APPENDIX M GEOTECHNICAL AND PALEONTOLOGICAL RESOURCES REPORTS

APPENDIX M.1 GEOTECHNICAL REPORT FOR THE WESTERN PORTION OF THE BAYLANDS

BAYLANDS RAILYARD
INFRASTRUCTURE IMPROVEMENTS
BRISBANE, CALIFORNIA

GEOTECHNICAL EXPLORATION

SUBMITTED TO
Mr. Howard Pearce
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San Francisco, CA 94124-3309

PREPARED BY
ENGEO Incorporated

March 31, 2021
Latest Revision January 21, 2022

PROJECT NO.
17270.000.000

ENGEO
Expect Excellence

Project No.
17270.000.000

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Latest Revision January 21, 2022

Mr. Howard Pearce
Baylands Development, Inc
150 Executive Park Blvd., Suite 4000
San Francisco, CA 94124-3309

Subject: Baylands Railyard
Infrastructure Improvements
Brisbane, California

GEOTECHNICAL EXPLORATION

Dear Mr. Pearce:

We prepared this geotechnical exploration report for the Infrastructure Improvements and associated grading at the Baylands Railyard site, as outlined in our agreement dated April 14, 2020. The purpose of this report is to provide our conclusions and recommendations regarding the planned infrastructure improvements and mass grading concepts. Once details regarding planned structures and other site improvements are determined, these will be addressed in separate reports.

From a geotechnical engineering viewpoint, the site is suitable for the proposed development provided the geotechnical conclusions and recommendations in this report are incorporated into the design and implemented during construction. The primary geotechnical concerns at the site include seismic hazards, undocumented existing fill, shallow groundwater, and compressible clay deposits susceptible to excessive total and differential settlement. We present our conclusions and recommendations for these and other planned development considerations in this report.

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems may be reduced by retaining the design geotechnical engineering firm to review the project plans and specifications and provide geotechnical observation and testing services during construction.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

We prepared this geotechnical exploration report for design of the planned infrastructure improvements and mass grading concepts at the Baylands Railyard in Brisbane, California. We prepared this report as outlined in our agreement dated April 14, 2020. Baylands Development, Inc. authorized us to conduct the following scope of services:

- Review previous reports by other consultants, available literature, historic aerial images, and published geologic maps covering the study area.
- Subsurface field exploration (six mud-rotary borings and 15 cone penetration tests).
- Laboratory testing.
- Interpretation of subsurface field exploration data.
- Evaluation of potential geotechnical hazards.
- Data analysis and conclusions.
- Report preparation.

For our use, we received the following:

1. BKF; Brisbane Baylands – Railyard Preliminary Grading - Plan, Brisbane, California; March 30, 2021.
2. BKF; Brisbane Baylands – Railyard Preliminary Grading (Cut Fill Map), Brisbane, California; March 3, 2021.
3. BKF; Brisbane Baylands – Railyard Frontage Road Sections, Brisbane, California; March 9, 2021.

We prepared this report for the exclusive use of Baylands Development, Inc. and their consultants for design of this project. In the event that any changes are made in the character, design or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended.

1.2 PROJECT LOCATION

As shown in Figure 1, the project site encompasses approximately 179 acres located in Brisbane, California. The site was formerly used as a railyard but is currently vacant, with some buildings and improvements in the southwestern portion of the site along Industrial Way. The site is bounded to the north by Baylands North (aka Visitacion Valley Redevelopment), to the west by Bayshore Boulevard, to the south by undeveloped land, and to the east by the Caltrain/Joint Powers Board (JPB) right-of-way (ROI) and train tracks. The San Francisco - San Mateo County line is located along the northern limit of the project site. The Topographic Datum used for this project is NGVD29 and all elevations in this report are in this datum. The site is relatively flat with topographic maps showing the property ranges from approximately Elevation 6 to 16 feet.

The Site Plan (Figure 2) shows site boundaries, proposed parcels, roadway areas, and exploration locations. A network of railway tracks was previously located on the eastern portion of the site, and this area is generally undeveloped and overgrown with grasses and shrubs. The northwestern portion of the site is currently occupied by foundation remnants, utilities, walls, fences, etc., associated with previous site uses. Existing industrial buildings and associated improvements currently occupy the southwest portion of the site along Industrial Way. The portion of the overall Baylands Development east of the Caltrain/JPB railroad tracks (Baylands Landfill project) is excluded from this study.

1.3 PROJECT DESCRIPTION

The planned infrastructure improvements at the site include new paved streets, underground utilities, concrete flatwork, open space areas, and a bridge (Geneva Bridge) crossing the Caltrain/JPB train tracks connecting to the Baylands Landfill project. We understand that the current Specific Plan calls for development of a mixed-use community with low- to high-density residential, mid- to high-density commercial, retail, wetlands, and open space. Building types are anticipated to consist of single-family houses, multi-family residential, low- to mid-rise podium structures, and high-rise buildings. We understand that the project site is undergoing environmental remediation efforts prior to future development.

The Brisbane Baylands – Railyard Preliminary Grading – Plan dated March 30, 2021, by BKF shows proposed site grades will generally be raised 0 to 15 feet above the existing ground surface, with some local areas planned to be raised up to 19 feet. Some of the development blocks will have basement levels below future street grades. We understand that a preliminary estimate of the quantity of fill necessary to raise grades is approximately 2.1 million cubic yards.

1.4 EIR MITGATION MEASURE COMPLIANCE

We prepared this report to be in compliance with the Brisbane Baylands Development Final Environmental Impact Report (EIR) Mitigation Measure 4.E-2a. Sections 3.4.2, 4.2, and 5.0 are in compliance with Mitigation Measure 4.E-3, and Section 3.5 is in compliance with Mitigation Measure 4.E-4b.

1.5 EXISTING GEOTECHNICAL DATA

In 1989, Kleinfelder performed a geotechnical exploration for the project site that included drilling nine borings approximately 25 to 80 feet deep. These borings were likely drilled using hollow stem augers. Kleinfelder performed lab testing, including Atterberg Limit, dry density, moisture content and sieve testing.

In 2003, Michelucci & Associates, Inc. performed a geotechnical exploration for the project site that included drilling eleven borings approximately 20 to 70 feet deep. These borings were drilled using hollow-stem augers. Michelucci & Associates, Inc. performed lab testing, including Atterberg Limit, dry density, moisture content, sieve, and consolidation testing.

The approximate locations of the previous explorations are shown on Figure 2. The previous exploration logs are included in Appendix D, and the previous lab testing is included in Appendix E. We used the data from these previous explorations together with the new explorations from this study to understand the geotechnical conditions of the site.

2.0 FINDINGS

2.1 SITE BACKGROUND

Historically, the site was part of the San Francisco Bay comprised of marshlands and mud flats. Circa 1914, the site underwent land reclamation. Some of the existing fill used to infill the former bay consisted of debris reported to be associated with the 1906 San Francisco Earthquake. Through the 1960s, the site operated as a railyard for servicing and distribution.

The 1930 aerial photograph of the site shows it occupied by a railyard, and numerous rail lines occupied the eastern portion of the site. The northwestern portion also had rail lines for storing train cars as well as several large buildings. Smaller buildings were located in the southwestern portion of the site, and the middle of the site was undeveloped. In the 1930 aerial photograph, the landfill portion of the Baylands property had not been infilled and is still open bay. The easternmost train tracks (in the location of the current Caltrain/JPB tracks) appear to be situated on a dike along the shoreline.

By the 1946 photograph, additional rail lines are apparent on the interior, previously undeveloped portion of the site. Through the 1960s, the original buildings in the southwestern portion were demolished and replaced. The site remained in generally the same condition until 1982, when portions appear to have been demolished and abandoned. The 1993 aerial photograph generally shows the site condition as it appears today.

2.2 REGIONAL GEOLOGY

The site is in the western portion of the San Francisco Bay, which lies within the Coast Ranges geomorphic province. The northwesterly trend of ridges and valleys characteristic of the Coast Ranges is apparent in the hills due west of the site. San Francisco Bay lies within a dropped down crustal block bounded by the East Bay Hills and the Santa Cruz Mountains. The San Francisco Bay depression resulted from interaction between the major faults of the San Andreas Fault zone, particularly the Hayward and San Andreas faults located east and west of the bay, respectively (Atwater, 1979).

The topography of the Coast Range on the San Francisco Peninsula is characterized by relatively rugged hills resulting mainly from east-west compression of coastal California during the late Pliocene and Pleistocene epochs (Norris and Webb, 1990). The site is underlain at depth by Jurassic- to Cretaceous-aged bedrock of the Franciscan complex, consisting of highly deformed and fractured sedimentary rocks (Graymer, 1997).

Quaternary sediments deposited on eroded Franciscan bedrock underlie the low-lying areas of the site vicinity. Sediment deposition within the pre-historic bay margin has been influenced by oscillating late-Quaternary sea levels that resulted from the advance and retreat of glaciers worldwide. The resulting sequence of alternating estuarine and terrestrial sediments corresponds to high and low sea-level stands, respectively. Quaternary sediments in the plains landward of the bay are predominantly terrestrial.

By late Pleistocene time, the high sea level associated with the Sangamon interglacial (125,000 years ago) resulted in deposition of the Yerba Buena Mud. Also known locally as “Old Bay Clay,” the Yerba Buena Mud was deposited in an estuarine environment similar in character and extent to the present bay. Sea level lowering associated with the onset of the Wisconsin glaciation exposed the bay floor and resulted in terrestrial sedimentation, such as the Colma Formation, on the Old Bay Clay. Sea level rose again starting roughly 20,000 years ago, fed by the melting of Wisconsin-age glaciers. The sea re-entered the Golden Gate about 10,000 years ago (Atwater, 1979). Inundation of the present bay resulted in deposition of estuarine sediments, called Young Bay Mud, which continues to accumulate.

Historical development of the San Francisco Bay shoreline resulted in placement of artificial fill material over substantial portions of modern estuaries, marshlands, tributaries, and creek beds in an effort to reclaim land (Nichols and Wright, 1971).

2.3 FAULTING AND SEISMICITY

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site; therefore, fault rupture through the site is not anticipated. The trace of the City College Fault Zone is shown crossing the site on the Regional Geologic Map (Figure 3). This fault zone is considered not to have been active in the late quaternary and there is no seismicity associated with it (AEG, 2018).

The region surrounding the project contains numerous active earthquake faults. The California Geologic Survey (CGS) defines an active fault as one that has had surface displacement within Holocene time (about the last 11,700 years) (CGS SP42, 2018). The Working Group on California Earthquake Probabilities (WGCEP, 2015) evaluated the 30-year probability of a Moment Magnitude 6.7 or greater earthquake occurring on the known active fault systems in the Bay Area in the Third Uniform California Earthquake Rupture Forecast (UCERF3). UCERF3 estimated a probability of 72 percent for the Bay Area as a whole, 14.3 percent for the Hayward Fault, and 6.4 for the Northern San Andreas Fault.

To determine nearby active faults that are capable of generating strong seismic ground shaking at the site, we utilized the United States Geological Survey (USGS) Unified Hazard Tool and disaggregated the hazard at the peak ground acceleration (PGA) for a 2,475-year return period, with the resulting faults listed below in Table 2.3-1. The locations of the faults are also presented in Figure 4.

TABLE 2.3-1: Nearby Active Faults, Latitude: 37.7020 Longitude: -122.4051

FAULT NAME	DISTANCE FROM SITE (MILES)	MAXIMUM MOMENT MAGNITUDE
San Andreas (Peninsula) [10]	8.3	7.9
San Gregorio (North) [6]	15.4	7.7
Hayward (No) [0]	22.0	7.5

Based on USGS Unified Hazard Tool: Dynamic Conterminous U.S. 2014 (update) (v4.2.0)

The faults listed above represent sources contributing at least one percent to the seismic hazard at the site at the PGA and for the given return period. Gridded or areal sources are not included.

Based on the historic seismicity, the proximity of known active faults, and the estimated earthquake probabilities for the Bay Area as a whole, it should be expected that the site will experience strong seismic ground shaking during the lifetime of the proposed improvements. The ground shaking hazard levels at the site are similar to those for most of the Bay Area.

The site is mapped in the current seismic hazard zone with potential permanent ground displacements due to liquefaction based on the California Geologic Survey Seismic Hazard Zone Maps. This liquefaction susceptibility mapping is based on regional geologic mapping of soil and rock deposits but is not based on site-specific exploration or analyses. We performed detailed analysis of the liquefaction-induced settlement using in-situ density and laboratory testing of the soil. Detail discussion of liquefaction is provided in the subsequent sections of this report.

2.4 FIELD EXPLORATION AND LABORATORY TESTING

Our field exploration included drilling six borings and advancing 15 cone penetration tests (CPTs) at various locations on the site between May 13 and May 29, 2020. The locations of the current explorations are shown on Figure 2.

2.4.1 Borings

We performed six borings at the site between May 26 and May 29, 2020, using rotary wash drilling method to depths between approximately 61 feet and 91 feet below existing ground surface. An engineer was present during the drilling to log the borings and collect representative samples. An explanation of our drilling methods and the boring logs are presented in Appendix A.

We obtained bulk soil samples from drill cuttings and retrieved disturbed and relatively "undisturbed" soil samples at various intervals in the borings using a 1½-inch-inside-diameter (I.D.) standard penetration test (SPT) sampler, 2½-inch I.D. California-type split-spoon sampler fitted with 6-inch-long steel liners, or a 3-inch-outside diameter (O.D.) thin-walled Shelby tube. We drove the SPT and California-type samplers with a 140-pound auto trip hammer falling a distance of 30 inches, and we advanced the Shelby tube sampler using hydraulic push methods. We field recorded the penetration of the SPT and California-type sampler into the soil material as the number of blows needed to drive the sampler 18 inches in 6-inch increments. The boring logs show the number of blows counts for the last 12 inches the sampler was driven, and we have not corrected the blow counts reported on the logs using any correction factors. We pushed the Shelby tube samples approximately 32 inches or less when stiff soil conditions were encountered.

2.4.2 Cone Penetration Tests

We retained the services of a CPT subcontractor to advance 15 CPTs between May 13 and May 15, 2020, to depths between approximately 55 to 118 feet below the existing ground surface. The CPTs were performed in general accordance with ASTM D-5778. Measurements include the tip resistance to penetration of the cone (Qc), the resistance of the surface sleeve (Fs), and pore pressure (U) (Robertson and Campanella, 1988). We also conducted V_s logging within 1-SCPT1 and 1-SCPT13. The CPT and shear wave velocity test logs are presented in Appendix B.

2.4.3 Laboratory Testing

We performed laboratory tests on selected soil samples to evaluate their engineering properties. For this project, we performed laboratory testing as shown in the table below. The lab test results are included in Appendix C. Table 2.4.3-1 shows the lab tests and testing methods that were performed for this project.

TABLE 2.4.3-1: Laboratory Testing

SOIL CHARACTERISTIC	TESTING METHOD
Unconsolidated Undrained Triaxial	ASTM D2850
Constant Rate of Strain Consolidation	ASTM D4186
Particle Size Distribution	ASTM D422
Moisture Content and Unit Weight	ASTM D7263
Plasticity Index, Wet Method	ASTM D4318
Corrosivity	ASTM D1498, D4972, D1125M, G57, D4658M, D4327

2.5 SUBSURFACE CONDITIONS

Based on the exploratory borings and CPTs, the subsurface conditions include (1) artificial fill; (2) underneath the artificial fill are Holocene Bay Deposits consisting of Young Bay Mud and sand stratum; (3) below the Holocene Bay Deposits the exploration encountered Pleistocene Aeolian, Alluvial, and Marine deposits; and (4) followed by Franciscan Bedrock at depth. Subsurface cross sections showing the site geology are provided on Figures 5A and 5B.

Artificial Fill (Undocumented Fill)

The artificial fill encountered at the site is highly variable, with different portions consisting of brown or olive grey gravel, sand, clay, and silt that varies from loose to dense or medium stiff to stiff. Rock fragments, organic matter, and “man-made” debris were encountered in many of the borings.

The artificial fill generally ranges from 6 to 12 feet in thickness, with some localized areas having deeper fill extending up to 22 feet deep. Aerial photographs of the site during land reclamation in the 1910s are not available; however, our local experience with adjacent projects indicates that areas of localized deeper fill are evidence of depressions formed by rotated/subsided blocks resulting from fill placement. These failures likely resulted in intermixing of the artificial fill and Young Bay Mud, as well as making the thickness of fill irregular. Such slope failures of the artificial fill and Young Bay Mud during fill placement on the adjacent Baylands Landfill site may be seen on the 1941 aerial photograph of the area.

Holocene Bay Deposits

The majority of project site lies within an area of reclaimed land that extends beyond the former historic shoreline and marsh limits mapped in 1869; the 1869 shoreline and marsh limits are shown on Figure 2. The Holocene Bay Deposits include intermixed soft clay, silt, sand, and organic material deposited by intertidal activity. We encountered these deposits between Elevation 2 feet and -48 feet.

The Bay Deposits include zones of highly compressible clay, locally known as Young Bay Mud. The thickness of the Young Bay Mud generally increases away (east) from the former shoreline. There is also a trough of deeper Young Bay Mud in the southern portion of the site leading to the former drainage outlet of Visitacion Valley. Laboratory testing indicates the Young Bay Mud has a shear strength varying from 250 to 700 pounds per square foot (psf) and is slightly overconsolidated. The Bay Deposits also include sandy soil strata that are loose to medium dense. Elevation contours of the bottom of the Young Bay Mud deposits are shown on Figure 6.

When subjected to new loads from fill or structures, the Young Bay Mud will have long-term compression resulting in potential detrimental effects on the planned improvements in the project area. Additionally, the sandy layers within the Bay Deposits may be susceptible to liquefaction during cyclic loading. Further discussion of the compressible/potentially liquefiable soil and recommended measures to reduce the risk of these on the proposed development are presented later in this report.

Pleistocene Aeolian, Alluvial and Marine Deposits

Below the Holocene Bay Deposits, the explorations encountered Pleistocene sand and clay that were deposited in aeolian, alluvial, and marine environments. The sand deposits range from greenish gray to orangish brown and are medium dense to dense. The Pleistocene marine clay deposits range from greenish gray to olive brown and generally increase in strength with depth from approximately 1,000 to 2,500 psf. Pleistocene marine clay deposits are locally known as Old Bay Clay. Old Bay Clay generally has similar consolidation properties as Young Bay Mud; however, it is only susceptible to settlement from very high loading conditions since it is overconsolidated.

Jurassic- and Cretaceous-Age Franciscan Bedrock

The Pleistocene deposits are underlain by Jurassic- and Cretaceous-age Franciscan bedrock that are generally comprise of interbedded mélange matrix and siltstone/sandstone. The bedrock was mapped by Bonilla (1964) ranging from Elevations 0 to -250 feet across the project site, with the shallower bedrock being at the northern and southern extents of the site and the deepest bedrock in the middle. We show the mapped depth to bedrock on Figure 7. Deeply weathered siltstone was encountered in Boring RRG-12 at approximately Elevation of -20 feet. The Franciscan bedrock typical of the area is friable to strong and severely weathered.

2.6 GROUNDWATER CONDITIONS

We measured groundwater at depths ranging between approximately 3 to 5½ feet below ground surface (bgs) at the time of drilling; however, groundwater levels in borings may take days or weeks to equilibrate to the actual groundwater level. We also measured the groundwater level above the ground surface in various CPTs through pore pressure dissipation tests; however, we did not see any evidence of artisan conditions during our exploration. Fluctuations in groundwater level may occur due to variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made.

For construction purposes, it should be expected that groundwater would be encountered as shallow as one foot below the existing ground surface.

3.0 DISCUSSION AND CONCLUSIONS

From a geotechnical engineering viewpoint, the site is suitable for the proposed development provided the geotechnical conclusions and recommendations in this report are incorporated into the design and implemented during construction. We evaluated the site with respect to known geologic and other hazards common to the greater San Francisco Bay Region. The primary geotechnical concerns at the site include:

- Variability and extent of undocumented artificial fill.

- Compressible soil and stability of compressible soil during fill placement.
- Seismic hazards, including strong ground shaking and liquefaction during seismic loading.
- Shallow groundwater.
- Corrosive soil.

These items and other geotechnical issues are discussed in the following sections of this report.

3.1 COMPRESSIBLE SOIL

Based on our review of published maps and the site explorations, the majority of the site is underlain by soft, highly compressible Young Bay Mud deposits up to 50 feet thick. The approximate thickness of the Young Bay Mud deposits is depicted on Figure 8. Young Bay Mud deposits are of particular concern since they are highly compressible and may be susceptible to significant settlement when subjected to additional loading.

As discussed in Section 2.1, the existing artificial fill was placed at least 50 years ago; therefore, we assume that settlement from previous infilling is essentially complete. However, future settlement of the compressible Young Bay Mud is anticipated when subjected to added loading, such as from placement of new fill to raise grades, and/or planned structural loads of buildings and site improvements.

The amount of settlement of the Young Bay Mud depends on proposed loads, the thickness, and the stress history, but will likely take up to 20 to 40 years to complete consolidation. The Old Bay Clay and alluvium are considerably less compressible under the range of anticipated loads for the planned infrastructure improvements; however, heavier buildings, such as high-rises, may trigger reconsolidation of these deeper layers and this should be analyzed during the design-level study of building foundations. We estimate the Young Bay Mud deposits will undergo additional consolidation settlement from the proposed new fill loads as shown in Table 3.1-1.

TABLE 3.1-1: Estimated Consolidation Settlement from Raising Grades

PLANNED CIVIL FILL ABOVE EXISTING GRADE (FEET)	ESTIMATED RANGE OF CONSOLIDATION SETTLEMENT (INCHES)
0 to 5	0 to 5
5 to 10	5 to 18
10 to 15	18 to 30
15 to 20	30 to 40

Based on the total and differential settlement potential, we recommend mitigation of the compressible soil within the infrastructure areas through either surcharging or compensating planned loads with lightweight fill. Alternatively, more extensive ground improvement program to enhance the strength of the compressible material may be performed, as discussed in in Section 4.0 of this report.

3.2 EXISTING ARTIFICIAL FILL

As previously mentioned, the site is underlain by artificial fill that generally ranges from about 6 to 12 feet thick with thicknesses up to 22 feet in localized areas. The explorations indicate that the existing fill includes debris and other deleterious material. The non-engineered fill can undergo several inches of settlement and result in variable performance for structures supported on shallow foundations. Additionally, based on our analyses, we estimate that the artificial fill is subject to potential deformation under seismic loading. Due to the depth of the fill, shallow groundwater, and environmental contamination at the site, it is impractical to completely remove and replace all artificial fill to develop the site.

We recommend that the upper portion of the existing artificial fill be overexcavated and recompacted (for planning purposes we suggest depth of reworking may be approximately 3 to 5 feet); however, specific areas and extent of existing non-engineered fill removal should be determined once site-specific land planning is completed. In addition, surcharging to mitigate consolidation settlement in the improvement areas will partially mitigate some potential settlement of the non-engineered fill. However, a surcharge program will not completely mitigate seismically induced deformation of the fill.

The contractor should anticipate that oversized material may be encountered during underground construction. Trenches may also encounter areas where loose fill results in localized trench stability issues requiring sloping trench walls or using trench shields.

3.3 SHALLOW GROUNDWATER

The explorations encountered groundwater at depths ranging from approximately 3 to 5 feet of existing grade. Therefore, temporary dewatering should be anticipated where excavations and utility trenches extend below approximately Elevation 10 feet. Temporary dewatering should be performed in a manner local to the excavation or trench such that the risk of driving settlement of Young Bay Mud is reduced; such conditions may require dewatering within tight interlocking sheet piles if dewatering measures may impact existing improvements in Young Bay Mud areas. The potential for contaminated groundwater should be discussed with the project environmental engineer so that appropriate treatment and sampling, if required, is implemented prior to discharging water from dewatering activities.

3.4 SEISMIC HAZARDS

Potential seismic hazards resulting from a design earthquake include ground rupture (surface faulting), ground shaking, soil liquefaction, dynamic densification, earthquake-induced landslides, regional subsidence or uplift, and tsunamis and seiches. The potential effects of liquefaction include lateral spreading, settlement, loss of bearing capacity, down-drag on deep foundations, ground loss due to sand boil formation and floatation of buried structures. The following sections present a discussion of these hazards as they apply to the site. Liquefaction-induced settlement and down-drag on deep foundations are the primary seismic hazards at the project site.

3.4.1 Seismic Hazard Analysis

The 2019 CBC utilizes design criteria set forth in ASCE 7-16. We classified the site as Site Class F per ASCE 7-16, based on the liquefaction hazard at the project site. ASCE 7-16 requires site response analysis be performed for Site Class F sites for design of structures and buildings. This site response analysis will be prepared separately during foundation design studies of structures when building plans are available. For the purpose of our liquefaction and slope stability analysis, we used the Mapped Maximum Considered Earthquake (MCE) Geometric Mean peak ground acceleration (PGA_M) for a Site Class E of 0.76g.

3.4.2 Liquefaction Analysis

We prepared this section to be in compliance with the Brisbane Baylands Development Final EIR Mitigation Measure 4.E-3.

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. The soil considered the most susceptible to liquefaction is clean, loose, saturated, uniformly graded fine sand below the groundwater table. Empirical evidence indicates that loose fine-grained soil including low plasticity silt and clay is also potentially liquefiable. When seismic ground shaking occurs, the soil is subjected to cyclic shear stresses that can cause excess hydrostatic pressures to develop and liquefaction of susceptible soil to occur. If liquefaction occurs, and if the soil consolidates or vents to the surface during and following liquefaction, ground settlement and surface deformation may occur.

We assessed the seismic susceptibility and deformation potential at the site based on material properties from laboratory testing and in-situ CPT data. We analyzed the CPT date to estimate the potential for liquefaction using the software program Cliq applying the methodologies published by Boulanger & Idriss in 2014.

We have conservatively assumed shallow design groundwater level (depth of 1 foot bgs) based on the exploration depth to groundwater. We used the PGA_M for a site class E of 0.76g and a moment magnitude (M_w) of 7.9, based on the deaggregation of the 2014 USGS hazard data. We also applied a weighting factor to the calculated volumetric strain using the methods outlined by Cetin et al. (2009).

The results indicate that material within the artificial fill and the sandy deposits below the Young Bay Mud are potentially liquefiable. The results of our liquefaction analyses are attached as Appendix F.

3.4.2.1 Shallow Soil Liquefaction

As discussed by Youd and Garris (1995), sites that have liquefiable soil that is not overlain by a sufficiently thick layer of non-liquefiable soil are more prone to ground surface disruptions such as fissures and sand boils. Building foundations could be subject to localized bearing capacity failures or excessive settlement due to ground loss. The thickness of non-liquefiable soil necessary to reduce this risk is a function of the thickness of the liquefiable soil layer below. Based on the study by Youd and Garris, a minimum of 6 to 8½ feet of not liquefiable soil is necessary to prevent ground surface disruptions at this site. The majority of the site has more than 5 feet of planned civil grading, and surcharge settlement due to Young Bay Mud consolidation will increase the thickness of the non-liquefiable layer. During the design process, we should evaluate specific areas that have potentially have a thinner non-liquefiable cap than required.

3.4.2.2 Liquefaction-Induced Ground Settlement

Seismic-induced settlement may be generally subdivided into two categories, settlement resulting from liquefaction of saturated, soil and dynamic densification of non-saturated soil. Since we are modeling the groundwater table at 1 foot below the ground surface, it is not necessary to analyze settlement from dynamic densification.

We evaluated potential post-liquefaction ground settlement at the site using the CPT data and methods outlined in Boulanger & Idriss (2014). For the majority of the project site, we estimate that liquefaction-induced settlement of generally between 2 to 3 inches may occur during a design seismic event. Some limited areas, closest to the historic shoreline, could have settlement up to 4½ inches.

We opine that the liquefaction of the fill will be the primary impact for the propose infrastructure. Settlement of deeper soil beneath the Young Bay Mud will not manifest to the surface or have significant impact to site improvements. We recommend that the site be designed for 1 to 1½ inches of differential settlement over a distance of 30 feet.

3.4.3 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, ground rupture is unlikely at the subject property.

3.4.4 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the 2019 California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.4.5 Ground Lurching

Ground lurching is a result of the rolling motion imparted to the ground surface during energy released by an earthquake. Such rolling motion may cause ground cracks to form in weaker soil. The potential for the formation of these cracks is considered greater at contacts between deep alluvium and bedrock. Such an occurrence is possible at the site as in other locations in the San Francisco Bay region, but based on the site location, the offset will be minor.

3.5 SLOPE STABILITY ANALYSES

We prepared this section to be in compliance with the Brisbane Baylands Development Final EIR Mitigation Measure 4.E-4b.

3.5.1 Geometry and Idealized Soil Profiles

We analyzed the short-term stability for both fill placed during construction for civil grades and for the surcharge program. We also analyzed the long-term stability of the civil fill slopes at the project boundary. We evaluated the short-term condition at various geologic conditions across the project site. We evaluated the long-term pseudostatic condition along the generalized Sections 1 and 2, adjacent to the Caltrain/JPB railroad tracks assuming a maximum fill height of 10 feet and a 2:1 (horizontal: vertical) slope. Section 1 is based on 1-CPT10 and analyzed a failure through the liquefiable sand underlying a relatively thin stratum of Young Bay Mud. Section 2 is based on 1-CPT03 and analyzed a failure through thicker Young Bay Mud.

Prior to performing slope stability analyses, we evaluated the shear strength of the soil profile. To obtain shear strength data, we performed in-situ Standard Penetration Tests (SPTs), CPTs, Unconsolidated Undrained Triaxial Compression Tests, and laboratory index tests. We reviewed the lab strength and in situ data and compared it with empirical correlations of SPT blow counts, plasticity index (PI), and soil type. Based on our data review, we developed the idealized soil profiles. For the pseudostatic analysis, we used a residual liquefied strength based on Seed and Harder (1990). For the Young Bay Mud deposit, we used the SHANSEP strength model and increased the over-consolidation ratio for the long-term seismic case to model the increased shear strength from the surcharge program. The strength parameters used in our short-term loading analyses are summarized in Table 3.5.1-1. The strength parameters used in our long-term loading analyses for Sections 1 and 2 are summarized in Tables 3.5.1-2 and 3.5.1-3, respectively.

TABLE 3.5.1-1: Static Slope Stability Analysis Material Properties – Short Term Loading

SOIL MATERIAL LAYER	UNIT WEIGHT (PCF)	COHESION (PSF)	FRICTION ANGLE (DEGREE)	SHANSEP S	SHANSEP M	OCR
Engineered Fill	125	1500	0			
Artificial Fill	125	0	30			
Young Bay Mud	95			0.3	0.8	1.4
Pleistocene Deposits	120	1500	0			

TABLE 3.5.1-2: Section 1 - Pseudostatic Slope Stability Analysis Material Properties

SOIL MATERIAL LAYER	UNIT WEIGHT (PCF)	COHESION (PSF)	FRICTION ANGLE (DEGREE)	SHANSEP S	SHANSEP M	OCR
Engineered Fill	125	1500	0			
Liquefiable Artificial Fill	125	600	0			
Young Bay Mud	95			0.30	0.8	2.1
Lower Young Bay Mud	95			0.33	0.5	2.7
Liquefiable Sand	120	400	0			
Pleistocene Deposits	130	1500	0			

TABLE 3.5.1-3: Section 2 - Pseudostatic Slope Stability Analysis Material Properties

SOIL MATERIAL LAYER	UNIT WEIGHT (PCF)	COHESION (PSF)	FRICTION ANGLE (DEGREE)	SHANSEP S	SHANSEP M	OCR
Engineered Fill	125	1500	0			
Liquefiable Artificial Fill	125	600	0			
Young Bay Mud	95			0.30	0.8	2.2
Liquefiable Sand	120	400	0			
Pleistocene Deposits	130	1500	0			

3.5.1 Method of Analysis

We performed a simplified deformation analysis using the computer program SLIDE, which is a limit equilibrium program that allows the user various search routines to locate the minimum factor of safety and critical slip surface. We used circular and non-circular searching methods and Spencer's method for our analyses (Spencer, 1973). We assumed a design groundwater level of 3 feet bgs based on the exploration depth to groundwater. We used the PGA_M for a site class E of 0.76g and a M_w of 7.9, based on the deaggregation of the 2014 USGS hazard data.

We performed a "pseudostatic" screening analysis as recommended in the California Geological Survey's (CGS) SP117A "Guidelines for Evaluating and Mitigating Seismic Hazards in California". For this screening analysis, we selected a seismic coefficient of 0.31g for an assumed displacement threshold of about 15 centimeters or approximately 6 inches. We evaluated the slope stability using the residual strength of the liquefied soil deposits as discussed above. Analyzing slope stability with both residual strengths and pseudostatic earthquake loading applied simultaneously is a conservative approach.

3.5.2 Short-Term Static Slope Stability Analyses Results

For the short-term loading from new civil fill and the surcharge program, our analysis indicates that a maximum of 20 feet should be placed at one time to limit the potential for static failures of the underlying Young Bay Mud. The surcharge may continue to be staged once consolidation and resulting strength increase has occurred. Once the final site grading is determined and the surcharge phasing designed, we can analyze the specific staging cases for more detailed recommendations.

3.5.3 Long-Term Pseudostatic Slope Stability Analyses Results

Our slope stability analyses for Sections 1 and 2 resulted in factors of safety greater than 1.0, thus passing SP117A screening analysis for less than 6 inches of deformation. According to SP117A, 6 inches of lateral displacement is generally considered small enough that structures may be designed with foundations stiff enough to allow for the movement without serious damage. Appendix G presents select printouts of our analyses.

3.6 SOIL CORROSION POTENTIAL

As part of this study, we obtained representative soil samples of the fill and Young Bay Mud materials and submitted them to a qualified analytical lab for determination of pH, resistivity, sulfate, and chloride. The Young Bay Mud underlying the site is likely highly corrosive to metals due to high clay content and brackish bay water. The results are included in Appendix C and summarized in Table 3.6-1.

TABLE 3.6-1: Corrosion Potential Test Results

SAMPLE LOCATION	MATERIAL	REDOX (mV)	PH	RESISTIVITY (OHMS-CM)	CHLORIDE (MG/KG)	SULFATE (%)
1-B05@ 3'	Fill	230	8.11	7,400	ND*	ND*
1-B05@26'	Young Bay Mud	230	7.23	630	450	140

**ND = None Detected*

The CBC references the American Concrete Institute Manual, ACI 318-14 for structural concrete requirements. According to Table 19.3.1.1, both samples are categorized as S0 sulfate exposure class. We recommend a corrosion consultant be retained if specific corrosion recommendations are desired for the project.

4.0 GEOTECHNICAL HAZARD MITIGATION RECOMMENDATIONS

4.1 CONSOLIDATION SETTLEMENT MITIGATION

4.1.1 Surcharge Program

As discussed above, consolidation settlement of the Young Bay Mud due to new loads will affect the proposed development if not mitigated during site grading. Surcharge programs have been successfully used to mitigate consolidation settlement from Young Bay Mud by accelerating primary consolidation and reducing settlement caused by subsequent loading. In a surcharge program, additional fill is placed in areas to receive new loads and removed once we determine that the desired degree of consolidation has been achieved.

Surcharging is often accelerated with installation of pre-fabricated vertical “wick drains,” which allow excess pore pressures to drain laterally, shortening the drainage path and taking advantage of the fact that the horizontal permeability of soil is normally much greater than the vertical permeability. The rate of consolidation can be approximated and duration of surcharge managed considering type of drain and the spacing between the drains.

Based on the Railyard - Preliminary Grading - Plan by BKF, dated March 30, 2021, up to 19 feet of new design fill is planned above the existing ground surface, however the majority of the new design fill at the site ranges from approximately 10 to 15 feet thick. The thickness of required surcharge fill is dependent on the proposed fill thickness, the thickness of the Young Bay Mud, and the construction schedule. For planning purposed, we have provided general zones for the surcharge program to account for the variation of geology across the site. The surcharge zones are shown on Figure 9. The average thickness of the Young Bay Mud in each zone is shown in Table 4.1.1-1.

TABLE 4.1.1-1: Surcharge Zones

SURCHARGE ZONES	AVERAGE YBM THICKNESS (FEET)
A	10
B	30

The surcharge program should be facilitated by vertical wick-drains installed in a triangular spacing pattern of 5 or 6 feet for approximate surcharge durations of 6 or 9 months, respectively. Table 4.1.1-2 shows a summary of our proposed surcharge program including the proposed civil fill thickness, surcharge areas, surcharge height required to mitigate anticipated settlement associated with the proposed civil fill, and wick drain spacing for approximate surcharge durations of 6 and 9 months.

TABLE 4.1.1-2: Surcharge Program Summary

CIVIL FILL THICKNESS (feet)	SURCHARGE AREAS	REQUIRED SURCHARGE HEIGHT (feet)	WICKDRAIN TRIANGULAR SPACING (feet)	
			PRO. 6 MONTHS	PRO.9 MONTHS
5	A & B	5	5	6
10	A	5		
	B	8		
15	A	6		
	B	12		
20	B	16		

If either shorter or longer surcharge program durations are desired, we can modify the thickness of the surcharge fill and/or spacing of wick drains to optimize the surcharge program. Surcharge fill should extend 10 feet into building footprints of the adjacent development blocks, so that utility connections into the buildings supported on deep foundations or ground improvement will not undergo significant differential settlement.

For light to moderate weight buildings, a surcharge program will allow for support of buildings on conventional shallow foundations. The design of the surcharge programs for buildings is dependent on building loads. Once the building types and loads are available, we should determine the feasibility and design of surcharge programs for particular parcels. In order to utilize this mitigation for various building parcels, the surcharge program has to take place prior to the streets and utilities construction, because settlement from the surcharge program will damage nearby improvements.

Even with proper surcharging, some amount of long-term settlement from secondary compression of the Young Bay Mud should be anticipated. The magnitude of this residual settlement will be dependent on the amount of fill placed, thickness of Young Bay Mud, and time allowed for surcharging. In general, this secondary settlement will be approximately 4 to 6 percent of the primary settlement (less than 1 inch).

4.1.1.1 Surcharge Placement and Wick Drain Installation Procedure

Below is the surcharge placement and wick drain installation procedure.

- Overexcavate subgrade in accordance with Section 6.2.
- Compact subgrade in accordance with Section 6.5.
- Install vertical wick drains in designated surcharge areas. Wick drains should be placed in a triangular grid pattern and should extend to the dense and stiff deposits below the Holocene Marsh and Bay Deposits.
- Place the recommended thickness of civil fill. Compact civil fill in accordance with Section 6.5.
- Place the recommended thickness of surcharge fill. Compact the first two to four feet of surcharge fill in accordance with recommendations in Section 6.5. Compact the rest of the surcharge fill to at least 85 percent relative compaction.

4.1.1.2 Surcharge and Settlement Monitoring

We recommended installing settlement-monitoring plates prior to surcharge placement to monitor consolidation. We should determine the number and location of the settlement monitoring plates when surcharge staging has been determined. The settlement-monitoring plates should be surveyed to determine elevations until we have determined that the desired degree of surcharge driven preconsolidation has been achieved. We should determine the monitoring program once the surcharge program is designed. All readings of settlement should be tied to benchmarks established well beyond the zone of surcharge influence.

4.1.2 Caltrain/JPB Railroad Track Settlement

New loading on the Young Bay Mud will result in settlement beyond the area of fill placement. The settlement beyond the surcharge limits will diminish with increased distance from the fill, however nearby adjacent improvements, such as the adjacent Caltrain/JPB ROW and train tracks, should be reviewed to determine tolerable settlement for various mitigation approaches. We estimated the settlement for the railroad ROW using the computer program Settle3D and consolidation parameters from laboratory testing.

We analyzed the Frontage Road sections shown on the Brisbane Baylands – Railyard Preliminary Grading – Plan. We analyzed the sections with the civil and necessary surcharge fill and with lightweight fill (LWF) in Frontage Road. Sections 1 and 2 represent areas where proposed buildings have basements. For these sections, we also analyzed areas where Frontage Road intersects other roads.

In Table 4.1.2-1, we show the estimated settlement at the western boundary of the ROW with surcharge and with LWF fully compensating for the new fill load.

TABLE 4.1.2-1: Caltrain/JPB ROW Settlement Summary

SECTION	SETTLEMENT AT EDGE OF ROW (inches)	
	CONVENTIONAL SURCHARGE PROGRAM	ALTERNATE LWF
Section 1 at Building with a Basement	< 1	0
Section 1 at Intersecting Road	< 1	0
Section 2 at Building with a Basement	up to 1½	0
Section 2 at Intersecting Road	< 2	< ¼
Section 3	up to 2½	< ½

A surcharge program can be used for Frontage Road, if the predicted settlements are acceptable or the surcharge fill is prevented from affecting the compressible deposits under the railroad ROW through the use of sheet piles placed at the property boundary that penetrate through the compressible soil. Alternately, a ground improvement solution, such as DSM, may be considered to mitigate consolidation settlement on Frontage Road.

The calculated consolidation settlements are associated with the placement of the proposed fill in the Baylands Railyard project site. Fill placed along the eastern side of the tracks in the Baylands Landfill project site could result in additional settlement and should be evaluated separately.

Compensation loading with LWF is further discussed in Section 4.1.3. For planning purposes, we present the total lightweight fill necessary and overexcavation depths for various civil fill thicknesses on Frontage Road in Table 4.1.2-2.

TABLE 4.1.2-2: Frontage Road Lightweight Fill Summary

PROPOSED NEW FILL THICKNESS INCLUDING PAVEMENT SECTION (feet)	LEF THICKNESS* (feet)	OVEREXCAVATION BELOW EXISTING GRADE (feet)
2	3½	3
4	6	3½
6	9	4½
8	11½	5

**LWF unit weight equal to 30 pcf*

The following exhibits show how the predicted settlements decrease with distance from Frontage Road across the Caltrain/JPB ROW. Exhibit 4.1.2-1 shows the predicted settlement across the railroad ROW where surcharge fill is placed on Frontage Road to mitigate long-term settlement. Exhibit 4.1.2-2 shows the predicted settlement across the railroad ROW using LWF mitigation on Frontage Road.

EXHIBIT 4.1.2-1: Settlement across Caltrain/JPB ROI from West to East Surcharge Program on Frontage Road

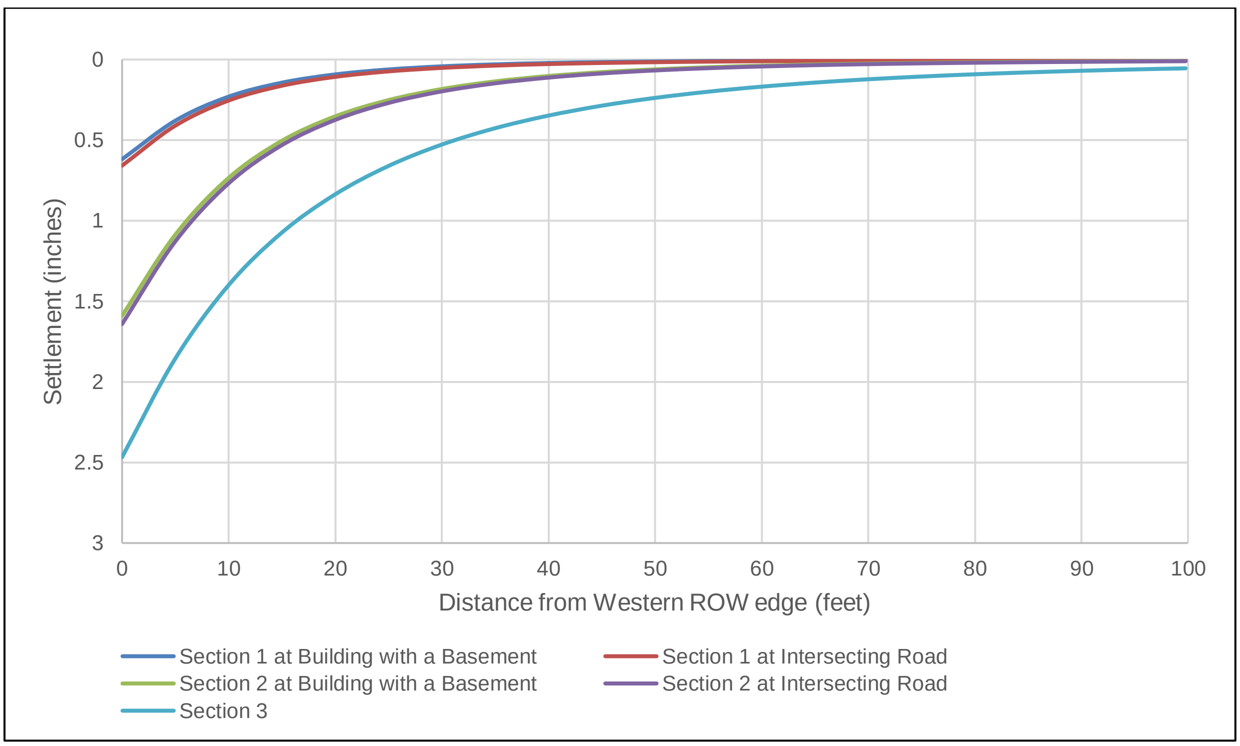
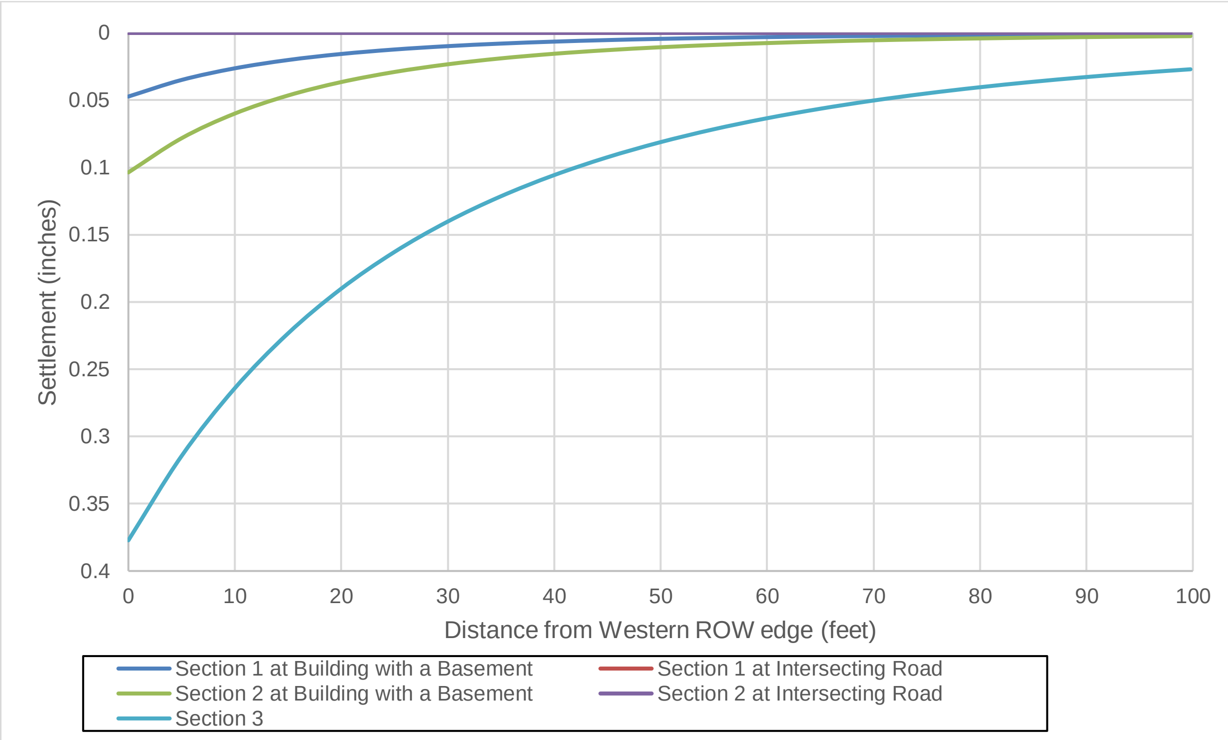


**EXHIBIT 4.1.2-2: Settlement across Caltrain/JPB ROI from West to East
LWF on Frontage Road**



4.1.3 Compensation Loading with Lightweight Fill

In some areas, surcharge may not be feasible, or it may be necessary to compensate a foundation load to mitigate settlement. An alternate settlement mitigation measure that can be utilized is to remove existing fill and replace with a lightweight cellular concrete as a means to compensate the load being added (either by adding new fill or a relatively light building load). Cellular concrete is a cement and water mixture injected with a stable foam to create a low-density material that cures in place without compaction. Cellular concrete can be prepared with a strict tolerance on the cured unit weight as well as other properties, such as compressive strength; unit weights of cellular concrete commonly range between 27 pcf and 45 pcf depending on mix specified. For the purpose of this report, LWC refers to a 30-pcf mix commonly used for this application. Assuming a unit weight of 30 pcf for the LWF, we generally recommend that for every 1 foot of new fill placed onsite, 4½ inches of existing soil be removed and backfilled with cellular concrete. We can provide LWF recommendations for specific areas during the design process.

Young Bay Mud is relatively light compared to fill due to the high water content. Where excavations for utilities remove Young Bay Mud, the lower portion of the utility backfill should be lightweight fill. The thickness of lightweight fill should be equal to the amount of Young Bay Mud removed. Recommendations for utility backfill are provided in Section 7.3.

4.1.3.1 Construction Considerations

Because cellular concrete is lighter than water, it will be buoyant when cast below the water table. Where water is encountered in areas to receive cellular concrete, the groundwater should be temporarily lowered to allow casting the cellular concrete and kept dewatered until the material has cured and a minimum of a 1-foot-thick layer of soil has been placed on top of the lightweight fill to prevent uplift. Uplift pressures of any cellular concrete constructed below the groundwater table should be included in design of elements supported on cellular concrete. Uplift pressures will be equal to approximately 30 pcf for each 1 foot of cellular concrete below the groundwater.

Excavation sidewalls may experience caving if cut vertically. Where feasible, the excavation for the cellular concrete should have sloping sidewalls or formwork to reduce the risk of trench wall collapse. Shoring may be necessary where existing improvements are adjacent to the planned structure. We also recommend staging equipment and excavated spoils at least 20 feet horizontally from the top of the excavation and the excavation be backfilled as quickly as possible once dewatered.

Cellular concrete lift height should be limited to 3 to 4 feet in thickness to limit the risk of collapsing under its own weight; the cellular concrete should be allowed to cure at least 12 hours or the minimum manufacturer specification before placing the next lift. If any collapse occurs, the resulting cellular concrete will be heavier than planned, therefore, the entire lift of material will need to be removed and disposed of prior to placing the next lift. We recommend we be retained to observe the cellular concrete backfill on a full-time basis to monitor the unit weight and collect samples for compressive strength testing. Pulverized or fractured pieces of lightweight fill should not be reused as backfilled of areas receiving LWF compensation mitigation.

4.2 LIQUEFACTION MITIGATION FOR INFRASTRUCTURE

We prepared this section to be in compliance with the Brisbane Baylands Development Final EIR Mitigation Measure 4.E-3.

Generally, liquefaction mitigation is not performed for utilities and other infrastructure except for "life-line utilities." Should liquefaction occur, some areas of differential settlement could experience reduced flow velocity due to flattening of slope at the invert, but other areas of the pipeline could become steeper. Some amount of repair or maintenance of the public improvements may be anticipated after the Maximum Considered Earthquake (MCE) event; the amount of potential damage should be limited and the utilities may remain operational, though with loss of efficiency, after repairs are made. Since the estimated liquefaction total settlement is generally up to 2½ inches and up to 1½ inches of differential over a horizontal distance of 30 feet, flexible utility connections may be designed to tolerate these settlements.

If reduction of the total and differential seismic settlement is desired, ground improvement to densify the artificial fill such as deep dynamic compaction, rammed aggregate piers, vibro-compaction may be considered. However, these ground improvement techniques are only limited to improving the settlement within the artificial fill. The deeper loose sand layers will not see significant improvement from these techniques.

4.3 GROUND IMPROVEMENT FOR CONSOLIDATION SETTLEMENT MITIGATION

We recommend that a site-specific design-level exploration be performed for individual development parcels to determine where ground improvement may be warranted. Ground improvement is typically procured as a design-build element of a project. This allows consideration of individual contractors' proprietary means and methods in selecting the most cost-effective approach that meets specific project performance and quality objectives.

Conceptual ground improvement plans should show the extent of the work, coordination with other elements, including foundation piles, utilities, and project phasing requirements. Once the building design is available and a site-specific geotechnical study is performed, we will prepare performance criteria for the ground improvement as necessary. This may include, total and differential performance, bearing capacity, subgrade modulus and minimum depth of ground improvement elements. We may assist in the preparation of a design-build RFP for the ground improvement and should review the design submittal prior to construction. During ground improvement selection, we should be consulted regarding the selection's load-transfer considering the recommended allowable bearing capacity and differential settlement recommendations provided in this report may need to be readdressed.

An experienced ground improvement designer/contractor should determine and design of the ground improvement system. For preliminary consideration, we provide a brief discussion on potential ground improvement options.

4.3.1 Deep Soil Mixing (DSM)

DSM includes numerous proprietary methods, including grouting, grout-mixing, and deep soil mixing. Each of these methods involves mixing the subsurface soil with cement and water to create columns of stiffened soil. The columns can be oriented as individual columns or overlapped to create walls around unimproved soil. The untreated soil is not densified by this technique. This ground improvement method relies on the improved stiffness of the columns to raise the composite stiffness of the site and reduce liquefaction by concentrating the cyclic stresses imparted by the seismic event on the columns and reducing the increase in pore pressure in the soil. This method of ground improvement results in significantly reduced construction vibrations versus the other alternatives. This method results in spoils that will be rich in cement; spoils could be mixed with on-site soil to reduce the cement content and be used as structural fill once the cement has cured. Depending on cement concentration and hydration time, the reaction of cement in the spoils could make conventional soil compaction techniques difficult. If spoils are used as structural fill, we recommend using a method specification to check that appropriate degrees of compaction are achieved.

4.3.2 Drilled Displacement Columns (DDC)

Another possible corrective approach is the use of DDC. DDC are constructed by first drilling to a desired depth of improvement with a heavy crowd. Once the desired depth is reached, the auger is slowly raised while simultaneously injecting grout under high pressure to form a well-defined cement column. Finally, steel rebar is installed within the column, serving as a ground anchor. DDC decreases the proportion of loose or soft soil, thereby, decreasing the total susceptibility to excessive deformation resulting from a seismic event or additional loads. DDC has negligible construction vibration and a relatively quiet construction method. The DDC is a displacement corrective treatment method and typically generates less than 3 percent in volume of soil being improved. The DDC are proprietary and should be designed by a design-build or specialty contractor. We should be provided with the opportunity to review the design to confirm assumed soil profile and soil shear strengths are in conformance with site conditions.

4.3.1 Aggregate Piers (AP)

Aggregate piers are columns of compacted aggregate consisted of crushed stone or recycled concrete installed in a triangular or rectangular grid pattern. The piers are pre-drilled to the depth of improvement and down-hole vibrator or tamper is lowered into the hole and aggregate is fed into the hole and compacted in lifts by the vibrator or temper. The vibratory energy also densifies the granular soil surrounding the pier. A bottom feed vibrator maybe required at the site due to the risk of cave or collapse of the hole. A displacement mandrel can be used to reduce generation of spoils.

4.3.3 Construction Quality Control and Post-Mitigation Testing

The contractor's design-build submittal should include quality control testing. The effectiveness of these alternatives relies in large part on the thoroughness of the installation across the site. It is advisable to have a representative of the owner or their Geotechnical Engineer observe the construction to verify that improvement is performed across the site.

Depending on the method recommended by the contractor, it may be necessary to perform a test section with full quality control measures implemented and post-construction verification. The purpose of this test section would be to verify that the proposed method will be successful for the on-site soil and to allow for any necessary modifications to the ground improvement pattern to achieve the intended improvement.

If performed, the effectiveness of soil-cement mixing is tied to the completeness of the mixing process. This may be verified through lab compression testing of grab samples from the columns. The amount of cement used in mixing should be regularly monitored to verify a consistent mixing process is performed across the site.

5.0 PRELIMINARY FOUNDATION CONSIDERATIONS

We prepared this section to be in compliance with the Brisbane Baylands Development Final EIR Mitigation Measure 4.E-3.

We understand various light to heavy building types are planned, but specific design is not available at this time. Site-specific geotechnical foundation explorations should be performed to develop foundation recommendations and/or ground improvement options for individual parcels. Based on the site conditions, we provide some preliminary recommendations for conceptual budgeting purposes given the geotechnical concerns at the site.

As previously discussed, we recommend a surcharge program to mitigate settlement for streets and buildings to provide a consistent performance. However, where surcharge program is not feasible for moderate to heavy buildings, a deep foundation system or foundations such as a mat slab or footings on soil improved by ground improvement may be utilized. Construction of driven piles or ground improvement will likely encounter debris and rubble within the artificial fill and may require pre-drilling.

Due to the presence of high groundwater, buildings that include basements should consider waterproofing surrounding the slab and walls based on the long-term design groundwater elevation, including an allowance for sea level rise. Buoyancy effects below the groundwater should also be included. A consultant that specializes in this area should design the waterproofing.

For preliminary planning, the foundation systems included in Table 5.0-1 may be suitable for various structures. The foundation systems are discussed in Sections 5.1, 5.2, and 5.3.

TABLE 5.0-1: Conceptual Foundation Types

FOUNDATION SYSTEM	FOUNDATION TYPE	GROUND IMPROVEMENT	PRELIMINARY CONCEPTUAL ESTIMATES [1]
A	Deep Foundation	Not required	16-inch square or octagonal driven precast pre-stressed concrete pile; driven steel H-pile/pipe pile; or 18-inch diameter drilled auger cast pile (continuous flight auger or displacement).
B	Shallow Foundation	DDC, DSM, or AP	DDC, DSM, or AP to extend at minimum 5 feet below the Young Bay Mud and/or potential liquefiable layers whichever is deeper.
C	Shallow Foundation	Surcharge	5 to 10 feet of surcharge depending on proposed building loads

[1] *The preliminary conceptual estimates are intended for project planning and budgeting purposes only. Final design parameters will be provided after completion of design-level geotechnical exploration and collaboration between the structural engineer or ground improvement contractor.*

Depending on planned structural loads, alternate foundation systems may be suitable for support of the structures at the site. The main geotechnical considerations for selected foundation are structural loads and potential total and differential settlement of compressible soil at depth.

5.1 FOUNDATION SYSTEM A – DEEP FOUNDATIONS

Deep foundation systems are suitable for moderate to heavy structures that are sensitive to post-construction settlement. Based on our experience, driven precast pre-stressed concrete piles or auger cast piles are generally used for similar structures within the vicinity of the project site. A deep foundation system extends elements to derive capacity from friction resistance in competent soil deep beneath the ground surface. Driven concrete piles are economical but will create noise and vibration. If neighboring properties are sensitive to noise and vibration during foundation construction, auger cast piles may be used. Recommendations for these piles may be provided in the design-level geotechnical reports for individual parcels. Prior to production pile construction, a pile load test program consisting of indicator piles and static load tests should be performed to confirm pile capacity.

Differential settlement between pile-supported structures and surrounding areas is anticipated if settlement from raising the site grades around the building is not mitigated. Thus, entries and pipe connections to pile-supported buildings will require flexibility to accommodate the significant differential settlement that will occur.

5.2 FOUNDATION SYSTEM B – SHALLOW FOUNDATION ON GROUND IMPROVEMENT

A conventional shallow foundation consisting of a reinforced mat or footings may be considered for light to moderately loaded structures. The mat foundation should be constructed on the improved ground, such as implementing DDC, DSM, or AP. These ground improvement methods are discussed in Section 4.3.

Pre-qualified specialty contractors typically perform ground improvement under design-build agreements. The Structural Engineer should coordinate with the ground improvement designer on design requirements. As a minimum, ground improvement should be performed within the entire building footprint to provide support for all foundation bearing elements. We should be retained to establish performance criteria, review, and evaluate the ground improvement design. Moreover, we should be retained to provide construction quality control or quality assurance to confirm that ground improvement installed is in conformance with the geotechnical recommendations and approved design plans.

Spacing of the ground improvement elements should be designed to provide adequate support to slab on grade floors and result in less than 1 inch of differential settlement over 40 feet. Otherwise, the floor slabs should be designed to structurally span across the ground improvement elements. Performance of the ground improvement system should be verified via a test program.

5.3 FOUNDATION SYSTEM C – SHALLOW FOUNDATION FOLLOWING SURCHARGE PROGRAM

A conventional shallow foundation consisting of a reinforced mat or footings may be and be considered for light to moderately loaded structures constructed following a surcharge program. The surcharge program for buildings could be performed in conjunction with the surcharging for streets and utilities as described in Section 4.1.1. We estimate that 5 to 10 feet of surcharge would be necessary for light to moderately loaded buildings. We may design a building specific surcharge program once building types and loads are known.

6.0 EARTHWORK AND OTHER RECOMMENDATIONS

6.1 GENERAL SITE CLEARING

Areas to be developed should be cleared of surface and subsurface deleterious material, including existing building foundations, slabs, buried utility and irrigation lines, pavements, debris, and designated trees, shrubs, and associated roots. The contractor should clean and backfill excavations extending below the planned finished site grades with suitable material compacted to the recommendations presented in Section 6.5. We should be retained to observe and test backfill.

Following clearing, the site should be stripped to remove surface organic material. Organics should be stripped from the ground surface to a depth of at least 2 to 3 inches below the surface. Strippings should be removed from the site or, if considered suitable by the landscape architect and owner, use them in landscape fill.

6.2 SUBGRADE OVEREXCAVATION

We recommend that the upper 3 to 5 feet of existing artificial fill in improvement areas be excavated, processed to remove oversized or deleterious material and compacted as engineered fill as described in Section 6.5 or the minimum City of Brisbane Public Works standard requirements to provide competent subgrade and enhance pavement performance.

6.3 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions during winter or spring grading, or during or following periods of rain. Wet soil may make proper compaction difficult or impossible. Wet soil conditions may be mitigated by:

1. Frequent spreading and mixing during warm dry weather,

2. Mixing with drier material,
3. Mixing with a lime, lime-flyash, or cement product, or
4. Stabilizing with aggregate, geotextile stabilization fabric, or both.

We should evaluate Options 3 and 4 prior to implementation.

6.4 ACCEPTABLE FILL

On-site soil is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 4 inches in maximum dimension. An exception to this is excavated Young Bay Mud; due to the highly expansive nature of Young Bay Mud and high natural moisture content, Young Bay Mud, excavated from the site, should be either removed or used in landscaping areas of the site.

With the exception of construction debris (wood, brick, asphalt, concrete, metal, etc.), trees, high organic content soil (soil which contains more than 3 percent organic content by weight), and environmentally impacted soil (if any), we anticipate the site soil is suitable for use as engineered fill. Other material and debris, including trees with their root balls, should be removed from the project site.

Imported fill material should be approved by us, meet the above requirements, and have a plasticity index less than 12. We should be allowed to sample and test proposed imported fill material at least 72 hours prior to delivery to the site.

6.5 FILL COMPACTION

The contractor should perform subgrade compaction prior to fill placement. The contractor should first scarify to a depth of at least 8 inches and then moisture condition and compact the subgrade in accordance with the table below.

The contractor should then place engineered fill in loose lifts that do not exceed 8 inches or the depth of penetration of the compaction equipment used, whichever is less. The contractor should moisture condition and compact engineered fill in accordance with the table below.

TABLE 6.5-1: Subgrade and Engineered Fill Compaction and Moisture Content Requirements

MATERIAL	MINIMUM RELATIVE COMPACTION (%)	MINIMUM RELATIVE COMPACTION (%) UPPER 6 INCHES OF FILL IN PAVEMENT AREAS	MINIMUM MOISTURE CONTENT (PERCENTAGE POINTS ABOVE OPTIMUM)
Import	90	95	1
Pavement AB*	95	--	0

**As specified in Section 8.3*

The relative compaction and optimum moisture content of soil and aggregate base referred to in this report are based on the most recent ASTM D1557 test method. Compacted soil is not acceptable if it is unstable. It should exhibit only minimal flexing or pumping, as observed by our field representative. As used in this report, the term “moisture condition” refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry.

6.5.1 Landscape Fill

In landscaping areas, the contractor should process, place, and compact fill in accordance with our engineered fill recommendations, except compaction requirement is reduced to a minimum of 85 percent relative compaction.

6.6 TEMPORARY DEWATERING

We anticipate that groundwater could be encountered in excavations deeper than 4 feet below the existing ground surface. Groundwater management and potential treatment prior to distance will be required for the groundwater encountered. The groundwater level at the trench locations should be maintained at a minimum of 2 feet below the bottom of the trenches for the duration of utility installation. The selection of equipment and method should be determined by the contractor. The dewatering system implemented should be selected to impose minimal impact on the groundwater level surrounding the proposed excavations. This can be achieved with localize dewatering combined with a watertight system used for the excavation. The dewatering should be designed to prevent pumping soil fines with the discharge water. Uncontrolled dewatering could cause settlement of the general area. Moist to saturated subgrade conditions should be anticipated at the bottom of the utility trench in areas underlain by fill and Bay Mud. The contactor may consider stabilizing the bottom of the utility trench with stabilization fabric such as Mirafi 600X of geogrid such as BX1200 overlain by at least 18 inches of ¾ inch to 1½ inch crushed rock, or other methods approved by the Geotechnical Engineer.

6.7 EXTERIOR SLABS-ON-GRADE

This section provides guidelines for secondary slabs such as exterior slabs and walkways. As much as possible, secondary slabs-on-grade should be constructed as units that are structurally independent of the foundation system. This allows the slabs to move with minimum distress to the slabs or the foundation. Where slabs need to be tied, such as at same-level doorways, they should be tied on only one side and be provided with enough slope to allow for rises in the slabs as a result of soil swell and still maintain drainable grades away from the entryways.

Slabs-on-grade should be designed specifically for their intended use and loading requirements. As a minimum, slabs-on-grades should be reinforced for control of cracking and should be designed by the Structural Engineer. As a minimum, slab reinforcement should consist of No. 3 bars spaced 16 inches on center each way. Minor concrete cracking should be expected in the future due to concrete shrinkage and expansive soil movement. Frequent joints should be provided in the slabs at a spacing determined from ACI Publication ACE 302.1R-89 recommendations. Exterior slabs-on-grade should have a minimum thickness of 5 inches with a thickened edge. The subgrade material under the exterior slabs should be uniform and properly moisturized. The upper 12 inches of subgrade should be moisture conditioned to at least 4 percentage points above optimum moisture content. The subgrade should not be allowed to dry prior to concrete placement.

If construction follows site grading by an extended period, slab subgrade soils may become desiccated and may need to be presoaked prior to placing concrete. The amount of presoaking required will depend upon the degree of desiccation, which will in turn be dependent upon the time of year of construction. Following placement of gravel beneath the slabs, we recommend that the subgrade soils again be extensively moistened. If inadequate pre-moisture conditioning occurs, slab heave may be experienced.

6.8 DRAINAGE

The project Civil Engineer is responsible for designing surface drainage improvements. With regard to geotechnical engineering issues, we recommend that finish grades be sloped away from buildings and pavements to the maximum extent practical to reduce the potentially damaging effects of expansive soil. The latest California Building Code Section 1804.3 specifies minimum slopes of 5 percent away from foundations. As a minimum, we recommend the following:

- Discharge roof downspouts into closed conduits and direct away from foundations to appropriate drainage devices.
- Consider the use of surface drainage collection system to reduce ponding of water at the ground surface near the foundation, pavements, or exterior flatwork.

6.9 STORMWATER BIORETENTION AREAS

If bioretention areas are implemented, we recommend that, when practical, they be planned a minimum of 5 feet away from structural site improvements, such as buildings, streets, retaining walls, and sidewalks/driveways. When this is not practical, bioretention areas located within 5 feet of structural site improvements may either:

1. Be constructed with structural side walls capable of withstanding the loads from the adjacent improvements, or
2. Incorporate filter material compacted to between 85 and 90 percent relative compaction and a waterproofing system designed to reduce the potential for moisture transmission into the subgrade soil beneath the adjacent improvement.

In addition, one of the following options should be followed.

1. We recommend that bioretention design incorporate a waterproofing system lining the bioswale excavation and a subdrain, or other storm drain system, to collect and convey water to an approved outlet. The waterproofing system should cover the bioretention area excavation in such a manner as to reduce the potential for moisture transmission beneath the adjacent improvements.
2. Alternatively, and with some risk of movement of adjacent improvements, if infiltration is desired, we recommend the perimeter of the bioretention areas be lined with an HDPE tree root barrier that extends at least 1 foot below the bottom of the bioretention areas/infiltration trenches.

Site improvements located adjacent to bioretention areas that are underlain by base rock, sand, or other imported granular material, should be designed with a deepened edge that extends to the bottom of the imported material underlying the improvement.

Where adjacent site improvements include buildings greater than three stories, streets steeper than 3 percent, or design elements subject to lateral loads (such as from impact or traffic patterns), additional design considerations may be recommended. If the surface of the bioretention area is depressed, the slope gradient should follow the slope guidelines described in earlier section(s) of this document. In addition, although not recommended, if trees are to be planted within bioretention areas, HDPE Tree Boxes that extend below the bottom of the bioretention system should be installed to reduce potential impact to subdrain systems that may be part of the bioretention area design. For this condition, the waterproofing system should be connected to the HPDE Tree Box with a waterproof seal.

If infiltration in the on-site soil is desirable, permeability may be variable and depend on the level of soil compaction and shape of the individual soil grain size particles. Field infiltration tests should be performed once the site is rough graded to obtain site-specific infiltration properties for final design.

Given the nature of bioretention systems and possible proximity to improvements, we recommend that we be retained to review design plans and provide testing and observation services during the installation of linings, compaction of the filter material, and connection of designed drains.

It should be noted that the contractor is responsible for conducting all excavation and shoring in a manner that does not cause damage to adjacent improvements during construction and future maintenance of the bioretention areas. As with any excavation adjacent to improvements, the contractor should reduce the exposure time such that the improvements are not detrimentally impacted.

7.0 UTILITY INSTALLATION

7.1 SETTLEMENT

Young Bay Mud is relatively light compared to fill due to the high water content. Where excavations for utilities remove Young Bay Mud, the lower portion of the utility backfill should be cellular concrete. The thickness of cellular concrete should be equal to the amount of Young Bay Mud removed. Cellular concrete is discussed further in Section 4.1.2.

Utility connections to structures supported on deep foundations should have flexible connections to allow for the potential post-construction site settlement from compressible soil and liquefaction. These connections should allow for at least 1½ inches of differential settlement between the site and building.

7.2 SHORING AND BACKFILL

Due to the shallow groundwater table conditions, heterogeneity of the existing fill, and soft nature of the Young Bay Mud, excavations extending into these deposits may become unstable. Temporary shoring such as sheet piling or continuous hydraulic shoring should be anticipated. The designing of shoring systems is the sole responsibility of the Contractor and/or shoring designer. We can provide supplemental recommendations for shoring design if needed.

It is the responsibility of the Contractor to provide stable, safe trench and construction slope conditions and to follow OSHA safety requirements. Since excavation procedures may be very dangerous, it is also the responsibility of the Contractor to provide a trained "competent person" as defined by OSHA to supervise all excavation operations, ensure that all personnel are working in safe conditions, and have thorough knowledge of OSHA excavation safety requirements. The contractor should not stockpile soil, place heavy construction material or park equipment near trenches or excavations extending into the Young Bay Mud.

7.3 UTILITY BACKFILL PLACEMENT AND COMPACTION

Soft subgrade conditions will be encountered at the bottom of the utility excavations in some portions of the site. It may become necessary to perform subgrade stabilization to mitigate such conditions. Excavations that bottom in unstable soft soil should be covered with a stabilization fabric overlain by at least 18 inches of aggregate base, subbase, or Caltrans Class 2 material. The stabilization fabric shall be Mirafi 600X or an equivalent fabric as approved by us. Other approaches may be acceptable and we should be consulted if alternative approaches are desired.

Pipe zone backfill (i.e., material beneath and immediately surrounding the pipe) may consist of a well-graded import or native material less than ¾ inch in maximum dimension. Trench zone backfill (i.e., material placed between the pipe zone backfill and the ground surface) may consist of native soil. Pipe and trench zone back fill should be compacted according to the recommendations in Section 6.5.

Where import material is used for pipe zone backfill, we recommend it consist of fine- to medium-grained sand or a well-graded mixture of sand and gravel and that this material not be used within 2 feet of finish grades. In general, uniformly graded gravel should not be used for pipe or trench zone backfill due to the potential for migration of: (1) soil into the relatively large void spaces present in this type of material and (2) water along trenches backfilled with this type of material. Where utility trenches pass under a building perimeter, they must be provided with an impervious seal consisting of native material or concrete. The impervious plug should extend at least 2 feet to each side of the crossing. This is to reduce surface-water percolation into the material under foundations and pavements where such water would remain trapped in a perched condition, allowing clay soil to develop its full expansion potential.

Care should be exercised where utility trenches are located beside foundation areas. Utility trenches constructed parallel to foundations should be located entirely above a plane extending down from the lower edge of the footing at an angle of 45 degrees. Utility companies and Landscape Architects should be made aware of this information.

Compaction of trench backfill by jetting should not be allowed at this site. If there appears to be a conflict between The City or other agency requirements and the recommendations contained in this report, this should be brought to the Owner’s attention for resolution prior to submitting bids.

8.0 PRELIMINARY PAVEMENT DESIGN

8.1 FLEXIBLE PAVEMENT

We provide preliminary pavement design values below based on assumed Traffic Index and an assumed subgrade resistance values (R-value) of 5. The Civil Engineer or appropriate public agency should determine the Traffic Index.

TABLE 8.1-1: Preliminary Flexible Pavement Design

TRAFFIC INDEX (TI)	PAVEMENT SECTION	
	AB (INCHES)	AC (INCHES)
4.0	8	3
5.0	10	3

TRAFFIC INDEX (TI)	PAVEMENT SECTION	
	AB (INCHES)	AC (INCHES)
6.0	13	4
7.0	16	5

Notes: AB is aggregate base Class 2 Material with minimum R = 78
AC is asphalt concrete

These sections are for estimating purposes only; actual sections should be based on R-Value tests performed on samples of actual subgrade material recovered at the time of grading. Pavement construction and all material should comply with the requirements of the Standard Specifications of the State of California Department of Transportation, Civil Engineer, and appropriate public agency.

8.2 CUT-OFF CURBS

Saturated pavement subgrade or aggregate base may cause premature failure or increased maintenance of asphalt concrete pavements. This condition often occurs where landscape areas directly abut and drain toward pavements. If desired to install pavement cutoff barriers, they should be considered where pavement areas lie downslope of any landscape areas that are to be sprinklered or irrigated, and should extend to a depth of at least 4 inches below the base rock layer. Cutoff barriers may consist of deepened concrete curbs or deep-root moisture barriers.

If reduced pavement life and greater than normal pavement maintenance are acceptable to the owner, then the cutoff barrier may be eliminated.

8.3 PAVEMENT CONSTRUCTION

Pavement construction and all material should conform to the specifications and requirements of the Standard Specifications by the State of California, Department of Transportation (Caltrans), latest edition, City of Brisbane requirements, and the following minimum requirements.

- The contractor should compact finished subgrade and aggregate base in accordance with Section 6.5.
- Subgrade soil should be in a stable, non-pumping condition at the time aggregate base material is placed and compacted.
- Adequate provisions must be made such that the subgrade soil and aggregate base material are not allowed to become saturated.
- Aggregate Base should meet the requirements for ¾-inch maximum Class 2 AB in accordance with Section 26 of the latest Caltrans Standard Specifications.
- Asphalt paving material should meet current Caltrans specifications for asphalt concrete.

9.0 CONSTRUCTION MONITORING

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems may be significantly lowered by retaining the design geotechnical engineering firm to:

1. Review the final grading plans prior to construction to evaluate whether our recommendations have been implemented, and to provide additional or modified recommendations, as needed. This also allows us to check if any changes have occurred in the nature, design, or location of the proposed improvements and provides the opportunity to prepare a written response with updated recommendations.
2. Perform construction monitoring to check the validity of the assumptions we made to prepare this report. Earthwork operations should be performed under the observation of our representative to check that the site is properly prepared, the selected fill material is satisfactory, and that placement and compaction of the fill has been performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is important.

If we are not retained to perform the services described above, then we are not responsible for any party's interpretation of our report (and subsequent addenda, letters, and verbal discussions).

10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical recommendations for design of the improvements discussed in Section 1.3 for the Baylands Railyard project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth material. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data is representative of the actual subsurface conditions across the site. Considering possible underground variability of soil, rock, stockpiled material, and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, notify us immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous material is encountered during construction, notify the proper regulatory officials immediately.

