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Stratford Ranch Investors, LLC
3649 Mission Inn Avenue
Murrieta, CA 92562

May 29, 2012
P/W 1204-05
Report No. 1204-05-B-2

Attention: Mr. John Abel

Subject: ***Updated Preliminary Geotechnical Investigation for the Stratford Ranch Project, City of Perris, California***

References: Appendix A

Gentlemen:

Pursuant to your request, presented herein are the results of Advanced Geotechnical Solutions, Inc.'s, (AGS's) geotechnical investigation of the proposed Stratford Ranch Project, City of Perris, California.

The purpose of this geotechnical study is to update previous geotechnical studies and to evaluate the proposed residential development relative to the near-site and on-site geologic and geotechnical conditions and provide conclusions and recommendation to aid in the construction of the project. A Composite Exhibit prepared by Keller Consulting, Inc. (KCI), at a scale of 1"=200', was provided for use in preparing this updated preliminary geotechnical investigation. The plan is essentially a topographic map and design was not presented. The site plan is included in this document with the collected geologic and geotechnical data superimposed upon it.

The information presented in the referenced documents and supplemented by this study provides the basis for this geotechnical review report. The geotechnical and geologic issues opined to be significant include:

- **Unsuitable Soil Removal Recommendations:**
  Based upon review of published geologic maps of the area, the referenced reports and this firm's subsurface investigation, the majority of the subject development area is underlain by Modern Alluvium overlying Quaternary- aged Very Old Fan Deposits. The silty sands, silty clays and clayey silts of the Modern Alluvium and Very Old Fan Deposits exist in a damp to moist and loose to medium dense state at the locations explored. Within the proposed development area, unsuitable soils removals should include undocumented artificial fill materials, and the upper three to five feet of alluvial deposits. In order to mitigate the potential for differential settlement, over-excavation is recommended to provide a minimum of three feet of newly place engineered fill. This removal will provide a uniform bearing surface of materials with non-differential expansion/contraction and consolidation characteristics and limit the potential for differential dynamic and static settlement.
- **Geologic Hazards:**
  The site is not within an Alquist-Priolo Earthquake Fault Zone. The site has not been evaluated by the State of California Seismic Hazard Zone Mapping program. The County of Riverside has

zoned a portion of the site as having a liquefaction potential and being within a potential flood zone.

- **Preliminary Foundation Design Parameters**
  Onsite soils are expected to have a "low" to "medium" expansion potential. Recommended remedial grading is intended to support structures with a conventional foundation on engineered fill.

Advanced Geotechnical Solutions, Inc., appreciates the opportunity to provide you with geotechnical consulting services and professional opinions. If you have any questions, please contact the undersigned at (619) 708-1649

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.

JEFFREY A. CHANEY, Vice President
RCE 46544/GE 2314, Reg. Exp. 6-30-13

DEAN C. ARMSTRONG
CEG 1197, Reg Exp. 9-30-12

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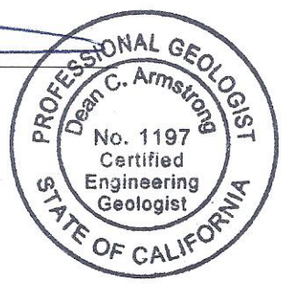

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ATTACHMENTS:

UPDATED PRELIMINARY GEOTECHNICAL INVESTIGATION STRATFORD RANCH DEVELOPMENT CITY OF PERRIS, CALIFORNIA

1.0 INTRODUCTION

This study is aimed at providing geologic and geotechnical information and recommendations for the residential development of Stratford Ranch, City of Perris, County of Riverside, California relative to: 1) existing site soil, and geologic conditions; 2) engineering characteristics of the onsite earth materials; 3) remedial grading; 4) earthwork recommendations; 5) seismic design parameters; and 6) preliminary foundation and retaining wall design parameters.

1.1. Scope of Work

The scope of our study included the following tasks:

- Review of pertinent published and unpublished geologic and geotechnical literature, maps, and aerial photographs readily available to this firm.
- Prepare geotechnical and geologic map depicting the site conditions. (Plate 1). The plan prepared by KCI, depicts a topographic map of the property and AGS has added the approximate location of trenches and borings and selected information associated with each of the trenches and borings. These include three (3) trenches and six (6) borings excavated, logged and sampled by Lawson Geotechnical Consulting, Inc. (LGC, 2004) during a previous study and thirteen (13) trenches excavated for this supplemental study.
- Excavate, log, and sample thirteen additional backhoe test trenches. A certified engineering geologist and a geotechnical engineer surface logged each trench. In-situ moisture and density test were conducted in select trenches during the field investigation. The Log of Trenches from this investigation is presented in Appendix B.
- Conduct laboratory testing including, expansion indices, chemical/resistivity, maximum dry density and optimum moisture content determinations, and moisture/density of samples of the onsite soils obtained during this subsurface investigation (Appendix C). Also included herein are laboratory results from the previous geotechnical investigation by Lawson Geotechnical Consulting, Inc. (LGC, 2004).
- Conduct a geotechnical engineering and geologic hazard analysis of the site.
- Evaluate groundwater conditions and the potential effects on construction.
- Evaluate the suitability of the soils generated from the proposed channel widening.
- Perform a liquefaction analysis and evaluate the potential for seismically induced settlement and/or lateral spreading
- Conduct a limited seismic hazards evaluation and research of readily available published maps and reports.
- Determine design parameters of onsite soils as a foundation medium.

- Provide a preliminary corrosivity evaluation of the onsite soils.
- Provide preliminary pavement design recommendations.
- Provide bearing and friction values for foundation soils.
- Prepare a geotechnical report with exhibits summarizing our findings. This report would be suitable for design, and regulatory review.

1.2. Geotechnical Study Limitations

The conclusions and recommendations in this report are professional opinions based on the data developed during this investigation and previous investigations. The conclusions presented herein are based upon an anticipated design of one-and two-story, wood framed, residential structures and associated infrastructure. Changes to this assumption may necessitate further review.

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

2.0 SITE LOCATION AND DESCRIPTION

The proposed rectangular residential site is located in the City of Perris northerly adjacent to Ramona Expressway and westerly adjacent to Evans Road (Site Location Map - Figure 1). An existing residential development is located northerly adjacent to the parcel and the Perris Valley Storm Drain Channel forms the western boundary. Lake Perris and its associated dam is approximately 0.75 mile west of the site. The approximately 143 acre flat parcel has historically been used for agricultural purposes. A levee for the storm drain channel and a storm water basin are the obvious man-made features on the property along with a fill mound in the north eastern portion of the property.

3.0 PROPOSED DEVELOPMENT

Tentative grading or development plans have not yet been provided. AGS understands that the Perris Valley Storm Drain Channel is going to be widened approximately 200 feet within the parcel by excavating approximately ten (10) to twelve (12) vertical feet in depth. The excavated soils will be placed across the remaining portion of the site to create residential building lots and on the commercial lot on the western side of the channel. The existing grades will be raised approximately three (3) to five (5) feet. It is anticipated that one-and two-story, wood framed, residential structures supported by slab-on-grade foundation systems will ultimately be constructed on the parcel. In addition, associated buried utilities, streets, and open space areas are anticipated to be constructed. Along the southerly boundary of the project, northerly adjacent to Ramona Expressway LID infiltration basins are proposed.

4.0 FIELD AND LABORATORY INVESTIGATION

Previous geologic and geotechnical studies have been performed near and at the site by Lawson Geotechnical Consulting Inc. (LGC 2004). Pertinent information from their study was utilized during this study. To supplement the previously collected data, site geologic reconnaissance mapping, as well as the

study. To supplement the previously collected data, site geologic reconnaissance mapping, as well as the subsurface investigation presented herein, were performed on May 4, 2012. The subsurface work consisted of excavating thirteen (13) trenches (TA-1 through TA-13). The approximate locations of the exploratory excavations are shown on Plate 1. The Log of Trenches is presented in Appendix B.

As part of our investigation, bulk samples and small bag samples were obtained that represented the site soils. The samples were transported to AGS's approved laboratory for testing. The test results are presented in Appendix C.

5.0 ENGINEERING GEOLOGY

5.1. Geologic Analysis

5.1.1. Literature Review

AGS has reviewed the referenced geologic documents in preparing this study. Where deemed appropriate, this information has been included with this document.

5.1.2. Aerial Photograph Review

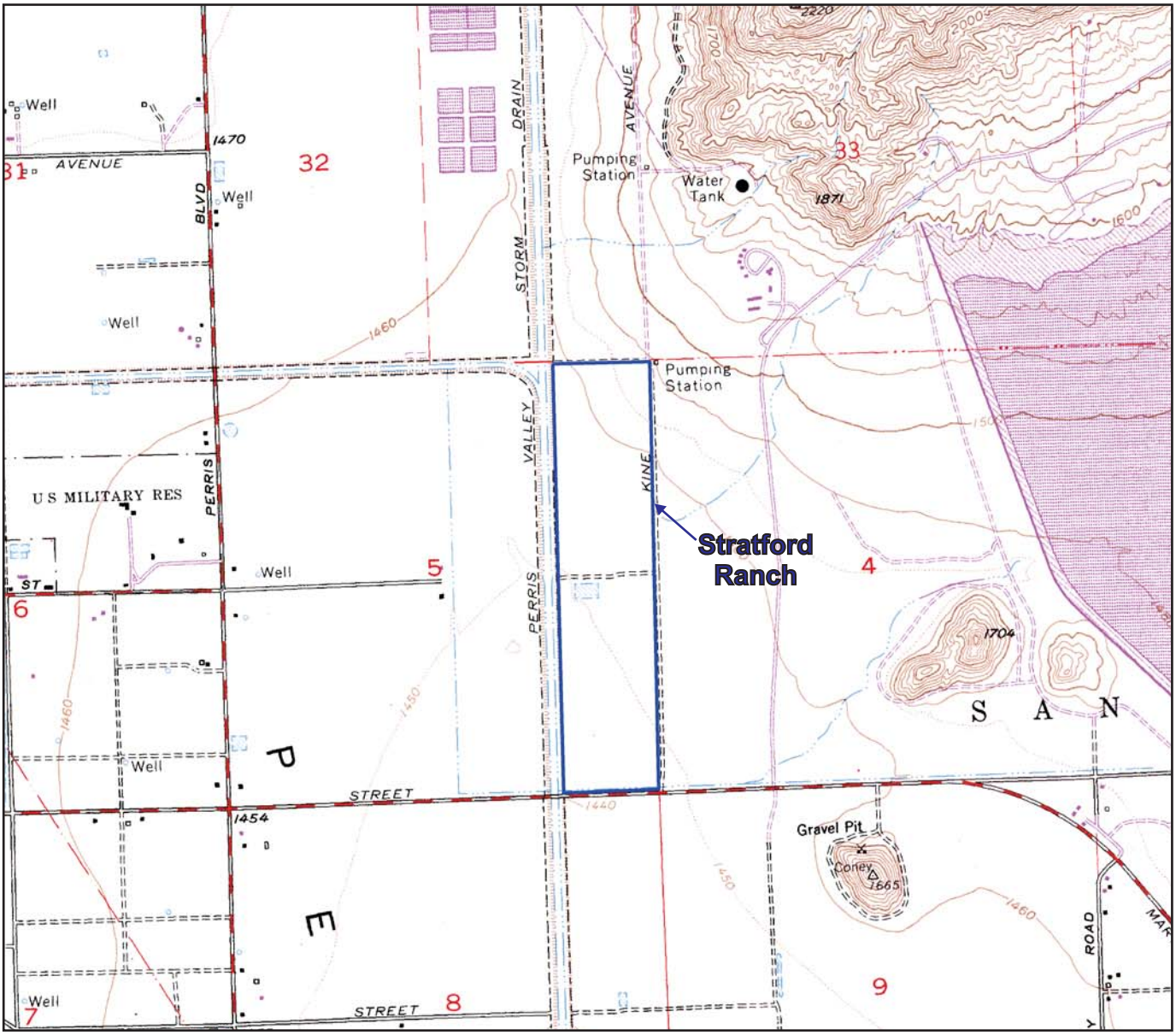
AGS has reviewed the aerial photographs available online and in our library, including a limited review of historical aerial photographs (1967, 1978, 2002 through 2009, and current). No significant geologic features were noted.

5.1.3. Field Mapping

A site reconnaissance was conducted at the site and its immediate vicinity. Due to the past agricultural use of the subject site, surface mapping was minimal.

5.2. Geologic and Geomorphic Setting

Stratford Ranch is located within part of the northeastern Perris Block (see Figure 2- Regional Geology Map). The Perris Block bound on the northeast by the San Jacinto fault and the associated San Jacinto trough and on the southwest by the Elsinore fault and the Elsinore-Temecula trough (Woodford and others, 1971). The Perris Block is in essence a broad igneous and metamorphic rock highland that is sporadically covered by usually thin sections of Tertiary and Quaternary, non-marine sediments -- principally alluvial fan and valley fill deposits. The absence of Quaternary deformation within the block, and hence long periods of landscape stability, gave rise to broad erosion surfaces that are now mantled by distinctive reddish relict paleosols. The surfaces, since uplifted along the aforementioned boundary faults, are preserved as rolling uplands commonly punctuated by resistant, "rocky", inselbergs that rise tens to several hundred feet above the surrounding land (Figure 2). This is evidenced by the rocky hills east of the site.



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SCALE: 1 in. = 2000 ft.

U.S.G.S. SITE LOCATION MAP
STRATFORD RANCH
CITY OF PERRIS, CALIFORNIA

FIGURE 1

SOURCE MAPS - Perris U.S.G.S.
7.5-minute Quadrangle

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5.3. Stratigraphy

5.3.1. Surficial Units

Surficial units mapped onsite include undocumented artificial fill, topsoil, Modern Alluvium and Very Old Fan Deposits. A detailed description of this unit is presented below.

5.3.1.1. Undocumented Artificial Fill (QafuR, QafuL and Qafu)

Three generations of undocumented fill have been differentiated onsite (Plate 1). Fills associated with the levee *(QafuL)*; Ramona Expressway and Evans Road *(QafuR)* have been mapped; as have been fills associated with the onsite basin and fill mound located near the center of the site *(Qafu).* These materials are assumed to be constructed of onsite and near-site soils and composed of silty fine grained sands to clayey silts and silty clays. At this time it is assumed that the levee and roadway fills were compacted to current standards. The onsite Qafu is considered to be un-controlled filling and does not meet current compaction standards.

5.3.1.2. Modern Alluvium (Qal)

The upper soils have been classified as Modern Alluvium and consist of silty sands, clayey silts and silty clays. These light brown to tan soils are typically dry to damp, loose and medium dense to slightly stiff.

