

Appendices

Appendix G Geotechnical Reports

Appendix G1: Geotechnical Feasibility Study

Appendix G2: Infiltration Testing

Appendices

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**GEOTECHNICAL FEASIBILITY STUDY
PROPOSED COMMERCIAL/INDUSTRIAL
DEVELOPMENT**

NEC Euclid Avenue and Merrill Avenue
Ontario, California
For
Real Estate Development Associates



**SOUTHERN
CALIFORNIA
GEOTECHNICAL**
A California Corporation

June 4, 2019

Real Estate Development Associates
4100 MacArthur Boulevard, Suite 120
Newport Beach, California 92660



**SOUTHERN
CALIFORNIA
GEOTECHNICAL**
A California Corporation

Attention: Mr. Chadwick Manista
Vice President

Project No.: **18G129-1R**

Subject: **Geotechnical Feasibility Study**
Proposed Commercial/Industrial Development
NEC Euclid Avenue and Merrill Avenue
Ontario, California

Gentlemen:

In accordance with your request, we have conducted a geotechnical feasibility study at the subject site. We are pleased to present this report summarizing the conclusions and recommendations developed from our investigation. It should be noted that this report has been revised since its original issue on April 11, 2018.

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Daniel W. Nielsen, RCE 77915
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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.

It should be noted that this investigation was focused on determining the geotechnical feasibility of the proposed development. **This report is not a design level investigation. Future studies will be necessary to refine the preliminary design parameters that are presented within this report.**

Preliminary Geotechnical Design Recommendations

- Demolition of the existing structures should include all foundations, floor slabs, utilities, septic systems, and any other subsurface improvements that will not remain in place for use with the new development. Debris resultant from demolition should be disposed of offsite. Alternatively, concrete and asphalt debris may be pulverized to a maximum 2-inch particle size, well mixed with the on-site soils, and incorporated into new structural fills.
- Site stripping of any existing vegetated areas should include all vegetation, organic soils, and root masses. The active cattle pen areas are covered with manure at the ground surface, with thicknesses of 4 to 8± inches at the boring and trench locations. In addition, organic topsoil was encountered at the boring and trench locations performed with the planted areas of the site. These highly organic soils extend to depths of 1 to 1½± feet at the boring and trench locations. All of the manure, vegetation, and any organic topsoil should be removed from the site or be placed in nonstructural areas of the site, such as landscape planters.
- Some the of soils in the upper 2 to 4± feet, located beneath the highly organic topsoil in the planted areas, possess organic contents greater than 3 percent. It may be feasible to use these soils in fills, provided that they are cleaned of appreciable 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 possess low to medium expansion potentials.
- The near-surface soils are considered to be corrosive to ferrous metals, including ductile iron pipe. Additionally, the near surface soils encountered at a boring located in the cattle pen area possess chloride concentrations which can be deleterious to steel in reinforced concrete.
- Existing undocumented fill soils were encountered at most of the boring and trench locations, extending to depths of 2 to 4½± feet.
- The proposed development is considered to be feasible with respect to the geotechnical conditions encountered at the boring and trench locations at the site. However, remedial grading will be necessary in order to support the proposed structures on conventional shallow foundation systems. Preliminary remedial grading and foundation design recommendations have been provided herein, based on the preliminary site plan, assumed site grading, and assumed foundation loads.
- Remedial grading should be performed within the proposed building areas, to remove the undocumented fill soils, as well as the upper portion of the alluvial soils, and replace these materials as structural compacted fill.
- Preliminarily, the overexcavation within the building area is also recommended to extend to a depth of at least 4 to 6 feet below existing site grades. The overexcavation should also

extend to a depth of at least 3 feet below bearing grade within the influence zones of any new foundations. These recommendations are subject to review and may be revised based on the results of the design-level geotechnical investigation.

- Preliminarily, the new parking area subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned to within 2 to 4 percent above the optimum moisture content and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Preliminary Foundation Design Recommendations

- Conventional shallow foundations, supported in newly placed compacted fill.
- 2,000 to 3,000 lbs/ft² maximum allowable soil bearing pressure.
- The design of the foundations will depend on the results of the future design-level geotechnical study. Minimum reinforcement consisting of four (4) to six (6) No. 5 rebars in strip footings. Additional reinforcement may be necessary for structural considerations.

Preliminary Floor Slab Design Recommendations

- Conventional slab-on-grade, minimum 6 to 7 inches thick.
- The design of the floor slabs will depend on the results of the future design-level geotechnical study. Based on the presence of low to medium expansive soils, a reinforced floor slabs will likely be necessary. The actual thickness and reinforcement of the floor slabs should be determined by the structural engineer.

Preliminary Pavement Design Recommendations

| ASPHALT PAVEMENTS (R = 10) | | | | | |
|-----------------------------------|----------------------------------|--------------------------------------|---------------|------------|------------|
| Materials | Thickness (inches) | | | | |
| | Automobile Parking (TI = 4.0) | Automobile Drive Lanes (TI = 5.0) | Truck Traffic | | |
| | | | (TI = 6.0) | (TI = 7.0) | (TI = 8.0) |
| Asphalt Concrete | 3 | 3 | 3½ | 4 | 5 |
| Aggregate Base | 6 | 9 | 12 | 15 | 16 |
| Compacted Subgrade | 12 | 12 | 12 | 12 | 12 |

| PORTLAND CEMENT CONCRETE PAVEMENTS | | | |
|--|--|---------------|------------|
| Materials | Thickness (inches) | | |
| | Automobile and Light Truck Traffic (TI = 5.0 & 6.0) | Truck Traffic | |
| | | (TI = 7.0) | (TI = 8.0) |
| PCC | 5½ | 7 | 8 |
| Compacted Subgrade (95% minimum compaction) | 12 | 12 | 12 |

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in general accordance with our Proposal No. 18P181, dated March 8, 2018. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to determine the geotechnical feasibility of the proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical feasibility study.

This is a revised report. The original report was issued on April 11, 2018. This report includes revisions to the Project Description (Section 3.2) and the Boring Location Plan, included as Plate 2 in Appendix A of this report.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located at the northeast corner of Euclid Avenue and Merrill Avenue in Ontario, California. The site is bounded to the north by Eucalyptus Avenue, to the west by Euclid Avenue, to the south by Merrill Avenue, and to the east by an existing dairy farm. The general location of the site is illustrated on the Site Location Map included as Plate 1 in Appendix A of this report.

The overall site is a rectangular-shaped property consisting of several contiguous parcels, which total $84.1\pm$ acres in size. The northeastern portion of the site is presently developed as a dairy farm with cattle pens, multiple canopy structures, farm houses, and structures associated with milking activities. 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 all of 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 northwestern portion and southern half of the site are presently being utilized for agricultural purposes. The ground surface cover throughout these areas consists of row crops and areas with limited areas of exposed soil. At the time of subsurface exploration, standing water was present to a depth of several inches in the planted areas. Additionally, a detention pond is located in the south-central portion of the overall site and is approximately 3 to 5 feet deep. At the time of subsurface exploration, this basin was nearly filled with water.

Topographic information for the subject site was obtained from a grading plan prepared by Thienes Engineering, Inc. The plan indicates that the site topography generally slopes downward to the south at a gradient of 1 to $2\pm$ percent, with some local variations. The existing site grades range from an elevation of $667\pm$ feet mean sea level (msl) in the northern area of the site to $631\pm$ feet msl in the southern area of the site.

3.2 Proposed Development

Based on a site plan prepared by HPA, the subject site will be developed with eight (8) new commercial/industrial buildings. The buildings will be identified as Buildings 1 through Buildings 8. Building 1 will be located in the east-central area of the site and will have a footprint of $570,960\pm$ ft² and Building 2 will be located in the southeastern area of the site and will have a footprint of $588,350\pm$ ft². These two buildings will be constructed in cross-dock configurations with dock-high doors along the north and south sides of the buildings. Buildings 3 through 6 will be located along the western side of the site and will have footprints that range from $39,140$ to $217,800\pm$ ft². These buildings will be constructed with dock-high doors along a portion of their eastern walls. Buildings 7 and 8 will be located in the northern area of the site and will have footprints of $85,400$ and $96,400\pm$ ft², respectively. These buildings will be constructed with dock-

high doors along a portion of their south walls. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive areas, Portland cement concrete pavements in the truck court areas with concrete flatwork and landscape planters.

Detailed structural information has not been provided. We assume that the buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundations with concrete slab-on-grade floors. Based on the assumed construction, we expect that maximum column and wall loads will be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Detailed grading plans were not available at the time of this report. The proposed development is not expected to include any significant amounts of below-grade construction such as basements or crawl spaces. Based on the existing and assumed topography, cuts and fills up to 6 to 8± feet are expected to be necessary to achieve the proposed building pad grades.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of four (4) borings advanced to depths of 10 to 30± feet below existing site grades. In addition to the four borings, a total of four (4) trenches were excavated at the site to depths of 4 to 12± feet below existing site grades. These trenches were excavated using a backhoe with a 36-inch wide bucket. All of the borings and trenches were logged during excavation by a member of our staff.

The trenches were excavated using a rubber tire backhoe with a 24-inch wide bucket. Three of the borings, Boring Nos. B-1 through B-3, inclusive, were advanced with hollow-stem augers, by a limited access track-mounted drilling rig. One boring, Boring No. B-4, was advanced utilizing manually operated augering equipment. Representative bulk and relatively undisturbed soil samples were obtained during drilling and trenching. Relatively undisturbed samples were taken with a split barrel "California Sampler" containing a series of one inch long, 2.416± inch diameter brass rings. This sampling method is described in ASTM Test Method D-3550. Samples were also taken using a 1.4± inch inside diameter split spoon sampler, in general accordance with ASTM D-1586. Both of these samplers were driven into the ground with successive blows of a 140-pound weight falling 30 inches. The blow counts obtained during driving are recorded for further analysis. Bulk samples were collected in plastic bags to retain their original moisture content. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory.

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

4.2 Geotechnical Conditions

Manure/Topsoil

Manure was present at the ground surface at Trench Nos. T-1 and T-2 and Boring No. B-3 with thicknesses of 4 to 8± inches below existing site grades.

Highly organic topsoil materials were encountered at the boring and trench locations performed in the planted areas on the site. At Trench No. T-3 and Boring No. B-4, these materials were approximately 1 to 1½ feet in thickness. These materials generally consist of silty fine sands and contain manure and/or other fibrous organic material.

Artificial Fill

Artificial fill soils were encountered at the ground surface or below the manure/topsoil at all of the boring and trench locations except Boring No. B-1 and Trench No. T-4. The fill materials at the boring locations extend to depths of 2 to 4½± feet and consist of loose to medium dense silty fine sands and fine sandy silts, and medium stiff to stiff clayey sands and sandy clays with occasional silty clays. The fill soils encountered in the planted areas of the site contain appreciable organic fibers. The fill soils generally possess a disturbed appearance and some samples possess minor debris content, such as asphaltic concrete fragments, resulting in their classification as artificial fill.

Additional soils classified as possible fill were encountered at the ground surface at Boring No. B-1 and Trench No. T-4, and below the artificial fill soils at Boring No. B-2. These soils extend to depths of 1½ to 5½± feet at the boring and trench locations. The possible fill soils generally resemble the native alluvial soils at the site but possess a slightly disturbed appearance, resulting in their classification as possible fill.

Alluvium

Native alluvial soils were encountered beneath the fill and possible fill soils at all of the boring and trench locations. The near surface alluvium generally consists of loose to medium dense silty fine sands to fine sandy silts, fine to medium sands, clayey fine sands and soft to medium stiff fine sandy clays, silty clays, and clayey silts, extending to at least the maximum depth explored of 30± feet below 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 been present 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/>. Available data for monitoring wells, located approximately 4,200± feet west from the site, indicate high groundwater levels ranging from 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. The field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown on the Boring Logs and are periodically referenced throughout this report.

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 and Trench Logs.

Consolidation

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

Maximum Dry Density and Optimum Moisture Content

Representative bulk samples were tested to determine their 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 Plates C-9 and C-10 in Appendix C of this report. This test is generally used for comparison with the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

Soluble Sulfates

Representative samples of the near-surface soils were submitted to a subcontracted analytical laboratory for determination of soluble sulfate content. Soluble sulfates are naturally present in soils, and if the concentration is high enough, can result in degradation of concrete which comes

into contact with these soils. The results of our soluble sulfate testing are presented below, and are discussed further in a subsequent section of this report.

| <u>Sample Identification</u> | <u>Soluble Sulfates (%)</u> | <u>Sulfate Classification</u> |
|-------------------------------------|------------------------------------|--------------------------------------|
| B-2 @ 0 to 5 feet | 0.012 | Negligible |
| B-3 @ 0 to 5 feet | 0.020 | Negligible |

Corrosivity Testing

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

| <u>Sample Identification</u> | <u>Resistivity (ohm-cm)</u> | <u>pH</u> | <u>Chlorides (mg/kg)</u> |
|-------------------------------------|--|------------------|-------------------------------------|
| B-2 @ 0 to 5 feet | 1,120 | 7.6 | 53 |
| B-3 @ 0 to 5 feet | 380 | 7.9 | 513 |

Expansion Index

The expansion potential of the on-site soils was determined in general accordance with ASTM D-4829 as required by the California Building Code (CBC). The testing apparatus is designed to accept a 4-inch diameter, 1-in high, remolded sample. The sample is initially remolded to 50± 1 percent saturation and then loaded with a surcharge equivalent to 144 pounds per square foot. The sample is then inundated with water, and allowed to swell against the surcharge. The resultant swell or consolidation is recorded after a 24-hour period. The results of the EI testing are as follows:

| <u>Sample Identification</u> | <u>Expansion Index</u> | <u>Expansive Potential</u> |
|-------------------------------------|-------------------------------|-----------------------------------|
| B-2 @ 0 to 5 feet | 27 | Very Low |
| B-3 @ 0 to 5 feet | 60 | Medium |

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:

| <u>Sample Identification</u> | <u>Organic Content (%)</u> |
|-------------------------------------|-----------------------------------|
| T-1 @ 0 to 6 inches | 25.4 |
| T-1 @ 6 to 12 inches | 2.3 |
| T-1 @ 12 to 18 inches | 2.1 |
| T-1 @ 18 to 24 inches | 5.1 |
| T-2 @ 0 to 6 inches | 54.3 |
| T-2 @ 6 to 12 inches | 2.3 |
| T-2 @ 12 to 18 inches | 2.1 |
| T-2 @ 18 to 24 inches | 3.9 |
| T-3 @ 0 to 6 inches | 11.5 |
| T-3 @ 12 to 18 inches | 5.4 |
| T-4 @ 0 to 6 inches | 5.4 |
| T-4 @ 12 to 18 inches | 8.2 |
| B-3 @ 3 to 4 feet | 9.0 |
| B-3 @ 5 to 6 feet | 5.4 |
| B-4 @ 0 to 6 inches | 33.2 |
| B-4 @ 6 to 12 inches | 23.3 |
| B-4 @ 3 to 4 feet | 7.4 |
| B-4 @ 5 to 6 feet | 3.6 |

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. **Based on the preliminary nature of this investigation, further geotechnical investigation(s) will be required prior to construction of the proposed development.** The preliminary 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 Grading Guide Specifications, included as Appendix D, should be considered part of this report, and should be incorporated into the project specifications. The contractor and/or owner of the development should bring to the attention of the geotechnical engineer any conditions that differ from those stated in this report, or which may be detrimental for the development.

6.1 Seismic Design Considerations

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

Faulting and Seismicity

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

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

Seismic Design Parameters

The 2016 California Building Code (CBC) was adopted by all municipalities within Southern California on January 1, 2017. 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 as Plate E-1 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 | 1.524 |
| 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} | 1.524 |
| Site Modified Spectral Acceleration at 1.0 sec Period | S_{M1} | 0.900 |
| Design Spectral Acceleration at 0.2 sec Period | S_{DS} | 1.016 |
| 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.

Research of the San Bernardino County Land Use Services website indicates that the subject site is not located within a zone of liquefaction susceptibility. In addition, the subsurface conditions at the boring locations are not considered to be conducive to liquefaction. Based on the mapping performed by San Bernardino County and the conditions encountered at the boring and trench 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 4 to 8± inches at the boring and trench locations. In addition, organic topsoil was encountered at the boring and trench locations performed with the planted areas of the site. These highly organic soils extend to depths of 1 to 1½± feet at the boring and trench locations. All of the manure and any organic topsoil should be removed from the site or utilized in non-structural areas, such as landscape planters.

Additionally, some of soils in the upper 2 to 4± feet, located beneath the highly organic topsoil in the planted areas, 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.

Artificial fill soils were encountered at most of the boring locations, extending to depths of 2 to 4½± feet. These fill soils vary in strength and composition, and some samples include varying amounts of debris including asphaltic concrete fragments. Boring No. B-4 encountered relatively low-density soils, classified as possible fill, extending to a depth of 5 to 6± feet. Based on the results of laboratory testing, these soils are highly compressible. The underlying native alluvial soils encountered at the boring and trench locations generally possess more favorable strengths and densities.

The existing fill soils and the upper portion of the near surface native alluvium are not considered suitable for support of new structures, in their present condition. Remedial grading will be necessary within the proposed building areas in order to remove and replace the existing fill and a portion of the near-surface alluvium as compacted structural fill.

Settlement

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

Soluble Sulfates

The results of the soluble sulfate testing, as discussed in Section 5.0 of this report, indicate soluble sulfate concentrations of 0.005 and 0.028 percent. These concentrations are considered to be negligible 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. We recommend that additional soluble sulfate testing be conducted during the design-level geotechnical investigation and at the completion of rough grading to verify the soluble sulfate concentrations of the soils which are present at the proposed building pad grades.

Expansion

The composition of the near surface soils at this site ranges from sands, silty sands, and sandy silts to silty clays, sandy clays, and clayey silts. Laboratory testing performed on representative samples of these materials indicate that they possess low to medium expansion potentials ($EI = 27$ to 60). Based on the presence of potentially expansive soils, special care should be taken to properly moisture condition and maintain adequate moisture content within all subgrade soils as well as newly placed fill soils. The preliminary foundation and floor slab design recommendations contained within this feasibility study are made in consideration of the expansion index test results. We recommend that additional expansion index testing be performed at the time of the design-level geotechnical investigation.

