Appendix F

Feasibility Study Proposed RV Storage Facility, Southern California
Geotechnical, January 5, 2017

FEASIBILITY STUDY
PROPOSED RV STORAGE FACILITY

31000 Lake Street
Lake Elsinore, California
for
Avocado Groves, LLC

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

January 5, 2017

Avocado Groves, LLC
2279 Eagle Glenn Parkway, Suite 112-470
Corona, California 92883

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Attention: Mr. Ron Clark

Project No.: **16G227-1R**

Subject: **Feasibility Study**
Proposed RV Storage Facility
31000 Lake Street
Lake Elsinore, California

Gentlemen:

In accordance with your request, we have prepared a feasibility study for the subject site. This report includes a summary of data previously collected by others at the subject site and new subsurface exploration performed by Southern California Geotechnical, Inc. (SCG). 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.

PROFESSIONAL GEOLOGIST DARYL R. KAS No. 2467 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

Daryl R. Kas, CEG 2467
Project Geologist

REGISTERED PROFESSIONAL ENGINEER JOHN A. SEMINARA No. 2294 GEOTECHNICAL STATE OF CALIFORNIA

John A. Seminara, GE 2294
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.

Preliminary Geotechnical Design Considerations

- Riverside County has designated the western portion of the site as having moderate potential for liquefaction susceptibility. Due to the anticipated subsurface conditions, a liquefaction evaluation was not considered necessary at the time of the investigation. Based on the relatively dense alluvium, older alluvium, bedrock, and lack of water to at least 30± feet below the existing site grades, liquefaction is preliminarily not considered a design concern for this project. However, it is recommended that a design level geotechnical investigation for any building located within the hazard zone include a comprehensive liquefaction evaluation.
- Two large stockpiles of debris are located at the subject site. The debris consists of concrete, asphalt, concrete tiles, brick, and rebar. The western stockpile is approximately 320 feet long by 120 feet wide and 26 to 40 feet in height. The eastern stockpile is approximately 260 feet long by 185 feet wide and approximately 30 feet in height.
- A large stockpile of concrete washout material was located in the east-central area of the site. The stockpile is approximately 280 feet long, 145 feet wide, and 6 feet in height.
- The subsurface conditions encountered at the boring and trench locations consist of fill soils extending from 4½± feet to at least 19± feet below the exiting site grades. Since compaction reports were not available for the fill soils, these soils are considered to be undocumented fill soils. Beneath the fill soils, native alluvial or volcanic bedrock were encountered at all of the trench and boring locations except for two trenches that were terminated with the fill soils.
- The existing undocumented fill soils were likely placed after the site was no longer used as a quarry. These materials represent uncontrolled fill and are not considered suitable for support of new structural improvements.
- The near surface on-site soils have been determined to possess a medium to high expansion potential.
- The borings, trenches, and previous seismic refraction survey performed at the subject site generally indicate that the existing bedrock materials are rippable, at least to the depths at which excavation will be required to achieve the new site grades. Although no such materials were encountered at the exploration locations, blasting of very dense bedrock in isolated areas cannot be precluded.
- A detailed rough grading plan for the proposed development was not available at the time of this report. It is recommended that formal grading plan review be conducted once this plan becomes available. This review should include stability analysis of the proposed slopes.

Preliminary Site Preparation Recommendations

- Demolition of the existing buildings/structures and removal of mining equipment will be required at this site. Demolition should include all subsurface remnants of the existing structures, including foundations, floor slabs, and any utilities that will not be reutilized.
- Initial site preparation should also include removal of any debris, as well as stripping of any vegetation and organics from the site. These materials should be disposed of offsite.

- The concrete, asphalt, and brick debris in the two large stockpiles may be crushed to a maximum 3-inch particle size and mixed with on-site soils and reutilized as structural fill. All organic material should be disposed of off-site.
- Overexcavation should be performed within the proposed building areas to remove the existing undocumented fill soils in their entirety. At the exploration points, these materials extend to depths of 4½ to 19½± feet.
- Based on the proposed cuts up to 24± feet, it is expected that the volcanic bedrock will be encountered at or near pad grade elevations. In order to provide a uniform blanket of structural fill beneath the foundations and floor slabs for the new structures, it is recommended that the existing soils within the proposed building areas be overexcavated to a depth of at least 3 feet below proposed building pad subgrade elevation and to a depth of at least 3 feet below existing site grade, whichever is greater.
- Overexcavations within new flatwork and pavement areas should extend to at least 1 foot below proposed subgrade elevation.

Preliminary Foundation Design Parameters
- Conventional shallow foundations, supported in newly placed engineered fill soils.
- 2,500 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least four (4) No. 5 rebars (2 top and 2 bottom) in strip footings due to expansive soils.

Preliminary Building Floor Slab
- Conventional Slab-on-Grade, 5 to 6 inches thick, supported on the newly placed layer of compacted structural fill.
- The design of the floor slabs will depend in large part on the results of the future geotechnical study, including a more detailed liquefaction evaluation. The floor slab should include sufficient rigidity to resist the effects of expansive soils. Minimum reinforcement consisting of No. 3 bars at 16-inches on center in both directions, due to expansion potential of the on-site soils. The actual thickness and reinforcement of the floor slabs should be determined by the structural engineer.

Pavements

ASPHALT PAVEMENTS (R = 30)					
Materials	**Thickness (inches)**				
	Auto Parking and 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	4	4	5	6
Aggregate Base	6	7	10	11	12
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R = 30)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Light Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	6½	8	9
Compacted Subgrade (95% minimum compaction)	12	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 16P414, dated November 3, 2016. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory geotechnical testing, and geotechnical engineering analysis to determine the geotechnical feasibility of the proposed development. This report also contains preliminary design criteria for building foundations, building floor slabs, and parking lot pavements. The evaluation of the environmental aspects of this site was beyond the scope of services for this feasibility study.

It should be noted that additional subsurface exploration, laboratory testing and engineering analysis will be necessary to provide a design level geotechnical investigation with specific foundation, floor slab, and grading recommendations.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located on at the southeast corner of Lake Street and the southbound on-ramp for the Corona Freeway (Interstate 15) in Lake Elsinore, California. The site is also referenced by the street address 31000 Lake Street. The site is bounded to the north by the southbound on-ramp for the Corona Freeway, to the east and south by Temescal Wash, and to the west by Lake Street. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The site consists of an irregular-shaped parcel, approximately 19.29 acres in size. Based on conversations with the client, review of previous reports, and historical aerial photographs, the site was previously used as a sand and gravel quarry and most recently used as a material recycling center. At the time of our investigation, the site was no longer operational. A security trailer and truck scale structure were located in the southwestern area of the site. Mining and construction equipment including conveyors, loaders, and above ground storage tanks (ASTs) are located in the central area of the site. Two (2) large stockpiles of debris are located at the site. The debris consists of concrete, asphalt, concrete tiles, brick, and rebar. The western stockpile is approximately 320 feet long by 120 feet wide and 26 to 40 feet in height. The eastern stockpile is approximately 260 feet long by 185 feet wide and approximately 30 feet in height. A large stockpile of concrete washout material is located in the east-central area of the site. The stockpile is approximately 280 feet long, 145 feet wide, and 6 feet in height.

Detailed topographic information was provided on a preliminary grading plan prepared by Hunsaker & Associates, Inc. The overall site topography slopes downward to the south-southwest. The topographic high is at elevation 1278± feet mean sea level (msl) located in the northern area of the site and the topographic low is at elevation 1218± feet msl located in the western area of the site. There is 60± feet of elevation differential across the site.

3.2 Proposed Development

Based on a site plan prepared by Herdman Rierson, the proposed development will consist of a total of six (6) buildings. The main building will be an RV storage facility located in the central area of the site. This building will be 93,750± ft^2 in size. A self-storage facility will consist of three (3) buildings located in the eastern area of the site. The buildings will range from 5,500± ft^2 to 19,120± ft^2 in size. A service station will be constructed in the western area of the site. The service station will include a 2,400± ft^2 convenience store and a 2,054± ft^2 canopy over the fuel islands. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, concrete flatwork, and landscape planters throughout.

Detailed structural information has not been provided. It is assumed that the proposed RV storage buildings will be single-story structures of concrete tilt-up construction. The proposed self-storage facility is assumed to be a single-story structure of masonry block construction and the service station is assumed to be a single-story structure of wood frame and stucco construction. All of the buildings are assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads for the RV storage and self-storage buildings are expected to be on the order of 80 kips and 3 to 4 kips per linear foot, respectively. The maximum column and wall loads for the service station building is expected to be on the order of 10 kips and 2 to 3 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 a review of the preliminary grading plan, cuts up to 24± feet and fills of up to 16± feet will be necessary to achieve the proposed building pad grades.

Several slopes will be located along the property lines at the site. A descending slope will be located the eastern property line approximately 20 feet in height, three (3) ascending slopes will be located along portions of the northern property line ranging from 10 to 15± feet in height, and a descending slope will be located along the southern property line ranging from 5 to 10± feet in height. All of the proposed slopes will have inclinations of 2h:1v.

3.3 Previous Studies

SCG was provided with two previous geotechnical reports prepared by Soil and Testing Engineers, Inc. (STE). The results of these geotechnical investigations are documented in the reports referenced below:

- Geotechnical Report of the Lake Street Property Located Southeast of the Intersection of I-15 and Lake Street in Lake Elsinore, California, prepared for Wyroc, Inc., prepared by STE, STE Report No. 9051063, dated November 2, 1990.

As part of this previous geotechnical investigation, five (5) test pits were excavated to depth up to 6± feet below the previously existing site grades with a TD25 dozer. Trench Nos. T-1, T-2 and T-5 were excavated to greater depths up to 12± feet with a track mounted excavator. In addition, a total of nine (9) seismic lines were performed at the subject site. STE indicated that all of the trenches encountered shallow meta-volcanic bedrock. STE reported several ancient faults that transect the subject site. These faults trend roughly northwest-southeast and are dipping 70 to 85 degrees to the northeast. STE also indicated that the rippability at Trench Nos. T-1 and T-2 were facilitated by close joint spacing of less than 3 feet. However, STE reported that ripping was more difficult in Trench No. T-4 where the joint spacing was between 3 to 6 feet. STE reported that the seismic lines profiles indicate that the seismic velocity of the bedrock ranges from 9,500 to 12,500 feet per second. However, STE also indicated that due to the jointing of the bedrock material and the fracturing of the bedrock due to the ancient faults, the observed velocity was between 6,000 to 8,000 feet per second. Therefore, STE concluded that the bedrock may be rippable to depths up to 35± feet. STE indicated that due to the nature of the material and the varying joint spacing, that blasting may be required in localized areas.

- Geotechnical Investigation, Proposed Aggregate Processing Facility, SE of Lake Street and I-15 Freeway, Lake Elsinore, California, prepared for Wyroc, Inc., prepared by STE, STE Report No. 9041151 dated December 26, 1990.

As part of this previous geotechnical study, five (5) hollow stem auger borings were drilled to depths ranging from 7 to 34½± feet below the previously existing site grades at the site.

STE reported that artificial fill was encountered at one of the borings extending to a depth of 1 foot below the existing site grades. The fill consisted of silty fine sands. STE encountered native colluvial soils at two of the boring locations extending from the ground surface to depths of 4½ to 7± feet below the existing site grades. STE reported that the colluvial soils consisted of silty sands. STE also encountered older alluvium at four of the borings extending from the ground surface to depths of at least 34½± feet. The older alluvial soils consisted of interbedded silty fine to medium sands, silty fine to coarse sands, fine to coarse sands with varying amounts of gravel and cobble content and fine to medium sandy silts. Meta-volcanic bedrock was encountered beneath the colluvium and older alluvium at several boring locations. STE reported that the bedrock consisted of slightly metamorphosed layers of andesite flows and flow breccias with minor interbeds of fluvial breccia and conglomerate deposits. Groundwater was encountered in the western portion of the site at depths of 22 to 25± feet.

STE recommended that all debris and deleterious material and mine tailings be removed from the site. STE also recommended all fill and colluvium be removed to competent materials. The excavation was recommended to be inspected by an engineering geologist to verify compliance and suitability of soils. The exposed soils were recommended to be scarified 12 inches, moisture conditioned to 2 percent above optimum moisture content and densified to a minimum of 90 percent relative compaction.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of eight (8) borings (Boring Nos. B-7 through B-14) advanced to depths of 7½ to 30± feet below the existing site grades. In addition to the eight borings, eight (8) trenches (Trench Nos. T-6 through T-13) were excavated at the site to depths of 10 to 20± feet below the existing site grades. These trenches were excavated using a track mounted excavator equipped with a 24-inch bucket. All of the borings and trenches were logged during excavation by a member of our staff.

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

The approximate locations of the borings and trenches are indicated on the Geotechnical Map, included as Plate 2 in Appendix A of this report. The Boring and Trench Logs, which illustrate the conditions encountered at the boring and trench locations, are included in Appendix B.

4.2 Geotechnical Conditions

Concrete Washout

Artificial fill soils consisting of loose, white, concrete washout material were encountered at Trench No. T-10 extending from the ground surface to a depth of 6± feet below the existing site grades.

Rubble Stockpile

Construction rubble debris consisting of concrete, asphalt, concrete tiles, clay pipes, and metal were encountered within the stockpiles at Trench Nos. T-6 and T-13 extending from the highest portion of the trench to 7± feet below the highest portion of the trench (the approximately elevation of the previously existing site grades).

Artificial Fill

Artificial fill soils were encountered at all of the trench and boring locations extending to depths up to 19½± feet below the existing site grades. The fill soils consist of medium dense to very dense silty fine to coarse sands, clayey fine to coarse, gravelly fine to coarse sands, and medium stiff fine to medium sandy clays. The fill soils possess trace amounts of asphalt and brick fragments, variable strengths, and a disturbed appearance, resulting in their classification as fill.

Alluvium

Native alluvial soils were encountered beneath the fill soils at Boring Nos. B-7 and B-9 and at Trench No. T-11 extending to depths of 5 to 27± feet below the existing site grades. The native alluvial soils consist of loose to medium dense clayey fine sand to very stiff fine sandy clay.

Older alluvial soils were encountered beneath the alluvium at Boring Nos. B-7 and B-9. The older alluvium consists of very stiff to hard fine to coarse sandy clay extending to depths of 22 and at least 30± feet, respectively.

Bedrock

Andesitic meta-volcanic bedrock was encountered at Boring Nos. B-7, B-8, B-10 through B-14 and Trench Nos. T-7, T-9, T-10, and T-12. The bedrock is very dense, aphanitic, friable, jointed, and slightly fractured. Refusal conditions were encountered at Trench Nos. T-7 and T-10 at depths of 10 feet and 14½ feet, respectively. Refusal conditions were also encountered at Boring Nos. B-12 and B-13 at depths of 15 and 7½± feet, respectively. The bedrock extends to depths of at least 30± feet at several of the boring locations. All of the borings and trenches which encountered bedrock at the site were terminated within the bedrock materials.

Groundwater

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

Regional groundwater data is limited due to the presence of shallow bedrock in the area of the subject site. However, STE encountered groundwater at depths of 22 and 25± feet at the time of their subsurface exploration. It should be expected that minor amounts of perched water may be present locally at the alluvium-bedrock contact.

4.3 Geologic Conditions

Regional geologic conditions were obtained from the Geologic Map of the Alberhill 7.5' Quadrangle, Riverside County, California, published by the California Geological Survey (CGS) (formerly California Department of Conservation Division of Mines and Geology0 by Richard B. Greenwood, 1992. This map indicates that the western area of the site is underlain by alluvium (Map Symbol Qa), the eastern area of the site is underlain by older alluvium (Map Symbol Qoa), and the central area of the site underlain by intrusive rocks associated with the Santiago Peak Volcanics (Map Symbol KJsp). The alluvium is described as undivided alluvium from active streams and flood plains. The older alluvium is described as moderately consolidated gravel, sand, and silt associated with inactive river and flood plain deposits. The bedrock is described as latite and dacite porphyry intrusive rocks of the Santiago Peaks Volcanics. A portion of this map indicating the location of the subject site is included as Plate 3 in Appendix A.

Bedrock materials were encountered at several of the boring and trench locations extending from beneath the artificial fill, alluvium, and older alluvium to depths of at least 30± feet. Based on the bedrock encountered at these boring and trench locations, it is our opinion that the majority of the site is underlain by the Santiago Peak Volcanics (Map Symbol KJsp). The bedrock is weathered, aphanitic, friable, jointed, fractured and consists of meta-volcanic andesite.

STE mapped several ancient faults in the northern area of the site. These faults trend roughly northwest-southeast and dip between 70 and 58 degrees to the northeast. Since STE did not discuss the observation of offset within the upper alluvial soils, these faults are considered to be ancient and no longer active.

5.0 LABORATORY TESTING

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

Classification

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

Consolidation

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

Maximum Dry Density and Optimum Moisture Content

A representative bulk sample was tested to determine its maximum dry density and optimum moisture content. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557, and are presented on Plate C-9 in Appendix C of this report. This test is generally used for comparison with the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

Soluble Sulfates

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

Sample Identification	Soluble Sulfates (%)	ACI Classification
B-9 @ 0 to 5 feet	0.005	Negligible
B-11 @ 0 to 5 feet	0.033	Negligible

Expansion Index

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

Sample Identification	Expansion Index	Expansive Potential
B-9 @ 0 to 5 feet	58	Medium
B-11 @ 0 to 5 feet	1	Very Low
T-9 @ 0 to 5 feet	100	High

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

6.1 Seismic Design Considerations

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

Faulting and Seismicity

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Although ancient faults were identified at the site by STE, the faults are considered to be inactive since no offset within the alluvial soils were discussed in the previous reports. Therefore, the possibility of significant fault rupture on the site is considered to be low.

The nearest mapped active fault is the Elsinore Fault, located approximately 1.6± miles southwest the subject site. Due to the proximity of this and other faults, significant seismic shaking could impact the site within the design life of the proposed development. Other known regionally active faults that could affect the site include San Jacinto, Whittier, San Andres, Cucamonga, Puente Hills Thrust, and San Jose faults.

The potential for other geologic hazards such as seismically induced settlement, lateral spreading, tsunamis, inundation, seiches, flooding, and subsidence affecting the site is considered low due to the shallow bedrock and the elevation of the site with respect to the nearest large body of water.

Seismic Design Parameters

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

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

The 2016 CBC Seismic Design Parameters have been generated using U.S. Seismic Design Maps, a web-based software application developed by the United States Geological Survey. This software application, available at the USGS web site, calculates seismic design parameters in accordance with the 2016 CBC, utilizing a database of deterministic site accelerations at 0.01 degree intervals. The table below is a compilation of the data provided by the USGS application. A copy of the output generated from this program is included as Plate E-1 in Appendix E of this report. A copy of the Design Response Spectrum, as generated by the USGS application is also included in Appendix E. Based on this output, the following parameters may be utilized for the subject site:

2016 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	2.267
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.900
Site Class	---	C
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	2.267
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	1.170
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.511
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.780

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 grain size characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. The depth within which the occurrence of liquefaction may impact surface improvements is generally identified as the upper 50 feet below the existing ground surface. Liquefaction potential is greater in saturated, loose, poorly graded fine sands with a mean (d_{50}) grain size in the range of 0.075 to 0.2 mm (Seed and Idriss, 1971). Clayey (cohesive) soils or soils which possess clay particles (d<0.005mm) in excess of 20 percent (Seed and Idriss, 1982) are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table.

The Riverside County RCIT GIS website indicates that the western portion of the subject site is located within a zone of moderate liquefaction susceptibility. Due to the anticipated subsurface conditions, a liquefaction evaluation was not considered necessary at the time of this feasibility study. Based on the relatively dense alluvium, older alluvium, bedrock, and groundwater is expected to be greater than 30± feet below the existing site grades, liquefaction is not considered a design concern for this project. However, it is recommended that a design level geotechnical investigation for any building located within the hazard zone include a comprehensive liquefaction evaluation.

