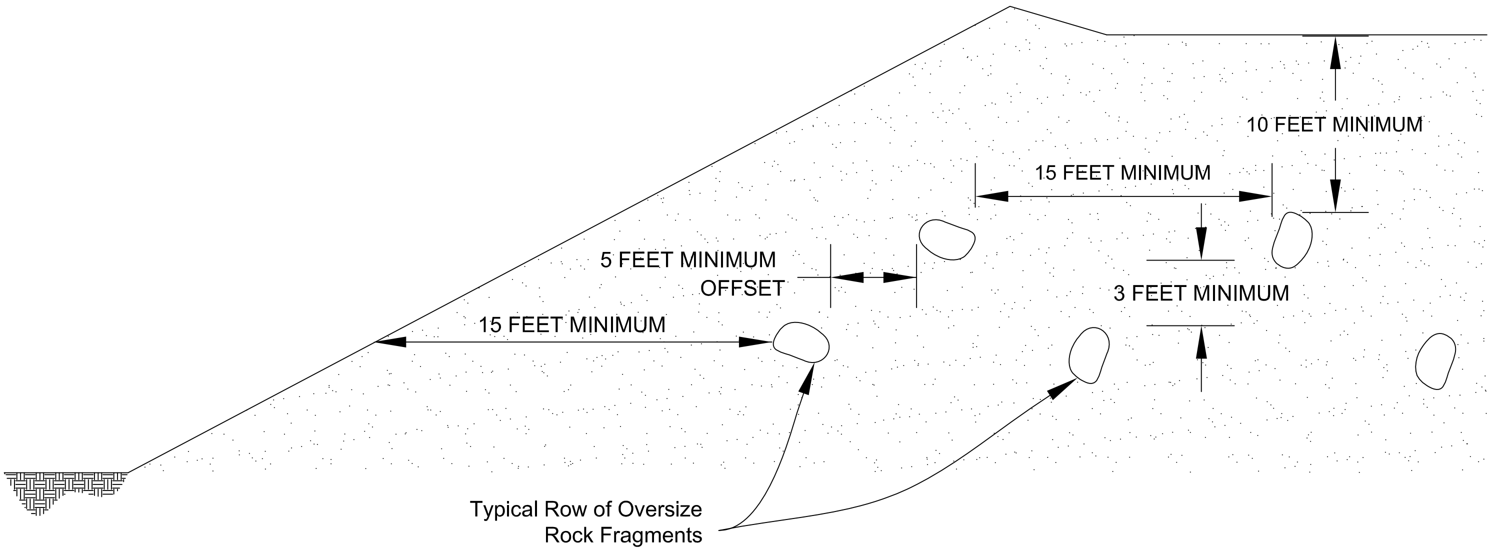
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