Organic Content

We recommend that all manure and any organic topsoil be removed during initial site stripping. Manure was present in the upper $8\pm$ inches at the boring and trench locations in the cattle pen areas. The near surface soils extending to depths of the upper 1 to $1\frac{1}{2}\pm$ feet in the planted areas consist of highly organic topsoil. Therefore, grubbing and segregating of the manure in the cattle pens and the highly organic soils in the planted areas will be necessary prior to grading. These soils should be removed from the site or reutilized in nonstructural areas, such as landscape planters. Any additional organic materials encountered in buried fills should also be segregated during grading.

The results of laboratory testing performed on near-surface soils beneath the manure (in active cattle pen areas) and beneath the organic topsoil (within the planted areas) indicates that soils within the upper 2 to $4\pm$ feet possess organic contents ranging from 2.1 to 8.2 percent. It is considered feasible to use most of these soils, not including the manure and organic topsoil, in the upper $1\frac{1}{2}$ to $4\pm$ 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 the design-level geotechnical investigation and at the completion of rough grading of the building pads in order to verify that the organic contents of the blended on-site soils are within the acceptable limits.

Corrosion Potential

Laboratory testing indicates that the tested samples of the near surface soils possesses resistivity values of 380 to $1,120$ ohm-cm, and pH values of 7.6 to 7.9 . These test results have been evaluated in accordance with guidelines published by the Ductile Iron Pipe Research Association (DIPRA). The DIPRA guidelines consist of a point system by which characteristics of the soils are used to quantify the corrosivity characteristics of the site. Resistivity, pH, Sulfides, and redox potential are factors that enter into the evaluation procedure. Relative soil moisture content is also considered. **Based on these factors, and utilizing the DIPRA procedure, the on-site soils are considered to be severely corrosive to ductile iron pipe. Therefore, protection for embedded metal improvements is expected to be required.** 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.

Laboratory testing also indicates that the on-site soils possess chloride concentrations of 53 to 513 parts per million (ppm). 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 ppm are considered to be corrosive. Chlorides present in soils in contact with reinforced concrete can cause corrosion and weakening of steel reinforcement within reinforced concrete. Based on the test results, some of the on-site soils, present within the active cattle pen area, exceed the Caltrans standard for corrosive soils with respect to chloride concentrations. However, since SCG does not practice in the area of corrosion engineering, the client should consult with a corrosion engineer to determine the chloride exposure category for this site with respect to the requirements of ACI 318-14. If deemed necessary, measures to protect steel reinforcement are expected to consist of the use of higher strength concrete and/or a low water to cement ratio.

We recommend that additional corrosivity testing be performed during the design-level geotechnical investigation to verify the extent of the soils possessing high concentrations of chloride.

Shrinkage/Subsidence

Removal and recompaction of the near-surface native fill soils is estimated to result in an average shrinkage of 7 to 17 percent. Additional exploration during the design level investigation will help to refine the potential shrinkage estimate. It should be noted that the potential shrinkage estimates are based on dry density testing performed on small-diameter samples taken at the boring locations. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test-pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be 0.10 feet.

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

Grading and Foundation Plan Review

No grading or foundation plans were available at the time of this report. It is therefore recommended that we be provided with copies of the preliminary plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report. These plans should also be made available prior to performance of the design level geotechnical investigation.

6.3 Preliminary Site Grading Recommendations

The preliminary grading recommendations presented below are based on the design details that were available at the time of this report, and the subsurface conditions encountered at our boring and trench locations. These recommendations are general in nature, and should be confirmed as part of the design level geotechnical investigation.

Site Stripping and Demolition

Initial site stripping should include removal of all manure, highly organic soils, and any surficial vegetation. The actual extent of site stripping should be determined in the field by the geotechnical engineer, based on the organic content and stability of the materials encountered.

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

Treatment of Existing Soils: Building Pads

Remedial grading will be necessary within the proposed building pad areas to remove all of the existing undocumented fill soils and near-surface alluvial soils and to provide a uniform blanket of compacted fill upon which to support the proposed structures. Based on the conditions at the boring and trench locations, the depths of fill of range from 2 to 4½± feet below ground surface. The actual depth of overexcavation should be refined during the design level geotechnical investigation. On a preliminary basis, overexcavation to depths of 4 to 6± feet below existing site grades should be anticipated. Within foundation influence zones, overexcavation to depths of about 3± feet below foundation bearing grade will be necessary. Please note that adverse geotechnical conditions encountered during the design level investigation could result in additional overexcavation requirements.

The overexcavation areas should extend at least 5 feet beyond the building perimeters and foundations, 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.

Based on conditions encountered at the exploratory boring locations, very moist soils will be encountered at or near the base of the recommended overexcavation. Stabilization of the exposed overexcavation subgrade soils may be necessary. Scarification and air drying of these materials is expected to be sufficient to obtain a stable subgrade. However, if highly unstable soils are identified, and if the construction schedule does not allow for delays associated with drying, mechanical stabilization, usually consisting of coarse crushed stone or geotextile, could be necessary. In this event, the geotechnical engineer should be contacted for supplementary recommendations.

Treatment of Existing Soils: Retaining Walls and Site Walls

Although not indicated on the site plan, it may be necessary to construct some small retaining walls or site walls at or near the existing surface grade. Overexcavation will also be necessary in these areas to remove the existing fill soils and lower strength alluvium. The overexcavation depth should be expected to be on the order of 2 to 3 feet below proposed foundation bearing grade.

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 areas should initially consist of removal of all soils disturbed during stripping and demolition operations. The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to within 2 to 4 percent above the optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

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

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to within 2 to 4 percent above the optimum moisture content and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer.
- All grading and fill placement activities should be completed in accordance with the requirements of the CBC and the grading code of the city of Ontario.
- 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 should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the city of Ontario. 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 Preliminary Construction Considerations

Excavation Considerations

The near surface soils generally consist of a variety of materials, including sands, silts, and clays. These materials may be subject to minor caving within shallow excavations. Where caving occurs within shallow excavations, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, the inclination of temporary slopes should not exceed 2h:1v. Deeper excavations may require some form of external stabilization such as shoring or bracing. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. All excavation activities on this site should be conducted in accordance with Cal-OSHA regulations.

Moisture Sensitive Subgrade Soils

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

If the construction schedule dictates that site grading will occur during a period of wet weather, allowances should be made for costs and delays associated with drying the on-site soils or import of a drier, less moisture sensitive fill material. Grading during wet or cool weather may also increase the depth of overexcavation in the pad areas as well as the need for and/or the thickness of the crushed stone stabilization layer, discussed in Section 6.3 of this report.

Groundwater

Based on the conditions encountered in the borings and trenches, groundwater is not present within 30± feet of the ground surface. Based on the anticipated depth to groundwater, it is not expected that the groundwater will affect excavations for the foundations or utilities.

6.5 Preliminary Foundation Design and Construction Recommendations

Based on the preceding geotechnical design considerations and preliminary grading recommendations, it is assumed that the new buildings will be underlain by newly placed structural fill soils, extending to depths of at least 3± feet below foundation bearing grade. Based on this subsurface profile, the proposed structures may be supported on conventional shallow foundations.

The foundation design parameters presented below provide anticipated ranges for the allowable soil bearing pressures. These ranges should be refined during the subsequent design level geotechnical investigation.

Building Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 to 3,000 lbs/ft².
- Minimum longitudinal steel reinforcement within strip footings: Four (4) to Six (6) No. 5 rebars.

General Foundation Design Recommendations

The allowable bearing pressures presented above may be increased by one-third when considering short duration wind or seismic loads. Additional reinforcement may be necessary for structural considerations. The actual design of the foundations should be determined by the structural engineer.

Estimated Foundation Settlements

Typically, foundations designed in accordance with the preliminary foundation design parameters presented above will experience total and differential settlements of less than 1.0 and 0.5 inches, respectively. A detailed settlement analysis should be conducted as part of the design level geotechnical investigation, once detailed foundation loading information is available.

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: 250 to 300 lbs/ft³

- Friction Coefficient: 0.25 to 0.30

6.6 Preliminary Floor Slab Design and Construction Recommendations

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. Preliminarily, the floors of the proposed structures may be constructed as conventional slabs-on-grade supported on newly placed structural fill. The parameters provided below should be refined during the design-level geotechnical investigation. Based on geotechnical considerations, the floor slab may be preliminarily designed as follows:

- Minimum slab thickness: 6 to 7 inches.
- Minimum slab reinforcement: Reinforced floor slabs are recommended based on the presence of low to medium expansive soils. Additional expansion index testing should be performed to confirm this recommendation at the time of the design level investigation. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading.
- Slab underlayment: If moisture sensitive floor coverings will be used then minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire area of the proposed slab which will incorporate such coverings. The moisture vapor barrier should meet or exceed the Class A rating as defined by ASTM E 1745-97 and have a permeance rating less than 0.01 perms as described in ASTM E 96-95 and ASTM E 154-88. A polyolefin material such as Stego® Wrap Vapor Barrier or equivalent will meet these specifications. The moisture vapor barrier should be properly constructed in accordance with all applicable manufacturer specifications. Given that a rock free subgrade is anticipated and that a capillary break is not required, sand below the barrier is not required. The need for sand and/or the amount of sand above the moisture vapor barrier should be specified by the structural engineer or concrete contractor. The selection of sand above the barrier is not a geotechnical engineering issue and hence outside our purview. Where moisture sensitive floor coverings are not anticipated, the vapor barrier may be eliminated.
- Moisture condition the floor slab subgrade soils to 2 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.
- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.

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

6.7 Preliminary Retaining Wall Design and Construction Recommendations

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

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. We have provided parameters assuming the use of on-site soils for retaining wall backfill. The near surface soils generally consist of fine sands, silty fine sands, fine sandy silts, fine sandy clays, silty clays, and clayey silts. **However, the silty clays and clayey silts possess a medium expansion potential and should not be used for retaining wall backfill.** Based on their classifications, the silty sand, clayey sand, and fine sandy silt materials are expected to possess a friction angle of at least 30 degrees when compacted to 90 percent of the ASTM-1557 maximum dry density.

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

RETAINING WALL DESIGN PARAMETERS

| Design Parameter | | Soil Type |
|------------------------------------|------------------------------------|-------------------------------------|
| | | On-Site Silty Sands and Sandy Silts |
| Internal Friction Angle (ϕ) | | 28° |
| Unit Weight | | 120 lbs/ft ³ |
| Equivalent Fluid Pressure: | Active Condition (level backfill) | 43 lbs/ft ³ |
| | Active Condition (2h:1v backfill) | 75 lbs/ft ³ |
| | At-Rest Condition (level backfill) | 63 lbs/ft ³ |

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

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

Seismic Lateral Earth Pressures

In addition to the lateral earth pressures presented in the previous section, retaining walls which are more than 6 feet in height should be designed for a seismic lateral earth pressure, in accordance with the 2016 CBC. Based on the current site plan, it is not expected that any walls in excess of 6 feet in height will be required for this project. If any such walls are proposed, our office should be contacted for supplementary design recommendations.

Backfill Material

Retaining wall backfill soils should consist of on-site sands, silty sands, and sandy silts possessing an expansion index less than 20. On-site silty clays and clayey silts should not be used to backfill retaining walls. All backfill material placed within 3 feet of the back wall face should have a particle size no greater than 3 inches. The retaining wall backfill materials should be well graded.

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

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

Subsurface Drainage

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

- A weep hole drainage system typically consisting of a series of 4-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 8-foot on-center spacing. The weep holes should include a 2

cubic foot pocket of open graded gravel, surrounded by an approved geotextile fabric, at each weep hole location.

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

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

6.9 Preliminary Pavement Design Parameters

Preliminary design recommendations for pavements that will be utilized on the subject site are presented below. Grading and pavement thickness recommendations for these pavement areas should be developed during the design level geotechnical investigation.

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The near-surface soils generally consist of silty clays, clayey silts, silty sands, sandy silts and fine sands. These soils are considered to possess poor to fair pavement support characteristics with an estimated R-values ranging from 10 to 30. The subsequent pavement design is based upon an assumed R-value of 10. 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 at the time of the design level investigation or after the 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 = 10) | | | | | |
|-----------------------------------|-------------------------------------|---|---------------|------------|------------|
| Materials | Thickness (inches) | | | | |
| | Automobile Parking (TI = 4.0) | Automobile Drive Lanes (TI = 5.0) | Truck Traffic | | |
| | | | (TI = 6.0) | (TI = 7.0) | (TI = 8.0) |
| Asphalt Concrete | 3 | 3 | 3½ | 4 | 5 |
| Aggregate Base | 6 | 9 | 12 | 15 | 16 |
| Compacted Subgrade | 12 | 12 | 12 | 12 | 12 |

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

Portland Cement Concrete

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

| PORTLAND CEMENT CONCRETE PAVEMENTS | | | |
|--|---|---------------|------------|
| Materials | Thickness (inches) | | |
| | Automobile and Light Truck Traffic (TI = 5.0 & 6.0) | Truck Traffic | |
| | | (TI = 7.0) | (TI = 8.0) |
| PCC | 5½ | 7 | 8 |
| Compacted Subgrade (95% minimum compaction) | 12 | 12 | 12 |

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

7.0 GENERAL COMMENTS

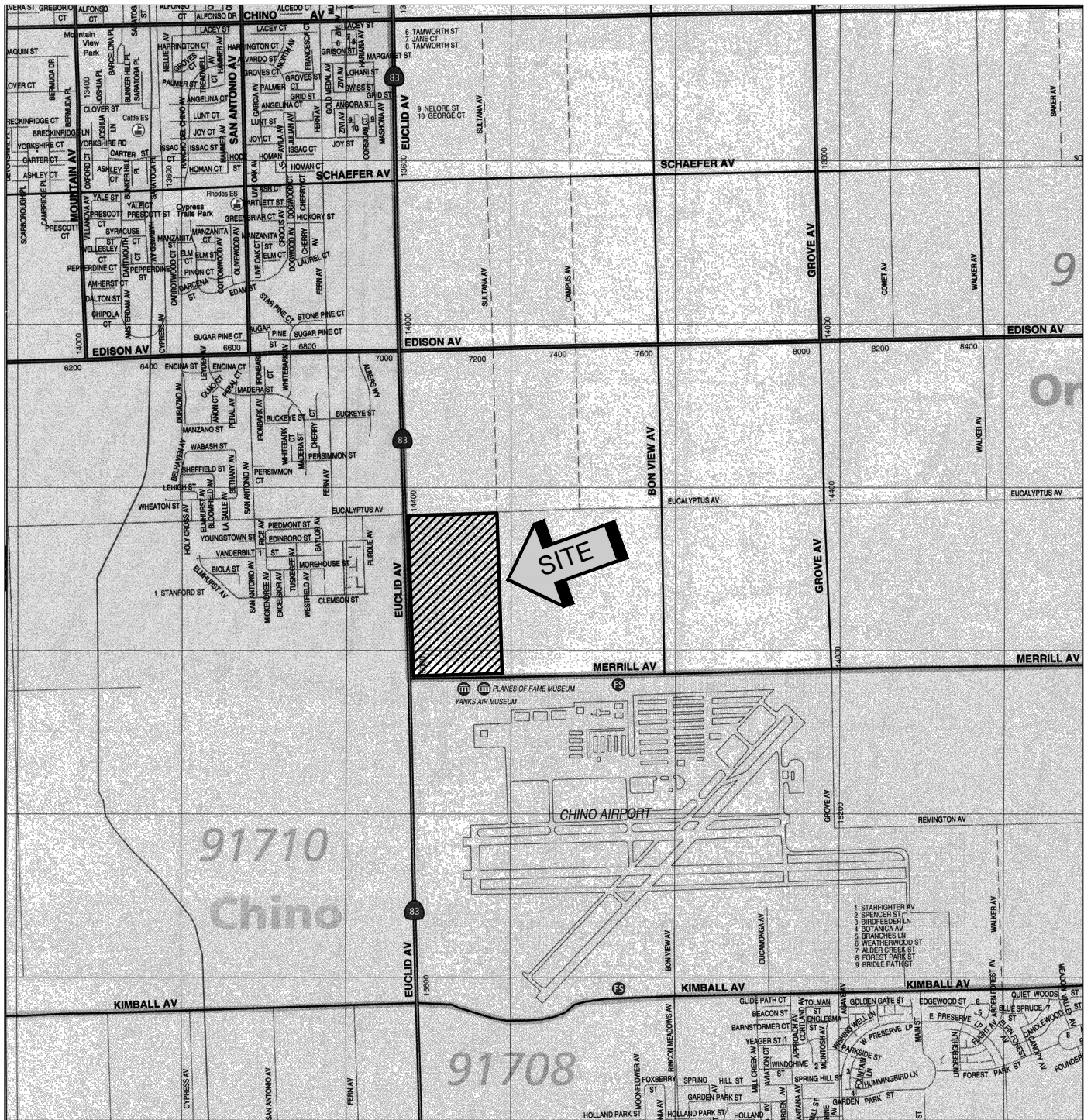
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other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

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

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

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

APPENDIX A



SOURCE: SAN BERNARDINO COUNTY
THOMAS GUIDE, 2013



SITE LOCATION MAP **PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT** **ONTARIO, CALIFORNIA**

SCALE: 1" = 2400'