This document must not be subject to unauthorized reuse, that is, reusing without our written authorization. Such authorization is essential because it requires us to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to our documents. Therefore, we must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If our scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, we cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various material such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

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FIGURES

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FEET

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence	VICINITY MAP BAYLANDS RAILYARD BRISBANE, CALIFORNIA	PROJECT NO.: 17270.000.000		FIGURE NO.
		SCALE: AS SHOWN		1
		DRAWN BY: LL	CHECKED BY: LC	

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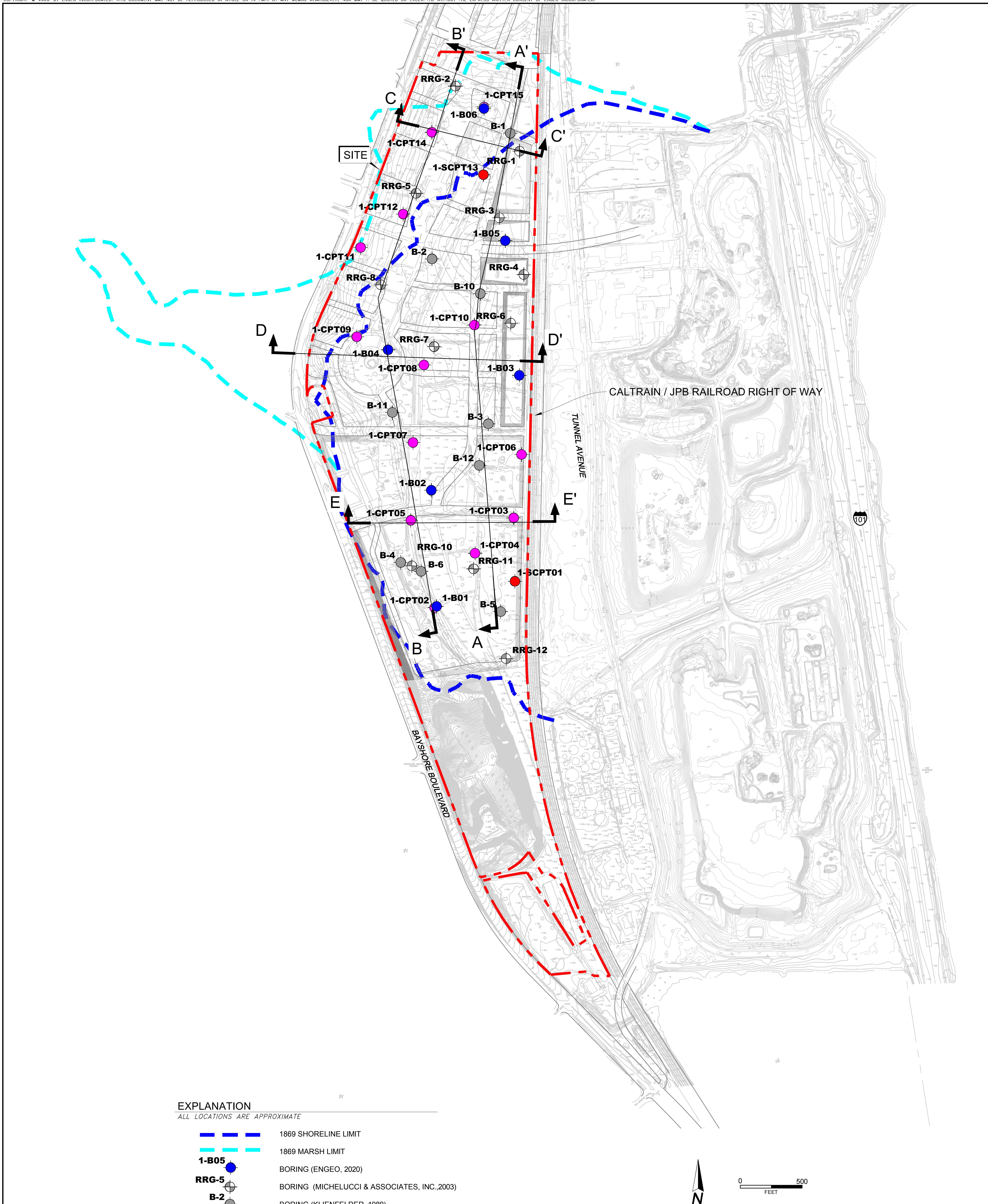

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

1869 SHORELINE LIMIT

1869 MARSH LIMIT

1-B05 BORING (ENGEO, 2020)

RRG-5 BORING (MICHELUCCI & ASSOCIATES, INC.,2003)

B-2 BORING (KLIENFELDER, 1989)

1-SCPT13 SEISMIC CONE PENETRATION TEST (ENGEO, 2020)

1-CPT12 CONE PENETRATION TEST (ENGEO, 2020)

E E' CROSS SECTION

BASE MAP SOURCE: UNKNOWN

ENGEO
Expect Excellence

SITE PLAN
BAYLANDS RAILYARD
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.000	FIGURE NO. 2
SCALE: AS SHOWN	
DRAWN BY: LL	CHECKED BY: LC

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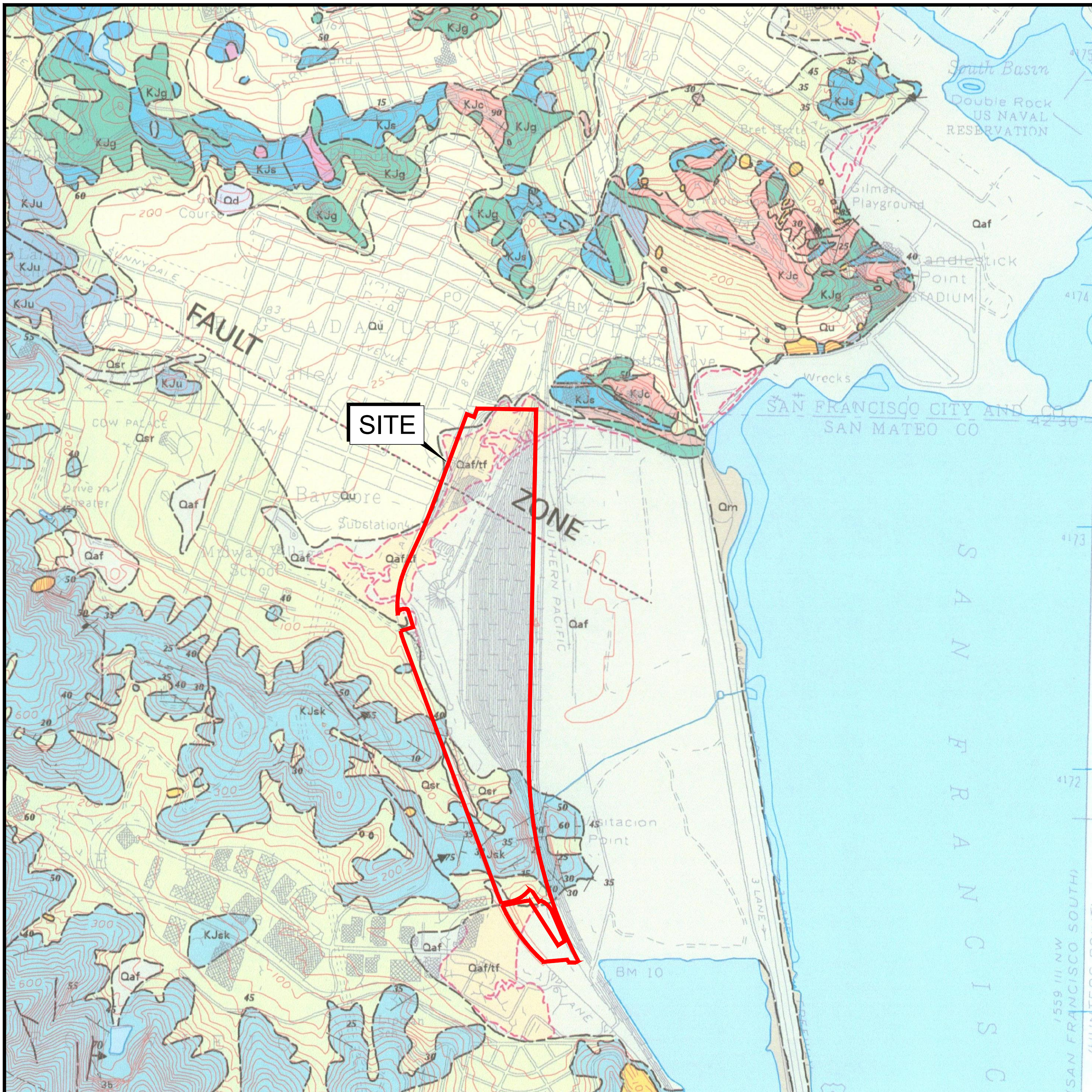

EXPLANATION

Qaf	ARTIFICIAL FILL	KJs	SANDSTONE AND SHALE, INTERBEDDED
Qaf/tf	ARTIFICIAL FILL OVER TIDAL FLAT	KJsk	SANDSTONE AND SHALE
Qm	BAY MUD	KJc	CHERT
Qd	DUNE SAND	KJg	GREENSTONE
Qsr	SLOPE DEBRIS AND RAVINE FILL	KJu	SHEARED ROCKS
Qu	SEDIMENTARY DEPOSITS		

N

0 2000
FEET

BASE MAP SOURCE: OFR98-0354 BONILLA, 1998

ENGEO
Expect Excellence

REGIONAL GEOLOGIC MAP
BAYLANDS RAILYARD
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.000
SCALE: AS SHOWN
DRAWN BY: LL
CHECKED BY: LC

FIGURE NO.
3

ORIGINAL FIGURE PRINTED IN COLOR

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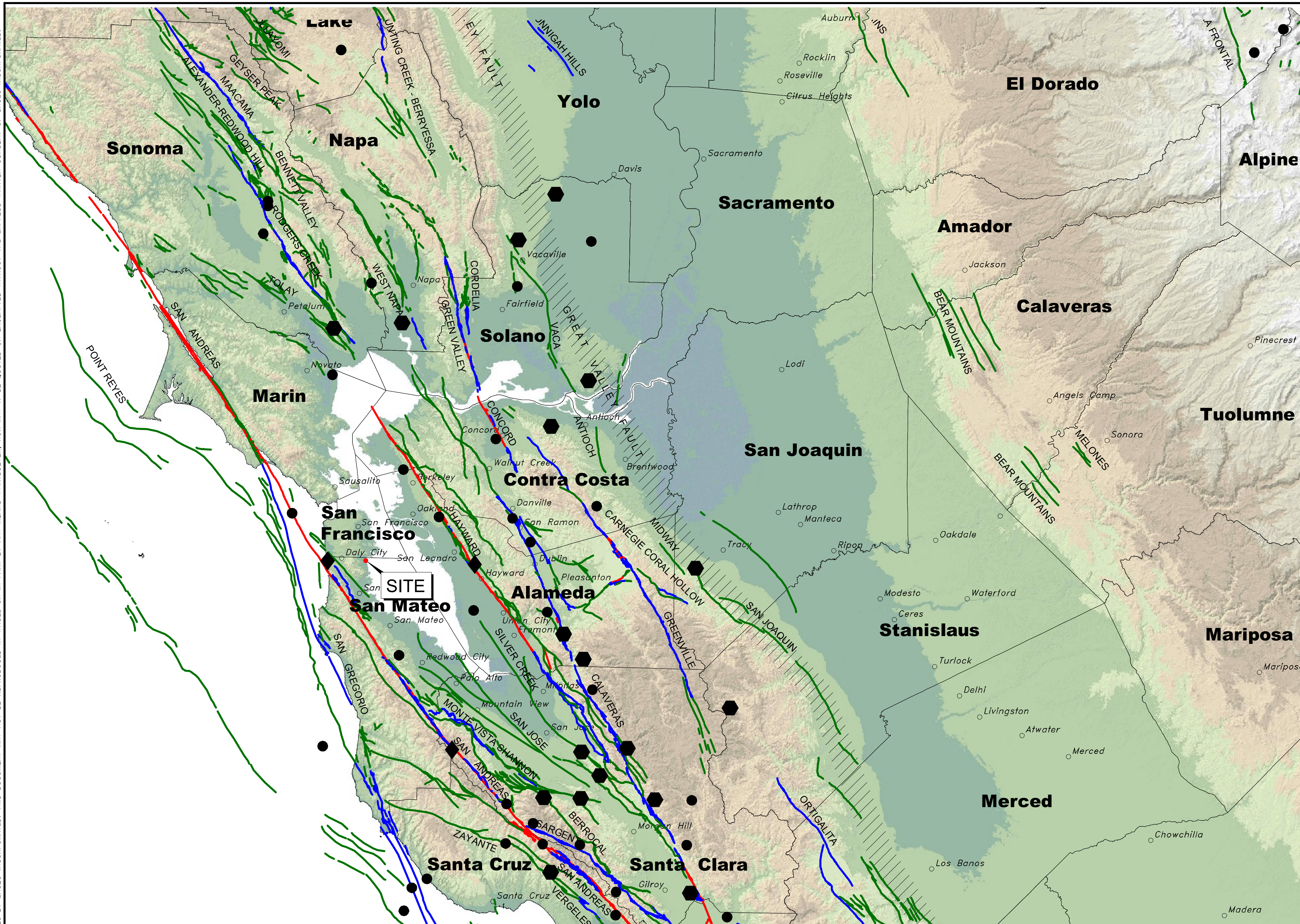

N

0 MILES 15
0 KILOMETERS 30

EXPLANATION

- MAGNITUTE 7+
- MAGNITUDE 6-7
- MAGNITUDE 5-6
- HISTORIC FAULT
- HOLOCENE FAULT
- QUATERNARY FAULT
- HISTORIC BLIND THRUST FAULT ZONE

BASE MAP SOURCE:
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATASET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, NOVEMBER, 2010
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800–2000)

ENGEO Expect Excellence	REGIONAL FAULTING AND SEISMICITY BAYLANDS RAILYARD BRISBANE, CALIFORNIA	PROJECT NO.: 17270.000.000 SCALE: AS SHOWN DRAWN BY: LL / CHECKED BY: LC	FIGURE NO. 4

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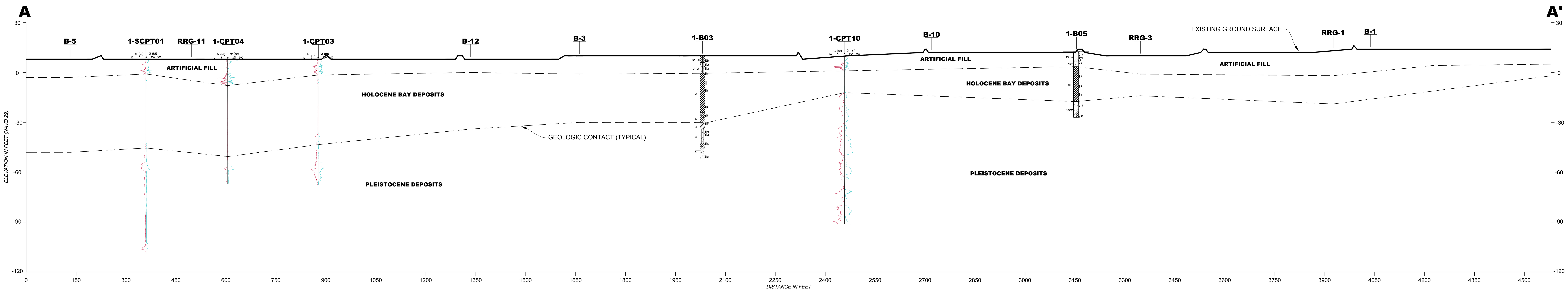
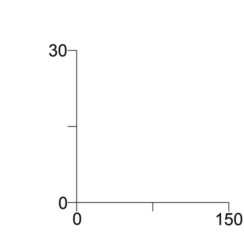


SECTION A-A'

VERTICAL 1" = 30'
HORIZONTAL 1" = 150'

SECTION B-B'

VERTICAL 1" = 30'
HORIZONTAL 1" = 150'



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

1-B02	BORING (ENGEO, 2020)
RRG-5	BORING (MICHELUCCI & ASSOCIATES, INC.,2003)
B-3	BORING (KLIENFELDER, 1989)
1-SCPT01	SEISMIC CONE PENETRATION TEST (ENGEO, 2020)
1-CPT03	CONE PENETRATION TEST (ENGEO, 2020)

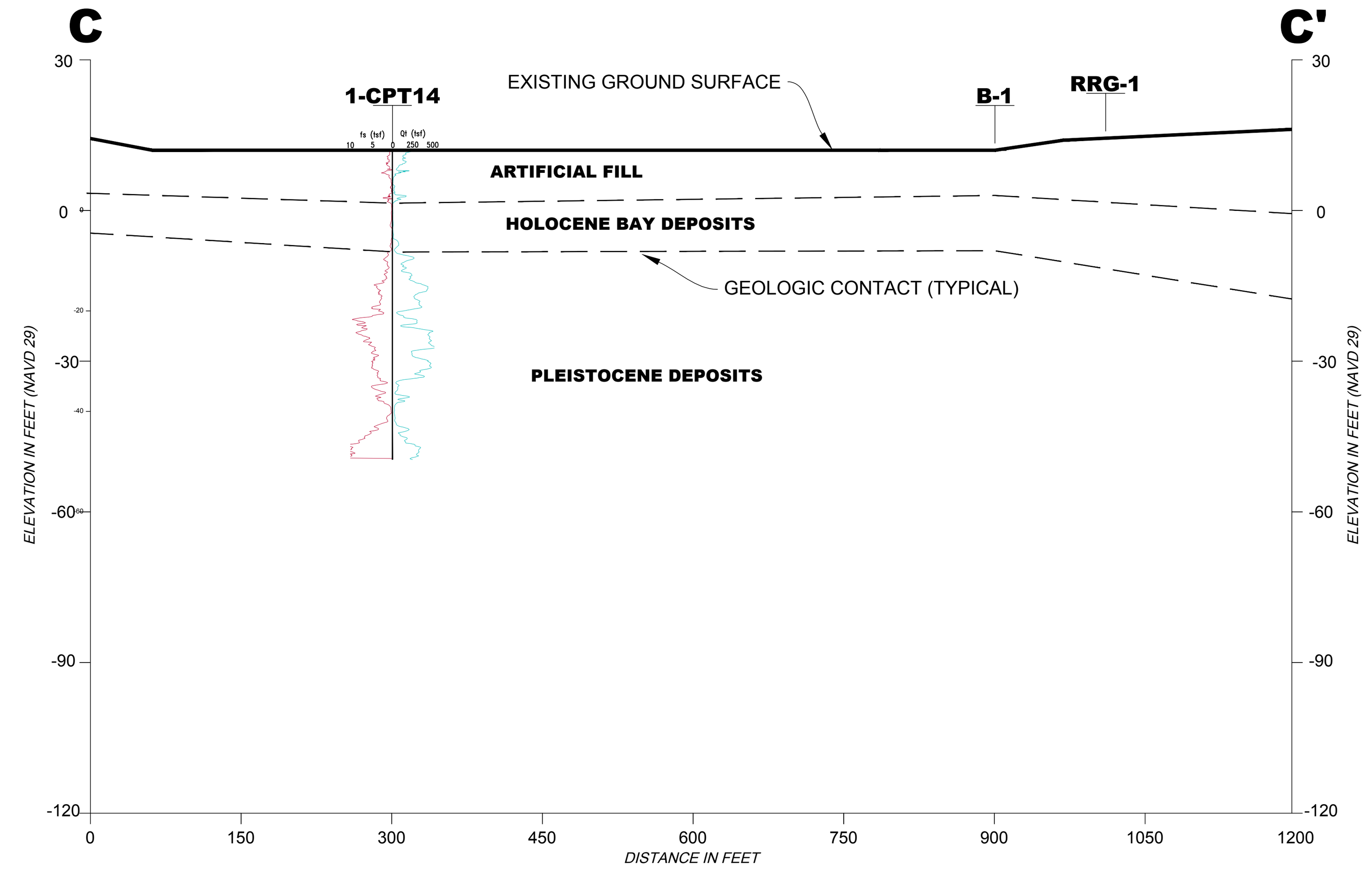
BASE MAP SOURCE: UNKNOWN

ENGEO — Expect Excellence

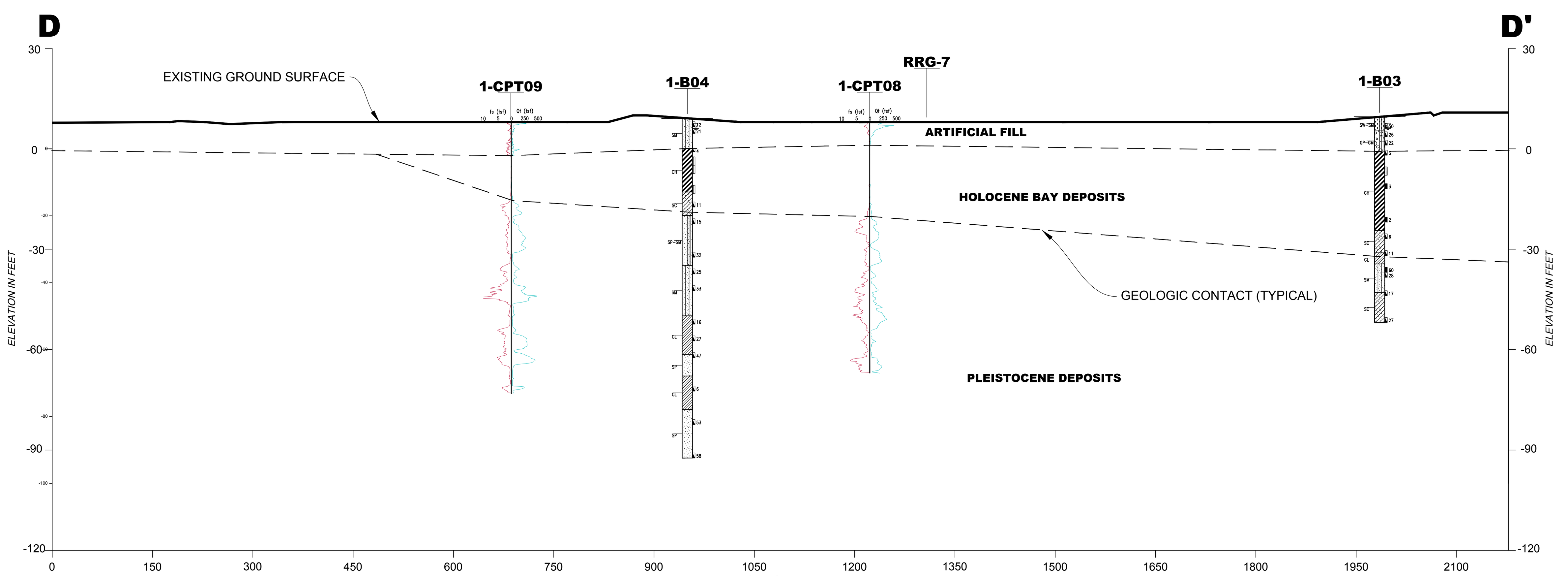
CROSS SECTION A-A' AND B-B'
BAYLANDS RAILYARD
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.000
SCALE: AS SHOWN
DRAWN BY: LL
CHECKED BY: LC
FIGURE NO. 5A

ORIGINAL FIGURE PRINTED IN COLOR



SECTION C-C'
VERTICAL 1" = 30'
HORIZONTAL 1" = 150'



SECTION D-D'
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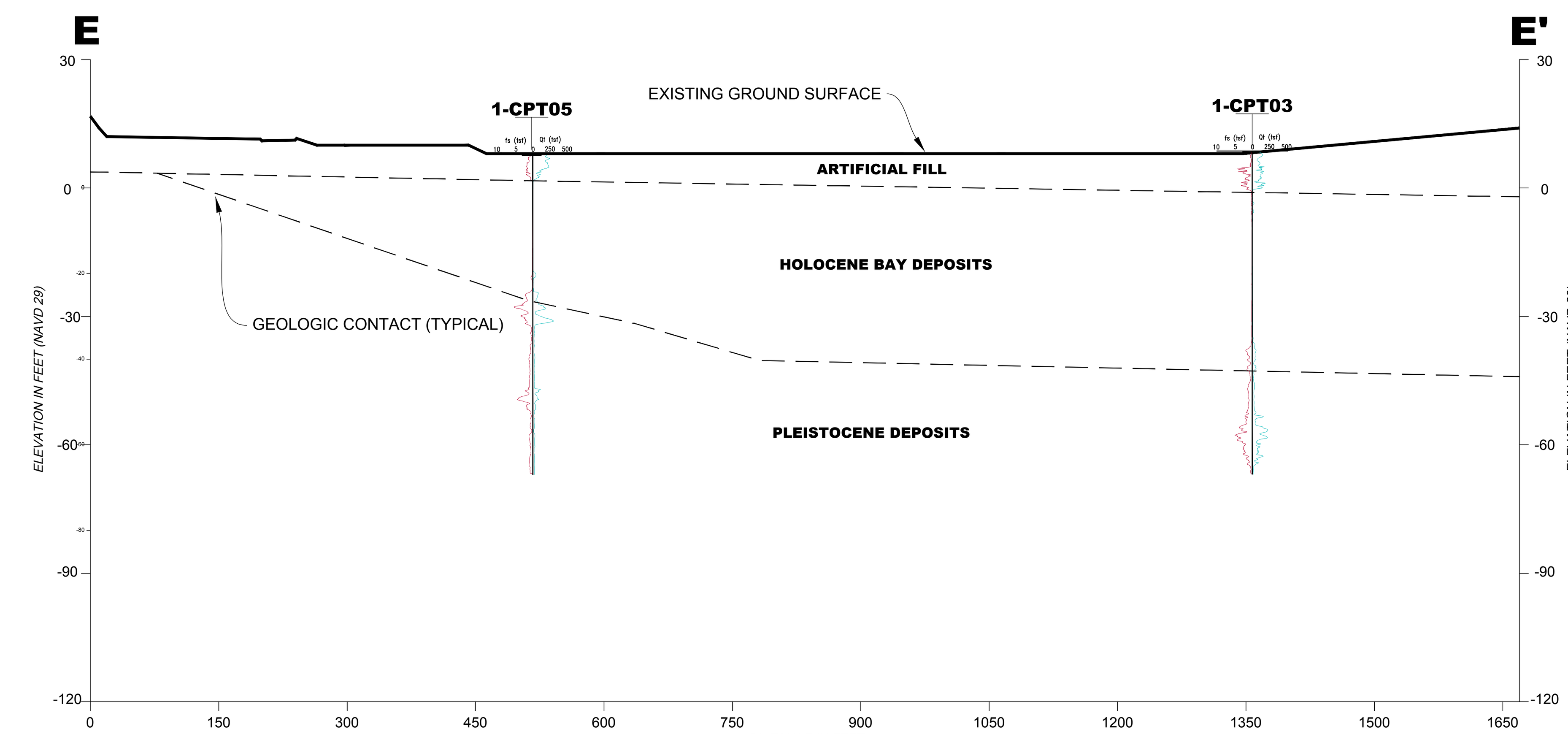
HORIZONTAL 1" = 150'



SECTION E-E'
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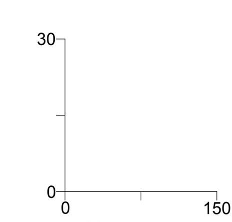
HORIZONTAL 1" = 150'



EXPLANATION
ALL LOCATIONS ARE APPROXIMATE

1-B02	BORING (ENGEO, 2020)
RRG-5	BORING (MICHELUCCI & ASSOCIATES, INC.,2003)
B-3	BORING (KLIENFELDER, 1989)
1-SCPT01	SEISMIC CONE PENETRATION TEST (ENGEO, 2020)
1-CPT03	CONE PENETRATION TEST (ENGEO, 2020)

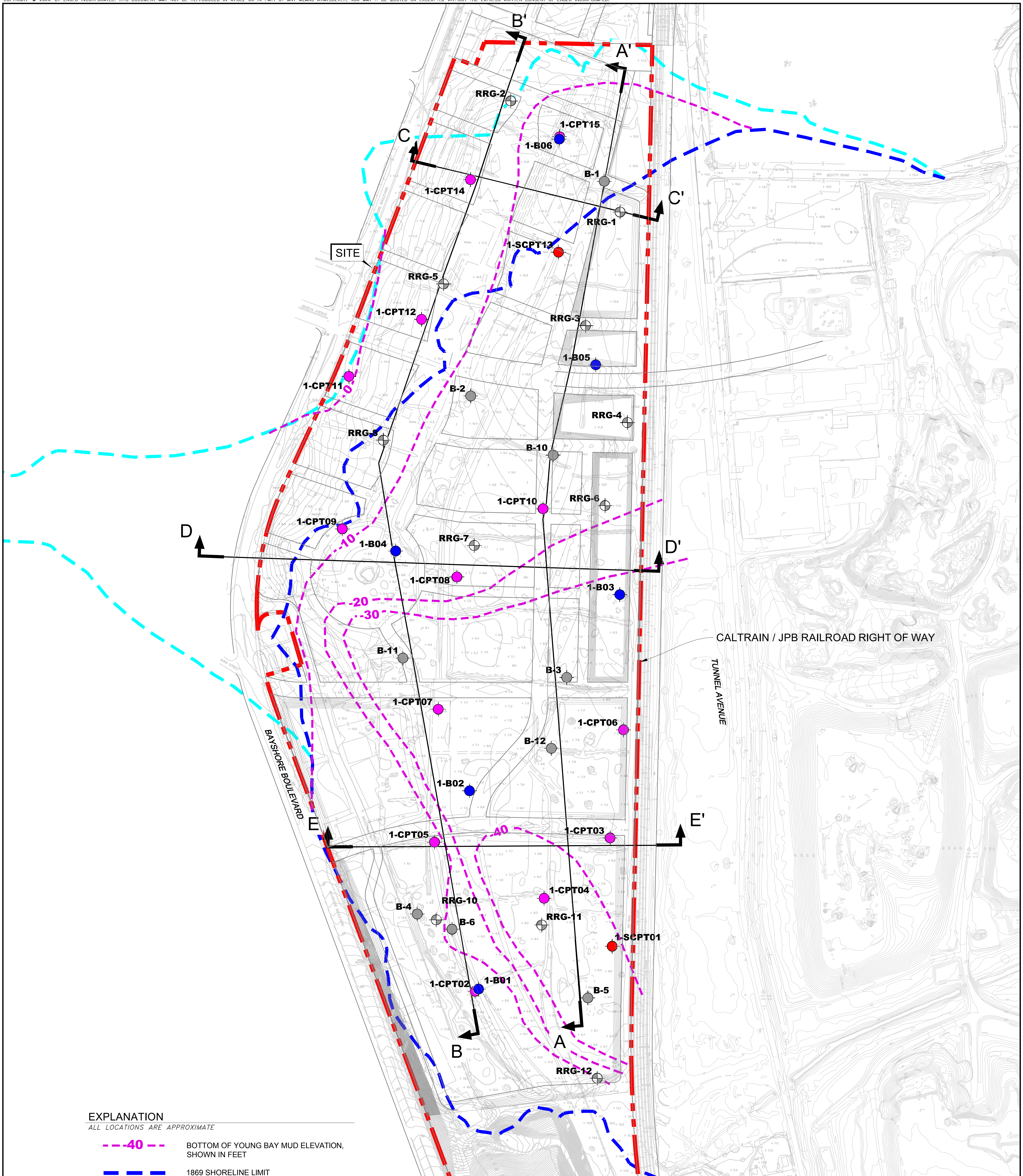
BASE MAP SOURCE: UNKNOWN

ENGEO
Expect Excellence

CROSS SECTION C-C', D-D', AND E-E'
BAYLANDS RAILYARD
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.000
SCALE: AS SHOWN
DRAWN BY: LL
CHECKED BY: LC
FIGURE NO. 5B

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- -40 – BOTTOM OF YOUNG BAY MUD ELEVATION, SHOWN IN FEET
- 1869 SHORELINE LIMIT
- 1869 MARSH LIMIT
- 1-B05 – BORING (ENGEO, 2020)
- RRG-5 – BORING (MICHELUCCI & ASSOCIATES, INC.,2003)
- B-2 – BORING (KLIENFELDER, 1989)
- 1-SCPT13 – SEISMIC CONE PENETRATION TEST (ENGEO, 2020)
- 1-CPT12 – CONE PENETRATION TEST (ENGEO, 2020)
- E – E' – CROSS SECTION

N

0 300 FEET

BASE MAP SOURCE: UNKNOWN

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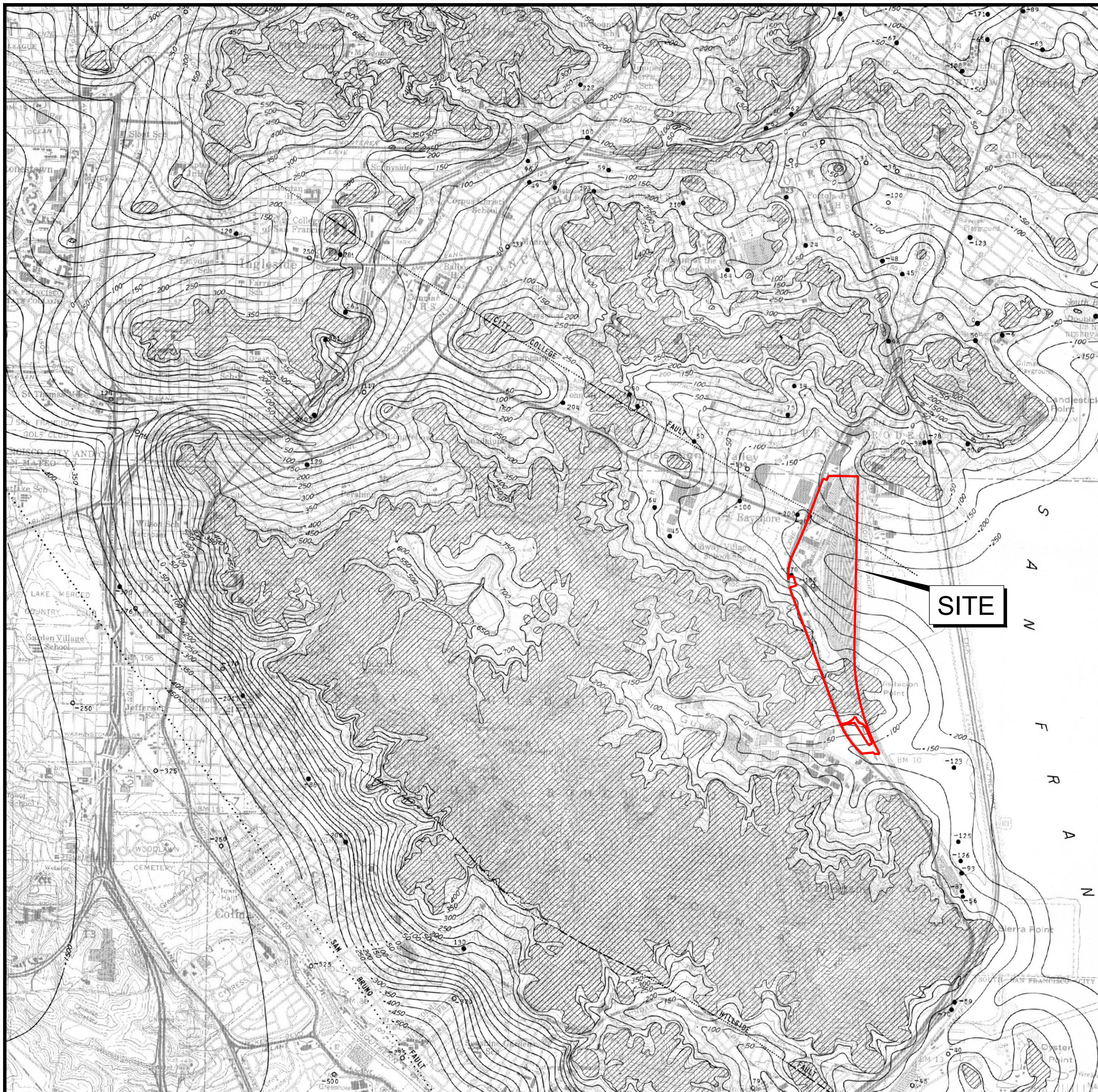
YOUNG BAY MUD ELEVATION PLAN
BAYLANDS RAILYARD
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.000	FIGURE NO. 6
SCALE: AS SHOWN	
DRAWN BY: LL	CHECKED BY: LC

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

- BEDROCK AT SURFACE
- —150— CONTOUR ON TOP OF BEDROCK WHERE BEDROCK IS BURIED, SHOWN IN FEET
- •-200? LOCATION OF BOREHOLE AND ELEVATION OF TOP OF BEDROCK IN BOREHOLE
- o-220 LOCATION OF BOREHOLE THAT DID NOT REACH BEDROCK
- Fault — FAULT
- Hypothetical fault — HYPOTHETICAL FAULT

N

0 4000
FEET

BASE MAP SOURCE: U.S.G.S MF-334/BONILLA, 1964

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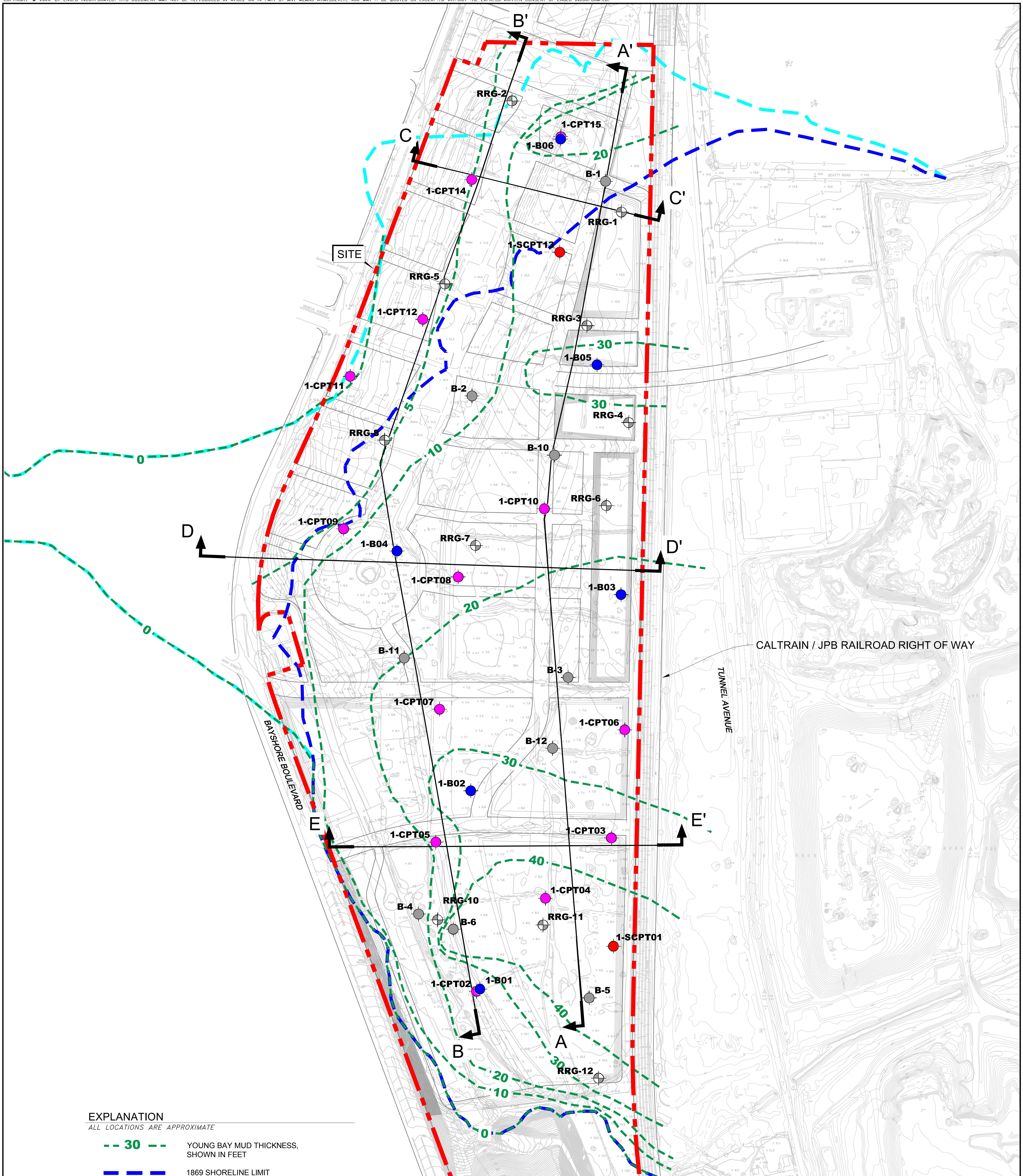
BEDROCK CONTOUR MAP
BAYLANDS RAILYARD
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.000	FIGURE NO. 7
SCALE: AS SHOWN	
DRAWN BY: LL	CHECKED BY: LC

ORIGINAL FIGURE PRINTED IN COLOR

FILE PATH: G:\Drafting\PROJECTS_16000 to 17999\17270\17270000000\Geotechnical\GEX-BaylandsRailYrd\17270000000-GEX-7-BedrockContours-0620.dwg SAVE DATE: 6/21/2020 8:56:04 PM SAVED BY: llee



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 30 — YOUNG BAY MUD THICKNESS, SHOWN IN FEET
- 1869 SHORELINE LIMIT
- 1869 MARSH LIMIT
- 1-B05 — BORING (ENGEO, 2020)
- RRG-5 — BORING (MICHELUCCI & ASSOCIATES, INC.,2003)
- B-2 — BORING (KLIENFELDER, 1989)
- 1-SCPT13 — SEISMIC CONE PENETRATION TEST (ENGEO, 2020)
- 1-CPT12 — CONE PENETRATION TEST (ENGEO, 2020)
- E — E' — CROSS SECTION

N

0 — 300 FEET

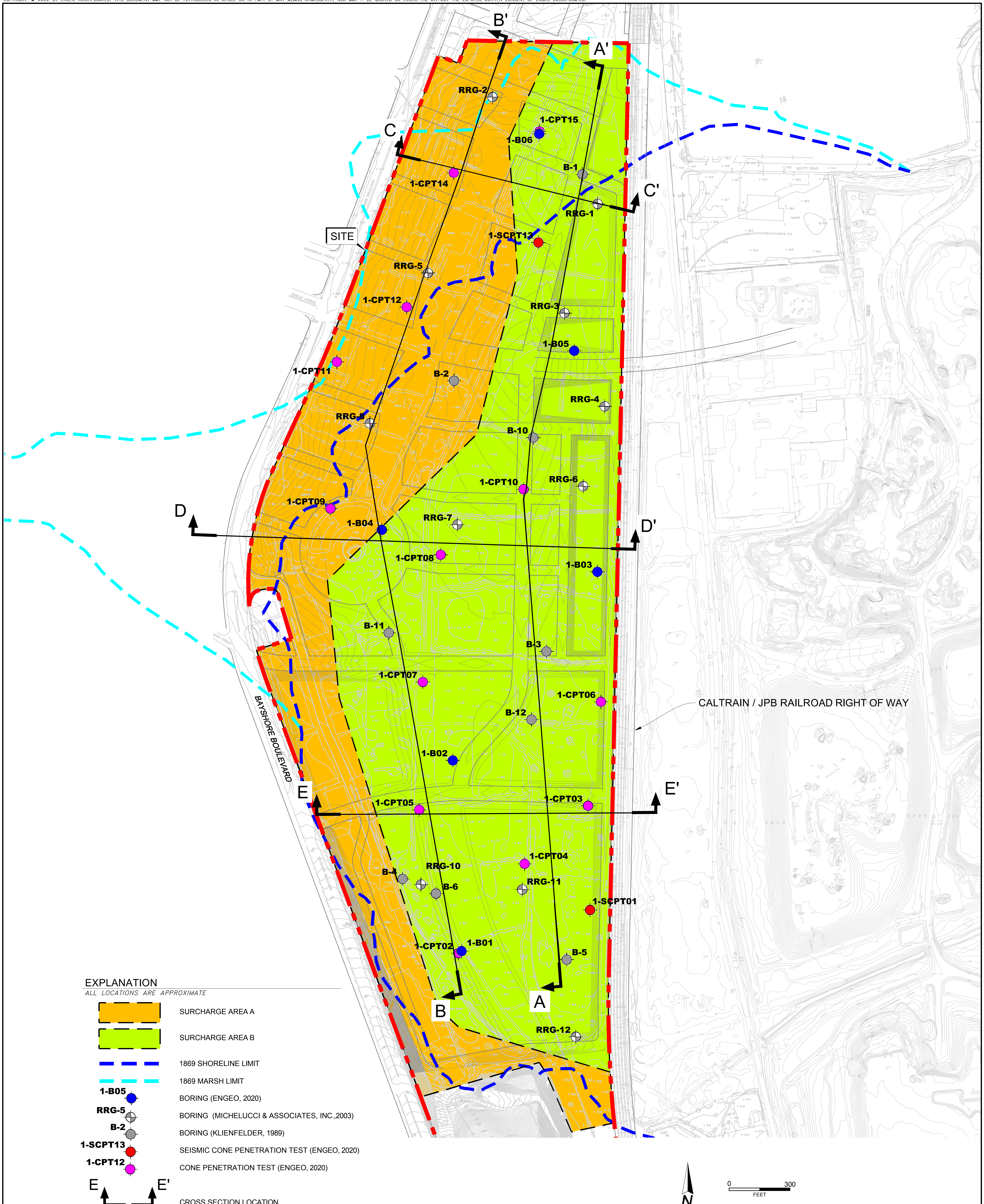
BASE MAP SOURCE: UNKNOWN

ENGEO — Expect Excellence

YOUNG BAY MUD THICKNESS PLAN BAYLANDS RAILYARD BRISBANE, CALIFORNIA	PROJECT NO.: 17270.000.000		FIGURE NO. 8
	SCALE: AS SHOWN		
	DRAWN BY: LL	CHECKED BY: LC	

ORIGINAL FIGURE PRINTED IN COLOR

FILE PATH: G:\Drafting\PROJECTS_16000 to 17999\17270\172700000000\Geotechnical\GEX-BaylandsRailYrd\172700000000-GEX-8-YBMThickness-0321.dwg SAVE DATE: 3/30/2021 5:34:29 PM SAVED BY: lee



BASE MAP SOURCE: UNKNOWN

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SURCHARGE PLAN
BAYLANDS RAILYARD
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.000		FIGURE NO. 9
SCALE: AS SHOWN		
DRAWN BY: LL	CHECKED BY: LC	

ORIGINAL FIGURE PRINTED IN COLOR

FILE PATH: G:\Drafting\PROJECTS_16000 to 17999\17270\172700000001\Geotechnical\GEX-BaylandsRailYrd\17270000000-GEX-9-Surcharge-0321.dwg SAVE DATE: 3/30/2021 5:34:34 PM SAVED BY: llee

APPENDIX A

BORING LOG KEY
BORING LOGS

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE: 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 (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Dames and Moore Piston
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

LINE TYPES

- Solid - Layer Break
- Dashed - Gradational or approximate layer break

GROUNDWATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

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LOG OF BORING 1-B01

LATITUDE: 37.696005555 LONGITUDE: -122.4045583

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/29/2020
HOLE DEPTH: 91.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 10 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	DESCRIPTION	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
		SANDY SILT WITH GRAVEL (ML), yellowish brown, moist, low plasticity, approximately 30% fine-grained sand, 15% fine gravel, some concrete and rock fragments [FILL]											
				17	24	22	2	50	19				
5	5		∇	3									
		FAT CLAY (CH), bluish gray, soft, high plasticity, [BAY DEPOSITS]											
10	0												
									78	56			
15	-5												
20	-10												
25	-15												

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LOG OF BORING 1-B01

LATITUDE: 37.696005555 LONGITUDE: -122.4045583

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/29/2020
HOLE DEPTH: 91.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 10 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SANDY SILTY CLAY (CL-ML), yellowish brown, stiff, medium plasticity, approximately 30% fine- to medium-grained sand			6					19	113	700*	1*	PP+TV
30	-20					21					18	110	714		UU
35	-25					13	24	18	6	54	21	112	1100*	1.5*	PP+TV
40	-30		CLAYEY SAND (SC), olive brown mottled with orange, medium dense, fine- to medium-grained sand, approximately 20% fines			18									
45	-35		LEAN CLAY (CL), pale olive brown, very stiff, medium plasticity, approximately 10% fine- to medium-grained sand			25									
50	-40														

LOG OF BORING 1-B01

ENGEO
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LATITUDE: 37.696005555 LONGITUDE: -122.4045583

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/29/2020
HOLE DEPTH: 91.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 10 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), pale olive brown, very stiff, medium plasticity, approximately 10% fine- to medium-grained sand												
											23	103	1578		UU
55	-45														
60	-50		some fine- to medium-grained sand and silt			25									
65	-55														
70	-60														
											36	86	1440		UU
75	-65														

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORINGS GINT.GPJ ENGEO INC.GDT 6/23/20

LOG OF BORING 1-B01

ENGEO Expect Excellence

LATITUDE: 37.696005555 LONGITUDE: -122.4045583

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/29/2020
HOLE DEPTH: 91.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 10 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), pale olive brown, very stiff, medium plasticity, approximately 10% fine- to medium-grained sand												
80	-70		olive brown to greenish gray, trace fine-grained sand			14									
85	-75														
90	-80					15									
			Boring terminated at a depth of 91.5 feet below ground surfce. Groundwater encountered at a depth of approxiately 5.5 feet below ground surface.												

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LOG OF BORING 1-B02

LATITUDE: 37.69860556 LONGITUDE: -122.4047139

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/26/2020
HOLE DEPTH: 62.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 7 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SILTY SAND WITH GRAVEL (SM), olive brown, medium dense, moist, fine- to coarse-grained sand, approximately 15% fine, subangular gravel [FILL]												
	5					13				18	13				
					∇										
			strong hydrocarbon odor, black oil												
5						2									
	0														
10															
			FAT CLAY (CH), bluish gray, soft, high plasticity, organic odor [BAY DEPOSITS]												
	-5										80	55			
15															
	-10										91	50			
20						0					83	58	300*	.5*	PP+TV
	-15														
25															

LOG OF BORING 1-B02

ENGEO Expect Excellence

LATITUDE: 37.69860556 LONGITUDE: -122.4047139

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/26/2020
HOLE DEPTH: 62.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 7 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet: 30, 35, 40, 45, 50
Elevation in Feet: -20, -25, -30, -35, -40

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			FAT CLAY (CH), bluish gray, soft, high plasticity, organic odor [BAY DEPOSITS]												
			trace fine-grained sand								75	55	605		UU
			SANDY CLAY (SC), bluish gray mottled with orange, loose, [BAY DEPOSITS]			5					18	116			
						3					20	108			
			LEAN CLAY (CL), greenish brown, stiff, medium plasticity, aproximately 15% fine-grained sand			20							1300*	2*	PP+TV

LOG OF BORING 1-B02

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LATITUDE: 37.69860556 LONGITUDE: -122.4047139

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/26/2020
HOLE DEPTH: 62.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 7 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	-45		CLAYEY SAND (SC), olive mottled with orange brown, medium dense, fine-grained sand, approximately 30% lean clay			13									
55			LEAN CLAY (CL), greenish gray, very stiff, medium plasticity, approximately 10% fine-grained sand			25					28	99	2600*	2.5*	PP+TV
	-50														
60			trace fine, angular gravel												
	-55		CLAYEY SAND (SC), greenish gray, dense										2000*	2.5*	PP+TV
			Boring terminated at a depth of 62.5 feet below ground surfce. Groundwater encountered at a depth of approxiately 3 feet below ground surface.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORINGS GINT.GPJ ENGEO INC.GDT 6/23/20

LOG OF BORING 1-B03

ENGEO
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LATITUDE: 37.70119167 LONGITUDE: -122.4023306

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/28/2020
HOLE DEPTH: 61.5 ft.
HOLE DIAMETER: 7.5 in.
SURF ELEV (NGVD29): Approx. 8 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	5		WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), brown, medium dense, moist, fine-to coarse-grained sand, approximately 20% fine gravel, angular to subangular, approximately 10% fines with concrete and brick debris [FILL]		▽	30									
5			WELL GRADED SAND WITH CLAY AND GRAVEL (SW-SC), brown, medium dense, wet, fine- to coarse-grained sand, fine gravel, subangular to subrounded [FILL]			26									
	0					22	32	18	14	8	16				
10			FAT CLAY (CH), bluish gray, soft, high plasticity, with shell fragments [BAY DEPOSITS]			3									
15	-5														
20	-10					3					80	53	400*	.5*	PP+TV
25	-15														

LOG OF BORING 1-B03

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LATITUDE: 37.70119167 LONGITUDE: -122.4023306

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/28/2020
HOLE DEPTH: 61.5 ft.
HOLE DIAMETER: 7.5 in.
SURF ELEV (NGVD29): Approx. 8 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	-20		FAT CLAY (CH), bluish gray, soft, high plasticity, with shell fragments [BAY DEPOSITS]												
30						2					62	63	500*	.5*	PP+TV
	-25														
35			CLAYEY SAND (SC), bluish gray, loose, wet, fine- to medium-grained sand, approximately 40% fines [BAY DEPOSITS]			6	28	16	12		29				
	-30														
40			SANDY CLAY (CL), olive brown, stiff, medium plasticity, approximately 30% fine-grained sand			11									
	-35														
45			SILTY SAND (SM), olive brown mottled with orange, medium dense, fine-to medium-grained sand, approximately 15% fines			60	NP	NP	NP		18				
						28									
	-40														
50															

LOG OF BORING 1-B03

LATITUDE: 37.70119167   LONGITUDE: -122.4023306

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/28/2020
HOLE DEPTH: 61.5 ft.
HOLE DIAMETER: 7.5 in.
SURF ELEV (NGVD29): Approx. 8 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SILTY SAND (SM), olive brown mottled with orange, medium dense, fine-to medium-grained sand, approximately 15% fines												
	-45		CLAYEY SAND (SC), greenish brown with olive, medium dense, fine-grained sand, approximately 40% fines			17	27	18	9		22				
55															
	-50														
60			approximately 30% fines			27									
			Boring terminated at a depth of 61.5 feet below ground surfce. Groundwater encountered at a depth of approxiately 3.5 feet below ground surface.												

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LOG OF BORING 1-B04

LATITUDE: 37.70170278 LONGITUDE: -122.4060222

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/27/2020
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 9 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	DESCRIPTION	Blow Count/Foot	Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
		POORLY GRADED SAND WITH SILT (SP-SM), dark brown, medium dense, moist, fine-grained sand, trace angular gravel and glass fragments [FILL]	12	NP	NP	NP	11	6				
	5	concrete debris and hydrocarbon odor	21									
5												
	0	FAT CLAY (CH), bluish gray, soft, high plasticity, [BAY DEPOSITS]	4									
10												
	-5											
15												
	-10	CLAYEY SAND (SC), dark gray, loose, wet, [BAY DEPOSITS]										
20												
		SILTY, CLAYEY SAND (SC-SM), greenish olive, medium dense, fine-grained sand, approximately 40% fines		25	12	13	35	16	110			
	-15											
25												

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LOG OF BORING 1-B04

LATITUDE: 37.70170278 LONGITUDE: -122.4060222

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/27/2020
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 9 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SILTY, CLAYEY SAND (SC-SM), greenish olive, medium dense, fine-grained sand, approximately 40% fines			11	22	16	6		19				
	-20		SILTY SAND (SM), orange brown, medium dense, fine- to medium-grained sand												
30						15				15	23				
35	-25														
	-30														
40			greenish brown, dense			32									
	-35		SILTY, CLAYEY SAND (SC-SM), greenish gray, medium dense, fine- to medium-grained sand, approximately 20% fines												
45						25	23	17	6		18				
	-40														
50															

LOG OF BORING 1-B04

ENGEO
Expect Excellence

LATITUDE: 37.70170278 LONGITUDE: -122.4060222

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/27/2020
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 9 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SILTY, CLAYEY SAND (SC-SM), greenish gray, medium dense, fine- to medium-grained sand, approximately 20% fines dense			33									
	-45														
55															
	-50		SANDY CLAY (CL), light brown, very stiff, medium plasticity, approximately 30% fine- to medium-grained sand												
60						16					24				
	-55														
65						27					21				
	-60														
70			POORLY GRADED SAND (SP), light yellowish brown, dense, fine- to medium-grained sand, trace fines			47									
	-65														
75															

LOG OF BORING 1-B04

ENGEO
Expect Excellence

LATITUDE: 37.70170278 LONGITUDE: -122.4060222

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/27/2020
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 9 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			POORLY GRADED SAND (SP), light yellowish brown, dense, fine- to medium-grained sand, trace fines												
			LEAN CLAY (CL), greenish gray, medium stiff, medium plasticity, trace fine-grained sand												
	-70														
80						6					69				
	-75														
85															
			POORLY GRADED SAND (SP), light yellowish brown, very dense, fine- to medium-grained sand, trace fines												
	-80														
90						53									
	-85														
95															
	-90														
100															

LOG OF BORING 1-B04

ENGEO
Expect Excellence

LATITUDE: 37.70170278 LONGITUDE: -122.4060222

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/27/2020
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 9 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			POORLY GRADED SAND (SP), light yellowish brown, very dense, fine- to medium-grained sand, trace fines			58									
			Boring terminated at a depth of 61.5 feet below ground surfce. Groundwater encountered at a depth of approxiately 3.5 feet below ground surface.												

LOG OF BORING 1-B05

ENGEO
Expect Excellence

LATITUDE: 37.70431111 LONGITUDE: -122.4024556

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/28/2020
HOLE DEPTH: 39.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 11 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	10		WELL GRADED SAND WITH GRAVEL AND SILT (SW-SM), light brown, medium dense, moist, approximately 15% fine gravel, approximately 10% fines, fine- to coarse-grained sand [FILL]			17									
			approximately 10% coarse, subangular gravel			17									
5			SILTY SAND (SM), light yellowish brown, loose, wet, fine-grained sand, approxmately 20%fines, trace fine gravel [FILL]		∇										
	5					5	NP	NP	NP		21				
			FAT CLAY (CH), bluish gray, soft, high plasticity, organic odor [BAY DEPOSITS]												
10															
	0														
											57	73			
15						4									
	-5														
20															
	-10					5									
25															

LOG OF BORING 1-B05

ENGEO Expect Excellence

LATITUDE: 37.70431111 LONGITUDE: -122.4024556

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/28/2020
HOLE DEPTH: 39.5 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 11 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	-15		FAT CLAY (CH), bluish gray, soft, high plasticity, organic odor [BAY DEPOSITS] medium stiff, approximately 15% fine-grained sand			5							900*	1*	PP+TV
30	-20		POORLY GRADED SAND WITH CLAY (SP-SC), bluish gray to light brown, medium dense, fine-grained sand, approximately 10% fines			19									
35	-25		orange brown, dense			36									
			Boring terminated at a depth of 39.5 feet below ground surfce. Groundwater encountered at a depth of approxiately 5 feet below ground surface.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORINGS GINT.GPJ ENGEO INC.GDT 6/23/20

ENGEO
Expect Excellence

LOG OF BORING 1-B05B

LATITUDE: 37.70431111 LONGITUDE: -122.4024556

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/28/2020
HOLE DEPTH: 17.5 ft.
HOLE DIAMETER: 7.5 in.
SURF ELEV (NGVD29): Approx. 11 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	10		WELL GRADED SAND WITH GRAVEL AND SILT (SW-SM), light brown, medium dense, moist, approximately 15% fine gravel, approximately 10% fines, fine- to coarse-grained sand [FILL]												
5	5														
10	0		FAT CLAY (CH), bluish gray, high plasticity, trace fine-grained sand [BAY DEPOSITS]												
15	-5										74	57	716		UU
			Boring terminated at a depth of 17.5 feet below ground surfce. Groundwater not encountered due to drilling method.												

LOG OF BORING 1-B06

ENGEO — Expect Excellence

LATITUDE: 37.70655278 LONGITUDE: -122.4049333

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/26/2020
HOLE DEPTH: 61 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 11 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	10		WELL GRADED SAND WITH SILT (SW-SM), olive brown, medium dense, moist, fine- to coarse-grained sand, approximately 10% fines, some concrete and rock fragments [FILL]		▽	19									
5	5		FAT CLAY WITH SAND (CH), bluish gray, soft, wet, approximately 20% fine-grained sand [BAY DEPOSITS]												
10			CLAYEY GRAVEL (GC), bluish gray, medium dense, angular, coarse gravel [BAY DEPOSITS]			12									
15	0, -5		FAT CLAY (CH), bluish gray mottled with brown, soft, high plasticity, organic odor, trace organics [BAY DEPOSITS]												
20	-10		CLAYEY SAND (SC), greenish gray, loose, [BAY DEPOSITS]				24	14	10	15	18	107	100*	.5*	PP+TV
25			FAT CLAY (CH), bluish gray mottled with brown, soft, high plasticity, organic odor, trace organics [BAY DEPOSITS]												

LOG OF BORING 1-B06

ENGEO Expect Excellence

LATITUDE: 37.70655278 LONGITUDE: -122.4049333

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/26/2020
HOLE DEPTH: 61 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 11 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	-15		POORLY GRADED SAND WITH SILT (SP-SM), orange brown, medium dense, fine-grained sand			28				11	22				
30	-20		olive brown mottled with orange, dense			35									
35	-25		very dense			52									
40	-30		olive brown mottled with reddish orange, dense			41									
45	-35					46									
50															

LOG OF BORING 1-B06

LATITUDE: 37.70655278 LONGITUDE: -122.4049333

Geotechnical Exploration
Baylands Railyard
Brisbane, CA
17270.000.000

DATE DRILLED: 5/26/2020
HOLE DEPTH: 61 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (NGVD29): Approx. 11 ft.

LOGGED / REVIEWED BY: J. Tognolini / SOR
DRILLING CONTRACTOR: H1 Drilling Company
DRILLING METHOD: SFA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	-40		POORLY GRADED SAND WITH SILT (SP-SM), orange brown, medium dense, fine-grained sand medium dense			29									
			CLAYEY SAND (SC), olive brown mottled with orange, medium dense, medium plasticity, fine-grained sand, approximately 25% fines												
55	-45					66								>4.5*	PP
60	-50					50/5"									
			Boring terminated at a depth of approximately 61 feet below ground surfce. Groundwater encountered at a depth of 3 feet below ground surface.												

APPENDIX B

CONE PENETRATION TEST DATA

Job No: 20-56-20832
Client: ENGEO Incorporated
Project: Baylands
Start Date: 13-May-2020
End Date: 15-May-2020

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Northing[2] (m)	Easting[2] (m)	Elevation[3] (ft)	Refer to Notation Number
1-SCPT-01	20-56-20832_1SP01	14-May-2020	496:T1500F15U1K	-3.0	117.37	4172309	552697	11	4
1-CPT-02	20-56-20832_1CP02	15-May-2020	496:T1500F15U1K	-3.0	78.25	4172266	552492	12	4
1-CPT-03	20-56-20832_1CP03	14-May-2020	447:T1500F15U500	-3.3	75.54	4172486	552699	10	
1-CPT-04	20-56-20832_1CP04	14-May-2020	496:T1500F15U1K	-3.7	75.05	4172413	552590	10	
1-CPT-05	20-56-20832_1CP05	15-May-2020	496:T1500F15U1K	-6.9	75.05	4172477	552426	10	
1-CPT-06	20-56-20832_1CP06	14-May-2020	447:T1500F15U500	-3.0	75.54	4172629	552696	11	4
1-CPT-07	20-56-20832_1CP07	15-May-2020	496:T1500F15U1K	-3.0	1.56	4172655	552429	10	4
1-CPT-07B	20-56-20832_1CP07B	15-May-2020	496:T1500F15U1K	-3.0	75.05	4172657	552429	10	
1-CPT-08	20-56-20832_1CP08	15-May-2020	496:T1500F15U1K	-2.5	75.13	4172856	552436	10	
1-CPT-09	20-56-20832_1CP09	15-May-2020	496:T1500F15U1K	-1.8	81.28	4172921	552292	12	
1-CPT-10	20-56-20832_1CP10	14-May-2020	447:T1500F15U500	-1.8	101.13	4172945	552563	11	
1-CPT-11	20-56-20832_1CP11	13-May-2020	447:T1500F15U500	-1.0	59.38	4173133	552291	12	4
1-CPT-12	20-56-20832_1CP12	13-May-2020	447:T1500F15U500	-1.0	56.10	4173220	552388	11	4
1-SCPT-13	20-56-20832_1SP13	13-May-2020	447:T1500F15U500	-1.0	9.84	4173315	552580	12	4
1-SCPT-13B	20-56-20832_1SP13B	13-May-2020	447:T1500F15U500	-1.0	100.06	4173315	552580	12	4
1-CPT-14	20-56-20832_1CP14	13-May-2020	447:T1500F15U500	-0.8	61.68	4173432	552462	12	
1-CPT-15	20-56-20832_1CP15	13-May-2020	447:T1500F15U500	-3.4	74.88	4173490	552599	13	

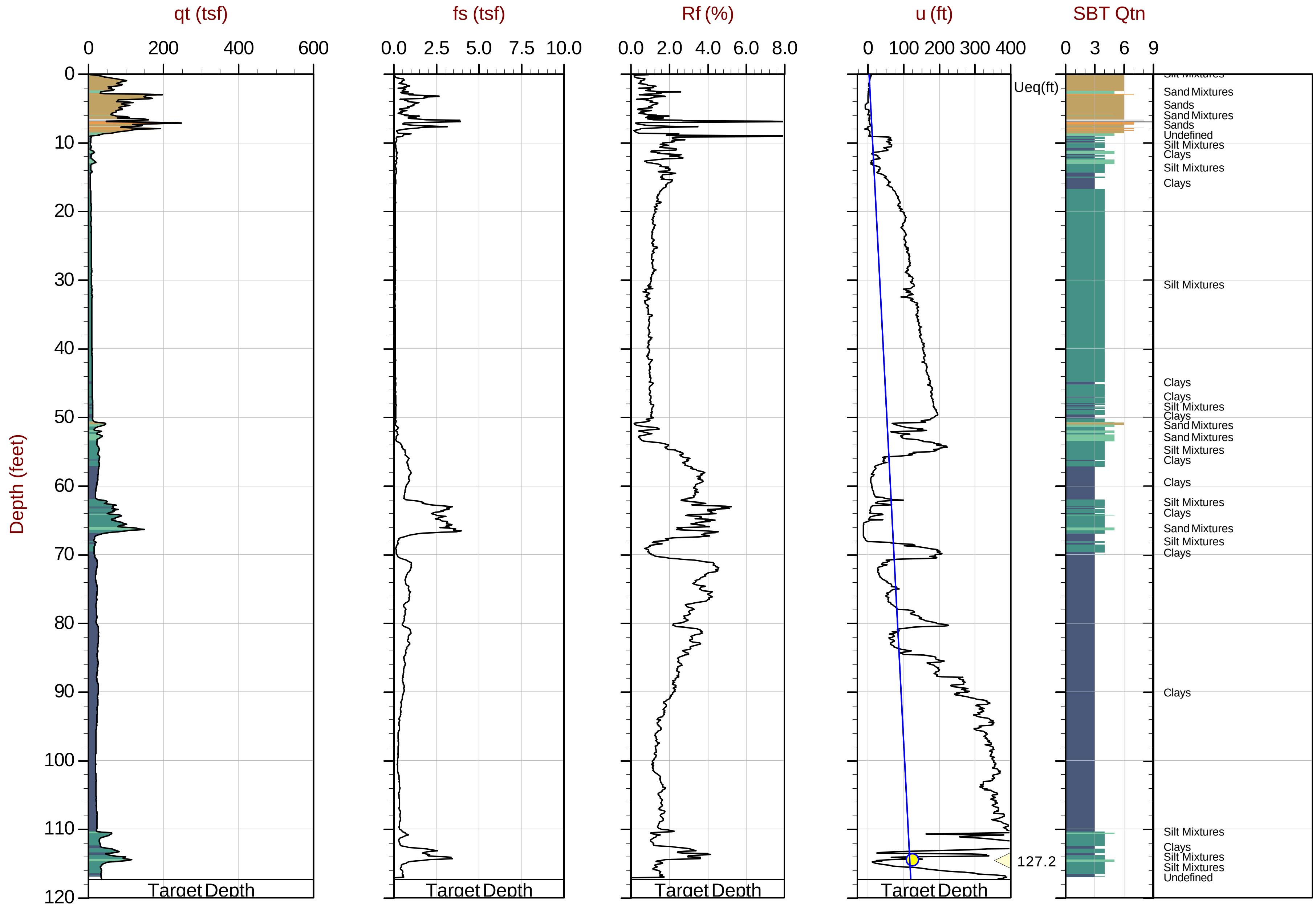
1. The assumed phreatic surface was based on the results of the shallowest pore pressure dissipation test performed within the sounding. Hydrostatic conditions were assumed for the calculated parameters.
2. The coordinates were acquired using consumer grade GPS equipment, datum: WGS 1984 / UTM Zone 10 North.
3. Elevations are refrenced to the ground surface and were acquired from the Google Earth Elevation for the recorded coordinates.
4. The assumed phreatic surface was based on the pore pressure dissipation tests at nearby soundings.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-14 13:04
Site: Baylands

Sounding: 1-SCPT-01
Cone: 496:T1500F15U1K



Max Depth: 35.775 m / 117.37 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1SP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172309m E: 552697m

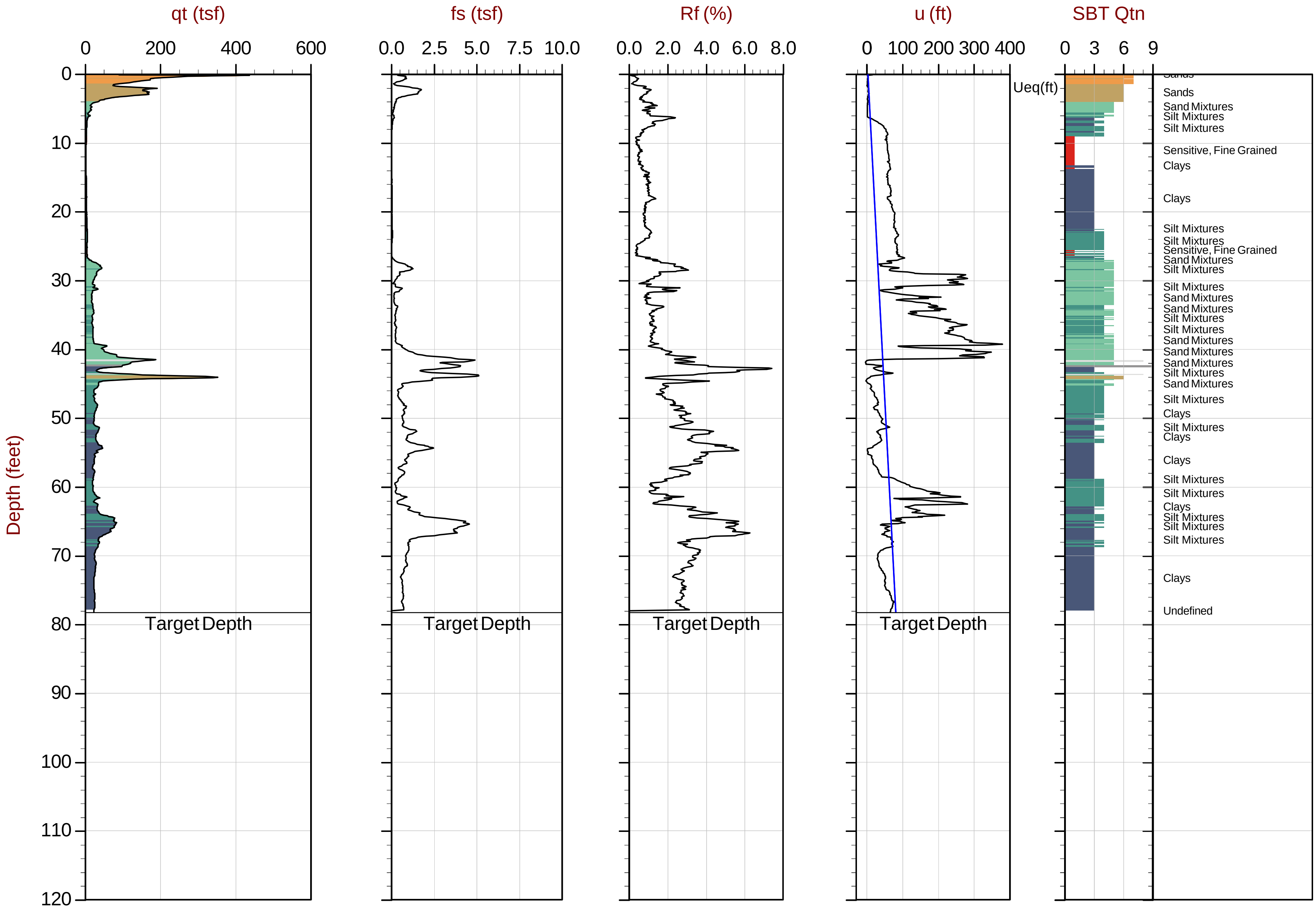
Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ENGEO

Job No: 20-56-20832
Date: 2020-05-15 08:59
Site: Baylands

Sounding: 1-CPT-02
Cone: 496:T1500F15U1K



Max Depth: 23.850 m / 78.25 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172266m E: 552492m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

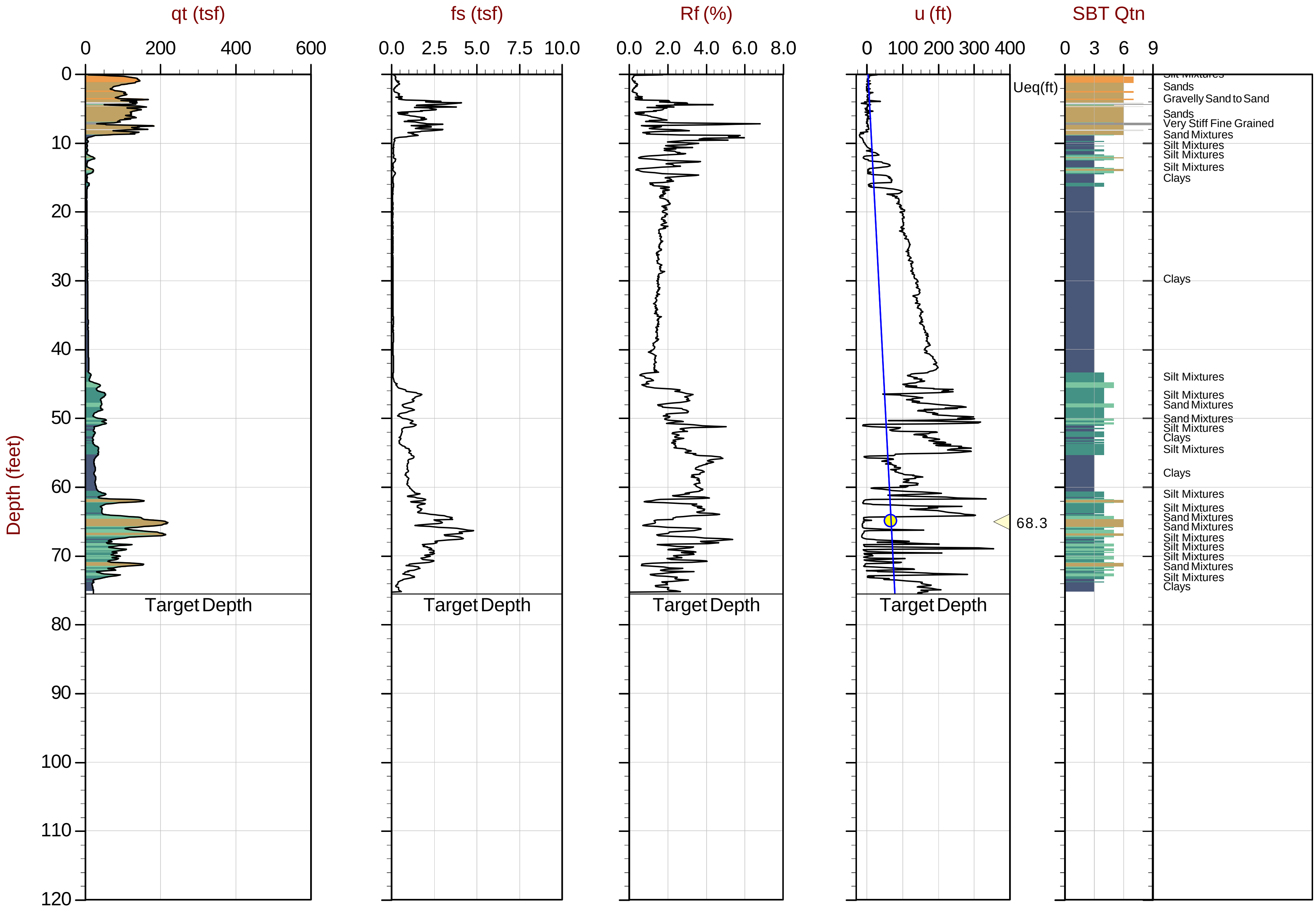
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-14 11:41
Site: Baylands

Sounding: 1-CPT-03
Cone: 447:T1500F15U500



Max Depth: 23.025 m / 75.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP03.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172486m E: 552699m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

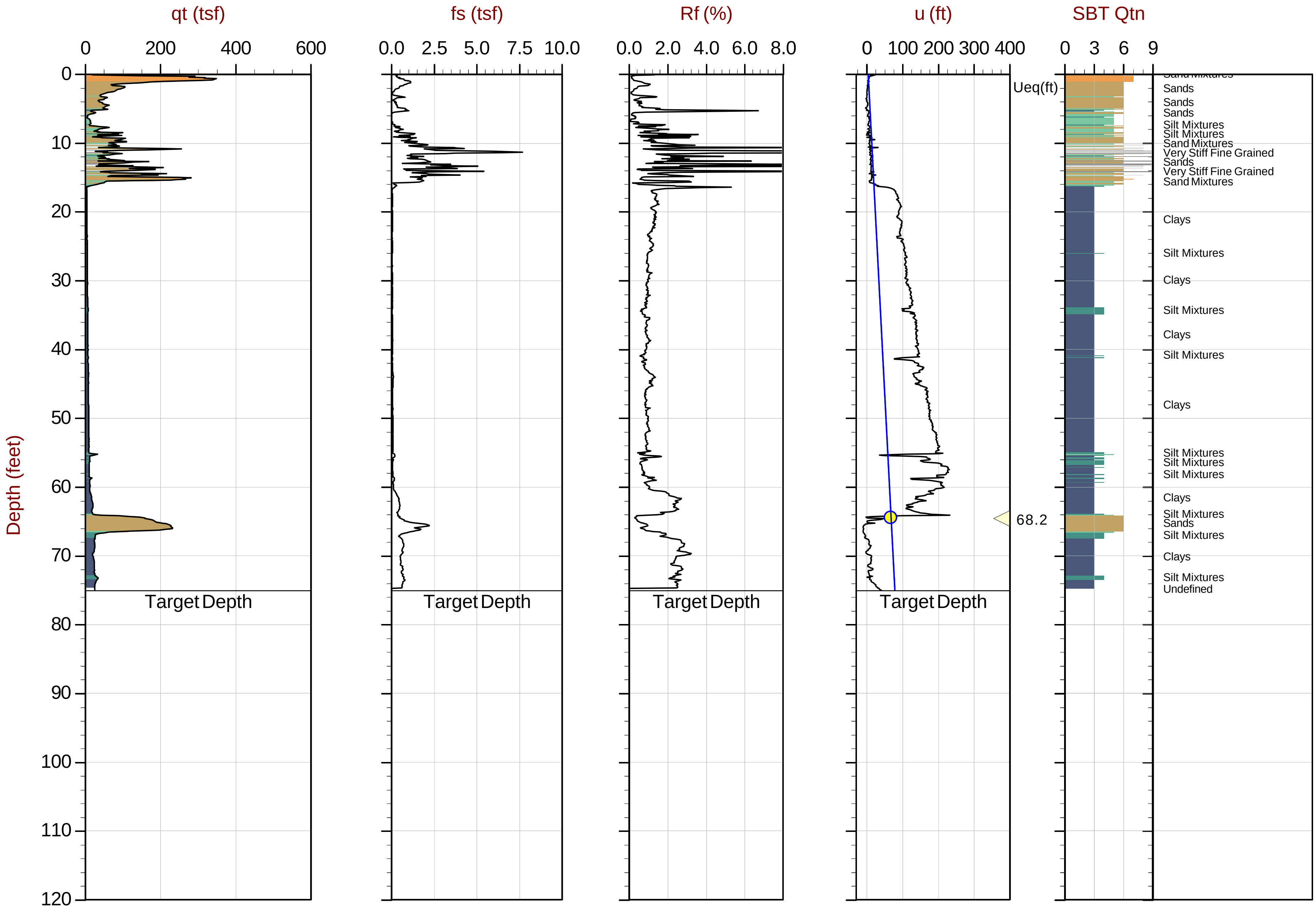
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

ENGEO

Job No: 20-56-20832
Date: 2020-05-14 14:39
Site: Baylands

Sounding: 1-CPT-04
Cone: 496:T1500F15U1K



Max Depth: 22.875 m / 75.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP04.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172413m E: 552590m

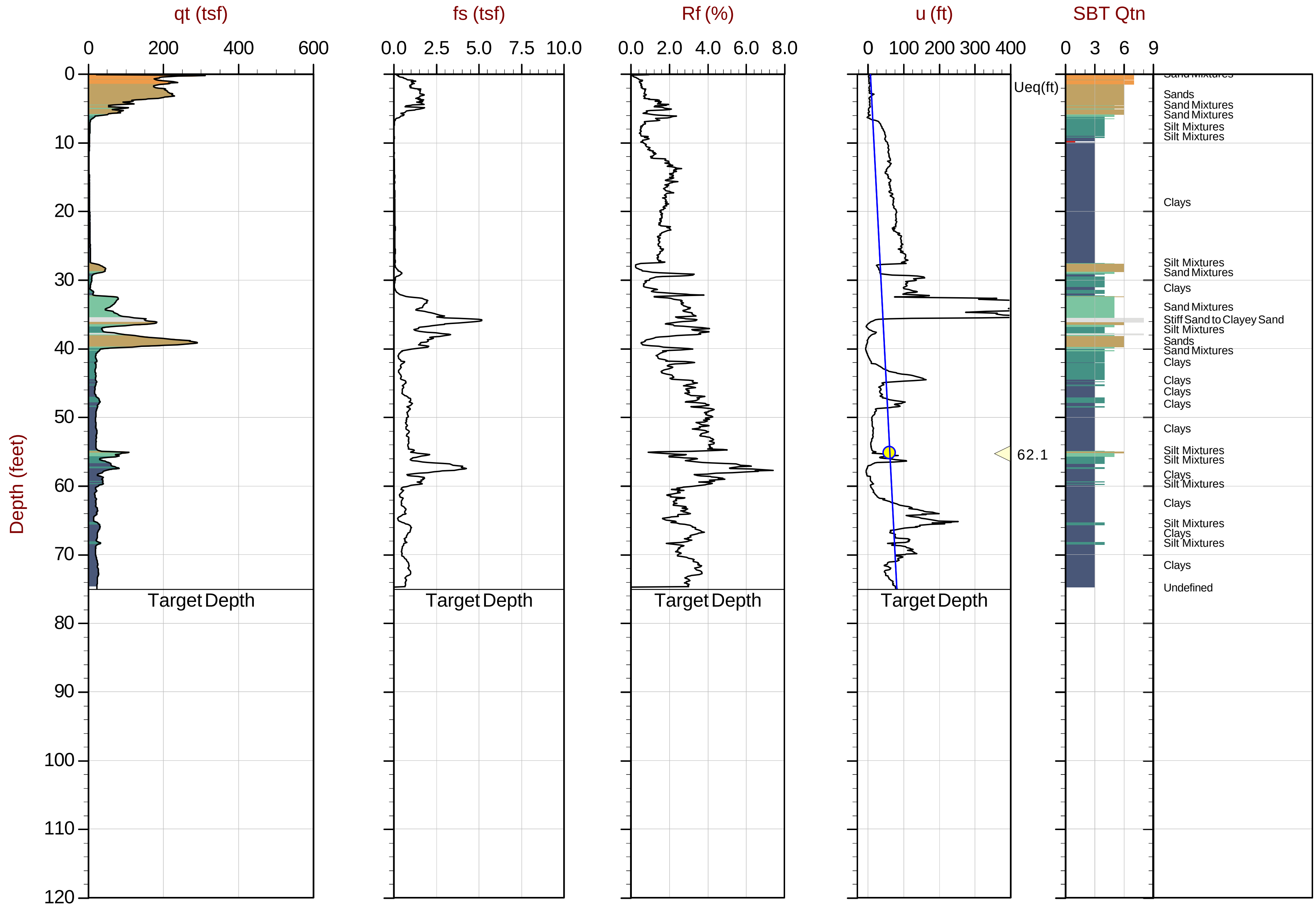
Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ENGEO

Job No: 20-56-20832
Date: 2020-05-15 10:07
Site: Baylands

Sounding: 1-CPT-05
Cone: 496:T1500F15U1K



Max Depth: 22.875 m / 75.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP05.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172477m E: 552426m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

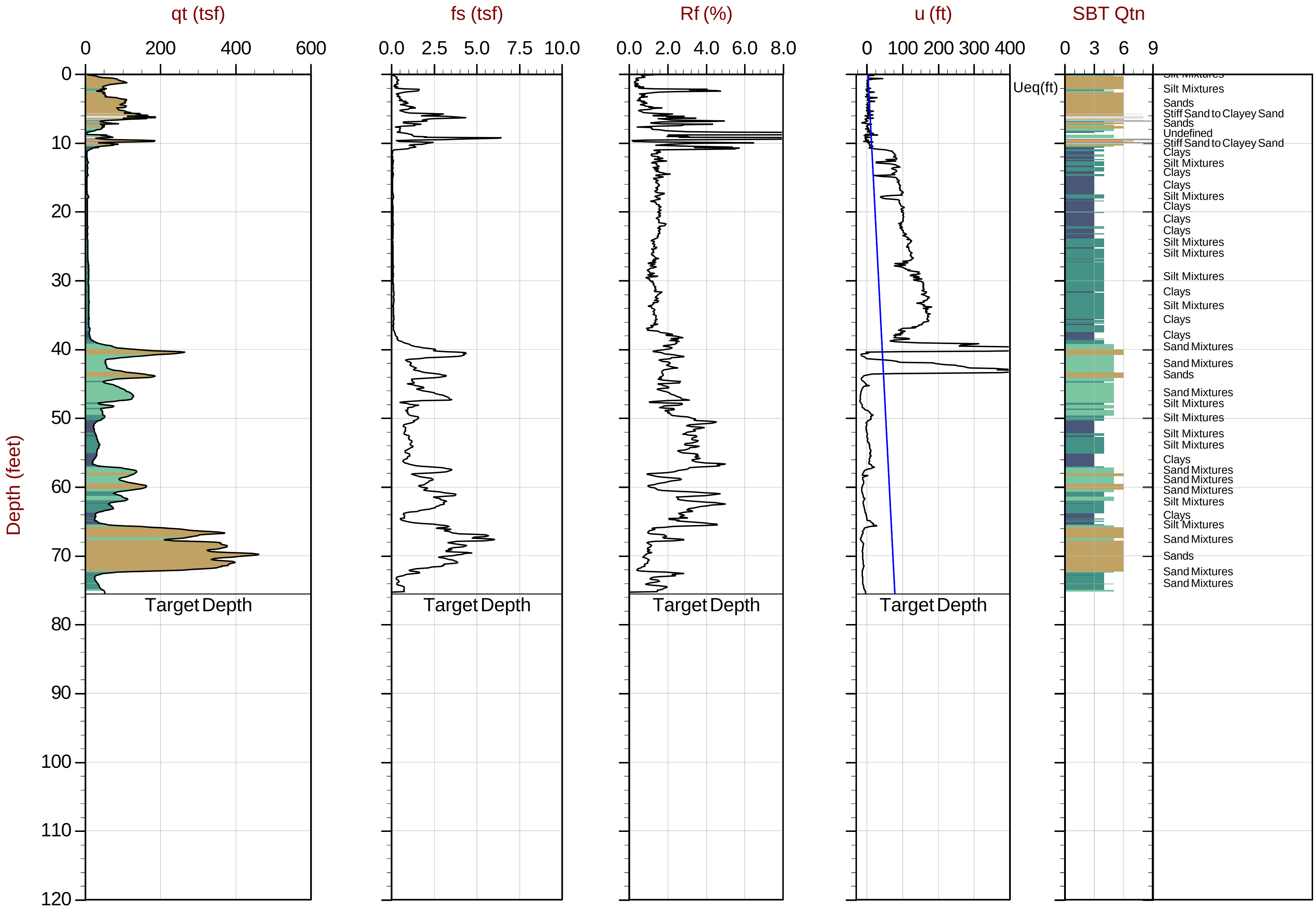
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-14 10:54
Site: Baylands

