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Rilling Enterprises, Inc.
1650 Sagewood Way
San Marcos, California 92078

May 13, 2022
P/W 2203-09
Report No. 2203-09-B-2

Attention: **Mr. Jonathan Rilling**

Subject: **Due Diligence Geotechnical Study, Proposed Capalina Apartments, APN 466120002, Capalina Road east of North Rancho Santa Fe, San Marcos, California**

References: Appendix A

Gentlemen:

Presented herein is Advanced Geotechnical Solutions, Inc.'s, (AGS) limited geotechnical study in support of your purchasing efforts on APN 466120002 located north of Capalina Road in San Marcos, California. The intent of AGS's study is to identify key geotechnical/geologic constraints that may have significant impacts to the development of the site and cost estimating purposes.

1.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

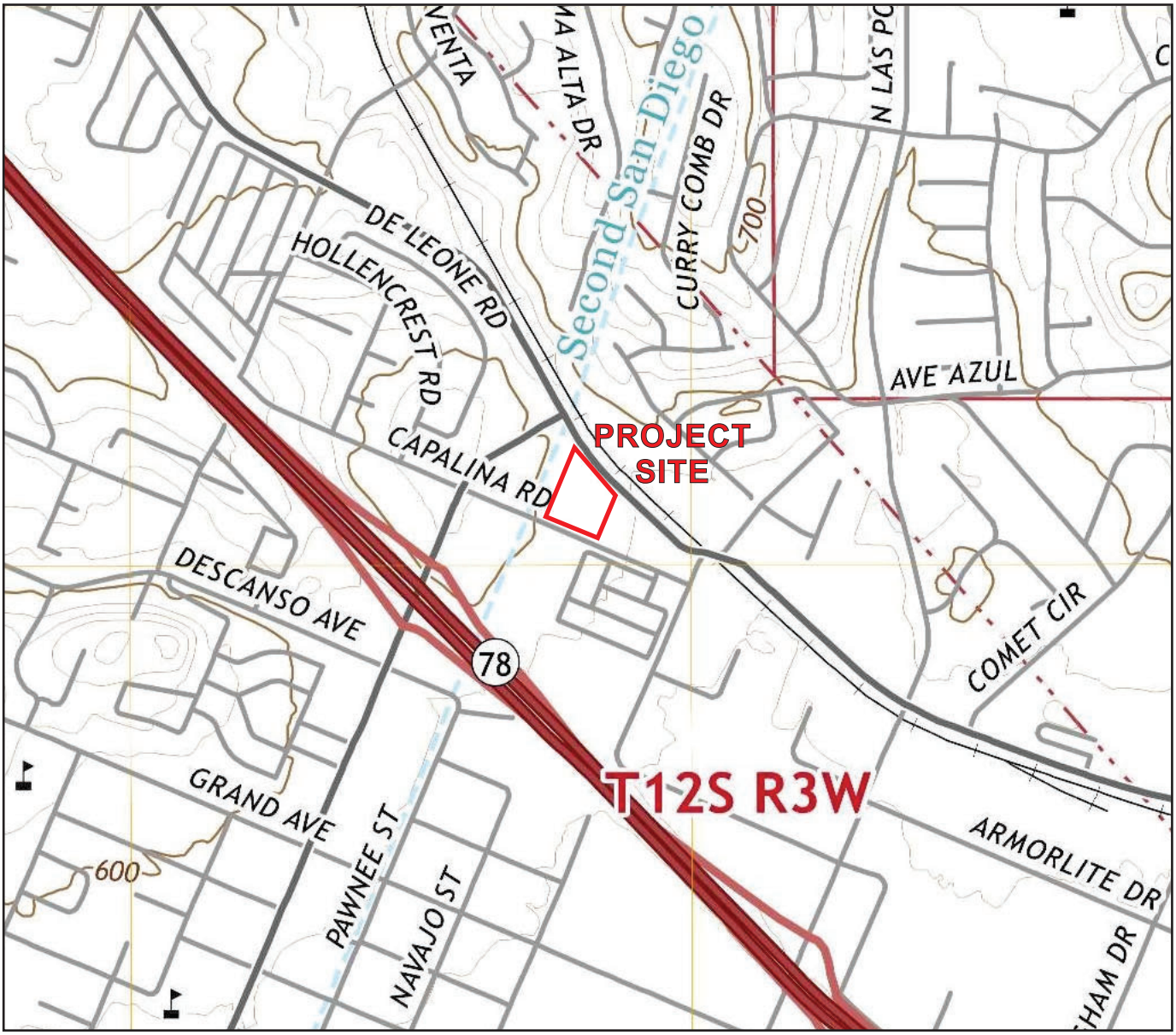
The roughly 2.5-acre site is located south of West Mission Road and north of Capalina Road in San Marcos, California. The site is undeveloped and surrounded by commercial development to the west and east and roads to the north and south. The site is somewhat level, separated into an upper and lower pad, with a 5- to 6-foot high gentle slope running north-south that separate the two pads. Elevations range from roughly 596 feet near the southwest corner to 583 feet near the northeast corner. The site is currently vacant and is covered with seasonal grasses.

A review of historic aerial imagery indicate that the site has largely remained undeveloped aside from use as a play field and contractor yard. Some clearing of the site occurred circa 1989. The central level area of the site was used as a play field for several years starting circa 2002. Numerous irrigation lines were placed circa 2002 to support the turf covered field. The area along Mission Road was cleared in 2006 and several trailers were placed in this area, possible being used as a construction staging yard. The site was cleared in 2004 and several end dump piles were placed between 2004 and 2007. By 2009, the site was cleared along the east side adjacent to the existing offsite parking lot and a small shed/bin is visible in the southeast corner of the site. This shed or bin has since been removed.

It is proposed to construct a multi-family apartment on the site. Preliminary development plans indicate that 114 units are planned. A single 4-story building is planned in the central portion of the site with surrounding parking.

2.0 SITE INVESTIGATION AND LABORATORY TESTING

On March 25, 2022, AGS performed subsurface exploration at the site consisting of excavating thirteen test pits using a rubber tired backhoe to depths of up to 13.5 feet below ground surface. The test pits were logged and sampled by a representative of this firm. The locations of the exploratory test pits are presented on Figure 2, Test Pit Location Plan. Test pit logs are presented in Appendix B.



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SITE LOCATION MAP
CAPALINA APARTMENTS
CAPALINA ROAD
SAN MARCOS, CALIFORNIA

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FIGURE 1

SOURCE MAP - U.S.G.S. TOPOGRAPHIC MAP OF THE SAN MARCOS 7.5 MINUTE QUADRANGLE, SAN DIEGO COUNTY, CALIFORNIA (2018)

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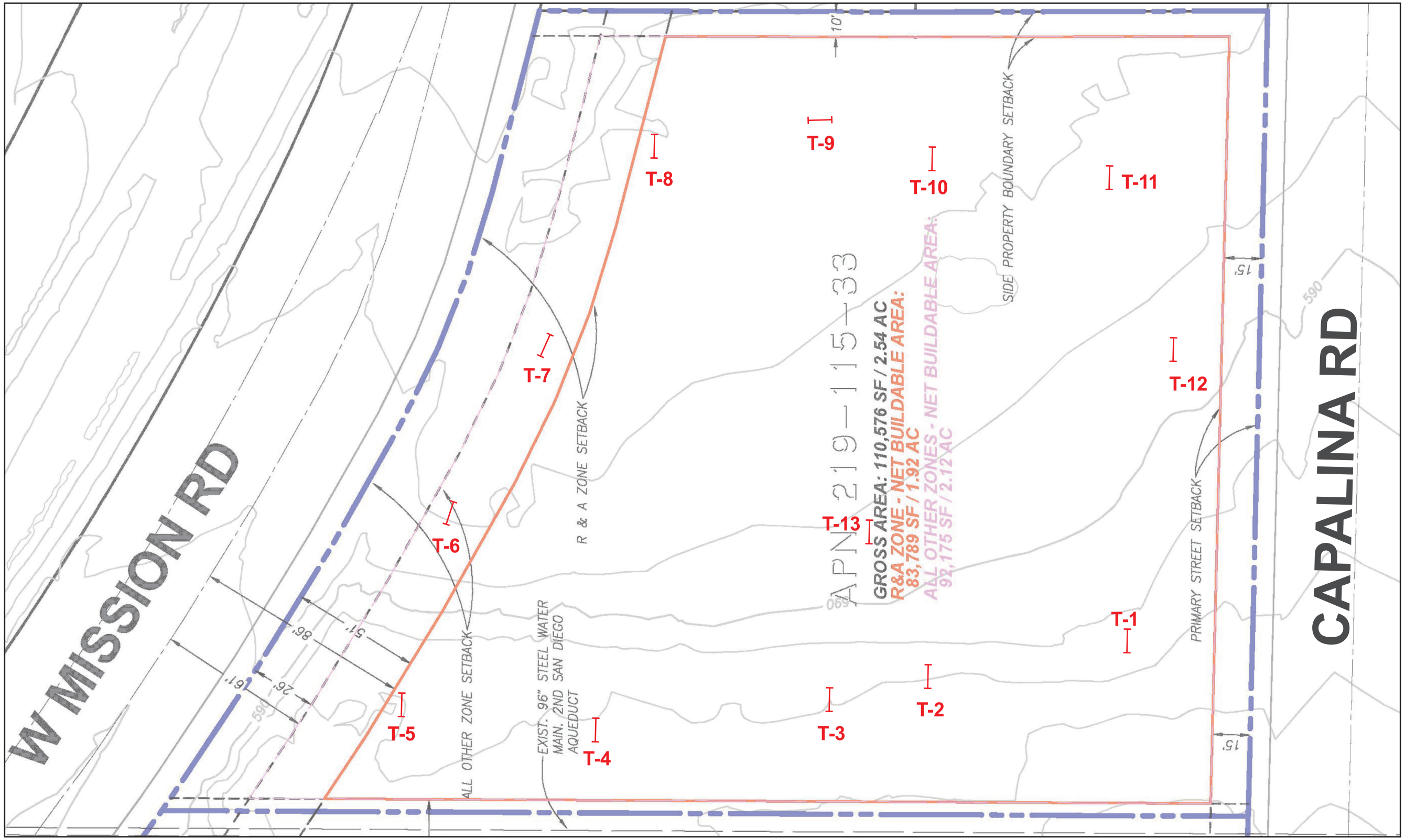

LEGEND:

T-1 Approximate location of backhoe test pit (AGS 2022)

Approximate limits of site

CAPALINA APARTMENTS PROPERTY

Capalina Road, San Marcos, California

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SCALE 1"=40'

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TEST PIT LOCATION PLAN

FIGURE 2

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Representative bulk and "undisturbed" ring samples were transported to our laboratory for testing. Testing included in-situ moisture content and density, remolded shear strength, maximum density and optimum moisture content, expansion potential, and chemical/corrosivity analysis. Laboratory test results are presented in Appendix C.

3.0 SITE GEOLOGY

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 young, steeply sloped, northwest trending mountain ranges underlain by metamorphosed Late Jurassic to Early Cretaceous-aged extrusive volcanic rock and Cretaceous-aged igneous plutonic rock of the Peninsular Ranges Batholith. The westernmost portion of the province is predominantly underlain by younger marine and non-marine sedimentary rocks. The Peninsular Ranges' dominant structural feature is northwest-southeast trending crustal blocks bounded by active faults of the San Andreas transform system.

3.1. Subsurface Conditions

The earth materials present at the site consist of surficial deposits of undocumented artificial fill and topsoil/alluvium overlying sedimentary rock assigned to the Santiago Formation. The site is geologically mapped as sitting near the boundary of the Santiago Formation and undifferentiated metasedimentary and metavolcanic rock (See Figure 3, Regional Geologic Map) although metasedimentary / metavolcanic rock was not encountered during our study. The following is a brief description of the subsurface materials encountered.

3.1.1. Artificial Fill – Undocumented

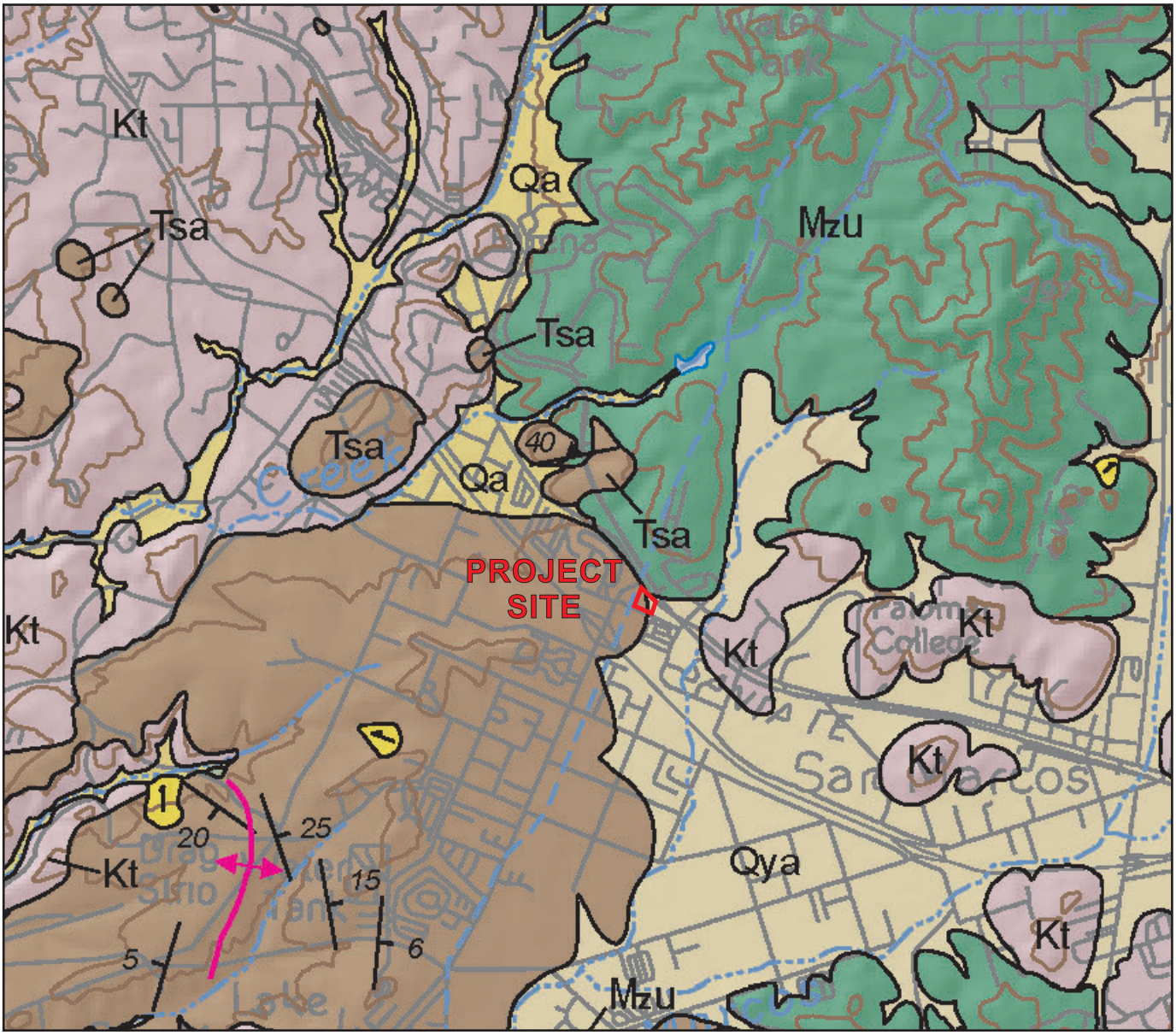
Artificial fill soils mantle portions of the site. These soils consist of light brown to red and orange brown silty sand with some angular pieces of rock observed in a few test pits. These materials may be related to the spreading of the end dump piles on the site or previous grading activities on the site. Deeper deposits were observed near the slope along the westerly side of the site and may be related to offsite grading activities or the previous installation of the offsite water lines. The fill materials were generally observed to be dry to slightly moist and loose with abundant roots.

3.1.2. Topsoil / Alluvium (Undifferentiated)

One to five feet of topsoil/alluvium was observed to overlie the Santiago Formation. These materials consist of brown to dark brown clayey sands and sandy clays in a dry to moist and loose/soft to medium dense / firm condition.

3.1.3. Santiago Formation

Middle Eocene age sedimentary rock assigned to the Santiago Formation was observed to underlie the project site below the fill and topsoil material. The depth to the Santiago Formation ranged from approximately 2 to 8 feet below the existing surface. The formation consisted of soft to moderately hard interbedded silty sandstone, clayey sandstone, and sandy claystone. The unit was observed to be soft and highly weathered in the upper 2 feet



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REGIONAL GEOLOGIC MAP
CAPALINA APARTMENTS
CAPALINA ROAD
SAN MARCOS, CALIFORNIA

Qya	Young Alluvial Flood Plain deposits (Holocene and late Pleistocene)
Tsa	Santiago Formation (mid-Eocene)

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FIGURE 3

SOURCE MAP - GEOLOGIC MAP OF THE OCEANSIDE 30'X60' QUADRANGLE, CALIFORNIA. KENNEDY & TAN 2007.

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and slightly less weathered below. Abundant iron oxide staining and carbonate development were observed.

3.2. Groundwater

Groundwater was not encountered to the maximum depths explored. Localized perched groundwater may develop at a later date, most likely at or near fill/bedrock contacts, due to fluctuations in precipitation, irrigation practices, or factors not evident at the time of our field explorations.

3.3. Flooding and Tsunami

According to available FEMA maps, the site is not within a FEMA identified flood hazard area. In addition, the site is outside the tsunami hazard inundation area.

3.4. Subsidence/Ground Fissuring

Due to the presence of the dense underlying Santiago Formation the potential for subsidence/settlement and ground fissuring is unlikely.

3.5. Landsliding/Slope Instability

Given the relatively flat gradients across the site and the surrounding area, landsliding, mass wasting, and/or surficial instability onsite is considered to be remote.

4.0 SEISMIC HAZARDS

The site is located in the tectonically active Southern California area and will likely experience shaking effects from earthquakes. The type and severity of seismic hazards affecting the site are to a large degree dependent upon the distance to the causative fault, the intensity of the seismic event, and the underlying soil characteristics. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction or dynamic settlement.

4.1. Surface Fault Rupture

No known active faults have been mapped at or near the subject site. The nearest known active surface fault is the Newport-Inglewood - Rose Canyon fault zone which is approximately 11.5 miles west - southwest of the subject site. Accordingly, the potential for fault surface rupture on the subject site is very low. This conclusion is based on literature review and aerial photographic analysis.

4.2. Seismicity

As noted, the site is within the tectonically active southern California area, and is approximately 11.5 miles from an active fault, the Newport-Inglewood-Rose Canyon fault zone. The potential exists for strong ground motion that may affect future improvements.

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

4.3. Seismic Design Parameters

The site may be classified as Seismic Site C consisting of a very dense soil and soft rock profile. Table 4.3 presents 2019 CBC seismic design parameters for site coordinates of Latitude 33.1515°N and Longitude 117.1953°W were utilized.

TABLE 4.3
2019 CBC SEISMIC DESIGN PARAMETERS

Seismic Site Class	C
Mapped Spectral Acceleration Parameter at Period of 0.2-Second, S_s	0.899g
Mapped Spectral Acceleration Parameter at Period 1-Second, S_1	0.331g
Site Coefficient, F_a	1.200
Site Coefficient, F_v	1.500
Adjusted MCE_R[1] Spectral Response Acceleration Parameter at Short Period, S_{MS}	1.078g
1-Second Period Adjusted MCE_R[1] Spectral Response Acceleration Parameter, S_{M1}	0.497g
Short Period Design Spectral Response Acceleration Parameter, S_{DS}	0.719g
1-Second Period Design Spectral Response Acceleration Parameter, S_{D1}	0.331g
Peak Ground Acceleration, PGA_M[2]	0.466g
Seismic Design Category	D

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

4.4. Liquefaction

Liquefaction is the phenomenon in which the buildup of excess pore pressures, in saturated granular soils due to seismic agitation, results in a temporary "quick" or "liquefied" condition. Dependent upon the thickness of undocumented fill and the existing water table, the liquefaction potential will be evaluated for the site. The underlying sedimentary rock is not considered susceptible to liquefaction. Upon conclusion of remedial grading, the site is not considered susceptible to liquefaction.

4.5. Dynamic Settlement

Dynamic settlement occurs in response to an earthquake event affecting loose sandy earth materials. The potential of dynamic settlement at the subject site is anticipated to be "very low" due to the presence of the shallow sedimentary rock.

4.6. Lateral Spreading

Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore pressure build-up or liquefaction in a shallow underlying deposit during an earthquake. Since the potential for liquefaction is very low, the potential for lateral spreading is also very low.

4.7. Seismically Induced Landsliding

Significant slopes are not located adjacent to the site. The shallow slope along the west side of the property line is not expected to be prone to seismically induced landsliding. Seismically induced landsliding is not considered to be a hazard at the site.

4.8. Earthquake Induced Flooding

Earthquake induced flooding can be caused by tsunamis, dam failures, or seiches. A seiche is a free or standing-wave oscillation on the surface of water in an enclosed or semi-enclosed basin. Due to the lack of a freestanding body of water nearby, the potential for a seiche impacting the site is considered to be non-existent. Considering the lack of dams located above the site, earthquake induced flooding caused by a dam failure is considered to be nonexistent. Our review of the 2009 Tsunami Inundation Map for Emergency Planning prepared by CalEMA, indicates that the site is not within the tsunami inundation limits.

5.0 GEOTECHNICAL ENGINEERING

Presented herein is a general discussion of the geotechnical properties of the various soil types and earth materials observed by AGS. It should be anticipated that detailed site-specific geotechnical analyses of the project should be conducted during the design and entitlement phase. Dependent upon these future studies these recommendations could change. The following is a summary of our opinions based upon the available data.

5.1. Material Properties

5.1.1. Excavation Characteristics

Based on our previous experience with similar projects in the vicinity of the site, it is our opinion that the majority of the earth material onsite can be readily excavated with conventional grading equipment.

5.1.2. Compressibility

The site is underlain with fill and topsoil/alluvial deposits over sedimentary rock. The artificial fill deposits, topsoil/alluvium, and upper highly weathered portion of Santiago Formation are expected to be compressible. Mitigation would include removing and replacing the upper compressible soils with compacted fill.

5.1.3. Collapse Potential/Hydro-Consolidation

The hydro-consolidation process is a singular response to the introduction of water into collapse-prone alluvial soils. Upon initial wetting, the soil structure and apparent strength are altered and an immediate settlement response occurs. Mitigation can include removing the upper collapse-prone soils during grading.

5.1.4. Expansion Potential

Based on test results by AGS, the expansion potential is expected to be "very low" to "medium" when classified in accordance with ASTM D 4829. It is possible that some materials with a "high" expansion potential may be encountered.

5.1.5. Shear Strength

Shear strength testing was conducted on a remolded sample of site soil. The results are presented in Appendix C. The shear strengths that were used by AGS for design are presented in Table 5.1.5.

TABLE 5.1.5
Shear Strengths Used for Design (Ultimate)

Material	Cohesion (psf)	Friction Angle (degrees)	Moist Density (pcf)
Compacted Fill	150	31	125

5.1.6. Chemical and Resistivity Test Results

The test results from a sample collected during the current investigation indicated a sulfate concentration that corresponds to class S0 sulfate exposure when classified in accordance with ACI 318. The onsite soils are expected to be highly corrosive to ferrous metals.

5.1.7. Pavement Support Characteristics

Compacted fill derived from onsite soils is expected to possess moderate pavement support characteristics. An assumed R-value of 25 may be used for preliminary design.

5.2. Removals and Overexcavation

Based upon AGS's investigation and our experience on similar sites, unsuitable soils removal depths across the site below settlement sensitive improvements may be on the order of 4 to 10 feet. Lesser removals may be considered for improvements that are not as sensitive to settlement. At-grade improvements should be supported on compacted fill. The placement of around 2 feet of fill may be needed below pavement areas and below lightly loaded on grade foundations. Removal depths can be further evaluated once development plans and design grades are available for review. Depending on the locations and depths of the proposed improvements, overexcavation and recompaction may be needed to provide more suitable support for spread footings.

5.3. Temporary Excavations

Temporary cut slopes should be made no steeper that 1½:1 adjacent to existing improvements. Where improvements may be affected by temporary instability, either on or offsite, further restrictions such as slot cutting, extending work days, implementing weekend schedules, and/or other requirements considered critical to serving specific circumstances may be imposed. All utility trenches and excavations should be shored or laid back in accordance with applicable Cal-OSHA standards.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information compiled during this investigation and AGS's experience in the vicinity of the subject site, it is our opinion that development of the proposed site is feasible, from the geotechnical point of view, provided that the constraints discussed in this report are addressed during future site specific geotechnical studies and during the design and construction of the proposed project.

Preliminary design recommendations are provided herein for the proposed improvements. AGS has assumed that the proposed 4 story structure will be supported near existing grades. More detailed recommendations should be provided in future studies.

6.1. Foundation Design Recommendations

The recommendations presented below may be used for cost estimating purposes and feasibility level design. Future geotechnical studies should be conducted to provide recommendations that can be used for final design.

Foundation should be designed in consideration of the expansion potential of the onsite soils. For preliminary budgeting purposes, a Lot Category of II (Medium expansion potential) can be assumed. Support of the improvements on conventionally reinforced foundations of post-tensioned foundations is considered feasible.

The following values may be used in the preliminary foundation design.

Allowable Bearing:	2000 psf.
Lateral Bearing:	300 psf per foot of depth to a maximum of 2,000 psf for level conditions
Sliding Coefficient:	0.35

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.

6.1.1. Conventional Foundations

Conventional slab-on-grade foundations can be utilized to support the proposed structures for Lot Categories I and II (very low to medium expansion potential). Conventional foundation systems should be designed in accordance with Table 6.1.1 below.

Table 6.1.1 Foundation Design Recommendations		
Lot Category	(Category I) Very Low to Low Expansion Potential	(Category II) Medium Expansion Potential
Footing Depth Below Lowest Adjacent Finish Grade		
	12 inches	18 inches
Footing Width		
	18 inches	18 inches
Footing Reinforcement		
	No. 4 rebar, one (1) on top and one (1) on bottom	No. 4 rebar, two (2) on top and two (2) on bottom or No. 5 rebar one (1) on top and one (1) on bottom
Slab Thickness	4 inches (actual)	4 inches (actual)
Slab Subgrade Moisture	Minimum of 110% optimum moisture prior to placing concrete.	Minimum of 120% of optimum moisture 24 hours prior to placing concrete.
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 five (5) feet are provided horizontally from edge of the footing to the face of the slope.		

6.1.2. Post-Tensioned Foundations

Post-tensioned foundations may be designed using the values provided in Table 6.1.2. Design and construction of the 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.

TABLE 6.1.2
POST-TENSIONED FOUNDATION DESIGN PARAMETERS

Soil Category	Expansion Index	Pad No.	Edge Beam Embedment (inches)*	Edge Lift**		Center Lift**	
				Em (ft.)	Ym (in.)	Em (ft.)	Ym (in.)
I	"Low"	***	12	5.4	0.54	9.0	-0.23
II	"Medium"	***	18	4.6	0.90	9.0	-0.38
III	"High"	***	24	3.9	1.26	7.5	-0.51
Moisture Barrier		An approved moisture and vapor barrier should be placed below all slabs-on-grade within living and moisture sensitive areas as discussed in Section 7.6.					
Slab Subgrade Moisture		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 120 percent of optimum moisture to a depth of 12 inches prior to placing concrete				
		Soil Category III	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.					

NOTES: ** The values of predicted lift are based on the procedures outlined in the *Design of Post-Tensioned Slabs-on-Ground*, Third Edition and related addendums. No corrections for vertical barriers at the edge of the slab or other corrections (e.g. horizontal barriers, tree roots, adjacent planters) are assumed. The values assume Post-Equilibrium conditions exist (as defined by the Post Tensioning Institute), and these conditions created during construction should be maintained throughout the life of the structure.
*** Final design parameters should be provided in a final grading report and should be based on as-graded soil conditions.

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 minimum recommended depth of the thickened edge is 12-inches for "low" expansion, 18-inches for "medium" expansion and 24-inches for "high" expansion if existent.

The project foundation design engineer should use the Post-Tensioning Institute (PTI) foundation design procedures as described in 2019 CBC, based upon appropriate soil design parameters relating to edge moisture variation and differential swell provided by the geotechnical consultant at the completion of rough grading operations. For preliminary design and budgeting purposes, Category II design parameters may be assumed. Upon completion of rough grading, finish grade samples should be collected and tested to develop final foundation design recommendations for individual lots.

6.2. Concrete Design

Testing by AGS indicated that the onsite soils have low concentrations of soluble sulfate, corresponding to an S0 exposure class when classified in accordance with ACI 318. Sulfate resistant concrete is not required per code. Additional testing should be completed during grading and final recommendations should be provided based on the results of the additional testing.

6.3. Corrosion

The onsite soils are expected to be severely corrosive to buried metallic materials. AGS recommends minimally that the current standard of care be employed for protection of metallic construction materials in contact with onsite soils or that consultation with an engineer specializing in corrosion to determine specifications for protection of the construction materials. Steel reinforcement in contact with onsite soils should be protected with an epoxy coating, adequate concrete cover, or other approved methods as detailed by the structural engineer.

7.0 FUTURE STUDY NEEDS

7.1. Future Geotechnical Studies

Design plans have not yet been developed. The recommendations provided herein are considered preliminary and subject to change based on the actual design. When available, AGS should review detailed construction plans.

7.2. Observation during Construction

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

8.0 LIMITATIONS AND FUTURE STUDIES

This due diligence report is based on the project as described and the information obtained during our recent site exploration, reviewed maps and available geologic literature within the general area. 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 preliminary and based on the assumption that additional design level studies including subsurface investigations and testing will be performed and an appropriate level of field review during construction will be provided by geotechnical engineers and engineering geologists who are familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this and future reports. AGS should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary

from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations of this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of AGS.

AGS has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the CONTRACTOR, or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

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.

JOHN J. DONOVAN
RCE 65051, RGE 2790, Reg. Exp. 6-30-23

PAUL J. DERISI
CEG 2536, Reg. Exp. 5-31-23

Attachments: Figure 1 - Site Location Map
Figure 2 – Test Pit Location Plan
Figure 3 - Regional Geologic Map
Appendix A - References
Appendix B - Log of Test Pits
Appendix C - Laboratory Data

Distribution: (1) Addressee (pdf)

2203-09-B-2 (May 13, 2022, Due-Diligence Study, Capalina Apartments).docx

APPENDIX A
REFERENCES

California Geological Survey, 2008, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, dated September 11, 2008, Special Publication 117A.

California Building Standards Commission, 2019, 2019 California Building Code, Title 24, Part 2, Volumes 1 and 2.

Jennings, C.W., 1994, Fault Activity Map of California and Adjacent Areas: California Geological Survey, California Geologic Data Map No. 6, Scale 1:750,000.

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

Southern California Earthquake Center, 2002, *Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California*, dated June 2002.

APPENDIX B

LOG OF TEST PITS

Date Excavated: 3/25/2022
Logged by: DL
Equipment: JD 310 Backhoe with 24" Bucket

LOG OF TEST PITS

Excavation No.	Depth (ft.)	USCS	Description
T-1	0 – 2.5	SC	**Topsoil/Alluvium** CLAYEY SAND, brown to dark brown, with abundant roots, moist, loose, highly porous.
	2.5 – 5	SM	**Santiago Formation (Tsa)** SILTY SANDSTONE, fine-grained, light brown to orange brown/green, highly weathered, soft.
	5 – 8		@ 5 ft.- less weathered, soft to moderately hard, some clay. TOTAL DEPTH 8 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-2	0 – 4	SC	**Topsoil/Alluvium** CLAYEY SAND, dark brown, with abundant roots, slightly moist, loose, highly porous.
	4 – 7		**Santiago Formation (Tsa)** SILTY SANDTONE, fine-grained, highly weathered, light brown to light orange brown, iron oxide staining, moist, soft to moderately hard.
	7 – 9		@ 7 ft.- orange brown, moist, moderately hard. TOTAL DEPTH 9 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-3	0 – 3	SC/CL	**Artificial Fill, Undocumented (afu)** SANDY CLAY to CLAYEY SAND, brown to red brown, slightly moist, loose.
	3 – 7	SC/CL	**Topsoil/Alluvium** SANDY CLAY to CLAYEY SAND, dark brown, slightly moist to moist, firm to stiff.
	7 – 10		**Santiago Formation (Tsa)** SILTY SANDTONE, with clay, fine-grained, highly weathered, light brown to orange brown, soft.
	10 - 12		@ 10 ft.- less weathered, orange brown, moist, moderately hard. TOTAL DEPTH 12 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-4	0 – 4	SM	**Artificial Fill, Undocumented (afu)** SILTY SAND, light brown, dry to slightly moist, loose.
	4 – 8	SC/CL	**Topsoil/Alluvium** SANDY CLAY to CLAYEY SAND, dark brown, slightly moist to moist, firm to stiff.
	8 – 10		**Santiago Formation (Tsa)** CLAYEY SANDTONE to SANDY CLAYSTONE, light brown to orange grey, highly weathered, moist, soft; iron oxide staining and calcium carbonate.
	10 - 13		@ 10 ft.- light brown to orange grey, less weathered, moderately hard. TOTAL DEPTH 13 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-5	0 – 5	SC	**Artificial Fill, Undocumented (afu)** CLAYEY SAND, reddish brown, dry to slightly moist, loose, abundant roots.
	5 – 8	SC/CL	**Topsoil/Alluvium** SANDY CLAY to CLAYEY SAND, dark brown, slightly moist, firm / medium dense.
	8 – 10		**Santiago Formation (Tsa)** Interbedded CLAYEY SANDTONE and SILTY SANDSTONE, highly weathered, moist, soft, light brown to orange brown, abundant iron oxide staining and calcium carbonate development.
	10 – 13.5		@ 10 ft.- less weathered, grey to orange, slightly moist to moist, moderately hard, some crushed snail shell fossils. TOTAL DEPTH 13.5 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-6	0 – 2	CL	**Topsoil/Alluvium** SANDY CLAY, dark brown, dry to slightly moist, soft, abundant roots.
	2 – 4		**Santiago Formation (Tsa)** CLAYEY SANDTONE to SILTY SANDSTONE, highly weathered, greyish green to orange brown, slightly moist, soft, abundant iron oxide staining and calcium carbonate development.
	4 – 13		@ 4 ft.- Interbedded SANDY CLAYSTONE and SILTY SANDSTONE, less weathered, grey green to orange brown, moist, moderately hard, abundant iron oxide staining. TOTAL DEPTH 13 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-7	0 – 1.5	SM	**Artificial Fill, Undocumented (afu)** SILTY SAND, with angular pieces of rock, reddish brown.
	1.5 – 5.5	SC/CL	**Topsoil/Alluvium** SANDY CLAY to CLAYEY SAND, dark brown, slightly moist, firm / medium dense.
	5.5 – 8		**Santiago Formation (Tsa)** CLAYEY SANDTONE, highly weathered, light brown to orange brown, moist, soft, abundant iron oxide staining and calcium carbonate development.
	8 – 9		@ 8 ft.- Interbedded SANDY CLAYSTONE and SILTY SANDSTONE less weathered, grey to orange brown, moist, moderately hard. TOTAL DEPTH 9 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-8	0 – 1	SM	**Artificial Fill, Undocumented (afu)** SILTY SAND, with angular pieces of rock to 4”, light brown to orange brown, dry, loose.
	1 – 6	CL	**Topsoil /Alluvium** SANDY CLAY, dark brown, slightly moist, soft to firm.
	6 – 8		**Santiago Formation (Tsa)** Interbedded CLAYEY SANDTONE and SILTY SANDSTONE, highly weathered, orange to grey, moist, soft.
	8 – 9		@ 8 ft.- less weathered, grey to orange brown, moist, soft to moderately hard. TOTAL DEPTH 9 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-9	0 – 2	SM	**Artificial Fill, Undocumented (afu)** SILTY SAND, light brown to tan.
	2 – 5	SC/CL	**Topsoil/Alluvium** SANDY CLAY to CLAYEY SAND, dark brown, slightly moist, soft / loose to firm / medium dense.
	5 – 7		**Santiago Formation (Tsa)** Interbedded CLAYEY SANDTONE and SILTY SANDSTONE, highly weathered, greenish grey to orange, moist, soft, abundant iron oxide staining and calcium carbonate development.
	7 – 9		@ 7 ft.- SILTY SANDSTONE, fine to medium-grained, less weathered, grey to orange brown, moderately hard, abundant iron oxide staining. TOTAL DEPTH 9 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-10	0 – 1	SM	**Artificial Fill, Undocumented (afu)** SILTY SAND, with angular pieces of rock to 4", light brown, dry, loose.
	1 – 3.5	SC/CL	**Topsoil/Alluvium** CLAYEY SAND to SANDY CLAY, dark brown, moist, soft / loose to medium dense / firm. Irrigation line encountered at a depth of 2 feet on side of trench.
	3.5 – 6		**Santiago Formation (Tsa)** SANDY CLAYSTONE, highly weathered, light brown to orange, moist, soft, abundant iron oxide staining and calcium carbonate development.
	6 – 8		@ 6 ft.- less weathered, light brown to orange, moist, moderately hard. TOTAL DEPTH 8 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-11	0 – 2	CL	**Topsoil/Alluvium** SANDY CLAY, dark brown, dry to slightly moist, soft.
	2 – 4		**Santiago Formation (Tsa)** CLAYEY SANDTONE to SILTY SANDSTONE, highly weathered, grey to orange brown, slightly moist, soft, abundant iron oxide staining and calcium carbonate development.
	4 – 8		@ 4 ft.- SILTY SANDSTONE, fine to medium-grained, less weathered, grey to orange, slightly moist, moderately hard, abundant iron oxide staining. TOTAL DEPTH 8 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-12	0 – 3	CL	**Topsoil/Alluvium** SANDY CLAY, dark brown, dry to slightly moist, soft.
	3 – 5		**Santiago Formation (Tsa)** CLAYEY SANDTONE, highly weathered, greyish green to orange, slightly moist, soft, abundant iron oxide staining and calcium carbonate development.
	5 – 7		@ 5 ft.- SILTY SANDSTONE, fine-grained, less weathered, grey to orange, moist, moderately hard, abundant iron oxide staining. TOTAL DEPTH 7 FT. NO WATER, NO CAVING.

Excavation No.	Depth (ft.)	USCS	Description
T-13	0 – 3	CL	**Topsoil/Alluvium** SANDY CLAY, dark brown, dry to slightly moist, soft.
	3 – 5		**Santiago Formation (Tsa)** Interbedded SILSTONE, CLAYSTONE, SILTY SANDSTONE, highly weathered, greenish grey to orange, moist, soft, abundant iron oxide staining and calcium carbonate development.
	5 – 7		@ 5 ft.- Interbedded orange to grey fine-grained SILTY SANDSTONE and greenish grey SANDY CLAYSTONE, less weathered, moderately hard.
			TOTAL DEPTH 7 FT. NO WATER, NO CAVING.

APPENDIX C

LABORATORY TEST RESULTS

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

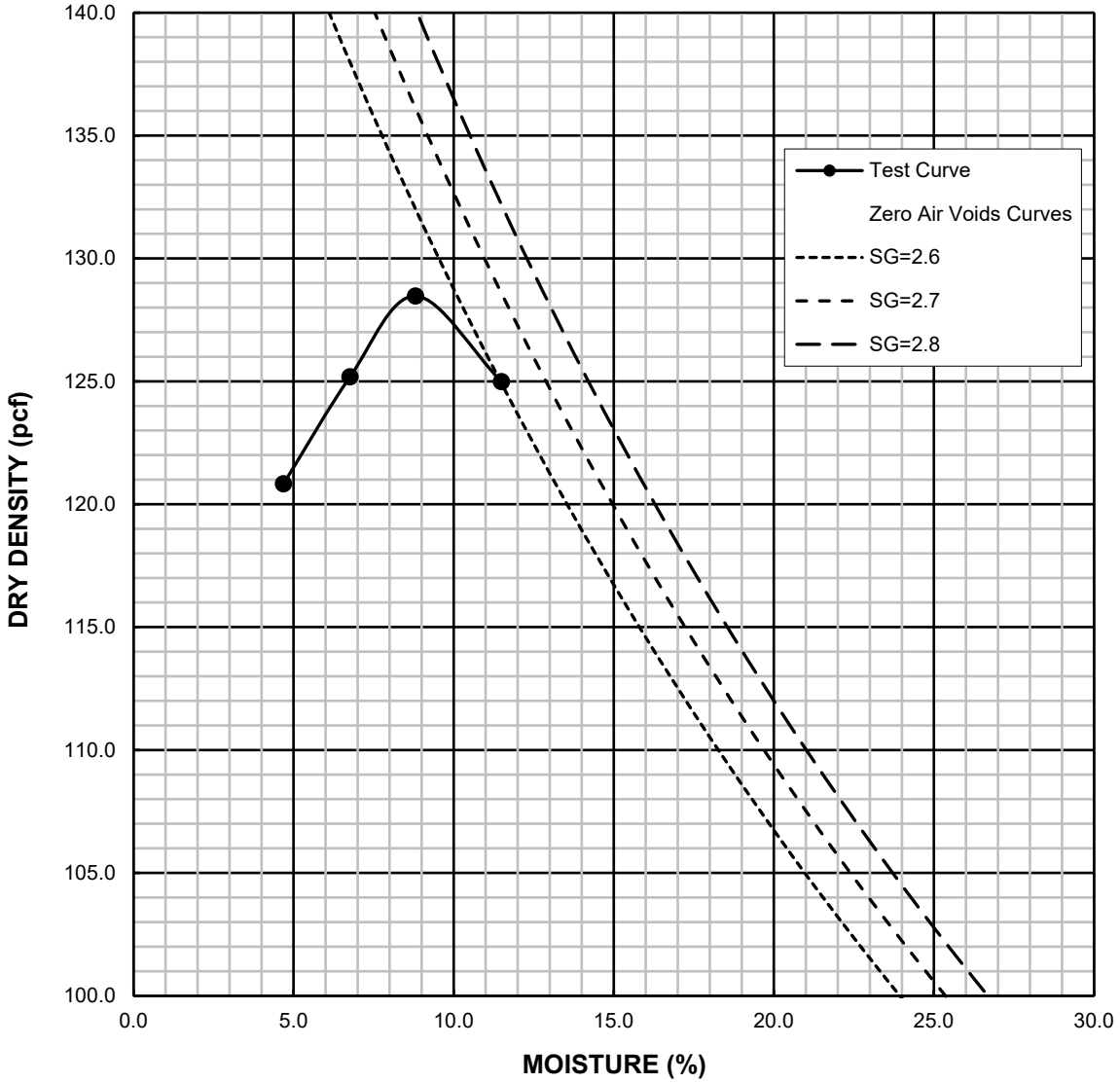
MAXIMUM DENSITY - ASTM D1557

AGS FORM E-8

Project Name:	Capalina Apartments	Excavation:	T-4
Location:	San Marcos	Depth:	2-3 ft
P/W No.:	2203-09	Soil Type:	Reddish Brn SC-SM afu
Date:	04-2022	Tested by:	FV
		Checked by:	SD

Method:	A	Oversize Retained: 25.3 %		
Point No.	1	2	3	4
Dry Density (pcf)	120.8	125.2	128.5	125.0
Moisture Content (%)	4.7	6.8	8.8	11.5

MAXIMUM DENSITY CURVE



Corrected Max. Dry Density	**136.3 pcf**	Corrected Moisture	**6.6** %
Max. Dry Density	**128.4 pcf**	Optimum Moisture	**8.8** %

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

DIRECT SHEAR - ASTM D3080

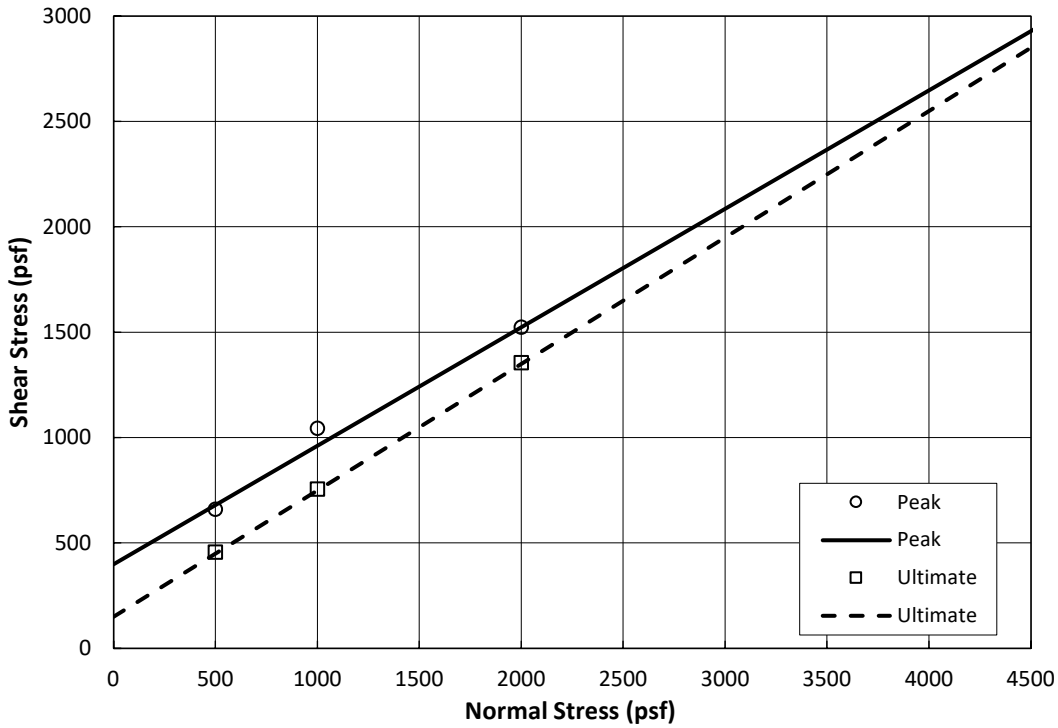
Project Name: Capalina Rd. Apartments
Location: San Marcos
Project No.: 2203-09
Date: 4/7/2022