DRAWN: SM

CHKD: RGT

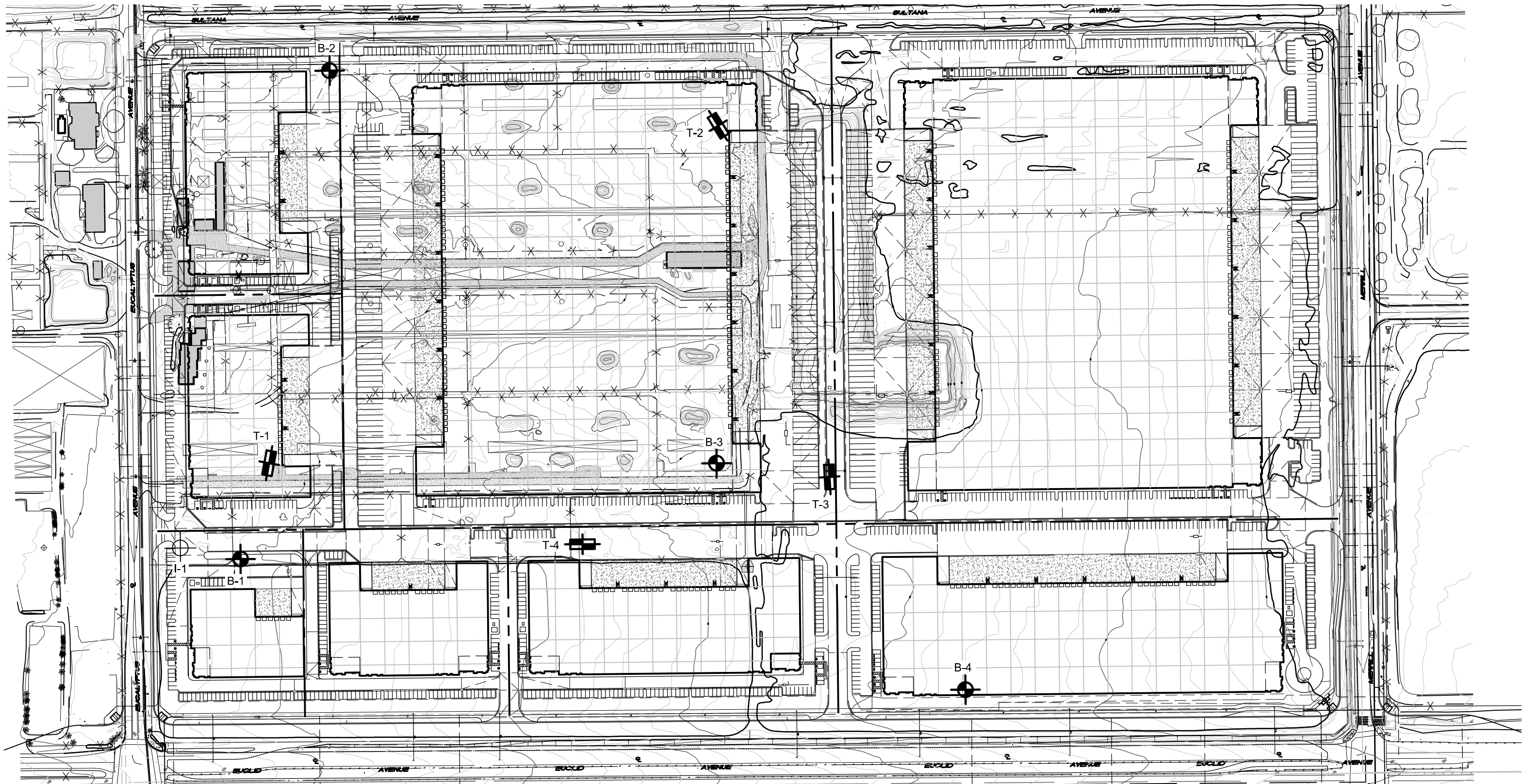
SCG PROJECT

18G129-1

PLATE 1



**SOUTHERN
CALIFORNIA
GEOTECHNICAL**



GEOTECHNICAL LEGEND



APPROXIMATE BORING LOCATION








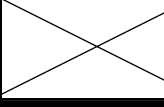


APPROXIMATE TRENCH LOCATION



| BORING AND TRENCH LOCATION PLAN | |
|--|---|
| PROPOSED COMMERCIAL/INDUSTRIAL DEVELOPMENT | |
| ONTARIO, CALIFORNIA | |
| SCALE: 1" = 200' |  SOUTHERN CALIFORNIA GEOTECHNICAL |
| DRAWN: SAM | |
| CHKD: GKM | |
| SCG PROJECT 18G129-1R | |
| PLATE 2 | |

APPENDIX B

BORING LOG LEGEND

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

COLUMN DESCRIPTIONS

DEPTH:

Distance in feet below the ground surface.

SAMPLE:

Sample Type as depicted above.

BLOW COUNT:

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

POCKET PEN.:

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

GRAPHIC LOG:

Graphic Soil Symbol as depicted on the following page.

DRY DENSITY:

Dry density of an undisturbed or relatively undisturbed sample in lbs/ft³.

MOISTURE CONTENT:

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

LIQUID LIMIT:

The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT:

The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE:

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

UNCONFINED SHEAR:

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

SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



| | | |
|----------------------------------|------------------------------------|------------------------------|
| JOB NO.: 18G129 | DRILLING DATE: 3/15/18 | WATER DEPTH: Dry |
| PROJECT: Proposed CI Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 26 feet |
| LOCATION: Ontario, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion |

| FIELD RESULTS | | | | | GRAPHIC LOG | DESCRIPTION | LABORATORY RESULTS | | | | | | COMMENTS |
|---|--------|------------|-------------------|-------------------|-------------|-------------|----------------------|--------------|---------------|------------------------|------------------------|--|----------|
| DEPTH (FEET) | SAMPLE | BLOW COUNT | POCKET PEN. (TSF) | DRY DENSITY (PCF) | | | MOISTURE CONTENT (%) | LIQUID LIMIT | PLASTIC LIMIT | PASSING #200 SIEVE (%) | UNCONFINED SHEAR (TSF) | | |
| | | | | | | | | | | | | | |
| SURFACE ELEVATION: --- MSL | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |

TBL 18G129.GPJ SOCALGEO.GDT 4/11/18



| | | |
|----------------------------------|------------------------------------|------------------------------|
| JOB NO.: 18G129 | DRILLING DATE: 3/15/18 | WATER DEPTH: Dry |
| PROJECT: Proposed CI Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 19 feet |
| LOCATION: Ontario, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion |

| FIELD RESULTS | | | | GRAPHIC LOG | DESCRIPTION | LABORATORY RESULTS | | | | | | COMMENTS |
|---|--------|------------|-------------------|-------------|-------------|--------------------|----------------------|--------------|---------------|------------------------|------------------------|----------|
| DEPTH (FEET) | SAMPLE | BLOW COUNT | POCKET PEN. (TSF) | | | DRY DENSITY (PCF) | MOISTURE CONTENT (%) | LIQUID LIMIT | PLASTIC LIMIT | PASSING #200 SIEVE (%) | UNCONFINED SHEAR (TSF) | |
| SURFACE ELEVATION: --- MSL | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |

TBL 18G129.GPJ SOCALGEO.GDT 4/11/18



| | | |
|----------------------------------|------------------------------------|------------------------------|
| JOB NO.: 18G129 | DRILLING DATE: 3/15/18 | WATER DEPTH: Dry |
| PROJECT: Proposed CI Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 27 feet |
| LOCATION: Ontario, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion |

| FIELD RESULTS | | | | GRAPHIC LOG | DESCRIPTION | LABORATORY RESULTS | | | | | | COMMENTS |
|----------------------------|--------|------------|-------------------|-------------|---|--------------------|----------------------|--------------|---------------|------------------------|------------------------|-------------------|
| DEPTH (FEET) | SAMPLE | BLOW COUNT | POCKET PEN. (TSF) | | | DRY DENSITY (PCF) | MOISTURE CONTENT (%) | LIQUID LIMIT | PLASTIC LIMIT | PASSING #200 SIEVE (%) | UNCONFINED SHEAR (TSF) | |
| SURFACE ELEVATION: --- MSL | | | | | | | | | | | | |
| | | | | | 8± inches Manure | | | | | | | EI = 60 @ 0 to 5' |
| | | | | | FILL: Dark Gray Brown to Black fine Sandy Clay, some Manure, medium dense-very moist to wet | 76 | 37 | | | | | |
| | | | | | FILL: Gray Brown Clayey fine Sand, trace fine Gravel, medium dense-very moist | 99 | 18 | | | | | |
| 5 | | | | | ALLUVIUM: Dark Gray Brown Clayey Silt to Silty Clay, trace calcareous veining, stiff-moist | | | | | | | |
| | | | | | Dark Gray Brown Silty fine Sand to fine Sandy Silt, medium dense-very moist | 74 | 21 | | | | | |
| | | | 4.5+ | | Light Gray Brown fine Sandy Clay to Silty Clay, stiff to very stiff-very moist | 111 | 18 | | | | | |
| 10 | | | 1.0 | | | 104 | 20 | | | | | |
| | | | | | Light Gray Brown Clayey fine to medium Sand, trace coarse Sand, little fine Gravel, medium dense-moist | | 11 | | | | | |
| 15 | | | | | | | | | | | | |
| | | | | | Light Brown Silty Clay, medium stiff-very moist | | 36 | | | | | |
| 20 | | | 2.0 | | | | | | | | | |
| | | | | | Brown Clayey fine Sand to fine Sandy Clay, some Iron oxide staining, medium dense to very stiff-moist to very moist | | 14 | | | | | |
| 25 | | | 4.5+ | | | | | | | | | |
| | | | | | Brown Silty Clay to Clayey Silt, trace fine Sand, trace Iron oxide staining, medium dense-very moist | | 24 | | | | | |
| 30 | | | 3.5 | | | | | | | | | |
| Boring Terminated at 30' | | | | | | | | | | | | |

TBL 18G129.GPJ SOCALGEO.GDT 4/11/18



| JOB NO.: 18G129 | | | | DRILLING DATE: 3/15/18 | | | | WATER DEPTH: Dry | | | | |
|----------------------------------|--------|------------|-------------------|-----------------------------|---|-------------------|----------------------|------------------------------|---------------|----------|------------------------|------------------------|
| PROJECT: Proposed CI Development | | | | DRILLING METHOD: Hand Auger | | | | CAVE DEPTH: 25 feet | | | | |
| LOCATION: Ontario, California | | | | LOGGED BY: Jason Hiskey | | | | READING TAKEN: At Completion | | | | |
| FIELD RESULTS | | | | | LABORATORY RESULTS | | | | | COMMENTS | | |
| DEPTH (FEET) | SAMPLE | BLOW COUNT | POCKET PEN. (TSF) | GRAPHIC LOG | DESCRIPTION | DRY DENSITY (PCF) | MOISTURE CONTENT (%) | LIQUID LIMIT | PLASTIC LIMIT | | PASSING #200 SIEVE (%) | UNCONFINED SHEAR (TSF) |
| SURFACE ELEVATION: --- MSL | | | | | | | | | | | | |
| 5 | | | 1.0 | | 6± inches Decomposed Manure and other Organic matter - Dark Brown to Black, fibrous, soft to loose-very moist | 72 | 190 | | | | | |
| | | | | | FILL: Dark Brown to Black Silty fine Sand, some Manure, very loose-very moist | | 79 | | | | | |
| | | | | | FILL: Dark Gray Brown to Black fine Sandy Clay, little Silt, some Organic fibers, soft to medium stiff-very moist | 66 | 45 | | | | | |
| | | | 2.0 | | ALLUVIUM: Dark Gray Brown fine Sandy Clay, medium stiff-very moist | 84 | 23 | | | | | |
| | | | | | | | 26 | | | | | |
| 10 | | | | | Light Brown Silty Clay, trace fine Sand, medium stiff-very moist | | 24 | | | | | |
| Boring Terminated at 10' | | | | | | | | | | | | |

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-1

JOB NO.: 18G129-1

EQUIPMENT USED: Backhoe

WATER DEPTH: Dry

PROJECT: Proposed Commercial/Industrial Development

LOGGED BY: Scott McCann

SEEPAGE DEPTH: Dry

LOCATION: Ontario, CA

ORIENTATION: S 81 E

READINGS TAKEN: At Completion

DATE: 3-15-2018

TOP OF TRENCH ELEVATION: 661 feet msl

| DEPTH | SAMPLE | DRY DENSITY (PCF) | MOISTURE (%) | EARTH MATERIALS DESCRIPTION | GRAPHIC REPRESENTATION |
|-------|--------|----------------------|--------------|--|---|
| | b | | 14 | A: MANURE: 4 inches thick | <p>SCALE: 1" = 5'</p> <p>S 81 E</p> <p>AC Fragments</p> |
| | b | | 15 | B: FILL: Gray Brown Silty fine Sand to fine Sandy Silt, trace to little Clay, trace Asphaltic concrete fragments, loose to medium dense - very moist | |
| | b | | 21 | C: ALLUVIUM: Dark Brown fine Sandy Clay to Silty Clay, medium stiff - very moist | |
| 5 | b | | 14 | D: ALLUVIUM: Light Gray Brown Clayey fine Sand, little medium Sand, trace Silt, medium dense - moist | |
| | | | | <p>Trench Terminated @ 5 feet</p> <p>Bottom of Trench Elevation: 656 feet msl</p> | |
| 10 | | | | | |
| 15 | | | | | |

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

TRENCH LOG

PLATE B-5

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-2

JOB NO.: 18G129-1

EQUIPMENT USED: Backhoe

WATER DEPTH: Dry

PROJECT: Proposed Commercial/Industrial Development

LOGGED BY: Scott McCann

SEEPAGE DEPTH: Dry

LOCATION: Ontario, CA

ORIENTATION: N 59 E

READINGS TAKEN: At Completion

DATE: 3-15-2018

TOP OF TRENCH ELEVATION: 649 feet msl

| DEPTH | SAMPLE | DRY DENSITY (PCF) | MOISTURE (%) | EARTH MATERIALS DESCRIPTION | GRAPHIC REPRESENTATION |
|-------|-----------------------|----------------------|----------------|--|-------------------------------------|
| 5 | b b b b b | | 20 27 32 | <p>A: MANURE: 5 inches thick</p> <p>B: FILL: Light Gray Brown fine Sandy Silt, trace Clay, trace medium Sand, trace Manure, medium dense - very moist</p> <p>C: ALLUVIUM: Gray Clayey Silt, little fine Sand, medium stiff to stiff - very moist</p> <p>D: ALLUVIUM: Gray Brown Silty fine Sand to fine Sandy Silt, medium dense - very moist</p> <p>Trench Terminated @ 5 feet Bottom of Trench Elevation: 644 feet msl</p> | <p>N 59 E</p> <p>SCALE: 1" = 5'</p> |
| 10 | | | | | |
| 15 | | | | | |

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

TRENCH LOG

PLATE B-6

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-3

JOB NO.: 18G129-1

EQUIPMENT USED: Backhoe

WATER DEPTH: Dry

PROJECT: Proposed Commercial/Industrial Development

LOGGED BY: Scott McCann

SEEPAGE DEPTH: Dry

LOCATION: Ontario, CA

ORIENTATION: N 84 E

READINGS TAKEN: At Completion

DATE: 3-15-2018

TOP OF TRENCH ELEVATION: 646.5 feet msl

| DEPTH | SAMPLE | DRY DENSITY (PCF) | MOISTURE (%) | EARTH MATERIALS DESCRIPTION | GRAPHIC REPRESENTATION |
|-------|-----------------------|----------------------|----------------------|--|-------------------------------------|
| 5 | b b b b b | | 52 42 34 30 | A: FILL: Dark Brown fine Sandy Clay, little Silt, trace medium Sand, trace fine Gravel, abundant organic fibers, trace fine root fibers, very soft - very moist B: DISTURBED ALLUVIUM: Dark Gray Clayey Silt, little fine Sand, trace organic fibers, medium stiff - very moist | <p>N 84 E</p> <p>SCALE: 1" = 5'</p> |
| | | | 38 | C: ALLUVIUM: Brown Silty Clay, trace organic fibers, soft - very moist | |
| | b | | 21 | D: ALLUVIUM: Light Gray Brown fine Sandy Clay, little Silt, soft - very moist | |
| 10 | b b | | 23 | E: ALLUVIUM: Light Brown fine Sandy Clay to Silty Clay, trace iron oxide staining, soft - very moist | |
| | b | | 21 | | |
| 15 | | | | Trench Terminated @ 12 feet Bottom of Trench Elevation: 634.5 feet msl | |

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-4

JOB NO.: 18G129-1

EQUIPMENT USED: Backhoe

WATER DEPTH: Dry

PROJECT: Proposed Commercial/Industrial Development

LOGGED BY: Scott McCann

SEEPAGE DEPTH: Dry

LOCATION: Ontario, CA

ORIENTATION: S 3 E

READINGS TAKEN: At Completion

DATE: 3-15-2018

TOP OF TRENCH ELEVATION: 653 feet msl

| DEPTH | SAMPLE | DRY DENSITY (PCF) | MOISTURE (%) | EARTH MATERIALS DESCRIPTION | GRAPHIC REPRESENTATION |
|-------|--------|----------------------|--------------|--|------------------------------------|
| 20 | b | | 18 | A: DISTURBED ALLUVIUM: Gray Brown Clayey fine Sand to fine Sandy Clay, moderate organic odor, abundant fine root fibers, loose to medium stiff - moist to very moist | <p>S 3 E</p> <p>SCALE: 1" = 5'</p> |
| 18 | b | | 19 | B: ALLUVIUM: Gray Brown Clayey Silt, little fine Sand, slightly porous, trace fine root fibers, stiff - very moist | |
| 18 | b | | 12 | C: ALLUVIUM: Dark Brown Silty fine Sand, little Clay, medium dense - moist to very moist | |
| 5 | b | | 18 | D: ALLUVIUM: Light Gray Brown Silty Clay, trace to little fine Sand, medium stiff - very moist | |
| | b | | 21 | E: ALLUVIUM: Light Brown fine Sandy Clay, little Silt, trace medium Sand, medium stiff - very moist | |
| 10 | b | | 17 | Trench Terminated @ 12 feet Bottom of Trench Elevation: 641 feet msl | |
| 15 | | | | | |

