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July 27, 2016
P/W 1602-06
Report No. 1602-06-B-3

Attention: **Mr. Jeff Lundstrom**

Subject: ***Preliminary Geotechnical Investigation, 2260 San Pasqual Valley Road Project, County of San Diego, California***

References: **See Appendix A**

Gentlemen:

Pursuant to your request Advanced Geotechnical Solutions, Inc. (AGS) has prepared this preliminary geotechnical investigation of the 2260 San Pasqual Valley Road Project, located in San Diego County, California. Based upon our conversations, review of available documents and plans, AGS understands that the project will be developed to support fourteen single-family residences.

The recommendations presented herein are based on a review of available geologic and geotechnical literature and maps pertinent to the proposed construction, the results of our recent subsurface exploration at the project site, associated laboratory testing, and our general experience in the area. Included in this report are: 1) engineering characteristics of the onsite soils; 2) discussion of the onsite geologic units; 3) limited geologic hazard analysis; 4) grading recommendations; and 5) geotechnical design recommendations for the proposed building, retaining walls and associated surface improvements.

AGS 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,

PHILLIP W. MADRID, EIT
Staff Engineer

REGISTERED PROFESSIONAL ENGINEER JOHN J. DONOVAN GE 2790 GEOTECHNICAL STATE OF CALIFORNIA

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Distribution: (3) Addressee
Attachments:
Figure 1 – Site Location Map
Plate 1– Geologic Map and Exploration Location Plan

Appendix A – References
Appendix B – Field Data
Appendix C - Laboratory Data
Appendix D – Percolation Test Data
Appendix E – General Earthwork Specifications & Grading Details
Appendix F – Homeowners Maintenance Guidelines

Preliminary Geotechnical Investigation
2260 San Pasqual Valley Road Project
County Of San Diego, California

1.0 SCOPE OF SERVICES

This study is aimed at providing geotechnical information as it relates to: 1) existing site soil conditions; 2) discussion of the geologic units onsite; 3) limited geologic hazard analysis; 4) engineering characteristics of the onsite soils; 5) excavation characteristics of earth materials; 6) preliminary geotechnical design for the proposed structures and associated improvements.

The scope of our study included the following tasks:

- Review of pertinent published and unpublished geologic and geotechnical literature, maps, and aerial photographs.
- Excavate, log and sample twelve excavator test pits (T-1 through T-12) at selected locations within the limits of the proposed development.
- Excavate fourteen percolation test borings (P-1 through P-14) utilizing a backhoe with flight auger attachment and conduct percolation tests to evaluate the feasibility of onsite wastewater disposal systems.
- Laboratory testing including maximum density, expansion potential, grain size analysis, and remolded shear strength testing.
- Prepare a plan depicting the onsite geologic contacts, percolation test boring and excavator pit locations, utilizing the 80-scale Preliminary Design Study plan prepared by Lundstrom Engineering and Surveying, Inc. (Plate 1).
- Conduct a geotechnical and geologic hazard analysis of the site.
- Develop general remedial grading recommendations for unsuitable soils and determine overexcavation recommendations for cut/bedrock areas.
- Evaluate presence of suitable capping materials and rippability of onsite bedrock.
- Conduct a limited seismicity analysis.
- Determine site specific seismic design parameters for use in the structural design.
- Determine design parameters of onsite soils as a foundation medium including bearing and friction values for foundation soils.
- Preparation of this geotechnical report with exhibits summarizing our findings. This report is suitable for design, contractor bidding, and regulatory review.

2.0 GEOTECHNICAL STUDY LIMITATIONS

The conclusions and recommendations in this report are professional opinions based on the data developed during this study.

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 material is beyond the scope of this firm's services.

3.0 SITE LOCATION AND DESCRIPTION

The irregular shaped site encompasses approximately 17 acres and is located in the County of San Diego, California. The site is bounded to the south by San Pasqual Valley Road (Highway 78), to the west by a southwesterly trending drainage, and to the north and east by existing single-family residential properties. In general, the site exhibits moderately sloping topography toward the south and west, with a hill in the central portion of the site. Approximate elevations within the overall site limits range from a low elevation of 655 msl at the southwesterly boundary to a high of 770 msl near the northeasterly boundary. The site currently supports an existing single-family residence on the hill in the central portion of the site, and the rest of the site is currently vacant and undeveloped with the exception of a few dirt roads. The site is covered with a light to moderate growth of weeds and grass with localized small trees and bushes. Evidence of previous agricultural use was noted during our field explorations.

4.0 PROPOSED DEVELOPMENT

Current conceptual plans by Lundstrom Engineering and Surveying, Inc., call for the site to be graded to fourteen (14) lots for single-family residences along with associated streets and improvements. Based on these plans and our conversations with the civil engineer, the maximum heights of cut slopes and fill slopes are anticipated to be on the order of 10 feet. The highest proposed cuts and fills are anticipated to be on the order of 15 feet.

5.0 FIELD AND LABORATORY INVESTIGATION

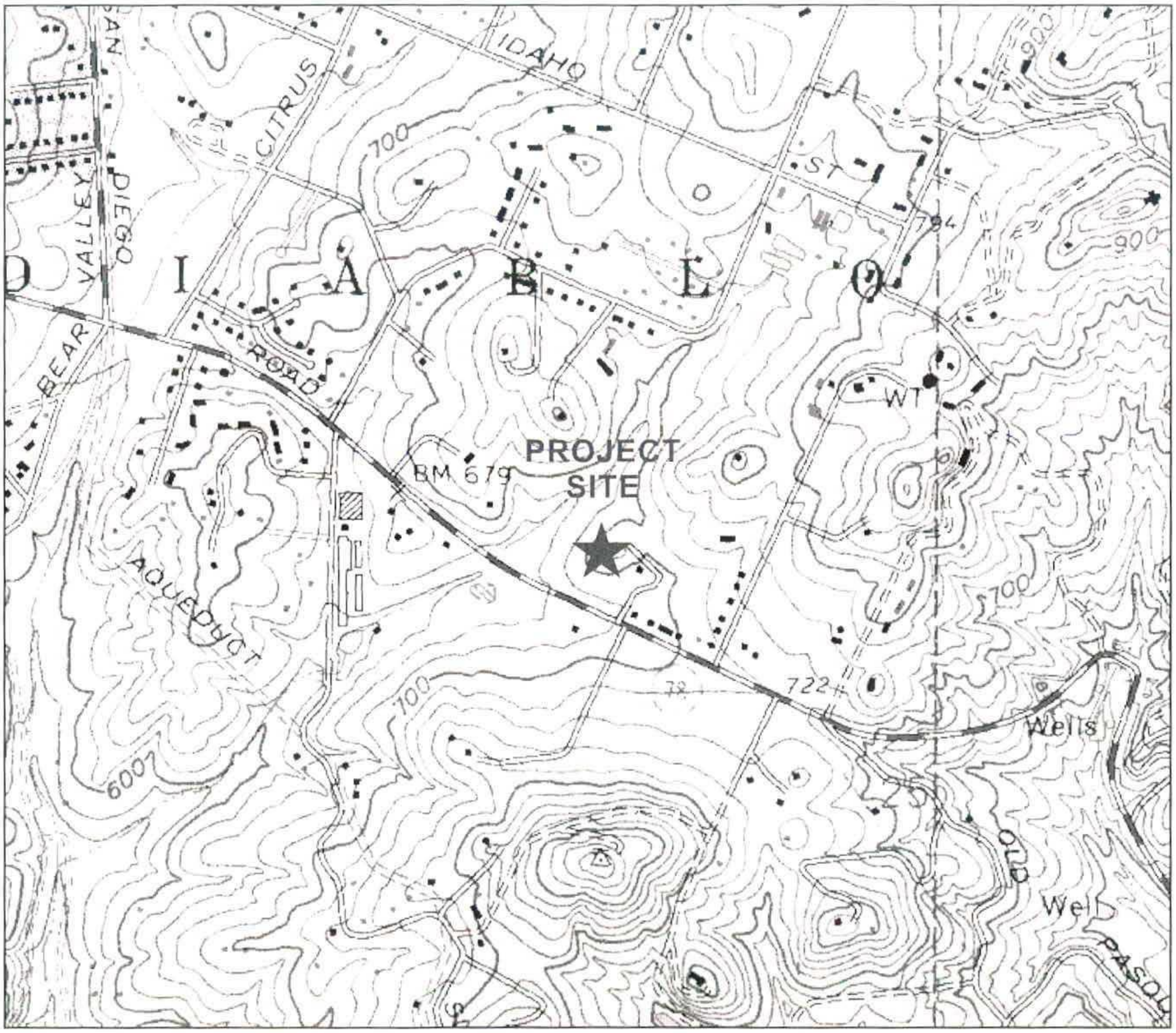
5.1. Current Study

As part of the current study, AGS excavated, logged, and sampled 12 excavator test pits with a Cat 328 excavator (approximate weight of 80,000lb). The depths ranged from 7.5 to 18.5 feet below ground surface. Logs of these test pits are presented in Appendix B.

AGS also excavated 14 percolation test borings with a backhoe equipped with a 12-inch diameter flight auger at predetermined locations onsite, as shown on Plate 1. AGS conducted percolation testing in accordance with the San Diego County Design Manual for Onsite Wastewater Treatment Systems. Results and calculations are presented in Appendix D. A summary of the percolation test results are presented in Section 7.10 below and a separate forthcoming report will present a more detailed discussion of the feasibility of onsite wastewater treatment systems for the proposed development.

5.2. Laboratory Testing

Laboratory testing was conducted on representative bulk samples obtained from the subsurface excavations. Testing consisted of expansion testing, maximum density and optimum moisture content, remolded direct shear strength testing, and grain size analyses. The results of laboratory testing are presented in Appendix C.



N

1" = 100'
(approx.)

SITE LOCATION MAP
2260 SAN PASQUAL VALLEY ROAD
SAN DIEGO COUNTY, CALIFORNIA

P/W 1602-06

FIGURE 1

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

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6.0 ENGINEERING GEOLOGY

6.1. Regional Geologic and Geomorphic Setting

The subject site is situated within the western portion of the Peninsular Ranges Geomorphic Province. The Peninsular Ranges province occupies the southwestern portion of California, extending southward from the Transverse Ranges and Los Angeles Basin to the southern tip of Baja California. In general the province consists of young, steeply sloped, northwest trending mountain ranges underlain by Late Jurassic to Early Cretaceous-age metavolcanic and metasedimentary rock and Cretaceous-age igneous plutonic rock of the Peninsular Ranges Batholith. The westernmost portion of the province is predominantly underlain by younger marine and non-marine sedimentary rocks. The Peninsular Ranges' dominant structural feature is northwest-southeast trending crustal blocks bounded by active faults of the San Andreas transform system.

6.2. Site Geology

Published regional geologic maps indicate the site is underlain by Mid-Cretaceous Granodiorite of Woodson Mountain. For the purposes of this report, the simple nomenclature of "granitic rock" will be used. This unit is mantled by relatively thin veneers of surficial soils including undocumented artificial fill, older alluvium, colluvium and topsoil. The following section contains a summary of the soil and bedrock units encountered onsite. The approximate distribution of these units are shown on Plate 1. Description of these geologic units, as observed during our investigation, are presented below. Test pit logs are presented in Appendix B.

6.2.1. Artificial Fill-undocumented (afu)

Undocumented artificial fill soils were encountered in test pit T-12 to a depth of 4.5 feet and are anticipated to exist locally at the site in relation to previous site improvements and agricultural activities.. As encountered these materials can generally be described as dark brown silty sand with some cobbles and small boulders in a generally dry to slightly moist and loose to moderately dense condition.

6.2.2. Topsoil (No map symbol)

A thin veneer of topsoil was encountered in test pits throughout the site. As encountered, these materials can generally be described as brown, silty sand in a dry and loose condition. The topsoil ranged from 0.5 to 1.5 feet in thickness.

6.2.3. Colluvium (Qcol)

A relatively thin veneer colluvium mantles a majority of the project site and was encountered the majority of the test pits. The colluvium can generally be described as reddish brown, silty sand with some gravel and cobble, in a dry to slightly moist and loose to moderately dense condition. The colluvium ranged from 2.5 to 5.5 feet in thickness.

6.2.4. Older Alluvium (Qoa)

Older alluvium was encountered to a depth of 16 feet in test pit T-1 and consisted of dark red brown silty to clayey sand with interbedded sandy clay. As encountered, the older alluvium was slightly moist to moist and moderately dense.

6.2.5. Granitic Rock (Kgr)

Granitic bedrock was encountered at depth across the site. This unit typically exhibited a completely weathered zone of residual soil on the order of 2 to 3 feet thick, becoming less weathered with depth. As encountered, these materials are moderately soft to very hard, generally reducing to soil and gravel-size fragments in the highly weathered zones and 12-inch minus in the moderately weathered zones. The excavator encountered refusal in the granitic rock at depths between 7.5 feet and 17.5 feet during our investigation.

6.3. Groundwater

Groundwater was not encountered in our exploratory excavations, nor was groundwater observed on site. No natural groundwater condition is known to exist at the site that would impact the proposed site development.

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.

6.4. Geologic Hazards

6.4.1. Landslides

No landslides have been mapped at the site. No topographic features were observed at the site that would indicate existing landslides. In addition, given the hard nature of the granitic rock, the potential for landsliding is considered very low.

6.4.2. Flooding

According to available FEMA maps, the site is not in a FEMA identified flood hazard area.

6.4.3. Subsidence/Ground Fissuring

Due to the presence of the hard underlying granitic rock and the proposed compacted fill that will be placed during grading activities, the potential for subsidence and ground fissuring due to settlement is very low.

6.5. Seismic Hazards

The 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, and the underlying soil characteristics. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction or dynamic settlement. The following is a site-specific discussion of ground motion parameters, earthquake-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 an acceptable level of risk.

6.5.1. Surface Fault Rupture

No faults have been mapped within the project site. The nearest known active fault to the site is the Newport-Inglewood-Rose Canyon fault zone which is approximately 18 miles southwest of the project site. Accordingly, the potential for fault surface rupture on the subject site is very low. This conclusion is based on literature review and aerial photographic analysis.

6.5.2. Seismicity

As noted, the site is within the tectonically active southern California area, and is approximately 18 miles from the Newport-Inglewood-Rose Canyon fault zone. The potential exists for strong ground motion that may affect future improvements.

At this point in time, non-critical structures (commercial, residential, and industrial) are usually designed according to the California Building Code (2013) and that of the controlling local agency.

6.5.3. Liquefaction

Due to the hard granitic rock that underlies the site, and given the lack of shallow groundwater at the site, and the dense compacted fill that will be placed during grading, the potential for liquefaction at the site is very low.

6.5.4. Dynamic Settlement

Dynamic settlement occurs in response to an earthquake event in loose sandy earth materials. Given the fact that hard granitic rock underlies the site, and the proposed removals, the potential for dynamic settlement is considered to be remote.

6.5.5. Seismically Induced Landsliding

Evidence of landsliding at the site was not observed during our field explorations, nor were any geomorphic features indicative of landslides noted during our review of aerial photos and published geologic maps. The granitic rock at the site is not usually susceptible to seismically induced landsliding. Therefore, the potential for landslides to impact the proposed development is low.

7.0 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.

7.1. Excavation Characteristics

Based on our subsurface investigation and previous experience with similar projects near the subject site, it is anticipated that excavations within the undocumented artificial fill, topsoil, colluvium, Older Alluvium, and the completely- to highly-weathered portions of the granitic bedrock can be accomplished with conventional equipment. It is likely that oversized "float" will be encountered in surface outcrops and shallow cuts which will require special handling. Deeper cuts within the granitic rock will require specialized equipment, such as large excavators equipped with hoe rams, D-9 bulldozer with a single shank ripper and/or blasting to efficiently excavate to the proposed grades and overexcavation grades. In addition, where proposed underground utilities are located in hard rock areas, overexcavation during grading is recommended to facilitate the installation of wet and dry utilities.

7.1.1. Rippability

As a means to characterize the excavateability/rippability of the granitic bedrock, twelve (12) test pits (T-1 through T-12) were excavated with a Caterpillar 328 tracked excavator (~80,000 lbs.). Logs of these excavations are presented in Appendix B. Based on these excavator test pit excavations and AGS's experience with grading of other sites in similar bedrock, the hard rock conditions encountered at the project site will likely require very heavy ripping, specialized grading techniques (Hoe-Rams, Breakers, etc.) and/or localized blasting at depths where the excavator encountered refusal. Typically this depth ranges from seven and one-half (7.5) to seventeen and one-half (17.5) feet below existing ground surface. The shallowest refusal depths encountered were in test pits T-3 and T-6 located in the westerly and northerly portions of the site. In addition, several hard rock outcrops were observed in the northerly and northwesterly portions of the site.

Oversized materials will be generated from cuts in the bedrock and these oversized materials should be handled as discussed in Section 8.4. Recommended undercuts to remove hard rock from the near pad grade and within utility alignments are presented in Section 8.5.

7.2. Groundwater

Groundwater is not anticipated to impact the proposed site improvements.

7.3. Compressibility

Onsite the undocumented artificial fill, topsoil, colluvium, weathered older alluvium, and highly weathered formational materials are considered to be moderately compressible in their present condition. These materials should be removed and recompacted within structural fill areas. The proposed compacted fill will have low compressibility.

7.4. Earthwork Adjustments

Table 7.4 summarizes estimated bulk/shrink factors which should be used by the design engineer for earthwork balance estimates. As is the case with every project, contingencies should be made to adjust the earthwork balance when grading is in progress and actual conditions are better defined.

TABLE 7.4 Earthwork Adjustment Factors	
Geologic Unit	**Adjustment Factor**
Undocumented Artificial Fill/Topsoil	Shrink 5%-10%
Colluvium/Weathered Older Alluvium	Shrink 5%-10%
Granitic Rock	Bulk 15 to 20%

7.5. Collapse Potential/Hydro-Consolidation

Given the hard and dense granitic rock below the site and the fact that the topsoil, colluvium, and undocumented artificial fill will be removed, the potential for hydro-consolidation is considered remote at the subject site.

