SDVOSB
Service Disabled Veteran Owned Small Business

EnGEN CORPORATION

41625 Enterprise Circle South,
B-2, Temecula California 92590
951.296.3511
www.engencorp.com

IN MEMORY OF

*Chris Stevens * Tyrone Woods*
*Sean Smith * Glen Doherty*
Ann Smedingoff

UPDATED GEOTECHNICAL REPORT

Summerland Senior Living Facility

13225 Serenity Trail, Chino, California

APN: 1023-011-051

Project Number: 4219GFS

August 15, 2017

Prepared For:

Mr. Steven Steward
Summerland Senior Living
1439 West Chapman Avenue, Suite 15
Orange, California 92468

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

August 15, 2017

Mr. Steven Steward
Summerland Senior Living
1439 West Chapman Avenue, Suite 15
Orange, California 92468
843.425.7951

Regarding: **Updated Geotechnical Study – Summerland Senior Living Facility**
3.61 Acres Located North of Serenity Drive, City of Chino, County of San Bernardino, California – Assessor's Parcel Number: 1023-011-51
Project Number: 4219GFS

References:
1) **Preliminary Geotechnical Feasibility Study – Summerland Senior Living Facility,** 3.61 Acres Located North of Serenity Drive, City of Chino, County of San Bernardino, California, Assessor's Parcel Number: 1023-011-51, dated: October 10th, 2016, Project Number: 4219GFS
2) ***United Engineering Group, Conceptual Grading Plan***, Summerland Senior Living, dated: September 26th, 2016, scale: 1"=30'.

Mr. Steward:

Per your request and signed authorization, we have performed additional field and laboratory work per the recommendations of the Reference No. 1 report to supplement those findings and complete our investigation at the subject site. This report replaces the Reference No. 1 Report in entirety. The purpose of this report is to provide the additional subsurface geotechnical data necessary to determine if the proposed development is feasible from a geotechnical standpoint. Submitted, herewith, are the results of our findings and recommendations, along with the supporting data.

1.0 EXECUTIVE SUMMARY

1.1 **General:** Supplemental field and laboratory work was conducted on June 27th, 2017 to complete the preliminary work performed in the Reference No. 1 report. The supplemental work included the advancement of 5 additional borings across the subject site to a maximum depth of 50-feet below adjacent ground surface. The additional borings were performed to evaluate the condition and approximate boundaries of the undocumented fill as well as establish the properties of the underlying soil strata. This additional information has been incorporated into this report which replaces the Reference No. 1 report in its entirty.

1.2 **Site Location and Description:** The subject property is situated at Latitude 34°01304 North and Longitude -117°73355 West and is comprised of approximately 3.16 acres of undeveloped land north of Serenity Trail, in the City of Chino, San Bernardino County, California. Topographic relief across the subject property is moderate to gently sloping to the south at a gradient of less than 12 percent.

1.3 **Proposed Development**: It is represented that the proposed development will be two (2) multi-story senior living and memory care facilities with a subterranean garage, associated parking, hardscape and landscape improvements. For the purposes of this report the structures are assumed to consist of wood/steel-framed and/or concrete block type design. The final design of the structure was not completed prior to publishing this report and a review of the final design should be made by this office so that supplemental recommendations can be made if necessary. Should the proposed design alter from that represented in this report, this office should be afforded the opportunity to review any changes and provide amended recommendations if warranted.

1.4 **Subsurface Exploration**: Five (5) exploratory borings and six (6) exploratory backhoe test pits were advanced across the subject property (see the Appendix & Plate 1). Samples were obtained and transported to our soils laboratory to be examined by professionals of this firm, then selected for laboratory testing. The data obtained from the field and laboratory work performed has been analyzed with respect to the project information furnished to us for the proposed development.

1.5 **Findings:** Most of the study site is underlain by undocumented fill which varies in thickness from approximately 1 foot in the northerly easterly areas of the site to approximately 35 feet in the southerly portion, (see Plate 1). The origin of the undocumented fill is unknown at this writing but it is likely the result of earth materials generated from the construction and grading improvements along Serenity Trail and State Highway 71. Test results from the exploratory borings and excavations conducted indicate that the undocumented fill **does not** meet current CBC requirements of 90% relative compaction, (see Exploratory Borings and Test Pit Logs). The earth materials underlying the undocumented fill consist of alluvium and sandstone bedrock formation mapped as the Soquel Sandstone (Tms). A thin deposit of alluvium underlies the undocumented fill in the southerly portion of the subject site (see Figure 2). The Soquel Formation Sandstone underlies the alluvium. Perched water conditions were encountered at a depth approximately 34 and 43 feet in Boring No. 1 and 2 respectively. Static groundwater was not encountered (see Appendix).

1.6 **Feasibility for Development:** The proposed development is feasible from a geotechnical standpoint, provided the recommendations presented in this report are implemented within the design and construction of the project. Some challenges regarding proper removal and replacement of the undocumented fill should be contemplated regarding the positioning of proposed structures along the westerly and southerly property areas. Due to the property boundary limitations, it **will not** be possible

to perform complete removals of the undocumented fill present on the subject site (see Plate 1A). Additional information will be required to determine alternative foundation design and or grading techniques, shuc as slot grading during rough grading operations. Soil material deemed unsuitable for use as fill should be determined by the project geotechnical engineer at the time of grading and properly disposed of under their observation and documentation.

1.7 **Recommendations**: Based on the subsurface exploration and testing performed and information obtained through standard research conducted for this study, removal and recompaction (remedial grading) of the undocumented fill will be required to conform with CBC code requirements. Upon completion of remedial grading operations, future structures at the subject site can be supported on conventional continuous and isolated foundations with slab-at-grade design founded on properly compacted earth materials. Recommendations for site grading are provided under § 8.3 of this report. Recommendations for bearing and lateral resistance are provided in § 8.4.5 and 8.4.7 of this report. The final grading plan should be provided to this office for review so that specific recommendations can be provided based on the final planned development design. Because of the logistical difficulties associated with achieving total removal and recompaction of the undocumented fill, alternative grading and/or foundation design may be warranted. In order to provide recommendations for alternative grading and/or foundation design, additional geotechnical data would be required.

2.0 INTRODUCTION

2.1 **General Background:** This report presents the results of the geologic and geotechnical engineering study performed on the subject site for the referenced proposed project. After initial attempts to enter the site with a CME 75 truck-mounted drill rig failed, the scope of work for the Reference No. 1 report was modified to exclude deep borings until such a time that access could be provided. This updated study includes the additional borings recommended by the Reference No. 1 report. ***Thus, this report replaces the Reference No. 1 report in its entirety.***

2.2 **Scope of Work:** The scope of work performed for this study was designed to evaluate the surface and subsurface conditions within the subject site with respect to its geotechnical characteristics and suitability to support future structures for human occupancy. To provide this evaluation and prepare the preliminary recommendations for use by the design engineer and architect for site design and construction, the scope of work included the following: a site reconnaissance, surface geologic mapping; subsurface exploration; sampling of on-site earth materials; laboratory testing; engineering analysis of field and laboratory data, and the preparation of this report.

2.3 **Previous Site Studies:** The subject site was previously investigation by this firm as represented in the Reference No. 1 Report, dated October 10th, 2016. This report replaces the Reference No. 1 Report in its entirety (see § 2.1 for additional information).

3.0 PROPOSED DEVELOPMENT / PROJECT DESCRIPTION

3.1 **Grading Plans:** A conceptual grading plan prepared by United Engineering Group was utilized to appraise the proposed development from a geotechnical perspective. The final grading plans should be made available to this office for subsequent review so that additional recommendations may be prepared, if necessary.

3.1.2 **Proposed Development:** It is our understanding that the development of the subject site will be a multi-story senior living facility. Foundation plans were not available prior to publishing this report and should be reviewed by this office once available so that supplemental recommendations can be given. For the purposes of this report foundations bearing load criteria will be based on the following criteria:

Maximum Structure Bearing Loads	
Description	**Maximum Loads**
Maximum Wall Loads	2 kips per linear foot
Maximum Column Loads	30 kips
Maximum Floor Slab Pressure	150 pounds per cubic foot
Parking and Traffic Structural Loads (Design Life of 20 Years)	
Description	**Maximum Loads**
Concrete and Asphalt Pavement Areas	Equivalent Single Axle Loads = 18 kips
Concrete and Asphalt Pavement Areas	Maximum vehicle Loads = 60,000 lbs

It is represented that the proposed development will include infrastructure such as street, storm drains and utility improvements.

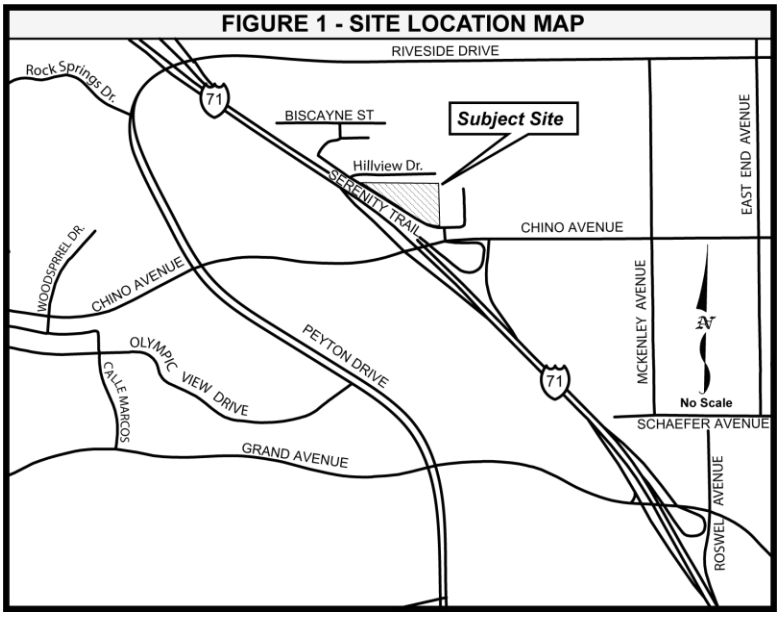
3.1.3 **Project Description:** It is assumed for the purposes of this report that the foundation bearing loads are not anticipated to exceed 2,000 pounds per lineal foot (plf) for continuous footings, or 30 kips per isolated column footing. It is represented that retaining walls and a subterranean parking structure are planned. This office should be notified if structures, foundation loads, grading, and/or details other than those represented herein are proposed for final development of the site so that a review can be performed, supplemental evaluation prepared, and revised recommendations submitted, if required.

4.0 SITE DESCRIPTION

4.1 **General**: The subject site is an unimproved essentially triangular shaped approximately 3.16-acre parcel of land located north of Serenity Trail, in the City of Chino, San Bernardino County, California. Topographic relief across the subject site drains from a high of approximately 740 feet

above mean sea level (amsl) near the northerly property boundary to a low of approximately 700 amsl near the southerly property boundary, resulting in a vertical relief of approximately 40 feet to the south across the subject site. At the time the field investigation was conducted, the subject property was covered with a light to moderate growth of natural grasses and weeds.

FIGURE 1 - SITE LOCATION MAP



5.0 FIELD STUDY

5.1 **Field Exploration and Sampling Program:** Initial field reconnaissance, geologic mapping subsurface exploration and sampling was conducted on September 29th, 2015 by our field Geologist. The work was conducted to evaluate the underlying earth strata and search for the presence of groundwater. Eight exploratory test pits were excavated across the site by **Levering Grading** using a John Deere, 310ASE, wheel-mounted backhoe with a 24-inch bucket. The test pits we're excavated to a maximum depth of 18 feet below existing ground surface and density tests were performed at 2-foot intervals to assess the density of near surface soils. Due to the potential of caving of the test pits, tests were generally only performed to a depth of approximately 6 feet. In July of 2017 access roads were constructed across the subject property for additional subsurface exploration to take place. On July 27, 2017 Five (5) deep exploratory soil borings were advanced across the study site by **Martini Drilling** utilizing a CME 75 truck-mounted drill rig, equipped with 7-inch outside diameter continuous flight hollow-stem auger drilling and sampling system.

5.1.1 **Depth of Exploration & Geotechnical Conditions Encountered:** The maximum depth of on-site exploration was approximately 50.5 feet below the existing ground surface (bgs). In general, the earth materials encountered throughout the site consisted of undocumented fill. The undocumented fill consisted of very silty fine sand to sandy silt and clay silt mixtures. Undocumented fill varied in

thickness to less than a foot in the northerly and northeasterly portion of the site to an approximate depth of 30 feet in the southerly extension of the property boundary near Serenity Trail. For further details, see the Exploratory Logs in the Appendix of this report.

5.1.2 **Soil Samples (Bulk):** Six bulk samples were collected from the backhoe test pit locations. All soil samples were subsequently returned to our soils laboratory for verification of field classifications and selected testing. Bulk samples were obtained from cuttings developed during the excavation process and represent a mixture of the soils within the depth indicated on the logs. The approximate locations of the test pits are denoted on the Geotechnical Report Site Plan, (Plate 1).

5.1.3 **Backfilling of Test Pits:** Upon completion of field operations, the test pits were marked with caution tape and left for the client to backfill per EnGEN's standard terms and conditions.

6.0 LABORATORY TESTING

6.1 **General:** The results of laboratory tests performed on samples of earth material obtained during the field investigation are presented in the Appendix of this report. Following is a listing and brief explanation of the laboratory tests which were performed. The samples obtained during the field investigation will be discarded 30 days after the date of this report. This office should be notified immediately if retention of samples will be needed beyond 30 days.

6.2 **Classification:** The field classification of soil materials encountered in the exploratory borings was verified in the laboratory in general accordance with the Unified Soils Classification System, ASTM D 2488-00, Standard Practice for Determination and Identification of Soils (Visual-Manual Procedures).

6.3 **In-Situ Moisture Content and Density Test:** The in-situ moisture content and dry density were determined in general accordance with ASTM D 2216-98 and ASTM D 2937-00 procedures, respectively, for each selected undisturbed sample obtained. The dry density is determined in pounds per cubic foot and the moisture content is determined as a percentage of the oven dry weight of the soil.

6.4 **Maximum Dry Density / Optimum Moisture Content Relationship Test:** Maximum dry density/optimum moisture content relationship determinations were performed on samples of near-surface earth material in general accordance with ASTM D 1557-02 procedures using a 4.0-inch diameter mold. Samples were prepared at various moisture contents and compacted in five (5) layers using a 10-pound weight dropping 18-inches and with 25 blows per layer. A plot of the compacted dry density versus the moisture content of the specimens is constructed and the maximum dry density and optimum moisture content determined from the plot.

6.5 **In-Situ Direct Shear Test:** Direct shear tests were performed on selected samples of near-surface earth material in general accordance with ASTM D 3080-03 procedures. The shear machine is of the constant strain type. The shear machine is designed to receive a 1.0-inch high, 2.416-inch

diameter ring sample. Specimens from the sample were sheared at various pressures normal to the face of the specimens. The specimens were tested in a submerged condition. The maximum shear stresses were plotted versus the normal confining stresses to determine the shear strength (cohesion and angle of internal friction).

6.6 **Expansion Test:** Laboratory expansion tests were performed on samples of near-surface earth material in general accordance with the California Building Code Standard (CBC 18-2). In this testing procedure, a remolded sample is compacted in two (2) layers in a 4.0-inch diameter mold to a total compacted thickness of approximately 1.0-inch by using a 5.5-pound weight dropping 12-inches and with 15 blows per layer. The sample is compacted at a saturation of between 49 and 51 percent. After remolding, the sample is confined under a pressure of 144 pounds per square foot (psf) and allowed to soak for 24 hours. The resulting volume change due to the increase in moisture content within the sample is recorded and the Expansion Index (EI) calculated.

6.7 **Soluble Sulfates:** Samples of near surface earth materials were obtained for soluble sulfate testing at the site. The concentration of soluble sulfate was determined in general conformance with California Test Method 417 procedures.

6.8 **pH/Minimum Resistivity:** Samples of near surface earth materials were obtained of near soils that will be in contact with the proposed footings and tested for pH and minimum resistivity in general conformance to CTM 643.

6.9 **Chloride Content:** Samples of near surface earth materials were obtained of near soils that will be in contact with the proposed footings and tested for chloride content in general conformance to CTM 422.