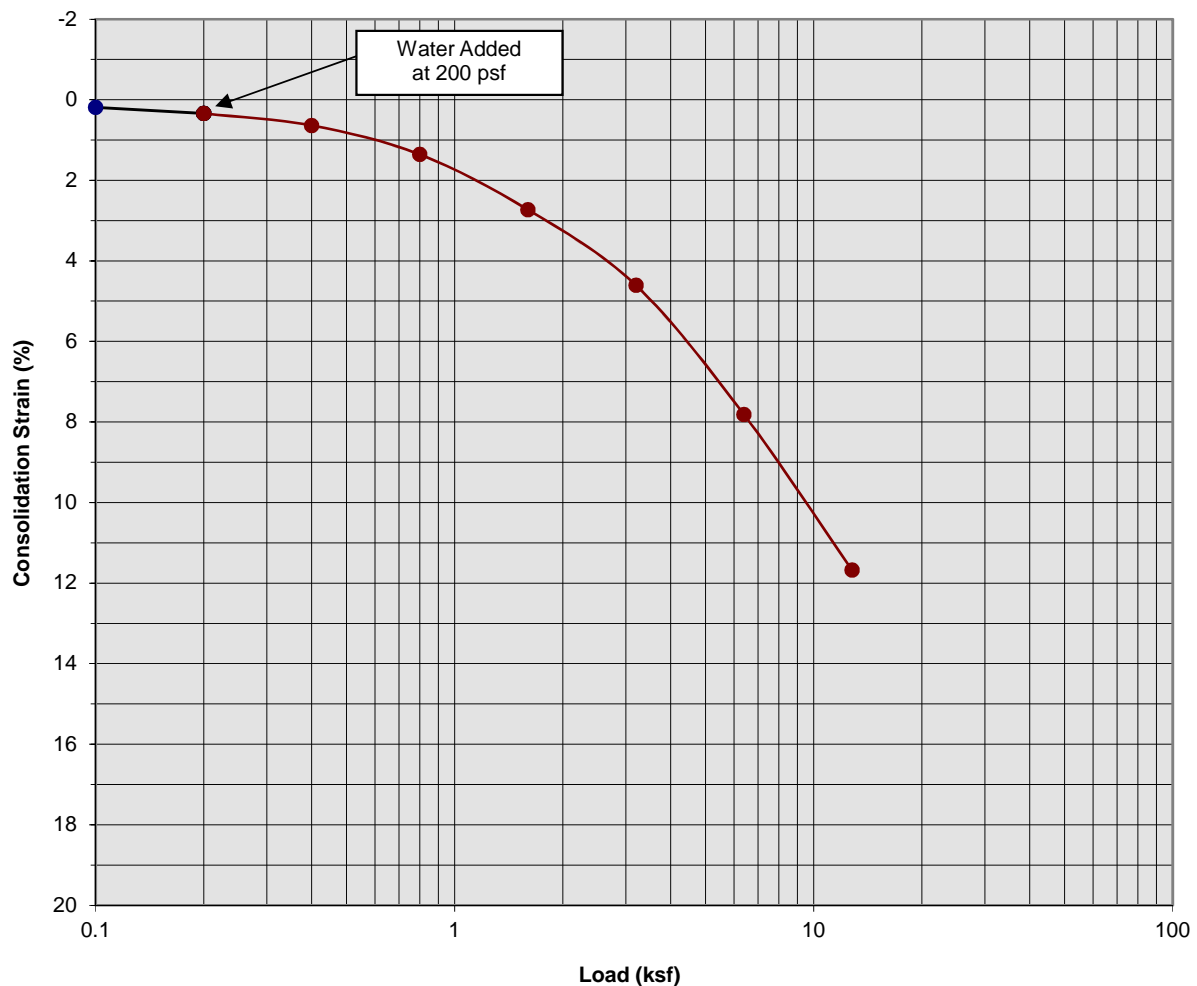
KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-8

APPENDIX

Consolidation/Collapse Test Results



Classification: POSSIBLE FILL: Dark Gray Brown Silty fine Sand to fine Sandy Silt

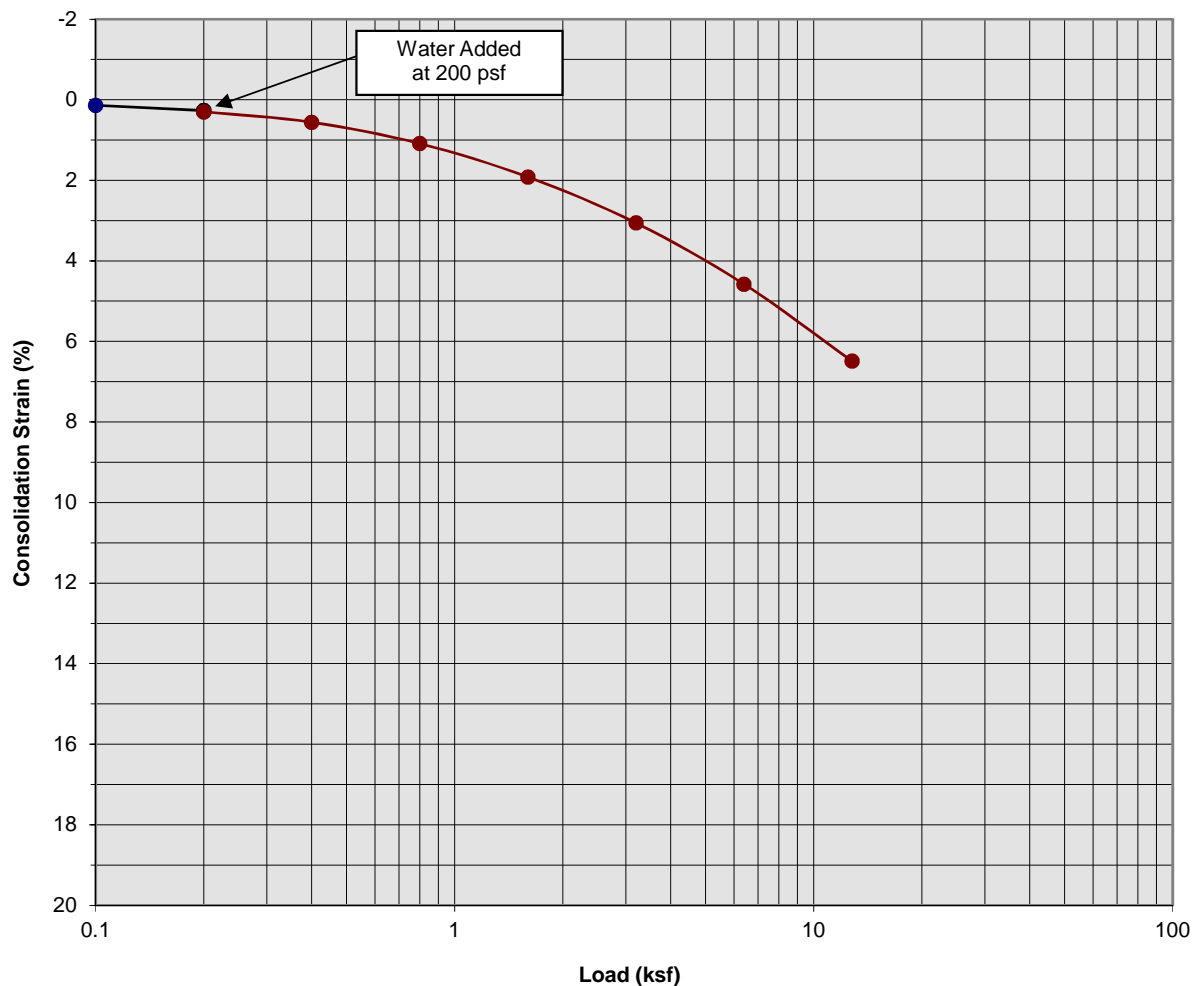
| | | | |
|-------------------------|--------|------------------------------|-------|
| Boring Number: | B-1 | Initial Moisture Content (%) | 28 |
| Sample Number: | --- | Final Moisture Content (%) | 28 |
| Depth (ft) | 1 to 2 | Initial Dry Density (pcf) | 90.5 |
| Specimen Diameter (in) | 2.4 | Final Dry Density (pcf) | 101.9 |
| Specimen Thickness (in) | 1.0 | Percent Collapse (%) | 0.00 |

Proposed Commercial/Industrial Development
Ontario, California
Project No. 18G129
PLATE C- 1



**SOUTHERN
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Consolidation/Collapse Test Results



Classification: Gray Brown Silty fine Sand to fine Sandy Silt

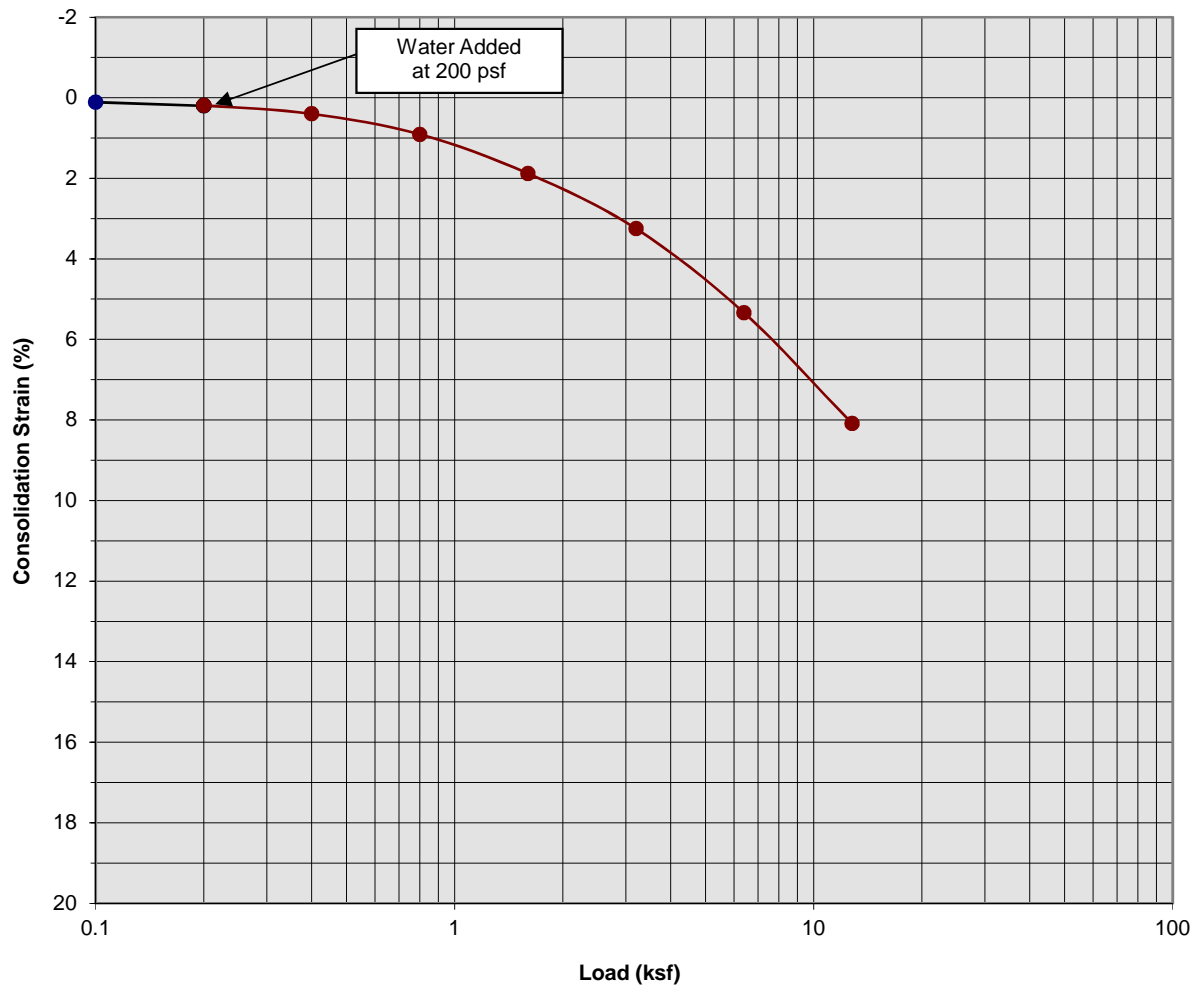
| | | | |
|-------------------------|--------|------------------------------|-------|
| Boring Number: | B-1 | Initial Moisture Content (%) | 21 |
| Sample Number: | --- | Final Moisture Content (%) | 20 |
| Depth (ft) | 3 to 4 | Initial Dry Density (pcf) | 106.3 |
| Specimen Diameter (in) | 2.4 | Final Dry Density (pcf) | 114.0 |
| Specimen Thickness (in) | 1.0 | Percent Collapse (%) | 0.03 |

Proposed Commercial/Industrial Development
Ontario, California
Project No. 18G129
PLATE C- 2



**SOUTHERN
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Consolidation/Collapse Test Results



Classification: Gray Brown fine Sandy Clay, little Silt

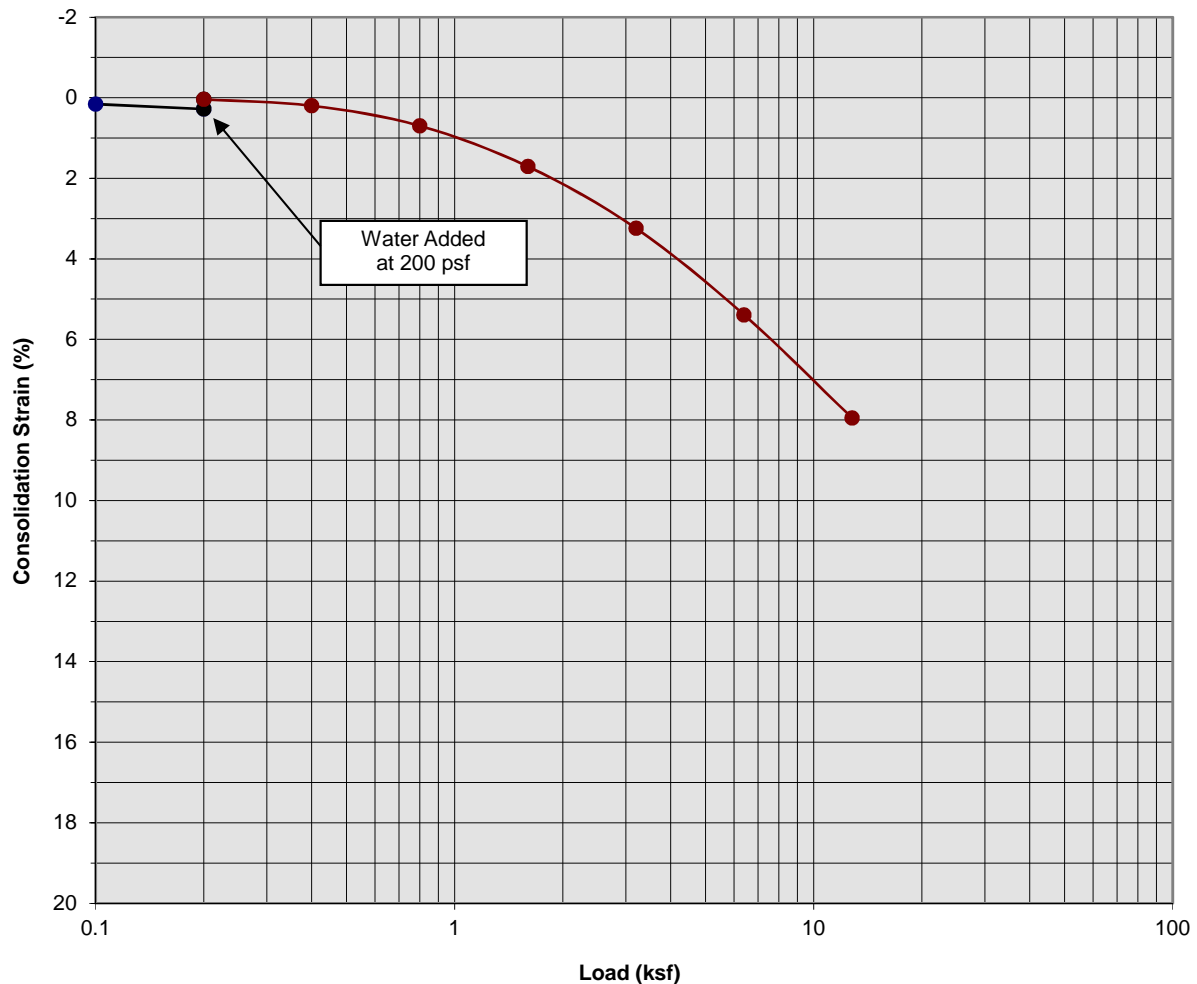
| | | | |
|-------------------------|--------|------------------------------|-------|
| Boring Number: | B-1 | Initial Moisture Content (%) | 21 |
| Sample Number: | --- | Final Moisture Content (%) | 20 |
| Depth (ft) | 5 to 6 | Initial Dry Density (pcf) | 100.8 |
| Specimen Diameter (in) | 2.4 | Final Dry Density (pcf) | 108.7 |
| Specimen Thickness (in) | 1.0 | Percent Collapse (%) | -0.01 |

Proposed Commercial/Industrial Development
Ontario, California
Project No. 18G129
PLATE C- 3



**SOUTHERN
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Consolidation/Collapse Test Results



Classification: Light Gray Brown Silty Clay, little fine Sand

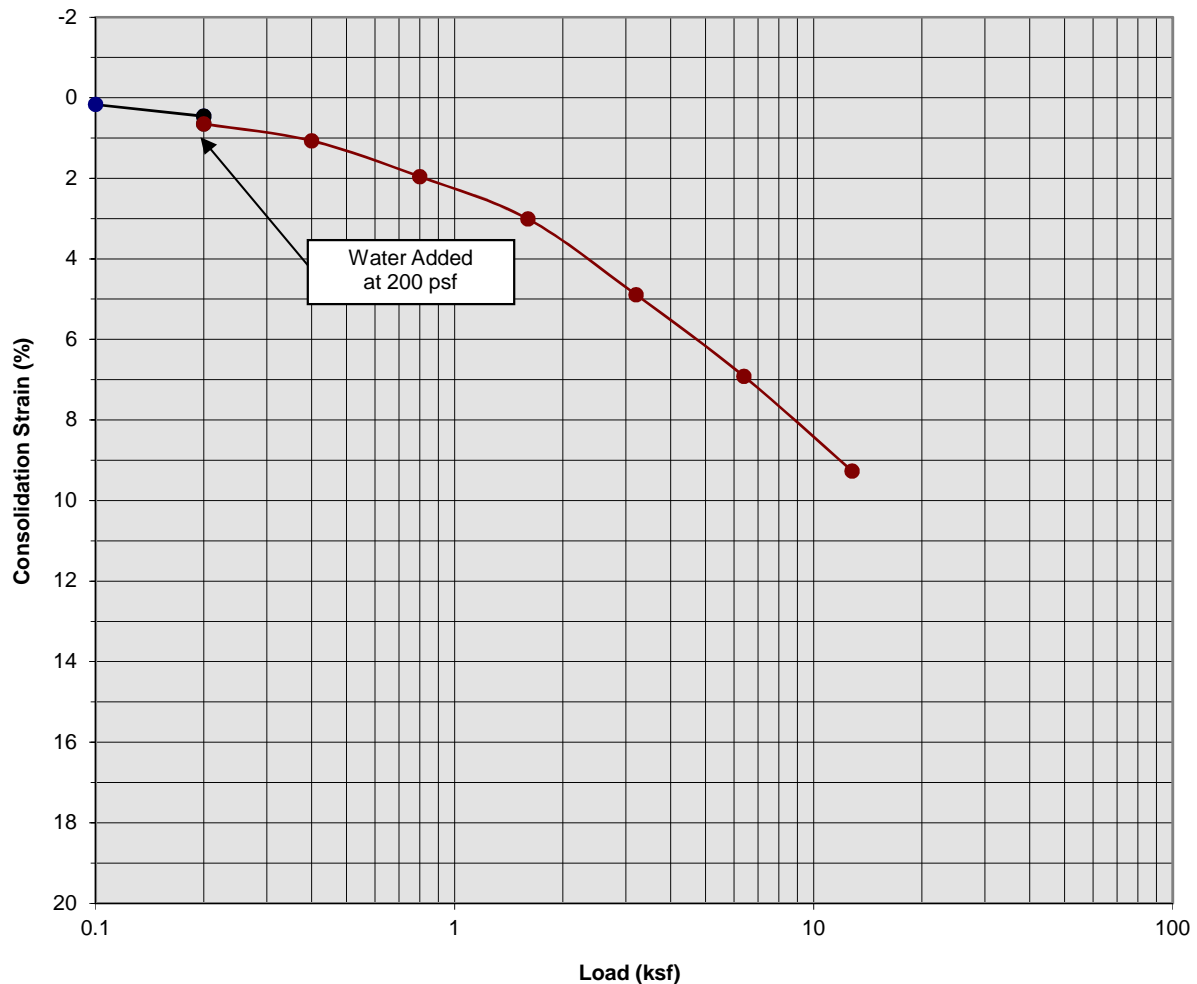
| | | | |
|-------------------------|--------|------------------------------|-------|
| Boring Number: | B-1 | Initial Moisture Content (%) | 19 |
| Sample Number: | --- | Final Moisture Content (%) | 18 |
| Depth (ft) | 7 to 8 | Initial Dry Density (pcf) | 110.6 |
| Specimen Diameter (in) | 2.4 | Final Dry Density (pcf) | 119.9 |
| Specimen Thickness (in) | 1.0 | Percent Collapse (%) | -0.24 |

