GEOTECHNICAL INVESTIGATION
PROPOSED WAREHOUSE

NEC Foothill Boulevard and Central Avenue
Upland, California
for
Bridge Development Partners

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

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November 12, 2019

Bridge Development Partners
1334 Parkview Avenue, Suite 310
Manhattan Beach, California 90266

Attention: Mr. Brendan Kotler

Project No.: **18G122-1R2**

Subject: **Geotechnical Investigation**
Proposed Warehouse
NEC Foothill Boulevard and Central Avenue
Upland, California

Gentlemen:

In accordance with your request, we have conducted a geotechnical investigation at the subject site. We are pleased to present this report summarizing the conclusions and recommendations developed from our investigation.

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

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

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

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Principal Engineer

Distribution: (1) Addressee

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1.0 EXECUTIVE SUMMARY

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

Geotechnical Design Considerations

- Artificial fill soils were encountered at most of the trench locations, extending from either the ground surface or from beneath the existing pavements to depths of 1½ to 7½± feet.
- The fill soils and near-surface alluvial soils possess variable strengths. The fill soils possessed varying amounts of trash and debris including fragments of brick, wire, paper, plastic, metal, wood, tree stumps, glass, concrete, and asphalt. In addition, the existing fill soils are considered to represent undocumented fill. These soils, in their present condition, are not considered suitable for support of the foundation loads of the new structure.
- Remedial grading will be necessary to remove the undocumented fill soils in their entirety as well as the upper portion of the near-surface native alluvium and replace these materials as compacted structural fill.
- The native alluvial soils possess significant amounts of oversized materials, including cobbles and boulders. Where grading will require excavation into these materials, consideration should be given to using selective grading techniques to remove the cobbles and/or boulders from these soils prior to reuse as fill. Recommendations regarding selective grading and handling of oversized materials are provided in Section 6.3 and Appendix D of this report.

Site Preparation Recommendations

- Initial site preparation should include stripping of any topsoil or vegetation. The site is moderately to heavily vegetated with shrubs, grasses, and weeds. Also, a significant amount of trash was observed at the surface throughout the site. These materials should be disposed of off-site.
- Remedial grading is recommended to be performed within the proposed building area in order to remove all of the artificial fill soils and a portion of the near-surface native alluvial soils. The soils within the proposed building area should be overexcavated to a depth of 3 feet below existing grade and to a depth of at least 3 feet below proposed building pad subgrade elevations.
- The depth of overexcavation should also be sufficient to remove any existing fill soils. The proposed foundation influence zones should be overexcavated to a depth of at least 2 feet below proposed foundation bearing grade.
- Following completion of the overexcavation, the exposed soils should be scarified and moisture conditioned to achieve a moisture content of 0 to 4 percent above optimum moisture, to a depth of at least 12 inches. The overexcavation subgrade soils should then be recompacted to at least 90% of the ASTM D-1557 maximum dry density. The previously excavated soils may then be replaced as compacted structural fill.
- The new pavement and flatwork subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Foundation Design Recommendations

- Conventional shallow foundations, supported in newly placed compacted fill.
- 3,000 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least two (2) No. 5 rebars (1 top and 1 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

Building Floor Slab Design Recommendations

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

Pavement Design Recommendations

ASPHALT PAVEMENTS (R=60)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	3	3	3	3	4
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R=60)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	6	7	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 18P177, dated March 1, 2018. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations, building floor slab, and parking lot pavements along with site preparation recommendations and construction considerations for the proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located near the northeast corner of Foothill Boulevard and Central Avenue in Upland, California. The site is also referenced as Assessor Parcel Nos. (APN) 1006-351-09, 1006-351-10, 1006-572-11, 1006-551-12, 1006-551-22, and 1006-574-10. The site is bounded to the north by Cable Airport and 13th Street, to the west by existing commercial/industrial buildings, to the south by existing retail/commercial/restaurant buildings and Foothill Boulevard, and to the east by a Lowe's Home Improvement Store. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The subject site consists of six (6) nearly rectangular-shaped parcels which total 50.25± acres. The northwestern portion of the site is currently developed as a material crushing and screening facility. This portion of the site contains various stockpiles of recycled concrete, asphalt, and brick as well as screened aggregate. These stockpiles vary in height with the largest stockpiles ranging from 20 to 30± feet in height. There are also some track-mounted conveying and screening equipment on site as well as some large construction vehicles. The remainder of the site is undeveloped with ground cover consisting of exposed soil with moderate to heavy vegetation and weed growth. A significant amount of garbage and makeshift structures are scattered throughout the undeveloped regions of the site.

Detailed topographic was obtained from a conceptual grading plan prepared by Thienes Engineering, Inc. With the exception of the existing stockpiles, the overall site topography slopes downward to the south and southwest at gradients ranging from 3 to 5 percent. The site topography ranges from an elevation high of 1400± feet mean sea level (msl) along the northern boundary of the site to an elevation low of 1360± feet msl in the southwestern region of the site. There are significant elevation fluctuations due to the large stockpiles within the western portion of the site.

3.2 Proposed Development

Based on a site plan dated November 8, 2019, prepared by Herdman Architecture + Design, the site will be developed with one (1) warehouse building located in the central area of the site. The warehouse will be 201,096± ft^2 in size, with dock-high doors constructed along the west building wall. The building will be surrounded by asphaltic concrete pavements in the parking and drive lane areas, Portland cement concrete pavements in the loading dock areas, concrete flatwork, and landscape planters throughout.

Detailed structural information has not been provided. It is assumed that the new building will be a single-story structure of concrete tilt-up construction supported by conventional shallow foundations with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 3 to 6 kips per linear foot, respectively.

No significant amounts of below grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the conceptual grading plan prepared by Thienes Engineering, Inc., and aside from the aforementioned stockpiles, cuts and fills of 10 to 20± feet are expected to be necessary to achieve the proposed site grades.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of twenty-one (21) exploratory trenches (identified as Trench Nos. T-1 through T-21) excavated to depths of 5 to 10± feet below the existing site grades. The trenches were excavated using a backhoe with a 24-inch wide bucket. All of the trenches were logged during excavation by a member of our staff.

Representative bulk and in-situ soil samples were taken during excavation. Bulk samples were collected in plastic bags to retain their original moisture content. The bulk samples were then sealed and transported to our laboratory.

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

4.2 Geotechnical Conditions

Pavements

Pavements consisting of base material was encountered at Trench Nos. T-1, T-2, T-3, T-6, T-8 and T-20 to T-21. The base material generally extended to depths of 6 inches to 2½ feet below existing grades.

Artificial Fill

Artificial fill soils were encountered at the ground surface or beneath the existing pavements at Trench Nos. T-2 to T-4, T-6, T-8, T-10, T-12, T-13, T-14, T-15 and T-20 to T-21. The fill soils extend to depths of 1 to 8± feet below existing site grades. These fill soils generally consist of medium dense to very dense silty fine sands and gravelly fine to coarse sands with varying amounts of cobbles and boulders. The fill soils possess a disturbed appearance and significant debris content (including fragments of brick, wire, paper, plastic, metal, wood, tree stumps, glass, concrete, and asphalt), resulting in their classification as artificial fill. Varying amounts of tree limbs, roots and rootlets were observed within the fill soils. A layer of organic material 6±-inches thick was observed at Trench No. T-14 at a depth of 2½ to 3± feet.

Alluvium

Alluvial soils were encountered at all trenches, except for Trench Nos. T-2 and T-21 which met refusal conditions in fill. The alluvial soils generally consisted of dense to very dense gravelly fine to coarse sand with extensive cobbles and boulders extending to a maximum depth explored of

10 feet below existing site grades. Varying amounts of tree limbs, roots and rootlets were observed within the native alluvial soils.

Groundwater

Free water was not encountered during the excavation of any of the trenches. Based on the lack of any water within the trenches, and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 10± feet at the time of the subsurface exploration.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the groundwater depths in this area is the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located approximately 1.1 miles northwest from the site. Water level readings within this monitoring well indicates a high groundwater level of 120± feet (Fall 2017).

5.0 LABORATORY TESTING

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

Classification

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

In-situ 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 Trench Logs.

Maximum Dry Density and Optimum Moisture Content

Three (3) representative soil samples have been tested for their maximum dry densities and optimum moisture contents. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557, and are presented on Plates C-1 through C-3 in Appendix C of this report. These tests are generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

Soluble Sulfates

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

Sample Identification	**Soluble Sulfates (%)**	**Sulfate Classification**
T-3 @ 0 to 5 feet	<0.001	Negligible
T-10 @ 0 to 5 feet	0.016	Negligible
T-13 @ 0 to 5 feet	<0.001	Negligible

6.0 CONCLUSIONS AND RECOMMENDATIONS

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

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

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

6.1 Seismic Design Considerations

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

Faulting and Seismicity

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

Seismic Design Parameters

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

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2016 edition of the California Building Code (CBC). However, it is also possible that the proposed development may be designed using the 2019 CBC, which will take effect on January 1, 2020. Therefore, this report provides design parameters for both the 2016 CBC and the 2019 CBC. Other design consultants should verify the version of the code under which the proposed development will be submitted.

The 2016 and 2019 CBC Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool, a web-based software application available at the website www.seismicmaps.org. This software application calculates seismic design parameters in accordance with several building code reference documents, including the ASCE 7-10 and ASCE 7-16, upon which the 2016 CBC and 2019 CBC are based, respectively. The application utilizes a database of risk-targeted maximum considered earthquake (MCE_R) site accelerations at 0.01-degree intervals for each of the code documents. The tables below were created using data obtained from the application. The output generated from this program is included as Plates E-1A (2016 CBC) and E-1B (2019 CBC) in Appendix E of this report. 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	2.495
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.933
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	2.495
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	1.400
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.663
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.933

The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than 0.2. However, Section 11.4.8 of ASCE 7-16 also indicates an exception from the requirement for a site-specific ground motion hazard analysis for certain structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) indicates that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." **Based on our understanding of the proposed development, the seismic design parameters presented below were calculated assuming that the exception in Section 11.8.4 applies to the proposed structure(s) at this site. However, the structural engineer should verify that this exception is applicable to the proposed structures.** Based on the exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped MCE_R Acceleration at 0.2 sec Period	S_S	1.701
Mapped MCE_R Acceleration at 1.0 sec Period	S_1	0.641
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.701
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	1.090
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.134
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.726

It should be noted that the site coefficient F_v and the parameters S_{M1} and S_{D1} were not included in the SEAOC/OSHPD Seismic Design Maps Tool output for the 2019 CBC. We calculated these parameters-based on Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC using the value of S_1 obtained from the Seismic Design Maps Tool, assuming that a site-specific ground motion hazards analysis is not required for the proposed buildings at this site.

Liquefaction

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

The California Geological Survey (CGS) has not yet conducted detailed seismic hazards mapping in the area of the subject site. The general liquefaction susceptibility of the site was determined by research of the San Bernardino County Official Land Use Plan, General Plan, Geologic Hazard Overlay. Map FH27C for the Ontario Quadrangle indicates that the site is not located within an area of liquefaction susceptibility. Based on the mapping performed by the county of San Bernardino and the lack of a historic high ground water table within the upper 50± feet of the ground surface, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The ground surface at the site generally consists of exposed soil and pavements comprised of compacted base material. Artificial fill soils were encountered at the ground surface or beneath the existing pavements at Trench Nos. T-2 to T-4, T-6, T-8, T-10, T-12, T-13, T-14, T-15 and T-20 to T-21, extending to depths of 1 to 8± feet below existing site grades. No documentation regarding the placement or compaction of these fill soils is known to exist. Based on their characteristics and the lack of documentation, the existing fill materials are considered to represent undocumented fill. Alluvial soils were encountered at all of the trenches, except for Trench Nos. T-2 and T-21 which met refusal conditions in fill, extending to the maximum depth explored of 10± feet. The alluvial soils generally consist of dense to very dense gravelly fine to coarse sand with extensive cobbles and boulders. The fill soils and near-surface alluvial soils possess variable strengths. Based on these conditions, remedial grading is recommended within the proposed building area to remove the existing undocumented fill materials and a portion of the underlying alluvium and replace these materials as compacted structural fill.

Significant amounts of oversize rock materials consisting of cobbles and boulders are present at the site. An important geotechnical-related aspect in developing this site will be properly handling the oversize materials. Geotechnical recommendations for the proper handling of these oversized materials are contained in later sections of this report. Another significant aspect of this site is the presence of the large stockpiles in the western portion of the subject site. Stockpiled materials meeting the requirements of the "Imported Structural Fill" section and other applicable sections of this report may be utilized within the site fills.

Settlement

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

Expansion

The near-surface soils generally consist of silty sands, sands, and gravelly sands. These materials have been visually classified as very low to non-expansive. Therefore, no design considerations related to expansive soils are considered warranted for this site.

Soluble Sulfates

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

Shrinkage/Subsidence

Removal and recompaction of the artificial fill and near-surface native soils is estimated to result in an average shrinkage of 6 to 14 percent. The shrinkage potential of the different soil strata at the site is expected to vary significantly due to the highly variable cobble and boulder content. It should be noted that this shrinkage estimate is based on our experience with similar projects in the area since collecting small-diameter soil samples was difficult due to the presence of cobbles and boulders. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

Minor ground subsidence is expected to occur in the soils below the zone of removal due to settlement and machinery working. The subsidence is estimated to be 0.1 feet. This estimate is based on previous experience and the subsurface conditions encountered at the test boring locations. The actual amount of subsidence is expected to be variable and will be dependent on the type of machinery used, repetitions of use, and dynamic effects, all of which are difficult to assess precisely. Additionally, volume loss due to removal of oversized rock materials and root masses is difficult to assess precisely.

Grading and Foundation Plan Review

This report was prepared in consideration of the conceptual grading plan that was provided to our office. However, it is recommended that we be provided with copies of the preliminary precise grading and foundation plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

6.3 Site Grading Recommendations

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

Site Stripping

Initial site stripping should include removal of any surficial vegetation. These materials should be disposed of off-site. A significant amount of above-ground and buried trash and other miscellaneous debris was observed throughout the site. These materials should also be disposed of off-site. Additionally, the existing stockpiles, tree roots, tree limbs, vegetation, grass and weed growth and organic topsoil should be stripped from the site. The actual extent of site stripping should be determined during grading by a representative of the geotechnical engineer, based on the organic content of the encountered materials.

Treatment of Existing Soils: Building Pad

Remedial grading should be performed within the proposed building pad area in order to remove the existing undocumented fill soils and a portion of the underlying near-surface alluvium. Based on conditions encountered at the trench locations, the existing soils within the proposed building area are recommended to be overexcavated to a depth of at least 3 feet below existing grade and to a depth of at least 3 feet below proposed building pad subgrade elevations, whichever is greater. **The depth of the overexcavation should also extend to a depth sufficient to remove all undocumented fill soils**. Undocumented fill soils at the trench locations extend to depths of 2 to 5½± feet. Additional overexcavation should be performed within the influence zones of the new foundations, to provide for a new layer of compacted structural fill extending to a depth of at least 2 feet below proposed bearing grades.

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

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of at least 12 inches and moisture conditioned to achieve a moisture content of 0 to 4 percent above optimum moisture content. The subgrade soils should then be recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. The building pad areas may then be raised to grade with previously excavated soils or imported structural fill.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of proposed retaining and non-retaining site walls should be overexcavated to a depth of at least 2 feet below foundation bearing grade and replaced as compacted structural fill. Any undocumented fill soils within any of these foundation areas should be removed in their entirety. In both cases, the overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning and recompacting the upper 12 inches of exposed subgrade soils. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Parking and Drive Areas

Based on economic considerations, overexcavation of the existing near-surface soils in the new parking and drive areas is not considered warranted, with the exception of areas where lower strength or unstable soils are identified by the geotechnical engineer during grading.

Subgrade preparation in the new parking and drive areas should initially consist of removal of all soils disturbed during stripping operations. Fill soils containing excessive roots, tree limbs, trash, and/or other debris should be removed. 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 0 to 4 percent above optimum, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength 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 in the parking and drive areas. As such, settlement and associated pavement distress could occur. Typically, repair of such distressed areas involves significantly lower costs than completely mitigating these soils at the time of construction. If the owner cannot tolerate the risk of such settlements, the parking and drive areas should be overexcavated to a depth of 2 feet below proposed pavement subgrade elevation, with the resulting soils replaced as compacted structural fill.

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 0 to 4 percent above the optimum moisture content, and compacted.
- **On-site soils may be used for fill provided they are cleaned of any debris (including, but not limited to trash, oversized materials, tree roots, tree limbs, etc.) 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 Upland.
- All fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Fill soils should be well mixed.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Selective Grading and Oversized Material Placement

The native alluvial soils possess significant cobble and/or boulder content. It is expected that large scrapers (Caterpillar 657 or equivalent) will be adequate to move the cobble containing soils as well as some of the soils containing smaller boulders. However, some larger boulders (2± feet in size) were also encountered at the trench locations. It will likely be necessary to move such larger boulders individually, and place them as oversized materials in accordance with the Grading Guide Specifications, in Appendix D of this report. **Based on observations during our subsurface exploration activities, the on-site soils possessed approximately 20 to 35% cobble content and approximately 20 to 35% boulder content.**

Since the proposed grading will require excavation of cobble and boulder containing soils, it may be desirable to selectively grade the proposed building pad area. The presence of particles greater than 3 inches in diameter within the upper 1 to 3 feet of the building pad subgrade will impact the utility and foundation excavations. Depending on the depths of fills required within the proposed parking areas, it may be feasible to sort the on-site soils, placing the materials greater than 3 inches in diameter within the lower depths of the fills, and limiting the upper 1 to 3 feet of soils to materials less than 3 inches in size. Oversized materials could also be placed within the lower depths of the recommended overexcavations. In order to achieve this grading, it would likely be necessary to use rock buckets and/or rock sieves to separate the oversized materials from the remaining soil. Although such selective grading will facilitate further construction activities, it is not considered mandatory and a suitable subgrade could be achieved without such extensive sorting. However, in any case, it is recommended that all materials greater than 6 inches in size be excluded from the upper 1 foot of the surface of any compacted fills.

The placement of any oversized materials should be performed in accordance with the Grading Guide Specifications included in Appendix D of this report. If disposal of oversized materials is required, rock blankets or windrows should be used and such areas should be observed during construction and placement by a representative of the geotechnical engineer.

