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ColRich
444 West Beech Street, Suite 300
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December 31, 2019
P/W 1304-04
Report No. 1304-04-B-14

Attention: **Mr. Jason Shepard**

Subject: **Geotechnical Review of Tentative Map, Lumina III, Lopez Parcel, Otay Mesa Area, City of San Diego, California.**

References: See Appendix A

Gentleperson:

Pursuant to your request, presented herein are the results of Advanced Geotechnical Solutions, Inc.'s, (AGS) Geotechnical Review of Tentative Map for the proposed Lumina III project in the Otay Mesa area, City of San Diego, California. AGS has been retained by ColRich to provide geotechnical services supporting the Tentative Map approval process for this project.

The purpose of this geotechnical review is to evaluate the proposed grading plans relative to the near-site and on-site geologic and geotechnical conditions, and provide conclusions and recommendations to aid in the development of the project. The 40-scale grading plan prepared by Project Design Consultants were provided to AGS for preparation of this report. The grading plan is included in this document with appurtenant geologic and geotechnical data superimposed.

Advanced Geotechnical Solutions, Inc., appreciates the opportunity to provide you with geotechnical consulting services and professional opinions. If you have any questions, please contact the undersigned at (619) 867-0487.

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.

ANDRES BERNAL, Sr. Geotechnical Engineer
RCE 62366, RGE 2715, Reg. Exp. 9-30-21

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CEG 2536, Reg. Exp. 5-31-21

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Geotechnical Review of Tentative Map, Lumina III Otay Mesa Area, City of San Diego, California

1.0 INTRODUCTION

1.1. Background and Purpose

The purpose of this report is to provide a Tentative Map (TM) level geotechnical study that may be utilized to support the submittal process for the proposed Lumina III project located in the Otay Mesa area, City of San Diego, California. Geotechnical conclusions and recommendations are presented herein, and the items addressed include: 1) unsuitable soil removals and remedial grading; 2) cut, fill and natural slope stability; 3) potential geologic hazards and general mitigation measures for these potential hazards; 4) cut/fill pad overexcavation criteria; 5) remedial and design grading recommendations; 6) rippability of the onsite bedrock; and 7) general foundation design recommendations based upon anticipated as-graded soil conditions.

1.2. Scope of Study

This study provides geotechnical/geologic conclusions and recommendations for development of the site as shown on the Tentative Map. The scope of this study included the following tasks:

- Review of pertinent published and unpublished geologic and geotechnical literature, maps, geotechnical studies in the general area, and aerial photographs readily available to this firm (Appendix A).
- Transfer geologic and geotechnical information generated from previous investigations from parcels surrounding the project site, onto the current 40-scale TM/Preliminary Grading and Storm Drain Plan prepared by Project Design Consultants, included as Plate 1 (attached). This plan depicts existing grades and proposed rough grading. AGS has added geologic and geotechnical information to the plan, including: the approximate limits of surficial geologic units and locations of exploratory excavations with abbreviated logs.
- Compile subsurface information generated from previous investigations for adjacent sites by AGS and others (Appendix B).
- Compile laboratory testing generated from previous investigations for adjacent sites by AGS and others (Appendix C).
- Conduct a geotechnical engineering and geologic hazard analysis of the site.
- Conduct a limited seismicity analysis.
- Data analyses in relation to the site-specific proposed improvements.
- Limited evaluation of liquefaction potential based upon field investigation and familiarity with the onsite soil conditions.
- Discussion of pertinent geologic and geotechnical topics.
- Prepare general foundation design parameters which can be used for preliminary design.
- Prepare this geotechnical review report of the current tentative map with associated exhibits summarizing our findings. This report is suitable for preliminary design and regulatory review.

1.3. Geotechnical Study Limitations

The conclusions and recommendations in this report are professional opinions based on the data developed during previous investigations for parcels that bound the project site on the north, west, and south sides. The conclusions presented herein are based upon the current design as reflected on the included Tentative Map. Changes to the plan would necessitate further review.

The materials immediately adjacent to or beneath those observed may have different characteristics than those observed. No representations are made as to the quality or extent of materials not observed. Any evaluation regarding the presence or absence of hazardous materials is beyond the scope of this firm's services.

2.0 SITE LOCATION AND DESCRIPTION

2.1. Site Location and Description

The project site is located in the Otay Mesa area of San Diego, California. The site is more specifically located westerly adjacent to Cactus Road and is bound to the north, west, and south by outbuilding structures, equipment storage and parking areas, and agricultural land. The L-shaped site encompasses a total area of approximately 1.34 acres and currently supports a single-family residence and on-grade auto and truck parking areas. In general, the site is relatively level to gently sloping to the southeast. Elevations within the project limits range from elevation 507.4 msl in the northeast corner of the site to 506.5 msl in the southern portion of site.

At this time, AGS is unaware of specific septic system(s), water well(s) or utilities that may exist on the properties. However, it is likely that these improvements are onsite. If encountered, septic systems and water wells must be abandoned/mitigated in accordance with the specifications of the County of San Diego Department of Environmental Health.

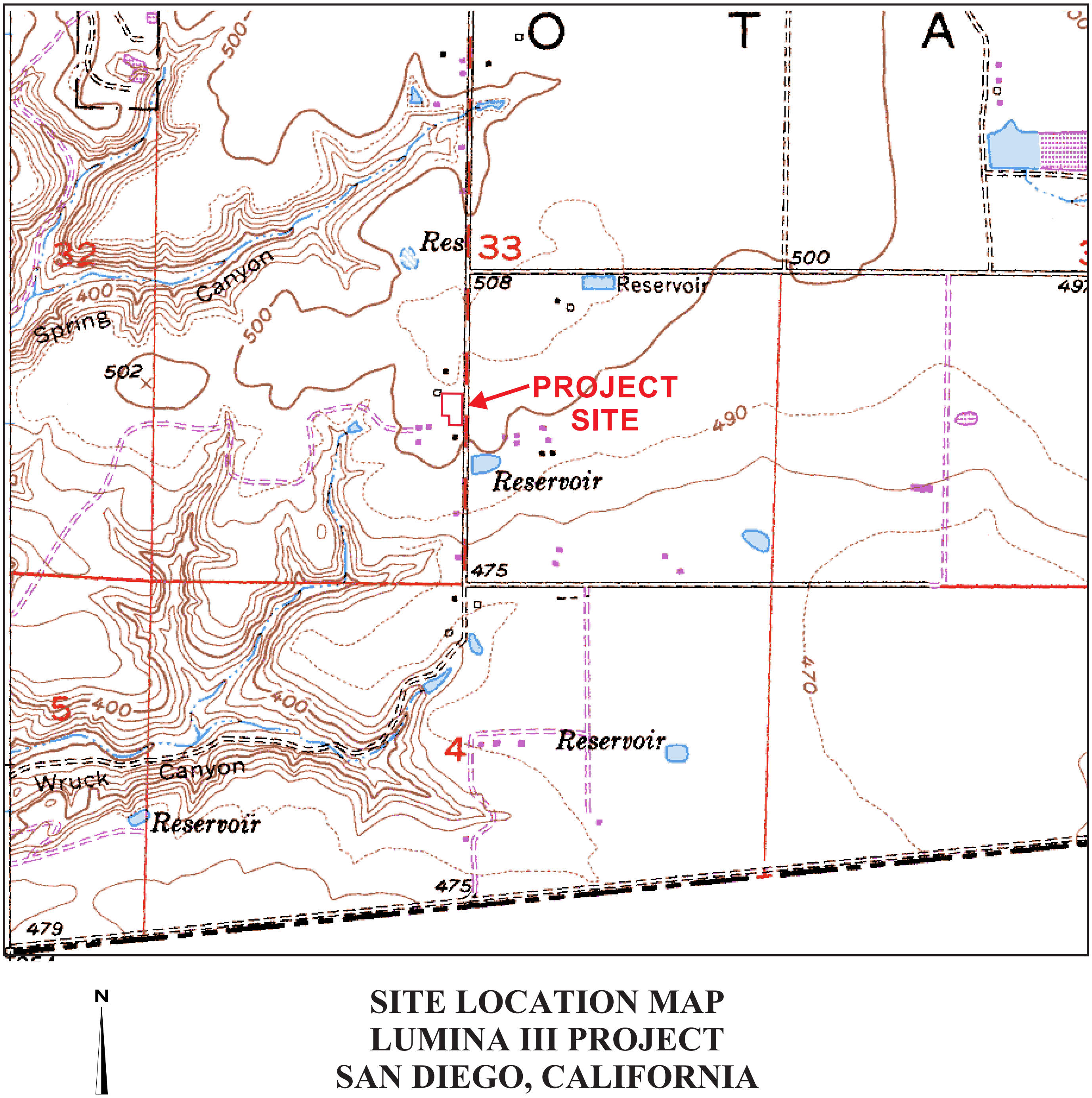
2.2. Proposed Development

As depicted on the grading plan (Plate 1), the proposed development consists of a single sheet graded pad. According the TM, planned use is multi-family residential (condominiums) with a maximum unit count of 25 units. Relatively lightly loaded structures are anticipated. In addition, proposed widening and improvement of Cactus Road with associated utilities are also proposed.

It is anticipated that conventional cut and fill grading techniques will be utilized to develop the project site. The current 40-scale plan prepared by Project Design Consultants show maximum cuts on the order of 8 feet. No fills are anticipated. Slopes up to 8 feet in height at slope ratios of 2:1 (H:V) will be constructed.

3.0 FIELD AND LABORATORY INVESTIGATION

Field exploration onsite was limited to field reconnaissance and surface mapping due to access constraints. However, AGS has conducted several geotechnical investigations for the parcels adjacent to the north, west, and south (AGS 2013, 2015a-b, 2017). Subsurface exploration for these investigations included the excavation, logging and sampling of several backhoe trenches, and small- and large-diameter borings. The approximate location of pertinent excavations in close proximity to the project site are shown on Plate l. Logs of these excavations are presented in Appendix B. Laboratory test results are presented in Appendix C.



SITE LOCATION MAP
LUMINA III PROJECT
SAN DIEGO, CALIFORNIA

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FIGURE 1

SOURCE MAP - TOPOGRAPHIC MAP OF THE OTAY MESA 7.5 MINUTE QUADRANGLE, SAN DIEGO COUNTY, CALIFORNIA

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In addition, six separate due diligence level geotechnical studies were prepared by Geocon (Geocon, 2003 to 2005) for adjacent parcels. In general, these studies consisted of limited mapping and excavation, logging and sampling of a total of 21 backhoe test pits extending to depths ranging from a few feet to 16 feet. The approximate location of pertinent excavations in close proximity to the project site are shown on Plate l. Logs of these excavations are presented in Appendix B. Laboratory test results are presented in Appendix C.

4.0 ENGINEERING GEOLOGY

4.1. Geologic Analysis

4.1.1. Literature Review

AGS reviewed the referenced geologic documents in preparing this study, and where appropriate, that information was included in this document.

4.1.2. Aerial Photograph Review

AGS reviewed historic aerial photographs and satellite imagery during this investigation. The photographs AGS reviewed are presented in the References (Appendix A).

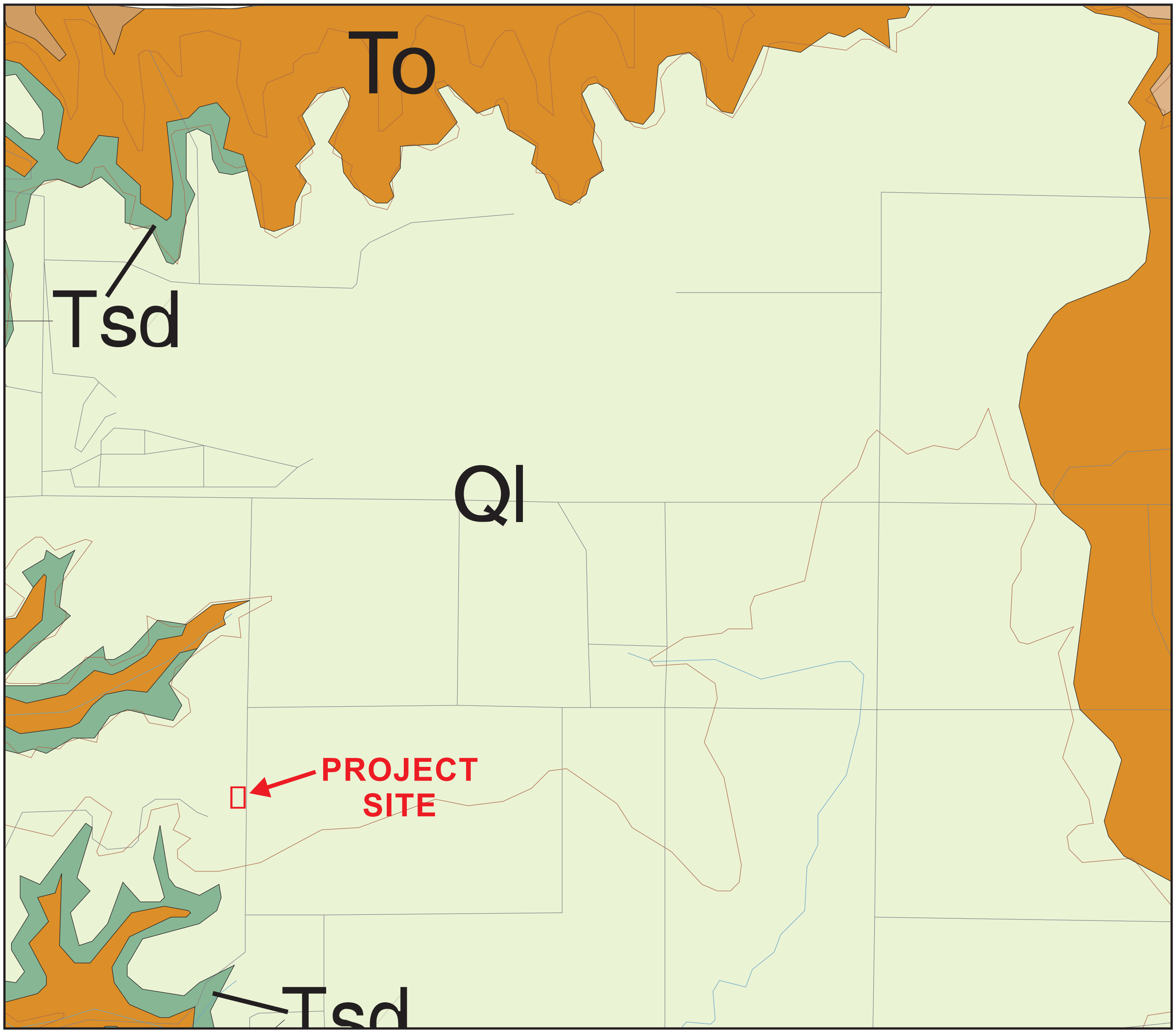
4.1.3. Field Mapping

The geologic contacts mapped on Plate 1 are based on our observations of the site and subsurface data collected from nearby subsurface excavations.

4.2. Geologic and Geomorphic Setting

The project is located in the lower Peninsular Range Region of San Diego County, a subset of the greater Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges Geomorphic province is approximately bounded to the east by Elsinore Fault Zone, to the north by the Transverse Ranges, the south by Baja California, and to the west by the Pacific Ocean. This portion of the Peninsular Ranges is underlain by Jurassic and Cretaceous plutonic rocks of the Peninsular Ranges Batholith, which contains screens of variably metamorphosed Mesozoic rocks. Late Jurassic and Early Cretaceous volcanic and volcanic-clastic rocks exposed southwest of the Elsinore Fault Zone represent an older superjacent part of the Peninsular Ranges magmatic arc. These basement rocks are non-conformably overlain by a thick sequence of relatively undisturbed sedimentary rocks ranging from upper Cretaceous to Pleistocene in age.

Specifically, the project site is located near the coastal plain. Geologically, the site has been mapped as being underlain by two principle rock types, the Pleistocene-age Lindavista Formation underlain by the Pliocene age San Diego Formation. The Tertiary age Otay Formation is thought to unconformably underlie the San Diego Formation (Todd 2004). However, the Pliocene age San Diego Formation was not encountered in deeper excavations nearby. The site is therefore thought to be underlain by the Lindavista Formation which is unconformably underlain by the Otay Formation. Undocumented artificial fill is anticipated to exist locally within the site. An excerpt of the regional geologic map for the site vicinity is shown on Figure 2.



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REGIONAL GEOLOGIC MAP
LUMINA III PROJECT
SAN DIEGO, CALIFORNIA

LEGEND:

Ql - Lindavista Fromation
Tsd - San Diego Formation
To - Otay Formation

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FIGURE 2

SOURCE MAP - EL CAJON 30x60
QUADRANGLE, SOUTHERN CALIFORNIA

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4.3. Stratigraphy

A brief description of the earth materials encountered on this site is presented in the following sections. More detailed descriptions of these materials are provided in the logs included in Appendix B. Based upon our investigation, the site is mantled by topsoil and undocumented artificial fill. Pleistocene-age terrace deposits assigned to the Lindavista Formation (Todd, 2004) exist below the topsoil and artificial fill at the site. It is anticipated that the Lindavista Formation is underlain by Tertiary age Otay Formation. The approximate limits of these units are shown on Plate 1.

4.3.1. Undocumented Artificial Fill (Map Symbol afu)

Based on available information, undocumented artificial fill locally mantles the project site. The fill primarily consists of dry to moist, very loose to moderately dense, silty to clayey sands and sandy clay with some gravel and cobbles that contains organic debris, trash and construction debris (e.g. concrete pieces).

4.3.2. Topsoil (No Map Symbol)

A relatively thin veneer of topsoil blankets most of the site. It typically consists of medium to dark brown sandy clay to clayey sand in a dry to slightly moist and loose to stiff condition. The topsoil is generally 1 to 3 feet in thickness and commonly contains roots.

