GEOTECHNICAL STUDY

SOUTHWEST VILLAGE
EMERGENCY VEHICLE ACCESS ROAD
SAN DIEGO, CALIFORNIA

PREPARED FOR

TRI POINTE HOMES
SAN DIEGO, CALIFORNIA

MARCH 27, 2024
PROJECT NO. 06847-42-04A

Project No. 06847-42-04A
March 27, 2024

Tri Pointe Homes
13520 Evening Creek Drive North, Suite 300
San Diego, California 92128

Attention: Mr. Allen Kashani

Subject: GEOTECHNICAL STUDY
SOUTHWEST VILLAGE EMERGENCY VEHICLE ACCESS ROAD
SAN DIEGO, CALIFORNIA

In accordance with your request, we have prepared this study to provide geotechnical recommendations for the construction of an emergency vehicle access road planned for the Southwest Village project. This study is based on geotechnical information obtained from previous investigations performed by Geocon in the site vicinity.

The accompanying report contains the results of our study with conclusions and recommendations pertaining to geotechnical aspects of the proposed project. The site is suitable for the construction of the emergency access road provided the recommendations in this report are incorporated into the design and construction of the project.

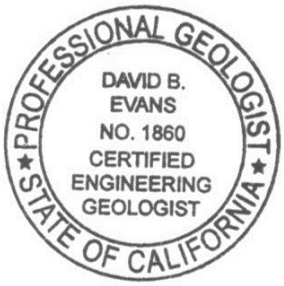
Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Rodney C. Mikesell
GE 2533

Dave B. Evans
CEG 1860



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(e-mail) Addressee

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GEOTECHNICAL STUDY

1. PURPOSE AND SCOPE

This report presents the findings of our geotechnical study for the emergency vehicle access (EVA) road planned for the Southwest Village project located in South Otay Mesa, San Diego, California (see Vicinity Map, Figure 1).

The purpose of this study was to evaluate the soil and geologic conditions along the alignment of the proposed EVA and provide recommendations for grading and structural pavement sections. A portion of the roadway lies within the San Ysidro landslide complex that borders the southwest, south, and southeast margins of Southwest Village property.

The scope of our investigation included reviewing readily available geologic literature, review of previous geotechnical reports prepared for the property and surrounding areas, performing engineering analyses, and preparing this report. The locations of previous borings and trenches near the EVA road alignment are shown on the Geologic Map (Figure 2). Logs of select borings and trenches are provided in Appendix A. Applicable laboratory testing is provided in Appendix B.

2. SITE AND PROJECT DESCRIPTION

The overall South Otay Mesa property consists of approximately 300 acres of undeveloped, formerly cultivated farmland located in the Otay Mesa area east of San Ysidro, south of U.S. Highway 905, and east of Interstate 805. The EVA road is located within the southern and eastern portions of the Southwest Village Tentative Map area. The property is surrounded by undeveloped properties or designated open-space.

The proposed roadway is planned across a portion of the San Ysidro Landslide complex which is one of the largest landslide features in San Diego County. Based on exploratory borings performed by Geocon Incorporated, the base of the landslide is approximately 100 to 300 feet-thick below existing grades in the area of the proposed roadway. The roadway also crosses the mesa top which is underlain by Terrace Deposits and the San Diego and Otay Formations.

Plans show the EVA road will be an approximately 1.7-mile-long roadway that follows established dirt roads. The roadway starts at Rail Court located southwest of the Southwest Village property. From Rail Court the road traverses eastward along the Border Fence road to Jeep Trail Road, where the road turns north and follows Jeep Trail Road up the hillside slope to the mesa top. The road then crosses the mesa top and terminates at the future Beyer Blvd. Ground surfaces elevation across the proposed EVA

roadway alignment vary from around 75 feet Mean Sea Level (MSL) near the connection with Rail Court to between about 490 MSL on the mesa top.

We understand the EVA road is required to satisfy a Southwest Village project condition to provide secondary emergency access during subdivision construction. Once the project is complete, the roadway will no longer be needed for the subdivision. However, we understand the fire department desires to keep the access roadway in service for emergency use. The roadway will also be utilized by Border Patrol agents. We understand access to the roadway will be restricted and will not serve as a circulation element for the subdivision.

Grading is planned for portions of the alignment to widen existing roads and reduce hillside gradients. Based on project plans, grading will occur between approximate roadway Stations 47+00 to 74+00. Roadway fill embankments that are 6 to 12 feet high are planned between Stations 47+00 to 54+00. Cuts up to approximately 15 feet will occur between Stations 55+00 to 58+50. This will result in cut slopes that range from 4 feet to 26 feet in height. Proposed cut and fill slopes will be 2:1 (horizontal to vertical) or flatter. The remainder of the roadway will be constructed near existing grades with only minor cuts and fills.

The majority of the roadway will be surfaced with disintegrated granite (DG). Steeper hillside portions will be surfaced with Portland cement concrete pavement (Stations 47+00 to 54+00 and 70+00 to 73+50). One area will be surfaced with asphalt concrete (Stations 63+00 to 66+00). The figure below shows the location of the planned roadway paving surfaces.

The locations, site descriptions, and proposed development are based on our site reconnaissance, review of published geologic literature, field investigations, project plans, and discussions with project personnel. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

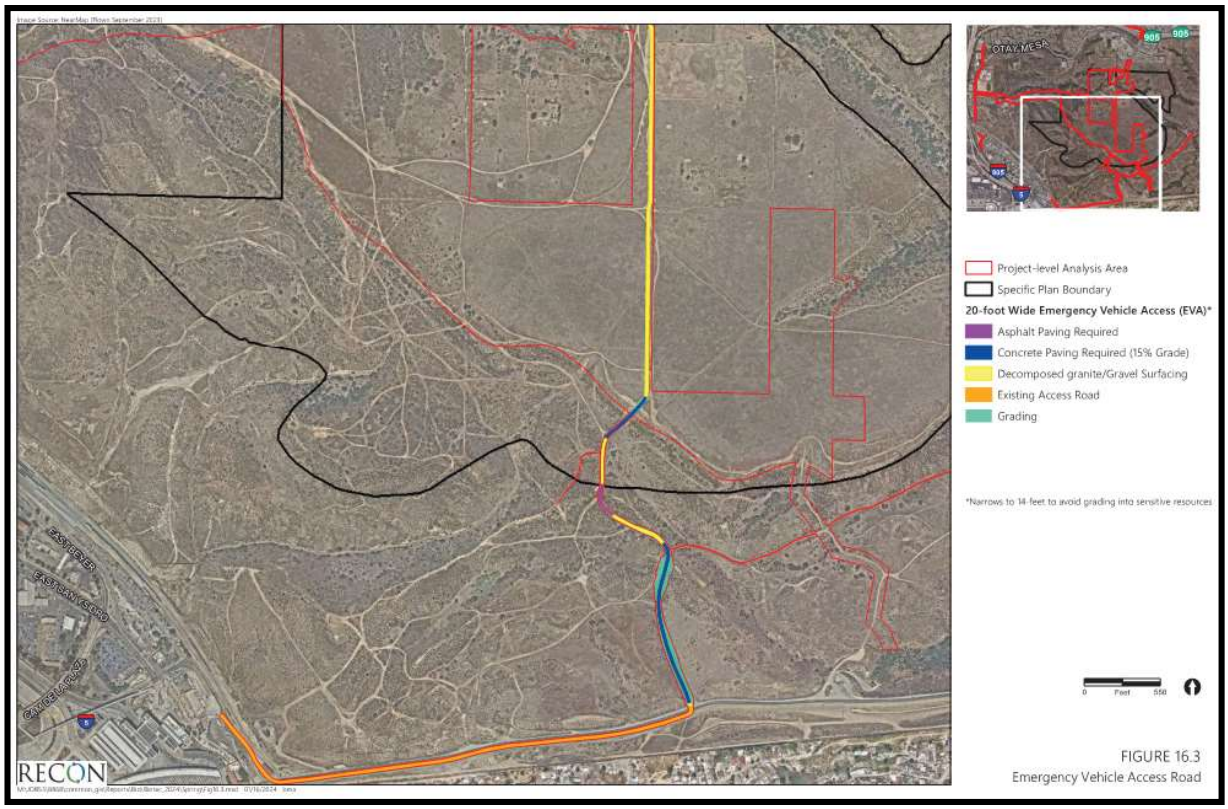


FIGURE 16.3
Emergency Vehicle Access Road

3. SOIL AND GEOLOGIC CONDITIONS

Soil and geologic conditions at the site were identified by a review of published and unpublished geologic literature for the general area, soil exposures noted during geologic mapping and observations within the subsurface explorations. Surficial soils and geologic units mapped or encountered during the previous field investigation in and near the roadway alignment include landslide debris, Pleistocene-age Terrace Deposits, and the Tertiary-age San Diego and Otay Formations. Each of these units is described below and their approximate limits are depicted on the Geologic Map (Figure 2) and geologic cross section Figure 3. The locations of applicable borings and trenches are shown on the geologic map. The base of the landslide shown on Figure 3 was estimated by comparing adjacent subsurface information and geomorphic interpretation. For conservatism, the toe of the slide elevation was modeled near the ground surface at the drainage on the south end of the cross section.

To prepare this report we have combined geologic maps, borings, and trenches from several geotechnical reports. Some of the nomenclature with respect to geologic units is different between the reports. To maintain consistency with the boring logs and trenches, we did not modify the nomenclature.

3.1 Landslide Debris (Qls)

A deep-seated landslide complex (Qls) has been identified along the western and southern mesa rim by Tan (1995), the City of San Diego Seismic Safety Element (2008, Sheets 2 and 3) and by this study (see Geologic Map, Figure No. 2). This landslide complex, also known as the *San Ysidro Landslide*, is located within the hillside area where the EVA roadway is planned. Large-diameter exploratory borings were performed along the mesa rim during previous field investigations to establish the position of the landslide headscarp (see Geocon 2002). More recent borings were performed east of the roadway alignment for the Southwest Village development (Geocon July 2021). Three continuous cores (identified on Figure 2 as B-22, B-23, and B-24) were excavated to establish the basial shear zone and obtain samples for laboratory testing. The information from these borings was utilized to generate the geologic cross section A-A' (Figure 3).

The landslide debris is expected to be suitable to support the roadway; however, remedial grading will be required at the toe of proposed fill slopes to remove compressible surficial soils. In addition, slope excavations exposing landslide debris may require a stability fill. The need for stability fills will be determined during grading.

3.2 Terrace Deposits (Qtc and Qtg)

Terrace deposits cap the entire mesa. These deposits are also known as Very Old Paralic Deposits (Qvop). To avoid confusion, we have left the mapped contacts as Qtc and Qtg for consistency between boring and trench logs from previous geotechnical studies and geologic maps.

The terrace deposits are divided on the geologic map into two members. The upper Terrace Deposit member consists of a highly expansive clay designated as Qtc. A very dense, granular cobble conglomerate member (Qtg) underlies the clay. Each member is described below.

Terrace Deposit Clay (Qtc) varied from 2 to 6 feet in thickness in trenches near the roadway alignment and consisted of stiff, moist, dark brown to olive clay. Expansion testing indicates the clay possesses high expansive characteristics.

Terrace Deposit Gravel (Qtg) was encountered below the clay and consists of dense to very dense interbedded reddish brown sandy coarse gravel and gravelly sands, with some silt and clay. Excavation of the Terrace Deposit Gravel required very heavy effort during drilling, and in some zones required the use of a rock core bucket to penetrate the deposit. Cobbles and boulders within the deposit generally increased in size with depth. In general, the upper 10 to 15 feet consisted of gravels less than 12 inches in dimension and contained zones with a relatively low percentage of cobble. Deeper materials contained a much higher percentage of cobble and larger boulders. Excavation of this deposit will require a very heavy effort with conventional heavy-duty earth moving equipment.