Imported Structural Fill

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

Utility Trench Backfill

In general, all utility trench backfill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. It is recommended that materials in excess of 3 inches in size not be used for utility trench backfill. Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the city of Upland. All utility trench backfills should be witnessed by the geotechnical engineer. The trench backfill soils should be compaction tested where possible; probed and visually evaluated elsewhere.

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

6.4 Construction Considerations

Excavation Considerations

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

Groundwater

The static groundwater table is considered to have existed at a depth in excess of 10± feet at the time of the subsurface exploration. Therefore, groundwater is not expected to impact the grading or foundation construction activities.

6.5 Foundation Design and Construction

Based on the preceding grading recommendations, it is assumed that the new building pad will be underlain by new structural fill soils used to replace existing undocumented fill soils and near surface alluvial soils. These structural fill soils are expected to extend to depths of at least 2 feet below proposed foundation bearing grades, underlain by 1± foot of additional soil that has been densified and moisture conditioned in place. Based on this subsurface profile, the proposed structure may be supported on conventional shallow foundations.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 3,000 lbs/ft^2.
- Minimum wall/column footing width: 14 inches/24 inches.
- Minimum longitudinal steel reinforcement within strip footings: Two (2) No. 5 rebars (1 top and 1 bottom).
- Minimum foundation embedment: 12 inches into suitable structural fill soils, and at least 18 inches below adjacent exterior grade. Interior column footings may be placed immediately beneath the floor slab.
- It is recommended that the perimeter building foundations be continuous across all exterior doorways. Any flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

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

Foundation Construction

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

The foundation subgrade soils should also be properly moisture conditioned to at least 0 to 4 percent of the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. **Since it is typically not feasible to increase the moisture content of the floor slab and**

foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

Estimated Foundation Settlements

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

Lateral Load Resistance

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

- Passive Earth Pressure: 350 lbs/ft^3
- Friction Coefficient: 0.35

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

6.6 Floor Slab Design and Construction

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

- Minimum slab thickness: 6 inches.

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

- Minimum slab reinforcement: Reinforcement is not considered necessary from a geotechnical standpoint. The actual floor slab reinforcement should be determined by the structural engineer, based on the imposed slab loading.

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

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

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

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

6.7 Retaining Wall Design and Construction

Although not indicated on the site plan, some small (less than 6 feet in height) retaining walls may be required to facilitate the new site grades. 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 trench locations, the following parameters may be used in the design of new retaining walls for this site. The following parameters assume that only the on-site soils will be utilized for retaining wall backfill. The near-surface soils generally consist of silty sands, sands and gravelly sands. Based on their composition, the on-site soils have been assigned a friction angle of 32 degrees when compacted to at least 90 percent of the ASTM D-1557 maximum dry density.

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

RETAINING WALL DESIGN PARAMETERS

Design Parameter		Soil Type: On-site Silty Sands
Internal Friction Angle (ϕ)		32°
Unit Weight		130 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	40 lbs/ft^3
	Active Condition (2h:1v backfill)	61 lbs/ft^3
	At-Rest Condition (level backfill)	61 lbs/ft^3

The walls should be designed using a soil-footing coefficient of friction of 0.35 and an equivalent passive pressure of 350 lbs/ft^3. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

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

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

Seismic Lateral Earth Pressures

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

Retaining Wall Foundation Design

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

Backfill Material

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

Some sorting and/or crushing operations may be required. The retaining wall backfill materials should be well graded.

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

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

Subsurface Drainage

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

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

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

6.8 Pavement Design Parameters

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

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The near-surface soils generally consist of sands, silty sands and gravelly sands. These soils are generally considered to possess good to excellent pavement support characteristics, with R-values in the range of 60 to 70. The subsequent pavement design is therefore based upon an assumed R-value of 60. Any fill material imported to the site should have support characteristics equal to or greater than that of the on-site soils and be placed and compacted under engineering controlled conditions. It is recommended that R-value testing be performed after completion of rough grading. Depending upon the results of the R-value testing, it may be feasible to use thinner pavement sections in some areas of the site.

Asphaltic Concrete

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

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

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

ASPHALT PAVEMENTS (R=60)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	3	3	3	3	4
Compacted Subgrade	12	12	12	12	12

The aggregate base course should be compacted to at least 95 percent of the ASTM D-1557 maximum dry density. The asphaltic concrete should be compacted to at least 95 percent of the Marshall maximum density, as determined by ASTM D-2726. The aggregate base course may consist of crushed aggregate base (CAB) or crushed miscellaneous base (CMB), which is a recycled gravel, asphalt and concrete material. The gradation, R-Value, Sand Equivalent, and

Percentage Wear of the CAB or CMB should comply with appropriate specifications contained in the current edition of the "Greenbook" Standard Specifications for Public Works Construction.

Portland Cement Concrete

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

PORTLAND CEMENT CONCRETE PAVEMENTS (R=60)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	6	7	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

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

7.0 GENERAL COMMENTS

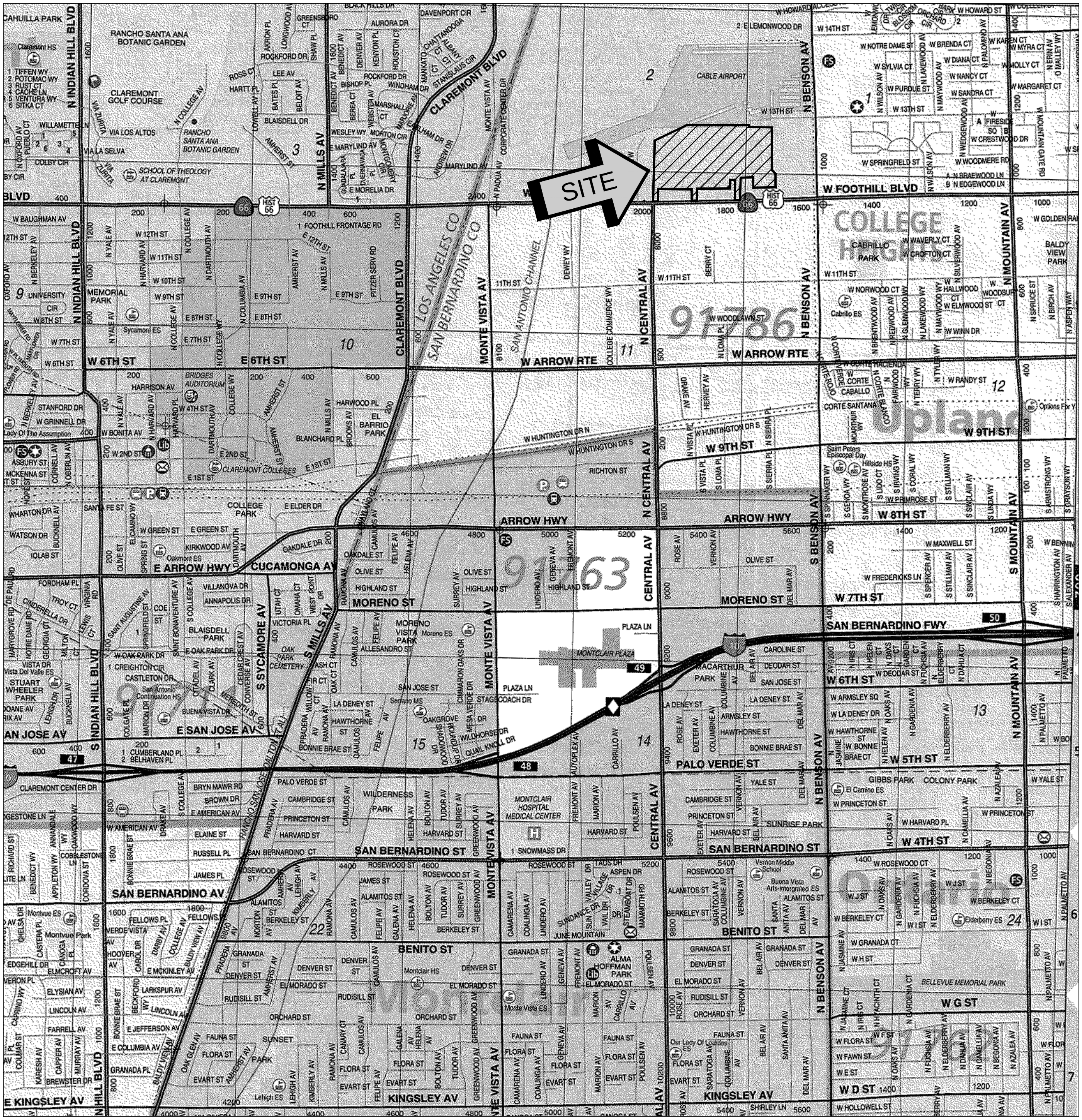
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other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

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between trench 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 WAREHOUSE

UPLAND, CALIFORNIA

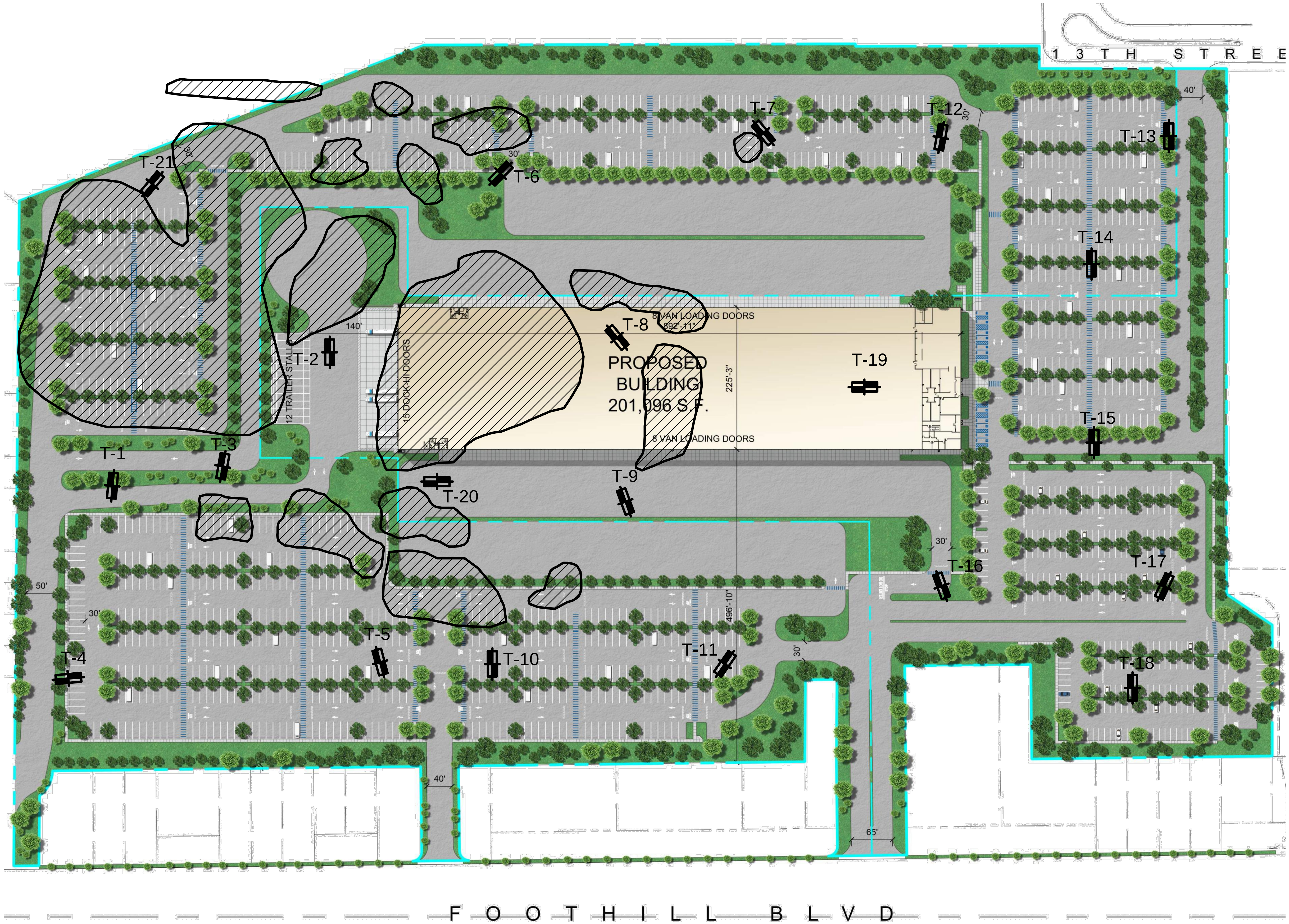
SCALE: 1" = 2400'

DRAWN: JH
CHKD: RGT

SCG PROJECT
18G122-1R2

PLATE 1

SOUTHERN CALIFORNIA GEOTECHNICAL



NORTH

GEOTECHNICAL LEGEND

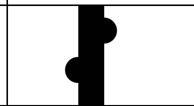
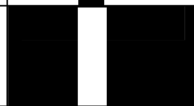
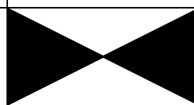
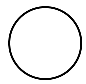
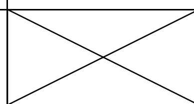
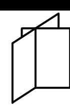
- APPROXIMATE TRENCH LOCATION
- APPROXIMATE STOCKPILE LOCATION

NOTE: SITE PLAN PROVIDED BY THE CLIENT.

TRENCH LOCATION PLAN	
PROPOSED WAREHOUSE	
UPLAND, CALIFORNIA	
SCALE: 1" = 160'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JH CHKD: RGT	
SCG PROJECT 18G122-1R2	
PLATE 2	

APPENDIX B

BORING LOG LEGEND

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

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

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

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

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

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

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

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

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

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

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

SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-1

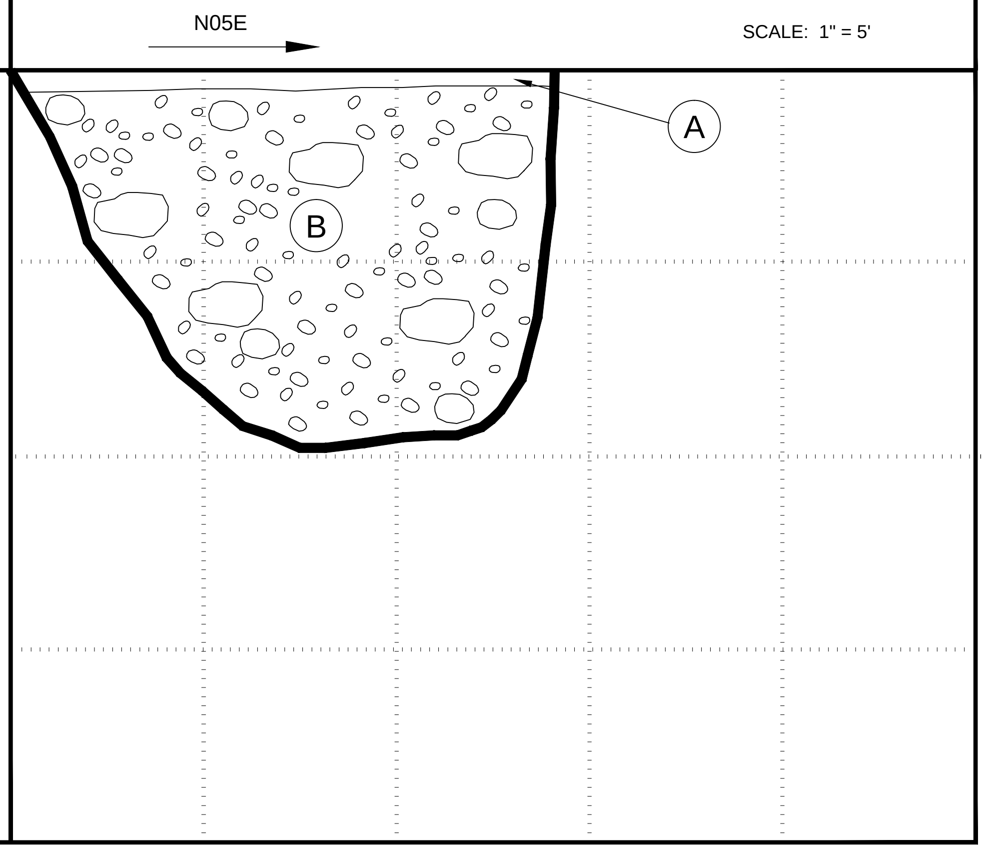
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-22-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N05E

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		4	A: PAVEMENTS: 6 inches Aggregate base B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-damp
	b		3	
5	b		4	
	b		5	
10	b		4	Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-1

SOUTHERN CALIFORNIA GEOTECHNICAL

**TRENCH NO.
T-2**

JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-22-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N00W

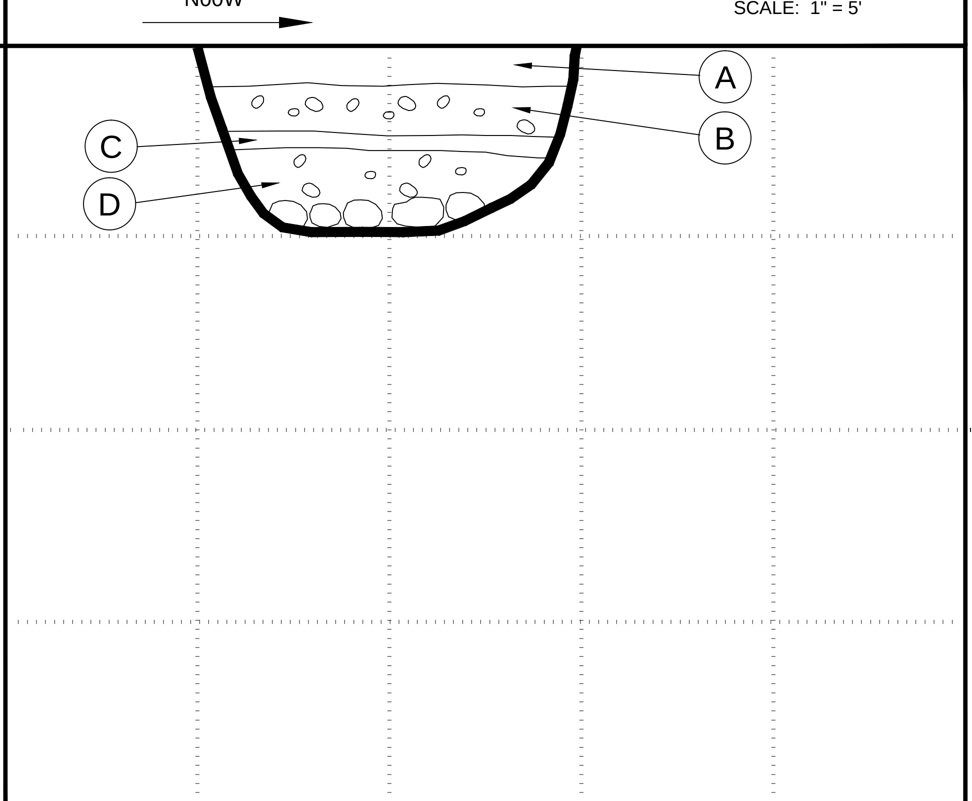
WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
				A and C: PAVEMENTS: 12 inches Aggregate base at (A) 6 inches at (C)
	b		5	B: FILL: Light Brown Silty fine to medium Sand, some coarse sand, some fine to coarse gravel, occasional cobbles, dense-damp
	b		7	D: FILL: Brown Silty fine Sand, trace medium to coarse Sand, abundant Cobbles and Boulders at base of excavation, very dense-damp to moist
5				Trench Refusal @ 5 feet
10				
15				

