Appendix G2. Geotechnical Investigation for Fanita Parkway Widening and Extension

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GEOTECHNICAL INVESTIGATION

FANITA RANCH
FANITA PARKWAY
WIDENING AND EXTENSION
STATION 9+35 TO 111+50
SANTEE, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

HOMEFED CORPORATION
CARLSBAD, CALIFORNIA

APRIL 17, 2020
PROJECT NO. 05254-32-18A

Project No. 05254-32-18A
April 17, 2020

HomeFed Corporation
1903 Wright Place, Suite 220
Carlsbad, California 92008

Attention: Mr. Tom Blessent

Subject: GEOTECHNICAL INVESTIGATION
FANITA RANCH
FANITA PARKWAY WIDENING AND EXTENSION
STATION 9+35 TO 111+50
SANTEE, CALIFORNIA

Dear Mr. Blessent:

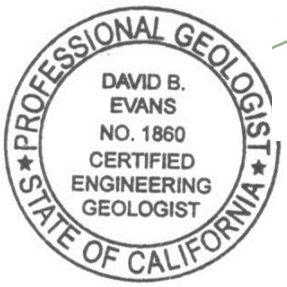
In accordance with your request, we have prepared this geotechnical investigation report for the widening and extension of Fanita Parkway in Santee, California. The accompanying report presents the findings of our study and our recommendations relative to the geotechnical aspects of improving the roadway as presently proposed. This information was also presented in 2007 during submittal of a previous Tentative Map and Specific Plan.

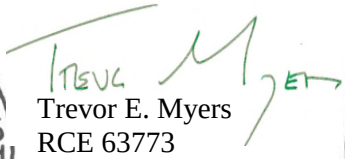
Should you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

David B. Evans
CEG 1860





Trevor E. Myers
RCE 63773

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(6/del) Addressee

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed widening and extension of Fanita Parkway between Stations 9+35 and 111+50. Specifically, the improvement of Fanita Parkway will span from the intersection of Mast Boulevard north to the southerly boundary of Orchard Village within the proposed Fanita Ranch development area located in Santee, California (see *Vicinity Map*, Figure 1). This information was previously presented in our report entitled *Fanita Ranch, Fanita Parkway Widening and Extension, Station 9+35 to 111+50*, dated June 21, 2007, during preparation of a previous Tentative Map and Environmental Impact Report. The purpose of the study was to investigate the soil and geologic conditions along the proposed project alignment, as well as geotechnical constraints, if any, that may impact the areas of planned development.

The scope of this investigation included a review of previous geotechnical reports prepared by Geocon, stereoscopic aerial photographs, and readily available published and unpublished geologic literature (see *List of References*). Please note, for continuity, the List of References is considered a "master list" applicable to all of our Fanita Ranch investigation reports. The scope also included a field investigation consisting of excavating 23 exploratory trenches and collecting representative bulk samples to aid in evaluating various physical properties of the prevailing soil conditions encountered.

Details of the field investigation as well as a description of the trench logs are presented in Appendix A and a summary of the laboratory test results are presented in Appendix B. Figures 2 through 5 (*Trench Location Map*) depict the approximate locations of each exploratory trench location. The base map used to depict the trench locations consisted of AutoCAD files of the proposed improvements entitled *Fanita Ranch – Vesting Tentative Map/Preliminary Grading Plan*, Sheets 25 through 32, prepared by Hunsaker & Associates San Diego, Inc., Revision 5 dated March 27, 2020.

2. SITE AND PROJECT DESCRIPTION

For the purpose of this report, we utilized stationing assignments from our previous study. The southerly segment of Fanita Parkway (Stations 9+35 to 75+50) presently supports an asphalt concrete-paved, two-lane road extending from Mast Boulevard to Ganley Road. From Ganley Road north to the southern boundary of the Orchard Village development (Stations 75+50 to 103+00), the future roadway has been rough-graded but is otherwise unimproved. The area between Stations 103+00 and 111+50 is essentially in its natural state, with the exception of an overhead SDG&E power easement and a large stockpile located outside the roadway extension. Improvements consisting of storm drains, sewer, water, and dry utilities traverse Fanita Parkway. Several drainage channels and/or collection points are located along the east portion of Fanita Parkway.

In general, the roadway surface varies from elevation 440 feet MSL (Mean Sea Level) at the north end to 355 feet MSL at the south end. The Santee Recreation Lakes border the west side of the alignment. The lake surfaces vary from 3 to 12 feet below the paved surface. The east side of the existing paved portion of Fanita Parkway, as well as the unpaved northerly portion, abuts an existing residential subdivision.

A review of the plans indicate the improvements for Fanita Parkway will consist of grading within existing open space areas along the eastern side of the proposed parkway, from Mast Boulevard to Ganley Road (Station 9+35 to 75+50), and placing additional embankments at several locations along the western edge of the existing roadway between Station 9+35 and 103+00. Proposed grading will consist of cuts and fills of generally less than 10 feet. Fill slopes will be inclined at 2:1 (horizontal:vertical), or flatter, and will have a maximum height of approximately 10 feet. Several relatively minor retaining walls are also proposed.

The locations and descriptions of the site and proposed improvements are based on a site reconnaissance and a review of the referenced plans. If development plans differ significantly from those described herein, Geocon Incorporated should be consulted for review and possible revisions to this report.

3. PREVIOUS GEOTECHNICAL STUDIES

Geocon Incorprated conducted a geotechnical study between February 1995 and November 1996 for the Orchard Village portion of a previous Fanita Ranch Tentative Map. This study included a portion of the proposed roadway alignment. Pertinent trench logs (T-204 through T-207) are presented in Appendix C and are illustrated on the *Trench Location Map* (Figure 5).

4. SOIL AND GEOLOGIC CONDITIONS

Three surficial soil types and three geologic formations were encountered during the field investigation. The surficial soil deposits consist of undocumented fill, topsoil, and alluvium. Formational units include Quaternary Terrace Deposits, Eocene-age Friars Formation, and Cretaceous-age granitic rock. Each of the surficial soil types and geologic units encountered is described below in order of increasing age.

We encountered existing fill soils along Fanita Parkway between approximately Stations 9+35 to 103+00. Geotechnial reports pertaining to the fill were not available for our review; thus, the existing fill embankment is refered herein as undocumented fill.

4.1 Undocumented Fill

Undocumented fill soils were found along the majority of the proposed alignment of the subject roadway. The majority of the deposits consist of medium dense, damp to moist, silty/clayey sands and sandy clays with varying degrees of gravel and cobble that have a maximum dimension of approximately 24 inches. The upper portions of these deposits will require remedial grading prior to placement of structural fill and/or settlement-sensitive improvements.

4.2 Topsoil

Topsoils were encountered in a number of trenches overlying formational units or underlying undocumented fill soils (Trench No. T-10). The topsoils are characterized as loose to medium dense, silty/clayey sands and sandy clays with varying percentages of gravel and cobbles up to 8 inches in diameter. The topsoil deposits will require removal and compaction in areas planned to receive structural fill and/or settlement-sensitive improvements.

4.3 Alluvium

Alluvial deposits were encountered in several of the exploratory excavations. These deposits consist of relatively loose to medium dense silty/clayey sands, sandy clays and sandy gravels with varying amounts of gravel, cobble and boulders up to 16 inches in diameter. The alluvial deposits are poorly consolidated, potentially compressible, and will require remedial grading.

4.4 Terrace Deposits

Terrace Deposits consisting of dense to very dense, silty/clayey sandstones and sandy conglomerates with varying amounts of gravel, cobble and boulders up to 14 inches were exposed in several trenches. In some areas, differentiating between the Terrace Deposits and the Friars Formation was difficult due to similar physical characteristics. Therefore, where this occurred, the units were not differentiated. The Terrace Deposits are suitable for the support of fill or structural loads in their present condition.

4.5 Friars Formation

The Eocene-age Friars Formation underlies the surficial deposits and the Terrace Deposits within the central and northern portions of the property. The deposits consist of stiff to hard, silty claystones and dense to very dense silty sandstones and sandy conglomerates with varying amounts of gravel and cobble.

4.6 Granitic Rock

Cretaceous-age granitic rock of the Southern California Batholith was exposed in two trenches within the southern portion of the site (see Trench Nos. T-2 and T-3). Granitic rock is the oldest geologic unit in the region and is believed to underlie the entire Fanita Ranch project at depth. The rock materials,

where encountered, were completely to highly weathered, with weak to moderately weak strength properties. However, weathering typically diminishes and strength increases with depth. Exposures within the granitic rock are anticipated to be very limited in regard to the future improvements for the roadway.

5. GROUNDWATER

No seeps or groundwater were observed along the proposed roadway alignment. However, during previous studies, standing water and vegetation suggestive of shallow groundwater were noted along the drainage swales that presently border the west side of Fanita Parkway. Remedial grading of surficial deposits will be required and, hence, localized seepage or perched groundwater may be encountered. Materials within drainages may be very moist to saturated during the winter or early spring depending on preceding precipitation, and may require mixing with drier material or drying prior to use as compacted fill.

6. GEOLOGIC HAZARDS

6.1 Faulting and Seismicity

Based on our reconnaissance and a review of published geologic maps and reports, the site is not located on any known "active," "potentially active" or "inactive" fault traces as defined by the California Geological Survey (CGS).

The Newport-Inglewood Fault and Rose Canyon Fault Zone, located approximately 13 miles west of the site, are the closest known active faults. The CGS considers a fault seismically active when evidence suggests seismic activity within roughly the last 11,000 years. The CGS has included portions of the Rose Canyon Fault Zone within an Alquist-Priolo Earthquake Fault Zone.

6.2 Seismicity-Deterministic Analysis

We used the computer program *EZ-FRISK* (Version 7.65) to determine the distance of known faults to the site and to estimate ground accelerations at the site for the maximum anticipated seismic event.

According to the results of the computer program *EZ-FRISK* (Version 7.65), 7 known active faults are located within a search radius of 50 miles from the property. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA in our analysis. The nearest known active faults are the Newport-Inglewood and Rose Canyon Fault Zones, located approximately 13 miles west of the site, respectively, and are the dominant sources of potential ground motion. Table 6.2 lists the estimated maximum earthquake magnitudes and PGA's for the most dominant faults for the site location calculated for Site Class D as defined by Table 1613.3.2 of the 2016 California Building Code (CBC).

TABLE 6.2
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood	13	7.5	0.24	0.19	0.24
Rose Canyon	13	6.9	0.21	0.17	0.18
Coronado Bank	26	7.4	0.17	0.11	0.13
Palos Verdes Connected	26	7.7	0.18	0.12	0.15
Elsinore	29	7.85	0.18	0.12	0.15
Earthquake Valley	33	6.8	0.11	0.07	0.07
San Jacinto	49	7.88	0.12	0.08	0.10

6.3 Seismicity-Probabilistic Analysis

We used the computer program *EZ-FRISK* (version 7.65) to perform a probabilistic seismic hazard analysis. *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the fault slip rate. The program accounts for earthquake magnitude as a function of rupture length. Site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2008) NGA USGS 2008 in the analysis. Table 6.3 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence for Site Class D.

