CHRISTIAN WHEELER
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REPORT OF GEOTECHNICAL INVESTIGATION

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET
SANTEE, CALIFORNIA

PREPARED FOR

NEW WEST INVESTMENT, INC.
565 NORTH MAGNOLIA AVENUE
EL CAJON, CALIFORNIA 92021

PREPARED BY

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June 24, 2020

New West Investment Inc.
565 North Magnolia Avenue
El Cajon, California 92021
Attention: James Cloud

CWE 2210096.01

Subject: **Report of Geotechnical Investigation**
11-Lot Residential Subdivision
9463 Slope Street, Santee, California

Ladies and Gentlemen:

In accordance with our Proposal dated April 28, 2021, we have completed an updated report of geotechnical investigation for the subject project. We are presenting herein our findings and recommendations.

In general, we found the subject property suitable for the proposed construction, provided the recommendations provided herein are followed. Based on the results of our investigation, the most significant geotechnical conditions to affect the proposed construction are the presence of potentially compressible near-surface soils that will require overexcavation and recompaction to provide a uniform bearing layer for the proposed improvements and the presence of moderately to very highly expansive soils. Specific design criteria are provided in the attached report.

If you have any questions after reviewing this report, please do not hesitate to contact our office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,

CHRISTIAN WHEELER ENGINEERING

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Distribution: (1) James Cloud via email

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9463 SLOPE STREET
SANTEE, CALIFORNIA

INTRODUCTION AND PROJECT DESCRIPTION

This report presents the results of an updated geotechnical investigation performed for a proposed 11-lot residential subdivision to be constructed at 9463 Slope Street, in the city of Santee, California. Figure Number 1, on the following page, presents a vicinity map showing the location of the project.

To assist in the preparation of this report, our firm has been given a Preliminary Grading Plan dated November 30, 2020. This plan was used as the base for our Site Plan and Geotechnical Map, which is included herewith as Plate Number 1. We have also been provided with laboratory test results presented by Alpine Engineering and have reviewed our previous geotechnical investigation performed for the site in 2006. Together, this information forms the basis of our understanding of the planned project. The previous subsurface explorations and laboratory testing data have been incorporated into the findings and recommendations presented in this report.

We understand that it is proposed to re-develop the site with an eleven-lot, residential subdivision. The new lots will be accessed by a cul-de-sac that connects to Slope Street and runs through the central portion of the development. The lots will support one- to two-story, single-family residences that are expected to be supported by conventional shallow foundations or post-tensioned concrete slabs/foundations. Site retaining walls of up to about 7 feet in height are also proposed. Grading to accommodate the proposed construction is expected to consist of cuts and fills of less than about 8 feet from existing site grades and engineered slopes will be created at inclinations of 2:1 (H:V) or flatter. A new 42-inch storm drain that will connect to the existing outfall in the southern portion of the site as well as additional wet and dry utilities are planned.

This report has been prepared for the exclusive use of New West Investment, Inc. and its consultants for specific application to the project described herein. Should the project be modified, the conclusions and recommendations presented in this report should be reviewed by Christian Wheeler Engineering for

SITE VICINITY

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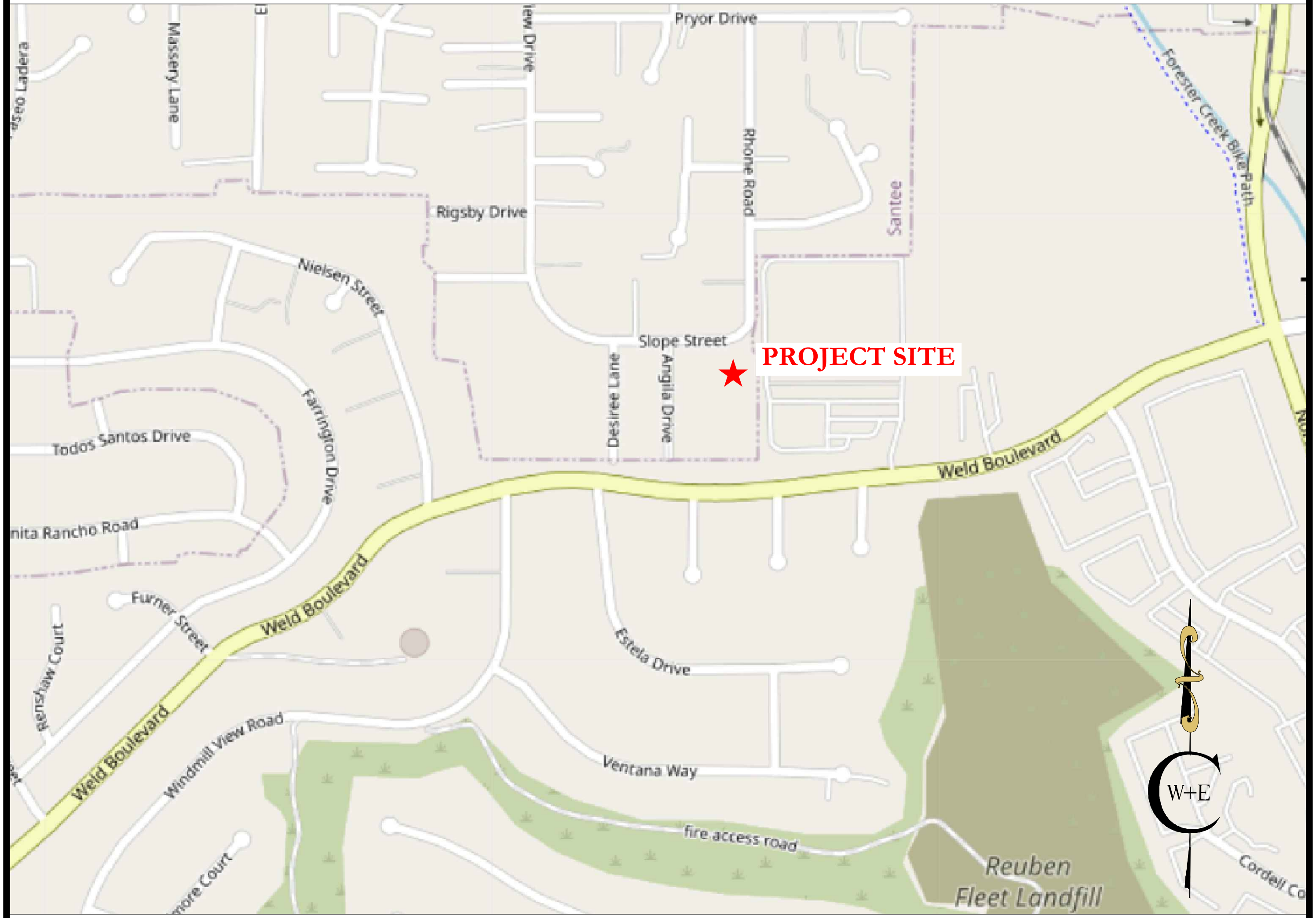

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET
SANTEE, CALIFORNIA

DATE: JUNE 2021

JOB NO.: 2210096.01

BY: SRD

FIGURE NO.: 1

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conformance with our recommendations and to determine whether any additional subsurface investigation, laboratory testing and/or recommendations are necessary. Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, expressed or implied.

PROJECT SCOPE

Our updated geotechnical investigation consisted of surface reconnaissance, review of our previous investigation, analysis of the previous field and laboratory data, and review relevant geologic literature. More specifically, our intent was to provide the services listed below.

- Perform a visual reconnaissance of the site to evaluate the current site conditions.
- Evaluate, by review of the previously conducted laboratory testing and subsurface explorations as well as our past experience with similar soil types, the engineering properties of the various soil strata that may influence the proposed construction, including bearing capacities, expansive characteristics and settlement potential.
- Describe the general geology at the site, including possible geologic hazards that could have an effect on the proposed construction, and provide the seismic design parameters in accordance with the 2019 edition of the California Building Code.
- Discuss potential construction difficulties that may be encountered due to soil conditions, groundwater or geologic hazards, and provide geotechnical recommendations to mitigate identified construction difficulties.
- Provide site preparation and grading recommendations for the anticipated work.
- Provide recommendations for temporary cut slopes and geotechnical design parameters for temporary shoring.
- Provide foundation recommendations for the type of construction anticipated and develop soil engineering design criteria for the recommended foundation designs.
- Provide design parameters for restrained and unrestrained retaining walls.
- Provide preliminary asphalt pavement recommendations based on an assumed R-value.
- Provide a preliminary geotechnical report, including a plot plan showing the location of our previous subsurface explorations, excavation logs, laboratory test results, and our conclusions and recommendations for the proposed project.

FINDINGS

SITE DESCRIPTION

The subject site is a nearly rectangular parcel of land located between Slope Street and Weld Boulevard, in the city of Santee, California. The property is located at 9463 Slope Street and is identified by Assessor's Parcel Number 384-232-03. It is bounded by Slope Street on the north, Weld Boulevard on the south, an industrial park on the east, and residential properties on the west. Topographically, the site slopes up gently from Slope Street, with on-site elevations varying from a low of about 410 feet to a high of 435 feet. Along the southern boundary of the site, there is a fill slope up to about 40 feet in height that ascends from the property to Weld Boulevard at an inclination ranging from 1.5:1 (H:V) to 1.8:1 (H:V). A storm drain daylights from the base of this fill slope into a natural drainage swale. This drainage swale crosses the property from about the center of the south boundary to the approximately center of the east boundary, where is empties into a storm drain on the adjacent, industrial park site. Two single-family residences and several sheds presently exist on the property.

GENERAL GEOLOGY AND SUBSURFACE CONDITIONS

GEOLOGIC SETTING AND SOIL DESCRIPTION: The subject site is located near the boundary between the Foothills and Coastal Plains Physiographic Provinces of San Diego County. Based on our subsurface explorations, and analysis of readily available, pertinent geologic literature, the site was determined to be underlain by minor amounts of artificial fill, Quaternary-age colluvial deposits, landslide debris, and Cretaceous-age granitics associated with the Southern California Batholith. These materials are described below in general order of increasing age:

> **ARTIFICIAL FILL (Qaf):** Relatively minor amounts of artificial fill were observed in three of our ten subsurface explorations. Where encountered, the fill material had a thickness of two feet or less and generally consisted of light to medium brown, silty sand (SM) and clayey sand (SC) with some trash and concrete debris. The fill was typically damp to moist and loose to medium dense in consistency. Based on our experience with similar soils, the on-site fill materials are expected to possess a low expansion index and, in their present condition, low strength parameters and a moderate settlement potential. The existing fill is considered unsuitable in its present condition to support fill and/or settlement-sensitive improvements, but may be used as structural fill.

COLLUVIUM (Qcol): An approximately 3- to 7-foot-thick layer of Quaternary-age colluvial deposits was encountered near the surface in six of our ten subsurface explorations. These materials are generally located in the lower, northern portion of the site and were noted to consist of medium to dark brown, damp to moist, loose, clayey sand (SC) with gravel and medium to dark reddish/grayish-brown, moist, medium stiff to stiff, sandy clay (CL) and silty clay (CH). Based on laboratory tests and experience with similar soils, the colluvial deposits are expected to possess a medium to very high expansion index and, in their current condition, low strength parameters and a moderate settlement potential. The colluvium is considered unsuitable in its present condition to support fill and/or settlement-sensitive improvements, but may be used as structural fill.

LANDSLIDE DEBRIS (Qls): Landslide debris was encountered within our four subsurface explorations performed in the southern portion of the site (see Plate No. 1). Based on our review of the referenced reports as well as published landslide maps, the subject site is located along the toe of a very large ancient landslide that is mapped to extend approximately 1,400 feet off-site to the south. Although the toe of this landslide is mapped near the northern property line of our site, adjacent to Slope Street, our subsurface explorations indicate that the toe actually traverses the central portion of the site. Based on the results of our subsurface explorations, the landslide debris increases in thickness towards the south and is up to approximately 30 feet deep near the southern property line. As discussed in their referenced Preliminary Soils Investigation, Benton Engineering, Inc. suggests that slide mass may have a thickness of up to 200 feet in its central portion, which is located to the south of the subject site (Benton, 1975). A geologic cross-section drawn through the landslide is presented herein on Plate No. 2.

Based upon information from previous borings drilled in the area and our recent subsurface explorations, the landslide has occurred in the slide-prone materials of the Friars Formation along a non-conformable contact between the Tertiary-age Friars Formation and the underlying Cretaceous-age granitic rock. The landslide materials consist of a mélange of medium brownish-gray to pale olive green, moist, medium stiff, sandy clays (CL and CH) and light brown to olive brown, moist, medium dense, clayey sand (SC)

Based on our laboratory tests and experience with similar soils, the landslide deposits are expected to possess a low to medium expansion index and, in their current condition, low to moderate strength parameters and a low to moderate settlement potential. The landslide debris is considered suitable in its present condition to support fill and/or settlement-sensitive improvements; however, the upper portions will require remedial grading as discussed in the "Earthwork and Grading" section of this report.

WEATHERED GRANITICS (Kgr): Granitic rock associated with the Southern California Batholith was encountered below the colluvium or landslide debris in eight of our ten subsurface explorations and is expected to underlie the entire site. The granitic materials encountered within our explorations generally consisted of medium grayish- to reddish-brown, well-graded sand-silty sand (SW-SM) that was damp to moist and dense to very dense in consistency. Based on the results of our laboratory testing, visual observation, and experience with similar materials in the vicinity of the site, we expect the weathered granitic material to generally possess a very low expansion potential, high strength parameters, and a low settlement potential. The weathered granitic rock is considered suitable in its present condition to support fill and/or settlement-sensitive improvements.

HYDROLOGIC SOIL GROUP: According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the site is located in the map unit designated Diablo clay (DaE). This material has a Hydrologic Soil Group rating of D. Group D soils have very slow infiltration rates when thoroughly wetted and a very slow rate of water transmission.

