Construction Testing & Engineering, Inc.
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED ANIMAL SHELTER- SANTEE
NORTHWEST OF MAGNOLIA AVENUE AND RIVERVIEW PARKWAY
SANTEE, CALIFORNIA

Prepared for:

COUNTY OF SAN DIEGO DEPARTMENT OF GENERAL SERVICES
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CTE JOB NO.: 10-15346G

February 17, 2020

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1.0 INTRODUCTION AND SCOPE OF SERVICES

1.1 Introduction

This report presents results of the preliminary feasibility investigation, performed by Construction Testing and Engineering, Inc. (CTE), and provides geotechnical information regarding the subsurface conditions encountered at the subject site located in Santee, California. The report is intended to be for informational purposes to be used by prospective design/build teams. This work has been performed in general accordance with the terms of proposal no. G-4845 dated December 10, 2019.

CTE understands that single-story animal shelter facilities with parking lots, retention basins, flatwork, landscaping, utilities and other associated minor improvements are to be constructed at the site. CTE performed CPT advancement, hollow-stem auger borings, and percolation tests throughout the proposed improvement area for the purpose of characterizing subsurface conditions and evaluating potential geotechnical and geological hazards. Results of the geotechnical evaluation are presented below. Selected references pertinent to this project are provided in Appendix A.

1.2 Scope of Services

The scope of services provided included:

- Review of readily available geologic and geotechnical reports.
- Obtaining boring permits from the County of San Diego Department of Environmental Health (DEH).
- Coordination of utility mark-out and location.

- Excavation of exploratory borings and soil sampling utilizing a truck-mounted drill rig and a 30-ton Cone Penetration Test (CPT) rig.
- Percolation testing in accordance with County of San Diego Department of Environmental Health (DEH) procedures.
- Laboratory testing of selected soil samples.
- Description of site geology and evaluation of potential geologic hazards.
- Preparation of this preliminary geotechnical investigation report.

2.0 SITE DESCRIPTION

The subject site is located northwest of Magnolia Avenue and Riverview Parkway (APN: 381-050-6900) in Santee, California (Figure 1). The site is bounded by Magnolia Avenue to the east, Riverview Parkway to the south, and undeveloped land to the north and west. Existing site conditions are illustrated on Figures 1 and 2. The site currently consists of an undeveloped lot with an elevated building pad. Based on reconnaissance and review of site topography, the proposed structural improvement area is generally flat at an approximate elevation of 351 feet above mean sea level (msl).

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

3.1 Field Investigation

CTE conducted a field investigation on January 14 and 15, 2020 that included a visual reconnaissance and excavation of eleven exploratory borings, four percolation test holes, and one CPT advancement. The borings and percolation test holes were excavated with a CME 95 truck-mounted drill rig equipped with eight-inch-diameter, hollow-stem augers. The borings extended to a maximum depth of approximately 50.8 feet below the ground surface (bgs) in Boring B-8.

Relatively undisturbed soil samples were collected by driving Standard Penetration Test (SPT) and Modified California samplers, and bulk samples were collected from the drill cuttings.

The CPT advancement was performed with a 30-ton Cone Penetration Test (CPT) rig. The CPT exploration was advanced to a depth of approximately 39 feet bgs. Additional CPT advancements were not considered to be feasible due to the presence of abundant gravel and rock inclusions in the underlying deposits.

The soils from the exploratory borings were logged in the field by a CTE Engineering Geologist, and were classified in general accordance with the Unified Soil Classification System via visual and tactile methods. The field descriptions have been modified, where appropriate, to reflect laboratory test results. Boring logs, including descriptions of the soils encountered, are included in Appendix B. The approximate locations of the borings are presented on Figure 2.

3.2 Laboratory Testing

Laboratory tests were conducted on selected soil samples for classification purposes, and to evaluate physical properties and engineering characteristics. Laboratory tests included: In-place Moisture and Density, Modified Proctor, Expansion Index, Resistance "R"-Value, Grain Size Analysis, Atterberg Limits, Direct Shear, Consolidation, and Chemical Characteristics. Test descriptions and laboratory test results are included in Appendix C.

4.0 PERCOLATION TESTING

It is CTE's understanding that a retention basin is proposed on the western portion of the site. Two percolation tests were performed in the anticipated western basin area and two additional tests were performed in other representative site areas. The percolation test holes were excavated to depths ranging from approximately 3.0 to 5.0 feet below the ground surface (bgs). The attached Figure 2 shows the approximate percolation test locations. The evaluation was performed in accordance with Appendix C of the Model BMP Design Manual for the San Diego Region "Geotechnical and Groundwater Investigation Requirements", dated January 2018.

4.1 Percolation Test Methods

The percolation tests were performed in general accordance with methods approved by the San Diego Region BMP Design Manual with a presoak period of approximately 18 to 19 hours. Percolation test results and calculated infiltration rates are presented below in Table 4.2. Field Data and percolation to infiltration calculations are included in Appendix E.

4.2 Calculated Infiltrated Rate

As per the San Diego Region BMP design documents (2018) infiltration rates are to be evaluated using the Porchet Method. San Diego BMP design documents utilized the Porchet Method through guidance of the County of Riverside (2011). The intent of calculating the infiltration rate is to take into account bias inherent in percolation test borehole sidewall infiltration that would not occur at a basin bottom where such sidewalls are not present.

The infiltration rate (I_t) is derived by the equation:

$$I_t = \frac{\Delta H \, \pi r2 \, 60}{\Delta t(\pi r2 + 2\pi r H_{avg})} = \frac{\Delta H \, 60 \, r}{\Delta t(r + 2H_{avg})}$$

Where:

I_t = tested infiltration rate, inches/hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
* r = effective radius of test hole
H_{avg} = average head over the time interval, inches

Given the measured percolation rates, the calculated infiltration rates are presented with and without a Factor of Safety applied in Table 4.2 below. The civil engineer of record should determine an appropriate factor of safety to be applied via completion of Worksheet D.5-1 of Appendix County of San Diego "Best Management Practice Design Manual", Appendix D or other approved methods. CTE does not recommend using a factor of safety of less than 2.0.

TABLE 4.2

RESULTS OF PERCOLATION TESTING WITH FACTOR OF SAFETY APPLIED

Test Location	Test Depth (inches)	Case	Geologic Unit	Percolation Rate (inches per hour)	Infiltration Rate (inches per hour)	Infiltration Rate with FOS of 2 Applied (inches per hour)
P-1	60	III	Qppf	0.0	0.0	0.0
P-2	36	III	Qppf	0.0	0.0	0.0
P-3	36	III	Qppf	0.0	0.0	0.0
P-4	36	III	Qppf	0.0	0.0	0.0

NOTES
Water level was measured from a fixed point at the top of the hole.
Weather was sunny during percolation testing.
Qppf = Quaternary Previously Placed Fill
The test holes were eight inches in diameter.

5.0 GEOLOGY

5.1 General Setting

Santee is located within the Peninsular Ranges physiographic province that is characterized by northwest-trending mountain ranges, intervening valleys, and predominantly northwest trending regional faults. The greater San Diego Region can be further subdivided into the coastal plain area, central mountain–valley area and eastern mountain and valley area. The site is located within the central mountain–valley area that generally comprises the western edge of the Peninsular Range Batholith (PRB) and generally consists of Cretaceous igneous rocks and localized Jurassic igneous rocks. The PRB contains remnant blocks of pre-Cretaceous metamorphic rocks that are locally covered with post-Cretaceous volcanic rocks, and marine and non-marine deposits. Throughout the batholith, colluvium and alluvium are present on mountain slopes and intervening valleys.

5.2 Geologic Conditions

Regional geologic mapping by Todd (2004) indicates the near surface geologic unit underlying the site consists of Quaternary Alluvium and Colluvium, undivided. Based on the recent reconnaissance Previously Placed Fill was observed over the Alluvium with Cretaceous Granitoid rock at depth. Descriptions of the geologic units encountered are presented below.

5.2.1 Quaternary Previously Placed Fill

Quaternary Previously Placed Fill was observed at the surface throughout the improvement area to a maximum explored depth of approximately 15 feet. This material was generally found to consist of medium dense, reddish brown silty to clayey fine to medium grained sand with gravel. This unit appears to have been imported to the site in order to create a large building pad that extends beyond the proposed improvement area. Isolated areas with deeper fill may exist throughout the site.

5.2.2 Quaternary Alluvium and Colluvium, undivided

Quaternary Alluvium and Colluvium, undivided (Alluvium) was observed in all the exploratory borings to a maximum depth of approximately 46 feet below the ground surface (bgs). This material was generally found to consist of loose to medium dense, grayish brown silty fine to medium grained sand.

5.2.3 Cretaceous Granitoid Rock

Cretaceous Granitoid Rock (Granitic Rock) was observed at depth in deep borings B-4, B-7, and B-8. This bedrock unit was generally found to consist of very dense, reddish gray granitic rock that excavates to silty fine to medium grained sand. This unit is anticipated at depth throughout the site.

5.3 Groundwater Conditions

Groundwater depths measured at the time of drilling during the recent investigation were found to range from approximately 16 to 21.5 feet bgs. It is anticipated that the noted fluctuations in observed groundwater depths throughout the site are primarily the result of variations in topography and subsurface geologic conditions.

Review of the California State Water Resources Control Board-Geotracker electronic database provided additional regional groundwater information in the general vicinity of the subject project. The RCP Block and Brick site located at 9631 North Magnolia Avenue, which is north of the subject site, reported groundwater at depths ranging from approximately 14.16 to 15.68 feet bgs. Groundwater flow direction was reported to be toward the west to southwest.

Based on recent and previous site explorations and review of available regional groundwater data, regional groundwater is anticipated at depths ranging from approximately 14 to 21.5 feet bgs. Groundwater conditions are anticipated to vary, especially following periods of sustained precipitation or irrigation.

5.4 Geologic Hazards

Geologic hazards that were considered to have potential impacts to site development were evaluated based on field observations, literature review, and laboratory test results. It appears that geologic hazards at the site are primarily limited to those caused by shaking from earthquake-generated ground motions. The following paragraphs discuss the geologic hazards considered and their potential risk to the site.

5.4.1 Surface Fault Rupture

In accordance with the Alquist-Priolo Earthquake Fault Zoning Act, (ACT), the State of California established Earthquake Fault Zones around known active faults. The purpose of the ACT is to regulate the development of structures intended for human occupancy near active fault traces in order to mitigate hazards associated with surface fault rupture. According to the California Geological Survey (Special Publication 42, Revised 2018), a fault that has had surface displacement within the last 11,700 years is defined as a Holocene-active fault and is either already zoned or pending zonation in accordance with the ACT. There are several other definitions of fault activity that are used to regulate dams, power plants, and other critical facilities, and some agencies designate faults that are documented as older than Holocene (last 11,700 years) and younger than late Quaternary (1.6 million years) as potentially active faults that are subject to local jurisdictional regulations.

Based on the site reconnaissance and review of referenced literature, the site is not located within a local or State-designated Earthquake Fault Zone, no known active fault traces underlie or project toward the site, and no known potentially active fault traces project toward the site. Therefore fault surface rupture potential is considered to be low at the subject site.

5.4.2 Local and Regional Faulting

The United States Geological Survey (USGS), with support of State Geological Surveys, and reviewed published work by various researchers, have developed a Quaternary Fault and Fold Database of faults and associated folds that are believed to be sources of earthquakes with magnitudes greater than 6.0 that have occurred during the Quaternary (the past 1.6 million years). The faults and folds within the database have been categorized into four Classes (Class A-D) based on the level of evidence confirming that a Quaternary fault is of tectonic origin and whether the structure is exposed for mapping or inferred from fault related deformational features. Class A faults have been mapped and categorized based on age of documented activity ranging from Historical faults (activity within last 150 years), Latest Quaternary faults (activity within last 15,000 years), Late Quaternary (activity within last 130,000 years), to Middle to late Quaternary (activity within last 1.6 million years). The Class A faults are considered to have the highest potential to generate earthquakes and/or surface rupture, and the earthquake and surface rupture potential generally increases from oldest to youngest. The evidence for Quaternary deformation and/or tectonic activity progressively decreases for Class B and Class C faults. When geologic evidence indicates that a fault is not of tectonic origin it is considered to be a Class D structure. Such evidence includes joints, fractures, landslides, or erosional and fluvial scarps that resemble fault features, but demonstrate a non-tectonic origin.

The nearest known Class A fault is the Newport-Inglewood-Rose Canyon fault zone (<1.6 million years), which is approximately 13.5 kilometers southwest of the site. The attached Figure 4 shows regional faults and seismicity with respect to the subject site.

5.4.3 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands or silts lose their physical strengths during earthquake-induced shaking and behave like a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with water level, soil type, material gradation, relative density, and probable intensity and duration of ground shaking. Seismic settlement can occur with or without liquefaction; it results from densification of loose soils.

The site is located within a potential liquefaction zone and, therefore, a quantitative evaluation of liquefaction and seismic settlement was performed as summarized herein. Input parameters for the liquefaction evaluation were based on the Maximum Considered Earthquake (MCE, 2% probability of exceedance with a 50-year period). A code-based acceleration value (PGA_M) was obtained in accordance with ASCE 7-16 Equation 11.8-1. In order to quantify site liquefaction susceptibility, computer programs SPTLIQ and CLiq were utilized. The following data were also considered for the analysis:

- Based on direct measurement during the recent subsurface exploration, groundwater was encountered at depths ranging from approximately 16 to 21.5 feet bgs. Based on available site area groundwater information, highest groundwater levels at the site appear to be on the order of 14 feet bgs. Given the available information, a conservative high groundwater depth of 10 feet bgs was modeled for the liquefaction analysis.
- As indicated, the code-based PGA_M value (0.418g) obtained using ASCE 7-16 Section 11.8.3 was used for the liquefaction evaluation.
- Based on the area tectonic framework and probable seismic hazard deaggregation for PGA (USGS Unified Hazard Tool), the modal contributing magnitude of 5.5 was used for the analysis.

A deep CPT advancement and four deep borings were analyzed using the PGA and magnitude values obtained. The conservative results of the evaluation indicate that potential total dynamic settlements at the site range from approximately 1.51 to 13.15 inches. The variation in estimated potential seismic settlement is likely related to fluctuations in density within the alluvial deposits, and resistance data associated with localized gravel-impacted soil layers.

Surface effects associated with liquefaction-related settlement can consist of sand boils, soil strength loss, and associated phenomena. In general, the potential for surface manifestations is related to the continuity and thickness of liquefiable layers compared to depth of overlying non-liquefiable material (Ishihara, 1985). Based on the depth and distribution of the potential liquefiable layers, significant surface effects are generally not anticipated. The liquefaction evaluation results are provided in Appendix F.

The potential hazard associated with lateral spreading is generally anticipated to be low, based on the lack of significant slopes or free faces adjacent to the site.

5.4.4 Tsunamis and Seiche Evaluation

According to http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation Maps/Pages/Statewide_Maps.aspx the site is not located within a tsunami inundation zone based on its elevation above sea level. Damage resulting from oscillatory waves (seiches) is considered unlikely due to the absence of large nearby confined bodies of water.

5.4.5 Landsliding

According to mapping by Tan (1995), the site is considered only "Marginally Susceptible" to landsliding. In addition, landslides are not mapped in the site area and were not encountered during the recent field exploration. Based on the preliminary investigation findings, landsliding is not considered to be a significant geologic hazard at the relatively flat-lying site.

5.4.6 Flooding

Based on Federal Emergency Management Agency mapping (FEMA 2012), site improvement areas are located within Zone AE, which is defined as: "Base Flood Elevations Determined".

5.4.7 Compressible and Expansive Soils

Based on observed site conditions and investigation findings, disturbed near surface soils and loose deposits may be potentially compressible and may be marginally susceptible to hydro-collapse where exposed to increased moisture content.

Based on geologic observation and generally granular nature of site soils, the near-surface materials are generally anticipated to exhibit a low expansion potential (Expansion Index of 50 or less).

5.4.8 Corrosive Soils

Testing of representative site soils was performed to evaluate the potential corrosive effects on concrete foundations and buried metallic utilities. Soil environments detrimental to concrete generally have elevated levels of soluble sulfates and/or pH levels less than 5.5. According to the American Concrete Institute (ACI) Table 318 4.3.1, specific guidelines have been provided for concrete where concentrations of soluble sulfate (SO_4) in soil exceed 0.10 percent by weight. These guidelines include low water/cement ratios, increased compressive strength, and specific cement-type requirements. A minimum resistivity value less than approximately 5,000 ohm-cm and/or soluble chloride levels in excess of 200 ppm generally indicate a corrosive environment for buried metallic utilities and untreated conduits.

Chemical test results indicate that near-surface soils at the site present a negligible corrosion potential for Portland cement concrete. Based on resistivity testing, the site soils have been interpreted to have a moderate corrosivity potential to buried metallic improvements. As such, it would likely be prudent for buried utilities to utilize plastic piping and/or conduits, where feasible. However, CTE does not practice corrosion engineering. Therefore, if corrosion of improvements is of more significant concern, a qualified corrosion engineer could be consulted.

6.0 CONCLUSIONS

Import fill material has been previously placed at the site to create a building pad that was observed to range in thickness from approximately 6 to 15 feet. Alluvial soils were observed beneath the fill and extended to depths ranging from approximately 43 to 46 feet bgs. This alluvial unit was found to be potentially susceptible to seismic settlement. Very dense granitoid rock was observed beneath the alluvial soils. Groundwater was encountered at depths ranging from approximately 16 to 21.5 feet bgs at the time of investigation.

The site may be subject to strong ground shaking in the event of an earthquake on a regional fault. As noted, the site is considered to be potentially susceptible to liquefaction and seismically induced settlement based on the presence of poorly consolidated soils and relatively shallow depth to groundwater.

Laboratory results indicate that the representative tested soils have a negligible corrosion potential for concrete improvements and moderate corrosion potential for buried metallic improvements.

Based on the investigation findings the site is generally considered feasible for construction from a geotechnical standpoint, provided the design and construction are appropriate for the potential geological hazards. Remedial excavation, re-compaction, deep foundations, soil improvement, and/or specialized structural design may be required in order to mitigate potential effects associated with dynamic settlement at the site.

It is anticipated that additional field exploration, laboratory testing, quantitative liquefaction evaluation, and engineering analysis will be required for final project design.

7.0 LIMITATIONS OF INVESTIGATION

The field evaluation, laboratory testing, and geotechnical analysis is presented in this preliminary report have been conducted according to current engineering practice and the standard of care exercised by the reputable geotechnical consultants performing similar tasks in the area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during construction.

The percolation test results were obtained in accordance with County standards. However, it should be noted that percolation test results can significantly vary laterally and vertically due to slight changes in soil type, degree of weathering, secondary mineralization, and other physical and chemical variabilities. As such, the test results are considered to be an estimate of percolation and converted infiltration rates for design purposes. No guarantee is made based on the percolation testing related to the actual functionality or longevity of associated infiltration basins or other BMP devices designed from the presented infiltration rates.

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

CTE's conclusions and preliminary recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered, this office should be notified and additional recommendations, if required, will be provided.

We appreciate this opportunity to be of service on this project. If you have any questions regarding this feasibility report, please do not hesitate to contact the undersigned.

Respectfully submitted,

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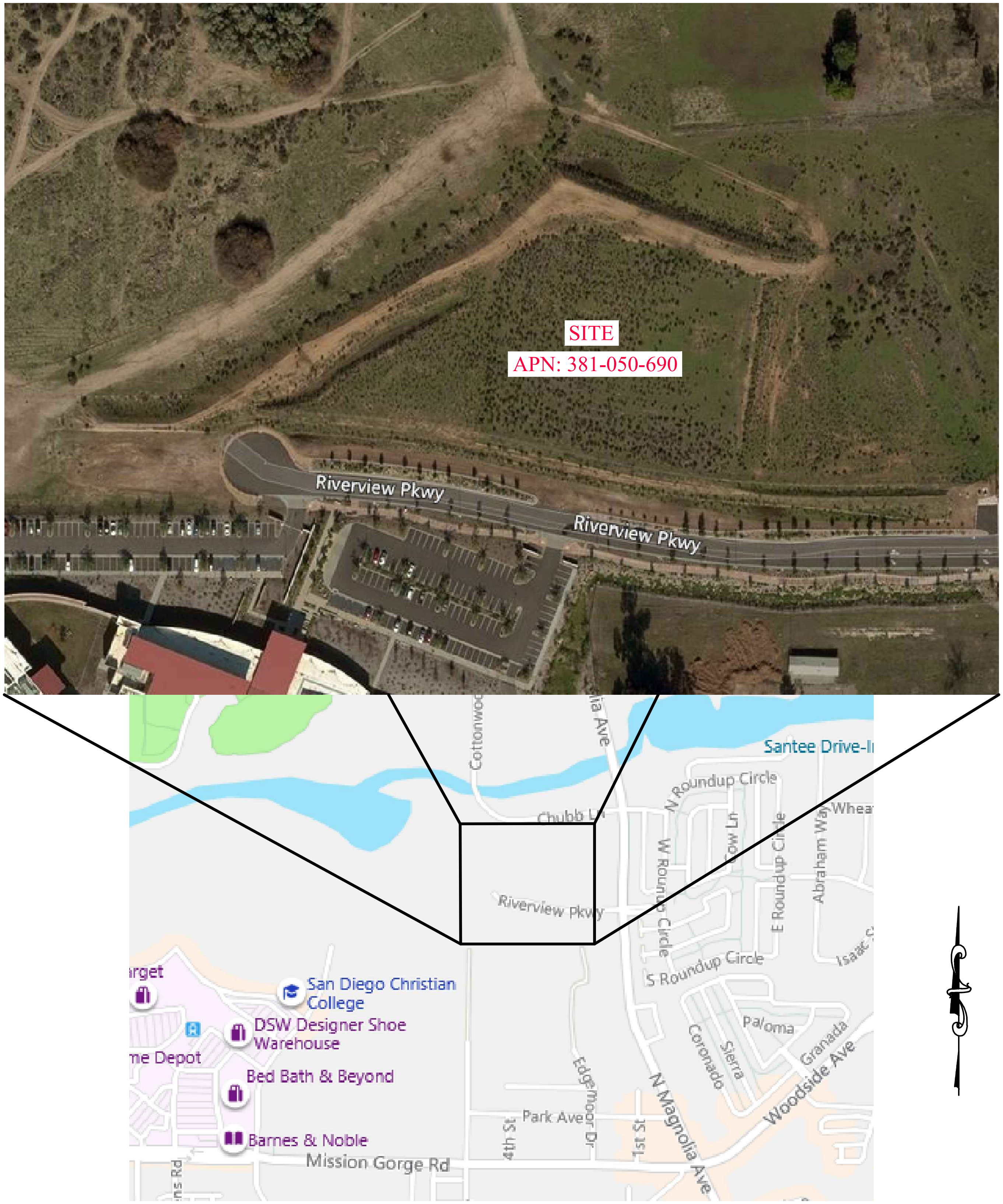
AJB/JFL/DTM:ack



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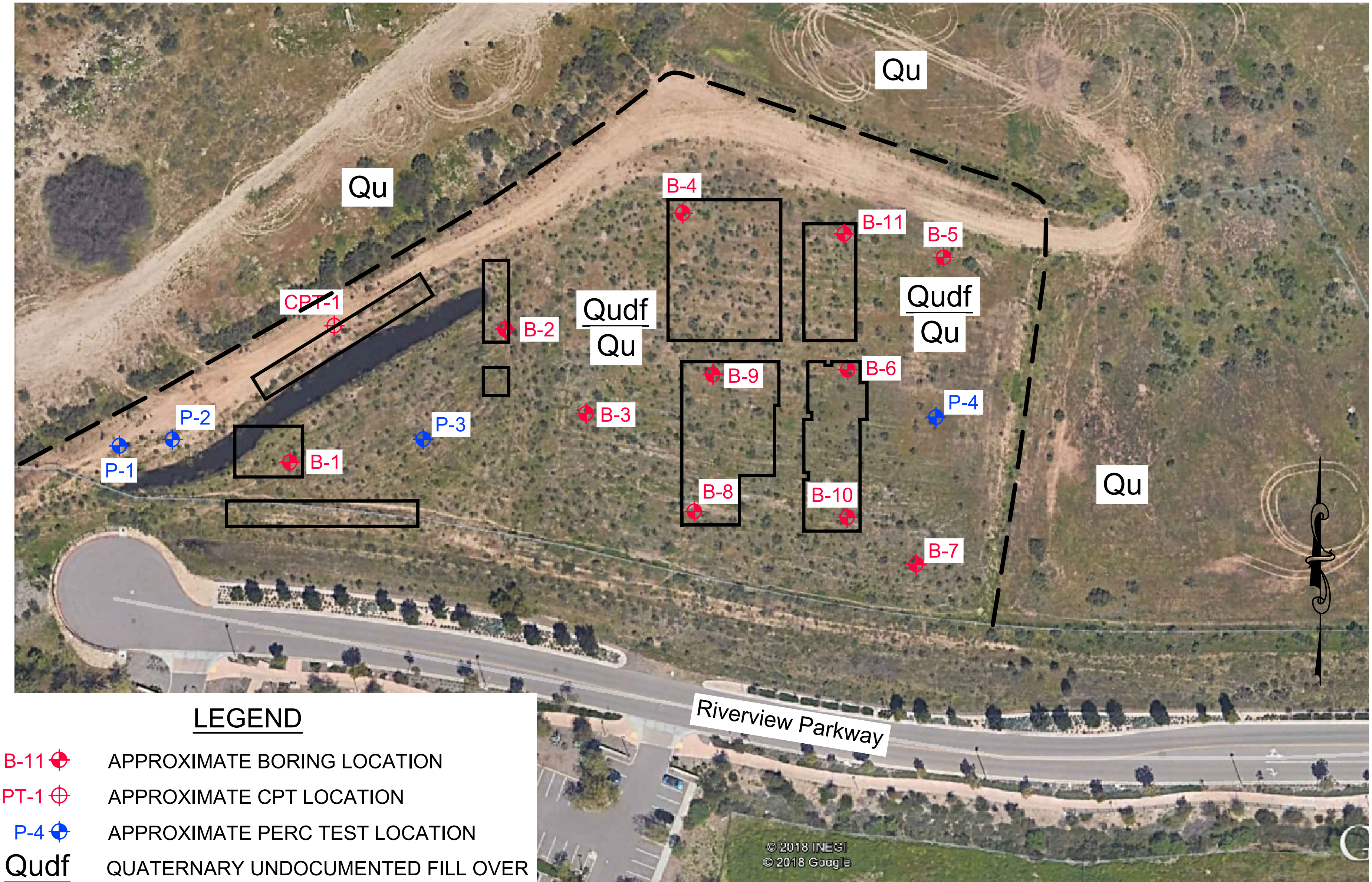
SITE INDEX MAP	SCALE: AS SHOWN	DATE: 1/20
PROPOSED SANTEE ANIMAL SHELTER NORTHWEST OF RIVERVIEW PARKWAY AND MAGNOLIA AVENUE SANTEE, CALIFORNIA	CTE JOB NO.: 10-15346G	FIGURE: 1



LEGEND

B-11	APPROXIMATE BORING LOCATION
CPT-1	APPROXIMATE CPT LOCATION
P-4	APPROXIMATE PERC TEST LOCATION
Qudf / Qu	QUATERNARY UNDOCUMENTED FILL OVER ALLUVIUM AND COLLUVIUM, UNDIVIDED
	APPROXIMATE GEOLOGIC CONTACT

100' 0 50' 100'

\\Esc_server\projects\10-15346G\Figure 2.dwg

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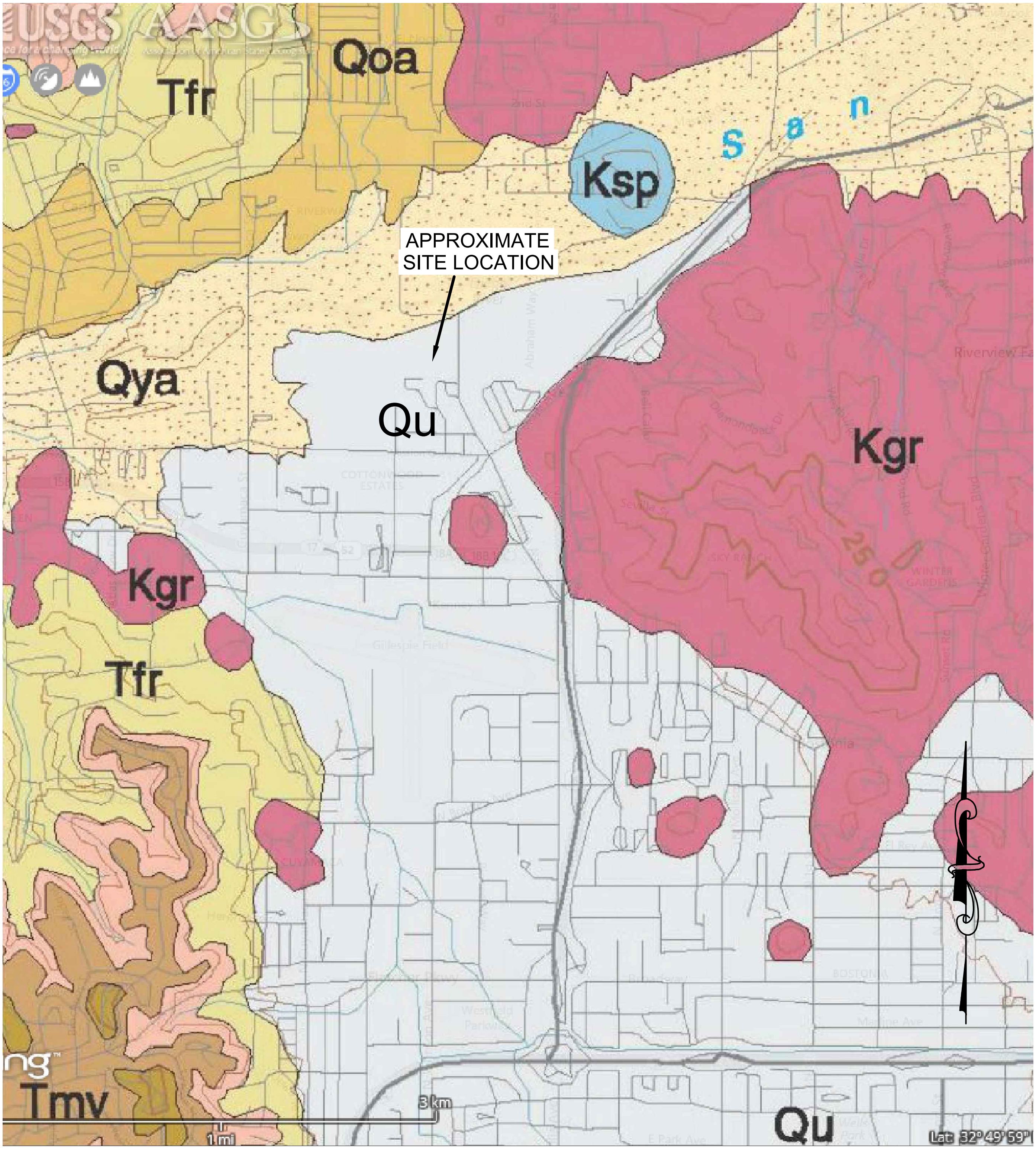
GEOLOGIC/EXPLORATION LOCATION MAP

PROPOSED SANTEE ANIMAL SHELTER
NORTHWEST OF RIVERVIEW PARKWAY AND MAGNOLIA AVENUE
SANTEE, CALIFORNIA

CTE JOB NO:	10-15346G
SCALE:	1" = 100'
DATE: 12/19	FIGURE: 2



LEGEND

Qya	YOUNG ALLUVIAL FLOOD PLAIN DEPOSITS
Qu	ALLUVIUM AND COLLUVIUM, UNDIVIDED
Tmv	MISSION VALLEY FORMATION
Tfr	FRIARS FORMATION
Kgr	GRANITOID ROCK
Ksp	SANTIAGO PEAK VOLCANICS

NOTE: Base Map by Kennedy and Tan, 2004, Geologic Map of the El Cajon 30' x 60' Quadrangle, California.