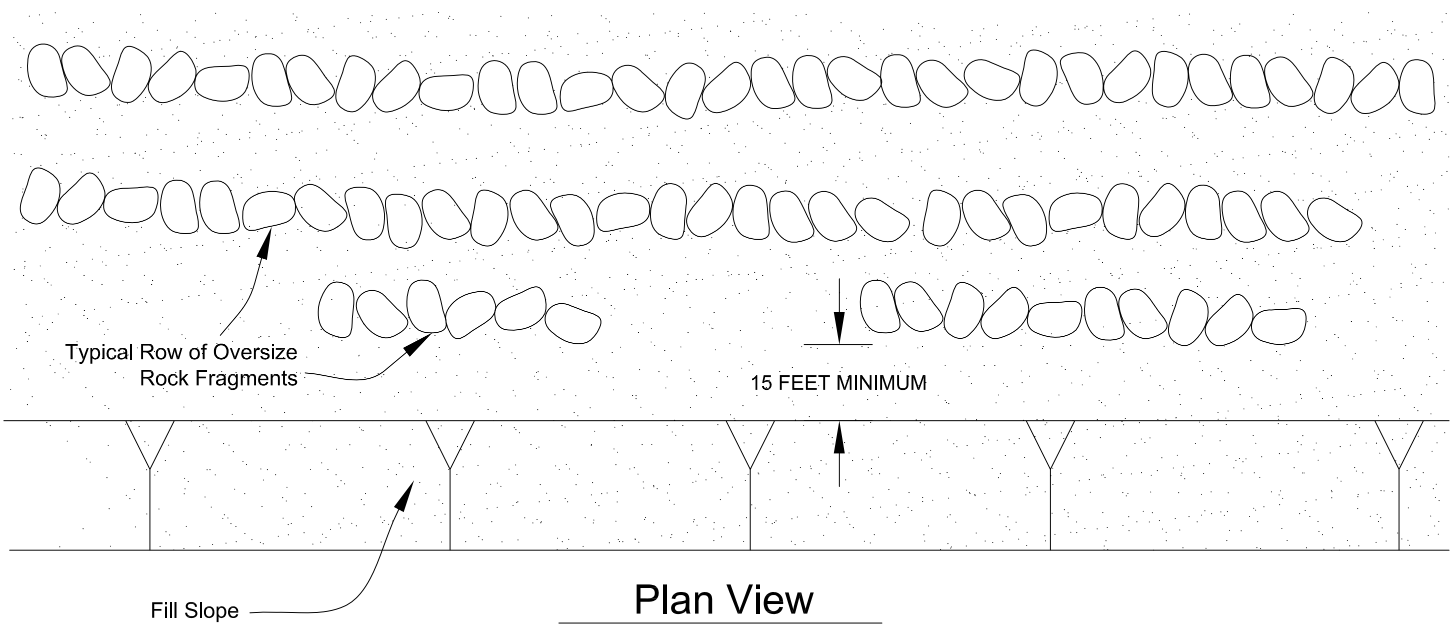
DRAWN: JAS
CHKD: GKM

PLATE D-7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

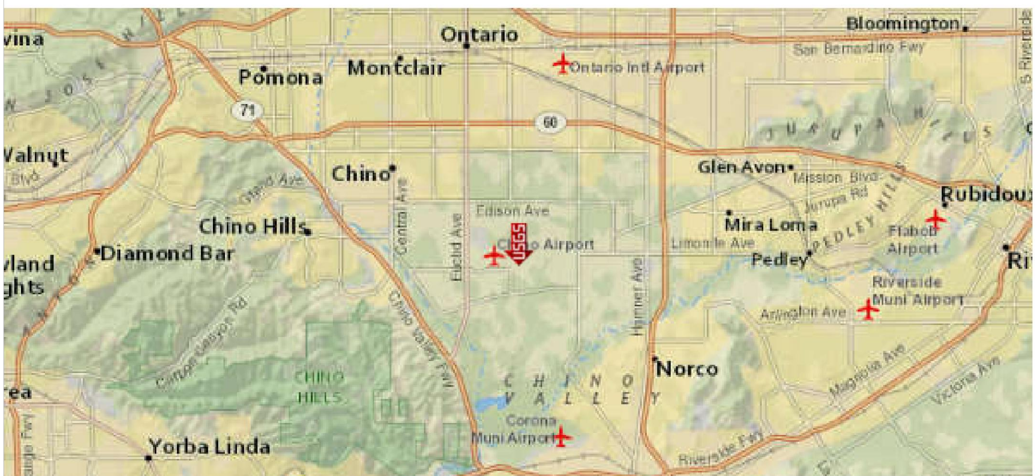
PLACEMENT OF OVERSIZED MATERIAL	
GRADING GUIDE SPECIFICATIONS	
NOT TO SCALE	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: PM CHKD: GKM	
PLATE D-8	

APPENDIX E

USGS Design Maps Summary Report

User–Specified Input

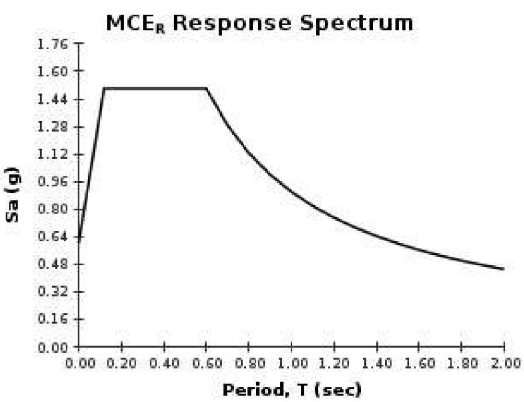
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	33.97958°N, 117.62419°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