3.3 San Diego Formation (Tsd)

Dense, light yellowish brown to gray-brown silty, fine micaceous sandstone with some thin interbedded conglomerate layers of the Pliocene-age San Diego Formation were encountered in previous borings immediately below the Pleistocene-age Terrace Deposit Gravel (Qtg) unit described above. Down-hole logging of the Qtg/Tsd contact indicated an irregularly horizontal depositional contact scoured into the generally finer-grained horizontally bedded sandstone of the San Diego Formation. The elevation of this disconformable contact varies between approximately 430 feet MSL to approximately 457 feet MSL, with the average contact elevation at 442 feet MSL. In some of the borings, the presence of interbedded, coarse subrounded volcanic conglomerate layers is suggestive of reported nonmarine facies of the San Diego Formation (Wagner, H. M., 2001). We don't expect the San Diego Formation will be encountered during grading.

3.4 Otay Formation (To)

Dense to hard, light olive to gray-brown, horizontally interbedded clayey siltstones, silty claystones and fine-grained sandstone of the Oligocene-age Otay Formation sandstone-mudstone member were encountered in some of the borings immediately below the Pliocene-age San Diego Formation. Down-hole logging of the contact with the San Diego Formation indicated a sharp, but irregular, depositional contact scoured into the generally finer-grained massive to horizontal beds of the Otay Formation. Laboratory shear strength testing indicated high strength values. The Otay sandstone-mudstone member as encountered is very dense and is suitable for support of structural loads and/or fills in its present condition. The sandstone portions typically possess low expansion and good shear strength properties. We don't expect the Otay Formation will be encountered during grading.

4. GROUNDWATER

Groundwater was encountered in continuous core borings B-22 through B-24. A groundwater study was prepared by Dudek & Associates (see Geocon 2021). Groundwater elevations from this study were utilized in our slope stability analysis.

With respect to EVA roadway construction, groundwater is not anticipated to be encountered or impact the roadway. It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Proper surface drainage of irrigation and rainwater will be critical to future performance of the project.

5. GEOLOGIC STRUCTURE

Bedding and formational contact attitudes observed and/or measured during previous investigations are mostly horizontal, exceptions being localized undulations and cross-laminations within a horizontally

bedded unit. The coarse conglomeratic portions of the Terrace Deposit Gravel (Qtg) are typically massive with few discernible attitudes, other than approximately horizontal imbrication of conglomerate clasts. Adverse geologic structures, based on observations of the exploratory excavations, do not present a significant hazard to roadway construction. However, during grading, cut slopes should be evaluated by an engineering geologist to confirm the presence or absence of adverse bedding or slope instability.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

Review of the City of San Diego, Seismic Safety Study, Geologic Hazards and Faults, 2008 edition indicates the roadway is designated in Geologic Hazard Category 21 (within the hillside slope) and Category 53 (across the mesa top). Hazard Category 21 is described under Landslides as "Confirmed, known, or highly suspected". Category 53 is described as Other Terrain, "level or sloping terrain, unfavorable geologic structure, low to moderate risk".

6.2 Landslides

As previously discussed, a portion of the proposed roadway cross the San Ysidro landslide complex. Considering the depth and size of the landslide, stabilization is not practical, nor is it warranted for the construction of an EVA road that will have limited use.

Based on our stability analysis, construction of the roadway does not impact existing hillside stability or affect the overall global stability of the landslide complex. A discussion of slope stability is provided below.

7. SLOPE STABILITY EVALUATION

7.1 General

Cross section A-A' was analyzed to evaluate stability of the landslide near the EVA road alignment. The geology and basal slide surface was determined from geomorphic interpretation and application of features observed during our December 2020/January 2021 field investigation (see Geocon July 2021) and continuous core borings performed in September and October 2021. The groundwater elevation used in the analysis was based on Dudek & Associates' groundwater study.

The computer program SLOPE/W distributed by Geo-Slope International was utilized to perform the slope stability analyses. This program uses conventional slope stability equations and a two-dimensional limit-equilibrium method to calculate the factor of safety against deep-seated failure. For our analysis,

Spencer's Method with a block failure mode was used for failure along landslide basal surface. Spencer's Method satisfies both moment and force equilibrium.

The computer program searches for the critical failure surface based on parameters inputted, including the location of the "left" and "right" sliding blocks. The output files and calculated factor of safety for the cross-sections analyzed are presented on Figures 4 and 5. The critical failure surface for each analysis is shown on computer-generated output. The factor of safety is shown on each figure directly above the failure surface.

7.2 Shear Strength Parameters

The shear strength parameters used in the analyses are based on laboratory direct shear testing performed on samples obtained from borings during our December 2020/January 2021 study and our experience with similar soil conditions. We utilized the same strength parameters as those used in our previous study (Geocon 2021). Shear strength values used in our analyses are shown on Table 7.2.1.

TABLE 7.2.1
SHEAR STRENGTH USED IN SLOPE STABILITY ANALYSES

Soil Type	Angle of Internal Friction (degrees)	Cohesion (psf)
Qcf (Compacted Fill)	30	300
Qal (Alluvium)	28	100
Qls (Landslide Debris)	31	135
To (Otay Formation)	34	450
Basal Slide Plane	8	50

7.3 Slope Stability Analysis

To assess the factor of safety for the existing hillside in the area of the EVA, we performed a slope stability analysis using Cross Section A-A'. We analyzed a failure along the basal slide plane and up the assumed landslide headscarp. The strength parameters used for the basal surface was also used along the landslide headscarp. The result of this analysis is shown on Figure 4 which indicates a factor of safety of 1.25 for existing conditions.

To assess if the proposed EVA roadway grading impacts the existing hillside stability, we analyzed the stability section with the roadway grading included. The result of this analysis is shown on Figure 5. Based on our analysis, the factor of safety for the proposed roadway grading is essentially the same as it is for existing conditions (1.24). This demonstrates that the proposed EVA road construction does not impact the stability of the hillside slope. It is our opinion that a factor of safety greater than 1.2 is appropriate for the intended development of an EVA roadway.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 No soil or geologic conditions were encountered during our field investigation, or noted in our geologic review, that would preclude construction of the EVA road. Recommendations for grading and roadway pavement sections are provided herein.

8.1.2 Our field investigations indicate that the mesa top is underlain by a Terrace Deposits that are overlain by the San Diego Formation and Otay Formation. The hillside area is underlain by landslide debris. Remedial grading will be required to construct fill slopes and provide suitable support for the roadway surface improvements. Cut slopes will need to be observed by an engineering geologist to assess if stability fills are needed.

8.1.3 Slope stability analyses indicate that the proposed EVA roadway construction will not impact the overall stability of the landslide complex.

8.1.4 Groundwater and/or seepage-related problems are not anticipated provided that surface drainage is directed into properly designed drainage structures and away from pavement edges.

8.1.5 It is our professional opinion that the development area for the proposed EVA road and associated grading required to construct the roadway will have a slope stability factor of safety that is appropriate for its intended use as a temporary EVA roadway based on our conjectured landslide geometry.

8.2 Excavation and Soil Characteristics

8.2.1 Excavation of the on-site soils should be possible with moderate to very heavy effort using conventional heavy-duty equipment. Excavation of the terrace deposit gravels, if encountered, could generate oversized cobbles/boulders that require exporting.

8.2.2 The soil encountered during previous field investigations are considered “expansive” (expansion index [EI] greater than 20) as defined by 2022 California Building Code (CBC) Section 1803.5.3. We expect most of the soil that will be encountered possess a “low” to “high” expansion potential (EI of 130 or less) in accordance with ASTM D 4829. The following table presents soil classifications based on the expansion index.

EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2022 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

8.3 Grading Recommendations

8.3.1 Grading should be performed in accordance with the recommendations provided in this report, the Recommended Grading Specifications contained in Appendix C and the local grading ordinance. Geocon Incorporated should observe the grading operations on a full-time basis and provide testing during fill placement.

8.3.2 Prior to commencing grading, a preconstruction conference should be held at the site with the agency inspector, 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, debris, and vegetation. The depth of vegetation removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

8.3.4 In areas of fill or where cuts are less than 1-foot, the upper 1-foot of existing soil within the roadway alignment should be removed and replaced as compacted fill. Deeper removals may be needed if unsuitable soil is encountered in the removal excavation.

8.3.5 In cut areas deeper than 1 foot, the subgrade surface should be observed by a representative of Geocon Incorporated once subgrade elevation has been attained to assess soil conditions and if overexcavation is needed. As a minimum the upper 12 inches of the subgrade should be scarified, moisture conditioned and recompacted.

8.3.6 In roadway areas that will be surfaced with concrete or asphalt concrete pavement, the upper 3 feet of subgrade soil should be checked during grading to assess the suitability of the soils for support of the pavement surface. If unsuitable soils or highly expansive soils (EI greater than 90) are encountered, the soils should be removed to a depth of at least 3 feet below

subgrade elevation and replaced with compacted fill that has an expansion index of 90 or less. Deeper removals may be required depending on the type and condition of soil encountered at subgrade elevation.

8.3.7 Remedial removals should extend to a horizontal distance of at least 3 feet beyond the edge of roadway improvements.

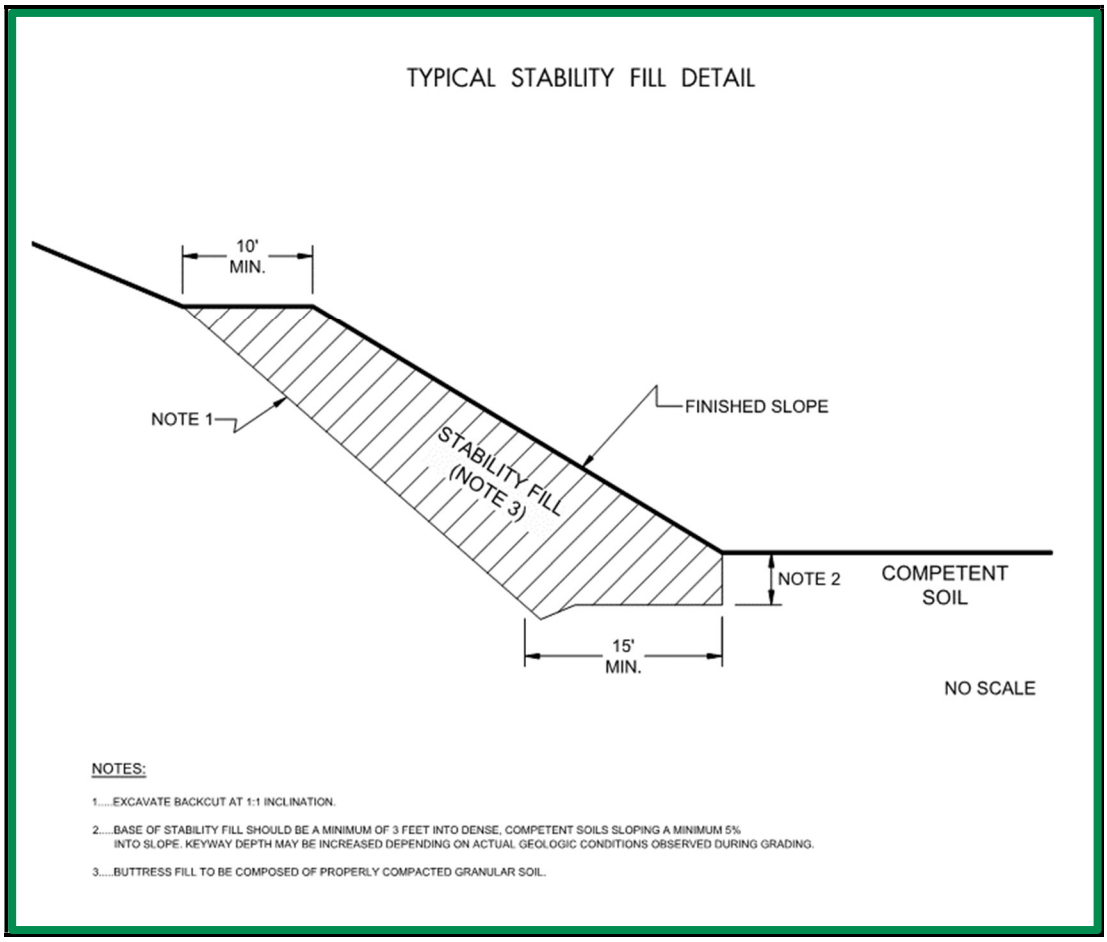
8.3.8 In the area of the proposed fill slopes, compressible soil deposits should be removed to expose competent landslide deposits. Within the slope key, the bottom of the removal should extend beyond the toe of the fill slope a horizontal distance equal to the depth of the removal. We expect removal depths of around 3 to 5 feet. The depth of required removals will be determined during grading when excavations can be performed to assess soil conditions.