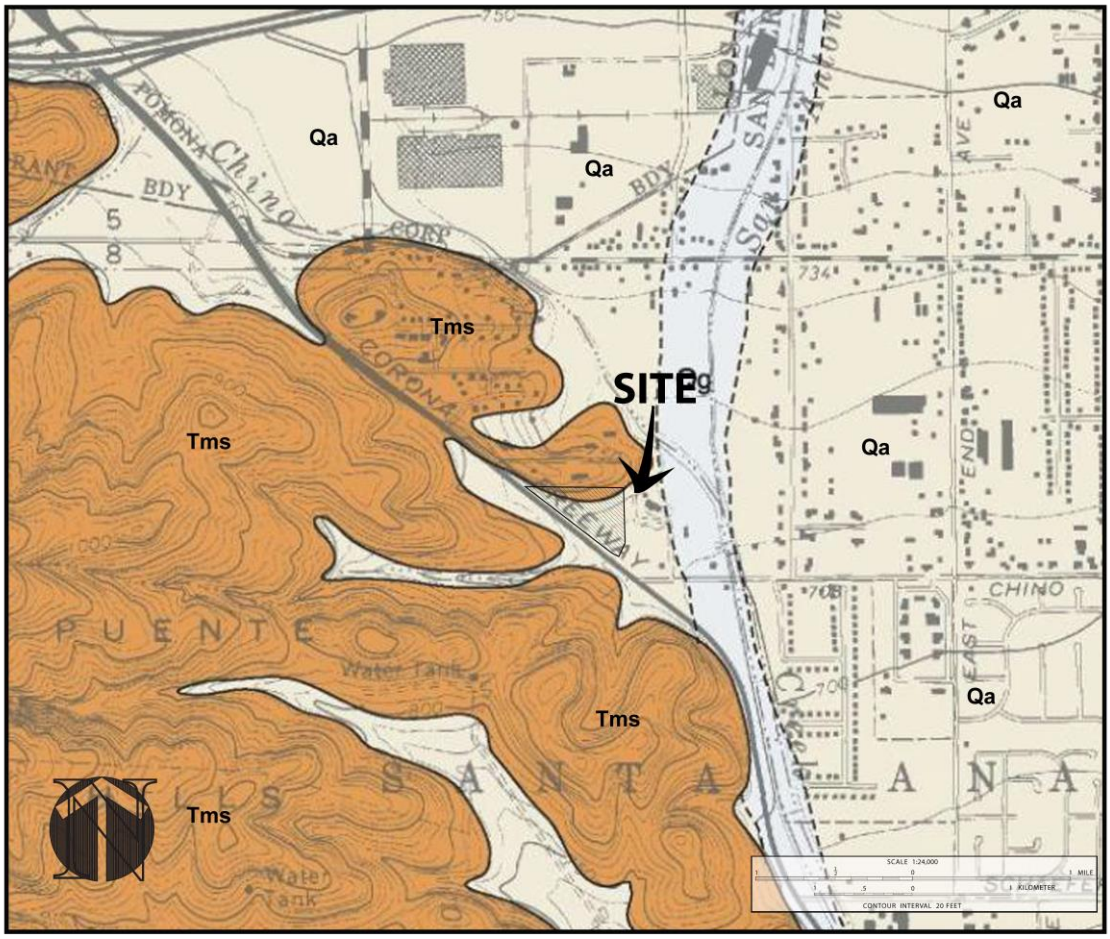
6.10 **R-Value Test:** An evaluation was performed on a selected representative soil sample in general accordance with California Test Method 301. The resistance (R-Value) test method is used to measure the potential strength of subgrade, subbase, and base course materials for use in road pavements.

6.11 **Grain Size Distribution Test:** An evaluation was performed on selected representative soil samples in general accordance with ASTM D 422-63 (2002). This “grain-size” or “sieve analysis” test method determines the distribution of particle sizes in soils which allows for the proper classification per the Unified Soils Classification System (USCS). In this test procedure, a weighed sample is processed through multiple sieves designated by their size generally ranging from a No. 4 (0.25-inch) to a No. 200 sieve by means of a lateral and vertical motion of the sieve on a mechanical shaker. The percentage of material passing each sieve is weighed and recorded with the results plotted in graph form.

7.0 GEOLOGY

7.1 **Geologic Setting:** The subject site Is located in the Chino Basin. The Chino Basin Is situated within the upper Santa Ana Valley of the Peninsular Ranges Geomorphic province and is a relatively flat alluvial plain formed from sediments deposited by the Santa Ana River and its tributaries such as Chino Creek, within the Perris Block. The Peninsular Ranges are the southernmost segment of the chain of North American Mesozoic batholiths that extend from Alaska to the southern tip of Baja California, and are a series of northwest-southeast trending mountain ranges separated by similarly trending valleys. These geomorphic structures in the area are sub-parallel to the major fault systems such as the Elsinore Fault zone, which Includes the Whittier, Chino-Central Avenue and the San Jacinto Fault zone. The Perris Block Is composed

FIGURE 2 - REGIONAL GEOLOGIC MAP



Base Map: Preliminary Geologic Map of San Dimas and Ontario Quandrangles, Thomas W. Dibblee, Jr. 2002

LEGEND

Qa = **Alluviual Gravel and sand, (Holcene)**

Tms = **Soquel sandstone facies, (Miocene)**, partly intertonged into Tmy, light grey to tan

Tmy = **Yorba Shale Member, (Miocene)**, light grey, thin bedded

chiefly of crystalline rocks of Cretaceous and earlier ages with thin mantles of sedimentary and volcanic rocks. The Perris Block Is bound on the northeast by the San Jacinto fault zone and, on the north by the Sierra Madre-Cucamonga fault zone, on the west by the Elsinore Fault zone. The southern boundary Is undefined.

7.2 **Faulting:** The site is not located within an Alquist-Priolo Earthquake Fault Zone (AP Zone). No known active faults traverse the property. Several USGS maps and interactive mapping resources were reviewed to locate the subject site relative to known mapped faults (see references in the Appendix to this report). However, the subject site is not mapped on any AP Zone maps. For the purposes of this report Figure 3 was prepared to illustrate the mapped faults near the subject site. The closest mapped fault is the Central Avenue Fault which is mapped approximate ¾ of a mile (1.3 kilometers) northeast of the subject site. The northern branch of the Elsinore Fault Zone (Chino Branch – Chino Fault) is mapped approximately 3.1 miles (4.9 km) southwest of the subject site, (see Figure 3).

7.3 **Seismicity**: The project lies within an active area of faulting and seismicity in the Southern California region. The seismicity has included approximately eight (8) earthquakes of Richter magnitude 6.0 or greater within approximately 70 miles of the site and approximately 10 earthquakes of Richter magnitude, ranging from 5.0 to 6.0 within 50 miles of the site. Numerous earthquakes ranging in magnitude from 4.0 to 5.0 within 30 miles of the subject site have been recorded during the periods of 1932 through 1972. This predominance of seismic activity has been associated with the San Jacinto Fault Zone along its southeast section in the vicinity of the Salton Sea, and within the northwest portion near its junction with the San Andreas Fault Zone. The predominance of the remaining recorded activity has been associated with the San Andreas Fault Zone.

7.3.1 **Seismic Risk**: Well-delineated fault lines cross through the region as shown on the Regional Fault Location Map, (Figure 3). However, no active faults are mapped in the immediate vicinity of the subject site. Therefore, active fault rupture is unlikely to occur at the project site. While fault rupture would most likely occur along previously established fault traces, future fault rupture could occur at other locations.

7.4 **Earth Materials:** A brief description of the earth materials encountered in the exploratory excavation is presented in the following sections. A more detailed description of the earth materials encountered is presented on the Backhoe Test Pit and Boring Logs in the Appendix. The earth material strata as shown on the log represent the conditions in the actual exploratory location. Lines of demarcation between the earth materials on the log represent the approximate boundary between the material types; however, the transitions may be gradual.

7.4.1 **Undocumented Fill (Af):** Undocumented fill underlies most of the subject property (see Plate 1) which is believed to have been derived from flood control, freeway (State Highway 71) and road improvements along Serenity Trail adjacent to and west of the subject site. As seen in exploratory subsurface exploratory pits and borings advanced across the subject site. The undocumented fill material consists of light grey silty fine sand (see logs in the Appendix) that was moist, loose to dense in place.

4.4.2 **Alluvium** (**Qa**): Some residual alluvium may underlie the undocumented fill in the southwesterly area of the subject site (see Appendix – Boring logs and Backhoe Test Pit Logs).

4.4.3 **Soquel Formation Bedrock (Mapped as Tms):** The Soquel Formation Bedrock consists of a sandstone conglomerate, siltstone and the shale of the Sycamore Canyon Member (Fife, et al, 1976) was mapped on the easterly portion of the subject site which consist of a thinly bedded siltstone that was massive and homogeneous in place.

7.5 **Groundwater:** Groundwater or evidence of historic high groundwater conditions was not observed within any of the exploratory backhoe test pits advanced at the subject site to the maximum depth explored (20 feet). Data from the nearest state well (02S08W23C006S) which is situated at an elevation of 629.22 AMSL and located approximately 2.25-miles southwest of the subject site indicates the depth to groundwater at that location to be approximately 65 feet in 2015, (California Department of Water Resources, 2016). Based on the information researched for this study groundwater is not anticipated to rise within 100 feet from surface elevation at the subject site.

7.5.1 **Perched Water Conditions**: While free water was not encountered within the exploratory excavations and borings advanced across the site, a perched water condition was encountered at a depth of 43 feet in boring number 1 (B1). Delayed water readings were measured after drilling was completed in all borings. The static water level recorded was in Boring No. 1 at a depth of 45.5-feet. Because the soil samples obtained to the maximum depth explored were not saturated they are not considered representative of samples obtained below free water levels. It is our interpretation that perched water conditions between silt/clay deposits at the depths recorded above the delayed measurement in B1 is not a free groundwater condition, but rather an thin perched water condition of saturated soil at a depth of approximately 42 feet from the surface.

7.6 **Liquefaction Potential:** Liquefaction is a phenomenon where a sudden large decrease of shearing resistance takes place in fine-grained cohesionless and/or low plastic cohesive soils due to the cyclic stresses produced by earthquakes causing a sudden, but temporary, increase of porewater pressure. The increased porewater pressure occurs below the water table, but can cause propagation of groundwater upward into overlying soil and possibly to the ground surface and cause sand boils as excess porewater escapes. Potential hazards due to liquefaction include significant

total and/or differential settlements of the ground surface and structures as well as possible collapse of structures due to loss of support of foundations. It has been shown by laboratory testing and from the analysis of soil conditions at sites where liquefaction has occurred that the soil types most susceptible to liquefaction are saturated, fine-grained sand to sandy silt with a mean grain size

FIGURE 3 - REGIONAL FAULT LOCATION MAP

SOURCE: U.S. Geologic Survey and California Geologic Survey, Quaternary Fault and Fold Database of the United States March 2016 (http://earthquake.usgs.gove/hazards/qfaults

ranging from approximately 0.075 mm to 0.5 mm. These soils derive their shear strength from intergranular friction and do not drain quickly during earthquakes. Published studies and field and laboratory test data indicate that coarse-grained sands and silty or clayey sands beyond the above-mentioned grain size range are considerably less vulnerable to liquefaction. The relative density of

the soil also controls the susceptibility to liquefaction for a given number of cycles and acceleration levels during a seismic event. Other characteristics such as confining pressure and the stresses created within the soil during a seismic event also affect the liquefaction potential of a site. Liquefaction of soil does not generally occur at depths greater than 50-feet bgs due to the confining pressure at that depth. Chapter 6 of Special Publication 117A (2008) provides the procedures recommended for the screening of seismic hazards when a site is mapped within a State designated seismic hazards zone. While the subject site is not mapped within a seismic hazards zone, it is the responsibility of the geotechnical consultant to screen each site for its potential to be impacted by geologic and geotechnical hazards associated with seismic events. We have screened the subject property using guidelines provided in SP117A in order to assess the need for a quantitative analysis of liquefaction potential. Relevant screening criteria is provided as follows:

1. *If present, are the potentially liquefiable soils saturated or might they become saturated?*

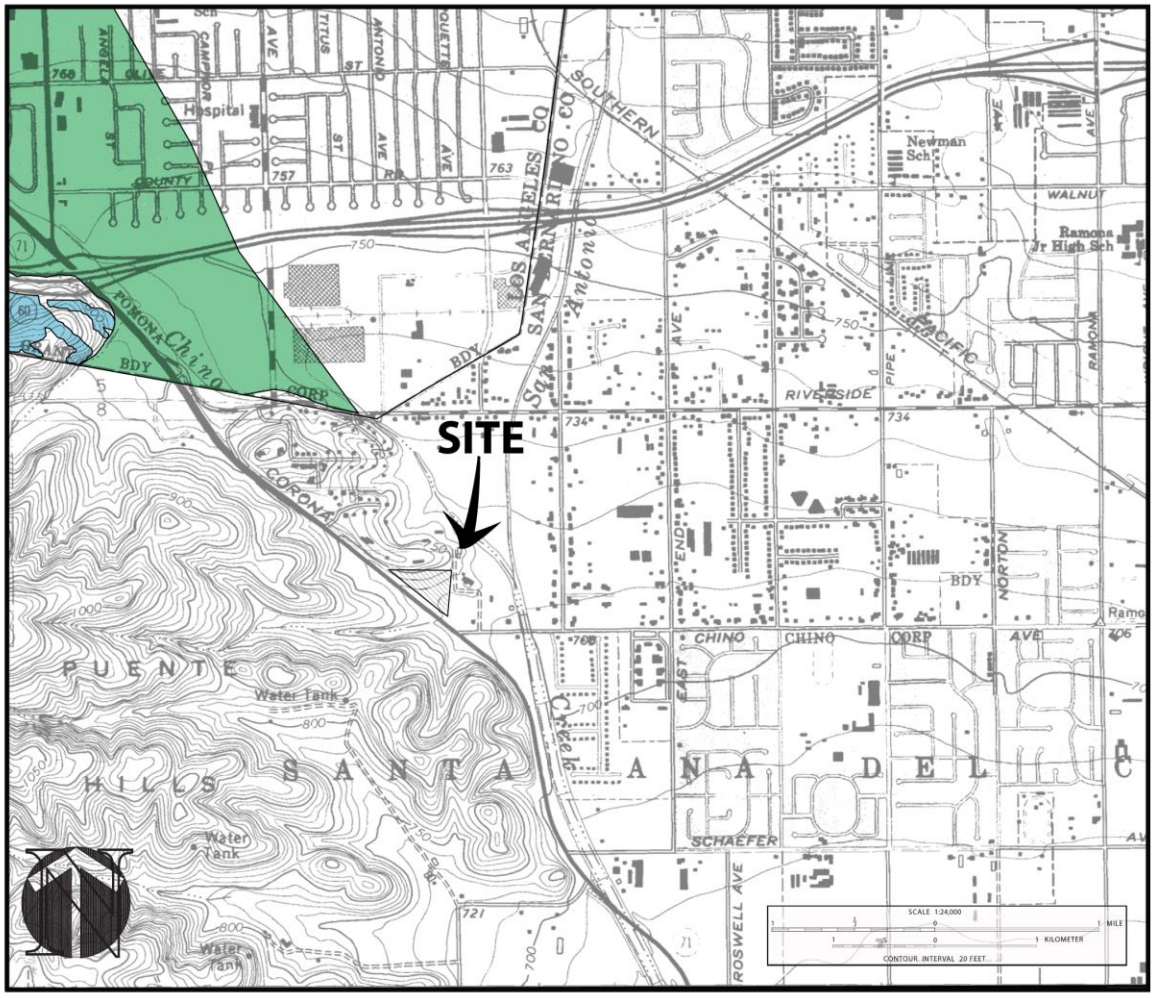
   The soil type present throughout most of the subject site is undocumented fill comprised of silty fine sand that was not saturated. The depth of undocumented fill across the site varies with the deepest section found to be 30 feet logged in the southwesterly area of the subject site (see Boring No. 1). Based on historical groundwater data researched for this investigation, free groundwater is not anticipated to encroach within 50-feet of surface elevation at the subject site. The perched water condition recorded at a depth of 43-feet in B1 is not considered sufficient to initiate liquefaction of the overlying soils. And, the overlying soils being comprised of very silty fine sands and interbedded clays do not possess soil characteristics susceptible to liquefaction.

2. *Are the in-situ soil densities sufficiently high to preclude liquefaction?*

   While the soil type on site is not considered to have properties that would be susceptible to liquefaction, the soil in question is undocumented fill and covers most the subject site. The undocumented fill was tested during the field portion of this investigation and found to be loose from the surface to a depth of approximately 30-feet. Based on the initial test results, the density of the existing on-site soils are **not** sufficient to preclude settlement during a seismic event though the soil properties themselves are not susceptible to liquefaction potential. Recommendations of this report requires the removal and replacement of undocumented fill as engineered fill compacted to a minimum of 90 percent relative compaction which eliminates the potential for liquefaction. ***Based the screening outlined above the potential for liquefaction is considered to be very low.***

7.7 **Secondary Effects of Seismic Activity:** The secondary effects of seismic activity normally considered as possible hazards to a site include various types of ground failure and flooding induced from dam failure. The site is not located near any large confined bodies of water.

FIGURE 4 - SEISMIC HAZARDS MAP



Base Map: State of California Seismic Hazards Zone Map, Ontario Quadrangle, California Department of Conservation, USGS, 2000.

LEGEND

= Areas requiring Liquefaction Analysis

= Areas requiring slope stability Analysis

Therefore, the potential for seismically-induced flooding and earthquake-induced surface flooding due to seiche activity is considered to be low. Due to the distance from the Pacific Ocean, the probability of a tsunami impacting the site is nil. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, the distance of the site from the zone of maximum energy release of the earthquake, the topography of the site, the subsurface materials

at the site, and the groundwater conditions beneath the site, besides other factors. Since there are no faults mapped on or near the site, the probability of hazards due to fault generated ground surface rupture at the site is low. Due to the low topographic relief of the site, the potential for earthquake-induced landslides is considered to be very low.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 **General:** The conclusions and recommendations presented in this report are based on the results of field and laboratory data obtained from the exploratory excavations located across the property, the project description and assumptions presented in § 3.0, of this report. Based on the field and laboratory data and the engineering analysis performed, the proposed development is feasible from a geotechnical engineering standpoint. The actual conditions of the near-surface supporting material across the site may vary. The nature and extent of variations of the surface and subsurface conditions between the exploratory excavations may not become evident until construction. If variations of the material become evident during grading, this office should be notified so that **EnGEN Corporation** can evaluate the characteristics of the material and, if needed, prepare revisions to the recommendations presented herein. Recommendations for general site grading, foundations, slab support, pavement design, slope maintenance, etc., are presented in the subsequent paragraphs.