4.3.3. Lindavista Formation (Map Symbol Ql)

Pleistocene-age terrace deposits assigned to the Lindavista Formation cap the site. This unit generally ranges in color from light reddish brown and yellowish brown to dark brown. As encountered during subsurface investigations by AGS and Geocon for adjacent parcels, these deposits vary from silty to sandy clay that is slightly moist to moist and firm to stiff, to well-graded gravelly sand with silt and sandy gravel with cobbles in a slightly moist and moderately dense to dense condition.

4.3.4. Otay Formation (Map Symbol To)

It is anticipated that the site is underlain at depth by the Tertiary age Otay Formation. As encountered in deeper borings excavated on adjacent parcels, the Otay Formation generally consists of light gray to olive brown fine-grained sandy siltstone and fine grained sandy to silty claystone that is moderately hard to hard.

4.4. Geologic Structure and Tectonic Setting

4.4.1. Regional Faulting

The San Andreas Fault zone is the dominant and controlling tectonic stress regime of southern California. As the boundary between the Pacific and North American structural plates, this northwest trending right lateral, strike–slip, active fault has controlled the crustal structural regimes of southern California since Miocene time. Numerous related active fault zones with a regular spacing, including the Elsinore-Whittier-Chino, Newport-Inglewood-Rose Canyon, and San Jacinto fault zones characterize the stress regime and also trend to the northwest as do the Santa Ana Mountains and the Peninsular Ranges. The

Newport-Inglewood-Rose Canyon fault zone is the closest known active fault to the project and is located approximately 9.5 miles to the west of the site.

4.4.2. Local Faulting

The site is not located within an Alquist-Priolo Special Studies Fault Zone or a San Diego County Fault Zone. No faults have been mapped onsite, nor were any observed during this geologic study. The most significant geologic fault potentially affecting the property is the active Silver Strand section of the Newport-Inglewood-Rose Canyon fault zone.

4.4.3. Geologic Structure

The Lindavista Formation/Terrace Deposits are predominantly thickly to massively bedded and are essentially flat lying. The Otay Formation unconformably underlies the Lindavista Formation and is characterized by regional westerly to southwesterly dipping beds with inclinations on the order of 3 to 7 degrees from horizontal.

4.5. Groundwater

Groundwater was not encountered in the nearby exploratory excavation by AGS and others. No natural groundwater condition is known to exist at the site that would impact the proposed site development. However, it should be noted that localized perched groundwater may develop at a later date, most likely at or near fill/bedrock contacts, due to fluctuations in precipitation, irrigation practices, or factors not evident at the time of our field explorations.

4.6. Non-seismic Geologic Hazards

4.6.1. Mass Wasting and Debris Flows

No evidence of mass wasting was observed onsite nor was any noted on the reviewed maps.

4.6.2. Flooding

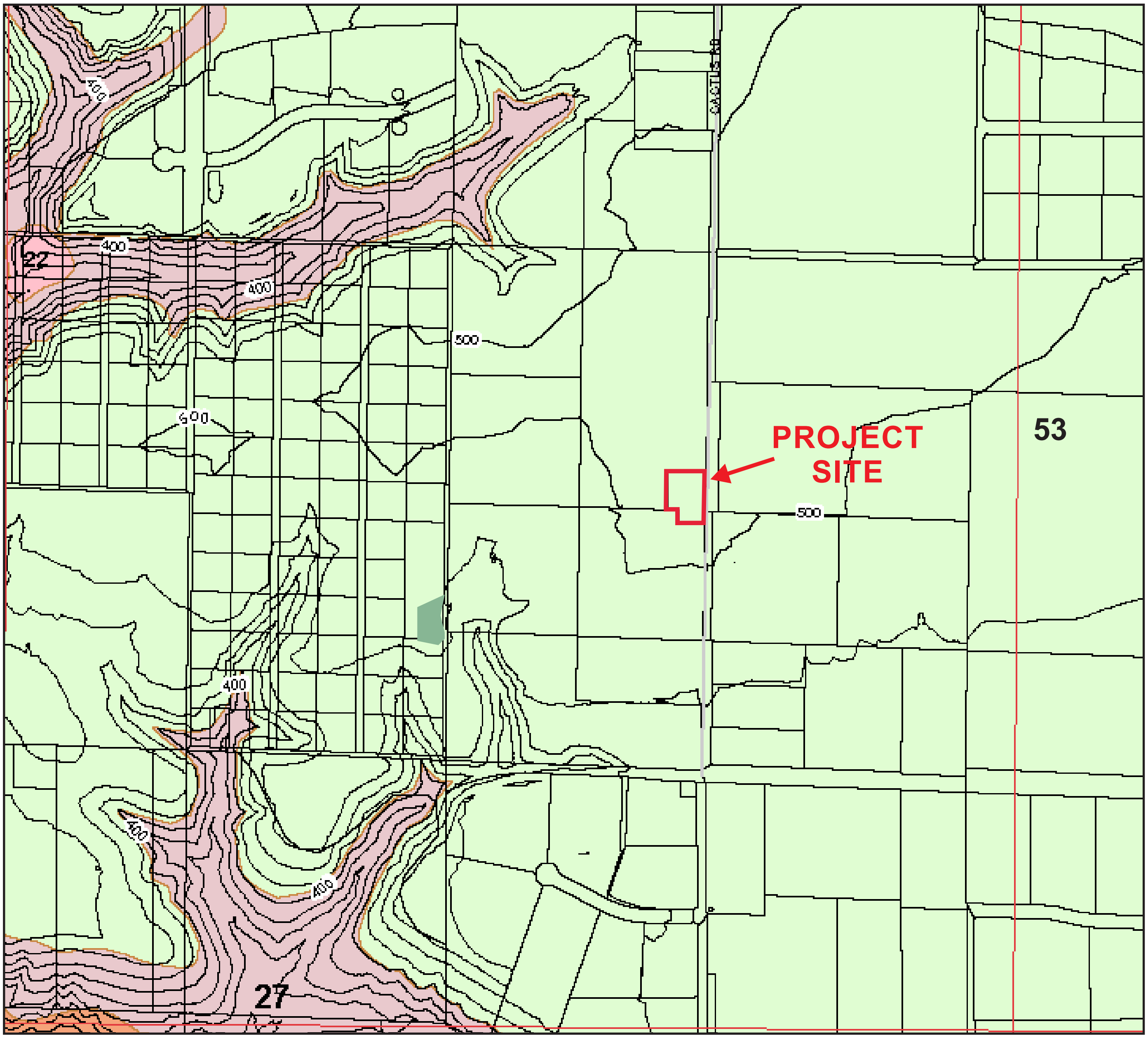
The FEMA (2012) flood map indicates that the site is located outside designated 500-year floodplain areas. The flood hazard for the site is considered to be minimal. Hydrology studies should be provided by the Civil Engineer.

4.6.3. Subsidence and Ground Fissuring

Owing to the presence of dense to moderately hard formational materials underlying the subject site, subsidence and ground fissuring potential at the site is considered very low.

4.7. Seismic Hazards

The project site is located in the tectonically active Southern California area, and will therefore likely experience shaking effects from earthquakes. The type and severity of seismic hazards affecting the site are to a large degree dependent upon the distance to the causative fault, the intensity of the seismic event, the direction of propagation of the seismic wave and the underlying soil characteristics. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction, seismically induced slope failure or dynamic settlement. The following is a site-specific discussion of ground motion parameters, earthquake-



LEGEND

21 Confirmed, known, or highly suspected

27 Otay, Sweetwater, and others

53 Level or sloping terrain, unfavorable geologic structure, Low to moderate risk

N

SCALE: 1 in. =800 ft.

SEISMIC HAZARD ZONES
LUMINA III PROJECT
SAN DIEGO, CALIFORNIA

FIGURE 3

SOURCE MAP(S):CITY OF SAND DIEGO SEISMIC SAFETY STUDY GEOLOGIC HAZARDS AND FAULTS, GRID TITLE 3

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induced landslide hazards, settlement, and liquefaction. The purpose of this analysis is to identify potential seismic hazards and propose mitigations, if necessary, to reduce the hazard to a less than significant level of risk. The following seismic hazards discussion is guided by the California Building Code (2016) and the City of San Diego Seismic Hazards Study, Geologic Hazards and Faults, 2008. A portion of this map is presented in Figure 3.

4.7.1. City of San Diego Seismic Safety Study

AGS has reviewed the 2008 City of San Diego Seismic Safety Study, Grid Tile 3 (Figure 3). The site is mapped as Unit 53 – Level or sloping terrain, unfavorable geologic structure, low to moderate risk.

There are fault traces mapped approximately 0.85 miles west of the project site. The fault is presumed inactive, does not project into the project site, and is not considered a design concern for the project.

4.7.2. Surface Fault Rupture

Surface rupture is a break in the ground surface during or as a consequence of seismic activity. In general, research supports the conclusion that active faults tend to rupture at or near pre-existing fault planes. No faults have been mapped within or near the project. As such, it is considered that the potential for surface fault rupture at the site is very low.

4.7.3. Liquefaction

Liquefaction is the phenomenon where seismic agitation of loose, saturated sands and silty sands can result in a buildup of pore pressures that, if sufficient to overcome overburden stresses, can produce a temporary quick condition. Localized, loose lenses/layers of sandy soils may be subject to liquefaction when a large, prolonged, seismic event affects the site. As the excess pore water pressure dissipates, the liquefied zones/lenses can consolidate causing settlement. Post liquefaction effects at a site can manifest in several ways and may include: 1) ground deformations; 2) loss of shear strength; 3) lateral spread; 4) dynamic settlement; and 5) flow failure.

In general, the more recently sediment has been deposited, the more likely it is to be susceptible to liquefaction. Further, liquefaction potential is greatest in loose, poorly graded sands and silty sands with mean grain size in the range of 0.1 to 0.2 mm. Other factors that must be considered are groundwater, confining stresses, relative density, intensity and duration of ground shaking.

The project site is not within an area zoned by the City of San Diego as a Potential Liquefaction Area. In consideration of the recommended remedial grading, and dense nature of the formational materials and proposed fills within the limits of the project site, the potential for liquefaction or seismically induced settlement is considered remote.

4.7.4. Lateral Spreading

Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore pressure build-up or liquefaction in a shallow underlying deposit during an earthquake. Due to the presence of dense underlying formational materials, the potential for lateral spreading is considered to be very low.

4.7.5. Seismically Induced Dynamic Settlement

Seismically induced dynamic settlement occurs in response to seismic shaking of loose cohesionless sand soils. The source of settlement is volumetric strain associated with liquefaction of saturated soils strata, and/or, the rearrangement of sandy particles in dry, relatively loose layers of cohesionless sandy soils. These two sources of settlement potential are mutually exclusive. As a result, if the groundwater rises, the liquefaction potential and its adverse effects increase, while dry sand settlement potential decreases; and, vice-versa.

Due to the anticipated removals proposed herein, the density of the Lindavista Formation to be left in-place, and the relative hardness of the underlying Otay Formation, the potential for seismically induced settlement is considered very low.

4.7.6. Seismically Induced Landsliding

The project site is relatively level and does not have any slopes greater than five feet in height. Evidence of landsliding at the site was not observed during our field explorations nor any geomorphic features indicative of landsliding noted during our review of aerial photos and published geologic maps.

4.7.7. Earthquake Induced Flooding

Earthquake induced flooding can be caused by tsunamis, dam failures, or seiches. Earthquakes can also cause landslides that dam rivers and streams, and flooding can occur upstream above the dam and also downstream when these dams are breached. A seiche is a free or standing-wave oscillation on the surface of water in an enclosed or semi-enclosed basin. The wave can be initiated by an earthquake and can vary in height from several centimeters to a few meters. Due to the lack of an up-gradient freestanding body of water nearby, the potential for a seiche impacting the site is considered to be non-existent.

Considering the lack of any dams or permanent water sources upstream, earthquake induced flooding caused by a dam failure is considered to be remote.

Considering the distance of the site from the coastline, the potential for flooding due to tsunamis is very low.

5.0 GEOTECHNICAL ENGINEERING

Presented herein is a general discussion of the geotechnical properties of the various soil types and the analytic methods used in this report.

5.1. Material Properties

5.1.1. Excavation Characteristics

The results of AGS's and others subsurface investigations, combined with grading experience in the area, indicate that the topsoil, undocumented fill, Lindavista Formation, and the Otay Formation are rippable with conventional grading equipment (i.e., scrapers). Deeper cuts (> 10 feet) in Lindavista Formation may encounter gravelly/cobbly and cemented materials requiring heavy ripping for efficient excavation.

Significant amounts of oversize rock (i.e., rocks > 12 inches) are not expected to be generated during grading at the site.

5.1.2. Oversized Materials

Oversized rock may be incorporated into the compacted fill section to within ten (10) feet of finish grade or within two (2) feet of the deepest utility (if utility is greater than ten (10) feet). Oversize rock is not to be placed within areas of proposed drainage structures and should be kept minimally five (5) feet outside and below proposed culverts, pipes, etc. Variances to the above rock hold-down must be approved by the owner, geotechnical consultant and governing agencies.

5.1.3. Compressibility

The onsite materials that are compressible include topsoil, undocumented fill, and highly weathered Lindavista Formation. Compressible materials will require removal from fill areas prior to placement of fill and where exposed at grade in cut areas.

5.1.4. Collapse Potential/Hydro-Consolidation

The hydro-consolidation process is a singular response to the introduction of water into collapse-prone sandy soils. Upon initial wetting, the soil structure and apparent strength are altered and a virtually immediate settlement response occurs. Recommended measures to mitigate potential for differential settlement due to hydro-collapse include removal/recompaction such as described in Section 6.1 of this report.

5.1.5. Expansion Potential

Based upon sampling and laboratory testing conducted by AGS and others, the onsite soils are considered to exhibit “Very Low” to “Very High” expansion potential, with the majority of the onsite soils possessing “Low” to “High” expansion potential. Typical mitigation measures for expansive soils include structural design, pre-saturation, and overexcavation of highly expansion soils and replacement with lower expansive soils (selective grading).

5.1.6. Shear Strength

Based on laboratory test results and our previous experience in the area with similar soils, the following shear strengths for compacted fill and Lindavista Formation are presented on table 5.1.6.

TABLE 5.1.6 RECOMMENDED SHEAR STRENGTHS FOR DESIGN			
Material	**Cohesion (psf)**	**Friction Angle (degrees)**	**Density (pcf)**
Artificial Fill Compacted	350	27	125
Lindavista Formation (Ql)	200	32	130

5.1.7. Chemical and Resistivity Test Results

Test results from AGS's investigations for the adjacent parcels indicate that water soluble sulfate concentrations of onsite soils tested ranged from 0.01% to 0.405% which corresponds to a S0 - Not Applicable to S2 - Severe sulfate exposure class per ACI 318-11 Table 4.2.1. Some of the onsite soils are expected to be corrosive to concrete. Based upon the initial test results, higher strength concrete, low water to cement ratios (0.5 to 0.45) and specialized cement types (Type V) could be required to mitigate the adverse effects these aggressive soils could have on concrete.

Resistivity testing of the onsite soils ranged from 260 ohm-cm to 2,300 ohm-cm. These results indicate that some of the onsite soils are expected to be corrosive to ferrous metals. Additional testing should be completed during grading to verify whether the soils tested produce similar test results.

5.1.8. Earthwork Adjustments

The onsite soils are expected to undergo a volume change when excavated and utilized as fill material. In an effort to balance earthwork quantities, the following volume adjustments can be utilized. These numbers are considered approximate and should be refined during grading when actual conditions are better defined. Contingencies should be made to adjust the earthwork balance during grading if these numbers are adjusted.

TABLE 5.1.8 RECOMMENDED EARTHWORK ADJUSTMENTS	
Geologic Unit	**Adjustment Factor**
Alluvium/Topsoil	Shrink 10 - 12%
Undocumented Artificial Fill	Shrink 8 - 15%
Lindavista Formation (Ql)	Bulk 2 - 5%

5.1.9. Pavement Support Characteristics

Compacted fill derived from onsite soils are expected to possess "poor" to "moderate" pavement support characteristics. Testing should be completed once subgrade elevations are reached for the onsite roadways. For preliminary planning purposes, AGS has used an R-Value of 20 for the preliminary design of roadway pavement sections.

6.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based on the information presented herein and our experience in the vicinity of the proposed project site, it is AGS's opinion that the proposed development of the Lumina III Project is feasible, from a geotechnical point of view, provided that the constraints discussed in this report are addressed in the design and construction of the proposed project. Key issues related to site development are discussed and associated geotechnical recommendations for use in planning and design are presented in the following sections of this report.

All grading shall be accomplished under the observation and testing of the project Geotechnical Consultant in accordance with the recommendations contained herein, the current codes and practiced by the City of San Diego and this firm's Earthwork Specifications (Appendix D).

6.1. Site Preparation and Removals/Overexcavation

Guidelines to determine the depth of removals are presented below; however, the exact extent of the removals must be determined in the field during grading, when observation and evaluation in greater detail afforded by those exposures can be performed by the Geotechnical Consultant. In general, removed soils will be suitable for reuse as compacted fill when free of deleterious materials and after adequate moisture conditioning and mixing.

Removal of unsuitable soils typically should be established at a 1:1 projection to suitable materials outside the proposed engineered fills. Front cuts should be made no steeper than 1:1, except where constrained by other factors such as property lines and protected structures. Removals should be initiated at approximately twice the distance of the anticipated removal depth, outside the engineered fills. During grading, the bottoms of all removal areas should be observed, mapped, and approved by the Geotechnical Consultant prior to fill placement. It is recommended the bottoms of removals be surveyed and documented.