8.3.9 Deeper than normal benching and/or stripping operations for sloping ground surfaces will be required where the thickness of compressible surficial deposits exceeds 3 feet.

8.3.10 After removal of unsuitable materials is performed, the site should then be brought to final subgrade 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. Expansive soils (EI greater than 90) should not be placed within the upper 3 feet of roadway areas underlain by concrete or asphalt concrete. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of maximum dry density at or above optimum moisture content, as determined in accordance with ASTM Test Procedure D1557. The upper 12 inches of subgrade soil should be compacted to at least 95 percent relative compaction.

8.3.11 It is recommended that excavations be observed during grading by a representative of Geocon Incorporated to verify that soil and geologic conditions do not differ significantly from those anticipated.

8.3.12 Cuts slopes in the landslide debris may require a stability fill. The need for stability fills will be determined during grading once the condition of soils in the cut excavation can be assessed. A typical stability fill detail is provided below.



8.3.13 The outer 15 feet (or a distance equal to the height of the slope, whichever is less) of fill slopes should be composed of properly compacted granular "soil" fill to reduce the potential for slope creep and surficial sloughing. In general, soil with an EI<90 should be used within the outer slope zone.

8.3.14 All fill slopes should be overbuilt at least 3 feet horizontally and cut back to the design finish grade. As an alternative, fill slopes may be compacted by back-rolling at vertical intervals not to exceed 4 feet and then track-walking with a D-8 dozer, or equivalent, upon completion such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope.

8.3.15 Slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. Slopes should also be properly maintained to reduce erosion.

8.4 Preliminary Pavement Recommendations

8.4.1 Preliminary pavement recommendations for the roadway are provided below. Final pavement sections should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. For preliminary design, we used a laboratory R-Value of 5. We also assumed a Traffic Index of 5.0.

8.4.2 Table 8.4.1 provides the preliminary flexible pavement sections for the roadway. The sections were calculated in general conformance with *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4). We are also providing a pavement section based on City of San Diego Schedule "J", should it be required.

TABLE 8.4.1
PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS FOR THE EMERGENCY VEHICLE ACCESS ROAD

Location	Full Depth Disintegrated Granite Base (inches)	Asphalt Concrete (inches)	Class 2 Base (inches)	City of San Diego Schedule "J"	
				Asphalt Concrete (inches)	Cement Treated Base (inches)
EVA Road	18	3	10	3	8

8.4.3 Disintegrated Granite base should conform to Section 200-2.7 of the *Standard Specifications for Public Works Construction* (Green Book). Asphalt concrete should conform to Section 203-6 of the Green Book. Cement treated base (CTB) should conform to Section 301-3.3 of the Green Book and Section 400-5 of the *Regional Supplement to 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* (Caltrans).

8.4.4 Prior to placing base material, the subgrade should be scarified, moisture conditioned and recompacted to a minimum of 95 percent relative compaction. The depth of compaction should be at least 12 inches. The base material should be compacted to at least 95 percent relative compaction. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

8.4.5 We calculated the rigid pavement section in general conformance with the procedure recommended by the Portland Cement Association (PCA) and AASHTO. We used the following traffic categories and design parameters in our analysis. The analysis is based on a 20-year design life.

TABLE 8.4.2
TRAFFIC CATEGORIES

Location	Traffic Category	Reliability (%)	Slabs Cracked at End of Design Life (%)
EVA	Residential	75	15

8.4.6 We used the parameters presented in the following table to calculate the pavement design sections.

TABLE 8.4.3
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
R-Value	5
Traffic Growth Rate	0%
Directional Distribution	100%
Design Lane Distribution	100%
Modulus of Rupture for Concrete, M_R	500 psi
Concrete Compressive Strength	3,000 psi
Concrete Modulus of Elasticity, E	3,150,000 psi

8.4.7 Based on the criteria presented herein, the PCC pavement sections should have the following minimum thickness.

TABLE 8.4.4
RIGID VEHICULAR PAVEMENT RECOMMENDATIONS

Location	Traffic Category	Trucks Per Day	Portland Cement Concrete, T (Inches)
EVA	Residential	< 10	6.5

8.4.8 The PCC vehicular pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content.

8.4.9 Adequate joint spacing based on PCA and AASHTO guidelines should be incorporated into the design and construction of the rigid pavement.

8.4.10 Reinforcing steel will not be necessary within the concrete pavement.

8.4.11 Perimeter curbs adjacent to landscape areas should extend at least 6 inches below the bottom of the pavement aggregate base. In lieu of extending the perimeter curb, an impermeable liner should be installed.

8.4.12 Concrete flatwork should be structurally connected to the curbs to help reduce potential offsets between the curbs and the flatwork.

8.4.13 To control the location and spread of concrete shrinkage cracks, crack-control joints should be included in the design of the concrete-pavement slab. Crack-control joints should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be in accordance with PCA and AASHTO guidelines.

8.4.14 Construction joints should be provided at the interface between areas of concrete placed at different times during construction. The project structural engineer should provide details for load transfer.

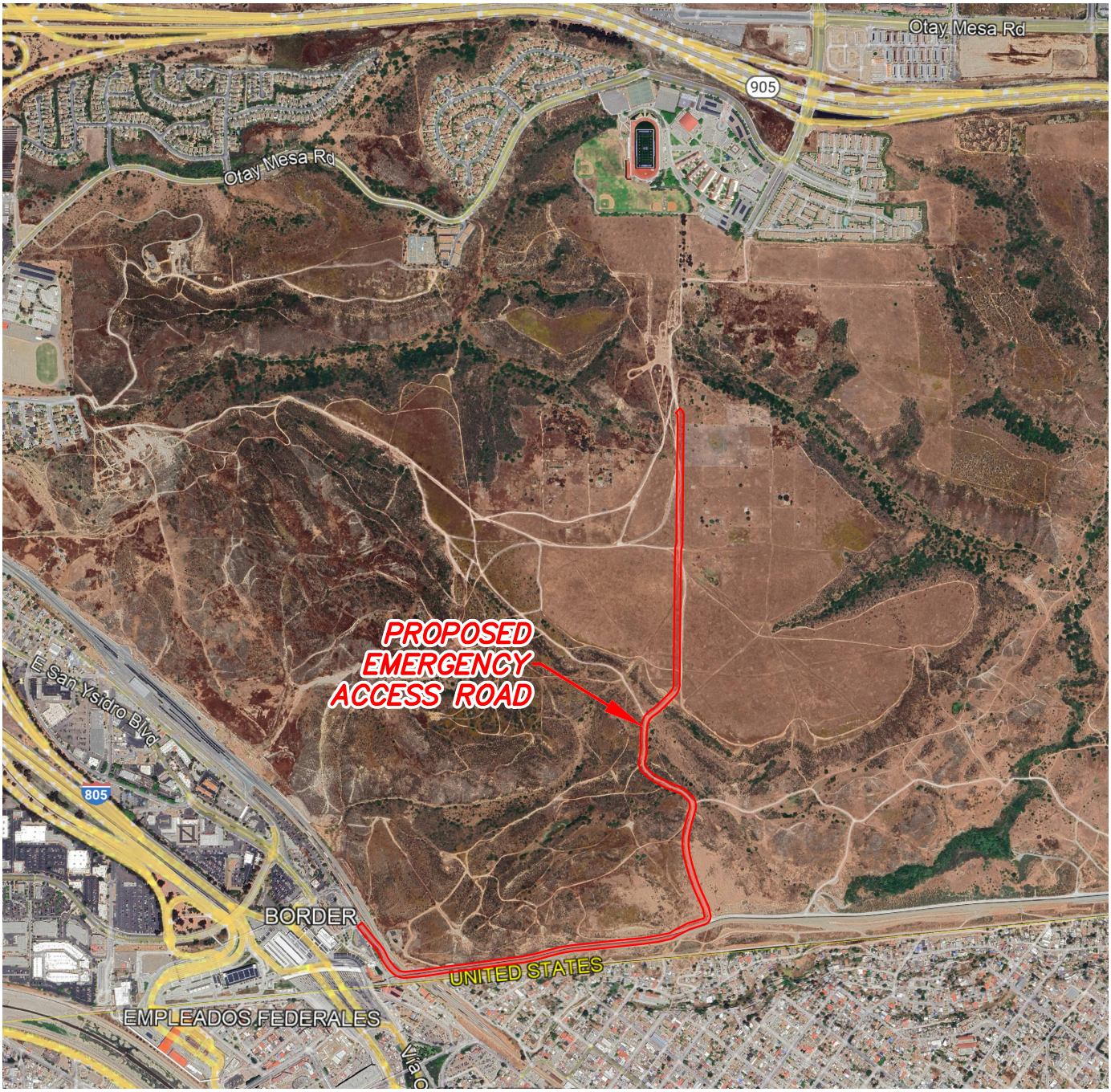
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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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NO SCALE

VICINITY MAP

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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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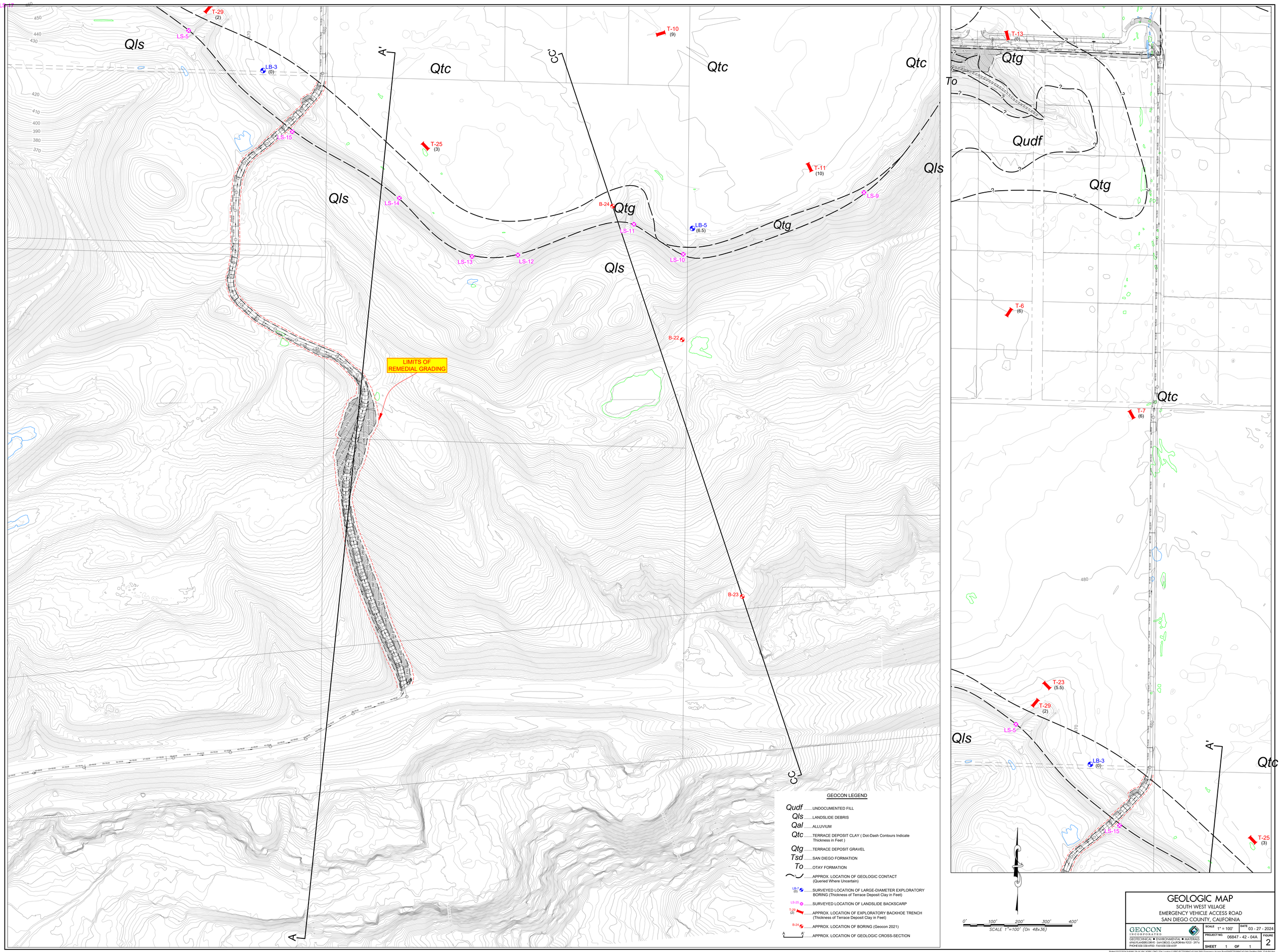
SOUTH WEST VILLAGE
EMERGENCY VEHICLE ACCESS ROAD
SAN DIEGO COUNTY, CALIFORNIA