6.2 Geotechnical Design Considerations

General

The subsurface conditions encountered at the boring and trench locations generally consist of artificial fill or alluvium underlain by andesitic volcanic bedrock. Compaction reports for the fill soils were not available at the time of this investigation. The undocumented fills were likely placed after the site was no longer used as a quarry. Therefore, these soils are considered to be undocumented fill soils. The fill and alluvial soils possess variable strengths and the fill soils possess unfavorable consolidation and collapse characteristics. Therefore, remedial grading will be necessary to overexcavate and recompact these soils. Within portions of the proposed development area, the cuts required to achieve the new finished pad elevations will remove all of the existing fill and/or alluvial soils, exposing very dense andesitic volcanic bedrock. Additional overexcavation of the bedrock materials is warranted within the development area to produce building pads that will facilitate future foundation and utility construction.

Of primary concern to the development of this site is the presence of andesitic volcanic bedrock. Several borings and trenches excavated at this site and the previous seismic line data by STE indicates that these materials are generally rippable using large grading equipment such as D-9 dozers equipped with a single shank ripper. Although not encountered at the boring or trench locations, some zones of soil requiring blasting may be present at the subject site. Excavation of the bedrock materials is expected to result in some oversized materials that will require offsite disposal, crushing, or specialized placement procedures if used as fill.

Settlement

The proposed remedial grading will result in removal and replacement of the existing undocumented fill soils, as well as a portion of the underlying alluvium or bedrock. Overexcavation will also be performed to remove the bedrock/fill transitions that would otherwise exist within some of the building areas. The bedrock or native soils that will remain in place beneath the recommended depth of overexcavation possess favorable consolidation/collapse characteristics and/or will not be subject to significant stress increases from the foundations of the new structure. Therefore, following completion of the recommended remedial grading, post-construction settlements are expected to be within tolerable limits.

Slope Stability

No evidence of landslides or deep seeded slope instability was noted during our investigation. However, the loose granular soils on sloping ground surfaces could be prone to surficial failures.

Newly constructed fill slopes, comprised of properly compacted engineered fill, at inclinations of 2h:1v or less will possess adequate gross stability. In addition, cut bedrock slopes within inclinations of 2h:1v or less are expected to possess adequate stability. Excavations within dense bedrock can likely be constructed at inclinations of 1.5h:1v. Further evaluation of the andesitic volcanic bedrock will be necessary at the time of site grading to evaluate the appropriate maximum inclinations.

Cut slopes excavated within the existing fill/alluvial soils may be subject to surficial instability due to the lack of cohesion within these materials. Therefore, stability fills may be required within these areas. This condition may affect the proposed cut slopes at the site. The need for stability fills should be determined by SCG as part of the detailed grading plan review.

Expansion

The near surface on-site soils have been determined to possess a very low to high expansion potential (EIs = 1 to 100). Please note that the high expansive soils were within fill soils located only at one trench location in the north-central portion of the site. All imported fill soils should have low expansive characteristics (EI less than 20). In addition to adequately moisture conditioning the subgrade soils and fill soils during grading, special care must be taken to maintaining moisture content of these soils at 2 to 4 percent above the Modified Proctor optimum. This will require the contractor to frequently moisture condition these soils throughout the grading process, unless grading occurs during a period of relatively wet weather.

Soluble Sulfates

The results of the soluble sulfate testing indicate that selected samples of the on-site soils contain a negligible concentration 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 areas.

Shrinkage/Subsidence

Removal and recompaction of the fill and alluvial soils is estimated to result in an average shrinkage of 7 to 12 percent. Where bedrock materials are excavated and replaced as fill, bulking of 0 to 5 percent should be expected. Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be 0.1± feet. This estimate may be used for grading in areas that are underlain by existing native soils. No significant subsidence should be expected in areas that are underlain by bedrock.

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

Grading and Foundation Plan Review

As discussed previously, detailed foundation plans and rough grading plans were not available at the time of this report. It is therefore recommended that we be provided with copies of the plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

Based on the complexity of the grading proposed for this site, a detailed grading plan review is considered warranted before the geotechnical investigation. This review can be conducted once the grading plan has been prepared. As part of this review, detailed slope stability analysis should be performed for any proposed cut or fill slopes, especially along the property lines as well as a gross stability analysis of the retaining wall system proposed for the southwestern corner of the property.

6.3 Site Grading Recommendations

The grading recommendations presented below are based on the subsurface conditions encountered at the boring and 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 and Demolition

Initial site stripping should include demolition of the existing buildings/structures and any remaining improvements from any previous site uses such as mining equipment, trailers, scales, and any other debris. The demolition should include all subsurface remnants of the existing structures, including foundations, floor slabs, and any utilities that will not be reutilized.

In addition, the site stripping should include removal of any surficial vegetation. This should include any weeds, grasses, shrubs, and trees. The actual extent of site stripping should be determined in the field by the geotechnical engineer, based on the organic content and stability of the materials encountered.

Treatment of the Existing Soils: Concrete Washout Material

A large stockpile of concrete washout material is located in the east-central area of the site. This material should be removed from the site in its entirety and properly disposed of or this material may be reused as fill, if well mixed and blended with on-site soils.

Treatment of Existing Soils: Stockpile Material

Two large stockpiles of construction debris including but not limited to concrete, asphalt, concrete tiles, bricks, clay pipes, and metal are located at the subject site. The construction debris may be crushed into a maximum 3-inch particle size and mixed with on-site soils and reutilized as structural fill. If construction debris is crushed into a maximum 12-inch particle size, the larger particles may be disposed of in a similar manner as the oversize bedrock materials discussed in the Bedrock Materials as Fill section below. All organic or deleterious material within the stockpiles should be removed and properly disposed of off-site.

Treatment of Existing Soils: Building Pads

Remedial grading should be performed within the proposed building area in order to remove all existing undocumented fill and mitigate any bedrock/fill transitions that would otherwise exist. It is recommended that the proposed building pad areas be overexcavated to a depth of at least 3 feet below proposed building pad subgrade elevation and to a depth of at least 3 feet below existing site grade, whichever is deeper. The influence zones of any new foundations should be overexcavated to a depth of at least 3 feet below proposed foundation bearing grade. Where buildings are underlain by fill soils, the overexcavation should extend to a depth to remove the fill soils in their entirety. Undocumented fill soils were identified extending to depths of up to 19½± feet. Therefore, local conditions may require deeper overexcavation be performed. The overexcavation should extend to at least 5 feet beyond of fill below the base of the new footing.

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

Overexcavation subgrade materials should consist of andesitic volcanic bedrock or competent native alluvium. Alluvial soils should possess a minimum relative compaction of 85 percent and near optimum moisture content.

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 or air dried to achieve a moisture content of 2 to 4 percent above the 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, using the previous excavated on-site soils.

Cut/Fill Transitions

The proposed grading may result in bedrock/fill transitions within some of the proposed development areas. In these areas, it is recommended that remedial grading be performed in order to remove and replace a portion of the bedrock as compacted structural fill. This grading is considered warranted, in order to soften the transition from the fill soils to the bedrock, thereby reducing the potential for excessive future settlements.

Treatment of Existing Soils: Cut and Fill Slopes

New cut and fill slopes will be constructed within and around the perimeter of the project. Maximum heights of cut and fill slopes are indicated on the plan to be 10± and 20± feet, respectively. All slopes should be at an inclination of 2h:1v. A keyway should be excavated at the toe of new fill slopes which are not located in fill areas. The keyway should be at least 15 feet in width and 3 feet deep. The recommended width of the keyway is based on 1.5 times the width of typical grading equipment. If smaller equipment is utilized, a smaller keyway may be suitable, at the discretion of the geotechnical engineer. The base of the keyway should slope at least 1 foot downward into the slope. Following completion of the keyway cut, the subgrade soils should be evaluated by the geotechnical engineer to verify that the keyway is founded into competent materials. The resulting subgrade soils should then be scarified to a depth of 10 to 12 inches, moisture conditioned to 2 to 4 percent above optimum moisture content and recompacted. During construction of the new fill slope, the existing slope should be benched in accordance with the detail presented on Plate D-4. Benches less than 4 feet in height may be used at the discretion of the geotechnical engineer.

Cut slopes in bedrock may be cut to grade, or blasted, undercut and replaced as stability fills. Stability fills for cut slopes will provide a more uniform appearance and allow landscaping on the slope. A keyway should be excavated at the toe of any stability fill slope. The keyway should be at least 15 feet in width. The recommended width of the keyway is based on 1.5 times the width of typical grading equipment. If smaller equipment is utilized, a smaller keyway may be suitable, at the discretion of the geotechnical engineer. Following completion of the keyway cut, the subgrade soils should be evaluated by the geotechnical engineer to verify that the keyway is founded into competent materials. The resulting subgrade soils should then be scarified to a depth of 10 to 12 inches, moisture conditioned to 2 to 4 percent above optimum moisture content and recompacted. During construction of the new fill slope, the existing slope should be benched in accordance with the detail presented on Plate D-5. Benches less than 4 feet in height may be used at the discretion of the geotechnical engineer.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of any proposed retaining walls should be overexcavated to a depth of 3 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pads. Within the retaining wall areas, the depth of overexcavation should also be sufficient to remove any undocumented fill soils.

The foundation areas for non-retaining site walls should be overexcavated to a depth of 1 foot below proposed foundation bearing grade. 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 Areas

Subgrade preparation in any new parking areas should initially consist of removal of all soils disturbed during stripping operations. The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 2 to 4 percent of the optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength fill 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.

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 2 to 4 percent of the optimum moisture content, and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer.
- All grading and fill placement activities should be completed in accordance with the requirements of the CBC and the grading code of the county of Riverside.
- All fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Fill soils should be well mixed.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Imported Structural Fill

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

Bedrock Materials as Fill

Excavated bedrock materials may be reutilized for compacted structural fill, provided that the maximum particle size is 12 inches or less. Based on the observed near-surface conditions, it is expected that excavation of the bedrock may result in significant quantities of oversized materials, including cobbles and boulders. Some sorting and/or crushing of these materials may be required to generate soils suitable for reuse as compacted structural fill.

To facilitate trenches for foundations and shallow utilities, it may also be desirable to limit the particle size of the structural fill materials that are present within 3 feet of finished pad grade. Typically, a maximum particle size of 3 to 6 inches or less is desirable. If materials 6 inches or greater in size are present within the upper 3 feet of the building pad, forming of footing trenches will likely be required.

Large cobbles and boulders (in excess of 12± inches in size) are expected to be encountered in limited areas where bedrock is encountered at shallow depths. In addition, "floaters" will likely be encountered within the weathered andesitic volcanic bedrock materials in other areas of the site. It will likely be necessary to move these larger rocks individually, and place them as oversize materials in accordance with the grading guide specifications, enclosed in Appendix D of this report. Alternatively, the oversized materials could be disposed of off-site.

It is recommended that all materials greater than 12 inches in size be excluded from fills that are within 10 feet of proposed finished grade. Materials greater than 12 inches in size can be crushed, disposed of off-site or placed in windrows. Particles up to 3 feet in size may be placed in windrows, located at least 10 feet below finished pad grade and at least 3 feet below the deepest anticipated utility in the disposal area. Windrows should be spaced at least 10 feet apart and at least 2 feet of space should be left between adjacent pieces within the row. The windrows should be covered with a free draining granular material (sand), which should then be jetted in-place with water. The placement of sand and the jetting should continue until the oversized materials have been completely covered. The grading contractor must take special care to place fill material completely around all oversized particles. The areas around and above the windrows should then be backfilled with compacted structural fill. At least 4 feet of vertical space should be allowed between the top of a windrow and the bottom of the next higher windrow.

The placement of oversized materials and the procedures used to backfill around the materials must be witnessed and documented by the geotechnical engineer.

Utility Trench Backfill

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

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

6.4 Construction Considerations

Excavation Considerations

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

As discussed previously, significant portions of the subject site are underlain at depth, or at the near surface, by andesitic volcanic bedrock. Results of detailed subsurface exploration as well as the previous seismic refraction survey indicate that nearly all of near surface materials will likely be rippable using conventional grading equipment. Relatively difficult excavation is expected at depths greater than 10 to 15± feet. The developer at this site should not preclude the possibility that blasting may be required within the upper 10 to 15± feet in isolated areas of the site to remove the existing bedrock materials.

Groundwater

The static groundwater table at this site is considered to exist at a depth greater than 30± feet. Therefore, groundwater is not expected to impact the grading or foundation construction activities.

6.5 Preliminary Foundation Design and Construction

Based on the preceding geotechnical design considerations and preliminary grading recommendations, it is assumed that the new buildings will be underlain by newly placed engineered fill soils. These fill soils will extend to a depth of at least 3 feet below proposed foundation bearing grade. Based on this subsurface profile and assuming that the proposed structures can tolerate the estimated liquefaction-induced settlements (if any), the proposed structure may be supported on conventional shallow foundations.

Conventional Spread Footing Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 lbs/ft^2.
- Minimum wall/column footing width: 14 inches/24 inches.
- Minimum longitudinal steel reinforcement within strip footings: Four (4) No. 5 rebars (2 top and 2 bottom).
- Minimum foundation embedment: 12 inches into newly placed structural fill soils, and at least 24 inches below adjacent exterior grade.
- It is recommended that the perimeter building foundations be continuous across all exterior doorways. Any flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

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

Foundation Construction

The foundation subgrade soils should be evaluated at the time of overexcavation, as discussed in Section 6.3 of this report. It is further recommended that the foundation subgrade soils be evaluated by the geotechnical engineer immediately prior to steel or concrete placement. Within the new building areas, soils suitable for direct foundation support should consist of newly placed structural fill, compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Any unsuitable materials should be removed to a depth of suitable bearing compacted structural fill or competent bedrock materials, 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 2 to 4 percent above the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. Since it is typically not feasible to increase the moisture content of the floor slab and foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

Estimated Foundation Settlements

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

Lateral Load Resistance

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

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

These are allowable values, and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill. The maximum allowable passive pressure is 2,500 lbs/ft^2.

6.6 Preliminary Floor Slab Design and Construction

Subgrades which will support new floor slabs should be prepared in accordance with the recommendations contained in the ***Site Grading Recommendations*** section of this report. Based on the anticipated grading which will occur at this site, the floors of the structures may be constructed as a conventional slabs-on-grade supported on the newly placed fill soils, extending to a depth of at least 3 feet below building pad subgrade elevation. The design of the floor slav will depend in part on the results of the future geotechnical studying, including a more detailed liquefaction evaluation. However, based on the preliminary geotechnical considerations, the floor slabs may be designed as follows:

- Minimum slab thickness: 5 to 6 inches.

- Minimum slab reinforcement: No. 3 bars at 16-inches on-center, in both directions, due to presence of medium to high expansive soils. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading, and any potential liquefaction induced settlements.

- Slab underlayment: If moisture sensitive floor coverings will be used, the minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire area of floor slab where the floor coverings are expected to be placed. 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. 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 will not be used, the vapor barrier may be eliminated.

- Moisture condition the floor slab subgrade soils to 2 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.

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

- The floor slab should be structurally connected to the foundations as detailed by the structural engineer.

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

6.7 Preliminary Retaining Wall Design and Construction

Although not indicated on the site plans provided to our office, some small retaining walls may be required at the site to facilitate the new site grades. Any such walls are expected to be less than 6 feet in height. 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 and boring locations, the following parameters may be used in the design of new retaining walls for this site. We have provided parameters assuming the use of onsite soils for retaining wall backfill. These soils generally consist of silty fine to coarse sands. Direct shear testing performed by STE indicated that these silty sand materials possess shear strength parameters of ϕ = 35 degrees and c = 150 lbs/ft^2.

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)		35°
Unit Weight		125 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	34 lbs/ft^3
	At-Rest Condition (level backfill)	53 lbs/ft^3
	Active Condition (2h:1v backfill)	49 lbs/ft^3

The walls should be designed using a soil-footing coefficient of friction of 0.35 and an equivalent passive pressure of 300 lbs/ft^3. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

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

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

Seismic Lateral Earth Pressures

In accordance with the 2013 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 structural fill, extending to at a depth of at least 2 feet below proposed foundation bearing grade. The retaining wall foundations should be designed in accordance with the building foundation design recommendations presented in Section 6.5 of this report.

Backfill Material

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

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

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

Subsurface Drainage

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

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

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

6.8 Preliminary 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 supported on the existing soils or bedrock that has been scarified, moisture conditioned, and recompacted. The pavement subgrades are expected to vary, ranging from medium expansive clayey sands to very low expansive silty sands and bedrock. These materials are expected to exhibit fair to good pavement support characteristics, with R-values ranging from 30 to at least 50. Since R-value testing was not included in the scope of services for this project, the subsequent pavement design is based upon a conservatively assumed R-value of 30. 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 = 30)					
Materials	**Thickness (inches)**				
	Auto Parking and 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	4	4	5	6
Aggregate Base	6	7	10	11	12
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.
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 = 30)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 6.0)	Light Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	6½	8	9
Compacted Subgrade (95% minimum compaction)	12	12	12	12

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

7.0 GENERAL COMMENTS

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

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

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

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

APPENDIX A

SOURCE: RIVERSIDE COUNTY THOMAS GUIDE, 2013

SITE LOCATION MAP

PROPOSED RV STORAGE FACILITY

LAKE ELSINORE, CALIFORNIA

SCALE: 1" = 2400'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: DRK CHKD: JAS	
SCG PROJECT 16G227-1R	
PLATE 1	

GEOTECHNICAL LEGEND

Ac - Concrete Washout Fill
Asp - Rubble Fill Stockpile
Af - Artificial Fill
Oal - Alluvium
Qoa - Older Alluvium
KJsp - Santiago Peak Volcanics

Approximate Boring Location

Approximate Trench Location

Previous Boring Location
(STE Report 9041151)

Previous Trench Location
(STE Report 9051063)

Previous Seismic Line Location
(STE Report 9051063)

Previously Reported Ancient Faults
(Dashed where Uncertain - Dotted where Buried)
(STE Report 9051063)

Geologic Contact (Queried where Uncertain)

88 Joints

Topographic Base Map prepared by Hunsaker & Associates. Site Plan prepared by Herdman Rierson

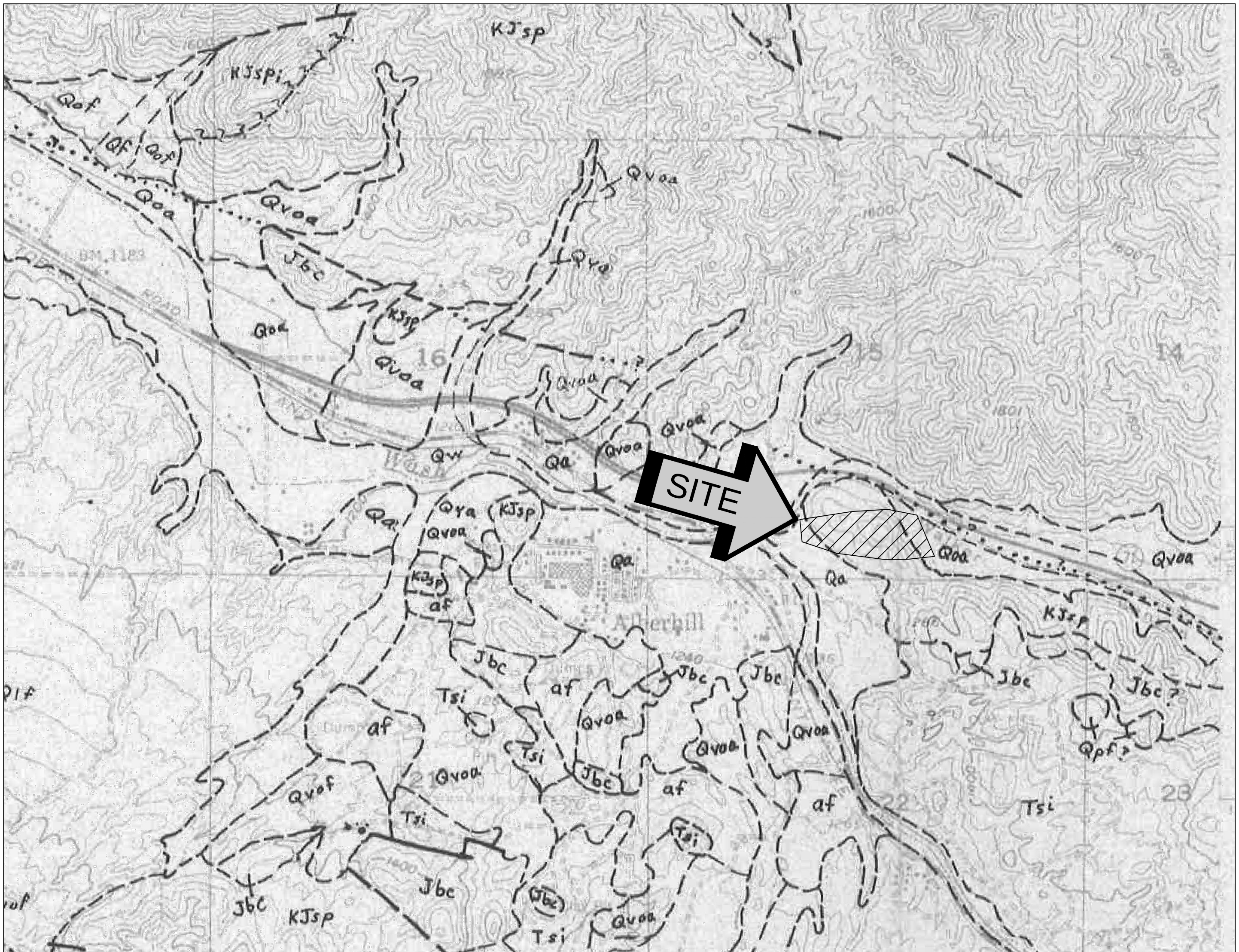
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation
SoCalGeo
22885 Savi Ranch Parkway
Suite E
Yorba Linda, CA 92887
Phone: (714) 685-1115
Fax: (714) 685-1118
www.socalgeo.com

SCALE: 1" = 50'
DRAWN: DRK
CHKD: JAS
SCG PROJECT 16G227R-1

GEOTECHNICAL MAP

PROPOSED RV STORAGE FACILITY
LAKE ELSINORE, CALIFORNIA

PLATE 2



EXPLANATION

Quaternary — Holocene

- **Qw** Active wash deposits
- **Qa** Undivided alluvium from active streams and flood plains.
- **Qya** Young alluvium; poorly-consolidated gravel, sand, and silt associated with intermittent to inactive river and flood plain deposition. Slightly dissected with incipient argillic horizons.
- **af** Artificial fill and mine tailings.
- **Qf** Undivided alluvium from active alluvial fans.
- **Qyf** Young alluvial fan deposits; poorly-consolidated gravel, sand and silt associated with intermittent to inactive alluvial fan deposition. Slightly dissected with incipient argillic horizons.
- **Qls** Landslide deposits; (Shown where practicable, arrows show general direction of movement).