Sounding: 1-CPT-06
Cone: 447:T1500F15U500



Max Depth: 23.025 m / 75.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP06.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172629m E: 552696m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

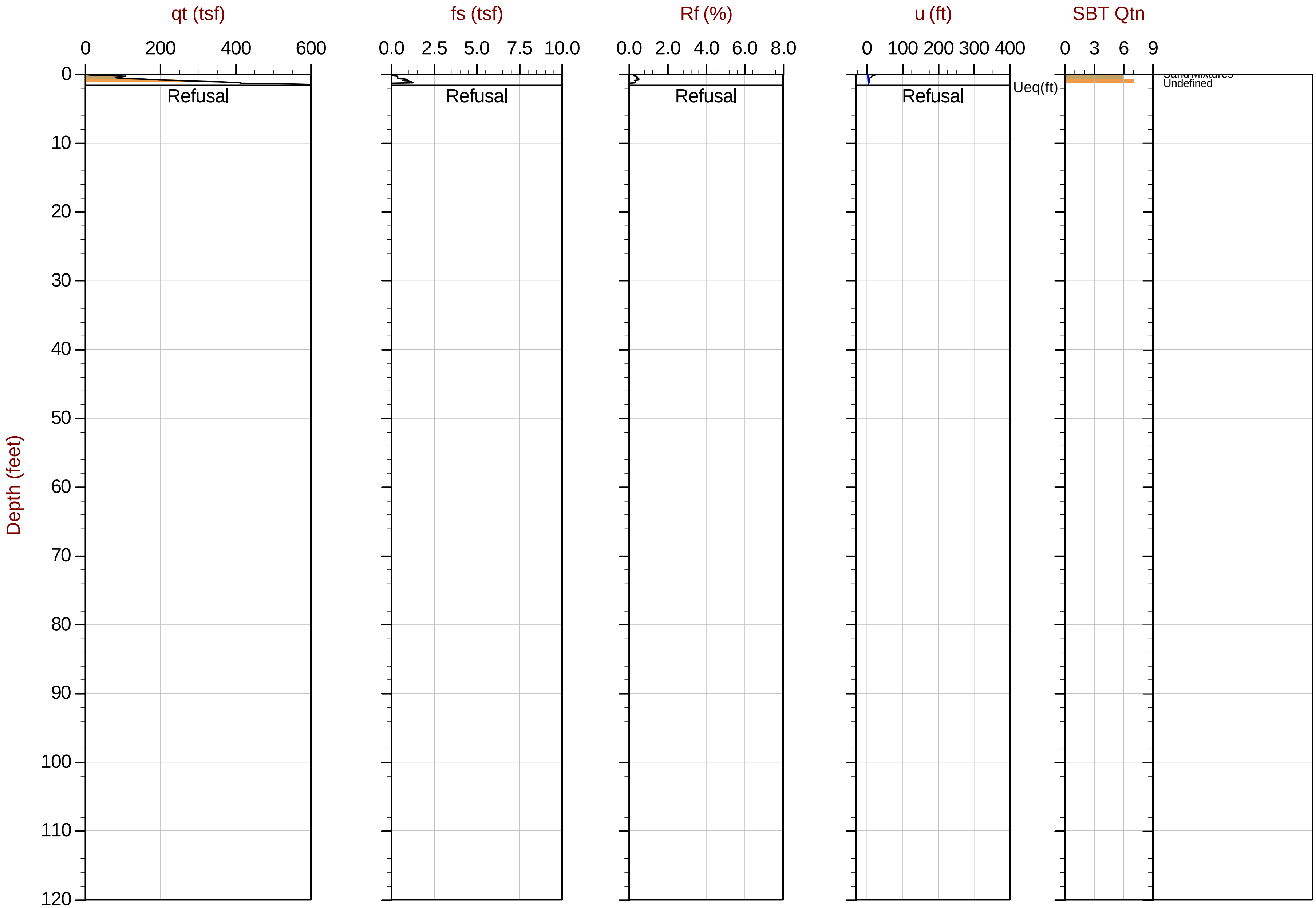
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

ENGEO

Job No: 20-56-20832
Date: 2020-05-15 11:01
Site: Baylands

Sounding: 1-CPT-07
Cone: 496:T1500F15U1K



Max Depth: 0.475 m / 1.56 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP07.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172655m E: 552429m

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

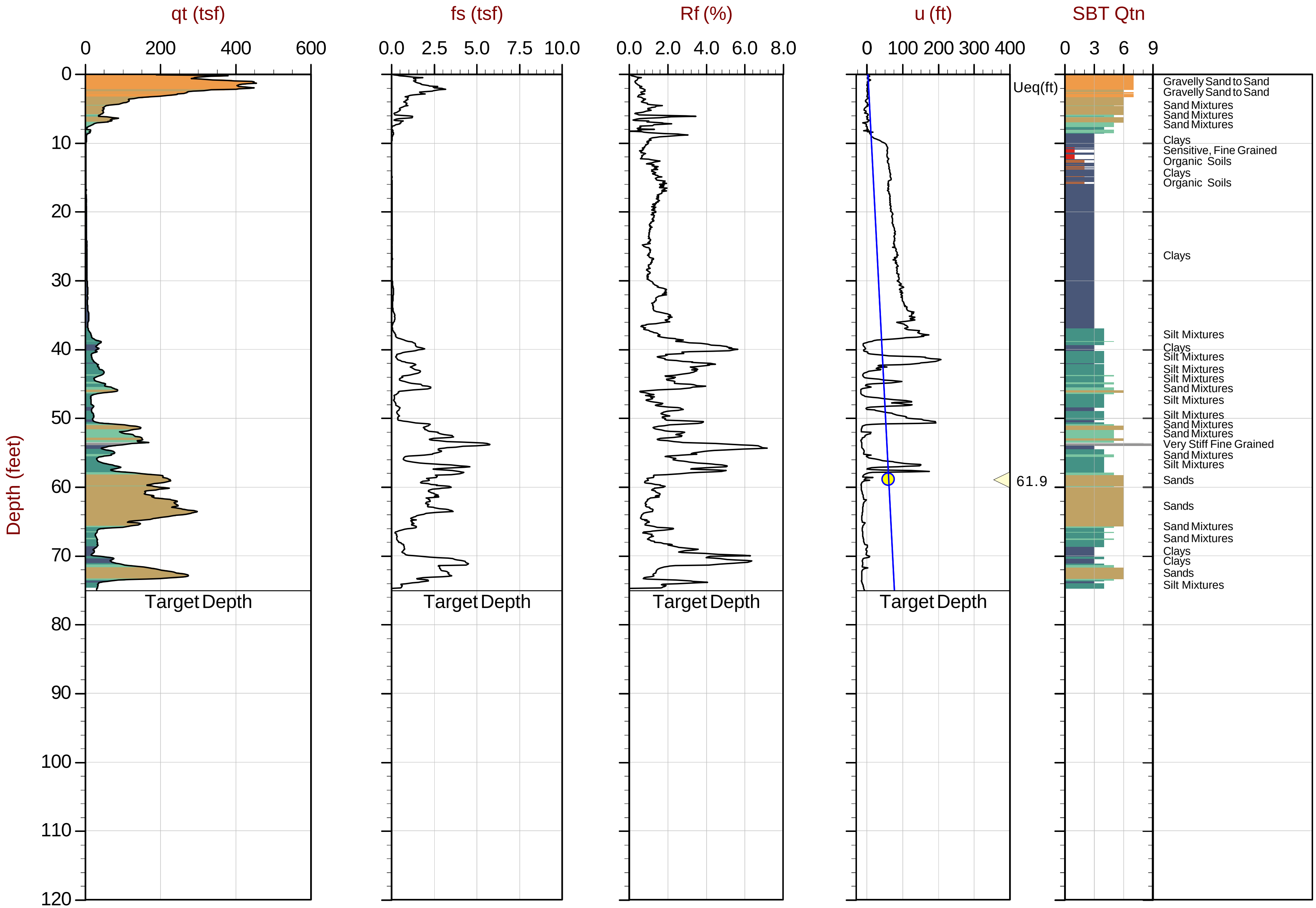
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

ENGEO

Job No: 20-56-20832
Date: 2020-05-15 11:12
Site: Baylands

Sounding: 1-CPT-07B
Cone: 496:T1500F15U1K



Max Depth: 22.875 m / 75.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP07B.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172657m E: 552429m

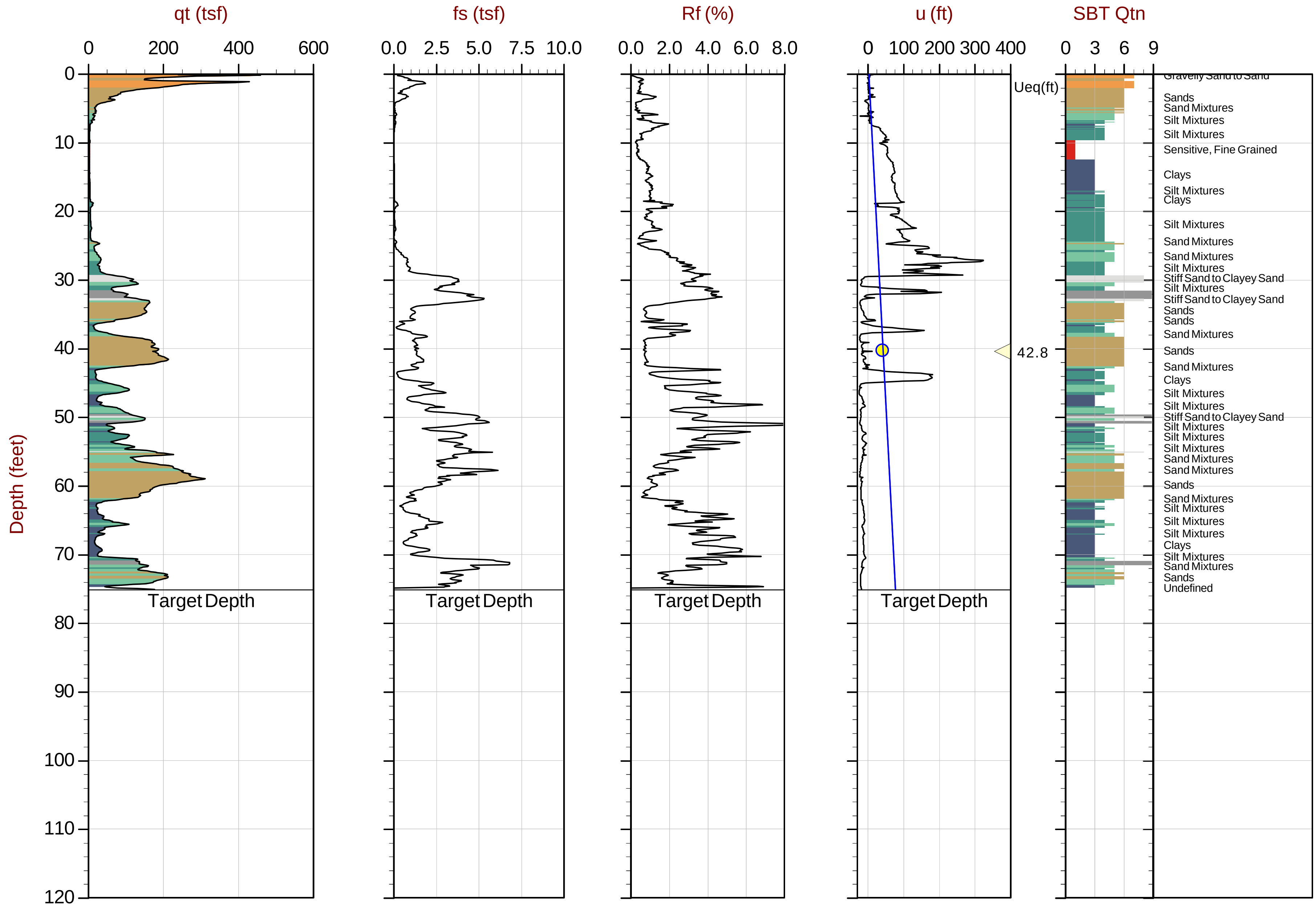
Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ENGEO

Job No: 20-56-20832
Date: 2020-05-15 12:03
Site: Baylands

Sounding: 1-CPT-08
Cone: 496:T1500F15U1K



Max Depth: 22.900 m / 75.13 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP08.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172856m E: 552436m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

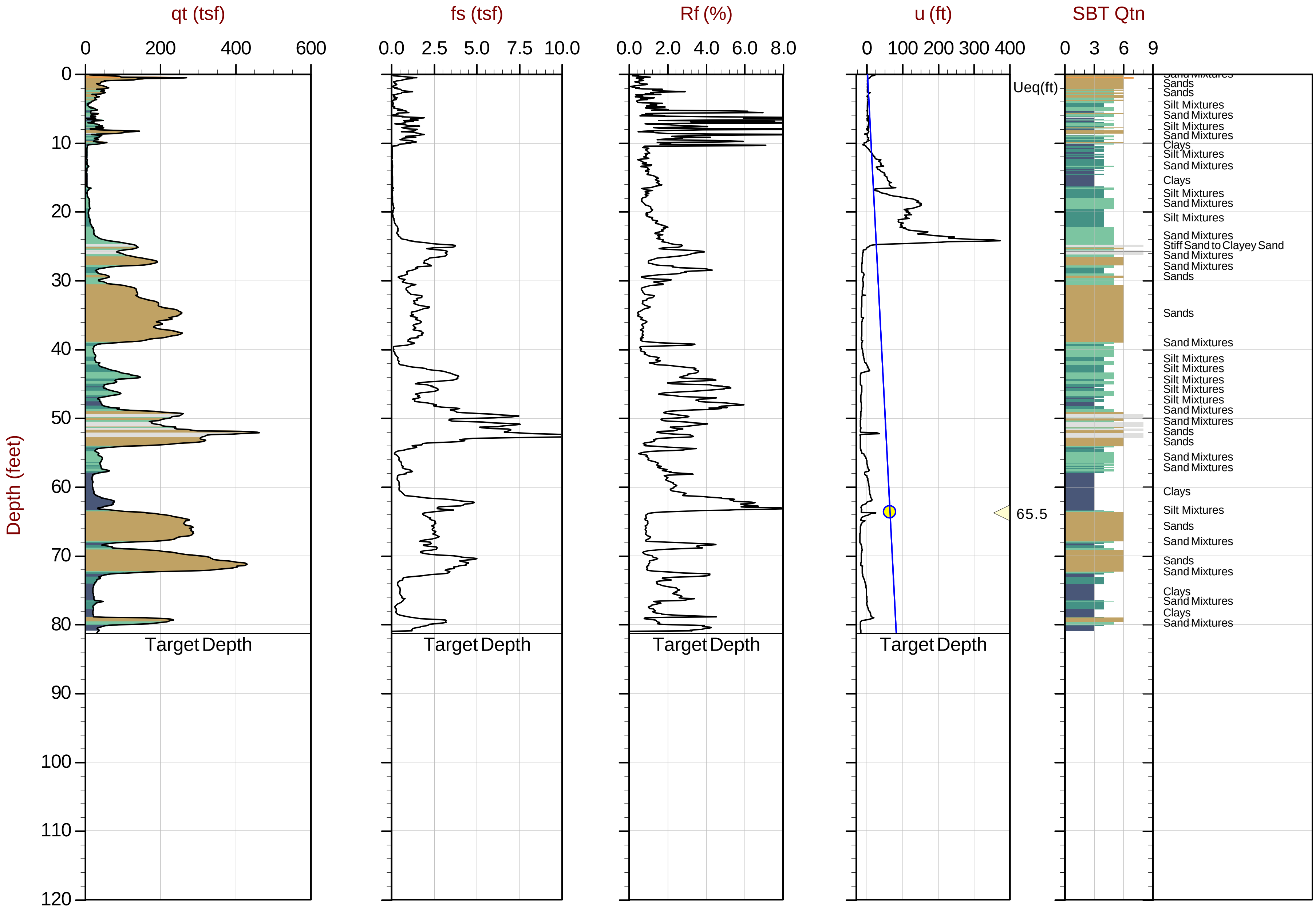
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-15 07:43
Site: Baylands

Sounding: 1-CPT-09
Cone: 496:T1500F15U1K



Max Depth: 24.775 m / 81.28 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP09.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172921m E: 552292m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

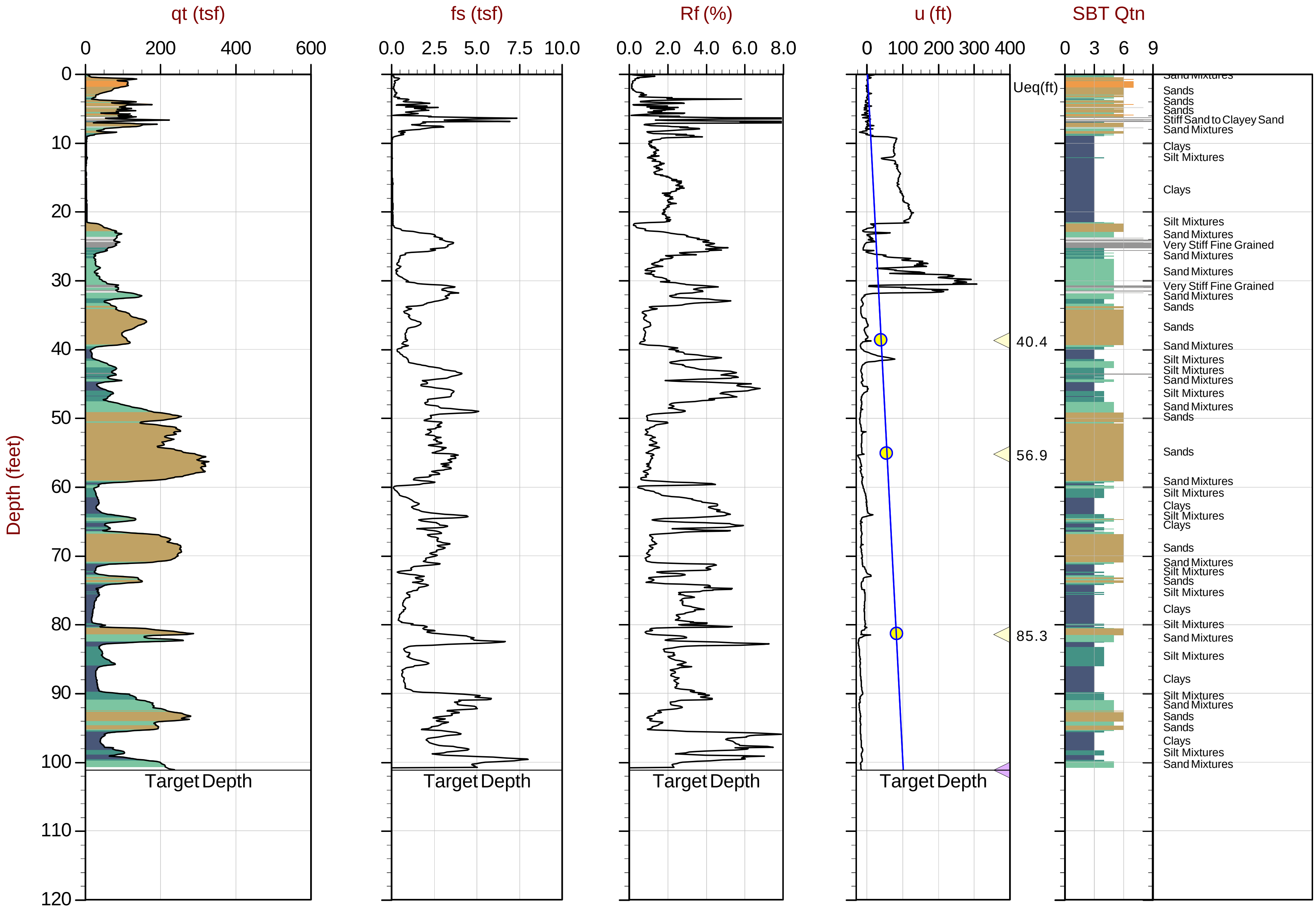
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-14 09:17
Site: Baylands

Sounding: 1-CPT-10
Cone: 447:T1500F15U500



Max Depth: 30.825 m / 101.13 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP10.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4172945m E: 552563m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

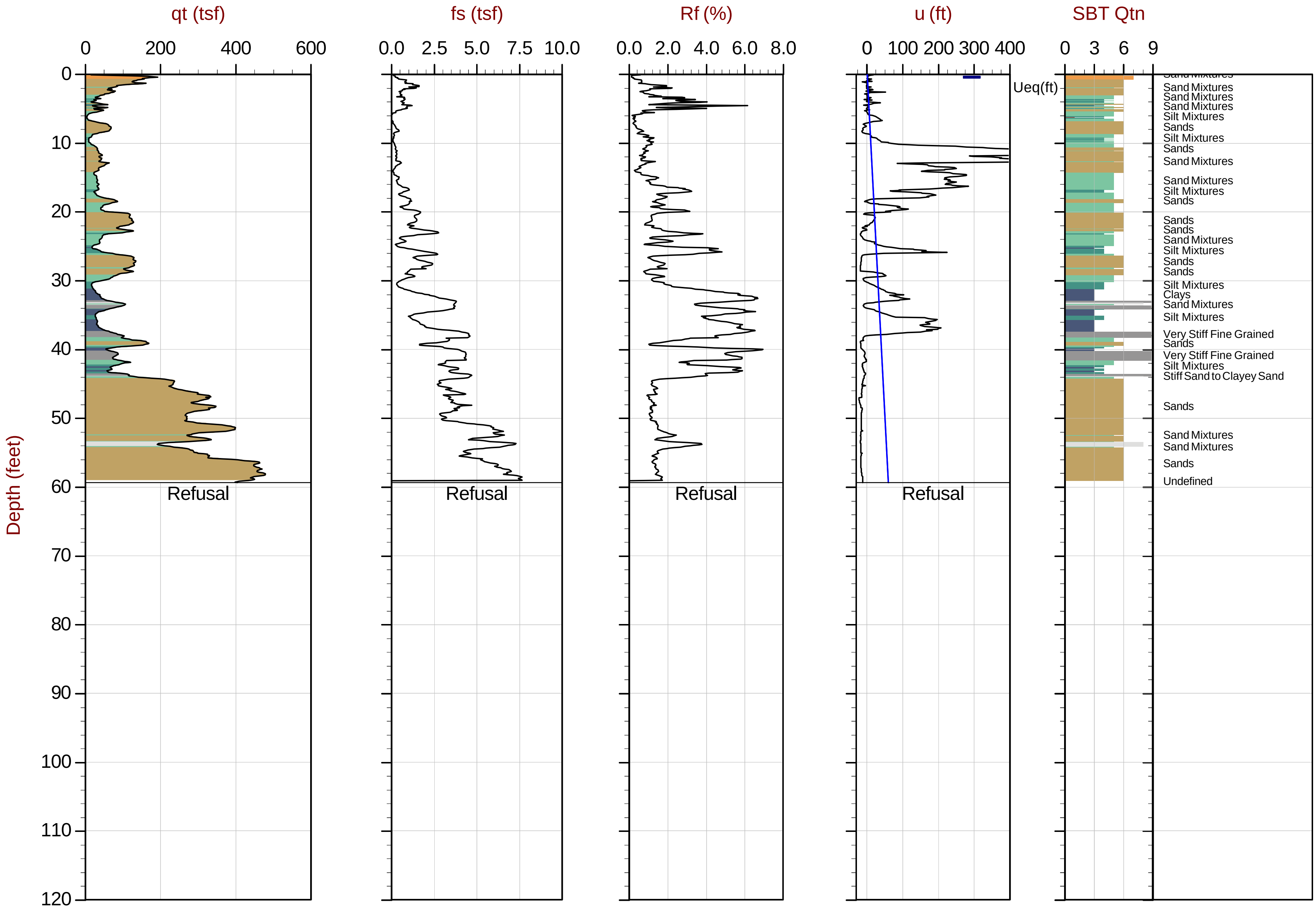
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-13 11:23
Site: Baylands

Sounding: 1-CPT-11
Cone: 447:T1500F15U500



Max Depth: 18.100 m / 59.38 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP11.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4173133m E: 552291m

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

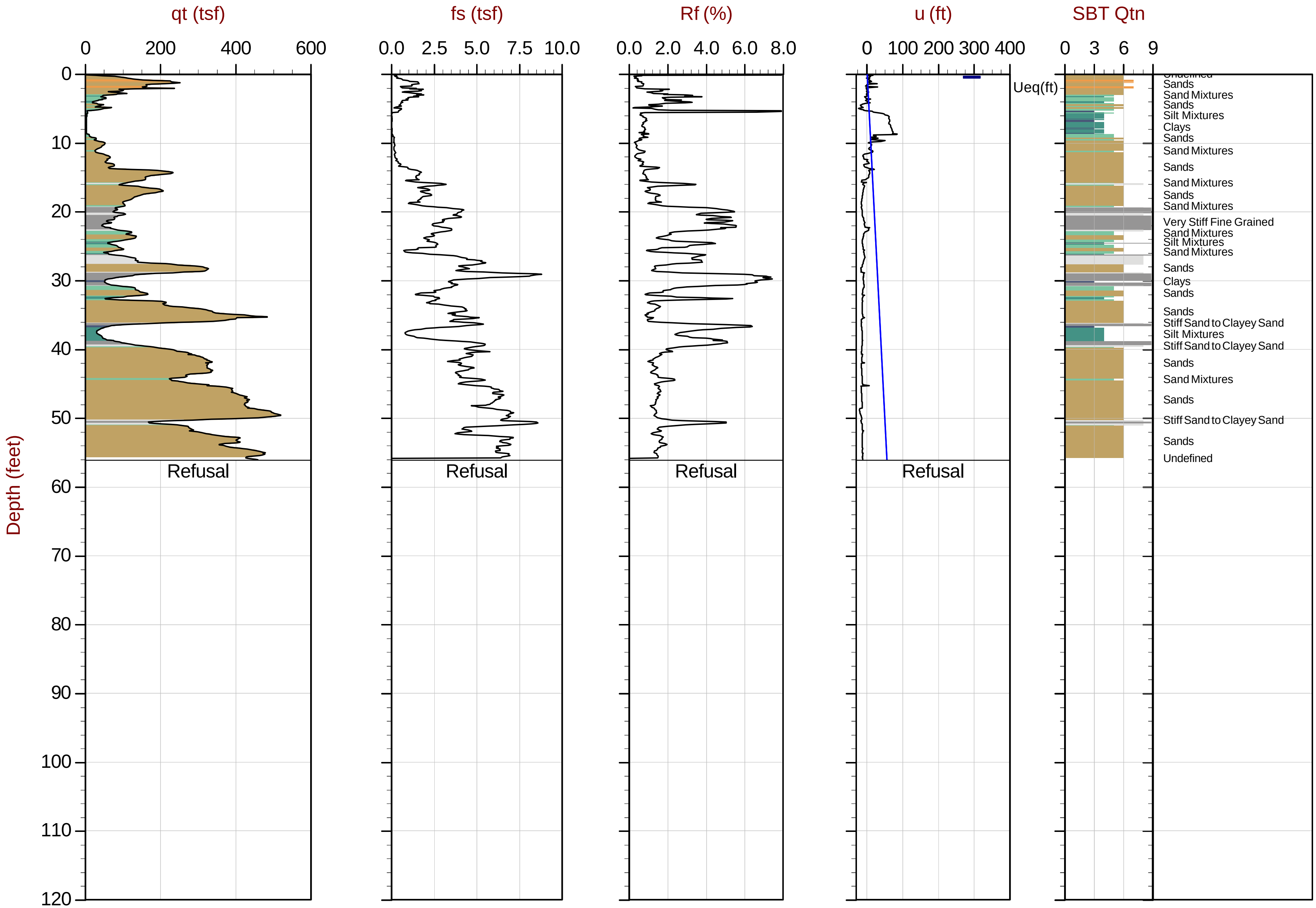
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-13 12:25
Site: Baylands

Sounding: 1-CPT-12
Cone: 447:T1500F15U500



Max Depth: 17.100 m / 56.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP12.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4173220m E: 552388m

Equilibrium Pore Pressure (Ueq) — Assumed Ueq — Dissipation, Ueq achieved — Dissipation, Ueq not achieved — Hydrostatic Line

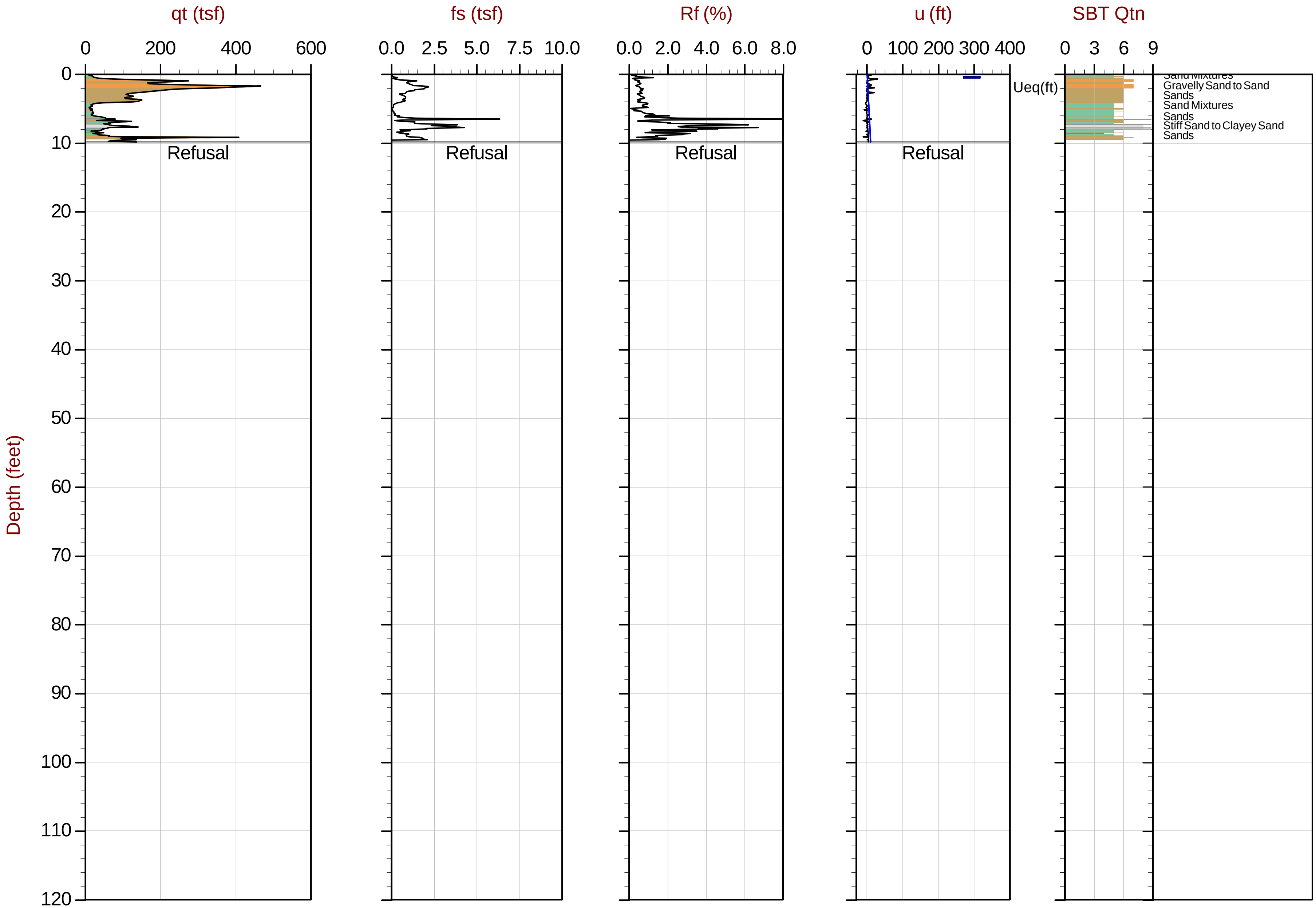
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-13 13:28
Site: Baylands

Sounding: 1-SCPT-13
Cone: 447:T1500F15U500



Max Depth: 3.000 m / 9.84 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1SP13.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4173315m E: 552580m

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

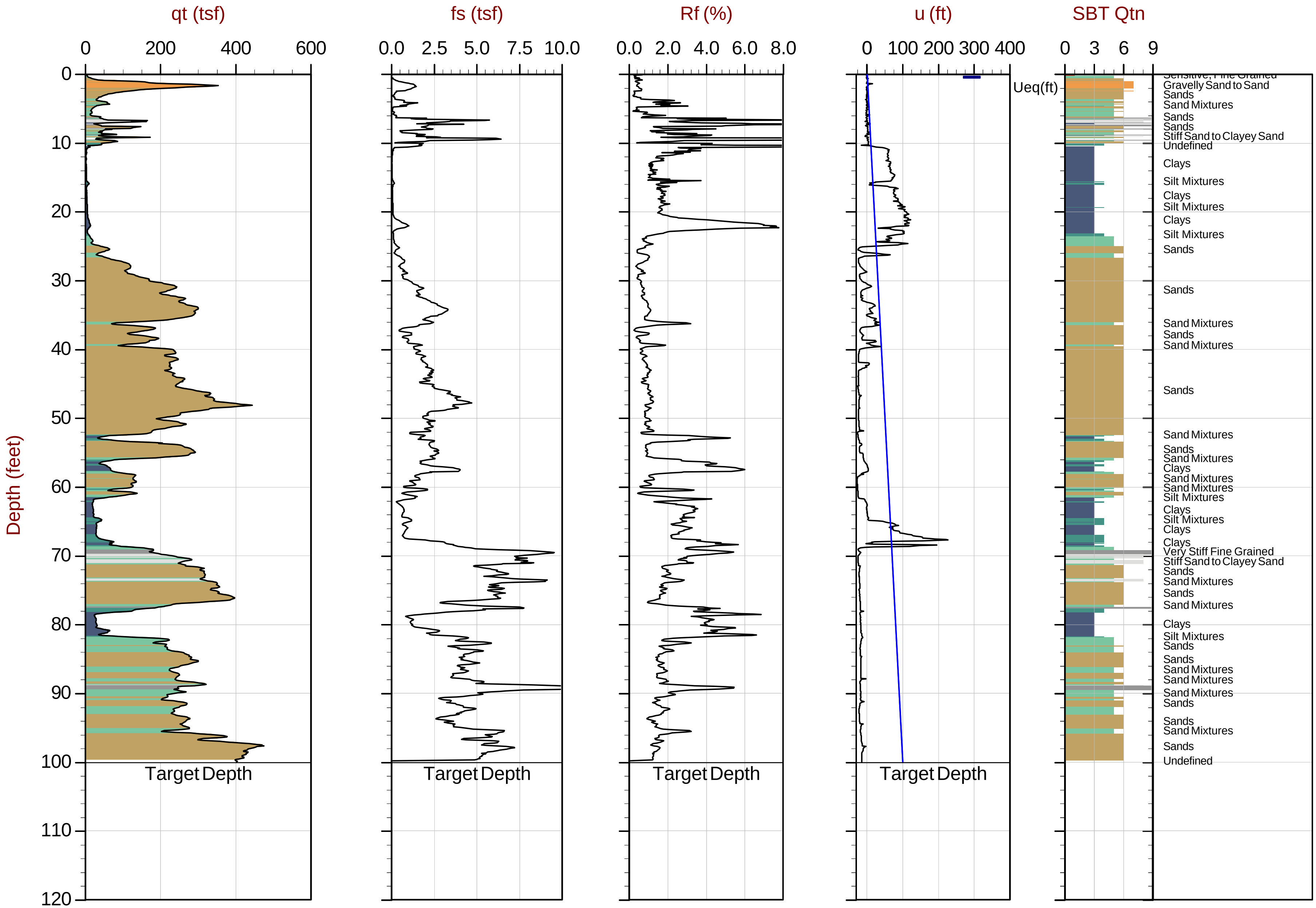
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-13 14:11
Site: Baylands

Sounding: 1-SCPT-13B
Cone: 447:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1SP13B.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4173315m E: 552580m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

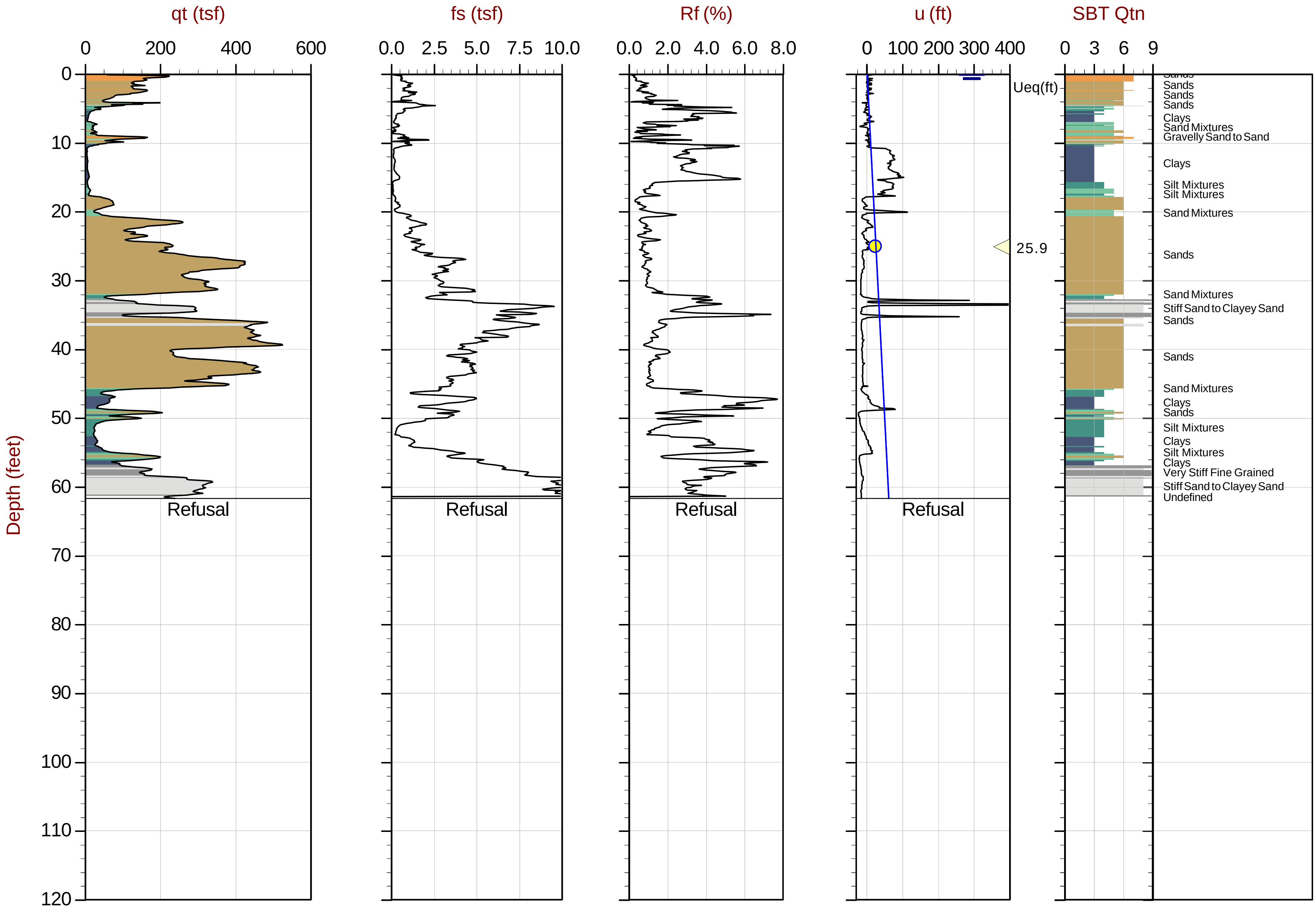
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

ENGEO

Job No: 20-56-20832
Date: 2020-05-13 09:59
Site: Baylands

Sounding: 1-CPT-14
Cone: 447:T1500F15U500



Max Depth: 18.800 m / 61.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP14.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4173432m E: 552462m

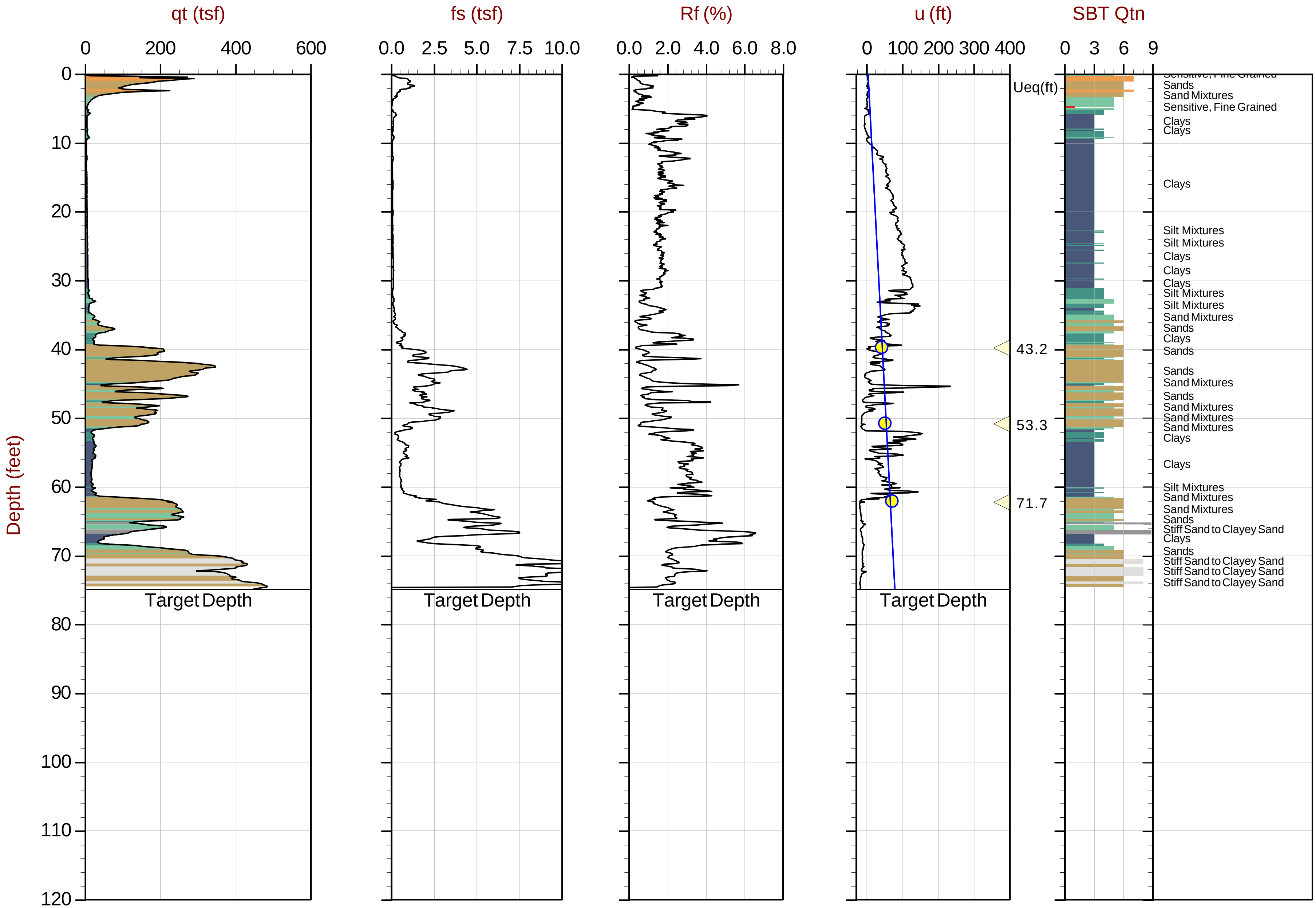
Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ENGEO

Job No: 20-56-20832
Date: 2020-05-13 08:26
Site: Baylands

Sounding: 1-CPT-15
Cone: 447:T1500F15U500



Max Depth: 22.825 m / 74.88 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 20-56-20832_1CP15.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM 10N N: 4173490m E: 552599m

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

APPENDIX C

LABORATORY TEST DATA

Moisture Density Determination
Particle Size Distribution Report
Liquid and Plastic Limits Test Report
Constant Rate of Strain Consolidation
Isotropic Unconsolidated undrained Triaxial Test
Analytical Results of Soil Corrosion

MOISTURE-DENSITY DETERMINATION
ASTM D7263

BORING ID:	1-B04	1-B06						
DEPTH (ft.):	22	22						
MOISTURE CONTENT (%):	16.0	17.6						
DRY DENSITY (lbs/ft^3):	110.1	107.1						

Testing remarks: For moisture content only, ASTM D2216

PROJECT NAME: Baylands Railyard
PROJECT NUMBER: 17270.000.000
CLIENT: Baylands Development Inc.
PHASE NUMBER: 002

DATE: 06/17/20

ENGEO Expect Excellence

Tested by: M. Quasem   Reviewed by: W. Miller

MOISTURE-DENSITY DETERMINATION
ASTM D7263

BORING ID:	1-B01	1-B01	1-B01	1-B01	1-B02	1-B02	1-B02	1-B02
DEPTH (ft.):	2-3.5	12-12.5	26-26.5	35.5-36	1-2.5	12-12.5	17-17.5	21-21.5
MOISTURE CONTENT (%):	18.5	77.8	19.2	21.2	12.5	79.5	90.6	82.6
DRY DENSITY (lbs/ft^3):		56.4	113.3	111.7		54.6	49.7	58.4

BORING ID:	1-B02	1-B02	1-B03	1-B03	1-B03	1-B03	1-B03	1-B03
DEPTH (ft.):	36-36.5	56-56.5	7-8.5	21-21.5	31-31.5	35-36.5	45.5-46	52.5-53.5
MOISTURE CONTENT (%):	18.0	27.5	15.8	80.2	62.3	28.5	18.4	21.8
DRY DENSITY (lbs/ft^3):	116.4	98.9		52.7	62.5			

BORING ID:	1-B04	1-B04	1-B04	1-B04	1-B04	1-B04	1-B04	1-B-5
DEPTH (ft.):	1-2.5	25-26.5	30-31.5	45-46.5	60-61.5	65-66.5	80-81.5	6-7.5
MOISTURE CONTENT (%):	6.3	18.6	23.1	18.2	23.7	21.1	68.8	21.4
DRY DENSITY (lbs/ft^3):								

BORING ID:	1-B05	1-B06	1-B06					
DEPTH (ft.):	12.5-13	22-22.5	26-27.5					
MOISTURE CONTENT (%):	56.9	20.9	22.3					
DRY DENSITY (lbs/ft^3):	72.5	108.8						

Testing remarks: For moisture content only, ASTM D2216

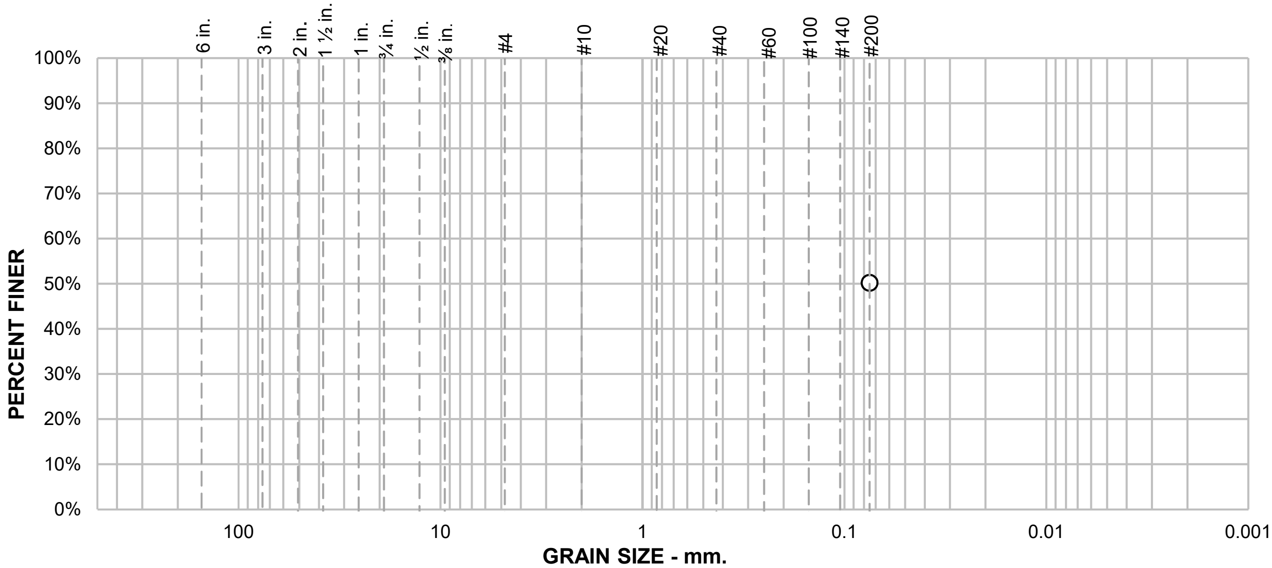
PROJECT NAME: Baylands Railyard
PROJECT NUMBER: 17270.000.000
CLIENT: Baylands Development Inc.
PHASE NUMBER: 002

DATE: 06/09/20

ENGEO
Expect Excellence

Tested by: M. Quasem   Reviewed by: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140



SAMPLE ID: 1-B01@2-3.5

DEPTH (ft): 2-3.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						50.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	50.2		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

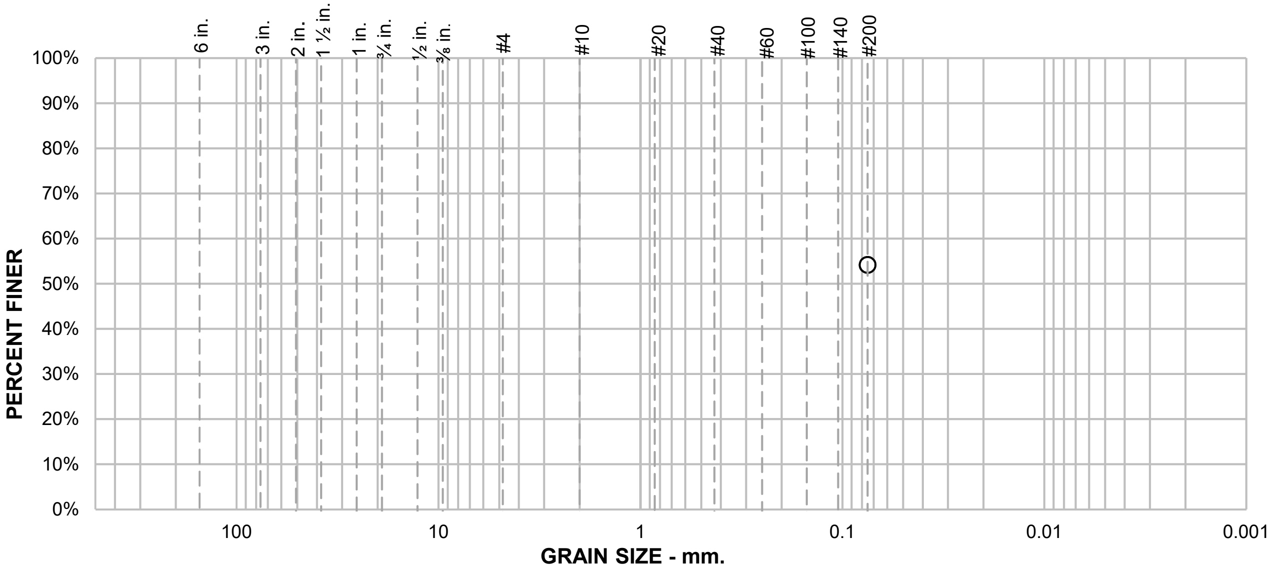
REMARKS

ASTM D1140, Method B
Soak time = 180 min
Dry sample weight = 242.37 g

ENGEO Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140



SAMPLE ID: 1-B01@35.5-36

DEPTH (ft): 35.5-36

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						54.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	54.2		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

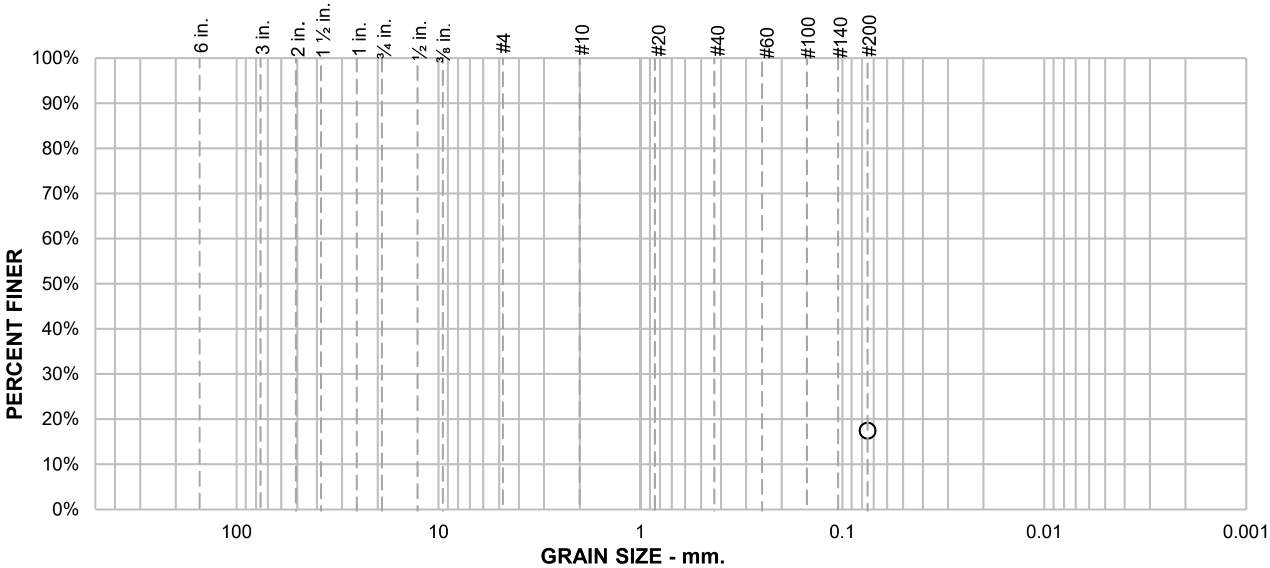
REMARKS

ASTM D1140, Method B
Soak time = 180 min
Dry sample weight = 165.64 g

ENGEO Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140



SAMPLE ID: 1-B02@1-2.5

DEPTH (ft): 1-2.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						17.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	17.5		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} =	D_{85} =	D_{60} =
D_{50} =	D_{30} =	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION

USCS =

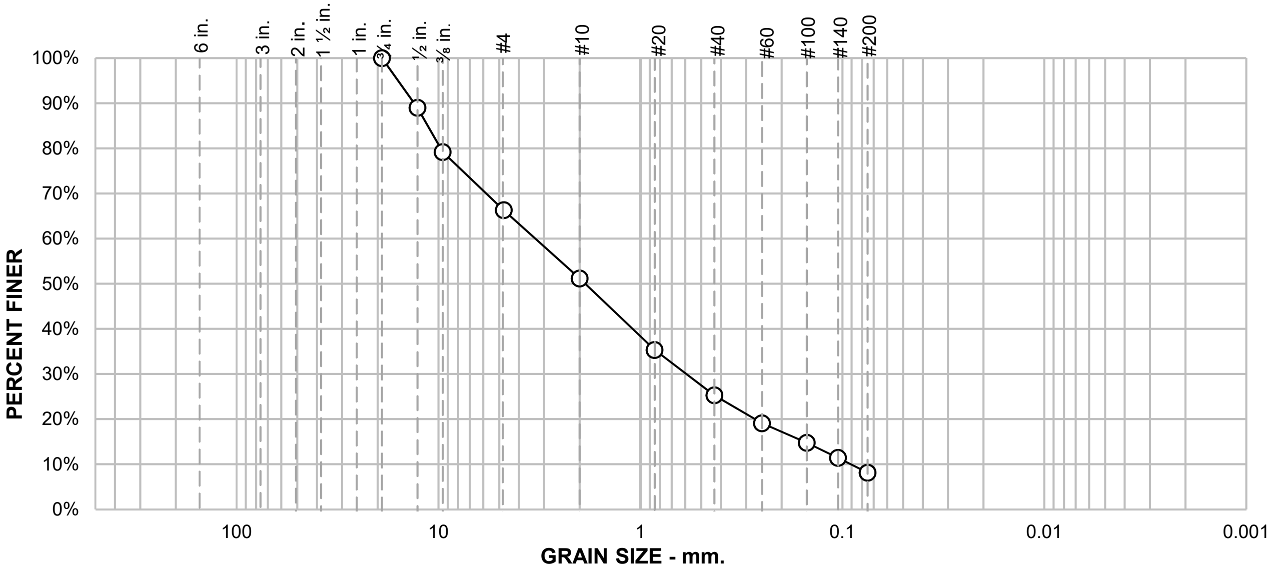
REMARKS

ASTM D1140, Method B
Soak time = 180 min
Dry sample weight = 489.16 g

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D6913



SAMPLE ID: 1-B03@7-8.5

DEPTH (ft): 7-8.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
		33.7	15.1	25.9	17.2	8.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
¾ in.	100.0		
½ in.	89.0		
⅜ in.	79.2		
#4	66.3		
#10	51.2		
#20	35.3		
#40	25.3		
#60	19.1		
#100	14.7		
#140	11.4		
#200	8.1		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 13.1769 mm	D_{85} = 11.2930 mm	D_{60} = 3.3110 mm
D_{50} = 1.8749 mm	D_{30} = 0.5923 mm	D_{15} = 0.1553 mm
D_{10} = 0.0910 mm	C_u = 36.37	C_c = 1.16

CLASSIFICATION

USCS =

REMARKS

ASTM D6913, Method B

ENGEO Expect Excellence

CLIENT: Baylands Development Inc.

PROJECT NAME: Baylands Railyard

PROJECT NO: 17270.000.000

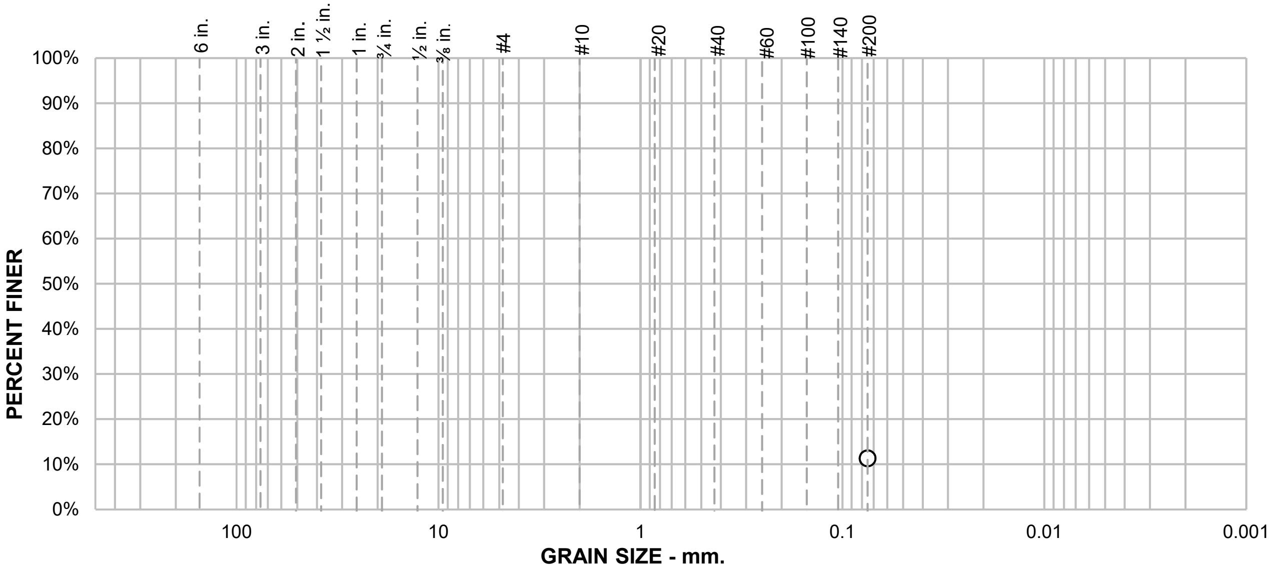
PROJECT LOCATION: Brisbane, CA

REPORT DATE: 6/10/2020

TESTED BY: M. Quasem

REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140



SAMPLE ID: 1-B04@1-2.5

DEPTH (ft): 1-2.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						11.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	11.3		

* (no specification provided)

SOIL DESCRIPTION
See exploration logs

ATTERBERG LIMITS
PL = LL = PI =

COEFFICIENTS

D_{90} =	D_{85} =	D_{60} =
D_{50} =	D_{30} =	D_{15} =
D_{10} =	C_u =	C_c =

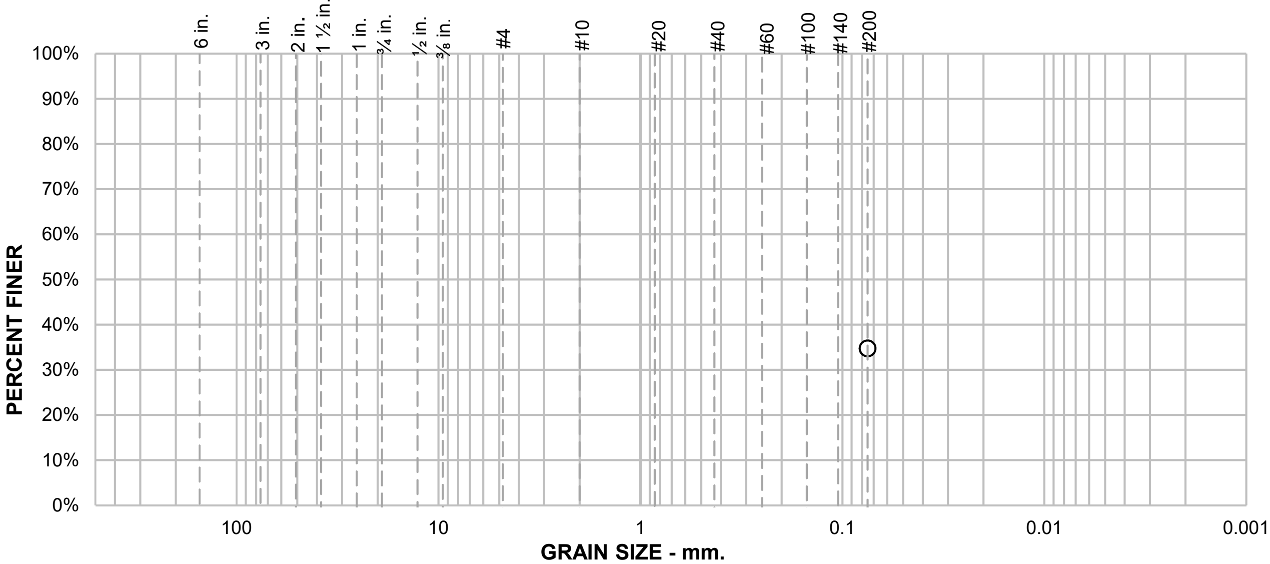
CLASSIFICATION
USCS =

REMARKS
ASTM D1140, Method B
Soak time = 180 min
Dry sample weight = 422.04 g

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140



SAMPLE ID: 1-B04@22

DEPTH (ft): 22 feet

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						34.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	34.8		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = 12 LL = 25 PI = 13

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

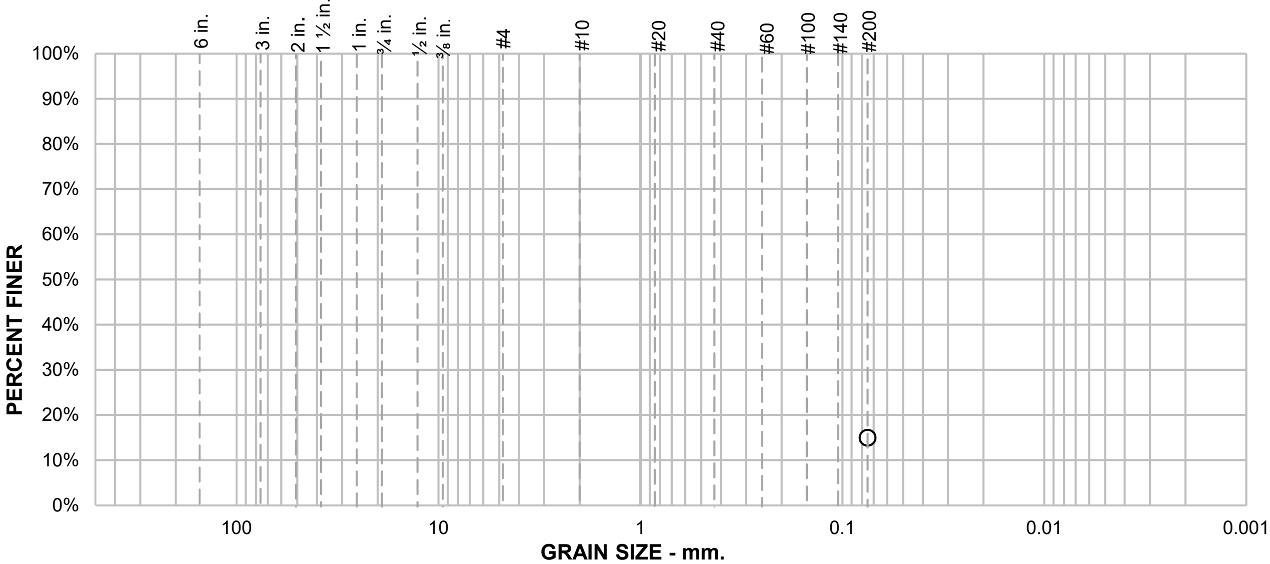
PI: ASTM D4318, Wet Method

ASTM D1140, Method B
Soak time = 180 min
Dry sample weight = 184.27 g

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140



SAMPLE ID: 1-B04@30-31.5

DEPTH (ft): 30-31.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						14.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	14.9		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} =	D_{85} =	D_{60} =
D_{50} =	D_{30} =	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION

USCS =

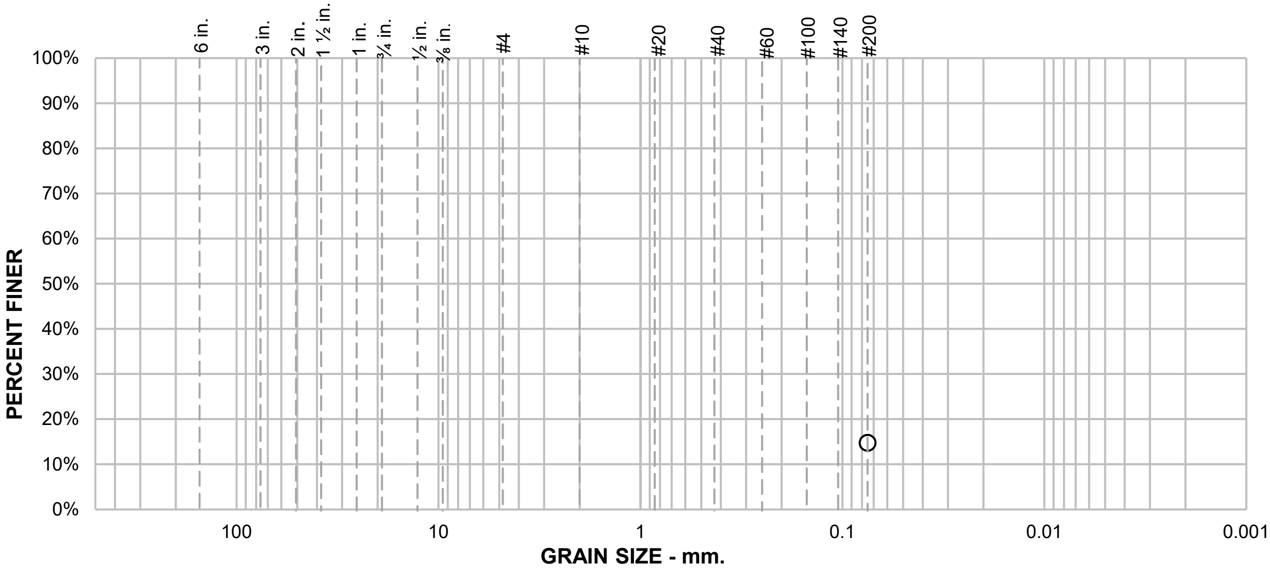
REMARKS

ASTM D1140, Method B
Soak time = 180 min
Dry sample weight = 193.77 g

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140



SAMPLE ID: 1-B06@22

DEPTH (ft): 22 feet

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						14.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	14.8		

* (no specification provided)

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = 14 LL = 24 PI = 10

COEFFICIENTS

D_{90} =	D_{85} =	D_{60} =
D_{50} =	D_{30} =	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION

USCS =

REMARKS

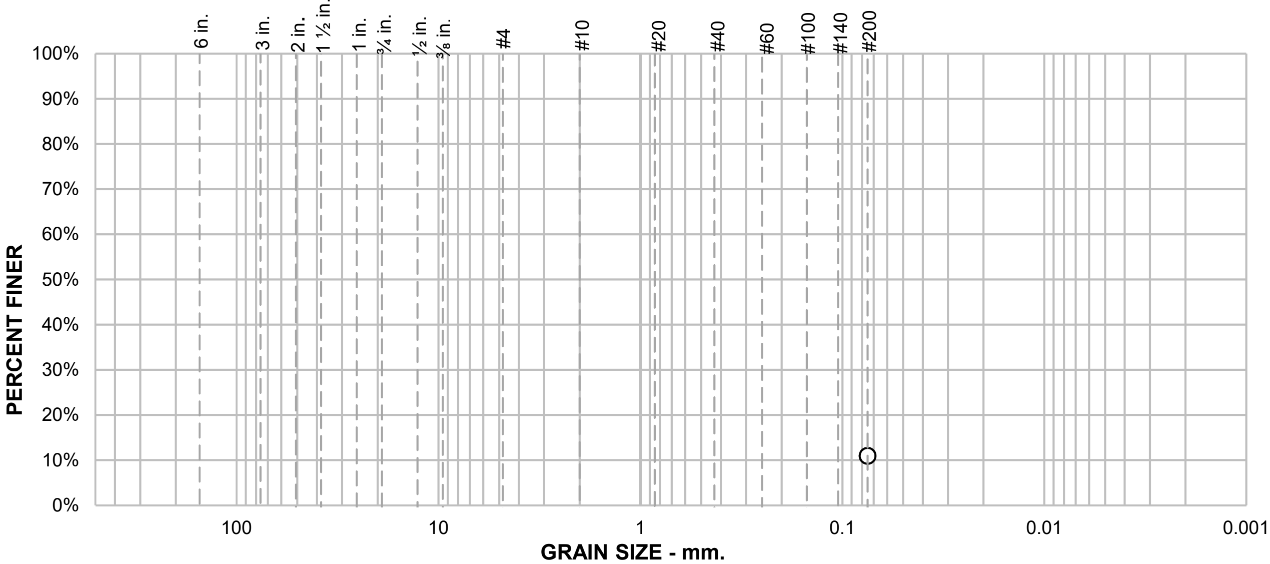
PI: ASTM D4318, Wet Method

ASTM D1140, Method B
Soak time = 180 min
Dry sample weight = 484.33 g

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT
ASTM D1140



SAMPLE ID: 1-B06@26-27.5

DEPTH (ft): 26-27.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						10.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	10.9		

* (no specification provided)

SOIL DESCRIPTION
See exploration logs

ATTERBERG LIMITS

PL =	LL =	PI =

COEFFICIENTS

D_{90} =	D_{85} =	D_{60} =
D_{50} =	D_{30} =	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION
USCS =

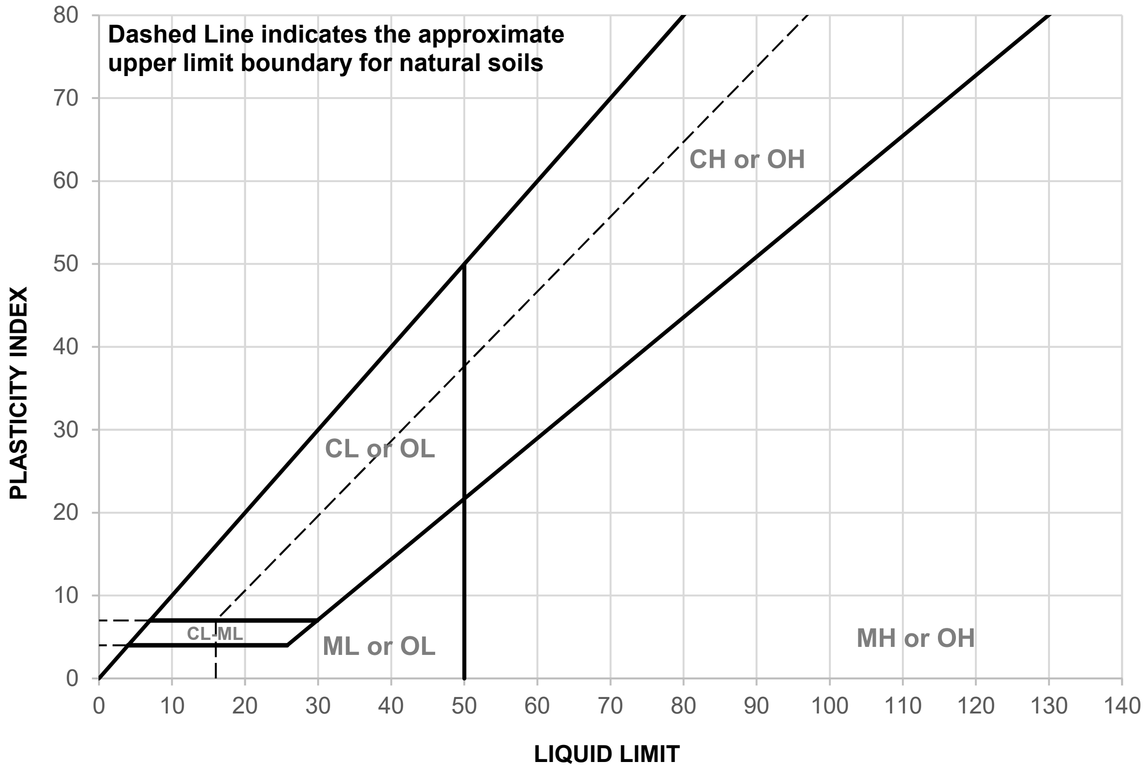
REMARKS
ASTM D1140, Method B
Soak time = 180 min
Dry sample weight = 443.8 g

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

3420 Fostoria Way, Suite E | Danville, CA 94526 | T: (925) 355-9047 | F: (925) 355-9052 | www.engeo.com

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B05	6-7.5 ft.	See Exploration Logs	NV	NP	NP

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B05	PI: ASTM D4318, Wet Method	

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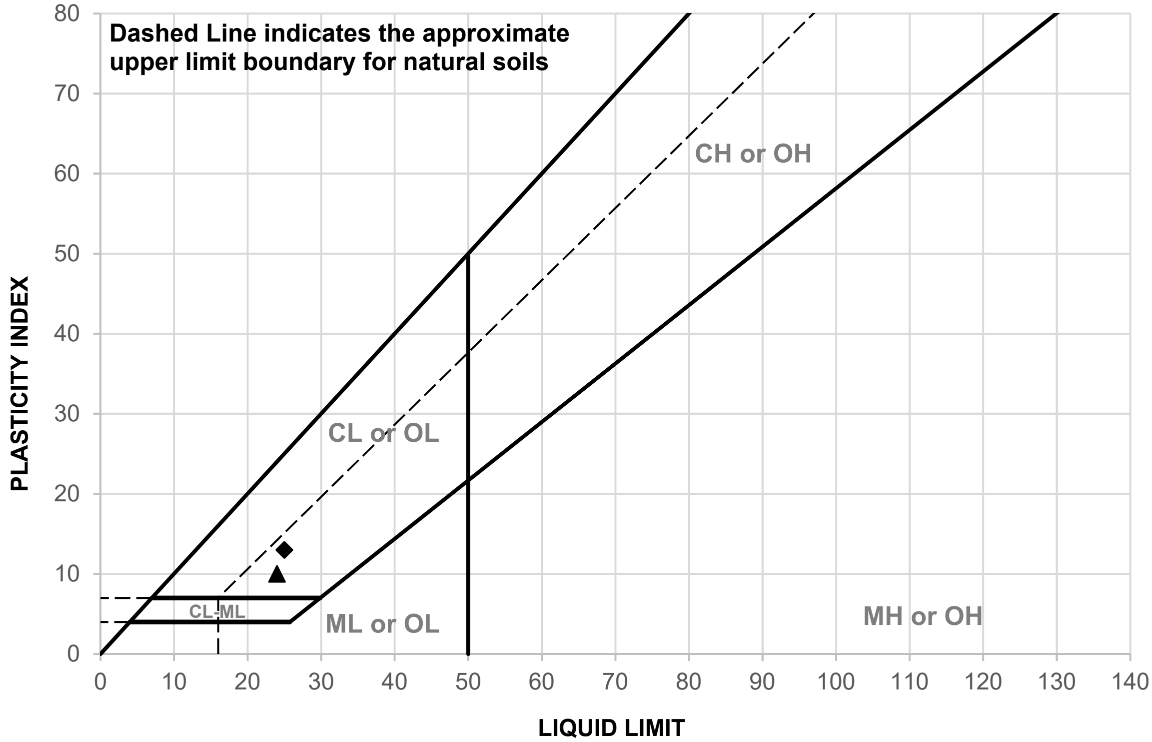
CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/10/2020
TESTED BY: W. Miller
REVIEWED BY: M. Quasem

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



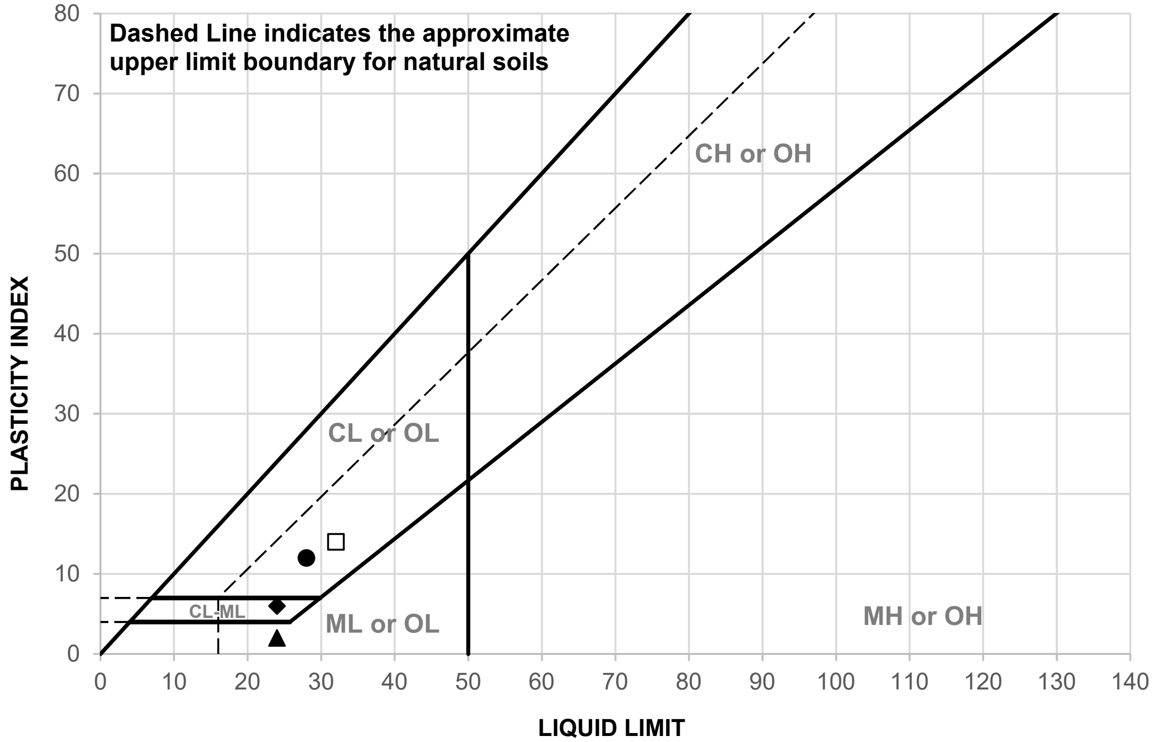
SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
1-B06 @ 20-22.5	20-22.5 ft	See exploration logs	24	14	10
1-B04 @ 20-22.4	20-22.5 ft	See exploration logs	25	12	13

SAMPLE ID	TEST METHOD	REMARKS
1-B06 @ 20-22.5	PI: ASTM D4318, Wet Method	
1-B04 @ 20-22.4	PI: ASTM D4318, Wet Method	

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/18/2020
TESTED BY: W. Miller
REVIEWED BY: D. Seibold

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B01@2-3.5	2-3.5 feet	See exploration logs	24	22	2
◆	1-B01@35.5-36	35.5-36 feet	See exploration logs	24	18	6
□	1-B03@7-8.5	7-8.5 feet	See exploration logs	32	18	14
●	1-B03@35-36.5	35-36.5 feet	See exploration logs	28	16	12
■	1-B03@45.5-46.5	45.5-46.5	See exploration logs	NV	NP	NP

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B01@2-3.5	PI: ASTM D4318, Wet Method	
◆	1-B01@35.5-36	PI: ASTM D4318, Wet Method	
□	1-B03@7-8.5	PI: ASTM D4318, Wet Method	
●	1-B03@35-36.5	PI: ASTM D4318, Wet Method	
■	1-B03@45.5-46.5	PI: ASTM D4318, Wet Method	