7.6. Expansion Potential

As part of our investigation, representative bulk samples of near surface soils were collected and tested to evaluate their potential for expansion. Testing was performed in general accordance with ASTM D 4829. Test results by AGS indicate that the soils tested possess an expansion index (EI) within the range of 14 to 55, which corresponds to a "Low" to "Medium" expansion potential. Post-grading testing should be conducted to define as-graded expansive soil characteristics. The results of those tests and the final as-graded conditions will govern design of foundations and street pavement sections.

7.7. Shear Strength

Shear strength testing was conducted on "re-molded" samples of the onsite soils. Based upon our test results and familiarity with the onsite geologic units, AGS has summarizes the recommended shear strengths in Table 7.7 for the various geologic units and compacted fill onsite.

TABLE 7.7 SHEAR STRENGTH		
Material	**Cohesion (psf)**	**Friction Angle (degrees)**
Compacted Fill	100	32
Older Alluvium	200	30
Granitic Rock	400	36

7.8. Chemical/Resistivity Test Results

Corrosivity testing was not performed as part of this investigation. Based on our observations and experience with similar projects, the onsite soils are anticipated to possess a "negligible" sulfate exposure condition when classified in accordance with ACI 318-11 Table 4.2.1 (per 2013 CBC). The soils are also anticipated to be "low to moderately" corrosive to metals in contact with those soils. Final determination should be based upon post-graded testing of near-surface soils. Determination as to the need and specification for protection of metal construction materials should be determined by engineers(s) specializing in corrosion analysis.

7.9. Bearing Capacity and Lateral Earth Pressures

Ultimate bearing capacity values were obtained using the graphs and formulas presented in *NAVFAC DM-7.1*. Allowable bearing was determined by applying a factor of safety of at least three (3) to the ultimate bearing capacity.

Static lateral earth pressures were calculated using *Rankine* methods for active and passive cases. If it is desired to use *Coulomb* forces, a separate analysis specific to the application can be conducted.

7.10. Permeability/Percolation Characteristics

AGS conducted a limited percolation study to evaluate the feasibility of the site for use of onsite wastewater treatment systems. Testing was conducted in general conformance with the San Diego County DEH Design Manual (2013).

One percolation test hole was excavated at each lot (P-1 through P-14) at the approximate locations depicted on Plate 1. Holes were approximately twelve inches in diameter and three to four feet deep.

Preliminary percolation rates ranged from 8 to 48 minutes per inch. A summary of results is presented in Table 7.10 below.

TABLE 7.10
Preliminary Percolation Rates

Percolation Test Boring	Percolation Rate (minutes per inch)		Percolation Test Boring	Percolation Rate (minutes per inch)
P-1	13		P-8	8
P-2	10		P-9	17
P-3	48		P-10	17
P-4	12		P-11	13
P-5	11		P-12	26
P-6	12		P-13	8
P-7	9		P-14	9

8.0 GRADING RECOMMENDATIONS

Based on the information presented it is the opinion of AGS that the proposed development is feasible from a geotechnical point of view. 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 practiced by the County of San Diego and this firm's Earthwork Specifications (Appendix E).

8.1. Site Preparation

Existing vegetation, trash, debris, and other deleterious materials should be removed and wasted from the site prior to commencing removal of unsuitable soils and placement of compacted fill materials.

8.2. Unsuitable Soils Removals

All topsoil/residual soil, colluvium, and highly weathered formational materials, and any undocumented fill will require removal in structural areas. It is anticipated that the depth of removals across the site will generally range from a 4 to 6 feet. Localized areas may require deeper removals. Minimally the removals should extend a lateral distance of at least 5 feet beyond the limits of settlement sensitive structures or the building pad, whichever is greater. If deeper removals are performed, the removals should extend a lateral distance equal to the depth of removal beyond the improvement limits. Removal bottoms should expose competent formational materials in a firm and unyielding condition. The resulting removal bottoms should be observed by a representative of AGS to verify that adequate removal of unsuitable materials have been conducted 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 and do not contain deleterious materials. Grading shall be accomplished under the observation and testing of the project soils engineer and engineering geologist or their authorized representative in accordance with the recommendations contained herein, the current grading ordinance of the County of San Diego.

8.3. Earthwork Considerations

8.3.1. Compaction Standards

All fills should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557. 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 of the maximum dry density (ASTM D1557). For roadways/driveway areas and other flatwork subjected to vehicular loading, a minimum compaction standard of 95 percent of the laboratory maximum dry density should be used within the upper 12 inches.

8.3.2. Treatment of Removal Bottoms

At the completion of unsuitable soil removals, the exposed bottom should be scarified to a minimum depth of eight inches, moisture conditioned to above optimum moisture and compacted in-place to the standards set forth in this report.

8.3.3. Fill Placement

Fill should be placed in thin lifts (eight-inch bulk), moisture conditioned to at or slightly above the optimum moisture content, uniformly mixed, and compacted by the use of both wheel rolling and kneading type (sheep's foot) compaction equipment until the designed grades are achieved.

8.3.4. Benching

Where the natural slope is steeper than 5-horizontal to 1-vertical and where determined by the project Geotechnical Engineer or Engineering Geologist, compacted fill material shall be keyed and benched into competent materials.

8.3.5. 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 the 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.

8.3.6. Haul Roads

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

8.3.7. Compaction Equipment

Compaction equipment on the project should include a combination of rubber-tired and sheepsfoot rollers to achieve proper compaction. Adequate water trucks/pulls should be available to provide sufficient moisture and dust control.

8.4. Oversized Materials

Oversized rock material [i.e., rock fragments greater than eight (8) inches] will likely be produced during the excavation of the design cuts and undercuts. Provided that the procedure is acceptable to the developer and governing agency, this rock may be incorporated into the compacted fill section to within three (3) feet of finish grade within residential areas and to one (1) foot below the deepest utility in street and house utility connection areas. Maximum rock size in the upper portion of the hold-down zone is restricted to eight (8) inches. Disclosure of the above rock hold-down zone should be made to prospective homebuyers explaining that excavations to accommodate swimming pools, spas, and other appurtenances will likely encounter oversize rock [i.e., rocks greater than eight (8) inches] below three (3) feet. Rock disposal details are presented on Detail 10, Appendix E. Rocks in excess of eight (8) inches in maximum dimension may be placed within the deeper fills, provided rock fills are handled in a manner described below. In order to separate oversized materials from the rock hold-down zones, the use of a rock rake may be necessary

8.4.1. Rock Blankets

Rock blankets consisting of a mixture of gravel, sand and rock to a maximum dimension of two (2) feet may be constructed. The rocks should be placed on prepared grade, mixed with sand and gravel, watered and worked forward with bulldozers and pneumatic compaction equipment such that the resulting fill is comprised of a mixture of the various particle sizes, contains no significant voids, and forms a dense, compact, fill matrix.

Rock blankets may be extended to the slope face provided the following additional conditions are met: 1) no rocks greater than twelve (12) inches in diameter are allowed within six (6) horizontal feet of the slope face; 2) 50 percent (by volume) of the material is three-quarter- (3/4) inch minus; and 3) backrolling of the slope face is conducted at four- (4) foot vertical intervals and satisfies project compaction specifications..

8.4.2. Rock Windrows

Rocks to maximum dimension of four (4) feet may be placed in windrows in deeper fill areas in accordance with Detail 10 (Appendix E). The base of the windrow should be excavated an equipment-width into the compacted fill core with rocks placed in single file within the excavation. Sands and gravels should be added and thoroughly flooded and tracked until voids are filled. Windrows should be separated horizontally by at least fifteen (15) feet of compacted fill, be staggered vertically, and separated by at least four (4) vertical feet of compacted fill. Windrows should not be placed within ten (10) feet of finish grade, within two (2) vertical feet of the lowest buried utility conduit in structural fills, or within fifteen (15) feet of the finish slope surface unless specifically approved by the developer, geotechnical consultant, and governing agency.

8.4.3. Individual Rock Burial

Rocks in excess of four (4) feet, but no greater than eight (8) feet may be buried in the compacted fill mass on an individual basis. Rocks of this size may be buried separately within the compacted fill by excavating a trench and covering the rock with sand/gravel, and compacting the fines surrounding the rock. Distances from slope face, utilities, and building pad areas (i.e., hold-down depth) should be the same as windrows.

8.4.4. Rock Disposal Logistics

The grading contractor should consider the amount of available rock disposal volume afforded by the design when excavation techniques and grading logistics are formulated. Rock disposal techniques should be discussed and approved by the geotechnical consultant and developer prior to implementation.

8.5. Overexcavation of Building Pads and Streets

8.5.1. Cut/Fill Transition Lots

Where design grades and/or remedial grading activities create a cut/fill transition, the cut and shallow fill portions of the building pad shall be overexcavated a minimum depth of three feet or 18 inches below the bottom of the proposed footings (whichever is deeper) and replaced with compacted fill. These remedial grading measures are recommended in order to minimize the potential for differential settlements between cut and fill areas. The undercut should be graded such that a gradient of at least one percent is maintained toward deeper fill areas or the front of the lot.

8.5.2. Cut Lots

It is recommended that for cut lots founded in hard bedrock, the bedrock should be overexcavated a minimum of 3 feet and replaced with compacted fill to facilitate utility and foundation construction. The bottom of the overexcavation should be graded such that a gradient of at least one percent is maintained toward the front of the lot.

8.5.3. Overexcavation of Streets/Driveways

Street/Driveway undercuts in hard rock areas should be based on depth of utilities within "right of way". The depth of undercut for streets should be at least one (1) foot below the deepest utility. In lieu of street undercutting and replacement with select soil, the streets can be line shot should hard rock be encountered.

8.6. Slope Stability

Cut and fill slopes on the order of 10 feet are proposed. As currently proposed, cut and fill slopes are anticipated to be globally and surficially stable, provided they are properly constructed and maintained. The highest cut and fill slopes should be analyzed when final grading plans are made available.

8.7. Seepage

Although not anticipated, if seepage is encountered during grading, it should be evaluated by the Geotechnical Consultant. If seepage is excessive, remedial measures such as horizontal drains or under drains may need to be installed.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Development of the site for the proposed residential structures is considered feasible, from a geotechnical standpoint, provided that the conclusions and recommendations presented herein are incorporated into the design and construction of the project. As with all projects, changes in observed conditions may result in alternative construction techniques and/or possible delays. The contractor should be aware of these possibilities and provide contingencies in his bids to account for them.

9.1. Preliminary Foundation Design

The proposed structures can be supported on conventional or post-tensioned shallow foundations and slab-on-grade systems. The expansion potential of the underlying soils is classified as "Low" to "Medium". The design of foundation systems should be based on as-graded conditions as determined after the completion of grading.

Foundations may be designed using the values provided in the following table. These 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.

TABLE 9.1
CONVENTIONAL FOUNDATION DESIGN PARAMETERS

Allowable Bearing		2,000 psf, based on a minimum width and depth	
Lateral Bearing (Level Condition)		250 psf/foot of depth to a maximum of 2,000 psf	
Lateral Bearing (Descending 2:1 Slope)		125 psf/foot of depth to a maximum of 1,500 psf	
Sliding Coefficient		0.35	
Expansion Index		**"Low"**	**"Medium"**
Soil Category**		**I**	**II**
Continuous Footings			
Footing Width	One-Story	12 inches	12 inches
	Two-Story	15 inches	15 inches
Footing Depth*	One-Story	12 inches	18 inches
	Two-Story	18 inches	18 inches
Reinforcement		No. 4 rebar - 1 on top, 1 on bottom	No. 4 rebar - 2 on top, 2 on bottom OR No. 5 rebar - 1 on top and 1 on bottom
Spread Footings			
Footing Width		24 inches	24 inches
Footing Depth*		18 inches	18 inches
Reinforcement		Per structural engineer	
Slab-on-Grade			
Minimum Slab Thickness		4 inches (actual)	
Minimum Slab Reinforcement		No. 3 rebar spaced 18 inches on center (maximum), each way	
Moisture Barrier		An approved moisture and vapor barrier should be placed below all slabs-on-grade within living and moisture sensitive areas as discussed in Section 9.2	
Slab Subgrade Moisture		Minimum of 110 percent of optimum moisture to a depth of 12 inches prior to placing concrete	Minimum of 120 percent of optimum moisture to a depth of 12 inches prior to placing concrete

***Notes on Footing Embedment:** Depth of embedment should be measured below lowest adjacent finish grade.

Footings Adjacent to Swales and Slopes: If exterior footings adjacent to drainage swales are to exist within 5 feet horizontally of the swale, the footing should be embedded sufficiently to assure embedment below the swale bottom is maintained. Footings adjacent to slopes should be embedded such that at least 5 feet is provided horizontally from edge of the footing to the face of the slope.

**Final design parameters should be provided in a final grading report and should be based on as-graded soil conditions. For budgeting purposes, a Soil Category of II may be assumed.

9.2. Moisture Barrier

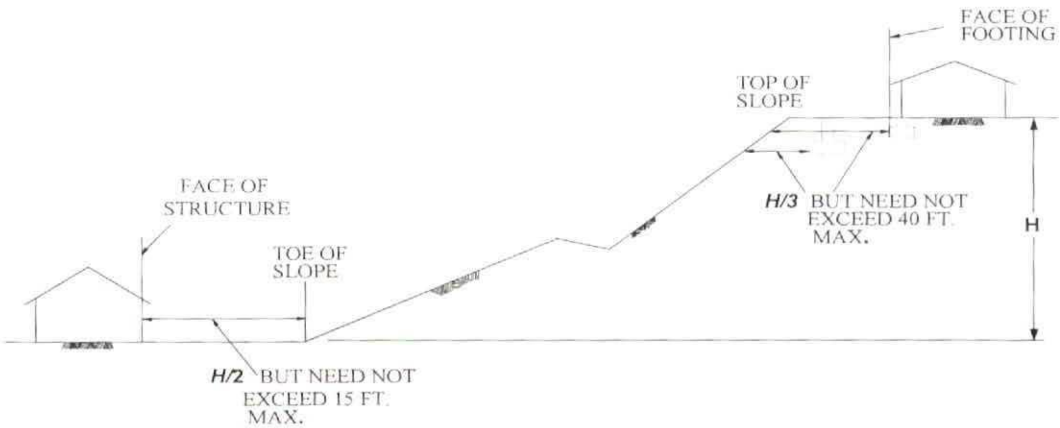
A moisture and vapor retarding system should be placed below the slabs-on-grade in portions of the structure considered to be moisture sensitive. The retarder should be of suitable composition, thickness, strength and low permeance to effectively prevent the migration of water and reduce the transmission 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.

9.3. Deepened Footings and Structural Setbacks

It is generally recognized that 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 (CBC), 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 Figure 9.2.

Figure 9.2



9.4. Concrete Design

Testing was not conducted, however it is anticipated that soils will exhibit "negligible" sulfate exposure when classified in accordance with ACI 318-11 Table 4.2.1 (per 2013 CBC). It should be noted that some fertilizers have been known to leach sulfates into soils otherwise containing "negligible" sulfate concentrations and increase the sulfate concentrations to potentially detrimental levels. It is incumbent upon the owner to determine whether additional protective measures are warranted to mitigate the potential for increased sulfate concentrations to onsite soils as a result of the future homeowner's actions.

9.5. Seismic Design Parameters

The following seismic design parameters are presented to be code compliant to the California Building Code (2013). The site is underlain with competent rock with minor to moderate fracturing and weathering, corresponding to a Site Class B. A Site Class C has been assigned to lots where 10 feet of fill soils are present between the bottom of the footing and underlying rock, in accordance with ASCE 7-10, Chapter 20.1. Lots should be categorized at the conclusion of grading, and seismic design recommendations should be provided on a lot by lot basis in the rough grading report. The site is located at Latitude 33.1053° N and Longitude 117.0391° W. Utilizing this information, the United States Geological Survey (USGS) web tool (http://earthquake.usgs.gov/designmaps) and ASCE 7 criterion, the mapped seismic acceleration parameters S_S, for 0.2 seconds and S_1, for 1.0 second period (CBC, 2013, 1613.3.1) for Risk-Targeted Maximum Considered Earthquake (MCE_R) can be determined. The mapped acceleration parameters are provided for Site Class "B". Adjustments for other Site Classes are made, as needed, by utilizing Site Coefficients F_a and F_v for determination of MCE_R spectral response acceleration parameters S_{MS} for short periods and S_{M1} for 1.0 second period (CBC, 2013 1613.3.3). Five-percent damped design spectral response acceleration parameters S_{DS} for short periods and S_{D1} for 1.0 second period can be determined from the equations in CBC, 2013, Section 1613.3.4.

TABLE 9.5
Seismic Design Criteria

Site Class	Seismic Design Category	Mapped Spectral Response Values		Spectral Response Accelerations		Design Spectral Response Accelerations	
		S_s (g) at 0.2 s	S_1 (g) at 1.0 s	S_{MS} (g) at 0.2 s	S_{M1} (g) at 1.0 s	S_{DS} (g) at 0.2 s	S_{D1} (g) at 1.0 s
B (Rock)	D	1.032	0.396	1.032	0.396	0.688	0.264
C (Dense Soil/ Soft Rock)	D	1.032	0.396	1.032	0.556	0.688	0.371

Using the United States Geological Survey (USGS) web-based ground motion calculator, the site class modified PGA_M (F_{PGA}*PGA) was determined to be 0.386g for Site Class B and 0.391g for Site Class C. This value does not include near-source factors that may be applicable to the design of structures on site.