TABLE 6.3
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.44	0.36	0.41
5% in a 50 Year Period	0.34	0.27	0.30
10% in a 50 Year Period	0.27	0.22	0.23

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including frequency and duration of motion and soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) or City of Santee guidelines.

6.4 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, groundwater is encountered within 50 feet of the surface, and soil relative density is less than about 70 percent. If all four criteria are met, a seismic event could result in a rapid increase in pore water pressure from the earthquake-generated ground accelerations. The potential for liquefaction at the site is considered low due to the dense formational material encountered, remedial grading recommended, and lack of significant deposits of saturated soils that could be susceptible to liquefaction.

6.5 Landslides

Numerous ancient landslides are known to have occurred in the Friars Formation in the Santee area. However, based on a review of available information, it appears that the closest known landslide deposits are at least 300 feet and possibly 500 feet east of the Fanita Parkway alignment. No obvious signs of slope instability, such as tension cracks, slope scars or abandoned properties, were observed along the roadway.

7. PAVEMENT STUDY (LAKE CANYON DRIVE)

7.1 Purpose and Scope

A pavement investigation was conducted during a previous study for a portion of Lake Canyon Road adjacent to Fanita Parkway. The purpose of the investigation was to measure the thickness of the existing pavement section, evaluate the underlying subgrade support characteristics, and provide recommendations to rehabilitate a portion of the subject road to meet city design standards.

The scope of our investigation included a site reconnaissance, field investigation, laboratory testing, and engineering analysis. The field investigation was performed June 7, 2007, and consisted of coring through the existing pavement at 2 locations and obtaining samples of the subgrade soils. Details of the field investigation are presented in Appendix A. The locations of the pavement cores are presented on Figure 3. A discussion pertaining to the laboratory testing and results is presented in Appendix B.

The conclusions and recommendations presented herein are based on analysis of the data obtained from the field investigation, laboratory tests and engineering analyses.

7.2 Existing Pavement Condition

The existing pavement on the portion of Lake Canyon Road (approximately 360 feet of road measured from the intersection of Fanita Parkway) was visually examined. With the exception of isolated areas, the street exhibited moderate to severe “alligator cracking” throughout the project limits.

In addition to observing areas of pavement distress, cores were drilled through the asphalt at two locations to evaluate the existing pavement section. Due to the magnitude of “alligator cracking” observed, the street will require rehabilitation to meet City standards. Pavement recommendations for Lake Canyon Road are presented in Section 8.8 of our Conclusions and Recommendations.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 No soil or geologic conditions were encountered that would preclude planned improvement of Fanita Parkway and associated improvements as presently planned, provided the recommendations of this report are followed.

8.1.2 The surficial soils (i.e. topsoils, alluvium, and the upper portion of undocumented fill) are not considered suitable for support of fill or structural loads in their present condition and will require remedial grading.

8.1.3 The on-site geologic units have permeability characteristics that are conducive to water transmission, natural or otherwise, and may result in future seepage conditions. It is not uncommon for groundwater or seepage conditions to develop where none previously existed, particularly after landscape irrigation is initiated. The occurrence of induced groundwater seepage from landscaping can be greatly reduced by implementing and monitoring a landscape program that limits irrigation to that sufficient to support the vegetative cover without over watering.

8.2 Soil and Excavation Characteristics

8.2.1 Based on our experience and previous laboratory testing of materials encountered throughout the proposed Fanita Ranch development area, the soil conditions encountered vary from low expansive (Expansion Index, EI, of 50 or less) sandy gravel, cobble conglomerate and silty sands to potentially highly expansive (EI greater than 90) clays and claystones.

8.2.2 It is anticipated that surficial deposits can be excavated with light to moderate effort using conventional heavy-duty grading equipment. The Friars Formation and Terrace Deposits will likely require moderately heavy to heavy ripping. These units are also known to have random cemented zones (see Trench No. T-19). If encountered, the cemented zones may require very heavy ripping. Oversize, cemented chunks of conglomerate and oversize concretions may be generated and will require special handling and placement in fill areas. Excavating within the granitic materials generally varies in difficulty depending on the depth of excavation. However, it is anticipated that excavations within the granitic rock will be very limited.

8.3 Grading

8.3.1 All grading should be performed in accordance with the attached *Recommended Grading Specifications* (Appendix D). Where the recommendations of this section conflict with

Appendix D, the recommendations of this section take precedence. All earthwork should be observed and all fills tested for proper compaction by Geocon Incorporated.

8.3.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

8.3.3 Site preparation should begin with the removal of deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition can remain on-site and be used for ecological restoration. Trash or any other objectionable materials not suitable for fills should be hauled off-site.

8.3.4 In general, the upper 3 feet of surficial soils (topsoil, undocumented fill and alluvium) within areas of planned grading should be removed and properly compacted prior to placing additional fill and/or structural loads. The actual extent and depth of surficial soils requiring removal should be determined in the field by the geotechnical engineer. Overly wet soils, as might be encountered in the vicinity of drainages, will require drying and/or mixing with drier soils to facilitate proper compaction.

8.3.5 After removal of unsuitable materials is performed, the site should then be brought to finish grade elevations with structural fill compacted in layers. In general, soils native to the site are suitable for re-use as fill if free from vegetation, debris and other deleterious material. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including trench and wall backfill, and scarified ground surfaces, should be compacted to at least 90 percent of maximum dry density at or slightly above optimum moisture content, as determined in accordance with ASTM Test Procedure D 1557-12. The project geotechnical engineer may consider fill materials below the recommended minimum moisture content unacceptable and may require additional moisture conditioning prior to placing additional fill.

8.3.6 Oversize material (defined as material greater than 12 inches in nominal dimension) may be generated during excavations into the surficial deposits and formational materials. Oversize material should be placed in accordance with the recommendations presented in Appendix D of this report and the City of Santee grading ordinance. Grading operations on the site should be scheduled such that oversize materials are placed in designated oversize disposal areas and/or deeper fills.

8.4 Seismic Design Criteria

8.4.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 8.4.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 seconds. The values presented in Table 8.4.1 are for the risk-targeted maximum considered earthquake (MCE_R). Based on soil conditions and planned grading, any structural improvements should be designed using a Site Class D. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10.

TABLE 8.4.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.878g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.341g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.149	Table 1613.3.3(1)
Site Coefficient, F_V	1.717	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.009g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.586g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.672g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.391g	Section 1613.3.4 (Eqn 16-40)

8.4.2 Table 8.4.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 8.4.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value, Site Class D	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.331g	Figure 22-7
Site Coefficient, F_{PGA}	1.169	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.387g	Section 11.8.3 (Eqn 11.8-1)

8.4.3 Conformance to the criteria for seismic design does not constitute any guarantee or assurance that significant structural damage or ground failure will not occur in the event of a maximum level earthquake. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

8.5 Slope Stability

8.5.1 Slope stability analyses were performed utilizing average drained direct shear strength parameters obtained from previous laboratory testing of similar soil types encountered throughout the proposed Fanita Ranch development area. These analyses indicate that the proposed fill slopes constructed of on-site materials should have calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions. Slope stability calculations for deep-seated and surficial slope stability are presented on Figures 6 and 7, respectively.

8.5.2 Fill slopes should be overbuilt at least 3 feet horizontally, and cut back to the design finish grade. As an alternative, slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope.

8.5.3 All slopes should be landscaped with drought-tolerant vegetation, having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion.

8.6 Corrosive Potential

8.6.1 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, it is recommended that further evaluation by a corrosion engineer be performed.

8.7 Preliminary Flexible Pavement Recommendations (Fanita Parkway)

8.7.1 Preliminary pavement recommendations provided herein are based on laboratory test results of bulk samples collected along the proposed roadway alignment that are anticipated to be near or at subgrade. The samples collected were subjected to Resistance Value (R-Value) testing to determine bearing characteristics for pavement design. The preliminary pavement section recommendations for Fanita Parkway are based on a Traffic Index (TI) of 8.0. The preliminary pavement recommendations presented in Table 8.7 are for planning and estimating purposes only and not for construction.

TABLE 8.7
PRELIMINARY PAVEMENT SECTIONS

Location	Traffic Index	R-Value	Asphalt Concrete (inches)	Aggregate Base Material* (inches)
Fanita Parkway Station 14+70	8.0	<5	5.0	17.5
Fanita Parkway Station 18+75	8.0	<5	5.0	17.5
Fanita Parkway Station 23+40	8.0	6	5.0	17.5
Fanita Parkway Station 28+70	8.0	<5	5.0	17.5
Fanita Parkway Station 33+40	8.0	60	5.0	6.0
Fanita Parkway Station 37+10	8.0	<5	5.0	17.5
Fanita Parkway Station 41+60	8.0	5	5.0	17.5
Fanita Parkway Station 46+75	8.0	<5	5.0	17.5
Fanita Parkway Station 51+80	8.0	<5	5.0	17.5
Fanita Parkway Station 56+80	8.0	<5	5.0	17.5
Fanita Parkway Station 61+60	8.0	61	5.0	6.0
Fanita Parkway Station 66+50	8.0	7	5.0	17.0
Fanita Parkway Station 69+00	8.0	<5	5.0	17.5
Fanita Parkway Station 77+80	8.0	9	5.0	16.5
Fanita Parkway Station 85+20	8.0	6	5.0	17.5
Fanita Parkway Station 88+00	8.0	8	5.0	17.0
Fanita Parkway Station 93+00	8.0	12	5.0	15.5
Fanita Parkway Station 99+00	8.0	8	5.0	17.0
Fanita Parkway Station 104+00	8.0	30	5.0	10.5
Fanita Parkway Station 108+60	8.0	11	5.0	16.0
Fanita Parkway Station 111+50	8.0	9	5.0	16.5

*or approved equivalent.

8.7.2 The following recommendations should also be implemented:

- The upper 12 inches of the subgrade supporting the structural section should be scarified, moisture conditioned, and compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly over optimum moisture as determined by ASTM Test Method D 1557-12.

- Aggregate base material should be properly moisture conditioned and compacted to a dry density of at least 95 percent of the laboratory maximum dry density at near to slightly above optimum moisture content per ASTM D 1557-12.

- Asphalt concrete should be compacted to at least 95 percent of the Hveem density as determined by ASTM D 2726-13.

