Appendix I

Preliminary Hydrology Memorandum

JENSEN
DESIGN & SURVEY, INC.
Delivering excellence through experience

1672 Donlon Street
Ventura, CA 93003
Local 805 654-6977
Fax 805 654-6979
www.jdscivil.com

PLA02.5893
Friday, November 01, 2019

County of Ventura
Watershed Protection District
Kim Loeb, Manager
800 S. Victoria Ave
Ventura, CA 93009

Subject: Somis Ranch Farmworker Housing – Preliminary Hydrology

Dear Mr. Loeb,

Somis Ranch is proposing to construct a 360-unit farmworker housing complex on an approximately 18-acre portion of Assessor Parcel Number (APN) 156-0-180-280. The proposed project site is located on Somis Road, immediately north of and adjacent to the Camarillo City limits. The project will create approximately 469,000 SF of additional impervious area. The intent of this letter is to show that the preliminary design of this project will meet County requirements.

Existing Conition
The current site is undeveloped and used for agriculture. It drains from north to south at an average slope of less than 1%. Flow from the site is directed towards a drainage channel along the west side of the site. The drainage channel flows south to the edge of the Rancho Campana High School parking lot and turns west between the neighboring Rancho Campana High School and Church of Latter-Day Saints properties. Runoff within the channel flows into an inlet structure 300 feet west of the project site (see attached Hydrology Exhibit for reference). From here, a City of Camarillo storm drain system carries the flow to Calleguas Creek.

Developed Condition
The proposed site will be broken up into three construction phases. Runoff from the area within Phase 1 (Subareas 15-17 & 24-29) and the western portions of Phase 2 & 3 (Subareas 18, 20, & 22) will be directed towards a detention basin in the southwest corner of the site. The remaining runoff tributary to Phases 2&3 (Subareas 1-14, 21 & 23) will be directed to a second detention basin on the east side of the site. Both of the basins have been designed to mitigate post-construction peak runoff flows to current peak runoff flows Outflow from the basins will be released into the existing drainage channel and continue to drain as in the pre-construction conditions.

Detention
Detention volumes for the site were determined using the County's Small Area Detention Calculator. The calculator is conservative and typically results in much larger volumes than required in final design of large projects. Detention volumes for final design will be calculated with the use of the County's TcCalc and VCRat programs, as well as the Hydraflow Program. The minimum required volumes for the western basin serving most of Phase 1 and the eastern basin serving most of Phases 2&3 are approximately 10,300 CF and 27,900 CF, respectively.

The preliminary design provides 15,400 CF of detention for the western basin and 40,350 CF of detention for the eastern basin, with the additional storage to allow for adjustments in final design.

MS4 Compliance

The proposed project is not within the County's Unincorporated Urban Area that requires MS4 compliance, but it is anticipated that the project will be conditioned to comply with the MS4 permit.

On site infiltration tests have shown that the infiltration rate is poor with an average rate less than 0.1 in/hr. Due to the poor infiltration rates, using infiltration to meet the MS4 requirements will be technically infeasible and stormwater will need to be treated and released offsite. The proposed project will use the Modular Wetlands proprietary product from Bio Clean to meet the County's MS4 requirements. The biofiltration devices will be used in parallel to treat the minimum stormwater quality design flow (SQDF). See attached SQDF calculations and manufacturer's detail.

Groundwater Recharge

The proposed project is increasing impervious area, which will result in a loss of recharge to the local groundwater basin. Due to the poor infiltration rates on site, minimal rainwater has the opportunity to infiltrate during rain events in the existing condition. The volume of water lost annually by the increased impervious area was calculated using historical data published by Ventura Watershed. Increased impervious area from the site will result in an average loss of 0.71 acre-feet of recharge per year, see attached calculations for reference. This amount is negligible for a 36 acre site.

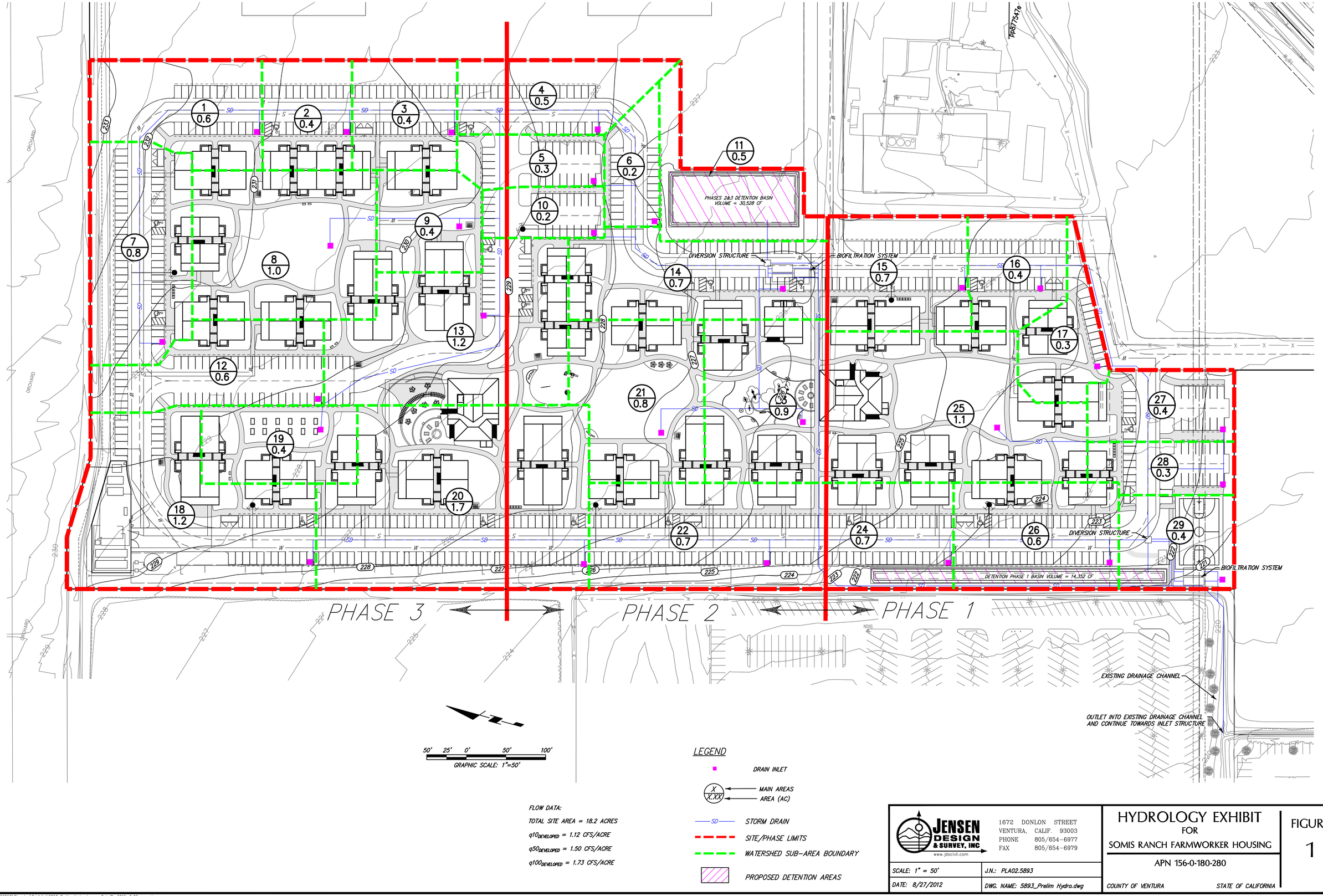
The proposed site is not within any FEMA Special Flood Hazard Areas.

This preliminary analysis shows that the proposed development can meet the County design requirements for stormwater treatment and detention. Many of the calculations will be refined during the final design process and will include pad protection, catch basin inlet capacity, and street conveyance capacity. If you have any questions regarding this information, please don't hesitate to contact me.

Sincerely,
Jensen Design & Survey, Inc.

Robert Harvey, P.E.
Civil Engineer

Enclosures
Hydrology Exhibit
County's Small Area Detention Calculations
SQDF Calculations
Bio Clean Modular Wetlands Detail
Groundwater Recharge Loss Calculations



LEGEND

- DRAIN INLET
- X / X.XX — MAIN AREAS / AREA (AC)
- SD — STORM DRAIN
- SITE/PHASE LIMITS
- WATERSHED SUB-AREA BOUNDARY
- PROPOSED DETENTION AREAS

FLOW DATA:

TOTAL SITE AREA = 18.2 ACRES

$q10_{DEVELOPED}$ = 1.12 CFS/ACRE

$q50_{DEVELOPED}$ = 1.50 CFS/ACRE

$q100_{DEVELOPED}$ = 1.73 CFS/ACRE

JENSEN DESIGN & SURVEY, INC
www.jdscivil.com
1672 DONLON STREET
VENTURA, CALIF. 93003
PHONE 805/654-6977
FAX 805/654-6979

SCALE: 1" = 50' | J.N.: PLA02.5893

DATE: 8/27/2012 | DWG. NAME: 5893_Prelim Hydro.dwg

HYDROLOGY EXHIBIT

FOR

SOMIS RANCH FARMWORKER HOUSING

APN 156-0-180-280

COUNTY OF VENTURA STATE OF CALIFORNIA

FIGURE 1

Detention Volume for Attenuating Peak Runoff from Small Developed Areas

Phase 1	**Predevelopment**	**Post-Dev**
100-yr 1-d Rain in	6.5	6.5
Soil Type	5	5
Land Use	Ag - Good	Residential - Condos
CN Exhibit 14	77	87
S = 1000/CN-10	2.99	1.49
Yield in	3.92	5.00
Volume Calculation		
Yield Difference in		1.08
Depression Storage in.		0.50
Net Yield		0.58
Impervious Area ac		4.90
Vol Increase CF- Max Basin Size Req'd		10277.10

Detention Volume for Attenuating Peak Runoff from Small Developed Areas

Phase 2&3	**Predevelopment**	**Post-Dev**
100-yr 1-d Rain in	6.5	6.5
Soil Type	5	5
Land Use	Ag - Good	Residential - Condos
CN Exhibit 14	77	87
S = 1000/CN-10	2.99	1.49
Yield in	3.92	5.00
Volume Calculation		
Yield Difference in		1.08
Depression Storage in.		0.50
Net Yield		0.58
Impervious Area ac		13.30
Vol Increase CF- Max Basin Size Req'd		27894.98

Project Name: Somis Farm Worker Housing
Job No: PLA02.5893
Date: 10/31/2019
Drainage Area Name: Phase 1

Step 1: Determine Water Quality Design Flow				
1-1	Enter Project Area (Acres), $A_{project}$	$A_{project}$=	4.9	ac
1-2	Enter impervious fraction, IMP	IMP =	0.59	
1-3	Determine pervious runoff coefficient using Table E-1, C_p	C_p =	0.05	
1-4	Calculate runoff coefficient $C=0.95*IMP + C_p(1-IMP)$	C =	0.581	
1-5	Enter design rainfall intensity (in/hr), i	i =	0.28	in/hr
1-6	Calculate water quality design flow (cfs), SQDF - CiA	SQDF =	0.797132	cfs

Note: Rainfall intensity per Table 2-1 of 2011 TGM.

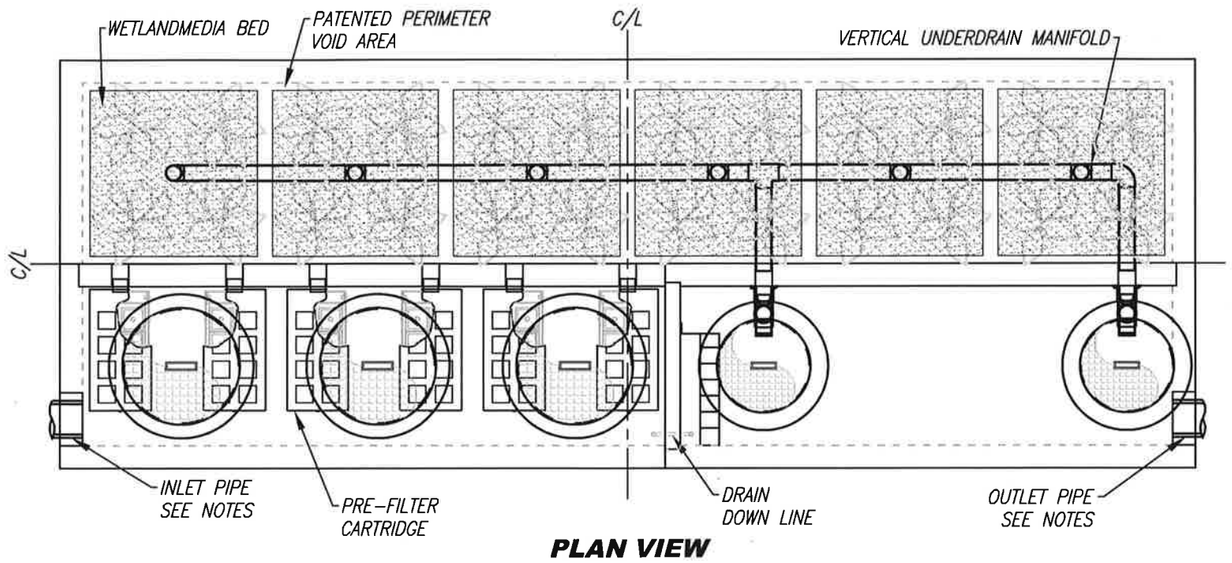
Project Name: Somis Farm Worker Housing
Job No: PLA02.5893
Date: 10/31/2019
Drainage Area Name: Phase 2 & 3

Step 1: Determine Water Quality Design Flow				
1-1	Enter Project Area (Acres), $A_{project}$	$A_{project}$=	13.3	ac
1-2	Enter impervious fraction, IMP	IMP =	0.59	
1-3	Determine pervious runoff coefficient using Table E-1, C_p	C_p =	0.05	
1-4	Calculate runoff coefficient $C=0.95*IMP + C_p(1-IMP)$	C =	0.581	
1-5	Enter design rainfall intensity (in/hr), i	i =	0.28	in/hr
1-6	Calculate water quality design flow (cfs), SQDF - CiA	SQDF =	2.163644	cfs

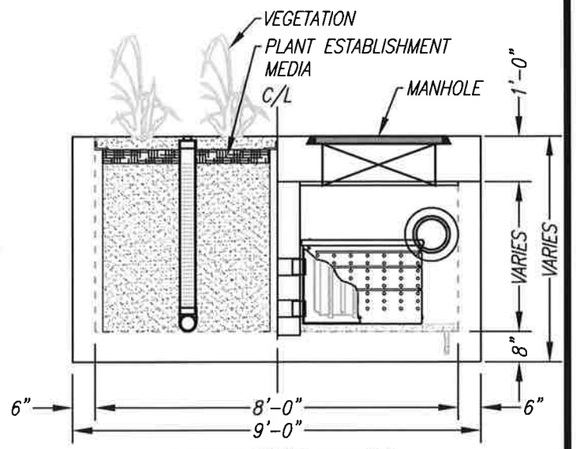
Note: Rainfall intensity per Table 2-1 of 2011 TGM.

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.693	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	DIRECT TRAFFIC		
FRAME & COVER	3EA ø30"	OPEN PLANTER	2EA ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



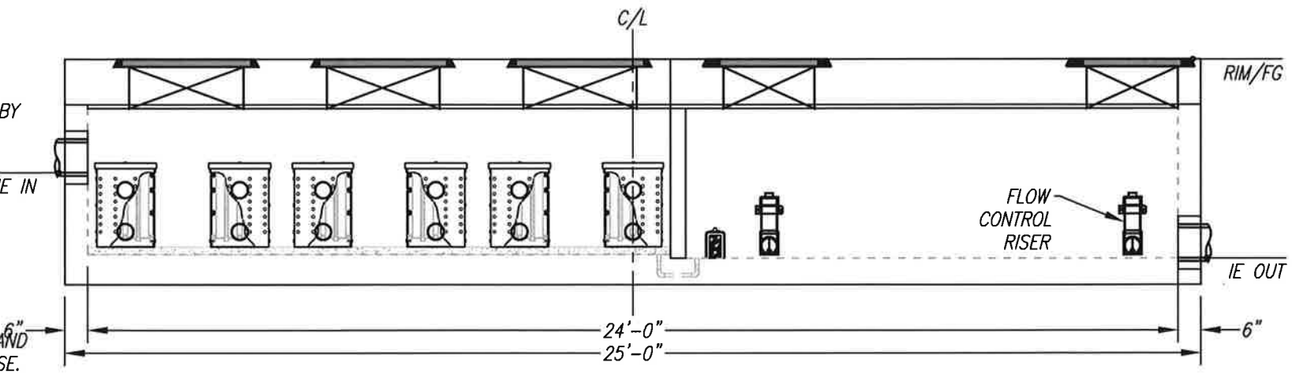
PLAN VIEW



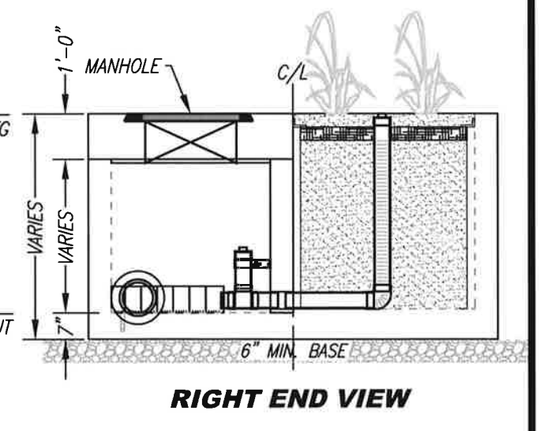
LEFT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.693
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

MWS-L-8-24-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOLFE

JENSEN DESIGN & SURVEY, INC

PROJECT: Somis Farm Worker Housing J.N. PLA 02.5893
Groundwater Recharge
DESCRIPTION: Loss Calculations DATE: 11/1/2019

Infiltration rate = 0.1 in/hr

Area = 18.2 acres

Avg. Distance of Travel (L) = 825'
Overland = 300'
Channel = 525'

Slope (S) = 0.008 ft/ft

% Impervious = 59%

Impervious Area = 10.7 AC

2-year 24 hr Rainfall (P) = 2.51"

Yearly Data Based on 2014-2018 Watershed Data:

Avg. Days of Rain Per Year = 22

Time of Concentration per TR-55

$T_c = T_1 + T_2$

T_1 = overland flow $= \dfrac{0.007(nL)^{0.8}}{P^{0.5} S^{0.4}}$

$= \dfrac{(0.007)((0.05)(300'))^{0.8}}{(2.51)^{0.5}(0.008)^{0.4}}$

$T_1 = 0.266$ hr (overland)

$T_2 = \dfrac{L}{3600V} = \dfrac{525'}{3600\left(1.53\frac{ft}{s}\right)}$

$T_2 = 0.095$ hr (channel)

$T_c = 0.266 + 0.095 = 0.361$ hr
(Total T_c Developed Condition)

Infil. Vol. Loss = $T_c \cdot$ (Inf. Rate) $\cdot$ (# of Rainy Days) $\cdot$ (Imp. Area)

$$V = (0.361\,\text{hr})\left(\frac{0.1\,\text{in}}{\text{hr}}\right)\left(\frac{1\,\text{ft}}{12\,\text{in}}\right) \cdot 22\ \text{days} \cdot 10.7\ \text{ac}$$

$V = 0.708$ acre-feet

Appendix J

Geotechnical Engineering Report

GEOTECHNICAL ENGINEERING REPORT

FOR PROPOSED

SOMIS RANCH RESIDENTIAL DEVELOPMENT

VENTURA COUNTY, CALIFORNIA

PROJECT NO.: 302947-001

SEPTEMBER 27, 2019

PREPARED FOR

PLAZA DEVELOPMENT PARTNERS LLC

ATTENTION: DAVE WHITE

BY

EARTH SYSTEMS PACIFIC

1731-A WALTER STREET

VENTURA, CALIFORNIA 93003

Earth Systems
1731 Walter Street, Suite A | Ventura, CA 93003 | Ph: 805.642.6727 | www.earthsystems.com

September 27, 2019

Project No.: 302947-001
Report No.: 19-9-26

Plaza Development Partners LLC
Attention: Dave White
P.O. Box 6045
Oxnard, CA 93031-6045

Project: Somis Ranch - Proposed Residential Development
Camarillo Area of Ventura County, California
Subject: Geotechnical Engineering Report

As authorized, Earth Systems Pacific (Earth Systems) has performed a geotechnical engineering study for the residential development at Somis Ranch in the Camarillo area of Ventura County, California. The accompanying Geotechnical Engineering Report presents the results of our subsurface exploration and laboratory testing programs, and our conclusions and recommendations pertaining to geotechnical aspects of project design. This report completes Phase 1 of the scope of services described within our Proposal VEN-18-12-002 dated December 6, 2018 and July 17, 2019.

We have appreciated the opportunity to be of service to you on this project. Please call if you have any questions, or if we can be of further service.

Respectfully submitted,

EARTH SYSTEMS PACIFIC

mlw
September 27, 2019
Meng Wei Lu
Civil Engineer

REGISTERED PROFESSIONAL ENGINEER
MENG WEI LU
C 89106
Exp 9/30/20
CIVIL
STATE OF CALIFORNIA

Reviewed and Approved

Richard M Beard 27 Sept. 2019
Richard M. Beard
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
RICHARD MICHAEL BEARD
GE 128
Exp. 12-31-19
GEOTECHNICAL
STATE OF CALIFORNIA

Todd J. Tranby
Engineering Geologist

PROFESSIONAL GEOLOGIST
TODD J. TRANBY
No. 2078
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Copies: 4 - Client (3 mail, 1 email)
1 - Project File

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

INTRODUCTION

Project Description

This report presents results of a geotechnical engineering study performed for a proposed residential development at Somis Ranch in the Camarillo area of Ventura County, California (see Vicinity Map in Appendix A). Current plans indicate that the proposed residential development will include about 59 residential buildings, a community center and garden, play fields, a basketball court, driveways, and parking areas.

Site development is anticipated to include grading to create building pads and streets, and improve drainage. Because the site is essentially flat with a gentle slope, cut and fill depths are not expected to exceed a few feet. When this report was prepared there was not a preliminary grading plan.

The proposed residences may include 1-, 2-, or 3-story structures supported by shallow conventional or post-tension foundations. Structural loads of 1.5 kips per lineal foot and column loads of up to 25 kips are anticipated. If actual loads vary significantly from these assumed loads, Earth Systems should be notified since reevaluation of the recommendations contained in this report may be required.

Purpose and Scope of Work

The purpose of the geotechnical study that led to this report was to analyze the soil conditions of the project site and to provide geotechnical recommendations for construction. The soil conditions include surface and subsurface soil types, expansion potential, soil strength, settlement potential, bearing capacity, and the presence or absence of subsurface water. The scope of work included:

- Performing a reconnaissance of the project site.
- Drilling, sampling, and logging 23 hollow-stem-auger borings (B-1 through B-19 and IT-1 through IT-4) to study soil and groundwater conditions. Four of the borings (IT-1 through IT-4) drilled were used for infiltration testing.
- Performing 3 Cone Penetrometer Test (CPT) soundings on the project site to study soil and groundwater conditions, and to evaluate the liquefaction potential of the soils within the depth tested.

- Laboratory testing soil samples obtained during the subsurface exploration to determine their physical and engineering properties.
- Performing infiltration tests.
- Consulting with owner representatives and design professionals.
- Analyzing the geotechnical data obtained.
- Preparing this report.

Contained in this report are:

- Descriptions and results of field and laboratory tests that were performed.
- Conclusions and recommendations pertaining to site grading and structural design.

Site Setting

The project site is a farmland used for growing row crops. The project site has a slight surficial drainage to the south/southwest, and is bounded by the Rancho Campana High School to the southwest and farmlands in all other directions. The elevations of the project site range from about 215 to 220 feet above mean sea level. The geographic coordinates of the project site are 34.2469˚ North Latitude and 119.0112° West Longitude.

REGIONAL GEOLOGY

The property lies within an alluvial valley intersecting the Camarillo foothills in the western portion of the Transverse Ranges geologic province. Numerous east-west trending folds and reverse faults indicative of active north-south transpressional tectonics characterize the region. The ongoing regional compression produces the east-west trending faults that deform early Pleistocene to Tertiary aged marine and non-marine sedimentary bedrock units.

Regional Geologic Map 1 (T.W. Dibblee, Jr, Geologic Map of the Camarillo and Newbury Park Quadrangles, 1990) shows that the southwest-northeast trending Santa Rosa Fault is about 4,500 feet southeast of the site (see Appendix A). Regional Geologic Map 2 (USGS/CGS, SCAMP Geologic Map of the Camarillo 7.5' Quadrangle, 2004) indicates that the southwest-northeast trending Somis Fault and Springville Fault Zone are about 200 and 2,000 feet southeast and northwest of the site, respectively (see Appendix A). The site is mapped by T.W. Dibblee, Jr. and the USGS/CGS to be underlain by alluvium, which was encountered during our study.

SEISMICITY AND SEISMIC DESIGN

Although the project site is not within a State-designated "fault rupture hazard zone", it is located in an active seismic region where large numbers of earthquakes are recorded each year. Historically, major earthquakes felt in the vicinity of the project site have originated from faults outside the area. These include the 1857 Fort Tejon earthquake, the 1872 Owens Valley earthquake, and the 1952 Arvin-Tehachapi earthquake.

It is assumed that the 2016 CBC and ASCE 7-10 guidelines will apply for the seismic design parameters. The 2016 CBC includes several seismic design parameters that are influenced by the geographic site location with respect to active and potentially active faults, and with respect to subsurface soil or rock conditions. The seismic design parameters presented herein were determined by the United States Seismic Design Maps "risk-targeted" calculator on the SEAOC/OSHPD website for the project site coordinates (34.2469˚ North Latitude and 119.0112° West Longitude). The calculator adjusts for Soil Site Class, which in this case is D, and for Risk Category, which in this case is II.

The calculated 2016 California Building Code (CBC) and ASCE 7-10 seismic parameters typically used for structural design are included in Appendix D and summarized in the following table.

Summary of Seismic Parameters (2016 CBC)

Seismic Design Category	E
Site Class (Table 20.3-1 of ASCE 7-10 with 2013 update)	D
Occupancy (Risk) Category	II
Maximum Considered Earthquake (MCE) Ground Motion	
Peak Modified Ground Acceleration – PGA_m	0.981 g
Spectral Response Acceleration, Short Period – S_s	2.552 g
Spectral Response Acceleration at 1 sec. – S_1	0.908 g
Site Coefficient – F_a	1.00
Site Coefficient – F_v	1.50
Site-Modified Spectral Response Acceleration, Short Period – S_{MS}	2.552 g
Site-Modified Spectral Response Acceleration at 1 sec. – S_{M1}	1.362 g
Design Earthquake Ground Motion	
Short Period Spectral Response – S_{DS}	1.701 g
One Second Spectral Response – S_{D1}	0.908 g

The values presented in the table above are appropriate for a 2 percent probability of exceedance in 50 years. A listing of the calculated 2016 CBC and ASCE 7-10 seismic parameters is included in Appendix D.

The Fault Parameters table in Appendix D lists the significant "active" and "potentially active" faults within a 33-mile (53-kilometer) radius of the project site. The distance between the project site and the nearest portion of each fault is shown as well as the respective estimated maximum earthquake magnitudes.

SOIL AND GROUNDWATER CONDITIONS

Evaluation of the subsurface indicates that much of the project site underlain directly by alluvium consisting of interbedded clay, silt, and sand. Testing indicates that anticipated bearing soils lie in the "Medium" to "High" expansion range based on measured expansion indices of 72 and 105. However, it is Earth Systems' professional judgement that the onsite soils should be considered to be in the "High" expansion range and that the recommendations provided in this report should be based on the "High" expansion range. A locally adopted version of this classification of soil expansion, Table 1809.7, is included in Appendix C of this report. It appears that soils can be cut by normal grading equipment.

Groundwater was not encountered in the onsite borings and CPT soundings to a maximum depth of about 61.5 feet below the existing ground surface. According to the Seismic Hazard Zones Report for the Camarillo 7.5-Minute Quadrangle, Ventura County, California (CGS, 2002), the depth of historical high groundwater is estimated to be deeper than 70 feet. See Historical High Groundwater Map in Appendix A. It should be noted that fluctuations in groundwater levels may occur because of variations in rainfall, regional climate, and other factors.

Two samples obtained from the upper 5 feet of Borings B-1 and B-8 were tested for pH, resistivity, soluble sulfates, and soluble chlorides. The test results provided in Appendix B should be distributed to the design team for their interpretations pertaining to the corrosivity or reactivity of various construction materials (such as concrete and piping) with the soils. It should be noted that the measured sulfate contents (710 and 510 mg/Kg) are in the "S0" exposure class (i.e. "Negligible" severity range) of Table 19.3.1.1 of ACI 318-14. Therefore, special concrete designs will not be necessary for the measured sulfate contents according to Table 19.3.2.1 of ACI 318-14.

Based on criteria established by the County of Los Angeles, the measured resistivity values of the soil samples (1,300 and 1,700 ohms-cm) indicates that near-surface soils are "Corrosive" to ferrous metal (i.e. cast iron, etc.) pipes. It should be noted that Earth Systems does not practice soil corrosion engineering.

HYDROCOLLAPSE POTENTIAL

Hydrocollapse is a phenomenon in which naturally occurring soil deposits, or non-engineered fill soils, collapse when wetted. Natural soils that are susceptible to this phenomenon are typically aeolian, debris flow, alluvial, or colluvial deposits with high apparent strength when dry. Loosely compacted fills can also be susceptible to this phenomenon. The dry strength is attributed to salts, clays, silts, and in some cases capillary tension, "bonding" larger soil grains together. So long as these soils remain dry, their strength and resistance to compression are retained. However, when wetted, the salt, clay, or silt bonding agent is weakened or dissolved, or capillary tension reduced, eventually leading to collapse. Soils susceptible to this phenomenon are found throughout the southwestern United States.

Although groundwater is anticipated to be deeper than 70 feet at the project site, Earth Systems understands that the project site may have agricultural, stormwater infiltration, and onsite wastewater effluent discharges in the future. Based on the consolidation tests performed on soil samples obtained from Boring B-1, it appears that the upper 20 feet of silty clay has negligible potential of hydrocollapse. However, the soil samples obtained between depths of 20 and 50 feet showed 0.5% to 1% of hydrocollapse potential. Gravel layers are assumed to have negligible hydrocollapse potential. Soil layers that have more than 70% of degree of saturation are also assumed to have negligible hydrocollapse potential. Based on the above, Earth Systems estimates a hydrocollapse-induced settlement of about 1.5 inches.

LIQUEFACTION POTENTIAL

Earthquake-induced cyclic loading can be the cause of several significant phenomena, including liquefaction in fine sands and silty sands. Liquefaction results in a loss of soil strength and can cause structures to settle and, in extreme cases, to experience bearing failure.

The potential hazard posed by liquefaction is considered to be low at the project site because:

- The project site does not lie within a potentially liquefiable zone (see Seismic Hazard Zones Map in Appendix A).
- Groundwater is anticipated to be deeper than 70 feet below the ground surface of the project site (see Historical High Groundwater Map in Appendix A).

SEISMIC-INDUCED SETTLEMENT OF DRY SANDS

Dry (unsaturated) soils tend to settle and densify when subjected to earthquake shaking. The amount of settlement is a function of relative density, cyclic shear strain magnitude, and the number of strain cycles. A procedure to evaluate this type of settlement was developed by Seed and Silver (1972) and later modified by Pyke, et al. (1975). Tokimatsu and Seed (1987) presented a simplified procedure that has been reduced to a series of equations by Pradel (1998).

Earth Systems used the three onsite CPT soundings to perform the dry-sand settlement analysis. The parameters used and analyses results are presented in Appendix E, and indicate a potential for about 0.2 inch of seismic-induced settlement during a design level earthquake, half of which may be differential.

FAULT RUPTURE HAZARD

A fault is a break in the earth's crust upon which movement has occurred in the recent geologic past and at which future movement is expected. A summary of nearby active faults is presented in Appendix D under Table 1 Fault Parameters.

The project site does not lie within a State of California designated active fault hazard zone. The activity of faults is classified by the State of California based on the Alquist-Priolo Earthquake Fault Zoning Act (1972, Revised 1999). An active fault has had surface rupture with Holocene time (the past 11,000 years). A potentially active fault shows evidence of surface displacement during Quaternary time (last 1.6 million years). An inactive fault has no evidence of movement within the Quaternary time.

As previously discussed in the Regional Geology section of this report, all nearby faults (as shown on both reviewed Regional Geologic Maps) are at least about 200 feet away from the project site. Therefore, the potential for fault rupture at the project site is considered low.

LANDSLIDES

Landsliding is a process where a distinct mass of rock or soil moves downslope because of gravity. No landslides are mapped on the project site by Dibblee or USGS/CGS (see Regional Geologic Maps in Appendix A). Because there are no identified landslides either on or trending into the project site, hazards associated with these phenomena are considered low.

ROCKFALL

Loose boulder-sized rocks and/or weathering bedrock outcrops located upslope from construction can lead to a rockfall hazard. Because the project site is located on a relatively flat alluvial plain with no nearby slopes, the potential for rockfall onto the project site appears to be low.

EARTHQUAKE-INDUCED FLOODING

Earthquake-induced flooding types include tsunamis, seiches, and reservoir failure. Because of the inland location of the project site, hazards from tsunamis and seiches are considered unlikely. Additionally, there are no reservoirs upstream of the project site. Therefore, earthquake-induced flooding is not considered a potential hazard at the project site.

OTHER FLOODING

The project site appears to be adjacent to, but not within any of the flood hazard areas mapped by Federal Emergency Management Agency (FEMA), FEMA Flood Map for Ventura County Unincorporated Areas, effective January 7, 2015, Map No. 06111C0932F.

INFILTRATION TESTING

On July 2 and 3 of 2019, four approximately 8-inch diameter infiltration borings (IT-1 through IT-4) were drilled to depths of about 4, 15, 7, and 18 feet, respectively, below the existing ground surface to determine the soil profile and allow installation of plastic casing for infiltration testing (see Site Plan in Appendix A for infiltration boring locations). All infiltration borings were bottomed into native Alluvium (see Logs of Borings in Appendix A).

After drilling was completed, 3-inch diameter slotted PVC casings were lowered into the boreholes. The annuli between the casings and boring walls were then filled with pea gravel. The falling-head borehole infiltration test procedure was used for infiltration testing. About 1 to 3 feet of water was added to the bottom of each of the holes to start the tests, and the drop in the water surface monitored by taking periodic measurements. Readings were taken at reasonable time intervals based on infiltrating rate, and after each of these intervals, water was added to return the water level to its original refill depth above the hole bottom for the next test interval. The tests were run until the infiltration rates were reasonably stable.

It should be noted that the rate the water surface drops in a borehole is a percolation rate, which is related to, but is not an infiltration rate. Percolation rate ignores the wetted soil surface area into which the water is infiltrating and does not account for the volume of water infiltrated. An infiltration rate considers both factors. Hence, percolation rates (in unit length per unit time) are an overestimation of infiltration rates (also in unit length per unit time). Earth Systems uses the Porchet equation to account for the wetted surface area and volume of water infiltrated to estimate an infiltration rate. Forms of the equation can be found in the Riverside County - Low Impact Development BMP Design Handbook (2001), the South Orange County Version, Technical Guidance Documents Appendices (2017), or in a paper by J.W. Van Hoorn, "Determining Hydraulic Conductivity with the Inversed Auger Hole and Infiltrometer Methods." The Porchet equation in its most simple form is the volume of water infiltrated divided by the product of the change in time and the wetted surface area. By substitution, the equation can be shown to be equal to:

$$\text{Infiltration Rate (inches /hr.)} = \frac{\Delta H * r * 60}{\Delta t * (r + 2H_{avg})}$$

where: ΔH = Change in water level (inches)
Δt = Change in time (minutes)
r = Radius of test hole (inches)
H_{avg} = Average height of water in test hole (inches)

The above equation does not account for the gravel pack in the annulus between the borehole wall and the slotted pipe fitted in the test hole. Ignoring the gravel pack inflates the amount of water infiltrated and, hence, yields an unconservative infiltration rate. A method

to account for the volume occupied by the gravel (and the slotted pipe) and adjust the infiltration rate accordingly is presented in Caltrans Test 750. Earth Systems makes this additional adjustment to our test data. The equation is:

$$\text{Correction Factor} = n * [\, 1 - (O/D)^2] + (I/D)^2$$

Where: n = Pea gravel porosity
O = Outside diameter of slotted pipe (inches)
D = Test hole diameter (inches)
I = Inside diameter of slotted pipe (inches)

Earth Systems has determined an average porosity for the pea gravel used in our testing. The other values are simple measurements.

Based on the infiltration testing results in Appendix F, the measured test infiltration rates for the depths tested and boring locations are summarized in the following table:

Boring	Boring Depth (feet)	Infiltration Rate (inch/hour)	Infiltration Rate (cm/s)
IT-1	4	0.02	0.00001
IT-2	15	0.03	0.00002
IT-3	7	0.22	0.00016
IT-4	18	0.12	0.00008

Please note that none of the tested rates is acceptable per the TGM because all the tested rates are slower than 0.5 inch/hour. There are many factors that influence the infiltration rate. Clear water was used in our tests, whereas deleterious material will likely be contained in the storm water. Variations in soil conditions within the limits of the proposed infiltration system will likely affect infiltration characteristics. The designer who utilizes the infiltration results should consider these factors, as well as apply a factor-of-safety to the infiltration rate to account for future disposal bed siltation.

CONCLUSIONS AND RECOMMENDATIONS

Based on the data provided in this report, it appears that the project site is suitable for the proposed residential development from a geotechnical engineering standpoint provided that the recommendations provided herein are properly implemented into the project.

Earth Systems believes that a conventional footing system with slab-on-grade floors or post-tensioned slabs will be suitable to support the proposed residential development. Given the site conditions encountered, we conclude that remedial grading will be needed to provide a more uniform and moisture-conditioned subgrade. Soil expansion Indices and corrosion characteristics will need to be re-tested for every 4 to 5 lots at the completion of grading.

Infiltration systems appear problematic because of unacceptable infiltration in the clayey soils that blanket the project site. Note that the blanket of clayey soils is about 20 feet thick.

Specific conclusions and recommendations addressing these geotechnical considerations, as well as general recommendations regarding the geotechnical aspects of design and construction, are presented in the following sections.

A. Grading

1. Pre-Grading Considerations

   a. Roof draining systems, if required by the appropriate jurisdictional agency, should be designed so that water is not discharged into bearing soils or near structures.

   b. Final site grade should be designed so that all water is diverted away from the structures over paved surfaces, or over landscaped surfaces in accordance with current codes. Water should not be allowed to pond anywhere on the pad.

   c. Shrinkage of soils (uncertified fills) affected by compaction is estimated to be about 25 percent based on an anticipated average compaction of 92 percent.

   d. Earth Systems should be retained to provide geotechnical engineering services during site development and grading, and foundation construction phases of the work to observe compliance with the design concepts, specifications and recommendations. This will allow for timely design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

e. Plans and specifications should be provided to Earth Systems prior to grading. Plans should include the grading plans, foundation plans, and foundation details. Earth Systems will review these plans only for conformity with geotechnical parameters not including drainage. It is the responsibility of the Client and other Engineers to review and approve designs and plans for conformity with all engineering and design requirements necessary to the proper function and performance of the structure.

f. Compaction tests should be made to determine the relative compaction of the fills in accordance with the following minimum guidelines: two tests for each 1.5-foot vertical lift in every isolated area graded; one test for each 500 cubic yards of material placed; and two tests in each building pad.

2. Rough Grading/Areas of Development

a. Grading at a minimum should conform to the 2016 California Building Code.

b. The existing ground surface should be initially prepared for grading by removing all vegetation, trees, large roots, debris, other organic material and non-complying fill. Organics and debris should be stockpiled away from areas to be graded, and ultimately removed from the project site to prevent their inclusion in fills. Voids created by removal of such material should be properly backfilled and compacted. No compacted fill should be placed unless the underlying soil has been observed by the Geotechnical Engineer.

c. To provide a more uniform and moisture-conditioned pad, overexcavation and recompaction of soils in these construction areas will be necessary.

d. Soils should be overexcavated throughout the entire construction area to the greater depth of the following: 1) 2 feet below the bottom of footings; or 2) 3.5 feet below the finished pad grade. Overexcavation should be extended to a distance of at least 5 feet laterally, but not less than a distance equal to the depth of removal, beyond the outside edge of the foundation elements.

e. The bottoms of all excavations should be observed by a representative of Earth Systems prior to processing or placing fill.

f. The resulting surface(s) should then be scarified an additional 6 inches, uniformly moisture conditioned to about 140 percent of the optimum moisture content, and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D 1557 maximum dry density. Compaction of the

prepared subgrade should be verified by testing prior to the placement of engineered fill.

g. Areas outside of the building to receive fill, exterior slabs-on-grade, sidewalks, or paving should be overexcavated to a minimum of 1 foot below finished pad grade. The resulting surfaces should then be scarified an additional 6 inches, moisture conditioned, and recompacted.

h. Voids created by dislodging cobbles and boulders (if any) during excavation should be backfilled and recompacted and the dislodged cobbles larger than 6 inches in diameter should be removed from the subgrade.

i. On-site soils may be used for fill once they are cleaned of all organic material, rocks, debris, and irreducible material larger than 6 inches.

j. Fill and backfill placed at about 140 percent of the optimum moisture in layers with a loose thickness not greater than 6 inches should be compacted to a minimum of 90 percent of the maximum dry density obtainable by the ASTM D 1557 test method unless otherwise recommended or specified by the Geotechnical Engineer or his/her representative. Random compaction tests by Earth Systems can assist the Grading Contractor in evaluating whether the Grading Contractor is meeting compaction requirements. However, compaction tests pertain only to a specific location and do not guaranty that all fill has been compacted to the prescribed percentage of maximum density. It is the ultimate responsibility of the Grading Contractor to achieve uniform compaction in accordance with the requirements of this report and the grading ordinance.

k. Import soils used (if any) to raise site grade should be equal to, or better than, on-site soils in strength, expansion, and compressibility characteristics. Import soil can be evaluated, but will not be prequalified by the Geotechnical Engineer. Final comments on the characteristics of the import will be given after the material is at the project site.

l. Based on the measured moisture contents, the excavated soils are likely to have in-place moisture contents well above the optimum moisture content (See Logs of Borings in Appendix A). As a result, it may be difficult to achieve a relative compaction of 90 percent of the maximum density following scarification of the upper 6 inches of subgrade exposed at the base of the remedial excavation. Stabilization of the excavation bottom will be required prior to placing fill if pumping soils are encountered. This can be accomplished

by various means. The first method would be drying the soils as much as possible through scarification and aeration. Another method is to work thin lifts of "6-inch minus" crushed angular rock into the excavation bottom with small equipment (such as a D-4) until stabilization is achieved. Use of a geotextile fabric such as Mirafi 500X, or Tensar TX-5, or an approved equivalent in combination with crushed rock, is another possible means of stabilizing the bottom. If this material is used, it should be laid on the excavation bottom and covered with approximately 12 inches of "3-inch minus" crushed angular rock prior to placement of filter fabric (until the bottom is stabilized). The rock should then be covered with a geotextile filter fabric before placing fill above. Unit prices should be obtained from the Contractor in advance for this work.

m. In landscape areas adjacent to the building, the 2016 CBC (Section 1803.3) requires a minimum gradient of 5% away from the edge of the building foundation for a minimum distance of 10 feet.

3. Utility Trenches

a. Utility trench backfill should be governed by the provisions of this report relating to minimum compaction standards. In general, on-site service lines may be backfilled with engineered fill compacted to 90 percent of the maximum density. Backfill of offsite service lines will be subject to the specifications of the jurisdictional agency or this report, whichever are greater.

b. Utility trenches running parallel to footings should be located at least 5 feet outside the footing line, or above a 1:1 (horizontal to vertical) projection downward from the outside edge of the bottom of the footing.

c. Compacted fills should be utilized for backfill. Clean sand backfill should be avoided under structures because it provides a conduit for water to migrate under foundations.

d. Backfill operations should be observed and tested by the Geotechnical Engineer to monitor compliance with these recommendations.

e. Rocks greater than 6 inches in diameter should not be placed in trench zones (from 12 inches below pavement subgrade or ground surface to 12 inches above top of pipe or box); rocks greater than 2.5 inches in diameter should not be placed in pipe zones (from 12 inches above top of pipe or box to 6 inches below bottom of pipe or box exterior).

f. Jetting should not be utilized for compaction in utility trenches.

g. Excavated soils are expected to be at high moisture contents, and drying may be necessary before replacing the excavated soils as compacted backfill. If water is present in trenches, backfilling should be with gravel to 6 inches above the water.