Quaternary — Late Pleistocene

- **Qoa** Old alluvium; moderately-consolidated gravel, sand, and silt associated with inactive river and flood plain deposition; moderately to well-dissected, with moderately-developed argillic horizons.
- **Qof** Old fan deposits; moderately-consolidated gravel, sand, and silt associated with inactive alluvial fan deposition. Moderately to well-dissected, with moderately-developed argillic horizons.
- **Qvoa** Older alluvium; well-consolidated gravel, sand, and silt associated with inactive river and flood plain deposition; well-dissected, with well-developed argillic horizons.
- **Qvof** Older fan deposits; well-consolidated gravel, sand, and silt associated with inactive alluvial fan deposition; well-dissected, with well-developed argillic horizons.
- **Qla** Oldest alluvium; well-consolidated gravel, sand, and silt associated with inactive river and flood plain deposition; well-dissected, with thick argillic horizons.
- **Qlf** Oldest fan deposits; well-consolidated gravel, sand, and silt associated with inactive alluvial fan deposition; well-dissected, with thick argillic horizons.

Quaternary — Early Pleistocene

- **Qpf** Pauba Formation(?); grayish-brown, well-indurated, poorly-sorted fanglomerate and mudstone.

Tertiary — Paleocene

- **Tsi** Silverado Formation; sandstone, conglomerate, siltstone, and shale overlying micaceous sandstone, lignite, and clay.

Late Cretaceous

- **Kgr** Undivided silicic to intermediate granitoid rocks.
- **Kgd** Granodiorite, undivided
- **Kgd_1** Medium-grained granodiorite, lighter colored, of the Elsinore Mountains.
- **Kt** Tonalite, undivided

Early Cretaceous

- **KJsp** Santiago Peak Volcanics; massive andesitic flows.
- **$KJsp_i$** Intrusive rocks, principally latite and dacite porphyry; tentatively associated with the Santiago Peak Volcanics.

SYMBOLS

Geologic Contact

Observed or approximately located, queried where inferred.

U
D

Fault

Solid where well-located, dashed where approximately located or inferred; dotted where concealed by alluvium; queried where continuation or existence is uncertain. U, upthrown side, D, downthrown side (relative or apparent).

Silicified and mineralized shear zones

50

Strike and dip of beds

SOURCE: "GEOLOGIC MAP OF THE ALBERHILL 7.5' QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA" GREENWOOD, 1992

GEOLOGIC MAP

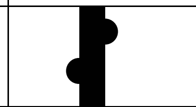
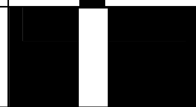
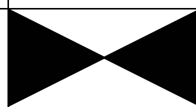
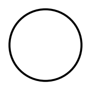
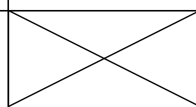
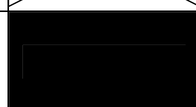
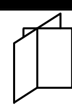
PROPOSED RV STORAGE FACILITY

LAKE ELSINORE, CALIFORNIA

SCALE: 1" = 2000'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: DRK CHKD: JAS	
SCG PROJECT 16G227-1R	
PLATE 3	

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.

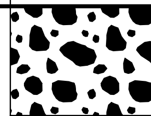
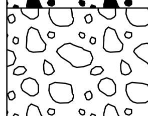
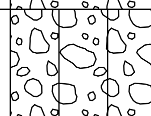
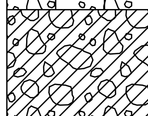
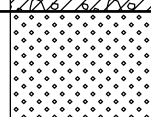
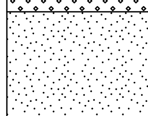
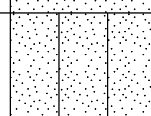
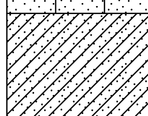
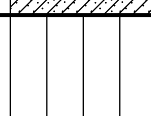
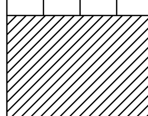
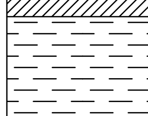
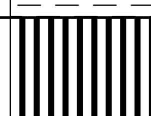
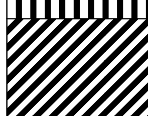
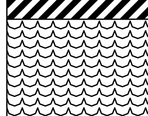
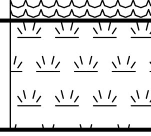
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

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

BORING NO. B-7

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 16G227
PROJECT: RV Storage Facility
LOCATION: Lake Elsinore, California

DRILLING DATE: 11/16/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

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

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1222 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Light Gray Silty fine Sand, trace fine Gravel, very dense-damp							
	X	66					9					
					FILL: Gray Brown Silty fine to coarse Sand, abundant fine to coarse Gravel, some Bedrock fragments, medium dense-damp							
	X	22					6					
5			4.5+		ALLUVIUM: Dark Brown fine Sandy Clay, trace medium Sand, stiff-damp to moist		13					
					ALLUVIUM: Brown Clayey fine Sand, loose-damp to moist							
	X	6					11					
	X	5					10					
10												
					OLDER ALLUVIUM: Dark Brown fine to medium Sandy Clay, very stiff to hard-moist							
	X	18	3.5				13					
15												
	X	44	4.5				21					
20												
					SANTIAGO PEAK VOLCANICS (KJsp): Dark Gray Andesitic meta-volcanic Bedrock, highly weathered, aphanitic, highly friable, very dense-moist							
	X	73					20					
25												
	X	78/5"					8					
30					Boring Terminated at 30'							

TBL 16G227.GPJ SOCALGEO.GDT 12/20/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-8

JOB NO.: 16G227
PROJECT: RV Storage Facility
LOCATION: Lake Elsinore, California

DRILLING DATE: 11/16/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

WATER DEPTH: Dry
CAVE DEPTH: 13 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1246 feet MSL

FIELD RESULTS: DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS: DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Gray Silty fine to medium Sand, trace Clay, trace to little coarse Sand, dense to very dense-damp to mist							
	X	40				116	9					
	X	60				114	11					
					FILL: Dark Brown Clayey fine to coarse Sand, little fine to coarse Gravel, very dense-damp							
5	X	66				121	8					
					FILL: Red Brown fine Sandy Clay, hard-moist							
	X	100/1"	4.5+			101	15					
					SANTIAGO PEAK VOLCANICS (KJsp): Gray Brown Andesitic meta-volcanic Bedrock, weathered, aphanitic, highly friable, very dense-damp							
	X	50/5"				98	11					
10												
	X	50/2"					9					
15												

Boring Terminated at 15'

TBL 16G227.GPJ SOCALGEO.GDT 12/20/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-9

JOB NO.: 16G227
PROJECT: RV Storage Facility
LOCATION: Lake Elsinore, California
DRILLING DATE: 11/16/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas
WATER DEPTH: Dry
CAVE DEPTH: 24 feet
READING TAKEN: At Completion

SURFACE ELEVATION: 1229 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Gray Brown Clayey fine to medium Sand, trace coarse Sand, mottled, dense-damp							
	X	68				109	7					EI = 58 @ 0 to 5'
	X	81/3"				113	10					
5					FILL: Gray Brown Clayey fine to coarse Sand, little fine Gravel, occasional Cobbles, dense to very dense-damp to moist							
	X	48				113	12					
	X	61					9					Disturbed Sample
10	X	23					4					Rock in sampler tip
					ALLUVIUM: Brown Clayey fine Sand to fine Sandy Clay, very stiff-damp to moist							
15	X	43	4.5			116	9					
					ALLUVIUM: Brown fine Sandy Clay, stiff to very stiff-moist to very moist							
20	X	14	2.0			108	16					
25	X	30	2.5			109	19					
					OLDER ALLUVIUM: Red Brown fine to coarse Sandy Clay, occasional Bedrock fragments, hard-damp							
30	X	65	2.5			116	11					
					Boring Terminated at 30'							

TBL 16G227.GPJ SOCALGEO.GDT 12/20/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-10

JOB NO.: 16G227
PROJECT: RV Storage Facility
LOCATION: Lake Elsinore, California

DRILLING DATE: 11/16/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

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

SURFACE ELEVATION: 1229 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Light Gray Silty fine Sand, trace medium Sand, trace to litle fine Gravel, very dense-damp							
	X	80/5"					7					
					FILL: Light Gray Silty fine to coarse Sand, trace fine Gravel, medium dense-damp							
	X	15					9					
5												
					FILL: Gray Brown Clayey fine Sand, trace medium Sand, medium dense-moist							
	X	16					14					
	X	4					4					
			3.0		FILL: Brown fine to medium Sandy Clay, mottled, medium stiff-moist		14					
10												
					FILL: Brown fine to medium Sand intermixed with Orange Brown Clayey fine to medium Sand, dense-moist							
	X	43					13					
15												
					SANTIAGO PEAK VOLCANICS (KJsp): Gray Brown Andesitic meta-volcanic Bedrock, highly weathered, aphanitic, fractured, highly friable, very dense-damp to moist							
	X	77/2"					12					
20												
	X	43					12					
25												
	X	50/3"					6					
30												
					Boring Terminated at 30'							

TBL 16G227.GPJ SOCALGEO.GDT 12/20/16

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-11

JOB NO.: 16G227
PROJECT: RV Storage Facility
LOCATION: Lake Elsinore, California

DRILLING DATE: 11/16/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

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

SURFACE ELEVATION: 1243 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Light Brown Silty fine to coarse Sand, trace fine Gravel, trace Bedrock fragments, very dense-damp							
	X	100				112	9					EI = 1 @ 0 to 5'
					FILL: Dark Gray Clayey fine to coarse Sand, little fine Gravel, medium dense to dense-damp							
	X	43				115	8					
5	X	38				95	6					
	X	50				94	8					
					FILL: Light Gray Brown Gravelly fine to coarse Sand, abundant Bedrock fragments, medium dense-damp							
10	X	38				100	5					
					SANTIAGO PEAK VOLCANICS (KJsp): Brown to Gray Brown Andesitic meta-volcanic Bedrock, highly weathered, aphanitic, highly friable, very dense-damp							
15	X	54				111	8					
20	X	50/5"				102	10					
25	X	50/3					6					
30	X	50/5"					7					
					Boring Terminated at 30'							

TBL 16G227.GPJ SOCALGEO.GDT 12/20/16

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-12

JOB NO.: 16G227
PROJECT: RV Storage Facility
LOCATION: Lake Elsinore, California

DRILLING DATE: 11/16/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

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

SURFACE ELEVATION: 1230 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Brown Silty fine to coarse Sand, trace Clay, trace to litte fine Gravel, dense-damp							
	X	58				115	5					
					FILL: Gray Brown Silty fine to medium Sand, trace fine Gravel, trace coarse Sand, trace Plastic/Brick fragments, dense-moist							
	X	56				94	16					
5	X	86				96	16					
	X	68				121	8					
					FILL: Dark Brown Clayey fine to coarse Sand, abundant Bedrock fragments, very dense-damp							
	X	86/5"				119	10					
10					SANTIAGO PEAK VOLCANICS (KJsp): Gray Brown Andesitic meta-volcanic Bedrock, highly weathered, aphanitic, highly friable, very dense-damp							
	X	50/3"					2					
15												

Boring Terminated at 15' due to refusal on very dense Bedrock

TBL 16G227.GPJ SOCALGEO.GDT 12/20/16

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-13

JOB NO.: 16G227
PROJECT: RV Storage Facility
LOCATION: Lake Elsinore, California

DRILLING DATE: 11/16/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

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

SURFACE ELEVATION: 1224 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Gray Brown Silty fine to coarse Sand, trace Brick fragments, dense-damp							
	X	72				117	8					
					FILL: Brown Clayey fine to coarse Sand, abundant Bedrock fragments, dense-damp							
	X	90/3"				126	4					
5	X	55				115	8					
					SANTIAGO PEAK VOLCANICS (KJsp): Dark Gray Andesitic meta-volcanic Bedrock, highly weathered, aphanitic, highly friable, very dense-damp							
	X	50/4"					3					

Boring Terminated at 7½' due to refusal on very dense Bedrock

TBL 16G227.GPJ SOCALGEO.GDT 12/20/16

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-14

JOB NO.: 16G227
PROJECT: RV Storage Facility
LOCATION: Lake Elsinore, California

DRILLING DATE: 11/16/16
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

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

SURFACE ELEVATION: 1242 feet MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					FILL: Gray Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel, medium dense-damp							
	X	13	2.0				5					
	X	8					5					
5					FILL: Brown fine to coarse Sand, some Silt, trace fine Gravel, loose-damp							
	X	6					6					
					FILL: Brown Silty fine to coarse Sand, little fine Gravel, trace Asphaltic concrete fragments, loose to medium dense-damp							
	X	10					4					
10												
	X	6					5					
15												
					FILL: Dark Gray Brown Clayey fine to medium Sand, some Bedrock fragments, medium dense-damp							
	X	21					7					
20					SANTIAGO PEAK VOLCANICS (KJsp): Dark Gray Andesitic meta-volcanic Bedrock, highly weathered, aphanitic, highly friable, dense to very dense-damp		6					
	X	50/3"					8					
25					Boring Terminated at 25'							

TBL 16G227.GPJ SOCALGEO.GDT 12/20/16

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-6

JOB NO.: 16G227-1R
PROJECT: Proposed RV Facility
LOCATION: Lake Elsinore, California
DATE: 11-14-2016

EQUIPMENT USED: Excavator
LOGGED BY: Daryl Kas
ORIENTATION: N 35 E
TOP OF TRENCH ELEVATION: 1240 feet

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

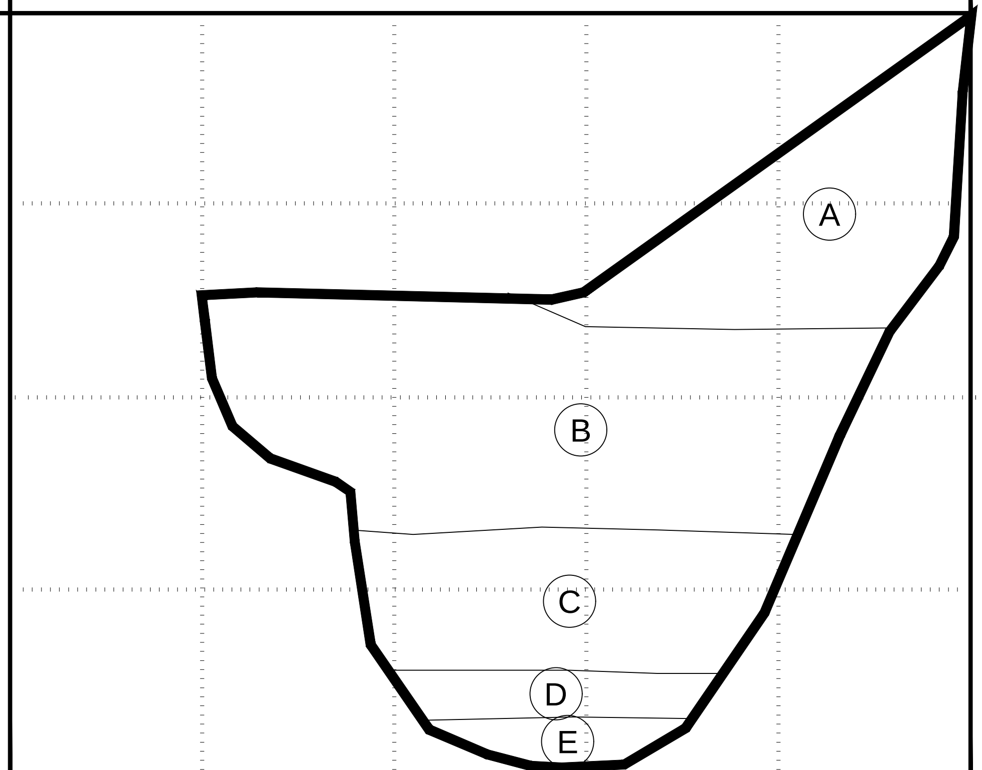
DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
0				A: STOCKPILE (Rubble): Concrete fragments, Concrete tiles, Asphaltic concrete fragments, Clay pipe fragments, in a fine to coarse Sand matrix with occasional Granitic boulders, loose - dry
5				
	b		14	B: FILL: Gray Gravelly fine to coarse Sand, some Silt, loose to medium dense - moist
10				
	b		14	
	b		19	
15				C: FILL: Dark Brown fine Sandy Clay, medium stiff - moist
				D: FILL: Dark Gray Brown Silty fine Sand, trace Clay, trace to little Organics, loose - moist
				E: ALLUVIUM: Brown Clayey fine Sand, slightly porous, medium dense - moist

Trench Terminated @ 20 feet

GRAPHIC REPRESENTATION

N 35 E

SCALE: 1" = 5'



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

TRENCH LOG

PLATE B-15

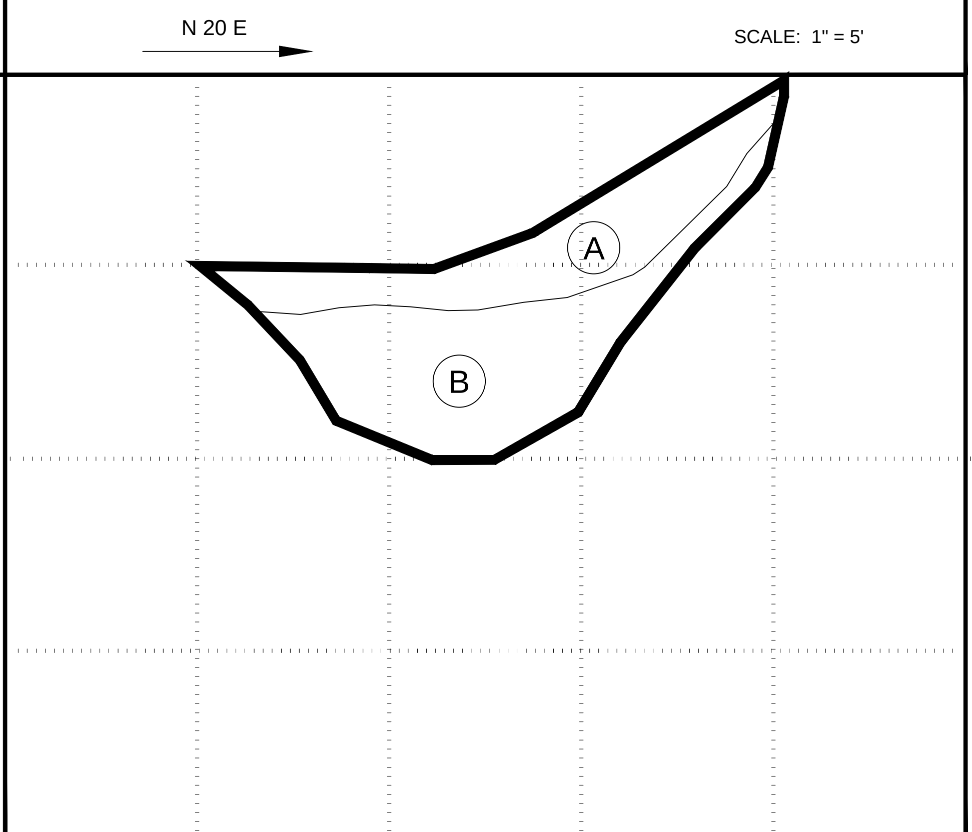
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-7