RM / RA		DSK/GTYPD

DATE 03 - 27 - 2024	PROJECT NO. 06847 - 42 - 04A	FIG. 1

Plotted:03/27/2024 8:44AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-04A SWV Emergency Access Road\DETAILS\06847-42-04A VicinityMap.dwg



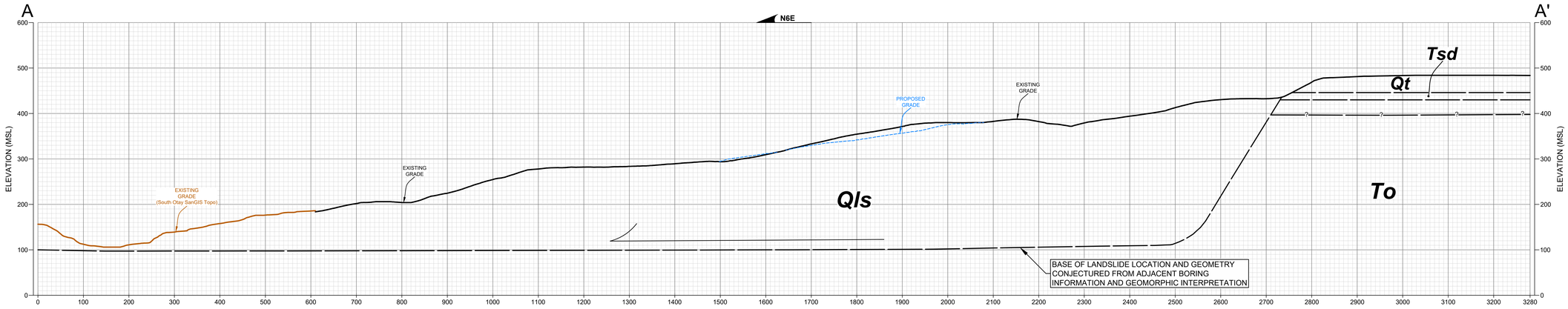
GEOLOGIC MAP

SOUTH WEST VILLAGE
EMERGENCY VEHICLE ACCESS ROAD
SAN DIEGO COUNTY, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'
DATE	03 - 27 - 2024
PROJECT NO.	06847 - 42 - 04A
FIGURE	2
SHEET	1 OF 1

Plotted:03/27/2024 8:40AM | By:ALYN LAZARILLO/MO | File Location: Y:\PROJECTS\06847-42-04A SWV Emergency Access Road\SHEETS\06847-42-04A GeoMap-SWV_EVA-RLA.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 100' (Vert. = Horiz.)

GEOCON LEGEND

Qls .....LANDSLIDE DEBRIS

Qt .....TERRACE DEPOSITS

Tsd .....SAN DIEGO FORMATION

To .....OTAY FORMATION

?..... APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS - SECTION

SOUTH WEST VILLAGE
EMERGENCY VEHICLE ACCESS ROAD
SAN DIEGO COUNTY, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 100'
DATE	03 - 27 - 2024
PROJECT NO.	06847 - 42 - 04A
FIGURE	3
SHEET	1 OF 1

Plotted:03/27/2024 8:42AM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\06847-42-04A SWV Emergency Access Road\SOURCE\SECTION\06847-42-04A Profile.dwg

Southwest Village
Project No. 06847-42-04A
Cross Section: A-A'

Analysis:
-- Failure Up Headscarp
-- Existing Conditions

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Qls	130	300	30	1
	Shear Zone	120	50	8	1
	To (2)				1

1.25

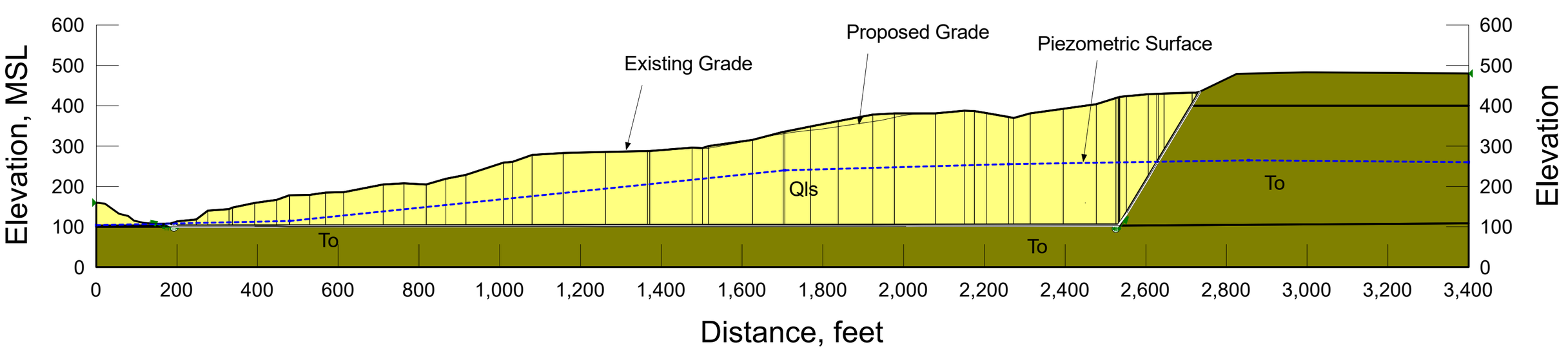


FIGURE 4

Southwest Village
Project No. 06847-42-04A
Cross Section: A-A'

Analysis:
-- Failure Up Headscarp
-- Proposed Conditions

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Qls	130	300	30	1
	Shear Zone	120	50	8	1
	To (2)				1

1.24

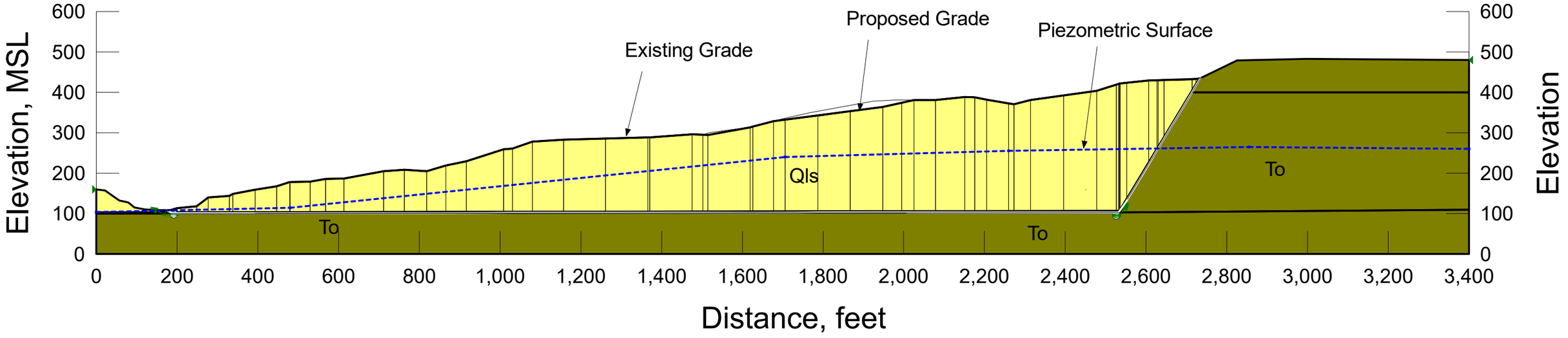


FIGURE 5

APPENDIX A

APPENDIX A

BORING AND TRENCH LOGS

FOR

SOUTHWEST VILLAGE
EMERGENCY VEHICLE ACCESS ROAD
SAN DIEGO, CALIFORNIA

PROJECT NO. 06847-42-04A

PROJECT NO. 06847-42-01

BORING LB 3

ELEV. (MSL.) 472 DATE COMPLETED 8/23/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TERRACE DEPOSIT GRAVEL** Medium dense to dense, damp, light to medium reddish brown, Sandy, medium to coarse GRAVEL to very Gravelly SAND, with some silt and trace clay			
2								
4								
6								
8				GM-SM				
10								
12								
14								
16					-Irregular transition 15 to 17 feet			
18					Dense, moist, medium reddish brown, Sandy, very coarse GRAVEL			
20					-Frequent occurances of 18 to 14 inch diameter, boulders of subrounded to rounded volcanic and granitic rock			
22				GM				
24								
26					-Very irregular, approximately horizontal, sharp depositional (scour) contact			
28				SM	**SAN DIEGO FORMATION** Dense, damp, light brown, Silty, fine to medium SANDSTONE			

Figure A-6, Log of Boring LB 3

SOM

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. 06847-42-01

BORING LB 3

ELEV. (MSL.) 472 DATE COMPLETED 8/23/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30								
32								
34				GM	Dense, moist, reddish brown, Sandy coarse GRAVEL, subrounded to subangular			
36					-Horizontal, sharp scour-contact			
38				SM	Dense, damp, light tan-brown, very Silty fine SANDSTONE, micaceous			
40				GM	Very dense, moist, reddish brown, Sandy coarse GRAVEL			
42					-Sharp, horizontal scour-contact			
44	LB3-1			SM	**OTAY FORMATION** Very dense, damp, light gray-olive, Silty, very fine SANDSTONE -Joint N80W, 80N, terminated by contact below			
46					-Sharp, horizontal scour-contact			
48	LB3-2 LB3-3			CL	Very stiff to hard, moist, light brown-pink, Silty CLAYSTONE; possibly bentonitic, massive and blocky			
50								
52					BORING TERMINATED AT 52 FEET			

Figure A-7, Log of Boring LB 3

SOM

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. 06847-42-01

BORING LB 5

ELEV. (MSL.) 477 DATE COMPLETED 8/30/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				CL	**TERRACE DEPOSIT CLAY** Stiff, damp to moist, dark brown, Sandy CLAY, with some cobble			
4								
6					-Irregular, approximately horizontal contact			
8				SM-GM	**TERRACE DEPOSIT GRAVEL** Medium dense to dense, medium to dark reddish brown, very Gravelly SAND; some silt, trace clay			
10								
12								
14								
16								
18								
20				GM	Very dense, damp, medium to dark reddish brown, Sandy, very coarse GRAVEL, with 8 to 18 inches diameter cobbles; some silt			
22								
24								
26								
28								

Figure A-11, Log of Boring LB 5

SOM

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. 06847-42-01

BORING LB 5

ELEV. (MSL.) 477 DATE COMPLETED 8/30/02

EQUIPMENT SOILMEC 108 TRUCK MT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				GM				
32								
34								
36								
38								
40								
42								
44								
46								
48					-Sharp, horizontal scour-contact at 48.5 feet			
50				SM	**SAN DIEGO FORMATION** Dense, damp, light tan-brown, Silty, fine to medium SANDSTONE; massive to cross-laminated, micaceous -6" pebble conglomerate layer, horizontally imbricated, rounded to subrounded dark volcanic rock			
52								
54								
56					-Contact transitional over 6 inches and approximately horizontal			
58				SM-ML	**OTAY FORMATION** Very dense, damp, light olive-gray-brown, very Silty, very fine SANDSTONE, with some clay lenses			

Figure A-12, Log of Boring LB 5

SOM

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. 06847-42-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING LB 5** ELEV. (MSL.) **477** DATE COMPLETED **8/30/02** EQUIPMENT **SOILMEC 108 TRUCK MT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60								
					BORING TERMINATED AT 61 FEET			

Figure A-13, Log of Boring LB 5

SOM

SAMPLE SYMBOLS
□ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE ◣ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