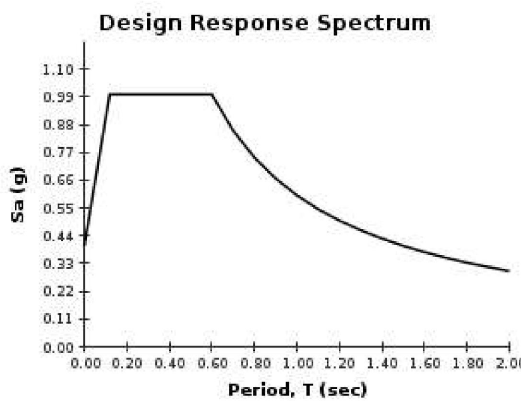


USGS–Provided Output

S_S =	1.500 g	S_{MS} =	1.500 g	S_{DS} =	1.000 g
S_1 =	0.600 g	S_{M1} =	0.900 g	S_{D1} =	0.600 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





SOURCE: U.S. GEOLOGICAL SURVEY (USGS)
<http://geohazards.usgs.gov/designmaps/us/application.php>

SEISMIC DESIGN PARAMETERS

PROPOSED LOGISTICS BUILDING

CHINO, CALIFORNIA

DRAWN: JLH
CHKD: RGT

SCG PROJECT
18G132-1

PLATE E-1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX F

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 16G173
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 7/1/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 28 feet
READING TAKEN: At Completion

SURFACE ELEVATION: --- MSL

DEPTH (FEET)	BLOW COUNT	POCKET PEN. (TSF)	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
	12		ALLUVIUM: Gray Brown Silty fine Sand, trace fine root fibers, trace calcareous veining, loose-moist	100	14					
	19		Light Gray Brown Silty fine Sand, trace fine root fibers, trace calcareous veining, trace Iron oxide staining, slightly porous, medium dense-moist	110	12					
5	16	4.5+	Light Gray Brown Clayey fine Sand to fine Sandy Clay, trace Silt, little calcareous nodules, slightly porous, trace Iron oxide staining, medium dense to very stiff-very moist	108	17					
	8		Gray Brown fine Sandy Silt, some Clay, slightly porous, trace calcareous veining, loose-very moist	108	19					
10	9	2.0	Brown fine to medium Sandy Clay, trace Silt, little fine Gravel, trace coarse Sand, medium stiff-moist to very moist	110	18					
15	10	2.0	Light Gray Brown fine Sandy Clay, trace Silt, occasional calcareous nodules, stiff-very moist		26					
20	13		Red Brown Silty fine to medium Sand, occasional calcareous veining, trace Iron oxide staining, medium dense-very moist		20					
25	16	3.0	Gray Brown fine Sandy Clay, trace Silt, some calcareous veining, very stiff-moist to very moist		20					
30	13		Light Brown Silty fine Sand, little Clay, some calcareous nodules, trace Iron oxide staining, medium dense-very moist		26					
			Boring Terminated at 30'							

TBL 16G173.GPJ SOCALGEO.GDT 8/10/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-2

JOB NO.: 16G173
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 7/1/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