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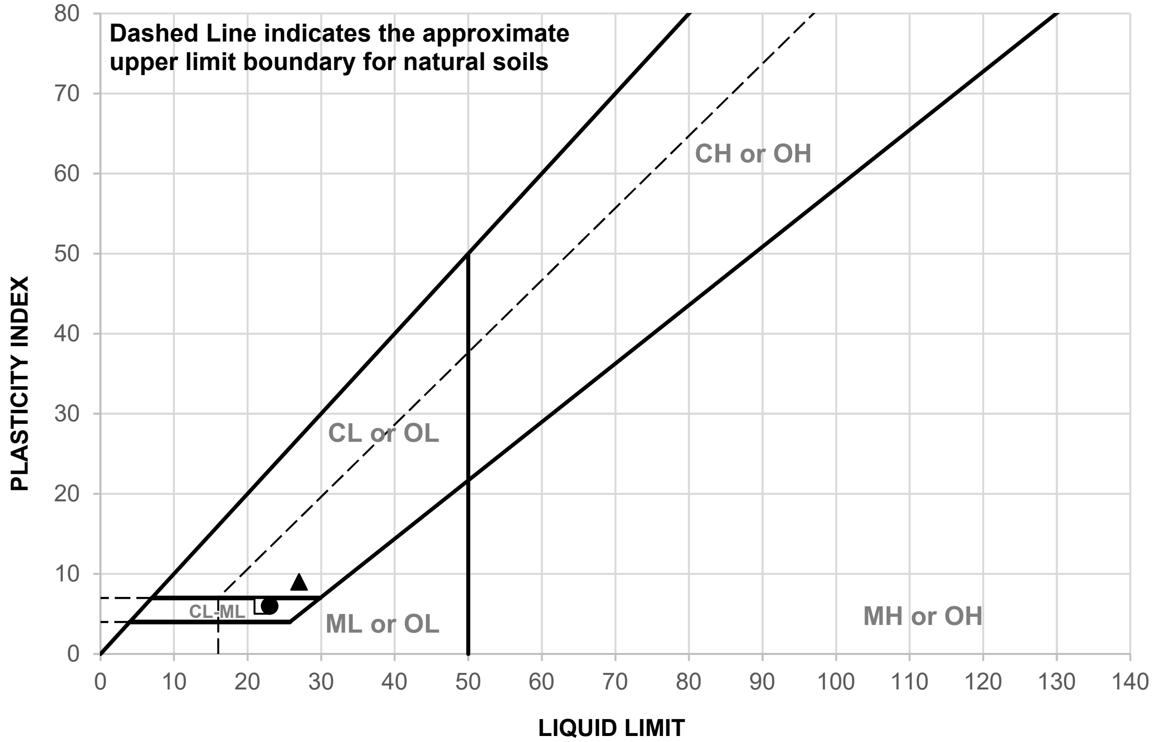
CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/9/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B03@52.5-53.5	52.5-53.5	See exploration logs	27	18	9
◆	1-B04@1-2.5	1-2.5 feet	See exploration logs	NV	NP	NP
□	1-B04@25-26.5	25-26.5 feet	See exploration logs	22	16	6
●	1-B04@45-46.5	45-46.5 feet	See exploration logs	23	17	6
■	1-B05@6-7.5	6-7.5 feet	See exploration logs	NV	NP	NP

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B03@52.5-53.5	PI: ASTM D4318, Wet Method	
◆	1-B04@1-2.5	PI: ASTM D4318, Wet Method	
□	1-B04@25-26.5	PI: ASTM D4318, Wet Method	
●	1-B04@45-46.5	PI: ASTM D4318, Wet Method	
■	1-B05@6-7.5	PI: ASTM D4318, Wet Method	

ENGEO
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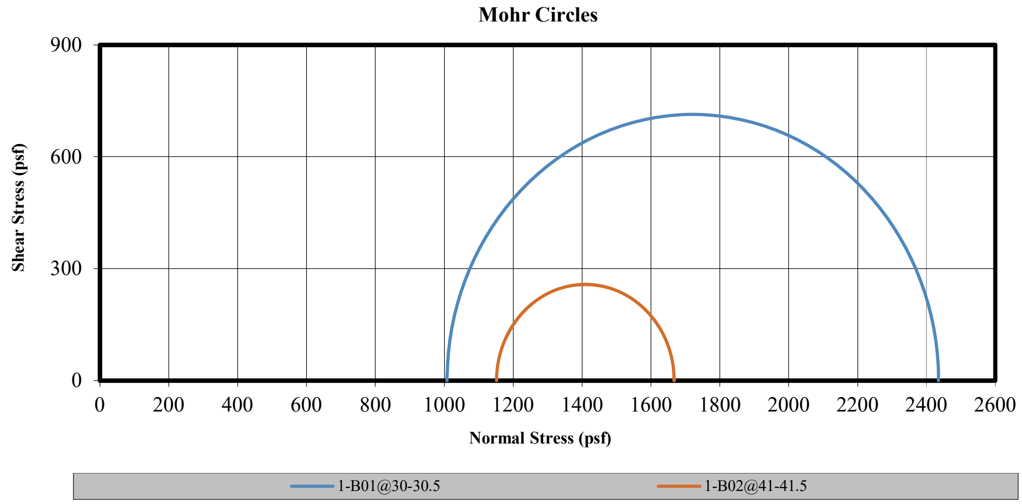
CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Railyard
PROJECT NO: 17270.000.000
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/9/2020
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

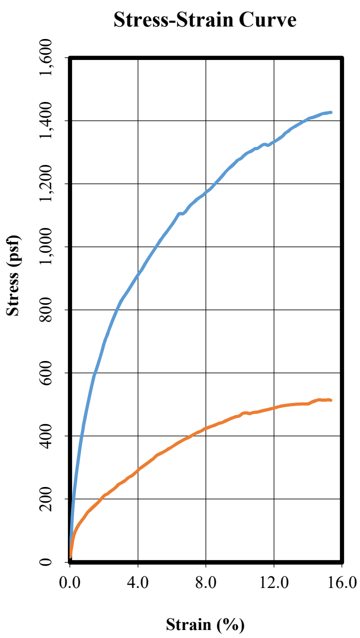
Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

Tested By: G. Criste   Date: 6/12/2020

Checked By: D. Seibold   Date: 06/12/20





Before Test	Specimen			
	1-B01@30-30.5	1-B02@41-41.5		
Water Content (%)	17.64	20.06		
Dry Density (pcf)	110.30	108.10		
Saturation (%)	88.89	95.62		
Void Ratio	0.54	0.57		
Diameter (in)	2.383	2.425		
Height (in)	4.977	4.921		
Height-to-Diameter Ratio	2.089	2.029		
ASTM D4318 - Wet Method				
Liquid Limit				
Plastic Limit				
ASTM D854 - Assumed				
Specific Gravity	2.720	2.720		
After Test	1-B01@30-30.5	1-B02@41-41.5		
Water Content (%)	17.64	20.06		
Saturation (%)	88.89	95.62		
Strain Rate (in/min)	0.05	0.05		
Peak Deviator Stress (psf)	1427.1	515.5		
Axial Strain @ Failure (%)	15.341	14.631		
	Cell Pressure			
Cell (psf)	1008.0	1152.0		
Back (psf)	n/a	n/a		
	Principle Stresses at Failure			
σ1 (psf)	2435.1	1667.5		
σ3 (psf)	1008.0	1152.0		
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)			Cohesion at Failure with a Zero Friction Angle (Ø=0)			
Cohesion, c (psf)	n/a		713.5	257.7		
Friction Angle Ø	n/a		n/a	n/a		

Project Information	
Project Name:	Baylands Railyard
Project Number:	17270.000.000 PH002
Project Location:	Brisbane, California
Client:	Baylands Development Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO
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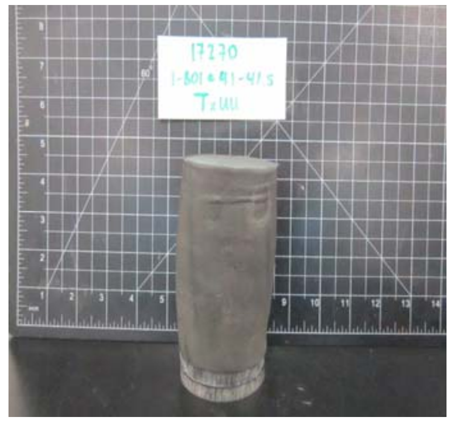
Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

Tested By: G. Criste   Date: 6/12/2020   Checked By: D. Seibold   Date: 06/12/20

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B01@30-30.5	SAMPLE NUMBER: 1-B02@41-41.5
	

Project Information		
Project Name:	Baylands Railyard	
Project Number:	17270.000.000 PH002	ENGEO Expect Excellence
Project Location:	Brisbane, California	
Client:	Baylands Development Inc.	
Description:	See exploration logs	
Test Remarks:		

Isotropic Unconsolidated Undrained Triaxial Test

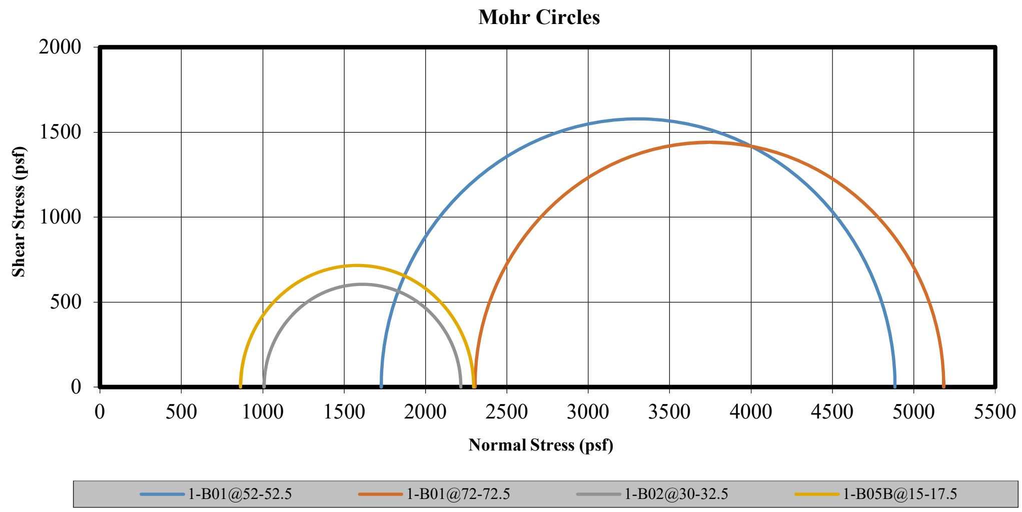
ASTM D2850

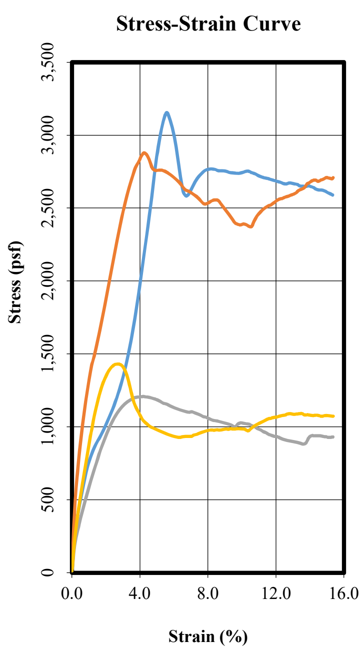
Date: 06/11/20

Checked By: D. Seibold

Date: 6/10/2020

Tested By: G. Criste





Before Test	Specimen 1-B01@52-52.5	1-B01@72-72.5	1-B02@30-32.5	1-B05B@15-17.5
Water Content (%)	22.53	35.86	75.27	73.92
Dry Density (pcf)	103.30	85.70	55.10	56.90
Saturation (%)	95.16	99.32	98.47	99.88
Void Ratio	0.64	0.98	2.08	2.08
Diameter (in)	2.839	2.855	2.854	2.823
Height (in)	6.267	6.148	5.958	5.990
Height-to-Diameter Ratio	2.207	2.153	2.088	2.122
ASTM D4318 - Wet Method				
Liquid Limit				
Plastic Limit				
ASTM D854 - Assumed				
Specific Gravity	2.720	2.720	2.720	2.805
After Test	1-B01@52-52.5	1-B01@72-72.5	1-B02@30-32.5	1-B05B@15-17.5
Water Content (%)	22.53	35.86	75.27	73.92
Saturation (%)	95.15	99.32	98.47	99.88
Strain Rate (in/min)	0.06	0.06	0.06	0.06
Peak Deviator Stress (psf)	3155.7	2879.5	1209.4	1431.7
Axial Strain @ Failure (%)	5.585	4.229	4.196	2.671
	Cell Pressure			
Cell (psf)	1728.0	2304.0	1008.0	864.0
Back (psf)	n/a	n/a	n/a	n/a
	Principle Stresses at Failure			
σ1 (psf)	4883.7	5183.5	2217.4	2295.7
σ3 (psf)	1728.0	2304.0	1008.0	864.0
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)	
Cohesion, c (psf)	n/a
Friction Angle Ø	n/a

	Cohesion at Failure with a Zero Friction Angle (Ø=0)			
	1577.9	1439.8	604.7	715.9
	n/a	n/a	n/a	n/a

Project Information	
Project Name:	Baylands Railyard
Project Number:	17270.000.000 PH002
Project Location:	Brisbane, California
Client:	Baylands Development Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO
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Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

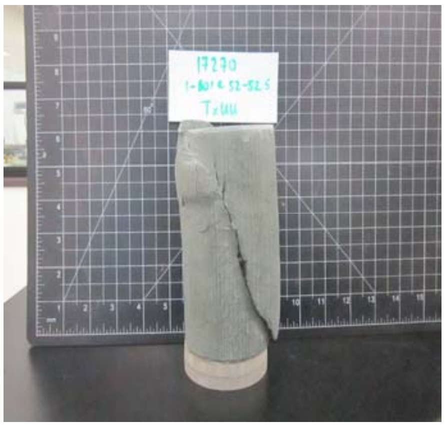
Date: 06/11/20

Checked By: D. Seibold

Date: 6/10/2020

Tested By: G. Criste

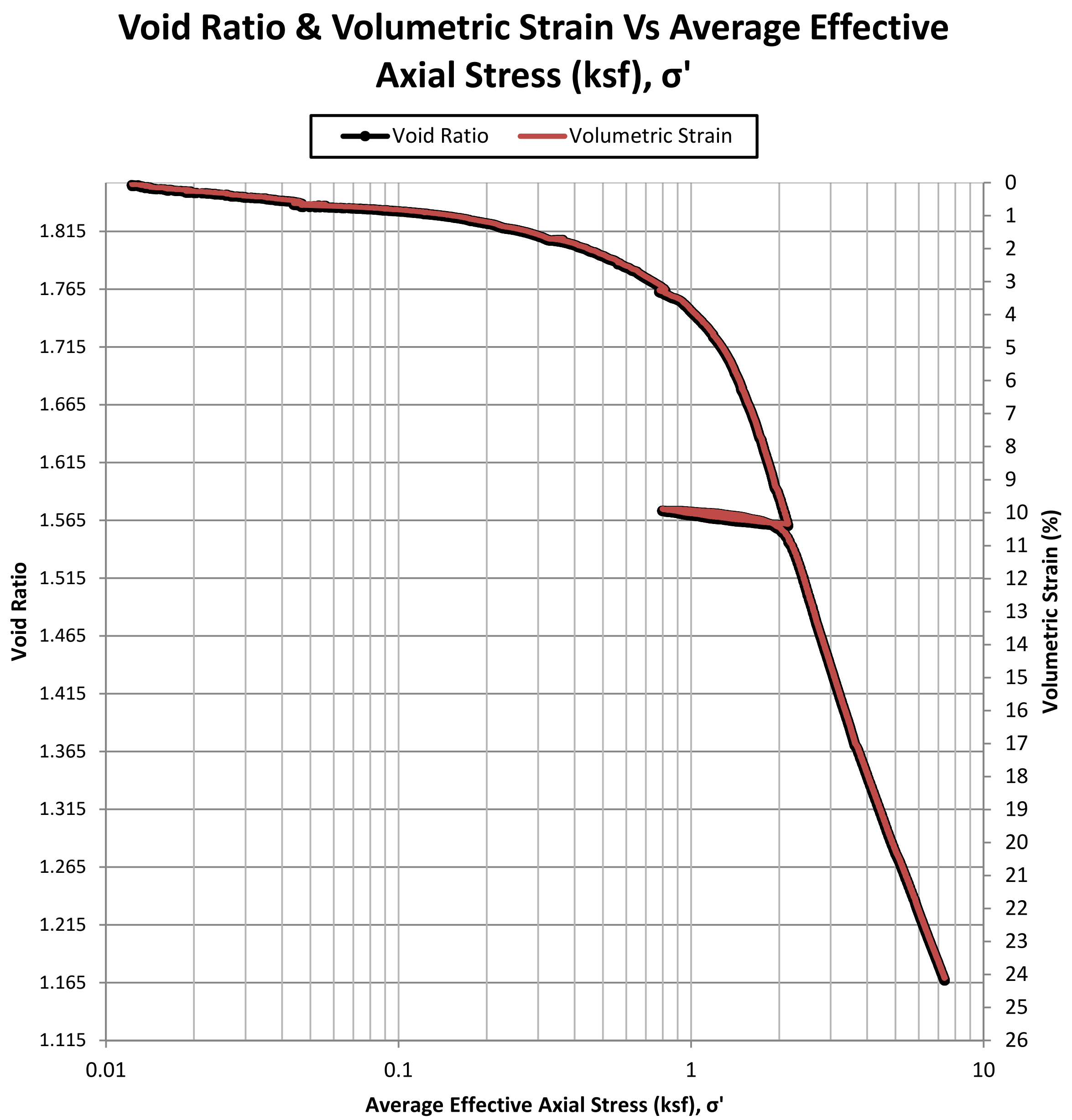
SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B01@52-52.5	SAMPLE NUMBER: 1-B01@72-72.5
	
SAMPLE NUMBER: 1-B02@30-32.5	**SAMPLE NUMBER: 1-B05B@15-17.5**
	

Project Information	
Project Name:	Baylands Railyard
Project Number:	17270.000.000 PH002
Project Location:	Brisbane, California
Client:	Baylands Development Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

Constant Rate of Strain Consolidation
ASTM D4186



ASTM D2216		
	As Received	Final
Moisture (%):	67.54%	54.86%
Dry Density (pcf):	60.25	79.40
Saturation (%):	100.50%	100.00%
Void Ratio:	1.8555	1.1670

Test Date: 6/19/2020

ASTM D4318 - Wet Method	
Liquid Limit:	
Plastic Limit:	
ASTM D854 - Measured	
Specific Gravity:	2.761
Soil Description:	See exploration logs

Strain Rate (in/min): 0.000051
Project Number: 17270.000.000
Sample Number: 1-B01 @ 10-12.5
Project Name: Baylands Railyard
Client: Baylands Development Inc.
Location: Brisbane, California
Tested By: D. Seibold

Depth: 11.75-12 ft
Boring #: 1-B01

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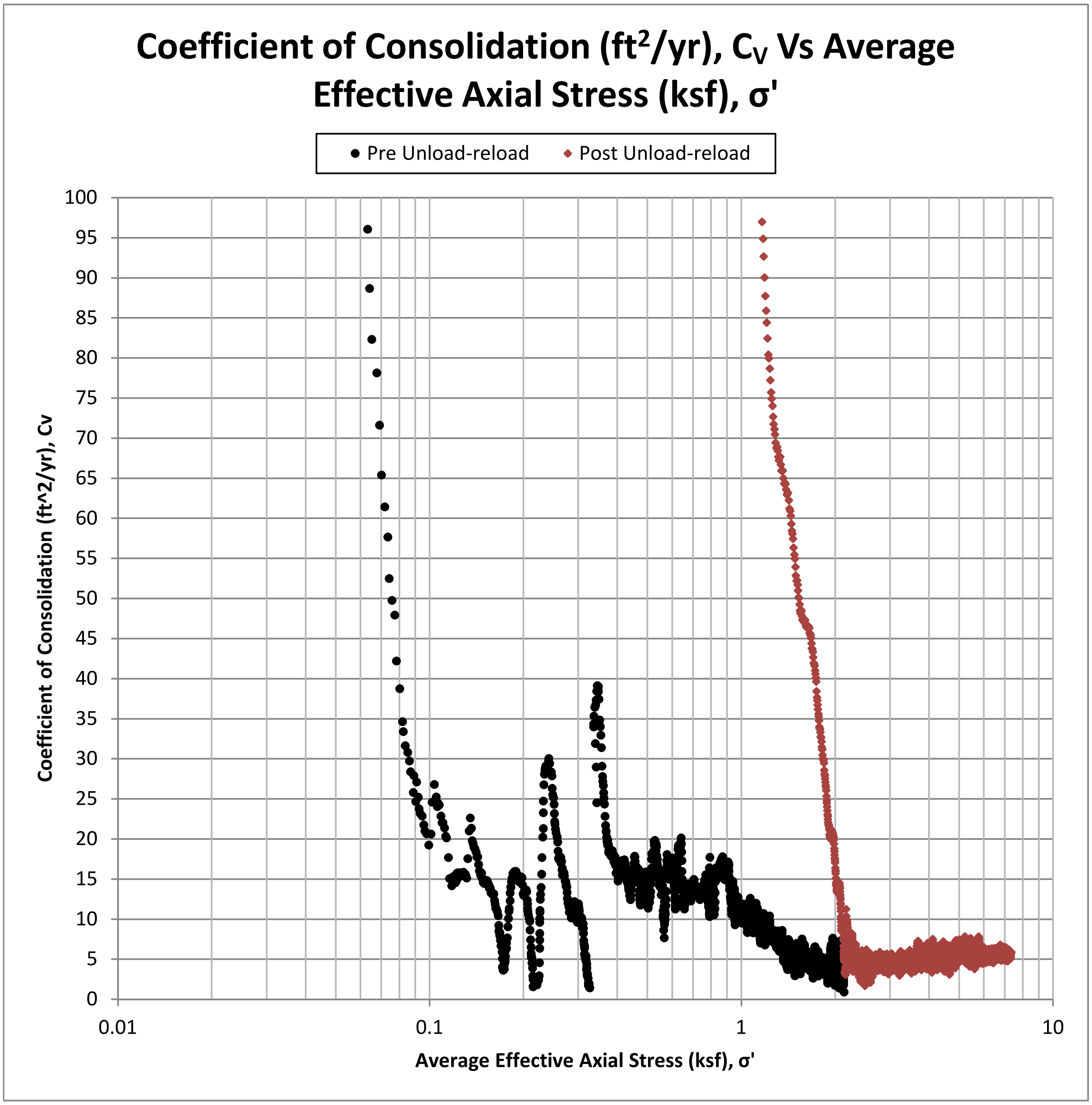
Reviewed By: L. Chan

Remarks: Pocket Pen < 0.25 tsf

Constant Rate of Strain Consolidation
ASTM D4186



ASTM D2216		
	As Received	Final
Moisture (%):	67.54%	54.86%
Dry Density (pcf):	60.25	79.40
Saturation (%):	100.50%	100.00%
Void Ratio:	1.8555	1.1670

Test Date: 6/19/2020

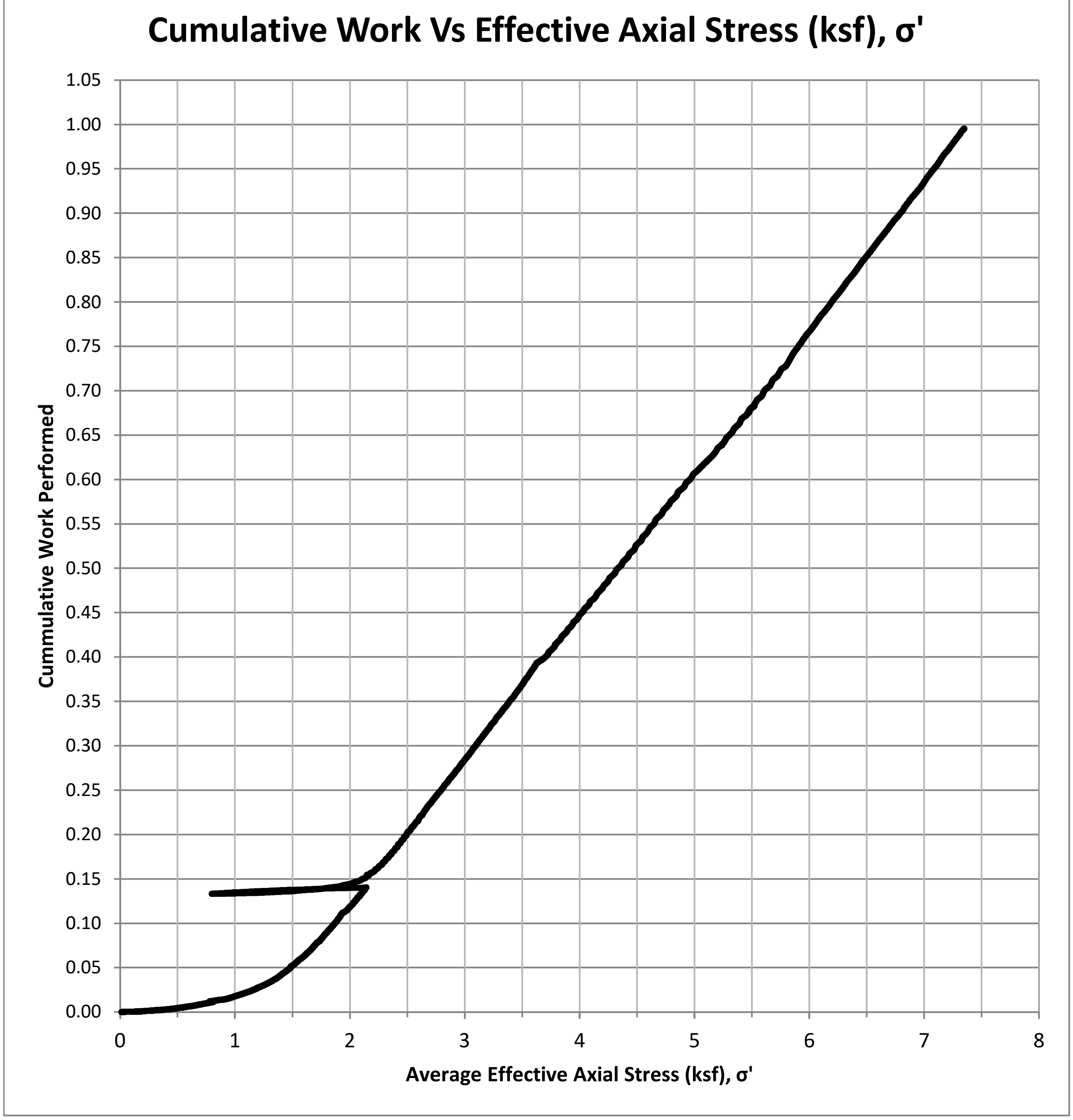
ASTM D4318 - Wet Method	
Liquid Limit:	0
Plastic Limit:	0
ASTM D854 - Measured	
Specific Gravity:	2.761
Soil Description:	See exploration logs

Strain Rate (in/min):	0.000051
Project Number:	17270.000.000
Sample Number:	1-B01 @ 10-12.5
Project Name:	Baylands Railyard
Client:	Baylands Development Inc.
Location:	Brisbane, California
Tested By:	D. Seibold
Depth:	11.75-12 ft
Boring #:	1-B01
Reviewed By:	L. Chan

ENGEO Expect Excellence

Remarks: Pocket Pen < 0.25 tsf

Constant Rate of Strain Consolidation
ASTM D4186



ASTM D2216

	As Received	Final
Moisture (%):	67.54%	54.86%
Dry Density (pcf):	60.25	79.40
Saturation (%):	100.50%	100.00%
Void Ratio:	1.8555	1.1670

Test Date: 6/19/2020

ASTM D4318 - Wet Method

Liquid Limit:	0
Plastic Limit:	0

ASTM D854 - Measured

Specific Gravity:	2.761
Soil Description:	See exploration logs

Strain Rate (in/min): 0.000051
Project Number: 17270.000.000
Sample Number: 1-B01 @ 10-12.5
Project Name: Baylands Railyard
Client: Baylands Development Inc.
Location: Brisbane, California
Tested By: D. Seibold

Depth: 11.75-12 ft
Boring #: 1-B01

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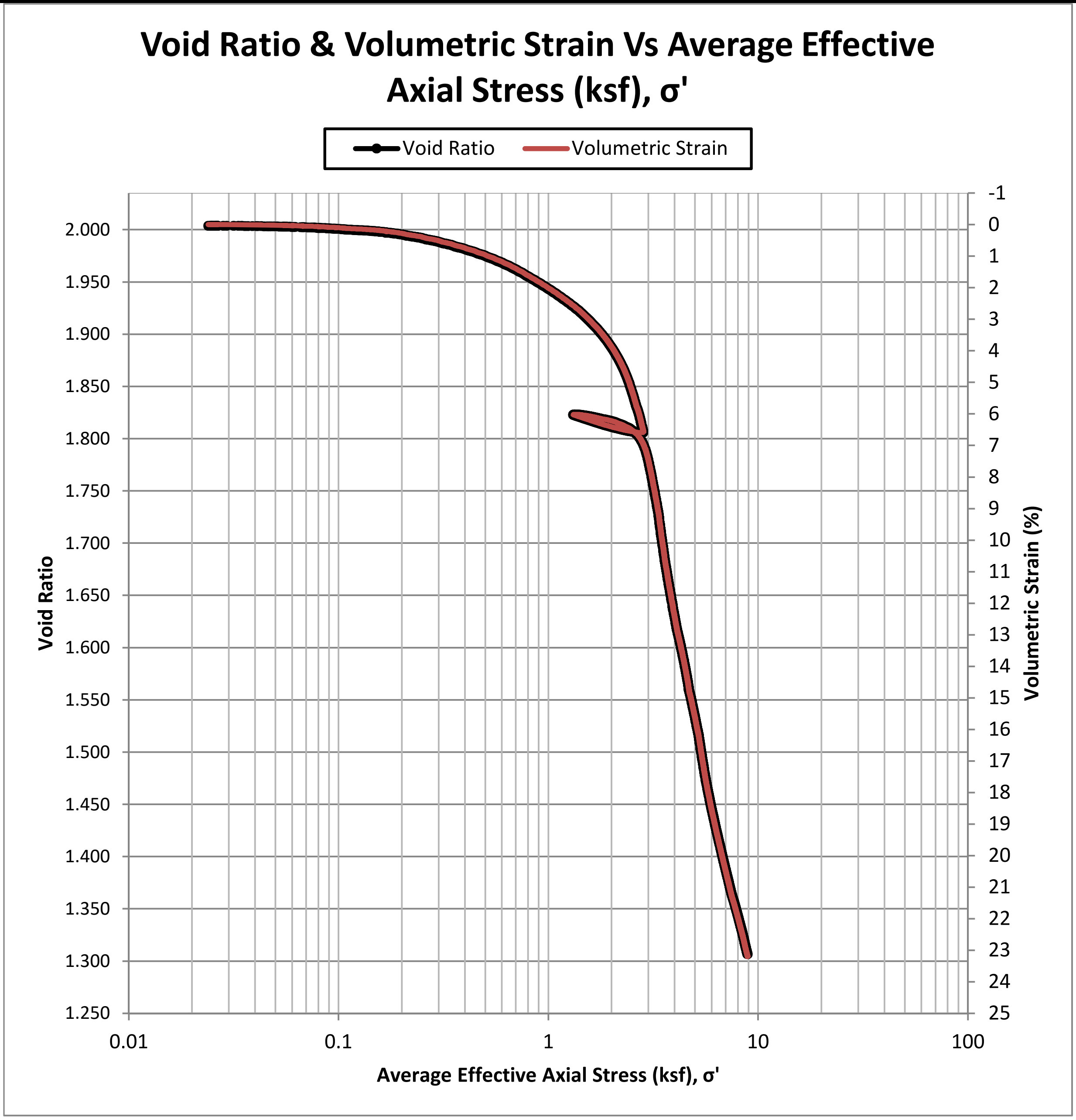
Reviewed By: L. Chan

Remarks: Pocket Pen < 0.25 tsf

Constant Rate of Strain Consolidation
ASTM D4186



ASTM D2216

	As Received	Final
Moisture (%):	70.59%	56.06%
Dry Density (pcf):	57.40	74.76
Saturation (%):	97.49%	100.00%
Void Ratio:	2.0036	1.3064

Test Date: 6/15/2020

ASTM D4318 - Wet Method

Liquid Limit:	
Plastic Limit:	

ASTM D854 - Measured

Specific Gravity:	2.767
Soil Description:	See exploration logs

Strain Rate (in/min): 0.000050
Project Number: 17270.000.000
Sample Number: 1-B5 @ 15-17.5
Project Name: Baylands Railyard
Client: Baylands Development Inc.
Location: Brisbane, California
Tested By: D. Seibold

Depth: 17-17.25 ft
Boring #: 1-B5
Reviewed By: L. Chan

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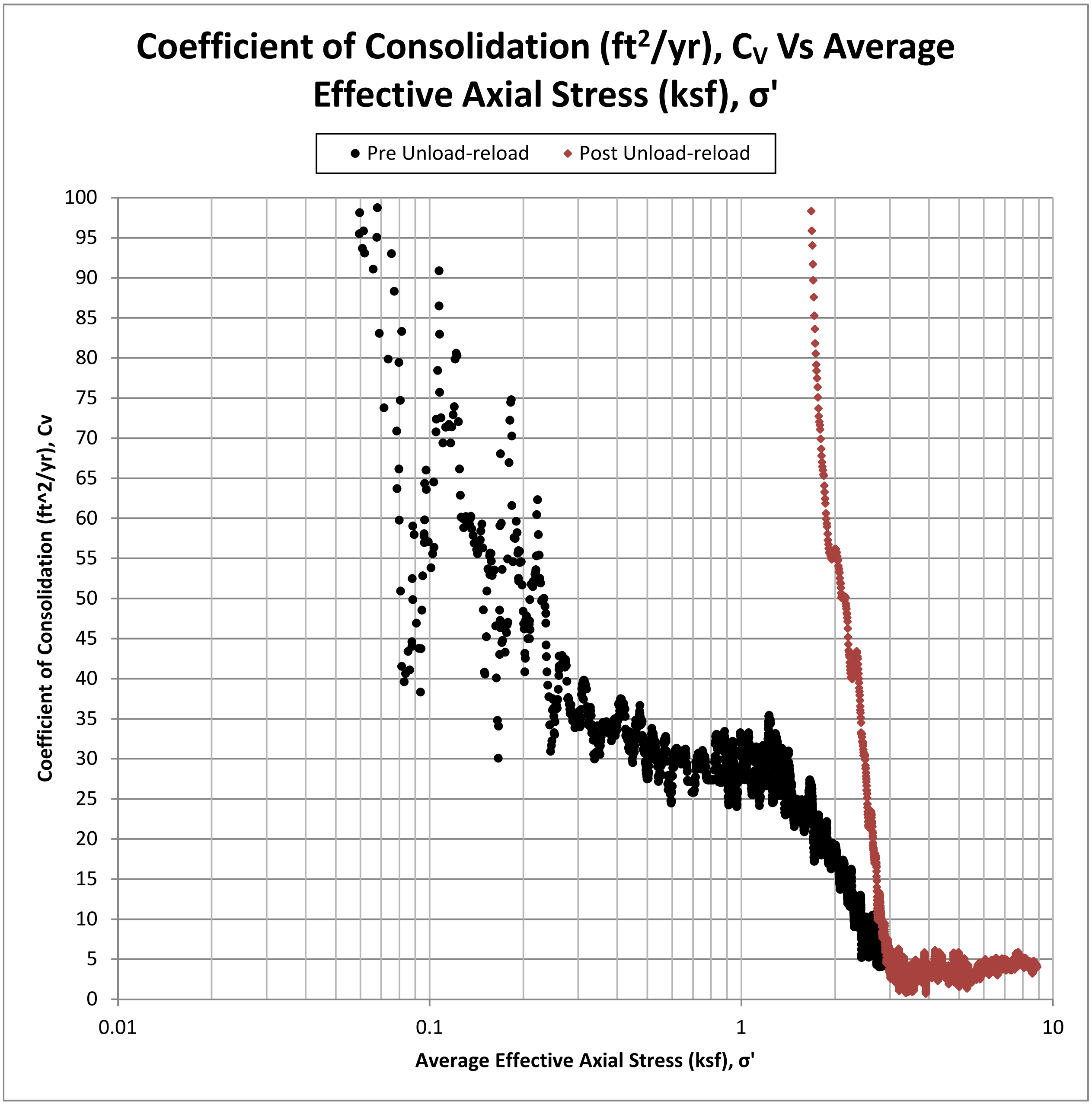
Remarks: Pocket Pen <0.25 tsf

Constant Rate of Strain Consolidation
ASTM D4186



ASTM D2216			ASTM D4318 - Wet Method	Test Date: 6/15/2020
	As Received	Final		
Moisture (%):	70.59%	56.06%	Liquid Limit:	
Dry Density (pcf):	57.40	74.76	Plastic Limit:	
Saturation (%):	97.49%	100.00%	ASTM D854 - Measured	
Void Ratio:	2.0036	1.3064	Specific Gravity:	2.767
Strain Rate (in/min):	0.000050		Soil Description:	See exploration logs
Project Number:	17270.000.000		Depth:	17-17.25 ft
Sample Number:	1-B5 @ 15-17.5		Boring #:	1-B5
Project Name:	Baylands Railyard			
Client:	Baylands Development Inc.			
Location:	Brisbane, California			
Tested By:	D. Seibold		Reviewed By:	L. Chan
Remarks:	Pocket Pen <0.25 tsf			

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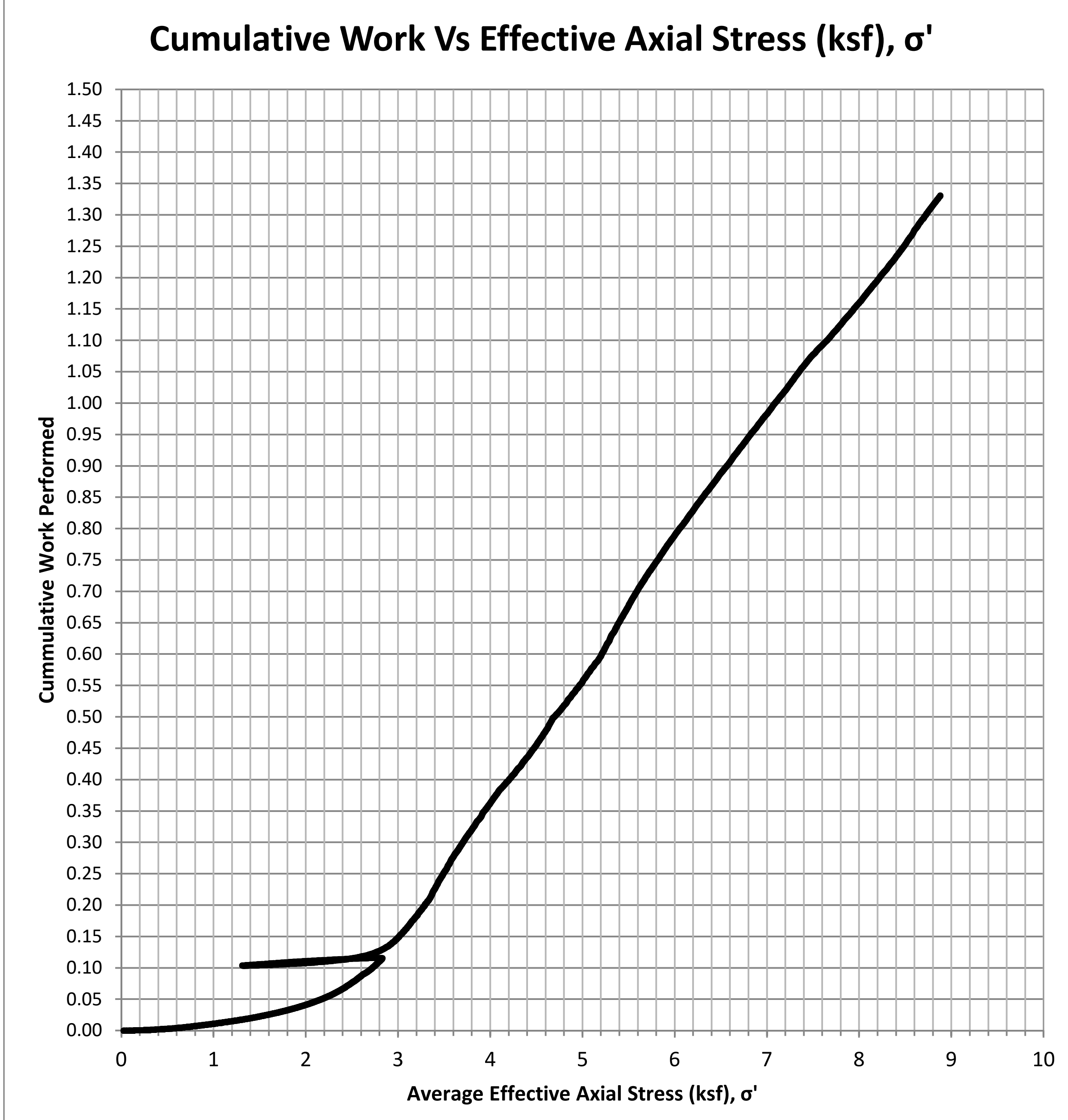
Constant Rate of Strain Consolidation
ASTM D4186



ASTM D2216		
	As Received	Final
Moisture (%):	70.59%	56.06%
Dry Density (pcf):	57.40	74.76
Saturation (%):	97.49%	100.00%
Void Ratio:	2.0036	1.3064

Test Date: 6/15/2020

ASTM D4318 - Wet Method	
Liquid Limit:	
Plastic Limit:	
ASTM D854 - Measured	
Specific Gravity:	2.767
Soil Description:	See exploration logs

Strain Rate (in/min): 0.000050
Project Number: 17270.000.000
Sample Number: 1-B5 @ 15-17.5
Project Name: Baylands Railyard
Client: Baylands Development Inc.
Location: Brisbane, California
Tested By: D. Seibold

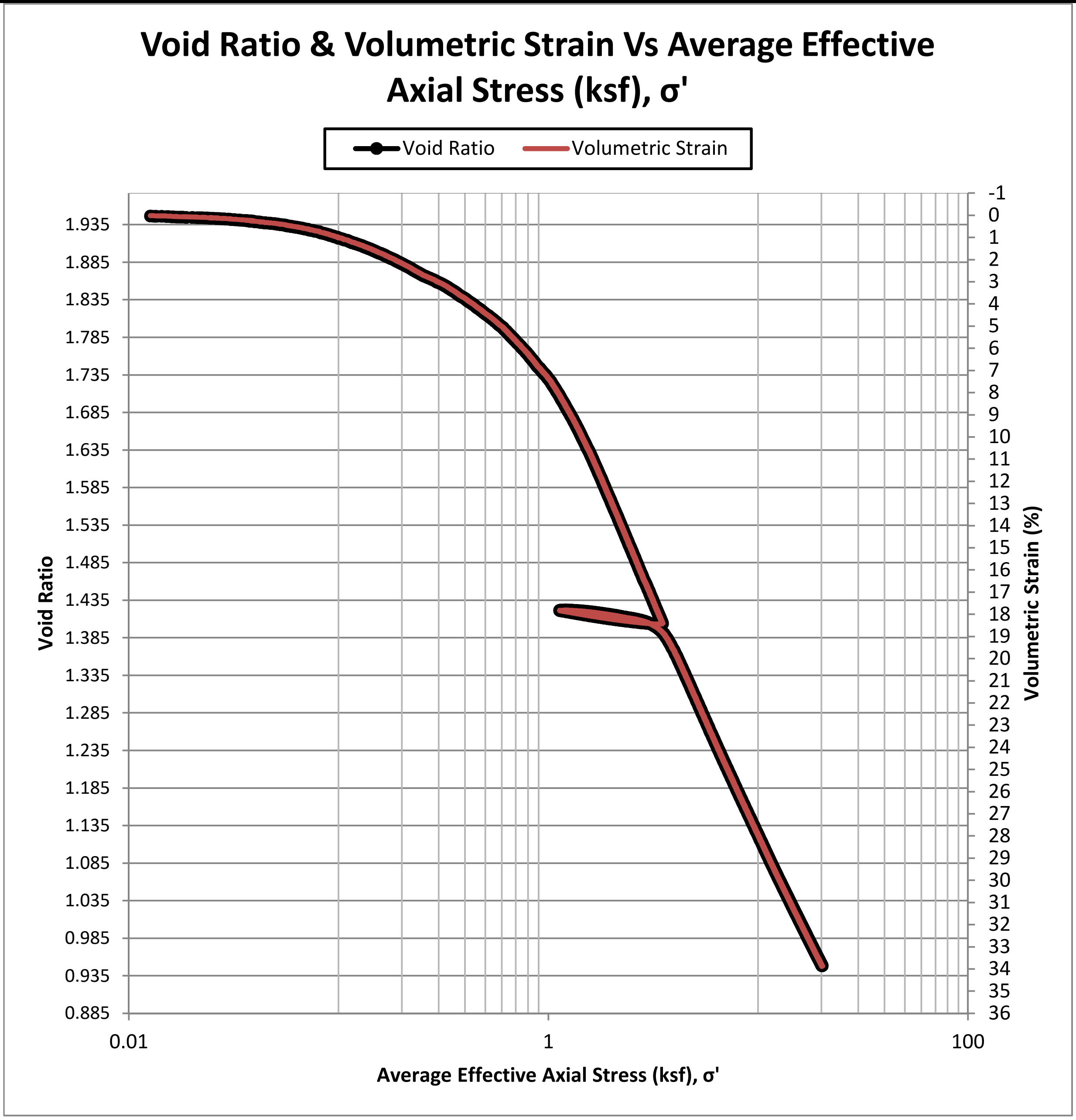
Depth: 17-17.25 ft
Boring #: 1-B5

ENGEO — Expect Excellence

Reviewed By: L. Chan

Remarks: Pocket Pen <0.25 tsf

Constant Rate of Strain Consolidation
ASTM D4186



Test Date: 6/19/2020

ASTM D2216

	As Received	Final
Moisture (%):	71.10%	43.07%
Dry Density (pcf):	57.18	86.71
Saturation (%):	98.75%	99.54%
Void Ratio:	1.9470	0.9433

ASTM D4318 - Wet Method

Liquid Limit:	
Plastic Limit:	

ASTM D854 - Measured

Specific Gravity:	2.704
Soil Description:	See exploration logs

Strain Rate (in/min): 0.000100
Project Number: 17270.000.000
Sample Number: 1-B02
Project Name: Baylands Railyard
Client: Baylands Development Inc.
Location: Brisbane, CA
Tested By: W. Miller

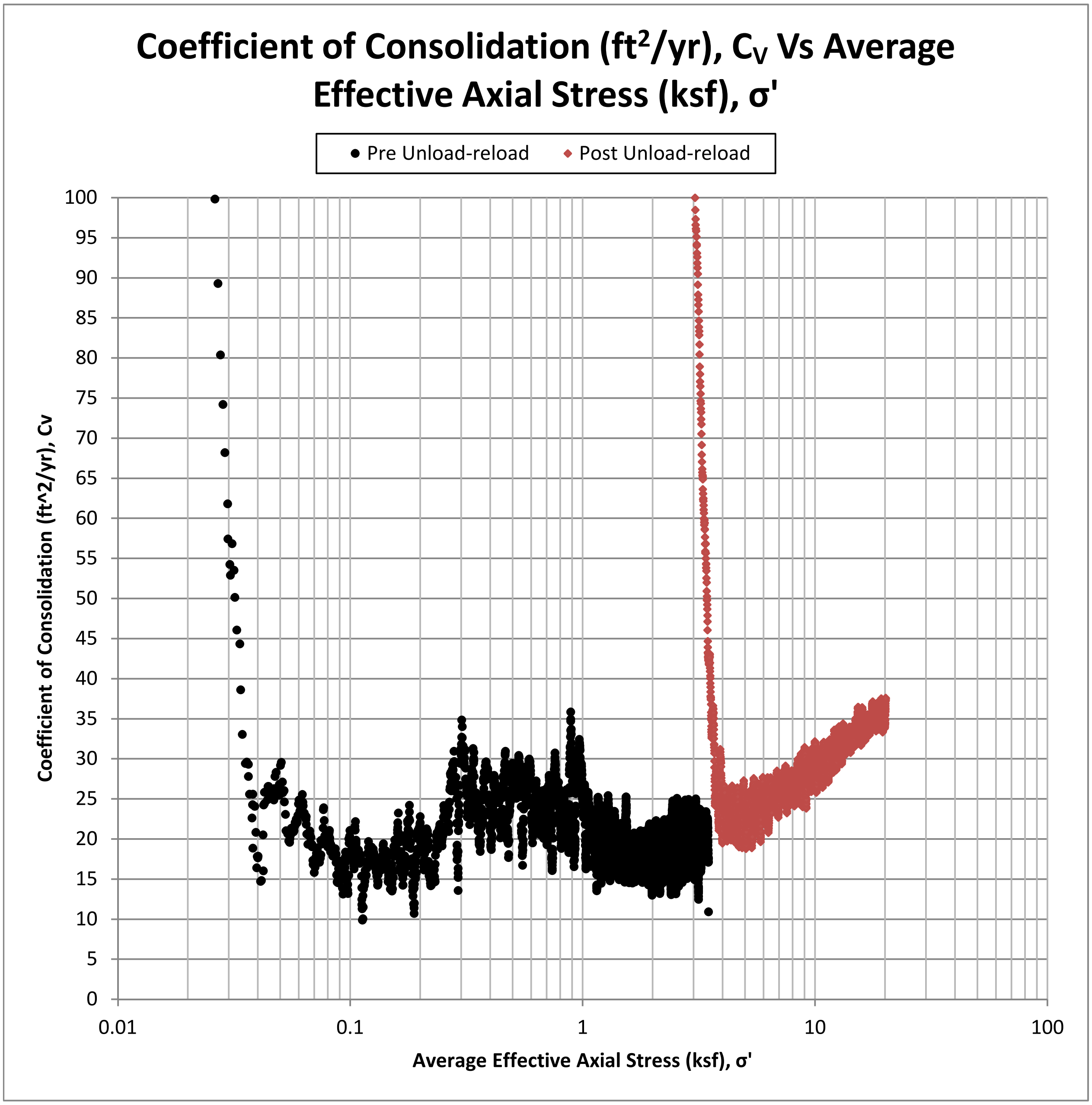
Depth: 10.5-10.75 ft.
Boring #: 1-B02

ENGEO Expect Excellence

Reviewed By: Siobahn O'Reilly-Shah

Remarks:

Constant Rate of Strain Consolidation
ASTM D4186



ASTM D2216		
	As Received	Final
Moisture (%):	71.10%	43.07%
Dry Density (pcf):	57.18	86.71
Saturation (%):	98.75%	99.54%
Void Ratio:	1.9470	0.9433

Test Date: 6/19/2020

ASTM D4318 - Wet Method	
Liquid Limit:	
Plastic Limit:	
ASTM D854 - Measured	
Specific Gravity:	2.704
Soil Description:	See exploration logs

Strain Rate (in/min):	0.000100
Project Number:	17270.000.000
Sample Number:	1-B02
Project Name:	Baylands Railyard
Client:	Baylands Development Inc.
Location:	Brisbane, CA
Tested By:	W. Miller

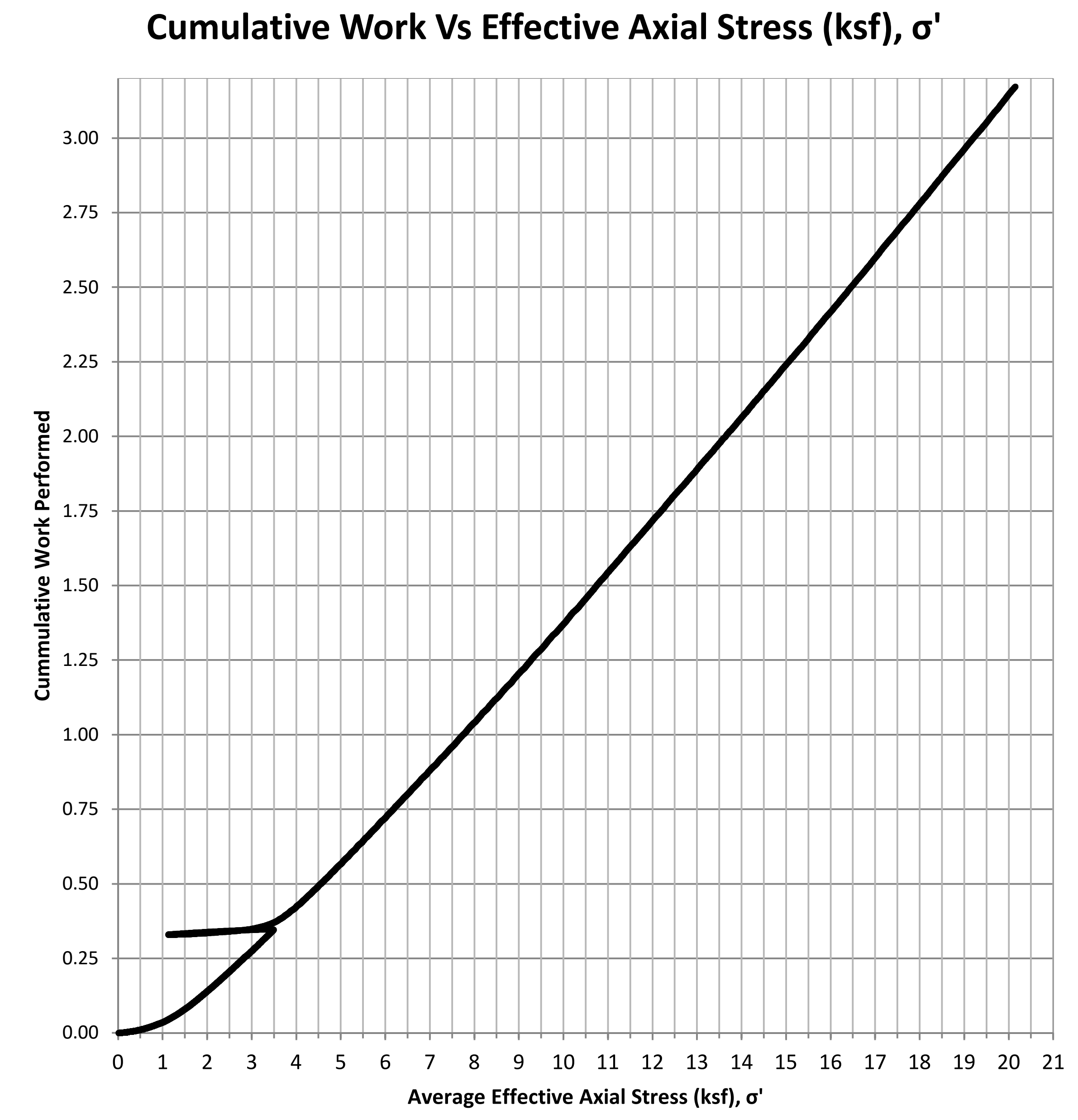
Depth: 10.5-10.75 ft.
Boring #: 1-B02

ENGEO Expect Excellence

Reviewed By: Siobahn O'Reilly-Shah

Remarks:

Constant Rate of Strain Consolidation
ASTM D4186



ASTM D2216		
	As Received	Final
Moisture (%):	71.10%	43.07%
Dry Density (pcf):	57.18	86.71
Saturation (%):	98.75%	99.54%
Void Ratio:	1.9470	0.9433

Test Date: 6/19/2020

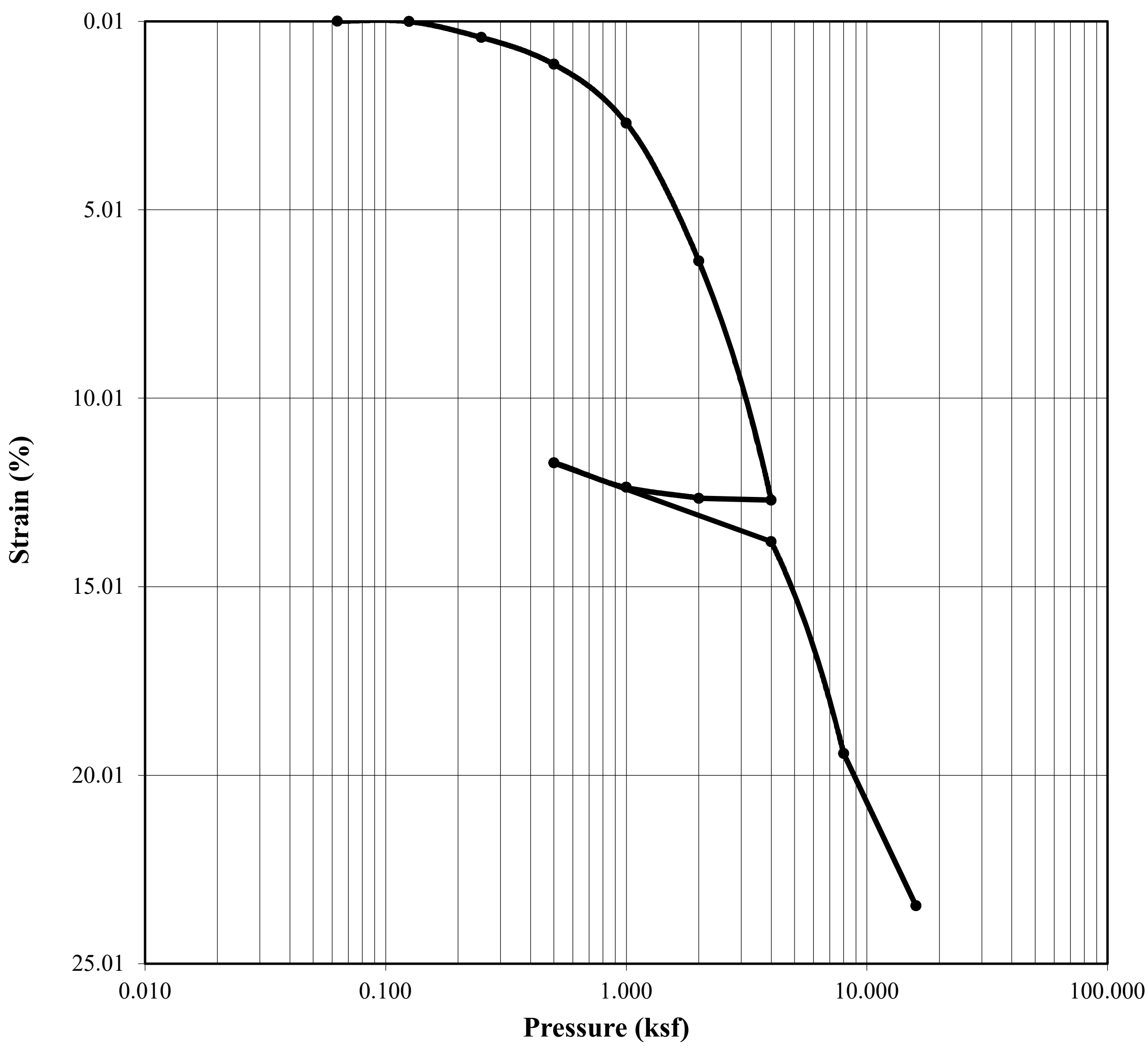
ASTM D4318 - Wet Method	
Liquid Limit:	
Plastic Limit:	
ASTM D854 - Measured	
Specific Gravity:	2.704
Soil Description:	See exploration logs

Strain Rate (in/min):	0.000100
Project Number:	17270.000.000
Sample Number:	1-B02
Project Name:	Baylands Railyard
Client:	Baylands Development Inc.
Location:	Brisbane, CA
Tested By:	W. Miller
Depth:	10.5-10.75 ft.
Boring #:	1-B02
Reviewed By:	Siobahn O'Reilly-Shah

ENGEO — Expect Excellence

Remarks:

Incremental Consolidation
ASTM D2435 - Method B



	Before	After	ASTM D4318 - Wet Method		Test Date: 6/22/2020
Moisture (%):	79.71	46.55	**Liquid Limit:**	0	
Dry Density (pcf):	53.13	74.76	**Plastic Limit:**	0	
Saturation (%):	98.95	99.98	ASTM D854 - Measured		
Void Ratio:	2.1819	1.4350	**Specific Gravity:**	2.707	
Sample Description:	See exploration logs		**Remarks:**		

Project Number:	17270.000.000 PH002	**Depth:**	18.0-20.5 feet
Sample Number:	1-B1@18.0-20.5 (20-20.25)	**Boring #:**	1-B1
Project Name:	Baylands Railyard		
Client:	Baylands Development, Inc.		
Location:	Brisbane, California		
Tested By: G. Criste	**Checked By:** D. Seibold		

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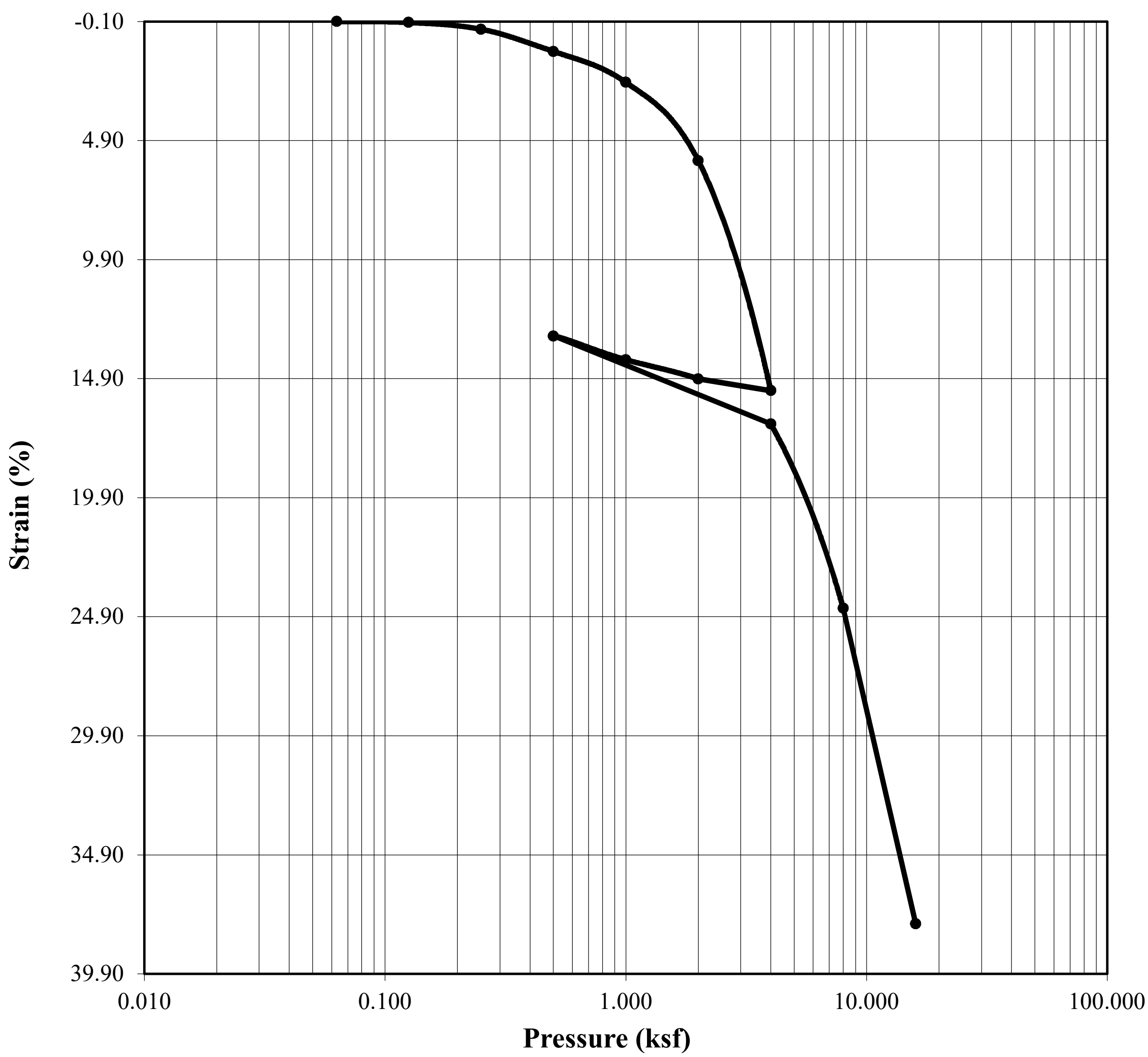
Expect Excellence

Incremental Consolidation
ASTM D2435 - Method B



	Before	After	ASTM D4318 - Wet Method		Test Date: 6/18/2020
Moisture (%):	49.73	23.53	**Liquid Limit:**		
Dry Density (pcf):	64.19	103.72	**Plastic Limit:**		
Saturation (%):	82.07	99.98	ASTM D854 - Measured		
Void Ratio:	1.6531	0.6503	**Specific Gravity:**	2.728	
Sample Description:	See exploration logs		**Remarks:** Specimen swelled on 0.063 ksf load		

Project Number:	17270.000.000	**Depth:**	30.0-32.5 feet
Sample Number:	1-B2@30	**Boring #:**	1-B2
Project Name:	Baylands Railyard		
Client:	Baylands Development, Inc.		
Location:	Brisbane, California		
Tested By: G. Criste	**Checked By:** D. Seibold		

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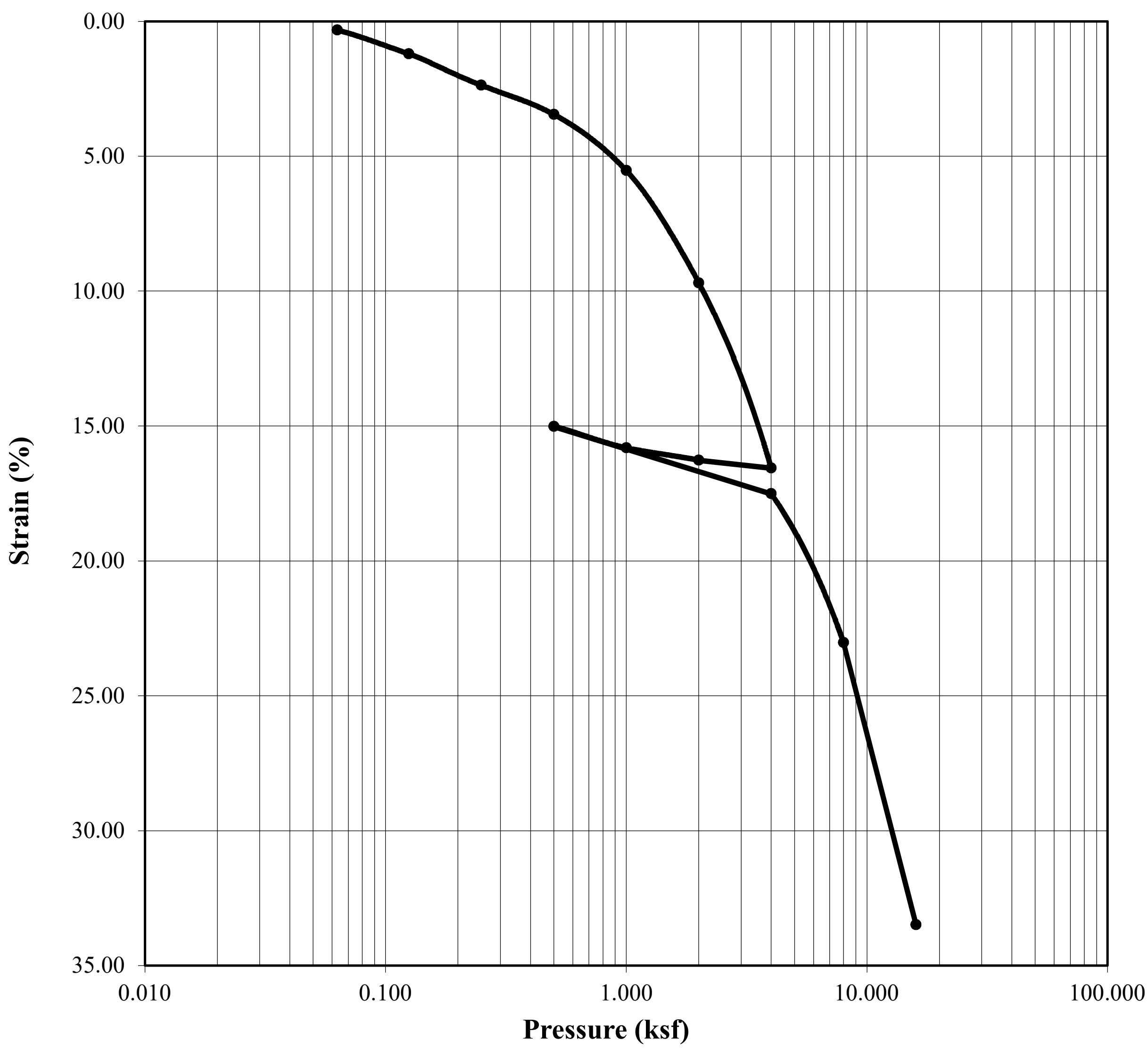
Incremental Consolidation
ASTM D2435 - Method B



	Before	After	ASTM D4318 - Wet Method		Test Date:	6/22/2020
Moisture (%):	52.68	22.05	**Liquid Limit:**			
Dry Density (pcf):	64.79	106.33	**Plastic Limit:**			
Saturation (%):	88.25	99.98	ASTM D854 - Measured			
Void Ratio:	1.6283	0.7481	**Specific Gravity:**	2.728		
Sample Description:	See exploration logs		**Remarks:**			

Project Number: 17270.000.000 PH002 **Depth:** 15.0 feet
Sample Number: 1-B3@15 (17.0-17.25) **Boring #:** 1-B3
Project Name: Baylands Railyard
Client: Baylands Development, Inc.
Location: Brisbane, California
Tested By: G. Criste **Checked By:** D. Seibold

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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: ENGEO Incorporated
Client's Project No.: 17270.000.000
Client's Project Name: Baylands
Date Sampled: 05/27 & 28/20
Date Received: 4-Jun-20
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 16-Jun-2020

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)*
2006020-002	1-BO5 3'-4.5'	+230	8.11	-	7,400	-	N.D.	N.D.
2006020-003	1-BO5 26'-26.5'	+230	7.23	-	630	-	450	140

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	15-Jun-2020	15-Jun-2020	-	16-Jun-2020	-	15-Jun-2020	15-Jun-2020

* Results Reported on "As Received" Basis

N.D. - None Detected

Cheryl McMillen
Laboratory Director

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

2006020

CHAIN OF CUSTODY RECORD

PROJECT NUMBER 17270.000.000 PROJECT NAME Baylands

SAMPLED BY: (SIGNATURE/PRINT) Joey Tognolini

PROJECT MANAGER: (SIGNATURE/PRINT) Leroy Chan

ROUTING: E-MAIL jtognolini@engeo.com

	SAMPLE NUMBER	DATE	TIME	MATRIX	NUMBER OF CONTAINERS	CONTAINER SIZE	PRESERVATIVE	Redox	pH	Sulfate	Resistivity	Chloride	REMARKS REQUIRED DETECTION LIMITS
001	1-B04 3'-4.5'	5/27/2020	10:00		1	ziplock bag		x	x	x	x	x	can't accept
002	1-B05 3'-4.5'	5/28/2020	10:00		1	ziplock bag		x	x	x	x	x	
003	1-B05 26'-26.5'	5/28/2020	12:00		1	6" Liner		x	x	x	x	x	

RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
[signature]	6/4/20 1040	[signature]			
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE/TIME		

REMARKS Please include a brief evaluation for each sample.

ENGEO
INCORPORATED

2010 CROW CANYON PLACE SUITE 250
SAN RAMON, CALIFORNIA 94583
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DISTRIBUTION: ORIGINAL ACCOMPANIES SHIPMENT; COPY TO PROJECT FIELD FILES

APPENDIX D

PREVIOUS EXPLORATION LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW		Well-graded gravels or gravel sand mixtures, little or no fines.
		GP		Poorly-graded gravels or gravel sand mixture, little or no fines.
		GM		Silty gravels, gravel-sand-clay mixtures.
		GC		Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW		Well-graded sands or gravelly sands, little or no fines.
		SP		Poorly-graded sands or gravelly sands, little or no fines.
		SM		Silty sands, sand-silt mixtures.
		SC		Clayey sands, sand-clay mixtures.

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
FINE GRAINED 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.
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL		Organic silts and organic silt-clays of low plasticity
	SILTS AND CLAYS LL>50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays.
		OH		Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils.

Standard Penetration Split Spoon Sampler

Modified California Sampler

Shelby Tube Sampler

Water level first observed in boring

Water level observed in boring following drilling

Note: Blow count represents the number of blows of a 140 pound hammer falling 30 inches per blow required to drive a sampler through the last 12 inches of an 18-inch penetration, unless otherwise noted.