JOB NO.: 16G227-1R	EQUIPMENT USED: Excavator	WATER DEPTH: Dry
PROJECT: Proposed RV Storage Facilty	LOGGED BY: Daryl Kas	SEEPAGE DEPTH: Dry
LOCATION: Lake Elsinore, California	ORIENTATION: N 20 E	READINGS TAKEN: At Completion
DATE: 11-14-2016	TOP OF TRENCH ELEVATION: 1236 feet	

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		9	A: FILL: Light Gray fine to coarse Sandy Gravel medium dense - damp to moist
5	b		13	
	b		19	B: SANTIAGO PEAK VOLCANICS (KJsp): Dark Brown Andesitic meta-volcanic bedrock, aphanitic, jointed, slighty weathered, moist - very dense Joints: S45W, 85NW N10W, 75E
10				Trench Refusal @ 10 feet Due to Dense Bedrock
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-8

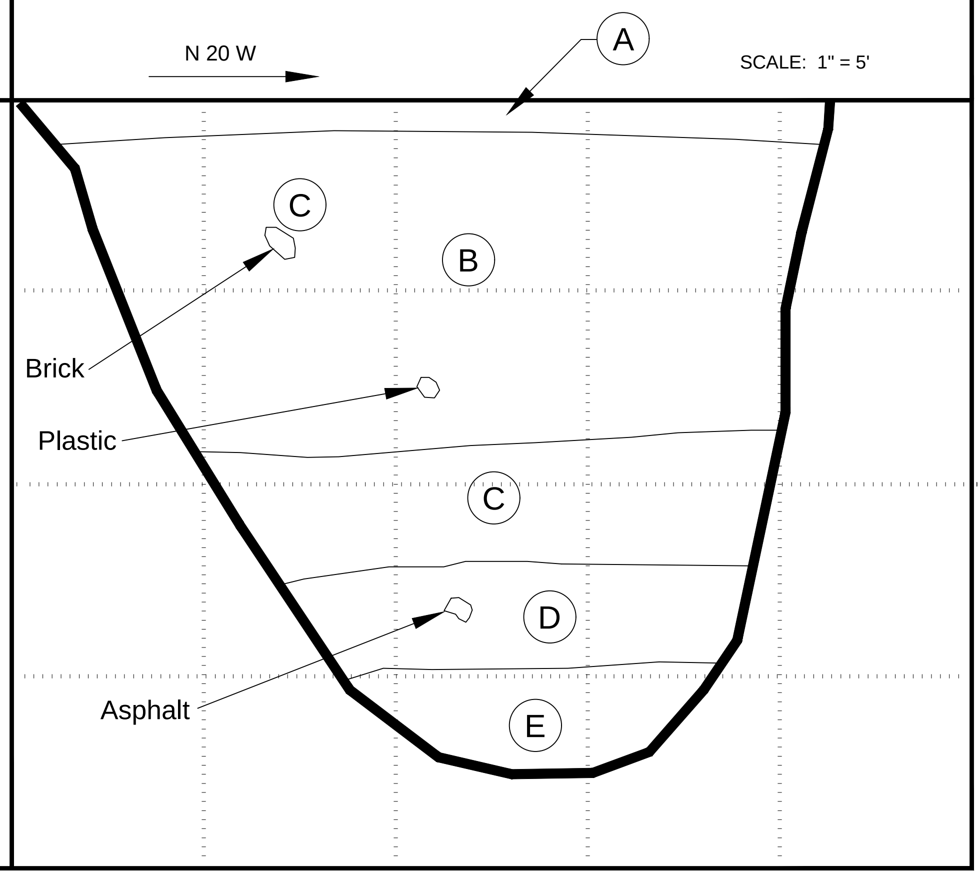
JOB NO.: 16G227-1R
PROJECT: Proposed RV Storage Facilty
LOCATION: Lake Elsinore, California
DATE: 11-14-2016

EQUIPMENT USED: Excavator
LOGGED BY: Daryl Kas
ORIENTATION: N 20 W
TOP OF TRENCH ELEVATION: 1248 feet

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
				A: FILL: Light Gray Silty fine Sand, loose - dry
	b		10	
5				B: FILL: Gray Brown Silty fine to coarse Sand, trace Brick, Wire, and Plastic fragments, medium dense - damp to moist
	b		13	
10				
				C: FILL: Brown Silty fine to medium Sand, medium dense - moist to very moist
	b		24	
				D: FILL: Brown fine to coarse Sand, trace Silt, trace Asphalt fragments, loose to medium dense - damp
15				
				E: FILL: Gray Brown Silty fine to coarse Sand, loose to medium dense - damp
	b		10	
				Trench Terminated @ 17.5 feet

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-9

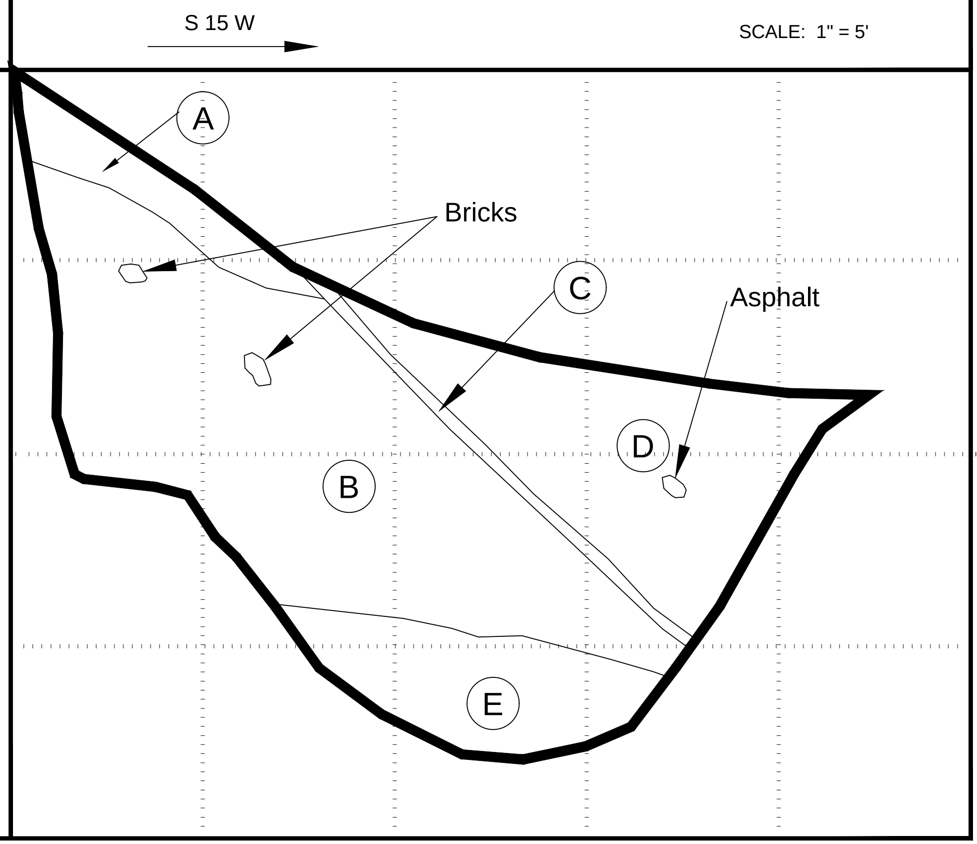
JOB NO.: 16G227-1R
PROJECT: Proposed RV Storage Faility
LOCATION: Lake Elsinore, California
DATE: 11-14-2016

EQUIPMENT USED: Excavator
LOGGED BY: Daryl Kas
ORIENTATION: S 15 W
TOP OF TRENCH ELEVATION: 1240 feet

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

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		19	A: FILL: Dark Gray Brown fine Sandy Clay, medium stiff - moist (EI = 100 @ 0-5')
	b		19	B: FILL: Dark Brown Silty Clay, trace fine Sand, trace Brick fragments, stiff - moist
5				
	b		5	C: FILL: Light Gray Brown fine to coarse Sandy Gravel, abundant Bedrock fragments, medium dense - damp
	b		15	D: FILL: Gray Brown Silty fine to coarse Sand, trace Asphat fragments, medium dense - moist
10				
15				E: SANTIAGO PEAK VOLCANICS (KJsp): Greenish Gray Andesidic meta-volcanic Bedrock, phaneritic, highly weathered, fractured, friable, dense - damp
	b		8	
				Trench Terminated @ 18 feet

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-10

JOB NO.: 16G227-1R
PROJECT: Proposed RV Storage Facility
LOCATION: Lake Elsinore, California
DATE: 11-14-2016

EQUIPMENT USED: Excavator
LOGGED BY: Daryl Kas
ORIENTATION: N 55 W
TOP OF TRENCH ELEVATION: 1232 feet

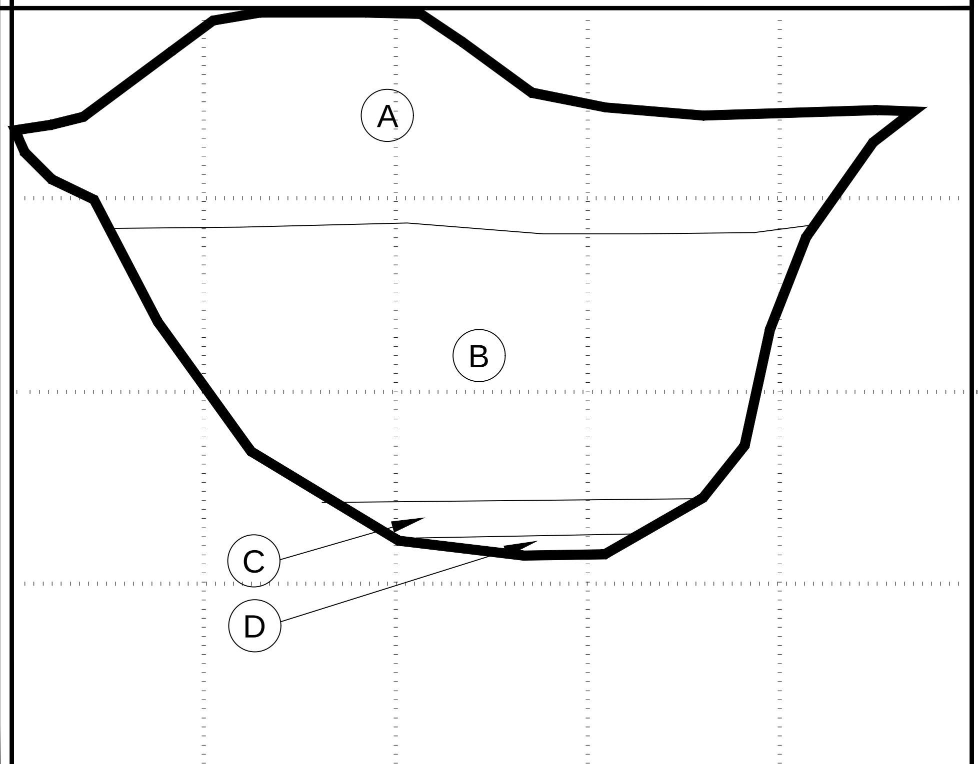
WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
				A: FILL (CONCRETE WASHOUT): Light Gray to White Concrete Washout material, loose - dry
	b		56	
5				
	b		44	
				B: FILL: Light Gray Silt, soft - very moist
10	b		62	
	b		13	C: FILL: Brown Silty fine to coarse Sand, medium dense - damp to moist
	b		1	D: SANTIAGO PEAK VOLCANICS (KJsp): Light Gray Andesitic meta-volcanic Bedrock, aphanitic, very dense - dry
15				Trench Refusal @ 14.5 feet Due to Very Dense Bedrock

GRAPHIC REPRESENTATION

N 55 W

SCALE: 1" = 5'



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

TRENCH LOG

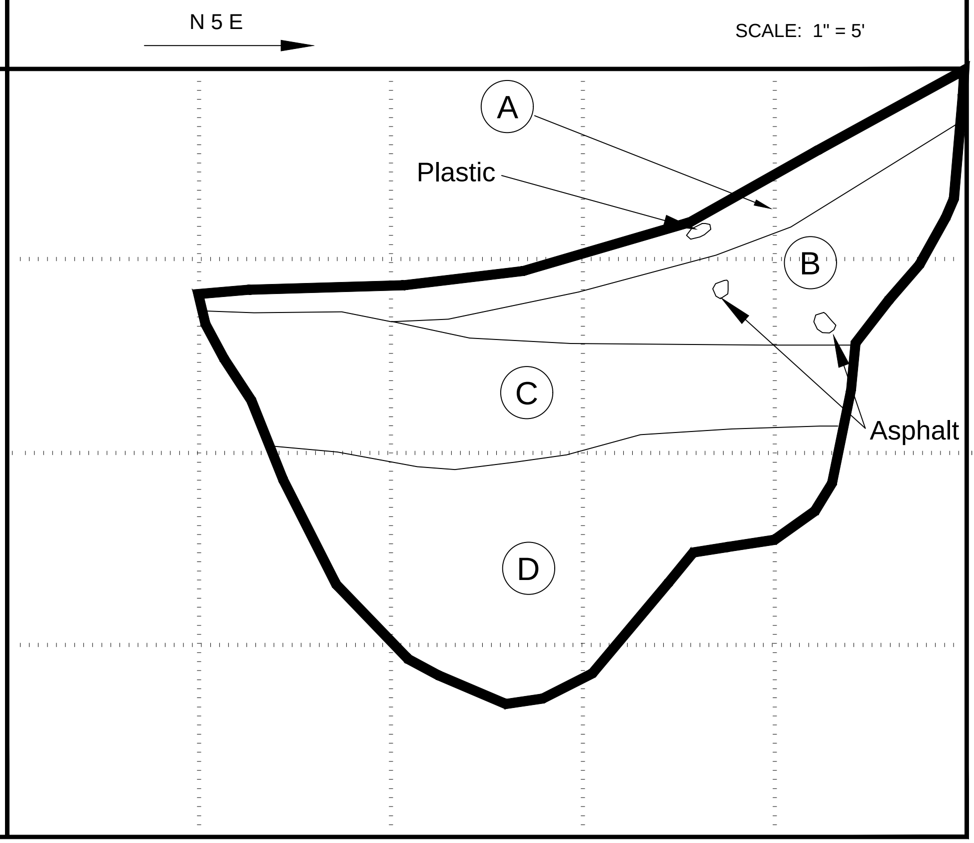
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-11

JOB NO.: 16G227-1R	EQUIPMENT USED: Excavator	WATER DEPTH: Dry
PROJECT: Proposed RV Storage Facility	LOGGED BY: Daryl Kas	SEEPAGE DEPTH: Dry
LOCATION: Lake Elsinore, California	ORIENTATION: N 5 E	READINGS TAKEN: At Completion
DATE: 11-14-2016	TOP OF TRENCH ELEVATION: 1246 feet	

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		1	A: FILL: Brown fine to coarse Sand, trace fine Gravel, trace to little Silt, trace Plastic fragments, loose - dry
	b		4	
	b		8	B: FILL: Gravelly fine to coarse Sand, trace Silt, some Asphalt fragments, loose - damp
5				
	b		9	C: ALLUVIUM: Gray Silty fine to coarse Sand, medium dense to dense - damp
10				
	b		10	D ALLUVIUM: Dark Gray Silty fine to coarse Sand, trace to little fine to coarse Sand, occasional Cobbles, medium dense to dense - damp
15				
				Trench Terminated @ 16.5 feet

GRAPHIC REPRESENTATION



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

TRENCH LOG

PLATE B-20

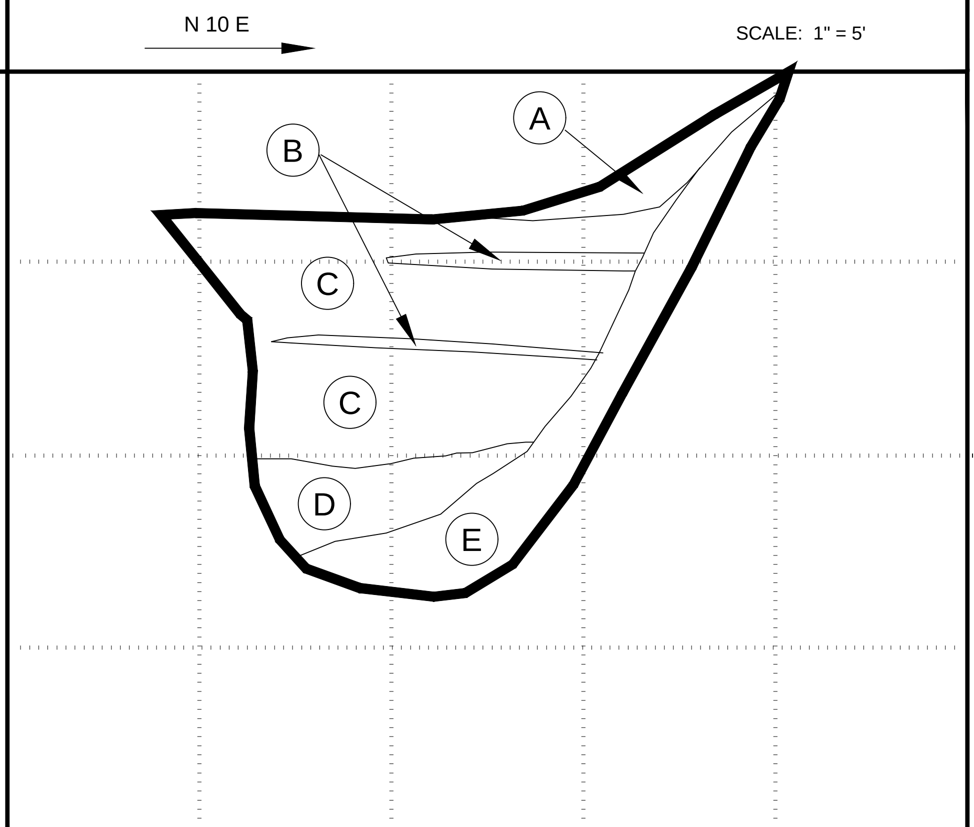
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. T-12

JOB NO.: 16G227-1R	EQUIPMENT USED: Excavator	WATER DEPTH: Dry
PROJECT: Proposed RV Storage Facility	LOGGED BY: Daryl Kas	SEEPAGE DEPTH: Dry
LOCATION: Lake Elsinore, California	ORIENTATION: N 10 E	READINGS TAKEN: At Completion
DATE: 11-14-2016	TOP OF TRENCH ELEVATION: 1232 feet	

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		7	A: FILL: Dark Brown Silty fine to medium Sand, trace fine Gravel, trace Plastic fragments, occasional Bedrock fragments, loose - damp
				B: FILL: Light Gray to White Washout material, loose - dry
5				
	b		9	C: FILL: Brown Silty fine to coarse Sand, medium dense - damp
				D: FILL: Gray Brown Gravelly fine to coarse Sand, trace to some Silt, abundant Bedrock fragments, medium dense - damp
10				E: SANTIAGO PEAK VOLCANICS (KJsp): Light Gray Andesitic meta-volcanic bedrock, aphanitic, jointed, slightly weathered, very dense - dry Joints: N87W, 88N N20W, 65NE
	b		8	
	b		1	
				Trench Terminated @ 13.5 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-21