9.6. Conventional Retaining Walls

The following earth pressures are recommended for the preliminary design of conventional retaining walls onsite:

Static Case

Level Backfill	Rankine Coefficients	Equivalent Fluid Pressure (psf/lin.ft.)
Coefficient of Active Pressure:	$K_a = 0.31$	40
Coefficient of Passive Pressure:	$K_p = 3.25$	423
Coefficient of at Rest Pressure:	$K_o = 0.47$	61

2 : 1 Backfill	Rankine Coefficients	Equivalent Fluid Pressure (psf/lin.ft.)
Coefficient of Active Pressure:	$K_a = 0.41$	54
Coefficient of Passive Pressure:		
Descending	K_p (-) = 2.41	313
Coefficient of At Rest Pressure:	$K_o = 0.68$	88

Seismic Case

In addition to the above static pressures, unrestrained retaining walls should be designed to resist seismic loading. In order to be considered unrestrained, retaining walls should be allowed to rotate a minimum of roughly 0.004 times the wall height. 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:

H = Height of the wall (feet)

γ = soil density = 130 pounds per cubic foot (pcf)

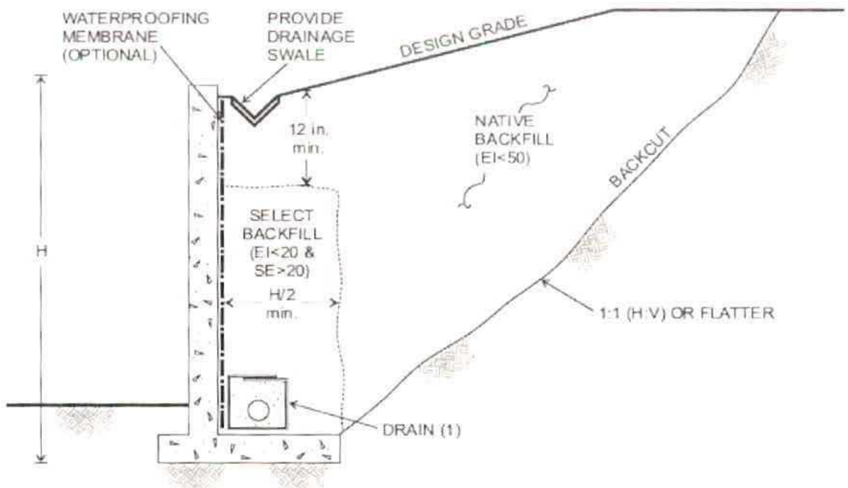
k_h = seismic pseudostatic coefficient = 0.5* peak horizontal ground acceleration / g

Peak ground acceleration onsite is estimated at 0.39g.

Walls should be designed to resist the combined effects of static pressures and the above seismic thrust load.

The foundations for retaining walls of appurtenant structures structurally separated from the building structures, may bear on properly compacted fill. A bearing value of 2,000 psf may be used for design of retaining walls. Retaining wall footings should be designed to resist the lateral forces by passive soil resistance and/or base friction as recommended for foundation lateral resistance. To relieve the potential for hydrostatic pressure wall backfill should consist of a free draining backfill (sand equivalent "SE" >20) and a heel drain should be constructed. The heel drain should be place at the heel of the wall and should consist of a 4-inch diameter perforated pipe (SDR35 or SCHD 40) surrounded by 4 cubic feet of crushed rock (3/4-inch) per lineal foot, wrapped in filter fabric (Mirafi® 140N or equivalent).

Proper drainage devices should be installed along the top of the wall backfill, which 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 section to the interior wall face.



NOTES: (1) DRAIN: 4-INCH PERFORATED ABS OR PVC PIPE OR APPROVED EQUIVALENT SUBSTITUTE PLACED PERFORATIONS DOWN AND SURROUNDED BY A MINIMUM OF 1 CUBIC FEET OF 3/4 INCH ROCK OR APPROVED EQUIVALENT SUBSTITUTE AND WRAPPED IN MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT SUBSTITUTE

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 relative compaction as determined by ASTM Test Method D1557. Flooding or jetting of backfill materials generally do not result in the required degree and uniformity of compaction and, therefore, is not recommended. The soils engineer or his representative should observe the retaining wall footings, backdrain installation and be present during placement of the wall backfill to confirm that the walls are properly backfilled and compacted.

9.7. Utility Trench Excavation

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. AGS should be consulted on these issues during construction.

9.8. Utility Trench Excavation

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. 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.

9.9. Exterior Slabs and Walkway

The subgrade below exterior slabs, sidewalks, driveways, patios, etc. should be moisture conditioned to a minimum of 110 (low expansive soils), 120 (medium expansive soils) percent of optimum moisture content prior to concrete placement, dependent upon the expansion potential of the subgrade soils.

9.9.1. Slab Thickness

Concrete flatwork and driveways should be designed utilizing four-inch minimum thickness.

9.9.2. Control Joints

Weakened plane joints should be installed on walkways at intervals of approximately eight to ten feet. Exterior slabs should be designed to withstand shrinkage of the concrete.

9.9.3. Flatwork Reinforcement

Consideration should be given to reinforcing any exterior flatwork.

9.9.4. Thickened Edge

Consideration should be given to construct a thickened edge (scoop footing) at the perimeter of slabs and walkways adjacent to landscape areas to minimize moisture variation below these improvements. The thickened edge (scoop footing) should extend approximately eight inches below concrete slabs and should be a minimum of six inches wide.

9.10. Onsite Wastewater Treatment

Based our preliminary percolation rates ranging from approximately 7 to 48 minutes per inch, onsite wastewater treatment is feasible.

No groundwater was encountered onsite during excavations, nor is groundwater anticipated to affect the feasibility of onsite wastewater disposal. Dependent upon final design, shallow granitic rock could impact the design and placement of onsite wastewater treatment systems.

9.11. Plan Review

Once final grading plans become available, they should be reviewed by AGS to verify that the design recommendations presented are consistent with the proposed construction.

9.12. 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.

10.0 SLOPE AND LOT MAINTENANCE

Maintenance of improvements is essential to the long-term performance of structures and slopes. Although the design and construction during mass grading is planned to create slopes that are both grossly and surficially stable, certain factors are beyond the control of the soil engineer and geologist. The homeowners must implement certain maintenance procedures.

In addition to the appended Homeowners Maintenance Guidelines, the following recommendations should be implemented.

10.1. Slope Planting

Slope planting should consist of ground cover, shrubs and trees that possess deep, dense root structures and require a minimum of irrigation. The resident should be advised of their responsibility to maintain such planting.

10.2. Lot Drainage

Roof, pad and lot drainage should be collected and directed away from structures and slopes and toward approved disposal areas. Design fine-grade elevations should be maintained through the life of the structure or if design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid discharge of water, away from structures and slopes. Residents should be made aware that they are responsible for maintenance and cleaning of all drainage terraces, down drains and other devices that have been installed to promote structure and slope stability.

10.3. Slope Irrigation

The resident, homeowner and Homeowner Association should be advised of their responsibility to maintain irrigation systems. Leaks should be repaired immediately. Sprinklers should be adjusted to provide maximum uniform coverage with a minimum of water usage and overlap.

Overwatering with consequent wasteful run-off and ground saturation should be avoided. If automatic sprinkler systems are installed, their use must be adjusted to account for natural rainfall conditions.

10.4. Burrowing Animals

Residents or homeowners should undertake a program for the elimination of burrowing animals. This should be an ongoing program in order to maintain slope stability.

11.0 LIMITATIONS

This report is based on the project as described and the information obtained from the excavations at the approximate locations indicated on the Plate 1. The findings are based on the results of the field, laboratory, and office investigations combined with an interpolation and extrapolation of conditions between and beyond the excavation locations. 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 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 report. 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.

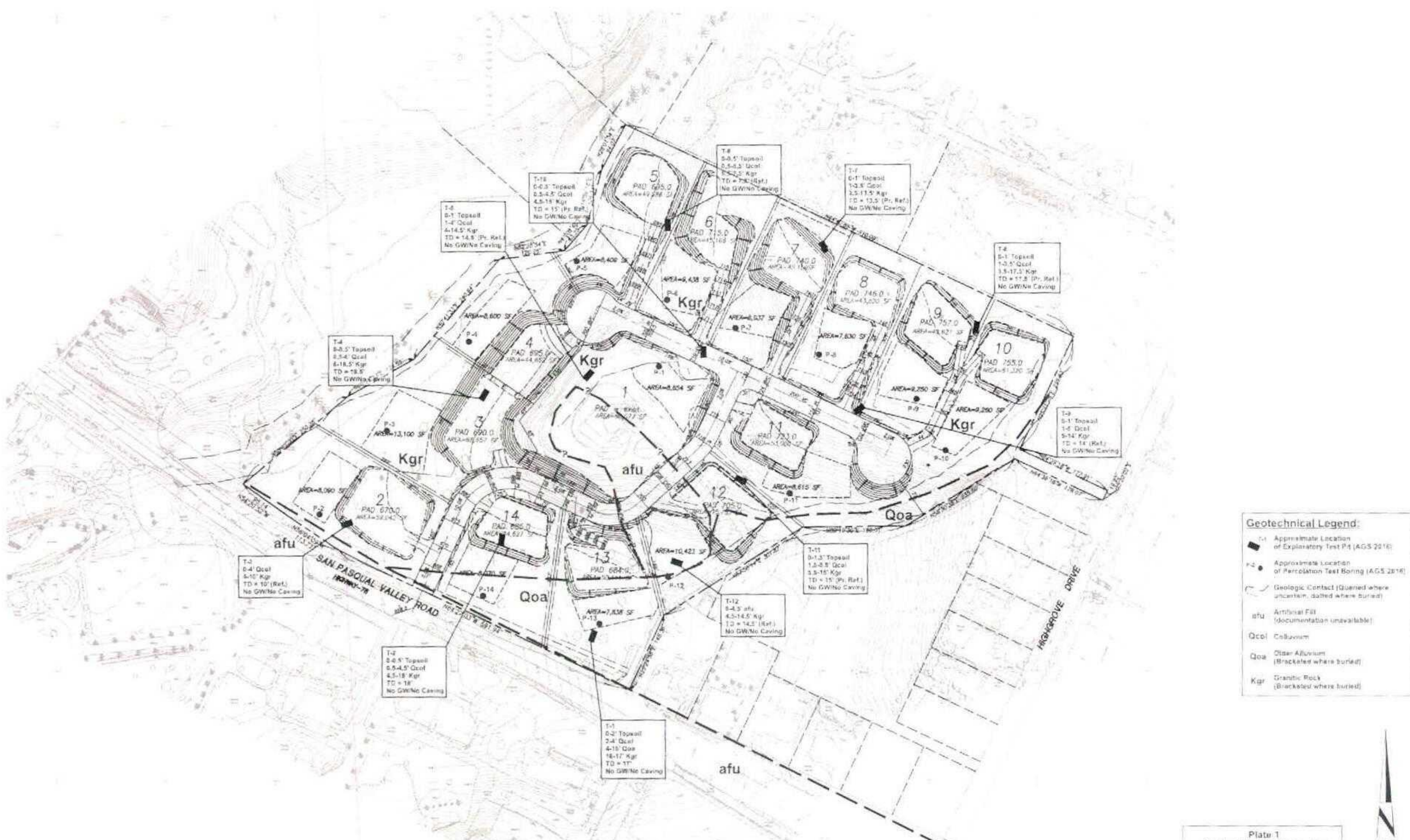


Plate 1
Geologic Map and Exploration Location Plan

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

Project	Report	Date
P/W 1602-08	1602-08-B-3	July 2016

Lundstrom Engineering and Surveying, Inc.

SAN PASQUAL VALLEY ROAD
SITE ADDRESS
PRELIMINARY DESIGN STUDY
APN

Appendix A

References

References

American Society for Testing and Materials (2008), *Annual Book of ASTM Standards, Section 4, Construction, Volume 04.08, Soil and Rock (I)*, ASTM International, West Conshohocken, Pennsylvania.

California Code of Regulation, Title 24, *2013 California Building Code*, 3 Volumes.

County of San Diego, Department of Environmental Health, Design Manual for Onsite Wastewater Treatment Systems, Updated November 25, 2013.

Jennings, C.W., and Bryant, W.A., 2010, Fault Activity Map of California: California Geological Survey, California Geologic Data Map No. 6, Scale 1:750,000.

Kennedy, M.P. and Tan, S.S. (2007). Geologic Map of the Oceanside 30' x 60' Quadrangle, California, 1:100,000 Scale.

Lundstrom Engineering and Surveying, Inc., (2016). 80-scale Preliminary Design Study for San Pasqual Valley Road, California, dated March 2, 2016.

United States Geological Survey, 2010 Ground Motion Parameter Calculator v. 5.1.0., World Wide Web, http://earthquake.usgs.gov/designmaps/us/application.php.

Appendix B

Field Data

Project San Pasqual
Date Excavated 5/23/16
Logged by PJD
Equipment Cat 328

LOG OF TEST PITS

Test Pit No.	Depth (ft.)	USCS	Description
T-1	0.0 – 2.0	SM	**Topsoil** SILTY SAND, brown to reddish brown, dry, loose.
	2.0 – 4.0	SC	**Colluvium (Qcol)** SILTY SAND, fine to coarse grained, reddish brown, dry to slightly moist, loose to moderately dense; weakly cemented, porous.
	4.0 – 16.0		**Older Alluvium** SILTY to CLAYEY SAND interbedded with SANDY CLAY, dark red brown, slightly moist to moist, moderately dense. @ 6' Dense
	16.0 – 17.0		**Granitic Bedrock (Kgr):** Highly weathered, moderately hard, friable, breaks into dark olive brown, fine to coarse grained SILTY SAND TOTAL DEPTH 17.0 FT. NO WATER, NO CAVING
T-2	0.0 – 0.5	SM	**Topsoil:** SILTY SAND, fine to coarse grained, brown, dry, loose; abundant roots.
	0.5 – 4.5	SM	**Colluvium (Qcol):** SILTY SAND, fine to coarse grained, reddish brown, dry, medium dense; occasional angular gravel; trace clay; porous.
	4.5 – 18.0		**Granitic Bedrock (Kgr):** RESIDUAL SOIL, completely weathered to SILTY TO CLAYEY SAND, fine to coarse grained, reddish brown, dry to slightly moist, medium dense. @7 ft. Highly weathered, moderately hard, friable, breaks into olive brown, fine to coarse grained SILTY SAND. @9 ft. Hard. @13 ft. Larger cobble-size chunks. @15 ft. Slow digging. TOTAL DEPTH 18.0 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
T-3	0.0 – 4.0	SM	**Colluvium (Qcol)** SILTY SAND, fine to coarse grained, reddish brown, dry, loose. @1.5 ft. Medium dense; porous; few large boulders to 3 ft. diameter.
	4.0 – 10.0		**Granitic Bedrock (Kgr):** Highly weathered, hard, breaks into fine to coarse grained SAND with SILT. @6 to 6.5' Very hard; freshening with depth. @8 ft. Very slow digging. TOTAL DEPTH 10.0 FT. (REFUSAL) NO WATER, NO CAVING
T-4	0.0 – 0.5	SM	**Topsoil:** SILTY SAND, brown to reddish brown, dry, loose.
	0.5 – 6.0	SM	**Colluvium (Qcol):** SILTY SAND with CLAY, fine to coarse grained, reddish brown, dry, loose to moderately dense. @3 ft. Weakly cemented; porous.
	6.0 – 18.5		**Granitic Bedrock (Kgr):** RESIDUAL SOIL, completely weathered to SILTY to CLAYEY SAND, fine to coarse grained, reddish brown, dry, medium dense. @6.5 ft. Weathered, olive brown to yellowish brown, moderately hard; breaks into fine to coarse grained SAND with SILT and small GRAVEL. @8 ft. Hard. @13 ft. Very hard; slow digging. @14 ft. Dark olive gray; breaks into very coarse SAND with small GRAVEL. @17 ft. Very slow digging. TOTAL DEPTH 18.5 FT. NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
T-5	0.0 – 1.0	SM	**Topsoil** SILTY SAND, brown, dry, loose.
	1.0 – 4.0	SM	**Colluvium (Qcol)** SILTY SAND, fine to coarse grained, reddish brown, dry, loose to moderately dense; with occasional gravel and small angular cobble.
	4.0 – 14.5		**Granitic Bedrock (Kgr):** RESIDUAL SOIL, completely weathered to SILTY to CLAYEY SAND with small GRAVEL, orange brown, moderately hard. @6 ft. Weathered, olive brown, hard, breaks into fine to coarse grained SAND with small GRAVEL. @9 ft. Olive brown to gray. @11 ft. Very hard, slow digging. TOTAL DEPTH 14.5 FT. (PRACTICAL REFUSAL) NO WATER, NO CAVING
T-6	0.0 – 0.5	SM	**Topsoil:** SILTY SAND, brown, dry, loose.
	0.5 – 5.5	SM	**Colluvium (Qcol):** SILTY SAND, reddish brown, loose to medium dense; with occasional gravel and cobble; weakly cemented; porous; roots to 24" deep.
	5.5 – 7.5		**Granitic Bedrock (Kgr):** Weathered, moderately hard to hard, olive brown; breaks into fine to coarse grained SILTY SAND with small GRAVEL. @6.5 ft. Freshens, hard; slow digging. TOTAL DEPTH 7.5 FT. (REFUSAL) NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
T-7	0.0 – 1.0	SM	**Topsoil** SILTY SAND, brown, dry, loose.
	1.0 – 3.5	SM	**Colluvium (Qcol)** SILTY SAND, fine to coarse grained, reddish brown, dry, loose to moderately dense.
	3.5 – 13.5		**Granitic Bedrock (Kgr):** RESIDUAL SOIL, completely weathered to SILTY SAND with CLAY, fine to coarse grained, reddish brown, moderately hard. @5 ft. Hard, orange brown; breaks into fine to coarse grained SILTY SAND with small GRAVEL. @8 ft. Freshens, yellowish brown to orange brown. @10 ft. Very hard; slow digging. @11.5 ft. Very slow digging. TOTAL DEPTH 13.5 FT. (PRACTICAL REFUSAL) NO WATER, NO CAVING
T-8	0.0 – 1.0	SM	**Topsoil:** SILTY SAND, brown, dry, loose.
	1.0 – 3.5	SM	**Colluvium (Qcol):** SILTY SAND with CLAY, reddish brown, dry, loose to moderately dense.
	3.5 – 17.5		**Granitic Bedrock (Kgr):** RESIDUAL SOIL, completely weathered to SILTY SAND with CLAY, fine to coarse grained, reddish brown, dry to slightly moist, medium dense to dense. @5 ft. Weathered, orange brown, hard; breaks into fine to coarse grained SILTY SAND with small GRAVEL. @9 ft. Olive brown, slow digging. @12 ft. Orange brown, breaks into fine to coarse grained SAND with hard cobble size chunks. @14.5 ft. Very hard; very slow digging. TOTAL DEPTH 17.5 FT. (PRACTICAL REFUSAL) NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
T-9	0.0 – 1.0	SM	**Topsoil** SILTY SAND, brown, dry, loose.
	1.0 – 5.0	SM	**Colluvium (Qcol)** SILTY SAND, reddish brown, dry to slightly moist, loose to moderately dense; weakly cemented; porous.
	5.0 – 14.0		**Granitic Bedrock (Kgr):** Completely to highly weathered, olive brown, hard; breaks into fine to coarse grained SILTY SAND with GRAVEL. @7 ft. Some cobble size non-friable chunks. @10 ft. Slow digging. @12 ft. Very hard; very slow digging. TOTAL DEPTH 14.0 FT. (REFUSAL) NO WATER, NO CAVING
T-10	0.0 – 0.5	SM	**Topsoil:** SILTY SAND, brown, dry, loose.
	0.5 – 4.5	SM	**Colluvium (Qcol):** SILTY SAND, fine to coarse grained, reddish brown, dry to slightly moist; with occasional gravel. @3 ft. Slightly moist.
	4.5 – 15.0		**Granitic Bedrock (Kgr):** Completely weathered, olive brown, moderately hard; breaks into fine to coarse grained SILTY SAND with GRAVEL. @7 ft. Hard. @9 ft. Hard cobble-size chunks. @10 ft. Slow digging. @12 ft. Larger chunks up to 15" (tabular) @13 ft. Very hard; very slow digging. TOTAL DEPTH 15.0 FT. (PRACTICAL REFUSAL) NO WATER, NO CAVING