GROUNDWATER: Moderate seepage was observed with our boring B-2 at a depth of 28½ feet below existing grade, which corresponds to an approximate elevation of 401.5 feet M.S.L. In addition, very wet to nearly saturated soils are expected within the drainage gully that traverses the site. The very wet to saturated gully materials will need to be dried back prior to placement as structural fill. Additionally, it should be recognized that minor groundwater seepage problems may occur after development of a site even where none were present before development. These are usually minor phenomena and are often the result of an alteration of the permeability characteristics of the soil, an alteration in drainage patterns and an increase in irrigation water. Based on the permeability characteristics of the soil and the anticipated usage of the development, it is our opinion that any seepage problems which may occur will be minor in extent. It is further our opinion that these problems can be most effectively corrected on an individual basis if and when they develop.

TECTONIC SETTING: No active or potentially active faults are known to traverse the subject site. However, it should be noted that much of Southern California, including the San Diego County area, is characterized by a series of Quaternary-age fault zones that consist of several individual, en echelon faults that generally strike in a northerly to northwesterly direction. Some of these fault zones (and the individual faults within the zone) are classified as "active" according to the criteria of the California Division of Mines and Geology. Active fault zones are those that have shown conclusive evidence of faulting during the Holocene Epoch (the most recent 11,000 years). The Division of Mines and Geology used the term "potentially active" on Earthquake Fault Zone maps until 1988 to refer to all Quaternary-age (last 1.6 million years) faults for the purpose of evaluation for possible zonation in accordance with the Alquist-Priolo Earthquake Fault Zoning Act and identified all Quaternary-age faults as “potentially active” except for certain faults that were presumed to be inactive based on direct geologic evidence of inactivity during all of Holocene time or longer. Some faults considered to be “potentially active” would be considered to be “active” but lack specific criteria used by the State Geologist, such as *sufficiently active* and *well-defined*. Faults older than Quaternary-age are not specifically defined in Special Publication 42, Fault Rupture Hazard Zones in California, published by the California Division of Mines and Geology. However, it is generally accepted that faults showing no movement during the Quaternary period may be considered to be “inactive”.

A review of available geologic maps indicates that the active Rose Canyon Fault Zone is located approximately 20 kilometers southwest of the subject site. Other active fault zones in the region that could possibly affect the site include the Coronado Bank Fault Zone to the southwest, the Newport-Inglewood Fault Zone to the northwest, and the Elsinore, Earthquake Valley, and San Jacinto Fault Zones to the east.

TABLE I: PROXIMAL FAULT ZONES

Fault Zone	Distance
Rose Canyon	12 mi
Coronado Bank	24 mi
Elsinore (Julian)	29 mi
Newport-Inglewood	34 mi
Earthquake Valley	34 mi
San Jacinto	52 mi

GEOLOGIC HAZARDS

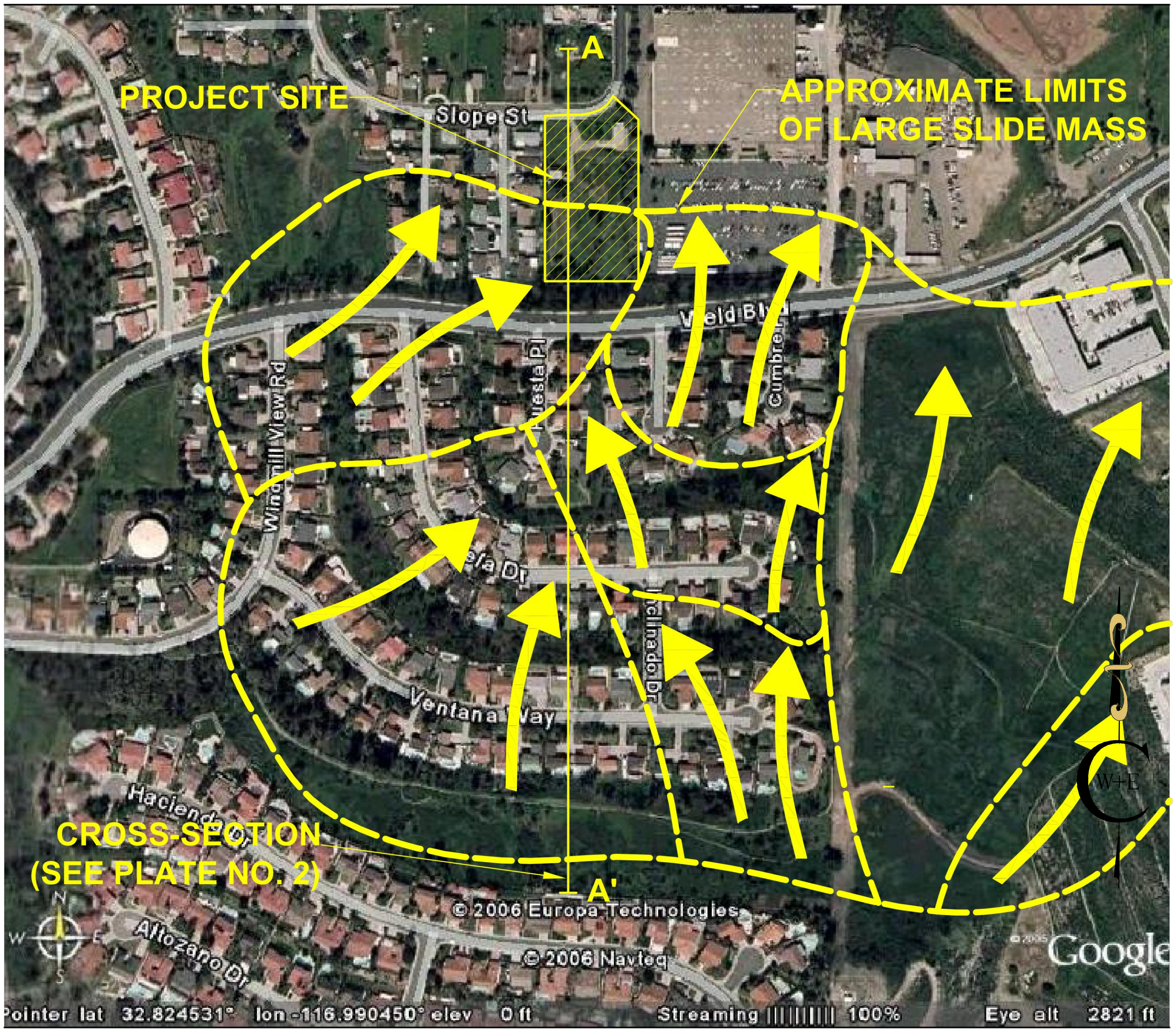
LANDSLIDE POTENTIAL AND SLOPE STABILITY: As part of our investigation, we reviewed the publication, “Landslide Hazards in the Southern Part of the San Diego Metropolitan Area" by Tan, 1995. This reference is a comprehensive study that classifies San Diego County into areas of relative landslide susceptibility. According to this publication, the site is located in Relative Landslide Susceptibility Area 4-2. Area 4 is considered to be “most susceptible” to landsliding. Subarea 4-2 is characterized by being located within the boundaries of definite mapped landslides.

We have also reviewed the Geotechnical Hazards Map of Santee, California, which is presented within the Geotechnical/Seismic Study for the Santee General Plan, prepared by Geocon, Inc, dated October 31, 2002. This map shows that the site is located near the toe of a very large slide mass extending to the south and east of the subject site, and is therefore within the Area D1 designation. “Area D1” is assigned to areas considered to be underlain by confirmed landslides. As discussed previously, this large slide mass was encountered by Benton Engineering, Inc. in their geotechnical investigation for the residential development south of the subject site. According to mapping presented by Benton, the mass extends approximately 1,400 to 1,500 feet to the south of the subject site and has an estimated thickness of up to about 200 feet. The approximate limits of this slide mass, based on our review of the above-mentioned reports as well as aerial photographs, are shown on Figure No. 2 on the following page. The reports by Benton indicate that the slopes of the adjacent development were stabilized by the construction of buttress fills in order to prevent localized slope failures and that special compaction requirements were required for the existing fill slope below Weld Boulevard; however, they do not indicate that any stabilization methods were used for the large slide mass. Additionally, our research at the City of Santee as well as the City of El Cajon did not produce any documentation regarding the stabilization of the existing large slide mass.

Based on our investigation, we have determined that the toe of the large slide mass actually traverses the central portion of the site, with the slide having a thickness of up to about 30 feet along the southern property line. A quantitative evaluation of the large slide mass was beyond the scope of our services and, given its significant area, would require a substantial geotechnical investigation. As noted above, it does not appear that any stabilization methods were applied to this large slide mass prior to the construction of the existing development to the south of the subject site, which is located above much of the central portion of the slide. As such, it should be recognized that reactivation of this landslide could occur at some point in the future. Although reactivation of this landslide is possible, it is our opinion that the subject site does not possess any greater risk of landsliding than the adjacent sites and that, based on the relatively minimal amount of proposed site grading, the proposed development will not significantly increase the possibility of reactivating the existing slide. Additionally, given the facts that the adjacent residential developments to the south of the site, within the upper portions of the landslide complex, are over 40 years old and that future changes in irrigation of these developed areas are unlikely, significant variations in the groundwater conditions that may adversely affect the stability of the slide mass are considered unlikely. That being stated, it is our opinion that the subject site does not possess any greater risk of landsliding than the adjacent sites and that, based on its relatively minimal grading, the proposed development will not increase the possibility of reactivating the existing, ancient landslide.

In addition, although there are no significant slopes either existing or proposed on the subject property, there is an up to approximately 40-foot-high, 1½:1 (H:V) fill slope adjacent to the southern property line that ascends from the subject property to Weld Boulevard. This fill slope was constructed in 1975/1976 during the grading for the adjacent subdivision to the south and is addressed in the Benton reports, which indicate that the outer 50 feet of the slope below a depth of 25 feet below finish grade were compacted to a relative

LANDSLIDE MAP



SCALE: 1" ≈ 400'

11-LOT RESIDENTIAL SUBDIVISION
9643 SLOPE STREET
SANTEE, CALIFORNIA

DATE:	JUNE 2021	JOB NO.:	2210096.01
BY:	SRD	FIGURE NO.:	2

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compaction of at least 95 percent. We understand that a small surficial failure occurred in the upper portion of this slope, just west of the subject site, sometime in the early 1980's. The failure area was repaired by installing 30-inch-diameter piers to an approximate depth of 28 feet at a spacing of 7.5 feet and backfilling the failed area behind the piers. Also, a series of subdrains was installed below the face of the slope to carry drainage to a concrete brow ditch at the bottom of the slope. Although the piers were installed only on the portion of the slope west of the subject property, it appears that some of the subdrains were placed on the portion of the slope adjacent to the subject property.

SEISMIC HAZARD: A likely geologic hazard to affect the site is ground shaking as a result of movement along one of the major active fault zones mentioned in the "Tectonic Setting" section of this report. Seismic design parameters were determined in accordance with Chapter 16 of the *2019 California Building Code (CBC)* and the applicable sections of *ASCE/SEI 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. For the subject site, measured and estimated blow counts within the underlying granitics indicate that the upper 100 feet of geologic subgrade can be characterized as Soil Site Class C.

TABLE II: CBC 2019/ASCE 7-16 – SEISMIC DESIGN PARAMETERS

CBC – Chapter 16 Section	Seismic Design Parameter	Recommended Value
Section 1613.2.2	Soil Site Class	C
Figure 1613.2.1 (1)	MCE_R Acceleration for Short Periods (0.2 sec), S_s	0.773 g
Figure 1613.2.1 (2)	MCE_R Acceleration for 1.0 Sec Periods (1.0 sec), S_1	0.284 g
Table 1613.2.3 (1)	Site Coefficient, F_a	1.200
Table 1613.3.3 (2)	Site Coefficient, F_v	1.500
Section 1613.2.3	S_{MS} = MCE_R Spectral Response at 0.2 sec. = $(S_s)(F_a)$	0.928 g
Section 1613.2.3	S_{M1} = MCE_R Spectral Response at 1.0 sec. = $(S_1)(F_v)$	0.426 g
Section 1613.2.4	S_{DS} = Design Spectral Response at 0.2 sec. = $2/3(S_{MS})$	0.619 g
Section 1613.2.4	S_{D1} = Design Spectral Response at 1.0 sec. = $2/3(S_{M1})$	0.284 g
Section 1613.2.5	Seismic Design Category	D
ASCE 7-16 Fig. 22-14	Mapped Long-Period Transition Period, T_L	8 sec
Section 1803.2.12	PGA_M per Section 11.8.3 of ASCE 7	0.40 g

LIQUEFACTION: The near-surface soils encountered at the site are not considered susceptible to liquefaction due to such factors as soil density, grain-size distribution, plasticity and the absence of shallow groundwater conditions.

FLOODING: As delineated on Flood Insurance Rate Map (FIRM) 06073C1653G prepared by the Federal Emergency Management Agency, the site is located within an area of minimal flood hazard.

TSUNAMIS: Tsunamis are great sea waves produced by submarine earthquakes or volcanic eruptions. The risk potential for damage to the subject site caused by tsunamis is very low.

SEICHES: Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays or reservoirs. The risk potential for damage to the subject site caused by seiches is very low.

CONCLUSIONS

It is our professional opinion and judgment that no geotechnical conditions exist on the subject property which would preclude the development of the residential subdivision as presently proposed, provided the recommendations presented herein are followed. Based on our investigation, the following are the most significant geologic and geotechnical items to affect the proposed development:

- The southern portion of the site is underlain by the toe of a relatively large, ancient landslide that is expected to extend approximately 1,400 to 1,500 feet off-site to the south and to have a maximum thickness on the order of 200 feet. Based on our subsurface explorations, the downhill extent of the slide materials terminates near the central portion of the site and the slide debris has a thickness of up to about 30 feet along the southern property line. Based on our review of the referenced geotechnical reports by Benton Engineering, Inc. for the adjacent development to the south, as well as on our research at the Cities of Santee and El Cajon, it does not appear that any stabilization methods have been applied to the existing slide mass. As such, it should be recognized that the possibility of future reactivation of this landslide cannot be completely ruled out. Although reactivation of this landslide is possible, it is our professional opinion and judgement that the subject site does not possess any greater risk of landsliding than the adjacent, developed sites and that, based on the relatively minimal amount of proposed site grading, the proposed development will not significantly increase the possibility of reactivating the existing slide mass. Additionally, given the facts that the adjacent residential developments to the south of the site, within the upper portions of the landslide complex, are over 40 years old and that future changes in irrigation of these developed areas are unlikely, significant variations in the groundwater conditions that may adversely affect the stability of the slide mass are considered unlikely. It should also be noted that based on the size of the subject property compared to the size of the landslide mass, it is not considered feasible to design an on-site slope stabilization procedure that would serve to increase the stability of the large landslide mass described above.