6.1.1. Site Preparation and Removals

Existing vegetation, trash, debris and other deleterious materials should be removed and wasted from the site prior to removal of unsuitable soils and placement of compacted fill. Artificial fill, topsoil, and highly weathered formational materials should be removed in areas planned to receive fill or where exposed at final grade. The resulting undercuts should be replaced with engineered fill. Estimated depths of removals based upon geologic units are presented in Table 6.1.1. It should be noted that local variations can be expected requiring an increase in the depth of removal for unsuitable and weathered deposits. The extent of removals can best be determined in the field during grading when observation and evaluation can be performed by the soil engineer and/or engineering geologist. Removals should expose competent formational materials and be observed and mapped by the engineering geologist prior to fill placement. In general, soils removed during remedial grading will be suitable for reuse in compacted fills provided they are properly moisture conditioned, mixed, and do not contain deleterious materials.

TABLE 6.1.1
ESTIMATED DEPTH OF REMOVALS

Geologic Unit	Estimated Removal Depth
Undocumented Artificial Fill	1 - 3 feet
Topsoil (no map symbol)	1 - 3 feet
Lindavista Formation (Ql)	3 - 5 feet

6.1.2. Overexcavation

6.1.2.1. Cut Lot Overexcavation

When structural sitings are made available, structural cut lots exposing the Lindavista Formation should be overexcavated such that a minimum of three feet of compacted fill is placed below the building pads. Deeper overexcavation may be considered for structures planned with deeper footings. The overexcavation should maintain a minimum one (1) percent gradient to the front of the lot. In addition, where steep cut/fill transitions are created, additional overexcavation and flattening of the transitions may be required.

6.1.2.2. Cut/Fill Transition Lot Overexcavation

Where design or remedial grading activities create a cut/fill transition on the "structural" lots, excavation of the cut and shallow fill portion should be performed such that a minimum of three (3) feet of compacted fill exists below pad grade. The undercut overexcavation should maintain a minimum one (1) percent gradient to the front of the lot. In addition, where steep cut/fill transitions are created, additional overexcavation and flattening of the transitions may be recommended.

6.1.3. Removals along Grading Limits and Property Lines

Removals of unsuitable soils will be required prior to fill placement along the project grading limits. A 1:1 projection, from toe of slope or grading limit, outward to competent materials should be established, when possible.

6.2. Earthwork Considerations

6.2.1. Compaction Standards

All fills should be compacted at least 90 percent of the maximum dry density as determined by ASTM D1557. All loose and or deleterious soils should be removed to expose firm native soils or bedrock. Prior to the placement of fill, the upper 6 to 8 inches should be ripped, moisture conditioned to optimum moisture or slightly above optimum, and compacted to a minimum of 90 percent relative compaction. Fill should be placed in thin (6 to 8-inch) lifts, moisture conditioned to optimum moisture or slightly above, and compacted to 90 percent relative compaction until the desired grade is achieved. Where the natural slope is steeper than 5-horizontal to 1-vertical and where determined by the

Geotechnical Consultant, compacted fill material shall be keyed and benched into competent materials.

6.2.2. Mixing and Moisture Control

In order to prevent layering of different soil types and/or different moisture contents, mixing and moisture control of materials will be necessary. The preparation of earth materials through mixing and moisture control should be accomplished prior to and as part of the compaction of each fill lift. Water trucks or other water delivery means may be necessary for moisture control. Discing may be required when either excessively dry or wet materials are encountered.

6.2.3. Haul Roads

All haul roads, ramp fills, and tailing areas shall be removed prior to engineered fill placement.

6.2.4. Import Soils

No import soils are anticipated since the project is proposed as a cut site. If this changes, the Geotechnical Consultant should be contacted.

6.2.5. Fill Slope Construction

Fill slopes may be constructed by preferably overbuilding and cutting back to the compacted core or by back-rolling and compacting the slope face. The following recommendations should be incorporated into construction of the proposed fill slopes. Care should be taken to avoid spillage of loose materials down the face of any slopes during grading. Spill fill will require complete removal before compaction, shaping, and grid rolling.

Seeding and planting of the slopes should follow as soon as practical to inhibit erosion and deterioration of the slope surfaces. Proper moisture control will enhance the long-term stability of the finish slope surface.

6.2.5.1. Overbuilding Fill Slopes

Fill slopes should be overfilled as determined by the grading contractor, but not less than 2 feet measured perpendicular to the slope face, so that when trimmed back to the compacted core, compaction of the slope face meets the minimum project requirements for compaction.

Compaction of each lift should extend out to the temporary slope face. The slope should be back-rolled at fill intervals not exceeding 4 feet in height, unless a more extensive overfilling is undertaken.

6.2.5.2. Compacting the Slope Face

As an alternative to overbuilding the fill slopes, the slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Back-rolling at more frequent intervals may be required.

Compaction of each fill lift should extend to the face of the slope. Upon completion, the slopes should be watered, shaped, and track-walked with a D-8 bulldozer or similar equipment until the compaction of the slope face meets the minimum project requirements. Multiple passes may be required.

6.2.6. Utility Trench Excavation and Backfill

All utility trenches should be shored or laid back in accordance with applicable OSHA standards. Excavations in bedrock areas should be made in consideration of underlying geologic structure, and the geotechnical consultant should be consulted on these issues during construction.

Mainline and lateral utility trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557. Onsite soils will not be suitable for use as bedding material but will be suitable for use in backfill, provided oversized materials are removed. No surcharge loads should be imposed above excavations. This includes spoil piles, lumber, concrete trucks, or other construction materials and equipment. Drainage above excavations should be directed away from the banks, and care should be taken to avoid saturation of the soils.

Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable.

To reduce moisture penetration beneath the slab-on-grade areas, shallow utility trenches should be backfilled with lean concrete or concrete slurry where they intercept the foundation perimeter, or such excavations can be backfilled with native soils, moisture-conditioned to over optimum, and compacted to a minimum of 90 percent relative compaction.

7.0 DESIGN RECOMMENDATIONS

From a geotechnical perspective, the proposed project is feasible provided the following recommendations are incorporated into the design and construction. Preliminary design recommendations presented herein are based on the general soils conditions encountered onsite and at adjacent properties as described in the referenced geotechnical investigations. As such, recommendations provided herein are considered preliminary and subject to change based on the results of additional observation and testing that will occur during grading operations. Final design recommendations should be provided in a final rough/precise grading report.

7.1. Structural Design Recommendations

It is expected that for typical one- to three-story residential/commercial products and loading conditions (1 ksf to 6 ksf for spread and continuous footings), conventional or post-tensioned shallow slab-on-grade foundation systems can be utilized.

Upon the completion of rough grading, finish grade samples should be collected and tested to develop specific recommendations as they relate to final foundation design recommendations for individual lots. These test results and corresponding design recommendations should be presented in a Final Grading Report.

7.1.1. Foundation Design

Residential/Commercial structures can be supported on conventional shallow foundations and slab-on-grade or post-tensioned slab/foundation systems, as discussed above. The design of foundation systems should be based on as-graded conditions as determined after grading completion. The following values may be used in preliminary foundation design:

Allowable Bearing:	2000 psf.
Lateral Bearing:	250 psf per foot of depth to a maximum of 2000 psf for level conditions. Reduced values may be appropriate for descending slope conditions.
Sliding Coefficient:	0.30

The above values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building code and structural design considerations may govern. Depth and reinforcement requirements and should be evaluated by a qualified engineer.

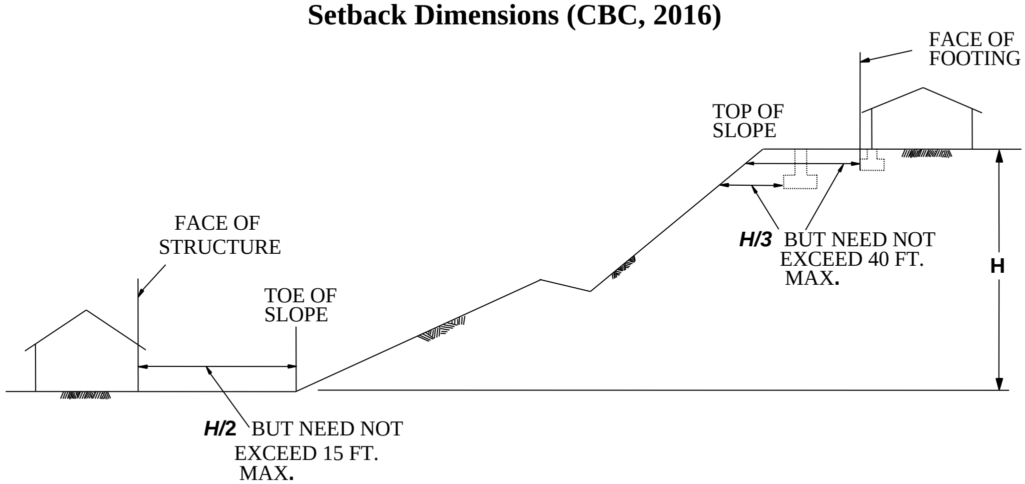
7.1.1.1. Deepened Footings and Setbacks

Improvements constructed in proximity to natural slopes or properly constructed, manufactured slopes can, over a period of time, be affected by natural processes including gravity forces, weathering of surficial soils and long-term (secondary) settlement. Most building codes, including the California Building Code, require that structures be set back or footings deepened where subject to the influence of these natural processes.

For the subject site, where foundations for residential structures are to exist in proximity to slopes, the footings should be embedded to satisfy the requirements presented in the following figure.

FIGURE 7.1.1.1

Setback Dimensions (CBC, 2016)



7.1.1.2. Moisture and Vapor Barrier

A moisture and vapor retarding system should be placed below the slabs-on-grade in portions of the structure considered to be moisture sensitive. The retarder should be of suitable composition, thickness, strength, and low permeance to effectively prevent the migration of water and reduce the transmission of water vapor to acceptable levels. Historically, a 10-mil plastic membrane, such as *Visqueen*, placed between one to four inches of clean sand, has been used for this purpose. More recently Stego® Wrap or similar underlayments have been used to lower permeance to effectively prevent the migration of water and reduce the transmission of water vapor to acceptable levels. The use of this system or other systems, materials, or techniques can be considered, at the discretion of the designer, provided the system reduces the vapor transmission rates to acceptable levels.

7.1.2. Retaining Wall Design

The foundations for retaining walls of appurtenant structures structurally separated from the building structure may bear on properly compacted fill. The foundations should be designed in accordance with the recommendations provided in Section 7.1.1. Retaining walls should be designed to resist earth pressures presented in Table 7.1.2. When calculating the lateral resistance, the upper 12 inches of soil cover should be ignored in areas not covered with hardscape. Retaining wall footings should be designed to resist the lateral forces by passive soil resistance and/or base friction.

TABLE 7.1.2
RETAINING WALL EARTH PRESSURES

"Native"* Backfill Materials (γ=125pcf, EI$\leq$50)				
	Level Backfill		**Sloping (2:1) Backfill**	
	Rankine Coefficients	**Equivalent Fluid Pressure (psf / lineal foot)**	**Rankine Coefficients**	**Equivalent Fluid Pressure (psf / lineal foot)**
Active Pressure	K_a = 0.36	45	K_a = 0.58	73
Passive Pressure	K_p = 2.77	345	K_p = 1.72	200
At Rest Pressure	K_o = 0.53	66	K_o = 0.77	96
"Select"* Backfill Materials (γ=120pcf, EI$\leq$20, SE$\geq$20)				
	Level Backfill		**Sloping (2:1) Backfill**	
	Rankine Coefficients	**Equivalent Fluid Pressure (psf / lineal foot)**	**Rankine Coefficients**	**Equivalent Fluid Pressure (psf / lineal foot)**
Active Pressure	K_a = 0.28	34	K_a = 0.44	53
Passive Pressure	K_p = 3.54	420	K_p = 1.33	160
At Rest Pressure	K_o = 0.44	53	K_o = 0.75	90

Notes: "Select" backfill materials should be granular, structural quality backfill with a Sand Equivalent of 20 or better and an Expansion Index of 20 or less. The "select" backfill must extend at least one-half the wall height behind the wall; otherwise, the values presented in the "Native" backfill materials columns must be used for the design. "Native" backfill materials should have an Expansion Index of 50 or less. The upper one-foot of backfill should be comprised of native on-site soils.

Retaining walls should be designed to resist additional loads such as construction loads, temporary loads, and other surcharges as evaluated by the structural engineer. In addition to the above static pressures, unrestrained retaining walls should be designed to resist seismic loading as required by the 2016 CBC. The seismic load can be modeled as a thrust load applied at a point 0.6H above the base of the wall, where H is equal to the height of the wall. This seismic load (in pounds per lineal foot of wall) is represented by the following equation:

$$Pe = \frac{3}{8} * \gamma * H^2 * k_h$$

Where: Pe = Seismic thrust load

H = Height of the wall (feet)

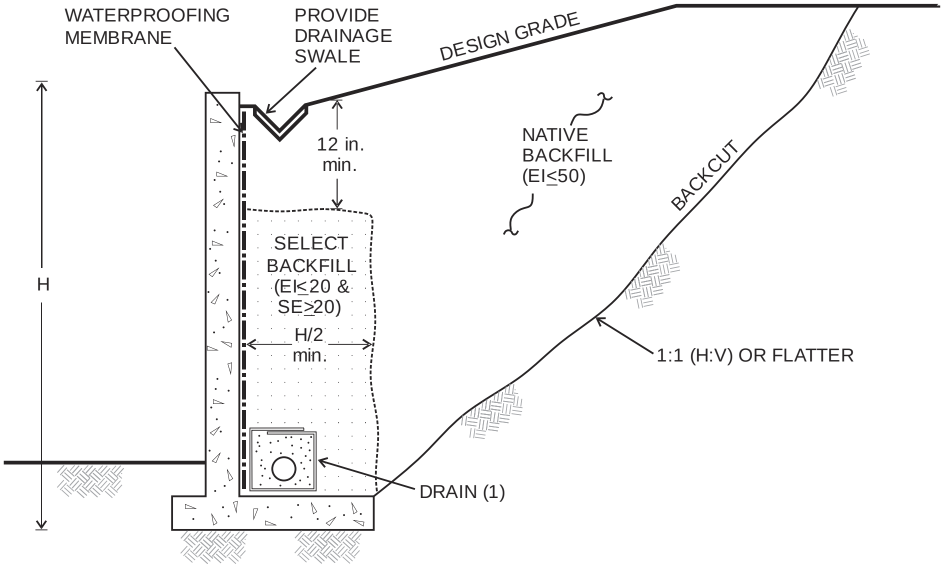
γ = soil density = 125 pounds per cubic foot (pcf)

k_h = seismic pseudostatic coefficient = 0.5 * PGA_M / g

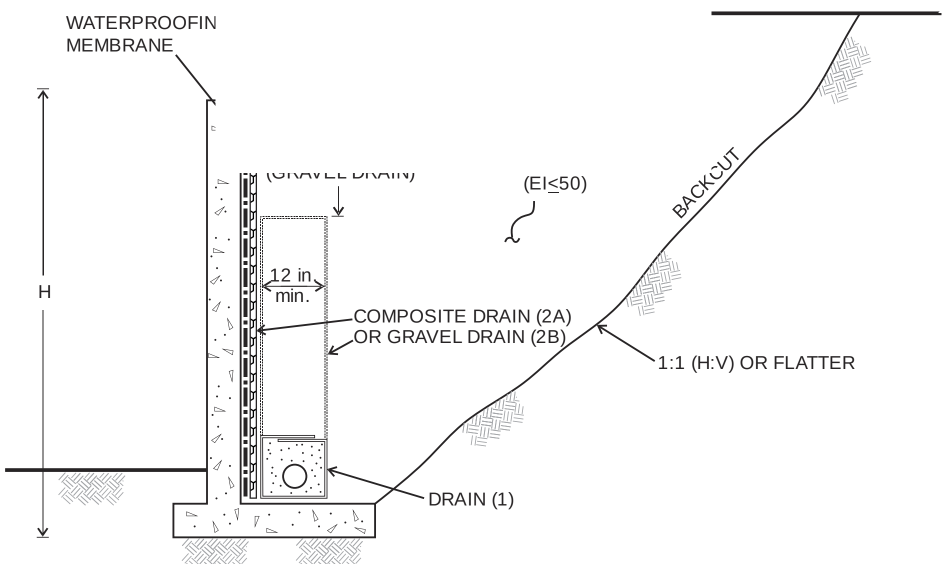
The peak horizontal ground acceleration (PGA_M) is provided in Section 7.1.3. Walls should be designed to resist the combined effects of static pressures and the above seismic thrust load.

Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces as shown in Figure 7.1.2 Details RTW-A and RTW-B. The type of backfill (“select” or “native”) should be specified by the wall designer and shown on the plans. Otherwise, the retaining walls should be designed to resist hydrostatic forces. Proper drainage devices should be installed along the top of the wall backfill and should be properly sloped to prevent surface water ponding adjacent to the wall. In addition to the wall drainage system, for building perimeter walls extending below the finished grade, the wall should be waterproofed and/or damp-proofed to effectively seal the wall from moisture infiltration through the wall to the interior wall face.

The wall should be backfilled with granular soils placed in loose lifts no greater than 8-inches thick, at or near optimum moisture content, and mechanically compacted to a minimum 90 percent of the maximum dry density as determined by ASTM D1557. Flooding or jetting of backfill materials generally do not result in the required degree and uniformity of compaction and is not recommended. No backfill should be placed against concrete until minimum design strengths are achieved as verified by compression tests of cylinders. The geotechnical consultant should observe the retaining wall footings, back drain installation, and be present during placement of the backfill to confirm that the walls are properly backfilled and compacted.



Detail RTW-A



Detail RTW-B

NOTES: (1) D

T

(2A)

(2B) IN

Figure 7.1.2 - Retaining Wall Backfill and Drainage

7.1.3. Seismic Design

After implementation of the recommendations provided in this report, the site may be classified as Seismic Site Class D consisting of a stiff soil profile with average SPT N blowcount between 15 and 50 blows per foot. Table 6.6.5 present seismic design parameters in accordance with 2016 CBC and mapped spectral acceleration parameters (United States Geological Survey, 2019). Site coordinates of Latitude 32.5575˚ N and Longitude 116.9889˚ W were utilized.

Table 7.1.3
2016 California Building Code Design Parameters

Seismic Site Class	D
Mapped Spectral Acceleration Parameter at Period of 0.2-Second, S_s	0.839g
Mapped Spectral Acceleration Parameter at Period 1-Second, S_1	0.319g
Site Coefficient, F_a	1.165
Site Coefficient, F_v	1.762
Adjusted MCE_R[1] Spectral Response Acceleration Parameter at Short Period, S_{MS}	0.977g
1-Second Period Adjusted MCE_R[1] Spectral Response Acceleration Parameter, S_{M1}	0.563g
Short Period Design Spectral Response Acceleration Parameter, S_{DS}	0.651g
1-Second Period Design Spectral Response Acceleration Parameter, S_{D1}	0.375g
Peak Ground Acceleration, PGA_M[2]	0.389g
Seismic Design Category	D

Note: [1] Targeted Maximum Considered Earthquake
[2] Peak Ground Acceleration adjusted for site effects

7.2. Civil Design Recommendations

7.2.1. Rear and Side Yard Walls and Fences

Block wall footings should be founded a minimum of 24-inches below the lowest adjacent grade. To reduce the potential for uncontrolled, unsightly cracks, it is recommended that a construction joint be incorporated at regular intervals. For side yard walls situated perpendicular to the top of slopes a joint should be constructed at approximately 10 feet from the slope hinge point. Spacing of the joints should be between 10 and 20 feet.

7.2.2. Drainage

Final site grading should assure positive drainage away from structures. Planter areas should be provided with area drains to transmit irrigation and rainwater away from structures. The use of gutters and down spouts to carry roof drainage well away from structures is recommended. Raised planters should be provided with a positive means to remove water through the face of the containment wall.

7.2.3. Pavement Design

Final pavement design will be determined based upon sampling and testing of post-grading conditions. For preliminary design and estimating purposes the pavement structural sections presented in Table 7.2.3 can be used for the range of likely traffic indices. The structural sections are based upon an assumed R-Value of 20 and the current City of San Diego Pavement Design Standards Schedule "J".

TABLE 7.2.3
PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS

Traffic Index	Asphalt Concrete (inches)	Cement Treated Base (inches)
5.0	3.0	7.5
5.5	3.0	9.0
6.0	3.0	10.5
6.5	4.0	10.5
7.0	4.0	12.0
7.5	4.5	13.0
8.0	5.0	14.0

Pavement subgrade soils should be at or near optimum moisture content and should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557. Aggregate base should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557 and should conform with the specifications listed in Section 26 of the *Standard Specifications for the State of California Department of Transportation* (Caltrans) or Section 200-2 of the *Standard Specifications for Public Works Construction* (Green Book). The asphalt concrete should conform to Section 26 of the Caltrans *Standard Specifications* or Section 203-6 of the Green Book.

8.0 FUTURE STUDY NEEDS

This report represents an updated TM review of the proposed project. As the project design progresses, additional site specific geologic and geotechnical issues will need to be considered in the ultimate design and construction of the project. Consequently, future geotechnical studies and reviews are necessary, potentially including the advancement of additional bucket auger borings to evaluate the natural descending slopes at the site. These future studies may include reviews of:

- Rough grading plans.
- Precise grading plans.
- Foundation plans.
- Retaining wall plans.

These plans should be forwarded to the project geotechnical engineer/geologist for evaluation and comment, as necessary.

9.0 CLOSURE

9.1. Geotechnical Review

As is the case in any grading project, multiple working hypotheses are established utilizing the available data, and the most probable model is used for the analysis. Information collected during the grading and construction operations is intended to evaluate the hypotheses, and some of the assumptions summarized herein may need to be changed as more information becomes available. Some modification of the grading and construction recommendations may become necessary, should the conditions encountered in the field differ significantly than those hypothesized to exist.

AGS should review the pertinent plans and sections of the project specifications, to evaluate conformance with the intent of the recommendations contained in this report. If the project description or final design varies from that described in this report, AGS must be consulted regarding the applicability of, and the necessity for, any revisions to the recommendations presented herein. AGS accepts no liability for any use of its recommendations if the project description or final design varies and AGS is not consulted regarding the changes.

9.2. Limitations

This report is based on the project as described and the information obtained from the exploratory excavations at the locations indicated on the plan. The findings are based on the review of the field and laboratory data combined with an interpolation and extrapolation of conditions between and beyond the exploratory excavations. The results reflect an interpretation of the direct evidence obtained. Services performed by AGS have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are based on the assumption that additional exploration will be performed and an appropriate level of field review will be provided by geotechnical engineers and engineering geologists who are familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this and future reports. AGS should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations of this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of AGS. AGS has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the CONTRACTOR, or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

APPENDIX A

REFERENCES

REFERENCES

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Aerial Photographs Reviewed for Report			
Year	**Flight ID**	**Photo ID**	**Photo Scale**
1928	SD	69B- 1, 2, 3 69C- 1, 2, 3 69D- 1, 2, 3	1” = 1000’
1960-1970	SDCT2/T11	2- 74 14- 28, 29, 30	1” = 1000’
1968	AXN	3JJ- 101, 102, 175	1” = 2800’
1970	SDC	13- 7, 8	1” = 2000’
1971	GS-VCSQ	1- 5	1” = 2600’
1973-1975	SDPD	14- 11, 12, 13 15- 14	1” = 1000’
1974	SDC ORTHOS	Jamul Mtn.	1” = 2000’
1974	SDPD	2- 3,4	1” = 2000’
1976	SAN DIEGO	235, 236, 247, 248	1” = 2000’
1978-1979	SDCO (WEST)	33- F1,F2 34- D22, D23, D24	1” = 1000’
1983	C11109 (CAS)	139, 140	1” = 2000’
1989	WAC (WEST)	18- 49, 51	1” = 2640’

APPENDIX B

SUBSURFACE LOGS (GEOCON)

PROJECT NO. 07147-42-01

TRENCH T 1B

ELEV. (MSL.) **508** DATE COMPLETED **08-11-2003**

EQUIPMENT **JD 510 RUBBERTIRE 24"**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TERRACE DEPOSIT CLAY** Soft to stiff, moist, dark brown, Sandy CLAY; porous, with roots, shrinkage cracks			
2	T 1-1			CL				
4					- Irregular contact with cobble layer			
6	T 1-2				**TERRACE DEPOSIT GRAVEL** Medium dense, damp, light yellow - brown, Gravelly, Silty medium to coarse SAND; with some clay			
8				SM	- Massive, with cleaner sand below 8 feet, trace gravel			
10					TRENCH TERMINATED AT 10 FEET			

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

07147-42-01.GPJ

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

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

PROJECT NO. 07147-42-03

TRENCH T 2 C

ELEV. (MSL.) **506'** DATE COMPLETED **12-30-03**

EQUIPMENT **JD 510**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2	T2-1			CL	**TERRACE DEPOSIT CLAY** Stiff, damp, dark brown Sandy CLAY -Porous, with shrinkage cracks, pinhole voids			
4 – 6	T2-2			SM	**TERRACE DEPOSIT GRAVEL** Medium dense, light yellow brown to reddish brown, Gravelly, Silty medium coarse SAND -Massive to horizontal bedding, trace clay			
8 – 12				SM-GM	Medium dense to dense, light yellow brown to reddish brown, very gravelly coarse SAND to sandy gravel; some silt			
14				SM-GM	Medium dense to dense, light yellow brown, very gravelly coarse SAND to sandy gravel with larger cobble 6"-8" max; some silt			

TRENCH TERMINATED AT 15 FEET

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

07147-42-03.GPJ

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

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

PROJECT NO. 07147-42-01

TRENCH T 2 G

ELEV. (MSL.) 505 DATE COMPLETED 08-11-2003

EQUIPMENT JD 510 RUBBERTIRE 24"

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2				CL	**TOPSOIL** Stiff, damp, dark brown, Sandy CLAY; very porous, with shrinkage cracks, roots			
2 – 7.5 (4, 6)				SM	**TERRACE DEPOSIT GRAVEL** Medium dense, damp, light reddish to yellowish - brown, Gravelly Silty, coarse SAND - Massive to horizontal bedded			
					TRENCH TERMINATED AT 7.5 FEET			

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

07147-42-01.GPJ

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

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

TRENCH T 4B

ELEV. (MSL.) **505** DATE COMPLETED **08-11-2003**

EQUIPMENT **JD 510 RUBBERTIRE 24"**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 5	T 4-1 (at 2)			CL	**TERRACE DEPOSIT CLAY** Stiff, moist, dark brown, Sandy CLAY; porous, with roots, shrinkage cracks			
5 – 7				SC	Dense, damp, olive - brown, mottled, Clayey coarse SAND			
7 – 9.5				SM	**TERRACE DEPOSIT GRAVEL** Medium dense, damp, light reddish - brown, Silty coarse SAND; trace gravel			
					TRENCH TERMINATED AT 9.5 FEET			

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

07147-42-01.GPJ

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

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

APPENDIX C

LABORATORY TEST RESULTS (GEOCON)

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for their in-place dry density and moisture content, direct shear strength, compaction, expansion, and soluble-sulfate characteristics. The results of the tests are summarized in tabular and graphical form herewith. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-1	Dark brown, Sandy CLAY with trace gravel	124.9	10.6
T1-2	Light olive-brown, Clayey, fine to coarse SAND	125.8	9.8
T3-1	Dark gray-brown, Silty, fine to medium SAND	120.5	13.0
T8-3	Light brown, Silty, fine SAND with trace clay	113.5	14.9
T17-2	Gray-brown, Clayey SILT with little sand	108.7	16.8

TABLE B-II
SUMMARY OF DIRECT SHEAR TEST RESULTS

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T1-1*	112.5	10.5	500	25
T1-2*	112.3	10.7	650	16

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

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T1-1	14.5	34.7	95.8	99
T1-3	14.1	30.2	98.8	52
T6-1	12.9	32.2	96.2	78

TABLE B-IV
SUMMARY OF LABORATORY SOLUBLE-SULFATE TEST RESULTS

Sample No.	Sulfate (% SO_4)	Sulfate Exposure*
T1-3	0.030	Negligible

* Reference: 1997 Uniform Building Code Table 19-A-3.

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for their in-place dry density and moisture content, direct shear strength, compaction, expansion, and soluble-sulfate characteristics. The results of the tests are summarized in tabular and graphical form herewith. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-1	Dark Reddish brown, very Sandy CLAY with trace gravel	118.8	13.8
T1-3	Olive-brown, Clayey, sandy SILT with trace gravel	113.1	13.9
T7-2	Light yellowish brown, Silty, fine to medium SAND with trace fine gravel	119.0	13.0

TABLE B-II
SUMMARY OF DIRECT SHEAR TEST RESULTS

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T1-1*	106.6	13.6	600	20

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

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T5-1	9.7	17.7	107.2	0
T7-1	13.0	30.3	100.9	130

TABLE B-IV
SUMMARY OF LABORATORY SOLUBLE-SULFATE TEST RESULTS

Sample No.	Sulfate (% SO_4)	Sulfate Exposure*
T3-1	0.360	Severe
T7-1	0.405	Severe
T1-2	0.013	Negligible

*Reference: 1997 Uniform Building Code Table 19-A-4.

TABLE B-V
SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST NO. 643

Sample No.	Ph	Resistivity (ohm centimeters)	Corrosive Rating
T7-1	6.7	280	Severely Corrosive

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for their moisture content, direct shear strength, compaction, expansion, and soluble-sulfate characteristics. The results of the tests are summarized in tabular and graphical form herewith. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T3-1	Light Olive-brown, Silty SAND with little clay; micaceous	122.6	10.8
T5-1	Light yellowish-brown, fine to med. SAND, with gravel and thin mica laminae	128.0	9.1
T7-1	Dark reddish-brown, silty CLAY, with some sand	122.0	12.1

TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T5-1*	116.6	16.6	370	38
T7-1	115.4	30.3	225	14

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

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T2-1	13.8	32.2	97.4	111
T5-1	11.7	20.5	109.5	49

TABLE B-IV
SUMMARY OF LABORATORY SOLUBLE SULFATE TEST RESULTS

Sample No.	Sulfate (% SO_4)	Sulfate Exposure*
T1-1	0.09	Negligible
T5-1	0.06	Negligible

* Reference: 1997 Uniform Building Code Table 19-A-3.

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for their in-place dry density and moisture content, direct shear strength, compaction, expansion, and soluble-sulfate characteristics. The results of the tests are summarized in tabular and graphical form herewith. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-1	Yellowish brown, gravelly silty SAND with trace clay	124.2	10.1

TABLE B-II
SUMMARY OF DIRECT SHEAR TEST RESULTS

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T1-1*	111.7	9.5	403	37

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

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T1-1	10.0	29.7	110.3	25
T1-2	10.0	27.3	100.5	38
T3-1	10.9	30.9	109.2	41
T4-1	9.8	28.4	111.5	58
T8-3	14.3	26.8	100.6	7
T10-1	13.0	34.9	89.7	72
T17-2	14.5	43.8	97.2	139
T18-1	10.3	21.1	109.8	7

TABLE B-IV
SUMMARY OF LABORATORY SOLUBLE-SULFATE TEST RESULTS

Sample No.	Sulfate (% SO_4)	Sulfate Exposure*
T1-1	0.011	Negligible
T1-2	0.048	Negligible
T3-1	0.033	Negligible
T4-1	0.038	Negligible
T18-1	0.030	Negligible

* Reference: 1997 Uniform Building Code Table 19-A-3.

APPENDIX D

EARTHWORK SPECIFICATIONS AND GRADING DETAILS

GENERAL EARTHWORK SPECIFICATIONS

I. General

A. General procedures and requirements for earthwork and grading are presented herein. The earthwork and grading recommendations provided in the geotechnical report are considered part of these specifications, and where the general specifications provided herein conflict with those provided in the geotechnical report, the recommendations in the geotechnical report shall govern. Recommendations provided herein and in the geotechnical report may need to be modified depending on the conditions encountered during grading.

B. The contractor is responsible for the satisfactory completion of all earthwork in accordance with the project plans, specifications, applicable building codes, and local governing agency requirements. Where these requirements conflict, the stricter requirements shall govern.

C. It is the contractor's responsibility to read and understand the guidelines presented herein and in the geotechnical report as well as the project plans and specifications. Information presented in the geotechnical report is subject to verification during grading. The information presented on the exploration logs depicts conditions at the particular time of excavation and at the location of the excavation. Subsurface conditions present at other locations may differ, and the passage of time may result in different subsurface conditions being encountered at the locations of the exploratory excavations. The contractor shall perform an independent investigation and evaluate the nature of the surface and subsurface conditions to be encountered and the procedures and equipment to be used in performing his work.

D. The contractor shall have the responsibility to provide adequate equipment and procedures to accomplish the earthwork in accordance with applicable requirements. When the quality of work is less than that required, the Geotechnical Consultant may reject the work and may recommend that the operations be suspended until the conditions are corrected.

E. Prior to the start of grading, a qualified Geotechnical Consultant should be employed to observe grading procedures and provide testing of the fills for conformance with the project specifications, approved grading plan, and guidelines presented herein. All remedial removals, clean-outs, removal bottoms, keyways, and subdrain installations should be observed and documented by the Geotechnical Consultant prior to placing fill. It is the contractor's responsibility to apprise the Geotechnical Consultant of their schedules and notify the Geotechnical Consultant when those areas are ready for observation.

F. The contractor is responsible for providing a safe environment for the Geotechnical Consultant to observe grading and conduct tests.

II. Site Preparation

A. Clearing and Grubbing: Excessive vegetation and other deleterious material shall be sufficiently removed as required by the Geotechnical Consultant, and such materials shall be properly disposed of offsite in a method acceptable to the owner and governing agencies. Where applicable, the contractor may obtain permission from the Geotechnical Consultant, owner, and governing agencies to dispose of vegetation and other deleterious materials in designated areas onsite.

B. Unsuitable Soils Removals: Earth materials that are deemed unsuitable for the support of fill shall be removed as necessary to the satisfaction of the Geotechnical Consultant.

C. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines, other utilities, or other structures located within the limits of grading shall be removed and/or abandoned in accordance with the requirements of the governing agency and to the satisfaction of the Geotechnical Consultant.

D. Preparation of Areas to Receive Fill: After removals are completed, the exposed surfaces shall be scarified to a depth of approximately 8 inches, watered or dried, as needed, to achieve a generally uniform moisture content that is at or near optimum moisture content. The scarified materials shall then be compacted to the project requirements and tested as specified.

E. All areas receiving fill shall be observed and approved by the Geotechnical Consultant prior to the placement of fill. A licensed surveyor shall provide survey control for determining elevations of processed areas and keyways.

III. Placement of Fill

A. Suitability of fill materials: Any materials, derived onsite or imported, may be utilized as fill provided that the materials have been determined to be suitable by the Geotechnical Consultant. Such materials shall be essentially free of organic matter and other deleterious materials, and be of a gradation, expansion potential, and/or strength that is acceptable to the Geotechnical Consultant. Fill materials shall be tested in a laboratory approved by the Geotechnical Consultant, and import materials shall be tested and approved prior to being imported.

B. Generally, different fill materials shall be thoroughly mixed to provide a relatively uniform blend of materials and prevent abrupt changes in material type. Fill materials derived from benching should be dispersed throughout the fill area instead of placing the materials within only an equipment-width from the cut/fill contact.

C. Oversize Materials: Rocks greater than 8 inches in largest dimension shall be disposed of offsite or be placed in accordance with the recommendations by the Geotechnical Consultant in the areas that are designated as suitable for oversize rock placement. Rocks that are smaller than 8 inches in largest dimension may be utilized in the fill provided that they are not nested and are their quantity and distribution are acceptable to the Geotechnical Consultant.

D. The fill materials shall be placed in thin, horizontal layers such that, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and shall be thoroughly mixed to obtain near uniform moisture content and uniform blend of materials.

E. Moisture Content: Fill materials shall be placed at or above the optimum moisture content or as recommended by the geotechnical report. Where the moisture content of the engineered fill is less than recommended, water shall be added, and the fill materials shall be blended so that near uniform moisture content is achieved. If the moisture content is above the limits specified by the Geotechnical Consultant, the fill materials shall be aerated by discing, blading, or other methods until the moisture content is acceptable.

F. Each layer of fill shall be compacted to the project standards in accordance to the project specifications and recommendations of the Geotechnical Consultant. Unless otherwise specified by the Geotechnical Consultant, the fill shall be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method: D1557-09.

G. Benching: Where placing fill on a slope exceeding a ratio of 5 to 1 (horizontal to vertical), the ground should be keyed or benched. The keyways and benches shall extend through all unsuitable materials into suitable materials such as firm materials or sound bedrock or as recommended by the Geotechnical Consultant. The minimum keyway width shall be 15 feet and extend into suitable materials, or as recommended by the geotechnical report and approved by the Geotechnical Consultant. The minimum keyway width for fill over cut slopes is also 15 feet, or as recommended by the geotechnical report and approved by the Geotechnical Consultant. As a general rule, unless otherwise recommended by the Geotechnical Consultant, the minimum width of the keyway shall be equal to 1/2 the height of the fill slope.

H. Slope Face: The specified minimum relative compaction shall be maintained out to the finish face of fill and stabilization fill slopes. Generally, this may be achieved by overbuilding the slope and cutting back to the compacted core. The actual amount of overbuilding may vary as field conditions dictate. Alternately, this may be achieved by back rolling the slope face with suitable equipment or other methods that produce the designated result. Loose soil should not be allowed to build up on the slope face. If present, loose soils shall be trimmed to expose the compacted slope face.

I. Slope Ratio: Unless otherwise approved by the Geotechnical Consultant and governing agencies, permanent fill slopes shall be designed and constructed no steeper than 2 to 1 (horizontal to vertical).

J. Natural Ground and Cut Areas: Design grades that are in natural ground or in cuts should be evaluated by the Geotechnical Consultant to determine whether scarification and processing of the ground and/or overexcavation is needed.

K. Fill materials shall not be placed, spread, or compacted during unfavorable weather conditions. When grading is interrupted by rain, filing operations shall not resume until the Geotechnical Consultant approves the moisture and density of the previously placed compacted fill.

IV. Cut Slopes

A. The Geotechnical Consultant shall inspect all cut slopes, including fill over cut slopes, and shall be notified by the contractor when cut slopes are started.

B. If adverse or potentially adverse conditions are encountered during grading; the Geotechnical Consultant shall investigate, evaluate, and make recommendations to mitigate the adverse conditions.

C. Unless otherwise stated in the geotechnical report, cut slopes shall not be excavated higher or steeper than the requirements of the local governing agencies. Short-term stability of the cut slopes and other excavations is the contractor's responsibility.

V. Drainage

A. Back drains and Subdrains: Back drains and subdrains shall be provided in fill as recommended by the Geotechnical Consultant and shall be constructed in accordance with the governing agency and/or recommendations of the Geotechnical Consultant. The location of subdrains, especially outlets, shall be surveyed and recorded by the Civil Engineer.

B. Top-of-slope Drainage: Positive drainage shall be established away from the top of slope. Site drainage shall not be permitted to flow over the tops of slopes.

C. Drainage terraces shall be constructed in compliance with the governing agency requirements and/or in accordance with the recommendations of the Geotechnical Consultant.

D. Non-erodible interceptor swales shall be placed at the top of cut slopes that face the same direction as the prevailing drainage.

VI. Erosion Control

A. All finish cut and fill slopes shall be protected from erosion and/or planted in accordance with the project specifications and/or landscape architect's recommendations. Such measures to protect the slope face shall be undertaken as soon as practical after completion of grading.

B. During construction, the contractor shall maintain proper drainage and prevent the ponding of water. The contractor shall take remedial measures to prevent the erosion of graded areas until permanent drainage and erosion control measures have been installed.

VII. Trench Excavation and Backfill

A. Safety: The contractor shall follow all OSHA requirements for safety of trench excavations. Knowing and following these requirements is the contractor's responsibility. All trench excavations or open cuts in excess of 5 feet in depth shall be shored or laid back. Trench excavations and open cuts exposing adverse geologic conditions may require further evaluation by the Geotechnical Consultant. If a contractor fails to provide safe access for compaction testing, backfill not tested due to safety concerns may be subject to removal.

B. Bedding: Bedding materials shall be non-expansive and have a Sand Equivalent greater than 30. Where permitted by the Geotechnical Consultant, the bedding materials can be densified by jetting.

C. Backfill: Jetting of backfill materials is generally not acceptable. Where permitted by the Geotechnical Consultant, the bedding materials can be densified by jetting provided the backfill materials are granular, free-draining and have a Sand Equivalent greater than 30.

VIII. Geotechnical Observation and Testing During Grading

A. Compaction Testing: Fill shall be tested by the Geotechnical Consultant for evaluation of general compliance with the recommended compaction and moisture conditions. The tests shall be taken in the compacted soils beneath the surface if the surficial materials are disturbed. The contractor shall assist the Geotechnical Consultant by excavating suitable test pits for testing of compacted fill.

B. Where tests indicate that the density of a layer of fill is less than required, or the moisture content not within specifications, the Geotechnical Consultant shall notify the contractor of the unsatisfactory conditions of the fill. The portions of the fill that are not within specifications shall be reworked until the required density and/or moisture content has been attained. No additional fill shall be placed until the last lift of fill is tested and found to meet the project specifications and approved by the Geotechnical Consultant.

C. If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as adverse weather, excessive rock or deleterious materials being placed in the fill, insufficient equipment, excessive rate of fill placement, results in a quality of work that is unacceptable, the consultant shall notify the contractor, and the contractor shall rectify the conditions, and if necessary, stop work until conditions are satisfactory.

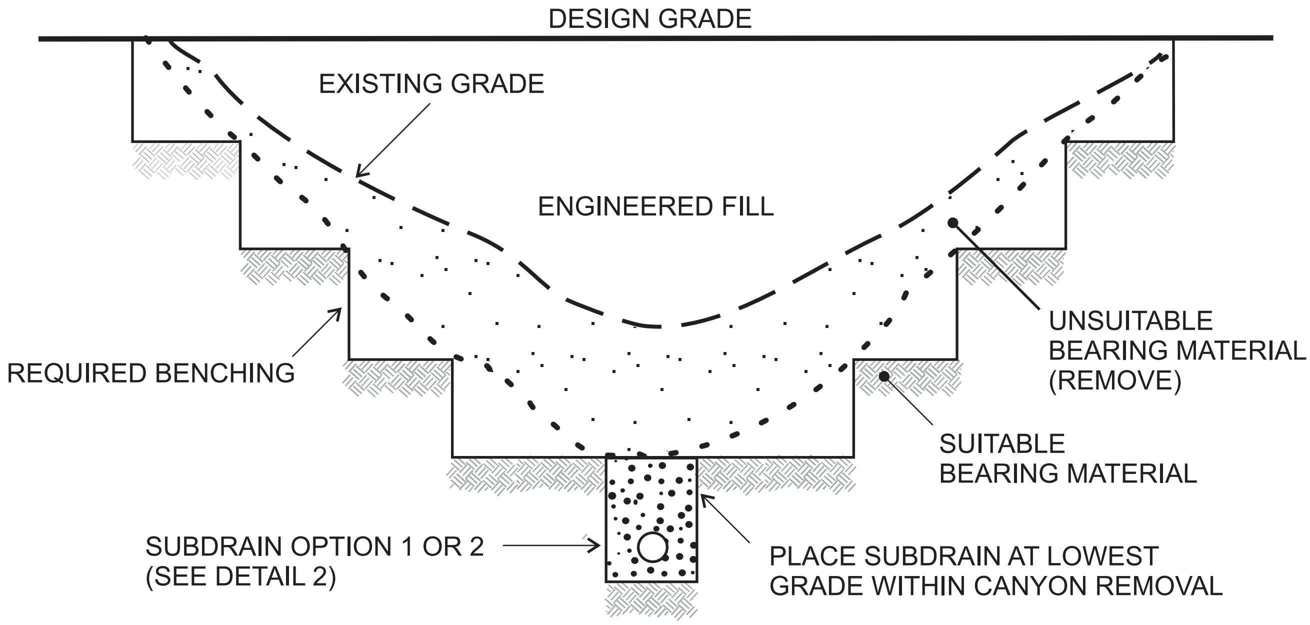
D. Frequency of Compaction Testing: The location and frequency of tests shall be at the Geotechnical Consultant's discretion. Generally, compaction tests shall be taken at intervals not exceeding two feet in fill height and 1,000 cubic yards of fill materials placed.

E. Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of the compaction test locations. The contractor shall coordinate with the surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations. Alternately, the test locations can be surveyed and the results provided to the Geotechnical Consultant.

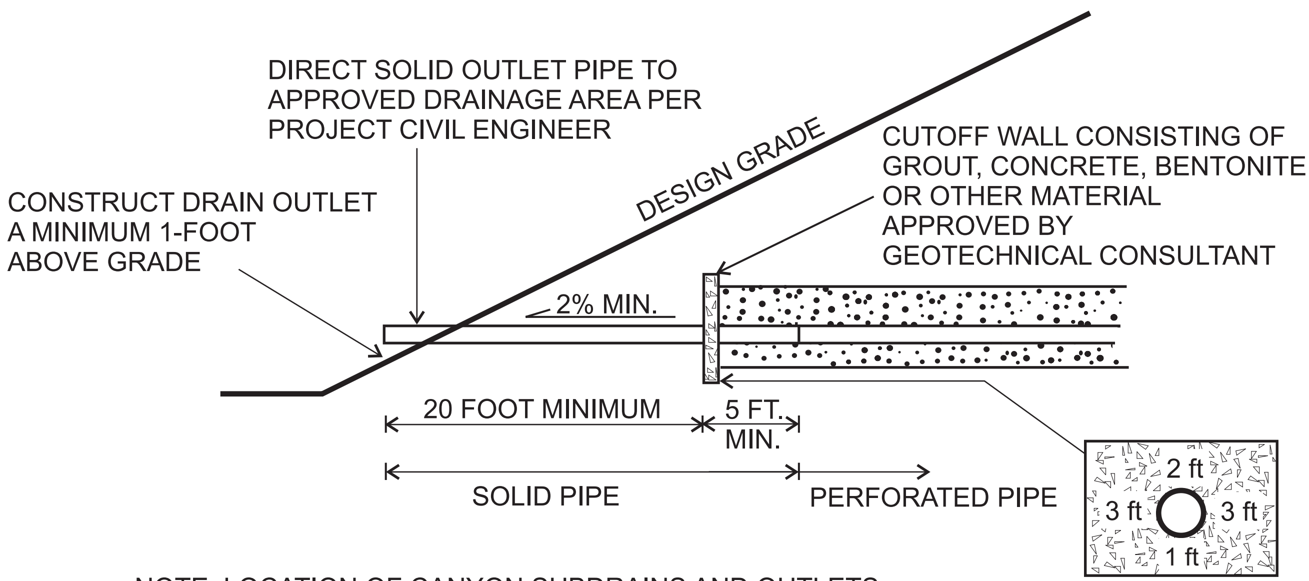
F. Areas of fill that have not been observed or tested by the Geotechnical Consultant may have to be removed and recompacted at the contractor's expense. The depth and extent of removals will be determined by the Geotechnical Consultant.

G. Observation and testing by the Geotechnical Consultant shall be conducted during grading in order for the Geotechnical Consultant to state that, in his opinion, grading has been completed in accordance with the approved geotechnical report and project specifications.

H. Reporting of Test Results: After completion of grading operations, the Geotechnical Consultant shall submit reports documenting their observations during construction and test results. These reports may be subject to review by the local governing agencies.



CANYON SUBDRAIN PROFILE



NOTE: LOCATION OF CANYON SUBDRAINS AND OUTLETS SHOULD BE DOCUMENTED BY PROJECT CIVIL ENGINEER. OUTLETS MUST BE KEPT UNOBSTRUCTED AT ALL TIMES.

CUTOFF WALL DIMENSIONS

CANYON SUBDRAIN TERMINUS

VER 1.0

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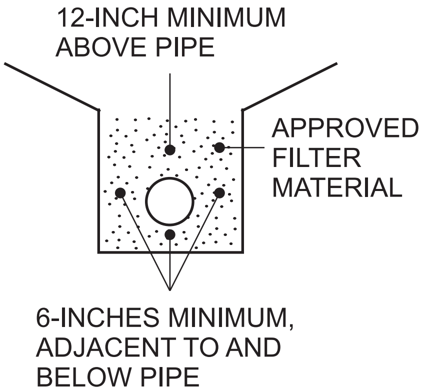
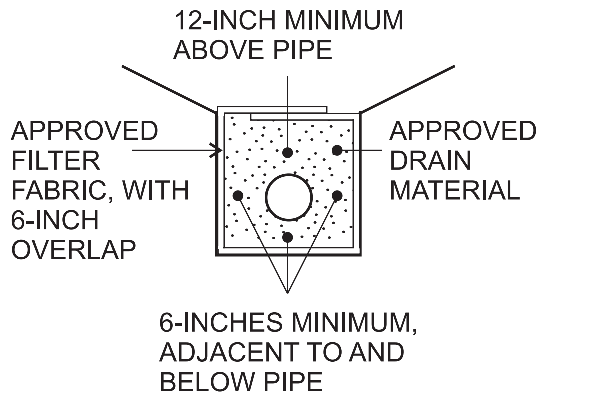
ADVANCED GEOTECHNICAL SOLUTIONS

CANYON SUBDRAIN

DETAIL 1





OPTION 1

FILTER MATERIAL: MINIMUM VOLUME OF 9 CUBIC FEET PER LINEAL FOOT OF CALTRANS CLASS 2 PERMEABLE MATERIAL

OPTION 2

DRAIN MATERIAL: MINIMUM VOLUME OF 9 CUBIC FEET PER LINEAL FOOT OF 3/4-INCH MAX ROCK OR APPROVED EQUIVALENT SUBSTITUTE

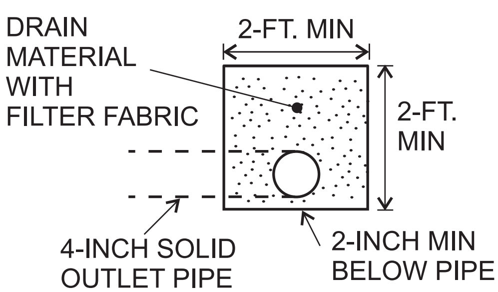
FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT SUBSTITUTE

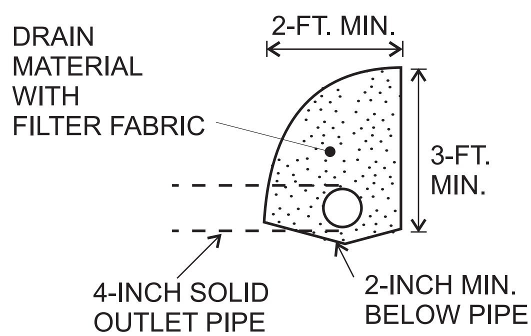
PIPE: 6 OR 8-INCH ABS OR PVC PIPE OR APPROVED SUBSTITUTE WITH A MINIMUM OF 8 PERFORATIONS (1/4-INCH DIAMETER) PER LINEAL FOOT IN BOTTOM HALF OF PIPE

(ASTM D2751, SDR-35 OR ASTM D3034, SDR-35
ASTM D1527, SCHD. 40 OR ASTM D1785, SCHD. 40)

NOTE: CONTINUOUS RUN IN EXCESS OF 5OO FEET REQUIRES 8-INCH DIAMETER PIPE (ASTM D3034, SDR-35, OR ASTM D1785, SCHD. 40)

CANYON SUBDRAIN





OPTION 1

OPTION 2

DRAIN MATERIAL: GRAVEL TRENCH TO BE FILLED WITH 3/4-INCH MAX ROCK OR APPROVED EQUIVALENT SUBSTITUTE

FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR EQUIVALENT SUBSTITUTE WITH A MINIMUM 6-INCH OVERLAP

PIPE: 4-INCH ABS OR PVC PIPE OR APPROVED EQUIVALENT SUBSTITUTE WITH A MINIMUM OF 8 PERFORATIONS (1/4-INCH DIAMETER) PER LINEAL FOOT IN BOTTOM HALF OF PIPE

(ASTM D2751, SDR-35 OR ASTM D3034, SDR-35
ASTM D1527, SCHD. 40 OR ASTM D1785, SCHD. 40)

BUTTRESS/STABILIZATION DRAIN

VER 1.0

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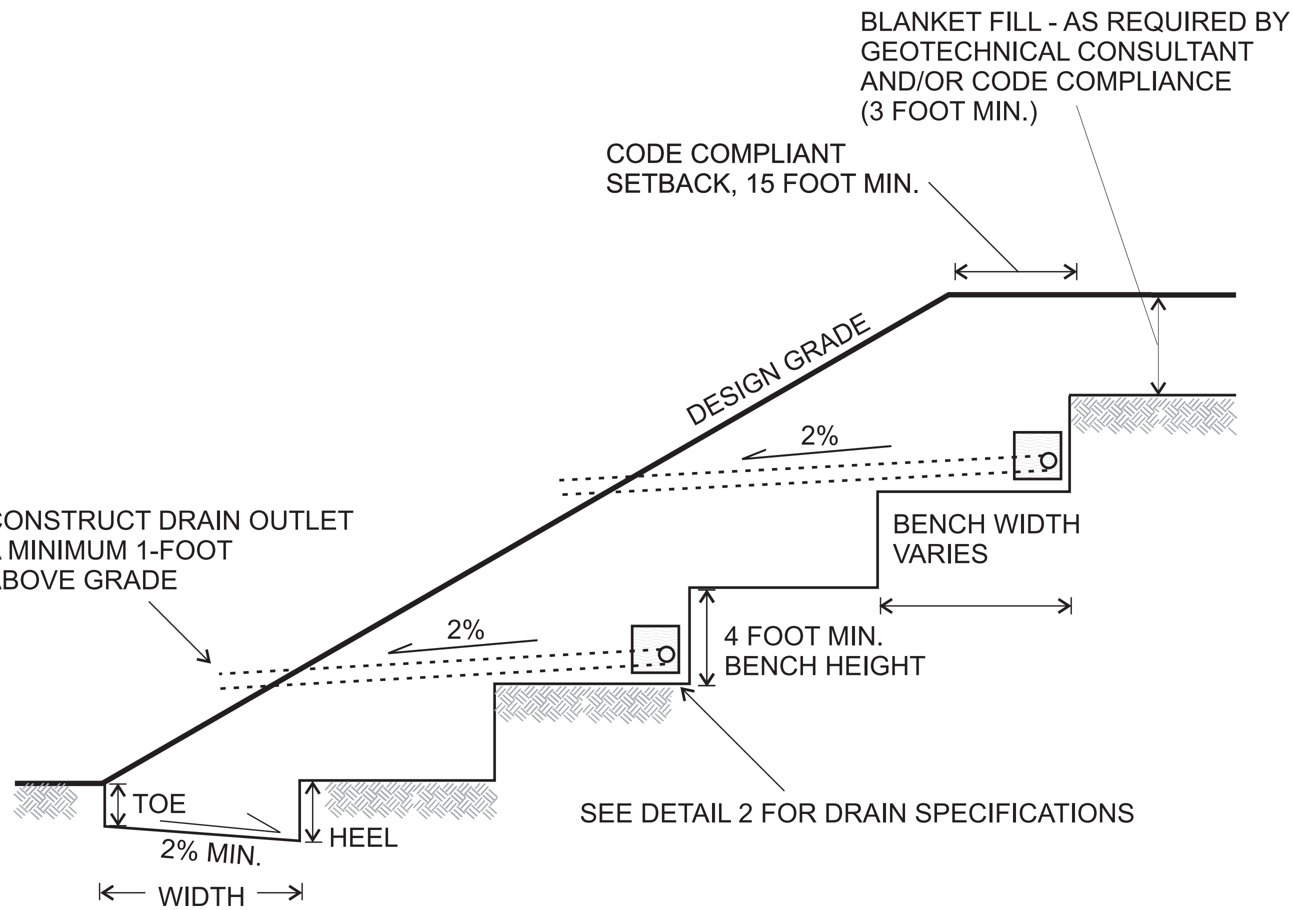
AGS ADVANCED GEOTECHNICAL SOLUTIONS	DRAIN SPECIFICATIONS	DETAIL 2



CODE COMPLIANT KEYWAY WITH MINIMUM DIMENSIONS:

TOE 2 FOOT MIN.
HEEL 3 FOOT MIN.
WIDTH 15 FOOT MIN.

NOTES:

1. DRAIN OUTLETS TO BE PROVIDED EVERY 100 FEET CONNECT TO PERFORATED DRAIN PIPE BY “L” OR “T” AT A MINIMUM 2% GRADIENT.

2. THE NECESSITY AND LOCATION OF ADDITIONAL DRAINS SHALL BE DETERMINED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT. UPPER STAGE OUTLETS SHOULD BE EMPTIED ONTO CONCRETE TERRACE DRAINS.

3. DRAIN PIPE TO EXTEND FULL LENGTH OF STABILIZATION/BUTTRESS WITH A MINIMUM GRADIENT OF 2% TO SOLID OUTLET PIPES.

4. LOCATION OF DRAINS AND OUTLETS SHOULD BE DOCUMENTED BY PROJECT CIVIL ENGINEER. OUTLETS MUST BE KEPT UNOBSTRUCTED AT ALL TIMES.

VER 1.0

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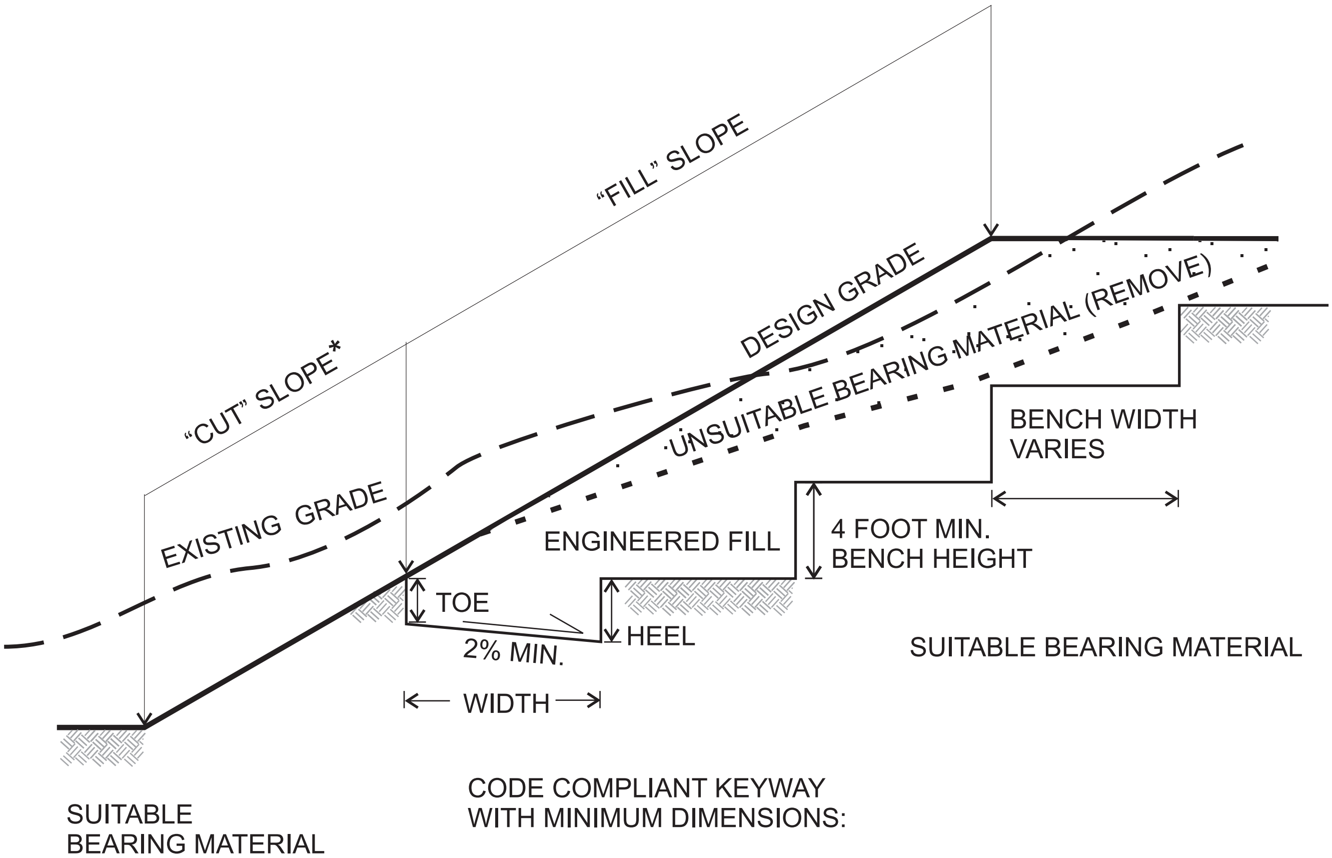
AGS ADVANCED GEOTECHNICAL SOLUTIONS	STABILIZATION/BUTTRESS FILL	DETAIL 3

* THE “CUT” PORTION OF THE SLOPE SHALL BE EXCAVATED AND EVALUATED BY THE GEOTECHNICAL CONSULTANT PRIOR TO CONSTRUCTING THE “FILL” PORTION



CODE COMPLIANT KEYWAY
WITH MINIMUM DIMENSIONS:

TOE: 2 FOOT MIN.
HEEL: 3 FOOT MIN.
WIDTH: 15 FOOT MIN.

NOTES:

1. THE NECESSITY AND LOCATION OF DRAINS SHALL BE DETERMINED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT

2. SEE DETAIL 2 FOR DRAIN SPECIFICATIONS

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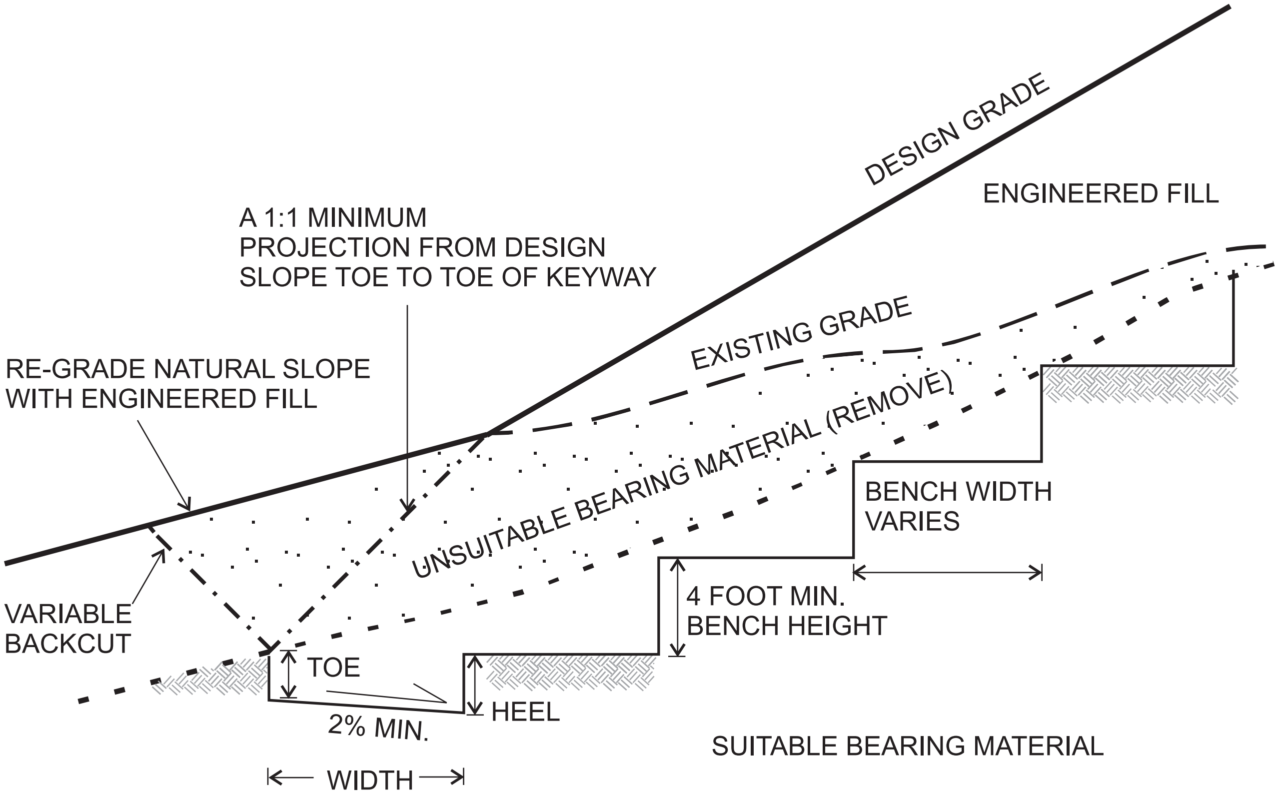
AGS
ADVANCED GEOTECHNICAL SOLUTIONS

FILL OVER CUT SLOPE

DETAIL 4



CODE COMPLIANT KEYWAY
WITH MINIMUM DIMENSIONS:

TOE: 2 FOOT MIN.
HEEL: 3 FOOT MIN.
WIDTH: 15 FOOT MIN.

NOTES:

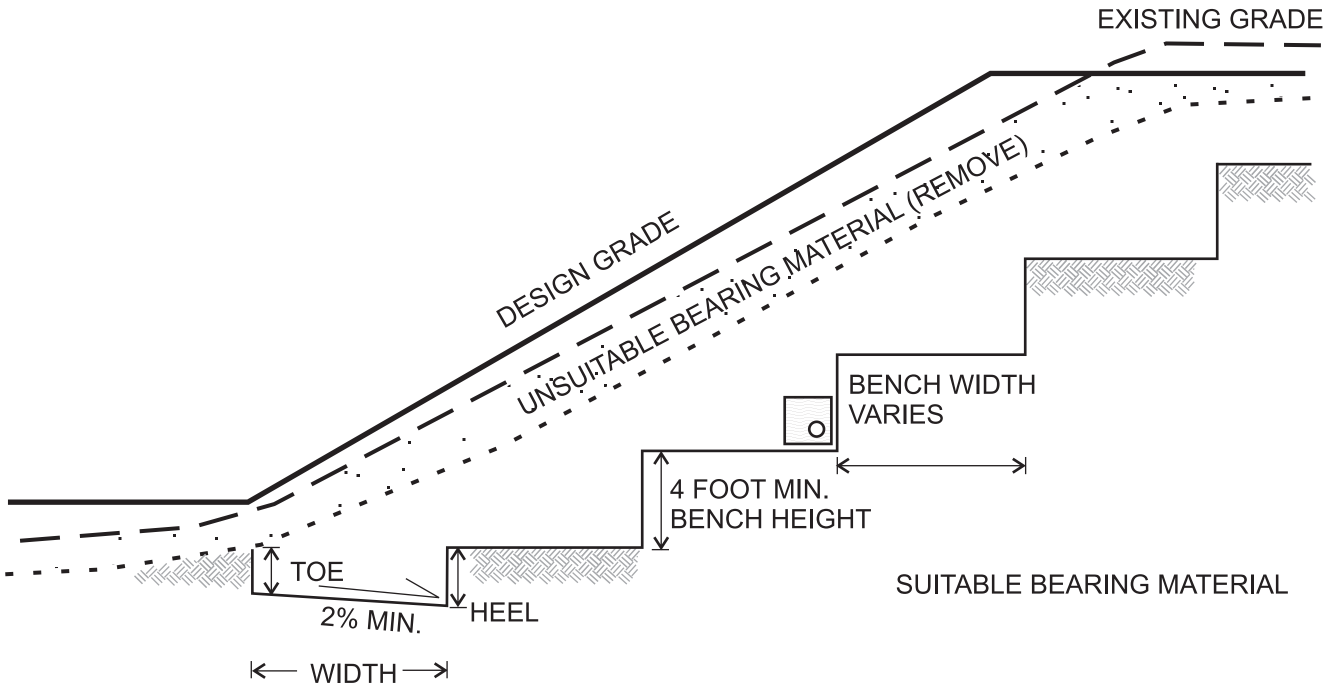
1. WHEN THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN GRADE SLOPE RATIO, SPECIAL RECOMMENDATIONS ARE NECESSARY BY THE GEOTECHNICAL CONSULTANT

2. THE GEOTECHNICAL CONSULTANT WILL DETERMINE THE REQUIREMENT FOR AND LOCATION OF SUBSURFACE DRAINAGE SYSTEMS.

3. MAINTAIN MINIMUM 15 FOOT HORIZONTAL WIDTH FROM FACE OF SLOPE TO BENCH/BACKCUT

VER 1.0 | NTS

AGS ADVANCED GEOTECHNICAL SOLUTIONS	FILL OVER NATURAL SLOPE	DETAIL 5



CODE COMPLIANT KEYWAY
WITH MINIMUM DIMENSIONS:

TOE: 2 FOOT MIN.
HEEL: 3 FOOT MIN.
WIDTH: 15 FOOT MIN.

NOTES:

1. MAINTAIN MINIMUM 15 FOOT HORIZONTAL WIDTH FROM FACE OF SLOPE TO BENCH/BACKCUT
2. SEE DETAIL 2 FOR DRAIN SPECIFICATIONS

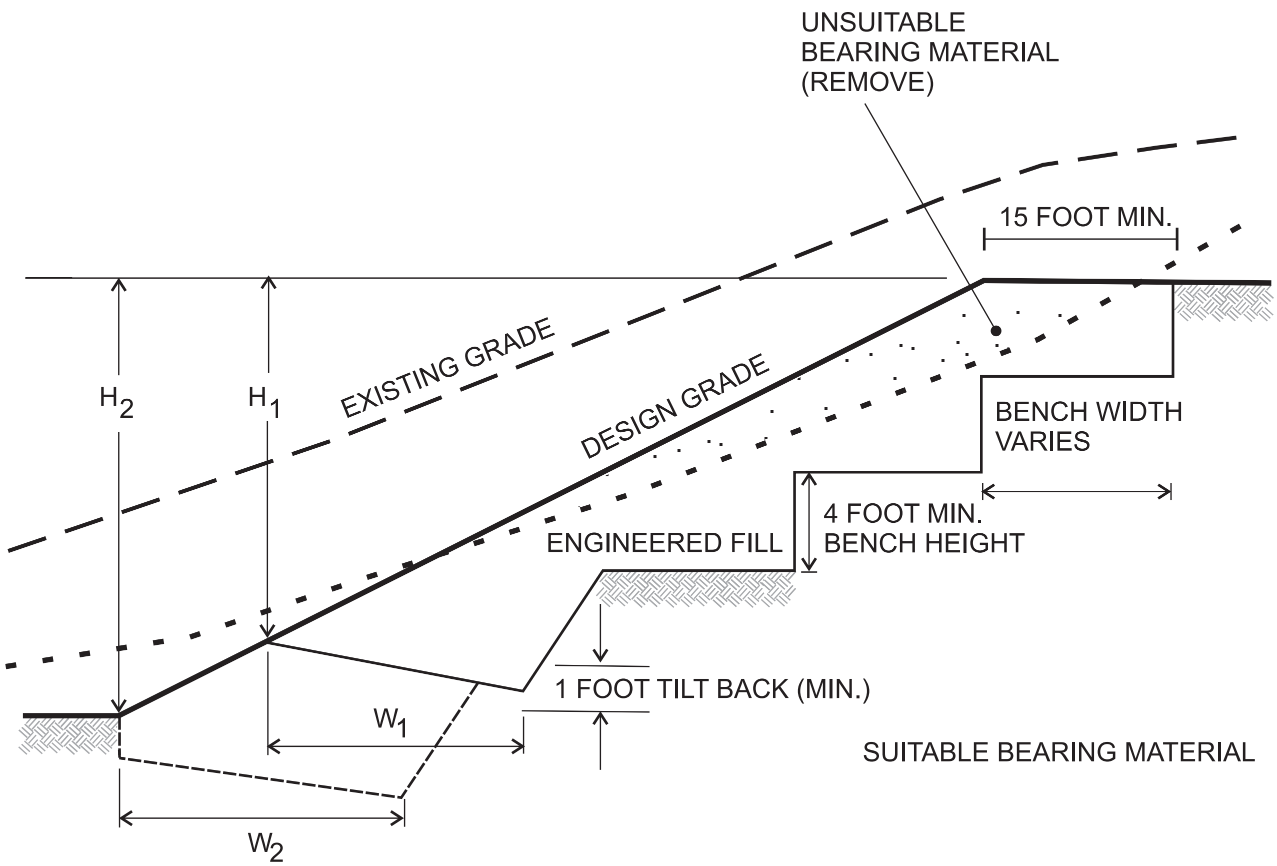
VER 1.0

NTS

ADVANCED GEOTECHNICAL SOLUTIONS

SKIN FILL CONDITION

DETAIL 6



NOTES:

1. IF RECOMMENDED BY THE GEOTECHNICAL CONSULTANT, THE REMAINING CUT PORTION OF THE SLOPE MAY REQUIRE REMOVAL AND REPLACEMENT WITH AN ENGINEERED FILL

2. “W” SHALL BE EQUIPMENT WIDTH (15 FEET) FOR SLOPE HEIGHT LESS THAN 25 FEET. FOR SLOPES GREATER THAN 25 FEET, “W” SHALL BE DETERMINED BY THE GEOTECHNICAL CONSULTANT. AT NO TIME SHALL “W” BE LESS THAN H/2

3. DRAINS WILL BE REQUIRED (SEE DETAIL 2)

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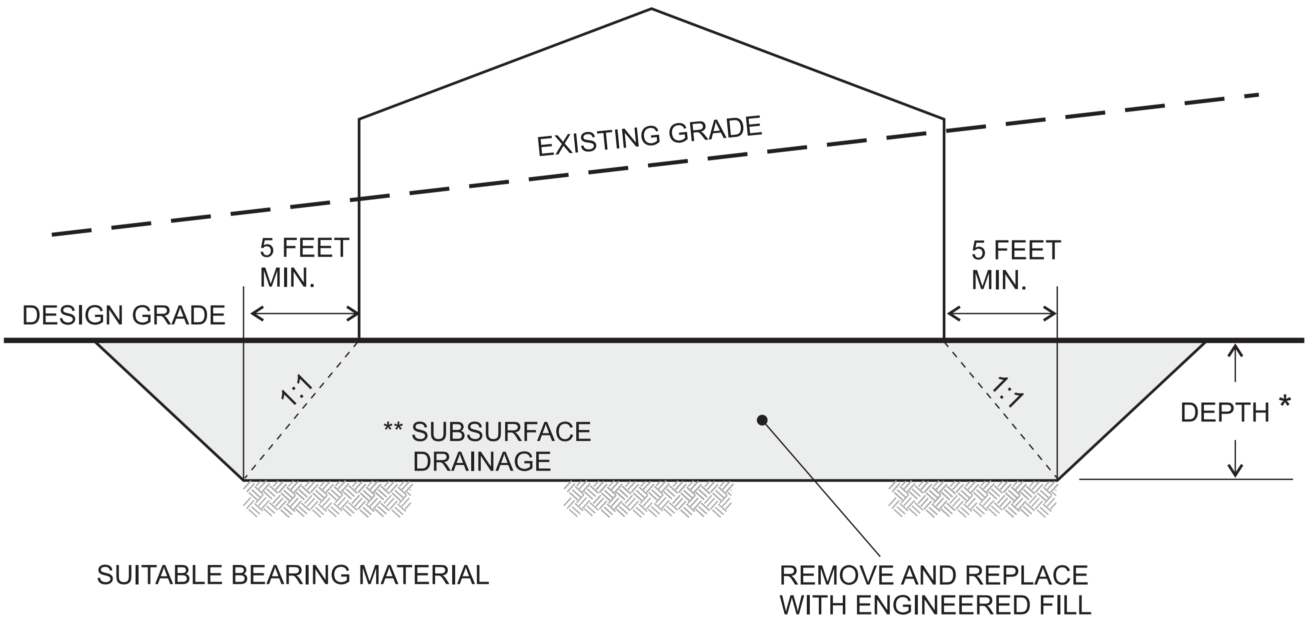
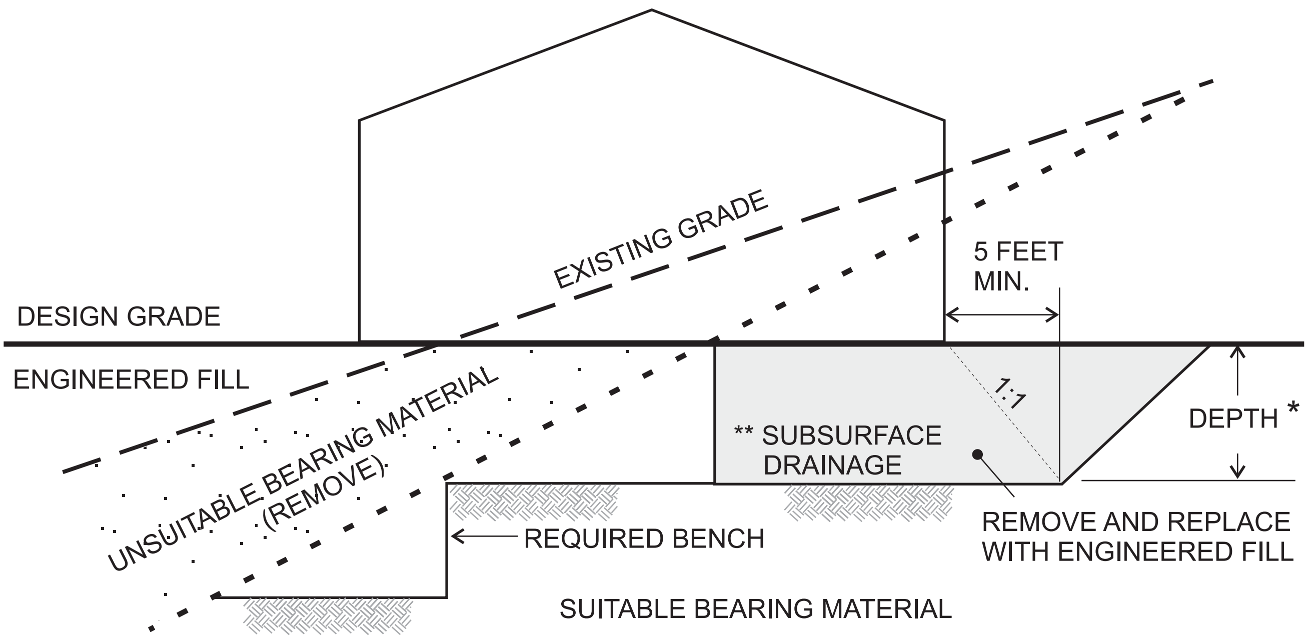
NTS

AGS ADVANCED GEOTECHNICAL SOLUTIONS	PARTIAL CUT SLOPE STABILIZATION	DETAIL 7



CUT LOT OVEREXCAVATION



CUT-FILL LOT OVEREXCAVATION

NOTES:

* SEE REPORT FOR RECOMMENDED DEPTHS, DEEPER OVEREXCAVATION MAY BE REQUIRED BY THE GEOTECHNICAL CONSULTANT BASED ON EXPOSED FIELD CONDITIONS

** CONSTRUCT EXCAVATION TO PROVIDE FOR POSITIVE DRAINAGE TOWARDS STREETS, DEEPER FILL AREAS OR APPROVED DRAINAGE DEVICES BASED ON FIELD CONDITIONS

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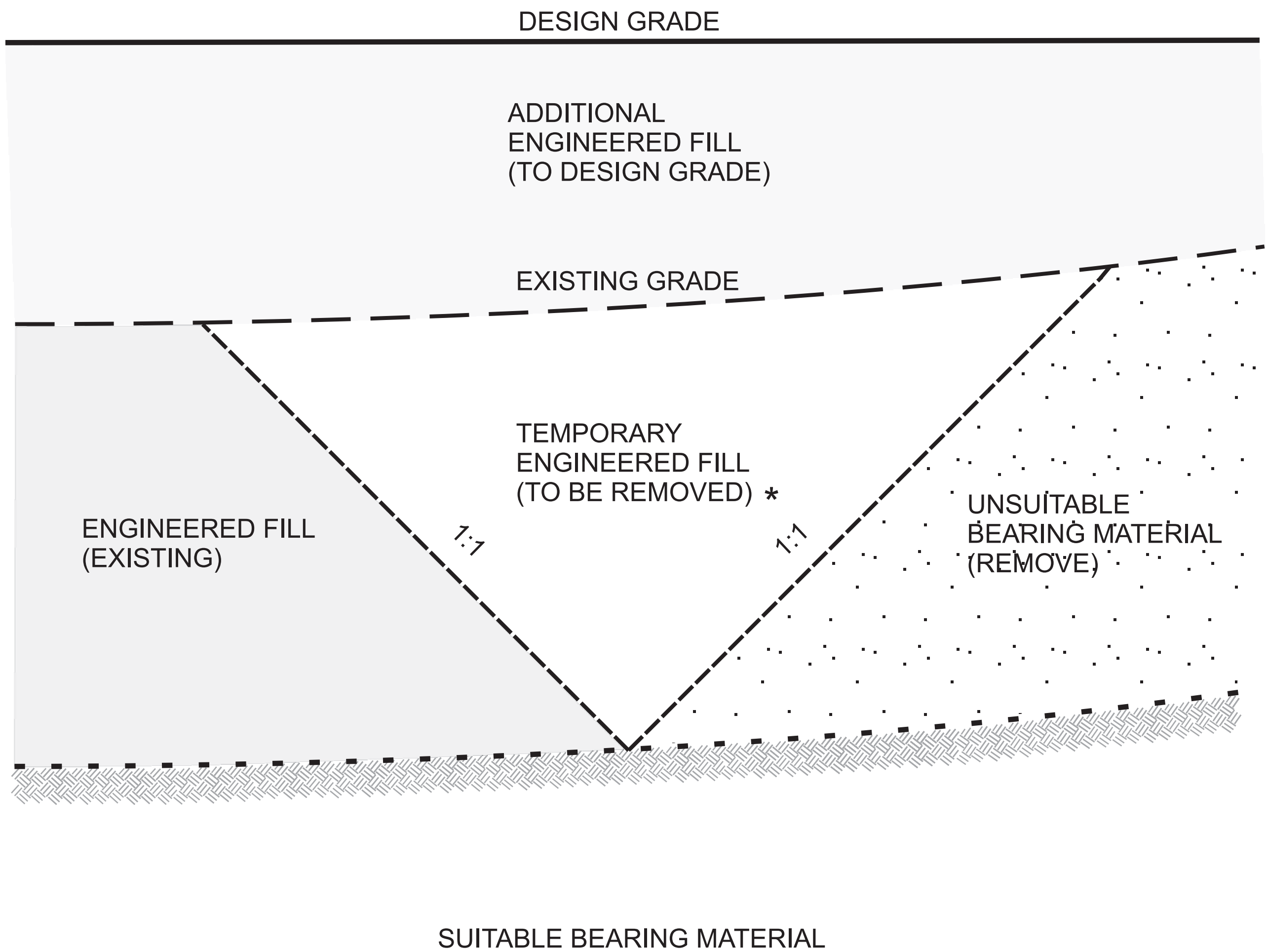
AGS ADVANCED GEOTECHNICAL SOLUTIONS	CUT & CUT-FILL LOT OVEREXCAVATION	DETAIL 8



* REMOVE BEFORE PLACING ADDITIONAL ENGINEERED FILL

TYPICAL UP-CANYON PROFILE

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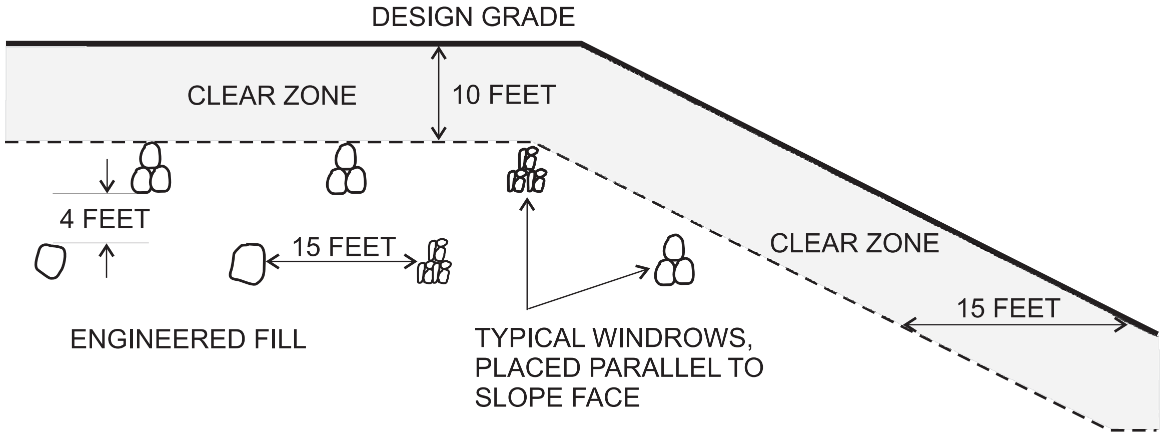
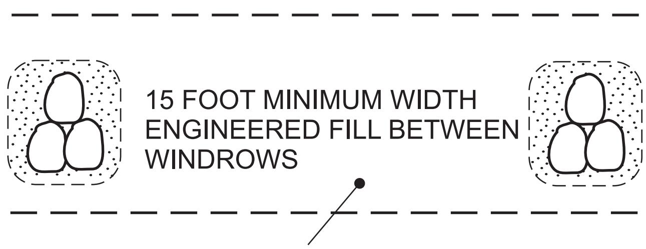
AGS ADVANCED GEOTECHNICAL SOLUTIONS	REMOVAL ADJACENT TO EXISTING FILL	DETAIL 9



CLEAR ZONE DIMENSIONS FOR REFERENCE ONLY, ACTUAL DEPTH, WIDTH, WINDROW LENGTH, ETC. TO BE BASED ON ELEVATIONS OF FOUNDATIONS, UTILITIES OR OTHER STRUCTURES PER THE GEOTECHNICAL CONSULTANT OR GOVERNING AGENCY APPROVAL

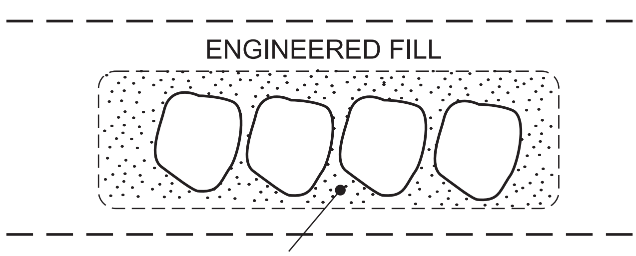
OVERSIZED MATERIAL DISPOSAL PROFILE



HORIZONTALLY PLACED ENGINEERED FILL, FREE OF OVERSIZED MATERIALS AND COMPACTED TO MINIMUM PROJECT STANDARDS

COMPACT ENGINEERED FILL ABOVE OVERSIZED MATERIALS TO FACILITATE "TRENCH" CONDITION PRIOR TO FLOODING GRANULAR MATERIALS

WINDROW CROSS-SECTION



GRANULAR MATERIAL APPROVED BY THE GEOTECHNICAL CONSULTANT AND CONSOLIDATED IN-PLACE BY FLOODING

WINDROW PROFILE

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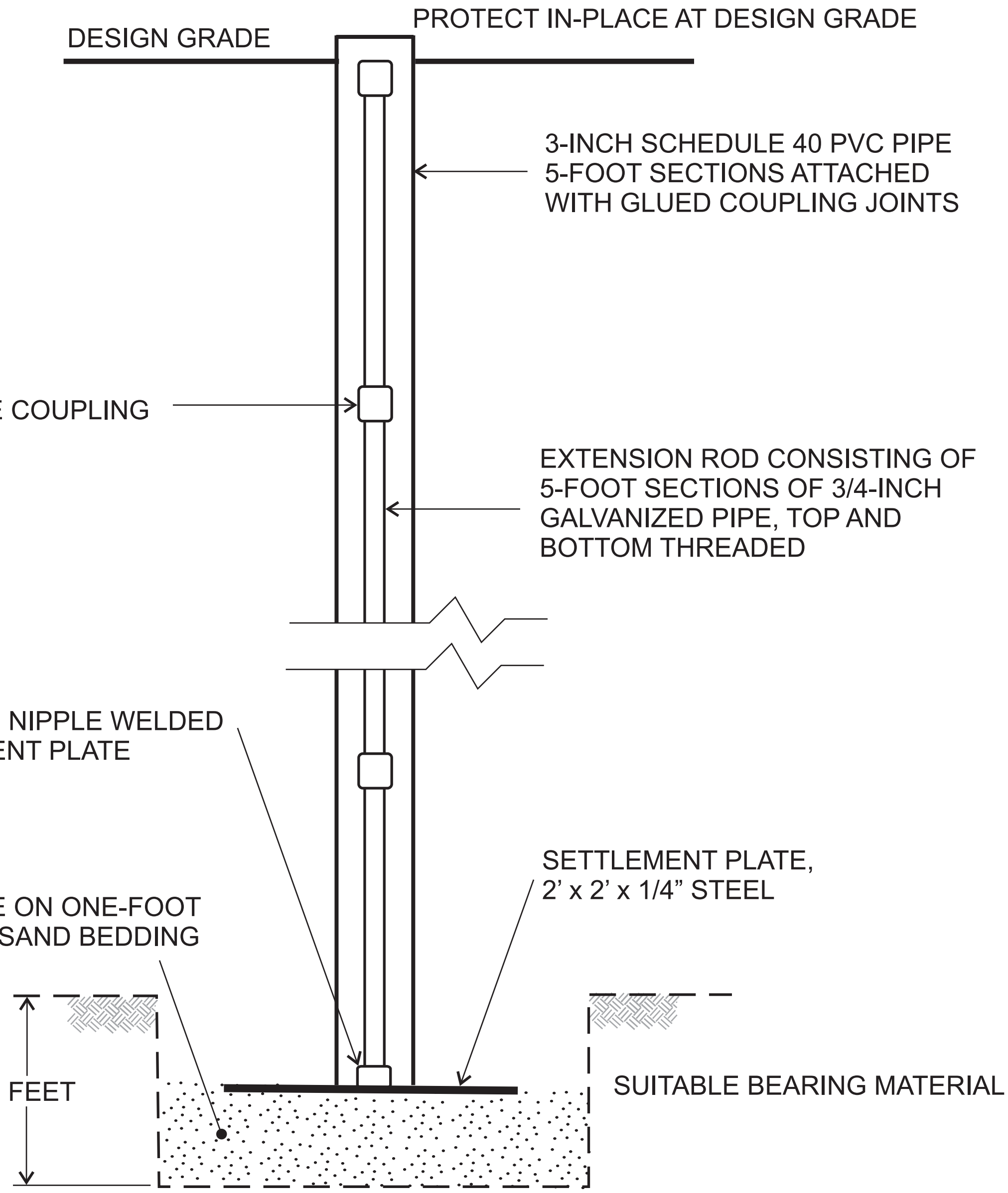
AGS ADVANCED GEOTECHNICAL SOLUTIONS	OVERSIZED MATERIAL DISPOSAL CRITERIA	DETAIL 10



NOTES:

1. SETTLEMENT PLATE LOCATIONS SHALL BE SUFFICIENTLY IDENTIFIED BY THE CONTRACTOR AND BE READILY VISIBLE TO EQUIPMENT OPERATORS.

2. CONTRACTOR SHALL MAINTAIN ADEQUATE HORIZONTAL CLEARANCE FOR EQUIPMENT OPERATION AND SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGE TO SETTLEMENT PLATE DURING SITE CONSTRUCTION.

3. A MINIMUM 5-FOOT ZONE ADJACENT TO SETTLEMENT PLATE/EXTENSION RODS SHALL BE ESTABLISHED FOR HAND-HELD MECHANICAL COMPACTION OF ENGINEERED FILL. ENGINEERED FILL SHALL BE COMPACTED TO MINIMUM PROJECT STANDARD.

4. ELEVATIONS OF SETTLEMENT PLATE AND ALL EXTENSION ROD PLACEMENT SHALL BE DOCUMENTED BY PROJECT CIVIL ENGINEER OR SURVEYOR.

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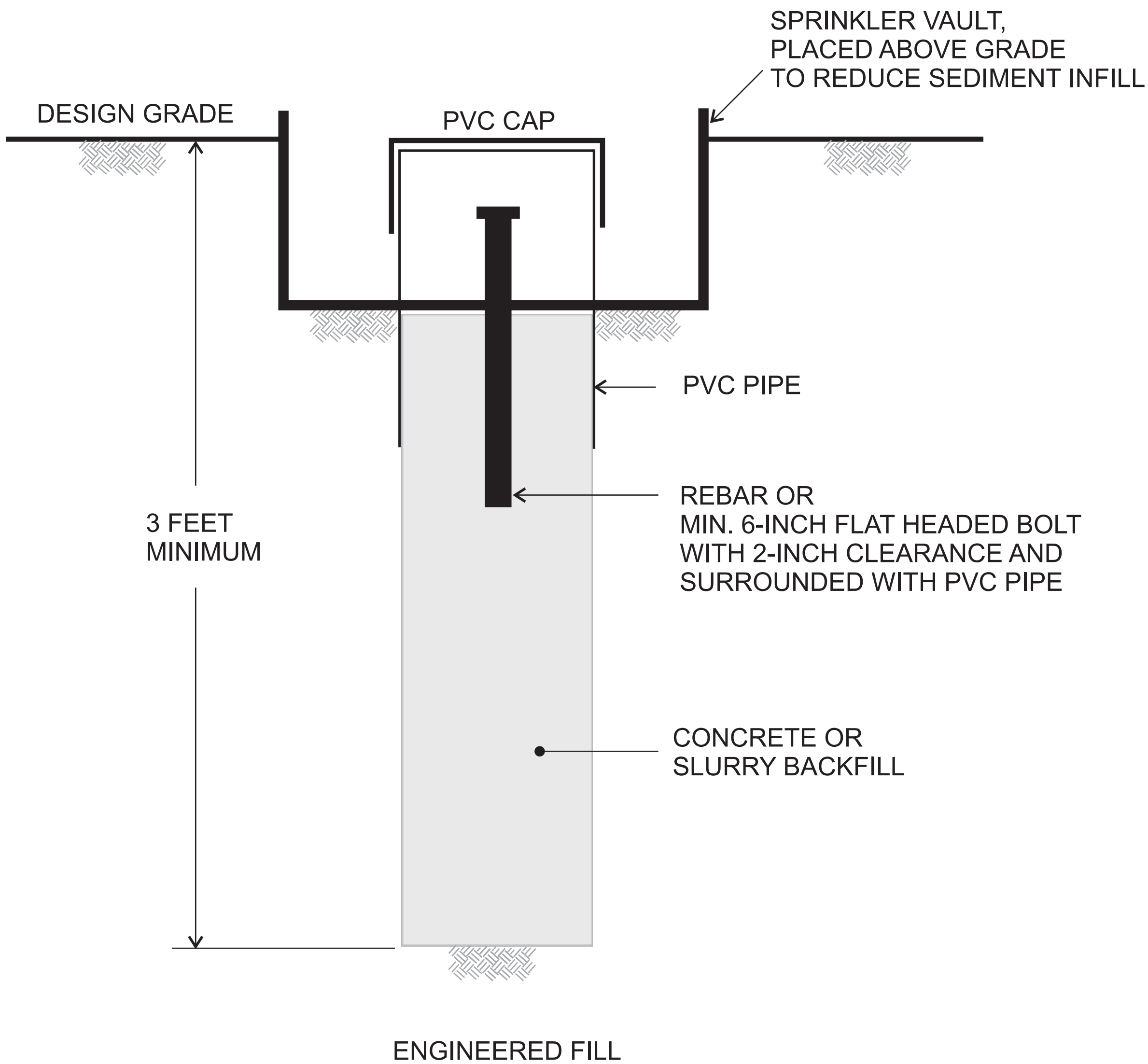
AGS ADVANCED GEOTECHNICAL SOLUTIONS	SETTLEMENT PLATE	DETAIL 11



NOTES:

1. SETTLEMENT MONUMENT LOCATIONS SHALL BE SUFFICIENTLY IDENTIFIED AND BE READILY VISIBLE TO EQUIPMENT OPERATORS.

2. ELEVATIONS OF SURFACE MONUMENTS SHALL BE DOCUMENTED BY PROJECT CIVIL ENGINEER OR SURVEYOR.

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ADVANCED GEOTECHNICAL SOLUTIONS

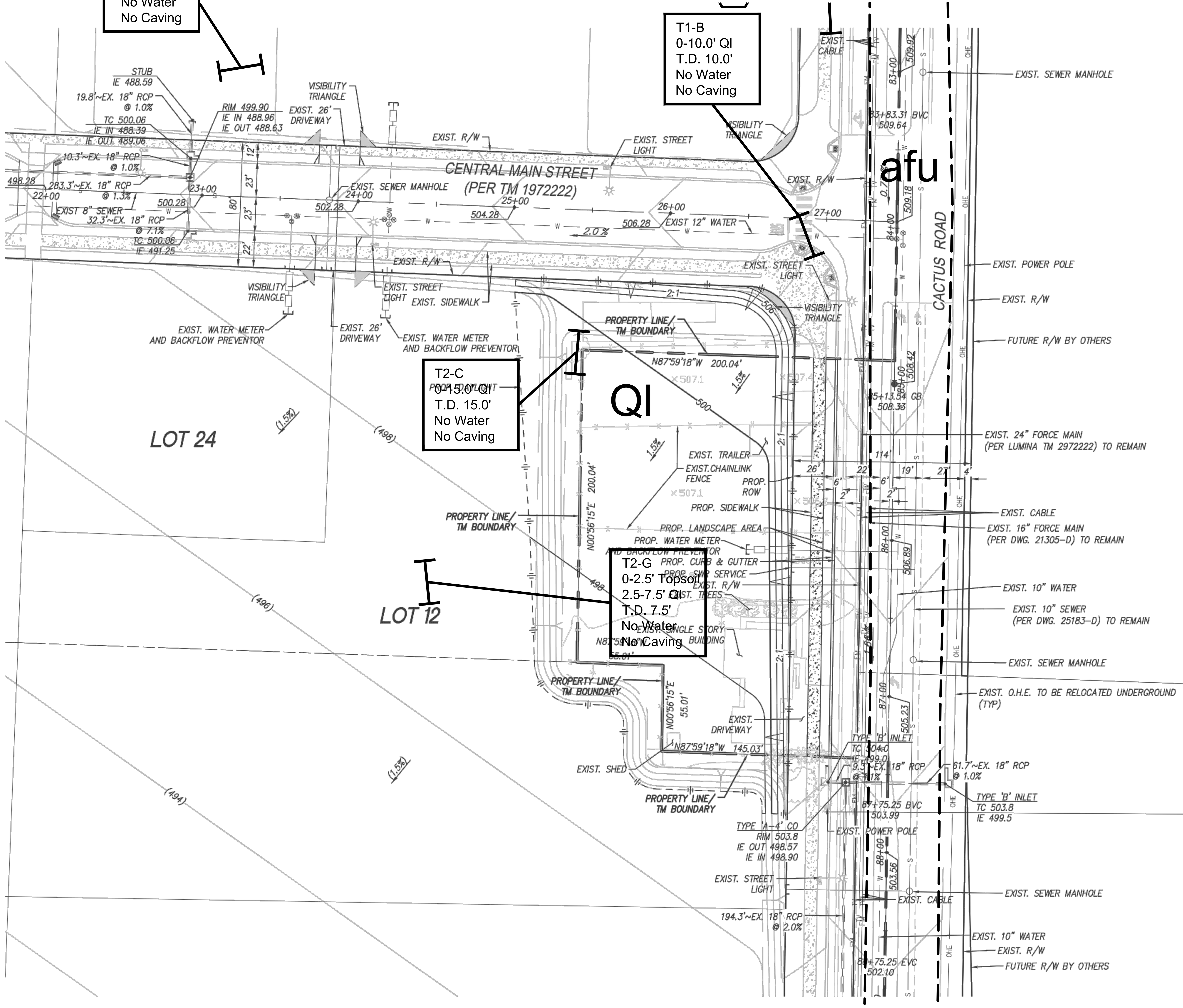
SETTLEMENT MONUMENT

DETAIL 12

LEGEND

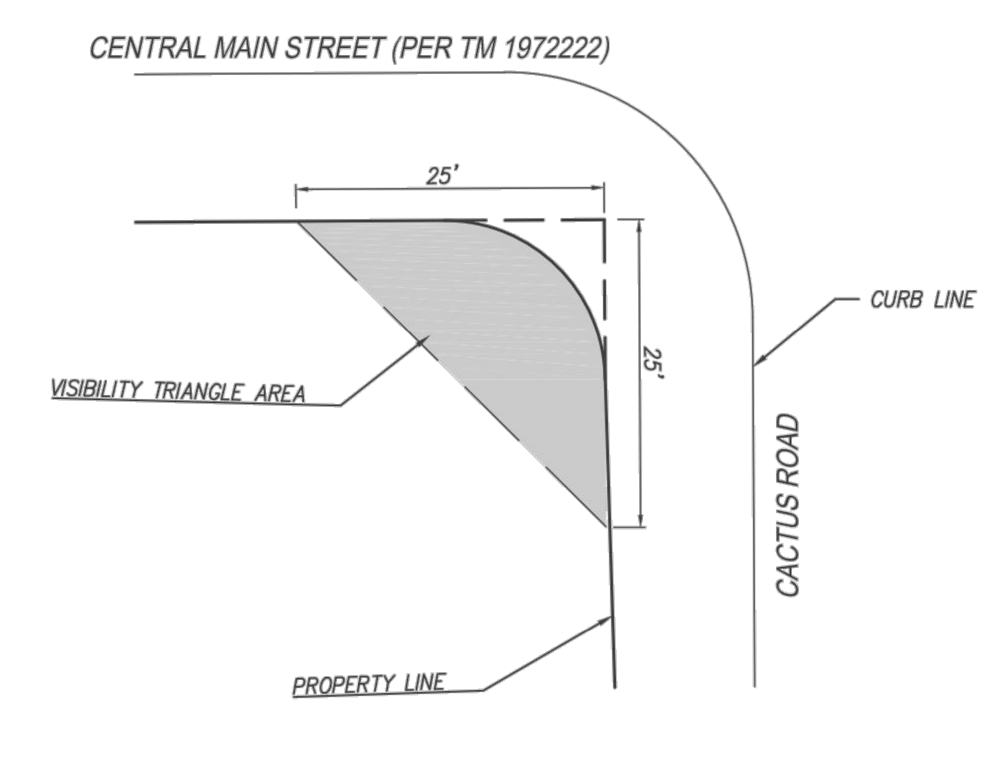
afu	ARTIFICIAL FILL-UNDOCUMENTED
Ql	LINDA VISTA FORMATION
— — ····?	GEOLOGIC CONTACT (DOTTED WHERE BURIED, QUERIED WHERE UNKNOWN)
T1-A,B ETC.	APPROXIMATE LOCATION OF EXPLORATORY TEST PIT (GEOCON, 2003-2005)

LUMINA III
TENTATIVE MAP NO.



NOTE:

1. NO OBSTRUCTION INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3 FEET IN HEIGHT. PLANT MATERIAL, OTHER THAN TREES, WITHIN THE PUBLIC RIGHT-OF-WAY THAT IS LOCATED WITHIN VISIBILITY AREAS SHALL NOT EXCEED 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF THE ADJACENT CURB.
2. ACCESS FOR EACH LOT SUBJECT TO FUTURE NEIGHBORHOOD DEVELOPMENT PERMIT.
3. ALL PROPOSED WET AND DRY UTILITIES ARE TO BE UNDERGROUND.
4. EXISTING OVERHEAD ELECTRICAL FACILITIES WITHIN CACTUS ROAD TO BE RELOCATED UNDERGROUND.
5. ALL PROPOSED STREETS TO BE DEDICATED ON FINAL MAP.
6. FOR ALL PRIVATE UTILITIES ENCROACHING INTO A PUBLIC RIGHT-OF-WAY, AN EMRA WILL BE REQUIRED.
7. ALL STORM DRAIN SHOWN ON PLANS IS PUBLIC UNLESS OTHERWISE NOTED AT PRIVATE.
8. ALL EXISTING IMPROVEMENTS ADJACENT TO SITE ARE PER TM NO. 1972222.



VISIBILITY TRIANGLE DETAIL

NOT TO SCALE

NOTE: NO OBSTRUCTION INCLUDING LANDSCAPING OR SOLID WALLS IN THE VISIBILITY TRIANGLE AREA SHALL EXCEED 24 INCHES IN HEIGHT.

PLATE 1

Geologic Map and Exploration Location Plan

AGS ADVANCED GEOTECHNICAL SOLUTIONS, INC.

Project:	Report:	Date:
P/W 1304-04	1304-04-B-15	Jan. 2020

GRAPHICAL SCALE
SCALE: 1" = 40'

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey
701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

REGISTERED PROFESSIONAL ENGINEER GREGORY M. SHIELDS No. 42951 Exp. 03-31-20 CIVIL STATE OF CALIFORNIA

PREPARED BY:
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ADDRESS: 701 'B' STREET, SUITE 800
SAN DIEGO, CALIFORNIA 92101
PHONE #: (619) 235-6471

PROJECT ADDRESS:
SAN DIEGO, CALIFORNIA

PROJECT NAME:
LUMINA III

SHEET TITLE:
GRADING AND STORM DRAIN PLAN

REVISION 14:
REVISION 13:
REVISION 12:
REVISION 11:
REVISION 10:
REVISION 09:
REVISION 08:
REVISION 07:
REVISION 06:
REVISION 05:
REVISION 04:
REVISION 03:
REVISION 02:
REVISION 01:
ORIGINAL DATE:
SHEET 3 OF 8
DEP #