- Asphalt concrete should conform to Section 200-2 of the *Standard Specifications for Public Works Construction* (2015 Greenbook). Class 2 aggregate base materials should conform to Section 26-1.02B of the *Standard Specifications of the State of California, Department of Transportation* (2015 Caltrans) or approved equivalent. Additionally, all materials should conform to City of Santee specifications.

8.8 Pavement Section Recommendations (Lake Canyon Road)

8.8.1 The existing pavement of Lake Canyon Road (within the study area) consists of 2 inches and 3⅜ inches (average) of asphalt concrete at Core Locations C-1 and C-2, respectively, and is underlain by approximately 9 inches of aggregate base (see Table 8.8.1).

8.8.2 A Traffic Index (TI) of 5.0 was used in our analysis.

8.8.3 Laboratory R-Value testing was performed on subgrade soil samples obtained from the field investigation. The R-value test results are presented in Appendix B, Table B-III.

8.8.4 Table 8.8.1 presents the existing pavement sections based on the cores drilled on the roadway.

TABLE 8.8.1
EXISTING PAVEMENT SECTIONS

Street*	Core No.	Asphalt Concrete Thickness (inches)*	Aggregate Base Thickness (inches)*
Lake Canyon Road	C-1	2.0	9.0
Lake Canyon Road	C-2	3.4	9.0

*See Figure 2 for locations.
**Average thickness measured.

8.8.5 Table 8.8.2 presents the required pavement sections based on current City of Santee standards using a TI of 5 and laboratory R-value test results.

TABLE 8.8.2
REQUIRED PAVEMENT SECTIONS

Roadway	Core No.	Traffic Index	R-Value	Asphalt Concrete Thickness (inches)	Aggregate Base Thickness (inches)
Lake Canyon Road	C-1	5.0	6	3.0	9.5
Lake Canyon Road	C-2	5.0	<5	3.0	10.0

8.8.6 Due to the extent of moderate to severe “alligator cracking” observed, the existing asphalt concrete should be removed and replaced with the required pavement sections presented in Table 8.8.2. The aggregate base and upper portions of the subgrade soils will also need to be removed and over-excavated to accommodate the required sections.

8.8.7 In-lieu of the removals discussed above and to utilize the existing approximately 9 inches of aggregate base section, an asphalt concrete section of 3.5 inches thick may be constructed. This alternate section also eliminates the need to excavate into the subgrade soils. Consideration may be given to using *Pavement Recycling System's* Cold In-Place Recycling (CIR) technique which is a treatment train approach that rehabilitates a dilapidated roadway by recycling the old asphalt concrete materials into a new pavement section. The underlying subgrade and aggregate base would need to be firm and unyielding if the CIR approach was considered.

8.8.8 Prior to placing new asphalt concrete, the exposed aggregate base should be evaluated. As a minimum, the aggregate base should be proof-rolled to identify potential pumping/yielding zones. Stabilization measures, if needed, for the aggregate base and/or subgrade soils are provided herein after.

8.8.9 Subsequent to removal of existing asphalt concrete and establishing base grade, the exposed base materials should be proof-rolled. Provided that the existing base is firm and unyielding and prior to placement of new asphalt concrete, the materials should be compacted to a minimum of 95 percent relative compaction in accordance with ASTM D 1557-12.

8.8.10 For existing zones of base that are found to be pumping and/or yielding, the underlying subgrade soils should be exposed and evaluated (i.e. proof-rolled). Overly wet or pumping materials, if encountered, will require removal/replacement or drying/mixing with drier soils to facilitate proper compaction. The depth of removal should be determined in the field by the geotechnical engineer. If wet pumping soils are exposed at the base of the over-excavation, the exposed soils should be stabilized with a geofabric layer, such as Mirafi HP370, or equivalent, prior to placing materials to re-establish subgrade elevations. Aggregate base may also be needed for additional subgrade stabilization.

8.8.11 Prior to placing aggregate base, the subgrade soils should be compacted to a minimum of 95 percent relative compaction in accordance with ASTM D 1557-12. The depth of compaction should be at least 12 inches. The base material and asphalt concrete pavement should be compacted to at least 95 percent relative compaction per ASTM D 1557-12 and D 2726-13, respectively.

8.8.12 Asphalt concrete should conform to Section 200-2 of the *Standard Specifications for Public Works Construction* (2015 Greenbook). Class 2 aggregate base materials should conform to Section 26-1.02B of the *Standard Specifications of the State of California, Department of Transportation* (2015 Caltrans) or approved equivalent. Additionally, all materials should conform to City of Santee specifications.

8.9 Retaining Walls and Lateral Loads Recommendations

8.9.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid with a density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an Expansion Index $\leq$50. Geocon Incorporated should be consulted for additional recommendations if backfill materials have an EI >50.

8.9.2 Retaining walls shall be designed to ensure stability against overturning sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

8.9.3 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf (where H equals the height of the retaining wall portion of the wall in feet) should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 12H where the wall is greater than 8 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to two feet of fill soil should be added (total unit weight of soil should be taken as 130 pcf).

8.9.4 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

8.9.5 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

8.9.6 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The

use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI $\leq$50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is presented on Figure 8. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

8.9.7 In general, wall foundations having a minimum depth and width of one foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within three feet below the base of the wall has an Expansion Index $\leq$ 90. The recommended allowable soil bearing pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf.

8.9.8 The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is anticipated. As a minimum, wall footings should be deepened such that the bottom outside edge of the footing is at least seven feet from the face of slope when located adjacent and/or at the top of descending slopes.

8.9.9 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2016 CBC or Section 11.6 of ASCE 7-10. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 20H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.387g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

8.9.10 For resistance to lateral loads, a passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed formational materials. The passive pressure assumes a horizontal surface extending away from the base of the wall at least five feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance.

8.9.11 An ultimate friction coefficient of 0.35 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the passive earth pressure when determining resistance to lateral loads.

8.9.12 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 12 feet. In the event that walls higher than 12 feet are planned, Geocon Incorporated should be consulted for additional recommendations.

8.10 Slope Maintenance

8.10.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions which are both difficult to prevent and predict, be susceptible to near surface slope instability. The instability is typically limited to the outer three feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is, therefore, recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. It should be noted that although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

8.11 Site Drainage

8.11.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to improvements. The site should be graded and maintained such that surface drainage is directed away from improvements in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Drainage should be directed into conduits that carry runoff away from the proposed improvements.

8.11.2 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

8.12 Grading Plan Review

8.12.1 Geocon Incorporated should review the grading plans for the project prior to final design submittal to determine if additional analysis and/or recommendations are required.

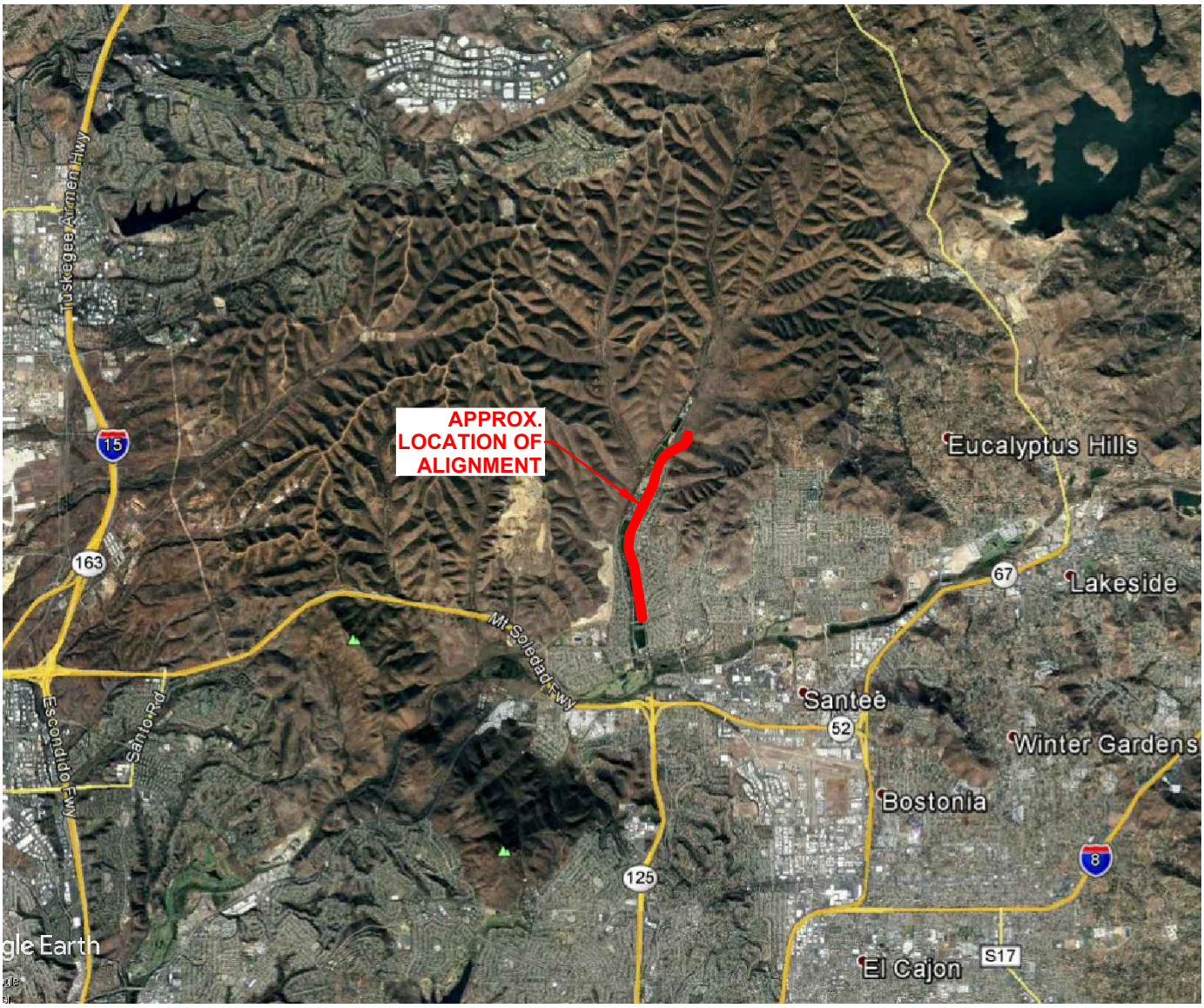
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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N

NO SCALE

VICINITY MAP

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FANITA RANCH
FANITA PARKWAY WIDENING AND EXTENSION
STATION 9+35 TO 111+50
SANTEE, CALIFORNIA

DATE 04 - 17 - 2020	PROJECT NO. 05254 - 32 - 18A	FIG. 1

Plotted:04/14/2020 2:19PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\05254-32-18A Fanita Ranch-Fanita Parkway Widening\DETAILS\05254-32-18A VicinityMap.dwg

T-6
<5
T-5
60
T-4
<5
T-3
6
T-2
<5
T-1
<5

0’ 200’ 400’

