ADDENDUM NO. 01
February 21, 2019

To RFQ/P #0906-8206-1

Lodi High School – RFP/Q Increment 1
Lodi Unified School District

Prepared by: **PBK**
2520 Venture Oaks Way, Suite 440
Sacramento, California 95833

PBK Project Nos.: 18206

A. Receipt of this Addendum shall be acknowledged in the proposal response.

B. This Addendum forms part of RFQ/P #0906-8206-1 and shall be incorporated integrally therewith.

C. Each bidder shall make necessary adjustments and submit this proposal with full knowledge of all modifications, clarifications, and supplemental data included therein. Where provisions of the following supplemental data differ from those of the original RFP/Q, this Addendum shall govern.

GENERAL INFORMATION

Item No. 1 The sign-in sheet for the Job Walk on February 20th, 2019 has been provided.

Item No. 2 Geologic Hazards & Geotechnical Engineering Report is attached. Dated August 17, 2018. (217 Pgs.)

Item No. 3 Site Lease and Facilities Lease documentation are attached**.**

DRAWINGS

Item No. 4 Addition of the attached Drawing Sheets and Presentation:

Title Sheet
SDC1 – Site Utility Plan
L1.1 – Preliminary Landscape Plan
L1.2 – Preliminary Landscape Plan
S2.01 – Structural Second Floor Plan
S3.00 – Structural Roof Plan
A1.01 – Architectural Site Plan
A2.00 – Architectural First Floor Plan
A2.01 – Architectural Second Floor Plan
A3.00 – Architectural Roof Plan
A6.01 – Architectural Exterior Elevations
A6.10 – Architectural Sections
M2.00 – Mechanical First Floor Plan
M2.01 – Mechanical Second Floor Plan
M3.00 – Mechanical Roof Plan
E0.00 – Electrical Abbreviations, Legend and Sheet Index
E1.00 – Electrical Site Plan
E2.01 – Electrical First Floor Plan
E2.02 – Electrical Second Floor Plan
E3.01 – Lighting Enlarged Plans
E3.02 – Electrical Enlarged Plans
FP2.00 – Fire Sprinkler First Floor Plan
Schematic Design Presentation Dated January 15, 2019

END OF ADDENDUM NO. 01

Roebbelen
QUALITY CONSTRUCTION SINCE 1959
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Lodi High- RFP/Q Meeting

February 19, 2019 Increment 1 10:00am

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Geologic Hazards
&
Geotechnical Engineering Report

LODI HIGH SCHOOL IMPROVEMENTS

Lodi, California

MPE No. 03849-01

MPE

MID PACIFIC ENGINEERING, INC.

August 17, 2018

Geologic Hazards and Geotechnical Engineering Report
LODI HIGH SCHOOL IMPROVEMENTS
MPE No. 03849-01
Lodi, California

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MID PACIFIC ENGINEERING, INC.

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Geologic Hazards and Geotechnical Engineering Report

LODI HIGH SCHOOL IMPROVEMENTS

3 South Pacific Avenue

Lodi, California

MPE No. 03849-01

August 17, 2018

INTRODUCTION

We have completed a Geologic Hazards and Geotechnical Engineering investigation for the site of the proposed new classroom buildings and associated pavement improvements at the existing Lodi High School campus located at 3 South Pacific Avenue in Lodi, California. The purposes of our study have been to investigate the site, soil, geologic and groundwater conditions of the school site, and to prepare Geologic and Geotechnical Engineering conclusions and recommendations for use by the other members of the design team in preparing project plans and specifications. Our work has been performed in general accordance with the conditions of our proposal to the Lodi Unified School District (c/o Petralogix Engineering, Inc.), dated May 25, 2018. This report presents the results of our work.

SCOPE OF SERVICES

Our scope of work included the following:

1. Site reconnaissance;
2. Review of available historic aerial photographs, topographic maps and groundwater information of the area;
3. Review of geologic maps and fault maps;
4. Review of historic seismicity within 100 kilometers of the site;
5. Subsurface exploration, including the:
   A. Drilling and sampling of 11 test borings to maximum depths of approximately 15 to 26½ feet below the existing ground surface;

B. Hand augering and sampling of 1 test boring to a maximum depth of approximately 6 feet below existing ground surface; and,
C. The completion of 2 Cone Penetration Test (CPT) soundings to a maximum depth of approximately 50 feet below existing site grades.

6. Collection of bulk samples of near-surface soils;
7. Laboratory testing of selected soil samples;
8. Engineering analyses; and,
9. Preparation of this report.

FIGURES AND ATTACHMENTS

Figure	Title	Figure	Title
1	Topographic Map	18	Earthquake Epicenter Map
2	Regional Geologic Map	19	FEMA Flood Map
3	Boring Location Map	20	Geologic Cross Section A-A'
4-15	Logs of Soil Borings	21	Geologic Cross Section B-B'
16	Unified Soil Classification System	22	Geologic Cross Section C-C'
17	Regional Fault Map		

Appended to this report are:

- Appendix A – General information regarding project concepts; exploratory methods used during our field investigation; and, laboratory test results not included on the boring logs.
- Appendix B – *Guide Earthwork Specifications* that may be used in the preparation of contract documents.
- Appendix C – Output files from the EQFAULT/EQSEARCH programs.
- Appendix D – The results of the CPT soundings and the CLiq Liquefaction Analyses.
- Appendix E – A list of references cited.

PROPOSED DEVELOPMENT

Based on information provided by representatives of Roebbelen Construction Management Services, Inc., Lodi Unified School District and our review of the April 6, 2018 *Request for Proposal (RFP)* Site Plan, prepared by PBK Architects, we understand three new, two-story classroom structures are proposed in the northeastern portion of the existing school campus. The exact square footages of the buildings were not provided during the preparation of this report, but based on the scaling of the provided drawings, it is our assumption the northern building will be approximately 29,000 square feet (sf) and the two buildings to the southeast and southwest of the northern building will be approximately 13,000 sf. The three buildings will consist of at least 52 classrooms and 6 science laboratories. A new, one-story addition to the existing Administration building will be constructed extending easterly from the existing structure. We anticipate the two-story classroom structures and the administration addition will be wood-frame construction with interior concrete slab-on-grade lower floors. We anticipate light to moderate structural loads based on the anticipated type of construction. Access to the upper floors is anticipated to be provided by stairways and an elevator.

Associated improvements will consist of construction of two new asphalt concrete parking lots. One lot is planned within the northwest corner of the campus and one lot is planned south of the administration building. Additionally, new construction is anticipated to include a new student quad area, exterior concrete flatwork, underground utilities, and landscaping.

Although grading plans were not available at this time, based on existing site topography we anticipate maximum excavations and fills on the order of one to three feet for development of the planned improvements, with deeper excavations anticipated for the elevator pits.

SITE HISTORY

We reviewed historical aerial photographs of the site from Google Earth and *Historicalaerials.com*, taken in 1967 and from May 1993 through May 2017. In 1967, The existing Lodi High School is shown as being developed, with the exception of the northeastern parking lot, which appears to be fallow land. Between 1967 and May 1993, the northeastern parking lot was developed.

The area of the planned two-story, classroom buildings has supported asphalt concrete pavements; the area of the proposed northwestern parking lot has supported multiple buildings and existing asphalt pavement; the proposed administrative building additions has supported irrigated grass, concrete flatwork and a hexagonal building; and, the proposed staff parking area supported existing buildings and irrigated grass and has remained relatively unchanged since at least May 1993.

FINDINGS

SITE DESCRIPTION

The existing Lodi High School campus encompasses a total area of approximately 44½ acres and is located at 3 South Pacific Avenue in Lodi, California. The center of the proposed classroom buildings is located at approximately latitude 38.1354° north and longitude 121.2911° west. The school campus is bounded to the north by existing single-family residences, beyond which is West Elm Street; to the east by North and South Pacific Avenue; to the west by existing single-family residences, beyond which is North and South Corinth Avenue; and, to the south by West Lodi Avenue. Topography across the property is relatively flat with average surface elevation of approximately +45 feet relative to mean sea level (msl), based on review of the 2012 *United States Geological Survey (USGS) 7.5-Minute Series Topographic Map Lodi North Quadrangle, California* (see Figure 1).

At the time of our investigation on July 10, 12, and 13, 2018, the area of the planned school improvements supported an existing campus and maintenance and operations facility.

The area of the planned northern classroom structure supported an asphalt concrete paved parking area, presumably designated as a student parking area. Asphalt concrete pavement in the parking area was observed to be severely cracked. Sparse weeds were present within the pavement cracks. Several storm drain inlets, electrical boxes, light poles, overhead utility power poles, concrete parking stop blocks, and chain-link fencing were present. Underground Service Alert (USA) markings indicate several underground utilities exist in the parking lot area. Within the location of the proposed southeast and southwest classrooms, a large mature pine tree, bushes, several modular buildings, irrigated grass, sidewalks, fire

hydrants, bollards, utility vaults, and a single-story, rectangular-shaped building designated as "FLA" were present.

The area of the proposed northwestern parking lot supported an existing asphalt concrete paved parking area. The pavements were observed to be in a fair condition. Many parked maintenance vehicles and maintenance equipment were present. Metal buildings, conex storage containers, manufactured office trailers, and a large maintenance shop were present around the maintenance and operations facility. Horse trailers, fences, gates, sheds, and a greenhouse structure were visible in the agricultural department.

The area of the planned administrative building addition supported irrigated grass, landscape plants, large decorative rocks, flatwork, covered walkway canopies, trees, irrigation water lines, and a tall, single-story, hexagonal-shaped building designated as "SDC".

The area of the planned southern staff parking supported student classroom buildings, mature trees, flatwork, bushes, storm drain inlets, irrigated grass, and underground utilities.

GEOLOGIC STRUCTURE

The project site is located within the Great Valley Geomorphic Province of California (Great Valley), a ~100-million year old sedimentary basin that formed as a low lying region between a subducting oceanic plate to the west and the Sierra Nevada mountain range to the east. The province is approximately 450 miles long and 50 miles wide and is comprised of two northwest to southeast-trending sub-basins: the Sacramento Valley to the northwest and the San Joaquin Valley to the southeast (CEC, *Geologic Hazards and Resources*). Each of these basins is filled by a thick sequence of Mesozoic to Quaternary sediment, whose terrigenous and subaerial depositional sources have been traced to the Sierra Nevada and Coast Range Geomorphic Provinces to the east and west, respectively (Anderson, 1943).

