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Stratford Ranch Associates, LLC
4100 Newport Place, Suite 790
Newport Beach, CA 92660

March 11, 2021
P/W 2012-05
Report No. 2012-05-B-2

Attention: **Jason Keller**

Subject: **Preliminary Geotechnical Investigation for Stratford Ranch East Project, Tentative Tract Map No. 38071, City of Perris, California**

Gentlepersons,

In accordance with your request, presented herein are the results of Advanced Geotechnical Solutions, Inc.'s (AGS) preliminary geotechnical investigation for the Stratford Ranch East project located in the City of Perris, California.

The purpose of this geotechnical investigation is to evaluate the proposed residential development relative to the site geologic and geotechnical conditions and provide conclusions and recommendations to aid in the design and construction of the project.

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

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.

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

PAUL J. DERISI, Vice President
CEG 2536, Reg. Exp. 5-31-21

Distribution: (1) Addressee

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ATTACHMENTS:

PRELIMINARY GEOTECHNICAL INVESTIGATION STRATFORD RANCH EAST - TENTATIVE TRACT MAP NO. 38071 CITY OF PERRIS, CALIFORNIA

1.0 INTRODUCTION

This study is aimed at providing geologic and geotechnical information and recommendations for the Stratford Ranch East residential development in the City of Perris relative to: 1) existing site subsurface and geologic conditions; 2) engineering characteristics of 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- Review pertinent published and unpublished geologic and geotechnical literature, maps, and aerial photographs readily available to this firm.
- Advance, log, and sample four borings and perform four borehole percolation tests onsite.
- Conduct laboratory testing of onsite soil samples obtained during the subsurface investigation.
- Prepare a geotechnical and geologic map depicting site conditions.
- Conduct a geotechnical engineering and geologic hazard analysis of the site.
- Evaluate groundwater conditions and the potential effects on construction.
- Provide a preliminary infiltration feasibility study for the site BMPs.
- Evaluate the potential for liquefaction, seismically induced settlement and/or lateral spreading at the site.
- 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 design parameters for foundation support on site 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 previous subsurface exploration by others, our field investigation, associated laboratory testing, review of referenced geologic maps, and our experience in the area. 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 L-shaped site encompasses approximately 45.8 acres and is bounded to the west by Evans Road, to the south by Ramona Expressway, to the east by Lake Perris Drive and to the north by the existing Cedanna neighborhood in the City of Perris, California as shown in Figure 1, Site Location Map. The site is relatively flat with approximate elevations ranging from 1462 feet above msl on the northeastern corner to 1451 msl in the southwestern corner. An approximately 4 to 5 ft. high embankment exists along the western boundary of the site. An ascending 7-foot high slope is located along the northerly boundary. The site is covered by grass and is currently vacant.

2.1. Proposed Development

Based on our review of the conceptual grading plan for Tentative Tract No. 38071 by KWC Engineers (Plate 1), the residential development will include 194 lots, which will be developed in two phases. 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 lots. In addition, the project includes two WQMP basins with variable depths ranging between 6 and 10 feet, utilities, driveways and associated improvements. The existing Department of Water Resources (DWR) drainage channel located on the southern boundary of the site is planned to be widened in the future. Cuts to 10 feet maximum depth and fills up to 4 feet are anticipated to develop the site.

3.0 FIELD AND LABORATORY INVESTIGATION

3.1. Previous Field Investigation

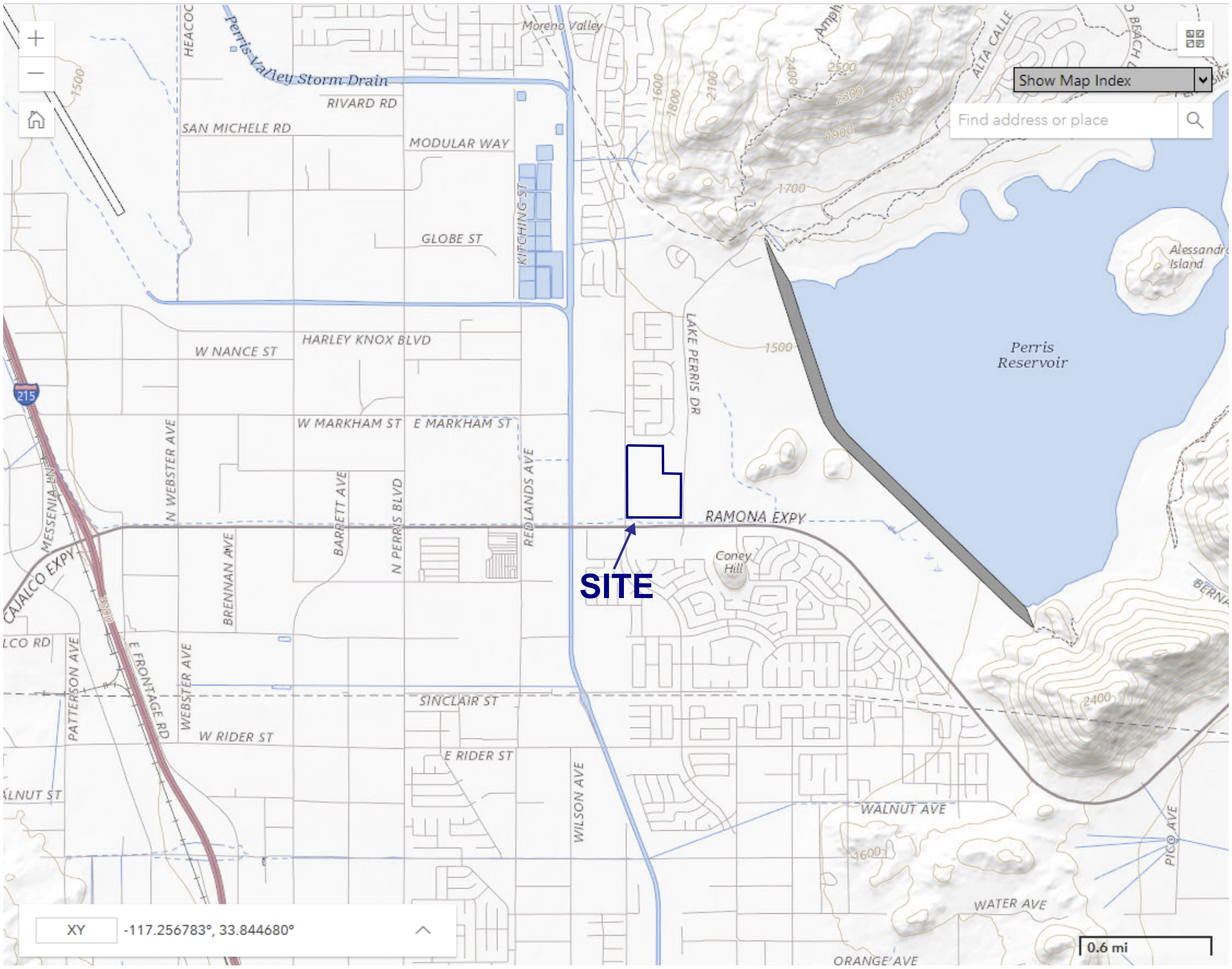
Previous geologic and geotechnical studies have been performed near and at the site by Lawson Geotechnical Consulting Inc. (2004), Geotechnical Professional, Inc. (2007) and AGS (2012, 2013 and 2020). Pertinent information from borings B-2, B-3 and B-20 and test pit TP-9 (LGC, 2004) which extended to variable depths ranging from 6 feet to 51.5 feet is presented in Appendix B. Laboratory test results by LGC are presented in Appendix C.

3.2. Field Investigation

AGS conducted subsurface exploration at the subject site on February 4, 2021. Four exploratory borings (BA-1 through BA-4) were advanced to an approximate depth of 26.5 ft. The borings were logged by our geotechnical engineer. The approximate locations of the exploratory borings are shown on Plate 1, Geologic Map and Exploration Location Plan. Boring logs are presented in Appendix B.

3.3. Laboratory Testing

Bulk and relatively undisturbed soil samples were obtained for laboratory testing at selected depths or where lithologic changes were encountered in the excavations. Samples were tested for in-situ density and moisture content, fines content, hydrometer analysis, Atterberg limits, expansion index, maximum dry density and optimum moisture content, direct shear and chemical/resistivity analyses. Results of the associated laboratory testing are presented in Appendix C.



SCALE: 1 in. = 4000 ft.

SITE LOCATION MAP
STRATFORD RANCH EAST
CITY OF PERRIS, CALIFORNIA

FIGURE 1

SOURCE MAP - Perris U.S.G.S. Topo Map

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3.4. Borehole Percolation Tests

As part of our subsurface exploration, on February 4, 2021, a total of four 8-inch diameter boreholes (P-1 through P-4) were advanced to variable depths ranging between 7.75 and 9.5 feet at the locations of the proposed WQMP basins. Borehole percolation tests were performed to evaluate the feasibility of storm water infiltration on the site and provide preliminary design infiltration rates in general conformance with Riverside County BMP Design Handbook (2011) Appendix A procedures. Exploratory logs and results of percolation testing are presented in Appendix D - Preliminary Infiltration Feasibility Study.

4.0 ENGINEERING GEOLOGY AND SUBSURFACE CONDITIONS

4.1. Regional Geologic Setting

The subject site is situated within the Peninsular Ranges Geomorphic Province. The Peninsular Ranges province occupies the southwestern portion of California and extends southward to the southern tip of Baja California. In general, the province consists of steeply sloped, northwest trending mountain ranges composed of metamorphosed Late Jurassic to Early Cretaceous-age volcanic rock and Cretaceous-age plutonic rock of the Peninsular Ranges Batholith. The materials within the project area are characterized by Pliocene - Pleistocene alluvium with thickness ranging from 20 feet to 200 feet. The alluvial deposits are underlain by the Perris Block which is a large mass of granitic rock bounded on the west by the Elsinore Trough, on the east and northeast by the San Jacinto Fault Zone including the San Jacinto Valley graben, on the north by the Cucamonga Fault Zone, in the San Bernardino Valley and San Jose Hills Fault in the Pomona Valley and on the south by the San Felipe Fault Zone. The regional geology is presented in Figure 2, Regional Geologic Map.

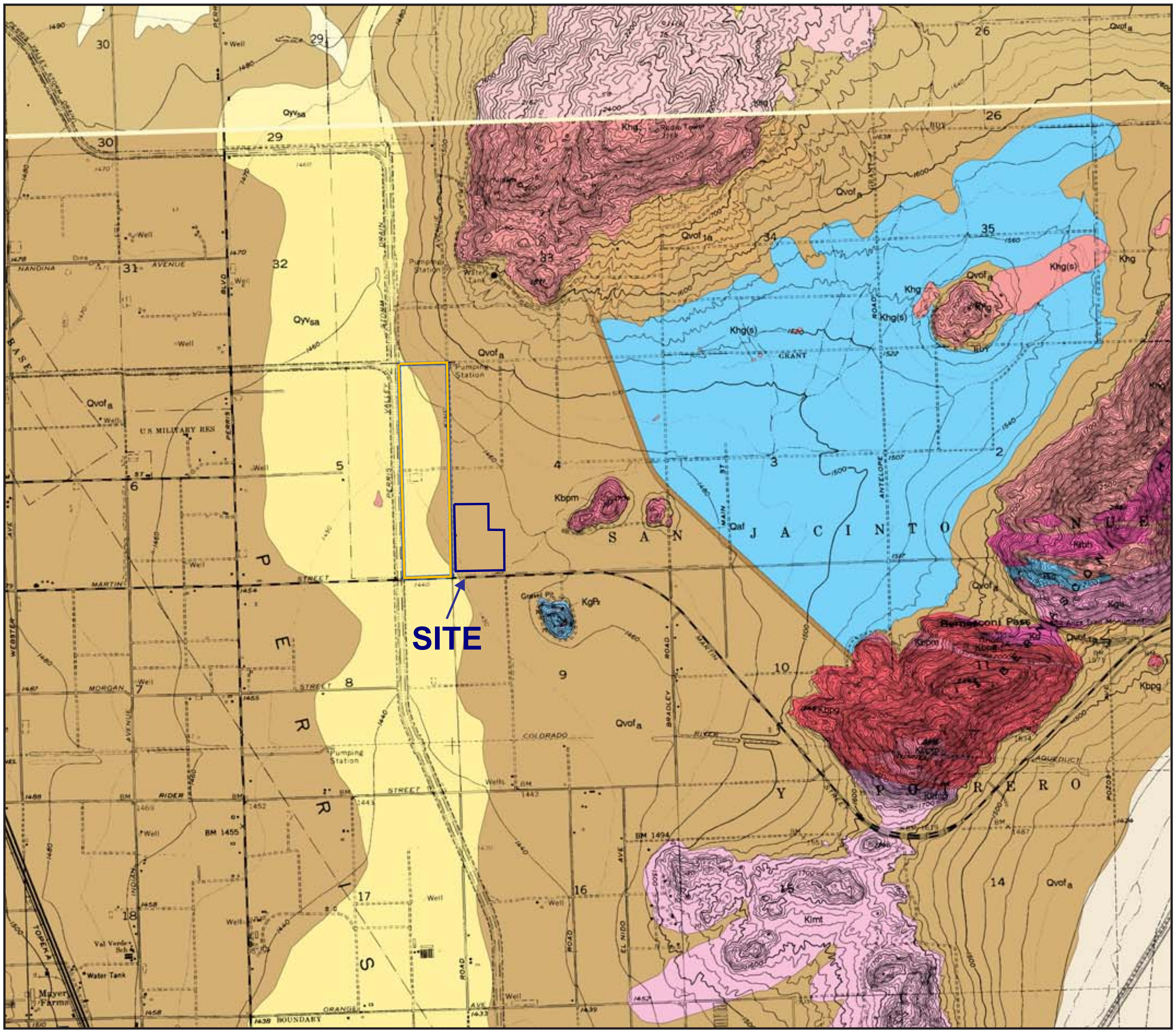
The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest-southeast. Several of these faults, which are shown on Figure 3, Fault Location Map are considered active including the San Jacinto and San Andreas faults located northeast of the project area, and the Elsinore fault located southwest of the project area. Major tectonic activity associated with these and other faults within this regional tectonic framework consists of strike-slip thrust and reverse movement.

4.2. Site Geology

Based on our site reconnaissance, subsurface excavations, and review of the referenced geologic maps (Morton, D. M. 2003, 2005), the site is mantled by topsoil/alluvium underlain by very old alluvial-fan deposits consisting of well-dissected, well-indurated, reddish brown sand deposits (see Figure 2, Regional Geologic Map). A brief description of the earth materials encountered onsite is presented in the following sections. More detailed description of these materials is provided in the boring logs included in Appendix B.

4.2.1. Topsoil/Young Alluvial-Valley Deposits (Map Symbol Qyv)

The surficial soils consist of topsoil/alluvium classified as light gray to light red brown silty sand to sandy silt that is damp to moist and loose to medium dense. During this investigation the topsoil/alluvium was observed to be three (3) to six (6) feet thick with roots in the upper 6 inches.