Proposed Commercial/Industrial Development
 Ontario, California
 Project No. 18G129
PLATE C- 4



**SOUTHERN
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Consolidation/Collapse Test Results



Classification: FILL: Dark Gray to Black fine Sandy Silt

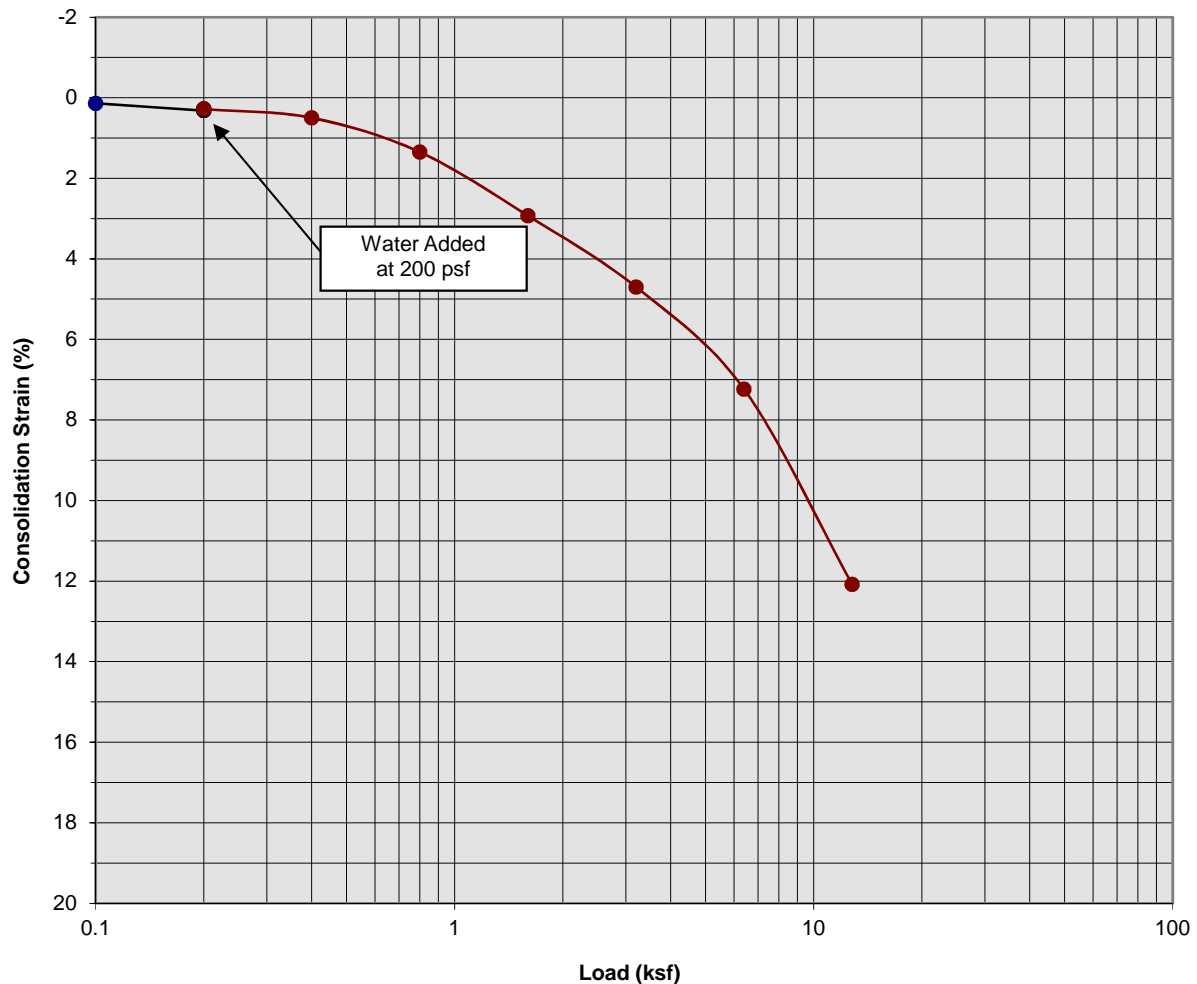
| | | | |
|-------------------------|--------|------------------------------|------|
| Boring Number: | B-2 | Initial Moisture Content (%) | 14 |
| Sample Number: | --- | Final Moisture Content (%) | 32 |
| Depth (ft) | 1 to 2 | Initial Dry Density (pcf) | 95.6 |
| Specimen Diameter (in) | 2.4 | Final Dry Density (pcf) | 92.1 |
| Specimen Thickness (in) | 1.0 | Percent Collapse (%) | 0.19 |

Proposed Commercial/Industrial Development
Ontario, California
Project No. 18G129
PLATE C- 5



**SOUTHERN
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Consolidation/Collapse Test Results



Classification: POSSIBLE FILL: Dark Gray to Black fine Sandy Silt, trace Clay

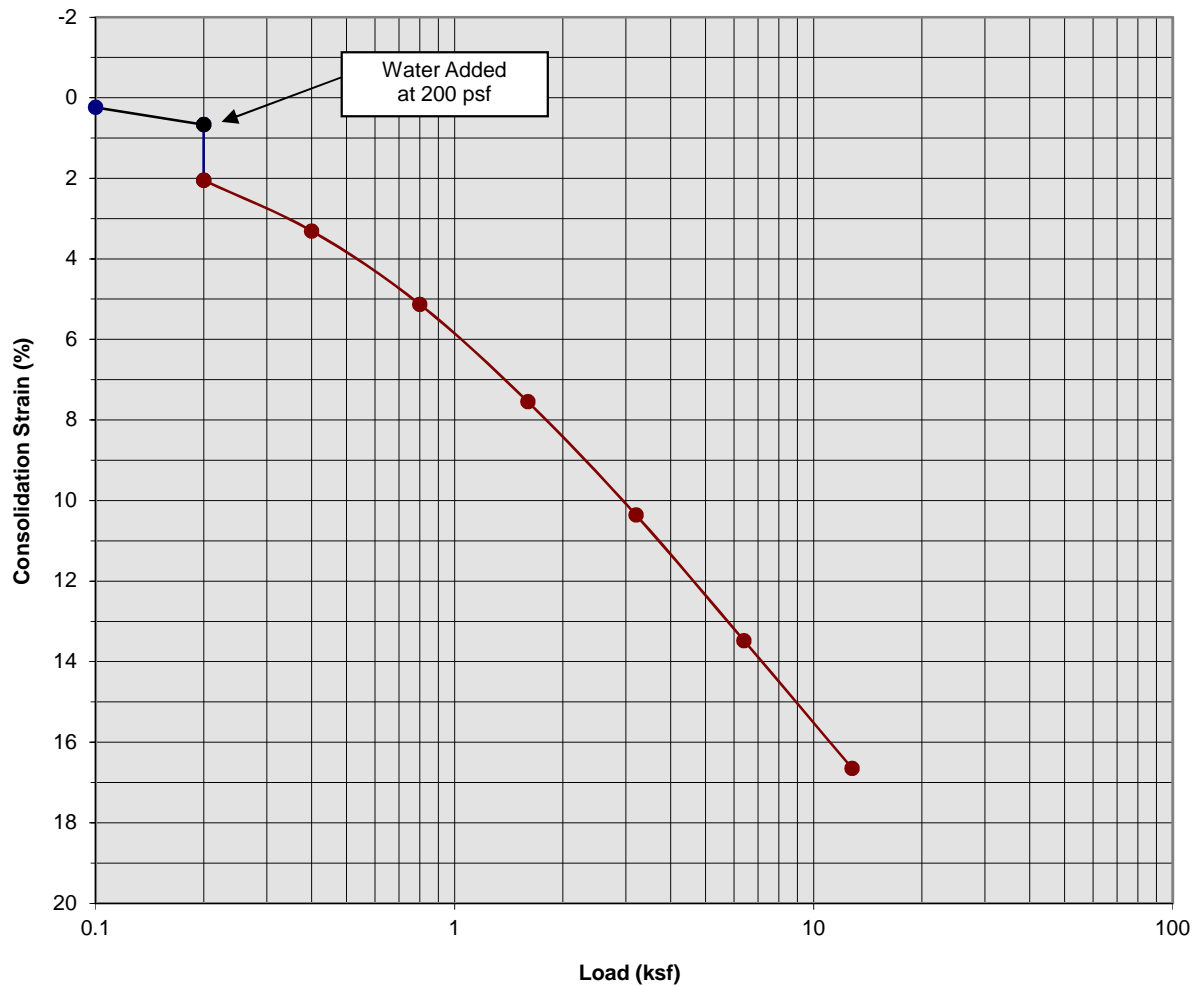
| | | | |
|-------------------------|--------|------------------------------|-------|
| Boring Number: | B-2 | Initial Moisture Content (%) | 21 |
| Sample Number: | --- | Final Moisture Content (%) | 23 |
| Depth (ft) | 3 to 4 | Initial Dry Density (pcf) | 96.2 |
| Specimen Diameter (in) | 2.4 | Final Dry Density (pcf) | 108.1 |
| Specimen Thickness (in) | 1.0 | Percent Collapse (%) | -0.04 |

Proposed Commercial/Industrial Development
Ontario, California
Project No. 18G129
PLATE C- 6



**SOUTHERN
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Consolidation/Collapse Test Results



Classification: POSSIBLE FILL: Dark Gray to Black fine Sandy Silt, trace Clay

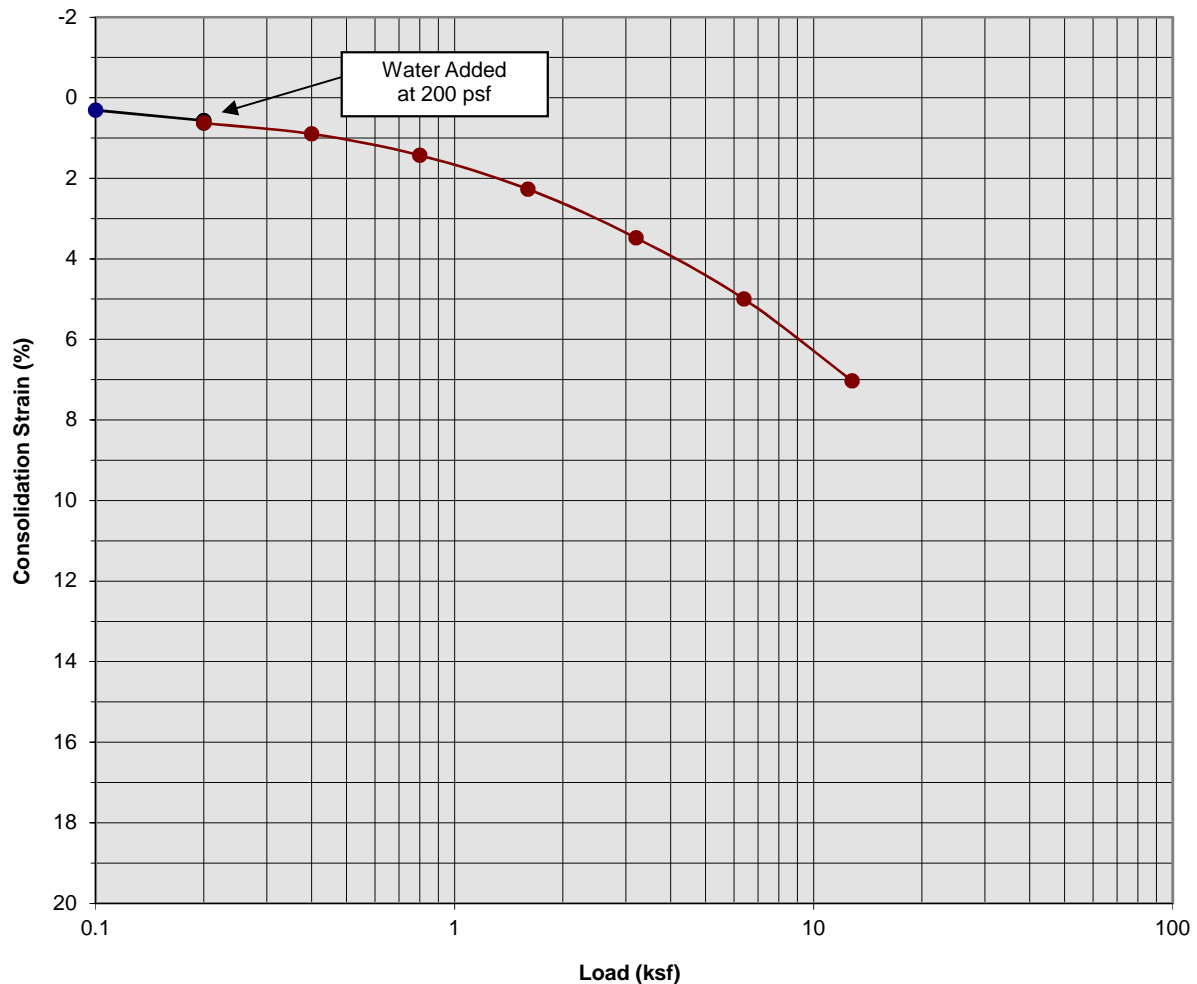
| | | | |
|-------------------------|--------|------------------------------|------|
| Boring Number: | B-2 | Initial Moisture Content (%) | 30 |
| Sample Number: | --- | Final Moisture Content (%) | 31 |
| Depth (ft) | 5 to 6 | Initial Dry Density (pcf) | 73.7 |
| Specimen Diameter (in) | 2.4 | Final Dry Density (pcf) | 88.4 |
| Specimen Thickness (in) | 1.0 | Percent Collapse (%) | 1.38 |

Proposed Commercial/Industrial Development
Ontario, California
Project No. 18G129
PLATE C- 7



**SOUTHERN
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Consolidation/Collapse Test Results



Classification: POSSIBLE FILL: Gray Brown fine Sandy Clay, some fine Sand

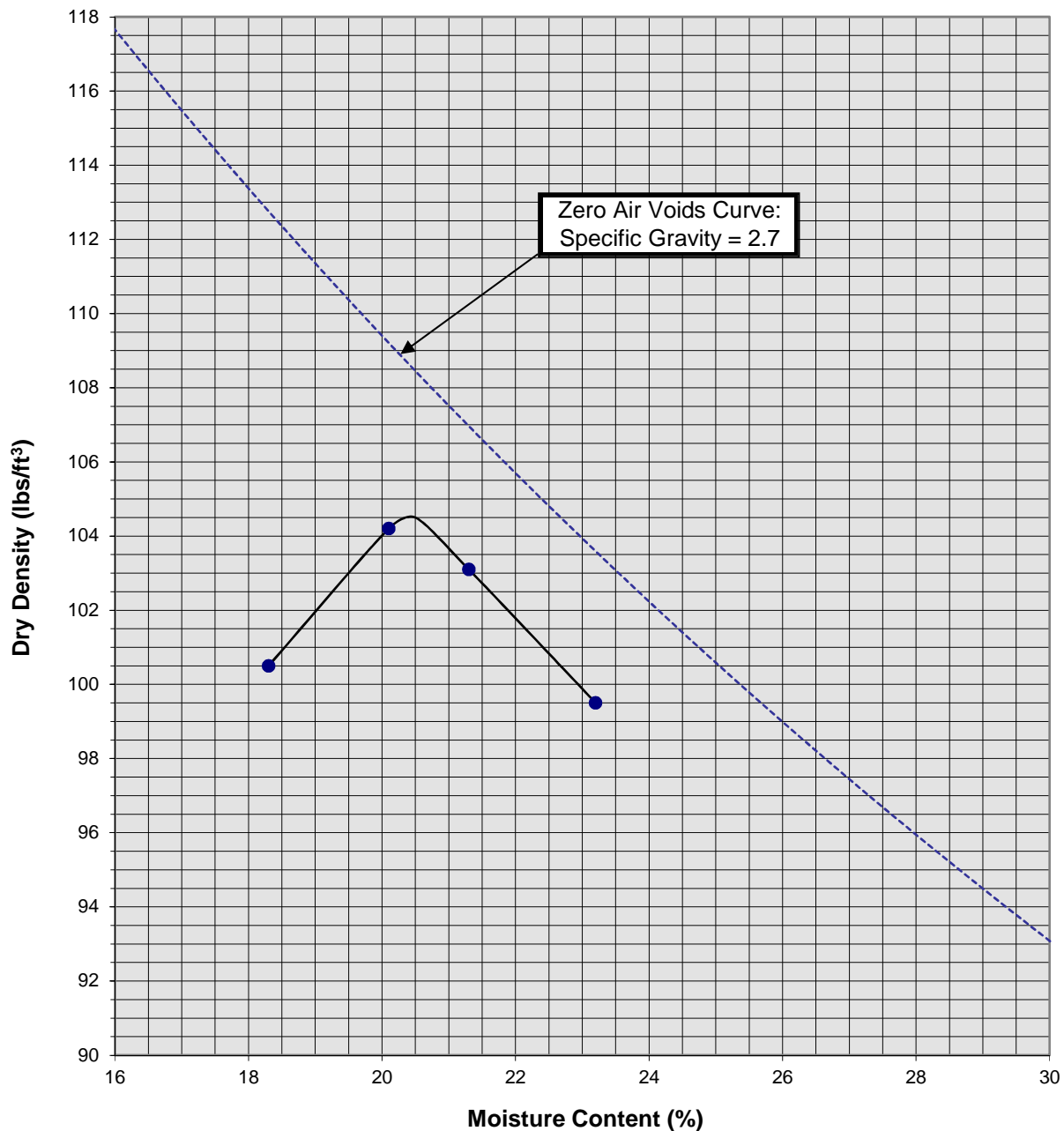
| | | | |
|-------------------------|--------|------------------------------|-------|
| Boring Number: | B-2 | Initial Moisture Content (%) | 24 |
| Sample Number: | --- | Final Moisture Content (%) | 21 |
| Depth (ft) | 7 to 8 | Initial Dry Density (pcf) | 111.4 |
| Specimen Diameter (in) | 2.4 | Final Dry Density (pcf) | 119.3 |
| Specimen Thickness (in) | 1.0 | Percent Collapse (%) | 0.06 |