Note: The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

KLEINFELDER	Tuntex Properties Brisbane, California	PLATE
PROJECT NO. 11-2147-02	BORING LOG LEGEND	B-1

Date Completed: 12/4/89

Logged By: Mike James

Total Depth: 41.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION — Surface Elevation: Estimated 11 feet (MSLD)
	■	41						**FILL: SILTY SAND (SM)** Medium dense, very dark brown, damp, fine grained, with gravel to 3/4", some glass fragments and wood chips
5	■	4		▼				-loose
								FILL: SILTY SANDY CLAY (CL) Soft, medium brown, wet, trace fine gravel
10	■	5						**SILTY SAND (SM-ML)** Loose, dark brown, damp, fine grained, with frequent roots
15	■	9	71	41				**SANDY CLAY (CL)** Firm, dark brown, moist, fine grained sand, trace silt, occasional roots
				▽				
20	■	15	112	20				**SAND (SP)** Medium dense, light brown, wet, medium grained
25	■	75						-dense
30	■	86						
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-1

PLATE B-2

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
								...Sand (SP)
40	■	37	124	16		-#200:10%		**SILTY SAND (SM)** Dense, light brown, wet
								Bottom of boring at 41.5 feet
45								
50								
55								
60								
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-1

PLATE B-3

Date Completed: 12/4/89

Logged By: Mike James

Total Depth: 61.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION — Surface Elevation: Estimated 10 feet (MSLD)
		31					1.5	**FILL: SAND (SW)** Medium dense, grey-brown, damp, trace of gravel to 3/4" and of silt
5		6						-loose, black, wet, with glass fragments
10		6						
15		4	75	43			0.6	**CLAYEY SILT (MH-CH) - BAY MUD** Soft, dark blue-grey, damp
20		30				-#200: 7%		**GRAVELLY SAND (SP)** Medium dense, black, wet, coarse grained, with some silt
25		26	114	18				**SAND (SP)** Medium dense, mixed grey and brown with slight orange-brown mottling, wet, trace silt -Lens of Silty Sand (SM-ML) Medium dense, grey and brown, wet
30		18						-dark grey
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-2

PLATE B-4

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
	■	19	110	21				...Sand (SP) -trace fine gravel
40	■	26	118	17				
45	■	15						-trace clay, few pieces of glazed pottery
50	■	27	106	21		-#200: 3%		
55								
60	■	36	90	10		Ø=35 deg c =360psf		**SILTY CLAYEY SAND (SC-CL)** Medium dense, grey with orange-brown mottling, wet
								Bottom of boring at 61.5 feet
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-2

PLATE B-5

Date Completed: 12/4/89

Logged By: Mike James

Total Depth: 46.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION — Surface Elevation: Estimated 9 feet (MSLD)
								FILL: SILTY GRAVEL (GM) Medium dense, medium brown, damp, gravel to 1", trace sand
		10						**FILL: SAND (SP)** Medium dense, dark brown, wet, medium grained
5		24	123	13				**FILL: SILTY GRAVEL (GM-ML)** Medium dense, dark brown, wet, gravel to 3/4", with some clayey areas
10		6						
								SILTY CLAY (CH) - BAY MUD Soft, dark blue-grey, wet, with frequent shells
15		4	71	51				
20		4				LL = 72 PI = 39		
25		13	61	61				
30		6						-trace fine grained sand -less frequent shells
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-3

PLATE B-6

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
								...Bay Mud
								-siltier
40	■	33	103	21				**SAND (SP)** Dense, light brown, wet, fine grained, trace clay
45	■	60	103	23		-#200: 17%		-mixed light brown and grey
								Bottom of boring at 46.5 feet
50								
55								
60								
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-3

PLATE B-7

Date Completed: 12/5/89

Logged By: Mike James

Total Depth: 25.0 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION — Surface Elevation: Estimated 9 feet (MSLD)
								FILL: GRAVELY SAND (SP) Medium dense, mixed browns, damp, coarse grained, gravel to 1", trace silt and clay
	■	15						
5	■	4						-loose
								BAY MUD: SILTY CLAY (CH) Very soft, medium blue-grey, wet
10	■	2					0.1	
15	■	2	56	72			0.1	
20	■	3					0.1	-with some shells and pockets of peat
25								Bottom of boring at 25 feet
30								
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-4

PLATE

B-8

Date Completed: 12/5/89

Logged By: Mike James

Total Depth: 71.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Surface Elevation: Estimated 8 feet (MSLD)

Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
	■	10						**FILL: GRAVELLY SAND (SW)** Loose, medium grey-brown, moist, coarse grained, gravel to 1/2", trace silt
5	■	18	123	9				**FILL: CLAYEY GRAVEL (GC-CH)** Loose, grey-brown, wet, gravel to 1", with some coarse sand
10	■	4	129	13				-clayier
15	■	4						**SILTY CLAY (CH) - BAY MUD** Very soft, dark grey, wet, with some shells
20	■	4	51	82				
25	■	4					0.2	-medium grey, occasional shells
30	■	4	55	73			0.2	
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-5

PLATE B-9

Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
	FIELD		LABORATORY					(Continued from previous plate)
		5					0.2	...Bay Mud
40		6	59	73		LL = 67 PI = 37		
45		8					0.3	-firm
50		6						
55		14	53	75				
60		34						SILTY SAND (SM-ML) / SANDY SILT (ML) Firm, dark grey, damp, with fine grained sand
65		100	111	17			2.0	SAND (SP) Dense, orange-brown and grey, damp, fine grained, trace silt
70		33					2.2	SILTY CLAY (CL) - (OLD BAY CLAY) Very stiff, medium grey, damp, moderate plasticity
75								Bottom of boring at 71.5 feet

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-5

PLATE B-10

Date Completed: 12/6/89

Logged By: Mike James

Total Depth: 81.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Surface Elevation: Estimated 9 feet (MSLD))
	■	11						**FILL: GRAVELLY SAND (SP)** Medium dense, mixed browns, moist, coarse grained, gravel to 1", trace silt
5	■	25		▼			0.3	**FILL: CLAYEY SILT (ML)** Firm, dark brown, moist, with some gravel to 1-1/2", with fragments of glass
								CLAYEY SILT (MH-CH) - BAY MUD Soft, blue-grey with some brown areas, moist, moderately organic
10	■	2						
15	■	6	60	69				-dark blue-grey, damp
20	■	2						
25	■	4						-dark grey
30	■	6	56	70				-firm
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-6

PLATE B-11

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
	■	6						...Bay Mud
40	■	6	54	74				-occasional shells, with pockets of silt
45	■	8						
								SILTY CLAY (CL-ML) - (OLD BAY CLAY)
50	■	23	54	76			3.5	Stiff, grey and orange-brown, moist
55								
60	■	26	57	74				
65								
70	■	20						
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-6

PLATE B-12

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION (Continued from previous plate)
								...Silty Clay (CL-ML)
80	■	33	96	28				Lens of Sand (SP) Dense, dark grey, moist, fine grained
								Bottom of boring at 81.5 feet
85								
90								
95								
100								
105								
110								
115								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-6

PLATE B-13

Date Completed: 12/13/89

Logged By: Mike James

Total Depth: 27.0 ft

Sampler: Sheby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Surface Elevation: Estimated 9 feet (MSLD))
0–10								**FILL: SILTY GRAVEL (GM-ML)** Medium dense, medium brown, moist, gravel to 1", trace fine grained sand -dark brown, damp -rubble
10–21								**SILTY CLAY (CH) - BAY MUD** Soft, dark grey, wet -firm
21–27								**SAND (SP)** Medium dense, medium blue-grey, wet, fine grained, trace silt
27								Bottom of boring at 27.0 feet

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-10

PLATE B-21

Date Completed: 12/13/89

Logged By: Mike James

Total Depth: 52.5 ft

Sampler: Standard Split Spoon - 2.0" OD, 1.4" ID
Shelby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Surface Elevation: Estimated 9 feet (MSLD))
0–20								FILL: SILTY GRAVEL (GM-ML) Medium dense, medium to dark brown, moist, gravel to 1", trace fine grained sand -wet; (at ~10 ft) -gravel to 1/2", less silt, with glass fragments
20–26.5								SAND (SP) Loose to medium dense, mixed browns, wet, coarse grained, with some gravel to 1/2", trace silt
26.5–29.5		4						SILTY SAND (SM-ML) Loose, grey-brown and grey, wet, fine grained
29.5–35								SILTY CLAY (CL) - BAY MUD Firm, dark grey, moist, with some shells

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-11

PLATE B-22

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
								...Bay Mud
40								
45								-trace fine grained sand
50	▮		85	34				
								SILTY CLAY (CL-ML) - (OLD BAY CLAY) Stiff, orange-brown and grey, moist, trace fine grained sand
55								Bottom of boring at 52.5 feet
60								
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-11

PLATE B-23

Date Completed: 12/13/89

Logged By: Mike James

Total Depth: 42.5 ft

Sampler: Shelby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Surface Elevation: Estimated 9 feet (MSLD))
0–11								**FILL: SILTY GRAVEL (GM)** Medium dense, light to medium brown, moist, gravel to 1"
~6								-wet, slightly clayey
11–35								**SILTY CLAY (CH) - BAY MUD** Firm, dark grey, moist, with frequent shells and occasional pockets of silt (ML)
20	Sample		52	82				

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-12

PLATE

B-24

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
								...Bay Mud
40								Lens of: Sand (SP) Medium dense, grey, wet, fine grained
								SAND (SP) Dense, grey-brown, wet, fine grained
45								Bottom of boring at 42.5 feet
50								
55								
60								
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-12

PLATE B-25

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-1

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 3-27-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-27-03	9 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, brown, sandy silty clay with rootlets and organics, damp **(Fill)**		1) 2.5"	5	---	14	----	
Loose, grey to dark grey, slightly clayey silty sand with pebbles, rock fragments and minor debris (brick, glass, etc.), moist **(Fill)**	5	2) 2.5"	37	102	6	----	
Firm to medium dense, brown to reddish brown, clayey fine sandy silt to silty fine sand with abundant rock fragments and pieces of debris (glass, plastic, etc.), damp to moist **(Fill)**	10	3) 2.5"	6	---	21	----	
Soft, olive brown to olive grey with minor orange brown, fine sandy clayey silt with rock fragments, very moist to wet **(Fill)**	15						
Very soft, very dark grey, silty clay with minor decomposing organics, very moist to wet **(Bay Mud)**		4) 2.5"	1	60	67	490	**PI (Fig. 18)**
Loose, dark grey, silty medium grained sand, wet **(Sand)**	20	5) 2.5"	7	45	89	880	
Very soft to soft, grey to light grey, organic rich layer with abundant shells and other decomposing materials, wet		6) spt*	5	96	22	----	
Very soft to soft, very dark grey, silty clay with minor decomposing organics, very moist to wet **(Bay Mud)** - slight color change to dark olive brown with depth	25	7) 2.5"	4	41	99	1610	
Loose, dark grey to black, silty fine sand with minor organics, wet **(Sand)**	30	8) 2.5"	7	93	23	1230	
Boring terminated at 31 feet 6 inches							
* spt denotes Standard Penetration Test	35						

Job No. 03-3324

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Figure 6

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-2

BORING SUPERVISOR	DK/JP
HAMMER WEIGHT	140 lb. Automatic Hammer
SURFACE ELEVATION	---
GROUNDWATER DEPTH	3-27-03: 5 feet
TYPE OF BORING	8" Hollow Stem Auger
DATE OF BORING	3-27-03

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, dark brown, sandy silty clay with rootlets and rock fragments, damp **(Fill)**		1) 2.5"	19	---	7	----	
Loose, mottled greyish brown, slightly clayey silty sand with rock fragments, pebbles and coarse sand, moist **(Fill)**	5	2) 2.5"	8	97	19	----	
Loose, greyish brown, silty sand with rock fragments and pebbles, wet **(Fill)**	10	3) 2.5"	10	117	15	----	
Very soft, dark grey to very dark grey, silty clay with minor decomposing organics, very moist to wet **(Bay Mud)**	15	4) 2.5"	3	41	97	----	
Boring terminated at 20 feet	20	5) 2.5"	2	42	97	----	**PI (Fig. 18)**
	25						
	30						
	35						

Job No. **03-3324**

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Figure 7

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-3

BORING SUPERVISOR	DK/JP
TYPE OF BORING	8" Hollow Stem Auger
DATE OF BORING	3-27-03
HAMMER WEIGHT	140 lb. Automatic Hammer
SURFACE ELEVATION	---
GROUNDWATER DEPTH	3-27-03: 2 feet 6 inches

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, brown, sandy silty clay with rootlets and organics, damp to moist **(Fill)**		1) 2.5"	3	92	23	----	
Soft, brown, sandy silt with rock and brick fragments, minor pebbles, moist **(Fill)**	5	2) 2.5"	46	---	8	----	
Loose to medium dense, olive brown, silty fine sand with rock fragments, wet **(Fill)**	10						
Firm to medium dense, olive brown, slightly clayey fine sandy silt to silty fine sand with abundant rock fragments, moist to wet **(Fill)**		3) 2.5"	4	---	46	----	
Very soft, very dark grey, silty clay with orange brown decomposing organics, very moist to wet **(Bay Mud)**	15	4) 2.5"	2	54	75	840	**PI (Fig. 18)**
Loose, very dark grey to black, slightly silty fine sand with abundant shell fragments, very moist to wet **(Sand)**	20	5) 2.5"	4	---	--	----	**Consolidation (Fig. 19)**
Very soft to soft, very dark grey, silty clay with minor orange brown decomposing organics, very moist to wet **(Bay Mud)** - dark grey slightly silty fine sand layer with minor shells and decaying organics at 20 feet 6 inches	25	6) 2.5"	12	103	19	850	
Loose to medium dense, dark olive grey, silty fine sand, wet **(Sand)**	30						
Medium dense, olive brown to yellowish brown, slightly silty fine sand, mottled with grey fine sand, very moist to wet **(Sand)**		7) 2.5"	33	103	18	1520	
Boring continued on Figure 8A	35						

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-3 (cont'd)

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 3-27-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-27-03	2 feet 6 inches	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 8		■	8) 2.5"	38	103	18	470	
- sand color gradually grades to olive grey with depth	40							
Boring terminated at 43 feet		■	9) 2.5"	40	110	19	790	
		■	10) spt*	46	---	20	----	
* spt denotes Standard Penetration Test	45							
	50							
	55							
	60							
	65							
	70							

Job No. 03-3324 | Michelucci & Associates, Inc. | Figure 8A

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-4

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 3-28-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-28-03	8 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, dark brown, sandy silty clay with rootlets and rock fragments, damp to moist **(Fill)**		1) 2"	29	---	7	----	
Medium stiff to stiff, olive brown to olive grey, sandy clayey silt with abundant rock fragments, damp to moist **(Fill)**	5	2) 2"	6	118	18	800	
Loose to medium dense, reddish brown, clayey silty fine sand, very moist **(Fill)**	10	3) 2.5"	1/18"	48	87	680	**Consolidation (Fig. 20)**
Loose, orange brown, slightly clayey silty fine sand, very moist **(Fill)**							
Very soft, very dark grey, silty clay, very moist to wet **(Bay Mud)** - minor shell fragments at 15 feet	15	4) 2.5"	3	---	67	----	**PI (Fig. 18)**
Medium dense, olive brown to olive grey, slightly silty fine sand, very moist to wet **(Sand)** - minor rock fragments and organics present in Sample 6 - grades to yellowish brown to orange brown in color at 30 feet - minor orange brown iron staining at 31 feet	20	5) 2.5"	2	56	67	1180	
	25	6) 2.5"	37	107	16	840	
	30	7) 2"	28	111	20	1220	
Boring continued on Figure 9A	35						

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-4 (cont'd)

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 3-28-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-28-03	8 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 9		▓	8) 2"	26	110	21	2330	
- slight increase in clay content beyond 37 feet - grades to light olive brown in color at 40 feet	40							
Boring terminated at 43 feet		▓	9) 2"	36	115	18	5350	
		▓	10) spt*	29	118	19	----	
* spt denotes Standard Penetration Test	45							
	50							
	55							
	60							
	65							
	70							

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-5

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 3-31-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-31-03	4 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, brown to dark olive brown, sandy clayey silt to sandy silty clay with rootlets and rock fragments, damp to moist **(Fill)**		1) 2"	47	120	10	----	
Firm to stiff, olive brown to olive grey, sandy clayey silt to sandy silty clay with abundant rock fragments, damp to moist **(Fill)** - dark brown silty clay lense with strong brown fine sand at 2 feet - seepage at 4 feet - abundant rock fragments at 5 feet	5	2) 2"	12	---	--	----	
	10	3) 2"	4	76	43	490	
Soft, very dark grey to black, sandy silty clay with rock fragments, wood chips, glass and pottery pieces, minor organics, very moist to wet **(Fill)**	15	4) 2.5"	17	100	19	310	
Medium dense to dense, olive grey to grey, silty fine sand with minor organics, very moist to wet **(Sand)** - rock fragments within Sample 4 - color changes to olive brown and orange brown at 20 feet - dense at 20 feet - very dense at 31 feet	20	5) 2.5"	36	101	20	1480	
	25	6) 2"	32	109	19	1100	
	30	7) 2"	24	110	21	2350	
		8) spt*	58	116	23	----	
	35						

Boring terminated at 33 feet

* spt denotes Standard Penetration Test

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-6

BORING SUPERVISOR	DK/JP
TYPE OF BORING	8" Hollow Stem Auger
DATE OF BORING	3-28-03
HAMMER WEIGHT	140 lb. Automatic Hammer
SURFACE ELEVATION	---
GROUNDWATER DEPTH	3-28-03: 4 feet

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, olive grey to olive brown, sandy silty clay to sandy clayey silt with rootlets and rock fragments, damp to moist **(Fill)**		1) 2"	33	123	8	1870	
Firm to medium stiff, olive grey and olive brown, sandy clayey silt with lenses of orange brown and reddish brown sand and silt and abundant rock fragments, damp **(Fill)** - seepage at 4 feet	5	2) 2"	11	---	9	----	
Firm to medium stiff, dark grey, silty clay with abundant rock fragments, wet **(Fill)**	10	3) 2.5"	6	---	--	----	
Medium stiff, olive brown, sandy clayey silt with abundant rock fragments, wet **(Fill)**	15	4) 2.5"	23	---	15	----	
Very soft to soft, very dark grey, silty clay with shell fragments, very moist to wet **(Bay Mud)**	20	5) 2.5"	17	---	13	----	
Medium dense to dense, mottled orange brown to strong brown, clayey silty fine sand, very moist **(Sand)** - lenses of olive grey to grey silty fine sand in Sample 8	25	6) 2.5"	4	64	53	1450	
	30	7) 2.5"	26	109	16	3960	
	35						

Boring continued on Figure 11A

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-6 (cont'd)

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 3-28-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-28-03: 4 feet		

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 11		8) 2"	43	110	20	3860	
Medium dense to dense, olive grey and olive brown, silty fine sand, very moist **(Sand)**	40						
Boring terminated at 53 feet		9) 2"	27	108	21	900	
* spt denotes Standard Penetration Test	45						
		10) 2"	48	108	20	1550	
	50						
		11) 2"	32	112	19	2770	
		12) spt*	26	111	21	----	
	55						
	60						
	65						
	70						

Job No. 03-3324	Michelucci & Associates, Inc.	Figure 11A

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-7

BORING SUPERVISOR	DK/JP
HAMMER WEIGHT	140 lb. Automatic Hammer
SURFACE ELEVATION	---
GROUNDWATER DEPTH	3-31-03: 5 feet
TYPE OF BORING	8" Hollow Stem Auger
DATE OF BORING	3-31-03

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Medium dense, olive grey to olive brown, silty clayey very fine sand with abundant rock fragments, moist to very moist **(Fill)**		1) 2"	21	---	9	----	
Soft, dark brown, sandy silt with abundant rock fragments, very moist to wet **(Fill)**	5	2) 2"	7	---	--	----	
Very soft to soft, very dark grey, silty clay with minor decomposing organics, very moist to wet **(Bay Mud)** - minor shell fragments at 15 feet	10	3) 2.5"	3	50	77	420	
Loose, mottled olive grey and minor brown, slightly clayey silty fine sand with minor organics, very moist to wet **(Sand)**	15	4) 2.5"	2/18"	42	98	490	**Consolidation (Fig. 21)**
Medium dense, dark olive grey, slightly clayey silty fine sand, very moist **(Sand)** - grades to yellowish brown in color at 30 feet - minor pebbles in Sample 8	20	5) 2.5"	6	105	18	1650	
	25	6) 2"	36	122	15	4880	
	30	7) 2"	30	107	21	2290	
	35						

Boring continued on Figure 12A

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-7 (cont'd)

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 3-31-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-31-03	5 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 12			8) 2"	30	101	23	270	
Boring terminated at 38 feet			9) spt*	50	---	21	----	
	40							
* spt denotes Standard Penetration Test								
	45							
	50							
	55							
	60							
	65							
	70							

Job No. 03-3324

Michelucci & Associates, Inc.

Figure 12A

PROJECT	Former Bayshore Railyard, Brisbane, California	**BORING NO.**	RRG-8
BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 3-31-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	3-31-03	5 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Medium dense to firm, brown to very dark brown, silty very fine sand to fine sandy silt with abundant rock fragments, rootlets and pieces of wood debris, damp **(Fill)** - lenses of black fine sand in Sample 1 - fragments of concrete debris		1) 2"	19/3"	98	13	----	
	5	2) 2"	9	---	12	----	
Firm, olive grey, sand and silt with abundant rock and concrete fragments, wet **(Fill)** - heavy seepage at 5 feet							
	10						
Loose, very dark grey to black, very clayey and silty fine sand with abundant shell fragments, very moist to wet **(Sand)**		3) 2"	1/18"	86	35	500	
	15						
Loose, very dark grey, silty fine sand with minor shells, very moist to wet **(Sand)**		4) 2.5"	17	101	20	4320	
Medium dense, mottled olive and strong brown, clayey silty fine sand with dark yellowish brown mottling, minor decomposing rootlets and organics, very moist to wet **(Sand)**	20	5) 2.5"	41	106	17	2390	
		6) spt*	46	121	17	----	
Dense, olive brown and dark yellowish brown, slightly clayey silty fine sand, very moist to wet **(Sand)**	25						
Boring terminated at 23 feet							
* spt denotes Standard Penetration Test	30						
	35						

Job No. **03-3324** | **Michelucci & Associates, Inc.** | Figure **13**

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-9

BORING SUPERVISOR	TYPE OF BORING	DATE OF BORING
HAMMER WEIGHT		
SURFACE ELEVATION ---		
GROUNDWATER DEPTH		

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
	5							
	10							
	15							
	20							
	25							
	30							
	35							

BORING ELIMINATED

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-10

BORING SUPERVISOR DK/JP	TYPE OF BORING 8" Hollow Stem Auger	DATE OF BORING 4-2-03
HAMMER WEIGHT 140 lb. Automatic Hammer		
SURFACE ELEVATION ---		
GROUNDWATER DEPTH 4-2-03, 7 feet		

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, olive grey to grey, sandy clayey silt with gravel, rock fragments and minor rootlets, damp **(Fill)**		1) 2"	21	---	3	----	
Medium dense, olive brown to brown, silty clayey fine sand with abundant rock fragments and pieces of debris (brick, concrete, etc.), damp **(Fill)**	5	2) 2"	12	72	51	540	
Firm, very dark brown to black, sandy silt with gravel, moist **(Fill)** - glass fragments at the bottom of Sample 1	10	3) 2.5"	2	49	75	620	**PI (Fig. 18)**
Soft, mottled dark grey, silty clay, moist to very moist **(Bay Mud)** - increase in moisture content at 7 feet - grades to very dark grey at 15 feet - minor shell fragments in Sample 4 - grades to dark grey at 20 feet - dark brown decomposing organics in Sample 6	15	4) 2.5"	1/18"	48	82	550	
Stiff, greenish grey, sandy silty clay with minor olive brown mottling and minor rock fragments, damp to moist **(Older Bay Mud)**	20	5) 2.5"	2/18"	46	86	840	**Consolidation (Fig. 22)**
Very stiff, olive brown to olive grey, silty clay with minor yellowish brown fine sand and strong brown mottling and scattered rock fragments, damp to moist **(Probable Colluvium)**	25	6) 2.5"	5	40	103	950	
Boring terminated at 33 feet	30	7) 2"	35	113	19	4490	
* spt denotes Standard Penetration Test		8) spt*	33	106	21	----	
	35						

Job No. **03-3324** | **Michelucci & Associates, Inc.** | Figure **15**

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-11

BORING SUPERVISOR	DK/JP
HAMMER WEIGHT	140 lb. Automatic Hammer
SURFACE ELEVATION	---
GROUNDWATER DEPTH	4-1-03 / 2 feet 6 inches
TYPE OF BORING	8" Hollow Stem Auger
DATE OF BORING	4-1-03

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Medium dense to firm, brown, slightly clayey silty fine sand to fine sandy silt with abundant rock fragments, damp **(Fill)**		1) 2"	16	130	10	1210	
Loose, mottled greyish brown, silty sand with rock fragments, very moist to wet **(Fill)** - seepage at 2 feet 6 inches - sand grades coarser in Sample 2 and increase in rock fragment content - brick fragments also present in Sample 2	5	2) 2"	3	---	14	----	
Very soft, very dark grey, silty clay, very moist to wet **(Bay Mud)** - abundant shell fragments in Sample 4	10	3) 2"	1/18"	62	65	550	
	15	4) 2.5"	1/18"	62	62	440	
	20	5) 2.5"	1/18"	54	69	1000	**Consolidation (Fig. 23)**
	25	6) 2.5"	2	54	71	370	
- minor shell fragments in Samples 6 to 8	30	7) 2.5"	3	52	74	430	**PI (Fig. 18)**
	35						

Boring continued on Figure 16A

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-11 (cont'd)

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 4-1-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	4-1-03	2 feet 6 inches	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER- SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
- Continued from Figure 16		8) 2.5"	3	54	68	370	
- minor orange brown mottling in Sample 9	40	9) 2.5"	6	58	64	390	**Consolidation (Fig. 24)**
- grades to dark greyish brown in color and sandier within top of Sample 12	45	10) 2"	4	59	67	740	
Medium dense, mottled very dark grey with olive grey, clayey silty fine sand, moist to very moist **(Sand)**	50	11) 2.5"	8	56	64	630	
Dense, greyish brown to olive brown, slightly silty fine sand, moist **(Sand)** - sand grades coarser with depth	55	12) 2.5"	6	111	18	470	
Stiff to very stiff, very dark greyish brown, fine sandy clayey silt, moist **(Older Bay Mud)** - dark greyish brown sand lens from 66 feet 6 inches to 67 feet 6 inches	60	13) 2.5"	53	108	16	790	
Boring terminated at 68 feet	65	14) 2"	17	102	26	1920	
		15) 2"	31	102	26	950	
	70						

PROJECT	Former Bayshore Railyard, Brisbane, California	BORING NO. RRG-12

BORING SUPERVISOR	DK/JP	TYPE OF BORING: 8" Hollow Stem Auger	DATE OF BORING: 4-1-03
HAMMER WEIGHT	140 lb. Automatic Hammer		
SURFACE ELEVATION	---		
GROUNDWATER DEPTH	4-1-03	5 feet	

DESCRIPTION OF MATERIALS	DEPTH IN FT.	SAMPLE NUMBER-SAMPLE DIAMETER	DRIVING RESISTANCE BLOWS PER FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT %	UNCONFINED COMPRESSIVE STRENGTH P.S.F.	OTHER TESTS
Firm, olive brown, fine sandy clayey silt with abundant rock fragments, damp **(Fill)**		1) 2"	42	---	3	----	
Firm, dark greyish brown to olive brown, sandy silty clay to clayey silt with abundant rock fragments, moist **(Fill)** - heavy seepage at 5 feet - abundant rock fragments between 7 feet and 11 feet	5	2) 2"	17	---	18	----	
Firm, mottled dark grey, silty clay with rock fragments, moist to wet **(Fill)**	10	3) 2"	20	---	10	----	
Soft, very dark grey, silty clay with minor decaying organics, wet **(Bay Mud)**	15	4) 2"	28	100	27	----	
Very soft, very dark grey, silty clay with minor sand, very moist to wet **(Older Bay Mud)** - grades sandier with depth - grades into dark grey silty clayey fine sand with minor shells and decaying brown organics at 26 feet	20	5) 2.5"	19	74	41	330	
Very dense, greenish grey to olive grey, silty fine sand, moist to wet **(Sand)** - grades to yellowish brown to olive brown in color	25	6) 2.5"	2/18"	63	56	1150	
Very dense, yellowish brown, deeply weathered siltstone with grey clayey veins, damp **(Weathered Bedrock)**	30	7) 2.5"	81	99	23	320	
Boring terminated at 33 feet 1 inch		8) 2"	50/4"	121	14	6370	
		9) spt*	50/3"	---	--	----	
* spt denotes Standard Penetration Test	35						

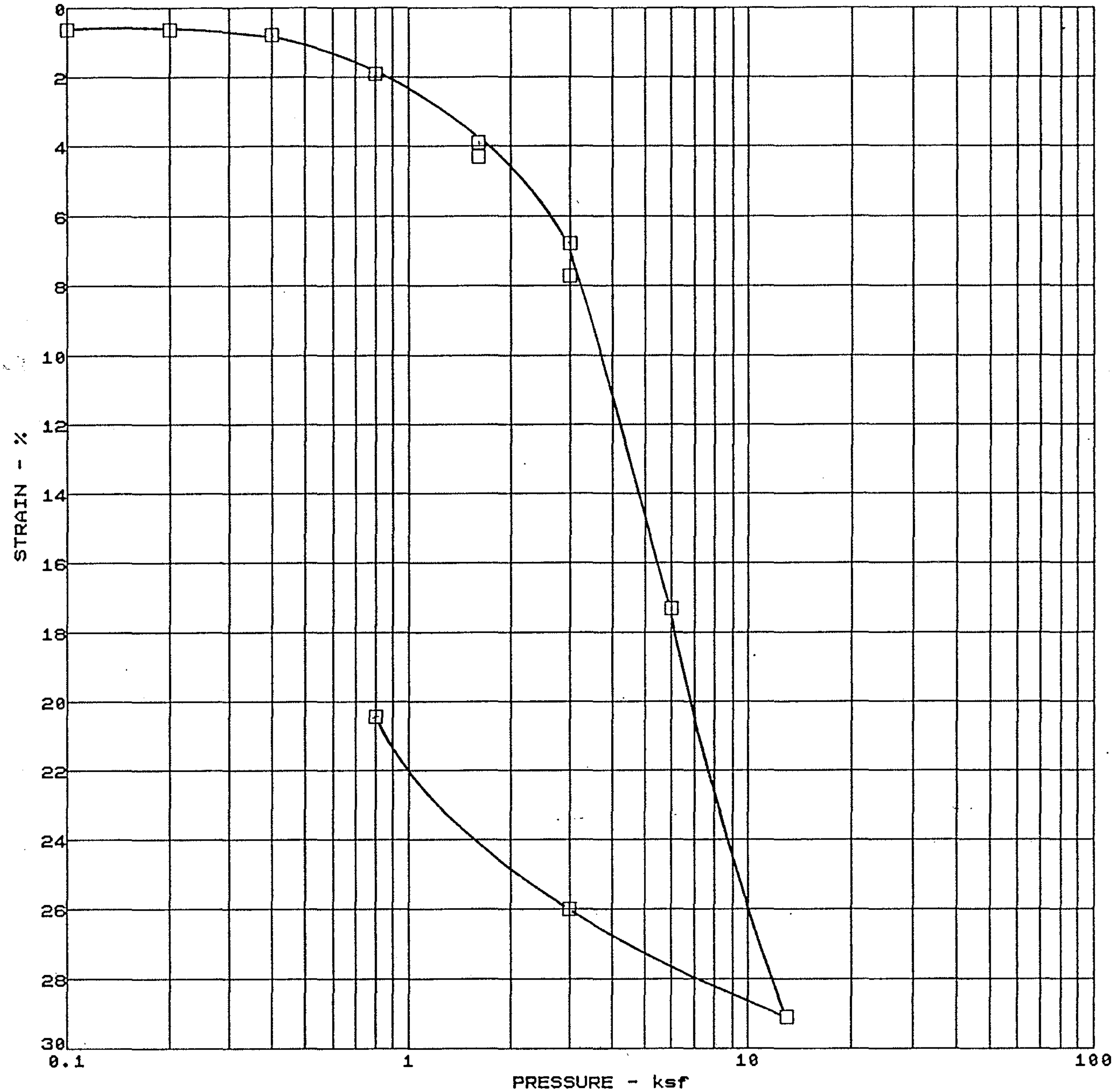
Job No. 03-3324

Michelucci & Associates, Inc.

Figure 17

APPENDIX E

PREVIOUS LABORATORY TEST DATA



BORING NO. B-8

DEPTH 60.0 ft

DESCRIPTION Dark blue-grey CLAYEY SILT (MH-CH) - BAY MUD

PRECONSOLIDATION PRESSURE ______ ksf

COMPRESSION RATIO= C_c /1+e_o ______

RECOMPRESSION RATIO= C_r /1+e_o ______

LL = 102 PL = 43

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	48.5	60.9
WATER CONTENT, %	89.9	68.7
VOID RATIO	2.809	2.034
DEG. OF SAT., %	94.7	100.0
SAMPLE HEIGHT, in.	0.770	0.610

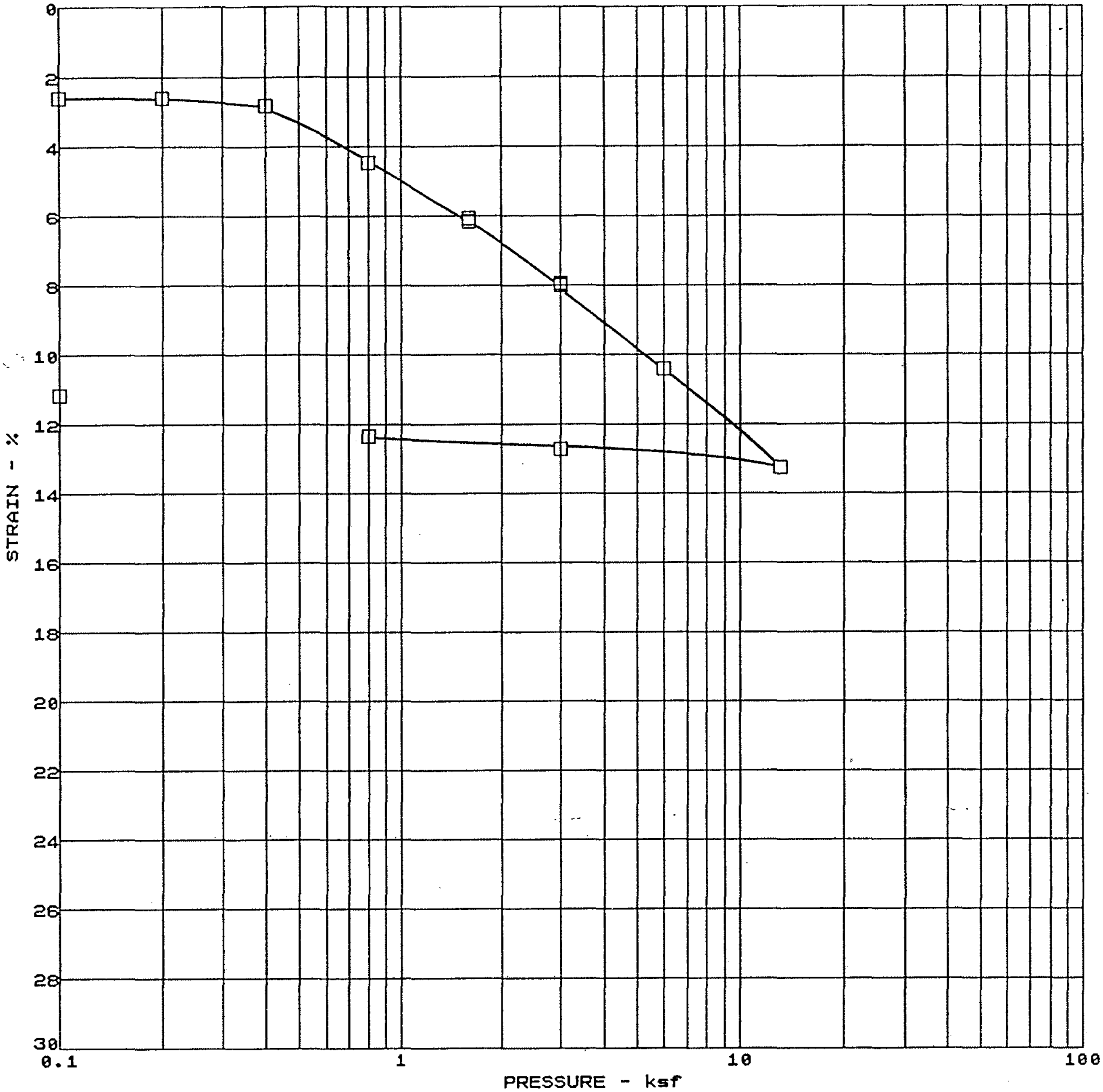
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

CONSOLIDATION TEST

PLATE C-2



BORING NO. B-11
DEPTH 50.0 ft
DESCRIPTION Dark grey SILTY CLAY (CH) - BAY MUD
PRECONSOLIDATION PRESSURE ______ ksf
COMPRESSION RATIO= C_c /1+e_0 ______
RECOMPRESSION RATIO= C_r /1+e_0 ______
LL = ______ PL = ______

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	84.8	95.1
WATER CONTENT, %	33.7	27.2
VOID RATIO	0.966	0.753
DEG. OF SAT., %	93.2	96.5
SAMPLE HEIGHT, in.	0.770	0.684

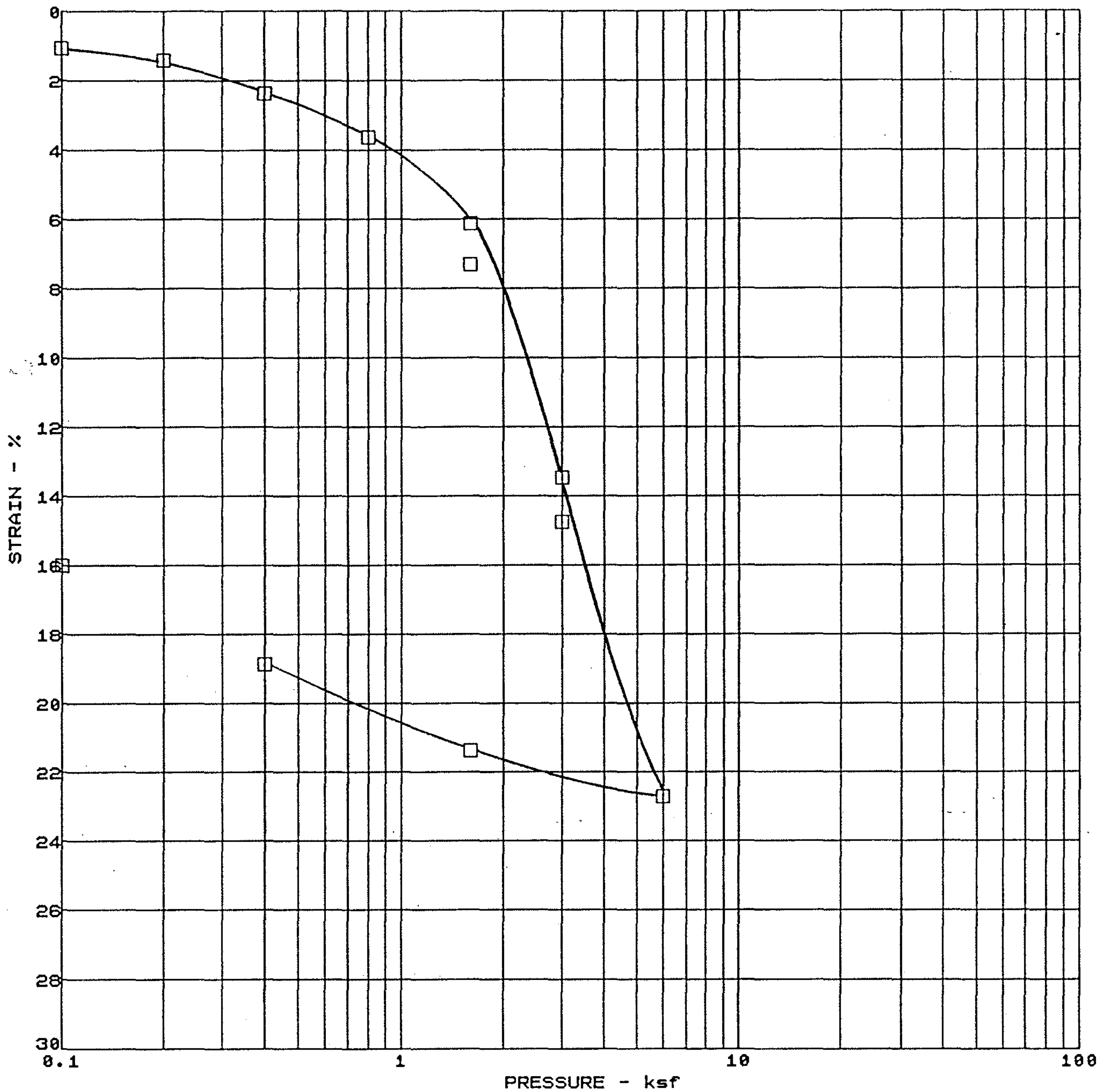
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

CONSOLIDATION TEST

PLATE C-3



BORING NO. B-12

DEPTH 20.0 ft

DESCRIPTION Dark grey SILTY CLAY (CH) - BAY MUD

PRECONSOLIDATION PRESSURE ______ ksf

COMPRESSION RATIO= C_c /1+e_0 ______

RECOMPRESSION RATIO= C_r /1+e_0 ______

LL = ______ PL = ______

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	51.9	61.4
WATER CONTENT, %	82.5	66.3
VOID RATIO	2.398	1.872
DEG. OF SAT., %	97.2	100.0
SAMPLE HEIGHT, in.	0.750	0.630

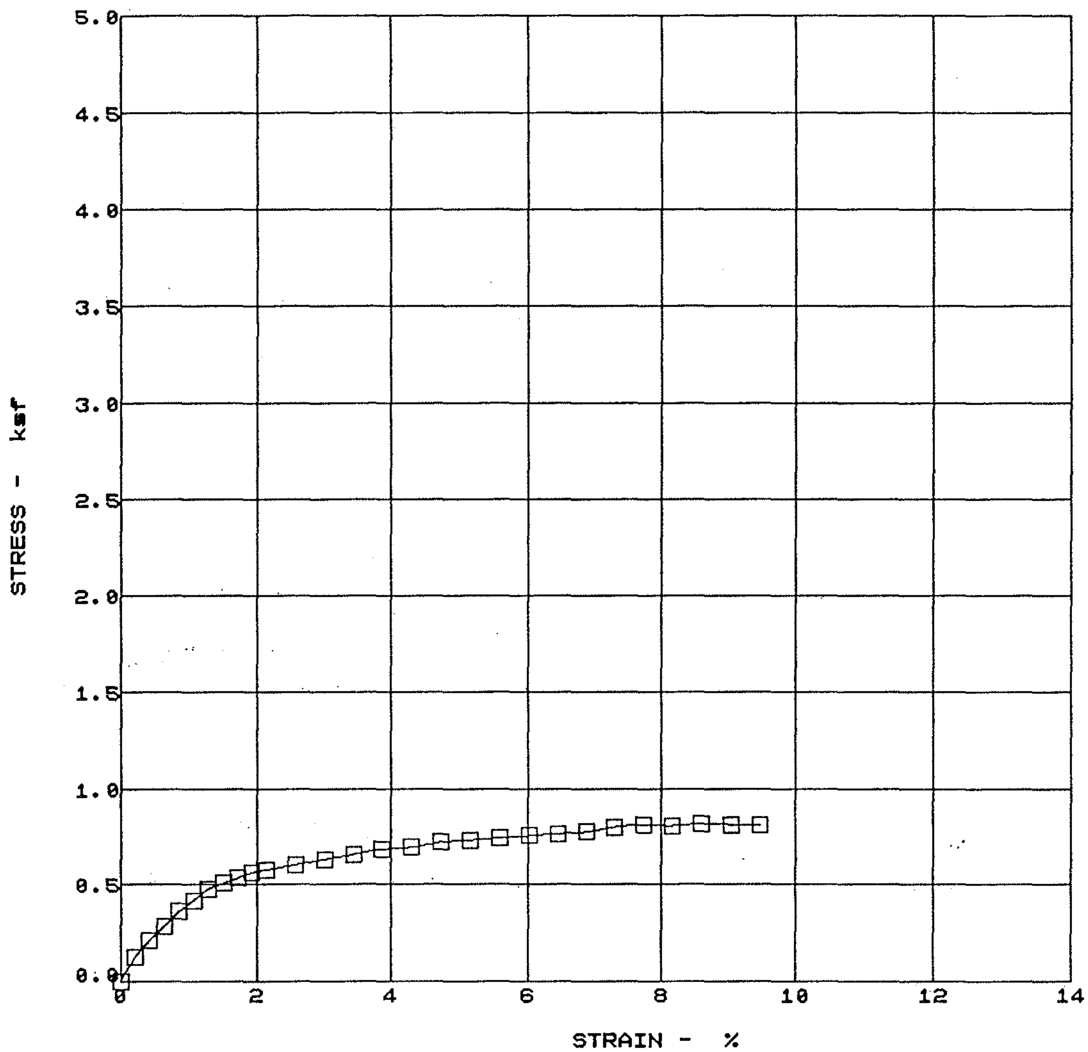
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

CONSOLIDATION TEST

PLATE C-4



BORING NO. B-6
DEPTH - ft 80.0
SOIL DESCRIPTION Dark grey SILTY CLAY (CL-ML), trace sand

DRY DENSITY - pcf 96
WATER CONTENT - % 28

MAX. UC STRENGTH= 0.8 ksf AT 8.6 % STRAIN

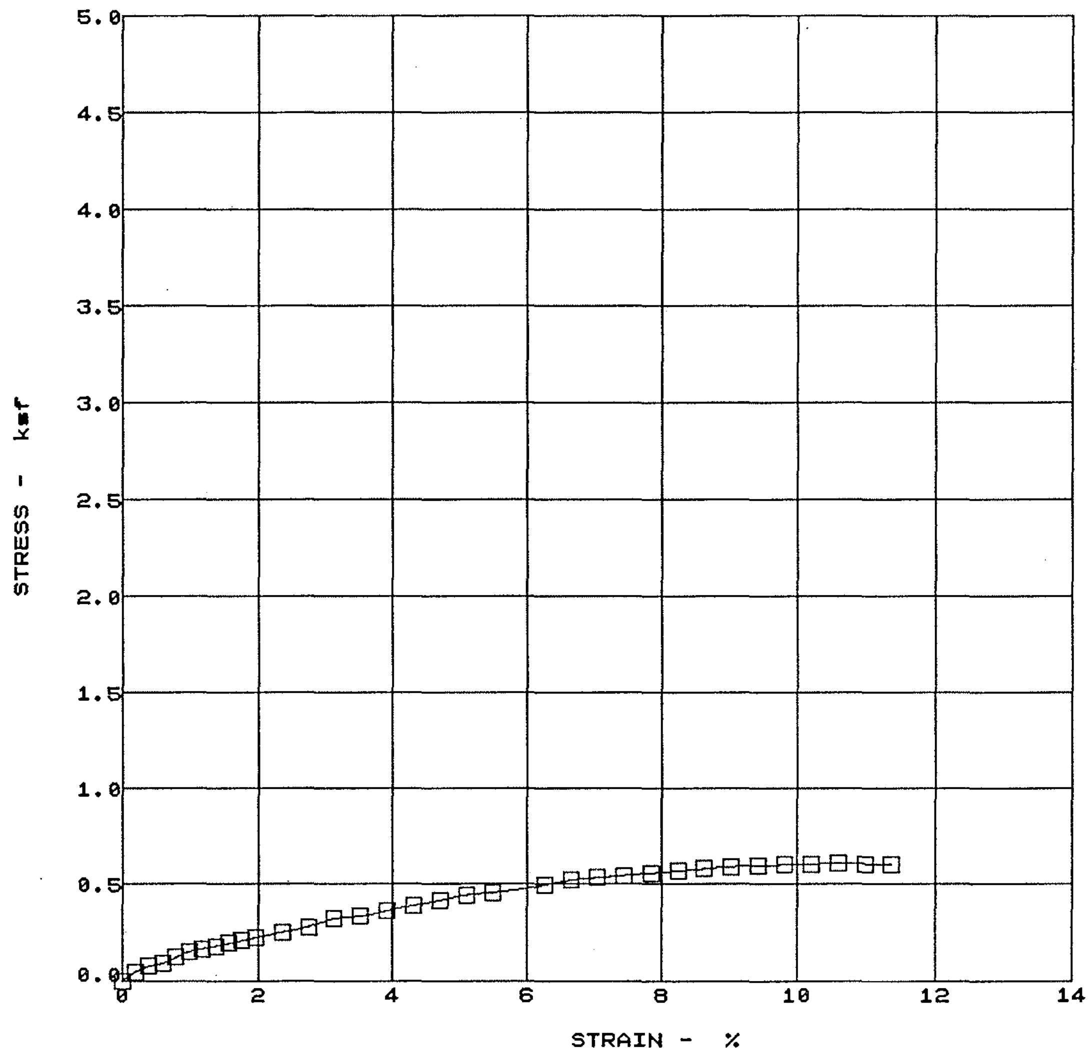
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

UNCONFINED COMPRESSION TEST

PLATE C-5



BORING NO. B-7

DEPTH - ft 0.0

SOIL DESCRIPTION Medium blue-grey SILTY CLAY (CH) - BAY MUD

DRY DENSITY - pcf 99

WATER CONTENT - % 0

MAX. UC STRENGTH= 0.6 ksf AT 10.6 % STRAIN

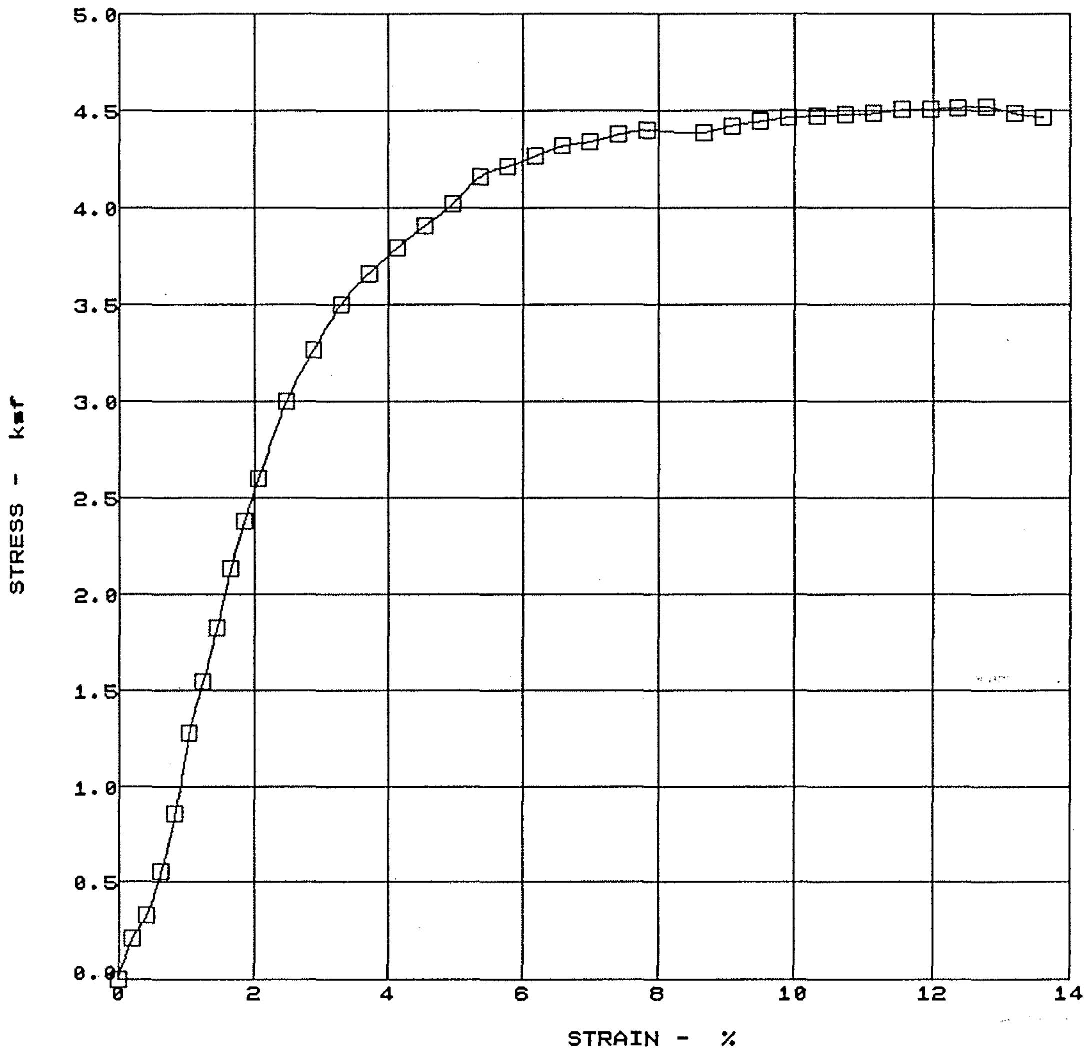
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

UNCONFINED COMPRESSION TEST

PLATE C-6



BORING NO.	B-9	DRY DENSITY - pcf	104
DEPTH - ft	80.0	WATER CONTENT - %	22
SOIL DESCRIPTION	Blue-grey SILTY CLAY (CL-ML)		

MAX. UC STRENGTH= 4.5 ksf AT 12.8 % STRAIN

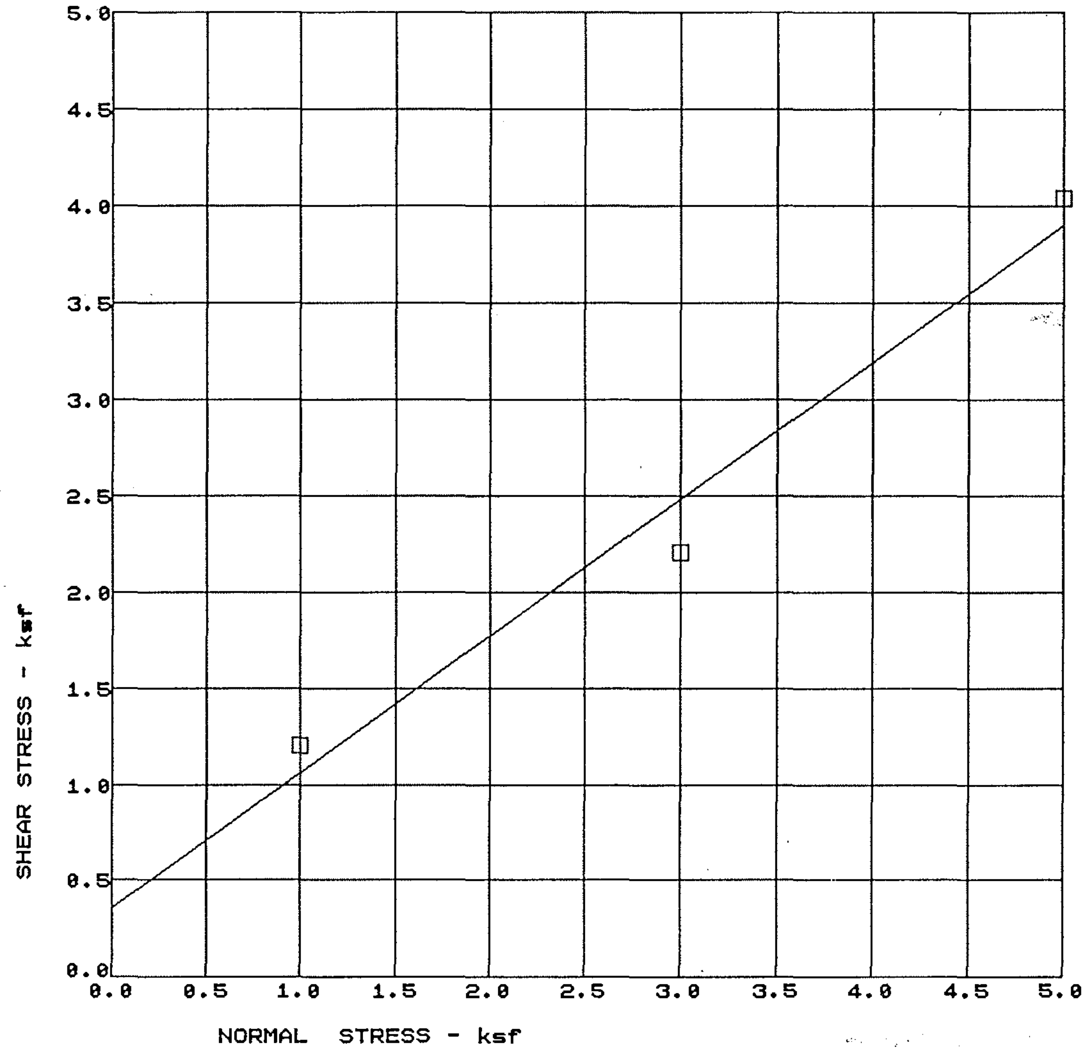
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

UNCONFINED COMPRESSION TEST

PLATE C-7



TEST TYPE: CU / RESIDUAL

RATE OF SHEAR - in/min 0.0048

DRY DENSITY - pcf	108.8	109.3	113.7
INITIAL WATER CONTENT - %	20.2	20.2	18.0
FINAL WATER CONTENT - %	18.2	18.5	16.0
NORMAL STRESS - psf	1000	3000	5000
MAXIMUM SHEAR - psf	1205	2201	4035

BORING NO: B-2
DEPTH: 60.0 ft
SILTY CLAYEY SAND (SC-CL)

FRICTION ANGLE = 35 deg.

COHESION= 0.36 ksf

KLEINFELDER

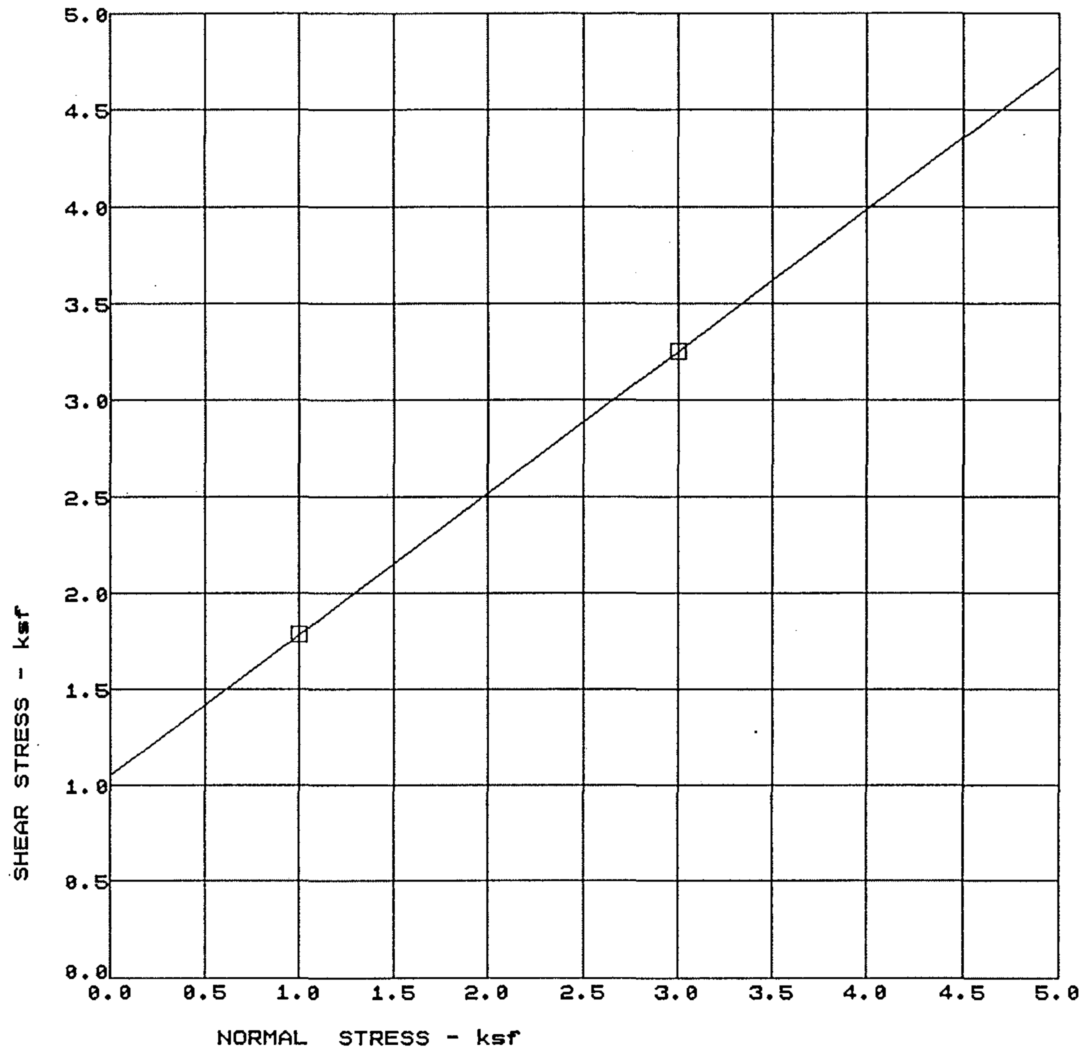
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-8



TEST TYPE: CU / STAGED

RATE OF SHEAR - in/min 0.0032

DRY DENSITY - pcf	105.0		
INITIAL WATER CONTENT - %	15.6		
FINAL WATER CONTENT - %	15.4		
NORMAL STRESS - psf	1000		3000
MAXIMUM SHEAR - psf	1781		3249

BORING NO: B-7
DEPTH: 1.0 ft
GRAVELLY SILT (ML)

FRICTION ANGLE = 36 deg.

COHESION= 1.05 ksf

KLEINFELDER

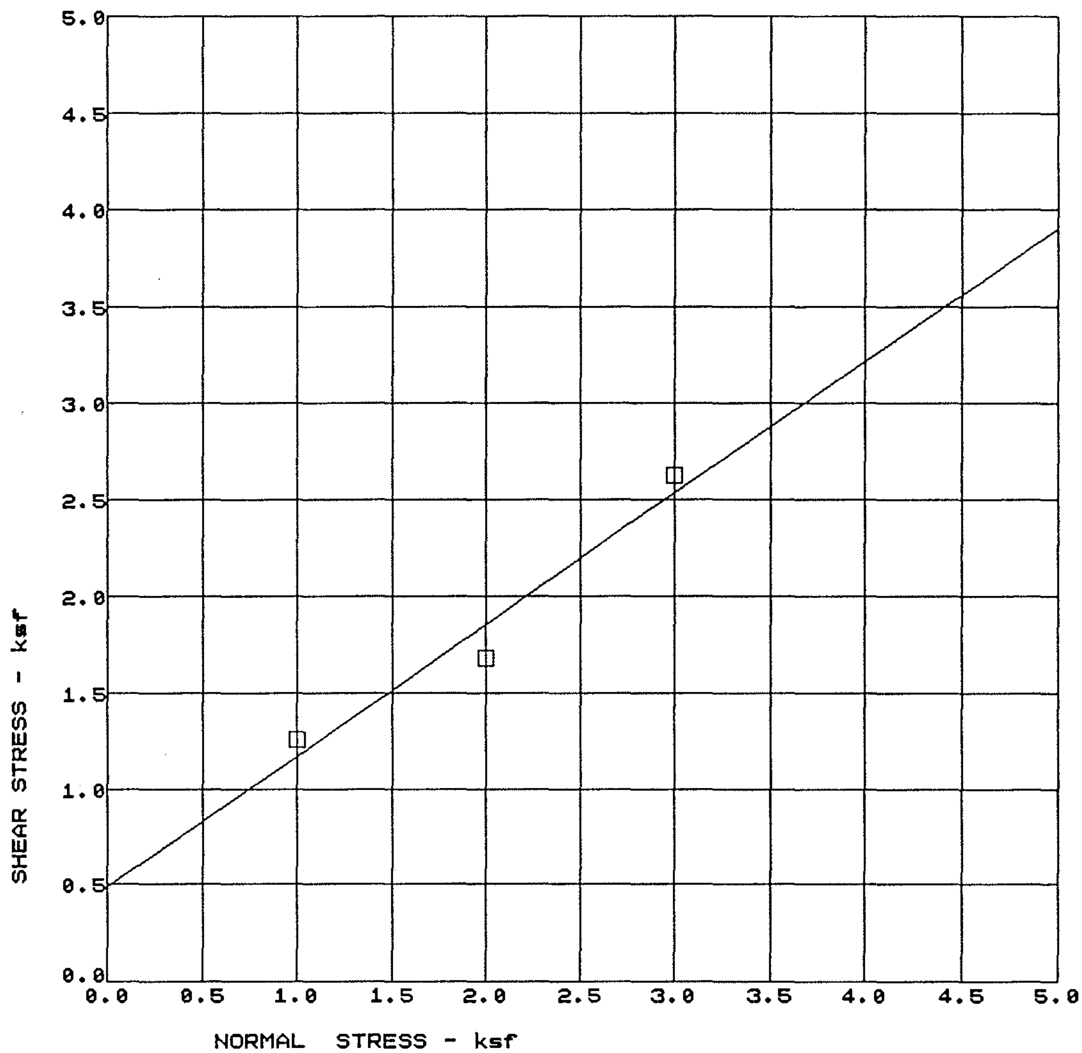
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-9



TEST TYPE: CU / RESIDUAL

RATE OF SHEAR - in/min 0.0048

DRY DENSITY - pcf	99.6	101.7	103.8
INITIAL WATER CONTENT - %	6.8	7.9	8.9
FINAL WATER CONTENT - %	5.6	7.0	8.9
NORMAL STRESS - psf	1000	2000	3000
MAXIMUM SHEAR - psf	1258	1677	2621

BORING NO: B-8
DEPTH: 1.0 ft
Brown SILTY SAND (SM)

FRICTION ANGLE = 34 deg.

COHESION= 0.49 ksf

KLEINFELDER

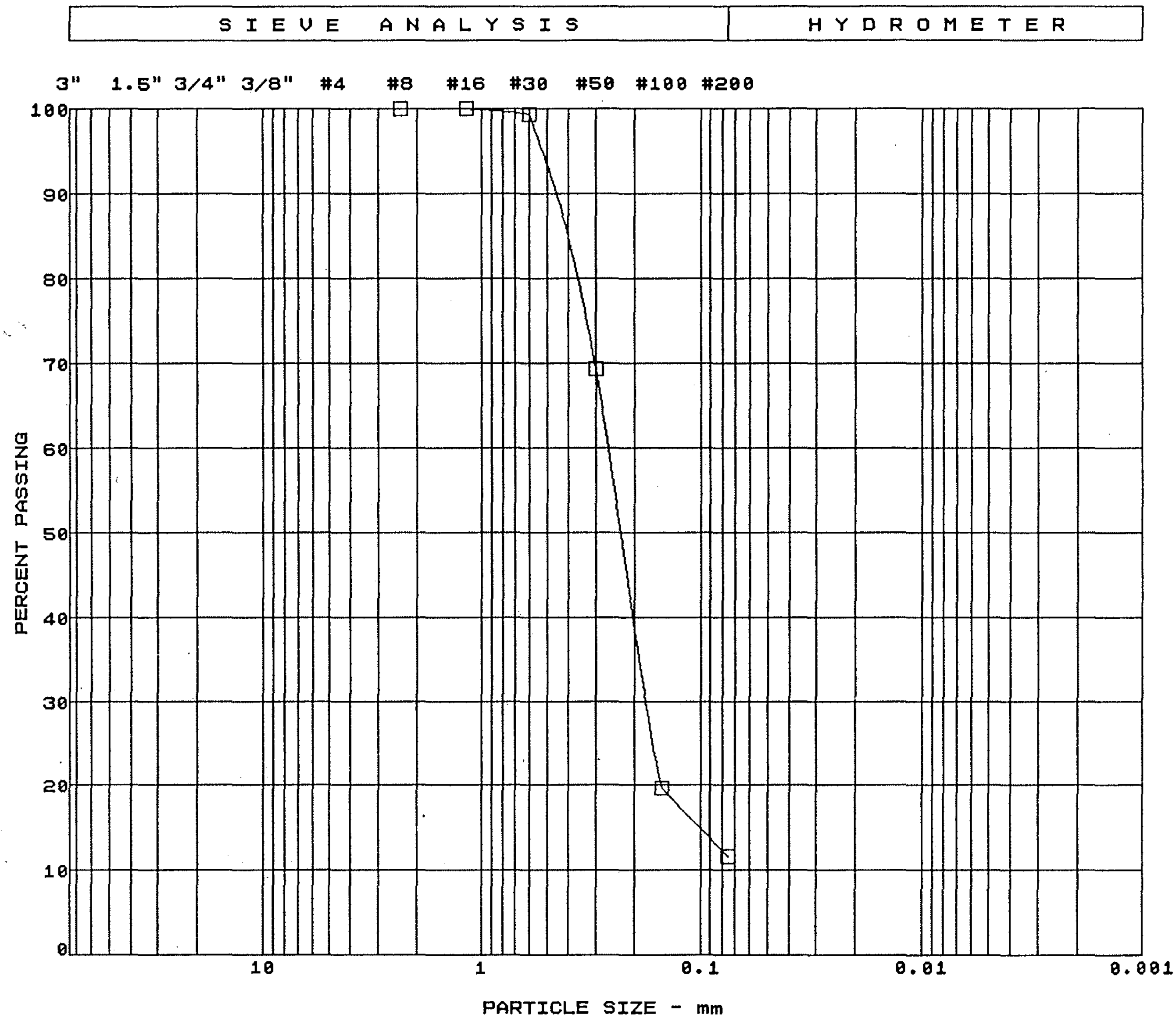
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-10



GRAVEL		SAND			FINES
coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION
□	B-7	55.00	Dark grey CLAYEY SAND (SC) - BAY MUD

KLEINFELDER

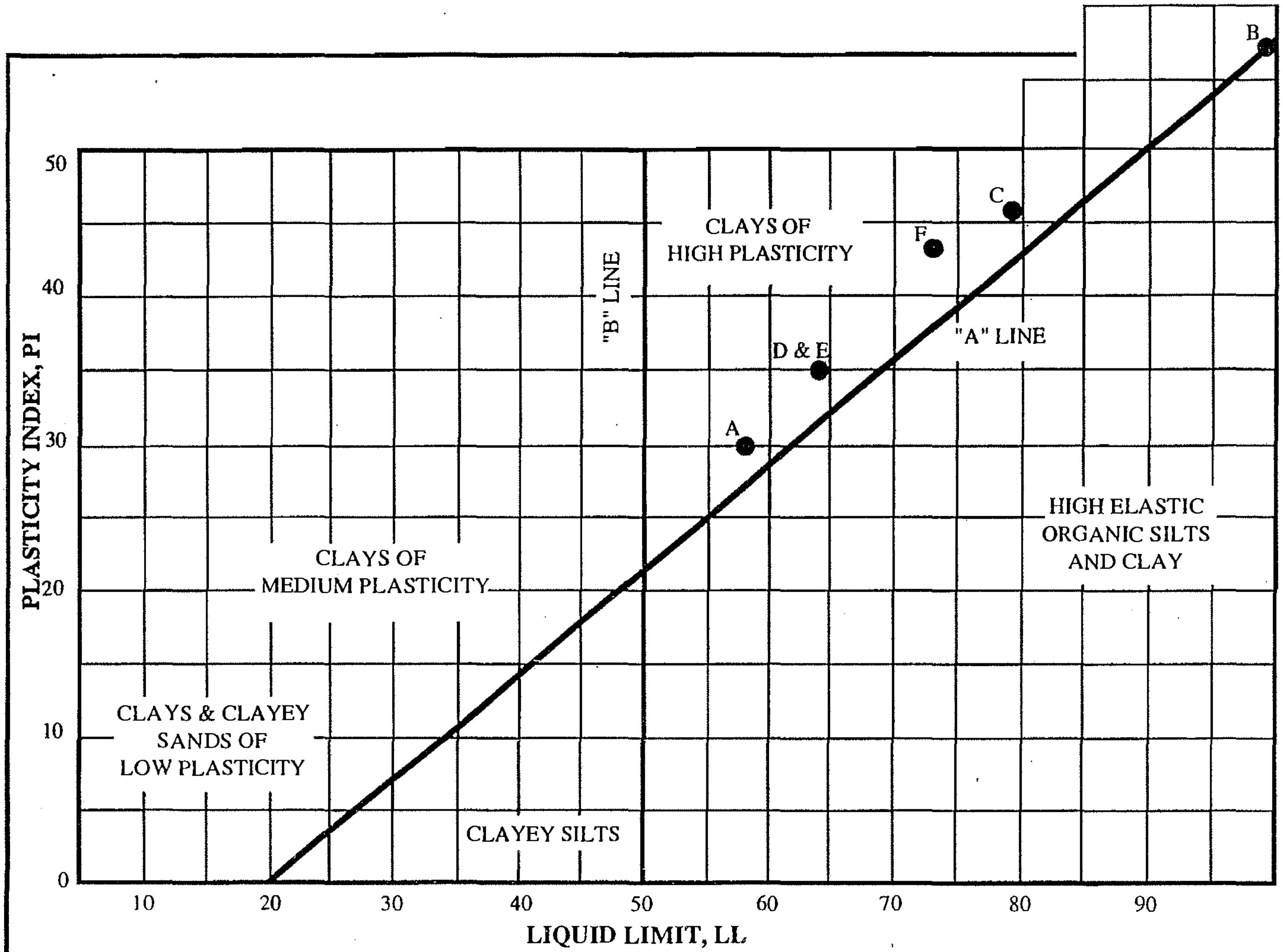
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

GRAIN SIZE DISTRIBUTION

PLATE

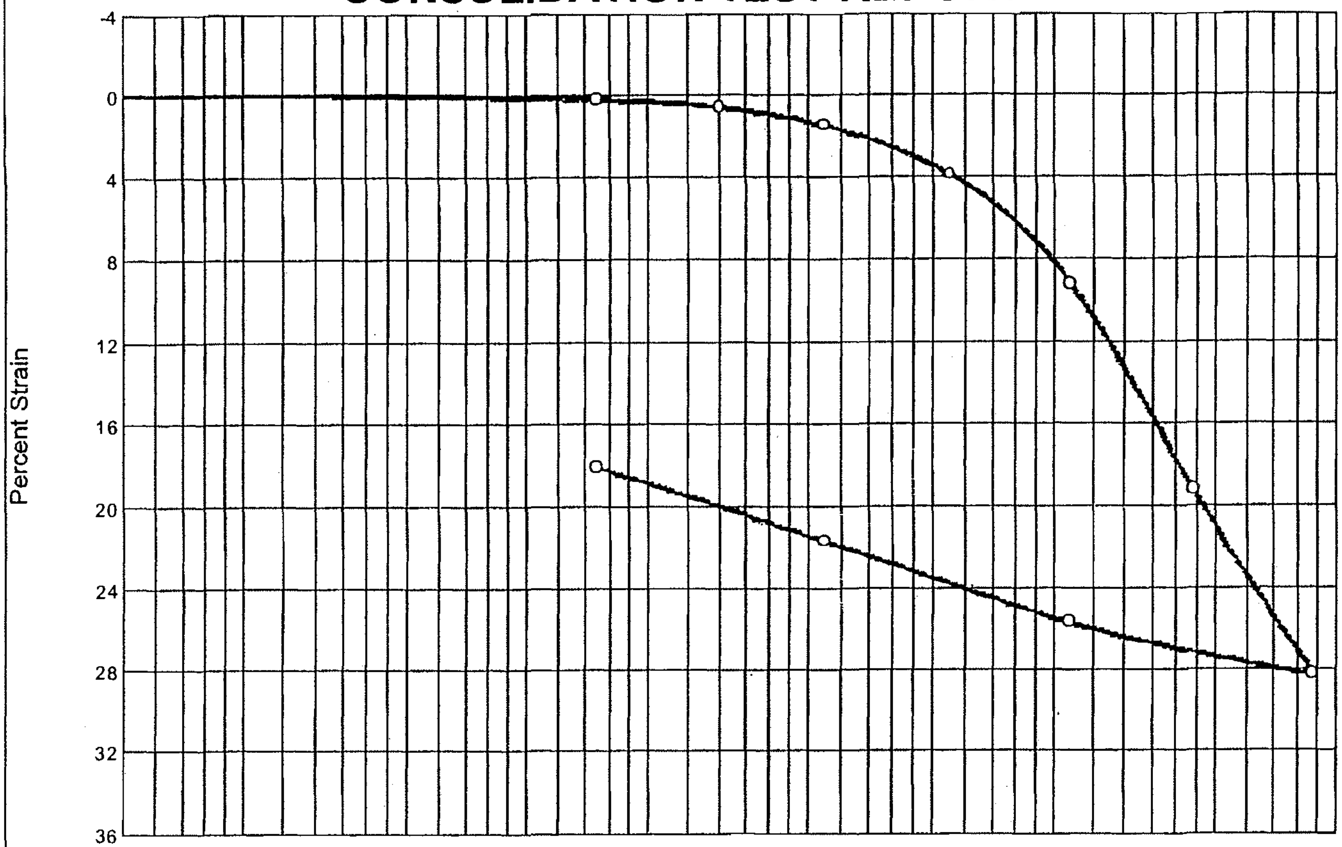
C-11

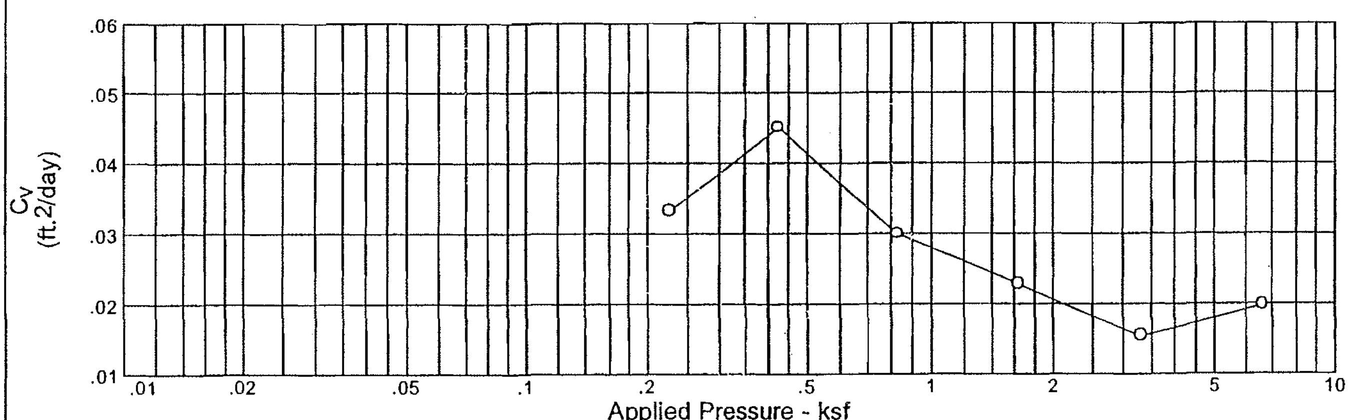


CLASSIFICATION TEST RESULTS										
SAMPLE IDENTIFICATION			ATTERBERG LIMITS			GRAIN SIZES % DRY WT.				
SAMPLE	LETTER DESIGNATION	DESCRIPTION	LIQUID LIMIT	PLASTICITY INDEX	SHRINKAGE LIMIT	SAND	SILT	CLAY	COLLOIDAL	
1-4	A	Dark grey silty clay	58	30	--	--	--	--	--	
2-5	B	Very dark grey silty clay	99	57	--	--	--	--	--	
3-4	C	Very dark grey silty clay	79	46	--	--	--	--	--	
4-4	D	Very dark grey silty clay	64	35	--	--	--	--	--	
10-3	E	Dark grey silty clay	64	35	--	--	--	--	--	
11-7	F	Dark grey silty clay	73	43	--	--	--	--	--	

PLASTICITY CLASSIFICATION

CONSOLIDATION TEST REPORT





Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
96.5 %	94.1 %	46.4			2.7			2.634

MATERIAL DESCRIPTION

gray CLAY

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 3-5-4

CONSOLIDATION TEST REPORT

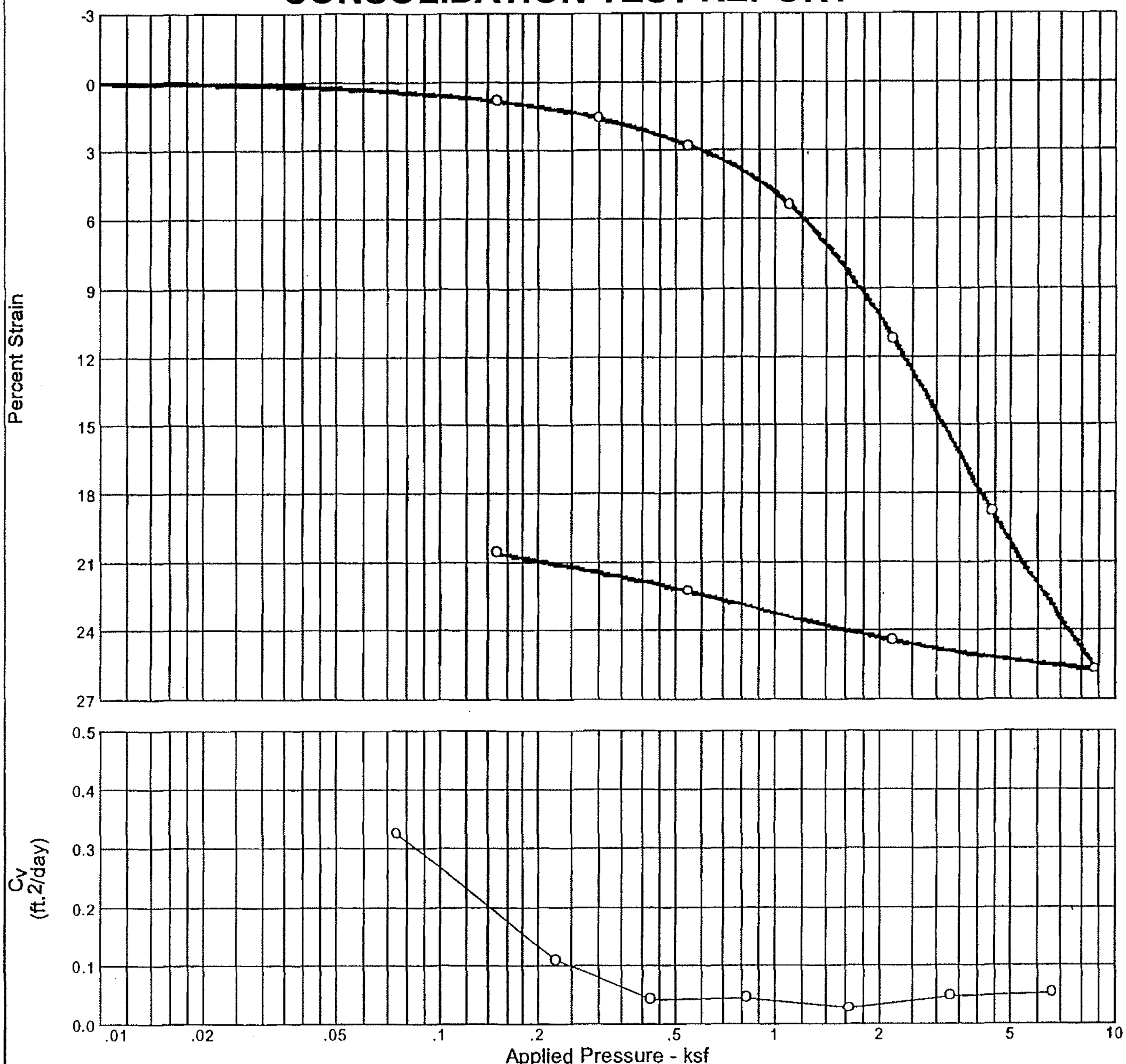
COOPER TESTING LABORATORY

Remarks:

Plate

Job No. 03-3324	Michelucci & Associates, Inc.	Figure 19

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
99.9 %	71.4 %	57.6			2.7			1.928

MATERIAL DESCRIPTION

gray CLAY, bay mud

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 4A-1-3

Remarks:

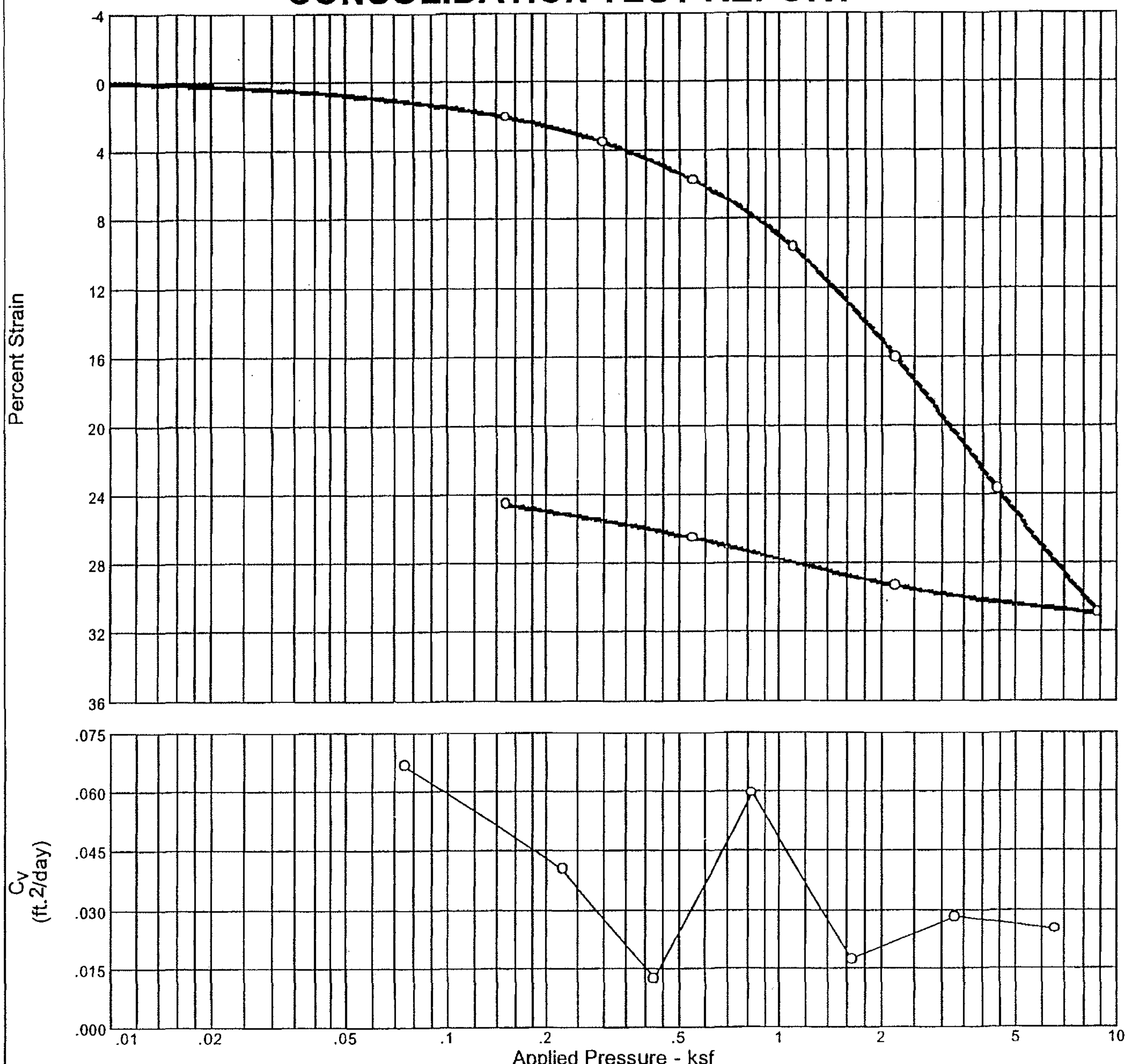
Sample disturbed. Sampled with mod Cal?

CONSOLIDATION TEST REPORT

COOPER TESTING LABORATORY

Plate

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.7 %	90.5 %	48.1			2.7			2.503

MATERIAL DESCRIPTION

gray CLAY, bay mud

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 7-4-3

Remarks:

Sample disturbed, taken with mod Cal?