SCALE 1”= 200’ (On 11x17)

GEOCON LEGEND

T-23 .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED IN MAY 2007

T-207 .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED IN NOVEMBER 1996

C-2 .....APPROX. LOCATION OF ASPHALT CONCRETE CORE

61 .....LABORATORY R-VALUE TEST RESULT

TRENCH LOCATION MAP

FANITA RANCH
FANITA PARKWAY WIDENING AND EXTENSION
STATION 9+35 TO 111+50
SANTEE, CALIFORNIA

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SCALE	1" = 200'
DATE	04 - 17 - 2020
PROJECT NO.	05254 - 32 - 18A
FIGURE	2
SHEET	1 OF 4

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T-10 <5
T-9 5
C-2
T-6 <5
C-1
T-8 <5
T-7 5
T-11 <5
T-12 <5
T-13 61
T-14 7
T-15 <5

0' 200' 400'
SCALE 1"= 200' (On 11x17)

GEOCON LEGEND

T-23 .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED IN MAY 2007

T-207 .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED IN NOVEMBER 1996

C-2 .....APPROX. LOCATION OF ASPHALT CONCRETE CORE

61 .....LABORATORY R-VALUE TEST RESULT

TRENCH LOCATION MAP

FANITA RANCH
FANITA PARKWAY WIDENING AND EXTENSION
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SANTEE, CALIFORNIA

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SCALE	1" = 200'
DATE	04 - 17 - 2020
PROJECT NO.	05254 - 32 - 18A
FIGURE	3
SHEET	2 OF 4

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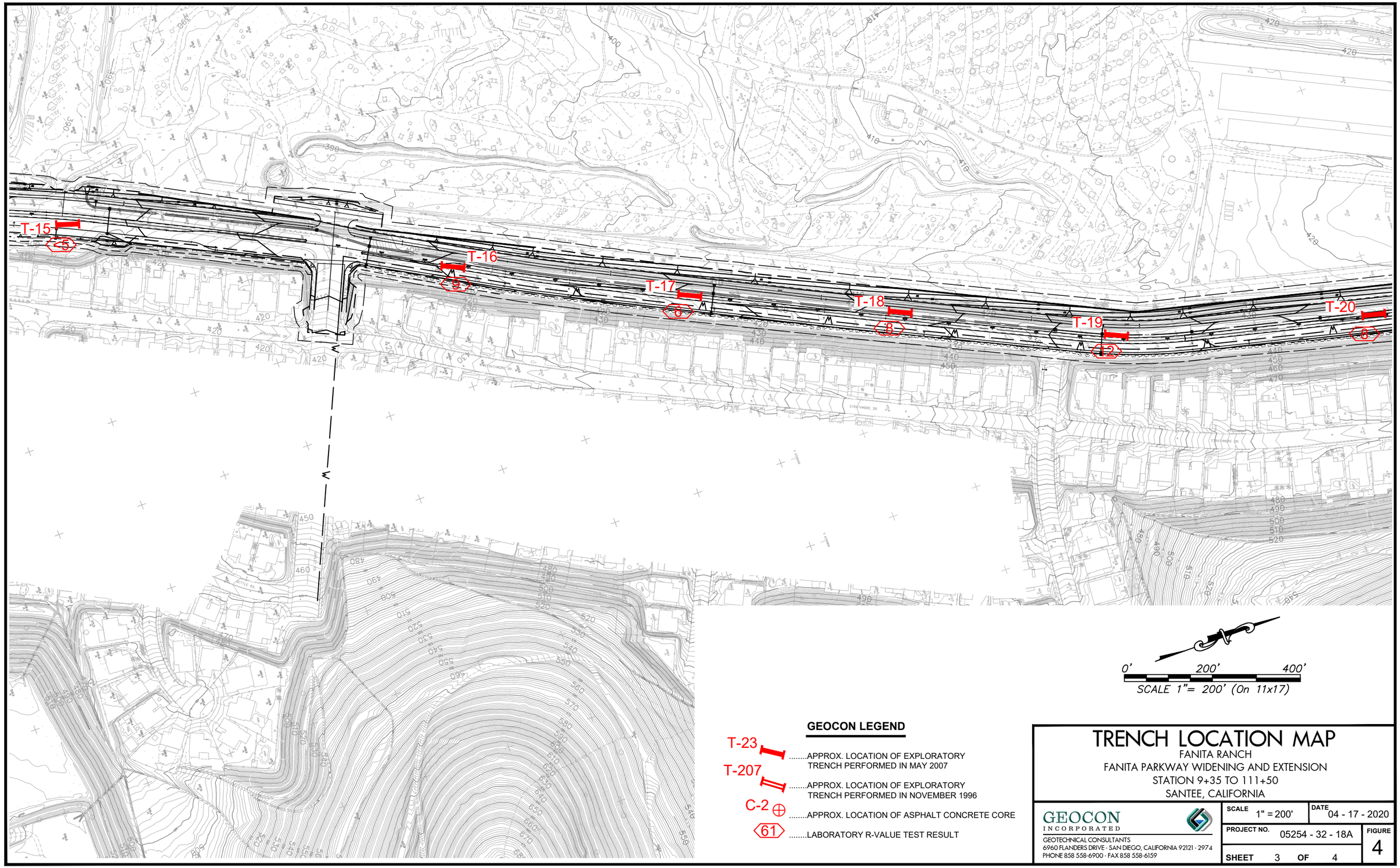

GEOCON LEGEND

T-23 .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED IN MAY 2007

T-207 .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED IN NOVEMBER 1996

C-2 ⊕ .....APPROX. LOCATION OF ASPHALT CONCRETE CORE

61 .....LABORATORY R-VALUE TEST RESULT

TRENCH LOCATION MAP

FANITA RANCH
FANITA PARKWAY WIDENING AND EXTENSION
STATION 9+35 TO 111+50
SANTEE, CALIFORNIA

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SCALE	1" = 200'
DATE	04 - 17 - 2020
PROJECT NO.	05254 - 32 - 18A
FIGURE	4
SHEET	3 OF 4

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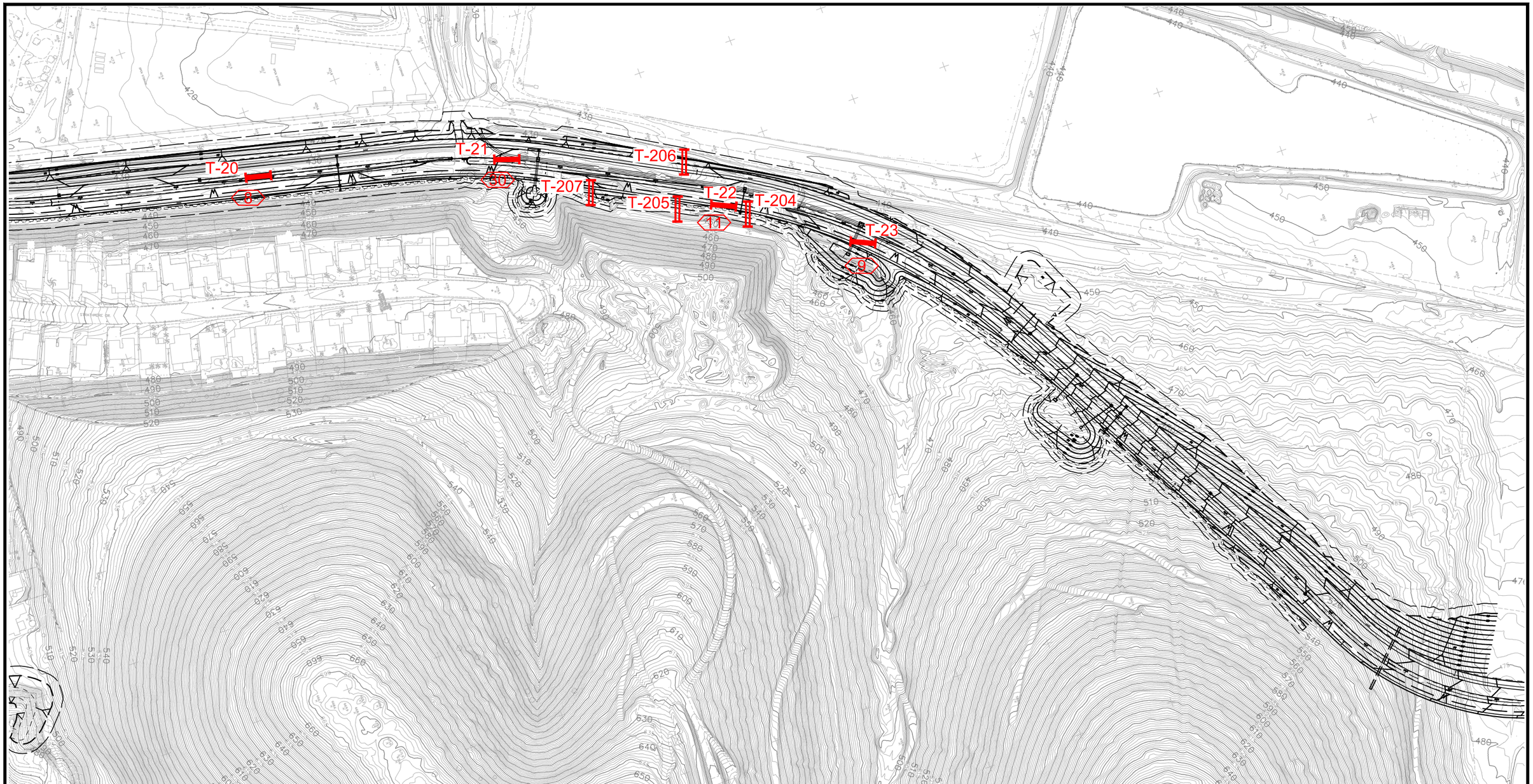

0’ 200’ 400’

SCALE 1”= 200’ (On 11x17)

GEOCON LEGEND

T-23 .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED IN MAY 2007

T-207 .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED IN NOVEMBER 1996

C-2 ⊕ .....APPROX. LOCATION OF ASPHALT CONCRETE CORE

61 .....LABORATORY R-VALUE TEST RESULT

TRENCH LOCATION MAP

FANITA RANCH
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STATION 9+35 TO 111+50
SANTEE, CALIFORNIA

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SCALE	1" = 200'	DATE	04 - 17 - 2020
PROJECT NO.	05254 - 32 - 18A	FIGURE	5
SHEET	4 OF 4		

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ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= 10	feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)		
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 130	pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 30	degrees
APPARENT COHESION	C	= 400	pounds per square foot
NO SEEPAGE FORCES			