8.2 **Earthwork Recommendations:**

8.2.1 **General:** The grading recommendations presented in this report are intended for: 1) the use of a conventional shallow foundation system and concrete slabs cast on-grade; and 2) the rework of unsuitable near-surface earth materials to create an engineered building pad and suitable support for exterior hardscape (sidewalks, patios, etc.) and pavement. If pavement subgrade soils are prepared at the time of rough grading of the building site and the areas are not paved immediately, additional observations and testing of the subgrade soil must be performed before placing aggregate base material or asphaltic concrete or PCC pavement to locate areas which may have been damaged by construction traffic, construction activities, and/or seasonal wetting and drying. The following recommendations may need to be modified and/or supplemented during rough grading as field conditions require.

8.2.2 **Clearing:** All debris, refuse, roots, grasses, weeds, brush and other deleterious materials should be removed from the proposed structure, exterior hardscape and pavement areas, as well as any areas to receive structural fill before grading is performed. No discing or mixing of organic material into the soils should be performed. Man-made objects encountered should be over-excavated and exported from the site.

8.2.3 **Excavation Characteristics:** Excavation within the study site is anticipated to be relatively easy.

8.2.4 **Suitability of On-Site Materials as Fill:** In general, the on-site earth materials present are considered suitable for reuse as new engineered fill. Fill materials should be free of significant amounts of organic materials and/or debris. Fill materials should not contain rocks greater than 6-inches in maximum diameter. There are no oversize rocks greater than 12-inches maximum diameter anticipated to be encountered at the subject site, therefore recommendation for disposal is not provided in this report. Should oversized material be encountered during site preparation, recommendations will be made during site grading under exposed conditions.

8.2.5 **Removal and Re-Compaction:** All existing unsuitable, loose, or disturbed near-surface soil in proposed structure and parking lot areas should be removed. The approved final grading plans should be made available for review by this office to prepare additional recommendations, if necessary. The following recommendations are based on field and laboratory test results:

1. ***Removal of Undocumented Fill:*** All undocumented fill material encountered on-site will require removal to unweathered bedrock. The estimated depth of removals will vary from several feet to approximately 30-feet in the southwesterly area of the site. Undocumented fill overlies the entirely westerly portion of the property and removal of undocumented fill beyond the westerly property boundary will not be possible. The undocumented fill cannot be relied upon for support of the engineered fill that will be removed and replaced during grading operations. As such, a structural setback from the westerly property boundary extending 1.5-feet horizontally and 1-foot vertically (1.5:1) should be established until an interface between the undocumented fill and competent alluvium or unweathered bedrock have been reached (see Plate 1). Undocumented fill within the setback zone may require special grading techniques to achieve full removals beneath the proposed structure. Special Foundation design will be necessary for an alternative to total removals of undocumented fill in areas where undocumented fill cannot be safely removed and recompacted beneath the proposed structures.

2. ***Foundations & Subterranean Parking Structure*:** Foundations for the proposed structures should ***not*** span transitions between cut and fill. Most of the subject site is underlain by undocumented fill that will require removal and re-compaction. The Referenced No. 1 Conceptual Grading Plan was reviewed for this report and indicates that the proposed structure will have a subterranean parking garage that will extend approximately 12-feet below finish grade. Once final grading plans are available, this office should review them and provide appropriate recommendations for the depths of removal and re-compaction operations prior to construction.

3. **Suitable Bottoms for *Removals***: Removal bottoms should be tested for competency. At least two confirmatory density tests within the proposed building pad should be performed. A competent removal bottom should be defined as an undisturbed bottom which is a minimum of 85 percent relative compaction, and free of large or abundant pores. Bottoms with densities less that 85 percent should be deepened.
4. **Over-Excavation in Natural *Ground***: Over-Excavation and recompaction of natural ground within in the hardscape portions of the site, should be performed to 2-feet below proposed grade in areas where natural ground is exposed.
5. ***Approval of Exposed Bottomes***: All exposed removal and over-excavation bottoms should be inspected by the Project Geotechnical Engineer and/or his representative prior to placement of any fill.
6. ***Preparation of Approved Bottoms***: The approved exposed bottoms of all removal areas should be scarified 12-inches, brought to near optimum moisture content, and compacted to a minimum of 90 percent relative compaction before placement of fill. Maximum dry density and optimum moisture content for compacted materials should be determined in accordance with ASTM D 1557-02 procedures.
7. ***Final Determination of Over-Excavation Depths***: Final determination of removal and over-excavation depths should be made during grading.
8. ***Import Material***: If import material is planned to be used, this firm should be notified immediately to perform additional testing and provide further recommendations, as necessary.

8.2.6 **Fill Placement Requirements:** All fill material, whether on-site material or import, should be approved by the Project Geotechnical Engineer and/or his representative before placement. All fill should be free of vegetation, organic material, and debris. Import fill should be no more expansive than the existing on-site material. Approved fill material should be placed in horizontal lifts not exceeding 10-inches in compacted thickness and watered or aerated to obtain near optimum moisture content (±2.0 percent of optimum). Each lift should be spread evenly and should be thoroughly mixed to ensure uniformity of soil moisture. Structural fill should meet a minimum relative compaction of 90 percent. Maximum dry density and optimum moisture content for compacted materials should be determined in accordance with ASTM D 1557-02 procedures. Moisture content of fill materials should not vary more than 2.0 percent from optimum, unless approved by the Project Geotechnical Engineer.

8.2.7 **Oversize Material:** Oversize material is defined as rock, or other irreducible material with a dimension greater than 12-inches. Oversize material is not anticipated to be encountered for the subject project and recommendations for the disposal of oversized material are not considered

necessary. Should oversized material be encountered during site grading, recommendations will be made in the field under exposed conditions.

8.2.8 **Compaction Equipment:** It is anticipated that fill compaction for the project will be achieved using a combination of rubber-tired and track-mounted heavy construction equipment. Compaction by rubber-tired or track-mounted equipment, by itself, may not be sufficient. Adequate water trucks, water pulls, and/or other suitable equipment should be available to provide sufficient moisture and dust control. The actual selection of equipment is the responsibility of the contractor performing the work and should be such that uniform and proper compaction of the fill is achieved.

8.2.9 **Shrinkage and Subsidence:** There will be a material loss due to the clearing and grubbing operations. Based on fill compaction of a minimum density of 90 percent, an average shrinkage of soils within the undocumented fill areas of the site that are excavated and replaced as compacted fill should be anticipated. It is estimated that the average shrinkage of these materials will be on the order of 8 percent. A higher relative compaction would mean a larger shrinkage value. No estimations can be given for the landscape material due to its unknown nature, however, due to the limited nature of the proposed grading operations, shrinkage is not anticipated to be of any significant impact to the site grading operations.

8.2.10 **Cut and Fill Slopes:** It is the opinion of this firm that as long as the recommendations provided in this report are implemented during the site grading operations, any cut or fill slopes in accordance with standard CCB code requirements will be grossly stable from a slope stability standpoint. This firm should review any future grading plans proposed for the subject site.

8.2.11 **Keyways:** A keyway excavated into competent soil should be constructed at the toe of all fill slopes that are proposed on natural grades of 5:1 (horizontal to vertical) or steeper prior to placing fill. A typical detail for keyway construction is included in the Appendix of this report.

8.2.12 **Subdrains:** Although the need for subdrains is not anticipated at this time, final recommendations should be made during grading by the Project Geotechnical Engineer and/or his authorized representative.

8.2.13 **Observation and Testing:** During grading, observation and testing should be conducted by the Project Geotechnical Engineer and/or his representative to verify that the grading is being performed per the recommendations presented in this report. The Project Geotechnical Engineer and/or his representative should observe the scarification and the placement of fill and should take tests to verify the moisture content, density, uniformity and degree of compaction obtained. Where testing demonstrates insufficient density, additional compaction effort, with the adjustment of the moisture content where necessary, should be applied until retesting shows that satisfactory relative compaction has been obtained. The results of observations and testing services should be presented in a formal Finish Grading Report following completion of the grading operations. Grading

operations undertaken at the site without the Project Geotechnical Engineer and/or his representative present may result in exclusions of the affected areas from the finish grading report for the project. The presence of the Project Geotechnical Engineer and/or his representative will be for the purpose of providing observations and field testing and will not include any supervision or directing of the actual work of the contractor or the contractor's employees or agents. Neither the presence and/or the non-presence of the Project Geotechnical Engineer and/or his field representative nor the field observations and testing shall excuse the contractor in any way for defects discovered in the contractor's work.

8.2.14 **Soil Expansion Potential:** Upon completion of fine grading of the building pad, near-surface samples should be obtained for expansion potential testing to identify the expansion potential for the pad and assign appropriate foundation and slab-on-grade recommendations for construction. Our Expansion Index (EI) testing of near surface on-site soils indicate an expansion of EI=96, which is classified as a high expansion potential. **Final foundation design parameters should be based on EI testing of soils that will be in direct contact with the foundation system and be performed at the conclusion of rough grading.**

8.2.15 **Corrosive Soils:** Organic clays and clayey soils as well as soils containing a high degree of organic material are most typically identified with having corrosive properties. Because of the nature of grading for any type of development, it is not known if these soils will be in contact with the proposed footings until near finished grade elevations have been achieved. It is recommended that soils that will be in contact with the proposed footings be sampled and tested for corrosive properties at near final grade elevations. If test results indicate that corrosive soils will be in contact with the proposed footings, appropriate recommendations should be provided in the rough grading report for final minimum foundation design based on soil properties. Preliminary testing for corrosive properties of the on-site soils have been performed and test results for pH, minimum resistivity, sulfate content, and chloride content (CTM 417, CT 643, CTM 422 procedures) were analyzed by Soil Core, Inc. A negligible concentration (0.002% by weight) of water soluble sulfates was reported. Thus, normal Type II cement may be used in concrete that will come in contact with native soils. Additional corrosivity related results included a pH of 7.7, a minimum resistivity of 1,200 ohm-cm, and a chloride content of 60 ppm. Should additional corrosivity analysis be required, a Corrosion Engineer should be consulted. Laboratory analytical results are included in the Appendix.

8.3 **Preliminary Foundation Design Recommendations:**

8.3.1 **General:** Foundations for the proposed structures may consist of conventional column footings and continuous wall footings founded upon properly compacted fill, as recommended in § 8.3, Earthwork Recommendations, of this report. The recommendations presented in the subsequent paragraphs for foundation design and construction are based on geotechnical characteristics and a high expansion potential for the supporting soils and are not intended to preclude more restrictive structural requirements. The Structural Engineer for the project should determine the actual footing width and depth to resist design vertical, horizontal, and uplift forces.

8.3.2 **Foundation Size:** Continuous footings should have a minimum width of 24-inches for single and two story structures. Continuous footings should be continuously reinforced with a minimum of two (2) No. 5 steel reinforcing bars located near the top and two (2) No. 5 steel reinforcing bars located near the bottom of the footings to minimize the effects of slight differential movements which may occur due to minor variations in the engineering characteristics or seasonal moisture change in the supporting soils. Final foundation size and reinforcing should be determined based on the expansive potential of the supporting soils. Column footings should have a minimum width of 18-inches by 18-inches and be suitably reinforced, based on structural requirements. A grade beam, founded at the same depths and reinforced the same as the adjacent footings, should be provided across the doorways, or any other types of perimeter openings.

8.3.3 **Depth of Embedment:** Exterior and interior footings founded in properly compacted fill should extend to a minimum depth of 18-inches below lowest adjacent finish grade for one story structures and 18-inches below lowest adjacent final grade for two story structures. Deeper footings may be necessary for structural reasons or for expansive soils purposes, depending on the final determination of pad specific expansive potential.

8.3.4 **Pre-saturation**: Moisture conditioning of the foundation and slab areas should be performed until a minimum of 120% of optimum moisture content extending to a minimum depth of 24-inches of finish grad elevations is achieved prior to trenching operations.

8.3.5 **Bearing Capacity:** Provided the recommendations for site earthwork, minimum footing width, and minimum depth of embedment for footings are incorporated into the project design and construction, the allowable bearing value for design of continuous and column footings for the total dead plus frequently-applied live loads is 1,500 psf for continuous footings, and 1,500 psf for column footings in properly compacted fill. The allowable bearing value has a factor of safety of at least 3.0 and may be increased by 33.3 percent for short durations of live and/or dynamic loading, such as wind or seismic forces.

8.3.6 **Settlement:** Footings designed per the recommended bearing values and the maximum assumed wall and column loads are not expected to exceed a maximum settlement of 0.50-inch

or a differential settlement of 0.25-inch over 40-feet in properly compacted fill under static load conditions.

8.3.7 **Preliminary Lateral Capacity:** Preliminary additional foundation design parameters for resistance to static lateral forces are as follows:

Allowable Lateral Pressure (Equivalent Fluid Pressure, Passive Case
Compacted Fill – 150 pcf

Allowable Coefficient of Friction – Compacted Fill – 0.35

Lateral load resistance may be developed by a combination of friction acting on the base of foundations and slabs and passive earth pressure developed on the sides of the footings and stem walls below grade when in contact with properly compacted fill. The above values are allowable design values and have safety factors of at least 2.0 incorporated into them and may be used in combination without reduction in evaluating the resistance to lateral loads. The allowable values may be increased by 33.3 percent for short durations of live and/or dynamic loading, such as wind or seismic forces. For the calculation of passive earth resistance, the upper 1.0-foot of material should be neglected unless confined by a concrete slab or pavement. The maximum recommended allowable passive pressure without further analysis is 5.0 times the recommended design value.

8.3.8 **Seismic Design Parameters:** The following minimum seismic design factors apply:

Description	Design Parameters
Site Latitude:	34.01304ºN
Site Longitude:	-117.73355ºW
Site Class:	D
Spectral Response (Short):	(0.2 sec) – Ss: 2.198 g
Spectral Response • (One Second):	(1.0 sec) – S_1: 0.795 g
Short Period Site Coefficient:	Fa: 1.0
1-Second Period Site Coefficient:	Va: 1.5
Adjusted Spectral Response:	(Short Period) - 0.2 sec – S_{ms}: 2.198 g
Adjusted Spectral Response:	(One Sec) – S_{m1}: 1.192 g
Design Spectral Response:	(Short Period) 0.2 sec – S_{ds}: 0.795 g
Design Spectral Response:	(One Sec) 1.0 sec – S_{d1}: 0.905 g

8.3.9 **Slab-on-Grade Recommendations:** The recommendations for concrete slabs, both interior and exterior, excluding PCC pavement, are based upon the expansion potential for the supporting material. Concrete slabs should be designed to minimize cracking as a result of shrinkage. Joints (isolation, contraction, and construction) should be placed in accordance with the American Concrete Institute (ACI) guidelines. Special precautions should be taken during placement and curing of all concrete slabs. Excessive slump (high water/cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could result in excessive shrinkage, cracking, or curling in the slabs. It is recommended that all concrete proportioning, placement, and curing be performed in accordance with ACI recommendations and procedures.

8.3.10 **Interior Slabs:** Interior concrete slabs-on-grade should be a minimum of 6.0-inches nominal in thickness and be underlain by a 1.0 to 2.0-inches of clean coarse sand or other approved granular material placed on properly prepared subgrade per Section 8.2 of this report. Minimum slab reinforcement should consist of No. 4 reinforcing bars placed 18-inches on center in either directions, or a suitable equivalent as determined by the Project Structural Engineer. Final pad identification and slab construction requirements will be presented in the compaction report upon completion of grading. It is essential that the reinforcing be placed at mid-depth in the slab. The concrete section and/or reinforcing steel should be increased appropriately for anticipated excessive or concentrated floor loads. In areas where moisture sensitive floor coverings are anticipated over the slab, we recommend the use of a polyethylene vapor barrier with a minimum of 10.0 mil in thickness be placed beneath the slab. The moisture barrier should be overlapped or sealed at splices and covered top and bottom by a 1.0 to 2.0-inch minimum layer of clean, moist (not saturated) sand to aid in concrete curing and to minimize potential punctures of the barrier material. If practical, a post-tensioned slab & foundation system can be used instead of the conventional reinforced slab recommended in this section.

8.3.11 **Exterior Slabs:** All exterior concrete slabs at finish subgrade (patios, sidewalks, etc., except for PCC pavement) should be a minimum of 4.0-inches nominal in thickness and underlain by a minimum of 24 inches of soil that has been prepared in accordance with Section 8.2 of this report. Reinforcing in the slabs and the use of a compacted sand or gravel base beneath the slabs should be per the current local standards.

8.4 **Utility Trench Recommendations:** Utility trenches within the zone of influence of foundations or under building floor slabs, exterior hardscape, and/or pavement areas should be backfilled with properly compacted soil. All utility trenches within the building pad and extending 5.0-feet beyond the building exterior footings should be backfilled with on-site or similar soil. Where interior or exterior utility trenches are proposed to pass beneath or parallel to building, retaining wall, and/or decorative concrete block perimeter wall footings, the bottom of the trench should not be located below a 1:1 plane projected downward from the outside bottom edge of the adjacent footing unless the utility lines are designed for the footing surcharge loads. It is recommended that all utility trenches excavated to depths of 5.0-feet or deeper be cut back per Section 8.9, Temporary Construction Excavation Recommendations, of this report or be properly shored during construction. Backfill material should be placed in a lift thickness appropriate for the type of backfill material and compaction equipment used. Backfill material should be compacted to a minimum of 90 percent relative compaction by mechanical means. In public roadway areas, backfill material should be compacted to a minimum 95-percent relative compaction. Jetting or flooding of the backfill material will not be considered a satisfactory method for compaction unless the procedures are reviewed and

approved in writing by the Project Geotechnical Engineer. Maximum dry density and optimum moisture content for backfill material should be determined per ASTM D 1557-02 procedures.