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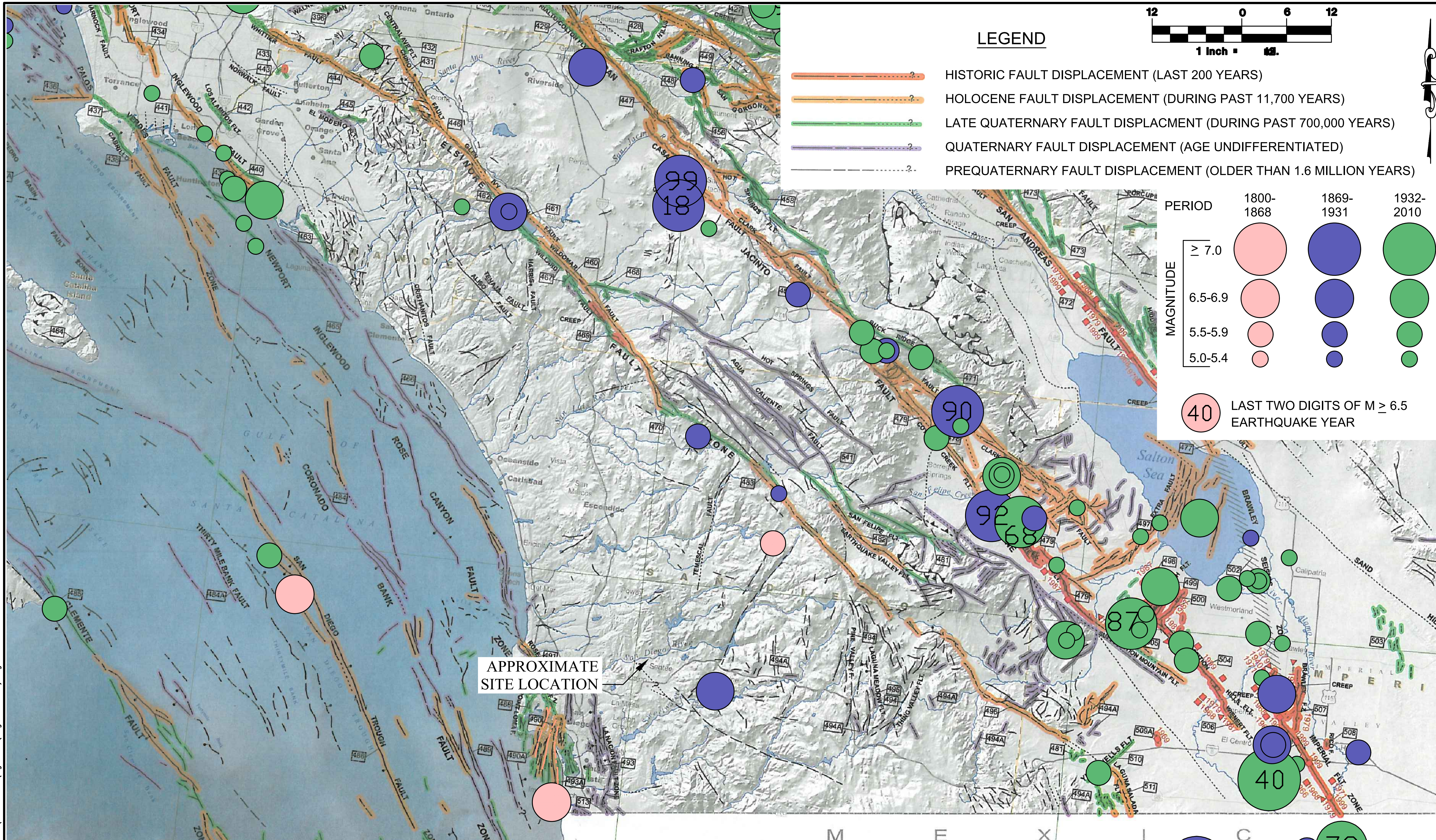
REGIONAL GEOLOGIC MAP
PROPOSED SANTEE ANIMAL SHELTER
NORTHWEST OF MAGNOLIA AVENUE AND RIVERVIEW PARKWAY
SANTEE, CALIFORNIA

SCALE:	DATE:
1"~3,000'	1/20
CTE JOB NO.:	FIGURE:
10-15346G	3

\\Esc_server\projects\10-15346G\Figure 3 (Regional Geologic Map).dwg



NOTES: FAULT ACTIVITY MAP OF CALIFORNIA, 2010, CALIFORNIA GEOLOGIC DATA MAP SERIES MAP NO. 6;
EPICENTERS OF AND AREAS DAMAGED BY M≥5 CALIFORNIA EARTHQUAKES, 1800-1999 ADAPTED AFTER TOPPOZADA, BRANUM, PETERSEN, HALLSTORM, CRAMER, AND REICHLE, 2000, CDMG MAP SHEET 49
REFERENCE FOR ADDITIONAL EXPLANATION; MODIFIED WITH CISN AND USGS SEISMIC MAPS

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REGIONAL FAULT AND SEISMICITY MAP
PROPOSED SANTEE ANIMAL SHELTER
NORTHWEST OF MAGNOLIA AVENUE AND RIVERVIEW PARKWAY
SANTEE, CALIFORNIA

CTE JOB NO: 10-15346G	
SCALE: 1 inch = 12 miles	
DATE: 1/20	FIGURE: 4

\\Esc_server\projects\10-15346G\Figure 4 (Regional Fault).dwg

APPENDIX A

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REFERENCES

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APPENDIX B

EXPLORATION LOGS

DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	**GRAVELS** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS < 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OF NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS < 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	**SILTS AND CLAYS** LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, SLIGHTLY PLASTIC CLAYEY SILTS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, SILTS OR LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 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, ORGANIC SILTY CLAYS
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

BOULDERS	COBBLES	GRAVEL		SAND			SILTS AND CLAYS
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" 4 10 40 200

CLEAR SQUARE SIEVE OPENING U.S. STANDARD SIEVE SIZE

ADDITIONAL TESTS

(OTHER THAN TEST PIT AND BORING LOG COLUMN HEADINGS)

MAX- Maximum Dry Density
GS- Grain Size Distribution
SE- Sand Equivalent
EI- Expansion Index
CHM- Sulfate and Chloride Content , pH, Resistivity
COR - Corrosivity
SD- Sample Disturbed

PM- Permeability
SG- Specific Gravity
HA- Hydrometer Analysis
AL- Atterberg Limits
RV- R-Value
CN- Consolidation
CP- Collapse Potential
HC- Hydrocollapse
REM- Remolded

PP- Pocket Penetrometer
WA- Wash Analysis
DS- Direct Shear
UC- Unconfined Compression
MD- Moisture/Density
M- Moisture
SC- Swell Compression
OI- Organic Impurities

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PROJECT:	DRILLER:	SHEET: of
CTE JOB NO:	DRILL METHOD:	DRILLING DATE:
LOGGED BY:	SAMPLE METHOD:	ELEVATION:

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	BORING LEGEND DESCRIPTION	Laboratory Tests
0								Block or Chunk Sample	
								Bulk Sample	
5									
								Standard Penetration Test	
10								Modified Split-Barrel Drive Sampler (Cal Sampler)	
								Thin Walled Army Corp. of Engineers Sample	
15								Groundwater Table	
								Soil Type or Classification Change	
20								? ? ? ? ? ? ?	
								Formation Change [(Approximate boundaries queried (?)]	
25						"SM"		Quotes are placed around classifications where the soils exist in situ as bedrock	

FIGURE: BL2

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/14/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~347 Feet

BORING: B-1

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC/CL		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, reddish brown, clayey fine to medium grained SAND / sandy CLAY with gravel and cobble.	
5		SPT	45 32 34					No Recovery	
10		Ring	13 9 7						
						SP/SM		**QUATERNARY ALLUVIUM AND COLLUVIUM, UNDIVIDED** Medium dense, dark grey, silty poorly graded fine to medium grained SAND with silt, clay blebs, micaceous and friable.	
15		Ring	6 8 12		▼			Groundwater encountered at approximately 16 feet	
20		Ring	3 5 6						
								Total Depth: 21.5' Groundwater Encountered at Approxiamtely 16 Feet Backfilled with Bentonite Grout mixed with Concrete	
25									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/14/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~347 Feet

BORING: B-2

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC/CL		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, reddish brown, clayey fine to medium grained SAND with gravel and cobble.	MD
5		X	12 25 29						
						SP/SM		**QUATERNARY ALLUVIUM AND COLLUVIUM, UNDIVIDED** Loose to medium dense, moist, dark olive, silty poorly graded fine to medium grained SAND with clay blebs, friable.	
10		X	13 17 20						
								Total Depth: 11.5' No Groundwater Encountered Backfilled with Bentonite Grout mixed with Concrete	
15									
20									
25									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/14/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~350 Feet

BORING: B-3

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		**QUATERNARY UNDOCUMENTED FILL:** Loose to medium dense, moist, dark brown, clayey fine to medium grained SAND.	RV
	X					SM		Loose to medium dnese, moist, dark brown, silty fine to medium grained SAND, friable, micaceous.	
5								Total Depth: 5' No Groundwater Encountered Backfilled with Bentonite Chips	
10									
15									
20									
25									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/15/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~350 Feet

BORING: B-4

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, dark brown, clayey fine to medium grained SAND.	
	X					SM		Medium dense, moist, dark brown, silty fine to medium grained SAND.	EI, CHM
	X					SC		Medium dense, moist, reddish brown, clayey fine to medium grained SAND with gravel.	
5		Ring	7 9 11						
10		SPT	25 31 21			GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	
						SC		Medium dense, moist, reddish brown, clayey fine to medium grained SAND with gravel.	
15		Ring	9 14 17			SM		**QUATERNARY ALLUVIUM AND COLLUVIUM, UNDIVIDED** Medium dense, moist, dark brown, silty fine to medium grained SAND with gravel.	
20		Ring	2 4 7		▼	SP-SM		Groundwater encountered at approximately 20 feet Loose to medium dense, wet, light brown to gray, silty fine to medium grained SAND, friabel.	
25									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/15/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~350 Feet

BORING: B-4

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25		Ring	3 2 4			SP-SM		Loose to medium dense, wet, light brown to gray, silty fine to medium grained SAND, friabel.	
30		Ring	3 4 4						
35									
						GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	
						SP-SM		Loose to medium dense, wet, light brown to gray, silty fine to medium grained SAND, friabel.	
40		Ring	2 5 8						
						"SM"		**GRETACEOUS GRANITOID ROCK:** Very dense, slightly moist, reddish gray, granitic rock that excavates to silty fine to medium grained SAND, moderately weathered, oxidized.	
45									
								Total Depth: 50.5' Groundwater Encountered at Approxiamtely 20 Feet Backfilled with Bentonite Grout mixed with Concrete	
50		Ring	50/6"						

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/15/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-5

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0–5	X					SC/SM		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, brown, clayey to silty fine to medium grained SAND.	RV
5								Total Depth: 5' No Groundwater Encountered Backfilled with Bentonite Chips	
10									
15									
20									
25									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/14/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-6

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, reddish brown, clayey fine to medium grained SAND with gravel and debris.	
								Abundant gravel from 3-6'	
5		SPT	15 50/6"					Becomes dark brown	DS
10		Ring	11 10 15						
						SP/SM		**QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSIT** Dense, slightly moist, dark brown, fine to medium grained silty SAND.	
						GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	
						SP/SM		Dense, slightly moist, dark brown, fine to medium grained silty SAND.	
15		Ring	10 11 17						
								Becomes micaceous	
20		Ring	9 20 21						
								Total Depth: 21.5' No Groundwater Encountered Backfilled with Bentonite Chips	
25									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/14/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-7

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, dark brown, clayey fine to medium grained SAND.	
5		SPT	21 28 22			SM		Medium dense, moist, reddish brown, silty fine to medium grained SAND.	
10		Ring	10 12 18			GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	
						SM		Medium dense, moist, reddish brown, silty fine to medium grained SAND.	
						SM		**QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSIT** Medium dense, moist, dark brown, silty fine to medium grained SAND.	
15		SPT	12 37 50						
						SC		Medium dense, moist, dark grayish brown, clayey fine to medium grained SAND.	
					▼			Groundwater encountered at approximately 20 feet	
20		Ring	7 6 4			CL		Very stiff, moist, grayish brown, fine grained sandy CLAY.	M, AL
						SM		Medium dense, moist, gray, silty fine to medium grained SAND.	
25									

PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/14/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-7

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25			3 5 6			SM		Medium dense, moist, gray, silty fine to medium grained SAND.	
30			1 2 2						M, AL
						SC		Loose, moist, brown, clayey fine to medium grained SAND.	
						SP-SM		Medium dense, very moist, gray, poorly graded fine to medium grained SAND with silt.	
35			3 4 10						
						GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	
						SP-SM		Medium dense, very moist, gray, poorly graded fine to medium grained SAND with silt.	
40			24 16 22						
45			9 14 25						
						"SM"		**<u>GRETACEOUS GRANITOID ROCK</u>:** Very dense, slightly moist, reddish gray, granitic rock that excavates to silty fine to medium grained SAND, moderately weathered, oxidized.	
			50/2"					Total Depth: 49.2' Groundwater Encountered at Approxiamtely 20 Feet Backfilled with Bentonite Grout mixed with Concrete	
50									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/15/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-8

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					SM		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, dark brown, silty fine grained SAND, friable.	
						GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	EI
						SM		Loose to medium dense, moist, dark brown, silty fine grained SAND, friable.	
5			32 15 20						GS
						SC		Very stiff, moist, light bluish gray, fine to medium grained SAND.	
						SM		Loose to medium dense, moist, dark brown, silty fine grained SAND, friable.	
10			50/6"			SC		Very dense, moist, dark brown, clayey fine to medium grained SAND with gravel.	
15			50/6"						M, GS, AL
						SM		**QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSIT** Very dense, moist, dark brown, Silty fine grained SAND.	
20			2 3 5					Groundwater encountered at approximately 21.5 feet	GS
					▼	SP-SM		Loose, to medium dense, wet, gray, fine to medium grained SAND.	
25									

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CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/15/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-8

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25		▯	3, 3, 5			SP-SM		Loose, to medium dense, wet, gray, fine to medium grained SAND.	GS
30		▯	1, 1, 2						M, AL, GS
						ML		Loose, moist to wet, dark brown, fine grained sandy SILT, mica.	
35									
						GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	
						ML		Loose, moist to wet, dark brown, fine grained sandy SILT, mica.	
40		▯	8, 5, 10			SP-SM		Loose to medium dense, very moist, gray, silty fine to medium grained SAND with cobble.	GS
45						"SM"		**GRETACEOUS GRANITOID ROCK:** Very dense, slightly moist, reddish gray, granitic rock that excavates to silty fine to medium grained SAND, moderately weathered, oxidized.	
50									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/15/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-8

Depth (Feet)	Bulk Sample	Driven Type	Blows/Foot	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
50		▯	13 50/3"			SP-SM		Very dense, slightly moist, reddish gray, granitic rock that excavates to silty fine to medium grained SAND, moderately weathered, oxidized.	GS
								Total Depth: 50.8' Groundwater Encountered at Approxiamtely 21.5 Feet Backfilled with Bentonite Grout mixed with Concrete	
55									
60									
65									
70									
75									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/14/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-9

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC/SM		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense, moist, brown, clayey to silty fine to medium grained SAND with trace gravel.	
						CL		Stiff, moist, brown, fine to medium grained sandy CLAY.	
5			20 10 11			SC/SM		Medium dense, moist, brown, clayey to silty fine to medium grained SAND with trace gravel.	
						CL		Very stiff, moist, brown, fine to medium grained sandy CLAY.	
						SC		Medium dense, moist, brown, clayey fine to medium grained SAND with trace gravel.	
10			28 50/3"						
						SM		**QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSIT** Dense, slightly moist, dark brown, silty fine to medium grained SAND.	
15			9 18 22						
								Groundwater encountered at approximately 19 feet	
20			2 4 5						
								Total Depth: 19' No Groundwater Encountered Backfilled with Bentonite Grout mixed with Concrete	
25									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/14/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-10

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SM		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, dark brown, silty fine to medium grained SAND with gravel.	
						SC		Loose to medium dense, moist, dark brown, clayey fine to medium grained SAND with gravel.	
5			2 4 8					Gravel 6-7'	
10			34 17 10						
						SM/SC		**QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSIT** Dense, slightly moist, dark brown, silty to clayay fine to medium grained SAND with trace gravel.	
15			6 25 39			SM		Medium dense, moist, dark brown, silty fine grained SAND.	DS
						SP-SM		Medium dnese, very moist, light brown t ogray, poorly graded fine to medium grained SNAD with silt.	
20			6 13 14						
								Total Depth: 21.5' No Groundwater Encountered Backfilled with Bentonite Chips	
25									

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/15/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

BORING: B-11

Depth (Feet)	Bulk Sample	Driven Sample Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC/SM		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, reddish brown, silty to clayey fine to medium grained SAND with trace gravel and roots.	
5		Ring	9 13 13						
10		Ring	13 8 6						GS
						SM		**QUATERNARY YOUNG ALLUVIAL FLOOD PLAIN DEPOSIT** Medium dense, slightly moist, dark brown, silty fine to medium grained SAND.	
15		SPT	19 20 28					Becomes micaceous	CN
								Clay blebs Groundwater encountered at approximately 20 feet	
20		Ring	7 15 16		▼				GS
25						SP		Medium dense, moist, gray, poorly graded fine to med. SAND.	

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PROJECT:	SANTEE ANIMAL SHELTER	DRILLER:	BAJA EXPLORATION	SHEET:	2 of 2
CTE JOB NO:	10-15346G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	1/15/2020
LOGGED BY:	AJB	SAMPLE METHOD:	BULK, RING AND SPT	ELEVATION:	~351 Feet

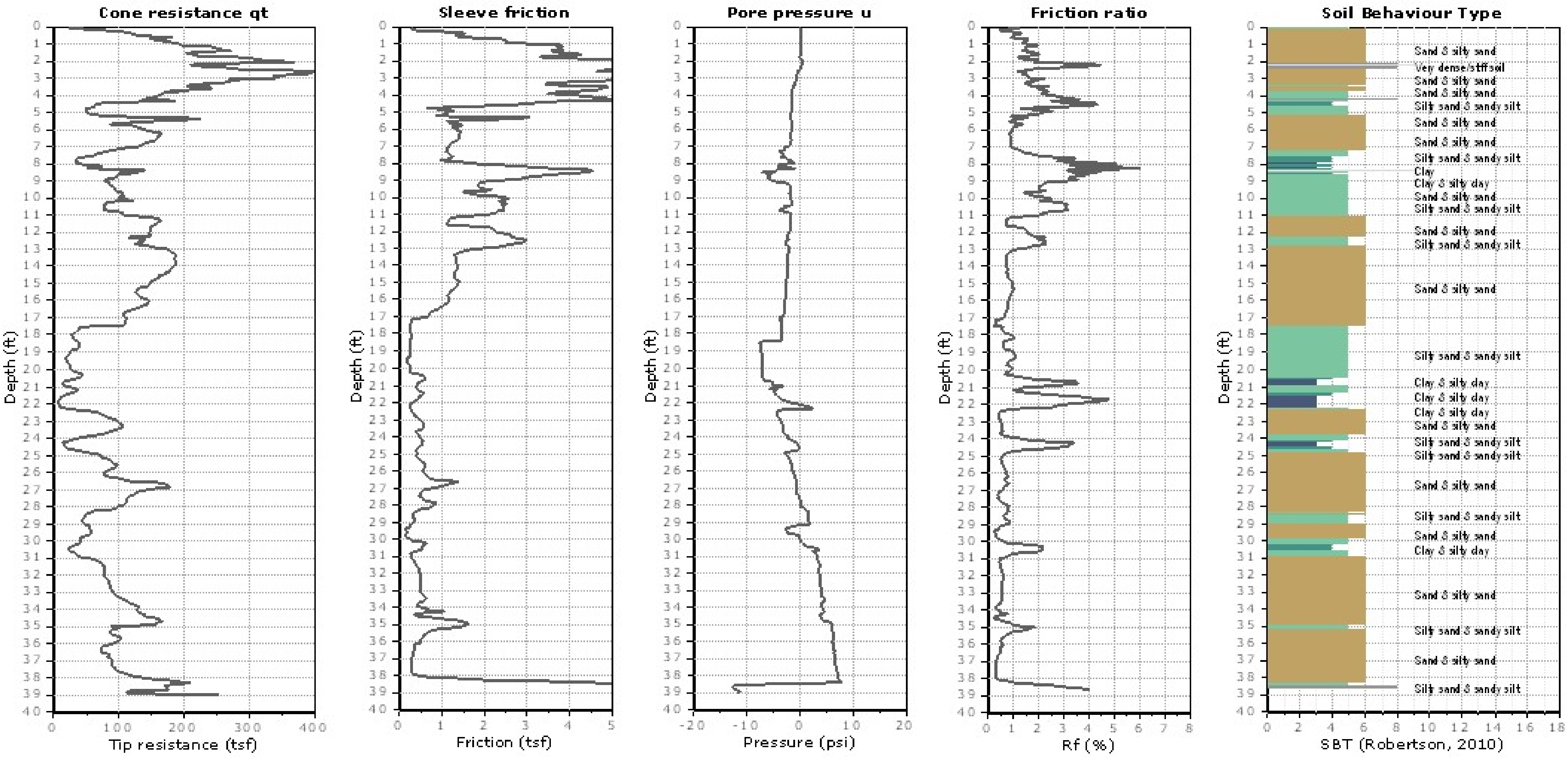
BORING: B-11

Depth (Feet)	Bulk Sample	Driven Type	Blows/6 inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25			3 8 5			SP		Medium dense, wet, gray, poorly graded fine to medium grained SAND with trace mica, friable.	GS
30			3 6 6			GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	GS
						SP		Medium dense, wet, gray, poorly graded fine to medium grained SAND with trace mica, friable.	
35			5 8 11						
40			15 23 25			GP		Medium dense, moist, grayish brown, poorly graded fine GRAVEL.	
45								Total Depth: 42.5' Groundwater Encountered at Approxiamtely 20 Feet Backfilled with Bentonite Grout mixed with Concrete	
50									

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

Project: CTE **C-1**

Location: Riverview Pkwy & N. Magnolia Ave, Santee, CA Total depth: 38.99 ft, Date: 1/14/2020



APPENDIX C

LABORATORY METHODS AND RESULTS

APPENDIX C
LABORATORY METHODS AND RESULTS

Laboratory Testing Program
Laboratory tests were performed on representative soil samples to detect their relative engineering properties. Tests were performed following test methods of the American Society for Testing Materials or other accepted standards. The following presents a brief description of the various test methods used.

Classification
Soils were classified visually according to the Unified Soil Classification System. Visual classifications were supplemented by laboratory testing of selected samples according to ASTM D2487. The soil classifications are shown on the Exploration Logs in Appendix B.

In-Place Moisture/Density
The in-place moisture content and dry unit weight of selected samples were determined using relatively undisturbed chunk soil samples.

Modified Proctor
Laboratory maximum dry density and optimum moisture content were evaluated according to ASTM D 1557, Method A. A mechanically operated rammer was used during the compaction process.

Expansion Index
Expansion testing was performed on selected samples of the matrix of the on-site soils according to ASTM D 4829.

Resistance “R” Value
The resistance “R”-value was measured by the California Test. 301. The graphically determined “R” value at an exudation pressure of 300 pounds per square inch is the value used for pavement section calculation.

Particle-Size Analysis
Particle-size analyses were performed on selected representative samples according to ASTM D 422.

Atterberg Limits
The procedure of ASTM D4518-84 was used to measure the liquid limit, plastic limit and plasticity index of representative samples.

Consolidation
To assess their compressibility and volume change behavior when loaded and wetted, relatively undisturbed samples of representative samples from the investigation were subject to consolidation tests in accordance with ASTM D 2435.

Direct Shear

Direct shear tests were performed on either samples direct from the field or on samples recompacted to a specific density. Direct shear testing was performed in accordance with ASTM D 3080. The samples were inundated during shearing to represent adverse field conditions.

Chemical Analysis

Soil materials were collected with sterile sampling equipment and tested for Sulfate and Chloride content, pH, Corrosivity, and Resistivity.

EXPANSION INDEX TEST

ASTM D 4829

LOCATION	DEPTH (feet)	EXPANSION INDEX	EXPANSION POTENTIAL
B-4	0-5	11	VERY LOW
B-8	0-5	0	VERY LOW

IN-PLACE MOISTURE AND DENSITY

LOCATION	DEPTH (feet)	% MOISTURE	DRY DENSITY
B-6	5	13.4	108.1
B-7	20	19.3	N/A
B-8	30	20.0	N/A
B-10	15	8.2	111.5
B-11	15	10.2	123.1

RESISTANCE "R"-VALUE

CALTEST 301

LOCATION	DEPTH (feet)	R-VALUE
B-3	0-5	12
B-5	0-5	6

SULFATE

LOCATION	DEPTH (feet)	RESULTS ppm
B-4	0-5	129.4

CHLORIDE

LOCATION	DEPTH (feet)	RESULTS ppm
B-4	0-5	2.4

p.H.

LOCATION	DEPTH (feet)	RESULTS
B-4	0-5	8.35

RESISTIVITY

CALIFORNIA TEST 424

LOCATION	DEPTH (feet)	RESULTS ohms-cm
B-4	0-5	5210

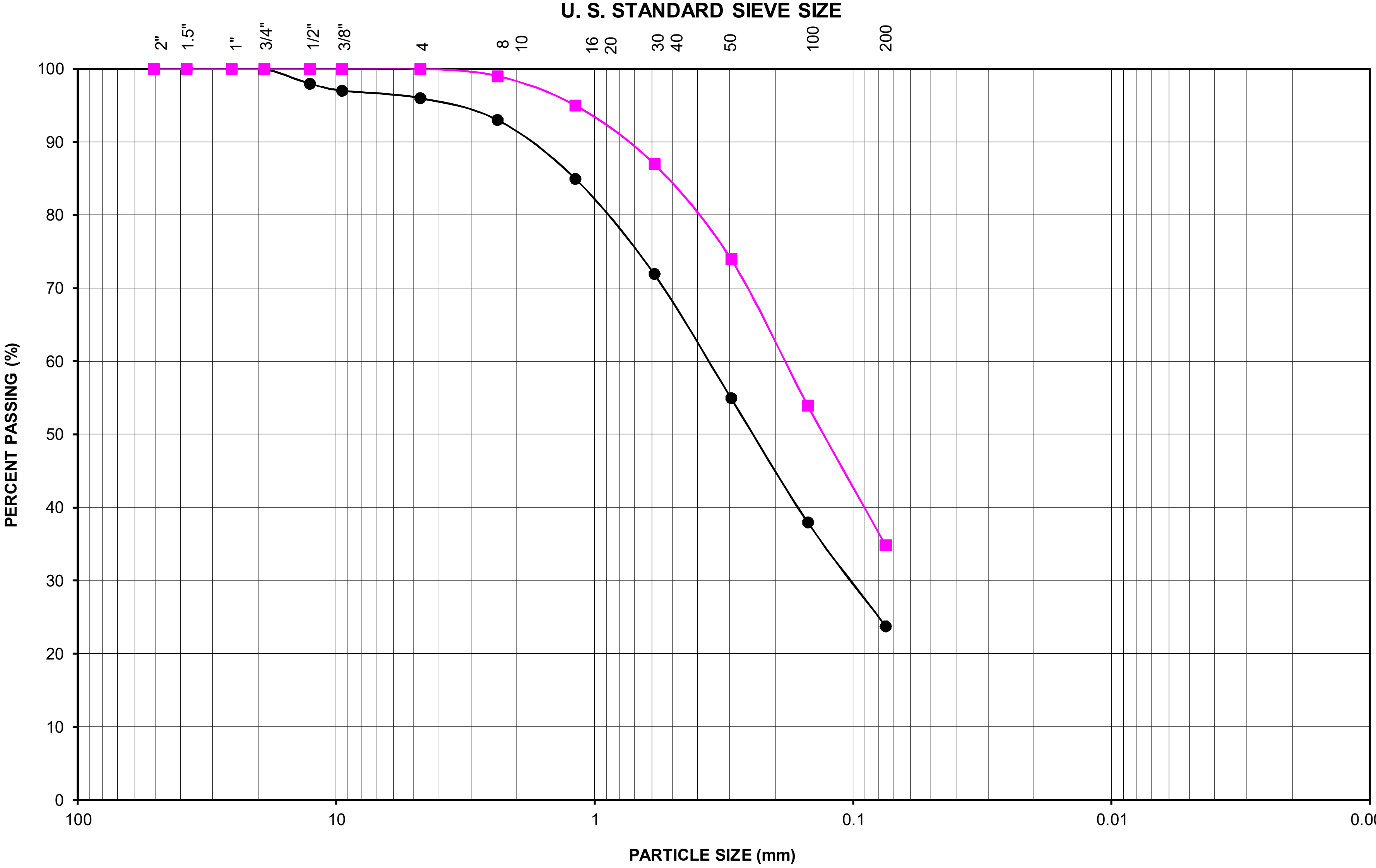
ATTERBERG LIMITS

LOCATION	DEPTH (feet)	LIQUID LIMIT	PLASTICITY INDEX	CLASSIFICATION
B-7	20	31	12	CL
B-7	30	NP	NP	SM
B-8	30	NP	NP	SM-ML

MODIFIED PROCTOR

ASTM D 1557

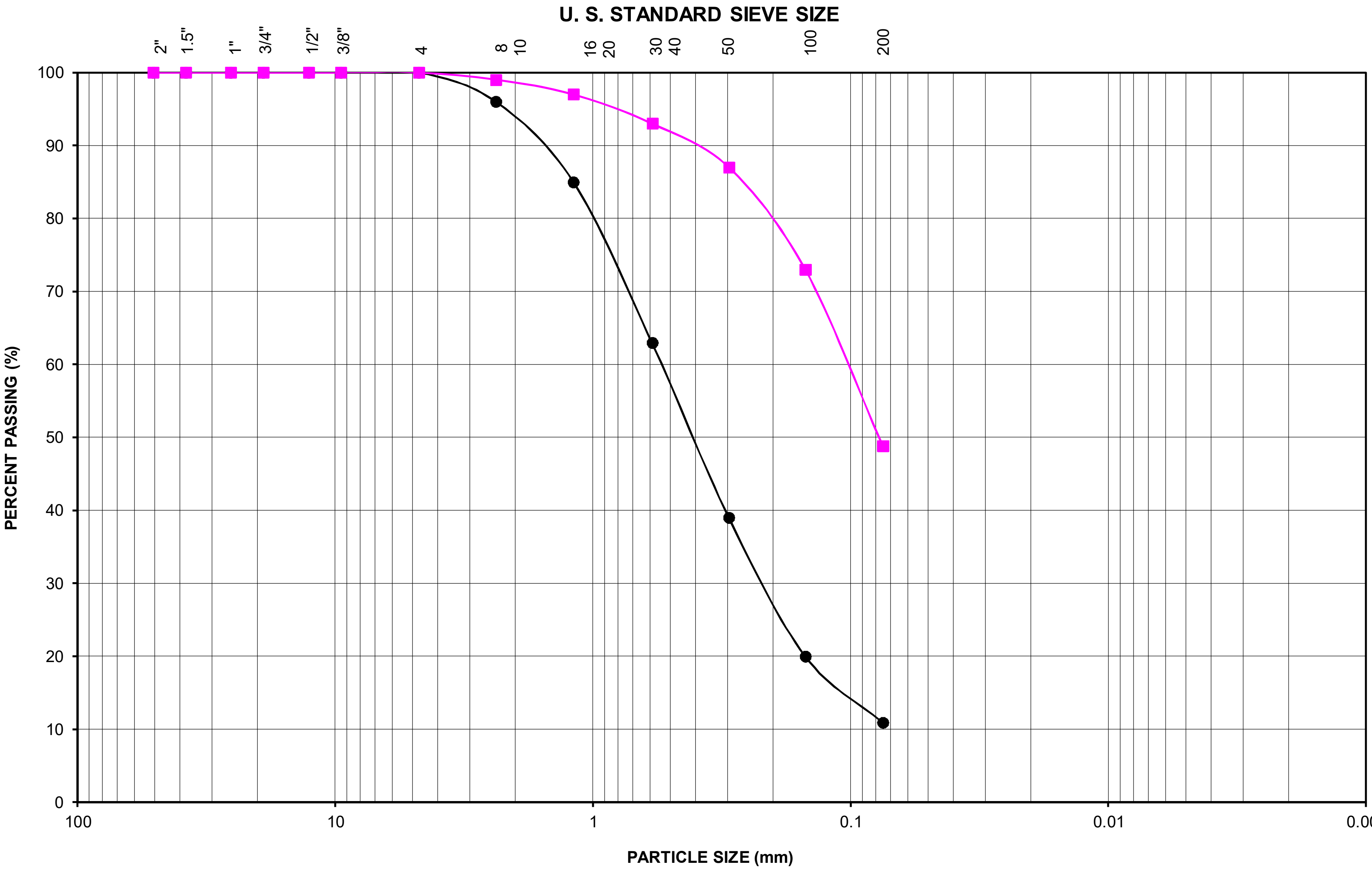
LOCATION	DEPTH (feet)	MAXIUM DRY DENSITY (PCF)	OPTIMUM MOISTURE (%)
B-2	0-5	129.7 (RC: 132.3)	8.3 (MC: 7.6)