5.3.1.3. Very Old Fan Deposit (Qvof)

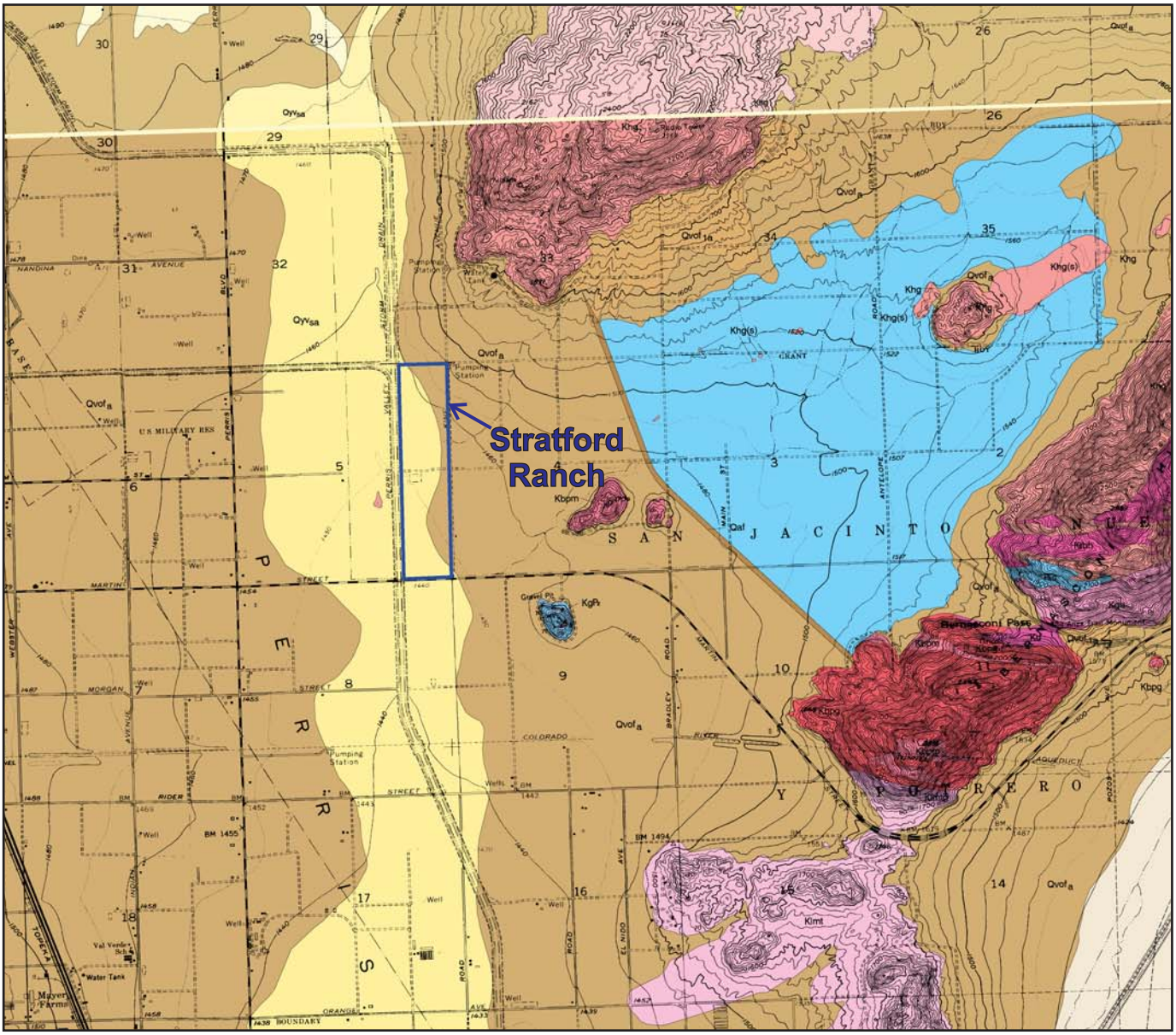
Soils underlying the Modern Alluvium have been classified as Very Old Fan Deposits. The differentiation is based upon the color and density changes observed. This unit is composed of fine grained silty sands to sandy silts with silty clay layers and is typically tan to red brown, very moist, firm to stiff, blocky, containing caliche, and occasionally carboniferous.

5.4. Geologic Structure and Tectonic Setting

5.4.1. Tectonic Setting and Regional Faulting

The Perris Block is bound on the northeast by the active San Jacinto fault and the associated San Jacinto trough and on the southwest by the Elsinore fault and the associated Elsinore trough. The San Jacinto fault is about 7-miles northeast of the study site, and the Elsinore fault is about 15 miles to the southwest. Responsible for the uplift of the Perris Block, these faults are two of many northwest trending faults that extend in a band from the Mojave Desert in the east to the Channel Islands in the west (see Figure 3-Fault Map).

The San Jacinto and Elsinore faults, along with the San Andreas Fault (13 miles northeast) are active, seismogenic, strike-slip faults that mark the boundary of the Pacific and North American Plates. Each is capable of moderate to large earthquakes (for



REGIONAL GEOLOGY MAP
STRATFORD RANCH
CITY OF PERRIS, CALIFORNIA

SCALE: 1 in. = 4000 ft.

FIGURE 2

SOURCE MAPS - GEOLOGY OF THE
PERRIS AND SUNNYMEAD
7.5 MINUTE QUADRANGLES

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example, Petersen, and others, 1996). The northwest, fault-parallel trend of the Peninsular Ranges (of which the Perris Block is part) bears witness to the dominance of this set of faults in Pleistocene to modern times (Figure 3).

5.4.2. Local Faulting

From the Pleistocene to modern times, the Perris Block (and hence the site locality) has acted as a coherent, little-deformed block of dense, plutonic rock around which miles of displacement along the bordering San Jacinto and Elsinore faults has and is taking place. The vestige of un-deformed Pleistocene topography and relict paleosols expresses this. Accordingly, larger scale, geologically recent faults are not common locally. For example, no on- or near-site faults are documented in the literature (Morton, 1972, undated; Dibble, 1981, LGC, 2004 and GPI, 2007).

5.4.3. Geologic Structure

The site is underlain by deposits of young alluvium consisting of roughly horizontal layers of sandy silt, silty sand, silty clay and clayey silt. No evidence of faulting was observed on the site during this study and no faults have been mapped on-site based upon a review of published maps.

5.5. Groundwater

Groundwater was encountered in AGS's investigation in Trenches 5, 6, 7, and 8 at depths ranging from 11.5 to 15 feet below ground surface. These trenches are located in the southwestern portion of the site. Groundwater levels will be a function of seasonal rainfall conditions.

5.6. Non-seismic Geologic Hazards

5.6.1. Mass Wasting and Debris Flows

Due to the flat nature of the site area, mass wasting and debris flows are not considered a geologic hazard to the site.

5.6.2. Flooding

The majority of the site has been identified by the County of Riverside as being within a flood zone. Evaluation of the flooding potential and its impact should be assessed by the project Civil Engineer.

5.6.3. Subsidence and Ground Fissuring

The site has been identified by the County of Riverside as being susceptible to subsidence. Based upon the remedial grading presented herein, subsidence and ground fissuring is not anticipated to be significant.

5.7. 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

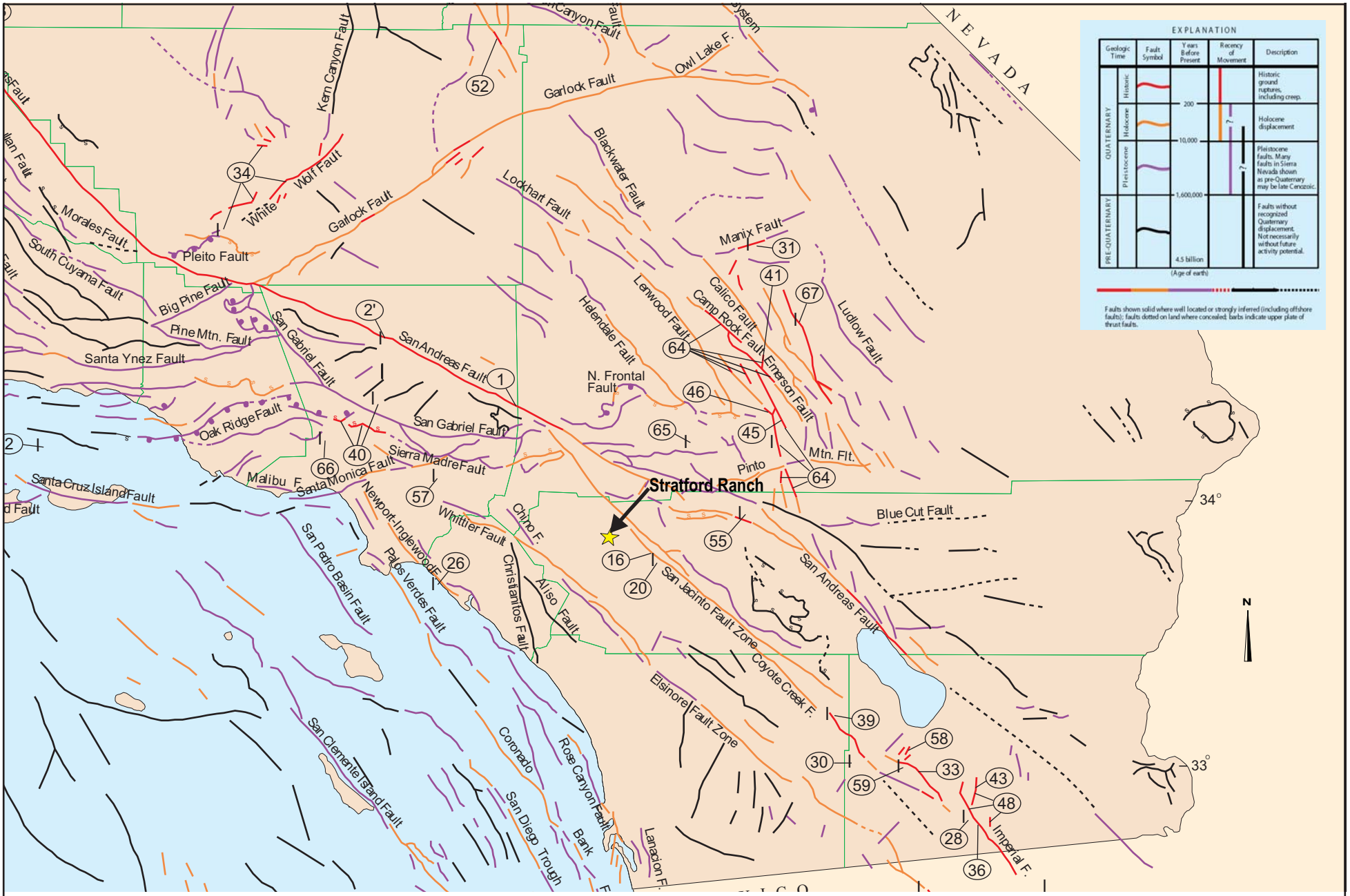

FIGURE 3

SIMPLIFIED FAULT ACTIVITY MAP OF CALIFORNIA

Compiled by Charles W. Jennings and George J. Saucedo
1999 (Revised 2002, Tousson Toppozada and David Branum)

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the site are to a large degree dependent upon the distance to the causative fault, the intensity of the seismic event, the direction of propagation of the seismic wave and the underlying soil characteristics. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction, seismically induced slope failure or dynamic settlement. The following is a site-specific discussion of ground motion parameters, earthquake-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. The following seismic hazards discussion is guided by the California Building Code (2010), CDMG (2008), and Martin and Lew (1998).

5.7.1. Surface Fault Rupture

Surface rupture is a break in the ground surface during or as a consequence of seismic activity. To a large part, research supports the conclusion that active faults tend to rupture at or near pre-existing fault planes. The site is not located in a State of California Alquist-Priolo Fault Zone nor a Riverside County Fault Zone and faulting has not been mapped at the site. The potential for surface rupture at the site is considered very low.

5.7.2. Seismicity

As noted, the site is within the tectonically active southern California area. The potential exists for strong ground motion that may affect future improvements. As part of this assessment, AGS utilized the California Geologic Survey Probabilistic Seismic Hazards Mapping Ground Motion Page. A site location of Latitude 33.8519˚N and Longitude -117.2107˚W was utilized. Latitude 33.851398 ˚ N and Longitude -117.203517˚ W. Ground motions (10% probability of being exceeded in 50 years) are expressed as a fraction of the acceleration due to gravity (g). Three values of ground motion are shown, peak ground acceleration (Pga), spectral acceleration (Sa) at short (0.2 second) and moderately long (1.0 second) periods. Ground motion values are also modified by the local site soil conditions. The site has been identified as being in a site category D (alluvium).

TABLE 5.7.2
SELECTED GROUND MOTIONS*

	Alluvium
Pga (g)	0.517
Sa 0.2 sec	1.256
Sa 1.0 sec.	0.678

*NEHRP Soil Corrections were used to calculate Soft Rock and Alluvium. Ground Motion values were interpolated from a grid (0.05 degree spacing) of calculated values. Interpolated ground motion may not equal values calculated for a specific site, therefore these values are not intended for design or analysis.

At this point in time, non-critical structures (commercial, residential, and industrial) are usually designed according to the 2010 California Building Code based upon the 2009 Uniform Building Code and that of the controlling local agency. However,

liquefaction/seismic slope stability analyses, critical structures, water tanks and unusual structural designs will likely require site specific ground motion input.

5.7.3. Liquefaction

Liquefaction is the phenomenon in which the buildup of excess pore pressures, in saturated granular soils due to seismic agitation, results in a temporary "quick" or "liquefied" condition. Loose lenses/layers of sandy soils may be subject to liquefaction when a large, prolonged, seismic event affects the site. Once the excess pore water pressure dissipates, the liquefied zones/lenses will likely consolidate causing settlement. Post liquefaction effects at a site can manifest in several ways, and may include: ground deformations, loss of bearing strength, lateral spreading, flow failure, and dynamic settlement.

The site is identified as being within a potentially high to very high liquefaction zone by the County of Riverside. Perched groundwater conditions were encountered during the recent investigation at depths as shallow as 11.5 feet below grade. During this and previous geotechnical studies onsite and adjacent to the site the onsite soils consist of cohesive clayey silts silty clays, moderately dense to dense silty sands to sands, with infrequent clean sands. Further, the alluvial soils are relatively shallow and are underlain by Very Old Fan Deposits which are considered to be non liquefiable due to their age, cementation and dense nature. Accordingly, based upon the proposed remedial grading measures presented herein and the anticipated raising of grade by 3 to 4 feet the potential for post construction surface manifestation of liquefaction (sand boils, loss of bearing, etc.) is considered to be remote. It is anticipated that the site could be subject to minor amounts of dynamic settlement ranging from ½ to 1 inch with differential dynamic settlement on the order of ½ inch in 40 feet or less.

In April 1991, the State of California enacted the Seismic Hazards Mapping Act (Public Resources Code, Division 2, Chapters 7-8). The purpose of the Act is to protect the public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure. The Act defines mitigation as "… those measures that are consistent with established practice and reduce seismic risk to acceptable levels." Acceptable level of risk is defined as "that level that provides reasonable protection of the public safety, though it does not necessarily ensure continued structural integrity and functionality of the project [California Code of Regulations; Section 3721 (a)]."

In the context of that Act and the guidelines presented in SP-117A (CDMG 2008), and given the results from this firm's preliminary study, mitigation of the liquefaction potential and dynamic settlement for the proposed structures on this site to appropriate levels of risk can be accomplished through remedial grading and appropriate foundation design.

5.7.4. Seismically Induced Landsliding

The site is level and slopes immediately adjacent to the proposed residential structures are not present. As such, the possibility for seismically induced landsliding to impact the development is considered nil.

5.7.5. Earthquake Induced Flooding

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

The site is located roughly 0.75 miles downstream of the Lake Perris Dam. Failure of the dam during a seismic event while full is considered unlikely.

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

6.0 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.

6.1. Material Properties

6.1.1. Excavation Characteristics

Based on the information gathered during our investigation for this report, it is our opinion that the majority of the earth material onsite can be readily excavated with conventional grading equipment. Saturated materials may be encountered at depths greater than roughly 10 feet, with some isolated zones of saturated materials near the surface.

6.1.2. Compressibility

The onsite materials that are compressible include the upper undocumented fill (afu) Topsoil/Modern Alluvium and the highly weathered Very Old Fan Deposits. Highly compressible materials will require removal from fill areas prior to placement of fill and where exposed at grade in cut areas.

6.1.3. Collapse Potential/Hydro-Consolidation

The hydro-consolidation process is a singular response to the introduction of water into collapse-prone alluvial soils. Upon initial wetting, the soil structure and apparent strength are altered and a virtually immediate settlement response occurs. Based upon

the results of the insitu densities and water content of the soils only the dry, loose/soft upper 3 to 5 feet are considered to be potentially hydro-compressible.

6.1.4. Expansion Potential

Samples of the near surface soil collected during this and previous studies were subjected to expansion testing. According to the test results presented in Appendices C, the expansion potential of the onsite materials ranges from "very low" to "medium" when classified in accordance with ASTM D 4829. It is our opinion that the majority of the fills derived primarily from onsite materials will produce a "low" to "medium" expansion potential.

Foundation design recommendations presented in this report assume that the soils affecting the foundation could vary in expansion potential from "low" to "medium" Further testing should be conducted during and upon completion of the grading operations to confirm the specific as-graded conditions or to modify the design recommendations accordingly.

6.1.5. Chemical and Resistivity Test Results

The test results from this and previous investigations indicate that the sulfate concentration are less than 0.10 % by dry weight, which corresponds to a "negligible" sulfate exposure when classified in accordance with ACI 318-05 Table 4.3.1 (per 2010 CBC). The resistivity testing results ranged from 820 ohm-cm to 2,300 ohm-cm indicating the sample tested were "fairly corrosive" to "very corrosive" to ferrous metals in direct contact with onsite soils..