Proposed Commercial/Industrial Development
 Ontario, California
 Project No. 18G129
PLATE C- 8



**SOUTHERN
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Moisture/Density Relationship ASTM D-1557



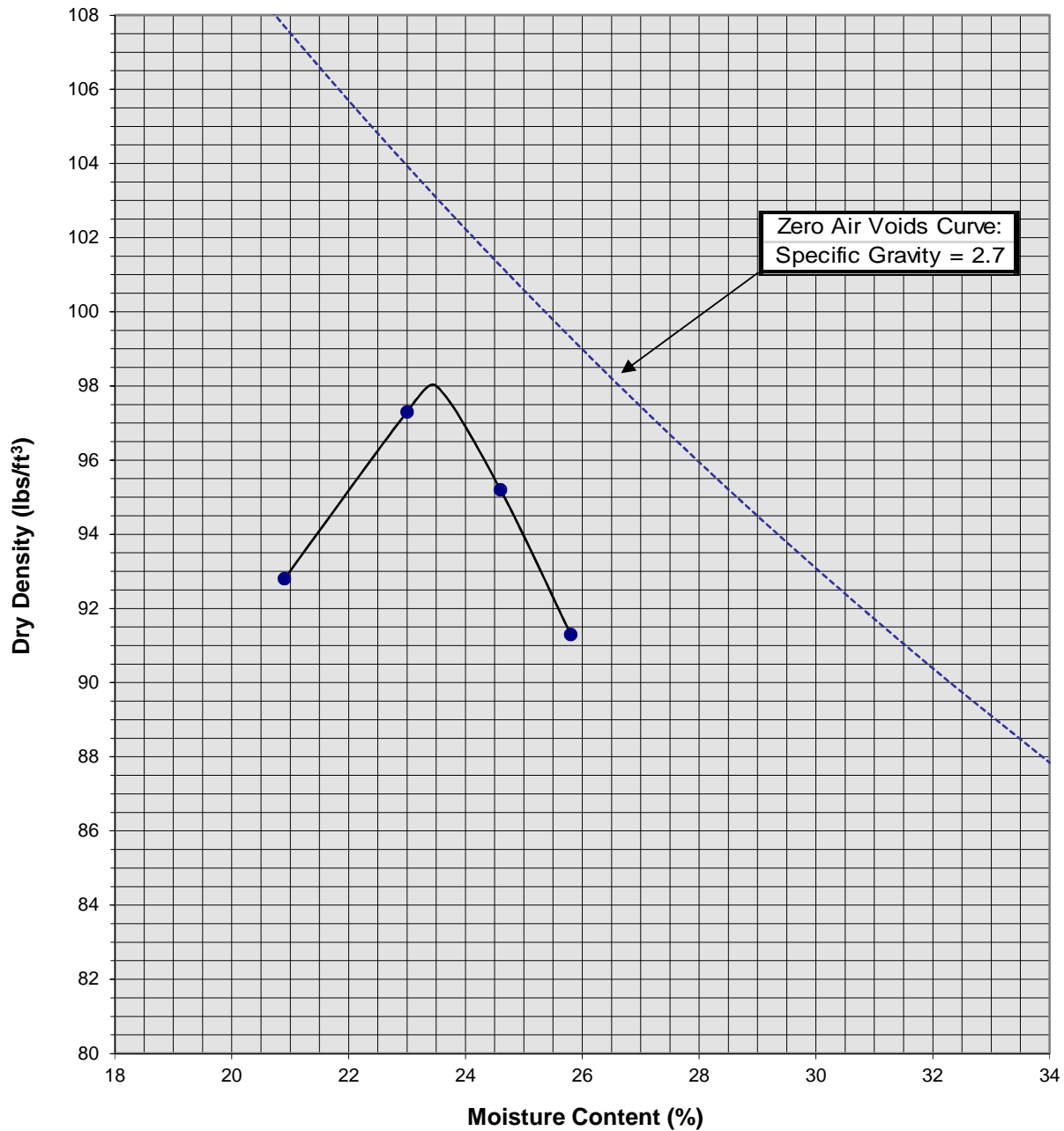
| | |
|---------------------------|--|
| Soil ID Number | B-2 @ 0 to 5' |
| Optimum Moisture (%) | 20.5 |
| Maximum Dry Density (pcf) | 104.5 |
| Soil Classification | Dark Gray fine Sandy Silt to Silty Clay, trace fine Gravel, trace fine Sand, some organic fibers |

Proposed Commercial/Industrial Development
Ontario, California
Project No. 18G129
PLATE C-9



**SOUTHERN
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Moisture/Density Relationship ASTM D-1557



| | |
|---------------------------|---|
| Soil ID Number | B-3 @ 0 to 5' |
| Optimum Moisture (%) | 23.5 |
| Maximum Dry Density (pcf) | 98 |
| Soil Classification | Dark Gray fine sandy clay and Clayey Silt, trace fine Sand, some Organic fibers |

Proposed Commercial/Industrial Development
Ontario, California
Project No. 18G129
PLATE C-10



**SOUTHERN
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APPENDIX

GRADING GUIDE SPECIFICATIONS

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

General

- The Earthwork Contractor is responsible for the satisfactory completion of all earthwork in accordance with the plans and geotechnical reports, and in accordance with city, county, and applicable building codes.
- The Geotechnical Engineer is the representative of the Owner/Builder for the purpose of implementing the report recommendations and guidelines. These duties are not intended to relieve the Earthwork Contractor of any responsibility to perform in a workman-like manner, nor is the Geotechnical Engineer to direct the grading equipment or personnel employed by the Contractor.
- The Earthwork Contractor is required to notify the Geotechnical Engineer of the anticipated work and schedule so that testing and inspections can be provided. If necessary, work may be stopped and redone if personnel have not been scheduled in advance.
- The Earthwork Contractor is required to have suitable and sufficient equipment on the job-site to process, moisture condition, mix and compact the amount of fill being placed to the approved compaction. In addition, suitable support equipment should be available to conform with recommendations and guidelines in this report.
- Canyon cleanouts, overexcavation areas, processed ground to receive fill, key excavations, subdrains and benches should be observed by the Geotechnical Engineer prior to placement of any fill. It is the Earthwork Contractor's responsibility to notify the Geotechnical Engineer of areas that are ready for inspection.
- Excavation, filling, and subgrade preparation should be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working surface. The Geotechnical Engineer must be informed of springs or water seepage encountered during grading or foundation construction for possible revision to the recommended construction procedures and/or installation of subdrains.

Site Preparation

- The Earthwork Contractor is responsible for all clearing, grubbing, stripping and site preparation for the project in accordance with the recommendations of the Geotechnical Engineer.
- If any materials or areas are encountered by the Earthwork Contractor which are suspected of having toxic or environmentally sensitive contamination, the Geotechnical Engineer and Owner/Builder should be notified immediately.

- Major vegetation should be stripped and disposed of off-site. This includes trees, brush, heavy grasses and any materials considered unsuitable by the Geotechnical Engineer.
- Underground structures such as basements, cesspools or septic disposal systems, mining shafts, tunnels, wells and pipelines should be removed under the inspection of the Geotechnical Engineer and recommendations provided by the Geotechnical Engineer and/or city, county or state agencies. If such structures are known or found, the Geotechnical Engineer should be notified as soon as possible so that recommendations can be formulated.
- Any topsoil, slopewash, colluvium, alluvium and rock materials which are considered unsuitable by the Geotechnical Engineer should be removed prior to fill placement.
- Remaining voids created during site clearing caused by removal of trees, foundations basements, irrigation facilities, etc., should be excavated and filled with compacted fill.
- Subsequent to clearing and removals, areas to receive fill should be scarified to a depth of 10 to 12 inches, moisture conditioned and compacted
- The moisture condition of the processed ground should be at or slightly above the optimum moisture content as determined by the Geotechnical Engineer. Depending upon field conditions, this may require air drying or watering together with mixing and/or discing.

Compacted Fills

- Soil materials imported to or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable in the opinion of the Geotechnical Engineer. Unless otherwise approved by the Geotechnical Engineer, all fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated," and shall be very low to non-expansive with a maximum expansion index (EI) of 50. The top 12 inches of the compacted fill should have a maximum particle size of 3 inches, and all underlying compacted fill material a maximum 6-inch particle size, except as noted below.
- All soils should be evaluated and tested by the Geotechnical Engineer. Materials with high expansion potential, low strength, poor gradation or containing organic materials may require removal from the site or selective placement and/or mixing to the satisfaction of the Geotechnical Engineer.
- Rock fragments or rocks less than 6 inches in their largest dimensions, or as otherwise determined by the Geotechnical Engineer, may be used in compacted fill, provided the distribution and placement is satisfactory in the opinion of the Geotechnical Engineer.
- Rock fragments or rocks greater than 12 inches should be taken off-site or placed in accordance with recommendations and in areas designated as suitable by the Geotechnical Engineer. These materials should be placed in accordance with Plate D-8 of these Grading Guide Specifications and in accordance with the following recommendations:
 - Rocks 12 inches or more in diameter should be placed in rows at least 15 feet apart, 15 feet from the edge of the fill, and 10 feet or more below subgrade. Spaces should be left between each rock fragment to provide for placement and compaction of soil around the fragments.
 - Fill materials consisting of soil meeting the minimum moisture content requirements and free of oversize material should be placed between and over the rows of rock or

concrete. Ample water and compactive effort should be applied to the fill materials as they are placed in order that all of the voids between each of the fragments are filled and compacted to the specified density.

- Subsequent rows of rocks should be placed such that they are not directly above a row placed in the previous lift of fill. A minimum 5-foot offset between rows is recommended.
- To facilitate future trenching, oversized material should not be placed within the range of foundation excavations, future utilities or other underground construction unless specifically approved by the soil engineer and the developer/owner representative.
- Fill materials approved by the Geotechnical Engineer should be placed in areas previously prepared to receive fill and in evenly placed, near horizontal layers at about 6 to 8 inches in loose thickness, or as otherwise determined by the Geotechnical Engineer for the project.
- Each layer should be moisture conditioned to optimum moisture content, or slightly above, as directed by the Geotechnical Engineer. After proper mixing and/or drying, to evenly distribute the moisture, the layers should be compacted to at least 90 percent of the maximum dry density in compliance with ASTM D-1557-78 unless otherwise indicated.
- Density and moisture content testing should be performed by the Geotechnical Engineer at random intervals and locations as determined by the Geotechnical Engineer. These tests are intended as an aid to the Earthwork Contractor, so he can evaluate his workmanship, equipment effectiveness and site conditions. The Earthwork Contractor is responsible for compaction as required by the Geotechnical Report(s) and governmental agencies.
- Fill areas unused for a period of time may require moisture conditioning, processing and recompaction prior to the start of additional filling. The Earthwork Contractor should notify the Geotechnical Engineer of his intent so that an evaluation can be made.
- Fill placed on ground sloping at a 5-to-1 inclination (horizontal-to-vertical) or steeper should be benched into bedrock or other suitable materials, as directed by the Geotechnical Engineer. Typical details of benching are illustrated on Plates D-2, D-4, and D-5.
- Cut/fill transition lots should have the cut portion overexcavated to a depth of at least 3 feet and rebuilt with fill (see Plate D-1), as determined by the Geotechnical Engineer.
- All cut lots should be inspected by the Geotechnical Engineer for fracturing and other bedrock conditions. If necessary, the pads should be overexcavated to a depth of 3 feet and rebuilt with a uniform, more cohesive soil type to impede moisture penetration.
- Cut portions of pad areas above buttresses or stabilizations should be overexcavated to a depth of 3 feet and rebuilt with uniform, more cohesive compacted fill to impede moisture penetration.
- Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure that excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls must be properly tested and approved by the Geotechnical Engineer with consideration of the lateral earth pressure used in the design.

Foundations

- The foundation influence zone is defined as extending one foot horizontally from the outside edge of a footing, and proceeding downward at a ½ horizontal to 1 vertical (0.5:1) inclination.
- Where overexcavation beneath a footing subgrade is necessary, it should be conducted so as to encompass the entire foundation influence zone, as described above.
- Compacted fill adjacent to exterior footings should extend at least 12 inches above foundation bearing grade. Compacted fill within the interior of structures should extend to the floor subgrade elevation.

Fill Slopes

- The placement and compaction of fill described above applies to all fill slopes. Slope compaction should be accomplished by overfilling the slope, adequately compacting the fill in even layers, including the overfilled zone and cutting the slope back to expose the compacted core
- Slope compaction may also be achieved by backrolling the slope adequately every 2 to 4 vertical feet during the filling process as well as requiring the earth moving and compaction equipment to work close to the top of the slope. Upon completion of slope construction, the slope face should be compacted with a sheepsfoot connected to a sideboom and then grid rolled. This method of slope compaction should only be used if approved by the Geotechnical Engineer.
- Sandy soils lacking in adequate cohesion may be unstable for a finished slope condition and therefore should not be placed within 15 horizontal feet of the slope face.
- All fill slopes should be keyed into bedrock or other suitable material. Fill keys should be at least 15 feet wide and inclined at 2 percent into the slope. For slopes higher than 30 feet, the fill key width should be equal to one-half the height of the slope (see Plate D-5).
- All fill keys should be cleared of loose slough material prior to geotechnical inspection and should be approved by the Geotechnical Engineer and governmental agencies prior to filling.
- The cut portion of fill over cut slopes should be made first and inspected by the Geotechnical Engineer for possible stabilization requirements. The fill portion should be adequately keyed through all surficial soils and into bedrock or suitable material. Soils should be removed from the transition zone between the cut and fill portions (see Plate D-2).

Cut Slopes

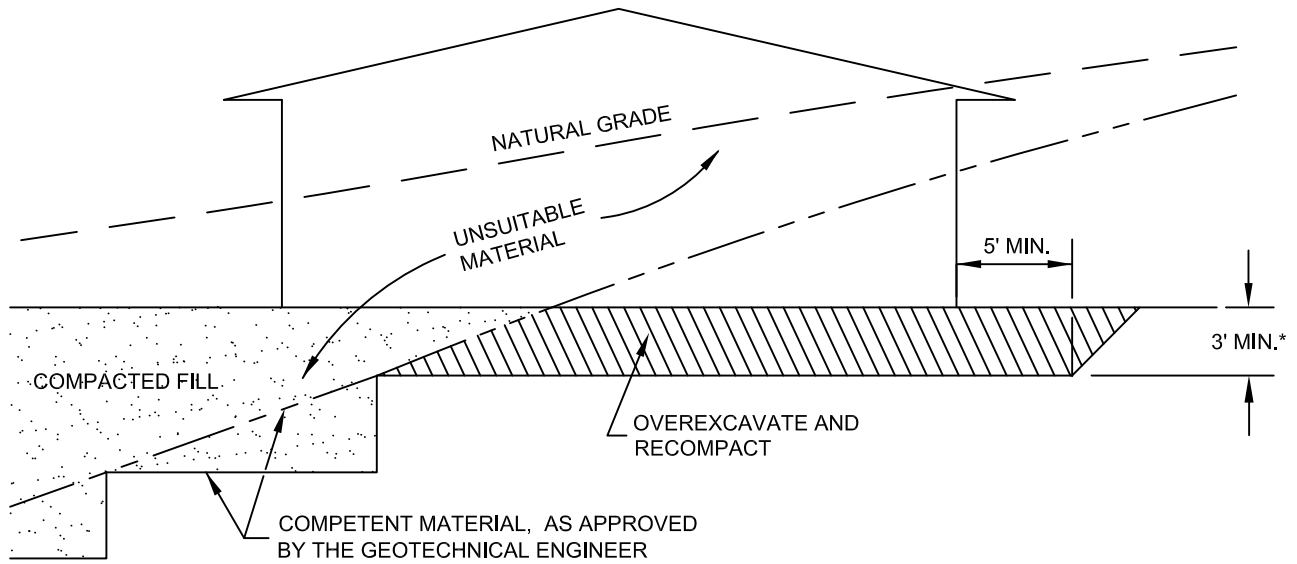
- All cut slopes should be inspected by the Geotechnical Engineer to determine the need for stabilization. The Earthwork Contractor should notify the Geotechnical Engineer when slope cutting is in progress at intervals of 10 vertical feet. Failure to notify may result in a delay in recommendations.
- Cut slopes exposing loose, cohesionless sands should be reported to the Geotechnical Engineer for possible stabilization recommendations.
- All stabilization excavations should be cleared of loose slough material prior to geotechnical inspection. Stakes should be provided by the Civil Engineer to verify the location and dimensions of the key. A typical stabilization fill detail is shown on Plate D-5.