- In addition to the landslide mass in its southern portion, the site is also underlain by a surficial veneer of colluvial deposits in the northern portion. In order to support the proposed development, the upper portion of the landslide debris and all existing colluvium that are not removed by the planned site grading will need to be overexcavated and replaced as properly compacted fill. Specific recommendations are presented in the "Grading and Earthwork" section of this report.

- Much of the on-site colluvium and landslide debris is expected to have a medium to very high expansion index. It should be realized that supporting the proposed improvements on expansive material can result in significant distress to lightly loaded structures such as one- or two-story residences. For the residences, the potential for distress can be largely mitigated by a combination of soil mixing and placement techniques combined with the use of deepened conventional foundations or post-tensioned slabs. Specifically, the on-site clayey soil can be mixed with the on-site sands (granitics) and/or imported sands in order to produce a blend that has only a "medium" expansion index rather than a "high" or "very high" expansion index. Additionally, this blended material can be placed at an elevated moisture content in order to reduce the amount of potential heave.

- Routine maintenance and possible replacement can be expected for lightweight exterior improvements, such as pavements and concrete flatwork, underlain by expansive soil. The potential for expansion can be largely mitigated through the grading techniques discussed above and by maintaining proper drainage and limiting irrigation to only the amount necessary to sustain plant life. Additional mitigation can be achieved by placing a two-foot-thick mat of sandy soils with an expansion index of 50 or less below the improvements; however, the decision to do so is an economic decision that will need to be made by the owner. It may be more cost effective for this project to provide occasional maintenance, repair and/or replacement of light exterior improvements if necessary.

- Other than the existing landslide, the site is located in an area that is relatively free of geologic hazards that will have a significant effect on the proposed development. In addition to the existing ancient slide mass, the most significant geologic hazard that could affect the site is ground shaking due to seismic activity along one of the regional active faults. However, construction in accordance with the requirements of the most recent edition of the California Building Code and the local governmental agencies should provide a level of life-safety suitable for the type of development proposed.

RECOMMENDATIONS

GRADING AND EARTHWORK

GENERAL: All grading should conform to the guidelines presented in Appendix J of the California Building Code, the minimum requirements of the City of Santee, and the recommended Grading Specifications and Special Provisions attached hereto, except where specifically superseded in the text of this report. Prior to grading, a representative of Christian Wheeler Engineering should be present at the pre-construction meeting to provide additional grading guidelines, if necessary, and to review the earthwork schedule.

OBSERVATION OF GRADING: Continuous observation by the Geotechnical Consultant is essential during the grading operation to confirm conditions anticipated by our investigation, to allow adjustments in design criteria to reflect actual field conditions exposed, and to determine that the grading proceeds in general accordance with the recommendations contained herein.

CLEARING AND GRUBBING: Site preparation should begin with the removal of the existing improvements that are designated for demolition. The removals should include all abandoned utilities, foundations, slabs, vegetation, construction debris and other deleterious materials from the site. This should include all significant root material. The resulting materials should be disposed of off-site in a legal dumpsite.

REMEDIAL GRADING: We recommend that the existing fill, colluvium, and/or landslide debris be overexcavated in areas to support new fill and/or settlement-sensitive improvements including the residences, pavements, retaining walls, and concrete flatwork. In general, the overexcavation should extend vertically to the contact with competent granitic material or 8 feet below the pad grade, whichever is shallower. The minimum overexcation depth is 3 feet below the planned pad grade. For site retaining walls, the overexcavation should extend at least 2 feet below the bottom of footing elevation. Laterally, the overexcavation should include all areas to receive fill and extend at least 5 feet outside the improvements or to the property line, whichever distance is least. Along the southern side of the project, the overexcavation should extend to the toe of the cut slopes (see Plate No. 1). The Geotechnical Consultant should observe the overexcavation operations and the base of removal areas prior to either filling or the construction of improvements.

Once the Geotechnical Consultant has observed the removal bottom, it should be prepared in accordance with the "Processing of Fill Areas" section of this report. Once the bottom has been prepared, the removed soils may be placed as properly compacted fill. All fill should be placed in accordance with the "Compaction and Method of Filling" section of this report.

SELECT GRADING: The existing on-site material can be replaced as structural fill, but the expansive clays should be mixed with either on-site or imported sands in order to produce a blend that has at most a "medium" expansion index (E.I. between 51 and 90). Additionally, the fill should be placed in accordance with the special moisture and compaction requirements presented in the "Compaction and Method of Filling" section of this report. As discussed previously, these site preparation recommendations will necessitate that the proposed structures be designed for the moderately expansive soil condition; however, the exterior improvements such as pavements, sidewalks, driveways, and patios will still be subject to potential heave damage. If it is desired to further reduce the potential for heave damage to these exterior improvements, the areas to support said improvements should be capped with an at least two-foot-thick layer of non-detrimentally expansive (E.I. ≤ 50) material. This cap should extend at least two feet outside the improvement area.

TEST TRENCH BACKFILL: Backfill associated with our subsurface explorations and those performed on-site by others that is not removed as part of site preparation operations should be removed and replaced as compacted fill.

PROCESSING OF REMOVAL BOTTOM: Prior to placing any new fill soils in removal areas that have been observed by our field personnel, the exposed soils should be scarified to a depth of at least 8 inches, moisture-conditioned, and compacted in accordance with the following sections.

STABILIZATION: If soft, pumping, or otherwise unsuitable soils are encountered that cannot be properly compacted, it will be necessary to remove the unstable soil to a competent stratum and replace it with soil that is suitable for compaction. Alternatively, wet soil can be allowed to dry back to a moisture content that allows proper compaction. Other methods of stabilization such as geosynthetic reinforcement, rock blankets, or chemical admixture can be discussed during construction upon request.

FILL SOIL AND METHOD OF COMPACTION: Fill and backfill soil should be thoroughly mixed and placed at a moisture content at least 3 percent above optimum moisture content, in lifts 6 to 8 inches thick, with each lift compacted by mechanical means. Fills should consist of approved earth material, free of trash or debris, roots, vegetation, or other materials determined to be unsuitable by our field personnel. Fill material should be free of rocks or lumps of soil in excess of 12 inches in maximum dimension. However, in the upper 5 feet of pad grade, no rocks or lumps of soil in excess of 6 inches should be allowed. Subgrade soil should be free of rocks or lumps of soil in excess of 3 inches.

SUBGRADE PREPARATION: Subgrade is considered to be the upper 12 inches of soil in areas to support surface improvements such as vehicular pavements other roadway structures, flatwork, curbs and gutters, driveways, or sidewalks. Preparation of subgrade should be performed just prior to the placement of subbase, aggregate base, or the surface improvement, and should not be considered to be completed as part of the mass grading requirements or operation. The preparation of subgrade should result in a uniform soil having a moisture content that is minus 1 percent of optimum or wetter just prior to compaction. Achieving this condition will likely require the contractor to scarify, overexcavate, or otherwise loosen the subgrade soil and perform moisture-conditioning by adding water or allowing the existing material to dry. The moisture-conditioned material should be thoroughly mixed and compacted. Proof rolling with a fully loaded water truck may be requested in order to verify that a uniform, stable subgrade has been achieved. Areas that exhibit rutting, pumping, yielding, and/or low compaction should be stabilized as discussed above.

SLOPE CONSTRUCTION: Cut and fill slopes up to about 5 feet in height are proposed. Cut and fill slopes should be constructed at an inclination of 2:1 (horizontal to vertical) or flatter. Compaction of fill slopes should be performed by back-rolling with a sheepsfoot compactor at vertical intervals of 4 feet or less as the fill is being placed, and track-walking the face of the slope when the slope is completed. As an alternative, the fill slopes may be overfilled by at least three feet and then cut back to the compacted core at the design line and grade.

In areas to support fill slopes, keys should be cut into the competent supporting materials. The keys should be at least 8 feet wide and be sloped back into the hillside at least two percent. The keys should extend at least 1 foot into the competent supporting materials. Where the existing ground has a slope of 5:1 (horizontal to vertical) or steeper, it should be benched into as the fill extends upward from the keyways. The benching should remove all loose surficial soils and should create level areas on which to place the fill material.

The placement of cohesionless soils within 10 feet of the face of slopes should be avoided. Slopes should be planted as soon as feasible after grading. Sloughing, deep rilling and slumping of surficial soils may be anticipated if slopes are left unplanted for a long period of time, especially during the rainy season. Irrigation of slopes should be carefully monitored to verify that only the minimum amount necessary to sustain plant life is used. Over-irrigating could be extremely erosive and should be avoided.

COMPACTION REQUIREMENTS: All structural fill placed at the site should be compacted to a relative compaction of at least 90 percent of its maximum dry density as determined by ASTM Laboratory Test D1557. In areas to support vehicular pavements, the upper 12 inches of subgrade and the aggregate base course should be compacted to at least 95 percent of the material's maximum dry density.

IMPORTED FILL MATERIAL: Soils to be imported to the site should be evaluated and approved by the Geotechnical Consultant prior to being imported. At least five working days-notice of a potential import source should be given to the Geotechnical Consultant so that appropriate testing can be accomplished. The type of material considered most desirable for import is granular material containing some silt or clay binder, which has an Expansion Index of less than 50. Less than 25 percent of the material should be larger than the Standard #4 sieve, and less than 25 percent finer than the Standard # 200 sieve. Soils not meeting these criteria should not be used for structural fill or backfill.

EXCAVATION CHRACTERISTICS: Based on our exploratory excavations, the subsurface materials at the site appear to be excavatable to the anticipated grading depths with conventional heavy-duty earthmoving equipment in good operating condition. Significant caving of the exploratory excavations was not encountered at the time of our subsurface explorations. Deeper excavations for site utilities may encounter zones of hard rock that require additional effort to excavate such as splitting or breaking.

DEWATERING: We expect that the excavations for the proposed structures and utilities will be above the local water table; however, the excavations may encounter very wet soil. In this case, it could be necessary to perform localized dewatering during construction to remove water from the excavation.

TEMPORARY CUT SLOPES: The contractor is solely responsible for designing and constructing stable, temporary excavations and will need to shore, slope, or bench the sides of trench excavations as required to maintain the stability of the excavation sides. The contractor's "competent person", as defined in the OSHA Construction Standards for Excavations, 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety process. We anticipate that the existing on-site soils will consist of Type C material. Our firm should be contacted to observe all temporary cut slopes during grading to ascertain that no unforeseen adverse conditions exist. No surcharge loads such as foundation loads, or soil or equipment stockpiles, vehicles, etc. should be allowed within a distance from the top of temporary slopes equal to half the slope height.

Temporary slopes up to about 15 feet in height are anticipated to be required during remedial grading. Unconfined temporary slopes up to 15 feet in height can be excavated at an inclination of 1.0 to 1.0 (horizontal to vertical) or flatter provided they are excavated and filled on the same day. Where there is not room to construct temporary slopes, temporary shoring of the excavation sides may be necessary. Geotechnical design parameters for temporary shoring are included in the next section of this report.

SURFACE DRAINAGE: The ground around the proposed structure should be graded so that surface water flows rapidly away from the structure without ponding. In general, we recommend that the ground adjacent to structure slope away at a gradient of at least two percent. Densely vegetated areas where runoff can be impaired should have a minimum gradient of five percent within the first five feet from the structure. Rain gutters with downspouts that discharge runoff away from the structure into controlled drainage devices are also recommended. It is our opinion that storm water systems incorporating infiltration are not appropriate for the site due to the potential for hydro-consolidation and/or expansion of the site soils.

GRADING PLAN REVIEW: The final grading plans should be submitted to this office for review in order to ascertain that the geotechnical recommendations remain applicable to the final plan and that no additional recommendations are needed due to changes in the anticipated development. Our firm should be notified of changes to the proposed project that could necessitate revisions of or additions to the information contained herein.

TEMPORARY SHORING

GENERAL: Where it is not possible to construct temporary cut slopes in accordance with the previously recommended criteria, it will be necessary to use temporary shoring to support the proposed excavations. For shoring systems, we considered the use of cantilevered soldier pile walls and soldier pile walls using tieback anchors or internal bracing (rakers). Based on shored heights of less than 15 feet, we are including herein recommendations for cantilevered walls. We recommend that a specialty contractor with experience in shoring and bracing provide the shoring recommendations and plans. It is recommended that a "survey" be made of adjacent properties and structures prior to the start of grading and excavation in order to establish the existing condition of existing neighboring structures and to reduce the possibility of potential damage claims as a result of site grading.

SHORING DESIGN AND LATERAL PRESSURES: For design of cantilevered shoring, a triangular distribution of lateral earth pressure may be used. It may be assumed that retained soils having a level surface behind the cantilevered shoring will exert a lateral pressure equal to that developed by a fluid with a density of 35 pounds per cubic foot (pcf). For 2:1 (H:V) sloping backfill the equivalent fluid pressure should be increased to 55 pcf. Cantilevered shoring is normally limited to excavations that do not exceed approximately 15 feet in depth in order to limit the deflection at the tops of the soldier piles.

DESIGN OF SOLDIER PILES: Soldier piles should be spaced no closer than two diameters on center. The ultimate lateral bearing value (passive value) of the soils below the level of excavation may be assumed to be 300 pounds per square foot per foot of depth from the excavated surface, up to a maximum of 4,500 pounds per square foot. The lateral bearing can be applied over a horizontal distance equal to twice the pile diameter. To develop the full lateral value, provisions should be made to assure firm contact between the soldier piles and the undisturbed soils. The concrete placed in the soldier pile excavations should be of sufficient strength to adequately transfer the imposed loads to the surrounding soils.

LAGGING: Continuous lagging will be required between the soldier piles. The soldier piles and anchors should be designed for the full anticipated lateral pressure. However, the pressure on the lagging will likely be somewhat less due to arching in the soils. We recommend that the lagging be designed for a semi-circular distribution of earth pressure where the maximum pressure is 400 pounds per square foot at the mid-point between soldier piles, and zero pounds per square foot at the soldier piles. This value does not include any surcharge pressures.