WATER DEPTH: Dry
CAVE DEPTH: 22 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Light Gray fine Sand, little Silt, medium dense-damp							
	X	23				101	4					
					ALLUVIUM: Light Gray Brown Silty fine Sand, trace calcareous veining, slightly porous, trace Iron oxide staining, medium dense-damp to moist							
	X	16				99	4					
5	X	23				105	5					
	X	39				108	8					
	X	29				112	12					
10												
					Light Brown Silty fine Sand to fine Sandy Silt, some calcareous nodules, medium dense-moist to very moist							
	X	12					16					
15			2.0		Light Gray Brown fine Sandy Clay, trace Silt, some calcareous nodules, stiff-moist		17					
					Brown Clayey fine Sand to fine Sandy Clay, trace Silt, trace Iron oxide staining, some calcareous nodules, medium dense to very stiff-moist							
	X	21	3.0				15					
20												
					Gray Brown Clayey fine Sand, trace Silt, occasional calcareous veining, medium dense-moist to very moist							
	X	20					15					
25												
					Boring Terminated at 25'							

TBL 16G173.GPJ SOCALGEO.GDT 8/10/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 16G173
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 7/1/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Brown Silty fine Sand, trace calcareous nodules, medium dense-damp to moist							
	X	18					8					
					Light Gray Silty fine Sand to fine Sandy Silt, trace calcareous nodules, medium dense-moist to very moist							
	X	15					16					
5												
	X	11					18					
					Brown fine Sandy silt, trace Clay, trace calcareous nodules, 2" Silt lenses, medium dense-very moist							
	X	14					31					
10												
					Light Gray Brown fine to medium Sand, little coarse Sand, trace fine Gravel, medium dense to dense-dry to damp							
	X	31					2					
15												
	X	26					4					
20					Gray to Black fine Sandy Silt, some Organic content, trace Iron oxide staining, medium dense-very moist		30					
					Boring Terminated at 20'							

TBL 16G173.GPJ SOCALGEO.GDT 8/10/16

TEST BORING LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 16G173
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 7/1/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

SURFACE ELEVATION: --- MSL

FIELD RESULTS: DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS: DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Dark Brown Silty fine Sand, loose-very moist							
	X	9					20					
					ALLUVIUM: Gray Brown Silty fine Sand, trace calcareous veining, trace Iron oxide staining, loose to medium dense-moist to very moist							
	X	15					13					
5												
	X	10			@ 6 to 7½ feet, slightly porous		16					
					Gray Brown Silty fine Sand to fine Sandy Silt, trace calcareous nodules, trace Iron oxide staining, loose to medium dense-very moist							
	X	10					18					
10												
					Light Brown Silty fine Sand, 2 to 3" lenses of Silt, trace to some Iron oxide staining, loose to medium dense-moist to very moist							
	X	10					19					
15												
	X	12					13					
20												
	X	18			@ 23½ to 24½ feet, extensive Silt lenses, wet		25					
					Light Brown fine Sand, little medium Sand, trace Silt, trace Iron oxide staining, medium dense-damp to moist		6					
25												
					Light Gray fine Sand, 3" lense of Silt, trace Organic content, medium dense-very moist							
	X	13					48					
30												
					Gray Silty fine Sand, medium dense-moist							
	X	14					14					

TBL 16G173.GPJ SOCALGEO.GDT 8/10/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 16G173
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 7/1/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (Continued)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					Gray Silty fine Sand, medium dense-moist							
					Light Gray Brown Silty fine Sand to fine Sandy Silt, 3" lense of Silt, trace Iron oxide staining, medium dense-very moist							
	X	17					31					
40												
					Light Gray Brown Silty fine Sand, trace medium Sand, medium dense-moist							
	X	17					14					
45												
					Light Gray Brown fine Sand, medium dense-moist							
	X	26					5					
50												
					Boring Terminated at 50'							

TBL 16G173.GPJ SOCALGEO.GDT 8/10/16

BORING NO. B-5

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 16G173
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 7/1/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Gray Brown fine Sandy Silt, trace medium Sand, little Clay, slightly porous, trace Iron oxide staining, loose-moist to very moist							
	X	13				95	18					EI = 33 @ 0 to 5'
	X	17				106	13					
5	X	15				106	13					
					Brown Clayey fine Sand to fine Sandy Clay, trace medium Sand, trace Silt, some to abundant Iron oxide staining, trace to some calcareous nodules, very stiff to medium dense-moist to very moist							
	X	9	4.5			114	13					
10	X	14	4.5			113	12					
15	X	20	4.5+				15					
					Light Brown fine Sandy Silt, medium dense-very moist							
20	X	16					18					