PARTICLE SIZE ANALYSIS

CTE INC.
Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

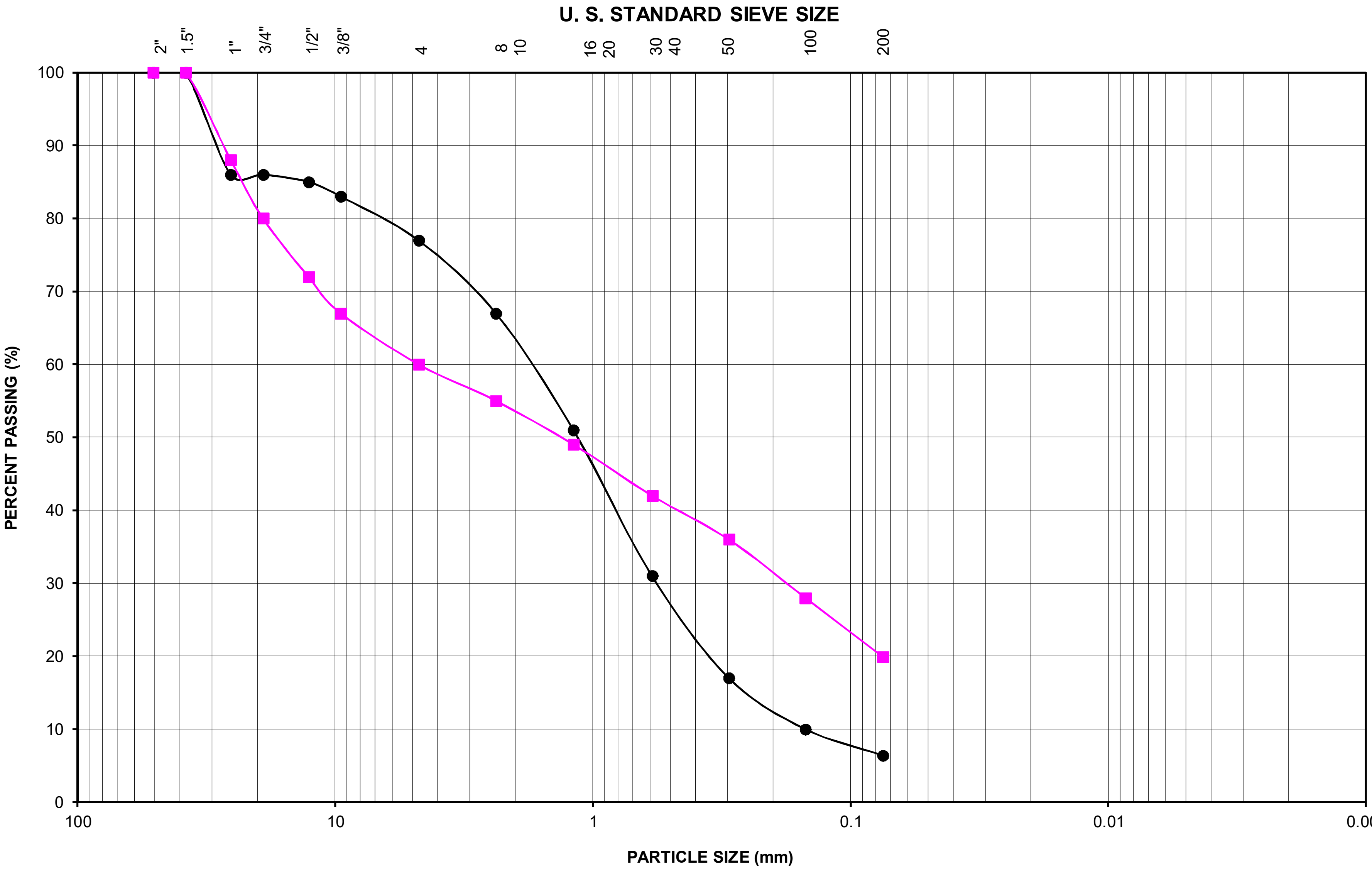
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-8	5	●	0	0	SM
B-8	20	■	0	0	SP-SM
CTE JOB NUMBER:		10-15346G		FIGURE:	C-1



PARTICLE SIZE ANALYSIS

CTE INC.
Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

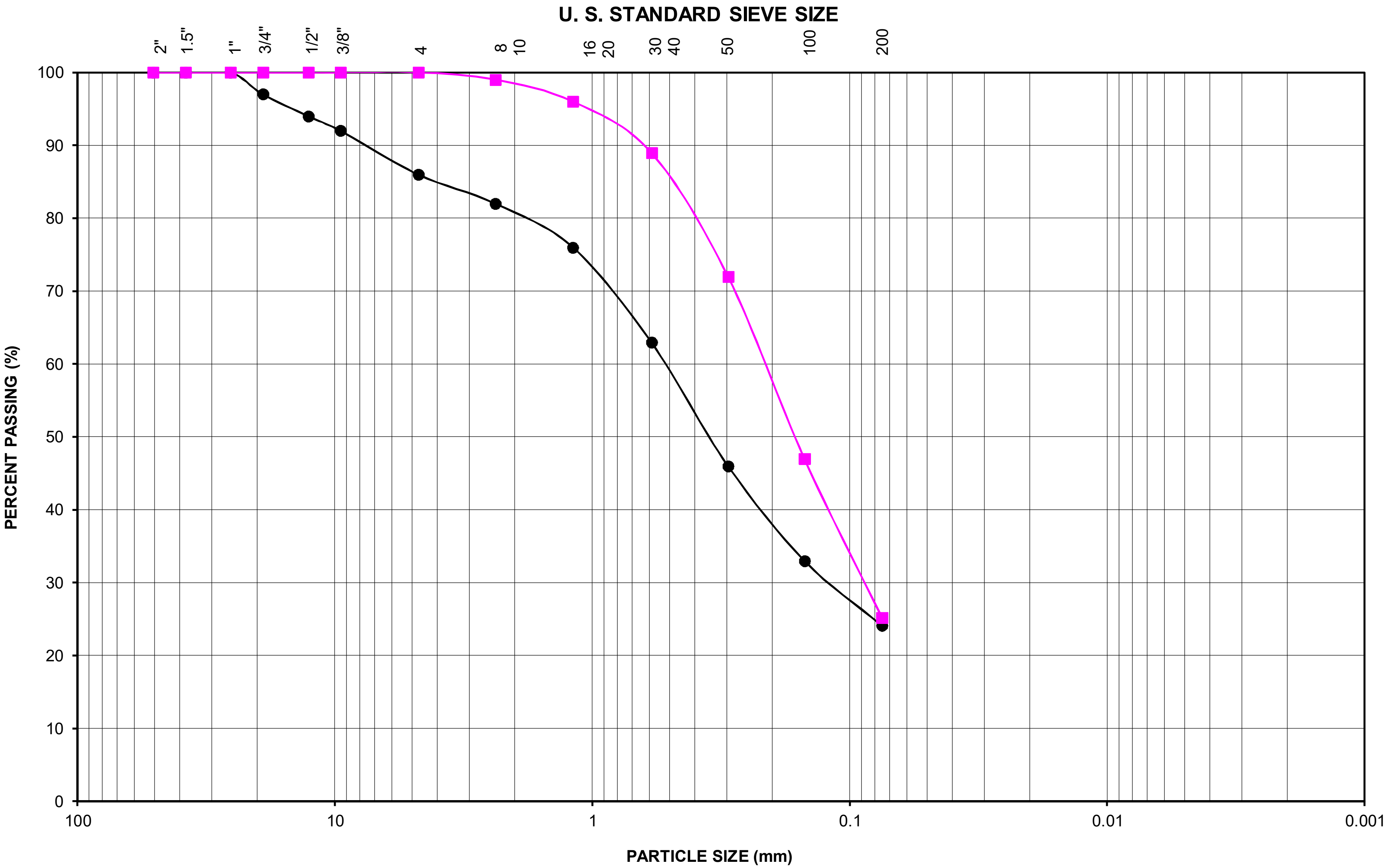
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-8	25	●	0	0	SP-SM
B-8	30	■	N/P	N/P	SM
CTE JOB NUMBER:		10-15346G		FIGURE:	C-2



PARTICLE SIZE ANALYSIS

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

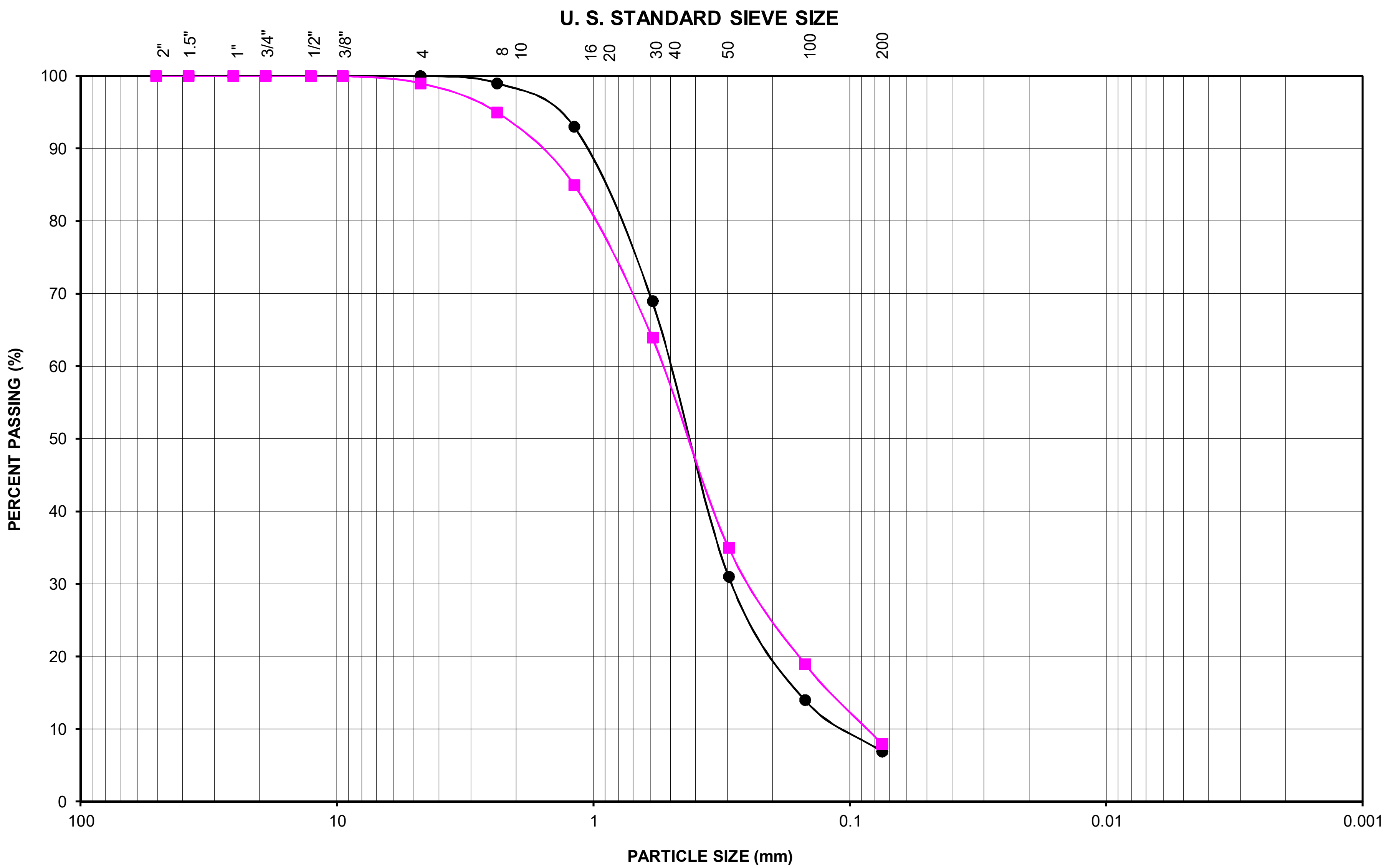
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-8	40	●	0	0	SP-SM
B-8	50	■	0	0	SM
CTE JOB NUMBER:		10-15346G		FIGURE:	C-3



PARTICLE SIZE ANALYSIS

Construction Testing & Engineering, Inc.
1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-11	10	●	0	0	SM
B-11	20	■	0	0	SM
CTE JOB NUMBER:		10-15346G	FIGURE:		C-4



PARTICLE SIZE ANALYSIS

CTE INC.

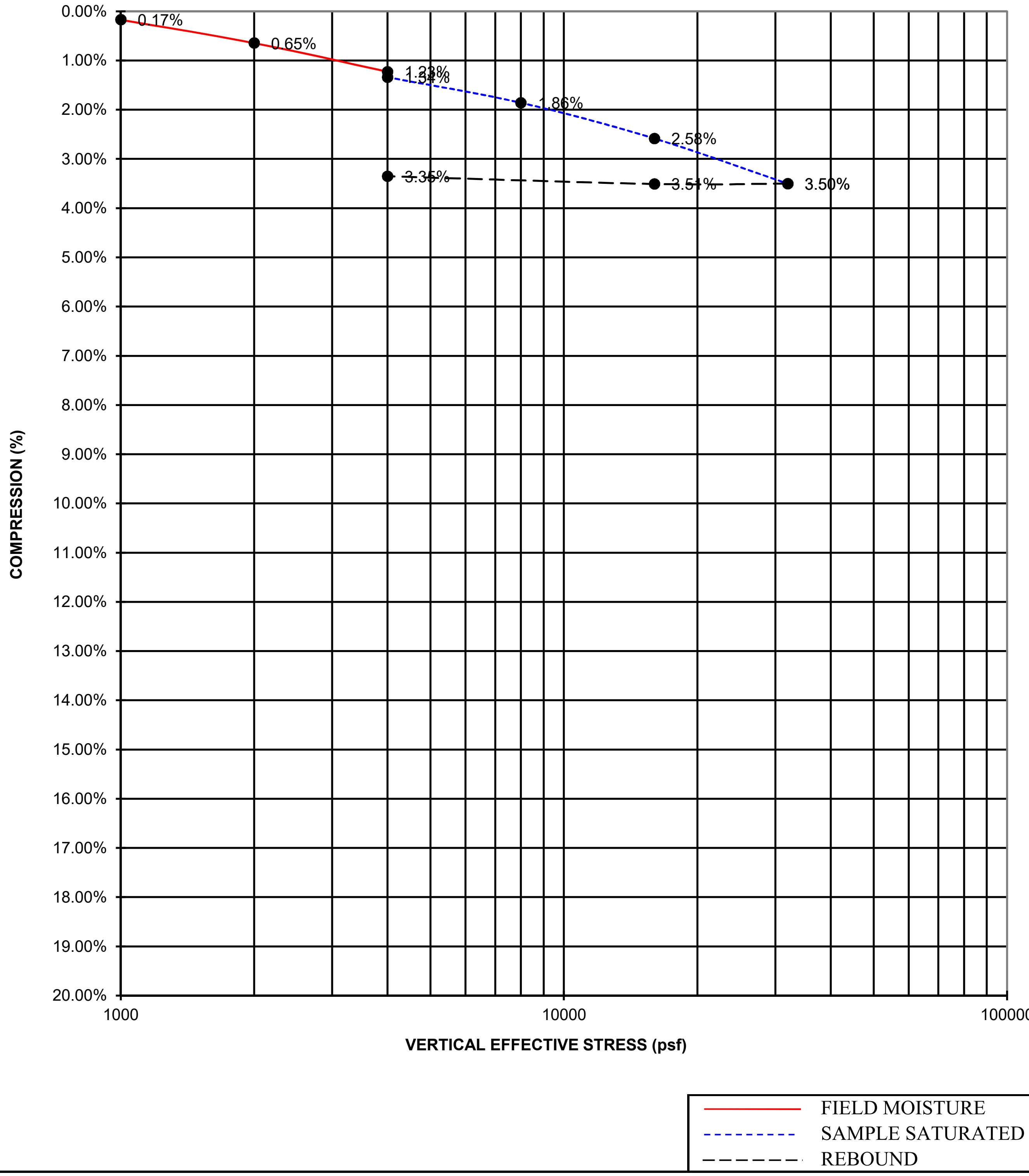
Construction Testing & Engineering, Inc.

1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-11	25	●	0	0	SP-SM
B-11	30	■	0	0	SP-SM
CTE JOB NUMBER:		10-15346G		FIGURE:	C-5

Construction Testing & Engineering, Inc.

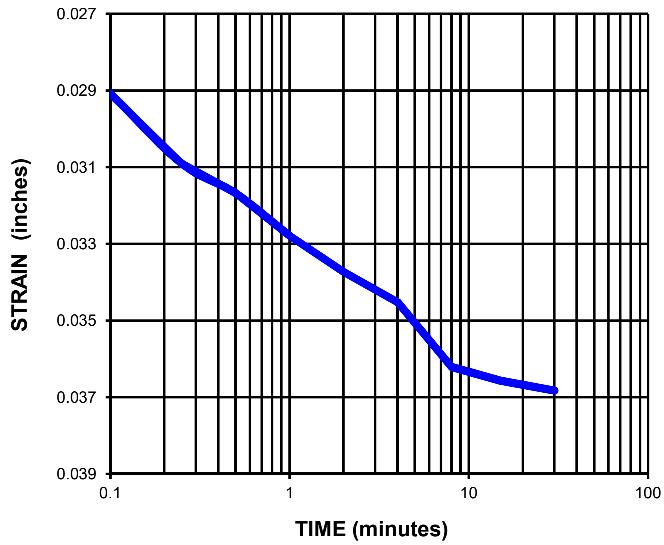
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



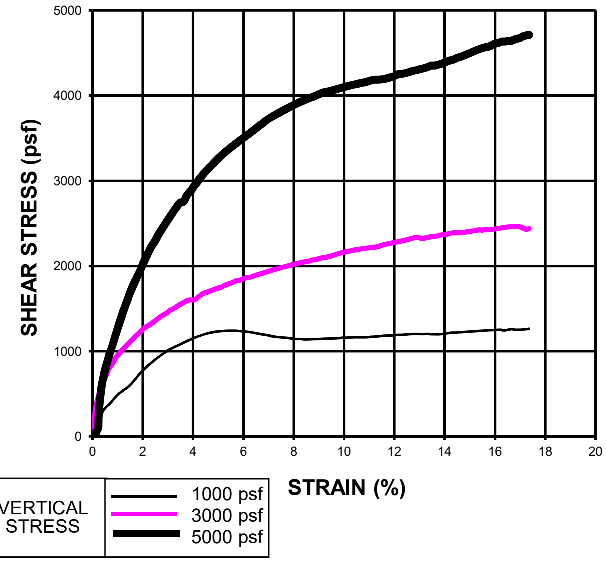
Consolidation Test ASTM D2435

Project Name:	Animal Shelter				
Project Number:	10-15346G	Sample Date:	1/14/2020	Initial Moisture (%):	10.2
Lab Number:	30364	Test Date:	1/21/2020	Final Moisture (%):	13.6
Sample Location:	B-11 @ 15'	Tested By:	KF	Initial Dry Density (PCF):	123.1
Sample Description:	Moderate Brown SP/SM			Final Dry Density (PCF):	124.0

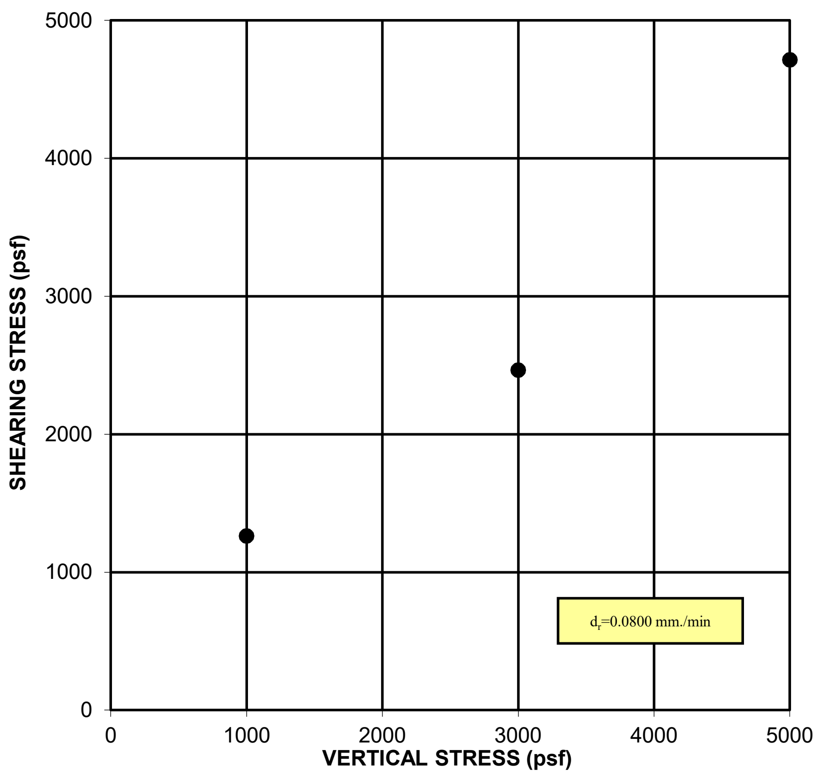
PRECONSOLIDATION



SHEARING DATA

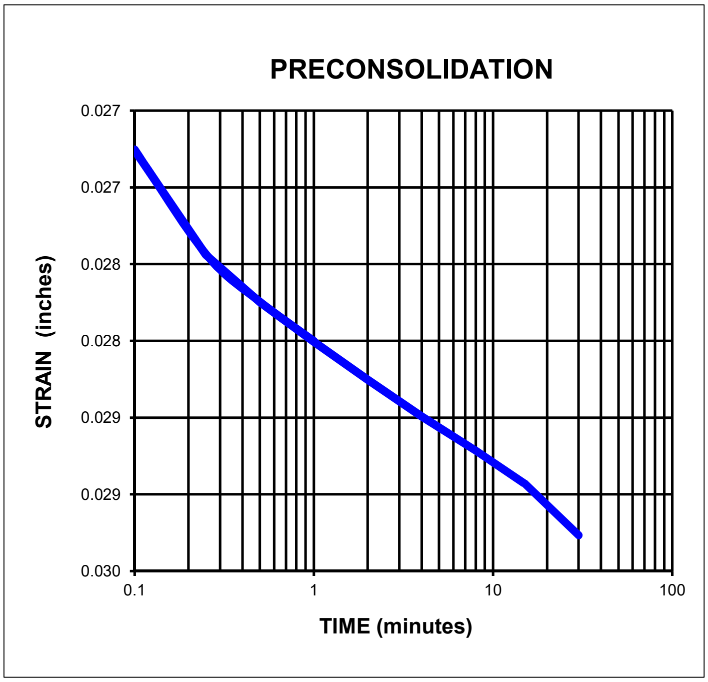


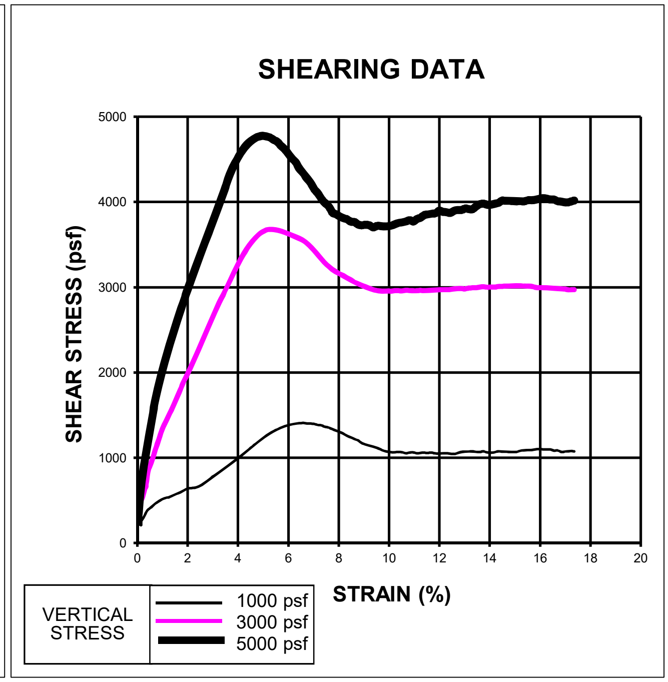
FAILURE ENVELOPE

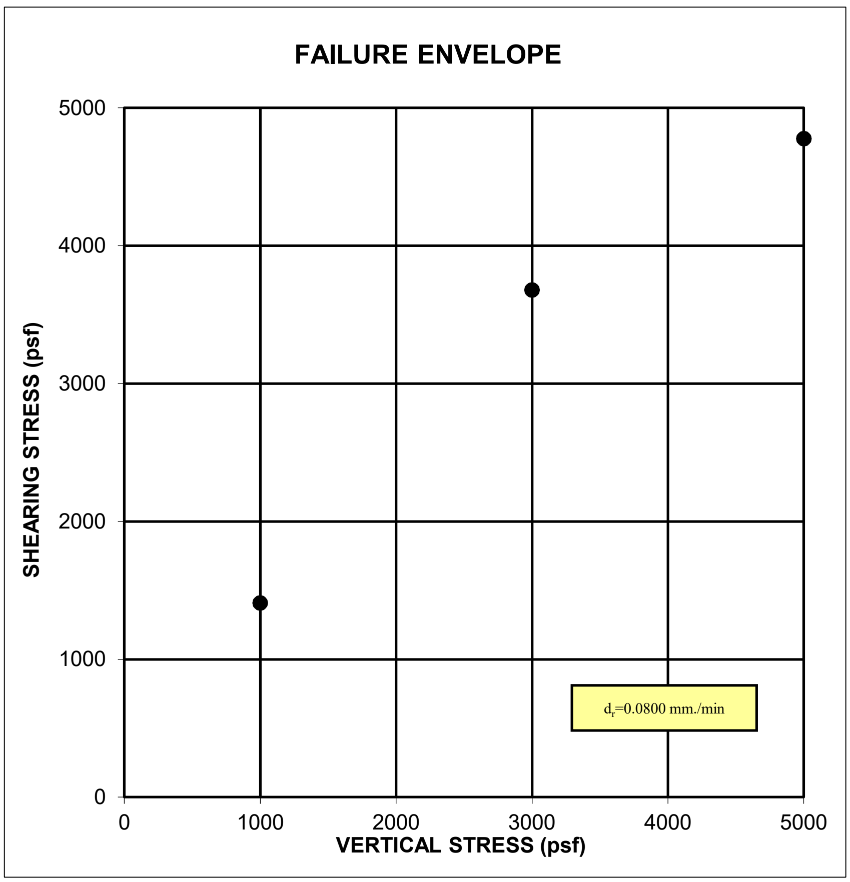


SHEAR STRENGTH TEST - ASTM D3080

Job Name:	Animal Shelter			Initial Dry Density (pcf):	108.1
Project Number:	10-15346G	Sample Date:	1/14/2020	Initial Moisture (%):	13.4
Lab Number:	30364	Test Date:	1/22/2020	Final Moisture (%):	21.1
Sample Location:	B-6 @ 5'	Tested by:	KF	Cohesion:	220 psf
Sample Description:	Moderate Brown SC			Angle Of Friction:	40.8







SHEAR STRENGTH TEST - ASTM D3080

Job Name:	Animal Shelter			Initial Dry Density (pcf):	111.5
Project Number:	10-15346G	Sample Date:	1/14/2020	Initial Moisture (%):	8.2
Lab Number:	30364	Test Date:	1/24/2020	Final Moisture (%):	19.2
Sample Location:	B-10 @ 15'	Tested by:	KF	Cohesion:	760 psf
Sample Description:	Moderate Brown SM			Angle Of Friction:	40.1

APPENDIX D

STANDARD SPECIFICATIONS FOR GRADING

Section 1 - General

Construction Testing & Engineering, Inc. presents the following standard recommendations for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications. Recommendations contained in the body of the previously presented soils report shall supersede the recommendations and or requirements as specified herein. The project geotechnical consultant shall interpret disputes arising out of interpretation of the recommendations contained in the soils report or specifications contained herein.

Section 2 - Responsibilities of Project Personnel

The geotechnical consultant should provide observation and testing services sufficient to general conformance with project specifications and standard grading practices. The geotechnical consultant should report any deviations to the client or his authorized representative.

The Client should be chiefly responsible for all aspects of the project. He or his authorized representative has the responsibility of reviewing the findings and recommendations of the geotechnical consultant. He shall authorize or cause to have authorized the Contractor and/or other consultants to perform work and/or provide services. During grading the Client or his authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

The Contractor is responsible for the safety of the project and satisfactory completion of all grading and other associated operations on construction projects, including, but not limited to, earth work in accordance with the project plans, specifications and controlling agency requirements.

Section 3 - Preconstruction Meeting

A preconstruction site meeting should be arranged by the owner and/or client and should include the grading contractor, design engineer, geotechnical consultant, owner's representative and representatives of the appropriate governing authorities.

Section 4 - Site Preparation

The client or contractor should obtain the required approvals from the controlling authorities for the project prior, during and/or after demolition, site preparation and removals, etc. The appropriate approvals should be obtained prior to proceeding with grading operations.

Clearing and grubbing should consist of the removal of vegetation such as brush, grass, woods, stumps, trees, root of trees and otherwise deleterious natural materials from the areas to be graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

Demolition should include removal of buildings, structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, mining shafts, tunnels, etc.) and other man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or rerouting pipelines at the project perimeter and cutoff and capping of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

Trees, plants or man-made improvements not planned to be removed or demolished should be protected by the contractor from damage or injury.

Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed off-site. Clearing, grubbing and demolition operations should be performed under the observation of the geotechnical consultant.

Section 5 - Site Protection

Protection of the site during the period of grading should be the responsibility of the contractor. Unless other provisions are made in writing and agreed upon among the concerned parties, completion of a portion of the project should not be considered to preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete as identified by the geotechnical consultant, the client and the regulating agencies.

Precautions should be taken during the performance of site clearing, excavations and grading to protect the work site from flooding, ponding or inundation by poor or improper surface drainage. Temporary provisions should be made during the rainy season to adequately direct surface drainage away from and off the work site. Where low areas cannot be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.

Rain related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions as determined by the geotechnical consultant. Soil adversely affected should be classified as unsuitable materials and should be subject to overexcavation and replacement with compacted fill or other remedial grading as recommended by the geotechnical consultant.

The contractor should be responsible for the stability of all temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations (e.g., backcuts) are made in consideration of stability of the completed project and, therefore, should not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant should not be considered to preclude requirements that are more restrictive by the regulating agencies. The contractor should provide during periods of extensive rainfall plastic sheeting to prevent unprotected slopes from becoming saturated and unstable. When deemed appropriate by the geotechnical consultant or governing agencies the contractor shall install checkdams, desilting basins, sand bags or other drainage control measures.

In relatively level areas and/or slope areas, where saturated soil and/or erosion gullies exist to depths of greater than 1.0 foot; they should be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where affected materials exist to depths of 1.0 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place, followed by thorough recompaction in accordance with the applicable grading guidelines herein may be attempted. If the desired results are not achieved, all affected materials should be overexcavated and replaced as compacted fill in accordance with the slope repair recommendations herein. If field conditions dictate, the geotechnical consultant may recommend other slope repair procedures.