8.5 **Preliminary Pavement Design Recommendations:** The following structural pavement section is for proposed parking, driveway and street improvements areas for the subject development and are presented for preliminary design purposes only. *The final design should be based on R-Values testing performed at subgrade upon completion of grading***.** The preliminary pavement sections as presented below are based on the City of Chino Standards and Specifications and an R-Value of 7.5. The sections listed are provided for reference purposes and are calculated as a minimum based on varying Traffic Indexes:

Street Type	Traffic Index	Minimum Section
Major Arterials	10.0	7.0" A.C. over 20-inches of Class II Base
Secondary Arterials	8.5	6.0" A.C. over 20-Inches of Class II Base
Collector (Industrial)	7.5	5.0" A.C. over 17-Inches of Class II Base
Collector (Residential)	6.0	6.0" A.C. over 7-Inches of Class II Base
Local (Residential)	5.0	4.0" A.C. over 7-Inches of Class II Base

8.5.1 **CalTrans Standard Specification:** Asphalt concrete pavement materials should be as specified in Sections 39-2.01 and 39-2.02 of the current **CalTrans** Standard Specifications or a suitable equivalent. Aggregate base should conform to ¾-inch Class-2 material as specified in Section 26-1.02B of the current **CalTrans** Standard Specifications or a suitable equivalent. **In privately maintained areas the subgrade soil, including utility trench backfill, should be compacted to a minimum of 90-percent relative compaction.** In public roadways, the subgrade soil, including utility trench backfill, should be compacted to at least 95 percent relative compaction. The aggregate base material should be compacted to at least 95 percent relative compaction. Maximum dry density and optimum moisture content for subgrade and aggregate base materials should be determined per ASTM D 1557-02 procedures. If pavement subgrade soils are prepared at the time of rough grading of the building site and the areas are not paved immediately, additional observations and testing will have to be performed before placing aggregate base material, asphaltic concrete, or PCC pavement to locate areas that may have been damaged by construction traffic, construction activities, and/or seasonal wetting and drying. In the proposed pavement areas, soil samples should be obtained at the time the subgrade is graded for R-Value testing per California Test Method 301 procedures to verify the pavement design recommendations.

8.6 **Finish Lot Drainage Recommendations:** Positive drainage should be established away from the tops of slopes, the exterior walls of structures, the back of retaining walls, and the decorative concrete block perimeter walls. Finish lot surface gradients in unpaved areas should be provided next to tops of slopes and buildings to guide surface water away from foundations and slabs and from flowing over the tops of slopes. The surface water should be directed toward suitable drainage

facilities. Ponding of surface water should not be allowed next to structures or on pavements. In unpaved areas, a minimum positive gradient of 2.0 percent away from the structures and tops of slopes for a minimum distance of 10-feet and a minimum of 1.0 percent pad drainage off the property in a non-erosive manner should be provided. Landscape trees and plants with high water needs should be planted at least 5.0-feet away from the walls of the structures. Downspouts from roof drains should discharge to a surface which slopes away from the structure a minimum of 5.0-feet from the exterior building walls. In no case should downspouts from roof drains discharge into planter areas immediately adjacent to the building unless there is positive drainage away from the structure at a minimum gradient of 2.0 percent, directed onto a permanent all-weather surface or subdrain system.

8.7 **Planter Recommendations:** Planters around the perimeter of the structures should be designed to ensure that adequate drainage is maintained and minimal irrigation water is allowed to percolate into the soils underlying the buildings.

8.8 **Temporary Construction Excavation Recommendations:** Temporary construction excavations for rough grading, foundations, retaining walls, utility trenches, etc., more than 5.0-feet in depth and to a maximum depth of 15-feet should be properly shored or cut back to the following inclinations:

Earth Material	Observed/Anticipated CalOSHA Soil Classification	Inclination
Alluvium or Compacted Fill	Type B	1:1

No surcharge loads (spoil piles, earthmoving equipment, trucks, etc.) should be allowed within a horizontal distance measured from the top of the excavation slope equal to 1.5 times the depth of the excavation. Excavations should be initially observed by the Project Geotechnical Engineer, Project Engineering Geologist, and/or their representative to verify our recommendations or to make additional recommendations to maintain stability and safety. Moisture variations, differences in the cohesive or cementation characteristics, or changes in the coarseness of the deposits may require slope flattening or, conversely, permit steepening upon review by the Project Geotechnical Engineer, Project Engineering Geologist, and/or their representative. Deep utility trenches may experience caving which will require special considerations to stabilize the walls and expedite trenching operations. Surface drainage should be controlled along the top of the slope to preclude erosion of the slope face. If excavations are to be left open for long periods, the slopes should be sprayed with a protective compound and/or covered to minimize drying out, raveling, and/or erosion of the slopes. For excavations more than 5.0-feet in depth which will not be cut back to the recommended slope inclination, the contractor should submit to the owner and/or the owner's designated representative detailed drawings showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection. If the drawings do not vary from the requirements of the OSHA Construction

Safety Orders (CAL OSHA or FED OSHA, whichever is applicable for the project at the time of construction), a statement signed by a registered Civil or Structural Engineer in the State of California, engaged by the contractor at his expense, should be submitted certifying that the contractor's excavation safety drawings comply with OSHA Construction Orders. If the drawings vary from the applicable OSHA Construction Safety Orders, the drawings should be prepared, signed, and sealed by a Registered Civil or Structural Engineer in the State of California. The contractor should not proceed with any excavations until the project owner or his designated representative has received and acknowledged the properly prepared excavation safety drawings.

8.9 **Stormwater Infiltration:** We were unable to verify that the infiltration test areas consisted of undisturbed natural ground. However, two test areas were selected for infiltration testing based on conceptual renderings provided by the project engineer. A total of four (4) infiltration tests were performed at the subject site at locations and elevations represented to be near the bottom of future infiltration basin. Soils within the test areas and throughout the subject site consist of silt with fine sand. The test results revealed impermeable soil conditions making infiltration unfeasible for this project. Accordingly, suitable alternatives need to be developed by the water quality consultant.

9.0 PLAN REVIEW

Grading and foundation plans for the proposed development should be provided for review by **EnGEN Corporation** to verify compatibility with site geotechnical conditions and conformance with the recommendations contained in this report. If **EnGEN Corporation** is not accorded the opportunity to make the recommended review, we will assume no responsibility for misinterpretation of the recommendations presented in this report.

10.0 PRE-BID CONFERENCE

It may be desirable to hold a pre-bid conference with the owner or an authorized representative, the Project Architect, the Project Civil Engineer, the Project Geotechnical Engineer, and the proposed contractors present. This conference will provide continuity in the bidding process and clarify questions relative to the grading and construction requirements of the project.

11.0 PRE-GRADING CONFERENCE

Before the start of grading, a conference should be held with the owner or an authorized representative, the contractor, the Project Architect, the Project Civil Engineer, and the Project Geotechnical Engineer present. The purpose of this meeting should be to clarify questions relating to the intent of the grading recommendations and to verify that the project specifications comply with

the recommendations of this Geotechnical Engineering Report. Any special grading procedures and/or difficulties seen, anticipated or proposed by the contractor can also be discussed at that time.

12.0 CONSTRUCTION OBSERVATIONS AND TESTING

12.1 **Rough Grading:** Rough grading of the property should be performed under engineering observation and testing performed by **EnGEN Corporation.** Rough grading includes, but is not limited to, over-excavation cuts and observations prior to placement of compacted fill, fill placement, and excavation of temporary and permanent cut and fill slopes. In addition, **EnGEN Corporation** should observe all foundation excavations.

12.2 **Footing Inspections**: Inspection of the footing excavations should be made before installation of concrete forms and/or reinforcing steel to verify and/or modify the conclusions and recommendations in this report.

12.3 **Over-excavation and Fill Placement**: Observations of over-excavation cuts, fill placement, finish grading, utility or other trench backfill, pavement subgrade and base course, retaining wall backfill, slab presaturation, or other earthwork completed for the subject development should be performed by **EnGEN Corporation.** If the observations and testing to verify site geotechnical conditions are not performed by **EnGEN Corporation**, liability for the performance of the development is limited to the actual portions of the project observed and/or tested by **EnGEN Corporation.** If parties other than **EnGEN Corporation** are engaged to perform soils and materials observations and testing, they must be notified that they will be required to assume complete responsibility for the geotechnical aspects of the project by concurring with the recommendations in this report or providing alternative recommendations. Neither the presence of the Project Geotechnical Engineer and/or his field representative, nor the field observations and testing, shall excuse the contractor in any way for defects discovered in the contractor's work. The Project Geotechnical Engineer and/or his representative shall not be responsible for job or project safety. Job or project safety shall be the sole responsibility of the contractor.

13.0 CLOSURE

This report has been prepared for use by the parties or project named or described in this document. It may or may not contain sufficient information for other parties or purposes. If changes in the assumed nature, design, or location of the proposed development as described in this report are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions and recommendations of this report modified or verified in writing. This study was conducted in general accordance with the applicable standards of our profession and the accepted geotechnical engineering principles

and practices at the time this report was prepared. No other warranty, implied or expressed beyond the representations of this report, is made. Although every effort has been made to obtain information regarding the geotechnical and subsurface conditions of the site, limitations exist with respect to the knowledge of unknown regional or localized off-site conditions which may have an impact at the site. The recommendations presented in this report are valid as of the date of the report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or to the works of man on this and/or adjacent properties. If conditions are observed or information becomes available during the design and construction process which are not reflected in this report, **EnGEN Corporation** should be notified so that supplemental evaluations can be performed and the conclusions and recommendations presented in this report can be modified or verified in writing. This report is not intended for use as a bid document. Any person or company using this report for bidding or construction purposes should perform such independent studies and explorations as he deems necessary to satisfy himself as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of the work on this project. Changes in applicable or appropriate standards of care or practice occur, whether they result from legislation or the broadening of knowledge and experience. Accordingly, the conclusions and recommendations presented in this report may be invalidated, wholly or in part, by changes outside the control of **EnGEN Corporation** which occur in the future.

Thank you for the opportunity to provide our services. Often, because of design and construction details which occur on a project, questions arise concerning the geotechnical conditions on the site. If we can be of further service or should you have questions regarding this report, please do not hesitate to contact this office at your convenience. Because of our involvement in the project to date, we would be pleased to discuss engineering testing and observation services that may be applicable on the project.

Respectfully submitted,
EnGEN Corporation

H. Wayne Baldridge, Principal
Project Manager, REPA 424679

Osbjorn Bratene, Principal
Project Geotechnical Engineer, GE162

HWB/OB:pm
Distribution: (4) Addressee

FILE: engen server\server projects\4200 series\4219gfs

APPENDIX

TECHNICAL REFERENCES

1. Bartlett, S.F. and Youd, T.L., 1995, Empirical Prediction of Liquefaction–Induced Lateral Spread, Journal of Geotechnical Engineering, Vol. 121, No. 4, April 1995.

2. Boore, D.M., Joyner, W.B., and Fumal, T.E., 1997, Equations for Estimating Horizontal Response Spectra and Peak Acceleration from Western North American Earthquakes: A Summary of Recent Work, *Seismological Research Letters*, Vol. 68, No. 1, pp. 128-153.

3. California Division of Mines and Geology (CDMG), 1997, Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117.

4. Hart, Earl W., and Bryant, William A., 1997, Revised 1999, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps: State of California, Department of Conservation, Division of Mines and Geology, 38 pages.

5. Morton, D. M., 1999, Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California, Version 1.0, United States Geological Survey, Open File Report 99-172.

6. Seed, H.B. and Idriss, I.M., 1982, Ground motions and soil liquefaction during earthquakes: Earthquake Engineering Research Institute, Volume 5 of a Series Titled Engineering Monographs on Earthquake Criteria, Structural Design, and Strong Motion Records.

7. Tokimatsu, K. and Seed, H.B., 1984, Simplified Procedures for the Evaluation of Settlements in Clean Sands, Earthquake Engineering Research Center, October 1984.

8. California Building Code (CBC), 2013 Edition, by International Conference of Building Officials, 3 Volumes.

9. United States Geological Survey, Earthquakes Hazards Program, U.S. Seismic Design Maps Interactive Program (2016) http://earthquake.usgs.gove/hazards/designmaps.

10. Huang, Y. N., A.S. Whittaker & N. Luco (2008), “Maximum Spectral Demands in the Near-Fault Region,” Earthquake Spectra, Vol. 24, No. 1, pp. 319-341.

11. Luco, N., B.R. Ellingwood, R.O. Hamburger, J.D. Hooper, J.K. Kimball & C.A. Kircher (2007), “Risk-Targeted versus Current Seismic Design Maps for the Conterminous United States,” Proceedings of the 2007 Structural Engineers Association of California Convention, Lake Tahoe, CA, pp. 163-175.

12. Building Seismic Safety Council (2009), “NEHRP Recommended Seismic Provisions for New Buildings and Other Structures (FEMA P-750): Part I, Provisions,” Federal Emergency Management Agency, Washington, D.C., pp. 5-8, 10-18, 67-71, and 92-93 in particular.

13. *Petersen, M.D., A.D. Frankel, S.C. Harmsen, C.S. Mueller, K.M. Haller, R.L. Wheeler, R.L. Wesson, Y. Zeng, O.S. Boyd, D.M. Perkins, N. Luco, E.H. Field, C.J. Wills, & K.S. Rukstales (2008), “Documentation for the 2008 Update of the United States National Seismic Hazard Maps,” U.S. Geological Survey Open-File Report 2008-1128, 61 p.*

EXPLORAYORY BORINGS AND BACKHOE TEST PIT LOGS

GEOTECHNICAL BORING LOG

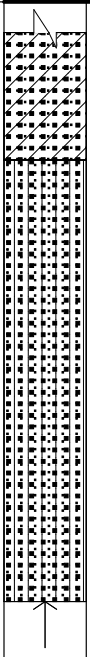
Project Number: 4219GS
Project: Summerland Senior Living
Boring Number: B1
Surface Elevation: 724
Date: 6-27-17
Logged By: WB

Elevation	Soil Graphic	Description	Sampler	Sample Depth	USCS	Blow Count	Dry Density	In-Situ Moisture Content	Maximum Density	Optimum Moisture Content
		Undocumented Fill (Af) Very silty, fine to medium sand, dry, loose, light grey (10YR-7/1) Moist		0	SM SM SM	7/7/9	106.6	2.7	127.4	11.1
				5	SM	10/12/12	109.9	4.5	127.4	11.1
		UNDOCUMENTED FILL (Af) Very silty sand with clay, moist, dense, yellowish brown (10YR-4/4)			SM	4/5/9	101.1	8.0	127.4	11.1
		UNDOCUMENTED FILL (Af) Clay, medium sand with silt, moist, stiff, dark grayish brown (10YR-4/2)		10	CL	10/16/18	110.8	8.8		
		UNDOCUMENTED FILL (Af) Brown (10YR-4/3)		15	CL	10/12/20	110.4	9.4		
		UNDOCUMENTED FILL (Af) Very stiff, yellowish brown (10YR-2/2)		20	CL	5/12/19	111.6	10.5		
		SANDSTONE BEDROCK Soqual Formation (Tms)/OLD ALLUVIUM(Qal)? Possible transition between undocumented fill and/or old alluvium		25	CL/SC	3/9/15	108.7	11.1		
		SANDSTONE BEDROCK - Soqual (Tms) Well consolidated, clayey fine to coarse sand wth some gravel, very dense, moist, yellowish brown (10YR-4/4)		30	SC	8/17/23	117.7	11.7		
				35	SC	7/13/16	117.6	12.1		

Notes:

GEOTECHNICAL BORING LOG

Project Number: 4219GS
Project: Summerland Senior Living
Boring Number: B1
Surface Elevation: 724
Date: 6-27-17
Logged By: WB

Elevation	Soil Graphic	Description	Sampler	Sample Depth	USCS	Blow Count	Dry Density	In-Situ Moisture Content	Maximum Density	Optimum Moisture Content
		SANDSTONE BEDROCK (Soqual (Tms) Very silty with coarse to fine sand, yellowish brown (10YR-5/4)		40	SM	13/17/22	119.0	12.5		
		Water seepage @ 43.5 Feet (BGS) likely perched water condition.								
		SANDSTONE BEDROCK - Soqual (Tms) Very silty fine sand, moist, dense, yellowish brown (10YR-5/4) - Samples were dry (not saturated) possible perched water condition @ 43.5') Low blow count possible due to perched water penetration from higher elevation		45	SM	15/20/29	119.2	12.3		
				50		14/22/50	121.4	12.5		
		BOTTOM OF BORING @ 51.5 FEET BELOW ADJACENT SURFACE ELEVATION. (WATER MEASURED @ 47.5 FEET IS LIKELY PERCHED WATER CONDITION)		55						
				60						
				65						
				70						

Notes:

GEOTECHNICAL BORING LOG

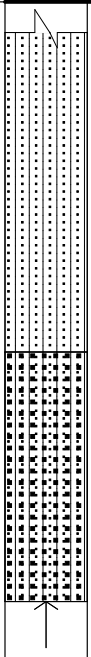
Project Number: 4219GS
Project: Summerland Senior Living
Boring Number: B2
Surface Elevation: 727
Date: 6-27-17
Logged By: JP

Elevation	Soil Graphic	Description	Sampler	Sample Depth	USCS	Blow Count	Dry Density	In-Situ Moisture Content	Maximum Density	Optimum Moisture Content
		UNDOCUMENTED FILL (Af) Very silty, fine to medium sand, dry, loose, Light Grey (10YR-7/1)		0	SM					
					SM	3/4/3				
		UNDOCUMENTED FILL Silt with fine sand, slightly stiff, moist, ligh Grey (10YR-7/1)		5	SM	3/3/2				
		UNDOCUMENTED FILL (Af)			SM	3/2/2				
		UNDOCUMENTED FILL (Af) Clay, moist, very stiff, dark grayish brown (10YR-4/2)		10	CL	3/4/5				
		UNDOCUMENTED FILL (Af)		15	CL	3/7/12				
		UNDOCUMNTED FILL Fine sand with silt Caliche		20	SM	3/2/4				
		BEDROCK Soquel Sandstone? (Tms) Very fine sand with silt, greenish gray (10Y-6/1) Caliche		25	SM	12/20/26				
		BEDROCK,Soquel Sandstone (Tms)		30	SM	10/19/25				
		BEDROCK, Soquel Sandstone (Tms) Light Olive Brown (2.5YR-5/6)		35	SM	7/19/23				

Notes:

GEOTECHNICAL BORING LOG

Project Number: 4219GS
Project: Summerland Senior Living
Boring Number: B2
Surface Elevation: 727
Date: 6-27-17
Logged By: JP

Elevation	Soil Graphic	Description	Sampler	Sample Depth	USCS	Blow Count	Dry Density	In-Situ Moisture Content	Maximum Density	Optimum Moisture Content
		BEDROCK, Soquel Sandstone (Tms)		40	SM	6/16/25				
		BEDROCK, Soquel Sandstone (Tms)		45	SM	11/15/22				
				50		14/21/29				
		BOTTOM OF BORING @ 51.5 FEET BELOW ADJACENT SURFACE ELEVATION. NO GROUNDWATER ENCOUNTERED AND NO INDICATIONS OF HISTORICAL HIGH GROUNDWATER CONDITIONS OBSERVED		55						
				60						
				65						
				70						

Notes:

GEOTECHNICAL BORING LOG

Project Number: 4219GS
Project: Summerland Senior Living
Boring Number: B3
Surface Elevation: 726
Date: 6-27-17
Logged By: jp

Elevation	Soil Graphic	Description	Sampler	Sample Depth	USCS	Blow Count	Dry Density	In-Situ Moisture Content	Maximum Density	Optimum Moisture Content
		UNDOCUMENTED FILL (Af) Very silty, fine to medium sand, dry, loose, dark yellowish brown (10YR-4/4)		0	SM					
		UNDOCUMENTED FILL (Af) Silt with fine sand, slightly stiff, moist, yellowish brown (10YR- 5/4)			SM/ML	4/7/12				
		UNDOCUMENTED FILL (Af)		5	SM	4/6/6				
		UNDOCUMENTED FILL (Af) Clay, moist, very stiff, very dark grayish brown (10YR-3/2)			CL	4/7/13				
		UNDOCUMENTED FILL (Af) Dark grayish brown (10YR-4/2)		10	CL	5/7/17				
		UNDOCUMENTED FILL (Af) Very fine sand with silt, reddish yellow (7.5YR-6/8)		15	SM	5/7/7				
		BEDROCK - Soquel Sandston (Tms) Caliche, very fine sand with silt, brownish yellow (10YR-6/8)		20	SM	11/20/30				
				25	SM	7/15/25				
		Soquel Sandstone? Very fine sand with silt, light greenish gray (10Y-7/1)		30	SM	9/15/26				
		BOTTOM OF EXCAVTION @ 31.5 NO GROUNDWATER ENCOUNTERED.		35						

Notes:

GEOTECHNICAL BORING LOG

Project Number: 4219GS
Project: Summerland Senior Living
Boring Number: B5
Surface Elevation: 737
Date: 6-27-17
Logged By: JP

Elevation	Soil Graphic	Description	Sampler	Sample Depth	USCS	Blow Count	Dry Density	In-Situ Moisture Content	Maximum Density	Optimum Moisture Content
		UNDOCUMENTED FILL (Af) Very silty, fine to medium sand, dry, loose, brown (10YR-5/3)		0	SM					
		BEDROCK - Soquel Sandstone (Tms) Silt with fine sand, moist, stiff			MH/SM	13/18/20				
		BEDROCK - Soquel Sandstone (Tms)		5	MH/SM	13/16/21				
		BEDROCK - Soquel Sandstone (Tms) Very fine sand with silt, light gray (5Y-7/1) Refusal			SM	15/30/50				
				10						
				15						
				20						
				25						
				30						
				35						

Notes:

GEOTECHNICAL BORING LOG

Project Number: 4219GS
Project: Summerland Senior Living
Boring Number: B4
Surface Elevation: 730
Date: 6-27-17
Logged By: JP

Elevation	Soil Graphic	Description	Sampler	Sample Depth	USCS	Blow Count	Dry Density	In-Situ Moisture Content	Maximum Density	Optimum Moisture Content
		UNDOCUMENTED FILL (Af) Very silty, fine to medium sand, dry, loose, dark yellowish brown		0	SM					
		UNDOCUMENTED FILL(Af) Silt with fine sand, moist, very stiff, dark grayish brown (10YR-3/2) A-2			ML/SM	8/18/24				
		UNDOCUMENTED FILL (Af)		5	ML/SM	11/20/21				
		BEDROCK - Soqual (Tms) Caliche, very fine sand with silt, brownish yellow (10YR-6/6)			SM	9/21/37				
		BEDROCK - Soqual (Tms)		10	SM	9/17/30				
		BEDROCK - Soqual (Tms)		15	SM	8/18/30				
				20						
				25						
				30						
				35						

Notes:

TEST PIT LOG
Test Pit No.: 1

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	728
EXCAVATION METHOD	LOGGER
	HWB
DEPTH TO - Water: n/a When checked: 09-30-2015	Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		SM	UNDOCUMENDED FILL (Af) Very silty fine sand, dry, loose, porous, light grey (10YR 7/1)							
			Intermitent layers of very silty fine sand and silt with fine sand, medium dense, slightly moist	7.5	2.1	11.1	127.4	110.4	86.7	Nuke
		ML	Silt with fine sand, slightly stiff, moist, light grey (10YR 7/1)							
4		SM-ML	Very silty fine sand, moist, medium dense, light grey (10YR 7/1)		4.3	11.1	127.4	111.7	87.7	Nuke
			dense		8.8	11.1	127.4	112.8	88.6	Nuke
8										
12										
16										
20			BOTTOM OF EXCAVATION @20'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 2

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	725.5
EXCAVATION METHOD	LOGGER
	HWB

DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		SM	UNDOCUMENTED FILL (Af) Very silty fine sand, dry, loose, light grey (10YR-7/1).							
		SM-ML	Intermitent layers of very silty fine sand and silt with fine sand, medium dense, slightly moist, light grey (10YR-7/1)		3.8	11.1	127.4	108.1	84.8	Nuke
4			Medium dense		4.7	11.1	127.4	111.7	87.0	Nuke
			dense		7.0	11.1	127.4	112.8	89.2	Nuke
8										
12										
			BOTTOM OF EXCAVATION @13.5'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
16										
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 3

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	723.5
EXCAVATION METHOD	LOGGER
	HWB

DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		ML	UNDOCUMENTD FILL (Af) Silty with fine sand, dry, soft, light grey (10YR-7/1)							
		SM-ML	Intermitent layers of very silty fine sand and silt with fine sand, medium dense, slightly moist, light grey (10YR-7/1)		3.5	11.1	127.4	105.2	82.5	Nuke
4			Medium dense		5.1	11.1	127.4	107.4	84.3	Nuke
			dense		7.9	11.1	127.4	110.3	86.4	Nuke
8										
12										
16			BOTTOM OF EXCAVATION @15'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 5

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	733.5
EXCAVATION METHOD	LOGGER
	HWB

DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		ML	UNDOCUMENTED FILL (Af) Silt with fine sand, dry, soft, light grey (10YR-7/1)							
					3.0	11.1	127.4	104.9	82.3	Nuke
4		ML	Stiff		4.4	11.1	127.4	109.4	85.9	Nuke
					5.4	11.1	127.4	114.5	89.8	Nuke
8			BEDROCK - (Yorba/Soquel Formation/Tms-Tmy) siltstone, dry, blocky, indurated							
			BOTTOM OF EXCAVATION @10'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
12										
16										
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 4

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	725
EXCAVATION METHOD	LOGGER
	HWB

DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		ML	UNDOCUMENTED FILL (Af) Silt with fine sand, dry, soft, light grey (10YR-7/1)							
		SM-ML	Intermitent thin layers of very silty fine sand and silt with fine sand, medium dense, slightly moist, light grey (10YR-7/ 1)		2.8	11.1	127.4	100.9	79.2	Nuke
4			Medium dense		4.4	11.1	127.4	101.3	79.5	Nuke
			dense		5.4	11.1	127.4	105.5	82.8	Nuke
8										
12										
16			BOTTOM OF EXCAVATION @15'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 6

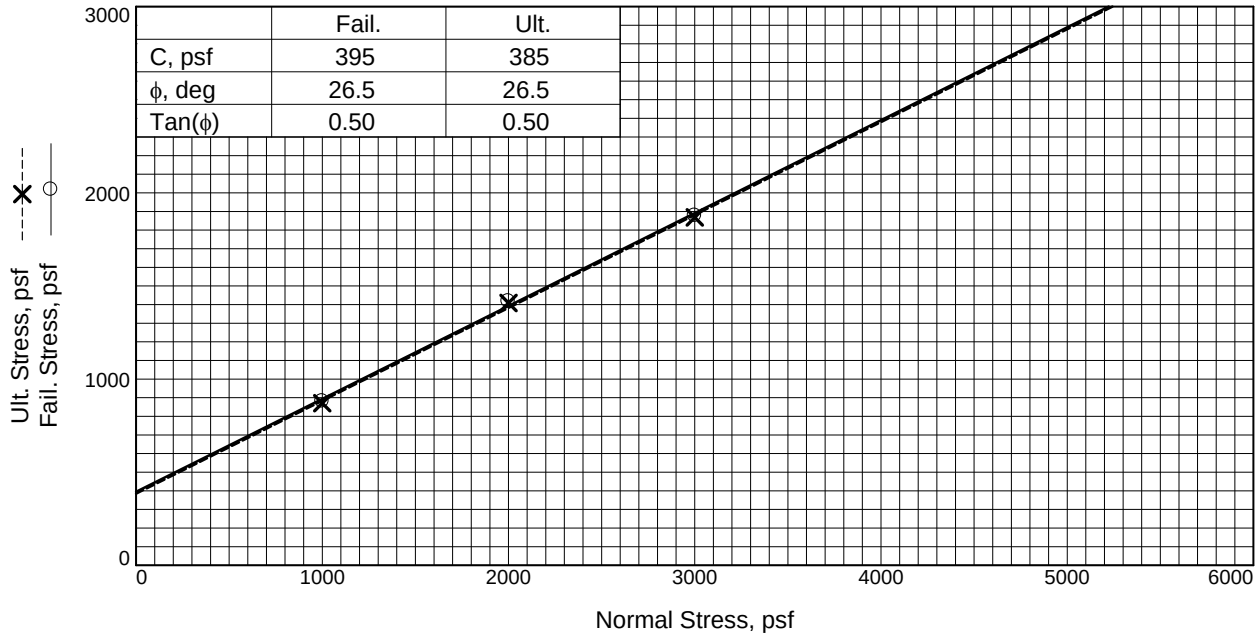
PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	743.5
EXCAVATION METHOD	LOGGER
	HWB

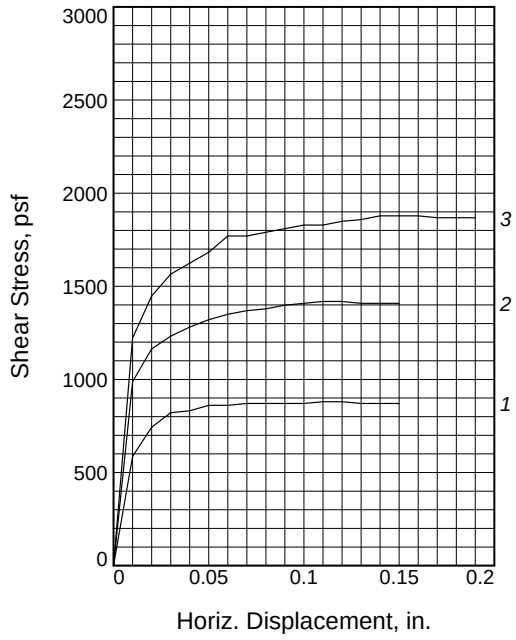
DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		ML	UNDOCUMENTED FILL (Af) Silt with fine sand, dry, soft, light grey (10YR-7 1)							
					1.7	16.8	103.6	88.8	82.3	Nuke
4			Medium Stiff		4.4	11.1	127.4	94.9	91.6	Nuke
			Stiff		5.4	11.1	127.4	95.5	92.2	Nuke
8			BEDROCK - (Yorba/Soquel Formation/Tms-Tmy) siltstone, dry, blocky, indurated							
12			BOTTOM OF EXCAVATION @10'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
16										
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

LABORATORY TEST RESULTS





Sample No.		1	2	3
Initial	Water Content, %	18.7	18.7	18.7
	Dry Density, pcf	100.5	97.9	97.4
	Saturation, %	78.0	73.1	72.1
	Void Ratio	0.6282	0.6701	0.6797
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	30.5	30.9	29.2
	Dry Density, pcf	100.5	97.9	97.4
	Saturation, %	127.0	120.7	112.4
	Void Ratio	0.6282	0.6701	0.6797
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
Normal Stress, psf		1000	2000	3000
Fail. Stress, psf		880	1418	1878
Displacement, in.		0.11	0.11	0.15
Ult. Stress, psf		871	1409	1868
Displacement, in.		0.13	0.13	0.17
Strain rate, in./min.		0.10	0.10	0.10

Sample Type:
Description: Silt with fine sand, light grey.

Specific Gravity= 2.62
Remarks: SAMPLE# A-2
SAMPLED BY WB
SAMPLED ON 9/29/15

Figure A-2

Client: United Engineering Group

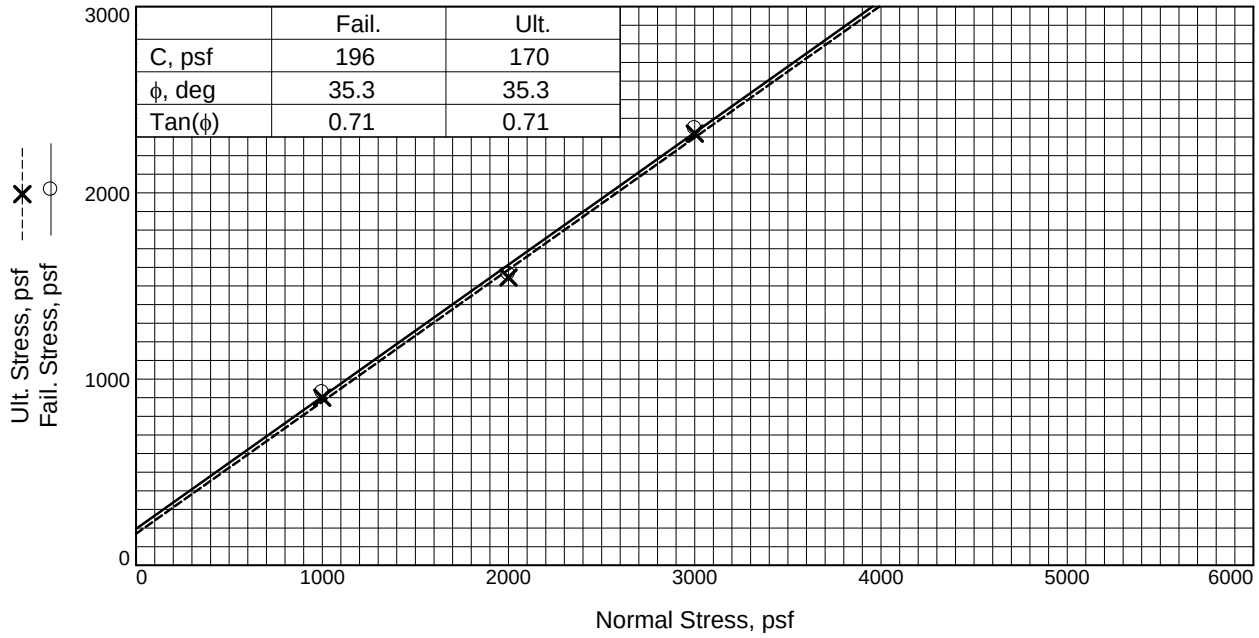
Project: Summerland Senior Living

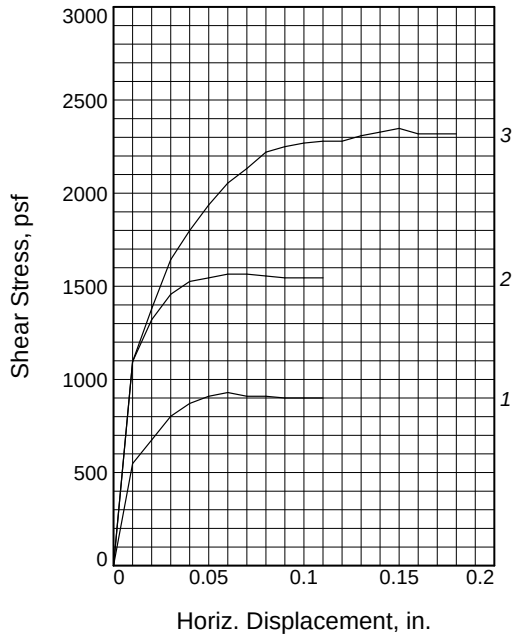
Location: TP-5
Sample Number: A-2 **Depth:** -2'
Proj. No.: 4219-GFS **Date Sampled:** 9/29/15

DIRECT SHEAR TEST REPORT

EnGEN Corporation

Tested By: PB **Checked By:** PB





Sample No.		1	2	3
Initial	Water Content, %	12.4	12.4	12.4
	Dry Density, pcf	118.2	118.4	117.7
	Saturation, %	84.4	84.9	83.2
	Void Ratio	0.3840	0.3814	0.3892
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	18.5	17.4	17.8
	Dry Density, pcf	118.2	118.4	117.7
	Saturation, %	125.9	119.4	120.1
	Void Ratio	0.3840	0.3814	0.3892
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
Normal Stress, psf		1000	2000	3000
Fail. Stress, psf		929	1565	2348
Displacement, in.		0.06	0.06	0.15
Ult. Stress, psf		900	1545	2318
Displacement, in.		0.09	0.09	0.16
Strain rate, in./min.		0.10	0.10	0.10

Sample Type: REMOLD
Description: Very silty fine sand, grey

Specific Gravity= 2.62
Remarks: SAMPLE# A-1
SAMPLED BY WB
SAMPLED ON 9/29/15

Figure A-1

Client: United Engineering Group

Project: Summerland Senior Living

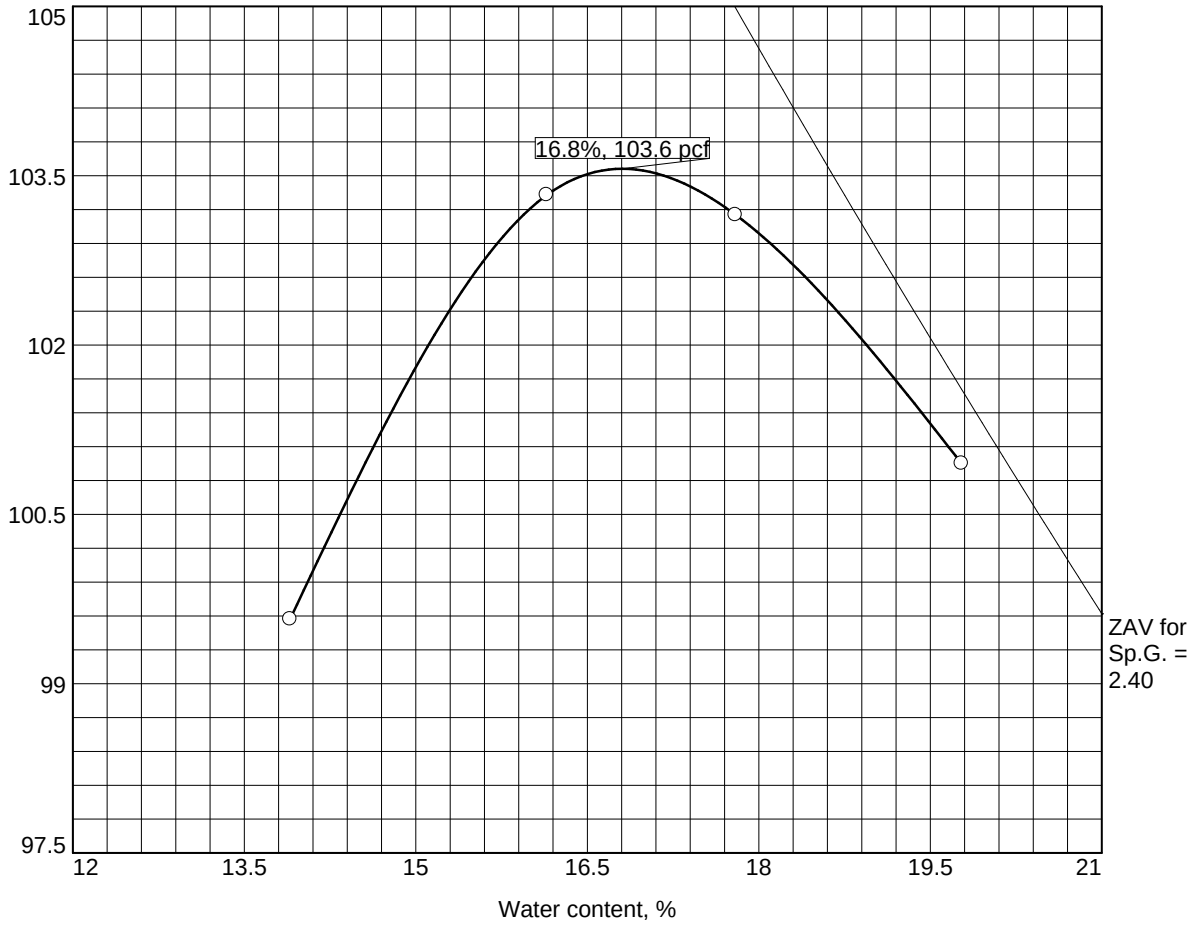
Location: TP-1
Sample Number: A-1
Proj. No.: 4219-GFS **Date Sampled:** 9/29/15

DIRECT SHEAR TEST REPORT

EnGEN Corporation

Tested By: PB **Checked By:** PB

MAXIMUM DENSITY - OPTIMUM MOISTURE REPORT



Test specification: ASTM D 1557-00 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
-2'	ML		11.8					

TEST RESULTS

Maximum dry density = 103.6 pcf

Optimum moisture = 16.8 %

MATERIAL DESCRIPTION

Silt with fine sand, light grey.

Project No. 4219-GFS **Client:** United Engineering Group

Project: Summerland Senior Living

○**Location:** TP-5 **Sample Number:** A-2

Remarks:

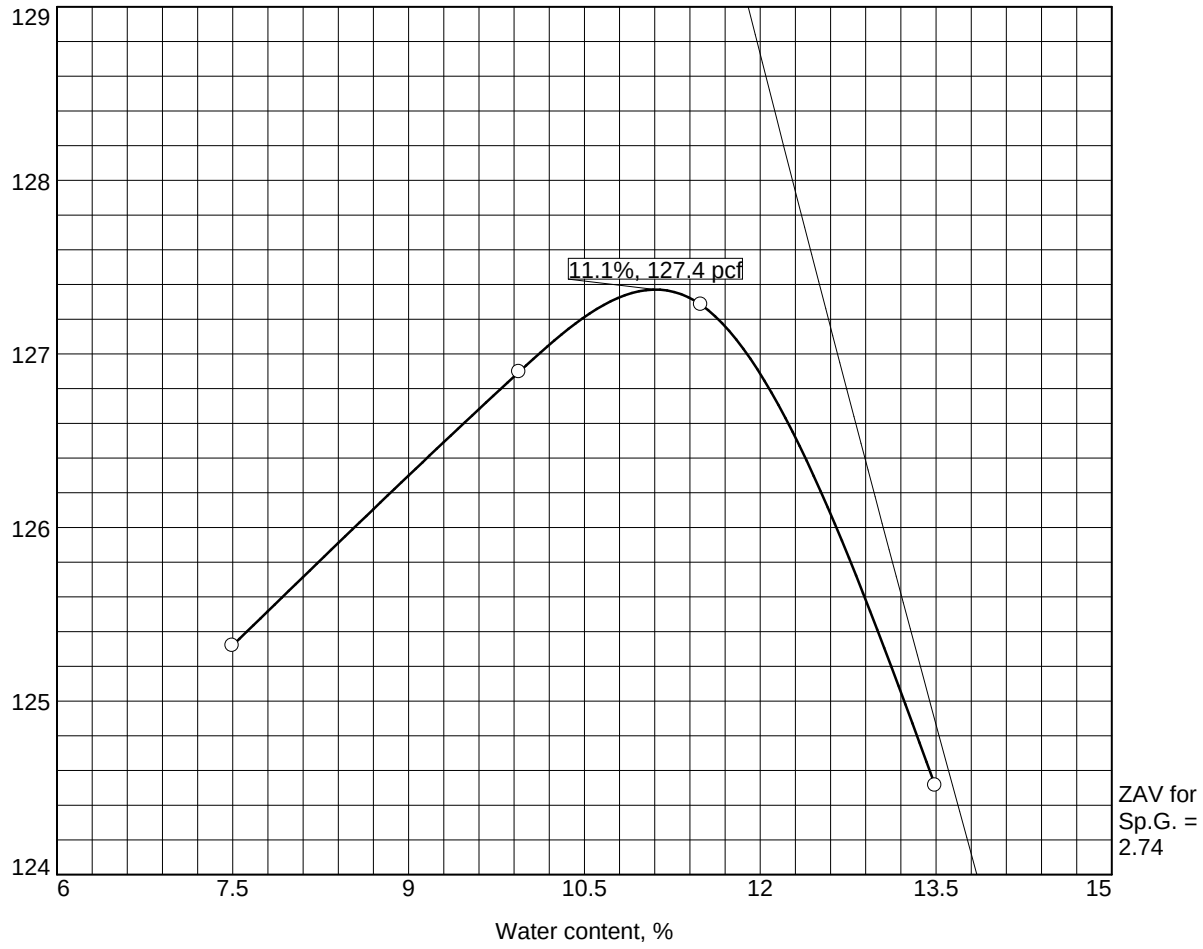
SAMPLE# A-2
SAMPLED BY WB
SAMPLED ON 9/29/15

EnGEN Corporation

Figure

Tested By: PB **Checked By:** PB

MAXIMUM DENSITY - OPTIMUM MOISTURE REPORT



Test specification: ASTM D 1557-00 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	SM		11.5					

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 127.4 pcf Optimum moisture = 11.1 %	Very silty fine sand, grey

Project No. 4219-GFS **Client:** United Engineering Group
Project: Summerland Senior Living

○**Location:** TP-1 **Sample Number:** A-1

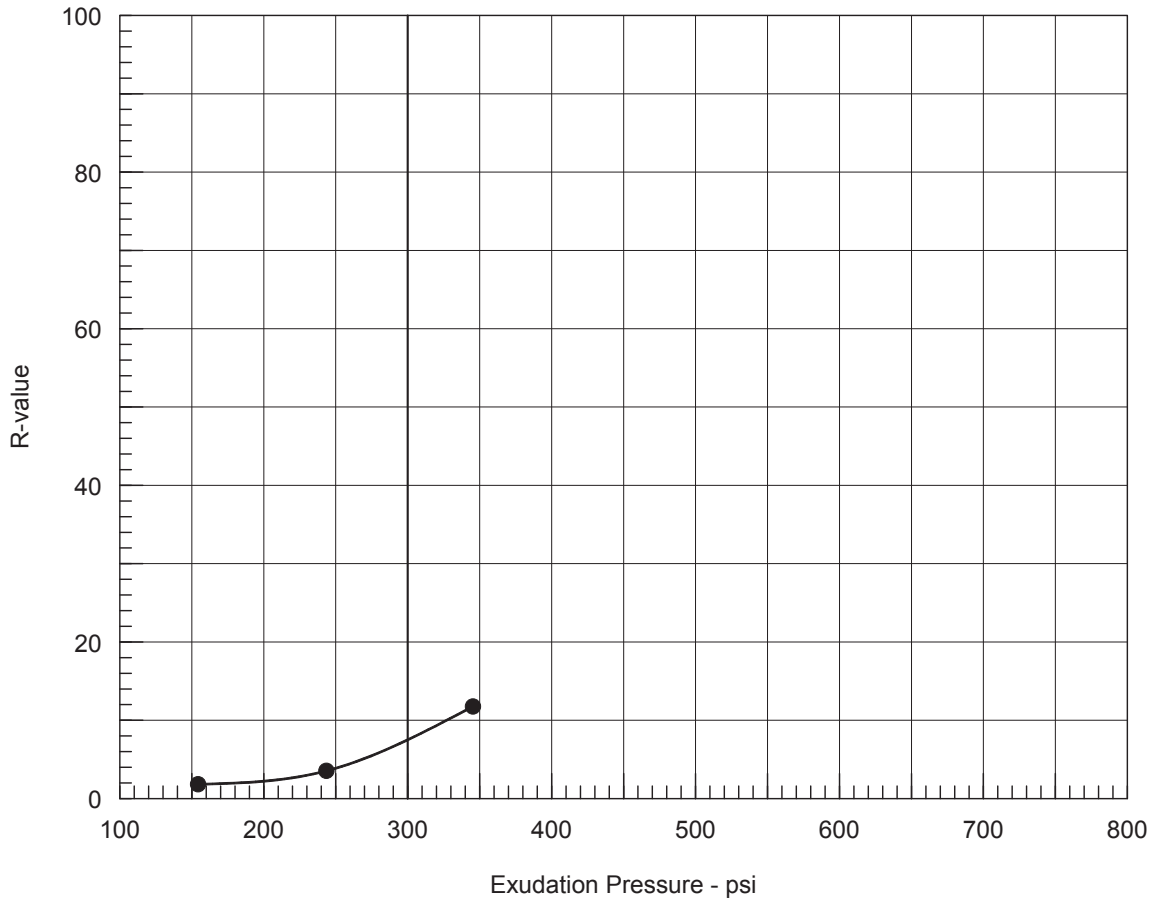
Remarks:
SAMPLE# A-1
SAMPLED BY WB
SAMPLED ON 9/29/15

EnGEN Corporation

Figure

Tested By: PB **Checked By:** PB

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	200	121.1	16.5	0.00	150	2.70	154	1.7	1.8
2	300	118.0	15.5	0.00	143	2.43	244	3.7	3.5
3	350	120.1	14.4	0.00	120	2.50	345	11.8	11.8

Test Results	Material Description
R-value at 300 psi exudation pressure = 7.5	Very silty fine sand, light grey

Project No.: 4219-GFS
Project: Summerland Senior Living
Location: TP-1
Sample Number: A-1
Date: 2/29/15

Tested by: PB
Checked by: PB

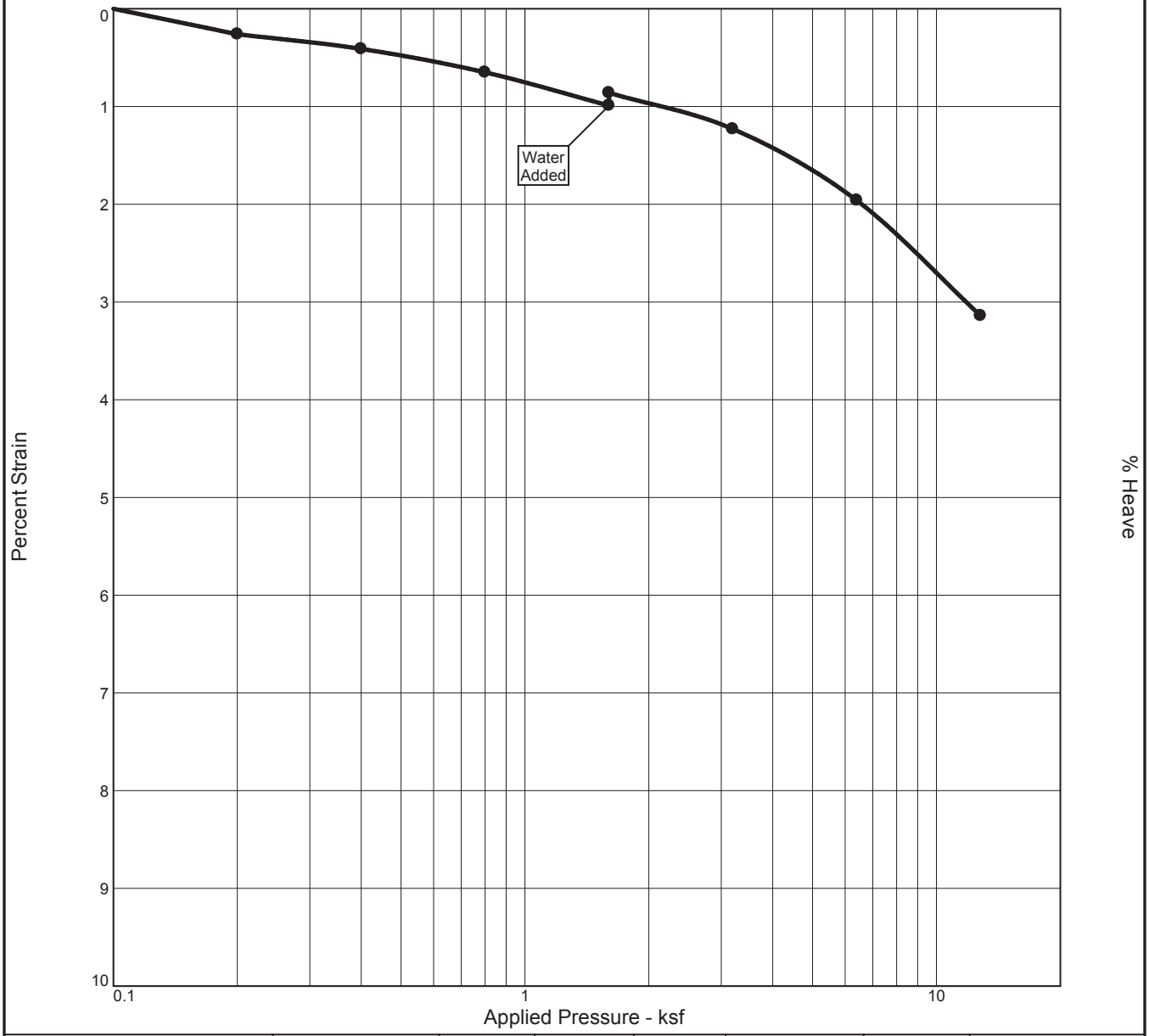
Remarks:
SAMPLE# A-1
SAMPLED BY WB
SAMPLED ON 9/29/15

R-VALUE TEST REPORT

EnGEN Corporation

Figure A-1

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (ksf)	C_c	e_o
Saturation	Moisture							
87.9%	12.1%	117.6			2.60	4.7	0.06	0.406

MATERIAL DESCRIPTION	USCS	AASHTO
CLAYEY FINE TO COARSE SAND, YELLOWISH BROWN	SC	

Project No. 4219GS **Client:** SUMMERLAND SENIOR LIVING

Project: SUMMERLAND SENIOR LIVING - CHINO

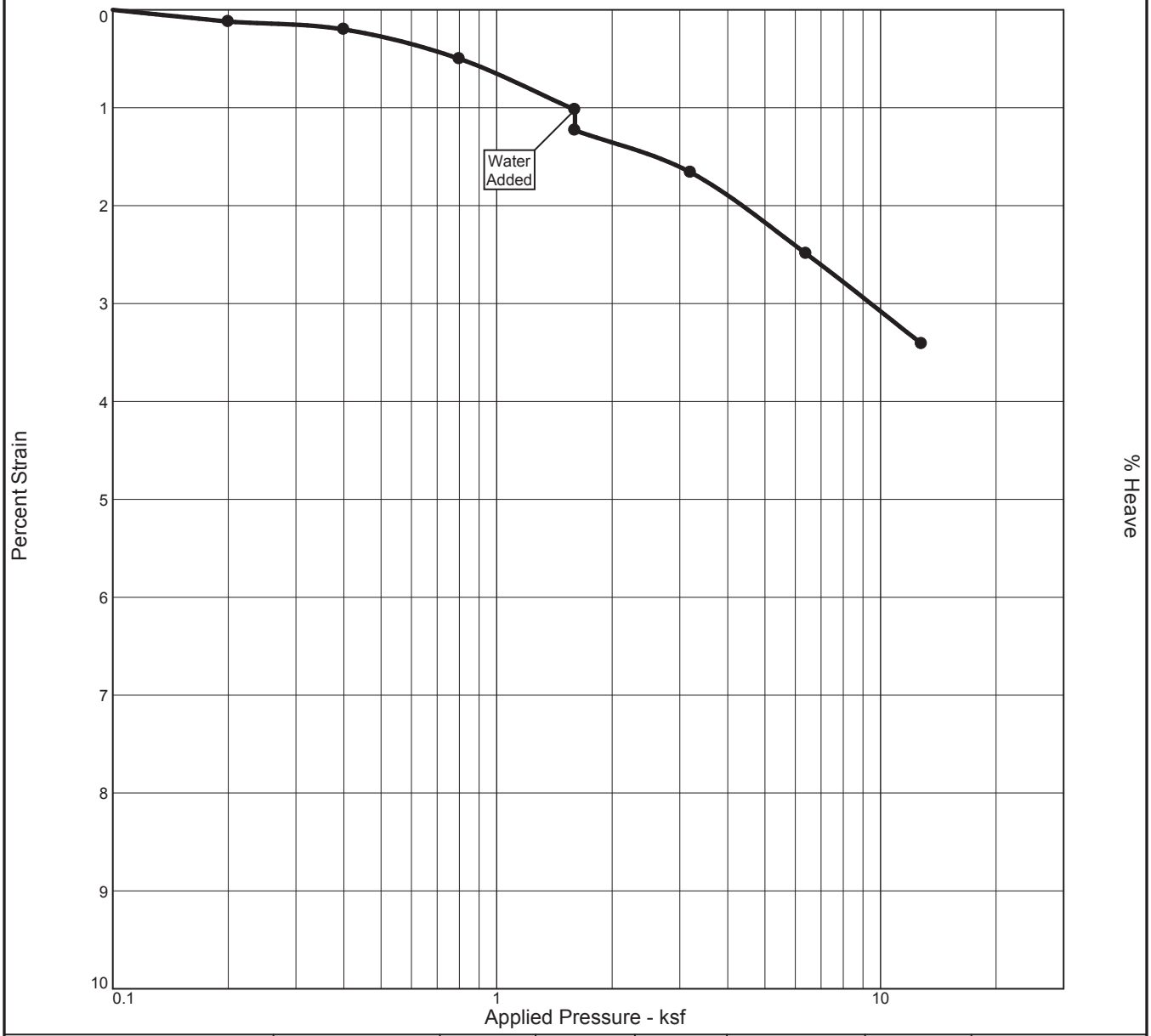
Source of Sample: CONSOL **Sample Number:** B1 @ 35'

Remarks:
COLLECTED BY HWB
COLLECTED ON (6/27/17)

EnGEN Corporation

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (ksf)	C_c	e_o
Saturation	Moisture							
88.8%	12.5%	119.0			2.65	3.54	0.04	0.390

MATERIAL DESCRIPTION	USCS	AASHTO
VERY SILTY COARSE TO FINE SAND, YELLOWISH BROWN	SM	

Project No. 4219GS **Client:** SUMMERLAND SENIOR LIVING

Project: SUMMERLAND SENIOR LIVING - CHINO

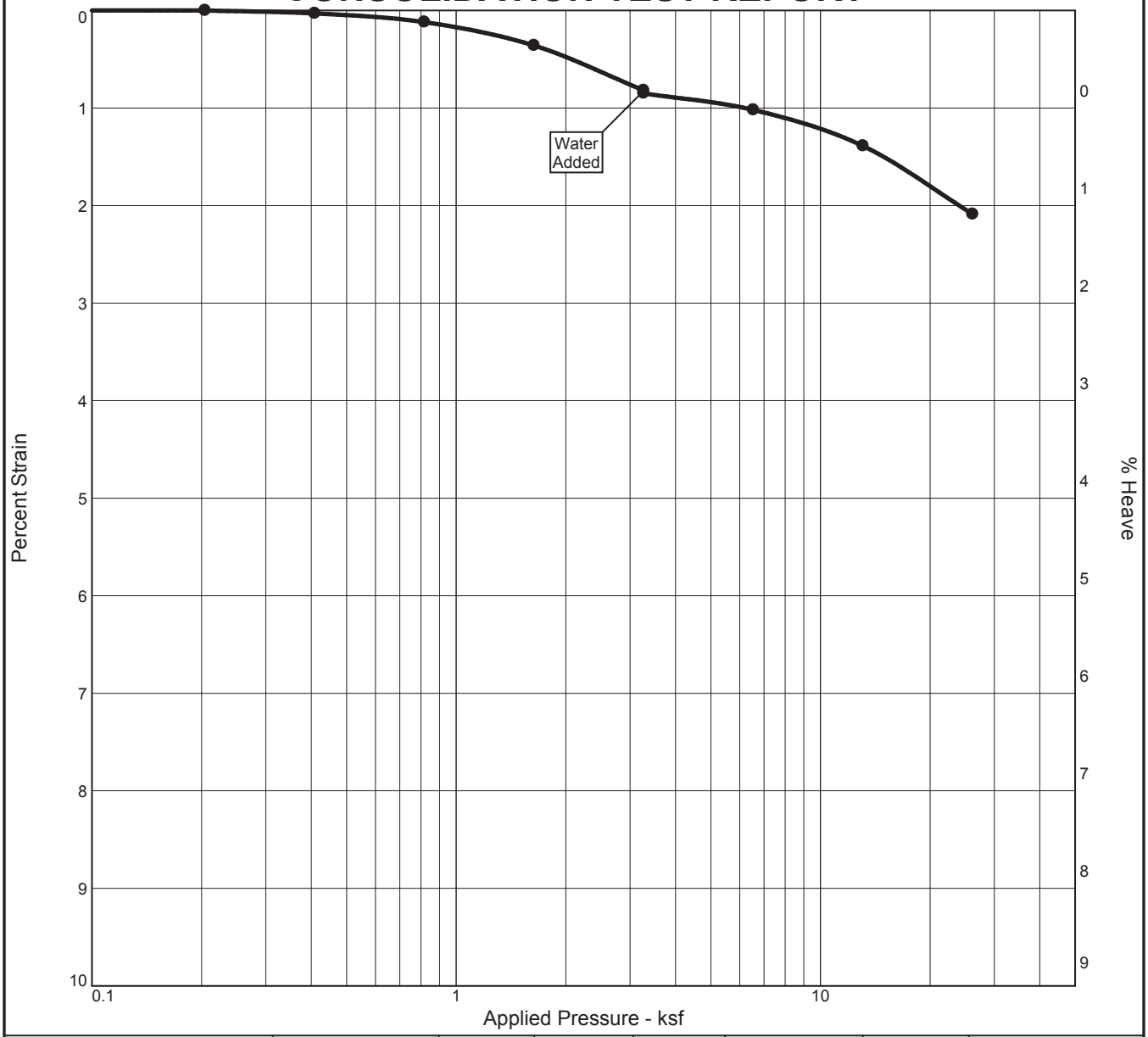
Source of Sample: CONSOL **Sample Number:** B1@40'

Remarks:
COLLECTED BY HWB
COLLECTED ON (6/27/17)

EnGEN Corporation

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (ksf)	C_c	Initial Void Ratio
Saturation	Moisture							
89.4 %	12.3%	119.2			2.60		0.03	0.422

MATERIAL DESCRIPTION	USCS	AASHTO
VERY SILTY FINE SAND, YELLOWISH BROWN	SM	

Project No. 4219GS **Client:** SUMMERLAND SENIOR LIVING

Project: SUMMERLAND SENIOR LIVING - CHINO

Source of Sample: CONSOL **Sample Number:** B1 @ 45'

Remarks:
COLLECTED BY HWB
COLLECTED ON (6/27/17)

EnGEN Corporation

Figure

CBC 1803

10/26/2015

Job Number: 4219-C
Job Name: Summerland Senior Living
Location: N. of Serenity Trail, Chino
Sample Source: TP-1
Sampled by: WB (9/29/15)
Lab Technician: PB
Sample Descr: Very silty fine sand, light grey
Sample #: A-1

Wet Compacted Wt.:	616.3
Ring Wt.:	199.1
Net Wet Wt.:	417.2
Wet Density:	126.0
Wet Soil:	223.6
Dry Soil:	205.1
Initial Moisture (%):	9.0%
Initial Dry Density:	115.6
% Saturation:	53.2%
Final Wt. & Ring Wt.:	649.7
Net Final Wt.:	450.6
Dry Wt.:	382.7
Loss:	67.9
Net Dry Wt.:	379.6
Final Density:	114.6
Saturated Moisture:	17.9%

	Dial	Change	Time
Reading 1:	0.100	N/A	12:00
Reading 2:	0.121	0.021	12:15
Reading 3:	0.128	0.028	12:30
Reading 4:	0.133	0.033	21-Oct

Expansion Index:	33
Adjusted Index:	34.9
(UBC 18-2)	

EnGEN Corporation
41625 Enterprise Circle South, B-2
Temecula, California 92590
951.296.3511 • engen@engencorp.com
www.engencorp.com

CBC 1803 10/26/2015

Job Number: 4219-GS
Job Name: Summerland Senior Living
Location: N. of Serenity Trail - Chino
Sample Source: TP-2
Sampled by: WB (9/29/15)
Lab Technician: PB
Sample Descr: Silt with fine sand, light grey
Sample #: A-2

Wet Compacted Wt.:	545.6
Ring Wt.:	197.0
Net Wet Wt.:	348.6
Wet Density:	105.3
Wet Soil:	227.1
Dry Soil:	199.5
Initial Moisture (%):	13.8%
Initial Dry Density:	92.5
% Saturation:	45.5%
Final Wt. & Ring Wt.:	606.6
Net Final Wt.:	409.6
Dry Wt.:	306.2
Loss:	103.4
Net Dry Wt.:	300.4
Final Density:	90.7
Saturated Moisture:	34.4%

	Dial	Change	Time
Reading 1:	0.100	N/A	1:00
Reading 2:	0.175	0.075	1:15
Reading 3:	0.190	0.090	1:30
Reading 4:	0.201	0.101	27-Oct

Expansion Index:	101
Adjusted Index:	96.7
(UBC 18-2)	

EnGEN Corporation
41625 Enterprise Circle South, B-2
Temecula, California 92590
951.296.3511 • engen@engencorp.com
www.engencorp.com

SoilCor
CORROSION & THERMAL SCIENCES
41765 Hawthorn Street Murrieta, CA 92562
ph (951) 894-2682 • fx (951) 894-2683

Work Order No.: 16C1332
Client: EnGEN Corporation
Project No.: 4102-65
Project Name: EMWD
Report Date: March 30, 2016

Laboratory Test(s) Results Summary

The subject soil samples were processed in accordance with California Test Method CTM 643 and tested for pH / Minimum Resistivity (CTM 643), Sulfate Content (CTM 417) and Chloride Content (CTM 422). The test results follow:

Sample Identification	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (mg/kg)	Sulfate Content (% by wgt)	Chloride Content (ppm)
Sample A-1	7.2	3,200	10	0.001	ND
Sample A-2	7.2	1,400	40	0.004	40

*ND=No Detection

We appreciate the opportunity to serve you. Please do not hesitate to contact us with any questions or clarifications regarding these results or procedures.

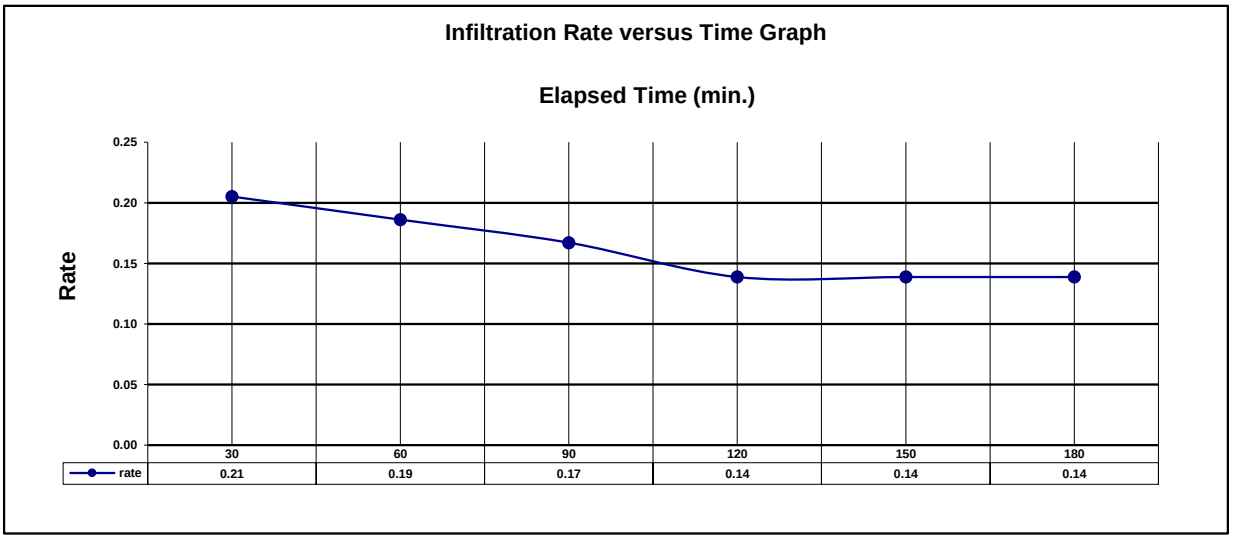
Ahmet K. Kaya, Laboratory Manager

INFILTRATION TEST RESULTS

PERCOLATION TEST RESULTS
TEST NO. 1

Project Number:	4219IP	**Tested by:**	DJ	Date of Test:	10/1/2015
Test Location:	See Plate 1	**USCS Class:**	ML	**Elevation of Test Hole**	**724 AMSL**
Test Number:	1	**Diameter Hole:**	8"	**Temperature:**	58 ^{0} F
SLOPE ACROSS SITE IS:	2%	Weather	Clear	**Starting Time:**	09:45.

Δt (min)	**Reading No.**	**Total Depth of Test Pit (Inches)**	**Depth of Test Hole (Inches)**	**Initial Height of Water (H_o) (Inches)**	**Final Height of Water (H_f) (Inches)**	**Change in Height (ΔH) (Inches)**	**Average Head (H_{avg}) (Inches)**	**Converted Infiltration Rate in/hr (I_t)**
30.00	1	36.00	21.00	20.00	18.90	1.10	19.45	0.2
30.00	2	36.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	3	36.00	21.00	20.00	19.10	0.90	19.55	0.2
30.00	4	36.00	21.00	20.00	19.25	0.75	19.63	0.1
30.00	5	36.00	21.00	20.00	19.25	0.75	19.63	0.1
30.00	6	36.00	21.00	20.00	19.25	0.75	19.63	0.1

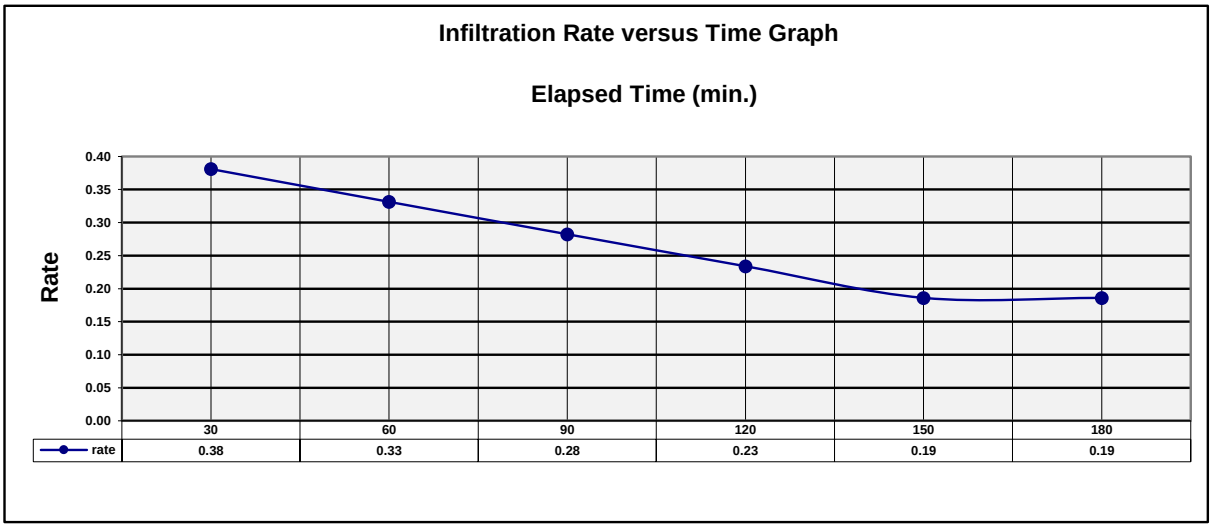


Notes:

PERCOLATION TEST RESULTS
TEST NO. 2

Project Number:	4219IP	**Tested by:**	DJ	Date of Test:	10/1/2015
Test Location:	See Plate 1	**USCS Class:**	ML	**Elevation of Test Hole**	**724.5 AMSL**
Test Number:	2	**Diameter Hole:**	8"	**Temperature:**	58 ^{0} F
SLOPE ACROSS SITE IS:	2%	Weather	Clear	**Starting Time:**	09:45.

Δt (min)	**Reading No.**	**Total Depth of Test Pit (Inches)**	**Depth of Test Hole (Inches)**	**Initial Height of Water (H_o) (Inches)**	**Final Height of Water (H_f) (Inches)**	**Change in Height (ΔH) (Inches)**	**Average Head (H_{avg}) (Inches)**	**Converted Infiltration Rate in/hr (I_t)**
30.00	1	36.00	21.00	20.00	18.00	2.00	19.00	0.4
30.00	2	36.00	21.00	20.00	18.25	1.75	19.13	0.3
30.00	3	36.00	21.00	20.00	18.50	1.50	19.25	0.3
30.00	4	36.00	21.00	20.00	18.75	1.25	19.38	0.2
30.00	5	36.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	6	36.00	21.00	20.00	19.00	1.00	19.50	0.2

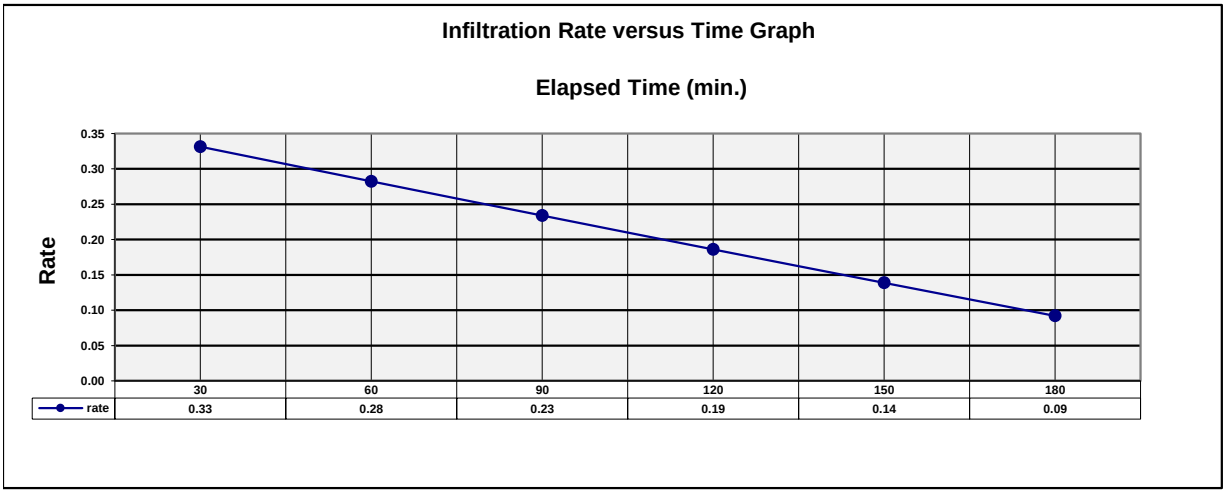


Notes:

PERCOLATION TEST RESULTS
TEST NO. 3

Project Number:	4219IP	**Tested by:**	DJ	Date of Test:	10/1/2015
Test Location:	See Plate 1	**USCS Class:**	ML	**Elevation of Test Hole**	227.5 AMSL
Test Number:	3	**Diameter Hole:**	8"	**Temperature:**	58 ^{0} F
SLOPE ACROSS SITE IS:	2%	Weather	Clear	**Starting Time:**	09:50.
PASSED SANDY SOIL CRITERIA TEST - THE CHANGE IN WATER LEVEL DROPPED GREATER THAN 6-INCHES IN TWO CONSECUTIVE READINGS					

Δt (min)	Reading No.	Total Depth of Test Pit (Inches)	Depth of Test Hole (Inches)	Initial Height of Water (H_o) (Inches)	Final Height of Water (H_f) (Inches)	Change in Height (ΔH) (Inches)	Average Head (H_{avg}) (Inches)	Converted Infiltration Rate in/hr (I_t)
30.00	1	24.00	21.00	20.00	18.25	1.75	19.13	0.3
30.00	2	24.00	21.00	20.00	18.50	1.50	19.25	0.3
30.00	3	24.00	21.00	20.00	18.75	1.25	19.38	0.2
30.00	4	24.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	5	24.00	21.00	20.00	19.25	0.75	19.63	0.1
30.00	6	24.00	21.00	20.00	19.50	0.50	19.75	0.1

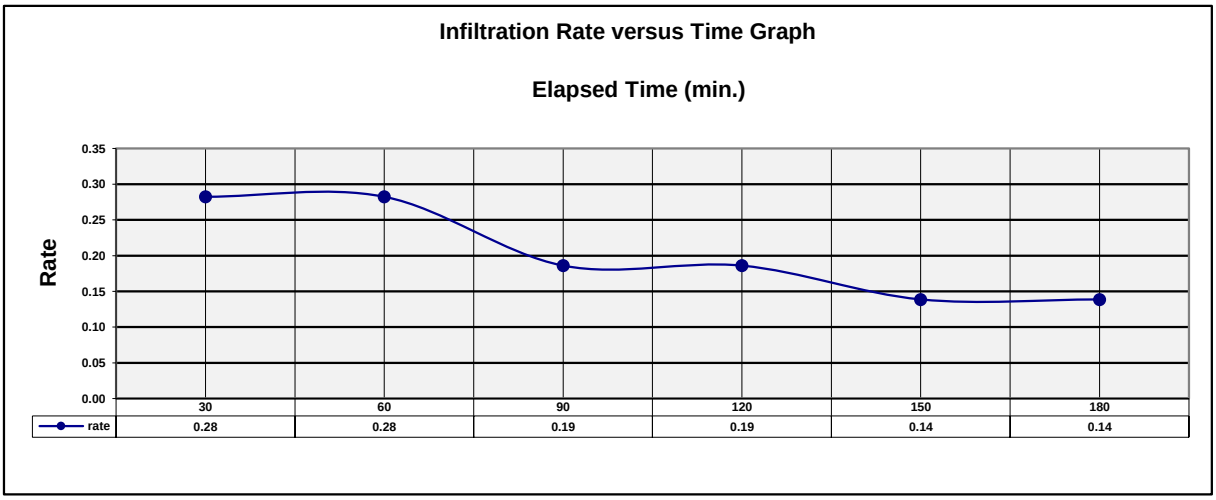


Notes:

PERCOLATION TEST RESULTS
TEST NO. 4

Project Number:	4219IP	**Tested by:**	DJ	Date of Test:	10/1/2015
Test Location:	See Plate 1	**USCS Class:**	ML	**Elevation of Test Hole**	**1309 AMSL**
Test Number:	4	**Diameter Hole:**	8"	**Temperature:**	58 ^{0} F
SLOPE ACROSS SITE IS:	2%	Weather	Clear	**Starting Time:**	09:50.
PASSED SANDY SOIL CRITERIA TEST - THE CHANGE IN WATER LEVEL DROPPED GREATER THAN 6-INCHES IN TWO CONSECUTIVE READINGS					

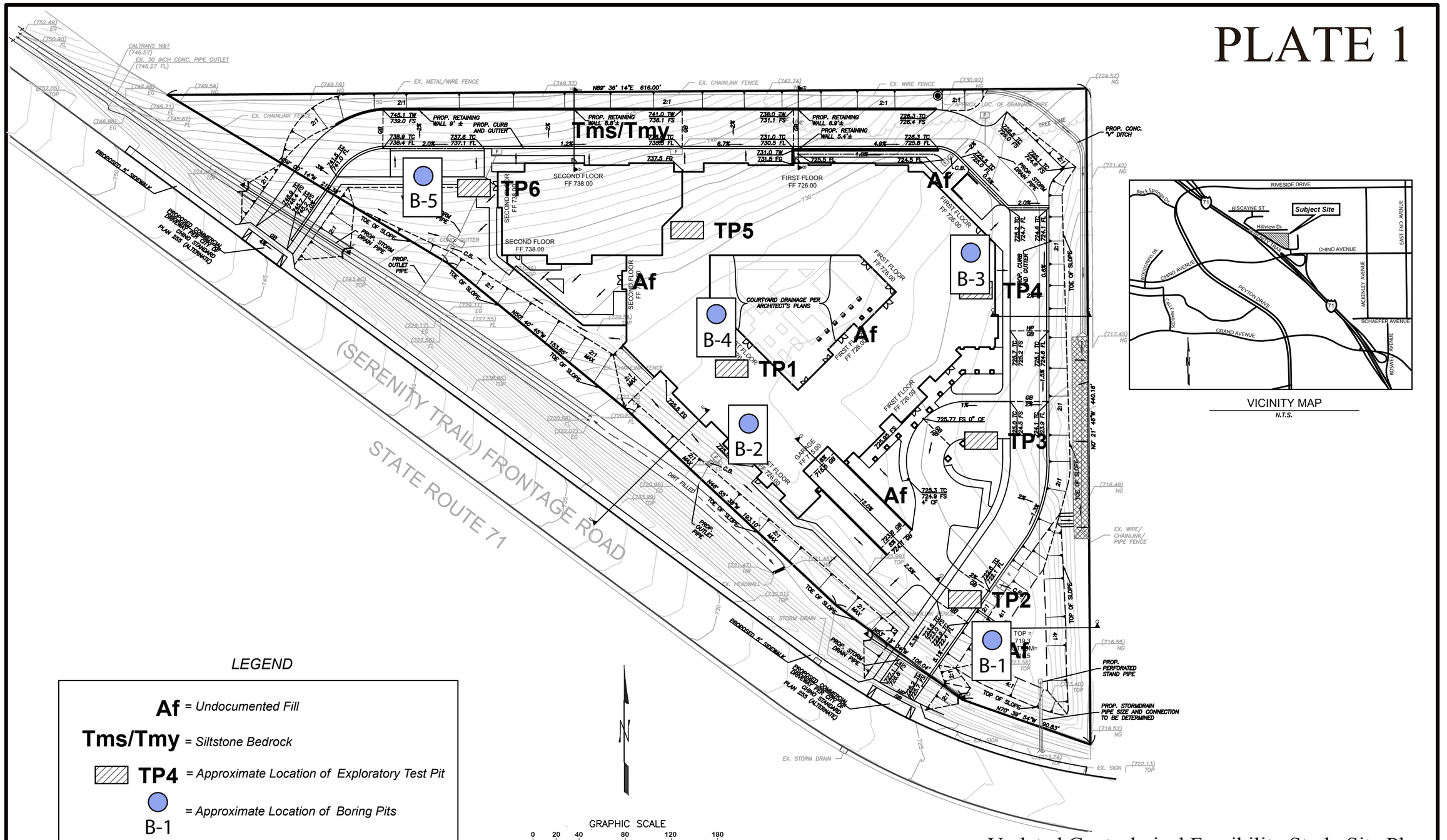
Δt (min)	Reading No.	Total Depth of Test Pit (Inches)	Depth of Test Hole (Inches)	Initial Height of Water (H_o) (Inches)	Final Height of Water (H_f) (Inches)	Change in Height (ΔH) (Inches)	Average Head (H_{avg}) (Inches)	Converted Infiltration Rate in/hr (I_t)
30.00	1	24.00	21.00	20.00	18.50	1.50	19.25	0.3
30.00	2	24.00	21.00	20.00	18.50	1.50	19.25	0.3
30.00	3	24.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	4	24.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	5	24.00	21.00	20.00	19.25	0.75	19.63	0.1
30.00	6	24.00	21.00	20.00	19.25	0.75	19.63	0.1



Notes:

PLATE 1 & 1A

PLATE 1



VICINITY MAP
N.T.S.

LEGEND

Af	*= Undocumented Fill*
Tms/Tmy	*= Siltstone Bedrock*
TP4	*= Approximate Location of Exploratory Test Pit*
B-1	*= Approximate Location of Boring Pits*

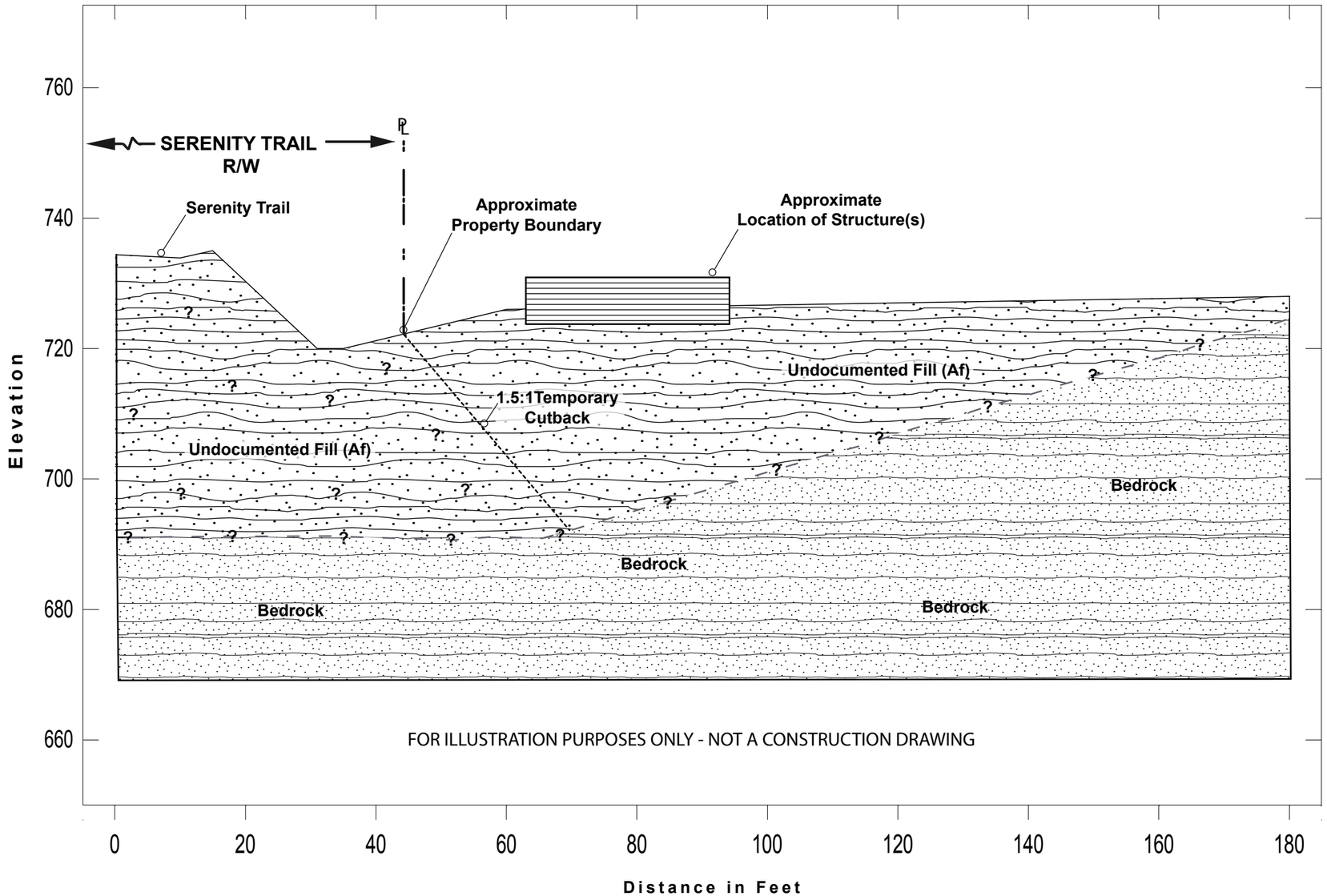
GRAPHIC SCALE
0 20 40 80 120 180
1" = 40'

Updated Geotechnical Feasibility Study Site Plan

Project Name:	Summerland Senior Living	Date:	July 2017
Project Number:	4219GFS	Client:	United Engineering Group
Legal Description:	13225 Serenity Trail, Chino	Plate No.	1

41625 Enterprise Circle South, B-2 · Temecula, California 92590 · 951.296.3511 · engen@engencorp.com · www.engencorp.com

PLATE 1A



LEGEND

- - - - = *Approximate Boundary of Geologic Contact*

Tms = *Soquel Sandstone Bedrock*

Af = *Approximate Limits of Undocumented Fill within improvement area (1' to 3.5' in depth)*

Note: Undocumented fill must be removed to unweathered bedrock. Alternative foundation design may be possible under favorable conditions based on additional data.

GRAPHIC SCALE

0 10 20 40 80 120

1" = 20'

Updated Geotechnical Feasibility Study Site Plan

Project Name: Summerland Senior Living		Date:	August 2017
Project Number: 4219GFS	Client: United Engineering Group		
Legal Description: 13225 Serenity Trail, Chino		Plate No.	1A

41625 Enterprise Circle South, B-2 · Temecula, California 92590 · 951. 296.3511 · engen@engencorp.com · www.engencorp.com