Test Pit No.	Depth (ft.)	USCS	Description
T-11	0.0 – 1.5	SM	**Topsoil** SILTY SAND, brown, dry, loose; with roots.
	1.5 – 5.5	SM	**Colluvium (Qcol)** SILTY SAND, fine to coarse grained, reddish brown, dry to slightly moist, loose to moderately dense. @2.5 to 3 ft. Slightly moist, medium dense; weakly cemented; porous.
	5.5 – 15.0		**Granitic Bedrock (Kgr):** Completely weathered, hard, orange brown; breaks into fine to coarse grained SILTY SAND with small gravel. @7.5 ft. Olive brown, hard; freshens with depth. @10 ft. Olive gray; slow digging. @12 ft. Very slow digging. @13.5 ft. Very hard. TOTAL DEPTH 15.0 FT. (PRACTICAL REFUSAL) NO WATER, NO CAVING
T-12	0.0 – 4.5	SM	**Artificial Fill – Undocumented (afu):** SILTY SAND, dark brown, dry to slightly moist, loose; with cobbles and small boulders to 15". @1.5 ft. Moist, loose to moderately dense.
	4.5 – 14.5		**Granitic Bedrock (Kgr):** Completely weathered, moderately hard, olive brown; breaks into fine to coarse grained SILTY SAND with small GRAVEL. @7.5 ft. Hard. @12 ft. Very hard. TOTAL DEPTH 14.5 FT. (REFUSAL) NO WATER, NO CAVING

Appendix C

Laboratory Data

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

EXPANSION INDEX - ASTM D4829

Project Name: San Pasqual Valley Rd

Location: Escondido Area, CA

File No: 1602-06

Date: 5/30/16

Excavation: TP-4

Depth: 2-4'

Description:

By: H - M

Expansion Index - ASTM D4829	
Initial Dry Density (pcf):	118.0
Initial Moisture Content (%):	8.0
Initial Saturation (%):	50.5
Final Dry Density (pcf):	116.4
Final Moisture Content (%):	15.8
Final Saturation (%):	99.4
Expansion Index:	14
Potential Expansion:	Very Low

ASTM D4829 - Table 5.3	
Expansion Index	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

EXPANSION INDEX - ASTM D4829

Project Name:	San Pasqual Valley Rd	Excavation:	TP-13
Location:	Escondido Area, CA	Depth:	4-6 '
File No:	1602-06	Description:	
Date:	6/1/16		
		By:	H - M

Expansion Index - ASTM D4829	
Initial Dry Density (pcf):	108.0
Initial Moisture Content (%):	10.0
Initial Saturation (%):	48.2
Final Dry Density (pcf):	102.4
Final Moisture Content (%):	20.4
Final Saturation (%):	98.2
Expansion Index:	55
Potential Expansion:	Medium

ASTM D4829 - Table 5.3	
Expansion Index	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

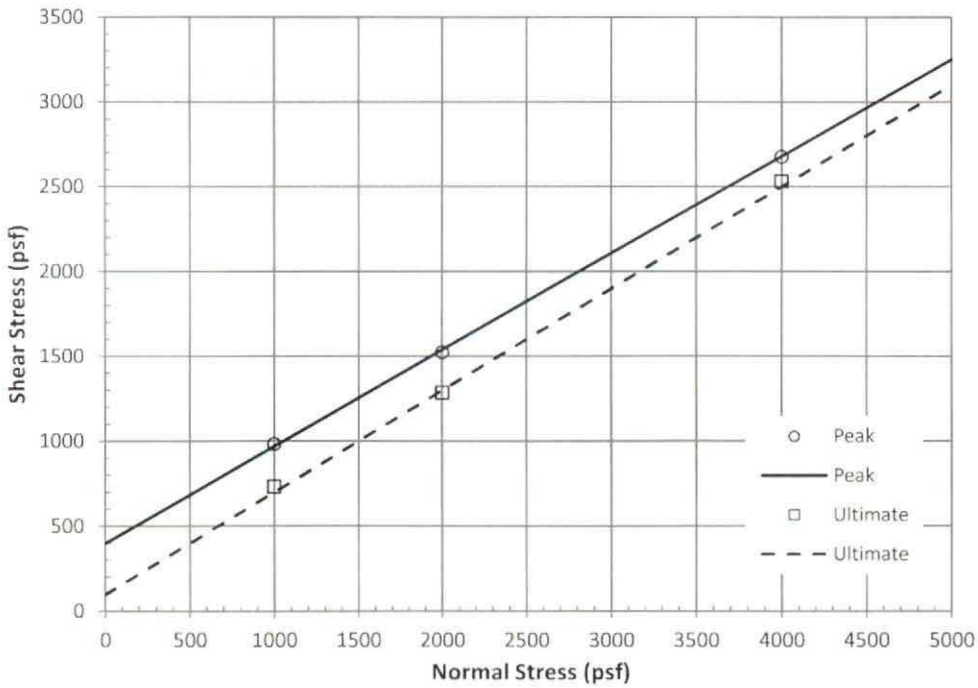
DIRECT SHEAR - ASTM D3080

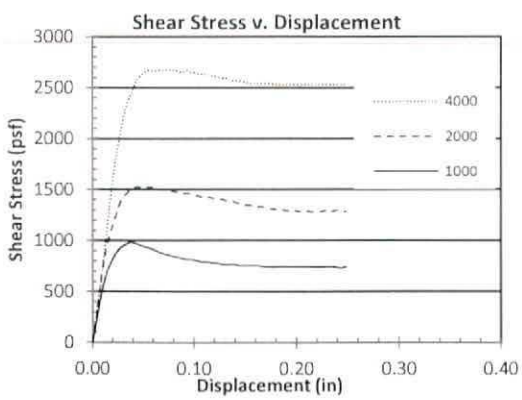
Project Name:	San Pasqual Valley	Excavation:	TP-2
Location:	San Diego County	Depth:	0-3
Project No.:	1602-06	Sample Type:	Remolded to 90%
Date:	6/8/16	By:	SD

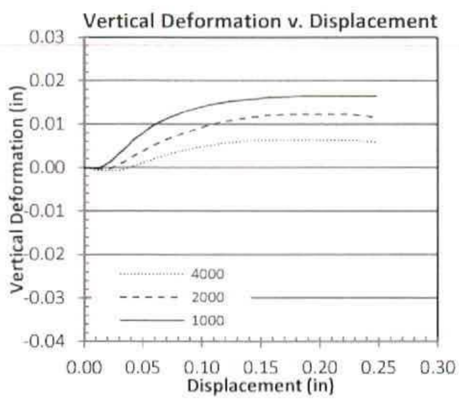
Samples Tested	1	2	3
Normal Stress (psf)	1000	2000	4000
Maximum Shear Stress (psf)	984	1524	2676
Ultimate Shear Stress (psf)	732	1284	2532
Initial Moisture Content (%)	9.0	9.0	9.0
Initial Dry Density (pcf)	116.1	116.1	116.1

Method:	Drained
Consolidation:	Yes
Saturation:	Yes
Shearing Rate (in/min):	0.05

	Peak	Ultimate
Friction Angle, phi (deg)	30	31
Cohesion (psf)	400	100







ADVANCED GEOTECHNICAL SOLUTIONS, INC.

DIRECT SHEAR - ASTM D3080

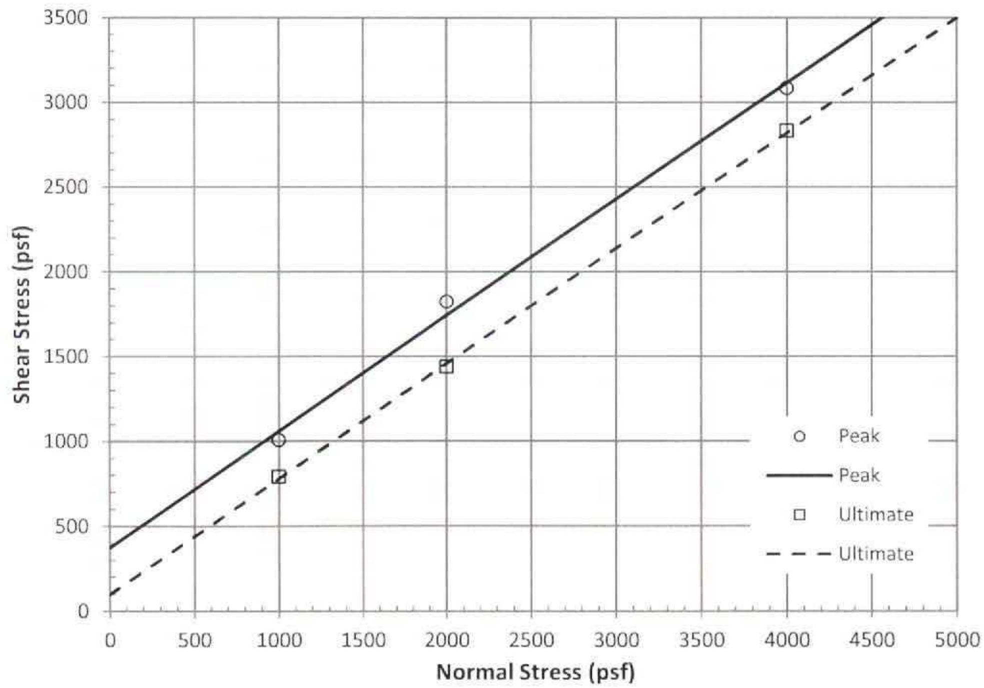
Project Name: San Pasqual Valley Rd
Location: San Diego County
Project No.: 1602-06
Date: 6/7/16

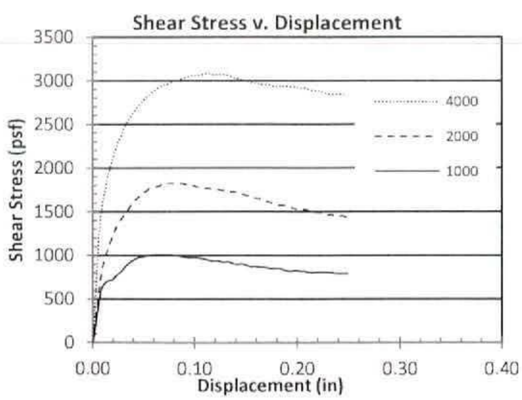
Excavation: TP-8
Depth: 3-5'
Sample Type: Remolded to 90%
By: FV

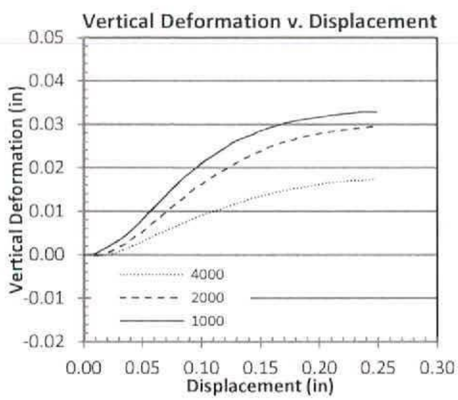
Samples Tested	1	2	3
Normal Stress (psf)	1000	2000	4000
Maximum Shear Stress (psf)	1008	1824	3084
Ultimate Shear Stress (psf)	792	1440	2832
Initial Moisture Content (%)	9.0	9.0	9.0
Initial Dry Density (pcf)	117.0	117.0	117.0

Method: Drained
Consolidation: Yes
Saturation: Yes
Shearing Rate (in/min): 0.05

	Peak	Ultimate
Friction Angle, phi (deg)	34	34
Cohesion (psf)	375	100







Advanced Geotechnical Solutions, Inc.

MAXIMUM DENSITY

ASTM D-1557

Project Name: **San Pasqual Valley Rd**
Location: **Escondido Area, CA**
File No: **1602-06**
Date: 5/28/2016

Excavation: **TP-2**
Depth: **0-3 '**
Description: Dark Brown Silty Sand Slightly Clay Micaschist

Sieve Size: 4
Mold Size: 4"
No. of Layers: 5

% Retained: None
Method: A

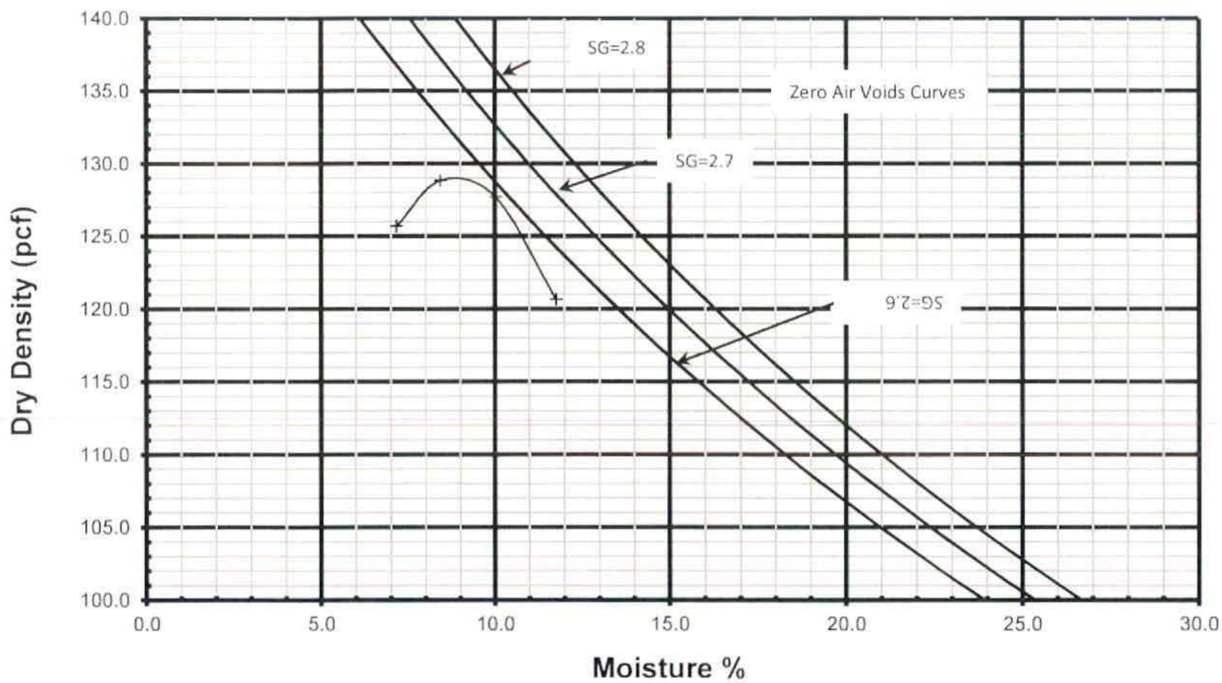
By: H-M

Test point number		1	2	3	4		
Wt. wet soil + mold	g	3899.8	3975.3	3987.6	3902.4		
Wt. wet soil + mold	lbs	8.59	8.76	8.78	8.60		
Wt. of mold	lbs	4.10	4.10	4.10	4.10		
Wt. wet of soil	lbs	4.49	4.66	4.68	4.50		
Wet density	pcf	134.70	139.69	140.50	134.87		
Dry density	pcf	125.70	128.84	127.71	120.68		

Moisture Determination (Oven)

Container number		5	7	11	18		
Wt. wet of soil+tare	g	263.4	254.8	256.7	245.3		
Dry wt. soil+tare	g	246.4	235.7	234.1	220.4		
Tare wt.	g	8.91	8.87	8.45	8.62		
Wt. of moisture	g	17.00	19.10	22.60	24.90		
Dry wt. of soil	g	237.49	226.83	225.65	211.78		
Moisture Content	g	7.16	8.42	10.02	11.76		

Max Density



Maximum Density **129.0** pcf

Optimum Moisture **9.0** %

Advanced Geotechnical Solutions, Inc.