Together, the Great Valley and the Sierra Nevada Geomorphic Province form the Sierran Block, a relatively stable crustal block comprised of a Mesozoic basement (CEC, *Geologic Hazards and Resources).* The western boundary of the Great Valley is characterized by strike-ridges and valleys associated with the Upper Mesozoic strata of the Coast Ranges

Geomorphic Province. These Mesozoic strata dip beneath the alluvium of the Great Valley (California Geological Survey [CGS], Note 36).

Surface elevations within the Great Valley range from several feet below mean sea level (msl) to elevations greater than 1000 feet above msl. Most notably, the Sutter Buttes (a volcanic remnant) rises to an elevation of approximately 1980 feet above the surrounding Sacramento Valley floor.

Regional Geology

Review of the *Preliminary Geologic Map of the Lodi 30'x60' Quadrangle, California* (CGS, 2009) indicates that the school site is underlain by late Pleistocene-aged alluvium (Map Symbol: Q_{m2}) of the Modesto Formation. These deposits primarily consist of arkosic sands with minor silts and gravels that form terraces, floodplains and alluvial fans along the Mokelumne and Consumnes Rivers (Dawson, 2009; See Figure 2).

The soil conditions encountered in our borings were generally consistent with the soils typically mapped as alluvial fan deposits.

Subsurface Soil Conditions

Ten of the twelve borings (D-1 through D-10) were drilled in areas covered by approximately two inches of existing asphalt concrete pavements. Only one boring (D-10) exposed four inches of aggregate base (AB) below the paved area. Boring D-8 exposed an additional 2-inch layer of asphalt concrete approximately 12 inches below existing grade. Beneath the pavements, AB and additional layers of asphalt concrete, the borings generally exposed soils consisting of very loose silty sands overlying medium dense to dense silty and cohesionless sands, and very hard clayey silts to a maximum depth of approximately 26½ feet below existing grade. A thin, loose clayey sand layer was encountered at an approximate depth of 25 feet below existing grade within Boring D-8.

The proposed administrative building addition footprint was occupied by existing structures and was inaccessible to the drill rig. Boring D-11 was drilled within the lawn area approximately 60-feet east of the building footprint to an approximate depth of 16½ feet

below existing grade, and Boring D-12 was hand augered within the building addition footprint to an approximate depth of 6 feet below existing grade to confirm uniformity of the soils encountered in the drilled boring. The borings generally exposed soils consisting of loose clayey sand overlying medium dense clayey and silty sand.

To supplement our soil borings, two Cone Penetration Test (CPT) soundings were performed to maximum depths of approximately 50 feet below existing site grades. The soil conditions encountered in the CPT soundings were relatively consistent with those encountered in the soil borings.

For more detail regarding the soil conditions at a specific location, please refer to the Logs of Soil Borings on Figures 4 through 15. The results of the CPT soundings are presented in Appendix D.

GROUNDWATER

Groundwater was encountered at depths of approximately 30½ and 36½ feet below existing site grades in both of our CPT soundings performed on July 10, 2018. Groundwater was not encountered in any of our soil borings drilled to a maximum depth of approximately 26½ feet below existing grade on July 12 and 13, 2018. Please note, the CPT soundings may not have been left open long enough for groundwater to reach static equilibrium.

To supplement our groundwater information, we reviewed groundwater elevation data obtained from five nearby California Department of Water Resources (DWR) groundwater monitoring wells (381356N1213056W001, 381287N1212851W001, 381331N1212761W001, 381338N1212785W001 and 381337N1212757W001) located within a 1-mile radius of the subject property. The DWR has periodically measured groundwater elevations within these wells from at least October 1, 1947 to March 12, 2018. During this time period, the groundwater depths have ranged from approximately -3½ to +32 feet msl (approximately 13 to 48½ feet below grade at the project site).

Recent measurements taken over the past three years by the DWR indicates the groundwater elevation in this area has varied between approximately 40 to 48½ feet below existing grades.

FAULTING

Review of the *City of Lodi General Plan, Safety Element* (adopted April 7, 2010) indicates that the project site is not located within the mapped trace of any known fault. There were no indications of surface rupture or fault-related surface disturbance at the site during our review of aerial photographs, site reconnaissance, or geotechnical investigation.

The site is not located within a State-designated *Alquist-Priolo* Earthquake Hazard Fault Zone (Hart and Bryant, 2007). The closest faults are the Foothills Fault System ~~Zone~~ located approximately 23.9 miles (38.4 kilometers) east-northeast of the project site. The next closest faults are the Great Valley Fault System and the Greenville fault located approximately 30.5 and 34.3 miles (49.0 and 50.4 kilometers), from the project site, respectively. The nearest identified fault trace, the Stockton fault, is not considered to be an active fault. A Regional Fault Map (Figure 13) is included with this report.

Using the USGS Earthquake Hazards Program, 2008 National Seismic Hazard Maps-Source Parameters (https://earthquake.usgs.gov/cfusion/hazfaults_2008_search/query_main.cfm) we have prepared Table 1, which contains CGS Class A and B faults and fault systems within 62 miles (100 km) of the site. The identified faults are considered to be capable of producing earthquakes with moment magnitudes (M_w) of 6.4 or greater. The closest active faults to the site are the Great Valley -Segment 7 Fault (30.5 miles/49.0 kilometers), Great Valley - Segment 5/Pittsburg Kirby Hills Fault (31.3 miles/50.4 kilometers), and the Greenville Connected Fault (34.3 miles/55.2 kilometers). The Great Valley - Segment 7 Fault is a 28 mile (45 kilometer) long, northwest to southeast-striking thrust fault, and the Great Valley - Segment 5, Pittsburg Kirby Hills Fault 20 mile (32 kilometer) long, northwest to southeast-striking reverse fault. Both faults are located to the west of the project site. The Greenville Connected Fault is a northwest to southeast-trending, strike slip fault that is located to the southwest of the project site.

Table 1 - Faults Influential to the Lodi High School

Fault Name	Maximum Magnitude (M_W)	Distance to Site Miles (km)
Foothills Fault System	6.5	23.9 (38.4)
Great Valley Fault System (Segment 7)	6.9	30.5 (49.0)

Fault Name	Maximum Magnitude (M_W)	Distance to Site Miles (km)
Great Valley Fault System (Segment 5)	6.7	31.3 (50.4)
Greenville Connected	7.0	34.3 (55.2)
Great Valley Fault System (Segment 4b)	6.8	37.2 (59.9)
Mount Diablo Thrust	6.7	40.4 (64.9)
Green Valley Connected	6.8	41.5 (66.8)
Calaveras CN	6.9	45.0 (72.4)
Calaveras CN+CC+CS	7.0	45.0 (72.4)
Calaveras CN+CC	7.0	45.0 (72.4)
Great Valley Fault System (Segment 4a)	6.6	47.2 (76.0)
Great Valley Fault System (Segment 8)	6.8	48.9 (78.7)
West Napa	6.7	52.0 (83.7)
Hayward-Rodgers Creek HS	6.8	53.5 (86.1)
Hayward-Rodgers Creek HN+HS	7.0	53.5 (86.1)
Hayward-Rodgers Creek RC +HN+HS	7.3	53.5 (86.1)
Hunting Creek-Berryessa	7.1	54.0 (86.9)
Hayward-Rodgers Creek HN	6.6	54.7 (88.0)
Hayward-Rodgers Creek RC+HN	7.2	54.7 (88.0)
Calaveras CC	6.4	55.4 (89.2)
Calaveras CC+CS	6.5	55.4 (89.2)
Great Valley Fault System (Segment 3)	7.1	56.2 (90.4)
Ortigalita	7.1	59.6 (95.9)

Review of the *Earthquake Outlook for the San Francisco Bay Region 2014–2043* (https://pubs.usgs.gov/fs/2016/3020/fs20163020.pdf), indicates the Hayward-Rodgers Creek Fault System has the highest probability (33 percent) of producing a magnitude 6.7 or greater earthquake in the next 30 years. The Greenville Fault, Mt. Diablo Thrust Fault, and the Green Valley fault were assigned a 16 percent probability of producing a magnitude 6.7 or greater earthquake in the next 30 years. Based on supplementary review of USGS fault parameters and EQFault data files, it is our opinion that the Great Valley Fault System should also be considered a potential causative fault system.

HISTORIC SEISMICITY

Seismological data regarding significant historical earthquakes affecting the site was obtained using the commercially available software program EQSEARCH (Blake, 2000; database updated 2017). The EQSEARCH database was developed by extracting records of events equal to or greater than magnitude 5.0 from the DMG Comprehensive Computerized Earthquake Catalog, and supplemented by records from the USGS; University of California, Berkeley; and the California Institute of Technology. A search radius of 62 miles (100 km) was specified for this analysis. A historic earthquake epicenter map showing earthquakes (magnitude 5 or greater) within a 62 mile (100 km) radius of the project site is presented as Figure 14.

A review of the historical earthquake data indicates that the most significant earthquake shaking experienced at the project site occurred during the M_R 6.8earthquake of October 21, 1868, with an epicenter located approximately 53.3miles (85.8 kilometers) southwest of the project site. An examination of the tabulated EQSEARCH data suggests that the project site has not experienced a ground shaking equivalent to Modified Mercalli Intensity X[1]. The closest earthquake to the site was 33.1 miles (53.2 kilometers) northwest, and measured MMI of VI.

The largest earthquakes to occur within the EQSEARCH radius of 62 miles (100 km) were measured at Mw 6.8, and the largest acceleration experienced at the site was estimated to be 0.080 g. The number of earthquakes greater than Mw 5.5 within a 62 mile (100 km) radius of the site is presented in the following table.

TABLE OF MAGNITUDES AND EXCEEDANCES	
Earthquake Magnitude	Number of Times Exceeded
5.5	21
6.0	9
6.5	2
7.0	N/A
7.5	N/A
8.0	N/A

[1] Most masonry and frame structure and their foundations destroyed. Ground badly cracked. Landslides. Wholesale destruction.

Output files from the EQFAULT/EQSEARCH programs are included in Appendix C.