B. Structural Design

1. Conventional Shallow Foundations

a. Conventional continuous footings and/or interior pad footings supported by recompacted fill may be used to support structures. It should be noted that if pad footings are to be used, they should be tied together by grade beams (each way) or by slabs because of the expansiveness of the soils. Based on the tested expansion indices of 72 and 105, perimeter continuous and/or pad footings should have a minimum embedment depth of 27 inches, and interior pad footings should have a minimum embedment depth of 18 inches. The expansion index should be re-evaluated at the completion of rough grading to confirm that these minimum footing depths are appropriate.

b. Footings should be embedded into recompacted fill as recommended elsewhere in this report. Foundation excavations should be observed by a representative of this firm after excavation, but prior to placing of reinforcing steel or concrete, to verify bearing conditions.

c. Footings embedded 27 inches deep may be designed based on an allowable bearing value of 2,100 psf. This value includes a safety factor of 3. This allowable bearing value is net (weight of footing and soil surcharge may be neglected) and is applicable for dead plus reasonable live loads.

d. Bearing values may be increased by one-third when transient loads such as wind and/or seismicity are included.

e. Lateral loads may be resisted by soil friction on floor slabs and foundations and by passive resistance of the soils acting on foundation stem walls. Lateral capacity is based on the assumption that any required backfill adjacent to foundations and grade beams is properly compacted.

f. The information that follows regarding reinforcement and premoistening for footings is the same as that given in Table 1809.7 for the "High" expansion range. Actual footing designs should be provided by the project Structural Engineer, but the dimensions and reinforcement he recommends should not

be less than the criteria set forth in Table 1809.7 for the appropriate expansion range.

g. Continuous footings bottomed in soils in the "High" expansion range should be reinforced, at a minimum, with two No. 4 bars along the bottom and two No. 4 bars along the top. In addition, bent No. 3 bars on 24-inch centers should extend from within the footings to a minimum of 3 feet into adjacent slabs.

h. Presaturation of the subgrade soils should be according to the Table 1809.7 in Appendix C and the expansion indices tested at the completion of grading.

2. Slabs-on-Grade Floors

a. Concrete slabs on grade should be supported by firm recompacted fills as recommended elsewhere in this report.

b. Because the soils of the project site are in the “High” expansion range, perimeter of slabs-on-grade floors should have moisture cutoffs of at least 27 inches deep. Examples of moisture cutoffs include turned down edges of footings and/or slabs, and grade beams. It should be anticipated that exterior concrete supported on grade will be susceptible to movement with seasonal change in soil moisture content. The following recommendations for concrete slabs on grade can help mitigate, but not eliminate, such movement.

c. It is recommended that perimeter slabs (walkways, patios, etc.) be designed relatively independent of footing stems (i.e. free floating) so foundation adjustment will be less likely to cause cracking. Because the on-site soils are highly expansive, the exterior concrete slabs on grade should have turned-down edges of at least 8 inches into the soil.

d. The information that follows regarding design criteria for slabs is generally the same as that given in Table 1809.7 for the "High" expansion range. Actual slab designs should be provided by the project Structural Engineer, but the reinforcement and slab thicknesses he recommends should not be less than the criteria set forth in Table 1809.7 for the appropriate expansion range, or as recommended below, whichever is more stringent.

e. Slabs bottomed on soils in the "High" expansion range should be underlaid with a minimum of 4 inches of sand. Areas where floor wetness would be undesirable should be underlaid with a vapor retarder (as specified by the Project Architect or Civil Engineer) to reduce moisture transmission from the

subgrade soils to the slab. The retarder should be placed as specified by the project Structural Engineer or Architect.

f. Slabs bottomed on soils in the "High" expansion range should at a minimum be reinforced at mid-slab with No. 3 bars on 24-inch centers, each way. No. 3 bars embedded 12-inch in footing and on 24-inch center acting as dowels should also extend out of the perimeter footings, and should be bent so that they extend a minimum of 3 feet into adjacent slabs.

g. Soils underlying slabs that are in the "High" expansion range should be premoistened to about 140 percent of the optimum moisture content to a depth of 33 inches below lowest adjacent grade.

h. Premoistening of slab areas should be observed and tested by this firm for compliance with these recommendations prior to placing of sand, reinforcing steel, or concrete.

3. Post-Tensioned Slabs

a. Post-tensioned slabs can be used to support the proposed residential construction. The following design criteria should be incorporated into the design by the Project Structural engineer. The foundations should be supported by compacted fill. We recommend that a post-tensioned slab be designed for soils in the “High” expansion range.

b. Earth Systems used PTI method (both Atterberg Limit method and Expansion Index method) to design the foundation; the more conservative results are included in the following table:

Thornthwaite Moisture Index	-20
Edge Moisture Variation Distance (e_m)	
Center Lift Condition	7.5 feet
Edge Lift Condition	4.0 feet
Estimated Differential Swell (y_m)	
Center Lift Condition	-0.52 inches
Edge Lift Condition	1.29 inches

c. A bearing value of 1,000 psf may be used for slabs situated on 4 inches of sand over compacted subgrade soils. A bearing capacity of 2,100 psf may be used for 27-inch deep footings.

d. To minimize moisture variations near the edges of slabs, we recommend that the perimeter beams be bottomed no less than 27 inches below lowest adjacent grade.
e. Slab areas should be underlaid with a minimum of 4 inches of sand. A vapor retarder should be placed on the subgrade (i.e., at the base of the sand layer) to reduce upward moisture transmission from the subgrade soils to the slab. the sand above the vapor retarder should be lightly moistened just prior to placing concrete.
f. Slab subgrade soils should be premoistened to above the optimum moisture content to a depth of 33 inches below lowest adjacent grade. Premoistening should be confirmed by testing.

4. Frictional and Lateral Coefficients
   a. Resistance to lateral loading may be provided by soil friction acting on the base of foundations. A coefficient of friction of 0.58 may be applied to dead load forces. This value does not include a safety factor.
   b. Passive resistance acting on the sides of foundation stems equal to 335 pcf of equivalent fluid weight may be included for resistance to lateral load. This value does not include a safety factor.
   c. A minimum safety factor of 1.5 should be used when designing for sliding or overturning.
   d. Passive resistance may be combined with frictional resistance provided that a one-third reduction in the coefficient of friction is used.

5. Retaining Walls
   a. Conventional cantilever retaining walls should not be backfilled with on-site soils because of the expansion potential of those soils. Walls that are backfilled at a 1:1 projection upward from the heels of the wall footings with crushed rock or non-expansive sand, may be designed for active pressures of 38 pcf of equivalent fluid weight for well-drained, level backfill; or 47 pcf of equivalent fluid weight for 2 horizontal versus 1 vertical backfill. An 18-inch thick cap of compacted native soils should be placed above the rock or sand. Filter fabric should be placed between the rock or sand and native soils and/or backfill over the top.

b. Restrained retaining walls should not be backfilled with on-site soils because of the expansion potential of those soils. Walls that are backfilled at a 1:1 projection upward from the heels of the wall footings with crushed rock or non-expansive sand may be designed for at-rest pressures of 58 pcf of equivalent fluid weight for well-drained, level backfill. An 18-inch thick cap of compacted native soils should be placed above the rock or sand. Filter fabric should be placed between the rock or sand and native soils and/or backfill over the top.

c. The pressures listed above were based on the assumption that backfill soils will be compacted to 90 percent of the maximum dry density as determined by the ASTM D 1557 Test Method.

d. Retaining walls will need to be designed for a seismic loading force that is applied in addition to the static forces when seismic shaking occurs if they retain more than 6 feet of soil. Seismic increments of earth pressure can be determined using 25 and 38 pcf of additional equivalent fluid weight need to be considered for cantilever and restrained retaining walls, respectively, if the proposed retaining walls will retain more than 6 feet of soil. These equivalent fluid weights have been determined by a procedure presented by Al Atik and Sitar (2010). The seismic increment of pressure can be assumed to be distributed so that the centroid of pressure acts at 0.33H above the base of a retaining wall, where H is the wall height in feet. Because this seismic force is transient, and in accordance with CBC Section 1807.2.3, a minimum safety factor of 1.1 may be used for sliding and overturning when seismic loads are included.

e. The lateral earth pressure to be resisted by the retaining walls or similar structures should also be increased to allow for any other applicable surcharge loads. The surcharges considered should include forces generated by any structures or temporary loads that would influence the wall design.

f. A system of backfill drainage should be incorporated into retaining wall designs. Backfill comprising the drainage system immediately behind retaining structures should be free-draining granular material with a filter fabric between it and the rest of the backfill soils. As an alternative, the backs of walls could be lined with geodrain systems. The backdrains should extend from the bottoms of the walls to about 18 inches from finished backfill grade.

Waterproofing may aid in reducing the potential for efflorescence on the faces of retaining walls.

g. Compaction on the uphill sides of walls within a horizontal distance equal to one wall height should be performed by hand-operated or other lightweight compaction equipment. This is intended to reduce potential "locked-in" lateral pressures caused by compaction with heavy grading equipment.

h. Water should not be allowed to pond near the tops of retaining walls. To accomplish this, final backfill site grades should be such that all water is diverted away from retaining walls.

6. Settlement Considerations

a. A maximum settlement (static and seismic combined) of about 2 inches is anticipated for foundations and floor slabs supported by recompacted fill as recommended.

b. Differential settlement between adjacent load bearing members could be about one-half the maximum settlement.

c. The Project Structural Engineer will need to design the foundation system to accommodate the potential settlement values.

7. Preliminary Asphalt Paving Sections

Two Resistance ("R") Value tests were conducted on two bulk samples obtained onsite. The tests were performed in accordance with California Method 301. Three specimens at different moisture contents were tested, and the R-Values at 300 psi exudation pressure were determined from the plotted results. R-Values of 2 and 3 were measured (see R-Value testing results in Appendix B).

The following preliminary paving sections table summarizes thicknesses of asphalt and Class II base required for different traffic indices (ranging from 4.0 to 8.0, with 0.5 intervals) using the more conservative tested R-Value of 2. Asphalt and Class II base should be compacted to a minimum of 95 percent of maximum dry density on subgrade soils compacted to a minimum of 90 percent of maximum dry density.

Traffic Index	Asphalt Thickness (inches)	Min. Aggregate Base Thickness (inches)
4.0	3.0	7.0
4.5	3.0	8.5
5.0	3.0	10.5

5.5	3.0	12.0
6.0	3.0	14.0
6.5	3.0	16.0
7.0	3.0	18.0
7.5	3.5	20.0
8.0	5.0	18.5

The preliminary paving sections table provided above has been designed for the type of traffic indicated. If the pavement is placed before construction on the project is complete, construction loads, which could increase the traffic indices above those assumed above, should be taken into account. Also, subgrade R-Values should be reevaluated at or near the end of rough grading so that final pavement designs can be made.

ADDITIONAL SERVICES

This report is based on the assumption that an adequate program of monitoring and testing will be performed by Earth Systems during construction to check compliance with the recommendations given in this report. The recommended tests and observations include, but are not necessarily limited to the following:

- Review of the building and grading plans during the design phase of the project.
- Observation and testing during site preparation, grading, placing of engineered fill, and foundation construction.
- Consultation as required during construction.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

The analyses and recommendations submitted in this report are based in part upon the data obtained from the onsite borings and CPT soundings. The nature and extent of variations beyond the points of exploration may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water,

groundwater or air, on, below, or around this site. Any statements in this report or on the soil boring logs regarding odors noted, unusual or suspicious items or conditions observed, are strictly for the information of the client.

Findings of this report are valid as of this date; however, changes in conditions of a property can occur with passage of time whether they are because of natural processes or works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur whether they result from legislation or broadening of knowledge. Accordingly, findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of 1 year.

In the event that any changes in the nature, design, or location of the proposed construction and/or other improvements are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

This report is issued with the understanding that it is the responsibility of the Owner, or of his representative to ensure that the information and recommendations contained herein are called to the attention of the Architect and Engineers for the project and incorporated into the plan and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

As the Geotechnical Engineers for this project, Earth Systems has striven to provide services in accordance with generally accepted geotechnical engineering practices in this community at this time. No warranty or guarantee is expressed or implied. This report was prepared for the exclusive use of the Client for the purposes stated in this document for the referenced project only. No third party may use or rely on this report without express written authorization from Earth Systems for such use or reliance.

It is recommended that Earth Systems be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications. If Earth Systems is not accorded the privilege of making this recommended review, it can assume no responsibility for misinterpretation of the recommendations contained herein.

BIBLIOGRAPHY

Al Atik, and N. Sitar, 2010, Seismic Earth Pressures on Cantilever Retaining Structures, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, October.

California Building Standards Commission, 2016, California Building Code, California Code of Regulations Title 24.

California Division of Mines and Geology (CDMG.), 1972 (Revised 1999), Fault Rupture Hazard Zones in California, Special Publication 42.

CDMG, 1998, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada to Be Used with the 1997 Uniform Building Code.

California Geological Survey (CGS.), 2002a, Seismic Hazard Zone Report for the Camarillo 7.5-Minute Quadrangle, Ventura County, California.

CGS, 2002b, State of California Seismic Hazard Zones, Camarillo Quadrangle, Official Map, February 7.

CGS, 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117A.

County of Los Angeles Department of Public Works, 2013, Manual for Preparation of Geotechnical Reports, July 1.

Dibblee, Jr., Thomas W., and Helmut E. Ehrenspeck, 1990, Geologic Map of the Camarillo and Newbury Park Quadrangles, Ventura County, California, Dibblee Foundation Map No. DF-28.

El Ehwany, M. and Houston, S.L., 1990, Settlement and Moisture Movement in Collapsible Soils, Journal of Geotechnical Engineering, Vol. 116, October.

Jennings, C.W. and W.A. Bryant, 2010, Fault Activity Map of California, CGS Geologic Data Map No. 6.

Petersen, M.D., W.A. Bryant, C.H. Cramer, T. Cao, M.S. Reichle, A.D. Frankel, J.J. Lienkaemper, P.A. McCrory and D.P. Schwartz, 1996, Probabilistic Seismic Hazard Assessment for the State of California, CDMG. Open-File Report 96-08, USGS Open-File Report 96-706.

Petersen, M., D. Beeby, W. Bryant, C. Cao, C. Cramer, J. Davis, M. Reichle, G. Saucedo, S. Tan, G. Taylor, T. Toppozada, J. Treiman, C. Wills, 1999, Seismic Shaking Hazard Maps of California, CDMG. Map Sheet 48.

Pradel, D., 1998 Procedure to Evaluate Earthquake-Induced Settlements in Dry Sandy Soils, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 124, No. 4, April.

Pyke, R., Seed, H. B. And Chan, C. K., 1975, Settlement of Sands Under Multidirectional Shaking, ASCE, Journal of Geotechnical Engineering, Vol. 101, No. 4, April, 1975.

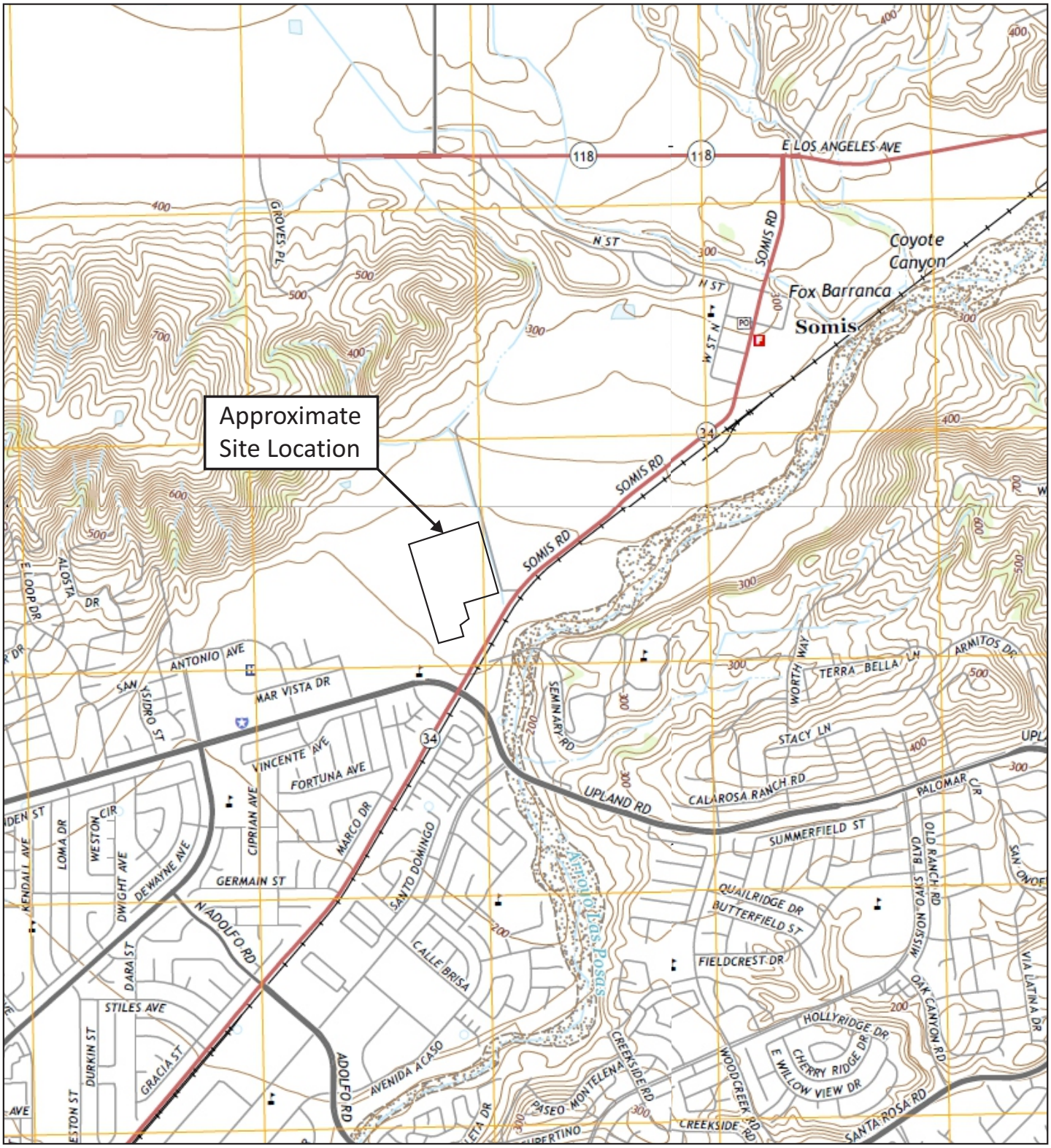
Seed, H. B., and Silver, M. L., 1972, Settlement of Dry Sands During Earthquakes, ASCE, Journal of Geotechnical Engineering, Vol. 98, No. 4.

Tokimatsu, Kohji and H. Bolton Seed, 1987, Evaluation of Settlements in Sands Due to Earthquake Shaking, Journal of Geotechnical Engineering, ASCE, August 1987, New York, New York.

United States Geological Survey (USGS) and CGS, 2004, SCAMP Geologic Map of the Camarillo 7.5’ Quadrangle, Ventura County, California.

APPENDIX A

Vicinity Map
Regional Geologic Map 1 (Dibblee)
Regional Geologic Map 2 (USGS/CGS [SCAMP])
Seismic Hazard Zones Map
Historical High Groundwater Map
Site Plan
Field Study
Logs of Borings
Logs of CPT Soundings and Interpretations
Boring Log Symbols
Unified Soil Classification System



*Taken from USGS Topo Maps, Newbury Park, Moorpark, Santa Paula, and Camarillo Quadrangles, California, 2015.

Approximate Scale: 1" = 2,000'

0 2,000' 4,000'

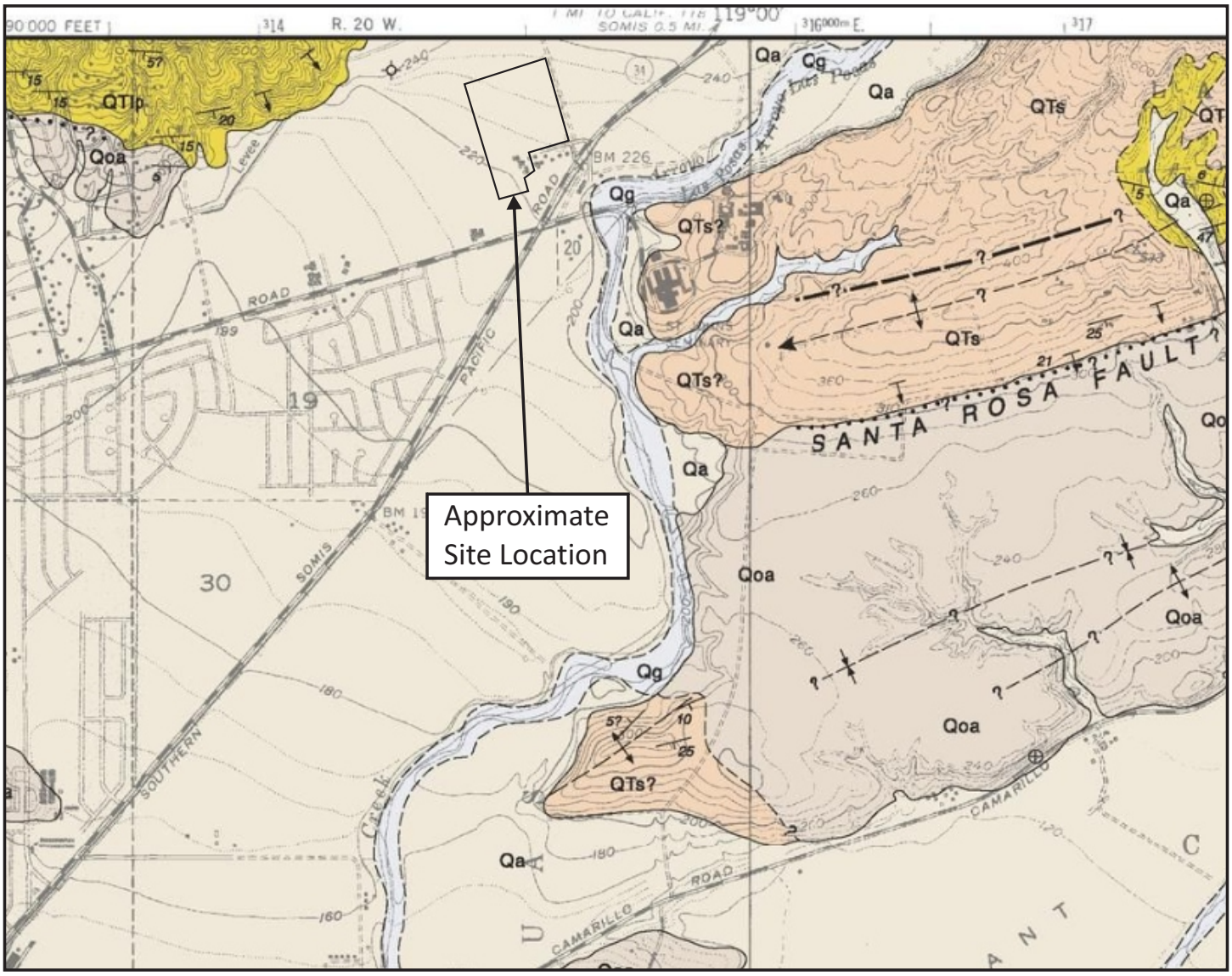
N

VICINITY MAP

Somis Ranch Farmworker Housing
Camarillo Area of Ventura County, California

Earth Systems

September 2019	302947-001



*Taken from Dibblee, Jr., Geologic Map of The Camarillo and Newbury Park Quadrangles, Ventura County, California, 1990, DF-28.

GEOLOGIC SYMBOLS

not all symbols shown on each map

FORMATION CONTACT — *dashed where inferred or indefinite, dotted where concealed*

MEMBER CONTACT — *between units of a formation* ····· Prominent bed

CONTACT BETWEEN SURFICIAL SEDIMENTS — *located only approximately in places*

FAULT: *Dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful. Parallel arrows indicate inferred relative lateral movement. Relative vertical movement is shown by U/D (U=upthrown side, D=downthrown side). Short arrow indicates dip of fault plane. Sawteeth are on upper plate of low angle thrust fault.*

FOLDS: *overturned* — ANTICLINE — SYNCLINE

arrow on axial trace of fold indicates direction of plunge; dotted where concealed by surficial sediments

Strike and dip of sedimentary rocks: inclined; inclined (approximate); overturned; horizontal; vertical

Strike and dip of metamorphic or igneous rock foliation or flow banding or compositional layers: inclined; inclined (approximate); vertical; overturned

OTHER SYMBOLS: *Direction of landslide movement; outline of water bodies shown on map; water well; oil well; springs*

LEGEND

af / Qg / Qf / Qa

SURFICIAL SEDIMENTS

af *Artificial fill*
Qg *Stream channel sand and gravel*
Qf *Alluvial fan gravel and sand, locally slightly indurated*
Qa *Alluvium: gravel, sand and clay of flatlands*

Approximate Scale: 1" = 2,000’

0 2,000’ 4,000’

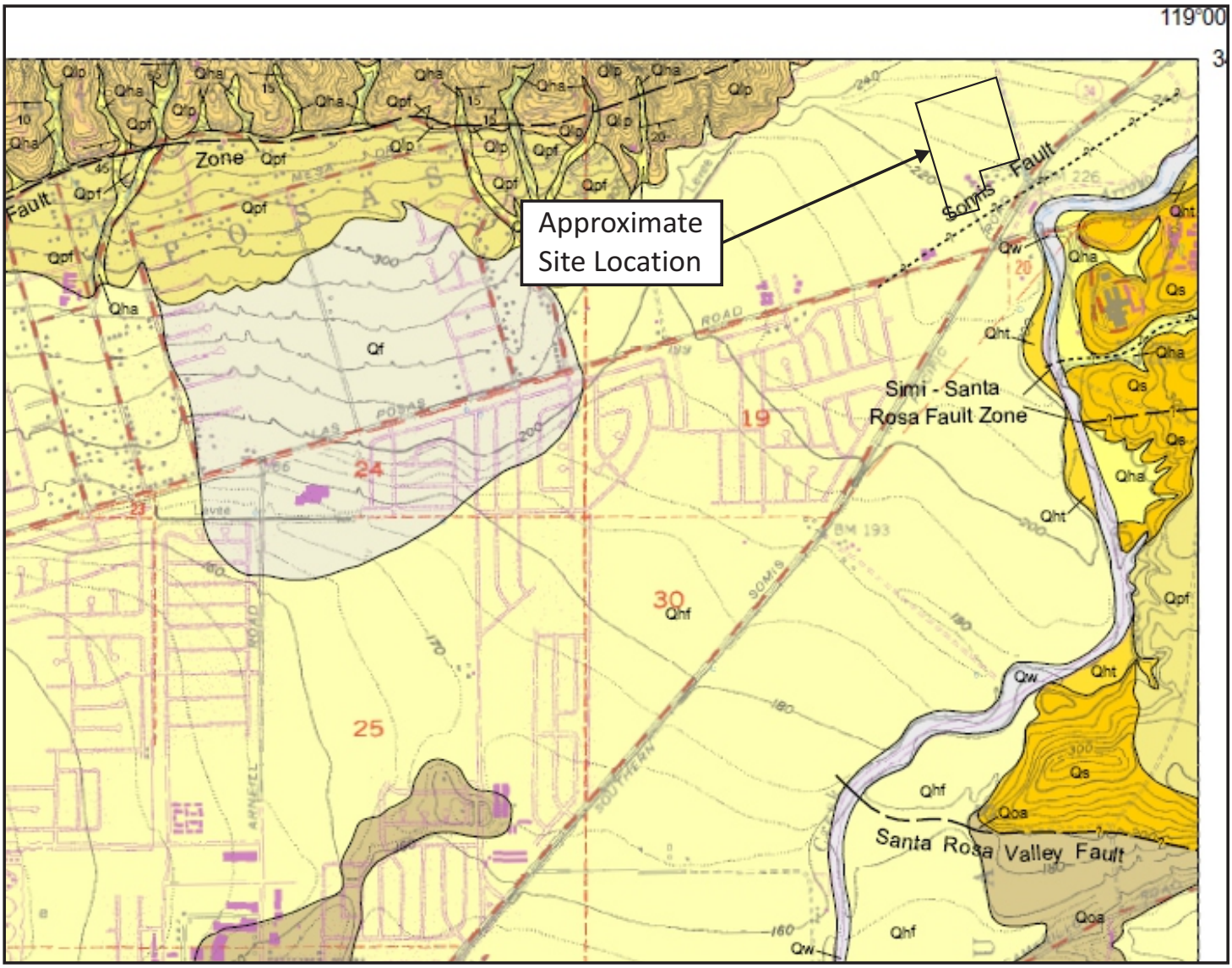
N

REGIONAL GEOLOGIC MAP 1

Somis Ranch Farmworker Housing
Camarillo Area of Ventura County, California

Earth Systems

September 2019	302947-001



*Taken from USGS, SCAMP Geologic Map of the Camarillo 7.5' Quadrangle, Ventura County, California, 2004.

MAP SYMBOLS

- Contact between map units - Generally approximately located or inferred, dotted where concealed.
- Contact between similar map units of different relative age - Recognized by scour and incised channelling features. Generally approximately located.
- Fault - Generally approximately located or inferred, dotted where concealed, queried where location is uncertain.
- Axis of anticline
- Axis of syncline
- 25 Strike and dip of bedding.
- Landslide - Arrows indicate principal direction of movement, queried where existence is questionable (some geologic features are drawn within questionable landslides); hachured where headscarp is mappable.

Southern California USGS SCAMP CDMG Areal Mapping Project

N

Qhf: Alluvial fan deposits (Holocene)

Approximate Scale: 1" = 2,000'

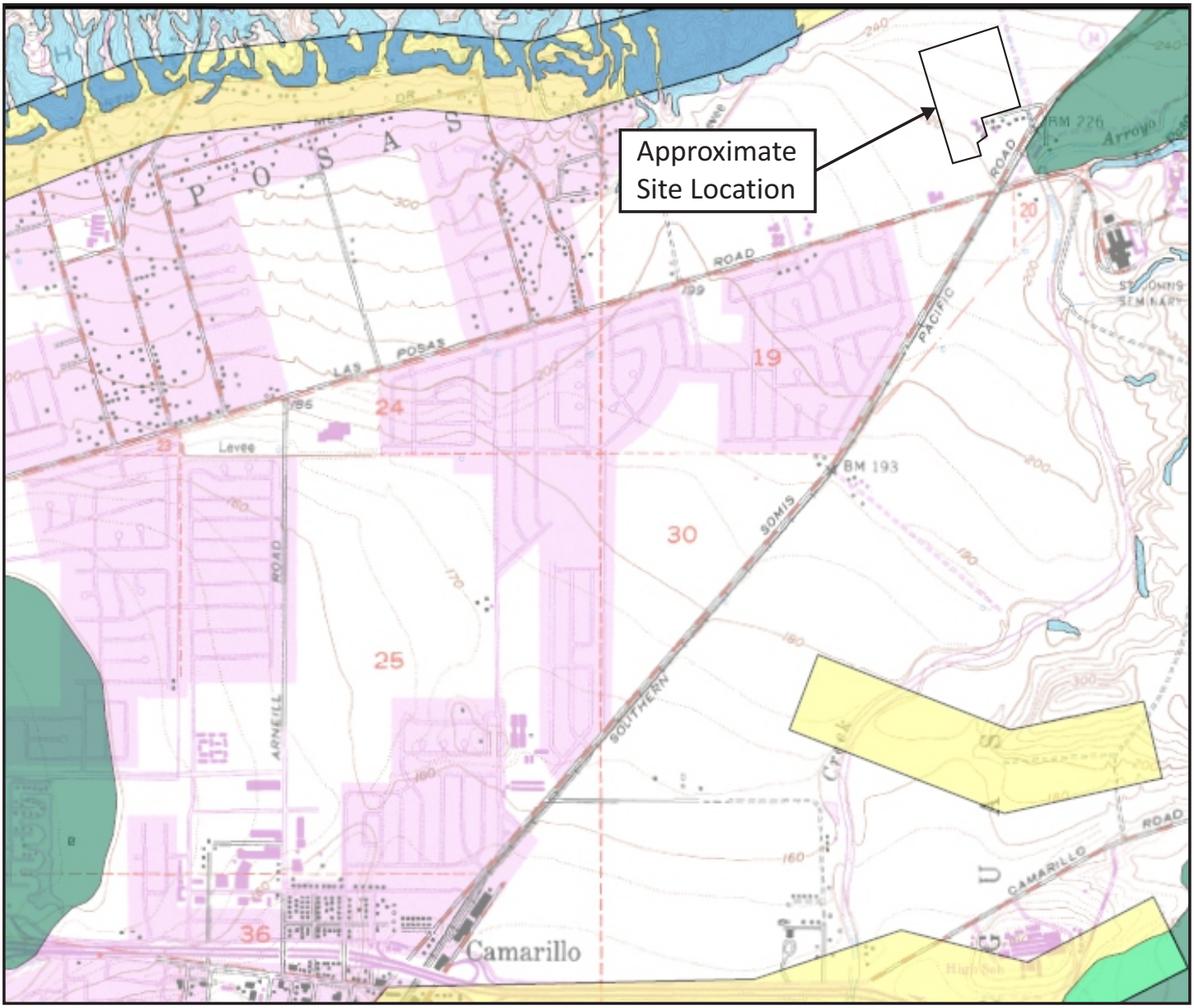
0 2,000' 4,000'

REGIONAL GEOLOGIC MAP 2

Somis Ranch Farmworker Housing
Camarillo Area of Ventura County, California

Earth Systems

September 2019	302947-001



EARTHQUAKE FAULT ZONES

Delineated in compliance with
Chapter 7.5 Division 2 of the California Public Resources Code
(Alquist-Priolo Earthquake Fault Zoning Act)

OFFICIAL MAP

Released: May 1, 1998

SEISMIC HAZARD ZONES

Delineated in compliance with
Chapter 7.8 Division 2 of the California Public Resources Code
(Seismic Hazards Mapping Act)

OFFICIAL MAP

Released: February 7, 2002

Approximate Scale: 1" = 2,000'

0 2,000' 4,000'

OVERLAPPING EARTHQUAKE FAULT AND SEISMIC HAZARD ZONES

Overlap of Earthquake Fault Zone and Liquefaction Zone
Areas that are covered by both Earthquake Fault Zone and Liquefaction Zone.

Overlap of Earthquake Fault Zone and Earthquake-Induced Landslide Zone
Areas that are covered by both Earthquake Fault Zone and Earthquake-Induced Landslide Zone.

Note: Mitigation methods differ for each zone –
AP Act only allows avoidance; Seismic Hazard Mapping Act allows mitigation by engineering/geotechnical design as well as avoidance.

N

SEISMIC HAZARD ZONES MAP

Somis Ranch Farmworker Housing
Camarillo Area of Ventura County, California

Earth Systems

September 2019	302947-001

*Taken from CGS, Seismic Hazard Zone Report For The Camarillo 7.5-Minute Quadrangle, Ventura County, California, 2002.

30 Depth to historically highest ground water level in feet

Valley / Mountains Boundary

Groundwater Barrier

Borehole Site

Approximate location of sand boils and lurch cracks observed following the Point Mugu Earthquake of February 21, 1973.

Approximate Scale: 1" = 2,000'

0 2,000' 4,000'

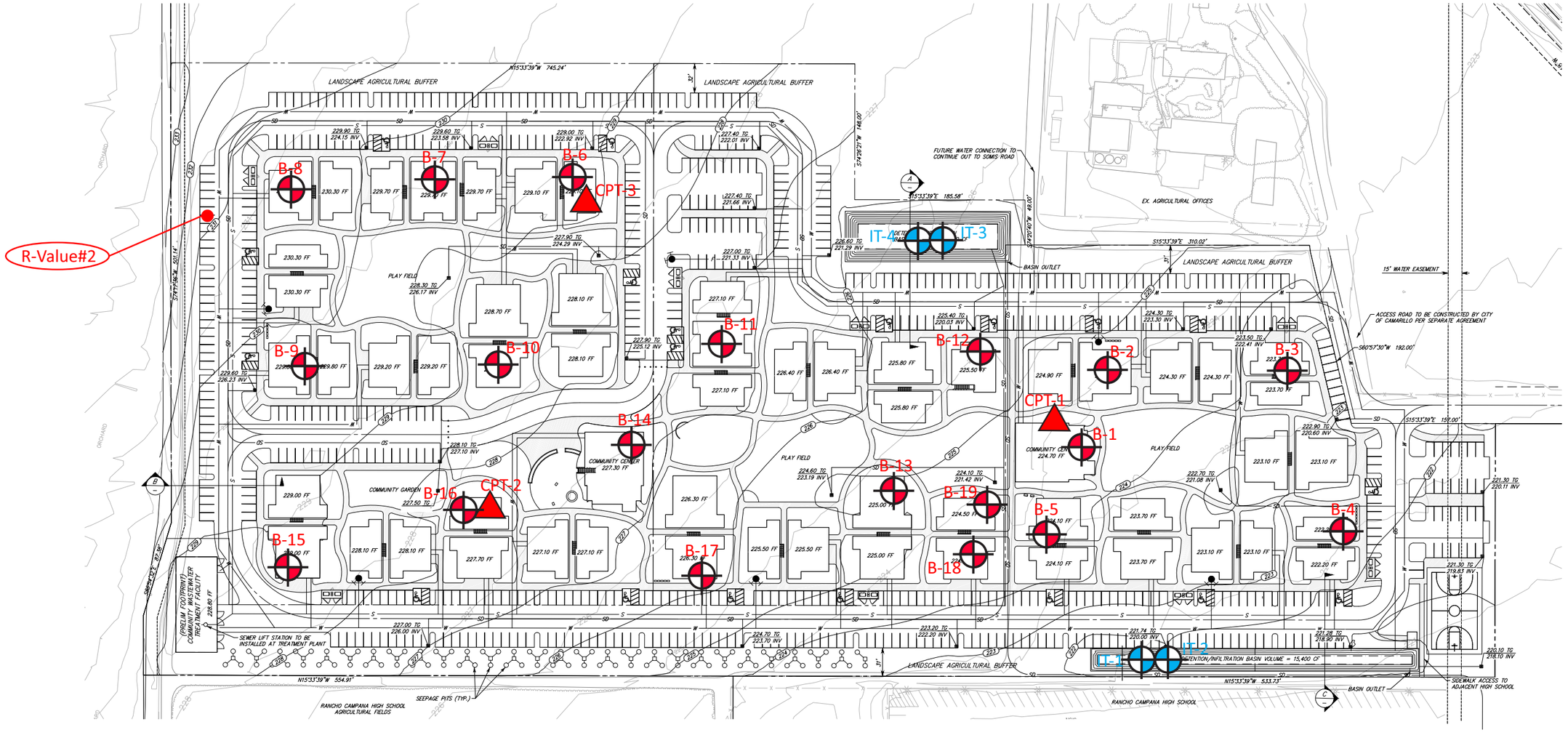
N

HISTORICAL HIGH GROUNDWATER MAP

Somis Ranch Farmworker Housing
Camarillo Area of Ventura County, California

Earth Systems

September 2019	302947-001



B-19 : Approximate boring locations.

IT-4 : Approximate infiltration testing locations.

CPT-3 : Approximate Cone Penetrometer Test (CPT) sounding locations.

N

Approximate Scale: 1" = 120'

0 120' 240'

SITE PLAN

Somis Ranch Farmworker Housing
Camarillo Area of Ventura County, California

Earth Systems

September 2019	302947-001

FIELD STUDY

A. Twenty-three borings (B-1 through B-19 and IT-1 through IT-4) were drilled to depths ranging from approximately 16.5 to 61.5 feet below the existing ground surface to observe the soil profile and to obtain samples for laboratory analyses, and in IT-1 through IT-4 to perform infiltration tests. The borings were drilled on March 25 and 26, June 27 and 28, and July 1, 2, and 3, of 2019, using 8-inch diameter hollow-stem continuous flight auger powered by a CME-85 truck mounted drilling rig. The approximate locations of the borings were determined in the field by pacing and sighting, and are shown on the Site Plan in this Appendix.

B. Samples were obtained within the borings with a Modified California (M.C.) ring sampler (ASTM D 3550 with shoe similar to ASTM D 1586), and with a Standard Penetration Test (SPT) sampler (ASTM D 1586). The M.C. sampler has a 3-inch outside diameter, and a 2.42-inch inside diameter when used with brass ring liners (as it was during this study). The SPT sampler has a 2.00-inch outside diameter and a 1.37-inch inside diameter, but when used without liners, as was done for this project, the inside diameter is 1.63 inches. The samples were obtained by driving the samplers with a 140-pound hammer dropping 30 inches in accordance with ASTM D 1586. The hammer was operated with an automatic trip mechanism.

C. Four bulk sample was collected from the cuttings of the soils encountered between the depths of 0 and 5 feet in Borings B-1, B-8, B-11, and B-15.

D. On March 28 and June 24 of 2019, three Cone Penetrometer Test (CPT) soundings (CPT-1 through CPT-3) were performed to obtain information pertaining to the soil profile. The CPT soundings were performed using equipment owned and operated by Middle Earth Geo Testing. During advancement of the cone penetrometer, readings of sleeve friction (in tons per square foot), tip resistance (also in tons per square foot), and friction ratio (in percent) were recorded at 0.05-meter intervals as per ASTM D 5778 and ASTM D 3441. The approximate locations of the test soundings were determined in the field by pacing and sighting, and are shown on the Site Plan in this Appendix.

E. The final logs of the borings represent interpretations of the contents of the field logs and the results of laboratory testing performed on the samples obtained during the subsurface study. The final logs, as well as the interpretations of the CPT soundings, are included in this Appendix.

Logs of Borings

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-1
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: March 25, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0	X			2/3/5		CL	80.1	29.9	**ALLUVIUM:** Olive brown silty clay; minor sand; medium stiff; moist.
5				2/3/5		CL	77.6	28.6	Same as above.
10				2/4/5		CL	80.1	34.5	**ALLUVIUM:** Olive brown sandy silty clay; medium stiff; very moist.
15				3/5/6		CL	84.2	31.2	**ALLUVIUM:** Olive brown sandy silty clay; stiff; very moist.
20				5/9/11		CL	97.7	21.5	
						ML			**ALLUVIUM:** Olive brown clayey silt; fine gravel; stiff; moist.
25				5/9/12		ML	92.5	27.4	**ALLUVIUM:** Pale olive brown clayey silt; very stiff; moist.
30				3/5/5		CL	86.5	31.4	**ALLUVIUM:** Olive brown silty clay; mica; medium stiff; very moist.
35				9/11/11		SM	97.2	18.5	**ALLUVIUM:** Pale yellowish brown silty sand; thin gravel lenses; medium dense; damp.

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-1 (Continued)
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: March 25, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40			■	10/18/32		SP	103.0	5.1	**ALLUVIUM:** Pale yellowish brown poorly-graded sand; medium dense; damp.
45			■	15/22/29		GM	110.0	7.8	**ALLUVIUM:** Yellowish brown silty gravel; dense; damp.
50			■	17/28/39		SP	100.3	4.9	**ALLUVIUM:** Pale yellowish fine poorly-graded sand; dense; damp to moist.
55									Total Depth: 51.5 feet. No Groundwater Encountered.
60									
65									
70									
75									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-2
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: March 25, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	2/4/2		CL	76.8	29.2	**ALLUVIUM:** Olive brown silty clay; minor sand; medium stiff; moist.
5			■	3/4/5		CL	78.0	26.4	**ALLUVIUM:** Olive brown silty clay; minor sand; medium stiff; moist.
10			■	3/3/5		CL	81.4	32.1	**ALLUVIUM:** Olive brown sandy silty clay; medium stiff; moist.
15			■	3/4/6		CL	88.0	26.7	**ALLUVIUM:** Olive brown sandy silty clay; medium stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-3
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: March 25, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0	X								
			■	3/3/4		CL	85.5	30.3	**ALLUVIUM:** Olive brown silty clay; minor sand; medium stiff; moist.
5			■	3/6/7		CL	87.4	27.0	**ALLUVIUM:** Olive brown silty clay; minor sand; stiff; moist.
10			■	2/3/6		CL	96.8	22.4	**ALLUVIUM:** Olive brown sandy silty clay; medium stiff; moist.
15			■	3/6/6		CL	92.3	25.1	**ALLUVIUM:** Olive brown sandy silty clay; stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-4
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: March 26, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	3/3/4		CL	77.1	27.5	**ALLUVIUM:** Olive brown silty clay; minor sand; medium stiff; moist.
5			■	2/3/6		CL	83.5	30.1	**ALLUVIUM:** Olive brown silty clay; minor sand; medium stiff; moist.
10			■	4/7/12		CL	111.8	13.1	**ALLUVIUM:** Olive brown sandy silty clay; stiff; moist.
15			■	3/5/7		CL	88.2	24.9	**ALLUVIUM:** Dark olive brown sandy silty clay; stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-5
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: March 26, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	2/3/5		CL	75.9	32.7	**ALLUVIUM:** Olive brown silty clay; minor sand; medium stiff; moist.
5			■	2/4/6		CL	69.7	35.3	**ALLUVIUM:** Olive brown silty clay; minor sand; medium stiff; moist.
10			■	2/4/5		CL	76.8	36.3	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
15			■	3/6/8		CL	97.1	30.7	**ALLUVIUM:** Olive brown silty clay; minor caliche; stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-6
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 27, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	3/4/5		CL	78.0	30.2	**ALLUVIUM**: Olive brown silty clay with minor sand; medium stiff; moist.
5			■	3/3/4		CL	78.7	29.1	**ALLUVIUM**: Olive brown silty clay with minor sand; medium stiff; moist.
10			■	2/2/4		CL	82.4	31.5	**ALLUVIUM**: Olive brown silty clay; medium stiff; moist.
15		■		2/2/3		CL			**ALLUVIUM**: Olive brown silty clay with some caliche; medium stiff; moist
20			■	4/5/7		CL			**ALLUVIUM:** Olive brown silty clay with sand and some caliche; medium stiff; moist.
25		■		2/3/3		CL			**ALLUVIUM:** Dark yellow brown silty clay with sand; medium stiff; moist.
30			■	10/10/10		SM			**ALLUVIUM:** Dark yellow brown silty fine sand; medium dense; moist.
35		■		3/6/8		SM/ ML			**ALLUVIUM:** Interbedded dark yellow brown silty fine sand and sandy silt; medium dense; moist.