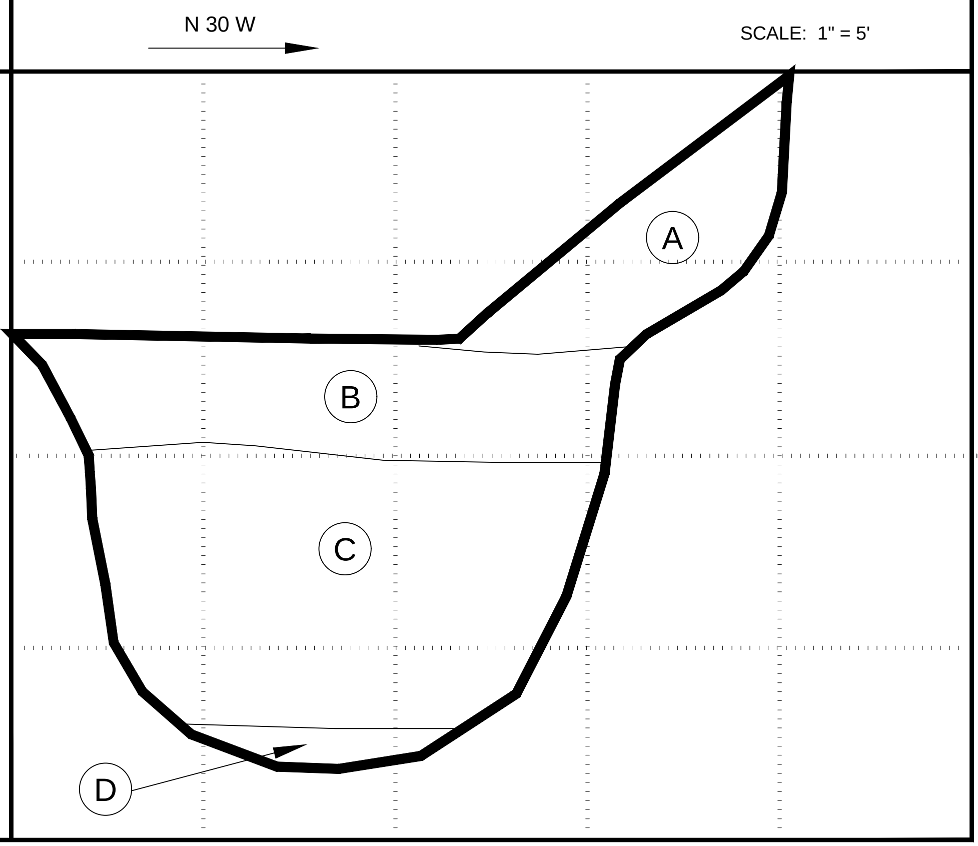
SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
T-13

JOB NO.: 16G227-1R	EQUIPMENT USED: Excavator	WATER DEPTH: Dry
PROJECT: Proposed RV Storage Facility	LOGGED BY: Daryl Kas	SEEPAGE DEPTH: Dry
LOCATION: Lake Elsinore	ORIENTATION: N 30 W	READINGS TAKEN: At Completion
DATE: 11-14-2016	TOP OF TRENCH ELEVATION: 1240 feet	

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
				A: STOCKPILE (Rubble): Concrete fragments, Concrete tile, Asphalt fragments, Metal, in a fine to coarse Sand matrix, loose - dry
5				
	b		10	B: FILL: Gray Brown Silty fine to coarse Sand, some fine to coarse Gravel, trace Asphalt and Concrete fragments, medium dense - damp
10				
	b		10	C: FILL: Gray Brown Silty fine to coarse Sand, trace Wood fragments, medium dense - damp
15				
	b		11	D: FILL: Gray Brown Silty fine to medium Sand, medium dense - damp
				Trench Terminated @ 18 feet

GRAPHIC REPRESENTATION



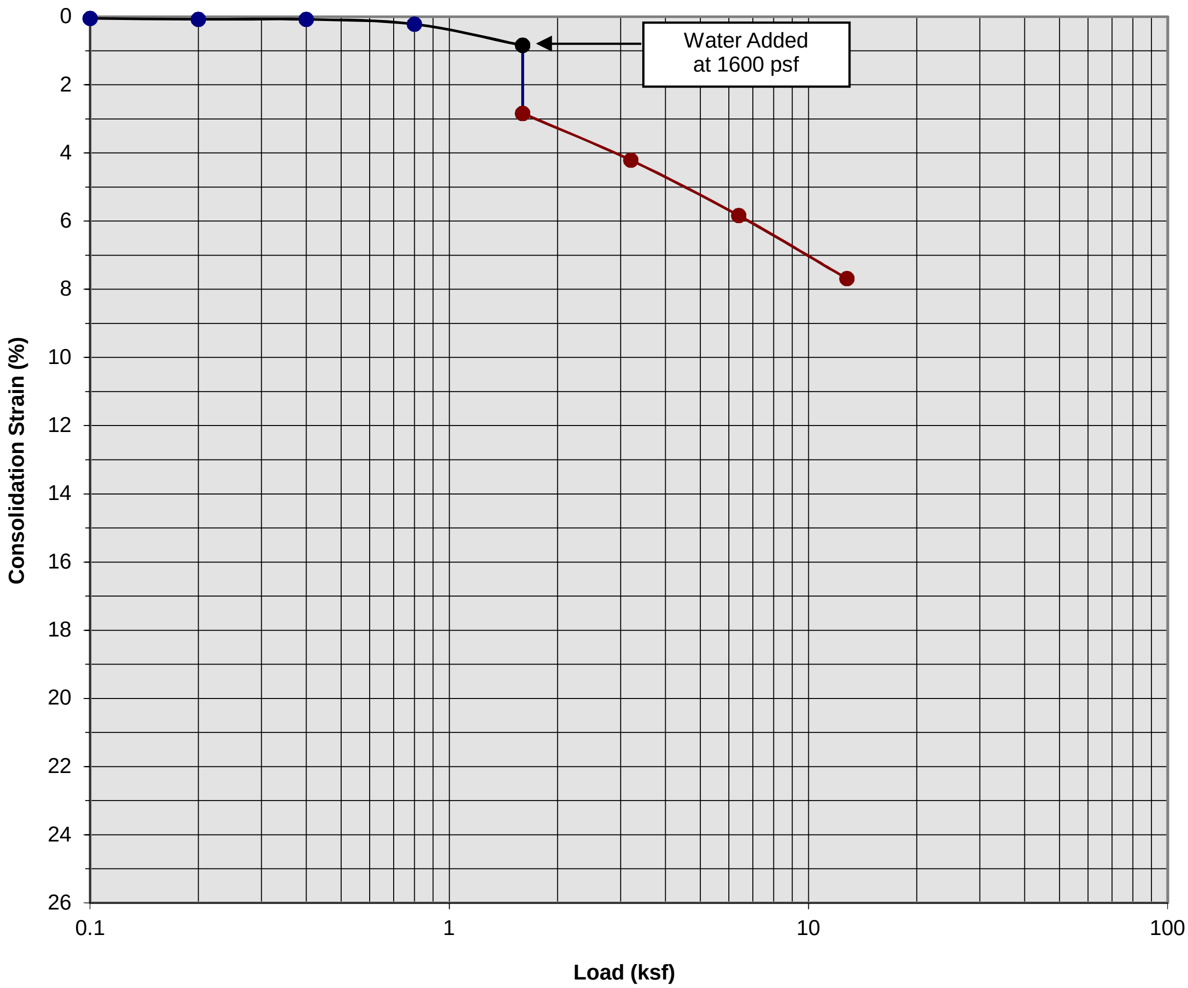
KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-22

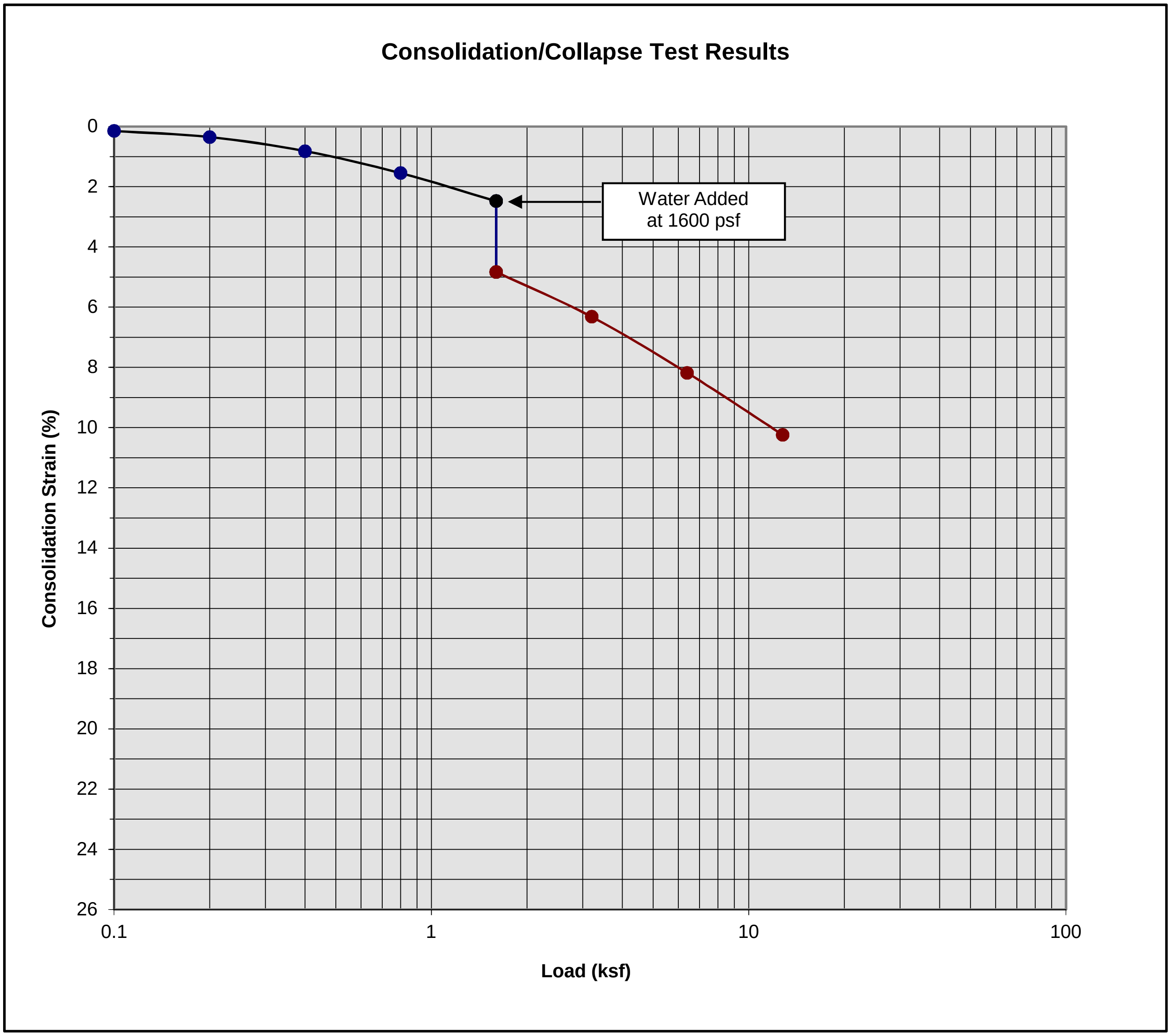
APPENDIX C

Consolidation/Collapse Test Results



Classification: FILL: Gray Silty fine to medium Sand, trace Clay

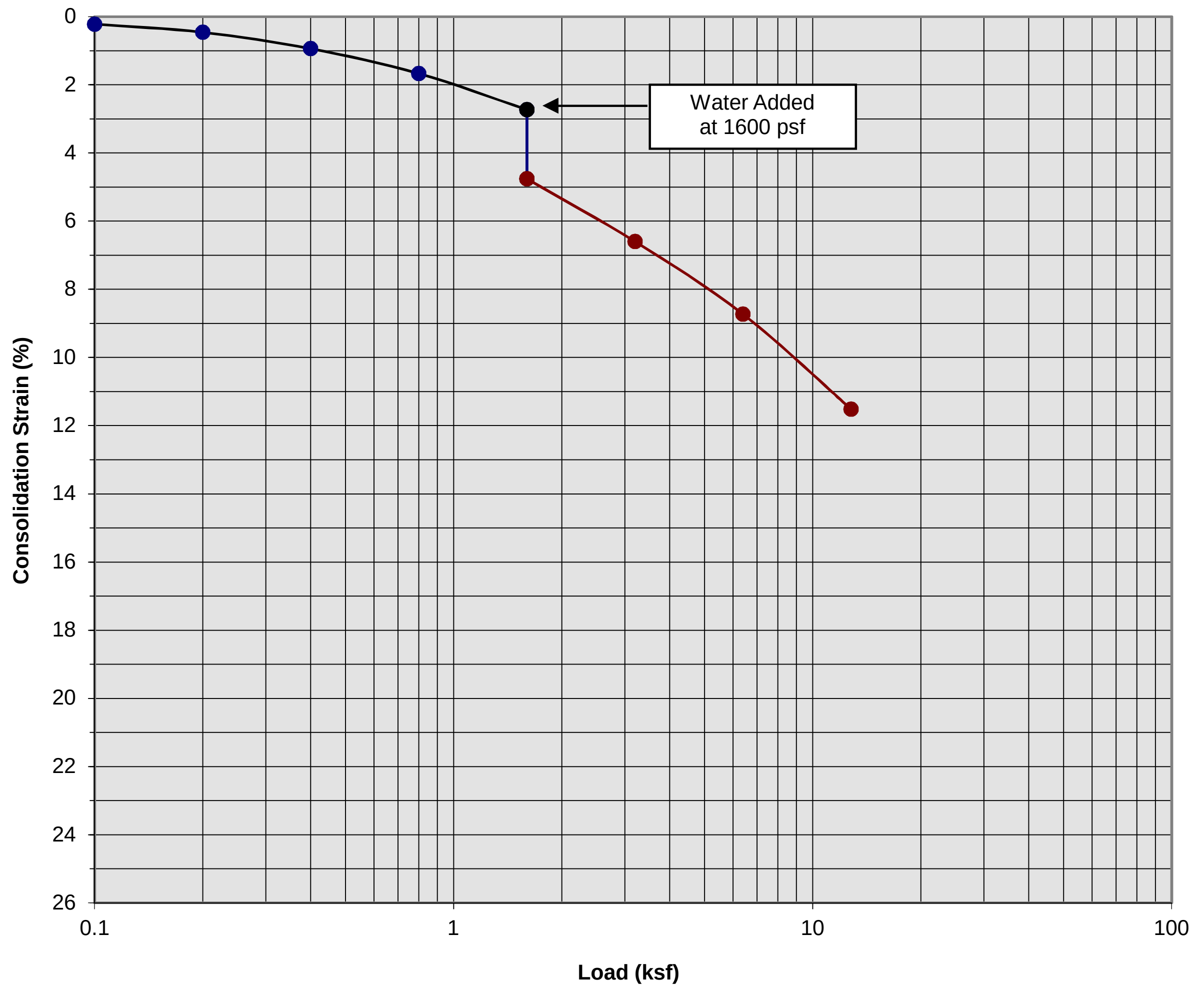
Boring Number:	B-8	Initial Moisture Content (%)	9
Sample Number:	---	Final Moisture Content (%)	15
Depth (ft)	1 to 2	Initial Dry Density (pcf)	115.7
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	123.8
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.00



Classification: FILL: Gray Silty fine to medium Sand, trace Clay

Boring Number:	B-8	Initial Moisture Content (%)	11
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	3 to 4	Initial Dry Density (pcf)	114.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	131.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.35

Consolidation/Collapse Test Results



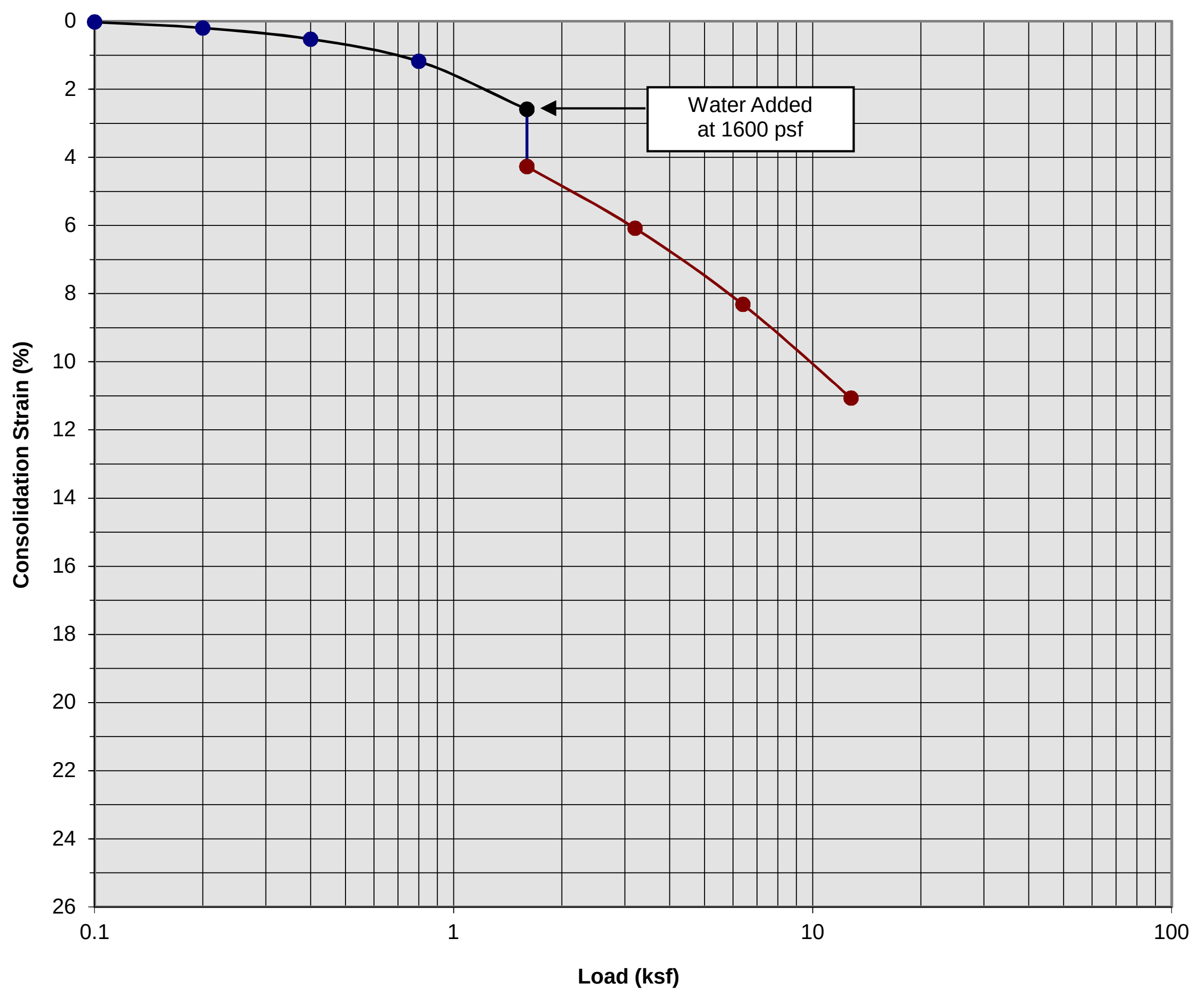
Classification: FILL: Dark Brown Clayey fine to coarse Sand,

Boring Number:	B-8	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	15
Depth (ft)	5 to 6	Initial Dry Density (pcf)	120.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	132.3
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.03