Coseismic Ground Deformation

The California State Legislature passed the Seismic Hazards Mapping Act (SHMA) in 1990 as a result of earthquake damage caused by the 1987 Whittier Narrows and 1989 Loma Prieta earthquakes. The SHMA was enacted to protect public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes (CGS, Special Publication [SP] 117).

There are currently no State designated Seismic Hazard Zone maps or Earthquake Fault Zone maps for the City of Lodi or San Joaquin County. For both Earthquake Fault Zones and Seismic Hazard Zones, San Joaquin County is currently listed as "not affected", therefore no maps are available. The project site is not located within a designated Seismic Hazard Zone.

CONCLUSIONS

Seismic Hazards

No active or potentially active faults are shown to cross the project site, as indicated on the published geologic maps and aerial photographs reviewed for this report. The project site is not located within an Earthquake Fault Zone, or designated seismic hazard zone. Therefore, a site-specific ground motion analysis is not warranted. The project site is located within a region of seismic activity. However, building structure designs in conformance with the 2016 edition of the California Building Code (Title 24 of the California Code of Regulations, Chapter 16A) should be sufficient to prevent significant damage from ground shaking during seismic events induced the by movement of any fault or fault system discussed in this report.

Seismic Code Parameters

Section 1613 of the 2016 edition of the CBC references ASCE Standard 7-10 for seismic design. The following seismic parameters were determined based on the site latitude and longitude using the public domain computer program developed by the USGS. The seismic design

parameters summarized in Table 1 may be used for seismic design of the proposed improvements.

Table 1 –2016 CBC/ASCE 7-10 Seismic Design Parameters

Latitude: 38.1354° N Longitude: 121.2911° W	ASCE 7-10 Table/Figure	2016 CBC Table/Figure	Factor/ Coefficient	Value
Short-Period MCE at 0.2s	Figure 22-1	Figure 1613.3.1(1)	S_S	0.753 g
1.0s Period MCE	Figure 22-2	Figure 1613.3.1(2)	S_1	0.302 g
Soil Class	Table 20.3-1	Section 1613.3.2	Site Class	D
Site Coefficient	Table 11.4-1	Table 1613.3.3(1)	F_a	1.199
Site Coefficient	Table 11.4-2	Table 1613.3.3(2)	F_v	1.796
Adjusted MCE Spectral Response Parameters	Equation 11.4-1	Equation 16-37	S_{MS}	0.903 g
	Equation 11.4-2	Equation 16-38	S_{M1}	0.542 g
Design Spectral Acceleration Parameters	Equation 11.4-3	Equation 16-39	S_{DS}	0.602 g
	Equation 11.4-4	Equation 16-40	S_{D1}	0.362 g
Seismic Design Category	Table 11.6-1	Section 1613.3.5(1)	Risk Category I to IV	C
	Table 11.6-2	Section 1613.3.5(2)	Risk Category I to IV	D

MCE – Maximum Considered Earthquake
g – Acceleration due to gravity

The PGA_M (Equation 11.8-1, ASCE 7-10) for the site is 0.33 g.

SEISMIC SOURCES

Several active and potentially active faults were identified as potential seismic sources within 62 miles (100 km) of the project site. These faults and fault systems include the Foothills Fault System, Great Valley Fault System, the Greenville Connected Fault, the Green Valley Connected Fault, the Mount Diablo Thrust Fault, the Calaveras Fault System, and the Hayward-Rodgers Creek Fault, among others. The closest active faults are Segments 7 and 5 of the Great Valley Fault System located 30.5 and 31.3 miles (49.0 and 50.4 kilometers), respectively, from the project site. The Maximum Magnitude Earthquakes (M_{max}) for the

faults within 62 miles (100 km) of the project site are listed in the Table 1 within the FAULTING section of this report. The M_{max} value represents the maximum earthquake believed possible for each fault.

The Central Valley and the Sierra Nevada margin are defined in the region by the Foothills Fault System. This fault zone is less active than the Central Coast area's strike-slip faults and the CRCV boundary located along the west side of the Sacramento and San Joaquin Valley. The Foothills Fault System is regarded as an aerial earthquake source that is based on poorly constrained Quaternary slip rates across the Bear Mountain and Melones Fault Zones (CDMG, 1996; Woodward-Clyde Consultants, 1978). Wakabayashi and Smith (1994) describe the Foothills Fault Zone as lacking evidence of active crustal shorting and note that deformation along the eastside of the Central Valley is extensional or transtensional.

The Great Valley Fault System extends from the southern San Joaquin Valley in Kern County northward into Tehama County, and serves as the boundary between the Coast Range and the Great Valley Geomorphic Provinces of California. It is characterized by a zone of low-angle, or blind thrust, and reverse faults that do not rupture the ground surface during sizable earthquake events. Although not exposed at the surface, regional studies have suggested that the Great Valley Fault System may be comprised of 18 to 25 segments that range in length from 7 to 35 miles (11.2 to 56.3 kilometers) – with most segment lengths measuring between 12 and 19 miles (19.3 to 30.6 kilometers). Several notable earthquake events have occurred along segments of the Great Valley Fault System, including: the 1892 M_w 6.4 and 6.2 Winters-Vacaville earthquakes, 1983 M_W 6.5 Coalinga earthquake, and the 1985 M_W 6.1 Kettleman Hills earthquake.

The Greenville Fault is an active dextral strike slip fault situated within the Diablo Range of California. It, along with the Green Valley Fault, defines the easternmost extent of the San Andreas Fault System in the San Francisco Bay region. Recent studies of the Greenville Fault have determined a long-term creep rate of 2 mm/year along the northern third of the fault system, with diminished aseismic releases in the two southern segments. A lack of large fault surface expressions (greater than 1 kilometer) and significant locking along the southern two-thirds of the Greenville Fault supplement seismic evidence for historic rupture events during the late Holocene. Estimations by Lienkaemper et al. (2013) imply that the

resulting strain accumulation along the fault system is sufficient enough to generate a M_W 6.9 earthquake with a mean recurrence of approximately 600 years.

The Green Valley Fault is an active Holocene dextral strike slip fault. It is characterized by aseismic creep, and has been monitored by Galehouse (1992, 1999) since 1984. Detailed reconnaissance level mapping exists for most of the fault, based on geologic and geomorphic data (Weaver, 1949; Dooley 1973; Sims, and others 1973; Frizzel and Brown, 1976; and Bryant 1982, 1992). Several site-specific studies in compliance with the *Alquist-Priolo Act* (Hart and Bryant, 1997) have documented the location and approximate age of most recent faulting. Preliminary data from the Lopes Ranch paleoseismic project site indicates the Green Valley Fault has produced multiple surface-rupturing events in the last 2700 years, and has a minimum late Holocene dextral slip rate of 3.8 mm/yr to 4.8 mm/yr based on 1.2 – 1.5 meters (3.9 – 4.9 feet) dextral offsets within a 310 year old paleochannel (Baldwin and Lienkaemper, 1999). Geomorphic expressions of the Green Valley Fault include closed depressions, ponded alluvium, dextrally offset drainages, linear troughs, sidehill benches, and scarps in young alluvium (Dooley, 1973; Frizzell and Brown, 1976; Bryant, 1982, 1992). Extensive landslides locally conceal fault traces along the northern extent of the fault in Wooden Valley, and locally obscure fault traces between Suisun Bay and Highway 80. Bryant (1982, 1991) estimated a long-term Quaternary slip rate of 3 mm/yr, based on unconstrained dextral separation of Pliocene Sonoma Volcanics mapped by Sims, et al (1973).

The Hayward-Rodgers Creek fault system is a significant seismic source located in the northern San Francisco Bay area. The Working Group on California Earthquake Probabilities (WGCEP, 2003) defined the Hayward-Rodgers Creek Fault System as having the greatest probability in the San Francisco Bay region of generating an earthquake of M_W 6.7 or greater. Most investigators interpreted the Rodgers Creek Fault as a single fault system capable of generating a M_W 7.1 earthquake, or if it ruptures simultaneously with the northern Hayward Fault, a M_W 7.3 earthquake (WGCEP, 2003). The roughly 37-mile (60 kilometers) long Rodgers Creek Fault, located between San Pablo Bay and Santa Rosa, strikes approximately N35°W, and is characterized by a late Holocene right-lateral slip rate of 6.4 to 10.4 mm/yr (Budding et. al, 1991; Schwartz et. al, 1992). The Rodgers Creek Fault is one fault in a series of right-stepping en echelon faults that include the Hayward fault to the south, and the Healdsburg and Maacama Faults to the north. The surface expression of the Rodgers Creek

Fault, as mapped by Randolph and Caskey (2001) and Hart (1992), includes classic fault-related geomorphic features such as offset drainages, side hill benches, tonal lineaments, sag ponds, and springs.

Surface Fault Rupture

No known faults are mapped crossing the immediate vicinity of the site. The site does not lie within an Alquist-Priolo Earthquake Fault Zone as currently designated by the State of California, and no evidence of surface faulting was observed during our historical aerial photography review, site reconnaissance, or geotechnical investigation. It is our opinion that the potential of fault-related surface rupture at the site is low.

Seismic Risk

Based on review of the peak site accelerations obtained from EQFAULT analysis, the primary seismic site risks are from earthquakes along the Foothills Fault System Segment 1. The fault system lies within approximately 23.9 miles (38.4 km) of the project site and is capable of producing large earthquakes. Results of the EQFAULT analysis indicate an Mw 6.5 earthquake on the Foothills Fault System Segment 1 would result in a site acceleration of 0.127g, based on the Boore et al (1997) Soil (310) attenuation relation.

Liquefaction

Liquefaction is a soil strength and stiffness loss phenomenon that typically occurs in loose, saturated, cohesionless soils as a result of strong ground shaking during earthquakes. The potential for liquefaction at a site is usually determined based on the results of a subsurface geotechnical investigation and the groundwater conditions beneath the site. Hazards to buildings associated with liquefaction include bearing capacity failure, lateral spreading, and differential settlement of soils below foundations, which can contribute to structural damage or collapse.