GRAPHIC REPRESENTATION

N00W

SCALE: 1" = 5'



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

TRENCH LOG

PLATE B-2

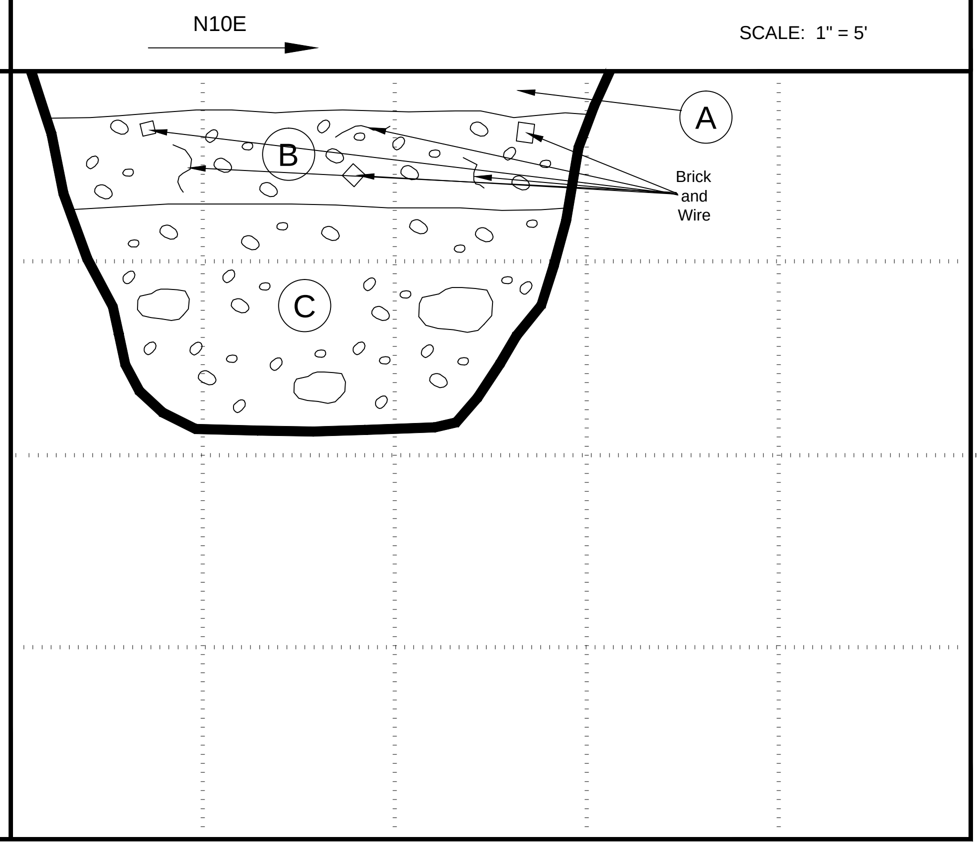
SOUTHERN CALIFORNIA GEOTECHNICAL

**TRENCH NO.
T-3**

JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION: N10E	READINGS TAKEN: At Completion
DATE: 3-22-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		5	A: PAVEMENTS: 12 inches Aggregate base B: FILL: Dark Brown Silty fine to coarse Sand, abundant fine to coarse Gravel, occasional Cobbles, trace wires, brick fragments and plastic fragments, very dense-dry to damp
	b		2	
5	b		3	C: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-damp
	b		3	
10				Trench Terminated @ 9.5 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-4

JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-22-2018

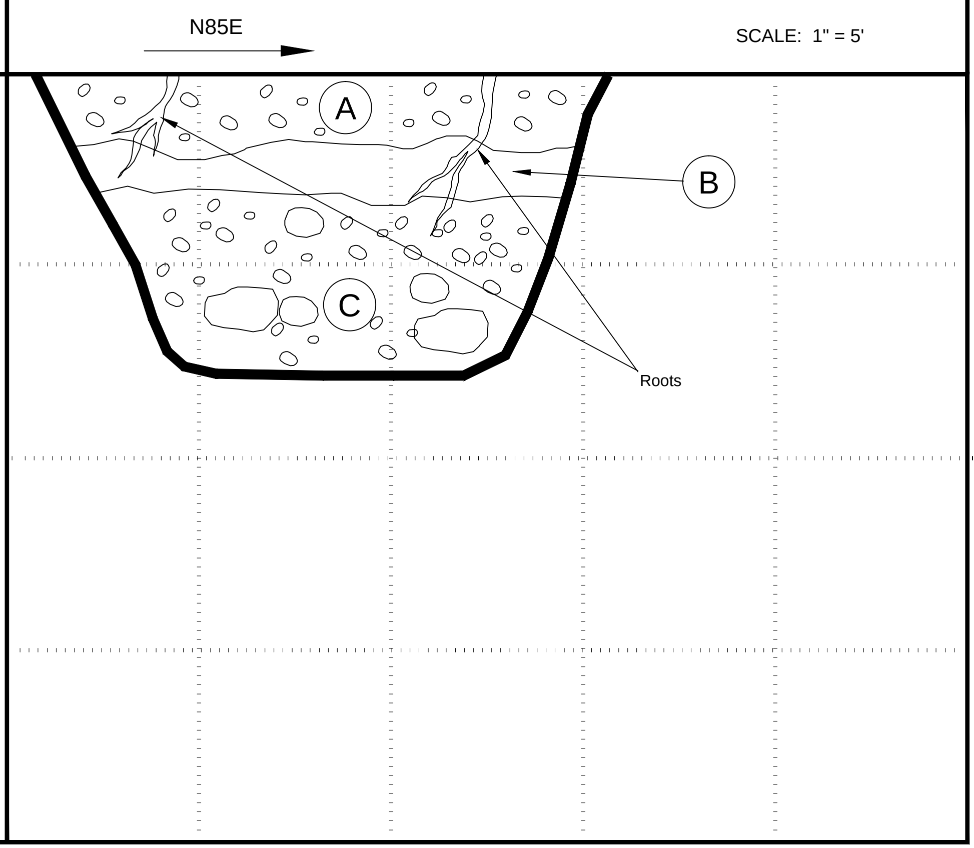
EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N85E

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		10	A: FILL: Brown Silty fine to medium Sand, some coarse Sand, some Cobbles, some fine to coarse Gravel, some Roots, medium dense-moist
	b		11	B: FILL: Brown fine Sand, little medium to coarse Sand, little fine Gravel, little Silt, some Roots- medium dense-moist
	b		5	C: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, trace Roots very dense-damp
5				
	b		6	
	b		4	
				Trench Terminated @ 8 feet
10				
15				

GRAPHIC REPRESENTATION

SCALE: 1" = 5'



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

TRENCH LOG

PLATE B-4

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-5

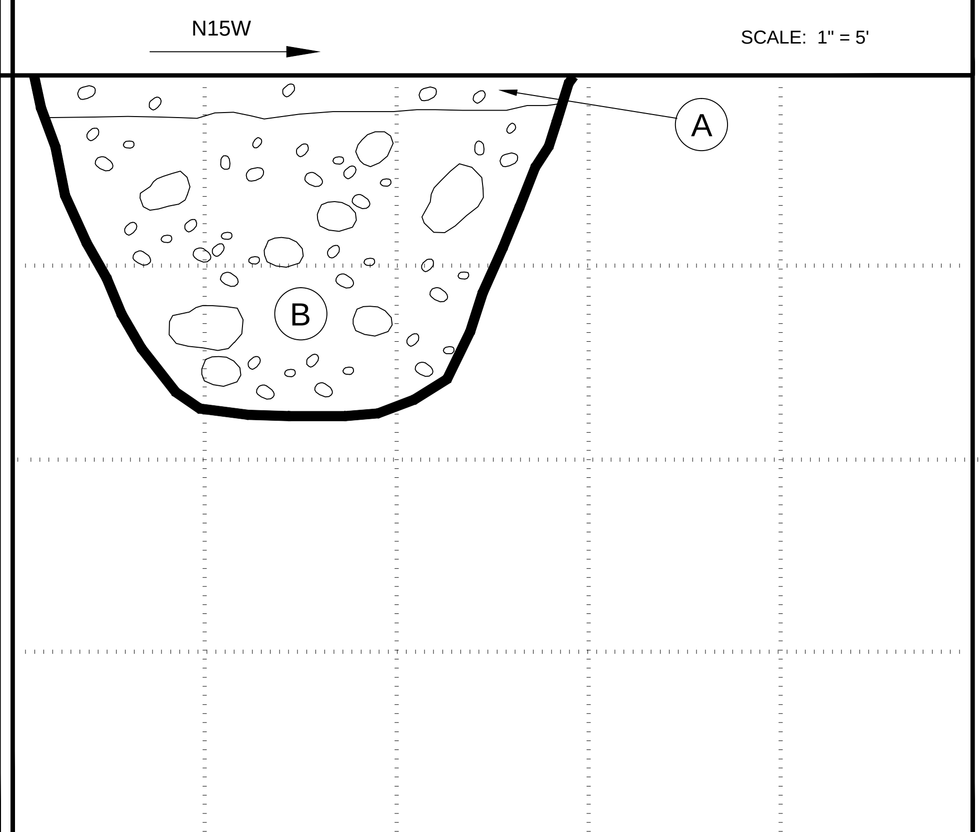
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N15W

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		8	A: DISTURBED ALLUVIUM: Brown Silty fine Sand, some fine to coarse Gravel, occasional Cobbles, abundant Root content, medium dense-moist
	b		2	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-damp
5	b		2	
	b		1	
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-5

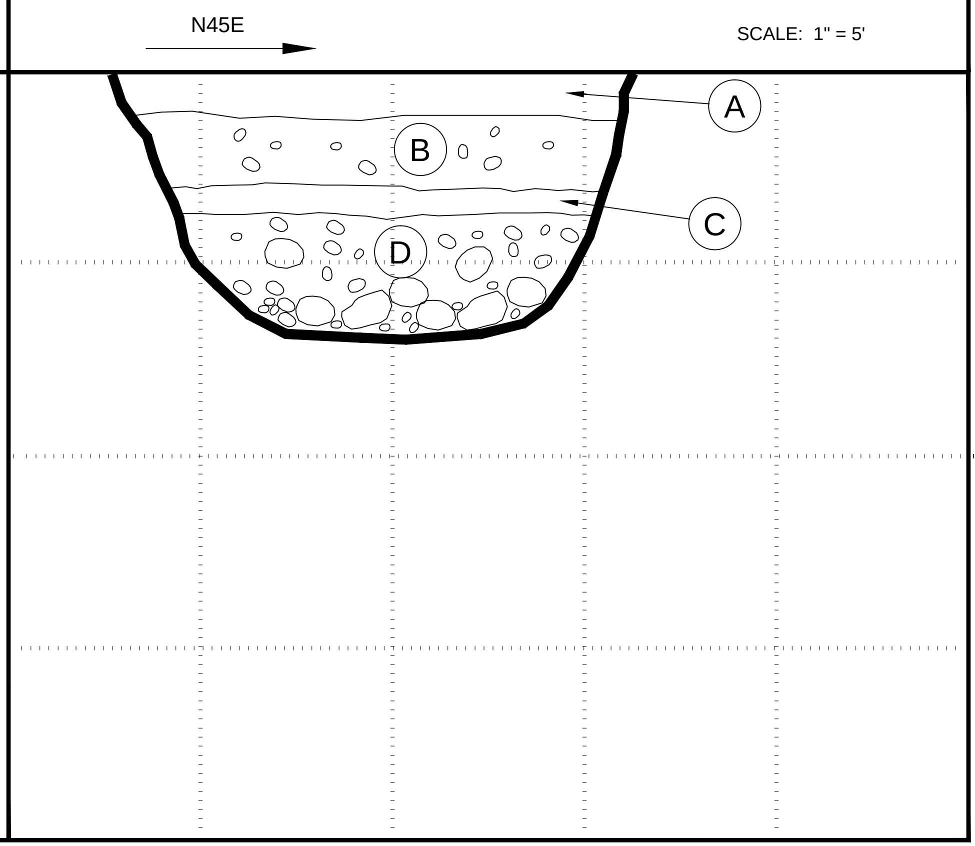
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-6

JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION: N45E	READINGS TAKEN: At Completion
DATE: 3-22-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
				A: PAVEMENTS: 12 inches Aggregate base
	b		15	B: FILL: Brown Silty fine Sand, occasional Cobbles, trace medium to coarse Sand, trace Paper and Plastic fragments, dense-moist
				C: PAVEMENTS: 6 inches Aggregate base
	b		6	
5				D: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-damp
	b		3	
				Trench Refusal @ 7 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-6

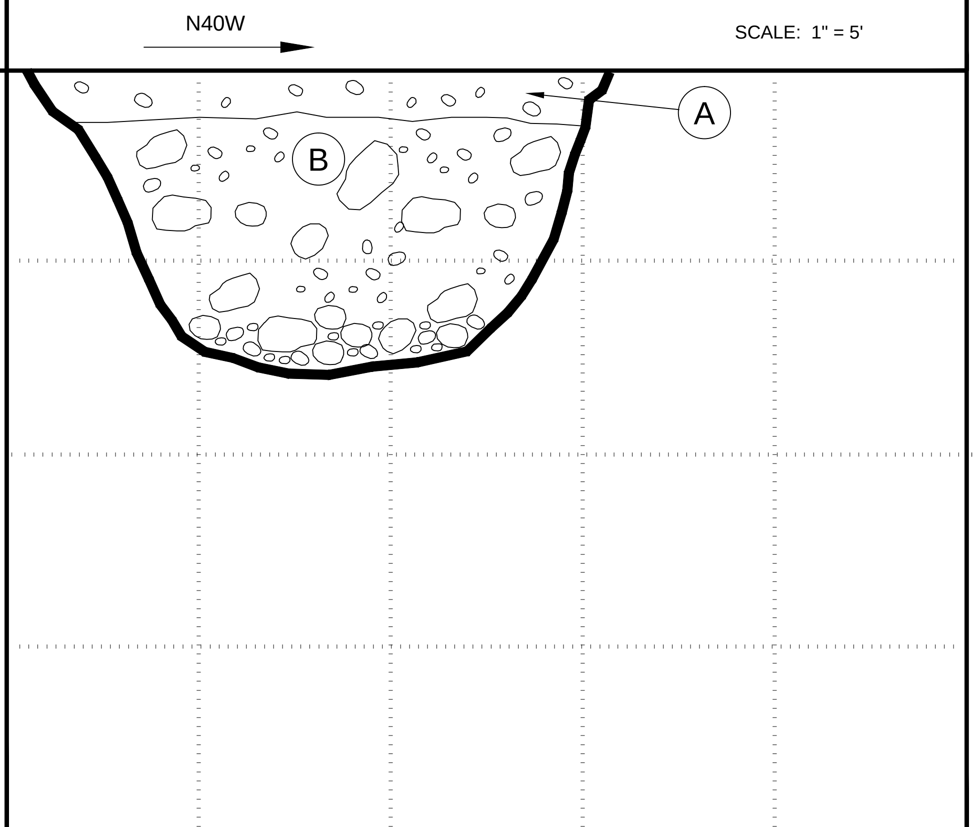
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-7

JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION: N40W	READINGS TAKEN: At Completion
DATE: 3-22-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		13	A: DISTURBED ALLUVIUM: Brown Silty fine Sand, some fine to coarse Gravel, occasional Cobbles, abundant Root content, medium dense-moist
	b		3	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-damp
5	b		5	
	b		5	
				Trench Refusal @ 8 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-7

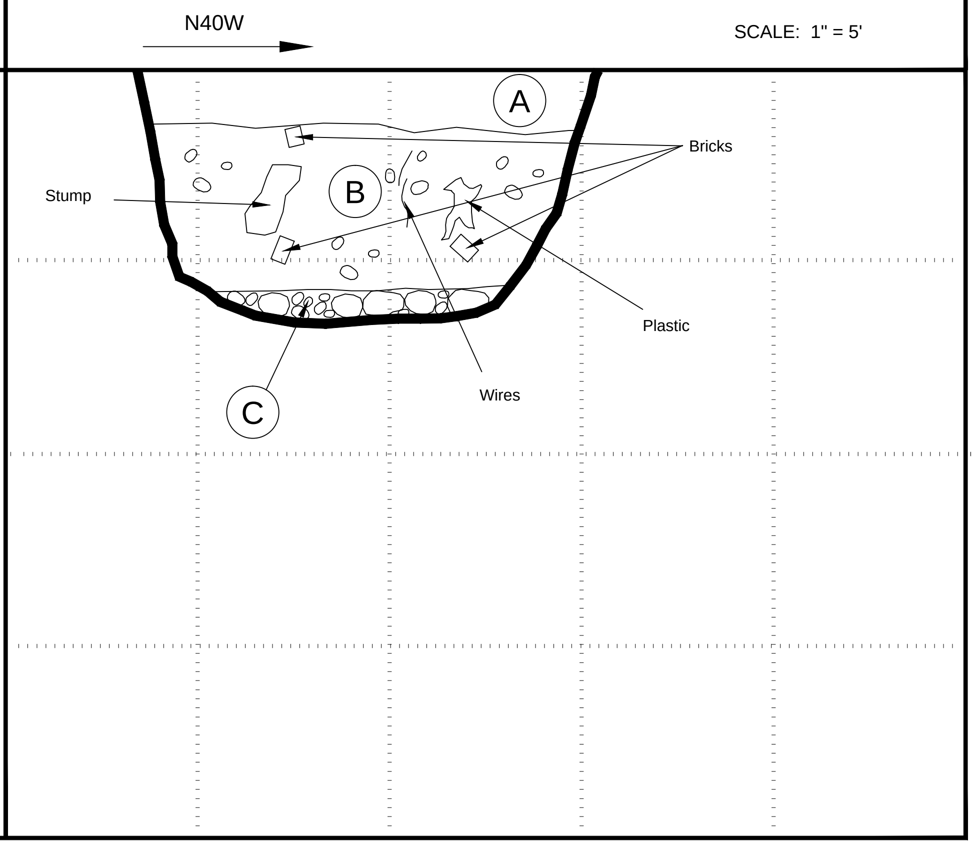
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-8

JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION: N40W	READINGS TAKEN: At Completion
DATE: 3-22-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
				A: PAVEMENTS: 18 inches Aggregate base
	b		7	B: FILL: Dark Brown Silty fine Sand, some medium to coarse Sand, occasional Cobbles, some tree debris, Brick fragments, Plastic and Metal fragments medium dense-moist
5				C: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders very dense-damp
	b		3	
				Trench Refusal @ 6.5 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-8

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-9

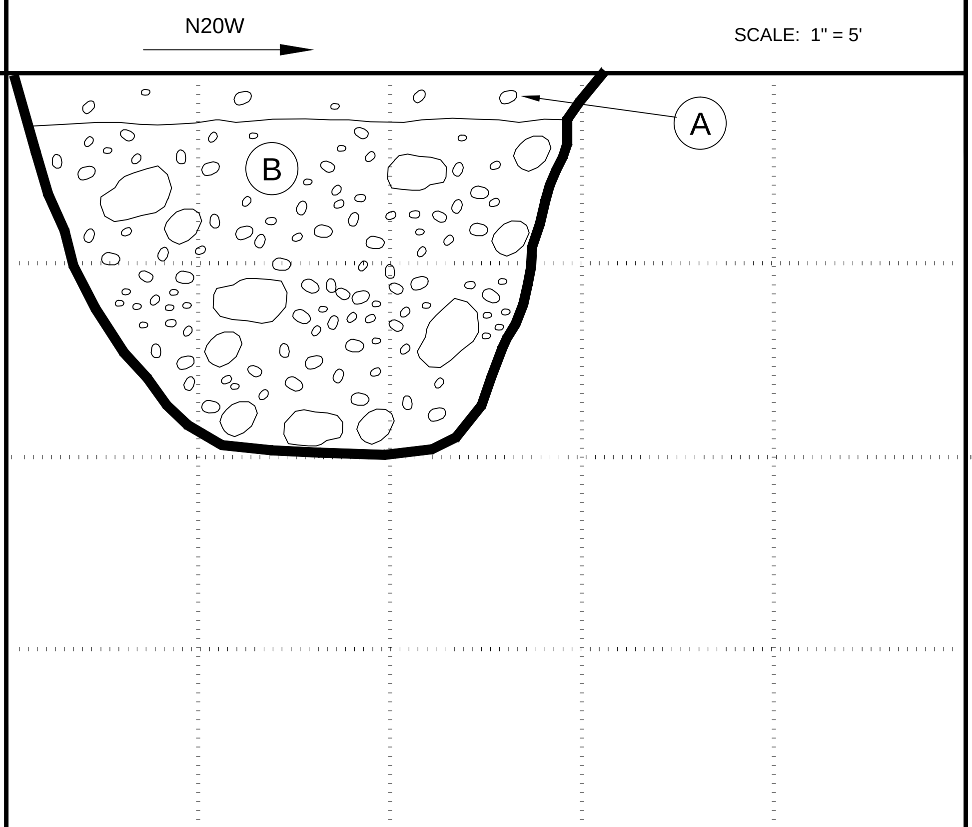
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N20W

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		8	A: DISTURBED ALLUVIUM: Brown Silty fine Sand, some fine to coarse Gravel, occasional Cobbles, abundant Root content, medium dense-moist
	b		3	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-dry to damp
5	b		2	
10	b		1	Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-9

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-10

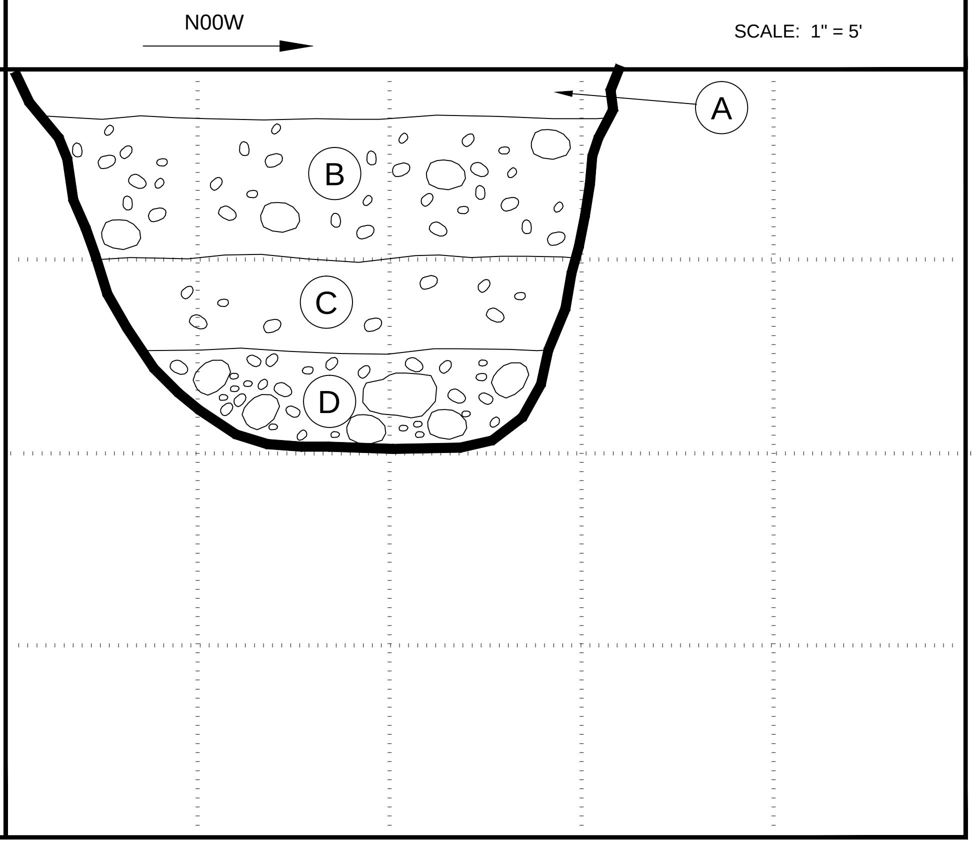
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N00W

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		3	A: FILL: Brown Silty fine to coarse Sand, some fine Gravel, abundant Root content, medium dense-moist
	b		4	B: FILL: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles, trace Silt, mottled, dense-damp
5				C: FILL: Brown Silty fine Sand, little medium to coarse Sand, occasional Cobbles, mottled medium dense-damp to moist
	b		8	D: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-dry to damp
10	b		2	
				Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-10

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-11

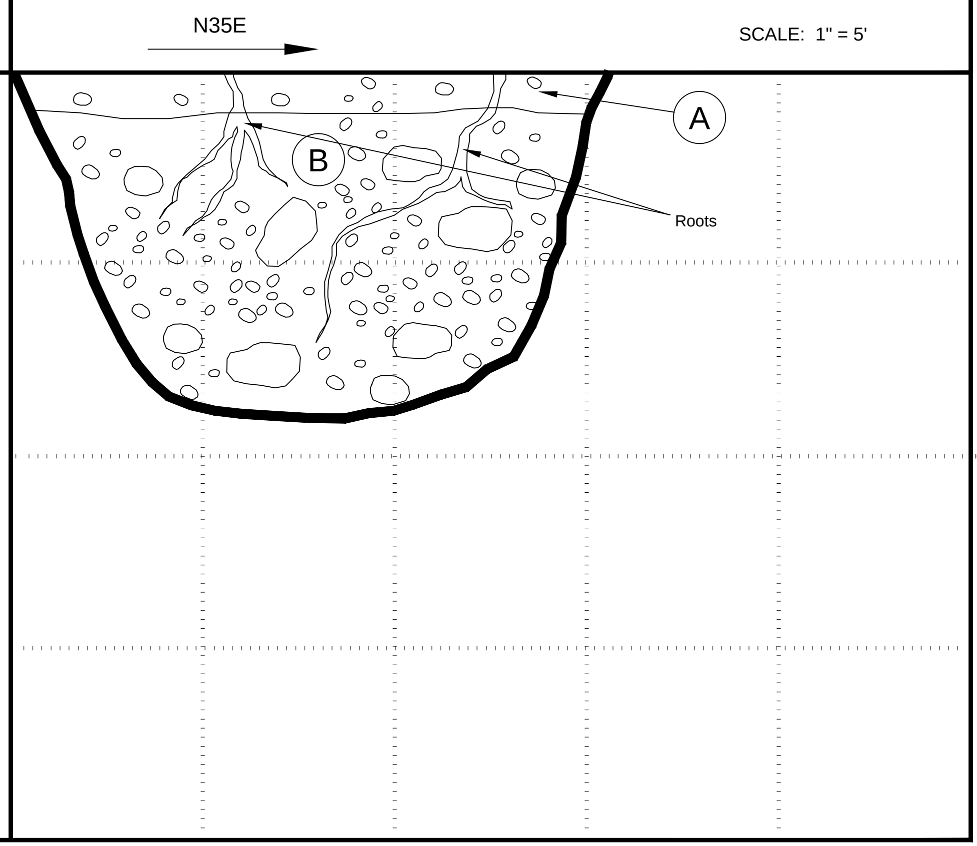
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N35E

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		9	A: DISTURBED ALLUVIUM: Brown Silty fine to coarse Sand, some Cobbles, some fine to coarse Gravel, abundant Root content, medium dense-moist
	b		3	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, some Roots, very dense-damp to moist
5	b		4	
	b		12	
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-11

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-12

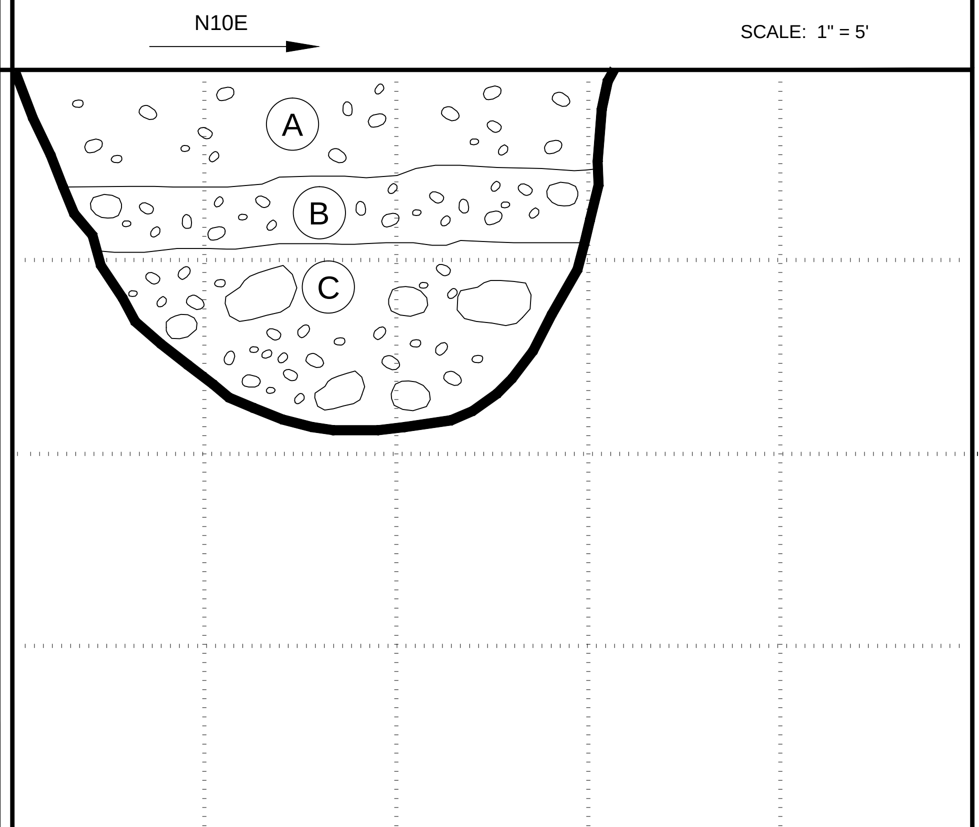
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N10E

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		10	A: FILL: Brown Silty fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles, some Roots medium dense-moist B: FILL: Light Brown Silty fine to coarse Sand, some fine to coarse Gravel, occasional Cobbles, some Roots dense-moist C: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-damp to moist
	b		5	
5				
	b		10	
	b		7	Trench Terminated @ 9.5 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-12

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-13

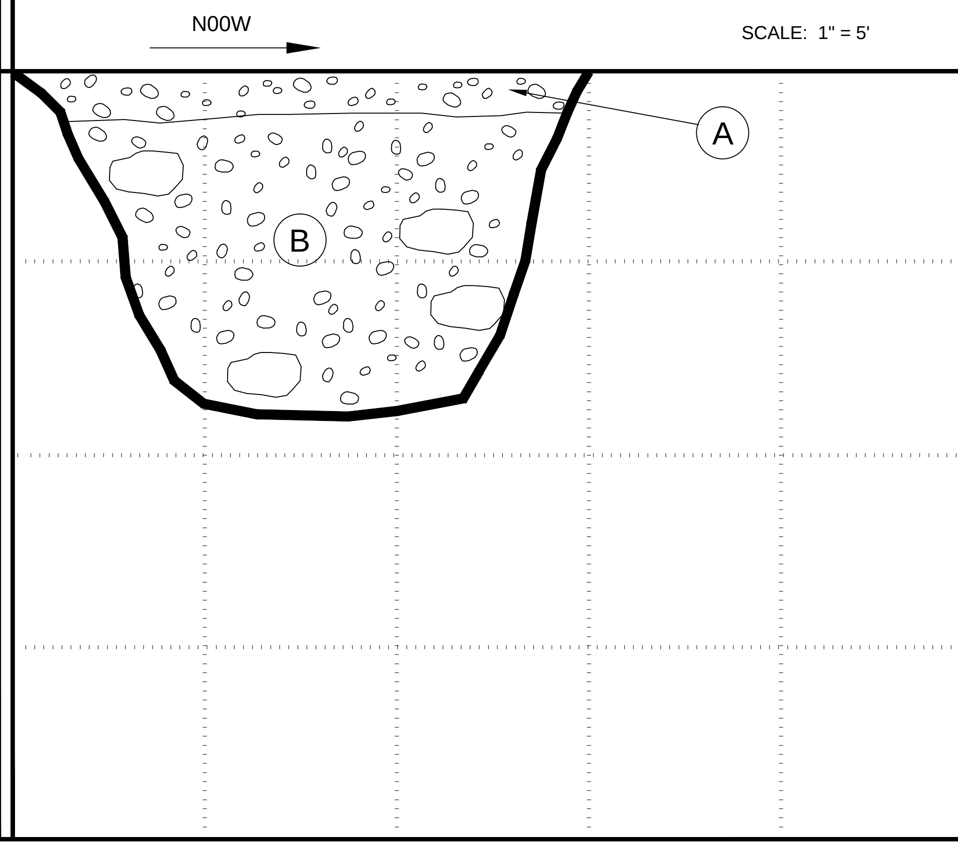
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N00W

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		7	A: FILL: Brown Silty fine to coarse Sand, abundant fine to coarse Gravel, occasional Cobbles, medium dense-moist
	b		6	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-damp to moist
5				
	b		7	
	b		9	Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-13

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-14

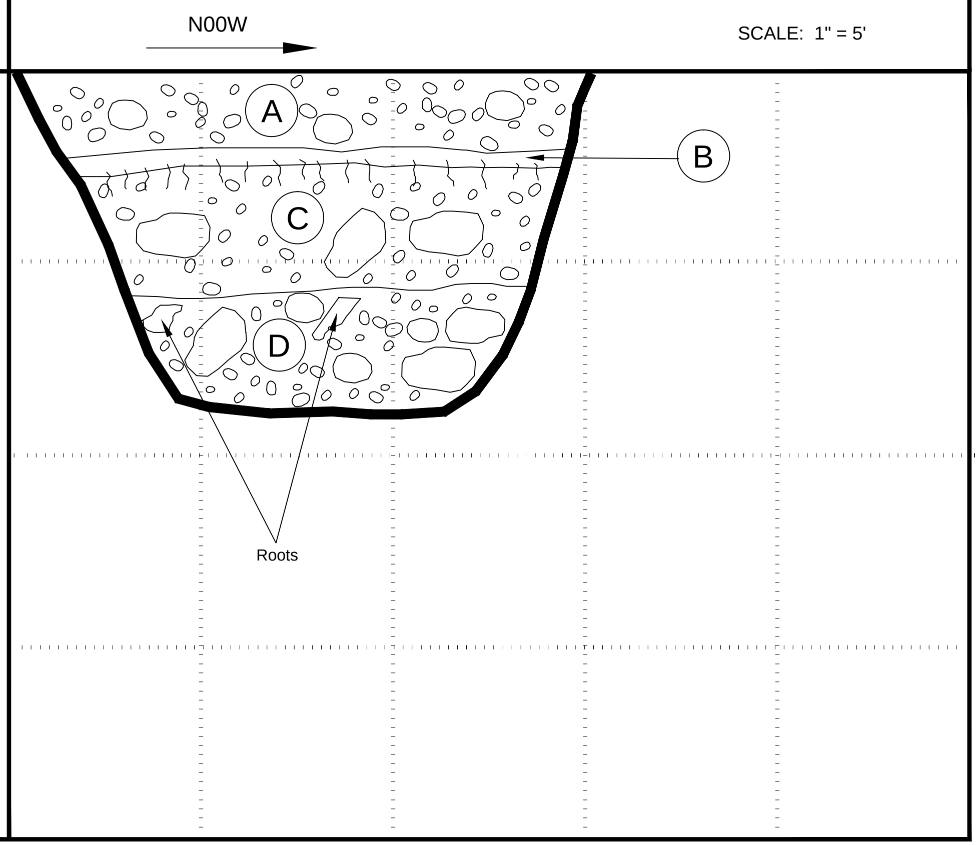
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N00W