RACE DEPOSIT CLAY

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. 06847-42-01

		GY	TER		**TRENCH T 18**	ON E)	-Y	;)

PROJECT NO. 06847-42-01

TRENCH T 6

ELEV. (MSL.) 489 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Firm to hard, damp to dry, dark yellowish brown, CLAY, abundant soil carbonate; topsoil zone			
2				CH	Firm to hard, moist, moderate olive brown, CLAY			
4								
6				SW-SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, dark to pale yellowish orange, well graded SAND with clay and fine and coarse gravel; scattered cobbles, less than 8 inches diameter			
8								
10								
12					TRENCH TERMINATED AT 12 FEET			

Figure A-24, Log of Trench T 6

SOM

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. 06847-42-01

TRENCH T 7

ELEV. (MSL.) 481 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Firm to hard, dry, dark yellowish brown, CLAY, abundant soil carbonate; topsoil zone			
2	T7-1			CH	Hard, damp to dry, dark yellowish brown, CLAY			
4	T7-2			CH	Becomes moist, moderate yellowish brown, CLAY with sand			
6	T7-3							
8	T7-4			SW	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, well graded, fine to coarse SAND with rounded, fine to coarse gravel, approximately 10 to 20% rounded cobbles and boulders up to 1 foot diameter, caving			
10								
					TRENCH TERMINATED AT 11 FEET			

Figure A-25, Log of Trench T 7

SOM

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. 06847-42-01

TRENCH T 10

ELEV. (MSL.) 479 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, cracks, roots, caliche; topsoil zone			
2					Firm to hard, moist, pale to dark yellowish brown, CLAY			
4	T10-1							
6	T10-2			CH				
8								
10	T10-3			SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with gravel, approximately 10% cobbles and boulders up to 1 foot diameter			
12					TRENCH TERMINATED AT 12 FEET			

Figure A-28, Log of Trench T 10

SOM

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. 06847-42-01

TRENCH T 11

ELEV. (MSL.) 481 DATE COMPLETED 8/22/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, caliche and rootlets; topsoil zone			
2					Firm to hard, moist, pale yellowish brown, CLAY			
4								
6				CH				
8								
10					-1 foot boulder			
				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with gravel, approximately 10% rounded cobbles and boulders up to 1 foot diameter			
					TRENCH TERMINATED AT 11 FEET			

Figure A-29, Log of Trench T 11

SOM

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. 06847-42-01

TRENCH T 13

ELEV. (MSL.) 478 DATE COMPLETED 8/23/02

EQUIPMENT JD 510 RUBBER TIRE

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	**TOPSOIL** Dense, dry, dark yellowish brown, Silty SAND, porous, soil cracking, roots			
2					**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate yellowish brown, Clayey SAND, scattered rounded gravel and cobbles less than 6 inches diameter			
4	T13-1			SC				
6					TRENCH TERMINATED AT 6 FEET			

Figure A-31, Log of Trench T 13

SOM

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. 06847-42-01

TRENCH T 23

ELEV. (MSL.) 468 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CH	**TERRACE DEPOSIT CLAY** Hard, moist, moderate yellowish brown, CLAY, cracked roots			
2	T23-1			CH	Firm, moist, moderate yellowish brown, CLAY			
4				CH	Firm, moist, moderate yellow brown, Sandy CLAY			
6	T23-2			SC	**TERRACE DEPOSIT GRAVEL** Becomes dense, moist, moderate yellowish brown and dark yellowish orange, Clayey SAND with gravel, approximately 25% cobbles and boulders up to 2 feet diameter			
8								
					TRENCH TERMINATED AT 9 FEET			

Figure A-41, Log of Trench T 23

SOM

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. 06847-42-01

TRENCH T 25

ELEV. (MSL.) 484 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CH	**TERRACE DEPOSIT CLAY** Hard, dry, dark yellowish brown, CLAY, cracks, roots			
2				CH	Hard, moist, dark yellowish brown, CLAY			
				SC	**TERRACE DEPOSIT GRAVEL** Dense, moist, moderate brown, Clayey SAND with rounded gravel, approximately 20% cobbles and boulders up to 1 foot diameter			
4								
6	T25-1			SC	No cobbles or boulders below 4.5 feet			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-43, Log of Trench T 25

SOM

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. 06847-42-01

TRENCH T 29

ELEV. (MSL.) 465 DATE COMPLETED 8/26/02

EQUIPMENT JD 510 RUBBER TIRE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				CH	**TOPSOIL** Hard, dry, dark yellowish brown, CLAY with gravel, cracking, roots			
4				SC-GC	**TERRACE DEPOSIT GRAVEL** Dense, moist, dusky yellow and moderate yellowish brown, Clayey, very Gravelly SAND, approximately 30% rounded cobbles and boulders up to 2.5 feet diameter			
6								
8								
10								
12	T29-1			SM	**SAN DIEGO FORMATION** Dense, damp, dusky yellow to light olive brown, Silty fine SAND			
14					TRENCH TERMINATED AT 14 FEET			

Figure A-47, Log of Trench T 29

SOM

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

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
1								**LANDSLIDE DEBRIS**
2								Medium dense, moist, black, Clayey, fine to coarse SAND with some gravel.
3		1	5	80				
4								
5								
6								
7								
8		1	5	40				-Becomes dark brown below 8 feet.
9								
10						SC		-Becomes predominately reddish brown below 10 feet with soft sheared clay at 10.1 feet.
11								
12								-Gravel and cobble size rock fragments below 12 feet.
13		1	5	50				
14								
15								
16								
17								
18		1	5	50				
19								
20								
21								Medium dense, moist, reddish brown, Silty, fine to coarse SAND with some gravel.
22								
23		2	5	80		SM		
24								

Appendix 1

Log of Boring B 22

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
26								
27		2	5	30		SM		
28								
29								
30								Dense to medium dense, moist, reddish brown, fine to coarse, Sandy GRAVEL; poor recoveries due to high gravel and cobble content.
31		2	2.5	40				
32								
33		2	2.5	80				
34								
35		3	1.5	100				
36								
37		3	3.5	57				
38								
39								
40		3	5	0				
41								
42								
43								
44								
45		4	5	0				
46								
47								
48								
49								

Appendix 1

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
51								Very stiff, moist, grayish brown, Silty CLAYSTONE to Clayey SILTSTONE blocks; disturbed with multiple fractures and apparent disturbed zones.
52		4	5	100				
53								
54								
55								
56		4	3.5	86		CL&ML		
57								
58								
59								-No core saple collected from 58.5 to 61 feet due to casing being added.
60								
61		5	1	50				
62								
63								Medium dense, moist, gray, Silty, fine to medium SAND/SANDSTONE; disturbed.
64		5	5	90		SM		
65								-Cobble present at 65 feet.
66								
67								Very stiff, moist, pale brown, Silty CLAY/CLAYSTONE to Clayey SILT/SILTSTONE; disturbed.
68								
69		5	5	100				
70						CL&ML		
71								-Becomes gray below 71 feet.
72								-Contorted beds present from 72 to 74.5 feet.
73		6	5	80				
74								-High angle fracture with gray siltstone bed above and reddish brown claystone bed below at 73.5 feet.
								-Gradational contact.

Appendix 1

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
76		6	5	80		ML		Hard, damp, gray, fine, Sandy SILT/SILTSTONE.
77								
78		6	2.5	100				
79								
80		6	2.5	80				-Pink bentonite rip-up clasts at 80 feet.
81								
82						SM		Medium dense to dense, damp to moist, gray, Silty, fine to medium SAND/SANDSTONE; fractured in areas.
83								
84		7	5	100				
85								
86								
87								
88		7	5	100				
89								
90								
91								-Becomes fine grained below 91 feet.
92								
93		8	5	100				-Disturbed appearance at 92.8 feet.
94								
95								
96								
97		8	5	100				-High angle shear with 1/2-inch thick, poorly remolded clay-sand-silt mixture along fissured-striated surface.
98								
99								

Appendix 1

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
101		8	5	100				-Disturbed appearance from 101 to 102.5 feet.
102								-Prominent fracture with striae at 101.6 feet.
103								
104								
105		9	5	100				
106						SM		
107								
108								
109								
110		9	5	100				
111								
112								Hard, moist, grayish brown, Silty CLAYSTONE to Sandy SILT/SILTSTONE.
113								
114								
115		10	5	100		CL/ML		**-BEDDING PLANE SHEAR AT 114.6 FEET**; 1-inch thick, stiff, pink, poorly to moderately remolded bentonite lens.
116								
117								
118								Medium dense to dense, moist, gray, Silty, fine to medium SAND/SANDSTONE.
119								
120		10	5	100				
121						SM		
122								
123								-3-inch thick, grayish brown claystone bed at 122.3 feet.
124		11	5	100				-Gradational contact.
						CL/ML		Hard, moist, grayish brown, Silty CLAYSTONE to Clayey SILTSTONE.

Appendix 1

Log of Boring B 22

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
126		11	5	100				-Becomes reddish brown between 126 and 127 feet.
127						CL/ML		-High angle fracture at 126.5 feet.
128								
129								-Shear zone at 128.5 feet; 6-inch think zone of multiple sheared clay planes.
130		11	5	90				Hard/dense, damp, gray, fine, Sandy SILTSTONE/Silty, fine SANDSTONE.
131								
132								
133								-Fracturing at 133 feet.
134								
135		12	5	100				-Fracturing at 135 feet.
136								
137								
138								
139								
140		12	5	100		ML/SM		
141								-1-foot thick, clayey siltstone bed at 141 feet.
142								
143								-Thinly laminated claystone beds present between 142.6 and 143.5 feet.
144								
145		13	5	100				-6-inch thick, unsheared pink bentonite bed at 145.5 feet.
146								
147								
148								-Clayey siltstone 148 to 150 feet.
149		13	5	100				

Appendix 1

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
151		13	5	100		ML/SM		-High fracture at 150 feet. -Fracturing 151 to 152 feet.
152								
153								
154		14	5	100				
155								Dense, damp, gray, Silty, fine SANDSTONE.
156								
157								
158								
159								
160		14	5	90				
161						SM		
162								
163								
164								
165		15	5	100				
166								-16-inch thick cemented zone at 165.6 feet.
167								Hard, moist, brown, Silty, CLAYSTONE with high fractures throughout.
168								-6-inch thick zone of highly fissured claystone at 168 feet.
169								
170		15	5	100		CL		
171								
172								
173		16	5	100				-Grades into fine, sandy siltstone below 173 feet.
174								
						SM		Dense, moist, light brown, Silty, fine to medium SANDSTONE; cemented.

Appendix 1

GEOCON

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
176		16	5	100		SM		
177								-Becomes fine to coarse below 177 feet (gritstone?).
178								
179		16	5	100				
180								
181								
182								
183								
184		17	5	100				
185								
186								
187								
188								
189		18	5	100				
190								
191								
192								
193								
194		18	5	100				
195								
196								-Some gravels between 196 and 201 feet.
197								
198		19	5	100				
199								

GEOCON

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
201		19	5	100		SM		-Some gravels present from 213.5 to 220.5 feet.
202								
203								
204								
205		19	5	100				
206								
207								
208								
209								
210		20	5	100				
211								
212								
213								
214								
215		20	5	100				
216								
217								
218								
219								
220		21	5	100				
221								
222								
223								
224		21	5	100				

Appendix 1

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
								-Some gravels present from 225 to 229 feet.
226		21	5	100				
227								
228								
229								
230		22	5	100				-Becomes fine grained below 229.5 feet -30-inch thick, hard, clayey siltstone bed at 229.5 feet.
231								-High angle fracture in 1/4-inch thick claystone bed at 230 feet.
232								
233								
234								
235		22	5	100				-Becomes fine to coarse below 235 feet.
236								
237						SM		
238								
239								
240		23	5	100				
241								-Very coarse grained with little to no silt between 241 and 244 feet.
242								
243								
244								
245		23	5	100				
246								
247								
248		24	5	100				-Becomes predominately fine to medium grained below 248 feet with high angle fracture between 248 and 249 feet.
249								

Appendix 1

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
251		24	5	100				
252								
253								
254								
255		24	5	100				
256								-16-inch thick, hard, brown claystone bed at 256 feet.
257						SM		-Becomes very coarse with gravel and low cohesion below 257 feet.
258								
259								
260		25	5	80				
261								
262								
263								
264								
265		25	5	100				
266								Hard, moist, brown, Silty, CLAYSTONE.
267								
268						CL		-Becomes sandy claystone and cemented below 267 feet.
269								
270		26	5	100				
271								
272								Very dense, damp, light brown, Clayey, fine to medium SANDSTONE.
273						SM		
274		26	5	100				

Appendix 1

Log of Boring B 22

Projec No.: 06847-42-06
Client:

Location:

Date:
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 347' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
276		26	5	100		SM		
277								
278								Hard, damp, brown, Silty to Sandy CLAYSTONE.
279		27	5	100		CL		
280								
281								
282								**-BEDDING PLANE SHEAR AT 281.9 FEET**; 1/8-inch thick, soft, moist, grayish brown, poorly remolded plastic clay gouge.
283								Very dense, light brown, Clayey, fine to medium SANDSTONE.
284		27	5	100		SC		
285								
286								
287								
288								
289		28	5	100				
290								
291								Hard, moist, light brown, Silty CLAYSTONE.
292								**-BEDDING PLANE SHEAR AT 292 FEET**; 1/4 to 1/2 inch thick, soft, moist, brownish gray, poorly remolded plastic clay gouge.
293								
294		28	5	100		CL		**-BEDDING PLANE SHEAR AT 293.2 FEET**; 1/2 to 3/4 inch thick, soft, moist, grayish brown, highly remolded plastic clay gouge.
295								
296								
297								BORING TERMINATED AT 297 FEET.