Review of the *Preliminary Geologic Map of the Lodi 30'x60' Quadrangle, California* (CGS, 2009) indicates that the school site is underlain by late Pleistocene-aged alluvium (Map Symbol: Q_{m2}) of the Modesto Formation. These deposits primarily consist of arkosic sands with

minor silts and gravels that form terraces, floodplains and alluvial fans along the Mokelumne and Consumnes Rivers (Dawson, 2009; See Figure 2). Groundwater was encountered in our CPT soundings advance at the project site at approximately 30½ and 36½ feet below existing grades. In addition, review of recent groundwater measurements taken over the past three years by the DWR indicates the groundwater elevation in this area has varied between approximately 40 to 48½ feet below existing grades.

The California Geological Survey has developed three criteria for delineating liquefaction hazards zones for the 1990 SHMA based on site geology, peak ground acceleration, and depth to groundwater (CGS SP 118, 1992; revised 2004). These criteria are:

(1) *Areas containing soil deposits of late Holocene age (current river channels and their historical floodplains, marshes and estuaries) where the M7.5-weighted peak acceleration that has a 10-percent probability of being exceeded in 50 years is greater than or equal to 0.10 g and the anticipated depth to saturated soil is less than 40 feet;*
(2) *Areas containing soil deposits of Holocene age (less than 11,000 years), where the M7.5-weighted peak acceleration that has a 10-percent probability of being exceeded in 50 years is greater than or equal to 0.20 g and the anticipated depth to saturated soil is less than 30 feet; or,*
(3) *Areas containing soil deposits of latest Pleistocene age (between 11,000 years and 15,000 years), where the M7.5-weighted peak acceleration that has a 10-percent probability of being exceeded in 50 years is greater than or equal to 0.30 g and the anticipated depth to saturated soil is less than 20 feet.*

It is our opinion that the site is <u>not</u> susceptible to large scale liquefaction based on the age and composition of the Pleistocene-aged alluvium deposits, site seismologic constraints (i.e., PGA_M= 0.33g from Section 1803A.5.11 of the 2016 CBC), and depth to groundwater (greater than 30 feet).

However, to confirm this opinion, we performed a liquefaction based on the site specific soils encountered in the CPTs.

Liquefaction Analysis Results & Seismically Induced Settlement

We performed our liquefaction analysis for the CPT soundings CPT-1 and CPT-2 using the commercially available software program CLiq (Version 2.0) developed by Geologismiki. The analysis was performed using the Robertson (2009) methodology. Input earthquake ground motion for the liquefaction analysis was 0.33g (*PGA_M, 2016 CBC Section 1803A.5.11 for Site Classification D*); M6.9 earthquake (*USGS Interactive Deaggregations webpage*); and, an in-situ depth to groundwater of about 13 feet determined based on historical high groundwater conditions for wells on the DWR website, monitored by the California Department of Water Resources from at least October 1, 1947 to March 12, 2018 that are located approximately 1-mile radius of the site. As required by Note 48, a factor of safety (FS) of 1.3 against liquefaction was used in the analysis. Appendix D of this report includes the output files of our liquefaction analysis.

Based on the results of our subsurface exploration, laboratory testing and analyses using the CLiq software program, the soils located between approximately 43 to 45 feet below existing grades in CPT-1 could be potentially liquefiable and susceptible to minor seismic settlements. Analysis using the CLiq software program and the current subsurface data indicates estimated maximum total seismic settlements due to liquefaction would be less than ½-inch. We estimate differential seismic settlements to be about half of the total seismic settlement. The Liquefaction Potential Index (LPI) value estimate from the analysis is approximately 0 to 0.55 for the CPT soundings CPT-2 and CPT-1, respectively. LPI values range from zero to 100. Iwasaki et al. (1982) suggested that liquefaction effects are low for $0 < LPI < 5$; moderate for $5 < LPI < 15$; and, major for $LPI > 15$. LPI combines depth, thickness, and factor of safety of liquefiable material inferred from a CPT sounding into a single parameter. The estimated LPI values fall into the low risk range. Based on our work, we consider the estimated seismic settlement to be conservative and a worst-case estimate.

CYCLIC SOFTENING

The soils encountered in our borings are generally granular (sandy) in nature and soft, low strength clays were not encountered; therefore, it is our opinion the potential for cyclic softening occurring beneath the site is low.

DRY SAND SEISMIC SETTLEMENT

Dry sand seismic settlement can be evaluated using the method of Pradel (1998). This method is a simplified method based on earlier work by Tokimatsu and Seed (1987) applicable to sands. The on-site soils above the groundwater surface generally consisted of loose silty and clayey sand. In our opinion, these soils may be subject to minor seismic settlements; however, we will be recommending either sub-excavation and recompaction of the loose sands below the bottoms of foundations to provide a uniform layer of compacted engineered fill, or the use ground improvement techniques, specifically compacted aggregate piers (CAPs), to densify the soils and provide uniform foundation support. In our opinion, the recommended sub-excavation and recompaction or use of CAPs will sufficiently densify the loose sands, and therefore mitigate potential excessive dry sand settlements. Provided the further recommendations contained in this report are followed, the potential for dry sand seismic settlements is considered low.

VOLCANIC HAZARDS

Review of the USGS Map of Potential Hazards from Future Volcanic Eruptions in California (Miller, 2011), shows there are six volcanic hazard zones in California. The project site does not lie within any of these six recognized volcanic hazard areas. The closest known volcanic center is the Clear Lake area, approximately 92 miles (148 km) northwest of the site. The most recent volcanic eruption from the Clear Lake area occurred approximately 10,000 years ago. Based on the above information, the volcanic hazard potential is low.

LANDSLIDES

Based on site observations and a review of the most recent topographic maps, the site has relatively flat topography. According to the 2012 *United States Geological Survey (USGS) 7.5-Minute Series Topographic Map Lodi North Quadrangle, California,* the average surface elevation across the site is approximately +45 feet mean sea level (msl). There are no slopes in the immediate or general area. Due to the relatively flat topography of the site and general area, potential for landslides is not considered applicable to the site.

SLOPE STABILITY

The project is located on a relatively flat site that has been previously developed. The proposed improvements to the site do not incorporate the formation of new slopes. Based on the current and anticipated final site conditions, slope stability is not considered a risk factor in site development.

NATURALLY OCCURRING ASBESTOS (NOA)

Asbestos is the generic term for the naturally occurring fibrous (asbestiform) varieties of six silicate minerals (croicidolite, tremolite, actinolite, anthophyllite, amosite, and chrysotile). These asbestiform minerals are naturally occurring in igneous ultramafic rock formations such as dunite, pyroxenite, peridotite, and hornblendite which form below the Earth's surface at high temperatures and then exposed by uplift and erosion. Chrysotile, the most common asbestos mineral in California, forms fibrous crystals in small veins in the altered metamorphic rock serpentinite. According to the USGS Open-File Report 2011-1188, *Reported Historic Asbestos Mines, Historic Asbestos Prospects, and Other Natural Occurrences of Asbestos in California* (Van Gosen and Clinkenbeard, 2011), the project site does not lie within an area mapped as containing Naturally Occurring Asbestos (NOA).

RADON GAS

Radon is a naturally occurring, colorless and tasteless gas produced in soil or rock by the decay of uranium and radium; radon is a known cause of lung cancer in the United States. Sections 307 and 309 of the Indoor Radon Abatement Act of 1988 (IRAA) directed EPA to list and identify areas of the U.S. with the potential for elevated indoor radon levels. EPA's Map of Radon Zones assigns each of the 3,141 counties in the U.S. to one of three zones based on radon potential. San Joaquin County and the project site are located in Zone 3 for radon potential. Zone 3 counties have a predicted average indoor radon screening level less than 2 pCi/L and are anticipated to have a low potential for radon.

Flood Hazards

The site is not located within a Special Flood Hazard Area (SFHA) as designated by the Federal Emergency Management Agency (FEMA). According to the Flood Insurance Rate Map (FIRM) Panel 168, Map Number 06077C0168F, published by the Federal Emergency Management Agency (FEMA), with an effective date of October 16, 2009, the school campus is within a segment of Zone X that is defined as areas of 0.2 percent annual chance flood; areas of one-percent annual-chance flood with averaged depths of less than one foot or with drainage areas less than one square mile; and areas protected by levees from one percent annual chance flood.

Dam Inundation

Based on review of the *City of Lodi General Plan, Safety Element* (adopted April 7, 2010), the school site is located within a potential dam inundation zone. Surface water stored in reservoirs on the Calaveras, Mokelumne, and Stanislaus River systems present a potential risk to inhabitants of the City of Lodi's Planning Area. Dams that present a threat of inundation to the site include Camanche, Camanche South and North Dikes, and Pardee.

Tsunamis and Seiches

The project site is inland and there are no significant bodies of standing water near the site; therefore, the potential for a tsunami hazard the site is low.

There are no water bodies adjacent to the site. The project site is located approximately 0.75 miles (1.2 kms) south of Lodi Lake. Due to the project site's distance from the lake, it is our opinion that the potential for seiches influencing the site is very low.

Subsidence and Hydrocollapse

Regional subsidence occurs when large areas of land sink in response to withdrawal of groundwater, petroleum, or natural gas. The site is within the San Joaquin Valley, a region historically subject to subsidence from over pumping of groundwater, petroleum or natural gas withdrawal and peat oxidation. According to a review of the *Areas of Land Subsidence in*

California Map (California Water Science Center), the site is not currently located within an area of land subsidence from groundwater pumping, peat loss, or oil extraction. According to the *State of California Public Utilities Commission – Lodi Gas Storage Project Area and Map*, the site is located approximately 6 miles (9.8 kms) southwest of the Lodi Gas Field. In our opinion, the site is not located in an area subject to high subsidence, due to the absence of factors and conditions needed to cause subsidence (excessive withdrawal of groundwater, petroleum, or natural gas). In addition, due to the age and composition of the native soils and geologic materials encountered during our field exploration, it is our opinion that subsidence of the on-site soils as the result of groundwater withdrawal is unlikely.

Due to the age and composition of the native soils and geologic materials encountered during our field exploration, it is our opinion that hydrocollapse of the on-site soils as the result of rain or irrigation water percolation is unlikely.