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		7	A: FILL: Brown Silty fine to coarse Sand, abundant Cobbles, abundant fine to coarse Gravel, occasional Boulders, trace fine root fibers, mottled, medium dense-moist
	b		8	B: ORGANICS: Silty fine Sand, abundant organics, abundant roots, loose-medium dense-damp to moist
5				C: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-damp to moist
	b		6	D: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, some roots, extensive Cobbles and Boulders, very dense-damp to moist
	b		6	
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-14

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-15

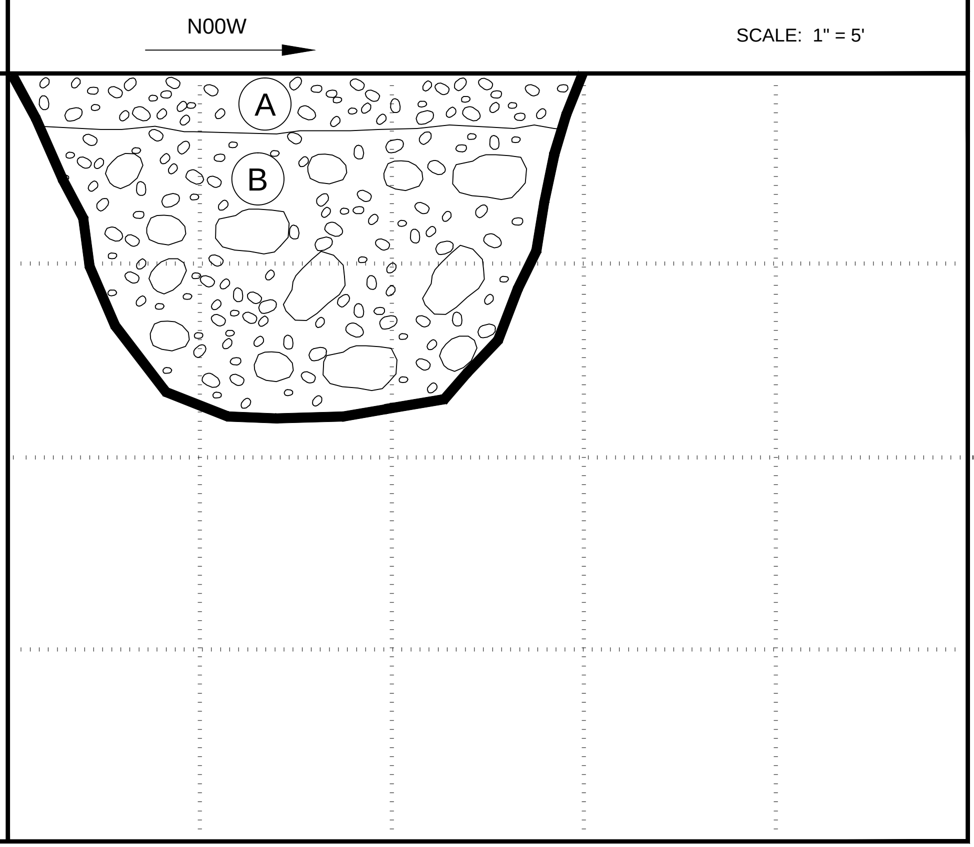
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N00W

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		10	A: FILL: Brown Silty fine to coarse Sand, abundant Gravel, extensive Cobbles, medium dense-moist
	b		1	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-dry to damp
5				
	b		2	
	b		2	
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-15

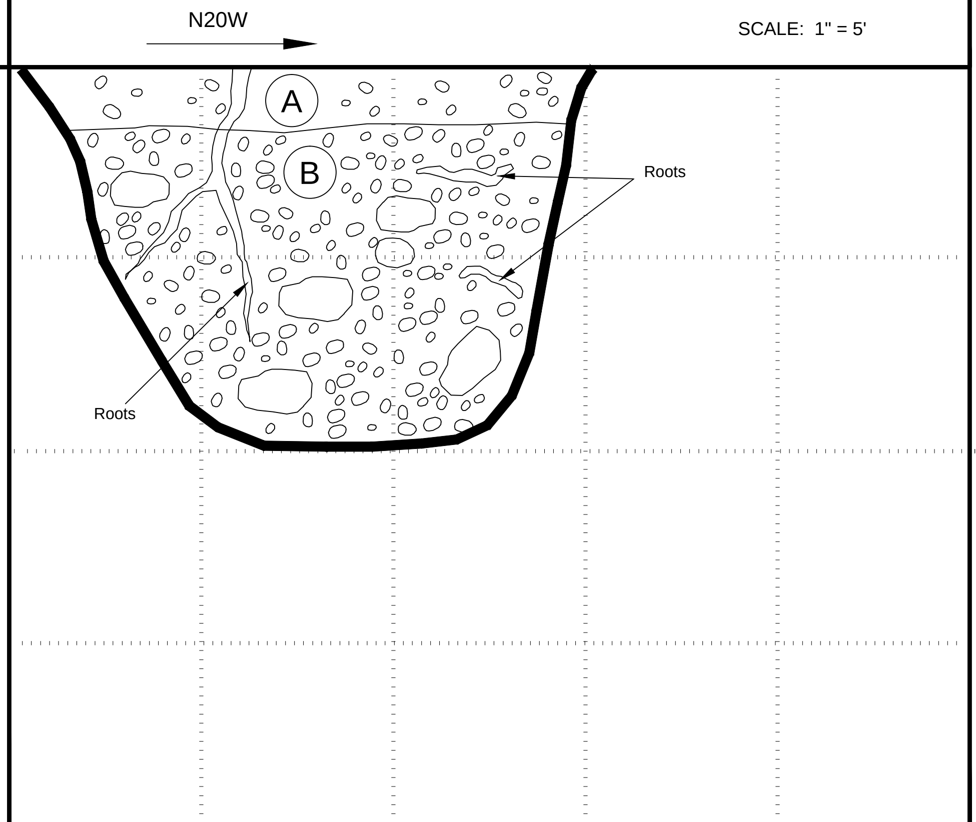
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-16

JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION: N20W	READINGS TAKEN: At Completion
DATE: 3-21-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		5	A: DISTURBED ALLUVIUM: Brown Silty fine to coarse Sand, occasional Cobbles, some fine to coarse Gravel, some large Roots, medium dense-moist
	b		2	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, some Roots very dense-dry to damp
5				
	b		2	
10	b		7	Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-16

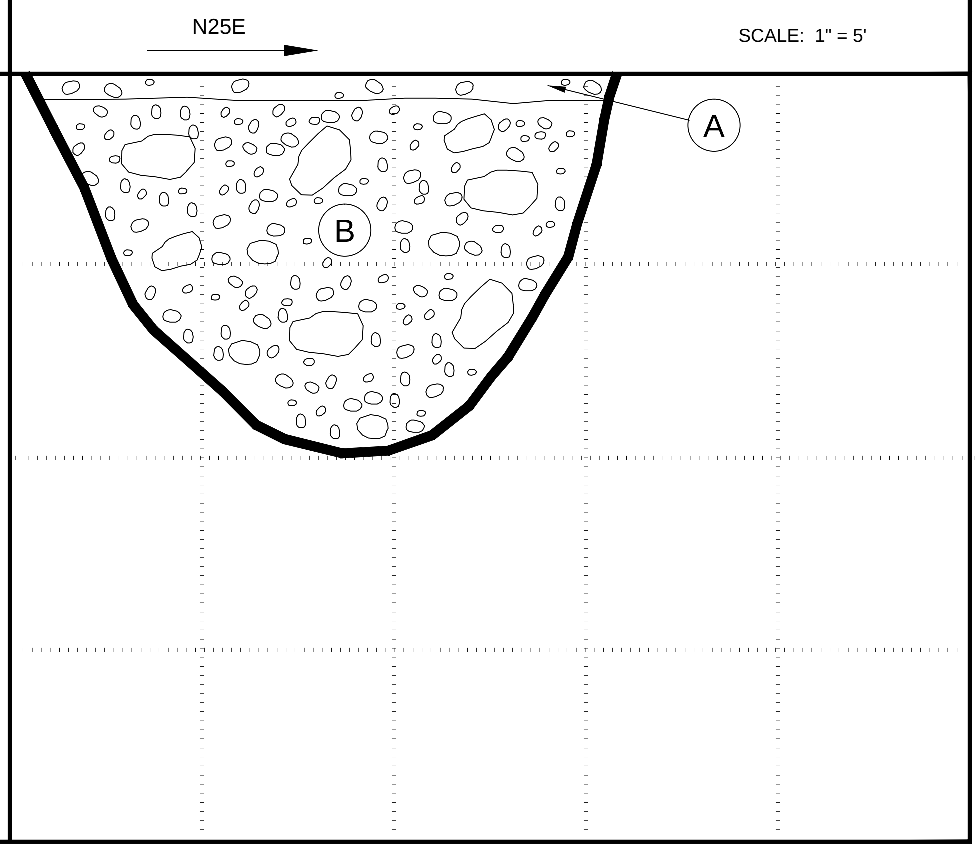
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-17

JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION: N25E	READINGS TAKEN: At Completion
DATE: 3-21-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		7	A: DISTURBED ALLUVIUM: Brown Silty fine to coarse Sand, occasional Cobbles, some fine to coarse Gravel, some large Roots, trace fine root fibers, medium dense-moist
	b		3	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-dry to damp
5				
	b		3	
10	b		2	Trench Terminated @ 10 feet
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-17

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-18

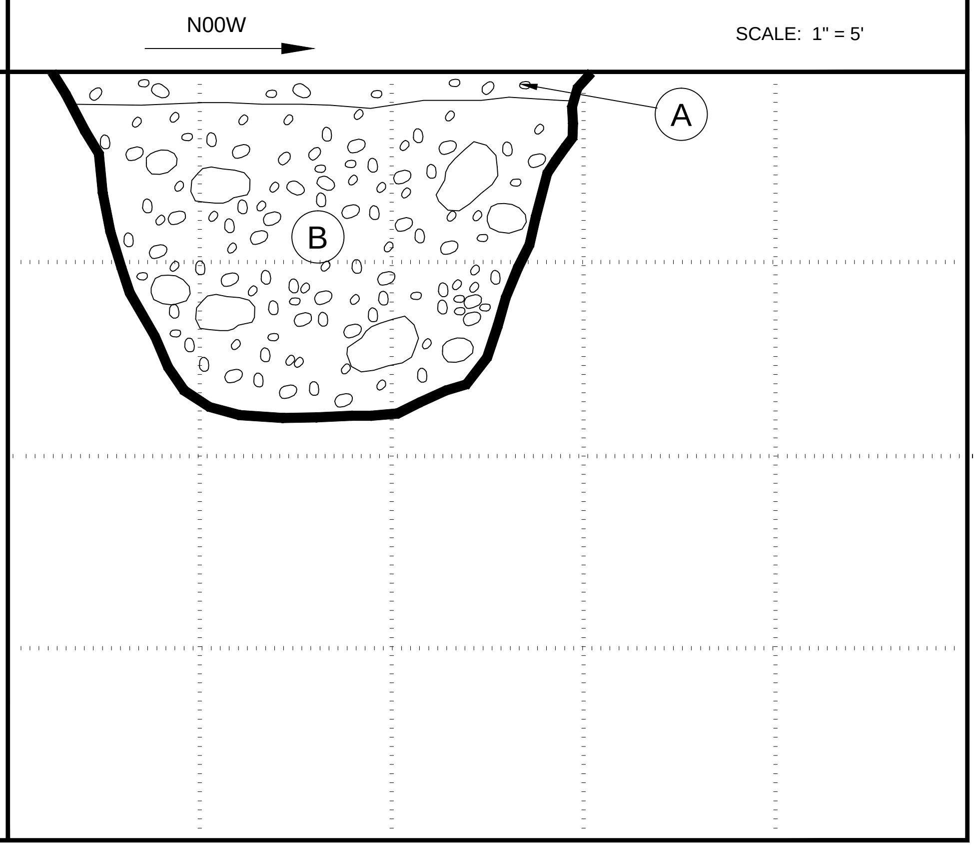
JOB NO.: 18G122-1
PROJECT: Proposed Warehouse
LOCATION: Upland, CA
DATE: 3-21-2018

EQUIPMENT USED: Backhoe
LOGGED BY: Jason Hiskey
ORIENTATION: N00W

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		7	A: DISTURBED ALLUVIUM: Brown Silty fine to coarse Sand, occasional Cobbles, some fine to coarse Gravel, abundant Root content, medium dense-moist
	b		2	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-dry to damp
5	b		4	
	b		3	
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-18

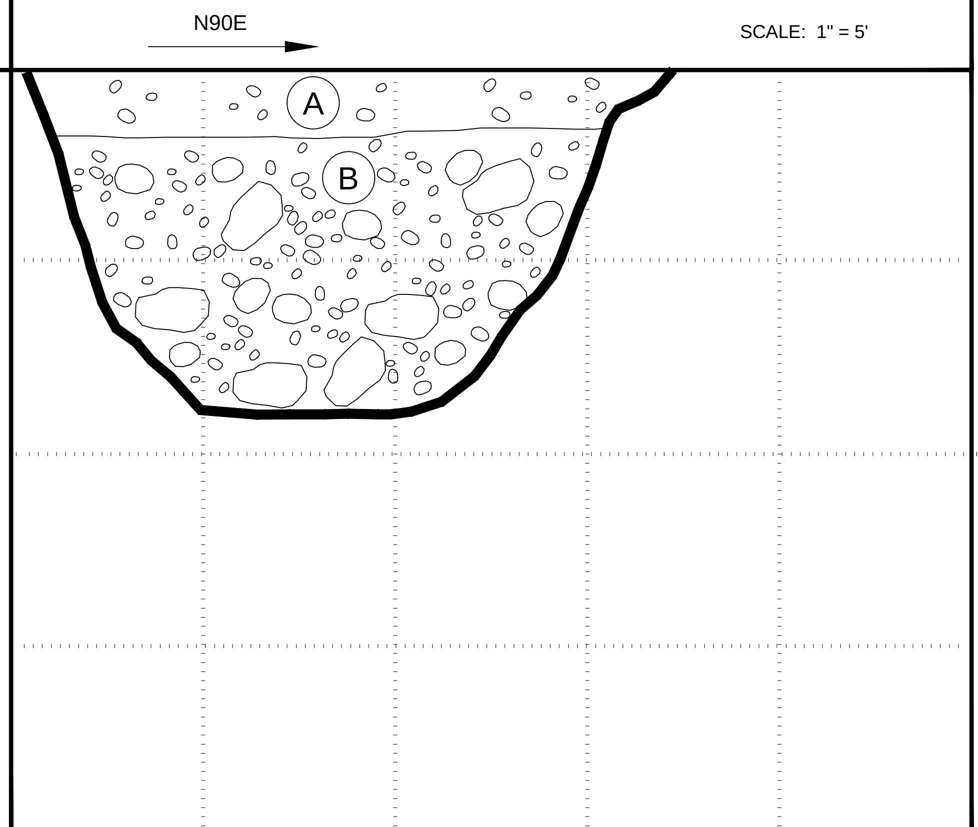
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-19

JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION:N90E	READINGS TAKEN: At Completion
DATE: 3-21-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		13	A: DISTURBED ALLUVIUM: Brown Silty fine to coarse Sand, occasional Cobbles, some fine to coarse Gravel, abundant Root content, medium dense-moist
	b		4	B: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, some Roots, very dense-dry to damp
5	b		6	
	b		2	
				Trench Terminated @ 9 feet
10				
15				

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-19

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-20

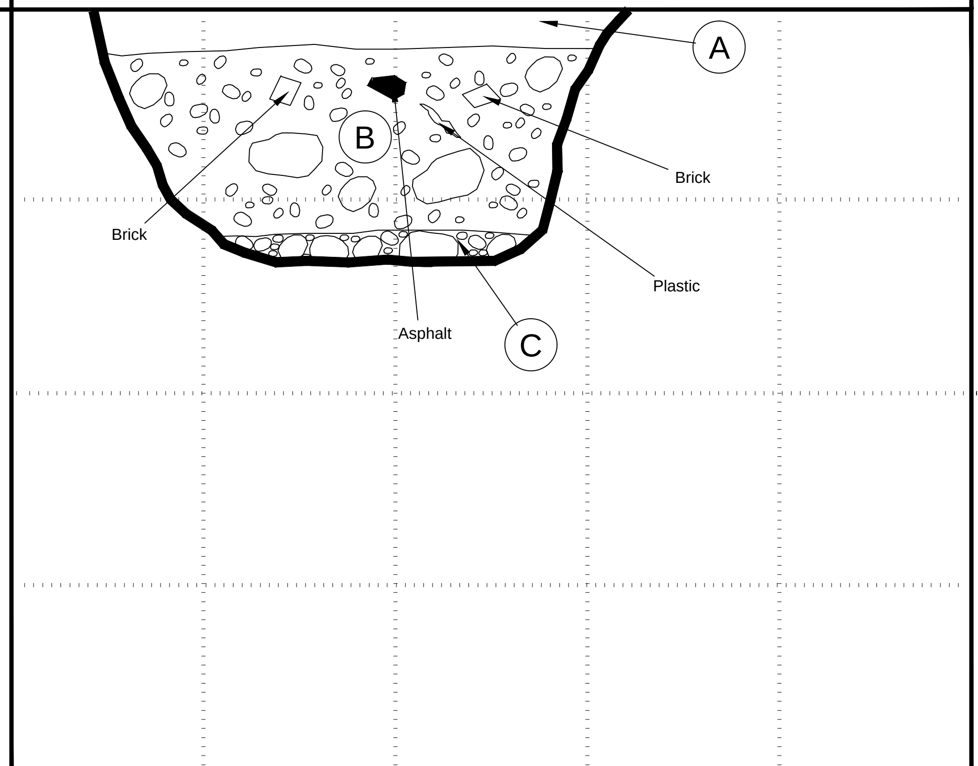
JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION: N90W	READINGS TAKEN: At Completion
DATE: 3-22-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		8	A: PAVEMENTS: 12 inches Aggregate base
	b		12	B: FILL: Dark Brown Silty fine to medium Sand, some coarse Sand, extensive Cobbles, occasional Boulders, some brick fragments, asphaltic concrete fragments, trace Plastic and Glass fragments, medium dense to dense-moist to very moist
5				C: ALLUVIUM: Gray to Brown Gravelly fine to coarse Sand, extensive Cobbles and Boulders, very dense-dry
	b		1	
				Trench Terminated @ 6.5 feet
10				
15				