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REGIONAL GEOLOGIC MAP
STRATFORD RANCH EAST
CITY OF PERRIS, CALIFORNIA

SCALE: 1 in. = 4000 ft.

LEGEND

Qyv	YOUNG ALLUVIAL-VALLEY DEPOSITS
Qvof	VERY OLD ALLUVIAL-FAN DEPOSITS

FIGURE 2

SOURCE MAP: GEOLOGY OF THE PERRIS AND SUNNYMEAD 7.5 MINUTE QUADRANGLES

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4.2.2. Very Old Alluvial-Fan Deposits (Map Symbol Qvof)

Very old alluvial-fan deposits underlie the topsoil/alluvium onsite. 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 red brown, moist to saturated, medium dense to very dense and very stiff to hard and extends to the depths explored.

4.2.3. Granitic Bedrock

Highly weathered granitic bedrock materials were encountered below the alluvial deposits in borings B-2 and B-3 by LGC (2004) at approximate depths of 36 feet and 50 feet, respectively. These materials consisted of gray black, moist very dense, silty sand with gravel and became less weathered at depth. Granitic bedrock is also present in outcrops to the west of the site.

4.3. Groundwater

Groundwater was encountered in borings BA-1 through BA-4 as described below.

TABLE 4.3
GROUNDWATER LEVEL - FEBRUARY 5, 2021

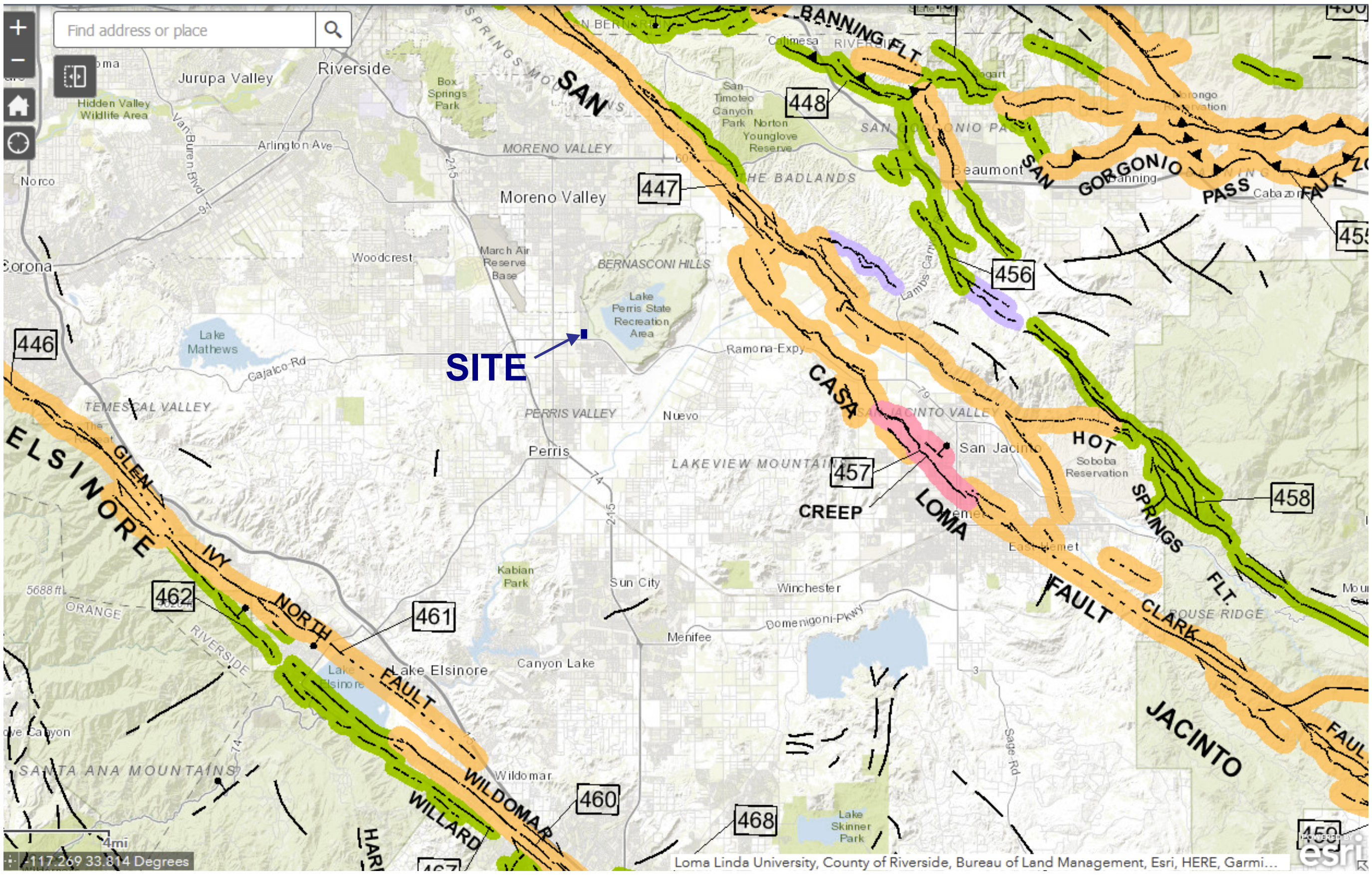
Boring No.	Approximate Surface Elevation (ft, msl)	Depth to Groundwater (ft)	Groundwater Elevation (ft, msl)
BA-1	1456.5	14.0	1442.5
BA-2	1453.3	9.3	1443.8
BA-3	1456.0	10.0	1446.0
BA-4	1458.8	11.8	1447.0

Groundwater was previously observed in test pits and borings excavated by LGC (2004) at variable depths ranging between 15 and 24.8 feet. It is likely that groundwater conditions vary across the site due to stratigraphic and hydrologic conditions related to Lake Perris pool elevation. Groundwater levels may change over time as a consequence of seasonal or meteorological fluctuations and human activities at this and nearby sites.

4.4. Seismic Hazards

The subject site is not located within a State of California Earthquake Fault Zone (formerly known as an Alquist-Priolo Special Studies Zone, Hart and Bryant, 1997). However, the site is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed structure. The nearest known active faults correspond to the San Jacinto fault located 7.4 miles northeast, the Elsinore fault located 14.8 miles southwest and the San Andreas fault located 18.7 miles northeast of the site (see Figure 3 - Fault Location Map).

The San Jacinto, Elsinore and San Andreas faults are active, seismogenic, strike-slip faults that mark the boundary of the Pacific and North American Plates. Principal seismic hazards from a strong earthquake event may include surface fault rupture and ground motion, liquefaction, landslides and seiches. A brief description of these and other hazards and the potential for their occurrence on site are discussed below.



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SCALE: 1 in. = 6 mi.

FAULT LOCATION MAP
STRATFORD RANCH EAST
CITY OF PERRIS, CALIFORNIA

FIGURE 3

SOURCE MAP: 2010 CALIFORNIA FAULT ACTIVITY MAP

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4.4.1. Surface Fault Rupture

Based on our review of the referenced literature and our site reconnaissance, no active faults are known to cross the project site. Therefore, the probability of damage from direct fault rupture is considered to be negligible. However, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

4.4.2. 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. At this point in time, non-critical structures (commercial, residential, and industrial) are designed according to 2019 California Building Code requirements and those of the controlling local agency.

4.4.3. Liquefaction and Dynamic Settlement

Liquefaction is the phenomenon where seismic agitation of loose, saturated sands and silty sands can result in a buildup of pore pressures that, if sufficient to overcome overburden stresses, can produce a temporary quick condition. Localized, loose lenses/layers of sandy soils may be subject to liquefaction when a large, prolonged, seismic event affects the site.

The site is identified as being within a zone with high liquefaction potential by the County of Riverside. Perched groundwater conditions were encountered during the recent investigation at depths as shallow as 9.3 feet below grade. Based on our recent and previous geotechnical studies onsite and the vicinity, site soils consist of moderately dense to dense silty sands to sands, very stiff clayey silts, with infrequent clean sands. Further, loose alluvial soils are relatively shallow. The underlying very old alluvial-fan deposits are considered to be non-liquefiable due to their age and dense nature.

Accordingly, based upon the proposed remedial grading measures, 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.

4.4.4. Landslides

Based on our review of the referenced geologic maps, literature, topographic maps, aerial photographs, and our subsurface evaluation, no landslides or related features underlie or are adjacent to the project sites. Due to the flat nature of the site and surrounding areas, the potential for lateral displacement or landslides at the project site is considered negligible.

4.4.5. Earthquake Induced Flooding

Earthquake induced flooding can be caused by tsunamis, dam failures, or seiches. 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. The site is located roughly 0.72 miles downstream of the Lake

Perris Dam and within the mapped inundation zone showing maximum inundation depths of between 10 to 20 feet. The dam has recently undergone a major seismic retrofit and has been designed to withstand a magnitude 7.5 earthquake. Accordingly, failure of the dam during a seismic event is considered unlikely. Considering the distance of the site from the coastline, the potential for flooding due to tsunamis is negligible.

4.5. Non-seismic Geologic Hazards

4.5.1. 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.

4.5.2. Flooding

According to FEMA flood mapping, the southwest portion of the site is located within Zone AE with Base Flood Elevation of 1,455.1 ft (msl).

4.5.3. Subsidence/Ground Fissuring

Due to the presence of the dense underlying alluvial fan materials, the potential for subsidence and ground fissuring due to settlement is low.

4.6. Seismic Design Parameters

Based on our subsurface exploration, the site may be classified as Seismic Site Class D consisting of a stiff soil profile. Site coordinates of Latitude 33.847°N and Longitude 117.205°W were utilized in conjunction with the SEAOC/OSHPD Seismic Design Maps web-based ground motion calculator (https://seismicmaps.org/) to obtain the seismic design parameters presented in Table 4.6. Seismic design parameters are in accordance with 2019 CBC mapped spectral acceleration parameters.

TABLE 4.6
2019 CBC SEISMIC DESIGN PARAMETERS

Seismic Site Class	D
Mapped Spectral Acceleration Parameter at Period of 0.2-Second, S_s	1.500g
Mapped Spectral Acceleration Parameter at Period 1-Second, S_1	0.598g
Site Coefficient, F_a	1.000
Site Coefficient, F_v	N/A[3]
Adjusted MCE_R[1] Spectral Response Acceleration Parameter at Short Period, S_{MS}	1.500g
1-Second Period Adjusted MCE_R[1] Spectral Response Acceleration Parameter, S_{M1}	N/A[3]
Short Period Design Spectral Response Acceleration Parameter, S_{DS}	1.000g
1-Second Period Design Spectral Response Acceleration Parameter, S_{D1}	N/A[3]
Peak Ground Acceleration, PGA_M[2]	0.595g
Seismic Design Category	N/A[3]

Notes: [1] Risk-Targeted Maximum Considered Earthquake
[2] Peak Ground Acceleration adjusted for site effects
[3] Requires Site Specific Ground Motion Hazard Analysis per ASCE 7-16 Section 11.4.8

As indicated above, a site specific ground motion hazard analysis is required per ASCE 7-16 Section 11.4.8 except if C_S is determined by Equation 12.8-2 for values of $T \leq 1.5T_S$ and taken as equal to 1.5 times the values computed with either Equation 12.8-3 for $T_L \geq T > 1.5Ts$ or Equation 12.8-4 for $T > T_L$.

5.0 GEOTECHNICAL ENGINEERING

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

5.1. Material Properties

5.1.1. Excavation Characteristics

It is anticipated that excavations within alluvium and very old alluvial-fan deposits can be accomplished with conventional grading equipment. Saturated materials may be encountered at an approximate depth of 9 feet.

5.1.2. Compressibility

The onsite materials that are compressible include topsoil/alluvium and the upper highly weathered portion of very old alluvial-fan deposits. Highly compressible materials will require removal from fill areas prior to placement of fill and where exposed at grade in cut areas..

5.1.3. Collapse Potential/Hydro-Consolidation

Given the removals proposed herein, the potential for hydro-consolidation is considered remote at the subject site.

5.1.4. 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 Appendix C, the expansion potential of 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 have “low” to “medium” expansion potential.

Foundation design recommendations presented in this report assume that as-graded soils could vary in expansion potential from “low” to “medium” Further testing should be conducted after grading completion to confirm or modify the design recommendations.

5.1.5. Earthwork Adjustments

The following average earthwork adjustment factors are presented in Table 5.1.5 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 5.1.5 EARTHWORK ADJUSTMENTS	
Geologic Unit	**Approximate Range**
Topsoil/Alluvium	Shrink 8 to 10 percent
Very Old Alluvial-Fan Deposits	Shrink 0 to 5 percent

5.1.6. Shear Strength

Shear strength parameters for compacted fill used by AGS for design are presented in Table 5.1.6.

TABLE 5.1.6 SHEAR STRENGTH USED FOR DESIGN			
Material	**Cohesion (psf)**	**Friction Angle (degrees)**	**Density (pcf)**
Artificial Fill - Compacted (afc)	175	28	120

5.1.7. Pavement Support Characteristics

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

5.2. Analytical Methods

5.2.1. 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.

5.2.2. 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.

6.0 GRADING RECOMMENDATIONS

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).

6.1. Site Preparation and Removals/Overexcavation

6.1.1. 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.

6.1.2. Disturbed Soils

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

6.1.3. Unsuitable Soil Removals

In areas to receive settlement sensitive improvements or structures, the topsoil/alluvium and upper weathered portion of the very old alluvial-fan deposits should be removed. It is anticipated that the upper 5 to 6 feet of onsite soils will require removal and recompaction. Localized areas may require deeper removals. Where possible the removals should extend a lateral distance of at least 5 feet beyond the limits of settlement sensitive improvements or structures.

Removal bottoms should expose competent very old alluvial-fan deposits in a firm and unyielding condition. The resulting removal bottoms should be observed by a representative of AGS to verify that adequate removal of unsuitable materials has been conducted prior to fill placement. In general, soils removed during remedial grading will be suitable for reuse in compacted fills, provided they are properly moisture conditioned and do not contain deleterious materials. Grading shall be accomplished under the observation and testing of the project soils engineer and engineering geologist or their authorized representative in accordance with the recommendations contained herein.

6.1.4. Overexcavation

It is recommended that cut lots and cut-fill transition lots created after removal activities be overexcavated to provide a minimum of three (3) feet of compacted engineered fill below pad grades, or two (2) feet below foundations, whichever is deeper. Streets should be overexcavated to provide a minimum of 2 feet of compacted fill below the subgrade.

6.1.5. Seepage

Seepage, if 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.

6.2. <u>Earthwork Considerations</u>

6.2.1. Compaction Standards

All loose and or deleterious soils should be removed to expose firm native soils. Prior to the placement of fill, the upper 6 to 8 inches of the removal bottom should be ripped, moisture conditioned to optimum moisture, and compacted to a minimum of 90 percent of the maximum dry density as determined by test method ASTM D1557.

Fill should be placed in thin (6 to 8-inch) lifts, moisture conditioned to optimum moisture and compacted to 90 percent of the maximum dry density (ASTM D1557) until the desired grade is achieved.

6.2.2. 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.