ANALYSIS :

$$\gamma_{c\phi} = \frac{\gamma_t H \tan\phi}{C}$$ EQUATION (3-3), REFERENCE 1

$$FS = \frac{NcfC}{\gamma_t H}$$ EQUATION (3-2), REFERENCE 1

$\gamma_{c\phi}$ = 1.90 CALCULATED USING EQ. (3-3)

Ncf = 12.5 DETERMINED USING FIGURE 10, REFERENCE 2

FS = 3.8 FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1.....Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2.....Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - FILL SLOPES

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DATE 04 - 17 - 2020	PROJECT NO. 05254 - 32 - 18A	FIG. 6

Plotted:04/14/2020 2:31PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\05254-32-18A Fanita Ranch-Fanita Parkway Widening\DETAILS\Slope Stability Analyses-Fill (SSAF).dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)	
SLOPE ANGLE	i	= 26.7 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 30 degrees
APPARENT COHESION	C	= 400 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ \cos^2 i\ \tan \phi}{\gamma_t\ Z\ \sin i\ \cos i} = 3.2$$

REFERENCES :

1.....Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2.....Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS

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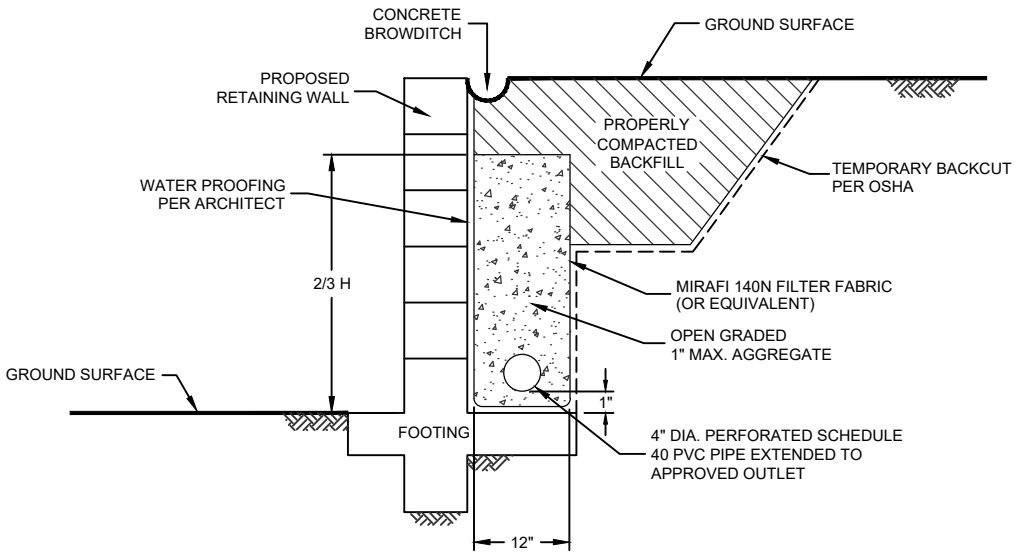
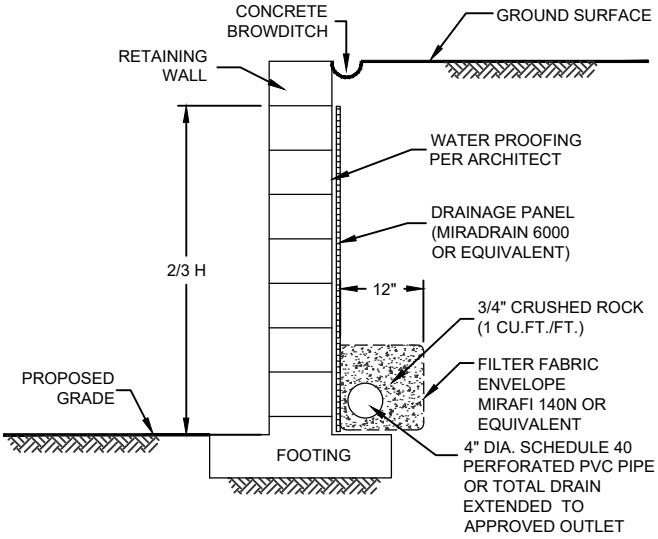
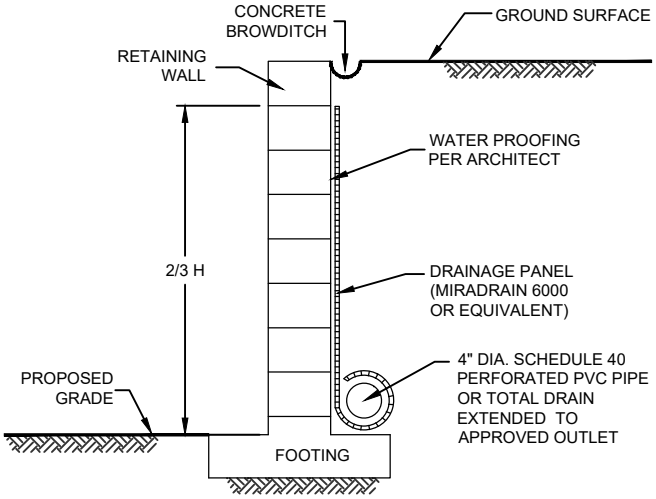
DE / RA		DSK/GTYPD	DATE 04 - 17 - 2020	PROJECT NO. 05254 - 32 - 18A	FIG. 7

Plotted:04/14/2020 2:31PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\05254-32-18A Fanita Ranch-Fanita Parkway Widening\DETAILS\Slope Stability Analyses-Surficial (SFSSA).dwg







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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DATE 04 - 17 - 2020	PROJECT NO. 05254 - 32 - 18A	FIG. 8

Plotted:04/14/2020 2:31PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\05254-32-18A Fanita Ranch-Fanita Parkway Widening\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The original field investigation for Fanita Parkway was performed on May 7 and 8, 2007, and consisted of a site reconnaissance and the excavation of 23 exploratory trenches. The approximate locations of the trenches are shown on the *Trench Location Map*, Figures 2 through 5.

The backhoe trenches were advanced to a maximum depth of 12 feet using a John Deere rubber-tire backhoe equipped with a 24-inch-wide bucket. The soils encountered in the excavations were visually classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual Manual Procedure D 2488). In addition, bulk samples were obtained from selected depths in the trenches for laboratory testing. Logs of the backhoe trenches depicting the soil and geologic conditions encountered are presented on Figures A-1 through A-23.

The field investigation for Lake Canyon Road was performed on June 7, 2007, and consisted of coring the asphalt concrete pavement at two locations. Hand augers were used to excavate through the core hole and into the subgrade soil. Ten-inch diameter cores were drilled to aid in obtaining a sufficient amount of subgrade soils for laboratory testing. The approximate locations of the cores are shown on Figure 3.

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 1 ELEV. (MSL.) 354' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL** Medium dense, damp, light brown, Silty, fine to medium SAND, with some clay and gravel			
2	T1-1			SM/SC	Medium dense, damp to moist, dark reddish brown, Silty/Clayey, fine to coarse SAND, with 10 to 20% gravel and cobble up to 8 inches			
4								
					TRENCH TERMINATED AT 5 FEET No groundwater encountered			

Figure A-1,
Log of Trench T 1, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 2 ELEV. (MSL.) 357' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
	T2-1			SM/SC	**UNDOCUMENTED FILL** Medium dense, damp to moist, dark brown, Silty/Clayey, fine to coarse SAND, with approximately 10 to 20% gravel and cobble up to 12 inches			
2								
4								
					GRANITIC ROCK Completely weathered, mottled reddish brown and white, weak GRANITIC ROCK -Becomes moderately weak below 6 feet			
6								
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered			

Figure A-2,
Log of Trench T 2, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 3 ELEV. (MSL.) 364' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL** Medium dense, damp to moist, dark brown, Silty, fine to medium SAND, with approximately 10% gravel and cobble up to 6 inches			
2								
4				SM/SC	Medium dense to dense, damp to moist, very pale green, Silty/Clayey SAND; random gravel and discontinuous dark brown to gray stiff clay lenses; several roots present throughout			
	T3-1							
6								
8								
10					-12-inch-thick discontinuous dark brown clay lens present above contact			
					GRANITIC ROCK Highly weathered, gray, moderately weak GRANITIC ROCK			
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered			

Figure A-3,
Log of Trench T 3, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 4 ELEV. (MSL.) 353' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T4-1			SM/SC	**UNDOCUMENTED FILL** Medium dense, damp to moist, dark brown to pale green, Silty/Clayey SAND, with approximately 10 to 15% gravel and cobble up to 12 inches; trace asphalt present between 1 and 3 feet			
2								
4								
6								
				SM/SC	**ALLUVIUM** Loose, wet, very dark brown, Silty/Clayey, fine to coarse SAND, with approximately 20 to 30% gravel and cobble up to 12 inches			
8								
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered			

Figure A-4,
Log of Trench T 4, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 5 ELEV. (MSL.) 355' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM** Loose, dry to damp, dark brown, Silty, fine to medium SAND, with approximately 20% gravel and cobble up to 6 inches			
2	T5-1							
				SP	Loose, damp, light brown to dark brown, fine to medium SAND, with approximately 10 to 20% gravel and cobble up to 6 inches			
4								
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered			

Figure A-5,
Log of Trench T 5, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 6 ELEV. (MSL.) 365' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
	T6-1			SC	**TOPSOIL** Medium dense, damp to moist, dark brown, Clayey, fine to coarse SAND, with approximately 10 to 20% gravel and cobble up to 6 inches			
2					-Becomes reddish brown below 2 feet			
				CL	**FRIARS FORMATION** Hard, moist, green, Silty CLAYSTONE; with several high angle caliche veins; fractured and weak from 2.5 to 4 feet			
4					-Becomes mottled green and marroon below 4 feet			
6					TRENCH TERMINATED AT 7 FEET No groundwater encountered			

Figure A-6,
Log of Trench T 6, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 7 ELEV. (MSL.) 386' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC/SM	**TOPSOIL** Medium dense, damp, dark brown, Clayey/Silty, fine to coarse SAND, with approximately 10 to 20% gravel and cobble up to 8 inches			
2	T7-1							
4				SC/SM	**TERRACE DEPOSITS** Dense, damp, reddish brown, Clayey/Silty, fine to coarse SANDSTONE, with approximately 20 to 30% gravel and cobble up to 8 inches			
6				CL	**FRIARS FORMATION** Stiff, moist, pale green, Silty CLAYSTONE, weak and fissured -Becomes very stiff to hard and mottled pale green and marroon below 7 feet with moist clay seams along parting surfaces; poorly remolded clay gouge present on high angle parting surfaces			
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered			

Figure A-7,
Log of Trench T 7, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