RV Storage Facility
Lake Elsinore, California
Project No. 16G227
PLATE C- 3

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



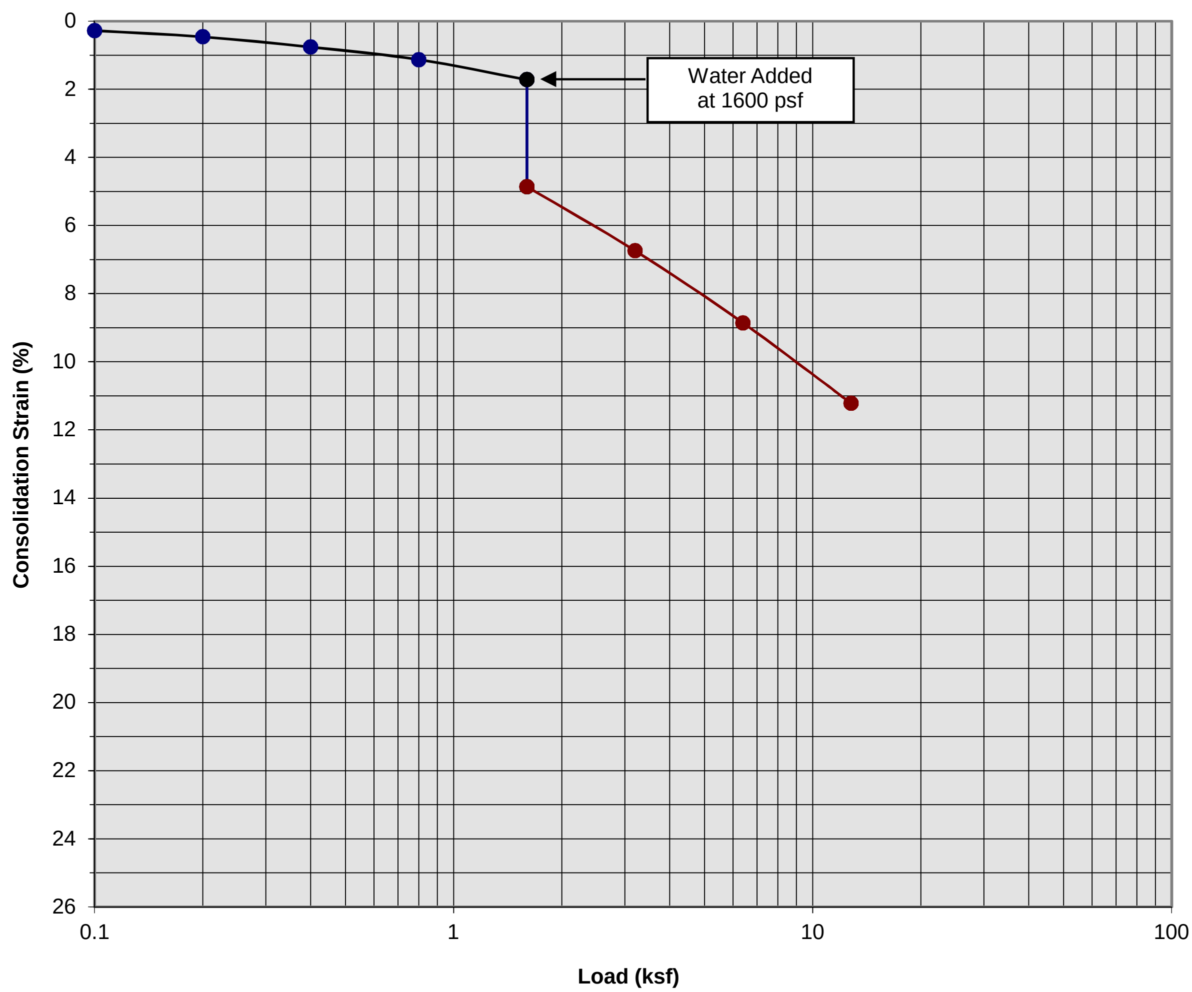
Classification: Gray Brown Andesitic meta-volcanic Bedrock

Boring Number:	B-8	Initial Moisture Content (%)	14
Sample Number:	---	Final Moisture Content (%)	24
Depth (ft)	7 to 8	Initial Dry Density (pcf)	100.7
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	109.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.68

RV Storage Facility
Lake Elsinore, California
Project No. 16G227
PLATE C- 4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

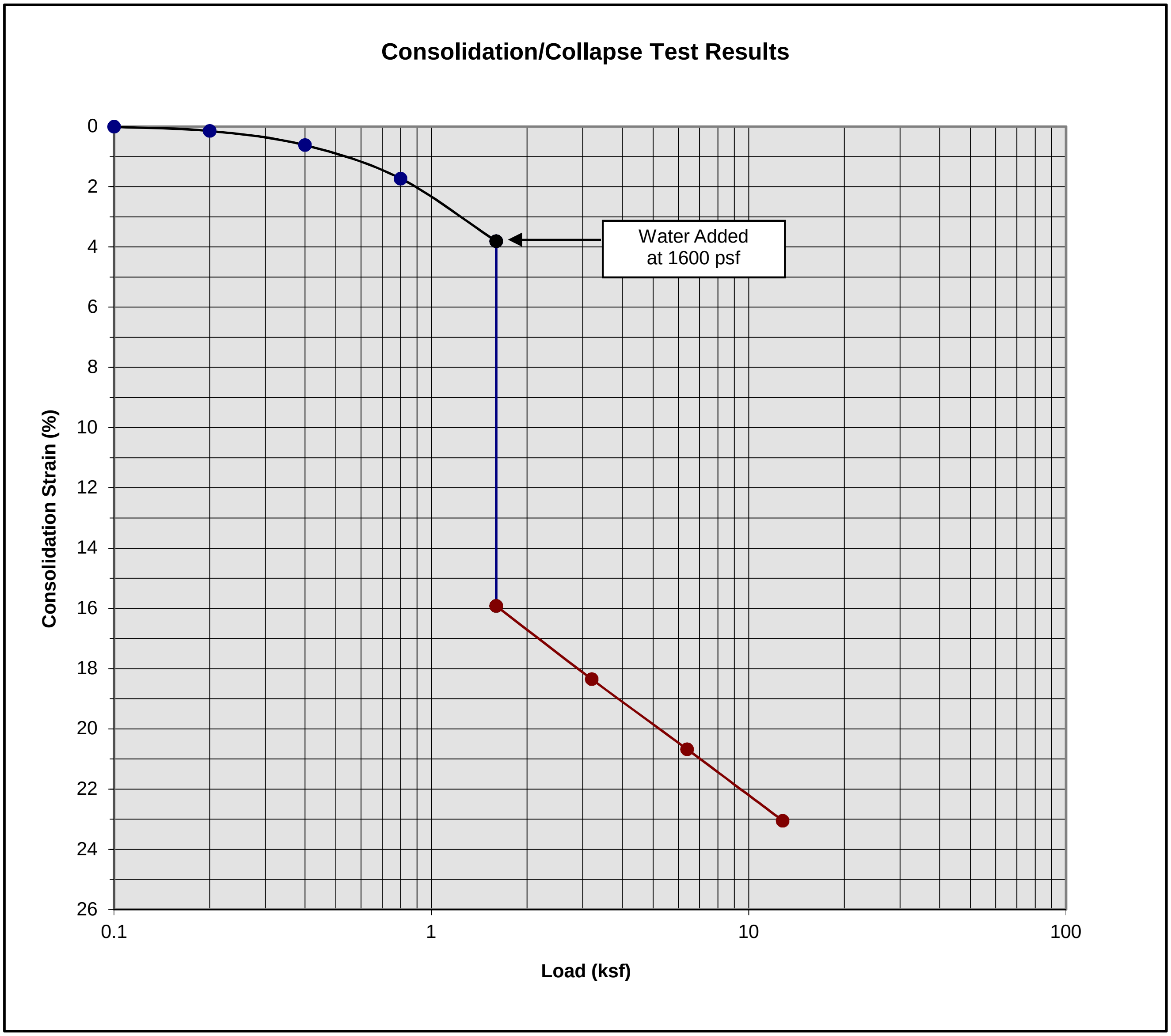


Classification: FILL: Dark Gray Clayey fine to coarse Sand, little fine Gravel

Boring Number:	B-11	Initial Moisture Content (%)	7
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	3 to 4	Initial Dry Density (pcf)	113.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	127.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	3.14

RV Storage Facility
Lake Elsinore, California
Project No. 16G227
PLATE C- 5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



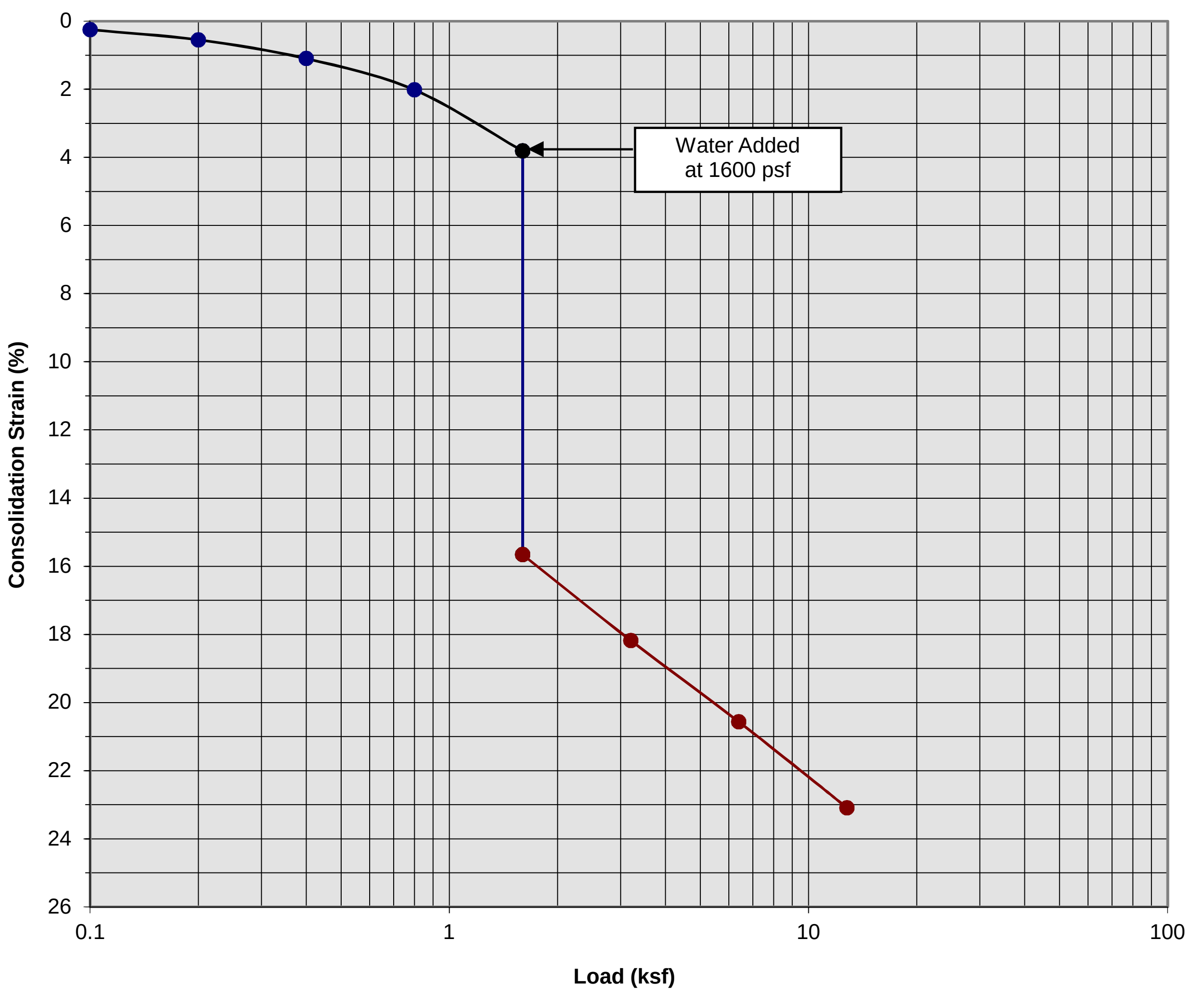
Classification: FILL: Dark Gray Clayey fine to coarse Sand, little fine Gravel

Boring Number:	B-11	Initial Moisture Content (%)	6
Sample Number:	---	Final Moisture Content (%)	12
Depth (ft)	5 to 6	Initial Dry Density (pcf)	94.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	123.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	12.11

RV Storage Facility
Lake Elsinore, California
Project No. 16G227
PLATE C- 6

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: FILL: Dark Gray Clayey fine to coarse Sand, little fine Gravel

Boring Number:	B-11	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	17
Depth (ft)	7 to 8	Initial Dry Density (pcf)	93.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	117.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	11.85

RV Storage Facility
Lake Elsinore, California
Project No. 16G227
PLATE C- 7

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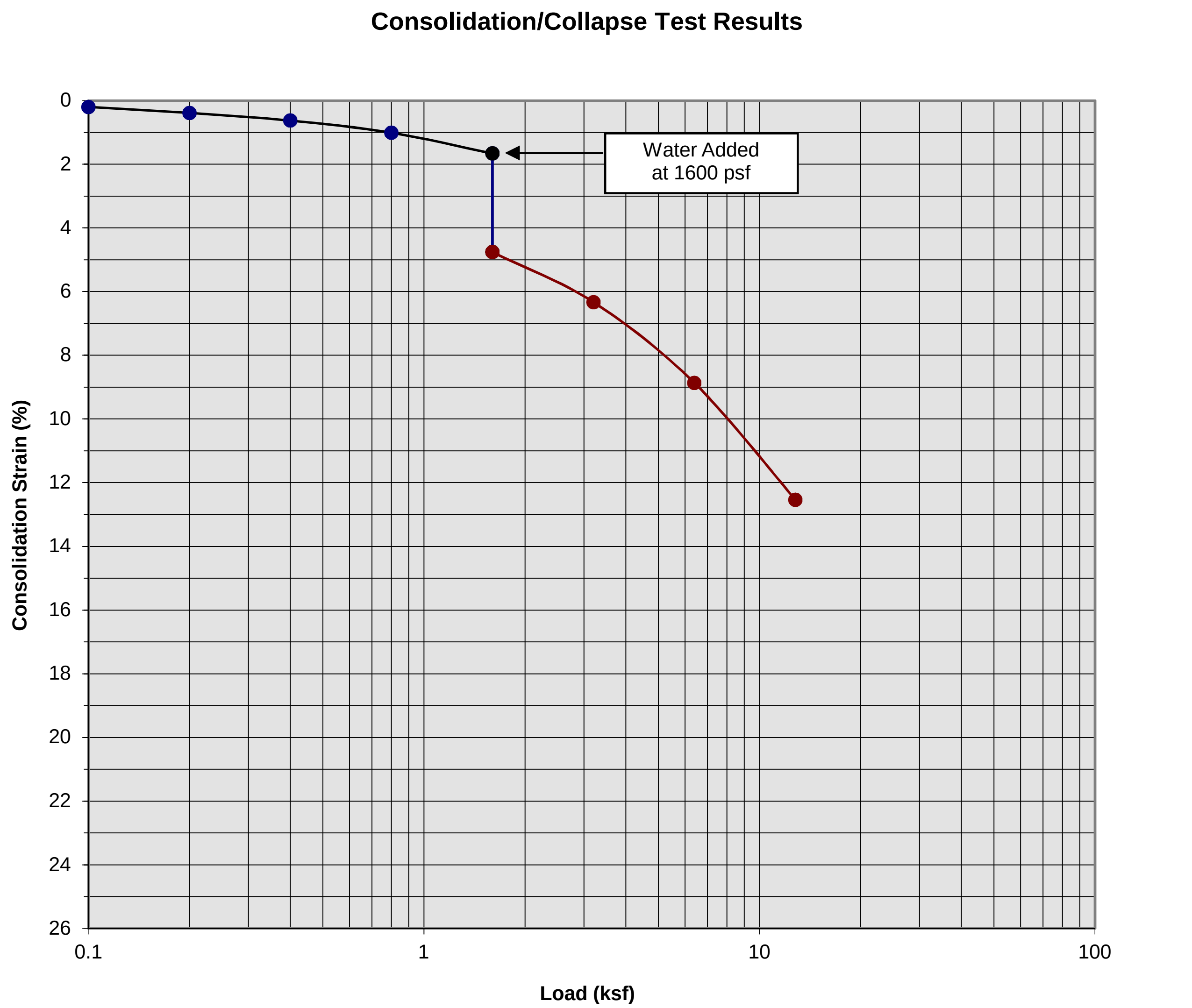

Classification: FILL: Light Gray Brown Gravelly fine to coarse Sand

Boring Number:	B-11		Initial Moisture Content (%)	6
Sample Number:	---		Final Moisture Content (%)	15
Depth (ft)	9 to 10		Initial Dry Density (pcf)	101.2
Specimen Diameter (in)	2.4		Final Dry Density (pcf)	115.2
Specimen Thickness (in)	1.0		Percent Collapse (%)	3.10

RV Storage Facility
Lake Elsinore, California
Project No. 16G227
PLATE C- 8

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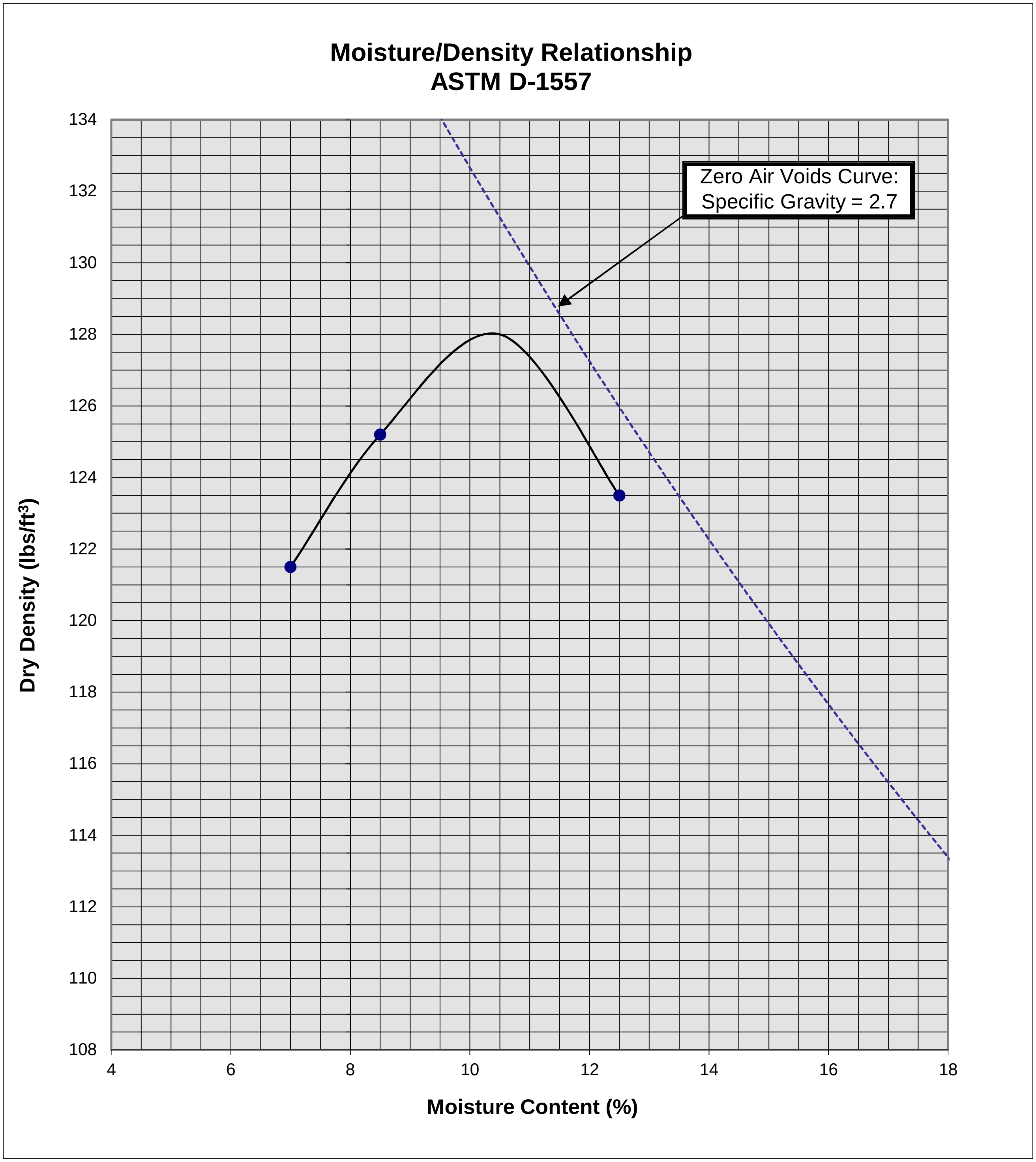