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-6 (Continued)
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 27, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6"	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40			■	10/9/14		SM			**ALLUVIUM:** Yellow silty fine sand; medium dense; damp.
45		■		3/4/2		SM/ ML			**ALLUVIUM:** Highly interbeded yellow brown silty fine sand and sandy silt; loose; moist; 2-3 inch lenses.
50			■	10/10/12		SM/ ML			**ALLUVIUM:** Highly interbedded yellow brown silty fine sand and sandy silt; thicker sand lenses (approximatley 6"); medium dense; moist.
55									Total Depth: 51.5 feet. No Groundwater Encountered.
60									
65									
70									
75									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-7
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 27, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	3/4/4		CL	77.6	30.4	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
5			■	3/4/5		CL	82.4	27.5	**ALLUVIUM:** Dark yellow brown; silty clay with sand; medium stiff; moist.
10			■	2/3/3		CL	80.4	32.0	**ALLUVIUM:** Olive brown silty clay with sand; medium stiff; moist.
15		■		1/3/3		CL			**ALLUVIUM:** Olive brown silty clay with sand; medium stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-8
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 27, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
	X			2/2/3		CL	80.0	27.6	**ALLUVIUM:** Olive brown; silty clay with sand; soft; moist.
5	X			2/3/5		CL	80.2	29.0	**ALLUVIUM:** Dark yellow brown; silty clay with sand; medium stiff; moist.
10				2/4/4		CL	80.2	32.2	**ALLUVIUM:** Dark yellow brown silty clay with sand; medium stiff; moist.
15				1/1/3		CL			**ALLUVIUM:** Dark yellow silty clay with sand with some caliche; soft; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-9
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 27, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	3/3/4		CL	77.9	31.8	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
5			■	3/4/6		CL	79.5	27.5	**ALLUVIUM:** Dark yellow brown silty clay with sand, medium stiff; moist.
10			■	3/4/4		CL	85.3	27.0	**ALLUVIUM:** Olive brown silty clay with sand; medium stiff; moist.
15		■		2/2/3		CL			**ALLUVIUM:** Dark yellow brown silty clay with some caliche; medium stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-10
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 27, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	2/3/5		CL	76.5	28.9	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
5			■	2/4/6		CL	84.0	28.2	**ALLUVIUM:** Dark olive brown silty clay; medium stiff, moist.
10			■	2/4/5		CL	86.7	27.8	**ALLUVIUM:** Yellow brown silty clay; medium stiff; moist.
15		■		3/6/8		CL			**ALLUVIUM:** Yellow brown silty clay with sand and some caliche; stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-11
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 27, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						CL			**ALLUVIUM:** Olive brown silty clay; dry.
				2/4/4		CL	77.4	32.3	**ALLUVIUM:** Olive brown, silty clay; medium stiff; moist.
5				2/4/6		CL	82.4	30.6	**ALLUVIUM:** Dark yellow brown silty clay with minor caliche; medium stiff; moist.
10				2/4/4		CL	78.7	36.6	**ALLUVIUM:** Dark yellow brown silty clay with sand and minor caliche; medium stiff; moist.
15				1/2/3		CL			**ALLUVIUM:** Dark yellow brown silty clay with sand and minor caliche; medium stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-12
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 28, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						CL			**ALLUVIUM:** Olive brown silty clay**.**
			■	3/3/5		CL	78.4	33.9	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
5			■	2/5/6		CL	83.6	28.2	**ALLUVIUM:** Dark yellow brown silty clay; stiff; moist.
10			■	3/4/6		CL	79.1	35.7	**ALLUVIUM:** Dark yellow brown silty clay; medium stiff; moist.
15		■		2/3/4		CL			**ALLUVIUM:** Dark yellow brown silty clay with sand and some caliche; medium stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-13
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 28, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6"	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	3/4/5		CL	74.9	33.7	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
5			■	3/5/6		CL	83.4	31.8	**ALLUVIUM:** Olive brown silty clay; stiff; moist.
10			■	1/4/6		CL	79.3	33.3	**ALLUVIUM:** Yellow brown silty clay with sand; medium stiff; moist.
15			■	3/3/5		CL			**ALLUVIUM:** Dark yellow brown silty clay with sand; medium stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-14
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 28, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	3/3/4		CL	71.3	30.6	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist**.**
5			■	2/3/6		CL	79.0	34.3	**ALLUVIUM**: Olive brown silty clay; medium stiff; moist.
10			■	4/7/12		CL	81.4	32.2	**ALLUVIUM:** Dark yellow brown silty clay with sand; stiff; moist.
15		■		3/5/7		CL			**ALLUVIUM:** Dark yellow brown silty clay with sand; stiff; moist**.**
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-15
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 28, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0	X								
	X		■	2/4/5		CL	75.2	29.6	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
5	X		■	3/5/7		CL	82.2	29.8	**ALLUVIUM:** Olive brown silty clay with minor sand; stiff; moist.
10			■	3/3/5		CL	78.5	35.2	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
15		■		2/2/4		CL			**ALLUVIUM:** Dark yellow brown silty clay with some caliche; medium stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-16
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 28, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									
			■	3/3/3		CL	71.3	32.3	**ALLUVIUM:** Mottled yellow brown and olive brown silty clay; medium stiff; moist.
5			■	2/5/6		CL	78.9	31.8	**ALLUVIUM:** Olive brown silty clay; stiff; moist
10			■	3/4/5		CL	81.3	32.0	**ALLUVIUM:** Dark yellow brown silty clay with sand; medium stiff; moist.
15		■		2/3/3		CL			**ALLUVIUM:** Dark yellow brown silty clay with some caliche; medium stiff; moist.
20			■	3/4/7		CL			**ALLUVIUM:** Dark yellow brown silty clay with some caliche; stiff; moist.
25		■		1/2/5		ML			**ALLUVIUM:** Dark yellow brown sandy silt; medium stiff; moist.
30			■	4/6/10		SM			**ALLUVIUM**: Yellow brown silty fine sand; medium dense; moist.
35		■		2/3/4		ML			**ALLUVIUM:** Dark brown silt; medium stiff; moist.

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-16 (Continued)
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 28, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
40			■	5/8/12		ML/ SM			**ALLUVIUM:** Dark yellow brown interbedded sandy silt and silty fine sand; stiff; moist.
45		■		4/6/6		ML/ SM			**ALLUVIUM:** Interbedded yellow brown sandy silt and silty fine sand; stiff; moist.
50			■	6/9/13		ML			**ALLUVIUM**: Dark yellow brown sandy silt; very stiff; very moist.
55									Total Depth: 51.5 feet. No Groundwater Encountered.
60									
65									
70									
75									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-17
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 28, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									**ALLUVIUM:** Olive brown silty clay; dry.
			■	2/3/3		CL	78.6	31.8	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
5			■	2/4/6		CL	76.7	34.4	**ALLUVIUM**: Olive brown silty clay; medium stiff; moist.
10			■	2/4/4		CL	81.7	32.1	**ALLUVIUM:** Dark yellow brown silty clay with sand; medium stiff; moist.
15			■	2/2/3		CL			**ALLUVIUM:** Dark yellow brown silty clay; soft; moist**.**
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-18
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: June 28, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									**ALLUVIUM**: Olive brown silty clay.
			■	2/3/4		CL	74.5	33.7	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
5			■	2/4/4		CL	77.6	34.7	**ALLUVIUM:** Olive brown silty clay; medium stiff; moist.
10			■	3/4/5		CL	84.3	30.1	**ALLUVIUM:** Dark yellow brown silty clay with some caliche; medium stiff; moist.
15			■	3/3/5		CL			**ALLUVIUM:** Dark yellow brown silty clay with some caliche; medium stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-19
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: July 1, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0									**ALLUVIUM:** Olive brown silty clay.
			■	2/3/5		CL	76.0	36.4	**ALLUVIUM:** Olive brown silty clay with sand; medium stiff; moist.
5			■	2/4/6		CL	79.1	31.0	**ALLUVIUM**: Olive brown silty clay with sand; medium stiff; moist.
10			■	2/4/5		CL	76.1	36.7	**ALLUVIUM:** Dark yellow brown silty clay with sand and some caliche; medium stiff; moist.
15			■	3/6/8		CL			**ALLUVIUM:** Dark yellow brown silty clay with sand and some caliche; stiff; moist.
20									Total Depth: 16.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: IT-1
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: July 2, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6"	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						CL			**ALLUVIUM:** Olive brown silty clay.
						CL			**ALLUVIUM:** Dark yellow brown silty clay.
5									Total Depth: 4.0 feet. No Groundwater Encountered. Installed 4.0 feet of 3" perforated pipe and gravel pack
10									
15									
20									
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: IT-2
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: July 2, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6"	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						CL			**ALLUVIUM:** Olive brown silty clay.
5						CL			**ALLUVIUM:** Dark yellow brown silty clay.
10									
15									Total Depth: 15.0 feet. No Groundwater Encountered. Installed 15.0 feet of 3" perforated pipe and gravel pack
20									
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: IT-3
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: July 3, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6"	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						CL			**ALLUVIUM:** Olive brown silty clay.
5						CL			**ALLUVIUM:** Yellow brown silty clay.
10									Total Depth: 7.0 feet. No Groundwater Encountered. Installed 7.0 feet of 3" perforated pipe and gravel pack
15									
20									
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: IT-4
PROJECT NAME: Somis Ranch Farmworker Housing
PROJECT NUMBER: 302947-001
BORING LOCATION: Per Plan

DRILLING DATE: July 3, 2019
DRILL RIG: CME-85
DRILLING METHOD: Eight-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0						CL			**ALLUVIUM:** Olive brown silty clay.
5									
10						CL			**ALLUVIUM:** Yellow brown silty clay.
15									
20									Total Depth: 18.0 feet. No Groundwater Encountered. Installed 18 feet of 3" perforated pipe and gravel pack
25									
30									
35									

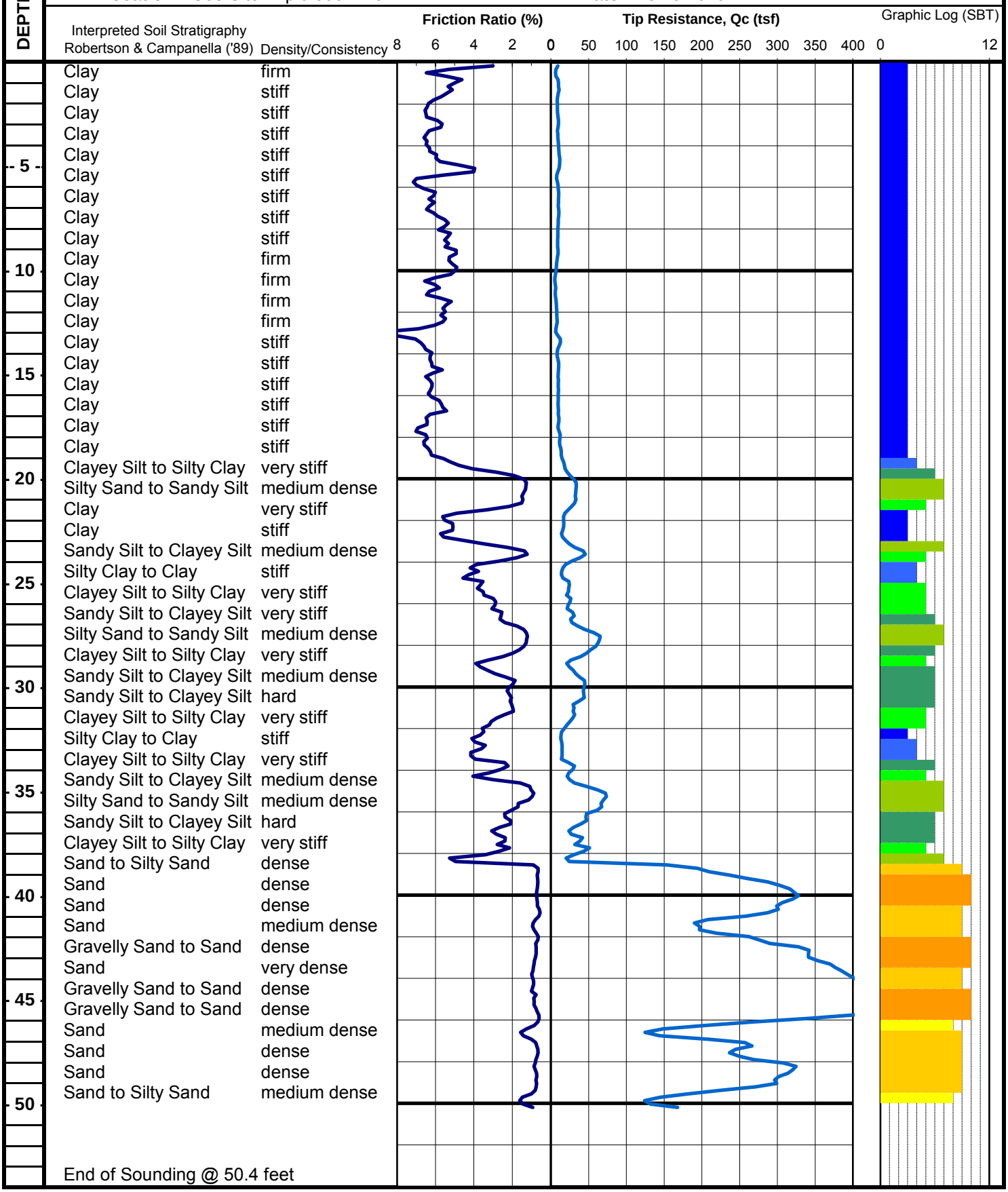
Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Logs of CPT Soundings and Interpretations

Earth Systems

CPT No: CPT-1
Project Name: Somis Ranch Farmworker Housing
Project No.: 302947-001
Location: See Site Exploration Plan

CPT Vendor: **Middle Earth GeoTesting**
Truck Mounted Electric
Cone with 23-ton reaction
Date: 3/28/2019



Earth Systems

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989)

Project: Somis Ranch Farmworker Housing Project No: 302947-001 Date: 03/28/19

CPT SOUNDING: CPT-1 Plot: 1 Density: 1 SPT N Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): **50.0** Dr correlation: 0 Baldi Qc/N: 1 Robertson Phi Correlation: 4 SPT N

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic	Clean Sand Qc1n	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg.)	Nk: 17 Su (tsf)	OCR
0.15	0.5	6.49	5.75	Clay	CL/CH	firm	110	1.0	6	0.014	0.014	5.76	0.95	1.70	10.4	3.15		6			0.38	141.2
0.30	1.0	9.90	5.00	Clay	CL/CH	stiff	110	1.0	10	0.041	0.041	5.02	0.90	1.70	15.9	2.97		10			0.58	71.7
0.46	1.5	9.83	5.41	Clay	CL/CH	stiff	110	1.0	10	0.069	0.069	5.45	0.91	1.70	15.8	3.00		10			0.57	42.6
0.61	2.0	8.54	6.30	Clay	CL/CH	firm	110	1.0	9	0.096	0.096	6.37	0.94	1.70	13.7	3.09		9			0.50	26.3
0.76	2.5	9.03	6.50	Clay	CL/CH	stiff	110	1.0	9	0.124	0.124	6.59	0.93	1.70	14.5	3.08		9			0.52	21.6
0.91	3.0	9.75	5.76	Clay	CL/CH	stiff	110	1.0	10	0.151	0.151	5.85	0.92	1.70	15.7	3.02		10			0.56	19.0
1.07	3.5	8.98	6.46	Clay	CL/CH	stiff	110	1.0	9	0.179	0.179	6.59	0.93	1.70	14.4	3.08		9			0.52	14.8
1.22	4.0	9.98	6.42	Clay	CL/CH	stiff	110	1.0	10	0.206	0.206	6.55	0.92	1.70	16.0	3.05		10			0.58	14.2
1.37	4.5	11.01	6.07	Clay	CL/CH	stiff	110	1.0	11	0.234	0.234	6.20	0.91	1.70	17.7	3.00		11			0.63	13.8
1.52	5.0	11.31	4.84	Clay	CL/CH	stiff	110	1.0	11	0.261	0.261	4.96	0.89	1.70	18.2	2.92		11			0.65	12.7
1.68	5.5	8.29	5.94	Clay	CL/CH	firm	110	1.0	8	0.289	0.289	6.15	0.94	1.70	13.3	3.09		8			0.47	8.3
1.83	6.0	9.86	6.53	Clay	CL/CH	stiff	110	1.0	10	0.316	0.316	6.74	0.93	1.70	15.8	3.06		10			0.56	9.1
1.98	6.5	10.10	6.16	Clay	CL/CH	stiff	110	1.0	10	0.344	0.344	6.38	0.92	1.70	16.2	3.03		10			0.57	8.5
2.13	7.0	10.30	6.29	Clay	CL/CH	stiff	110	1.0	10	0.371	0.371	6.53	0.92	1.70	16.6	3.03		10			0.58	8.0
2.29	7.5	9.94	5.58	Clay	CL/CH	stiff	110	1.0	10	0.399	0.399	5.82	0.92	1.70	16.0	3.01		10			0.56	7.2
2.44	8.0	9.23	5.53	Clay	CL/CH	stiff	110	1.0	9	0.426	0.426	5.80	0.92	1.70	14.8	3.04		9			0.52	6.2
2.59	8.5	8.90	5.40	Clay	CL/CH	firm	110	1.0	9	0.454	0.454	5.69	0.93	1.70	14.3	3.04		9			0.50	5.6
2.74	9.0	9.29	5.12	Clay	CL/CH	stiff	110	1.0	9	0.481	0.481	5.40	0.92	1.70	14.9	3.01		9			0.52	5.5
2.90	9.5	8.02	5.24	Clay	CL/CH	firm	110	1.0	8	0.509	0.509	5.59	0.94	1.70	12.9	3.07		8			0.44	4.4
3.05	10.0	6.64	5.02	Clay	CL/CH	firm	110	1.0	7	0.536	0.536	5.46	0.96	1.70	10.7	3.13		7			0.36	3.4
3.20	10.5	5.44	6.21	Clay	CL/CH	firm	110	1.0	5	0.564	0.564	6.93	1.00	1.70	8.7	3.26		5			0.29	2.6
3.35	11.0	6.05	6.20	Clay	CL/CH	firm	110	1.0	6	0.591	0.591	6.87	0.99	1.70	9.7	3.22		6			0.32	2.8
3.51	11.5	6.85	5.45	Clay	CL/CH	firm	110	1.0	7	0.619	0.619	5.99	0.96	1.68	10.8	3.15		7			0.37	3.0
3.66	12.0	7.63	5.61	Clay	CL/CH	firm	110	1.0	8	0.646	0.646	6.13	0.96	1.60	11.6	3.13		8			0.41	3.2
3.81	12.5	8.01	5.72	Clay	CL/CH	firm	110	1.0	8	0.674	0.674	6.25	0.96	1.54	11.7	3.14		8			0.43	3.3
3.96	13.0	7.52	7.95	Clay	CL/CH	firm	110	1.0	8	0.701	0.701	8.77	1.00	1.51	10.7	3.26		8			0.40	2.9
4.11	13.5	11.96	6.81	Clay	CL/CH	stiff	110	1.0	12	0.729	0.729	7.25	0.94	1.42	16.0	3.08		12			0.66	4.6
4.27	14.0	8.57	6.32	Clay	CL/CH	firm	110	1.0	9	0.756	0.756	6.94	0.97	1.39	11.2	3.18		9			0.46	3.1
4.42	14.5	9.93	6.23	Clay	CL/CH	stiff	110	1.0	10	0.784	0.784	6.76	0.96	1.33	12.5	3.14		10			0.54	3.5
4.57	15.0	9.68	6.11	Clay	CL/CH	stiff	110	1.0	10	0.811	0.811	6.66	0.96	1.29	11.8	3.15		10			0.52	3.3
4.72	15.5	9.85	6.22	Clay	CL/CH	stiff	110	1.0	10	0.839	0.839	6.80	0.97	1.25	11.6	3.16		10			0.53	3.2
4.88	16.0	9.84	6.16	Clay	CL/CH	stiff	110	1.0	10	0.866	0.866	6.76	0.97	1.21	11.3	3.17		10			0.53	3.1
5.03	16.5	9.71	5.58	Clay	CL/CH	stiff	110	1.0	10	0.894	0.894	6.15	0.97	1.18	10.8	3.16		10			0.52	3.0
5.18	17.0	10.28	6.40	Clay	CL/CH	stiff	110	1.0	10	0.921	0.921	7.03	0.97	1.14	11.1	3.19		10			0.55	3.0
5.33	17.5	10.07	6.79	Clay	CL/CH	stiff	110	1.0	10	0.949	0.949	7.50	0.98	1.11	10.6	3.22		10			0.54	2.9
5.49	18.0	11.83	6.51	Clay	CL/CH	stiff	110	1.0	12	0.976	0.976	7.10	0.96	1.08	12.1	3.16		12			0.64	3.3
5.64	18.5	12.78	6.42	Clay	CL/CH	stiff	110	1.0	13	1.004	1.004	6.96	0.96	1.05	12.7	3.14		13			0.69	3.5
5.79	19.0	15.03	5.67	Clay	CL/CH	stiff	110	1.0	15	1.031	1.031	6.09	0.93	1.02	14.5	3.06		15			0.82	4.1
5.94	19.5	19.38	3.90	Silty Clay to Clay	CL	very stiff	110	1.5	13	1.059	1.059	4.12	0.87	1.00	18.3	2.87		13			1.08	5.2
6.10	20.0	29.63	1.53	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	12	1.086	1.086	1.58	0.76	0.98	27.5	2.48	73.1	11	15	23	30		
6.25	20.5	33.21	1.34	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	11	1.114	1.114	1.39	0.73	0.96	30.2	2.41	71.3	10	14	27	30		
6.40	21.0	32.31	1.49	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	11	1.141	1.141	1.54	0.75	0.94	28.9	2.45	73.4	10	15	25	30		
6.55	21.5	22.98	3.46	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	11	1.169	1.169	3.65	0.86	0.92	19.9	2.81		11			1.28	5.6
6.71	22.0	16.97	5.42	Clay	CL/CH	stiff	110	1.0	17	1.196	1.196	5.83	0.93	0.89	14.3	3.05		17			0.93	4.0
6.86	22.5	15.42	5.31	Clay	CL/CH	stiff	110	1.0	15	1.224	1.224	5.77	0.94	0.87	12.7	3.09		15			0.84	3.5
7.01	23.0	19.80	4.53	Clay	CL/CH	very stiff	110	1.0	20	1.251	1.251	4.83	0.90	0.86	16.1	2.96		20			1.09	4.4
7.16	23.5	39.98	1.61	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	13	1.279	1.279	1.66	0.74	0.87	32.8	2.43	79.7	12	16	31	31		
7.32	24.0	28.62	2.77	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	14	1.306	1.306	2.90	0.82	0.84	22.7	2.70		14			1.61	6.3
7.47	24.5	14.77	4.08	Silty Clay to Clay	CL	stiff	110	1.5	10	1.334	1.334	4.48	0.94	0.81	11.2	3.06		10			0.79	3.0
7.62	25.0	21.34	3.92	Silty Clay to Clay	CL	very stiff	110	1.5	14	1.361	1.361	4.19	0.89	0.80	16.1	2.92		14			1.18	4.4
7.77	25.5	22.52	3.60	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	11	1.389	1.389	3.84	0.88	0.79	16.8	2.88		11			1.24	4.6
7.92	26.0	24.76	2.92	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	12	1.416	1.416	3.10	0.85	0.78	18.3	2.79		12			1.37	4.9
8.08	26.5	26.76	2.71	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	13	1.444	1.444	2.86	0.84	0.77	19.5	2.75		13			1.49	5.3
8.23	27.0	35.87	1.86	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	14	1.471	1.471	1.94	0.78	0.77	26.3	2.55	78.9	12	16	21	31		
8.38	27.5	62.22	1.25	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	21	1.499	1.499	1.28	0.68	0.79	46.4	2.24	81.9	17	16	45	32		
8.53	28.0	58.12	1.44	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	19	1.526	1.526	1.47	0.70	0.77	42.5	2.31	83.7	16	17	41	32		
8.69	28.5	37.74	2.57	Sandy Silt to Clayey Silt	ML	hard	110	2.5	15	1.554	1.554	2.68	0.80	0.73	26.2	2.63		15			2.13	7.0
8.84	29.0	25.03	3.62	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	13	1.581	1.581	3.86	0.88	0.70	16.6	2.89		13			1.38	4.4
8.99	29.5	38.40	2.37	Sandy Silt to Clayey Silt	ML	hard	110	2.5	15	1.609	1.609	2.48	0.80	0.72	26.0	2.61		15			2.16	6.9
9.14	30.0	43.94	2.13	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	18	1.636	1.636	2.21	0.77	0.71	29.6	2.54	88.0	14	18	26	31		
9.30	30.5	41.67	2.10	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	17	1.664	1.664	2.19	0.78	0.70	27.7	2.56	85.3	13	17	24	31		
9.45	31.0	29.94	1.99	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	12	1.691	1.691	2.11	0.82	0.68	19.3	2.67		12			1.66	5.0
9.60	31.5	28.53	2.78	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	14	1.719	1.719	2.96	0.85	0.66	17.8	2.79		14			1.58	4.7
9.75	32.0	17.82	3.42	Clayey Silt to Silty Clay	ML/CL	stiff	110	2.0	9	1.746	1.746	3.79	0.93	0.63	10.6	3.04		9			0.95	2.8
9.91	32.5	13.56	3.91	Clay	CL/CH	stiff	110	1.0	14	1.774	1.774	4.50	0.98	0.60	7.7	3.19		14			0.69	2.0
10.06	33.0	14.71	3.72	Silty Clay to Clay	CL	stiff	110	1.5	10	1.801	1.801	4.24	0.97	0.60	8.3	3.15		10			0.76	2.2
10.21	33.5	17.42	3.49	Silty Clay to Clay	CL	stiff	110	1.5	12	1.829	1.829	3.90	0.94	0.60	9.8	3.07		12			0.92	2.6
10.36	34.0	28.09	2.66	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	11	1.856	1.856	2.85	0.86	0.62	16.4	2.81		11			1.54	4.2
10.52	34.5	25.77	2.88	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	13	1.884	1.884	3.11	0.88	0.60	14.7	2.87		13			1.41	3.8
10.67	35.0	60.26	1.00	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	20	1.911	1.911	1.03	0.69	0.66	37.9	2.26	69.0	15	14	37	32		
10.82	35.5	69.77	1.27	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	23	1.939	1.939	1.30	0.69	0.66	43.4	2.27	80.2	17	16	42	32		
10.97	36.0	58.59	2.05	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	20	1.966	1.966	2.12	0.75	0.63	34.7	2.47	91.4	14	18	33	31		
11.13	36.5	40.66	2.31	Sandy Silt to Clayey Silt	ML	hard	110	2.5	16	1.994	1.994	2.43	0.81	0.60	23.0	2.65		16			2.27	5.8
11.28	37.0	30.89	2.76	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	12	2.021	2.021	2.95	0.86	0.57	16.7	2.81		12			1.70	4.3
11.43	37.5	40.39	2.44	Sandy Silt to Clayey Silt	ML	hard	110	2.5	16	2.049	2.049	2.57	0.82	0.58	22.2	2.68		16			2.26	5.6

Project: Somis Ranch Farmworker Housing Project No: 302947-001 Date: 03/28/19

CPT SOUNDING: CPT-1 Plot: 1 Density: 1 SPT N Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): **50.0** Dr correlation: 0 Baldi Qc/N: 1 Robertson Phi Correlation: 4 SPT N

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	2.6 Ic	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg.)	Nk: 17 Su (tsf)	OCR
11.58	38.0	31.48	3.79	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	16	2.076	2.076	4.05	0.89	0.55	16.4	2.90		16				1.73	4.2
11.73	38.5	124.12	2.18	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	41	2.104	2.104	2.21	0.68	0.63	73.3	2.24	130.1	29	26	64	36		
11.89	39.0	235.45	0.68	Sand	SP	dense	100	5.0	47	2.130	2.130	0.69	0.51	0.70	155.9	1.66	157.3	32	31	95	37		
12.04	39.5	302.33	0.68	Gravelly Sand to Sand	SW	dense	110	6.0	50	2.156	2.156	0.69	0.50	0.70	200.2	1.58	200.2	34	40	100	37		
12.19	40.0	323.40	0.73	Gravelly Sand to Sand	SW	dense	110	6.0	54	2.184	2.184	0.73	0.50	0.70	212.8	1.58	212.8	36	43	100	38		
12.34	40.5	302.34	0.66	Gravelly Sand to Sand	SW	dense	110	6.0	50	2.211	2.211	0.66	0.50	0.69	197.7	1.57	197.7	34	40	100	37		
12.50	41.0	250.89	0.66	Sand	SP	dense	100	5.0	50	2.238	2.238	0.66	0.50	0.69	162.9	1.63	162.9	34	33	97	37		
12.65	41.5	194.67	0.91	Sand	SP	medium dense	100	5.0	39	2.263	2.263	0.92	0.56	0.65	120.3	1.83	135.5	26	27	84	35		
12.80	42.0	252.65	0.69	Sand	SP	dense	100	5.0	51	2.288	2.288	0.69	0.51	0.68	161.6	1.65	162.0	33	32	97	37		
12.95	42.5	319.95	0.76	Gravelly Sand to Sand	SW	dense	110	6.0	53	2.314	2.314	0.77	0.50	0.68	204.5	1.60	204.5	35	41	100	37		
13.11	43.0	345.30	0.80	Gravelly Sand to Sand	SW	dense	110	6.0	58	2.341	2.341	0.80	0.50	0.67	219.4	1.59	219.4	38	44	100	38		
13.26	43.5	377.24	0.90	Gravelly Sand to Sand	SW	dense	110	6.0	63	2.369	2.369	0.90	0.50	0.67	238.3	1.60	238.3	41	48	100	39		
13.41	44.0	400.62	0.94	Sand	SP	very dense	100	5.0	80	2.395	2.395	0.95	0.50	0.66	251.7	1.60	251.7	52	50	100	41		
13.56	44.5	413.72	0.94	Sand	SP	very dense	100	5.0	83	2.420	2.420	0.95	0.50	0.66	258.6	1.60	258.6	53	52	100	41		
13.72	45.0	503.18	0.83	Gravelly Sand to Sand	SW	very dense	110	6.0	84	2.446	2.446	0.83	0.50	0.66	312.8	1.50	312.8	54	63	100	41		
13.87	45.5	481.80	0.78	Gravelly Sand to Sand	SW	very dense	110	6.0	80	2.474	2.474	0.78	0.50	0.65	297.8	1.49	297.8	51	60	100	41		
14.02	46.0	335.21	0.63	Gravelly Sand to Sand	SW	dense	110	6.0	56	2.501	2.501	0.63	0.50	0.65	206.1	1.54	206.1	35	41	100	37		
14.17	46.5	158.67	1.23	Sand to Silty Sand	SP/SM	medium dense	100	4.0	40	2.528	2.528	1.25	0.62	0.58	87.6	2.02	115.8	25	23	71	35		
14.33	47.0	218.73	0.99	Sand	SP	medium dense	120	5.0	44	2.555	2.555	1.00	0.56	0.61	125.9	1.83	142.6	27	29	86	35		
14.48	47.5	243.51	0.68	Sand	SP	dense	120	5.0	49	2.585	2.585	0.68	0.52	0.63	145.0	1.68	148.6	30	30	92	36		
14.63	48.0	300.49	0.81	Sand	SP	dense	120	5.0	60	2.615	2.615	0.82	0.51	0.63	178.8	1.66	181.1	37	36	100	38		
14.78	48.5	312.06	0.75	Sand	SP	dense	120	5.0	62	2.645	2.645	0.76	0.50	0.63	186.4	1.63	186.4	38	37	100	38		
14.94	49.0	288.85	0.75	Sand	SP	dense	120	5.0	58	2.675	2.675	0.76	0.51	0.62	170.1	1.66	171.6	35	34	99	37		
15.09	49.5	184.42	1.09	Sand	SP	medium dense	120	5.0	37	2.705	2.705	1.11	0.59	0.57	99.7	1.94	122.6	22	25	77	34		
15.24	50.0	141.23	1.33	Sand to Silty Sand	SP/SM	medium dense	120	4.0	35	2.735	2.735	1.36	0.64	0.54	72.4	2.10	105.7	21	21	63	34		

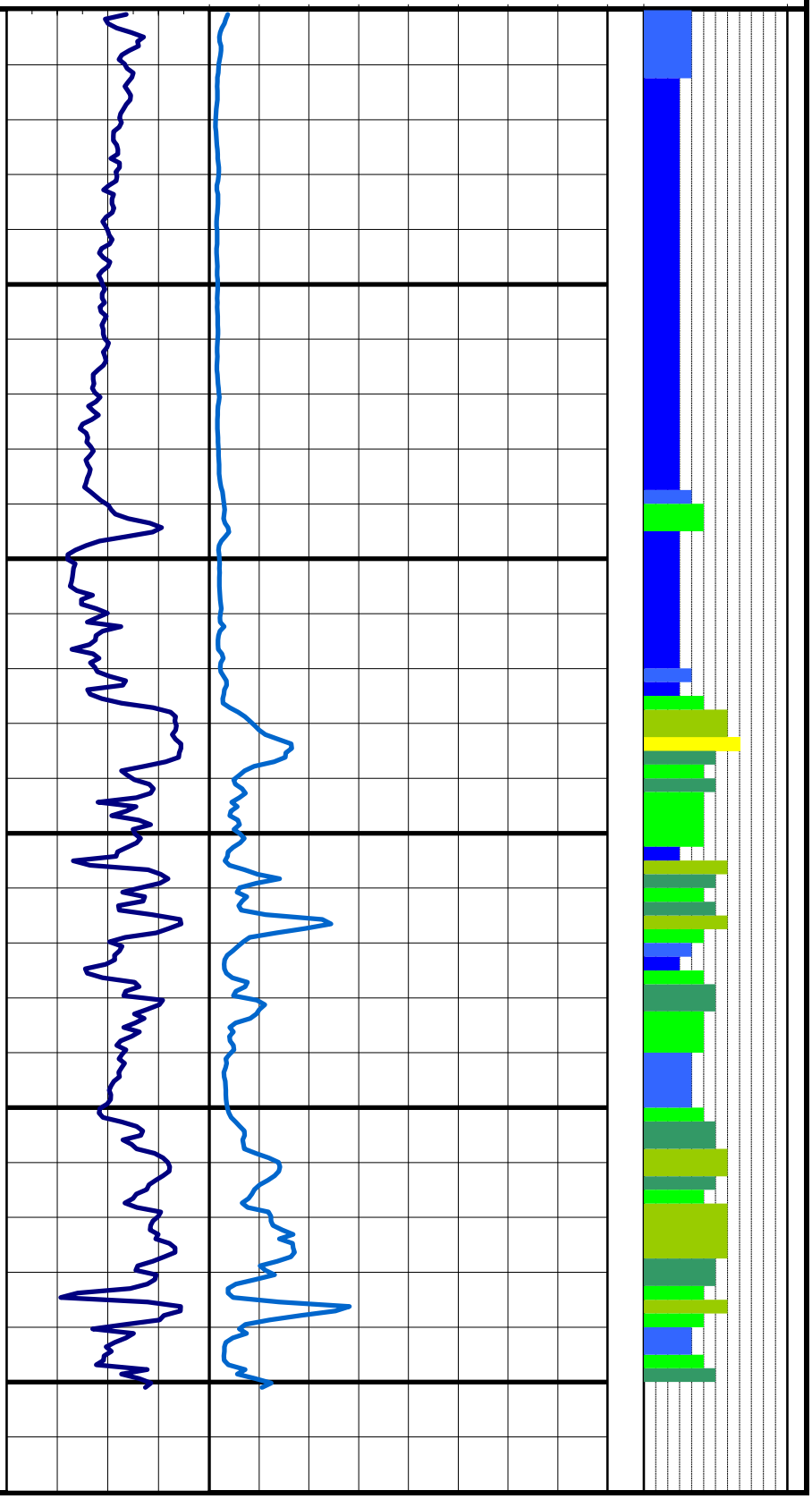
Earth Systems

CPT No: CPT-2
Project Name: Somis Ranch Farmworker Housing
Project No.: 302947-001
Location: See Site Exploration Plan

CPT Vendor: **Middle Earth GeoTesting**
Truck Mounted Electric
Cone with 23-ton reaction
Date: 6/24/2019

DEPTH (FEET)	Interpreted Soil Stratigraphy Robertson & Campanella ('89)	Density/Consistency
	Silty Clay to Clay	stiff
	Silty Clay to Clay	stiff
	Silty Clay to Clay	firm
	Clay	firm
	Clay	firm
5	Clay	stiff
	Clay	firm
	Clay	firm
	Clay	firm
	Clay	firm
10	Clay	firm
	Clay	firm
	Clay	firm
	Clay	firm
	Clay	firm
15	Clay	firm
	Clay	stiff
	Clay	stiff
	Clayey Silt to Silty Clay	stiff
20	Clay	stiff
	Clay	stiff
	Clay	stiff
	Clay	stiff
	Clay	stiff
25	Silty Clay to Clay	stiff
	Sandy Silt to Clayey Silt	medium dense
	Silty Sand to Sandy Silt	medium dense
	Sandy Silt to Clayey Silt	hard
	Clayey Silt to Silty Clay	very stiff
30	Clayey Silt to Silty Clay	very stiff
	Silty Clay to Clay	very stiff
	Sandy Silt to Clayey Silt	medium dense
	Sandy Silt to Clayey Silt	medium dense
	Sandy Silt to Clayey Silt	medium dense
35	Silty Clay to Clay	stiff
	Clayey Silt to Silty Clay	very stiff
	Sandy Silt to Clayey Silt	hard
	Clayey Silt to Silty Clay	very stiff
	Silty Clay to Clay	stiff
40	Silty Clay to Clay	stiff
	Clayey Silt to Silty Clay	very stiff
	Sandy Silt to Clayey Silt	medium dense
	Sandy Silt to Clayey Silt	medium dense
	Sandy Silt to Clayey Silt	hard
45	Silty Sand to Sandy Silt	medium dense
	Silty Sand to Sandy Silt	medium dense
	Sandy Silt to Clayey Silt	hard
	Sandy Silt to Clayey Silt	medium dense
	Silty Clay to Clay	stiff
50	Sandy Silt to Clayey Silt	hard

End of Sounding @ 50.4 feet



Earth Systems

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Somis Ranch Farmworker Housing Project No: 302947-001 Date: 06/24/19

CPT SOUNDING: CPT-2 Plot: 1 Density: 1 SPT N Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): **55.0** Dr correlation: 0 Baldi Qc/N: 1 Robertson Phi Correlation: 4 SPT N