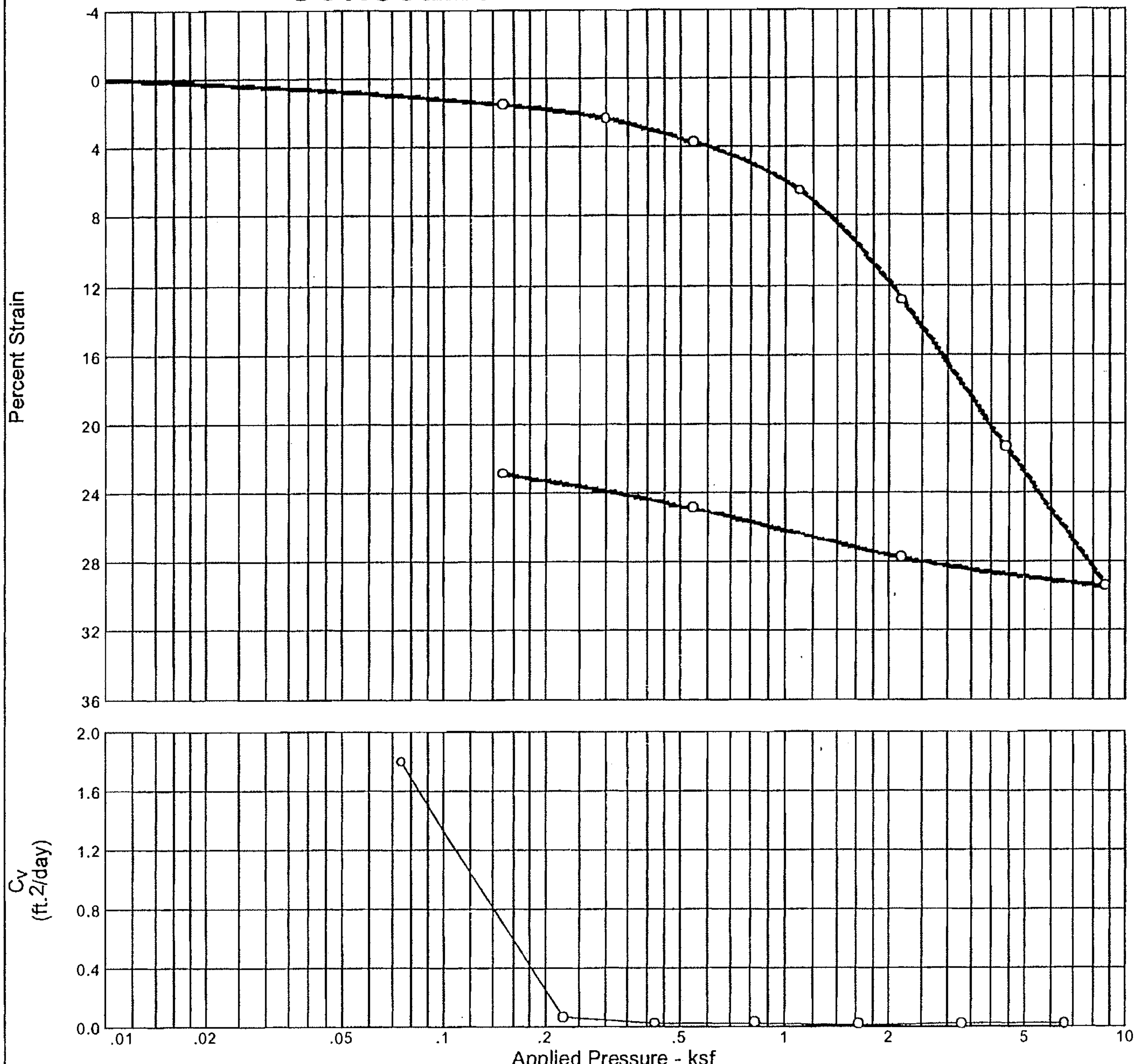
CONSOLIDATION TEST REPORT

COOPER TESTING LABORATORY

Plate

Job No. **03-3324** | Michelucci & Associates, Inc. | Figure **21**

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.9 %	89.4 %	48.6			2.7			2.467

MATERIAL DESCRIPTION
gray CLAY, bay mud

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 10-5-3

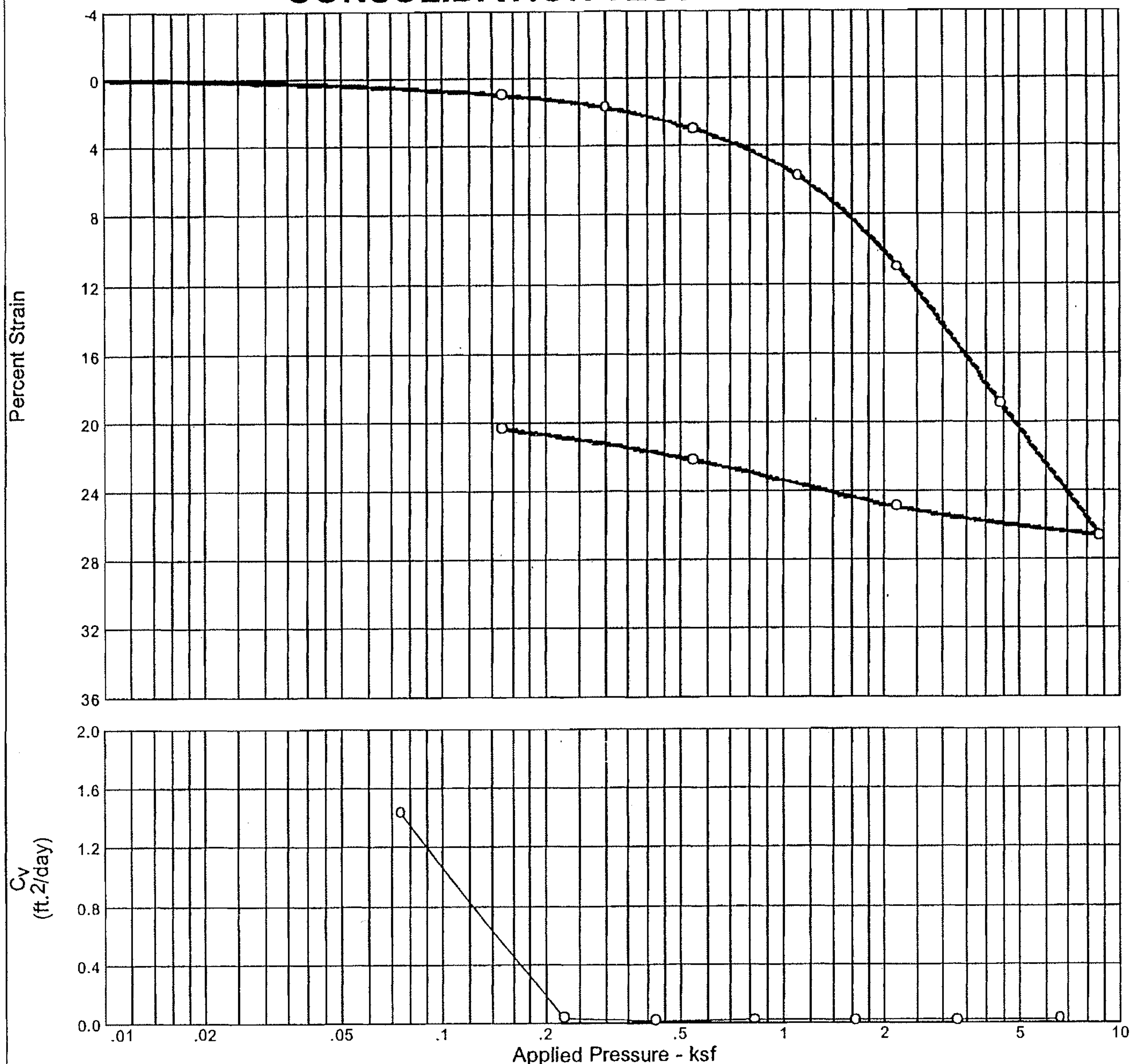
Remarks:
Sample disturbed, sampled with mod Cal sampler?

CONSOLIDATION TEST REPORT

COOPER TESTING LABORATORY

Plate

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.9 %	80.7 %	52.3			2.7			2.225

MATERIAL DESCRIPTION

gray CLAY

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 11-5-3

Remarks:
Sample disturbed, sampled with mod Cal sampler?

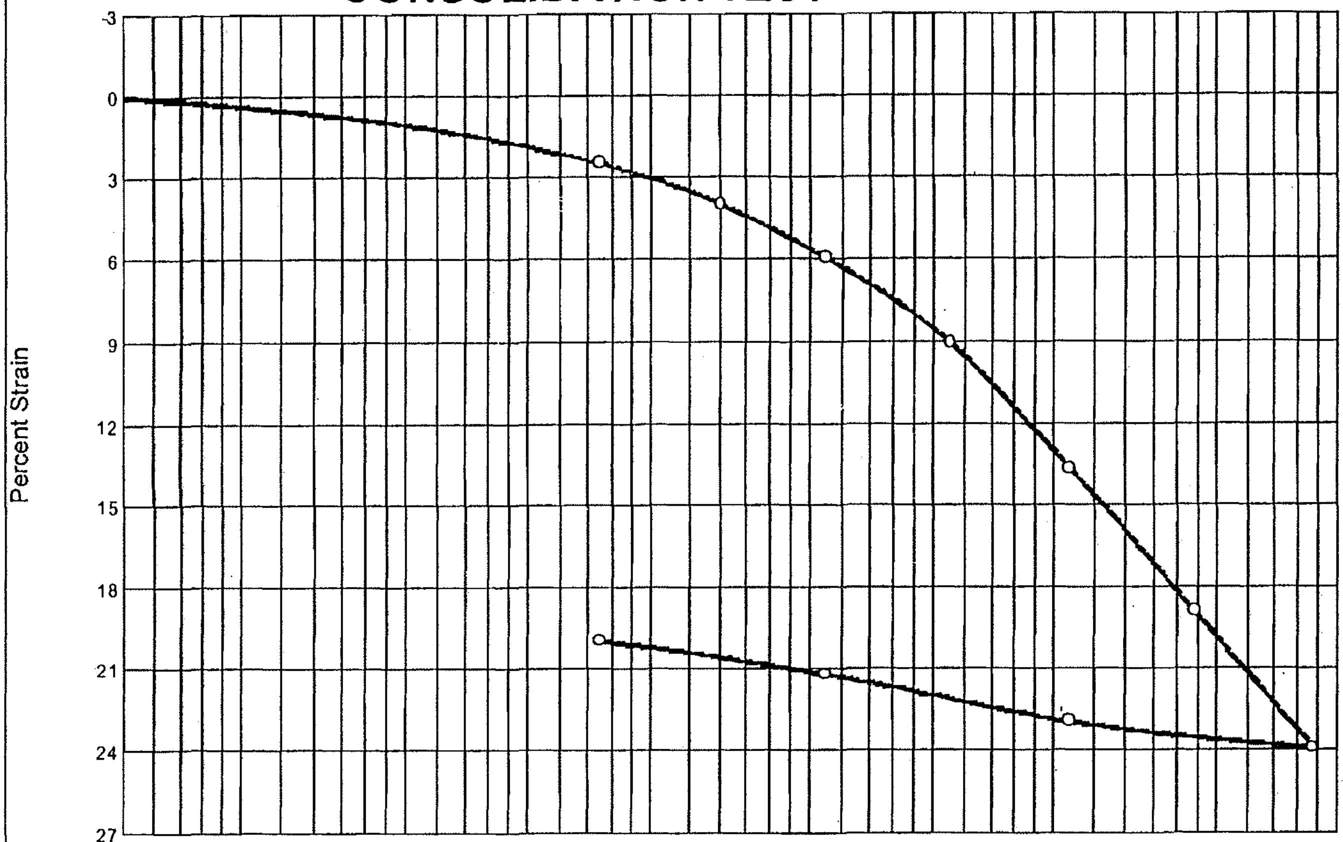
CONSOLIDATION TEST REPORT

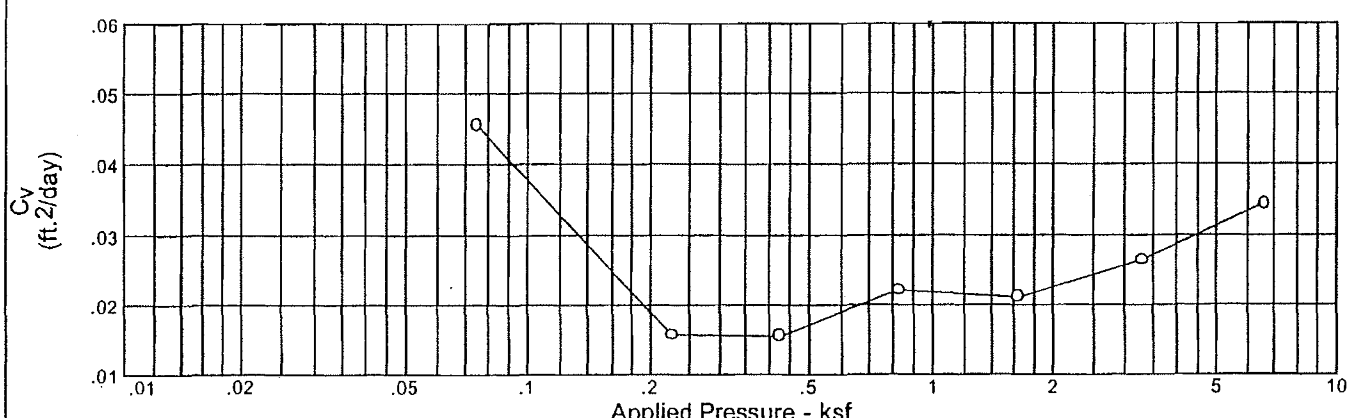
COOPER TESTING LABORATORY

Plate

Job No. **03-3324** | Michelucci & Associates, Inc. | Figure **23**

CONSOLIDATION TEST REPORT





Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
94.2 %	56.2 %	64.5			2.7			1.612

MATERIAL DESCRIPTION

gray CLAY, bay mud

Project No. 073-025 **Client:** Michelucci

Project: 03-3324

Source: 03-3324 **Sample No.:** 11-9-3

CONSOLIDATION TEST REPORT

COOPER TESTING LABORATORY

Remarks:

Sample disturbed, taken with mod Cal sampler? The sample may indicate underconsolidation due to disturbance.

Plate

APPENDIX F

LIQUEFACTION ANALYSIS

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

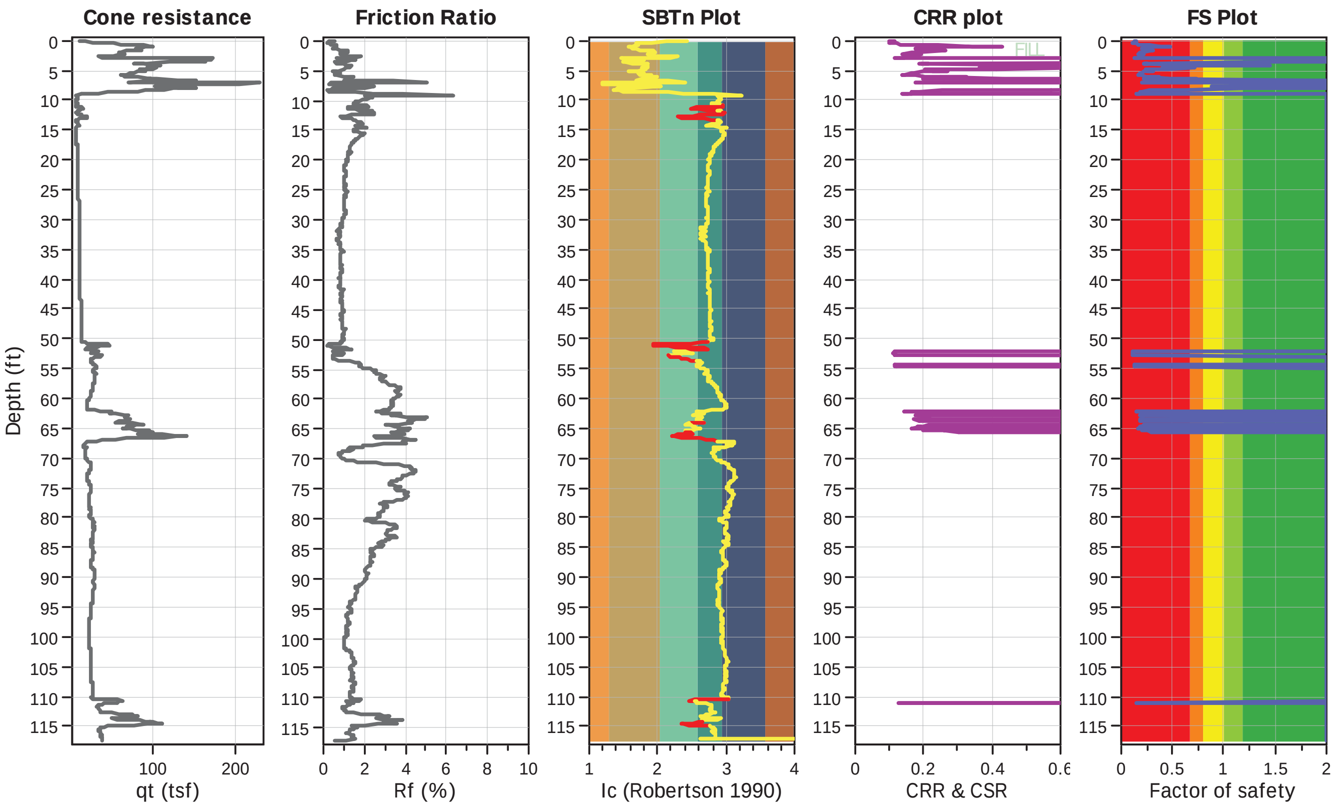
LIQUEFACTION ANALYSIS REPORT

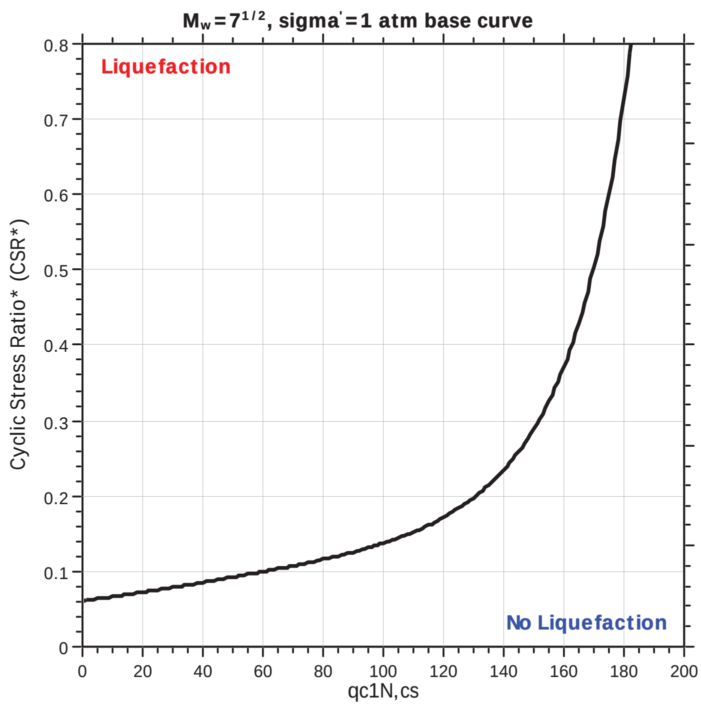
Project title : Baylands Railroad **Location : Brisbane, CA**

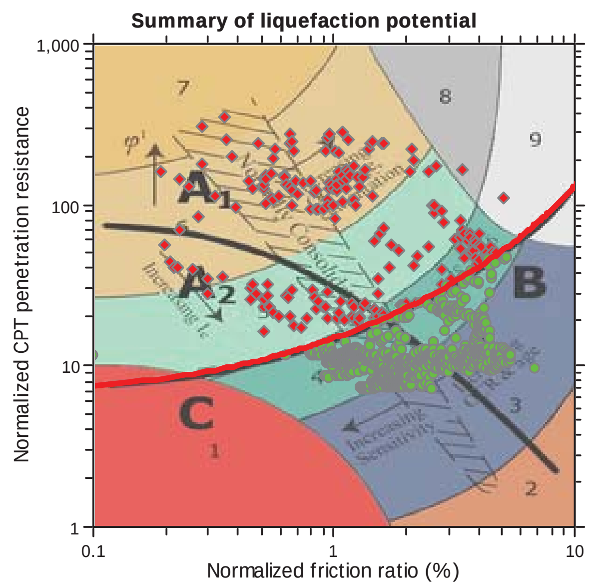
CPT file : 1-SCPT01

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

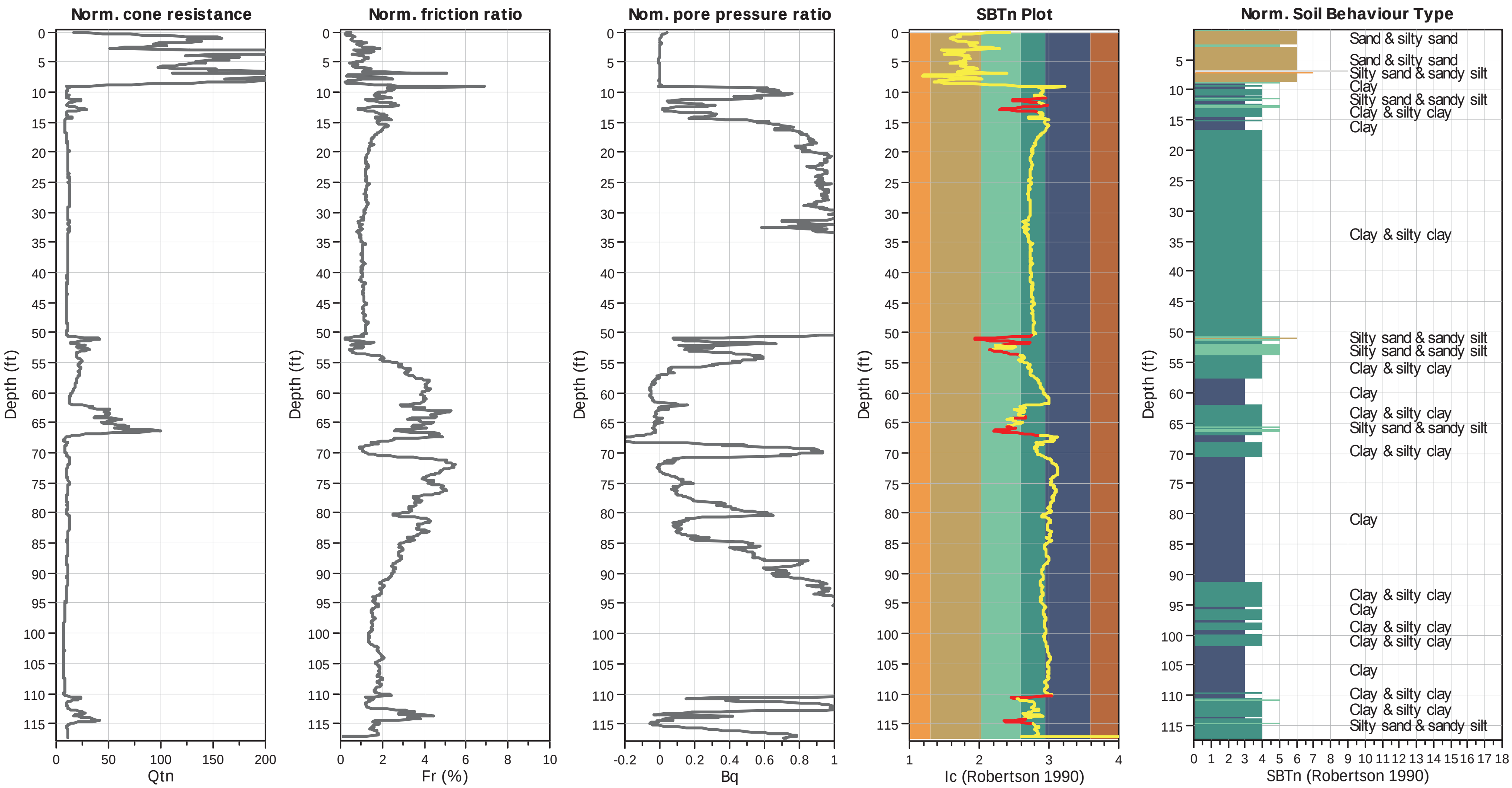






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



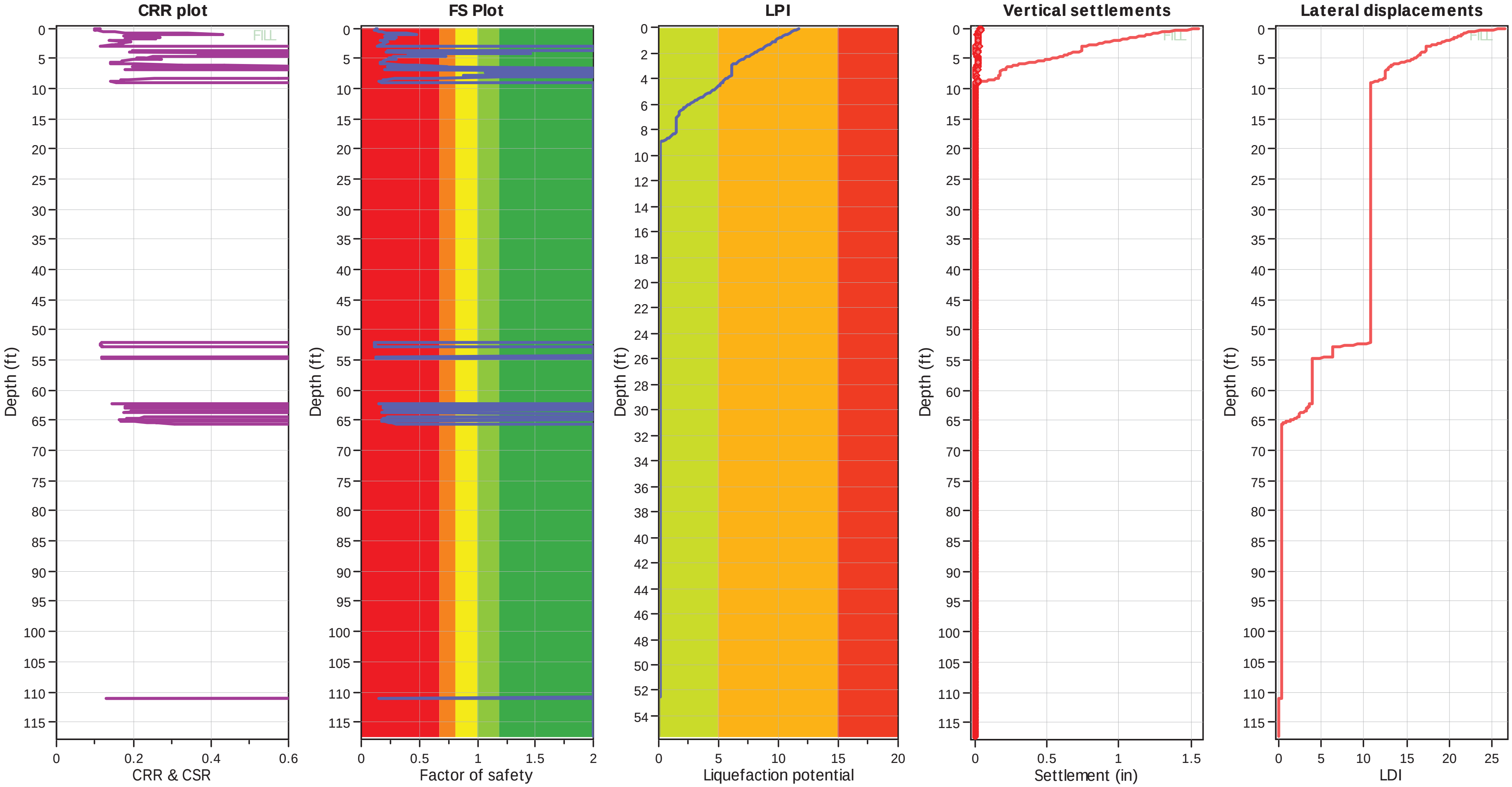
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

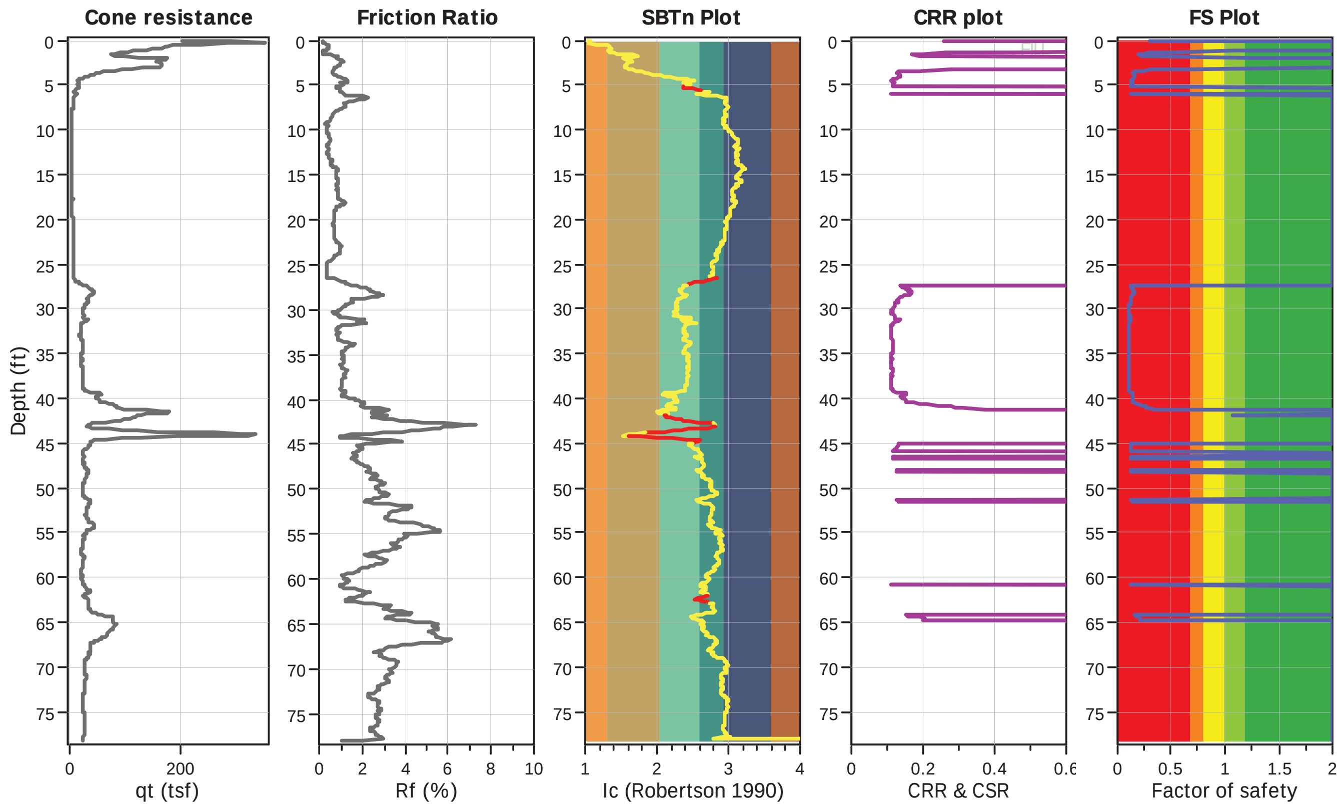
LIQUEFACTION ANALYSIS REPORT

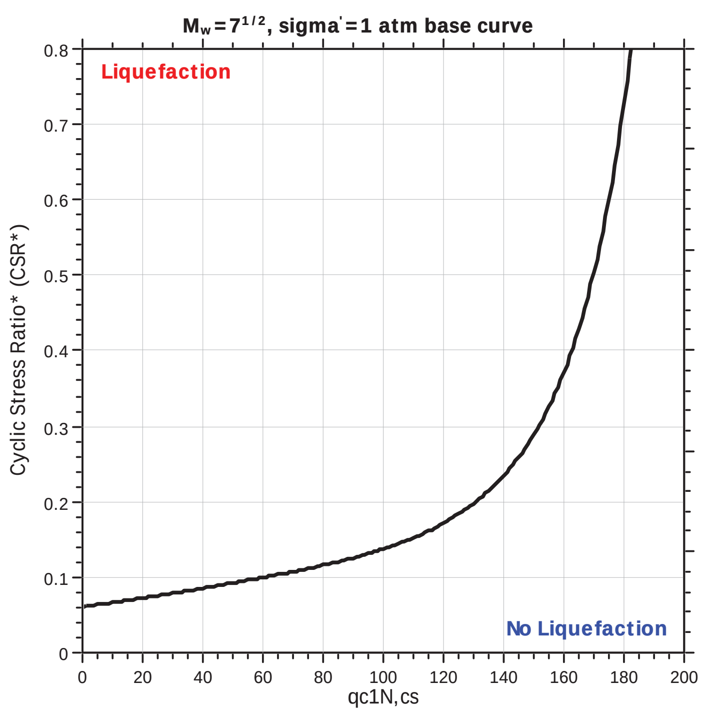
Project title : Baylands Railroad **Location : Brisbane, CA**

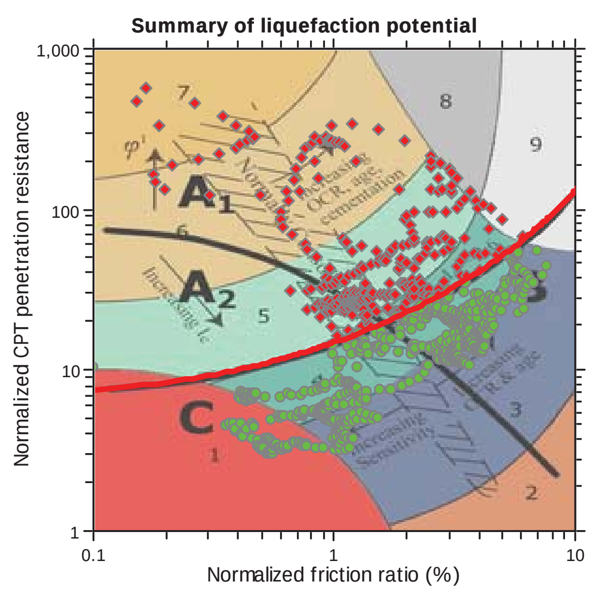
CPT file : 1-CPT02

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

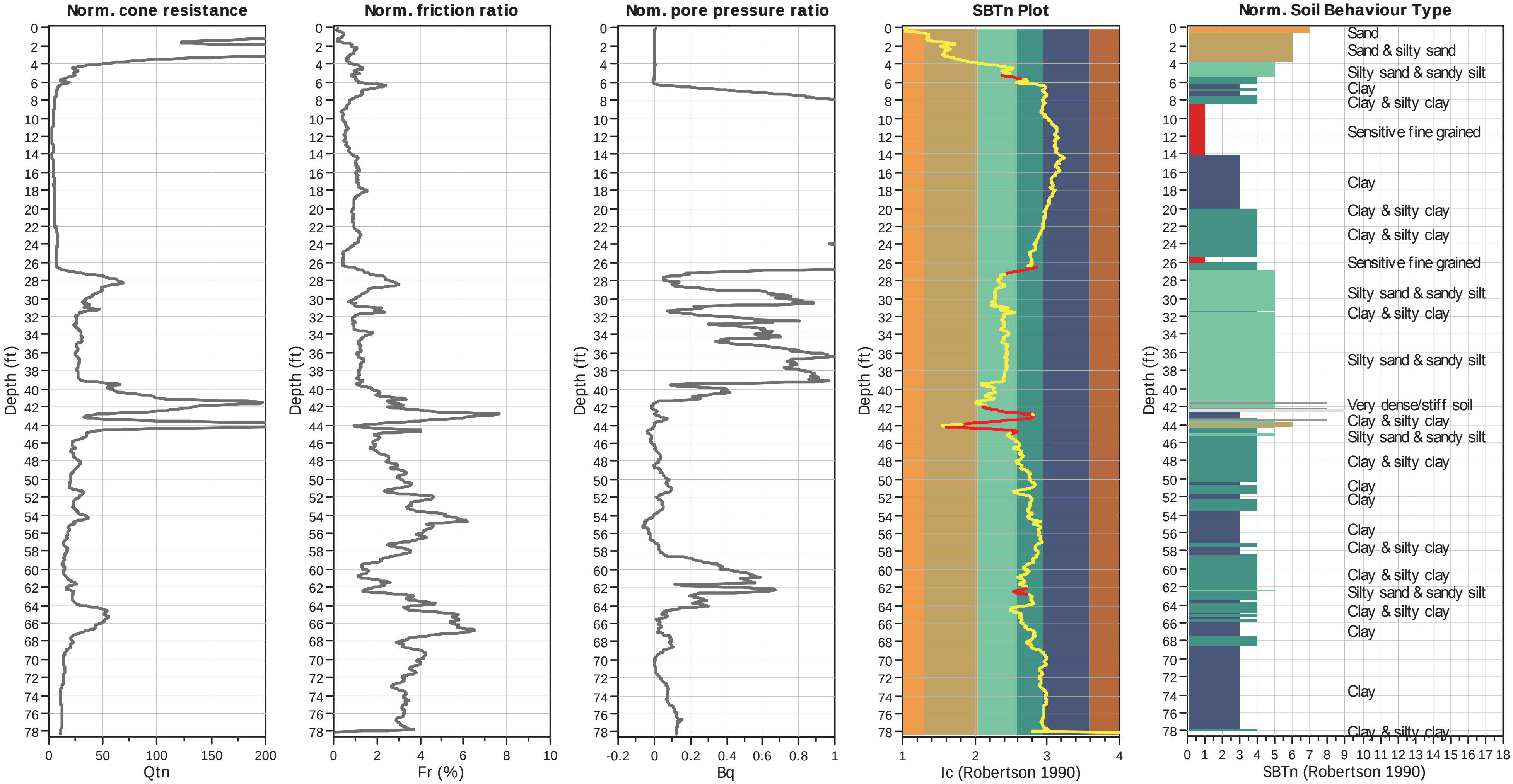






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



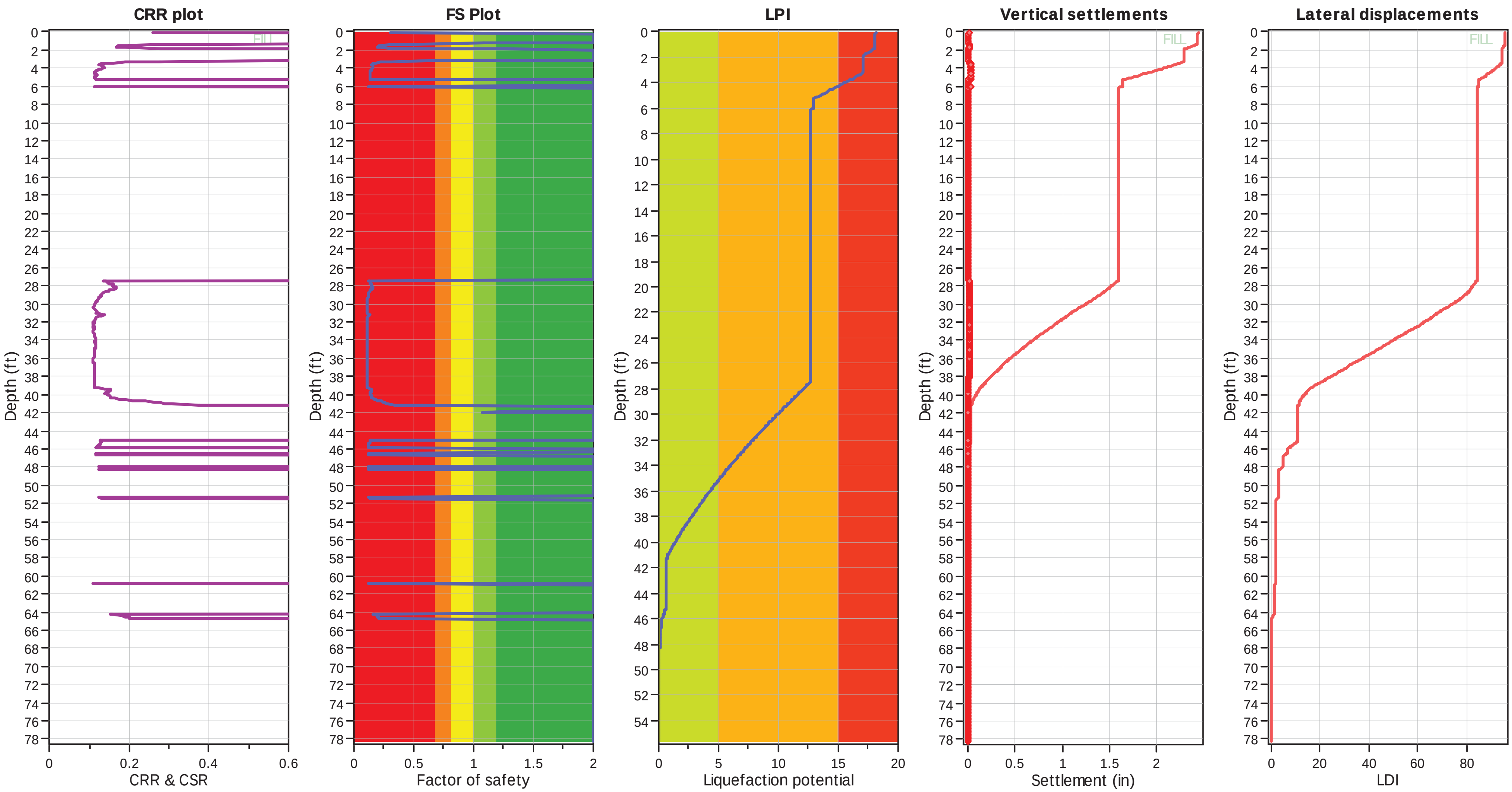
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

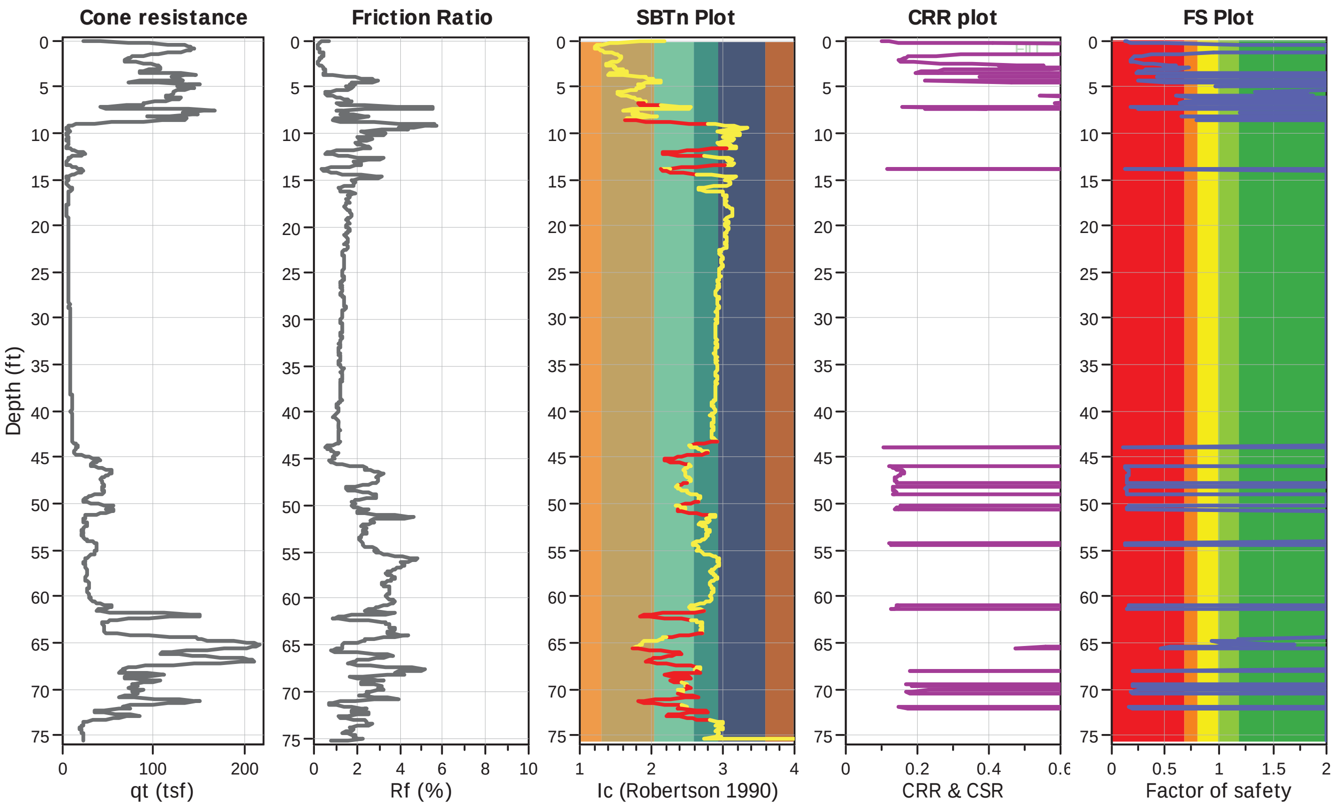
LIQUEFACTION ANALYSIS REPORT

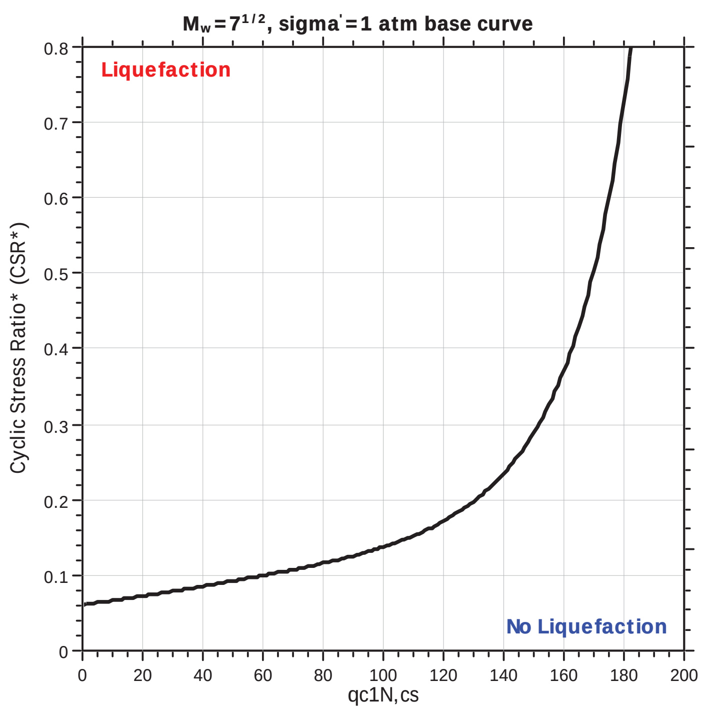
Project title : Baylands Railroad **Location : Brisbane, CA**

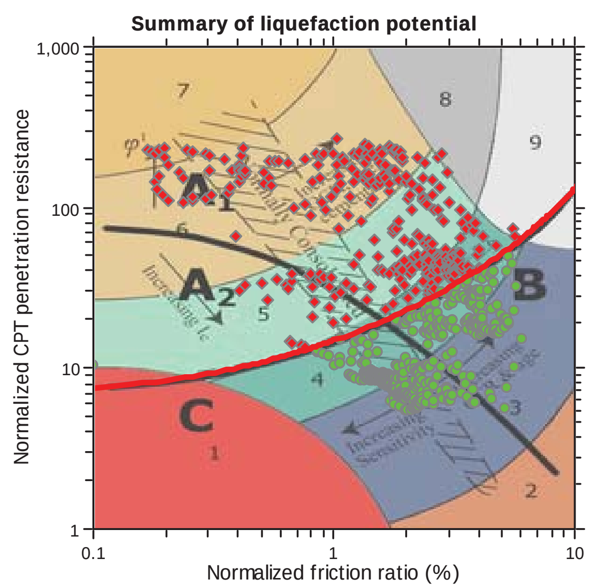
CPT file : 1-CPT03

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

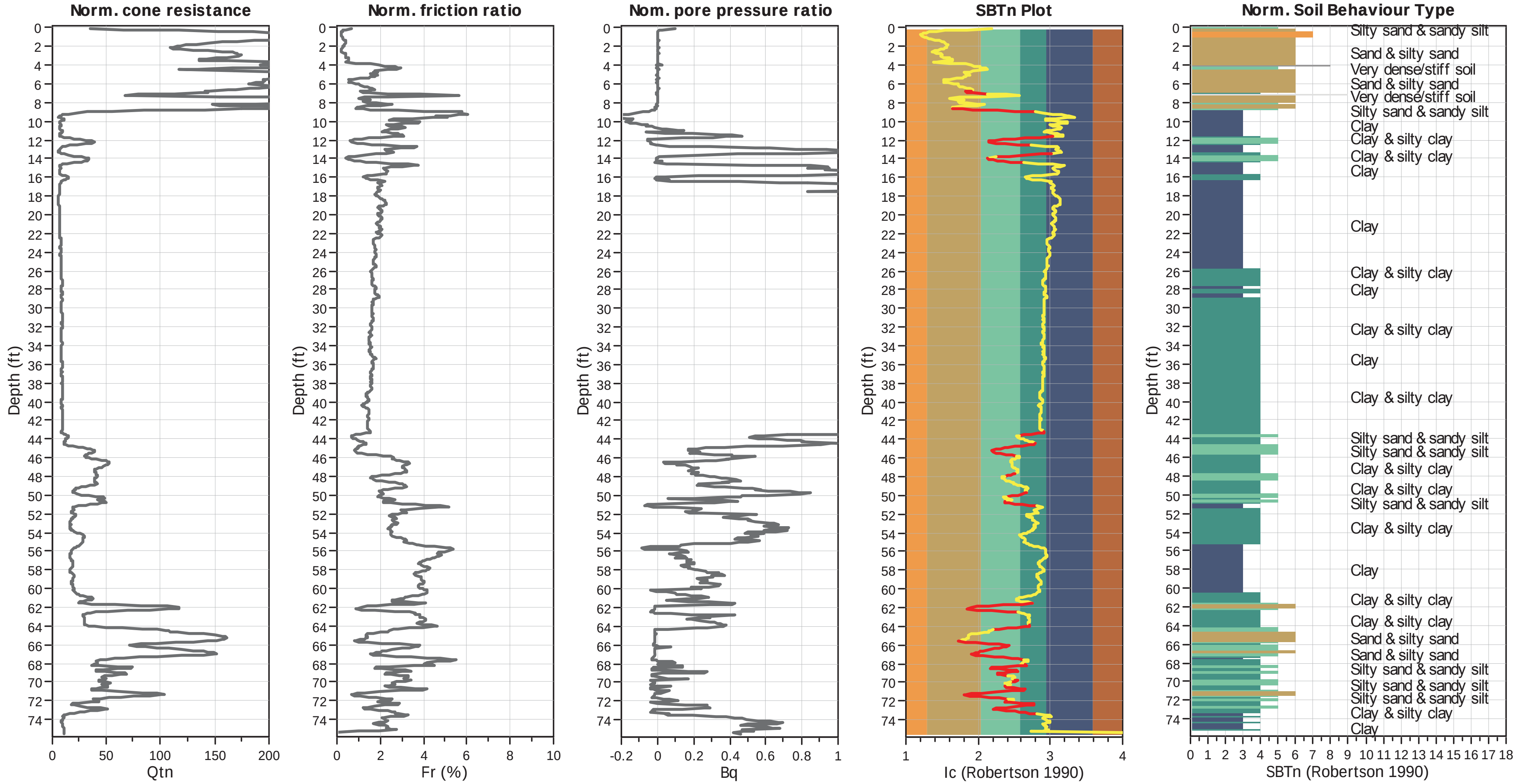






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



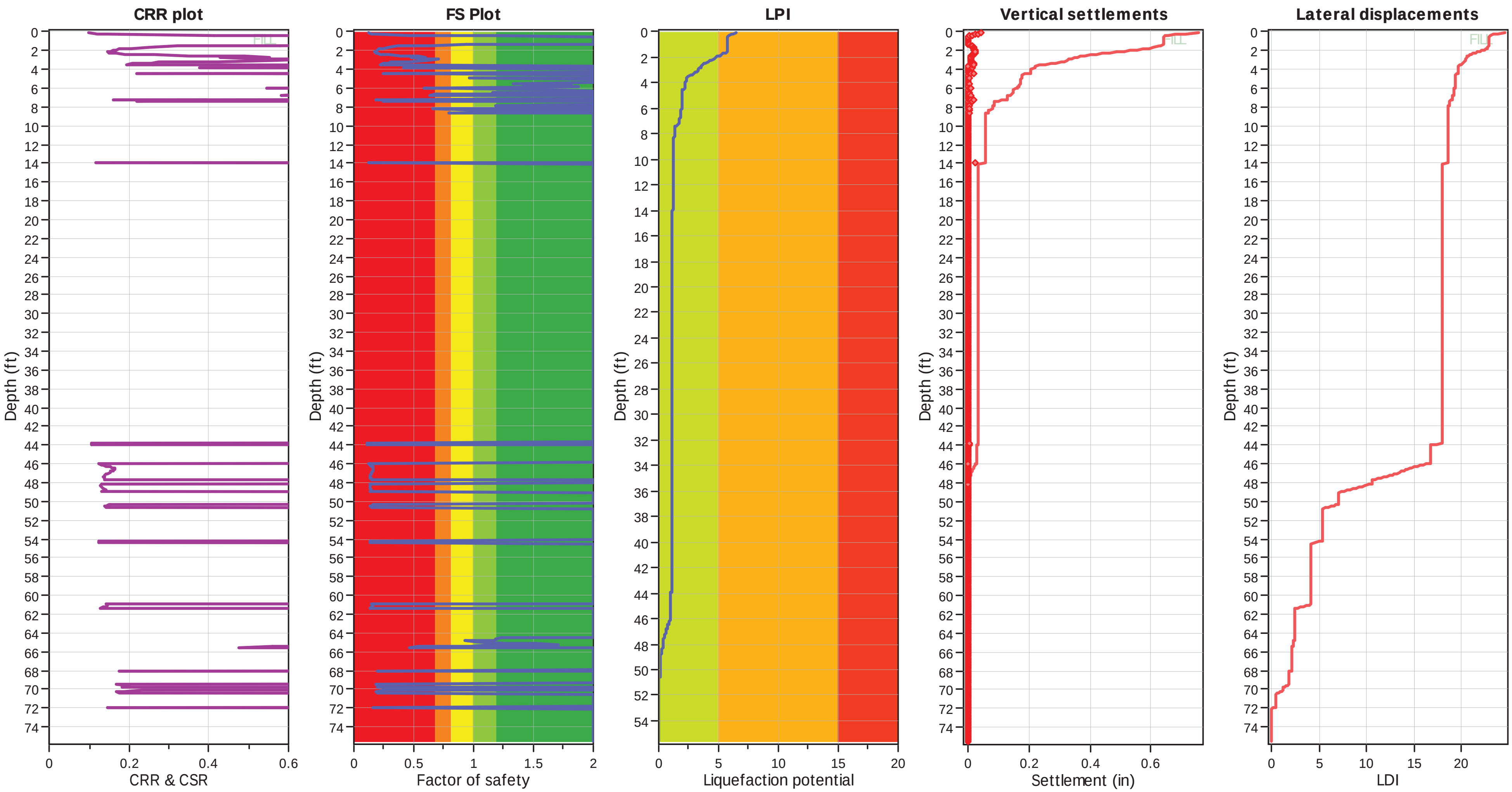
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

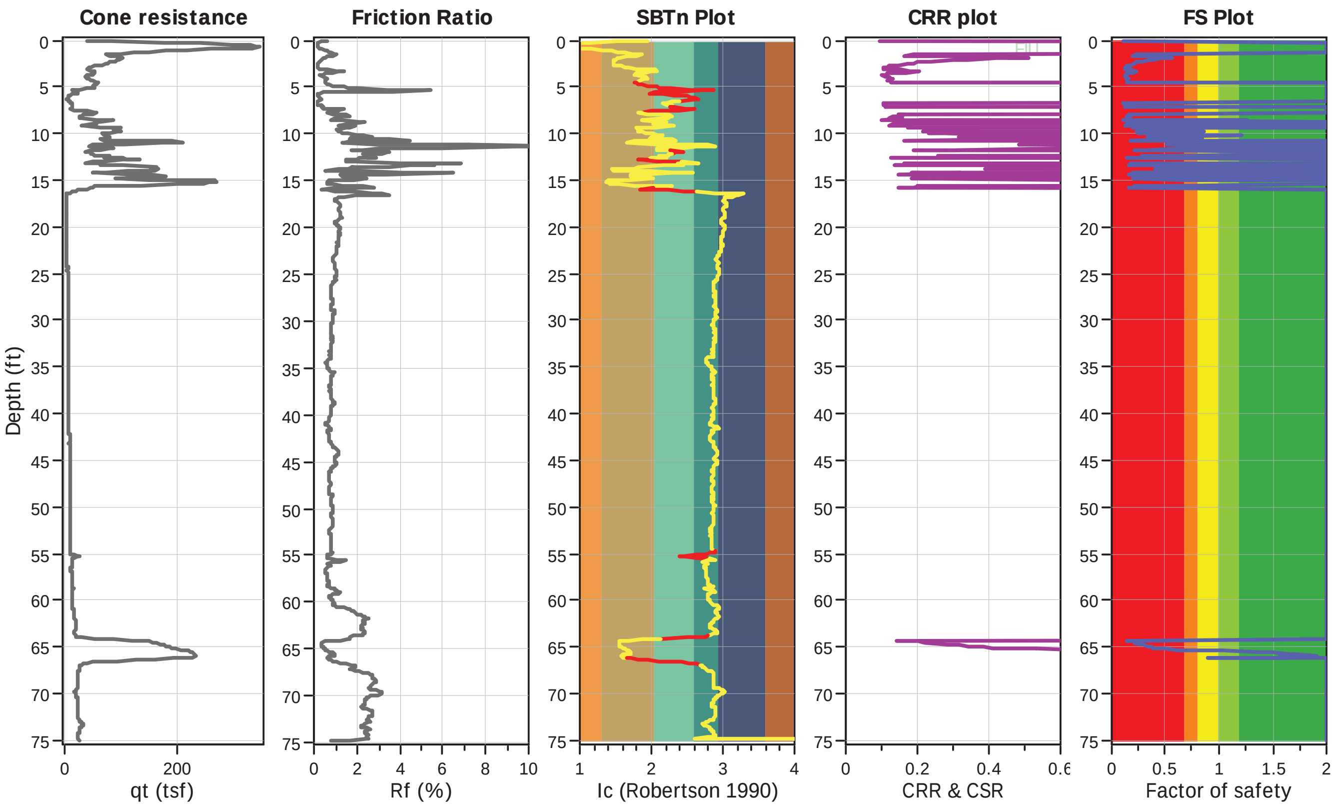
LIQUEFACTION ANALYSIS REPORT

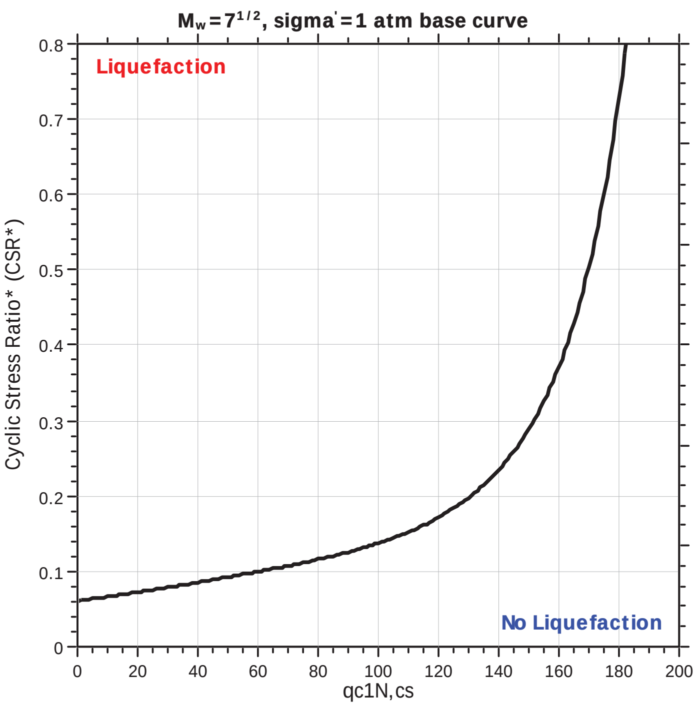
Project title : Baylands Railroad **Location : Brisbane, CA**

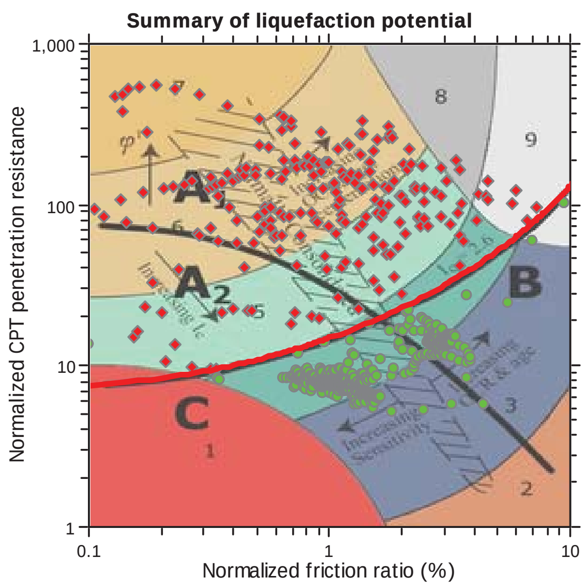
CPT file : 1-CPT04

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

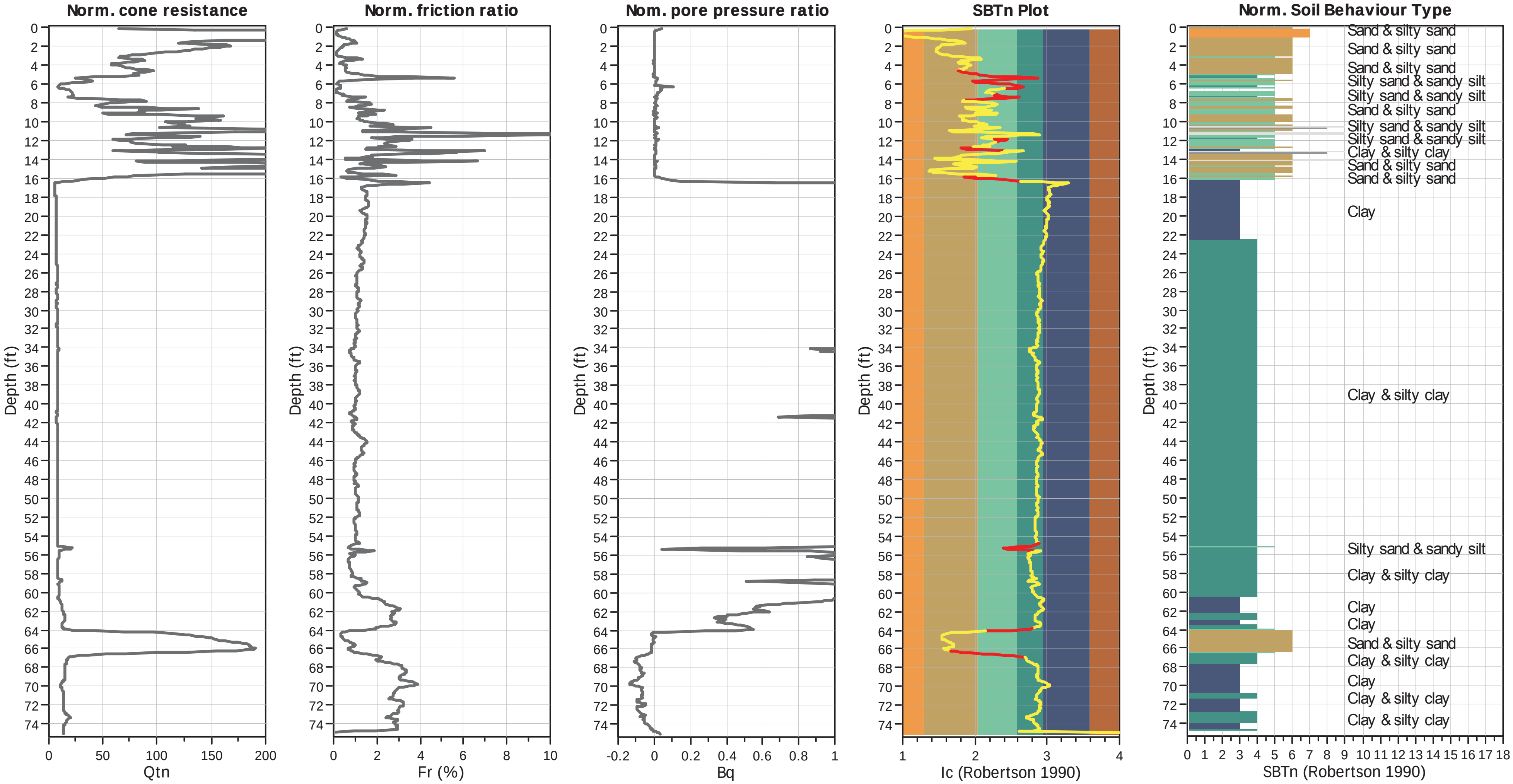






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



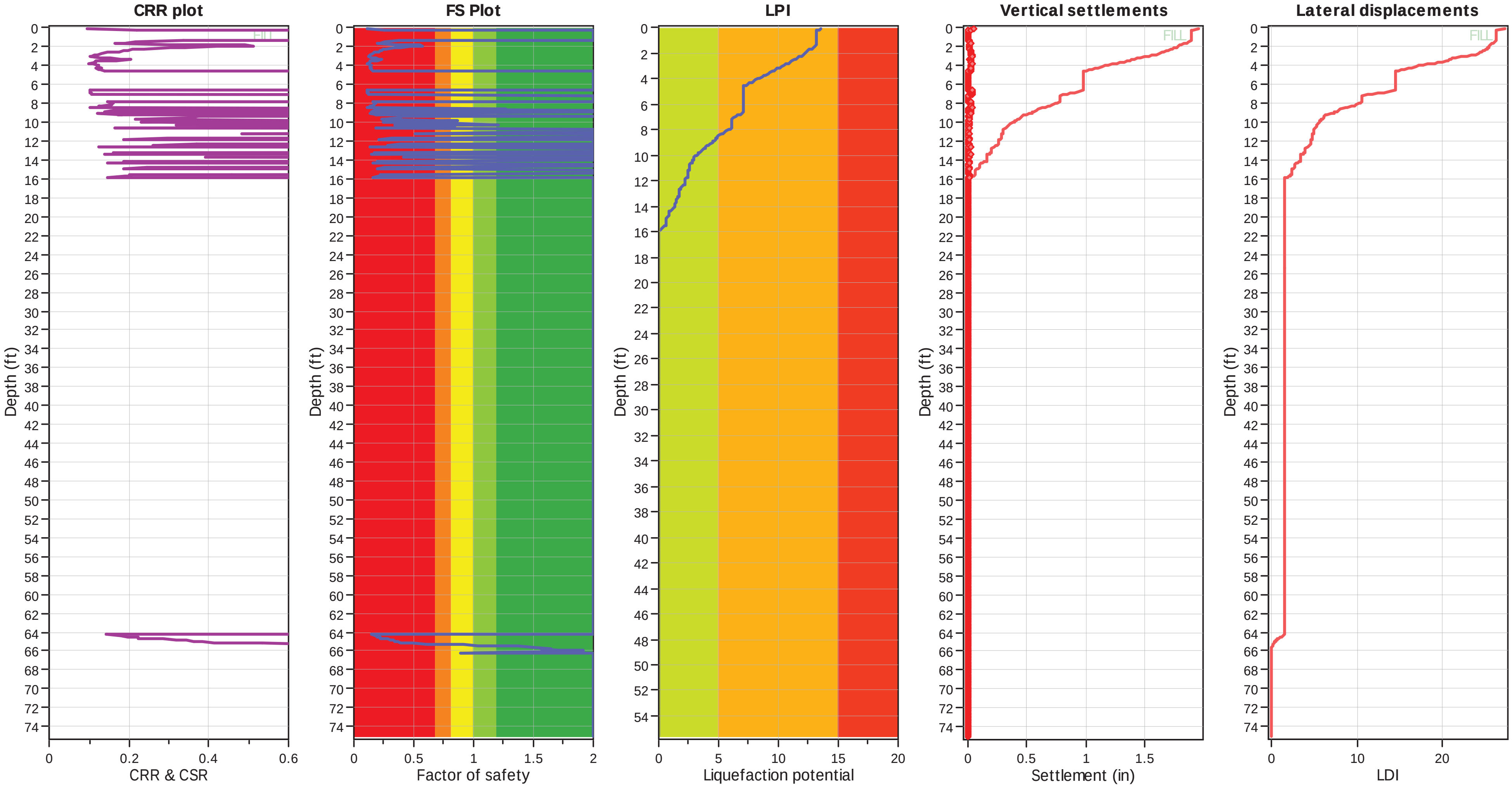
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

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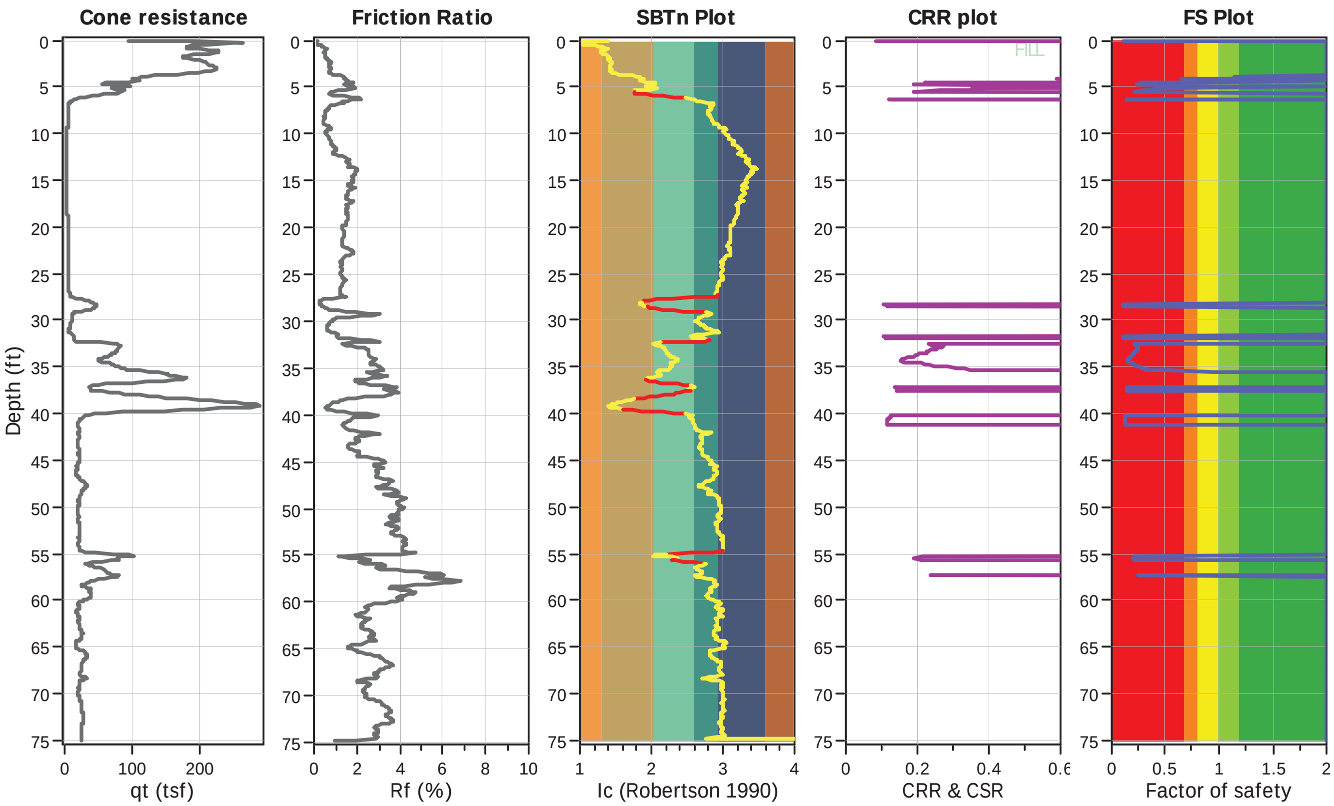
LIQUEFACTION ANALYSIS REPORT

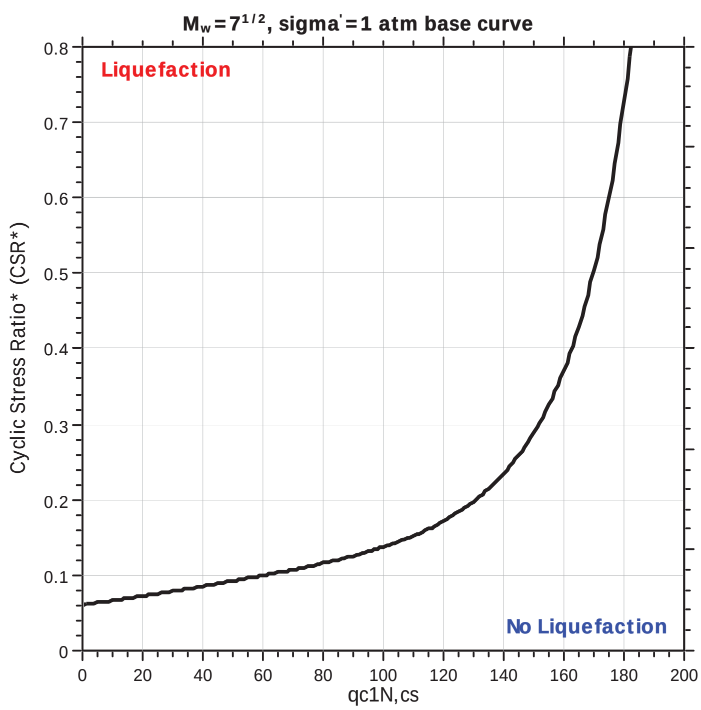
Project title : Baylands Railroad **Location : Brisbane, CA**

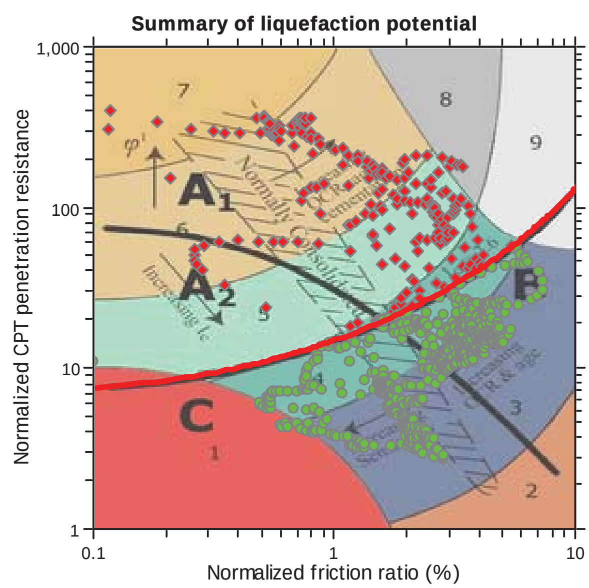
CPT file : 1-CPT05

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

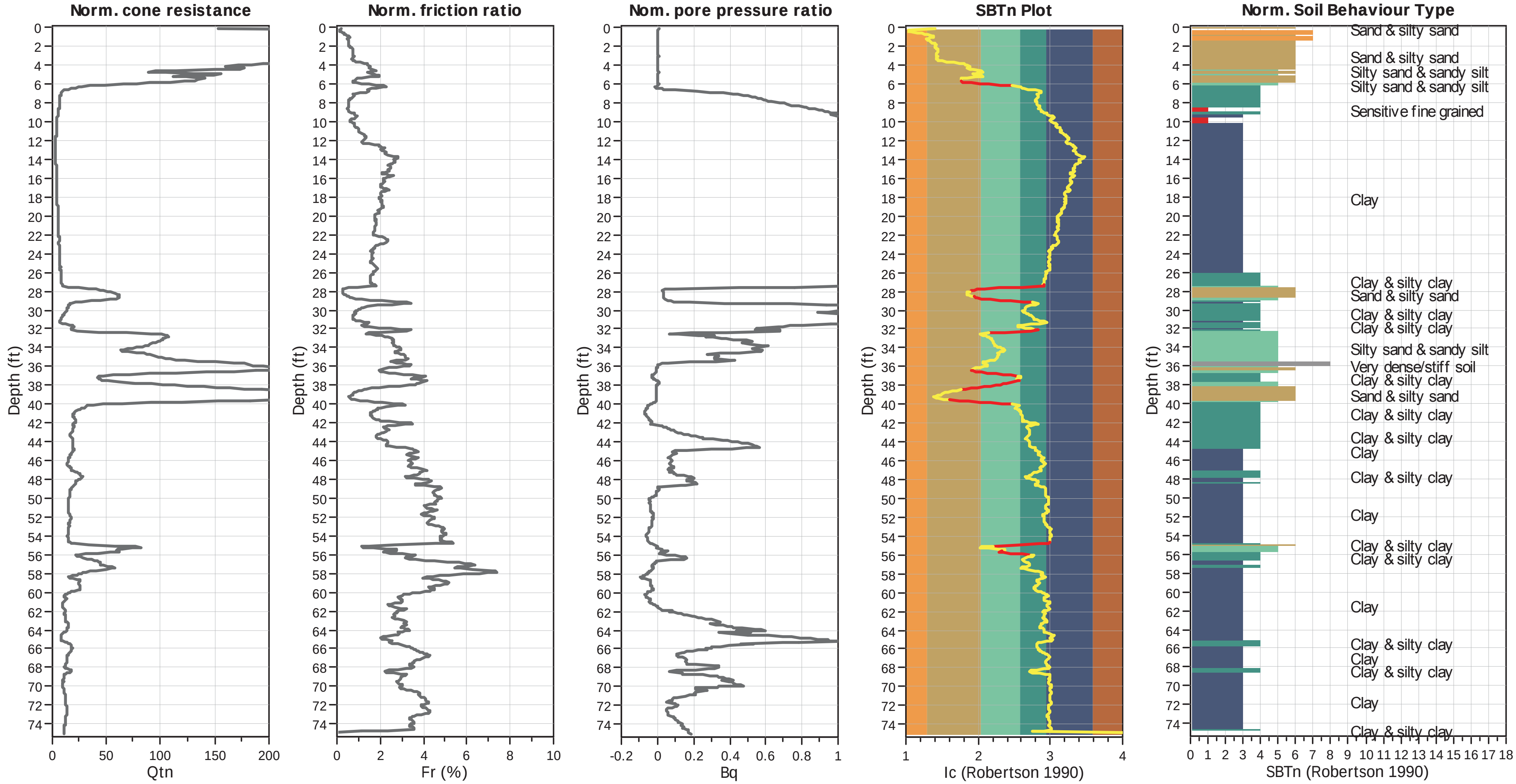






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



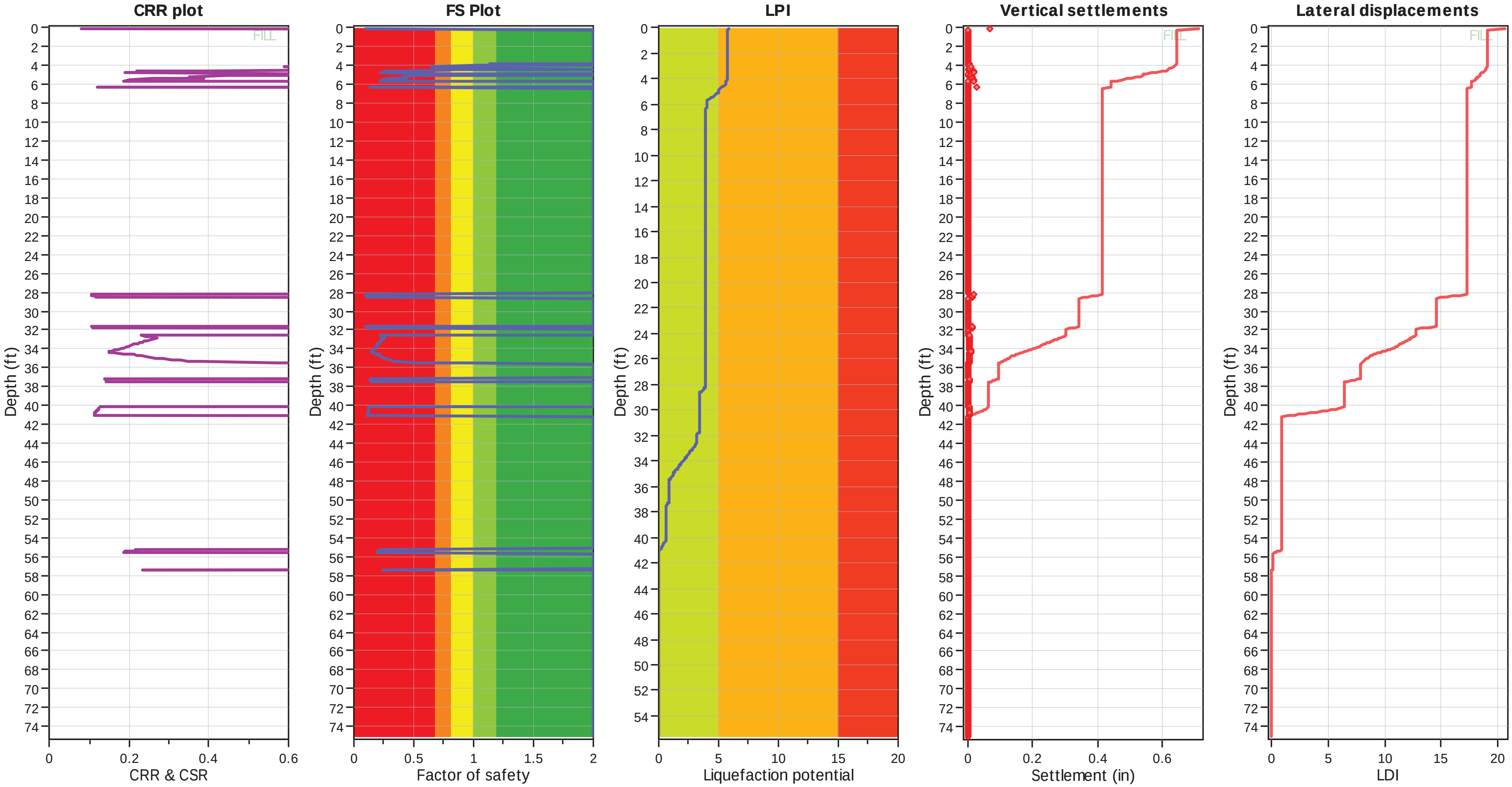
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

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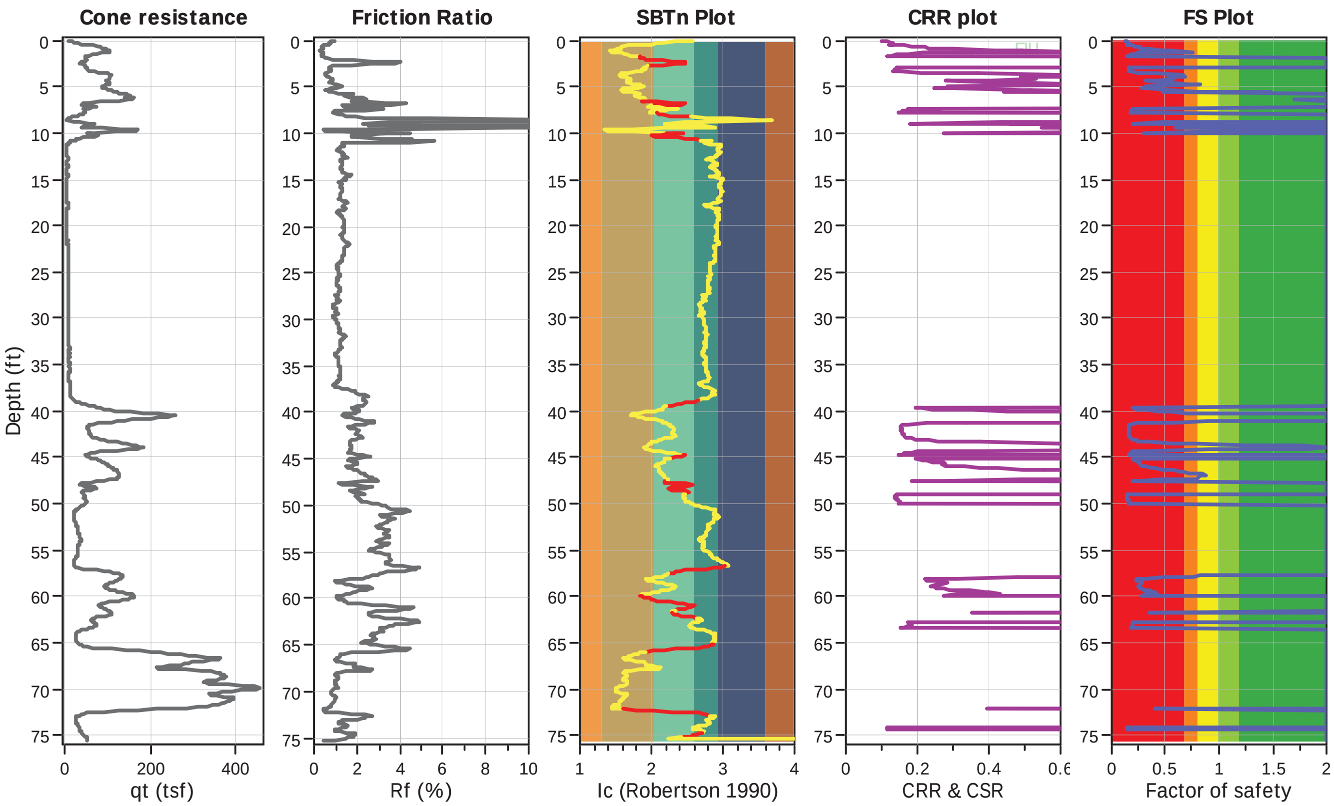
LIQUEFACTION ANALYSIS REPORT