Testing should be conducted during and upon completion of grading operations to further evaluate the sulfate content and potential corrosivity on the onsite soils.

6.1.6. Earthwork Adjustments

The following average earthwork adjustment factors are presented in table 6.1.6 for use in evaluating earthwork quantities. These numbers are considered approximate and should be refined during grading when actual conditions are better defined. Contingencies should be made to adjust the earthwork balance during grading if these numbers are adjusted.

TABLE 6.1.6 EARTHWORK ADJUSTMENTS	
Geologic Unit	**Approximate Range**
Undocumented Fill	Shrink 10 to 12 percent
Alluvium	Shrink 10 to 12 percent
Very Old Fan Deposits	Shrink 0 to 5 percent

6.1.7. Shear Strength

Based upon past experience in the general area the very old fan deposits will have slightly higher shear strength characteristics than the alluvium. While the recompacted soils comprising the proposed fills will have higher shear strength characteristics than the existing "undisturbed "site soils. For our calculations presented herein AGS has elected to use the same shear strengths for remolded samples representing compacted fill for the "undisturbed" shear strength of the very old fan deposits. The shear strengths that were used by AGS for design are presented in Table 6.1.7.

TABLE 6.1.7 SHEAR STRENGTHS USED FOR DESIGN			
Material	**Cohesion (psf)**	**Friction Angle (degrees)**	**Density (pcf)**
Artificial Fill Compacted (afc)	175	28	120
Very Old Fan Deposits (Qvof)	200	25	120

6.1.8. Pavement Support Characteristics

Compacted fill derived from onsite soils is expected to possess low to moderate pavement support characteristics.

6.2. Analytical Methods

6.2.1. Pavement Design

Asphalt concrete pavement sections have been designed using the recommendations and methods presented in the Caltrans Highway Design Manual. Portland cement concrete pavement for onsite roads and driveways has been designed in accordance with the recommendations presented in the "Design of Concrete Pavement for City Streets" by the American Concrete Pavement Association.

6.2.2. Bearing Capacity and Lateral Pressure

Ultimate bearing capacity values were obtained using the graphs and formula presented in NAVFAC DM-7.1. Allowable bearing was determined by applying a factor of safety

of at least 3 to the ultimate bearing capacity. Static lateral earth pressures were calculated using Rankine methods for active and passive cases.

7.0 EARTHWORK CONCLUSIONS AND RECOMMENDATIONS

Based on the information presented herein and our experience in the vicinity of the subject site, it is AGS's opinion that the proposed construction of the residential development is feasible, from the geotechnical point of view, provided that the constraints discussed in this report are addressed in the design and construction of each proposed commercial structure.

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 City of Perris and this firm's Earthwork Specifications (Appendix E).

7.1. Site Preparation and Removals/Overexcavation

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

7.1.1. 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. Abandoned utilities, if extant, should be removed and/or abandoned in accordance with local regulations.

7.1.2. Disturbed Soils

Materials that have been disturbed by agricultural activities should be removed in their entirety prior to placement of compacted engineered fill.

7.1.3. Undocumented Artificial Fill

Pre-existing undocumented artificial fill materials within the influence of designed structures should be removed to competent bearing material as deemed by the project geotechnical engineer. It is anticipated that these materials will be suitable for re-use provided that all deleterious materials (wood, non inert construction debris, ect.) is removed prior to incorporation into fill. At this time it is assumed that the undocumented fills associated with the roadways and levee were compacted to current standards and minimal removals are anticipated in these areas. Final determination will be dependent upon additional documentation and field exposures.

7.1.4. Modern Alluvium

The upper three (3) to five (5) feet of modern alluvium within the influence of designed structural fills should be removed to competent bearing material as deemed by the project

geotechnical engineer. It is anticipated that these materials will be suitable for re-use provided that all deleterious materials (brush, roots, etc.) is removed prior to incorporation into fill.

7.1.5. Very Old Fan Deposits

The upper three (3) of the very old fan deposits within the influence of the proposed residential structures should be overexcavated and replaced as compacted fill due to the irregular nature of the soils.

7.2. Subsurface Drainage

Canyon subdrains are not anticipated for this project due to the relatively flat topography of the site. Drains should be installed behind all retaining walls, if proposed.

7.3. Seepage

Seepage, when encountered during grading, should be evaluated by the Geotechnical Consultant. In general, seepage is not anticipated to adversely affect grading. If seepage is excessive, remedial measures such as horizontal drains or under drains may need to be installed.

7.4. Earthwork Considerations

7.4.1. Compaction Standards

All fills should be compacted at least 90 percent of the maximum dry density as determined by ASTM D1557-09. All loose and or deleterious soils should be removed to expose firm native soils or bedrock. Prior to the placement of fill, the upper 6 to 8 inches should be ripped, moisture conditioned to optimum moisture or slightly above optimum, and compacted to a minimum of 90 percent of the maximum dry density (ASTM D1557-09). Fill should be placed in thin (6 to 8-inch) lifts, moisture conditioned to optimum moisture or slightly above, and compacted to 90 percent of the maximum dry density (ASTM D1557-09) until the desired grade is achieved.

7.4.2. Benching

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

7.4.3. 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.

7.4.4. Haul Roads

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

7.4.5. Import Soils

Import soils, if required, should consist of clean, structural quality, compactable materials similar to the on-site soils and should be free of trash, debris or other objectionable materials. Import soils should be tested and approved by the Geotechnical Consultant prior to importing. At least three working days should be allowed in order for the geotechnical consultant to sample and test the potential import material.

7.4.6. Channel Material

Soils generated from the proposed drainage channel widening will be suitable for use on the subject site. Wet materials, if generated during the channel excavation can be incorporated into the design fills provided that they are thoroughly mixed with dryer materials or allowed to dry to near optimum moisture content prior to incorporation into the design fills. The grading contract should consider the moisture content of these materials in their earth management plan.

7.4.7. Fill Slope Construction

Fill slopes may be constructed by preferably overbuilding and cutting back to the compacted core or by back-rolling and compacting the slope face. The following recommendations should be incorporated into construction of the proposed fill slopes.

Care should be taken to avoid spillage of loose materials down the face of any slopes during grading. Spill fill will require complete removal before compaction, shaping and grid rolling.

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

7.4.7.1. Overbuilding Fill Slopes

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

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

7.4.7.2. Compacting the Slope Face

As an alternative to overbuilding the fill slopes, the slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or track walked with a D-8 or equivalent bulldozer at maximum 4-foot fill height intervals. Back-rolling at more frequent intervals may be required. Compaction of each fill should extend to the face of the slope. Upon completion, the slopes should be watered, shaped, and track-walked with a D-8 bulldozer or similar equipment until the compaction of the slope face meets the minimum project requirements. Multiple passes may be required.

7.4.8. Utility Trench Excavation and Backfill

All utility trenches should be shored or laid back in accordance with applicable OSHA standards.

Mainline and lateral utility trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557-09. 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.

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

7.5. Slope Stability and Remediation

Proposed maximum slope heights to be created during this phase of grading are not known at this time however they are assumed to be on the order of 12 to 15 feet or less on the channel widening with interior slope less than 10 feet. At this time specific slope inclinations are not known, however, it is anticipated that the slopes will be graded at slope ratios of 2:1 (horizontal to vertical) or flatter.

7.5.1. Cut Slopes

The highest proposed cut slope will be associated with the channel grading and is to be approximately 12 to 15 feet at a slope ratio of 2:1 (horizontal: vertical). Based upon the currently available information, observations of offsite adjacent cut slopes for the existing channel AGS anticipates that proposed cut slopes will be grossly stable as designed.

Cut slopes should be observed by the Geotechnical Consultant during grading. Where cut slopes expose unfavorable geology, uncemented or poorly consolidated sandy

materials, replacement of the unsuitable portions of the cut with a stabilization fill will be recommended.

7.5.2. Fill Slopes

Fill slopes on the project are anticipated to be designed at 2:1 ratios (horizontal to vertical). The highest anticipated fill slope is assumed to be no higher than 10 feet. Fill slopes, when properly constructed with onsite materials, are expected to be grossly stable as designed.

Keys should be constructed at the toe of all fill slopes "toeing" on existing or cut grade. Fill keys should have a minimum width equal to one-half the height of ascending slope. Unsuitable soil removals below the toe of proposed fill slopes should extend from the catch point of the design toe outward at a minimum 1:1 projection into approved material to establish the location of the key. Backcuts to establish that removal geometry should be cut no steeper than 1:1 or as recommended by the Geotechnical Consultant.

7.5.3. Surficial Stability

The proposed 2:1 fill and cut slopes constructed in accordance with the recommendations presented herein are anticipated to be surficially stable. When fill and cut slopes are properly constructed and maintained, satisfactory performance can be anticipated although slopes will be subject to erosion, particularly before landscaping is fully established.

8.0 DESIGN RECOMMENDATIONS

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

8.1. Foundation Design Criteria

The single-family residential structure can be supported on post-tensioned or conventional slab-on-grade foundation systems. The expansion potential of the underlying soils is classified as "Low" to "Medium". The following values may be used in the foundation design.

Allowable Bearing:	2000 lbs./sq.ft.
Lateral Bearing:	250 lbs./sq.ft. at a depth of 12 inches plus 125 lbs./sq.ft. for each additional 12 inches embedment to a maximum of 2000 lbs./sq.ft.
Sliding Coefficient:	0.30

Settlement Potential: Total = 3/4 inch

Differential = 3/8 inch in 20 feet

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

8.2. Seismic Design Criteria

The following seismic design parameters are presented on Table 8.2 to be code compliant to the California Building Code (2010). The subject lots have been identified to be site class "D" in accordance with CBC, 2010, Table 1613.5.3 (1). The lot is located at Latitude 33.851398 ˚ N and Longitude -117.203517˚ W. Utilizing this information, the computer program USGS Earthquake Ground Motion Parameters Version 5.0.7 and ASCE 7 criterion, the seismic design category for 0.20 seconds (S_S) and 1.0 second (S_1) period response accelerations can be determined (CBC, 2010 1613.5.5.1) along with the design spectral response acceleration (CBC, 2010 1613.5.4).

Table 8.2

Seismic Design Criteria

Mapped Spectral Acceleration (0.2 sec Period), S_S	1.5g
Mapped Spectral Acceleration (1.0 sec Period), S_1	0.6g
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.5
MCE Spectral Response Acceleration (0.2 sec Period), SM_S	1.5g
MCE Spectral Response Acceleration (1.0 sec Period), SM_1	0.9g
Design Spectral Response Acceleration (0.2 sec Period), SD_S	1.0g
Design Spectral Response Acceleration (1.0 sec Period), SD_1	0.6g

8.3. Structural Design Recommendations

The proposed one and two-story residential structures can be supported by either post-tensioned or conventional foundation systems designed in accordance to the expansion potential of the near surface soils once grading is completed. The design of these systems should be based on as-graded conditions.

8.3.1. Conventional Foundation Design

The following Conventional Slab-On -Grade foundation design parameters (Table 8.3.1) are presented for the structural engineer for use in the design of conventional slabs at the subject project. These design values are based upon near surface soils exhibiting "Low" to "Medium" expansion potential.

Table 8.3.1

Conventional Slab Design Recommendations

Expansion Potential	**Low**	**Medium**
Soil Category	**I**	**II**
Plasticity Index (PI)	15	25
Footing Depth Below Lowest Adjacent Finish Grade		
One-Story Interior	12 inches	12 inches
One-Story Exterior	12 inches	18 inches
Two-Story Interior	12 inches	18 inches
Two-Story Exterior	18 inches	18 inches
Footing Width		
One-Story	12 inches	12 inches
Two-Story	15 inches	15 inches
Footing Reinforcement	No. 4 rebar one (1) on top one (1) on bottom.	No. 4 rebar: two (2) on top, two (2) on bottom. OR No. 5 rebar; one (1) on top, one (1) on bottom
Slab Thickness	5 inches (actual)	5 inches (actual)
Slab Reinforcement	No. 3 rebar spaced 18 inches on center, each way.	No. 3 rebar spaced 15 inches on center, each way.

Footing Embedment Next to Swales and Slopes
If exterior footings adjacent to drainage swales are to exist within five (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 a least seven (7) feet is provided horizontally from edge of the footing to the face of the slope.

Isolated Spread Footings
Isolated spread footings should be embedded a minimum of 18 inches below lowest adjacent finish grade and should at least 24 inches wide. A grade beam should also be constructed for interior and exterior spread footings and should be tied into the structure in two orthogonal directions footing dimensions and reinforcement should be similar to the aforementioned continuous footing recommendations. Final depth, width and reinforcement should be determined by the structural engineer.

Garages
A grade beam reinforced continuously with the garage footings shall be constructed across the garage entrance, tying together the ends of the perimeter footings and between individual spread footings. This grade beam should be embedded at the same depth as the adjacent perimeter footings. A thickened slab, separated by a cold joint from the garage beam, should be provided at the garage entrance. Minimum dimensions of the thickened edge shall be six (6) inches deep. Footing depth, width and reinforcement should be the same as the structure. Slab thickness, reinforcement and under-slab treatment should be the same as the structure.

8.3.2. Post Tensioned Foundation Design

The following post-tensioned design parameters are presented (Table 8.3.2) for the structural engineer for use in the design of post tensioned slabs at the subject project. These design values are based upon near surface soils exhibiting "Low" to "Medium" expansion potential and inconsideration of the as graded fill differential and overall fill depth.

Table 8.3.2

Post-Tensioned Foundation Design Parameters

Soil Category	Expansion Index	Edge Beam Embedment (inches)*	Edge Lift**		Center Lift**	
			Em (ft.)	Ym (in.)	Em (ft.)	Ym (in.)
I	"Low"	18	5.4	0.54	9.0	-0.23
II	"Medium"	18	4.6	0.90	9.0	-0.38
Footing Embedment*		Depth of embedment should be measured below lowest adjacent finish grade.				

NOTES: **The values of predicted lift are based on the procedures outlined in the *Design of Post-Tensioned Slabs-on-Ground*, Third Edition and related addendums. No corrections for vertical barriers at the edge of the slab or other corrections (e.g. horizontal barriers, tree roots, adjacent planters) are assumed. The values assume Post-Equilibrium conditions exist (as defined by the Post Tensioning Institute), and these conditions created during construction should be maintained throughout the life of the structure. Please refer to the appended Homeowner Maintenance Guidelines for a summary of recommended practices to maintain the conditions created during construction.

8.3.3. Presaturation Requirements

Prior to concrete placement the subgrade soils should be moisture conditioned to *optimum* moisture content for "low" expansion lots. For "medium" expansion potential lots the subgrade soils should be moisture conditioned to a *120% of optimum* moisture a minimum of 24 hours prior to concrete placement.

8.3.4. Under Slab

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.

8.3.5. Footing Excavations

Footing excavations should be observed by the geotechnical consultant. Spoils from the footing excavations should not be placed on slab-on-grade areas unless the soils are properly compacted. The footing excavations should not be allowed to dry back and should be kept moist until concrete is poured. The excavations should be free of all loose and sloughed materials, be neatly trimmed, and moisture conditioned at the time of concrete placement.

8.3.6. Concrete Design

Preliminary testing indicates some of the onsite soils generally exhibit a "very low" sulfate exposure when classified in accordance with ACI 318-05 Table 4.3.1 (per 2010 CBC). As such, sulfate resistant concrete is not required by code. However, samples should be collected during grading at or near finish grades and recommendations should be provided according to the results of those tests.

8.3.7. Exterior Flatwork

8.3.7.1. Slab Thickness

Concrete flatwork should be designed utilizing 4-inch minimum thickness.

8.3.7.2. Control Joints

Weakened plane joints should be installed on walkways at intervals of approximately 6 to 8 feet. Exterior slabs should be designed to withstand shrinkage of the concrete.

8.3.7.3. Flatwork Reinforcement

Consideration should be given to reinforcing any exterior flatwork.

8.3.7.4. 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 8 inches below concrete slabs and should be a minimum of 6 inches wide.

8.3.8. Pavement Design

Presented below are preliminary pavement sections for a range of traffic indices and an assumed Resistance-Value (R-Value) for both asphaltic concrete and Portland concrete roadways.