Nk: 17

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	2.6 Ic	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg.)	Su (tsf)	OCR
0.15	0.5	14.79	3.92	Silty Clay to Clay	CL	stiff	110	1.5	10	0.014	0.014	3.92	0.84	1.70	23.8	2.77		10				0.87	####
0.30	1.0	10.44	2.83	Silty Clay to Clay	CL	stiff	110	1.5	7	0.041	0.041	2.84	0.85	1.70	16.8	2.80		7				0.61	75.6
0.46	1.5	11.49	3.13	Silty Clay to Clay	CL	stiff	110	1.5	8	0.069	0.069	3.15	0.85	1.70	18.5	2.79		8				0.67	49.9
0.61	2.0	9.62	3.38	Silty Clay to Clay	CL	stiff	110	1.5	6	0.096	0.096	3.42	0.87	1.70	15.5	2.88		6				0.56	29.7
0.76	2.5	8.30	3.08	Silty Clay to Clay	CL	firm	110	1.5	6	0.124	0.124	3.13	0.88	1.70	13.3	2.91		6				0.48	19.8
0.91	3.0	7.98	3.21	Clay	CL/CH	firm	110	1.0	8	0.151	0.151	3.28	0.89	1.70	12.8	2.93		8				0.46	15.5
1.07	3.5	7.45	3.26	Clay	CL/CH	firm	110	1.0	7	0.179	0.179	3.34	0.90	1.70	12.0	2.96		7				0.43	12.2
1.22	4.0	6.33	3.49	Clay	CL/CH	firm	110	1.0	6	0.206	0.206	3.61	0.92	1.70	10.2	3.04		6				0.36	8.9
1.37	4.5	6.56	3.70	Clay	CL/CH	firm	110	1.0	7	0.234	0.234	3.84	0.92	1.70	10.5	3.04		7				0.37	8.1
1.52	5.0	7.67	3.68	Clay	CL/CH	firm	110	1.0	8	0.261	0.261	3.81	0.91	1.70	12.3	2.98		8				0.44	8.5
1.68	5.5	8.76	3.64	Clay	CL/CH	firm	110	1.0	9	0.289	0.289	3.77	0.89	1.70	14.1	2.94		9				0.50	8.8
1.83	6.0	9.02	3.67	Clay	CL/CH	stiff	110	1.0	9	0.316	0.316	3.80	0.89	1.70	14.5	2.93		9				0.51	8.3
1.98	6.5	7.82	3.97	Clay	CL/CH	firm	110	1.0	8	0.344	0.344	4.15	0.91	1.70	12.6	3.00		8				0.44	6.5
2.13	7.0	8.53	3.82	Clay	CL/CH	firm	110	1.0	9	0.371	0.371	3.99	0.90	1.70	13.7	2.96		9				0.48	6.6
2.29	7.5	7.52	4.03	Clay	CL/CH	firm	110	1.0	8	0.399	0.399	4.26	0.92	1.70	12.1	3.02		8				0.42	5.4
2.44	8.0	7.59	4.02	Clay	CL/CH	firm	110	1.0	8	0.426	0.426	4.25	0.92	1.70	12.2	3.02		8				0.42	5.0
2.59	8.5	7.55	4.00	Clay	CL/CH	firm	110	1.0	8	0.454	0.454	4.26	0.92	1.70	12.1	3.02		8				0.42	4.7
2.74	9.0	7.49	4.14	Clay	CL/CH	firm	110	1.0	7	0.481	0.481	4.43	0.92	1.70	12.0	3.03		7				0.41	4.4
2.90	9.5	7.90	4.20	Clay	CL/CH	firm	110	1.0	8	0.509	0.509	4.49	0.92	1.70	12.7	3.02		8				0.43	4.4
3.05	10.0	8.40	4.20	Clay	CL/CH	firm	110	1.0	8	0.536	0.536	4.49	0.91	1.70	13.5	3.00		8				0.46	4.4
3.20	10.5	7.93	4.19	Clay	CL/CH	firm	110	1.0	8	0.564	0.564	4.51	0.92	1.70	12.7	3.02		8				0.43	3.9
3.35	11.0	8.07	4.22	Clay	CL/CH	firm	110	1.0	8	0.591	0.591	4.55	0.92	1.70	13.0	3.01		8				0.44	3.8
3.51	11.5	8.49	4.19	Clay	CL/CH	firm	110	1.0	8	0.619	0.619	4.52	0.92	1.64	13.1	3.01		8				0.46	3.8
3.66	12.0	8.41	4.09	Clay	CL/CH	firm	110	1.0	8	0.646	0.646	4.43	0.92	1.58	12.5	3.02		8				0.46	3.6
3.81	12.5	7.76	4.11	Clay	CL/CH	firm	110	1.0	8	0.674	0.674	4.50	0.94	1.53	11.2	3.06		8				0.42	3.2
3.96	13.0	7.63	4.21	Clay	CL/CH	firm	110	1.0	8	0.701	0.701	4.64	0.94	1.47	10.6	3.09		8				0.41	3.0
4.11	13.5	8.38	4.57	Clay	CL/CH	firm	110	1.0	8	0.729	0.729	5.00	0.94	1.42	11.3	3.09		8				0.45	3.1
4.27	14.0	9.56	4.48	Clay	CL/CH	stiff	110	1.0	10	0.756	0.756	4.86	0.93	1.37	12.4	3.05		10				0.52	3.5
4.42	14.5	8.74	4.61	Clay	CL/CH	firm	110	1.0	9	0.784	0.784	5.06	0.95	1.33	11.0	3.10		9				0.47	3.0
4.57	15.0	8.16	4.67	Clay	CL/CH	firm	110	1.0	8	0.811	0.811	5.19	0.96	1.29	10.0	3.14		8				0.43	2.7
4.72	15.5	8.39	4.92	Clay	CL/CH	firm	110	1.0	8	0.839	0.839	5.46	0.97	1.25	9.9	3.15		8				0.44	2.7
4.88	16.0	9.05	4.70	Clay	CL/CH	firm	110	1.0	9	0.866	0.866	5.20	0.96	1.21	10.4	3.13		9				0.48	2.8
5.03	16.5	9.67	4.79	Clay	CL/CH	stiff	110	1.0	10	0.894	0.894	5.27	0.95	1.17	10.7	3.12		10				0.52	2.9
5.18	17.0	10.34	4.80	Clay	CL/CH	stiff	110	1.0	10	0.921	0.921	5.27	0.95	1.14	11.1	3.11		10				0.55	3.1
5.33	17.5	12.81	4.70	Clay	CL/CH	stiff	110	1.0	13	0.949	0.949	5.08	0.93	1.11	13.4	3.03		13				0.70	3.8
5.49	18.0	14.78	4.04	Silty Clay to Clay	CL	stiff	110	1.5	10	0.976	0.976	4.33	0.90	1.08	15.0	2.95		10				0.81	4.2
5.64	18.5	14.92	3.08	Clayey Silt to Silty Clay	ML/CL	stiff	110	2.0	7	1.004	1.004	3.30	0.88	1.05	14.8	2.88		7				0.82	4.2
5.79	19.0	18.12	2.46	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	9	1.031	1.031	2.61	0.84	1.02	17.5	2.76		9				1.01	5.0
5.94	19.5	10.32	4.82	Clay	CL/CH	stiff	110	1.0	10	1.059	1.059	5.37	0.97	1.00	9.8	3.16		10				0.54	2.6
6.10	20.0	9.94	5.49	Clay	CL/CH	stiff	110	1.0	10	1.086	1.086	6.16	0.98	0.97	9.2	3.21		10				0.52	2.4
6.25	20.5	10.12	5.38	Clay	CL/CH	stiff	110	1.0	10	1.114	1.114	6.05	0.98	0.95	9.1	3.21		10				0.53	2.4
6.40	21.0	10.10	5.38	Clay	CL/CH	stiff	110	1.0	10	1.141	1.141	6.07	0.99	0.93	8.9	3.22		10				0.53	2.4
6.55	21.5	11.02	4.90	Clay	CL/CH	stiff	110	1.0	11	1.169	1.169	5.48	0.97	0.91	9.5	3.17		11				0.58	2.5
6.71	22.0	11.22	4.30	Clay	CL/CH	stiff	110	1.0	11	1.196	1.196	4.81	0.96	0.89	9.4	3.14		11				0.59	2.5
6.86	22.5	12.09	4.17	Clay	CL/CH	stiff	110	1.0	12	1.224	1.224	4.64	0.95	0.87	9.9	3.11		12				0.64	2.7
7.01	23.0	8.73	4.56	Clay	CL/CH	firm	110	1.0	9	1.251	1.251	5.33	1.00	0.85	7.0	3.27		9				0.44	1.8
7.16	23.5	11.81	4.79	Clay	CL/CH	stiff	110	1.0	12	1.279	1.279	5.37	0.97	0.83	9.3	3.17		12				0.62	2.5
7.32	24.0	11.20	4.54	Clay	CL/CH	stiff	110	1.0	11	1.306	1.306	5.14	0.98	0.81	8.6	3.19		11				0.58	2.3
7.47	24.5	16.24	3.55	Silty Clay to Clay	CL	stiff	110	1.5	11	1.334	1.334	3.87	0.91	0.81	12.4	2.98		11				0.88	3.4
7.62	25.0	14.35	4.58	Clay	CL/CH	stiff	110	1.0	14	1.361	1.361	5.06	0.95	0.79	10.7	3.11		14				0.76	2.9
7.77	25.5	20.98	2.40	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	10	1.389	1.389	2.57	0.85	0.79	15.7	2.80		10				1.15	4.2
7.92	26.0	40.66	1.32	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	14	1.416	1.416	1.37	0.73	0.81	31.0	2.40	71.6	11	14	28	30		
8.08	26.5	64.49	1.31	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	21	1.444	1.444	1.34	0.68	0.81	49.3	2.23	85.9	18	17	48	33		
8.23	27.0	78.58	1.17	Sand to Silty Sand	SP/SM	medium dense	100	4.0	20	1.470	1.470	1.19	0.65	0.81	60.0	2.13	90.8	16	18	56	32		
8.38	27.5	48.46	2.58	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	19	1.496	1.496	2.66	0.77	0.77	35.1	2.53	103.0	16	21	33	32		
8.53	28.0	26.91	2.85	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	13	1.524	1.524	3.02	0.85	0.73	18.7	2.78		13				1.49	5.0
8.69	28.5	33.08	2.46	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	13	1.551	1.551	2.58	0.81	0.73	22.9	2.67		13				1.85	6.1
8.84	29.0	24.07	3.52	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	12	1.579	1.579	3.76	0.88	0.70	16.0	2.89		12				1.32	4.3
8.99	29.5	26.52	2.98	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	13	1.606	1.606	3.17	0.86	0.70	17.5	2.81		13				1.47	4.7
9.14	30.0	30.25	2.88	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	15	1.634	1.634	3.05	0.84	0.69	19.8	2.76		15				1.68	5.3
9.30	30.5	24.40	3.24	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	12	1.661	1.661	3.48	0.88	0.67	15.5	2.88		12				1.34	4.1
9.45	31.0	17.97	4.58	Clay	CL/CH	stiff	110	1.0	18	1.689	1.689	5.05	0.95	0.64	10.9	3.10		18				0.96	2.9
9.60	31.5	51.33	1.98	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	17	1.716	1.716	2.05	0.75	0.69	33.7	2.47	88.8	13	18	32	31		
9.75	32.0	35.19	2.69	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	14	1.744	1.744	2.83	0.83	0.66	22.0	2.71		14				1.97	5.8
9.91	32.5	33.34	2.91	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	17	1.771	1.771	3.08	0.84	0.65	20.4	2.75		17				1.86	5.3
10.06	33.0	67.29	2.32	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	27	1.799	1.799	2.38	0.74	0.67	42.9	2.43	105.5	20	21	42	33		
10.21	33.5	95.36	1.59	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	32	1.826	1.826	1.62	0.67	0.69	62.5	2.20	104.4	24	21	57	34		
10.36	34.0	34.36	3.57	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	17	1.854	1.854	3.77	0.86	0.62	20.1	2.82		17				1.91	5.3
10.52	34.5	18.98	3.67	Silty Clay to Clay	CL	very stiff	110	1.5	13	1.881	1.881	4.08	0.94	0.58	10.5	3.06		13				1.01	2.7
10.67	35.0	15.60	4.60	Clay	CL/CH	stiff	110	1.0	16	1.909	1.909	5.24	0.98	0.56	8.3	3.21		16				0.81	2.2
10.82	35.5	32.42	3.30	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	16	1.936	1.936	3.51	0.86	0.59	18.2	2.83		16				1.79	4.7
10.97	36.0	32.87	2.83	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	13	1.964	1.964	3.01	0.85	0.59	18.4	2.78		13				1.82	4.7
11.13	36.5	48.55	2.49	Sandy Silt to Clayey Silt	ML	hard	110	2.5	19	1.991	1.991	2.59	0.79	0.61	27.8	2.60		19				2.74	7.0
11.28	37.0	23.62	3.02	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	12	2.019	2.019	3.30	0.90	0.56	12.5	2.94		12				1.27	3.2
11.43	37.5	21.65	3.40	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	11	2.046	2.046	3.76	0.92	0.54	11.1	3.02		11				1.15	2.9

Earth Systems

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989)

Project: Somis Ranch Farmworker Housing Project No: 302947-001 Date: 06/24/19

CPT SOUNDING: CPT-2 Plot: 1 Density: 1 SPT N Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

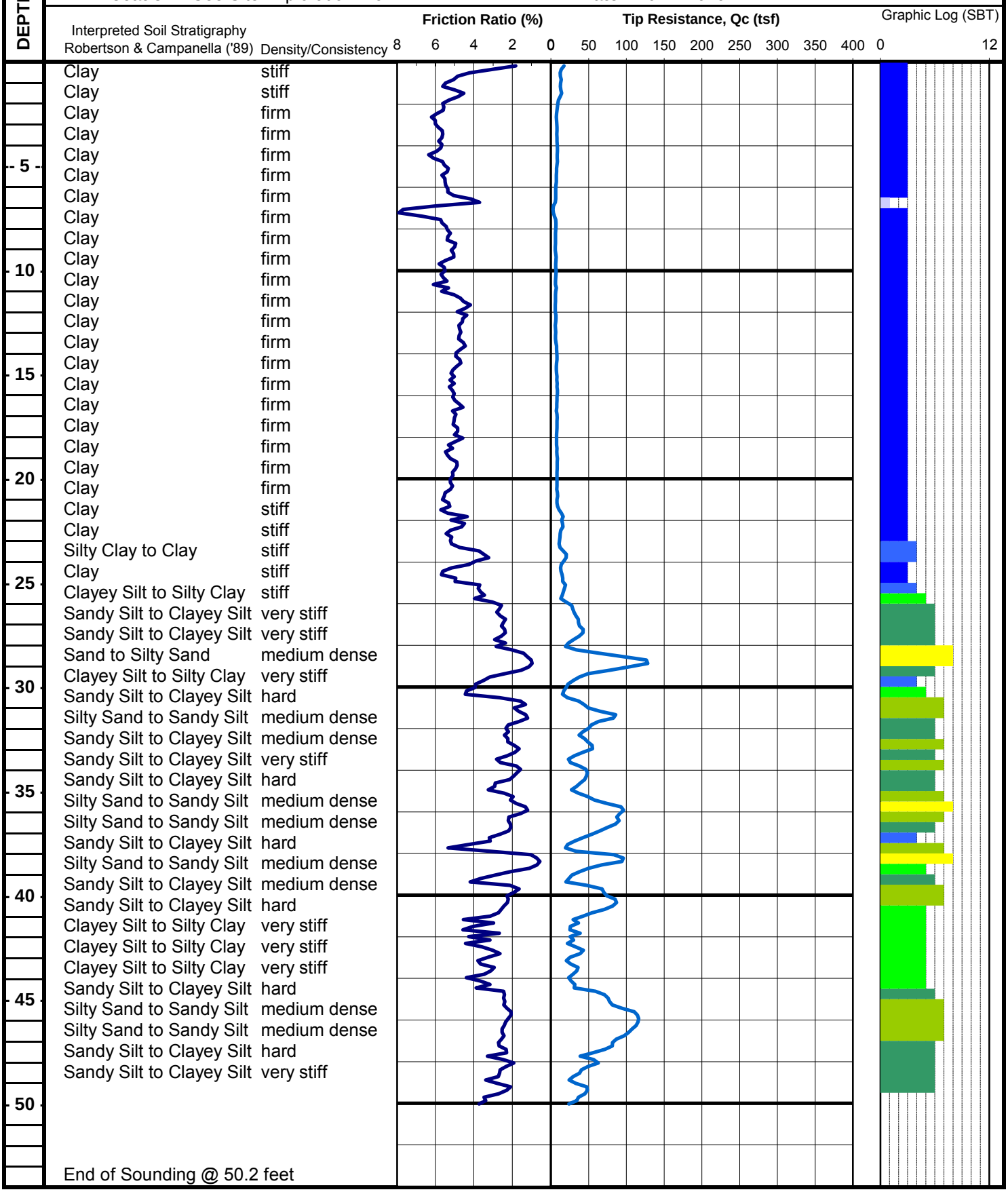
Est. GWT (feet): **55.0** Dr correlation: 0 Baldi Qc/N: 1 Robertson Phi Correlation: 4 SPT N

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	2.6 Ic	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg.)	Nk: 17 Su (tsf)	OCR
11.58	38.0	20.51	3.43	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	10	2.074	2.074	3.81	0.93	0.53	10.3	3.05		10				1.08	2.7
11.73	38.5	16.06	3.46	Silty Clay to Clay	CL	stiff	110	1.5	11	2.101	2.101	3.98	0.97	0.51	7.8	3.16		11				0.82	2.0
11.89	39.0	15.67	3.72	Silty Clay to Clay	CL	stiff	110	1.5	10	2.129	2.129	4.31	0.98	0.50	7.5	3.19		10				0.80	1.9
12.04	39.5	16.62	3.91	Silty Clay to Clay	CL	stiff	110	1.5	11	2.156	2.156	4.49	0.98	0.50	7.8	3.18		11				0.85	2.0
12.19	40.0	18.46	4.23	Silty Clay to Clay	CL	stiff	110	1.5	12	2.184	2.184	4.80	0.97	0.49	8.6	3.17		12				0.96	2.2
12.34	40.5	26.27	3.50	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	13	2.211	2.211	3.82	0.91	0.51	12.7	2.97		13				1.42	3.3
12.50	41.0	34.61	2.91	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	14	2.239	2.239	3.11	0.86	0.52	17.2	2.82		14				1.90	4.3
12.65	41.5	38.74	2.70	Sandy Silt to Clayey Silt	ML	hard	110	2.5	15	2.266	2.266	2.86	0.84	0.53	19.3	2.75		15				2.15	4.8
12.80	42.0	66.71	1.67	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	22	2.294	2.294	1.73	0.74	0.57	35.7	2.41	83.9	15	17	34	32		
12.95	42.5	64.66	1.84	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	22	2.321	2.321	1.91	0.75	0.56	33.9	2.45	86.1	14	17	32	31		
13.11	43.0	46.22	2.57	Sandy Silt to Clayey Silt	ML	hard	110	2.5	18	2.349	2.349	2.71	0.82	0.52	22.7	2.68		18				2.58	5.6
13.26	43.5	36.85	3.06	Clayey Silt to Silty Clay	ML/CL	hard	110	2.0	18	2.376	2.376	3.28	0.86	0.50	17.3	2.83		18				2.03	4.4
13.41	44.0	61.01	2.05	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	20	2.404	2.404	2.13	0.77	0.53	30.7	2.52	87.5	13	18	28	31		
13.56	44.5	73.64	2.22	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	25	2.431	2.431	2.29	0.75	0.53	37.2	2.47	97.6	16	20	36	32		
13.72	45.0	79.36	1.67	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	26	2.459	2.459	1.73	0.72	0.54	40.8	2.36	88.3	17	18	40	32		
13.87	45.5	78.50	1.78	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	26	2.486	2.486	1.84	0.73	0.54	39.8	2.39	90.1	17	18	39	32		
14.02	46.0	57.57	2.60	Sandy Silt to Clayey Silt	ML	hard	110	2.5	23	2.514	2.514	2.72	0.80	0.50	27.2	2.62		23				3.24	6.6
14.17	46.5	30.58	2.57	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	12	2.541	2.541	2.80	0.88	0.46	13.4	2.88		12				1.65	3.3
14.33	47.0	63.37	3.65	Clayey Silt to Silty Clay	ML/CL	hard	110	2.0	32	2.569	2.569	3.81	0.82	0.48	28.9	2.70		32				3.58	7.1
14.48	47.5	92.91	1.63	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	31	2.596	2.596	1.67	0.71	0.53	46.6	2.31	92.1	19	18	45	33		
14.63	48.0	34.49	3.63	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	17	2.624	2.624	3.93	0.90	0.44	14.4	2.94		17				1.87	3.6
14.78	48.5	18.30	3.69	Silty Clay to Clay	CL	stiff	110	1.5	12	2.651	2.651	4.32	0.99	0.40	7.0	3.22		12				0.92	1.8
14.94	49.0	14.79	4.06	Silty Clay to Clay	CL	stiff	110	1.5	10	2.679	2.679	4.96	1.00	0.39	5.5	3.33		10				0.71	1.4
15.09	49.5	27.73	3.46	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	14	2.706	2.706	3.83	0.93	0.42	11.0	3.03		14				1.47	2.8
15.24	50.0	53.69	2.53	Sandy Silt to Clayey Silt	ML	hard	110	2.5	21	2.734	2.734	2.66	0.82	0.46	23.4	2.67		21				3.00	5.6

Earth Systems

CPT No: CPT-3
Project Name: Somis Ranch Farmworker Housing
Project No.: 302947-001
Location: See Site Exploration Plan

CPT Vendor: **Middle Earth GeoTesting**
Truck Mounted Electric
Cone with 23-ton reaction
Date: 6/24/2019



Earth Systems

CONE PENETROMETER INTERPRETATION (based on Robertson & Campanella, 1989)

Project: Somis Ranch Farmworker Housing Project No: 302947-001 Date: 06/24/19

CPT SOUNDING: CPT-3 Plot: 2 Density: 1 SPT N Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): **55.0** Dr correlation: 0 Baldi Qc/N: 1 Robertson Phi Correlation: 4 SPT N

Nk: 17

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	2.6 Ic	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg.)	Su (tsf)	OCR
0.15	0.5	12.90	4.05	Clay	CL/CH	stiff	110	1.0	13	0.014	0.014	4.05	0.86	1.70	20.7	2.82		13				0.76	####
0.30	1.0	13.05	5.39	Clay	CL/CH	stiff	110	1.0	13	0.041	0.041	5.40	0.88	1.70	21.0	2.90		13				0.77	94.6
0.46	1.5	13.26	4.79	Clay	CL/CH	stiff	110	1.0	13	0.069	0.069	4.82	0.87	1.70	21.3	2.86		13				0.78	57.6
0.61	2.0	9.25	5.49	Clay	CL/CH	stiff	110	1.0	9	0.096	0.096	5.55	0.92	1.70	14.9	3.02		9				0.54	28.5
0.76	2.5	7.56	5.91	Clay	CL/CH	firm	110	1.0	8	0.124	0.124	6.01	0.94	1.70	12.1	3.11		8				0.44	18.0
0.91	3.0	7.71	5.96	Clay	CL/CH	firm	110	1.0	8	0.151	0.151	6.08	0.94	1.70	12.4	3.11		8				0.44	15.0
1.07	3.5	7.88	5.65	Clay	CL/CH	firm	110	1.0	8	0.179	0.179	5.78	0.94	1.70	12.7	3.09		8				0.45	12.9
1.22	4.0	8.27	5.74	Clay	CL/CH	firm	110	1.0	8	0.206	0.206	5.89	0.93	1.70	13.3	3.08		8				0.47	11.7
1.37	4.5	8.43	6.14	Clay	CL/CH	firm	110	1.0	8	0.234	0.234	6.31	0.94	1.70	13.6	3.09		8				0.48	10.5
1.52	5.0	8.06	5.50	Clay	CL/CH	firm	110	1.0	8	0.261	0.261	5.69	0.93	1.70	13.0	3.08		8				0.46	9.0
1.68	5.5	7.31	5.52	Clay	CL/CH	firm	110	1.0	7	0.289	0.289	5.75	0.95	1.70	11.7	3.11		7				0.41	7.3
1.83	6.0	6.41	5.40	Clay	CL/CH	firm	110	1.0	6	0.316	0.316	5.68	0.96	1.70	10.3	3.15		6				0.36	5.8
1.98	6.5	6.15	4.30	Clay	CL/CH	firm	110	1.0	6	0.344	0.344	4.55	0.95	1.70	9.9	3.11		6				0.34	5.1
2.13	7.0	3.12	7.20	Organic Material	OL/OH	soft	110	1.0	3	0.371	0.371	8.18	1.00	1.70	5.0	3.50		3				0.16	2.2
2.29	7.5	5.84	6.03	Clay	CL/CH	firm	110	1.0	6	0.399	0.399	6.47	0.98	1.70	9.4	3.22		6				0.32	4.1
2.44	8.0	6.39	5.35	Clay	CL/CH	firm	110	1.0	6	0.426	0.426	5.73	0.96	1.70	10.3	3.16		6				0.35	4.2
2.59	8.5	6.01	5.23	Clay	CL/CH	firm	110	1.0	6	0.454	0.454	5.66	0.97	1.70	9.7	3.17		6				0.33	3.7
2.74	9.0	5.92	5.08	Clay	CL/CH	firm	110	1.0	6	0.481	0.481	5.53	0.97	1.70	9.5	3.17		6				0.32	3.4
2.90	9.5	6.54	5.44	Clay	CL/CH	firm	110	1.0	7	0.509	0.509	5.90	0.96	1.70	10.5	3.16		7				0.35	3.6
3.05	10.0	6.65	5.59	Clay	CL/CH	firm	110	1.0	7	0.536	0.536	6.08	0.96	1.70	10.7	3.16		7				0.36	3.4
3.20	10.5	6.29	5.70	Clay	CL/CH	firm	110	1.0	6	0.564	0.564	6.26	0.97	1.70	10.1	3.18		6				0.34	3.0
3.35	11.0	6.62	5.35	Clay	CL/CH	firm	110	1.0	7	0.591	0.591	5.87	0.96	1.70	10.6	3.15		7				0.35	3.1
3.51	11.5	6.03	4.47	Clay	CL/CH	firm	110	1.0	6	0.619	0.619	4.98	0.96	1.68	9.6	3.14		6				0.32	2.6
3.66	12.0	6.14	4.57	Clay	CL/CH	firm	110	1.0	6	0.646	0.646	5.10	0.97	1.61	9.4	3.16		6				0.32	2.6
3.81	12.5	6.22	4.66	Clay	CL/CH	firm	110	1.0	6	0.674	0.674	5.22	0.97	1.55	9.1	3.17		6				0.33	2.5
3.96	13.0	6.15	4.74	Clay	CL/CH	firm	110	1.0	6	0.701	0.701	5.34	0.98	1.50	8.7	3.19		6				0.32	2.3
4.11	13.5	6.75	4.60	Clay	CL/CH	firm	110	1.0	7	0.729	0.729	5.15	0.97	1.44	9.2	3.17		7				0.35	2.5
4.27	14.0	7.87	4.86	Clay	CL/CH	firm	110	1.0	8	0.756	0.756	5.37	0.96	1.38	10.3	3.14		8				0.42	2.8
4.42	14.5	7.52	4.77	Clay	CL/CH	firm	110	1.0	8	0.784	0.784	5.33	0.97	1.34	9.5	3.16		8				0.40	2.6
4.57	15.0	7.56	5.10	Clay	CL/CH	firm	110	1.0	8	0.811	0.811	5.72	0.98	1.30	9.3	3.19		8				0.40	2.5
4.72	15.5	8.07	5.19	Clay	CL/CH	firm	110	1.0	8	0.839	0.839	5.79	0.97	1.25	9.6	3.18		8				0.43	2.6
4.88	16.0	8.29	5.06	Clay	CL/CH	firm	110	1.0	8	0.866	0.866	5.65	0.97	1.21	9.5	3.18		8				0.44	2.6
5.03	16.5	7.62	4.82	Clay	CL/CH	firm	110	1.0	8	0.894	0.894	5.46	0.98	1.18	8.5	3.21		8				0.40	2.3
5.18	17.0	8.08	4.99	Clay	CL/CH	firm	110	1.0	8	0.921	0.921	5.64	0.98	1.15	8.7	3.21		8				0.42	2.3
5.33	17.5	7.93	4.92	Clay	CL/CH	firm	110	1.0	8	0.949	0.949	5.59	0.99	1.11	8.3	3.22		8				0.41	2.2
5.49	18.0	7.50	4.85	Clay	CL/CH	firm	110	1.0	7	0.976	0.976	5.58	1.00	1.08	7.7	3.25		7				0.38	2.0
5.64	18.5	7.72	5.31	Clay	CL/CH	firm	110	1.0	8	1.004	1.004	6.10	1.00	1.05	7.7	3.27		8				0.39	2.0
5.79	19.0	8.30	5.16	Clay	CL/CH	firm	110	1.0	8	1.031	1.031	5.90	1.00	1.03	8.0	3.25		8				0.43	2.1
5.94	19.5	8.17	4.98	Clay	CL/CH	firm	110	1.0	8	1.059	1.059	5.72	1.00	1.00	7.7	3.25		8				0.42	2.0
6.10	20.0	7.99	5.18	Clay	CL/CH	firm	110	1.0	8	1.086	1.086	6.00	1.00	0.97	7.4	3.28		8				0.41	1.9
6.25	20.5	8.11	5.28	Clay	CL/CH	firm	110	1.0	8	1.114	1.114	6.12	1.00	0.95	7.3	3.29		8				0.41	1.9
6.40	21.0	8.31	5.50	Clay	CL/CH	firm	110	1.0	8	1.141	1.141	6.37	1.00	0.93	7.3	3.30		8				0.42	1.9
6.55	21.5	11.32	5.45	Clay	CL/CH	stiff	110	1.0	11	1.169	1.169	6.08	0.98	0.91	9.7	3.19		11				0.60	2.6
6.71	22.0	15.26	4.68	Clay	CL/CH	stiff	110	1.0	15	1.196	1.196	5.08	0.93	0.89	12.9	3.05		15				0.83	3.5
6.86	22.5	13.70	5.10	Clay	CL/CH	stiff	110	1.0	14	1.224	1.224	5.60	0.95	0.87	11.3	3.12		14				0.73	3.1
7.01	23.0	11.44	5.18	Clay	CL/CH	stiff	110	1.0	11	1.251	1.251	5.82	0.98	0.85	9.2	3.20		11				0.60	2.4
7.16	23.5	16.18	3.99	Silty Clay to Clay	CL	stiff	110	1.5	11	1.279	1.279	4.33	0.92	0.84	12.9	3.00		11				0.88	3.5
7.32	24.0	16.93	3.80	Silty Clay to Clay	CL	stiff	110	1.5	11	1.306	1.306	4.12	0.91	0.83	13.2	2.98		11				0.92	3.6
7.47	24.5	13.78	5.49	Clay	CL/CH	stiff	110	1.0	14	1.334	1.334	6.08	0.97	0.80	10.4	3.17		14				0.73	2.8
7.62	25.0	16.95	4.54	Clay	CL/CH	stiff	110	1.0	17	1.361	1.361	4.94	0.93	0.79	12.7	3.04		17				0.92	3.4
7.77	25.5	16.53	3.63	Silty Clay to Clay	CL	stiff	110	1.5	11	1.389	1.389	3.96	0.92	0.78	12.2	3.00		11				0.89	3.3
7.92	26.0	20.15	3.20	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	10	1.416	1.416	3.44	0.88	0.77	14.7	2.90		10				1.10	4.0
8.08	26.5	32.15	2.62	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	13	1.444	1.444	2.74	0.81	0.78	23.6	2.67		13				1.81	6.4
8.23	27.0	39.04	2.47	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	16	1.471	1.471	2.57	0.79	0.77	28.4	2.59	93.4	13	19	25	31		
8.38	27.5	36.55	2.62	Sandy Silt to Clayey Silt	ML	hard	110	2.5	15	1.499	1.499	2.73	0.80	0.76	26.1	2.64		15				2.06	7.0
8.53	28.0	25.33	2.41	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	10	1.526	1.526	2.57	0.84	0.73	17.6	2.76		10				1.40	4.7
8.69	28.5	95.29	1.21	Sand to Silty Sand	SP/SM	medium dense	100	4.0	24	1.553	1.553	1.23	0.64	0.78	70.6	2.09	100.9	19	20	62	33		
8.84	29.0	103.32	1.22	Sand to Silty Sand	SP/SM	medium dense	100	4.0	26	1.578	1.578	1.24	0.63	0.78	76.0	2.06	105.5	21	21	65	33		
8.99	29.5	38.93	3.01	Sandy Silt to Clayey Silt	ML	hard	110	2.5	16	1.604	1.604	3.14	0.82	0.71	26.2	2.68		16				2.20	7.0
9.14	30.0	19.91	4.08	Silty Clay to Clay	CL	very stiff	110	1.5	13	1.631	1.631	4.44	0.92	0.67	12.6	3.02		13				1.08	3.4
9.30	30.5	24.72	2.90	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	12	1.659	1.659	3.11	0.87	0.68	15.8	2.84		12				1.36	4.2
9.45	31.0	52.95	1.63	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	18	1.686	1.686	1.68	0.73	0.71	35.6	2.40	82.6	14	17	34	31		
9.60	31.5	77.22	1.38	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	26	1.714	1.714	1.41	0.68	0.72	52.6	2.22	90.6	20	18	50	33		
9.75	32.0	48.74	2.25	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	19	1.741	1.741	2.33	0.77	0.68	31.4	2.53	92.3	15	18	29	32		
9.91	32.5	43.54	2.29	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	17	1.769	1.769	2.38	0.79	0.67	27.5	2.58	88.7	13	18	23	31		
10.06	33.0	50.67	1.80	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	17	1.796	1.796	1.87	0.75	0.67	32.2	2.47	83.6	13	17	30	31		
10.21	33.5	26.63	2.57	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	11	1.824	1.824	2.75	0.86	0.63	15.8	2.81		11				1.46	4.1
10.36	34.0	44.13	1.71	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	15	1.851	1.851	1.78	0.77	0.65	27.2	2.51	76.8	11	15	23	30		
10.52	34.5	43.54	2.32	Sandy Silt to Clayey Silt	ML	hard	110	2.5	17	1.879	1.879	2.43	0.80	0.63	26.1	2.61		17				2.45	6.7
10.67	35.0	32.61	2.86	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	13	1.906	1.906	3.04	0.85	0.61	18.7	2.78		13				1.81	4.8
10.82	35.5	60.16	1.95	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	20	1.934	1.934	2.02	0.75	0.64	36.3	2.44	90.8	14	18	35	31		
10.97	36.0	93.44	1.37	Sand to Silty Sand	SP/SM	medium dense	100	4.0	23	1.960	1.960	1.40	0.67	0.66	58.6	2.18	95.1	17	19	55	32		
11.13	36.5	84.57	2.14	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	28	1.986	1.986	2.19	0.72	0.64	50.9	2.36	108.8	20	22	49	33		
11.28	37.0	53.87	2.67	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	22	2.014	2.014	2.78	0.79	0.60	30.6	2.59	99.9	15	20	28	32		
11.43	37.5	24.26	4.26	Silty Clay to Clay	CL	very stiff	110	1.5	16	2.041	2.041	4.65	0.93	0.54	12.5	3.03		16				1.31	3.3

Earth Systems

CONE PENETROMETER INTERPRETATION

(based on Robertson & Campanella, 1989)

Project: Somis Ranch Farmworker Housing Project No: 302947-001 Date: 06/24/19

CPT SOUNDING: CPT-3 Plot: 2 Density: 1 SPT N Program developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Est. GWT (feet): **55.0** Dr correlation: 0 Baldi Qc/N: 1 Robertson Phi Correlation: 4 SPT N

Base Depth meters	Base Depth feet	Avg Tip Qc, tsf	Avg Friction Ratio, %	Soil Classification	USCS	Density or Consistency	Est. Density (pcf)	Qc to N	SPT N(60)	Total po tsf	p'o tsf	F	n	Cq	Norm. Qc1n	Ic	Clean Sand Qc1n	$N_{1(60)}$	Clean Sand $N_{1(60)}$	Rel. Dens. Dr (%)	Phi (deg.)	Nk: 17 Su (tsf)	OCR
11.58	38.0	71.02	1.63	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	24	2.069	2.069	1.68	0.72	0.62	41.5	2.35	87.8	16	18	40	32		
11.73	38.5	70.35	0.80	Sand to Silty Sand	SP/SM	medium dense	100	4.0	18	2.095	2.095	0.82	0.66	0.64	42.3	2.17	67.1	12	13	41	31		
11.89	39.0	29.88	2.89	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	15	2.121	2.121	3.11	0.87	0.55	15.4	2.85		15				1.63	3.9
12.04	39.5	45.04	2.65	Sandy Silt to Clayey Silt	ML	hard	110	2.5	18	2.149	2.149	2.79	0.82	0.56	23.9	2.67		18				2.52	6.0
12.19	40.0	76.38	2.13	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	25	2.176	2.176	2.20	0.74	0.59	42.4	2.42	100.8	17	20	41	32		
12.34	40.5	80.02	2.42	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	27	2.204	2.204	2.49	0.74	0.58	43.8	2.44	108.8	18	22	43	33		
12.50	41.0	42.19	3.47	Clayey Silt to Silty Clay	ML/CL	hard	110	2.0	21	2.231	2.231	3.67	0.85	0.53	21.1	2.79		21				2.35	5.4
12.65	41.5	29.16	3.86	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	15	2.259	2.259	4.19	0.91	0.50	13.8	2.97		15				1.58	3.6
12.80	42.0	31.42	3.37	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	16	2.286	2.286	3.63	0.89	0.50	15.0	2.90		16				1.71	3.8
12.95	42.5	32.50	3.68	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	16	2.314	2.314	3.97	0.89	0.50	15.3	2.92		16				1.78	3.9
13.11	43.0	28.23	3.23	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	14	2.341	2.341	3.53	0.90	0.49	13.0	2.94		14				1.52	3.3
13.26	43.5	32.15	3.23	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	16	2.369	2.369	3.49	0.89	0.49	14.9	2.90		16				1.75	3.8
13.41	44.0	26.56	3.83	Clayey Silt to Silty Clay	ML/CL	very stiff	110	2.0	13	2.396	2.396	4.21	0.93	0.47	11.8	3.03		13				1.42	3.0
13.56	44.5	40.54	3.17	Clayey Silt to Silty Clay	ML/CL	hard	110	2.0	20	2.424	2.424	3.37	0.86	0.49	18.8	2.81		20				2.24	4.7
13.72	45.0	74.77	2.42	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	30	2.451	2.451	2.50	0.76	0.53	37.3	2.49	102.2	19	20	36	33		
13.87	45.5	95.31	2.26	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	32	2.479	2.479	2.32	0.73	0.54	48.4	2.39	109.5	20	22	47	33		
14.02	46.0	115.50	2.20	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	38	2.506	2.506	2.25	0.71	0.54	59.4	2.31	118.3	24	24	55	34		
14.17	46.5	107.84	2.50	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	36	2.534	2.534	2.56	0.73	0.53	54.1	2.38	120.8	23	24	51	34		
14.33	47.0	86.65	2.60	Silty Sand to Sandy Silt	SM/ML	medium dense	110	3.0	29	2.561	2.561	2.68	0.76	0.51	42.0	2.47	111.1	18	22	41	33		
14.48	47.5	55.28	2.64	Sandy Silt to Clayey Silt	ML	hard	110	2.5	22	2.589	2.589	2.77	0.81	0.48	25.3	2.65		22				3.10	6.1
14.63	48.0	56.27	2.24	Sandy Silt to Clayey Silt	ML	medium dense	110	2.5	23	2.616	2.616	2.34	0.79	0.49	25.9	2.60	86.1	14	17	21	31		
14.78	48.5	35.91	2.67	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	14	2.644	2.644	2.88	0.87	0.45	15.3	2.84		14				1.96	3.8
14.94	49.0	34.92	2.75	Sandy Silt to Clayey Silt	ML	very stiff	110	2.5	14	2.671	2.671	2.98	0.88	0.44	14.7	2.86		14				1.90	3.6
15.09	49.5	43.22	2.83	Sandy Silt to Clayey Silt	ML	hard	110	2.5	17	2.699	2.699	3.01	0.85	0.45	18.4	2.78		17				2.38	4.5
15.24	50.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	###	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

BORING LOG SYMBOLS


Modified California Split Barrel Sampler


Modified California Split Barrel Sampler - No Recovery


Standard Penetration Test (SPT) Sampler


Standard Penetration Test (SPT) Sampler - No Recovery


Perched Water Level


Water Level First Encountered


Water Level After Drilling


Pocket Penetrometer (tsf)


Vane Shear (ksf)

1. The location of borings were approximately determined by pacing and/or siting from visible features. Elevations of borings are approximately determined by interpolating between plan contours. The location and elevation of the borings should be considered.

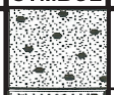
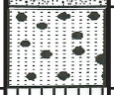
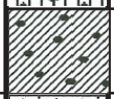
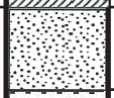
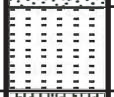
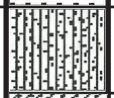
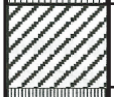
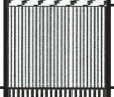
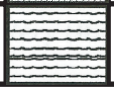
2. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

3. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. This data has been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, tides, temperature, and other factors at the time measurements were made.

BORING LOG SYMBOLS

Earth Systems

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNTOF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

Earth Systems

APPENDIX B

Laboratory Testing
Tabulated Laboratory Test Results
Individual Laboratory Test Results

LABORATORY TESTING

A. Samples were reviewed along with field logs to determine which would be analyzed further. Those chosen for laboratory analyses were considered representative of soils that would be exposed and/or used during grading, and those deemed to be within the influence of proposed structures. Test results are presented in graphic and tabular form in this Appendix.

B. In-situ moisture content and dry unit weight for the ring samples were determined in general accordance with ASTM D 2937.

C. Maximum density tests were performed to estimate the moisture-density relationship of typical soil materials. The tests were performed in accordance with ASTM D 1557.

D. The relative strength characteristics of soils were determined from the results of direct shear tests on two remolded samples. The specimens were placed in contact with water at least 24 hours before testing, and were then sheared under normal loads ranging from 1 to 3 ksf in general accordance with ASTM D 3080.

E. Settlement characteristics were developed from the results of one-dimensional consolidation/hydrocollapse tests performed in general accordance with ASTM D 2435. The samples were incrementally loaded to their appropriate overburden pressure and then flooded with water. After monitoring for collapse, the samples were incrementally loaded up to 8 ksf. The samples were allowed to consolidate under each load increment. Rebound was measured under reverse alternate loading. Compression was measured by dial gauges accurate to 0.0001 inch. Results of the consolidation tests are presented in this Appendix in the form of percent consolidation versus log of pressure curves.

F. Expansion index tests were performed on bulk soil samples in accordance with ASTM D 4829. The samples were surcharged under 144 pounds per square foot at moisture content of near 50 percent saturation. Samples were then submerged in water for 24 hours and the amount of expansion was recorded with a dial indicator.

G. The gradation characteristics of certain samples were evaluated by hydrometer (in accordance with ASTM D 7928) and sieve analysis procedures. The samples were soaked in water until individual soil particles were separated, then washed on the No. 200 mesh sieve, oven dried, weighed to calculate the percent passing the No. 200 sieve, and mechanically sieved. Additionally, hydrometer analyses were performed to assess the distribution of the particles that passed the No. 200 screen. The hydrometer portions of the tests were run using sodium hexametaphosphate as a dispersing agent.

LABORATORY TESTING (Continued)

H. Resistance ("R") Value tests were conducted on bulk samples secured during the field study. The tests were performed in accordance with California Method 301. Three specimens at different moisture contents were tested for each sample, and the R-Value at 300 psi exudation pressure was determined from the plotted results.

I. Portions of the bulk samples were sent to another laboratory for analyses of soil pH, resistivity, chloride contents, and sulfate contents. Soluble chloride and sulfate contents were determined on a dry weight basis. Resistivity testing was performed in accordance with California Test Method 424, wherein the ratio of soil to water was 1:3.