MAXIMUM DENSITY

ASTM D-1557

Project Name: **San Pasqual Valley Rd**
Location: **Escondido Area, CA**
File No: **1602-06**
Date: 5/31/2016

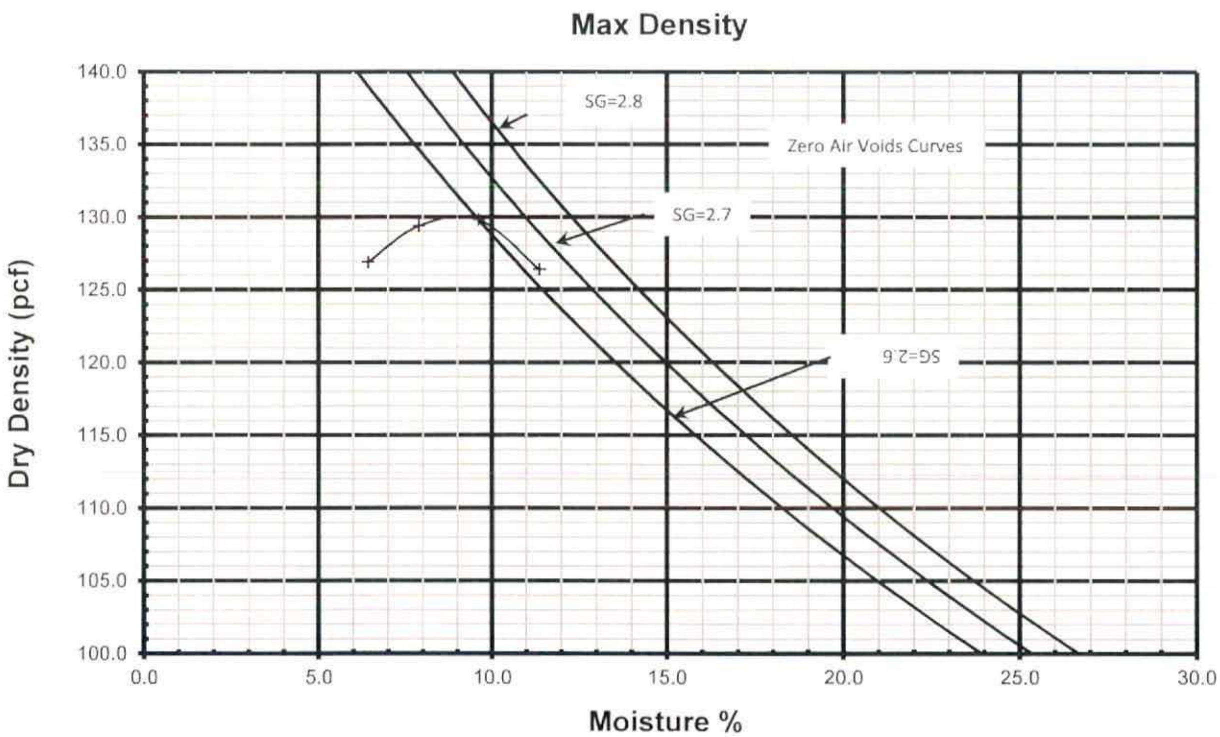
Excavation: **TP-8**
Depth **3-5'**
Description: Dark Brown Silty Sand, DG, With Mica.

Sieve Size 4
Mold Size 4"
No. of Layers 5

% Retained 3
Method A

By: H-M

Test point number		1	2	3	4		
Wt. wet soil + mold	g	3905.3	3973.7	4014.9	3991.7		
Wt. wet soil + mold	lbs	8.60	8.75	8.84	8.79		
Wt. of mold	lbs	4.10	4.10	4.10	4.10		
Wt. wet of soil	lbs	4.50	4.65	4.74	4.69		
Wet density	pcf	135.06	139.58	142.30	140.77		
Dry density	pcf	126.91	129.38	129.82	126.40		
Moisture Determination (Oven)							
Container number		18	11	7	32		
Wt. wet of soil+tare	g	277.3	281.1	274.6	264.3		
Dry wt. soil+tare	g	261.1	261.2	251.3	238.2		
Tare wt.	g	8.81	8.65	8.94	8.62		
Wt. of moisture	g	16.20	19.90	23.30	26.10		
Dry wt. of soil	g	252.29	252.55	242.36	229.58		
Moisture Content	g	6.42	7.88	9.61	11.37		



Maximum Density **130.0** pcf

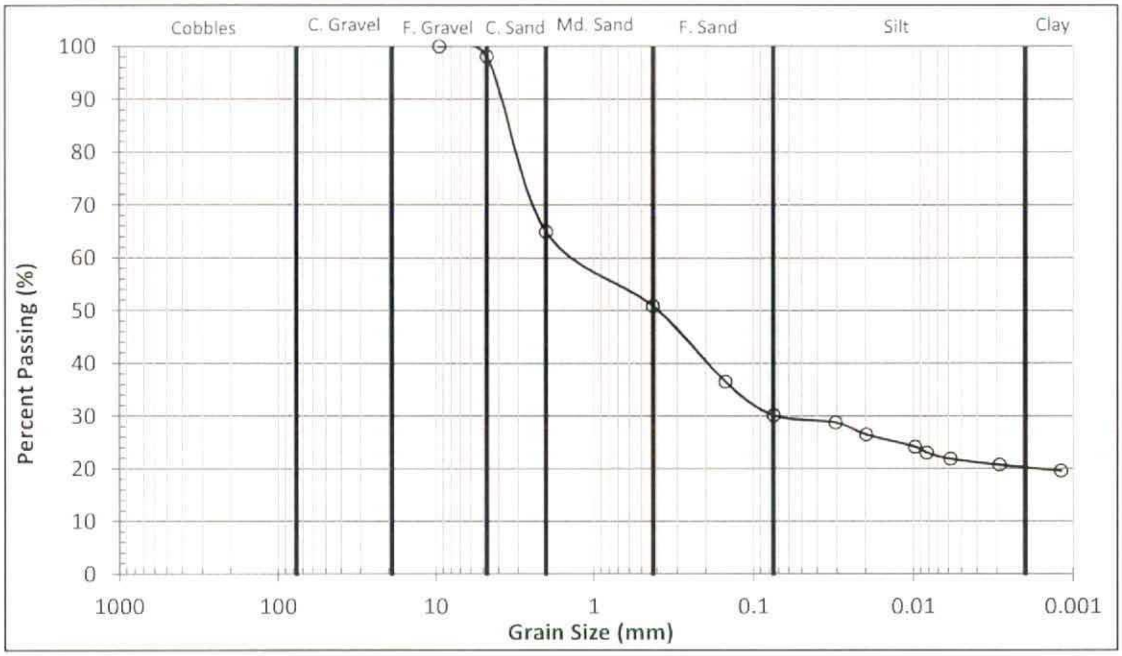
Optimum Moisture **9.0** %

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

PARTICLE SIZE ANALYSIS - ASTM D422

Project Name: San Pasqual Valley Rd
Location: Escondido Area, CA
Project No.: 1602-06
Date: 6/1/16

Excavation: TP-13
Depth: 4-6 '
By: H M



Grain Size (in/#)	Grain Size (mm)	Amount Passing (%)
3 "	76.20	
2 1/2 "	63.50	
2 "	50.80	
1 1/2 "	38.10	
1 "	25.40	
3/4 "	19.05	
1/2 "	12.70	
3/8 "	9.53	100.00
# 4	4.75	98.12
# 10	2.00	64.98
# 20	0.85	#N/A
# 30	0.60	#N/A
# 40	0.425	50.92
# 50	0.30	#N/A
# 60	0.212	#N/A
# 100	0.15	36.52
# 200	0.075	30.17
Hydro	0.0307	28.80
Hydro	0.0197	26.49
Hydro	0.0098	24.19
Hydro	0.0082	23.04
Hydro	0.0058	21.89
Hydro	0.0029	20.73
Hydro	0.0012	19.58

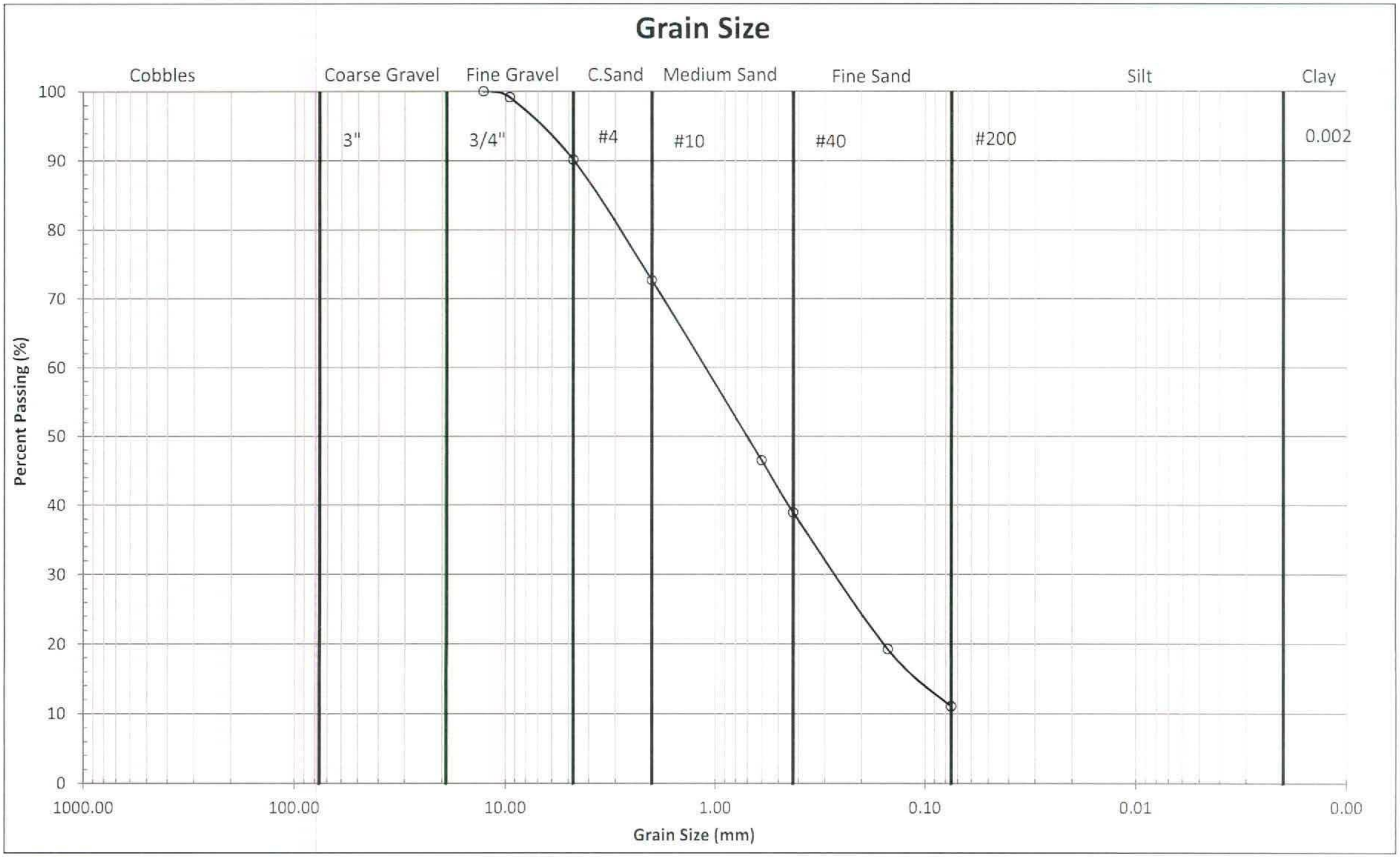
Summary	
% Gravel =	1.9
% Sand =	68.0
% Fines =	30.2
Sum =	100.0

LL= ________

PL= ________

PI= ________

Soil Type: ________



Project Name: **San Pasqual Valley Rd**
Location: Escondido Area, CA
File No: 1602-06
Date: 6/4/2016
Excavation: TP-5
Depth: 4-6'
By: HM

Gravel	9.8
Sand	79.2
Passing No. 200	11.0
Total	100.0

LL= ________ PL= ________ PI= ________

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

Appendix D

Percolation Test Data

PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/27/2016

Test Hole No.: P-1 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 36" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 36" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	8:12	8:42	30	8.81	5.88	2.94	10	
2	8:43	9:13	30	9.38	6.38	3.00	10	
3	9:14	9:44	30	9.00	6.63	2.38	13	
4	9:50	10:20	30	9.06	6.69	2.38	13	
5	10:56	11:26	30	9.00	6.81	2.19	14	
6	11:27	11:57	30	9.25	6.88	2.38	13	
7	11:58	12:28	30	9.00	6.69	2.31	13	
8	12:29	12:59	30	9.06	6.69	2.38	13	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/25/2016

Test Hole No.: P-2 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 34" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 34" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time	Stop Time	Time Interval	(Piezometric Surface in inches)			Perc Rate	Notes
	(hr and min)	(hr and min)	(min.)	Start Depth	End Depth	Depth Change	(min./in.)	
1	10:26	10:56	30	8.50	4.56	3.94	8	
2	10:57	11:27	30	8.56	4.25	4.31	7	
3	12:56	13:26	30	8.25	4.88	3.38	9	
4	13:28	13:58	30	8.19	4.31	3.88	8	
5	13:59	14:29	30	8.19	4.56	3.63	8	
6	14:30	15:00	30	8.25	4.13	4.13	7	
7	15:01	15:31	30	8.32	4.25	4.07	7	
8	15:32	16:02	30	8.50	4.50	4.00	8	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/25/2016

Test Hole No.: P-3 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 35" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 35" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Piezometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	10:29	10:59	30	8.50	7.06	1.44	21	
2	11:00	11:30	30	8.06	6.88	1.19	25	
3	11:30	12:00	30	8.50	7.75	0.75	40	
4	12:01	12:31	30	8.50	7.88	0.63	48	
5	12:31	13:01	30	7.88	7.38	0.50	60	
6	13:02	13:32	30	8.50	7.75	0.75	40	
7	13:32	14:02	30	7.75	7.13	0.63	48	
8	14:03	14:33	30	8.25	7.63	0.63	48	
9	14:33	15:03	30	7.63	7.00	0.63	48	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/25/2016

Test Hole No.: P-4 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 36" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 36" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time	Stop Time	Time Interval	(Piezometric Surface in inches)			Perc Rate	Notes
	(hr and min)	(hr and min)	(min.)	Start Depth	End Depth	Depth Change	(min./in.)	
1	10:35	11:05	30	8.13	3.44	4.69	6	
2	11:06	11:36	30	8.31	3.88	4.44	7	
3	11:08	11:38	30	8.00	4.75	3.25	9	
4	12:09	12:39	30	8.06	5.31	2.75	11	
5	13:04	13:34	30	8.00	4.75	3.25	9	
6	13:35	14:05	30	8.06	5.31	2.75	11	
7	14:06	14:35	29	8.31	5.81	2.50	12	
8	14:37	15:07	30	8.69	6.25	2.44	12	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual
Project No.: 1602-06
Date: 5/25/2016
Test Hole No.: P-5
Tested By: PWM/KC/FE
Water Temp.: 65
Depth of Test Hole: 32"
USCS : SM
Air Temp.: 70

Test Hole Dimensions (Inches)

Length 32"
Width
Diameter 12"
Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Piezometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	10:39	11:09	30	24.88	29.25	4.38	7	
2	11:10	11:40	30	24.88	27.38	2.50	12	
3	13:07	13:37	30	24.25	26.88	2.63	11	
4	13:38	14:09	31	24.38	27.00	2.63	12	
5	14:10	14:40	30	23.94	26.75	2.81	11	
6	14:40	15:10	30	23.81	26.33	2.51	12	
7	15:11	15:41	30	23.75	26.56	2.81	11	
8	15:42	16:12	30	23.81	26.50	2.69	11	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/25/2016

Test Hole No.: P-6 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 36" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 36" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Piezometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	10:42	11:12	30	9.63	7.13	2.50	12	
2	11:13	11:43	30	10.13	7.63	2.50	12	
3	11:43	12:13	30	9.63	7.06	2.56	12	
4	13:12	13:42	30	9.50	7.63	1.88	16	
5	13:43	14:13	30	10.19	7.50	2.69	11	
6	14:13	14:43	30	10.50	8.75	1.75	17	
7	14:44	15:14	30	9.81	7.25	2.56	12	
8	15:15	15:45	30	10.13	7.63	2.50	12	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual
Project No.: 1602-06
Date: 5/27/2016

Test Hole No.: P-7
Tested By: PWM/KC/FE
Water Temp.: 65

Depth of Test Hole: 36"
USCS : SM
Air Temp.: 70

Test Hole Dimensions (Inches)

Length 36"
Width
Diameter 12"
Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches)			Perc Rate (min./in.)	Notes
				Start Depth	End Depth	Depth Change		
1	8:17	8:47	30	7.94	3.44	4.50	7	
2	8:48	9:18	30	7.94	3.75	4.19	7	
3	9:19	9:49	30	7.94	3.69	4.25	7	
4	9:50	10:20	30	7.94	0.63	7.31	4	
5	10:21	10:51	30	7.94	4.13	3.81	8	
6	10:52	11:22	30	7.94	4.44	3.50	9	
7	11:32	12:02	30	8.13	4.44	3.69	8	
8	11:01	11:31	30	7.94	4.13	3.81	8	
9	11:32	12:02	30	7.94	4.44	3.50	9	
10	12:03	12:33	30	8.06	4.56	3.50	9	
11								
12								
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/27/2016