Boring Terminated at 20'

TBL 16G173.GPJ SOCALGEO.GDT 8/10/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-6

JOB NO.: 16G173
PROJECT: Proposed C/I Development
LOCATION: Chino, California

DRILLING DATE: 7/1/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Jason Hiskey

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

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					ALLUVIUM: Light Gray fine Sandy Silt, trace Clay, trace fine root fibers, slightly porous, medium dense-damp							
	X	25				97	5					
	X	48			@ 3 to 4 feet, weakly cemented, some calcareous veining, dense	102	8					
5					ALLUVIUM: Light Gray Brown Silty fine Sand, slightly porous, trace Iron oxide staining, trace medium to coarse Sand, medium dense-moist to very moist							
	X	19				104	11					
	X	20				112	15					
	X	13				114	15					
10												
					Light Gray Brown fine Sandy Clay, trace Silt, trace Iron oxide staining, trace calcareous veining, stiff-moist to very moist							
	X	10	1.5				20					
15												
					@ 18½ to 20 feet, Gray Brown							
	X	22	1.5				19					
20												
					Brown fine to medium Sandy Clay, trace Silt, trace Organic content, trace calcareous nodules, very stiff-moist to very moist							
	X	23	2.5				17					
25												
					Gray Brown fine Sandy Silt to Silty fine Sand, trace Iron oxide staining, trace Organic content, medium dense-very moist							
	X	22					20					
30												
					Boring Terminated at 30'							

TBL 16G173.GPJ SOCALGEO.GDT 8/10/16

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-1

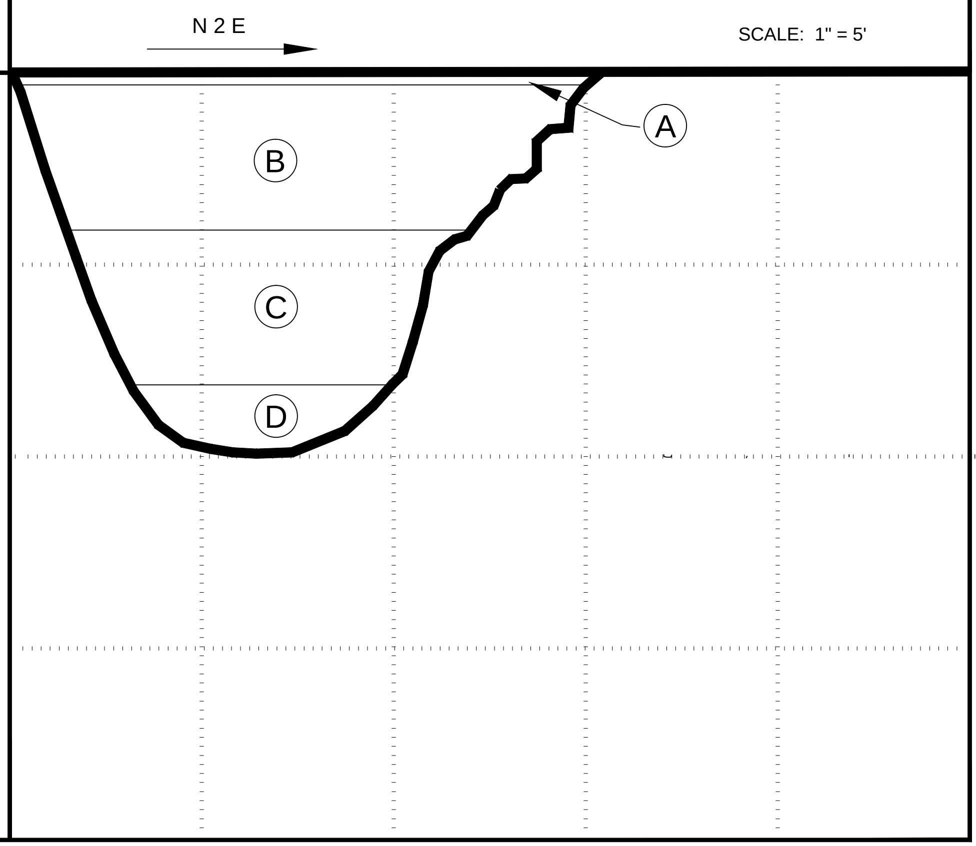
JOB NO.: 16G173-1
PROJECT: Proposed C/I Dev - Feas Study
LOCATION: Chino, CA
DATE: 6-30-2016