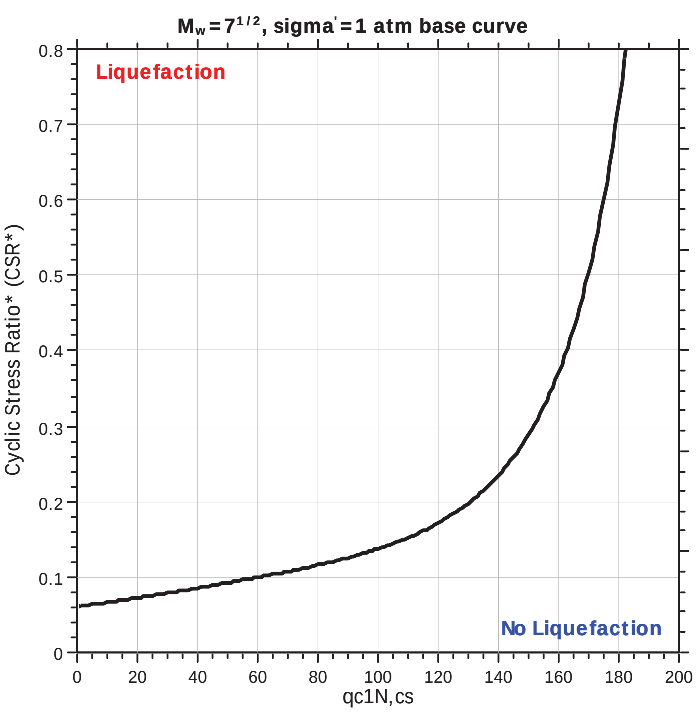
Project title : Baylands Railroad **Location : Brisbane, CA**

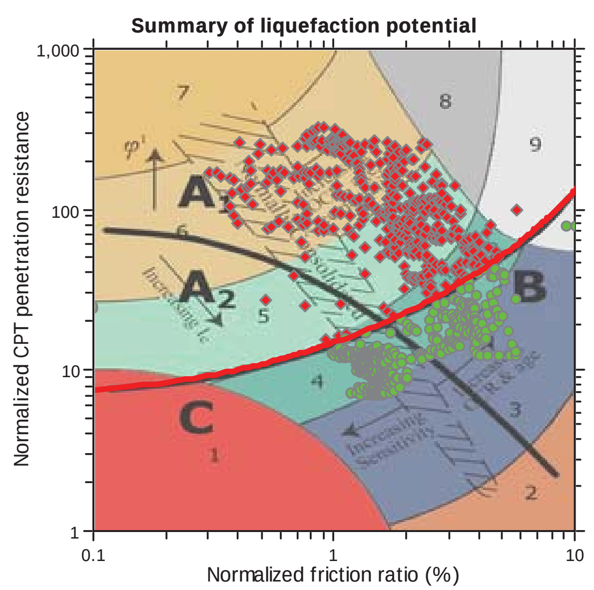
CPT file : 1-CPT06

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth applied:	No
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method

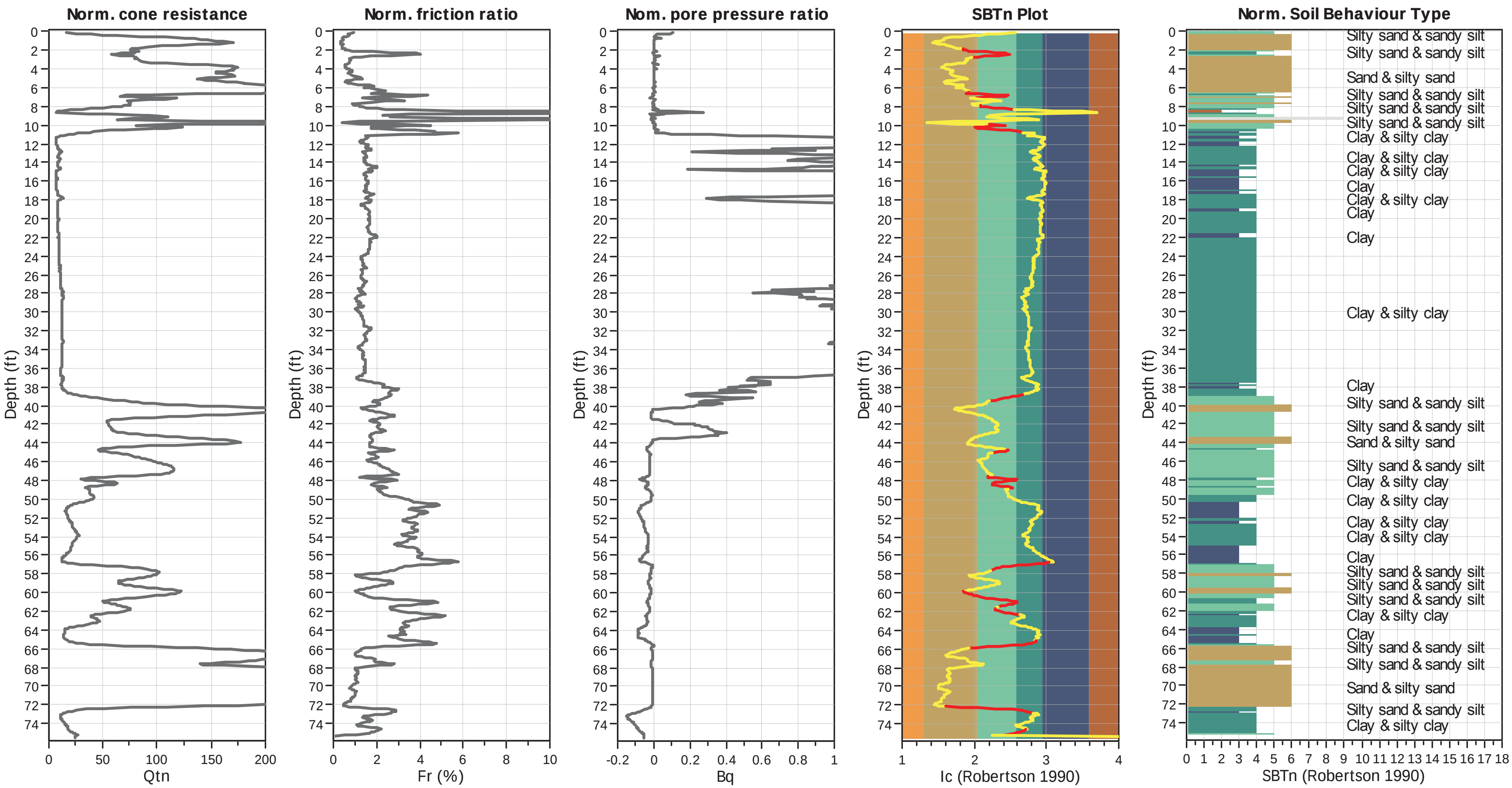






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



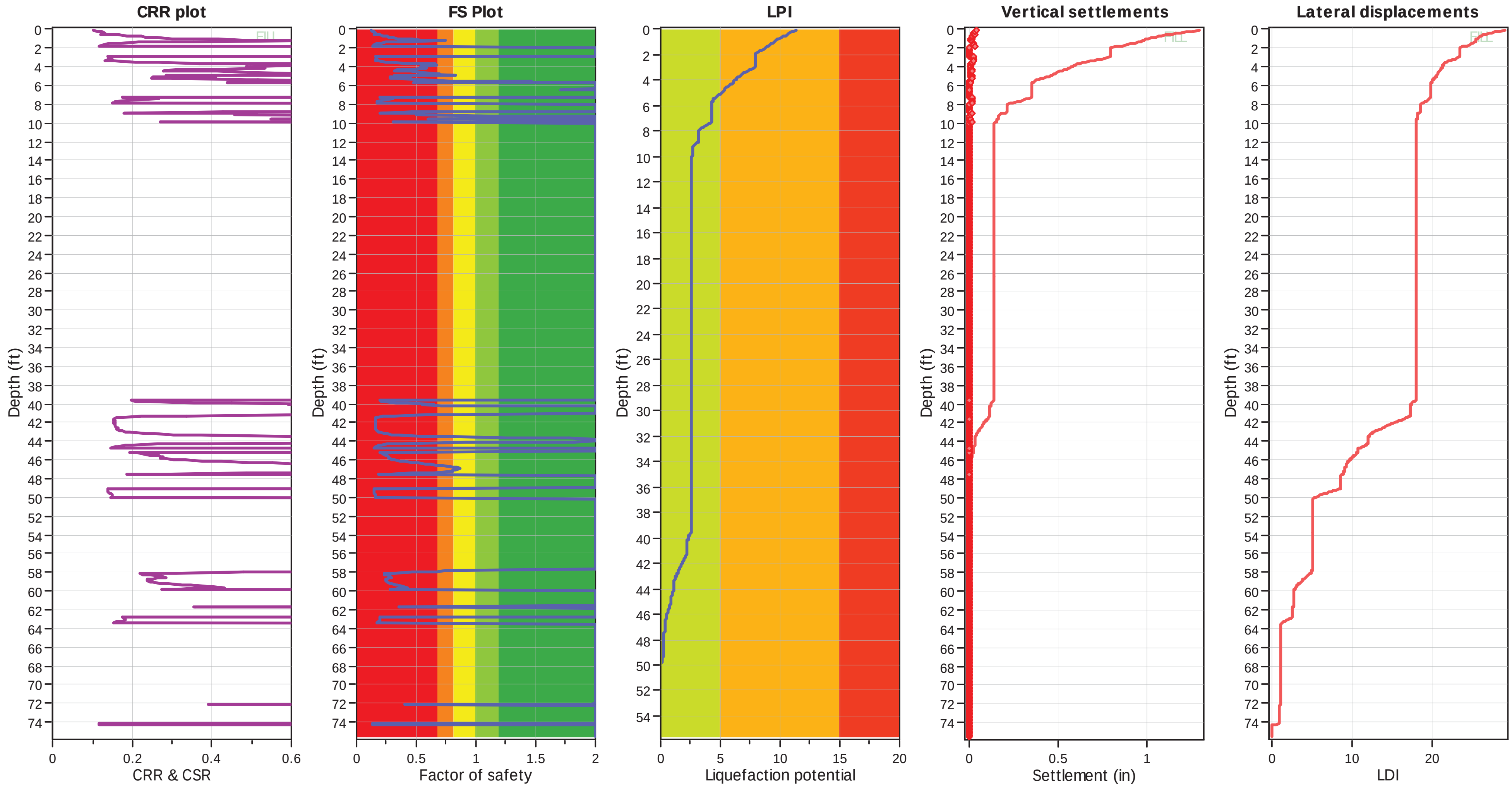
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

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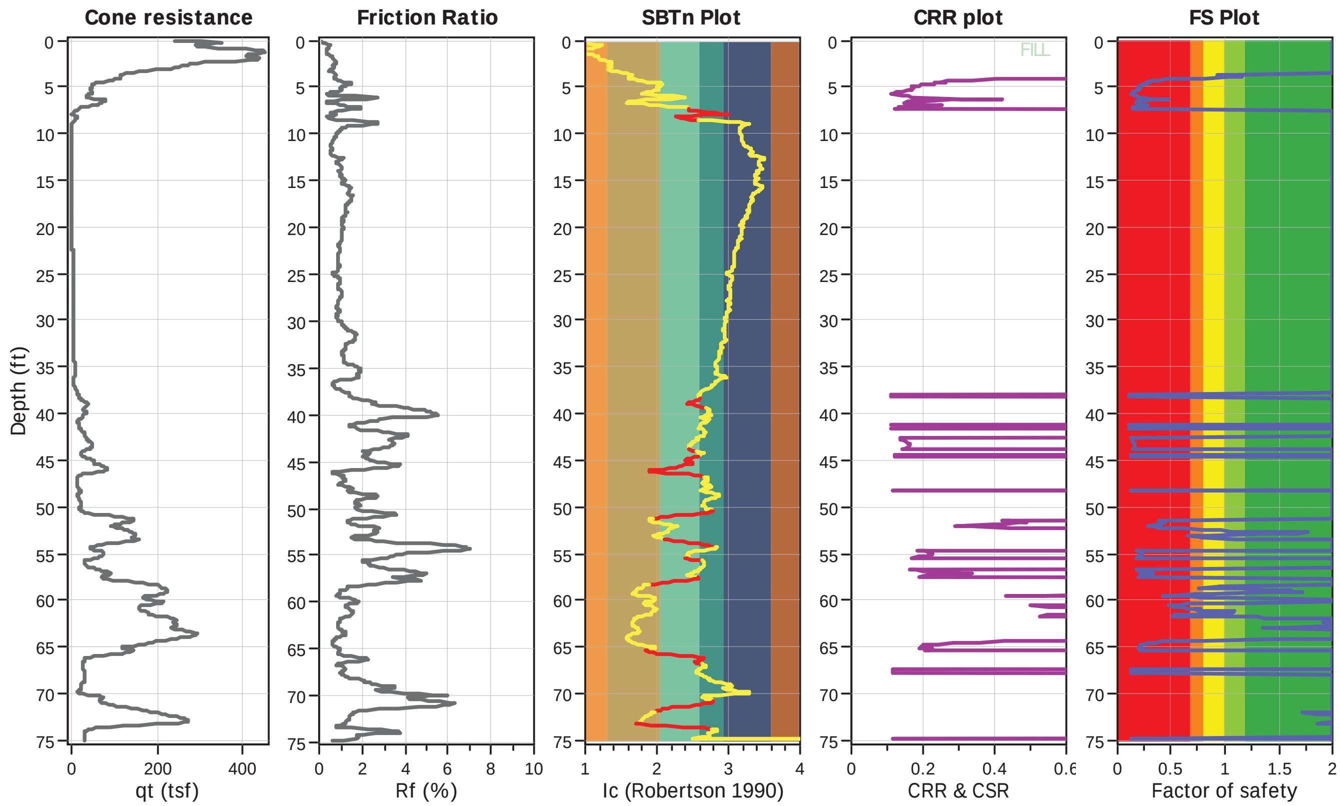
LIQUEFACTION ANALYSIS REPORT

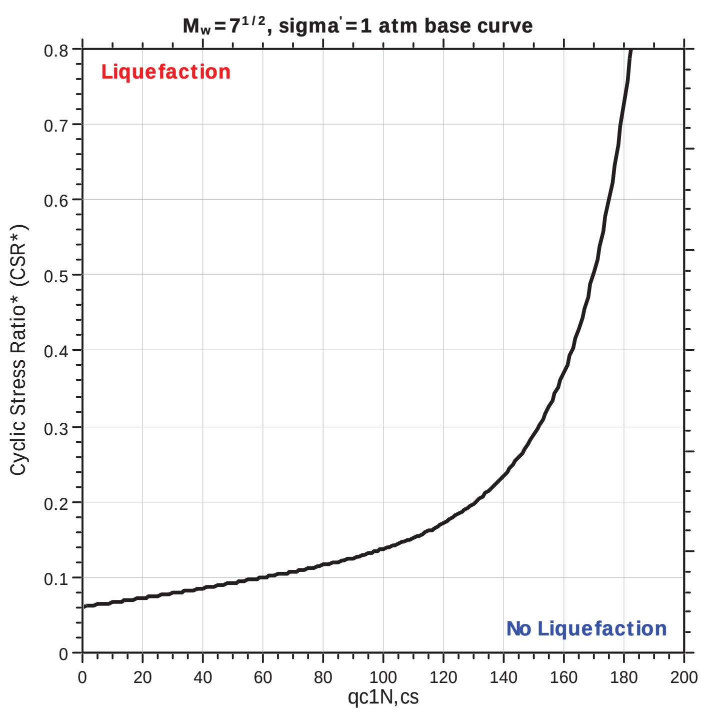
Project title : Baylands Railroad **Location : Brisbane, CA**

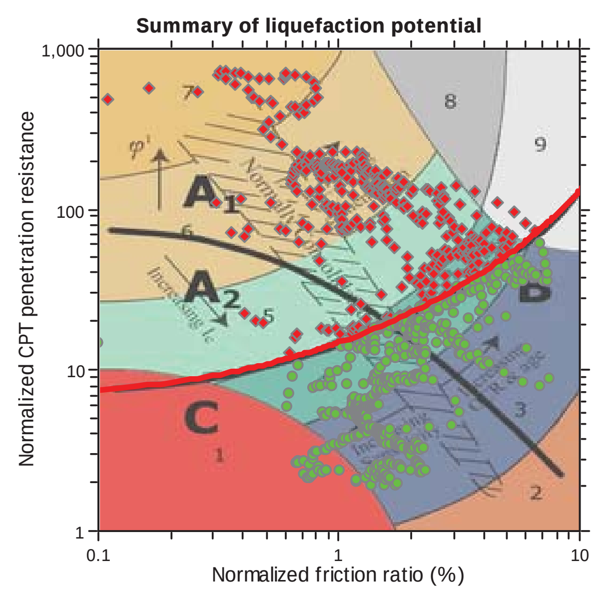
CPT file : 1-CPT07

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft³	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

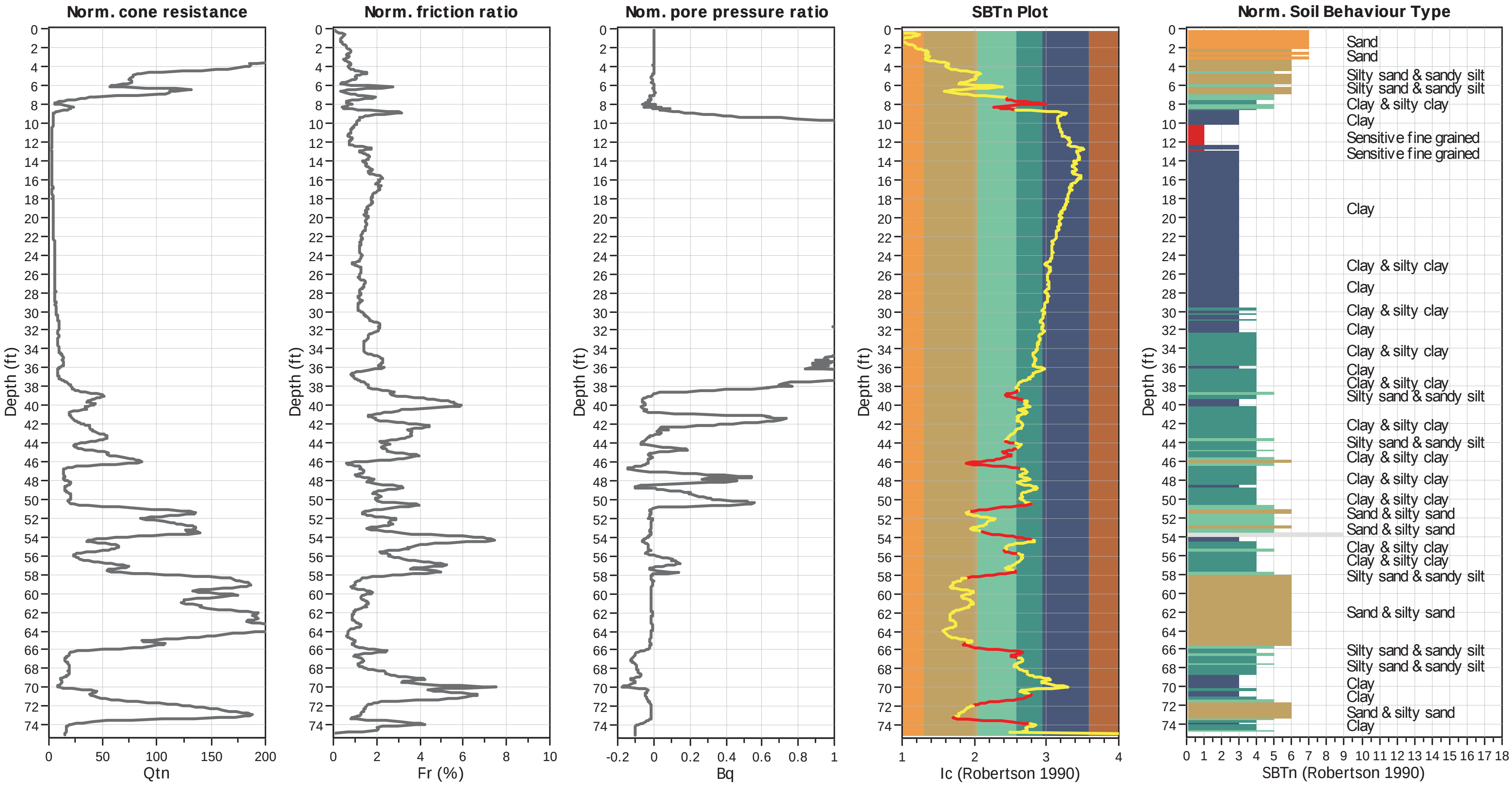






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



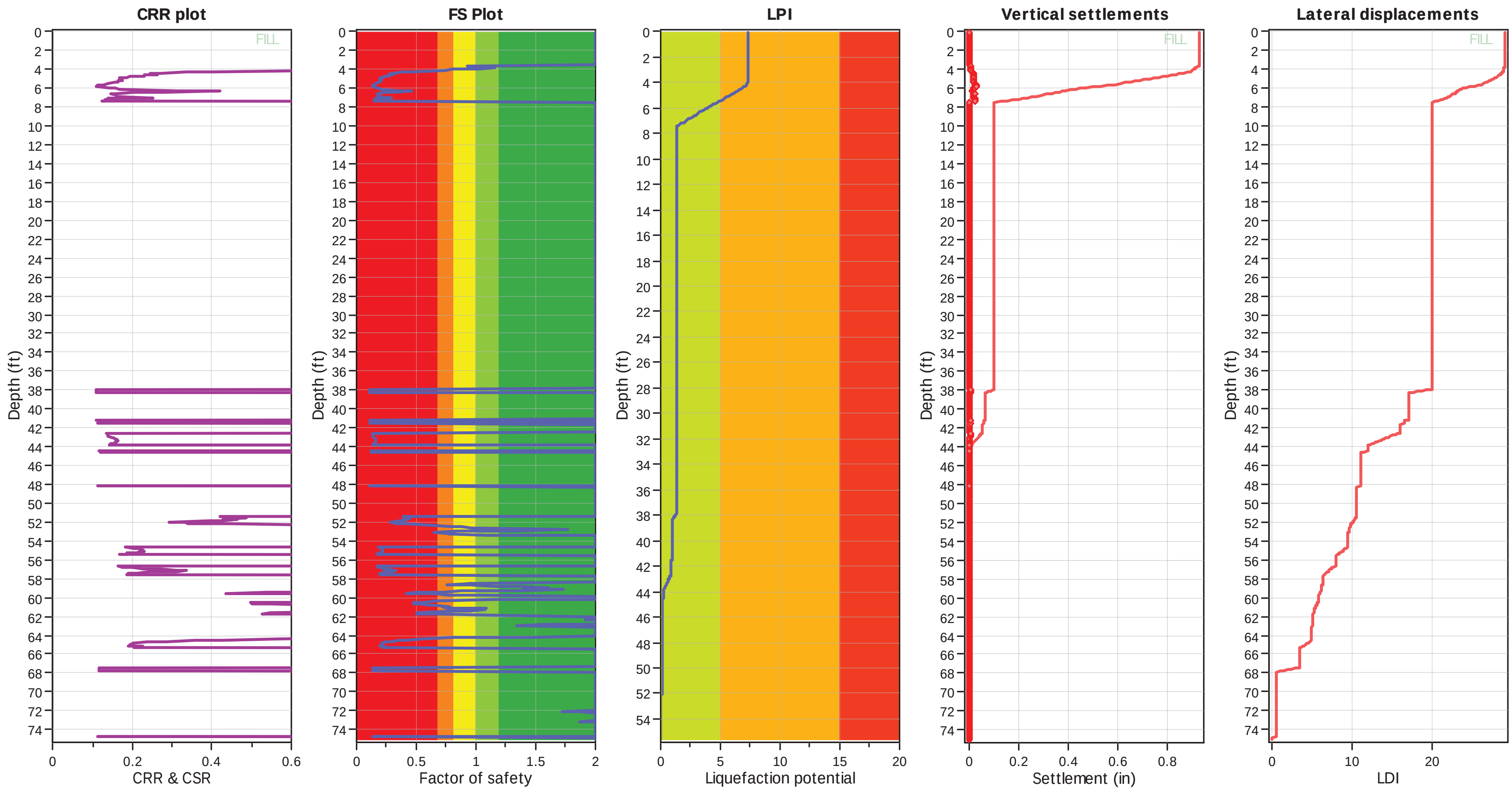
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

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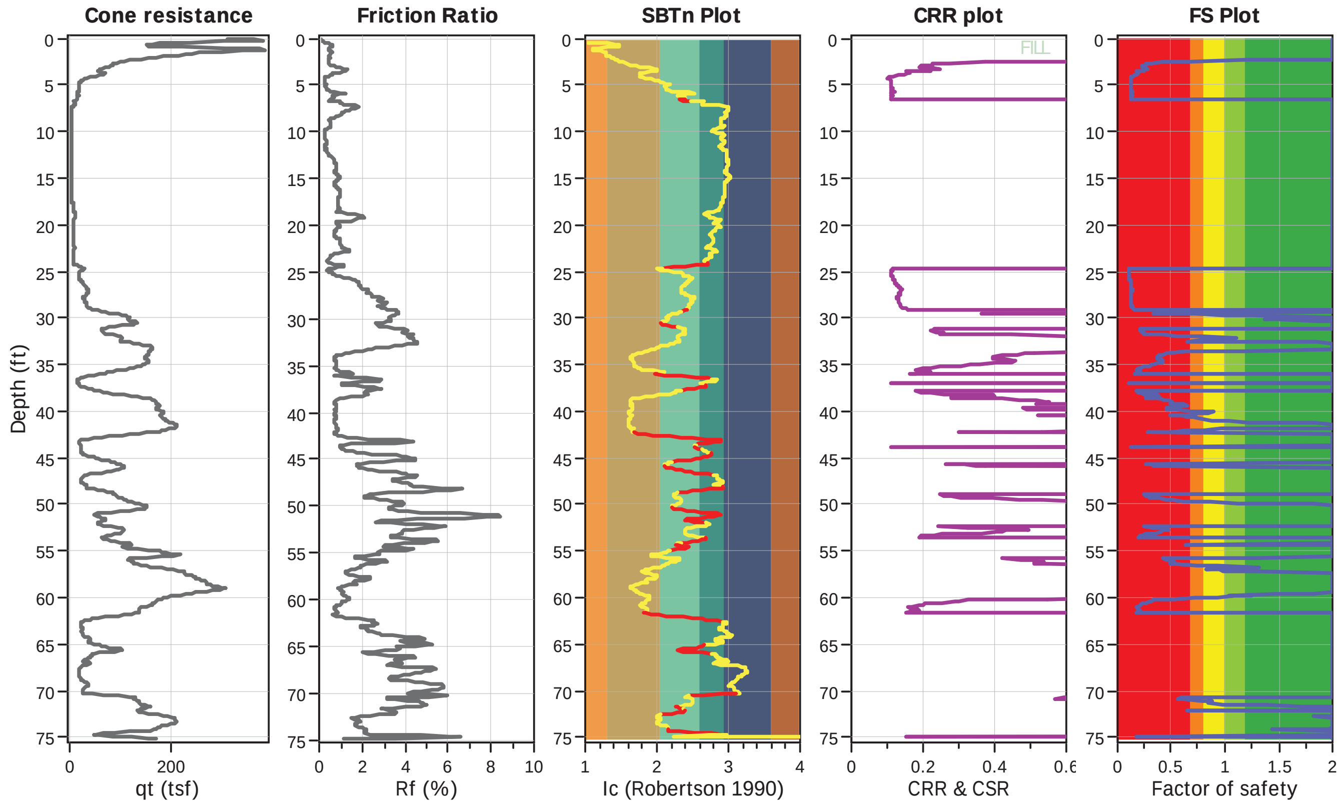
LIQUEFACTION ANALYSIS REPORT

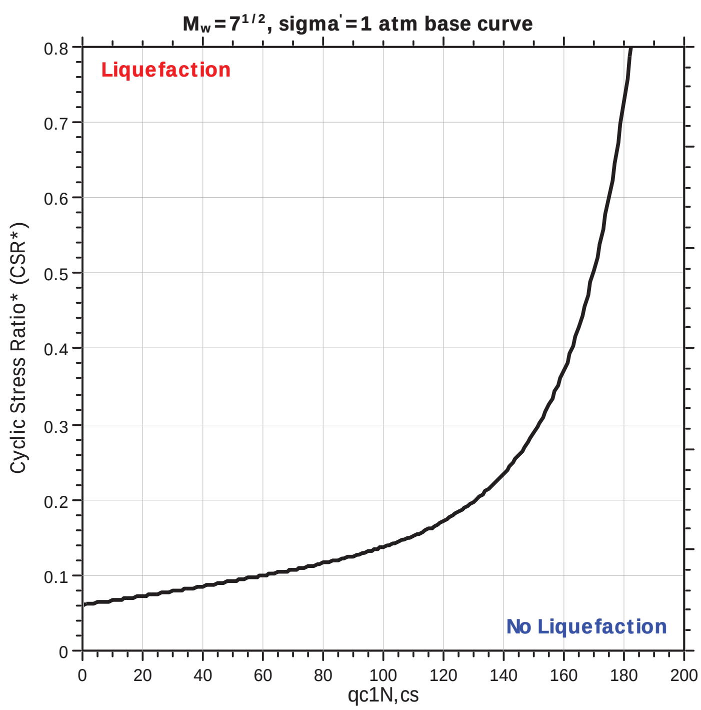
Project title : Baylands Railroad **Location : Brisbane, CA**

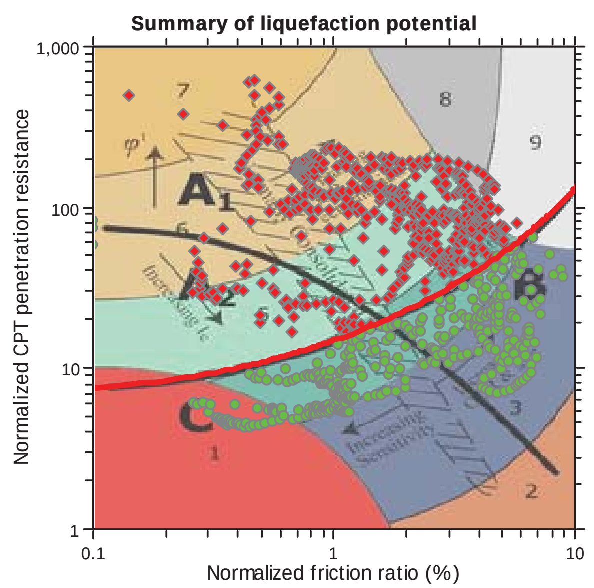
CPT file : 1-CPT08

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

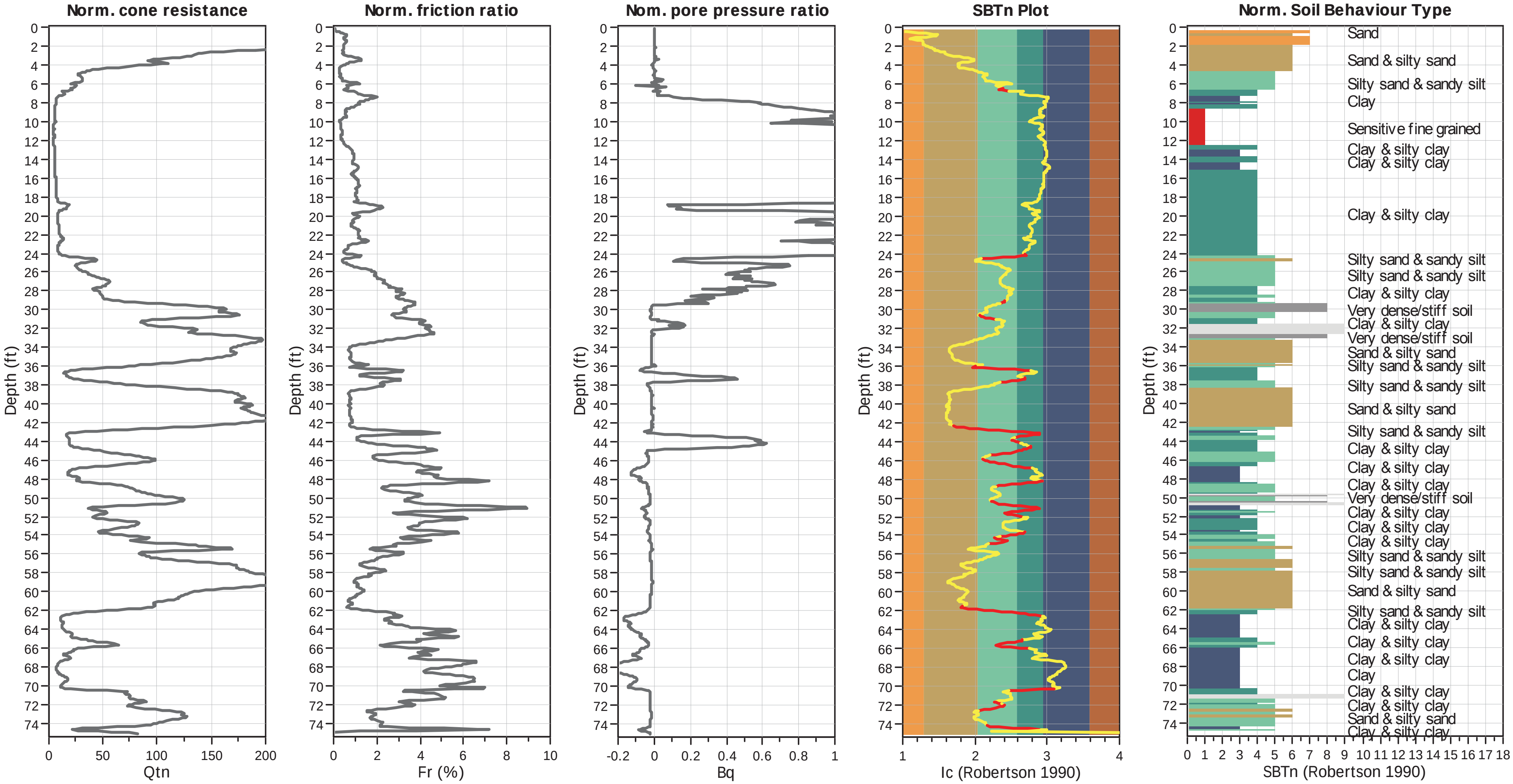






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



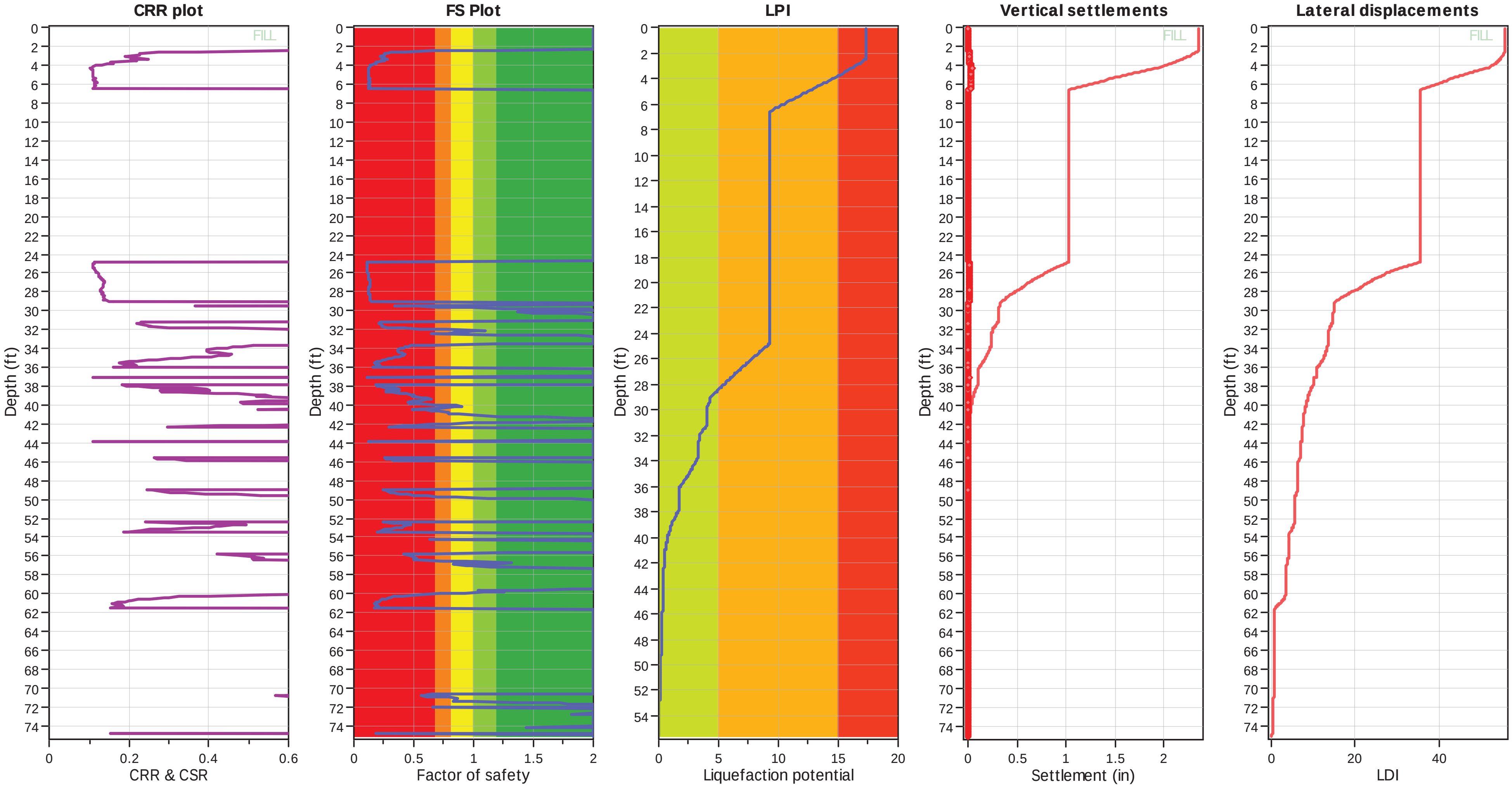
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

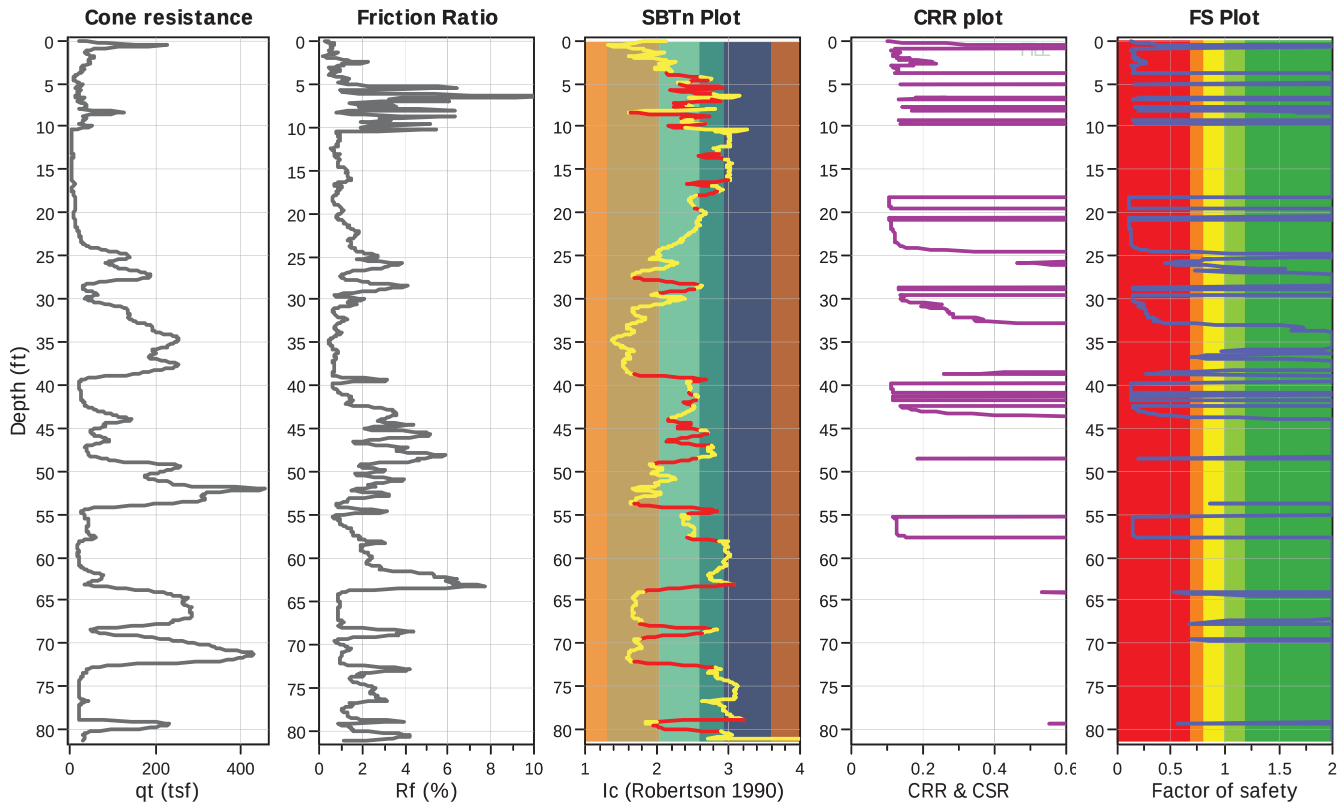
LIQUEFACTION ANALYSIS REPORT

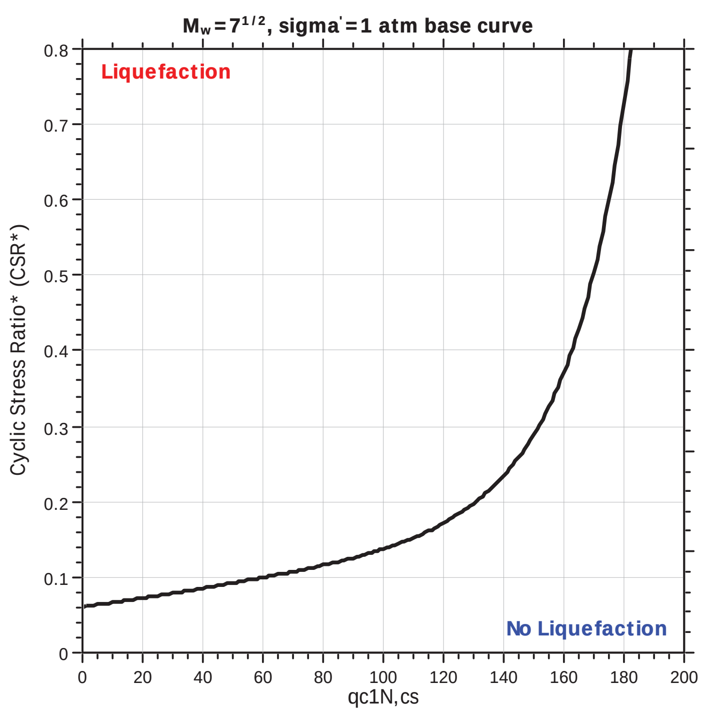
Project title : Baylands Railroad **Location : Brisbane, CA**

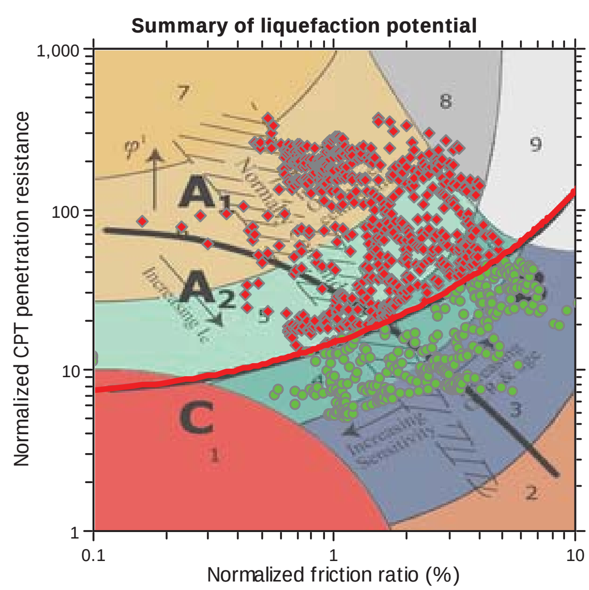
CPT file : 1-CPT09

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

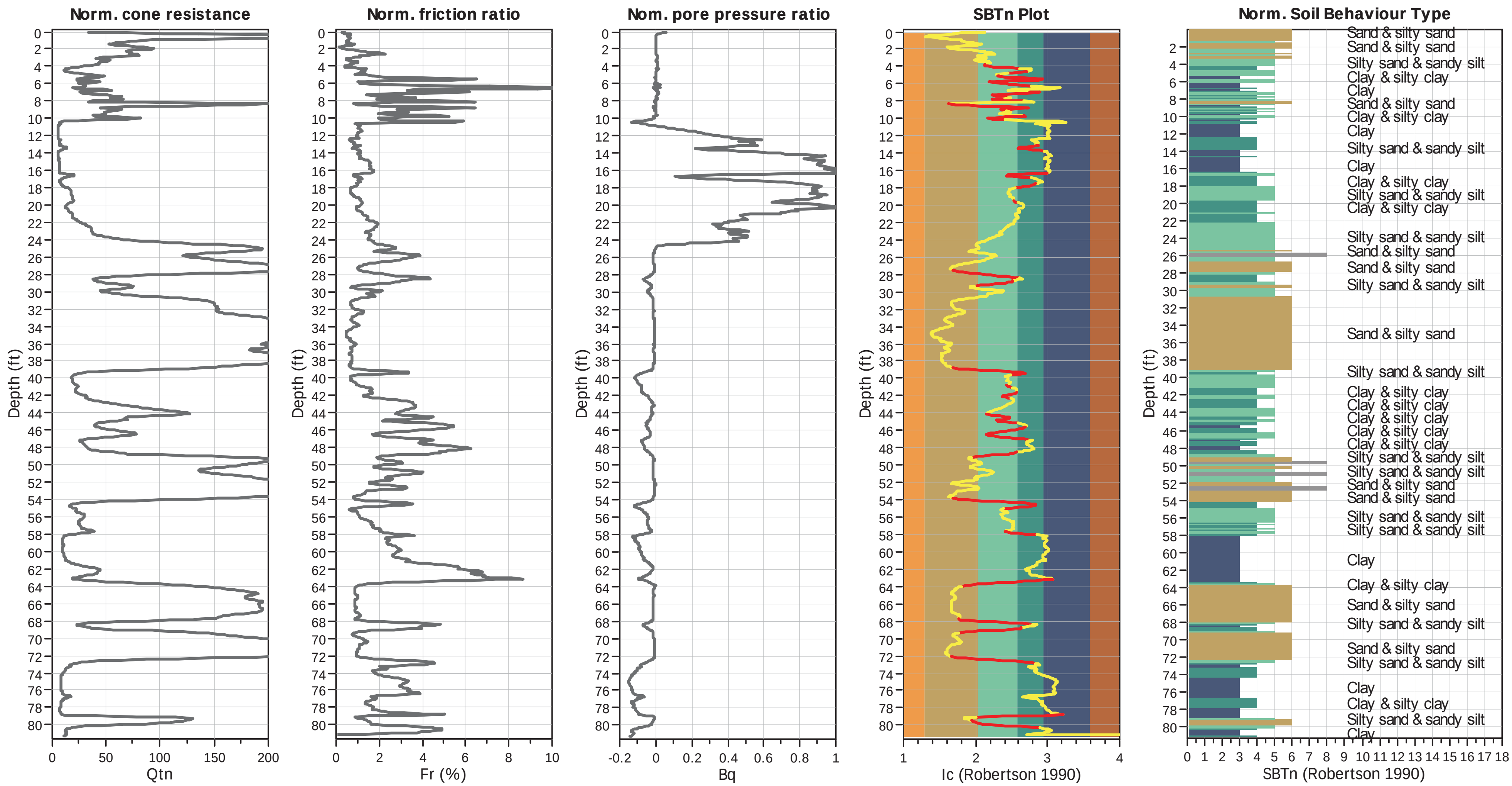






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



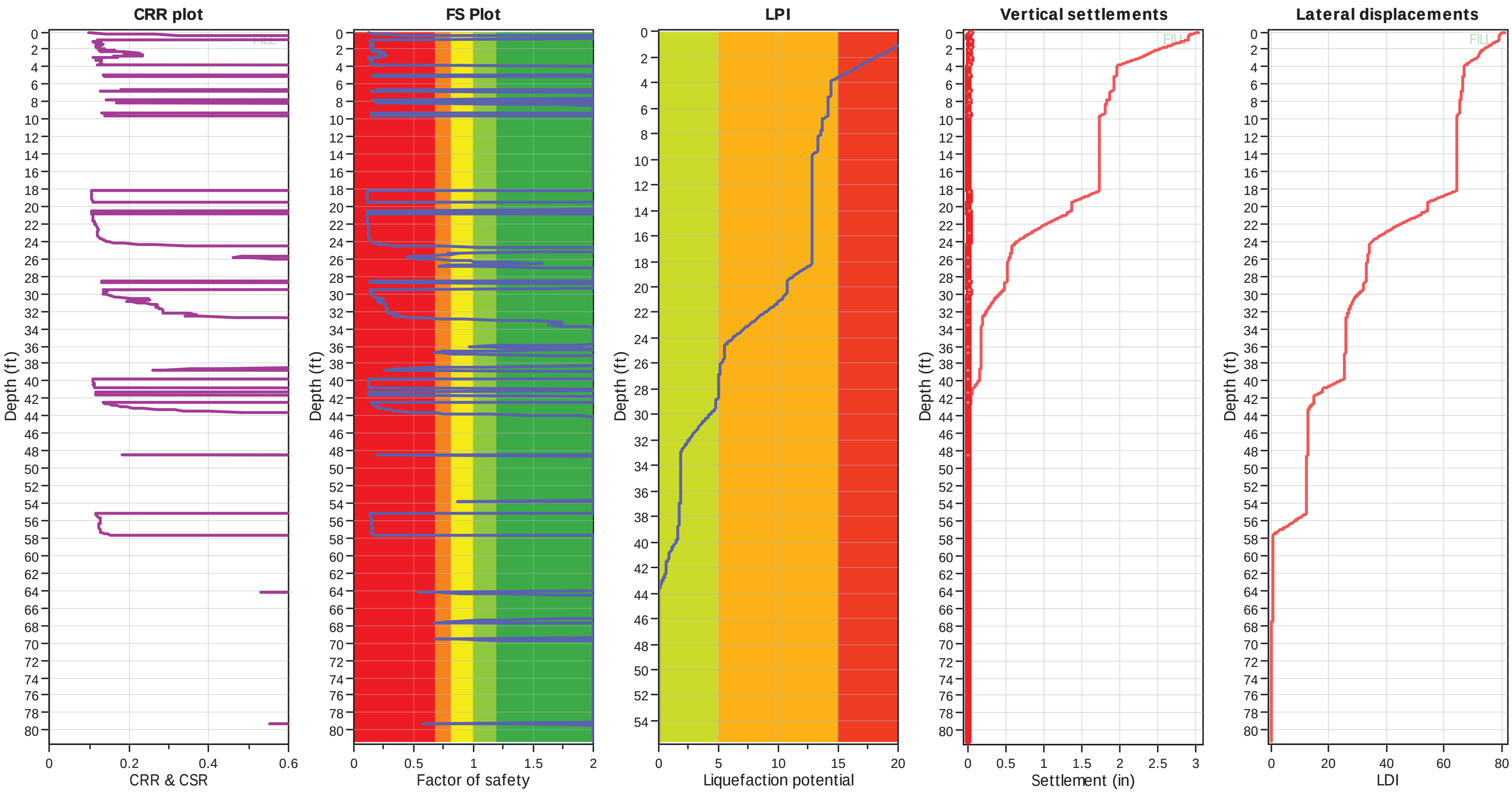
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

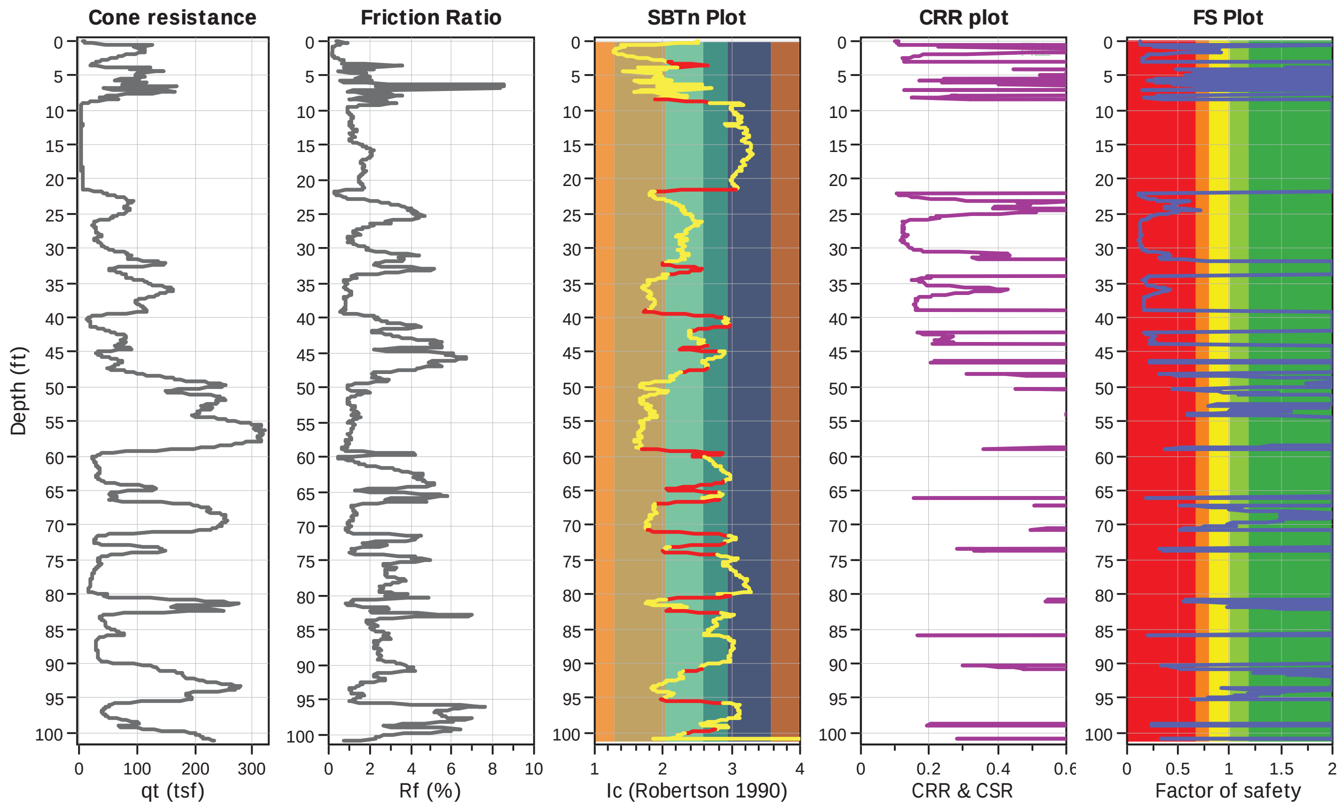
LIQUEFACTION ANALYSIS REPORT

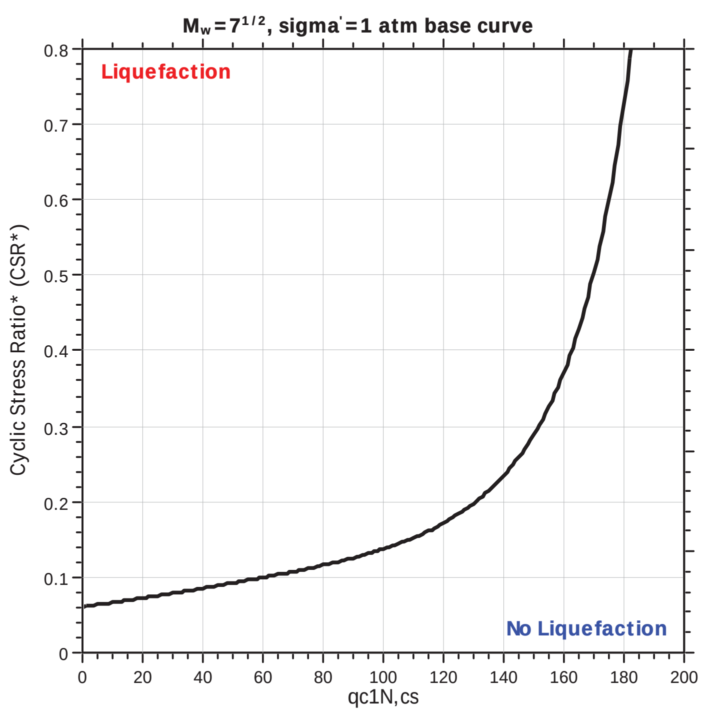
Project title : Baylands Railroad **Location : Brisbane, CA**

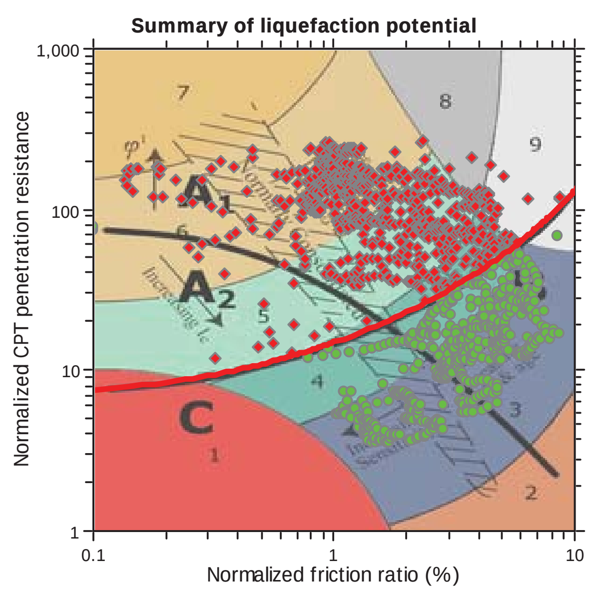
CPT file : 1-CPT10

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

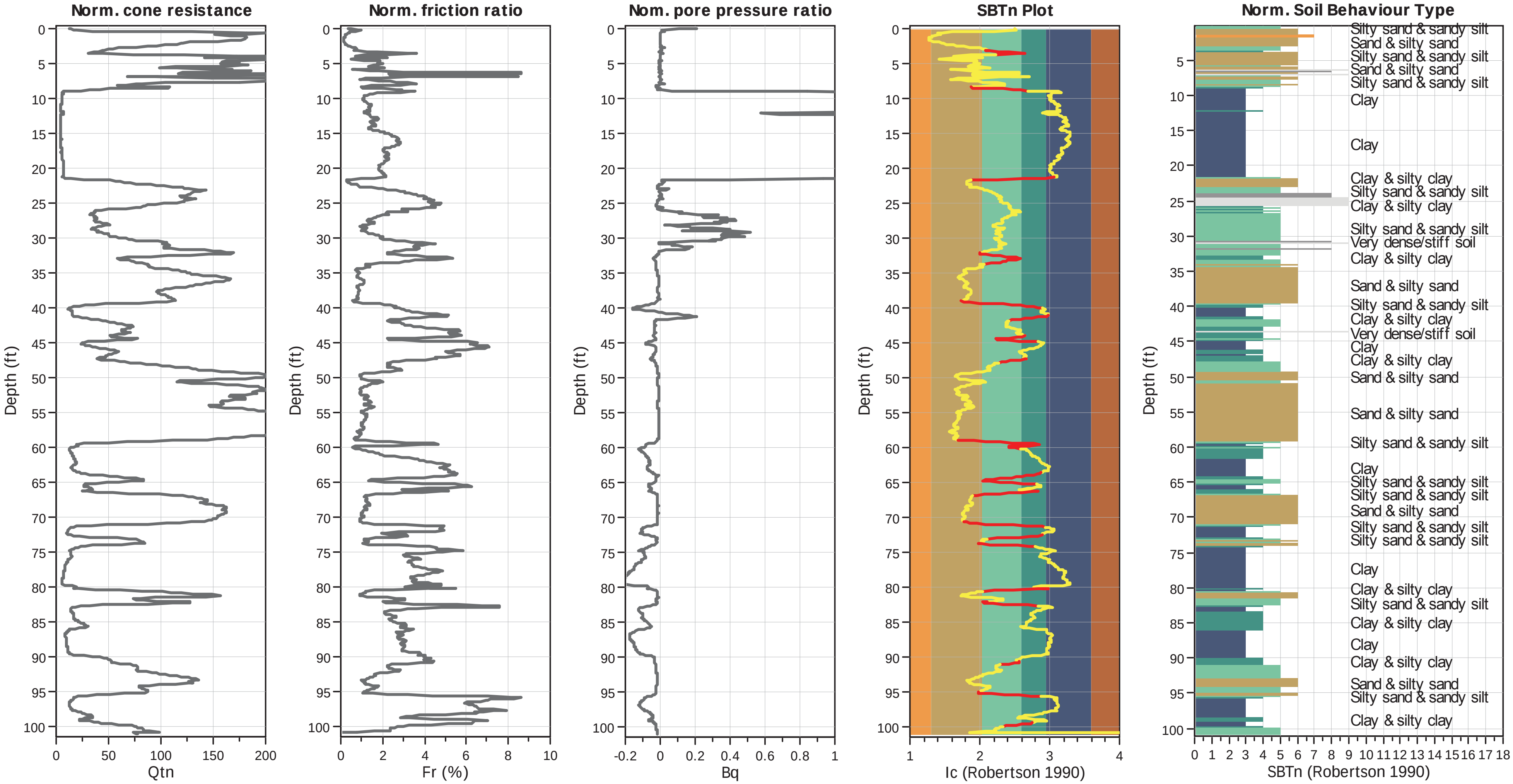






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



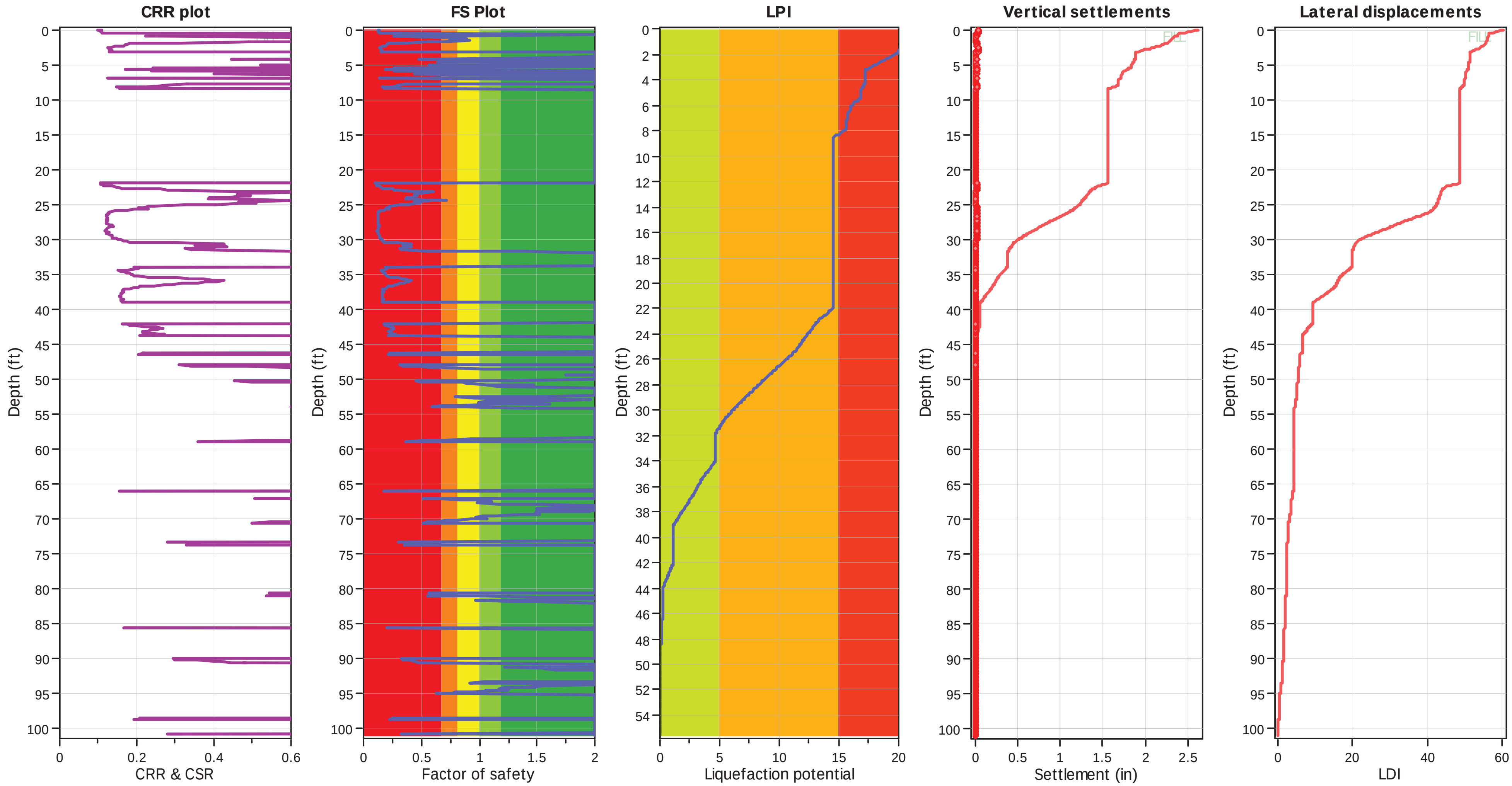
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

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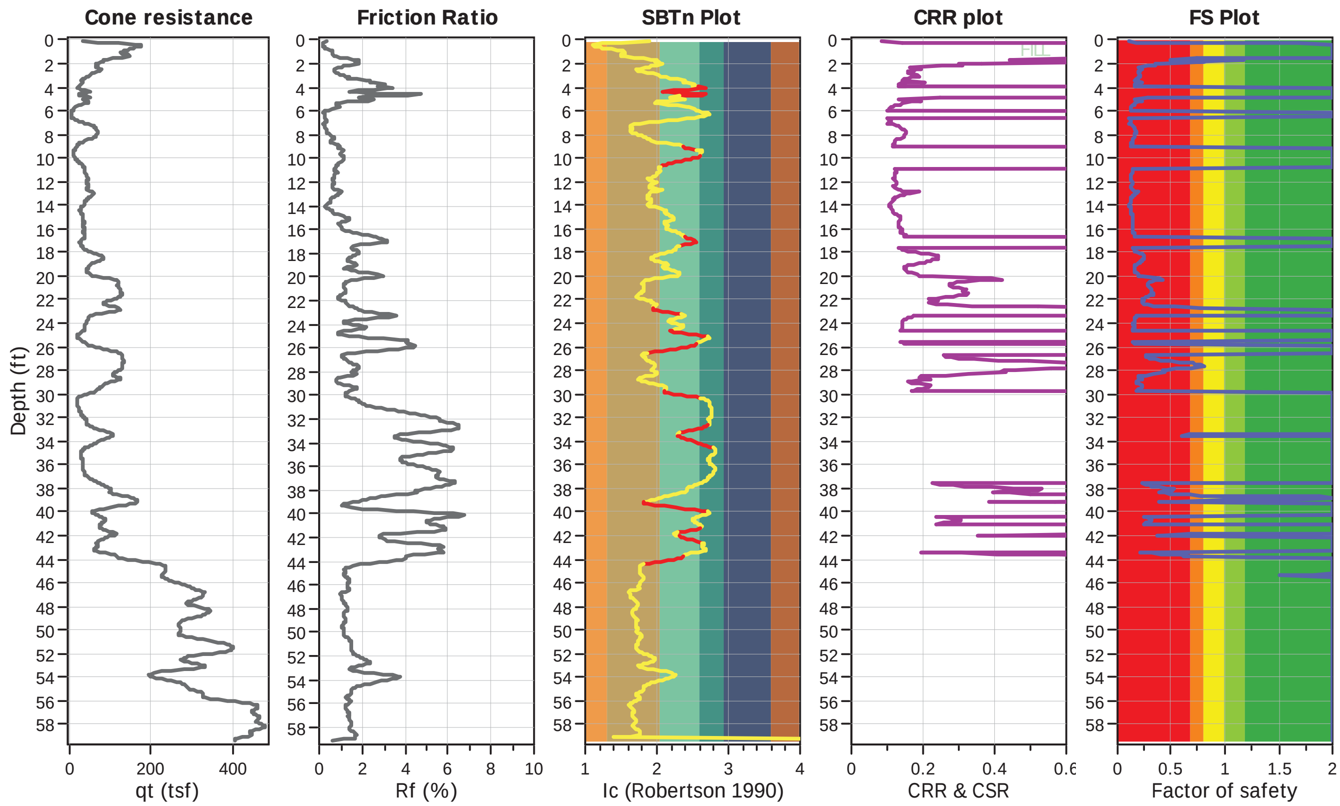
LIQUEFACTION ANALYSIS REPORT

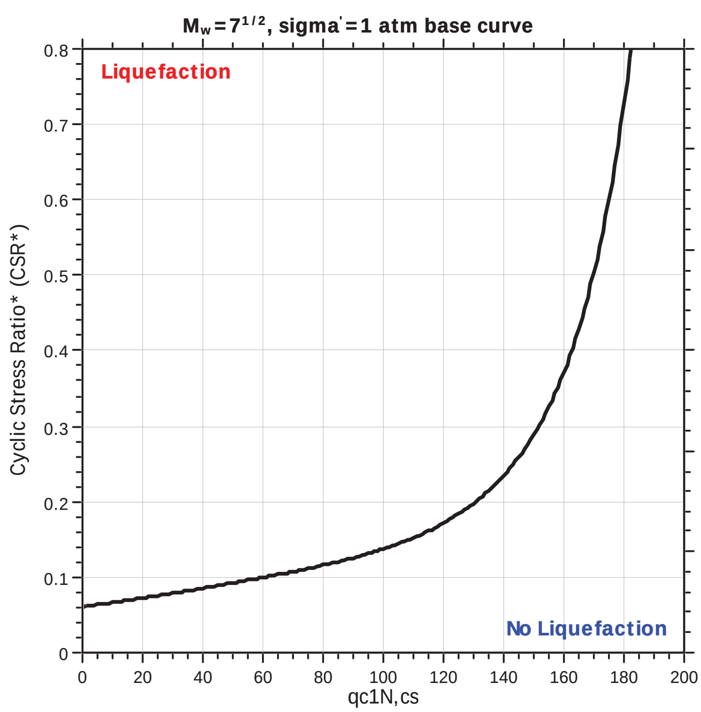
Project title : Baylands Railroad **Location : Brisbane, CA**

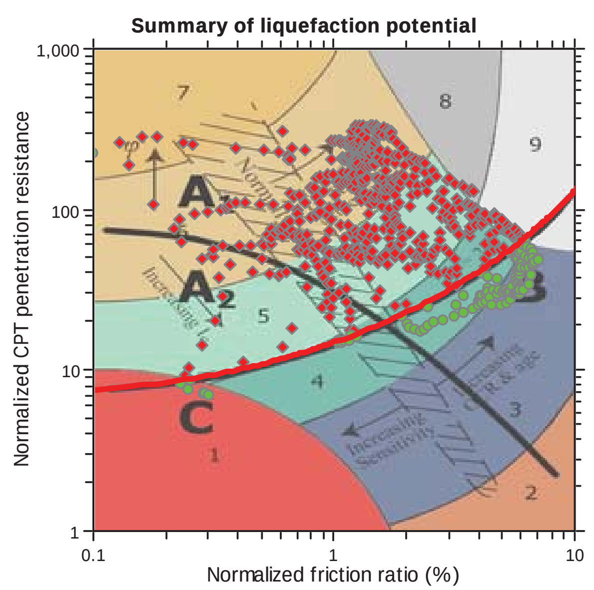
CPT file : 1-CPT11

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft³	Limit depth applied:	No
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method

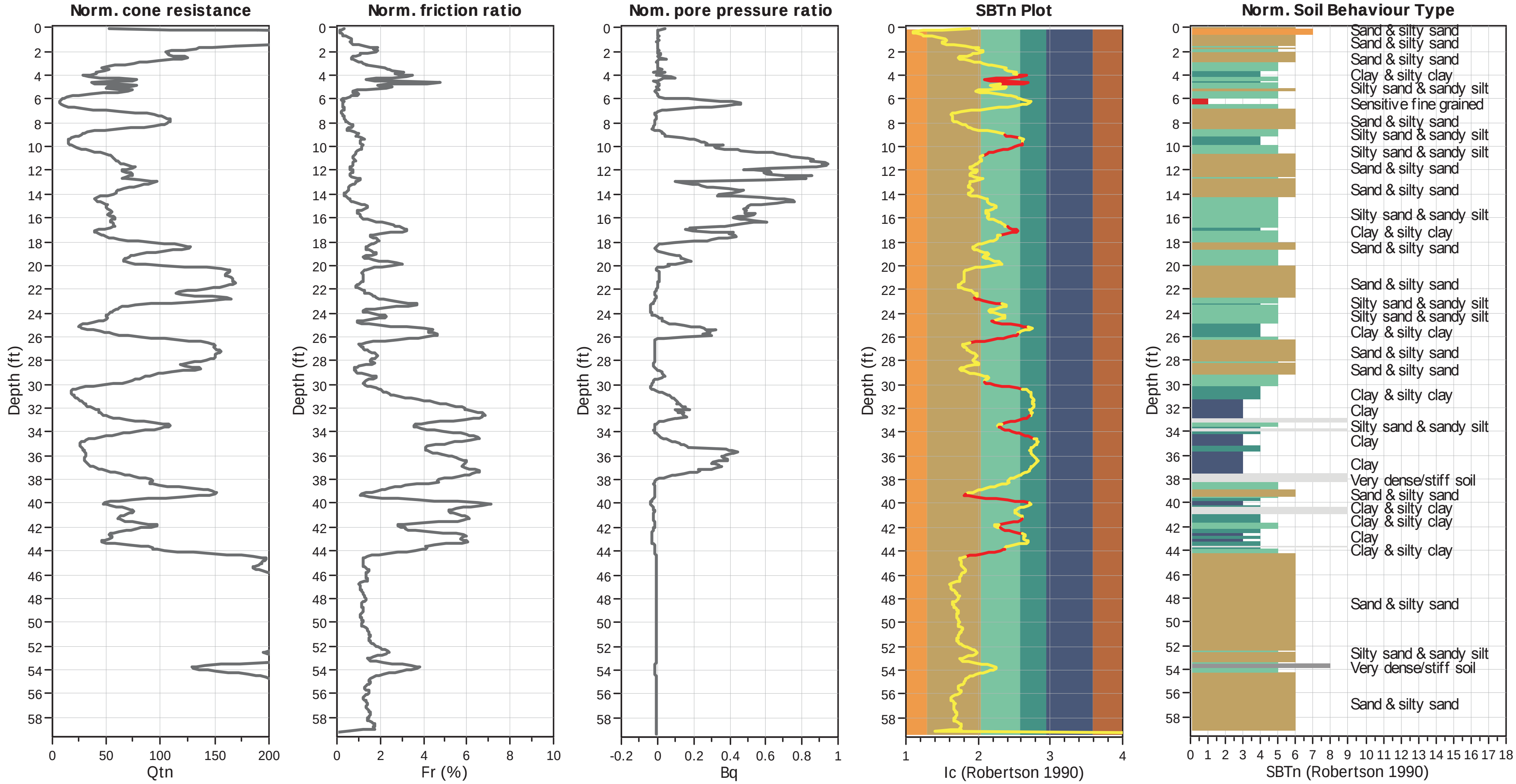






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



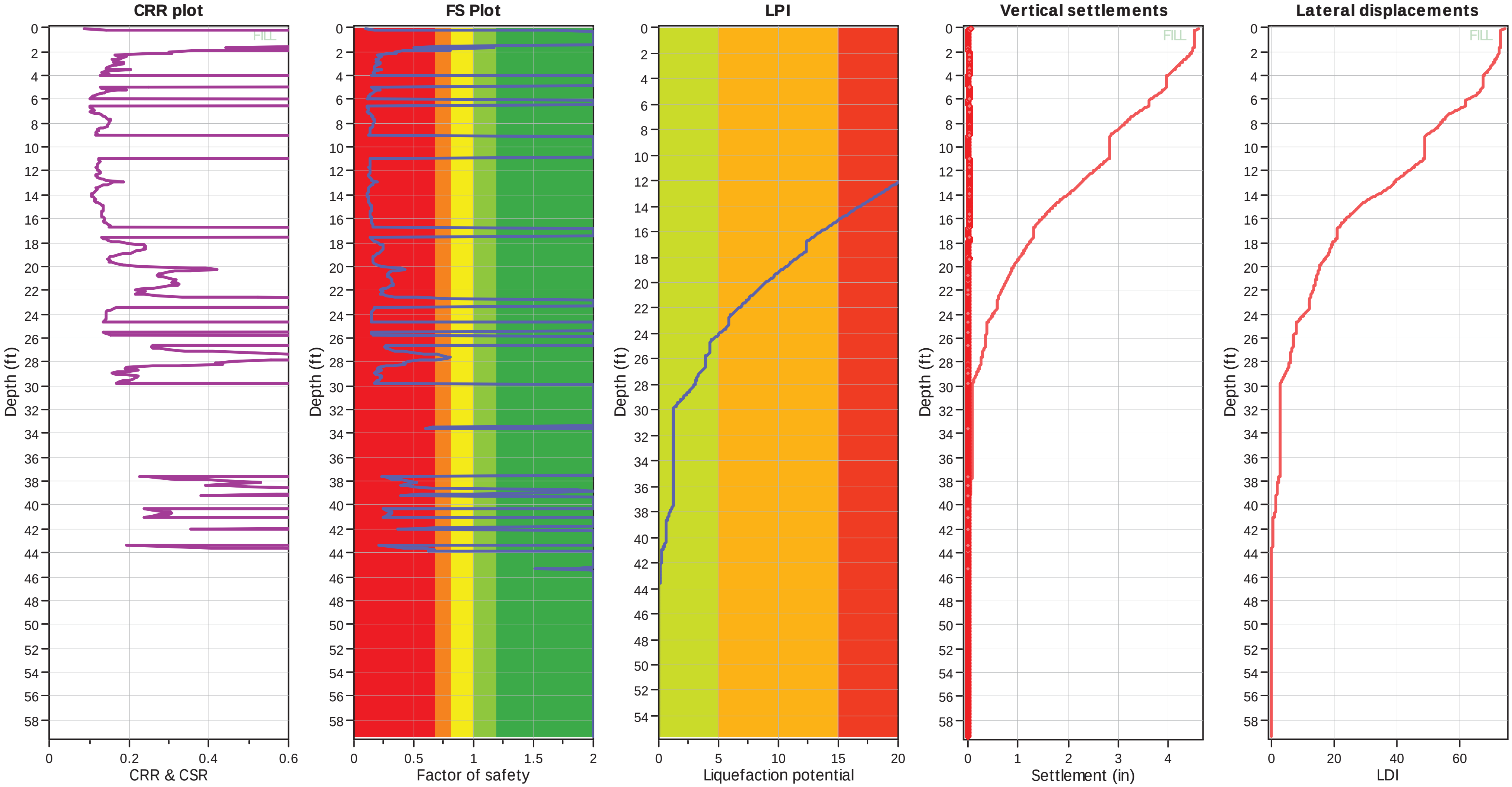
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