Bearing Capacity And Foundation Support

The site contains existing buildings, pavements, concrete and trees; therefore, proper clearing and removal of existing buildings and proper backfilling of excavations is very important to provide adequate and uniform structural support for the planned structures. Demolition of existing buildings and site clearing operations will disturb the surface and near-surface soils creating loose and variable soil conditions; therefore, we will recommend all disturbed soils within building pads and all site structural areas be sub-excavated, processed and re-compacted as engineered fill to promote more uniform support for the planned slab-on-grade structures, foundations, concrete flatwork, and associated improvements. Depending on the depth of disturbance, some deeper over-excavations of disturbed and/or saturated soils may be required.

The surface and near-surface soils encountered in our borings are generally loose and variable with respect to density and strength characteristics. In our opinion, these soils are not considered capable of providing adequate or uniform support of the two-story classroom structures without experiencing damaging differential settlements. Therefore, we will recommend over-excavation of the building sites to provide a uniform layer of engineered fill beneath foundations, or the use of a ground improvement system (specifically compacted aggregate piers (or CAPs)) to provide uniform and adequate

building support, and minimize the potential for excessive total and/or differential settlements.

Based on this, it is our opinion the two-story classroom structures can be supported on shallow conventional foundations that are supported by a sub-excavated and recompacted building pad, or by a ground improvement system (i.e. Compacted Aggregate Piers (CAP), etc.). The CAP system consists of a drilled shaft backfilled with compacted aggregate base to improve subgrade stability, increase bearing capacity and reduce settlements within the treated area. The CAP system should be designed by a professional engineer in the State of California that is qualified and experienced in ground improvement systems.

In our opinion, recompacted soils, as recommended, will be capable of supporting the proposed pavements, administration building addition, and improvements outside of the two-story classroom structures provided the future recommendations regarding site preparation and soils compaction are followed. Our work also indicates that engineered fill, properly placed and compacted in accordance with the recommendations of this report, will be capable of supporting the proposed improvements.

Due to the presence of the existing pavements and improvements, the soils exposed will likely be wet or unstable requiring additional sub-excavation to expose a firm base, or a stabilized subgrade, on which to begin engineered fill placement.

Specific recommendations for sub-excavation, processing and recompaction are presented in the SUB-EXCAVATION and SITE PREPARATION section of this report.

EXCAVATION CONDITIONS

Based on our field investigation, the native soils on the site should be readily excavatable with conventional earthmoving and trenching equipment typically used in the area. Based on the loose and relatively clean, silty, clayey and cohesionless sands exposed in all of our borings, excavations likely will be subject to sloughing or caving during excavation, especially if left open for an extended period of time, or if the soils are allowed to dry, or become saturated. Excavations entered by workers must conform to current OSHA requirements (i.e., sloped or braced shoring).

EXPANSIVE SOILS

The results of our subsurface exploration indicate the major portion of the on-site surface and near-surface soils consist of silty sands. Borings D-11 and D-12 encountered clayey sands to depths of approximately 5 to 8½ feet below existing grade. Laboratory testing the on-site silty and clayey sands indicates these soils possess a very low expansion potential when testing in accordance with ASTM D4829 (See figures A1 and A2). Based on the generally granular nature of the soils encountered in our field exploration and results of laboratory testing, it is our opinion that special site preparation or foundation design to mitigate expansive soil will not be required for development of this site.

FILL MATERIAL SUITABILITY

In our opinion, the on-site soils encountered in our test borings are considered suitable for use as engineered fill materials, provided they are free of rubble, debris, roots and organics, and are at a proper moisture content to achieve the desired degree of compaction. Removal of roots, organics, rubble and debris from the on-site soils may require laborers handpicking the fill materials to properly clean the soils prior to allowing their use as engineered fill.

PAVEMENT SUBGRADE QUALITY & SUPPORT

Laboratory test results indicate the near-surface silty sands are moderate quality materials for the support of asphalt concrete pavements with a Resistance ("R") – values of 32 and 78, when tested in accordance with California Test (CT) 301 (see Figures A3 and A4). Based on the natural variation of soils across the site and the anticipated mixing during construction, it is our opinion that a Resistance-value of 30 is considered appropriate for design of pavements at the site.

GROUNDWATER AND SEASONAL WATER

Based upon anticipated groundwater depths, we conclude that the permanent groundwater level should not be a significant factor in design and construction of the structures at this site.

The near-surface soils may be in a near-saturated condition during and for a period of time following the rainy season. If grading operations are to proceed shortly after the rainy season, and before prolonged periods of warm dry weather, the near-surface soils may be at moisture contents where significant aeration or chemical-treatment may be required to dry the soils to moisture content where the specified degree of compaction can be achieved. The contractor should anticipate the additional time and effort necessary to achieve a compactable moisture content.

In addition, soils located beneath existing buildings and pavements, or within or adjacent to irrigated and landscaped areas, will likely be at elevated moisture contents regardless of the time of year of construction and require drying. Wet soils should be anticipated and considered in the construction schedule for this project.

Seasonal moisture and landscape irrigation will result in high soil moisture contents below interior floor slabs throughout their lifetime. Moisture vapor penetration resistance should be a significant consideration in design and construction of interior floor slabs.

SOIL CORROSION POTENTIAL

Three representative samples of the near-surface soils were submitted to Sunland Analytical to determine soil pH, minimum resistivity, chloride and sulfate concentrations to help evaluate potential for corrosive attack upon reinforced concrete and exposed buried metal. The results of the corrosivity testing are summarized in Table 3.

TABLE 3 - SOIL CORROSIVITY TESTING

Analyte	Test Method	Sample Identification		
		D5-1II (3')	D8-1II (2')	D11 (0'-3')
Soil pH	CT 643 Modified*	6.78	7.08	6.90
Minimum Resistivity	CT 643 Modified*	9,110 Ω-cm	7,240 Ω-cm	6,970 Ω-cm
Chloride	CT 417	0.7 ppm	0.7 ppm	2.7 ppm
Sulfate	CT 422	7.9 ppm	4.5 ppm	6.3 ppm

* = Small cell method Ω-cm = Ohm-centimeters ppm = Parts per million

The California Department of Transportation Corrosion Technology Section, Office of Materials and Foundations, Corrosion Guidelines Version 2.1, January 2015, considers a site to be corrosive to foundation elements if one or more of the following conditions exists for the representative soil and/or water samples taken: has a chloride concentration greater than or equal to 500 ppm, sulfate concentration greater than or equal to 2000 ppm, or the pH is 5.5 or less. Based on this criterion, the on-site soils are not considered corrosive to steel reinforcement properly embedded within Portland cement concrete for the samples tested.

Table 19.3.1.1 – *Exposure Categories and Classes*, American Concrete Institute (ACI) 318-14, Section 19.3, as referenced in Section 1904.1 of the 2016 CBC, indicates the severity of sulfate exposure for the samples tested is "not a concern". Ordinary Type I-II Portland cement is considered suitable for use on this project, assuming a minimum concrete cover is maintained over the reinforcement.

Mid Pacific Engineering, Inc. are not corrosion engineers. Therefore, to further define the soil corrosion potential at the site, or to determine the need or design parameters for cathodic protection or grounding systems, a corrosion engineer should be consulted.

Import fills, if used for construction, should be sampled and tested to verify the materials have corrosion characteristics within acceptable limits and generally should be similar to the tested on-site soils.

RECOMMENDATIONS

Based on existing site topography, we anticipate maximum excavations and fills to obtain finished subgrades to be on the order of one to five three, with potentially deeper excavations anticipated for the elevator pits. The recommendations contained in this report are based upon this assumption. We consider it essential that our office review site, grading, and structural foundation plans to verify the applicability of the following recommendations, perform additional investigations, and provide supplemental recommendations, as conditions dictate. Our recommendations are contingent upon our office performing the recommended plan reviews and providing a letter indicating that the recommendations of this report are applicable to the proposed construction.

Specific recommendations for sub-excavations, additional processing and recompaction of the near-surface soils, and those disturbed by site clearing operations, are presented below to promote more uniform support for the planned structures.

The recommendations presented below are appropriate for typical construction in the late spring through fall months. The on-site soils likely will be saturated by rainfall in the winter and spring months, and will not be compactable without drying by aeration or the addition of lime (or a similar product) to dry the soils. Should the construction schedule require work to continue during the wet months, additional recommendations should be provided by the Geotechnical Engineer retained to provide services during construction.

Site Clearing

Prior to site grading, the construction areas should be cleared of all surface and subsurface structures associated with previous development of the site, existing buildings and modular, concrete slabs, foundations, asphalt concrete, undocumented fills, utilities to be relocated or abandoned including all associated backfill, fences, trees, demolition debris, rubbish, rubble, and other deleterious materials. Adequate removal of roots, rubble or debris may require laborers and handpicking to clear the subgrade soils to the satisfaction of our representative, prior to further site preparation. Trees designated for removal should include the rootball and all exposed roots greater than ½-inch in diameter. Existing underground utilities, located within the proposed building pads should be completely removed and/or rerouted as necessary. Removal of underground utilities should include all associated trench backfill. Utilities located outside the building area should be properly abandoned (i.e., fully grouted provided the abandoned utility is situated at least 2½ feet below the final subgrade level to reduce the potential for localized "hard spots"). Where practical, the clearing should extend a minimum of five feet beyond the limits of the proposed improvements and structural areas of the site.

Our representative should be present during clearing, excavation and grading operations to verify adequate removal of existing rubble and debris and determine the need for additional sub-excavation. Any loose, disturbed, soft or otherwise unsuitable materials, should be removed to expose a firm base for the support of the fill needed to restore the areas back to the required grades. Excavations resulting from clearing operations should be left as

shallow dish-shaped depressions for proper location and to allow proper access with compaction equipment during grading operations.

All depressions resulting from the removal of such items, as well as all loose, disturbed or saturated soils in areas of clearing operations, as identified by our representative in the field, should be cleaned out to firm, undisturbed soil, as determined by our representative and should be restored to grade with engineered fill compacted in accordance with the recommendations of this report. It is considered essential that our representative be notified prior to site clearing operations to schedule periodic site visits.

It is very important that our representative be present during clearing operations to verify adequate removal of existing structures and pavements to determine the need for additional over-excavation of areas. If clearing and removal of structures takes place without our direct observation, additional over-excavation of the areas of existing structures and the building pad affected will be required (if sub-excavation isn't chosen). It is important that excavations resulting from clearing operations be left as shallow dish-shaped depressions for proper location and to allow proper access with compaction equipment during grading operations. If this is not the case, deeper over-excavations will be required.