EQUIPMENT USED: Backhoe
LOGGED BY: Anthony Luna
ORIENTATION: N 2 E
TOP OF TRENCH ELEVATION:

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		17	A: FILL: Brown to Dark Brown Silty fine Sand, trace medium Sand, trace fine Gravel, trace fine root fibers, mottled, loose-moist to very moist
	b		8	
	b		7	
	b		8	B: ALLUVIUM: Light Gray Brown Silty fine Sand, trace calcareous nodules, medium dense-moist to very moist
	b		9	
	b		11	
	b		16	
5				
	b		18	C: ALLUVIUM: Light Brown fine Sandy Silt, trace Clay, trace Iron oxide staining, medium dense-moist to very moist
	b		12	D: ALLUVIUM: Light Brown Silty fine Sand to fine Sandy Silt, medium dense-moist to very moist
10				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-7

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-2

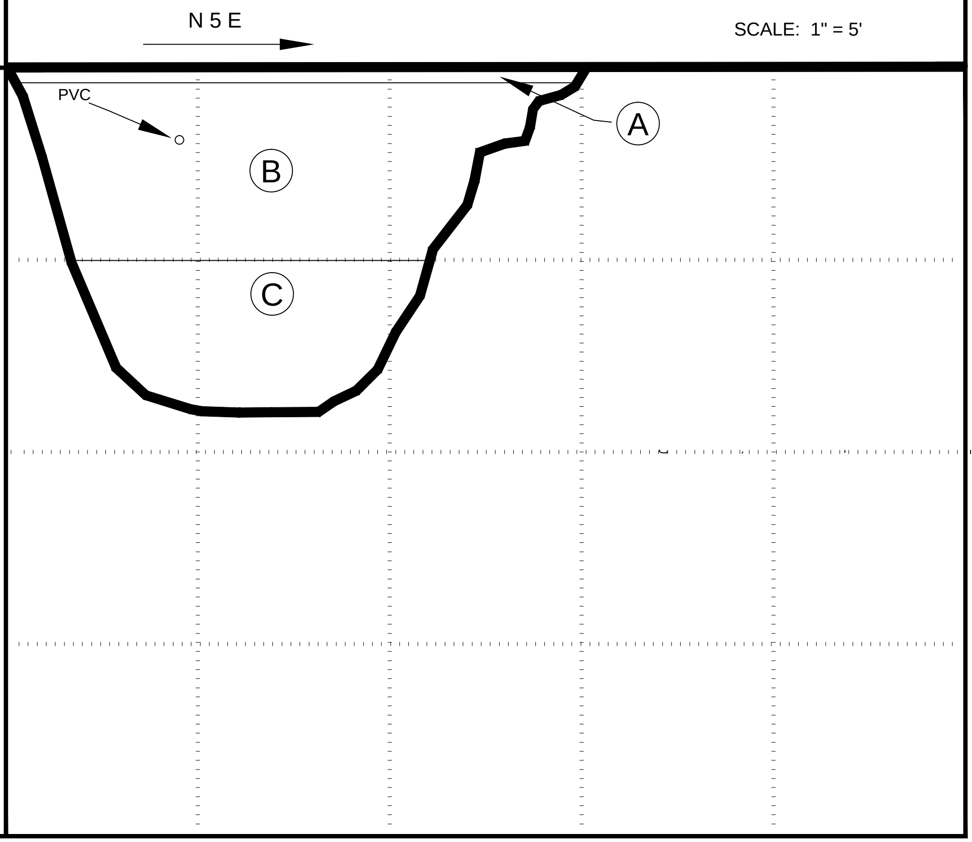
JOB NO.: 16G173-1
PROJECT: Proposed C/I Dev - Feas Study
LOCATION: Chino, CA
DATE: 6-30-2016