DEFLECTIONS: We recommend, from a geotechnical standpoint, that the deflection at the top of the shoring not exceed about one inch. If greater deflection occurs during construction, additional bracing may be necessary. If desired to reduce the deflection of the shoring, a greater lateral earth pressure could be used in the shoring design.

MONITORING: Some means of monitoring the performance of the shoring system is recommended. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of the soldier piles approximately every 50 lineal feet. We will be pleased to discuss this further with the design consultants and the contractor when the design of the shoring system has been finalized.

CONVENTIONAL SHALLOW FOUNDATIONS

GENERAL: It is our opinion that the proposed residences and site retaining walls may be supported by conventional continuous and isolated spread footings. The following recommendations are considered the minimum based on the anticipated soil conditions anticipated after the recommendations contained in this report are implemented and are not intended to be in lieu of structural considerations. All foundations should be designed by a qualified structural engineer.

MINIMUM DIMENSIONS: New spread footings supporting the planned residences should be embedded at least 24 inches below the finish pad grade. Continuous and isolated footings should have minimum widths of 12 and 24 inches, respectively. Retaining wall footings should be embedded at least 18 inches below the lowest adjacent finish grade and should have a minimum width of 24 inches.

ALLOWABLE BEARING PRESSURE: Residence footings with the above minimum dimensions may be designed for an allowable soil bearing pressure of 2,500 pounds per square foot (psf) for dead plus live load conditions. Site retaining wall footings may be designed for an allowable soil bearing pressure of 1,000 psf. The allowable bearing capacity may be increased by one-third for combinations of temporary loads, such as those due to wind or seismic loads.

FOOTING REINFORCING: Reinforcement requirements for foundations should be provided by a structural engineer. However, based on the anticipated soil conditions, we recommend that the minimum reinforcing for continuous footings consist of at least two No. 4 bars positioned near the bottom of the footing and at least two No. 4 bars positioned near the top of the footing.

LATERAL LOAD RESISTANCE: Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.35. The passive resistance may be considered to be equal to an equivalent fluid weight of 350 pounds per cubic foot. This assumes the footings are poured tight against undisturbed soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

SETTLEMENT CHARACTERISTICS: Provided the recommendations presented in this report are followed, the anticipated total and differential foundation settlement is expected to be less than about 1 inch and 1 inch over 40 feet, respectively. It should be recognized that minor cracks normally occur in concrete slabs and foundations due to shrinkage during curing or redistribution of stresses, therefore some cracks should be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

EXPANSIVE CHARACTERISTICS: The anticipated foundation soils are expected to have a medium expansion potential (50<EI<91). The recommendations presented in this report reflect this condition.

POST-TENSIONED FOUNDATIONS

As an alternative to conventional shallow foundations, post-tensioned foundations could be used to support the proposed residences. Post-tensioned foundations should be designed in accordance with the design procedures of the Post-Tension Institute, using the design criteria presented below in Table III and the applicable information from the "Conventional Shallow Foundations" section above.

TABLE III: POST-TENSION DESIGN CRITERIA

Post-Tensioning Institute (PTI) – 3rd Edition	**Design Value**
Edge Moisture Variation, e_m	
Center Lift (ft)	8.7
Edge Lift (ft)	4.5
Differential Soil Movement, y_m	
Center Lift (in)	0.42
Edge Lift (in)	1.10

CORROSIVITY

The water-soluble sulfate content was determined in accordance with California Test Method 417 for two representative soil samples from the site. The results of these tests indicate that the foundation soils may be categorized as negligible (S0) per *ACI 318: Building Code Requirements for Structural Concrete*.

It should be understood Christian Wheeler Engineering does not practice corrosion engineering. If such an analysis is considered necessary, we recommend that the client retain an engineering firm that specializes in this field to consult with them on this matter. The results of our tests should only be used as a guideline to determine if additional testing and analysis is necessary.

ON-GRADE SLABS

GENERAL: It is our understanding that the floor systems of the proposed structure will consist of a concrete slab-on-grade. The following recommendations are considered the minimum requirements for conventional slabs based on the soil conditions and are not intended to be in lieu of structural considerations. Post-tension slabs will be designed by others.

INTERIOR SLAB: From a geotechnical perspective, we recommend that the minimum floor slab thickness be 6 inches and that the floor slab be reinforced with at least No. 3 reinforcing bars placed at 18 inches on center each. Slab reinforcement should be supported on chairs such that the reinforcing bars are positioned at mid-height in the floor slab. The slab reinforcement should extend into the perimeter foundations at least six inches. The owner and the project structural engineer should determine if the on-grade slabs need to be designed for special loading conditions. For such cases, a subgrade modulus of 100 pounds per cubic inch can be assumed for the subgrade provided it is prepared as recommended in this report. The allowable bearing load for the slab is 1,500 pounds per square foot.

UNDER-SLAB VAPOR RETARDERS: Where floor coverings are installed, steps should be taken to minimize the transmission of moisture vapor from the subsoil through the interior slabs where it can potentially damage the interior floor coverings. We recommend that the owner/contractor follow national standards for the installation of vapor retarders below interior slabs as presented in currently published standards including ACI 302, "Guide to Concrete Floor and Slab Construction" and ASTM E1643, "Standard Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs". If sand is placed above or below the vapor retarding material, it should have a sand equivalent of at least 30 and contain less than 20% passing the Number 100 sieve and less than 10% passing the Number 200 sieve.

EXTERIOR CONCRETE FLATWORK: Exterior concrete on-grade slabs should have a minimum thickness of 4 inches. Exterior slabs abutting perimeter foundations should be doweled into the footings. All slabs should be provided with weakened plane joints in accordance with the American Concrete Institute (ACI) guidelines. Alternative patterns consistent with ACI guidelines can also be used. A concrete mix with a 1-inch maximum aggregate size and a water/cement ratio of less than 0.6 is recommended for exterior slabs. Lower water content will decrease the potential for shrinkage cracks. Both coarse and fine aggregate should conform to the latest edition of the "Standard Specifications for Public Works Construction" ('Greenbook"). Special attention should be paid to the method of concrete curing to reduce the potential for excessive shrinkage and resultant random cracking. It should be recognized that minor cracks occur normally in concrete slabs due to shrinkage. Some shrinkage cracks should be expected and are not necessarily an indication of excessive movement or structural distress.

EARTH RETAINING WALLS

PASSIVE PRESSURE: The passive pressure for the prevailing soil conditions may be considered to be 350 pounds per square foot per foot of depth. This pressure may be increased one-third for seismic loading. The coefficient of friction for concrete to soil may be assumed to be 0.35 for the resistance to lateral movement. When combining frictional and passive resistance, the friction should be reduced by one-third. The upper 12 inches of exterior retaining wall footings should not be included in passive pressure calculations where abutted by landscaped areas.

ACTIVE PRESSURE: The active soil pressure for the design of unrestrained and restrained earth retaining structures with level backfill surface may be assumed to be equivalent to the pressure of a fluid weighing 40 and 60 pounds per cubic foot, respectively. Thirty percent of any area surcharge placed adjacent to the retaining wall may be assumed to act as a uniform horizontal pressure against the wall. Where vehicles will be allowed within ten feet of the retaining wall, a uniform horizontal pressure of 100 pounds per square foot should be added to the upper 10 feet of the retaining wall to account for the effects of adjacent traffic. Seismic pressure can be assumed to be equivalent to the pressure of a fluid weighing 10 pounds per cubic foot. Special cases such as a combination of shored and sloping temporary slopes, or other surcharge loads not described above, may require an increase in the design values recommended above. These conditions should be evaluated by the project geotechnical engineer on a case-by-case basis. If any other loads are anticipated, the Geotechnical Consultant should be contacted for the necessary increase in soil pressure. All values are based on a drained backfill condition.

WATERPROOFING AND SUBDRAINS: The project architect should provide (or coordinate) waterproofing details for the retaining walls. The design values presented above are based on a drained backfill condition and do not consider hydrostatic pressures. Unless hydrostatic pressures are incorporated into the design, the retaining wall designer should provide a subdrain detail. A typical retaining wall subdrain detail is presented as Plate No. 4 of this report. Additionally, outlet points for the retaining wall subdrains should be coordinated by the project civil engineer.

BACKFILL: All backfill soils should be compacted to at least 90 percent relative compaction. Expansive or clayey soils should not be used for backfill material. The wall should not be backfilled until the masonry has reached an adequate strength.

PRELIMINARY PAVEMENT SECTIONS

GENERAL: We expect that new pavement will be installed as part of the project. The following presents preliminary sections for asphalt concrete (AC) construction. The pavement section provided in Table IV should be considered preliminary and should be used for planning purposes only. Final pavement designs should be determined after R-value tests have been performed in the actual subgrade material in place after grading. Presuming the grading recommendations presented previously are followed, we estimate that the subgrade soils will have an R-Value of at least 5. The Traffic Index and Traffic Category shown below are assumed. The project client and/or civil engineer should determine whether these assumed values are appropriate for the traffic conditions.

ASPHALT CONCRETE: We expect that Street "A" will primarily support passenger vehicles with heavily loaded vehicles such as garbage trucks or delivery trucks on average about twice per week. The asphalt concrete pavement section was calculated using the Caltrans design method using an assumed Traffic Index of 5.0.

TABLE IV: ASPHALT CONCRETE PAVEMENT SECTION

Location	Traffic Index	Pavement Thickness	Base Thickness	Base Material	Subgrade Compaction
Street "A"	5.0	3.0 in.	10.0 in.	CAB or Class II	95% in upper 12"

Prior to placing the base material beneath asphalt concrete pavements, the subgrade soil should be scarified to a depth of 12 inches and compacted to at least 95 percent of its maximum dry density at a moisture content at or slightly above optimum.

The base material could consist of Crushed Aggregate Base (CAB) or Class II Aggregate Base. The Crushed Aggregate Base should conform to the requirements set forth in Section 200-2.2 of the Standard Specifications for Public Works Construction. The Class II Aggregate Base should conform to requirements set forth in Section 26-1.02A of the Standard Specifications for California Department of Transportation. Asphalt concrete should be placed in accordance with 'Standard Specifications for Public Works Construction (Greenbook), Section 302-5. Asphalt concrete pavement should be compacted to at least 95 % of Hveem density.

LIMITATIONS

REVIEW, OBSERVATION AND TESTING

The recommendations presented in this report are contingent upon our review of final plans and specifications. Such plans and specifications should be made available to the geotechnical engineer and engineering geologist so that they may review and verify their compliance with this report and with the California Building Code.

It is recommended that Christian Wheeler Engineering be retained to provide continuous soil engineering services during the earthwork operations. This is to verify compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

UNIFORMITY OF CONDITIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations and/or cut and fill slopes may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the geotechnical engineer so that he may make modifications if necessary.

CHANGE IN SCOPE

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. This should be verified in writing or modified by a written addendum.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Government Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations.

PROFESSIONAL STANDARD

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our test pits, surveys, and explorations are made, and that our data, interpretations, and recommendations be based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

CLIENT'S RESPONSIBILITY

It is the client's responsibility, or its representatives, to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and architect for the project and incorporated into the project's plans and specifications. It is further their responsibility to take the necessary measures to ensure that the contractor and his subcontractors carry out such recommendations during construction.

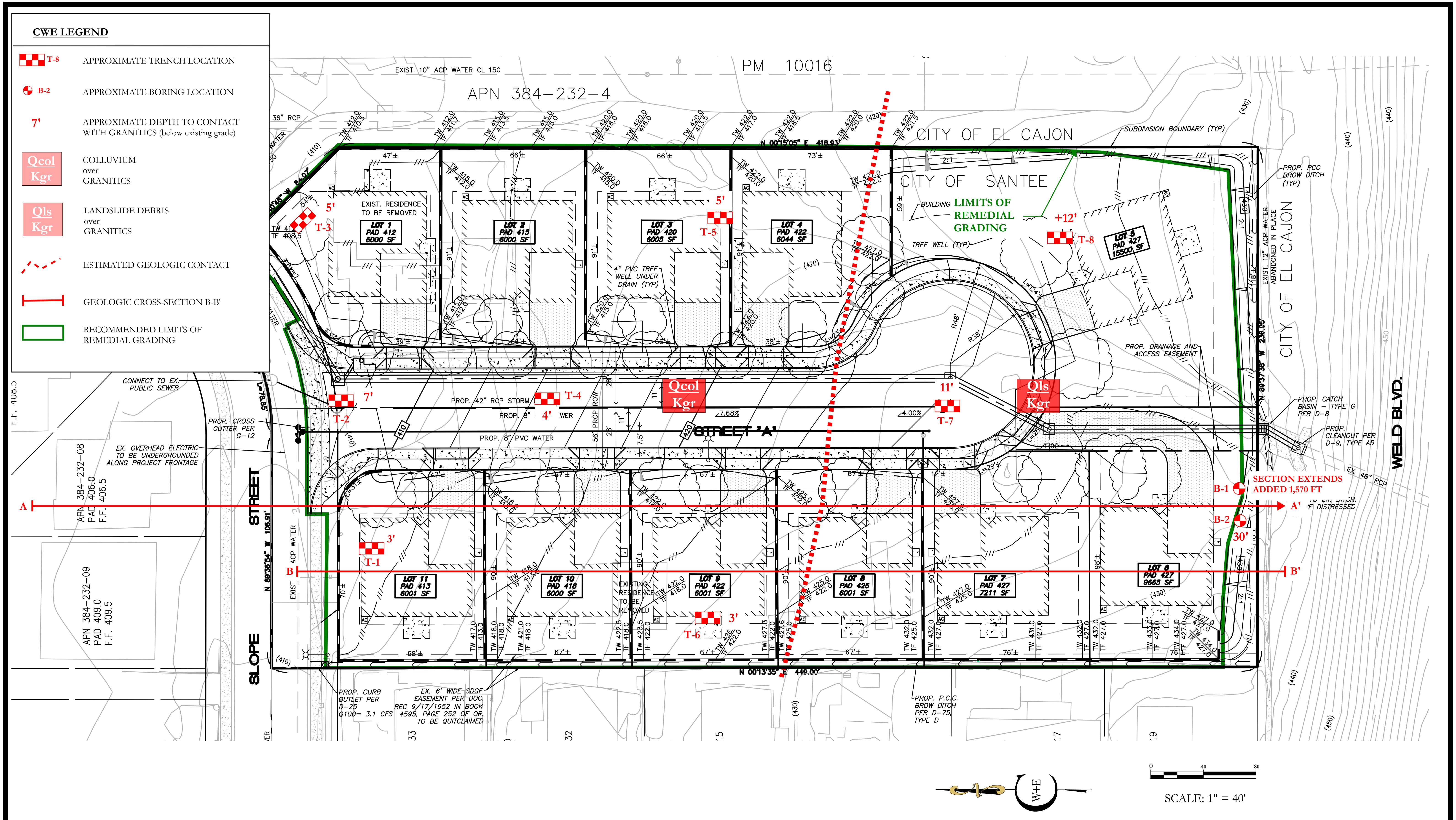
FIELD EXPLORATIONS

Ten subsurface explorations were made at the locations indicated on the attached Plate Number 1 between June 15 and July 17, 2006. These explorations consisted of two small diameter borings drilled with a truck-mounted drill rig and eight test trenches excavated by a Case 580 Super M backhoe using an 18-inch bucket. The fieldwork was conducted under the observation of our engineering geology personnel.