Appendix 1

Log of Boring B 23

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
1								**LANDSLIDE DEBRIS**
2		1	5	100				Medium dense/very stiff, moist, gray and reddish brown, Silty to Clayey SAND and Silty to Sandy CLAY; chunks of claystone and siltstone present in matrix.
3								
4								
5								
6								
7		1	5	80				
8								
9					■			
10								
11								
12		2	5	80		SM/SC/CL		
13								
14					■			
15								
16								
17		2	5	80				
18								
19					■			
20								
21								
22		2	4	50	■			
23								
24								
		3	1	100				

Appendix 2

Log of Boring B 23

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
26						SM/SC/CL		
27		3	5	100				Very stiff/medium dense, moist, dark brown to brown, Sandy CLAY to Clayey SAND; some gravel at 28 feet
28								-Some marbling present from 27.5 to 29 feet.
29								
30								Medium dense, moist, gray-brown, Silty/Clayey, fine to medium SAND; no fabric.
31								
32		3	5	100				
33								
34								
35								-4-inch thick zone of white caliche at 35 feet.
36								
37		4	5	100				
38						SM/SC		
39								-1/2-inch siltstone rip-up clasts present below 39 feet.
40								
41								
42		4	5	100				
43								
44								-16-inch thick, gravel/cobble lens at 44 feet.
45								
46								Very stiff, moist, mottled dark brown and brown, Silty/Sandy CLAY.
47								
48		5	5	100		CL		**-BASAL SHEAR ZONE FROM 45.2 TO 50 FEET**; melange of viscous deformation, marbled appearance; moderately remolded with apparent grayish brown to black alluvial soils present in shear zone.
49								

Appendix 2

Log of Boring B 23

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
51						SC		**OTAY FORMATION (To)** Dense, moist, grayish brown, Clayey, fine to medium SANDSTONE. -4-inch gravel lens at 51 feet.
52		6	5	100				-6-inch gray clay lens at 51.5 feet.
53								Dense, damp, Silty, fine to coarse SANDSTONE. -Gravel and cobble lens between 53 and 56 feet.
54								
55								
56						SM		-Becomes fine grained below 56 feet.
57		6	5	100				
58								
59								
60								
61						CL		Hard, moist, light grayish brown to brown, Silty CLAYSTONE with high angle fracturing.
62		7	5	100				
63								
64								
65						ML		Hard, damp, grayish brown, fine, Sandy/Clayey SILTSTONE.
66								
67		7	5	100				-Gradational contact.
68								Dense, damp, gray, Silty, fine SANDSTONE.
69								
70								
71						SM		-Some coarse sand below 71 feet.
72		8	5	100				
73								
74								

Appendix 2

GEOCON

Log of Boring B 23

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
76								-Becomes fine to coarse below 75 feet (gritstone?).
77		8	5	100				-Cemented from 77 to 79 feet.
78								
79								-Trace gravel present below 79 feet.
80								
81								
82		9	5	100				
83								
84								
85								
86								
87		9	5	100		SM		
88								
89								
90								-Cemented from 90 to 92 feet with little to no silt.
91								
92		10	5	100				
93								
94								
95								
96								
97		10	5	80				-Becomes fine to medium grained from 96.5 to 98 feet.
98								
99								-High angle fractures from 96.5 to 99 feet.

Appendix 2

Log of Boring B 23

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
101								
102		11	4	100				
103								
104		11	1	100				
105								-Becomes fine to medium grained from 105 to 110.
106								
107		11	5	100		SM		-High angle fracture at 107 feet.
108								
109								
110								
111								
112		12	5	100				-Cemented with some gravels from 112 to 114 feet.
113								
114								
115								
116								Hard, moist, grayish brown, Silty CLAYSTONE.
117								
118		13	5	100				-**BEDDING PLANE SHEAR ZONE AT 117.3 FEET**; multiple 1/4 inch thick, soft, moist, grayish brown, poorly remolded plastic clay gouge seams.
119						CL		-High angle fracture at 119.1 feet.
120								
121		13	2.5	100				
122								
123								-**BEDDING PLANE SHEAR AT 122.5 FEET**; 1/2 to 3/4 inch thick, soft, brownish gray, moderately remolded plastic clay gouge.
124		13	2.5	100		SM		Dense, damp, gray, Silty, fine to coarse SAND.

Appendix 2

Log of Boring B 23

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
126								Dense, damp, light brown, fine to coarse SAND with trace gravel.
127		14	5	100				
128								
129						SP		
130								
131								
132		14	5	100				-Cobble/boulder at contact.
133								Dense, moist, light brown, Silty to Clayey, fine to medium SAND.
134								
135								
136								
137		15	5	100				
138								
139						SM/SC		-3-foot thick, fine to coarse sand bed with trace gravel at 139 feet.
140								
141								
142								
143		15	5	100				-High angle fracture at 142.5 feet.
144								
145								
146		16	2.5	100				
147								
148								
149		16	2.5	100				

Appendix 2

Log of Boring B 23

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
151								-1-foot thick, moist, grayish brown claystone bed at 150 feet.
152		16	5	100				
153								
154								
155								Hard, moist, mottled reddish brown and olive green, Silty, CLAYSTONE, near vertical fracture from 155 to 157 feet.
156								
157		17	5	100				
158								
159								-**SHEARED CLAY ZONE AT 158.7 FEET**; 3/4 inch thick, soft, moist, remolded plastic clay gouge.
160						CL		
161								
162		17	5	100				
163								
164								
165								-**BEDDING PLANE SHEAR AT 165 FEET**; 3/4 to 1-inch thick, soft, moist, remolded plastic clay gouge.
166								-Gradational contact.
167								Dense, damp to moist, grayish brown, Silty to Clayey, fine to medium SANDSTONE.
168		18	5	100				
169								
170						SM/SC		-Becomes less clayey and fine to coarse below 169 feet.
171								
172								
173		19	5	100				-Gradational contact.
174						CL		Hard, moist, grayish brown, Silty CLAYSTONE with some fine, sandy siltstone interbeds.

Appendix 2

Log of Boring B 23

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
176								
177		19	5	100				
178								
179						CL		
180								
181		20	2.5	100				-**BEDDING PLANE SHEAR AT 181.3 FEET**; 1/8 inch thick, poorly remolded plastic clay gouge.
182								
183								-**BEDDING PLANE SHEAR AT 182.1 FEET**; 1/8 inch thick, poorly remolded plastic clay gouge.
184		20	2.5	100				Dense, damp, grayish brown, Clayey, fine to medium SANDSTONE.
185								
186						SC		-Becomes fine to coarse below 185 feet.
187		20	5	100				
188								
189								Hard, moist, grayish brown, Silty CLAYSTONE.
190								
191								
192		21	5	100				
193								
194						CL		-Becomes brown, waxy claystone below 194 feet with high angle fractures and black manganese staining.
195								
196								
197		21	5	100				
198								
199								

Appendix 2

Log of Boring B 23

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
201								Dense, damp, grayish brown, Silty, fine SANDSTONE.
202								
203		22	5	100		SM		
204								
205								
206								-Gradational contact.
207								Dense, moist, pale green, fine to coarse SANDSTONE.
208		22	5	100				
209								
210								
211								-Trace gravel below 211 feet.
212								
213		23	5	100				-Gravel and cobble below 212.5 feet.
214								
215								
216						SP		-Becomes fine to medium grained and massive below 216.
217								
218		24	5	100				
219								
220								
221		24	2	100				-Some orange straining below 221 feet.
222								
223		24	3	100				
224								

Appendix 2

GEOCON

Log of Boring B 23

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
226								
227		25	5	100				
228								
229								
230								
231								
232		25	5	100				
233								
234								
235								
236								
237		26	5	100		SP		-Becomes grayish brown, fine grained with orange staining below 237 feet.
238								
239								
240								
241								
242		26	5	100				
243								
244								
245								
246								
247		27	5	100				-Becomes predominately gray below 247 feet.
248								
249								

Appendix 2

GEOCON

Log of Boring B 23

Projec No.: 06847-42-06
Client:

Location:

Date: 9/8/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 230' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
251								
252		27	5	100				
253								
254								
255						SP		
256								
257		28	5	100				
258								
259								
260								BORING TERMINATED AT 260 FEET.

Appendix 2

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
1		1	2	50				**VERY OLD PARALIC DEPOSITS (Qvop)** Dense, damp, brown, fine to coarse, Sandy GRAVEL with interbeds of gravelly sand.
2								
3		1	3	100				
4								
5								
6		1	2	50				
7		1	1	75				
8								
9		1	2	75				
10								
11		1	1.5	50				
12								
13		1	3.5	100		GM		-Becomes reddish brown below 13 feet.
14								
15								
16		2	2.5	80				
17								
18		2	1	25				
19		2	1.5	20				
20		2	.5	50				
21								
22								
23		2	4.5	67				-20-inch thick reddish brown sand bed at 23 feet.
24								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
26								
27		2	5	100				
28								
29								
30		3	1	100				
31								
32		3	2	100				
33								
34		3	2	75		GM		
35								
36								
37		3	5	100				
38								
39								
40		4	.5	0				
41								
42								
43		4	4.5	89				Dense, damp, light brown with faint orange staining, Silty, fine to medium SAND with gravel/cobble lenses.
44								
45						SM		
46								**OTAY FORMATION (To)**
47								Dense, moist, gray, Silty, fine SANDSTONE with interbeds of siltstone.
48		4	5	90		SM		
49								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
51								Hard, moist, grayish brown, Silty CLAYSTONE/Clayey SILTSTONE; fractures in areas.
52		5	5	100				
53								
54								
55								-16-inch thick, gray, fine sandstone bed at 55 feet.
56								
57		5	4	50				
58								
59								
60								
61		6	2	100				
62						CL/ML		-High angle fractures with moist clay films along trace at 61.5 feet. -1-foot gray, fine sandstone bed at 62 feet.
63								
64		6	3	67				
65								
66								
67		7	2.5	100				
68								
69		7	2.5	100				-Zone of high angle bentonitic banding from 68 to 70 feet with 1/2 inch thick, high angle shear with 1/8 inch thick remolded plastic clay gouge along trace.
70								
71								-4-inch thick, unsheared pink bentonite bed at 70 feet.
72								
73		7	5	100				
74						SM		Dense, damp, grayish brown, Silty, fine SANDSTONE.