Section 6 - Excavations

6.1 Unsuitable Materials

Materials that are unsuitable should be excavated under observation and recommendations of the geotechnical consultant. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic compressible natural soils and fractured, weathered, soft bedrock and nonengineered or otherwise deleterious fill materials.

Material identified by the geotechnical consultant as unsatisfactory due to its moisture conditions should be overexcavated; moisture conditioned as needed, to a uniform at or above optimum moisture condition before placement as compacted fill.

If during the course of grading adverse geotechnical conditions are exposed which were not anticipated in the preliminary soil report as determined by the geotechnical consultant additional exploration, analysis, and treatment of these problems may be recommended.

6.2 Cut Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent cut slopes should not be steeper than 2:1 (horizontal: vertical).

The geotechnical consultant should observe cut slope excavation and if these excavations expose loose cohesionless, significantly fractured or otherwise unsuitable material, the materials should be overexcavated and replaced with a compacted stabilization fill. If encountered specific cross section details should be obtained from the Geotechnical Consultant.

When extensive cut slopes are excavated or these cut slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top of the slope.

6.3 Pad Areas

All lot pad areas, including side yard terrace containing both cut and fill materials, transitions, located less than 3 feet deep should be overexcavated to a depth of 3 feet and replaced with a uniform compacted fill blanket of 3 feet. Actual depth of overexcavation may vary and should be delineated by the geotechnical consultant during grading, especially where deep or drastic transitions are present.

For pad areas created above cut or natural slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm drainage swale and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slopes of 2 percent or greater is recommended.

Section 7 - Compacted Fill

All fill materials should have fill quality, placement, conditioning and compaction as specified below or as approved by the geotechnical consultant.

7.1 Fill Material Quality

Excavated on-site or import materials which are acceptable to the geotechnical consultant may be utilized as compacted fill, provided trash, vegetation and other deleterious materials are removed prior to placement. All import materials anticipated for use on-site should be sampled tested and approved prior to and placement is in conformance with the requirements outlined.

Rocks 12 inches in maximum and smaller may be utilized within compacted fill provided sufficient fill material is placed and thoroughly compacted over and around all rock to effectively fill rock voids. The amount of rock should not exceed 40 percent by dry weight passing the 3/4-inch sieve. The geotechnical consultant may vary those requirements as field conditions dictate.

Where rocks greater than 12 inches but less than four feet of maximum dimension are generated during grading, or otherwise desired to be placed within an engineered fill, special handling in accordance with the recommendations below. Rocks greater than four feet should be broken down or disposed off-site.

7.2 Placement of Fill

Prior to placement of fill material, the geotechnical consultant should observe and approve the area to receive fill. After observation and approval, the exposed ground surface should be scarified to a depth of 6 to 8 inches. The scarified material should be conditioned (i.e. moisture added or air dried by continued discing) to achieve a moisture content at or slightly above optimum moisture conditions and compacted to a minimum of 90 percent of the maximum density or as otherwise recommended in the soils report or by appropriate government agencies.

Compacted fill should then be placed in thin horizontal lifts not exceeding eight inches in loose thickness prior to compaction. Each lift should be moisture conditioned as needed, thoroughly blended to achieve a consistent moisture content at or slightly above optimum and thoroughly compacted by mechanical methods to a minimum of 90 percent of laboratory maximum dry density. Each lift should be treated in a like manner until the desired finished grades are achieved.

The contractor should have suitable and sufficient mechanical compaction equipment and watering apparatus on the job site to handle the amount of fill being placed in consideration of moisture retention properties of the materials and weather conditions.

When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Keying and benching should be sufficient to provide at least six-foot wide benches and a minimum of four feet of vertical bench height within the firm natural ground, firm bedrock or engineered compacted fill. No compacted fill should be placed in an area after keying and benching until the geotechnical consultant has reviewed the area. Material generated by the benching operation should be moved sufficiently away from the bench area to allow for the recommended review of the horizontal bench prior to placement of fill.

Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a false slope, benching should be conducted in the same manner as above described. At least a 3-foot vertical bench should be established within the firm core of adjacent approved compacted fill prior to placement of additional fill. Benching should proceed in at least 3-foot vertical increments until the desired finished grades are achieved.

Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface or previously compacted fill should be processed by scarification, moisture conditioning as needed to at or slightly above optimum moisture content, thoroughly blended and recompacted to a minimum of 90 percent of laboratory maximum dry density. Where unsuitable materials exist to depths of greater than one foot, the unsuitable materials should be over-excavated.

Following a period of flooding, rainfall or overwatering by other means, no additional fill should be placed until damage assessments have been made and remedial grading performed as described herein.

Rocks 12 inch in maximum dimension and smaller may be utilized in the compacted fill provided the fill is placed and thoroughly compacted over and around all rock. No oversize material should be used within 3 feet of finished pad grade and within 1 foot of other compacted fill areas. Rocks 12 inches up to four feet maximum dimension should be placed below the upper 10 feet of any fill and should not be closer than 15 feet to any slope face. These recommendations could vary as locations of improvements dictate. Where practical, oversized material should not be placed below areas where structures or deep utilities are proposed. Oversized material should be placed in windrows on a clean, overexcavated or unyielding compacted fill or firm natural ground surface. Select native or imported granular soil (S.E. 30 or higher) should be placed and thoroughly flooded over and around all windrowed rock, such that voids are filled. Windrows of oversized material should be staggered so those successive strata of oversized material are not in the same vertical plane.

It may be possible to dispose of individual larger rock as field conditions dictate and as recommended by the geotechnical consultant at the time of placement.

The contractor should assist the geotechnical consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill. The contractor should provide this work at no additional cost to the owner or contractor's client.

Fill should be tested by the geotechnical consultant for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Test D 1556-00, D 2922-04. Tests should be conducted at a minimum of approximately two vertical feet or approximately 1,000 to 2,000 cubic yards of fill placed. Actual test intervals may vary as field conditions dictate. Fill found not to be in conformance with the grading recommendations should be removed or otherwise handled as recommended by the geotechnical consultant.

7.3 Fill Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent fill slopes should not be steeper than 2:1 (horizontal: vertical).

Except as specifically recommended in these grading guidelines compacted fill slopes should be over-built two to five feet and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes should be overexcavated and reconstructed under the guidelines of the geotechnical consultant. The degree of overbuilding shall be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface.

At the discretion of the geotechnical consultant, slope face compaction may be attempted by conventional construction procedures including backrolling. The procedure must create a firmly compacted material throughout the entire depth of the slope face to the surface of the previously compacted firm fill intercore.

During grading operations, care should be taken to extend compactive effort to the outer edge of the slope. Each lift should extend horizontally to the desired finished slope surface or more as needed to ultimately established desired grades. Grade during construction should not be allowed to roll off at the edge of the slope. It may be helpful to elevate slightly the outer edge of the slope. Slough resulting from the placement of individual lifts should not be allowed to drift down over previous lifts. At intervals not exceeding four feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly dozer trackrolled.

For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished using a berm and pad gradient of at least two percent.

Section 8 - Trench Backfill

Utility and/or other excavation of trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 90 percent of the laboratory maximum density.

Within slab areas, but outside the influence of foundations, trenches up to one foot wide and two feet deep may be backfilled with sand and consolidated by jetting, flooding or by mechanical means. If on-site materials are utilized, they should be wheel-rolled, tamped or otherwise compacted to a firm condition. For minor interior trenches, density testing may be deleted or spot testing may be elected if deemed necessary, based on review of backfill operations during construction.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, the contractor may elect the utilization of light weight mechanical compaction equipment and/or shading of the conduit with clean, granular material, which should be thoroughly jetted in-place above the conduit, prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review of the geotechnical consultant at the time of construction.

In cases where clean granular materials are proposed for use in lieu of native materials or where flooding or jetting is proposed, the procedures should be considered subject to review by the geotechnical consultant. Clean granular backfill and/or bedding are not recommended in slope areas.

Section 9 - Drainage

Where deemed appropriate by the geotechnical consultant, canyon subdrain systems should be installed in accordance with CTE’s recommendations during grading.

Typical subdrains for compacted fill buttresses, slope stabilization or sidehill masses, should be installed in accordance with the specifications.

Roof, pad and slope drainage should be directed away from slopes and areas of structures to suitable disposal areas via non-erodible devices (i.e., gutters, downspouts, and concrete swales).

For drainage in extensively landscaped areas near structures, (i.e., within four feet) a minimum of 5 percent gradient away from the structure should be maintained. Pad drainage of at least 2 percent should be maintained over the remainder of the site.

Drainage patterns established at the time of fine grading should be maintained throughout the life of the project. Property owners should be made aware that altering drainage patterns could be detrimental to slope stability and foundation performance.

Section 10 - Slope Maintenance

10.1 - Landscape Plants

To enhance surficial slope stability, slope planting should be accomplished at the completion of grading. Slope planting should consist of deep-rooting vegetation requiring little watering. Plants native to the southern California area and plants relative to native plants are generally desirable. Plants native to other semi-arid and arid areas may also be appropriate. A Landscape Architect should be the best party to consult regarding actual types of plants and planting configuration.

10.2 - Irrigation

Irrigation pipes should be anchored to slope faces, not placed in trenches excavated into slope faces.

Slope irrigation should be minimized. If automatic timing devices are utilized on irrigation systems, provisions should be made for interrupting normal irrigation during periods of rainfall.

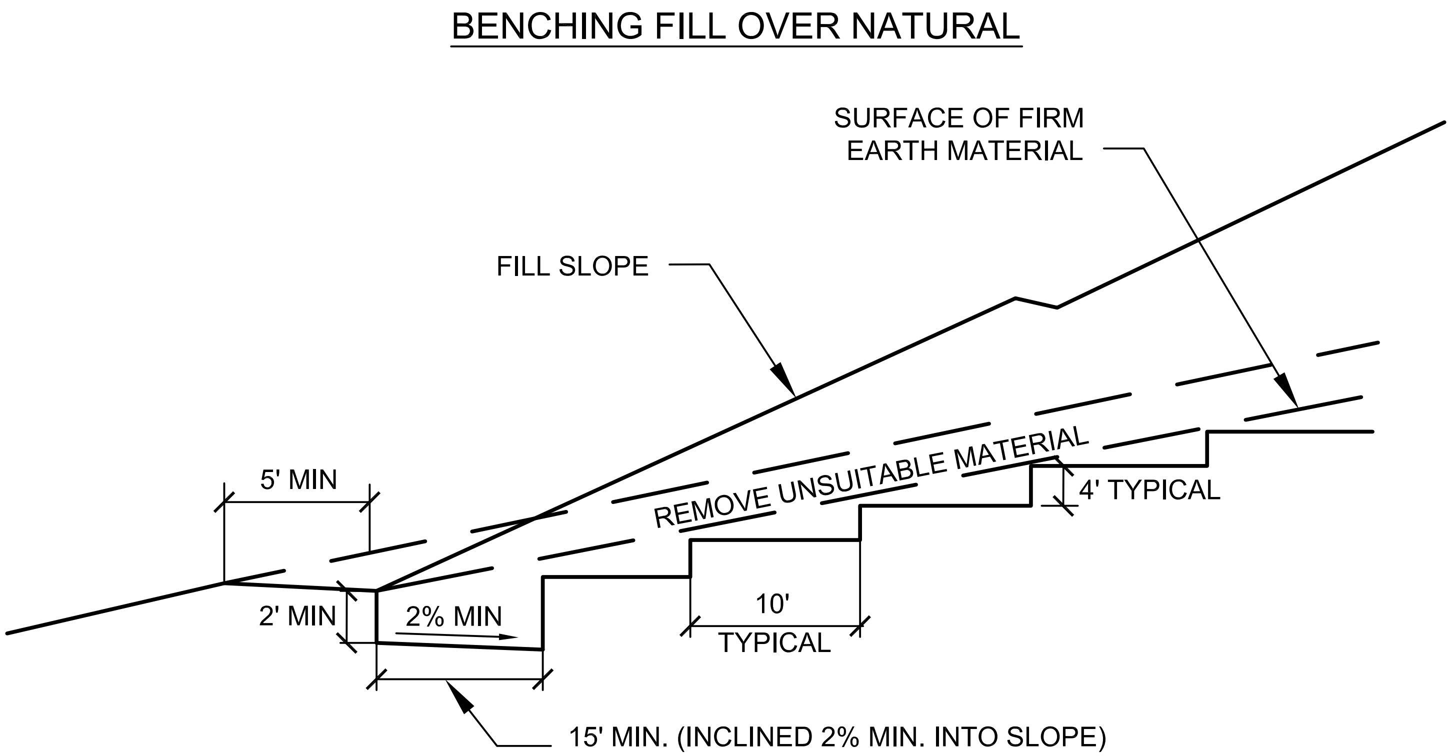
10.3 - Repair

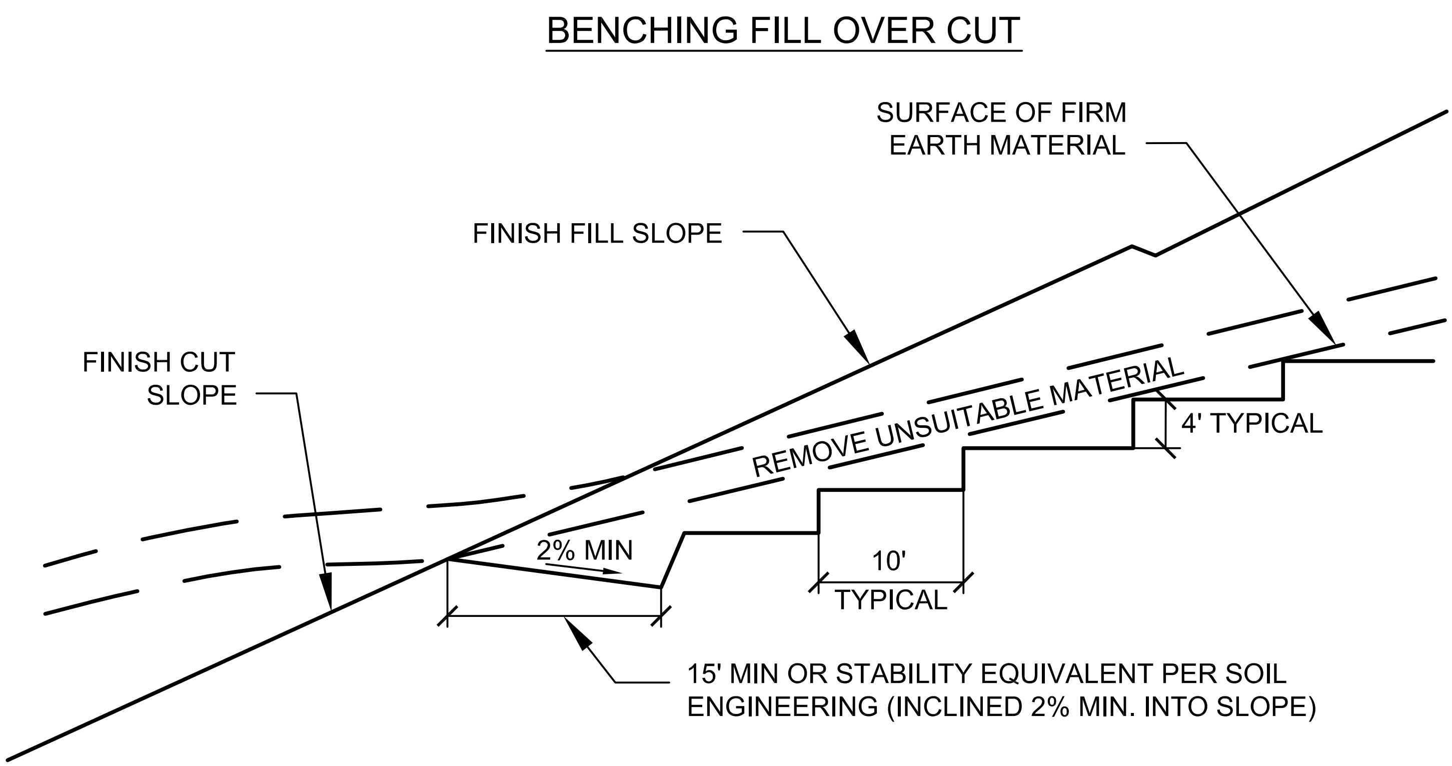
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

If slope failures occur, the geotechnical consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.

If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

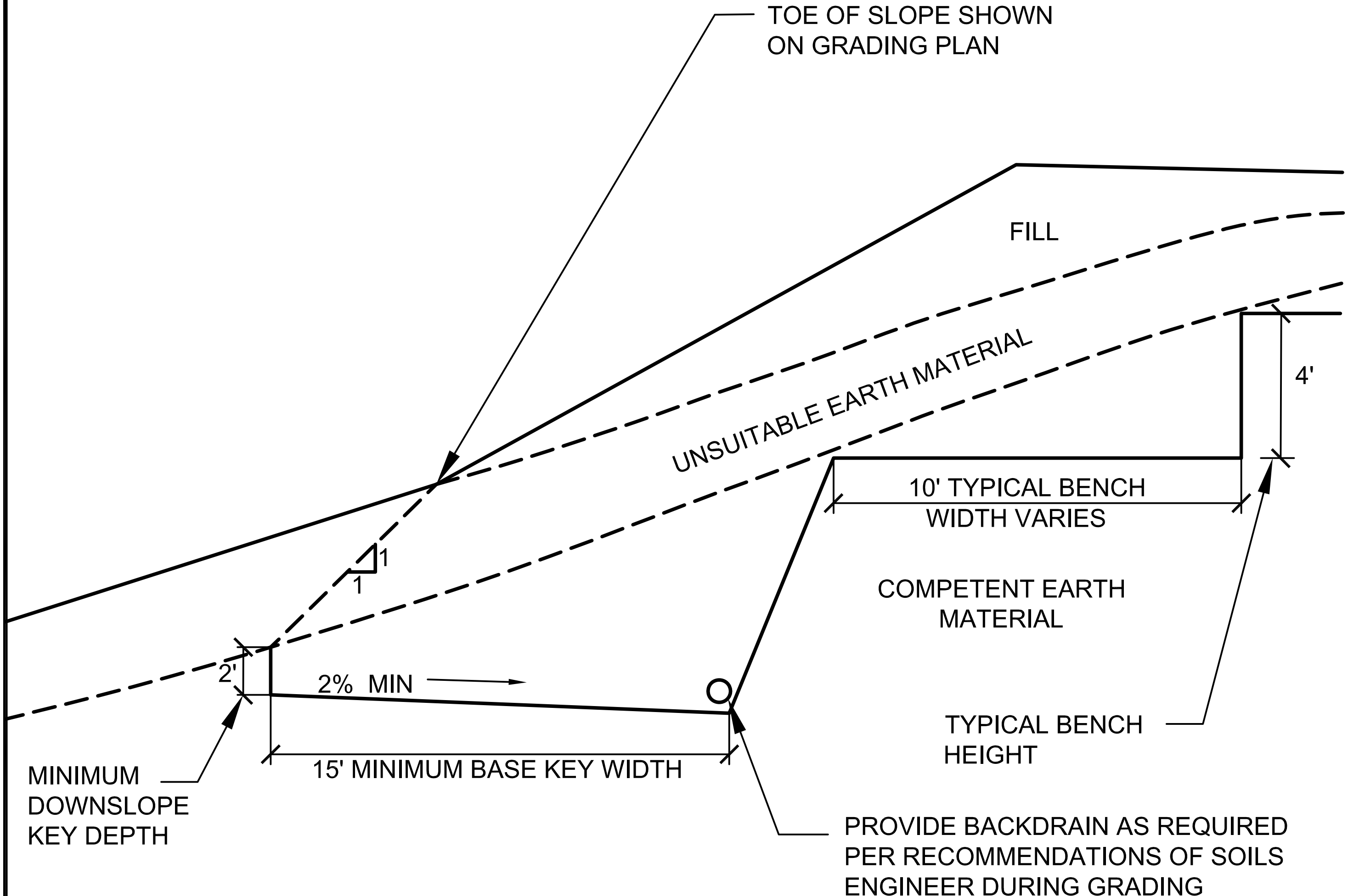
In the accompanying Standard Details, appropriate repair procedures are illustrated for superficial slope failures (i.e., occurring typically within the outer one foot to three feet of a slope face).





NOT TO SCALE

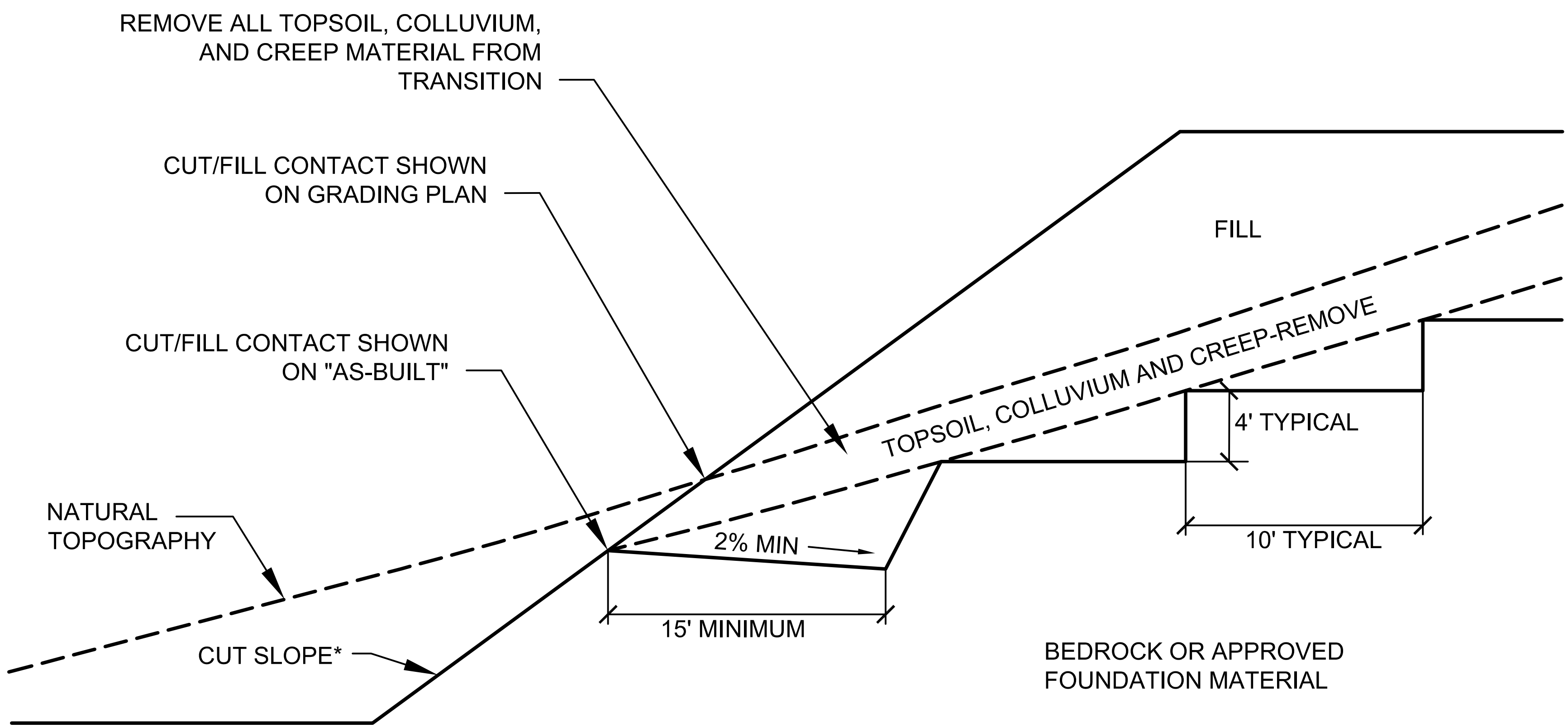
BENCHING FOR COMPACTED FILL DETAIL



WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

NOT TO SCALE

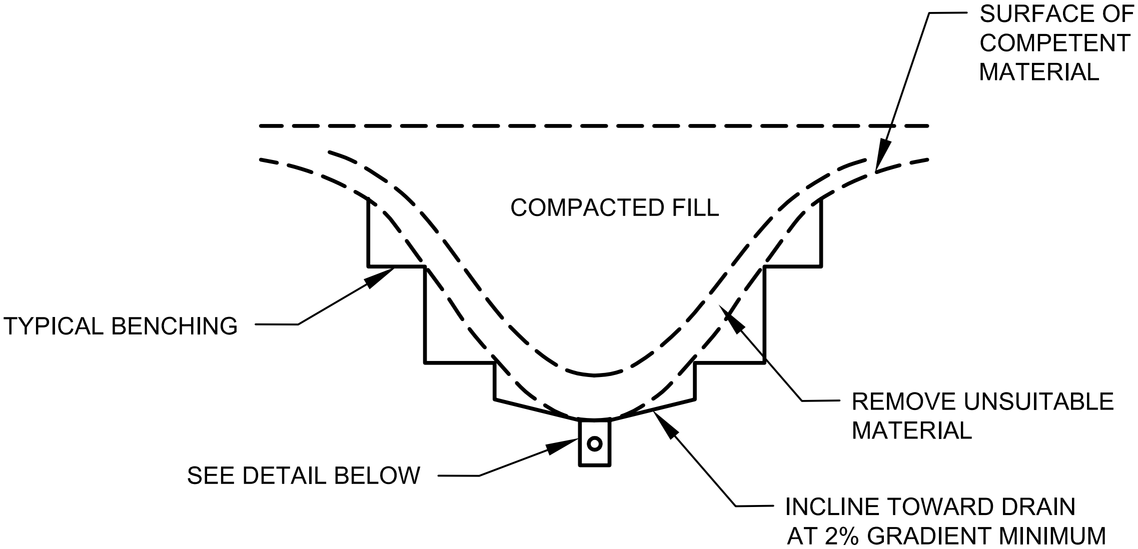
FILL SLOPE ABOVE NATURAL GROUND DETAIL



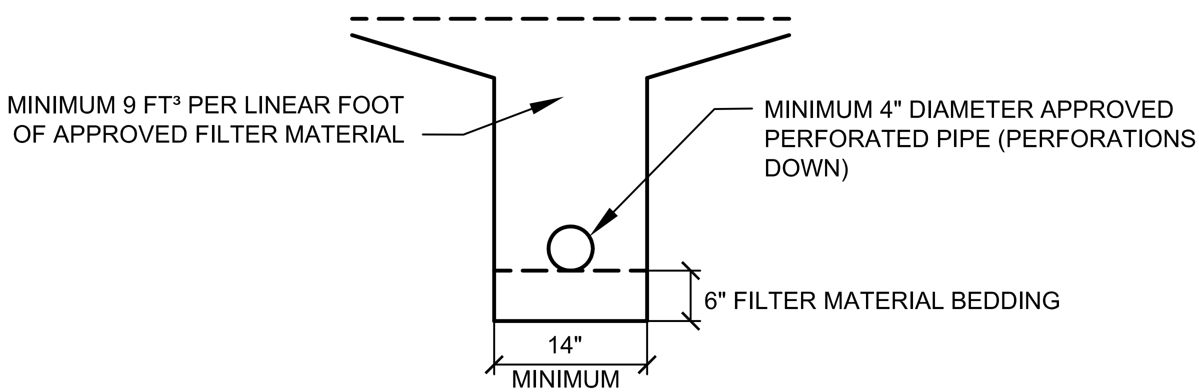
*NOTE: CUT SLOPE PORTION SHOULD BE
MADE PRIOR TO PLACEMENT OF FILL

NOT TO SCALE

FILL SLOPE ABOVE CUT SLOPE DETAIL



DETAIL



CALTRANS CLASS 2 PERMEABLE MATERIAL FILTER MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYL-CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 psi

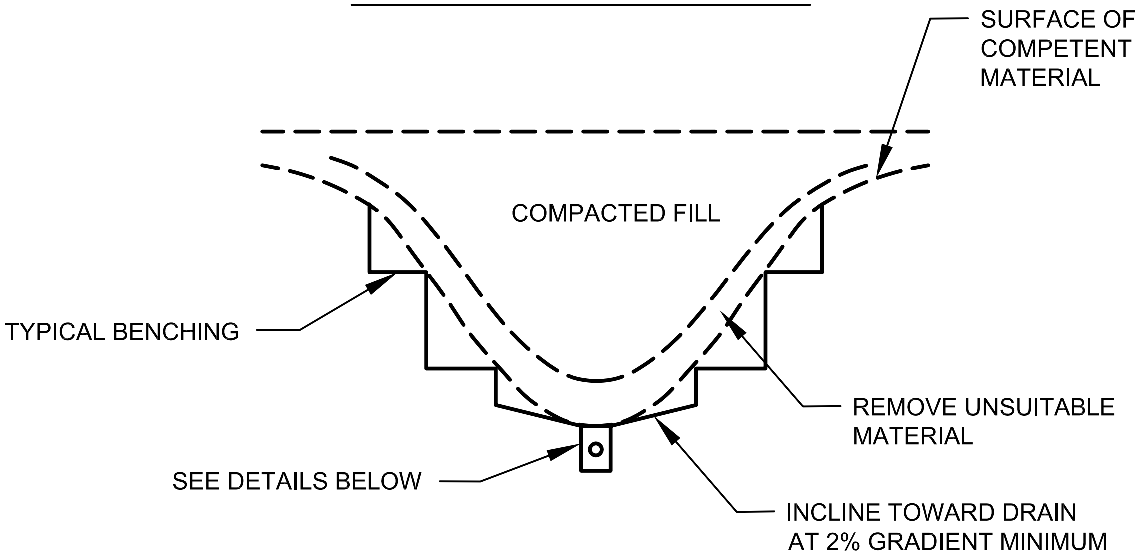
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

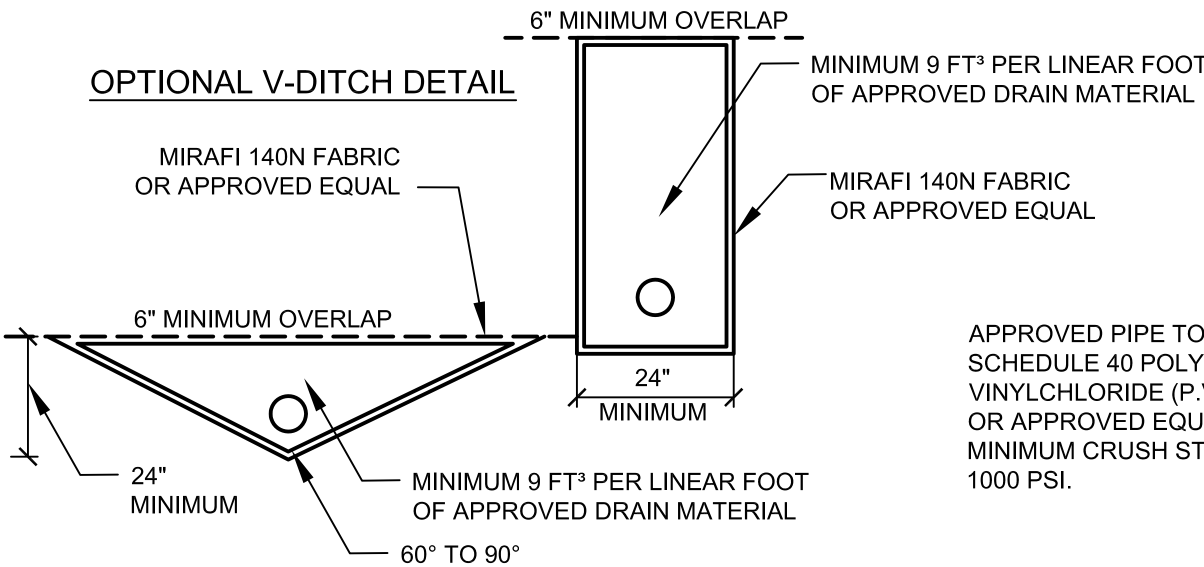
NOT TO SCALE

TYPICAL CANYON SUBDRAIN DETAIL

CANYON SUBDRAIN DETAILS



TRENCH DETAILS



APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYLCHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 PSI.