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

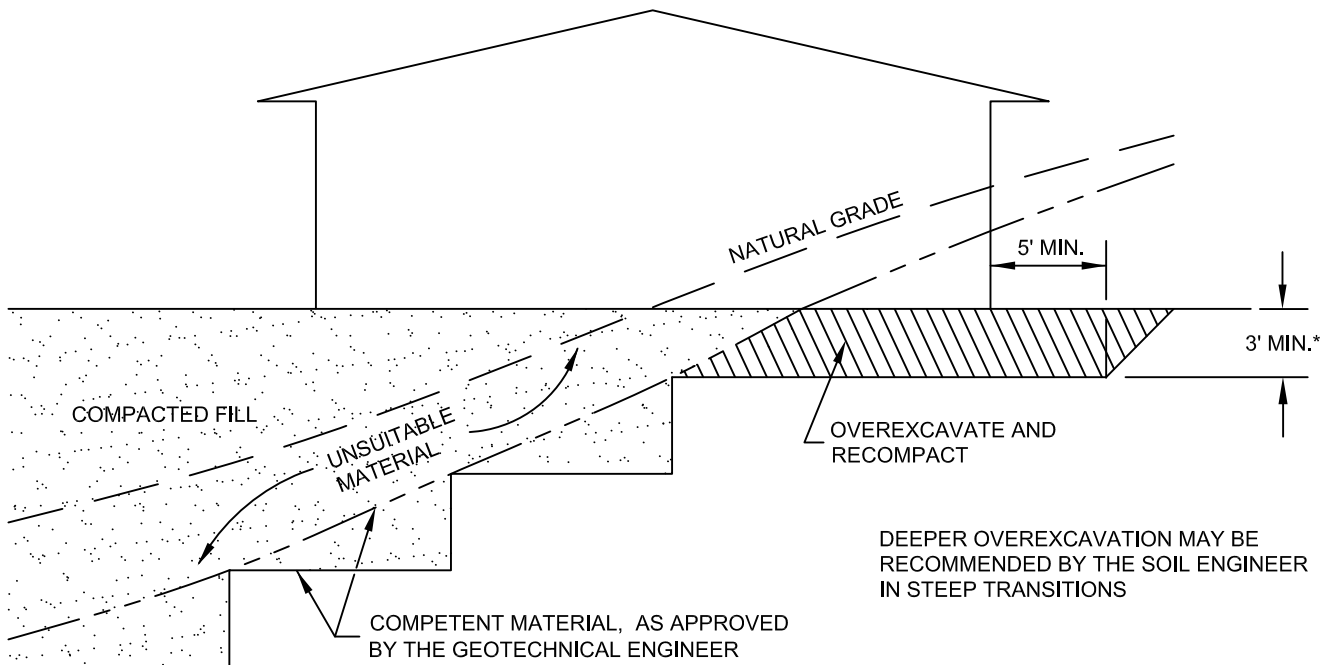
Subdrains

- Subdrains may be required in canyons and swales where fill placement is proposed. Typical subdrain details for canyons are shown on Plate D-3. Subdrains should be installed after approval of removals and before filling, as determined by the Soils Engineer.
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.
- Filter material for subdrains should conform to CALTRANS Specification 68-1.025 or as approved by the Geotechnical Engineer for the specific site conditions. Clean $\frac{3}{4}$ -inch crushed rock may be used provided it is wrapped in an acceptable filter cloth and approved by the Geotechnical Engineer. Pipe diameters should be 6 inches for runs up to 500 feet and 8 inches for the downstream continuations of longer runs. Four-inch diameter pipe may be used in buttress and stabilization fills.

CUT LOT



CUT/FILL LOT (TRANSITION)



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

TRANSITION LOT DETAIL

GRADING GUIDE SPECIFICATIONS

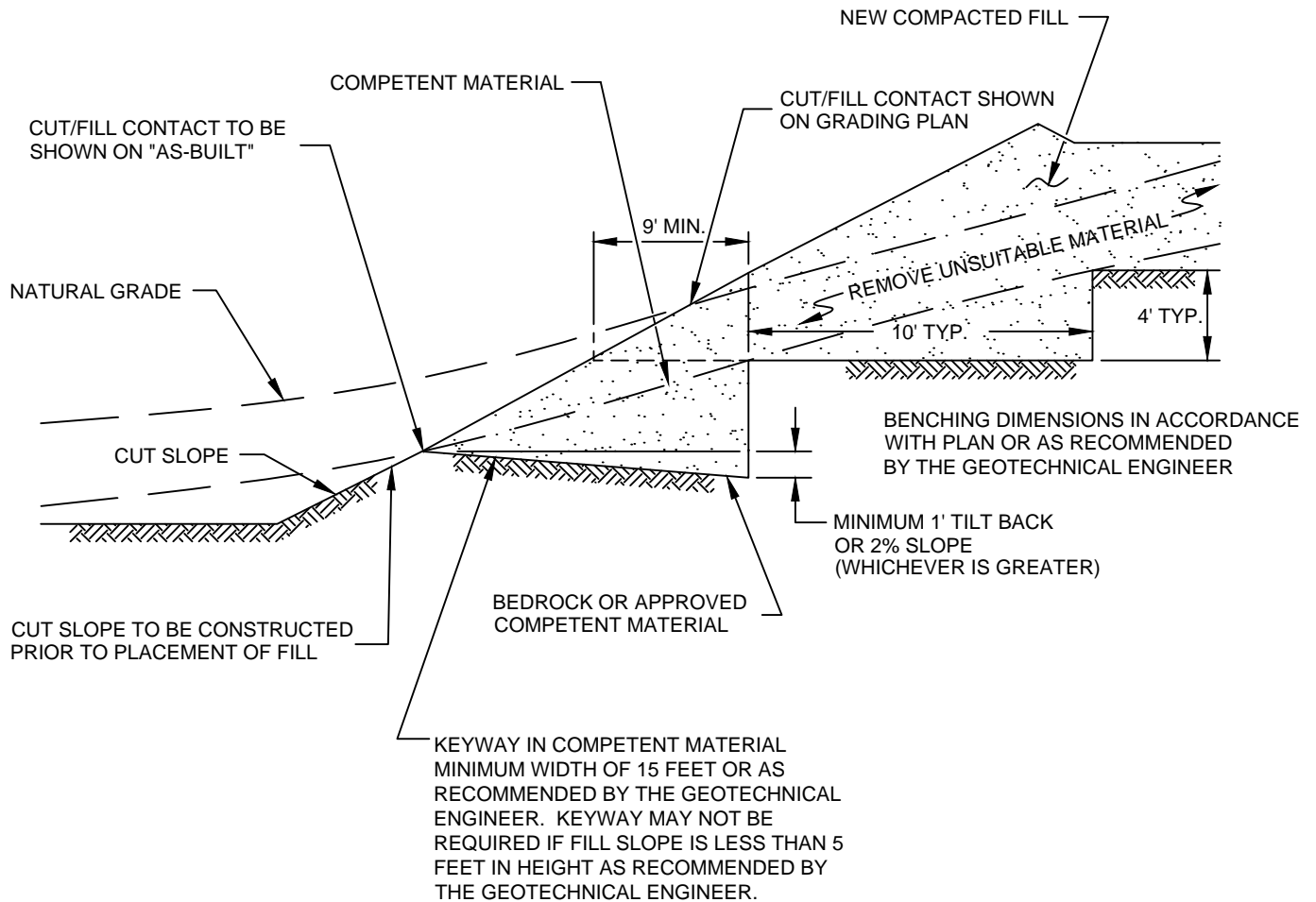
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1



**SOUTHERN
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FILL ABOVE CUT SLOPE DETAIL
GRADING GUIDE SPECIFICATIONS

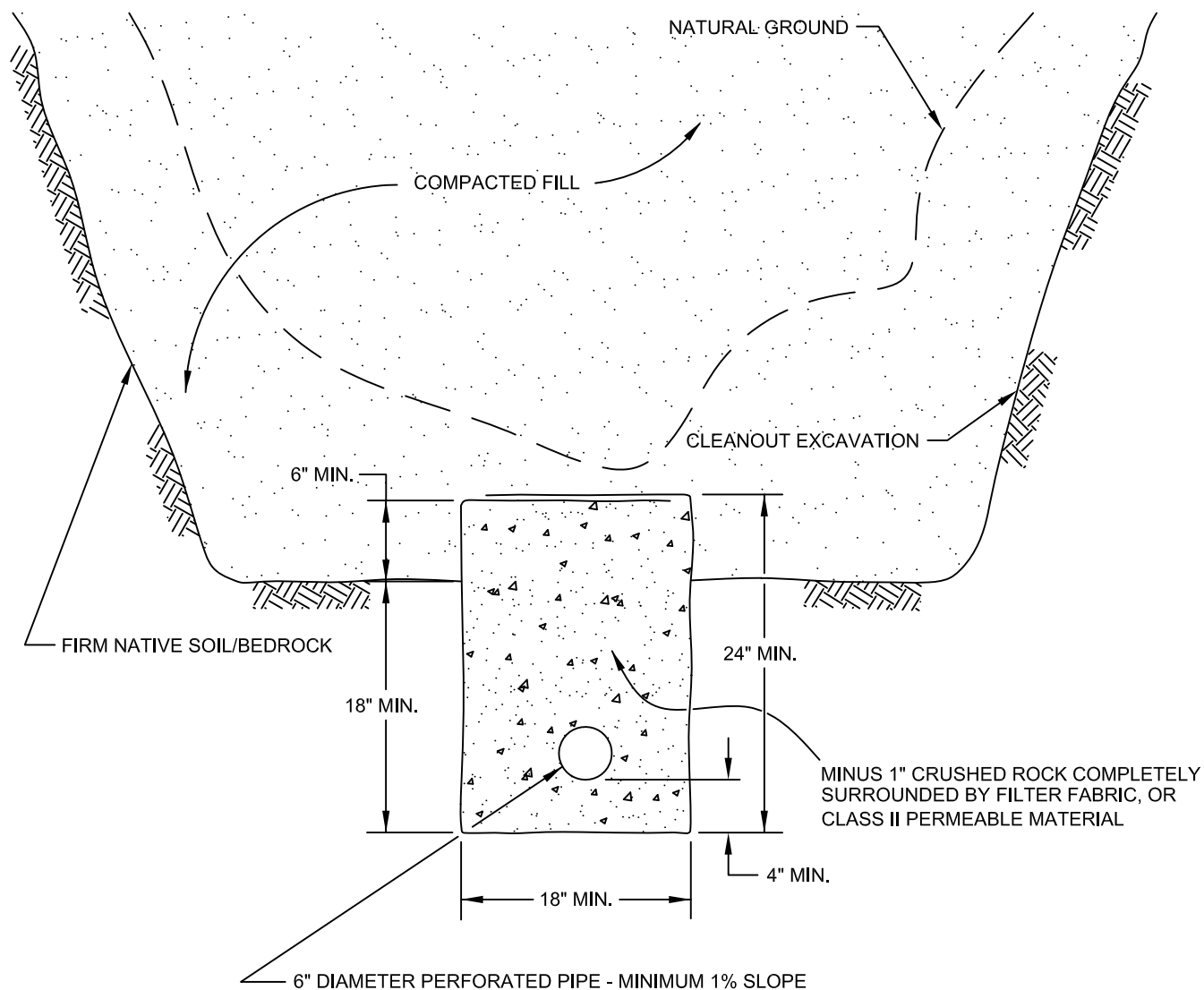
NOT TO SCALE

DRAWN: JAS
 CHKD: GKM

PLATE D-2




**SOUTHERN
 CALIFORNIA
 GEOTECHNICAL**

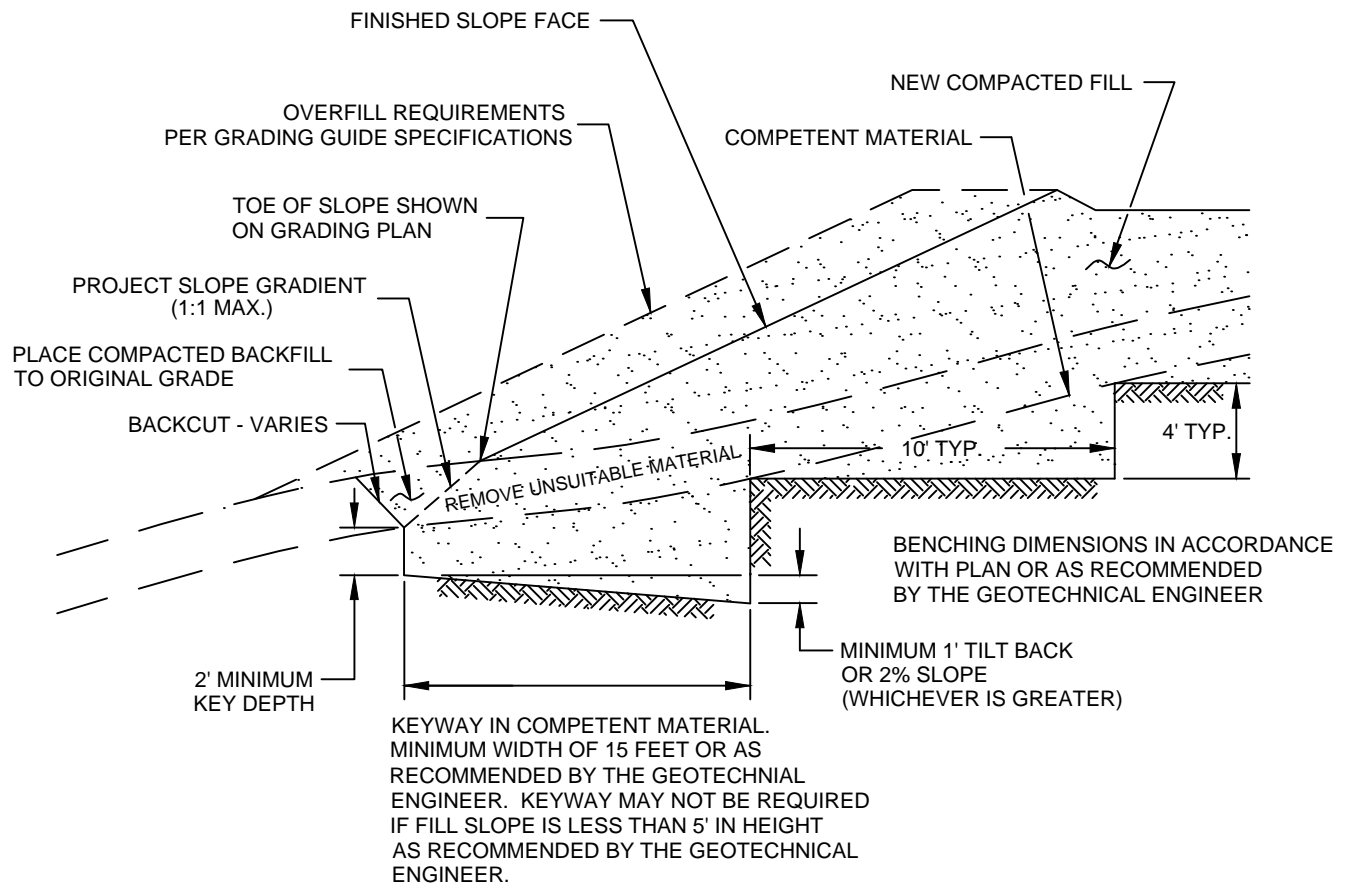


| PIPE MATERIAL |
|------------------------------|
| ADS (CORRUGATED POLETHYLENE) |
| TRANSITE UNDERDRAIN |
| PVC OR ABS: SDR 35 |
| SDR 21 |