Test Hole No.: P-8 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 39" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 39" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	8:15	8:45	30	26.75	31.25	4.50	7	
2	8:46	9:16	30	26.13	29.50	3.38	9	
3	9:17	9:47	30	25.50	30.00	4.50	7	
4	9:48	10:18	30	26.13	29.13	3.00	10	
5	10:20	10:50	30	25.88	30.00	4.13	7	
6	10:52	11:22	30	26.00	29.00	3.00	10	
7	11:23	11:53	30	26.13	30.13	4.00	7	
8	11:54	12:24	30	26.50	30.00	3.50	9	
9	12:26	12:56	30	26.00	29.50	3.50	9	
10	13:04	13:34	30	26.13	29.88	3.75	8	
11	13:36	14:06	30	26.25	30.13	3.88	8	
12								
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15								

PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/27/2016

Test Hole No.: P-9 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 34" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 34" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Piezometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	8:07	8:37	30	28.00	29.75	1.75	17	
2	8:38	9:08	30	27.13	28.75	1.63	18	
3	9:09	9:39	30	27.13	29.25	2.13	14	
4	9:39	10:09	30	27.63	29.50	1.88	16	
5	10:10	10:40	30	27.25	29.25	2.00	15	
6	10:44	11:14	30	27.75	25.88	1.88	16	
7	11:16	11:46	30	26.63	29.13	2.50	12	
8	11:47	12:17	30	27.13	29.13	2.00	15	
9	12:18	12:48	30	27.50	29.25	1.75	17	
10	12:49	13:19	30	27.13	28.88	1.75	17	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/27/2016

Test Hole No.: P-10 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 39" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 39" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time	Stop Time	Time Interval	(Piezometric Surface in inches)			Perc Rate	Notes
	(hr and min)	(hr and min)	(min.)	Start Depth	End Depth	Depth Change	(min./in.)	
1	8:00	8:30	30	31.75	33.75	2.00	15	
2	8:31	9:01	30	32.75	34.25	1.50	20	
3	9:02	9:32	30	30.75	33.00	2.25	13	
4	9:33	10:03	30	31.13	32.63	1.50	20	
5	10:04	10:34	30	31.00	33.00	2.00	15	
6	10:37	11:07	30	30.88	32.75	1.88	16	
7	11:08	11:38	30	32.25	34.00	1.75	17	
8	11:39	12:09	30	31.50	33.25	1.75	17	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/27/2016

Test Hole No.: P-11 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 36" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 36" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Piezometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	8:21	8:51	30	32.13	34.81	2.69	11	
2	8:52	9:22	30	32.38	34.88	2.50	12	
3	9:23	9:53	30	32.88	35.06	2.19	14	
4	9:54	10:24	30	32.00	34.25	2.25	13	
5	10:30	11:03	33	31.50	33.75	2.25	15	
6	11:04	11:34	30	32.50	34.38	1.88	16	
7	11:36	12:06	30	31.19	33.63	2.44	12	
8	12:08	12:38	30	31.25	33.63	2.38	13	
9	12:39	13:09	30	32.00	34.31	2.31	13	
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PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/27/2016

Test Hole No.: P-12 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 35" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 35" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time	Stop Time	Time Interval	(Piezometric Surface in inches)			Perc Rate	Notes
	(hr and min)	(hr and min)	(min.)	Start Depth	End Depth	Depth Change	(min./in.)	
1	8:26	8:56	30	8.69	7.69	1.00	30	
2	8:57	9:27	30	8.69	7.44	1.25	24	
3	9:28	9:58	30	8.69	7.44	1.25	24	
4	10:00	10:30	30	8.81	7.38	1.44	21	
5	10:32	11:02	30	8.69	7.56	1.13	27	
6	11:07	11:37	30	8.69	7.56	1.13	27	
7	11:38	12:10	32	8.56	7.25	1.31	24	
8	12:13	12:43	30	8.94	7.81	1.13	27	
9	12:44	13:14	30	8.94	7.79	1.15	26	
10								
11								
12								
13								
14								
15								

PERCOLATION TEST DATA SHEET

Project Name: San Pasqual
Project No.: 1602-06
Date: 5/25/2016
Test Hole No.: P-13
Tested By: PWM/KC/FE
Water Temp.: 65
Depth of Test Hole: 36"
USCS : SM
Air Temp.: 70

Test Hole Dimensions (Inches)

Length 36" Width ______ Diameter 12" Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Pieziometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	10:14	10:44	30	8.69	2.13	6.56	5	
2	10:46	11:16	30	8.00	2.19	5.81	5	
3	12:48	13:18	30	8.13	3.56	4.56	7	
4	13:19	13:49	30	7.94	3.13	4.81	6	
5	13:50	14:20	30	8.19	4.25	3.94	8	
6	14:21	14:51	30	8.39	4.50	3.89	8	
7	14:52	15:22	30	8.19	4.25	3.94	8	
8	15:24	15:54	30	8.25	4.39	3.86	8	
9								
10								
11								
12								
13								
14								
15								

PERCOLATION TEST DATA SHEET

Project Name: San Pasqual | Project No.: 1602-06 | Date: 5/25/2016

Test Hole No.: P-14 | Tested By: PWM/KC/FE | Water Temp.: 65

Depth of Test Hole: 35" | USCS : SM | Air Temp.: 70

Test Hole Dimensions (Inches)

Length 35" | Width | Diameter 12" | Avg. Water Column 6"

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	(Piezometric Surface in inches) Start Depth	End Depth	Depth Change	Perc Rate (min./in.)	Notes
1	10:19	10:49	30	8.44	2.88	5.56	5	
2	10:50	11:20	30	8.63	3.88	4.75	6	
3	12:52	13:22	30	8.00	5.13	2.88	10	
4	13:23	13:53	30	8.69	6.06	2.63	11	
5	13:55	14:25	30	8.50	5.25	3.25	9	
6	14:26	14:56	30	9.19	5.63	3.56	8	
7	14:58	15:28	30	8.50	5.25	3.25	9	
8	15:29	15:59	30	8.63	5.39	3.24	9	
9								
10								
11								
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13								
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15								

Appendix E

General 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.

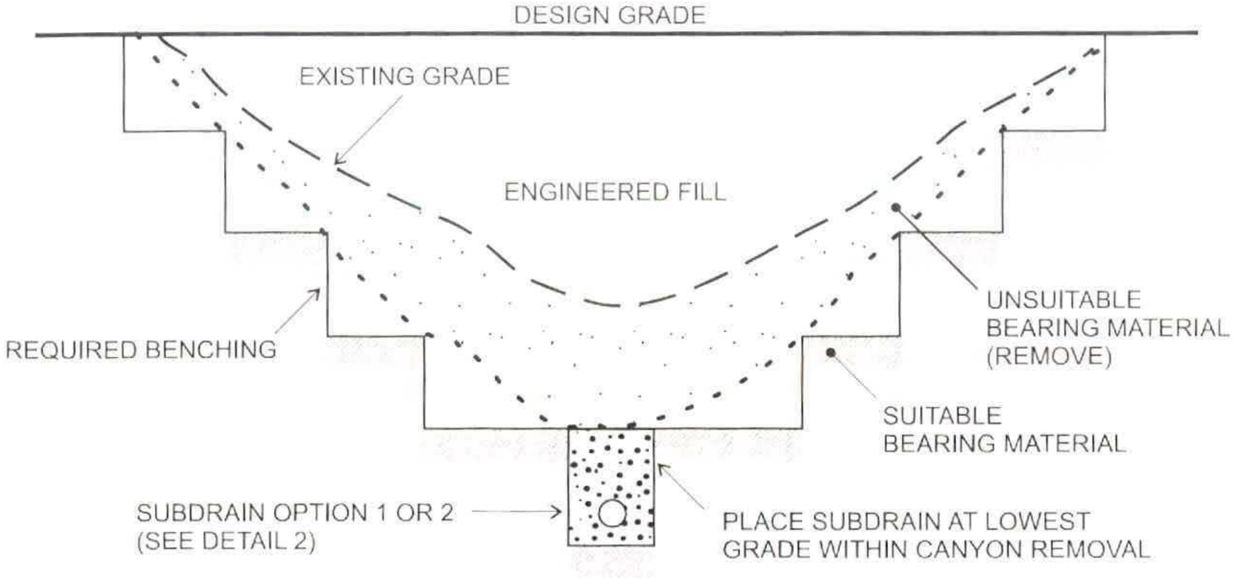
D. Frequency of Compaction Testing: The location and frequency of tests shall be at the Geotechnical Consultant's discretion. Generally, compaction tests shall be taken at intervals not exceeding two feet in fill height and 1,000 cubic yards of fill materials placed.

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.

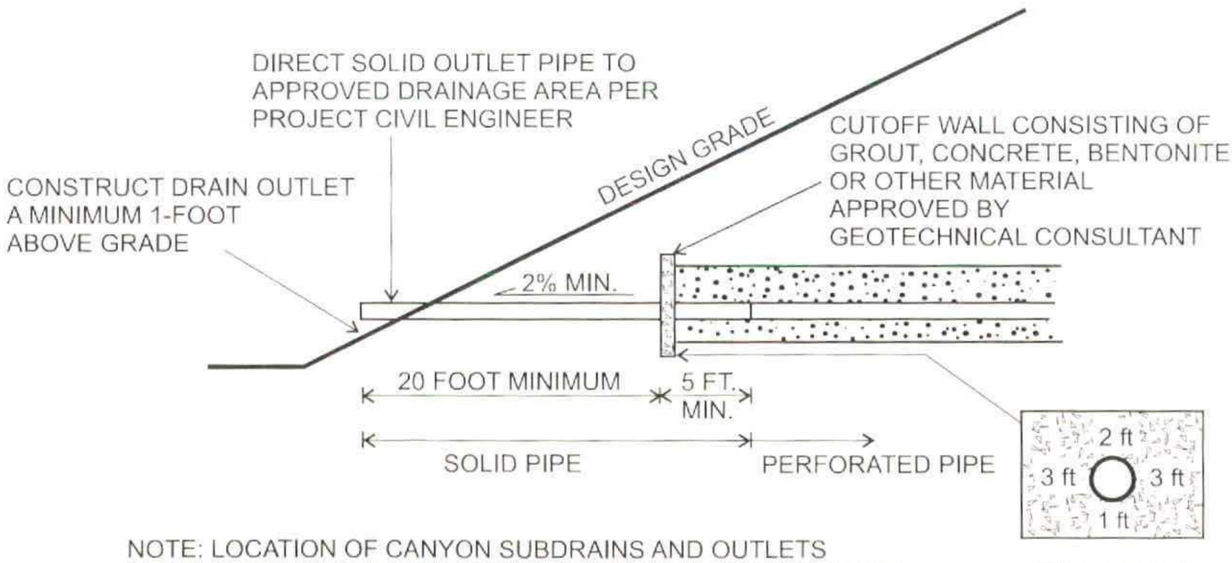
F. Areas of fill that have not been observed or tested by the Geotechnical Consultant may have to be removed and recompacted at the contractor's expense. The depth and extent of removals will be determined by the Geotechnical Consultant.

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



CUTOFF WALL DIMENSIONS

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

CANYON SUBDRAIN TERMINUS

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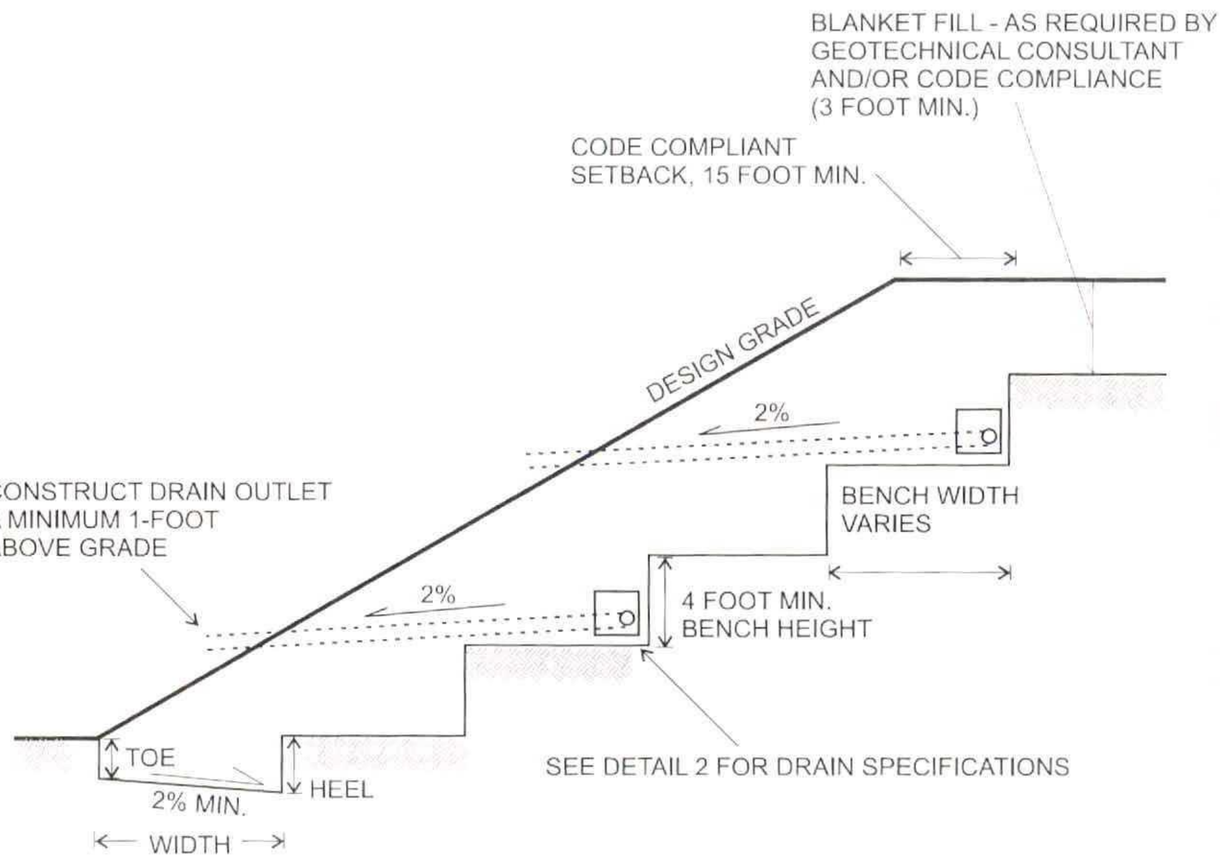
AGS ADVANCED GEOTECHNICAL SOLUTIONS	CANYON SUBDRAIN	DETAIL 1



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.

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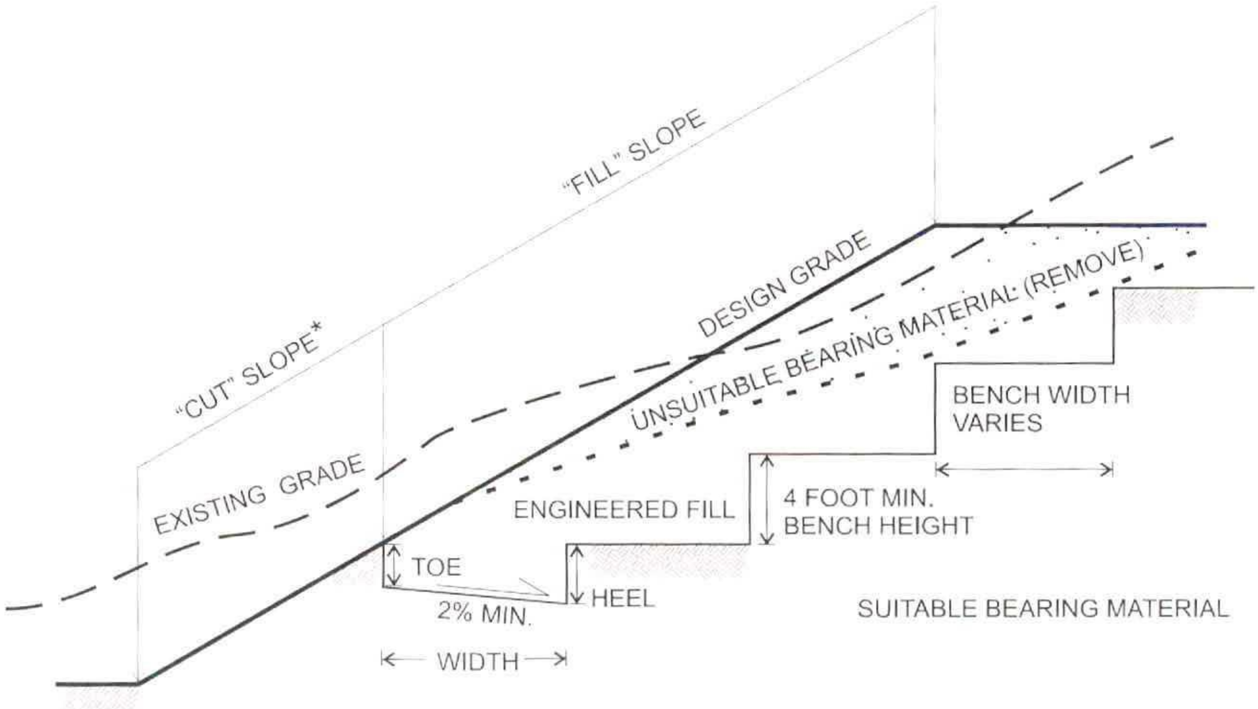
AGS ADVANCED GEOTECHNICAL SOLUTIONS	STABILIZATION/BUTTRESS FILL	DETAIL 3