DRAIN MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	88-100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

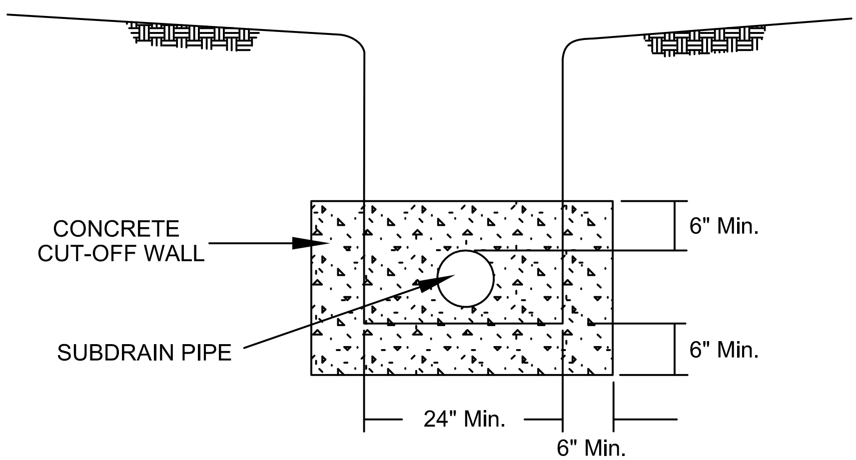
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

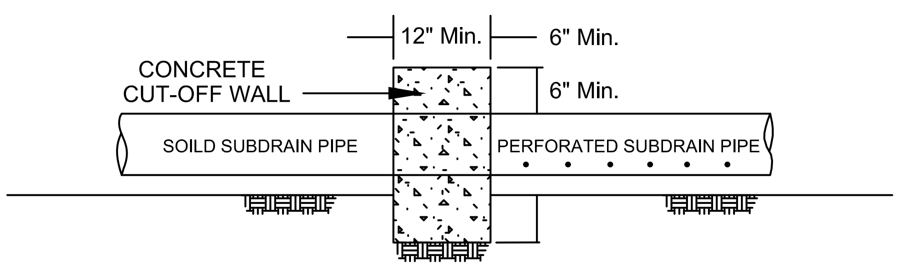
NOT TO SCALE

GEOFABRIC SUBDRAIN

FRONT VIEW



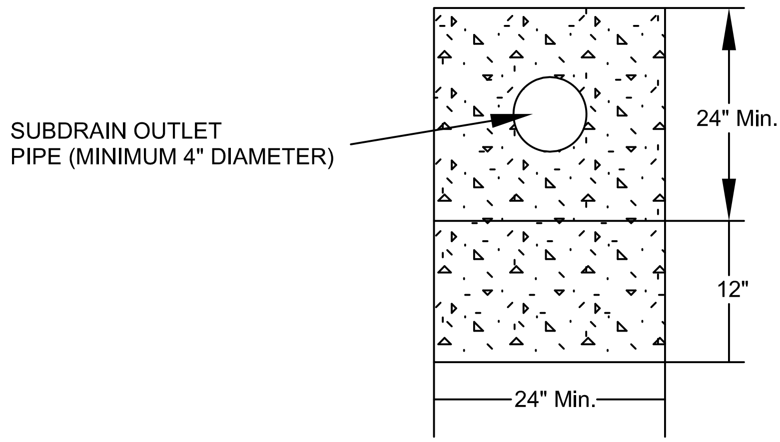
SIDE VIEW



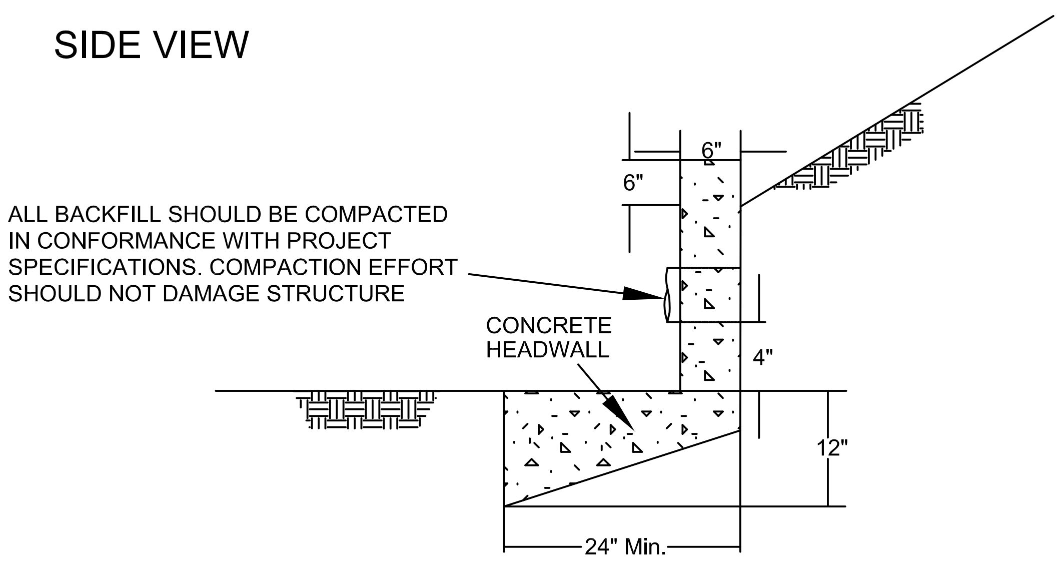
NOT TO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

FRONT VIEW



SIDE VIEW



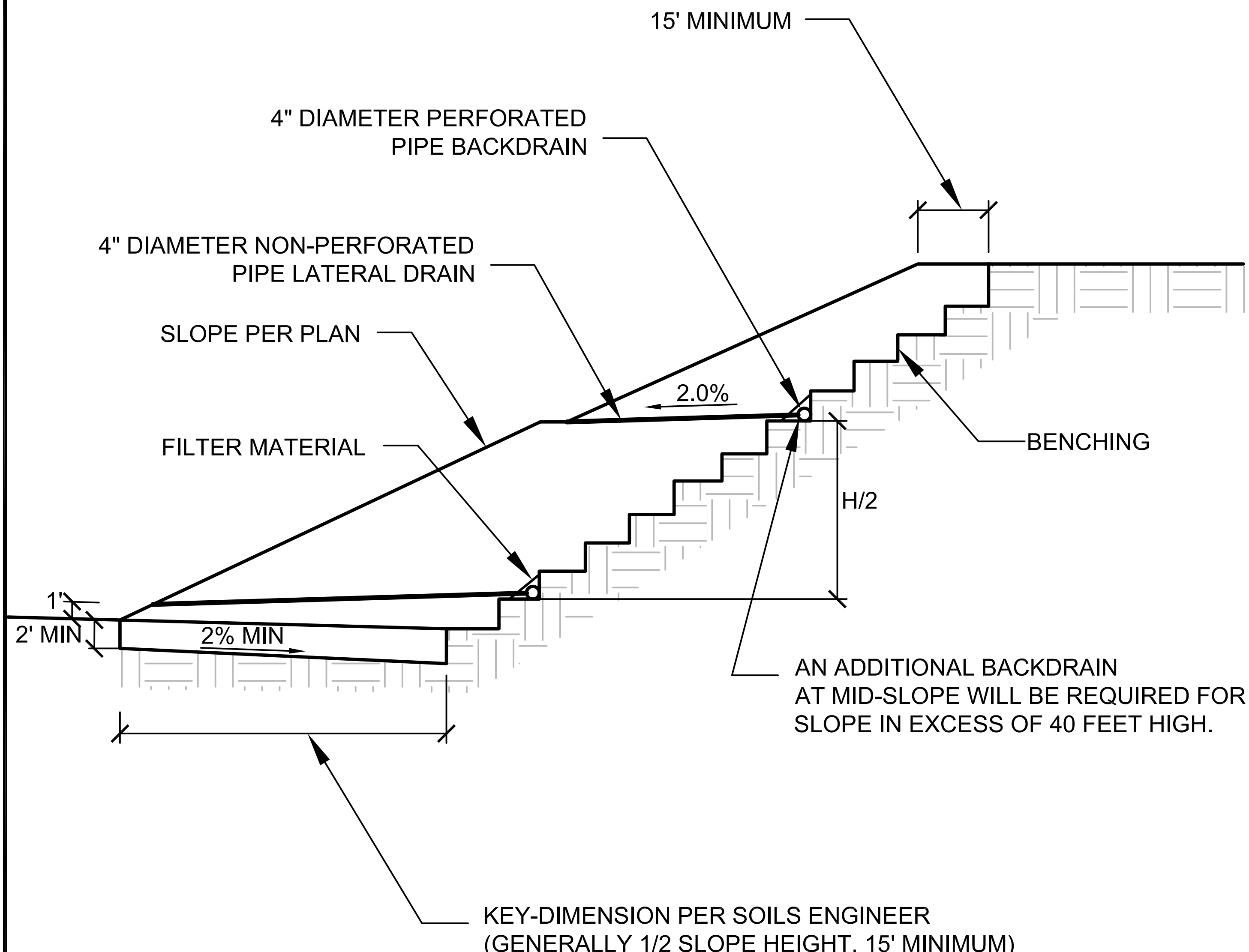
NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

ALL DISCHARGE SHOULD BE CONTROLLED

THIS DETAIL IS A MINIMUM DESIGN AND MAY BE MODIFIED DEPENDING UPON ENCOUNTERED CONDITIONS AND LOCAL REQUIREMENTS

NOT TO SCALE

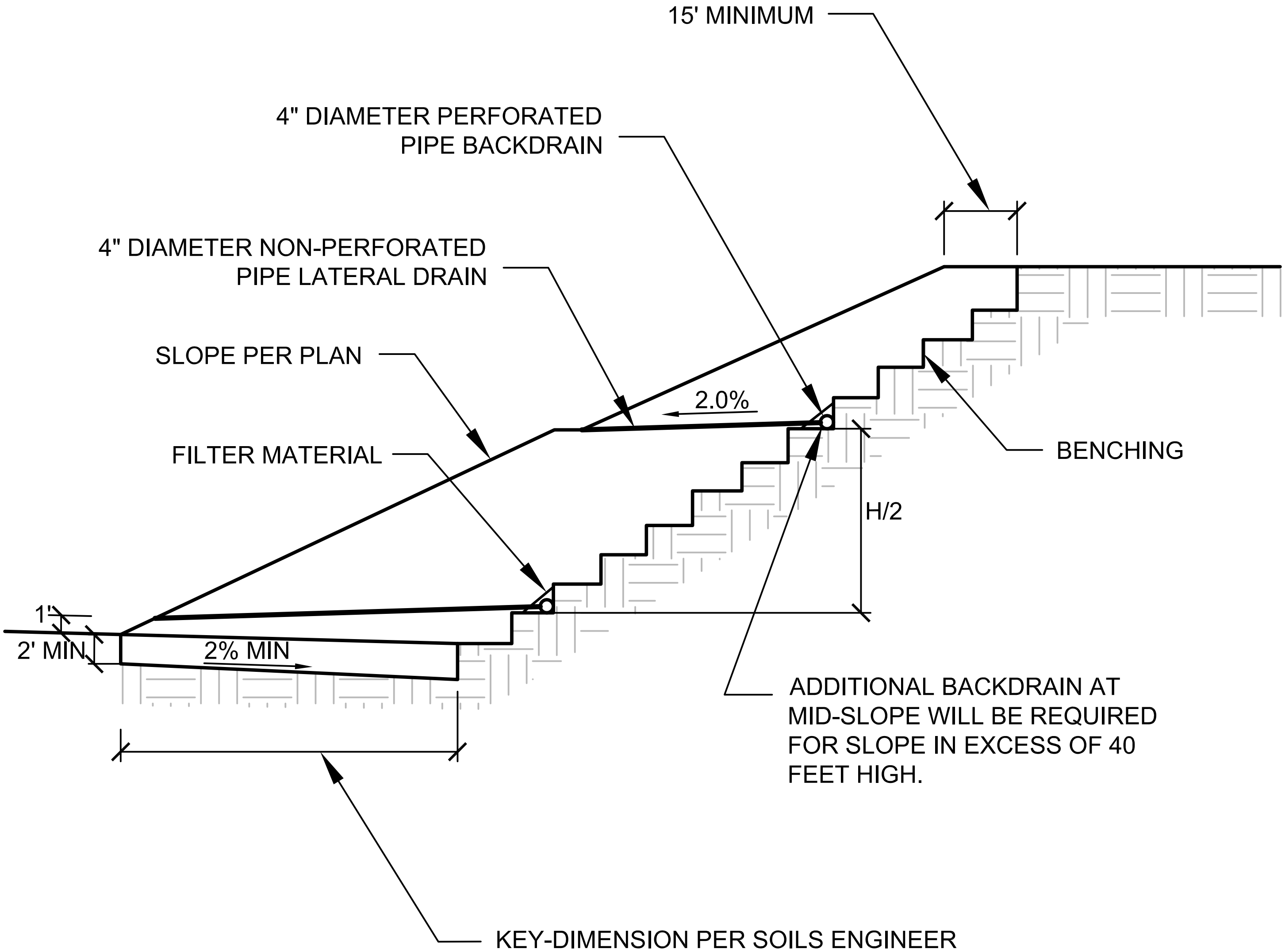
TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

NOT TO SCALE

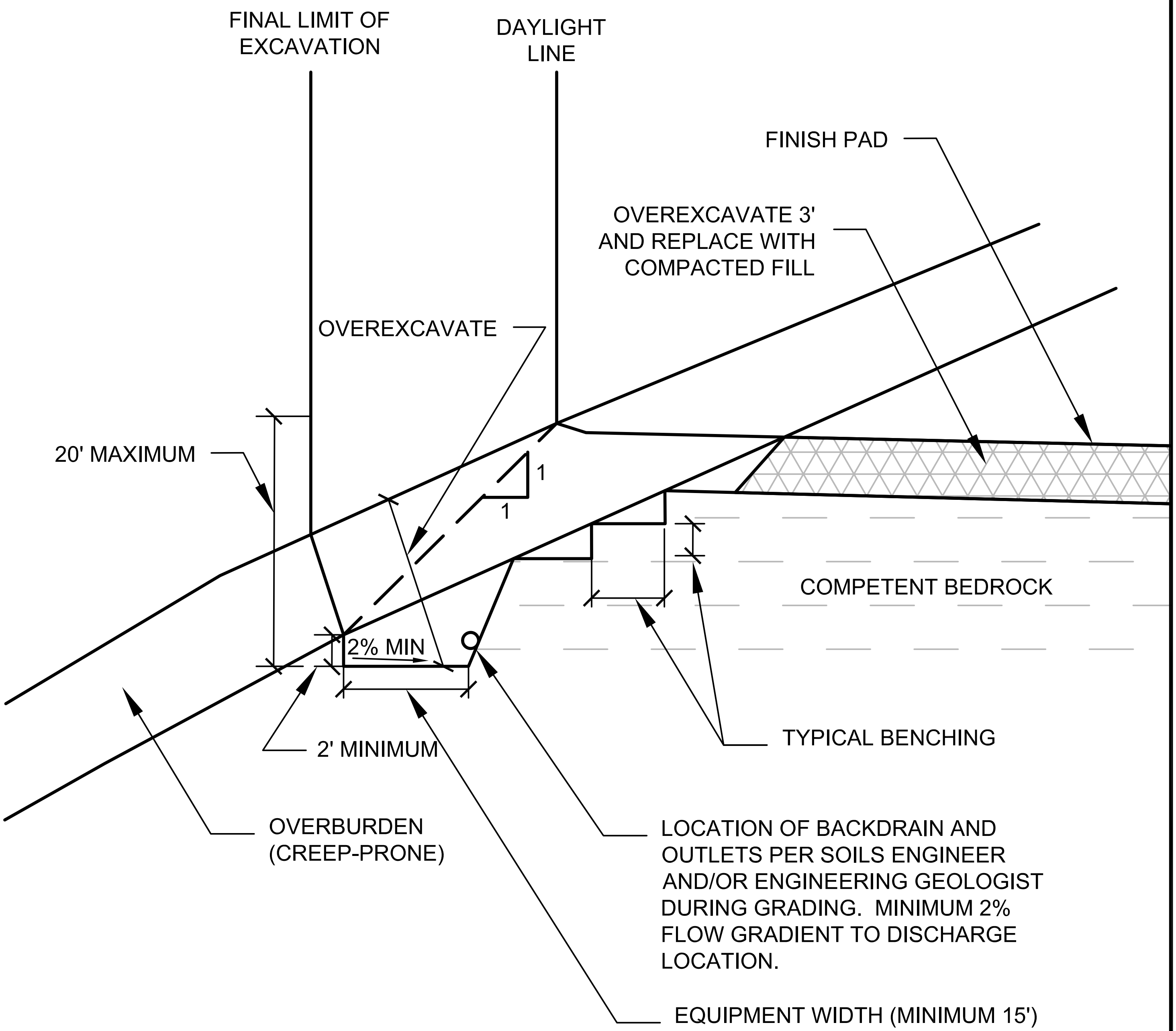
TYPICAL SLOPE STABILIZATION FILL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

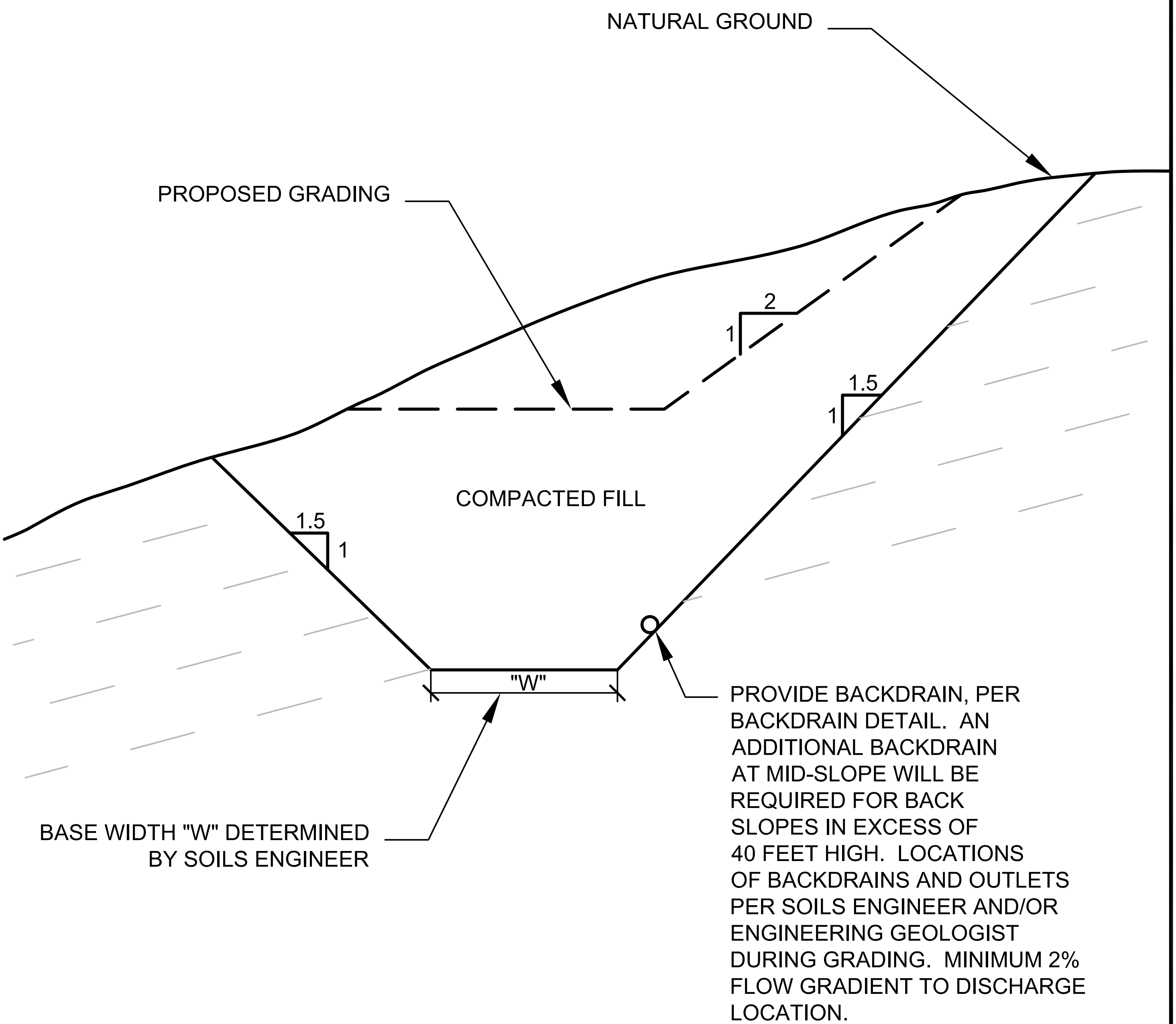
NOT TO SCALE

TYPICAL BUTTRESS FILL DETAIL



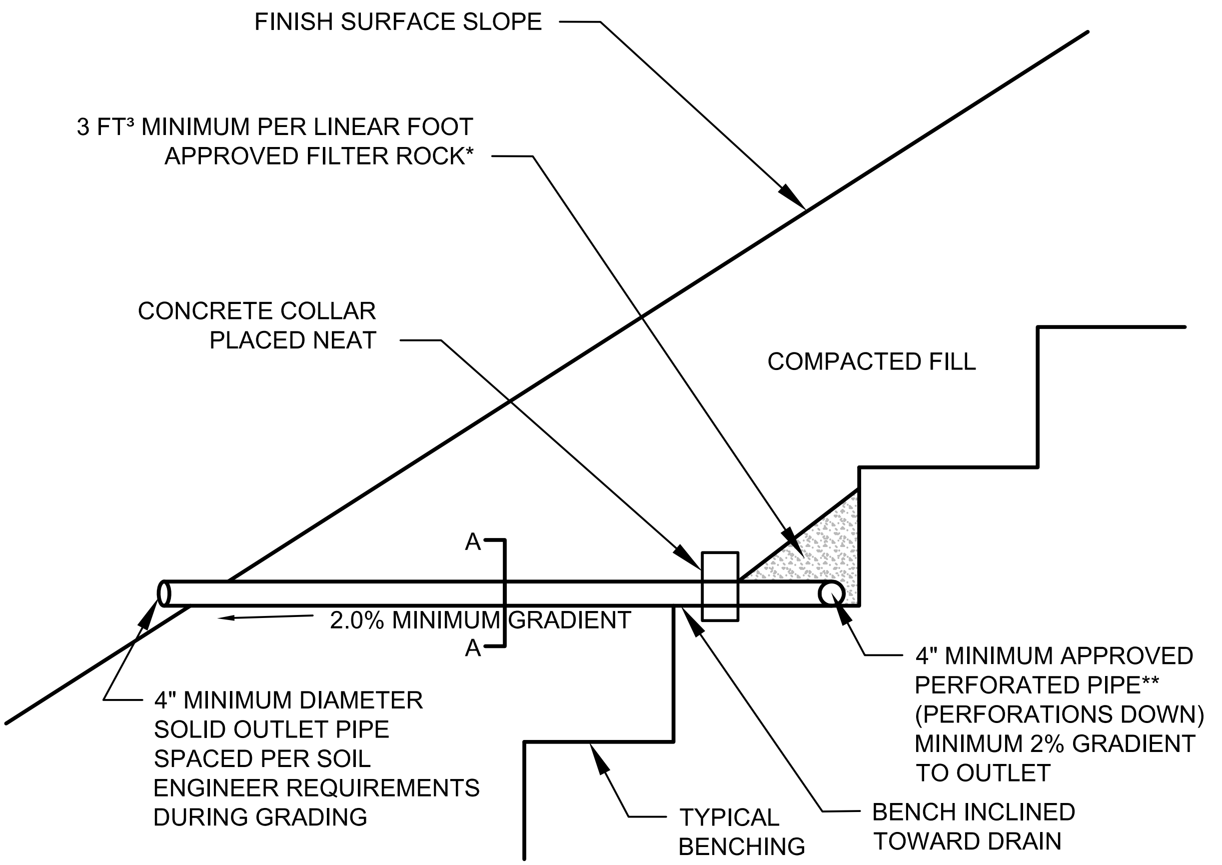
NOT TO SCALE

DAYLIGHT SHEAR KEY DETAIL

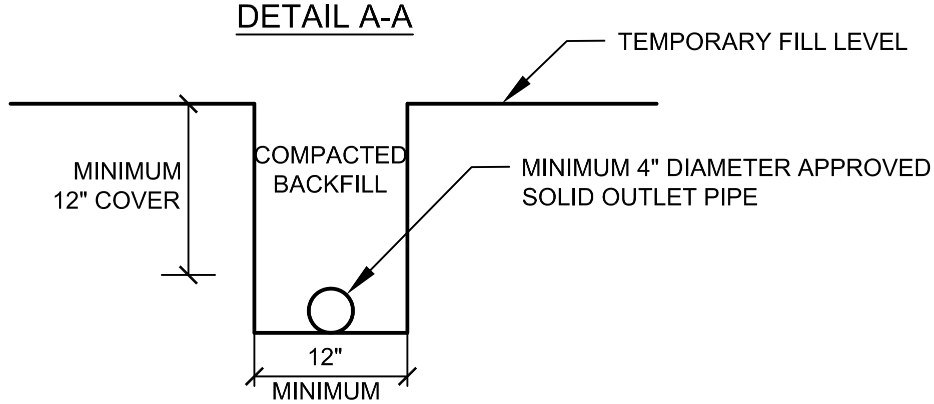


NOT TO SCALE

TYPICAL SHEAR KEY DETAIL



DETAIL A-A



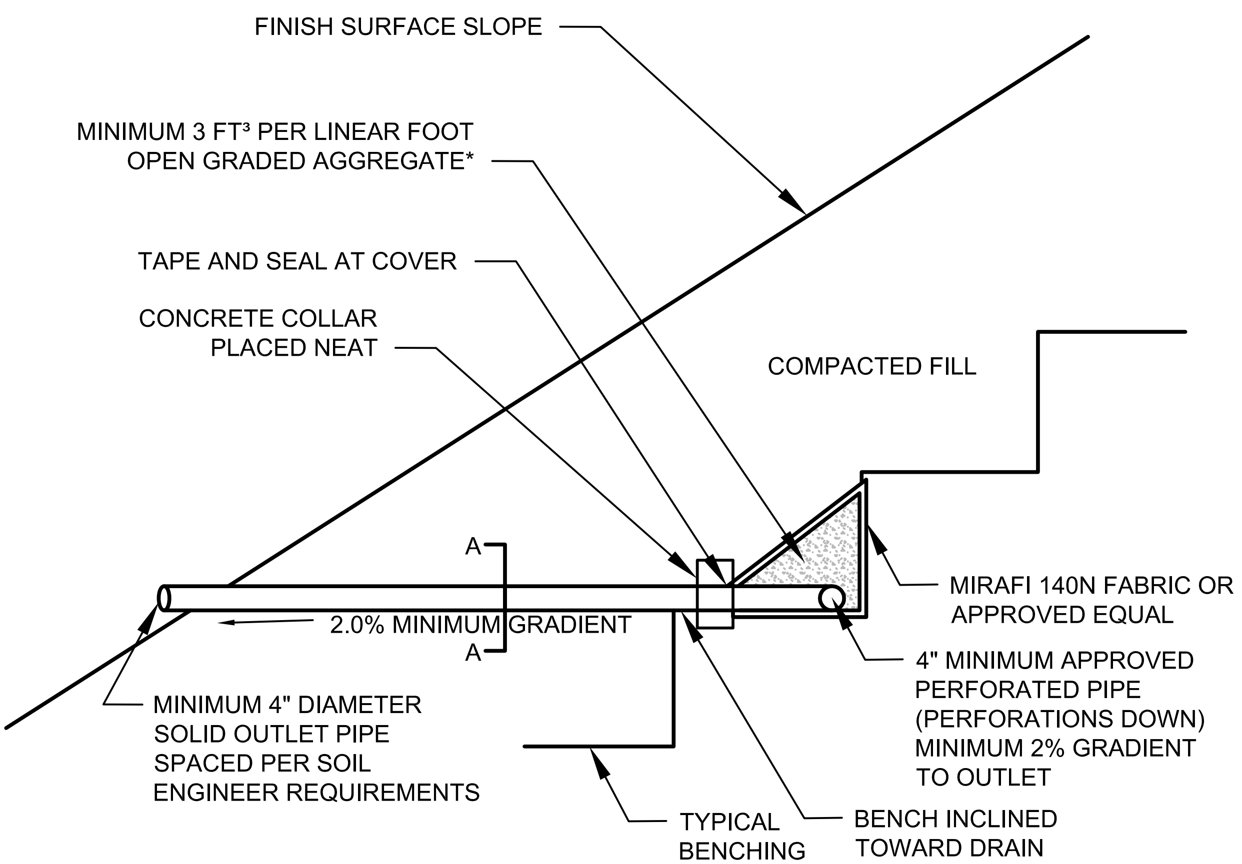
**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE
(P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

*FILTER ROCK TO MEET FOLLOWING
SPECIFICATIONS OR APPROVED EQUAL:

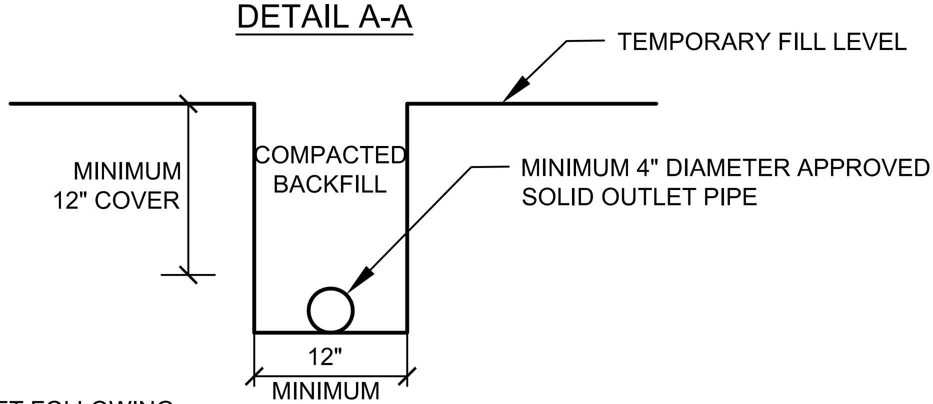
SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