The explorations were carefully logged when made. The logs are presented in the attached Appendix A. The soils are described in accordance with the Unified Soils Classification System. In addition, a verbal textural description, the wet color, the apparent moisture and the density or consistency are provided. The density of granular soils is given as very loose, loose, medium dense, dense or very dense. The consistency of silts or clays is given as either very soft, soft, medium stiff, stiff, very stiff, or hard.

LABORATORY TESTING

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. A brief description of the tests performed and the subsequent results are presented in Appendix B.

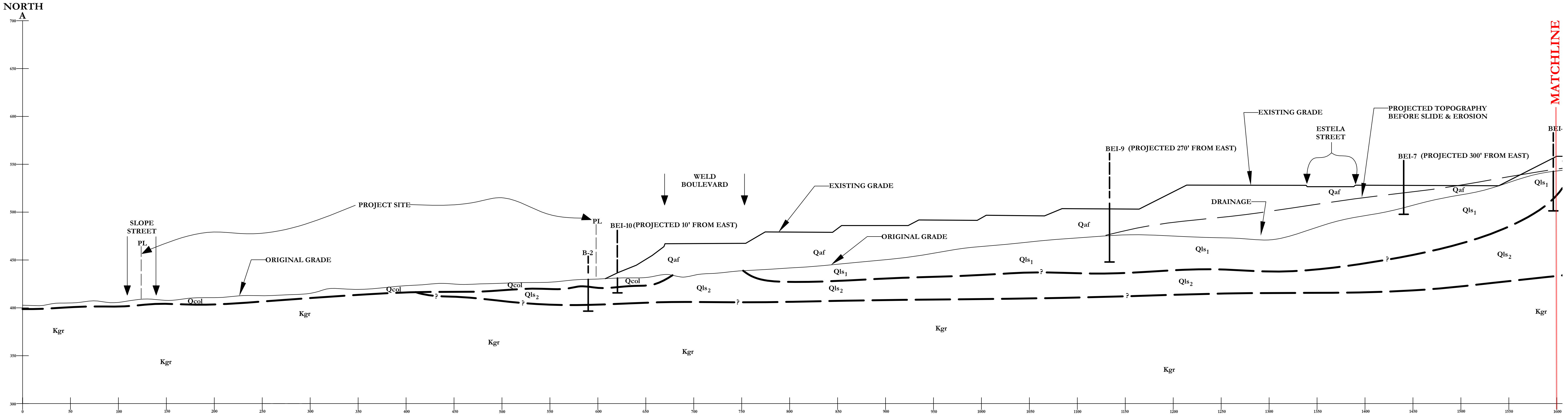


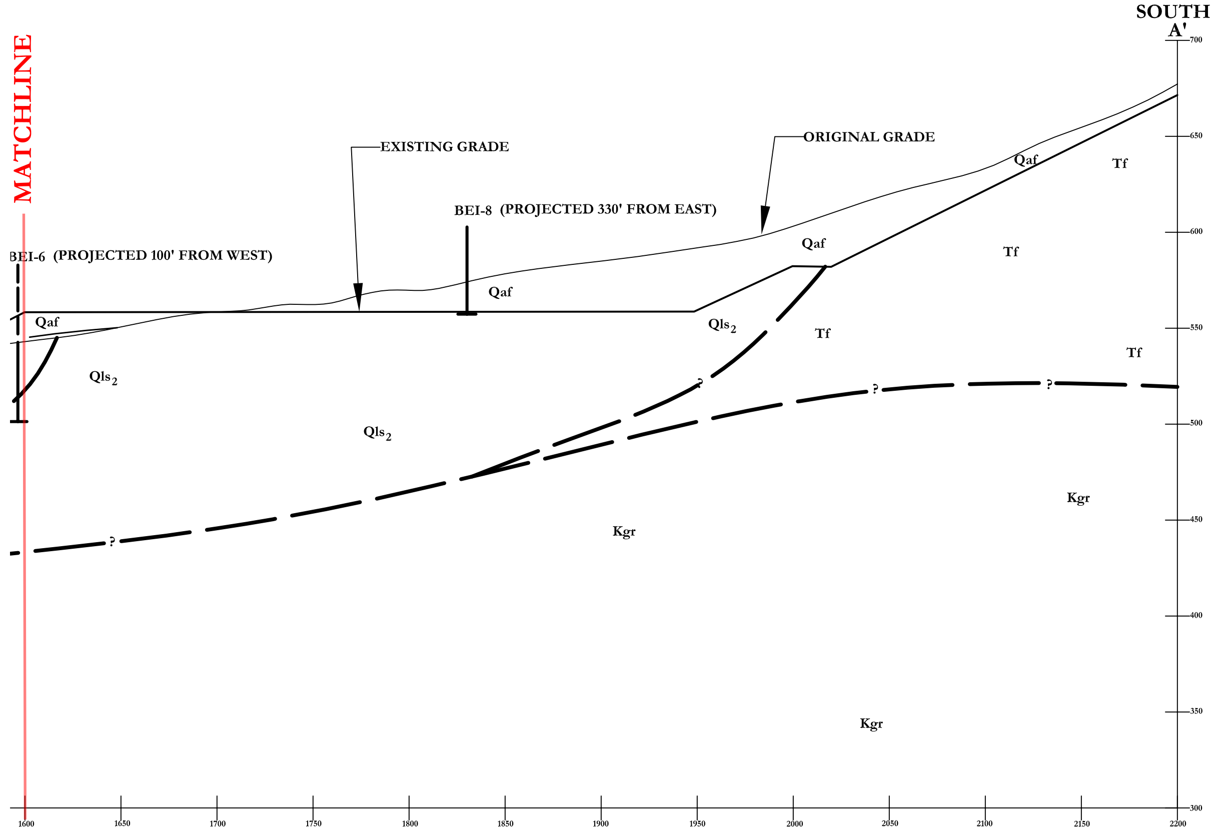
11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET, SANTEE, CA

SITE PLAN AND GEOTECHNICAL MAP

DATE: JUNE 2021	REPORT NO.: 2210096.01
BY: SCC	PLATE NO.: 1

CHRISTIAN WHEELER
ENGINEERING





CWE LEGEND

B-2	APPROXIMATE BORING LOCATION DONE BY CHRISTIAN WHEELER ENGINEERING
BEI-10	APPROXIMATE BORING LOCATION DONE BY BENTON ENGINEERING INC.
Qaf	ARTIFICIAL FILL
Qcol	COLLUVIUM
Qls_1	UPPER LANDSLIDE DEPOSITS
Qls_2	LOWER LANDSLIDE DEPOSITS
Tf	FRIARS FORMATION
Kgr	GRANITICS
— — ? —	GEOLOGIC CONTACT

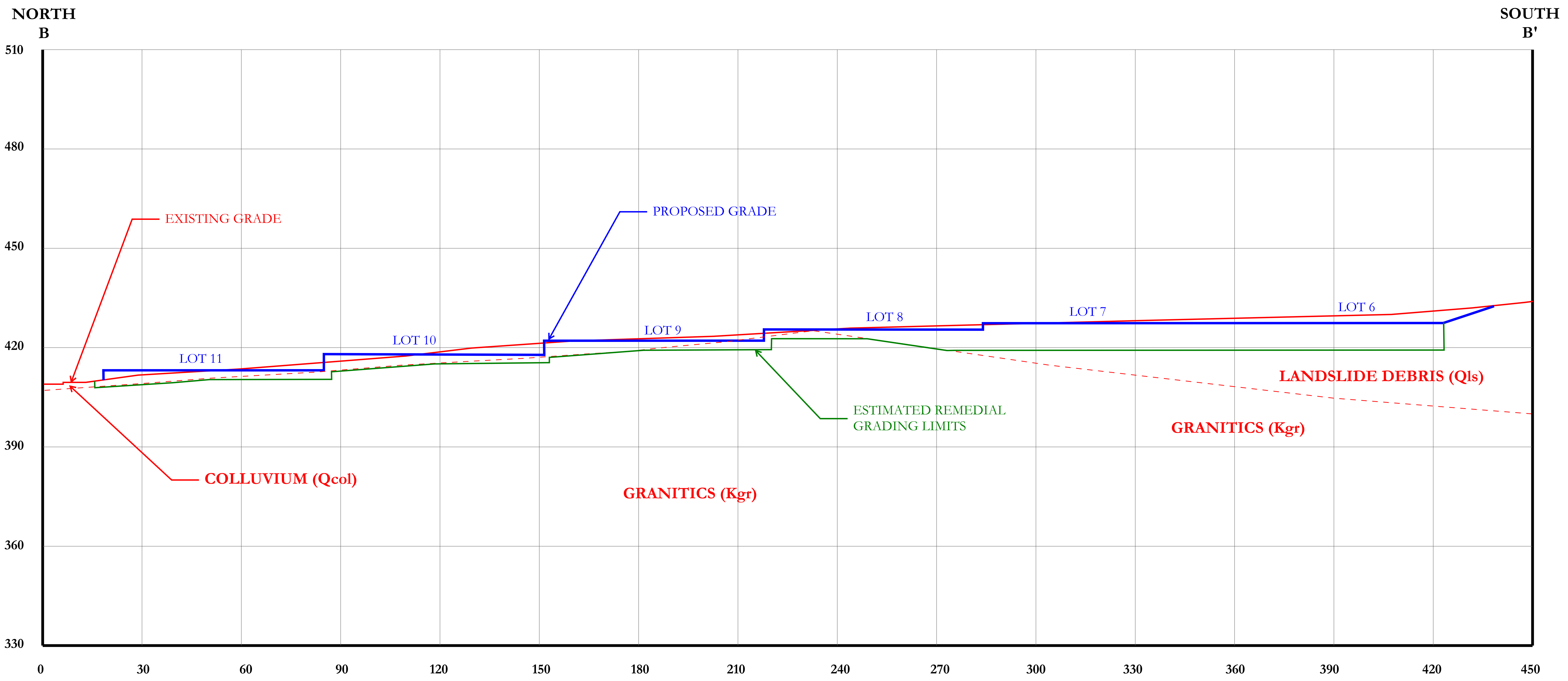
SCALE: 1" = 100'

GEOLOGIC CROSS SECTION A-A'

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET, SANTEE, CA

DATE: JUNE 2021	REPORT NO.: 2210096.01
BY: SCC	PLATE NO.: 2

CHRISTIAN WHEELER
ENGINEERING



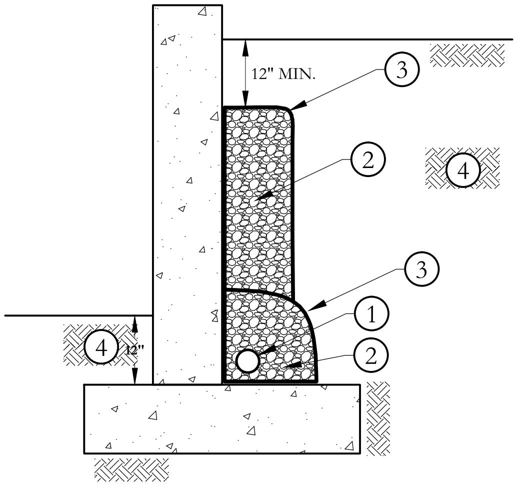
SCALE: 1" = 30'

GEOLOGIG CROSS-SECTION B-B'

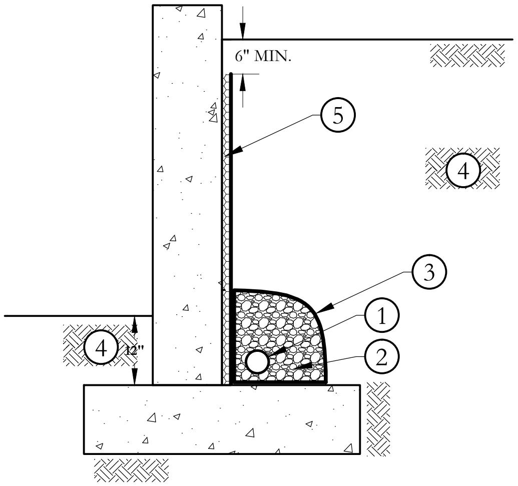
11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET, SANTEE, CA

DATE: JUNE 2021	REPORT NO.: 2210096.01
BY: SCC	PLATE NO.: 3

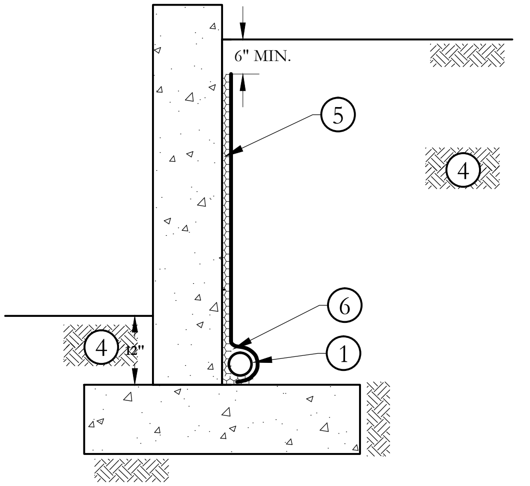
CHRISTIAN WHEELER
ENGINEERING



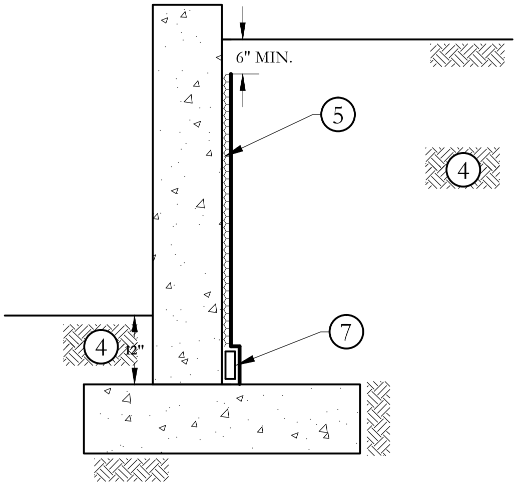
1 DETAIL



2 DETAIL



3 DETAIL



4 DETAIL

NOTES AND DETAILS

GENERAL NOTES:

1) THE NEED FOR WATERPROOFING SHOULD BE EVALUATED BY OTHERS.
2) WATERPROOFING TO BE DESIGNED BY OTHERS (CWE CAN PROVIDE A DESIGN IF REQUESTED).
3) EXTEND DRAIN TO SUITABLE DISCHARGE POINT PER CIVIL ENGINEER.
4) DO NOT CONNECT SURFACE DRAINS TO SUBDRAIN SYSTEM.