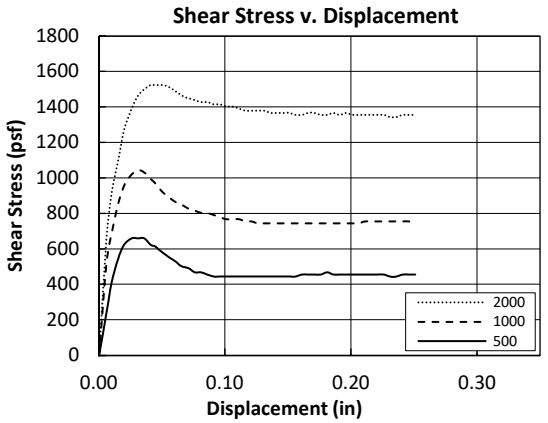
Excavation: T-4
Depth: 2-3 ft
Tested by: FV
Reviewed by: SD

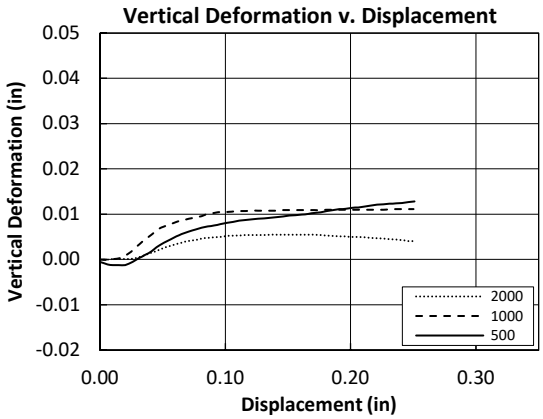
Samples Tested	1	2	3
Intial Moisture (%)	8.8	8.8	8.8
Initial Dry Density (pcf)	115.6	115.6	115.6
Normal Stress (psf)	500	1000	2000
Peak Shear Stress (psf)	660	1044	1524
Ult. Shear Stress (psf)	456	756	1356

Soil Type: Reddish Brn SC-SM (afu)
Test: Remold 90%
Method: Drained
Consolidation: Yes
Saturation: Yes
Shear Rate ($^{in}/_{min}$): 0.01

Strength Parameters	Peak	Ultimate
Friction Angle, phi (deg)	29	31
Cohesion (psf)	400	150







ADVANCED GEOTECHNICAL SOLUTIONS, INC.

EXPANSION INDEX - ASTM D4829

AGS FORM E-6

Project Name:	Capalina Rd Apartments	Excavation/Tract:	T-2
Location:	San Marcos	Depth/Lot:	5-7 ft
P/W:	2203-09	Description:	Yellow SC
Date:	4/4/22	Tested by:	FV
		Checked by:	SD

Expansion Index - ASTM D4829	
Initial Dry Density (pcf):	102.9
Initial Moisture Content (%):	11.8
Initial Saturation (%):	50.0
Final Dry Density (pcf):	100.5
Final Moisture Content (%):	23.7
Final Saturation (%):	94.5
Expansion Index:	24
Potential Expansion:	Low

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

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

EXPANSION INDEX - ASTM D4829

AGS FORM E-6

Project Name:	Capalina Rd Apartments	Excavation/Tract:	T-5
Location:	San Marcos	Depth/Lot:	1-3 ft
P/W:	2203-09	Description:	Reddish Brn SC
Date:	4/4/22	Tested by:	FV
		Checked by:	SD

Expansion Index - ASTM D4829	
Initial Dry Density (pcf):	113.3
Initial Moisture Content (%):	9.1
Initial Saturation (%):	50.5
Final Dry Density (pcf):	112.8
Final Moisture Content (%):	16.9
Final Saturation (%):	92.2
Expansion Index:	5
Potential Expansion:	Very Low

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

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

EXPANSION INDEX - ASTM D4829

AGS FORM E-6

Project Name:	Capalina Rd Apartments	Excavation/Tract:	T-12
Location:	San Marcos	Depth/Lot:	1-3 ft
P/W:	2203-09	Description:	Brown CL-ML
Date:	4/4/22	Tested by:	FV
		Checked by:	SD

Expansion Index - ASTM D4829	
Initial Dry Density (pcf):	96.7
Initial Moisture Content (%):	13.9
Initial Saturation (%):	50.6
Final Dry Density (pcf):	90.1
Final Moisture Content (%):	29.8
Final Saturation (%):	92.5
Expansion Index:	74
Potential Expansion:	Medium

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

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

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

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

Date: April 06, 2022
Purchase Order Number: 2203-09
Sales Order Number: 55183
Account Number: ADVG

To:

Advanced Geotechnical Solutions Inc
485 Corporate Drive, Suite B
San Diego, CA 92029
Attention: Fernando Velez

Laboratory Number: SO8719 Customers Phone: 619-867-0487

Sample Designation:

One soil sample received on 04/01/22 at 10:00am, marked as

Project:	Capalina Rd Apartments
Project #:	2203-09
Date Sampled	03/25/2022
Sampled by	DL
Location:	On Site
Sample ID#	T-12
Depth:	1-3 ft

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

pH 7.7

Water Added (ml)	Resistivity (ohm-cm)
10	120000
5	9500
5	3300
5	2000
5	960
5	750
5	750
5	800
5	940

27 years to perforation for a 16 gauge metal culvert.
35 years to perforation for a 14 gauge metal culvert.
49 years to perforation for a 12 gauge metal culvert.
62 years to perforation for a 10 gauge metal culvert.
76 years to perforation for a 8 gauge metal culvert.

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

Rosa Bernal
RMB/arr