EQUIPMENT USED: Backhoe
LOGGED BY: Anthony Luna
ORIENTATION: N 5 E
TOP OF TRENCH ELEVATION:

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		18	A: TOPSOIL: 4" Grass/Turf
	b		15	
	b		16	
	b		14	B: FILL: Dark Brown Silty fine Sand, trace fine Gravel, abundant fine root fibers, PVC pipe, medium dense-moist to very moist
	b		16	
	b		16	
5				
	b		18	C: ALLUVIUM: Light Brown fine Sandy Clay, trace silt, trace calcareous nodules, trace Iron oxide staining, medium dense-moist to very moist
	b		19	
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-8

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-3

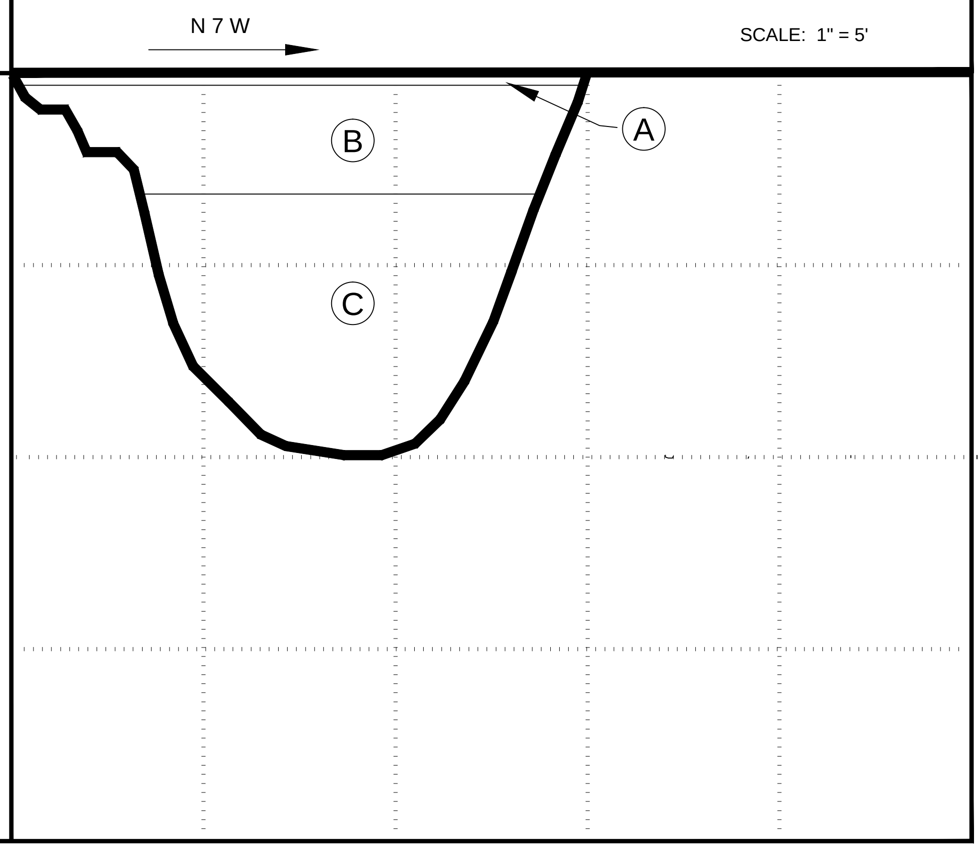
JOB NO.: 16G173-1
PROJECT: Proposed C/I Dev - Feas Study
LOCATION: Chino, CA
DATE: 6-30-2016

EQUIPMENT USED: Backhoe
LOGGED BY: Anthony Luna
ORIENTATION: N 7 W
TOP OF TRENCH ELEVATION:

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		16	A: MANURE: 3" thick
	b		12	
	b		13	B: ALLUVIUM: Dark Brown Silty fine Sand, medium dense-moist
	b		14	
	b		14	
	b		14	
	b		8	
5				C: ALLUVIUM: Light Brown fine Sand, trace Silt, medium dense-moist
	b		8	
	b		6	
10				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-9

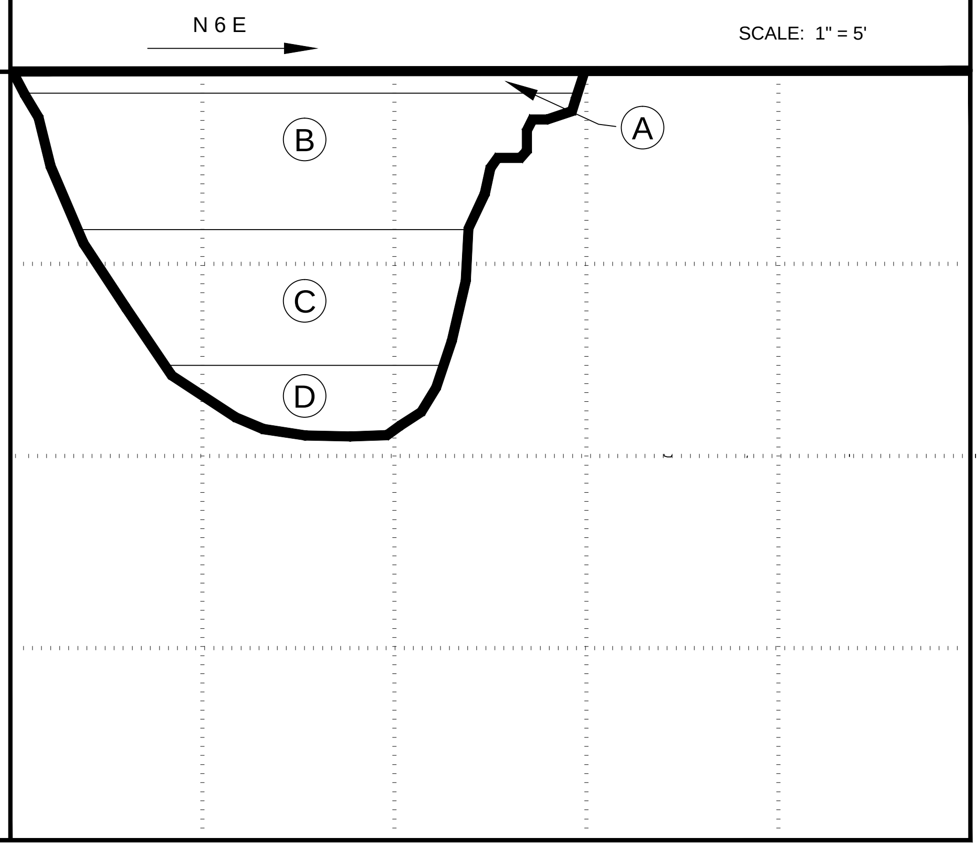
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-4

JOB NO.: 16G173-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed C/I Dev - Feas Study	LOGGED BY: Anthony Luna	SEEPAGE DEPTH: Dry
LOCATION: Chino, CA	ORIENTATION: N 6 E	READINGS TAKEN: At Completion
DATE: 6-30-2016	TOP OF TRENCH ELEVATION:	

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		7	A: FILL: Light Gray fine Sandy Silt, trace fine root fibers,mottled, loose-damp
	b		11	
	b		16	B: ALLUVIUM: Gray Brown Silty fine Sand, trace Clay, trace calcareous nodules, medium dense-moist to very moist
5				C: ALLUVIUM: Light Brown Clayey fine Sand, trace Silt, medium dense-moist
	b		14	
				D: ALLUVIUM: Light Brown Clayey fine Sand to fine Sandy Clay, trace Silt, trace Iron oxide staining, trace calcareous nodules, medium dense-moist
	b		14	
10				Trench Terminated @ 9.5 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-10