DETAILS:

① 4-INCH PERFORATED PVC PIPE ON TOP OF FOOTING, HOLES POSITIONED DOWNWARD (SDR 35, SCHEDULE 40, OR EQUIVALENT).

② ¾ INCH OPEN-GRADED CRUSHED AGGREGATE.

③ GEOFARBRIC WRAPPED COMPLETELY AROUND ROCK.

④ PROPERLY COMPACTED BACKFILL SOIL.

⑤ WALL DRAINAGE PANELS (MIRADRAIN OR EQUIVALENT) PLACED PER MANUFACTURER'S REC'S.

⑥ UNDERLAY SUBDRAIN WITH AND CUT FABRIC BACK FROM DRAINAGE PANELS AND WRAP FABRIC AROUND PIPE.

⑦ COLLECTION DRAIN (TOTAL DRAIN OR EQUIVALENT) LOCATED AT BASE OF WALL DRAINAGE PANEL PER MANUFACTURER'S RECOMMENDATIONS.

CANTILEVER RETAINING WALL
DRAINAGE SYSTEMS

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET
SANTEE, CALIFORNIA

DATE: JUNE 2021
JOB NO.: 2210096.01
BY: SRD
PLATE NO.: 4

CHRISTIAN WHEELER
ENGINEERING

Appendix A

Subsurface Explorations

LOG OF TEST BORING NUMBER B-1

Date Excavated:	6/15/2006	Logged by:	TSW
Equipment:	Larive Bucket Rig	Project Manager:	CHC
Existing Elevation:	429.0 feet	Depth to Water:	N/A
Finish Elevation:	428.7 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
		Artificial Fill (Qaf): Light brown, damp to moist, loose to medium						
2		dense, SILTY SAND (SM), with some rock up to 12 inches in	CK					
		diameter. Contact at 2½ feet.						
4		**Landslide Deposits (Qls):** Dark brownish-gray, moist, medium stiff,	CK			23.5	98.2	
		SANDY CLAY (CL), with some rock up to 6 inches in diameter.	Cal			23.4	99.2	
6								
8		Pale olive to grayish-brown, moist to very moist, loose to medium						
		dense, CLAYEY GRAVEL (GC), with abundant cobble sized rock.						
10		Contact at 8 feet-8 inches.	Cal*					
		Light to medium olive green, moist, medium stiff, SANDY						
12		CLAY (CL), massive, with some gravel and cobble sized rock.	Cal			24.3	99.8	
		Fractures near vertical and horizontal present from 9 to 20 feet.	CK					
14		At 13 feet fine decrease and becomes stiff.						
			Cal			20.7	105.6	
16								
		Slight to moderate plastic lense 1/16 to 1/18 inch thick present at						
18		18 feet-2 inches.						
		Hard rock floater > 30 inches in diameter sloping to the southwest						
20		present at 19 feet-8 inches.	Cal		3	18.5	109.6	

Test boring terminated at 20 feet and properly backfilled with ± 7 cubic feet of bentonite grout mix.

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT

9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	11

LOG OF TEST BORING NUMBER B-2

Date Excavated:	6/15/2006	Logged by:	TSW
Equipment:	Larive Bucket Rig	Project Manager:	CHC
Existing Elevation:	430.0 feet	Depth to Water:	N/A
Finish Elevation:	428.7 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
			SAMPLE TYPE	BULK				
2		**Artificial Fill (Qaf):** Light brown, damp to moist, loose to medium dense, SILTY SAND (SM), with some rock up to 12 inches in diameter. Contact at 2½ feet.						
4		**Landslide Deposits (Qls):** Dark brownish-gray, moist, medium stiff, SANDY CLAY (CL), with some rock up to 4 inches in diameter.						
6								
8		Pale olive to grayish-brown, moist, medium stiff, CLAYEY GRAVEL (GC), with abundant cobbles. Contact at 8½ feet.						
10		Light to medium olive green, moist, medium stiff, SANDY CLAY (CL), with slight to moderate caliche infilled fractures.						
12		At 12½ feet becomes stiff.						
14								
16								
18		Precipitate infilled fractures present at 17 feet. Gradational decrease in fines from 18½ to 20 feet.						
20								

Test boring continued on Plate No. 13

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT

9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	12

LOG OF TEST BORING NUMBER B-2 Continued

Date Excavated: 6/15/2006
Equipment: Larive Bucket Rig
Existing Elevation: 430.0 feet
Finish Elevation: 428.7 feet

Logged by: TSW
Project Manager: CHC
Depth to Water: N/A
Drive Weight: N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
			SAMPLE TYPE	BULK				
		Landslide Deposits (Qls): Light red to olive green, moist, stiff,						
22		SANDY CLAY (CL), with trace gravels.						
		Brecciated zone of claystone with chunks of sandstone and some						
24		gravels present from 23 to 24 feet.						
		Light brown to olive brown, moist, medium dense, CLAYEY	Cal		4	16.1	113.1	
26		SAND (SC), fine to very fine-grained, with print cross bedding.						
		Abundant precipitate infilled fractures present from 24 to 25 feet.						
28		Moderate seepage from west to east present at 28 feet-3 inches.						
		Large boulders up to 24 inches in diameter present from 28 to 30 feet.						
30		Seepage becomes heavy at 29½ feet.	Cal		6/5"	8.8	125.6	
		Weathered Granitic Rock (Kgr): Medium gray to medium reddish-						
32		brown, moist to very moist, dense to very dense, SILTY SAND-						
		WELL GRADED SAND (SM-SP).	CK			7.4	137.4	
34								
36								
		Test boring terminated at 37 feet.						
38		Boring properly backfilled with ± 13 cubic feet of bentonite grout mix.						
40								

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT
9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	13

LOG OF TEST TRENCH NUMBER T-1

Date Excavated:	7/17/2006	Logged by:	TSW
Equipment:	Case 580 Super M	Project Manager:	CHC
Existing Elevation:	412.5 feet	Depth to Water:	N/A
Finish Elevation:	412.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES SAMPLE TYPE	SAMPLES BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
		Colluvium (Qcol): Medium to dark brown, damp, loose, CLAYEY SAND (SC), with trace gravel sized rock.	CK					
2		Medium to dark reddish-brown, moist, medium stiff, SANDY CLAY-CLAYEY SAND (CL-SC).	CK					
4 6		**Weathered Granitic Rock (Kgr):** Light brown, damp to moist, medium dense to dense, SILTY SAND-WELL GRADED SAND (SM-SW), medium to coarse-grained. At 5½ feet becomes dense.						
8 10 12 14 16 18 20		Test trench terminated at 7 feet. No groundwater or seepage.						

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT

9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	3

LOG OF TEST TRENCH NUMBER T-2

Date Excavated:	7/17/2006	Logged by:	TSW
Equipment:	Case 580 Super M	Project Manager:	CHC
Existing Elevation:	410.5 feet	Depth to Water:	N/A
Finish Elevation:	412.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
			SAMPLE TYPE	BULK				
		Colluvium (Qcol): Medium to dark brown, damp, loose, CLAYEY SAND (SC), with trace gravel sized rock.						
2 4		Medium to dark grayish-brown, moist, stiff, SANDY CLAY (CL). Contact at 5½ feet.	CK			11.9	113.1	MD, DS, HA, EI, SO_4
6		Medium reddish-brown, moist, loose to medium dense, CLAYEY SAND (SC). Contact at 7½ feet.						
8		**Weathered Granitic Rock (Kgr):** Light to medium brown, damp to moist, medium dense to dense, SILTY SAND-WELL GRADED SAND (SM-SW), medium to coarse-grained.						
10 12 14 16 18 20		Test trench terminated at 9 feet. No groundwater or seepage.						

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT
9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	4

LOG OF TEST TRENCH NUMBER T-3

Date Excavated:	7/17/2006	Logged by:	TSW
Equipment:	Case 580 Super M	Project Manager:	CHC
Existing Elevation:	410 feet	Depth to Water:	N/A
Finish Elevation:	408 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
			SAMPLE TYPE	BULK				
		Colluvium (Qcol): Medium to dark brown, damp, loose, CLAYEY SAND (SC), with trace gravel sized rock.						
2 4		Medium to dark grayish-brown, moist, medium stiff to stiff, SANDY CLAY (CL).	CK			6.4	120.5	
6 8		**Weathered Granitic Rock (Kgr):** Light brown, damp to moist, medium dense to dense, SILTY SAND-WELL GRADED SAND (SM-SW), medium to coarse-grained. At 6½ feet becomes dense.	CK					
		Test trench terminated at 7 feet. No groundwater or seepage.						
10 12 14 16 18 20								

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT

9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	5

LOG OF TEST TRENCH NUMBER T-4

Date Excavated:	7/17/2006	Logged by:	TSW
Equipment:	Case 580 Super M	Project Manager:	CHC
Existing Elevation:	415.5 feet	Depth to Water:	N/A
Finish Elevation:	413.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
			SAMPLE TYPE	BULK				
		Artificial Fill (Qaf): Medium brown, damp, loose, CLAYEY SAND (SC), fine to medium-grained. Contact at 1½ feet.						
2		**Colluvium (Qcol):** Medium to dark grayish-brown, moist, medium stiff to stiff, SANDY CLAY (CL). Contact at 4½ feet.	CK			7.7	116.5	
4		**Weathered Granitic Rock (Kgr):** Light to medium brown, damp to moist, medium dense to dense, SILTY SAND-WELL GRADED SAND (SM-SW). At 6 feet becomes dense.	CK			2.7	139.1	
6		Test trench terminated at 6½ feet. No groundwater or seepage.						
8								
10								
12								
14								
16								
18								
20								

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT

9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	6

LOG OF TEST TRENCH NUMBER T-5

Date Excavated: 7/17/2006
Equipment: Case 580 Super M
Existing Elevation: 418 feet
Finish Elevation: 420.7 feet

Logged by: TSW
Project Manager: CHC
Depth to Water: N/A
Drive Weight: N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
			SAMPLE TYPE	BULK				
2		**Colluvium (Qcol):** Medium to dark grayish-brown, damp, loose, CLAYEY SAND (SC), with trace gravel-sized rock.	CK			12.5	110.8	
4		Medium to dark grayish-brown, moist, medium stiff, SANDY CLAY (CL).						
6		Medium to dark brown, moist, medium dense, CLAYEY GRAVEL (GC), with rock up to 12 inches in diameter.						
8		**Weathered Granitic Rock (Kgr):** Light to medium reddish-brown, moist, medium dense to dense, SILTY SAND-WELL GRADED SAND (SM-SW). At 6½ feet becomes dense.						
10		Test trench terminated at 7 feet. No groundwater or seepage.						
12								
14								
16								
18								
20								

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT

9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	7

LOG OF TEST TRENCH NUMBER T-6

Date Excavated:	7/17/2006	Logged by:	TSW
Equipment:	Case 580 Super M	Project Manager:	CHC
Existing Elevation:	425 feet	Depth to Water:	N/A
Finish Elevation:	420.7 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES SAMPLE TYPE	SAMPLES BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Colluvium (Qcol):** Medium to dark grayish-brown, damp to moist, soft, SANDY CLAY (CL).						
4		**Weathered Granitic Rock (Kgr):** Light to medium reddish-brown, damp to moist, medium dense to dense, SILTY SAND-WELL GRADED SAND (SM-SW). At 5 feet becomes dense and fractured.						
6 8 10 12 14 16 18 20		Test trench terminated at 6 feet. No groundwater or seepage.						