GRAPHIC REPRESENTATION

N90W

SCALE: 1" = 5'



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

TRENCH LOG

PLATE B-20

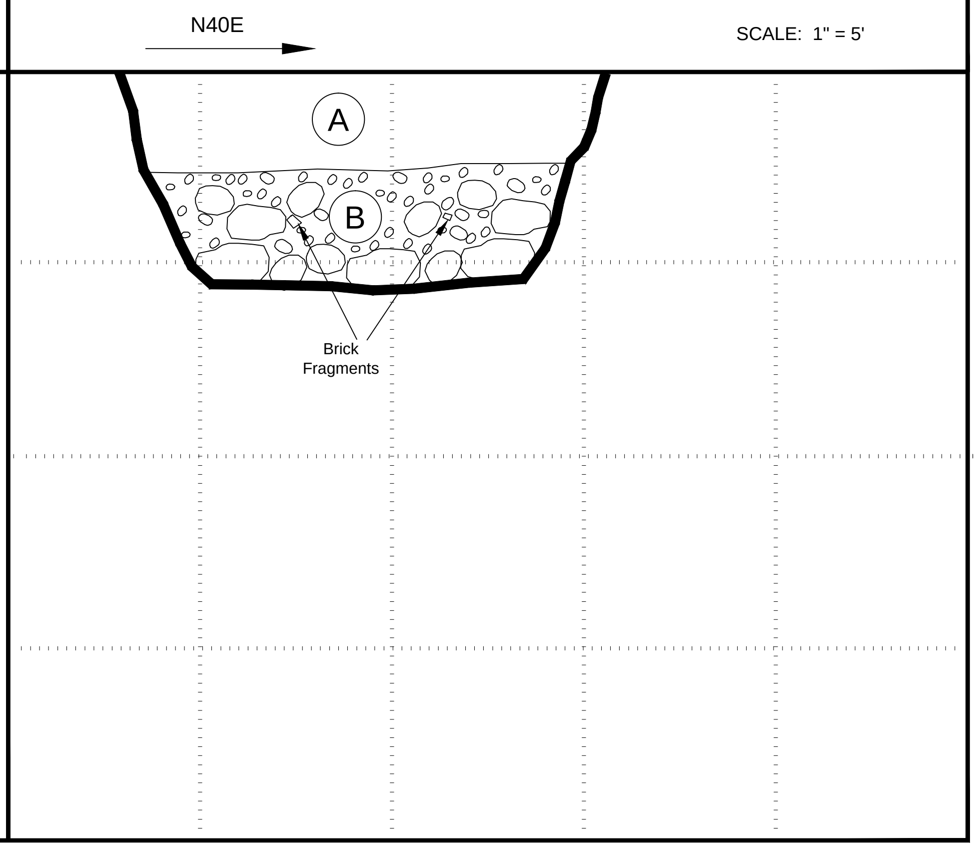
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-21

JOB NO.: 18G122-1	EQUIPMENT USED: Backhoe	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	LOGGED BY: Jason Hiskey	SEEPAGE DEPTH: Dry
LOCATION: Upland, CA	ORIENTATION: N40E	READINGS TAKEN: At Completion
DATE: 3-22-2018		

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
				A: PAVEMENTS: 30 inches Aggregate base B: FILL: Dark Brown Silty fine to medium Sand, some coarse Sand, some fine to coarse Gravel, occasional Cobbles, extensive Boulders, trace brick fragments, very dense-damp to moist
	b		7	
5	b		9	
				Trench Terminated @ 5.5 feet
10				
15				

GRAPHIC REPRESENTATION

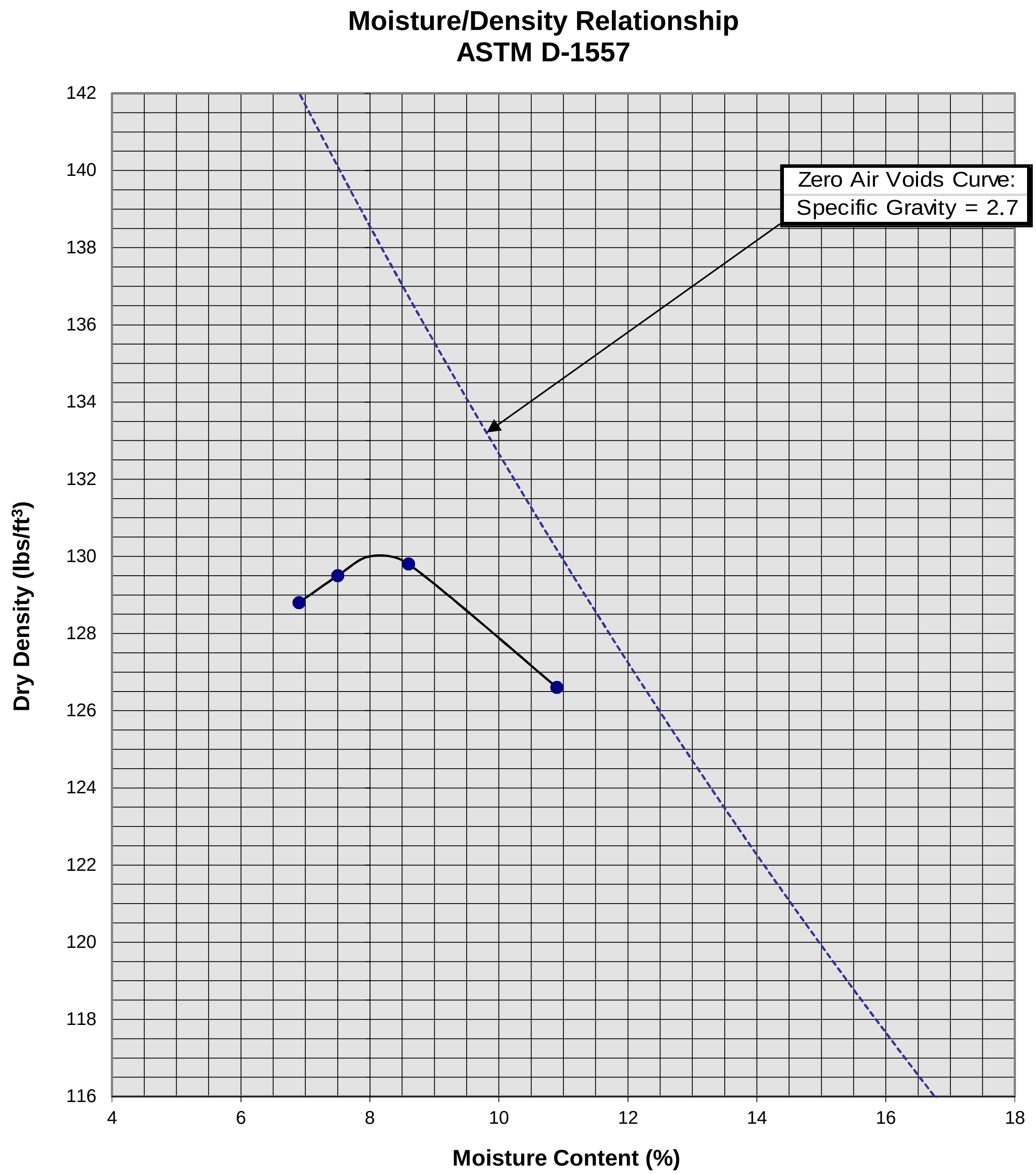


KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-21

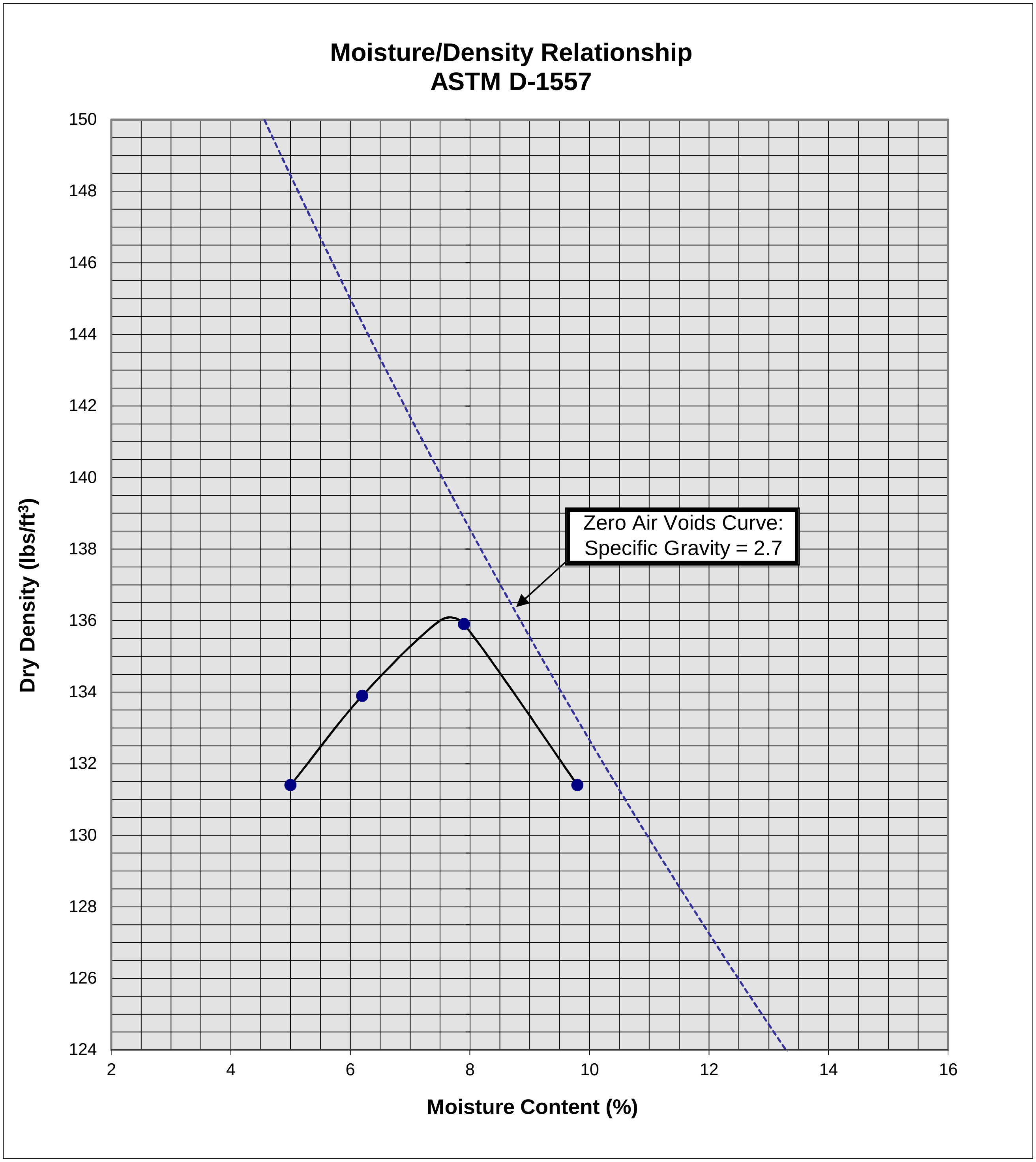
APPENDIX C



Soil ID Number		T-3 @ 0 to 5'
Optimum Moisture (%)		8
Maximum Dry Density (pcf)		130
Soil Classification	Gray Brown Silty fine to coarse Sand, trace fine Gravel, some Cobbles	

Proposed Warehouse
Upland, California
Project No. 18G122
PLATE C-1

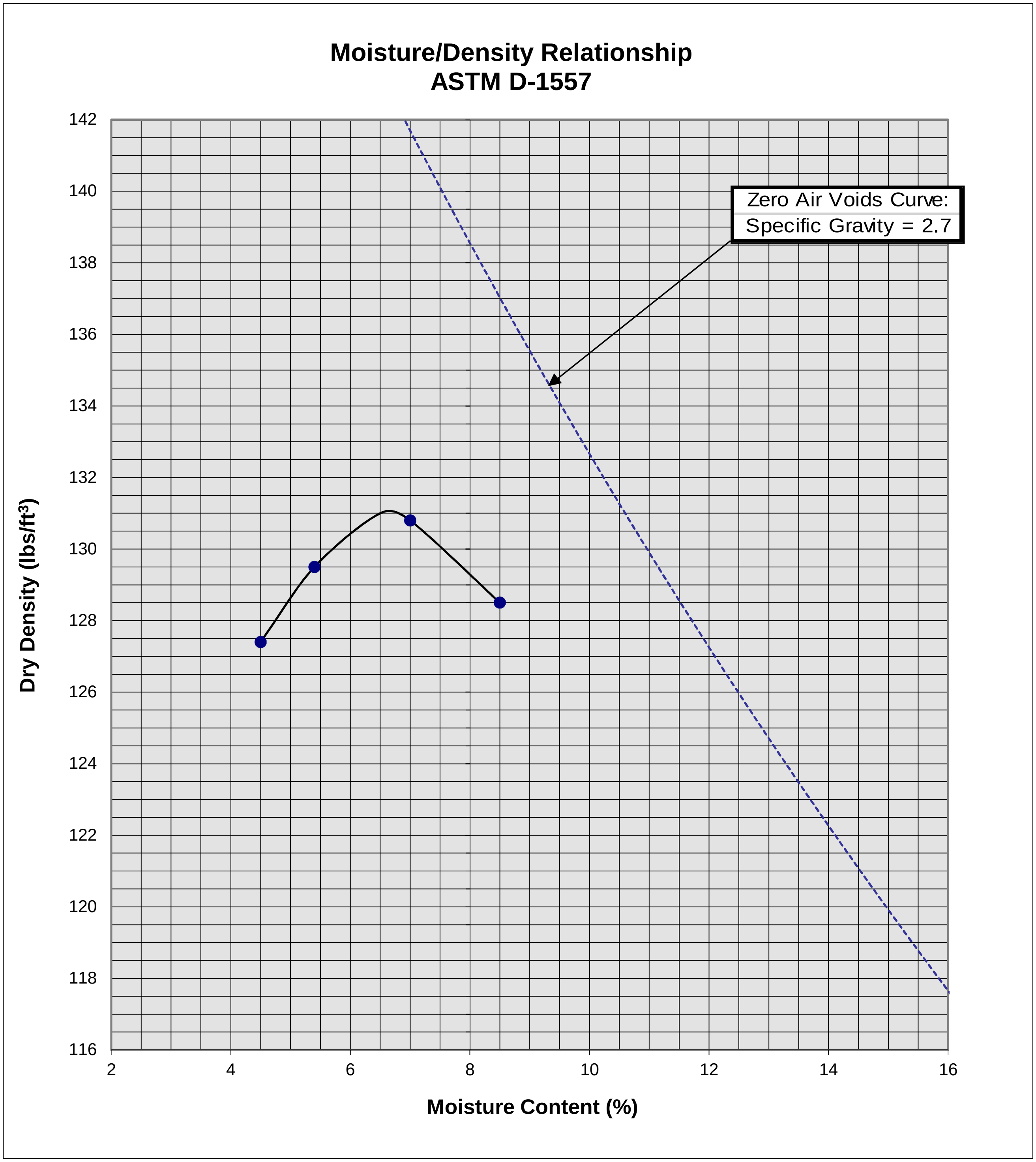
SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	T-10 @ 0 to 5'
Optimum Moisture (%)	7.5
Maximum Dry Density (pcf)	136
Soil Classification	Gray Brown Silty fine to coarse Sand, trace fine Gravel, some Cobbles

Proposed Warehouse
Upland, California
Project No. 18G122
PLATE C-2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	T-13 @ 0 to 5'
Optimum Moisture (%)	6.5
Maximum Dry Density (pcf)	131
Soil Classification	Gray Brown fine to coarse Sand, some fine to coarse Gravel, Cobbles

Proposed Warehouse
Upland, California
Project No. 18G122
PLATE C-3

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL *A California Corporation*