J. The Plasticity Indices of selected samples were evaluated in accordance with ASTM D 4318.

TABULATED LABORATORY TEST RESULTS

REMOLDED SAMPLES

BORING AND DEPTH	B-1@0'-5'	B-8@0'-5'
USCS	CL	CL
MAXIMUM DRY DENSITY (pcf)	109.5	107.0
OPTIMUM MOISTURE (%)	16.0	15.5
PEAK COHESION (psf)	400	320
PEAK FRICTION ANGLE	27°	25°
ULTIMATE COHESION (psf)	0	90
ULTIMATE FRICTION ANGLE	33°	28°
EXPANSION INDEX	72	105
pH	8.3	8.4
RESISTIVITY (ohms-cm)	1,300	1,700
SOLUBLE CHLORIDES (mg/Kg)	100	85
SOLUBLE SULFATES (mg/Kg)	710	510

ATTERBERG LIMITS AND GRADATION

BORING AND DEPTH	B-1@25'	B-1@30'
USCS	ML	CL
LIQUID LIMIT	32	31
PLASTIC LIMIT	26	22
PLASTICITY INDEX	6	9
GRAIN SIZE DISTRIBUTION (%)		
GRAVEL	0.0	0.0
SAND	4.6	13.9
SILT	69.8	67.2
CLAY (2μm to 5μm)	6.2	6.6
CLAY (≤2μm)	19.4	12.3

Individual Laboratory Test Results

File Number: 302947-001 Lab Number: 098216

MAXIMUM DENSITY / OPTIMUM MOISTURE

ASTM D 1557-12 (Modified)

Job Name: Somis Ranch
Sample ID: B 1 @ 0-5'

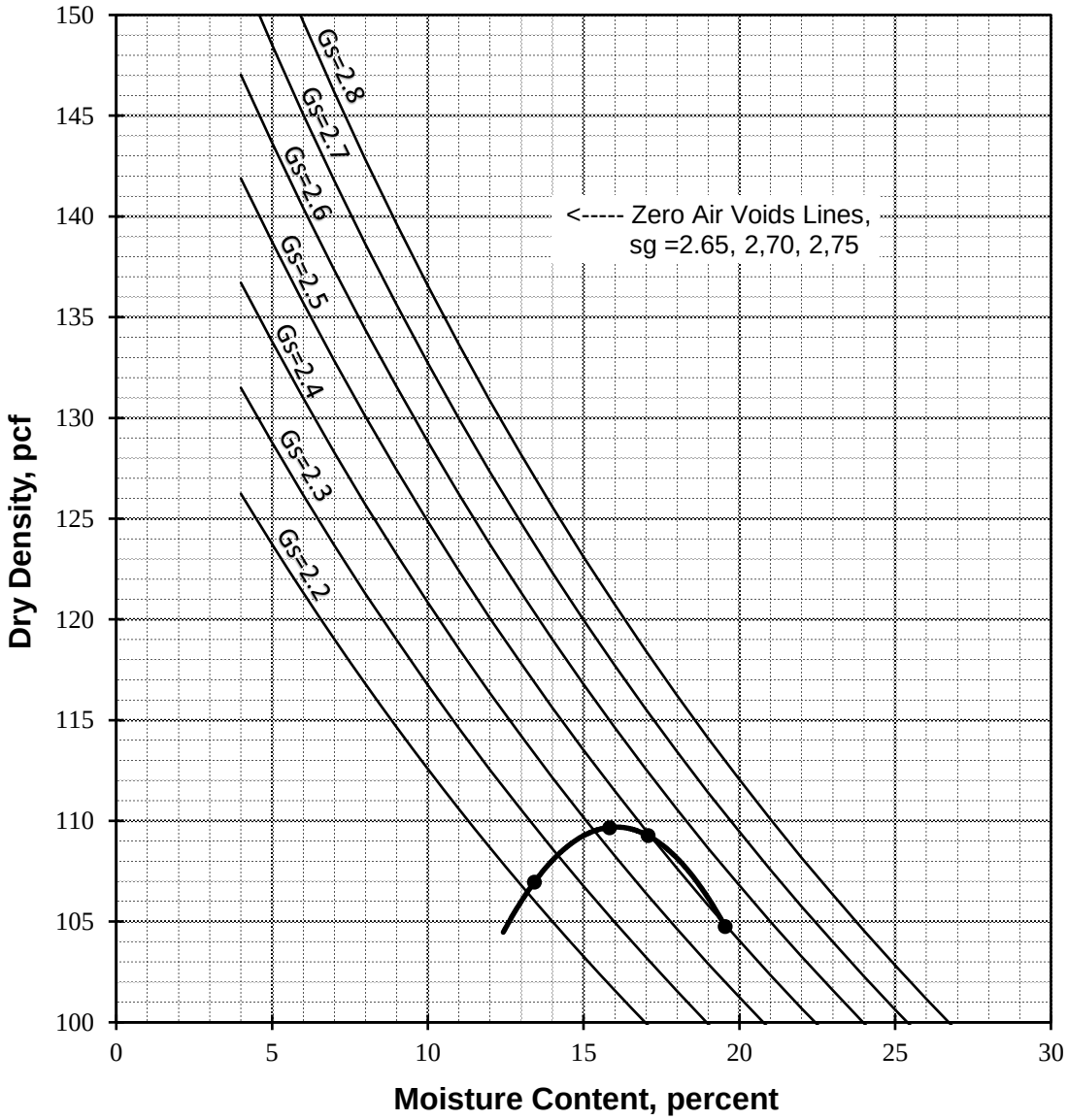
Procedure Used: B
Prep. Method: Moist

Date: 8/14/2019
Description: Olive Brown Silty Clay
SG: 2.50

Rammer Type: Automatic

Maximum Density: **109.5 pcf**
Optimum Moisture: **16%**

Sieve Size	% Retained
3/4"	0.0
3/8"	0.2
#4	0.0



File Number: 302947-001 Lab Number: 098216

MAXIMUM DENSITY / OPTIMUM MOISTURE

ASTM D 1557-12 (Modified)

Job Name: Somis Ranch
Sample ID: B 8 @ 0-5'

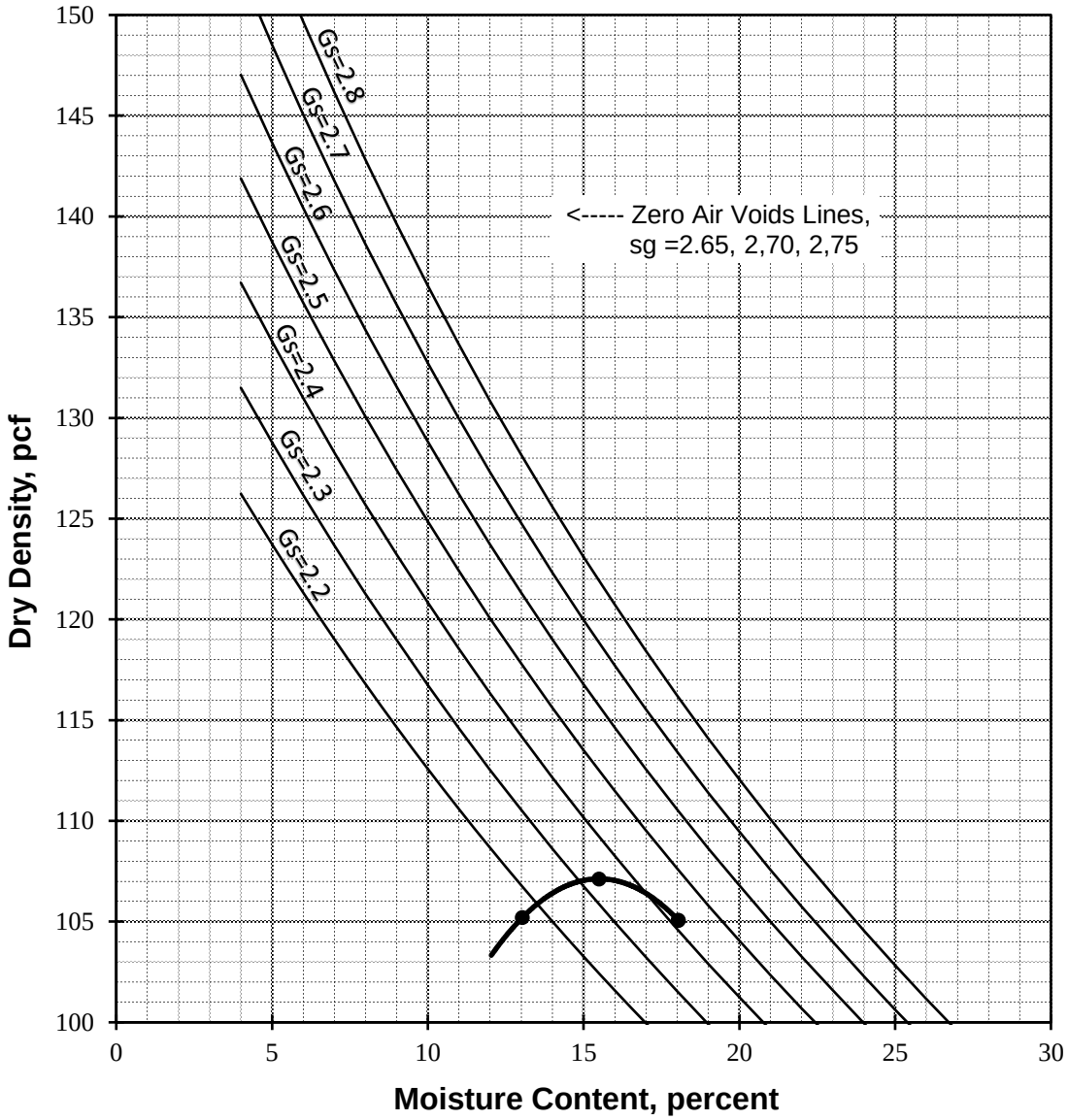
Procedure Used: A
Prep. Method: Moist

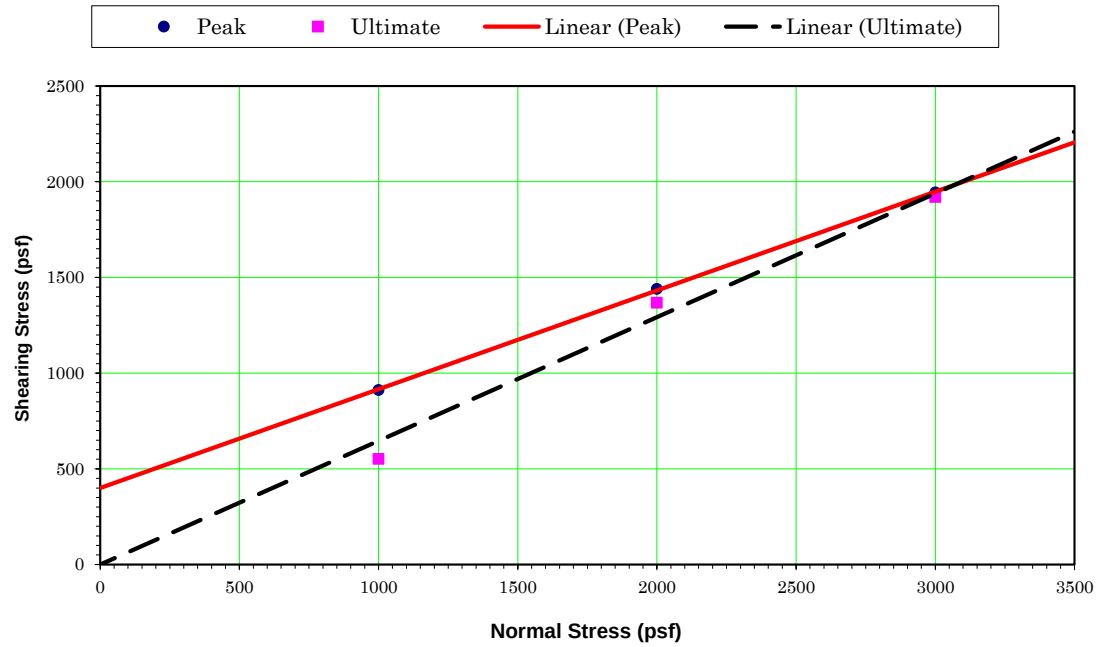
Date: 8/14/2019
Description: Dark Grayish Brown Silty Clay
SG: 2.34

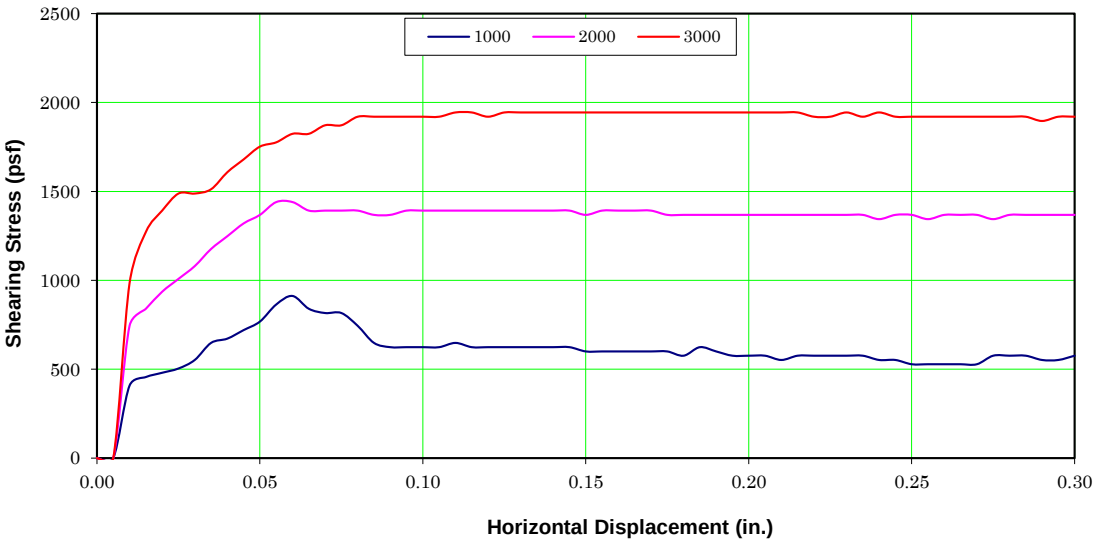
Rammer Type: Automatic

Maximum Density: **107 pcf**
Optimum Moisture: **15.5%**

Sieve Size	% Retained
3/4"	0.0
3/8"	0.0
#4	0.0







DIRECT SHEAR DATA*

Sample Location: B 1 @ 0-5'
Sample Description: Silty Clay
Dry Density (pcf): 98.7
Intial % Moisture: 16
Average Degree of Saturation: 100.0
Shear Rate (in/min): 0.005 in/min

Normal stress (psf)	1000	2000	3000
Peak stress (psf)	912	1440	1944
Ultimate stress (psf)	552	1368	1920

	Peak	Ultimate
ϕ Angle of Friction (degrees):	27	33
c Cohesive Strength (psf):	400	0

Test Type: Peak & Ultimate

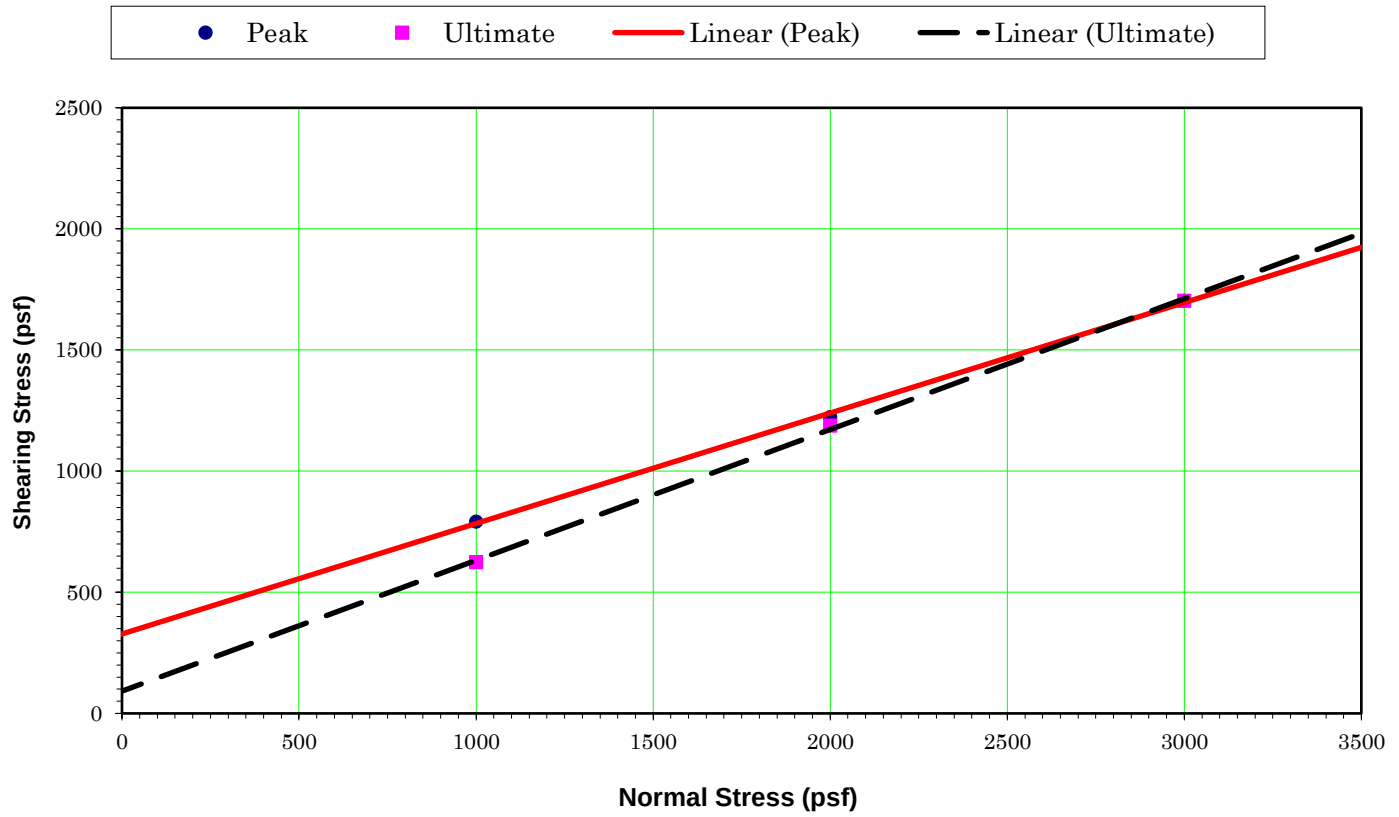
* Test Method: ASTM D-3080

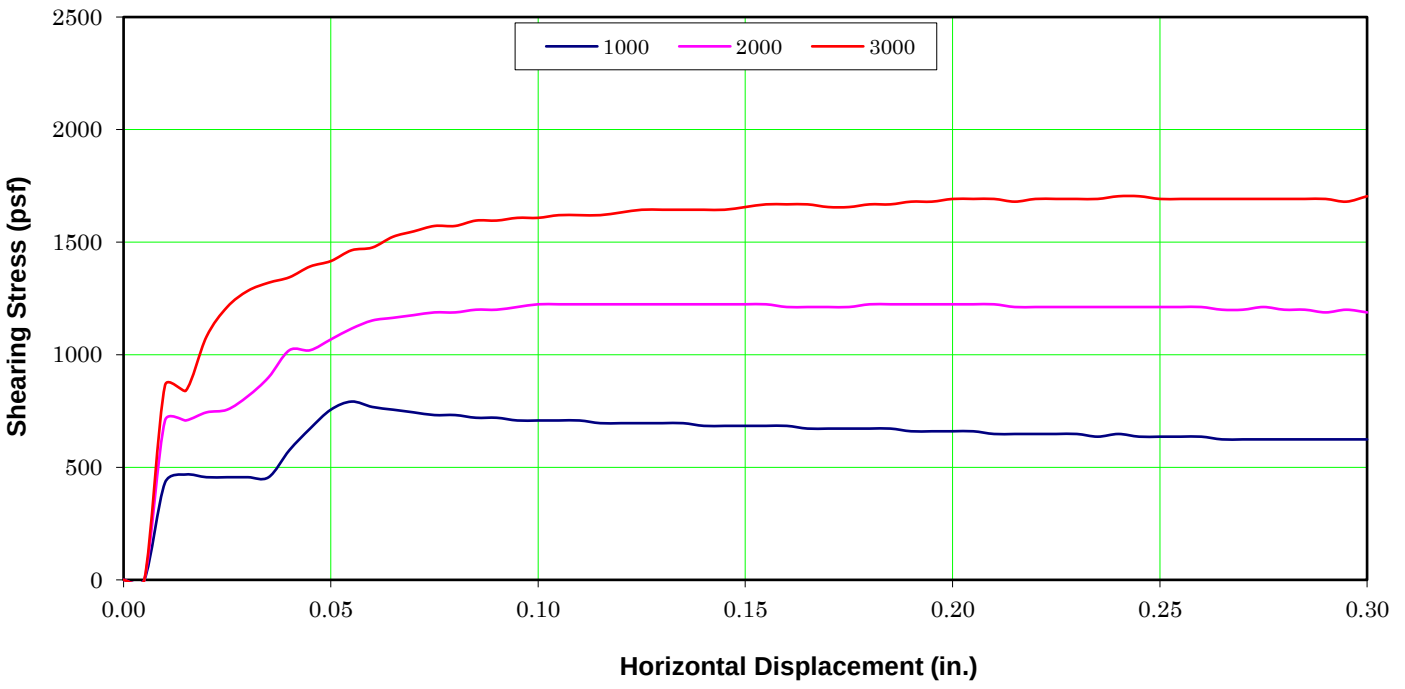
DIRECT SHEAR TEST

Somis Ranch Farmworker Housing

Earth Systems

9/19/2019 | 302947-001





DIRECT SHEAR DATA*

Sample Location: B 8 @ 0-5'
Sample Description: Silty Clay with Sand
Dry Density (pcf): 96.5
Intial % Moisture: 15.5
Average Degree of Saturation: 100.0
Shear Rate (in/min): 0.005 in/min

Normal stress (psf)	1000	2000	3000
Peak stress (psf)	792	1224	1704
Ultimate stress (psf)	624	1188	1704

	Peak	Ultimate
ϕ Angle of Friction (degrees):	25	28
c Cohesive Strength (psf):	320	90

Test Type: Peak & Ultimate

* Test Method: ASTM D-3080

DIRECT SHEAR TEST

Somis Ranch Farmworker Housing

Earth Systems

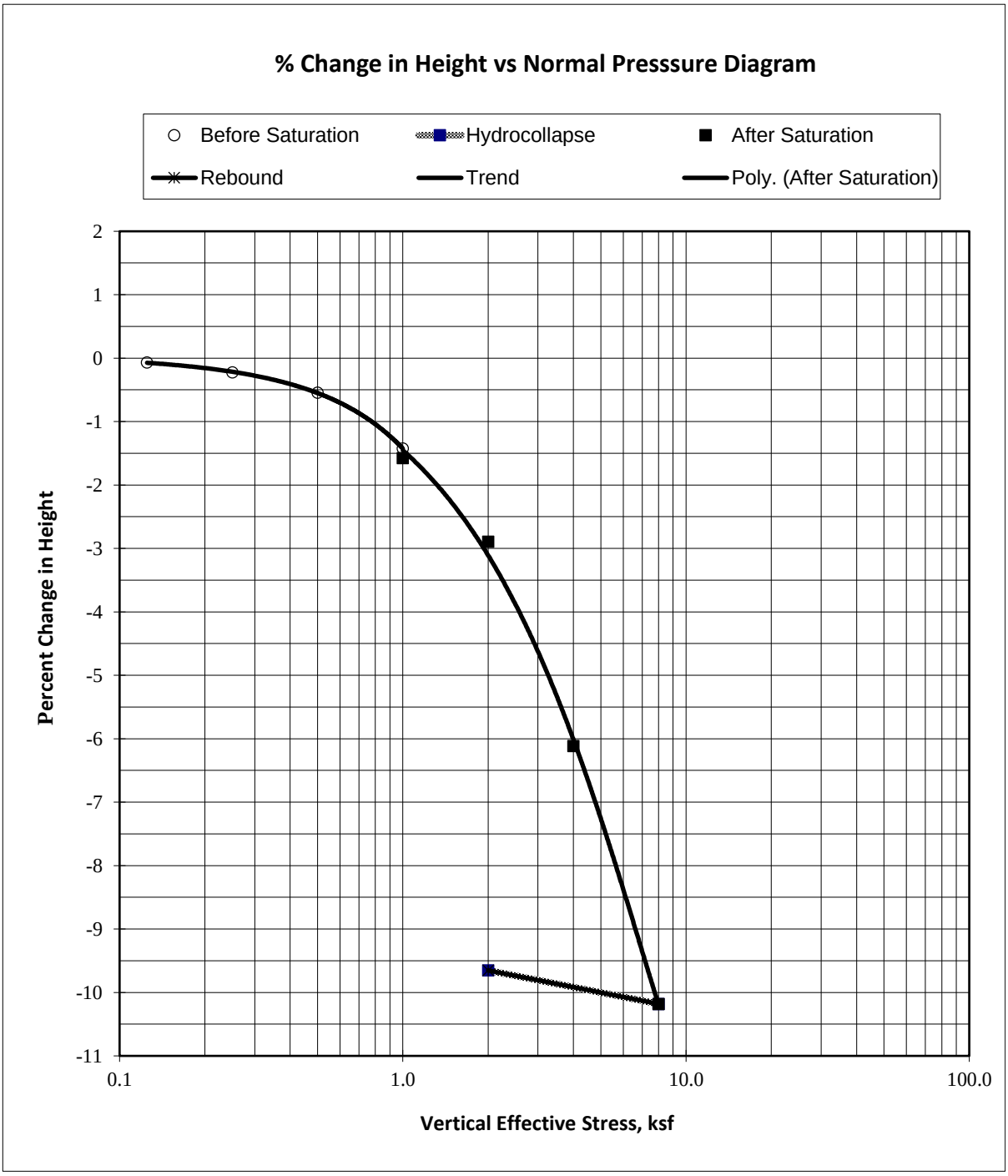
9/19/2019 | 302947-001

CONSOLIDATION TEST

ASTM D 2435-90 & D5333

Somis Ranch Farmworkers Housing
B 1 @ 10'
CL
Ring Sample

Initial Dry Density: 80.1 pcf
Initial Moisture, %: 34.5%
Specific Gravity: 2.67 (assume
Initial Void Ratio: 1.082

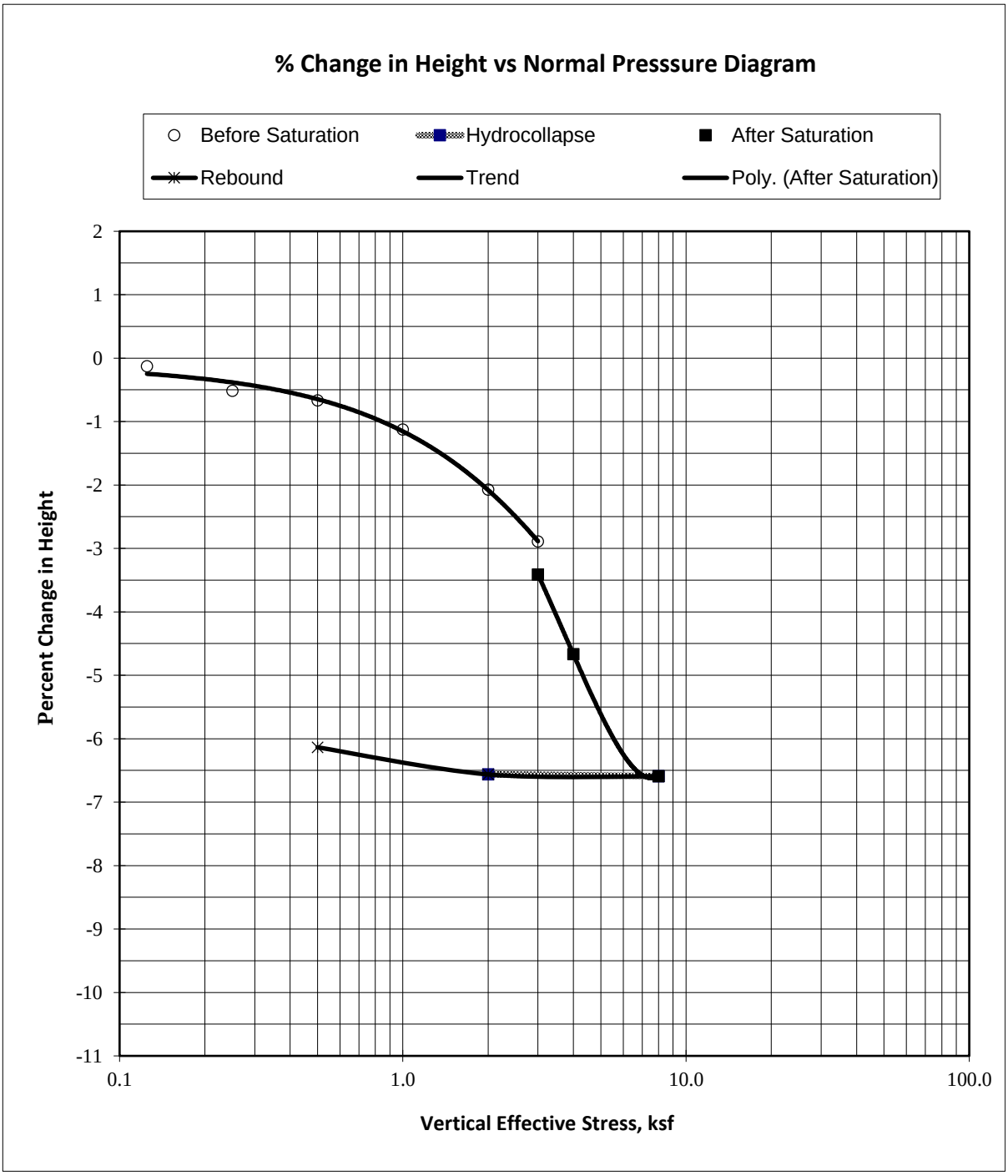


CONSOLIDATION TEST

ASTM D 2435-90 & D5333

Somis Ranch Farmworkers Housing
B 1 @ 30'
CL
Ring Sample

Initial Dry Density: 86.5 pcf
Initial Moisture, %: 31.4%
Specific Gravity: 2.67 (assume
Initial Void Ratio: 0.928

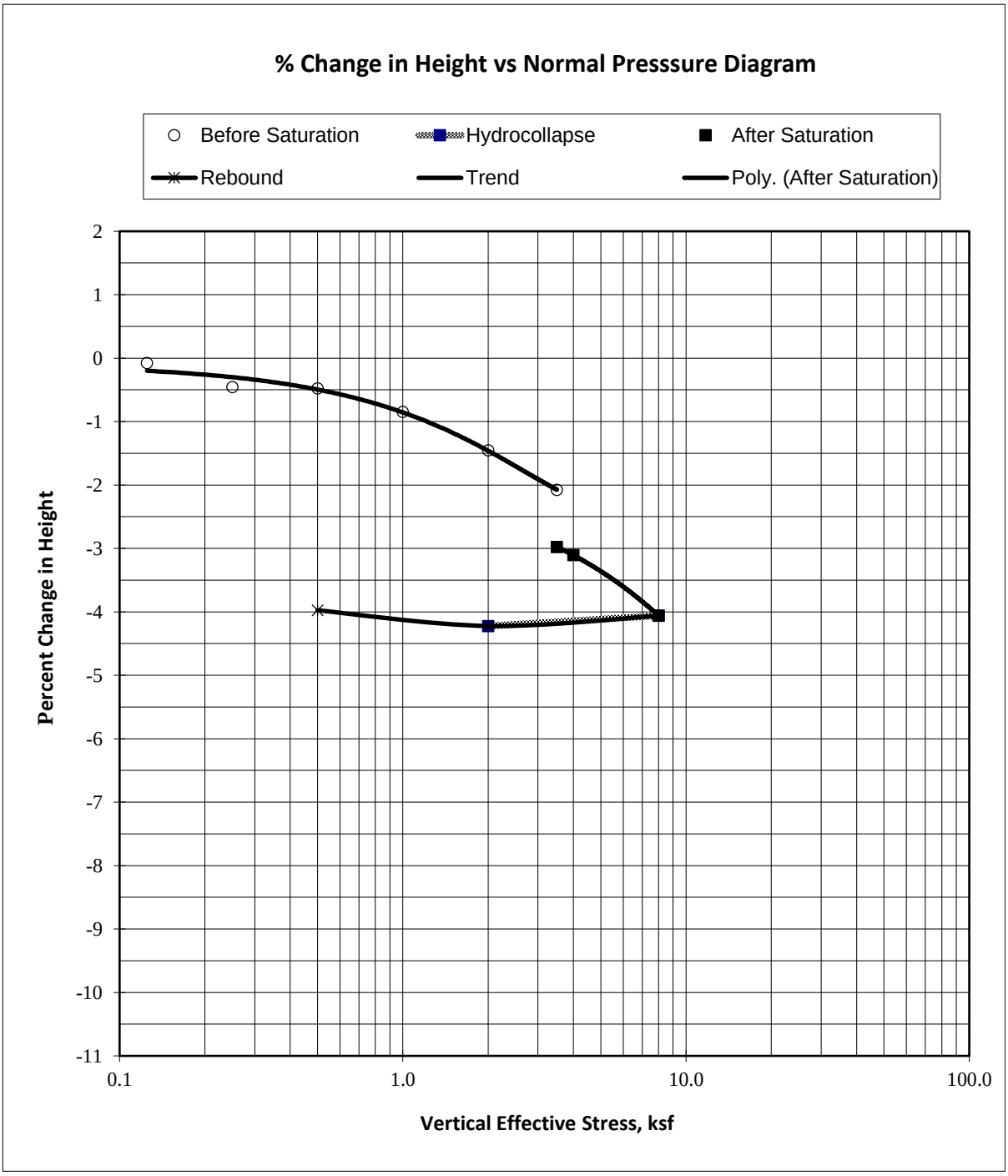


CONSOLIDATION TEST

ASTM D 2435-90 & D5333

Somis Ranch Farmworkers Housing
B 1 @ 35'
SM
Ring Sample

Initial Dry Density: 97.2 pcf
Initial Moisture, %: 18.5%
Specific Gravity: 2.67 (assume
Initial Void Ratio: 0.715

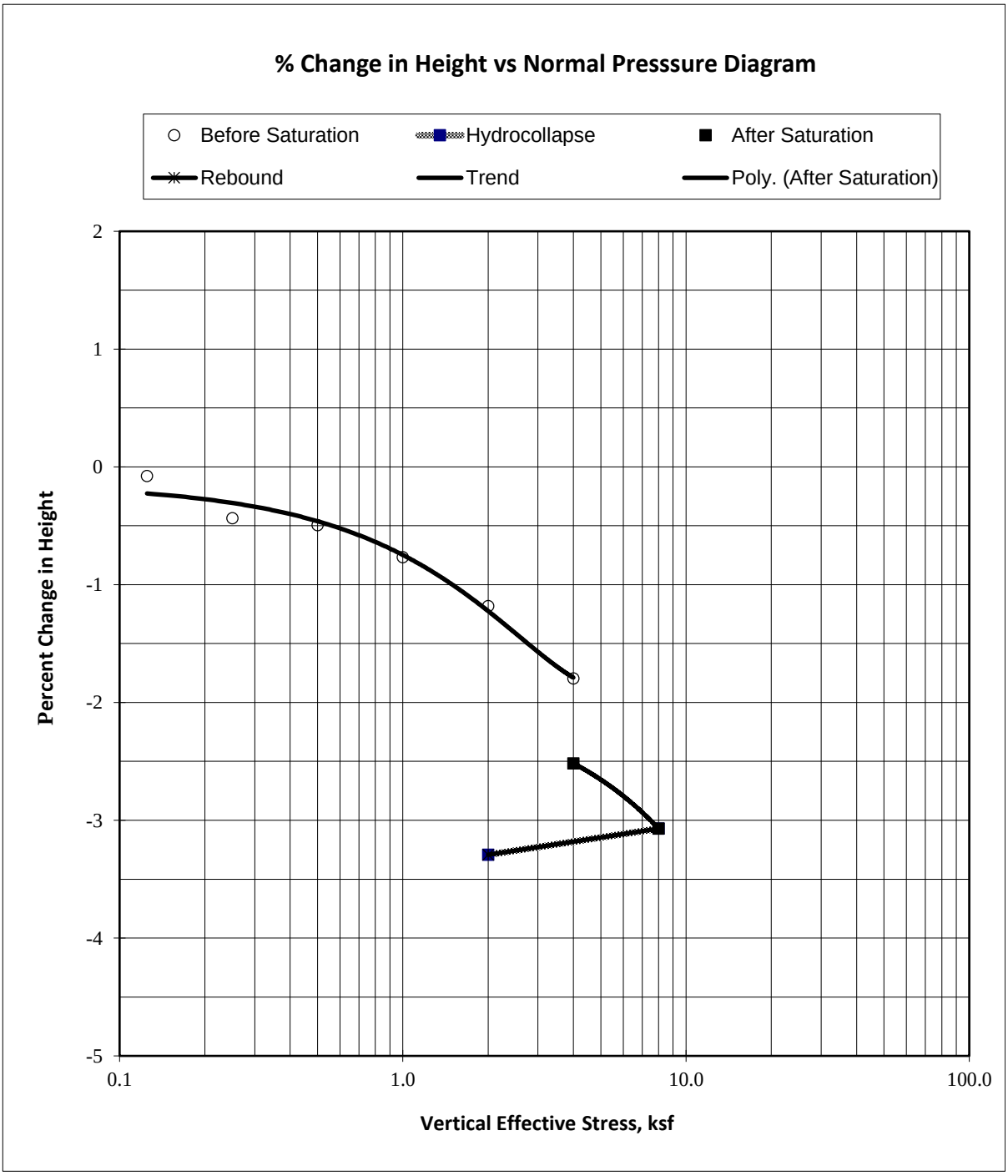


CONSOLIDATION TEST

ASTM D 2435-90 & D5333

Somis Ranch Farmworkers Housing
B 1 @ 40'
SP
Ring Sample

Initial Dry Density: 103.1 pcf
Initial Moisture, %: 5.1%
Specific Gravity: 2.67 (assume
Initial Void Ratio: 0.617



File No.: 302947-001

EXPANSION INDEX

ASTM D-4829, UBC 18-2

Job Name: Somis Ranch Farmworker Housing
Sample ID: B 1 @ 0-5'
Soil Description: CL

Initial Moisture, %:	13.2
Initial Compacted Dry Density, pcf:	99.1
Initial Saturation, %:	51
Final Moisture, %:	35.8
Volumetric Swell, %:	7.2
Expansion Index:	**72** **Medium**

EI	UBC Classification
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
130+	Very High

File No.: 302947-001

EXPANSION INDEX

ASTM D-4829, UBC 18-2

Job Name: Somis Ranch Farmworker Housing
Sample ID: B 8 @ 0-5'
Soil Description: CL

Initial Moisture, %:	12.4
Initial Compacted Dry Density, pcf:	101.6
Initial Saturation, %:	51
Final Moisture, %:	29.4
Volumetric Swell, %:	10.5
Expansion Index:	**105** **High**

EI	UBC Classification
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
130+	Very High

MECHANICAL ANALYSIS

CTM 203-08

Job Name: Somis Ranch Farmworker Housing
Job No.: 302947-001
Sample ID: **B 1 @ 25'**
Soil Description: **ML**
Hydrometer ID: 504229

Hydroscopic Moisture

Air Dry Wt, g:	100.0
Oven Dry Wt, g	100.0
% Moisture:	0.0

Air Dry Sample Wt., g:	672.4
Corrected Wt., g:	672.4

Sieve Analysis for +#10 Material

Sieve Size	Wt Ret	% Ret	% Passing
1/2 inch	0.0	0.00	100.00
3/8 inch	0.0	0.00	100.00
#4	0.0	0.00	100.00
#8	0.9	0.13	99.87
#10	2.7	0.40	99.60

Air Dry Hydro Sample Wt., g:	64.2
Corrected Wt., g:	64.2
Calculation Factor	0.6446

Hydrometer Analysis for <#10 Material

Start time: 1:23:00 AM

Short Hydro	Time of Reading	Hydro Reading	Temp. at Reading, °C	Correction Factor	Corrected Hydro Reading
20 sec	1:23:20 AM	66	24	4.5	61.5
1 hour	2:23:00 AM	21	24	4.5	16.5
6 hour	7:23:00 AM	17	24	4.5	12.5

% Gravel:	0.0
% Sand(2mm - 74µm):	4.6
% Silt(74µm- 5µm):	69.8
% Clay(5µm - 2µm):	6.2
% Clay(≤2µm):	19.4

MECHANICAL ANALYSIS

CTM 203-08

Job Name: Somis Ranch Farmworker Housing
Job No.: 302947-001
Sample ID: **B 1 @ 30'**
Soil Description: **CL**
Hydrometer ID: 504229

Hydroscopic Moisture

Air Dry Wt, g:	100.0
Oven Dry Wt, g	100.0
% Moisture:	0.0

Air Dry Sample Wt., g:	540.6
Corrected Wt., g:	540.6

Sieve Analysis for +#10 Material

Sieve Size	Wt Ret	% Ret	% Passing
1/2 inch	0.0	0.00	100.00
3/8 inch	0.0	0.00	100.00
#4	0.0	0.00	100.00
#8	0.2	0.04	99.96
#10	0.5	0.09	99.91

Air Dry Hydro Sample Wt., g:	60.9
Corrected Wt., g:	60.9
Calculation Factor	0.6095

Hydrometer Analysis for <#10 Material

Start time: 3:02:00 AM

Short Hydro	Time of Reading	Hydro Reading	Temp. at Reading, °C	Correction Factor	Corrected Hydro Reading
20 sec	3:02:20 AM	57	24	4.5	52.5
1 hour	4:02:00 AM	16	24	4.5	11.5
6 hour	9:02:00 AM	12	24	4.5	7.5

% Gravel:	0.0
% Sand(2mm - 74µm):	13.9
% Silt(74µm- 5µm):	67.2
% Clay(5µm - 2µm):	6.6
% Clay(≤2µm):	12.3

Somis Ranch Farmworker Housing 302947-001

RESISTANCE '*R* ' VALUE AND EXPANSION PRESSURE

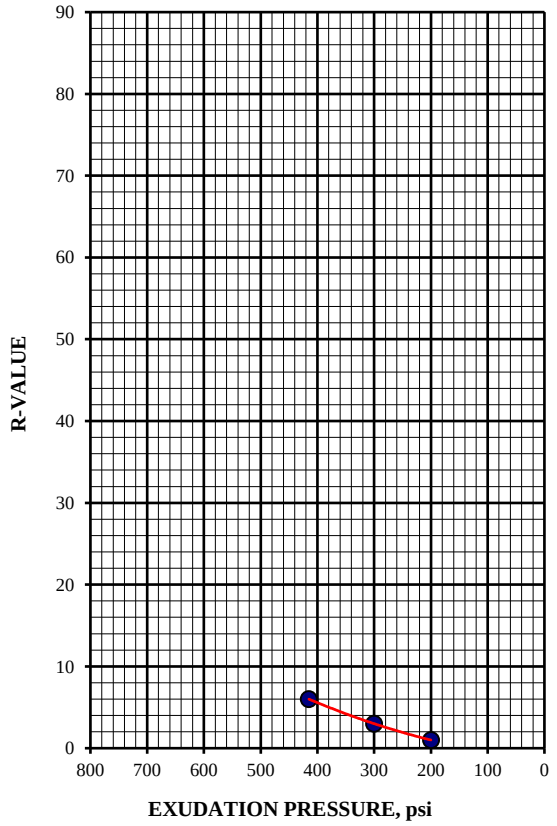
ASTM D 2844/D2844M-13

August 7, 2019

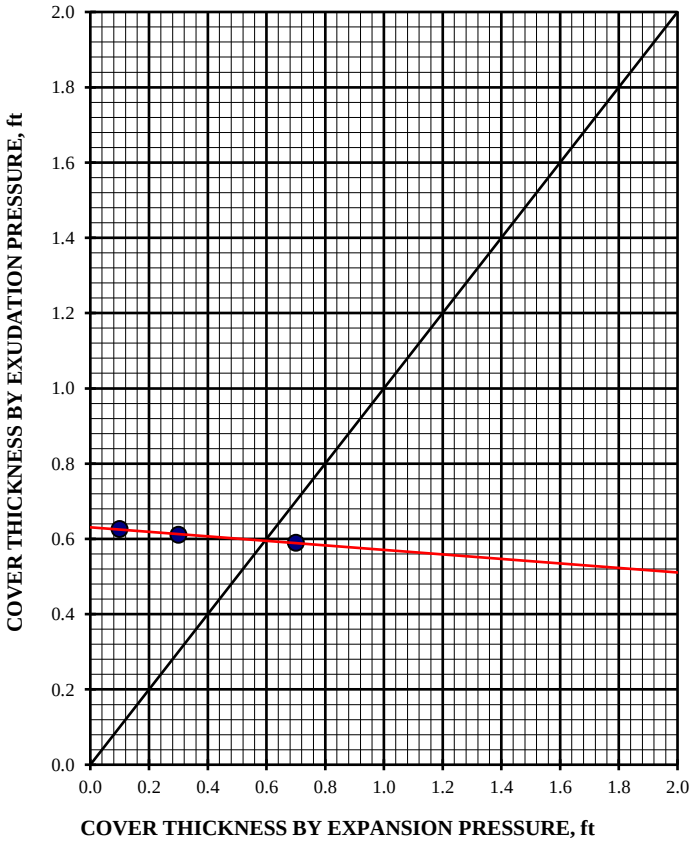
Boring #3 @ 0.0 - 3.0'
Dark Brown Lean Clay with Sand (CL)
Specified Traffic Index: 5.0

Dry Density @ 300 psi Exudation Pressure: 108.6-pcf
%Moisture @ 300 psi Exudation Pressure: 26.0%
R-Value - Exudation Pressure: 3
R-Value - Expansion Pressure: 6
R-Value @ Equilibrium: 3

EXUDATION PRESSURE CHART



EXPANSION PRESSURE CHART



Somis Ranch Farmworker Housing 302947-001

RESISTANCE '*R* ' VALUE AND EXPANSION PRESSURE

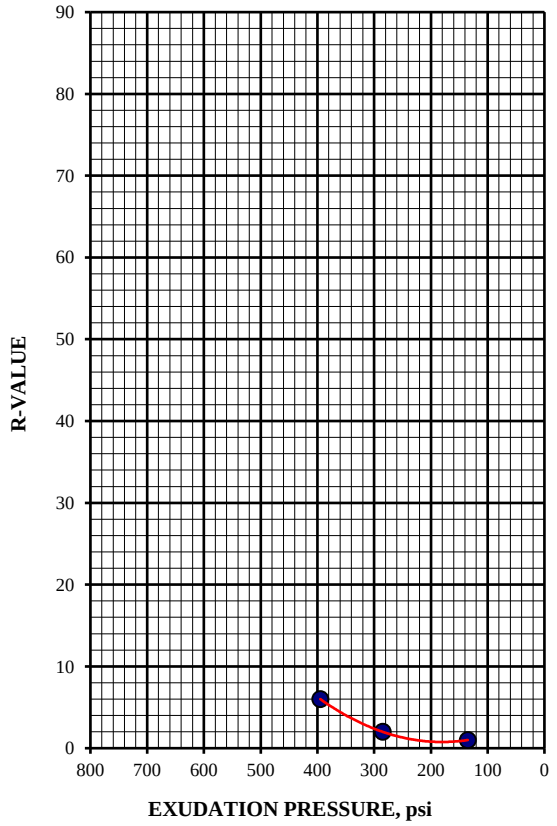
ASTM D 2844/D2844M-13

August 7, 2019

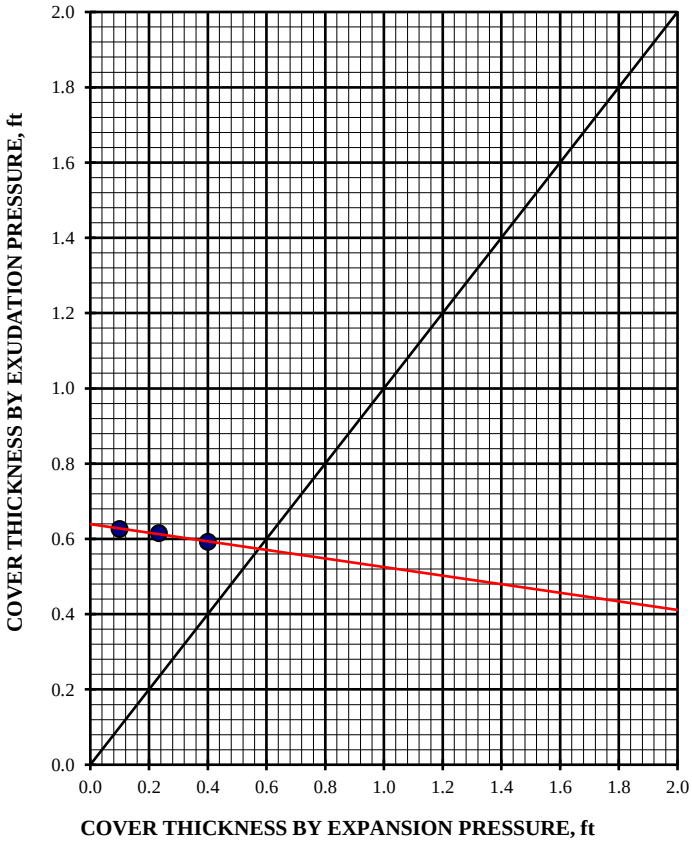
R-Value #2
Dark Brown Lean Clay with Sand (CL)
Specified Traffic Index: 5.0

Dry Density @ 300 psi Exudation Pressure: 106.1-pcf
%Moisture @ 300 psi Exudation Pressure: 28.3%
R-Value - Exudation Pressure: 2
R-Value - Expansion Pressure: 9
R-Value @ Equilibrium: 2

EXUDATION PRESSURE CHART



EXPANSION PRESSURE CHART



CAPCO
Analytical Services, Inc.

Environmental and Analytical Services-Since 1994
California State Accredited Laboratory in Accordance with ELAP Certificate # 2332

Prepared for: Earth Systems Pacific
1731 A Walter Street
Ventura, CA 93003
Attn: Todd Tranby

Report Date: July 25, 2019
Laboratory Number: 191286
Project Name: Somis Ranch
Project No: 302947-001
Sampled by: Stephen DeBolt

Enclosed are the analysis results for samples received July 17, 2019 with the Chain of Custody document. The samples were received in good condition, at 27.9°C, and they were identified and assigned the laboratory ID numbers listed below:

SAMPLE DESCRIPTION	CAS LAB NUMBER ID
B1@0-5'	191286-01
B8@0-5'	191286-02

By my signature below, I certify that the results contained in this laboratory report comply with applicable standards for certification by the California Department of Public Health's Environmental Laboratories Accreditation Program (ELAP), both technically and for completeness, and that, based on my inquiry of the person or persons directly responsible for performing the analyses, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

Lance Lewy-Laboratory Director

If you have any further questions or concerns, please contact me at your convenience. This report consists of 3 pages excluding the cover letter and the Chain of Custody.

CAPCO
Analytical Services, Inc.

Environmental and Analytical Services-Since 1994
California State Accredited Laboratory in Accordance with ELAP Certificate # 2332

CERTIFICATE OF ANALYSIS

Client: Earth Systems Pacific
CAS LAB NO: 191286-01
Sample ID: B1@0-5'
Analyst: GP

Date Sampled: 07/15/19
Date Received: 07/17/19
Sample Matrix: Soil

WET CHEMISTRY SUMMARY

COMPOUND	RESULTS	UNITS	DF	PQL	METHOD	ANALYZED
pH (Corrosivity)	8.3	S.U.	1	---	9045	07/24/19
Resistivity*	1300	Ohms-cm	1	---	SM 120.1M	07/24/19
Chloride	100	mg/Kg	1	0.3	300.0M	07/24/19
Sulfate	710	mg/Kg	2	0.6	300.0M	07/24/19

*Sample was extracted using a 1:3 ratio of soil and DI water.

DF: Dilution Factor
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
mg/Kg: Milligrams/Kilograms(ppm)

CAPCO
Analytical Services, Inc.

Environmental and Analytical Services-Since 1994
California State Accredited Laboratory in Accordance with ELAP Certificate # 2332

CERTIFICATE OF ANALYSIS

Client: Earth Systems Pacific
CAS LAB NO: 191286-02
Sample ID: B8@0-5'
Analyst: GP

Date Sampled: 07/15/19
Date Received: 07/17/19
Sample Matrix: Soil

WET CHEMISTRY SUMMARY

COMPOUND	RESULTS	UNITS	DF	PQL	METHOD	ANALYZED
pH (Corrosivity)	8.4	S.U.	1	---	9045	07/24/19
Resistivity*	1700	Ohms-cm	1	---	SM 120.1M	07/24/19
Chloride	85	mg/Kg	1	0.3	300.0M	07/24/19
Sulfate	510	mg/Kg	1	0.3	300.0M	07/24/19

*Sample was extracted using a 1:3 ratio of soil and DI water.

DF: Dilution Factor
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
mg/Kg: Milligrams/Kilograms(ppm)

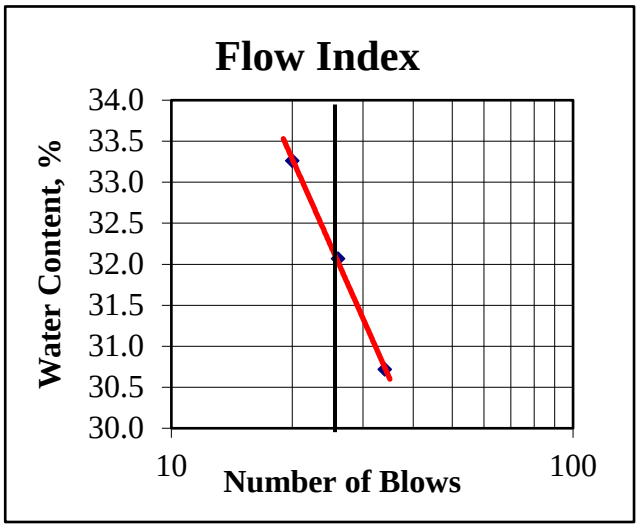
File No.: 302947-001 September 13, 2019

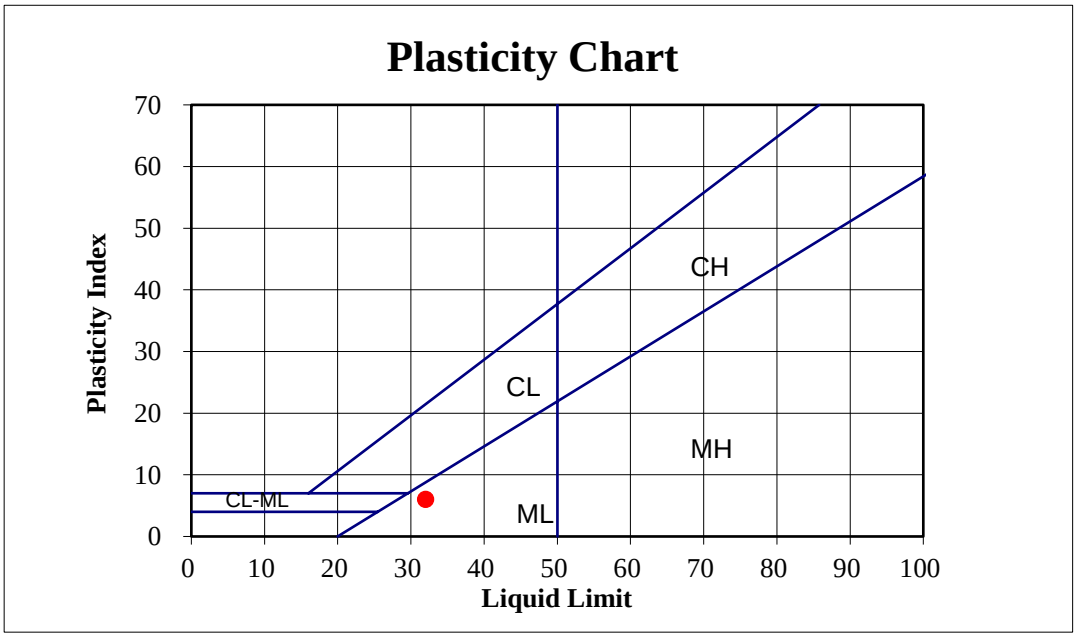
PLASTICITY INDEX

ASTM D-4318

Job Name: Somis Ranch Farmworker Housing
Sample ID: B 1 @ 25'
Soil Description: ML

DATA SUMMARY				TEST RESULTS	
Number of Blows:	20	26	34	**LIQUID LIMIT**	**32**
Water Content, %	33.3	32.1	30.7	**PLASTIC LIMIT**	**26**
Plastic Limit:	26.1	26.0		**PLASTICITY INDEX**	**6**





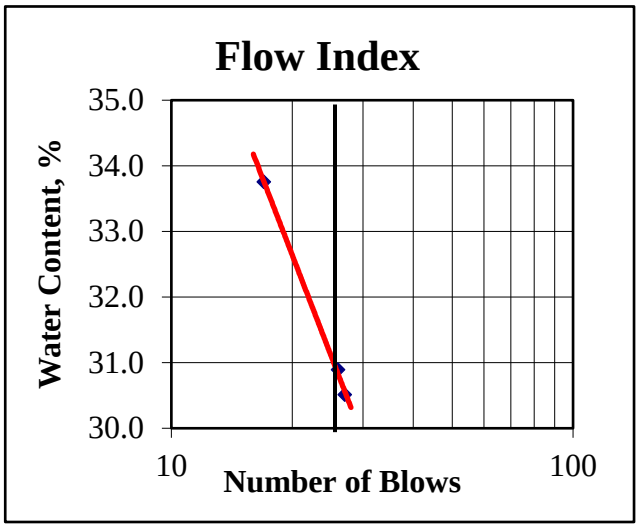
File No.: 302947-001 September 13, 2019

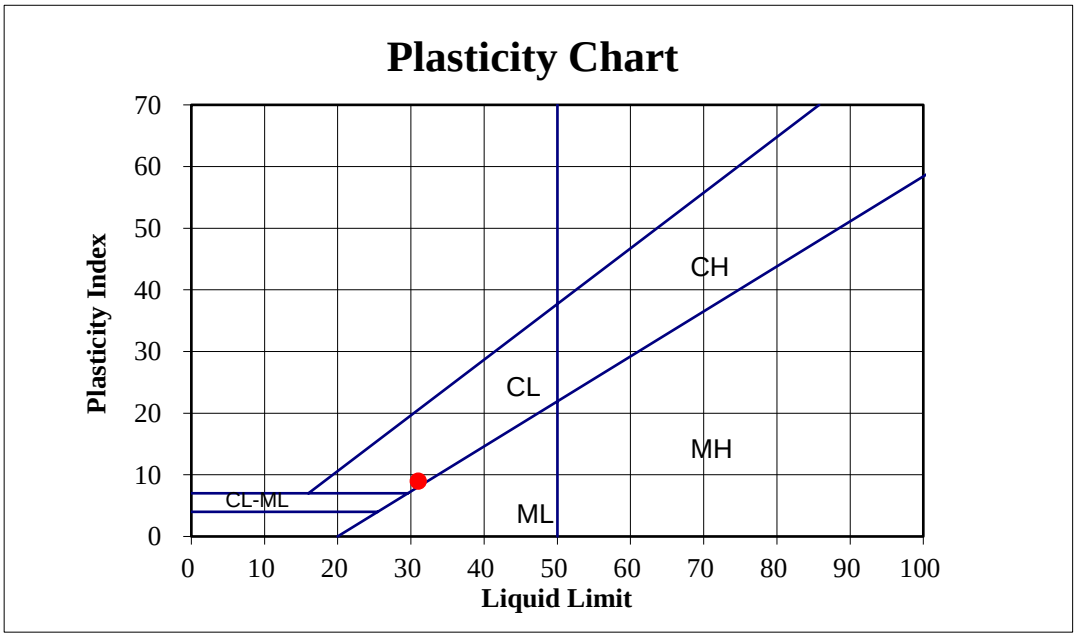
PLASTICITY INDEX

ASTM D-4318

Job Name: Somis Ranch Farmworker Housing
Sample ID: B 1 @ 30'
Soil Description: CL

DATA SUMMARY				TEST RESULTS	
Number of Blows:	17	26	27	**LIQUID LIMIT**	**31**
Water Content, %	33.8	30.9	30.5	**PLASTIC LIMIT**	**22**
Plastic Limit:	22.1	22.2		**PLASTICITY INDEX**	**9**





APPENDIX C

Table 1809.7 Minimum Foundation Design Table

TABLE 1809.7
PRESCRIPTIVE FOOTINGS FOR SUPPORTING WALLS OF LIGHT FRAME CONSTRUCTION*

WEIGHTED EXPANSION INDEX (13)	FOUNDATION FOR SLAB & RAISED FLOOR SYSTEM (4) (8)							CONCRETE SLABS (8) (12)		PREMOISTENING OF SOILS UNDER FOOTINGS, PIERS AND SLABS (4) (5)	RESTRICTION ON PIERS UNDER RAISED FLOORS
	NUMBER OF STORIES	STEM THICKNESS	FOOTING WIDTH	FOOTING THICKNESS	ALL PERIMETER FOOTINGS (5)	INTERIOR FOOTINGS FOR SLAB AND RAISED FLOORS (5)	REINFORCEMENT FOR CONTINUOUS FOUNDATIONS (2) (6)	3-1/2" MINIMUM THICKNESS			
					DEPTH BELOW NATURAL SURFACE OF GROUND AND FINISH GRADE			REINFORCEMENT (3)	TOTAL THICKNESS OF SAND (10)		
		(INCHES)									
0 - 20 Very Low (non-expansive)	1 2 3	6 8 10	12 15 18	6 6 8	12 18 24	12 18 24	1-#4 top and bottom	#4 @ 48" o.c. each way, or #3 @ 36" o.c. each way	2"	Moistening of ground recommended prior to placing concrete	Piers allowed for single floor loads only
21-50 Low	1 2 3	6 8 10	12 15 18	6 6 8	15 18 24	12 18 24	1-#4 top and bottom	#4 @ 48" o.c. each way, or #3 @ 36" o.c. each way	4"	120% of optimum moisture required to a depth of 21" below lowest adjacent grade. Testing required.	Piers allowed for single floor loads only
51-90 Medium	1 2	6 8	12 15	6 6	21 21	12 18	1-#4 top and bottom	#3 @ 24" o.c. each way	4"	130% of optimum moisture required to a depth of 27" below lowest adjacent grade. Testing required	Piers not allowed
	3	10	18	8	24	24	#3 bars @ 24" in ext. footing Bend 3' into slab (7)				
91-130 High	1 2	6 8	12 15	6 6	27 27	12 18	2-#4 Top and Bottom	#3 @ 24" o.c. each way	4"	140% of optimum moisture required to a depth of 33" below lowest adjacent grade. Testing required.	Piers not allowed
	3	10	18	8	27	24	#3 bars @ 24" in ext. footing Bend 3' into slab (7)				
Above 130 Very High	Special design by licensed engineer/architect										

*Refer to next page for footnotes (1) through (14).

FOOTNOTES TO TABLE 1809.7

1. Premoistening is required where specified in Table 1809.7 in order to achieve maximum and uniform expansion of the soil prior to construction and thus limit structural distress caused by uneven expansion and shrinkage. Other systems which do not include premoistening may be approved by the Building Official when such alternatives are shown to provide equivalent safeguards against the adverse effects of expansive soil.

2. Reinforcement for continuous foundations shall be placed not less than 3" above the bottom of the footing and not less than 3" below the top of the stem.

3. Reinforcement shall be placed at mid-depth of slab.

4. After premoistening, the specified moisture content of soils shall be maintained until concrete is placed. Required moisture content shall be verified by an approved testing laboratory not more than 24 hours prior to placement of concrete.

5. Crawl spaces under raised floors need not be pre-moistened except under interior footings. Interior footings which are not enclosed by a continuous perimeter foundation system or equivalent concrete or masonry moisture barrier complying with Footnote # 12 of Table 1809.7 shall be designed and constructed as specified for perimeter footings in Table 1809.7.

6. Foundation stem walls which exceed a height of three times the stem thickness above lowest adjacent grade shall be reinforced in accordance with Chapter 21 and Section 1914 in the IBC, or as required by engineering design, whichever is more restrictive.

7. Bent reinforcing bars between exterior footing and slab shall be omitted when floor is designed as an independent, "floating' slab.

8. Where frost conditions or unusual conditions beyond the scope of this table are found, design shall be in accordance with recommendations of a foundation investigation. Concrete slabs shall have a minimum thickness of 4 inches when the expansion index exceeds 50.

9. The ground under a raised floor system may be excavated to the elevation of the top of the perimeter footing, except where otherwise required by engineering design or to mitigate groundwater conditions.

10. GRADE BEAM, GARAGE OPENING. A grade beam not less than 12" x 12" in cross section, or 12" x depth required by Table 1809.7, whichever is deeper, reinforced as specified for continuous foundations in Table 1809.7, shall be provided at garage door openings..

11. Where a post-tensioning slab system is used, the width and depth of the perimeter footings shall meet the requirements of this table.

12. An approved vapor barrier shall be installed below concrete slab-on-grade floors of all residential occupancies in such a manner as to form an effective barrier against the migration of moisture into the slab. When sheet plastic material is employed for this purpose it shall be not less than 6 mils (.006 inch) in thickness. The installation of a vapor barrier shall not impair the effectiveness of required anchor bolts or other structural parts of a building. Foundations at the perimeter of concrete floor slabs shall form a continuous moisture barrier of Portland cement concrete or solid grouted masonry to the depths required by Table 1809.7.

13. When buildings are located on expansive soil having an expansion index greater than 50, gutters, downspouts, piping, and/or other non-erosive devices shall be provided to collect and conduct rainwater to a street, storm drain, or other approved watercourse or disposal area.

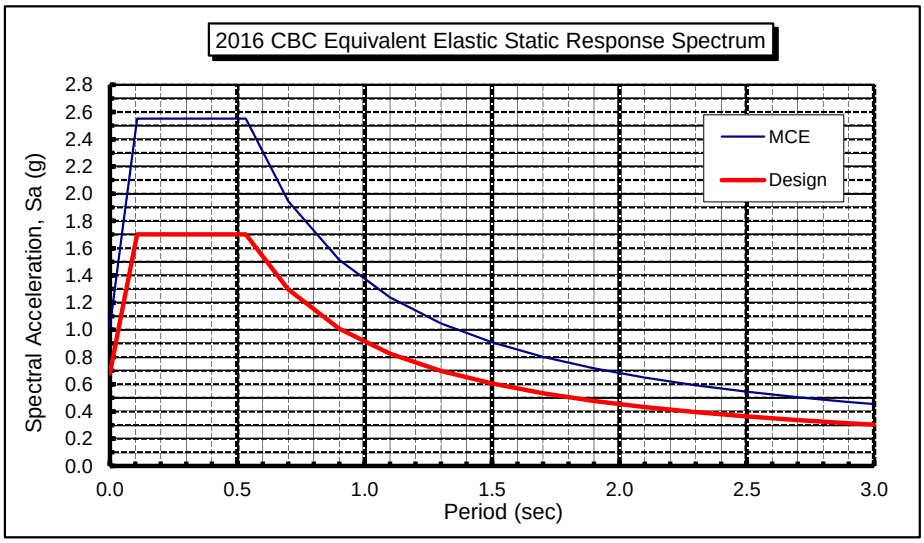
14. Fireplace footings shall be reinforced with a horizontal grid located 3" above the bottom of the footing and consisting of not less than No. 4 Bars at 12" on center each way. Vertical chimney reinforcing bars shall be hooked under the grid. Depth of fireplace chimney footings shall be no less than that required by Table 1809.7.

APPENDIX D

2016 CBC & ASCE 7-10 Seismic Parameters
Fault Parameters
SEAOC/OSHPD Seismic Design Maps

2016 California Building Code (CBC) (ASCE 7-10) Seismic Design Parameters

				CBC Reference	ASCE 7-10 Reference
Seismic Design Category		**E**		Table 1613.5.6	Table 11.6-2
Site Class		**D**		Table 1613.5.2	Table 20.3-1
Latitude:		34.247	N		
Longitude:		-119.011	W		
Maximum Considered Earthquake (MCE) Ground Motion					
Short Period Spectral Reponse	S_S	**2.552**	**g**	Figure 1613.5	Figure 22-3
1 second Spectral Response	S_1	**0.908**	**g**	Figure 1613.5	Figure 22.4
Site Coefficient	F_a	1.00		Table 1613.5.3(1)	Table 11.4-1
Site Coefficient	F_v	1.50		Table 1613.5.3(2)	Table 11-4.2
	S_{MS}	2.552	g	$= F_a*S_S$	
	S_{M1}	1.362	g	$= F_v*S_1$	
Design Earthquake Ground Motion					
Short Period Spectral Reponse	S_{DS}	**1.701**	**g**	$= 2/3*S_{MS}$	
1 second Spectral Response	S_{D1}	**0.908**	**g**	$= 2/3*S_{M1}$	
	To	0.11	sec	$= 0.2*S_{D1}/S_{DS}$	
	Ts	0.53	sec	$= S_{D1}/S_{DS}$	
Seismic Importance Factor	I	1.00		Table 1604.5	Table 11.5-1
	F_{PGA}	1.00			



Design	
Period T (sec)	Sa (g)
0.00	0.681
0.05	1.159
0.11	1.701
0.53	1.701
0.70	1.297
0.90	1.009
1.10	0.825
1.30	0.698
1.50	0.605
1.70	0.534
1.90	0.478
2.10	0.432
2.30	0.395
2.50	0.363
2.70	0.336
2.90	0.313

Table 1
Fault Parameters

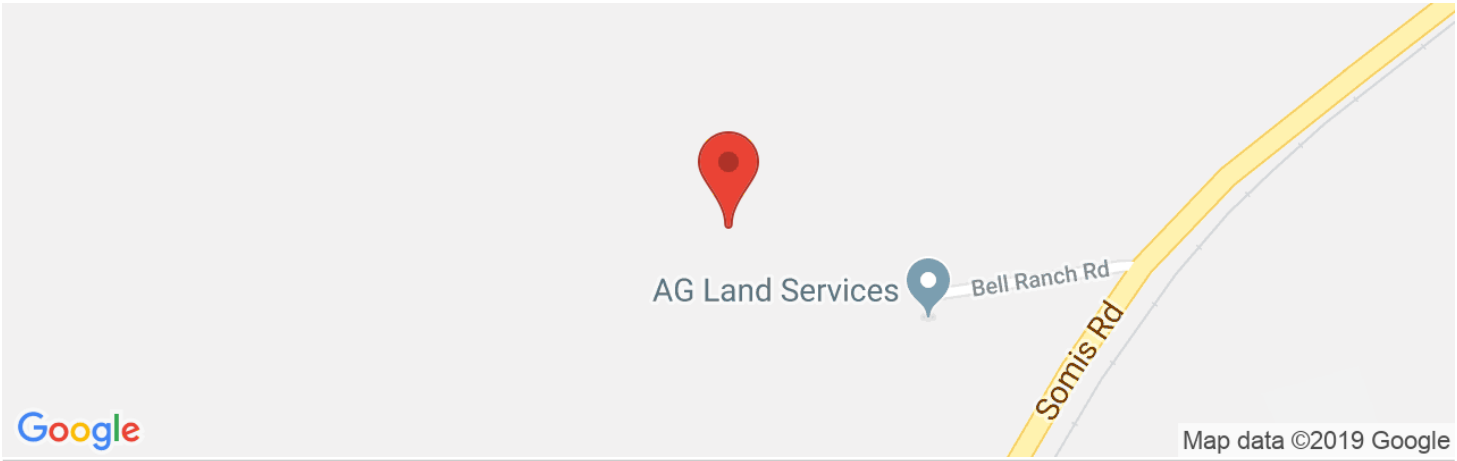
Fault Section Name	Distance (miles)	Distance (km)	Avg Dip Angle (deg.)	Avg Dip Direction (deg.)	Avg Rake (deg.)	Trace Length (km)	Fault Type	**Mean Mag**	Mean Return Interval (years)	Slip Rate (mm/yr)
Simi-Santa Rosa	0.7	1.1	60	346	30	39	B	**6.8**		1
Oak Ridge (Onshore)	6.9	11.1	65	159	90	49	B	**7.2**		4
Ventura-Pitas Point	10.0	16.0	64	353	60	44	B	**6.9**		1
San Cayetano	12.1	19.4	42	3	90	42	B	**7.2**		6
Malibu Coast (Extension), alt 1	13.3	21.4	74	4	30	35	B'	**6.5**		
Malibu Coast (Extension), alt 2	13.3	21.4	74	4	30	35	B'	**6.9**		
Sisar	13.5	21.8	29	168	na	20	B'	**7.0**		
Malibu Coast, alt 1	14.5	23.4	75	3	30	38	B	**6.6**		0.3
Malibu Coast, alt 2	14.5	23.4	74	3	30	38	B	**6.9**		0.3
Oak Ridge (Offshore)	14.9	24.1	32	180	90	38	B	**6.9**		3
Santa Susana, alt 1	15.9	25.7	55	9	90	27	B	**6.8**		5
Santa Susana, alt 2	16.2	26.1	53	10	90	43	B'	**6.8**		
Mission Ridge-Arroyo Parida-Santa Ana	17.7	28.6	70	176	90	69	B	**6.8**		0.4
Northridge Hills	17.8	28.7	31	19	90	25	B'	**7.0**		
Red Mountain	17.9	28.7	56	2	90	101	B	**7.4**		2
Anacapa-Dume, alt 1	19.1	30.8	45	354	60	51	B	**7.2**		3
Anacapa-Dume, alt 2	19.1	30.8	41	352	60	65	B	**7.2**		3
Del Valle	19.4	31.2	73	195	90	9	B'	**6.3**		
Holser, alt 1	19.8	31.8	58	187	90	20	B	**6.7**		0.4
Holser, alt 2	19.8	31.8	58	182	90	17	B'	**6.7**		
Northridge	20.7	33.3	35	201	90	33	B	**6.8**		1.5
Channel Islands Thrust	21.0	33.8	20	354	90	59	B	**7.3**		1.5
Santa Ynez (East)	21.1	34.0	70	172	0	68	B	**7.2**		2
Pine Mtn	22.9	36.9	45	5	na	62	B'	**7.3**		
Santa Cruz Island	23.1	37.2	90	188	30	69	B	**7.1**		1
Shelf (Projection)	23.9	38.5	17	21	na	70	B'	**7.8**		
North Channel	24.1	38.8	26	10	90	51	B	**6.7**		1
San Pedro Basin	24.4	39.3	88	51	na	69	B'	**7.0**		
Channel Islands Western Deep Ramp	25.7	41.4	21	204	90	62	B'	**7.3**		
Santa Monica Bay	26.3	42.4	20	44	na	17	B'	**7.0**		
Pitas Point (Lower)-Montalvo	27.1	43.7	16	359	90	30	B	**7.3**		2.5
Compton	27.8	44.8	20	34	90	65	B'	**7.5**		
San Gabriel	27.9	44.9	61	39	180	71	B	**7.3**		1
Santa Monica, alt 1	30.0	48.3	75	343	30	14	B	**6.5**		1
Santa Monica, alt 2	30.6	49.2	50	338	30	28	B	**6.7**		1
Sierra Madre (San Fernando)	30.7	49.4	45	9	90	18	B	**6.6**		2
San Pedro Escarpment	31.3	50.4	17	38	na	27	B'	**7.3**		
Santa Cruz Catalina Ridge	31.7	51.1	90	38	na	137	B'	**7.3**		
Palos Verdes	32.2	51.9	90	53	180	99	B	**7.3**		3
Big Pine (Central)	32.6	52.5	76	167	na	23	B'	**6.3**		

Reference: USGS OFR 2007-1437 (CGS SP 203) Based on Site Coordinates of 34.2469 Latitude, -119.0112 Longitude

Mean Magnitude for Type A Faults based on 0.1 weight for unsegmented section, 0.9 weight for segmented model (weighted by probability of each scenario with section listed as given on Table 3 of Appendix G in OFR 2007-1437). Mean magntude is average of Ellworths-B and Hanks & Bakun moment area relationship.

Somis Ranch Farmworkers Housing

Latitude, Longitude: 34.2469, -119.0112

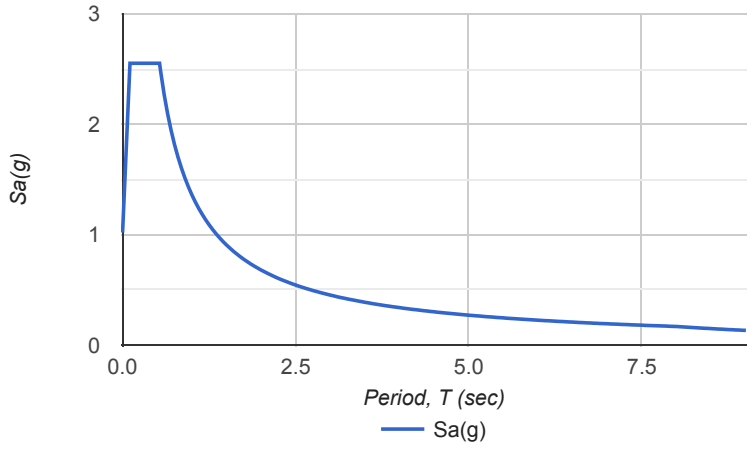


Date	4/25/2019, 5:00:13 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

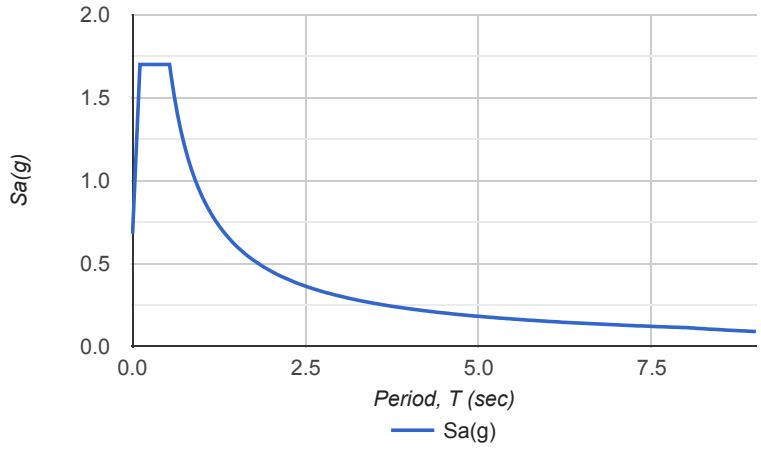
Type	Value	Description
S_S	2.552	MCE_R ground motion. (for 0.2 second period)
S_1	0.908	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.552	Site-modified spectral acceleration value
S_{M1}	1.362	Site-modified spectral acceleration value
S_{DS}	1.701	Numeric seismic design value at 0.2 second SA
S_{D1}	0.908	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	E	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.981	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.981	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.552	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.757	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.821	Factored deterministic acceleration value. (0.2 second)
S1RT	0.908	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.98	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.074	Factored deterministic acceleration value. (1.0 second)
PGAd	1.101	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.925	Mapped value of the risk coefficient at short periods
C_{R1}	0.927	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum



Design Response Spectrum



APPENDIX E

CPT-Based Dry Sand Seismic Settlement Analyses

CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA

Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Somis Ranch Farmworker Housing

Job No: 302947-001

Date: 9/4/2019

Sounding: CPT-1

Plot: 1

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

Total Liquefied Thickness (feet)
0.0
Total Induced Subsidence (inches)
0.2

EARTHQUAKE INFORMATION:

Magnitude: 7.2 (7.5)

PGA, g: 0.98 (0.88)

MSF: 1.11

GWT, feet: 50.0

Calc GWT, feet: 50.0

Method Used: 1 — 1998 NCEER (Robertson & Wride)

Averaging Increment: 3 — 0.15 m

Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF

Clean Sand Qc1n = C_Q*K_C*K_H*Qc

SF = $CRR_{7.5}$*Kσ/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes

Ignore/remediate upper: 1.0 m

Unit Weight of unsaturated soils: 115 pcf

Unit Weight of saturated soils: 130 pcf

Limiting Ic for liquefiable soils: 2.60 — Limiting Ic for K_H: 2.6

Use Moss @ P_L: 15%

Use Tokimatsu & Seed (0) or Ishihara &Yoshmine (1): 0

Required SF: 1.50 — Max $\Delta N_{1(60)}$ - post liquefied: 5.5

Min SF of Liquefiable Layers: 0.00 — Max $\Delta N_{1(60)}$ - non liquefied: 5.0

Avg SF of Liquefiable Layers: #DIV/0!

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc_{1mod} MPa	Moss eff K_C	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel. Dens. Dr (%)	K_C	K_H	Clean Sand Qc1n	1.0 Kσ	CRR	Induced M=7.5 CSR	**Liquefac. Safety Factor**	Qc1n $N_{1(60)}$ Ratio	Equiv. $N_{1(60)}$	FC Adj. $\Delta N_{1(60)}$	Equiv. $N_{1(60)cs}$	***Volumetric Strain (%)***
0.49	0.15	7.35	0.34	4.66	0.70	115	0.028	0.028	1.000	4.67	0.92	1.70	11.76	1.20	4.55	5.75		11.80	3.05		0			1.00	1.00		0.383	**Non-Liq.**	3.0	3.9			**0.00**
0.98	0.30	8.76	0.23	2.67	0.84	115	0.057	0.057	1.000	2.69	0.86	1.70	13.98	1.43	2.37	3.80		14.07	2.85		0			1.00	1.00		0.383	**Non-Liq.**	3.4	4.1			**0.00**
1.48	0.45	10.35	0.49	4.74	0.99	115	0.085	0.085	0.999	4.78	0.89	1.70	16.50	1.69	4.64	6.33		16.64	2.95		0			1.00	1.00		0.382	**Non-Liq.**	3.2	5.1			**0.00**
1.97	0.60	9.08	0.54	5.90	0.87	115	0.113	0.113	0.997	5.98	0.92	1.70	14.41	1.48	4.92	6.40		14.60	3.05		0			1.00	1.00		0.382	**Non-Liq.**	3.0	4.8			**0.00**
2.46	0.75	8.77	0.55	6.25	0.84	115	0.141	0.141	0.996	6.35	0.93	1.70	13.86	1.43	4.92	6.35		14.09	3.08		0			1.00	1.00		0.382	**Non-Liq.**	3.0	4.8			**0.00**
2.95	0.90	9.77	0.58	5.91	0.94	115	0.170	0.170	0.995	6.02	0.92	1.70	15.43	1.59	4.92	6.51		15.70	3.03		0			1.00	1.00		0.381	**Non-Liq.**	3.1	5.1			**0.00**
3.44	1.05	9.05	0.57	6.32	0.87	115	0.198	0.198	0.994	6.46	0.93	1.70	14.22	1.47	4.92	6.39		14.54	3.08		0			1.00	1.00		0.381	**Non-Liq.**	3.0	4.9			**0.00**
3.94	1.20	9.58	0.59	6.17	0.92	115	0.226	0.226	0.993	6.32	0.92	1.70	15.02	1.56	4.92	6.48		15.39	3.06		0			1.00	1.00		0.380	**Non-Liq.**	3.0	5.1			**0.00**
4.43	1.35	10.60	0.64	6.03	1.01	115	0.255	0.255	0.992	6.18	0.91	1.70	16.62	1.73	4.91	6.64		17.03	3.02		0			1.00	1.00		0.380	**Non-Liq.**	3.1	5.5			**0.00**
4.92	1.50	11.59	0.65	5.58	1.11	115	0.283	0.283	0.990	5.72	0.90	1.70	18.17	1.89	4.91	6.80		18.63	2.97		0			1.00	1.00		0.379	**Non-Liq.**	3.2	5.8			**0.00**
5.41	1.65	9.23	0.52	5.68	0.88	115	0.311	0.311	0.989	5.88	0.92	1.70	14.33	1.50	4.91	6.41		14.83	3.05		0			1.00	1.00		0.379	**Non-Liq.**	3.0	4.9			**0.00**
5.91	1.80	8.52	0.50	5.93	0.82	115	0.340	0.340	0.988	6.17	0.94	1.70	13.14	1.39	4.91	6.30		13.68	3.09		0			1.00	1.00		0.379	**Non-Liq.**	2.9	4.6			**0.00**
6.40	1.95	10.17	0.62	6.06	0.97	115	0.368	0.368	0.987	6.29	0.92	1.70	15.75	1.66	4.91	6.56		16.34	3.04		0			1.00	1.00		0.378	**Non-Liq.**	3.1	5.4			**0.00**
6.89	2.10	9.96	0.63	6.29	0.95	115	0.396	0.396	0.986	6.55	0.93	1.70	15.36	1.62	4.90	6.53		16.00	3.06		0			1.00	1.00		0.378	**Non-Liq.**	3.0	5.3			**0.00**
7.38	2.25	10.46	0.63	6.04	1.00	115	0.424	0.424	0.985	6.30	0.92	1.70	16.13	1.70	4.90	6.60		16.81	3.03		0			1.00	1.00		0.377	**Non-Liq.**	3.1	5.5			**0.00**
7.87	2.40	9.76	0.59	6.03	0.93	115	0.453	0.453	0.984	6.32	0.94	1.70	14.95	1.56	4.90	6.46		15.68	3.06		0			1.00	1.00		0.377	**Non-Liq.**	3.0	5.2			**0.00**
8.37	2.55	9.23	0.52	5.65	0.88	115	0.481	0.481	0.983	5.96	0.94	1.70	14.06	1.45	4.90	6.35		14.84	3.06		0			1.00	1.00		0.376	**Non-Liq.**	3.0	4.9			**0.00**
8.86	2.70	8.90	0.50	5.57	0.85	115	0.509	0.509	0.982	5.91	0.95	1.70	13.48	1.36	4.90	6.26		14.30	3.07		0			1.00	1.00		0.376	**Non-Liq.**	3.0	4.8			**0.00**
9.35	2.85	9.29	0.48	5.14	0.89	115	0.538	0.538	0.981	5.46	0.94	1.70	14.06	1.36	4.90	6.26		14.92	3.04		0			1.00	1.00		0.376	**Non-Liq.**	3.1	4.9			**0.00**
9.84	3.00	8.02	0.45	5.58	0.77	115	0.566	0.566	0.979	6.00	0.96	1.70	11.98	1.17	4.89	6.06		12.89	3.12		0			1.00	1.00		0.375	**Non-Liq.**	2.9	4.4			**0.00**
10.33	3.15	6.64	0.38	5.67	0.64	115	0.594	0.594	0.978	6.23	0.99	1.70	9.71	0.98	4.89	5.87		10.66	3.20		0			1.00	1.00		0.375	**Non-Liq.**	2.7	3.9			**0.00**
10.83	3.30	5.44	0.34	6.16	0.52	115	0.623	0.623	0.977	6.95	1.00	1.70	7.74	0.81	4.89	5.70		8.74	3.30		0			1.00	1.00		0.374	**Non-Liq.**	2.5	3.4			**0.00**
11.32	3.45	6.05	0.36	5.88	0.58	115	0.651	0.651	0.976	6.59	1.00	1.63	8.30	0.85	4.89	5.74		9.30	3.27		0			1.00	1.00		0.374	**Non-Liq.**	2.6	3.6			**0.00**
11.81	3.60	6.85	0.37	5.45	0.66	115	0.679	0.679	0.975	6.06	0.99	1.55	9.06	0.91	4.89	5.80		10.06	3.21		0			1.00	1.00		0.374	**Non-Liq.**	2.7	3.7			**0.00**
12.30	3.75	7.63	0.40	5.25	0.73	115	0.707	0.707	0.974	5.79	0.98	1.48	9.71	0.97	4.88	5.85		10.70	3.18		0			1.00	1.00		0.373	**Non-Liq.**	2.8	3.8			**0.00**
12.80	3.90	8.01	0.44	5.53	0.77	115	0.736	0.736	0.973	6.09	0.98	1.43	9.82	0.98	4.88	5.86		10.81	3.19		0			1.00	1.00		0.373	**Non-Liq.**	2.8	3.9			**0.00**
13.29	4.05	7.52	0.53	7.02	0.72	115	0.764	0.764	0.972	7.81	1.00	1.38	8.84	0.90	4.88	5.78		9.84	3.29		0			1.00	1.00		0.372	**Non-Liq.**	2.6	3.8			**0.00**
13.78	4.20	11.96	0.71	5.91	1.15	115	0.792	0.792	0.971	6.33	0.95	1.31	13.88	1.34	4.88	6.22		14.86	3.08		0			1.00	1.00		0.372	**Non-Liq.**	3.0	5.0			**0.00**
14.27	4.35	8.57	0.68	7.92	0.82	115	0.821	0.821	0.970	8.76	1.00	1.29	9.45	0.96	4.88	5.84		10.45	3.30		0			1.00	1.00		0.372	**Non-Liq.**	2.5	4.1			**0.00**
14.76	4.50	9.93	0.58	5.84	0.95	115	0.849	0.849	0.969	6.39	0.97	1.24	10.63	1.08	4.88	5.96		11.62	3.17		0			1.00	1.00		0.371	**Non-Liq.**	2.8	4.2			**0.00**
15.26	4.65	9.68	0.60	6.24	0.93	115	0.877	0.877	0.968	6.86	0.98	1.20	10.00	1.04	4.87	5.91		11.00	3.21		0			1.00	1.00		0.371	**Non-Liq.**	2.7	4.1			**0.00**
15.75	4.80	9.85	0.60	6.11	0.94	115	0.906	0.906	0.967	6.73	0.98	1.16	9.84	1.03	4.87	5.91		10.84	3.21		0			1.00	1.00		0.370	**Non-Liq.**	2.7	4.0			**0.00**
16.24	4.95	9.88	0.62	6.24	0.95	115	0.934	0.934	0.966	6.89	0.98	1.13	9.56	1.02	4.87	5.89		10.56	3.23		0			1.00	1.00		0.370	**Non-Liq.**	2.7	3.9			**0.00**
16.73	5.10	9.65	0.59	6.07	0.92	115	0.962	0.962	0.965	6.75	0.99	1.10	9.01	0.98	4.87	5.85		10.01	3.24		0			1.00	1.00		0.370	**Non-Liq.**	2.7	3.8			**0.00**
17.22	5.25	10.04	0.58	5.78	0.96	115	0.990	0.990	0.964	6.41	0.98	1.07	9.13	1.00	4.87	5.87		10.13	3.23		0			1.00	1.00		0.369	**Non-Liq.**	2.7	3.8			**0.00**
17.72	5.40	9.96	0.63	6.35	0.95	115	1.019	1.019	0.962	7.08	0.99	1.04	8.78	0.98	4.86	5.84		9.78	3.27		0			1.00	1.00		0.369	**Non-Liq.**	2.6	3.7			**0.00**
18.21	5.55	11.70	0.72	6.12	1.12	115	1.047	1.047	0.961	6.73	0.97	1.01	10.17	1.13	4.86	5.99		11.17	3.20		0			1.00	1.00		0.368	**Non-Liq.**	2.7	4.1			**0.00**
18.70	5.70	12.00	0.78	6.50	1.15	115	1.075	1.075	0.960	7.14	0.97	0.98	10.16	1.14	4.86	6.00		11.16	3.22		0			1.00	1.00		0.368	**Non-Liq.**	2.7	4.1			**0.00**
19.19	5.85	14.02	0.81	5.80	1.34	115	1.104	1.104	0.959	6.29	0.95	0.96	11.73	1.31	4.86	6.17		12.73	3.14		0			1.00	0.99		0.367	**Non-Liq.**	2.9	4.5			**0.00**
19.69	6.00	17.77	0.84	4.71	1.70	115	1.132	1.132	0.958	5.03	0.90	0.94	14.79	1.65	4.54	6.19		15.80	3.00		0			1.00	0.99		0.367	**Non-Liq.**	3.1	5.0			**0.00**
20.18	6.15	25.68	0.67	2.60	2.46	115	1.160	1.160	0.956	2.72	0.82	0.93	21.49	2.36	2.27	4.62		22.51	2.70		0			1.00	0.98		0.366	**Non-Liq.**	3.7	6.1			**0.00**
20.67	6.30	33.39	0.47	1.40	3.20	115	1.188	1.188	0.955	1.45	0.74	0.92	27.93	4.24	0.97	5.21		40.74	2.45		0			1.41	0.98		0.366	**Non-Liq.**	4.2	9.7			**0.00**
21.16	6.45	32.81	0.45	1.38	3.14	115	1.217	1.217	0.954	1.44	0.74	0.90	26.92	4.12	0.95	5.07		39.32	2.46		0			1.41	0.97		0.365	**Non-Liq.**	4.2	9.4			**0.00**
21.65	6.60	27.28	0.54	1.99	2.61	115	1.245	1.245	0.952	2.09	0.79	0.88	21.63	2.41	1.61	4.02		22.66	2.63		0			1.00	0.97		0.365	**Non-Liq.**	3.8	5.9			**0.00**
22.15	6.75	17.39	0.77	4.42	1.67	115	1.273	1.273	0.951	4.77	0.91	0.84	12.87	1.52	4.22	5.75		13.89	3.03		0			1.00	0.96		0.364	**Non-Liq.**	3.1	4.5			**0.00**
22.64	6.90	16.50	0.89	5.37	1.58	115	1.302	1.302	0.950	5.83	0.93	0.82	11.84	1.43	4.84	6.27		12.85	3.11		0			1.00	0.96		0.364	**Non-Liq.**	2.9	4.4			**0.00**
23.13	7.05	16.36	0.85	5.18	1.57	115	1.330	1.330	0.948	5.63	0.93	0.81	11.48	1.40	4.84	6.24		12.49	3.11		0			1.00	0.96		0.363	**Non-Liq.**	2.9	4.3			**0.00**

Depth		Tip Qc	Friction Fs	Friction Ratio	qc	Total Unit Wt.	Total Stress	Eff. Stress				Max 1.70		Moss qc1	Moss Δqc	Moss qc_{1mod}	Moss eff			Overide	Liquef. Suscept.	Rel. Dens.			Clean Sand	1.0		Induced M=7.5	Liquefac. Safety	Qc1n $N_{1(60)}$	Equiv.	FC Adj.	Equiv.	Volumetric Strain
(feet)	(m)	(tsf)	(tsf)	Rf %	MPa	(pcf)	po (tsf)	p'o (tsf)	rd	%	n	Cq	Q	MPa	MPa	MPa	K_C	Qc1n	Ic		(0 or 1)	Dr (%)	K_C	K_H	Qc1n	Kσ	CRR	CSR	Factor	Ratio	$N_{1(60)}$	$ΔN_{1(60)}$	$N_{1(60)cs}$	(%)
23.62	7.20	32.89	0.78	2.37	3.15	115	1.358	1.358	0.946	2.48	0.79	0.82	24.46	2.82	2.01	4.84		25.52	2.63		0			1.00		0.95		0.363	Non-Liq.	3.8	6.6			0.00
24.11	7.35	37.36	0.69	1.84	3.58	115	1.387	1.387	0.945	1.91	0.76	0.81	27.70	5.00	1.43	6.44		45.45	2.52		0			1.58		0.95		0.362	Non-Liq.	4.1	11.2			0.00
24.61	7.50	16.51	0.66	3.97	1.58	115	1.415	1.415	0.943	4.35	0.91	0.77	10.94	1.36	3.73	5.09		11.96	3.06		0			1.00		0.94		0.361	Non-Liq.	3.0	4.0			0.00
25.10	7.65	17.93	0.69	3.83	1.72	115	1.443	1.443	0.941	4.17	0.90	0.76	11.78	1.47	3.57	5.05		12.81	3.02		0			1.00		0.94		0.361	Non-Liq.	3.1	4.2			0.00
25.59	7.80	23.71	0.80	3.36	2.27	115	1.471	1.471	0.940	3.58	0.86	0.75	15.83	1.96	3.06	5.02		16.88	2.88		0			1.00		0.94		0.360	Non-Liq.	3.4	5.0			0.00
26.08	7.95	24.10	0.81	3.35	2.31	115	1.500	1.500	0.938	3.57	0.86	0.74	15.83	1.97	3.05	5.02		16.88	2.88		0			1.00		0.93		0.359	Non-Liq.	3.4	5.0			0.00
26.57	8.10	24.29	0.71	2.93	2.33	115	1.528	1.528	0.936	3.13	0.85	0.73	15.74	1.96	2.60	4.57		16.80	2.85		0			1.00		0.93		0.359	Non-Liq.	3.4	4.9			0.00
27.07	8.25	28.19	0.70	2.48	2.70	115	1.556	1.556	0.934	2.62	0.82	0.73	18.34	2.26	2.12	4.38		19.42	2.75		0			1.00		0.93		0.358	Non-Liq.	3.6	5.4			0.00
27.56	8.40	45.66	0.69	1.51	4.37	115	1.585	1.585	0.932	1.56	0.73	0.75	31.05	4.61	1.08	5.69		40.67	2.43		0			1.26		0.92		0.357	Non-Liq.	4.2	9.6			0.00
28.05	8.55	64.03	0.73	1.14	6.13	115	1.613	1.613	0.930	1.17	0.67	0.75	44.48	6.43	0.68	7.12	1.11	57.69	2.23		1	54	1.75	1.26	100.8	0.88	0.175	0.356	Non-Liq.	4.6	12.5	5.0	17.5	0.51
28.54	8.70	53.09	0.84	1.58	5.08	115	1.641	1.641	0.928	1.63	0.72	0.73	35.51	5.34	1.15	6.49		46.33	2.39		0			1.26		0.92		0.355	Non-Liq.	4.3	10.7			0.00
29.04	8.85	29.01	0.88	3.04	2.78	115	1.670	1.670	0.925	3.23	0.84	0.68	17.64	2.29	2.71	4.99		18.71	2.82		0			1.00		0.91		0.354	Non-Liq.	3.5	5.4			0.00
29.53	9.00	28.90	0.91	3.17	2.77	115	1.698	1.698	0.923	3.36	0.84	0.67	17.26	2.26	2.84	5.10		18.34	2.83		0			1.00		0.91		0.354	Non-Liq.	3.5	5.3			0.00
30.02	9.15	42.51	0.91	2.13	4.07	115	1.726	1.726	0.920	2.22	0.77	0.69	26.47	4.68	1.73	6.41		38.81	2.58		0			1.41		0.91		0.353	Non-Liq.	4.0	9.8			0.00
30.51	9.30	43.43	0.91	2.10	4.16	115	1.754	1.754	0.918	2.19	0.77	0.68	26.75	4.75	1.70	6.45		39.21	2.57		0			1.41		0.90		0.352	Non-Liq.	4.0	9.9			0.00
31.00	9.45	37.40	0.86	2.30	3.58	115	1.783	1.783	0.915	2.41	0.79	0.66	22.29	2.87	1.91	4.78		23.41	2.66		0			1.00		0.90		0.351	Non-Liq.	3.8	6.2			0.00
31.50	9.60	29.98	0.74	2.47	2.87	115	1.811	1.811	0.913	2.63	0.82	0.64	17.12	2.26	2.09	4.35		18.22	2.77		0			1.00		0.90		0.350	Non-Liq.	3.6	5.1			0.00
31.99	9.75	21.44	0.71	3.30	2.05	115	1.839	1.839	0.910	3.61	0.89	0.61	11.36	1.58	2.97	4.55		12.42	3.00		0			1.00		0.90		0.349	Non-Liq.	3.1	4.0			0.00
32.48	9.90	13.60	0.60	4.44	1.30	115	1.868	1.868	0.907	5.15	0.97	0.58	6.40	0.96	4.17	5.13		7.42	3.29		0			1.00		0.89		0.347	Non-Liq.	2.6	2.9			0.00
32.97	10.05	14.56	0.52	3.57	1.39	115	1.896	1.896	0.904	4.11	0.94	0.58	6.91	1.01	3.25	4.26		7.94	3.21		0			1.00		0.89		0.346	Non-Liq.	2.7	2.9			0.00
33.46	10.20	14.55	0.56	3.87	1.39	115	1.924	1.924	0.901	4.46	0.95	0.57	6.76	1.01	3.55	4.56		7.79	3.23		0			1.00		0.89		0.345	Non-Liq.	2.7	2.9			0.00
33.96	10.35	27.90	0.63	2.26	2.67	115	1.953	1.953	0.898	2.43	0.83	0.60	14.76	2.00	1.86	3.86		15.87	2.81		0			1.00		0.88		0.344	Non-Liq.	3.5	4.5			0.00
34.45	10.50	23.34	0.73	3.13	2.24	115	1.981	1.981	0.894	3.42	0.88	0.58	11.66	1.67	2.77	4.44		12.74	2.98		0			1.00		0.88		0.343	Non-Liq.	3.2	4.0			0.00
34.94	10.65	46.54	0.67	1.44	4.46	115	2.009	2.009	0.891	1.50	0.74	0.62	26.25	4.22	0.99	5.21		34.69	2.48		0			1.26		0.88		0.341	Non-Liq.	4.1	8.4			0.00
35.43	10.80	71.70	0.63	0.88	6.87	115	2.037	2.037	0.888	0.91	0.65	0.65	42.96	6.39	0.40	6.79	1.06	55.91	2.18		1	53	1.62	1.26	90.7	0.82	0.149	0.340	Non-Liq.	4.7	11.8	5.0	16.8	0.52
35.93	10.95	65.06	0.95	1.45	6.23	115	2.066	2.066	0.884	1.50	0.70	0.63	37.25	6.00	1.00	7.00		48.64	2.36		0			1.26		0.87		0.339	Non-Liq.	4.4	11.1			0.00
36.42	11.10	46.94	1.12	2.39	4.50	115	2.094	2.094	0.880	2.50	0.78	0.59	24.93	3.45	1.98	5.44		26.09	2.63		0			1.00		0.87		0.337	Non-Liq.	3.9	6.8			0.00
36.91	11.25	30.95	0.93	3.00	2.96	115	2.122	2.122	0.877	3.22	0.84	0.56	15.14	2.21	2.61	4.83		16.26	2.87		0			1.00		0.87		0.336	Non-Liq.	3.4	4.8			0.00
37.40	11.40	35.72	0.84	2.34	3.42	115	2.151	2.151	0.873	2.49	0.81	0.56	17.88	2.53	1.92	4.45		19.03	2.74		0			1.00		0.87		0.334	Non-Liq.	3.6	5.2			0.00
37.89	11.55	42.06	0.97	2.30	4.03	115	2.179	2.179	0.869	2.43	0.79	0.57	21.31	3.01	1.88	4.89		22.48	2.68		0			1.00		0.87		0.333	Non-Liq.	3.8	6.0			0.00
38.39	11.70	25.17	1.08	4.29	2.41	115	2.207	2.207	0.865	4.70	0.90	0.52	11.20	1.78	3.94	5.72		12.27	3.07		0			1.00		0.86		0.331	Non-Liq.	3.0	4.1			0.00
38.88	11.85	185.77	1.23	0.66	17.79	115	2.235	2.235	0.861	0.67	0.53	0.67	116.62	13.09	0.17	13.26		118.48	1.75		0			1.00		0.86		0.330	Non-Liq.	5.6	21.3			0.00
39.37	12.00	261.43	1.57	0.60	25.03	115	2.264	2.264	0.857	0.61	0.50	0.68	167.47	18.44	0.10	18.54	1.01	168.93	1.60		1	99	1.00	1.00	168.9	0.74	Infin.	0.328	Non-Liq.	5.9	28.8	5.0	33.8	0.11
39.86	12.15	313.97	2.00	0.64	30.07	115	2.292	2.292	0.852	0.64	0.50	0.68	200.15	22.43	0.14	22.57	1.01	201.62	1.56		1	100	1.00	1.00	201.6	0.73	Infin.	0.326	Non-Liq.	6.0	33.9	5.0	38.9	0.08
40.35	12.30	318.18	2.24	0.71	30.47	115	2.320	2.320	0.848	0.71	0.50	0.68	201.59	22.91	0.21	23.12	1.01	203.07	1.58		1	100	1.00	1.00	203.1	0.73	Infin.	0.325	Non-Liq.	5.9	34.4	5.0	39.4	0.08
40.85	12.45	295.72	2.04	0.69	28.32	115	2.349	2.349	0.843	0.70	0.50	0.67	186.11	21.05	0.20	21.25	1.01	187.60	1.60		1	100	1.00	1.00	187.6	0.73	Infin.	0.323	Non-Liq.	5.9	32.0	5.0	37.0	0.09
41.34	12.60	218.61	1.74	0.79	20.93	115	2.377	2.377	0.839	0.80	0.53	0.65	132.89	15.46	0.30	15.76	1.02	134.35	1.75		1	89	1.07	1.00	144.4	0.72	0.360	0.321	Non-Liq.	5.6	24.2	4.7	28.9	0.15
41.83	12.75	204.50	1.70	0.83	19.58	115	2.405	2.405	0.834	0.84	0.54	0.64	122.28	14.41	0.34	14.75	1.02	123.73	1.80		1	86	1.10	1.00	136.5	0.72	0.317	0.320	Non-Liq.	5.5	22.6	4.7	27.3	0.16
42.32	12.90	276.11	1.84	0.67	26.44	115	2.434	2.434	0.830	0.67	0.50	0.66	170.56	19.23	0.17	19.40	1.01	172.08	1.62		1	99	1.00	1.00	172.1	0.72	Infin.	0.318	Non-Liq.	5.8	29.5	4.9	34.4	0.10
42.81	13.05	337.04	2.24	0.66	32.28	115	2.462	2.462	0.825	0.67	0.50	0.66	207.31	23.66	0.17	23.83	1.01	208.84	1.56		1	100	1.00	1.00	208.8	0.71	Infin.	0.316	Non-Liq.	5.9	35.1	5.0	40.1	0.07
43.31	13.20	354.88	2.76	0.78	33.98	115	2.490	2.490	0.820	0.78	0.50	0.65	217.11	25.36	0.28	25.64	1.01	218.64	1.59		1	100	1.00	1.00	218.6	0.71	Infin.	0.314	Non-Liq.	5.9	37.1	5.0	42.1	0.07
43.80	13.35	384.72	3.29	0.85	36.84	115	2.518	2.518	0.816	0.86	0.50	0.65	234.15	27.82	0.36	28.18	1.01	235.69	1.59		1	100	1.00	1.00	235.7	0.71	Infin.	0.312	Non-Liq.	5.9	40.1	5.0	45.1	0.06
44.29	13.50	404.66	3.64	0.90	38.75	115	2.547	2.547	0.811	0.91	0.50	0.64	244.97	29.41	0.41	29.82	1.01	246.52	1.60		1	100	1.00	1.00	246.5	0.70	Infin.	0.311	Non-Liq.	5.9	42.0	5.0	47.0	0.05
44.78	13.65	435.52	3.79	0.87	41.71	115	2.575	2.575	0.806	0.87	0.50	0.64	262.30	31.56	0.37	31.94	1.01	263.86	1.57		1	100	1.00	1.00	263.9	0.70	Infin.	0.309	Non-Liq.	5.9	44.5	5.0	49.5	0.05
45.28	13.80	522.60	4.21	0.81	50.04	115	2.603	2.603	0.801	0.81	0.50	0.64	313.32	37.81	0.31	38.12	1.01	314.89	1.49		1	100	1.00	1.00	314.9	0.70	Infin.	0.307	Non-Liq.	6.1	51.8	5.0	56.8	0.04
45.77	13.95	438.57	3.80	0.87	42.00	115	2.632	2.632	0.796	0.87	0.50	0.63	261.26	31.57	0.37	31.94	1.01	262.84	1.57		1	100	1.00	1.00	262.8	0.69	Infin.	0.305	Non-Liq.	5.9	44.3	5.0	49.3	0.05
46.26	14.10	270.12	2.47	0.91	25.87	115	2.660	2.660	0.791	0.92	0.53	0.61	155.28	18.91	0.42	19.33	1.02	156.83	1.74		1	95	1.07	1.00	167.4	0.69	Infin.	0.303	Non-Liq.	5.6	28.1	5.0	33.1	0.10
46.75	14.25	139.07	1.91	1.38	13.32	115	2.688	2.688	0.786	1.40	0.63	0.56	71.58	9.71	0.88	10.59	1.09	72.99	2.12		1	64	1.48	1.00	108.4	0.76	0.198	0.301	Non-Liq.	4.9	15.0	5.0	20.0	0.28
47.24	14.40	243.55	1.99	0.82	23.32	130	2.720	2.720	0.781	0.83	0.53	0.61	137.99	16.56	0.32	16.88	1.02	139.55	1.75		1	91	1.07	1.00	149.5	0.69	0.391	0.299	Non-Liq.	5.6	25.0	4.9	29.9	0.12
47.74	14.55	243.51	1.83	0.75	23.32	130	2.752	2.752	0.776	0.76	0.52	0.61	137.92	16.31	0.25	16.56	1.02	139.49	1.73		1	91	1.06	1.00	147.3	0.68	0.377	0.297	Non-Liq.	5.6	24.8	4.6	29.5	0.13
48.23	14.70	300.49	2.05	0.68	28.77	130	2.784	2.784	0.771	0.69	0.50	0.62	173.46	20.07	0.18	20.25	1.01	175.08	1.62		1	100	1.00	1.00	175.1	0.68	Infin.	0.295	Non-Liq.	5.8	30.1	4.9	35.0	0.09
48.72	14.85	312.06	2.41	0.77	29.88	130	2.816	2.816	0.766	0.78	0.50	0.61	178.76	21.17	0.27	21.44	1.01	180.39	1.65		1	100	1.00	1.00	180.8	0.68	Infin.	0.293	Non-Liq.	5.8	31.3	4.9	36.2	0.08
49.21	15.00	288.85	2.27	0.79	27.66	130	2.848	2.848	0.761	0.79	0.51	0.60	162.80	19.46	0.28	19.74	1.01	164.42	1.68		1	97	1.03	1.00	168.9	0.67	Infin.	0.291	Non-Liq.	5.7	28.8	4.9	33.8	0.09
49.70	15.15	184.42	2.05	1.11	17.66	130	2.880	2.880	0.756	1.13	0.59	0.56	95.26	12.53	0.61	13.13	1.05	96.77	1.96		1	75	1.25	1.00	121.2	0.67	0.245	0.289	Non-Liq.	5.2	18.8	5.0	23.8	0.19
50.20	15.30	141.23	1.88	1.33	13.52	130	2.912	2.912	0.751	1.36	0.63	0.53	69.06	9.56	0.94	10.51	1.10	70.51	2.12		1	62	1.49	1.00	105.0	0.74	0.188	0.431	Non-Liq.	4.9	14.5	5.0	19.5	0.00

CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA

Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Somis Ranch Farmworker Housing

Job No: 302947-001

Date: 9/4/2019

Sounding: CPT-2

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

Total Liquefied Thickness (feet)
0.0

Total Induced Subsidence (inches)
0.1

EARTHQUAKE INFORMATION:

Magnitude: 7.2 (7.5)

PGA, g: 0.981 (0.88)

MSF: 1.11

GWT, feet: 50.0

Calc GWT, feet: 50.0

Plot: 1

Method Used: 1 (1998 NCEER (Robertson & Wride))

Averaging Increment: 3 (0.15 m)

Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF

Clean Sand Qc1n = C_Q*K_C*K_H*Qc

SF = $CRR_{7.5}$*Kσ/CSR

Ignore 1st/last increment into sand/silt soils: 1 (yes)

Ignore/remediate upper: 1.0 m

Unit Weight of unsaturated soils: 115 pcf

Unit Weight of saturated soils: 130 pcf

Limiting Ic for liquefiable soils: 2.60 Limiting Ic for K_H: 2.6

Use Moss @ P_L: 15%

Use Tokimatsu & Seed (0) or Ishihara &Yoshmine (1): 0

Required SF: 1.50 Max $\Delta N_{1(60)}$ - post liquefied: 5.5

Min SF of Liquefiable Layers: 0.00 Max $\Delta N_{1(60)}$ - non liquefied: 5.0

Avg SF of Liquefiable Layers: #DIV/0!

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc_{1mod} MPa	Moss eff K_C	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel. Dens. Dr (%)	K_C	K_H	Clean Sand Qc1n	1.0 Kσ	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n $N_{1(60)}$ Ratio	Equiv. $N_{1(60)}$	FC Adj. $\Delta N_{1(60)}$	Equiv. $N_{1(60)cs}$	*Volumetric Strain (%)*
0.49	0.15	16.70	0.63	3.77	1.60	115	0.028	0.028	1.000	3.77	0.82	1.70	26.78	2.72	3.58	6.30		26.83	2.72		0			1.00	1.00		0.383	Non-Liq.	3.7	7.3			0.00
0.98	0.30	11.17	0.29	2.63	1.07	115	0.057	0.057	1.000	2.65	0.84	1.70	17.85	1.82	2.34	4.15		17.94	2.76		0			1.00	1.00		0.383	Non-Liq.	3.6	5.0			0.00
1.48	0.45	10.85	0.33	3.03	1.04	115	0.085	0.085	0.999	3.05	0.85	1.70	17.29	1.77	2.77	4.53		17.43	2.81		0			1.00	1.00		0.382	Non-Liq.	3.5	5.0			0.00
1.97	0.60	10.80	0.33	3.07	1.03	115	0.113	0.113	0.997	3.10	0.85	1.70	17.17	1.76	2.81	4.57		17.35	2.82		0			1.00	1.00		0.382	Non-Liq.	3.5	5.0			0.00
2.46	0.75	8.67	0.31	3.61	0.83	115	0.141	0.141	0.996	3.67	0.89	1.70	13.71	1.41	3.40	4.81		13.94	2.94		0			1.00	1.00		0.382	Non-Liq.	3.3	4.3			0.00
2.95	0.90	7.91	0.26	3.32	0.76	115	0.170	0.170	0.995	3.39	0.89	1.70	12.44	1.29	3.09	4.37		12.72	2.95		0			1.00	1.00		0.381	Non-Liq.	3.2	3.9			0.00
3.44	1.05	7.86	0.25	3.21	0.75	115	0.198	0.198	0.994	3.30	0.89	1.70	12.31	1.28	2.97	4.25		12.62	2.95		0			1.00	1.00		0.381	Non-Liq.	3.2	3.9			0.00
3.94	1.20	6.59	0.24	3.62	0.63	115	0.226	0.226	0.993	3.75	0.92	1.70	10.23	1.07	3.41	4.48		10.59	3.04		0			1.00	1.00		0.380	Non-Liq.	3.0	3.5			0.00
4.43	1.35	6.28	0.23	3.62	0.60	115	0.255	0.255	0.992	3.77	0.93	1.70	9.69	1.02	3.41	4.43		10.10	3.07		0			1.00	1.00		0.380	Non-Liq.	3.0	3.4			0.00
4.92	1.50	7.31	0.25	3.42	0.70	115	0.283	0.283	0.990	3.55	0.91	1.70	11.29	1.19	3.18	4.37		11.75	3.00		0			1.00	1.00		0.379	Non-Liq.	3.1	3.7			0.00
5.41	1.65	8.27	0.29	3.50	0.79	115	0.311	0.311	0.989	3.64	0.90	1.70	12.79	1.35	3.28	4.62		13.29	2.96		0			1.00	1.00		0.379	Non-Liq.	3.2	4.1			0.00
5.91	1.80	9.21	0.32	3.46	0.88	115	0.340	0.340	0.988	3.59	0.88	1.70	14.25	1.50	3.22	4.72		14.79	2.92		0			1.00	1.00		0.379	Non-Liq.	3.3	4.5			0.00
6.40	1.95	8.43	0.32	3.83	0.81	115	0.368	0.368	0.987	4.01	0.90	1.70	12.95	1.37	3.63	5.01		13.54	2.98		0			1.00	1.00		0.378	Non-Liq.	3.2	4.3			0.00
6.89	2.10	8.18	0.32	3.89	0.78	115	0.396	0.396	0.986	4.09	0.91	1.70	12.51	1.33	3.69	5.02		13.15	3.00		0			1.00	1.00		0.378	Non-Liq.	3.1	4.2			0.00
7.38	2.25	8.32	0.32	3.83	0.80	115	0.424	0.424	0.985	4.04	0.91	1.70	12.68	1.35	3.63	4.99		13.36	2.99		0			1.00	1.00		0.377	Non-Liq.	3.1	4.2			0.00
7.87	2.40	7.34	0.31	4.22	0.70	115	0.453	0.453	0.984	4.49	0.94	1.70	11.06	1.19	4.05	5.24		11.79	3.06		0			1.00	1.00		0.377	Non-Liq.	3.0	3.9			0.00
8.37	2.55	7.59	0.30	3.99	0.73	115	0.481	0.481	0.983	4.26	0.93	1.70	11.42	1.24	3.80	5.04		12.20	3.04		0			1.00	1.00		0.376	Non-Liq.	3.1	4.0			0.00
8.86	2.70	7.55	0.30	4.02	0.72	115	0.509	0.509	0.982	4.31	0.94	1.70	11.32	1.23	3.83	5.06		12.14	3.05		0			1.00	1.00		0.376	Non-Liq.	3.0	4.0			0.00
9.35	2.85	7.49	0.31	4.08	0.72	115	0.538	0.538	0.981	4.40	0.94	1.70	11.18	1.17	3.90	5.07		12.04	3.06		0			1.00	1.00		0.376	Non-Liq.	3.0	4.0			0.00
9.84	3.00	7.90	0.32	4.06	0.76	115	0.566	0.566	0.979	4.37	0.94	1.70	11.78	1.18	3.87	5.05		12.69	3.04		0			1.00	1.00		0.375	Non-Liq.	3.1	4.1			0.00
10.33	3.15	8.40	0.34	4.07	0.80	115	0.594	0.594	0.978	4.38	0.94	1.70	12.54	1.20	3.88	5.08		13.49	3.02		0			1.00	1.00		0.375	Non-Liq.	3.1	4.4			0.00
10.83	3.30	7.93	0.34	4.32	0.76	115	0.623	0.623	0.977	4.69	0.95	1.66	11.45	1.10	4.15	5.25		12.42	3.06		0			1.00	1.00		0.374	Non-Liq.	3.0	4.1			0.00
11.32	3.45	8.07	0.34	4.17	0.77	115	0.651	0.651	0.976	4.54	0.95	1.59	11.12	1.09	3.99	5.07		12.10	3.07		0			1.00	1.00		0.374	Non-Liq.	3.0	4.0			0.00
11.81	3.60	8.49	0.35	4.10	0.81	115	0.679	0.679	0.975	4.45	0.95	1.52	11.23	1.10	3.90	5.01		12.21	3.06		0			1.00	1.00		0.374	Non-Liq.	3.0	4.0			0.00
12.30	3.75	8.41	0.35	4.16	0.81	115	0.707	0.707	0.974	4.54	0.95	1.47	10.67	1.06	3.97	5.04		11.66	3.08		0			1.00	1.00		0.373	Non-Liq.	3.0	3.9			0.00
12.80	3.90	7.76	0.33	4.27	0.74	115	0.736	0.736	0.973	4.72	0.97	1.42	9.43	0.96	4.10	5.06		10.42	3.13		0			1.00	1.00		0.373	Non-Liq.	2.9	3.6			0.00
13.29	4.05	7.63	0.32	4.20	0.73	115	0.764	0.764	0.972	4.67	0.97	1.37	8.89	0.92	4.01	4.94		9.88	3.15		0			1.00	1.00		0.372	Non-Liq.	2.8	3.5			0.00
13.78	4.20	8.38	0.35	4.20	0.80	115	0.792	0.792	0.971	4.64	0.96	1.32	9.46	0.98	4.01	4.99		10.45	3.13		0			1.00	1.00		0.372	Non-Liq.	2.9	3.6			0.00
14.27	4.35	9.56	0.41	4.24	0.92	115	0.821	0.821	0.970	4.64	0.95	1.27	10.51	1.08	4.05	5.13		11.49	3.09		0			1.00	1.00		0.372	Non-Liq.	3.0	3.9			0.00
14.76	4.50	8.74	0.42	4.75	0.84	115	0.849	0.849	0.969	5.26	0.97	1.24	9.24	0.97	4.60	5.57		10.23	3.17		0			1.00	1.00		0.371	Non-Liq.	2.8	3.7			0.00
15.26	4.65	8.16	0.39	4.80	0.78	115	0.877	0.877	0.968	5.38	0.98	1.20	8.27	0.89	4.66	5.54		9.27	3.21		0			1.00	1.00		0.371	Non-Liq.	2.7	3.4			0.00
15.75	4.80	8.39	0.40	4.73	0.80	115	0.906	0.906	0.967	5.30	0.98	1.16	8.23	0.89	4.57	5.47		9.23	3.21		0			1.00	1.00		0.370	Non-Liq.	2.7	3.4			0.00
16.24	4.95	8.98	0.42	4.64	0.86	115	0.934	0.934	0.966	5.18	0.97	1.13	8.59	0.93	4.48	5.41		9.59	3.19		0			1.00	1.00		0.370	Non-Liq.	2.8	3.5			0.00
16.73	5.10	9.50	0.44	4.62	0.91	115	0.962	0.962	0.965	5.14	0.97	1.10	8.85	0.97	4.45	5.42		9.84	3.18		0			1.00	1.00		0.370	Non-Liq.	2.8	3.5			0.00
17.22	5.25	9.96	0.46	4.66	0.95	115	0.990	0.990	0.964	5.17	0.96	1.07	9.03	0.99	4.50	5.49		10.03	3.17		0			1.00	1.00		0.369	Non-Liq.	2.8	3.6			0.00
17.72	5.40	11.88	0.52	4.40	1.14	115	1.019	1.019	0.962	4.81	0.94	1.04	10.64	1.16	4.21	5.38		11.63	3.10		0			1.00	1.00		0.369	Non-Liq.	2.9	4.0			0.00
18.21	5.55	14.20	0.59	4.13	1.36	115	1.047	1.047	0.961	4.46	0.91	1.01	12.55	1.37	3.93	5.29		13.55	3.02		0			1.00	1.00		0.368	Non-Liq.	3.1	4.4			0.00
18.70	5.70	14.88	0.57	3.82	1.42	115	1.075	1.075	0.960	4.12	0.90	0.99	12.85	1.41	3.59	5.00		13.86	2.99		0			1.00	1.00		0.368	Non-Liq.	3.1	4.4			0.00
19.19	5.85	18.04	0.46	2.56	1.73	115	1.104	1.104	0.959	2.72	0.85	0.96	15.44	1.69	2.22	3.91		16.45	2.82		0			1.00	0.99		0.367	Non-Liq.	3.5	4.7			0.00
19.69	6.00	12.53	0.45	3.55	1.20	115	1.132	1.132	0.958	3.90	0.92	0.94	10.13	1.15	3.29	4.45		11.13	3.06		0			1.00	0.99		0.367	Non-Liq.	3.0	3.7			0.00
20.18	6.15	9.61	0.52	5.36	0.92	115	1.160	1.160	0.956	6.10	0.99	0.91	7.29	0.87	4.85	5.72		8.29	3.29		0			1.00	0.98		0.366	Non-Liq.	2.6	3.2			0.00
20.67	6.30	10.16	0.53	5.26	0.97	115	1.188	1.188	0.955	5.96	0.98	0.89	7.56	0.91	4.85	5.76		8.57	3.27		0			1.00	0.98		0.366	Non-Liq.	2.6	3.3			0.00
21.16	6.45	10.03	0.54	5.43	0.96	115	1.217	1.217	0.954	6.17	0.99	0.87	7.26	0.88	4.85	5.73		8.26	3.29		0			1.00	0.97		0.365	Non-Liq.	2.6	3.2			0.00
21.65	6.60	10.65	0.54	5.04	1.02	115	1.245	1.245	0.952	5.71	0.98	0.85	7.58	0.93	4.85	5.77		8.58	3.26		0			1.00	0.97		0.365	Non-Liq.	2.6	3.3			0.00
22.15	6.75	11.51	0.52	4.55	1.10	115	1.273	1.273	0.951	5.11	0.96	0.84	8.10	0.99	4.36	5.35		9.10	3.21		0			1.00	0.96		0.364	Non-Liq.	2.7	3.3			0.00
22.64	6.90	12.05	0.51	4.23	1.15	115	1.302	1.302	0.950	4.74	0.95	0.82	8.34	1.02	4.01	5.04		9.35	3.18		0			1.00	0.96		0.364	Non-Liq.	2.8	3.4			0.00
23.13	7.05	9.46	0.46	4.84	0.91	115	1.330	1.330	0.948	5.63	0.99	0.80	6.12	0.78	4.66	5.45		7.12	3.33		0			1.00	0.96		0.363	Non-Liq.	2.5	2.9			0.00

Depth		Tip Qc	Friction Fs	Friction Ratio	qc	Total Unit Wt.	Total Stress	Eff. Stress				Max 1.70		Moss qc1	Moss Δqc	Moss qc_{1mod}	Moss eff			Overide	Liquef. Suscept.	Rel. Dens.			Clean Sand	1.0		Induced M=7.5	**Liquefac. Safety**	Qc1n $N_{1(60)}$	Equiv.	FC Adj.	Equiv.	***Volumetric Strain***
(feet)	(m)	(tsf)	(tsf)	Rf %	MPa	(pcf)	po (tsf)	p'o (tsf)	rd	%	n	Cq	Q	MPa	MPa	MPa	K_C	Qc1n	Ic		(0 or 1)	Dr (%)	K_C	K_H	Qc1n	Kσ	CRR	CSR	**Factor**	Ratio	$N_{1(60)}$	$\Delta N_{1(60)}$	$N_{1(60)cs}$	***(%)***
23.62	7.20	9.96	0.45	4.51	0.95	115	1.358	1.358	0.946	5.23	0.98	0.78	6.36	0.82	4.31	5.13		7.36	3.30		0			1.00		0.95		0.363	**Non-Liq.**	2.5	2.9			**0.00**
24.11	7.35	12.08	0.51	4.26	1.16	115	1.387	1.387	0.945	4.81	0.96	0.77	7.80	0.99	4.04	5.03		8.81	3.20		0			1.00		0.95		0.362	**Non-Liq.**	2.7	3.2			**0.00**
24.61	7.50	14.22	0.54	3.82	1.36	115	1.415	1.415	0.943	4.24	0.93	0.76	9.24	1.16	3.56	4.72		10.26	3.11		0			1.00		0.94		0.361	**Non-Liq.**	2.9	3.5			**0.00**
25.10	7.65	15.72	0.61	3.85	1.51	115	1.443	1.443	0.941	4.24	0.92	0.75	10.14	1.28	3.59	4.88		11.17	3.08		0			1.00		0.94		0.361	**Non-Liq.**	3.0	3.8			**0.00**
25.59	7.80	15.83	0.58	3.68	1.52	115	1.471	1.471	0.940	4.06	0.92	0.74	10.04	1.28	3.41	4.69		11.07	3.07		0			1.00		0.94		0.360	**Non-Liq.**	3.0	3.7			**0.00**
26.08	7.95	35.07	0.49	1.40	3.36	115	1.500	1.500	0.938	1.47	0.75	0.77	24.43	3.26	0.97	4.22		29.42	2.50		0			1.15		0.93		0.359	**Non-Liq.**	4.1	7.2			**0.00**
26.57	8.10	50.59	0.59	1.16	4.84	115	1.528	1.528	0.936	1.20	0.69	0.77	35.93	4.70	0.71	5.41	1.15	42.70	2.31		1	42	1.99	1.15	85.1	0.93	0.137	0.359	**Non-Liq.**	4.5	9.6	5.0	14.6	**0.80**
27.07	8.25	78.13	0.80	1.03	7.48	115	1.556	1.556	0.934	1.05	0.64	0.78	56.58	7.29	0.57	7.86	1.08	66.54	2.12		1	60	1.49	1.15	99.2	0.89	0.171	0.358	**Non-Liq.**	4.8	13.7	5.0	18.7	**0.43**
27.56	8.40	72.72	0.95	1.31	6.96	115	1.585	1.585	0.932	1.34	0.67	0.76	51.38	6.80	0.86	7.67		60.54	2.21		0			1.15		0.92		0.357	**Non-Liq.**	4.7	13.0			**0.00**
28.05	8.55	36.81	1.05	2.85	3.52	115	1.613	1.613	0.930	2.98	0.80	0.71	23.71	2.98	2.51	5.49		24.79	2.69		0			1.00		0.92		0.356	**Non-Liq.**	3.7	6.7			**0.00**
28.54	8.70	27.83	0.90	3.25	2.67	115	1.641	1.641	0.928	3.45	0.85	0.69	17.07	2.21	2.93	5.14		18.14	2.85		0			1.00		0.92		0.355	**Non-Liq.**	3.4	5.3			**0.00**
29.04	8.85	29.61	0.79	2.68	2.84	115	1.670	1.670	0.925	2.84	0.82	0.69	18.13	2.32	2.32	4.64		19.21	2.77		0			1.00		0.91		0.354	**Non-Liq.**	3.6	5.4			**0.00**
29.53	9.00	23.44	0.83	3.56	2.24	115	1.698	1.698	0.923	3.84	0.88	0.66	13.58	1.82	3.26	5.07		14.64	2.95		0			1.00		0.91		0.354	**Non-Liq.**	3.2	4.5			**0.00**
30.02	9.15	27.88	0.76	2.72	2.67	115	1.726	1.726	0.920	2.90	0.83	0.66	16.43	2.15	2.36	4.51		17.51	2.81		0			1.00		0.91		0.353	**Non-Liq.**	3.5	5.0			**0.00**
30.51	9.30	32.29	0.83	2.57	3.09	115	1.754	1.754	0.918	2.72	0.81	0.66	19.11	2.49	2.20	4.69		20.21	2.74		0			1.00		0.90		0.352	**Non-Liq.**	3.6	5.6			**0.00**
31.00	9.45	19.33	0.84	4.33	1.85	115	1.783	1.783	0.915	4.77	0.92	0.62	10.28	1.45	4.06	5.52		11.32	3.11		0			1.00		0.90		0.351	**Non-Liq.**	2.9	3.9			**0.00**
31.50	9.60	34.58	0.83	2.41	3.31	115	1.811	1.811	0.913	2.54	0.80	0.65	20.11	2.63	2.03	4.66		21.22	2.71		0			1.00		0.90		0.350	**Non-Liq.**	3.7	5.7			**0.00**
31.99	9.75	49.39	0.93	1.89	4.73	115	1.839	1.839	0.910	1.96	0.75	0.66	29.76	5.96	1.47	7.44		48.83	2.51		0			1.58		0.90		0.349	**Non-Liq.**	4.1	11.9			**0.00**
32.48	9.90	32.80	0.94	2.87	3.14	115	1.868	1.868	0.907	3.05	0.83	0.63	18.29	2.48	2.51	4.99		19.39	2.79		0			1.00		0.89		0.347	**Non-Liq.**	3.5	5.5			**0.00**
32.97	10.05	39.28	1.04	2.64	3.76	115	1.896	1.896	0.904	2.78	0.80	0.63	22.16	2.98	2.27	5.25		23.28	2.70		0			1.00		0.89		0.346	**Non-Liq.**	3.7	6.3			**0.00**
33.46	10.20	110.84	1.27	1.15	10.61	115	1.924	1.924	0.901	1.17	0.62	0.69	71.00	13.34	0.69	14.02		114.14	2.07		0			1.58		0.89		0.345	**Non-Liq.**	4.9	23.1			**0.00**
33.96	10.35	47.14	1.38	2.92	4.51	115	1.953	1.953	0.898	3.04	0.79	0.62	26.33	3.61	2.55	6.16		27.46	2.67		0			1.00		0.88		0.344	**Non-Liq.**	3.8	7.3			**0.00**
34.45	10.50	23.42	1.10	4.68	2.24	115	1.981	1.981	0.894	5.11	0.91	0.57	11.47	1.73	4.40	6.12		12.53	3.09		0			1.00		0.88		0.343	**Non-Liq.**	3.0	4.2			**0.00**
34.94	10.65	15.09	0.74	4.87	1.45	115	2.009	2.009	0.891	5.62	0.97	0.54	6.65	1.05	4.60	5.64		7.67	3.30		0			1.00		0.88		0.341	**Non-Liq.**	2.5	3.0			**0.00**
35.43	10.80	26.05	0.80	3.08	2.49	115	2.037	2.037	0.888	3.35	0.86	0.57	12.89	1.86	2.71	4.58		13.98	2.93		0			1.00		0.88		0.340	**Non-Liq.**	3.3	4.3			**0.00**
35.93	10.95	28.98	0.93	3.22	2.77	115	2.066	2.066	0.884	3.47	0.86	0.56	14.35	2.09	2.85	4.94		15.45	2.91		0			1.00		0.87		0.339	**Non-Liq.**	3.3	4.7			**0.00**
36.42	11.10	51.27	0.98	1.92	4.91	115	2.094	2.094	0.880	2.00	0.75	0.60	27.85	5.90	1.48	7.38		45.87	2.53		0			1.58		0.87		0.337	**Non-Liq.**	4.0	11.3			**0.00**
36.91	11.25	38.14	1.07	2.81	3.65	115	2.122	2.122	0.877	2.97	0.81	0.57	19.31	2.77	2.41	5.18		20.44	2.76		0			1.00		0.87		0.336	**Non-Liq.**	3.6	5.7			**0.00**
37.40	11.40	21.62	0.87	4.00	2.07	115	2.151	2.151	0.873	4.44	0.91	0.52	9.64	1.51	3.65	5.16		10.71	3.11		0			1.00		0.87		0.334	**Non-Liq.**	2.9	3.7			**0.00**
37.89	11.55	23.12	0.73	3.16	2.21	115	2.179	2.179	0.869	3.49	0.88	0.53	10.45	1.59	2.77	4.36		11.53	3.02		0			1.00		0.87		0.333	**Non-Liq.**	3.1	3.7			**0.00**
38.39	11.70	18.07	0.71	3.94	1.73	115	2.207	2.207	0.865	4.49	0.93	0.50	7.55	1.21	3.58	4.79		8.60	3.20		0			1.00		0.86		0.331	**Non-Liq.**	2.7	3.1			**0.00**
38.88	11.85	15.24	0.58	3.80	1.46	115	2.235	2.235	0.861	4.46	0.95	0.49	6.02	0.98	3.43	4.41		7.05	3.28		0			1.00		0.86		0.330	**Non-Liq.**	2.6	2.7			**0.00**
39.37	12.00	16.24	0.58	3.58	1.56	115	2.264	2.264	0.857	4.16	0.94	0.49	6.45	1.05	3.20	4.24		7.49	3.23		0			1.00		0.86		0.328	**Non-Liq.**	2.7	2.8			**0.00**
39.86	12.15	16.90	0.65	3.82	1.62	115	2.292	2.292	0.852	4.42	0.94	0.48	6.66	1.10	3.44	4.54		7.71	3.24		0			1.00		0.86		0.326	**Non-Liq.**	2.7	2.9			**0.00**
40.35	12.30	19.93	0.76	3.81	1.91	115	2.320	2.320	0.848	4.31	0.92	0.48	8.06	1.32	3.42	4.74		9.13	3.16		0			1.00		0.85		0.325	**Non-Liq.**	2.8	3.3			**0.00**
40.85	12.45	30.64	0.88	2.86	2.93	115	2.349	2.349	0.843	3.10	0.85	0.51	13.60	2.09	2.43	4.52		14.73	2.90		0			1.00		0.85		0.323	**Non-Liq.**	3.3	4.4			**0.00**
41.34	12.60	34.41	0.98	2.83	3.29	115	2.377	2.377	0.839	3.04	0.83	0.51	15.41	2.37	2.40	4.77		16.55	2.85		0			1.00		0.85		0.321	**Non-Liq.**	3.4	4.8			**0.00**
41.83	12.75	47.19	1.04	2.21	4.52	115	2.405	2.405	0.834	2.33	0.78	0.53	22.33	3.27	1.75	5.02		23.53	2.65		0			1.00		0.85		0.320	**Non-Liq.**	3.8	6.2			**0.00**
42.32	12.90	70.03	1.07	1.53	6.71	115	2.434	2.434	0.830	1.59	0.71	0.56	35.46	6.12	1.06	7.18		46.45	2.39		0			1.26		0.85		0.318	**Non-Liq.**	4.3	10.7			**0.00**
42.81	13.05	58.32	1.16	2.00	5.59	115	2.462	2.462	0.825	2.08	0.75	0.53	28.06	5.12	1.53	6.65		37.04	2.54		0			1.26		0.84		0.316	**Non-Liq.**	4.0	9.2			**0.00**
43.31	13.20	42.45	1.19	2.81	4.07	115	2.490	2.490	0.820	2.99	0.81	0.50	18.84	2.94	2.36	5.30		20.01	2.77		0			1.00		0.84		0.314	**Non-Liq.**	3.6	5.6			**0.00**
43.80	13.35	43.50	1.14	2.62	4.17	115	2.518	2.518	0.816	2.78	0.80	0.50	19.27	2.98	2.16	5.14		20.46	2.75		0			1.00		0.84		0.312	**Non-Liq.**	3.6	5.6			**0.00**
44.29	13.50	62.51	1.24	1.98	5.99	115	2.547	2.547	0.811	2.06	0.74	0.52	29.52	4.97	1.50	6.47		35.48	2.52		0			1.15		0.84		0.311	**Non-Liq.**	4.1	8.7			**0.00**
44.78	13.65	75.81	1.49	1.97	7.26	115	2.575	2.575	0.806	2.04	0.72	0.53	36.42	6.11	1.49	7.60	1.24	43.45	2.45		1	42	2.51	1.15	109.1	0.84	0.201	0.309	**Non-Liq.**	4.2	10.3	5.0	15.3	**0.53**
45.28	13.80	84.44	1.41	1.67	8.09	115	2.603	2.603	0.801	1.72	0.70	0.53	41.29	6.73	1.18	7.91	1.18	49.10	2.36		1	47	2.15	1.15	105.5	0.84	0.189	0.307	**Non-Liq.**	4.4	11.2	5.0	16.2	**0.46**
45.77	13.95	66.95	1.33	1.99	6.41	115	2.632	2.632	0.796	2.07	0.74	0.51	31.05	5.30	1.50	6.80		37.26	2.50		0			1.15		0.83		0.305	**Non-Liq.**	4.1	9.1			**0.00**
46.26	14.10	55.98	1.40	2.50	5.36	115	2.660	2.660	0.791	2.63	0.78	0.49	24.64	3.85	2.01	5.86		25.86	2.65		0			1.00		0.83		0.303	**Non-Liq.**	3.8	6.8			**0.00**
46.75	14.25	21.45	1.03	4.82	2.05	115	2.688	2.688	0.786	5.52	0.94	0.41	7.36	1.37	4.34	5.72		8.41	3.26		0			1.00		0.83		0.301	**Non-Liq.**	2.6	3.2			**0.00**
47.24	14.40	78.22	1.15	1.47	7.49	130	2.720	2.720	0.781	1.52	0.70	0.52	36.92	7.32	0.97	8.30		53.81	2.36		0			1.41		0.83		0.299	**Non-Liq.**	4.4	12.3			**0.00**
47.74	14.55	92.91	1.49	1.61	8.90	130	2.752	2.752	0.776	1.65	0.69	0.52	44.19	6.33	1.10	7.43		45.54	2.32		0			1.00		0.83		0.297	**Non-Liq.**	4.5	10.2			**0.00**
48.23	14.70	34.49	1.33	3.84	3.30	130	2.784	2.784	0.771	4.18	0.87	0.43	12.92	2.30	3.33	5.63		14.06	2.99		0			1.00		0.82		0.295	**Non-Liq.**	3.1	4.5			**0.00**
48.72	14.85	18.30	0.95	5.18	1.75	130	2.816	2.816	0.766	6.12	0.97	0.39	5.64	1.12	4.47	5.60		6.67	3.38		0			1.00		0.82		0.293	**Non-Liq.**	2.4	2.8			**0.00**
49.21	15.00	14.79	0.63	4.28	1.42	130	2.848	2.848	0.761	5.30	0.99	0.38	4.23	0.84	3.75	4.59		5.24	3.44		0			1.00		0.82		0.291	**Non-Liq.**	2.3	2.3			**0.00**
49.70	15.15	27.73	0.75	2.71	2.66	130	2.880	2.880	0.756	3.02	0.87	0.42	9.83	1.69	2.18	3.88		10.97	3.00		0			1.00		0.82		0.289	**Non-Liq.**	3.1	3.5			**0.00**
50.20	15.30	53.69	1.12	2.09	5.14	130	2.912	2.912	0.751	2.21	0.77	0.46	21.97	3.48	1.82	5.30		23.23	2.64		0			1.00		0.82		0.431	**Non-Liq.**	3.8	6.1			**0.00**

CPT-LIQUEFY.XLS - A SPREADSHEET FOR EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL USING CPT DATA

Developed 2003 by Shelton L. Stringer, GE, Earth Systems Southwest

Project: Somis Ranch Farmworker Housing

Job No: 302947-001

Date: 9/4/2019

Sounding: CPT-3

Liquefaction Analysis using 1998 NCEER (Robertson & Wride) method

Settlement Analysis using Tokimatsu & Seed (1987), clean sand Qc1n/N1(60) ratio =5

Total Liquefied Thickness (feet)
0.0
Total Induced Subsidence (inches)
0.2

EARTHQUAKE INFORMATION:

Magnitude: 7.2 (7.5)

PGA, g: 0.981 (0.88)

MSF: 1.11

GWT, feet: 50.0

Calc GWT, feet: 50.0

Plot: 2

Method Used: 1 — 1998 NCEER (Robertson & Wride)

Averaging Increment: 3 — 0.15 m

Induced CSR (M=7.5) = 0.65*PGA*(po/p'o)*rd/MSF

Clean Sand Qc1n = C_Q*K_C*K_H*Qc

SF = $CRR_{7.5}$*Kσ/CSR

Ignore 1st/last increment into sand/silt soils: 1 yes

Ignore/remediate upper: 1.0 m

Unit Weight of unsaturated soils: 115 pcf

Unit Weight of saturated soils: 130 pcf

Limiting Ic for liquefiable soils: 2.60 — Limiting Ic for K_H: 2.6

Use Moss @ P_L: 15%

Use Tokimatsu & Seed (0) or Ishihara &Yoshmine (1): 0

Required SF: 1.50 — Max $\Delta N_{1(60)}$ - post liquefied: 5.5

Min SF of Liquefiable Layers: 0.00 — Max $\Delta N_{1(60)}$ - non liquefied: 5.0

Avg SF of Liquefiable Layers: #DIV/0!