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT

9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	8

LOG OF TEST TRENCH NUMBER T-7

Date Excavated:	7/17/2006	Logged by:	TSW
Equipment:	Case 580 Super M	Project Manager:	CHC
Existing Elevation:	425 feet	Depth to Water:	N/A
Finish Elevation:	425 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
		Artificial Fill (Qaf): Medium brown, damp, very loose, SILTY SAND/ CLAYEY SAND (SM/SC), with some concrete and trash debris.						
2		**Landslide Deposits (Qls):** Medium to dark grayish-brown, moist, medium stiff, SANDY CLAY (CL), with traces of rock up to 2 inches.	CK			18.2	100.1	
4								
6			CK			18.3	104.1	
		Contact at 7½ feet.						
8		Light to medium olive green, moist, medium stiff, CLAYEY SAND (SC), with abundant light grayish-green sandy clay infilled fractures.	CK			22.8	100.4	
10			CK			13.8	111.9	
12		**Weathered Granitic Rock (Kgr):** Medium gray to medium reddish-brown, moist, medium dense to dense, SILTY SAND-WELL GRADED SAND (SM-SW), with some infilled fractures.						
14		Test trench terminated at 12 feet. No groundwater or seepage.						
16								
18								
20								

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT

9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	9

LOG OF TEST TRENCH NUMBER T-8

Date Excavated:	7/17/2006	Logged by:	TSW
Equipment:	Case 580 Super M	Project Manager:	CHC
Existing Elevation:	425.7 feet	Depth to Water:	N/A
Finish Elevation:	428.7 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
			SAMPLE TYPE	BULK				
		Landslide Deposits (Qls): Medium to dark brown, damp, loose, CLAYEY SAND (SC).						
2		Medium to dark grayish-brown, moist, medium stiff to stiff, SANDY CLAY (CL). Contact at 4½ feet.	CK			13.8	108.5	
4		Light grayish-brown, damp to moist, loose to medium dense/medium stiff, SANDY CLAY (CL).						
6			CK			17.2	94.5	MD, DS, HA, SO_4
8			CK			17.4	97.2	
10		At 11 feet becomes medium dense.	CK			16.6	111.6	
12		Test trench terminated at 12 feet. No groundwater or seepage.						
14								
16								
18								
20								

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PROPOSED 10-LOT RESIDENTIAL DEVELOPMENT
9463 Slope Street, Santee, California

BY:	MW	DATE:	September 2006
JOB NO. :	2051040	PLATE NO.:	10

Appendix B

Laboratory Test Results

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

a) **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System and are presented on the exploration logs in Appendix A.

b) **MOISTURE-DENSITY:** In-place moisture contents and dry densities were determined for representative soil samples. This information was an aid to classification and permitted recognition of variations in material consistency with depth. The dry unit weight is determined in pounds per cubic foot, and the in-place moisture content is determined as a percentage of the soil's dry weight. The results of these tests are summarized in the exploration logs presented in Appendix A.

c) **GRAIN SIZE DISTRIBUTION:** The grain size distributions of selected samples were determined in accordance with ASTM C136 and/or ASTM D422.

d) **MAXIMUM DENSITY & OPTIMUM MOISTURE CONTENT:** The maximum dry density and optimum moisture content of typical soils were determined in the laboratory in accordance with ASTM Standard Test D-1557, Method A.

e) **DIRECT SHEAR:** Direct shear tests were performed to determine the failure envelope of selected soils based on yield shear strength. The shear box was designed to accommodate a sample having a diameter of 2.375 inches or 2.50 inches and a height of 1.0 inch. Samples were tested at different vertical loads and a saturated moisture content. The shear stress was applied at a constant rate of strain of approximately 0.05 inch per minute.

f) **EXPANSION INDEX TEST:** The expansion index of a selected soil was determined in accordance with ASTM D4829. A 1-inch-thick by 4-inch-diameter specimen was prepared by compacting the soil with a specified energy at approximately 50 percent saturation. The specimen was placed in a consolidometer with porous stones at the top and bottom and a total normal pressure of 144.7 psf was applied. The specimen was allowed to consolidate for a period of 10 minutes and then saturated. The change in vertical movement was recorded until the rate of expansion became nominal.

g) **SOLUBLE SULFATES:** The soluble sulfate content was determined for samples of soil likely to be present at the foundation level. The soluble sulfate content was determined in accordance with California Test Method 417.

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LABORATORY TEST RESULTS

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET, SANTEE, CA

PROJECT NO. 2210096
DATE 06/2021
FIGURE
B-1

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557)

Sample Location:	**Trench T-2 @ 1'-5'**	**Trench T-8 @ 4½'-10'**
Sample Description:	Grayish-brown, CL	Grayish-brown, CL
Maximum Density:	114.8 pcf	115.0 pcf
Optimum Moisture:	12.0 %	14.3 %

DIRECT SHEAR (ASTM D3080)

Sample Location:	**Trench T-2 @ 1'-5'**	**Trench T-8 @ 4½'-10'**
Sample Type:	Remolded to 90 %	Remolded to 90 %
Friction Angle:	9 °	17 °
Cohesion:	450 psf	400 psf

GRAIN SIZE DISTRIBUTION (ASTM D422)

Sample Location	**Trench T-2 @ 1'-5'**	**Trench T-8 @ 4½'-10'**
Sieve Size	*Percent Passing*	*Percent Passing*
#4	100	100
#8	99	99
#16	95	97
#30	88	92
#50	79	84
#100	70	75
#200	64	70
0.05 mm	60	66
0.005 mm	38	46
0.001 mm	28	30

EXPANSION INDEX (ASTM D4829)

Sample Location:	**Trench T-2 @ 1'-5'**
Initial Moisture:	11.3 %
Initial Dry Density:	97.7 pcf
Final Moisture:	19.3 %
Expansion Index:	73 (medium)

SOLUBLE SULFATES (CALIFORNIA TEST 417)

Sample Location:	**Trench T-2 @ 1'-5'**	**Trench T-8 @ 4½'-10'**
Soluble Sulfate:	0.001 % (SO_4)	0.008 % (SO_4)

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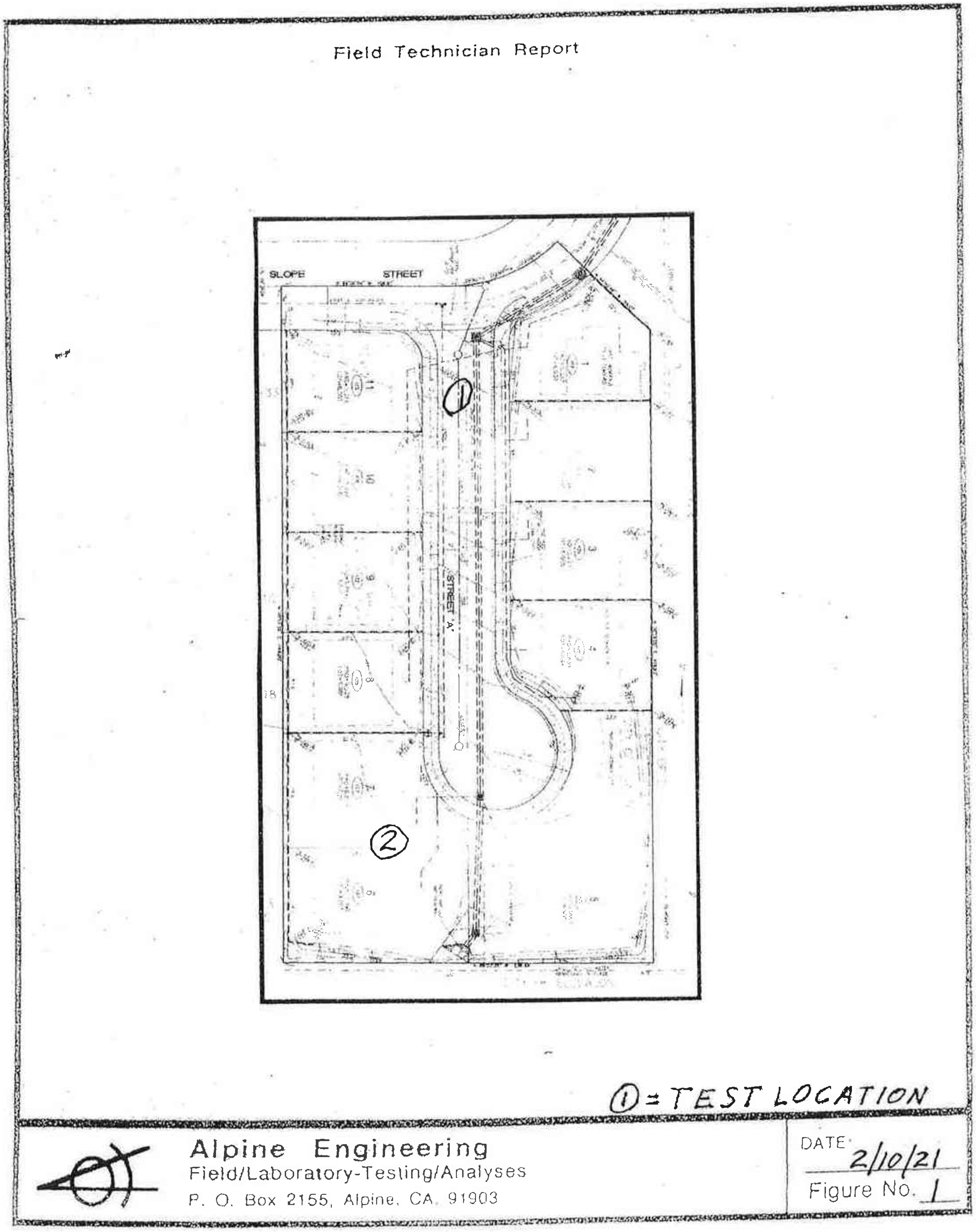
LABORATORY TEST RESULTS

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET, SANTEE, CA

PROJECT NO. 2210096
DATE 06/2021
FIGURE
B-2



Field Technician Report

① = TEST LOCATION

Alpine Engineering
Field/Laboratory-Testing/Analyses
P. O. Box 2155, Alpine, CA 91903

DATE 2/10/21
Figure No. 1

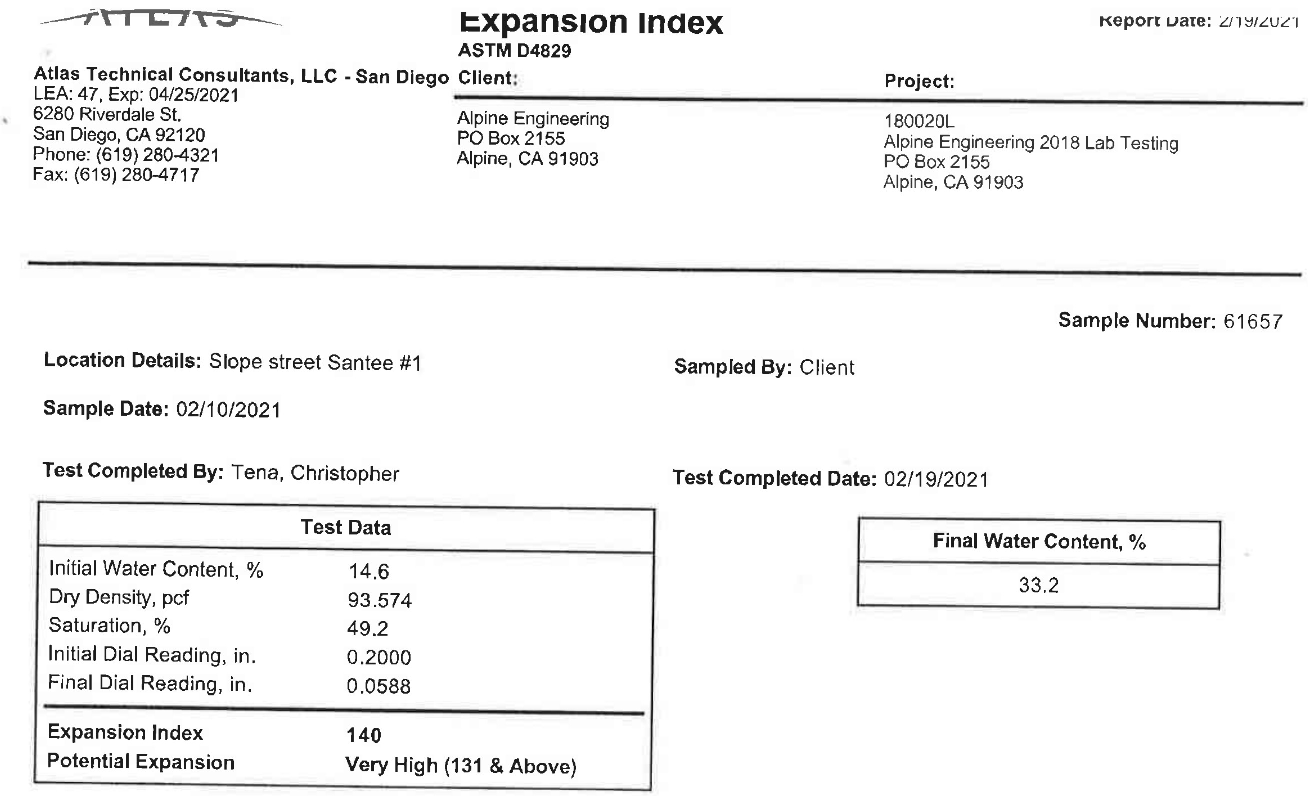
CHRISTIAN WHEELER
ENGINEERING

LABORATORY TEST RESULTS

PROJECT NO. 2210096
DATE 06/2021

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET, SANTEE, CA

FIGURE
B-3



Expansion Index

ASTM D4829

Report Date: 2/19/2021

Atlas Technical Consultants, LLC - San Diego
LEA: 47, Exp: 04/25/2021
6280 Riverdale St.
San Diego, CA 92120
Phone: (619) 280-4321
Fax: (619) 280-4717

Client:
Alpine Engineering
PO Box 2155
Alpine, CA 91903

Project:
180020L
Alpine Engineering 2018 Lab Testing
PO Box 2155
Alpine, CA 91903