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



SUITABLE
BEARING MATERIAL

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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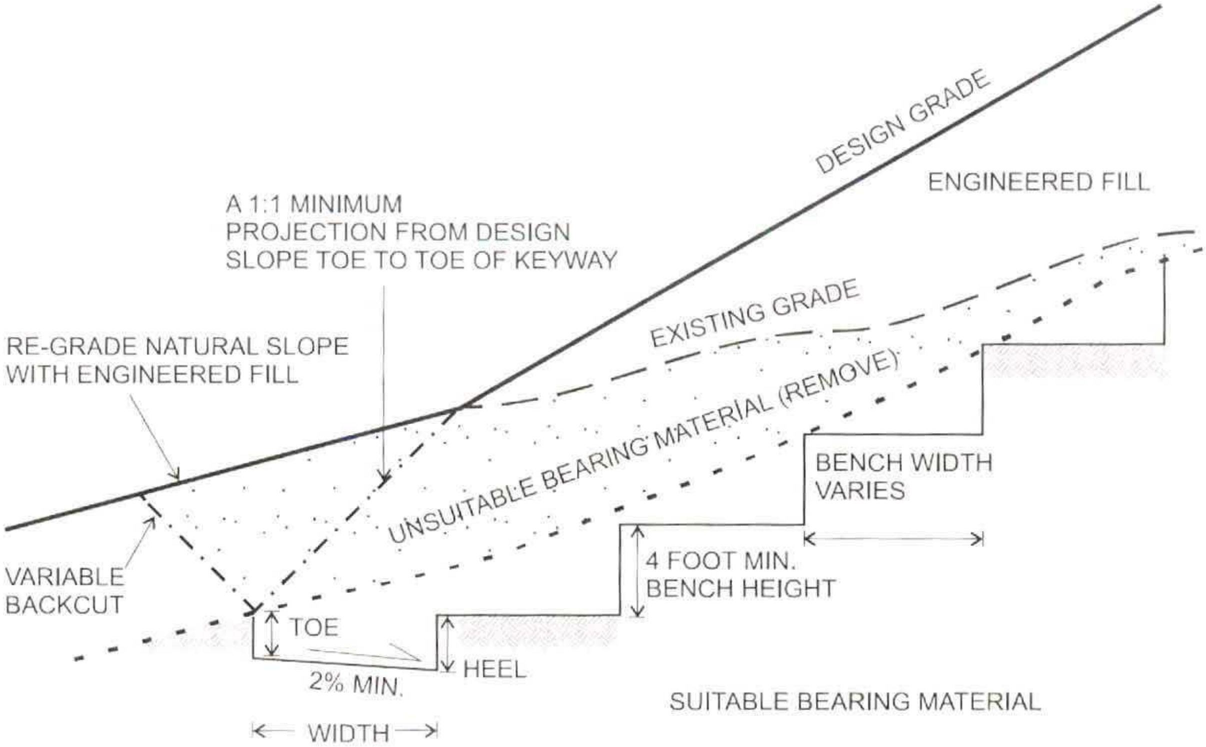
ADVANCED GEOTECHNICAL SOLUTIONS

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

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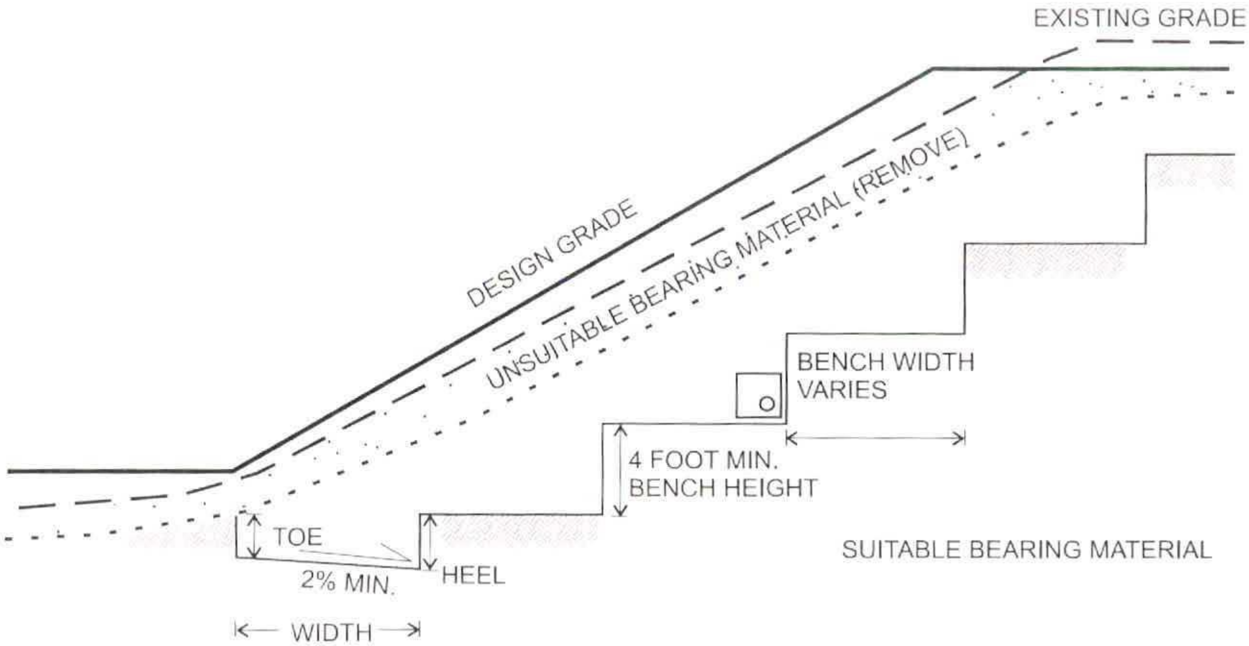
AGS ADVANCED GEOTECHNICAL SOLUTIONS	FILL OVER NATURAL SLOPE	DETAIL 5



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

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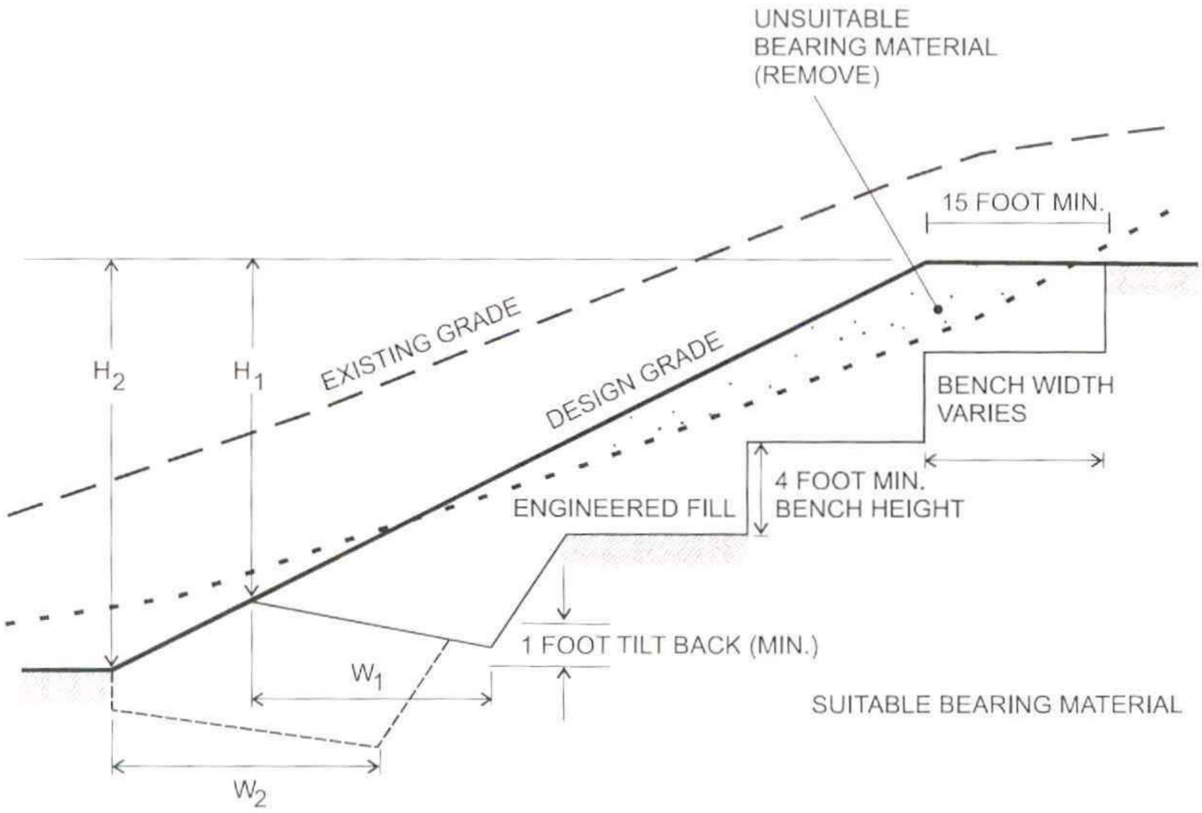
AGS ADVANCED GEOTECHNICAL SOLUTIONS	SKIN FILL CONDITION	DETAIL 6



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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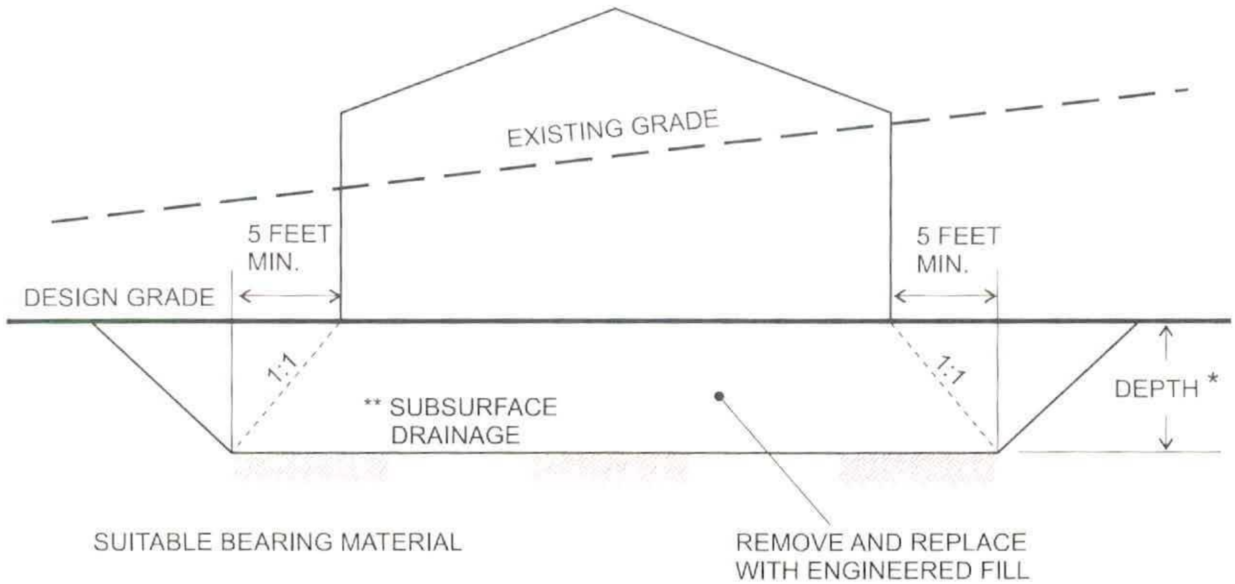
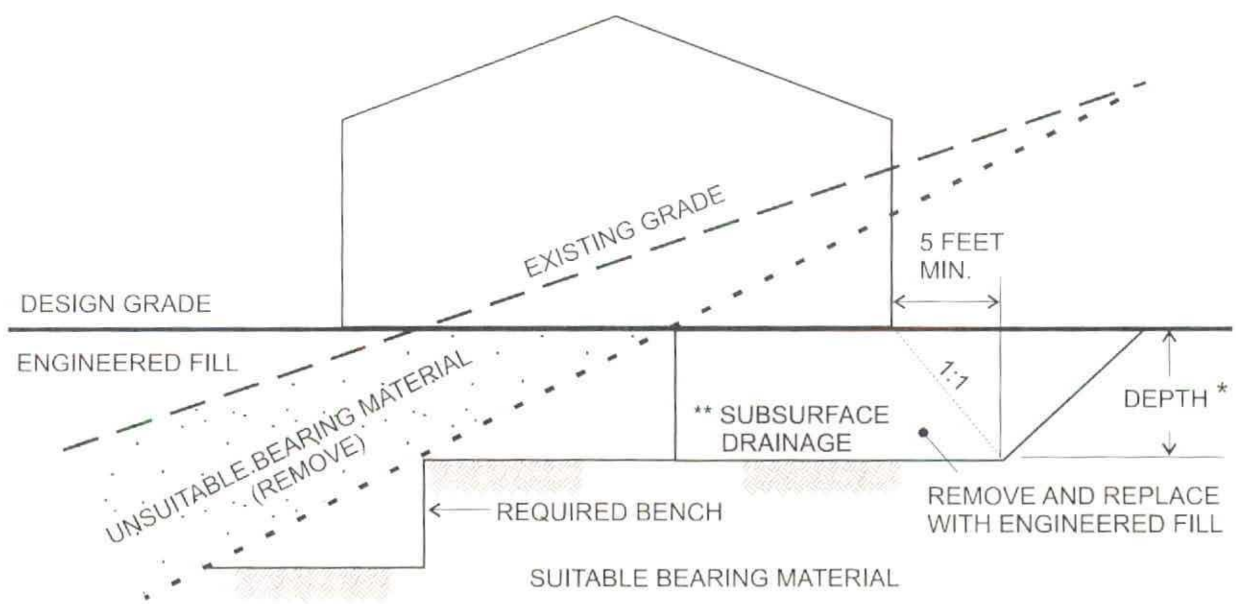
AGS ADVANCED GEOTECHNICAL SOLUTIONS	PARTIAL CUT SLOPE STABILIZATION	DETAIL 7



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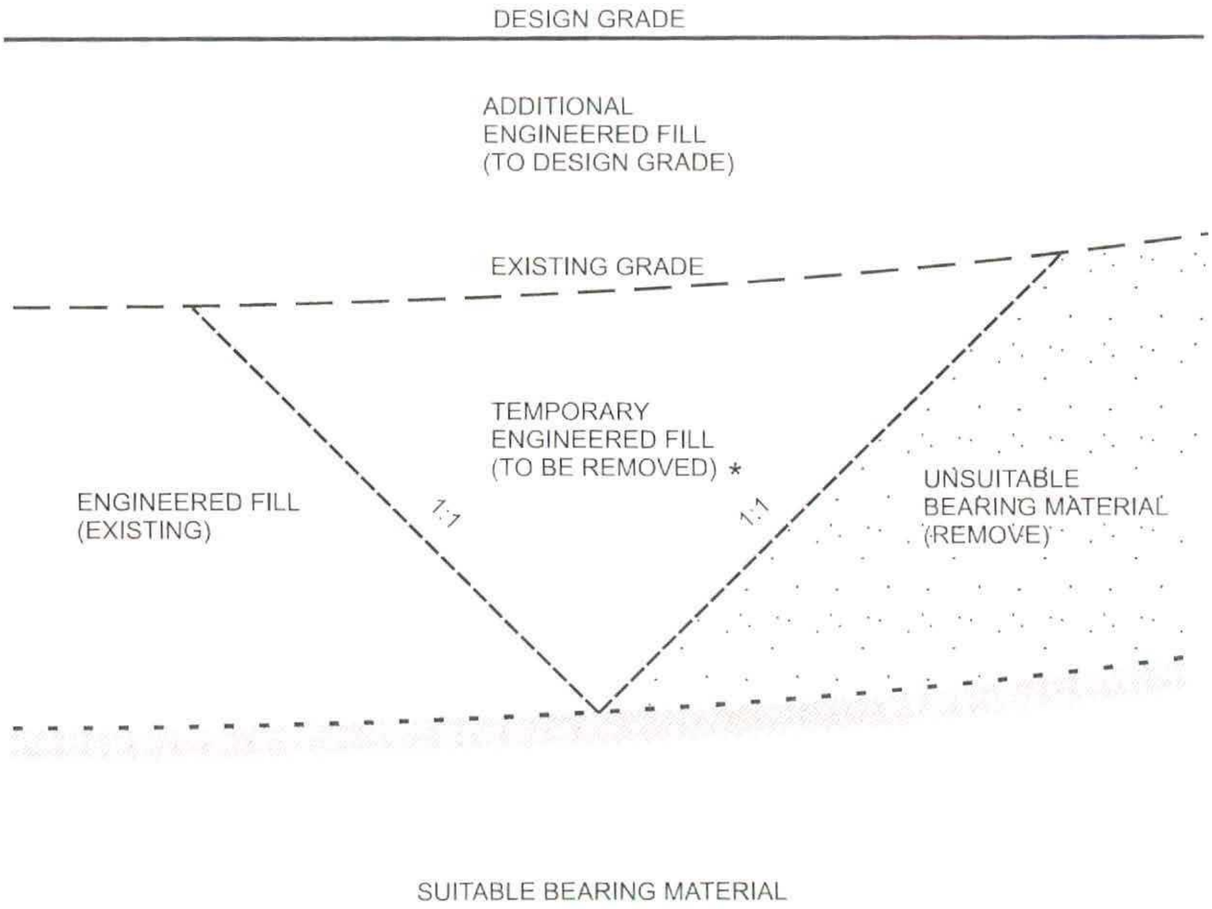
AGS ADVANCED GEOTECHNICAL SOLUTIONS	CUT & CUT-FILL LOT OVEREXCAVATION	DETAIL 8