Depth (feet)	(m)	Tip Qc (tsf)	Friction Fs (tsf)	Friction Ratio Rf %	qc MPa	Total Unit Wt. (pcf)	Total Stress po (tsf)	Eff. Stress p'o (tsf)	rd	F %	n	Max 1.70 Cq	Q	Moss qc1 MPa	Moss Δqc MPa	Moss qc_{1mod} MPa	Moss eff K_C	Qc1n	Ic	Override	Liquef. Suscept. (0 or 1)	Rel. Dens. Dr (%)	K_C	K_H	Clean Sand Qc1n	1.0 Kσ	CRR	Induced M=7.5 CSR	Liquefac. Safety Factor	Qc1n $N_{1(60)}$ Ratio	Equiv. $N_{1(60)}$	FC Adj. $\Delta N_{1(60)}$	Equiv. $N_{1(60)cs}$	*Volumetric Strain (%)*
0.49	0.15	14.46	0.42	2.90	1.39	115	0.028	0.028	1.000	2.90	0.82	1.70	23.19	2.35	2.63	4.98		23.24	2.69		0			1.00	1.00		0.383	Non-Liq.	3.7	6.2			0.00
0.98	0.30	13.02	0.33	2.50	1.25	115	0.057	0.057	1.000	2.51	0.82	1.70	20.84	2.12	2.19	4.31		20.93	2.69		0			1.00	1.00		0.383	Non-Liq.	3.7	5.6			0.00
1.48	0.45	12.86	0.68	5.30	1.23	115	0.085	0.085	0.999	5.34	0.88	1.70	20.53	2.09	4.93	7.02		20.67	2.91		0			1.00	1.00		0.382	Non-Liq.	3.3	6.2			0.00
1.97	0.60	11.87	0.64	5.39	1.14	115	0.113	0.113	0.997	5.44	0.89	1.70	18.90	1.93	4.92	6.86		19.08	2.94		0			1.00	1.00		0.382	Non-Liq.	3.2	5.9			0.00
2.46	0.75	8.02	0.52	6.48	0.77	115	0.141	0.141	0.996	6.60	0.95	1.70	12.65	1.31	4.92	6.23		12.88	3.13		0			1.00	1.00		0.382	Non-Liq.	2.9	4.5			0.00
2.95	0.90	7.45	0.45	6.10	0.71	115	0.170	0.170	0.995	6.24	0.95	1.70	11.70	1.21	4.92	6.13		11.98	3.14		0			1.00	1.00		0.381	Non-Liq.	2.9	4.2			0.00
3.44	1.05	7.90	0.45	5.72	0.76	115	0.198	0.198	0.994	5.87	0.94	1.70	12.38	1.29	4.92	6.20		12.69	3.10		0			1.00	1.00		0.381	Non-Liq.	2.9	4.3			0.00
3.94	1.20	8.08	0.46	5.65	0.77	115	0.226	0.226	0.993	5.81	0.94	1.70	12.62	1.32	4.92	6.23		12.98	3.09		0			1.00	1.00		0.380	Non-Liq.	3.0	4.4			0.00
4.43	1.35	8.44	0.48	5.74	0.81	115	0.255	0.255	0.992	5.92	0.93	1.70	13.15	1.37	4.91	6.29		13.56	3.08		0			1.00	1.00		0.380	Non-Liq.	3.0	4.6			0.00
4.92	1.50	8.37	0.49	5.91	0.80	115	0.283	0.283	0.990	6.12	0.94	1.70	12.99	1.36	4.91	6.28		13.45	3.09		0			1.00	1.00		0.379	Non-Liq.	2.9	4.6			0.00
5.41	1.65	7.42	0.44	5.98	0.71	115	0.311	0.311	0.989	6.25	0.95	1.70	11.43	1.21	4.91	6.12		11.93	3.14		0			1.00	1.00		0.379	Non-Liq.	2.8	4.2			0.00
5.91	1.80	7.06	0.40	5.62	0.68	115	0.340	0.340	0.988	5.91	0.95	1.70	10.79	1.15	4.91	6.06		11.34	3.15		0			1.00	1.00		0.379	Non-Liq.	2.8	4.0			0.00
6.40	1.95	6.27	0.36	5.72	0.60	115	0.368	0.368	0.987	6.08	0.97	1.70	9.48	1.02	4.91	5.93		10.07	3.20		0			1.00	1.00		0.378	Non-Liq.	2.7	3.7			0.00
6.89	2.10	5.13	0.28	5.39	0.49	115	0.396	0.396	0.986	5.85	0.99	1.70	7.60	0.83	4.90	5.74		8.24	3.26		0			1.00	1.00		0.378	Non-Liq.	2.6	3.2			0.00
7.38	2.25	3.60	0.24	6.77	0.35	115	0.424	0.424	0.985	7.68	1.00	1.70	5.11	0.59	4.90	5.49		5.79	3.47		0			1.00	1.00		0.377	Non-Liq.	2.2	2.6			0.00
7.87	2.40	6.39	0.31	4.92	0.61	115	0.453	0.453	0.984	5.30	0.97	1.70	9.53	1.04	4.82	5.86		10.26	3.16		0			1.00	1.00		0.377	Non-Liq.	2.8	3.6			0.00
8.37	2.55	6.39	0.35	5.53	0.61	115	0.481	0.481	0.983	5.98	0.98	1.70	9.49	1.04	4.90	5.94		10.27	3.19		0			1.00	1.00		0.376	Non-Liq.	2.7	3.7			0.00
8.86	2.70	6.01	0.33	5.46	0.58	115	0.509	0.509	0.982	5.97	0.99	1.70	8.84	0.98	4.90	5.88		9.66	3.22		0			1.00	1.00		0.376	Non-Liq.	2.7	3.6			0.00
9.35	2.85	5.92	0.31	5.20	0.57	115	0.538	0.538	0.981	5.72	0.99	1.70	8.65	0.96	4.90	5.86		9.52	3.21		0			1.00	1.00		0.376	Non-Liq.	2.7	3.5			0.00
9.84	3.00	6.54	0.33	5.02	0.63	115	0.566	0.566	0.979	5.49	0.98	1.70	9.60	1.01	4.89	5.90		10.51	3.17		0			1.00	1.00		0.375	Non-Liq.	2.8	3.8			0.00
10.33	3.15	6.65	0.36	5.46	0.64	115	0.594	0.594	0.978	6.00	0.99	1.70	9.74	0.98	4.89	5.87		10.69	3.19		0			1.00	1.00		0.375	Non-Liq.	2.8	3.9			0.00
10.83	3.30	6.29	0.37	5.80	0.60	115	0.623	0.623	0.977	6.44	1.00	1.70	9.11	0.90	4.89	5.79		10.11	3.23		0			1.00	1.00		0.374	Non-Liq.	2.7	3.8			0.00
11.32	3.45	6.62	0.36	5.39	0.63	115	0.651	0.651	0.976	5.97	0.99	1.62	9.15	0.91	4.89	5.80		10.14	3.21		0			1.00	1.00		0.374	Non-Liq.	2.7	3.7			0.00
11.81	3.60	6.03	0.31	5.17	0.58	115	0.679	0.679	0.975	5.83	1.00	1.56	7.88	0.82	4.89	5.71		8.88	3.25		0			1.00	1.00		0.374	Non-Liq.	2.6	3.4			0.00
12.30	3.75	6.14	0.28	4.48	0.59	115	0.707	0.707	0.974	5.06	1.00	1.49	7.67	0.81	4.32	5.13		8.67	3.22		0			1.00	1.00		0.373	Non-Liq.	2.7	3.2			0.00
12.80	3.90	6.22	0.28	4.58	0.60	115	0.736	0.736	0.973	5.19	1.00	1.44	7.45	0.79	4.42	5.22		8.45	3.24		0			1.00	1.00		0.373	Non-Liq.	2.7	3.2			0.00
13.29	4.05	6.15	0.29	4.72	0.59	115	0.764	0.764	0.972	5.39	1.00	1.38	7.05	0.76	4.58	5.34		8.05	3.27		0			1.00	1.00		0.372	Non-Liq.	2.6	3.1			0.00
13.78	4.20	6.75	0.30	4.45	0.65	115	0.792	0.792	0.971	5.04	0.99	1.33	7.50	0.81	4.28	5.09		8.50	3.23		0			1.00	1.00		0.372	Non-Liq.	2.7	3.2			0.00
14.27	4.35	7.87	0.35	4.40	0.75	115	0.821	0.821	0.970	4.91	0.97	1.28	8.53	0.90	4.23	5.13		9.52	3.18		0			1.00	1.00		0.372	Non-Liq.	2.8	3.4			0.00
14.76	4.50	7.52	0.37	4.93	0.72	115	0.849	0.849	0.969	5.56	0.99	1.24	7.84	0.84	4.80	5.64		8.84	3.24		0			1.00	1.00		0.371	Non-Liq.	2.7	3.3			0.00
15.26	4.65	7.56	0.37	4.92	0.72	115	0.877	0.877	0.968	5.57	0.99	1.20	7.61	0.83	4.79	5.62		8.61	3.25		0			1.00	1.00		0.371	Non-Liq.	2.6	3.3			0.00
15.75	4.80	8.07	0.40	4.98	0.77	115	0.906	0.906	0.967	5.61	0.99	1.17	7.90	0.86	4.85	5.71		8.90	3.24		0			1.00	1.00		0.370	Non-Liq.	2.7	3.3			0.00
16.24	4.95	8.41	0.42	5.03	0.81	115	0.934	0.934	0.966	5.66	0.99	1.13	8.00	0.88	4.87	5.75		8.99	3.24		0			1.00	1.00		0.370	Non-Liq.	2.7	3.4			0.00
16.73	5.10	7.83	0.40	5.12	0.75	115	0.962	0.962	0.965	5.84	1.00	1.10	7.14	0.80	4.87	5.67		8.14	3.28		0			1.00	1.00		0.370	Non-Liq.	2.6	3.2			0.00
17.22	5.25	7.85	0.38	4.89	0.75	115	0.990	0.990	0.964	5.60	1.00	1.07	6.92	0.79	4.75	5.54		7.92	3.28		0			1.00	1.00		0.369	Non-Liq.	2.6	3.1			0.00
17.72	5.40	7.96	0.40	4.96	0.76	115	1.019	1.019	0.962	5.69	1.00	1.04	6.81	0.78	4.83	5.61		7.81	3.29		0			1.00	1.00		0.369	Non-Liq.	2.6	3.1			0.00
18.21	5.55	7.63	0.38	5.01	0.73	115	1.047	1.047	0.961	5.80	1.00	1.01	6.29	0.74	4.86	5.60		7.29	3.33		0			1.00	1.00		0.368	Non-Liq.	2.5	2.9			0.00
18.70	5.70	7.61	0.38	4.98	0.73	115	1.075	1.075	0.960	5.80	1.00	0.98	6.08	0.72	4.84	5.56		7.08	3.34		0			1.00	1.00		0.368	Non-Liq.	2.5	2.9			0.00
19.19	5.85	8.11	0.41	5.09	0.78	115	1.104	1.104	0.959	5.89	1.00	0.96	6.35	0.75	4.86	5.61		7.35	3.33		0			1.00	0.99		0.367	Non-Liq.	2.5	3.0			0.00
19.69	6.00	8.28	0.42	5.08	0.79	115	1.132	1.132	0.958	5.88	1.00	0.93	6.32	0.76	4.86	5.61		7.32	3.33		0			1.00	0.99		0.367	Non-Liq.	2.5	2.9			0.00
20.18	6.15	7.98	0.41	5.12	0.76	115	1.160	1.160	0.956	5.99	1.00	0.91	5.88	0.72	4.85	5.57		6.88	3.36		0			1.00	0.98		0.366	Non-Liq.	2.4	2.8			0.00
20.67	6.30	7.95	0.41	5.18	0.76	115	1.188	1.188	0.955	6.09	1.00	0.89	5.69	0.70	4.85	5.55		6.69	3.37		0			1.00	0.98		0.366	Non-Liq.	2.4	2.8			0.00
21.16	6.45	8.50	0.44	5.21	0.81	115	1.217	1.217	0.954	6.08	1.00	0.87	5.99	0.74	4.85	5.59		6.99	3.36		0			1.00	0.97		0.365	Non-Liq.	2.4	2.9			0.00
21.65	6.60	9.28	0.49	5.27	0.89	115	1.245	1.245	0.952	6.09	1.00	0.85	6.46	0.80	4.85	5.65		7.46	3.33		0			1.00	0.97		0.365	Non-Liq.	2.5	3.0			0.00
22.15	6.75	14.80	0.62	4.18	1.42	115	1.273	1.273	0.951	4.57	0.92	0.84	10.77	1.29	3.96	5.25		11.79	3.08		0			1.00	0.96		0.364	Non-Liq.	3.0	4.0			0.00
22.64	6.90	14.79	0.72	4.85	1.42	115	1.302	1.302	0.950	5.32	0.94	0.82	10.50	1.27	4.68	5.95		11.51	3.13		0			1.00	0.96		0.364	Non-Liq.	2.9	4.0			0.00
23.13	7.05	11.88	0.67	5.60	1.14	115	1.330	1.330	0.948	6.31	0.98	0.80	7.98	1.00	4.84	5.84		8.98	3.27		0			1.00	0.96		0.363	Non-Liq.	2.6	3.4			0.00

Depth		Tip Qc	Friction Fs	Friction Ratio	qc	Total Unit Wt.	Total Stress	Eff. Stress				Max 1.70		Moss qc1	Moss Δqc	Moss qc_{1mod}	Moss eff			Override	Liquef. Suscept.	Rel. Dens.			Clean Sand	1.0		Induced M=7.5	Liquefac. Safety	Qc1n $N_{1(60)}$	Equiv.	FC Adj.	Equiv.	Volumetric Strain
(feet)	(m)	(tsf)	(tsf)	Rf %	MPa	(pcf)	po (tsf)	p'o (tsf)	rd	%	n	Cq	Q	MPa	MPa	MPa	K_C	Qc1n	Ic		(0 or 1)	Dr (%)	K_C	K_H	Qc1n	Kσ	CRR	CSR	Factor	Ratio	$N_{1(60)}$	$ΔN_{1(60)}$	$N_{1(60)cs}$	(%)
23.62	7.20	13.02	0.60	4.63	1.25	115	1.358	1.358	0.946	5.17	0.95	0.79	8.69	1.09	4.44	5.53		9.70	3.19		0			1.00		0.95		0.363	**Non-Liq.**	2.8	3.5			**0.00**
24.11	7.35	19.14	0.63	3.27	1.83	115	1.387	1.387	0.945	3.53	0.88	0.79	13.23	1.60	2.98	4.58		14.26	2.94		0			1.00		0.95		0.362	**Non-Liq.**	3.2	4.4			**0.00**
24.61	7.50	13.40	0.67	5.02	1.28	115	1.415	1.415	0.943	5.61	0.96	0.76	8.57	1.10	4.83	5.93		9.59	3.21		0			1.00		0.94		0.361	**Non-Liq.**	2.7	3.5			**0.00**
25.10	7.65	15.43	0.74	4.77	1.48	115	1.443	1.443	0.941	5.26	0.94	0.75	9.88	1.26	4.58	5.85		10.90	3.15		0			1.00		0.94		0.361	**Non-Liq.**	2.8	3.8			**0.00**
25.59	7.80	17.97	0.73	4.09	1.72	115	1.471	1.471	0.940	4.45	0.91	0.74	11.56	1.47	3.84	5.31		12.59	3.05		0			1.00		0.94		0.360	**Non-Liq.**	3.0	4.1			**0.00**
26.08	7.95	16.00	0.61	3.80	1.53	115	1.500	1.500	0.938	4.19	0.92	0.73	9.95	1.28	3.53	4.81		10.98	3.08		0			1.00		0.93		0.359	**Non-Liq.**	3.0	3.7			**0.00**
26.57	8.10	29.00	0.66	2.29	2.78	115	1.528	1.528	0.936	2.41	0.81	0.74	19.28	2.34	1.91	4.26		20.36	2.71		0			1.00		0.93		0.359	**Non-Liq.**	3.7	5.5			**0.00**
27.07	8.25	35.23	0.83	2.34	3.37	115	1.556	1.556	0.934	2.45	0.79	0.74	23.46	2.86	1.97	4.83		24.55	2.65		0			1.00		0.93		0.358	**Non-Liq.**	3.8	6.4			**0.00**
27.56	8.40	41.01	0.94	2.28	3.93	115	1.585	1.585	0.932	2.38	0.77	0.73	27.28	4.21	1.91	6.12		35.88	2.59		0			1.26		0.92		0.357	**Non-Liq.**	3.9	9.1			**0.00**
28.05	8.55	30.13	0.90	2.98	2.89	115	1.613	1.613	0.930	3.14	0.83	0.70	19.00	2.41	2.64	5.06		20.08	2.78		0			1.00		0.92		0.356	**Non-Liq.**	3.5	5.7			**0.00**
28.54	8.70	38.83	0.75	1.94	3.72	115	1.641	1.641	0.928	2.02	0.77	0.71	25.10	3.88	1.53	5.41		33.14	2.57		0			1.26		0.92		0.355	**Non-Liq.**	4.0	8.4			**0.00**
29.04	8.85	116.81	0.97	0.83	11.19	115	1.670	1.670	0.925	0.84	0.58	0.77	83.45	11.66	0.35	12.01	1.03	107.05	1.93		1	80	1.21	1.26	130.1	0.83	0.285	0.354	**Non-Liq.**	5.2	20.5	5.0	25.5	**0.21**
29.53	9.00	77.02	1.21	1.57	7.38	115	1.698	1.698	0.923	1.60	0.68	0.73	51.66	7.80	1.14	8.94		66.79	2.26		0			1.26		0.91		0.354	**Non-Liq.**	4.6	14.6			**0.00**
30.02	9.15	30.03	1.11	3.70	2.88	115	1.726	1.726	0.920	3.93	0.85	0.66	17.63	2.36	3.41	5.77		18.71	2.87		0			1.00		0.91		0.353	**Non-Liq.**	3.4	5.5			**0.00**
30.51	9.30	17.47	0.89	5.09	1.67	115	1.754	1.754	0.918	5.66	0.94	0.62	9.22	1.32	4.78	6.10		10.25	3.19		0			1.00		0.90		0.352	**Non-Liq.**	2.8	3.7			**0.00**
31.00	9.45	36.13	0.72	2.00	3.46	115	1.783	1.783	0.915	2.10	0.78	0.66	21.57	2.74	1.59	4.34		22.69	2.63		0			1.00		0.90		0.351	**Non-Liq.**	3.8	5.9			**0.00**
31.50	9.60	77.99	0.89	1.14	7.47	115	1.811	1.811	0.913	1.16	0.65	0.70	50.65	8.38	0.67	9.06		72.95	2.18		0			1.41		0.90		0.350	**Non-Liq.**	4.7	15.4			**0.00**
31.99	9.75	55.56	1.10	1.98	5.32	115	1.839	1.839	0.910	2.05	0.74	0.67	33.79	6.04	1.57	7.61		49.17	2.47		0			1.41		0.90		0.349	**Non-Liq.**	4.2	11.8			**0.00**
32.48	9.90	41.44	1.04	2.50	3.97	115	1.868	1.868	0.907	2.62	0.79	0.64	23.89	3.17	2.12	5.28		25.02	2.66		0			1.00		0.89		0.347	**Non-Liq.**	3.8	6.6			**0.00**
32.97	10.05	52.86	0.98	1.85	5.06	115	1.896	1.896	0.904	1.92	0.74	0.65	31.32	5.63	1.42	7.06		45.70	2.48		0			1.41		0.89		0.346	**Non-Liq.**	4.1	11.0			**0.00**
33.46	10.20	32.15	0.86	2.68	3.08	115	1.924	1.924	0.901	2.85	0.82	0.61	17.45	2.39	2.30	4.69		18.56	2.79		0			1.00		0.89		0.345	**Non-Liq.**	3.5	5.2			**0.00**
33.96	10.35	36.54	0.70	1.92	3.50	115	1.953	1.953	0.898	2.03	0.78	0.62	20.22	2.66	1.50	4.16		21.36	2.65		0			1.00		0.88		0.344	**Non-Liq.**	3.8	5.6			**0.00**
34.45	10.50	46.67	0.80	1.71	4.47	115	1.981	1.981	0.894	1.79	0.75	0.63	26.42	3.94	1.27	5.21		31.80	2.52		0			1.15		0.88		0.343	**Non-Liq.**	4.1	7.8			**0.00**
34.94	10.65	33.46	0.95	2.85	3.20	115	2.009	2.009	0.891	3.03	0.83	0.59	17.49	2.46	2.47	4.93		18.60	2.80		0			1.00		0.88		0.341	**Non-Liq.**	3.5	5.3			**0.00**
35.43	10.80	47.69	1.01	2.12	4.57	115	2.037	2.037	0.888	2.21	0.76	0.61	26.15	4.05	1.70	5.75		31.48	2.58		0			1.15		0.88		0.340	**Non-Liq.**	3.9	8.0			**0.00**
35.93	10.95	87.68	1.13	1.29	8.40	115	2.066	2.066	0.884	1.32	0.66	0.64	52.07	7.45	0.82	8.28	1.11	61.46	2.21		1	57	1.68	1.15	103.4	0.82	0.183	0.339	**Non-Liq.**	4.7	13.1	5.0	18.1	**0.44**
36.42	11.10	89.66	1.51	1.68	8.59	115	2.094	2.094	0.880	1.72	0.68	0.63	52.04	7.77	1.24	9.01	1.16	61.42	2.28		1	57	1.88	1.15	115.8	0.81	0.224	0.337	**Non-Liq.**	4.5	13.5	5.0	18.5	**0.41**
36.91	11.25	75.17	1.69	2.24	7.20	115	2.122	2.122	0.877	2.31	0.72	0.60	41.74	6.55	1.82	8.38		49.50	2.43		0			1.15		0.87		0.336	**Non-Liq.**	4.2	11.7			**0.00**
37.40	11.40	42.69	1.43	3.34	4.09	115	2.151	2.151	0.873	3.52	0.82	0.56	21.45	3.16	2.96	6.13		22.59	2.77		0			1.00		0.87		0.334	**Non-Liq.**	3.6	6.3			**0.00**
37.89	11.55	24.93	1.13	4.55	2.39	115	2.179	2.179	0.869	4.98	0.91	0.52	11.18	1.78	4.22	5.99		12.25	3.09		0			1.00		0.87		0.333	**Non-Liq.**	3.0	4.1			**0.00**
38.39	11.70	91.24	0.85	0.93	8.74	115	2.207	2.207	0.865	0.95	0.63	0.63	52.82	8.04	0.45	8.49		68.45	2.12		0			1.26		0.86		0.331	**Non-Liq.**	4.8	14.1			**0.00**
38.88	11.85	51.62	0.65	1.26	4.94	115	2.235	2.235	0.861	1.32	0.72	0.58	27.22	4.45	0.79	5.24		35.97	2.44		0			1.26		0.86		0.330	**Non-Liq.**	4.2	8.5			**0.00**
39.37	12.00	23.83	0.72	3.04	2.28	115	2.264	2.264	0.857	3.36	0.88	0.51	10.43	1.61	2.63	4.24		11.53	3.01		0			1.00		0.86		0.328	**Non-Liq.**	3.1	3.7			**0.00**
39.86	12.15	61.83	1.00	1.61	5.92	115	2.292	2.292	0.852	1.67	0.72	0.57	32.23	5.49	1.15	6.64		42.32	2.44		0			1.26		0.86		0.326	**Non-Liq.**	4.2	10.0			**0.00**
40.35	12.30	82.03	1.50	1.83	7.86	115	2.320	2.320	0.848	1.88	0.70	0.58	43.43	7.52	1.37	8.90	1.18	56.51	2.36		1	53	2.17	1.26	122.8	0.79	0.252	0.325	**Non-Liq.**	4.4	12.9	5.0	17.9	**0.41**
40.85	12.45	69.21	1.81	2.61	6.63	115	2.349	2.349	0.843	2.70	0.75	0.55	34.74	6.44	2.17	8.61		45.47	2.54		0			1.26		0.85		0.323	**Non-Liq.**	4.0	11.3			**0.00**
41.34	12.60	36.12	1.51	4.19	3.46	115	2.377	2.377	0.839	4.48	0.86	0.50	15.88	2.58	3.79	6.38		17.00	2.94		0			1.00		0.85		0.321	**Non-Liq.**	3.2	5.2			**0.00**
41.83	12.75	29.94	1.17	3.90	2.87	115	2.405	2.405	0.834	4.24	0.88	0.49	12.66	2.07	3.49	5.56		13.77	3.00		0			1.00		0.85		0.320	**Non-Liq.**	3.1	4.4			**0.00**
42.32	12.90	25.81	1.04	4.03	2.47	115	2.434	2.434	0.830	4.45	0.90	0.47	10.45	1.75	3.62	5.37		11.54	3.08		0			1.00		0.85		0.318	**Non-Liq.**	3.0	3.9			**0.00**
42.81	13.05	38.11	1.08	2.85	3.65	115	2.462	2.462	0.825	3.04	0.83	0.50	16.79	2.62	2.40	5.01		17.94	2.82		0			1.00		0.84		0.316	**Non-Liq.**	3.5	5.2			**0.00**
43.31	13.20	24.05	1.01	4.20	2.30	115	2.490	2.490	0.820	4.68	0.91	0.46	9.33	1.60	3.77	5.38		10.41	3.13		0			1.00		0.84		0.314	**Non-Liq.**	2.9	3.6			**0.00**
43.80	13.35	33.16	0.95	2.86	3.18	115	2.518	2.518	0.816	3.10	0.84	0.48	13.94	2.22	2.41	4.63		15.08	2.89		0			1.00		0.84		0.312	**Non-Liq.**	3.3	4.5			**0.00**
44.29	13.50	27.39	1.03	3.74	2.62	115	2.547	2.547	0.811	4.13	0.89	0.46	10.76	1.82	3.30	5.12		11.86	3.05		0			1.00		0.84		0.311	**Non-Liq.**	3.0	3.9			**0.00**
44.78	13.65	53.61	1.23	2.29	5.13	115	2.575	2.575	0.806	2.41	0.77	0.50	24.28	3.68	1.82	5.50		25.50	2.63		0			1.00		0.84		0.309	**Non-Liq.**	3.9	6.6			**0.00**
45.28	13.80	78.24	1.68	2.14	7.49	115	2.603	2.603	0.801	2.22	0.73	0.52	37.18	5.91	1.66	7.57		41.20	2.46		0			1.07		0.84		0.307	**Non-Liq.**	4.2	9.9			**0.00**
45.77	13.95	106.38	2.08	1.96	10.19	115	2.632	2.632	0.796	2.01	0.69	0.53	52.42	8.14	1.47	9.61	1.18	57.58	2.32		1	54	2.01	1.07	116.0	0.76	0.225	0.305	**Non-Liq.**	4.5	12.9	5.0	17.9	**0.37**
46.26	14.10	114.94	2.46	2.14	11.01	115	2.660	2.660	0.791	2.20	0.69	0.53	56.27	8.91	1.65	10.56	1.19	61.71	2.32		1	57	2.02	1.07	124.9	0.76	0.261	0.303	**Non-Liq.**	4.5	13.9	5.0	18.9	**0.32**
46.75	14.25	102.58	2.62	2.55	9.82	115	2.688	2.688	0.786	2.62	0.72	0.51	48.44	7.99	2.06	10.04	1.26	53.29	2.42		1	51	2.41	1.07	128.3	0.76	0.276	0.301	**Non-Liq.**	4.3	12.5	5.0	17.5	**0.37**
47.24	14.40	83.13	2.39	2.87	7.96	130	2.720	2.720	0.781	2.97	0.75	0.49	37.50	5.98	2.37	8.35		38.77	2.54		0			1.00		0.83		0.299	**Non-Liq.**	4.0	9.6			**0.00**
47.74	14.55	55.28	1.81	3.27	5.29	130	2.752	2.752	0.776	3.44	0.80	0.46	23.05	3.85	2.76	6.62		24.26	2.74		0			1.00		0.83		0.297	**Non-Liq.**	3.6	6.7			**0.00**
48.23	14.70	56.27	1.33	2.36	5.39	130	2.784	2.784	0.771	2.48	0.77	0.47	23.92	3.79	1.85	5.64		25.16	2.64		0			1.00		0.82		0.295	**Non-Liq.**	3.8	6.6			**0.00**
48.72	14.85	35.91	1.10	3.07	3.44	130	2.816	2.816	0.766	3.33	0.85	0.44	13.65	2.34	2.56	4.90		14.81	2.91		0			1.00		0.82		0.293	**Non-Liq.**	3.3	4.5			**0.00**
49.21	15.00	34.92	0.93	2.67	3.34	130	2.848	2.848	0.761	2.91	0.84	0.44	13.19	2.22	2.15	4.37		14.37	2.89		0			1.00		0.82		0.291	**Non-Liq.**	3.3	4.3			**0.00**
49.70	15.15	43.22	1.05	2.44	4.14	130	2.880	2.880	0.756	2.61	0.81	0.45	16.97	2.79	1.92	4.70		18.19	2.77		0			1.00		0.82		0.289	**Non-Liq.**	3.6	5.1			**0.00**

APPENDIX F

Infiltration Testing Results

INFILTRATION RATE BY THE BOREHOLE PERCOLATION TEST METHOD

This workbook calculates an adjusted infiltration rate from a borehole percolation test. The percolation rate is adjusted for sidewall area according to the Porchet method, and then re-adjusted for the effect of the gravel placed in annulus between the borehole wall and a pipe placed in the borehole by a method presented in Caltrans Test 750.

Project Name	Somis Ranch Farmworker Housing
Project Number	302947-001
Test Hole No.	IT-1
Tester	SC
Pre-Soak Date	
Test Date	7-5-15

Test Hole Radius, r (inches)	4
Total Depth of Test Hole, D_T (feet)	4.0
Inside Diameter of Pipe, I (inches)	3.00
Outside Diameter of Pipe, O (inches)	3.25
Pipe Stick-Up (feet)	0.4
Porosity of Gravel, n	0.41
Porosity Correction Factor, C	0.48
Factor of Safety (FOS), F	N/A

Interval No.	Delta Time, Δt (min.)	Initial Depth to Water from TOP, D_o (ft.)	Final Depth to Water from TOP, D_f (ft.)	Initial Water Height, H_o (in.)	Final Water Height, H_f (in.)	Change in Water Height, ΔH (in.)	Perc Rate, (in/hr)	Infiltration Rate (in./hr.)	Corrected Infiltration Rate (in/hr)
1	30.00	2.11	2.14	26.88	26.52	0.36	0.72	0.05	0.02
2	30.00	2.14	2.16	26.52	26.28	0.24	0.48	0.03	0.02
3	30.00	2.16	2.17	26.28	26.16	0.12	0.24	0.02	0.01
4	30.00	2.17	2.18	26.16	26.04	0.12	0.24	0.02	0.01
5	30.00	2.18	2.19	26.04	25.92	0.12	0.24	0.02	0.01
6	30.00	2.19	2.20	25.92	25.80	0.12	0.24	0.02	0.01
7	30.00	2.20	2.23	25.80	25.44	0.36	0.72	0.05	0.03
8	30.00	2.23	2.25	25.44	25.20	0.24	0.48	0.04	0.02
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

INFILTRATION RATE BY THE BOREHOLE PERCOLATION TEST METHOD

This workbook calculates an adjusted infiltration rate from a borehole percolation test. The percolation rate is adjusted for sidewall area according to the Porchet method, and then re-adjusted for the effect of the gravel placed in annulus between the borehole wall and a pipe placed in the borehole by a method presented in Caltrans Test 750.

Project Name	Somis Ranch Farmworker Housing
Project Number	302947-001
Test Hole No.	IT-2
Tester	SC
Pre-Soak Date	
Test Date	7-5-15

Test Hole Radius, r (inches)	4
Total Depth of Test Hole, D_T (feet)	15.0
Inside Diameter of Pipe, I (inches)	3.00
Outside Diameter of Pipe, O (inches)	3.25
Pipe Stick-Up (feet)	0.0
Porosity of Gravel, n	0.41
Porosity Correction Factor, C	0.48
Factor of Safety (FOS), F	N/A

Interval No.	Delta Time, Δt (min.)	Initial Depth to Water from TOP, D_o (ft.)	Final Depth to Water from TOP, D_f (ft.)	Initial Water Height, H_o (in.)	Final Water Height, H_f (in.)	Change in Water Height, ΔH (in.)	Perc Rate, (in/hr)	Infiltration Rate (in./hr.)	Corrected Infiltration Rate (in/hr)
1	30.00	12.26	12.34	32.88	31.92	0.96	1.92	0.11	0.05
2	30.00	12.34	12.37	31.92	31.56	0.36	0.72	0.04	0.02
3	30.00	12.37	12.40	31.56	31.20	0.36	0.72	0.04	0.02
4	30.00	12.30	12.34	32.40	31.92	0.48	0.96	0.06	0.03
5	30.00	12.34	12.38	31.92	31.44	0.48	0.96	0.06	0.03
6	30.00	12.23	12.27	33.24	32.76	0.48	0.96	0.05	0.03
7	30.00	12.27	12.33	32.76	32.04	0.72	1.44	0.08	0.04
8	30.00	12.33	12.36	32.04	31.68	0.36	0.72	0.04	0.02
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

INFILTRATION RATE BY THE BOREHOLE PERCOLATION TEST METHOD

This workbook calculates an adjusted infiltration rate from a borehole percolation test. The percolation rate is adjusted for sidewall area according to the Porchet method, and then re-adjusted for the effect of the gravel placed in annulus between the borehole wall and a pipe placed in the borehole by a method presented in Caltrans Test 750.

Project Name	Somis Ranch Farmworker Housing
Project Number	302947-001
Test Hole No.	IT-3
Tester	SC
Pre-Soak Date	
Test Date	7-3-15

Test Hole Radius, r (inches)	4
Total Depth of Test Hole, D_T (feet)	7.0
Inside Diameter of Pipe, I (inches)	3.00
Outside Diameter of Pipe, O (inches)	3.25
Pipe Stick-Up (feet)	0.0
Porosity of Gravel, n	0.41
Porosity Correction Factor, C	0.48
Factor of Safety (FOS), F	N/A

Interval No.	Delta Time, Δt (min.)	Initial Depth to Water from TOP, D_o (ft.)	Final Depth to Water from TOP, D_f (ft.)	Initial Water Height, H_o (in.)	Final Water Height, H_f (in.)	Change in Water Height, ΔH (in.)	Perc Rate, (in/hr)	Infiltration Rate (in./hr.)	Corrected Infiltration Rate (in/hr)
1	30.00	5.87	6.00	13.56	12.00	1.56	3.12	0.42	0.20
2	30.00	6.00	6.10	12.00	10.80	1.20	2.40	0.36	0.17
3	30.00	6.03	6.15	11.64	10.20	1.44	2.88	0.45	0.22
4	30.00	6.02	6.16	11.76	10.08	1.68	3.36	0.52	0.25
5	30.00	6.00	6.11	12.00	10.68	1.32	2.64	0.40	0.19
6	30.00	5.98	6.10	12.24	10.80	1.44	2.88	0.43	0.21
7	30.00	6.00	6.12	12.00	10.56	1.44	2.88	0.43	0.21
8	30.00	6.00	6.13	12.00	10.44	1.56	3.12	0.47	0.23
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

INFILTRATION RATE BY THE BOREHOLE PERCOLATION TEST METHOD

This workbook calculates an adjusted infiltration rate from a borehole percolation test. The percolation rate is adjusted for sidewall area according to the Porchet method, and then re-adjusted for the effect of the gravel placed in annulus between the borehole wall and a pipe placed in the borehole by a method presented in Caltrans Test 750.

Project Name	Somis Ranch Farmworker Housing
Project Number	302947-001
Test Hole No.	IT-4
Tester	SC
Pre-Soak Date	
Test Date	7-3-15

Test Hole Radius, r (inches)	4
Total Depth of Test Hole, D_T (feet)	18.0
Inside Diameter of Pipe, I (inches)	3.00
Outside Diameter of Pipe, O (inches)	3.25
Pipe Stick-Up (feet)	0.0
Porosity of Gravel, n	0.41
Porosity Correction Factor, C	0.48
Factor of Safety (FOS), F	N/A

Interval No.	Delta Time, Δt (min.)	Initial Depth to Water from TOP, D_o (ft.)	Final Depth to Water from TOP, D_f (ft.)	Initial Water Height, H_o (in.)	Final Water Height, H_f (in.)	Change in Water Height, ΔH (in.)	Perc Rate, (in/hr)	Infiltration Rate (in./hr.)	Corrected Infiltration Rate (in/hr)
1	30.00	16.05	16.06	23.40	23.28	0.12	0.24	0.02	0.01
2	30.00	16.06	16.08	23.28	23.04	0.24	0.48	0.04	0.02
3	30.00	16.08	16.12	23.04	22.56	0.48	0.96	0.08	0.04
4	30.00	16.12	16.26	22.56	20.88	1.68	3.36	0.28	0.14
5	30.00	16.26	16.41	20.88	19.08	1.80	3.60	0.33	0.16
6	30.00	16.01	16.14	23.88	22.32	1.56	3.12	0.25	0.12
7	30.00	16.00	16.09	24.00	22.92	1.08	2.16	0.17	0.08
8	30.00	15.99	16.12	24.12	22.56	1.56	3.12	0.25	0.12
9	30.00	15.95	16.07	24.60	23.16	1.44	2.88	0.22	0.11
10	30.00	15.98	16.12	24.24	22.56	1.68	3.36	0.26	0.13
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

Appendix K

Domestic Water Use Calculations

JENSEN DESIGN & SURVEY, INC.

Delivering Excellence through Experience

1672 Donlon Street
Ventura, CA 93003
Phone: (805) 654-6977
www.jdscivil.com

PLA02.5893
October 29, 2019

SOMIS FARMWORKER HOUSING
DOMESTIC WATER USE CALCULATIONS

SOMIS RANCH- DOMESTIC WATER USE CALCULATIONS		
Number of Units	360.00	*persons*
Approximate of Residents	1215.00	*persons**
Gallons Per Day (Per Capita)	55.00	*gal*
Gallons Per Day (Total)	66825.00	*gal/day*
Gallons Per Year	**24391125.00**	***gal/year***
Cubic Feet Per Year	**3260409.70**	***CF/year***
Acre Feet Per Year	**74.85**	***AF/year***

**See Population Estimate Table Below*

POPULATION ESTIMATE TABLE

UNIT TYPE	# OF UNITS	AV. PERSONS PER UNIT	TOTAL
1 Bedroom	90	2	180
2 Bedroom	180	3.5	630
3 Bedroom	90	4.5	405
		GRAND TOTAL:	**1215**

On May 31, 2018, Governor Edmund G. Brown signed into SB 606 and AB 1668, two water laws which emphasize efficiency and stretching existing water supplies statewide. As part of these pieces of legislation, the State Water Board established a new indoor water use standard of 55 gallons per person per day until January 2025, with the standard becoming stronger over time[1]. This standard has been used to generate daily per capita water usage above.

[1] "Water Efficiency Legislation Fact Sheet." *California State Water Resources Control Board*, State of California, 2018, www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/water_efficiency_bill_factsheet.pdf.

Appendix L

AB 52 Correspondence

Ms. Julie Tumamait-Stenslie
Barbareno-Ventureno Mission Indians
365 North Poli Avenue
Ojai, CA 93023

Subject: Request for Review of New Project Application
Somis Ranch Farmworker Housing Case No. PL19-0046
2789 Somis Road, Somis CA 93066
Assessor's Parcel Number: 156-0-180-285

Dear Ms. Tumamait-Stenslie,

The Planning Division has received the following new land use project application:

Somis Ranch Partners, LLC. Together with associated non-profit affordable housing developers, is proposing to construct a 360-unit farmworker housing complex on an approximately 18.4-acre portion of APN 156-0-180-285. The proposed farmworker community is intended to be 100% affordable to farm workers who qualify as lower income, which is classified as individuals and families who make 80% of area median income and below. The project site is located on Somis Road, immediately north of and adjacent to the Camarillo City limits. Although the project site is immediately next to the City of Camarillo, it is located outside of the City's sphere of influence and CURB. Enclosed for your review are the following documents:

- Project Plans
- Aerial Map

Please review the project application materials included with this request, and provide information regarding the following:

- Concerns you may have about the proposed project; and/or
- Requirements or standards you may recommend that the County impose.

Provide any comments or questions to me no later than July 21, 2020. If you have questions or need additional time to review the project, please contact me at justin.bertoline@ventura.org, or (805) 654-2466 prior to the requested response date. The Planning Division will consider a non-response to this letter as an indication that the agency you represent does not wish to comment on the proposed development at this time. Please contact me if you wish to be sent copies of formal correspondence regarding the project, a notice informing you of the opportunity to comment on the draft environmental document for this project, and/or a notice of the public hearing.

Sincerely,

Justin Bertoline, Senior Planner
Commercial & Industrial Permits Section
Ventura County Planning Division

Encl.: Project Application Materials