Sample Number: 61657

Location Details: Slope street Santee #1

Sampled By: Client

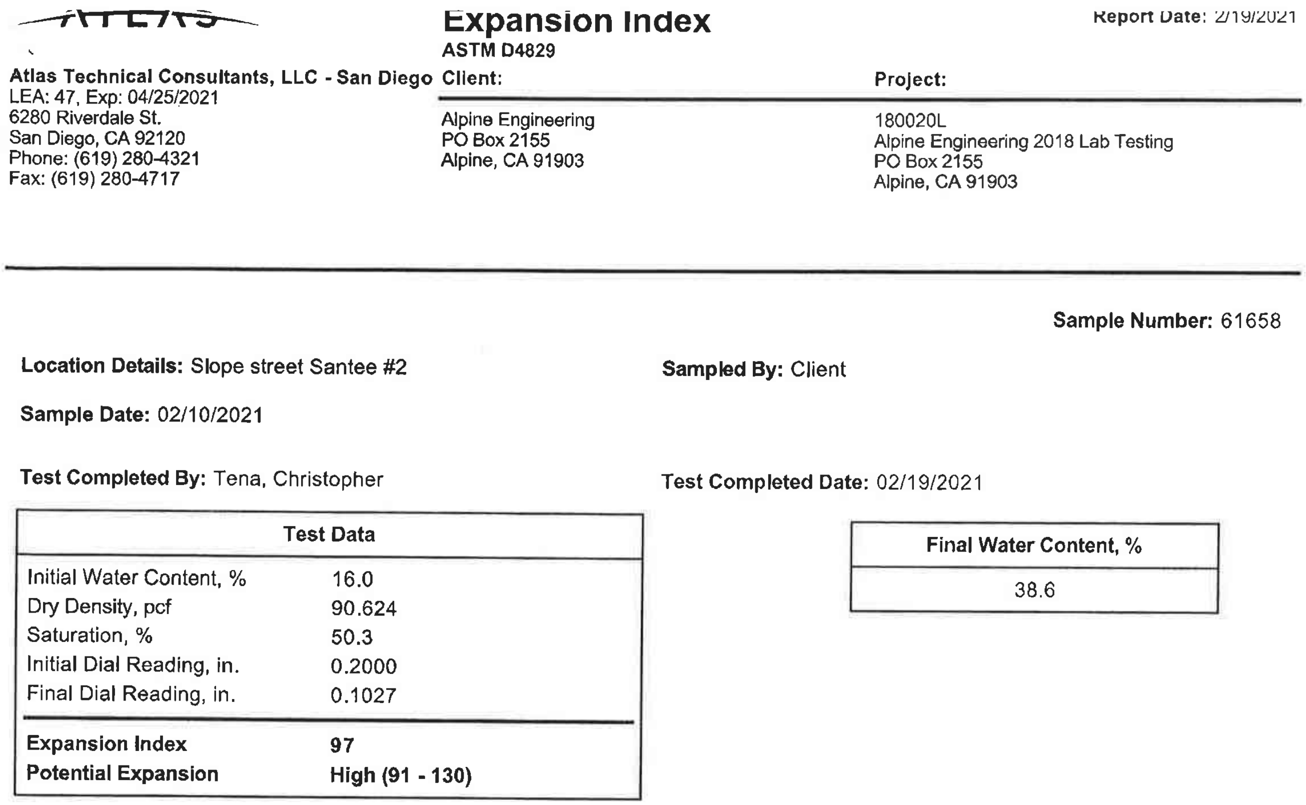
Sample Date: 02/10/2021

Test Completed By: Tena, Christopher

Test Completed Date: 02/19/2021

Test Data	
Initial Water Content, %	14.6
Dry Density, pcf	93.574
Saturation, %	49.2
Initial Dial Reading, in.	0.2000
Final Dial Reading, in.	0.0588
Expansion Index	**140**
Potential Expansion	**Very High (131 & Above)**

Final Water Content, %
33.2



Expansion Index

ASTM D4829

Report Date: 2/19/2021

Atlas Technical Consultants, LLC - San Diego
LEA: 47, Exp: 04/25/2021
6280 Riverdale St.
San Diego, CA 92120
Phone: (619) 280-4321
Fax: (619) 280-4717

Client:
Alpine Engineering
PO Box 2155
Alpine, CA 91903

Project:
180020L
Alpine Engineering 2018 Lab Testing
PO Box 2155
Alpine, CA 91903

Sample Number: 61658

Location Details: Slope street Santee #2

Sampled By: Client

Sample Date: 02/10/2021

Test Completed By: Tena, Christopher

Test Completed Date: 02/19/2021

Test Data	
Initial Water Content, %	16.0
Dry Density, pcf	90.624
Saturation, %	50.3
Initial Dial Reading, in.	0.2000
Final Dial Reading, in.	0.1027
Expansion Index	**97**
Potential Expansion	**High (91 - 130)**

Final Water Content, %
38.6

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LABORATORY TEST RESULTS

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET, SANTEE, CA

PROJECT NO. 2210096
DATE 06/2021
FIGURE
B-4

Appendix C

References

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TOPOGAPHIC MAPS

County of San Diego, 1958, 200 Scale, Topographic Map, Sheet 238-1767.

County of San Diego, 1973, 200 Scale, Ortho-topographic Map, Sheet 238-1767.

County of San Diego, 1958, 200 Scale, Topographic Map, Sheet 238-1773.

County of San Diego, 1973, 200 Scale, Ortho-topographic Map, Sheet 238-1773.

PHOTOGRAPHS

Aerial FotoBank/Thomas Bros., Inc., Aerial Foto-Map Book, San Diego County, 1995-96, Sheet 1251-C1, Scale: 1 inch = 2000 feet (approximate).

San Diego County, 1928, Flight 54A, Photo 4 and 5; Scale: 1 inch = 2000 feet (approximate).

San Diego County, 1953, Photographs AXN-9M-15 and AXN-10M-15; Scale: 1 inch = 2000 feet (approximate).

San Diego County, 1970, Flight 11, Photographs 16 and 17; Scale: 1 inch = 2000 feet (approximate).

San Diego County, 1973, Flight 18, Photographs 25 and 26; Scale: 1 inch = 1000 feet (approximate).

San Diego County, 1978, Flight 30, Photographs C15 and C16; Scale: 1 inch = 1000 feet (approximate).

San Diego County, 1983, Photographs 124 and 125; Scale: 1 inch = 2000 feet (approximate).

San Diego County, 1989, Photograph 1-125, 18-12, 18-14; Scale: 1 inch = 2640 feet (approximate).

Appendix D

Recommended Grading Specifications – General Provisions

RECOMMENDED GRADING SPECIFICATIONS - GENERAL PROVISIONS

11-LOT RESIDENTIAL SUBDIVISION
9463 SLOPE STREET
SANTEE, CALIFORNIA

GENERAL INTENT

The intent of these specifications is to establish procedures for clearing, compacting natural ground, preparing areas to be filled, and placing and compacting fill soils to the lines and grades shown on the accepted plans. The recommendations contained in the preliminary geotechnical investigation report and/or the attached Special Provisions are a part of the Recommended Grading Specifications and shall supersede the provisions contained hereinafter in the case of conflict. These specifications shall only be used in conjunction with the geotechnical report for which they are a part. No deviation from these specifications will be allowed, except where specified in the geotechnical report or in other written communication signed by the Geotechnical Engineer.

OBSERVATION AND TESTING

Christian Wheeler Engineering shall be retained as the Geotechnical Engineer to observe and test the earthwork in accordance with these specifications. It will be necessary that the Geotechnical Engineer or his representative provide adequate observation so that he may provide his opinion as to whether or not the work was accomplished as specified. It shall be the responsibility of the contractor to assist the Geotechnical Engineer and to keep him appraised of work schedules, changes and new information and data so that he may provide these opinions. In the event that any unusual conditions not covered by the special provisions or preliminary geotechnical report are encountered during the grading operations, the Geotechnical Engineer shall be contacted for further recommendations.

If, in the opinion of the Geotechnical Engineer, substandard conditions are encountered, such as questionable or unsuitable soil, unacceptable moisture content, inadequate compaction, adverse weather, etc., construction should be stopped until the conditions are remedied or corrected or he shall recommend rejection of this work.

Tests used to determine the degree of compaction should be performed in accordance with the following American Society for Testing and Materials test methods:

Maximum Density & Optimum Moisture Content - ASTM D-1557-91
Density of Soil In-Place - ASTM D-1556-90 or ASTM D-2922

All densities shall be expressed in terms of Relative Compaction as determined by the foregoing ASTM testing procedures.

PREPARATION OF AREAS TO RECEIVE FILL

All vegetation, brush and debris derived from clearing operations shall be removed, and legally disposed of. All areas disturbed by site grading should be left in a neat and finished appearance, free from unsightly debris.

After clearing or benching the natural ground, the areas to be filled shall be scarified to a depth of 6 inches, brought to the proper moisture content, compacted and tested for the specified minimum degree of compaction. All loose soils in excess of 6 inches thick should be removed to firm natural ground which is defined as natural soil which possesses an in-situ density of at least 90 percent of its maximum dry density.

When the slope of the natural ground receiving fill exceeds 20 percent (5 horizontal units to 1 vertical unit), the original ground shall be stepped or benched. Benches shall be cut to a firm competent formational soil. The lower bench shall be at least 10 feet wide or 1-1/2 times the equipment width, whichever is greater, and shall be sloped back into the hillside at a gradient of not less than two (2) percent. All other benches should be at least 6 feet wide. The horizontal portion of each bench shall be compacted prior to receiving fill as specified herein for compacted natural ground. Ground slopes flatter than 20 percent shall be benched when considered necessary by the Geotechnical Engineer.

Any abandoned buried structures encountered during grading operations must be totally removed. All underground utilities to be abandoned beneath any proposed structure should be removed from within 10 feet of the structure and properly capped off. The resulting depressions from the above described procedure should be backfilled with acceptable soil that is compacted to the requirements of the Geotechnical Engineer. This includes, but is not limited to, septic tanks, fuel tanks, sewer lines or leach lines, storm drains and water lines. Any buried structures or utilities not to be abandoned should be brought to the attention of the Geotechnical Engineer so that he may determine if any special recommendation will be necessary.

All water wells which will be abandoned should be backfilled and capped in accordance to the requirements set forth by the Geotechnical Engineer. The top of the cap should be at least 4 feet below finish grade or 3 feet below the bottom of footing whichever is greater. The type of cap will depend on the diameter of the well and should be determined by the Geotechnical Engineer and/or a qualified Structural Engineer.

FILL MATERIAL

Materials to be placed in the fill shall be approved by the Geotechnical Engineer and shall be free of vegetable matter and other deleterious substances. Granular soil shall contain sufficient fine material to fill the voids. The definition and disposition of oversized rocks and expansive or detrimental soils are covered in the geotechnical report or Special Provisions. Expansive soils, soils of poor gradation, or soils with low strength characteristics may be thoroughly mixed with other soils to provide satisfactory fill material, but only with the explicit consent of the Geotechnical Engineer. Any import material shall be approved by the Geotechnical Engineer before being brought to the site.

PLACING AND COMPACTION OF FILL

Approved fill material shall be placed in areas prepared to receive fill in layers not to exceed 6 inches in compacted thickness. Each layer shall have a uniform moisture content in the range that will allow the compaction effort to be efficiently applied to achieve the specified degree of compaction. Each layer shall be uniformly compacted to the specified minimum degree of compaction with equipment of adequate size to economically compact the layer. Compaction equipment should either be specifically designed for soil compaction or of proven reliability. The minimum degree of compaction to be achieved is specified in either the Special Provisions or the recommendations contained in the preliminary geotechnical investigation report.

When the structural fill material includes rocks, no rocks will be allowed to nest and all voids must be carefully filled with soil such that the minimum degree of compaction recommended in the Special Provisions is achieved. The maximum size and spacing of rock permitted in structural fills and in non-structural fills is discussed in the geotechnical report, when applicable.

Field observation and compaction tests to estimate the degree of compaction of the fill will be taken by the Geotechnical Engineer or his representative. The location and frequency of the tests shall be at the Geotechnical Engineer's discretion. When the compaction test indicates that a particular layer is at less than the required degree of compaction, the layer shall be reworked to the satisfaction of the Geotechnical Engineer and until the desired relative compaction has been obtained.

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction by sheepsfoot roller shall be at vertical intervals of not greater than four feet. In addition, fill slopes at a ratio of two horizontal to one vertical or flatter, should be trackrolled. Steeper fill slopes shall be over-built and cut-back to finish contours after the slope has been constructed. Slope compaction operations shall result in all fill material six or more inches inward from the finished face of the slope having a relative compaction of at least 90 percent of maximum dry density or the degree of compaction specified in the Special Provisions section of this specification. The compaction operation on the slopes shall be continued until the Geotechnical Engineer is of the opinion that the slopes will be surficially stable.

Density tests in the slopes will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the Contractor will be notified that day of such conditions by written communication from the Geotechnical Engineer or his representative in the form of a daily field report.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no cost to the Owner or Geotechnical Engineer.

CUT SLOPES

The Engineering Geologist shall inspect cut slopes excavated in rock or lithified formational material during the grading operations at intervals determined at his discretion. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer to determine if mitigating measures are necessary.

Unless otherwise specified in the geotechnical report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of the controlling governmental agency.

ENGINEERING OBSERVATION

Field observation by the Geotechnical Engineer or his representative shall be made during the filling and compaction operations so that he can express his opinion regarding the conformance of the grading with acceptable standards of practice. Neither the presence of the Geotechnical Engineer or his representative or the observation and testing shall release the Grading Contractor from his duty to compact all fill material to the specified degree of compaction.

SEASON LIMITS

Fill shall not be placed during unfavorable weather conditions. When work is interrupted by heavy rain, filling operations shall not be resumed until the proper moisture content and density of the fill materials can be achieved. Damaged site conditions resulting from weather or acts of God shall be repaired before acceptance of work.

RECOMMENDED GRADING SPECIFICATIONS - SPECIAL PROVISIONS

RELATIVE COMPACTION: The minimum degree of compaction to be obtained in compacted natural ground, compacted fill, and compacted backfill shall be at least 90 percent. For street and parking lot subgrade, the upper twelve inches should be compacted to at least 95 percent relative compaction.

EXPANSIVE SOILS: Detrimentally expansive soil is defined as clayey soil which has an expansion index of 50 or greater when tested in accordance with the American Society of Testing Materials (ASTM) Laboratory Test D4829-95.

OVERSIZED MATERIAL: Oversized fill material is generally defined herein as rocks or lumps of soil over six inches in diameter. Oversized materials should not be placed in fill unless recommendations of placement of such material is provided by the Geotechnical Engineer. At least 40 percent of the fill soils shall pass through a No. 4 U.S. Standard Sieve.

TRANSITION LOTS: Where transitions between cut and fill occur within the proposed building pad, the cut portion should be undercut a minimum of one foot below the base of the proposed footings and recompacted as structural backfill. In certain cases that would be addressed in the geotechnical report, special footing reinforcement or a combination of special footing reinforcement and undercutting may be required.