APPENDIX D

GRADING GUIDE SPECIFICATIONS

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

General

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

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

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

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

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

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

Site Preparation

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

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

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

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

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

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

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

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

Compacted Fills

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Foundations

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

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

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

Fill Slopes

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

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

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

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

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

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

Cut Slopes

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

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

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

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

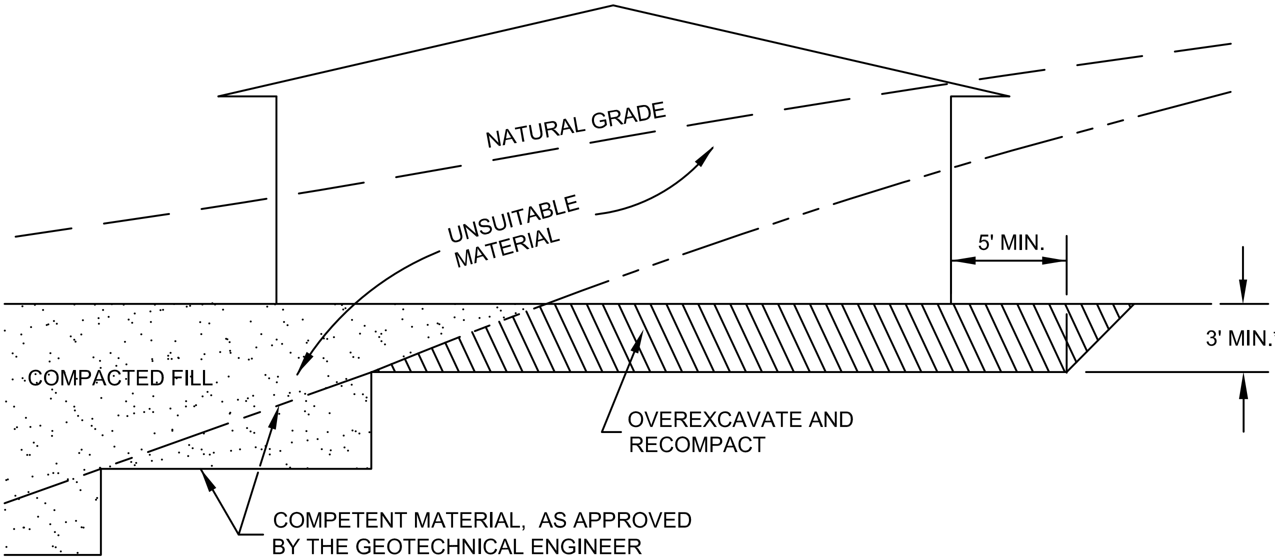
Subdrains

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

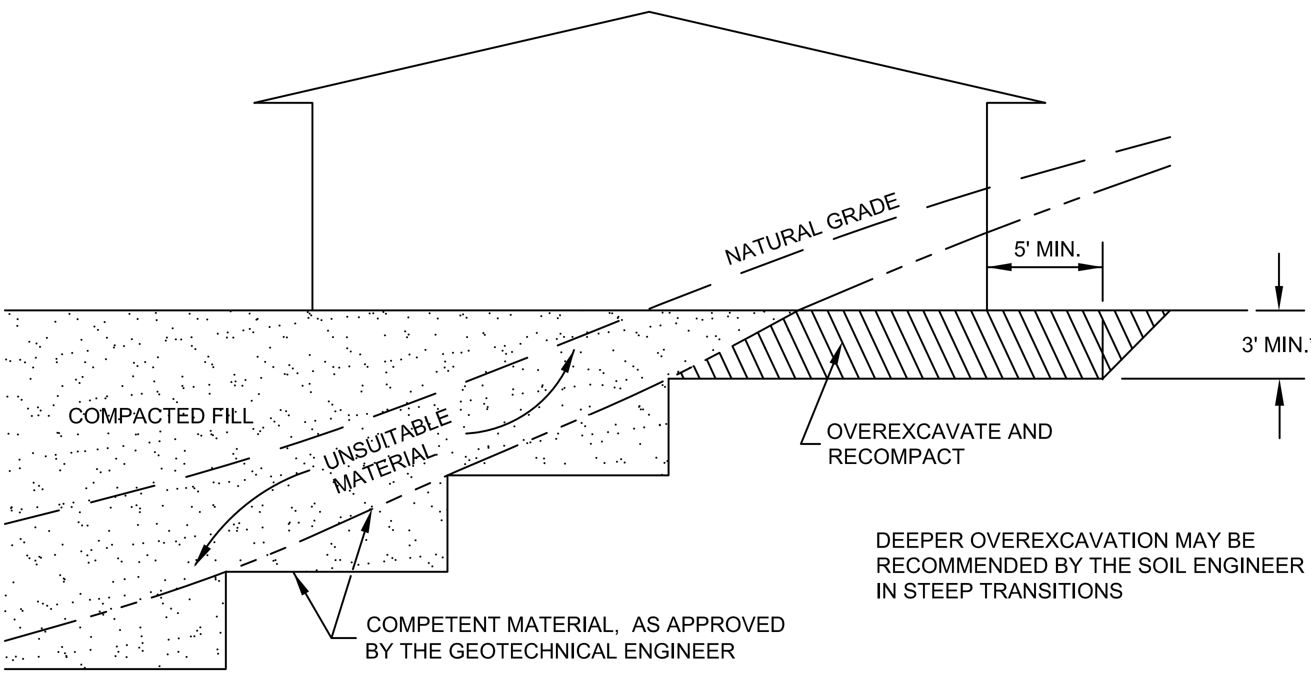
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

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

CUT LOT



CUT/FILL LOT (TRANSITION)



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

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

TRANSITION LOT DETAIL

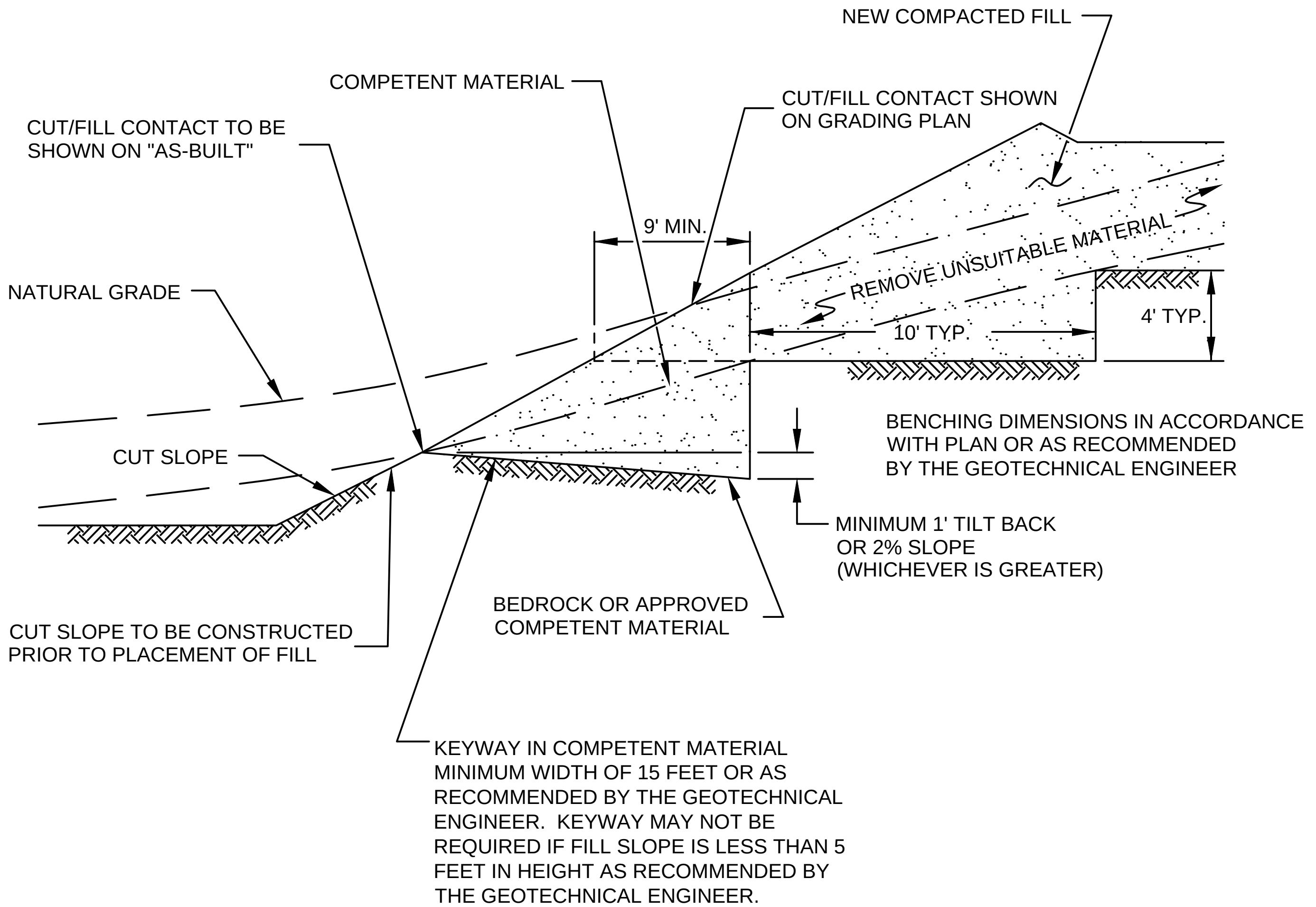
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

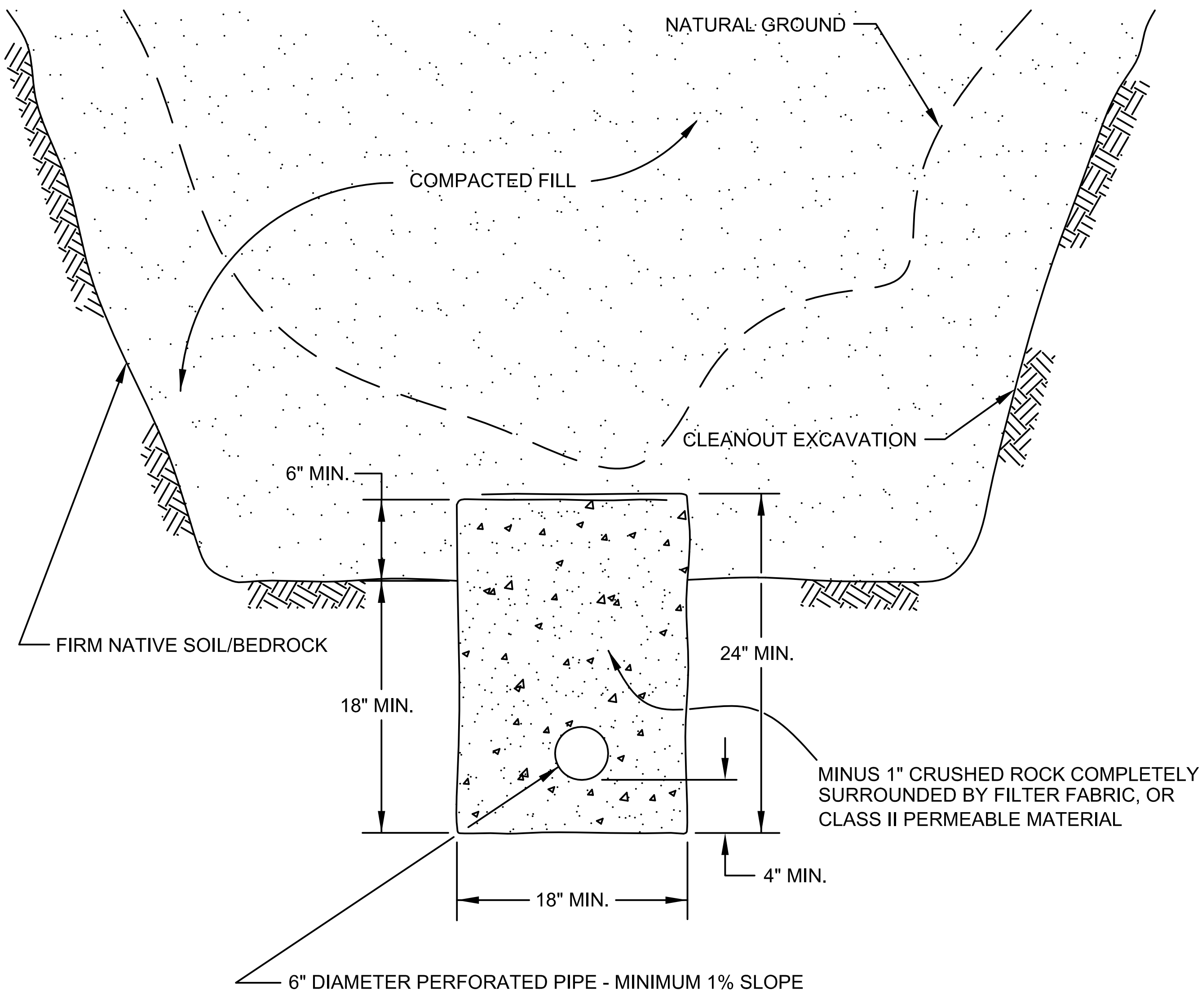
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SOUTHERN CALIFORNIA GEOTECHNICAL



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

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

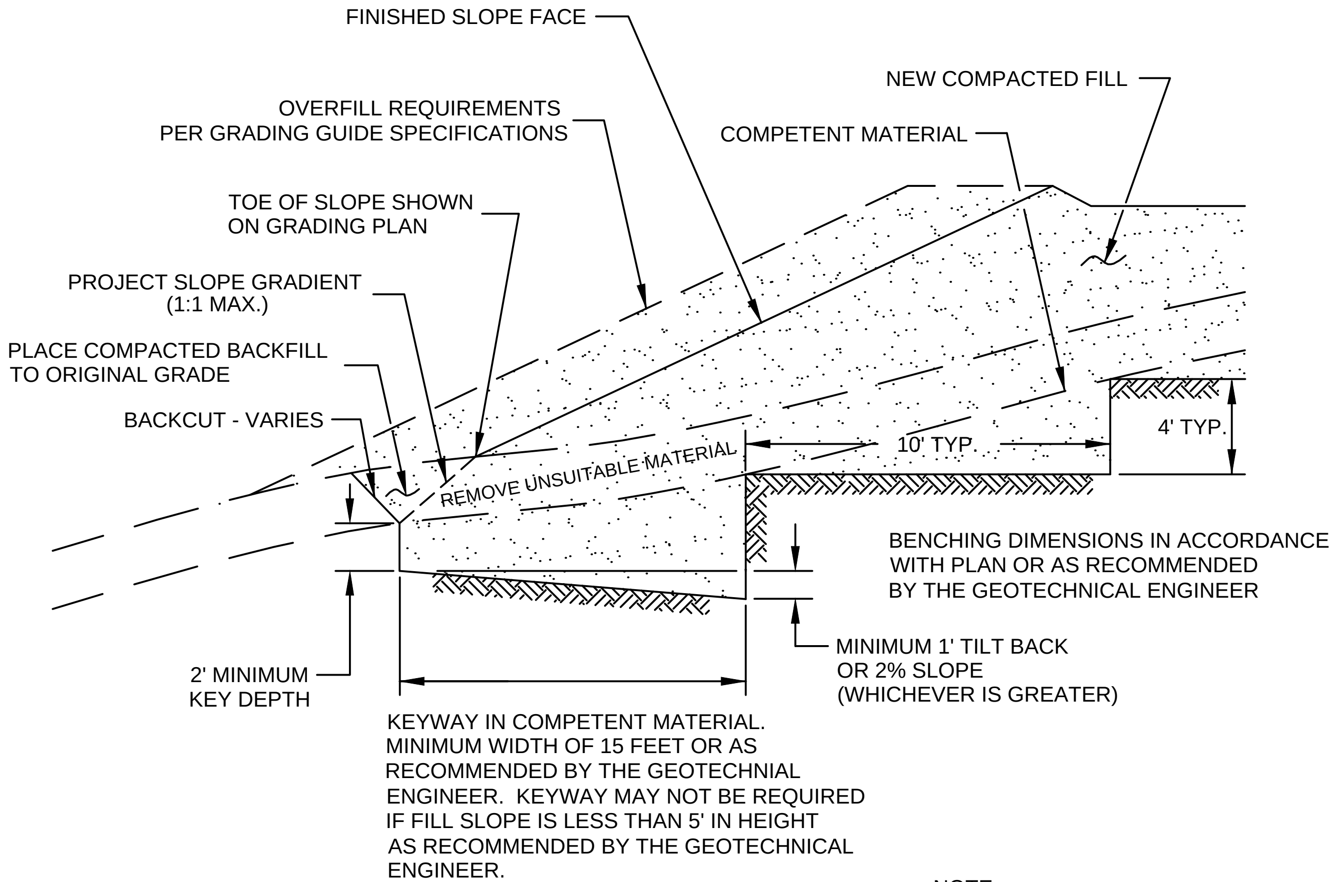
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE NATURAL SLOPE DETAIL

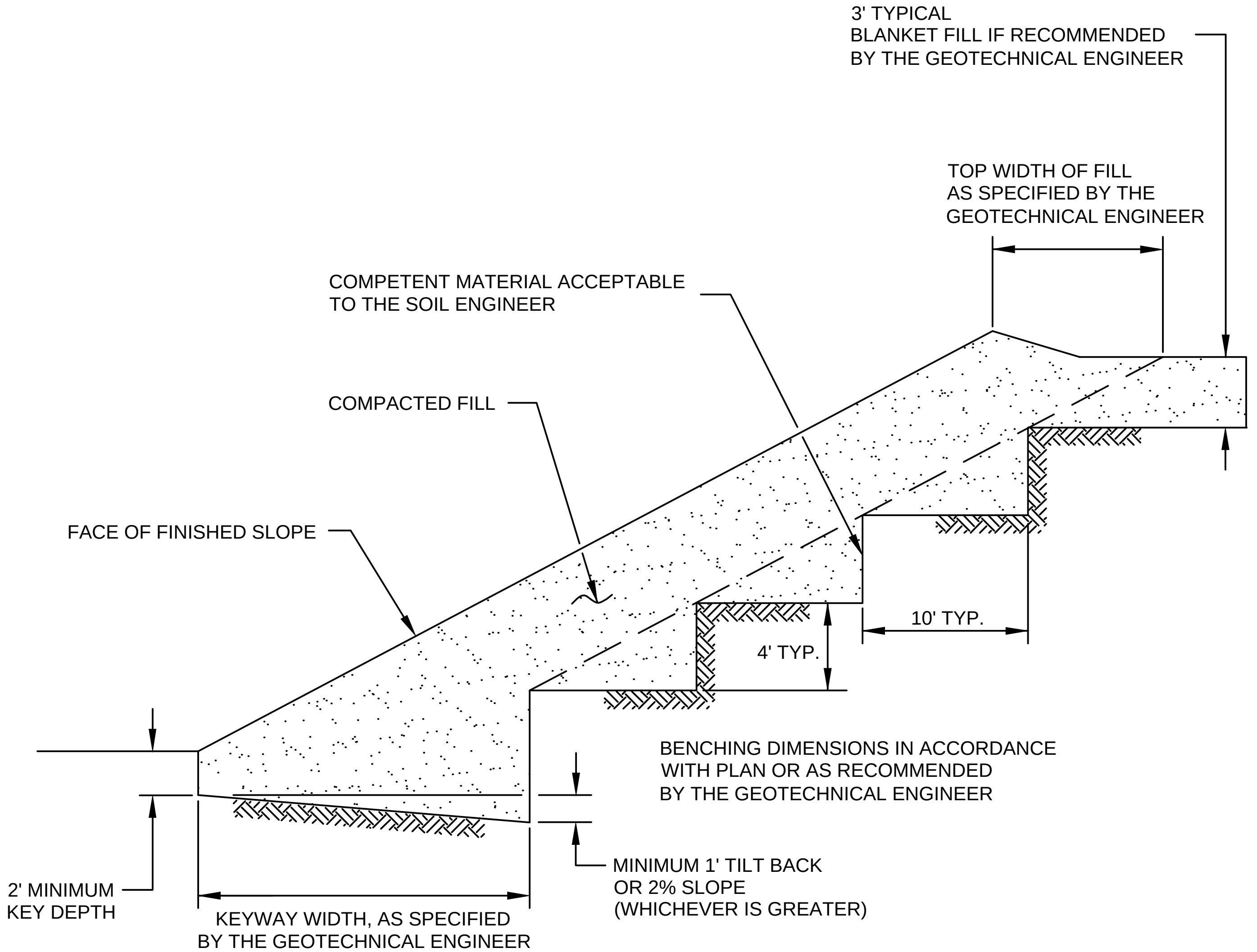
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