NOT TO SCALE

TYPICAL BACKDRAIN DETAIL



DETAIL A-A

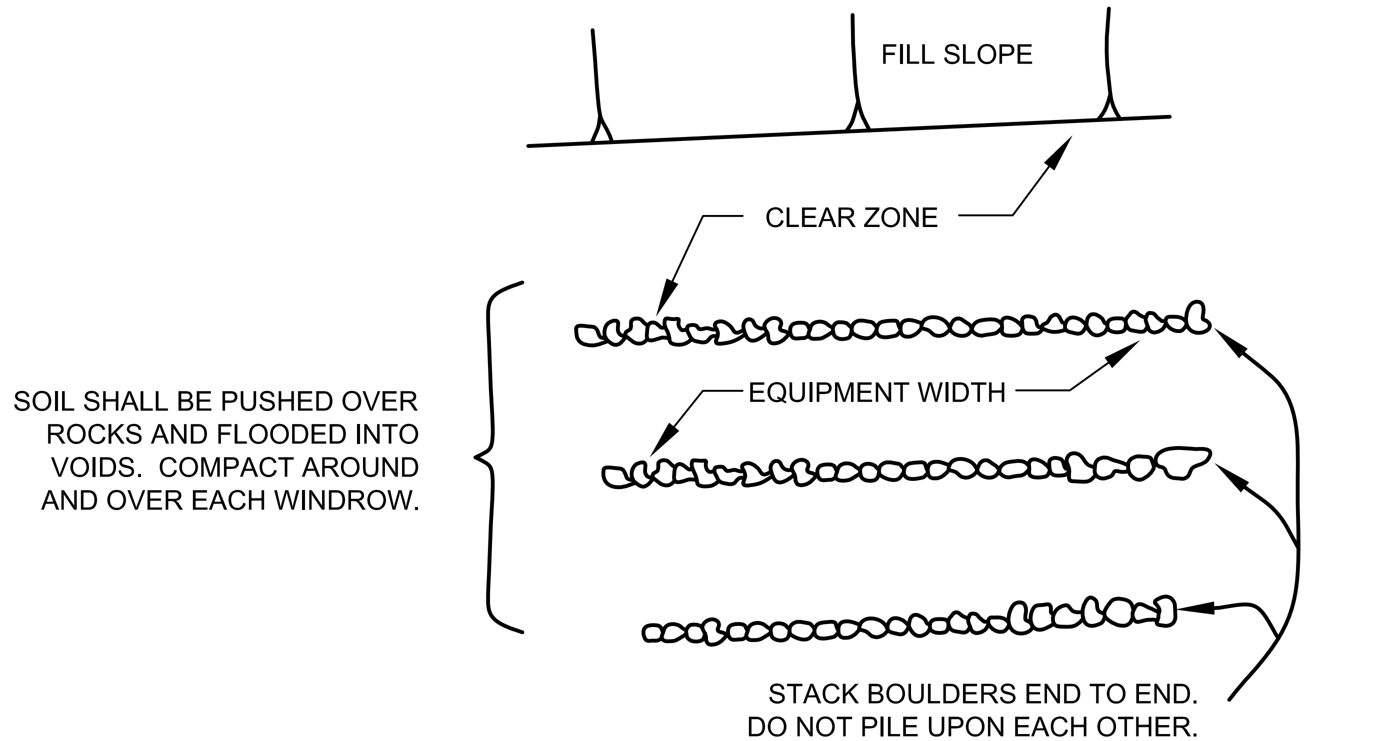


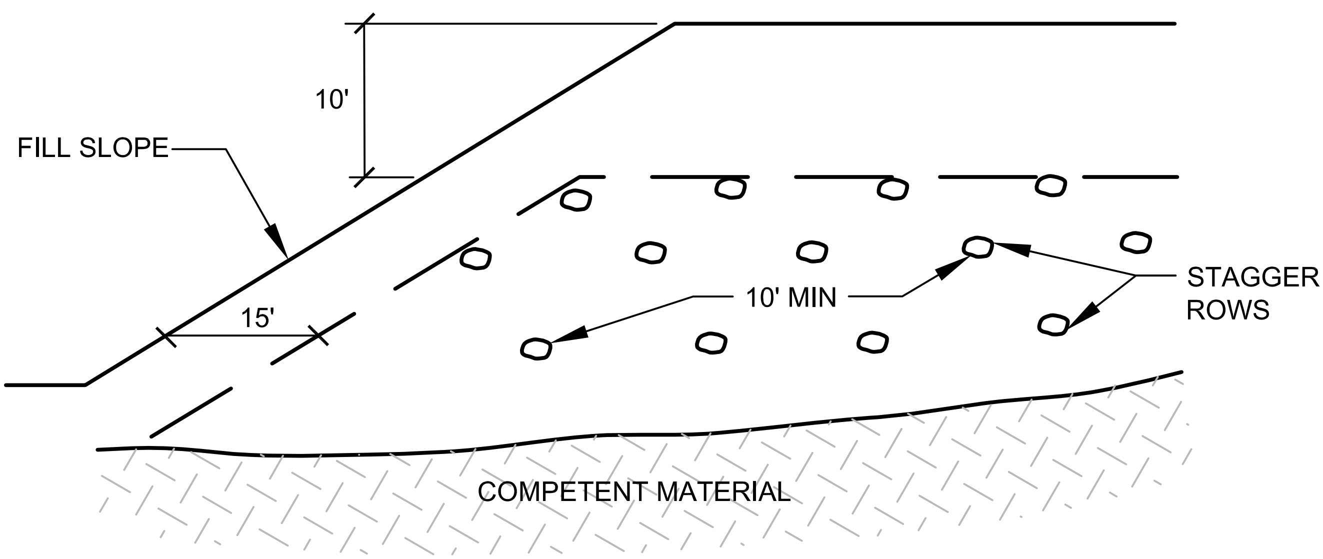
*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

NOT TO SCALE

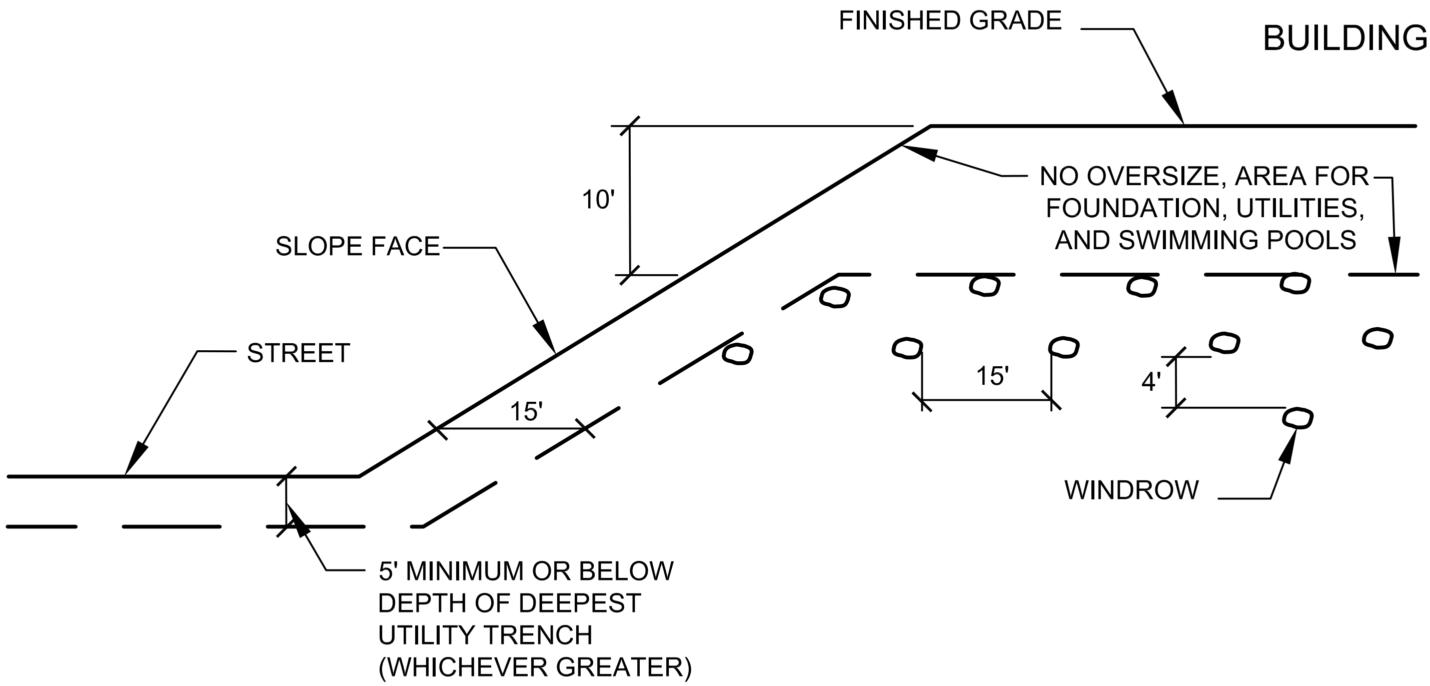
BACKDRAIN DETAIL (GEOFRABIC)



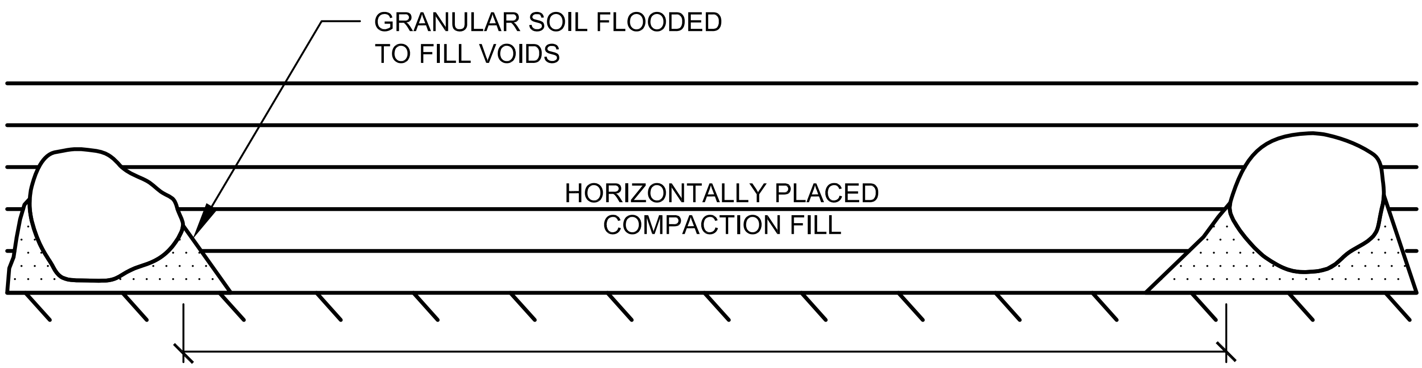


NOT TO SCALE

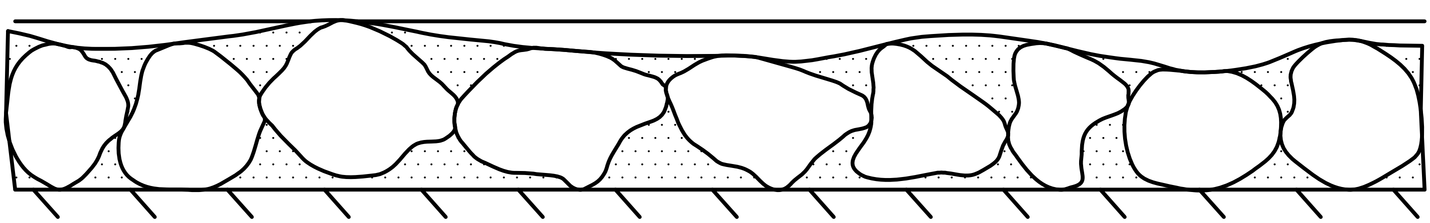
ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (EDGE VIEW)



PROFILE VIEW

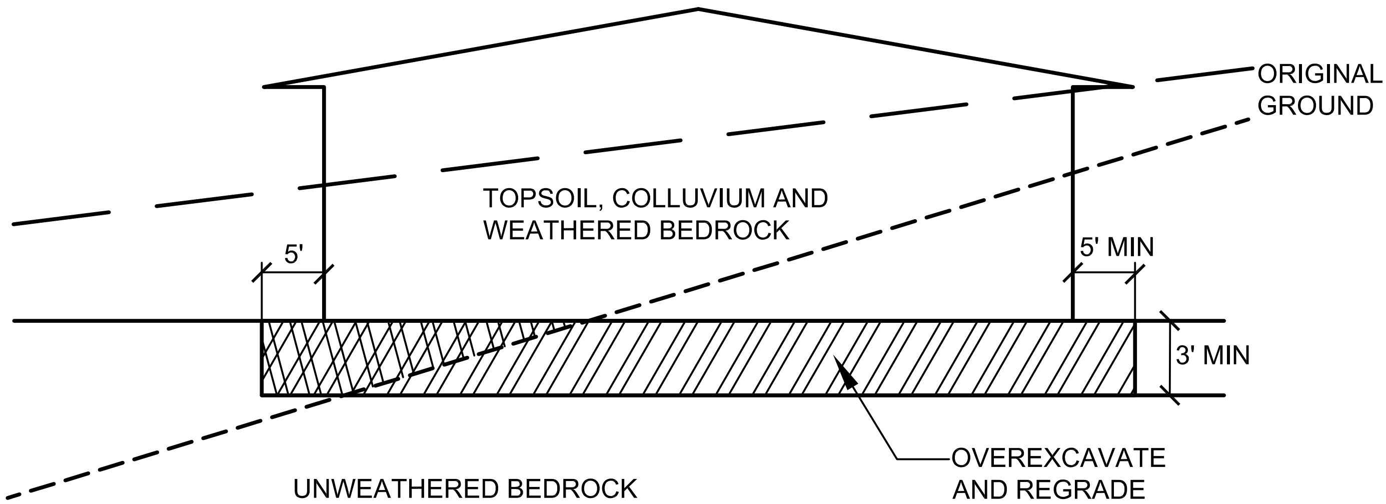


NOT TO SCALE

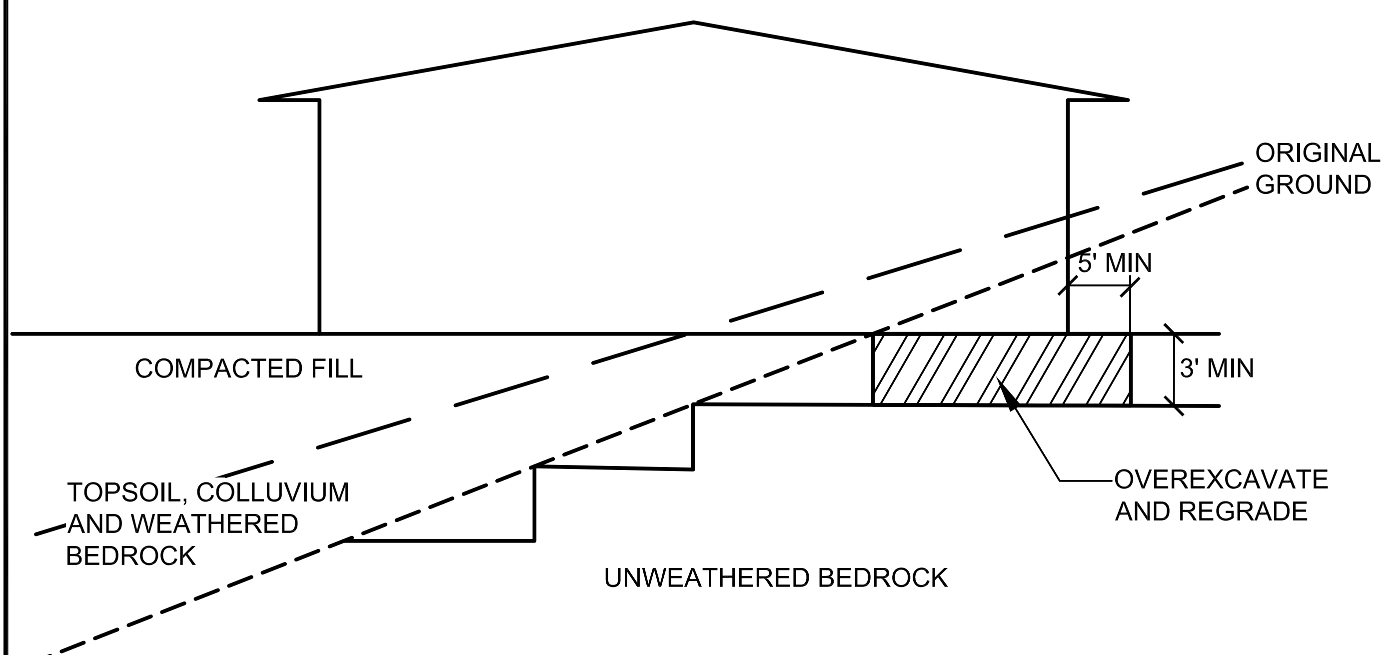
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSITION)



NOT TO SCALE

TRANSITION LOT DETAIL

APPENDIX E

PERCOLATION TO INFILTRATION CALCULATIONS AND FIELD DATA

TABLE 3.3
PERCOLATION TEST DATA

P-1 **Total Depth: 60 inches**

Time	Test Interval Time (minutes)	Test Refill Depth /Inches	Water Level Initial/Start Depth /Inches	Water Level End/Final Depth /Inches	Incremental Water Level Change (inches)	Percolation Rate inches/minutes	Percolation Rate inches/hour
7:02:00	Initial	None	32.63	initial	-		
7:32:00	30	NO	52.63	52.69	0.06	0.00	0.13
8:02:00	30	NO	52.69	52.69	0.00	0.00	0.00

P-2 **Total Depth: 36 inches**

Time	Test Interval Time (minutes)	Test Refill Depth /Inches	Water Level Initial/Start Depth /Inches	Water Level End/Final Depth /Inches	Incremental Water Level Change (inches)	Percolation Rate inches/minutes	Percolation Rate inches/hour
7:04:00	Initial	None	34.50	initial	-		
7:34:00	30	NO	28.06	28.13	0.063	0.002	0.125
8:04:00	30	NO	28.13	28.13	0.000	0.000	0.000

P-3 **Total Depth: 60 inches**

Time	Test Interval Time (minutes)	Test Refill Depth /Inches	Water Level Initial/Start Depth /Inches	Water Level End/Final Depth /Inches	Incremental Water Level Change (inches)	Percolation Rate inches/minutes	Percolation Rate inches/hour
7:06:00	Initial	None	27.56	initial	-		
7:36:00	30	NO	27.56	27.63	0.06	0.00	0.13
8:06:00	30	NO	27.63	27.63	0.00	0.00	0.00

P-4 **Total Depth: 36 inches**

Time	Test Interval Time (minutes)	Test Refill Depth /Inches	Water Level Initial/Start Depth /Inches	Water Level End/Final Depth /Inches	Incremental Water Level Change (inches)	Percolation Rate inches/minutes	Percolation Rate inches/hour
7:08:00	Initial	None	28.56	initial	-		
7:38:00	30	NO	28.56	28.56	0.00	0.00	0.00
8:08:00	30	NO	28.56	28.56	0.00	0.00	0.00

Percolation Rate Conversion P-1			Percolation Rate Conversion P-2		
		Inches			Inches
Time Interval,	Δt =	30	Time Interval,	Δt =	30
Final Depth of Water,	D_f =	52.69	Final Depth of Water,	D_f =	28.13
Test Hole Radius,	r =	4	Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	52.69	Initial Depth to Water,	D_0 =	28.13
Total Depth of Test Hole,	D_T =	60	Total Depth of Test Hole,	D_T =	36
H_o =	7.3125 in		H_o =	7.875 in	
H_f =	7.3125 in		H_f =	7.875 in	
$\Delta H = \Delta D$ =	0 in		$\Delta H = \Delta D$ =	0 in	
H_{avg} =	7.3125 in		H_{avg} =	7.875 in	
I_t =	0.000 in/hr		I_t =	0.000 in/hr	

Percolation Rate Conversion P-3			Percolation Rate Conversion P-4		
		Inches			Inches
Time Interval,	Δt =	30	Time Interval,	Δt =	30
Final Depth of Water,	D_f =	27.63	Final Depth of Water,	D_f =	28.56
Test Hole Radius,	r =	4	Test Hole Radius,	r =	4
Initial Depth to Water,	D_0 =	27.63	Initial Depth to Water,	D_0 =	28.56
Total Depth of Test Hole,	D_T =	60	Total Depth of Test Hole,	D_T =	36
H_o =	32.375 in		H_o =	7.4375 in	
H_f =	32.375 in		H_f =	7.4375 in	
$\Delta H = \Delta D$ =	0 in		$\Delta H = \Delta D$ =	0 in	
H_{avg} =	32.375 in		H_{avg} =	7.4375 in	
I_t =	0.000 in/hr		I_t =	0.000 in/hr	

TABLE 4.2 RESULTS OF PERCOLATION TESTING WITH FACTOR OF SAFETY APPLIED						
Test Location	Test Depth (inches)	Case	Soil Type* (USCS Classification)	Percolation Rate (inches per hour)	Infiltration Rate (inches per hour)	Infiltration Rate with FOS of 2 Applied (inches per hour)
P-1	60	III	Qppf	0.000	0.000	0.000
P-2	36	III	Qppf	0.000	0.000	0.000
P-3	60	III	Qppf	0.000	0.000	0.000
P-4	36	III	Qppf	0.000	0.000	0.000

APPENDIX F

LIQUEFACTION EVALUATION

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

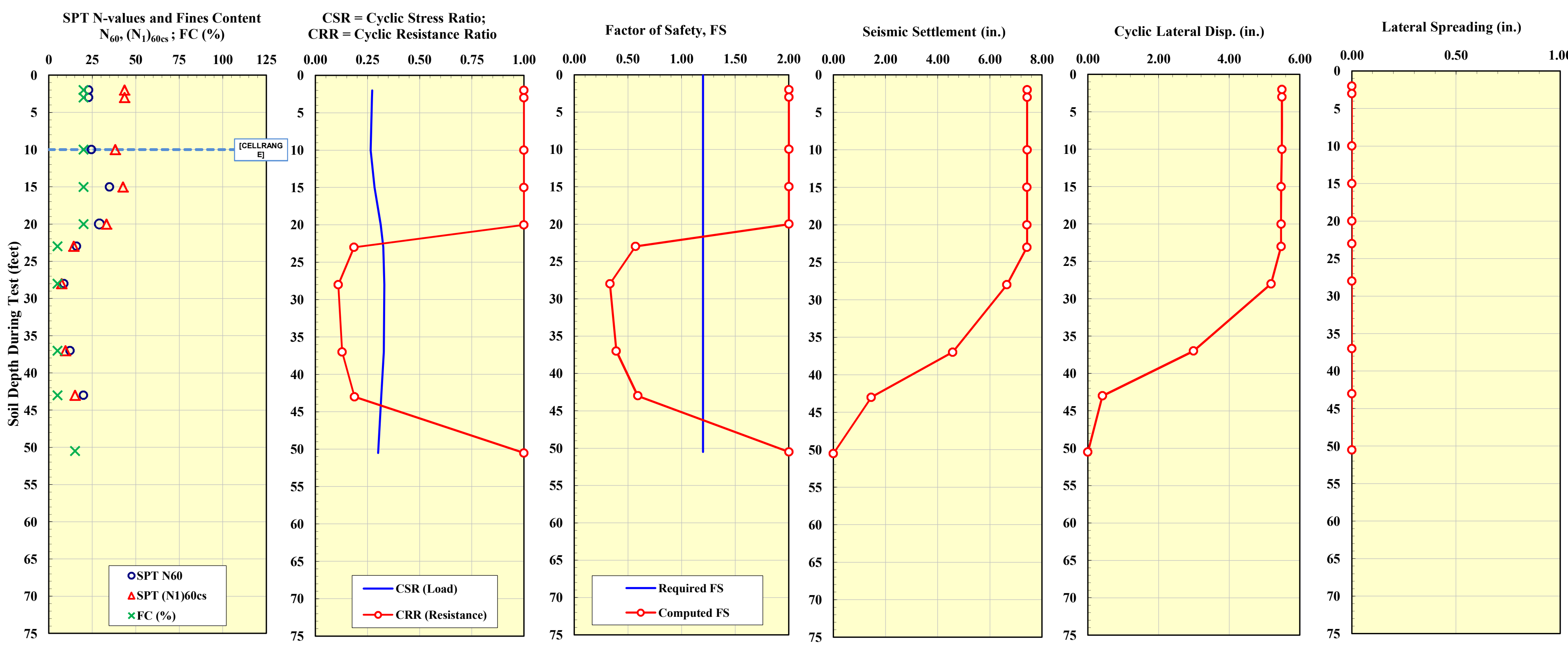
PROJECT INFORMATION	
Project Name	Animal Shelter
Project No.	10-15346G
Project Location	Santee
Analyzed By	AJB
Reviewed By	

TOPOGRAPHIC CONDITIONS	
Ground Slope, S	N/A
Free Face (L/H) Ratio	14.30 H = 8.00 feet

GROUNDWATER LEVEL DATA	
GWL Depth Measured During Test	20.00 feet
GWL Depth Used in Design	10.00 feet

BORING DATA	
Boring No.	B-4
Ground Surface Elevation	350.00 feet
Proposed Grade Elevation	350.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	80.00 %
Hammer Distance to Ground Surface	5.00 feet

SEISMIC DESIGN PARAMETERS	
Earthquake Moment Magnitude, M_w	5.50
Peak Ground Acceleration, A_{max}	0.42 g
Required Factor of Safety, FS	1.20



Analysis Methods Used ==>>

Liquefaction Triggering:
Boulanger-Idriss (2014)

Seismic Settlements:
Above GWL: Pradel (1998)
Below GWL: Ishihara and Yoshimine (1992)

Cyclic Lateral Displacements:
Above GWL: Pradel (1998)
Below GWL: Tokimatsu and Asaka (1998)

Lateral Spreading:
Zhang et al. (2004)

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

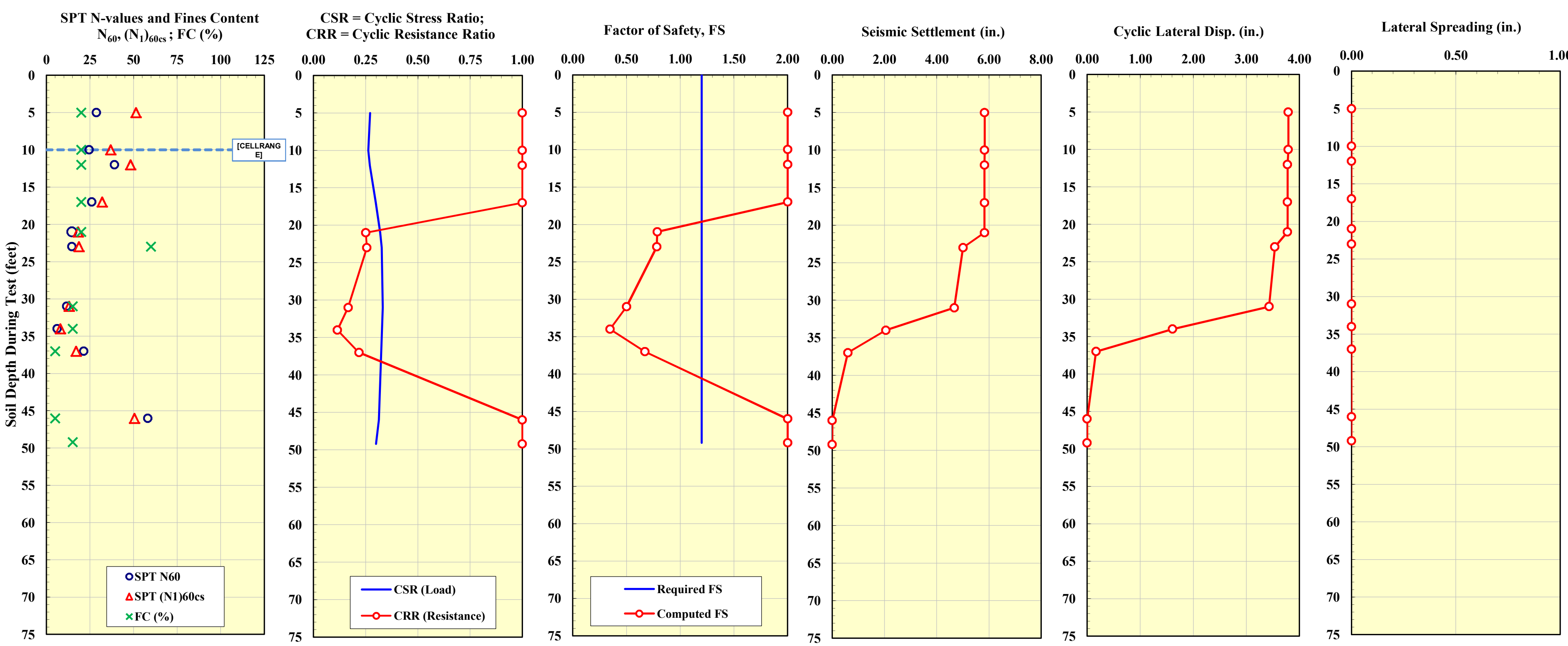
PROJECT INFORMATION	
Project Name	Animal Shelter
Project No.	10-15346G
Project Location	Santee
Analyzed By	AJB
Reviewed By	

TOPOGRAPHIC CONDITIONS		
Ground Slope, S	N/A	
Free Face (L/H) Ratio	19.50	H = 4.00 feet

GROUNDWATER LEVEL DATA	
GWL Depth Measured During Test	20.00 feet
GWL Depth Used in Design	10.00 feet

BORING DATA	
Boring No.	B-7
Ground Surface Elevation	351.00 feet
Proposed Grade Elevation	351.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	80.00 %
Hammer Distance to Ground Surface	5.00 feet

SEISMIC DESIGN PARAMETERS	
Earthquake Moment Magnitude, M_w	5.50
Peak Ground Acceleration, A_{max}	0.42 g
Required Factor of Safety, FS	1.20



Analysis Methods Used ==>>

Liquefaction Triggering:
Boulanger-Idriss (2014)

Seismic Settlements:
Above GWL: Pradel (1998)
Below GWL: Ishihara and Yoshimine (1992)

Cyclic Lateral Displacements:
Above GWL: Pradel (1998)
Below GWL: Tokimatsu and Asaka (1998)

Lateral Spreading:
Zhang et al. (2004)

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

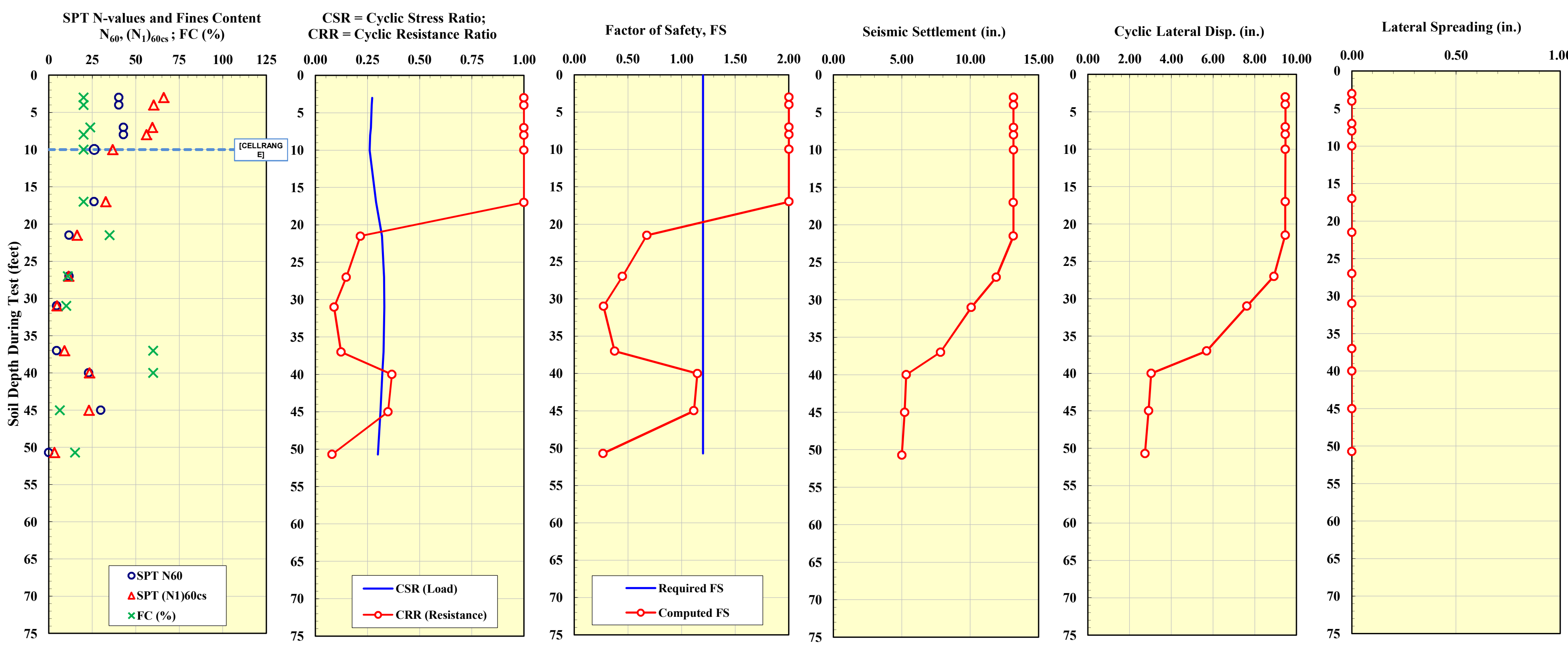
PROJECT INFORMATION	
Project Name	Animal Shelter
Project No.	10-15346G
Project Location	Santee
Analyzed By	AJB
Reviewed By	

TOPOGRAPHIC CONDITIONS		
Ground Slope, S	N/A	
Free Face (L/H) Ratio	33.40	H = 8.00 feet

GROUNDWATER LEVEL DATA	
GWL Depth Measured During Test	21.50 feet
GWL Depth Used in Design	10.00 feet