6.2.3. 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. Preparation of earth materials through mixing and moisture control should be accomplished prior to and as part of the compaction of each fill lift. Water trucks or other water delivery means may be necessary for moisture control. Discing may be required when either excessively dry or wet materials are encountered.

6.2.4. Haul Roads

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

6.2.5. 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. <u>Import soils should be tested and approved by the Geotechnical Consultant prior to importing.</u> At least three working days should be allowed in order for the geotechnical consultant to sample and test the potential import material.

6.2.6. 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.

6.3. <u>Fill Slope Construction</u>

Fill slopes shall be overfilled to an extent determined by the contractor, but not less than two (2) feet measured perpendicular to the slope face, so that when trimmed back to the compacted core, the required compaction is achieved. Compaction of each fill lift should extend out to the temporary slope face. Backrolling during mass filling at intervals not exceeding four (4) feet in height is recommended unless more extensive overfill is undertaken.

As an alternative to overfilling, fill slopes may be built to the finish slope face in accordance with the following recommendations:

- Compaction of each fill lift shall extend to the face of the slopes.
- Backrolling during mass grading shall be undertaken at intervals not exceeding four (4) feet in height. Backrolling at more frequent intervals may be required.
- Care should be taken to avoid spillage of loose materials down the face of the slopes during grading.
- At completion of mass filling, the slope surface shall be watered, shaped and compacted first with a sheepsfoot roller, then with a grid roller operated from a side boom Cat, or equivalent, such that compaction to project standards is achieved to the slope face.

Seeding and planting or protection 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 finished slope surface.

6.4. Slope Stability and Remediation

Based on our review of the tentative tract map, maximum slope heights to be created during this phase of grading are approximately 10 feet for the stormwater basin and 15 feet for the drainage channel widening. It is anticipated that the slopes will be graded at slope ratios of 2:1 (horizontal to vertical) or flatter.

6.4.1. Cut Slopes

The highest proposed cut slope associated with the channel grading is approximately 12 to 15 feet at a slope ratio of 2:1 (horizontal: vertical). According to our observation of adjacent channel cut slopes, AGS anticipates that the 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.

6.4.2. Fill Slopes

The highest fill slope has an approximate 10 feet in height at 2:1 (horizontal to vertical) inclination. 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 the 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 (H:V) or as recommended by the Geotechnical Consultant.

6.4.3. 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.

6.5. Utility Trench Excavation and Backfill

Utility trenches should be shored or laid back in accordance with applicable OSHA standards for Type C soil. Mainline and lateral utility trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557. Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable.

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.

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.

7.0 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 presented herein are based on the general soils conditions encountered during the recent and referenced geotechnical investigations. As such, recommendations provided herein are considered preliminary and subject to change based on the results of additional observation and testing that will occur during grading operations. Final design recommendations should be provided in a final rough/precise grading report.

7.1. Foundation Design Criteria

Single-family residential structures can be supported on post-tensioned or conventional slab-on-grade foundation systems. The expansion potential of the underlying soils is anticipated to range from “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 = 1 inch Differential = ½ 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.

7.1.1. Conventional Foundation Design Criteria

According to the onsite soil conditions and information supplied by the 2019 CBC, conventional foundation systems should be designed in accordance with Section 7.1 and Table 7.1.1 below.

TABLE 7.1.1
CONVENTIONAL SLAB DESIGN RECOMMENDATIONS

Expansion Potential	Very Low to Low	Medium
Soil Category	**I**	**II**
Footing Depth Below Lowest Adjacent Finish Grade		
One-Story	12 inches	18 inches
Two-Story	12 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 and 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.		

7.1.2. Post Tensioned Foundation Design

Post-tensioned foundations may be designed using the values provided in Table 7.1.2. Design and construction of post-tensioned foundations should be undertaken by firms experienced in the field. It is the responsibility of the foundation design engineer to select the design methodology and properly design the foundation system for the onsite soils conditions. The slab designer should provide deflection potential to the project architect/structural engineer for incorporation into the design of the structure.

Post-tensioned slabs should incorporate a perimeter-thickened edge to reduce the potential for moisture infiltration, seasonal moisture fluctuation and associated differential movement around the slab perimeter. The depth of the thickened edge could vary from 12-inches for "low" expansion and 18-inches for "medium" expansion potential.

TABLE 7.1.2
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	"Very Low" to "Low"	12	5.4	0.54	9.0	-0.23
II	"Medium"	18	4.6	0.90	9.0	-0.38

Moisture Barrier	An approved moisture and vapor barrier, per the post-tensioned slab designer, should be placed below all slabs-on-grade within living and moisture sensitive areas.	
Slab Subgrade Moisture (Presaturation)	Soil Category I	Minimum of 110 percent of optimum moisture to a depth of 12 inches prior to placing concrete
	Soil Category II	Minimum of 130 percent of optimum moisture to a depth of 12 inches prior to placing concrete
Footing Embedment*	Depth of embedment should be measured below lowest adjacent finish grade. **Footings Adjacent to Swales and Slopes:** If exterior footings adjacent to drainage swales are to exist within 5 feet horizontally of the swale, the footing should be embedded sufficiently to assure embedment below the swale bottom is maintained. Footings adjacent to slopes should be embedded such that at least 5 feet is provided horizontally from edge of the footing to the face of the slope.	

Note: **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. <u>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.</u>

7.2. 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.

Additionally, some fertilizers have been known to leach sulfates into soils and increase the sulfate concentrations to potentially detrimental levels. It is incumbent upon the owner to determine whether additional protective measures are warranted to mitigate the potential for increased sulfate concentrations to onsite soils as a result of the future homeowner's actions.

7.3. Corrosion

Laboratory testing was performed on representative samples of onsite soils to evaluate pH, electrical resistivity, chloride and sulfate contents. The results of corrosivity testing indicated electrical resistivity values of 1,100 and 2,400 ohm-cm, soil pH of 7.2 and 7.3, chloride content of 163 and 94 parts per million (ppm), and sulfate content of 0.02 percent (i.e., 202 and 226 ppm). Based on Caltrans (2018) corrosion criteria, the onsite soils would not be classified as corrosive, which is defined as soils with more than 500 ppm chlorides, more than 0.2 percent sulfates, or pH less than 5.5. Laboratory test results are presented in Appendix C.

Onsite soils are expected to be moderately corrosive to buried metallic materials. Metallic piping proposed should be protected with a suitable corrosion inhibiting material (foam, plastic sleeve, tape, or similar products) and non-aggressive backfill (sand) soils should be placed around all metallic pipe. Additional recommendations may be provided by a corrosion engineer.

7.4. Concrete Design

Test results from this and previous investigations indicate that the soil sulfate concentration are less than 0.10% by dry weight, which corresponds to Class S0 sulfate exposure when classified in accordance with ACI 318-14 Table 19.3.1.1. Based on the potential use of fertilizers, we recommend that Type II/V cement be used for concrete in contact with onsite soils. Final determination will be based on testing of near surface soils obtained at the conclusion of grading.

7.5. Exterior Flatwork

7.5.1. Subgrade Compaction

The subgrade below exterior slabs, sidewalks, driveways, patios, etc. should be compacted to minimum 90 percent relative compaction as determined by ASTM D1557.

7.5.2. Subgrade Moisture

The subgrade below exterior slabs, sidewalks, driveways, patios, etc. should be moisture conditioned to a minimum of optimum moisture content prior to concrete placement.

7.5.3. Slab Thickness

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

7.5.4. Control Joints

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

7.5.5. Flatwork Reinforcement

Consideration should be given to reinforcing any exterior flatwork.

7.5.6. Thickened Edge

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

7.6. 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.

7.6.1. Asphalt Concrete Pavement

Presented below are preliminary pavement sections for a range of traffic indices using an assumed Resistance-Value of 25 for compacted native 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 Perris.

TABLE 7.6.1
PRELIMINARY ASPHALT CONCRETE PAVEMENT RECOMMENDATIONS

Traffic Index	Assumed R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
5.0	25	3	6.5
6.0	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. Aggregate base should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557 and should conform with the specifications listed in Section 26 of the Standard Specifications for the State of California Department of Transportation (Caltrans) or Section 200-2 of the Standard Specifications for Public Works Construction (Green Book). The asphalt concrete should conform to Section 26 of the Caltrans Standard Specifications or Section 203-6 of the Green Book.

7.6.2. 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 7.6.2
PORTLAND CEMENT CONCRETE PAVEMENT

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

Notes: k = Modulus of subgrade reaction; ADDT = Average daily truck traffic;
MR = Flexural strength of concrete (Modulus of Rupture);
MR = 550 psi correlates to concrete with compressive strength f'c= 3,000 psi.;
MR = 600 psi correlates to f'c= 3,600 psi; MR = 650 psi correlates to f'c= 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.

8.0 SLOPE AND LOT MAINTENANCE

Maintenance of improvements is essential to the long-term performance of structures and slopes. The homeowners must implement certain maintenance procedures as described below.

8.1. Slope Planting

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

8.2. Lot Drainage

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

8.3. Burrowing Animals

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

9.0 FUTURE STUDY NEEDS

9.1. Geotechnical Review

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

9.2. 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. 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. 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 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.

APPENDIX A

REFERENCES

APPENDIX A
REFERENCES

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APPENDIX B

SUBSURFACE EXPLORATION (AGS, LGC)

APPENDIX B
SUBSURFACE EXPLORATION

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer free-falling from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound hammer, in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

AGS ADVANCED GEOTECHNICAL SOLUTIONS, INC.

BORING NUMBER BA-1

CLIENT Stratford Ranch Investors, LLC
PROJECT NAME Stratford Ranch East - Tentative Tract No. 38071
PROJECT NUMBER 2012-05
PROJECT LOCATION City of Perris, California
DATE STARTED 2/4/21 **COMPLETED** 2/4/21
GROUND ELEVATION 1456.5 ft **HOLE SIZE** 8
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
∇ **AT TIME OF DRILLING** 14.00 ft / Elev 1442.50 ft
LOGGED BY AB **CHECKED BY** PJD
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Topsoil/Alluvium** Silty SAND, light red brown, moist. fine-grained, loose to medium dense, roots to 6" depth. @1 ft., light yellowish brown, damp, medium dense										
				MC	16-50/6"	126	7.4	59	EI MAX RM DS				37
		ML	**Older Alluvial Fan Deposits (Qvof)** Sandy SILT to Silty SAND, red brown, moist, very dense, trace coarse sand.	BU									52
5		SC	Clayey SAND, fine- to medium-grained, moist, dense, trace gravel, few manganese and calcium carbonate nodules.	SPT	11-15-21 (36)								
10			@10 ft., wet, medium dense	MC	11-16-22 (38)	126	8.5	67					
		∇	@14 ft., groundwater										
15				SPT	5-8-10 (18)								
20		SM	Silty SAND, medium- to coarse-grained, grey brown, saturated, dense, few manganese nodules and quartz.	MC	22-26-34 (60)	128	8.3	71					
25		SC-SM	Silty to Clayey SAND, fine- to medium-grained, wet, dense, few manganese nodules, micaceous	SPT	8-11-16 (27)								

Terminated at 26.5 feet
Groundwater encountered at 14 ft. during drilling.

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

BORING NUMBER BA-2

CLIENT Stratford Ranch Investors, LLC
PROJECT NAME Stratford Ranch East - Tentative Tract No. 38071
PROJECT NUMBER 2012-05
PROJECT LOCATION City of Perris, California
DATE STARTED 2/4/21 **COMPLETED** 2/4/21
GROUND ELEVATION 1453.3 ft **HOLE SIZE** 8
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
▽ **AT TIME OF DRILLING** 14.00 ft / Elev 1439.30 ft
LOGGED BY AB **CHECKED BY** PJD
▼ **AT END OF DRILLING** 9.50 ft / Elev 1443.80 ft
NOTES
▼ **AFTER DRILLING** 9.32 ft / Elev 1443.98 ft

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		ML	**Topsoil/Alluvium** Sandy SILT to Silty SAND, light red brown, moist. fine-grained, loose to medium dense, roots to 6" depth. @2 ft., light yellowish brown, damp, medium dense										
4		ML	**Older Alluvial Fan Deposits (Qvof)** Sandy SILT to Silty SAND, red brown, moist, very dense, trace clay and coarse sand.										
5				MC	14-26-36 (62)	119	8.9	58					59
9.5			▼										
10		CL	Sandy to Silty CLAY, red brown, fine- to medium-grained, wet, very stiff.	SPT	3-4-6 (10)				ATT	34	18	16	
14			▽ @14 ft., groundwater. @15 ft., saturated.										
15				MC	8-16-14 (30)	126	10.3	83					
20		SC-SM	Clayey to Silty SAND, fine- to medium-grained, wet, dense, few manganese and calcium carbonate nodules, micaceous.	SPT	7-10-13 (23)								
25		SC	Clayey SAND, fine- to medium-grained, wet, dense, manganese nodules, micaceous	MC	6-19-32 (51)	129	9.4	84					

Terminated at 26.5 feet
Groundwater encountered at 14 ft. during drilling and at 9.3 ft. after drilling.

BORING NUMBER BA-3

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT	Stratford Ranch Investors, LLC	**PROJECT NAME**	Stratford Ranch East - Tentative Tract No. 38071
PROJECT NUMBER	2012-05	**PROJECT LOCATION**	City of Perris, California
DATE STARTED	2/4/21 **COMPLETED** 2/4/21	**GROUND ELEVATION**	1456 ft **HOLE SIZE** 8
DRILLING CONTRACTOR	Baja Exploration	**GROUND WATER LEVELS:**	
DRILLING METHOD	Hollow Stem Auger	**AT TIME OF DRILLING**	12.00 ft / Elev 1444.00 ft
LOGGED BY	AB **CHECKED BY** PJD	**AT END OF DRILLING**	10.83 ft / Elev 1445.17 ft
NOTES		**AFTER DRILLING**	10.00 ft / Elev 1446.00 ft

DEPTH (ft)	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0	ML	**Topsoil/Alluvium** Silty SAND to Sandy SILT, light red brown, moist. fine-grained, loose to medium dense, roots to 6" depth. @1.0 ft., light red brown, damp.										
5	SM	**Old Alluvial-Fan Deposits (Qvof)** Silty SAND, yellow brown, moist, fine-grained, very dense; few gravel, manganese and calcium carbonate nodules, micaceous.	MC	12-34-50/5"	125	8.6	65	DS				25
	SC	Clayey SAND, fine-grained, with silt, wet, medium dense.										
10			SPT	5-7-12 (19)								
		@12.0 ft., saturated										
15		@15.0 ft., wet	MC	8-17-25 (42)	129	9.4	82					
20			SPT	8-13-14 (27)								49
	SM	Silty SAND, medium- to coarse-grained, grey brown, saturated, dense, few manganese nodules and quartz.										
25		@25 ft., very dense	MC	9-17-26 (43)	125	10.5	81					23

Terminated at 26.5 feet
Groundwater encountered at 12.0 ft. during drilling and at 10 ft. after drilling.

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

BORING NUMBER BA-4

CLIENT Stratford Ranch Investors, LLC
PROJECT NAME Stratford Ranch East - Tentative Tract No. 38071
PROJECT NUMBER 2012-05
PROJECT LOCATION City of Perris, California
DATE STARTED 2/4/21 **COMPLETED** 2/4/21
GROUND ELEVATION 1458.8 ft **HOLE SIZE** 8
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 12.00 ft / Elev 1446.80 ft
LOGGED BY AB **CHECKED BY** PJD
AT END OF DRILLING 12.00 ft / Elev 1446.80 ft
NOTES
AFTER DRILLING 11.80 ft / Elev 1447.00 ft

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Topsoil/Alluvium** Silty SAND, light gray to red brown, moist. fine-grained, loose to medium dense, roots to 6" depth. @2 ft., light red to yellow brown, damp.										
5				SPT	5-3-25 (28)								37
		SM	**Old Alluvial-Fan Deposits (Qvof)** Silty SAND, red brown, mottled black, moist, fine-grained, trace coarse-grained sand, dense; manganese and carbonate nodules, micaceous @9 ft., dark red brown, some clay.										
10		ML	Silty SAND to Sandy SILT, red brown, wet, fine-grained, dense @12.0 ft., groundwater.	MC	18-22-27 (49)	131	9.2	85					
15				SPT	3-7-11 (18)				HYDRO				51
			@18 ft., some clay.										
20			@20 ft., fine- to medium-grained, trace clay, saturated.	MC	11-15-18 (33)	125	11.5	90					
25			@25 ft., red to yellow brown, wet, very dense.	SPT	13-26-39 (65)								

Terminated at 26.5 feet
Groundwater encountered at 12.0 ft. during drilling and at 11.8 ft. after drilling.

BORING NUMBER P-1

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Stratford Ranch Investors, LLC
PROJECT NAME Stratford Ranch East - Tentative Tract No. 38071
PROJECT NUMBER 2012-05
PROJECT LOCATION City of Perris, California
DATE STARTED 2/4/21 **COMPLETED** 2/4/21
GROUND ELEVATION 1453.3 ft **HOLE SIZE** 8
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY AB **CHECKED BY** PJD
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Topsoil/Alluvium** Silty SAND, light red brown, moist. fine- to medium-grained, loose to medium dense, roots to 6" depth, few carbonate nodules, micaceous.										
		ML	**Older Alluvial Fan Deposits (Qvof)** Sandy SILT to Silty SAND, light red brown, damp, fine- to medium-grained, very dense, trace coarse sand.										
5													
		SC	Clayey SAND, fine- to medium-grained, trace gravel, few manganese and calcium carbonate nodules.										

Terminated at 7.75 feet
No groundwater encountered during drilling.
Placed gravel to 2 ft. from bottom, set slotted 3-inch PVC pipe and added gravel in annular space.

BORING NUMBER P-2

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Stratford Ranch Investors, LLC
PROJECT NAME Stratford Ranch East - Tentative Tract No. 38071
PROJECT NUMBER 2012-05
PROJECT LOCATION City of Perris, California
DATE STARTED 2/4/21 **COMPLETED** 2/4/21
GROUND ELEVATION 1453.3 ft **HOLE SIZE** 8
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY AB **CHECKED BY** PJD
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Topsoil/Alluvium** Silty SAND, light red brown, moist. fine- to medium-grained, loose to medium dense, roots to 6" depth, few carbonate nodules, micaceous.										
		ML	**Older Alluvial Fan Deposits (Qvof)** Sandy SILT to Silty SAND, light red brown, damp, fine- to medium-grained, very dense, trace coarse sand.										
5			@5 ft., same, trace coarse-grained sand.										
		SC	Clayey SAND, fine- to medium-grained, trace gravel.										

Terminated at 9.5 feet.
No groundwater encountered during drilling.
Placed gravel to 2 ft. from bottom, set slotted 3-inch PVC pipe and added gravel in annular space.

BORING NUMBER P-3

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Stratford Ranch Investors, LLC
PROJECT NAME Stratford Ranch East - Tentative Tract No. 38071
PROJECT NUMBER 2012-05
PROJECT LOCATION City of Perris, California
DATE STARTED 2/4/21 **COMPLETED** 2/4/21
GROUND ELEVATION 1458.8 ft **HOLE SIZE** 8
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY AB **CHECKED BY** PJD
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Topsoil/Alluvium** Silty SAND, light red brown, moist to wet. fine-grained, loose to medium dense, roots to 6" depth, few carbonate nodules, micaceous.										
		ML	**Older Alluvial Fan Deposits (Qvof)** Sandy SILT to Silty SAND, light red brown, moist, fine- to medium-grained, very dense, trace coarse sand.										
5		SC	Clayey SAND, red brown and grey brown, fine-grained, moist, medium dense, few manganese and calcium carbonate nodules.										
			@9 ft., fine- to medium-grained.										

Terminated at 9 feet.
No groundwater encountered during drilling.
Placed gravel to 2 ft. from bottom, set slotted 3-inch PVC pipe and added gravel in annular space.

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

BORING NUMBER P-4

CLIENT Stratford Ranch Investors, LLC
PROJECT NAME Stratford Ranch East - Tentative Tract No. 38071
PROJECT NUMBER 2012-05
PROJECT LOCATION City of Perris, California
DATE STARTED 2/4/21 **COMPLETED** 2/4/21
GROUND ELEVATION 1458.8 ft **HOLE SIZE** 8
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY AB **CHECKED BY** PJD
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Topsoil/Alluvium** Silty SAND, light red brown, moist to wet. fine-grained, loose to medium dense, roots to 6" depth, few carbonate nodules, micaceous.										
		ML	**Older Alluvial Fan Deposits (Qvof)** Sandy SILT to Silty SAND, light red brown, damp, fine- to medium-grained, very dense, trace coarse sand.										
5			@6 ft. light red brown and grey brown, damp, fine- to medium-grained, trace clay.										54
		SC	Clayey SAND, red brown and grey brown, fine-grained, moist, medium dense.										

Terminated at 9.17 feet.
No groundwater encountered during drilling.
Placed gravel to 2 ft. from bottom, set slotted 3-inch PVC pipe and added gravel in annular space.

Geotechnical Boring Log B-2

Date: April 30, 2004	Project Name: Sheffield - Perris — Page 1 of 2
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-2 0-2'			Qvof	***Older Alluvium:***	
					SC	Clayey SAND; reddish brown, moist, medium dense, fine to coarse sand.	
	2 4 7	R-1	118.8	3.4			
5	20 28 50	R-2	116.8	4.9		reddish brown, moist, very dense, fine to coarse sand.	
		Bag-3 5-9'					
10	10 26 27	R-3	124.0	6.7		porosity.	
15	5 9 15	R-4	119.3	6.5		medium dense.	
20	3 6 9	SPT-1		13.5		very moist.	
					¥	***Groundwater @ 24 Feet 9 Inches.***	
25	28 34 47	R-5	121.8	13.2	CL	Sandy Clay; yellowish brown, very moist, very stiff, lenses of clayey sand.	
30							

LGC INLAND

Geotechnical Boring Log B-2

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
30	4 6 10	SPT-2		17.3		wet.	
35	31 50/ 6"	R-6	126.7	9.4			
					SM	***Bedrock (Granitics)*** Silty SAND, gray black, moist, very dense, fine to coarse sand, fine to medium gravel, relic structure.	
40	20/ 1"	SPT-3		13.8			
45	50/ 4"	SPT-4		15.3			
						Refusal @ 46 Feet. ***Total Depth - 46 Feet.*** ***Groundwater @ 24 Feet 9 Inches.***	
50							
55							
60							

LGC INLAND

Geotechnical Boring Log B-3

Date: April 30, 2004	Project Name: Sheffield - Perris — Page 1 of 2
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-3 0-3'			Qvof SC	***Older Alluvium:*** Clayey SAND; reddish brown, moist, medium dense, fine to coarse sand.	
	15 15 30	R-1	120.6	12.8			
5	20 24 36	R-2	125.9	10.8		reddish brown, dense, fine to coarse sand.	
10	8 12 20	R-3	113.6	17.7		medium dense, moist.	
15	10 27 48	R-4	125.1	12.3	¥	***Groundwater @ 15 Feet.*** reddish brown, moist, dense, fine to medium sand, trace coarse sand.	
20	4 8 10	SPT-1		18.0		Higher SAND content; reddish brown, wet, medium dense, fine to coarse sand, trace silt.	
25	14 17 23	R-5	113.7	18.3	CL-ML	Sandy Clayey SILT; reddish brown, moist, very stiff, fine to medium sand, trace coarse sand.	
30							

LGC INLAND

Geotechnical Boring Log B-3

Date: April 30, 2004	Project Name: Sheffield - Perris — Page 2 of 2
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
30	6 10 14	SPT-2		13.8	SC	Clayey SAND; reddish brown, wet, medium dense, fine to coarse sand.	
35	8 14 22	R-6	118.8	15.6			
40	17 25 26	SPT-3		12.9		reddish brown, wet, very dense, fine to coarse sand.	
45	18 26 38	R-7	118.1	13.7		dense.	
50	15 25 32	SPT-4		14.7		***Bedrock (Granitics)*** weathered bedrock, relic structure.	
						Total Depth - 51½ Feet. ***Groundwater @ 15 Feet.***	
55							
60							

LGC INLAND

Geotechnical Boring Log B-20

Date: 6-18-04	Project Name: Sheffield - Perris Page 1 of 1
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

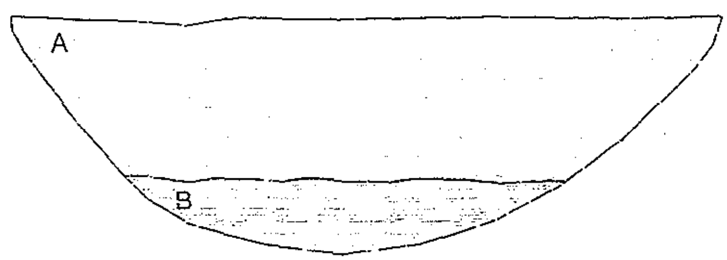
Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / ASTM Symbol	DESCRIPTION	Type of Test
0					Qvof	**Older Alluvium:**	
					SC	Clayey SAND; olive brown, slightly moist, very dense, fine to coarse sand, porosity caliche.	
	24 40 50/5.5"	R-1					
5	16 44 50/5"	R-2					
	19 31 40	R-3					
10	12 22 27	R-4			CL	Sandy CLAY; olive brown, moist, very stiff, fine to coarse sand, porosity, caliche.	
					¥	*Groundwater @ 18 Feet*	
15	4 8 13	S-1			SC	Clayey SAND; olive brown, moist, medium dense, fine to coarse sand.	
20	11 13 20	R-5				olive brown, wet, medium dense, fine to coarse sand.	
						Total Depth - 21.5 Feet	
						Groundwater @ 18 Feet	
25							
30							

LGC INLAND

Project Name: SHEFFIELD PERRIS	**Logged by:** AW	**LOG OF TEST PIT 9**
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)
		Older Alluvium:					
0-4'	A	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, fine to coarse sand with silt, porosity.	--	SC	-- --	--	--
--	--	--	--	--	-- --	--	--
--	--	Practical Refusal @ 6'	--	--	-- --	--	--
--			--	--	-- --	--	--

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



TOTAL DEPTH= 6.0FEET
NO GROUNDWATER
ENCOUNTERED

LGC

APPENDIX C

LABORATORY TEST RESULTS (AGS, LGC)

APPENDIX C
LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D2488. Soil classifications are indicated on the boring logs in Appendix B.

In-situ Moisture Content and Density Tests

The moisture content and dry density of selected driven samples obtained from the exploratory borings were evaluated in general accordance with ASTM D2937. The test results are presented on the boring logs in Appendix B.

Hydrometer Grain-Size Distribution

The grain-size distribution of a selected sample was evaluated by hydrometer. The test was performed in general accordance with ASTM D 7928. The results are presented on Figure C-1. The percentage of material finer than No. 200 sieve (75-µm) of soil samples is presented on the boring logs in Appendix B.

Atterberg Limits

Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with USCS. The test results and classification are shown on Figure C-2.

Expansion Index

The expansion index of selected materials was evaluated in general accordance with ASTM D4829. Specimens were molded under a specified compactive energy at approximately 50 percent saturation (±1 percent). The prepared 1-inch thick by 4-inch diameter specimens were loaded with a surcharge of 144 pounds per square foot and were inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The results of this test are presented on Figure C-3.

Maximum Dry Density-Optimum Moisture Content

The maximum dry density and optimum moisture content of a selected representative soil sample was evaluated using the Modified Proctor method in general accordance with ASTM D1557. The results of these tests are summarized on Figure C-4.

Direct Shear

Direct shear tests were performed on remolded samples in general accordance with ASTM D3080 to evaluate the shear strength characteristics. The samples were inundated during shearing to represent adverse field conditions. The test results are shown on Figure C-5.

Soil Corrosivity

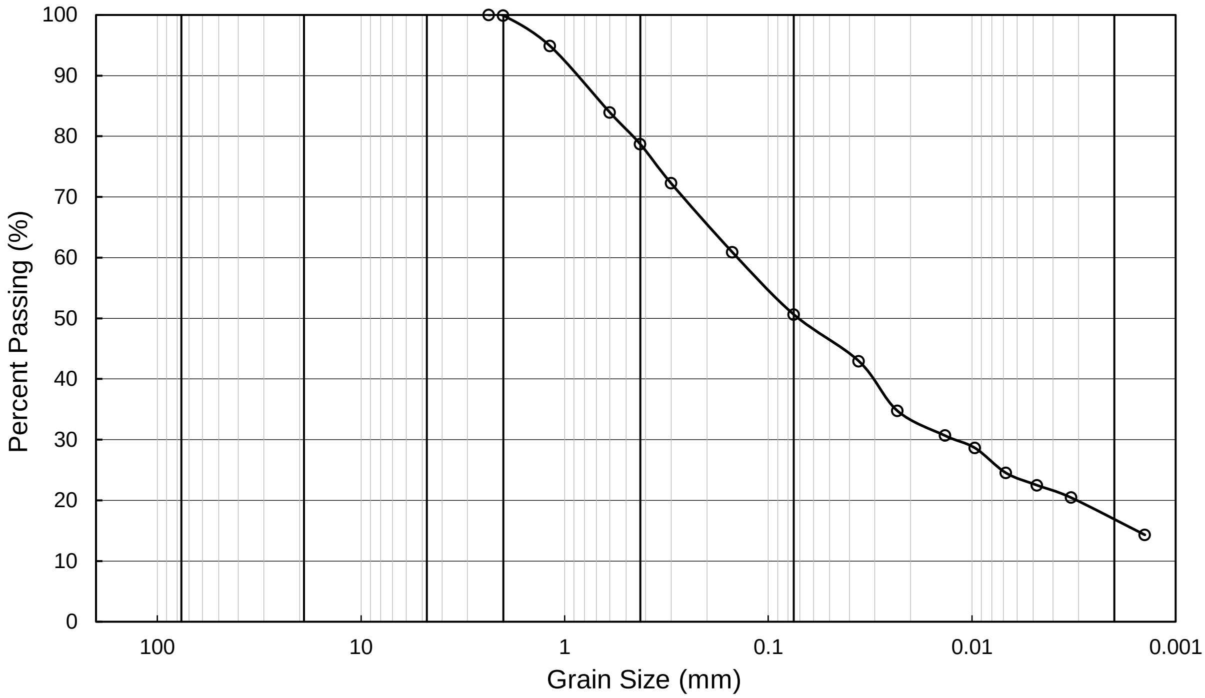
Soil pH, and resistivity tests were performed on a representative sample in general accordance with California Test (CT)643. The chloride content of a selected sample was evaluated in general accordance with CT422. The sulfate content of a selected sample was evaluated in general accordance with CT417. The test results are presented on Figure C-7.

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

PARTICLE SIZE ANALYSIS - ASTM D422

Project Name: Stratford Ranch East
Location: Perris
Project No.: 2012-05
Date: 2/15/2021

Excavation: BA-4
Depth: 15-16.5 ft
Tested by: FV
Checked by: AB



COBBLE	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	Coarse	Medium	Fine		

Grain Size (in/#)	Grain Size (mm)	Amount Passing (%)
3 "	76.20	100
2 1/2 "	63.50	100
2 "	50.80	100
1 1/2 "	38.10	100
1 "	25.40	100
3/4 "	19.05	100
1/2 "	12.70	100
3/8 "	9.53	100
# 4	4.75	100
# 8	2.36	100
#10	2.00	100
#16	1.18	95
# 30	0.60	83.9
# 40	0.425	78.7
# 50	0.30	72.3
# 100	0.15	60.9
# 200	0.075	50.6
Hydro	0.0359	42.9
Hydro	0.0232	34.8
Hydro	0.0136	30.7
Hydro	0.0097	28.6
Hydro	0.0068	24.5
Hydro	0.0048	22.5
Hydro	0.0033	20.4
Hydro	0.0014	14.3

Summary	
% Gravel =	0.0
% Sand =	49.4
% Fines =	50.6
Sum =	100.0

LL= ______
PL= ______
PI = ______

Soil Type: SM/ML

FIGURE C-1

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

AGS Form E-2

ATTERBERG LIMITS - ASTM D4318

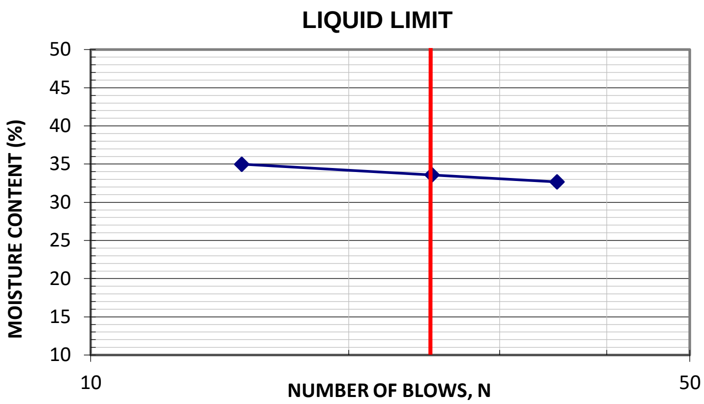
Project Name:	Stratford Ranch East	Excavation:	BA-2
Location:	Perris	Depth:	10-11.5 ft
Project No:	2012-05	Description:	CL
Date:	2/15/2021	By:	FV

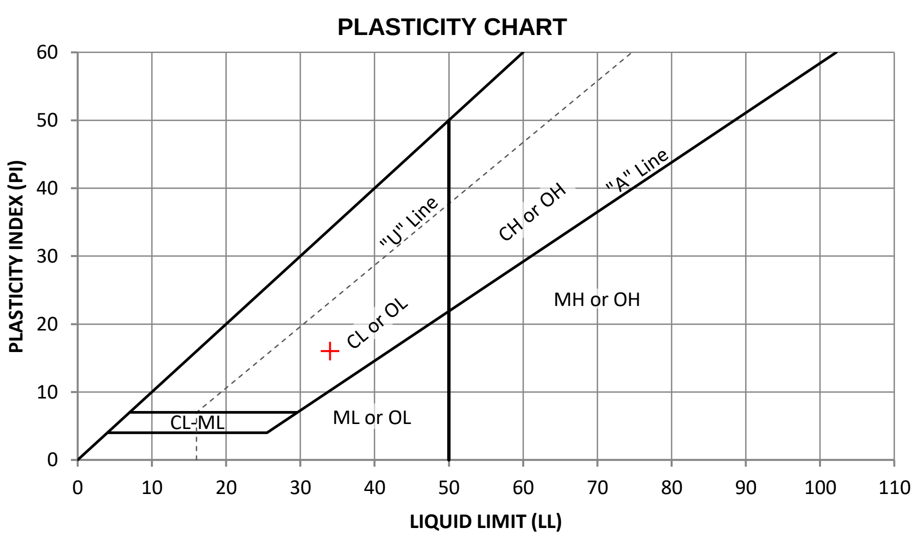
LIQUID LIMIT

Can No.	6	4	15
Wt. wet soil+can (g)	20.21	20.30	19.28
Wt. dry soil+can (g)	17.89	17.99	17.31
Wt. can (g)	11.26	11.11	11.28
Wt. mosture (g)	2.32	2.31	1.97
Wt. dry soil (g)	6.63	6.88	6.03
Water Content %	34.99	33.58	32.67
No. of Blows	15	25	35

PLASTIC LIMIT

109	111
64.44	65.69
62.45	63.48
51.56	51.43
1.99	2.21
10.89	12.05
18.27	18.34





Liquid Limit (LL) 34 Plastic Limit (PL) 18 Plasticity Index (PI) 16

2012-05-Atterberg_B-2_10-11.5 ft_02-15-2021_FV.xlsx

FIGURE C-2

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

EXPANSION INDEX - ASTM D4829

AGS FORM E-6

Project Name:	Stratford Ranch East	Excavation/Tract:	BA-1
Location:	Perris	Depth/Lot:	2.5-5.0 ft
P/W:	2012-05	Description:	SM/ML
Date:	2/16/21	Tested by:	FV
		Checked by:	AB

Expansion Index - ASTM D4829

Initial Dry Density (pcf):	118.2
Initial Moisture Content (%):	7.9
Initial Saturation (%):	50.1
Final Dry Density (pcf):	116.4
Final Moisture Content (%):	15.6
Final Saturation (%):	94.0
Expansion Index:	16
Potential Expansion:	Very Low

ASTM D4829 - Table 5.3

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

2012-05_EI_B-1_2.5-5.0 ft_02-16-2021_FV.xlsx

FIGURE C-3

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

MAXIMUM DENSITY - ASTM D1557

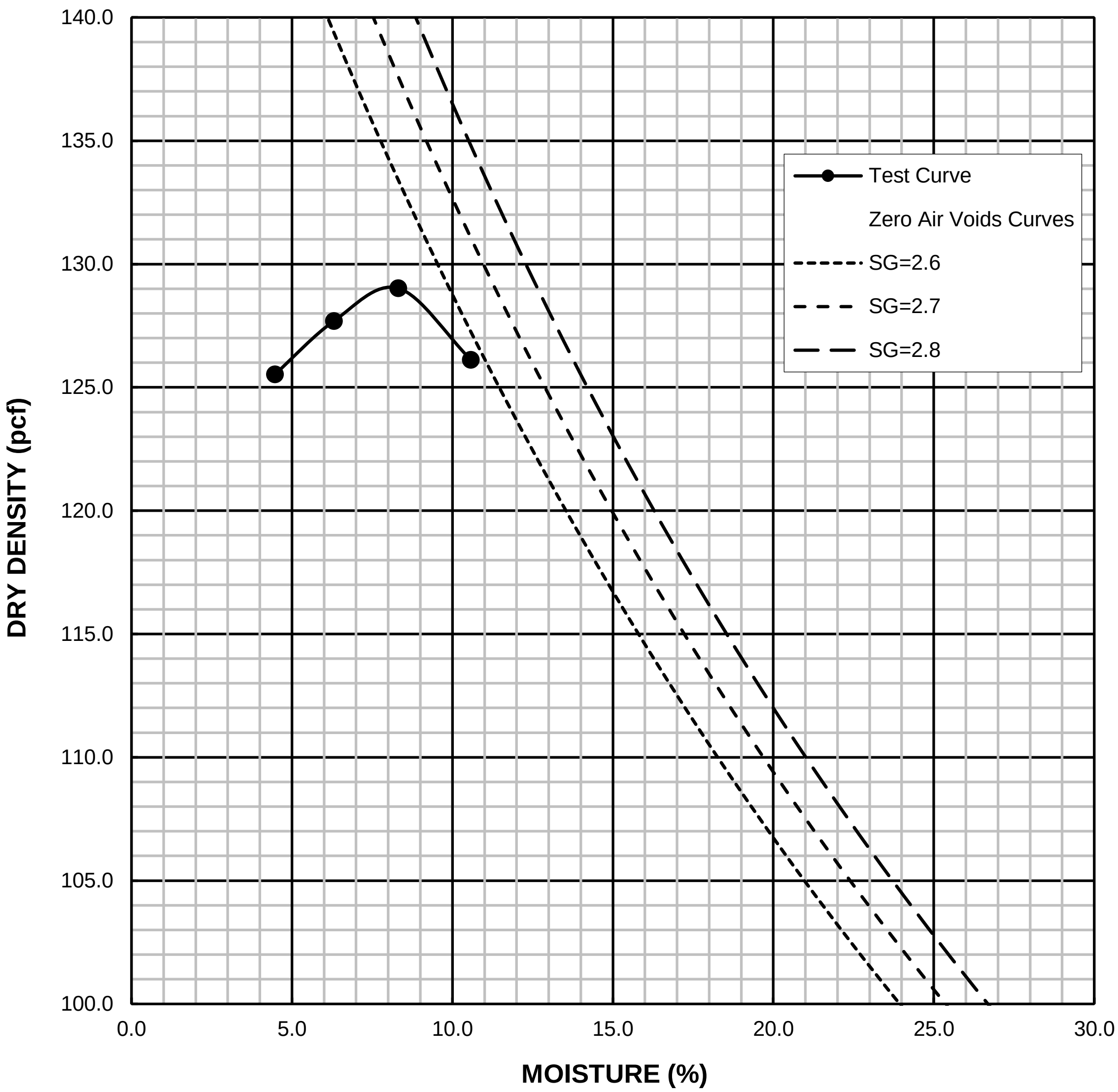
AGS FORM E-8

Project Name: Stratford Ranch East
Location: Perris
P/W No.: 2012-05
Date: 02-2021

Excavation: BA-1
Depth: 2.5-5.0 ft
Soil Type: SM/ML
Tested by: FV
Checked by: AB

Method:	A	Oversize Retained: 5 %		
Point No.	1	2	3	4
Dry Density (pcf)	125.5	127.7	129.0	126.1
Moisture Content (%)	4.5	6.3	8.3	10.6

MAXIMUM DENSITY CURVE



Corrected Max. Dry Density **130.6 pcf**   Corrected Moisture **7.6** %

Max. Dry Density **129.1 pcf**   Optimum Moisture **8.0** %

FIGURE C-4

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

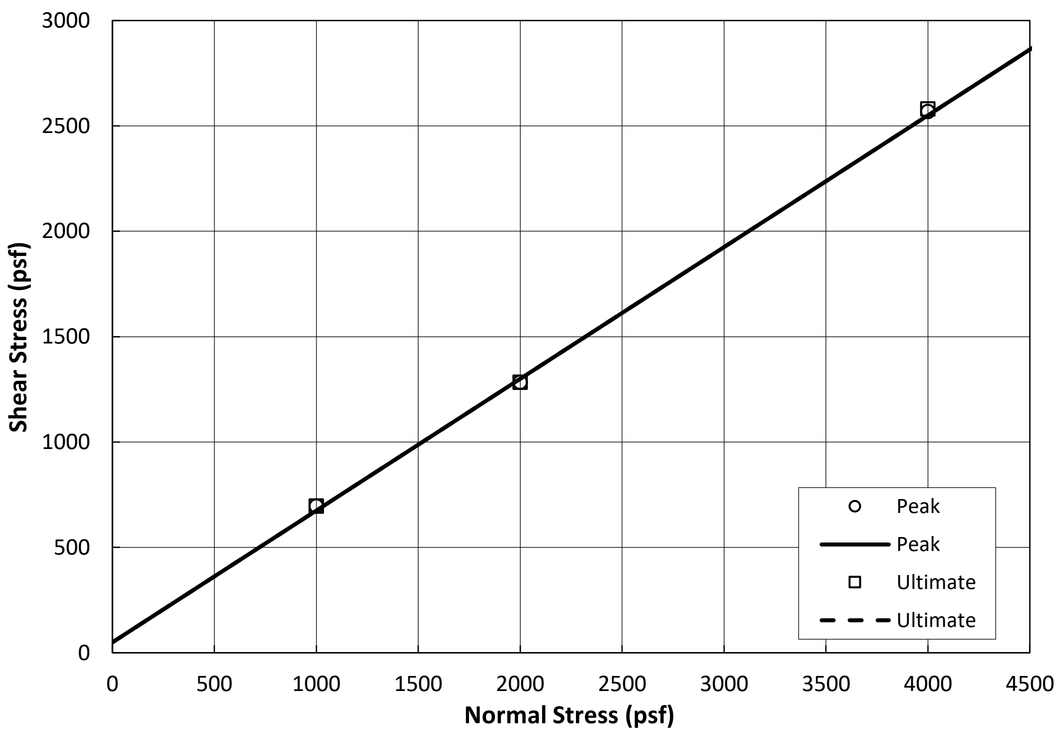
DIRECT SHEAR - ASTM D3080

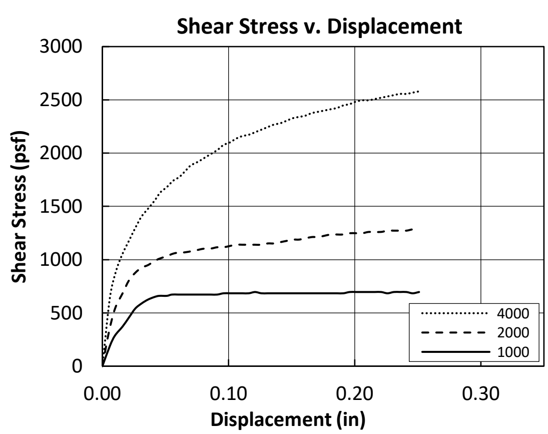
Project Name:	Stratford Ranch East	Excavation:	BA-1
Location:	Perris	Depth:	2.5-5.0 ft
Project No.:	2012-05	Tested by:	FV
Date:	2/17/2021	Reviewed by:	AB

Samples Tested	1	2	3
Intial Moisture (%)	9.2	9.2	9.2
Initial Dry Density (pcf)	116.1	116.1	116.1
Normal Stress (psf)	1000	2000	4000
Peak Shear Stress (psf)	696	1284	2568
Ult. Shear Stress (psf)	696	1284	2580

Soil Type:	SM/ML
Test:	Remolded 90%
Method:	Drained
Consolidation:	Yes
Saturation:	Yes
Shear Rate (in/min):	0.01

Strength Parameters	Peak	Ultimate
Friction Angle, phi (deg)	32	32
Cohesion (psf)	50	50





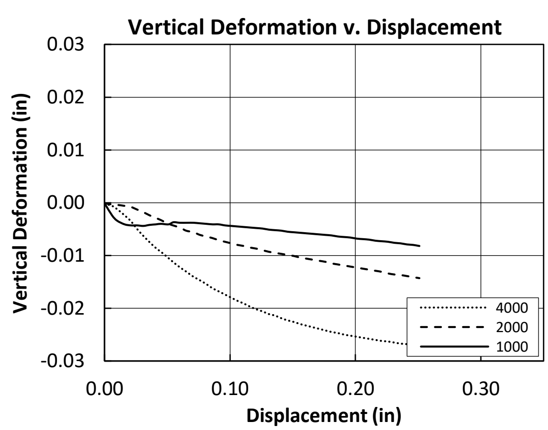


FIGURE C-5

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

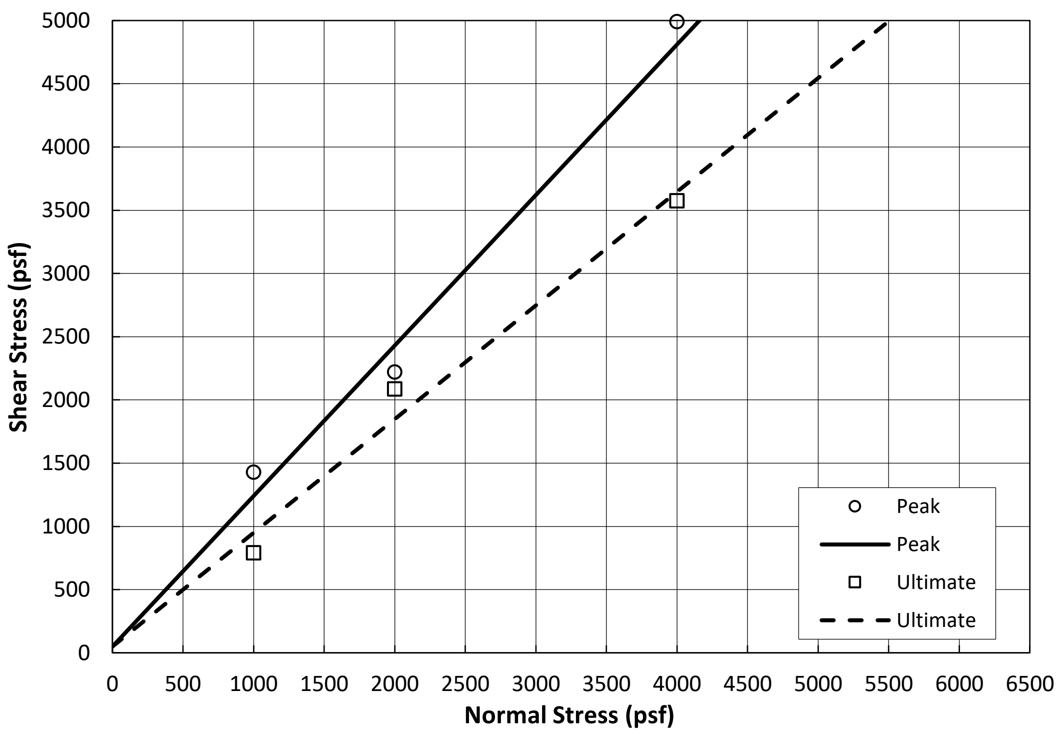
DIRECT SHEAR - ASTM D3080

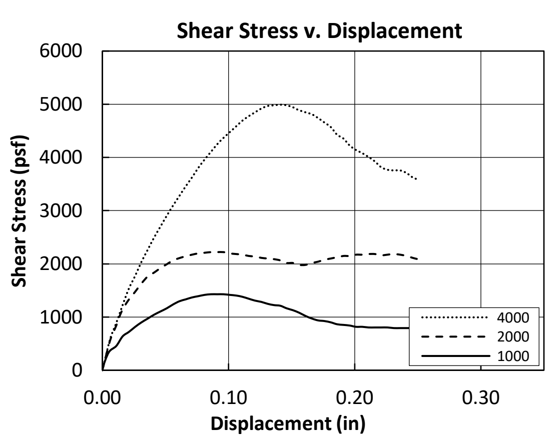
Project Name:	Stratford Ranch East	Excavation:	BA-3
Location:	Perris	Depth:	5.0-6.5 ft
Project No.:	2012-05	Tested by:	FV
Date:	2/10/2021	Reviewed by:	AB

Samples Tested	1	2	3
Intial Moisture (%)	8.6	8.6	8.6
Initial Dry Density (pcf)	119.4	119.3	119.2
Normal Stress (psf)	1000	2000	4000
Peak Shear Stress (psf)	1428	2220	4992
Ult. Shear Stress (psf)	792	2088	3576

Soil Type:	SM
Test:	Undisturbed
Method:	Drained
Consolidation:	Yes
Saturation:	Yes
Shear Rate (in/min):	0.01

Strength Parameters	Peak	Ultimate
Friction Angle, phi (deg)	50	42
Cohesion (psf)	50	50





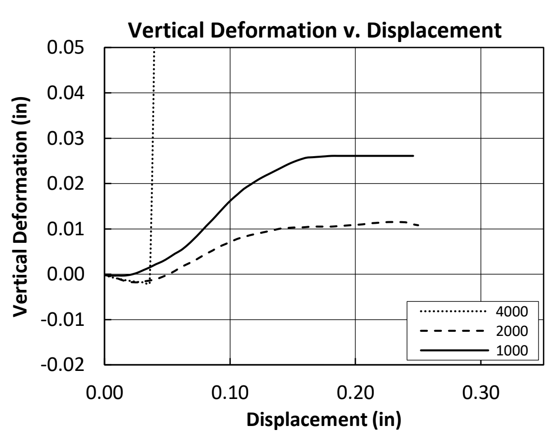


FIGURE C-6

ANAHEIM TEST LAB, INC.
196 Technology Dr., Unit D
Irvine, CA 92618
Phone (949) 366-6544

DATE: 2/22/2021

Advanced Geotechnical Solutions, Inc.
485 Corporate Ave., Suite B
Escondido, CA 92029

P.O. NO.: Chain of Custody

LAB NO.: C-4450, 1-2

SPECIFICATION: CTM-417/422/643

MATERIAL: Soil

Project No.: 2012-05
Project: Stratford Ranch East
Date sampled: 2/10/2021

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

	pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
1) B-1 @ 2.5-5’	7.3	1,100	202	163
2) B-4 @ 10-11.5’	7.2	2,400	226	94

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

FIGURE C-7

APPENDIX C - LGC (2004)

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

PRELIMINARY INFILTRATION FEASIBILITY STUDY

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Suite B
Escondido, California 92029
P: (619) 867-0487 | E: info@adv-geosolutions.com

Stratford Ranch Associates, LLC
4100 Newport Place, Suite 790
Newport Beach, CA 92660

March 11, 2021
P/W 2012-05
Report No. 2012-05-B-3

Attention: **Jason Keller**

Subject: ***Preliminary Infiltration Feasibility Study for Stratford Ranch East Project, Tentative Tract Map No. 38071, City of Perris, California***

References: See Attached

Gentleperson:

In accordance with your request, Advanced Geotechnical Solutions, Inc. (AGS) has prepared this infiltration feasibility study for the proposed Stratford Ranch East residential development located in the City of Perris, California. This report is based on the conceptual grading plan for Tentative Tract No. 38071 prepared by KWC Engineers (dated December 29, 2020) and is intended to meet the preliminary infiltration testing requirements of the County of Riverside. AGS has evaluated the feasibility for storm water infiltration in accordance with the Design Handbook for Low Impact Development and Best Management Practices by the Riverside County Flood Control and Water Conservation District (2011).

1.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The L-shaped site encompasses approximately 45.8 acres and is bounded to the west by Evans Road, to the south by Ramon Expressway, to the east by Lake Perris Drive and to the north by the existing Cedanna neighborhood in the City of Perris, California. The site is flat with approximate elevations ranging from 1462 feet above msl on the northeastern corner to 1451 msl in the southwestern corner. An approximately 4 to 5 ft. high embankment exists along the western boundary of the site. The site is covered by grass and is currently vacant.

Based on our review of the conceptual grading plan (see Plate 1), the residential development will include 194 lots which will be developed in two phases. In addition, the project includes two WQMP basins with variable depths ranging between 6 and 10 feet located on the west central and southeast portions of the site, respectively.

2.0 FIELD INVESTIGATION

On February 4, 2021, four (4) percolation test borings (P-1 through P-4) were advanced to depths ranging between 7.75 and 9.5 feet below ground surface using a truck mounted drill rig equipped with 8-inch diameter hollow-stem augers. In addition, four exploratory borings (BA-1 through BA-4) were advanced at the project site to a maximum depth of 26.5 feet below ground surface. Approximate boring and percolation test locations are shown on Plate 1, Geologic Map and Exploration Location Plan. An engineer from our firm logged the exploratory and percolation test borings for soil and geologic conditions. Boring logs are presented in Appendix B.

Previous subsurface exploration was performed by Lawson Geotechnical Consulting Inc. (2004) near and at the site. Pertinent information from borings B-2, B-3 and B-20 and test pit TP-9 (LGC, 2004) which extended to variable depths ranging from 6 feet to 51.5 feet is presented in Appendix B.

3.0 GEOLOGY

Borings P-1 through P-4 extended into Very Old Alluvial-Fan Deposits (Map Symbol Qvof). This unit is composed of fine grained silty sands to sandy silts with silty clay layers and is typically red brown, moist to saturated, medium dense to very dense and very stiff to hard. As shown in Plate 1, borings P-1 and P-2 are located in the vicinity of boring BA-1. Borings P-3 and P-4 are located in the vicinity of boring B-20. Highly weathered granitic bedrock materials were encountered below the alluvial-fan deposits at approximate depths of 36 feet and 50 feet in borings B-2 and B-3 by LGC (2004), respectively.

4.0 TEST PROCEDURE

Borehole percolation tests were performed to evaluate the feasibility of storm water infiltration at the two proposed WQMP basins onsite and provide preliminary design infiltration rates in general conformance with Appendix A, Section 2.3 of the Low Impact Development BMP Design Handbook. After drilling, the test holes were cleaned of sediment and the bottom was lined with approximately 2 inches of washed gravel. Three-inch diameter slotted PVC pipe was installed in the holes and the annular space was backfilled with gravel. The test holes were then successively filled with clean, potable water and allowed to pre-soak.

On February 5, 2021, a series of borehole percolation tests were performed. The test holes were filled with clean potable water to depths ranging between 50 and 100 inches. Water was allowed to infiltrate during 30- to 60-minute periods and the water drop was measured to calculate the percolation rate in inches per hour. The test hole was then refilled with water as necessary and the test procedure was repeated over the course of several hours until a stabilized percolation rate was recorded. The stabilized percolation rate was then converted to an infiltration rate based on the “Porchet Method” utilizing the following equation:

$$I_t = \frac{\Delta H \, \pi r^2 \, 60}{\Delta t(\pi r^2 + 2\pi r H_{avg})} = \frac{\Delta H \, 60 \, r}{\Delta t(r + 2H_{avg})}$$

Where:

I_t = tested infiltration rate, inches/hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
*r = effective radius of test hole
H_{avg} = average head over the time interval, inches

Logs of the field testing and graphical representations of the test data presented as infiltration versus time interval are included in Appendix AA.

5.0 TEST RESULTS AND PRELIMINARY DESIGN VALUES

In accordance with Appendix A, Section 2.3 of the BMP Design Handbook, a minimum ‘Factor of Safety’ of 3 should be applied to the tested infiltration rates to determine the design infiltration rates. The percolation test observations and results are summarized in Table 1.

TABLE 1 SUMMARY OF INFILTRATION TEST RESULTS							
Test No.	**Depth of Test Hole (ft)**	**Approximate Test Elevation (ft, msl)**	**Geologic Unit**	**Soil Classification (USCS)**	**Infiltration Rate (in/hr)**	**Factor of Safety**	**Design Infiltration Rate (in/hr)**
P-1	7.8	1445.6	Qvof	Clayey Sand (SC)	0.014	3	0.005
P-2	9.5	1443.8	Qvof	Clayey Sand (SC)	0.014	3	0.005
P-3	9.0	1449.8	Qvof	Clayey Sand (SC)	0.156	3	0.052
P-4	9.2	1449.6	Qvof	Clayey to Silty Sand (SC/SM)	0.299	3	0.100

Utilizing a factor of safety of 3, the design infiltration rates range between 0.005 and 0.100 in/hr, which correspond to “No Infiltration” to “Partial Infiltration” conditions.

6.0 DESIGN CONSIDERATIONS

6.1. Groundwater

Groundwater was not observed in the percolation test boreholes during our subsurface exploration. However, groundwater was encountered in borings BA-1 through BA-4 as shown below.

TABLE 2 GROUNDWATER LEVEL - FEBRUARY 5, 2021			
Boring No.	**Approximate Surface Elevation (ft, msl)**	**Depth to Groundwater (ft)**	**Groundwater Elevation (ft, msl)**
BA-1	1456.5	14.0	1442.5
BA-2	1453.3	9.3	1443.8
BA-3	1456.0	10.0	1446.0
BA-4	1458.8	11.8	1447.0

Based on our review of information available at http://lakeperris.lakesonline.com and California Department of Water Resources data, the Lake Perris pool elevation has risen approximately 40 feet since 2015. This rise may have affected the groundwater levels onsite. Groundwater levels may change over time due to stratigraphic and hydrologic conditions or as a consequence of seasonal or meteorological fluctuations and human activities at this and nearby sites.

According to the BMP Design Handbook, in areas where infiltration BMPs are planned, a minimum separation of 10 feet between the infiltration surface and the historic high groundwater should be maintained.

6.2. Soil Characteristics and Anticipated Flow Paths

Based on our subsurface exploration and infiltration testing performed at the site, Very Old Alluvial-Fan Deposits will allow for “Partial Infiltration” to “No Infiltration” with design infiltration rates on the order of 0.005 to 0.100 inches per hour. Therefore, vertical infiltration is anticipated to be very low to negligible.

6.3. Geotechnical Hazards

We anticipate that the proposed basins will be located in close proximity to proposed structures and underground utilities. There is a high likelihood for water intrusion to occur in subjacent utility trenches and saturated soil conditions beneath structures and other settlement sensitive improvements. This potential geotechnical hazard should be mitigated by designing the basin for no infiltration and lining the basin with an impermeable membrane, deepening foundation elements of nearby proposed structures, installing moisture cut-off walls between the infiltration basins and nearby settlement-sensitive improvements, and/or backfilling subjacent utility trenches with a lean sand-cement slurry.

6.4. Soil Contamination

During our recent site investigation, no evidence of soil contamination was observed, nor is any contamination known to exist onsite. Utilizing the DWR online resource Geotracker.ca.gov, no open cases were identified within 1000 feet of the subject site.

6.5. Proximity to Water Supply Wells

No known water supply wells are located within a 100-foot radius of the site.

6.6. Maintenance of Infiltration Device

Regular maintenance of any infiltration system is critical to the long term successful operation of the system. Responsibilities of maintaining the system are typically borne by the owner. Improperly maintained infiltration devices and basins have a high failure rate. A plan should be developed by the designer of the system and implemented throughout the project's lifetime.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Infiltration testing in the upper soils yielded preliminary design infiltration rates ranging between 0.005 and 0.100 inches per hour which correspond to a "No Infiltration" to "Partial Infiltration" condition. Vertical infiltration within the underlying very old alluvial-fan deposits is anticipated to be negligible. In addition, the groundwater level onsite is within 10 feet of the proposed infiltration basin bottom elevation.

Infiltration at the potential BMP locations will increase the potential for geotechnical issues such as water intrusion and ground settlement. Mitigation typically includes an appropriate setback between nearby improvements and infiltration devices. An alternative mitigation can include construction of a cutoff wall, such as placement of a vertical impermeable liner or slurry filled trench, to mitigate infiltration of water below adjacent improvements. To prevent the migration of water along utility pipe bedding zones, slurry backfill should be considered in utility pipes located near infiltration devices. Preventing all water intrusion may be accomplished by installing an impermeable liner on all underground BMP improvements. It should be recognized that if infiltration is allowed, some water intrusion is possible beneath nearby existing improvements such as roadways and nearby structures.

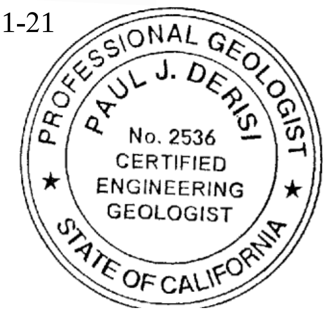
The infiltration rates presented in this report are based on limited testing performed as part of a preliminary screening for feasibility purposes. Dependent upon the final location, depth, and type of proposed BMP, additional testing may be warranted.

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

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.

ANDRES BERNAL, Sr. Geotechnical Engineer
RCE 62366/RGE 2715

PAUL J. DERISI, Vice President
CEG 2536, Reg. Exp. 5-31-21



Distribution: (1) Addressee

Attachments: References
Appendix AA - Storm Water Standards BMP Design Manual - Worksheet Form C.4-1, Support Documents and Field Data
Appendix B - Boring Logs
Plate 1 - Geologic Map and Exploration Location Plan

REFERENCES

Advanced Geotechnical Solutions, Inc., 2021, Preliminary Geotechnical Investigation for Stratford Ranch East Project, Tentative Tract Map No. 38071, City of Perris, California, dated March 11, 2021 (Report No. 2012-05-B-2).

-----, 2020, Limited Geotechnical Investigation, Stratford Ranch - Tract No. 36647 East Basin, City of Perris, California, dated August 27, 2020 (Report No. 1204-05-B-16R).

-----, 2013, Infiltration Test Results and Recommendations Regarding Hydrologic Conditions, Stratford Ranch Project TTM 36647 & 36648, City of Perris, California, dated October 14, 2013 (Report No. 1204-05-B-3).

-----, 2012, Updated Preliminary Geotechnical Investigation for the Stratford Ranch Project, City of Perris, California, dated May 29, 2012 (Report No. 1204-05-B-2).

D. M. Morton, 2004, Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California, United States Geologic Survey, Pamphlet to Accompany Open-File Report 99-172, Version 2.0, 2004.

D. M. Morton, 2003, Preliminary Digital Geologic Map of the Perris 7.5’ Quadrangle, Riverside County, United States Geologic Survey, Open-File Report 03-270.

Geotechnical Professional, Inc. (GPI), 2007, ***Draft*** Geotechnical Investigation Proposed Stratford Ranch Distribution Center, Ramona Expressway and Redlands Avenue, Perris California, dated December 5, 2007 (their Project No. 2193.I).

Lawson Geotechnical Consulting, Inc. (LGC), 2004, Preliminary Geotechnical Investigation Proposed 450-Acre Development, Located North of Ramona Expressway Between Redlands Avenue and Lake Perris Drive, in the City of Perris, Riverside California, dated July 29, 2004 (their Project No. 032338-10).

Riverside County Flood Control and Water Conservation District, 2011, Design Handbook for Low Impact Development and Best Management Practices, dated September 2011.

APPENDIX AA

BOREHOLE PERCOLATION FIELD DATA

PERCOLATION TEST DATA SHEET

Project:	Stratford Ranch East	Project No.:	2012-05	Date:	2/4/2021
Test Hole No.:	P-1	Surface El.:	1453.3 ft, msl	Tested By:	AB
Depth of Test Hole:	7.75 ft.	Test El.:	1445.6 ft, msl	USCS:	SC

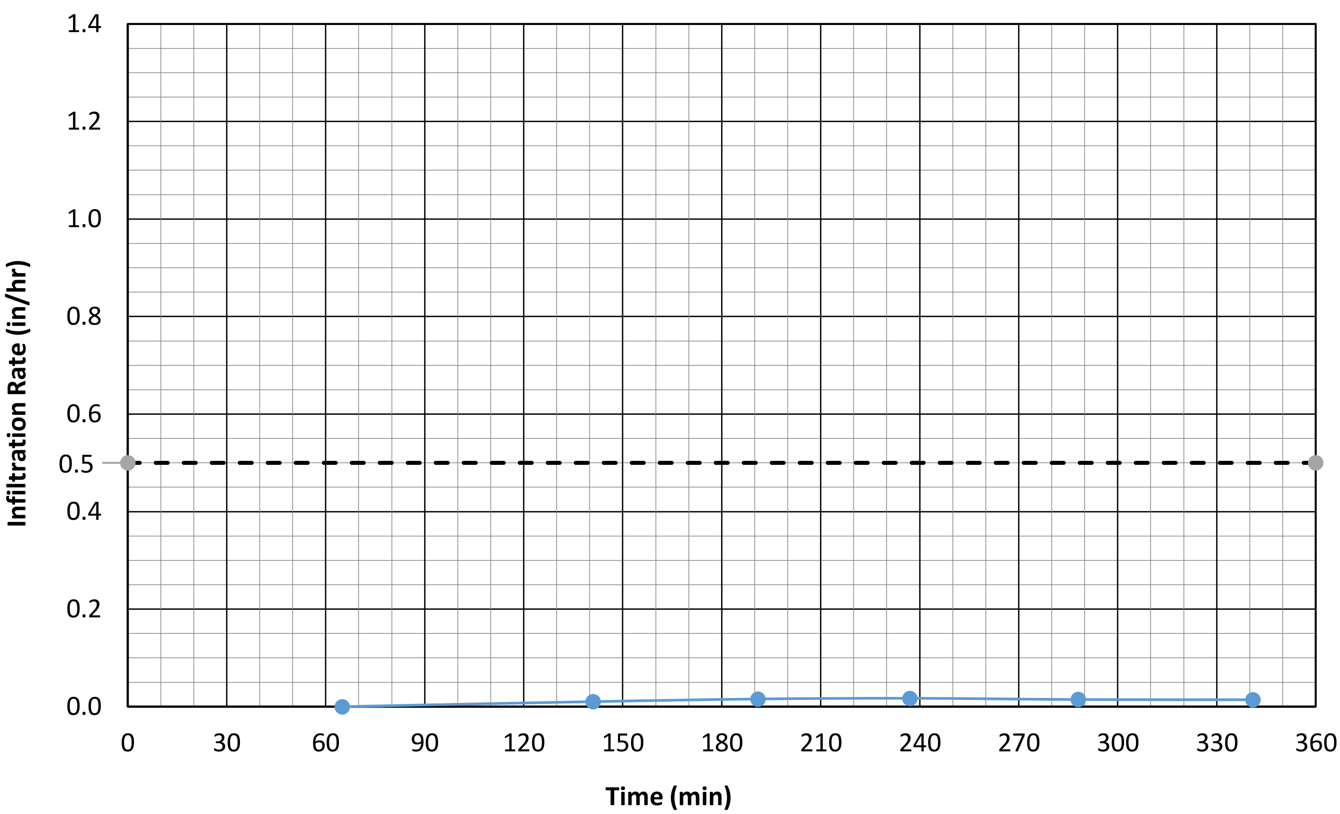
Test Hole Dimensions (in.)

Depth:	93	Diameter:	8	Weather:	Sunny 57 to 70°F

Infiltration Test

Trial No.	Start Time (hr:min)	Stop Time (hr:min)	Interval (min)	Depth to Water (in.) Start	End	Change	Ave. Water Column (in.)	Perc. Rate (in/hr)	Infiltration Rate (in/hr)*
1	10:00	11:05	65	34.25	34.25	0.00	58.75	0.00	0.000
2	11:05	12:21	76	34.25	34.65	0.39	58.55	0.31	0.010
3	12:21	13:11	50	34.65	35.04	0.39	58.16	0.47	0.016
4	13:11	13:57	46	35.04	35.43	0.39	57.76	0.51	0.017
5	13:57	14:48	51	31.50	31.89	0.39	61.31	0.46	0.015
6	14:48	15:41	53	31.89	32.28	0.39	60.91	0.45	0.014

*Calculated by Porchet Method



PERCOLATION TEST DATA SHEET

Project: Stratford Ranch East | Project No.: 2012-05 | Date: 2/4/2021

Test Hole No.: P-2 | Surface El.: 1453.3 ft, msl | Tested By: AB

Depth of Test Hole: 9.5 ft. | Test El.: 1443.8 ft, msl | USCS: SC

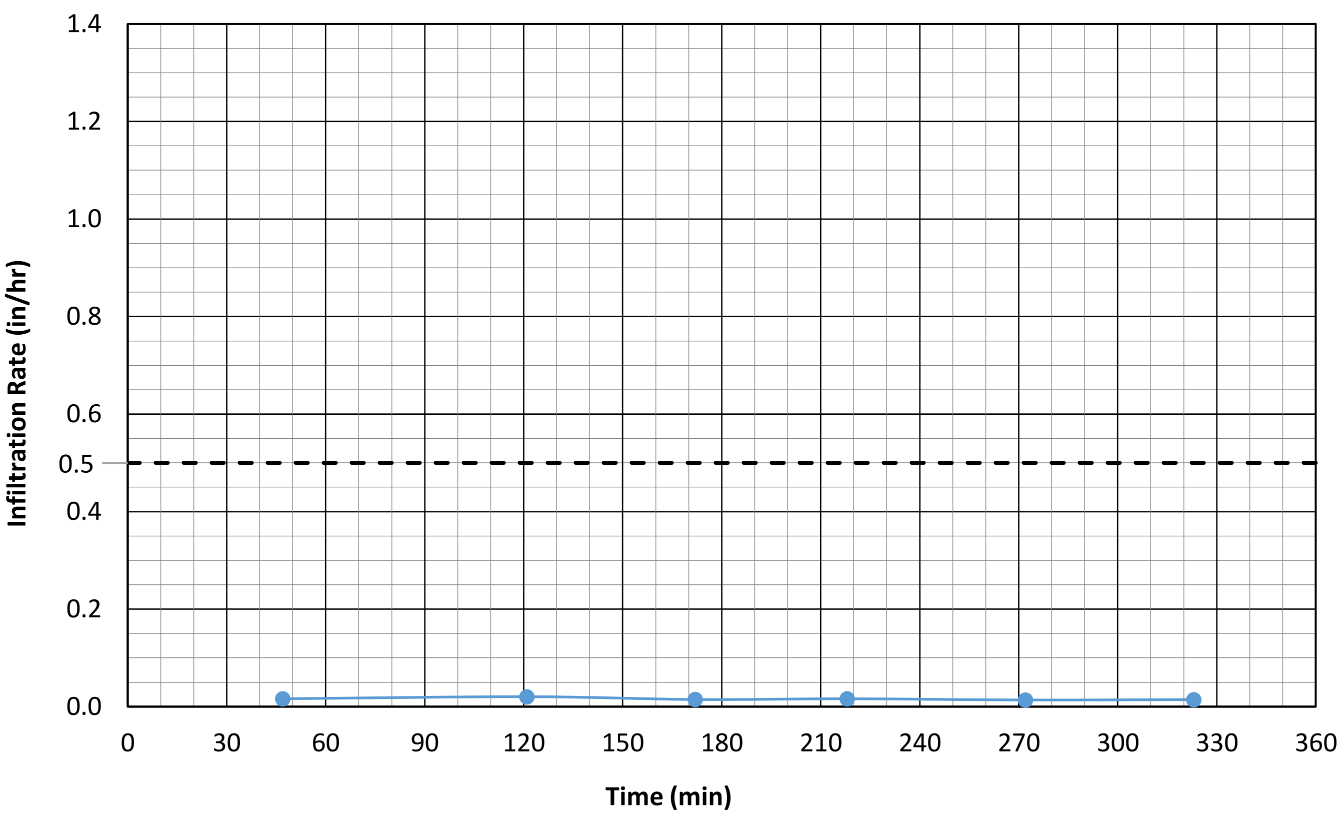
Test Hole Dimensions (in.)