TRENCH T 8

ELEV. (MSL.) **387'** DATE COMPLETED **05-07-2007**

EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T8-1			SC	**TOPSOIL** Medium dense, damp, dark brown, Clayey, fine to coarse SAND, with approximately 10 to 20% gravel and cobble up to 8 inches			
2				SM/SC	**TERRACE DEPOSITS** Dense, damp to moist, mottled orange brown and gray, Silty/Clayey, fine to coarse SANDSTONE, with approximately 30% gravel and cobble up to 8 inches			
4				CL	**FRIARS FORMATION** Very stiff to hard, moist, pale green, Silty CLAYSTONE, weak, waxy and fissured			
6					TRENCH TERMINATED AT 7 FEET No groundwater encountered			

Figure A-8,
Log of Trench T 8, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 9** ELEV. (MSL.) **365'** DATE COMPLETED **05-07-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T9-1			CL/SC	**UNDOCUMENTED FILL** Stiff to medium dense, damp to moist, dark brown, Sandy CLAY/Clayey SAND, with approximately 10 to 20% gravel and cobble up to 12 inches			
2								
4				CL	**ALLUVIUM** Medium dense, moist, very dark brown, Sandy CLAY, with approximately 10 to 20 % gravel and cobble up to 16 inches -Becomes moist to wet below 6 feet			
6					TRENCH TERMINATED AT 6.5 FEET No groundwater encountered			

Figure A-9,
Log of Trench T 9, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 10** ELEV. (MSL.) **376'** DATE COMPLETED **05-07-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**UNDOCUMENTED FILL** Loose, dry, dark brown, Clayey, fine to medium SAND, with approximately 10 to 15% gravel and cobble up to 8 inches			
2	T10-1			CL	**TOPSOIL** Medium dense, moist, dark brown, Sandy CLAY, with approximately 10 to 20% gravel and cobble up to 12 inches			
4				SM	**TERRACE DEPOSITS/FRIARS FORMATION** Very dense, damp, mottled reddish brown and gray, Silty, fine to coarse SANDSTONE, with approximately 20 to 30% gravel and cobble up to 8 inches			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered			

Figure A-10,
Log of Trench T 10, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 11** ELEV. (MSL.) **379'** DATE COMPLETED **05-07-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				CL	**TOPSOIL** Medium dense, damp to moist, dark brown, Sandy CLAY, with approximately 10% gravel and cobble up to 8 inches			
2	T11-1				-Transitional contact			
				SM	**TERRACE DEPOSITS/FRIARS FORMATION** Very dense, damp, mottled reddish brown to gray, Silty, fine to coarse SANDSTONE, with approximately 30 to 40% gravel and cobble up to 12 inches			
4								
					TRENCH TERMINATED AT 5 FEET No groundwater encountered			

Figure A-11,
Log of Trench T 11, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 12 ELEV. (MSL.) 383' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC/SM	**UNDOCUMENTED FILL** Medium dense, moist, dark brown, Clayey/Silty, fine to medium SAND, with approximately 10 to 15% gravel and cobble up to 8 inches; along with scattered amounts of concrete, asphalt, and bottles			
2	T12-1							
4								
6				SM	**TERRACE DEPOSITS/FRIARS FORMATION** Very dense, damp, mottled reddish brown and gray, Silty, fine to coarse SANDSTONE, with approximately 30 to 40% gravel and cobble up to 12 inches			
					TRENCH TERMINATED AT 6.5 FEET No groundwater encountered			

Figure A-12,
Log of Trench T 12, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 13 ELEV. (MSL.) **393'** DATE COMPLETED **05-07-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				GM	**ALLUVIUM** Loose to medium dense, damp, brown to reddish brown, Sandy GRAVEL, with approximately 50 to 60% gravel and cobble up to 8 inches			
2	T13-1							
4					-Minor caving below 5 feet			
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered			

Figure A-13,
Log of Trench T 13, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

TRENCH T 14

ELEV. (MSL.) **395'** DATE COMPLETED **05-07-2007**

EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**UNDOCUMENTED FILL** Loose, damp, brown, Clayey, fine to medium SAND			
				SM	Medium dense, damp, white, Silty, fine to medium SAND			
2	T14-1							
				CL	Stiff, moist, dark brown, Sandy CLAY, with approximately 10% gravel and cobble up to 6 inches -Becomes mottled dark brown and reddish brown below 4 feet			
4								
6								
					TRENCH TERMINATED AT 7 FEET No groundwater encountered			

Figure A-14,
Log of Trench T 14, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 15 ELEV. (MSL.) 398' DATE COMPLETED 05-07-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL** Loose, damp, light brown, Silty, fine to medium SAND -Becomes medium dense and white below 0.5 feet			
2	T15-1							
4				CL	Very stiff to stiff, moist, mottled reddish brown and brown, Silty/Sandy CLAY, with approximately 10% gravel and cobble -Asphalt chunk present at 6 feet			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered			

Figure A-15,
Log of Trench T 15, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 16 ELEV. (MSL.) 409' DATE COMPLETED 05-08-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL** Medium dense, damp, gray, Silty, fine to medium SAND, with approximately 10 to 15% gravel and cobble up to 10 inches			
2	T16-1							
4								
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered			

Figure A-16,
Log of Trench T 16, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 17 ELEV. (MSL.) **417'** DATE COMPLETED **05-08-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL** Medium dense, damp, gray, Silty, fine to medium SAND, with approximately 10 to 20% gravel and cobble up to 12 inches			
2	T17-1							
4					-Random dark clay chunks present below 4 feet			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered			

Figure A-17,
Log of Trench T 17, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 18 ELEV. (MSL.) **425'** DATE COMPLETED **05-08-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL** Medium dense, damp, gray, Silty, fine to medium SAND, with approximately 20 to 30% gravel and cobble up to 24 inches			
2	T18-1				-Random dark brown silty clay lense present at 3 feet			
4					TRENCH TERMINATED AT 4 FEET No groundwater encountered			

Figure A-18,
Log of Trench T 18, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 19 ELEV. (MSL.) 433' DATE COMPLETED 05-08-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**FRIARS FORMATION** Dense, damp, gray, Silty, fine to medium SANDSTONE; slightly fractured with rootlets along fractures down to 2 feet			
2	T19-1				-Becomes very dense with random 12-inch concretions below 2 feet			
4					TRENCH TERMINATED AT 4 FEET No groundwater encountered			

Figure A-19,
Log of Trench T 19, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 20 ELEV. (MSL.) 433' DATE COMPLETED 05-08-2007 EQUIPMENT JD RUBBER TIRE BACKHOE BY: T. REIST	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T20-1			SM	**FRIARS FORMATION** Dense, damp, gray, Silty, fine to medium SANDSTONE; fractured and slightly weathered with rootlets along fractures in upper foot -Becomes very dense and light brown with some orange oxidation below 2 feet -12-inch-thick cobble lens present at 3.5 feet with cobble up to 8 inches			
2								
4					TRENCH TERMINATED AT 5 FEET No groundwater encountered			

Figure A-20,
Log of Trench T 20, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 21 ELEV. (MSL.) **434'** DATE COMPLETED **05-08-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SP	**ALLUVIUM** Medium dense to dense, damp, dark brown, Gravelly, fine to medium SAND, with approximately 30 to 40% gravel and cobble up to 12 inches; very difficult trenching due to cobble			
2	T21-1							
4								
6				GM	**FRIARS FORMATION/TERRACE DEPOSITS** Dense, damp, light brown, Sandy CONGLOMERATE, with gravel and cobble up to 12 inches			
					TRENCH TERMINATED AT 7.5 FEET No groundwater encountered			

Figure A-21,
Log of Trench T 21, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... DISTURBED OR BAG SAMPLE
... STANDARD PENETRATION TEST
... CHUNK SAMPLE
... DRIVE SAMPLE (UNDISTURBED)
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 22** ELEV. (MSL.) **443'** DATE COMPLETED **05-08-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T22-1			GM	**FRIARS FORMATION/TERRACE DEPOSITS** Dense, damp, mottled reddish brown and gray, Sandy CONGLOMERATE, with approximately 50 to 70% gravel and cobble up to 14 inches and some clay			
2								
4					TRENCH TERMINATED AT 5.5 FEET No groundwater encountered			

Figure A-22,
Log of Trench T 22, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 05254-32-18A

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 23 ELEV. (MSL.) **445'** DATE COMPLETED **05-08-2007** EQUIPMENT **JD RUBBER TIRE BACKHOE** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Medium dense, damp, dark brown, Clayey, fine to medium SAND, with approximately 10 to 15% gravel and cobble up to 20 inches			
2	T23-1			SM	**TERRACE DEPOSITS/FRIARS FORMATION** Dense, damp, mottled, reddish brown and white, Silty SANDSTONE, with random green claystone rip-up clasts and gravel up to 3 inches			
4								
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered			

Figure A-23,
Log of Trench T 23, Page 1 of 1

05254-32-18A.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

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GEOCON

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples obtained during the field exploratory excavations for this study were tested for their maximum dry density and optimum moisture content and Resistance value (R-value). The shear strength value presented herein was obtained from a previous geotechnical study for the Fanita Ranch Specific Plan area (see Reference No. 11). The results of the laboratory tests are summarized on Tables B-I through B-III.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-12

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T3-1	Pale green, Silty/Clayey, fine SAND with trace gravel	109.4	17.9
B37-1*	Light green-gray, Clayey SAND	116.1	15.4
T15-1	Pale gray, Silty, fine to medium SAND	119.0	13.1

*Obtained from geotechnical report dated April 28, 2005 (Reference No. 10).

TABLE B-II
SUMMARY OF DIRECT SHEAR TEST RESULTS
ASTM D 3080-11

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B37-1*	104.8	15.2	400	30

*Sample remolded to 90 percent of the maximum dry density at near optimum moisture content.

TABLE B-III
SUMMARY OF LABORATORY RESISTANCE VALUE TEST RESULTS
CALIFORNIA TEST METHOD 301

Sample No.	Location	R-Value
T1-1	Fanita Parkway Station 14+75	<5
T2-1	Fanita Parkway Station 18+60	<5
T3-1	Fanita Parkway Station 23+40	6
T4-1	Fanita Parkway Station 28+60	<5
T5-1	Fanita Parkway Station 33+35	60
T6-1	Fanita Parkway Station 37+20	<5
T9-1	Fanita Parkway Station 41+60	5
T10-1	Fanita Parkway Station 46+65	<5
T11-1	Fanita Parkway Station 51+90	<5
T12-1	Fanita Parkway Station 56+80	<5
T13-1	Fanita Parkway Station 61+50	61
A1-1	Fanita Parkway Station 66+55	7
T15-1	Fanita Parkway Station 69+00	<5
T16-1	Fanita Parkway Station 77+80	9
T17-1	Fanita Parkway Station 83+25	6
T18-1	Fanita Parkway Station 87+90	8
T19-1	Fanita Parkway Station 93+00	12
T20-1	Fanita Parkway Station 99+00	8
T21-1	Fanita Parkway Station 104+05	30
T22-1	Fanita Parkway Station 108+60	11
T23-1	Fanita Parkway Station 111+60	9
C-1	Lake Canyon Drive	6
C-2	Lake Canyon Drive	<5

*Referenced Stations were determined using the north bound lane stationing for Fanita Parkway.