8.3.8.1. Asphalt Concrete Pavement

Presented below are preliminary pavement sections for a range of traffic indices using an assumed Resistance-Value of 25 for the compacted subgrade soils. The project Civil Engineer or Traffic Engineer should select traffic indices that are appropriate for the anticipated pavement usage and level of maintenance desired through the pavement life. Final pavement structural sections will be dependent on the R-value of the subgrade materials and the traffic index for the specific street or area being addressed. The pavement sections may be subject to the review and approval of the City of Cerritos.

TABLE 8.2.3.1
PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS

Traffic Index	Assumed R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
5.0	25	3	6.5
5.0	25	3	9.5
7.0	25	3	11

Pavement subgrade soils should be at or near optimum moisture content and should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557-09. Aggregate base should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557-09 and should conform with the specifications listed in Section 26 of the *Standard Specifications for the State of California Department of Transportation* (Caltrans) or Section 200-2 of the *Standard Specifications for Public Works Construction* (Green Book). The asphalt concrete should conform to Section 26 of the Caltrans *Standard Specifications* or Section 203-6 of the Green Book.

8.3.8.2. Portland Cement Concrete Pavement

Portland cement concrete may be used for the onsite driveways. The following concrete pavement sections were determined using the recommendations provided in "Design of Concrete Pavement for City Streets" by the American Concrete Pavement Association. Testing of subgrade soils should be performed once subgrade is achieved to determine the actual R-Value of the subgrade soils and/or corresponding modulus of subgrade reaction.

TABLE 8.2.3.2
PORTLAND CEMENT CONCRETE PAVEMENT

Traffic Classification	Maximum ADDT*	Portland Cement Concrete Section (inches)	k* (pci)	MR* (psi)
Residential	50	7	150	550
Residential	50	6.5	150	600
Residential	50	6.0	150	650

*Notes: k = Modulus of subgrade reaction; ADDT = Average daily truck traffic; MR=Flexural strength of concrete (Modulus of Rupture) 550 corresponds to concrete having a minimum compressive strength of roughly 3,000 psi.; 600 corresponds to concrete having a minimum compressive strength of roughly 3,600 psi.; 650 corresponds to concrete having a minimum compressive strength of roughly 4,200 psi.

Joints should be provided at a minimum spacing of 8 feet. The joints should be caulked and sealed with a flexible compound to reduce the potential for moisture infiltration. The civil engineer should determine the need for reinforcement and doweling.

The subgrade should be moisture conditioned and compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557-09. Subgrade soils should be at or near the optimum moisture content to a depth of 12-inches immediately prior to placing concrete.

8.4. Corrosion

Resistivity and pH tests indicated the onsite soils are “fairly corrosive” to “very corrosive” to ferrous metals in direct contact with onsite soils AGS recommends minimally that the current standard of care be employed for protection of metallic construction materials in contact with onsite soils or that consultation with an engineer specializing in corrosion to determine specifications for protection of the construction materials.

8.5. Drainage

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

9.0 FUTURE STUDY NEEDS

9.1. Future Geotechnical Studies

This report presents the results of a geotechnical review of conceptual development of the site. The Geotechnical Consultant should review the tentative tract map, the grading plans, retaining wall plans, and foundation plans once they are available.

9.2. In-Grading Observation

Geologic exposures afforded during remedial and rough grading operations provide the best opportunity to evaluate the anticipated site geologic structure. Continuous geologic and geotechnical observations, testing, and mapping should be provided throughout site development. Additional near-surface samples should be collected by the geotechnical consultant during grading and subjected to laboratory testing. Final design recommendations should be provided in a grading report based on the observation and test results collected during grading.

10.0 CLOSURE

10.1. Geotechnical Review

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

AGS should review the pertinent plans and sections of the project specifications, to evaluate conformance with the intent of the recommendations contained in this report.

If the project description or final design varies from that described in this report, AGS must be consulted regarding the applicability of, and the necessity for, any revisions to the recommendations presented herein. AGS accepts no liability for any use of its recommendations if the project description or final design varies and AGS is not consulted regarding the changes.

10.2. Limitations

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

The recommendations presented in this report are based on the assumption that 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.

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

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APPENDIX B

SUBSURFACE EXPLORATION

APPENDIX B

SUBSURFACE EXPLORATION

AGS excavated logged and sampled 13 test pits onsite with a JBC Extenda-Hoe equipped with a two foot wide bucket. Representatives of AGS observed and logged these test pits on May 4, 2012. As part of our investigation insitu moisture density testing was conducted in selected test pits utilizing a CPN Nuclear Densitometer. In addition, bulk samples were obtained in selected test pits and were transported to our certified laboratory for testing and analysis.

Also included herein are the logs of borings and test pits conducted by LGC during their 2007 site investigation. Boring logs for Hollowstem Auger borings B-4, B-6, B-7, B-15, B-16, and B-17 are included herewith. Also included are test pits T-6, T-7 and T-10 excavated, logged and sampled during LGC's site investigation.

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	Test Pit *TA-1* — MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium (Qal) Silty Sand, light brown, dry, loose, at 3' becoming slightly moist to moist				
5				**Older Fan Deposit (Qvof)** Silty Sand, brown, moist to very moist, moderately dense, porous at 6.5' tan/brown, moderately dense to dense, moist at 8.5' medium to coarse grained Sand to Silty Sand, tan/brown, moist to very moist, dense				
10				Total Depth - 11.5 Feet No Ground Water Encountered, No Caving Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	Test Pit *TA-2* — MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium (Qal) Fine grained Silty Sand, light brown, dry, loose,				
	B			**Older Fan Deposit (Qvof)** Medium to coarse grained Silty Sand to Sand, dark brown, moderately dense, slightly porous, root hairs	10.7	109.4	55	
5				at 6.5' interbedded medium to coarse grained Sand and medium to coarse grained Silty Sand, dark brown, moist to very moist, dense, slightly porous, root hairs, at 8.5' medium to coarse grained Sand to Silty Sand, tan/brown, moist to very moist, dense				
10				Total Depth at 10.0 Feet No Groundwater Encountered, No Caving Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample		B --- Bulk Sample	--Water Table
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Test Pit *TA-3*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium(Qal)				
				Silty Sand to Sandy Silt, light brown, dry, loose to very soft, blocky				
				at 3' Silt to Clayey Silt, tan/light brown, moist, soft, blocky	20.0	100.9	82	
				at 4' Silt to Clayey Silt, tan, moist, firm				
5				at 5.5' very moist				
				at 8' firm				
10	B				13.2			EI, SR
				Older Fan Deposit(Qvof)				
				Interbedded Silty fine grained Sand/Clayey Silt/Silty Clay, gray/red brown/tan, very moist, firm, dense				
				at 13' Silty Sand, medium to coarse grained, red brown, very moist dense to very dense				
15				Total Depth 14.5 Feet				
				No Groundwater Encountered, No Caving				
				Backfilled with Trench Spoils and Tamped				

LEGEND

Sample Type: R --- Drive Sample; B --- Bulk Sample; --Water Table

Laboratory Testing: AL = Atterberg Limits; EI = Expansion Index; MD = Maximum Density; SA = Sieve Analysis; SR = Sulfate/Resistivity Test; DS = Shear Testing; RV = R-Value Test; CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Test Pit *TA-4*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium (Qal)				
				Clayey Silt to Silt, light tan, dry, very soft, porous, root hairs				
				at 4' slightly moist, blocky, some porosity				
5				**Older Fan Deposit (Qvof)**				
				Fine grained Silty Sand to Silt, red brown, moist to very moist, firm				
				at 7.5' red brown, very moist, porous, blocky				
10	B				13.2			SR
				Total Depth at 12.5 Feet				
				No Groundwater Encountered, No Caving				
				Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Test Pit *TA-5*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium(Qal)				
				Clayey Silt to Silt, light tan, dry, very soft, root hairs				
				at 3.5' Silt to fine grained Sandy Silt, light tan to light brown, soft to firm, blocky				
5				at 4.5' moist to very moist				
				at 8.5' very moist				
				at 9' wet, porous, root hairs				
10				at 11' silty clay, tan to light gray, wet to very moist, stiff				
				at 11.5' Groundwater				
				Total Depth at 11.5 Feet Groundwater Encountered at 11.5 feet, No Caving Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Test Pit *TA-6*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium				
				Clayey Silt to Silt, light tan, dry, soft, root hairs				
				at 3.5' silt to fine grained sandy silt, light tan to light brown, slightly moist, soft to firm				
	B				27.4			EI
5				at 4.5' moist to very moist				
				at 8.5' very moist to wet, porous, rootlets				
10				at 11' Silty Clay, tan to light gray, wet, firm to stiff				
				at 11.5' Groundwater				
				Total Depth at 12.0 Feet Groundwater Encountered at 11.5', No Caving Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Test Pit *TA-7*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Saturation (percent)	Laboratory Testing: Others
				Topsoil/Alluvium				
				Fine grained Sandy Silt to Silt, light tan, dry, very stiff				
	B							MD
				at 4' Silty Sand to Silt, red brown, porous, slightly moist, soft to firm				
5								
				at 6' fine grained Sandy Silt to Silt, tan to red brown, moist, firm				
				at 9' Silty Clay, tan/light brown/red brown, very moist to wet, firm				
10								
				at 12' Groundwater				
				Total Depth at 12.5 Feet Groundwater Encountered at 12.0', No Caving Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Perris, California		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	Test Pit *TA-8* — MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium				
				Fine grained Sandy Silt, tan, dry, soft				
				at 3' slightly moist to moist				
	B			at 4' fine grained Silty Sand to Sand, mottled light gray to light brown moist, medium dense, porous	20.5			
5				at 5' Silt, light gray, medium firm to stiff, porous				
				at 7' scattered caliche				
				Older Fan Deposit (Qvof)				
				at 7.5' Clayed Silt to Silty Clay, tan to red brown, very moist to wet				
10				Fine grained Silty Sand to Sandy Silt, tan to red brown, very moist firm to stiff, blocky, carboniferous				
				at 14' medium to coarse grained Silty Sand, red brown, very wet to wet, dense to very dense				
15				at 15' groundwater				

Total Depth at 16.0 Feet
Groundwater Encountered at 15.0', No Caving
Backfilled with Trench Spoils and Tamped

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Test Pit *TA-9*

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium(Qal)				
				Fine grained Silty Sand to Silt, light brown to tan, dry, loose to soft				
				at 3' medium to fine grained Silty Sand, red brown to tan, medium dense, slightly porous				
				Older Fan Deposit (Qvof)				
5				Medium to coarse grained Silty Sand, red brown, very moist, dense				
				at 8.5 caliche, blocky, very moist, very dense				
10								
				Total Depth at 12.0 Feet No Groundwater Encountered, No Caving Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	Test Pit *TA-10* / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium Medium to coarse grained Silty Sand, tan, dry, loose				
	B			**Older Fan Deposit (Qvof)** Medium to coarse grained Silty Sand, red brown, slightly moist to dense, slightly porous at 4' abundant caliche, hard	12.8			
5				Total Depth at 5.0 Feet No Groundwater Encountered, No Caving Backfilled with Trench Spoils and Tamped				
10								
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	Test Pit *TA-11* / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium Sandy Silt, light brown to gray, dry, soft				
5				**Older Fan Deposit (Qvof)** Medium to coarse grained Sandy Silt to Clay, tan to red brown, moist, medium dense at 4' very moist, dense to very dense at 6' very dense, caliche, hard digging				
10				Total Depth at 7.5 Feet No Groundwater Encountered, No Caving Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	Test Pit *TA-12* / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium				
				Silty medium to coarse grained Sand, light brown to gray, dry, loose				
				at 2.5' fine grained Sandy Silt to Sand, slightly moist, soft to firm				
5				**Older Fan Deposit (Qvof)**				
				Medium to coarse grained sandy silt to silty sand, tan to red brown dense, slightly porous				
	B			at 6' caliche, red brown, very moist, hard				MD
				Total Depth at 7.5 Feet				
				No Groundwater Encountered, No Caving				
10				Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
LOG OF EXPLORATORY TEST PIT

P/W NO.:	**1204-05**	**LOGGED BY:**	JC
PROJECT NAME:	Stratford Ranch	**EQUIPMENT:**	JBC Extenda Hoe
CLIENT:	Stratford Ranch, llc.	**DATE:**	5/4/2012
LOCATION:	Moreno Valley, California		

Depth (ft)	SAMPLES: Sample Type*	SAMPLES: Sample Number	USCS Symbol	Test Pit *TA13* — MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Dry Density (pcf)	Saturation (percent)	Others
				Topsoil/Alluvium				
				Fine grained Sandy Silt to Silt, dark brown, dry, soft				
				at 2.5' moist, soft				
	B			at 3' Silt, mottled tan and light gray, moist, firm, slightly porous,	16.9			
5								
				Older Fan Deposit (Qvof)				
				Fine grained Sandy Silt, red brown to tan, very moist, firm,				
				at 9' very moist to wet, blocky, slightly porous				
10								
				Total Depth at 10.5 Feet				
				No Groundwater Encountered, No Caving				
				Backfilled with Trench Spoils and Tamped				
15								

LEGEND

Sample Type:	R --- Drive Sample	B --- Bulk Sample	--Water Table	
Laboratory Testing:	AL = Atterberg Limits	EI = Expansion Index	MD = Maximum Density	SA = Sieve Analysis
	SR = Sulfate/Resistivity Test	DS = Shear Testing	RV = R-Value Test	CO = Consolidation

Geotechnical Boring Log B-4

Date: April 30, 2004	Project Name: Sheffield - Perris
Project Number: 032338-10	Logged By: AW
Drilling Company: 2R Drilling	Type of Rig: CME-55
Drive Weight (lbs): 140	Drop (in): 30 Hole Dia (in): 8
Top of Hole Elevation (ft):	Hole Location: See Geotechnical Map

Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / ASTM Symbol	DESCRIPTION	Type of Test
0		Bag-1 0-2'			Qyv ML	***Younger Alluvium:*** Sandy SILT; yellowish brown, moist, stiff, fine sand, porosity.	
	5 6 7	R-1	95.5	13.8			
5	11 12 14	R-2	112.2	7.3	SC	Clayey SAND; yellowish brown, slightly moist, medium dense, fine to coarse sand.	
10	9 12 17	R-3	122.9	8.0		slightly moist, medium dense, fine to coarse sand.	
15	14 25 32	R-4	124.8	12.1		reddish brown, slightly moist, dense, fine to coarse sand.	
					CL	Sandy CLAY; yellowish brown, moist, stiff, fine to medium sand.	
20	6 5 6	SPT-1		16.5			
					¥	***Groundwater @ 24 Feet.***	
25	4 50/6"	R-5	126.2	11.8	SC	Clayey SAND; reddish brown, moist, very dense.	
30							

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Geotechnical Boring Log B-6

Date: April 30, 2004	Project Name: Sheffield - Perris
Project Number: 032338-10	Logged By: AW
Drilling Company: 2R Drilling	Type of Rig: CME-55
Drive Weight (lbs): 140	Drop (in): 30 Hole Dia (in): 8
Top of Hole Elevation (ft):	Hole Location: See Geotechnical Map

Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / ASTM Symbol	DESCRIPTION	Type of Test
0	12 20 13	R-1	113.4	2.2	Qvof SC	***Alluvium:*** Clayey SAND; yellowish brown, dry, medium dense, fine to coarse sand.	
5	17 25 30	R-2	119.7	5.1		dense, porosity.	
10	34 50/ 5"	R-3	116.9	7.0		slightly moist, very dense.	
15	22 50/ 6"	R-4	127.3	9.0		dark yellowish brown, moist.	
20	8 7 8	SPT-1		11.3	SCSM	Silty Clayey SAND; dark yellowish brown, moist, medium dense.	
					¥	***Groundwater @ 23½ Feet.***	
25	10 12 15	R-5				No Recovery.	
						Total Depth - 26½ Feet. ***Groundwater @ 23½ Feet.***	
30							

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Geotechnical Boring Log B-7

Date: April 30, 2004	Project Name: Sheffield - Perris
Project Number: 032338-10	Logged By: AW
Drilling Company: 2R Drilling	Type of Rig: CME-55
Drive Weight (lbs): 140	Drop (in): 30 Hole Dia (in): 8
Top of Hole Elevation (ft):	Hole Location: See Geotechnical Map

Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / ASTM Symbol	DESCRIPTION	Type of Test
0		Bag-1 0-5'			Qyv CL-ML	***Younger Alluvium:*** Sandy Silty CLAY; dark yellowish brown, moist, stiff, fine to coarse sand.	
	9 14 9	R-1	109.8	14.1			
5	15 24 50/ 5½"	R-2	123.7	11.0	SC	Clayey SAND; dark yellowish brown, moist, dense, fine to coarse sand.	
10	8 10 8	R-3	119.6	12.5		dark yellow brown, wet, medium dense, fine to coarse sand with sandy clay lenses.	
15	9 9 11	R-4	110.3	20.6	¥	***Groundwater @ 15 Feet.***	
20	6 9 15	SPT-1		16.7		dark yellowish brown, wet, medium dense, fine to coarse sand, sandy clay lenses.	
25	9 20 27	R-5					
						Total Depth - 26½ Feet. ***Groundwater @ 15 Feet.***	
30							

LGC INLAND

Geotechnical Boring Log B-15

Date: 6-18-04	Project Name: Sheffield - Perris
Project Number: 032338-10	Logged By: AW
Drilling Company: 2 R Drilling	Type of Rig: CME - 55
Drive Weight (lbs): 140	Drop (in): 30 Hole Dia (in): 8
Top of Hole Elevation (ft):	Hole Location: See Geotechnical Map

Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / ASTM Symbol	DESCRIPTION	Type of Test
0					Qyv	**Younger Alluvium:**	
					CL	CLAY; dark olive brown, very moist, hard, porosity, fine to medium rootlets, caliche.	
	5 21 36	R-1	86.4	31.6			
5	11 16 18	R-2	99.8	21.9		very stiff	
	8 9 6	R-3	88.3	29.4		stiff	
10	1 1 3	R-4	60.3	66.4	CL	Sandy CLAY; light olive brown/ tan, wet, soft, caliche.	
					¥	***Groundwater @ 10.5 Feet***	
					CL	Sandy Clay, dark reddish yellow, moist, stiff, clayey sand lenses.	
15	2 5 8	S-1		19.7			
20	3 10 16	R-5	113.0	18.2		very stiff.	
25	7 11 18	S-2		15.0		dark reddish yellow, moist, very stiff, fine to coarse sand.	
						Total Depth - 26.5 Feet	
						Groundwater @ 10.5 Feet	
30							

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Geotechnical Boring Log B-16

Date: 6-18-04	Project Name: Sheffield - Perris
Project Number: 032338-10	Logged By: AW
Drilling Company: 2 R Drilling	Type of Rig: CME - 55
Drive Weight (lbs): 140	Drop (in): 30 Hole Dia (in): 8
Top of Hole Elevation (ft):	Hole Location: See Geotechnical Map

Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / ASTM Symbol	DESCRIPTION	Type of Test
0					Qyv	**Younger Alluvium:**	
					CL	CLAY; dark olive brown, moist, very stiff, trace fine coarse sand, porosity, caliche, fine to medium rootlets.	
	5 7 21	R-1	117.3	13.4			
5	27 50/2"	R-2	122.9	10.6	SC	Clayey SAND; dark reddish yellow, slightly moist, very dense, fine to coarse sand, porosity, sandy clay lenses.	
	14 18 27	R-3	127.1	10.3		dark olive brown, slightly moist, very stiff, fine to coarse sand, porosity.	
10	17 24 35	R-4	125.3	11.6		dark reddish yellow, slightly moist, dense, fine to coarse sand, Silty sand lenses.	
					⊻	*Groundwater @ 13 Feet*	
15	3 5 5	S-1		14.3		loose.	
20	9 22 33	R-5	121.5	13.0		dense, moist.	
25	5 8 11	S-2		14.9		dark reddish yellow, moist, medium dense, fine to coarse sand, porosity.	
						Total Depth - 26.5 Feet *Groundwater @ 13 Feet*	
30							

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Geotechnical Boring Log B-17

Date: 6-18-04	Project Name: Sheffield - Perris
Project Number: 032338-10	Logged By: AW
Drilling Company: 2 R Drilling	Type of Rig: CME - 55
Drive Weight (lbs): 140	Drop (in): 30 Hole Dia (in): 8
Top of Hole Elevation (ft):	Hole Location: See Geotechnical Map

Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / ASTM Symbol	DESCRIPTION	Type of Test
0	12 17 17	R-1	114.3	8.6	Qyf CL	**Younger Alluvium:** Sandy CLAY; dark olive brown, dry, stiff, porosity, fine to medium rootlets, caliche.	
5	15 26 27	R-2	121.7	7.1	SC	Clayey SAND; dark olive brown, slightly moist, hard, porosity, fine to medium rootlets, caliche.	
	8 13 22	R-3	127.1	9.3		olive brown, moist, very stiff, porosity, fine to medium rootlets, caliche.	
10	17 28 26	R-4	120.7	13.3		Sandy Clay lenses, reddish yellow, moist, hard, porosity.	
15	4 5 3	S-1		14.5	¥	*Groundwater @ 15 Feet* reddish yellow, moist, loose, fine to coarse sand, porosity.	
20	10 14 16	R-5	124.2	12.1		olive gray, wet, medium dense, fine to coarse sand with silt, porosity.	
25	6 12 19	S-2		13.7		reddish yellow, moist to wet, medium dense, fine to coarse sand with silt, pinhole porosity.	
						Total Depth - 26.5 Feet ***Groundwater @ 15 Feet***	
30							

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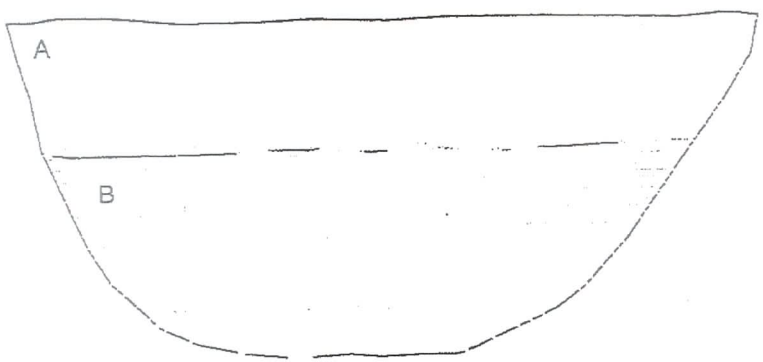
Project Name: SHEFFIELD PERRIS	**Logged by: AW**	**LOG OF TEST PIT 6**	
Project Number: 032338-10	**Elevation: --**	**Engineering Properties**	
Equipment: CASE 580	**Location/Grid: SEE GEOTECHNICAL MAP**		

Depth	Date: 6-17-04 Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0-3.5	Younger Alluvium: A Clay; whitish tan (olive brown wet), slightly moist, firm, porosity.	Qyv	CL	--	--	--
3.5-9'	B Sandy CLAY; reddish yellow, slightly moist, firm, fine to coarse sand, porosity.	--	--	--	--	--
--	-- --	--	--	--	--	--
--	-- --	--	--	--	--	--
--		--	--	--	--	--

GRAPHICAL REPRESENTATION: NORTH WALL	**SCALE: 1" = 5'**	**SURFACE SLOPE: LEVEL**	**TREND: WE**



TOTAL DEPTH= 9.0FEET
NO GROUNDWATER ENCOUNTERED

--

LGC

Project Name: SHEFFIELD PERRIS	Logged by: AW	LOG OF TEST PIT 7
Project Number: 032338-10	Elevation: --	Engineering Properties
Equipment: CASE 580	Location/Grid: SEE GEOTECHNICAL MAP	

Depth	Date: 6-17-04 Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0-3'	Younger Alluvium: A CLAY; dark olive brown, slightly moist, firm, porosity, fine to medium rootlets.	Qyv	CL	--	--	--
3-4'	B CLAY; whitish tan, slightly moist, firm, porosity.	--	--	--	--	--
4-8'	C Sandy CLAY; dark olive brown, slightly moist, soft (after 6'), fine to coarse sand, porosity.	--	--	--	--	--
--	-- --	--	--	--	--	--
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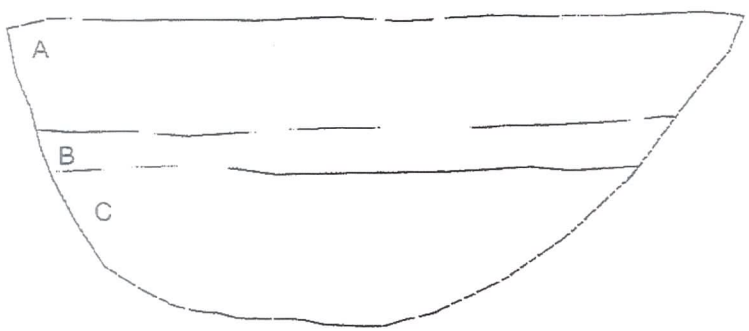
GRAPHICAL REPRESENTATION: NORTH WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: WE



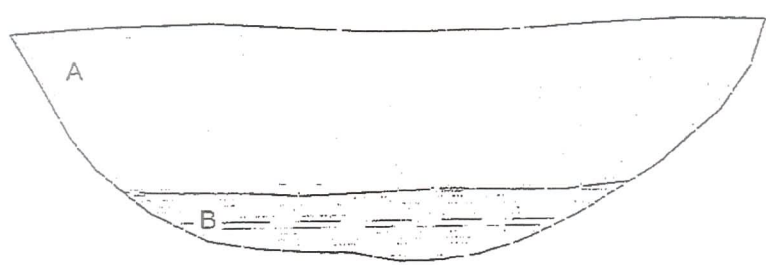
TOTAL DEPTH= 8.0FEET
NO GROUNDWATER ENCOUNTERED

LGC

Project Name: SHEFFIELD PERRIS	Logged by: AW	LOG OF TEST PIT 10			
Project Number: 032338-10	Elevation: --	Engineering Properties			
Equipment: CASE 580	Location/Grid: SEE GEOTECHNICAL MAP				

Depth	Date: 6-17-04	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0-4'	A	Older Alluvium: Silty SAND; yellowish brown, dry, medium dense, fine to coarse sand, porosity, fine to medium rootlets.	Qvof	SM	--	--	--
4-6'	B	Clayey SAND, reddish yellow, slightly moist, dense to very dense.	--	SC	--	--	--
--	C	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--			--	--	--	--	--

GRAPHICAL REPRESENTATION: NORTH WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: WE



TOTAL DEPTH= 6.0FEET
NO GROUNDWATER ENCOUNTERED

LGC

APPENDIX C

LABORATORY TESTING RESULTS

APPENDIX C

LABORATORY TESTING RESULTS

The results of laboratory testing performed during this study are enclosed within this Appendix. Laboratory testing was conducted at our Certified Laboratory (G-Force, Inc and Clarkson Laboratory and Supply, Inc.). Descriptions of the testing procedures are presented below.

Classification

Soils were classified with respect to the Unified Soil Classification System (USCS) in accordance with ASTM D2487 and D2488.

In-Situ Dry Density and Moisture Content

The in-situ dry density and moisture content were determined utilizing a CPN Nuclear Densitometer and by the determination of moisture content from bulk samples of soils obtained in the test areas. The results are presented on the Logs of Exploratory Test Pits (Appendix B)

Expansion Index Tests

Expansion Index tests were performed to evaluate the expansion potential of typical on-site soils. Testing was carried out according to ASTM D4829. The results are appended.

Maximum Dry Density and Moisture Content

The maximum dry densities and optimum moisture contents of a representative bulk sample were evaluated in accordance with ASTM D-1557/Method A. The results of this test are appended.

Chemical Analyses

The results of selected chemical (sulfate, chloride, etc.) and corrosion tests (Resistivity, pH, and Electrical conductivity) performed by Clarkson Laboratory and Supply, Inc. on a selected sample are appended.

Also Include herein are the laboratory test results from the 2007 LGC site investigation.

Expansion Index

(ASTM D4829)

G Force Lab No.	8522		
Date Sampled:	05/07/12	By	PJ
Date Submitted:	05/08/12	By:	PJ
Sample Location:	TA - 3 @ 9.5'		
Sample Description:	Light Brown Silty Sand		

Initial Water Content, %	8.3
Dry Density, pcf	117.6
Saturation, %	51.8
Final Water Content, %	17.1
Expansion Index	**18**
Potential Expansion	**Very Low**

Checked by: Ricardo Hernandez
Ricardo Hernandez, Lab Manger

Reviewed by: W Clements
Neal W. Clements, P.E., C54902

Expansion Index

(ASTM D4829)

G Force Lab No.: 8524
Date Sampled: 05/07/12 By: PJ
Date Submitted: 05/08/12 By: PJ
Sample Location: TA - 6 @ 4'
Sample Description: Tan Silty Clay

Initial Water Content, %	16.4
Dry Density, pcf	92.4
Saturation, %	53.8
Final Water Content, %	35.1
Expansion Index	**74.6**
Potential Expansion	**Medium**

Checked by: Ricardo Hernandez
Ricardo Hernandez, Lab Manger

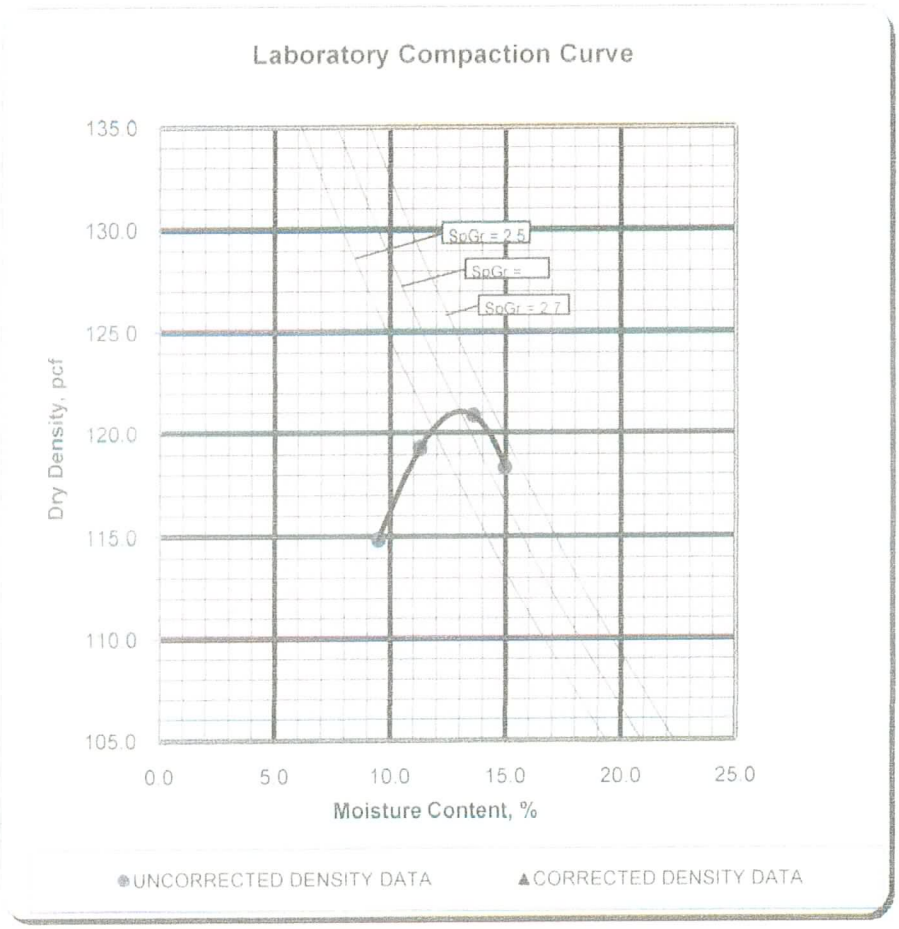
Reviewed by: W Clements
Neal W. Clements, P.E., C54902

LABORATORY COMPACTION CURVE

G Force Lab No.: **8519**
Sample Location: **TA - 7** Depth, ft.: **3**
Soil Description: **Light Brown Sandy Silty Clay**
Source of Soil: **Native**

Test Designation: **ASTM D1557** Method **A**
% +3/4" **0** % +3/8" **0** % +#4 **0**
Oversize Correction Applied? **No**
Method of Sample Preparation: **Wet**
Type of Rammer Used: **Manual**

M/D Curve No. 2



Test Results

Maximum Density, pcf	**121.0**
Optimum Moisture, %	**13.0**

Oversize Corrected Results

Maximum Density, pcf	**N/A**
Optimum Moisture, %	**N/A**

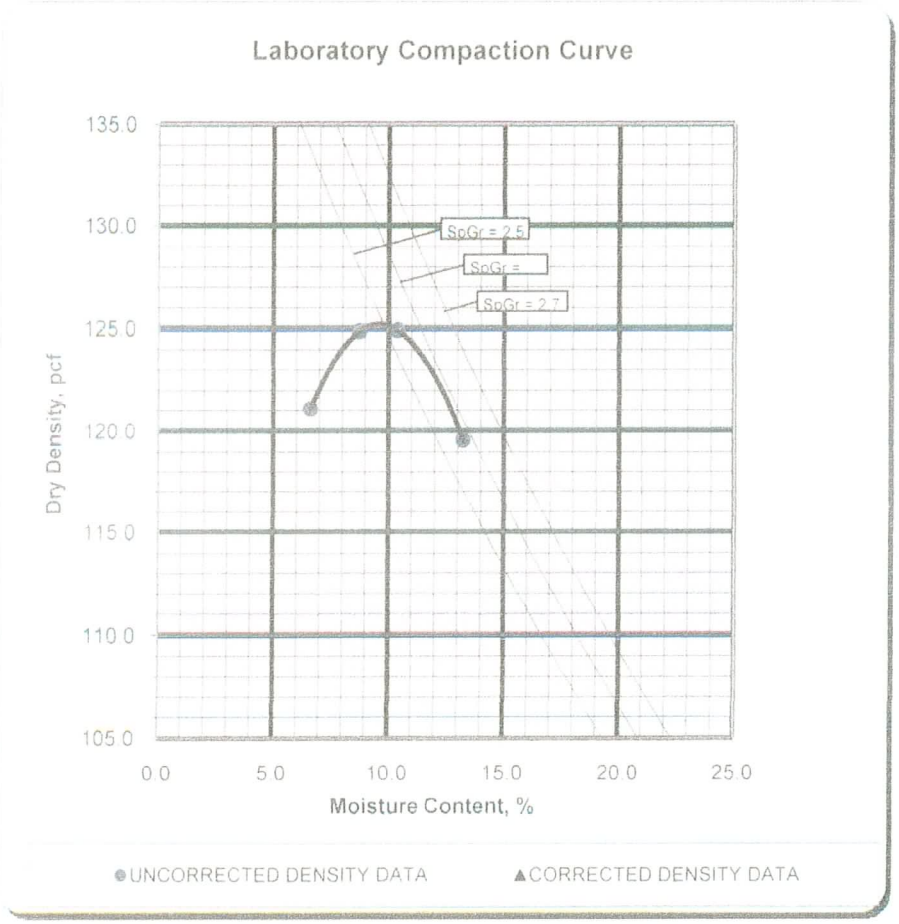
Reviewed by: _____
Neal W. Clements, P.E., C54902

LABORATORY COMPACTION CURVE

G Force Lab No.: **8520**
Sample Location: **TA - 12** Depth, ft.: **6**
Soil Description: **Brown Silty Sand**
Source of Soil: **Native**

Test Designation: **ASTM D1557** Method **A**
% +3/4" **0** % +3/8" **0** % +#4 **0**
Oversize Correction Applied? **No**
Method of Sample Preparation: **Wet**
Type of Rammer Used: **Manual**

M/D Curve No. 3



Test Results

Maximum Density, pcf	**125.0**
Optimum Moisture, %	**9.5**

Oversize Corrected Results

Maximum Density, pcf	**N/A**
Optimum Moisture, %	**N/A**

Reviewed by: Neal W. Clements, P.E., C54902

L A B O R A T O R Y R E P O R T

Telephone (619) 425-1993 Fax 425-7917 Established 1928

C L A R K S O N L A B O R A T O R Y A N D S U P P L Y I N C.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
A N A L Y T I C A L A N D C O N S U L T I N G C H E M I S T S

Date: May 11, 2012
Purchase Order Number: P/W 1204-05
Sales Order Number: 10760
Account Number: ADVG
To:

AGS, Advanced Geotechnical Solutions Inc
529 West 4th Ave
Escondido, CA 92025
Attention: Paul Derisi

Laboratory Number: SO4754-1 Customers Phone: 714-850-3980
Fax:

Sample Designation:

One soil sample received on 05/08/12 at 12:00pm,
taken from Job# P/W 1204-05 marked as TA-3@9.5'.

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 8.4

Water Added (ml)	Resistivity (ohm-cm)
50	2100
25	1100
25	950
25	770
25	800
25	820

27 years to perforation for a 16 gauge metal culvert.
36 years to perforation for a 14 gauge metal culvert.
49 years to perforation for a 12 gauge metal culvert.
63 years to perforation for a 10 gauge metal culvert.
77 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417	0.008%
Water Soluble Chloride Calif. Test 422	0.023%

Rosa M. Bernal
RMB/ram

L A B O R A T O R Y R E P O R T

Telephone (619) 425-1993 Fax 425-7917 Established 1928

C L A R K S O N L A B O R A T O R Y A N D S U P P L Y I N C.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
A N A L Y T I C A L A N D C O N S U L T I N G C H E M I S T S

Date: May 11, 2012
Purchase Order Number: P/W 1204-05
Sales Order Number: 10760
Account Number: ADVG

To:
--
AGS, Advanced Geotechnical Solutions Inc
529 West 4th Ave
Escondido, CA 92025
Attention: Paul Derisi

Laboratory Number: SO4754-2 Customers Phone: 714-850-3980
Fax:

Sample Designation:
--
One soil sample received on 05/08/12 at 12:00pm,
taken from Job# P/W 1204-05 marked as TA-4@9'.

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 9.1

Water Added (ml)	Resistivity (ohm-cm)
25	14000
25	4400
25	2600
25	2200
25	1800
25	1500
25	2000
25	2300

36 years to perforation for a 16 gauge metal culvert.
47 years to perforation for a 14 gauge metal culvert.
65 years to perforation for a 12 gauge metal culvert.
83 years to perforation for a 10 gauge metal culvert.
101 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417	0.003%
Water Soluble Chloride Calif. Test 422	0.004%

Rosa M. Bernal

APPENDIX C

Laboratory Testing Procedures and Test Results

The laboratory testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of the test type and a table summarizing the test results.

Expansion Index: The expansion potential of selected samples were evaluated by the Expansion Index Test ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

SAMPLE LOCATION	*EXPANSION INDEX*	*EXPANSION POTENTIAL**
B-1 @ 0-3 feet	7	Very Low
B-3 @ 0-3 feet	24	Low
B-8 @ 0-5 feet	39	Low
TP-1 @ 2-5 feet	55	Medium
TP- 4 @ 2-4 feet	29	Low

* Per Table 18-1-B of 1997 UBC.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM D1557. The results of these tests are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION*	*MAXIMUM DRY DENSITY (pcf)*	*OPTIMUM MOISTURE CONTENT (%)*
B-1 @ 0-3 feet	Silty Sand	138.5	7.0
B-3 @ 0-3 feet	Clayey Sand	135.0	8.0
B-8 @ 0-5 feet	Sandy Clay	117.5	14.0
TP-1 @ 2-5 feet	Sandy Clay	100.5	21.0
TP-1 @ 9 feet	Sandy Clay	99.0	22.0
TP-4 @ 2-4 feet	Clay	118.5	13.5

Soluble Sulfates: The soluble sulfate contents of selected sample(s) were determined by standard geochemical methods (CTM 417). The soluble sulfate content is used to determine the appropriate cement type and maximum water-cement ratios. The test results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION*	*SULFATE CONTENT (ppm)**	*SULFATE EXPOSURE**
B-1 @ 0-3 feet	Silty Sand	54	Negligible

* Based on the 1997 edition of the Uniform Building Code (UBC), Table No. 19-A-4, prepared by the International Conference of Building Officials (ICBO, 1997).

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with CTM 643 and standard geochemical methods. The electrical resistivity of a soil is a measure of its resistance to the flow of electrical current. As a results of soil's resistivity decreases corrosivity increases. The results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION*	*pH*	*MINIMUM RESISTIVITY (OHMS-CM)*
B-1 @ 0-3 feet	Silty Sand	7.5	1,900

Chloride Content: Chloride content was tested in accordance with Caltrans Test Method (CTM) 422. The results are presented below:

SAMPLE LOCATION	*CHLORIDE CONTENT, PPM*
B-1 @ 0-3 feet	82

R-Value: The resistance R-value was determined by the ASTM D2844 soils. The sample was prepared and exudation pressure and R-value were determined. This result was used for asphaltic concrete pavement design purposes.

SAMPLE LOCATION	*SAMPLE DESCRIPTION*	*R-VALUE*
B-4 @ 0-7 feet	Silty Sand	30

Grain Size Distribution: Representative samples were dried, weighed, and soaked in water until individual soil particles were separated (per ASTM D421) and then washed on a No. 200 sieve. The portion retained on the No. 200 sieve was dried and then sieved on a U.S. Standard brass sieve set in accordance with ASTM D422 (CTM 202

SAMPLE LOCATION	*DESCRIPTION*	*% PASSING # 200 SIEVE*
B-1 @ 20 feet	Silty Sand	15
B-2 @ 20 feet	Clayey Sand	36
B-4 @ 35 feet	Clayey Sand	41

Atterberg Limits: The liquid and plastic limits ("Atterberg Limits") were determined in accordance with ASTM Test Method D4318 for engineering classification of fine-grained material and presented in the table below:

SAMPLE LOCATION	*LIQUID LIMIT (%)*	*PLASTIC LIMIT (%)*	*PLASTICITY INDEX (%)*	*USCS SOIL CLASSIFICATION*
B-1 @ 20 feet	22	22	0	Silty Sand
B-2 @ 20 feet	26	12	14	Clayey Sand
B-4 @ 35 feet	35	19	16	Clayey Sand
TP-4 @ 2-4 feet	26	18	8	Clay

APPENDIX D

GENERAL EARTHWORK SPECIFICATIONS

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 depict 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 clearing and grubbing, 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 cesspoles, 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. Environmental evaluation of existing conditions is not the responsibility of the Geotechnical Consultant.

D. Preparation of Areas to Receive Fill: After removals are completed, the exposed surfaces shall be processed or 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 12 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 and do not inhibit the ability to properly compact fill materials.

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 a 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 a 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 ½ 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 backrolling 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 observe 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. Backdrains and Subdrains: Backdrains 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 Civil Engineer.

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 to achieve compaction 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 will be tested and evaluated 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 is 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.

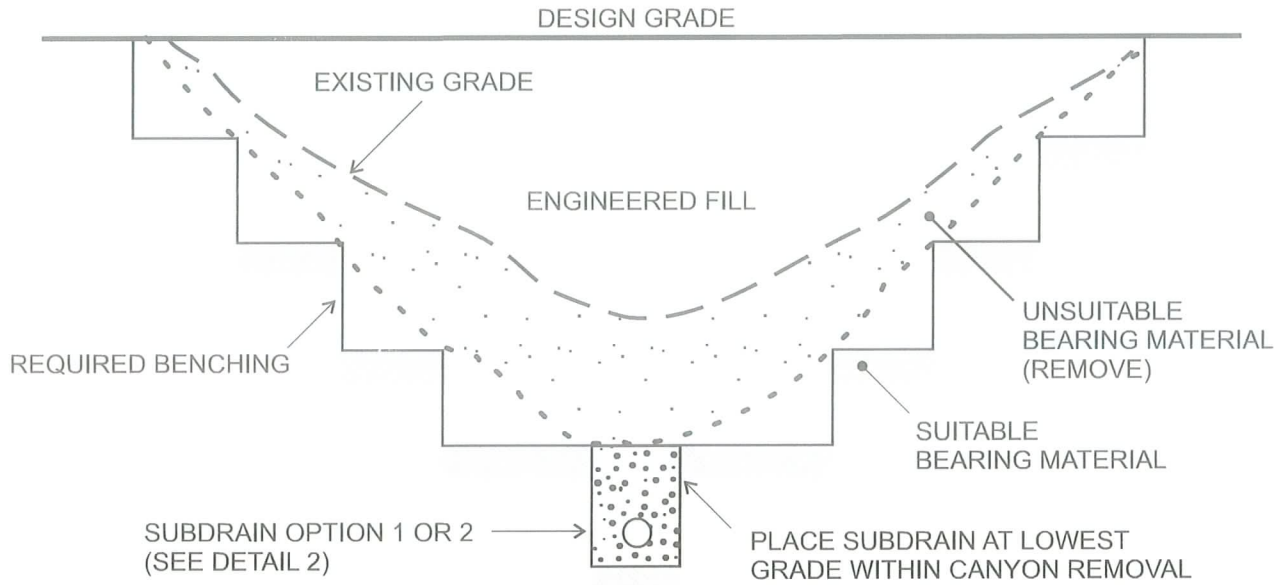
D. Frequency of Compaction Testing: The location and frequency of tests shall be at the Geotechnical Consultant's discretion. Generally, compaction tests shall be taken at intervals approximately two feet in fill height.

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

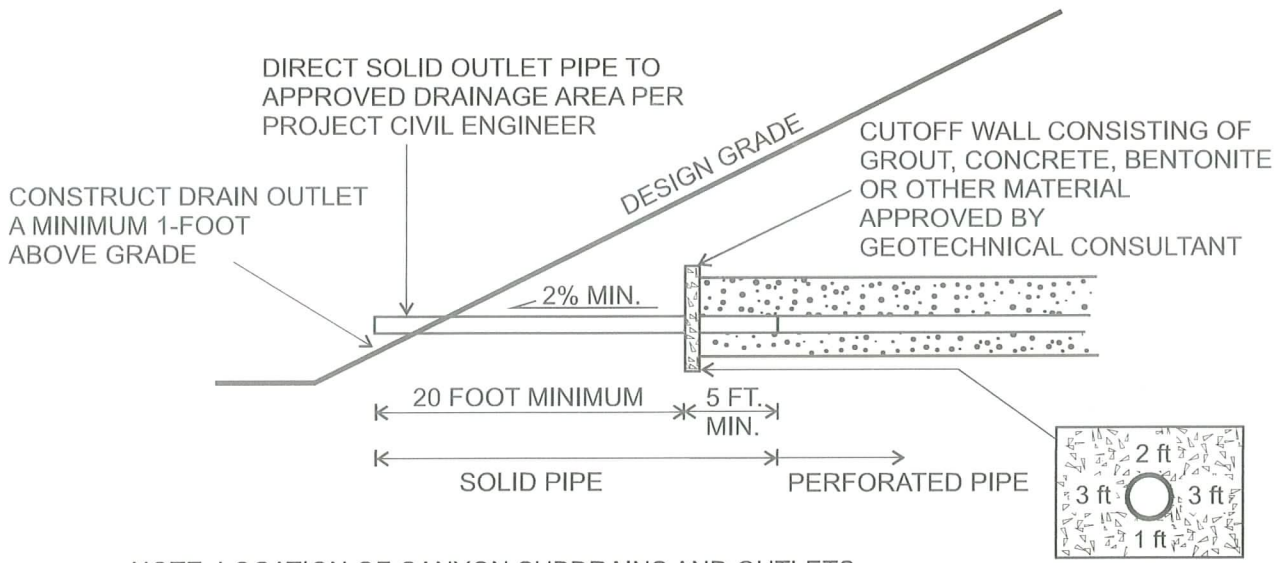
F. Areas of fill that have not been observed or tested by the Geotechnical Consultant may have to be removed and recompacted at the contractor's expense. The depth and extent of removals will be determined by the Geotechnical Consultant.