Depth: 114 | Diameter: 8 | Weather: Sunny 57 to 70°F

Infiltration Test

Trial No.	Start Time (hr:min)	Stop Time (hr:min)	Interval (min)	Depth to Water (in.) Start	End	Change	Ave. Water Column (in.)	Perc. Rate (in/hr)	Infiltration Rate (in/hr)*
1	10:23	11:10	47	59.84	60.24	0.39	60.04	0.50	0.016
2	11:10	12:24	74	60.24	61.02	0.79	60.63	0.64	0.020
3	12:24	13:15	51	61.02	61.42	0.39	61.22	0.46	0.015
4	13:15	14:01	46	61.42	61.81	0.39	61.61	0.51	0.016
5	14:01	14:55	54	61.81	62.20	0.39	62.01	0.44	0.014
6	14:55	15:46	51	62.20	62.60	0.39	62.40	0.46	0.014

*Calculated by Porchet Method



PERCOLATION TEST DATA SHEET

Project:	Stratford Ranch East	Project No.:	2012-05	Date:	2/4/2021
Test Hole No.:	P-3	Surface El.:	1458.8 ft, msl	Tested By:	AB
Depth of Test Hole:	9 ft.	Test El.:	1449.8 ft, msl	USCS:	SC

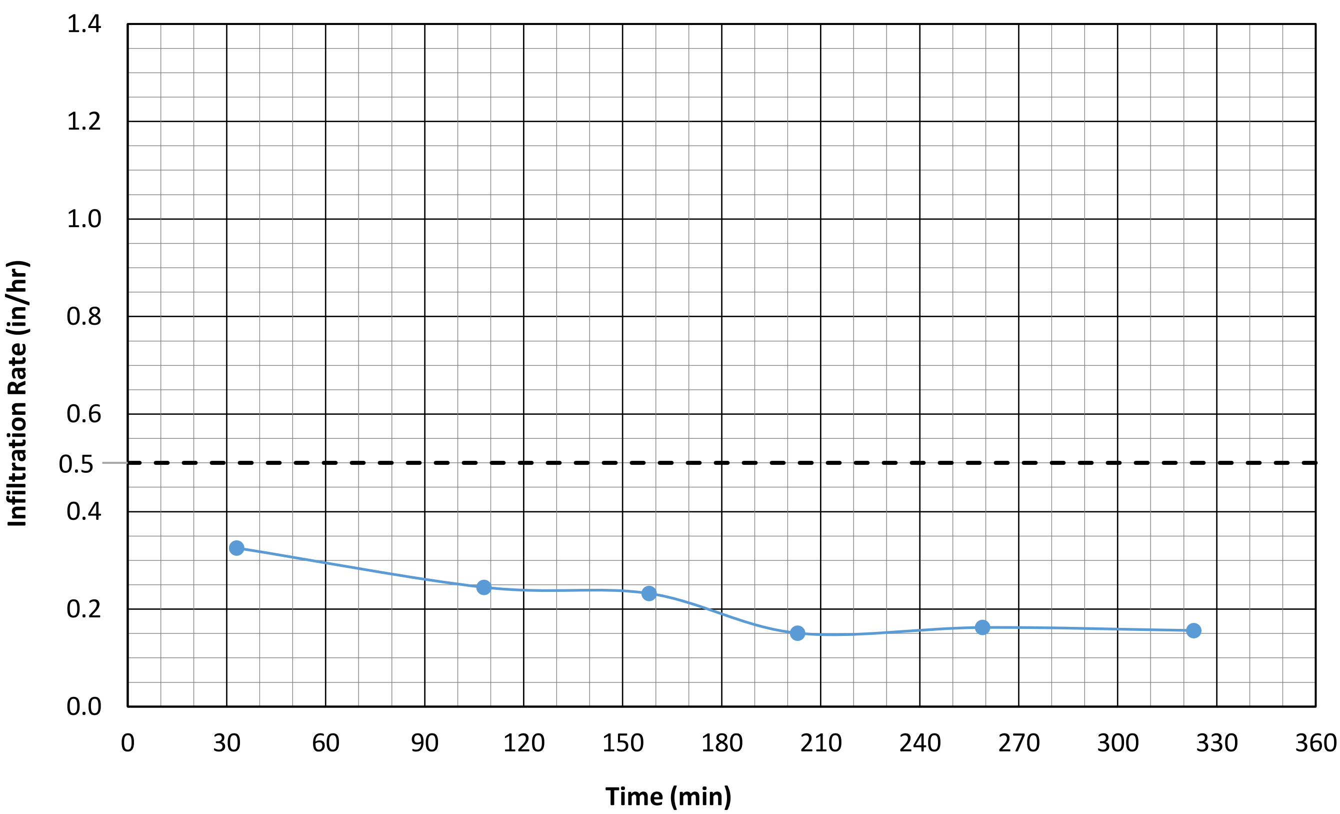
Test Hole Dimensions (in.)

Depth:	108	Diameter:	8	Weather:	Sunny 57 to 70°F

Infiltration Test

Trial No.	Start Time (hr:min)	Stop Time (hr:min)	Interval (min)	Depth to Water (in.) Start	End	Change	Ave. Water Column (in.)	Perc. Rate (in/hr)	Infiltration Rate (in/hr)*
1	10:43	11:16	33	61.02	66.93	5.91	63.98	10.74	0.325
2	11:16	12:31	75	66.93	78.35	11.42	72.64	9.13	0.245
3	12:31	13:21	50	67.72	74.80	7.09	71.26	8.50	0.232
4	13:21	14:06	45	72.44	76.77	4.33	74.61	5.77	0.151
5	14:06	15:02	56	62.99	68.11	5.12	65.55	5.48	0.162
6	15:02	16:06	64	61.42	66.93	5.51	64.17	5.17	0.156

*Calculated by Porchet Method



PERCOLATION TEST DATA SHEET

Project: Stratford Ranch East | Project No.: 2012-05 | Date: 2/4/2021

Test Hole No.: P-4 | Surface El.: 1458.8 ft, msl | Tested By: AB

Depth of Test Hole: 9.2 ft. | Test El.: 1449.6 ft, msl | USCS: SC/SM

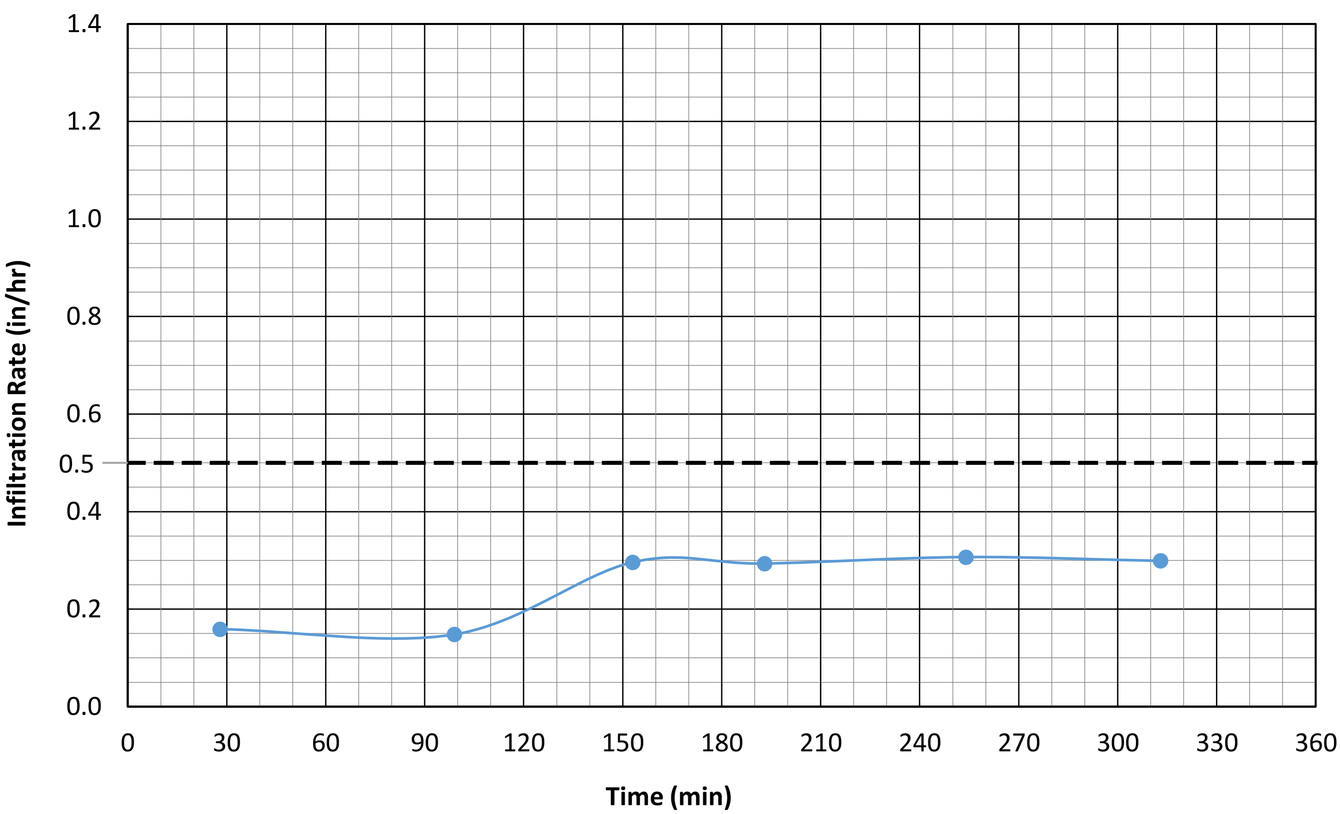
Test Hole Dimensions (in.)

Depth: 110 | Diameter: 8 | Weather: Sunny 57 to 70°F

Infiltration Test

Trial No.	Start Time (hr:min)	Stop Time (hr:min)	Interval (min)	Depth to Water (in.)			Ave. Water Column (in.)	Perc. Rate (in/hr)	Infiltration Rate (in/hr)*
				Start	End	Change			
1	10:55	11:23	28	91.73	95.28	3.54	93.50	7.59	0.159
2	11:29	12:40	71	88.19	96.46	8.27	92.32	6.99	0.148
3	12:46	13:40	54	44.88	51.57	6.69	48.23	7.44	0.296
4	13:40	14:20	40	51.57	57.09	5.51	54.33	8.27	0.294
5	14:20	15:21	61	49.21	57.87	8.66	53.54	8.52	0.307
6	15:21	16:20	59	47.64	55.51	7.87	51.57	8.01	0.299

*Calculated by Porchet Method



APPENDIX E

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 depicts conditions at the particular time of excavation and at the location of the excavation. Subsurface conditions present at other locations may differ, and the passage of time may result in different subsurface conditions being encountered at the locations of the exploratory excavations. The contractor shall perform an independent investigation and evaluate the nature of the surface and subsurface conditions to be encountered and the procedures and equipment to be used in performing his work.

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

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

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

II. Site Preparation

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

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

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

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

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

III. Placement of Fill

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

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

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

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

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

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

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

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

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

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

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

IV. Cut Slopes

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

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

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

V. Drainage

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

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

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

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

VI. Erosion Control

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

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

VII. Trench Excavation and Backfill

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

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

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

VIII. Geotechnical Observation and Testing During Grading

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

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

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

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

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

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

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

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

APPENDIX F

HOMEOWNERS MAINTENANCE GUIDELINES

HOMEOWNER MAINTENANCE AND IMPROVEMENT CONSIDERATIONS

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

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

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

Expansive Soils

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

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

- ❖ Employing contractors for homeowner improvements who design and build in recognition of local building code and site specific soils conditions.
- ❖ Establishing and maintaining positive drainage away from all foundations, walkways, driveways, patios, and other hardscape improvements.
- ❖ Avoiding the construction of planters adjacent to structural improvements. Alternatively, planter sides/bottoms can be sealed with an impermeable membrane and drained away from the improvements via subdrains into approved disposal areas.
- ❖ Sealing and maintaining construction/control joints within concrete slabs and walkways to reduce the potential for moisture infiltration into the subgrade soils.
- ❖ Utilizing landscaping schemes with vegetation that requires minimal watering. Alternatively, watering should be done in a uniform manner as equally as possible on all sides of the foundation, keeping the soil "moist" but not allowing the soil to become saturated.

- ❖ Maintaining positive drainage away from structures and providing roof gutters on all structures with downspouts installed to carry roof runoff directly into area drains or discharged well away from the structures.
- ❖ Avoiding the placement of trees closer to the proposed structures than a distance of one-half the mature height of the tree.
- ❖ Observation of the soil conditions around the perimeter of the structure during extremely hot/dry or unusually wet weather conditions so that modifications can be made in irrigation programs to maintain relatively constant moisture conditions.

Sulfates

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

Water - Natural and Man-Induced

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

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

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

- ❖ Before the rainy season arrives, check and clear roof drains, gutters and down spouts of all accumulated debris. Roof gutters are an important element in your arsenal against rain damage. If you do not have roof gutters and down spouts, you may elect to install them. Roofs, with their, wide, flat area can shed tremendous quantities of water. Without gutters or other adequate drainage, water falling from the eaves collects against foundation and basement walls.
- ❖ Make sure to clear surface and terrace drainage ditches, and check them frequently during the rainy season. This task is a community responsibility.
- ❖ Test all drainage ditches for functioning outlet drains. This should be tested with a hose and done before the rainy season. All blockages should be removed.
- ❖ Check all drains at top of slopes to be sure they are clear and that water will not overflow the slope itself, causing erosion.
- ❖ Keep subsurface drain openings (weep-holes) clear of debris and other material which could block them in a storm.

- ❖ Check for loose fill above and below your property if you live on a slope or terrace.
- ❖ Monitor hoses and sprinklers. During the rainy season, little, if any, irrigation is required. Oversaturation of the ground is unnecessary, increases watering costs, and can cause subsurface drainage.
- ❖ Watch for water backup of drains inside the house and toilets during the rainy season, as this may indicate drain or sewer blockage.
- ❖ Never block terrace drains and brow ditches on slopes or at the tops of cut or fill slopes. These are designed to carry away runoff to a place where it can be safely distributed.
- ❖ Maintain the ground surface upslope of lined ditches to ensure that surface water is collected in the ditch and is not permitted to be trapped behind or under the lining.
- ❖ Do not permit water to collect or pond on your home site. Water gathering here will tend to either seep into the ground (loosening or expanding fill or natural ground), or will overflow into the slope and begin erosion. Once erosion is started, it is difficult to control and severe damage may result rather quickly.
- ❖ Never connect roof drains, gutters, or down spouts to subsurface drains. Rather, arrange them so that water either flows off your property in a specially designed pipe or flows out into a paved driveway or street. The water then may be dissipated over a wide surface or, preferably, may be carried away in a paved gutter or storm drain. Subdrains are constructed to take care of ordinary subsurface water and cannot handle the overload from roofs during a heavy rain.
- ❖ Never permit water to spill over slopes, even where this may seem to be a good way to prevent ponding. This tends to cause erosion and, in the case of fill slopes, can eat away carefully designed and constructed sites.
- ❖ Do not cast loose soil or debris over slopes. Loose soil soaks up water more readily than compacted fill. It is not compacted to the same strength as the slope itself and will tend to slide when laden with water; this may even affect the soil beneath the loose soil. The sliding may clog terrace drains below or may cause additional damage in weakening the slope. If you live below a slope, try to be sure that loose fill is not dumped above your property.
- ❖ Never discharge water into subsurface blanket drains close to slopes. Trench drains are sometimes used to get rid of excess water when other means of disposing of water are not readily available. Overloading these drains saturates the ground and, if located close to slopes, may cause slope failure in their vicinity.
- ❖ Do not discharge surface water into septic tanks or leaching fields. Not only are septic tanks constructed for a different purpose, but they will tend, because of their construction, to naturally accumulate additional water from the ground during a heavy rain. Overloading them artificially during the rainy season is bad for the same reason as subsurface subdrains, and is doubly dangerous since their overflow can pose a serious health hazard. In many areas, the use of septic tanks should be discontinued as soon as sewers are made available.
- ❖ Practice responsible irrigation practices and do not over-irrigate slopes. Naturally, ground cover of ice plant and other vegetation will require some moisture during the hot summer months, but during the wet season, irrigation can cause ice plant and other heavy ground cover to pull loose. This not only destroys the cover, but also starts serious erosion. In some areas, ice plant and other heavy cover can cause surface sloughing when saturated due to the increase in weight and weakening of the near-surface soil. Planted slopes should be planned where possible to acquire sufficient moisture when it rains.
- ❖ Do not let water gather against foundations, retaining walls, and basement walls. These walls are built to withstand the ordinary moisture in the ground and are, where necessary, accompanied by subdrains to carry off the excess. If water is permitted to pond against them, it may seep through the wall, causing dampness and leakage inside the basement. Further, it may cause the foundation to swell up, or the water pressure could cause structural damage to walls.

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

Geotechnical Review

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

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

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

TENTATIVE TRACT NO. 38071
CONCEPTUAL GRADING