APPENDIX C

APPENDIX C

LOGS OF PREVIOUS EXPLORATORY TRENCHES

FOR

FANITA RANCH
FANITA PARKWAY WIDENING AND EXTENSION
STATION 9+35 TO 111+50
SANTEE, CALIFORNIA

PROJECT NO. 05254-32-18A

PROJECT NO. 05254-52-02

TRENCH T204

ELEV. (MSL.) 446 DATE COMPLETED 11/20/96

EQUIPMENT JD 310 EXTEND-A-HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**FILL** Loose, damp, light brown, Silty, fine to medium SAND			
2				GC/GM	**TERRACE DEPOSIT** Very dense, damp to moist, orange-brown, Clayey, fine to very coarse Sandy GRAVEL/COBBLE CONGLOMERATE; little to no cementation, 50% to 60% gravel/cobble up to 8-inches in length			
4					TRENCH TERMINATED AT 4 FEET			

Figure A-221, Log of Trench T204

FRNC1

SAMPLE SYMBOLS: ☐ ... SAMPLING UNSUCCESSFUL; ◧ ... STANDARD PENETRATION TEST; ■ ... DRIVE SAMPLE (UNDISTURBED); ▨ ... DISTURBED OR BAG SAMPLE; ◪ ... CHUNK SAMPLE; ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 05254-52-02

TRENCH T205

ELEV. (MSL.) 447 DATE COMPLETED 11/20/96

EQUIPMENT JD 310 EXTEND-A-HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SC/GC	**TOPSOIL** Loose, damp, brown, Clayey, fine to medium SAND with gravel/cobble -Stiff, very moist, Silty CLAY horizon from 1.5 to 2.5 feet			
2				SM	**FRIARS FORMATION** Dense, damp, light gray, Silty, fine SANDSTONE			
4					TRENCH TERMINATED AT 5 FEET			

Figure A-222, Log of Trench T205

FRNC1

SAMPLE SYMBOLS: ☐ ... SAMPLING UNSUCCESSFUL; ◧ ... STANDARD PENETRATION TEST; ■ ... DRIVE SAMPLE (UNDISTURBED); ▨ ... DISTURBED OR BAG SAMPLE; ◥ ... CHUNK SAMPLE; ▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 05254-52-02

TRENCH T206

ELEV. (MSL.) 437 DATE COMPLETED 11/20/96

EQUIPMENT JD 310 EXTEND-A-HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GC	**ALLUVIUM** Loose, damp, brown, Clayey, fine to very coarse SAND with abundant gravel/cobble			
2								
4				CL/GC	Stiff, very moist, olive green, Silty CLAY mixed with orange-brown, fine to very coarse Sandy CLAY with cobble -Cemented cobbly lense from 2.5 to 3.5 feet			
6				GC	**TERRACE DEPOSIT** Dense, moist, orange-brown, Clayey, fine to very coarse Sandy GRAVEL/COBBLE CONGLOMERATE; cobbles up to 10-inches in length			
8				SM	**FRIARS FORMATION** Dense, damp, pale olive green, Silty, fine SANDSTONE			
					TRENCH TERMINATED AT 9 FEET			

Figure A-223, Log of Trench T206

FRNC1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ⧩ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 05254-52-02

TRENCH T207

ELEV. (MSL.) 445 DATE COMPLETED 11/20/96

EQUIPMENT JD 310 EXTEND-A-HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CL	**TOPSOIL** Stiff, moist to very moist, dark brown, fine to medium Sandy CLAY			
2								
				SM	**FRIARS FORMATION** Dense, damp, pale olive green, Silty, fine SANDSTONE			
4								
					TRENCH TERMINATED AT 5 FEET			

Figure A-224, Log of Trench T207

FRNC1

SAMPLE SYMBOLS: ☐ ... SAMPLING UNSUCCESSFUL; ◧ ... STANDARD PENETRATION TEST; ■ ... DRIVE SAMPLE (UNDISTURBED); ⊠ ... DISTURBED OR BAG SAMPLE; ◪ ... CHUNK SAMPLE; ▼ ... WATER TABLE OR SEEPAGE

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APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

FANITA RANCH
FANITA PARKWAY WIDENING AND EXTENSION
STATION 9+35 TO 111+50
SANTEE, CALIFORNIA

PROJECT NO. 05254-32-18A

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4. CLEARING AND PREPARING AREAS TO BE FILLED

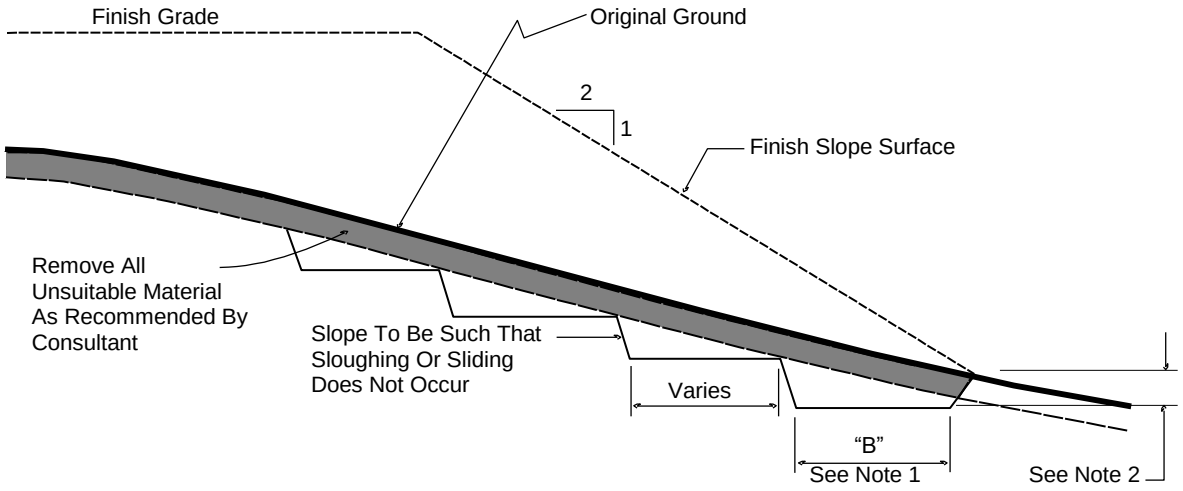
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection

variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

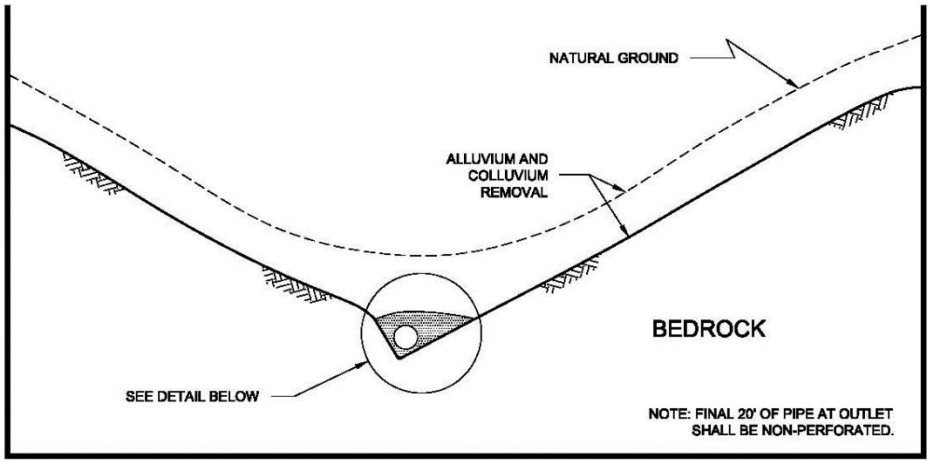
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

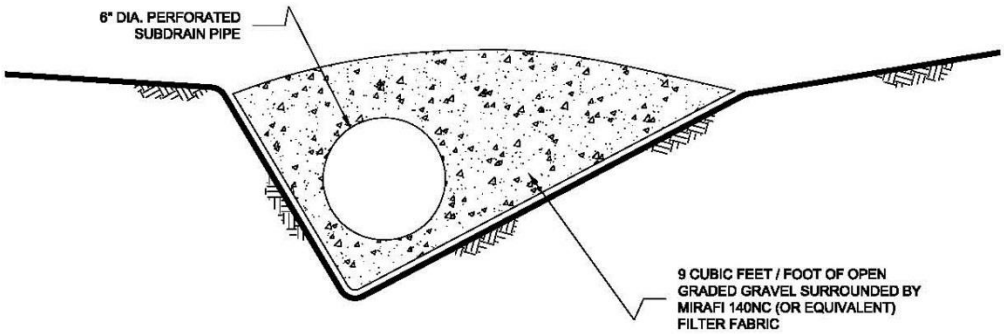
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

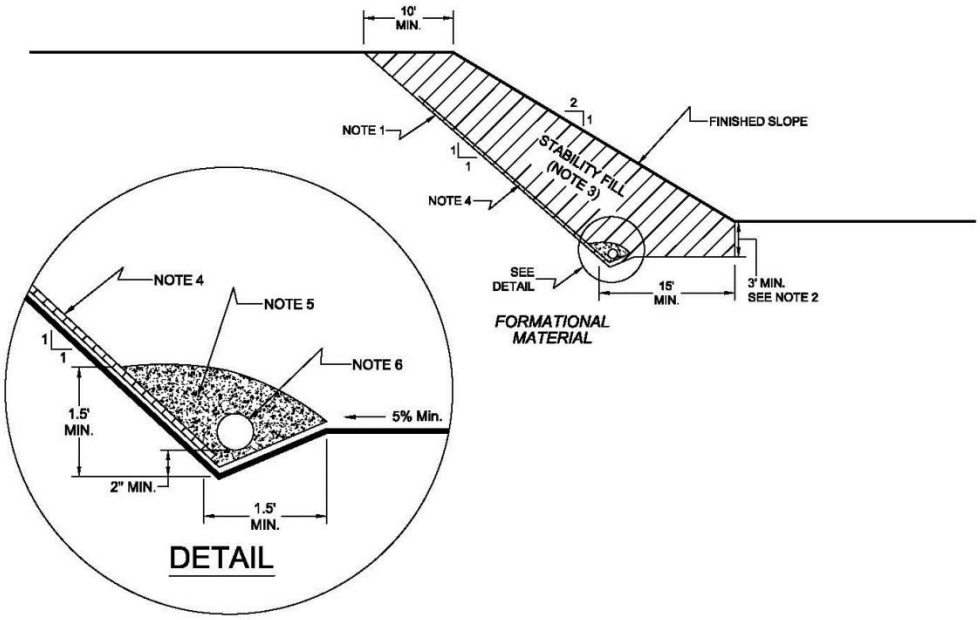
1.....6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