BORING DATA	
Boring No.	B-8
Ground Surface Elevation	351.00 feet
Proposed Grade Elevation	351.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	80.00 %
Hammer Distance to Ground Surface	5.00 feet

SEISMIC DESIGN PARAMETERS	
Earthquake Moment Magnitude, M_w	5.50
Peak Ground Acceleration, A_{max}	0.42 g
Required Factor of Safety, FS	1.20



Analysis Methods Used ==>>

Liquefaction Triggering:
Boulanger-Idriss (2014)

Seismic Settlements:
Above GWL: Pradel (1998)
Below GWL: Ishihara and Yoshimine (1992)

Cyclic Lateral Displacements:
Above GWL: Pradel (1998)
Below GWL: Tokimatsu and Asaka (1998)

Lateral Spreading:
Zhang et al. (2004)

SIMPLIFIED LIQUEFACTION HAZARDS ASSESSMENT USING STANDARD PENETRATION TEST (SPT) DATA

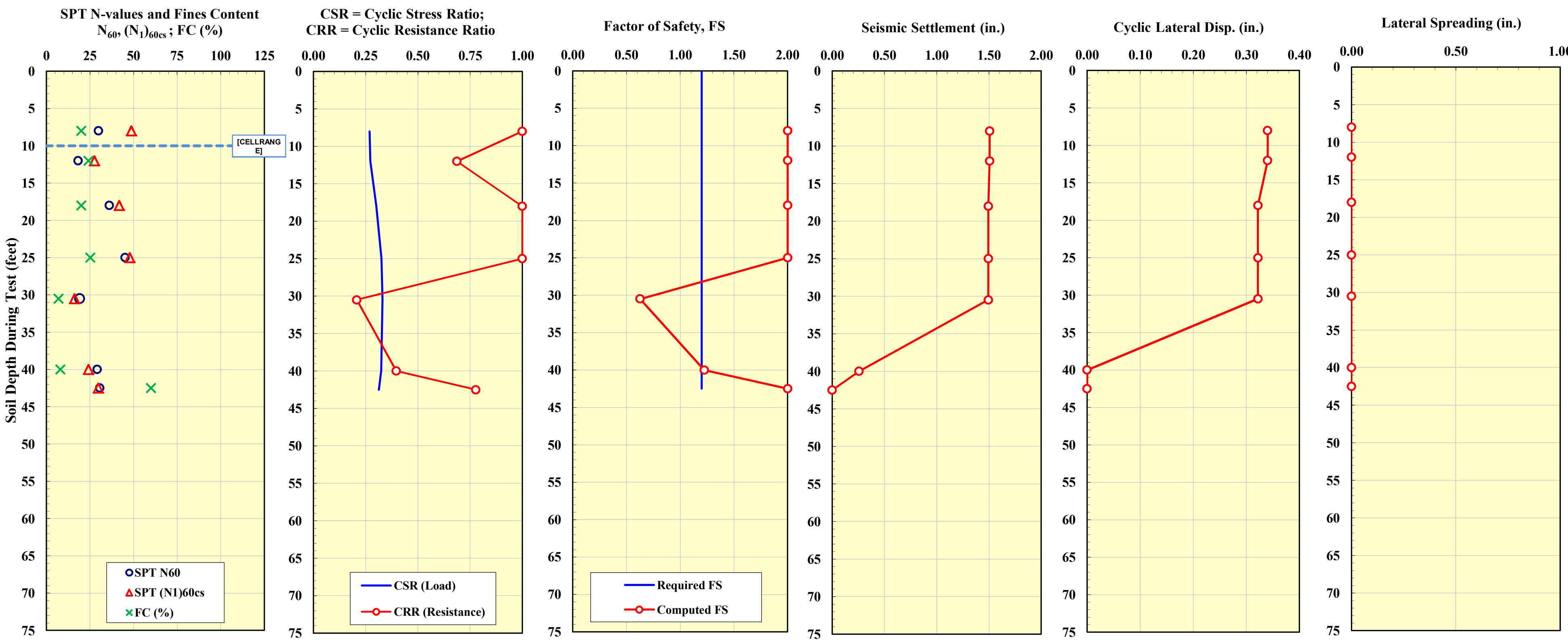
PROJECT INFORMATION	
Project Name	Animal Shelter
Project No.	10-15346G
Project Location	Santee
Analyzed By	AJB
Reviewed By	

TOPOGRAPHIC CONDITIONS		
Ground Slope, S	N/A	
Free Face (L/H) Ratio	10.10	H = 8.00 feet

GROUNDWATER LEVEL DATA	
GWL Depth Measured During Test	20.00 feet
GWL Depth Used in Design	10.00 feet

BORING DATA	
Boring No.	B-11
Ground Surface Elevation	351.00 feet
Proposed Grade Elevation	351.00 feet
Borehole Diameter	8.00 inches
Hammer Weight	140.00 pounds
Hammer Drop	30.00 inches
Hammer Energy Efficiency Ratio, ER	80.00 %
Hammer Distance to Ground Surface	5.00 feet

SEISMIC DESIGN PARAMETERS	
Earthquake Moment Magnitude, M_w	5.50
Peak Ground Acceleration, A_{max}	0.42 g
Required Factor of Safety, FS	1.20



Analysis Methods Used ==>>

Liquefaction Triggering:
Boulanger-Idriss (2014)

Seismic Settlements:
Above GWL: Pradel (1998)
Below GWL: Ishihara and Yoshimine (1992)

Cyclic Lateral Displacements:
Above GWL: Pradel (1998)
Below GWL: Tokimatsu and Asaka (1998)

Lateral Spreading:
Zhang et al. (2004)

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http://www.geologismiki.gr

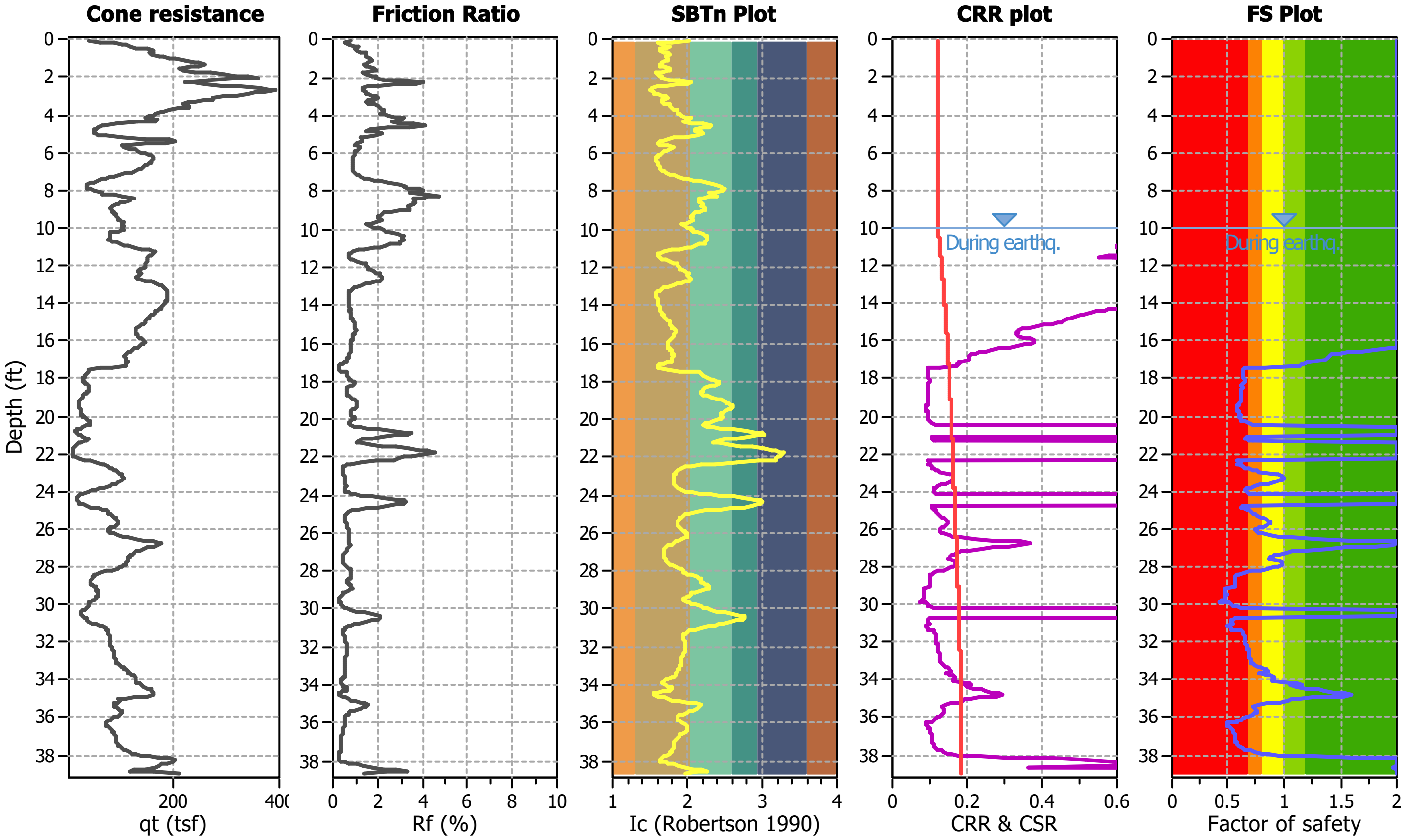
LIQUEFACTION ANALYSIS REPORT

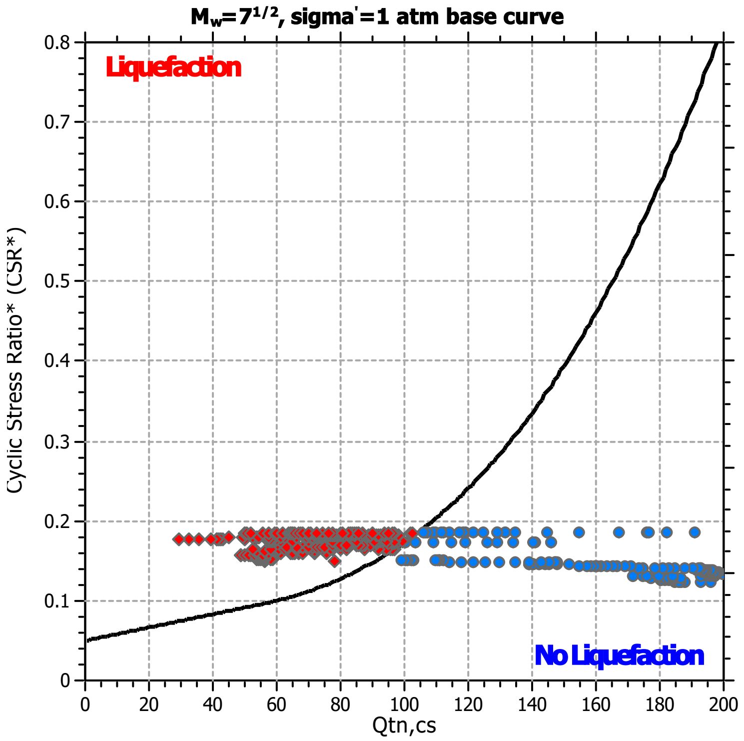
Project title : Animal Shelter 10-15346G **Location :**

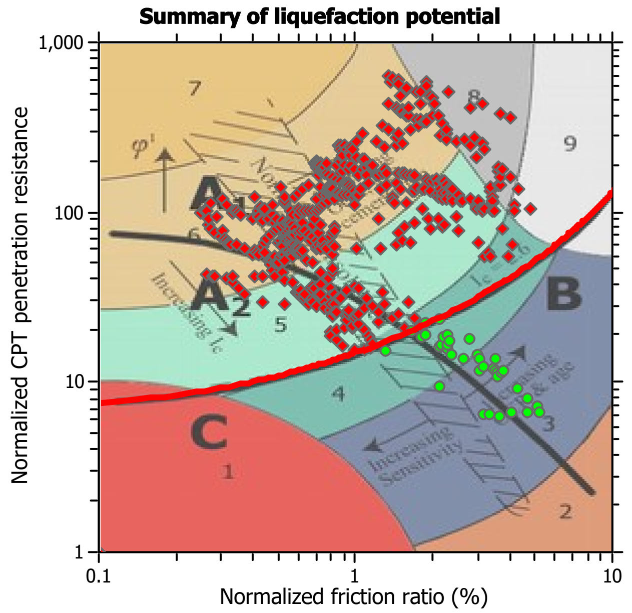
CPT file : C-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	19.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	10.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

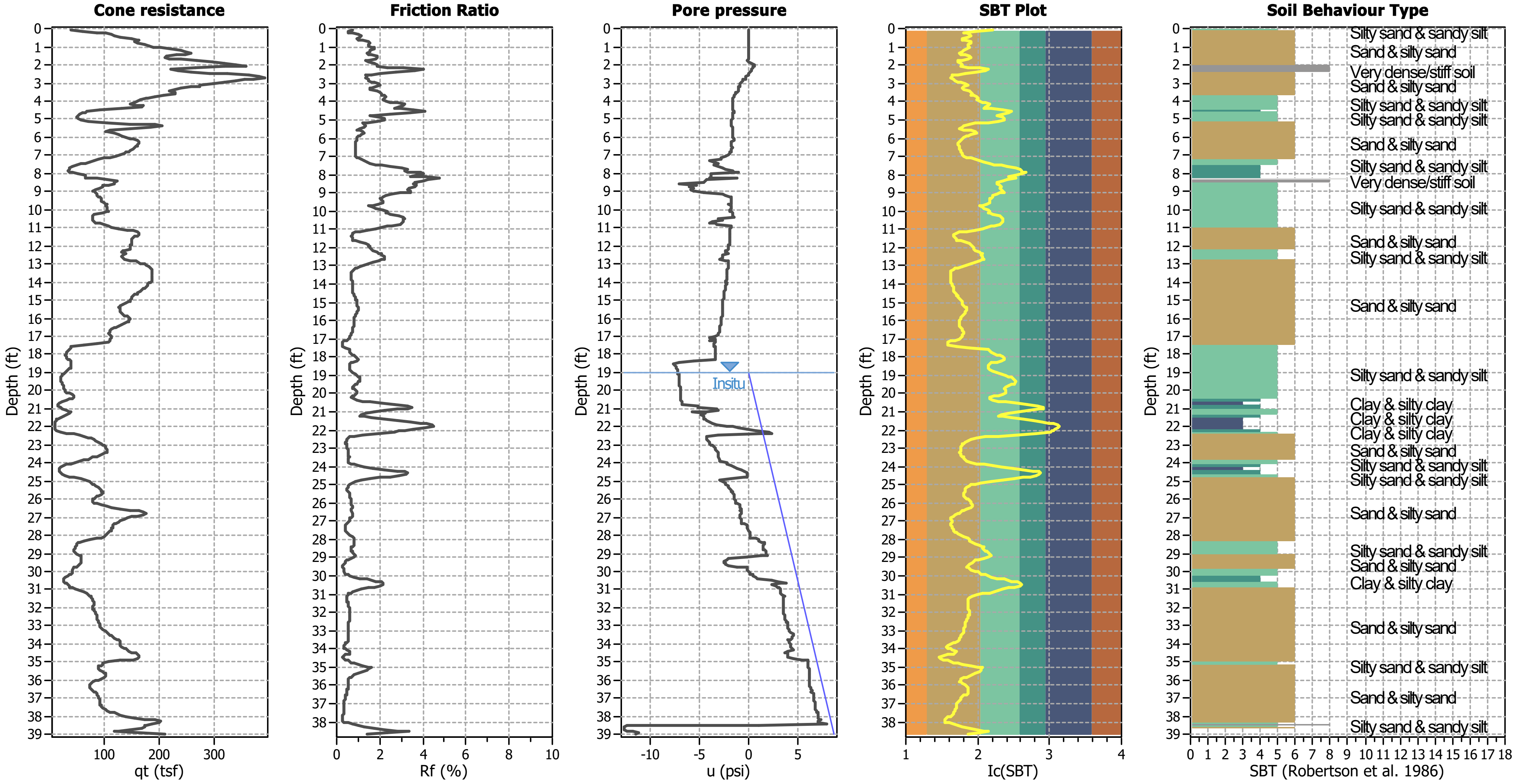






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



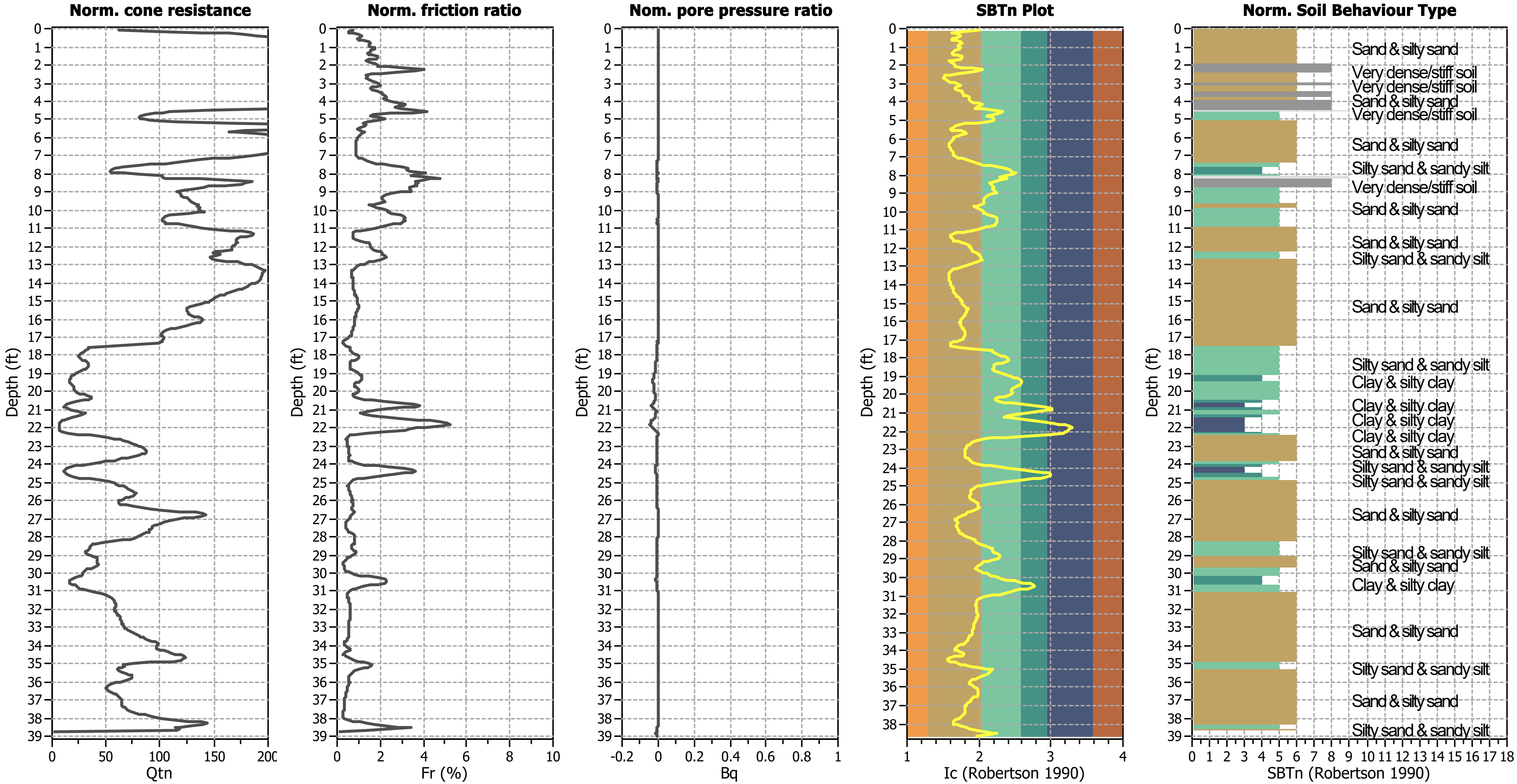
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	10.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	19.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT 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

CPT basic interpretation plots (normalized)



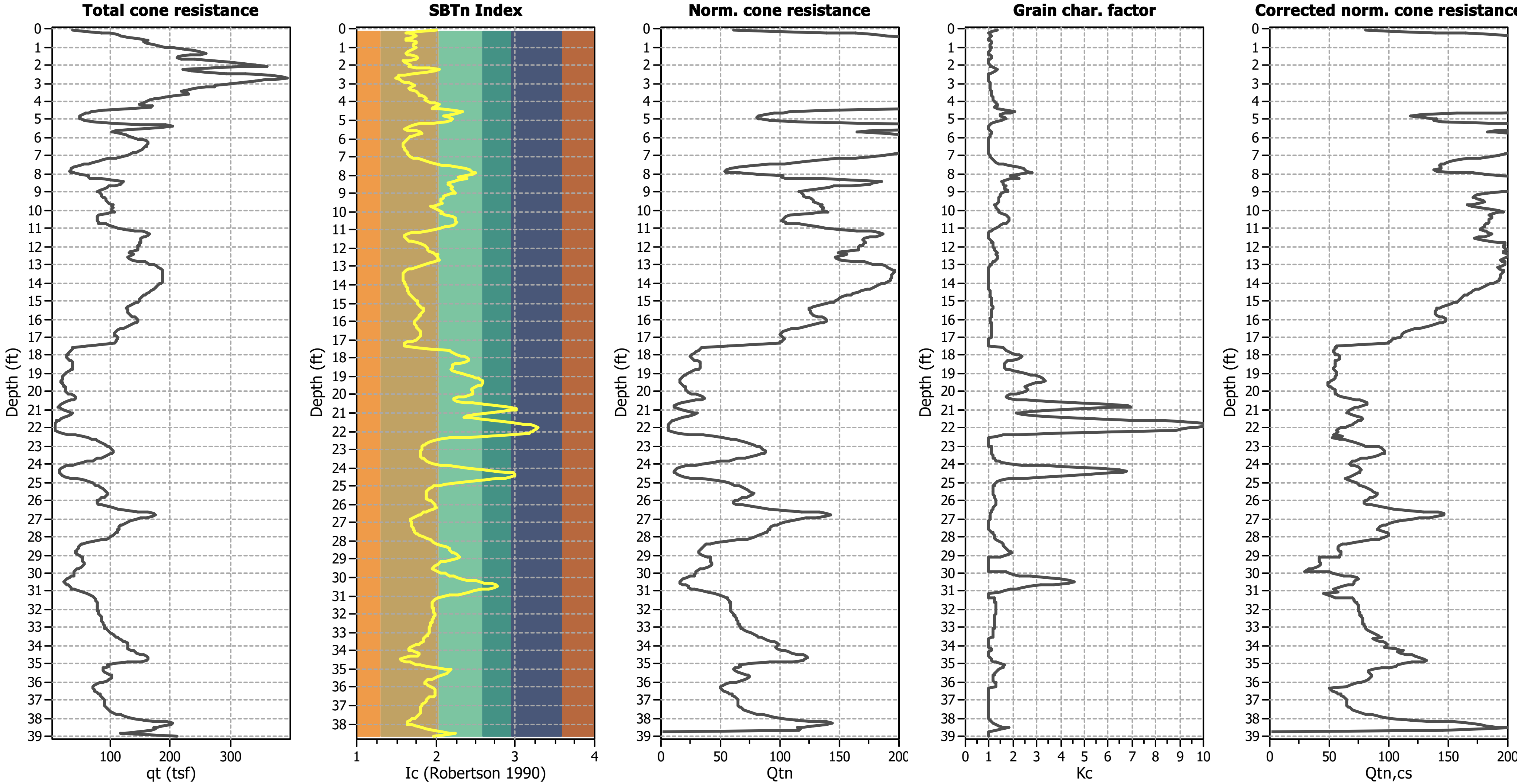
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	10.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	19.00 ft	Fill height:	N/A	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

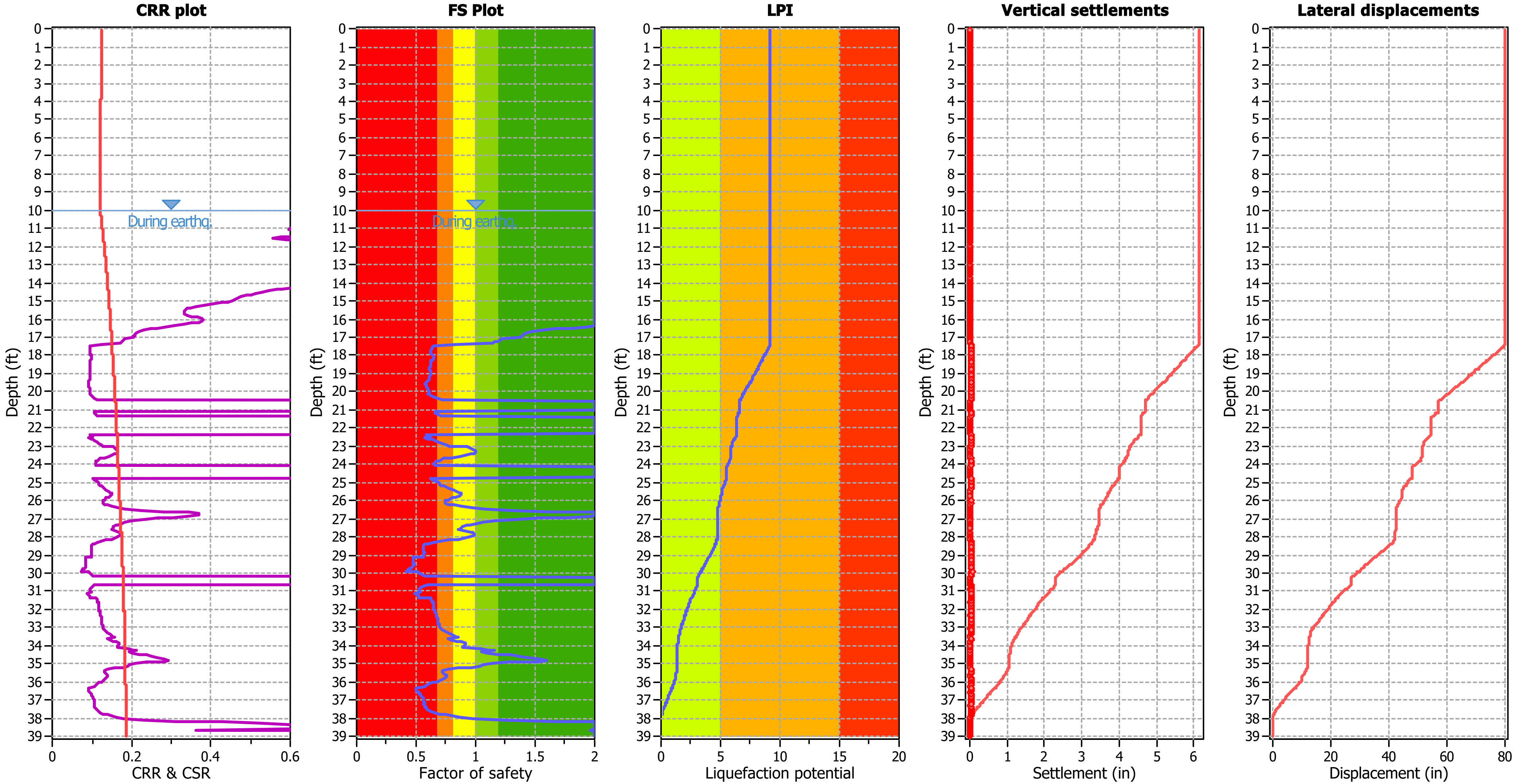
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	10.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	19.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	10.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	19.00 ft	Fill height:	N/A	Limit depth:	N/A

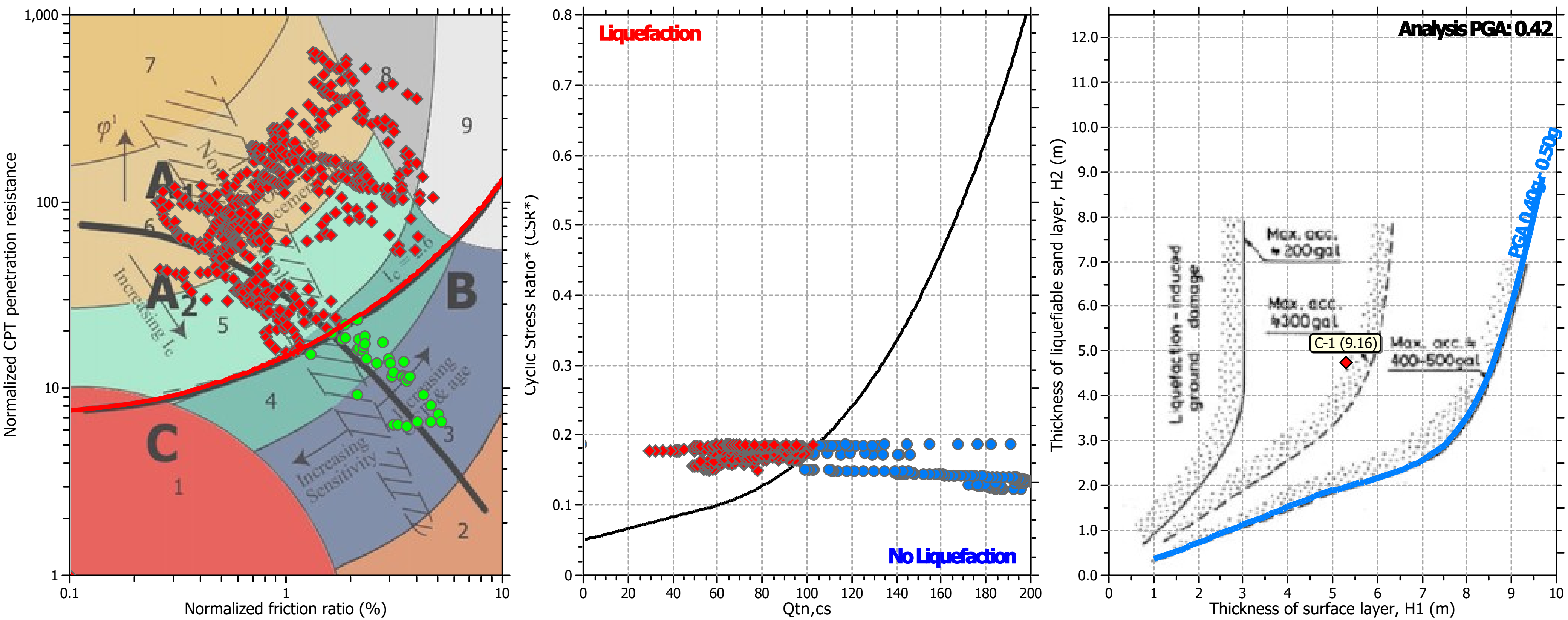
F.S. color scheme

- 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

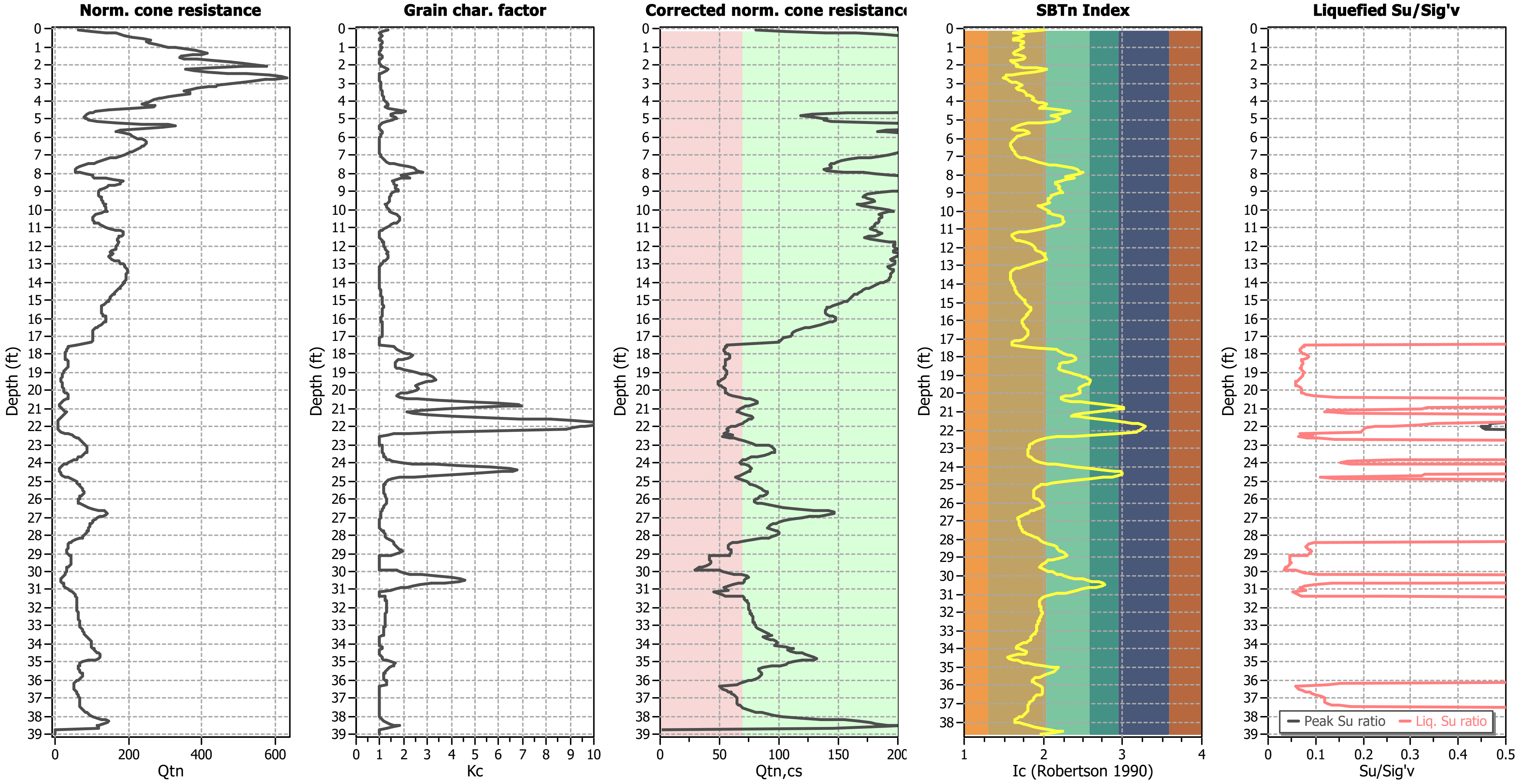
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	10.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	19.00 ft	Fill height:	N/A	Limit depth:	N/A