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

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



CANYON SUBDRAIN PROFILE



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

CUTOFF WALL DIMENSIONS

CANYON SUBDRAIN TERMINUS

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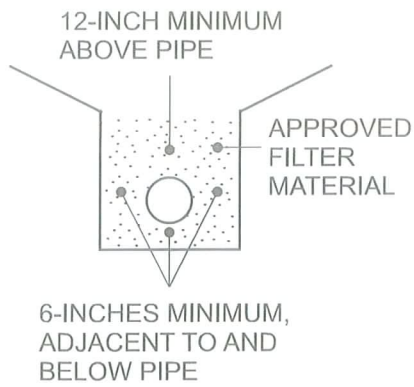
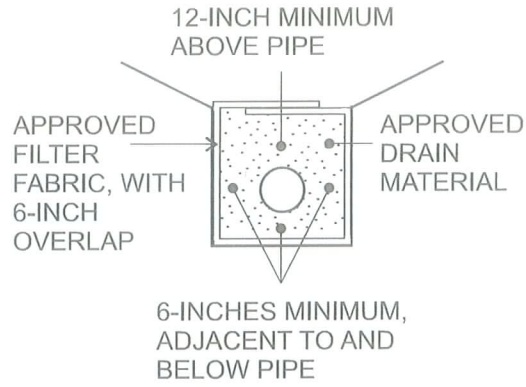
AGS ADVANCED GEOTECHNICAL SOLUTIONS	CANYON SUBDRAIN	DETAIL 1



OPTION 1

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



OPTION 2

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

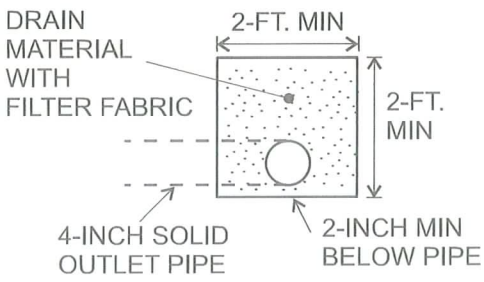
FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT SUBSTITUTE

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

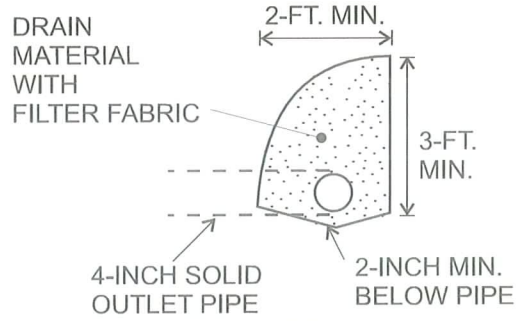
(ASTM D2751, SDR-35 OR ASTM D3034, SDR-35
ASTM D1527, SCHD. 40 OR ASTM D1785, SCHD. 40)

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

CANYON SUBDRAIN



OPTION 1



OPTION 2

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

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

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

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

BUTTRESS/STABILIZATION DRAIN

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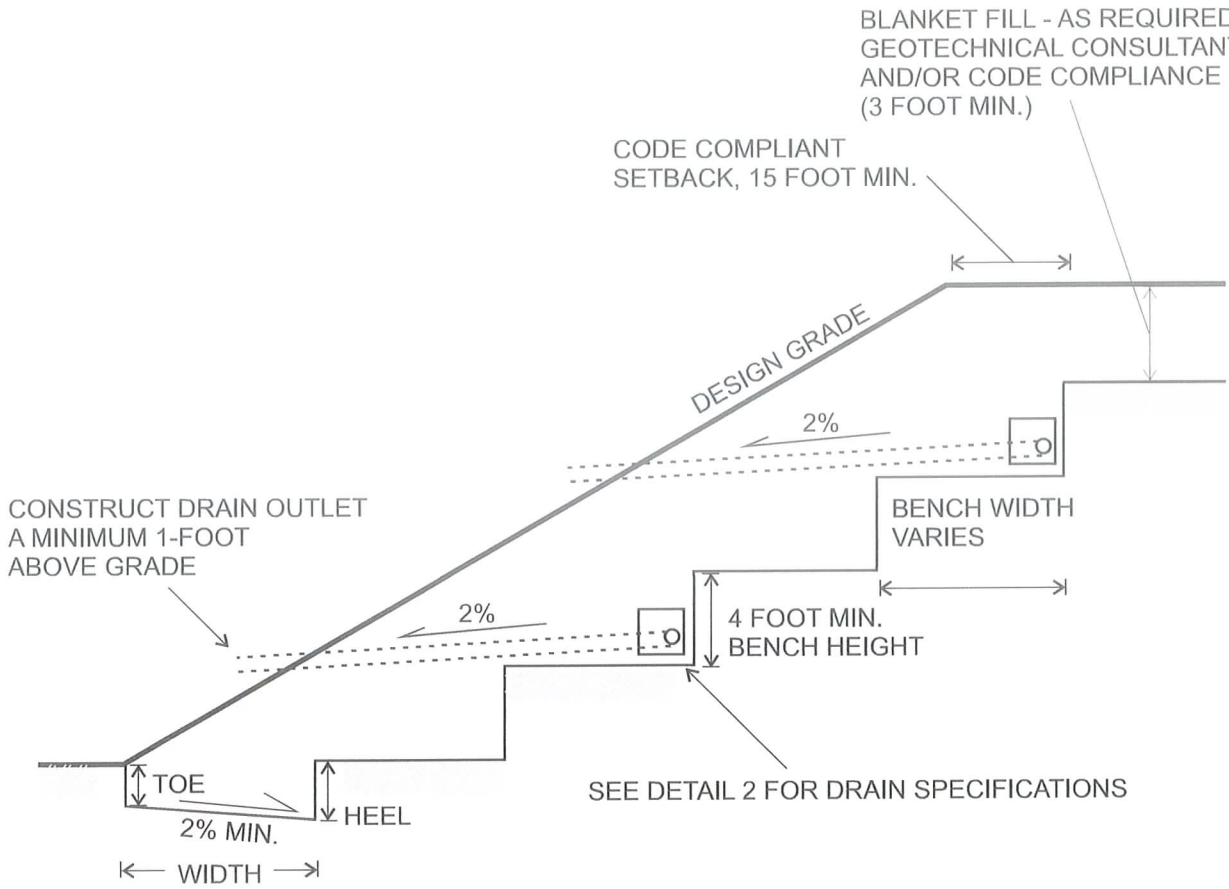
AGS ADVANCED GEOTECHNICAL SOLUTIONS	DRAIN SPECIFICATIONS	DETAIL 2



CODE COMPLIANT KEYWAY WITH MINIMUM DIMENSIONS:

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

NOTES:

1. DRAIN OUTLETS TO BE PROVIDED EVERY 100 FEET CONNECT TO PERFORATED DRAIN PIPE BY "L" OR "T" AT A MINIMUM 2% GRADIENT.
2. THE NECESSITY AND LOCATION OF ADDITIONAL DRAINS SHALL BE DETERMINED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT. UPPER STAGE OUTLETS SHOULD BE EMPTIED ONTO CONCRETE TERRACE DRAINS.
3. DRAIN PIPE TO EXTEND FULL LENGTH OF STABILIZATION/BUTTRESS WITH A MINIMUM GRADIENT OF 2% TO SOLID OUTLET PIPES.
4. LOCATION OF DRAINS AND OUTLETS SHOULD BE DOCUMENTED BY PROJECT CIVIL ENGINEER. OUTLETS MUST BE KEPT UNOBSTRUCTED AT ALL TIMES.

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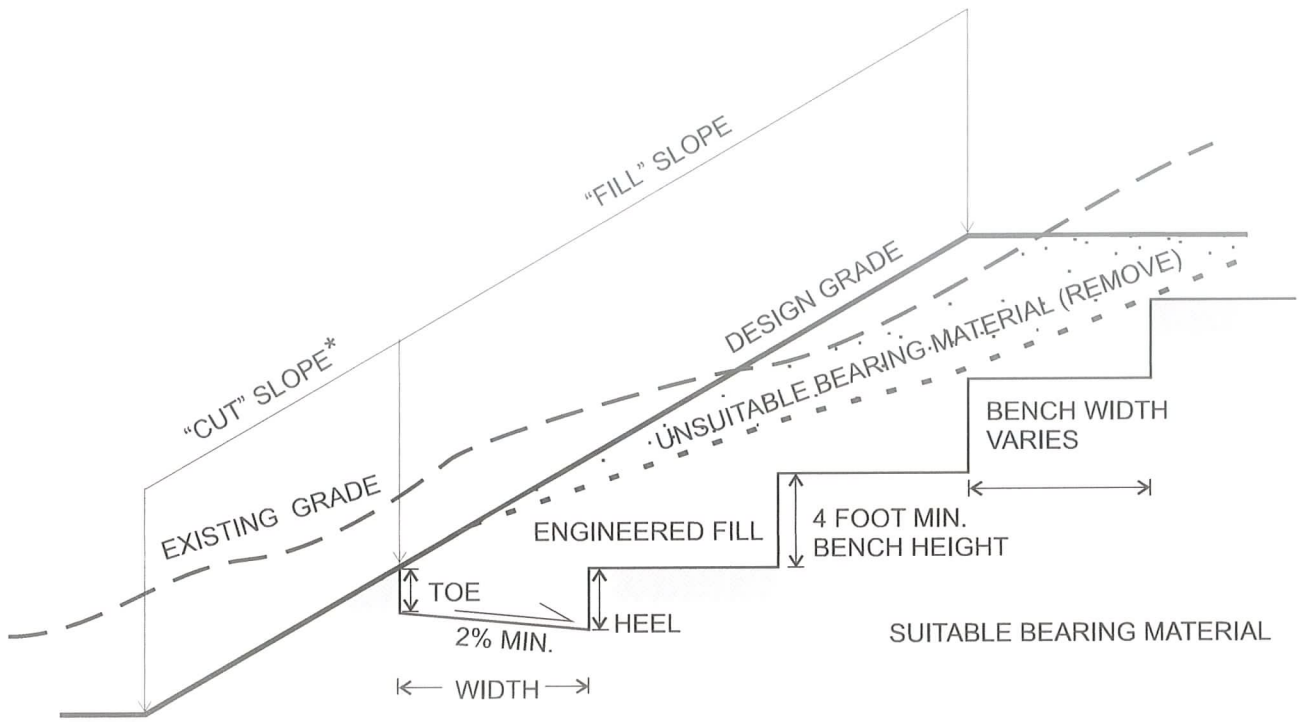
AGS
ADVANCED GEOTECHNICAL SOLUTIONS

STABILIZATION/BUTTRESS FILL

DETAIL 3

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



CODE COMPLIANT KEYWAY
WITH MINIMUM DIMENSIONS:

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

NOTES:

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

2. SEE DETAIL 2 FOR DRAIN SPECIFICATIONS

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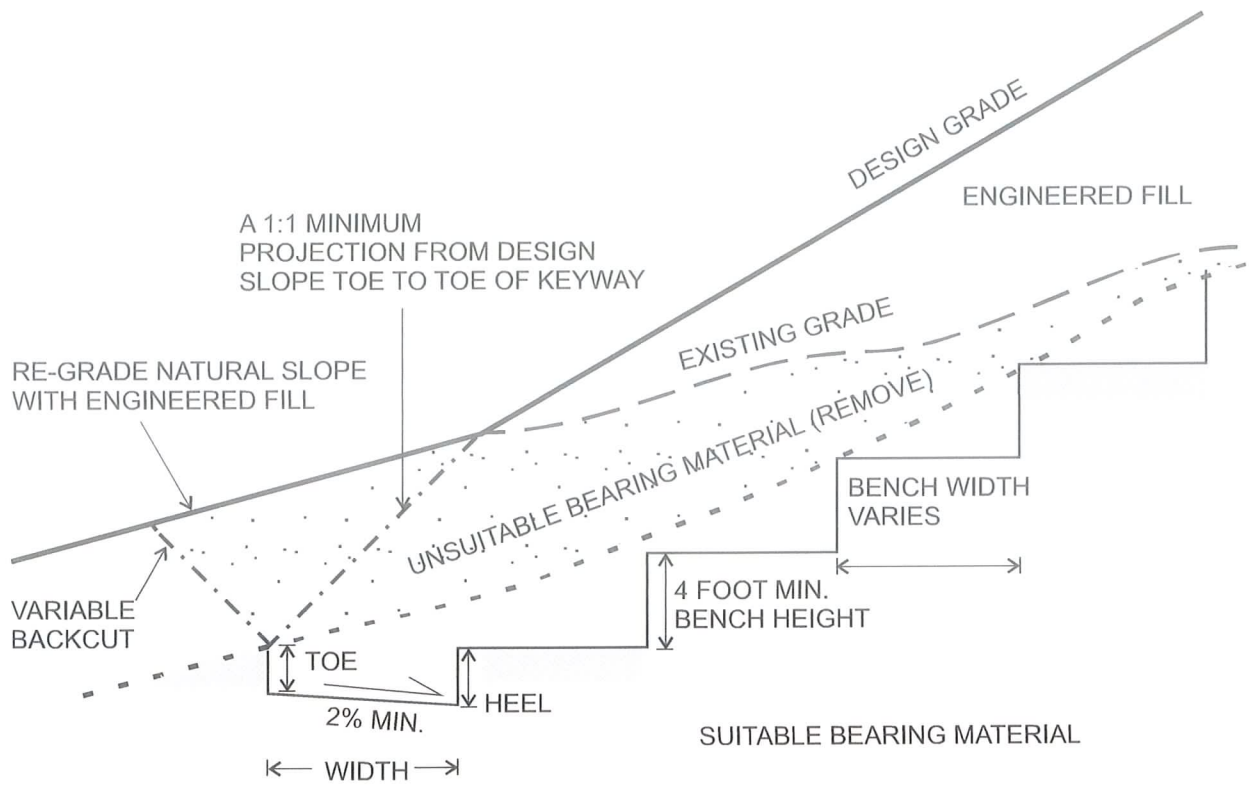
AGS
ADVANCED GEOTECHNICAL SOLUTIONS

FILL OVER CUT SLOPE

DETAIL 4



CODE COMPLIANT KEYWAY
WITH MINIMUM DIMENSIONS:

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

NOTES:

1. WHEN THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN GRADE SLOPE RATIO, SPECIAL RECOMMENDATIONS ARE NECESSARY BY THE GEOTECHNICAL CONSULTANT
2. THE GEOTECHNICAL CONSULTANT WILL DETERMINE THE REQUIREMENT FOR AND LOCATION OF SUBSURFACE DRAINAGE SYSTEMS.
3. MAINTAIN MINIMUM 15 FOOT HORIZONTAL WIDTH FROM FACE OF SLOPE TO BENCH/BACKCUT

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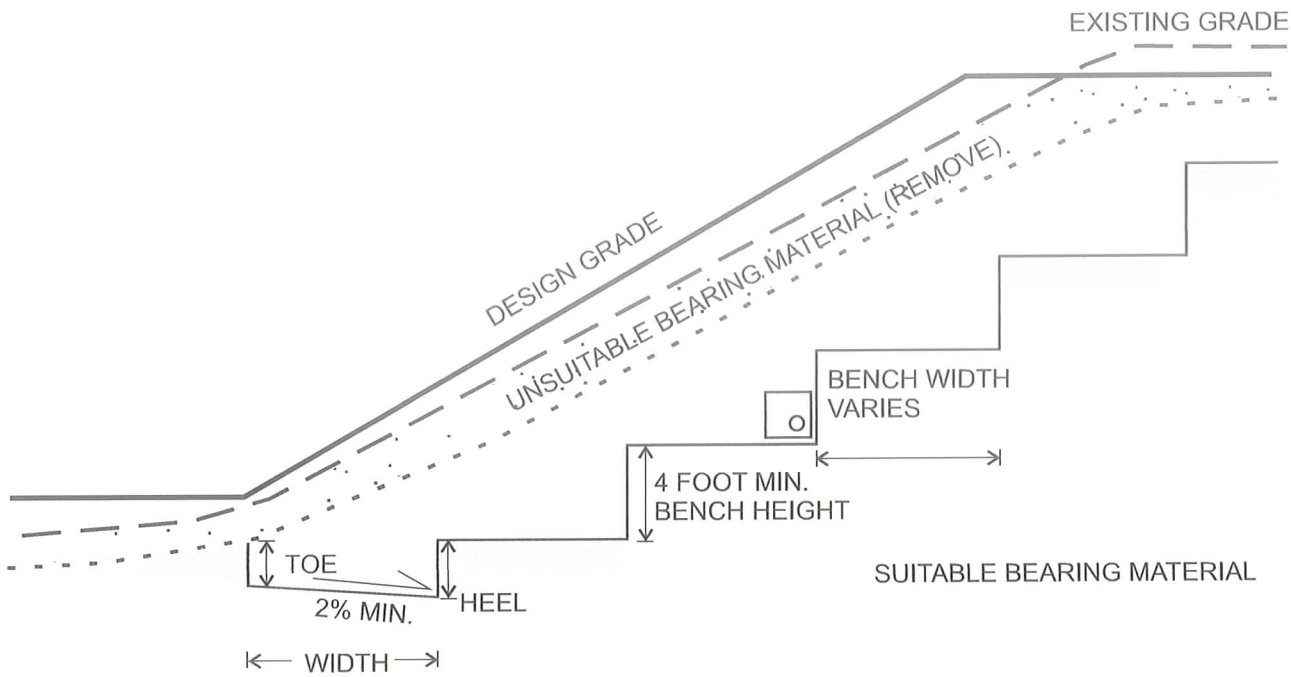
AGS
ADVANCED GEOTECHNICAL SOLUTIONS