* REMOVE BEFORE PLACING ADDITIONAL ENGINEERED FILL

TYPICAL UP-CANYON PROFILE

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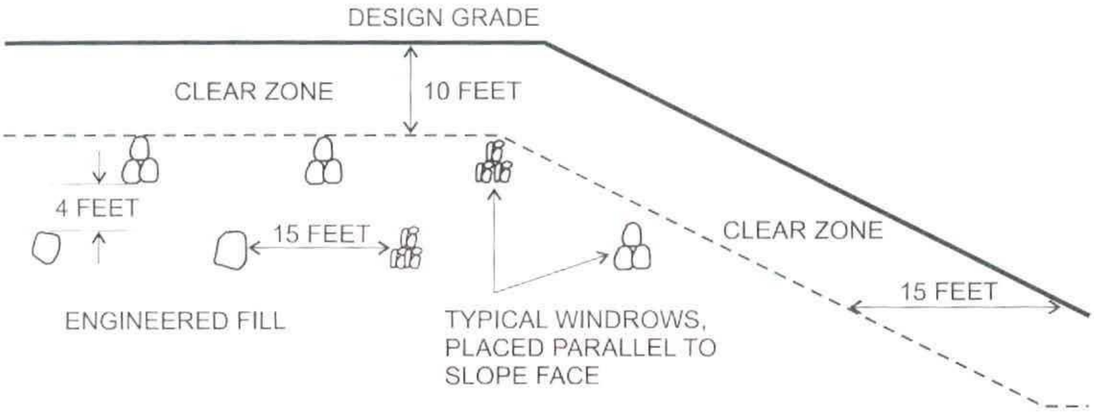
AGS ADVANCED GEOTECHNICAL SOLUTIONS	REMOVAL ADJACENT TO EXISTING FILL	DETAIL 9



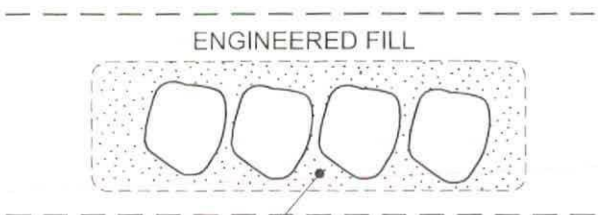
CLEAR ZONE DIMENSIONS FOR REFERENCE ONLY, ACTUAL DEPTH, WIDTH, WINDROW LENGTH, ETC. TO BE BASED ON ELEVATIONS OF FOUNDATIONS, UTILITIES OR OTHER STRUCTURES PER THE GEOTECHNICAL CONSULTANT OR GOVERNING AGENCY APPROVAL

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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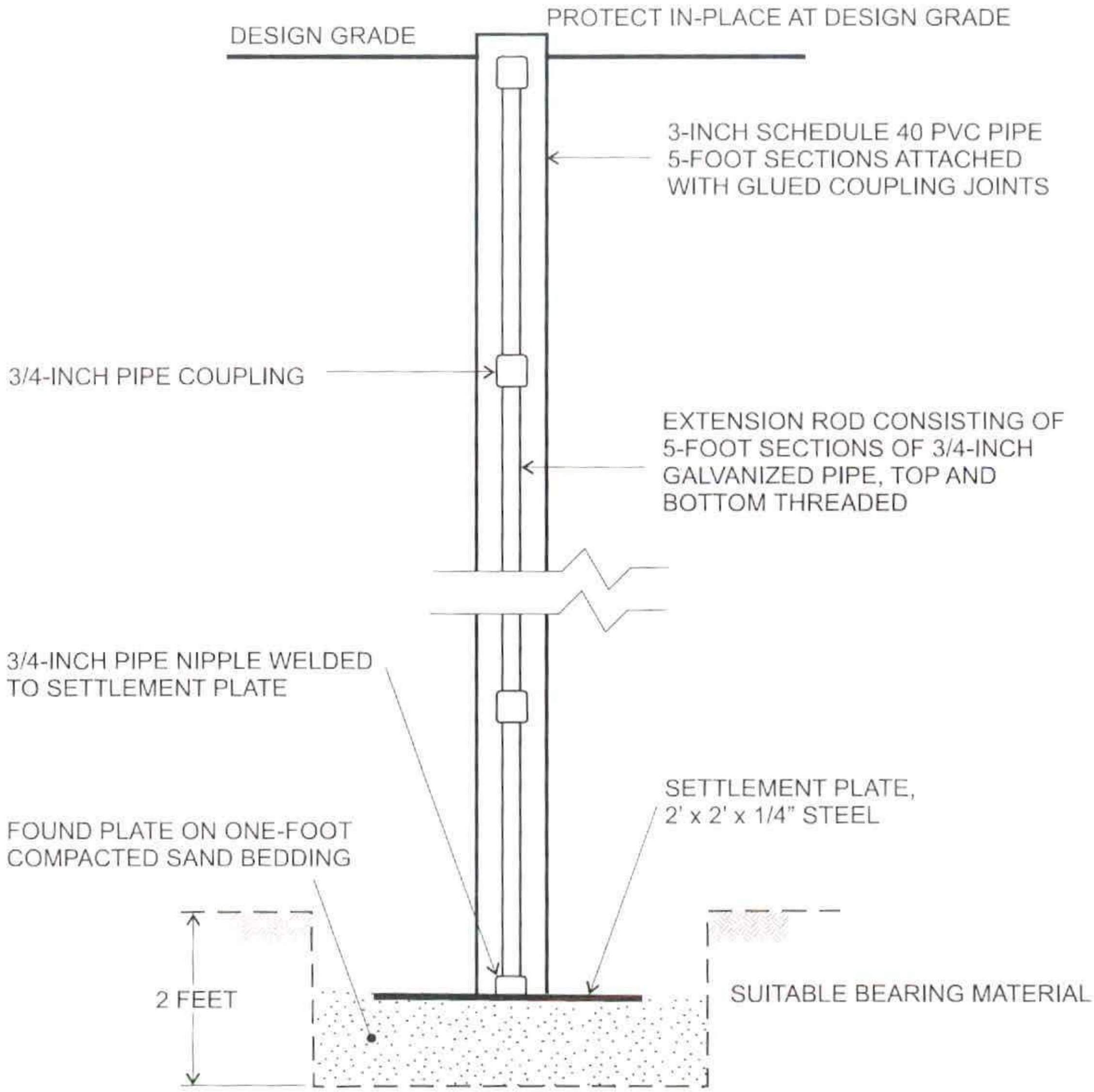
AGS ADVANCED GEOTECHNICAL SOLUTIONS	OVERSIZED MATERIAL DISPOSAL CRITERIA	DETAIL 10



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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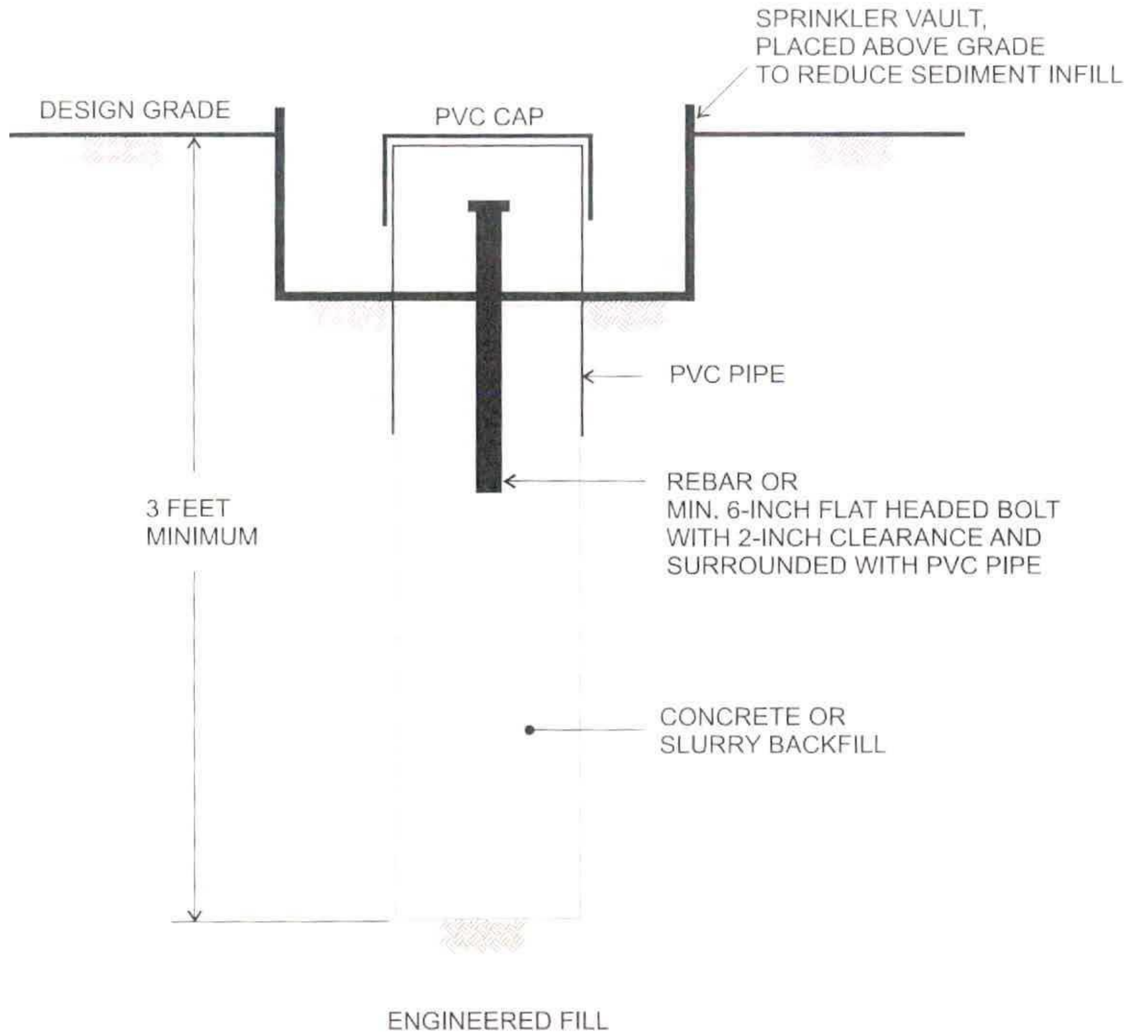
AGS ADVANCED GEOTECHNICAL SOLUTIONS	SETTLEMENT PLATE	DETAIL 11



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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AGS ADVANCED GEOTECHNICAL SOLUTIONS	SETTLEMENT MONUMENT	DETAIL 12

Appendix F

Homeowner Maintenance Guidelines

HOMEOWNER MAINTENANCE AND IMPROVEMENT CONSIDERATIONS

Homeowners are accustomed to maintaining their homes. They expect to paint their houses periodically, replace wiring, clean out clogged plumbing, and repair roofs. Maintenance of the home site, particularly on hillsides, should be considered on the same basis or even on a more serious basis because neglect can result in serious consequences. In most cases, lot and site maintenance can be taken care of along with landscaping, and can be carried out more economically than repair after neglect.

Most slope and hillside lot problems are associated with water. Uncontrolled water from a broken pipe, cesspool, or wet weather causes most damage. Wet weather is the largest cause of slope problems, particularly in California where rain is intermittent, but may be torrential. Therefore, drainage and erosion control are the most important aspects of home site stability; these provisions must not be altered without competent professional advice. Further, maintenance must be carried out to assure their continued operation.

As geotechnical engineers concerned with the problems of building sites in hillside developments, we offer the following list of recommended home protection measures as a guide to homeowners.

Expansive Soils

Some of the earth materials on site have been identified as being expansive in nature. As such, these materials are susceptible to volume changes with variations in their moisture content. These soils will swell upon the introduction of water and shrink upon drying. The forces associated with these volume changes can have significant negative impacts (in the form of differential movement) on foundations, walkways, patios, and other lot improvements. In recognition of this, the project developer has constructed homes on these lots on post-tensioned or mat slabs with pier and grade beam foundation systems, intended to help reduce the potential adverse effects of these expansive materials on the residential structures within the project. Such foundation systems are not intended to offset the forces (and associated movement) related to expansive soil, but are intended to help soften their effects on the structures constructed thereon.

Homeowners purchasing property and living in an area containing expansive soils must assume a certain degree of responsibility for homeowner improvements as well as for maintaining conditions around their home. Provisions should be incorporated into the design and construction of homeowner improvements to account for the expansive nature of the onsite soils material. Lot maintenance and landscaping should also be conducted in consideration of the expansive soil characteristics. Of primary importance is minimizing the moisture variation below all lot improvements. Such design, construction and homeowner maintenance provisions should include:

- Employing contractors for homeowner improvements who design and build in recognition of local building code and site specific soils conditions.
- Establishing and maintaining positive drainage away from all foundations, walkways, driveways, patios, and other hardscape improvements.
- Avoiding the construction of planters adjacent to structural improvements. Alternatively, planter sides/bottoms can be sealed with an impermeable membrane and drained away from the improvements via subdrains into approved disposal areas.
- Sealing and maintaining construction/control joints within concrete slabs and walkways to reduce the potential for moisture infiltration into the subgrade soils.

- ❖ Utilizing landscaping schemes with vegetation that requires minimal watering. Alternatively, watering should be done in a uniform manner as equally as possible on all sides of the foundation, keeping the soil "moist" but not allowing the soil to become saturated.
- ❖ Maintaining positive drainage away from structures and providing roof gutters on all structures with downspouts installed to carry roof runoff directly into area drains or discharged well away from the structures.
- ❖ Avoiding the placement of trees closer to the proposed structures than a distance of one-half the mature height of the tree.
- ❖ Observation of the soil conditions around the perimeter of the structure during extremely hot/dry or unusually wet weather conditions so that modifications can be made in irrigation programs to maintain relatively constant moisture conditions.

Sulfates

Homeowners should be cautioned against the import and use of certain fertilizers, soil amendments, and/or other soils from offsite sources in the absence of specific information relating to their chemical composition. Some fertilizers have been known to leach sulfate compounds into soils otherwise containing "negligible" sulfate concentrations and increase the sulfate concentrations in near-surface soils to "moderate" or "severe" levels. In some cases, concrete improvements constructed in soils containing high levels of soluble sulfates may be affected by deterioration and loss of strength.

Water - Natural and Man Induced

Water in concert with the reaction of various natural and man-made elements, can cause detrimental effects to your structure and surrounding property. Rain water and flowing water erodes and saturates the ground and changes the engineering characteristics of the underlying earth materials upon saturation. Excessive irrigation in concert with a rainy period is commonly associated with shallow slope failures and deep seated landslides, saturation of near structure soils, local ponding of water, and transportation of water soluble substances that are deleterious to building materials including concrete, steel, wood, and stucco.

Water interacting with the near surface and subsurface soils can initiate several other potentially detrimental phenomena other than slope stability issues. These may include expansion/contraction cycles, liquefaction potential increase, hydro-collapse of soils, ground surface settlement, earth material consolidation, and introduction of deleterious substances.

The homeowners should be made aware of the potential problems which may develop when drainage is altered through construction of retaining walls, swimming pools, paved walkways and patios. Ponded water, drainage over the slope face, leaking irrigation systems, over-watering or other conditions which could lead to ground saturation must be avoided.

- ❖ Before the rainy season arrives, check and clear roof drains, gutters and down spouts of all accumulated debris. Roof gutters are an important element in your arsenal against rain damage. If you do not have roof gutters and down spouts, you may elect to install them. Roofs, with their, wide, flat area can shed tremendous quantities of water. Without gutters or other adequate drainage, water falling from the eaves collects against foundation and basement walls.
- ❖ Make sure to clear surface and terrace drainage ditches, and check them frequently during the rainy season. This task is a community responsibility.
- ❖ Test all drainage ditches for functioning outlet drains. This should be tested with a hose and done before the rainy season. All blockages should be removed.

subdrains to carry off the excess. If water is permitted to pond against them, it may seep through the wall, causing dampness and leakage inside the basement. Further, it may cause the foundation to swell up, or the water pressure could cause structural damage to walls.

- Do not try to compact soil behind walls or in trenches by flooding with water. Not only is flooding the least efficient way of compacting fine-grained soil, but it could damage the wall foundation or saturate the subsoil.
- Never leave a hose and sprinkler running on or near a slope, particularly during the rainy season. This will enhance ground saturation which may cause damage.
- Never block ditches which have been graded around your house or the lot pad. These shallow ditches have been put there for the purpose of quickly removing water toward the driveway, street or other positive outlet. By all means, do not let water become ponded above slopes by blocked ditches.
- Seeding and planting of the slopes should be planned to achieve, as rapidly as possible, a well-established and deep-rooted vegetal cover requiring minimal watering.
- It should be the responsibility of the landscape architect to provide such plants initially and of the residents to maintain such planting. Alteration of such a planting scheme is at the resident's risk.
- The resident is responsible for proper irrigation and for maintenance and repair of properly installed irrigation systems. Leaks should be fixed immediately. Residents must undertake a program to eliminate burrowing animals. This must be an ongoing program in order to promote slope stability. The burrowing animal control program should be conducted by a licensed exterminator and/or landscape professional with expertise in hill side maintenance.

Geotechnical Review

Due to the fact that soil types may vary with depth, it is recommended that plans for the construction of rear yard improvements (swimming pools, spas, barbecue pits, patios, etc.), be reviewed by a geotechnical engineer who is familiar with local conditions and the current standard of practice in the vicinity of your home.

In conclusion, your neighbor's slope, above or below your property, is as important to you as the slope that is within your property lines. For this reason, it is desirable to develop a cooperative attitude regarding hillside maintenance, and we recommend developing a "good neighbor" policy. Should conditions develop off your property, which are undesirable from indications given above, necessary action should be taken by you to insure that prompt remedial measures are taken. Landscaping of your property is important to enhance slope and foundation stability and to prevent erosion of the near surface soils. In addition, landscape improvements should provide for efficient drainage to a controlled discharge location downhill of residential improvements and soil slopes.

Additionally, recommendations contained in the Geotechnical Engineering Study report apply to all future residential site improvements, and we advise that you include consultation with a qualified professional in planning, design, and construction of any improvements. Such improvements include patios, swimming pools, decks, etc., as well as building structures and all changes in the site configuration requiring earth cut or fill construction.