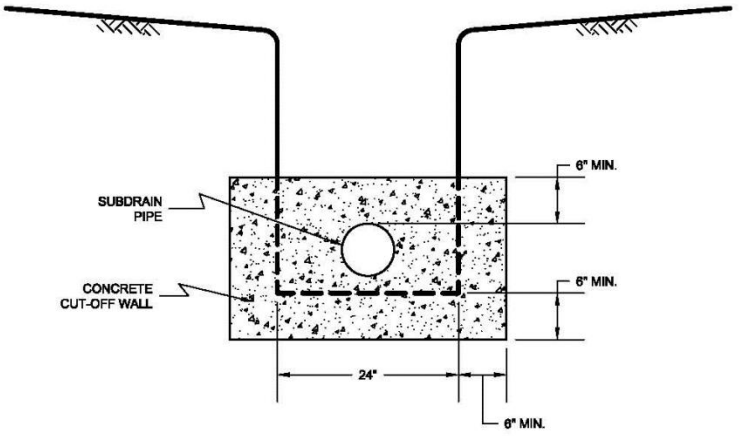
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

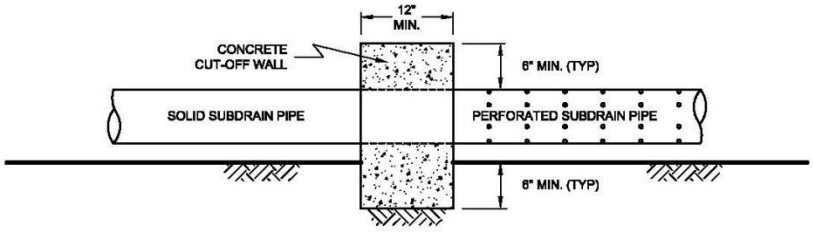
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

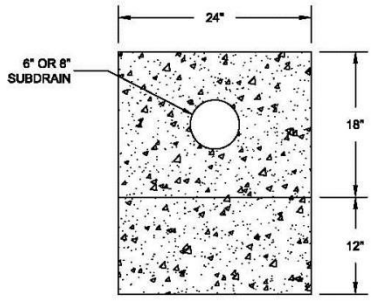


NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

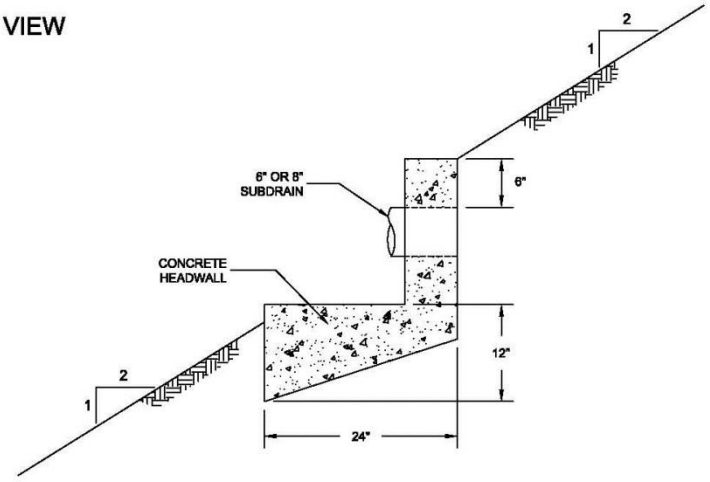
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. California Division of Mines and Geology, *Landslide Hazards in The El Cajon Quadrangle, San Diego County, California,* Open File Report 92-11 (1992).

2. California Division of Mines and Geology, *Landslide Hazards in The San Vicente Reservoir Quadrangle, San Diego County, California,* Open File Report 92-04 (1992).

3. California Division of Mines and Geology, *Landslide Hazards in The Southern Part of The San Diego Metropolitan Area, San Diego County, California,* Open File Report 95-03 (1995).

4. California Division of Mines and Geology, *Landslide Hazards in The Northern Part of The San Diego Metropolitan Area, San Diego County, California,* Open File Report 95-04 (1995).

5. California Geological Survey, *Fault Activity Map of California,* compiled by Charles W. Jennings and William A. Bryant, 2010. https://www.conservation.ca.gov/cgs/Pages/Program-RGMP/2010_faultmap.aspx

6. Geocon Incorporated, *Geotechnical Investigation, Fanita Ranch, Central Village (Area C)* (Project No. 05254-32-02), dated June 11, 1997.

7. Geocon Incorporated, *Geotechnical Investigation, Fanita Ranch, East Village (Area D)* (Project No. 05254-32-02), dated June 11, 1997.

8. Geocon Incorporated, *Soil and Geologic Reconnaissance, Fanita Ranch, Fanita Parkway Off-Site Improvements, Santee, California* (Project No. 05254-32-02), dated June 11, 1997.

9. Geocon Incorporated, *Geotechnical Investigation, Fanita Ranch, Off-site Improvement to Cuyamaca Street, Santee, California* (Project No. 05254-32-02), dated June 11, 1997.

10. Geocon Incorporated, *Update Geotechnical Investigation, Fanita Ranch, Sycamore Glen and Oak View, Santee, California* (Project No. 05254-32-11), dated April 25, 2005.

11. Geocon Incorporated, *Update Geotechnical Investigation, Fanita Ranch, Rock Point, Santee, California* (Project No. 05254-32-11), dated April 25, 2005.

12. Geocon Incorporated, *Update Geotechnical Investigation, Fanita Ranch, Sage Hill, Santee, California* (Project No. 05254-32-11), dated April 28, 2005.

13. Geocon Incorporated, *Supplemental Rippability Study, Rock Point/Sycamore Glen, Fanita Ranch, Santee, California* (Project No. 05254-32-12), dated September 29, 2005.

14. Geocon Incorporated, *Geotechnical Investigation, The Lake at Fanita, Santee, California* (Project No. 05254-32-13), dated March 29, 2007.

15. Geocon Incorporated, *Fanita Ranch, Fanita Parkway Widening and Extension, Station 9+35 to 111+50* (Project No. 05254-32-14), dated June 21, 2007.

16. Geocon Incorporated, *Supplemental Rippability Study for Oak View Street, Sycamore Glen, Fanita Ranch, Santee, California* (Project No. 05254-32-16), dated September 11, 2007.

LIST OF REFERENCES

17. Geocon Incorporated, *Transmittal of Preliminary Geotechnical Information, Rock Point, Fanita Ranch, Santee, California* (Project No. 05254-32-11A), dated August 28, 2014.

18. Law/Crandall, *Report of Geotechnical Consultation and Third Party Review, Oak Hills Landslide Repair and Geotechnical Evaluation, Santee Sports Park, Carlton Hills Boulevard, Santee, California*, dated August 30, 1991.

19. Leighton & Associates, *As-Graded Report of Rough Grading Operations of The Fill Areas at Council Heights Park, Santee, California*, dated December 12, 1984.

20. Leighton & Associates, *Revised Update Study for Geotechnical Land-Use Feasibility, Fanita Ranch - 2,500 Acres, Santee, California*, dated June 14, 1985, revised March 10, 1986.

21. Leighton & Associates, *Preliminary Geotechnical Studies, Fanita Ranch Phase 3, Santee, California*, dated January 19, 1987.

22. Leighton & Associates, *Preliminary Geotechnical Studies, Fanita Ranch Phase 4, Santee, California*, dated January 20, 1987.

23. Leighton & Associates, *Preliminary Geotechnical Studies, Fanita Ranch Phase 5, Santee, California*, dated January 21, 1987.

24. Leighton & Associates, *Geotechnical Studies, Fanita Ranch, Santee, California*, dated June 27, 1988.

25. Pacific Soils Engineering Inc., *Supplemental Geotechnical Evaluation and Grading Plan Review, Silver Country Estates, Units 2 and 3*, dated March 7, 1997.

26. Pacific Soils Engineering Inc., *Response to Third Party Review, Silver Country Estates, Units 2 and 7 (TM 92-02, 6-471)*, dated April 17, 1997.

27. Pacific Soils Engineering Inc., *Response to Third Party Review Comments (May 6, 1997), Silver Country Estates, Units 2 thru 7 (TM 93-02, G-471)*, dated May 13, 1997.

28. Southern California Soils and Testing Inc., *Revised Report of Geotechnical Investigation, Silver Country Estates, Cuyamaca Street and Cardoza Drive, Santee, California*, dated June 18, 1995.

29. U.S. Department of Agriculture, *1953 Stereoscopic Aerial Photographs, Flight AXN-9M*, Photo Nos. 151, 152 and 153 (scale 1:20,000).

30. U.S. Geological Survey, *San Vicente Reservoir Quadrangle, 7.5 Minute Series (Topographic)*, 1955, photorevised 1971.

31. U.S. Geological Survey, *El Cajon Quadrangle, 7.5 Minute Series (Topographic)*, 1967.

32. U.S. Geological Survey, *La Mesa Quadrangle, 7.5 Minute Series (Topographic)*, 1994.

33. U.S. Geological Survey, *Poway Quadrangle, 7.5 Minute Series (Topographic)*, 1967, photorevised 1975.

LIST OF REFERENCES

34. U.S. Geological Survey, 2004, *Preliminary Geologic Map of the El Cajon 30'x60' Quadrangle, Southern California*, USGS Open File Report 2004-1361, Scale 1:100,000, compiled by Victoria R. Todd.

35. U.S. Geological Survey computer program, *Seismic Hazard Curves and Uniform Hazard Response Spectra.* https://earthquake.usgs.gov/designmaps/us/application.php

36. *EZ-FRISK*, Site-specific Earthquake Hazard Analysis Software, Copyright 2016.

37. Boore, D. M., and G. M. Atkinson (2008), *Ground-Motion Prediction for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods Between 0.01 and 10.0 s*, Earthquake Spectra, Volume 24, Issue 1, pages 99-138, February 2008 (utilized by *EZ-FRISK* software).

38. Campbell, K. W., Y. Bozorgnia (2008), *NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10 s*, Earthquake Spectra, Volume 24, Issue 1, pages 139-171, February 2008 (utilized by *EZ-FRISK* software).

39. Chiou, Brian S. J., and Robert R. Youngs (2008), *A NGA Model for the Average Horizontal Component of Peak Ground Motion and Response Spectra*, preprint for article to be published in NGA Special Edition for Earthquake Spectra (utilized by *EZ-FRISK* software).