The upper 12 inches of soil subgrades within areas of removed foundations, concrete slabs, flatwork, pavements, and trees should be ripped and cross-ripped to expose any remaining rubble, roots or debris. All exposed rubble, roots and debris should be cleared from the site. Adequate removal of debris may require laborers and handpicking to the clear the subgrade soils to the satisfaction of our on-site representative, prior to further site preparation.

The existing pavements and flatwork (asphalt concrete and concrete) that are not incorporated into the new design should be pulverized and can be re-used in engineered fill construction. Reuse of the pulverized asphalt concrete, when mixed with an adequate volume of soil, is suitable for on-site fills from a geotechnical standpoint. However, reuse of asphalt concrete in building pads is not recommended due to potential environmental concerns, especially if environmental standards change in the future. Portland cement concrete rubble may be used as fill provided it is processed into fragments less than three inches in largest dimension and is mixed with soil to form a compactable mixture.

It has been our experience that subgrade soils under demolished pavements or concrete flatwork, or those soils within or adjacent to landscaped areas likely will be too wet to properly compact and may require drying, probably by aeration depending on site and weather conditions, prior to achieving compaction. Evaluation of the condition and determination of the appropriate drying technique should be made by our representative at the time of construction.

Following removal of existing structures, the site should be stripped of surface vegetation and organically contaminated topsoil; strippings may be re-used in non-structural areas or disposed of off-site. *If used, on-site strippings may be placed in landscape or other non-structural areas, provided they are kept at least five feet from all structural areas (building pads, pavement areas, subgrades supporting exterior concrete flatwork) moisture conditioned and compacted*. Strippings should not be used in landscaped berms that will support either retaining walls or sound walls.

Sub-Excavation

Two-Story Classrooms

Following site clearing operations, if the sub-excavation and recompaction option is chosen for support of the proposed two-story classroom buildings instead of ground improvements, the building pads for the classroom buildings should be excavated to a depth of at least four feet below existing or final grade, or below the planned bottom of foundations, whichever is deeper. The sub-excavation should extend at least five feet beyond the proposed exterior edge of perimeter foundations and should include any exterior columns. The exposed soils then should be ripped and cross-ripped to a depth of at least 12 inches, thoroughly moisture conditioned to at least the optimum moisture content, and uniformly compacted to at least 95 percent of the ASTM D1557 maximum dry density. Disturbed soils or debris encountered during excavation or cross-ripping activities should be removed, and resulting excavation restored to grade with engineered fill compacted in accordance with the recommendations in the ENGINEERED FILL CONSTRUCTION section of this report.

Administration Building Addition and Areas of Removed Structures

Demolition of existing buildings and site clearing operations will disturb the surface and near-surface soils creating loose and variable soil conditions; therefore, we recommend the building addition pad and all structural areas that have been disturbed, or where structures have been removed, be sub-excavated to a minimum depth of 12 inches, processed and re-compacted as engineered fill to promote more uniform support for the planned structures and improvements. Depending on the depth of disturbance, some deeper over-excavations of disturbed and/or saturated soils may be required. As recommended above, the exposed soils then should be ripped and cross-ripped to a depth of at least 12 inches, thoroughly moisture conditioned to at least the optimum moisture content, and uniformly compacted to at least 95 percent of the ASTM D1557 maximum dry density. Disturbed soils or debris encountered during excavation or cross-ripping activities should be removed, and resulting excavation restored to grade with engineered fill compacted in accordance with the recommendations in the ENGINEERED FILL CONSTRUCTION section of this report.

SITE PREPARATION

All structural areas (subgrades supporting buildings, slabs, pavements, etc.) designated to receive fill, remain at-grade, or achieved by excavation should be scarified to a depth of at least 12 inches, thoroughly moisture conditioned to at least the optimum moisture content, and uniformly compacted to not less than 90 percent of the ASTM D1557 maximum dry density.

Compaction operations should be undertaken with a heavy, self-propelled, compactor and should be performed in the presence of our representative who will evaluate the performance of the subgrade under compactive load and identify loose or unstable soils that could require additional excavation and/or compaction. Loose, soft, or unstable soils, as identified by our representative in the field, should be cleaned out to firm, undisturbed and stable soils, as determined by our representative, and should be restored to grade with engineered fill compacted in accordance with the recommendations of this report. Difficulty in achieving subgrade compaction or unusual soil instability may be indications of loose fill associated with past subsurface items. Should these conditions exist, the materials should

be excavated to check for subsurface structures and the excavations backfilled with engineered fill. We recommend construction bid documents contain a unit price (price per cubic yard) for all excess excavation due to loose, soft, or unstable materials and replacement with engineered fill.

Engineered Fill Construction

Engineered fill should be placed in horizontal lifts not exceeding six inches in compacted thickness. Each lift should be thoroughly moisture conditioned to at least the optimum moisture content and uniformly compacted to at least 90 percent of the ASTM D1557 maximum dry density. Each lift of engineered fill should be property benched into adjacent side slopes to remove loose soils and promote uniformity.

The on-site soils will be suitable for use as engineered fill if the materials are at a workable moisture content and free of rubbish, rubble, debris, roots and concentrations of organics, and have a maximum particle size of three inches or less. Removal of roots, organics, rubble and debris from the on-site soils may require laborers handpicking the fill materials to properly clean the soils prior to allowing their use as engineered fill.

Imported fill material, if required, should consist of granular soils or well graded aggregates with a Plasticity Index of 15 or less, an Expansion Index of 20 or less, and should have no particles greater than three inches in maximum dimension. Clean, open graded gravels (such as crushed rock or pea gravel) and other such materials are *not* acceptable for fill construction. The contractor also should supply appropriate documentation for imported fill materials indicating the materials are free of known contamination and have corrosion characteristics within acceptable limits. The imported materials should be sampled, tested, and approved well in advance (at least one week) of being transported to the project site.

The upper 12 inches of final building pad subgrades should be brought to at least the optimum moisture content and uniformly compacted to not less than 90 percent of the maximum dry density, regardless of whether final grade is achieved by excavation, filling or left at existing grade.

The upper six inches of final exterior flatwork subgrades should be scarified, brought to at

least the optimum moisture content, and uniformly compacted to not less than 90 percent of the maximum dry density, as determined by ASTM D1557, regardless of whether final grade is completed by excavation, filling, or left at-grade.

The upper six inches of pavement subgrades and exterior slab subgrades supporting vehicle loadings should be scarified, moisture conditioned to at least the optimum moisture content, processed, and uniformly compacted to at least 95 percent of the maximum dry density, regardless of whether final grade is completed by excavation, filling, or left at existing grade. Final pavement subgrade preparation and compaction should be performed just prior to placement of aggregate base, after construction of underground utilities is complete. The completed pavement subgrades must be stable under construction traffic prior to placement of aggregate base.

Permanent excavation and fill slopes should be constructed no steeper than two horizontal to one vertical (2:1) and should be vegetated as soon as practical following grading to minimize erosion. As a minimum, erosion control measures including placement of straw bale sediment barriers or construction of silt filter fences in areas where surface run-off may be concentrated would be prudent. Slopes should be over-built and cutback to design grades and inclinations.

Site preparation should be accomplished in accordance with the recommendations of this section and appended *Guide Earthwork Specifications* provided in Appendix B. It is essential that a representative of the Geotechnical Engineer be present on a nearly full-time basis during site clearing and preparation and all grading operations to identify unstable soil deposits, observe the earthwork construction, perform compaction testing and verify compliance with our recommendations and the job specifications.

Preliminary Stabilization Recommendations

The soils beneath removed pavements or flatwork or those subgrades located adjacent to landscaped areas, and soils removed from excavations, may be in an over optimum or wet moisture condition, and too wet or unstable to properly compact. If such conditions are exposed, alternate stabilization recommendations will be needed to allow pavement subgrade construction to proceed. The following are preliminary options to help facilitate

pavement construction. Final recommendations can be provided at the time of grading based on the actual field conditions exposed at the time.

Aeration

The first option would be to aerate the wet soils to dry them back to a compactable moisture content. This would involve near continuous scarification and aeration of the upper 12 inches of soils and exposure to the sun and wind for an extended period of time, to provide a better opportunity for drying. Factors influencing the usefulness and applicability of aeration include the depth of saturation and instability, and construction schedule constraints.

Removal and Replacement

Another acceptable alternative would be to completely remove the saturated/unstable soils to expose a firm, stable base and replace them to design soil subgrade elevation with dry, on-site or imported granular soils or Class 2 aggregate base (AB) (or on-site pavement grindings, where applicable) placed and properly compacted as engineered fill. The actual lateral extent and depth of excavation needed for stabilization will depend upon the observed soil conditions at the time of excavation and should be anticipated to be variable.

Mechanical Stabilization (Geogrid)

An alternative to complete removal of the unstable soils within pavement areas would be to excavate, as a minimum, an additional 12 to 18 inches of soils below the soil subgrade elevation, place a geogrid soil reinforcement (Tensar BX1100 or better) over the exposed soils and backfill to the design AB grades with Class 2 aggregate base. During excavation it is essential that our representative be present to help identify isolated areas of obviously deeper deposits of wet and very unstable soils that may require deeper sub-excavation, prior to placing geogrid.

With this option, backfill below a planned pavement subgrade elevation can be either Class 2 AB or approved on-site grindings; however, all backfill above the planned pavement soil subgrade elevation must be Class 2 AB.

Aggregate base (or approved grindings) used for stabilization should be compacted in thin lifts to at least 95 percent of the ASTM D1557 maximum dry density at a uniform moisture content near the optimum.

Utility Trench Backfill

Utility trench backfill within structural areas should be mechanically compacted as engineered fill in accordance with the following recommendations. We recommend that native soil be used as trench backfill within the perimeter of the building foundations to help minimize soil moisture variations beneath the structures. The native soil backfill should extend at least three feet horizontally beyond perimeter foundation lines. Utility trench backfill should be placed in maximum six-inch lifts, moisture conditioned to near the optimum moisture content, and mechanically compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557.

We recommend that underground utility trenches that are aligned nearly parallel with foundations be at least three feet laterally from the outer edge of foundations, wherever possible. As a general rule, trenches should not encroach into the zone extending outward at a 1:1 inclination below the bottom of the foundations. Additionally, trenches parallel to foundations should not remain open longer than 72 hours. The intent of these recommendations is to prevent loss of both lateral and vertical support of foundations, resulting in possible settlement.