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
76								
77		8	5	100				-Fracture between 77 and 79 feet.
78								
79						SM		
80								
81								
82		8	5	100				
83								
84								Cemented at 83.5 feet.
85								Hard, damp, grayish brown, Clayey/Sandy SILTSTONE/Silty CLAYSTONE.
86								
87		9	5	180				**-18-inch thick zone of several poorly developed bedding plane shears with poorly** remolded plastic clay gouge at 87 feet**.**
88								
89								
90								**-BEDDING PLANE SHEAR AT 89.6 FEET**; 1/4 to 1/2 inch thick, soft, moist, brownish gray, moderately remolded plastic clay gouge.
91								
92		9	5	100		ML/CL		
93								
94								
95								
96								
97		10	5	100				
98								
99								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
101								
102		10	5	100				
103								
104								
105								-2-foot thick, gray sandstone bed at 105 feet.
106								
107		11	5	100				-6-inch cemented zone at 106.5 feet.
108								
109								
110								
111								
112		11	5	100		ML/CL		
113								-**BEDDING PLANE SHEAR AT 113 FEET**; 1/8 to 1/4 inch thick, soft, moist, reddish brown, poorly remolded plastic clay gouge.
114								
115								
116								
117		12	5	100				
118								
119								
120								
121								
122		12	5	100				
123								
124								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
126						ML/CL		
127		13	5	100		SM		Dense, moist, gray, Silty, fine to medium SANDSTONE.
128								
129								
130								Hard, moist, grayish brown, Silty CLAYSTONE to Clayey SILTSTONE.
131								
132		13	4.5	89		CL/ML		
133								
134								
135		13	.5	100				Dense, moist, gray, Silty, fine SANDSTONE.
136								
137		14	5	100				
138								
139								
140						SM		-6-inch cemented zone at 139.5 feet.
141								
142		14	5	100				
143								-Becomes fine to medium grained below 143 feet.
144								
145								Hard, moist, grayish brown, Silty CLAYSTONE.
146								
147		15	5	100		CL		-Zone of shearing from 146.8 to 147.5 feet; disturbed claystone with several remolded clay planes.
148								-16-inch thick fractured sandstone bed at 148 feet.
149								

Appendix 3

GEOCON

Log of Boring B 24

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
151								
152		16	5	100				
153								
154								-**BEDDING PLANE SHEAR AT 153.3 FEET**; 1/4-inch thick, soft, moist, reddish brown, highly remolded plastic clay gouge.
155								
156								
157		16	5	100				-2.5 inch thick, gray, fine sandstone bed at 157 feet.
158								
159								
160								
161								
162		17	5	100		CL		-6-inch zone of paper thin clay beds with slight remolding at 162.5 feet.
163								
164								-2-foot thick, gray, fine sandstone bed at 164 feet.
165								
166								
167		17	5	100				
168								
169								
170								-Becomes pale grayish green below 170 feet.
171								
172		18	5	100				
173								
174								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
176						CL		
177		18	5	100				Dense, damp, grayish green, Silty, fine SANDSTONE with interbedded fine, sandy siltstone beds.
178								
179								
180								
181								
182		19	5	100		SM		
183								
184								
185								
186		19	2.5	100				Hard, moist, reddish brown to grayish green, Silty CLAYSTONE to Clayey SILTSTONE.
187								
188		19	2.5	100		CL/ML		-**BEDDING PLANE SHEAR AT 187.5 FEET**; 1/8-inch thick, soft, moist, reddish brown poorly remolded plastic clay gouge.
189								
190								Dense, moist, gray, Silty fine SANDSTONE with fine, sandy siltstone interbeds.
191								
192		20	5	100				
193								
194								-**BEDDING PLANE SHEAR AT 193.7 FEET**; 1/8-inch thick, soft, moist, poorly remolded plastic clay gouge.
195						SM		
196		20	3	100				
197								
198								
199		20	2	100				

Appendix 3

GEOCON

Log of Boring B 24

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
201								
202		21	5	100				
203								
204								
205								
206								
207		21	5	100				
208								
209								
210								
211								
212		22	5	100		SM		
213								
214								
215								
216								
217		22	5	100				
218								
219								
220								
221								
222		23	5	100				
223								
224								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
226								-2-foot thick claystone bed at 225 feet.
227		23	5	100				
228								
229								
230								
231								
232		24	3.5	86				
233					■	SM		
234		24	1.5	100				
235								
236								
237		24	5	100				
238								
239								
240								
241								
242								Hard, moist, grayish brown, Silty CLAYSTONE.
243		25	5	100				-18-inch thick, pink to brown bentonite bed; no apparent remolding at 242.5 feet.
244								
245								
246						CL		
247								
248		25	5	100				
249								
						SM		Dense, moist, gray, Silty, fine SANDSTONE.

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
251								-Becomes interbedded with silty to sandy claystone between 251 to 254 feet.
252		26	5	100				
253								
254								-2-foot thick claystone bed at 253.7 feet.
255								
256								
257		26	5	100				-**BEDDING PLANE SHEAR AT 256.8 FEET**; 1/8 to 1/4-inch thick, soft, moist, poorly to moderately remolded plastic clay gouge.
258								
259								
260								
261						SM		-2-foot thick, interbedded claystone and siltstone beds at 260.7 feet.
262		27	5	100				
263								
264								
265								
266								
267		27	5	100				
268								
269								
270								
271								
272		28	5	160				
273								Hard, moist, gray, interbedded fine, Sandy/Clayey SILTSTONE and Silty CLAYSTONE.
274								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
276								
277		28	5	100				-6-inch thick bentonite bed with a 1/4-inch **BEDDING PLANE SHEAR AT 276.6** FEET; soft, moist, moderatley remolded plastic clay gouge.
278								
279						CL/ML		.
280								
281								-18-inch thick zone of weak clay films with some areas with poorly remolded clay gouge at 281 feet.
282		29	5	100				
283								Dense, damp, gray, Silty, fine SANDSTONE.
284								
285								
286								
287		29	5	100				
288								
289								
290						SM		
291								
292		30	5	100				
293								
294								
295								
296								
297		31	5	100				Hard, moist, brown, Silty CLAYSTONE.
298						CL		-18-inch thick zone of weak clay films with some areas with poorly remolded clay gouge at 298 feet.
299								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
301						CL		-Becomes sandy claystone below 301 feet.
302		31	5	100				
303								Dense, damp, brownish gray, Silty, fine SANDSTONE.
304								
305								-Becomes brown and fine to medium grained with trace gravel below 305 feet (gritstone?).
306								
307		32	5	100				
308								
309								
310								
311								
312		32	5	100				
313								-Cemented below 313 feet.
314						SM		
315								
316								
317		33	5	100				
318								
319								
320								
321								
322		33	5	100				
323								
324								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
326								
327		34	5	100				
328								
329								
330								
331								
332		34	5	100				
333								
334						SM		
335								
336								
337		35	5	100				
338								
339								
340								-2-foot thick cemented gravel bed at 340 feet.
341		35	3	100				
342								
343								
344		36	2	100				Dense, damp, light brown, Sandy GRAVEL; cemented.
345								
346								
347		36	5	100		GM		
348								
349								

Appendix 3

Log of Boring B 24

GEOCON

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
351		36	2	100		GM		
352								
353								
354		37	4	100				Dense, damp, gray, Silty, fine to medium SANDSTONE.
355								
356								
357								
358		37	5	100				-Becomes fine to coarse below 358 feet.
359								
360								
361								
362								
363		38	5	100				-Some gravel at 363.5 feet.
364								-Becomes fine to medium grained below 364.
365						SM		
366								
367								
368		35	5	100				
369								-Becomes fine to coarse grained below 369.
370								
371								
372								
373		39	5	100				-4-foot gravel bed at 372.5 feet.
374								

Appendix 3

GEOCON

Log of Boring B 24

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
376		39	5	100		SM		
377								-Becomes gray with orange to reddish staining below 377 feet.
378								
379		39	5	100				
380								
381								-Becomes dark reddish brown below 381 feet.
382								
383								
384		40	5	100				
385								
386								
387								
388								
389		40	5	100				Dense, damp, gray, fine to coarse, Sandy GRAVEL with interbedded sandstone.
390								
391						GM		-18-inch thick sandstone bed at 391 feet.
392								
393								
394		41	5	100				
395								-4-foot thick sandstone bed at 394.7 feet.
396								
397								
398		41	5	100				
399								

Appendix 3

GEOCON

Log of Boring B 24

Projec No.: 06847-42-06
Client:

Location:

Date: 9/30/21
Drilling Company:
Excavation Method: Hollow-Stem Auger
Boring Diameter: inches
Elevation: 479' feet above MSL
Geologist: T. REIST

Depth (Feet)	Elevation MSL (Feet)	Box	Run	% Rec	Recovery	USCS Class.	Lithology	Material Description
		41	5	100		GM		
401								BORING TERMINATED AT 401 FEET.

Appendix 3

APPENDIX B

APPENDIX B

LABORATORY TESTING

As part of our previous geotechnical studies, we performed laboratory tests in general accordance with the test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected samples to evaluate in-place dry density and moisture content, direct shear strength, Atterberg limits, and gradation. The results of the laboratory tests are presented in the following tables and graphs.

TABLE B-I
SUMMARY OF DIRECT SHEAR TEST RESULTS
(ASTM D 3080)

Sample No.	Geologic Unit	Dry Density (pcf)	Moisture Content (%)	Angle of Shear Resistance (degrees)	Unit Cohesion (psf)
LB3-3†*	Otay Formation	93.4	19.0	32	500
LB1-3**	Landslide Debris	101.0	25.9	31	135
LB4-9†**	Remolded Shear Plane	--	--	27	180
B1@215 ft	Otay Formation	121.2	6.1	45 (peak) 39 (ultimate)	3,260 (peak) 960 (ultimate)
B2@289 ft	Otay Formation	116.4	6.4	38 (peak) 29 (ultimate)	1,720 (peak) 600 (ultimate)
B3@394 ft	Otay Formation	113.5	8.9	49 (peak) 37 (ultimate)	1,550 (peak) 1,000 (ultimate)
B3@328–330 ft	Basal Shear Zone (Remolded)	107.4	18.3	21 (peak) 20 (ultimate)	150 (peak) 160 (ultimate)

†Sample remolded to approximately 90 percent of relative compaction near optimum moisture content.
*From Geocon October 2004
**From Geocon May 2006

TABLE B-II
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
ASTM D 4318

Sample No.	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index
B1@161-164 ft	66	27	39
B2@263 ft	40	21	19
B3@324 ft	51	23	28
B3@328-330 ft	35	18	17
B23@46 ft	52	19	33

TABLE B-III
RESIDUAL SHEAR STRENGTH VALUES FOR BASAL SLIDE PLANE
BASED ON STARK, CHOI, MCCONE (2005)

Sample No.	Liquid Limit	Percent Clay	Angle of Internal Friction (degrees)	Cohesion (psf)
B1@161 – 164 feet	66	27	11	50
B2@263 feet	40	10	24	20
B3@324 feet	51	22	15	60
B3@328-330 feet	35	14	22	60
B23@46 feet	52	30	16	57

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

SOUTHWEST VILLAGE
EMERGENCY VEHICLE ACCESS ROAD
SAN DIEGO, CALIFORNIA

PROJECT NO. 06847-42-04A

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

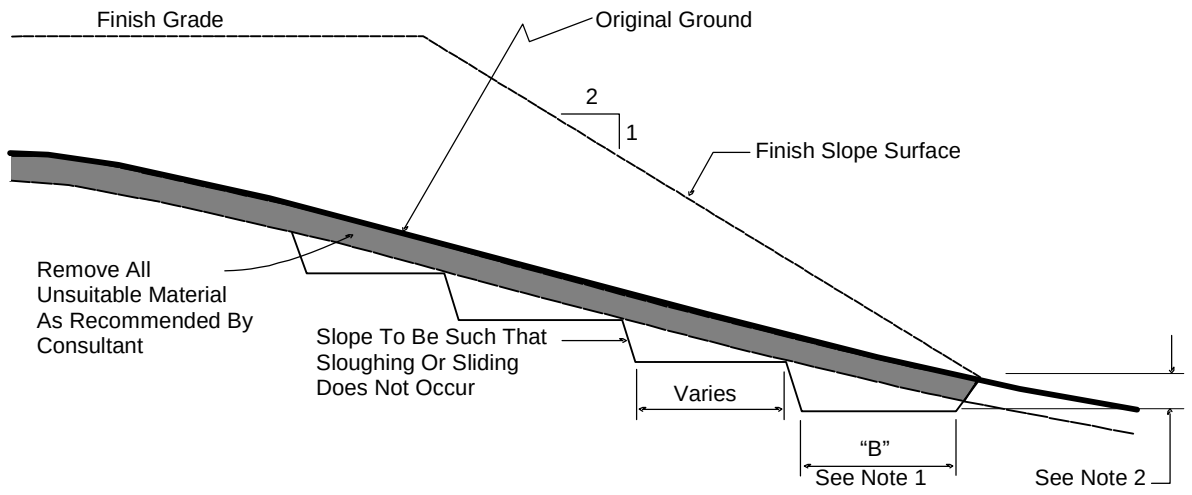
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material 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*