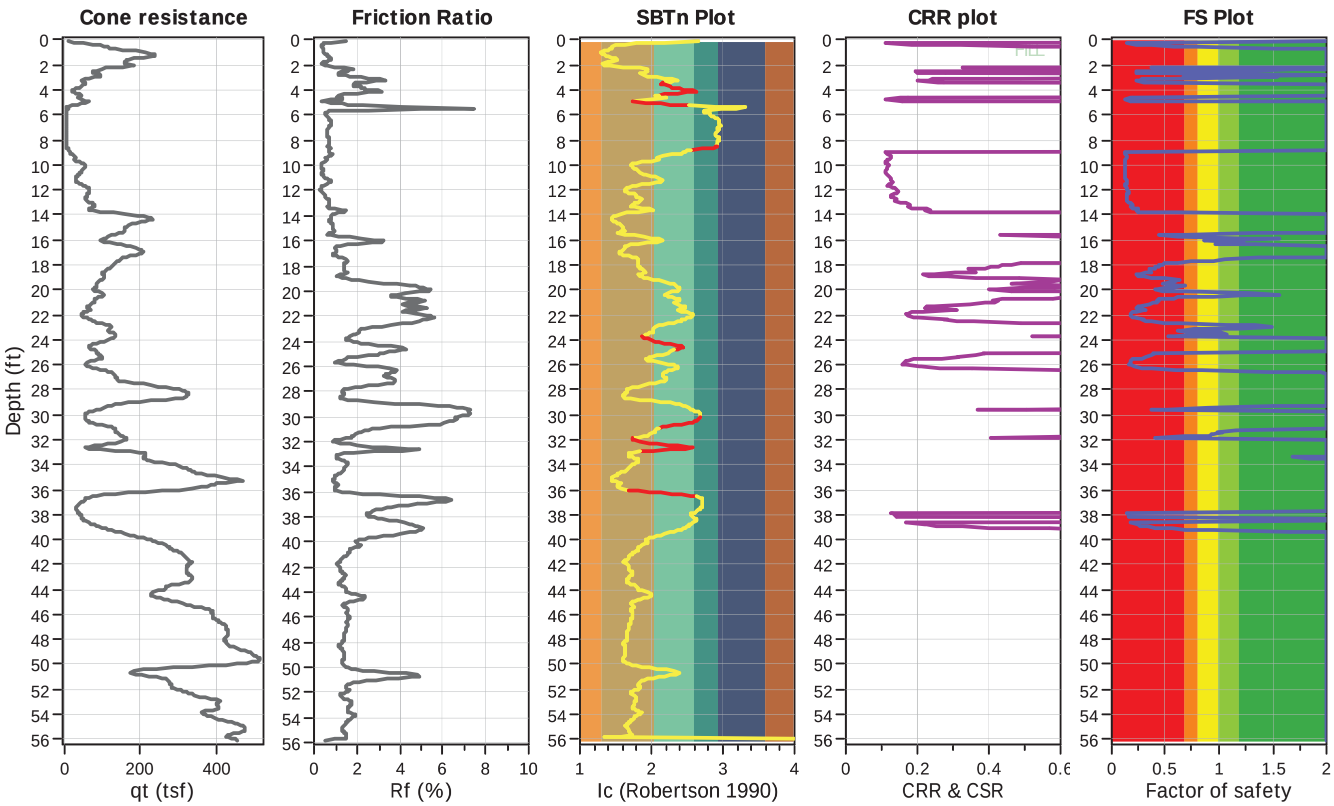
LIQUEFACTION ANALYSIS REPORT

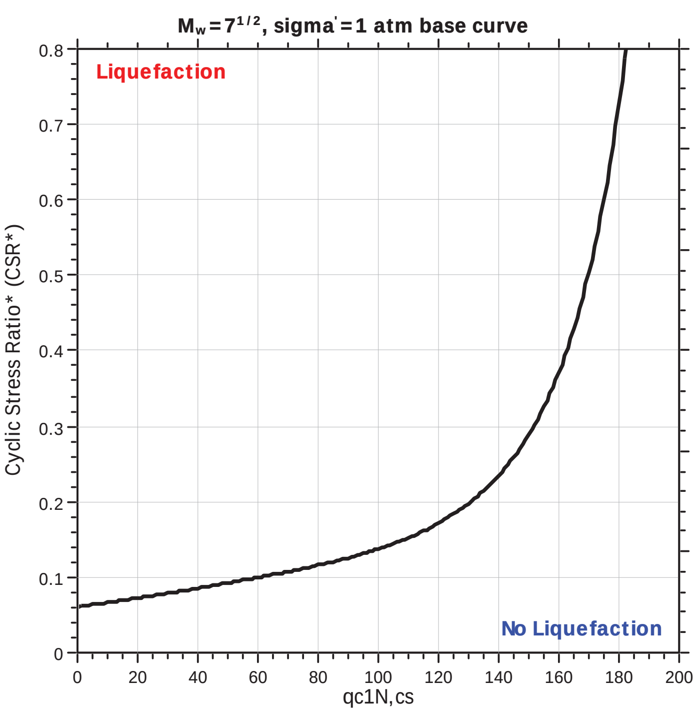
Project title : Baylands Railroad **Location : Brisbane, CA**

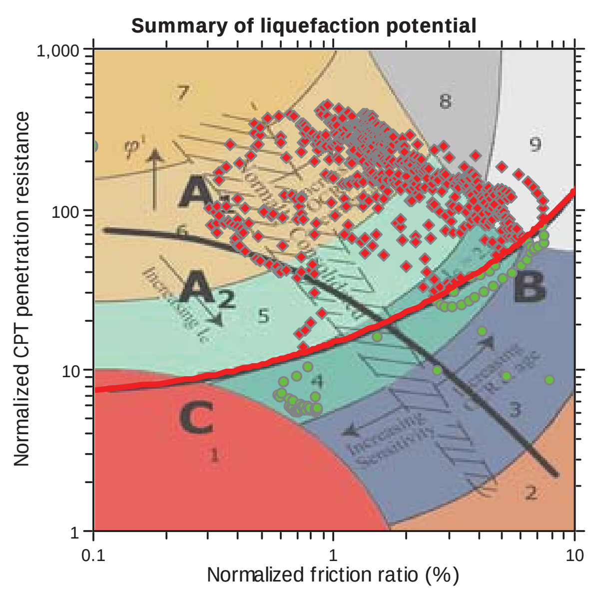
CPT file : 1-CPT12

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft³	Limit depth applied:	No
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method

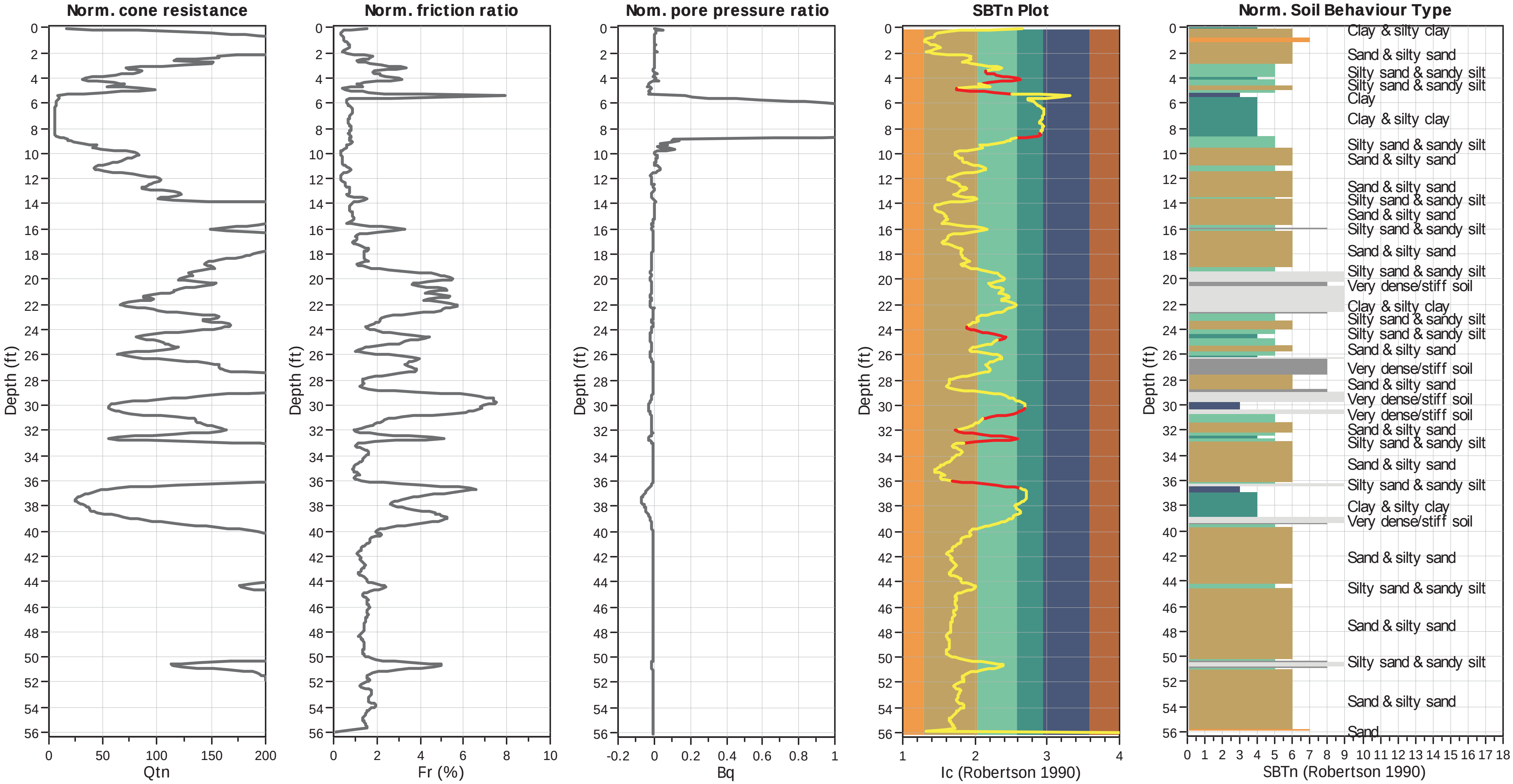






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



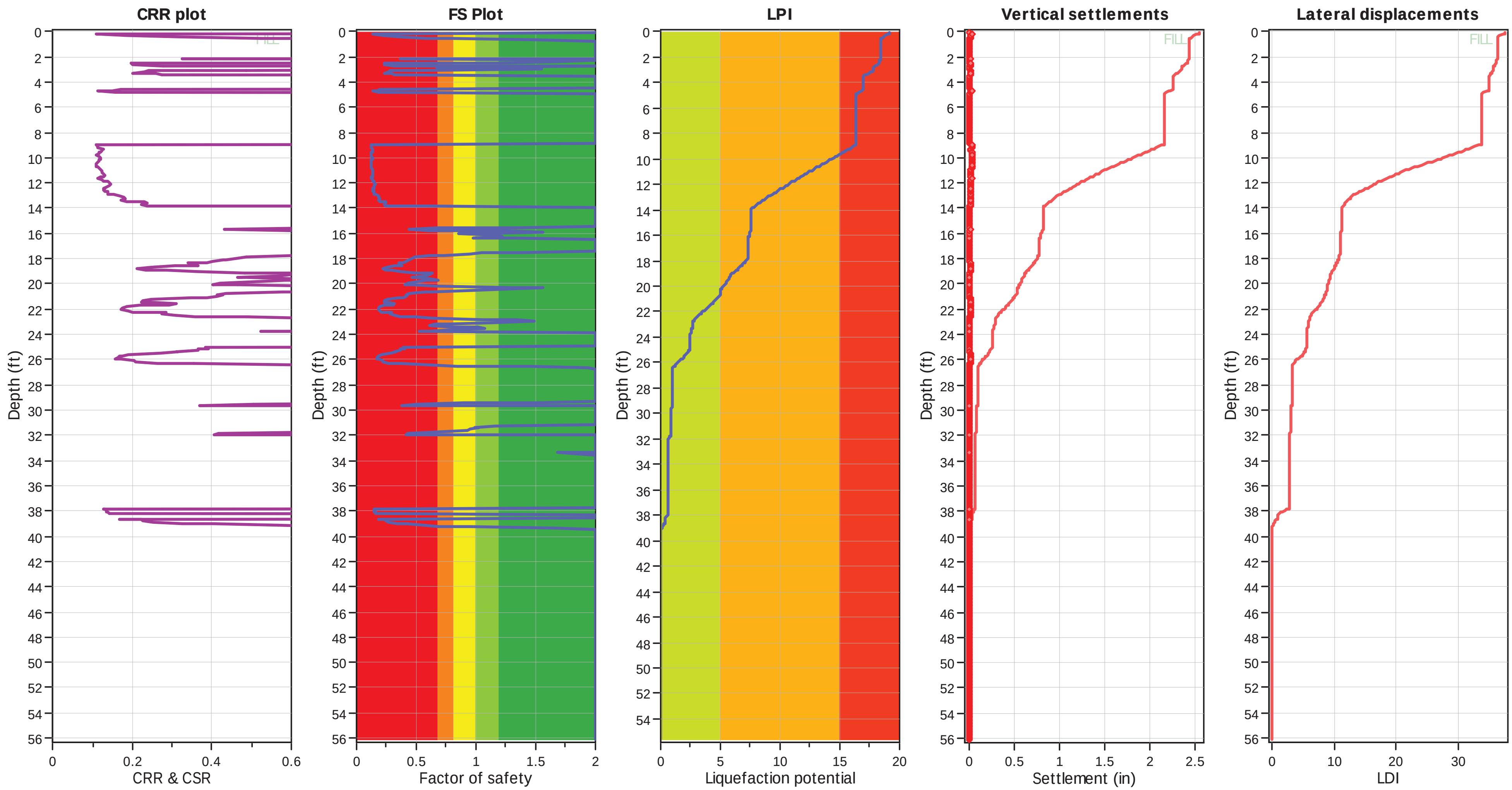
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

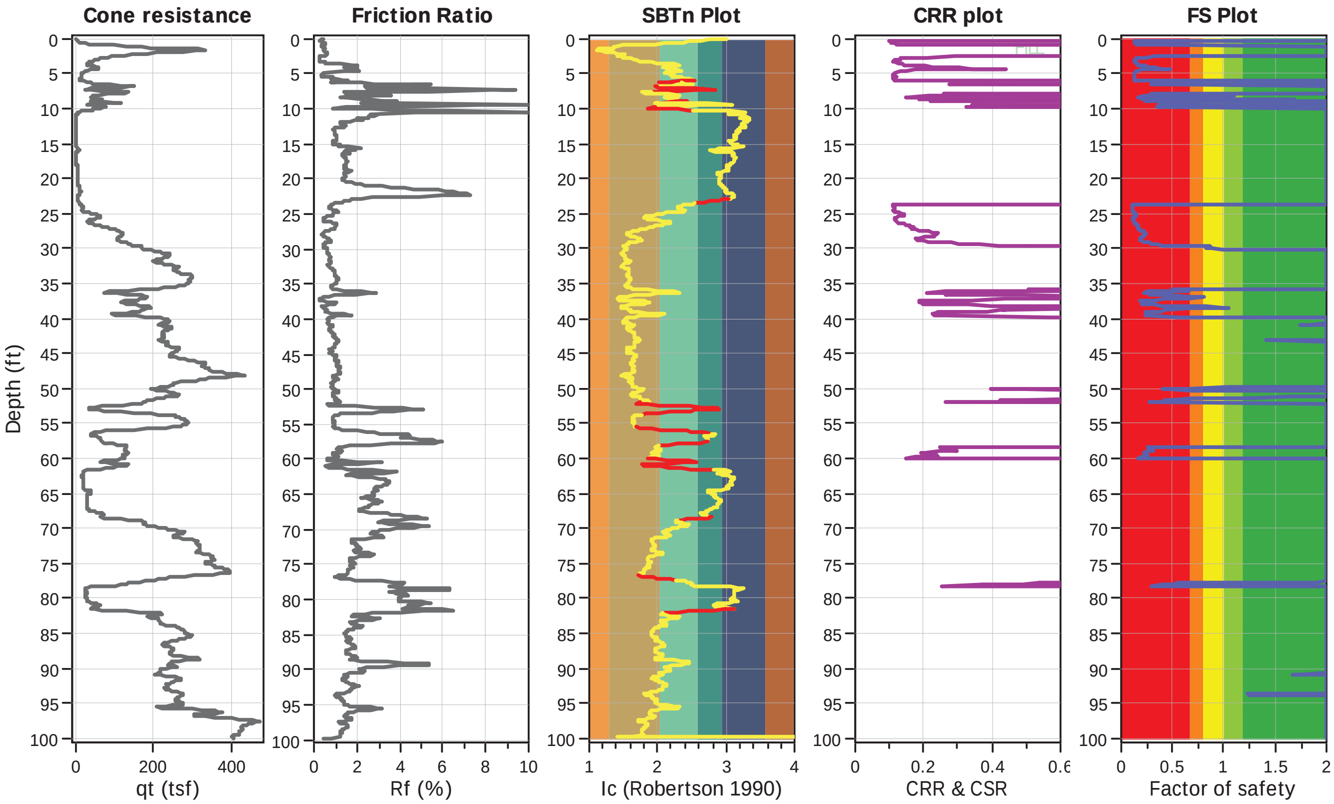
LIQUEFACTION ANALYSIS REPORT

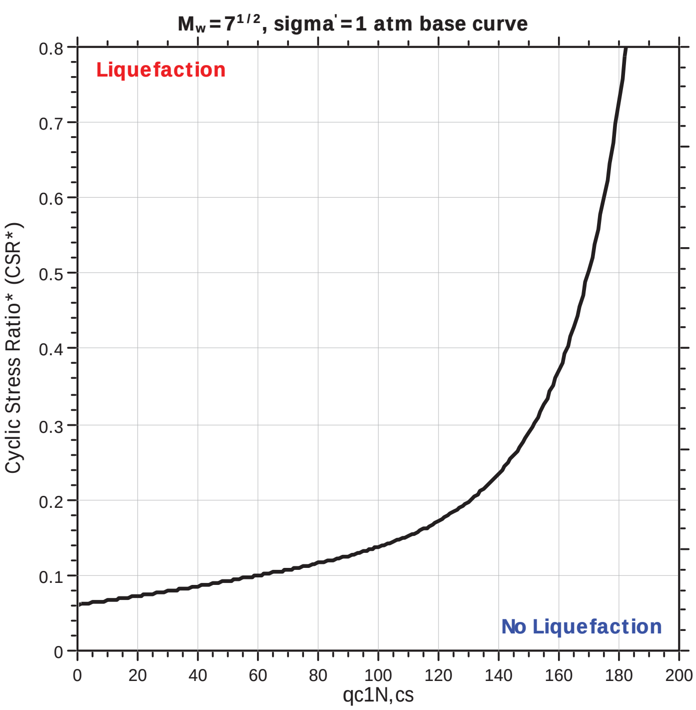
Project title : Baylands Railroad **Location : Brisbane, CA**

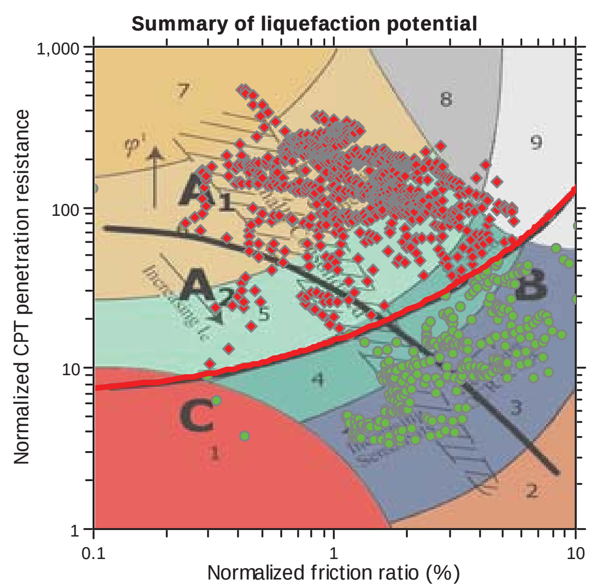
CPT file : 1-SCPT13

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

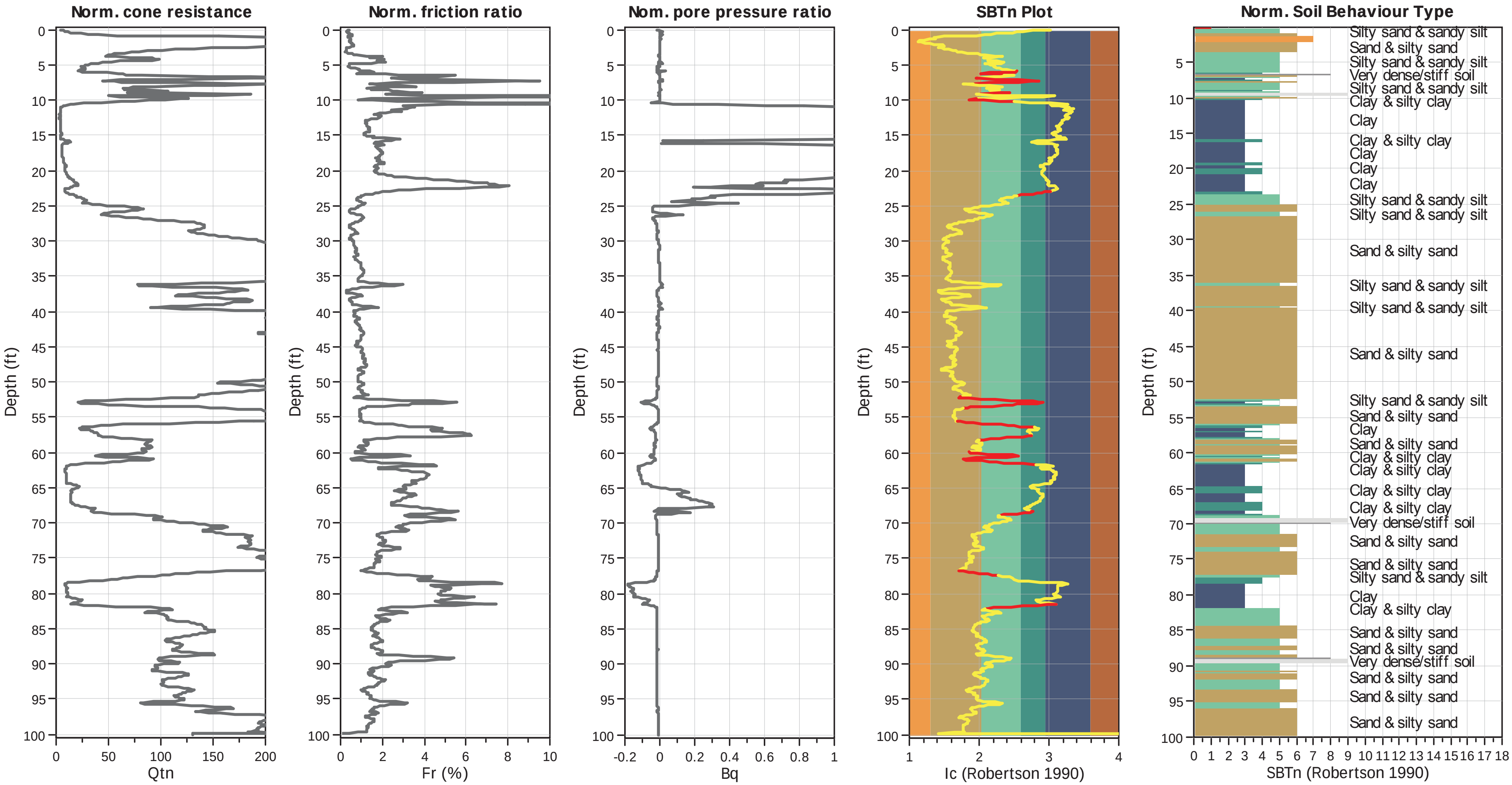






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



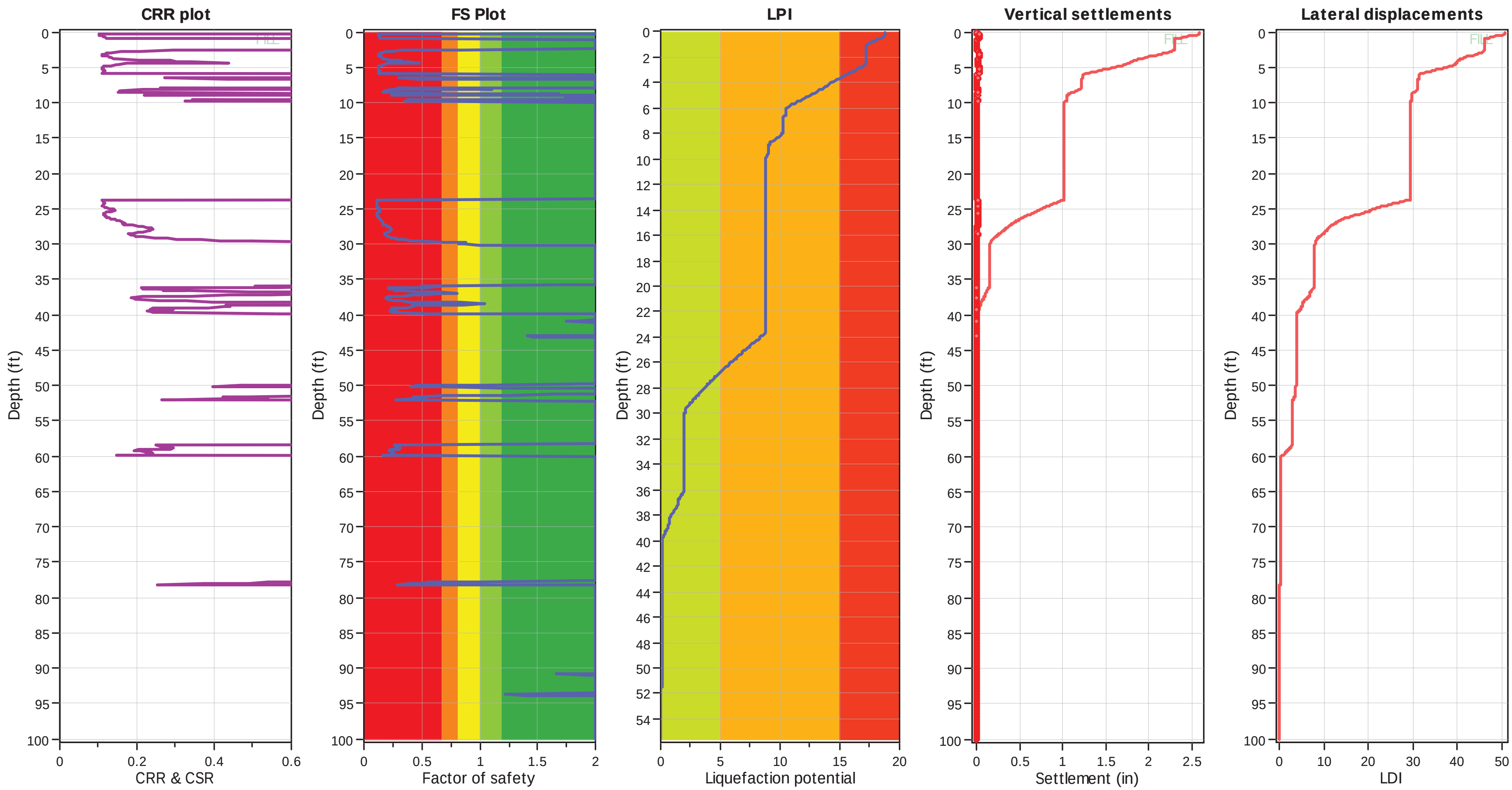
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

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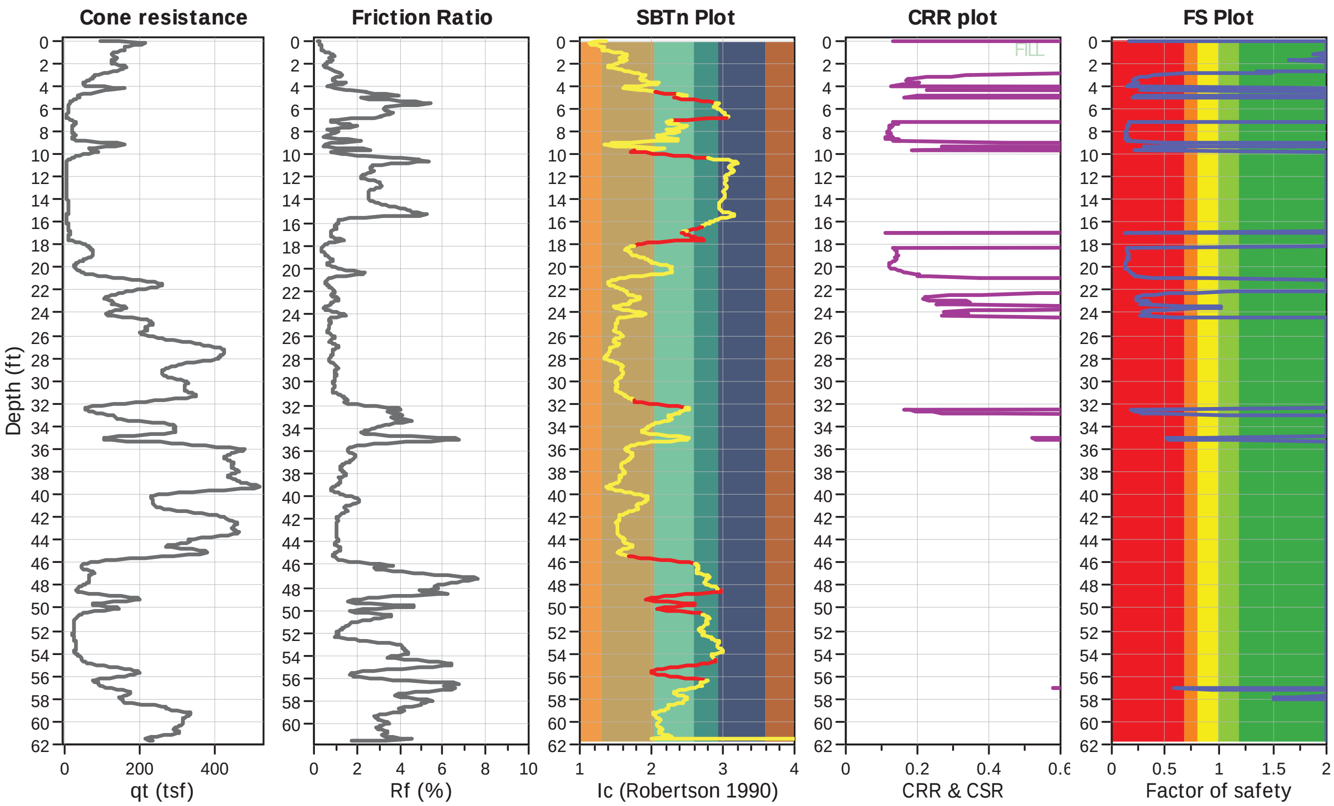
LIQUEFACTION ANALYSIS REPORT

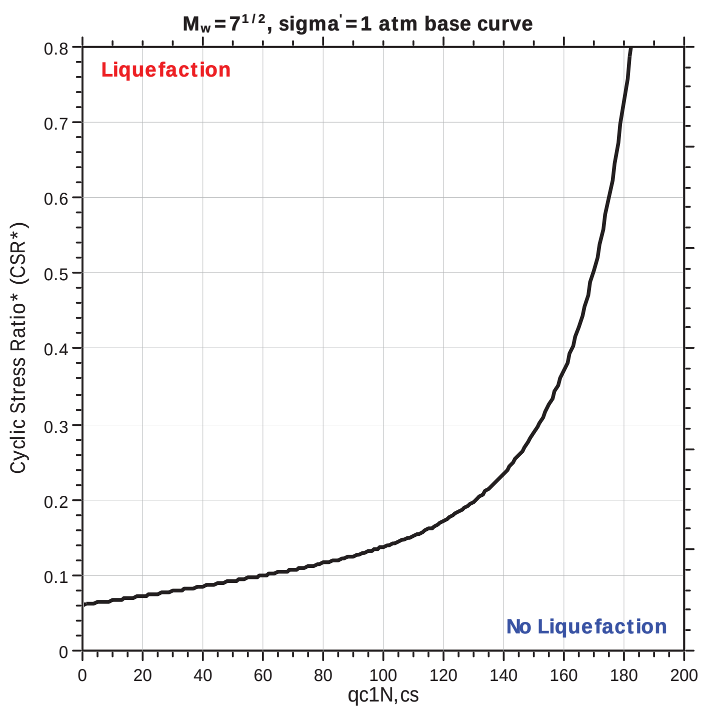
Project title : Baylands Railroad **Location : Brisbane, CA**

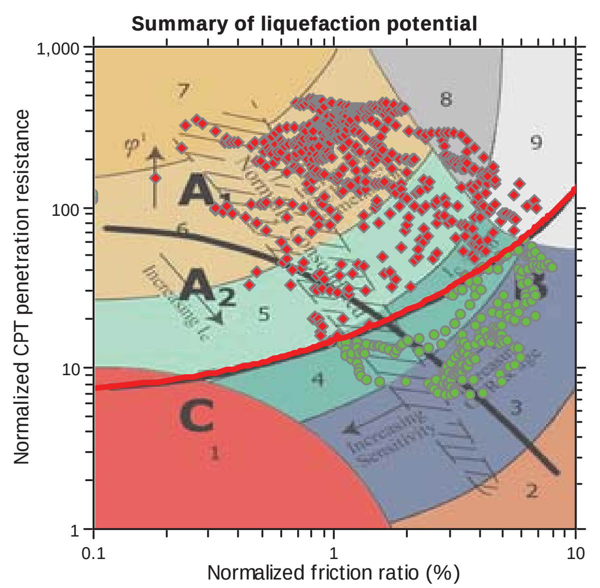
CPT file : 1-CPT14

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

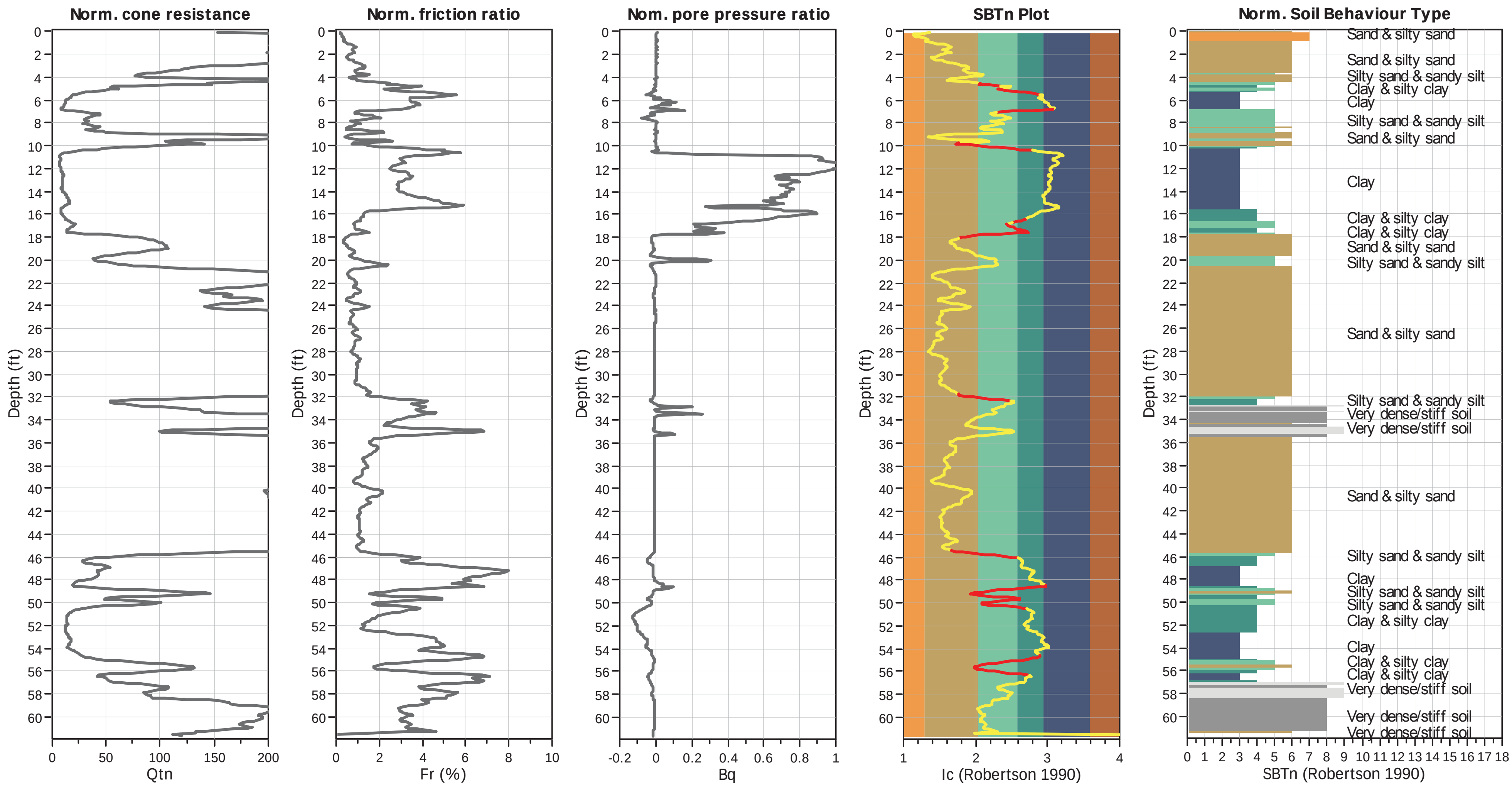






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normalized)



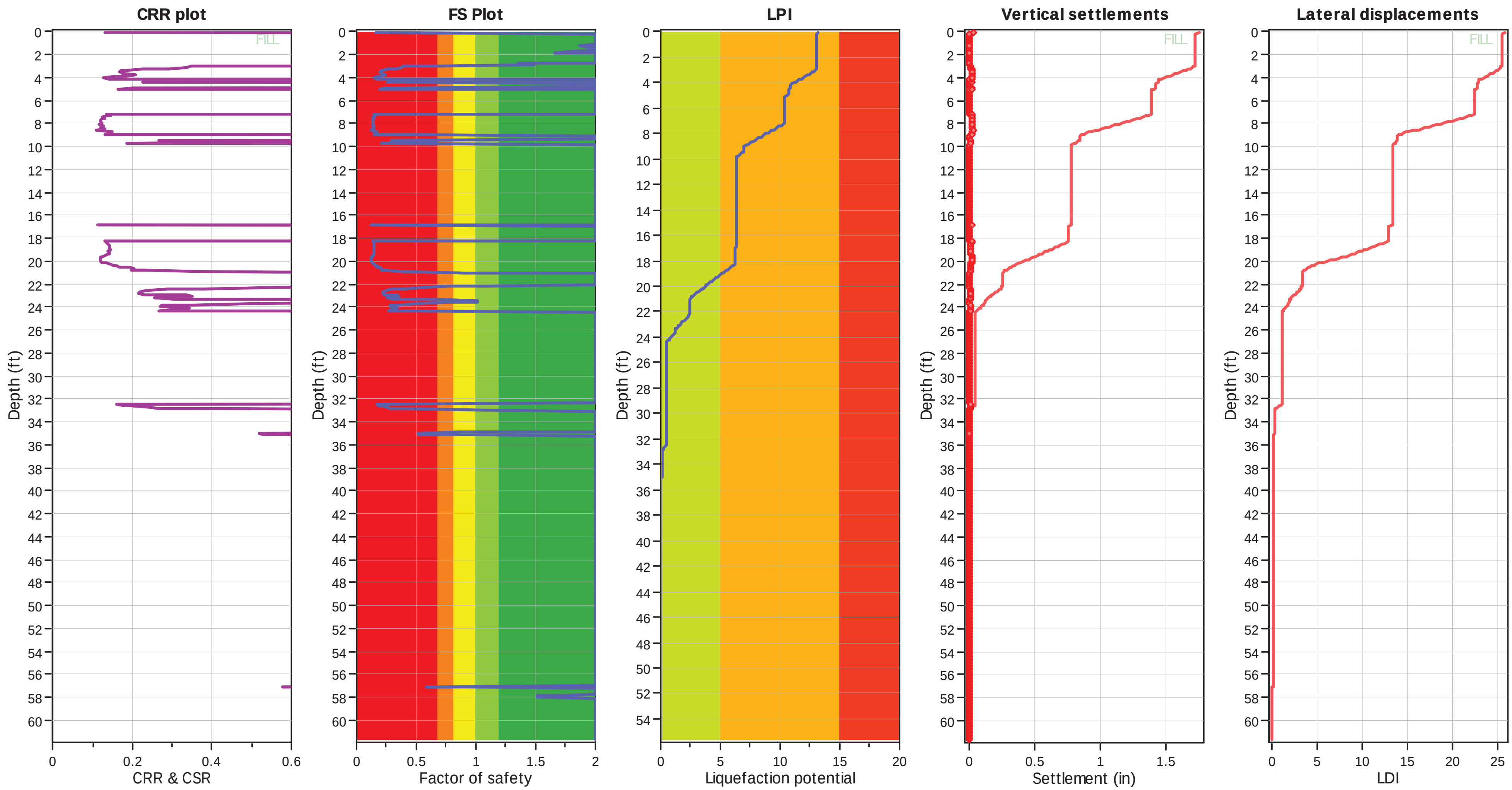
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

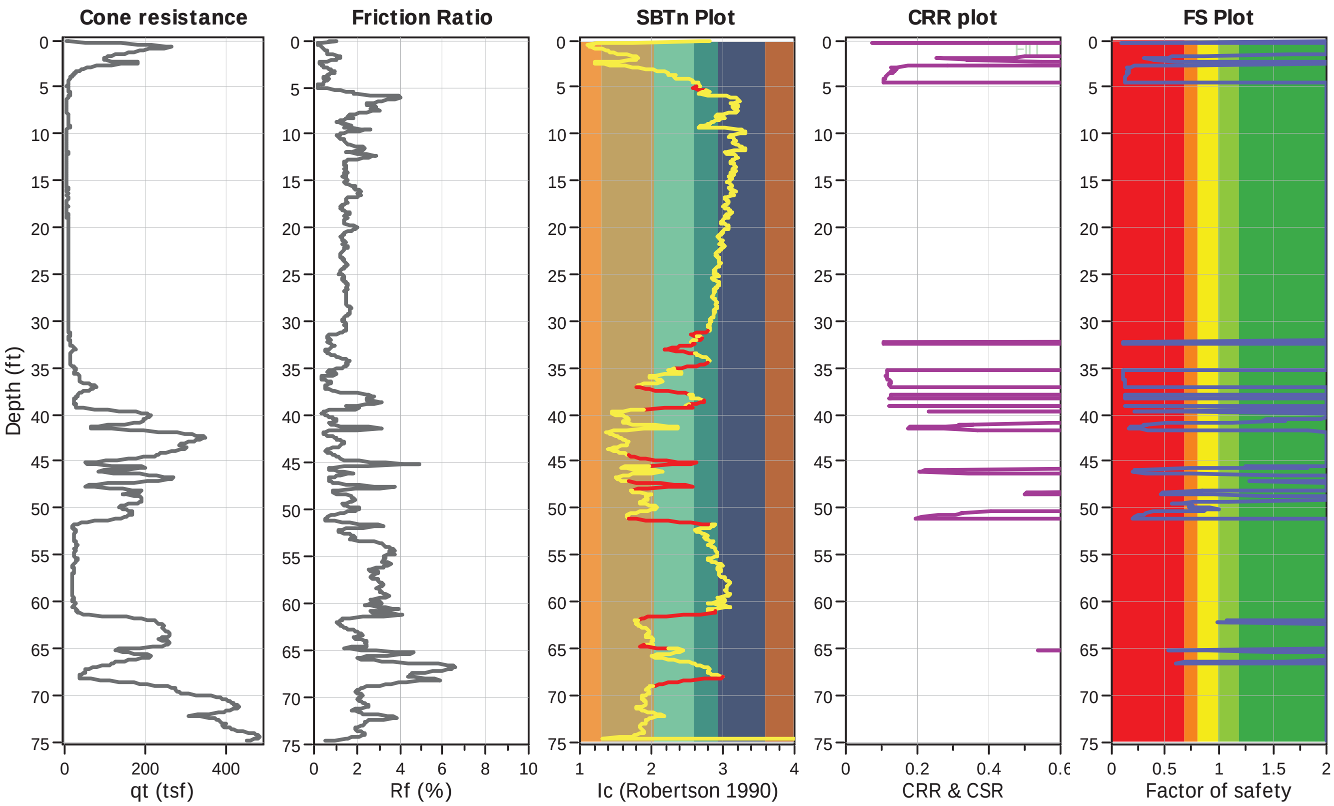
LIQUEFACTION ANALYSIS REPORT

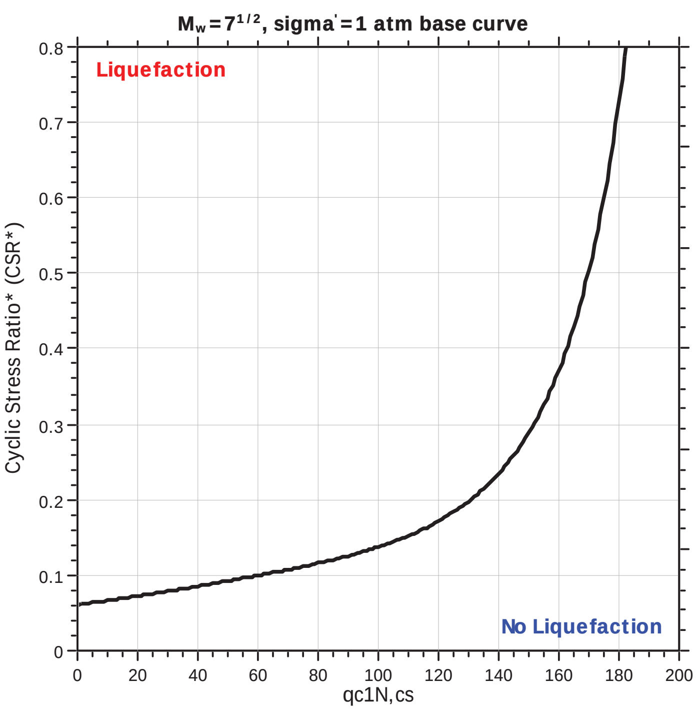
Project title : Baylands Railroad **Location : Brisbane, CA**

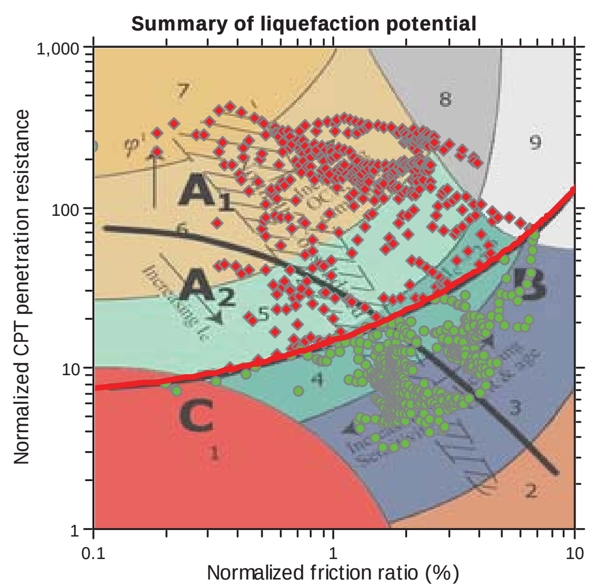
CPT file : 1-CPT15

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.76	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
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Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
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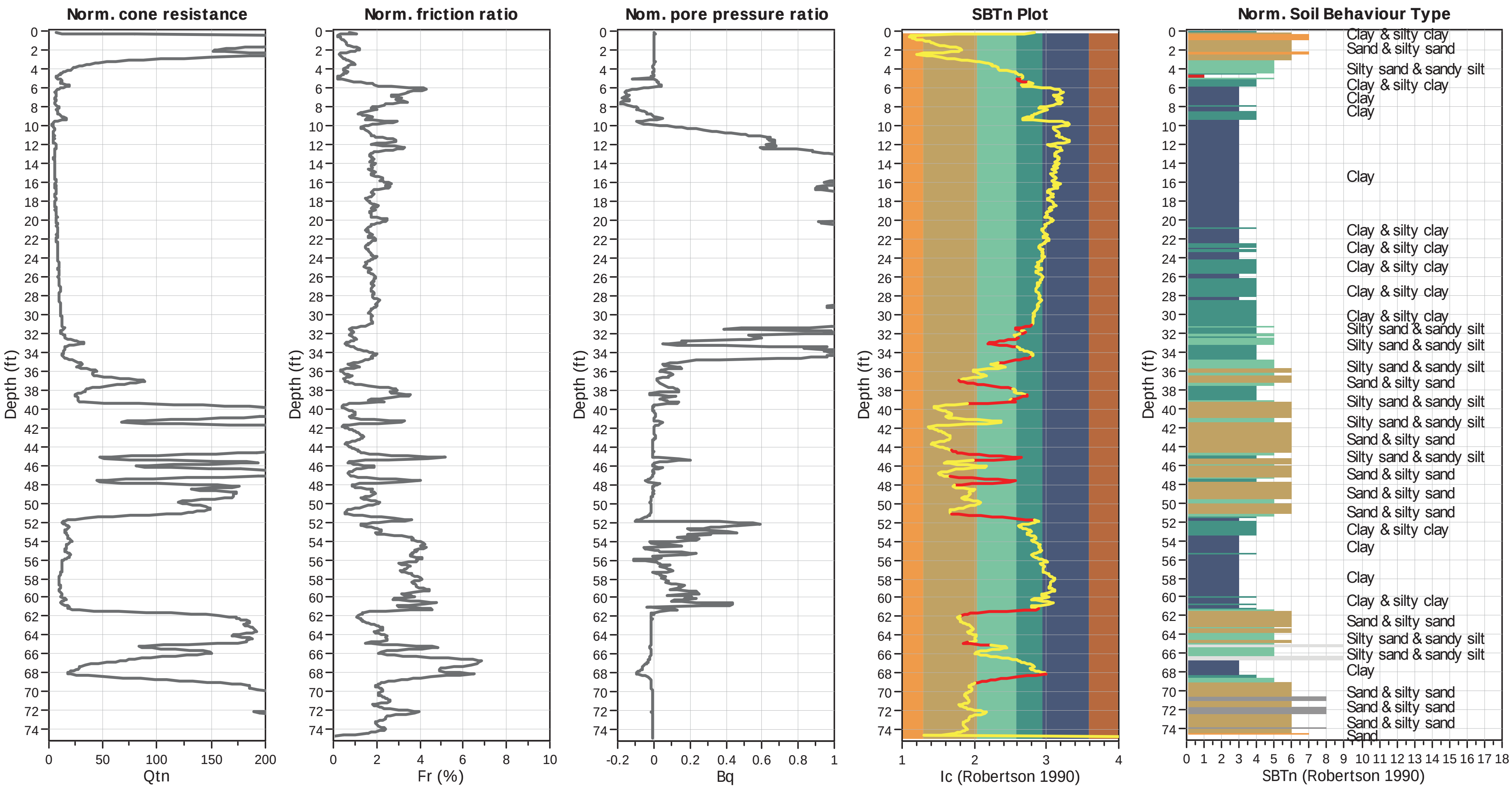
CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
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3. Clay to silty clay
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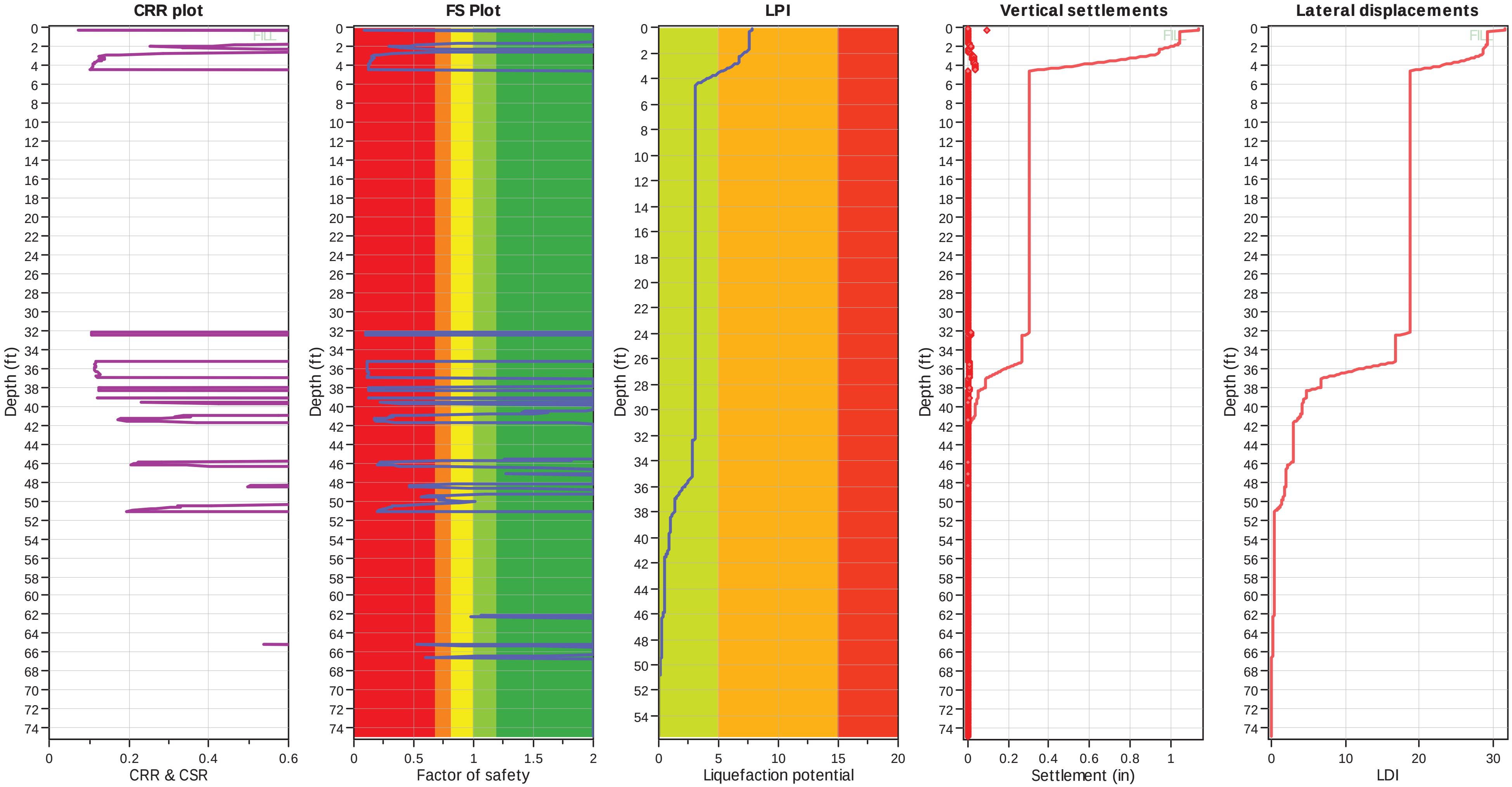
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 ft	Fill weight:	125.00 lb/ft^3
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.80	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.76	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

F.S. color scheme

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- Unlike to liquefy
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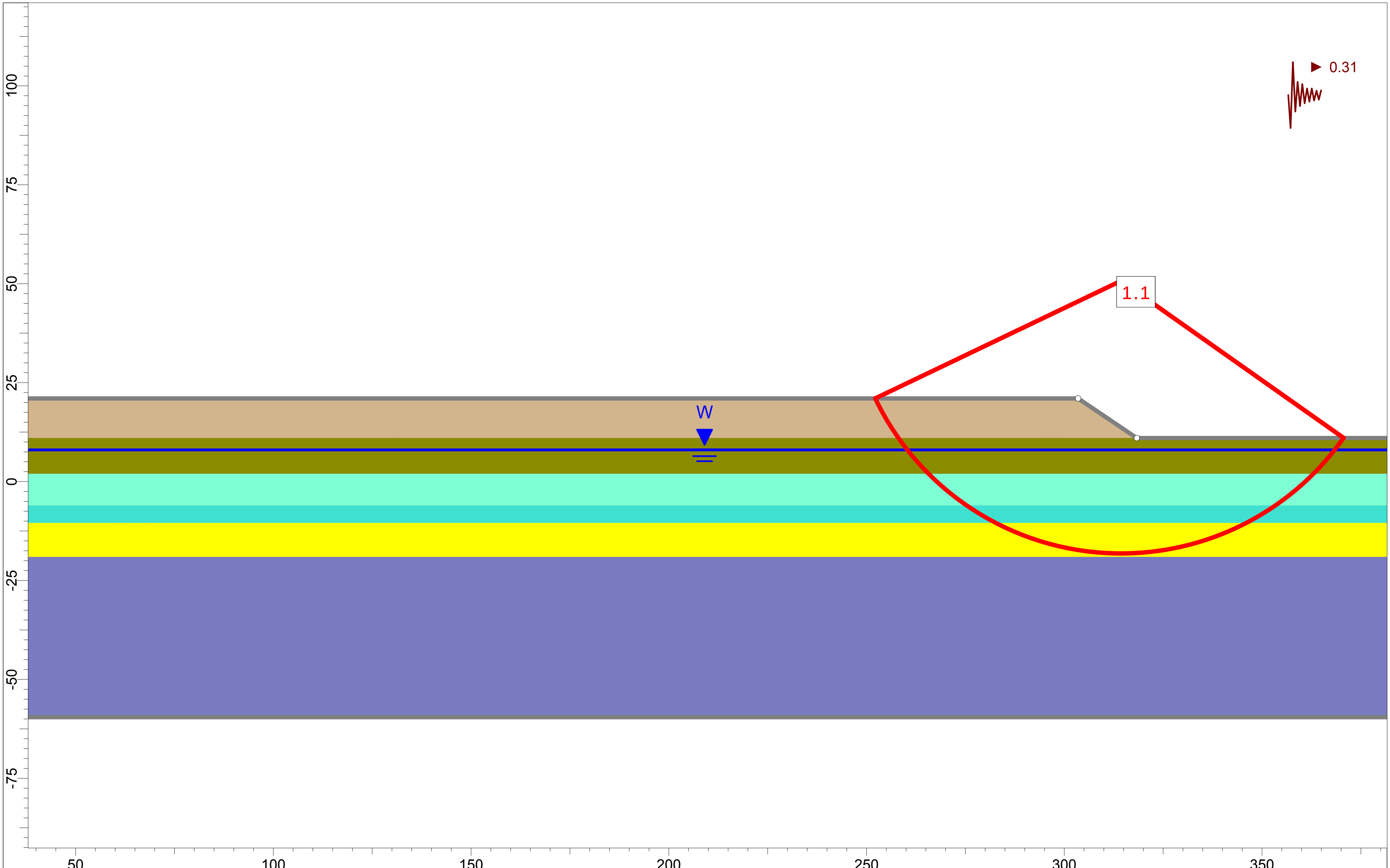
LPI color scheme

- Very high risk
- High risk
- Low risk

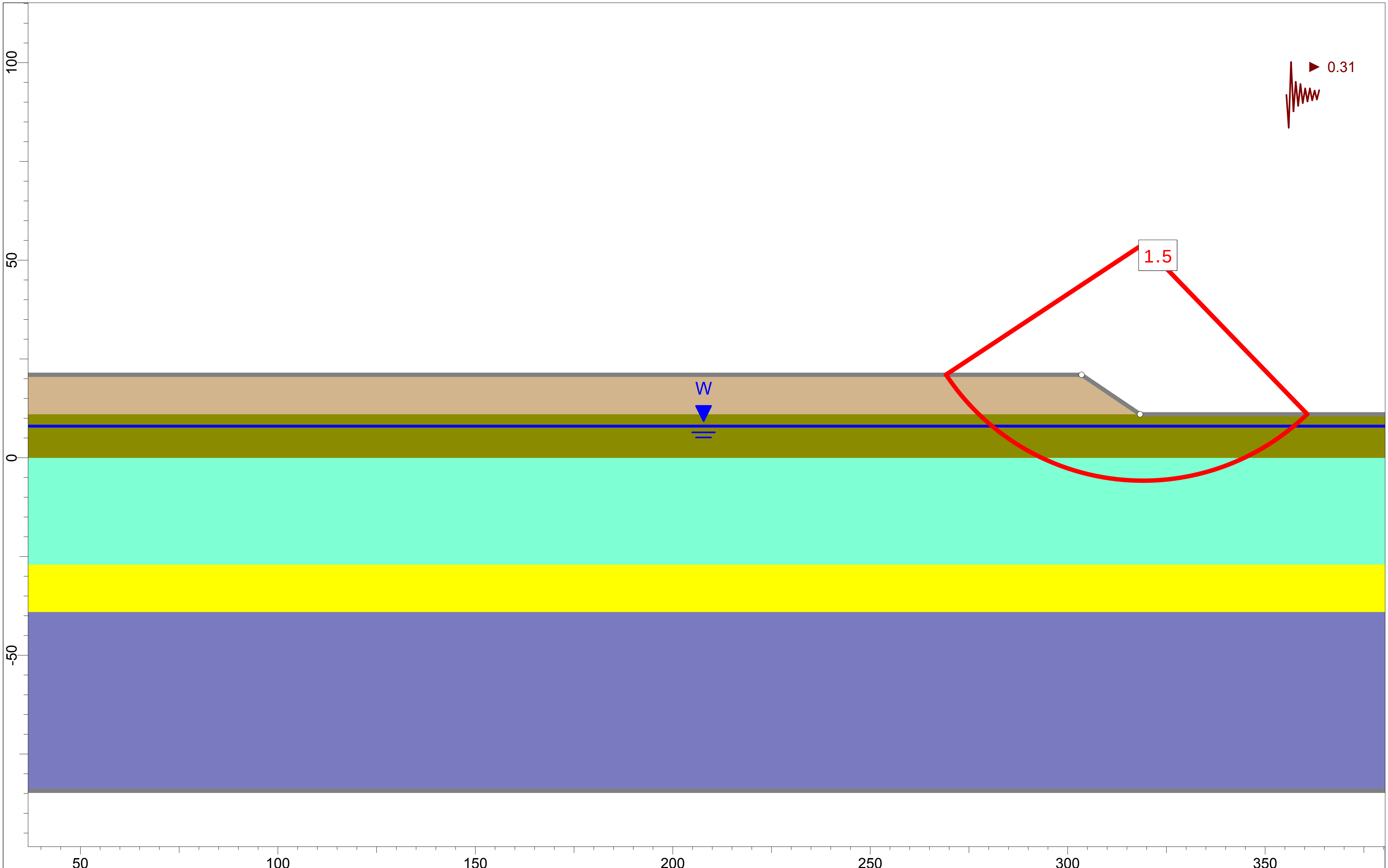
APPENDIX G

SLOPE STABILITY ANALYSIS



ENGEO
Expect Excellence

Section **Section 1 (1-CPT10)**		*Project* Baylands Railyard
Analysis **Pseudo-Static**	*Condition* **Proposed Grades**	
Author SOS	*Method* Spencer	*Project No.* 17270.000.000
Date 6/17/2020	*Scale* 1:400	



ENGEO Expect Excellence	Section	Section 2 (1-CPT03)	Project	Baylands Railyard
	Analysis: Pseudo-Static	Condition: Proposed Grades		
	Author: SOS	Method: Spencer	Project No.	17270.000.000
	Date: 6/17/2020	Scale: 1:400		

APPENDIX H

SUPPLEMENTAL RECOMMENDATIONS

SUPPLEMENTAL RECOMMENDATIONS

Prepared by
ENGEO Incorporated

ENGEO
Expect Excellence

TABLE OF CONTENTS

GENERAL INFORMATION

PREFACE

These supplemental recommendations are intended as a guide for earthwork and are in addition to any previous earthwork recommendations made by the Geotechnical Engineer. If there is a conflict between these supplemental recommendations and any previous recommendations, it should be immediately brought to the attention of ENGEO. Testing standards identified in this document shall be the most current revision (unless stated otherwise).

DEFINITIONS

BACKFILL	Soil, rock or soil-rock material used to fill excavations and trenches.
DRAWINGS	Documents approved for construction which describe the work.
THE GEOTECHNICAL ENGINEER	The project geotechnical engineering consulting firm, its employees, or its designated representatives.
ENGINEERED FILL	Fill upon which the Geotechnical Engineer has made sufficient observations and tests to confirm that the fill has been placed and compacted in accordance with geotechnical engineering recommendations.
FILL	Soil, rock, or soil-rock materials placed to raise the grades of the site or to backfill excavations.
IMPORTED MATERIAL	Soil and/or rock material which is brought to the site from offsite areas.
ONSITE MATERIAL	Soil and/or rock material which is obtained from the site.
OPTIMUM MOISTURE	Water content, percentage by dry weight, corresponding to the maximum dry density as determined by ASTM D-1557.
RELATIVE COMPACTION	The ratio, expressed as a percentage, of the in-place dry density of the fill or backfill material as compacted in the field to the maximum dry density of the same material as determined by ASTM D-1557.
SELECT MATERIAL	Onsite and/or imported material which is approved by the Geotechnical Engineer as a specific-purpose fill.

PART I - EARTHWORK

1.0 GENERAL

1.1 WORK COVERED

Supplemental recommendations for performing earthwork and grading. Activities include:

- ✓ Site Preparation and Demolition
- ✓ Excavation
- ✓ Grading
- ✓ Backfill of Excavations and Trenches
- ✓ Engineered Fill Placement, Moisture Conditioning, and Compaction

1.2 CODES AND STANDARDS

The contractor should perform their work complying with applicable occupational safety and health standards, rules, regulations, and orders. The Occupational Safety and Health Standards (OSHA) Board is the only agency authorized in the State to adopt and enforce occupational safety and health standards (Labor Code § 142 et seq.). The owner, their representative and contractor are responsible for site safety; ENGEO representatives are not responsible for site safety.

Excavating, trenching, filling, backfilling, shoring and grading work should meet the minimum requirements of the applicable Building Code, and the standards and ordinances of state and local governing authorities.

1.3 TESTING AND OBSERVATION

Site preparation, cutting and shaping, excavating, filling, and backfilling should be carried out under the testing and observation of ENGEO. ENGEO shall be retained to perform appropriate field and laboratory tests to check compliance with the recommendations. Any fill or backfill that does not meet the supplemental recommendations shall be removed and/or reworked, until the supplemental recommendations are satisfied.

Tests for compaction shall be made in accordance with test procedures outlined in ASTM D-1557, as applicable, unless other testing methods are deemed appropriate by ENGEO. These and other tests shall be performed in accordance with accepted testing procedures, subject to the engineering discretion of ENGEO.

2.0 MATERIALS

2.1 STANDARD

Materials, tools, equipment, facilities, and services as required for performing the required excavating, trenching, filling and backfilling should be furnished by the Contractor.

2.2 ENGINEERED FILL AND BACKFILL

Material to be used for engineered fill and backfill should be free from organic matter and other deleterious substances, and of such quality that it will compact thoroughly without excessive voids when watered and rolled.

Unless specified elsewhere by ENGEO, engineered fill and backfill shall be free of significant organics, or any other unsatisfactory material. In addition, engineered fill and backfill shall comply with the grading requirements shown in the following table:

TABLE 2.2-1: Engineered Fill and Backfill Requirements

US STANDARD SIEVE	PERCENTAGE PASSING
3"	100
No. 4	35–100
No. 30	20–100

Earth materials to be used as engineered fill and backfill shall be cleared of debris, rubble and deleterious matter. Rocks and aggregate exceeding the maximum allowable size shall be removed from the site. Rocks of maximum dimension in excess of two-thirds of the lift thickness shall be removed from any fill material to the satisfaction of ENGEO.

ENGEO shall be immediately notified if potential hazardous materials or suspect soils exhibiting staining or odor are encountered. Work activities shall be discontinued within the area of potentially hazardous materials. ENGEO shall be notified at least 72 hours prior to the start of filling and backfilling operations. Materials to be used for filling and backfilling shall be submitted to ENGEO no less than 10 days prior to intended delivery to the site. Unless specified elsewhere by ENGEO, where conditions require the importation of low expansive fill material, the material shall be an inert, low to non-expansive soil, or soil-rock material, free of organic matter and meeting the following requirements:

TABLE 2.2-2: Imported Fill Material Requirements

GRADATION (ASTM D-421)	SIEVE SIZE	PERCENT PASSING
	2-inch	100
	#200	15 - 70
PLASTICITY (ASTM D-4318)	Plasticity Index < 12	
ORGANIC CONTENT (ASTM D-2974)	Less than 3 percent	

A sample of the proposed import material should be submitted to ENGEO no less than 10 days prior to intended delivery to the site.

2.3 SUBDRAINS

A subdrain system is an underground network of piping used to remove water from areas that collect or retain surface water or subsurface water. Subsurface water is collected by allowing water into the pipe through perforations. Subdrain systems may drain and discharge to an appropriate outlet such as storm drain, natural swales or drainage, etc.. Details for subdrain systems may vary depending on many items, including but not limited to site conditions, soil types, subdrain spacing, depth of the pipe and pervious medium, as well as pipe diameter.

2.4 PIPE

Subdrain pipe shall conform with these supplemental recommendations unless specified elsewhere by ENGEO. Perforated pipe for various depths shall be manufactured in accordance with the following requirements:

TABLE 2.4-1: Perforated Pipe Requirements

PIPE TYPE	STANDARD	TYPICAL SIZES (INCHES)	PIPE STIFFNESS (PSI)
PIPE STIFFNESS ABOVE 200 PSI (BELOW 50 FEET OF FINISHED GRADE)			
ABS SDR 15.3		4 to 6	450
PVC Schedule 80	ASTM D1785	3 to 10	530
PIPE STIFFNESS BETWEEN 100 PSI AND 150 PSI (BETWEEN 15 AND 50 FEET OF FINISHED GRADE)			
ABS SDR 23.5	ASTM D2751	4 to 6	150
PVC SDR 23.5	ASTM D3034	4 to 6	153
PVC Schedule 40	ASTM D1785	3 to 10	135
ABS Schedule 40/DWV	ASTM D1527 & D2661	3 to 10	
PIPE STIFFNESS BETWEEN 45 PSI AND 50 PSI* (BETWEEN 0 TO 15 FEET OF FINISHED GRADE)			
PVC A-2000	ASTM F949	4 to 10	50
PVC SDR 35	ASTM D3034	4 to 8	46
ABS SDR 35	ASTM D2751	4 to 8	45
Corrugated PE	AASHTO M294 Type S	4 to 10	45

***Pipe with a stiffness less than 45 psi should not be used.**

Other pipes not listed in the table above shall be submitted for review by the Geotechnical Engineer not less 72 hours before proposed use.

2.5 OUTLETS AND RISERS

Subdrain outlets and risers must be fabricated from the same material as the subdrain pipe. Outlet and riser pipe and fittings must not be perforated. Covers must be fitted and bolted into the riser pipe or elbow. Covers must seat uniformly and not be subject to rocking.

2.6 PERMEABLE MATERIAL

Permeable material shall generally conform to Caltrans Standard Specification unless specified otherwise by ENGEO. Class 2 permeable material shall comply with the gradation requirements shown in the following table.

TABLE 2.6-1: Class 2 Permeable Material Grading Requirements

SIEVE SIZES	PERCENTAGE PASSING
1"	100
3/4"	90 to 100
3/8"	40 to 100
No. 4	25 to 40
No. 8	18 to 33
No. 30	5 to 15
No. 50	0 to 7
No. 200	0 to 3

2.7 FILTER FABRIC

Filter fabric shall meet the following Minimum Average Roll Values unless specified elsewhere by ENGEO.

Grab Strength (ASTM D-4632) .... 180 lbs
Mass per Unit Area (ASTM D-4751) ....6 oz/yd^2
Apparent Opening Size (ASTM D-4751) ....70-100 U.S. Std. Sieve
Flow Rate (ASTM D-4491)... 80 gal/min/ft^2
Puncture Strength (ASTM D-4833) .... 80 lbs

Areas to receive filter fabric must comply with the compaction and elevation tolerance specified for the material involved. Handle and place filter fabric under the manufacturer's instructions. Align and place filter fabric without wrinkles.

Overlap adjacent roll ends of filter fabric in accordance with manufacturer’s recommendations. The preceding roll must overlap the following roll in the direction that the permeable material is being spread. Completely replace torn or punctured sections damaged during placement or repair by placing a piece of filter fabric that is large enough to cover the damaged area and comply with the overlap specified. Cover filter fabric with the thickness of overlying material shown within 72 hours of placing the fabric.

2.8 GEOCOMPOSITE DRAINAGE

Geocomposite drainage is a prefabricated material that includes filter fabric and plastic pipe. Filter fabric must be Class A. The drain shall be of composite construction consisting of a supporting structure or drainage core material surrounded by a geotextile. The geotextile shall encapsulate the drainage core and prevent random soil intrusion into the drainage structure. The drainage core material shall consist of a three-dimensional polymeric material with a structure that permits flow along the core laterally. The core structure shall also be constructed to permit flow regardless of the water inlet surface. The drainage core shall provide support to the geotextile.

A geotextile flap shall be provided along drainage core edges. This flap shall be of sufficient width for sealing the geotextile to the adjacent drainage structure edge to prevent soil intrusion into the structure during and after installation. The geotextile shall cover the full length of the core. The geocomposite core shall be furnished with an approved method of constructing and connecting with outlet pipes. If the fabric on the geocomposite drain is torn or punctured, replace the damaged section completely. The specific drainage composite material and supplier shall be preapproved by ENGEO.

The Contractor shall submit a manufacturer's certification that the geocomposite meets the design properties and respective index criteria measured in full accordance with applicable test methods. The manufacturer's certification shall include a submittal package of documented test results that confirm the design values. In case of dispute over validity of design values, the Contractor will supply design property test data from a laboratory approved by ENGEO, to support the certified values submitted.

Geocomposite material suppliers shall provide a qualified and experienced representative onsite to assist the Contractor and ENGEO at the start of construction with directions on the use of drainage composite. If there is more than one application on a project, this criterion will apply to construction of the initial application only. The representative shall also be available on an as-needed basis, as requested by ENGEO, during construction of the remaining applications. The soil surface against which the geocomposite is to be placed shall be free of debris and inordinate irregularities that will prevent intimate contact between the soil surface and the drain.

Edge seams shall be formed by utilizing the flap of the geotextile extending from the geocomposite's edge and lapping over the top of the fabric of the adjacent course. The fabric flap shall be securely fastened to the adjacent fabric by means of plastic tape or non-water-soluble construction adhesive, as recommended by the supplier. To prevent soil intrusion, exposed edges of the geocomposite drainage core edge must be covered.

Approved backfill shall be placed immediately over the geocomposite drain. Backfill operations should be performed to not damage the geotextile surface of the drain. Also during operations, avoid excessive settlement of the backfill material. The geocomposite drain, once installed, shall not be exposed for more than 7 days prior to backfilling.

PART II - GEOGRID SOIL REINFORCEMENT

Geogrid soil reinforcement (geogrid) shall be submitted to ENGEO and should be approved before use. The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. The geogrid structure shall be dimensionally stable and able to retain its geometry under construction stresses and shall have high resistance to damage during construction to ultraviolet degradation and to chemical and biological degradation encountered in the soil being reinforced. The geogrids shall have an Allowable Tensile Strength (T_a) and Pullout Resistance, for the soil type(s) as specified on design plans.

The contractor shall submit a manufacturer's certification that the geogrids supplied meet plans and project specifications. The contractor shall check the geogrid upon delivery to ensure that the proper material has been received. During periods of shipment and storage, the geogrid shall be protected from temperatures greater than 140°F, mud, dirt, dust, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the geogrid will be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be repaired by placing a patch over the damaged area. Any geogrid damaged during storage or installation shall be replaced by the Contractor at no additional cost to the owner.

Geogrid material suppliers shall provide a qualified and experienced representative onsite at the initiation of the project, for a minimum of three days, to assist the Contractor and ENGEO personnel at the start of construction. If there is more than one slope on a project, this criterion will apply to construction of the initial slope only. The representative shall also be available on an as-needed basis, as requested by ENGEO, during construction of the remaining slope(s). Geogrid reinforcement may be joined with mechanical connections or overlaps as recommended and approved by the manufacturer. Joints shall not be placed within 6 feet of the slope face, within 4 feet below top of slope, nor horizontally or vertically adjacent to another joint.

The geogrid reinforcement shall be installed in accordance with the manufacturer's recommendations. The geogrid reinforcement shall be placed within the layers of the compacted soil as shown on the plans or as directed. The geogrid reinforcement shall be placed in continuous longitudinal strips in the direction of main reinforcement. However, if the Contractor is unable to complete a required length with a single continuous length of geogrid, a joint may be made with the manufacturer's approval. Only one joint per length of geogrid shall be allowed. This joint shall be made for the full width of the strip by using a similar material with similar strength. Joints in geogrid reinforcement shall be pulled and held taut during fill placement.

Adjacent strips, in the case of 100 percent coverage in plan view, need not be overlapped. The minimum horizontal coverage is 50 percent, with horizontal spacing between reinforcement no greater than 40 inches. Horizontal coverage of less than 100 percent shall not be allowed unless specifically detailed in the construction drawings. Adjacent rolls of geogrid reinforcement shall be overlapped or mechanically connected where exposed in a wrap around face system, as applicable.

The Contractor may place only that amount of geogrid reinforcement required for immediately pending work to prevent undue damage. After a layer of geogrid reinforcement has been placed, the next succeeding layer of soil shall be placed and compacted as appropriate. After the specified soil layer has been placed, the next geogrid reinforcement layer shall be installed. The process shall be repeated for each subsequent layer of geogrid reinforcement and soil. Geogrid reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geogrid reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geogrid reinforcement in position until the subsequent soil layer can be placed.

Under no circumstances shall a track-type vehicle be allowed on the geogrid reinforcement before at least 6 inches of soil have been placed. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and the geogrid reinforcement. If approved by the Manufacturer, rubber-tired equipment may pass over the geosynthetic reinforcement at slow speeds, less than 10 mph. Sudden braking and sharp turning shall be avoided. During construction, the surface of the fill should be kept approximately horizontal. Geogrid reinforcement shall be placed directly on the compacted horizontal fill surface. Geogrid reinforcements are to be placed as shown on plans, and oriented correctly.

PART III - GEOTEXTILE SOIL REINFORCEMENT

The specific geotextile material and supplier shall be preapproved by ENGEO. The contractor shall submit a manufacturer's certification that the geotextiles supplied meet the respective index criteria set when geotextile was approved by ENGEO, measured in full accordance with specified test methods and standards.

The contractor shall check the geotextile upon delivery to ensure that the proper material has been received. During periods of shipment and storage, the geotextile shall be protected from temperatures greater than 140°F, mud, dirt, dust, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the geotextile will be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be repaired by placing a patch over the damaged area. Any geotextile damaged during storage or installation shall be replaced by the Contractor at no additional cost to the owner.

Geotextile material suppliers shall provide a qualified and experienced representative onsite at the initiation of the project to assist the Contractor and ENGEO personnel at the start of construction. The geotextile reinforcement shall be installed in accordance with the manufacturer's recommendations. The geotextile reinforcement shall be placed within the layers of the compacted soil as shown on the plans or as directed, secured with staples, pins, or small piles of backfill, placed without wrinkles, and aligned with the primary strength direction perpendicular to slope contours. Cover geotextile reinforcement with backfill within the same work shift. Place at least 6 inches of backfill on the geotextile reinforcement before operating or driving equipment or vehicles over it, except those used under the conditions specified below for spreading backfill.

Adjacent strips, in the case of 100 percent coverage in plan view, need not be overlapped. The minimum horizontal coverage is 50 percent, with horizontal spacing between reinforcement no greater than 40 inches. Horizontal coverage of less than 100 percent shall not be allowed unless specifically detailed in the construction drawings. Adjacent rolls of geotextile reinforcement shall be overlapped or mechanically connected where exposed in a wraparound face system, as applicable.

The contractor may place only that amount of geotextile reinforcement required for immediately pending work to prevent undue damage. After a layer of geotextile reinforcement has been placed, the succeeding layer of soil shall be placed and compacted as appropriate. After the specified soil layer has been placed, the next geotextile reinforcement layer shall be installed. The process shall be repeated for each subsequent layer of geotextile reinforcement and soil.

Geotextile reinforcement shall be placed to lay flat and be pulled tight prior to backfilling. After a layer of geotextile reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geotextile reinforcement in position until the subsequent soil layer can be placed. Under no circumstances shall a track-type vehicle be allowed on the geotextile reinforcement before at least six inches of soil has been placed. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and the geotextile reinforcement. If approved by the Manufacturer, rubber-tired equipment may pass over the geotextile reinforcement as slow speeds, less than 10 mph. Sudden braking and sharp turning shall be avoided.

During construction, the surface of the fill should be kept approximately horizontal. Geotextile reinforcement shall be placed directly on the compacted horizontal fill surface. Geotextile reinforcements are to be placed within three inches of the design elevations and extend the length as shown on the elevation view unless otherwise directed by ENGEO.

Replace or repair any geotextile reinforcement damaged during construction. Grade and compact backfill to ensure the reinforcement remains taut. Geotextile soil reinforcement must be tested to the required design values using the following ASTM test methods.

TABLE III-1: Geotextile Soil Reinforcements

PROPERTY	TEST
Elongation at break, percent	ASTM D 4632
Grab breaking load, lb, 1-inch grip (min) in each direction	ASTM D 4632
Wide width tensile strength at 5 percent strain, lb/ft (min)	ASTM D 4595
Wide width tensile strength at ultimate strength, lb/ft (min)	ASTM D 4595
Tear strength, lb (min)	ASTM D 4533
Puncture strength, lb (min)	ASTM D 6241
Permittivity, sec^{-1} (min)	ASTM D 4491
Apparent opening size, inches (max)	ASTM D 4751
Ultraviolet resistance, percent (min) retained grab break load, 500 hours	ASTM D 4355

PART IV - EROSION CONTROL MAT

Work shall consist of furnishing and placing a synthetic erosion control mat and/or degradable erosion control blanket for slope face protection and lining of runoff channels. The specific erosion control material and supplier shall be pre-approved by ENGEO.

The Contractor shall submit a manufacturer's certification that the erosion mat/blanket supplied meets the criteria specified when the material was approved by ENGEO. The manufacturer's certification shall include a submittal package of documented test results that confirm the property values. Jute mesh shall consist of processed natural jute yarns woven into a matrix, and netting shall consist of coconut fiber woven into a matrix. Erosion control blankets shall be made of processed natural fibers that are mechanically, structurally, or chemically bound together to form a continuous matrix that is surrounded by two natural nets.

The Contractor shall check the erosion control material upon delivery to ensure that the proper material has been received. During periods of shipment and storage, the erosion mat shall be protected from temperatures greater than 140°F, mud, dirt, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the erosion mat/blanket shall be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be removed by cutting out a section of the mat. The remaining ends should be overlapped and secured with ground anchors. Any erosion mat/blanket damaged during storage or installation shall be replaced by the Contractor at no additional cost to the Owner.

Erosion control material suppliers shall provide a qualified and experienced representative onsite, to assist the Contractor and ENGEO personnel at the start of construction. If there is more than one slope on a project, this criterion will apply to construction of the initial slope only. The representative shall be available on an as-needed basis, as requested by ENGEO, during construction of the remaining slope(s). The erosion control material shall be placed and anchored on a smooth graded, firm surface approved by the Engineer. Anchoring terminal ends of the erosion control material shall be accomplished through use of key trenches. The material in the trenches shall be anchored to the soil on maximum 1½ foot centers. Topsoil, if required by construction drawings, placed over final grade prior to installation of the erosion control material shall be limited to a depth not exceeding 3 inches.

Erosion control material shall be anchored, overlapped, and otherwise constructed to ensure performance until vegetation is well established. Anchors shall be as designated on the construction drawings, with a minimum of 12-inch length, and shall be spaced as designated on the construction drawings, with a maximum spacing of 4 feet.

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