Foundation Design

We are providing design soil values for the analysis of the foundations, and suggested minimums for dimensions, but only from a Geotechnical Engineering perspective. The project Structural Engineer should determine final foundation width and depth dimensions, concrete strengths, and reinforcement requirements, based on their specific structural design which should include an appropriate factor of safety applied to the overall design.

Two-story Classroom Foundations: Ground Improvement – Compacted Aggregate Piers

The planned two-story class room buildings may be supported upon continuous perimeter foundations and interior continuous and isolated spread foundations constructed on soils that have been improved by CAP's, or other similar ground improvement system. Foundations should be embedded at least 18 inches below lowest adjacent soil grade. Lowest soil grade shall be either the compacted exterior soil grade or the surface of the finished pads, whichever is lower. Continuous foundations should be at least 12 inches wide; isolated spread foundations should maintain a minimum 24-inch width dimension. To provide a lateral barrier to moisture migration beneath the structures it is crucial that the perimeter foundation be continuous around the entire structures.

Specific recommendations for design allowable bearing pressures should be developed by the CAP designer. Based on our experience, it is possible that allowable bearing capacities on the order of approximately 4000 pounds per square foot (psf) for dead plus live loads can be achievable with the compacted aggregate pier (or similar) ground improvement system. A specialty contractor should be retained for the design and installation of the ground improvement system. Load testing of the ground improvement systems must be performed to verify the maximum and allowable bearing capacities presented in this report. Because most of the ground improvement systems are proprietary systems, the specialty contractor should work with the structural engineer to determine the appropriate number, depth, and spacing of improvement elements, based on the anticipated structural loads and their experience with similar soil conditions.

Two-story Classroom Foundations: Sub-Excavation and Recompaction Option

Provided the building pads are sub-excavated and recompacted to provide at least four feet of engineered fill beneath the bottoms of the planned foundations, the proposed two-story classroom buildings may be supported on conventional shallow foundations extending at least 18 inches below building pad soil subgrade, or lowest adjacent soils grade, whichever is deeper. For this project, the building pad soil subgrade shall be defined as the surface on which the capillary break gravel is placed. Continuous foundations should be at least 12 inches wide and isolated spread foundations should be at least 24 inches wide.

Foundations so established may be sized for a maximum allowable soil bearing pressures of 2500 pounds per square foot (psf) for dead plus live load, with a 1/3 increase to include wind or seismic forces. The weight of foundation concrete extending below adjacent grade may be disregarded in sizing computations.

To provide a lateral barrier to moisture migration beneath the structures it is crucial that the perimeter foundation be continuous around the entire structures.

We recommend that all foundations be adequately reinforced to provide structural continuity, mitigate cracking and permit spanning of local soil irregularities. The structural engineer should determine final foundation reinforcing requirements. However, *as a minimum,* we recommend that continuous foundations be reinforced with two No. 4 steel reinforcing bars, placed one each near the top and bottom of the foundations. The project designer should determine the need for additional reinforcement based on structural requirements, including the use of slab ties to provide structural continuity and integrity of the slab and foundation system.

Resistance to lateral displacement of shallow foundations may be computed using an allowable friction factor of 0.30 multiplied by the effective vertical load on each foundation. Additional lateral resistance may be achieved using an allowable passive earth pressure against the vertical projection of the foundation equal to an equivalent fluid pressure of 300 psf per foot of depth. These two modes of resistance should not be added unless the frictional component is reduced by 50 percent since mobilization of the passive resistance requires some horizontal movement, effectively reducing the frictional resistance.

Foundation excavations should be observed by a representative of MPE to verify competent and uniform bearing conditions and evaluate the need for any modifications to these recommendations as may be required by specific circumstances. The observations should take place prior to placement of reinforcing steel but following cleaning of the excavations. To account for any re-compaction of foundation bottoms or deepening of foundations that might be required, we suggest bid documents include a unit price for additional compaction or foundation excavation and concrete that may be required.

Uplift resistance of the foundations can be provided by weight of the concrete extending below soil grade (150 pcf) and a friction value of 150 psf applied to the sides of the foundations in contact with the soils below lowest adjacent grade.

We must review the project plans when complete to verify the applicability of our recommendations, and determine the need for modified or revised recommendations.

Building Addition Foundations

We assume the new administration building addition will abut the existing administration building and may be structurally connected. New foundation may be designed using the design parameters contained above. Our office should review the final plans to determine if additional or revised recommendations are needed.

In general, new foundations constructed adjacent to existing foundations should extent at least to the bottom of, or below, the existing foundations. In addition, the project designer should determine the need for, and design of, dowelling of new and existing slabs, and doweling of new and existing foundations. The size and depth of existing foundations are not known and as-built drawings are not available; therefore, additional investigation and/or research may be needed to determine the locations, type, depth and size of the existing foundations.

It is an essential requirement that foundation excavations for the building addition be observed by a representative of MPE to verify competent and uniform bearing conditions and evaluate the need for any modifications to these recommendations as may be required by specific circumstances.

RETAINING STRUCTURES AND ELEVATOR PIT

We should review the final plans to verify the applicability of the following preliminary recommendations. Retaining walls capable of slight rotation about their base (unrestrained at the top or sides) should be capable of resisting an "active" lateral earth pressure equal to an equivalent fluid pressure of 40 psf per foot of wall backfill for horizontal backfill conditions. Retaining walls, including those for the below grade elevator pit, that are fixed at the top should be capable of resisting an "at-rest" lateral earth pressure equal to an

equivalent fluid pressure of 60 psf per foot for horizontal backfill conditions. For retaining walls with backfill sloped at a gradient no steeper than 2:1 (horizontal to vertical), add 20 psf per foot of depth to the values provided above.

Retaining walls could experience additional surcharge loading if vehicles are parked or at-grade foundations are constructed within a one horizontal to one vertical (1:1) projection from the bottom of the retaining wall. Surcharge loading under these circumstances should be evaluated on a case-by-case basis.

Provided site earthwork is performed as recommended, foundations may be designed as follows: Retaining wall foundations should extend at least 12 inches below soil grade and can be designed utilizing the parameters provided in the FOUNDATION DESIGN section of this report.

Retaining walls should be fully drained to prevent the build-up of hydrostatic pressure behind the wall. Retaining walls should be provided with a drainage blanket (Class 2 permeable material, Caltrans Specification Section 68-2.02F(3)) at least one foot wide extending from the base of wall to within one foot of the top of the wall. The top foot above the drainage layer should consist of compacted on-site materials, unless covered by a slab or pavement. Weep holes or perforated rigid pipe should be provided near the base of the wall to allow drainage of accumulated water. Drain pipes, if used, should slope to discharge at no less than a one percent fall to suitable drainage facilities. Open-graded ½-to ¾-inch crushed rock may be used in lieu of the Class 2 permeable material, if the rock and drain pipe are completely enveloped in an approved non-woven geotextile filter fabric.

Structural backfill materials for retaining walls and structures, other than the drainage layer, should consist of on-site or imported granular soils free of significant quantities of rubbish, rubble, organics and rock over three inches in size. Structural backfill should be placed in lifts not exceeding six inches in compacted thickness, and should be mechanically compacted to at least 90 percent relative compaction. Final detailing of wall drainage should be provided by the designer of the retaining wall.

INTERIOR FLOOR SLAB SUPPORT

Interior concrete slab-on-grade floors can be suitably supported upon the soil subgrades prepared in accordance with the recommendations in this report and maintained in that condition (at or near optimum conditions). The project designer should determine the final dimensions and reinforcement based on structural requirements. We are providing suggested minimums for dimensions, but only from a Geotechnical Engineering perspective. The project Structural Engineer should determine final dimensions and reinforcement for the slabs, and the need for slab ties between the foundation and the slab.

Interior concrete slab-on-grade floors should be at least four inches thick and, as a guide minimum, should be reinforced with chaired No. 3 reinforcing bars on 18-inch center-to-center spacing, located at mid-slab depth. It is emphasized that thicker slabs with greater reinforcing will be needed in areas supporting higher loads or where increased performance is desired. *The Architect or Structural Engineer should determine the final thickness, strength, reinforcement, and joint spacing of slab-on-grade concrete based on anticipated slab loadings, proposed uses and Owner's performance expectations.* Temporary loads exerted during construction should be considered in the design of the slab-on-grade floors. Proper and consistent location of the reinforcement at mid-slab is essential to its performance. The risk of uncontrolled shrinkage cracking is increased if the reinforcement is not properly located within the slab.

Floor slabs that will receive moisture sensitive floor covering may be underlain by a layer of free-draining crushed rock, serving as a deterrent to migration of capillary moisture. The crushed rock layer should be at least four inches thick and graded such that 100 percent passes a one-inch sieve and none passes a No. 4 sieve. Additional moisture protection may be provided by placing a plastic water vapor retarder (at least 10-mils thick) directly over the crushed rock. The plastic water vapor retarder should meet or exceed the minimum specifications as outlined in ASTM E1745. Consideration should be given to using a thicker, higher quality membrane for additional moisture protection such as a 15-mil thick Stego vapor barrier or other product. The membrane should be installed so that there are no holes or uncovered areas. All seams should overlap and be sealed with manufacturer-approved tape, continuous at the laps to create vapor tight conditions. All perimeter edges of the membrane, such as pipe penetrations, interior and exterior footings, joints, etc., should be

sealed or caulked per manufacturer's recommendations. An optional, thin layer of clean sand above the membrane is acceptable, as an aid to curing of the slab concrete.

Floor slab construction over the past 25 years or more has included placement of a thin layer of sand over the vapor retarder membrane. The intent of the sand is to aid in the proper curing of the slab concrete. However, recent debate over excessive moisture vapor emissions from floor slabs includes concern for water trapped within the sand. As a consequence, we consider the use of the sand layer as optional. The concrete curing benefits should be weighed against efforts to reduce slab moisture vapor transmission.

The recommendations presented above are intended to mitigate any significant soils-related cracking of the slab-on-grade floors. More important to the performance and appearance of a Portland cement concrete slab is the quality of the concrete, the workmanship of the concrete contractor, the curing techniques utilized and the spacing of control joints.