| DEPTH OF FILL OVER SUBDRAIN |
|-----------------------------|
| 8 |
| 20 |
| 35 |
| 100 |

**SCHEMATIC ONLY
NOT TO SCALE**

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



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

FILL ABOVE NATURAL SLOPE DETAIL GRADING GUIDE SPECIFICATIONS

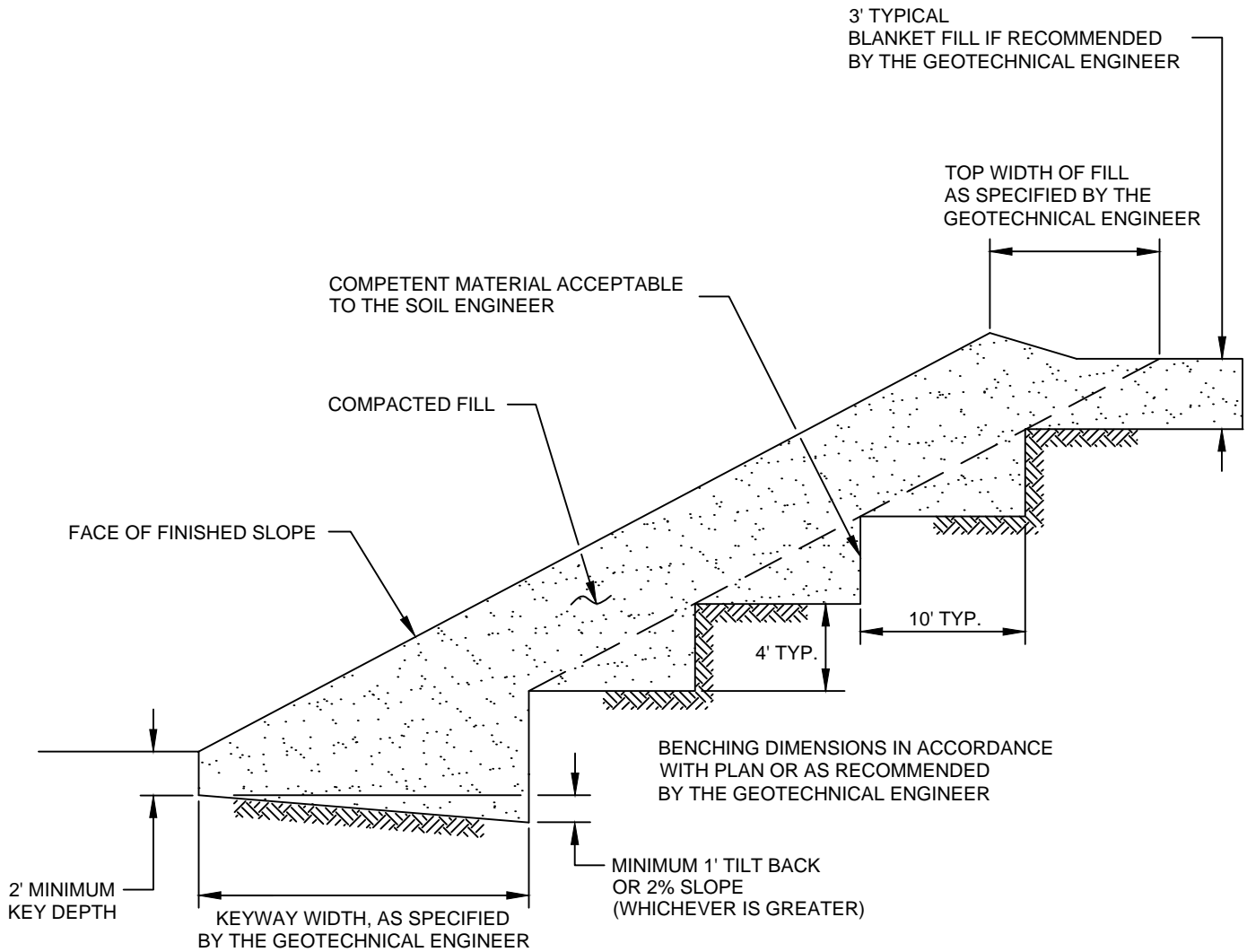
NOT TO SCALE


DRAWN: JAS
CHKD: GKM

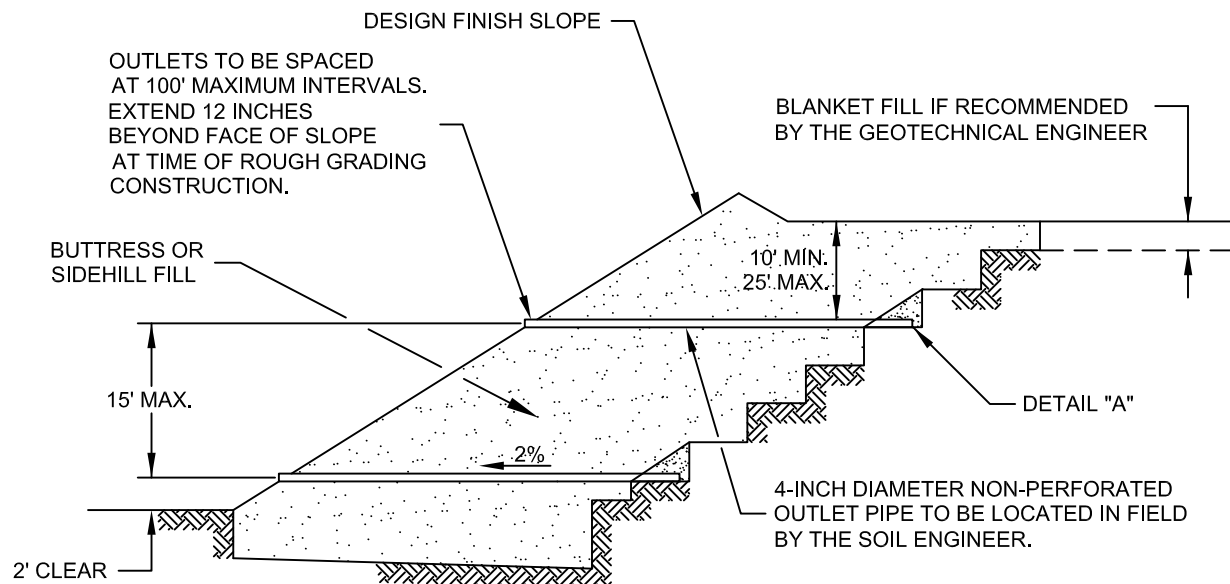
PLATE D-4



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



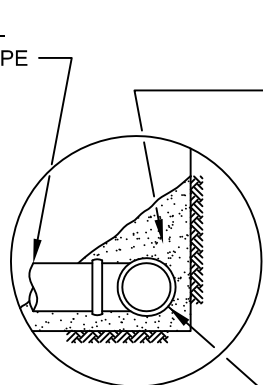
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

| SIEVE SIZE | MAXIMUM PERCENTAGE PASSING |
|---------------------------------|----------------------------|
| 1 1/2" | 100 |
| NO. 4 | 50 |
| NO. 200 | 8 |
| SAND EQUIVALENT = MINIMUM OF 50 | |

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



DETAIL "A"

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


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

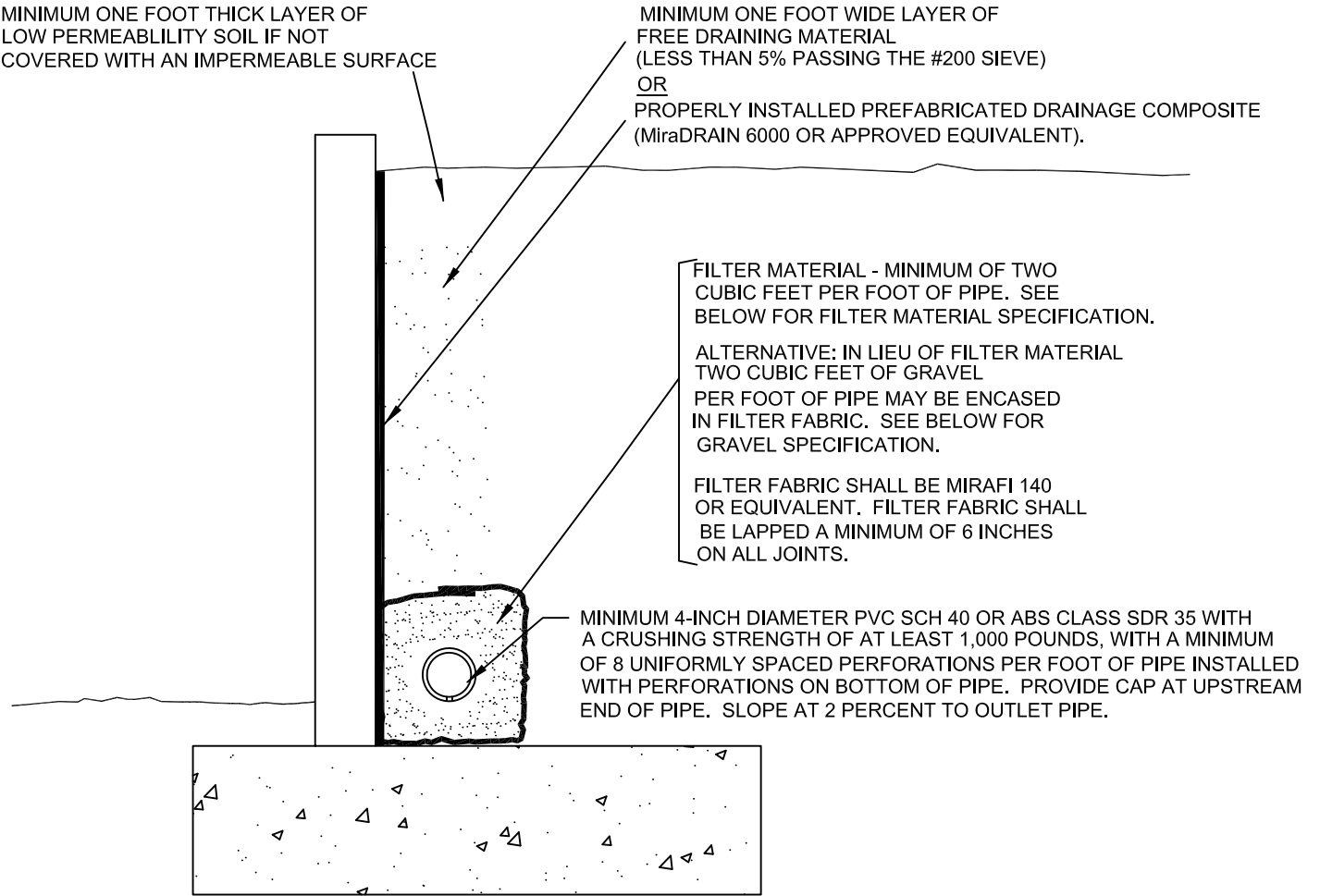
FILTER FABRIC SHALL BE MIRAFI 140 OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

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

NOTES:

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

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




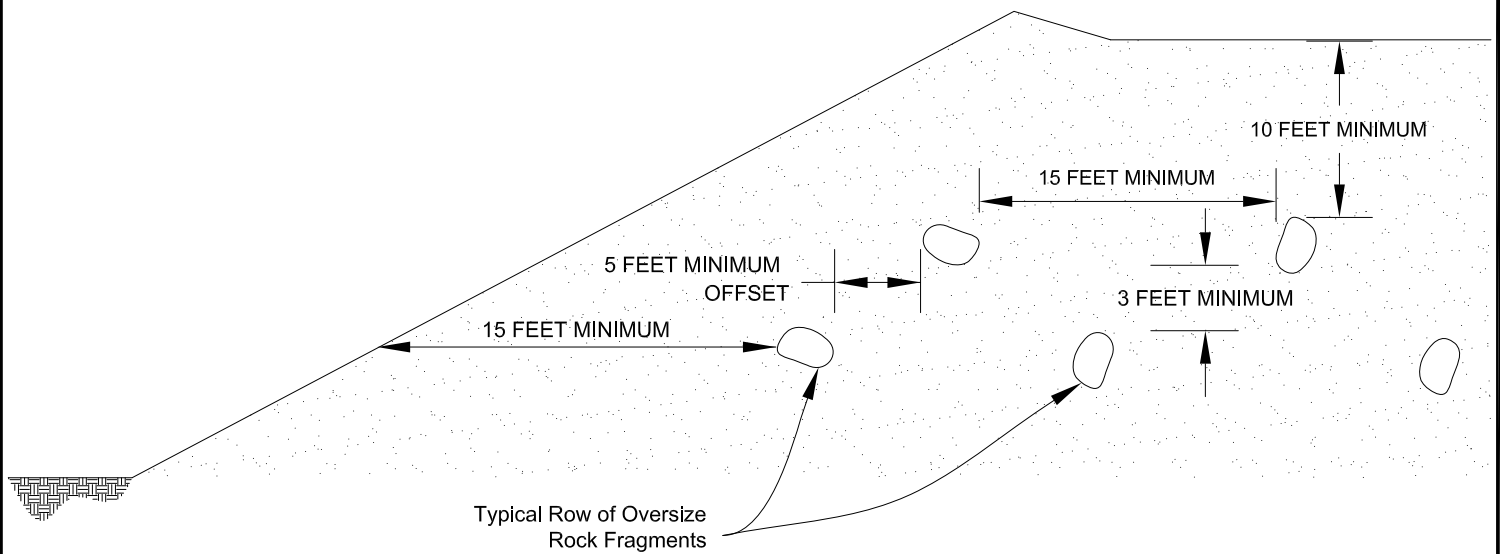
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION
OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

| 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 |

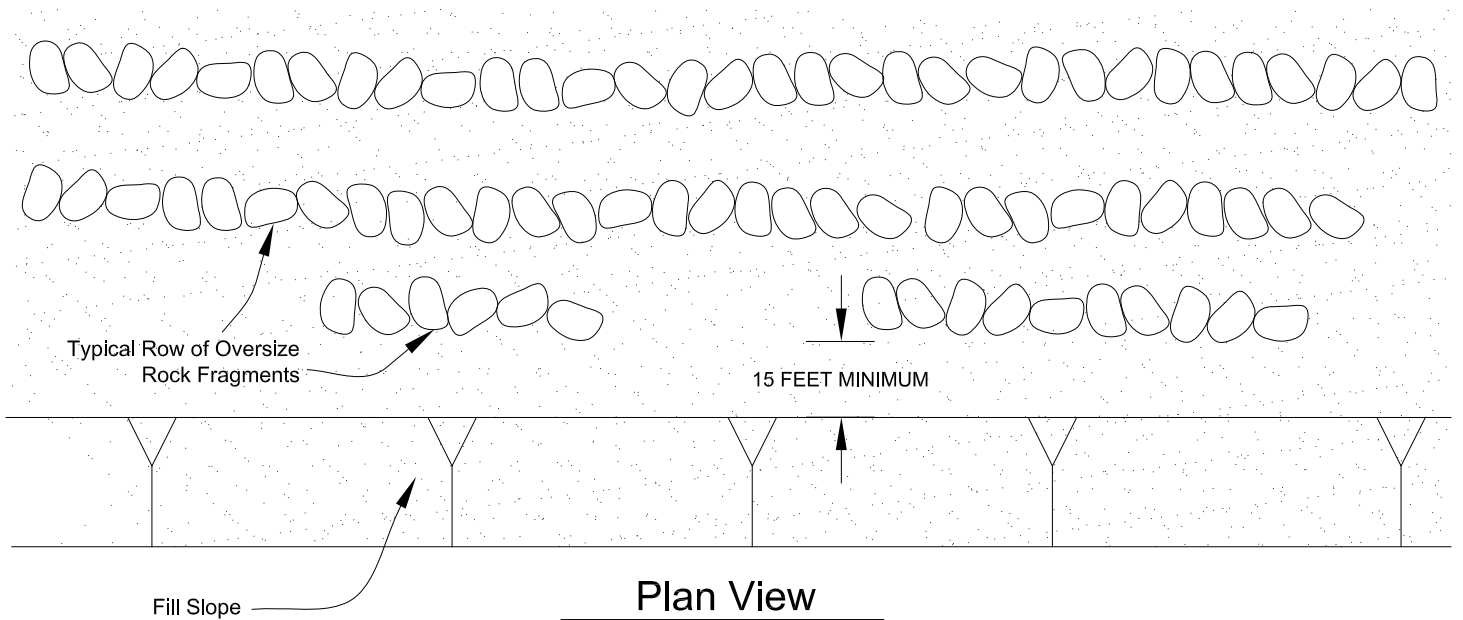
"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR
APPROVED EQUIVALENT:

| 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 | |



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
 CHKD: GKM

PLATE D-8



**SOUTHERN
 CALIFORNIA
 GEOTECHNICAL**

APPENDIX

USGS Design Maps Summary Report

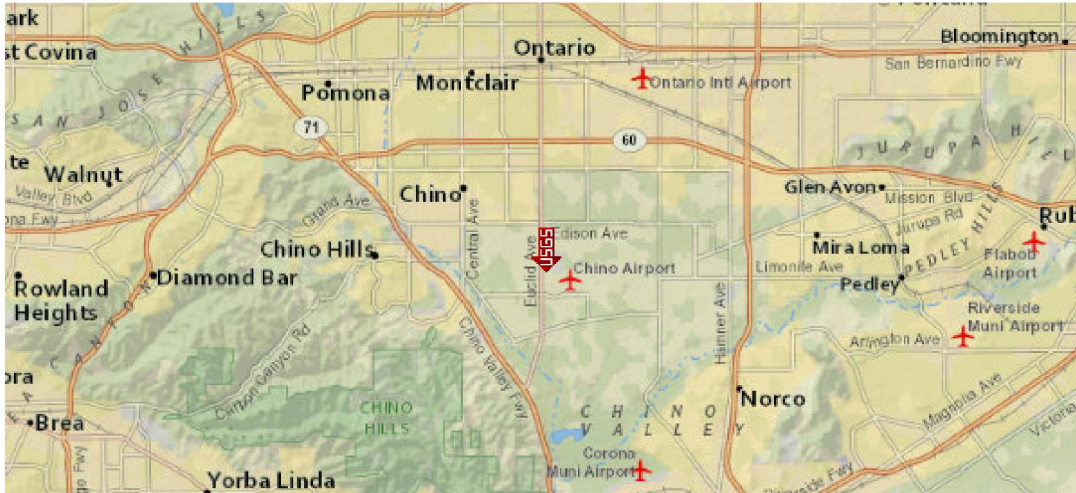
User-Specified Input

Building Code Reference Document ASCE 7-10 Standard
(which utilizes USGS hazard data available in 2008)

Site Coordinates 33.9869°N, 117.64856°W

Site Soil Classification Site Class D – “Stiff Soil”

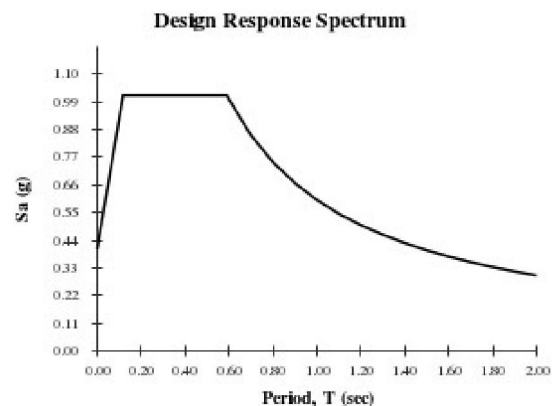
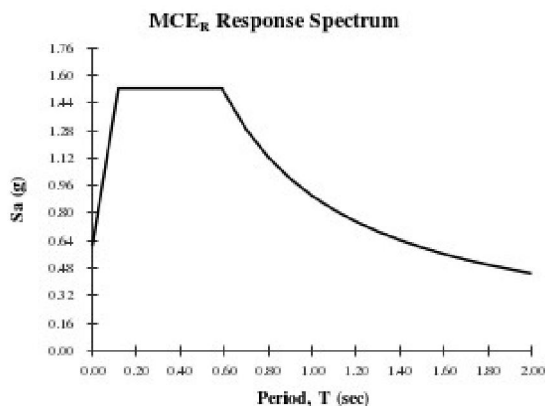
Risk Category I/II/III



USGS-Provided Output

| | | |
|-------------------------|----------------------------|----------------------------|
| $S_s = 1.524 \text{ g}$ | $S_{Ms} = 1.524 \text{ g}$ | $S_{Ds} = 1.016 \text{ g}$ |
| $S_1 = 0.600 \text{ g}$ | $S_{M1} = 0.900 \text{ g}$ | $S_{D1} = 0.600 \text{ g}$ |

For information on how the S_s and S_1 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 COMMERCIAL/INDUSTRIAL DEVELOPMENT | |
| ONTARIO, CALIFORNIA | |
| DRAWN: JLH |  SOUTHERN CALIFORNIA GEOTECHNICAL |
| CHKD: RGT | |
| SCG PROJECT 18G129-1 | |
| PLATE E-1 | |