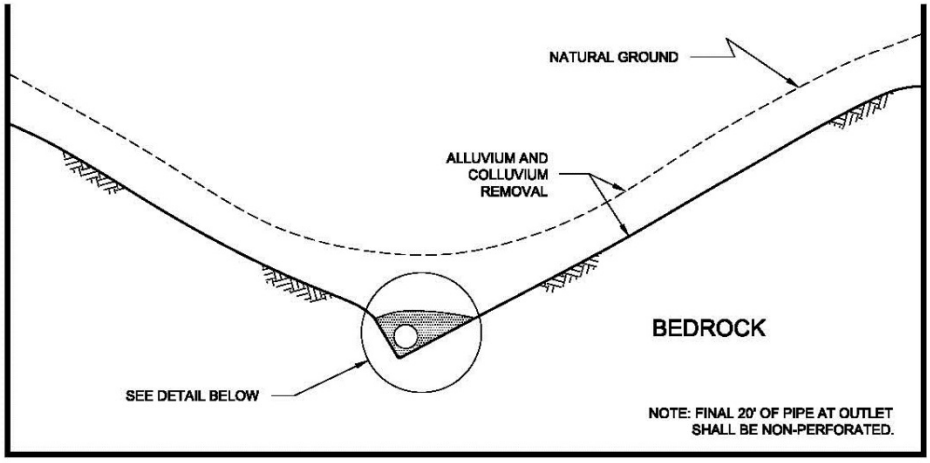
should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

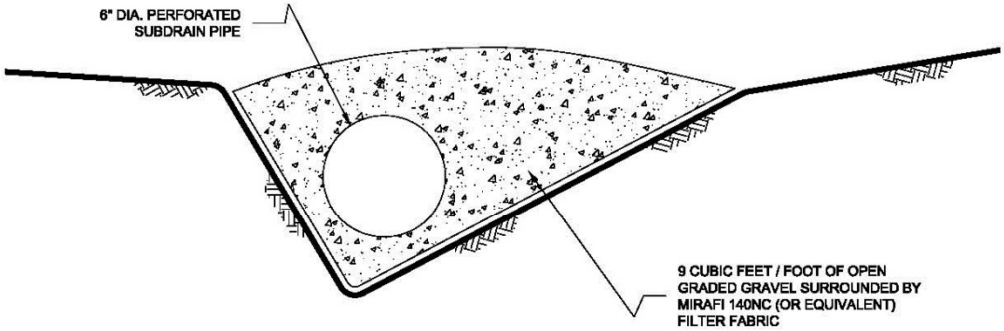
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

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:

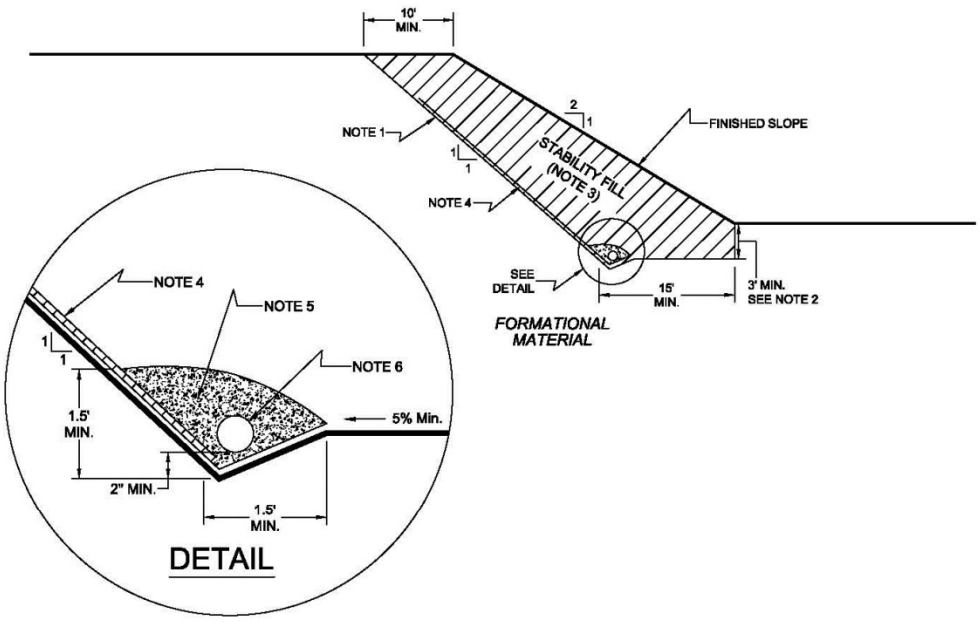
1.....6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

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

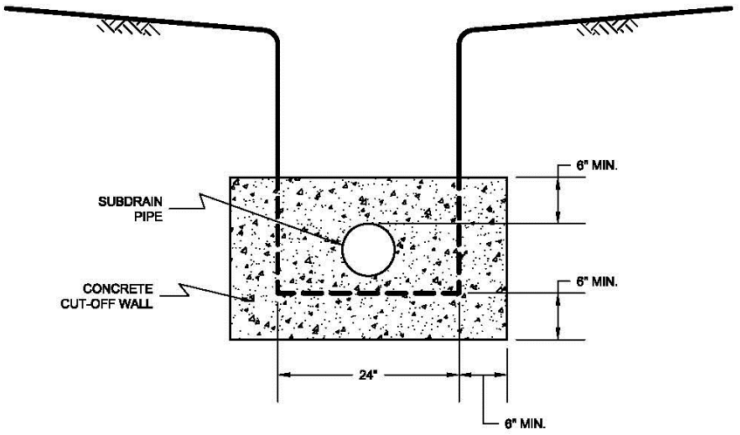
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing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

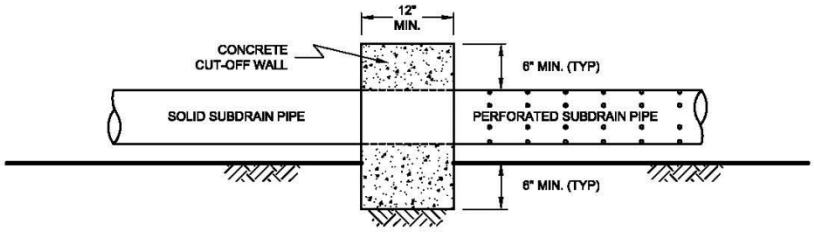
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

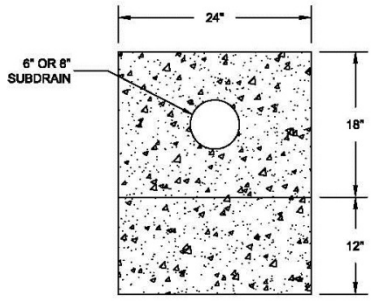


NO SCALE

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

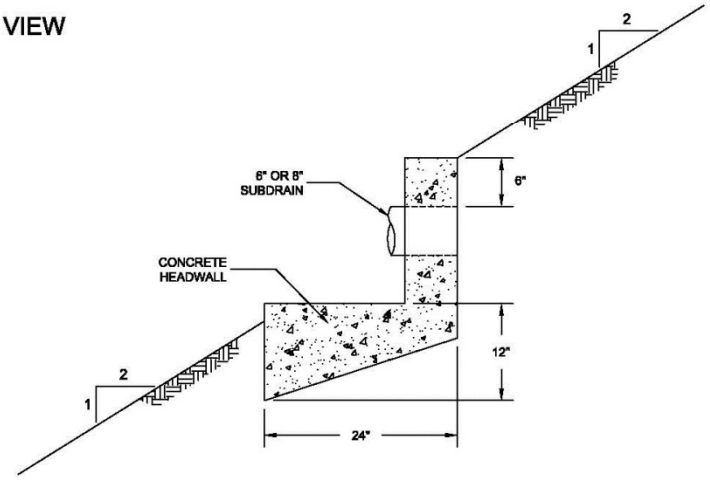
TYPICAL HEADWALL DETAIL

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. Abbott, P. L. and J. A. May, *Eocene Geologic History San Diego Region,* SEPM, Pacific Section, 1991.

2. Anderson, J. G., *Synthesis of Seismicity and Geologic Data in California,* U.S. Geologic Survey Open-File Report, 84-424, 1984, pp. 1-186.

3. *City of San Diego Seismic Safety Study, Geologic Hazards and Faults*, 2008 Edition.

4. California Geological Survey, formerly Division of Mines and Geology, *Landslide Hazards in the Southern Part of the San Diego County Metropolitan Area, San Diego County, California,* DMG Open-File Report 95-03, 1995.

5. California Geological Survey, *Seismic Shaking Hazards in California,* Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years. http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

6. Geocon Incorporated, *Geotechnical Investigation, Intermodal Transportation Center, San Ysidro, California*, dated May 21, 2001 (Project No. 06637-32-01).

7. Geocon Incorporated, *Geotechnical Feasibility Study, South Otay Mesa Property, San Diego, California*, dated October 4, 2002 (Project No. 06847-42-01).

8. Geocon Incorporated, *Update to Geotechnical Feasibility Study, Pipitone Lot Split – Parcel 2, South Otay Mesa Property, San Diego, California*, dated July 17, 2013 (Project No. 06847-42-02).

9. *Preliminary Geotechnical Investigation, Southwest Village, Vesting Tentative Map, San Diego, California,* prepared by Geocon Incorporated, dated March 28, 2019 (Project No. 06847-42-03).

10. Geocon Incorporated, *Supplemental Geotechnical Investigation and Slope Stability Analysis, Southwest Village VTM-1, San Diego, California*, dated June 25, 2021 (Project No. 06847-42-04).

11. Geocon Incorporated, *Preliminary Geotechnical Evaluation and Slope Stability Analysis, Southwest Village VTM-2 (Borrow/Fill Site), San Diego, California,* dated July 2, 2021 (Project No. 06847-42-04).

12. Jennings, C. W., *Fault Activity Map of California and Adjacent Areas,* California Geologic Survey, formerly Division of Mines and Geology, 1975 (revised 1987).

13. Kennedy, M. P., *Geology of the San Diego Metropolitan Area, California,* Bulletin 200, California Geological Survey, formerly Division of Mines and Geology, 1975.

14. Kennedy, M. P. and S. S. Tan, *Geologic Map of the San Diego 30'x60' Quadrangle, California*, USGS Regional Map Series Map No. 3, Scale 1:100,000, 2005.

15. Rick Engineering Company, *Landslide Hydrology Analysis for Southwest Village, Rick Engineering Job Number 15013-C*, dated April 21, 2021.

16. San Diego Association of Geologists, *Geology of Southwestern San Diego County, California and Northwestern Baja California,* edited by Gregory T. Ferrand, 1976.

17. Stark, Choi, McCone, 2005, *Journal of Geotechnical and Geoenvironmental Engineering, Drained Shear Strength Parameters for Analysis of Landslides.*

18. The Geological Society of America, *The Otay Mesa Lateral Spread, a Late Tertiary Mega Landslide in Metropolitan San Diego County, California*, by W.L. Vanderhurst, M.W. Hart and C. Warren, August, 2011.

19. USGS (2014), *U.S. Seismic Design Maps Web Application (version 3.1.0)*, http://earthquake.usgs.gov/designmaps/us/application.php.

20. USGS (2016), *Quaternary Fault and Fold Database of the United States:* U.S. Geological Survey website, http://earthquakes,usgs.gov/hazards/qfaults.

21. Unpublished reports, aerial photographs, and maps on file with Geocon Incorporated.

22. Wesnousky, S. G., *Earthquakes, Quaternary Faults, and Seismic Hazard in California,* Journal of Geophysical Research, Vol. 91, No. B12, 1986, pp. 12, 587, 631.