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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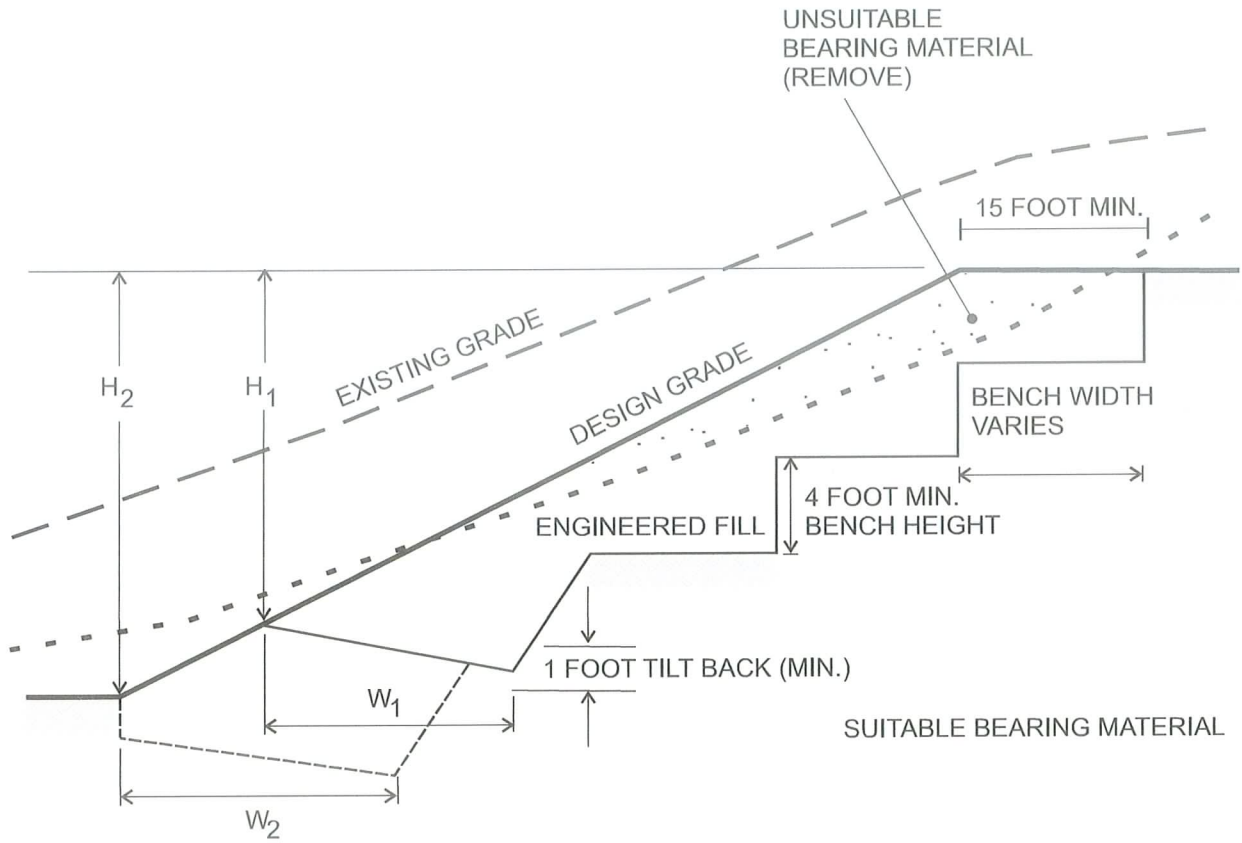
AGS ADVANCED GEOTECHNICAL SOLUTIONS	SKIN FILL CONDITION	DETAIL 6



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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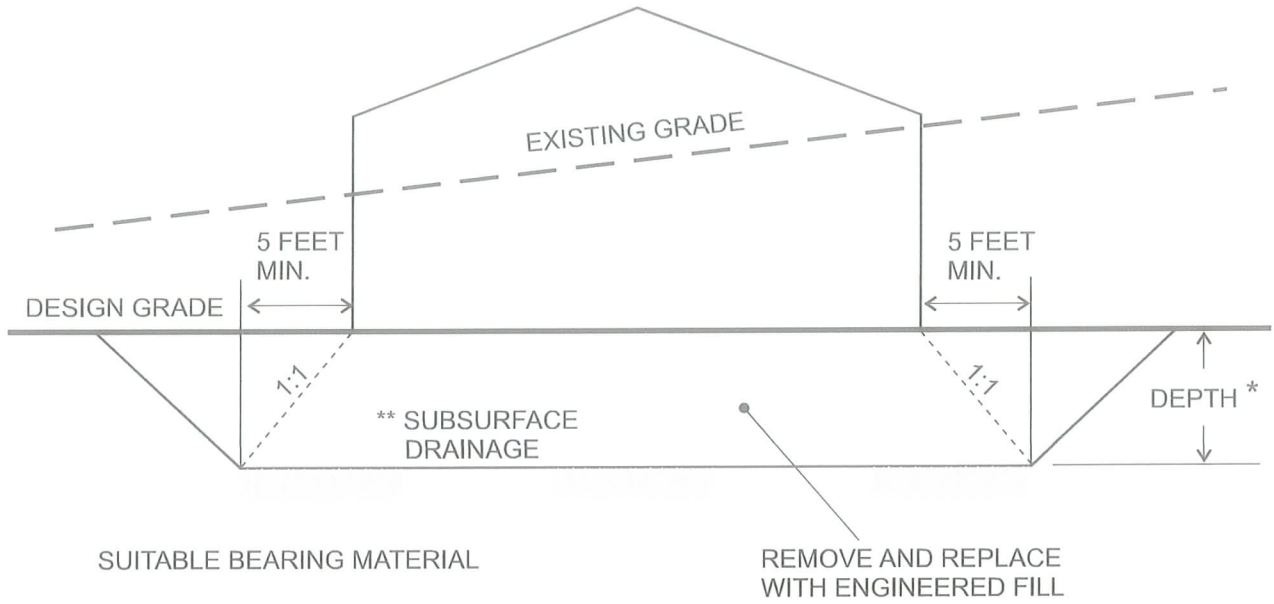
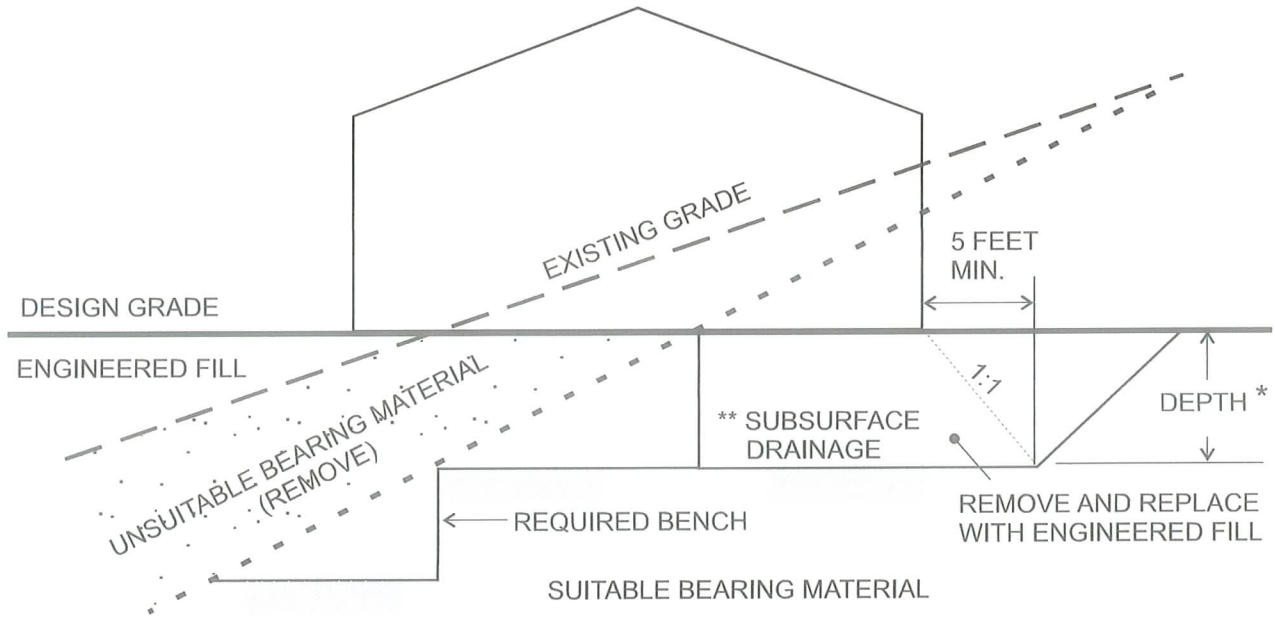
AGS
ADVANCED GEOTECHNICAL SOLUTIONS

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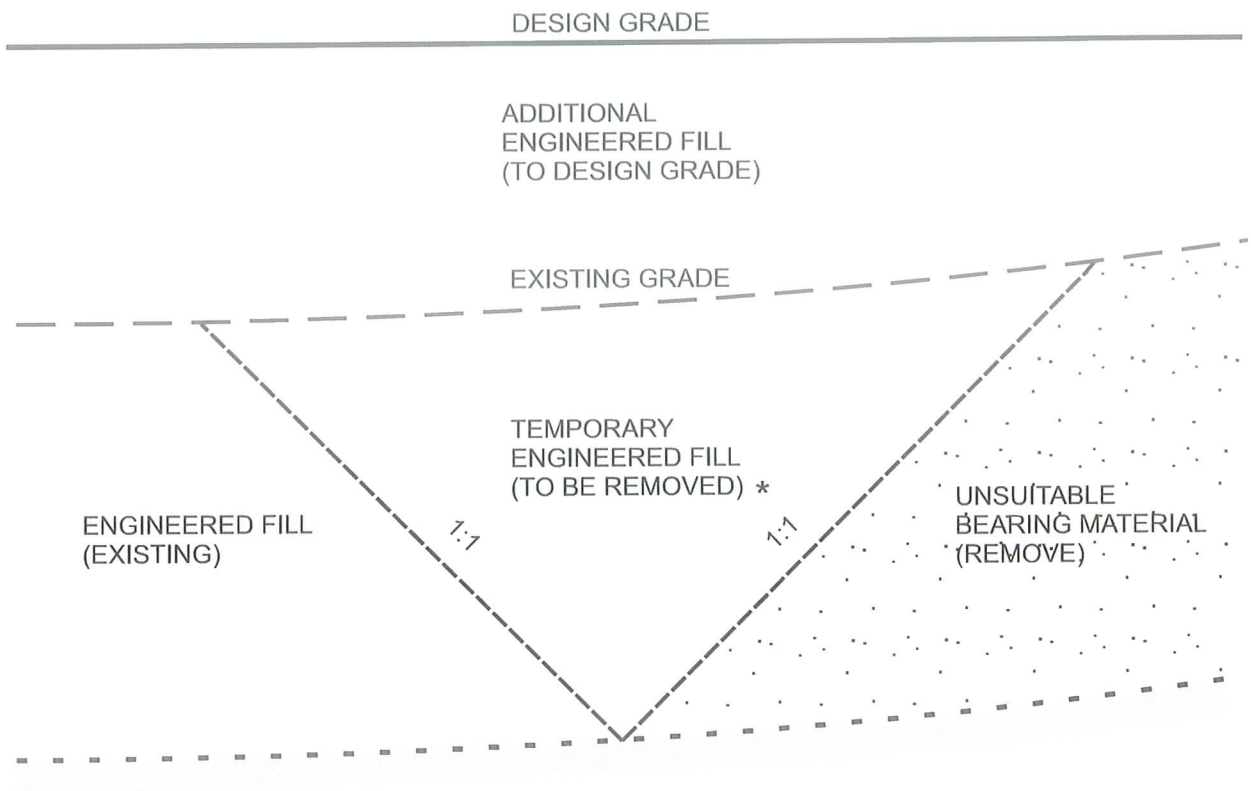
AGS ADVANCED GEOTECHNICAL SOLUTIONS	CUT & CUT-FILL LOT OVEREXCAVATION	DETAIL 8



* 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

HARLEY KNOX BLVD.

NANCE STREET

MARKHAM STREET

PERRY STREET

RAMONA EXPRESSWAY

EVANS ROAD

PERRIS VALLEY STORM DRAIN

FUTURE RESIDENTIAL

FUTURE BASIN

FUTURE BASIN

afu

afu

afu

afu

afu$_L$

afu$_L$

afu$_L$

afu$_R$

afu$_R$

Qal
(Qvof)

Qal
(Qvof)

TA-1
0-4 Qal
4-11.5 Qvof
TD 11 1/2
NW/NC

TA-2
0-3 Qal
3-10 Qvof
TD-10
NW/NC

TA-3
0-12 Qal
12-13 Qvof
TD-14 1/2
NW/NC

TA-4
0-5 Qal
5-12 1/2 Qvof
NW/NC
TD-12 1/2

TA-5
0-11 1/2 Qal
GW@ 11 1/2
NC
TD-12

TA-6
0-12 Qal
GW@ 10'
NC
TD-12'

TA-7
0-12 1/2 Qal
GW@ 12 NC
TD-12 1/2

TA-8
0-12 1/2 Qal
12 1/2 Qvof
GW@ 15
NC
TD-16

TA-9
0-4 Qal
4-12' Qvof
TD 12

TA-10
0-3 Qal
3-5 Qvof
NW/NC
TD-5'

TA-11
0-3 Qal
3-7 1/2 Qvof
NW/NC
TD-7 1/2

TA-12
0-4 1/2 Qal
4 1/2-7 1/2 Qvof
NW/NC
TD-7 1/2

TA-13
0-6 Qal
6-10 1/2 Qvof
TD 10 1/2
NW/NC

B-6
B-17
TP-7
B-16
TP-6
B-15
B-7
TP-10
B-4

LEGEND

— —	GEOLOGIC CONTACT; DOTTED WHERE BURIED, QUERIED WHERE UNCERTAIN
Qal	MODERN ALLUVIUM
Qvof	VERY OLD FAN DEPOSITS
afu$_R$	ARTIFICIAL FILL, ROADWAY
afu$_L$	ARTIFICIAL FILL, LEVEE
afu	ARTIFICIAL FILL, UNDOCUMENTED
TA-1	APPROXIMATE LOCATION OF BACKHOE TEST PIT (THIS STUDY)
B-1	APPROXIMATE LOCATION OF EXPLORATORY BORING (LGC, 2004)
T-1	APPROXIMATE LOCATION OF BACKHOE TEST PIT (LGC, 2004)

N
W E
S

200 0 100 200 400 600

SCALE 1"= 200'

PLATE I- GEOTECHNICAL MAP

AGS ADVANCED GEOTECHNICAL SOLUTIONS, INC.
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Project: P/W 1204-05 | REPORT NO. 1204-05-B-2

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PREPARED FOR:
MISSION PACIFIC LAND COMPANY

STRATFORD RANCH
COMPOSITE EXHIBIT

DATE
4-3-12
DRAWN BY
JEK
SHEET 1 OF 1

May 01, 2012 at 4:13pm G:\Users\Jason Keller\Documents\KCI\MPLC\Stratford Ranch Industrial\DWG\Exhibit\Stratford Ranch Industrial Composite.dwg by Jason Keller on JASONKELLER-PC