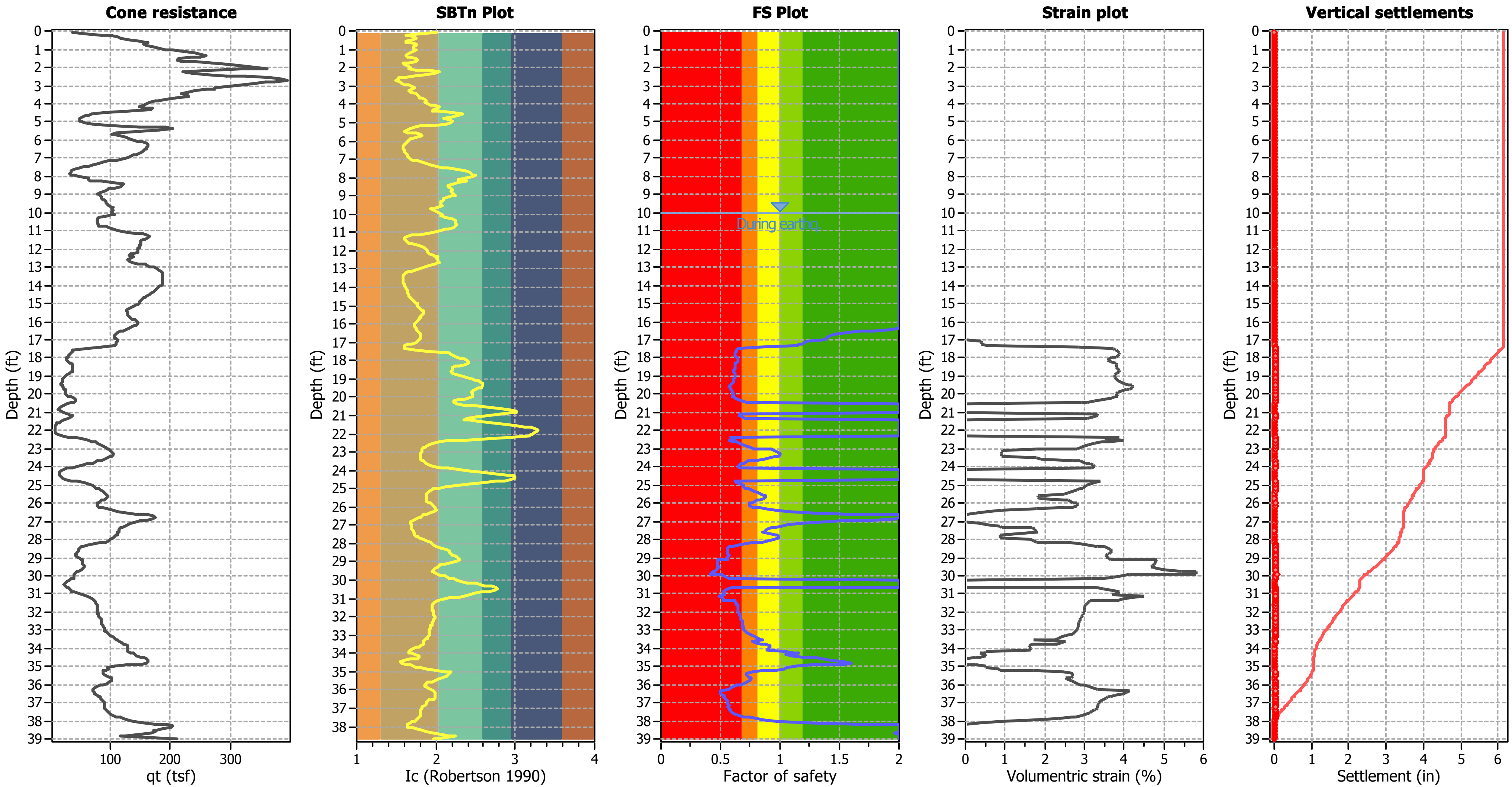
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	10.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	19.00 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
10.06	195.94	2.00	0.00	1.00	0.00	10.12	192.83	2.00	0.00	1.00	0.00
10.18	187.84	2.00	0.00	1.00	0.00	10.26	184.74	2.00	0.00	1.00	0.00
10.31	186.95	2.00	0.00	1.00	0.00	10.39	186.78	2.00	0.00	1.00	0.00
10.44	186.14	2.00	0.00	1.00	0.00	10.53	184.08	2.00	0.00	1.00	0.00
10.59	184.29	2.00	0.00	1.00	0.00	10.64	184.21	2.00	0.00	1.00	0.00
10.72	182.83	2.00	0.00	1.00	0.00	10.78	181.92	2.00	0.00	1.00	0.00
10.83	180.79	2.00	0.00	1.00	0.00	10.91	180.33	2.00	0.00	1.00	0.00
10.97	177.67	2.00	0.00	1.00	0.00	11.05	177.27	2.00	0.00	1.00	0.00
11.11	180.28	2.00	0.00	1.00	0.00	11.16	182.03	2.00	0.00	1.00	0.00
11.24	183.24	2.00	0.00	1.00	0.00	11.30	186.85	2.00	0.00	1.00	0.00
11.36	184.65	2.00	0.00	1.00	0.00	11.44	180.02	2.00	0.00	1.00	0.00
11.49	175.01	2.00	0.00	1.00	0.00	11.58	172.15	2.00	0.00	1.00	0.00
11.63	176.26	2.00	0.00	1.00	0.00	11.71	184.46	2.00	0.00	1.00	0.00
11.76	192.99	2.00	0.00	1.00	0.00	11.82	197.21	2.00	0.00	1.00	0.00
11.92	196.98	2.00	0.00	1.00	0.00	11.95	196.15	2.00	0.00	1.00	0.00
12.03	195.74	2.00	0.00	1.00	0.00	12.09	197.19	2.00	0.00	1.00	0.00
12.15	200.03	2.00	0.00	1.00	0.00	12.23	195.93	2.00	0.00	1.00	0.00
12.29	195.75	2.00	0.00	1.00	0.00	12.34	196.56	2.00	0.00	1.00	0.00
12.43	202.24	2.00	0.00	1.00	0.00	12.48	202.82	2.00	0.00	1.00	0.00
12.54	202.31	2.00	0.00	1.00	0.00	12.62	198.78	2.00	0.00	1.00	0.00
12.68	196.17	2.00	0.00	1.00	0.00	12.75	193.63	2.00	0.00	1.00	0.00
12.81	195.01	2.00	0.00	1.00	0.00	12.87	197.19	2.00	0.00	1.00	0.00
12.95	197.94	2.00	0.00	1.00	0.00	13.01	197.60	2.00	0.00	1.00	0.00
13.09	194.94	2.00	0.00	1.00	0.00	13.15	191.87	2.00	0.00	1.00	0.00
13.20	193.26	2.00	0.00	1.00	0.00	13.28	195.42	2.00	0.00	1.00	0.00
13.34	196.71	2.00	0.00	1.00	0.00	13.39	196.24	2.00	0.00	1.00	0.00
13.47	195.18	2.00	0.00	1.00	0.00	13.53	194.20	2.00	0.00	1.00	0.00
13.59	194.12	2.00	0.00	1.00	0.00	13.67	193.76	2.00	0.00	1.00	0.00
13.73	193.81	2.00	0.00	1.00	0.00	13.81	193.17	2.00	0.00	1.00	0.00
13.86	192.57	2.00	0.00	1.00	0.00	13.92	190.72	2.00	0.00	1.00	0.00
14.00	187.96	2.00	0.00	1.00	0.00	14.05	185.19	2.00	0.00	1.00	0.00
14.14	182.97	2.00	0.00	1.00	0.00	14.19	181.09	2.00	0.00	1.00	0.00
14.25	178.44	2.00	0.00	1.00	0.00	14.33	175.13	2.00	0.00	1.00	0.00
14.39	173.53	2.00	0.00	1.00	0.00	14.44	171.13	2.00	0.00	1.00	0.00
14.52	169.08	2.00	0.00	1.00	0.00	14.60	166.75	2.00	0.00	1.00	0.00
14.65	165.65	2.00	0.00	1.00	0.00	14.71	163.80	2.00	0.00	1.00	0.00
14.79	162.03	2.00	0.00	1.00	0.00	14.85	160.84	2.00	0.00	1.00	0.00
14.91	159.93	2.00	0.00	1.00	0.00	14.99	158.83	2.00	0.00	1.00	0.00
15.04	157.52	2.00	0.00	1.00	0.00	15.10	155.30	2.00	0.00	1.00	0.00
15.18	152.07	2.00	0.00	1.00	0.00	15.24	148.28	2.00	0.00	1.00	0.00
15.29	144.58	2.00	0.00	1.00	0.00	15.38	142.41	2.00	0.00	1.00	0.00
15.43	140.70	2.00	0.00	1.00	0.00	15.51	140.31	2.00	0.00	1.00	0.00
15.56	139.57	2.00	0.00	1.00	0.00	15.64	139.53	2.00	0.00	1.00	0.00
15.70	139.62	2.00	0.00	1.00	0.00	15.76	140.71	2.00	0.00	1.00	0.00
15.84	142.71	2.00	0.00	1.00	0.00	15.89	145.48	2.00	0.00	1.00	0.00
15.97	147.22	2.00	0.00	1.00	0.00	16.03	147.90	2.00	0.00	1.00	0.00
16.08	147.26	2.00	0.00	1.00	0.00	16.16	145.73	2.00	0.00	1.00	0.00
16.22	143.03	2.00	0.00	1.00	0.00	16.30	139.30	2.00	0.00	1.00	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
16.35	134.92	2.00	0.00	1.00	0.00	16.41	130.23	1.94	0.00	1.00	0.00
16.50	125.63	1.79	0.00	1.00	0.00	16.55	121.60	1.67	0.00	1.00	0.00
16.61	117.83	1.57	0.00	1.00	0.00	16.69	114.41	1.48	0.00	1.00	0.00
16.75	112.27	1.43	0.00	1.00	0.00	16.80	111.15	1.40	0.00	1.00	0.00
16.89	110.96	1.39	0.00	1.00	0.00	16.94	110.83	1.39	0.00	1.00	0.00
17.03	110.30	1.37	0.00	1.00	0.00	17.08	103.39	1.22	0.40	1.00	0.00
17.13	102.66	1.21	0.40	1.00	0.00	17.22	101.38	1.18	0.40	1.00	0.00
17.28	100.48	1.16	0.40	1.00	0.00	17.33	99.49	1.14	0.55	1.00	0.00
17.41	77.97	0.82	2.87	1.00	0.03	17.48	56.42	0.64	3.74	1.00	0.03
17.54	56.10	0.64	3.75	1.00	0.03	17.60	55.25	0.63	3.80	1.00	0.03
17.66	54.50	0.63	3.84	1.00	0.03	17.74	53.94	0.62	3.88	1.00	0.04
17.79	53.80	0.62	3.88	1.00	0.03	17.87	54.34	0.63	3.85	1.00	0.04
17.93	55.37	0.63	3.79	1.00	0.03	17.98	56.87	0.64	3.71	1.00	0.03
18.07	58.33	0.65	3.64	1.00	0.04	18.12	58.99	0.65	3.60	1.00	0.02
18.20	58.00	0.64	3.65	1.00	0.04	18.26	56.05	0.63	3.76	1.00	0.03
18.31	54.96	0.62	3.82	1.00	0.03	18.40	55.01	0.62	3.81	1.00	0.04
18.45	55.40	0.62	3.79	1.00	0.03	18.53	55.24	0.62	3.80	1.00	0.04
18.59	54.73	0.62	3.83	1.00	0.03	18.65	54.14	0.62	3.86	1.00	0.03
18.73	53.84	0.61	3.88	1.00	0.04	18.79	54.12	0.61	3.87	1.00	0.03
18.84	54.86	0.62	3.82	1.00	0.03	18.93	55.74	0.62	3.77	1.00	0.04
18.98	56.15	0.62	3.75	1.00	0.02	19.06	56.03	0.62	3.76	1.00	0.04
19.12	55.72	0.62	3.77	1.00	0.03	19.18	55.28	0.62	3.80	1.00	0.03
19.23	54.49	0.61	3.84	1.00	0.03	19.32	53.40	0.60	3.91	1.00	0.04
19.37	51.82	0.60	4.01	1.00	0.03	19.45	50.28	0.59	4.11	1.00	0.04
19.51	49.02	0.58	4.19	1.00	0.03	19.56	48.76	0.58	4.21	1.00	0.03
19.65	49.04	0.58	4.19	1.00	0.04	19.70	49.82	0.58	4.14	1.00	0.03
19.76	51.18	0.59	4.05	1.00	0.03	19.84	52.87	0.60	3.94	1.00	0.04
19.90	54.38	0.60	3.85	1.00	0.03	19.96	55.00	0.61	3.82	1.00	0.03
20.04	54.99	0.60	3.82	1.00	0.04	20.10	54.80	0.60	3.83	1.00	0.03
20.15	55.55	0.61	3.78	1.00	0.03	20.23	57.40	0.62	3.68	1.00	0.04
20.29	61.47	0.64	3.48	1.00	0.02	20.37	66.58	0.68	3.26	1.00	0.03
20.43	71.84	0.72	3.06	1.00	0.02	20.48	75.59	0.76	2.94	1.00	0.02
20.54	79.39	2.00	0.00	1.00	0.00	20.63	81.62	2.00	0.00	1.00	0.00
20.68	81.73	2.00	0.00	1.00	0.00	20.74	78.37	2.00	0.00	1.00	0.00
20.81	74.78	2.00	0.00	1.00	0.00	20.87	71.88	2.00	0.00	1.00	0.00
20.95	69.86	2.00	0.00	1.00	0.00	21.01	67.56	2.00	0.00	1.00	0.00
21.07	65.33	0.66	3.31	1.00	0.02	21.15	64.58	0.65	3.34	1.00	0.03
21.21	65.30	0.66	3.31	1.00	0.02	21.27	67.96	0.68	3.21	1.00	0.02
21.35	72.04	0.71	3.06	1.00	0.03	21.41	76.41	2.00	0.00	1.00	0.00
21.46	78.00	2.00	0.00	1.00	0.00	21.55	77.01	2.00	0.00	1.00	0.00
21.60	74.97	2.00	0.00	1.00	0.00	21.66	73.04	2.00	0.00	1.00	0.00
21.74	71.32	2.00	0.00	1.00	0.00	21.80	69.12	2.00	0.00	1.00	0.00
21.86	66.26	2.00	0.00	1.00	0.00	21.94	62.81	2.00	0.00	1.00	0.00
22.00	59.18	2.00	0.00	1.00	0.00	22.06	57.43	2.00	0.00	1.00	0.00
22.14	56.55	2.00	0.00	1.00	0.00	22.19	56.95	2.00	0.00	1.00	0.00
22.28	55.49	2.00	0.00	1.00	0.00	22.34	53.91	0.58	3.88	1.00	0.03
22.39	55.99	0.59	3.76	1.00	0.02	22.45	60.93	0.62	3.51	1.00	0.02
22.53	52.27	0.57	3.98	1.00	0.04	22.59	58.25	0.60	3.64	1.00	0.02

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
22.64	62.59	0.63	3.43	1.00	0.02	22.72	66.39	0.65	3.27	1.00	0.03
22.78	70.57	0.69	3.11	1.00	0.02	22.86	74.17	0.72	2.99	1.00	0.03
22.91	77.71	0.75	2.87	1.00	0.02	22.99	80.21	0.78	2.80	1.00	0.03
23.05	91.78	0.92	1.78	1.00	0.01	23.11	93.82	0.95	0.94	1.00	0.01
23.19	95.52	0.98	0.92	1.00	0.01	23.25	96.75	1.00	0.91	1.00	0.01
23.30	96.87	1.00	0.91	1.00	0.01	23.39	96.14	0.99	0.92	1.00	0.01
23.44	94.45	0.96	0.93	1.00	0.01	23.50	91.65	0.92	1.78	1.00	0.01
23.58	87.46	0.86	1.91	1.00	0.02	23.64	82.08	0.79	2.71	1.00	0.02
23.70	76.68	0.74	2.91	1.00	0.02	23.78	72.20	0.69	3.05	1.00	0.03
23.84	69.48	0.67	3.15	1.00	0.02	23.90	67.89	0.66	3.21	1.00	0.02
23.96	67.17	0.65	3.24	1.00	0.02	24.04	68.18	0.66	3.20	1.00	0.03
24.09	71.28	0.68	3.08	1.00	0.02	24.18	74.22	2.00	0.00	1.00	0.00
24.24	76.22	2.00	0.00	1.00	0.00	24.29	76.36	2.00	0.00	1.00	0.00
24.35	76.18	2.00	0.00	1.00	0.00	24.43	75.85	2.00	0.00	1.00	0.00
24.48	74.42	2.00	0.00	1.00	0.00	24.56	72.15	2.00	0.00	1.00	0.00
24.62	69.48	2.00	0.00	1.00	0.00	24.68	66.51	2.00	0.00	1.00	0.00
24.76	63.96	0.62	3.37	1.00	0.03	24.82	63.41	0.62	3.40	1.00	0.02
24.87	66.32	0.64	3.27	1.00	0.02	24.96	70.02	0.67	3.13	1.00	0.03
25.02	72.78	0.69	3.03	1.00	0.02	25.07	73.88	0.70	2.99	1.00	0.02
25.16	75.22	0.71	2.95	1.00	0.03	25.21	77.30	0.73	2.89	1.00	0.02
25.27	79.91	0.76	2.81	1.00	0.02	25.35	82.44	0.78	2.69	1.00	0.03
25.41	84.91	0.81	2.58	1.00	0.02	25.47	87.19	0.84	2.48	1.00	0.02
25.55	89.25	0.86	1.86	1.00	0.02	25.60	90.64	0.88	1.81	1.00	0.01
25.66	90.42	0.88	1.82	1.00	0.01	25.75	89.13	0.86	1.86	1.00	0.02
25.80	87.16	0.83	2.48	1.00	0.02	25.86	84.73	0.80	2.59	1.00	0.02
25.95	82.18	0.77	2.71	1.00	0.03	26.00	79.97	0.75	2.81	1.00	0.02
26.06	79.22	0.74	2.83	1.00	0.02	26.14	79.80	0.75	2.81	1.00	0.03
26.20	81.97	0.77	2.72	1.00	0.02	26.26	85.82	0.81	2.54	1.00	0.02
26.34	91.06	0.88	1.80	1.00	0.02	26.40	97.01	0.96	0.91	1.00	0.01
26.45	103.49	1.07	0.54	1.00	0.00	26.54	115.28	1.30	0.26	1.00	0.00
26.60	129.40	1.64	0.00	1.00	0.00	26.65	141.41	2.00	0.00	1.00	0.00
26.73	146.08	2.00	0.00	1.00	0.00	26.79	146.04	2.00	0.00	1.00	0.00
26.85	140.71	1.97	0.00	1.00	0.00	26.93	134.08	1.77	0.00	1.00	0.00
26.99	126.16	1.55	0.00	1.00	0.00	27.05	119.45	1.38	0.00	1.00	0.00
27.13	109.23	1.17	0.38	1.00	0.00	27.19	103.59	1.06	0.54	1.00	0.00
27.24	100.55	1.01	0.88	1.00	0.01	27.33	97.15	0.96	0.91	1.00	0.01
27.37	94.86	0.92	1.70	1.00	0.01	27.44	92.76	0.89	1.75	1.00	0.01
27.52	92.02	0.88	1.77	1.00	0.02	27.57	91.10	0.87	1.80	1.00	0.01
27.63	90.39	0.86	1.82	1.00	0.01	27.71	98.14	0.97	0.90	1.00	0.01
27.77	99.11	0.98	0.89	1.00	0.01	27.85	99.62	0.99	0.89	1.00	0.01
27.91	99.44	0.98	0.89	1.00	0.01	27.96	97.07	0.95	1.64	1.00	0.01
28.05	94.37	0.91	1.71	1.00	0.02	28.11	90.89	0.86	1.81	1.00	0.01
28.17	85.03	0.79	2.57	1.00	0.02	28.23	77.68	0.71	2.87	1.00	0.02
28.29	70.24	0.64	3.12	1.00	0.02	28.37	64.91	0.60	3.33	1.00	0.03
28.43	61.21	0.58	3.49	1.00	0.02	28.48	59.05	0.57	3.60	1.00	0.02
28.57	57.92	0.56	3.66	1.00	0.04	28.62	57.51	0.56	3.68	1.00	0.02
28.68	57.84	0.56	3.66	1.00	0.02	28.76	58.58	0.56	3.62	1.00	0.03
28.82	59.57	0.57	3.57	1.00	0.02	28.90	60.11	0.57	3.55	1.00	0.03

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
28.96	59.76	0.57	3.56	1.00	0.03	29.01	58.95	0.56	3.60	1.00	0.02
29.10	58.13	0.56	3.65	1.00	0.04	29.15	41.41	0.48	4.82	1.00	0.03
29.21	41.68	0.48	4.79	1.00	0.03	29.29	41.48	0.48	4.81	1.00	0.05
29.35	41.84	0.48	4.77	1.00	0.03	29.42	42.26	0.48	4.74	1.00	0.04
29.48	42.92	0.48	4.68	1.00	0.03	29.54	42.34	0.48	4.73	1.00	0.03
29.60	41.11	0.48	4.84	1.00	0.03	29.69	39.19	0.47	5.04	1.00	0.05
29.74	35.65	0.45	5.44	1.00	0.04	29.80	32.54	0.43	5.80	1.00	0.04
29.88	29.68	0.42	5.80	1.00	0.06	29.94	49.86	0.51	4.13	1.00	0.03
29.99	52.88	0.53	3.94	1.00	0.03	30.08	56.71	0.54	3.72	1.00	0.04
30.13	62.28	0.57	3.45	1.00	0.02	30.19	68.59	0.62	3.18	1.00	0.02
30.28	73.21	2.00	0.00	1.00	0.00	30.33	73.88	2.00	0.00	1.00	0.00
30.39	72.41	2.00	0.00	1.00	0.00	30.47	70.91	2.00	0.00	1.00	0.00
30.53	70.67	2.00	0.00	1.00	0.00	30.60	69.25	2.00	0.00	1.00	0.00
30.67	65.95	0.60	3.29	1.00	0.03	30.74	61.26	0.57	3.49	1.00	0.03
30.81	56.94	0.54	3.71	1.00	0.03	30.85	54.01	0.53	3.87	1.00	0.02
30.91	53.73	0.53	3.89	1.00	0.03	30.99	54.42	0.53	3.85	1.00	0.03
31.05	57.25	0.54	3.69	1.00	0.03	31.12	45.12	0.49	4.49	1.00	0.04
31.19	49.33	0.51	4.17	1.00	0.03	31.26	52.43	0.52	3.97	1.00	0.03
31.33	54.42	0.53	3.85	1.00	0.03	31.40	69.33	0.62	3.16	1.00	0.03
31.46	70.42	0.62	3.12	1.00	0.03	31.53	71.21	0.63	3.09	1.00	0.03
31.57	72.20	0.64	3.05	1.00	0.01	31.64	73.04	0.64	3.02	1.00	0.02
31.71	73.76	0.65	3.00	1.00	0.03	31.77	74.08	0.65	2.99	1.00	0.02
31.84	74.04	0.65	2.99	1.00	0.02	31.91	73.99	0.65	2.99	1.00	0.02
31.98	74.02	0.65	2.99	1.00	0.02	32.05	74.35	0.65	2.98	1.00	0.02
32.12	74.84	0.66	2.96	1.00	0.02	32.18	75.33	0.66	2.95	1.00	0.02
32.25	75.80	0.66	2.93	1.00	0.02	32.32	76.17	0.67	2.92	1.00	0.03
32.36	76.74	0.67	2.90	1.00	0.01	32.43	77.20	0.68	2.89	1.00	0.02
32.50	77.64	0.68	2.88	1.00	0.02	32.57	77.78	0.68	2.87	1.00	0.02
32.64	77.94	0.68	2.87	1.00	0.02	32.71	78.09	0.68	2.86	1.00	0.02
32.77	78.42	0.69	2.85	1.00	0.02	32.84	78.91	0.69	2.84	1.00	0.02
32.91	79.52	0.70	2.82	1.00	0.02	32.97	79.98	0.70	2.81	1.00	0.02
33.01	80.39	0.70	2.79	1.00	0.01	33.08	80.98	0.71	2.78	1.00	0.02
33.15	82.27	0.72	2.74	1.00	0.02	33.22	84.22	0.74	2.69	1.00	0.02
33.29	86.54	0.77	2.51	1.00	0.02	33.36	88.74	0.79	2.42	1.00	0.02
33.42	91.08	0.82	2.33	1.00	0.02	33.49	92.64	0.84	2.27	1.00	0.02
33.56	93.78	0.86	1.72	1.00	0.01	33.63	86.34	0.76	2.52	1.00	0.02
33.70	89.15	0.80	2.40	1.00	0.02	33.73	92.17	0.84	2.29	1.00	0.01
33.81	95.32	0.88	1.68	1.00	0.01	33.88	97.85	0.91	1.62	1.00	0.01
33.94	98.23	0.92	1.61	1.00	0.01	34.01	97.10	0.90	1.64	1.00	0.01
34.08	96.35	0.89	1.66	1.00	0.01	34.14	106.64	1.05	0.53	1.00	0.00
34.22	110.04	1.11	0.52	1.00	0.00	34.29	112.25	1.15	0.37	1.00	0.00
34.33	106.78	1.05	0.53	1.00	0.00	34.40	109.52	1.10	0.52	1.00	0.00
34.46	114.15	1.19	0.37	1.00	0.00	34.53	119.45	1.30	0.25	1.00	0.00
34.59	121.91	1.35	0.00	1.00	0.00	34.65	125.31	1.43	0.00	1.00	0.00
34.74	129.54	1.54	0.00	1.00	0.00	34.78	132.02	1.60	0.00	1.00	0.00
34.86	129.26	1.53	0.00	1.00	0.00	34.92	118.94	1.29	0.26	1.00	0.00
34.98	111.66	1.14	0.51	1.00	0.00	35.05	107.55	1.06	0.53	1.00	0.00
35.12	106.12	1.04	0.84	1.00	0.01	35.19	101.79	0.97	0.87	1.00	0.01

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
35.25	94.03	0.85	1.72	1.00	0.01	35.33	86.74	0.76	2.50	1.00	0.02
35.39	82.97	0.72	2.72	1.00	0.02	35.46	82.90	0.72	2.73	1.00	0.02
35.53	83.97	0.73	2.70	1.00	0.02	35.59	85.28	0.75	2.66	1.00	0.02
35.65	85.88	0.75	2.54	1.00	0.02	35.71	85.69	0.75	2.55	1.00	0.02
35.78	84.63	0.74	2.68	1.00	0.02	35.85	82.63	0.72	2.73	1.00	0.02
35.92	80.07	0.69	2.80	1.00	0.02	35.99	77.27	0.67	2.89	1.00	0.02
36.06	74.13	0.64	2.99	1.00	0.02	36.12	70.48	0.61	3.11	1.00	0.03
36.19	67.26	0.59	3.23	1.00	0.03	36.23	65.21	0.57	3.32	1.00	0.02
36.30	50.04	0.50	4.12	1.00	0.04	36.37	49.99	0.50	4.13	1.00	0.04
36.45	50.78	0.50	4.07	1.00	0.04	36.52	52.10	0.50	3.99	1.00	0.03
36.56	55.66	0.52	3.78	1.00	0.02	36.63	57.60	0.53	3.67	1.00	0.03
36.70	59.33	0.54	3.59	1.00	0.03	36.76	59.99	0.54	3.55	1.00	0.03
36.83	61.90	0.55	3.46	1.00	0.03	36.90	63.61	0.56	3.39	1.00	0.03
36.97	64.28	0.57	3.36	1.00	0.03	37.03	64.49	0.57	3.35	1.00	0.03
37.11	64.61	0.57	3.34	1.00	0.03	37.17	64.59	0.57	3.34	1.00	0.03
37.24	64.59	0.57	3.34	1.00	0.03	37.28	64.99	0.57	3.33	1.00	0.02
37.35	65.82	0.57	3.29	1.00	0.03	37.42	66.94	0.58	3.25	1.00	0.03
37.49	68.19	0.59	3.20	1.00	0.03	37.56	69.95	0.60	3.13	1.00	0.03
37.63	72.73	0.62	3.03	1.00	0.02	37.69	76.50	0.66	2.91	1.00	0.02
37.75	80.92	0.70	2.78	1.00	0.02	37.82	85.38	0.74	2.66	1.00	0.02
37.89	90.31	0.80	2.36	1.00	0.02	37.96	95.10	0.86	1.69	1.00	0.01
38.00	102.55	0.97	0.86	1.00	0.00	38.07	117.75	1.25	0.36	1.00	0.00
38.15	135.21	1.67	0.00	1.00	0.00	38.20	155.10	2.00	0.00	1.00	0.00
38.29	167.62	2.00	0.00	1.00	0.00	38.33	176.51	2.00	0.00	1.00	0.00
38.42	182.27	2.00	0.00	1.00	0.00	38.48	191.00	2.00	0.00	1.00	0.00
38.54	205.63	2.00	0.00	1.00	0.00	38.61	176.62	2.00	0.00	1.00	0.00
38.67	144.98	1.96	0.00	1.00	0.00	38.73	-1.00	2.00	0.00	1.00	0.00
38.79	-1.00	2.00	0.00	1.00	0.00	38.85	-1.00	2.00	0.00	1.00	0.00
38.93	-1.00	2.00	0.00	1.00	0.00	38.99	-1.00	2.00	0.00	1.00	0.00

Total estimated settlement: 6.15

Abbreviations

$Q_{tn,cs}$: Equivalent clean sand normalized cone resistance
FS: Factor of safety against liquefaction
e_v (%): Post-liquefaction volumentric strain
DF: e_v depth weighting factor
Settlement: Calculated settlement