

Proposed Jurupa Valley Skilled Nursing Facility

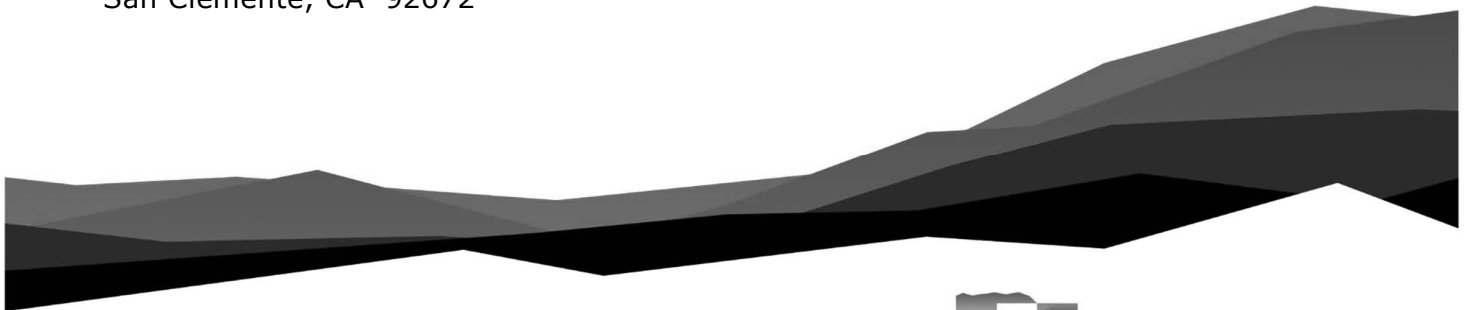
Geotechnical Engineering Report

Jurupa Valley, California

July 11, 2025 | Terracon Project No. CB235085

Prepared for:

Providence Administrative Consulting
Services c/o Strategic Medical
Properties
1810 S. El Camino Real, Suite C
San Clemente, CA 92672



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July 11, 2025

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Re: Geotechnical Engineering Report
Proposed Jurupa Valley Skilled Nursing Facility
6401 33rd Street
Jurupa Valley, California
Terracon Project No. CB235085

Dear Mr. Cooke:

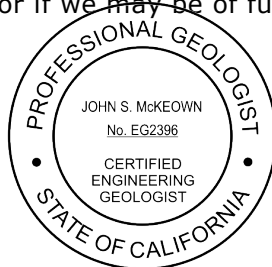
We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PCB235085 dated September 16, 2024. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project. Revisions to an earlier version of this document, based on comments from City of Jurupa Valley, are included herein.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

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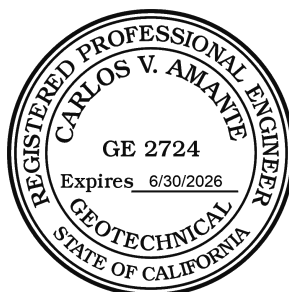


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Attachments

- Exploration and Testing Procedures**
- Site Location and Exploration Plans**
- Exploration and Laboratory Results**
- Supporting Information**

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the  Terracon logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

Refer to each individual Attachment for a listing of contents.



Report Summary

Topic ¹	Overview Statement ²
Project Description	The project consists of a new skilled nursing facility (SNF) building and a new medical office building (MOB) on approximately 5-acres. Specific building locations and footprint extents are depicted on the 2024 concept plan and quantified on the Preliminary Grading Plan and include: 1) a 99-bed skilled nursing building and 2) dialysis center. Stormwater infiltration improvements are planned at the southeast corner of the development area. The project will also include the eastward extension of 33rd Street with a cul-de-sac as part of scope.
Geotechnical Characterization	Native soils at the site generally consisted of loose to very dense sand with varying amounts of silt, clay, and gravel with minor interbedded layers of stiff to very stiff sandy silt. Groundwater was not observed during our exploration.
Earthwork	<u>At-grade Structures:</u> We recommend that the proposed at-grade structure foundations and floor slabs be supported on reinforced engineered fill extending to a minimum depth of 4 feet below the bottom of foundations, or 6 feet below existing grades, whichever is greater. Exposed soils at the bottom of excavations should be saturated with water and the upper 12 inches scarified, moisture conditioned, and recompacted with heavy rollers prior to placement of reinforced engineered fill. This is expected to mitigate the effects of any hydro-collapse potential of soils between 6 to 10 feet bgs. Engineered fill placed beneath the entire footprint of the at-grade structures should extend horizontally a minimum distance of 2 feet beyond the outside edge of perimeter footings. <u>Exterior Slabs and Pavements:</u> Subgrade soils beneath exterior slabs and pavements should be scarified, moisture conditioned, and compacted to a minimum depth of 12 inches below the proposed pavement section. <u>General Site Grading:</u> Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report.



Topic ¹	Overview Statement ²
Shallow Foundations	2,000 psf for footings up to 8 feet in width 1,500 psf for footings up to 12 feet in width Expected settlements: 1-inch total, < 1/2-inch differential
Pavements	With subgrade prepared as noted in Earthwork , the following minimum flexible and rigid pavements are recommended: <u>Flexible Pavements:</u> ■ Auto Parking Areas – 3” HMA over 3” Class II AB ■ Drive Lanes – 3” HMA over 4” Class II AB ■ Truck Delivery Areas – 3” HMA over 7” Class II AB <u>Rigid Pavements:</u> ■ Light Duty – 5” PCC over 4” Class II AB ■ Medium Duty – 5” PCC over 4” Class II AB ■ Heavy Duty – 6” PCC over 4” Class II AB
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Jurupa Valley Consulting Services Expansion project to be located at 6401 33rd Street in Jurupa Valley, California.

The scope of services included the following:

- Review of published and unpublished literature and maps
- Examination of aerial imagery dated between 1948 and 2024
- Field reconnaissance of the site and surrounding area
- Marking of exploration locations in the field and notification of Underground Service Alert (Dig Alert)
- Locating buried utilities in the marked areas using geophysical methods including ground-penetrating radar
- Subsurface explorations within the site including hollow stem auger borings and cone penetrometer soundings
- Logging and sampling of borings for testing and evaluation
- Laboratory testing on selected samples (additional testing provided in final version of this report)
- Percolation testing in general accordance with the Riverside County Low Impact Development BMP Design Handbook (2024)
- Geologic hazards evaluation in accordance with CGS Note 48 guidelines (provided in final version of this report)
- Evaluation of the geotechnical engineering/geologic data
- Preparation of this report summarizing our findings, professional opinions and recommendations for the geotechnical aspects of project design and construction.

The purpose of these services is to provide information and geotechnical engineering recommendations related to:

- Subsurface soil conditions
- Groundwater conditions
- 2022 California Building Code (CBC) seismic design parameters
- Liquefaction and seismic settlement analysis
- Subgrade preparation/earthwork recommendations
- Foundation design and concrete slabs-on-grade
- Pavement section
- Infiltration and drainage

The geotechnical engineering Scope of Services for this project included utility location services, the advancement of twelve test borings, six cone penetrometer soundings

(CPTs), percolation testing, laboratory testing, geologic hazard evaluation, engineering analysis, and preparation of this report.

Drawings showing the site and exploration locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs or as separate graphs in the **Exploration and Laboratory Results** section.

Site Conditions

The following description of site conditions is derived from our site visit in association with our field explorations and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 6401 33rd Street in Jurupa Valley, California. The approximately 5-acre development site is generally located north of 33rd Street and east of an existing care facility. Approximate coordinates at the center of the proposed SNF structure are: Latitude 34.0125° N, Longitude 117.4219° W (see Site Location)
Existing Improvements	The site is undeveloped open land. An existing care facility is located west of the proposed development area. 33rd Street trends along the southern portion of the project area and includes underground and overhead utilities.
Current Ground Cover	Exposed soil surface of undeveloped land with seasonal growth of low weeds.
Existing Topography	The site is relatively level to gently sloping down towards the southeast with elevations ranging from approximately 885 to 895 feet and generally slopes.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

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Item	Description
Documents/Plans Provided	Project information was furnished to us via an email dated May 15, 2023, June 7, 2024, and September 15, 2024 and included the following plans. ■ Parcel map dated September 2, 2024 ■ Parcel overlay on aerial with proposed areas of development labeled. ■ Overall Conceptual Site Plan dated September 13, 2023 ■ Campus Expansion Plan dated June 4, 2024 ■ Campus Plan dated July 8, 2024 ■ Preliminary Grading Plan dated August 15, 2024
Proposed Development	The project consists of a new skilled nursing facility building and a new medical office building on approximately 5 acres. Specific building locations and footprint extents are depicted on the 2024 concept plan and quantified on the Preliminary Grading Plan and include a 99-bed skilled nursing building (42,000 SF) and dialysis center (12,000 SF). Stormwater infiltration improvements are planned at the southeast corner of the development area. The project will also include the eastward extension of 33rd Street with a cul-de-sac as part of the scope.
Building Construction	One-story, wood frame and stucco construction founded on conventional spread footings with concrete slabs on grade. Since the project includes a Type V skilled nursing facility, the field investigation and geotechnical report for final design of the SNF building will be subject to 2022 CBC. The Type V SNF building is subject to review by HCAI/CGS with reference to CGS Note 48 guidelines for evaluation of geologic hazards.
Finished Floor Elevation (feet)	99-Bed SNF: 889.70 Dialysis Center MOB: 889.10 Parking: Elevations range from 895 to 888 (as shown on Preliminary Grading Plan dated 8/15/2024)
Structural Loads (assumed)	■ Columns: 40 - 80 kips ■ Walls: 1 to 3 kips per linear foot (klf) ■ Slabs: 150 pounds per square foot (psf)
Grading Requirements	Up to 2 to 5 feet of cut and fill may be required to develop final grade, excluding remedial grading. Permanent slopes are not anticipated.

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Item	Description
Below Grade Structures	Underground utility runs.
Infiltration Systems	On-site stormwater retention/infiltration (water quality) basin is planned in the southeast portion of the planned development area.
Free Standing Walls	Perimeter masonry wall
Free-Standing Retaining Wall	Not anticipated
Pavements	Paved driveway and parking will be constructed on site. We assume both rigid (concrete) and flexible (asphalt) pavement sections should be considered. Please confirm this assumption. Anticipated traffic indices (TIs) are as follows for asphalt pavement: ■ Auto Parking Areas: TI=5.0 ■ Drive Lanes: TI=5.5 ■ Truck Delivery Areas: TI=7.0 ■ The pavement design period is 20 years. Anticipated average daily truck traffic (ADTT) are as follows for concrete pavement: ■ Light Duty: ADTT=1 (Category A) ■ Medium Duty: ADTT=25 (Category B) ■ Heavy Duty: ADTT=700 (Category C)

Geotechnical Characterization

Site Geology

The site is located in the northern portion of the Perris Block, part of the Peninsular Ranges Geomorphic Province (Woodford and others, 1971). The northern Perris Block is bounded on the southwest by the Chino-Elsinore fault, on the north by the Cucamonga fault, and on the northeast by the San Jacinto fault. The Perris Block is largely underlain by granitic rocks of the Peninsular Ranges batholith. These rocks consist mostly of varied granitic rock types such as those exposed in the Jurupa Hills near the site.

Based on geologic mapping by Morton (2003), the site is underlain by older alluvial fan deposits. As encountered in our site explorations, these materials include interlayered

mixtures of silty sand and poorly graded sand. Scattered gravel and secondary clay were noted in local intervals. A **Geologic Map** is attached.

Aerial Imagery

Examination of historical aerial imagery indicates that the site was undeveloped as early as 1931. Agricultural use is suggested in imagery dated 1938 and 1953. The existing care facility is visible in imagery dated 1989 with the site appearing undeveloped. Localized surface drainage projecting onto the site from the care facility is visible in imagery dated from 2002 to present. Indications of geologic hazards including faulting or landslide were not observed in the imagery examined.

Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Surface cover consisted of earthen cover. Fill materials were not noted at the site. Near surface soils appeared tilled for removal of weeds; therefore, the upper soil zone is expected to include disturbed native soils to an approximate depth ranging between 1 and 2½ feet below existing site grades (bgs). Fill associated with utility emplacement is expected near and within the 33rd Street alignment. As such, the fill materials are considered undocumented.

Native soils at the site generally consisted of loose to very dense sand with varying amounts of silt, clay, and gravel with minor interbedded layers of stiff to very stiff sandy silt.

Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration and Laboratory Results. Cross Section A A'** illustrating the subsurface conditions relative to the planned SNF Building is attached.

Laboratory Test Results

Laboratory tests were conducted on selected soil samples and the test results are presented in the **Exploration and Laboratory Results** section and on the boring logs.

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Atterberg limit test results indicate that the on-site soils generally are non-plastic to having low plasticity. Direct shear testing indicated onsite soils within the upper 5 feet have friction angles ranging between 30.3 and 33.2 with corresponding cohesion ranging between 0 and 54 psf. An R-value test conducted on near-surface bulk sample resulted in an R-value of 54. An expansion index test conducted on near-surface bulk samples resulted in an expansion index of 3 indicating very low expansion potential. A Modified Proctor Test was performed on composite near surface sample and indicate the soils have maximum dry density of 133.3 pounds per cubic foot (pcf) at an optimum water content of 7.8 percent. Consolidation test results are discussed in the following section.

Hydroconsolidation

To evaluate the potential deformation that may be caused by the addition of water to subsurface soils, hydroconsolidation testing was performed on representative relatively undisturbed sample. The test result for the sample, indicates a **moderate collapse potential** of 4.5%, B-6 at 5 feet. The soil sample was saturated under an axial pressure of 2,000 psf. Remedial grading is anticipated to mitigate the potential effects of hydroconsolidation.

Groundwater Conditions

The following table summarizes groundwater depth information for a well located near the site.

Data ID	Reference Point Elevation (feet)	Date of Measurement	Depth to Water (feet)	Distance to Site	Direction
Lumber Site	900	11/1/1992	165	150 feet	S
Well 02S05W8G001S	903	3/9/2021	178	¼ mile	S
Well 02S05W8G003S	903	3/5/2021	178	¼ mile	S
Carson & Matti (1985)	--	1979	150+	contour	--

Groundwater was not encountered within the maximum 51½ foot depth of the auger borings drilled for the project. Groundwater is not indicated by porewater pressure readings in CPTs extended to 75 feet bgs. These observations represent groundwater conditions at the time of exploration and may not be indicative of other times, or at other locations.

Groundwater level fluctuations can occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. We do not anticipate groundwater to impact construction.

Based on available data, groundwater is not anticipated within 100 feet of ground surface at the site.

Geologic Hazards

Liquefaction and Lateral Spreading

According to the County of Riverside (2024), the site is located within an area identified as having a 'moderate' liquefaction potential based on the presence of potentially susceptible sediments. Historic groundwater levels are not within 100 feet of the ground surface; therefore, liquefaction is not anticipated. The relatively level site relief and lack of free face slopes within or near the site precludes the potential for lateral spreading. A detailed analysis of anticipated seismic settlement is provided in the **Supporting Information** section of this report and discussed further in the **Liquefaction and Seismic Settlement** section.

Regional Faulting

The tectonics of the Southern California area are dominated by the interaction of the North American and Pacific tectonic plates, which are sliding past each other in transform motion. Although some of the motion may be accommodated by rotation of crustal blocks such as the western Transverse Ranges (Dickinson, 1996), the San Andreas fault zone represents the major surface expression of the tectonic boundary and accommodates a significant portion of the slip between the Pacific and North American plates. Some of the slip is accommodated by other northwest-trending strike-slip faults that are related to the San Andreas system, such as the San Jacinto and Elsinore faults. A **Regional Fault Map** is attached. The following table lists selected faults within the site region.

Fault	Magnitude ¹	Distance (km)	Direction
Fontana Seismic zone	6.75	6½	N
San Jacinto	7.76	12	NE
Cucamonga	6.88	17	NNW
San Andreas	8.18	22	NE
Crafton Hills	6 ²	23	E

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Elsinore	7.77	24	SW
Whittier	6.55	25	SW
Sierra Madre	7.16	29	NW
San Gorgonio Pass	6.94	32	E

1 BSSC (2014)

2 Estimated based on Wells & Coppersmith (1994)

San Jacinto Fault Zone: The San Jacinto fault zone is a system of northwest-trending, right-lateral, strike-slip faults and is a major element of the San Andreas fault system in southern California (Treiman and others, 1999). This right-slip fault zone branches off from the San Andreas near Cajon pass and extends southeastward through the Peninsular Ranges for 75 miles into southwestern Imperial Valley. The San Bernardino segment of the San Jacinto fault zone is located approximately 12 kilometers northeast of the site. Recent surface ruptures along the San Jacinto fault zone occurred in 1968 along the Coyote Creek segment during a magnitude 6.5 earthquake and in 1987 during the Superstition Hills (magnitude 6.6) and Elmore Ranch (magnitude 6.2) earthquakes.

San Andreas Fault Zone: The San Andreas fault zone (SAFZ), a prominent geologic feature of California, traverses the northern side of the San Bernardino Valley along the southwest flank of the San Bernardino Mountains and is located approximately 22 kilometers northeast of the site. The mountain front in the San Bernardino area roughly demarcates the presently active trace of the San Andreas fault that is characterized by youthful fault scarps, aligned vegetation, topographic troughs, springs and offset drainage channels.

The greater San Andreas fault system is composed of multiple named segments extending through California that are postulated to rupture singly or together with other segments. The SAFZ is capable of producing magnitude 7.5 to 8 earthquakes under multi-segment rupture scenarios. The ShakeOut Scenario (USGS, 2008) is a study aimed at identifying the physical, social and economic effects of a major earthquake in southern California and preparing Californians before such an event occurs. The scenario earthquake selected for ShakeOut is a magnitude 7.8 event on the southern SAFZ, postulated to generate similar events on average every 150 years. Lateral slip for the scenario event is estimated as 9 to 30 feet. Fault rupture and strong ground shaking from the SAFZ present hazards to be mitigated for developments in the project area. Southwestward decrease in slip rates along the SAFZ northwest of its junction with the San Jacinto fault zone is suggested in studies by McGill and others (2021) and attests to the complexity of fault systems in southern California.

Elsinore Fault: The northwest-trending Chino fault, a northern splay of the Elsinore fault zone, is present approximately 23 kilometers southwest of the site. The Elsinore fault zone is composed of multiple en echelon and diverging fault traces and splays into

the Whittier and Chino faults to the north. Although a zone of overall right-lateral deformation consistent with the regional plate tectonics, traces of the Elsinore fault zone form the graben of the Elsinore and Temecula Valleys. Holocene surface rupture events have been documented for several principal strands of the Elsinore fault zone (Saul, 1978; Rockwell and others, 1986; Wills, 1988).

Cucamonga Fault: The southern margin of the San Gabriel Mountains is coincident with a series of east-west trending, predominantly reverse and thrust faults known as the Transverse Ranges frontal fault system. The San Fernando fault of this system ruptured during the 1971 magnitude 6.7 San Fernando earthquake. The Cucamonga fault of this system is located at the base of the San Gabriel Mountains, approximately 17 kilometers northwest of the site. Evidence of recent activity on this fault includes fresh scarps, sag ponds and disrupted Holocene alluvium (Dutcher and Garrett, 1963; Yerkes, 1985; Morton and Yerkes, 1987).

Fault Rupture Potential

The site is not located within an Alquist-Priolo Earthquake Fault Zone (APZ) designated by the State of California for active faults.

(<https://maps.conservation.ca.gov/cgs/informationwarehouse/eqzapp>).

The closest APZ boundary, designated for the San Jacinto fault zone, is located approximately 11 kilometers northeast of the site. Known faults or fault-related features are not located within the site; therefore, the potential for fault rupture within the site is considered low.

Historical Earthquakes

A search of the USGS earthquake catalog for earthquakes of magnitude 4.5 or greater within 150 kilometers of the site returned 340 results including 3 events of magnitude 7 or greater, 24 events of magnitude 6 to 6.9, 94 events of magnitude 5 to 6 and 218 events of magnitude 4.5 to 5. A **Regional Seismicity Map** based on these data is attached.

The Clark segment of the San Jacinto fault zone is associated with the magnitude 6.4 San Jacinto earthquake of 1954. The most recent surface rupture along the San Jacinto fault zone occurred in 1968 along the Coyote Creek segment during an Mw 6.5 earthquake. Two earthquakes took place in the San Bernardino Valley. A magnitude 6.5 event in 1899 near Lytle Creek and a magnitude 6.2 event in 1923 near Loma Linda may have occurred on the San Jacinto fault.

The Coachella Valley segment of the San Andreas fault was the locus for the 1948 Mw 6.5 earthquake in the Desert Hot Springs area and for the 1986 Mw 5.6 earthquake in the North Palm Springs area. Surface rupture occurred on the Mojave segment of the

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San Andreas fault in the great 1857 Fort Tejon earthquake. Using dendrochronological evidence, Jacoby and others (1987) inferred that a great earthquake on December 8, 1812, ruptured the northern reaches of the San Bernardino Mountains segment. Recent trenching studies have revealed evidence of rupture on the San Andreas fault at Wrightwood within this time frame (Fumal and others, 1993). Comparison of rupture events at the Wrightwood site and Pallett Creek, and analysis of reported intensities at the coastal missions, led Fumal and others (1993) to conclude that the December 8, 1812, event ruptured the San Bernardino Mountains segment of the San Andreas fault largely to the southeast of Wrightwood, possibly extending into the San Bernardino Valley.

The following table summarizes selected earthquakes recorded in the site region.

Event ID	Date	Magnitude	Distance (km)	Direction
Palmdale	12-18-1812	7.5	46	NW
Devore area	12-16-1858	6.0	21	N
NW of San Bernardino	7-30-1894	6.2	36	NW
Cajon Pass area	7-22-1899	6.4	34	NNW
San Jacinto	12-25-1899	6.7	46	SE
San Jacinto	4-21-1918	6.7	50	SE
SE of San Bernardino	7-23-1923	6.2	17	NE
Long Beach	3-11-1933	6.4	67	SW
Whittier	10-1-1987	5.9	60	W
Upland	2-28-1990	5.5	29	NW
Landers	6-28-1992	7.3	94	ENE
Big Bear	6-28-1992	6.4	60	NE
Northridge	1-17-1994	6.7	105	WNW
Hector Mine	10-16-1999	7.1	126	NE
Yucaipa	6-16-2005	4.9	39	E
Chino Hills	7-29-2008	5.4	32	WSW

Mitigation of seismic shaking hazard includes design and construction of buildings and improvements according to applicable codes. The following section provides seismic design information specific to this project site.

Tsunamis, Inundation, and Seiche and Flooding Potential

The site is located within an area designated with 'minimal flood hazard' (FEMA, 2024). No evidence of recent significant flooding of the site was observed during the field

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reconnaissance or on the aerial photographs reviewed. An evaluation of the storm-induced flood potential of the site falls under the purview of others.

The site is not located within a potential inundation zone for seismically induced dam/reservoir failure (County of Riverside General Plan, Safety Element, 2024).

The site is not located in a coastal area. No large water storage facilities are known to exist within the area of the site. Therefore, the potential for seismically induced flooding due to seiche or tsunami to affect the site is considered very low.

Subsidence Potential

The County of Riverside (2024) depicts an area of subsidence potential that includes the site area. However, the site is not within an area of documented subsidence. Structures susceptible to subsidence include gravity sewers, surface drainage and storm drains. The proposed development is unlikely to be significantly affected should subsidence occur.

Erosion Potential

Most of the subject site will be covered with structures or flatwork. Erosion by wind and water is not considered to be a hazard at the site.

Slope Stability and Landslide Potential

The site is not located in an area identified as having a potential for landslides (County of Riverside, 2024). The site is relatively flat and level, and significant natural or manmade slopes are not located within the project boundaries. Therefore, the potential for landsliding is considered very low.

Additional Geohazards

The site is underlain by granular, non-expansive soils. Expansive soils and associated effects are not anticipated within the site area.

Hazardous materials including methane gas, hydrogen-sulfide gas, or tar seeps are not present in the site area.

The site lies within an Environmental Protection Agency (EPA) Zone 2 Radon area designated for Riverside County. Zone 2 Radon areas potentially contain between 2 and 4 pCi/L of predicted average indoor radon. However, the data are not intended for site-scale determination of radon hazard. The site is not within an area assessed for radon potential according to the CGS indoor radon maps. Based on geologic conditions at the

site, we do not consider naturally occurring radon gas to be a hazard to the proposed project.

Rock formations with the potential for naturally-occurring asbestos do not occur in the vicinity of the project site. Therefore, the potential for naturally-occurring asbestos to affect the site is considered very low.

Oil or gas wells are not mapped near the site (CalGEM, 2024). The closest well, located approximately 6 kilometers northeast of the site, is listed as being a dry plugged hole. One idle oil/gas well is located approximately 6.4 kilometers southwest of the site. We do not consider oil- and gas-related features to be potential hazards at the site.

Seismic Considerations

Subsurface exploration cone penetrometer test soundings at this site were extended to a maximum depth of 75 feet and included seismic velocity sampling at 5-foot intervals in CPT-4. The site properties to a profile depth of 100 feet (30 meters) were extrapolated based on our experience and knowledge of geologic conditions of the general area.

Based on site seismic shear wave velocities measured in CPT-4, the calculated average shear wave velocity at the site V_{s30} is 423 m/s, which indicates Site Class 'C' per ASCE 7-16, Chapter 20. The seismic shear wave velocity data from CPT-4 is attached in tabular form.

The site is located in southern California, which is a region of moderate to high seismicity. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. Based on the NSHM Conterminous U.S. 2023 interactive disaggregation, the San Jacinto and San Andreas fault zones comprise the most significant contribution to site seismic hazard. Based on the disaggregation for the MCE_R -level seismic hazard (2% probability of exceedance in 50 years or a return period of 2,475 years), a modal earthquake magnitude of 7.7 and mean magnitude of 7.0 may be considered for this site. Based on disaggregation, the PGA at the subject site for an MCE_R -level earthquake is 0.88g.

Based on the ASCE 7-16 Standard, the design peak ground acceleration (PGA_M) for the subject site is 0.612g.

The 2022 California Building Code (CBC) Seismic Design Parameters have been generated using the ASCE Seismic Hazard Design Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16, and 2022 CBC.

The spectral response accelerations presented in the following table were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2022 CBC.

Parameter	Value
Site Classification ¹	C
Site Latitude	34.0125° N
Site Longitude	117.4219° W
Mapped Spectral Acceleration Parameters ²	$S_s = 1.5$ and $S_1 = 0.6$
Site Coefficients ³	$F_a = 1.2$ and $F_v = 1.4$
Spectral Response Acceleration Parameters ²	$S_{MS} = 1.8$ and $S_{M1} = 0.84$
Design Spectral Acceleration Parameters ²	$S_{DS} = 1.2$ and $S_{D1} = 0.56$
Site-Modified Peak Ground Acceleration ²	$PGA_M = 0.612g$
De-aggregated Modal Magnitude ⁴	7.7

1. Seismic site classification in general accordance with ASCE 7-16, Chapter 20.
2. These values were obtained using the online ASCE seismic hazard design tool; <https://www.ascehazardtool.org>
3. ASCE 7-16 11.4.4.
4. USGS Earthquake Hazard Toolbox <https://earthquake.usgs.gov/nshmp>.

Liquefaction and Seismic Settlement

Liquefaction: Liquefaction is a mode of ground failure that results from the generation of high excess porewater pressures during earthquake ground shaking, causing loss of shear strength, and is typically a hazard where loose sandy soils exist below groundwater. Riverside County has identified certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and/or the presence of a relatively shallow water table.

The subsurface materials at the site generally consisted of loose to very dense sand with varying amounts of silt, clay, and gravel with minor interbedded layers of stiff to very stiff sandy silt. Groundwater was not observed within the maximum 75-foot depth of site explorations and has historically been greater than 100 feet bgs.

According to the County of Riverside (2024), the site is located within an area identified as having a 'moderate' liquefaction potential. Historic groundwater levels are not within 100 feet of the ground surface; therefore, liquefaction is not anticipated. Based on the low relief across the site and lack of free-face slope conditions, lateral spreading is also not anticipated.

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Seismic Settlement: To determine the amount of seismic settlement (dry sand), we utilized the software "LiquefyPro" by CivilTech Software, seismic settlement was estimated using the soil profile from B-3 and B-4. A Peak Ground Acceleration (PGA) of 0.612g and the de-aggregated mode magnitude of 7.7 were utilized as input into the liquefaction analysis program. Settlement analysis used the Tokimatsu and Seed (1987) method and the Standard Penetration Test (SPT) blow counts corrected for fines content using the NCEER/NSF method (Youd et al, 2001).

We performed a seismic settlement analysis to determine the seismic settlement of dry/unsaturated sandy soils using data from borings B-3 and B-4. Based on data from these borings, seismically induced settlement (dry sand) is estimated to be approximately 0.83 inches to 2.15 inches, respectively.

We also performed an analysis for dry seismic settlement using data from soundings CPT-1 through CPT-6 and the software "CLiq" by Geologismiki. Settlement analysis and fines correction used the Robertson (2009) method.

Based on the analysis, the computed total seismic settlement ranges from 0.17 to 1.2 inches based on data from the CPTs. The differential seismic settlement can be taken as equal to one-half of the total seismic settlement over a distance of 40 feet.

Corrosivity

The table below lists the results of laboratory soluble sulfate, sulfides, soluble chloride, electrical resistivity (as received and saturated), redox potential, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary

Boring	Sample Depth (feet)	Soil Description	Soluble Sulfate (%)	Sulfides (ppm)	Soluble Chloride (%)	Redox potential (mV)	Saturated Minimum Resistivity (Ω -cm)	pH
B-3	0-5	Silty Sand	0.003	<0.001	ND	+135	6,500	7.37

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class S0 provisions of the ACI Design Manual, Section 318, Chapter 19.

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Imported fill materials may have significantly different properties than the site materials noted above and should be evaluated if expected to be in contact with metals used for construction. Consultation with a NACE-certified corrosion professional is recommended for buried metals on the site.

For protection against corrosion to buried metals, Terracon recommends that an experienced corrosion engineer be retained to design a suitable corrosion protection system for underground metal structures or components.

If corrosion of buried metal is critical, it should be protected using a non-corrosive backfill, wrapping, coating, sacrificial anodes, or a combination of these methods, as designed by a qualified corrosion engineer.

Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, and our current understanding of the proposed project.

Geotechnical recommendations for earthwork and foundations are presented in the following report sections. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

To mitigate the potential seismic settlement and hydro-compaction of the soil, foundations and stiffened floor slabs bearing on reinforced engineered fill are recommended for support of the proposed structures.

Estimated movements described in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained. Exposed ground, extending at least 10 feet from the perimeter, should be sloped a minimum of 5% away from the building to provide positive drainage away from the structure. Grades around the structure should be periodically inspected and adjusted as part of the structure's maintenance program.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration and Laboratory Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

The **General Comments** section provides an understanding of the report limitations.

Earthwork

The following recommendations include site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs, and pavements are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

An on-site, pre-job meeting with the owner, the contractor and the Geotechnical Engineer should occur prior to all grading-related operations. Observation, testing, documentation, and reporting of the grading operation should be performed by the Geotechnical Engineer of Record. A final compaction report should be issued by the Geotechnical Engineer of Record at the completion of the grading operation. Interim reports may be issued according to project requirements. Operations undertaken at the site without the Geotechnical Engineer present may result in exclusions of affected areas from compaction reports for the project.

Grading of the subject site should be performed, at a minimum, in accordance with these recommendations and with applicable portions of the current version of CBC. The following recommendations are presented for your assistance in establishing proper grading criteria.

Site Preparation

Strip and remove existing vegetation, debris, and other deleterious materials from proposed building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

All materials derived from the demolition of existing improvements should be removed from the site and not be allowed for use as on-site fill, unless processed in accordance with the fill requirements included in this report.

Structures that are classified as "occupied structures" in accordance with California Code of Regulations Section 3601 should not be constructed on undocumented fill. We

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recommend that all fill soils be removed within the proposed building area and the excavation thoroughly cleaned prior to backfill placement and/or construction. If such documentation exists, Terracon should be notified and the recommendations in this report may be appropriately modified. Fill was not identified in the area of the proposed new buildings; however, the recommendations for minimum depth of remedial grading (see Subgrade Preparation) also apply.

Existing utility lines were noted at the site. However, although no evidence of other underground facilities such as septic tanks, cesspools, and basements, was observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

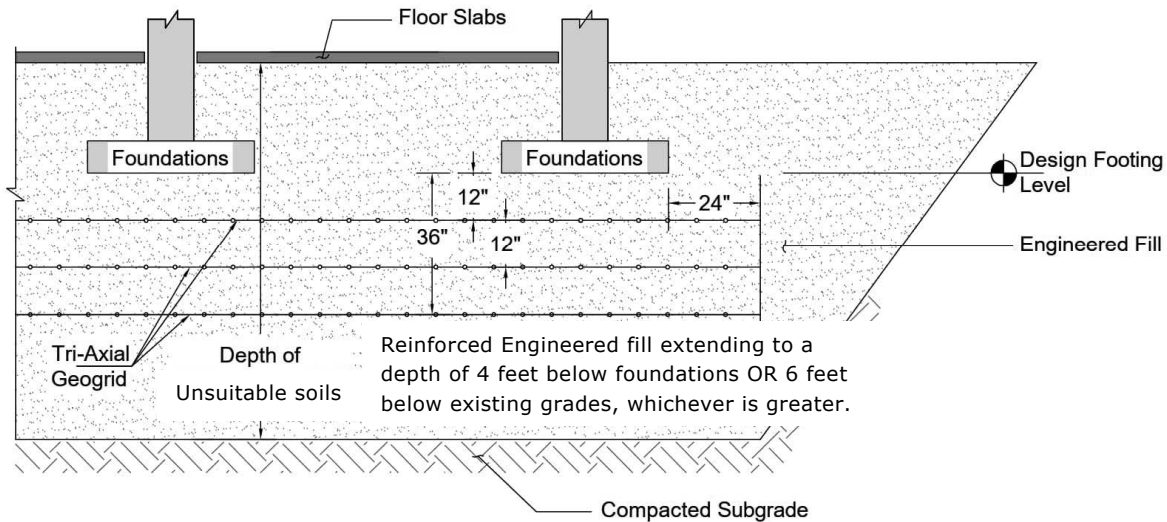
Subgrade Preparation

Due to potential hazard of seismic settlement of dry/unsaturated soils on site and potentially hydrocollapsible soils, we recommend that the proposed building foundations be supported on reinforced engineered fill extending to a minimum depth of 4 feet below the bottom of foundations, or 6 feet below existing grades, whichever is greater. Exposed soils at the bottom of excavations should be saturated with water and the upper 12 inches scarified, moisture conditioned, and recompacted with heavy rollers prior to placement of reinforced engineered fill. This is expected to mitigate the effects of any hydro-collapse potential of soils between 6 to 10 feet bgs. Engineered fill placed beneath the entire footprint of the building should extend horizontally a minimum distance of 2 feet beyond the outside edge of perimeter footings. The geogrid should be placed at one-foot centers with the top geogrid placed one foot below the bottom of the footing. A minimum of 3 layers of multiaxial geogrid (such as Tensar InterAX or equivalent) will reduce the potential differential settlement beneath the proposed building but will not reduce potential total dynamic settlement.

Exposed soils at the bottom of footing and floor slab excavations, once properly cleared and benched where necessary, should be presaturated and the upper 12 inches scarified, moisture conditioned, and recompacted with heavy rollers prior to placement of reinforced engineered fill.

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Excavation

We anticipate that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Onsite soils may include layers of cohesionless sandy soils. Such soils have the tendency to cave and slough during excavations. Therefore, formwork may be needed for foundation excavations. Based on the relatively flat-lying site surface and planned development, significant temporary cut slopes are not expected during the proposed construction. For purposes of construction, the soils encountered in our explorations are considered type "C" materials. Accordingly, temporary slopes in near surface native soil should conform to applicable standards as outlined by Cal/OSHA for construction excavations (https://www.dir.ca.gov/title8/1541_1a.html). On-site soils shall be sloped at a minimum of 1.5H:1V. Benching is not permitted.

Soils from the excavation should not be stockpiled higher than six 6 feet or within ten 10 feet of the edge of an open trench. Construction of open cuts adjacent to existing structures, including underground pipes, is not recommended within a 1½H:1V plane extending beyond and down from the perimeter of the structure. Cuts that are proposed within five 5 feet of light standards, other utilities, underground structures, and pavement should be provided with temporary shoring.

It may be necessary for the contractor to retain a geotechnical engineer to monitor the soils exposed in all excavations and provide engineering services for slopes. This will provide an opportunity to monitor the soils encountered and to modify the excavation

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slopes as necessary. It also offers an opportunity to verify the stability of the excavation slopes during construction.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Material Types

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than three inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

- general site grading
- foundation areas
- interior floor slab areas
- foundation backfill
- pavement areas
- exterior slab areas

If imported soils are used as fill materials to raise grades, these soils should conform to low volume change materials and should conform to the following requirements:

<u>Gradation</u>	<u>Percent Finer by Weight</u> <u>(ASTM C 136)</u>
3"	100
No. 4 Sieve	50 - 100
No. 200 Sieve	20 - 50
■ Liquid Limit	30 (max)
■ Plasticity Index	15 (max)
■ Maximum Expansive Index*	20 (max)

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria. The reports shall be accompanied by a written statement from the

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contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

Fill Placement and Compaction Requirements

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
On-site soils and/or low volume change imported fill:			
Beneath foundations:	90	0%	+3%
Beneath interior slabs:	90	0%	+3%
Miscellaneous backfill:	90	0%	+3%
Beneath pavements:	95	0%	+3%
Utility Trenches*:	90	0%	+3%
Bottom of excavation receiving fill:	90	0%	+3%
Aggregate base (beneath pavements):	95	0%	+3%

* Upper 12 inches should be compacted to 95% within pavement and structural areas. Low-volume change imported soils should be used in structural areas.

Utility Trench Backfill

We anticipate that the on-site soils will provide suitable support for underground utilities and piping that may be installed. Any soft and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 is recommended for bedding and shading of utilities, unless otherwise allowed by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances.

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Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

Roof drainage should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems and landscaped irrigation should not be installed within 5 feet of foundation walls.

Exterior Slab Design and Construction

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. To reduce the potential for damage caused by movement, we recommend:

- minimizing moisture increases in the backfill;
- controlling moisture-density during placement of backfill;
- using designs which allow vertical movement between the exterior features and adjoining structural elements;
- placing effective control joints on relatively close centers.

Earthwork Construction Considerations

Shallow excavations for the proposed structures are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent

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ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/precondition survey may be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines may be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill. This testing frequency criteria may be adjusted during construction as specified by the geotechnical engineer of record.

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In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Shallow Foundations

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Item	Recommendation
Foundation Support	Reinforced engineered fill extending 4 feet below the bottom of foundations, or 6 feet below existing grades, or to the depth of disturbed soils from removal of existing foundations whichever is greatest.
Net Allowable Bearing Pressure ^{1, 2} (On-site Soils or Structural Fill)	<u>Column Footing:</u> 2,000 psf for footings up to 8 feet width 1,500 psf for footings up to 12 feet width <u>Continuous Footing:</u> 1,500 psf for footings up to 3 feet in width
Minimum Foundation Dimensions	Column Footing: 24 inches wide Continuous Footing: 18 inches wide
Minimum Footing Embedment Depth	24 inches below finish grade
Ultimate Passive Resistance ⁴	400 pcf
Ultimate Coefficient of Sliding Friction ⁵	0.32
Estimated Total Static Settlement from Structural Loads ²	1 inch
Estimated Differential Settlement ^{2, 6}	1/2 of total settlement

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1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied.
2. Values provided are for maximum loads noted in **Project Description**. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations. The above settlement estimates have assumed that the maximum footing size is 12 feet for column footings and 3 feet for continuous footings.
3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**.
4. Use of passive earth pressures requires the footing forms be removed and compacted structural fill be placed against the vertical footing face. A factor of safety of 2.0 is recommended. Passive pressure and sliding friction may be combined to resist sliding provided the passive pressure is reduced by 50 percent. Ultimate passive resistance should be capped at 4,000 psf.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions. A factor of safety of 1.5 is recommended.
6. Differential settlements are as measured over a span of 40 feet.

Differential settlement between the new and existing foundations is expected to approach the magnitude of the total settlement of the new footings. The structural engineer should account for the anticipated differential settlement between new and existing footings in the design of the improvements. Care should be taken during excavation adjacent to existing foundations, to avoid disturbing existing foundation bearing soils.

New footings should bear at or near the bearing elevation of immediately adjacent existing foundations. If this depth varies from the minimum footing depth required herein, Terracon should be notified to adjust our recommendations as needed. Depending upon their locations and current loads on the existing footings, footings for the wall and/or columns could cause settlement of adjacent walls. To reduce this concern and risk, clear distances at least equal to the new footing widths should be maintained between the new footings and footings supporting the existing building. In the event such clearance is not feasible, overlapping stresses should be considered for both existing and new foundations.

Design Parameters – Overturning and Uplift Loads

Shallow foundations subjected to overturning loads should be proportioned such that the resultant eccentricity is maintained in the center-third of the foundation (e.g., $e < b/6$, where b is the foundation width). This requirement is intended to keep the entire foundation area in compression during the extreme lateral/overturning load event. Foundation oversizing may be required to satisfy this condition.

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Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils with consideration to the CBC basic load combinations.

Item	Recommendation
Soil Effective Unit Weight	125 pcf
Soil Weight Included in Uplift Resistance	Soil included within the prism extending up from the top perimeter of the footing at an angle of 20 degrees from vertical to ground surface

Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

To ensure foundations have adequate support, special care should be taken when footings are located adjacent to trenches. The bottom of such footings should be at least 1 foot below an imaginary plane with an inclination of 1.5 horizontal to 1.0 vertical extending upward from the nearest edge of adjacent trenches.

Floor Slabs

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Recommendation
Interior Floor System ¹	6-inches thick stiffened reinforced concrete slab-on-grade
Floor slab support	Reinforced engineered fill extending 4 feet below the bottom of foundations, or 6 feet below existing grades, whichever is greater.
Subbase	Minimum 4-inches of Aggregate Base

Modulus of Subgrade reaction

200 pounds per square inch per inch (psi/in) (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas.

¹ Stiffened reinforced concrete slabs-on-grade may be designed in accordance with the CBC Section 1808.6.2.

The slab should have a minimum thickness of 6 inches and be designed with concrete having a minimum compressive strength of 3,000 psi. The slab should be continuously reinforced with #5 reinforcing bars placed in both directions at a maximum spacing of 18 inches on center.

Slabs designed for exterior surface improvements should be a minimum 4 inches thick. In areas abutting landscape areas, the edge of the slab should be deepened to approximately 8 inches below the adjacent finish subgrade.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing, or other means.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning

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of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

Lateral Earth Pressures

For engineered fill comprising of on-site soils or imported low volume change materials above any free water surface, recommended equivalent fluid pressures for unrestrained foundation elements are:

Parameter	Value ^{1, 2}
Active Pressure	39 psf/ft
Passive Pressure	400 psf/ft
At-Rest Pressure	59 psf/ft
Lateral Surcharge Pressure	0.31 * S where S is the vertical surcharge load
Coefficient of Friction	0.32

¹ The values are based on engineered fill materials used as backfill.

² Uniform, horizontal backfill, compacted to at least 90% of the ASTM D 1557 maximum dry density, rendering a maximum unit weight of 125 pcf.

The lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/hydrostatic loading. Additional recommendations may be necessary if such conditions are to be included in the design. Fill against foundation walls should be compacted to densities specified in the Earthwork section of this report. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors.

The design of the shored excavation should be performed by an engineer knowledgeable and experienced with the on-site soil conditions. The contractor should be aware that slope height, slope inclination or excavation depths should in no case exceed those specified in local, state or federal safety regulations, e.g. OSHA Health and Safety Standards for Excavation, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if not followed, the owner or the contractor could be liable for substantial penalties.

The design shoring systems should consider surcharge loads imposed by the foundations. In addition, the design should take into consideration new footing loads and anticipated vehicular loads in the vicinity of the proposed temporary excavation. In general, surcharge loads should be considered where they are located within a horizontal distance behind the excavation equal to the height of the excavation.

Surcharge loads acting at the top of the excavation should be applied to the wall over the backfill as a uniform pressure over the entire wall height and should be added to the static earth pressures. Surcharge stresses due to point loads, line loads, and those of limited extent, such as compaction equipment, should be evaluated using elastic theory.

For the design of braced shoring, we recommend such shoring be designed using a rectangular-shaped distribution of lateral earth pressure of $26H$ (in psf) (H is the total height of the braced excavation). This pressure does not consider the effects of surcharge from foundations or vehicles.

Pavements

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description**, including the extension of 33rd Street (unless other Traffic design information is provided), and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Pavement Design Parameters

Design of asphalt concrete (AC) pavements is based on the procedures outlined in the Caltrans "Highway Design Manual" (Caltrans, 2018). Design of Portland cement concrete (PCC) pavements are based upon American Concrete Institute (ACI) 330R-08; "Guide for Design and Construction of Concrete Parking Lots."

A design R-value of 50 was used for the AC pavement design. A modulus of rupture of 600 psi and modulus of subgrade reaction of 150 psi/in was used for pavement concrete. The structural sections are predicated upon proper compaction of the utility trench backfills and the subgrade soils as prescribed by in **Earthwork**, with the upper 12 inches of subgrade soils and all aggregate base material brought to a minimum relative compaction of 95 percent in accordance with ASTM D 1557 prior to paving. The aggregate base should meet Caltrans requirements for Class 2 base.

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The pavement designs were based upon the results of preliminary sampling and testing and should be verified by additional sampling and testing (specifically R-value testing) during construction when the actual subgrade soils are exposed. Additionally, the preliminary sections provided are minimums based on procedures previously referenced. The project civil engineer should confirm minimum Traffic Indices and sections required by local agencies or jurisdictions if applicable.

Pavement Section Thicknesses

The following table provides options for AC and PCC Sections:

Asphalt Concrete (AC) Pavement Design		
Usage	Assumed Traffic Index	Recommended Structural Section
Auto Parking Areas	5.0	3" HMA ¹ /3" Class 2 AB ²
Drive lanes	5.5	3" HMA ¹ /4" Class 2 AB ²
Truck Delivery Areas	7.0	3" HMA ¹ /7" Class 2 AB ²

1. HMA = Hot-mix Asphalt

2. AB = Aggregate Base

Portland Cement Concrete (PCC) Pavement Design			
Layer	Thickness (inches)		
	Light (Automobile) Parking ¹	On-site Driveways and Delivery Areas ²	Heavy Duty On-site Driveways and Delivery Areas ³
PCC	5.0	5.0	6.0
Aggregate Base ⁴	4.0	4.0	4.0

1. Car Parking and Access Lanes, Average Daily Truck Traffic (ADTT) = 1 (Category A).

2. Truck Parking Areas, Multiple Units, ADTT = 25 (Category B)

3. In areas of anticipated heavy traffic, fire trucks, delivery trucks, or concentrated loads (e.g., dumpster pads), and areas with repeated turning or maneuvering of heavy vehicles, ADTT = 700 (Category C).

4. Aggregate base is not required. Compacted on-site material is considered competent.

Recommended structural sections were calculated based on assumed TIs and our preliminary sampling and testing. Terracon does not practice traffic engineering. We

recommend that the project civil engineer or traffic engineer verify that the TIs and ADTT traffic indices used are appropriate for this project.

Although not required for structural support, a minimum 4-inch-thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles. A maintenance program including surface sealing, joint cleaning and sealing, and timely repair of cracks and deteriorated areas will increase the pavement's service life. As an option, thicker sections could be constructed to decrease future maintenance.

Concrete for rigid pavements should have a minimum 28-day compressive strength of 4,000 psi, and be placed with a maximum slump of 4 inches. Although not required for structural support, a minimum 4-inch thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its "green" state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. This is especially applicable for islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils. The civil design for the pavements with these conditions should include features to restrict or collect and discharge excess water from the islands. Examples of features are edge drains connected to the storm water collection system, longitudinal subdrains, or other suitable outlets and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325. PCC pavements should be provided with mechanically reinforced joints (doweled or keyed) in accordance with ACI 330.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2 percent.
- Subgrade and pavement surfaces should have a minimum 2 percent slope to promote proper surface drainage.
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.

- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

Storm Water Management

Two in-situ infiltration tests (falling head borehole permeability) were performed at approximate depths of 5 and 10 feet bgs. The objective of the infiltration testing is to provide infiltration rates for designing the proposed infiltration system. A 2-inch thick, 3/8-inch gravel layer was placed in the bottom of each boring after the borings were drilled to investigate the soil profile.

Three-inch diameter perforated pipes were installed on top of the gravel layer. Gravel was used to backfill between the perforated pipes and the boring sidewall. The borings were then filled with water for a pre-soak period.

At the beginning of each test, the pipes were refilled with water and readings were taken at periodic time intervals as the water level dropped. The soil at the percolation test locations was classified in the field using a visual/manual procedure. The infiltration velocity is presented as the infiltration rate and is summarized in the following table. The infiltration rates provided do not include safety factors.

Infiltration Test Results

Test Location	Boring Depth (ft.)	Test Depth Range (ft.)	Soil Type	Percolation Rate (in./hr.)	Correlated Infiltration Rate (in./hr.)
P-1	5	0 to 5	SM	38.3	1.4
P-2	10	5 to 10	SM/ML	65.3	2.3

The above infiltration rates determined by the shallow percolation test method are based on field test results utilizing clear water. Infiltration rates can be affected by silt buildup, debris, degree of soil saturation, site variability and other factors. The rate obtained at specific location and depth is representative of the location and depth tested and may not be representative of the entire site. Application of an appropriate safety factor is prudent to account for subsoil inconsistencies, possible compaction related to site grading, and potential silting of the percolating soils, depending on the application.

The design engineer should also check with the local agency for the limitation of the infiltration rate allowed in the design. If the maximum allowable design infiltration rate is lower than the above recommended rate, the maximum allowable design infiltration rate should be used. The designer of the basins should also consider other possible site variability in the design.

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The percolation test was performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Based on the soils encountered in our borings, we expect the percolation rates of the soils could be different than measured in the field due to variations in fines and gravel content. The design elevation and size of the proposed infiltration system should account for this expected variability in infiltration rates.

Infiltration testing should be performed after construction of the infiltration system to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of the infiltration areas. The actual infiltration rate may vary from the values reported here. Infiltration systems should be located at least 10 feet from any existing or proposed foundation system.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not

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intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

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Aerial Imagery Examined

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Attachments

Exploration and Testing Procedures

Field Exploration

Terracon conducted twelve soil-testing borings and six CPT soundings. These explorations are summarized below.

Exploration	Depth (feet) ¹	Location
B-3 and B-4	51½	Planned SNF building
B-5 and B-6	26½	Planned SNF building
B-2	36½	Planned MO Dialysis building
B-1, B-7, B-8	11½	Parking area
B-9 to B-10	11½	33 rd Street Extension
CPT-1 to CPT-4	75	Planned SNF building
CPT-5	50	Planned SNF building
CPT-6	50	Planned MO Dialysis building
P-1 to P-2	5 and 10	Water quality basin

1. Below ground surface.

Boring Layout and Elevations: Terracon personnel provided the exploration layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. Approximate ground surface elevations were obtained by interpolation were estimated using Google Earth. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advance the borings with a truck-mounted drill rig using 8-inch-diameter hollow-stem augers. Both a standard penetration test (SPT) sampler (2-inch outer diameter and 1-3/8-inch inner diameter) and a modified California ring-lined sampler (3-inch outer diameter and 2-3/8-inch inner diameter) are utilized in our investigation. The penetration resistance is recorded on the boring logs as the number of hammer blows used to advance the sampler in 6-inch increments (or less if noted). The samplers are driven with an automatic hammer that drops a 140-pound weight 30 inches for each blow. After the required seating, samplers are advanced up to 18 inches, providing up to three sets of blowcounts at each sampling interval. The sampling depths, penetration distances, and other sampling information are recorded on the field boring logs. The recorded blows are raw numbers without any corrections for hammer type (automatic vs. manual cathead) or sampler size (ring sampler vs. SPT sampler). Relatively undisturbed and bulk samples of the soils encountered are placed in sealed containers and returned to the laboratory for testing and evaluation.

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We observe and record groundwater levels during drilling and sampling. For safety purposes, all borings are backfilled with auger cuttings after their completion.

Our exploration team prepares field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs are prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Cone Penetrometer Testing: We performed six (6) cone penetrometer tests (CPT) to depths ranging from approximately 50.15 feet to 75.2 feet bgs. The digital data recorded includes tip resistance, friction resistance, and probe inclination angle and was recorded about every 2 centimeters while advancing through the ground at a rate between 1½ and 2½ centimeters per second. Additionally, seismic cone measurements were obtained at intervals of approximately 5 feet in CPT-4 and utilized for shear wave velocity determination. No soil samples were gathered through the CPT subsurface investigation technique. CPT testing was conducted in general accordance with ASTM D5778 "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils."

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed

- Moisture Content
- Dry Unit Weight
- Particle size distribution (gradation) of soils using sieve analysis
- Hydroconsolidation test
- Modified Proctor
- Plasticity Index
- R value
- Corrosion suite

The laboratory testing program often includes examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

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Site Location and Exploration Plans

Contents:

- Site Location Plan
- Exploration Plan
- Exploration – Grading Plan
- Cross Section (provided in final version of this report)
- Geologic Map
- Regional Fault Map
- Regional Seismicity Map

Note: All attachments are one page unless noted above.

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Exploration Plan

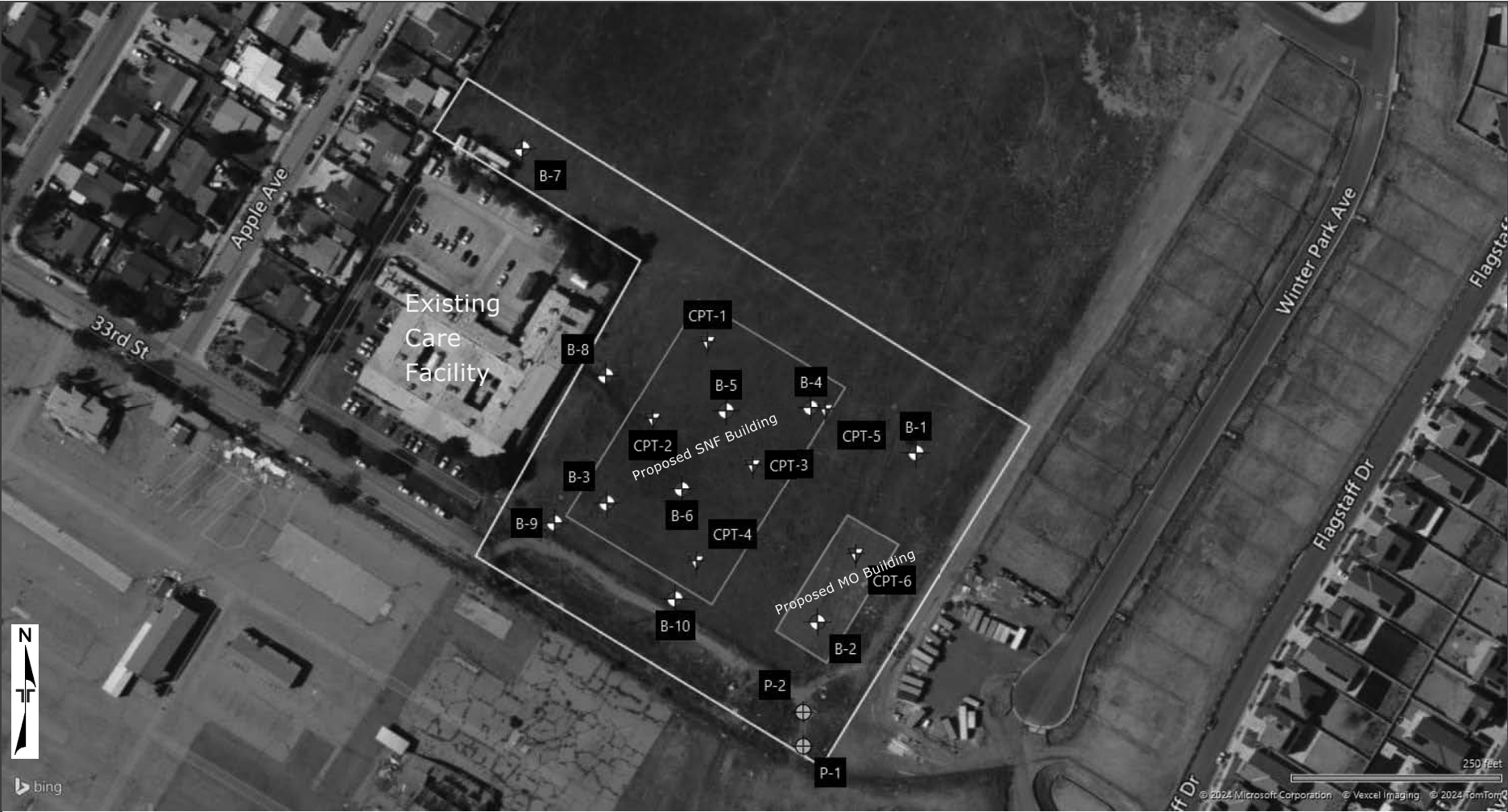
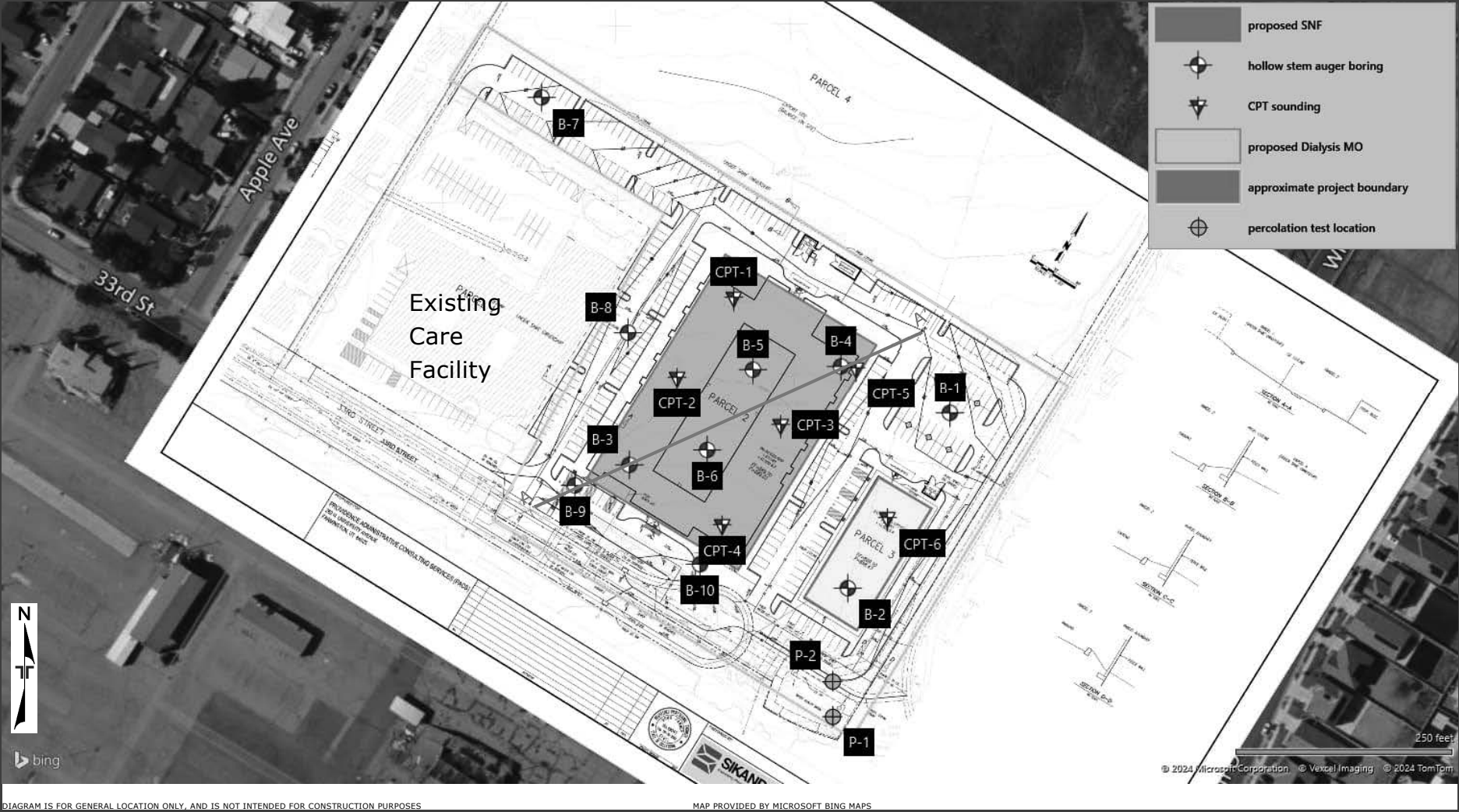


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

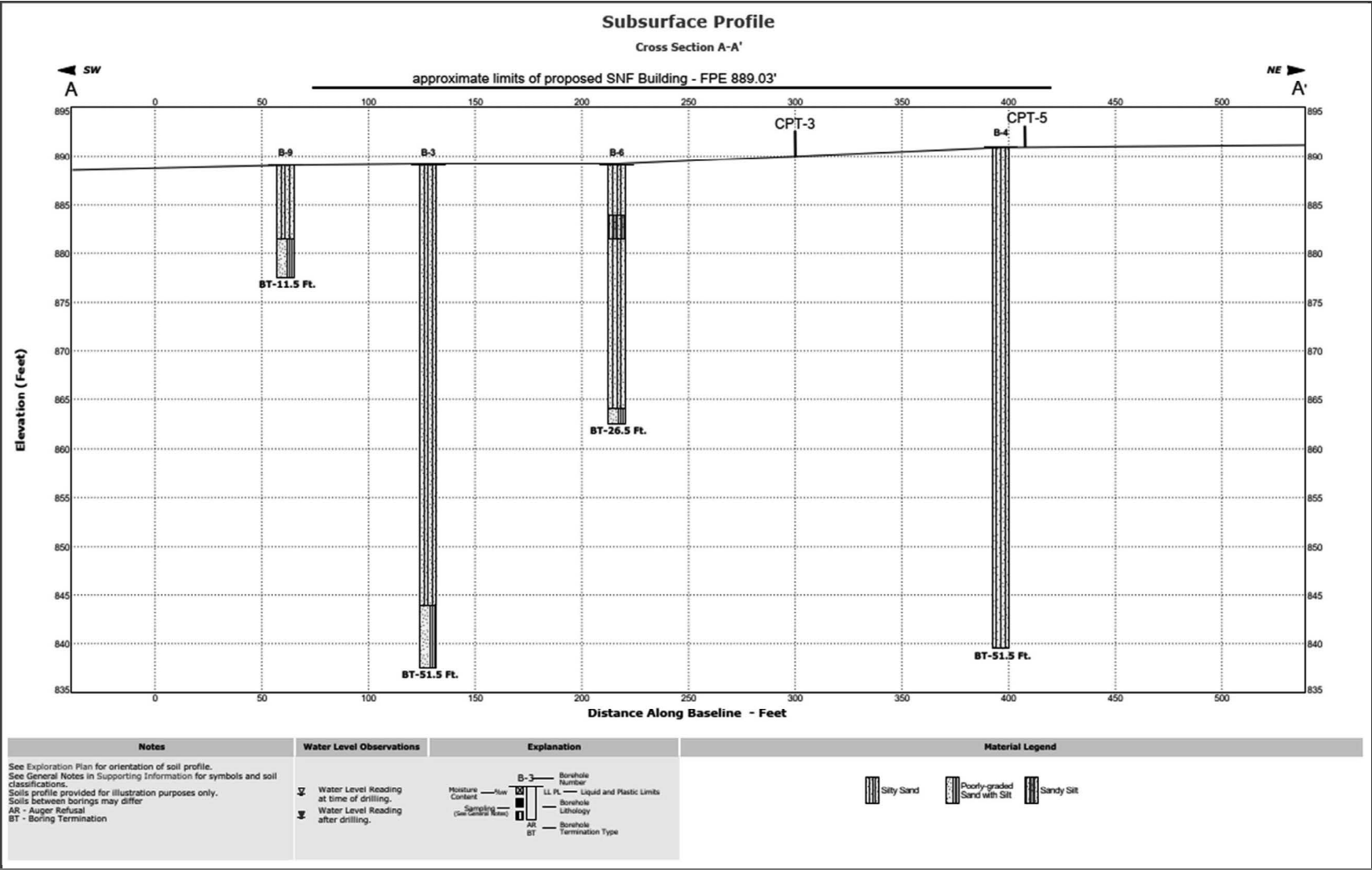
MAP PROVIDED BY MICROSOFT BING MAPS

Exploration - Grading Plan





Cross Section A A'

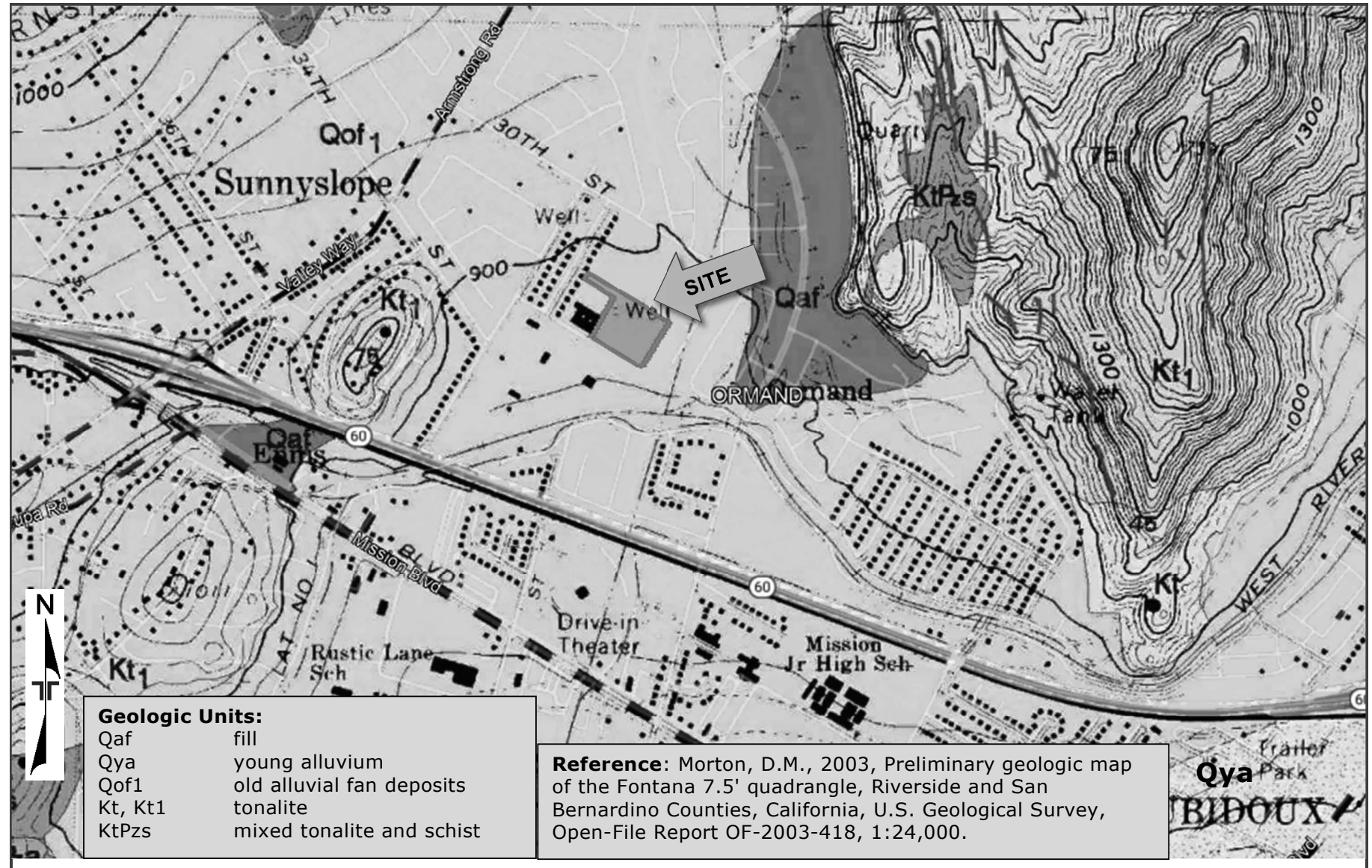


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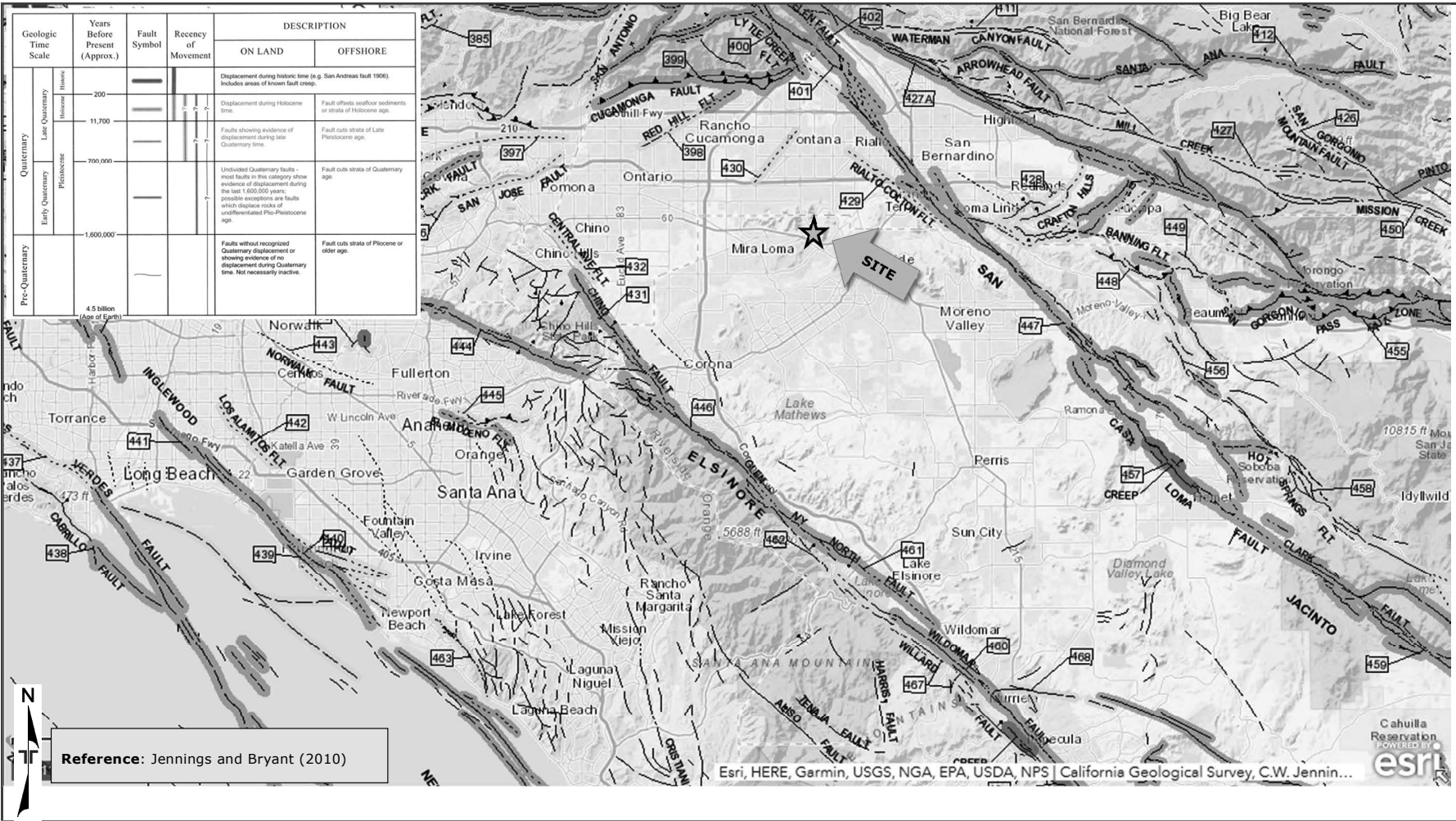
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Geologic Map



Regional Fault Map

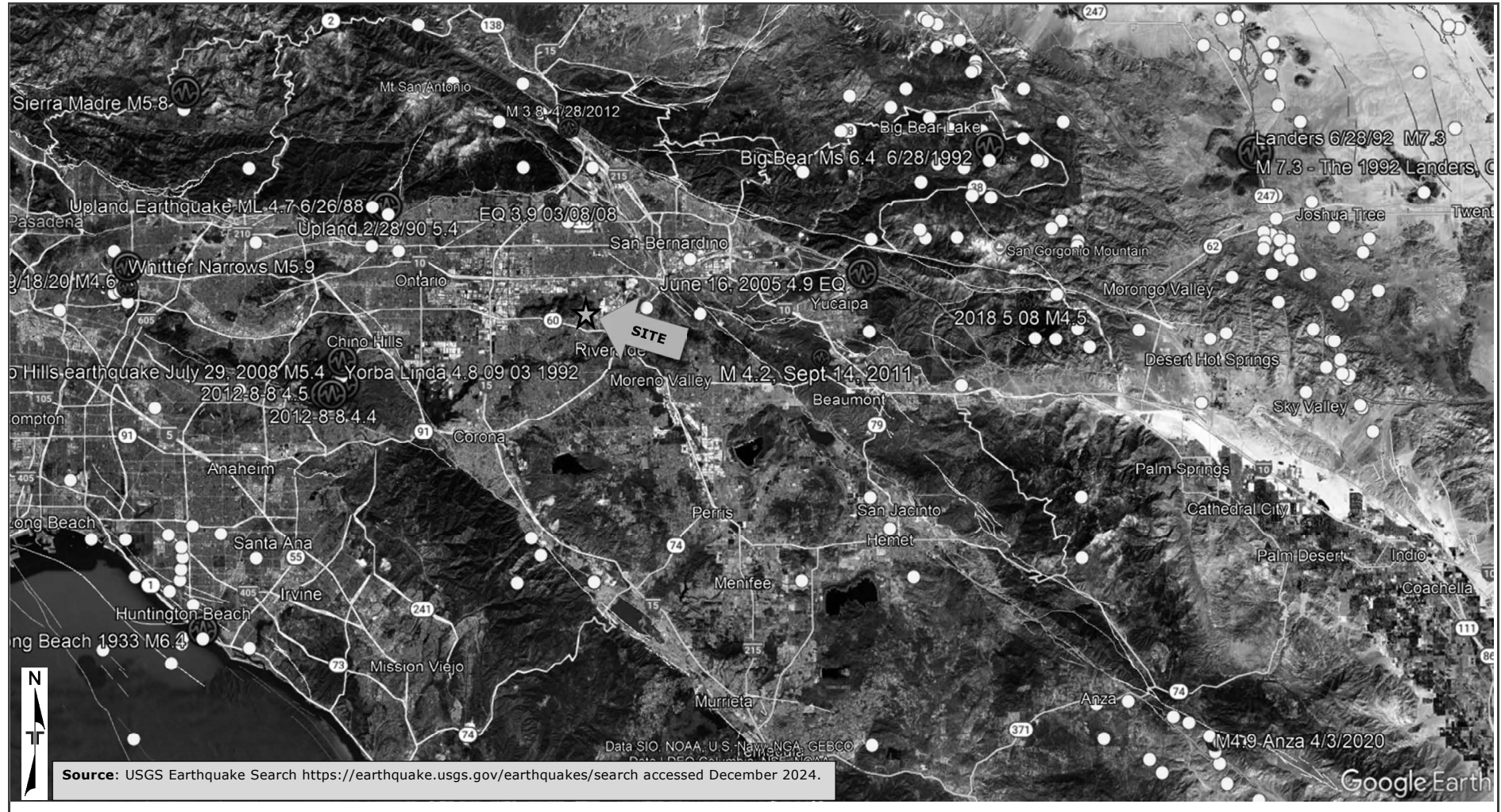


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Regional Seismicity Map



Exploration and Laboratory Results

Contents:

- Boring Logs B-1 through P-2 (XX pages)
- CPT Soundings CPT-1 through CPT-6
- Percolation Test Data (2 pages)
- Atterberg Limit Results
- Grain Size Distribution
- Direct Shear Test (2 pages)
- Consolidation
- Moisture Density Relationship
- R value
- Corrosion Suite
- Seismic Shear Wave Velocity Data (xx pages)

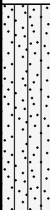
Note: All attachments are one page unless noted above.

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Boring Log No. B-2

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits		Percent Fines
	Latitude: 34.0121° Longitude: -117.4215°									LL-PL-PI		
Depth (Ft.)			Elevation.: 887 (Ft.)									
	SILTY SAND (SM) , trace gravel, brown											
	loose											
						4-5-7		2.1	114			
		5				4-6-7		0.4	121		17	
	medium dense					8-10-17						
	dense					11-24-38		4.2	106			
	trace clay, medium dense	15				6-9-11 N=20						
	trace gravel	20				7-8-11 N=19						
		25				6-7-12 N=19						
		30										
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.							Water Level Observations Groundwater not encountered			Drill Rig CME-75 Hammer Type Automatic Driller 2R Drilling		
Notes							Advancement Method Hollow Stem Auger Abandonment Method Boring backfilled with auger cuttings upon completion.			Logged by AT Boring Started 11-26-2024 Boring Completed 11-26-2024		

Boring Log No. B-2

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0121° Longitude: -117.4215°									LL-PL-PI	
	Depth (Ft.)	Elevation.: 887 (Ft.)									
	SILTY SAND (SM) , trace gravel, brown <i>(continued)</i> medium dense		35		X	6-8-10 N=18					
	35.0	852									
	POORLY GRADED SAND WITH SILT (SP-SM) , brown, medium dense				X	7-13-14 N=27					
	36.5	850.5									
Boring Terminated at 36.5 Feet											

Boring Log No. B-3

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0125° Longitude: -117.4223°									LL-PL-PI	
Depth (Ft.)			Elevation.: 889 (Ft.)								
	SILTY SAND (SM) , trace clay, brown						3				
	loose										
	medium dense										
trace gravel									NP		

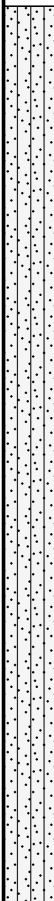
Boring Log No. B-3

Graphic Log	Location: See Exploration Plan Latitude: 34.0125° Longitude: -117.4223°		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Depth (Ft.)	Elevation.: 889 (Ft.)								LL-PL-PI	
	SILTY SAND (SM) , trace clay, brown <i>(continued)</i>					6-7-8 N=15					
			35								
	with clay					11-11-12 N=23				19-16-3	47
			40			8-10-12 N=22					
	trace clay										
	45.0	844	45			7-12-17 N=29					
	POORLY GRADED SAND WITH SILT (SP-SM) , brown, medium dense										
			50			9-14-18 N=32					
	51.5	837.5									
Boring Terminated at 51.5 Feet											
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.				Water Level Observations Groundwater not encountered				Drill Rig CME-75 Hammer Type Automatic Driller 2R Drilling			
Notes				Advancement Method Hollow Stem Auger Abandonment Method Boring backfilled with auger cuttings upon completion.				Logged by AT Boring Started 11-26-2024 Boring Completed 11-26-2024			

Boring Log No. B-4

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0128° Longitude: -117.4215°									LL-PL-PI	
	Depth (Ft.)	Elevation.: 891 (Ft.)									
	SILTY SAND (SM) , trace gravel, brown										
	medium dense					4-9-14 N=23					40
	trace clay, dense		5			11-16-21 N=37					
						11-13-22 N=35					
	medium dense		10			10-11-16 N=27					
	dense		15			10-14-20 N=34					
	medium dense		20			6-11-14 N=25					
	with clay		25			7-9-15 N=24					
			30								
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.			Water Level Observations Groundwater not encountered						Drill Rig CME-75		
									Hammer Type Automatic		
									Driller 2R Drilling		
Notes			Advancement Method Hollow Stem Auger						Logged by AT		
			Abandonment Method Boring backfilled with auger cuttings upon completion.						Boring Started 11-26-2024		
									Boring Completed 11-26-2024		

Boring Log No. B-4

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0128° Longitude: -117.4215°									LL-PL-PI	
	Depth (Ft.)		Elevation.: 891 (Ft.)								
	SILTY SAND (SM) , trace gravel, brown <i>(continued)</i> trace clay		35		10-14-15 N=29					NP	42
					10-11-15 N=26						
					7-11-15 N=26						
	40		10-12-14 N=26								
	45		8-12-15 N=27								
51.5	839.5										
Boring Terminated at 51.5 Feet											
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.			Water Level Observations Groundwater not encountered						Drill Rig CME-75		
									Hammer Type Automatic		
									Driller 2R Drilling		
									Logged by AT		
Notes			Advancement Method Hollow Stem Auger						Boring Started 11-26-2024		
			Abandonment Method Boring backfilled with auger cuttings upon completion.						Boring Completed 11-26-2024		

Boring Log No. B-5

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0128° Longitude: -117.4218°									LL-PL-PI	
	Depth (Ft.)		Elevation.: 890.5 (Ft.)								
	SILTY SAND (SM) , trace gravel, brown										
	medium dense					15-16-25		4.4	115		
	5.0	885.5	5			15-22-32		4.4	113		53
	SANDY SILT (ML) , brown, hard										
	7.5	883				13-22-33		3.4	106		
	SILTY SAND (SM) , trace gravel, brown, medium dense					22-33-33		1.3	117		
	dense		10								
	trace clay, medium dense		15			5-7-8 N=15					
			20			5-7-13 N=20					
			25			10-10-14 N=24					
	26.5		864								
Boring Terminated at 26.5 Feet											
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.				Water Level Observations Groundwater not encountered				Drill Rig CME-75			
								Hammer Type Automatic			
								Driller 2R Drilling			
Notes				Advancement Method Hollow Stem Auger				Logged by AT			
				Abandonment Method Boring backfilled with auger cuttings upon completion.				Boring Started 11-26-2024			
								Boring Completed 11-26-2024			

Boring Log No. B-6

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0125° Longitude: -117.4220°									LL-PL-PI	
	Depth (Ft.)	Elevation.: 889 (Ft.)									
	SILTY SAND (SM) , brown		5			3-7-9		3.7	105		
	trace clay, loose										
	5.0	884									
	SANDY SILT (ML) , brown, very stiff										
	7.5	881.5									
	SILTY SAND (SM) , brown, medium dense										
	POORLY GRADED SAND WITH SILT (SP-SM) , trace clay, brown, medium dense		25			5-8-8 N=16					
	25.0	864									
	26.5	862.5									
	Boring Terminated at 26.5 Feet										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Drill Rig
CME-75
Hammer Type
Automatic
Driller
2R Drilling

Advancement Method
Hollow Stem Auger

Logged by
AT
Boring Started
11-26-2024

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Completed
11-26-2024

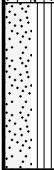
Boring Log No. B-7

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0136° Longitude: -117.4226°									LL-PL-PI	
	Depth (Ft.)	Elevation.: 895.5 (Ft.)									
	SILTY SAND (SM) , brown										
		trace clay, dense				9-24-38		8.0	109		
		medium dense	5			13-20-30		14.1	106		
		dense				13-28-40		3.1	114		
	10.0	885.5	10								
	POORLY GRADED SAND WITH SILT (SP-SM) , brown, medium dense					11-18-23		1.9	123		
	11.5	884									
Boring Terminated at 11.5 Feet											
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.				Water Level Observations Groundwater not encountered				Drill Rig CME-75			
								Hammer Type Automatic			
Notes				Advancement Method Hollow Stem Auger				Driller 2R Drilling			
				Abandonment Method Boring backfilled with auger cuttings upon completion.				Logged by AT			
								Boring Started 11-27-2024			
								Boring Completed 11-27-2024			

Boring Log No. B-8

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0129° Longitude: -117.4223°									LL-PL-PI	
Depth (Ft.)			Elevation.: 891 (Ft.)								
	SILTY SAND (SM) , brown		5			16-20-24		4.3	121		
	trace clay, medium dense										
10.0	881		10			8-9-12		2.6	114		
POORLY GRADED SAND WITH SILT (SP-SM) , brown, medium dense											
11.5	879.5										
Boring Terminated at 11.5 Feet											

Boring Log No. B-9

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0124° Longitude: -117.4225°									LL-PL-PI	
	Depth (Ft.)		Elevation.: 889 (Ft.)								
	SILTY SAND (SM) , trace clay, brown										
	medium dense					6-7-15		6.7	118		
						7-12-12		8.6	112		
						8-11-15		5.9	121		
						7-10-15					
	7.5	881.5	5								
	POORLY GRADED SAND WITH SILT (SP-SM) , brown, medium dense		10								
	11.5	877.5									
	Boring Terminated at 11.5 Feet										
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.				Water Level Observations Groundwater not encountered				Drill Rig CME-75			
				Advancement Method Hollow Stem Auger				Hammer Type Automatic			
								Driller 2R Drilling			
								Logged by AT			
Notes				Abandonment Method Boring backfilled with auger cuttings upon completion.				Boring Started 11-27-2024			
								Boring Completed 11-27-2024			

Boring Log No. B-10

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits		Percent Fines
	Latitude: 34.0122° Longitude: -117.4220°									LL-PL-PI		
Depth (Ft.)			Elevation.: 886 (Ft.)									
	SILTY SAND (SM) , trace clay, brown											
	medium dense											
						5						
	light brown, dense											
	medium dense					10						
11.5			874.5									
Boring Terminated at 11.5 Feet												

Boring Log No. P-1

Graphic Log	Location: See Exploration Plan		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Latitude: 34.0117° Longitude: -117.4215°									LL-PL-PI	
	Depth (Ft.)	Elevation.: 884 (Ft.)									
	SILTY SAND (SM) , trace gravel, brown		5			7-8-10 N=18					39
	5.0	879									
	Boring Terminated at 5 Feet										
See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.			Water Level Observations Groundwater not encountered						Drill Rig CME-75 Hammer Type Automatic Driller 2R Drilling		
Notes			Advancement Method Hollow Stem Auger						Logged by AT		
			Abandonment Method Boring backfilled with auger cuttings upon completion.						Boring Started 11-26-2024 Boring Completed 11-26-2024		

Boring Log No. P-2

Graphic Log	Location: See Exploration Plan Latitude: 34.0118° Longitude: -117.4215°		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits	Percent Fines
	Depth (Ft.)	Elevation.: 883.5 (Ft.)								LL-PL-PI	
	SILTY SAND (SM) , trace gravel, brown										
	medium dense		5			8-13-16 N=29					
	8.5	875									
	SANDY SILT (ML) , trace clay, brown, very stiff					7-10-13 N=23					69
	10.0	873.5	10								
Boring Terminated at 10 Feet											

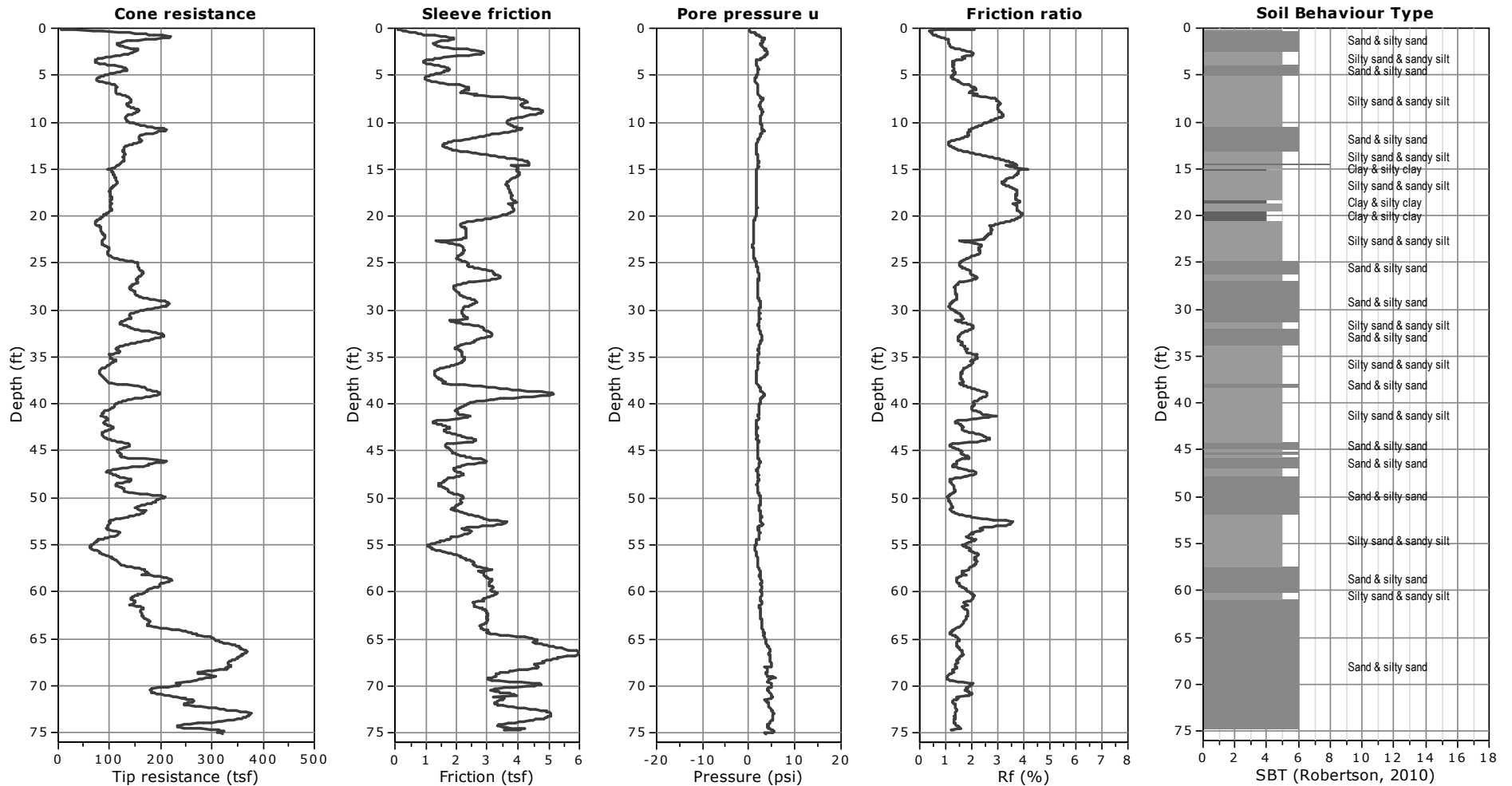


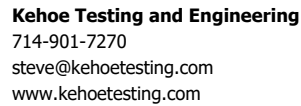
Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: Terracon Consultants / Jurupa Valley Health
Location: 6401 33rd St, Riverside, CA

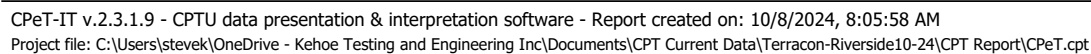
CPT-1

Total depth: 75.14 ft, Date: 10/7/2024





CPT-2
Total depth: 75.20 ft, Date: 10/7/2024



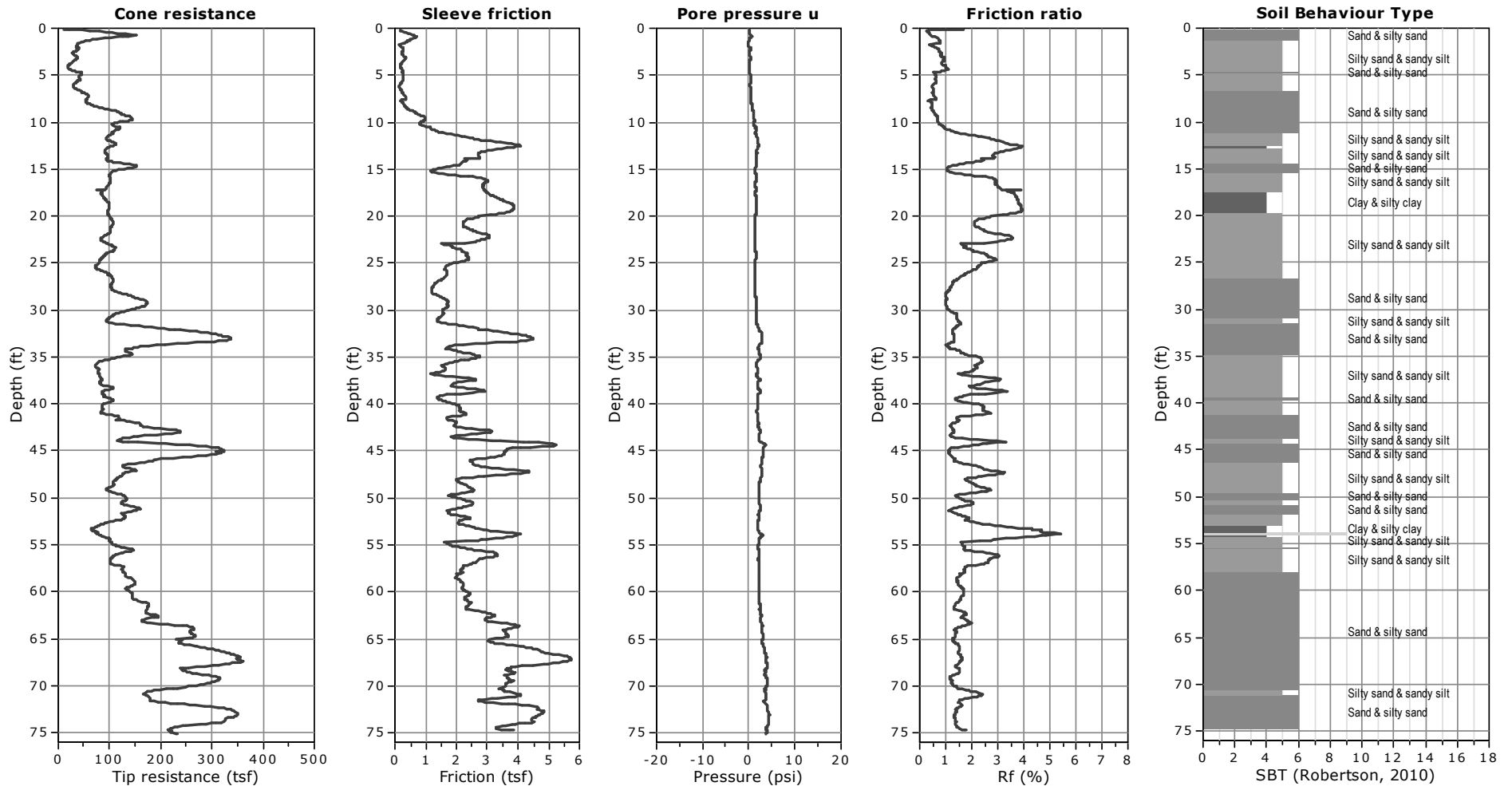


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Project: Terracon Consultants / Jurupa Valley Health
Location: 6401 33rd St, Riverside, CA

CPT-3

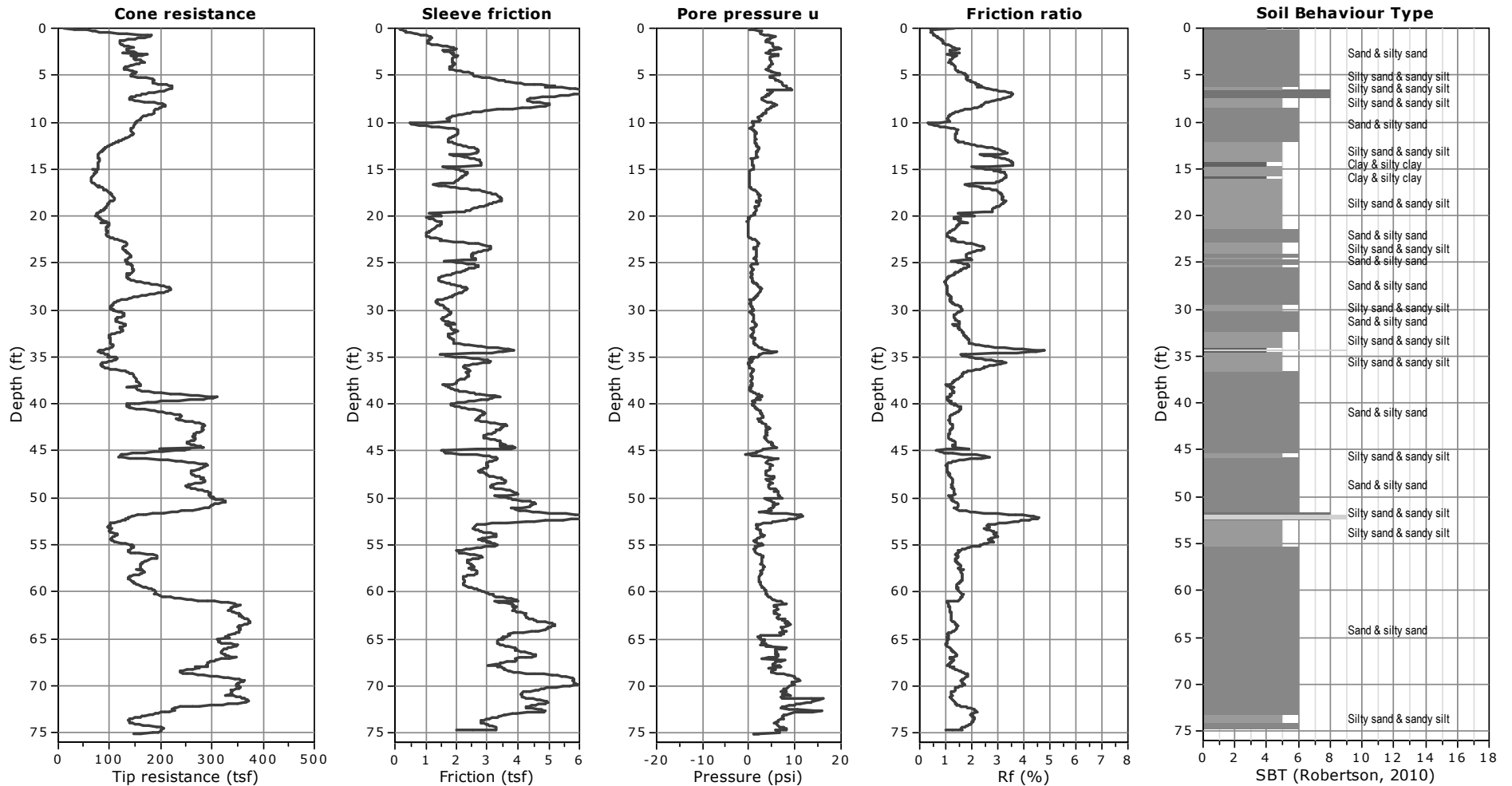
Total depth: 75.14 ft, Date: 10/7/2024



Project: Terracon Consultants / Jurupa Valley Health
Location: 6401 33rd St, Riverside, CA

CPT-4

Total depth: 75.15 ft, Date: 10/7/2024



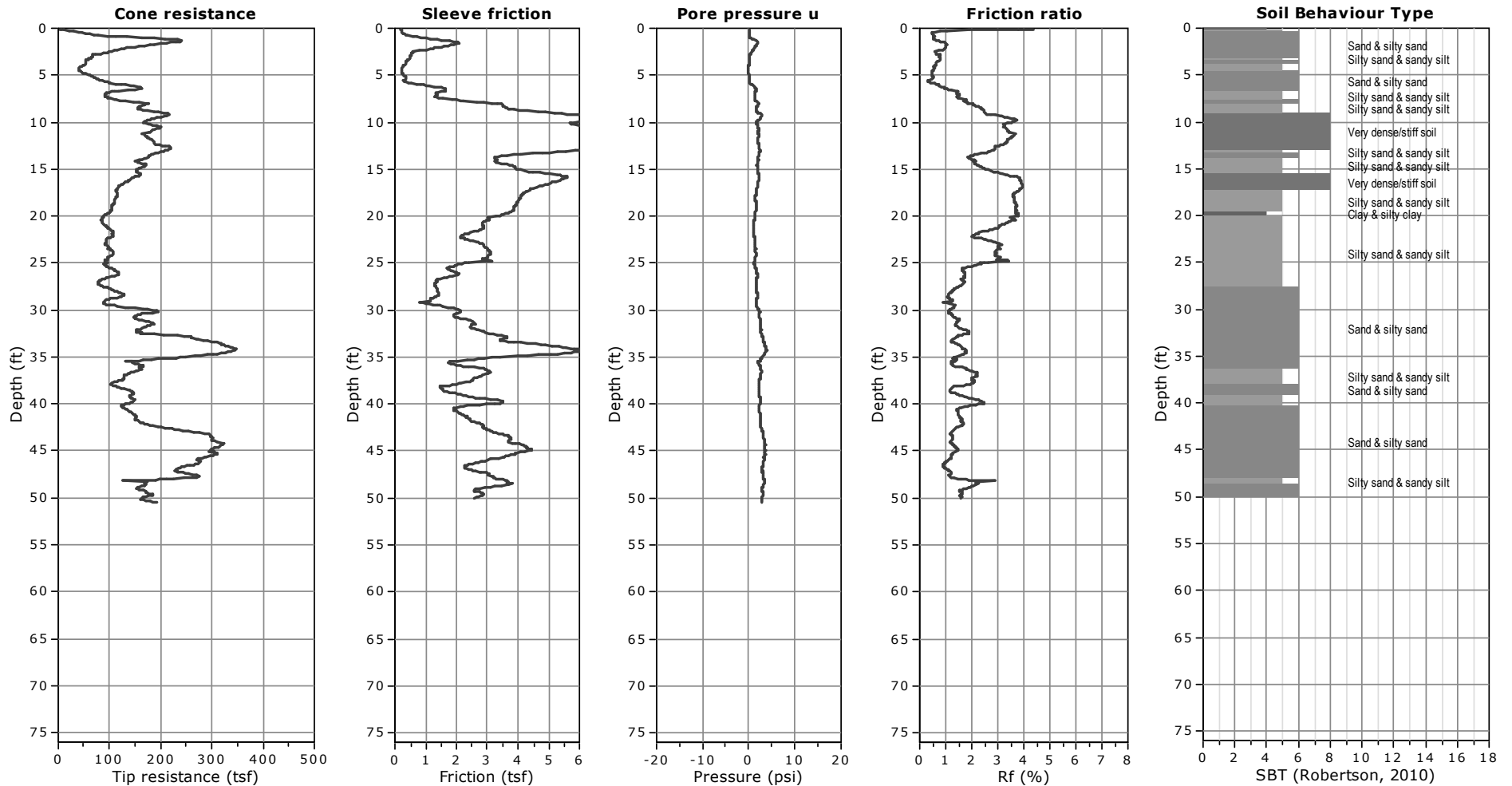


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Project: Terracon Consultants / Jurupa Valley Health
Location: 6401 33rd St, Riverside, CA

CPT-5

Total depth: 50.47 ft, Date: 10/7/2024



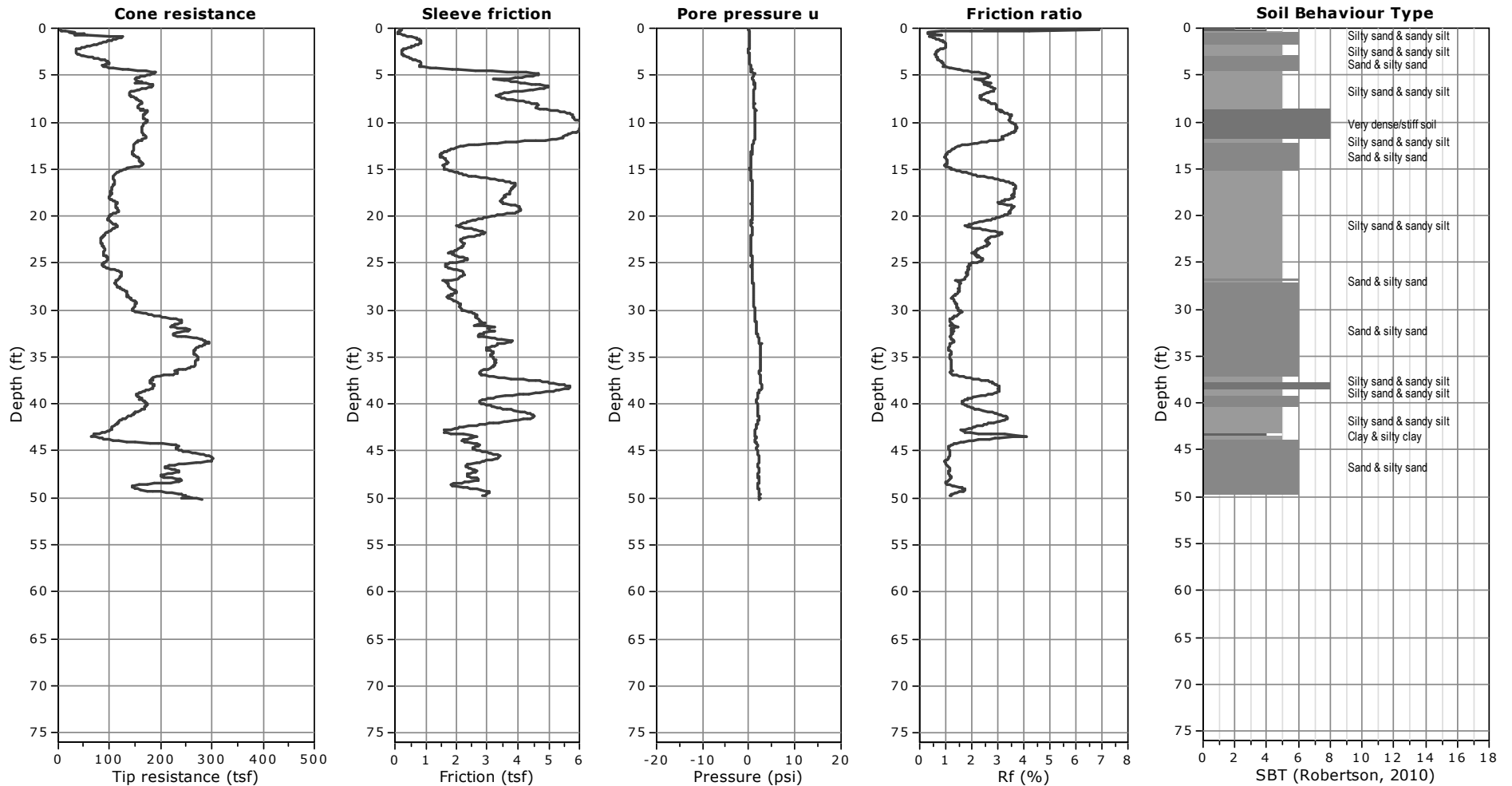


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Project: Terracon Consultants / Jurupa Valley Health
Location: 6401 33rd St, Riverside, CA

CPT-6

Total depth: 50.15 ft, Date: 10/7/2024



Terracon Consultants
Jurupa Valley Health
Riverside, CA

CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
CPT-4	5.02	4.02	4.49	4.16	1079	
	10.01	9.01	9.23	8.76	1054	1030
	14.99	13.99	14.13	12.84	1101	1202
	20.01	19.01	19.11	16.70	1145	1291
	25.00	24.00	24.08	21.30	1131	1080
	29.99	28.99	29.06	26.46	1098	964
	35.01	34.01	34.07	30.16	1130	1354
	39.99	38.99	39.04	33.48	1166	1498
	44.98	43.98	44.03	36.06	1221	1932
	50.00	49.00	49.04	38.92	1260	1754
	55.02	54.02	54.06	43.06	1255	1212
	60.01	59.01	59.04	46.56	1268	1425
	64.99	63.99	64.02	49.44	1295	1728
	70.01	69.01	69.04	53.02	1302	1402
	75.00	74.00	74.03	55.98	1322	1685

Shear Wave Source Offset - 2 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

Job No.: CB235085

PERCOLATION TEST DATA

BORING NUMBER: P-1
LOT No: N/A
TRACT No: N/A

CLIENT: Jurupa Valley
PROJECT:
DATE OF DRILLING: November 26, 2024
DATE OF PRESOAK: November 27, 2024
DATE OF TEST: November 27, 2024
TESTED BY: JB
DEPTH BEFORE (ft.): 5.0
DEPTH AFTER (ft.): 5.0
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

Time Interval	Total Elapsed Time (min.)	Initial Water Level (in.)	Final Water Level (in.)	Change in Water Level (in.)	Initial Hole Depth (in.)	Final Hole Depth (in.)	Percolation Rate (in/hr)	Infiltration rate (in/hr)
25	25	6.5	24.0	17.5	60.0	60.0	42.0	1.80
25	50	6.0	23.0	17.0	60.0	60.0	40.8	1.72
10	60	6.0	12.0	6.0	60.0	60.0	36.0	1.36
10	70	6.0	13.0	7.0	60.0	60.0	42.0	1.60
10	80	6.0	12.0	6.0	60.0	60.0	36.0	1.36
10	90	6.0	12.5	6.5	60.0	60.0	39.0	1.48
10	100	6.0	12.0	6.0	60.0	60.0	36.0	1.36
10	110	6.0	12.0	6.0	60.0	60.0	36.0	1.36

Ave last 4 readings

38.3

1.4

PERCOLATION TEST DATA

BORING NUMBER: P-2
LOT No: N/A
TRACT No: N/A

CLIENT: Providence Administrative Health Services
PROJECT: Jurupa Valley
DATE OF DRILLING: November 26,2024
DATE OF PRESOAK: November 27,2024
DATE OF TEST: November 27,2024
TESTED BY: JB
DEPTH BEFORE (ft.): 10.0
DEPTH AFTER (ft.): 10.0
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

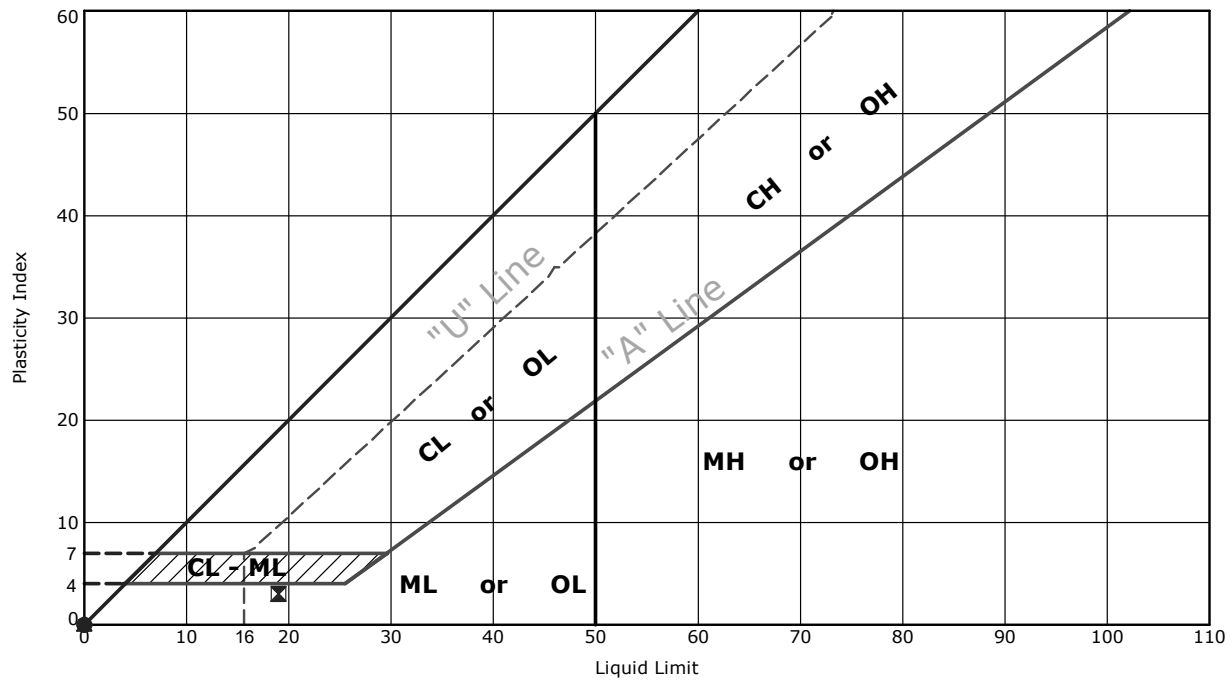
Time	Total	Initial	Final	Change	Initial	Final	Percolation	Infiltration
Interval	Elapsed	Water	Water	in Water	Hole	Hole	Rate	rate
(min.)	Time	Level	Level	Level	Depth	Depth	(in/hr)	(Porchet Method)
(min.)	(min.)	(in.)	(in.)	(in.)	(in.)	(in.)	(in/hr)	(in/hr)

25	25	60.0	80.0	20.0	120.0	120.0	48.0	1.85
25	50	60.0	78.0	18.0	120.0	120.0	43.2	1.63
10	60	60.0	72.0	12.0	120.0	120.0	72.0	2.57
10	70	60.0	71.0	11.0	120.0	120.0	66.0	2.34
10	80	60.0	71.0	11.0	120.0	120.0	66.0	2.34
10	90	60.0	71.0	11.0	120.0	120.0	66.0	2.34
10	100	60.0	71.0	11.0	120.0	120.0	66.0	2.34
10	110	60.0	70.5	10.5	120.0	120.0	63.0	2.22

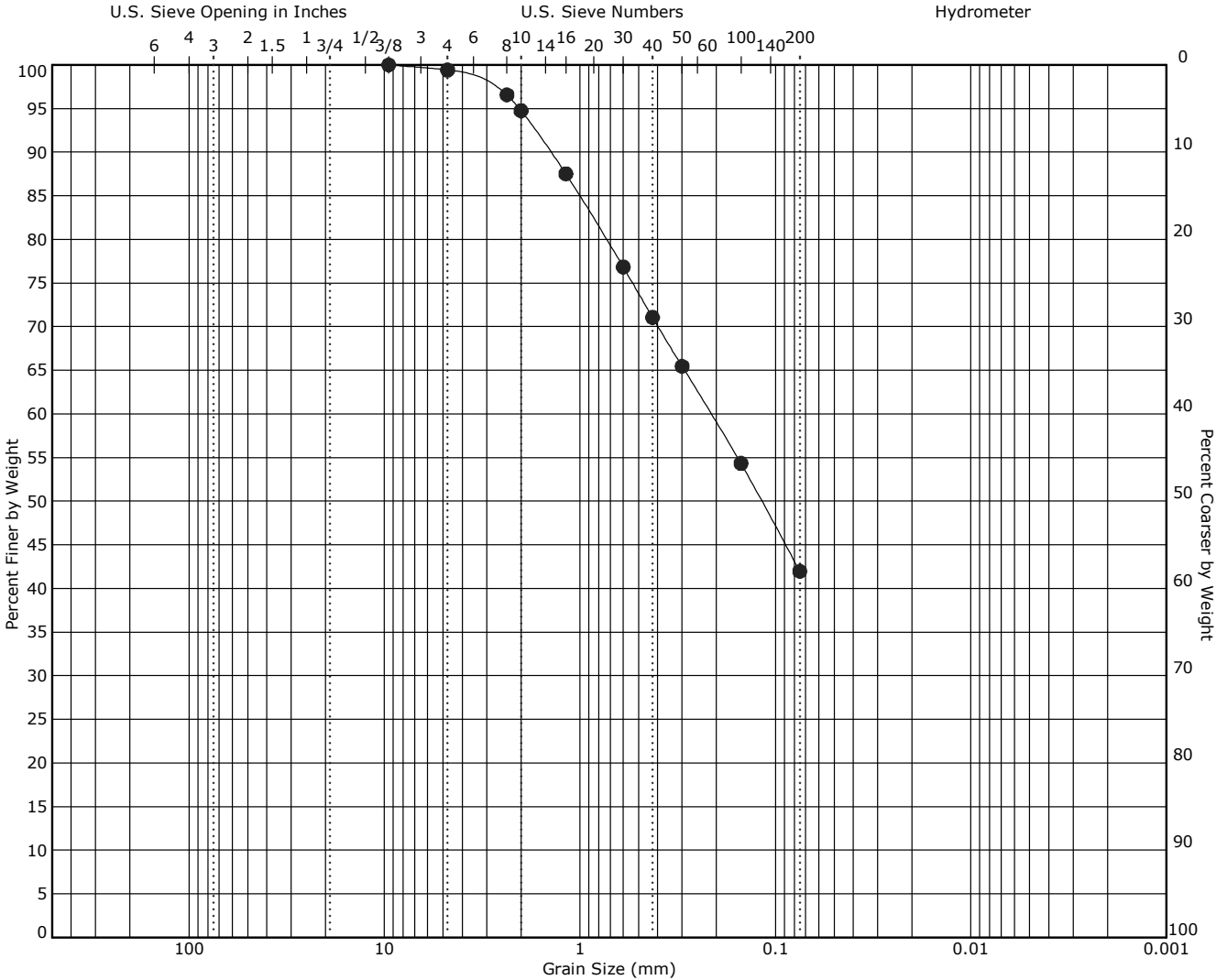
Ave last 4 readings

65.3

2.3

ASTM D4318[illegible]

Grain Size Distribution
ASTM D422 / ASTM C136 / AASHTO T27



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
● B-3	2.5 - 4	SILTY SAND	SM					

--	--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--	--

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
● B-3	2.5 - 4	9.5	0.214			0.0	0.6	57.4	42.0		

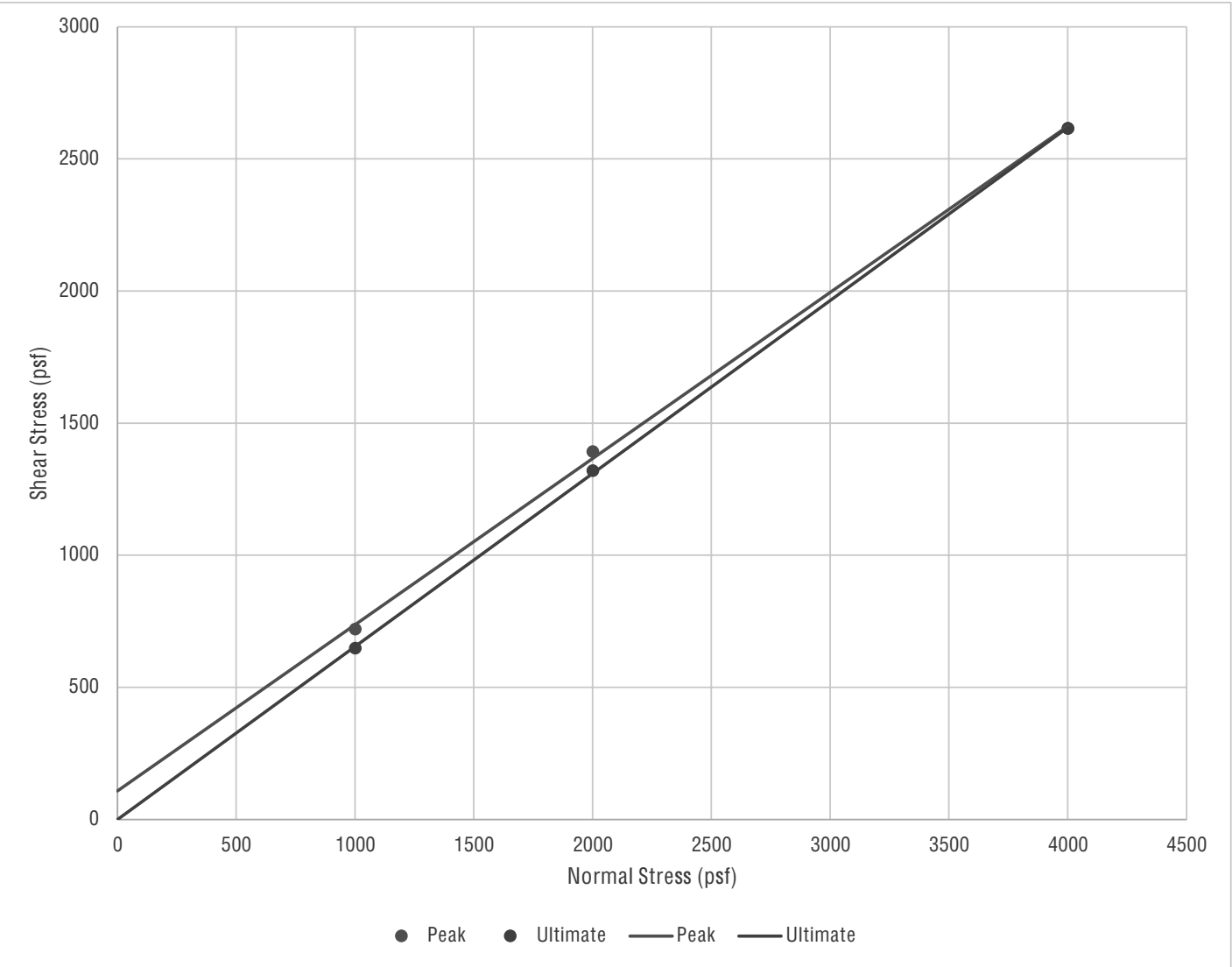
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Direct Shear Test
ASTM D3080

Boring ID	Depth	Description	USCS	γ_d (pcf)	W(%)
B-2	2.5	Silty Sand	SM	114	2.1

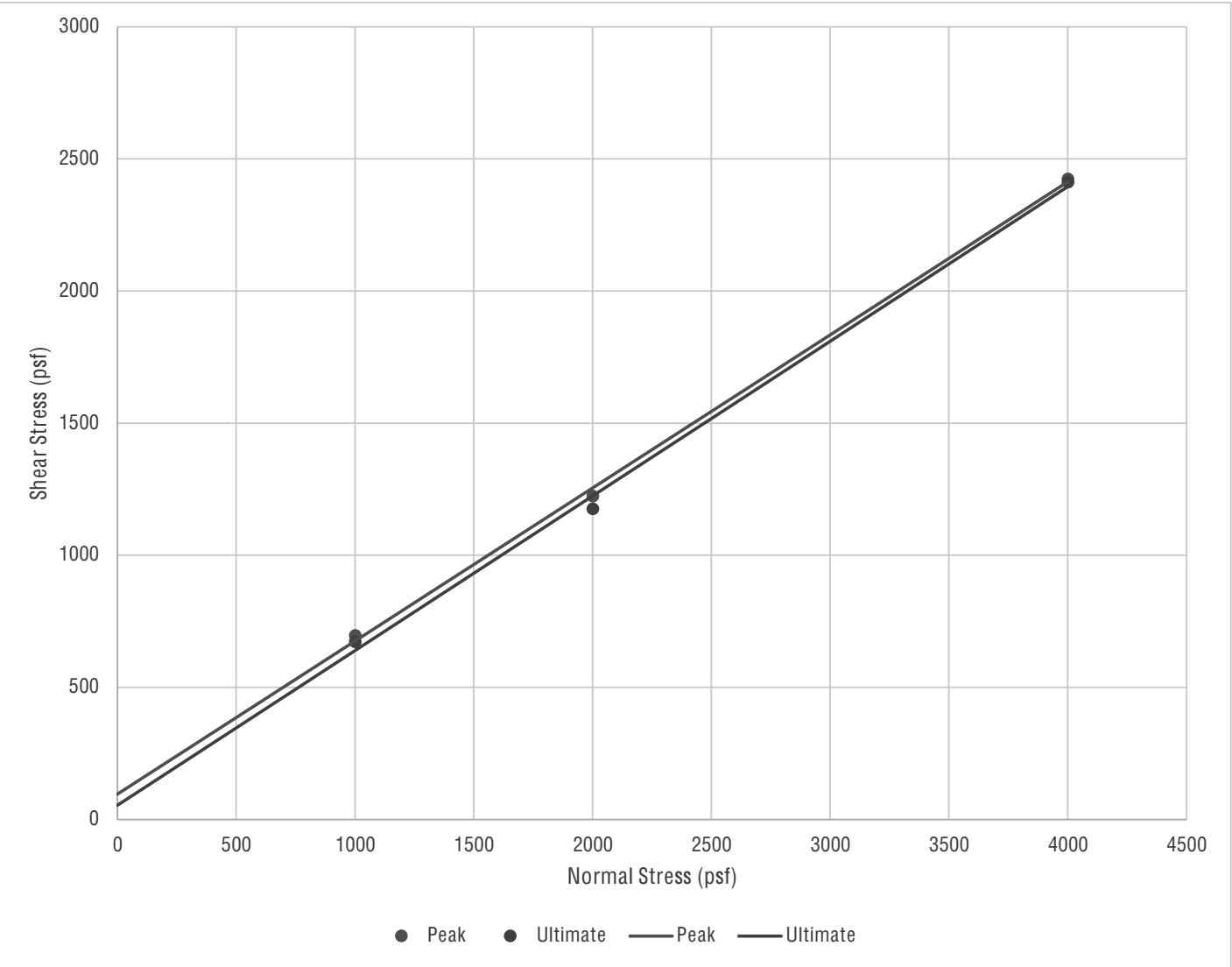
Normal Stress (psf)	Peak Shear Stress (psf)	Ultimate Shear Stress (psf)	Peak		Ultimate	
			ϕ°	C (psf)	ϕ°	C (psf)
1000	720	648	32.2	108	33.2	0
2000	1392	1320				
4000	2616	2616				



Direct Shear Test
ASTM D3080

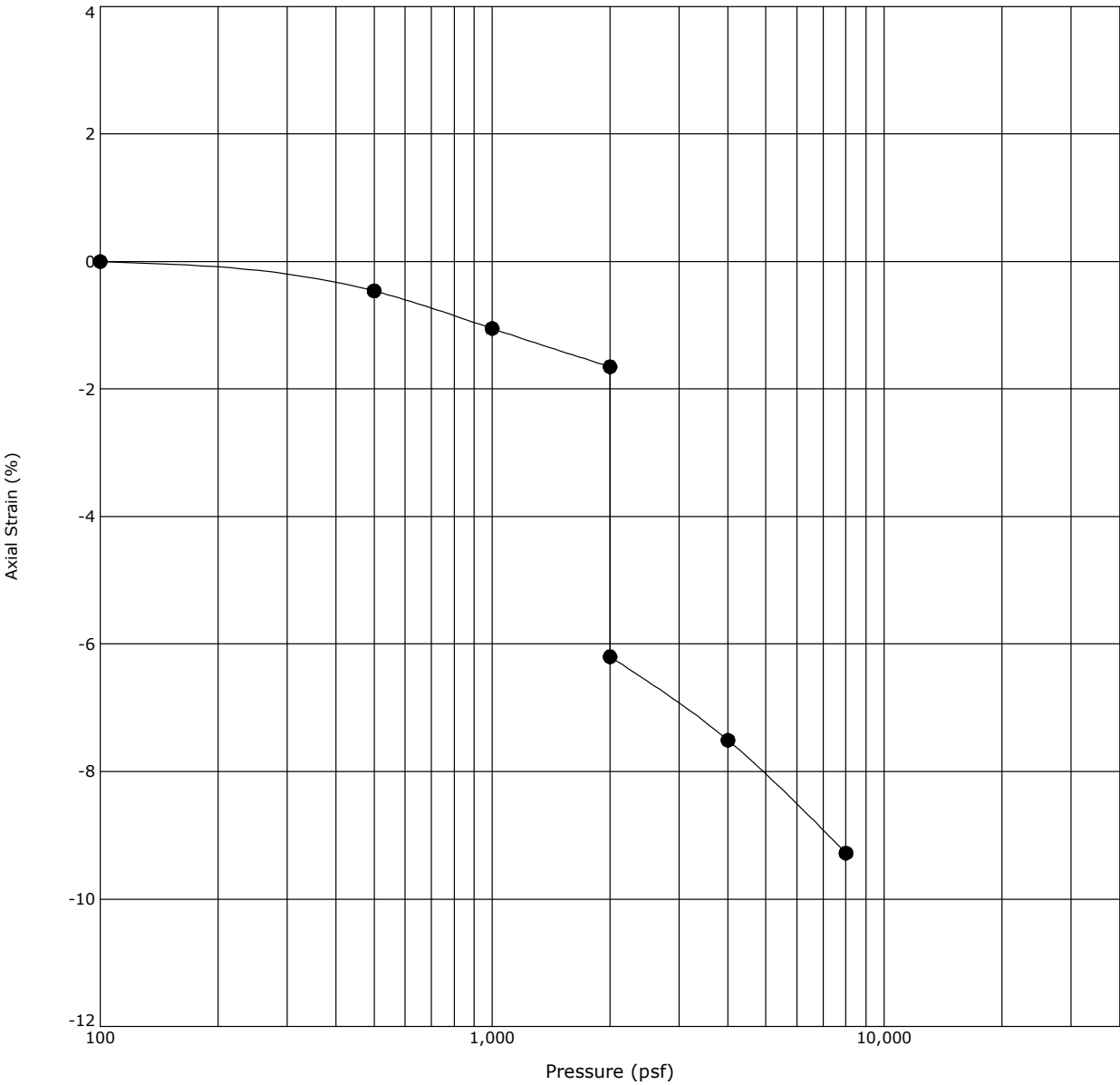
Boring ID	Depth	Description	USCS	γ_d (pcf)	W(%)
B-5	5	Sandy Silt	ML	113	4.4

Normal Stress (psf)	Peak Shear Stress (psf)	Ultimate Shear Stress (psf)	Peak		Ultimate	
			ϕ°	C (psf)	ϕ°	C (psf)
1000	696	672	30.1	96	30.3	54
2000	1224	1176				
4000	2424	2412				



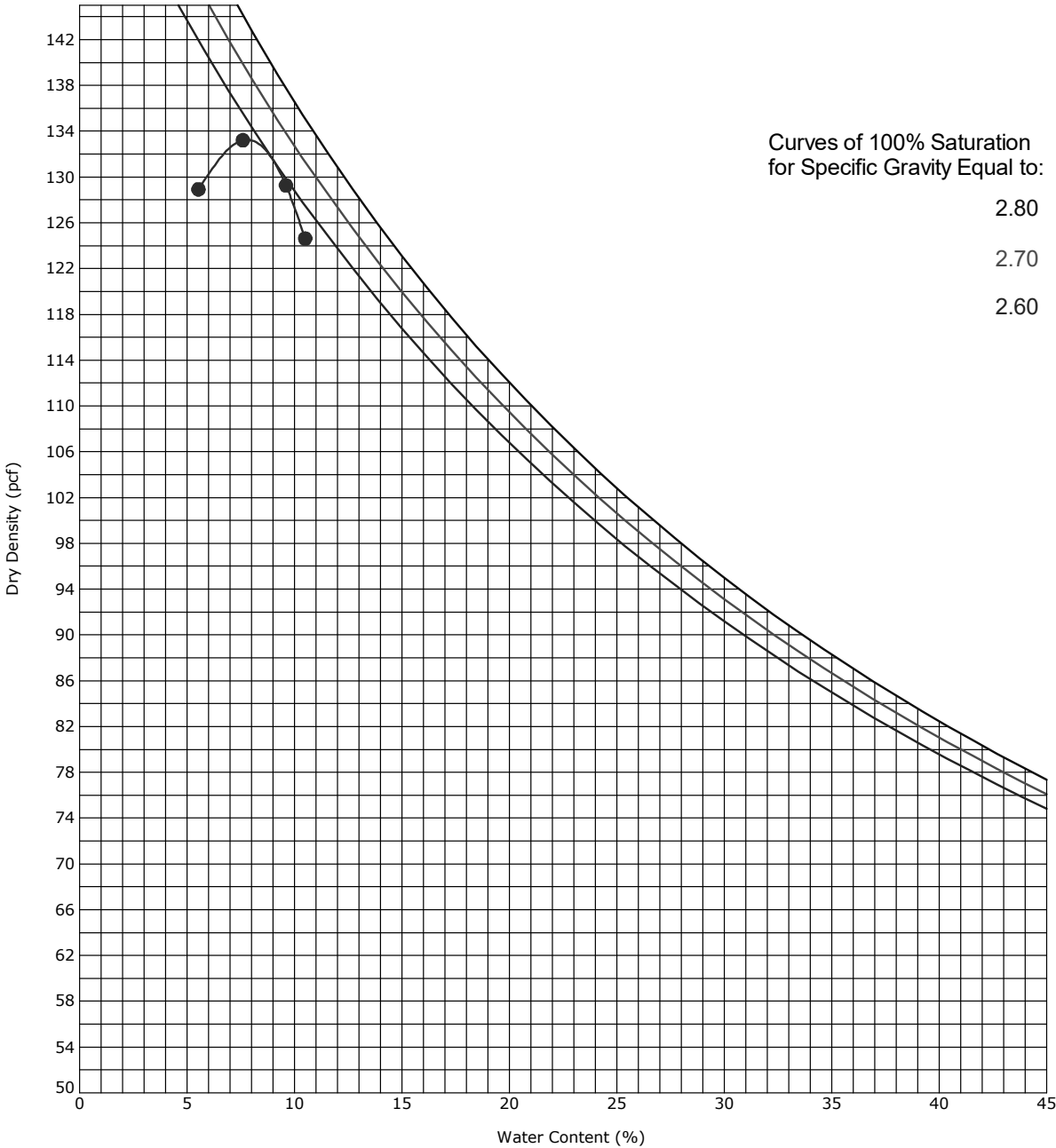
One-Dimensional Swell or Collapse

ASTM D4546



Boring ID		Depth (Ft)	Description	USCS	γ_d (pcf)	WC (%)
●	B-6	5 - 6.5	SANDY SILT	ML	112	3.4
Notes: Water added at 2,000 psf						

Moisture-Density Relationship
ASTM D1557-Method B



Boring ID		Depth (Ft)		Description of Materials			
B-3		0 - 5		SILTY SAND			
Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
	0.0				ASTM D1557-Method B	133.3	7.8

Job No. CB235085
Date. 12/20/2024

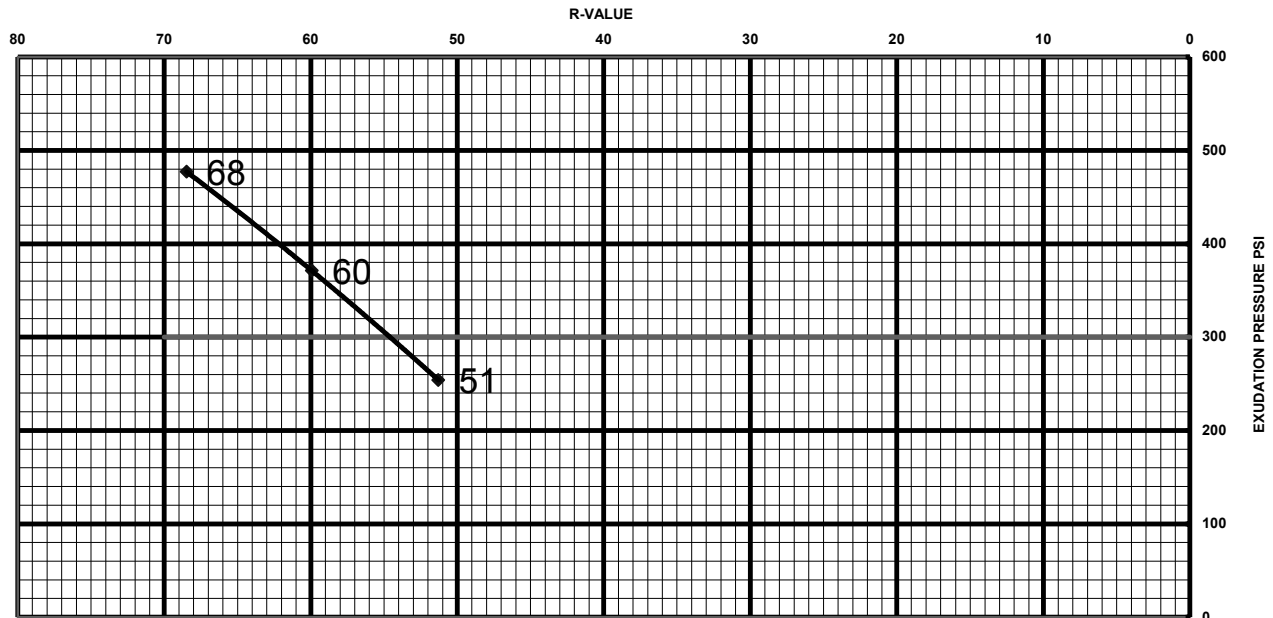
**LABORATORY RECORD OF TESTS MADE ON
BASE, SUBBASE, AND BASEMENT SOILS**

CLIENT: Providence Administrative Consulting Services Inc.
PROJECT Jurupa Valley SNF Expansion
LOCATION: Jurupa Valley SNF Expansion
R-VALUE # : B-9
T.I. :

COMPACTOR AIR PRESSURE P.S.I.
INITIAL MOISTURE %
WATER ADDED, ML
WATER ADDED %
MOISTURE AT COMPACTION %
HEIGHT OF BRIQUETTE
WET WEIGHT OF BRIQUETTE
DENSITY LB. PER CU.FT.
STABILOMETER PH AT 1000 LBS.
2000 LBS.
DISPLACEMENT
R-VALUE
EXUDATION PRESSURE
THICK. INDICATED BY STAB.
EXPANSION PRESSURE
THICK. INDICATED BY E.P.

A	B	C	D
250	350	350	
2.7	2.7	2.7	
85	75	65	
7.6	6.7	5.8	
10.3	9.4	8.5	
2.47	2.49	2.48	
1145	1148	1147	
127.3	127.7	129.1	
26	22	19	
47	38	30	
5.71	5.37	4.99	
51	60	68	
254	371	477	
0.00	0.00	0.00	
0	0	4	
0.00	0.00	0.13	

EXUDATION CHART



R-Value: 54

902 Industrial Way
Lodi, California 95240
(209) 367-3701



Client

Providence Administrative Consulting Services Inc

Project

Jurupa Valley SNF expansion

Sample Submitted By: Terracon (CB)

Date Received: 1/2/2025

Project Number: CB235085

Results of Corrosion Analysis

Sample Type	BAG
Sample Location	B3
Sample Depth (ft.)	0.0 - 5.0
pH Analysis, ASTM G 51	7.37
Water Soluble Sulfate (SO ₄), ASTM D516 (%)	0.003
Sulfides, AWWA 4500-S ²⁻ D, (ppm)	<0.001
Chlorides, AWWA 4500-CL ⁻ E, (%)	Nil
Red-Ox, ASTM G 200, (mV)	+135
Total Salts, AWWA 2520 B, (mg/kg)	69.5
Saturated Minimum Resistivity, ASTM G 57, (ohm-cm)	6,500

Reviewed By: Paula Arends
Paula Arends
Laboratory Manager

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

Supporting Information

Contents:

General Notes

Unified Soil Classification System

Analysis of Seismic Settlement (31 pages)

Note: All attachments are one page unless noted above.

Geotechnical Engineering Report

Proposed Jurupa Valley Skilled Nursing Facility | Jurupa Valley, California
February 5, 2025 | Terracon Project No. CB235085



General Notes

Sampling	Water Level	Field Tests
 Auger Cuttings  Grab Sample  Modified Dames & Moore Ring Sampler  Standard Penetration Test	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance			Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)	Consistency	Unconfined Compressive Strength Q_u (tsf)	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Very Loose	0 - 3	0 - 6	Very Soft	less than 0.25	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium Stiff	0.50 to 1.00	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	> 99	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
			Hard	> 4.00	> 30	> 42

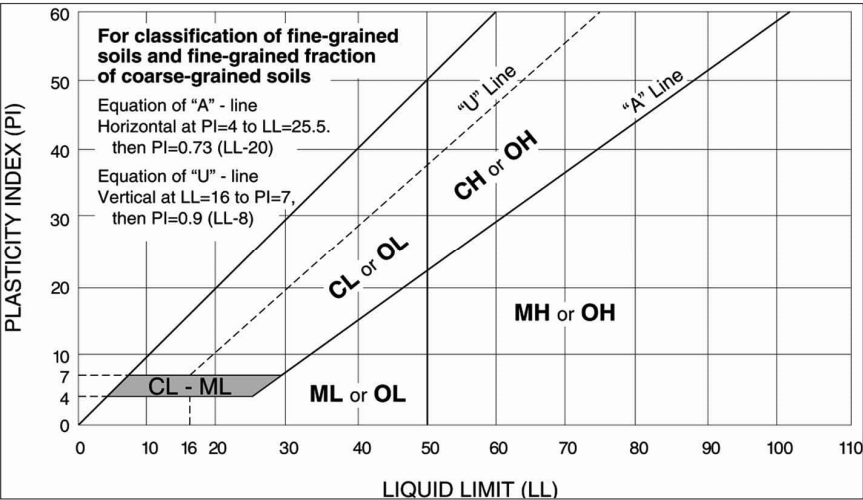
Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

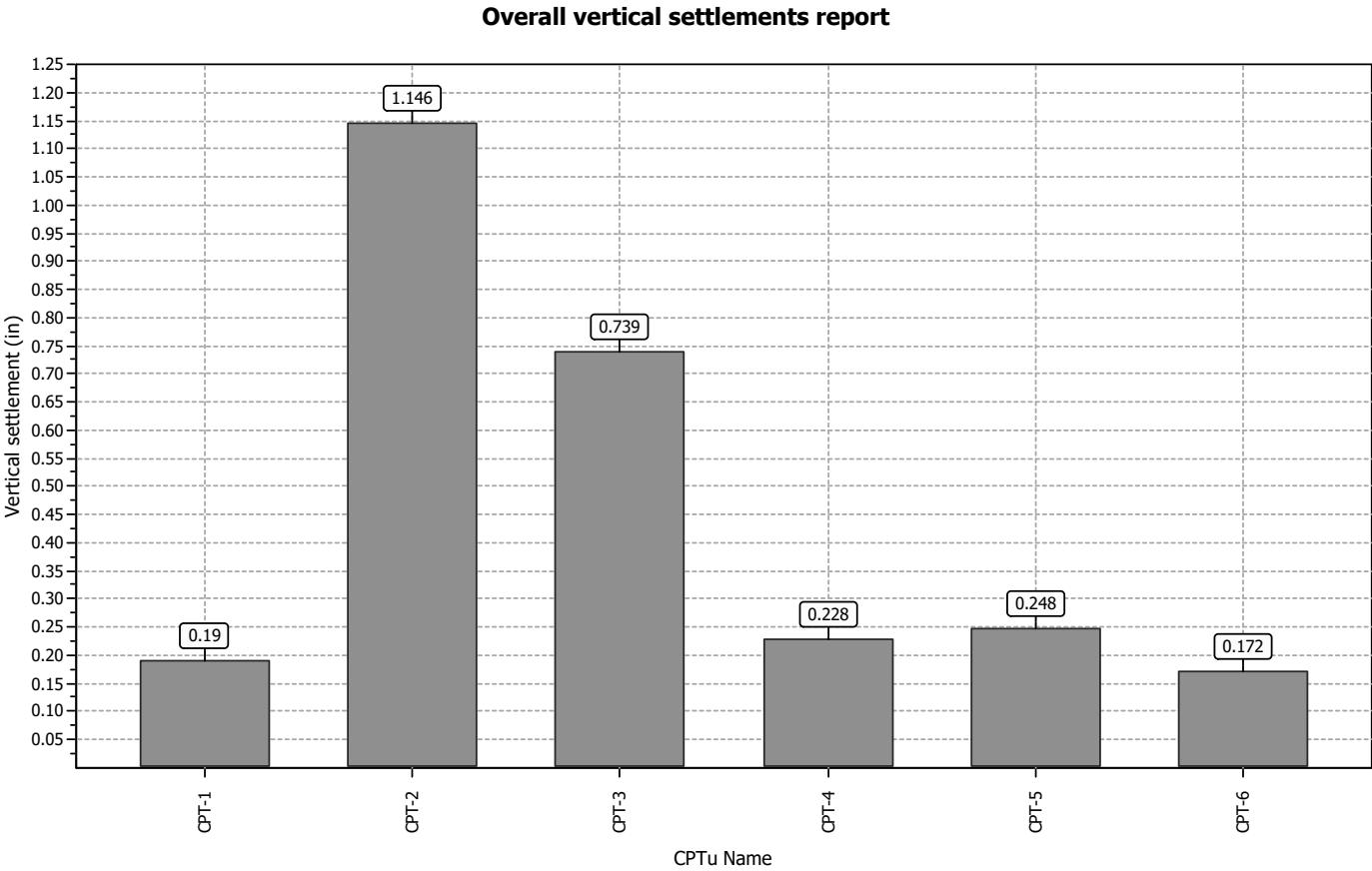
Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F
			$Cu < 4$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ ^E	GP	Poorly graded gravel ^F
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	SW	Well-graded sand ^I
			$Cu < 6$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ ^E	SP	Poorly graded sand ^I
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	$PI > 7$ and plots above "A" line ^J	CL	Lean clay ^{K, L, M}
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K, L, M}
	Silts and Clays: Liquid limit 50 or more	Organic:	$\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$	OL	Organic clay ^{K, L, M, N}
					Organic silt ^{K, L, M, O}
		Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}
			PI plots below "A" line	MH	Elastic silt ^{K, L, M}
		Organic:	$\frac{LL \text{ oven dried}}{LL \text{ not dried}} < 0.75$	OH	Organic clay ^{K, L, M, P}
					Organic silt ^{K, L, M, Q}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

^A Based on the material passing the 3-inch (75-mm) sieve.
^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
^E $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.
^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
^H If fines are organic, add "with organic fines" to group name.
^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.
^N $PI \geq 4$ and plots on or above "A" line.
^O $PI < 4$ or plots below "A" line.
^P PI plots on or above "A" line.
^Q PI plots below "A" line.



Project title : Jurupa SNF
Location :



LIQUEFACTION ANALYSIS REPORT

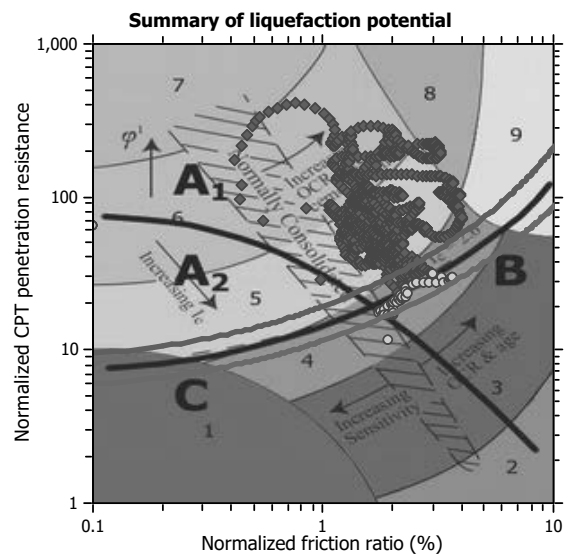
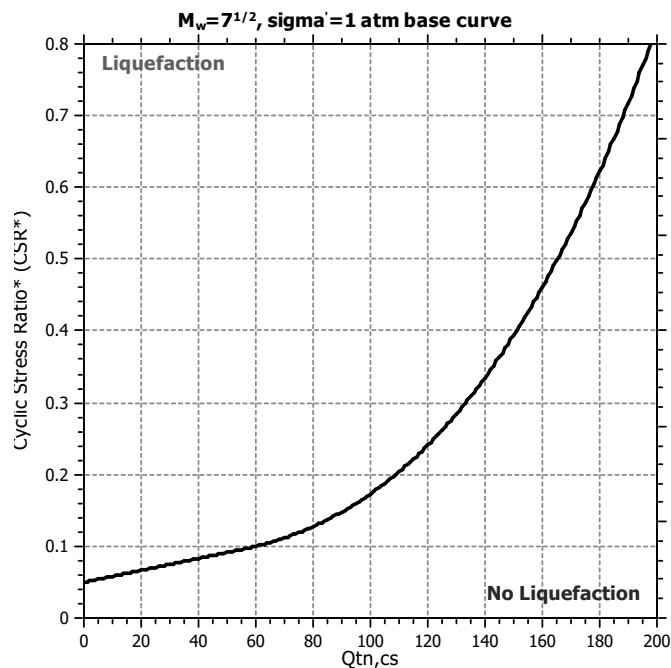
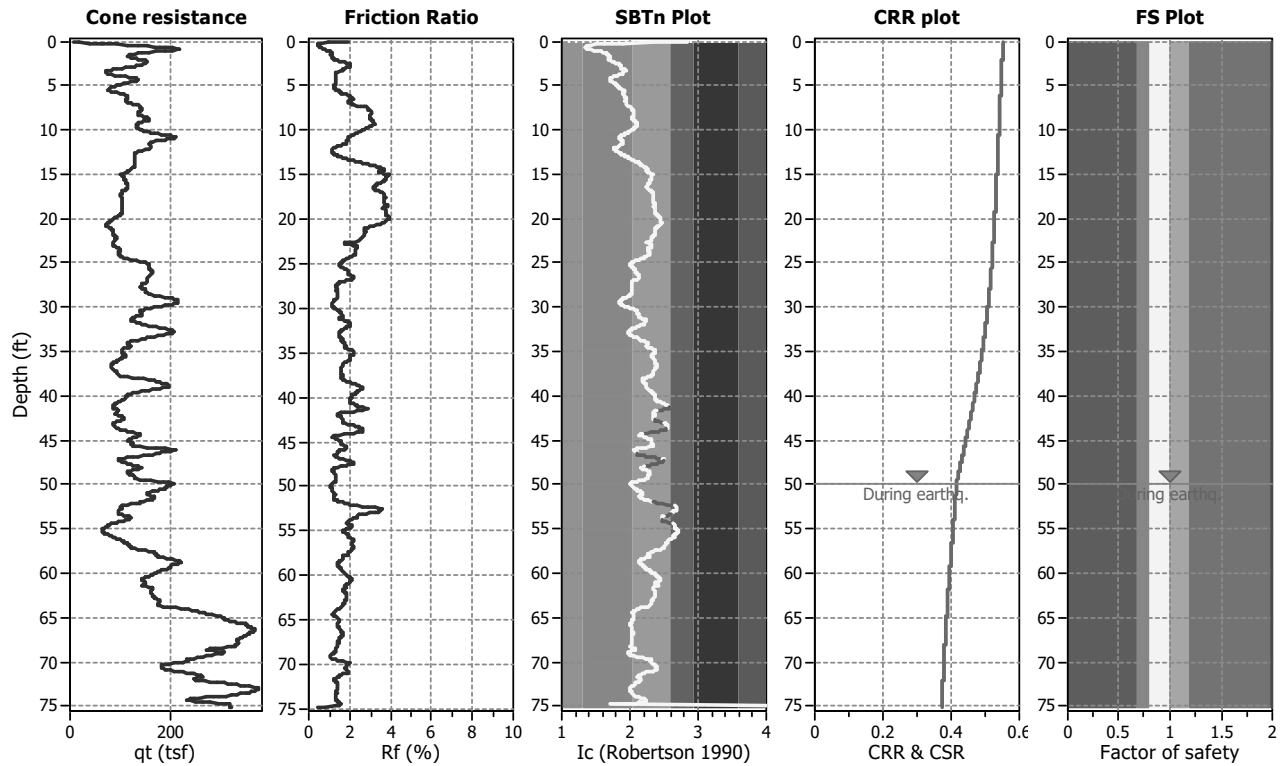
Project title : Jurupa SNF

Location :

CPT file : CPT-1

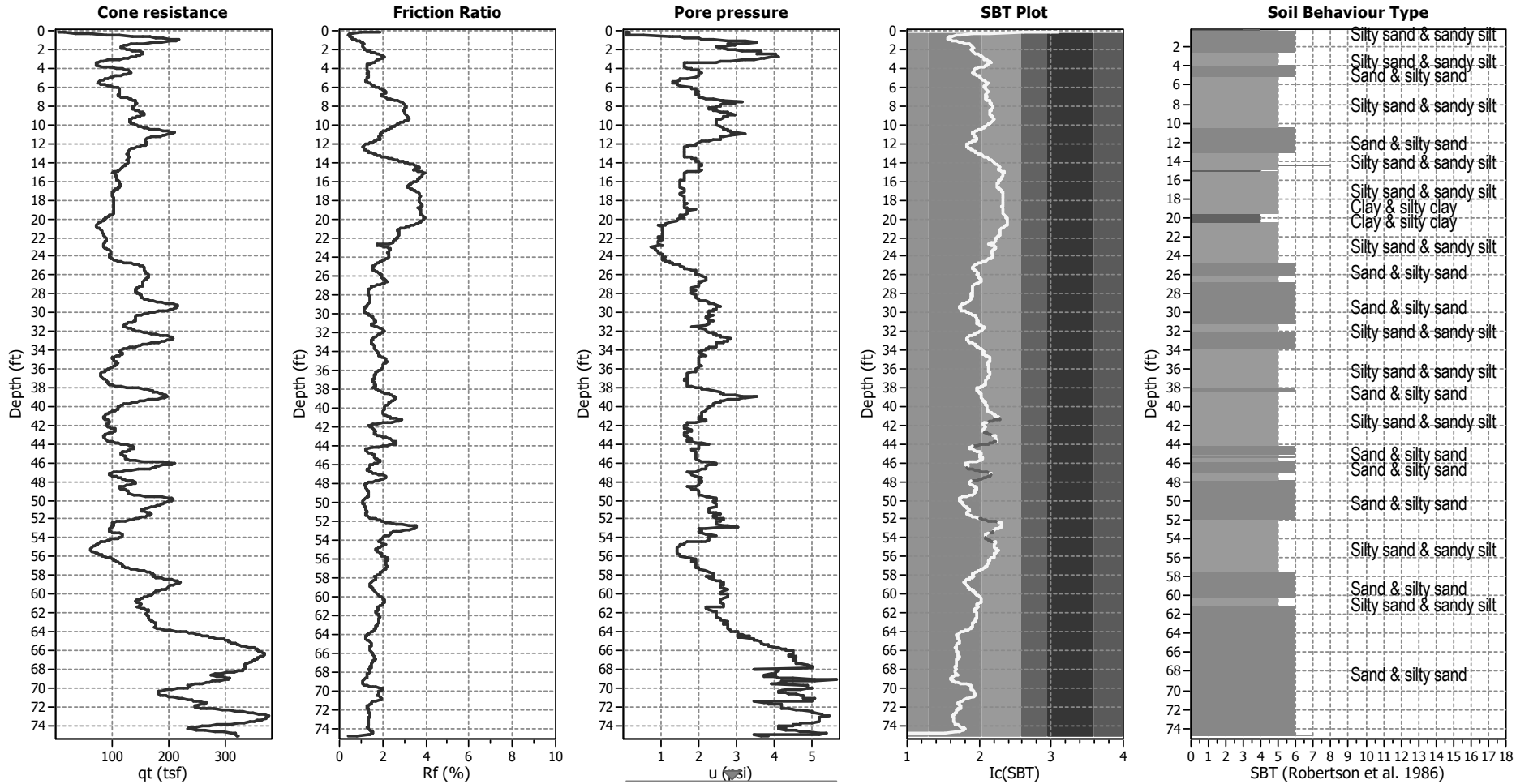
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	80.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_0 applied:	No	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



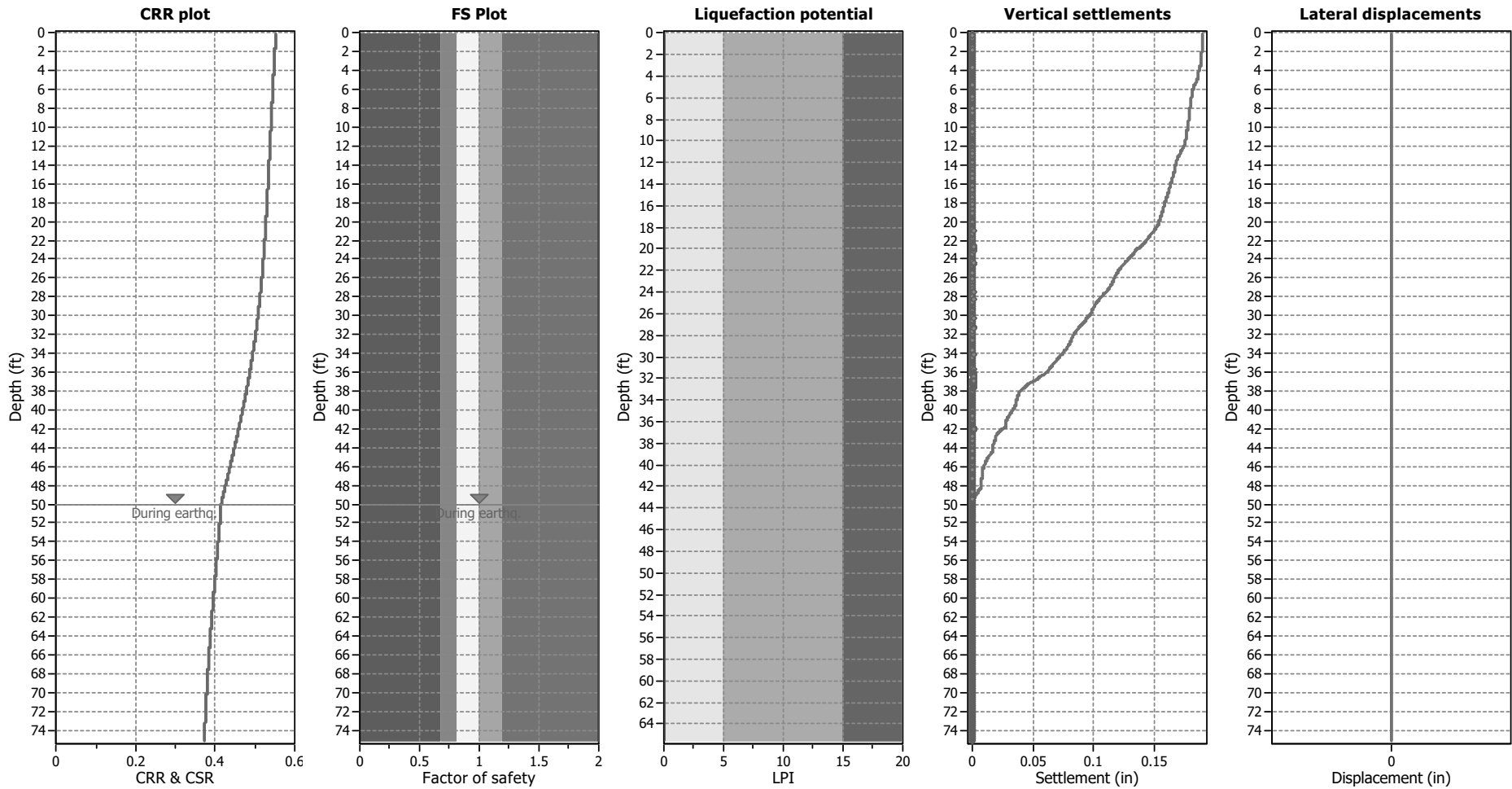
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

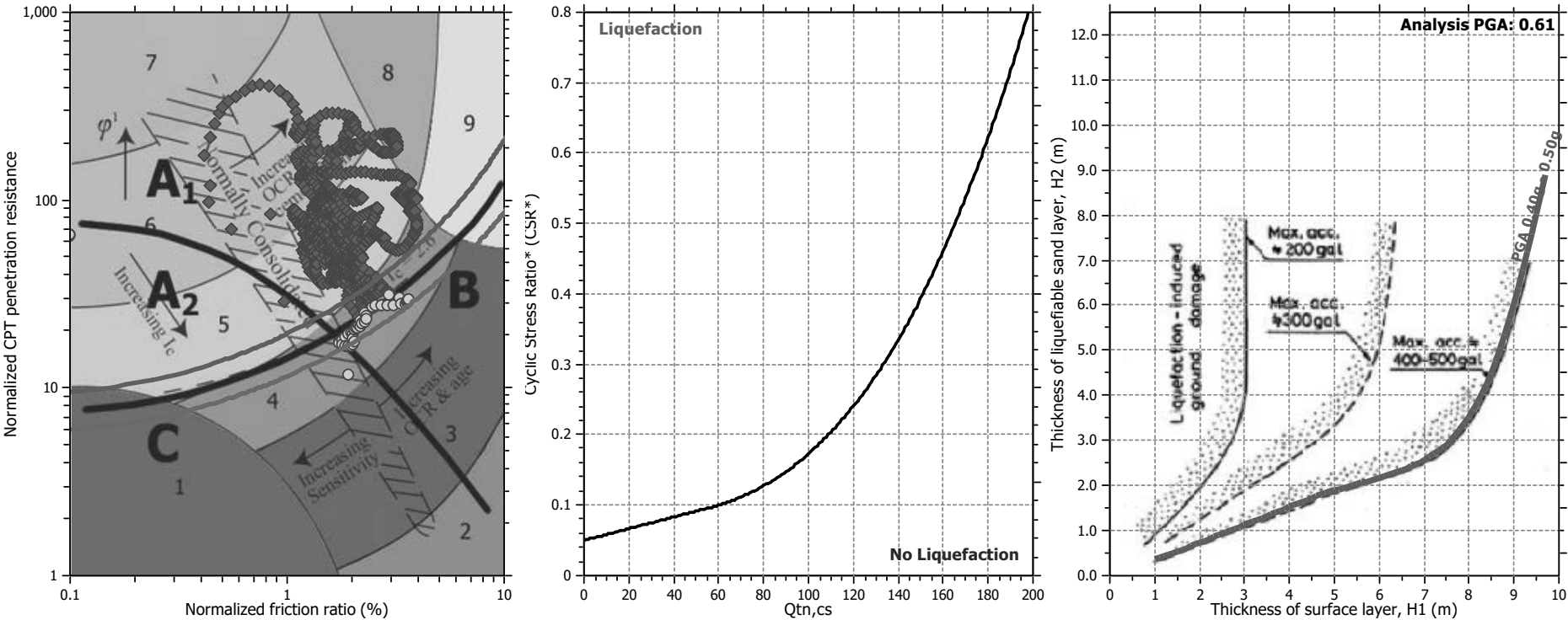
F.S. color scheme

Very high risk
High risk
Liquefaction and no liq. are equally likely
Unlike to liquefy
Almost certain it will not liquefy

LPI color scheme

Very high risk
High risk
Low risk

Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_o applied:	No
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

LIQUEFACTION ANALYSIS REPORT

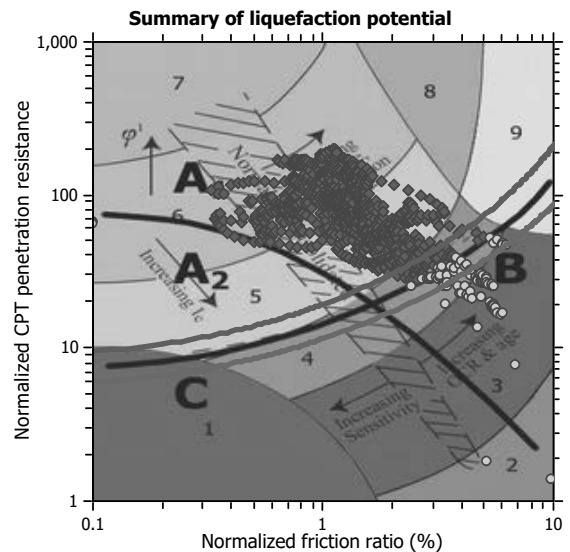
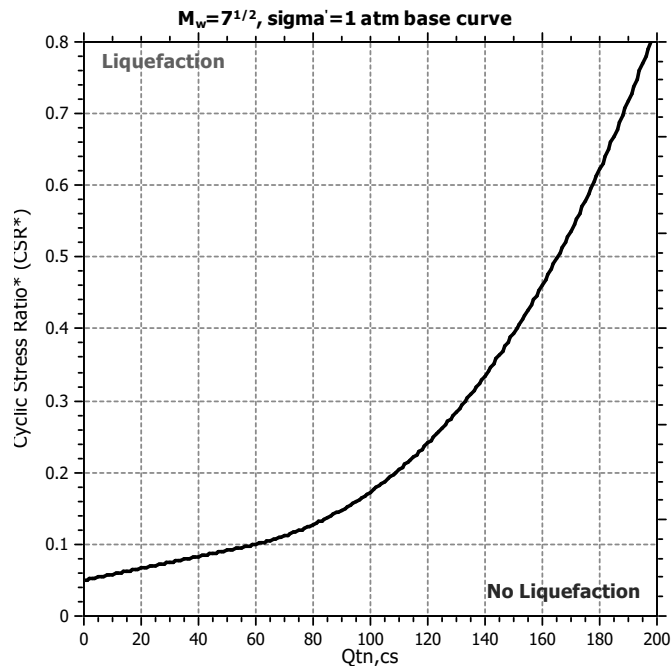
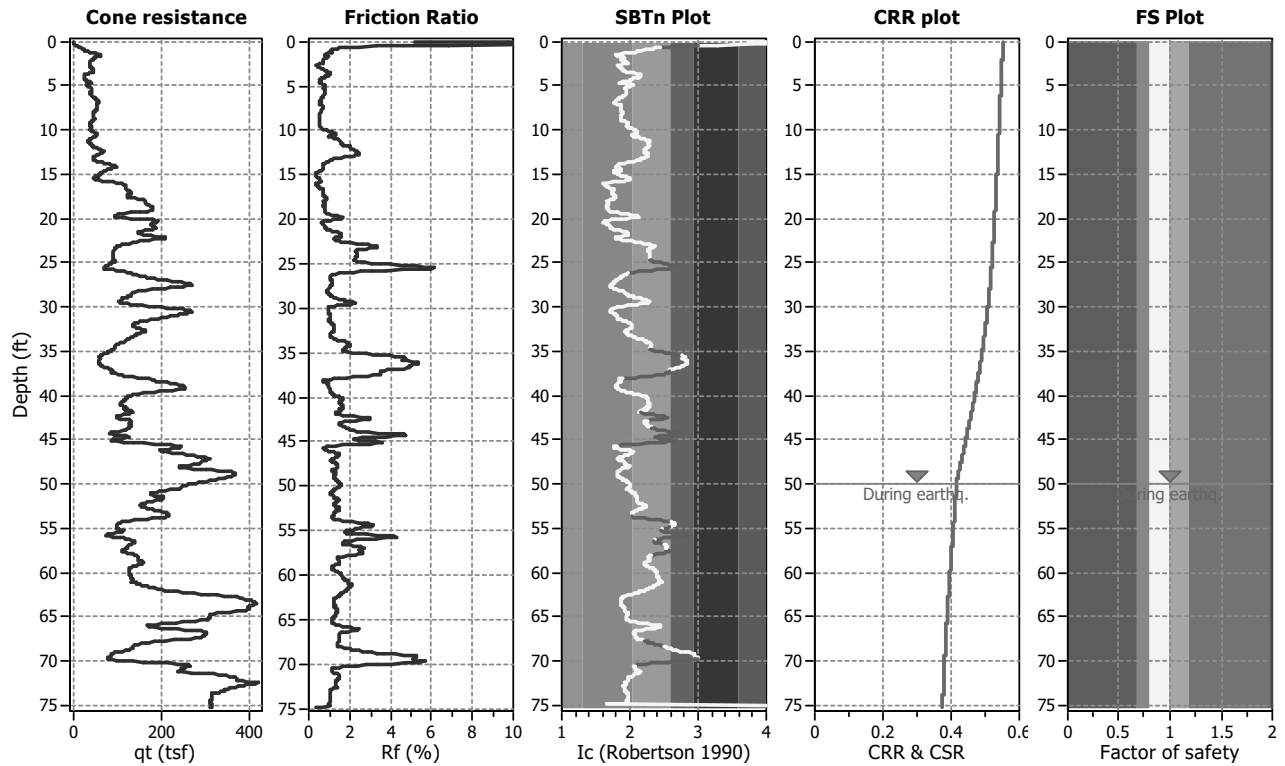
Project title : Jurupa SNF

Location :

CPT file : CPT-2

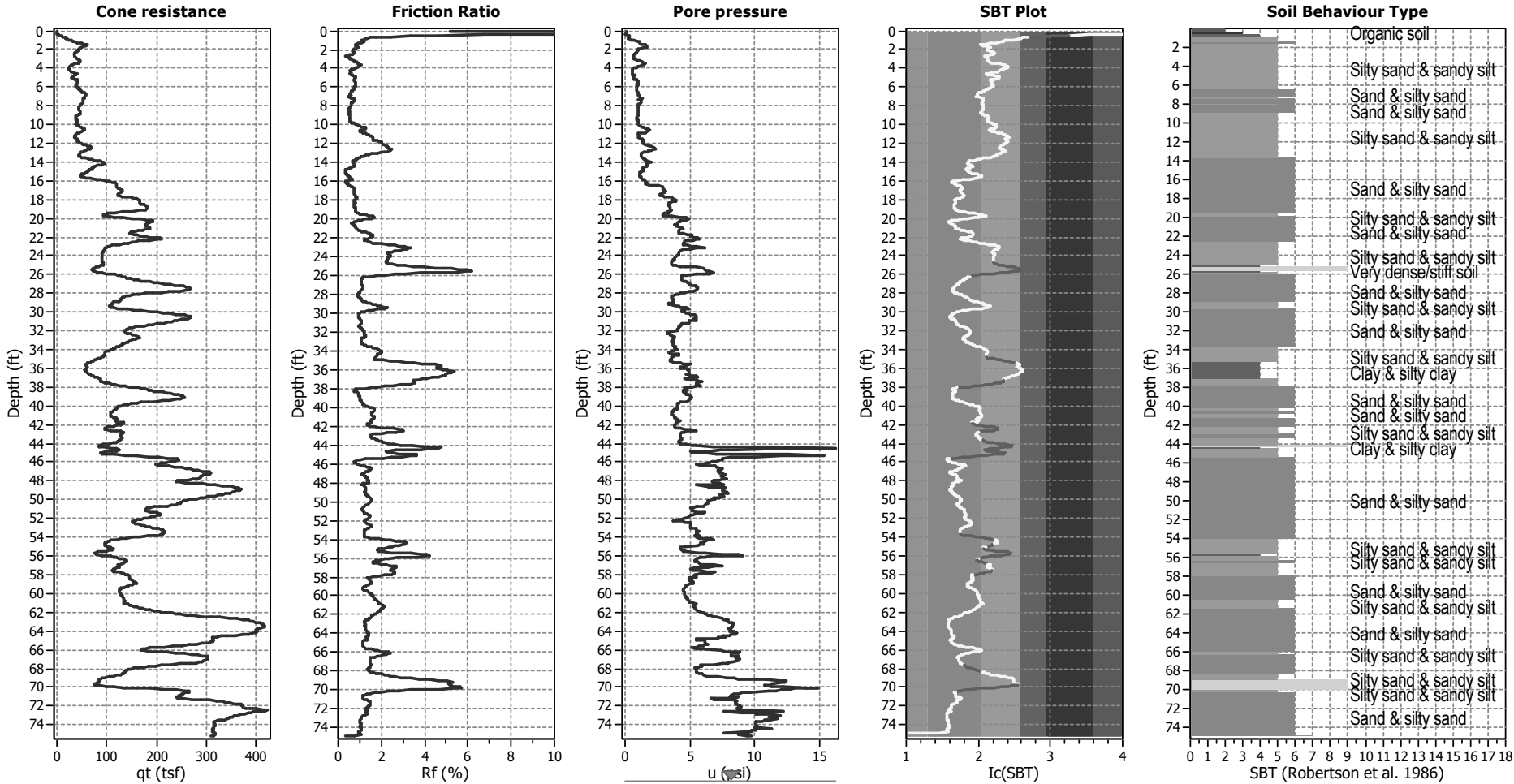
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	80.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_0 applied:	No	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

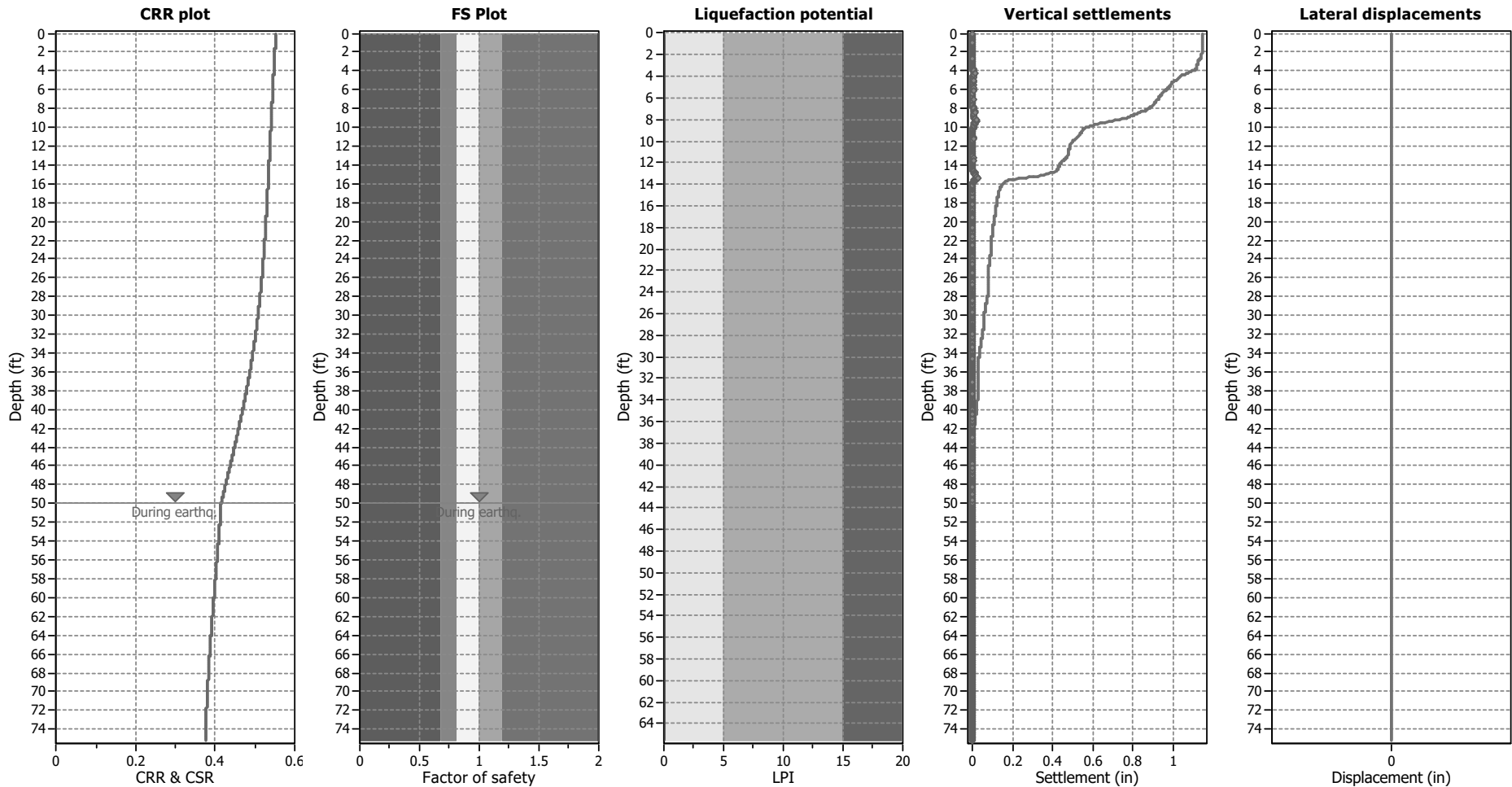
CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

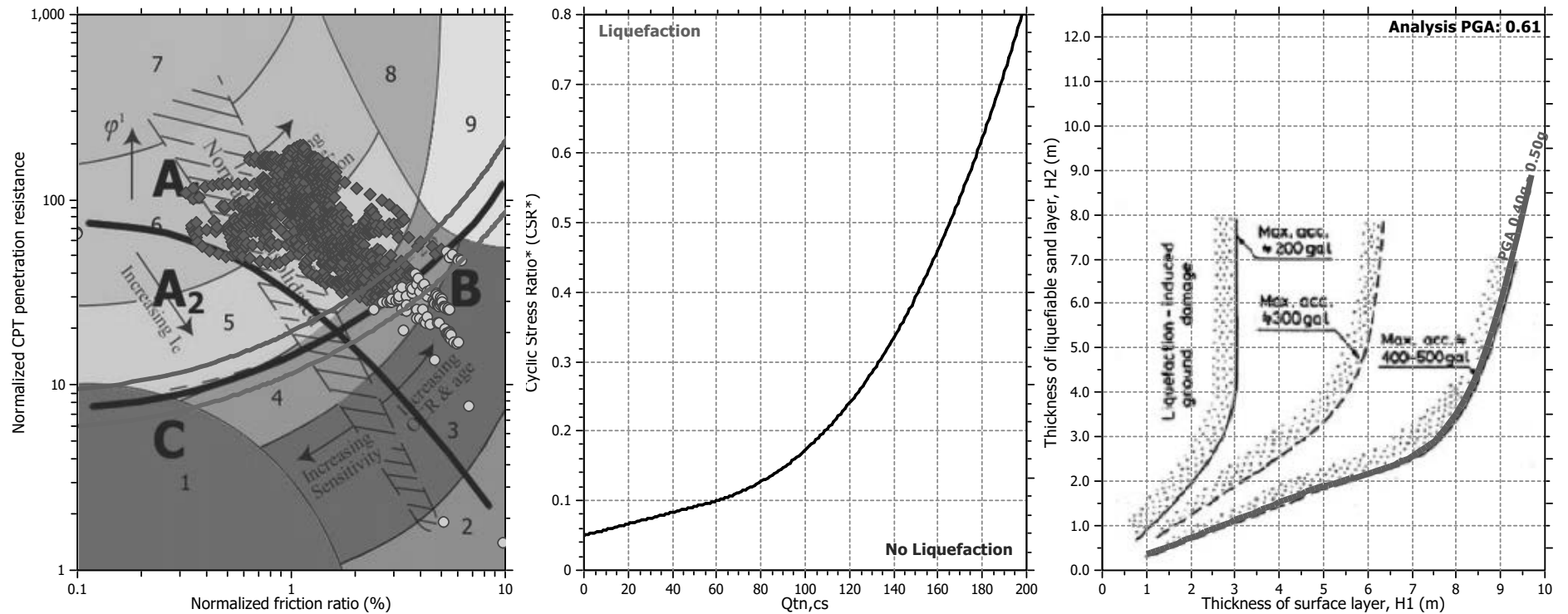
F.S. color scheme

Very dark grey	Almost certain it will liquefy
Dark grey	Very likely to liquefy
Medium grey	Liquefaction and no liq. are equally likely
Light grey	Unlike to liquefy
White	Almost certain it will not liquefy

LPI color scheme

Very dark grey	Very high risk
Dark grey	High risk
Light grey	Low risk

Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_o applied:	No
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

LIQUEFACTION ANALYSIS REPORT

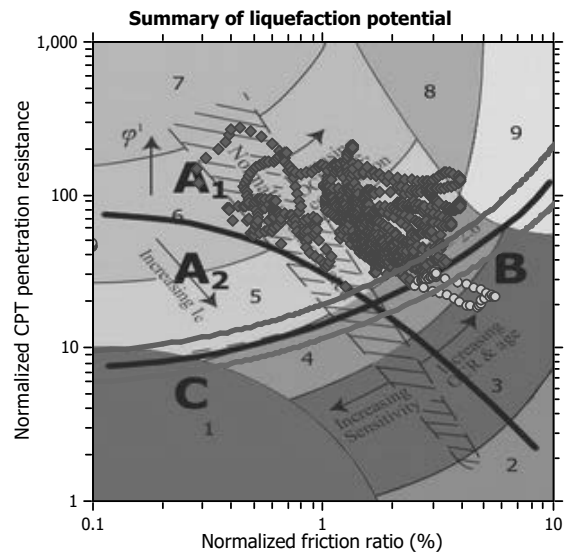
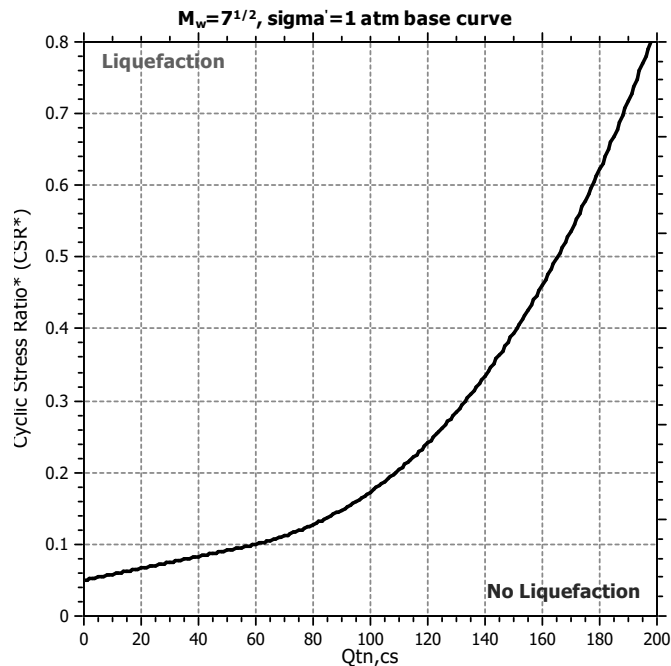
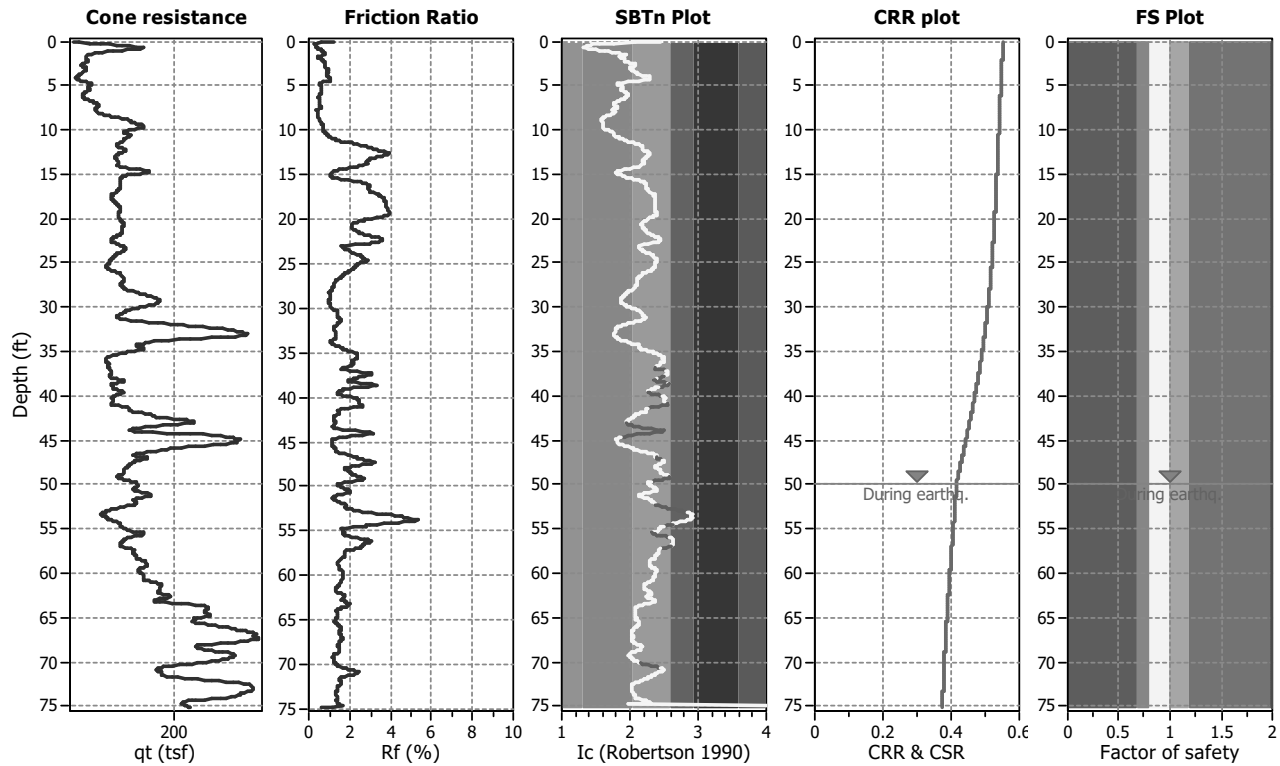
Project title : Jurupa SNF

Location :

CPT file : CPT-3

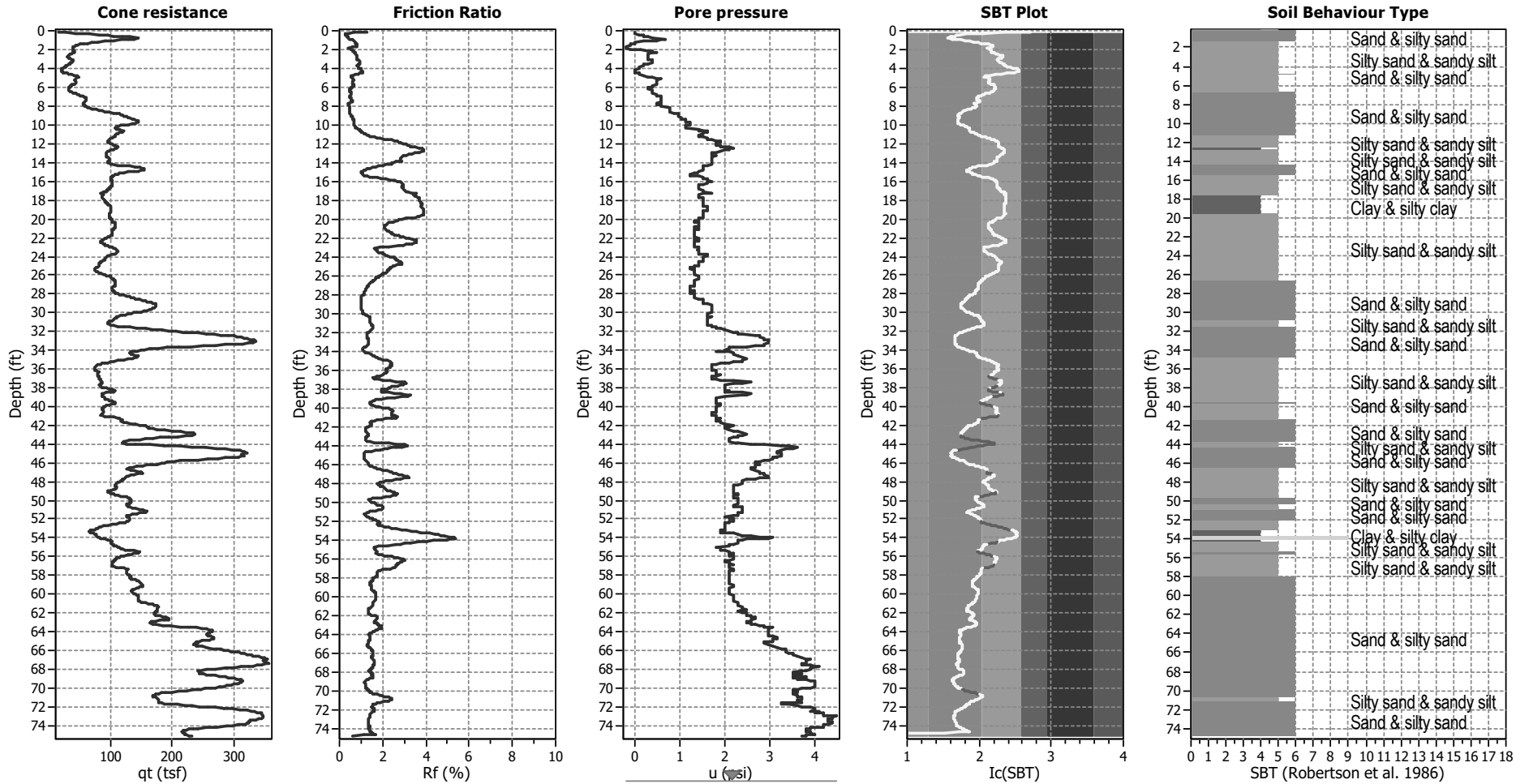
Input parameters and analysis data

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Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_0 applied:	No	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



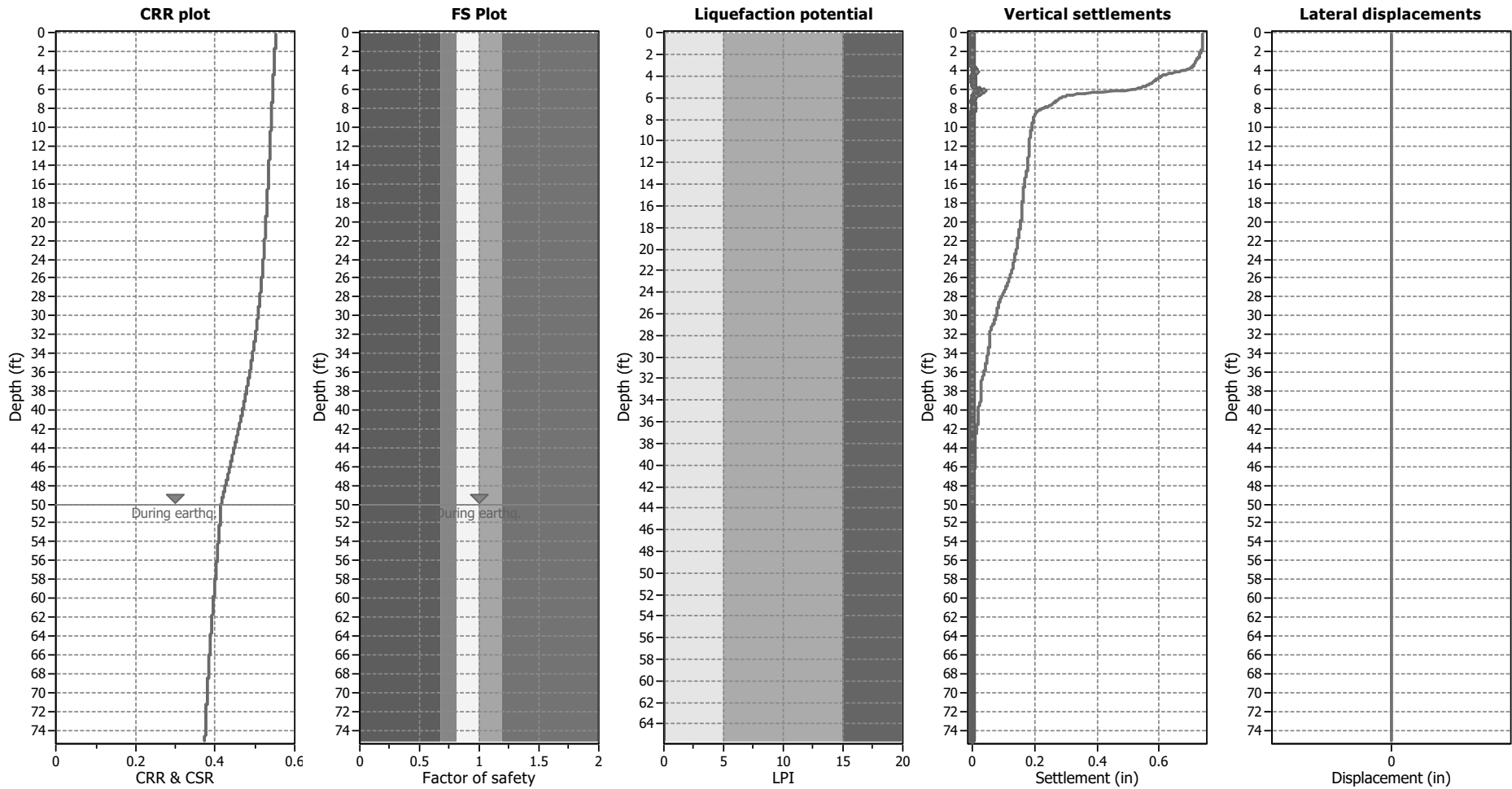
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

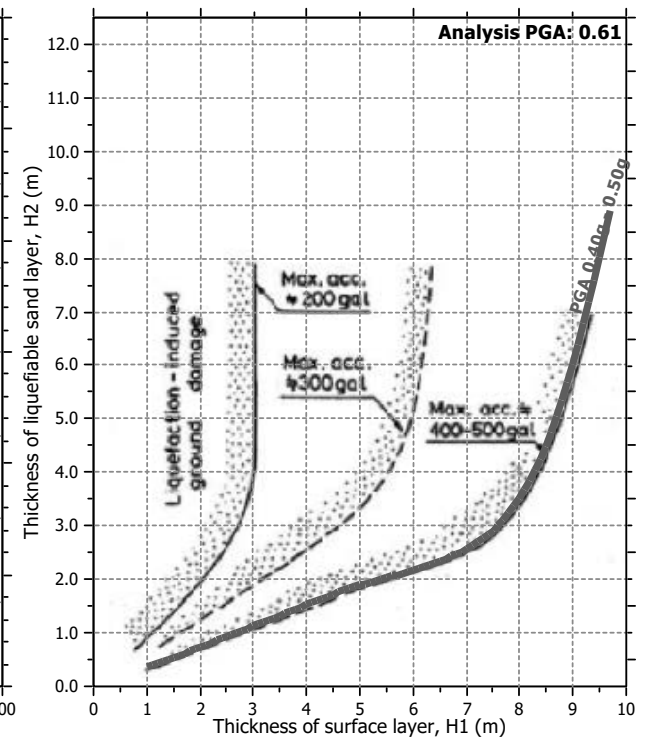
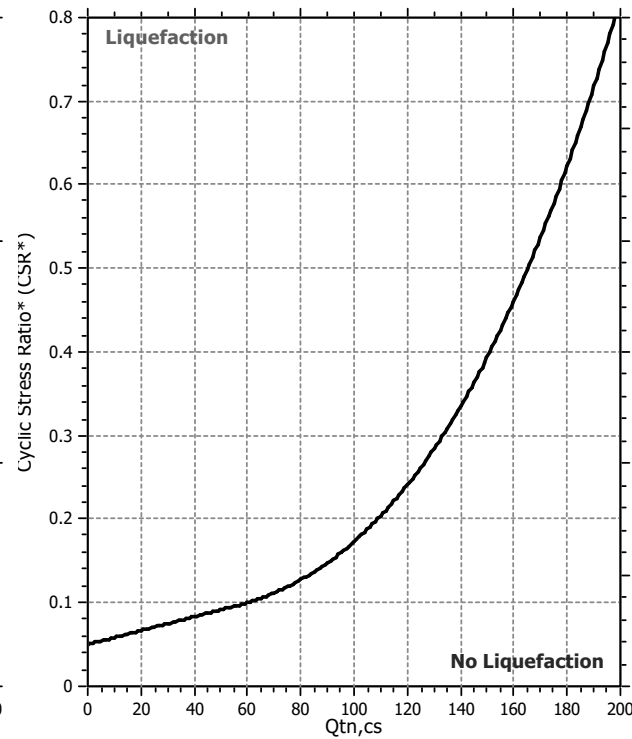
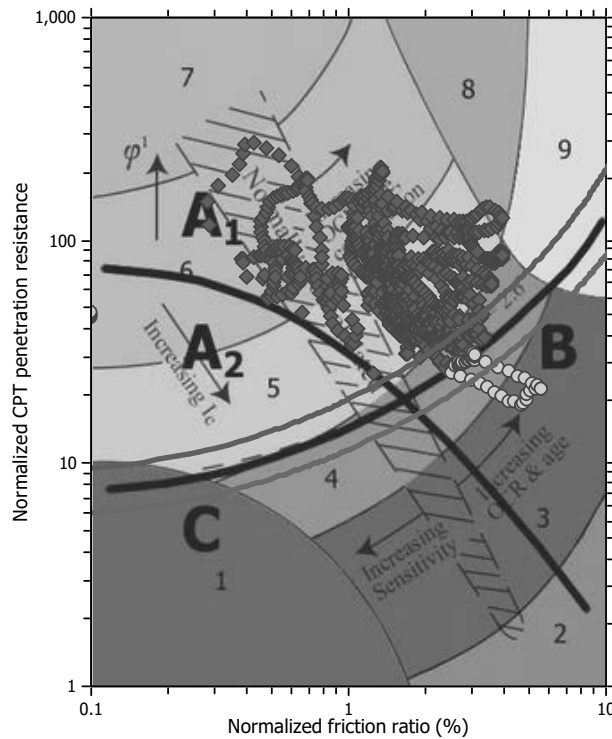
F.S. color scheme

Very high risk
High risk
Liquefaction and no liq. are equally likely
Unlike to liquefy
Almost certain it will not liquefy

LPI color scheme

Very high risk
High risk
Low risk

Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

LIQUEFACTION ANALYSIS REPORT

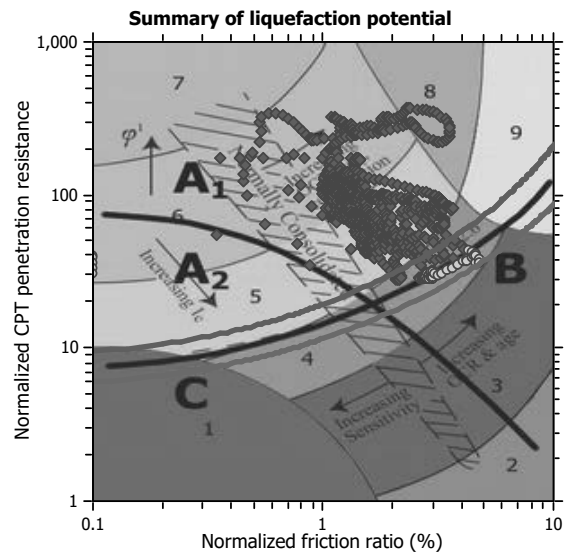
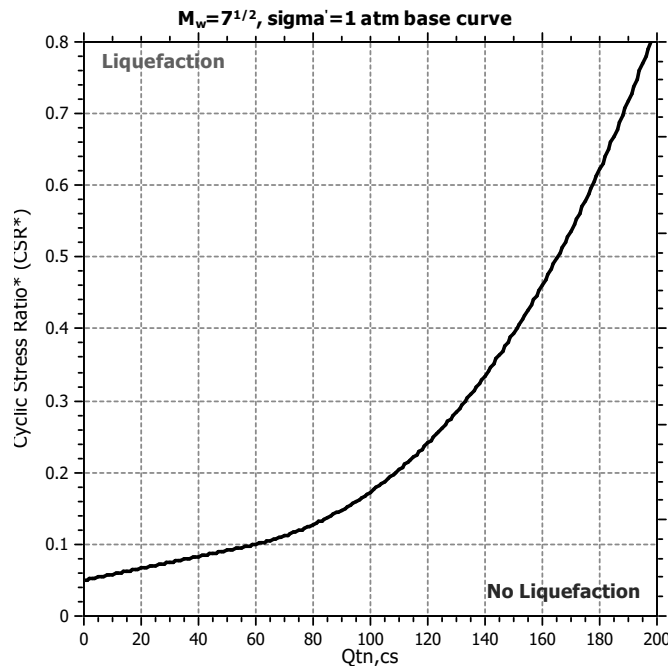
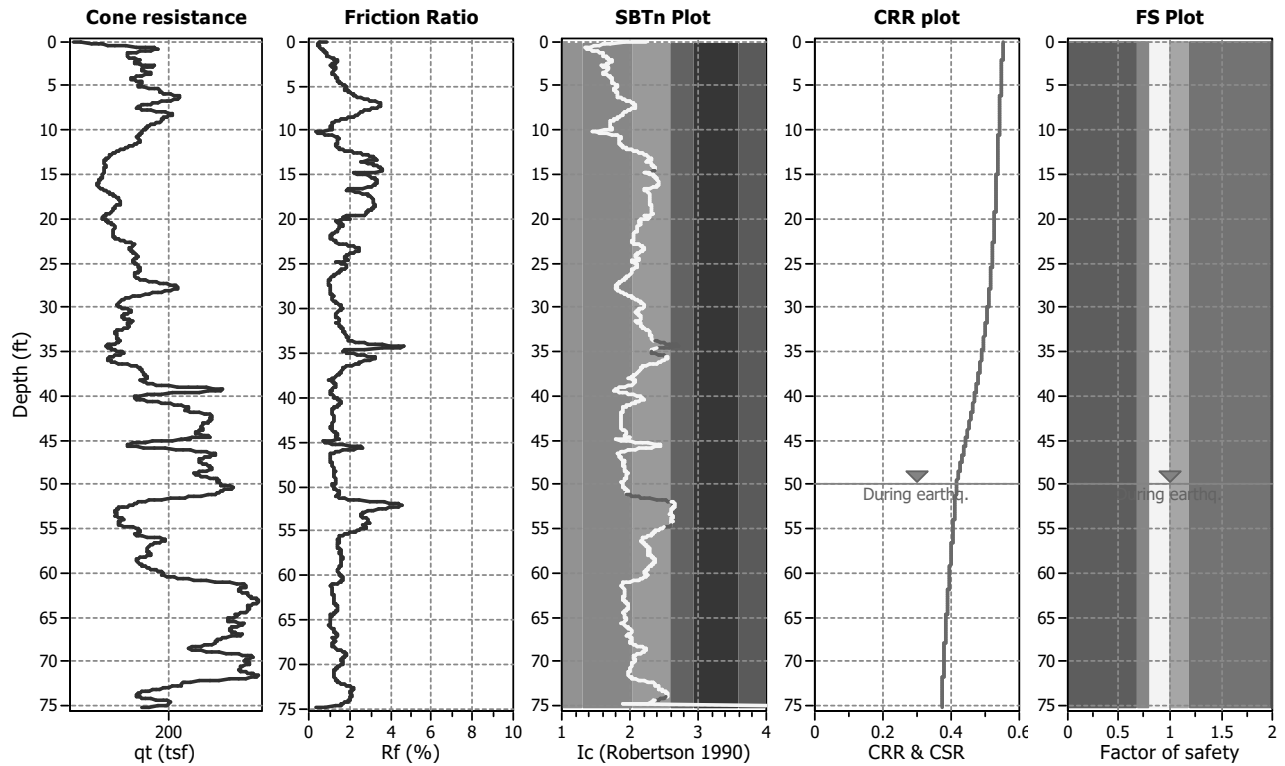
Project title : Jurupa SNF

Location :

CPT file : CPT-4

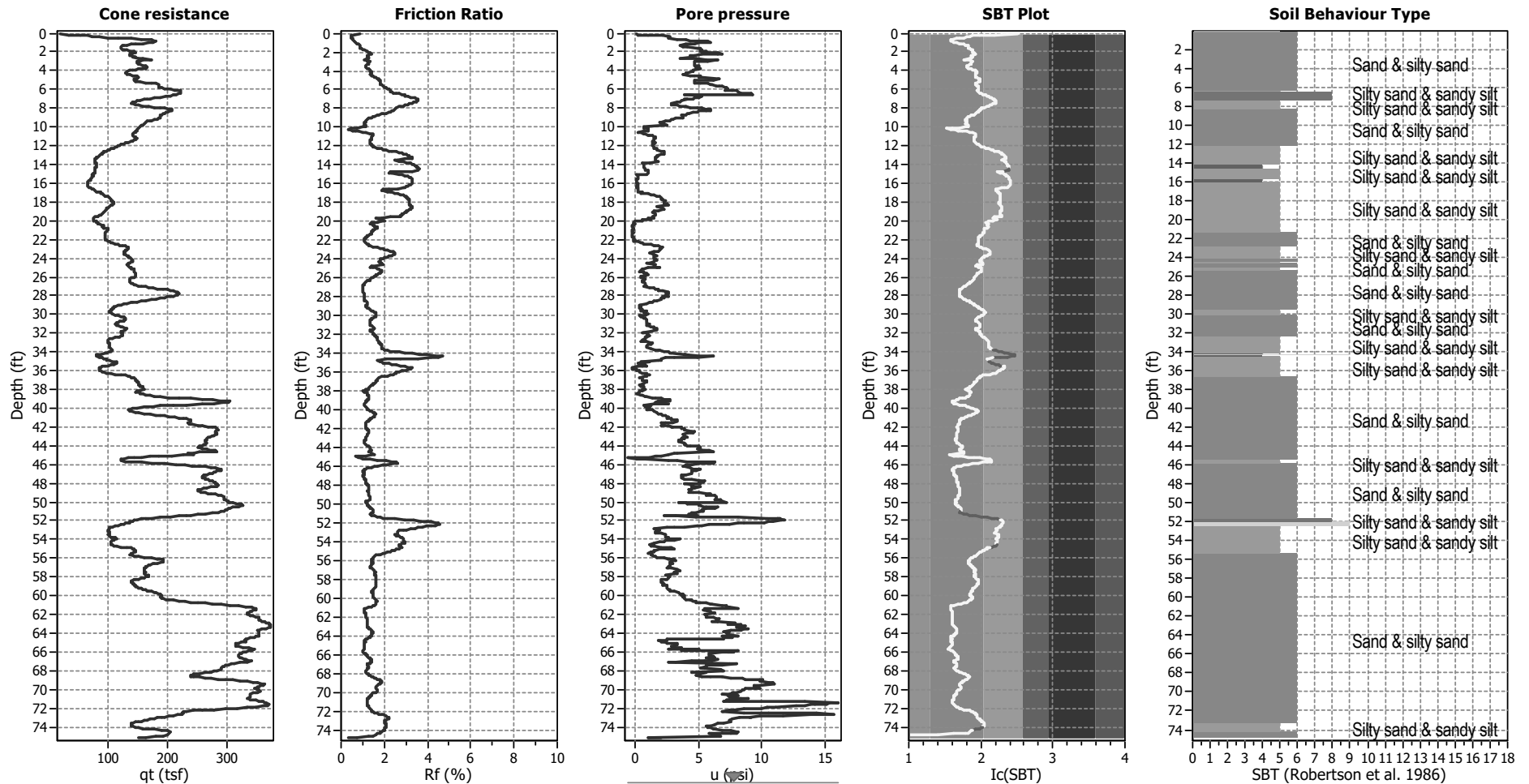
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	80.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_0 applied:	No	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



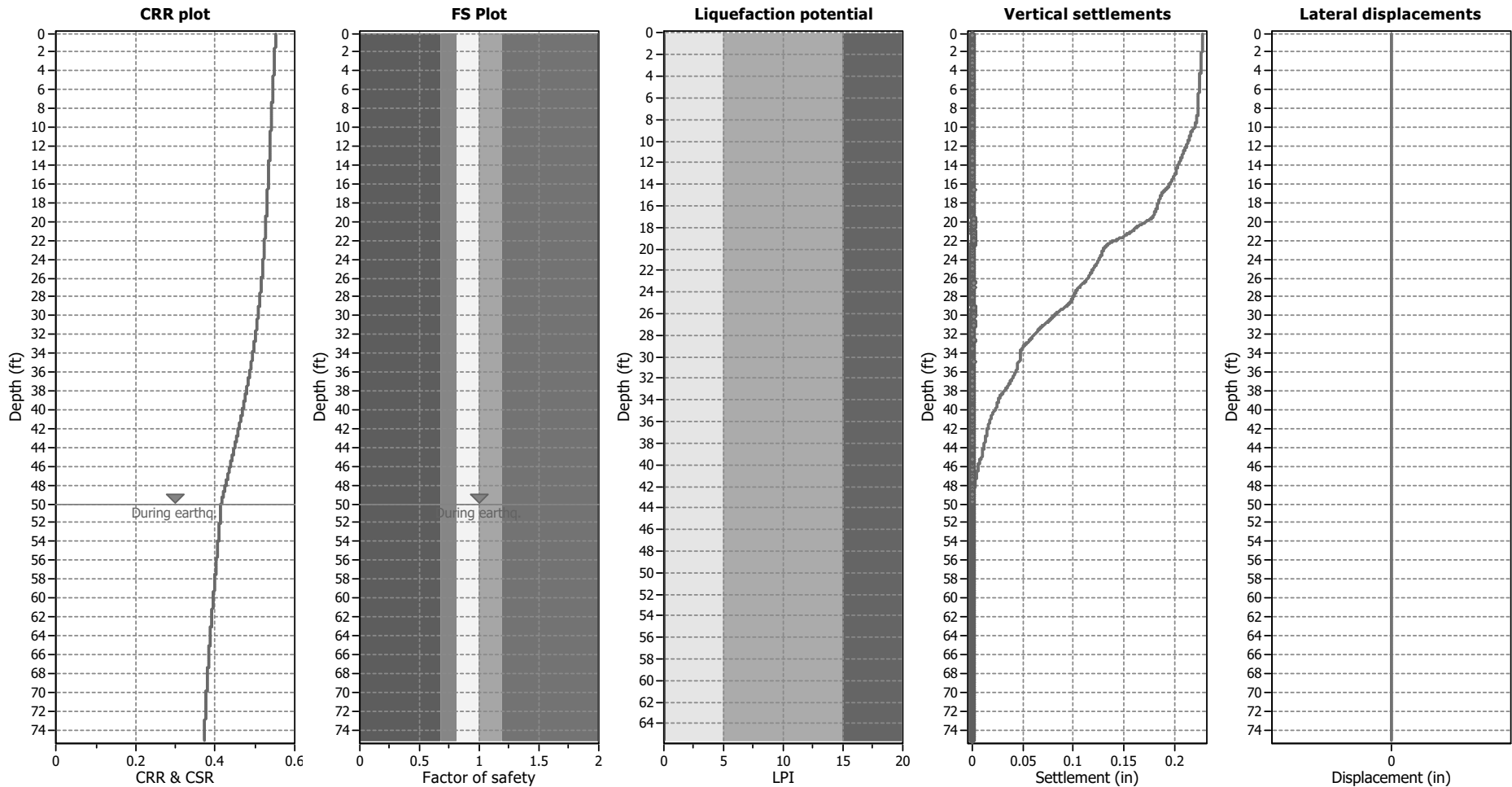
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _a applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

- | | | | | | |
|---|---------------------------|---|-----------------------------|---|----------------------------|
|  | 1. Sensitive fine grained |  | 4. Clayey silt to silty |  | 7. Gravely sand to sand |
|  | 2. Organic material |  | 5. Silty sand to sandy silt |  | 8. Very stiff sand to |
|  | 3. Clay to silty clay |  | 6. Clean sand to silty sand |  | 9. Very stiff fine grained |

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

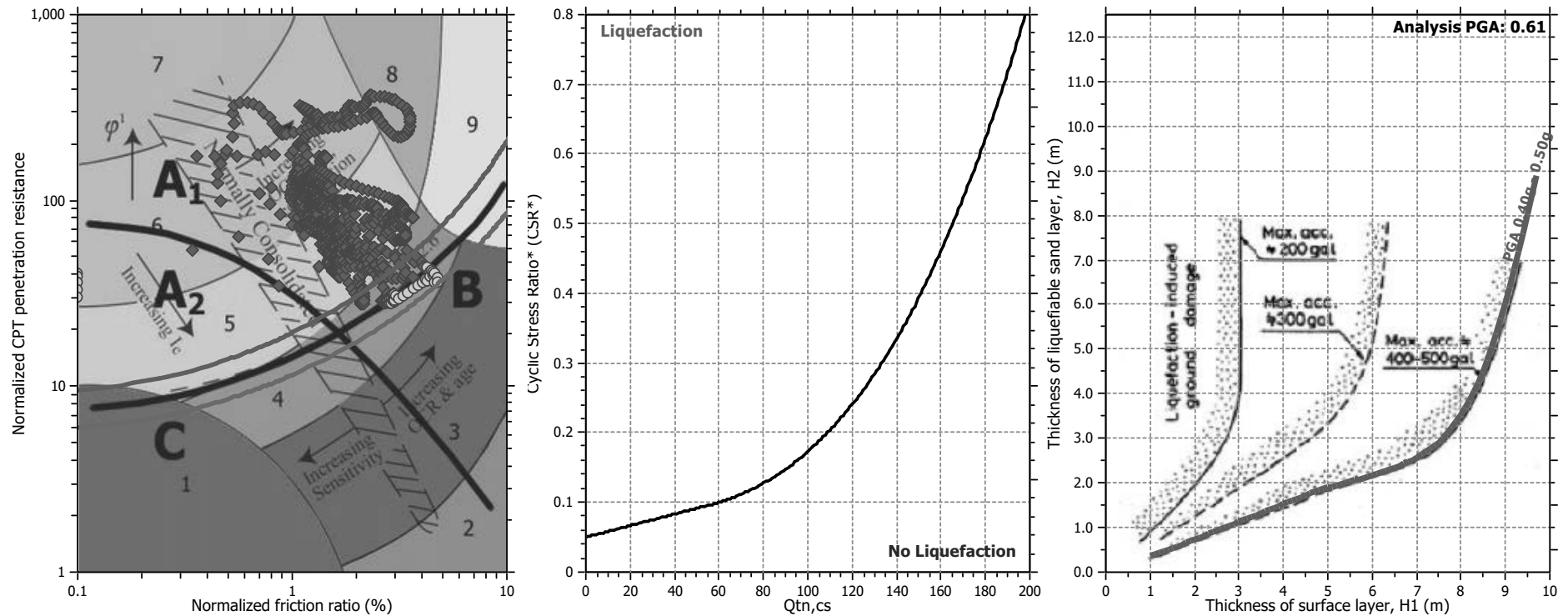
F.S. color scheme

Very dark grey	Almost certain it will liquefy
Dark grey	Very likely to liquefy
Light grey	Liquefaction and no liq. are equally likely
White	Unlike to liquefy
Very light grey	Almost certain it will not liquefy

LPI color scheme

Very dark grey	Very high risk
Dark grey	High risk
Light grey	Low risk

Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_o applied:	No
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

LIQUEFACTION ANALYSIS REPORT

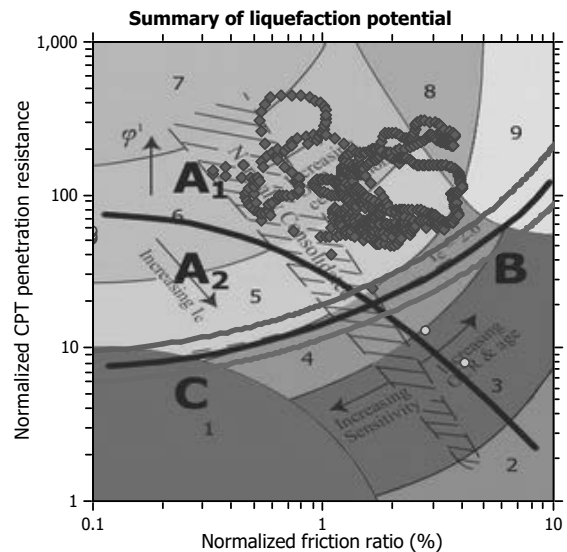
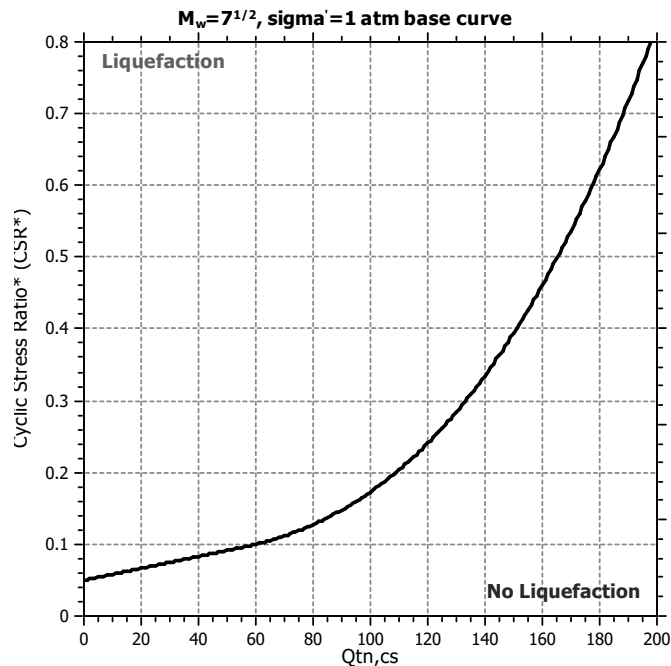
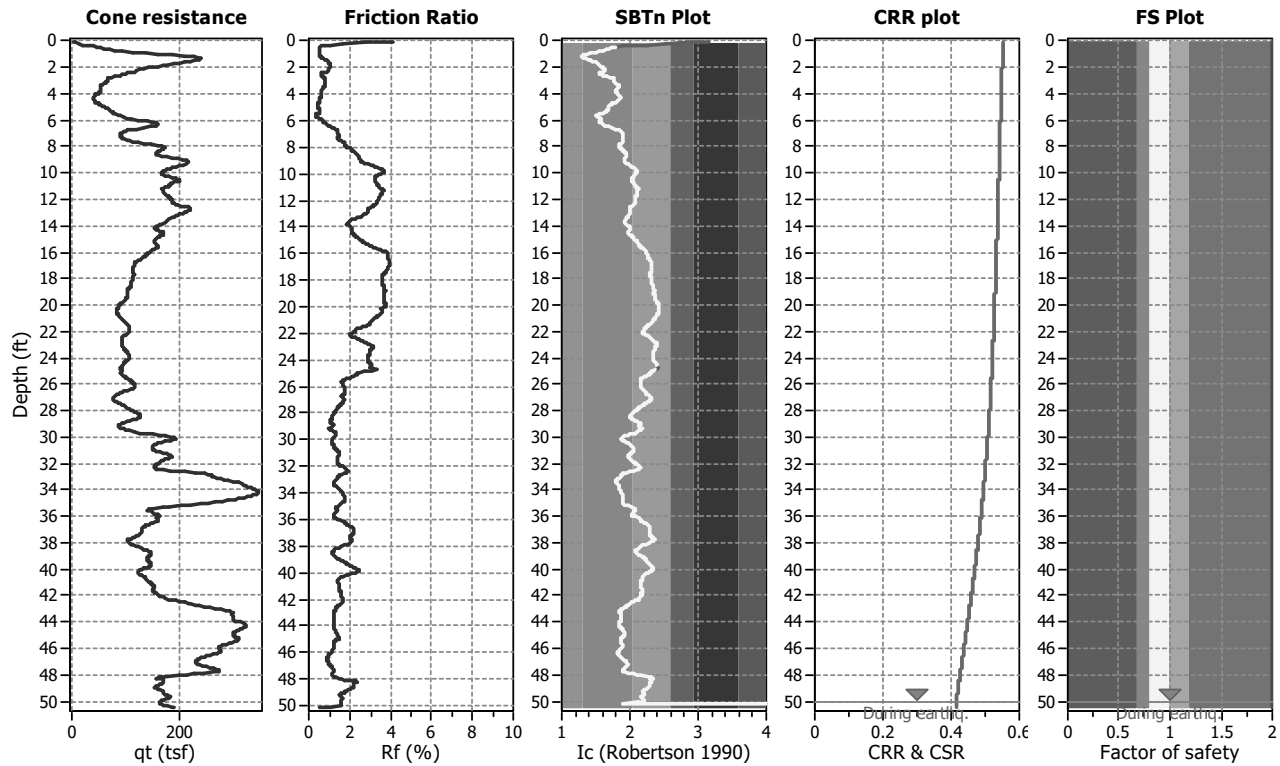
Project title : Jurupa SNF

Location :

CPT file : CPT-5

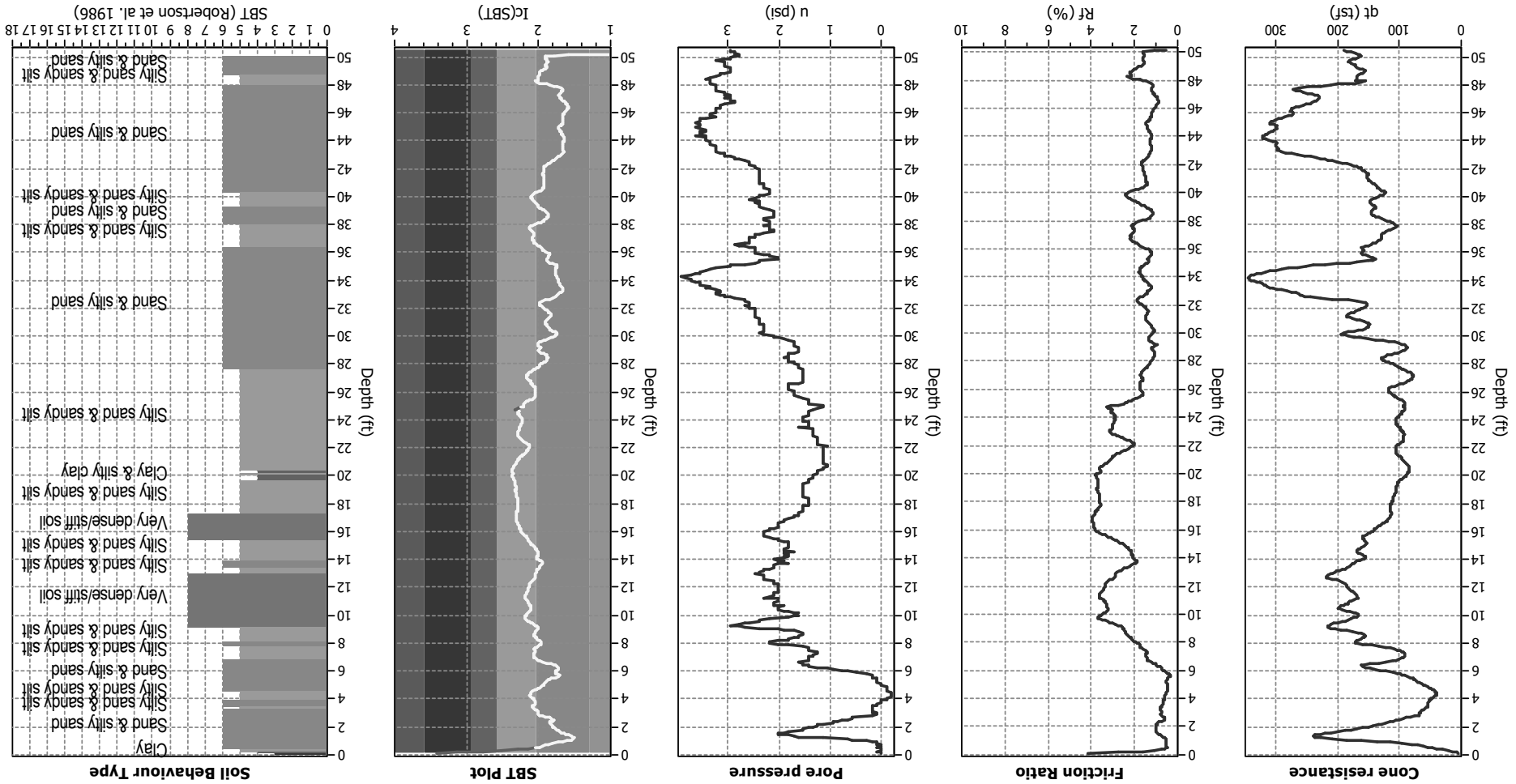
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	80.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_0 applied:	No	MSF method:	Method based



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



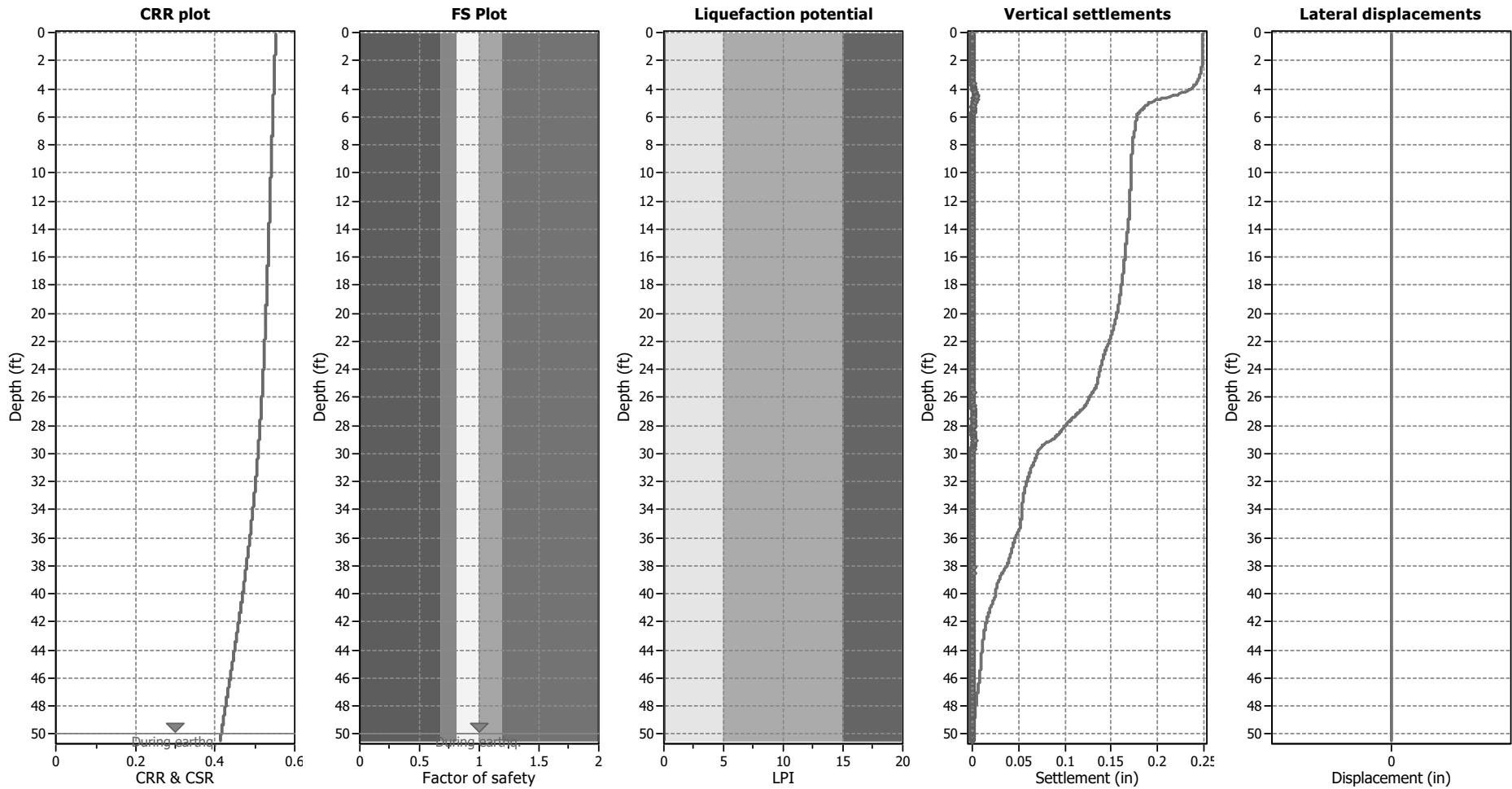
Input parameters and analysis data

Analysis method:	Robertson (2009)
Fines correction method:	Robertson (2009)
Points to test:	Based on Ic value
Earthquake magnitude M_w :	7.70
Peak ground acceleration:	0.61
Depth to water table (instu):	80.00 ft
Fill height:	
Use fill:	No
Unit weight calculation:	Based on SBT
Ic cut-off value:	2.60
Average results interval:	3
Depth to water table (ethq.):	50.00 ft
Fill weight:	N/A
Transition detect. applied:	Yes
K_0 applied:	No
Clay like behavior applied:	All soils
Limit depth applied:	Yes
Limit depth:	50.00 ft

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty
2. Organic material	5. Silty sand to sandy silt
3. Clay to silty clay	6. Clean sand to silty sand
	7. Gravely sand to sand
	8. Very stiff sand to
	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

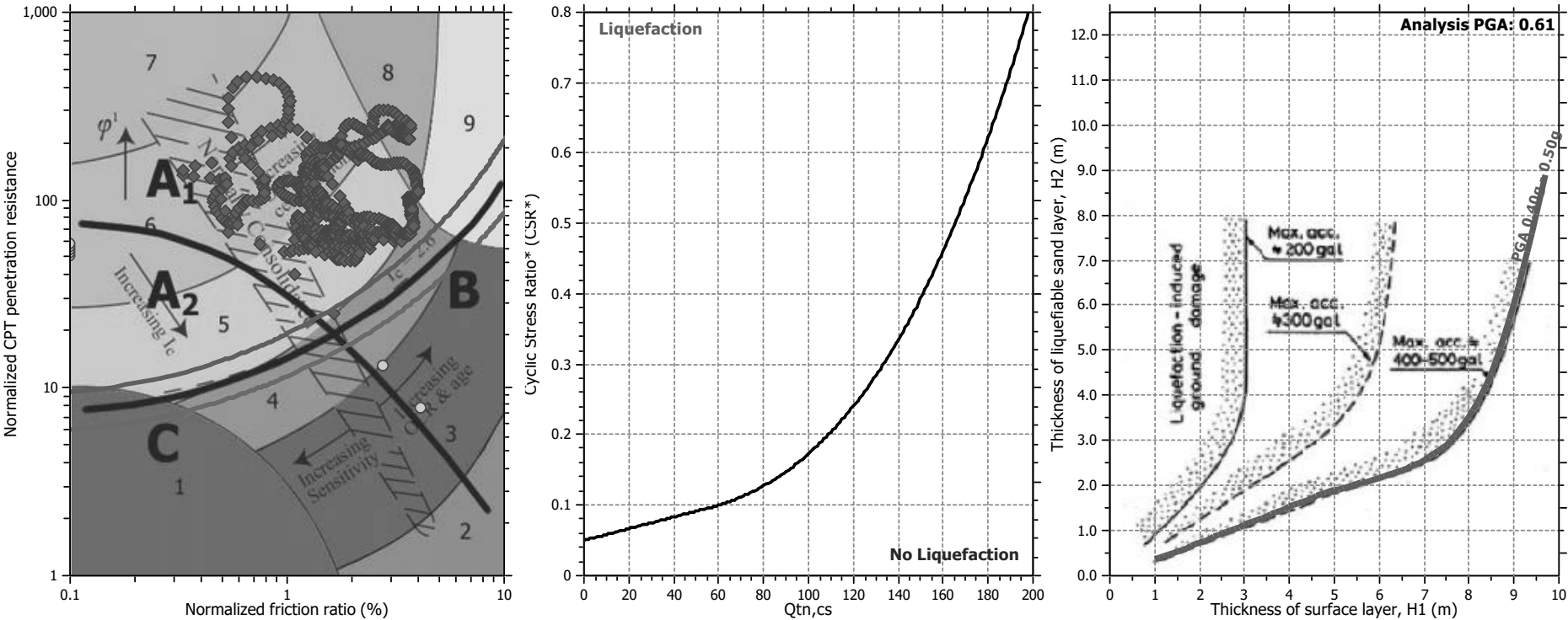
F.S. color scheme

Very high risk
High risk
Liquefaction and no liq. are equally likely
Unlike to liquefy
Almost certain it will not liquefy

LPI color scheme

Very high risk
High risk
Low risk

Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_o applied:	No
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

LIQUEFACTION ANALYSIS REPORT

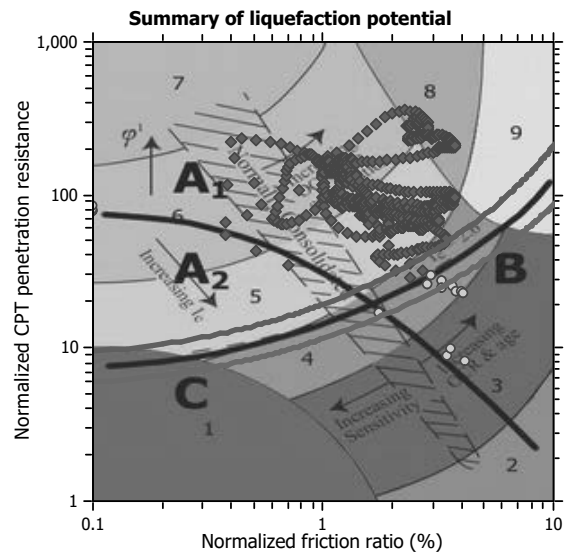
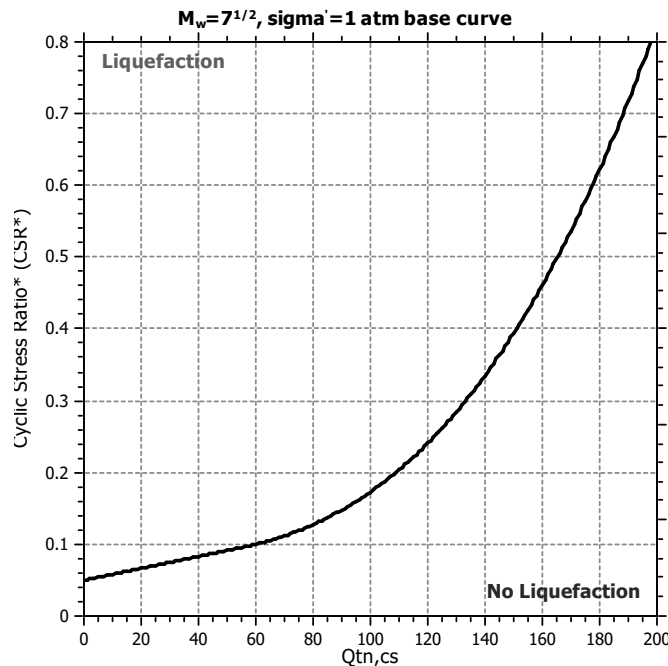
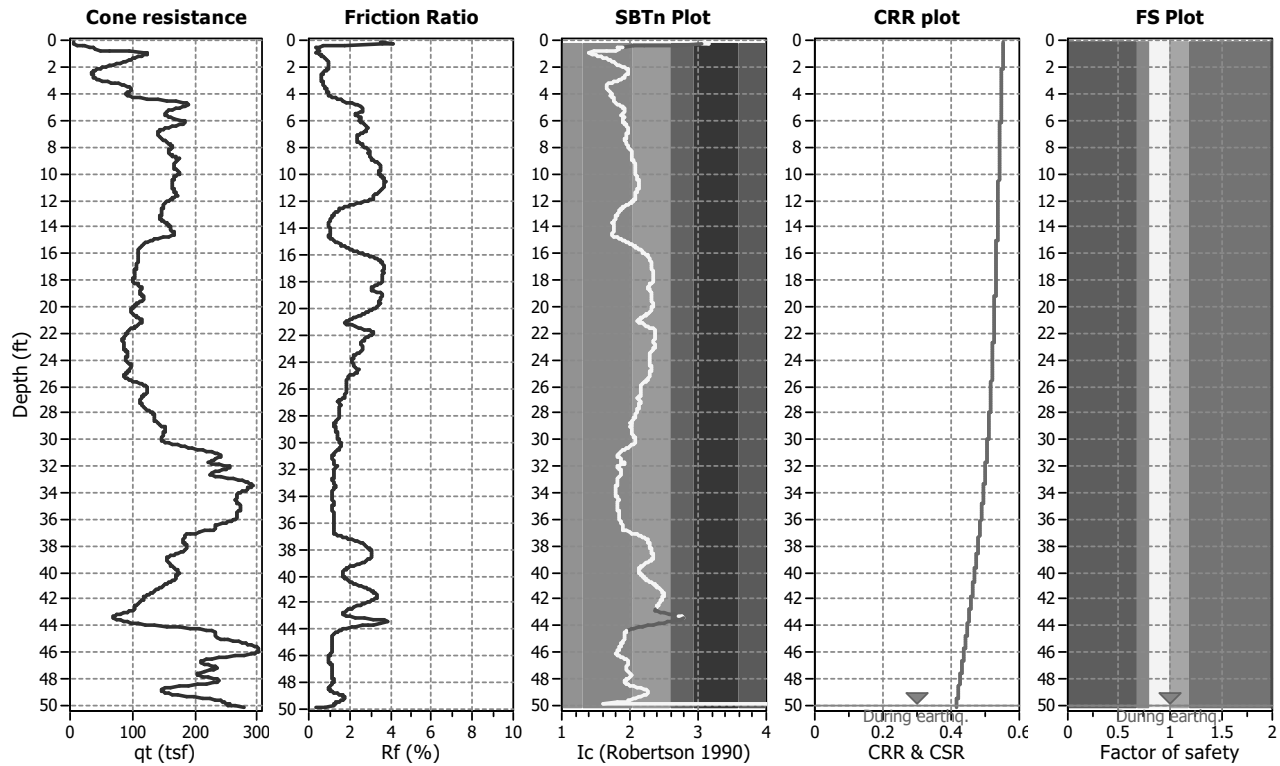
Project title : Jurupa SNF

Location :

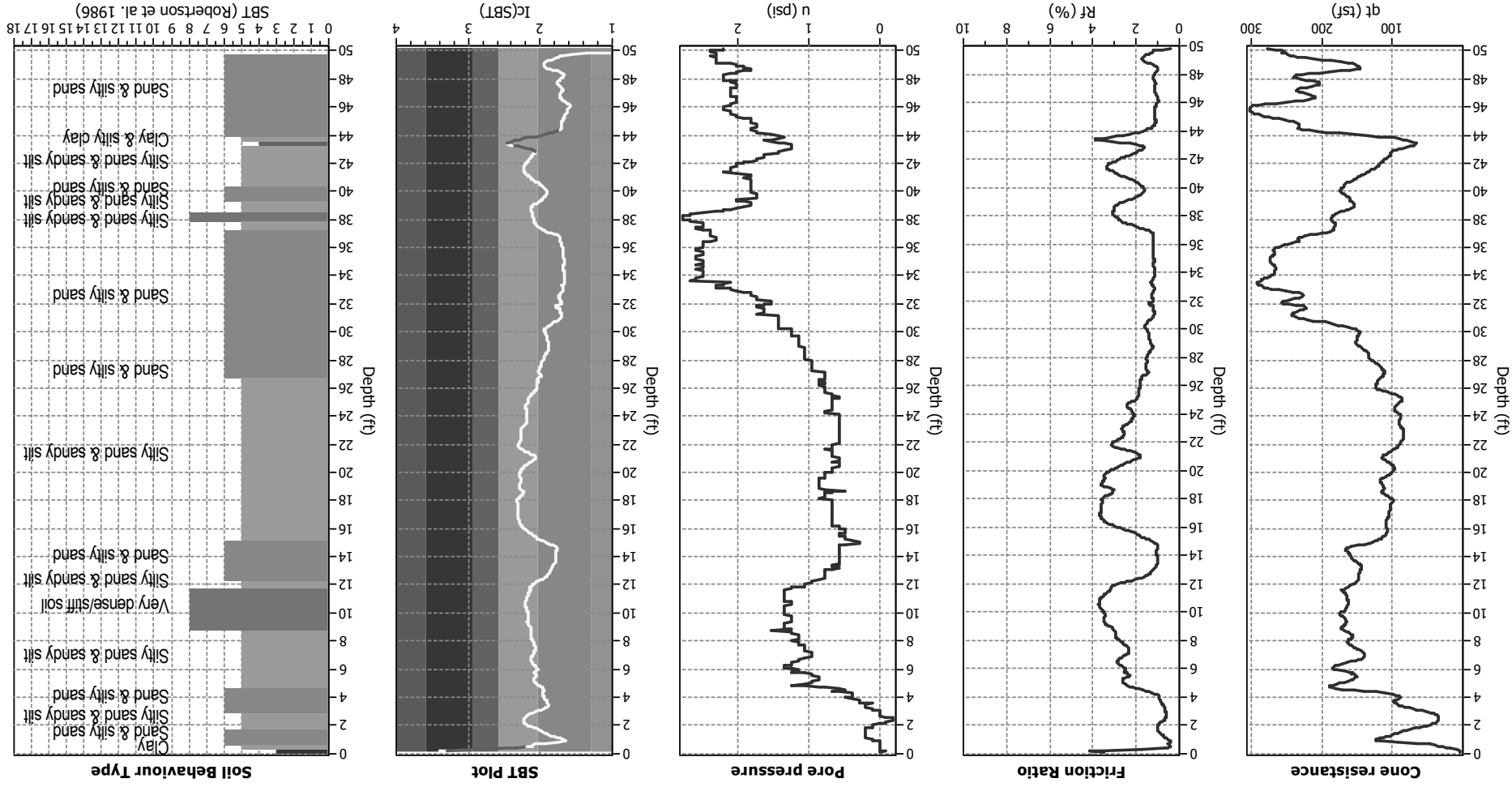
CPT file : CPT-6

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	80.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	0.61	Unit weight calculation:	Based on SBT	K_0 applied:	No	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry



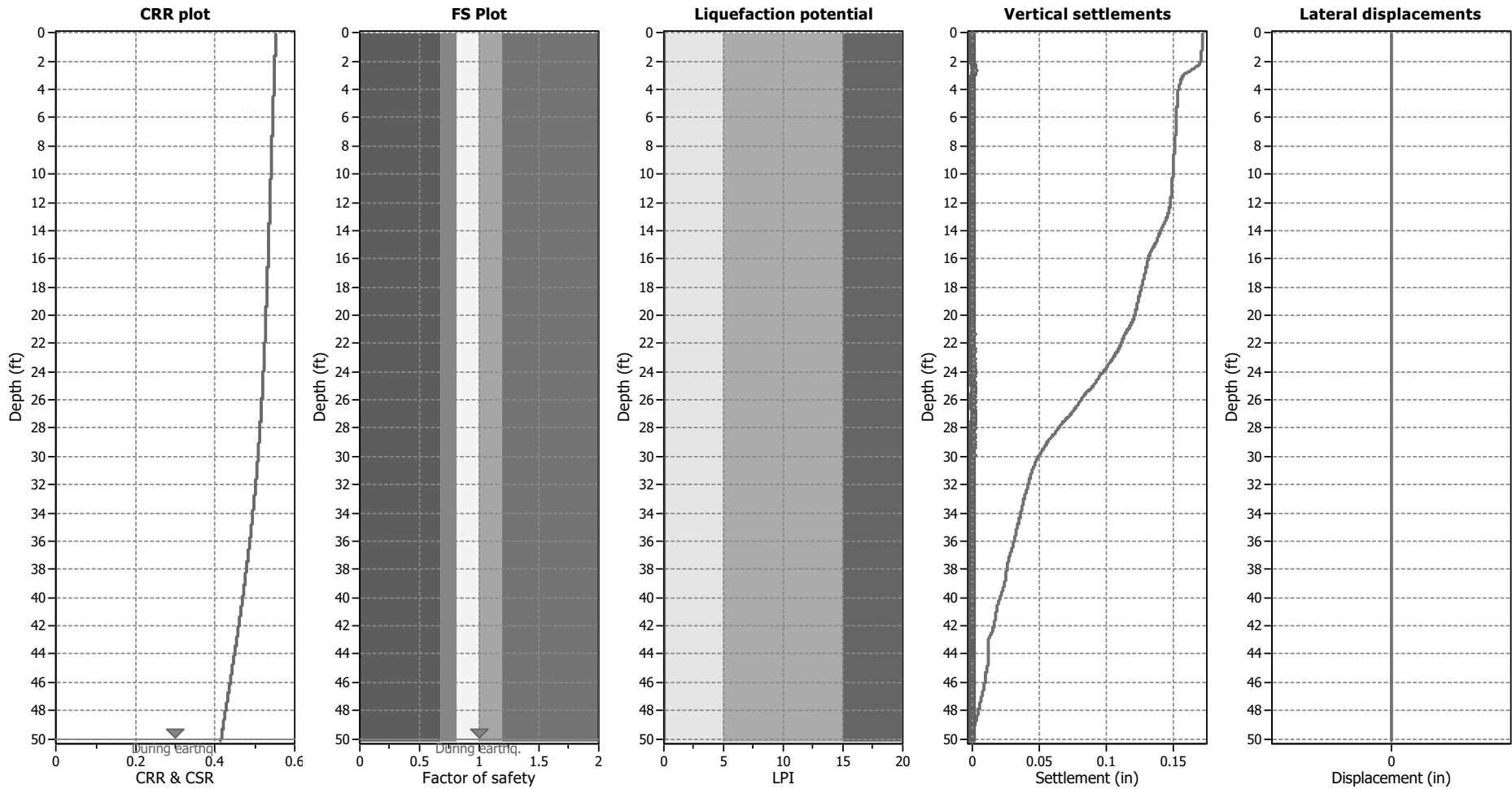
Input parameters and analysis data

SBT legend		Fill weight:		Average results interval:		Based on I_c value:		Earthquake magnitude M_w :		Depth to water table (instn):	
9. Very stiff fine grained		1. Sensitive fine grained		Yes	3	Robertson (2009)	0.61	7.20	80.00 ft		
8. Very stiff sand to		4. Clayey silt to silty		No	2.60	Based on SBT	7.20				
7. Gravely sand to sand		5. Silty sand to sandy silt		Yes	3						
		6. Clean sand to silty sand									
		3. Clay to silty clay									
		2. Organic material									
		1. Sensitive fine grained									

SRT legend

1. Sensitive fine grained	
2. Organic material	
3. Clay to silty clay	
4. Clayey silt to silty	
5. Silty sand to sandy silt	
6. Clean sand to silty sand	
7. Gravely sand to sand	
8. Very stiff sand to	
9. Very stiff fine grained	

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	No
Earthquake magnitude M _w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

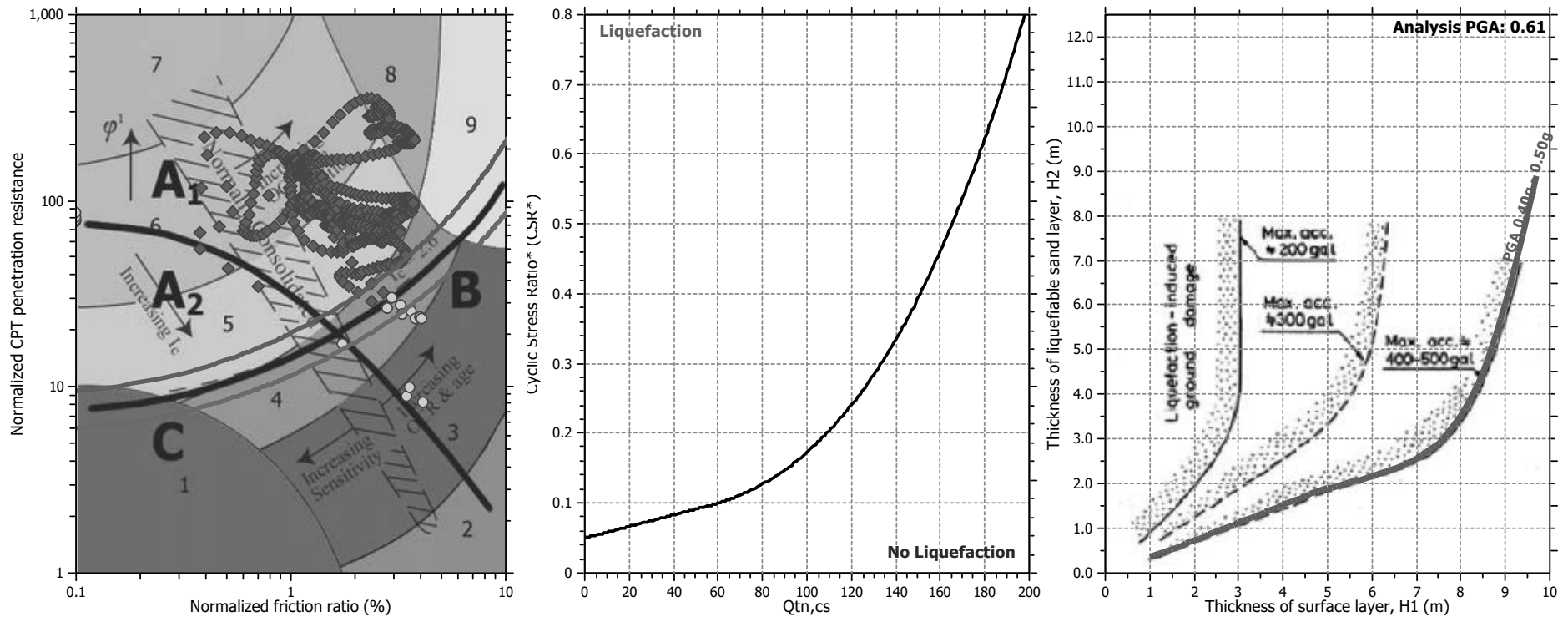
F.S. color scheme

Very high risk	Almost certain it will liquefy
High risk	Very likely to liquefy
Low risk	Liquefaction and no liq. are equally likely
	Unlike to liquefy
	Almost certain it will not liquefy

LPI color scheme

Very high risk
High risk
Low risk

Liquefaction analysis summary plots



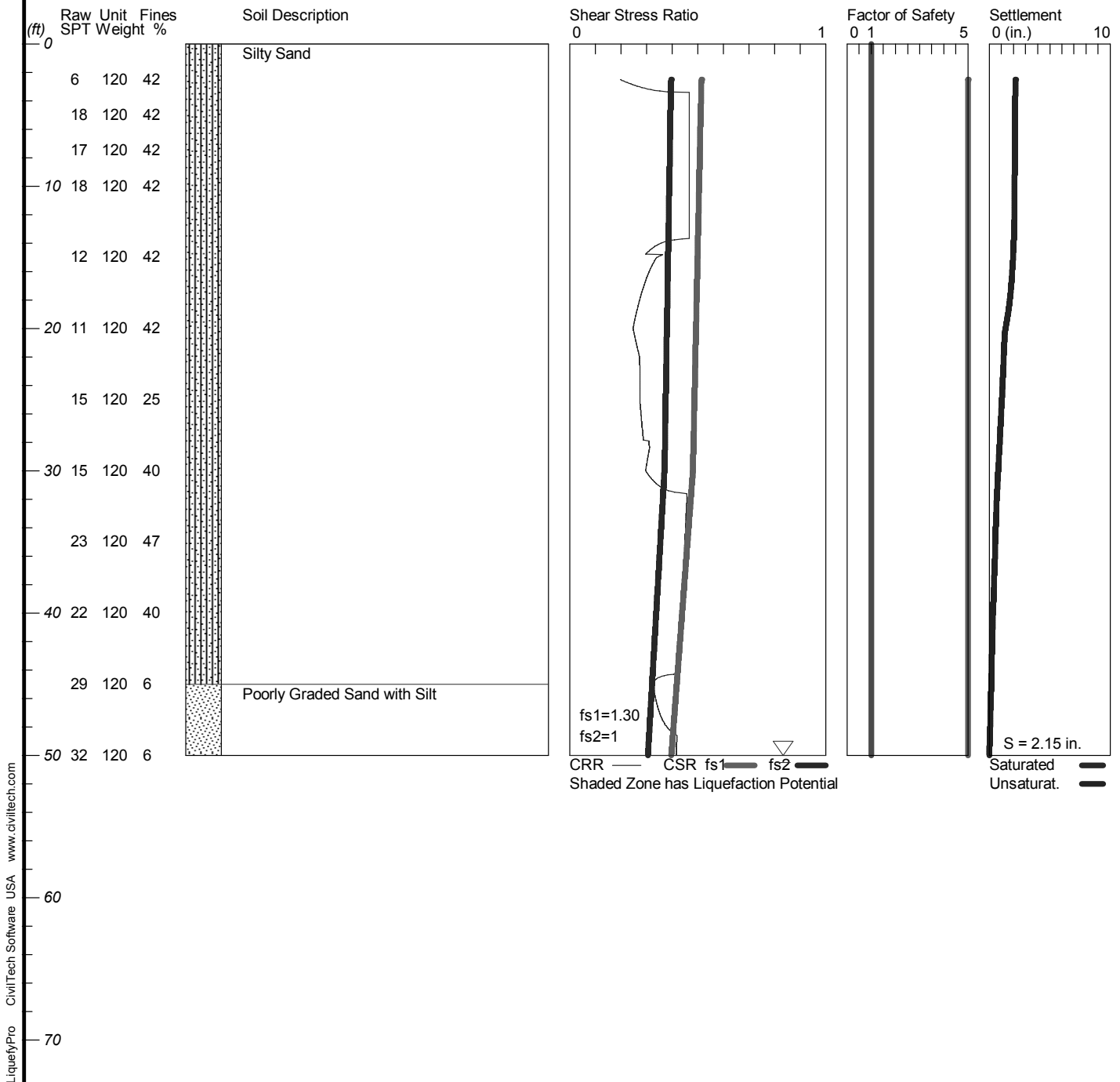
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_o applied:	No
Earthquake magnitude M_w :	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.61	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	80.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Jurupa SNF

Hole No.=B-3 Water Depth=50 ft

Magnitude=7.7
Acceleration=.612g



LIQUEFACTION ANALYSIS SUMMARY
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Font: Courier New, Regular, Size 8 is recommended for this report.
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Input File Name: N:\Projects\2023\CB235085\Working Files\Calculations-Analyses\Liquefaction\CB235085 Liquefaction B-3.liq
Title: Jurupa SNF
Subtitle: CB235085

Surface Elev.=
Hole No.=B-3
Depth of Hole= 50.00 ft
Water Table during Earthquake= 50.00 ft
Water Table during In-Situ Testing= 60.00 ft
Max. Acceleration= 0.61 g
Earthquake Magnitude= 7.70

Input Data:

Surface Elev.=
Hole No.=B-3
Depth of Hole=50.00 ft
Water Table during Earthquake= 50.00 ft
Water Table during In-Situ Testing= 60.00 ft
Max. Acceleration=0.61 g
Earthquake Magnitude=7.70
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu/Seed
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.33
7. Borehole Diameter, Cb = 1
8. Sampling Method, Cs = 1.2
9. User request factor of safety (apply to CSR) , User= 1.3
Plot two CSR (fs1=User, fs2=1)
10. Use Curve Smoothing: Yes*
- * Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
2.50	6.00	120.00	42.00
5.00	18.00	120.00	42.00
7.50	17.00	120.00	42.00
10.00	18.00	120.00	42.00
15.00	12.00	120.00	42.00
20.00	11.00	120.00	42.00
25.00	15.00	120.00	25.00
30.00	15.00	120.00	40.00
35.00	23.00	120.00	47.00
40.00	22.00	120.00	40.00
45.00	29.00	120.00	6.00
50.00	32.00	120.00	6.00

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=2.15 in.
Total Settlement of Saturated and Unsaturated Sands=2.15 in.
Differential Settlement=1.077 to 1.422 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
2.50	0.20	0.51	5.00	0.00	2.15	2.15
3.00	0.27	0.51	5.00	0.00	2.15	2.15
3.50	0.47	0.51	5.00	0.00	2.14	2.14
4.00	0.47	0.51	5.00	0.00	2.13	2.13
4.50	0.47	0.51	5.00	0.00	2.13	2.13
5.00	0.47	0.51	5.00	0.00	2.13	2.13
5.50	0.47	0.51	5.00	0.00	2.13	2.13
6.00	0.47	0.51	5.00	0.00	2.13	2.13
6.50	0.47	0.51	5.00	0.00	2.12	2.12
7.00	0.47	0.51	5.00	0.00	2.12	2.12
7.50	0.47	0.51	5.00	0.00	2.12	2.12
8.00	0.47	0.51	5.00	0.00	2.11	2.11
8.50	0.47	0.51	5.00	0.00	2.11	2.11
9.00	0.47	0.51	5.00	0.00	2.10	2.10
9.50	0.47	0.51	5.00	0.00	2.09	2.09
10.00	0.47	0.51	5.00	0.00	2.09	2.09
10.50	0.47	0.50	5.00	0.00	2.08	2.08
11.00	0.47	0.50	5.00	0.00	2.08	2.08
11.50	0.47	0.50	5.00	0.00	2.07	2.07
12.00	0.47	0.50	5.00	0.00	2.07	2.07
12.50	0.47	0.50	5.00	0.00	2.06	2.06
13.00	0.47	0.50	5.00	0.00	2.05	2.05
13.50	0.47	0.50	5.00	0.00	2.03	2.03
14.00	0.35	0.50	5.00	0.00	2.01	2.01
14.50	0.31	0.50	5.00	0.00	1.98	1.98
15.00	0.34	0.50	5.00	0.00	1.96	1.96
15.50	0.32	0.50	5.00	0.00	1.93	1.93
16.00	0.31	0.50	5.00	0.00	1.89	1.89
16.50	0.30	0.50	5.00	0.00	1.85	1.85
17.00	0.29	0.50	5.00	0.00	1.80	1.80
17.50	0.28	0.50	5.00	0.00	1.75	1.75
18.00	0.27	0.50	5.00	0.00	1.69	1.69
18.50	0.27	0.49	5.00	0.00	1.62	1.62
19.00	0.26	0.49	5.00	0.00	1.53	1.53
19.50	0.25	0.49	5.00	0.00	1.44	1.44
20.00	0.25	0.49	5.00	0.00	1.34	1.34
20.50	0.25	0.49	5.00	0.00	1.26	1.26
21.00	0.26	0.49	5.00	0.00	1.23	1.23
21.50	0.27	0.49	5.00	0.00	1.21	1.21
22.00	0.27	0.49	5.00	0.00	1.19	1.19
22.50	0.27	0.49	5.00	0.00	1.16	1.16
23.00	0.27	0.49	5.00	0.00	1.14	1.14
23.50	0.27	0.49	5.00	0.00	1.11	1.11
24.00	0.27	0.49	5.00	0.00	1.09	1.09
24.50	0.27	0.49	5.00	0.00	1.06	1.06
25.00	0.27	0.49	5.00	0.00	1.03	1.03
25.50	0.28	0.49	5.00	0.00	1.00	1.00
26.00	0.28	0.49	5.00	0.00	0.97	0.97
26.50	0.28	0.49	5.00	0.00	0.95	0.95
27.00	0.28	0.48	5.00	0.00	0.91	0.91
27.50	0.29	0.48	5.00	0.00	0.88	0.88
28.00	0.31	0.48	5.00	0.00	0.85	0.85

28.50	0.31	0.48	5.00	0.00	0.82	0.82
29.00	0.31	0.48	5.00	0.00	0.79	0.79
29.50	0.30	0.48	5.00	0.00	0.76	0.76
30.00	0.30	0.48	5.00	0.00	0.73	0.73
30.50	0.32	0.48	5.00	0.00	0.70	0.70
31.00	0.34	0.48	5.00	0.00	0.67	0.67
31.50	0.41	0.47	5.00	0.00	0.64	0.64
32.00	0.46	0.47	5.00	0.00	0.61	0.61
32.50	0.46	0.47	5.00	0.00	0.59	0.59
33.00	0.45	0.47	5.00	0.00	0.57	0.57
33.50	0.45	0.47	5.00	0.00	0.55	0.55
34.00	0.45	0.46	5.00	0.00	0.53	0.53
34.50	0.45	0.46	5.00	0.00	0.51	0.51
35.00	0.45	0.46	5.00	0.00	0.49	0.49
35.50	0.45	0.46	5.00	0.00	0.48	0.48
36.00	0.45	0.46	5.00	0.00	0.46	0.46
36.50	0.45	0.45	5.00	0.00	0.44	0.44
37.00	0.44	0.45	5.00	0.00	0.42	0.42
37.50	0.44	0.45	5.00	0.00	0.40	0.40
38.00	0.44	0.45	5.00	0.00	0.38	0.38
38.50	0.44	0.45	5.00	0.00	0.36	0.36
39.00	0.44	0.44	5.00	0.00	0.34	0.34
39.50	0.44	0.44	5.00	0.00	0.32	0.32
40.00	0.44	0.44	5.00	0.00	0.30	0.30
40.50	0.44	0.44	5.00	0.00	0.27	0.27
41.00	0.44	0.43	5.00	0.00	0.26	0.26
41.50	0.43	0.43	5.00	0.00	0.25	0.25
42.00	0.43	0.43	5.00	0.00	0.24	0.24
42.50	0.43	0.43	5.00	0.00	0.22	0.22
43.00	0.43	0.43	5.00	0.00	0.21	0.21
43.50	0.43	0.42	5.00	0.00	0.20	0.20
44.00	0.43	0.42	5.00	0.00	0.19	0.19
44.50	0.35	0.42	5.00	0.00	0.17	0.17
45.00	0.32	0.42	5.00	0.00	0.15	0.15
45.50	0.33	0.42	5.00	0.00	0.14	0.14
46.00	0.34	0.41	5.00	0.00	0.12	0.12
46.50	0.34	0.41	5.00	0.00	0.11	0.11
47.00	0.35	0.41	5.00	0.00	0.09	0.09
47.50	0.36	0.41	5.00	0.00	0.08	0.08
48.00	0.38	0.41	5.00	0.00	0.06	0.06
48.50	0.41	0.40	5.00	0.00	0.04	0.04
49.00	0.42	0.40	5.00	0.00	0.03	0.03
49.50	0.42	0.40	5.00	0.00	0.01	0.01
50.00	0.42	0.40	5.00	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone

(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm Cyclic resistance ratio from soils

CSRsf Cyclic stress ratio induced by a given earthquake (with user request factor of safety)

F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRsf

S_sat Settlement from saturated sands

S_dry Settlement from Unsaturated Sands

S_all Total Settlement from Saturated and Unsaturated Sands

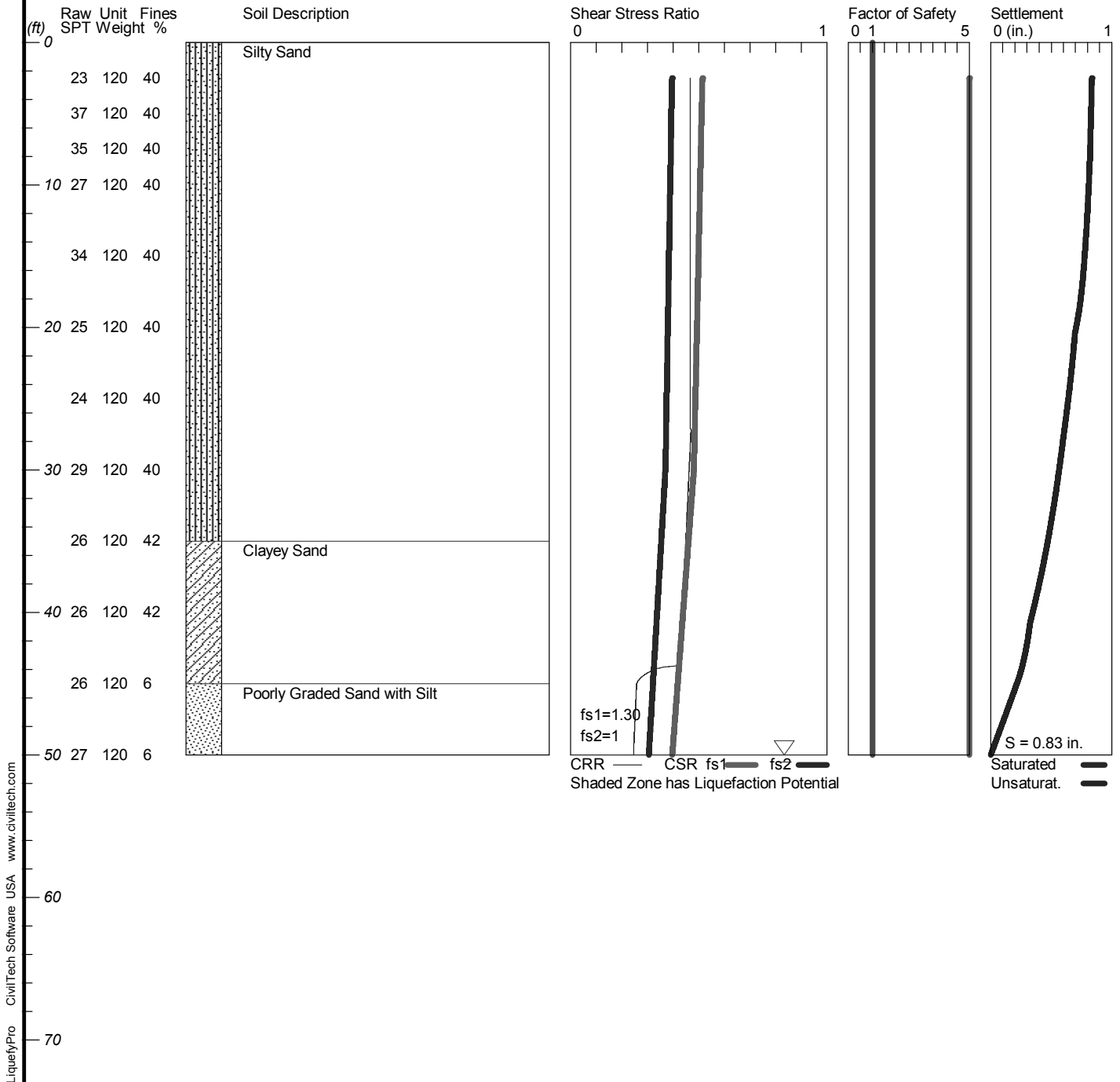
NoLiq No-Liquefy Soils

LIQUEFACTION ANALYSIS

Jurupa SNF

Hole No.=B-4 Water Depth=50 ft

Magnitude=7.7
Acceleration=.612g



LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: N:\Projects\2023\CB235085\Working Files\Calculations-Analyses\Liquefaction\CB235085 Liquefaction B-4.liq
Title: Jurupa SNF
Subtitle: CB235085

Surface Elev.=
Hole No.=B-4
Depth of Hole= 50.00 ft
Water Table during Earthquake= 50.00 ft
Water Table during In-Situ Testing= 60.00 ft
Max. Acceleration= 0.61 g
Earthquake Magnitude= 7.70

Input Data:

Surface Elev.=
Hole No.=B-4
Depth of Hole=50.00 ft
Water Table during Earthquake= 50.00 ft
Water Table during In-Situ Testing= 60.00 ft
Max. Acceleration=0.61 g
Earthquake Magnitude=7.70
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu/Seed
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.33
7. Borehole Diameter, Cb = 1
8. Sampling Method, Cs = 1.2
9. User request factor of safety (apply to CSR) , User = 1.3
Plot two CSR (fs1=User, fs2=1)
10. Use Curve Smoothing: Yes*
- * Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
2.50	23.00	120.00	40.00
5.00	37.00	120.00	40.00
7.50	35.00	120.00	40.00
10.00	27.00	120.00	40.00
15.00	34.00	120.00	40.00
20.00	25.00	120.00	40.00
25.00	24.00	120.00	40.00
30.00	29.00	120.00	40.00
35.00	26.00	120.00	42.00
40.00	26.00	120.00	42.00
45.00	26.00	120.00	6.00
50.00	27.00	120.00	6.00

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.83 in.
Total Settlement of Saturated and Unsaturated Sands=0.83 in.
Differential Settlement=0.417 to 0.551 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
2.50	0.47	0.51	5.00	0.00	0.83	0.83
3.00	0.47	0.51	5.00	0.00	0.83	0.83
3.50	0.47	0.51	5.00	0.00	0.83	0.83
4.00	0.47	0.51	5.00	0.00	0.83	0.83
4.50	0.47	0.51	5.00	0.00	0.83	0.83
5.00	0.47	0.51	5.00	0.00	0.83	0.83
5.50	0.47	0.51	5.00	0.00	0.83	0.83
6.00	0.47	0.51	5.00	0.00	0.83	0.83
6.50	0.47	0.51	5.00	0.00	0.82	0.82
7.00	0.47	0.51	5.00	0.00	0.82	0.82
7.50	0.47	0.51	5.00	0.00	0.82	0.82
8.00	0.47	0.51	5.00	0.00	0.82	0.82
8.50	0.47	0.51	5.00	0.00	0.82	0.82
9.00	0.47	0.51	5.00	0.00	0.81	0.81
9.50	0.47	0.51	5.00	0.00	0.81	0.81
10.00	0.47	0.51	5.00	0.00	0.81	0.81
10.50	0.47	0.50	5.00	0.00	0.81	0.81
11.00	0.47	0.50	5.00	0.00	0.80	0.80
11.50	0.47	0.50	5.00	0.00	0.80	0.80
12.00	0.47	0.50	5.00	0.00	0.80	0.80
12.50	0.47	0.50	5.00	0.00	0.79	0.79
13.00	0.47	0.50	5.00	0.00	0.79	0.79
13.50	0.47	0.50	5.00	0.00	0.79	0.79
14.00	0.47	0.50	5.00	0.00	0.78	0.78
14.50	0.47	0.50	5.00	0.00	0.78	0.78
15.00	0.47	0.50	5.00	0.00	0.78	0.78
15.50	0.47	0.50	5.00	0.00	0.77	0.77
16.00	0.47	0.50	5.00	0.00	0.77	0.77
16.50	0.47	0.50	5.00	0.00	0.76	0.76
17.00	0.47	0.50	5.00	0.00	0.76	0.76
17.50	0.47	0.50	5.00	0.00	0.75	0.75
18.00	0.47	0.50	5.00	0.00	0.74	0.74
18.50	0.47	0.49	5.00	0.00	0.73	0.73
19.00	0.47	0.49	5.00	0.00	0.73	0.73
19.50	0.47	0.49	5.00	0.00	0.72	0.72
20.00	0.47	0.49	5.00	0.00	0.70	0.70
20.50	0.47	0.49	5.00	0.00	0.69	0.69
21.00	0.47	0.49	5.00	0.00	0.69	0.69
21.50	0.47	0.49	5.00	0.00	0.68	0.68
22.00	0.47	0.49	5.00	0.00	0.68	0.68
22.50	0.47	0.49	5.00	0.00	0.67	0.67
23.00	0.47	0.49	5.00	0.00	0.67	0.67
23.50	0.47	0.49	5.00	0.00	0.66	0.66
24.00	0.47	0.49	5.00	0.00	0.65	0.65
24.50	0.47	0.49	5.00	0.00	0.65	0.65
25.00	0.47	0.49	5.00	0.00	0.64	0.64
25.50	0.47	0.49	5.00	0.00	0.63	0.63
26.00	0.47	0.49	5.00	0.00	0.63	0.63
26.50	0.47	0.49	5.00	0.00	0.62	0.62
27.00	0.47	0.48	5.00	0.00	0.61	0.61
27.50	0.47	0.48	5.00	0.00	0.60	0.60
28.00	0.47	0.48	5.00	0.00	0.60	0.60

28.50	0.47	0.48	5.00	0.00	0.59	0.59
29.00	0.47	0.48	5.00	0.00	0.58	0.58
29.50	0.46	0.48	5.00	0.00	0.57	0.57
30.00	0.46	0.48	5.00	0.00	0.56	0.56
30.50	0.46	0.48	5.00	0.00	0.56	0.56
31.00	0.46	0.48	5.00	0.00	0.55	0.55
31.50	0.46	0.47	5.00	0.00	0.54	0.54
32.00	0.46	0.47	5.00	0.00	0.53	0.53
32.50	0.46	0.47	5.00	0.00	0.52	0.52
33.00	0.45	0.47	5.00	0.00	0.51	0.51
33.50	0.45	0.47	5.00	0.00	0.50	0.50
34.00	0.45	0.46	5.00	0.00	0.49	0.49
34.50	0.45	0.46	5.00	0.00	0.48	0.48
35.00	0.45	0.46	5.00	0.00	0.47	0.47
35.50	0.45	0.46	5.00	0.00	0.46	0.46
36.00	0.45	0.46	5.00	0.00	0.45	0.45
36.50	0.45	0.45	5.00	0.00	0.44	0.44
37.00	0.44	0.45	5.00	0.00	0.43	0.43
37.50	0.44	0.45	5.00	0.00	0.41	0.41
38.00	0.44	0.45	5.00	0.00	0.40	0.40
38.50	0.44	0.45	5.00	0.00	0.39	0.39
39.00	0.44	0.44	5.00	0.00	0.37	0.37
39.50	0.44	0.44	5.00	0.00	0.36	0.36
40.00	0.44	0.44	5.00	0.00	0.35	0.35
40.50	0.44	0.44	5.00	0.00	0.33	0.33
41.00	0.44	0.43	5.00	0.00	0.32	0.32
41.50	0.43	0.43	5.00	0.00	0.31	0.31
42.00	0.43	0.43	5.00	0.00	0.30	0.30
42.50	0.43	0.43	5.00	0.00	0.29	0.29
43.00	0.43	0.43	5.00	0.00	0.28	0.28
43.50	0.43	0.42	5.00	0.00	0.27	0.27
44.00	0.33	0.42	5.00	0.00	0.25	0.25
44.50	0.28	0.42	5.00	0.00	0.24	0.24
45.00	0.26	0.42	5.00	0.00	0.22	0.22
45.50	0.26	0.42	5.00	0.00	0.19	0.19
46.00	0.25	0.41	5.00	0.00	0.17	0.17
46.50	0.25	0.41	5.00	0.00	0.15	0.15
47.00	0.25	0.41	5.00	0.00	0.13	0.13
47.50	0.25	0.41	5.00	0.00	0.11	0.11
48.00	0.25	0.41	5.00	0.00	0.09	0.09
48.50	0.25	0.40	5.00	0.00	0.07	0.07
49.00	0.25	0.40	5.00	0.00	0.04	0.04
49.50	0.25	0.40	5.00	0.00	0.02	0.02
50.00	0.25	0.40	5.00	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone

(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm Cyclic resistance ratio from soils

CSRsf Cyclic stress ratio induced by a given earthquake (with user request factor of safety)

F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRsf

S_sat Settlement from saturated sands

S_dry Settlement from Unsaturated Sands

S_all Total Settlement from Saturated and Unsaturated Sands

NoLiq No-Liquefy Soils