GRADING GUIDE SPECIFICATIONS

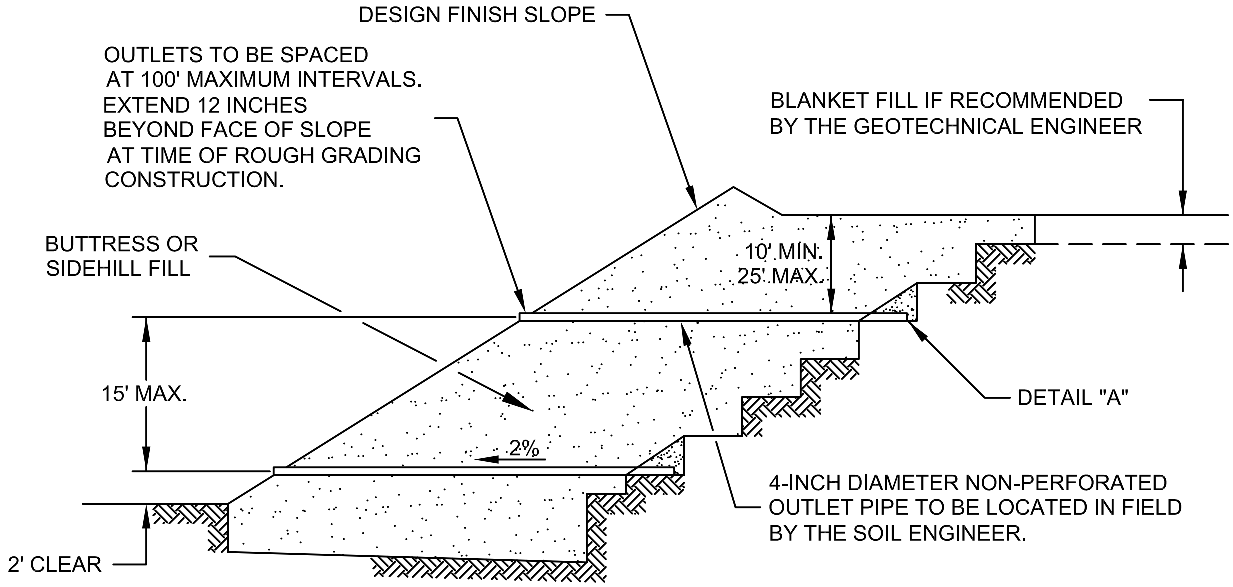
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



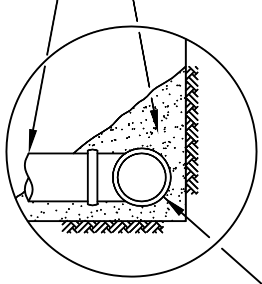
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

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

SAND EQUIVALENT = MINIMUM OF 50



DETAIL "A"

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

SLOPE FILL SUBDRAINS

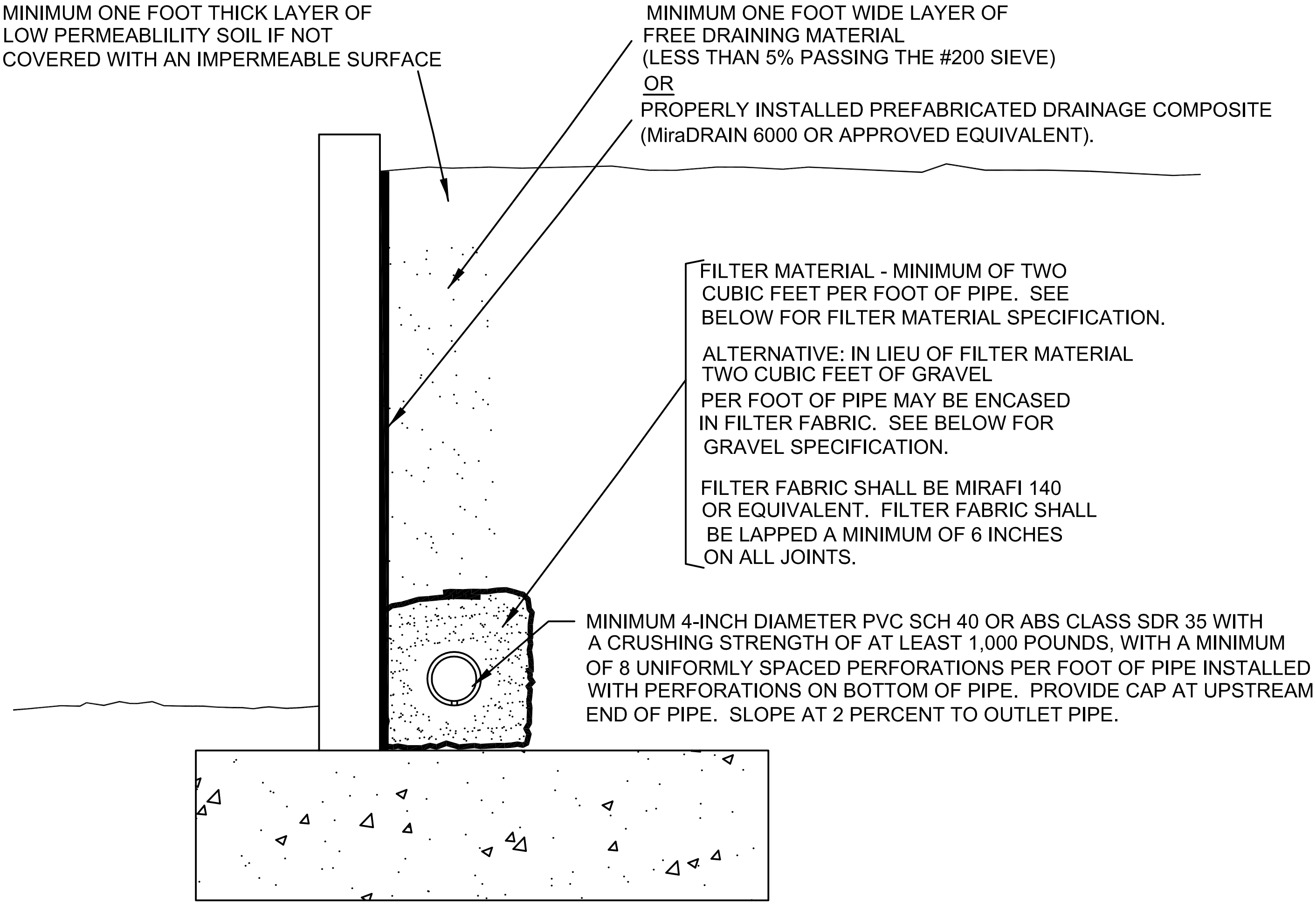
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



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

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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

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

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

GRADING GUIDE SPECIFICATIONS

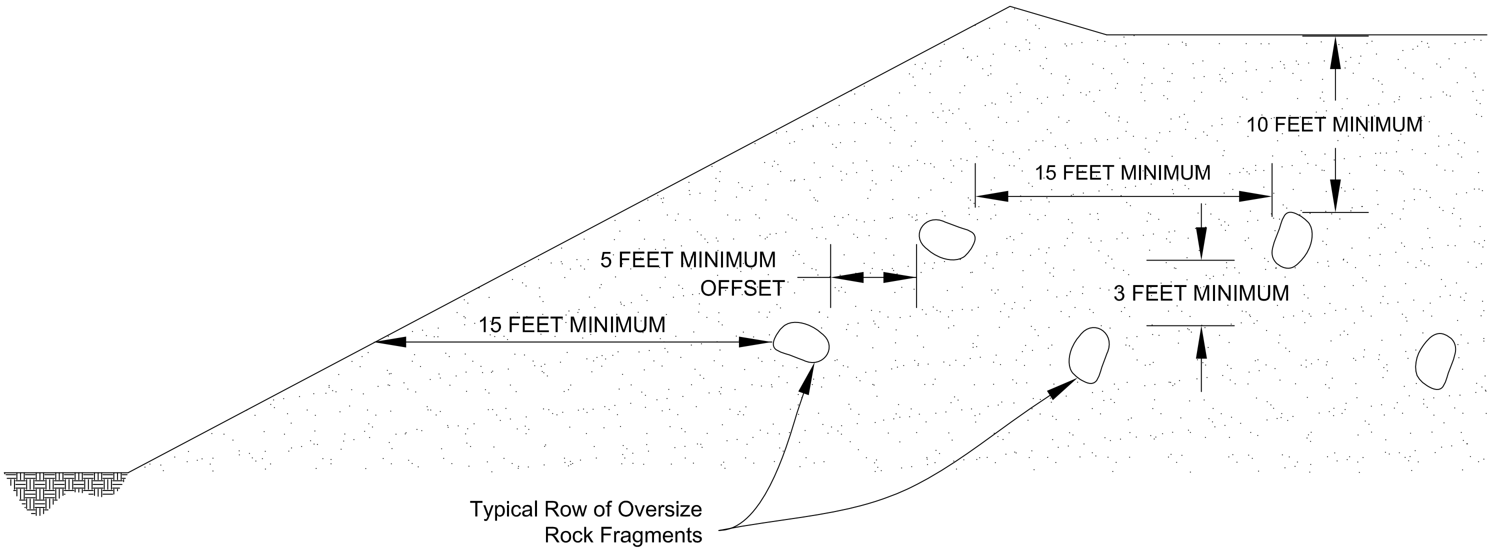
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

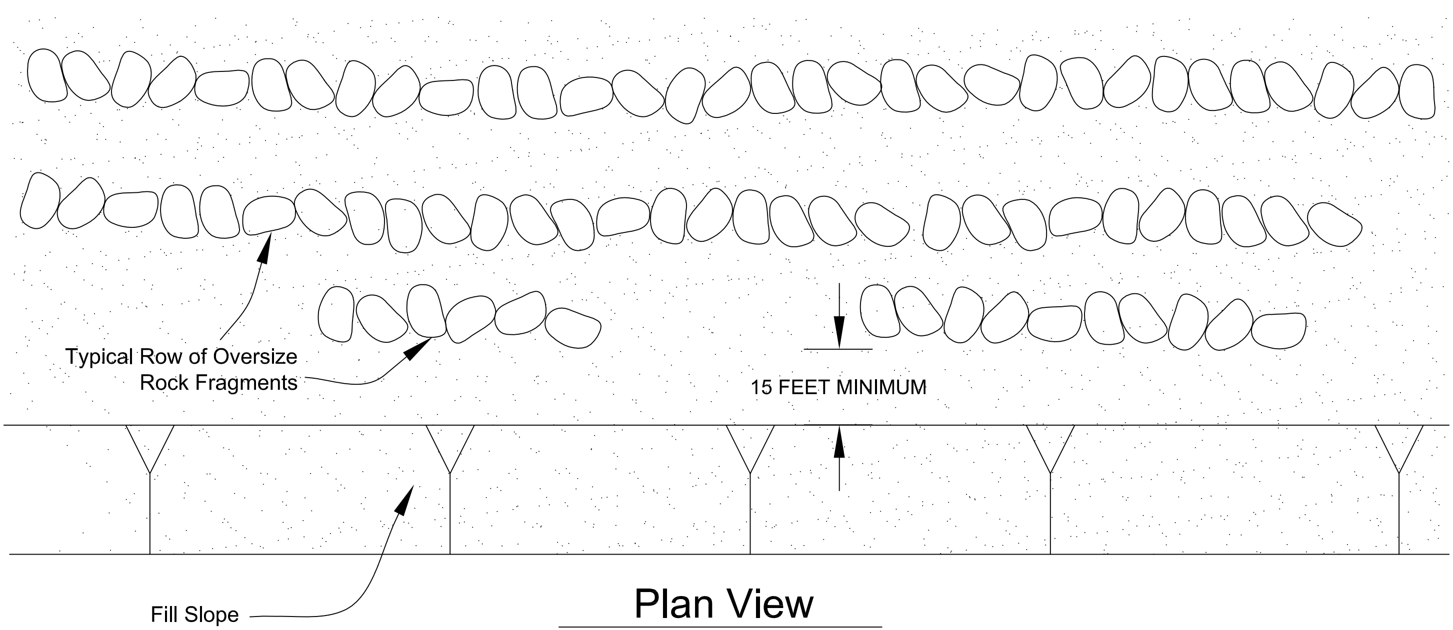
PLATE D-7

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
CHKD: GKM

PLATE D-8

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL

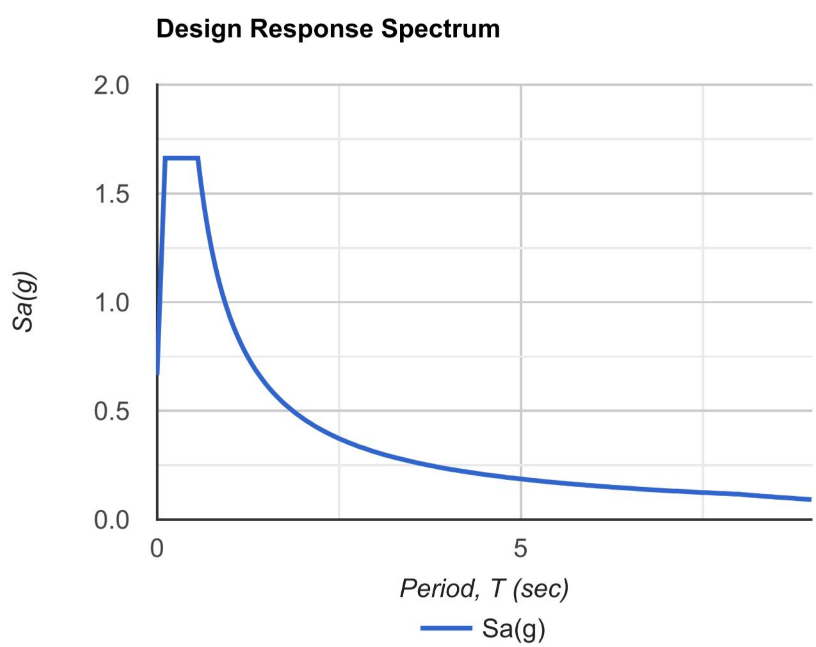
APPENDIX E

Latitude, Longitude: 34.108500, -117.686704

Date	11/11/2019, 10:30:50 AM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.495	MCE_R ground motion. (for 0.2 second period)
S_1	0.933	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.495	Site-modified spectral acceleration value
S_{M1}	1.4	Site-modified spectral acceleration value
S_{DS}	1.663	Numeric seismic design value at 0.2 second SA
S_{D1}	0.933	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	E	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.973	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.973	Site modified peak ground acceleration

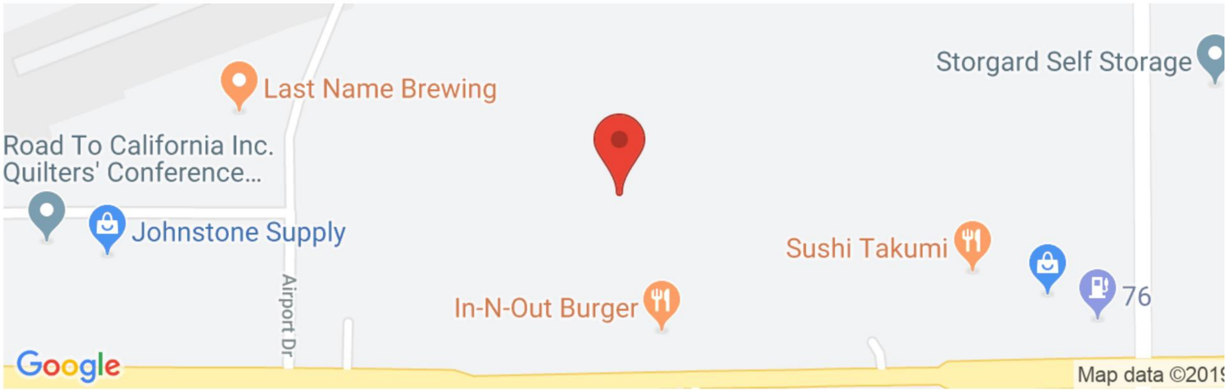


SOURCE: SEAOC/OSHPD Seismic Design Maps Tool
<https://seismicmaps.org/>

SEISMIC DESIGN PARAMETERS - 2016 CBC	
PROPOSED WAREHOUSE	
UPLAND, CALIFORNIA	
DRAWN: JH CHKD: RGT	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
SCG PROJECT 18G122-1R2	
PLATE E-1A	

OSHPD

Latitude, Longitude: 34.108500, -117.686704



Date	11/11/2019, 10:31:27 AM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.701	MCE_R ground motion. (for 0.2 second period)
S_1	0.641	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.701	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.134	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.723	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.795	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.701	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.83	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.102	Factored deterministic acceleration value. (0.2 second)
S1RT	0.641	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.702	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.685	Factored deterministic acceleration value. (1.0 second)
PGAd	0.863	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.929	Mapped value of the risk coefficient at short periods
C_{R1}	0.913	Mapped value of the risk coefficient at a period of 1 s

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

SEISMIC DESIGN PARAMETERS - 2019 CBC

PROPOSED WAREHOUSE

UPLAND, CALIFORNIA

DRAWN: JH
CHKD: RGT

SCG PROJECT
18G122-1R2

PLATE E-1B

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL