February 24, 2017

Mr. Terry Pries
P.O. Box 6540
San Jose, CA 95150

Re: Geotechnical Investigation
New Supermarket Development, West San Carlos & Race Street, San Jose, California
SFB Project No.: 502-6

Mr. Pries:

As requested, Stevens, Ferrone & Bailey Engineering Company, Inc. has performed a geotechnical investigation for the proposed new supermarket development at the southeastern corner of West San Carlos and Race Street in San Jose, California. The accompanying report presents the results of our field investigation, laboratory tests, and engineering analysis. The geotechnical conditions are discussed, and recommendations for the geotechnical engineering aspects of the project are presented. Conclusions and recommendations contained herein are based upon applicable standards of our profession at the time this report has been prepared. Should you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,

Stevens, Ferrone & Bailey
Engineering Company, Inc.

Ken Ferrone
President

TC/KCF/JHB:tc\encl.
Copies: Addressee (1 by email)

Stevens Ferrone & Bailey Engineering Company, Inc

Geotechnical Engineering
Engineering Geology
Storm Water Management
Construction Observation & Testing Services

February 24, 2017

GEOTECHNICAL INVESTIGATION
NEW SUPERMARKET DEVEELOPEMNT
WEST SAN CARLOS & RACE STREET
SAN JOSE, CALIFORNIA
SFB PROJECT NO. 502-6

Prepared For:

Mr. Terry Pries
P.O. Box 6540
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Prepared By:

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1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed new supermarket development to be located on southeastern corner of West San Carlos Street and Race Street in San Jose, California as shown on the Site Plan, Figure 1. The site includes the parcels of APN 264-14-017, -019, -020, -082 & -083. The purpose of our investigation was to evaluate the geotechnical conditions at the site and provide recommendations regarding the geotechnical engineering aspects of the project.

Based on the information indicated on the Site Plan, as well as information provided by Mr. Terry Pries, it is our understanding that the project will consist of developing approximately 2 acres for a supermarket development. Associated underground utilities and paved parking and access ways will be provided. The existing buildings and associated facilities will be demolished prior to new construction. Minimal grading is anticipated.

The conclusions and recommendations provided in this report are based upon the information presented above; Stevens, Ferrone & Bailey Engineering Company, Inc. (SFB) should be consulted if any changes to the project occur to assess if the changes affect the validity of this report.

2.0 SCOPE OF WORK

This investigation included the following scope of work:

- Reviewing published and unpublished geotechnical and geological literature relevant to the site;
- Performing reconnaissance of the site and surrounding area;
- Performing a subsurface exploration program, including drilling four exploratory borings to a maximum depth of about 41-1/2 feet and conducting five Cone Penetration Tests (CPT's) to a maximum depth of about 50 feet;
- Performing laboratory testing of samples retrieved from the borings;
- Performing engineering analysis of the field and laboratory data; and
- Preparing this report.

The data obtained and the analyses performed were for the purpose of providing geotechnical design and construction criteria for site earthwork, underground utilities, drainage, building foundations, retaining walls/soundwalls, and pavements. Toxicity potential assessment of onsite materials or groundwater (including mold) and flooding evaluations were beyond our scope of work.

3.0 SITE INVESTIGATION

Reconnaissance of the site and surrounding area was performed on January 17 and February 10, 2017. Subsurface explorations were performed using a truck-mounted drill rig equipped with 4-inch diameter solid stem continuous flight augers, and a 25-ton push capacity truck-mounted CPT rig. Four exploratory borings were drilled on January 17, 2017 to a maximum depth of about 41-1/2 feet. Five Cone Penetration Tests (CPT's) were advanced on February 10, 2017 to a maximum depth of about 50 feet. The approximate locations of our borings and CPT's are shown on the Site Plan, Figure 1. Logs of our borings and CPT's and details regarding SFB's field investigation are included in Appendix A. The results of SFB's laboratory tests are discussed in Appendix B. It should be noted that changes in the surface and subsurface conditions can occur over time as a result of either natural processes or human activity and may affect the validity of the conclusions and recommendations in this report.

3.1 Surface

At the time of our investigation and as shown on Figure 1, the site was bounded by West San Carlos Street on the north, Race Street on the west, Earle Lane on the south, and existing commercial/industrial developments on the east. The site was rectangular in shape having a plan area of about 2 acres with maximum dimensions of about 350 feet by 250 feet.

The site was occupied by an existing commercial development with associated buildings and asphalt concrete paved parking lots. A large billboard structure was also located near the northwestern corner of the site. Some trees were located along the eastern site boundary.

3.2 Subsurface

The near-surface soil materials encountered by our borings and CPT's at the site (below the pavement sections) generally consisted of undocumented fill materials that extended to an average depth of about 3 feet. These fills were heterogeneous, and potentially weak and compressible if they were not placed and compacted in accordance with acceptable engineering standards. Below the surficial fill layer, interbedded stiff to very stiff silty clays and medium dense to very dense sands and gravels were encountered to the maximum depth explored of about 50 feet.

According to the results of laboratory testing, the near-surface more clayey soils have a high plasticity and high expansion potential. Detailed descriptions of the materials encountered in our exploratory borings and CPT's are presented on the boring and CPT logs in Appendix A. Our attached boring and CPT logs and related information depict location specific subsurface conditions encountered during our field investigation. The approximate locations of our borings and CPT's were determined using pacing or landmark references and should be considered accurate only to the degree implied by the method used.

3.3 Previous Underground Facilities

According to the site Phase I Environmental Site Assessment (ESA) report (prepared by AEI Consultants and dated June 15, 2016) and Phase II subsurface investigation report (prepared by PIERS Environmental Services, Inc. and dated August 3, 2015), a gasoline service station existed in the northwestern corner of the site and was removed at an unknown date. The approximate extent of the previous service station is shown on Figure 1 for reference based on te information in the PIERS report. According to these reports, no information pertinent to the status and operation of an underground storage tank (UST) system and/or the removal of UST's was on file with the fire department or environmental health department. According to PIERS, several anomalies were detected during their geophysical survey of the former gasoline service station area.

We recommend any available UST removal, UST closed in place, soil over-excavation, and backfill compaction records be forwarded to SFB for further review to evaluate their potential impacts on the proposed development construction. We also recommend pot-holing be performed at the previous service station area to locate any remaining underground facilities and to investigate the extent of the existing fills and backfills.

3.4 Groundwater

Groundwater was measured in our borings at depths of about 39 to 41 feet at the end of drilling. Pore Pressure Dissipation Tests (PPDT) were performed in CPT-1 and CPT-5 within the encountered sand and gravel layers at depths of about 40 to 50 feet and the results generally indicated piezometric groundwater level was at depths of about 26-1/2 to 30-1/2 feet. The PPDT results are included in Appendix A for reference. SFB's borings and CPT's were backfilled with lean cement grout in accordance with Santa Clara Valley Water District requirements prior to leaving the site. Historically, groundwater in the vicinity of the site has been reported at depths of about 25 to 30 feet[1]. It should be noted that our borings and CPT's might not have been left open for a sufficient period of time to establish equilibrium ground water conditions. In addition, fluctuations in the ground water level could occur due to change in seasons, variations in rainfall, and other factors.

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[1]State of California, 2002, *Seismic Hazard Zone Report for the San Jose West, 7.5-Minute Quadrangle, Santa Clara County, California*, CGS Seismic Hazard Zone Report 058.

3.5 Hydrologic Soil Group

The surface soils of the site have been mapped as Urban Land - Newpark complex (0 to 2 percent slopes, drained) by USDA Web Soil Survey (WSS)[2]. The soils were assigned to Hydrologic Soil Groups C by USDA Natural Resources Conservation Service (NRCS); the soils have been categorized as having moderately high transmission rates (approximately 0.2 to 0.6 inch per hour).

The Group C soil is defined as having a slow infiltration rate when thoroughly wet and may consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture.

3.6 Geology and Seismicity

According to Wentworth, et al (1999)[3], the site (below pavement sections and fills) is underlain by Holocene older alluvial fan deposits that have been previously described as brown, gravelly sand and sandy and clayey gravel, grading upward to sandy and silty clay.

The project site is located in the San Francisco Bay Area that is considered one of the most seismically active regions in the United States. Significant earthquakes have occurred in the San Francisco Bay Area and are believed to be associated with crustal movements along a system of sub-parallel fault zones that generally trend in a northwesterly direction. The site is not located within an Alquist-Priolo Earthquake Fault Zone as designated by the State of California[4]. In addition, according to Santa Clara County Hazard Zone Map No. 20[5], the site is not located in a fault rupture hazard zone as designated by the County. The site is also not located within a City of San Jose designated fault hazard zone (1983).

Earthquake intensities will vary throughout the San Francisco Bay Area, depending upon numerous factors including the magnitude of earthquake, the distance of the site from the causative fault, and the type of materials underlying the site. The U.S. Geological Survey (2016)[6] has stated that there is a 72 percent chance of at least one magnitude 6.7 or greater earthquake striking the San Francisco Bay region between 2014 and 2043. Therefore, the site

[2] http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

[3] Wentworth, Blake, McLaughlin, and Graymer, 1999, *Preliminary Geologic Description of the San Jose 30 x 60 Minute Quadrangle, California*, USGS Miscellaneous Open-File Report 98-795.

[4] Hart and Bryant, *Fault-Rupture Hazard Zones in California*, CDMG Special Publication 42, Interim Revision 2007.

[5] Version: 10/26/12.

[6] Aagaard, Blair, Boatwright, Garcia, Harris, Michael, Schwartz, and DiLeo, *Earthquake Outlook for the San Francisco Bay Region 2014–2043*, USGS Fact Sheet 2016–3020, Revised August 2016 (ver. 1.1).

will probably be subjected to at least one moderate to severe earthquake that will cause strong ground shaking.

According to the Probabilistic Seismic Hazard Analysis (NSHMP PSHA) interactive deaggregation model developed by U.S. Geological Survey (2008)[7], the site has a 10% probability of exceeding a peak ground acceleration of about 0.5g in 50 years (design basis ground motion based on stiff soil site condition; mean return time of 475 years). The actual ground surface acceleration might vary depending upon the local seismic characteristics of the underlying bedrock and the overlying unconsolidated soils.

3.7 Liquefaction

Soil liquefaction is a phenomenon primarily associated with saturated, cohesionless, soil layers located close to the ground surface. These soils lose strength during cyclic loading, such as imposed by earthquakes. During the loss of strength, the soil acquires mobility sufficient to permit both horizontal and vertical movements. Soils that are most susceptible to liquefaction are clean, loose, uniformly graded, saturated, fine-grained sands that lie close to the ground surface.

According to the Association of Bay Area Governments (ABAG) and the U.S. Geological Survey, the site is located in an area that has been characterized as having moderate liquefaction susceptibility[8,9]. According to the Seismic Hazard Zones Map of the San Jose West Quadrangle, the site is located in a seismic hazard zone due to liquefaction as designated by the State of California[10]. In addition, according to Santa Clara County Hazard Zone Map No. 20, the site is also located in a liquefaction hazard zone as designated by the County. Cooper-Clark & Associates (1974)[11] characterized the site as having a moderately high liquefaction potential. Geomatrix (1992)[12] characterized the site as having a low susceptibility to liquefaction. The site is located in an area having an absence of liquefaction-related features (such as increased baseflow to streams, disturbed wells, lateral spreading, sand boils, and ground settlement)

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[7]http://geohazards.usgs.gov/deaggint/2008/

[8]Witter, Knudsen, Sowers, Wentworth, Koehler, and Randolph, 2006, *Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California*", USGS Open File Report 2006-1037.

[9]Knudsen, Sowers, Witter, Wentworth, and Helly, 2000, "*Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California*", USGS Open File Report 00-444.

[10]State of California, *Seismic Hazard Zones, San Jose West Quadrangle*, Official Map, Released: February 7, 2002.

[11]Cooper-Clark & Associates, 1974, *Geotechnical Investigation, City of San Jose's Sphere of Influence, For the City of San Jose.*

[12]Geomatrix, 1992, *Evaluation of Liquefaction Potential in San Jose, California*.

observed following historical earthquakes according to Geomatrix and CGS Seismic Hazard Zone Report 058[13].

SFB performed both SPT-based and CPT-based liquefaction analyses based on procedures described by the Southern California Earthquake Center (SCEC, Martin and Lew, 1999), research papers by Seed (2001)[14], EERI Monograph 12 (2008)[15], and the CPT applications guide by Robertson (2001)[16]. Peak ground acceleration from a Maximum Considered Earthquake (MCE) was used in our analyses. The MCE peak ground motion has a 2% probability of being exceeded in a 50-year period (mean return time of 2,475 years), which results in an onsite peak ground acceleration of 0.5g per ASCE 7 with a modal earthquake magnitude of 8.0 per the USGS 2008 deaggregation model. A historically high groundwater level of 25 feet deep was used in our analyses to assess its impacts on liquefaction and liquefaction induced ground surface damage potential.

Our detailed calculations are shown in spread sheet form in Appendix C. The parameters used in our analyses are presented on the spread sheets and are defined in the SCEC, Seed (2001), EERI (2008), and Robertson (2001) documents. Please refer to those documents for further details regarding the definition of the parameters.

The results of our analyses indicate that some of the very thin to thin silt and sand lenses of about 1 to 3 feet in combined total thickness encountered by the borings and CPT's within 50 feet of the ground surface at the site have a moderate to high potential for liquefying where they are saturated or become saturated and are subjected to an MCE earthquake. The potentially liquefiable soil layers are shown on Figure 2, Cross-Sections A-A'.

The earthquake induced liquefaction in these soil lenses could result in residual volumetric strains varying from about 1% to 2%. The estimated liquefaction-induced ground settlement at each boring and CPT location is summarized in the table below.

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[13]State of California, 2002, *Seismic Hazard Zone Report for the San Jose West, 7.5-Minute Quadrangle, Santa Clara County, California*, CGS Seismic Hazard Zone Report 058.
[14]Seed et al., 2001, *Recent Advances in Soil Liquefaction Engineering and Seismic Site Response Evaluation*, Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics and Symposium in Honor of Professor W.D. Liam Finn, San Diego, California.
[15]Idriss & Boulanger, 2008, *Soil Liquefaction during Earthquakes*, Earthquake Engineering Research Institute, MNO-12.
[16]Robertson et al., 2001, *Cone Penetration Testing, Geotechnical Applications Guide, Third Edition.*

Location	Depth Explored (ft)	Combined Total Thickness of Liquefiable Soil (ft)	Estimated Liquefaction Induced Ground Settlement (inches)
SFB-1	40.4	0	0
SFB-2	6.5	-	-
SFB-3	41.5	0	0
SFB-4	6.5	-	-
CPT-1	50	1.6	0.4
CPT-2	50	1.3	0.2
CPT-3	50	2.0	0.4
CPT-4	50	1.3	0.2
CPT-5	50	2.3	0.5

Under a conservative historically high groundwater table scenario (at 25 feet deep), we estimate that liquefaction of these soils at the site, if subjected to an MCE earthquake, may cause total aerial ground surface settlements up to about 1 inch, with differential settlements up to about 1/2 inch across typical building column spacings. The actual ground surface damage will vary depending on the thickness of the overlying non-liquefiable soils and the underlying liquefiable soils[17].

To reduce the liquefaction effects on foundations, we recommend the building foundations be designed to resist 1/2 inch of differential settlement of the supporting soils. This magnitude of settlement could occur between typical building columns or directly below the center of a building mat foundation (at a distance of about 30 feet), creating a “cupping” shape of the underlying supporting subgrade. In addition, underground pipelines (gas lines, sanitary sewers, water services, etc.) should be properly designed to compensate for the settlement caused by the liquefaction of the underlying supporting soils. It should be noted that after a major liquefaction event, phenomena such as sand boils, ground cracking, and differential movement of overlying improvements such as roadways and utilities may be observed and may require repair.

[17]Ishihara, K., 1985, *Stability of Natural Deposits During Earthquakes*, Proceedings of the Eleventh International Conference on Soil Mechanics and Foundation Engineering, San Francisco, CA Volume 1, p. 321-376, August.

4.0 CONCLUSIONS AND RECOMMENDATIONS

It is our opinion that the site is suitable for the proposed project from a geotechnical engineering standpoint. The conclusions and recommendations presented in this report should be incorporated in the design and construction of the project to reduce soil or foundation related issues. The following are the primary geotechnical considerations for development of the site.

EXISTING FILL MATERIALS AND PREVOUS UNDERGROUND FACILITIES: As described previously, undocumented fill materials exist at the site and extend to an average depth of about 3 feet. These fills are heterogeneous, weak, and compressible if they were not placed and compacted in accordance with acceptable engineering standards. In addition, deeper undocumented fills and UST removal backfills (if any) may exist within the previous service station area at the northwestern corner of the site. We recommend pot-holing be performed at the previous service station area to locate any remaining underground facilities and to investigate the extent of the existing fills and backfills.

In order to reduce the potential for damaging differential settlement of overlying improvements (such as new fills, building foundations, driveways, exterior flatwork, and pavements), we recommend that the existing fill materials be completely removed and re-compacted. The over-excavation should extend to depths where competent soil is encountered. We estimate the process can consist of removing the upper 2 feet of fills, scarifying and re-compacting the exposed bottom 12 inches, and placing compacted engineered fill over the properly prepared subgrade. Deeper removal may be required within the previous service station area. The over-excavation and re-compaction should also extend at least 5 feet beyond building footprints and at least 3 feet beyond exterior flatwork (including driveways) and pavement wherever possible. Where the over-excavation limits abut adjacent property, SFB should be consulted to determine the actual vertical and lateral extent of over-excavation so that adjacent property is not adversely impacted. In order to reduce the potential for differential settlement, over-excavations should be performed so that no more than 5 feet of differential fill thickness exists below building foundations.

The removed fill and soil materials can be used as new fill provided it is placed and compacted in accordance with the recommendations presented in this report. The extent of the removal and re-compaction will vary across the site and should be determined in the field by SFB at the time of the earthwork operations.

LIQUEFACTION: As described in Section 3.7 of this report, very thin to thin silt and sand lenses of about 1 to 3 feet in combined total thickness encountered by the borings and CPT's within 50 feet of the ground surface at the site have a moderate to high potential for liquefying where they are saturated or become saturated and are subjected to an MCE earthquake. The earthquake induced liquefaction in these soil lenses could result in residual volumetric strains varying from about 1% to 2%. We estimate that liquefaction of these soils at the site, if subjected to an MCE earthquake, may cause total aerial ground surface settlements up to about 1 inch, with differential settlements up to about 1/2 inch across typical building column spacings. The actual ground surface damage will vary depending on the thickness of the overlying non-liquefiable soils and the underlying liquefiable soils[18].

To reduce the liquefaction effects on the proposed building, we recommend the building foundations and associated structural elements be designed to resist 1/2 inch of differential settlement of the supporting soils. This magnitude of settlement could occur between typical building column spacing (at a distance of about 30 feet). In addition, underground pipelines (gas lines, sanitary sewers, water services, etc.) should be properly designed to compensate for the settlement caused by the liquefaction of the underlying supporting soils. It should be noted that after a major liquefaction event, phenomena such as sand boils, ground cracking, and differential movement of overlying improvements such as roadways and utilities may be observed and may require repair.

EXPANSION POTENTIAL: The more clayey, highly expansive, surface soil materials will be subjected to volume changes during seasonal fluctuations in moisture content. To reduce the potential for post-construction distress to the proposed structures resulting from swelling and shrinkage of these materials, we recommend that the proposed building be supported on a foundation system that is designed to reduce the impact of the expansive soils. It should be noted that special design considerations will be required for exterior slabs.

CORROSION POTENTIAL: Two onsite soil samples were tested for pH (ASTM D4972), chlorides (ASTM D4327), sulfates (ASTM D4327), sulfides (ASTM D4658M), resistivity at 100% saturation (ASTM G57), and Redox potential (ASTM D1498) for use in evaluating the potential for corrosion on concrete and buried metal such as utilities and reinforcing steel. The results of these tests are included in Appendix B. The testing results only reflect the corrosion characteristics of the soil sample taken at the noted boring location, sampling depth, and time. We recommend these test results be forwarded to your underground contractors, pipeline designers, and foundation designers and contractors so that they can design and install corrosion protection measures. Please be aware that we are not corrosion protection experts; we recommend corrosion protection measures be designed and constructed so that all concrete and

[18]Ishihara, K., 1985, *Stability of Natural Deposits During Earthquakes*, Proceedings of the Eleventh International Conference on Soil Mechanics and Foundation Engineering, San Francisco, CA Volume 1, p. 321-376, August.

metal is protected against corrosion. We also recommend additional testing be performed if the test results in Appendix B are deemed insufficient by the designers of the corrosion protection.

ADDITIONAL RECOMMENDATIONS: Detailed drainage, earthwork, foundation, retaining wall/soundwall, and pavement recommendations for use in design and construction of the project are presented below. We recommend SFB review the design and specifications to verify that the recommendations presented in this report have been properly interpreted and implemented in the design, plans, and specifications. We also recommend SFB be retained to provide consulting services and to perform construction observation and testing services during the construction phase of the project to observe and test the implementation of our recommendations, and to provide supplemental or revised recommendations in the event conditions different than those described in this report are encountered. We are not responsible for misinterpretation of our recommendations.

4.1 Earthwork

4.1.1 Clearing and Site Preparation

The site should be cleared of all obstructions including any existing structures and their entire foundation systems, asphalt concrete pavements, existing utilities and pipelines and their associated backfill, any remaining previous underground facilities, designated trees and their associated entire root systems, and debris. Holes resulting from the removal of underground obstructions extending below the proposed finish grade should be cleared and backfilled with fill materials as specified in **Section 4.1.4, *Fill Material***, and compacted to the requirements in **Section 4.1.5, *Compaction***. Tree roots may extend to depths of about 3 to 4 feet. Wells and septic systems (if exist) should be abandoned in accordance with Santa Clara Valley Water District standards.

From a geotechnical standpoint, any existing trench backfill materials, clay or concrete pipes, pavements, and concrete that are removed can be used as new fill onsite provided debris is removed and it is broken up to meet the size requirement for fill material in **Section 4.1.4, *Fill Material***. We recommend fill materials composed of broken up concrete or asphalt concrete not be located within 3 feet of the ground surface in landscaping areas. Consideration should be given to placing these materials below pavements, directly under building footprints, or in deeper excavations. We recommend backfilling operations for any excavations be performed under the observation and testing of SFB.

4.1.2 Existing Fill Removal and Re-Compaction

As described previously, undocumented fills exist at the site and extend to an average depth of about 3 feet. The fills are heterogeneous, and potentially weak and compressible if they were not placed and compacted in accordance with acceptable engineering standards. In addition, deeper fills and backfills may exist in the area of the previous service station. Where these weak fills will not be removed during grading and where proposed improvements including new fills, building foundations, driveways, exterior flatwork, and pavements will be constructed, we recommend these fills be completely removed and re-compacted.

We recommend the process consist of over-excavating 2 feet, scarifying and re-compacting the bottom 12 inches in-place, and replacing the excavation with compacted fill materials. Deeper removal may be required within the previous service station area. Where the over-excavation limits abut adjacent buildings or property, SFB should be consulted to determine the actual vertical and lateral extent of over-excavation so that adjacent buildings or property is not adversely impacted. Over-excavations should be performed so that no more than 5 feet of differential fill thickness exists below the proposed building foundations. The removed fill and soil materials can be used as new fill provided it is placed and compacted in accordance with the recommendations presented in this report. The extent of the removal and re-compaction may vary across the site and should be determined in the field by SFB at the time of the earthwork operations.

Removed fill and soil materials may be used as new fill onsite provided it satisfies the recommendations provided in **Section 4.1.4, *Fill Material***. Compaction should be performed in accordance with the recommendations in **Section 4.1.5, *Compaction***.

4.1.3 Subgrade Preparation

After the completion of clearing, site preparation, and weak fill re-compaction, soil exposed in areas to receive improvements (such as structural fill, building foundations, driveways, exterior flatwork, and pavements) should be scarified to a depth of about 12 inches, moisture conditioned to approximately 3 to 5 percent over optimum water content, and compacted to the requirements for structural fill. If building pads or pavement subgrade are allowed to remain exposed to sun, wind, or rain for an extended period of time, or are disturbed by borrowing animals or vehicles, the exposed subgrade or pavement subgrade may need to be reconditioned (moisture conditioned and/or scarified and recompacted) prior to foundation or pavement construction. SFB should be consulted on the need for subgrade reconditioning when the subgrade is left exposed for extended periods of time.

4.1.4 Fill Material

From a geotechnical and mechanical standpoint, onsite soils having an organic content of less than 3 percent by volume can be used as fill. Fill should not contain rocks or lumps larger than 6 inches in greatest dimension with not more than 15 percent larger than 2.5 inches. Imported, non-expansive fill should have a plasticity index of 12 or less and have a significant amount of cohesive fines. Imported fill not used as non-expansive fill should have a plasticity index of 25 or less.

In addition to the mechanical properties specifications, all imported fill material should have a resistivity (100% saturated) no less than the resistivity for the onsite soils, a pH of between approximately 6.0 and 8.5, a total water soluble chloride concentration less than 300 ppm, and a total water soluble sulfate concentration less than 500 ppm. We recommend import samples be submitted for corrosion and geotechnical testing at least two weeks prior to being brought onsite. We recommend all corrosion test results be forwarded to your underground contractors, pipeline designers, and foundation designers and contractors so that they can design and install corrosion protection measures.

4.1.5 Compaction

Within the upper 5 feet of the finished ground surface, we recommend structural fill be compacted between 88 and 92 percent relative compaction, and structural fill below a depth of 5 feet be compacted to at least 95 percent relative compaction, as determined by ASTM D1557 (latest edition). We recommend the new fill be moisture conditioned approximately 3 to 5 percent over optimum water content. The upper 6 inches of subgrade soils beneath pavements should be compacted to at least 95 percent relative compaction. Fill material should be spread and compacted in lifts not exceeding approximately 8 to 12 inches in uncompacted thickness.

4.1.6 Utility Trench Backfill

Pipeline trenches should be backfilled with fill placed in lifts of approximately 8 inches in uncompacted thickness. Thicker lifts can be used provided the method of compaction is approved by SFB and the required minimum degree of compaction is achieved. Backfill should be placed by mechanical means only. Jetting is not permitted.

Onsite trench backfill should be compacted to at least 90 percent relative compaction. Imported sand trench backfill should be compacted to at least 95 percent relative compaction and sufficient water is added during backfilling operations to prevent the soil from "bulking" during compaction. The upper 3 feet of trench backfill in foundation, slab, and pavement areas should be entirely compacted to at least 95 percent relative compaction. To reduce piping and settlement of overlying improvements, we recommend rock bedding and rock backfill (if used) be completely surrounded by a filter fabric such as Mirafi 140N (or equivalent); alternatively, filter fabric would not be necessary if Caltrans Class 2 permeable material is used in lieu of rock bedding and rock backfill.

Sand or gravel backfilled trench laterals that extend toward driveways, exterior slabs-on-grade, or under the building foundations, and are located below irrigated landscaped areas such as lawns or planting strips, should be plugged with onsite clays, low strength concrete, or sand/cement slurry. The plug for the trench lateral should be located below the edge of pavement or slabs, and under the perimeter of the foundation. The plug should be at least 24 inches thick, extend the entire width of the trench, and extend from the bottom of the trench to the top of the sand or gravel backfill.

4.1.7 Exterior Flatwork

We recommend that exterior slabs (including patios, sidewalks, and driveways) be placed directly on the properly compacted fills. We do not recommend using aggregate base, gravel, or crushed rock below these improvements. If imported granular materials are placed below these elements, subsurface water can seep through the granular materials and cause the underlying soils to saturate or pipe. Prior to placing concrete, subgrade soils should be moisture conditioned to increase their moisture content to approximately 3 to 5 percent above laboratory optimum moisture (ASTM D-1557).

The more expansive clayey soils at the site could be subjected to volume changes during fluctuations in moisture content. As a result of these volume changes, some vertical movement of exterior slabs (such as driveways, sidewalks, patios, exterior flatwork, etc.) should be anticipated. This movement could result in damage to the exterior slabs and might require periodic maintenance or replacement. Adequate clearance should be provided between the exterior slabs and building elements that overhang these slabs, such as window sills or doors that open outward.

We recommend reinforcing exterior slabs with steel bars in lieu of wire mesh. To reduce potential crack formation, the installation of #4 bars spaced at approximately 18 inches on center in both directions should be considered. Score joints and expansion joints should be used to control cracking and allow for expansion and contraction of the concrete slabs. We recommend appropriate flexible, relatively impermeable fillers be used at all cold/expansion joints. The installation of dowels at all expansion and cold joints will reduce differential slab movements; if used, the dowels should be at least 30 inches long and should be spaced at a maximum lateral spacing of 18 inches. Although exterior slabs that are adequately reinforced will still crack, trip hazards requiring replacement of the slabs will be reduced if the slabs are properly reinforced.

4.1.8 Construction During Wet Weather Conditions

If construction proceeds during or shortly after wet weather conditions, the moisture content of the onsite soils could be significantly above optimum. Consequently, subgrade preparation, placement and/or reworking of onsite soil or fills as structural fill might not be possible. Alternative wet weather construction recommendations can be provided by our representative in the field at the time of construction, if appropriate. All the drainage measures recommended in this report should be implemented and maintained during and after construction, especially during wet weather conditions.

4.1.9 Surface Drainage, Irrigation, and Landscaping

Ponding of surface water must not be allowed on pavements, adjacent to foundations, at the top or bottom of slopes, and at the top or adjacent to retaining walls. Ponding of water should also not be allowed on the ground surface adjacent to or near exterior slabs, including driveways, walkways, and patios. Surface water should not be allowed to flow over the top of slopes, down slope faces, or over retaining walls.

We recommend positive surface gradients of at least 2 percent be provided adjacent to foundations to direct surface water away from the foundations and toward suitable discharge facilities. Roof downspouts and landscaping drainage inlets should be connected to solid pipes that discharge the collected water into appropriate water collection facilities. We recommend the surface drainage be designed in accordance with the latest edition of the California Building Code.

In order to reduce differential foundation movements, landscaping (where used) should be placed uniformly adjacent to the foundation and exterior slabs. We recommend trees be no closer to the structure or exterior slabs than half the mature height of the tree; in no case should tree roots be allowed to extend near or below the foundations or exterior slabs.

Drainage inlets should be provided within enclosed planter areas and the collected water should be discharged onto pavement, into drainage swales, or into storm water collection systems. In order to reduce the potential for heaving, consideration should be given to lining planting areas and collecting the accumulated surface water in subdrain pipes that discharge to appropriate collection facilities. The drainage should be designed and constructed so that the moisture content of the soils surrounding the foundations do not become elevated and no ponding of water occurs. The inlets should be kept free of debris and be lower in elevation than the adjacent ground surface.

We recommend regular maintenance of the drainage systems be performed, including maintenance prior to rainstorms. The inspection should include checking drainage patterns to make sure they are performing properly, making sure drainage systems and inlets are functional and not clogged, and checking that erosion control measures are adequate for anticipated storm events. Immediate repairs should be performed if any of these measures appears to be inadequate.

Irrigation should be performed in a uniform, systematic manner as equally as possible on all sides of the foundations and exterior slabs to maintain moist soil conditions. Over-watering must be avoided. To reduce moisture changes in the natural soils and fills in landscaped areas, we recommend that drought resistant plants and low flow watering systems be used. All irrigation systems should be regularly inspected for leakage.

4.1.10 Storm Water Runoff Structures

To satisfy local and state permit requirements, most new development projects must control pollutant sources and reduce, detain, retain, and treat specified amounts of storm water runoff. The types of improvements that are designed to accomplish these goals are known as Post-Construction Requirements (PCR's) and/or Low Impact Development (LID's). The intent of these types of improvements is to conserve and incorporate on-site natural features, together with constructed hydrologic controls, to more closely mimic pre-development hydrology and watershed processes.

If needed and to aid in the Civil Engineering design and analyses of appropriate treatment facilities, we recommend the onsite soils be categorized as Hydrologic Soil Group C[19]. Groundwater was measured in our borings at depths of about 39 to 41 feet at the end of drilling. Pore Pressure Dissipation Tests (PPDT) performed in CPT's generally indicated piezometric groundwater level was at depths of about 26-1/2 to 30-1/2 feet.

We recommend PCR/LID improvements that are designed to detain or retain water such as bio-swales, porous pavement structures, and water detention basins, be lined with a relatively impermeable membrane in order to reduce water seepage and the potential for damage to other infrastructure improvements (such as pavements, foundations, and walkways). We recommend a relatively impermeable membrane such as STEGO Wrap 15-mil or equivalent be installed below and along the sides of these facilities that direct the collected water into subdrain pipes. The membrane should be lapped and sealed in accordance with the manufacture's specifications, including taping joints where pipes penetrate the membrane.

The soil filter materials within basins and swales will consolidate over time causing long-term ground surface settlement. Additional filling within the basins and swales over time may be needed to maintain design surface elevations. The soil filter materials and associated compaction requirements should be specified by the Civil Engineer and shown in detail on the grading and improvement plans.

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[19]U.S. Department of Agriculture, Natural Resources Conservation Service, *National Engineering Handbook Part 630, Chapter 7, Hydrologic Soil Groups*, updated January 2009.

Sidewalls of earthen swales and basins steeper than 2:1 (horizontal to vertical) will experience downward and lateral movements that can cause significant ground surface movements. The magnitude and rate of movement depends upon the swale and basin backfill material type and compaction. To reduce the potential for damaging movements, we recommend 2:1 sidewall slopes be used or the slopes be appropriately restrained. SFB should be consulted to evaluate the need for sidewall restraint when swales or basins are planned.

Where swales and basins are located adjacent to improvements (such as foundations, pavements, curbs, driveways, and sidewalks), the improvements will be susceptible to settlement and lateral movements. To reduce the potential for vertical and lateral movement of the improvements, we recommend either the improvements be setback beyond a 1:1 (horizontal to vertical) plane projected upward from the bottom of the swale/basin or lateral restraint (such as deepened curbs or walls) be provided that is designed to resist the soil's lateral pressures. In order to resist the lateral pressures, the lateral restraint will need to extend below the bottom of the swale/basin and should be engineered. Where foundations are located near swales or basins, we recommend the foundations be extended below the projected 1:1 plane projected upward from the bottom of the swale or basin.

4.1.11 Future Maintenance

In order to reduce water-created issues, we recommend regular maintenance of the site be performed, including maintenance prior to rainstorms. Maintenance should include the recompaction of loosened soils, collapsing and infilling holes with compacted soils or low strength sand/cement grout, removal and control of digging animals, modifying storm water drainage patterns to allow for sheet flow into drainage inlets or ditches rather than concentrated flow or ponding, removal of debris within drainage ditches and inlets, and immediately repairing any erosion or soil flow. The inspection should include checking drainage patterns, making sure drainage systems are functional and not clogged, and erosion control measures are adequate for anticipated storm events. Immediate repair should be performed if any of these measures appears to be inadequate. Temporary and permanent erosion and sediment control measures should be installed over any exposed soils immediately after repairs are made.

Differential movement of exterior slabs can occur over time as a result of numerous factors. We recommend the owners perform inspections and maintenance of the slabs, including infilling significant cracks, providing fillers at slab offsets, and replacing slabs if severely damaged.

4.1.12 Additional Recommendations

We recommend the drainage, irrigation, landscaping, and maintenance recommendations provided in this report be forwarded to your designers and contractors.

4.2 Foundation Support

4.2.1 Conventional Spread Footings

The proposed new building can be supported on spreading footing foundations bearing on properly compacted engineered fills and/or onsite competent native soils. In order to reduce the impact of differential ground surface settlement due to liquefaction, we also recommend the building foundations and associated structural elements be designed to resist 1/2 inch of differential settlement of the supporting soils. This magnitude of settlement could occur between typical building column spacing (at a distance of about 30 feet). Recommendations for building pad preparation are described previously in **Sections 4.1.2, *Existing Fill Removal and Re-Compaction***, and **4.1.3, *Subgrade Preparation.*** Prior to the concrete pour, we recommend the subgrade materials be moisture conditioned to approximate 3 to 5 percent above laboratory optimum moisture. If the building pad is left exposed for an extended period of time prior to constructing foundations, we recommend SFB be contacted for recommendations to re-condition the pads in order provide adequate building support.

Footings should be at least 12 inches wide and should be founded at least 30 inches below lowest adjacent finished grade. A continuous footing should be provided around the perimeter of the proposed building. Continuous footings should be designed with steel reinforcing, both top and bottom, to provide structural continuity and permit spanning of local irregularities.

The footings should be designed for an allowable bearing pressure of 1,500 pounds per square foot due to dead loads, 2,300 pounds per square foot due to dead plus live loads, and 3,000 pounds per square foot for all loads, including wind or seismic. These allowable bearing pressures are net values; therefore, the weight of the footing can be neglected for design purposes.

Lateral load resistance can be developed by friction between the footing foundation bottom and the supporting subgrade. A friction coefficient of 0.3 is considered applicable. As an alternative, a passive resistance equal to an equivalent fluid weighing 300 pcf acting against the vertical face of the foundations can be used; however the upper 30 inches should be ignored in the passive resistance design. If foundations are poured neat against the subgrade, the friction and passive resistance can be used in combination.

At least 10 feet of soil cover must be provided between the face of the footings and the face of slopes, as measured horizontally. The portion of the footing located closer than 10 feet from the face of slopes should be ignored in both the vertical and lateral load design.

Where foundations are located adjacent to utility trenches or bio-swales, the foundation bearing surface should bear below an imaginary 1 horizontal to 1 vertical plane extending upward from the bottom edge of the adjacent utility trench or bio-swale. Alternatively, the foundation reinforcing could be increased to span the area defined above assuming no soil support is provided.

Wetting prior to construction of the foundations should close any visible cracks in the bottoms of the footing excavations. We recommend that we observe the footing excavations prior to placing reinforcing steel or concrete to check that footings are founded on appropriate material.

Settlement of spread footing foundations under the proposed building loads is anticipated to be within tolerable limits for the proposed structure.

4.2.2 Interior Slabs-on-Grade

We recommend that the supermarket interior slabs-on-grade (used in conjunction with footing foundations) be at least 6 inches thick and be supported on at least 12 inches of imported, non-expansive fill. We recommend vehicular interior slabs-on-grade be at least 6 inches thick and that the upper 6 inches of non-expansive fill consist of Caltrans Class 2 aggregate base that is compacted to at least 95 percent relative compaction. The actual thickness of the slabs should be based upon the actual use and loading of the slabs. All slabs should be reinforced with at least #4 bars on 18-inch centers, both ways; however, the actual reinforcing should be provided with the anticipated use and loading of the slab.

We are not waterproofing experts. The recommendations provided below are only meant to reduce the potential for water vapor from soil to permeate the interior concrete slabs-on-grade. We recommend a vapor retarder be placed between the bottom of the interior slabs-on-grade and the underlying aggregate base. We recommend the vapor retarder consist of a single layer of Stego Wrap Vapor Barrier 15 mil or equivalent provided the equivalent satisfies the following criteria: a permeance as tested before and after mandatory conditioning of less than 0.01 Perms and strength of Class A as determined by ASTM E 1745 (latest edition), and a thickness of at least 15 mils. Installation of the vapor retarder should conform to the latest edition of ASTM E 1643 and the manufacturers requirements, including the requirements that all joints be lapped at least 6 inches and sealed with Stego Tape or equal in accordance with the manufacturer’s specifications. Protrusions where pipes or conduit penetrate the membranes should be sealed with either one or a combination of Stego Tape, Stego Mastic, Stego Pipe Boots, or a product of equal quality as determined by the manufacturer’s instructions and ASTM E 1643. Care must be taken to protect the membrane from tears and punctures during construction. We do not recommend placing sand or gravel over the membrane.

We recommend that 4 inches of ½ to ¾ inch drain rock be placed below the vapor retarder where interior slabs-on-grade are used (the 4 inches of drain rock can be considered part of the non-expansive layer), except where the vehicular slabs are underlain by the 6 inches of baserock. Prior to placement of the vapor retarder, the subgrade surfaces should be proof-rolled to provide a smooth, unyielding surface for slab support. The edges of the vapor retarder membrane should be draped over the interior side of the footing excavations and at least 12 inches below the pad grade prior to pouring the concrete. We recommend that the interior slabs-on-grade be poured monolithically with the footings except for vehicular slabs. The edges of vehicular slabs should be structurally separated from surrounding foundations; a relatively impermeable and flexible filler should be used in the joint between the vehicular slabs and the footing foundation. If a garage door is used, both the driveway and vehicular slabs should be connected to the perimeter footing below the garage door opening with dowels to reduce the potential for differential movements.

Concrete slabs retain moisture and often take many months to dry; construction water added during the concrete pour further increases the curing time. If the slabs are not allowed to completely cure prior to constructing the super-structure, the concrete slabs will expel water vapor and the vapor will be trapped under impermeable flooring. The concrete mix design for the slabs should have a maximum water/cement ratio of 0.45; the actual water/cement ratio may need to be reduced if the concentration of soluble sulfates or chlorides in the supporting subgrade is detrimental to the concrete. We recommend the foundation designer determine if corrosion protection is needed for the foundation concrete and reinforcing steel. The results of corrosion testing on onsite soil samples are included in Appendix B; the foundation designer should determine if additional testing is needed. In addition, we recommend you consult with your concrete slab designers and concrete contractors regarding methods to reduce the potential for differential concrete curing.

4.2.3 Retaining Walls and Soundwalls

Where walls retain soil, they must be designed to resist both lateral earth pressures and any additional lateral loads caused by surcharging such as building and roadway loads. The recommendations provided below are for retaining walls that are located at least 1.5H feet away from a building, where H is the height of the retaining portion of the walls. Where concrete or masonry walls are used to retain soil, we recommend unrestrained walls (walls free to deflect and disconnected from other structures) be designed to resist an equivalent fluid pressure of 50 pounds per cubic foot. This assumes a level backfill. Restrained walls (walls restrained from deflection) should be designed to resist an equivalent fluid pressure of 50 pounds per cubic foot plus a uniform pressure of 10H pounds per square foot, where H is the height of the wall in feet. Walls with inclined backfill should be designed for an additional equivalent fluid pressure of 1 pound per cubic foot for every 1 degree of slope inclination. Walls subjected to surcharge loads should be designed for an additional uniform lateral pressure equal to one-third and one-half the anticipated surcharge load for unrestrained and restrained walls, respectively. These lateral pressures depend upon the moisture content of the retained soils to be constant over time; if the moisture content of the retained soils will fluctuate or increase compared to the moisture content at time of construction, then SFB should be consulted and provide written modifications to this design criteria.

For retaining walls that need to resist earthquake induced lateral loads from nearby foundations, walls that are to be designed to resist earthquake loads, and any retaining walls that are higher than 6 feet, we recommend the walls also be designed to resist a triangular pressure distribution equal to an equivalent fluid pressure of 50 pounds per cubic foot based on the ground acceleration from a design basis earthquake[20,21]. This seismic induced earth pressure is in addition to the pressures noted above. Due to the transient nature of the seismic loading, a factor of safety of at least 1.1 can be used in the design of the walls when they resist seismic lateral loads. Some movement of the walls may occur during moderate to strong earthquake shaking and may result in distress as is typical for all structures subjected to earthquake shaking.

The recommended lateral pressures assume walls are fully-back drained to prevent the build-up of hydrostatic pressures. This can be accomplished by using ½ to ¾ inch crushed, uniformly graded gravel entirely wrapped in filter fabric such as Mirafi 140N or equal (an overlap of at least 12 inches should be provided at all fabric joints). The gravel and fabric should be at least 8 inches wide and extend from the base of the wall to within 12 inches of the finished grade at the top (Caltrans Class 2 permeable material (Section 68) may be used in lieu of gravel and filter fabric). A 4-inch diameter, perforated pipe should be installed at the base and centered within the gravel. The perforated pipe should be connected to a solid collector pipe that transmits the water directly to a storm drain, drainage inlet, or onto pavement. If weep holes are used in the wall, the perforated pipe within the gravel is not necessary provided the weep holes are kept free of animals and debris, are located no higher than approximately 6 inches from the lowest adjacent grade, and are able to function properly. As an alternative to using gravel, drainage panels (such as AWD SITEDRAIN Sheet 94 for walls or equal) may be used behind the walls in conjunction with perforated pipe (connected to solid collector pipe), weep holes, or strip drains (such as SITEDRAIN Strip 6000 or equal). If used, the drainage panels can be spaced on-center at approximately 2 times the panel width.

If heavy compaction equipment is used behind the walls, the walls should be appropriately designed to withstand loads exerted by the heavy equipment and/or temporarily braced. Fill

[20]Seed and Whitman, 1970, *Design of Earth Retaining Structures for Dynamic Loads.*
[21]Atik and Sitar, 2007, *Development of Improved Procedures for Seismic Design of Buried and Partially Buried Structures*, Pacific Earthquake Engineering Research Center.

placed behind walls should conform to the recommendations provided in **Section 4.1.4, *Fill Material***, and **Section 4.1.5, *Compaction***.

Retaining walls and soundwalls can be supported on footings foundations; recommendations for footing foundations are provided in this report in Section 4.2.1. Alternatively, drilled, cast-in-place, straight shaft friction piers that develop their load carrying capacity in the materials underlying the site. The piers should have a minimum diameter of 12 inches and a center-to-center spacing of at least three times the shaft diameter. We recommend that piers be at least 6 feet long. The pier reinforcing should be based on structural requirements but in no case should less than two #4 bars for the entire length of the pier be used.

The actual design depth of the piers should be determined using an allowable skin friction of 500 pounds per square foot (psf) for dead plus live loads, with a one-third increase for all loads including wind or seismic. Seventy percent of the skin friction value can be used to resist uplift. Lateral load resistance can be developed in passive resistance for pier foundations. A passive resistance equal to an equivalent fluid weighing 350 pounds per cubic foot acting against twice the projected diameter of pier shafts can be used. The upper two feet of pier embedment should be neglected in the vertical and passive resistance design as measured from finished grade. The portion of the pier shaft located within 10 feet (as measured laterally) of the nearest slope face should also be ignored in the design.

We recommend the pier foundations be located outside of (or beyond) a 1:1 (horizontal to vertical) plane projected upward from the base of any wall or utility trench, or the portion of a pier located within this zone should be ignored in the design of the pier.

The bottoms of the pier excavations should be relatively dry and free of all loose cuttings or slough prior to placing reinforcing steel and concrete. Any accumulated water in pier excavations should be removed prior to placing concrete. We recommend that the excavation of all piers be performed under the direct observation of SFB to confirm that the pier foundations are founded in suitable materials and constructed in accordance with the recommendations presented herein. Preliminarily, we recommend concrete pours of pier excavations be performed within 24 hours of excavation and prior to any rainstorms. Where caving or high groundwater conditions exist, additional measures such as using casing, tremie methods, and pouring concrete immediately after excavating may be necessary. SFB should be consulted on the need for additional measures for pier construction as needed during construction.

4.2.4 Seismic Design Criteria

The following parameters were calculated using the U.S. Seismic Design Map program[22], and were based on the site being located at approximate latitude 37.323°N and longitude 121.911°W. For seismic design using the 2016 California Building Code (CBC), we recommend the following tabulated seismic design values be used.

Since site soils are vulnerable to potential failure or collapse under seismic loading, such as liquefiable soils, ASCE 7 (which has been adopted by the 2016 CBC) requires that site soils be assigned as Site Class "F" and a site response analysis be performed. However, the results of our field explorations and engineering analyses generally indicate that the liquefiable soils underlying the site exist in forms of isolated discontinuous thin pockets and we estimate that the liquefaction of these soil pockets, if subjected to a MCE earthquake event, may only cause total aerial ground surface settlements of up to about 1 inch with differential settlements of about 1/2 inch across typical building column spacing.

In addition, it is our understanding that the proposed structures will have fundamental periods of vibration less than 0.5 second, so a site specific response analysis is not required for liquefiable soils per Section 20.3.1 of ASCE 7; therefore, the site class and seismic design parameters can be determined in accordance with ASCE 7/2016 CBC. SFB should be consulted if modifications to these assumptions are made.

2016 CBC SEISMIC PARAMETERS		
Seismic Parameter	Design Value	CBC Reference
Site Class	D	Section 1613.3.2
S_S	1.5	Figure 1613.3.1(1)
S_1	0.6	Figure 1613.3.1(2)
F_a	1.0	Table 1613.3.3(1)
F_v	1.5	Table 1613.3.3(2)

4.3 Pavements

4.3.1 Asphalt Concrete

Based on the results of laboratory testing of onsite materials, we recommend that an R-value of 5 be used in preliminary asphalt concrete pavement design. We recommend additional R-value tests be performed once the pavement subgrade is established to confirm the R-value used in the

[22]USGS Website, *http://earthquake.usgs.gov/hazards/designmaps/usdesign.php*, last updated 6/23/14.

design. Pavement subgrade composed of sandy and gravelly fills will result in higher R-values and thinner pavement sections.

We developed the following alternative preliminary pavement sections using Topic 608 of the State of California Department of Transportation Highway Design Manual, the recommended R-value, and typical traffic indices for commercial developments.

PRELIMINARY PAVEMENT DESIGN ALTERNATIVES SUBGRADE R-VALUE = 5			
Location	Pavement Components		Total Thickness (inches)
	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	
T.I. = 4.5 (auto & light truck parking)	3.0	9.0	12.0
	4.0	6.0	10.0
T.I. = 5.0 (access ways/courts)	3.0	11.0	14.0
	4.0	8.0	12.0

If the pavements are planned to be placed prior to or during construction, the traffic indices and pavement sections may not be adequate for support of what is typically more frequent and heavier construction traffic. If the pavement sections will be used for construction access by heavy trucks or construction equipment (especially fork lifts with support footings), SFB should be consulted to provide recommendations for alternative pavement sections capable of supporting the heavier use and heavier loads. If requested, SFB can provide recommendations for a phased placement of the asphalt concrete to reduce the potential for mechanical scars caused by construction traffic in the finished grade.

Pavement baserock and asphalt concrete should be compacted to at least 95 percent relative compaction. The asphalt concrete compacted unit weight should be determined using Caltrans Test Method 308-A or ASTM Test Method D1188. Asphalt concrete should also satisfy the S-value requirements by Caltrans.

We recommend regular maintenance of the asphalt concrete be performed at approximately five year intervals. Maintenance may include sand slurry sealing, crack filling, and chip seals as necessary. If regular maintenance is not performed, the asphalt concrete layer could experience premature degradation requiring more extensive repairs.

4.3.2 Concrete Slab for Trash Enclosures

The analytical procedure used in our design of the rigid vehicular concrete pavement was the method published by the Portland Cement Association. A modulus of subgrade reaction of 75 pounds per square inch per inch was assigned to represent a reworked, onsite subgrade underlain by 6 inches of aggregate base. The modulus of rupture for concrete was assumed to be 550 pounds per square inch. Based on our analysis, we recommend the concrete slab for the trash enclosure consist of 6 inches of concrete overlying 6 inches of Caltrans Class 2 aggregate baserock. The concrete and baserock should be constructed in accordance with the appropriate specifications for pavements.

5.0 CONDITIONS AND LIMITATIONS

SFB is not responsible for the validity or accuracy of information, analyses, test results, or designs provided to SFB by others or prepared by others. The analysis, designs, opinions, and recommendations submitted in this report are based in part upon the data obtained from our field work and upon information provided by others. Site exploration and testing characterizes subsurface conditions only at the locations where the explorations or tests are performed; actual subsurface conditions between explorations or tests may be different than those described in this report. Variations of subsurface conditions from those analyzed or characterized in this report are not uncommon and may become evident during construction. In addition, changes in the condition of the site can occur over time as a result of either natural processes (such as earthquakes, flooding, or changes in ground water levels) or human activity (such as construction adjacent to the site, dumping of fill, or excavating). If changes to the site's surface or subsurface conditions occur since the performance of the field work described in this report, or if differing subsurface conditions are encountered, we should be contacted immediately to evaluate the differing conditions to assess if the opinions, conclusions, and recommendations provided in this report are still applicable or should be amended.

We recommend SFB be retained to provide geotechnical services during design, reviews, earthwork operations, paving operations, and foundation installation to confirm and observe compliance with the design concepts, specifications and recommendations presented in this report. Our presence will also allow us to modify design if unanticipated subsurface conditions are encountered or if changes to the scope of the project, as defined in this report, are made.

This report is a design document that has been prepared in accordance with generally accepted geological and geotechnical engineering practices for the exclusive use of Mr. Terry Pries and his consultants for specific application to the proposed new supermarket development to be located on southeastern corner of West San Carlos and Race Street in San Jose, California, and is intended to represent our design recommendations to Mr. Terry Pries for specific application to the West San Carlos and Race Street in San Jose. The conclusions and recommendations contained in this report are solely professional opinions. It is the responsibility of Mr. Terry Pries to transmit the information and recommendations of this report to those designing and constructing the project. We will not be responsible for the misinterpretation of the information provided in this report. We recommend SFB be retained to review geological and geotechnical aspects of the construction calculations, specifications, and plans; we should also be retained to participate in prebid and preconstruction conferences to clarify the opinions, conclusions, and recommendations contained in this report.

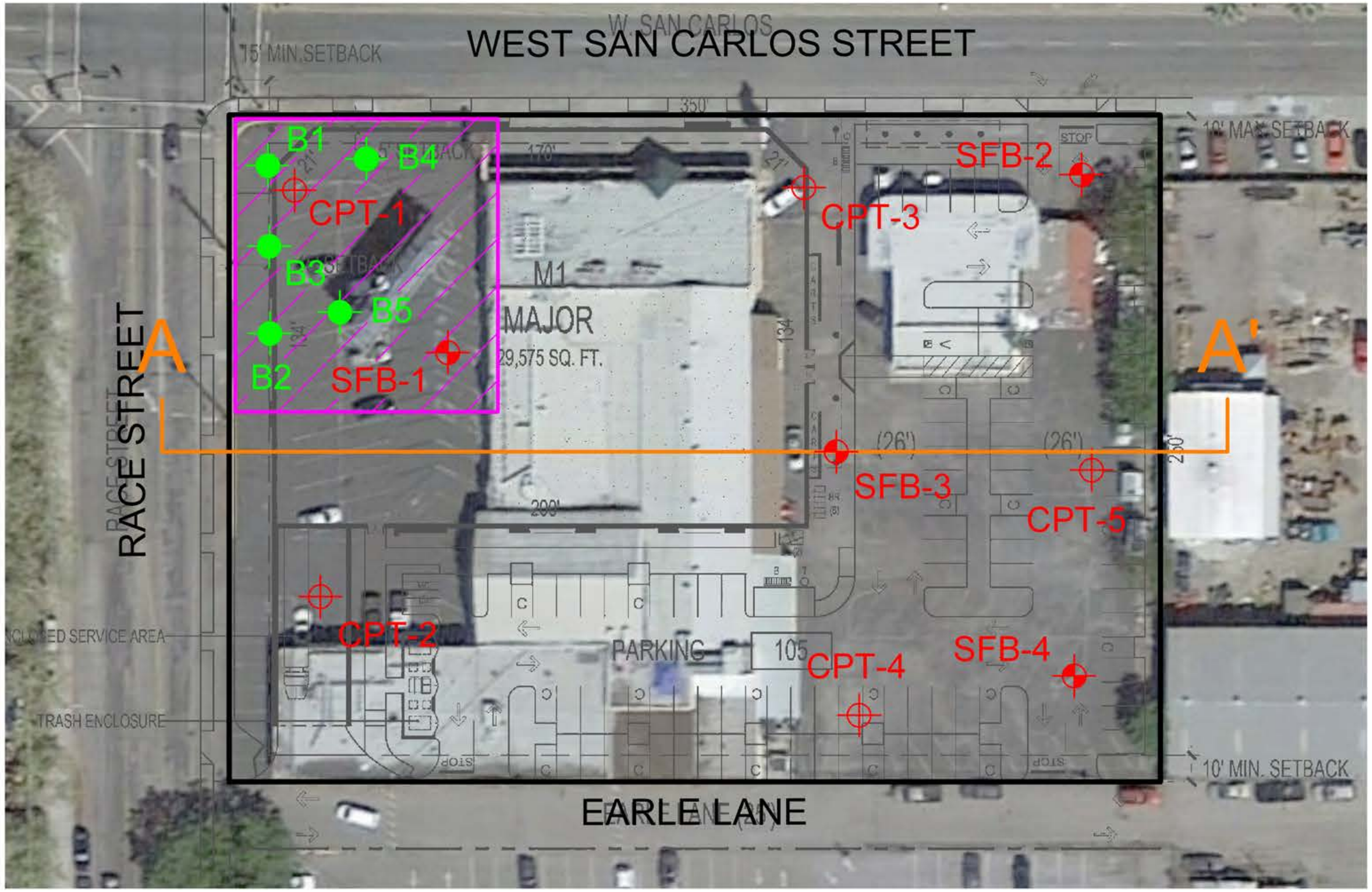
It should be understood that advancements in the practice of geotechnical engineering and engineering geology, or discovery of differing surface or subsurface conditions, may affect the validity of this report and are not uncommon. SFB strives to perform its services in a proper and professional manner with reasonable care and competence but we are not infallible. Geological engineering and geotechnical engineering are disciplines that are far less exact than other engineering disciplines; therefore we should be consulted if it is not completely understood what the limitations to using this report are.

In the event that there are any changes in the nature, design or location of the project, as described in this report, or if any future additions are planned, the conclusions and recommendations contained in this report shall not be considered valid unless we are contacted in writing, the project changes are reviewed by us, and the conclusions and recommendations presented in this report are modified or verified in writing. The opinions, conclusions, and recommendations contained in this report are based upon the description of the project as presented in the introduction section of this report.

This report does not necessarily represent all of the information that has been communicated by us to Mr. Terry Pries and his consultants during the course of this engagement and our rendering of professional services to Mr. Terry Pries. Reliance on this report by parties other than those described above must be at their own risk unless we are first consulted as to the parties' intended use of this report and only after we obtain the written consent of Mr. Terry Pries to divulge information that may have been communicated to Mr. Terry Pries. We cannot accept consequences for use of segregated portions of this report.

Please refer to Appendix D for additional guidelines regarding use of this report.

FIGURES



KEY

SFB-4	APPROXIMATE LOCATION OF SFB EXPLORATORY BORING (1/17/17)
CPT-5	APPROXIMATE LOCATION OF SFB CPT (2/10/17)
	APPROXIMATE PROJECT LIMIT
A — A'	LOCATION OF CROSS-SECTION (SEE FIGURE 2 FOR THE SECTION)
B5	APPROXIMATE LOCATION OF PREVIOUS BORING BY PIERS ENVIRONMENTAL (7/19/16)
	APPROXIMATE AREA OF PREVIOUS SERVICE STATION

N

NOTE: Base map was created by overlying the project conceptual site plan prepared by SGPA and dated 11/10/16 on Google Earth image dated 4/5/16.

APPROXIMATE SCALE: 1" = 50'

0 50' 100'

DATE: February 2017

PROJECT NO.: 502-6

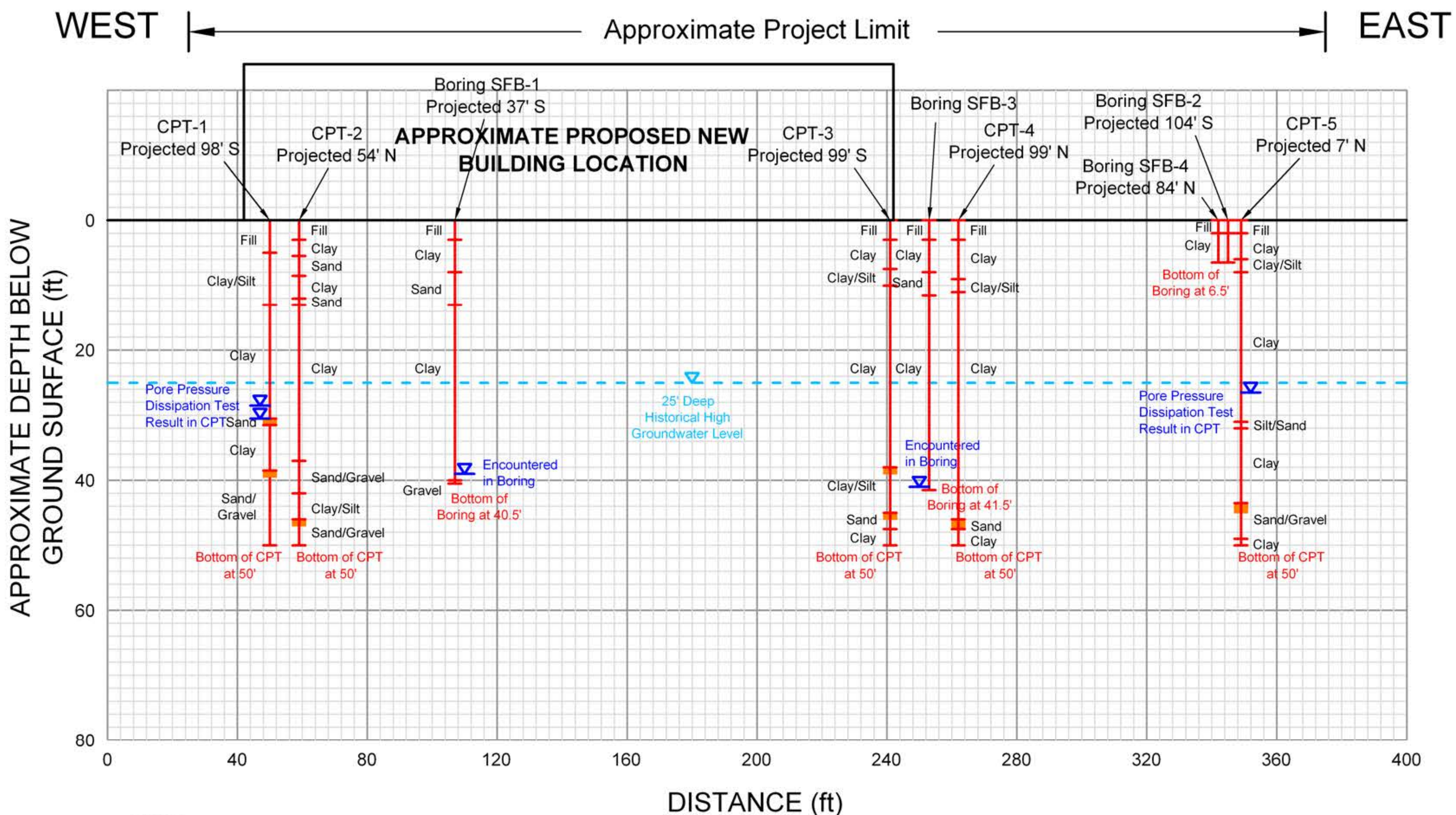
Stevens Ferrone & Bailey Engineering Company, Inc

1600 Willow Pass Court
Concord, CA 94520
Tel 925.688.1001
Fax 925.688.1005
www.SFandB.com

SITE PLAN

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

FIGURE 1



CROSS-SECTION A - A'

KEY

Historical High Groundwater Level

Potentially Liquefiable Soils if Saturated

NOTE:
1. See Figure 1 for location of section.
2. Improvements, elevations, and locations of explorations are approximate.
3. Refer to exploration logs for more details. Boring & CPT logs projected onto cross-section.
4. See report for additional conditions and limitations.

VERTICAL SCALE: 1" = 20' 0 20' 40'

HORIZONTAL SCALE: 1" = 40' 0 40' 80'

DATE: February 2017

PROJECT NO.: 502-6

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CROSS-SECTION A - A'

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

FIGURE 2

APPENDIX A

Field Investigation

APPENDIX A

Field Investigation

Our field investigation for the proposed new supermarket development to be located on southeastern corner of West San Carlos and Race Street in San Jose, California, consisted of surface reconnaissance and a subsurface exploration program. Geotechnical reconnaissance of the site and surrounding area was performed on January 17 and February 10, 2017. Subsurface explorations were performed using a truck-mounted drill rig equipped with 4-inch diameter solid stem, continuous flight augers and a 25-ton push capacity truck mounted CPT rig. Four exploratory borings were drilled on January 17, 2017 to a maximum depth of about 41-1/2 feet. Five Cone Penetration Tests (CPT's) were advanced on February 10, 2017 to a maximum depth of about 50 feet. Our representative continuously logged the soils encountered in the borings in the field. The soils are described in general accordance with the Unified Soil Classification System (ASTM D2487). The logs of the borings and CPT's as well as a key for the classification of the soil (Figure A-1) are included as part of this appendix. The elevations discussed in this report and shown on the logs in this appendix were obtained from the base map shown on Figure 1; datum unknown.

Representative samples were obtained from our exploratory boring at selected depths appropriate to the investigation. Relatively undisturbed samples were obtained using a 3-inch O.D. split barrel sampler with liners, and disturbed samples were obtained using the 2-inch O.D. split spoon sampler. All samples were transmitted to our offices for evaluation and appropriate testing. Both sampler types are indicated in the "Sampler" column of the boring logs as designated in Figure A-1.

Resistance blow counts were obtained in our boring with the samplers by dropping a 140-pound safety hammer through a 30-inch free fall. The sampler was driven 18 inches and the number of blows were recorded for each 6 inches of penetration. The blows per foot recorded on the boring logs represent the accumulated number of converted blows that were required to drive the last 12 inches, or the number of inches indicated where hard resistance was encountered. The blow counts recorded on the boring logs have been converted to equivalent SPT field blowcounts, but have not been corrected for overburden, silt content, or other factors.

The attached boring and CPT logs and related information show our interpretation of the subsurface conditions at the dates and locations indicated, and it is not warranted that they are representative of subsurface conditions at other locations and times.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		grf	ltr	Description	Major Divisions		grf	ltr	Description
Coarse Grained Soils	Gravel Gravelly Soils		GW	Well-graded gravels or gravel sand mixtures, little or no fines	Soils	Silts And Clays LL < 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			GP	Poorly-graded gravels or gravel sand mixture, little or no fines				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			GM	Silty gravels, gravel-sand-silt mixtures				OL	Organic silts and organic silt-clays of low plasticity
			GC	Clayey gravels, gravel-sand-clay mixtures		Silts And Clays LL > 50		MH	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts
	Sand And Sandy Soils		SW	Well-graded sands or gravelly sands, little or no fines				CH	Inorganic clays of high plasticity, fat clays
			SP	Poorly-graded sands or gravelly sands, little or no fines				OH	Organic clays of medium to high plasticity
			SM	Silty sands, sand-silt mixtures					
			SC	Clayey sands, and-clay mixtures	Highly Organic Soils			PT	Peat and other highly organic soils

GRAIN SIZES

U.S. STANDARD SERIES SIEVE: 200, 40, 10, 4
CLEAR SQUARE SIEVE OPENINGS: 3/4", 3", 12"

Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

RELATIVE DENSITY

Sands and Gravels	Blows/Foot*
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

CONSISTENCY

Silts and Clays	Blows/Foot*	Strength (tsf)**
Very Soft	0 - 2	0 - 1/4
Soft	2 - 4	1/4 - 1/2
Firm	4 - 8	1/2 - 1
Stiff	8 - 16	1 - 2
Very Stiff	16 - 32	2 - 4
Hard	Over 32	Over 4

*Number of Blows for a 140-pound hammer falling 30 inches, driving a 2-inch O.D. (1-3/8" I.D.) split spoon sampler.
**Unconfined compressive strength.

SYMBOLS & NOTES

- Standard Penetration sampler (2" OD Split Barrel)
- Modified California sampler (3" OD Split Barrel)
- California Sampler (2.5" OD Split Barrel)
- Shelby Tube
- Pitcher Barrel
- HQ Core
- Ground Water level initially encountered
- Ground Water level at end of drilling

PI = Plasticity Index
LL = Liquid Limit
R = R-Value

Increasing Visual Moisture Content

Saturated
Wet
Moist
Damp
Dry

Constituent Percentage

trace	<5%
some	5-15%
with	16-30%
-y	31-49%

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KEY TO EXPLORATORY BORING LOGS

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

PROJECT NO.	DATE	FIGURE NO.
502-6	February 2017	A-1

DRILL RIG Mobile B-24 CFA	SURFACE ELEVATION ---	LOGGED BY RAC
DEPTH TO GROUND WATER 39 feet	BORING DIAMETER 4-inch	DATE DRILLED 01/17/17

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
Asphalt Concrete (AC) about 3" thick.			0						
Aggregate Base (AB) about 6" thick.									
FILL: CLAY (CL), mottled gray brown, silty, some to with sand(fine- to coarse-grained), some gravel(fine to coarse, angular to subangular), some pieces of glass, damp.	very stiff				21	20	107		
A 2" rock fragment at 2'.	very stiff				22				
CLAY (CL), dark brown, silty, some sand(fine- to medium-grained), dry to damp.	very stiff								
CLAY (CL), mottled grayish brown, silty, with to sandy(fine- to medium-grained), some gravel(fine, subrounded to subangular), dry to damp.			5		20	15	109	3.7	
SAND (SC/SM), mottled light gray brown, fine- to medium-grained, silty, with clay, dry to damp.	medium dense		10		16	16	109	4.0	
CLAY (CL), mottled grayish brown, silty, trace sand(fine-grained), damp.	stiff		15		11	30	88	1.2	
With to sandy(fine-grained), damp to moist.	very stiff		20		16				
Some sand(fine-grained), damp.			25		17				
	stiff		30		14				

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EXPLORATORY BORING LOG

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

PROJECT NO.	DATE	BORING NO.
502-6	February 2017	SFB-1

DRILL RIG Mobile B-24 CFA	SURFACE ELEVATION ---	LOGGED BY RAC
DEPTH TO GROUND WATER 39 feet	BORING DIAMETER 4-inch	DATE DRILLED 01/17/17

DESCRIPTION AND CLASSIFICATION			DEPTH (FEET)	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE							
CLAY(CL), Continued.	stiff		35						
			▼						
GRAVEL (GP-GM), mottled brownish gray, fine to coarse, subangular to subrounded, sandy(fine- to coarse-grained), some clay & silt, wet.	very dense		40		50/5"				
Bottom of Boring = 40.4 feet Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.									
			45						
			50						
			55						
			60						
			65						

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EXPLORATORY BORING LOG

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

PROJECT NO.	DATE	BORING NO.
502-6	**February 2017**	**SFB-1**

DRILL RIG Mobile B-24 CFA	SURFACE ELEVATION ---	LOGGED BY RAC
DEPTH TO GROUND WATER Not Encountered	BORING DIAMETER 4-inch	DATE DRILLED 01/17/17

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
Asphalt Concrete (AC) about 5" thick.			0						
Aggregrate Base (AB) about 3" thick.									
FILL: CLAY (CL), dark grayish brown, silty, some to with sand(fine- to medium-grained), dry to damp.	very stiff				24				
CLAY (CL), mottled dark grayish brown, silty, with sand(fine- to medium-grained), dry to damp.	stiff				13				
Sandy(fine- to medium-grained).			5		16				
SAND (SM/SC), mottled brownish gray, fine- to medium-grained, silty, with clay, dry to damp.	medium dense								
Bottom of Boring = 6.5 feet Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.			10						
			15						
			20						
			25						
			30						

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EXPLORATORY BORING LOG

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

PROJECT NO.	DATE	BORING NO.
502-6	**February 2017**	**SFB-2**

DRILL RIG Mobile B-24 CFA	SURFACE ELEVATION ---	LOGGED BY RAC
DEPTH TO GROUND WATER 41 feet	BORING DIAMETER 4-inch	DATE DRILLED 01/17/17

DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
Asphalt Concrete (AC) about 5" thick.			0						At 2': Liquid Limit = 53 Plasicity Index = 29 Medium Sand = 2% Fine Sand = 11% Silt = 25% Clay = 62%
Aggregrate Base (AB) about 8" thick.									
FILL: CLAY (CL), grayish brown, silty, with sand(fine- to coarse-grained), some pieces of glass, dry to damp.	very stiff				30	28	95	4.4	
Change color to dark brown, some sand(fine-grained).					24				
CLAY (CL), mottled dark grayish brown, silty, with sand(fine- to medium-grained), dry to damp.	very stiff								
Change color to mottled light gray brown, sandy(fine- to medium-grained).	stiff		5		16	16	114	6.9	
SAND (SC), mottled gray brown, fine- to medium-grained, silty, with clay, some gravel(fine, subrounded to rounded), damp.	medium dense		10		12	18	103	2.2	
CLAY (CL), mottled gray brown, silty, with sand(fine- to medium-grained), damp.	stiff								
	very stiff		15		18	21	102		
Some sand(fine-grained), damp to moist.	stiff		20		11				
With sand(fine- to medium-grained), moist.			25		15				
	very stiff		30		18				

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EXPLORATORY BORING LOG

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

PROJECT NO.	DATE	BORING NO.
502-6	**February 2017**	**SFB-3**

DRILL RIG Mobile B-24 CFA	SURFACE ELEVATION ---	LOGGED BY RAC
DEPTH TO GROUND WATER 41 feet	BORING DIAMETER 4-inch	DATE DRILLED 01/17/17

DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE	DEPTH (FEET)	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
CLAY(CL) Continued, some sand(fine-grained), damp to moist.	very stiff		35		16				
	stiff		40		14				
Bottom of Boring = 41.5 feet Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.			45						
			50						
			55						
			60						
			65						

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EXPLORATORY BORING LOG

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

PROJECT NO.	DATE	BORING NO.
502-6	**February 2017**	**SFB-3**

DRILL RIG Mobile B-24 CFA	SURFACE ELEVATION ---	LOGGED BY RAC
DEPTH TO GROUND WATER Not Encountered	BORING DIAMETER 4-inch	DATE DRILLED 01/17/17

DESCRIPTION AND CLASSIFICATION			DEPTH (FEET)	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE							
Asphalt Concrete (AC) about 5" thick.			0						
Aggregrate Base (AB) about 8" thick.									
FILL: CLAY (CL), dark brown, silty, some to with sand(fine- to coarse-grained), some gravel(fine, subangular to subrounded), dry to damp.	very stiff				27				
CLAY (CL), mottled dark grayish brown, silty, some sand(fine-grained), dry to damp.	very stiff				20				
With sand(fine- to medium-grained), dry to damp.			5		21				
Bottom of Boring = 6.5 feet Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.			10 15 20 25 30						

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EXPLORATORY BORING LOG

WEST SAN CARLOS STREET & RACE STREET
San Jose, California

PROJECT NO.	DATE	BORING NO.
502-6	**February 2017**	**SFB-4**

GREGG DRILLING & TESTING, INC.
GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION SERVICES

February 13, 2017

Stevens, Ferrone & Bailey Eng. Co.
Attn: Taiming Chen

Subject: CPT Site Investigation
W. San Carlos St.
San Jose, California
GREGG Project Number: 17-008MA

Dear Mr. Chen:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	UVOST Laser Induced Fluorescence	(UVOST)	☐
5	Groundwater Sampling	(GWS)	☐
6	Soil Sampling	(SS)	☐
7	Vapor Sampling	(VS)	☐
8	Membrane Interface Probe	(MIP)	☐
9	Vane Shear Testing	(VST)	☐
10	Dilatometer Testing	(DMT)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (925) 313-5800.

Sincerely,
GREGG Drilling & Testing, Inc.

Mary Walden

Mary Walden
Operations Manager

950 Howe Rd • Martinez, California 94553 • (925) 313-5800 • FAX (925) 313-0302
www.greggdrilling.com

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (feet)	Depth of Groundwater Samples (feet)	Depth of Soil Samples (feet)	Depth of Pore Pressure Dissipation Tests (feet)
CPT-1	2/10/17	50	-	-	41.8, 50.0
CPT-2	2/10/17	50	-	-	-
CPT-3	2/10/17	50	-	-	-
CPT-4	2/10/17	50	-	-	-
CPT-5	2/10/17	50	-	-	44.6

Bibliography

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Campanella, R.G. and I. Weemees, “Development and Use of An Electrical Resistivity Cone for Groundwater Contamination Studies”, Canadian Geotechnical Journal, Vol. 27 No. 5, 1990 pp. 557-567.

DeGroot, D.J. and A.J. Lutenegger, “Reliability of Soil Gas Sampling and Characterization Techniques”, International Site Characterization Conference - Atlanta, 1998.

Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, “Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT”, 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, “Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers” BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

Copies of ASTM Standards are available through www.astm.org

Cone Penetration Testing Procedure (CPT)

Gregg Drilling carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*.

The cone takes measurements of tip resistance (q_c), sleeve resistance (f_s), and penetration pore water pressure (u_2). Measurements are taken at either 2.5 or 5 cm intervals during penetration to provide a nearly continuous profile. CPT data reduction and basic interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored electronically for further analysis and reference. All CPT soundings are performed in accordance with revised ASTM standards (D 5778-12).

The 5mm thick porous plastic filter element is located directly behind the cone tip in the u_2 location. A new saturated filter element is used on each sounding to measure both penetration pore pressures as well as measurements during a dissipation test (*PPDT*). Prior to each test, the filter element is fully saturated with oil under vacuum pressure to improve accuracy.

When the sounding is completed, the test hole is backfilled according to client specifications. If grouting is used, the procedure generally consists of pushing a hollow tremie pipe with a "knock out" plug to the termination depth of the CPT hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

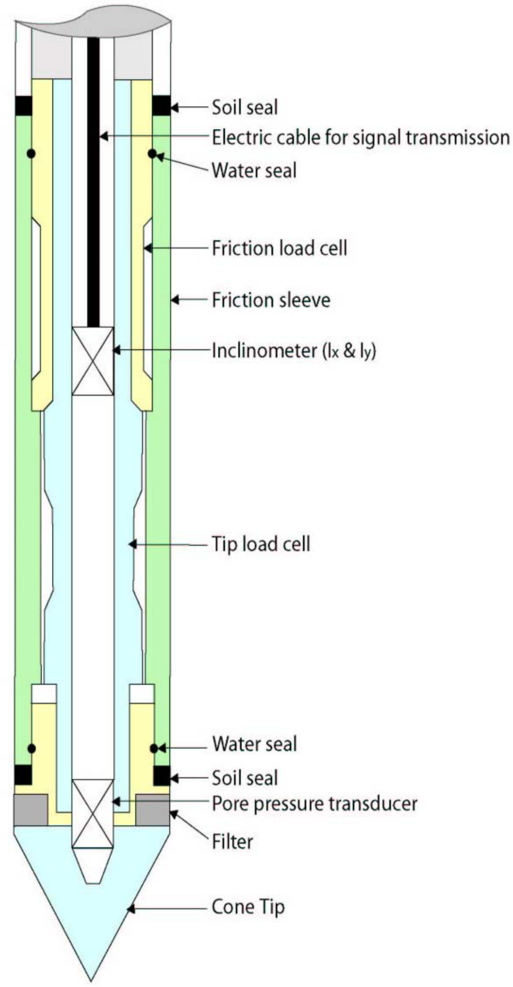


Figure CPT

Gregg 15cm^2 Standard Cone Specifications

Dimensions	
Cone base area	15 cm^2
Sleeve surface area	225 cm^2
Cone net area ratio	0.80
Specifications	
Cone load cell	
Full scale range	180 kN (20 tons)
Overload capacity	150%
Full scale tip stress	120 MPa (1,200 tsf)
Repeatability	120 kPa (1.2 tsf)
Sleeve load cell	
Full scale range	31 kN (3.5 tons)
Overload capacity	150%
Full scale sleeve stress	1,400 kPa (15 tsf)
Repeatability	1.4 kPa (0.015 tsf)
Pore pressure transducer	
Full scale range	7,000 kPa (1,000 psi)
Overload capacity	150%
Repeatability	7 kPa (1 psi)

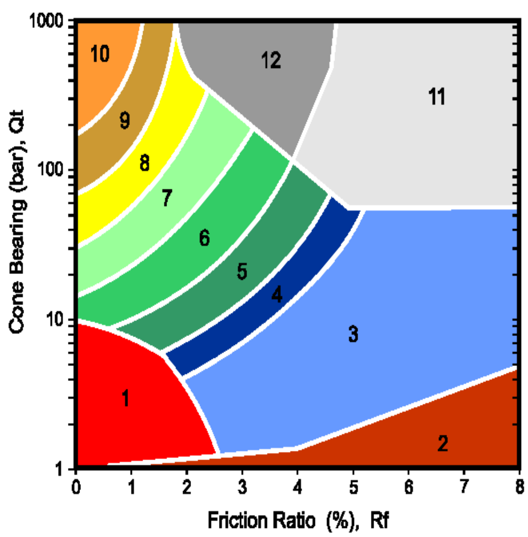
Note: The repeatability during field use will depend somewhat on ground conditions, abrasion, maintenance and zero load stability.

Cone Penetration Test Data & Interpretation

The Cone Penetration Test (CPT) data collected are presented in graphical and electronic form in the report. The plots include interpreted Soil Behavior Type (SBT) based on the charts described by Robertson (1990). Typical plots display SBT based on the non-normalized charts of Robertson et al (1986). For CPT soundings deeper than 30m, we recommend the use of the normalized charts of Robertson (1990) which can be displayed as SBTn, upon request. The report also includes spreadsheet output of computer calculations of basic interpretation in terms of SBT and SBTn and various geotechnical parameters using current published correlations based on the comprehensive review by Lunne, Robertson and Powell (1997), as well as recent updates by Professor Robertson (Guide to Cone Penetration Testing, 2015). The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg Drilling & Testing Inc. does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software. Some interpretation methods require input of the groundwater level to calculate vertical effective stress. An estimate of the in-situ groundwater level has been made based on field observations and/or CPT results, but should be verified by the user.

A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Note that it is not always possible to clearly identify a soil type based solely on q_t, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the correct soil behavior type.



ZONE		SBT
1		Sensitive, fine grained
2		Organic materials
3		Clay
4		Silty clay to clay
5		Clayey silt to silty clay
6		Sandy silt to clayey silt
7		Silty sand to sandy silt
8		Sand to silty sand
9		Sand
10		Gravely sand to sand
11		Very stiff fine grained*
12		Sand to clayey sand*

*over consolidated or cemented

Figure SBT (After Robertson et al., 1986) – Note: Colors may vary slightly compared to plots

Cone Penetration Test (CPT) Interpretation

Gregg uses a proprietary CPT interpretation and plotting software. The software takes the CPT data and performs basic interpretation in terms of soil behavior type (SBT) and various geotechnical parameters using current published empirical correlations based on the comprehensive review by Lunne, Robertson and Powell (1997). The interpretation is presented in tabular format using MS Excel. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg does not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

The following provides a summary of the methods used for the interpretation. Many of the empirical correlations to estimate geotechnical parameters have constants that have a range of values depending on soil type, geologic origin and other factors. The software uses 'default' values that have been selected to provide, in general, conservatively low estimates of the various geotechnical parameters.

Input:

1 Units for display (Imperial or metric) (atm. pressure, p_a = 0.96 tsf or 0.1 MPa)
2 Depth interval to average results (ft or m). Data are collected at either 0.02 or 0.05m and can be averaged every 1, 3 or 5 intervals.
3 Elevation of ground surface (ft or m)
4 Depth to water table, z_w (ft or m) – input required
5 Net area ratio for cone, a (default to 0.80)
6 Relative Density constant, C_{Dr} (default to 350)
7 Young's modulus number for sands, α (default to 5)
8 Small strain shear modulus number
   a. for sands, S_G (default to 180 for SBT_n 5, 6, 7)
   b. for clays, C_G (default to 50 for SBT_n 1, 2, 3 & 4)
9 Undrained shear strength cone factor for clays, N_{kt} (default to 15)
10 Over Consolidation ratio number, k_{ocr} (default to 0.3)
11 Unit weight of water, (default to γ_w = 62.4 lb/ft^3 or 9.81 kN/m^3)

Column

1 Depth, z, (m) – CPT data is collected in meters
2 Depth (ft)
3 Cone resistance, q_c (tsf or MPa)
4 Sleeve resistance, f_s (tsf or MPa)
5 Penetration pore pressure, u (psi or MPa), measured behind the cone (i.e. u_2)
6 Other – any additional data
7 Total cone resistance, q_t (tsf or MPa) $q_t = q_c + u\,(1-a)$

8	Friction Ratio, R_f (%)	$R_f = (f_s/q_t) \times 100\%$
9	Soil Behavior Type (non-normalized), SBT	see note
10	Unit weight, γ (pcf or kN/m^3)	based on SBT, see note
11	Total overburden stress, σ_v (tsf)	$\sigma_{vo} = \sigma\ z$
12	In-situ pore pressure, u_o (tsf)	$u_o = \gamma_w (z - z_w)$
13	Effective overburden stress, σ'_{vo} (tsf)	$\sigma'_{vo} = \sigma_{vo} - u_o$
14	Normalized cone resistance, Q_{t1}	$Q_{t1}= (q_t - \sigma_{vo}) / \sigma'_{vo}$
15	Normalized friction ratio, F_r (%)	$F_r = f_s / (q_t - \sigma_{vo}) \times 100\%$
16	Normalized Pore Pressure ratio, B_q	$B_q = u - u_o / (q_t - \sigma_{vo})$
17	Soil Behavior Type (normalized), SBT_n	see note
18	SBT_n Index, I_c	see note
19	Normalized Cone resistance, Q_{tn} (n varies with I_c)	see note
20	Estimated permeability, k_{SBT} (cm/sec or ft/sec)	see note
21	Equivalent SPT N_{60}, blows/ft	see note
22	Equivalent SPT $(N_1)_{60}$ blows/ft	see note
23	Estimated Relative Density, D_r, (%)	see note
24	Estimated Friction Angle, ϕ', (degrees)	see note
25	Estimated Young's modulus, E_s (tsf)	see note
26	Estimated small strain Shear modulus, Go (tsf)	see note
27	Estimated Undrained shear strength, s_u (tsf)	see note
28	Estimated Undrained strength ratio	s_u/σ_v'
29	Estimated Over Consolidation ratio, OCR	see note

Notes:

1 Soil Behavior Type (non-normalized), SBT (Lunne et al., 1997 and table below)

2 Unit weight, γ either constant at 119 pcf or based on Non-normalized SBT (Lunne et al., 1997 and table below)

3 Soil Behavior Type (Normalized), SBT_n Lunne et al. (1997)

4 SBT_n Index, I_c $I_c = ((3.47 - \log Q_{t1})^2 + (\log F_r + 1.22)^2)^{0.5}$

5 Normalized Cone resistance, Q_{tn} (n varies with Ic)

$Q_{tn} = ((q_t - \sigma_{vo})/pa)\ (pa/(\sigma'_{vo})^n$ and recalculate I_c, then iterate:

When $I_c < 1.64$, n = 0.5 (clean sand)
When $I_c > 3.30$, n = 1.0 (clays)
When $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
Iterate until the change in n, $\Delta n < 0.01$

6 Estimated permeability, k_{SBT} based on Normalized SBT_n (Lunne et al., 1997 and table below)

7 Equivalent SPT N_{60}, blows/ft Lunne et al. (1997)

$$\frac{(q_t/p_a)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$

8 Equivalent SPT $(N_1)_{60}$ blows/ft $(N_1)_{60} = N_{60}\, C_N,$
where $C_N = (pa/\sigma'_{vo})^{0.5}$

9 Relative Density, D_r, (%) $D_r^2 = Q_{tn} / C_{Dr}$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

10 Friction Angle, ϕ', (degrees) $\tan \phi' = \frac{1}{2.68}\left[\log\left(\frac{q_c}{\sigma'_{vo}}\right) + 0.29\right]$

Only SBT_n 5, 6, 7 & 8 *Show'N/A' in zones 1, 2, 3, 4 & 9*

11 Young's modulus, E_s $E_s = \alpha\, q_t$
Only SBT_n 5, 6, 7 & 8 *Show 'N/A' in zones 1, 2, 3, 4 & 9*

12 Small strain shear modulus, Go

a. $G_o = S_G (q_t\ \sigma'_{vo}\ pa)^{1/3}$ *For SBT_n 5, 6, 7*

b. $G_o = C_G\, q_t$ *For SBT_n 1, 2, 3& 4*

Show 'N/A' in zones 8 & 9

13 Undrained shear strength, s_u $s_u = (q_t - \sigma_{vo}) / N_{kt}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

14 Over Consolidation ratio, OCR $OCR = k_{ocr}\, Q_{t1}$
Only SBT_n 1, 2, 3, 4 & 9 *Show 'N/A' in zones 5, 6, 7 & 8*

The following updated and simplified SBT descriptions have been used in the software:

SBT Zones		**SBT_n Zones**	
1	sensitive fine grained	1	sensitive fine grained
2	organic soil	2	organic soil
3	clay	3	clay
4	clay & silty clay	4	clay & silty clay
5	clay & silty clay		
6	sandy silt & clayey silt		

7	silty sand & sandy silt	5	silty sand & sandy silt
8	sand & silty sand	6	sand & silty sand
9	sand		
10	sand	7	sand
11	very dense/stiff soil*	8	very dense/stiff soil*
12	very dense/stiff soil*	9	very dense/stiff soil*

*heavily overconsolidated and/or cemented

Track when soils fall with zones of same description and print that description (i.e. if soils fall only within SBT zones 4 & 5, print 'clays & silty clays')

Estimated Permeability (see Lunne et al., 1997)

SBT_n	Permeability (ft/sec)	(m/sec)
1	$3x\ 10^{-8}$	$1x\ 10^{-8}$
2	$3x\ 10^{-7}$	$1x\ 10^{-7}$
3	$1x\ 10^{-9}$	$3x\ 10^{-10}$
4	$3x\ 10^{-8}$	$1x\ 10^{-8}$
5	$3x\ 10^{-6}$	$1x\ 10^{-6}$
6	$3x\ 10^{-4}$	$1x\ 10^{-4}$
7	$3x\ 10^{-2}$	$1x\ 10^{-2}$
8	$3x\ 10^{-6}$	$1x\ 10^{-6}$
9	$1x\ 10^{-8}$	$3x\ 10^{-9}$

Estimated Unit Weight (see Lunne et al., 1997)

SBT	Approximate Unit Weight (lb/ft^3)	(kN/m^3)
1	111.4	17.5
2	79.6	12.5
3	111.4	17.5
4	114.6	18.0
5	114.6	18.0
6	114.6	18.0
7	117.8	18.5
8	120.9	19.0
9	124.1	19.5
10	127.3	20.0
11	130.5	20.5
12	120.9	19.0

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals can be used to measure equilibrium water pressure (at the time of the CPT). If conditions are hydrostatic, the equilibrium water pressure can be used to determine the approximate depth of the ground water table. A PPDT is conducted when penetration is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (*u*) with time is measured behind the tip of the cone and recorded.

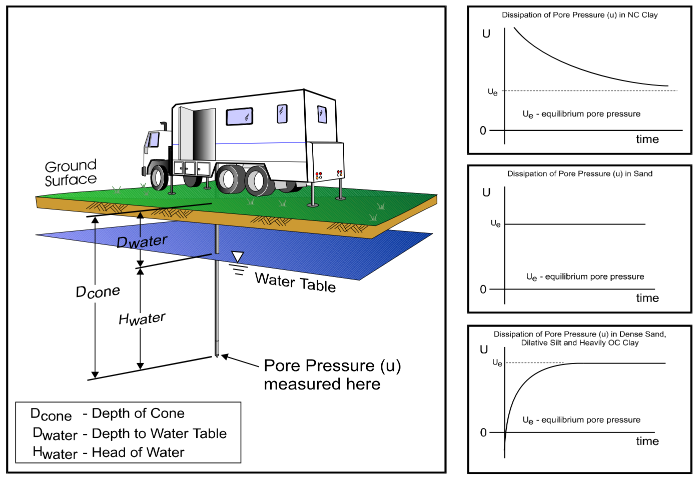
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permeability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until it reaches equilibrium, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1992 and Lunne et al. 1997.

A summary of the pore pressure dissipation tests are summarized in Table 1.



Water Table Calculation

$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_e$ (depth units)

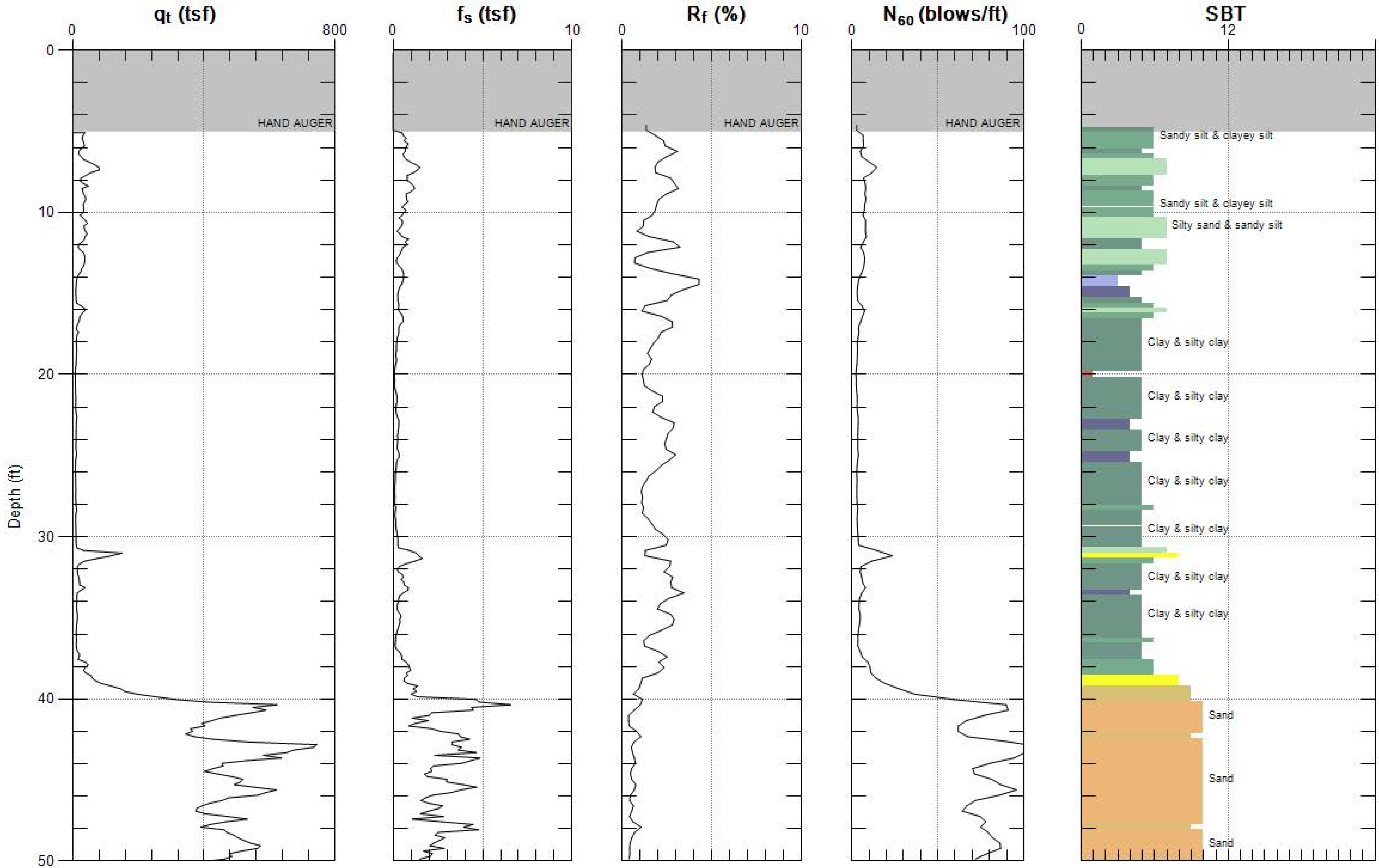
Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure PPDT

GREGG

STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.
Engineer: T.CHEN
Sounding: CPT-1
Date: 2/10/17 08:37



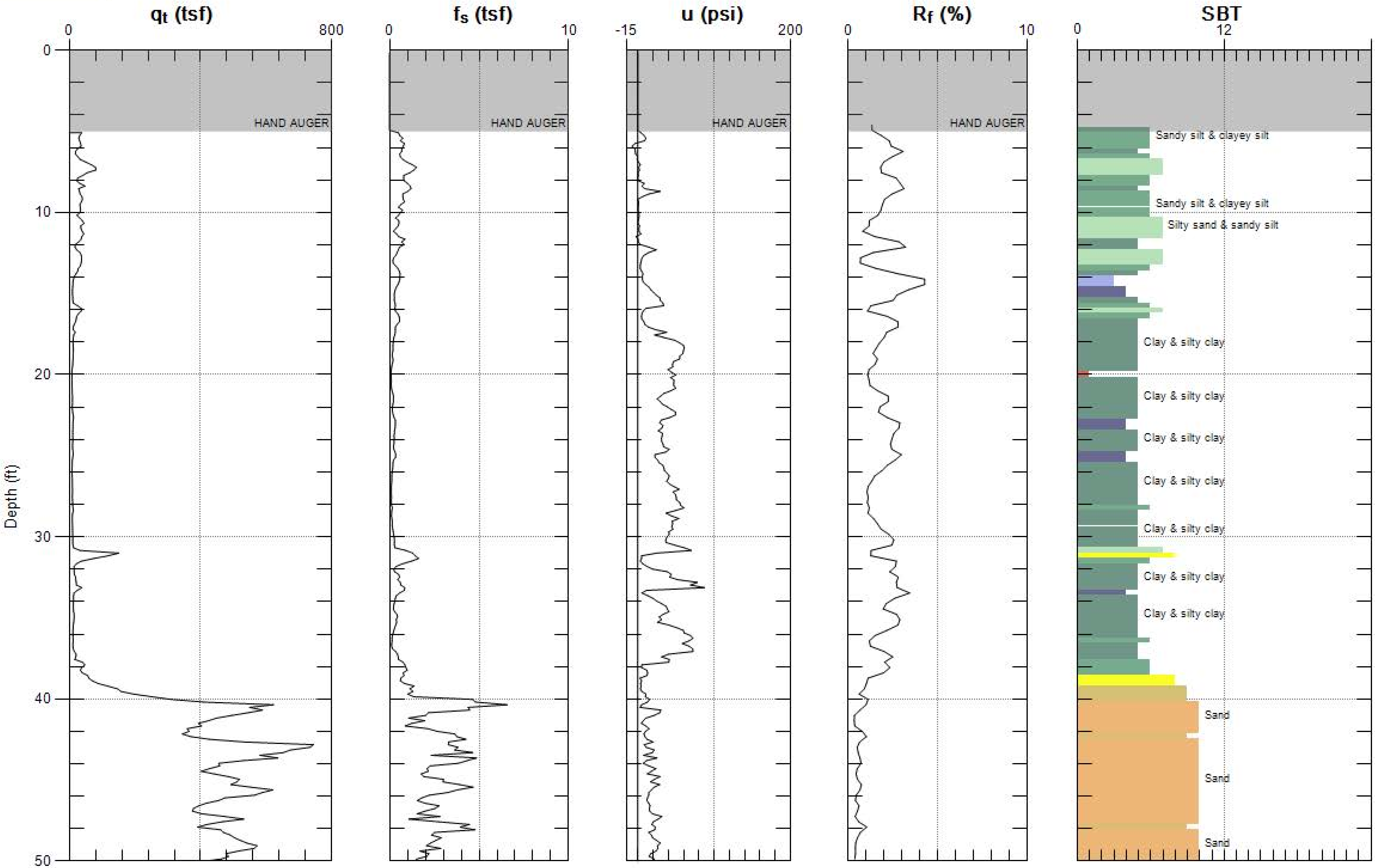
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST. | Engineer: T.CHEN
Sounding: CPT-1 | Date: 2/10/17 08:37



Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

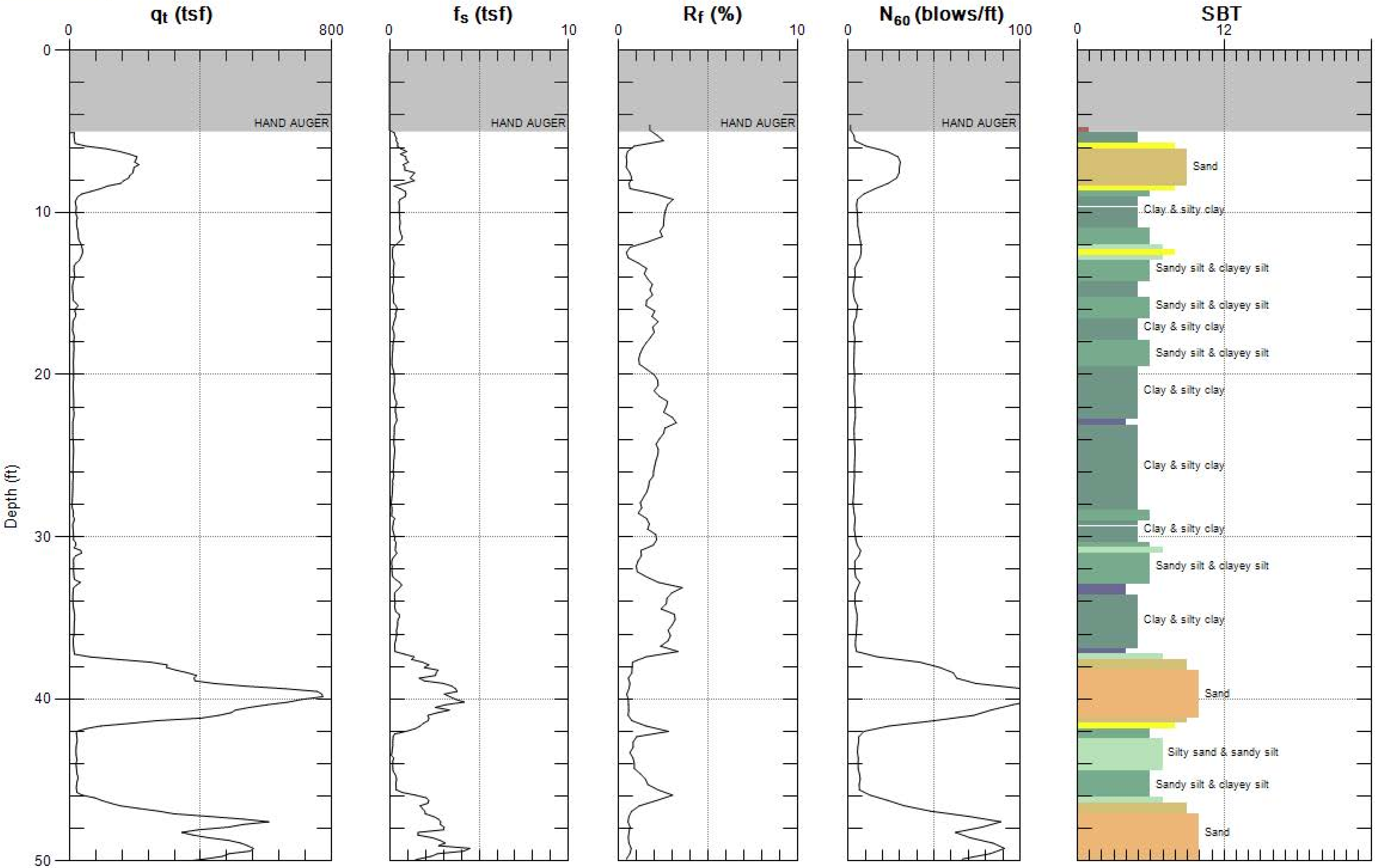
STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.

Sounding: CPT-2

Engineer: T.CHEN

Date: 2/10/17 10:13



Max. Depth: 50.033 (ft)

Avg. Interval: 0.328 (ft)

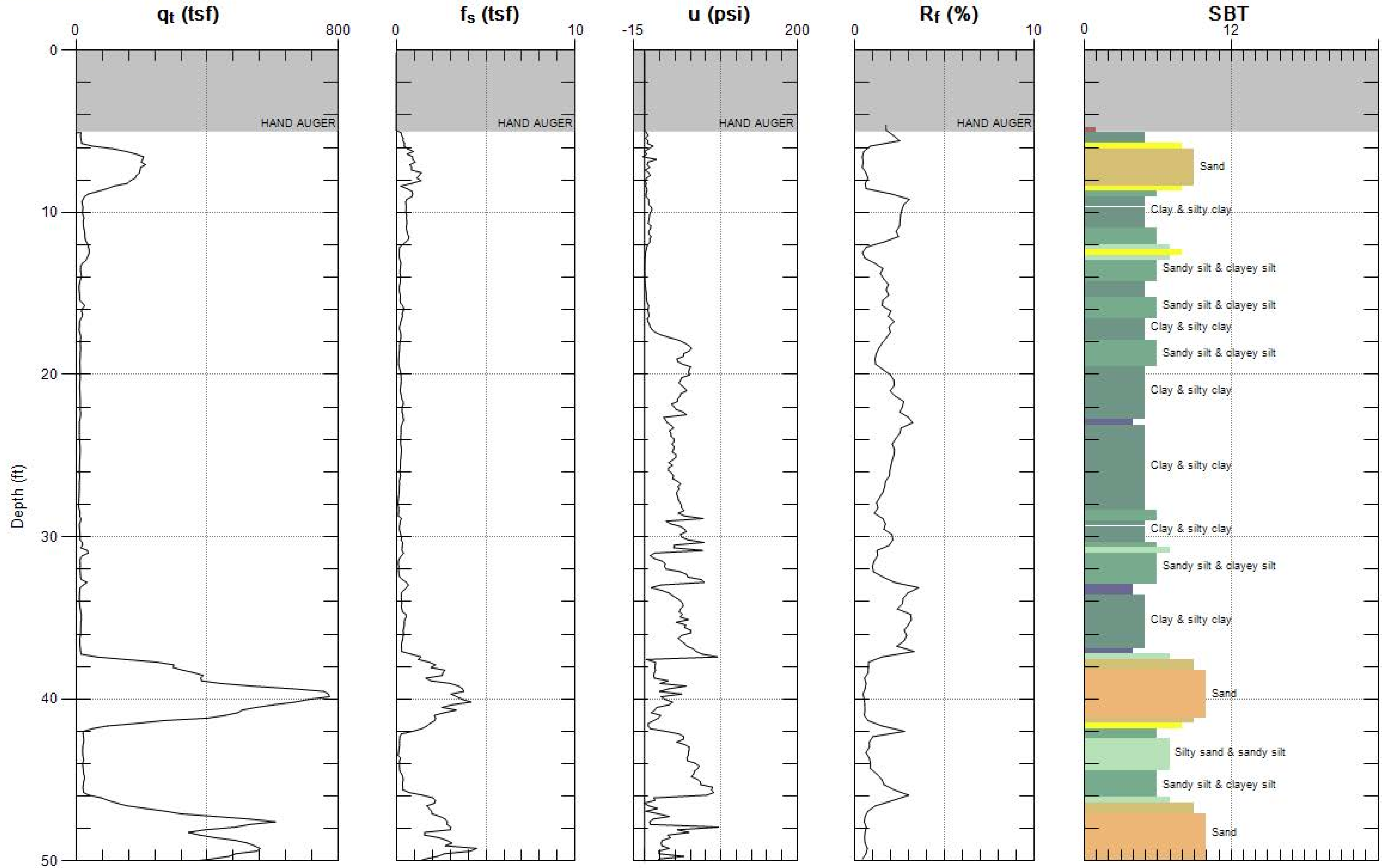
SBT: Soil Behavior Type (Robertson 1990)

GREGG

STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.
Sounding: CPT-2

Engineer: T.CHEN
Date: 2/10/17 10:13



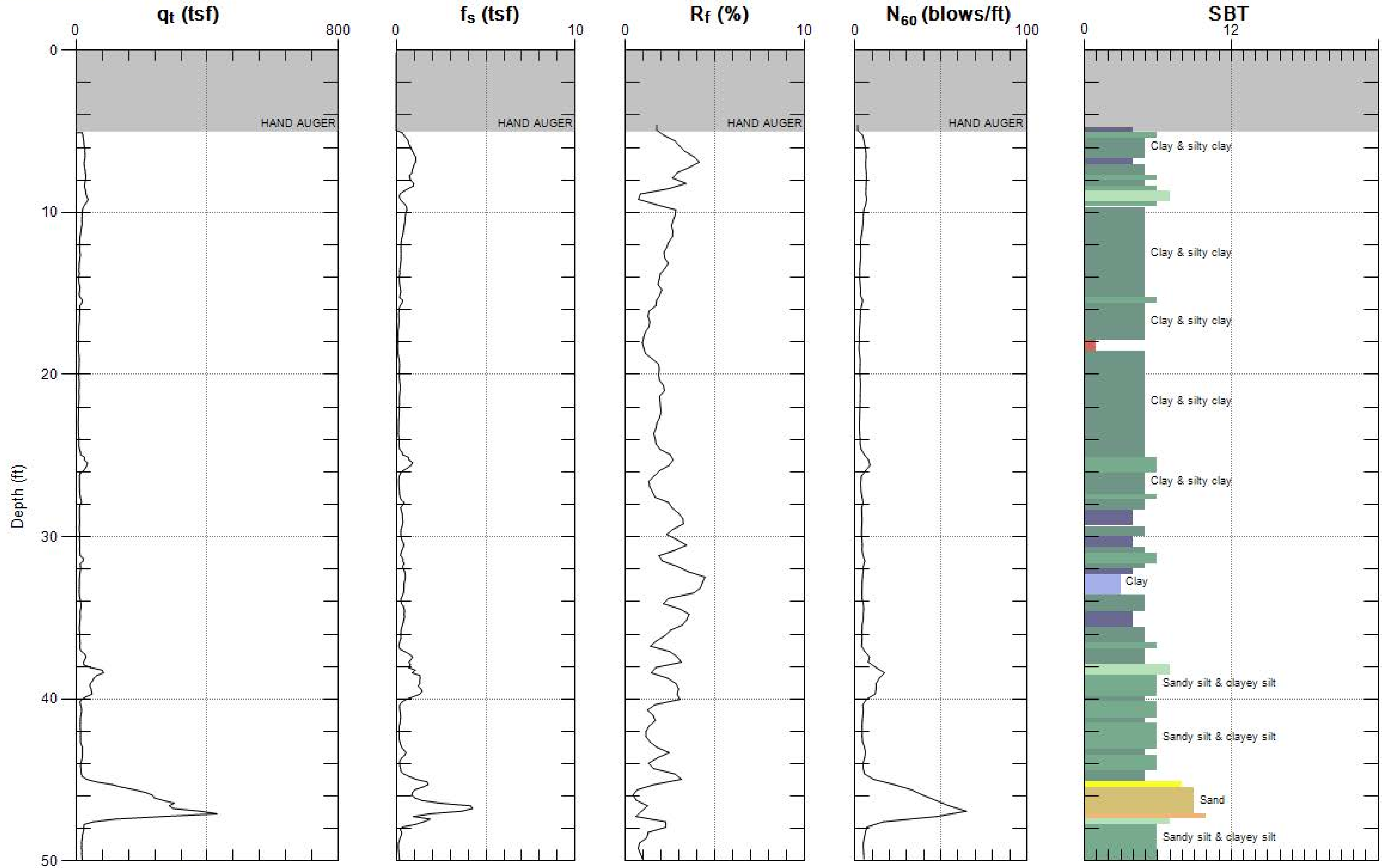
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.
Sounding: CPT-3

Engineer: T.CHEN
Date: 2/10/17 11:17



Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

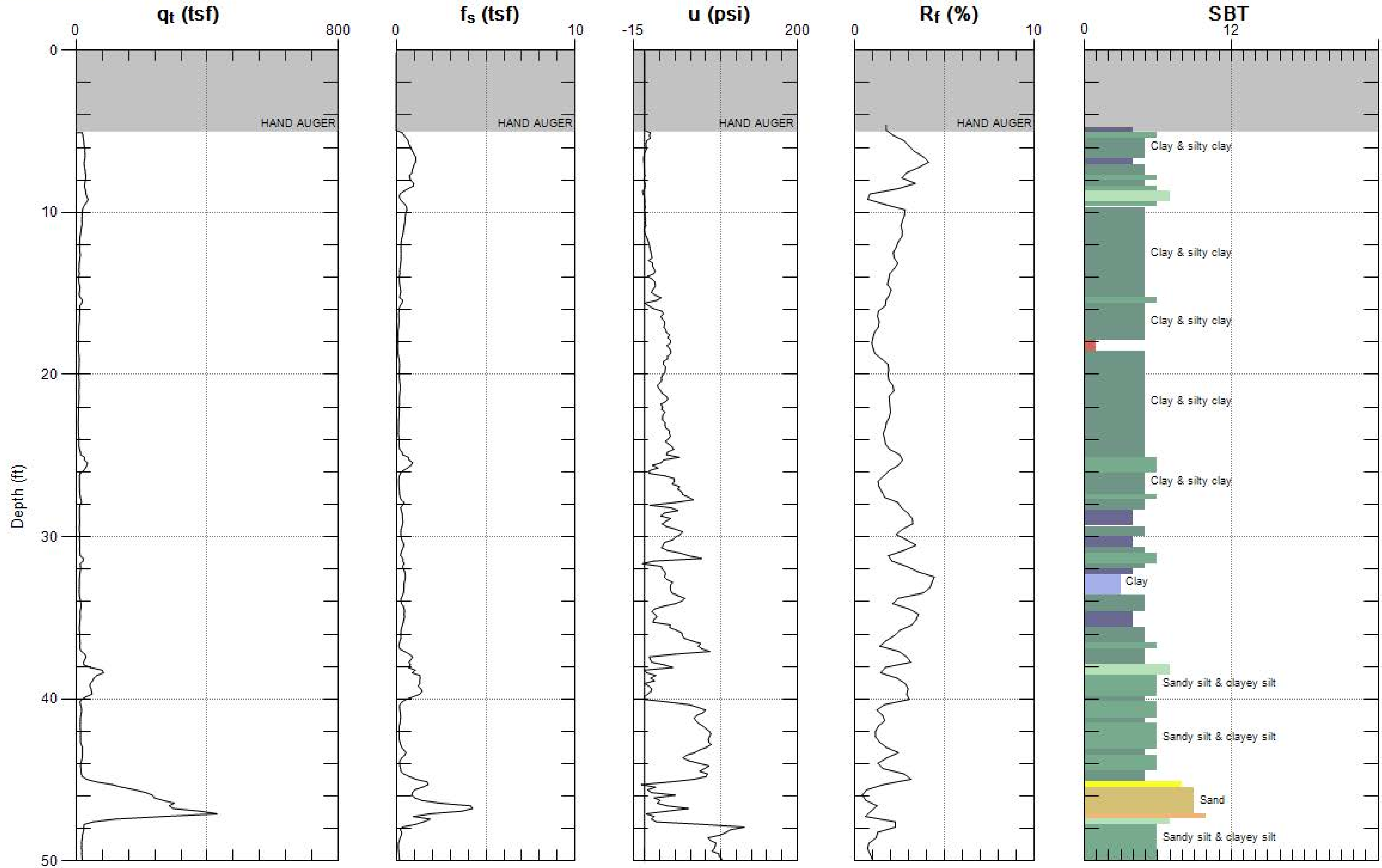
SBT: Soil Behavior Type (Robertson 1990)

GREGG

STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.
Sounding: CPT-3

Engineer: T.CHEN
Date: 2/10/17 11:17

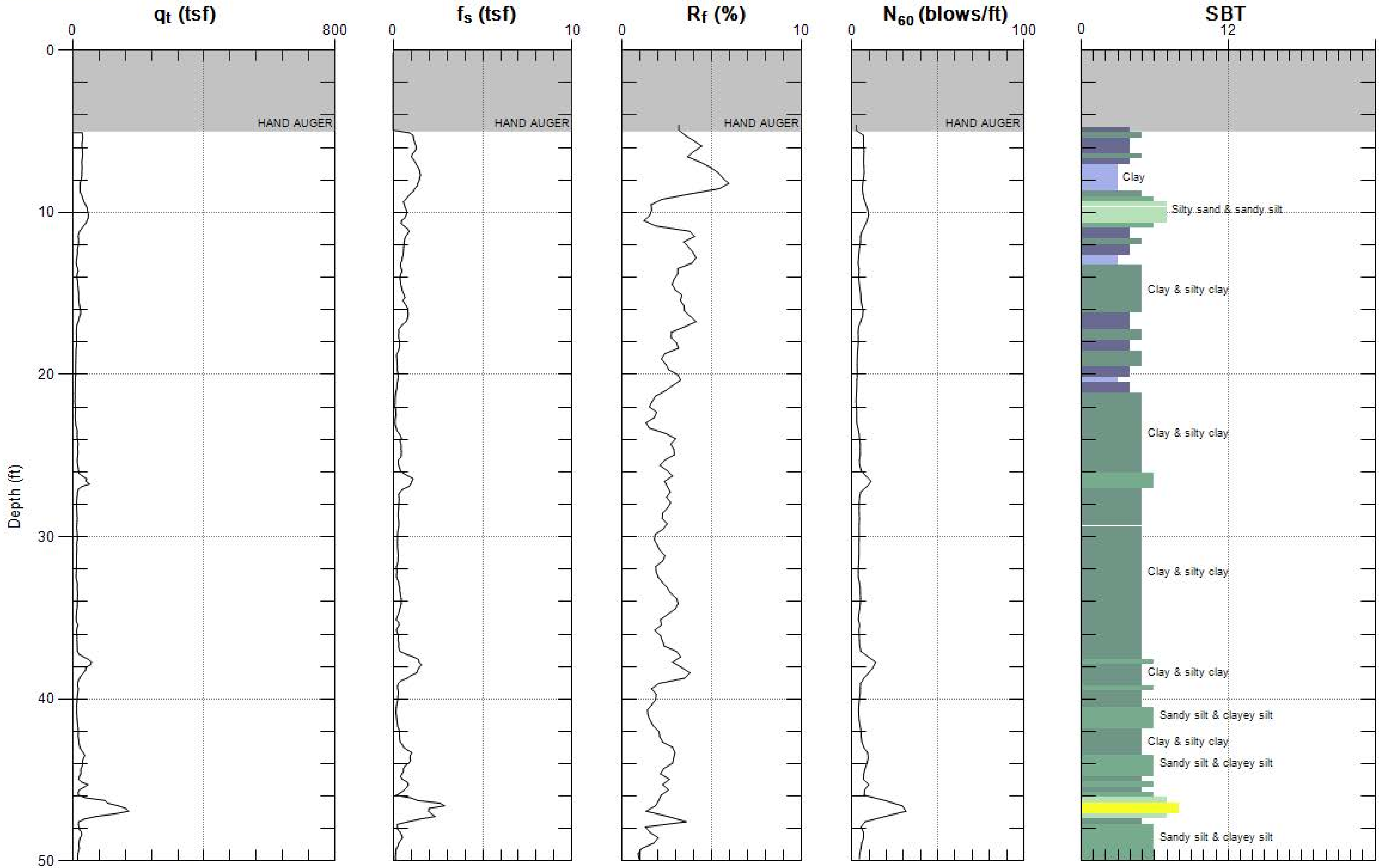


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.
Sounding: CPT-4
Engineer: T.CHEN
Date: 2/10/17 12:38



Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

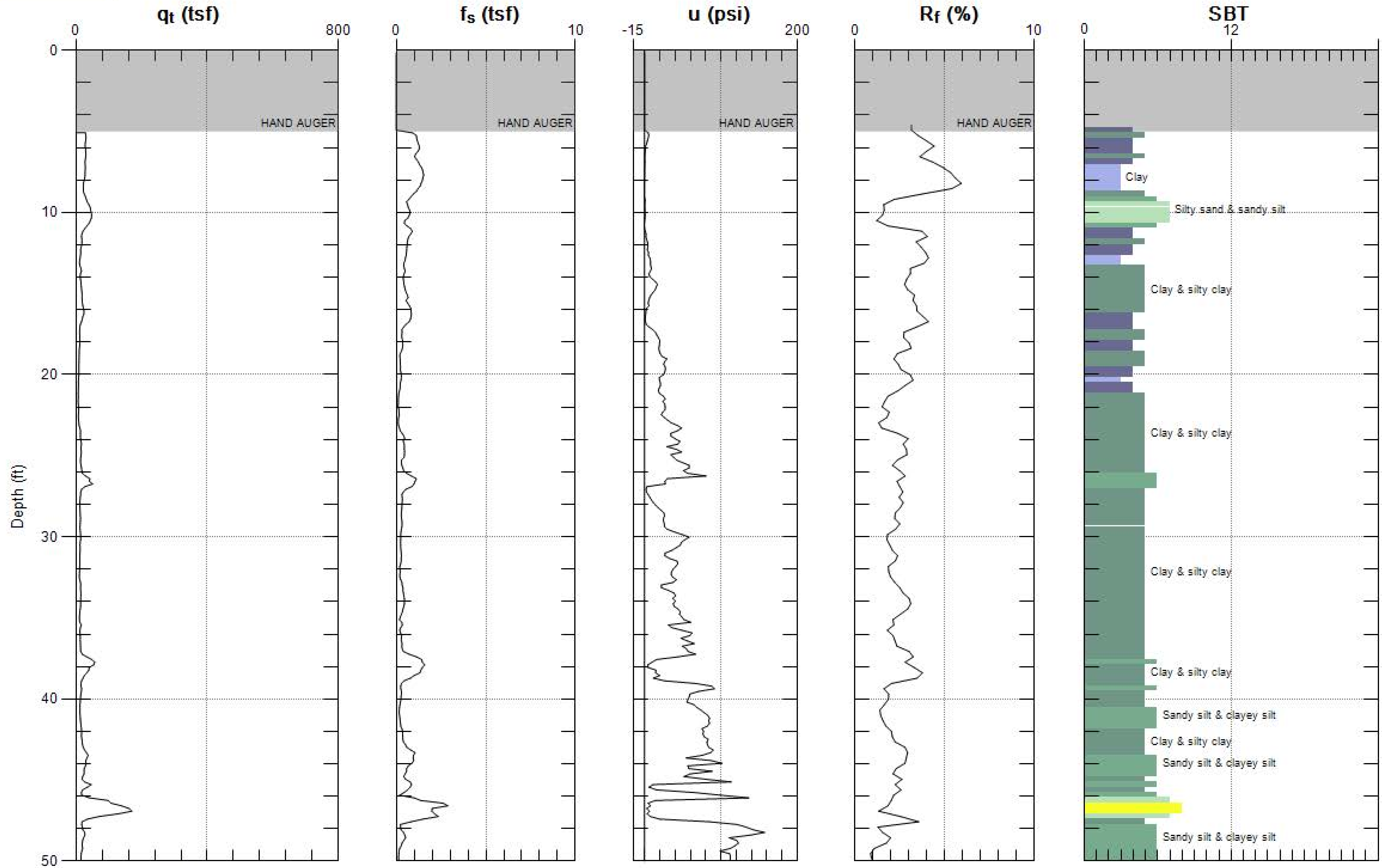
STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.

Sounding: CPT-4

Engineer: T.CHEN

Date: 2/10/17 12:38



Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

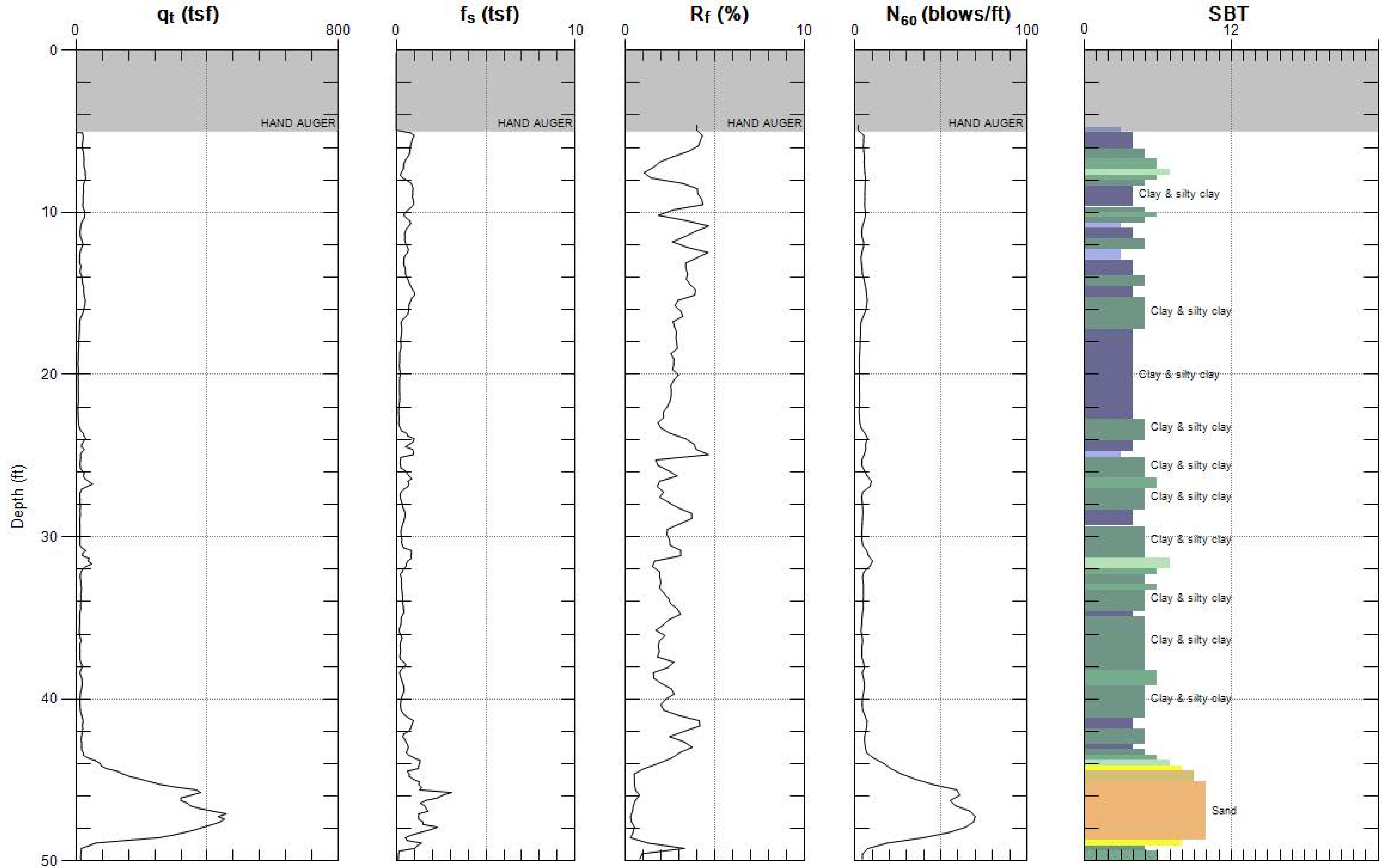
SBT: Soil Behavior Type (Robertson 1990)

GREGG

STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.
Sounding: CPT-5

Engineer: T.CHEN
Date: 2/10/17 01:31



Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

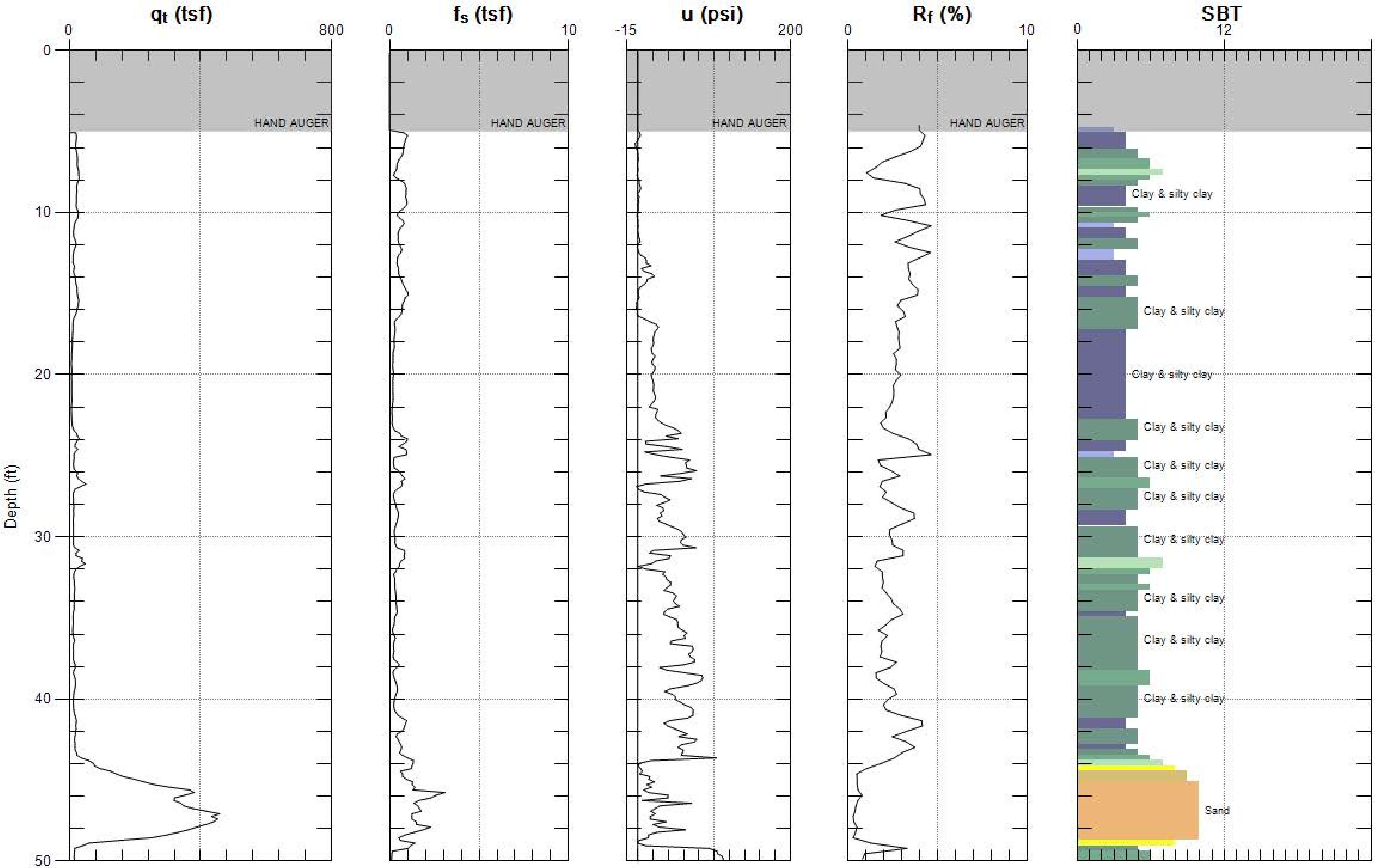
SBT: Soil Behavior Type (Robertson 1990)

GREGG

STEVENS, FERRONE & BAILEY

Site: W. SAN CARLOS ST.
Sounding: CPT-5

Engineer: T.CHEN
Date: 2/10/17 01:31



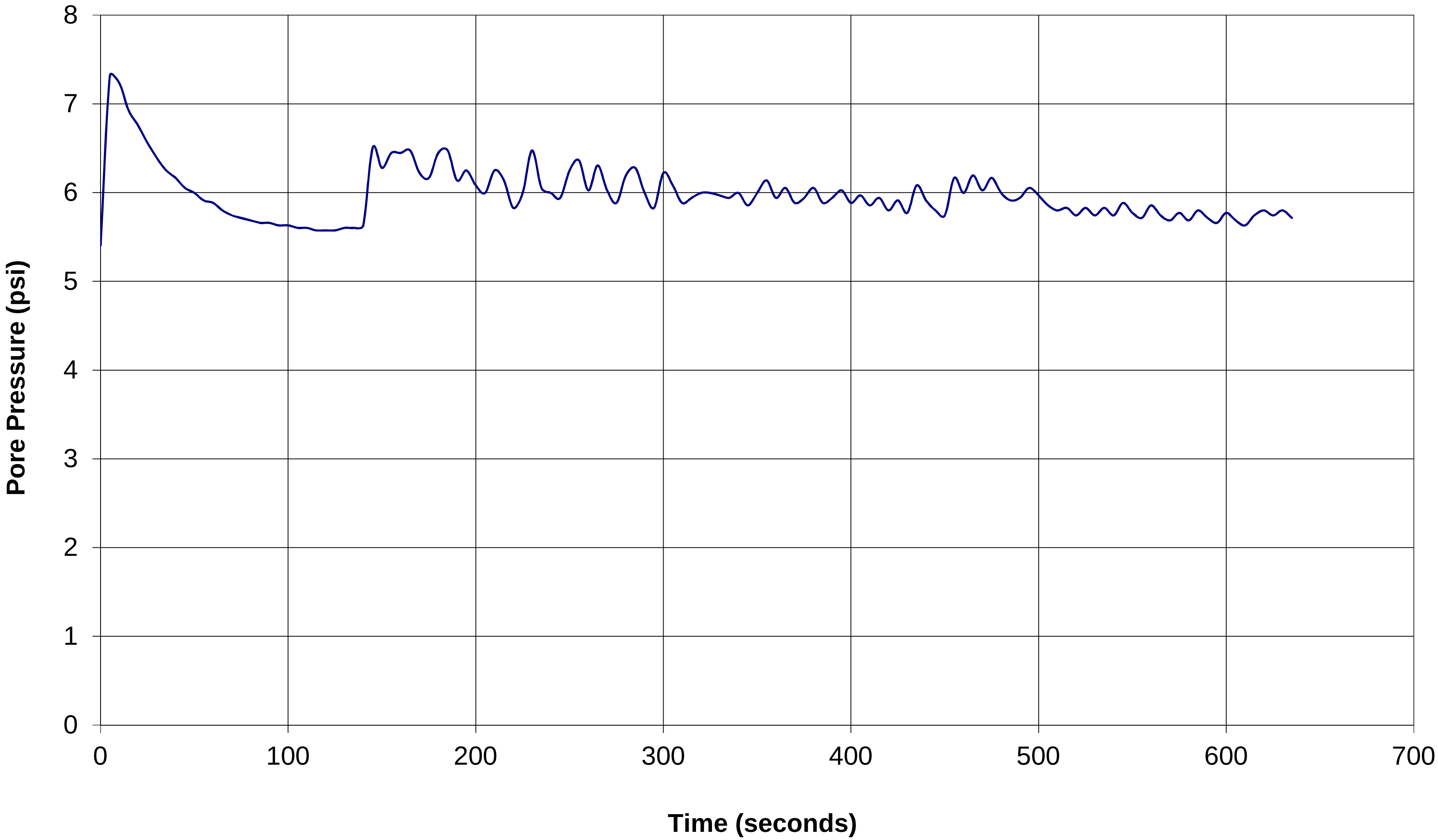
Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

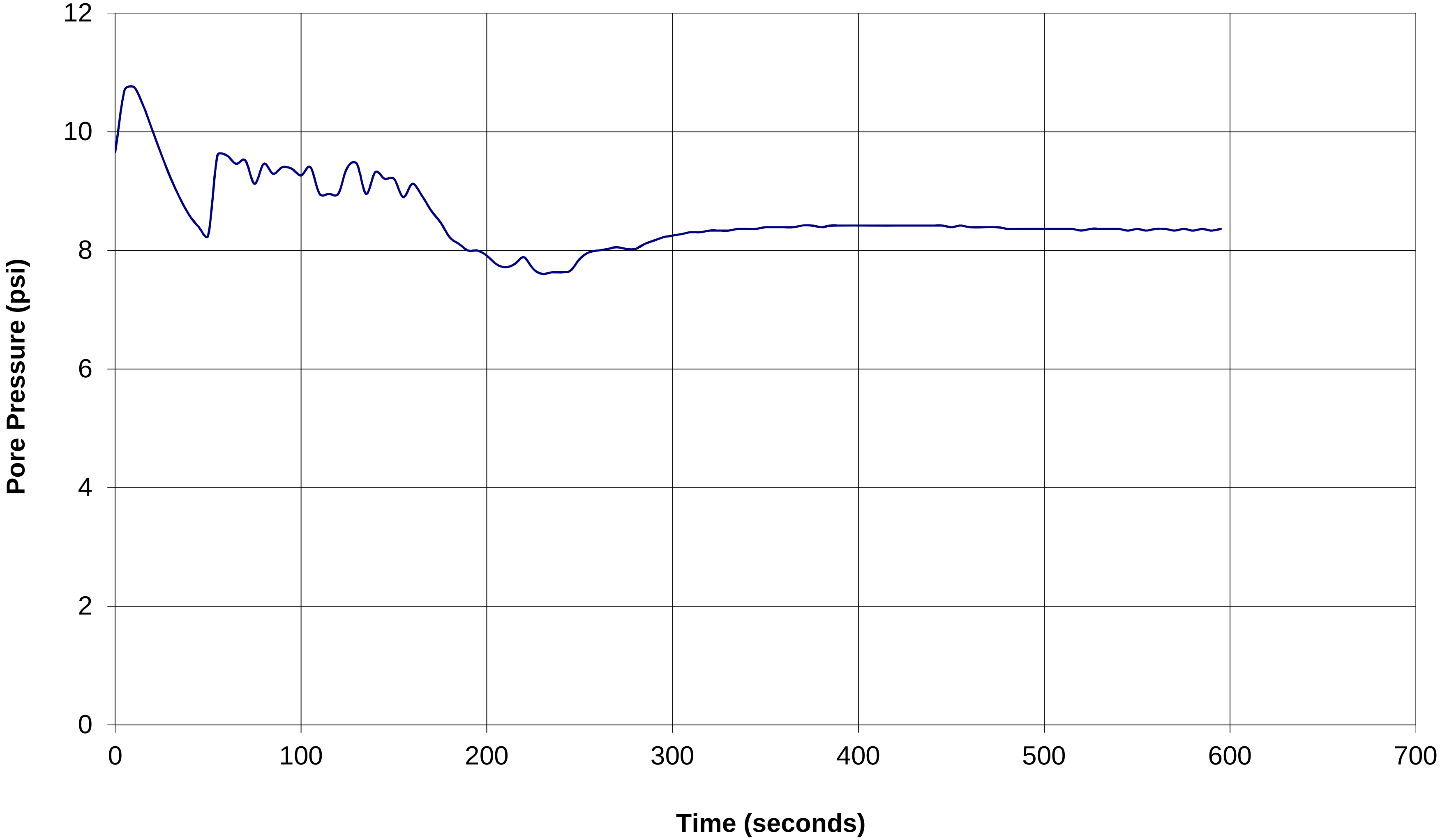
Sounding: CPT-1
Depth: 41.8305825
Site: W.SAN CARLOS
Engineer: T.CHEN



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

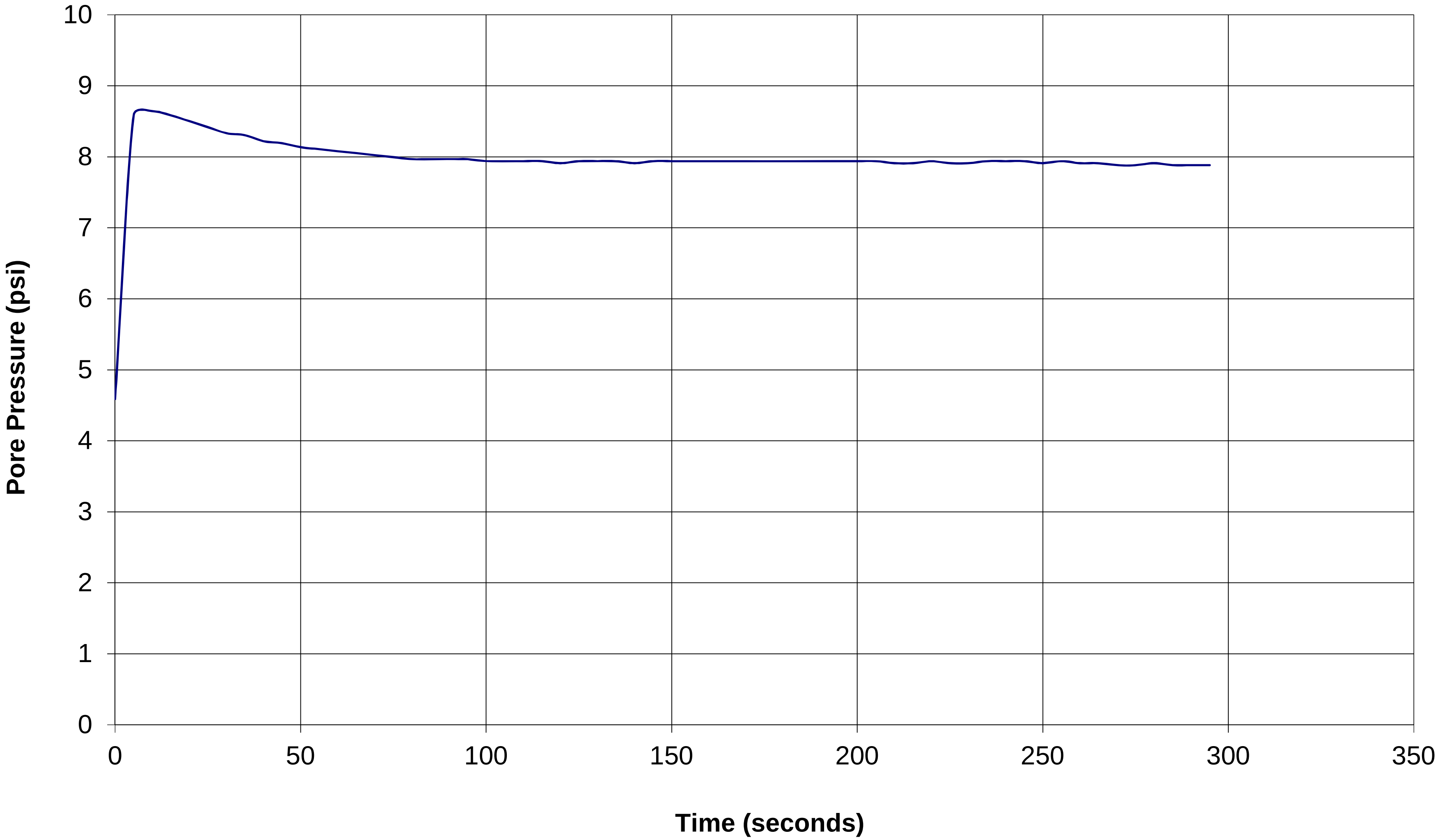
Sounding: CPT-1
Depth: 50.0326575
Site: W.SAN CARLOS
Engineer: T.CHEN



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding:	CPT-5
Depth:	44.619288
Site:	W.SAN CARLOS
Engineer:	T.CHEN



APPENDIX B

Laboratory Investigation

APPENDIX B
Laboratory Investigation

Our laboratory testing program for the proposed new supermarket development to be located on southeastern corner of West San Carlos and Race Street in San Jose, California was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the soils underlying the site.

The natural water content was determined on eight samples of the subsurface soils. The water contents are recorded on the boring logs at the appropriate sample depths.

Dry density determination was performed on eight samples of the subsurface soils to evaluate their physical properties. The results of the tests are shown on the boring logs at the appropriate sample depths.

Atterberg Limit determinations were performed on one sample of the subsurface soils to determine the range of water content over which these materials exhibit plasticity. These values are used to classify the soil in accordance with the Unified Soil Classification System and to indicate the soil's compressibility and expansion potentials. The results of the tests are presented on the boring log at the appropriate sample depth and are also attached to this appendix.

Gradation and hydrometer tests were performed on one sample of the subsurface soils. These tests were performed to assist in the classification of the soils and to determine their grain size distribution. The results of the tests are presented on the boring log at the appropriate sample depth and are also attached to this appendix.

Unconfined compression test was performed on six relatively undisturbed samples of the subsurface soils to evaluate the undrained shear strengths of these materials. Failure was taken as the peak normal stress. The results of the tests are presented on the boring logs at the appropriate sample depths and are also attached to this appendix.

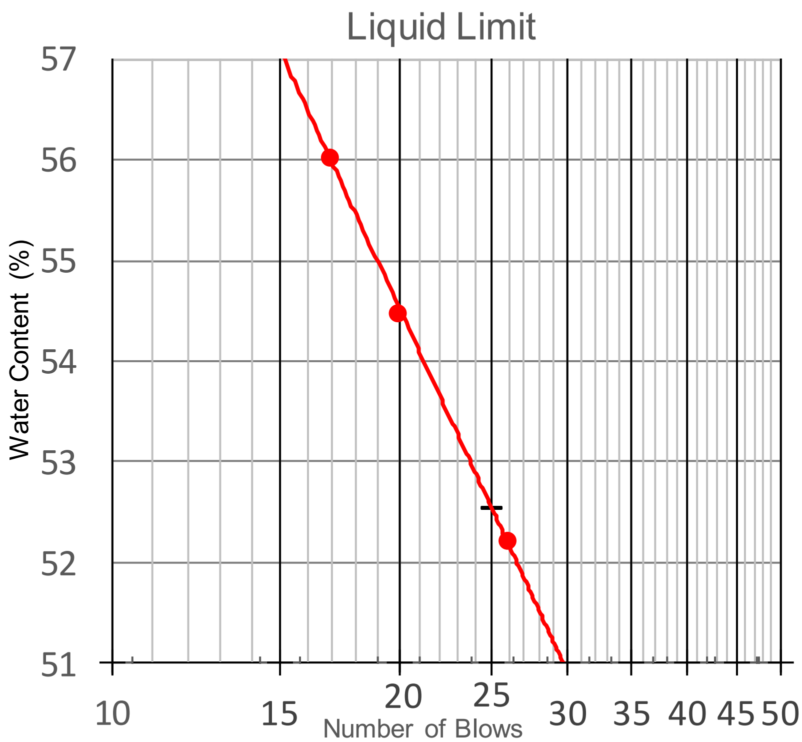
Two onsite soil samples were tested for pH (ASTM D4972), chlorides (ASTM D4327), sulfates (ASTM D4327), sulfides (ASTM D4658M), resistivity at 100% saturation (ASTM G57), and Redox potential (ASTM D1498) for use in evaluating the potential for corrosion on concrete and buried metal such as utilities and reinforcing steel. The results of these tests are included in Appendix B. We recommend these test results be forwarded to your underground contractors, pipeline designers, and foundation designers and contractors.

Atterberg Limits Test – ASTM D4318

Project Number: 502-6 **Project Name:** West San Carlos St. & Race St.

Boring/Sample No: SFB-3 **Depth:** 2 ft **Date:** 01-23-17

Description of Sample: Dark brown silty CLAY some sand (CH) **Tested By** R

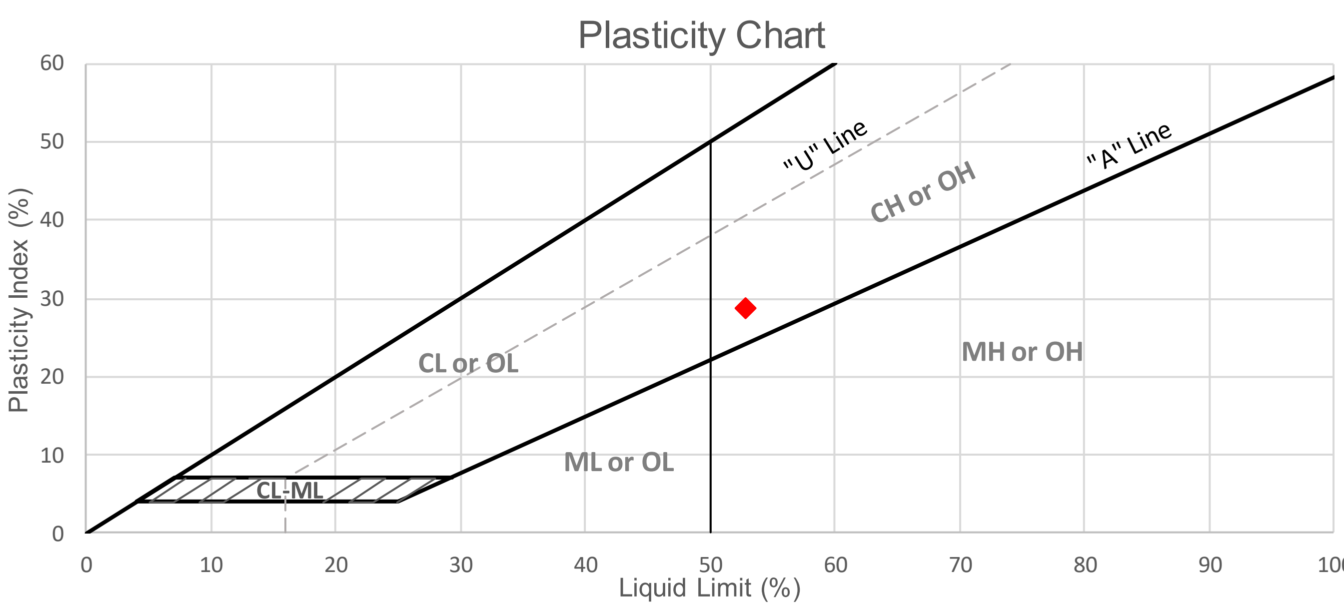


Plastic Limit Data

Trial	1	2	Ave
Water Content (%)	23.6	23.4	24

Data Summary

Liquid Limit	**53**
Plastic Limit	**24**
Plasticity Index	**29**
Natural Water Content	**27.6**
Liquidity Index	**0.129**
% Passing #200	**87.4**



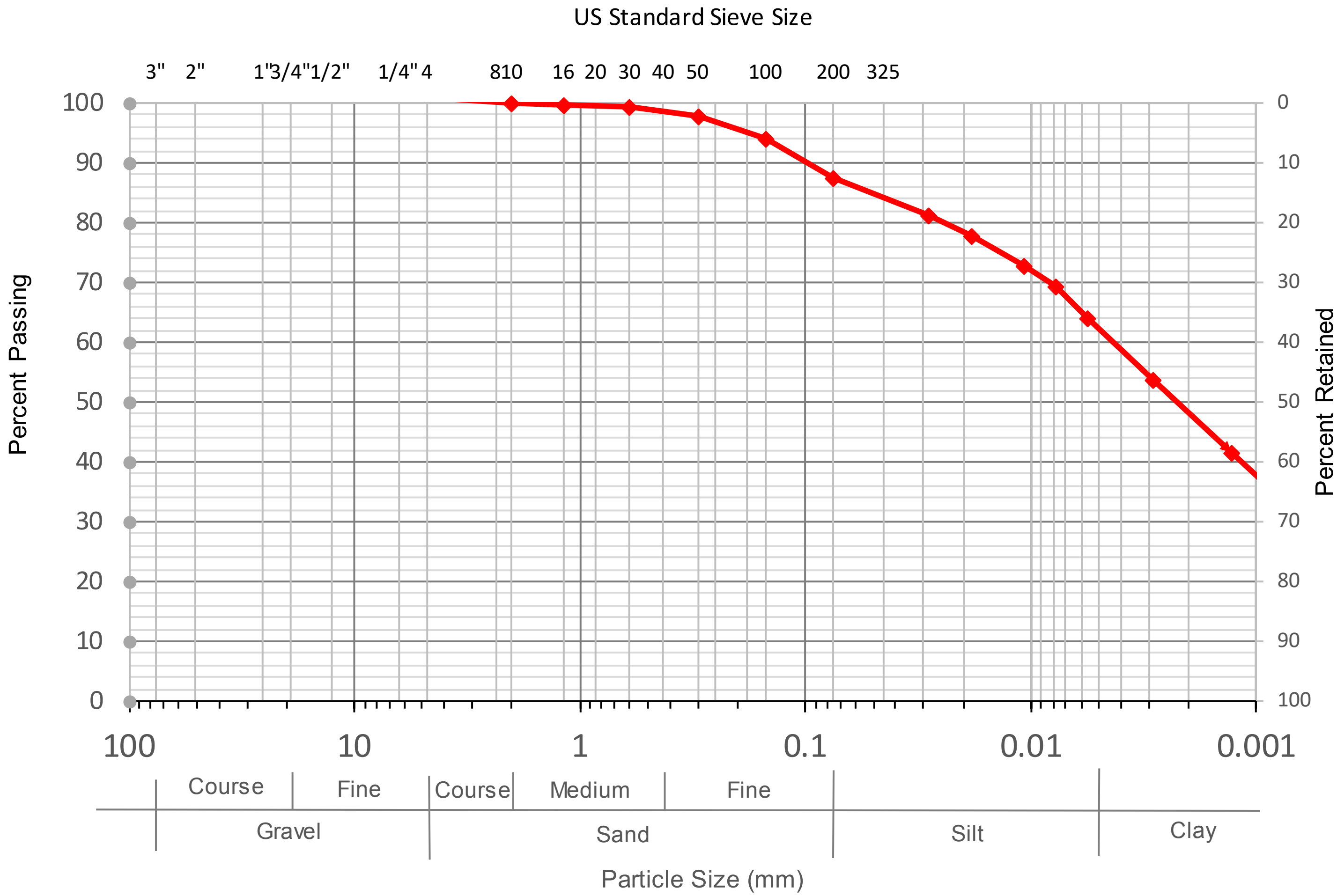
Stevens Ferrone & Bailey Engineering Company, Inc

Hydrometer Analysis – ASTM D422

Project Number: 502-6 **Project Name:** West San Carlos St. & Race St.

Sample Number: SFB-3 **Description:** Dark brown silty CLAY some sand (CH)

Depth: 2 ft **Test Date:** 01-24-17 **Tested By:** R



Composite Sieve Data

Standard Sieve Size	Percent Passing
3”	
1.5”	
3/4”	
3/8”	
#4	
#10	100
#16	99.8
#30	99.3
#50	97.9
#100	93.9
#200	87.4

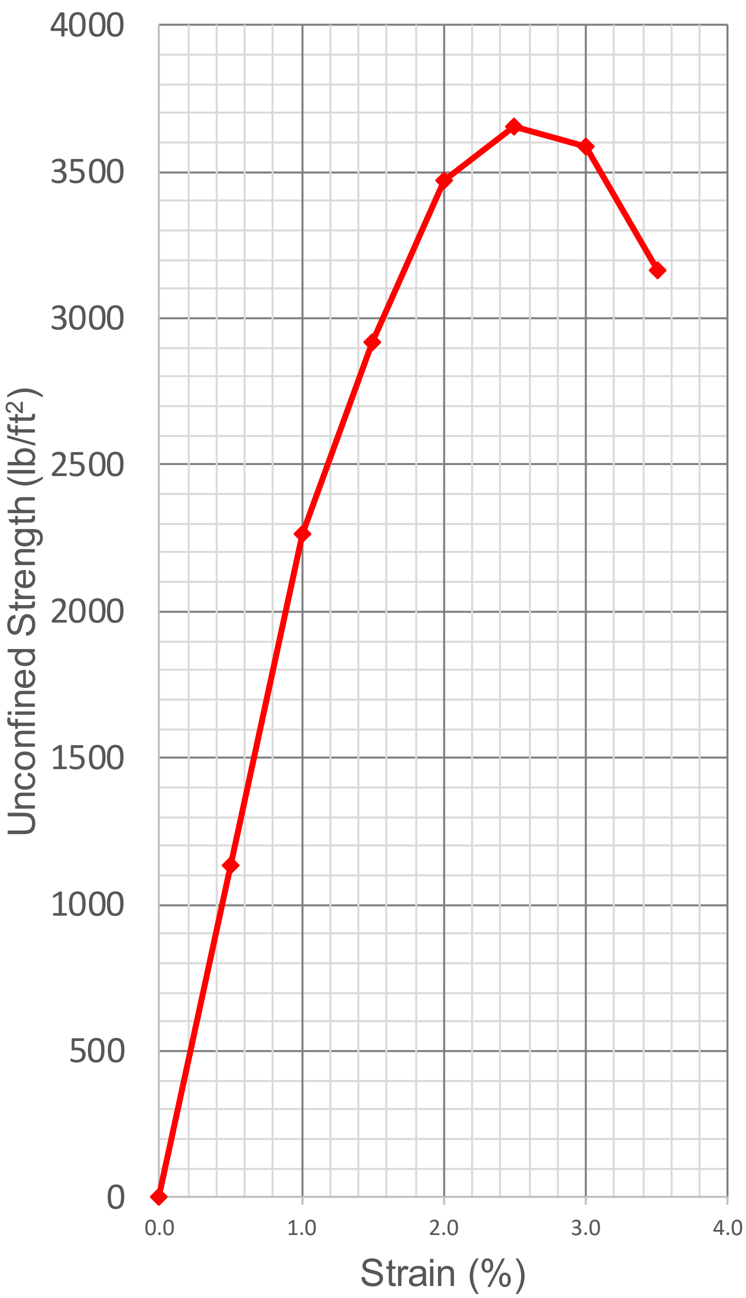
Particle Diameter (mm)	Percent Soil in Suspension
0.0283	81.3
0.0182	77.9
0.0108	72.7
0.0078	69.2
0.0056	64.0
0.0029	53.6
0.0013	41.5

UNCONFINED COMPRESSIVE STRENGTH – D2166

Project Number: 502-6 **Boring #:** SFB-1 **Depth:** 6 ft

Project Name: West San Carlos St. & Race St. **Date:** 1/20/2017

Description: Brown sandy silty CLAY (CL) **Tested By:** R



Soil Specimen Initial Measurements	
Diameter	2.42 in
Initial Area	4.60 in^2
Initial Length	5 in
Volume	0.01331 ft^3
Water Content	15.1
Wet Density	125.6 pcf
Dry Density	109.1 pcf

Max Unconfined Compressive Strength	
Elapsed Time	2.5 min
Vertical Dial	0.125 in
Strain	2.5 %
Area	0.03276 ft^2
Axial Load	119.7 lbs
Compressive Strength	3,653 psf

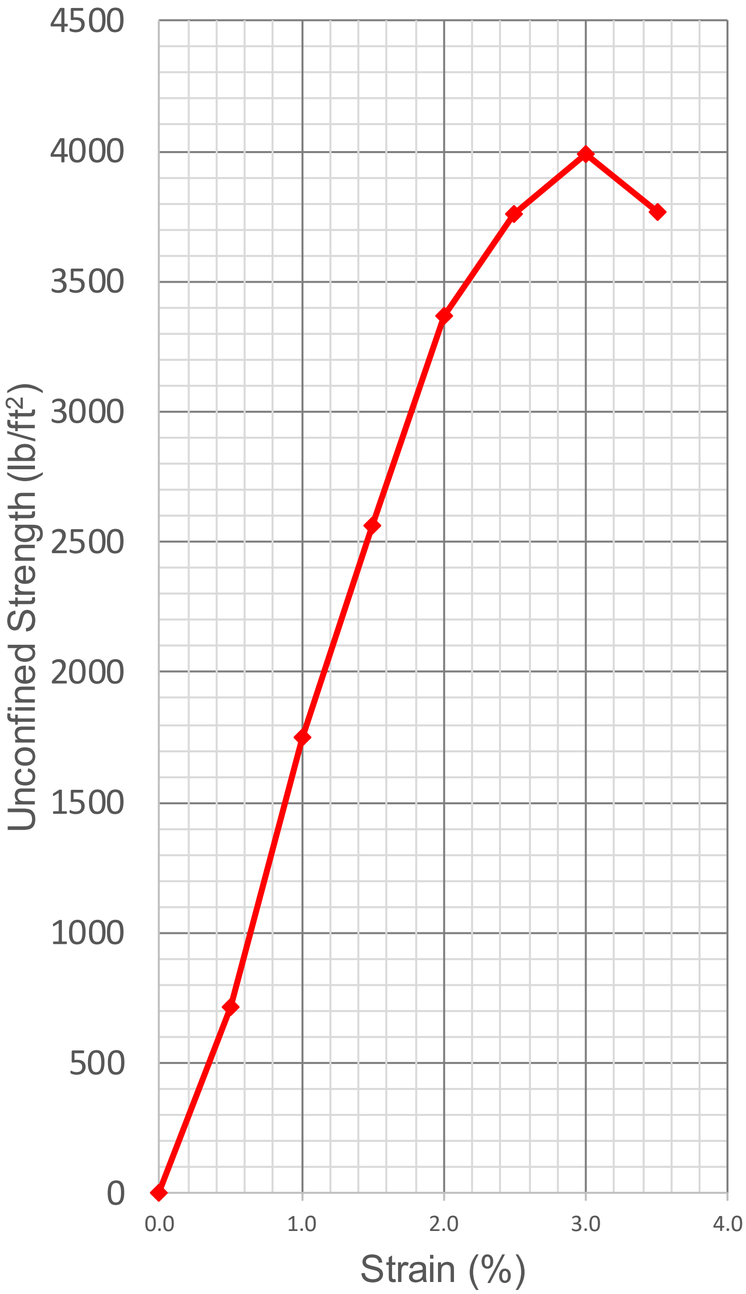
Stevens Ferrone & Bailey Engineering Company, Inc

UNCONFINED COMPRESSIVE STRENGTH – D2166

Project Number: 502-6 **Boring #:** SFB-1 **Depth:** 11 ft

Project Name: West San Carlos St. & Race St. **Date:** 1/20/2017

Description: Rust gray brown sandy silty CLAY (CL/SC) **Tested By:** R



Soil Specimen Initial Measurements	
Diameter	2.42 in
Initial Area	4.60 in^2
Initial Length	5 in
Volume	0.01331 ft^3
Water Content	16.0
Wet Density	126.3 pcf
Dry Density	108.9 pcf

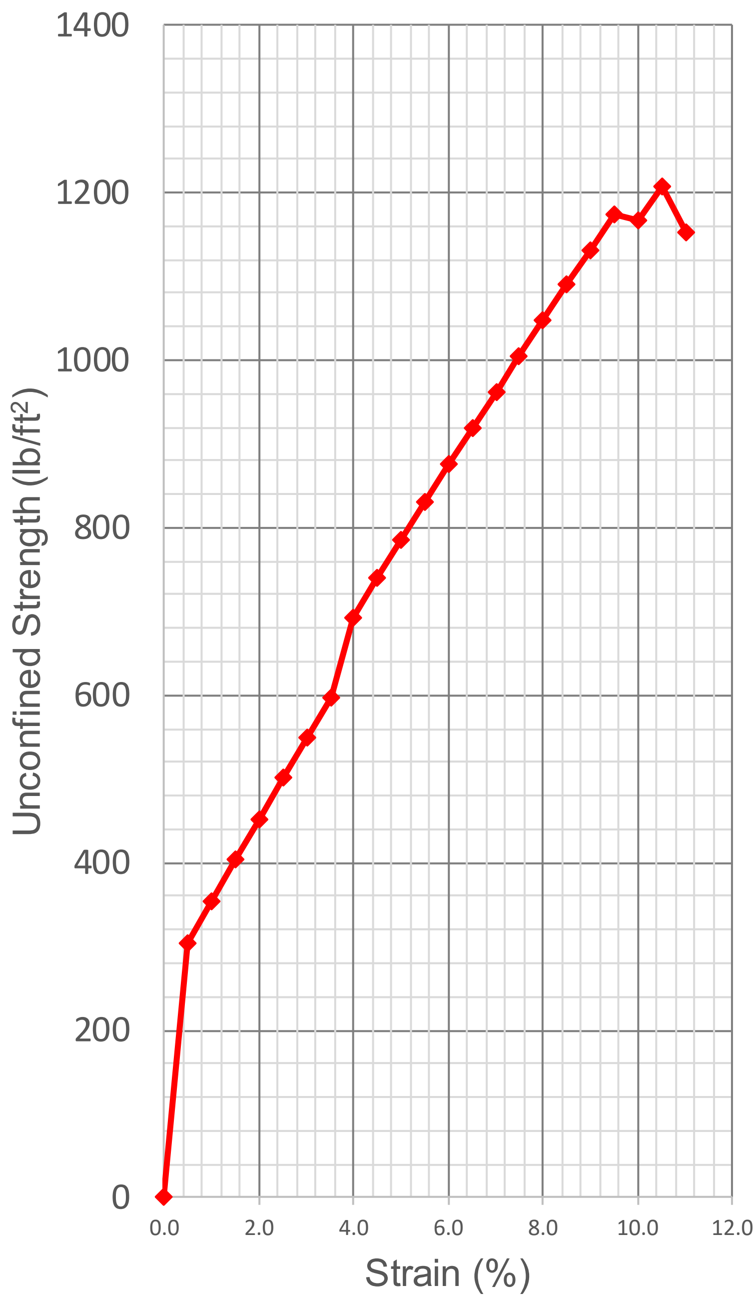
Max Unconfined Compressive Strength	
Elapsed Time	3 min
Vertical Dial	0.15 in
Strain	3.0 %
Area	0.03293 ft^2
Axial Load	131.4 lbs
Compressive Strength	3,990 psf

UNCONFINED COMPRESSIVE STRENGTH – D2166

Project Number: 502-6 **Boring #:** SFB-1 **Depth:** 16 ft

Project Name: West San Carlos St. & Race St. **Date:** 1/20/2017

Description: Light brown silty CLAY some sand (CL) **Tested By:** R



Soil Specimen Initial Measurements	
Diameter	2.42 in
Initial Area	4.60 in^2
Initial Length	5 in
Volume	0.01331 ft^3
Water Content	29.5
Wet Density	114.3 pcf
Dry Density	88.3 pcf

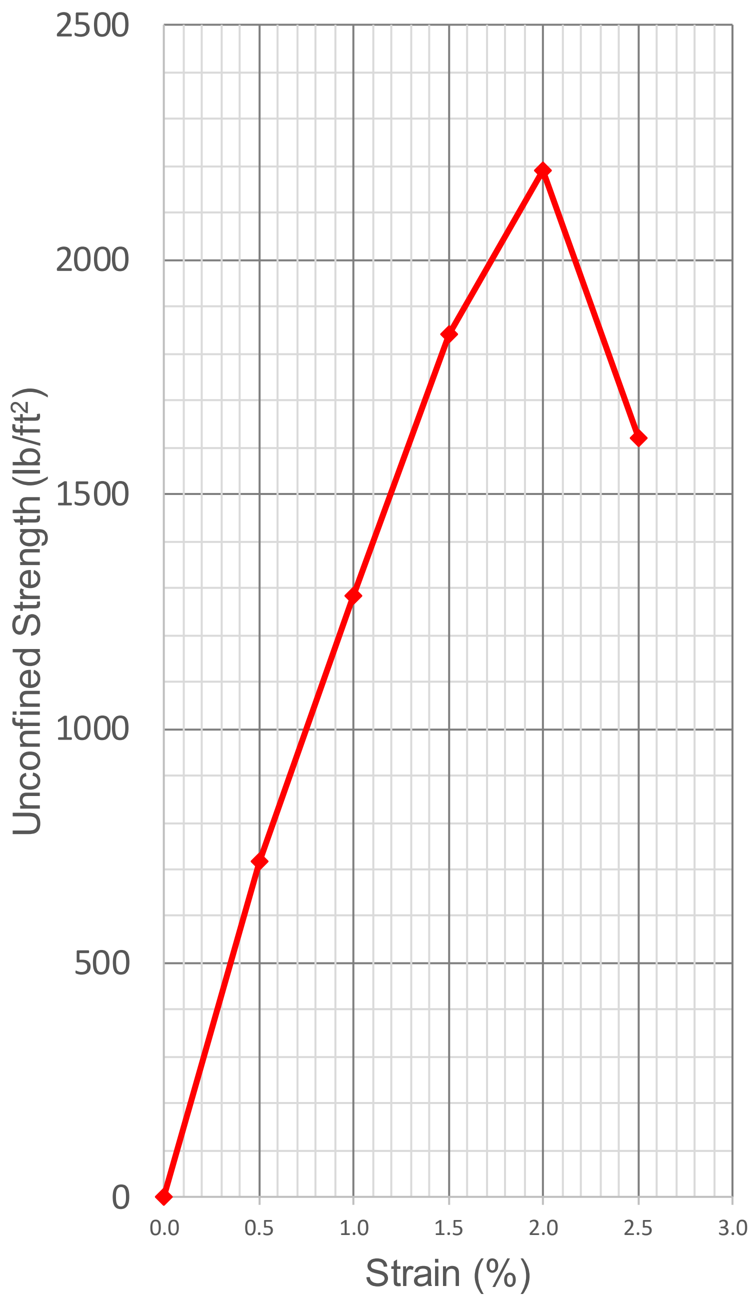
Max Unconfined Compressive Strength	
Elapsed Time	10.5 min
Vertical Dial	0.525 in
Strain	10.5 %
Area	0.03569 ft^2
Axial Load	43.1 lbs
Compressive Strength	1,208 psf

UNCONFINED COMPRESSIVE STRENGTH – D2166

Project Number: 502-6 **Boring #:** SFB-3 **Depth:** 11 ft

Project Name: West San Carlos St. & Race St. **Date:** 1/20/2017

Description: Light rust brown sandy silty CLAY (CL/SC) **Tested By:** R



Soil Specimen Initial Measurements	
Diameter	2.42 in
Initial Area	4.60 in^2
Initial Length	5 in
Volume	0.01331 ft^3
Water Content	17.5
Wet Density	120.9 pcf
Dry Density	102.9 pcf

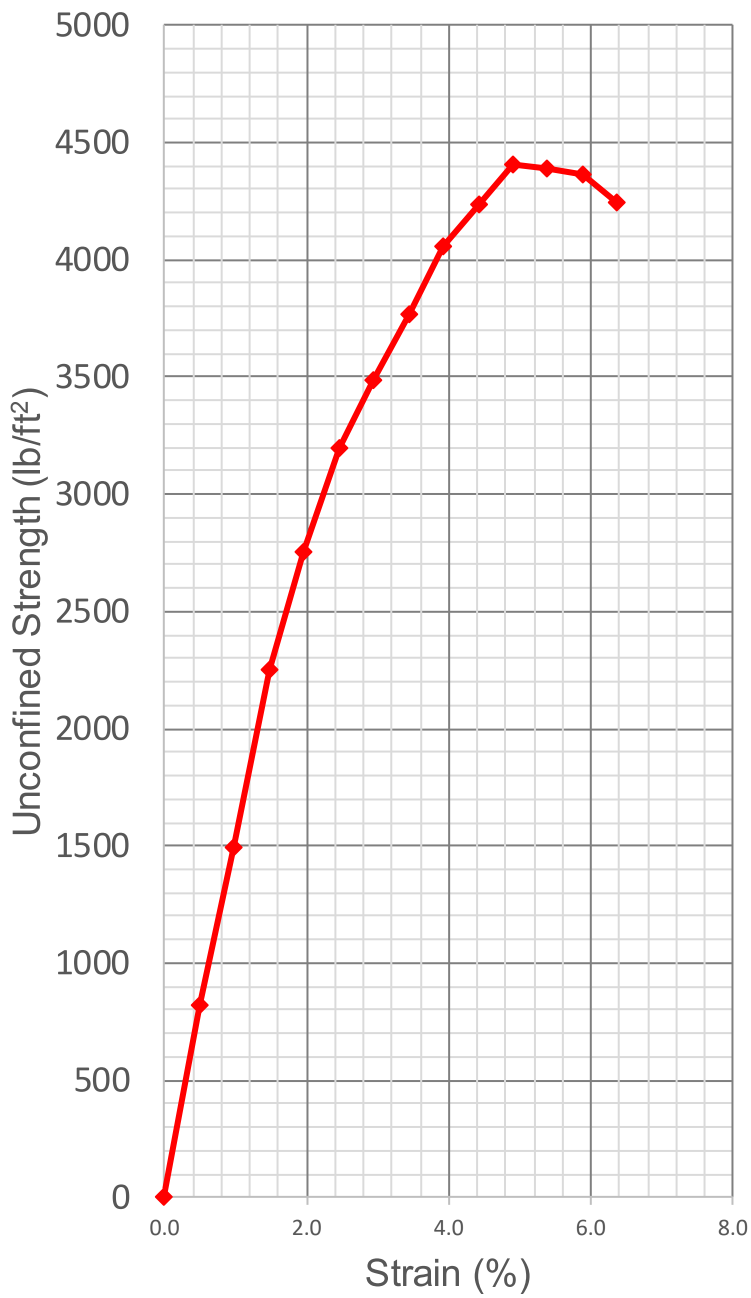
Max Unconfined Compressive Strength	
Elapsed Time	2 min
Vertical Dial	0.1 in
Strain	2.0 %
Area	0.03260 ft^2
Axial Load	71.4 lbs
Compressive Strength	2,190 psf

UNCONFINED COMPRESSIVE STRENGTH – D2166

Project Number: 502-6 **Boring #:** SFB-3 **Depth:** 2 ft

Project Name: West San Carlos St. & Race St. **Date:** 1/20/2017

Description: Dark brown silty CLAY some sand (CH) **Tested By:** R



Soil Specimen Initial Measurements	
Diameter	2.42 in
Initial Area	4.60 in^2
Initial Length	5.1 in
Volume	0.01358 ft^3
Water Content	27.6
Wet Density	120.7 pcf
Dry Density	94.6 pcf

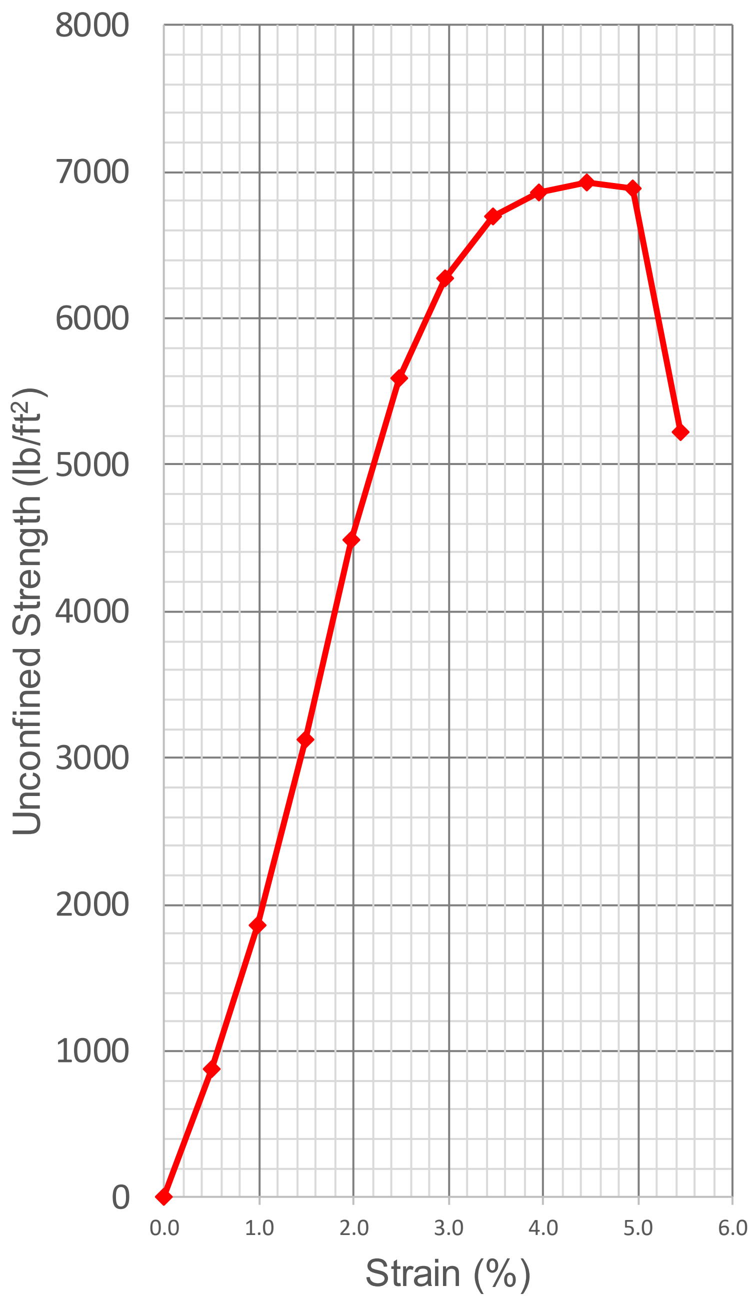
Max Unconfined Compressive Strength	
Elapsed Time	5 min
Vertical Dial	0.25 in
Strain	4.9 %
Area	0.03359 ft^2
Axial Load	148.1 lbs
Compressive Strength	4,409 psf

UNCONFINED COMPRESSIVE STRENGTH – D2166

Project Number: 502-6 **Boring #:** SFB-3 **Depth:** 6 ft

Project Name: West San Carlos St. & Race St. **Date:** 1/20/2017

Description: Light brown silty CLAY some sand (CL) **Tested By:** R



Soil Specimen Initial Measurements	
Diameter	2.42 in
Initial Area	4.60 in^2
Initial Length	5.05 in
Volume	0.01344 ft^3
Water Content	15.6
Wet Density	131.7 pcf
Dry Density	113.9 pcf

Max Unconfined Compressive Strength	
Elapsed Time	4.5 min
Vertical Dial	0.225 in
Strain	4.5 %
Area	0.03343 ft^2
Axial Load	231.4 lbs
Compressive Strength	6,921 psf

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Stevens, Ferrone & Bailey
Client's Project No.: SFB 502-6
Client's Project Name: W. San Carlos St. & Race St., San Jose
Date Sampled: 17-Jan-17
Date Received: 19-Jan-17
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 30-Jan-2017

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1701153-001	SFB-1 @ 2'	430	8.14	-	1,800	N.D.	N.D.	61
1701153-002	SFB-3 @ 6'	430	8.04	-	1,100	N.D.	N.D.	24

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	27-Jan-2017	27-Jan-2017	-	25-Jan-2017	24-Jan-2017	25-Jan-2017	25-Jan-2017

Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis
N.D. - None Detected

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

APPENDIX C

Liquefaction Analyses

LIQUEFACTION ANALYSES BASED ON CPT DATA
WEST SAN CARLOS STREET & RACE SREEET, SAN JOSE, CALIFORNIA

SFB 502-6
2/17/17 TC

a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-1
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ^*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
ft	ft	tsf	tsf				psf	psf																					
	0.3																												
	0.7																												
	1.0																												
	1.3																												
	1.6																												
	2.0																												
	2.3																												
	2.6																												
	3.0																												
	3.3																												
	3.6																												
	3.9																												
	4.3																												
	4.6																												
	4.9	12.50	0.17	6	Sandy Silt to Clayey Silt	3	565.9	565.9	43.2	1.4	2.28	23.0	2.51	23.0	2.51	2.8	64.5	0.10	0.98	0.32	0.875	0.36	1.49	0.25	Not Saturated				
	5.2	32.59	0.60	6	Sandy Silt to Clayey Silt	7	603.6	603.6	107.0	1.9	2.07	58.1	2.27	58.1	2.27	1.8	107.0	0.19	0.98	0.32	0.875	0.36	1.46	0.25	Not Saturated				
	5.6	31.59	0.72	6	Sandy Silt to Clayey Silt	7	641.4	641.4	97.5	2.3	2.17	54.6	2.35	54.6	2.35	2.1	115.4	0.22	0.98	0.32	0.875	0.36	1.43	0.25	Not Saturated				
	5.9	31.91	0.76	6	Sandy Silt to Clayey Silt	7	679.2	679.2	93.0	2.4	2.20	53.6	2.37	53.6	2.37	2.2	116.9	0.23	0.98	0.32	0.875	0.36	1.41	0.26	Not Saturated				
	6.2	20.98	0.64	5	Clayey Silt to Silt Clay	5	716.9	716.9	57.5	3.1	2.42	34.3	2.58	34.3	2.58	3.2	110.9	0.21	0.97	0.32	0.875	0.36	1.38	0.26	Not Saturated				
	6.6	25.97	0.64	6	Sandy Silt to Clayey Silt	6	754.6	754.6	67.8	2.5	2.30	41.4	2.46	41.4	2.46	2.6	106.5	0.19	0.97	0.32	0.875	0.36	1.36	0.26	Not Saturated				
	6.9	50.21	1.00	7	Silty Sand to Sandy Silt	11	792.4	792.4	125.7	2.0	2.05	78.1	2.19	78.1	2.19	1.6	128.5	0.28	0.97	0.32	0.875	0.36	1.34	0.27	Not Saturated				
	7.2	76.08	1.38	7	Silty Sand to Sandy Silt	15	830.1	830.1	182.3	1.8	1.91	115.6	2.04	115.6	2.04	1.4	157.3	0.44	0.97	0.31	0.875	0.36	1.32	0.27	Not Saturated				
	7.5	59.01	1.10	7	Silty Sand to Sandy Silt	12	867.8	867.8	135.0	1.9	2.01	87.7	2.14	87.7	2.14	1.5	133.5	0.30	0.97	0.31	0.875	0.36	1.31	0.27	Not Saturated				
	7.9	29.82	0.80	6	Sandy Silt to Clayey Silt	7	905.5	905.5	64.9	2.7	2.34	43.4	2.47	43.4	2.47	2.6	113.6	0.22	0.97	0.31	0.875	0.36	1.29	0.28	Not Saturated				
	8.2	33.94	0.99	6	Sandy Silt to Clayey Silt	8	943.2	943.2	71.0	2.9	2.34	48.4	2.46	48.4	2.46	2.6	124.1	0.26	0.96	0.31	0.875	0.36	1.27	0.28	Not Saturated				
	8.5	35.73	1.12	5	Clayey Silt to Silt Clay	9	981.0	981.0	71.9	3.2	2.36	50.0	2.47	50.0	2.47	2.6	131.3	0.29	0.96	0.31	0.875	0.36	1.26	0.28	Not Saturated				
	8.9	33.86	0.84	6	Sandy Silt to Clayey Silt	8	1,018.7	1,018.7	65.5	2.5	2.31	46.5	2.42	46.5	2.42	2.4	112.0	0.21	0.96	0.31	0.875	0.36	1.25	0.29	Not Saturated				
	9.2	38.49	0.78	6	Sandy Silt to Clayey Silt	9	1,056.4	1,056.4	71.9	2.1	2.23	51.9	2.33	51.9	2.33	2.1	106.5	0.19	0.96	0.31	0.875	0.35	1.23	0.29	Not Saturated				
	9.5	34.20	0.65	6	Sandy Silt to Clayey Silt	8	1,094.1	1,094.1	61.5	1.9	2.26	45.3	2.36	45.3	2.36	2.2	97.5	0.17	0.96	0.31	0.875	0.35	1.22	0.29	Not Saturated				
	9.8	33.40	0.61	6	Sandy Silt to Clayey Silt	8	1,131.9	1,131.9	58.0	1.9	2.27	43.5	2.36	43.5	2.36	2.2	94.1	0.16	0.96	0.31	0.875	0.35	1.21	0.29	Not Saturated				
	10.2	29.20	0.49	6	Sandy Silt to Clayey Silt	7	1,169.7	1,169.7	48.9	1.7	2.30	37.4	2.39	37.4	2.39	2.3	84.6	0.14	0.95	0.31	0.875	0.35	1.19	0.30	Not Saturated				
	10.5	38.74	0.46	7	Silty Sand to Sandy Silt	8	1,207.4	1,207.4	63.2	1.2	2.12	48.8	2.21	48.8	2.21	1.7	82.0	0.13	0.95	0.31	0.875	0.35	1.18	0.30	Not Saturated				
	10.8	38.45	0.45	7	Silty Sand to Sandy Silt	8	1,245.1	1,245.1	60.8	1.2	2.13	47.7	2.21	47.7	2.21	1.7	80.9	0.13	0.95	0.31	0.875	0.35	1.17	0.30	Not Saturated				
	11.2	39.80	0.32	7	Silty Sand to Sandy Silt	8	1,282.8	1,282.8	61.0	0.8	2.03	48.7	2.11	48.7	2.11	1.5	72.1	0.11	0.94	0.31	0.875	0.35	1.16	0.30	Not Saturated				
	11.5	39.59	0.59	7	Silty Sand to Sandy Silt	9	1,320.5	1,320.5	59.0	1.5	2.20	47.7	2.27	47.7	2.27	1.9	88.9	0.15	0.94	0.31	0.875	0.35	1.15	0.30	Not Saturated				
	11.8	27.58	0.78	5	Clayey Silt to Silt Clay	7	1,358.3	1,358.3	39.6	2.9	2.52	32.8	2.58	32.8	2.58	3.2	105.1	0.19	0.94	0.31	0.875	0.35	1.14	0.31	Not Saturated				
	12.1	19.22	0.62	5	Clayey Silt to Silt Clay	5	1,396.0	1,396.0	26.5	3.4	2.69	26.5	2.69	26.5	2.69	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.13	0.30	Not Saturated				
	12.5	30.30	0.43	7	Silty Sand to Sandy Silt	7	1,433.7	1,433.7	41.3	1.4	2.31	35.0	2.37	35.0	2.37	2.2	76.7	0.12	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	12.8	37.11	0.26	7	Silty Sand to Sandy Silt	8	1,471.4	1,471.4	49.4	0.7	2.07	42.4	2.13	42.4	2.13	1.5	64.1	0.10	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	13.1	35.71	0.24	7	Silty Sand to Sandy Silt	8	1,509.1	1,509.1	46.3	0.7	2.09	40.2	2.15	40.2	2.15	1.5	62.2	0.10	0.92	0.30	0.875	0.34	1.11	0.31	Not Saturated				
	13.5	28.84	0.45	6	Sandy Silt to Clayey Silt	7	1,546.9	1,546.9	36.3	1.6	2.38	32.1	2.43	32.1	2.43	2.4	77.8	0.12	0.92	0.30	0.875	0.34	1.10	0.31	Not Saturated				
	13.8	20.38	0.57	5	Clayey Silt to Silt Clay	5	1,584.7	1,584.7	24.7	2.9	2.67	24.7	2.67	24.7	2.67	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.09	0.31	Not Saturated				
	14.1	13.05	0.56	3	Clay	4	1,622.4	1,622.4	15.1	4.6	2.96	15.1	2.96	15.1	2.96	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.4	10.78	0.47	3	Clay	4	1,660.1	1,660.1	12.0	4.7	3.05	12.0	3.05	12.0	3.05	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.8	9.53	0.33	4	Silty Clay to Clay	3	1,697.9	1,697.9	10.2	3.8	3.05	10.2	3.05	10.2	3.05	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.07	0.32	Not Saturated				
	15.1	9.77	0.28	4	Silty Clay to Clay	3	1,735.6	1,735.6	10.3	3.1	2.99	10.3	2.99	10.3	2.99	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.06	0.31	Not Saturated				
	15.4	10.86	0.28	5	Clayey Silt to Silt Clay	3	1,773.3	1,773.3	11.2	2.8	2.94	11.2	2.94	11.2	2.94	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	15.7	24.21	0.31	6	Sandy Silt to Clayey Silt	6	1,811.0	1,811.0	25.7	1.3	2.46	24.9	2.47	24.9	2.47	2.6	65.7	0.11	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	16.1	33.42	0.36	7	Silty Sand to Sandy Silt	8	1,848.7	1,848.7	35.2	1.1	2.30	34.0	2.31	34.0	2.31	2.0	68.0	0.11	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.4	23.76	0.52	6	Sandy Silt to Clayey Silt	6	1,886.5	1,886.5	24.2	2.3	2.62	24.2	2.62	24.2	2.62	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.7	18.42	0.51	5	Clayey Silt to Silt Clay	5	1,924.2	1,924.2	18.1	2.9	2.78	18.1	2.78	18.1	2.78	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.03	0.32	Not Saturated				
	17.1	12.69	0.36	5	Clayey Silt to Silt Clay	4	1,961.9	1,961.9	11.9	3.1	2.94	11.9	2.94	11.9	2.94	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.4	14.22	0.31	5	Clayey Silt to Silt Clay	4	1,999.6	1,999.6	13.2	2.4	2.84	13.2	2.84	13.2	2.84	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.7	12.00	0.25	5	Clayey Silt to Silt Clay	4	2,037.5	2,037.5	10.8	2.3	2.90	10.8	2.90	10.8	2.90	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.0	10.84	0.20	5	Clayey Silt to Silt Clay	3	2,075.2	2,075.2	9.4	2.1	2.93	9.4	2.93	9.4	2.93	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.4	11.28	0.19	5	Clayey Silt to Silt Clay	3	2,112.9	2,112.9	9.7	1.9	2.90	9.7	2.90	9.7	2.90	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	18.7	11.17	0.17	5	Clayey Silt to Silt Clay	3	2,150.6	2,150.6	9.4	1.7	2.88	9.4	2.88	9.4	2.88	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	19.0	10.41	0.18	5	Clayey Silt to Silt Clay	3	2,188.3	2,188.3	8.5	2.0	2.96	8.5	2.96	8.5	2.96	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.99	0.32	Not Saturated				
	19.4	9.52	0.15	5	Clayey Silt to Silt Clay	3	2,226.1	2,226.1	7.5	1.8	2.98	7.5	2.98	7.5	2.98	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	19.7	7.95	0.10	5	Clayey Silt to Silt Clay	3	2,263.8	2,263.8	6.0	1.5	3.03	6.0	3.03	6.0	3.03	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	20.0	7.48	0.09	1	Sensitive Fine Grained	3	2,301.5	2,301.5	5.5	1.4	3.05	5.5	3.05	5.5	3.05	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.98	0.31	Not Saturated				
	20.3	7.67	0.10	5	Clayey Silt to Silt Clay	3	2,339.2	2,339.2	5.6	1.5	3.06	5.6	3.06	5.6	3.06	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	20.7	7.65	0.10	5	Clayey Silt to Silt Clay	3	2,376.9	2,376.9	5.4	1.6	3.08	5.4	3.08	5.4	3.08	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	21.0	8.20	0.15	5	Clayey Silt to Silt Clay	3	2,414.7	2,414.7	5.8	2.1	3.11	5.8	3.11	5.8	3.11	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.96	0.32	Not Saturated				
	21.3	8.95	0.21	5	Clayey Silt to Silt Clay	3	2,452.4	2,452.4	6.3	2.7	3.14	6.3	3.14	6.3	3.14	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.96	0.32	Not Saturated				
	21.7	9.07	0.21	5	Clayey Silt to Silt Clay	3	2,490.2	2,490.2	6.3	2.7	3.14	6.3	3.14	6.3	3.14	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.0	8.88	0.17	5	Clayey Silt to Silt Clay	3	2,527.9	2,527.9	6.0	2.2	3.11	6.0	3.11	6.0	3.11	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.3	9.76	0.18	5	Clayey Silt to Silt Clay	3	2,565.7	2,565.7	6.6	2.1	3.06	6.6	3.06	6.6	3.06	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.31	Not Saturated				
	22.6	11.47	0.26	5	Clayey Silt to Silt Clay	4	2,603.4	2,603.4	7.8	2.6	3.05	7.8	3.05	7.8	3.05	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.0	10.85	0.33	4	Silty Clay to Clay	4	2,641.1	2,641.1	7.2	3.4	3.15	7.2	3.15	7.2	3.15	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.3	10.32	0.30	4	Silty Clay to Clay	4	2,678.8	2,678.8	6.7	3.4	3.17	6.7	3.17	6.7	3.17	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	23.6	10.04	0.27	5	Clayey Silt to Silt Clay	4	2,716.5	2,716.5	6.4	3.1	3.16	6.4	3.16	6.4	3.16	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	24.0	10.05	0.26	5	Clayey Silt to Silt Clay	4	2,754.3	2,754.3	6.3	3.0	3.16	6.3	3.16	6.3	3.16	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.92	0.32	Not Saturated				

SFB 502-6
2/17/17 TC
a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-1
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
	24.3	9.76	0.24	5	Clayey Silt to Silt Clay	4	2,792.0	2,792.0	6.0	2.9	3.17	6.0	3.17	6.0	3.17	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.6	10.05	0.26	5	Clayey Silt to Silt Clay	4	2,829.7	2,829.7	6.1	3.0	3.18	6.1	3.18	6.1	3.18	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.9	10.77	0.33	4	Silty Clay to Clay	4	2,867.4	2,867.4	6.5	3.5	3.19	6.5	3.19	6.5	3.19	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.91	0.31	Not Saturated				
	25.3	9.20	0.25	4	Silty Clay to Clay	4	2,906.4	2,890.1	5.4	3.3	3.24	5.4	3.24	5.4	3.24	-	Non-Liquefiable	-	0.76	0.25	0.875	0.28	0.91	0.31	-				
	25.6	8.17	0.19	5	Clayey Silt to Silt Clay	3	2,945.9	2,909.0	4.6	2.8	3.27	4.6	3.27	4.6	3.27	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.31	-				
	25.9	7.86	0.16	5	Clayey Silt to Silt Clay	3	2,985.3	2,927.9	4.3	2.5	3.26	4.3	3.26	4.3	3.26	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.32	-				
	26.2	8.13	0.13	5	Clayey Silt to Silt Clay	3	3,024.6	2,946.8	4.5	1.9	3.20	4.5	3.20	4.5	3.20	-	Non-Liquefiable	-	0.74	0.25	0.875	0.28	0.91	0.31	-				
	26.6	8.62	0.12	5	Clayey Silt to Silt Clay	3	3,064.0	2,965.7	4.8	1.7	3.14	4.8	3.14	4.8	3.14	-	Non-Liquefiable	-	0.74	0.25	0.875	0.29	0.90	0.32	-				
	26.9	8.74	0.10	5	Clayey Silt to Silt Clay	3	3,103.4	2,984.6	4.8	1.4	3.11	4.8	3.11	4.8	3.11	-	Non-Liquefiable	-	0.74	0.25	0.875	0.29	0.90	0.32	-				
	27.2	8.91	0.10	5	Clayey Silt to Silt Clay	3	3,142.7	3,003.5	4.9	1.4	3.10	4.9	3.10	4.9	3.10	-	Non-Liquefiable	-	0.73	0.25	0.875	0.28	0.90	0.31	-				
	27.6	8.65	0.11	5	Clayey Silt to Silt Clay	3	3,182.1	3,022.4	4.7	1.5	3.13	4.7	3.13	4.7	3.13	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	27.9	9.22	0.11	5	Clayey Silt to Silt Clay	3	3,221.4	3,041.3	5.0	1.4	3.09	5.0	3.09	5.0	3.09	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	28.2	10.61	0.13	6	Sandy Silt to Clayey Silt	4	3,260.8	3,060.2	5.9	1.5	3.04	5.9	3.04	5.9	3.04	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.90	0.32	-				
	28.5	9.98	0.12	5	Clayey Silt to Silt Clay	3	3,300.2	3,079.1	5.4	1.4	3.06	5.4	3.06	5.4	3.06	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.89	0.32	-				
	28.9	8.53	0.13	5	Clayey Silt to Silt Clay	3	3,339.5	3,098.0	4.4	1.9	3.20	4.4	3.20	4.4	3.20	-	Non-Liquefiable	-	0.71	0.25	0.875	0.29	0.89	0.32	-				
	29.2	8.76	0.16	5	Clayey Silt to Silt Clay	3	3,378.9	3,116.9	4.5	2.2	3.22	4.5	3.22	4.5	3.22	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.5	9.22	0.18	5	Clayey Silt to Silt Clay	3	3,418.4	3,135.8	4.8	2.4	3.22	4.8	3.22	4.8	3.22	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.9	9.61	0.23	5	Clayey Silt to Silt Clay	4	3,457.7	3,154.7	5.0	2.9	3.25	5.0	3.25	5.0	3.25	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	30.2	9.95	0.27	5	Clayey Silt to Silt Clay	4	3,497.1	3,173.6	5.2	3.3	3.26	5.2	3.26	5.2	3.26	-	Non-Liquefiable	-	0.68	0.24	0.875	0.28	0.89	0.32	-				
	30.5	10.85	0.28	5	Clayey Silt to Silt Clay	4	3,536.4	3,192.5	5.7	3.1	3.21	5.7	3.21	5.7	3.21	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	30.8	64.78	0.84	7	Silty Sand to Sandy Silt	14	3,575.8	3,211.4	39.2	1.3	2.31	50.1	2.22	50.1	2.22	1.7	86.4	0.14	0.68	0.25	0.875	0.28	0.88	0.32	0.4	16	2.3	0.3	0.09
	31.2	114.60	1.45	8	Sand to Silty Sand	23	3,615.2	3,230.3	69.8	1.3	2.10	88.3	2.02	88.3	2.02	1.3	117.4	0.23	0.67	0.24	0.875	0.28	0.88	0.32	0.7	23	1.4	0.3	0.05
	31.5	44.43	1.20	6	Sandy Silt to Clayey Silt	12	3,654.5	3,249.2	26.2	2.8	2.64	26.2	2.64	26.2	2.64	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	31.8	16.64	0.44	5	Clayey Silt to Silt Clay	6	3,693.9	3,268.1	9.1	3.0	3.03	9.1	3.03	9.1	3.03	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	32.2	14.27	0.34	5	Clayey Silt to Silt Clay	5	3,733.2	3,287.0	7.5	2.8	3.08	7.5	3.08	7.5	3.08	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.88	0.32	-				
	32.5	17.66	0.51	5	Clayey Silt to Silt Clay	6	3,772.6	3,305.8	9.5	3.2	3.03	9.5	3.03	9.5	3.03	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	32.8	19.95	0.56	5	Clayey Silt to Silt Clay	6	3,812.0	3,324.7	10.9	3.1	2.98	10.9	2.98	10.9	2.98	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	33.1	27.21	0.77	5	Clayey Silt to Silt Clay	8	3,851.3	3,343.6	15.1	3.0	2.85	15.1	2.85	15.1	2.85	-	Non-Liquefiable	-	0.65	0.24	0.875	0.28	0.87	0.32	-				
	33.5	17.10	0.59	4	Silty Clay to Clay	6	3,890.8	3,362.6	9.0	3.9	3.10	9.0	3.10	9.0	3.10	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.32	-				
	33.8	12.64	0.34	5	Clayey Silt to Silt Clay	5	3,930.2	3,381.5	6.3	3.1	3.17	6.3	3.17	6.3	3.17	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.33	-				
	34.1	11.92	0.26	5	Clayey Silt to Silt Clay	4	3,969.5	3,400.4	5.8	2.6	3.16	5.8	3.16	5.8	3.16	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.87	0.32	-				
	34.4	11.94	0.24	5	Clayey Silt to Silt Clay	4	4,008.9	3,419.3	5.8	2.5	3.15	5.8	3.15	5.8	3.15	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.87	0.32	-				
	34.8	13.68	0.38	5	Clayey Silt to Silt Clay	5	4,048.2	3,438.2	6.8	3.3	3.16	6.8	3.16	6.8	3.16	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	35.1	13.71	0.41	5	Clayey Silt to Silt Clay	5	4,087.6	3,457.0	6.7	3.5	3.18	6.7	3.18	6.7	3.18	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.86	0.32	-				
	35.4	11.87	0.35	5	Clayey Silt to Silt Clay	5	4,127.0	3,475.9	5.6	3.5	3.24	5.6	3.24	5.6	3.24	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.32	-				
	35.8	10.50	0.25	5	Clayey Silt to Silt Clay	4	4,166.3	3,494.8	4.8	2.9	3.26	4.8	3.26	4.8	3.26	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	36.1	10.23	0.17	5	Clayey Silt to Silt Clay	4	4,205.7	3,513.7	4.6	2.1	3.20	4.6	3.20	4.6	3.20	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.32	-				
	36.4	10.48	0.14	6	Sandy Silt to Clayey Silt	4	4,245.0	3,532.6	4.7	1.6	3.14	4.7	3.14	4.7	3.14	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.33	-				
	36.7	10.28	0.14	5	Clayey Silt to Silt Clay	4	4,284.4	3,551.5	4.6	1.7	3.16	4.6	3.16	4.6	3.16	-	Non-Liquefiable	-	0.63	0.25	0.875	0.28	0.86	0.33	-				
	37.1	15.01	0.32	5	Clayey Silt to Silt Clay	5	4,323.8	3,570.4	7.2	2.5	3.07	7.2	3.07	7.2	3.07	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.32	-				
	37.4	18.68	0.48	5	Clayey Silt to Silt Clay	6	4,363.2	3,589.4	9.2	2.9	3.02	9.2	3.02	9.2	3.02	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	37.7	34.46	0.71	6	Sandy Silt to Clayey Silt	9	4,402.6	3,608.2	17.9	2.2	2.71	17.9	2.71	17.9	2.71	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	38.1	39.49	0.92	6	Sandy Silt to Clayey Silt	11	4,442.0	3,627.1	20.5	2.5	2.69	20.5	2.69	20.5	2.69	-	Non-Liquefiable	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	38.4	42.80	0.86	6	Sandy Silt to Clayey Silt	11	4,481.3	3,646.0	22.3	2.1	2.63	22.3	2.63	22.3	2.63	-	Non-Liquefiable	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	38.7	61.61	0.69	8	Sand to Silty Sand	13	4,520.7	3,664.9	32.4	1.2	2.34	44.6	2.23	44.6	2.23	1.7	77.4	0.12	0.61	0.24	0.875	0.28	0.85	0.33	0.4	14	2.6	0.3	0.10
	39.0	91.51	0.94	8	Sand to Silty Sand	19	4,560.0	3,683.8	48.4	1.1	2.17	66.0	2.06	66.0	2.06	1.4	92.1	0.15	0.60	0.24	0.875	0.28	0.85	0.33	0.5	17	2.2	0.3	0.08
	39.4	140.36	1.27	9	Sand	27	4,599.4	3,702.7	74.6	0.9	1.99	101.0	1.88	101.0	1.88	1.2	118.7	0.24	0.60	0.24	0.875	0.28	0.85	0.33	0.7	23	1.4	0.3	0.06
	39.7	201.72	1.23	9	Sand	36	4,638.8	3,721.6	107.2	0.6	1.76	144.8	1.65	144.8	1.65	1.0	145.6	0.37	0.60	0.24	0.875	0.28	0.84	0.33	1.1				
	40.0	323.97	3.59	9	Sand	58	4,678.1	3,740.5	172.0	1.1	1.77	232.0	1.68	232.0	1.68	1.0	237.9	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.4	526.96	5.25	10	Gravelly Sand to Sand	89	4,717.5	3,759.4	279.1	1.0	1.59	376.4	1.51	376.4	1.51	1.0	376.4	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.7	560.76	3.68	10	Gravelly Sand to Sand	90	4,756.8	3,778.3	295.6	0.7	1.44	399.5	1.35	399.5	1.35	1.0	399.5	-	0.59	0.24	0.875	0.28	0.84	0.33	-				
	41.0	496.60	1.75	10	Gravelly Sand to Sand	76	4,796.3	3,797.2	260.3	0.4	1.31	352.9	1.20	352.9	1.20	1.0	352.9	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.3	421.97	1.42	10	Gravelly Sand to Sand	65	4,835.7	3,816.1	219.9	0.3	1.35	299.1	1.25	299.1	1.25	1.0	299.1	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.7	384.97	1.41	10	Gravelly Sand to Sand	61	4,875.0	3,835.0	199.5	0.4	1.41	272.2	1.30	272.2	1.30	1.0	272.2	-	0.58	0.24	0.875	0.28	0.84	0.33	-				
	42.0	356.07	2.82	10	Gravelly Sand to Sand	61	4,914.4	3,853.9	183.5	0.8	1.65	251.2	1.55	251.2	1.55	1.0	251.2	-	0.58	0.24	0.875	0.28	0.84	0.33	-				
	42.3	380.72	3.89	9	Sand	66	4,953.8	3,872.8	195.3	1.0	1.71	267.9	1.61	267.9	1.61	1.0	267.9	-	0.58	0.24	0.875	0.27	0.83	0.33	-				
	42.7	567.87	3.61	10	Gravelly Sand to Sand	91	4,993.1	3,891.7	290.6	0.6	1.44	398.6	1.34	398.6	1.34	1.0	398.6	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.0	716.73	3.58	10	Gravelly Sand to Sand	109	5,032.5	3,910.6	365.3	0.5	1.29	501.9	1.20	501.9	1.20	1.0	501.9	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.3	635.28	3.54	10	Gravelly Sand to Sand	99	5,071.8	3,929.5	322.0	0.6	1.36	443.8	1.27	443.8	1.27	1.0	443.8	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	43.6	581.90	3.84	10	Gravelly Sand to Sand	93	5,111.2	3,948.4	293.5	0.7	1.45	405.5	1.35	405.5	1.35	1.0	405.5	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.0	481.00	3.48	10	Gravelly Sand to Sand	79	5,150.6	3,967.3	241.2	0.7	1.53	334.4	1.44	334.4	1.44	1.0	334.4	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.3	429.03	2.18	10	Gravelly Sand to Sand	69	5,189.9	3,986.2	214.0	0.5	1.47	297.6	1.36	297.6	1.36	1.0	297.6	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	44.6	441.93	1.95	10	Gravelly Sand to Sand	70	5,229.3	4,005.1	219.4	0.4	1.42	305.8	1.31	305.8	1.31	1.0	305.8	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	44.9	504.02	2.64	10	Gravelly Sand to Sand	80	5,268.8	4,024.0	249.2	0.5	1.43	347.9	1.32	347.9	1.32	1.0	347.9	-	0.57	0.24	0.875	0.28	0.82	0.33	-				
	45.3	518.63	3.86	10	Gravelly Sand to Sand	85	5,308.1	4,042.9	255.3	0.7	1.52	357.2	1.43	357.2	1.43	1.0	357.2	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	45.6	587.26	3.90	10	Gravelly Sand to Sand	94	5,347.5	4,061.8	287.8	0.7	1.45	403.5	1.36	403.5	1.36	1.0	403.5	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	45.9	542.00	2.42	10	Gravelly Sand to Sand	84	5,386.8	4,080.7	264.3	0.4	1.36	371.5	1.25	371.5	1.25	1.0	371.5	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.3	448.76	1.77	10	Gravelly Sand to Sand	70	5,426.2	4,099.6	217.6	0.4	1.40	306.9	1.28	306.9	1.28	1.0	306.9	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.6	396.54	2.43	10	Gravelly Sand to Sand	65	5,465.6	4,118.5	191.2	0.6	1.56	270.6	1.45	270.6	1.45	1.0	270.6	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.9	385.41	2.02	10	Gravelly Sand to Sand	63	5,504.9	4,137.4	185.0	0.5	1.53	262.4	1.41	262.4	1.41	1.0	262.4	-	0.56	0.24	0.875	0.27	0.82	0.34	-				
	47.2	469.24	1.81	10	Gravelly Sand to Sand	73	5,544.3	4,156.3	224.5	0.4	1.38	318.7	1.26	318.7	1.26	1.0	318.7	-	0.55	0.24	0.875	0.27	0.82	0.33	-				
	47.6	471.98	2.77	10	Gravelly Sand to Sand	76	5,583.6	4,175.1	224.8	0.6	1.49	319.9	1.38	319.9	1.38	1.0	319.9	-	0.55	0.24	0.875	0.27	0.82	0.33	-				
	47.9	423.72	4.39	9	Sand	73	5,623.0	4,194.0	200.7	1.0	1.70	286.5	1.60	286.5	1.60	1.0	286.5	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.2	473.64	3.21	10	Gravelly Sand to Sand	78	5,662.4	4,212.9	223.5	0.7	1.54	319.5	1.43	319.5	1.43	1.0	319.5	-	0.55	0.24	0.875	0.27	0.81	0.33	-				
	48.6	504.81	2.61	10	Gravelly Sand to Sand	80	5,701.7	4,231.8	237.2	0.5	1.44	339.8	1.33	339.8	1.33	1.0	339.8	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.9	544.16	2.31	10	Gravelly Sand to Sand	84	5,741.2	4,250.8	254.7	0.4	1.36	365.5	1.24	365.5	1.24	1.0	365.5	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	49.2	549.50	2.21	10	Gravelly Sand to Sand	84	5,780.6	4,269.7	256.0	0.4	1.35	368.3	1.22	368.3	1.22	1.0	368.3	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
	49.5	492.01	1.99	10	Gravelly Sand to Sand	77	5,819.9	4,288.6	228.1	0.4	1.39	329.0	1.26	329.0	1.26	1.0	329.0	-	0.54	0.24	0.875	0.27	0.81	0.34	-				

SFB 502-6
2/17/17 TC

a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-1
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	$K_\sigma{}^*$	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	Δs (in)
	49.9	448.79	1.66	10	Gravelly Sand to Sand	70	5,859.3	4,307.5	207.0	0.4	1.40	299.4	1.27	299.4	1.27	1.0	299.4	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
																									Total		2.0	1.6	0.4

LIQUEFACTION ANALYSES BASED ON CPT DATA
WEST SAN CARLOS STREET & RACE SREEET, SAN JOSE, CALIFORNIA

SFB 502-6
2/17/17 TC

a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-2
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ^*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
ft	ft	tsf	tsf				psf	psf																					
	0.3																												
	0.7																												
	1.0																												
	1.3																												
	1.6																												
	2.0																												
	2.3																												
	2.6																												
	3.0																												
	3.3																												
	3.6																												
	3.9																												
	4.3																												
	4.6																												
	4.9	5.22	0.09	1	Sensitive Fine Grained	1	565.9	565.9	17.4	1.8	2.68	17.4	2.68	17.4	2.68	-	Non-Liquefiable	-	0.98	0.32	0.875	0.36	1.49	0.25	Not Saturated				
	5.2	15.01	0.32	5	Clayey Silt to Silt Clay	4	603.6	603.6	48.7	2.2	2.37	26.8	2.57	26.8	2.57	3.2	84.3	0.14	0.98	0.32	0.875	0.36	1.46	0.25	Not Saturated				
	5.6	16.35	0.41	5	Clayey Silt to Silt Clay	4	641.4	641.4	50.0	2.5	2.40	28.3	2.59	28.3	2.59	3.3	92.7	0.15	0.98	0.32	0.875	0.36	1.43	0.25	Not Saturated				
	5.9	60.17	0.51	8	Sand to Silty Sand	11	679.2	679.2	176.2	0.9	1.68	101.1	1.86	101.1	1.86	1.2	117.0	0.23	0.98	0.32	0.875	0.36	1.41	0.26	Not Saturated				
	6.2	149.13	0.73	9	Sand	24	716.9	716.9	415.0	0.5	1.25	243.9	1.42	243.9	1.42	1.0	243.9	-	0.97	0.32	0.875	0.36	1.38	0.26	Not Saturated				
	6.6	197.17	0.82	9	Sand	31	754.6	754.6	521.6	0.4	1.13	314.3	1.28	314.3	1.28	1.0	314.3	-	0.97	0.32	0.875	0.36	1.36	0.26	Not Saturated				
	6.9	204.85	0.92	9	Sand	32	792.4	792.4	516.1	0.4	1.15	318.7	1.30	318.7	1.30	1.0	318.7	-	0.97	0.32	0.875	0.36	1.34	0.27	Not Saturated				
	7.2	201.57	0.82	9	Sand	32	830.1	830.1	484.7	0.4	1.14	306.4	1.29	306.4	1.29	1.0	306.4	-	0.97	0.31	0.875	0.36	1.32	0.27	Not Saturated				
	7.5	191.24	1.17	9	Sand	31	867.8	867.8	439.7	0.6	1.30	284.3	1.43	284.3	1.43	1.0	284.3	-	0.97	0.31	0.875	0.36	1.31	0.27	Not Saturated				
	7.9	177.13	1.27	9	Sand	30	905.5	905.5	390.2	0.7	1.39	257.8	1.51	257.8	1.51	1.0	257.8	-	0.97	0.31	0.875	0.36	1.29	0.28	Not Saturated				
	8.2	146.31	0.84	9	Sand	25	943.2	943.2	309.2	0.6	1.39	208.6	1.51	208.6	1.51	1.0	208.6	-	0.96	0.31	0.875	0.36	1.27	0.28	Not Saturated				
	8.5	92.94	0.58	8	Sand to Silty Sand	17	981.0	981.0	188.5	0.6	1.57	129.9	1.69	129.9	1.69	1.0	134.4	0.31	0.96	0.31	0.875	0.36	1.26	0.28	Not Saturated				
	8.9	43.71	0.89	6	Sandy Silt to Clayey Silt	10	1,018.7	1,018.7	84.8	2.1	2.17	60.0	2.28	60.0	2.28	1.9	113.7	0.22	0.96	0.31	0.875	0.36	1.25	0.29	Not Saturated				
	9.2	21.79	0.66	5	Clayey Silt to Silt Clay	6	1,056.4	1,056.4	40.2	3.1	2.53	29.4	2.64	34.8	2.58	3.2	111.5	0.21	0.96	0.31	0.875	0.35	1.23	0.29	Not Saturated				
	9.5	19.70	0.54	5	Clayey Silt to Silt Clay	5	1,094.1	1,094.1	35.0	2.8	2.55	26.1	2.65	30.6	2.59	3.3	100.5	0.17	0.96	0.31	0.875	0.35	1.22	0.29	Not Saturated				
	9.8	20.55	0.54	5	Clayey Silt to Silt Clay	5	1,131.9	1,131.9	35.3	2.7	2.53	26.7	2.63	31.2	2.58	3.2	99.2	0.17	0.96	0.31	0.875	0.35	1.21	0.29	Not Saturated				
	10.2	21.88	0.56	5	Clayey Silt to Silt Clay	6	1,169.7	1,169.7	36.4	2.6	2.52	28.0	2.60	32.4	2.55	3.1	99.0	0.17	0.95	0.31	0.875	0.35	1.19	0.30	Not Saturated				
	10.5	23.10	0.58	5	Clayey Silt to Silt Clay	6	1,207.4	1,207.4	37.3	2.6	2.50	29.1	2.59	29.1	2.59	3.2	94.5	0.16	0.95	0.31	0.875	0.35	1.18	0.30	Not Saturated				
	10.8	23.01	0.58	5	Clayey Silt to Silt Clay	6	1,245.1	1,245.1	36.0	2.6	2.51	28.6	2.59	28.6	2.59	3.3	93.4	0.16	0.95	0.31	0.875	0.35	1.17	0.30	Not Saturated				
	11.2	25.91	0.60	6	Sandy Silt to Clayey Silt	7	1,282.8	1,282.8	39.4	2.4	2.46	31.7	2.53	31.7	2.53	2.9	93.1	0.16	0.94	0.31	0.875	0.35	1.16	0.30	Not Saturated				
	11.5	27.67	0.68	6	Sandy Silt to Clayey Silt	7	1,320.5	1,320.5	40.9	2.5	2.46	33.3	2.53	33.3	2.53	2.9	97.8	0.17	0.94	0.31	0.875	0.35	1.15	0.30	Not Saturated				
	11.8	32.33	0.53	6	Sandy Silt to Clayey Silt	8	1,358.3	1,358.3	46.6	1.7	2.31	38.4	2.37	38.4	2.37	2.2	84.8	0.14	0.94	0.31	0.875	0.35	1.14	0.31	Not Saturated				
	12.1	38.36	0.24	7	Silty Sand to Sandy Silt	8	1,396.0	1,396.0	54.0	0.6	2.02	45.0	2.09	45.0	2.09	1.4	64.5	0.10	0.93	0.30	0.875	0.35	1.13	0.30	Not Saturated				
	12.5	39.69	0.17	8	Sand to Silty Sand	8	1,433.7	1,433.7	54.4	0.4	1.93	45.9	2.00	45.9	2.00	1.0	45.9	0.09	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	12.8	34.29	0.18	7	Silty Sand to Sandy Silt	7	1,471.4	1,471.4	45.6	0.5	2.04	39.1	2.10	39.1	2.10	1.5	57.2	0.10	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	13.1	21.85	0.24	6	Sandy Silt to Clayey Silt	5	1,509.1	1,509.1	28.0	1.1	2.39	24.6	2.44	24.6	2.44	2.5	60.8	0.10	0.92	0.30	0.875	0.34	1.11	0.31	Not Saturated				
	13.5	14.54	0.23	6	Sandy Silt to Clayey Silt	4	1,546.9	1,546.9	17.8	1.6	2.64	17.8	2.64	17.8	2.64	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.10	0.31	Not Saturated				
	13.8	15.55	0.22	6	Sandy Silt to Clayey Silt	4	1,584.7	1,584.7	18.6	1.5	2.61	18.6	2.61	18.6	2.61	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.09	0.31	Not Saturated				
	14.1	14.39	0.23	6	Sandy Silt to Clayey Silt	4	1,622.4	1,622.4	16.7	1.7	2.68	16.7	2.68	16.7	2.68	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.4	10.68	0.20	5	Clayey Silt to Silt Clay	3	1,660.1	1,660.1	11.9	2.0	2.84	11.9	2.84	11.9	2.84	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.8	9.92	0.17	5	Clayey Silt to Silt Clay	3	1,697.9	1,697.9	10.7	1.9	2.87	10.7	2.87	10.7	2.87	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.07	0.32	Not Saturated				
	15.1	11.11	0.21	5	Clayey Silt to Silt Clay	3	1,735.6	1,735.6	11.8	2.1	2.85	11.8	2.85	11.8	2.85	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.06	0.31	Not Saturated				
	15.4	14.49	0.23	6	Sandy Silt to Clayey Silt	4	1,773.3	1,773.3	15.3	1.7	2.70	15.3	2.70	15.3	2.70	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	15.7	22.49	0.34	6	Sandy Silt to Clayey Silt	6	1,811.0	1,811.0	23.8	1.6	2.53	23.1	2.54	23.1	2.54	3.0	69.0	0.11	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	16.1	18.87	0.38	6	Sandy Silt to Clayey Silt	5	1,848.7	1,848.7	19.4	2.1	2.67	19.4	2.67	19.4	2.67	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.4	17.86	0.33	6	Sandy Silt to Clayey Silt	5	1,886.5	1,886.5	17.9	2.0	2.68	17.9	2.68	17.9	2.68	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.7	11.95	0.26	5	Clayey Silt to Silt Clay	4	1,924.2	1,924.2	11.4	2.4	2.89	11.4	2.89	11.4	2.89	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.03	0.32	Not Saturated				
	17.1	10.25	0.20	5	Clayey Silt to Silt Clay	3	1,961.9	1,961.9	9.4	2.1	2.93	9.4	2.93	9.4	2.93	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.4	11.39	0.23	5	Clayey Silt to Silt Clay	3	1,999.6	1,999.6	10.4	2.2	2.91	10.4	2.91	10.4	2.91	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.7	13.73	0.25	5	Clayey Silt to Silt Clay	4	2,037.5	2,037.5	12.5	2.0	2.82	12.5	2.82	12.5	2.82	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.0	13.07	0.21	6	Sandy Silt to Clayey Silt	4	2,075.2	2,075.2	11.6	1.7	2.82	11.6	2.82	11.6	2.82	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.4	13.09	0.19	6	Sandy Silt to Clayey Silt	4	2,112.9	2,112.9	11.4	1.5	2.79	11.4	2.79	11.4	2.79	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	18.7	12.64	0.16	6	Sandy Silt to Clayey Silt	4	2,150.6	2,150.6	10.8	1.4	2.79	10.8	2.79	10.8	2.79	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	19.0	12.17	0.14	6	Sandy Silt to Clayey Silt	4	2,188.3	2,188.3	10.1	1.3	2.80	10.1	2.80	10.1	2.80	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.99	0.32	Not Saturated				
	19.4	11.62	0.14	6	Sandy Silt to Clayey Silt	3	2,226.1	2,226.1	9.4	1.4	2.84	9.4	2.84	9.4	2.84	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	19.7	12.05	0.20	5	Clayey Silt to Silt Clay	4	2,263.8	2,263.8	9.6	1.9	2.90	9.6	2.90	9.6	2.90	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	20.0	12.46	0.26	5	Clayey Silt to Silt Clay	4	2,301.5	2,301.5	9.8	2.3	2.94	9.8	2.94	9.8	2.94	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.98	0.31	Not Saturated				
	20.3	12.03	0.28	5	Clayey Silt to Silt Clay	4	2,339.2	2,339.2	9.3	2.5	2.98	9.3	2.98	9.3	2.98	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	20.7	10.91	0.25	5	Clayey Silt to Silt Clay	4	2,376.9	2,376.9	8.2	2.6	3.04	8.2	3.04	8.2	3.04	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	21.0	11.26	0.24	5	Clayey Silt to Silt Clay	4	2,414.7	2,414.7	8.3	2.3	3.00	8.3	3.00	8.3	3.00	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.96	0.32	Not Saturated				
	21.3	12.05	0.29	5	Clayey Silt to Silt Clay	4	2,452.4	2,452.4	8.8	2.6	3.01	8.8	3.01	8.8	3.01	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.96	0.32	Not Saturated				
	21.7	12.76	0.36	5	Clayey Silt to Silt Clay	4	2,490.2	2,490.2	9.2	3.1	3.04	9.2	3.04	9.2	3.04	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.0	12.78	0.35	5	Clayey Silt to Silt Clay	4	2,527.9	2,527.9	9.1	3.1	3.04	9.1	3.04	9.1	3.04	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.3	13.17	0.35	5	Clayey Silt to Silt Clay	4	2,565.7	2,565.7	9.3	2.9	3.02	9.3	3.02	9.3	3.02	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.31	Not Saturated				
	22.6	12.63	0.39	5	Clayey Silt to Silt Clay	4	2,603.4	2,603.4	8.7	3.5	3.08	8.7	3.08	8.7	3.08	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.0	10.56	0.35	4	Silty Clay to Clay	4	2,641.1	2,641.1	7.0	3.8	3.18	7.0	3.18	7.0	3.18	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.3	10.12	0.27	5	Clayey Silt to Silt Clay	4	2,678.8	2,678.8	6.6	3.1	3.16	6.6	3.16	6.6	3.16	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	23.6	10.04	0.26	5	Clayey Silt to Silt Clay	4	2,716.5	2,716.5	6.4	3.0	3.16	6.4	3.16	6.4	3.16	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	24.0	10.53	0.25	5	Clayey Silt to Silt Clay	4	2,754.3	2,754.3	6.6	2.8	3.12	6.6	3.12	6.6	3.12	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.92	0.32	Not Saturated				

SFB 502-6
2/17/17 TC
a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-2
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	$K_\sigma{}^*$	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
	24.3	11.76	0.26	5	Clayey Silt to Silt Clay	4	2,792.0	2,792.0	7.4	2.5	3.06	7.4	3.06	7.4	3.06	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.6	12.40	0.29	5	Clayey Silt to Silt Clay	4	2,829.7	2,829.7	7.8	2.6	3.05	7.8	3.05	7.8	3.05	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.9	12.08	0.28	5	Clayey Silt to Silt Clay	4	2,867.4	2,867.4	7.4	2.6	3.07	7.4	3.07	7.4	3.07	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.91	0.31	Not Saturated				
	25.3	11.28	0.25	5	Clayey Silt to Silt Clay	4	2,906.4	2,890.1	6.8	2.5	3.09	6.8	3.09	6.8	3.09	-	Non-Liquefiable	-	0.76	0.25	0.875	0.28	0.91	0.31	-				
	25.6	10.88	0.23	5	Clayey Silt to Silt Clay	4	2,945.9	2,909.0	6.5	2.4	3.11	6.5	3.11	6.5	3.11	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.31	-				
	25.9	10.45	0.21	5	Clayey Silt to Silt Clay	4	2,985.3	2,927.9	6.1	2.4	3.12	6.1	3.12	6.1	3.12	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.32	-				
	26.2	10.92	0.22	5	Clayey Silt to Silt Clay	4	3,024.6	2,946.8	6.4	2.3	3.10	6.4	3.10	6.4	3.10	-	Non-Liquefiable	-	0.74	0.25	0.875	0.28	0.91	0.31	-				
	26.6	10.28	0.19	5	Clayey Silt to Silt Clay	4	3,064.0	2,965.7	5.9	2.1	3.11	5.9	3.11	5.9	3.11	-	Non-Liquefiable	-	0.74	0.25	0.875	0.29	0.90	0.32	-				
	26.9	9.81	0.17	5	Clayey Silt to Silt Clay	3	3,103.4	2,984.6	5.5	2.1	3.13	5.5	3.13	5.5	3.13	-	Non-Liquefiable	-	0.74	0.25	0.875	0.29	0.90	0.32	-				
	27.2	9.51	0.16	5	Clayey Silt to Silt Clay	3	3,142.7	3,003.5	5.3	2.0	3.14	5.3	3.14	5.3	3.14	-	Non-Liquefiable	-	0.73	0.25	0.875	0.28	0.90	0.31	-				
	27.6	8.79	0.13	5	Clayey Silt to Silt Clay	3	3,182.1	3,022.4	4.8	1.8	3.16	4.8	3.16	4.8	3.16	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	27.9	8.16	0.11	5	Clayey Silt to Silt Clay	3	3,221.4	3,041.3	4.3	1.6	3.18	4.3	3.18	4.3	3.18	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	28.2	9.02	0.13	5	Clayey Silt to Silt Clay	3	3,260.8	3,060.2	4.8	1.7	3.14	4.8	3.14	4.8	3.14	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.90	0.32	-				
	28.5	11.14	0.13	6	Sandy Silt to Clayey Silt	4	3,300.2	3,079.1	6.2	1.3	3.00	6.2	3.00	6.2	3.00	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.89	0.32	-				
	28.9	12.83	0.21	6	Sandy Silt to Clayey Silt	4	3,339.5	3,098.0	7.2	1.9	3.01	7.2	3.01	7.2	3.01	-	Non-Liquefiable	-	0.71	0.25	0.875	0.29	0.89	0.32	-				
	29.2	11.33	0.20	5	Clayey Silt to Silt Clay	4	3,378.9	3,116.9	6.2	2.1	3.09	6.2	3.09	6.2	3.09	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.5	10.77	0.19	5	Clayey Silt to Silt Clay	4	3,418.4	3,135.8	5.8	2.1	3.11	5.8	3.11	5.8	3.11	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.9	11.70	0.26	5	Clayey Silt to Silt Clay	4	3,457.7	3,154.7	6.3	2.6	3.13	6.3	3.13	6.3	3.13	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	30.2	13.97	0.31	5	Clayey Silt to Silt Clay	5	3,497.1	3,173.6	7.7	2.6	3.05	7.7	3.05	7.7	3.05	-	Non-Liquefiable	-	0.68	0.24	0.875	0.28	0.89	0.32	-				
	30.5	17.25	0.35	6	Sandy Silt to Clayey Silt	5	3,536.4	3,192.5	9.7	2.2	2.94	9.7	2.94	9.7	2.94	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	30.8	28.38	0.36	7	Silty Sand to Sandy Silt	7	3,575.8	3,211.4	16.6	1.3	2.62	16.6	2.62	16.6	2.62	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	31.2	23.33	0.30	6	Sandy Silt to Clayey Silt	6	3,615.2	3,230.3	13.3	1.4	2.71	13.3	2.71	13.3	2.71	-	Non-Liquefiable	-	0.67	0.24	0.875	0.28	0.88	0.32	-				
	31.5	12.69	0.14	6	Sandy Silt to Clayey Silt	4	3,654.5	3,249.2	6.7	1.3	2.96	6.7	2.96	6.7	2.96	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	31.8	12.65	0.13	6	Sandy Silt to Clayey Silt	4	3,693.9	3,268.1	6.6	1.2	2.95	6.6	2.95	6.6	2.95	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	32.2	12.64	0.14	6	Sandy Silt to Clayey Silt	4	3,733.2	3,287.0	6.6	1.3	2.96	6.6	2.96	6.6	2.96	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.88	0.32	-				
	32.5	13.97	0.23	6	Sandy Silt to Clayey Silt	5	3,772.6	3,305.8	7.3	1.9	3.01	7.3	3.01	7.3	3.01	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	32.8	23.40	0.53	6	Sandy Silt to Clayey Silt	7	3,812.0	3,324.7	12.9	2.5	2.86	12.9	2.86	12.9	2.86	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	33.1	15.34	0.55	4	Silty Clay to Clay	6	3,851.3	3,343.6	8.0	4.1	3.15	8.0	3.15	8.0	3.15	-	Non-Liquefiable	-	0.65	0.24	0.875	0.28	0.87	0.32	-				
	33.5	10.69	0.33	4	Silty Clay to Clay	4	3,890.8	3,362.6	5.2	3.8	3.29	5.2	3.29	5.2	3.29	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.32	-				
	33.8	10.17	0.29	5	Clayey Silt to Silt Clay	4	3,930.2	3,381.5	4.9	3.5	3.30	4.9	3.30	4.9	3.30	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.33	-				
	34.1	10.66	0.30	5	Clayey Silt to Silt Clay	4	3,969.5	3,400.4	5.1	3.5	3.28	5.1	3.28	5.1	3.28	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.87	0.32	-				
	34.4	12.82	0.32	5	Clayey Silt to Silt Clay	5	4,008.9	3,419.3	6.3	2.9	3.16	6.3	3.16	6.3	3.16	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.87	0.32	-				
	34.8	14.89	0.48	5	Clayey Silt to Silt Clay	5	4,048.2	3,438.2	7.5	3.8	3.16	7.5	3.16	7.5	3.16	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	35.1	15.07	0.50	5	Clayey Silt to Silt Clay	5	4,087.6	3,457.0	7.5	3.8	3.16	7.5	3.16	7.5	3.16	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.86	0.32	-				
	35.4	14.19	0.44	5	Clayey Silt to Silt Clay	5	4,127.0	3,475.9	7.0	3.7	3.17	7.0	3.17	7.0	3.17	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.32	-				
	35.8	13.82	0.40	5	Clayey Silt to Silt Clay	5	4,166.3	3,494.8	6.7	3.4	3.17	6.7	3.17	6.7	3.17	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	36.1	12.67	0.39	5	Clayey Silt to Silt Clay	5	4,205.7	3,513.7	6.0	3.7	3.23	6.0	3.23	6.0	3.23	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.32	-				
	36.4	11.46	0.33	5	Clayey Silt to Silt Clay	4	4,245.0	3,532.6	5.3	3.6	3.27	5.3	3.27	5.3	3.27	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.33	-				
	36.7	11.91	0.30	5	Clayey Silt to Silt Clay	4	4,284.4	3,551.5	5.5	3.0	3.22	5.5	3.22	5.5	3.22	-	Non-Liquefiable	-	0.63	0.25	0.875	0.28	0.86	0.33	-				
	37.1	13.58	0.48	4	Silty Clay to Clay	5	4,323.8	3,570.4	6.4	4.2	3.24	6.4	3.24	6.4	3.24	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.32	-				
	37.4	75.50	1.15	7	Silty Sand to Sandy Silt	17	4,363.2	3,589.4	40.9	1.6	2.34	55.2	2.23	55.2	2.23	1.8	96.8	0.16	0.62	0.24	0.875	0.28	0.85	0.33	0.5	18	2.0	0.3	0.08
	37.7	232.09	1.76	9	Sand	41	4,402.6	3,608.2	127.4	0.8	1.75	169.2	1.66	169.2	1.66	1.0	171.0	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	38.1	306.38	2.28	9	Sand	52	4,442.0	3,627.1	167.7	0.8	1.66	222.8	1.57	222.8	1.57	1.0	222.8	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	38.4	357.73	2.63	10	Gravelly Sand to Sand	60	4,481.3	3,646.0	195.0	0.7	1.61	259.4	1.52	259.4	1.52	1.0	259.4	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	38.7	383.29	2.05	10	Gravelly Sand to Sand	62	4,520.7	3,664.9	207.9	0.5	1.49	277.3	1.40	277.3	1.40	1.0	277.3	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	39.0	452.53	2.81	10	Gravelly Sand to Sand	73	4,560.0	3,683.8	244.4	0.6	1.48	326.5	1.39	326.5	1.39	1.0	326.5	-	0.60	0.24	0.875	0.28	0.85	0.33	-				
	39.4	650.03	3.65	10	Gravelly Sand to Sand	101	4,599.4	3,702.7	349.9	0.6	1.34	467.8	1.26	467.8	1.26	1.0	467.8	-	0.60	0.24	0.875	0.28	0.85	0.33	-				
	39.7	765.38	3.40	10	Gravelly Sand to Sand	115	4,638.8	3,721.6	410.1	0.4	1.22	549.4	1.14	549.4	1.14	1.0	549.4	-	0.60	0.24	0.875	0.28	0.84	0.33	-				
	40.0	715.39	3.75	10	Gravelly Sand to Sand	109	4,678.1	3,740.5	381.3	0.5	1.29	512.2	1.21	512.2	1.21	1.0	512.2	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.4	606.11	3.28	10	Gravelly Sand to Sand	94	4,717.5	3,759.4	321.2	0.5	1.36	432.9	1.27	432.9	1.27	1.0	432.9	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.7	515.94	2.86	10	Gravelly Sand to Sand	82	4,756.8	3,778.3	271.8	0.6	1.42	367.6	1.32	367.6	1.32	1.0	367.6	-	0.59	0.24	0.875	0.28	0.84	0.33	-				
	41.0	449.97	2.34	10	Gravelly Sand to Sand	72	4,796.3	3,797.2	235.7	0.5	1.44	319.8	1.35	319.8	1.35	1.0	319.8	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.3	283.76	2.08	9	Sand	49	4,835.7	3,816.1	147.4	0.7	1.70	201.1	1.60	201.1	1.60	1.0	201.1	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.7	110.19	1.67	8	Sand to Silty Sand	23	4,875.0	3,835.0	56.2	1.6	2.22	77.9	2.12	77.9	2.12	1.5	115.8	0.22	0.58	0.24	0.875	0.28	0.84	0.33	0.7	22	1.5	0.3	0.06
	42.0	31.23	0.88	6	Sandy Silt to Clayey Silt	9	4,914.4	3,853.9	14.9	3.0	2.86	14.9	2.86	14.9	2.86	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.84	0.33	-				
	42.3	22.10	0.23	6	Sandy Silt to Clayey Silt	6	4,953.8	3,872.8	10.1	1.1	2.78	10.1	2.78	10.1	2.78	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.83	0.33	-				
	42.7	22.41	0.19	7	Silty Sand to Sandy Silt	6	4,993.1	3,891.7	10.2	0.9	2.73	10.2	2.73	10.2	2.73	-	Using Other Criteria	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.0	20.19	0.17	7	Silty Sand to Sandy Silt	6	5,032.5	3,910.6	9.0	1.0	2.79	9.0	2.79	9.0	2.79	-	Using Other Criteria	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.3	19.85	0.13	7	Silty Sand to Sandy Silt	6	5,071.8	3,929.5	8.8	0.7	2.75	8.8	2.75	8.8	2.75	-	Using Other Criteria	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	43.6	21.59	0.18	7	Silty Sand to Sandy Silt	6	5,111.2	3,948.4	9.6	0.9	2.76	9.6	2.76	9.6	2.76	-	Using Other Criteria	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.0	20.59	0.18	7	Silty Sand to Sandy Silt	6	5,150.6	3,967.3	9.1	1.0	2.80	9.1	2.80	9.1	2.80	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.3	20.87	0.19	7	Silty Sand to Sandy Silt	6	5,189.9	3,986.2	9.2	1.0	2.79	9.2	2.79	9.2	2.79	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	44.6	23.24	0.29	6	Sandy Silt to Clayey Silt	7	5,229.3	4,005.1	10.3	1.4	2.81	10.3	2.81	10.3	2.81	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	44.9	24.38	0.38	6	Sandy Silt to Clayey Silt	7	5,268.8	4,024.0	10.8	1.7	2.84	10.8	2.84	10.8	2.84	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.82	0.33	-				
	45.3	21.38	0.36	6	Sandy Silt to Clayey Silt	7	5,308.1	4,042.9	9.3	1.9	2.92	9.3	2.92	9.3	2.92	-	Non-Liquefiable	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	45.6	21.10	0.49	6	Sandy Silt to Clayey Silt	7	5,347.5	4,061.8	9.1	2.7	3.00	9.1	3.00	9.1	3.00	-	Non-Liquefiable	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	45.9	46.25	1.42	6	Sandy Silt to Clayey Silt	13	5,386.8	4,080.7	21.3	3.3	2.75	21.3	2.75	21.3	2.75	-	Non-Liquefiable	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.3	101.01	2.13	7	Silty Sand to Sandy Silt	22	5,426.2	4,099.6	48.0	2.2	2.37	69.1	2.25	69.1	2.25	1.8	125.1	0.26	0.56	0.24	0.875	0.27	0.82	0.33	0.8	24	1.3	0.3	0.05
	46.6	164.40	1.89	9	Sand	32	5,465.6	4,118.5	78.5	1.2	2.03	112.2	1.92	112.2	1.92	1.2	135.2	0.31	0.56	0.24	0.875	0.27	0.82	0.33	0.9	27	1.0	0.3	0.04
	46.9	267.81	1.93	9	Sand	47	5,504.9	4,137.4	128.1	0.7	1.74	182.3	1.62	182.3	1.62	1.0	182.3	-	0.56	0.24	0.875	0.27	0.82	0.34	-				
	47.2	424.85	2.39	10	Gravelly Sand to Sand	69	5,544.3	4,156.3	203.1	0.6	1.52	288.6	1.40	288.6	1.40	1.0	288.6	-	0.55	0.24	0.875	0.27	0.82	0.33	-				
	47.6	555.34	2.81	10	Gravelly Sand to Sand	87	5,583.6	4,175.1	264.7	0.5	1.40	376.4	1.29	376.4	1.29	1.0	376.4	-	0.55	0.24	0.875	0.27	0.82	0.33	-				
	47.9	468.77	2.97	10	Gravelly Sand to Sand	76	5,623.0	4,194.0	222.2	0.6	1.52	317.0	1.41	317.0	1.41	1.0	317.0	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.2	370.35	2.06	10	Gravelly Sand to Sand	61	5,662.4	4,212.9	174.5	0.6	1.56	249.9	1.45	249.9	1.45	1.0	249.9	-	0.55	0.24	0.875	0.27	0.81	0.33	-				
	48.6	429.33	2.27	10	Gravelly Sand to Sand	69	5,701.7	4,231.8	201.6	0.5	1.50	289.0	1.38	289.0	1.38	1.0	289.0	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.9	517.02	2.90	10	Gravelly Sand to Sand	82	5,741.2	4,250.8	241.9	0.6	1.46	347.3	1.34	347.3	1.34	1.0	347.3	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	49.2	551.45	3.79	10	Gravelly Sand to Sand	89	5,780.6	4,269.7	257.0	0.7	1.50	369.6	1.39	369.6	1.39	1.0	369.6	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
	49.5	500.89	3.05	10	Gravelly Sand to Sand	81	5,819.9	4,288.6	232.2	0.6	1.49	334.9	1.38	334.9	1.38	1.0	334.9	-	0.54	0.24	0.875	0.27	0.81	0.34	-				

SFB 502-6
2/17/17 TC

a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-2
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ^*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	Δs (in)
	49.9	406.77	1.70	10	Gravelly Sand to Sand	65	5,859.3	4,307.5	187.5	0.4	1.47	271.4	1.34	271.4	1.34	1.0	271.4	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
																									Total		1.5	1.3	0.2

LIQUEFACTION ANALYSES BASED ON CPT DATA
WEST SAN CARLOS STREET & RACE SREEET, SAN JOSE, CALIFORNIA

SFB 502-6
2/17/17 TC

a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-3
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	$K_\sigma{}^*$	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
ft	ft	tsf	tsf				psf	psf																					
	0.3																												
	0.7																												
	1.0																												
	1.3																												
	1.6																												
	2.0																												
	2.3																												
	2.6																												
	3.0																												
	3.3																												
	3.6																												
	3.9																												
	4.3																												
	4.6																												
	4.9	6.33	0.11	4	Silty Clay to Clay	2	565.9	565.9	21.4	1.8	2.60	21.4	2.60	21.4	2.60	-	Non-Liquefiable	-	0.98	0.32	0.875	0.36	1.49	0.25	Not Saturated				
	5.2	20.73	0.45	6	Sandy Silt to Clayey Silt	5	603.6	603.6	67.7	2.2	2.26	37.0	2.46	37.0	2.46	2.6	95.1	0.16	0.98	0.32	0.875	0.36	1.46	0.25	Not Saturated				
	5.6	23.38	0.64	5	Clayey Silt to Silt Clay	6	641.4	641.4	71.9	2.8	2.32	40.4	2.50	40.4	2.50	2.8	111.7	0.21	0.98	0.32	0.875	0.36	1.43	0.25	Not Saturated				
	5.9	25.75	0.78	5	Clayey Silt to Silt Clay	6	679.2	679.2	74.8	3.0	2.33	43.3	2.50	43.3	2.50	2.8	120.6	0.24	0.98	0.32	0.875	0.36	1.41	0.26	Not Saturated				
	6.2	27.58	0.91	5	Clayey Silt to Silt Clay	7	716.9	716.9	75.9	3.4	2.36	45.1	2.52	45.1	2.52	2.9	129.2	0.28	0.97	0.32	0.875	0.36	1.38	0.26	Not Saturated				
	6.6	27.63	1.05	5	Clayey Silt to Silt Clay	7	754.6	754.6	72.2	3.9	2.42	44.0	2.57	44.0	2.57	3.1	138.4	0.33	0.97	0.32	0.875	0.36	1.36	0.26	Not Saturated				
	6.9	25.71	1.06	4	Silty Clay to Clay	7	792.4	792.4	63.9	4.2	2.48	40.0	2.62	50.9	2.55	3.0	154.2	0.42	0.97	0.32	0.875	0.36	1.34	0.27	Not Saturated				
	7.2	26.60	0.95	5	Clayey Silt to Silt Clay	7	830.1	830.1	63.1	3.6	2.44	40.4	2.58	40.4	2.58	3.2	128.7	0.28	0.97	0.31	0.875	0.36	1.32	0.27	Not Saturated				
	7.5	28.99	0.84	5	Clayey Silt to Silt Clay	7	867.8	867.8	65.8	2.9	2.36	43.1	2.49	43.1	2.49	2.7	117.7	0.23	0.97	0.31	0.875	0.36	1.31	0.27	Not Saturated				
	7.9	29.66	0.78	6	Sandy Silt to Clayey Silt	7	905.5	905.5	64.5	2.7	2.34	43.2	2.46	43.2	2.46	2.6	112.0	0.21	0.97	0.31	0.875	0.36	1.29	0.28	Not Saturated				
	8.2	27.42	0.92	5	Clayey Silt to Silt Clay	7	943.2	943.2	57.1	3.4	2.45	39.1	2.57	39.1	2.57	3.1	122.9	0.25	0.96	0.31	0.875	0.36	1.27	0.28	Not Saturated				
	8.5	28.03	0.68	6	Sandy Silt to Clayey Silt	7	981.0	981.0	56.2	2.5	2.36	39.2	2.47	39.2	2.47	2.6	103.5	0.18	0.96	0.31	0.875	0.36	1.26	0.28	Not Saturated				
	8.9	31.41	0.26	7	Silty Sand to Sandy Silt	7	1,018.7	1,018.7	60.7	0.8	2.04	43.1	2.16	43.1	2.16	1.6	68.2	0.11	0.96	0.31	0.875	0.36	1.25	0.29	Not Saturated				
	9.2	34.64	0.25	7	Silty Sand to Sandy Silt	7	1,056.4	1,056.4	64.6	0.7	1.98	46.7	2.10	46.7	2.10	1.5	67.9	0.11	0.96	0.31	0.875	0.35	1.23	0.29	Not Saturated				
	9.5	27.68	0.48	6	Sandy Silt to Clayey Silt	7	1,094.1	1,094.1	49.6	1.8	2.30	36.7	2.40	36.7	2.40	2.3	85.3	0.14	0.96	0.31	0.875	0.35	1.22	0.29	Not Saturated				
	9.8	20.41	0.57	5	Clayey Silt to Silt Clay	5	1,131.9	1,131.9	35.1	2.9	2.55	26.6	2.65	31.0	2.60	3.3	102.2	0.18	0.96	0.31	0.875	0.35	1.21	0.29	Not Saturated				
	10.2	18.66	0.52	5	Clayey Silt to Silt Clay	5	1,169.7	1,169.7	30.9	2.8	2.59	23.9	2.68	27.6	2.63	-	Non-Liquefiable	-	0.95	0.31	0.875	0.35	1.19	0.30	Not Saturated				
	10.5	18.34	0.49	5	Clayey Silt to Silt Clay	5	1,207.4	1,207.4	29.4	2.7	2.60	23.1	2.68	26.5	2.63	-	Non-Liquefiable	-	0.95	0.31	0.875	0.35	1.18	0.30	Not Saturated				
	10.8	17.53	0.45	5	Clayey Silt to Silt Clay	5	1,245.1	1,245.1	27.2	2.7	2.62	27.2	2.62	27.2	2.62	-	Non-Liquefiable	-	0.95	0.31	0.875	0.35	1.17	0.30	Not Saturated				
	11.2	15.20	0.40	5	Clayey Silt to Silt Clay	4	1,282.8	1,282.8	22.7	2.8	2.69	22.7	2.69	22.7	2.69	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.16	0.30	Not Saturated				
	11.5	12.95	0.34	5	Clayey Silt to Silt Clay	4	1,320.5	1,320.5	18.6	2.8	2.76	18.6	2.76	18.6	2.76	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.15	0.30	Not Saturated				
	11.8	11.74	0.29	5	Clayey Silt to Silt Clay	3	1,358.3	1,358.3	16.3	2.6	2.79	16.3	2.79	16.3	2.79	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.14	0.31	Not Saturated				
	12.1	11.62	0.27	5	Clayey Silt to Silt Clay	3	1,396.0	1,396.0	15.6	2.5	2.79	15.6	2.79	15.6	2.79	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.13	0.30	Not Saturated				
	12.5	12.41	0.27	5	Clayey Silt to Silt Clay	3	1,433.7	1,433.7	16.3	2.3	2.76	16.3	2.76	16.3	2.76	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	12.8	12.19	0.27	5	Clayey Silt to Silt Clay	3	1,471.4	1,471.4	15.6	2.3	2.78	15.6	2.78	15.6	2.78	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	13.1	10.33	0.25	5	Clayey Silt to Silt Clay	3	1,509.1	1,509.1	12.7	2.6	2.88	12.7	2.88	12.7	2.88	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.11	0.31	Not Saturated				
	13.5	9.41	0.21	5	Clayey Silt to Silt Clay	3	1,546.9	1,546.9	11.2	2.4	2.91	11.2	2.91	11.2	2.91	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.10	0.31	Not Saturated				
	13.8	9.54	0.19	5	Clayey Silt to Silt Clay	3	1,584.7	1,584.7	11.0	2.1	2.88	11.0	2.88	11.0	2.88	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.09	0.31	Not Saturated				
	14.1	8.95	0.17	5	Clayey Silt to Silt Clay	3	1,622.4	1,622.4	10.0	2.1	2.91	10.0	2.91	10.0	2.91	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.4	10.37	0.19	5	Clayey Silt to Silt Clay	3	1,660.1	1,660.1	11.5	2.0	2.85	11.5	2.85	11.5	2.85	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.8	11.50	0.24	5	Clayey Silt to Silt Clay	3	1,697.9	1,697.9	12.5	2.2	2.84	12.5	2.84	12.5	2.84	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.07	0.32	Not Saturated				
	15.1	11.15	0.22	5	Clayey Silt to Silt Clay	3	1,735.6	1,735.6	11.9	2.1	2.85	11.9	2.85	11.9	2.85	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.06	0.31	Not Saturated				
	15.4	16.91	0.30	6	Sandy Silt to Clayey Silt	5	1,773.3	1,773.3	18.1	1.8	2.67	18.1	2.67	18.1	2.67	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	15.7	13.80	0.23	5	Clayey Silt to Silt Clay	4	1,811.0	1,811.0	14.2	1.8	2.75	14.2	2.75	14.2	2.75	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	16.1	11.38	0.15	5	Clayey Silt to Silt Clay	3	1,848.7	1,848.7	11.3	1.5	2.78	11.3	2.78	11.3	2.78	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.4	11.04	0.14	5	Clayey Silt to Silt Clay	3	1,886.5	1,886.5	10.7	1.4	2.80	10.7	2.80	10.7	2.80	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.7	10.37	0.15	5	Clayey Silt to Silt Clay	3	1,924.2	1,924.2	9.8	1.5	2.85	9.8	2.85	9.8	2.85	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.03	0.32	Not Saturated				
	17.1	9.09	0.12	5	Clayey Silt to Silt Clay	3	1,961.9	1,961.9	8.3	1.5	2.91	8.3	2.91	8.3	2.91	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.4	8.33	0.10	5	Clayey Silt to Silt Clay	3	1,999.6	1,999.6	7.3	1.3	2.93	7.3	2.93	7.3	2.93	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.7	8.36	0.09	5	Clayey Silt to Silt Clay	3	2,037.5	2,037.5	7.2	1.2	2.92	7.2	2.92	7.2	2.92	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.0	8.24	0.08	1	Sensitive Fine Grained	3	2,075.2	2,075.2	6.9	1.1	2.92	6.9	2.92	6.9	2.92	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.4	7.53	0.08	1	Sensitive Fine Grained	2	2,112.9	2,112.9	6.1	1.3	2.99	6.1	2.99	6.1	2.99	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	18.7	8.52	0.10	5	Clayey Silt to Silt Clay	3	2,150.6	2,150.6	6.9	1.3	2.96	6.9	2.96	6.9	2.96	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	19.0	9.65	0.15	5	Clayey Silt to Silt Clay	3	2,188.3	2,188.3	7.8	1.8	2.96	7.8	2.96	7.8	2.96	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.99	0.32	Not Saturated				
	19.4	9.51	0.18	5	Clayey Silt to Silt Clay	3	2,226.1	2,226.1	7.5	2.2	3.02	7.5	3.02	7.5	3.02	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	19.7	8.87	0.17	5	Clayey Silt to Silt Clay	3	2,263.8	2,263.8	6.8	2.2	3.07	6.8	3.07	6.8	3.07	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	20.0	8.83	0.17	5	Clayey Silt to Silt Clay	3	2,301.5	2,301.5	6.7	2.2	3.07	6.7	3.07	6.7	3.07	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.98	0.31	Not Saturated				
	20.3	9.46	0.18	5	Clayey Silt to Silt Clay	3	2,339.2	2,339.2	7.1	2.2	3.05	7.1	3.05	7.1	3.05	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	20.7	9.74	0.21	5	Clayey Silt to Silt Clay	3	2,376.9	2,376.9	7.2	2.5	3.07	7.2	3.07	7.2	3.07	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	21.0	9.27	0.21	5	Clayey Silt to Silt Clay	3	2,414.7	2,414.7	6.7	2.6	3.11	6.7	3.11	6.7	3.11	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.96	0.32	Not Saturated				
	21.3	9.13	0.18	5	Clayey Silt to Silt Clay	3	2,452.4	2,452.4	6.4	2.3	3.09	6.4	3.09	6.4	3.09	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.96	0.32	Not Saturated				
	21.7	8.89	0.18	5	Clayey Silt to Silt Clay	3	2,490.2	2,490.2	6.1	2.3	3.12	6.1	3.12	6.1	3.12	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.0	8.38	0.17	5	Clayey Silt to Silt Clay	3	2,527.9	2,527.9	5.6	2.4	3.15	5.6	3.15	5.6	3.15	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.3	7.89	0.16	5	Clayey Silt to Silt Clay	3	2,565.7	2,565.7	5.1	2.5	3.20	5.1	3.20	5.1	3.20	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.31	Not Saturated				
	22.6	7.41	0.15	5	Clayey Silt to Silt Clay	3	2,603.4	2,603.4	4.7	2.4	3.22	4.7	3.22	4.7	3.22	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.0	7.22	0.13	5	Clayey Silt to Silt Clay	3	2,641.1	2,641.1	4.5	2.3	3.23	4.5	3.23	4.5	3.23	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.3	7.24	0.13	5	Clayey Silt to Silt Clay	3	2,678.8	2,678.8	4.4	2.2	3.23	4.4	3.23	4.4	3.23	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	23.6	7.76	0.13	5	Clayey Silt to Silt Clay	3	2,716.5	2,716.5	4.7	2.0	3.19	4.7	3.19	4.7	3.19	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	24.0	8.76	0.15	5	Clayey Silt to Silt Clay	3	2,754.3	2,754.3	5.4	2.0	3.14	5.4	3.14	5.4	3.14	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.92	0.32	Not Saturated				

SFB 502-6
2/17/17 TC
a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-3
Ground Elevation = ft
Depth to Ground Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
	24.3	8.76	0.16	5	Clayey Silt to Silt Clay	3	2,792.0	2,792.0	5.3	2.1	3.15	5.3	3.15	5.3	3.15	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.6	11.06	0.22	5	Clayey Silt to Silt Clay	4	2,829.7	2,829.7	6.8	2.3	3.08	6.8	3.08	6.8	3.08	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.9	17.90	0.46	5	Clayey Silt to Silt Clay	6	2,867.4	2,867.4	11.5	2.8	2.93	11.5	2.93	11.5	2.93	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.91	0.31	Not Saturated				
	25.3	28.73	0.77	6	Sandy Silt to Clayey Silt	8	2,906.4	2,890.1	18.9	2.8	2.76	18.9	2.76	18.9	2.76	-	Non-Liquefiable	-	0.76	0.25	0.875	0.28	0.91	0.31	-				
	25.6	32.44	0.79	6	Sandy Silt to Clayey Silt	9	2,945.9	2,909.0	21.3	2.6	2.69	21.3	2.69	21.3	2.69	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.31	-				
	25.9	21.84	0.42	6	Sandy Silt to Clayey Silt	6	2,985.3	2,927.9	13.9	2.0	2.79	13.9	2.79	13.9	2.79	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.32	-				
	26.2	11.22	0.19	5	Clayey Silt to Silt Clay	4	3,024.6	2,946.8	6.6	1.9	3.05	6.6	3.05	6.6	3.05	-	Non-Liquefiable	-	0.74	0.25	0.875	0.28	0.91	0.31	-				
	26.6	10.55	0.14	5	Clayey Silt to Silt Clay	4	3,064.0	2,965.7	6.1	1.6	3.04	6.1	3.04	6.1	3.04	-	Non-Liquefiable	-	0.74	0.25	0.875	0.29	0.90	0.32	-				
	26.9	10.54	0.15	5	Clayey Silt to Silt Clay	4	3,103.4	2,984.6	6.0	1.7	3.05	6.0	3.05	6.0	3.05	-	Non-Liquefiable	-	0.74	0.25	0.875	0.29	0.90	0.32	-				
	27.2	10.95	0.18	5	Clayey Silt to Silt Clay	4	3,142.7	3,003.5	6.2	1.9	3.06	6.2	3.06	6.2	3.06	-	Non-Liquefiable	-	0.73	0.25	0.875	0.28	0.90	0.31	-				
	27.6	13.02	0.23	6	Sandy Silt to Clayey Silt	4	3,182.1	3,022.4	7.6	2.0	3.00	7.6	3.00	7.6	3.00	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	27.9	14.36	0.36	5	Clayey Silt to Silt Clay	5	3,221.4	3,041.3	8.4	2.8	3.04	8.4	3.04	8.4	3.04	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	28.2	10.88	0.29	5	Clayey Silt to Silt Clay	4	3,260.8	3,060.2	6.0	3.2	3.19	6.0	3.19	6.0	3.19	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.90	0.32	-				
	28.5	10.51	0.32	4	Silty Clay to Clay	4	3,300.2	3,079.1	5.8	3.6	3.24	5.8	3.24	5.8	3.24	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.89	0.32	-				
	28.9	10.88	0.36	4	Silty Clay to Clay	4	3,339.5	3,098.0	5.9	3.9	3.25	5.9	3.25	5.9	3.25	-	Non-Liquefiable	-	0.71	0.25	0.875	0.29	0.89	0.32	-				
	29.2	10.71	0.36	4	Silty Clay to Clay	4	3,378.9	3,116.9	5.8	4.0	3.26	5.8	3.26	5.8	3.26	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.5	10.17	0.28	5	Clayey Silt to Silt Clay	4	3,418.4	3,135.8	5.4	3.4	3.25	5.4	3.25	5.4	3.25	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.9	10.80	0.26	5	Clayey Silt to Silt Clay	4	3,457.7	3,154.7	5.7	2.9	3.19	5.7	3.19	5.7	3.19	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	30.2	10.82	0.33	4	Silty Clay to Clay	4	3,497.1	3,173.6	5.7	3.6	3.24	5.7	3.24	5.7	3.24	-	Non-Liquefiable	-	0.68	0.24	0.875	0.28	0.89	0.32	-				
	30.5	11.38	0.40	4	Silty Clay to Clay	4	3,536.4	3,192.5	6.0	4.1	3.26	6.0	3.26	6.0	3.26	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	30.8	11.30	0.32	5	Clayey Silt to Silt Clay	4	3,575.8	3,211.4	5.9	3.4	3.22	5.9	3.22	5.9	3.22	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	31.2	14.98	0.30	6	Sandy Silt to Clayey Silt	5	3,615.2	3,230.3	8.2	2.2	3.00	8.2	3.00	8.2	3.00	-	Non-Liquefiable	-	0.67	0.24	0.875	0.28	0.88	0.32	-				
	31.5	18.81	0.40	6	Sandy Silt to Clayey Silt	6	3,654.5	3,249.2	10.5	2.3	2.92	10.5	2.92	10.5	2.92	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	31.8	13.71	0.40	5	Clayey Silt to Silt Clay	5	3,693.9	3,268.1	7.3	3.4	3.14	7.3	3.14	7.3	3.14	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	32.2	12.73	0.46	4	Silty Clay to Clay	5	3,733.2	3,287.0	6.6	4.2	3.23	6.6	3.23	6.6	3.23	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.88	0.32	-				
	32.5	10.86	0.50	3	Clay	5	3,772.6	3,305.8	5.4	5.5	3.37	5.4	3.37	5.4	3.37	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	32.8	10.17	0.46	3	Clay	4	3,812.0	3,324.7	5.0	5.5	3.40	5.0	3.40	5.0	3.40	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	33.1	9.84	0.43	3	Clay	4	3,851.3	3,343.6	4.7	5.4	3.41	4.7	3.41	4.7	3.41	-	Non-Liquefiable	-	0.65	0.24	0.875	0.28	0.87	0.32	-				
	33.5	9.74	0.39	3	Clay	4	3,890.8	3,362.6	4.6	5.0	3.40	4.6	3.40	4.6	3.40	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.32	-				
	33.8	11.57	0.30	5	Clayey Silt to Silt Clay	4	3,930.2	3,381.5	5.7	3.1	3.21	5.7	3.21	5.7	3.21	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.33	-				
	34.1	14.62	0.32	5	Clayey Silt to Silt Clay	5	3,969.5	3,400.4	7.4	2.5	3.06	7.4	3.06	7.4	3.06	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.87	0.32	-				
	34.4	14.17	0.43	5	Clayey Silt to Silt Clay	5	4,008.9	3,419.3	7.1	3.6	3.16	7.1	3.16	7.1	3.16	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.87	0.32	-				
	34.8	12.67	0.46	4	Silty Clay to Clay	5	4,048.2	3,438.2	6.2	4.3	3.26	6.2	3.26	6.2	3.26	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	35.1	12.38	0.43	4	Silty Clay to Clay	5	4,087.6	3,457.0	6.0	4.2	3.26	6.0	3.26	6.0	3.26	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.86	0.32	-				
	35.4	10.74	0.35	4	Silty Clay to Clay	4	4,127.0	3,475.9	5.0	4.1	3.32	5.0	3.32	5.0	3.32	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.32	-				
	35.8	10.45	0.28	5	Clayey Silt to Silt Clay	4	4,166.3	3,494.8	4.8	3.3	3.29	4.8	3.29	4.8	3.29	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	36.1	11.23	0.26	5	Clayey Silt to Silt Clay	4	4,205.7	3,513.7	5.2	2.9	3.23	5.2	3.23	5.2	3.23	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.32	-				
	36.4	11.50	0.22	5	Clayey Silt to Silt Clay	4	4,245.0	3,532.6	5.3	2.3	3.17	5.3	3.17	5.3	3.17	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.33	-				
	36.7	11.34	0.17	6	Sandy Silt to Clayey Silt	4	4,284.4	3,551.5	5.2	1.8	3.13	5.2	3.13	5.2	3.13	-	Non-Liquefiable	-	0.63	0.25	0.875	0.28	0.86	0.33	-				
	37.1	17.94	0.47	5	Clayey Silt to Silt Clay	6	4,323.8	3,570.4	8.8	2.9	3.04	8.8	3.04	8.8	3.04	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.32	-				
	37.4	28.23	0.82	5	Clayey Silt to Silt Clay	9	4,363.2	3,589.4	14.5	3.2	2.88	14.5	2.88	14.5	2.88	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	37.7	24.72	0.78	5	Clayey Silt to Silt Clay	8	4,402.6	3,608.2	12.5	3.4	2.95	12.5	2.95	12.5	2.95	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	38.1	49.66	0.85	7	Silty Sand to Sandy Silt	12	4,442.0	3,627.1	26.2	1.8	2.53	36.1	2.41	36.1	2.41	2.4	85.5	0.14	0.61	0.24	0.875	0.28	0.85	0.33	0.4	16	2.3	0.3	0.09
	38.4	76.03	1.09	7	Silty Sand to Sandy Silt	17	4,481.3	3,646.0	40.5	1.5	2.32	55.1	2.22	55.1	2.22	1.7	94.4	0.16	0.61	0.24	0.875	0.28	0.85	0.33	0.5	17	2.2	0.3	0.08
	38.7	56.27	1.32	6	Sandy Silt to Clayey Silt	14	4,520.7	3,664.9	29.5	2.4	2.57	40.7	2.46	40.7	2.46	2.6	104.6	0.19	0.61	0.24	0.875	0.28	0.85	0.33	0.6	20	1.7	0.3	0.07
	39.0	45.65	1.28	6	Sandy Silt to Clayey Silt	12	4,560.0	3,683.8	23.5	3.0	2.69	23.5	2.69	23.5	2.69	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.85	0.33	-				
	39.4	45.31	1.34	6	Sandy Silt to Clayey Silt	12	4,599.4	3,702.7	23.2	3.1	2.71	23.2	2.71	23.2	2.71	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.85	0.33	-				
	39.7	42.81	1.24	6	Sandy Silt to Clayey Silt	12	4,638.8	3,721.6	21.8	3.1	2.73	21.8	2.73	21.8	2.73	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.84	0.33	-				
	40.0	20.08	0.61	5	Clayey Silt to Silt Clay	7	4,678.1	3,740.5	9.5	3.4	3.05	9.5	3.05	9.5	3.05	-	Non-Liquefiable	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.4	13.61	0.23	6	Sandy Silt to Clayey Silt	5	4,717.5	3,759.4	6.0	2.1	3.10	6.0	3.10	6.0	3.10	-	Non-Liquefiable	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.7	15.51	0.20	6	Sandy Silt to Clayey Silt	5	4,756.8	3,778.3	7.0	1.5	2.98	7.0	2.98	7.0	2.98	-	Non-Liquefiable	-	0.59	0.24	0.875	0.28	0.84	0.33	-				
	41.0	14.19	0.23	6	Sandy Silt to Clayey Silt	5	4,796.3	3,797.2	6.2	2.0	3.08	6.2	3.08	6.2	3.08	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.3	12.72	0.23	5	Clayey Silt to Silt Clay	5	4,835.7	3,816.1	5.4	2.2	3.15	5.4	3.15	5.4	3.15	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.7	12.50	0.18	6	Sandy Silt to Clayey Silt	4	4,875.0	3,835.0	5.2	1.8	3.12	5.2	3.12	5.2	3.12	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.84	0.33	-				
	42.0	12.92	0.16	6	Sandy Silt to Clayey Silt	4	4,914.4	3,853.9	5.4	1.5	3.08	5.4	3.08	5.4	3.08	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.84	0.33	-				
	42.3	13.04	0.16	6	Sandy Silt to Clayey Silt	4	4,953.8	3,872.8	5.5	1.5	3.07	5.5	3.07	5.5	3.07	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.83	0.33	-				
	42.7	13.63	0.20	6	Sandy Silt to Clayey Silt	5	4,993.1	3,891.7	5.7	1.8	3.09	5.7	3.09	5.7	3.09	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.0	17.52	0.33	6	Sandy Silt to Clayey Silt	6	5,032.5	3,910.6	7.7	2.2	3.02	7.7	3.02	7.7	3.02	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.3	18.70	0.48	5	Clayey Silt to Silt Clay	6	5,071.8	3,929.5	8.2	2.9	3.06	8.2	3.06	8.2	3.06	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	43.6	17.69	0.33	6	Sandy Silt to Clayey Silt	6	5,111.2	3,948.4	7.7	2.2	3.02	7.7	3.02	7.7	3.02	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.0	14.40	0.20	6	Sandy Silt to Clayey Silt	5	5,150.6	3,967.3	6.0	1.7	3.06	6.0	3.06	6.0	3.06	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.3	14.08	0.24	6	Sandy Silt to Clayey Silt	5	5,189.9	3,986.2	5.8	2.1	3.11	5.8	3.11	5.8	3.11	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	44.6	16.13	0.47	5	Clayey Silt to Silt Clay	6	5,229.3	4,005.1	6.7	3.5	3.18	6.7	3.18	6.7	3.18	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	44.9	37.18	1.19	5	Clayey Silt to Silt Clay	11	5,268.8	4,024.0	17.2	3.4	2.84	17.2	2.84	17.2	2.84	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.82	0.33	-				
	45.3	103.69	1.66	8	Sand to Silty Sand	22	5,308.1	4,042.9	50.0	1.6	2.28	71.4	2.16	71.4	2.16	1.6	112.6	0.21	0.56	0.24	0.875	0.27	0.82	0.33	0.6	22	1.5	0.3	0.06
	45.6	177.37	1.14	9	Sand	32	5,347.5	4,061.8	86.0	0.7	1.85	121.9	1.73	121.9	1.73	1.1	128.7	0.28	0.56	0.24	0.875	0.27	0.82	0.33	0.8	25	1.2	0.3	0.05
	45.9	228.12	0.95	9	Sand	39	5,386.8	4,080.7	110.5	0.4	1.66	156.4	1.53	156.4	1.53	1.0	156.4	0.44	0.56	0.24	0.875	0.27	0.82	0.33	1.3				
	46.3	267.99	1.65	9	Sand	46	5,426.2	4,099.6	129.4	0.6	1.69	183.3	1.58	183.3	1.58	1.0	183.3	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.6	292.76	3.62	9	Sand	53	5,465.6	4,118.5	140.8	1.2	1.86	199.8	1.76	199.8	1.76	1.1	215.5	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.9	367.95	3.27	9	Sand	63	5,504.9	4,137.4	176.5	0.9	1.69	250.5	1.59	250.5	1.59	1.0	250.5	-	0.56	0.24	0.875	0.27	0.82	0.34	-				
	47.2	271.38	1.58	10	Gravelly Sand to Sand	46	5,544.3	4,156.3	129.3	0.6	1.68	184.3	1.56	184.3	1.56	1.0	184.3	-	0.55	0.24	0.875	0.27	0.82	0.33	-				
	47.6	65.87	1.49	7	Silty Sand to Sandy Silt	16	5,583.6	4,175.1	30.2	2.4	2.55	44.6	2.42	44.6	2.42	2.4	106.8	0.19	0.55	0.24	0.875	0.27	0.82	0.33	0.6	20	1.8	0.3	0.07
	47.9	22.78	0.55	6	Sandy Silt to Clayey Silt	7	5,623.0	4,194.0	9.5	2.7	2.99	9.5	2.99	9.5	2.99	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.2	20.39	0.28	6	Sandy Silt to Clayey Silt	6	5,662.4	4,212.9	8.3	1.6	2.92	8.3	2.92	8.3	2.92	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.81	0.33	-				
	48.6	17.78	0.23	6	Sandy Silt to Clayey Silt	6	5,701.7	4,231.8	7.1	1.5	2.97	7.1	2.97	7.1	2.97	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.9	16.24	0.14	6	Sandy Silt to Clayey Silt	5	5,741.2	4,250.8	6.3	1.0	2.94	6.3	2.94	6.3	2.94	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	49.2	16.26	0.12	6	Sandy Silt to Clayey Silt	5	5,780.6	4,269.7	6.3	0.9	2.92	6.3	2.92	6.3	2.92	-	Using Other Criteria	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
	49.5	16.65	0.15	6	Sandy Silt to Clayey Silt	5	5,819.9	4,288.6	6.4	1.1	2.94	6.4	2.94	6.4	2.94	-	Non-Liquefiable	-	0.54	0.24	0.875	0.27	0.81	0.34	-				

SFB 502-6
2/17/17 TC

a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-3
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ *	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
	49.9	17.54	0.18	6	Sandy Silt to Clayey Silt	6	5,859.3	4,307.5	6.8	1.2	2.95	6.8	2.95	6.8	2.95	-	Non-Liquefiable	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
																									Total		1.8	2.0	0.4

LIQUEFACTION ANALYSES BASED ON CPT DATA
WEST SAN CARLOS STREET & RACE SREEET, SAN JOSE, CALIFORNIA

SFB 502-6
2/17/17 TC
a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-4
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ^*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
ft	ft	tsf	tsf				psf	psf																					
	0.3																												
	0.7																												
	1.0																												
	1.3																												
	1.6																												
	2.0																												
	2.3																												
	2.6																												
	3.0																												
	3.3																												
	3.6																												
	3.9																												
	4.3																												
	4.6																												
	4.9	9.60	0.30	4	Silty Clay to Clay	3	565.9	565.9	32.9	3.3	2.61	32.9	2.61	32.9	2.61	-	Non-Liquefiable	-	0.98	0.32	0.875	0.36	1.49	0.25	Not Saturated				
	5.2	30.03	1.06	5	Clayey Silt to Silt Clay	7	603.6	603.6	98.5	3.6	2.31	53.5	2.48	53.5	2.48	2.7	143.8	0.36	0.98	0.32	0.875	0.36	1.46	0.25	Not Saturated				
	5.6	29.65	1.18	4	Silty Clay to Clay	7	641.4	641.4	91.5	4.0	2.37	51.3	2.54	51.3	2.54	3.0	151.5	0.40	0.98	0.32	0.875	0.36	1.43	0.25	Not Saturated				
	5.9	28.68	1.27	4	Silty Clay to Clay	7	679.2	679.2	83.5	4.5	2.43	48.2	2.59	48.2	2.59	3.2	156.6	0.44	0.98	0.32	0.875	0.36	1.41	0.26	Not Saturated				
	6.2	29.99	1.19	4	Silty Clay to Clay	8	716.9	716.9	82.7	4.0	2.40	49.0	2.55	49.0	2.55	3.0	148.6	0.38	0.97	0.32	0.875	0.36	1.38	0.26	Not Saturated				
	6.6	29.85	1.08	5	Clayey Silt to Silt Clay	7	754.6	754.6	78.1	3.7	2.38	47.6	2.53	47.6	2.53	2.9	139.1	0.33	0.97	0.32	0.875	0.36	1.36	0.26	Not Saturated				
	6.9	28.31	1.23	4	Silty Clay to Clay	7	792.4	792.4	70.4	4.4	2.47	44.0	2.61	56.1	2.54	3.0	165.9	-	0.97	0.32	0.875	0.36	1.34	0.27	Not Saturated				
	7.2	28.39	1.39	3	Clay	7	830.1	830.1	67.4	5.0	2.52	43.1	2.65	54.3	2.59	3.2	175.9	-	0.97	0.31	0.875	0.36	1.32	0.27	Not Saturated				
	7.5	28.13	1.50	3	Clay	7	867.8	867.8	63.8	5.4	2.57	41.8	2.69	52.1	2.63	-	Non-Liquefiable	-	0.97	0.31	0.875	0.36	1.31	0.27	Not Saturated				
	7.9	26.65	1.49	3	Clay	7	905.5	905.5	57.9	5.7	2.61	57.9	2.61	57.9	2.61	-	Non-Liquefiable	-	0.97	0.31	0.875	0.36	1.29	0.28	Not Saturated				
	8.2	23.51	1.39	3	Clay	6	943.2	943.2	48.8	6.1	2.68	48.8	2.68	48.8	2.68	-	Non-Liquefiable	-	0.96	0.31	0.875	0.36	1.27	0.28	Not Saturated				
	8.5	22.74	1.23	3	Clay	6	981.0	981.0	45.4	5.5	2.67	45.4	2.67	45.4	2.67	-	Non-Liquefiable	-	0.96	0.31	0.875	0.36	1.26	0.28	Not Saturated				
	8.9	25.76	0.97	5	Clayey Silt to Silt Clay	7	1,018.7	1,018.7	49.6	3.8	2.53	35.3	2.64	42.3	2.58	3.2	135.5	0.31	0.96	0.31	0.875	0.36	1.25	0.29	Not Saturated				
	9.2	31.93	0.70	6	Sandy Silt to Clayey Silt	8	1,056.4	1,056.4	59.5	2.2	2.31	43.0	2.42	43.0	2.42	2.4	102.3	0.18	0.96	0.31	0.875	0.35	1.23	0.29	Not Saturated				
	9.5	39.21	0.63	7	Silty Sand to Sandy Silt	9	1,094.1	1,094.1	70.7	1.6	2.16	51.9	2.26	51.9	2.26	1.8	95.4	0.16	0.96	0.31	0.875	0.35	1.22	0.29	Not Saturated				
	9.8	45.16	0.74	7	Silty Sand to Sandy Silt	10	1,131.9	1,131.9	78.8	1.6	2.13	58.8	2.23	58.8	2.23	1.7	101.9	0.18	0.96	0.31	0.875	0.35	1.21	0.29	Not Saturated				
	10.2	47.48	0.73	7	Silty Sand to Sandy Silt	10	1,169.7	1,169.7	80.2	1.5	2.11	60.8	2.20	60.8	2.20	1.7	101.0	0.18	0.95	0.31	0.875	0.35	1.19	0.30	Not Saturated				
	10.5	43.91	0.53	7	Silty Sand to Sandy Silt	9	1,207.4	1,207.4	71.7	1.2	2.08	55.3	2.17	55.3	2.17	1.6	87.8	0.14	0.95	0.31	0.875	0.35	1.18	0.30	Not Saturated				
	10.8	33.72	0.62	6	Sandy Silt to Clayey Silt	8	1,245.1	1,245.1	53.2	1.9	2.30	41.8	2.38	41.8	2.38	2.2	92.8	0.15	0.95	0.31	0.875	0.35	1.17	0.30	Not Saturated				
	11.2	22.40	0.84	4	Silty Clay to Clay	6	1,282.8	1,282.8	33.9	3.9	2.65	33.9	2.65	33.9	2.65	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.16	0.30	Not Saturated				
	11.5	17.94	0.72	4	Silty Clay to Clay	5	1,320.5	1,320.5	26.2	4.2	2.76	26.2	2.76	26.2	2.76	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.15	0.30	Not Saturated				
	11.8	18.39	0.63	5	Clayey Silt to Silt Clay	5	1,358.3	1,358.3	26.1	3.5	2.71	26.1	2.71	26.1	2.71	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.14	0.31	Not Saturated				
	12.1	16.09	0.60	4	Silty Clay to Clay	5	1,396.0	1,396.0	22.1	3.9	2.79	22.1	2.79	22.1	2.79	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.13	0.30	Not Saturated				
	12.5	14.44	0.57	4	Silty Clay to Clay	4	1,433.7	1,433.7	19.1	4.2	2.86	19.1	2.86	19.1	2.86	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	12.8	12.68	0.52	3	Clay	4	1,471.4	1,471.4	16.2	4.4	2.93	16.2	2.93	16.2	2.93	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	13.1	11.45	0.45	3	Clay	4	1,509.1	1,509.1	14.2	4.2	2.96	14.2	2.96	14.2	2.96	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.11	0.31	Not Saturated				
	13.5	14.74	0.46	5	Clayey Silt to Silt Clay	4	1,546.9	1,546.9	18.1	3.3	2.81	18.1	2.81	18.1	2.81	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.10	0.31	Not Saturated				
	13.8	14.36	0.45	5	Clayey Silt to Silt Clay	4	1,584.7	1,584.7	17.1	3.3	2.83	17.1	2.83	17.1	2.83	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.09	0.31	Not Saturated				
	14.1	13.88	0.40	5	Clayey Silt to Silt Clay	4	1,622.4	1,622.4	16.1	3.1	2.84	16.1	2.84	16.1	2.84	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.4	15.80	0.44	5	Clayey Silt to Silt Clay	5	1,660.1	1,660.1	18.0	3.0	2.79	18.0	2.79	18.0	2.79	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.8	17.17	0.51	5	Clayey Silt to Silt Clay	5	1,697.9	1,697.9	19.2	3.1	2.78	19.2	2.78	19.2	2.78	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.07	0.32	Not Saturated				
	15.1	18.43	0.62	5	Clayey Silt to Silt Clay	5	1,735.6	1,735.6	20.2	3.5	2.79	20.2	2.79	20.2	2.79	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.06	0.31	Not Saturated				
	15.4	19.05	0.62	5	Clayey Silt to Silt Clay	5	1,773.3	1,773.3	20.5	3.4	2.78	20.5	2.78	20.5	2.78	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	15.7	21.18	0.73	5	Clayey Silt to Silt Clay	6	1,811.0	1,811.0	22.4	3.6	2.77	22.4	2.77	22.4	2.77	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	16.1	23.91	0.83	5	Clayey Silt to Silt Clay	7	1,848.7	1,848.7	24.9	3.6	2.73	24.9	2.73	24.9	2.73	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.4	21.72	0.82	4	Silty Clay to Clay	6	1,886.5	1,886.5	22.0	4.0	2.80	22.0	2.80	22.0	2.80	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.7	16.80	0.69	4	Silty Clay to Clay	5	1,924.2	1,924.2	16.5	4.3	2.92	16.5	2.92	16.5	2.92	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.03	0.32	Not Saturated				
	17.1	12.35	0.43	4	Silty Clay to Clay	4	1,961.9	1,961.9	11.6	3.8	3.00	11.6	3.00	11.6	3.00	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.4	11.48	0.32	5	Clayey Silt to Silt Clay	4	1,999.6	1,999.6	10.5	3.0	2.98	10.5	2.98	10.5	2.98	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.7	11.69	0.33	5	Clayey Silt to Silt Clay	4	2,037.5	2,037.5	10.5	3.1	2.98	10.5	2.98	10.5	2.98	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.0	11.73	0.36	4	Silty Clay to Clay	4	2,075.2	2,075.2	10.3	3.4	3.02	10.3	3.02	10.3	3.02	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.4	10.57	0.34	4	Silty Clay to Clay	4	2,112.9	2,112.9	9.0	3.6	3.08	9.0	3.08	9.0	3.08	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	18.7	9.73	0.24	5	Clayey Silt to Silt Clay	3	2,150.6	2,150.6	8.1	2.7	3.05	8.1	3.05	8.1	3.05	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	19.0	9.46	0.21	5	Clayey Silt to Silt Clay	3	2,188.3	2,188.3	7.6	2.6	3.06	7.6	3.06	7.6	3.06	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.99	0.32	Not Saturated				
	19.4	9.06	0.23	5	Clayey Silt to Silt Clay	3	2,226.1	2,226.1	7.1	2.9	3.11	7.1	3.11	7.1	3.11	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	19.7	8.97	0.24	4	Silty Clay to Clay	3	2,263.8	2,263.8	6.9	3.1	3.14	6.9	3.14	6.9	3.14	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	20.0	8.61	0.28	4	Silty Clay to Clay	3	2,301.5	2,301.5	6.5	3.7	3.20	6.5	3.20	6.5	3.20	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.98	0.31	Not Saturated				
	20.3	7.79	0.26	3	Clay	3	2,339.2	2,339.2	5.7	4.0	3.27	5.7	3.27	5.7	3.27	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	20.7	7.63	0.22	4	Silty Clay to Clay	3	2,376.9	2,376.9	5.4	3.4	3.25	5.4	3.25	5.4	3.25	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	21.0	7.25	0.18	4	Silty Clay to Clay	3	2,414.7	2,414.7	5.0	3.0	3.25	5.0	3.25	5.0	3.25	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.96	0.32	Not Saturated				
	21.3	6.88	0.13	5	Clayey Silt to Silt Clay	3	2,452.4	2,452.4	4.6	2.4	3.23	4.6	3.23	4.6	3.23	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.96	0.32	Not Saturated				
	21.7	6.81	0.12	5	Clayey Silt to Silt Clay	3	2,490.2	2,490.2	4.5	2.1	3.22	4.5	3.22	4.5	3.22	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.0	7.72	0.12	5	Clayey Silt to Silt Clay	3	2,527.9	2,527.9	5.1	1.9	3.14	5.1	3.14	5.1	3.14	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.3	7.90	0.16	5	Clayey Silt to Silt Clay	3	2,565.7	2,565.7	5.2	2.4	3.19	5.2	3.19	5.2	3.19	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.31	Not Saturated				
	22.6	7.53	0.14	5	Clayey Silt to Silt Clay	3	2,603.4	2,603.4	4.8	2.2	3.20	4.8	3.20	4.8	3.20	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.0	8.54	0.12	5	Clayey Silt to Silt Clay	3	2,641.1	2,641.1	5.5	1.7	3.09	5.5	3.09	5.5	3.09	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.3	11.43	0.18	5	Clayey Silt to Silt Clay	4	2,678.8	2,678.8	7.5	1.8	2.98	7.5	2.98	7.5	2.98	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	23.6	13.30	0.33	5	Clayey Silt to Silt Clay	4	2,716.5	2,716.5	8.8	2.8	3.02	8.8	3.02	8.8	3.02	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	24.0	13.90	0.43	5	Clayey Silt to Silt Clay	5	2,754.3	2,754.3	9.1	3.4	3.06	9.1	3.06	9.1	3.06	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.92	0.32	Not Saturated				

SFB 502-6
2/17/17 TC
a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-4
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
	24.3	15.46	0.43	5	Clayey Silt to Silt Clay	5	2,792.0	2,792.0	10.1	3.1	3.00	10.1	3.00	10.1	3.00	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.6	15.34	0.46	5	Clayey Silt to Silt Clay	5	2,829.7	2,829.7	9.8	3.3	3.02	9.8	3.02	9.8	3.02	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.9	15.22	0.46	5	Clayey Silt to Silt Clay	5	2,867.4	2,867.4	9.6	3.3	3.04	9.6	3.04	9.6	3.04	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.91	0.31	Not Saturated				
	25.3	13.90	0.35	5	Clayey Silt to Silt Clay	5	2,906.4	2,890.1	8.6	2.8	3.03	8.6	3.03	8.6	3.03	-	Non-Liquefiable	-	0.76	0.25	0.875	0.28	0.91	0.31	-				
	25.6	14.87	0.33	5	Clayey Silt to Silt Clay	5	2,945.9	2,909.0	9.2	2.4	2.98	9.2	2.98	9.2	2.98	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.31	-				
	25.9	17.50	0.46	5	Clayey Silt to Silt Clay	6	2,985.3	2,927.9	10.9	2.8	2.95	10.9	2.95	10.9	2.95	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.32	-				
	26.2	29.53	0.85	6	Sandy Silt to Clayey Silt	8	3,024.6	2,946.8	19.0	3.0	2.77	19.0	2.77	19.0	2.77	-	Non-Liquefiable	-	0.74	0.25	0.875	0.28	0.91	0.31	-				
	26.6	44.46	1.06	6	Sandy Silt to Clayey Silt	11	3,064.0	2,965.7	28.9	2.5	2.57	35.8	2.50	35.8	2.50	2.8	99.7	0.17	0.74	0.25	0.875	0.29	0.90	0.32	0.5	19	1.8	0.3	0.07
	26.9	31.97	0.80	6	Sandy Silt to Clayey Silt	9	3,103.4	2,984.6	20.4	2.6	2.71	20.4	2.71	20.4	2.71	-	Non-Liquefiable	-	0.74	0.25	0.875	0.29	0.90	0.32	-				
	27.2	15.57	0.42	5	Clayey Silt to Silt Clay	5	3,142.7	3,003.5	9.3	3.0	3.02	9.3	3.02	9.3	3.02	-	Non-Liquefiable	-	0.73	0.25	0.875	0.28	0.90	0.31	-				
	27.6	13.32	0.33	5	Clayey Silt to Silt Clay	5	3,182.1	3,022.4	7.8	2.8	3.07	7.8	3.07	7.8	3.07	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	27.9	12.14	0.33	5	Clayey Silt to Silt Clay	4	3,221.4	3,041.3	6.9	3.1	3.14	6.9	3.14	6.9	3.14	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	28.2	12.16	0.31	5	Clayey Silt to Silt Clay	4	3,260.8	3,060.2	6.9	3.0	3.13	6.9	3.13	6.9	3.13	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.90	0.32	-				
	28.5	12.67	0.29	5	Clayey Silt to Silt Clay	4	3,300.2	3,079.1	7.2	2.6	3.09	7.2	3.09	7.2	3.09	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.89	0.32	-				
	28.9	13.22	0.30	5	Clayey Silt to Silt Clay	4	3,339.5	3,098.0	7.5	2.6	3.07	7.5	3.07	7.5	3.07	-	Non-Liquefiable	-	0.71	0.25	0.875	0.29	0.89	0.32	-				
	29.2	12.56	0.32	5	Clayey Silt to Silt Clay	4	3,378.9	3,116.9	7.0	3.0	3.13	7.0	3.13	7.0	3.13	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.5	12.42	0.29	5	Clayey Silt to Silt Clay	4	3,418.4	3,135.8	6.8	2.7	3.11	6.8	3.11	6.8	3.11	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.9	13.35	0.26	5	Clayey Silt to Silt Clay	4	3,457.7	3,154.7	7.4	2.2	3.04	7.4	3.04	7.4	3.04	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	30.2	13.24	0.25	5	Clayey Silt to Silt Clay	4	3,497.1	3,173.6	7.2	2.2	3.04	7.2	3.04	7.2	3.04	-	Non-Liquefiable	-	0.68	0.24	0.875	0.28	0.89	0.32	-				
	30.5	12.14	0.25	5	Clayey Silt to Silt Clay	4	3,536.4	3,192.5	6.5	2.4	3.10	6.5	3.10	6.5	3.10	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	30.8	12.23	0.27	5	Clayey Silt to Silt Clay	4	3,575.8	3,211.4	6.5	2.5	3.12	6.5	3.12	6.5	3.12	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	31.2	11.53	0.28	5	Clayey Silt to Silt Clay	4	3,615.2	3,230.3	6.0	2.9	3.17	6.0	3.17	6.0	3.17	-	Non-Liquefiable	-	0.67	0.24	0.875	0.28	0.88	0.32	-				
	31.5	11.43	0.27	5	Clayey Silt to Silt Clay	4	3,654.5	3,249.2	5.9	2.8	3.17	5.9	3.17	5.9	3.17	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	31.8	11.09	0.22	5	Clayey Silt to Silt Clay	4	3,693.9	3,268.1	5.7	2.3	3.15	5.7	3.15	5.7	3.15	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	32.2	10.62	0.21	5	Clayey Silt to Silt Clay	4	3,733.2	3,287.0	5.3	2.4	3.17	5.3	3.17	5.3	3.17	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.88	0.32	-				
	32.5	10.47	0.22	5	Clayey Silt to Silt Clay	4	3,772.6	3,305.8	5.2	2.6	3.20	5.2	3.20	5.2	3.20	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	32.8	13.04	0.30	5	Clayey Silt to Silt Clay	5	3,812.0	3,324.7	6.7	2.7	3.12	6.7	3.12	6.7	3.12	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	33.1	14.14	0.36	5	Clayey Silt to Silt Clay	5	3,851.3	3,343.6	7.3	3.0	3.11	7.3	3.11	7.3	3.11	-	Non-Liquefiable	-	0.65	0.24	0.875	0.28	0.87	0.32	-				
	33.5	14.38	0.40	5	Clayey Silt to Silt Clay	5	3,890.8	3,362.6	7.4	3.2	3.12	7.4	3.12	7.4	3.12	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.32	-				
	33.8	14.18	0.45	5	Clayey Silt to Silt Clay	5	3,930.2	3,381.5	7.2	3.6	3.16	7.2	3.16	7.2	3.16	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.33	-				
	34.1	13.85	0.45	5	Clayey Silt to Silt Clay	5	3,969.5	3,400.4	7.0	3.8	3.18	7.0	3.18	7.0	3.18	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.87	0.32	-				
	34.4	12.56	0.39	5	Clayey Silt to Silt Clay	5	4,008.9	3,419.3	6.2	3.7	3.22	6.2	3.22	6.2	3.22	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.87	0.32	-				
	34.8	10.79	0.29	5	Clayey Silt to Silt Clay	4	4,048.2	3,438.2	5.1	3.3	3.26	5.1	3.26	5.1	3.26	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	35.1	10.51	0.24	5	Clayey Silt to Silt Clay	4	4,087.6	3,457.0	4.9	2.8	3.24	4.9	3.24	4.9	3.24	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.86	0.32	-				
	35.4	13.42	0.30	5	Clayey Silt to Silt Clay	5	4,127.0	3,475.9	6.5	2.7	3.12	6.5	3.12	6.5	3.12	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.32	-				
	35.8	12.14	0.23	5	Clayey Silt to Silt Clay	4	4,166.3	3,494.8	5.8	2.3	3.14	5.8	3.14	5.8	3.14	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	36.1	12.28	0.28	5	Clayey Silt to Silt Clay	4	4,205.7	3,513.7	5.8	2.7	3.17	5.8	3.17	5.8	3.17	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.32	-				
	36.4	12.71	0.30	5	Clayey Silt to Silt Clay	5	4,245.0	3,532.6	6.0	2.8	3.17	6.0	3.17	6.0	3.17	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.33	-				
	36.7	13.21	0.33	5	Clayey Silt to Silt Clay	5	4,284.4	3,551.5	6.2	3.0	3.17	6.2	3.17	6.2	3.17	-	Non-Liquefiable	-	0.63	0.25	0.875	0.28	0.86	0.33	-				
	37.1	15.28	0.49	5	Clayey Silt to Silt Clay	6	4,323.8	3,570.4	7.3	3.7	3.16	7.3	3.16	7.3	3.16	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.32	-				
	37.4	32.95	1.09	5	Clayey Silt to Silt Clay	10	4,363.2	3,589.4	17.1	3.5	2.85	17.1	2.85	17.1	2.85	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	37.7	53.13	1.49	6	Sandy Silt to Clayey Silt	14	4,402.6	3,608.2	28.2	2.9	2.63	28.2	2.63	28.2	2.63	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	38.1	44.56	1.48	5	Clayey Silt to Silt Clay	12	4,442.0	3,627.1	23.3	3.5	2.74	23.3	2.74	23.3	2.74	-	Non-Liquefiable	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	38.4	32.61	1.23	5	Clayey Silt to Silt Clay	10	4,481.3	3,646.0	16.7	4.1	2.90	16.7	2.90	16.7	2.90	-	Non-Liquefiable	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	38.7	21.21	0.75	5	Clayey Silt to Silt Clay	7	4,520.7	3,664.9	10.3	3.9	3.05	10.3	3.05	10.3	3.05	-	Non-Liquefiable	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	39.0	15.23	0.33	5	Clayey Silt to Silt Clay	5	4,560.0	3,683.8	7.0	2.5	3.08	7.0	3.08	7.0	3.08	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.85	0.33	-				
	39.4	15.39	0.27	6	Sandy Silt to Clayey Silt	5	4,599.4	3,702.7	7.1	2.0	3.04	7.1	3.04	7.1	3.04	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.85	0.33	-				
	39.7	14.35	0.29	5	Clayey Silt to Silt Clay	5	4,638.8	3,721.6	6.5	2.4	3.10	6.5	3.10	6.5	3.10	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.84	0.33	-				
	40.0	12.91	0.26	5	Clayey Silt to Silt Clay	5	4,678.1	3,740.5	5.7	2.4	3.15	5.7	3.15	5.7	3.15	-	Non-Liquefiable	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.4	11.76	0.21	5	Clayey Silt to Silt Clay	4	4,717.5	3,759.4	5.0	2.2	3.18	5.0	3.18	5.0	3.18	-	Non-Liquefiable	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.7	11.35	0.17	6	Sandy Silt to Clayey Silt	4	4,756.8	3,778.3	4.7	1.9	3.17	4.7	3.17	4.7	3.17	-	Non-Liquefiable	-	0.59	0.24	0.875	0.28	0.84	0.33	-				
	41.0	11.70	0.18	6	Sandy Silt to Clayey Silt	4	4,796.3	3,797.2	4.9	2.0	3.17	4.9	3.17	4.9	3.17	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.3	12.97	0.22	6	Sandy Silt to Clayey Silt	5	4,835.7	3,816.1	5.5	2.1	3.13	5.5	3.13	5.5	3.13	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.7	14.65	0.27	6	Sandy Silt to Clayey Silt	5	4,875.0	3,835.0	6.4	2.2	3.09	6.4	3.09	6.4	3.09	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.84	0.33	-				
	42.0	16.02	0.35	5	Clayey Silt to Silt Clay	5	4,914.4	3,853.9	7.0	2.6	3.09	7.0	3.09	7.0	3.09	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.84	0.33	-				
	42.3	16.47	0.37	5	Clayey Silt to Silt Clay	6	4,953.8	3,872.8	7.2	2.6	3.08	7.2	3.08	7.2	3.08	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.83	0.33	-				
	42.7	18.07	0.43	5	Clayey Silt to Silt Clay	6	4,993.1	3,891.7	8.0	2.8	3.06	8.0	3.06	8.0	3.06	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.0	21.67	0.64	5	Clayey Silt to Silt Clay	7	5,032.5	3,910.6	9.8	3.3	3.03	9.8	3.03	9.8	3.03	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.3	30.80	0.94	5	Clayey Silt to Silt Clay	9	5,071.8	3,929.5	14.4	3.3	2.89	14.4	2.89	14.4	2.89	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	43.6	32.59	0.96	6	Sandy Silt to Clayey Silt	10	5,111.2	3,948.4	15.2	3.2	2.87	15.2	2.87	15.2	2.87	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.0	29.06	0.84	6	Sandy Silt to Clayey Silt	9	5,150.6	3,967.3	13.4	3.2	2.91	13.4	2.91	13.4	2.91	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.3	25.65	0.61	6	Sandy Silt to Clayey Silt	8	5,189.9	3,986.2	11.6	2.7	2.91	11.6	2.91	11.6	2.91	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	44.6	22.63	0.50	6	Sandy Silt to Clayey Silt	7	5,229.3	4,005.1	10.0	2.5	2.95	10.0	2.95	10.0	2.95	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	44.9	20.78	0.58	5	Clayey Silt to Silt Clay	7	5,268.8	4,024.0	9.0	3.2	3.05	9.0	3.05	9.0	3.05	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.82	0.33	-				
	45.3	35.29	0.81	6	Sandy Silt to Clayey Silt	10	5,308.1	4,042.9	16.1	2.5	2.78	16.1	2.78	16.1	2.78	-	Non-Liquefiable	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	45.6	23.55	0.62	5	Clayey Silt to Silt Clay	8	5,347.5	4,061.8	10.3	3.0	2.98	10.3	2.98	10.3	2.98	-	Non-Liquefiable	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	45.9	23.78	0.54	6	Sandy Silt to Clayey Silt	7	5,386.8	4,080.7	10.3	2.6	2.95	10.3	2.95	10.3	2.95	-	Non-Liquefiable	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.3	81.45	1.66	7	Silty Sand to Sandy Silt	18	5,426.2	4,099.6	38.4	2.1	2.44	55.7	2.31	55.7	2.31	2.0	111.2	0.21	0.56	0.24	0.875	0.27	0.82	0.33	0.6	21	1.6	0.3	0.06
	46.6	135.85	2.50	8	Sand to Silty Sand	28	5,465.6	4,118.5	64.6	1.9	2.23	92.7	2.12	92.7	2.12	1.5	138.2	0.33	0.56	0.24	0.875	0.27	0.82	0.33	1.0				
	46.9	153.98	2.04	8	Sand to Silty Sand	31	5,504.9	4,137.4	73.1	1.3	2.10	104.8	1.98	104.8	1.98	1.3	133.8	0.30	0.56	0.24	0.875	0.27	0.82	0.34	0.9	27	1.0	0.3	0.04
	47.2	78.43	2.00	7	Silty Sand to Sandy Silt	18	5,544.3	4,156.3	36.4	2.6	2.52	53.3	2.39	53.3	2.39	2.3	122.1	0.25	0.55	0.24	0.875	0.27	0.82	0.33	0.7	24	1.3	0.3	0.05
	47.6	22.90	0.85	5	Clayey Silt to Silt Clay	8	5,583.6	4,175.1	9.6	4.2	3.10	9.6	3.10	9.6	3.10	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.82	0.33	-				
	47.9	17.50	0.25	6	Sandy Silt to Clayey Silt	6	5,623.0	4,194.0	7.0	1.7	3.00	7.0	3.00	7.0	3.00	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.2	23.11	0.39	6	Sandy Silt to Clayey Silt	7	5,662.4	4,212.9	9.6	1.9	2.90	9.6	2.90	9.6	2.90	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.81	0.33	-				
	48.6	22.17	0.48	6	Sandy Silt to Clayey Silt	7	5,701.7	4,231.8	9.1	2.5	2.98	9.1	2.98	9.1	2.98	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.9	17.98	0.35	6	Sandy Silt to Clayey Silt	6	5,741.2	4,250.8	7.1	2.3	3.06	7.1	3.06	7.1	3.06	-	Non-Liquefiable	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	49.2	17.65	0.21	6	Sandy Silt to Clayey Silt	6	5,780.6	4,269.7	6.9	1.4	2.97	6.9	2.97	6.9	2.97	-	Non-Liquefiable	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
	49.5	15.12	0.15	6	Sandy Silt to Clayey Silt	5	5,819.9	4,288.6	5.7	1.2	3.01	5.7	3.01	5.7	3.01	-	Non-Liquefiable	-	0.54	0.24	0.875	0.27	0.81	0.34	-				

SFB 502-6
2/17/17 TC

a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-4
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	$K_\sigma{}^*$	$CSR_{eq, M=7.5, 1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
	49.9	14.06	0.15	6	Sandy Silt to Clayey Silt	5	5,859.3	4,307.5	5.2	1.3	3.06	5.2	3.06	5.2	3.06	-	Non-Liquefiable	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
																									Total		1.5	1.3	0.2

SFB 502-6
2/17/17 TC
a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-5
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ^*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
ft	ft	tsf	tsf				psf	psf																					
	0.3																												
	0.7																												
	1.0																												
	1.3																												
	1.6																												
	2.0																												
	2.3																												
	2.6																												
	3.0																												
	3.3																												
	3.6																												
	3.9																												
	4.3																												
	4.6																												
	4.9	6.62	0.26	3	Clay	2	565.9	565.9	22.4	4.2	2.81	22.4	2.81	22.4	2.81	-	Non-Liquefiable	-	0.98	0.32	0.875	0.36	1.49	0.25	Not Saturated				
	5.2	21.10	0.91	4	Silty Clay to Clay	5	603.6	603.6	68.9	4.4	2.47	37.6	2.65	51.3	2.56	3.1	158.4	0.45	0.98	0.32	0.875	0.36	1.46	0.25	Not Saturated				
	5.6	20.92	0.87	4	Silty Clay to Clay	5	641.4	641.4	64.2	4.2	2.49	36.2	2.66	48.6	2.57	3.1	152.3	0.41	0.98	0.32	0.875	0.36	1.43	0.25	Not Saturated				
	5.9	19.73	0.80	4	Silty Clay to Clay	5	679.2	679.2	57.1	4.1	2.51	33.1	2.68	43.9	2.59	3.3	143.1	0.35	0.98	0.32	0.875	0.36	1.41	0.26	Not Saturated				
	6.2	21.73	0.76	5	Clayey Silt to Silt Clay	5	716.9	716.9	59.6	3.5	2.45	35.5	2.61	46.4	2.53	2.9	134.6	0.31	0.97	0.32	0.875	0.36	1.38	0.26	Not Saturated				
	6.6	24.19	0.64	5	Clayey Silt to Silt Clay	6	754.6	754.6	63.1	2.7	2.35	38.6	2.50	38.6	2.50	2.8	107.4	0.20	0.97	0.32	0.875	0.36	1.36	0.26	Not Saturated				
	6.9	24.45	0.47	6	Sandy Silt to Clayey Silt	6	792.4	792.4	60.7	1.9	2.26	38.0	2.42	38.0	2.42	2.4	90.9	0.15	0.97	0.32	0.875	0.36	1.34	0.27	Not Saturated				
	7.2	25.83	0.40	6	Sandy Silt to Clayey Silt	6	830.1	830.1	61.2	1.6	2.20	39.3	2.35	39.3	2.35	2.1	83.4	0.13	0.97	0.31	0.875	0.36	1.32	0.27	Not Saturated				
	7.5	28.46	0.29	7	Silty Sand to Sandy Silt	6	867.8	867.8	64.6	1.0	2.07	42.3	2.22	42.3	2.22	1.7	72.9	0.12	0.97	0.31	0.875	0.36	1.31	0.27	Not Saturated				
	7.9	28.87	0.41	6	Sandy Silt to Clayey Silt	7	905.5	905.5	62.8	1.4	2.17	42.0	2.30	42.0	2.30	2.0	82.5	0.13	0.97	0.31	0.875	0.36	1.29	0.28	Not Saturated				
	8.2	24.89	0.79	5	Clayey Silt to Silt Clay	6	943.2	943.2	51.8	3.2	2.46	35.5	2.58	35.5	2.58	3.2	114.5	0.22	0.96	0.31	0.875	0.36	1.27	0.28	Not Saturated				
	8.5	22.90	0.92	4	Silty Clay to Clay	6	981.0	981.0	45.7	4.1	2.58	32.0	2.69	38.7	2.63	-	Non-Liquefiable	-	0.96	0.31	0.875	0.36	1.26	0.28	Not Saturated				
	8.9	22.59	0.91	4	Silty Clay to Clay	6	1,018.7	1,018.7	43.4	4.1	2.59	31.0	2.70	37.1	2.64	-	Non-Liquefiable	-	0.96	0.31	0.875	0.36	1.25	0.29	Not Saturated				
	9.2	21.99	0.94	4	Silty Clay to Clay	6	1,056.4	1,056.4	40.6	4.4	2.63	40.6	2.63	40.6	2.63	-	Non-Liquefiable	-	0.96	0.31	0.875	0.35	1.23	0.29	Not Saturated				
	9.5	21.47	0.93	4	Silty Clay to Clay	6	1,094.1	1,094.1	38.2	4.4	2.65	38.2	2.65	38.2	2.65	-	Non-Liquefiable	-	0.96	0.31	0.875	0.35	1.22	0.29	Not Saturated				
	9.8	24.74	0.66	5	Clayey Silt to Silt Clay	6	1,131.9	1,131.9	42.7	2.7	2.47	32.2	2.57	32.2	2.57	3.1	100.8	0.18	0.96	0.31	0.875	0.35	1.21	0.29	Not Saturated				
	10.2	26.61	0.49	6	Sandy Silt to Clayey Silt	6	1,169.7	1,169.7	44.5	1.9	2.36	34.1	2.45	34.1	2.45	2.5	85.6	0.14	0.95	0.31	0.875	0.35	1.19	0.30	Not Saturated				
	10.5	21.03	0.71	5	Clayey Silt to Silt Clay	6	1,207.4	1,207.4	33.8	3.5	2.62	33.8	2.62	33.8	2.62	-	Non-Liquefiable	-	0.95	0.31	0.875	0.35	1.18	0.30	Not Saturated				
	10.8	15.27	0.71	3	Clay	4	1,245.1	1,245.1	23.5	4.8	2.83	23.5	2.83	23.5	2.83	-	Non-Liquefiable	-	0.95	0.31	0.875	0.35	1.17	0.30	Not Saturated				
	11.2	13.32	0.52	4	Silty Clay to Clay	4	1,282.8	1,282.8	19.8	4.1	2.84	19.8	2.84	19.8	2.84	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.16	0.30	Not Saturated				
	11.5	14.41	0.48	4	Silty Clay to Clay	4	1,320.5	1,320.5	20.8	3.5	2.78	20.8	2.78	20.8	2.78	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.15	0.30	Not Saturated				
	11.8	19.35	0.51	5	Clayey Silt to Silt Clay	5	1,358.3	1,358.3	27.5	2.7	2.62	27.5	2.62	27.5	2.62	-	Non-Liquefiable	-	0.94	0.31	0.875	0.35	1.14	0.31	Not Saturated				
	12.1	18.19	0.62	5	Clayey Silt to Silt Clay	5	1,396.0	1,396.0	25.1	3.5	2.72	25.1	2.72	25.1	2.72	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.13	0.30	Not Saturated				
	12.5	13.13	0.61	3	Clay	4	1,433.7	1,433.7	17.3	4.9	2.94	17.3	2.94	17.3	2.94	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	12.8	11.49	0.46	3	Clay	4	1,471.4	1,471.4	14.6	4.3	2.96	14.6	2.96	14.6	2.96	-	Non-Liquefiable	-	0.93	0.30	0.875	0.35	1.12	0.31	Not Saturated				
	13.1	12.60	0.43	4	Silty Clay to Clay	4	1,509.1	1,509.1	15.7	3.6	2.89	15.7	2.89	15.7	2.89	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.11	0.31	Not Saturated				
	13.5	14.29	0.49	4	Silty Clay to Clay	4	1,546.9	1,546.9	17.5	3.6	2.85	17.5	2.85	17.5	2.85	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.10	0.31	Not Saturated				
	13.8	14.85	0.52	4	Silty Clay to Clay	4	1,584.7	1,584.7	17.7	3.7	2.85	17.7	2.85	17.7	2.85	-	Non-Liquefiable	-	0.92	0.30	0.875	0.34	1.09	0.31	Not Saturated				
	14.1	18.58	0.64	5	Clayey Silt to Silt Clay	5	1,622.4	1,622.4	21.9	3.6	2.77	21.9	2.77	21.9	2.77	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.4	21.23	0.77	5	Clayey Silt to Silt Clay	6	1,660.1	1,660.1	24.6	3.8	2.75	24.6	2.75	24.6	2.75	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.08	0.31	Not Saturated				
	14.8	23.69	0.93	4	Silty Clay to Clay	7	1,697.9	1,697.9	26.9	4.1	2.74	26.9	2.74	26.9	2.74	-	Non-Liquefiable	-	0.91	0.30	0.875	0.34	1.07	0.32	Not Saturated				
	15.1	25.19	0.97	4	Silty Clay to Clay	7	1,735.6	1,735.6	28.0	4.0	2.72	28.0	2.72	28.0	2.72	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.06	0.31	Not Saturated				
	15.4	27.78	0.81	5	Clayey Silt to Silt Clay	7	1,773.3	1,773.3	30.3	3.0	2.62	30.3	2.62	30.3	2.62	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	15.7	26.30	0.72	5	Clayey Silt to Silt Clay	7	1,811.0	1,811.0	28.0	2.8	2.62	28.0	2.62	28.0	2.62	-	Non-Liquefiable	-	0.90	0.29	0.875	0.33	1.05	0.32	Not Saturated				
	16.1	22.38	0.69	5	Clayey Silt to Silt Clay	6	1,848.7	1,848.7	23.2	3.2	2.72	23.2	2.72	23.2	2.72	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.4	16.60	0.53	5	Clayey Silt to Silt Clay	5	1,886.5	1,886.5	16.6	3.4	2.85	16.6	2.85	16.6	2.85	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.04	0.32	Not Saturated				
	16.7	11.62	0.31	5	Clayey Silt to Silt Clay	4	1,924.2	1,924.2	11.1	2.9	2.96	11.1	2.96	11.1	2.96	-	Non-Liquefiable	-	0.89	0.29	0.875	0.33	1.03	0.32	Not Saturated				
	17.1	10.54	0.30	5	Clayey Silt to Silt Clay	3	1,961.9	1,961.9	9.7	3.1	3.02	9.7	3.02	9.7	3.02	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.4	10.17	0.30	4	Silty Clay to Clay	3	1,999.6	1,999.6	9.2	3.2	3.05	9.2	3.05	9.2	3.05	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.02	0.32	Not Saturated				
	17.7	9.12	0.27	4	Silty Clay to Clay	3	2,037.5	2,037.5	8.0	3.3	3.10	8.0	3.10	8.0	3.10	-	Non-Liquefiable	-	0.87	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.0	8.79	0.26	4	Silty Clay to Clay	3	2,075.2	2,075.2	7.5	3.3	3.13	7.5	3.13	7.5	3.13	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.01	0.32	Not Saturated				
	18.4	8.35	0.25	4	Silty Clay to Clay	3	2,112.9	2,112.9	6.9	3.4	3.16	6.9	3.16	6.9	3.16	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	18.7	7.48	0.20	4	Silty Clay to Clay	3	2,150.6	2,150.6	6.0	3.1	3.19	6.0	3.19	6.0	3.19	-	Non-Liquefiable	-	0.86	0.28	0.875	0.32	1.00	0.32	Not Saturated				
	19.0	6.87	0.19	4	Silty Clay to Clay	3	2,188.3	2,188.3	5.3	3.3	3.25	5.3	3.25	5.3	3.25	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.99	0.32	Not Saturated				
	19.4	6.44	0.18	4	Silty Clay to Clay	3	2,226.1	2,226.1	4.8	3.4	3.29	4.8	3.29	4.8	3.29	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	19.7	7.18	0.20	4	Silty Clay to Clay	3	2,263.8	2,263.8	5.3	3.3	3.24	5.3	3.24	5.3	3.24	-	Non-Liquefiable	-	0.84	0.27	0.875	0.31	0.98	0.32	Not Saturated				
	20.0	6.94	0.21	4	Silty Clay to Clay	3	2,301.5	2,301.5	5.0	3.7	3.29	5.0	3.29	5.0	3.29	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.98	0.31	Not Saturated				
	20.3	6.81	0.19	4	Silty Clay to Clay	3	2,339.2	2,339.2	4.8	3.4	3.29	4.8	3.29	4.8	3.29	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	20.7	7.00	0.18	4	Silty Clay to Clay	3	2,376.9	2,376.9	4.9	3.2	3.27	4.9	3.27	4.9	3.27	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.97	0.32	Not Saturated				
	21.0	6.93	0.19	4	Silty Clay to Clay	3	2,414.7	2,414.7	4.7	3.2	3.29	4.7	3.29	4.7	3.29	-	Non-Liquefiable	-	0.83	0.27	0.875	0.31	0.96	0.32	Not Saturated				
	21.3	7.29	0.19	4	Silty Clay to Clay	3	2,452.4	2,452.4	4.9	3.2	3.27	4.9	3.27	4.9	3.27	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.96	0.32	Not Saturated				
	21.7	7.10	0.18	4	Silty Clay to Clay	3	2,490.2	2,490.2	4.7	3.1	3.28	4.7	3.28	4.7	3.28	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.0	6.23	0.15	4	Silty Clay to Clay	3	2,527.9	2,527.9	3.9	3.1	3.34	3.9	3.34	3.9	3.34	-	Non-Liquefiable	-	0.81	0.26	0.875	0.30	0.95	0.32	Not Saturated				
	22.3	6.11	0.14	4	Silty Clay to Clay	3	2,565.7	2,565.7	3.8	2.8	3.34	3.8	3.34	3.8	3.34	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.31	Not Saturated				
	22.6	6.69	0.15	4	Silty Clay to Clay	3	2,603.4	2,603.4	4.1	2.8	3.30	4.1	3.30	4.1	3.30	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.0	7.90	0.15	5	Clayey Silt to Silt Clay	3	2,641.1	2,641.1	5.0	2.3	3.19	5.0	3.19	5.0	3.19	-	Non-Liquefiable	-	0.80	0.26	0.875	0.30	0.94	0.32	Not Saturated				
	23.3	11.02	0.23	5	Clayey Silt to Silt Clay	4	2,678.8	2,678.8	7.2	2.4	3.06	7.2	3.06	7.2	3.06	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	23.6	19.97	0.52	5	Clayey Silt to Silt Clay	6	2,716.5	2,716.5	13.7	2.8	2.87	13.7	2.87	13.7	2.87	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.93	0.31	Not Saturated				
	24.0	25.50	0.87	5	Clayey Silt to Silt Clay	8	2,754.3	2,754.3	17.5	3.6	2.85	17.5	2.85	17.5	2.85	-	Non-Liquefiable	-	0.79	0.26	0.875	0.29	0.92	0.32	Not Saturated				

SFB 502-6
2/17/17 TC

a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-5
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ^*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	ε v (%)	ΔH (ft)	ΔS (in)
	24.3	19.17	0.74	4	Silty Clay to Clay	6	2,792.0	2,792.0	12.7	4.2	3.00	12.7	3.00	12.7	3.00	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.6	19.79	0.80	4	Silty Clay to Clay	6	2,829.7	2,829.7	13.0	4.4	3.00	13.0	3.00	13.0	3.00	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.92	0.31	Not Saturated				
	24.9	15.27	0.72	3	Clay	5	2,867.4	2,867.4	9.6	5.2	3.15	9.6	3.15	9.6	3.15	-	Non-Liquefiable	-	0.77	0.25	0.875	0.29	0.91	0.31	Not Saturated				
	25.3	13.00	0.23	5	Clayey Silt to Silt Clay	4	2,906.4	2,890.1	8.0	2.0	2.99	8.0	2.99	8.0	2.99	-	Non-Liquefiable	-	0.76	0.25	0.875	0.28	0.91	0.31	-				
	25.6	12.31	0.24	5	Clayey Silt to Silt Clay	4	2,945.9	2,909.0	7.4	2.2	3.03	7.4	3.03	7.4	3.03	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.31	-				
	25.9	18.21	0.46	5	Clayey Silt to Silt Clay	6	2,985.3	2,927.9	11.4	2.7	2.93	11.4	2.93	11.4	2.93	-	Non-Liquefiable	-	0.76	0.25	0.875	0.29	0.91	0.32	-				
	26.2	24.52	0.73	5	Clayey Silt to Silt Clay	7	3,024.6	2,946.8	15.6	3.2	2.85	15.6	2.85	15.6	2.85	-	Non-Liquefiable	-	0.74	0.25	0.875	0.28	0.91	0.31	-				
	26.6	38.23	0.74	6	Sandy Silt to Clayey Silt	9	3,064.0	2,965.7	24.8	2.0	2.58	30.7	2.50	30.7	2.50	2.8	85.2	0.14	0.74	0.25	0.875	0.29	0.90	0.32	0.4	16	2.3	0.3	0.09
	26.9	33.71	0.59	6	Sandy Silt to Clayey Silt	9	3,103.4	2,984.6	21.5	1.8	2.60	21.5	2.60	21.5	2.60	-	Non-Liquefiable	-	0.74	0.25	0.875	0.29	0.90	0.32	-				
	27.2	14.08	0.30	5	Clayey Silt to Silt Clay	5	3,142.7	3,003.5	8.3	2.4	3.01	8.3	3.01	8.3	3.01	-	Non-Liquefiable	-	0.73	0.25	0.875	0.28	0.90	0.31	-				
	27.6	11.66	0.23	5	Clayey Silt to Silt Clay	4	3,182.1	3,022.4	6.7	2.3	3.08	6.7	3.08	6.7	3.08	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	27.9	12.42	0.31	5	Clayey Silt to Silt Clay	4	3,221.4	3,041.3	7.1	2.9	3.11	7.1	3.11	7.1	3.11	-	Non-Liquefiable	-	0.73	0.25	0.875	0.29	0.90	0.32	-				
	28.2	12.96	0.39	5	Clayey Silt to Silt Clay	5	3,260.8	3,060.2	7.4	3.5	3.14	7.4	3.14	7.4	3.14	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.90	0.32	-				
	28.5	12.62	0.48	4	Silty Clay to Clay	5	3,300.2	3,079.1	7.1	4.4	3.21	7.1	3.21	7.1	3.21	-	Non-Liquefiable	-	0.71	0.25	0.875	0.28	0.89	0.32	-				
	28.9	11.94	0.46	4	Silty Clay to Clay	5	3,339.5	3,098.0	6.6	4.4	3.24	6.6	3.24	6.6	3.24	-	Non-Liquefiable	-	0.71	0.25	0.875	0.29	0.89	0.32	-				
	29.2	11.74	0.37	4	Silty Clay to Clay	4	3,378.9	3,116.9	6.4	3.7	3.21	6.4	3.21	6.4	3.21	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.5	11.62	0.29	5	Clayey Silt to Silt Clay	4	3,418.4	3,135.8	6.3	2.9	3.16	6.3	3.16	6.3	3.16	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	29.9	11.37	0.28	5	Clayey Silt to Silt Clay	4	3,457.7	3,154.7	6.1	2.9	3.17	6.1	3.17	6.1	3.17	-	Non-Liquefiable	-	0.70	0.25	0.875	0.28	0.89	0.32	-				
	30.2	11.60	0.31	5	Clayey Silt to Silt Clay	4	3,497.1	3,173.6	6.2	3.1	3.18	6.2	3.18	6.2	3.18	-	Non-Liquefiable	-	0.68	0.24	0.875	0.28	0.89	0.32	-				
	30.5	13.28	0.35	5	Clayey Silt to Silt Clay	5	3,536.4	3,192.5	7.2	3.1	3.12	7.2	3.12	7.2	3.12	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	30.8	22.24	0.70	5	Clayey Silt to Silt Clay	7	3,575.8	3,211.4	12.7	3.4	2.94	12.7	2.94	12.7	2.94	-	Non-Liquefiable	-	0.68	0.25	0.875	0.28	0.88	0.32	-				
	31.2	26.64	0.83	5	Clayey Silt to Silt Clay	8	3,615.2	3,230.3	15.4	3.3	2.87	15.4	2.87	15.4	2.87	-	Non-Liquefiable	-	0.67	0.24	0.875	0.28	0.88	0.32	-				
	31.5	41.69	0.68	7	Silty Sand to Sandy Silt	10	3,654.5	3,249.2	24.5	1.7	2.54	32.0	2.44	32.0	2.44	2.5	80.0	0.13	0.67	0.25	0.875	0.28	0.88	0.32	0.4	15	2.4	0.3	0.09
	31.8	33.52	0.50	7	Silty Sand to Sandy Silt	9	3,693.9	3,268.1	19.4	1.6	2.60	19.4	2.60	19.4	2.60	-	Non-Liquefiable	-	0.67	0.25	0.875	0.28	0.88	0.32	-				
	32.2	16.55	0.32	6	Sandy Silt to Clayey Silt	5	3,733.2	3,287.0	8.9	2.2	2.96	8.9	2.96	8.9	2.96	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.88	0.32	-				
	32.5	13.33	0.27	5	Clayey Silt to Silt Clay	5	3,772.6	3,305.8	6.9	2.3	3.07	6.9	3.07	6.9	3.07	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	32.8	14.42	0.30	5	Clayey Silt to Silt Clay	5	3,812.0	3,324.7	7.5	2.4	3.04	7.5	3.04	7.5	3.04	-	Non-Liquefiable	-	0.66	0.25	0.875	0.28	0.87	0.32	-				
	33.1	15.66	0.31	6	Sandy Silt to Clayey Silt	5	3,851.3	3,343.6	8.2	2.2	3.00	8.2	3.00	8.2	3.00	-	Non-Liquefiable	-	0.65	0.24	0.875	0.28	0.87	0.32	-				
	33.5	15.17	0.34	5	Clayey Silt to Silt Clay	5	3,890.8	3,362.6	7.9	2.5	3.04	7.9	3.04	7.9	3.04	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.32	-				
	33.8	14.38	0.36	5	Clayey Silt to Silt Clay	5	3,930.2	3,381.5	7.3	2.9	3.10	7.3	3.10	7.3	3.10	-	Non-Liquefiable	-	0.65	0.25	0.875	0.28	0.87	0.33	-				
	34.1	14.17	0.37	5	Clayey Silt to Silt Clay	5	3,969.5	3,400.4	7.2	3.1	3.12	7.2	3.12	7.2	3.12	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.87	0.32	-				
	34.4	13.52	0.41	5	Clayey Silt to Silt Clay	5	4,008.9	3,419.3	6.7	3.6	3.18	6.7	3.18	6.7	3.18	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.87	0.32	-				
	34.8	11.48	0.37	4	Silty Clay to Clay	4	4,048.2	3,438.2	5.5	3.9	3.28	5.5	3.28	5.5	3.28	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	35.1	10.87	0.28	5	Clayey Silt to Silt Clay	4	4,087.6	3,457.0	5.1	3.2	3.25	5.1	3.25	5.1	3.25	-	Non-Liquefiable	-	0.64	0.24	0.875	0.28	0.86	0.32	-				
	35.4	10.66	0.24	5	Clayey Silt to Silt Clay	4	4,127.0	3,475.9	4.9	2.8	3.24	4.9	3.24	4.9	3.24	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.32	-				
	35.8	9.83	0.18	5	Clayey Silt to Silt Clay	4	4,166.3	3,494.8	4.4	2.3	3.24	4.4	3.24	4.4	3.24	-	Non-Liquefiable	-	0.64	0.25	0.875	0.28	0.86	0.33	-				
	36.1	11.08	0.26	5	Clayey Silt to Silt Clay	4	4,205.7	3,513.7	5.1	2.9	3.24	5.1	3.24	5.1	3.24	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.32	-				
	36.4	13.61	0.27	5	Clayey Silt to Silt Clay	5	4,245.0	3,532.6	6.5	2.4	3.10	6.5	3.10	6.5	3.10	-	Non-Liquefiable	-	0.63	0.24	0.875	0.28	0.86	0.33	-				
	36.7	11.49	0.23	5	Clayey Silt to Silt Clay	4	4,284.4	3,551.5	5.3	2.4	3.18	5.3	3.18	5.3	3.18	-	Non-Liquefiable	-	0.63	0.25	0.875	0.28	0.86	0.33	-				
	37.1	11.26	0.23	5	Clayey Silt to Silt Clay	4	4,323.8	3,570.4	5.1	2.5	3.21	5.1	3.21	5.1	3.21	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.32	-				
	37.4	11.31	0.22	5	Clayey Silt to Silt Clay	4	4,363.2	3,589.4	5.1	2.4	3.19	5.1	3.19	5.1	3.19	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	37.7	14.02	0.40	5	Clayey Silt to Silt Clay	5	4,402.6	3,608.2	6.6	3.4	3.18	6.6	3.18	6.6	3.18	-	Non-Liquefiable	-	0.62	0.24	0.875	0.28	0.85	0.33	-				
	38.1	16.22	0.40	5	Clayey Silt to Silt Clay	6	4,442.0	3,627.1	7.7	2.8	3.08	7.7	3.08	7.7	3.08	-	Non-Liquefiable	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	38.4	12.95	0.21	6	Sandy Silt to Clayey Silt	4	4,481.3	3,646.0	5.9	2.0	3.10	5.9	3.10	5.9	3.10	-	Non-Liquefiable	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	38.7	15.86	0.27	6	Sandy Silt to Clayey Silt	5	4,520.7	3,664.9	7.4	2.0	3.01	7.4	3.01	7.4	3.01	-	Non-Liquefiable	-	0.61	0.24	0.875	0.28	0.85	0.33	-				
	39.0	17.56	0.37	6	Sandy Silt to Clayey Silt	6	4,560.0	3,683.8	8.3	2.4	3.02	8.3	3.02	8.3	3.02	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.85	0.33	-				
	39.4	16.14	0.43	5	Clayey Silt to Silt Clay	6	4,599.4	3,702.7	7.5	3.1	3.11	7.5	3.11	7.5	3.11	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.85	0.33	-				
	39.7	13.14	0.37	5	Clayey Silt to Silt Clay	5	4,638.8	3,721.6	5.8	3.4	3.23	5.8	3.23	5.8	3.23	-	Non-Liquefiable	-	0.60	0.24	0.875	0.28	0.84	0.33	-				
	40.0	11.91	0.28	5	Clayey Silt to Silt Clay	5	4,678.1	3,740.5	5.1	2.9	3.24	5.1	3.24	5.1	3.24	-	Non-Liquefiable	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.4	11.63	0.25	5	Clayey Silt to Silt Clay	4	4,717.5	3,759.4	4.9	2.7	3.23	4.9	3.23	4.9	3.23	-	Non-Liquefiable	-	0.59	0.24	0.875	0.27	0.84	0.33	-				
	40.7	12.86	0.30	5	Clayey Silt to Silt Clay	5	4,756.8	3,778.3	5.5	2.8	3.20	5.5	3.20	5.5	3.20	-	Non-Liquefiable	-	0.59	0.24	0.875	0.28	0.84	0.33	-				
	41.0	16.54	0.52	5	Clayey Silt to Silt Clay	6	4,796.3	3,797.2	7.4	3.6	3.15	7.4	3.15	7.4	3.15	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.3	20.25	0.86	4	Silty Clay to Clay	7	4,835.7	3,816.1	9.3	4.8	3.14	9.3	3.14	9.3	3.14	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	41.7	19.91	0.85	4	Silty Clay to Clay	7	4,875.0	3,835.0	9.1	4.9	3.15	9.1	3.15	9.1	3.15	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.84	0.33	-				
	42.0	18.66	0.64	5	Clayey Silt to Silt Clay	7	4,914.4	3,853.9	8.4	3.9	3.12	8.4	3.12	8.4	3.12	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.84	0.33	-				
	42.3	16.16	0.42	5	Clayey Silt to Silt Clay	6	4,953.8	3,872.8	7.1	3.1	3.13	7.1	3.13	7.1	3.13	-	Non-Liquefiable	-	0.58	0.24	0.875	0.27	0.83	0.33	-				
	42.7	15.71	0.55	5	Clayey Silt to Silt Clay	6	4,993.1	3,891.7	6.8	4.1	3.21	6.8	3.21	6.8	3.21	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.0	16.61	0.65	4	Silty Clay to Clay	6	5,032.5	3,910.6	7.2	4.6	3.22	7.2	3.22	7.2	3.22	-	Non-Liquefiable	-	0.58	0.24	0.875	0.28	0.83	0.33	-				
	43.3	20.15	0.63	5	Clayey Silt to Silt Clay	7	5,071.8	3,929.5	9.0	3.6	3.08	9.0	3.08	9.0	3.08	-	Non-Liquefiable	-	0.57	0.24	0.875	0.27	0.83	0.33	-				
	43.6	38.71	1.02	6	Sandy Silt to Clayey Silt	11	5,111.2	3,948.4	18.3	2.8	2.77	18.3	2.77	18.3	2.77	-	Non-Liquefiable	-	0.57	0.24	0.875	0.28	0.83	0.33	-				
	44.0	69.81	1.30	7	Silty Sand to Sandy Silt	16	5,150.6	3,967.3	33.9	1.9	2.46	48.5	2.33	48.5	2.33	2.1	100.2	0.17	0.57	0.24	0.875	0.28	0.83	0.33	0.5	19	1.9	0.3	0.07
	44.3	98.75	1.03	8	Sand to Silty Sand	20	5,189.9	3,986.2	48.2	1.1	2.18	68.5	2.06	68.5	2.06	1.4	94.8	0.16	0.57	0.24	0.875	0.27	0.83	0.33	0.5	17	2.2	0.3	0.09
	44.6	144.23	0.69	9	Sand	26	5,229.3	4,005.1	70.7	0.5	1.86	99.8	1.73	99.8	1.73	1.0	99.8	0.17	0.57	0.24	0.875	0.27	0.83	0.33	0.5	19	1.9	0.3	0.07
	44.9	196.44	0.99	9	Sand	34	5,268.8	4,024.0	96.3	0.5	1.75	135.6	1.63	135.6	1.63	1.0	135.6	0.31	0.57	0.24	0.875	0.28	0.82	0.33	0.9	27	1.0	0.3	0.04
	45.3	263.73	1.32	10	Gravelly Sand to Sand	44	5,308.1	4,042.9	129.2	0.5	1.64	181.6	1.52	181.6	1.52	1.0	181.6	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	45.6	350.71	1.94	10	Gravelly Sand to Sand	58	5,347.5	4,061.8	171.4	0.6	1.57	241.0	1.45	241.0	1.45	1.0	241.0	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	45.9	350.50	2.67	10	Gravelly Sand to Sand	60	5,386.8	4,080.7	170.5	0.8	1.66	240.3	1.55	240.3	1.55	1.0	240.3	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.3	326.01	1.77	10	Gravelly Sand to Sand	54	5,426.2	4,099.6	157.7	0.5	1.59	223.0	1.47	223.0	1.47	1.0	223.0	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.6	354.42	1.53	10	Gravelly Sand to Sand	57	5,465.6	4,118.5	170.8	0.4	1.51	241.8	1.39	241.8	1.39	1.0	241.8	-	0.56	0.24	0.875	0.27	0.82	0.33	-				
	46.9	416.91	1.57	10	Gravelly Sand to Sand	65	5,504.9	4,137.4	200.2	0.4	1.41	283.8	1.29	283.8	1.29	1.0	283.8	-	0.56	0.24	0.875	0.27	0.82	0.34	-				
	47.2	447.68	1.25	10	Gravelly Sand to Sand	68	5,544.3	4,156.3	214.1	0.3	1.32	304.1	1.19	304.1	1.19	1.0	304.1	-	0.55	0.24	0.875	0.27	0.82	0.33	-				
	47.6	435.78	1.42	10	Gravelly Sand to Sand	67	5,583.6	4,175.1	207.4	0.3	1.37	295.3	1.24	295.3	1.24	1.0	295.3	-	0.55	0.24	0.875	0.27	0.82	0.33	-				
	47.9	388.96	1.90	10	Gravelly Sand to Sand	63	5,623.0	4,194.0	184.1	0.5	1.51	263.0	1.39	263.0	1.39	1.0	263.0	-	0.55	0.24	0.875	0.27	0.81	0.34	-				
	48.2	330.09	1.37	10	Gravelly Sand to Sand	54	5,662.4	4,212.9	155.4	0.4	1.53	222.7	1.40	222.7	1.40	1.0	222.7	-	0.55	0.24	0.875	0.27	0.81	0.33	-				
	48.6	233.27	0.66	10	Gravelly Sand to Sand	38	5,701.7	4,231.8	108.9	0.3	1.58	157.0	1.44	157.0	1.44	1.0	157.0	0.44	0.55	0.24	0.875	0.27	0.81	0.34	1.3				
	48.9	84.09	1.06	8	Sand to Silty Sand	18	5,741.2	4,250.8	38.2	1.3	2.31	56.5	2.18	56.5	2.18	1.6	91.0	0.15	0.55	0.24	0.875	0.27	0.81	0.34	0.4	17	2.2	0.3	0.09
	49.2	23.15	0.79	5	Clayey Silt to Silt Clay	8	5,780.6	4,269.7	9.5	3.9	3.08	9.5	3.08	9.5	3.08	-	Non-Liquefiable	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
	49.5	13.78	0.14	6	Sandy Silt to Clayey Silt	5	5,819.9	4,288.6	5.1	1.3	3.07	5.1	3.07	5.1	3.07	-	Non-Liquefiable	-	0.54	0.24	0.875	0.27	0.81	0.34	-				

SFB 502-6
2/17/17 TC
a_{max} = 0.50 g ASCE 7
Mw = 8.0 *2%PE in 50 Years (MCE)*

CPT-5
Ground Elevation = ft
Depth to Groumd Water Table = 25 ft Historically High
γ = 115 pcf
γ_{sat} = 120 pcf

Elevation	Depth	q_c	f_s	SBT	Material	N_{60}	σ_v	σ_v'	Q	F	Ic1	q_{c1N1}	Ic2	q_{c1N2}	Ic3	K_c	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	DWF_M	$CSR_{eq, M=7.5}$	K_σ^*	$CSR_{eq, M=7.5,1 atm}$	FoS for Liquefaction	$N_{1, 60, CS}$	εv (%)	ΔH (ft)	ΔS (in)
	49.9	13.63	0.12	6	Sandy Silt to Clayey Silt	5	5,859.3	4,307.5	5.0	1.1	3.05	5.0	3.05	5.0	3.05	-	Non-Liquefiable	-	0.54	0.24	0.875	0.27	0.81	0.34	-				
																									Total		2.0	2.3	0.5

APPENDIX D

ASFE Guidelines

Important Information about Your
Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/The Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

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