Soil ID Number		B-9 @ 0 to 5'
Optimum Moisture (%)		10.5
Maximum Dry Density (pcf)		128
Soil Classification	Gray Brown Clayey fine to medium Sand	

RV Storage Facility
Lake Elsinore, California
Project No. 16G227
PLATE C-9

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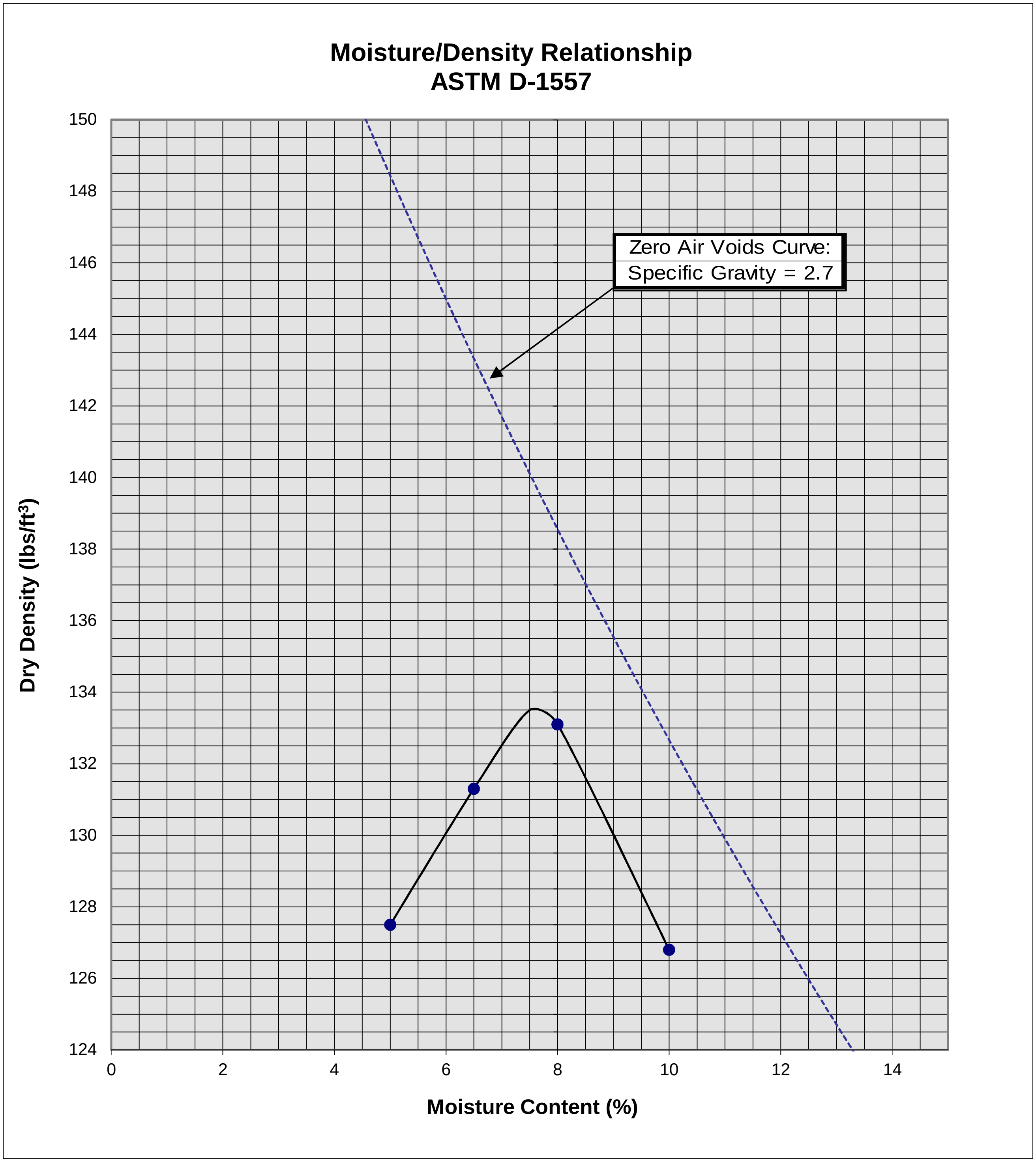

Soil ID Number	B-11 @ 0 to 5'
Optimum Moisture (%)	7.5
Maximum Dry Density (pcf)	133.5
Soil Classification	Brown Silty fine to coarse Sand, trace Clay

RV Storage Facility
Lake Elsinore, California
Project No. 16G227
PLATE C-10

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APPENDIX D

GRADING GUIDE SPECIFICATIONS

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

General

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

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

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

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

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

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

Site Preparation

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

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

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

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

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

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

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

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

Compacted Fills

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Foundations

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

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

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

Fill Slopes

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

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

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

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

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

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

Cut Slopes

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

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

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

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

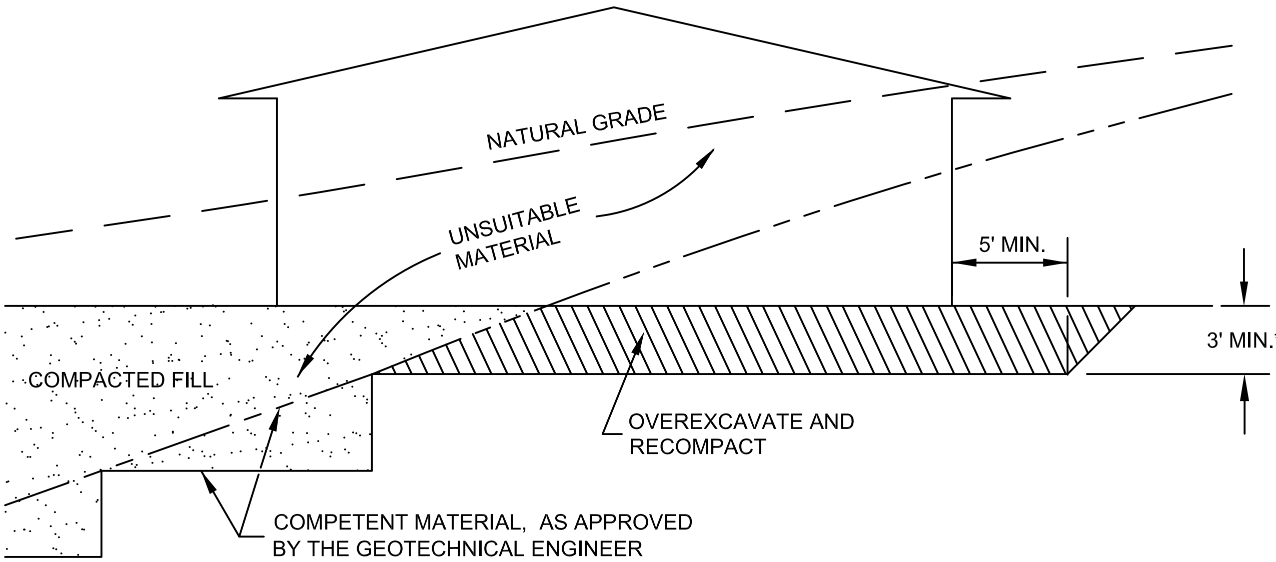
Subdrains

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

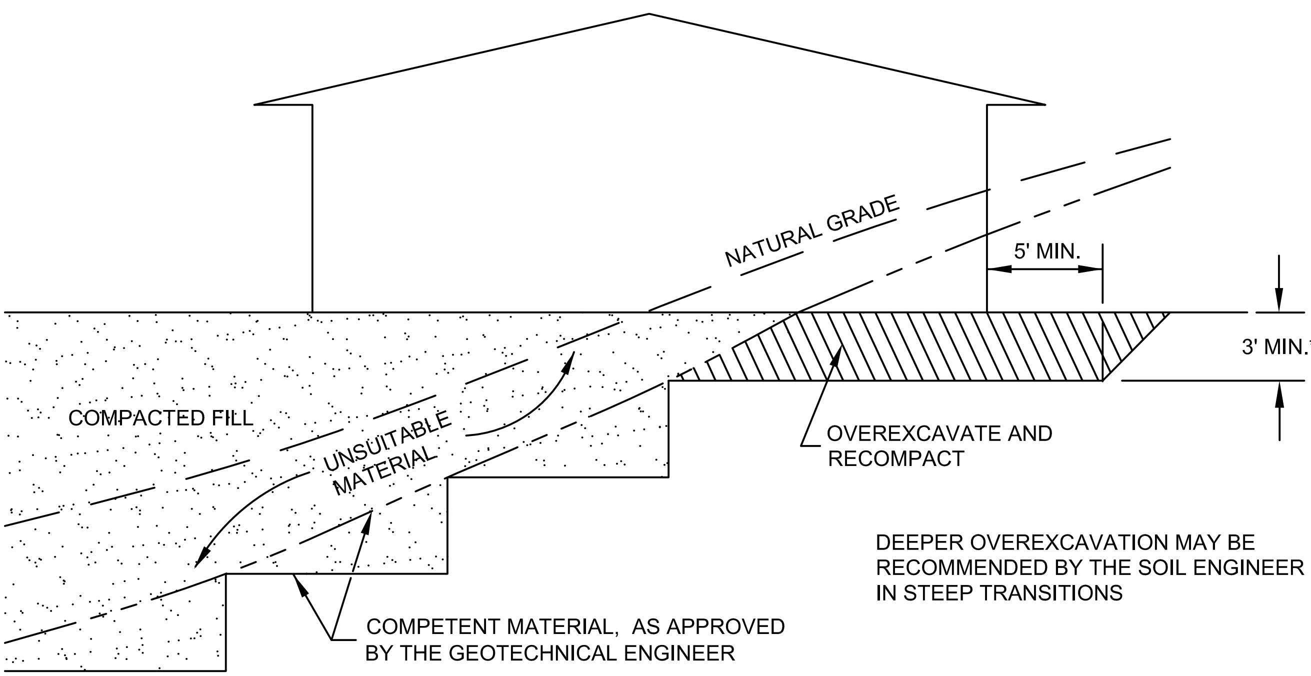
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- Filter material for subdrains should conform to CALTRANS Specification 68-1.025 or as approved by the Geotechnical Engineer for the specific site conditions. Clean 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

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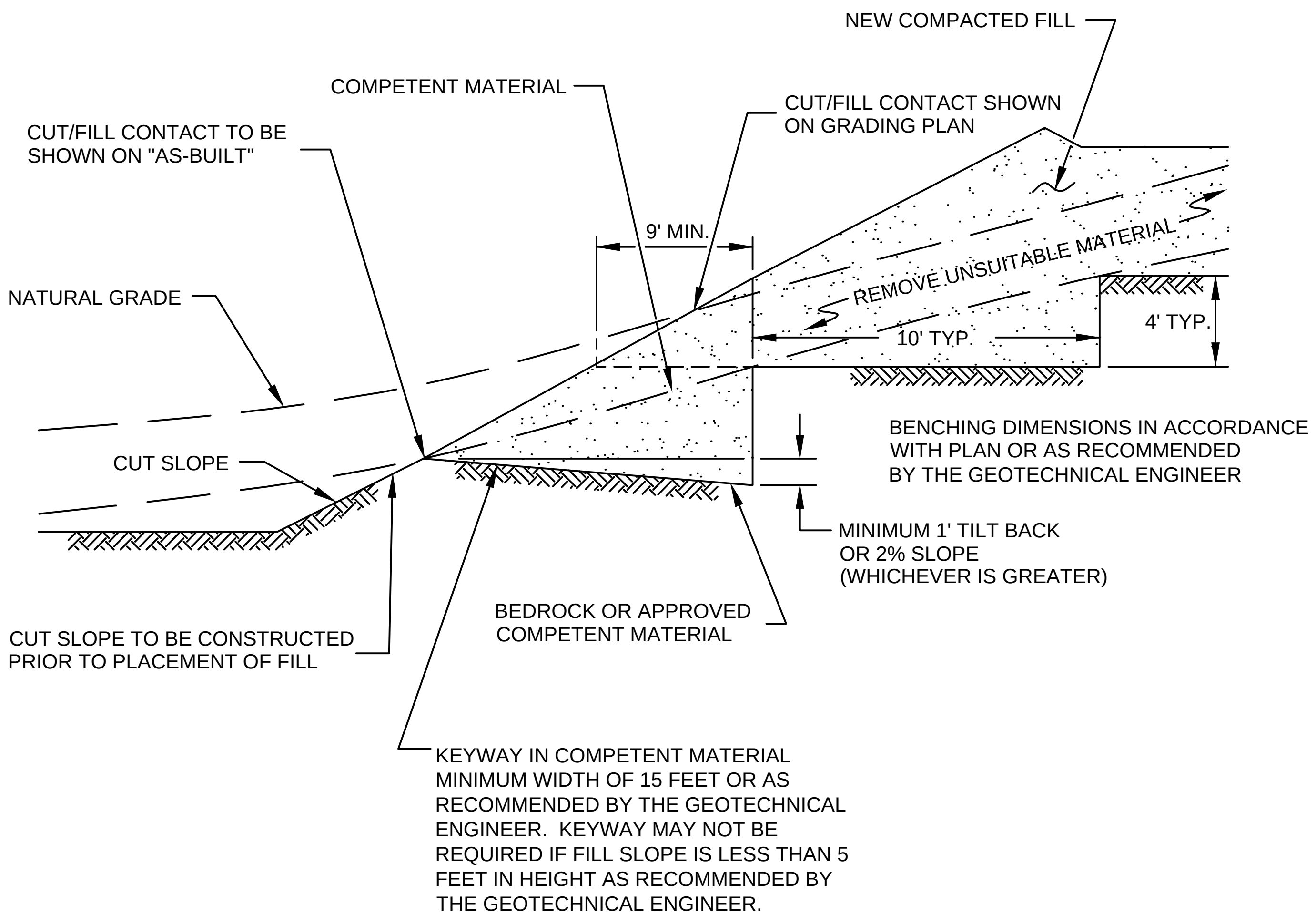


FILL ABOVE CUT SLOPE DETAIL

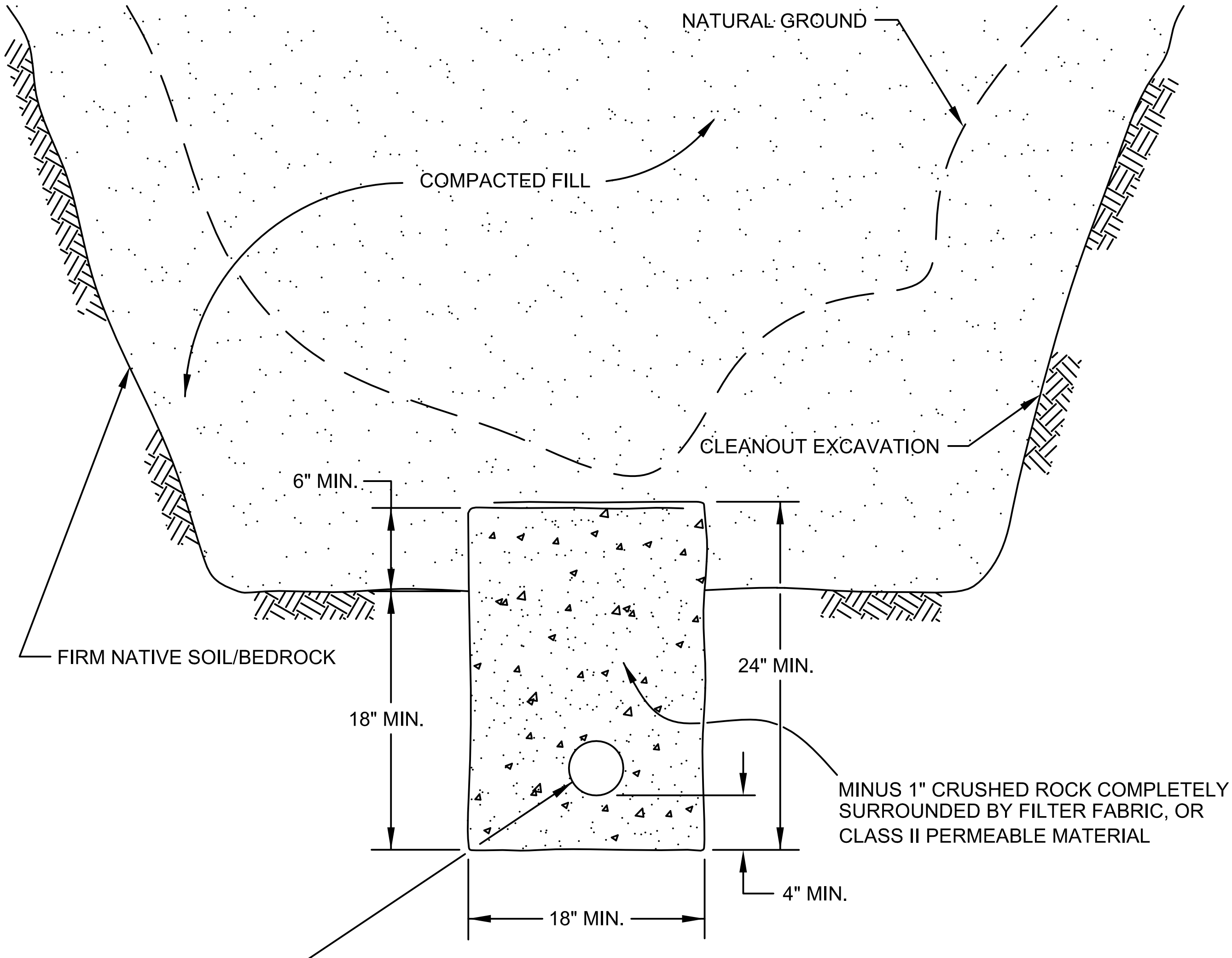
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



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

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

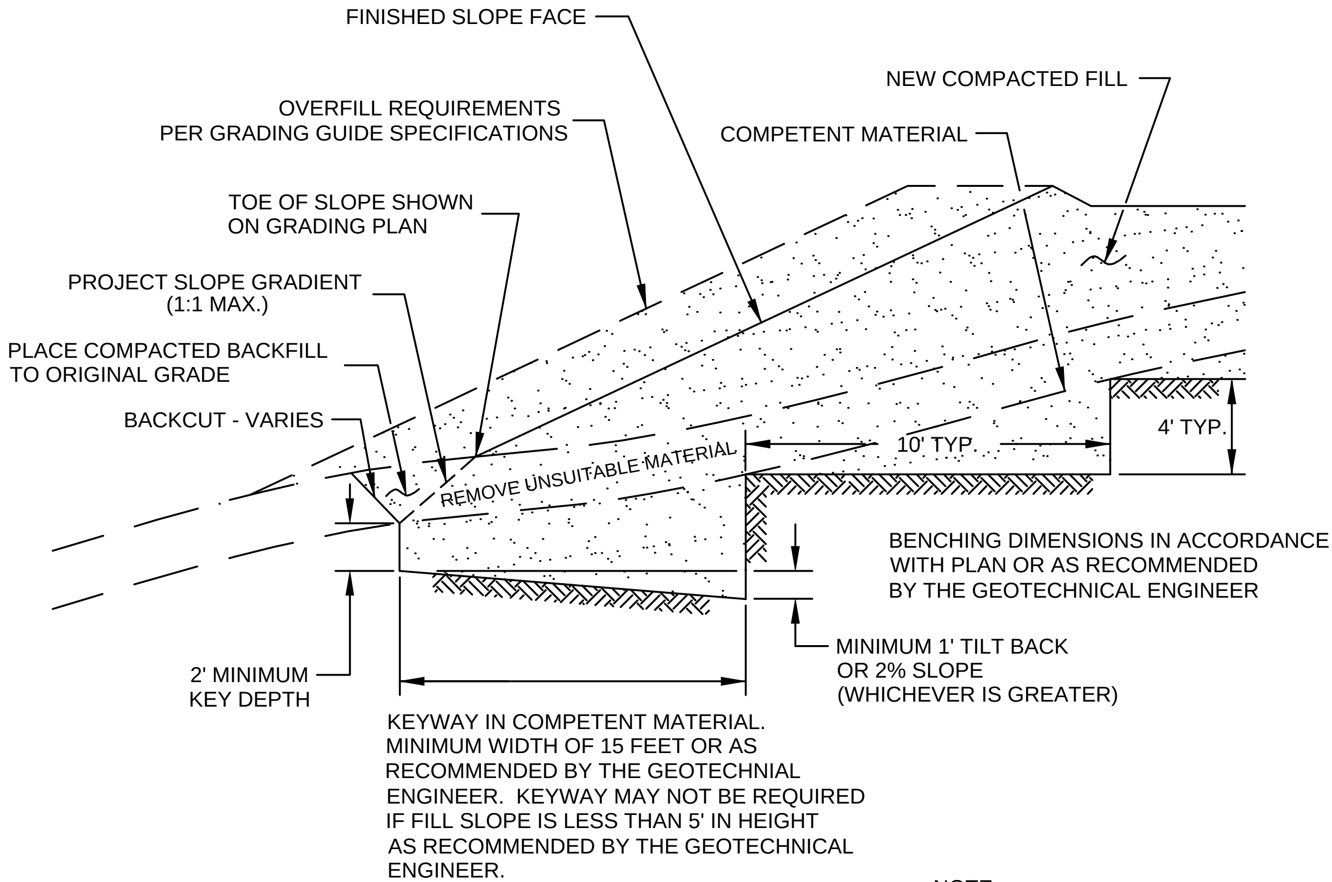
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SOUTHERN CALIFORNIA GEOTECHNICAL

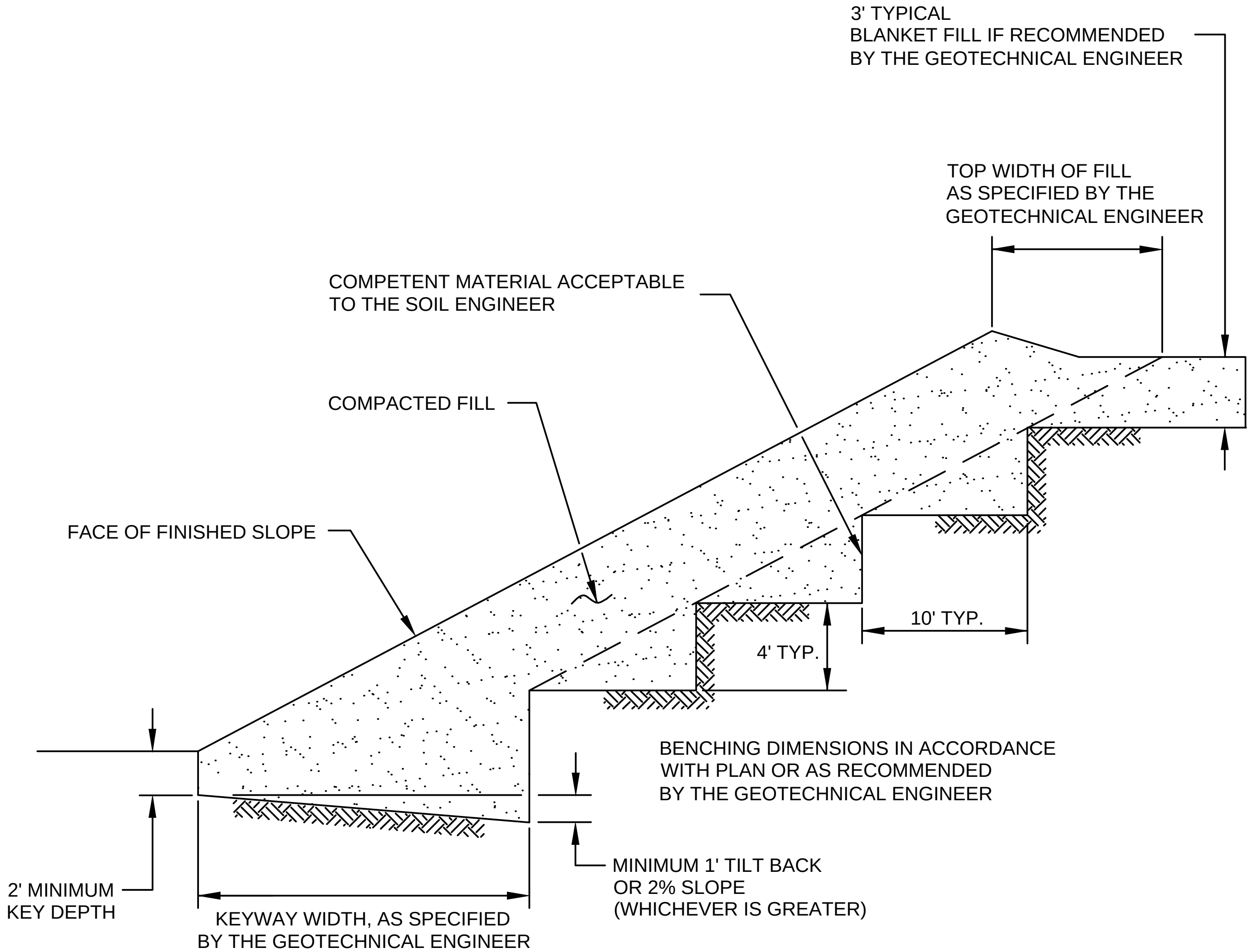


NOTE:
BENCHING SHALL BE REQUIRED WHEN NATURAL SLOPES ARE EQUAL TO OR STEEPER THAN 5:1 OR WHEN RECOMMENDED BY THE GEOTECHNICAL ENGINEER.

FILL ABOVE NATURAL SLOPE DETAIL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JAS CHKD: GKM	
PLATE D-4	



STABILIZATION FILL DETAIL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

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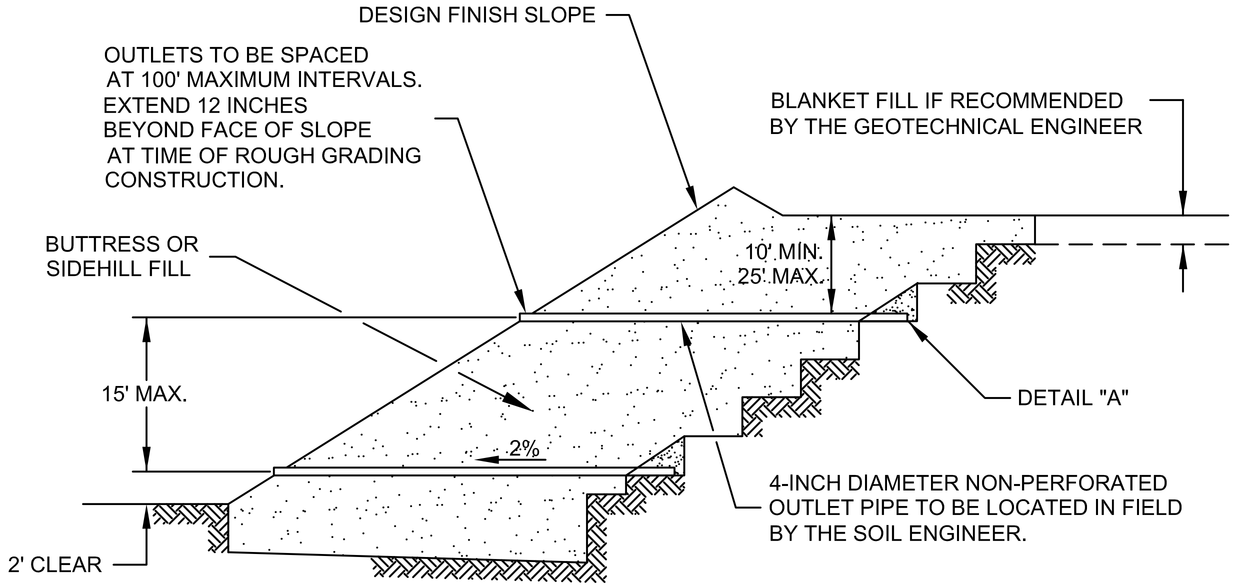


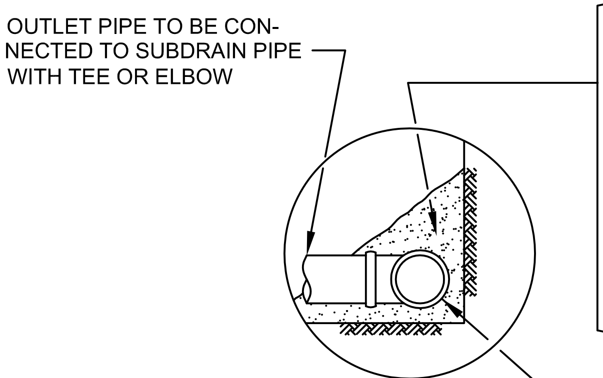
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

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

SAND EQUIVALENT = MINIMUM OF 50



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

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

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

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

DETAIL "A"

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

SLOPE FILL SUBDRAINS

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

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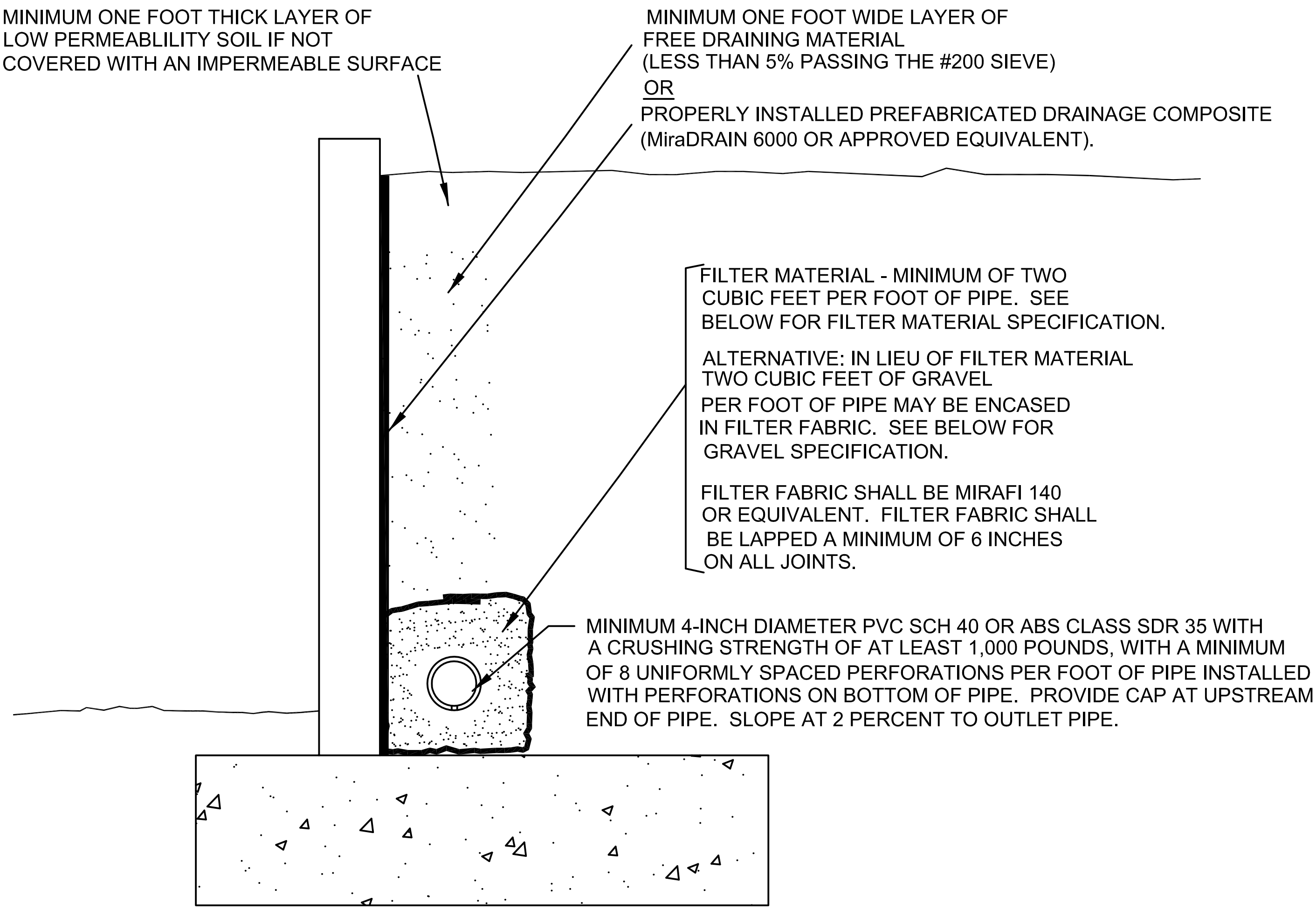

"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

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

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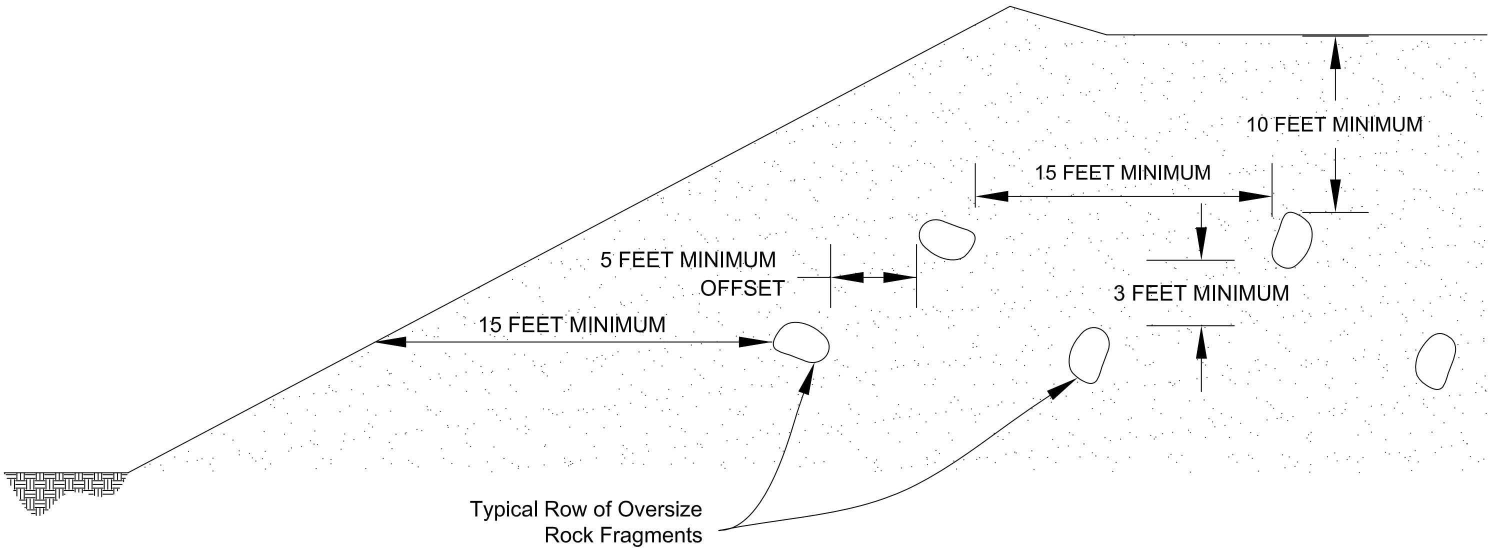
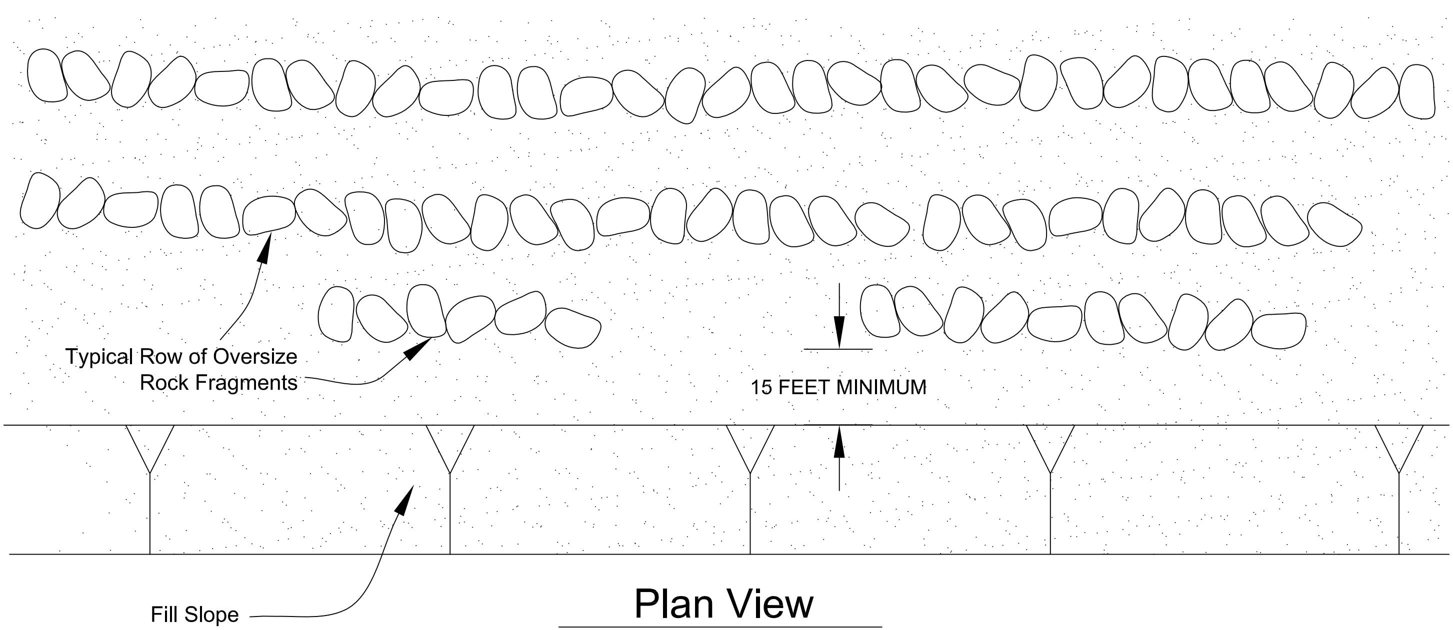
SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
CHKD: GKM

PLATE D-8

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APPENDIX E

USGS Design Maps Summary Report

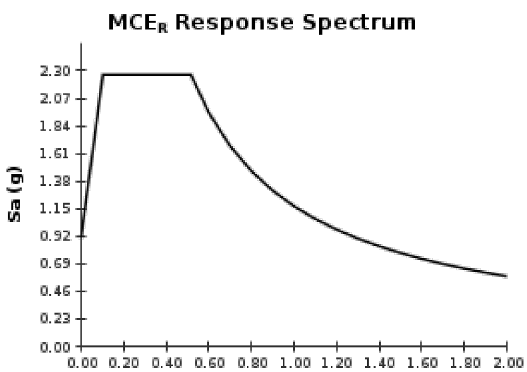
User–Specified Input

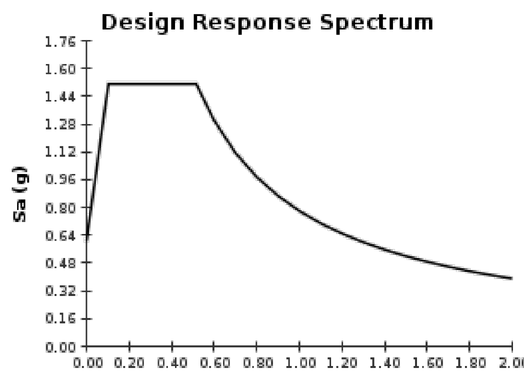
Report Title	Proposed RV Storage Facility Mon December 19, 2016 22:34:16 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	33.72853°N, 117.39071°W
Site Soil Classification	Site Class C – "Very Dense Soil and Soft Rock"
Risk Category	I/II/III

USGS–Provided Output

S_S = 2.267 g	S_{MS} = 2.267 g	S_{DS} = 1.511 g
S_1 = 0.900 g	S_{M1} = 1.170 g	S_{D1} = 0.780 g

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





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

SEISMIC DESIGN PARAMETERS
PROPOSED RV STORAGE FACILITY
LAKE ELSINORE, CALIFORNIA

DRAWN: DRK
CHKD: JAS

SCG PROJECT
16G227-1R

PLATE E-1

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SOUTHERN CALIFORNIA GEOTECHNICAL