Floor Slab Moisture Penetration Resistance

It is considered likely that floor slab subgrade soils will become wet to near-saturated at some time during the life of the structures. This is a certainty when slabs are constructed during the wet seasons or when constantly wet ground or poor drainage conditions exist adjacent to structures. For this reason, it should be assumed that all slabs in occupied areas, as well as those intended for moisture-sensitive floor coverings or materials, require protection against moisture or moisture vapor penetration. Standard practice includes the gravel and water vapor retarder as suggested above. However, the gravel and plastic membrane offer only a limited, first-line of defense against soil-related moisture. Recommendations contained in this report concerning foundation and floor slab design are presented as *minimum* requirements, only from the Geotechnical Engineering standpoint.

It is emphasized that the use of sub-slab crushed rock and water vapor retarder will not "moisture proof" the slab, nor does it assure that slab moisture transmission levels will be low enough to prevent damage to floor coverings or other building components. If increased protection against moisture vapor penetration of slabs is desired, a concrete moisture protection specialist should be consulted. The Architect and design team should consider all available measures for slab moisture protection. It is commonly accepted that

maintaining the lowest practical water-cement ratio in the slab concrete is an effective way to help reduce future moisture vapor penetration of the completed slabs.

EXTERIOR FLATWORK (NON-PAVEMENT AREAS)

Subgrades to receive exterior concrete flatwork (i.e., sidewalks, patios, etc.) should be scarified 6 inches, moisture conditioned to at least the optimum moisture content and uniformly compacted to not less than 90 percent of the maximum ASTM D1557 dry unit weight, immediately prior to the placement of the concrete. Proper moisture conditioning of the subgrade soils is considered essential to the performance of the exterior flatwork. All engineered fill placed under flatwork should be compacted as recommended in the ENGINEERED FILL CONSTRUCTION section of this report. A leveling course of crushed gravel may be placed for support of the concrete; however, the gravel should not exceed six inches in thickness.

Expansion joints should be provided to allow for minor vertical movement of the flatwork. Exterior flatwork should be constructed independent of perimeter building foundations by the placement of a layer of felt material between the flatwork and the foundation. Consideration should be given to thickening the outer edges of sidewalks to at least twice the slab thickness.

The architect or project civil engineer should determine the final thickness, strength, reinforcement, and joint spacing of exterior slab-on-grade concrete; however, we offer the following suggested minimum guidelines. Reinforcement should consist of steel reinforcing bars, placed mid-depth of the slab. Edges thickened to at least twice the slab thickness may be constructed along the perimeter of exterior slabs where intermittent light loading is expected over the slabs. Slabs receiving wheeled traffic should be designed as pavements and be appropriately thickened and reinforced. For increased support and performance, the exterior slabs may be underlain by a minimum four inches of Class 2 aggregate compacted to 95 percent relative compaction.

Proper and thorough moisture conditioning of subgrade soils is important to reduce the risk of non-uniform moisture withdrawal from the concrete and the possibility of plastic

shrinkage cracks. Practices recommended by the Portland Cement Association (PCA) and the American Concrete Institute (ACI) for proper placement and curing of concrete, as well as for joint spacing and construction, should be followed during exterior concrete slab construction.

Site Drainage

Site drainage should be accomplished to provide positive drainage of surface water away from the buildings and prevent ponding of water adjacent to structures. The grade adjacent to the structures should be sloped away from foundations at a minimum two percent. Proper control of surface water drainage is essential to the performance of foundations, slabs-on-grade and pavements. We recommend using full-roof gutters, with downspouts from roof drains connected to rigid non-perforated piping directed to an appropriate drainage point away from the structures, or discharging onto paved surfaces leading away from the structures and foundations. Concentrated storm water discharge collected from roof downspouts or surface drains should not be allowed to drain on unprotected slopes adjacent to structures. Finished grades should be graded to drain positively away from all pavement and building structures. Ponding of surface water should be avoided near foundations and pavements. Landscape berms, if planned, should be constructed in such a manner as to promote drainage away from the buildings. All excavations should be protected from concentrated storm water run-off to minimize potential erosion. Ponding of surface water or allowing sheet flow of water over any open excavation must be avoided.

Pavement Design Recommendations

Based on the anticipated traffic loads, we are providing pavement designs for Traffic Indices (TI's) of 4.5, 6.0 and 7.0. The following pavement sections presented in Table 4 have been calculated based on an R-value of 30, the assumed TI's, and the procedures contained within Chapters 600 to 670 of the 6th Edition of the California Highway Design Manual. The project civil engineer should determine the appropriate traffic index based on anticipated traffic conditions. Additional pavement sections can be provided upon request.

TABLE 4 - ASPHALT CONCRETE PAVEMENT DESIGN ALTERNATIVES

Traffic Index (TI)	Traffic Condition	Untreated Pavement Subgrade R-value = 30	
		Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
4.5	Automobile Parking Only	2½	6
		3*	5
6.0	Driveways / Fire Lanes	2½	10
		3½*	8
7.0	Bus Lanes	3	12
		4*	10

* = Asphalt concrete thickness includes the Caltrans Safety Factor.

We emphasize that the performance of pavements is critically dependent upon adequate and uniform compaction of the subgrade soils, including utility trench backfill within the limits of the pavements.

It has been our experience that pavement failures may occur where a non-uniform or disturbed subgrade soil condition is created. Subgrade disturbances can result if pavement subgrade preparation is performed prior to underground utility construction and/or if a significant time period passes between subgrade preparation and placement of aggregate base. Therefore, we recommend that pavement subgrade preparation, i.e. scarification, moisture conditioning and compaction, be performed **just prior** to aggregate base placement.

The upper six inches of final pavement subgrades should be uniformly moisture conditioned to at least the optimum moisture content and compacted to at least 95 percent relative compaction. Pavement subgrades should be proof-rolled with a loaded water truck and must be stable under construction traffic prior to placement of aggregate base. All aggregate base (AB) should be compacted to at least 95 percent of the maximum dry

density. The AB should be proof rolled with a loaded water truck. Any areas of observed instability should be stabilized and recompacted as necessary to achieve the compaction requirements above. Earthwork construction within the limits of the pavements should be performed in accordance with the recommendation contained within this report. Materials quality and construction of the structural section should conform to the applicable provisions of the Caltrans Standard Specifications, latest editions.

In the summer heat, high axle loads coupled with shear stresses induced by sharply turning tire movements can lead to failure in asphalt concrete pavements. Therefore, we recommend that consideration be given to using a Portland cement concrete (PCC) section in areas subjected to concentrated heavy wheel loading, such as entry driveways, truck maneuvering areas, and in front of trash enclosures. At the time this report was prepared, the need for, and locations of, PCC pavements had not yet been determined. Therefore, when more information is available regarding uses, loading and potential subgrade conditions, we should review the information and provide specific thicknesses as applicable. For preliminary purposes, it may be assumed that Portland cement concrete slabs in areas of entry driveways, truck maneuvering areas, and in front of trash enclosures should be at least 6 inches thick and be underlain by at least 6 inches of 95 percent compacted Class 2 aggregate base. Thicker slabs will be needed in areas of frequent bus traffic, in heavy duty areas, or areas subjected to high traffic frequencies by heavy trucks or equipment. In these areas, Portland cement concrete slabs with a minimum thickness of 7 inches and underlain by at least 6 inches of 95 percent compacted Class 2 aggregate base may be needed. These sections are preliminary and subject to revision based on review of additional information regarding loadings and traffic frequencies.

We suggest the concrete slabs be constructed with thickened edges in accordance with American Concrete Institute (ACI) design standards. Reinforcing for crack control, if desired, should consist of No. 4 reinforcing bars placed on maximum 24-inch centers each way throughout the slab. Reinforcement must be located at mid-slab depth to be effective. Construction of Portland cement concrete pavements should be performed in accordance with applicable American Concrete Institute (ACI) or PCA standards. Portland cement concrete utilized in pavements should attain a compressive strength of at least 3500 psi at 28 days.

Pavement Drainage

Efficient drainage of all surface water to avoid infiltration and saturation of the supporting aggregate base and subgrade soils is important to pavement performance. Consideration should be given to using full-depth curbs between landscaped areas and pavements to serve as a cut off for water that could migrate into the pavement base materials or subgrade soils. Geotextile water barriers also could be used to prevent migration of water into pavement base materials, if extruded curbs are used. Proprietary geotextile moisture barriers and curb details should be reviewed and approved by our office prior to construction. Weep holes are recommended in parking lot drop inlets to allow accumulating water moving through the aggregate base to drain from beneath the pavements.

Earthwork construction within the limits of the pavements should be performed in accordance with the recommendation contained within this report.

EARTHWORK TESTING AND OBSERVATION

Site preparation should be accomplished in accordance with the recommendations of this report and the appended *Guide Earthwork Specifications*. Representatives of Mid Pacific Engineering, Inc. must be present during site preparation and all grading operations to observe and test the fills to verify compliance with our recommendations and the job specifications. In the event that MPE is not retained to provide geotechnical engineering observation and testing services during construction, the Geotechnical Engineer retained to provide this service should indicate in writing that they agree with the recommendations of this report, and prepare supplemental recommendations as necessary.

A final report by the "Geotechnical Engineer" should be prepared upon completion of the project indicating compliance with or deviations from this report and the project plans and specifications. Please be aware that the title Geotechnical Engineer is restricted in the State of California to a Civil Engineer authorized by the State of California to use the title "Geotechnical Engineer."

FUTURE SERVICES

We recommend that our firm be given the opportunity to review the final plans and specifications to verify that the intent of our recommendations has been implemented in those documents. Testing and approval of proposed import sources is an essential requirement to qualify the proposed soils for use as engineered fill for this project. This sampling and testing should be completed well in advance of the proposed start of construction.

LIMITATIONS

Our recommendations are based upon the information provided regarding the proposed construction, combined with our analysis of site conditions revealed by the field exploration and laboratory testing programs. We have used our best engineering judgment based upon the information provided and the data generated from our investigation. This report has been prepared in accordance with generally accepted standards of practice existing in northern California at the time of the report. No warranty, either express or implied, is provided.

If the proposed construction is modified or re-sited; or, if it is found during construction that subsurface conditions differ from those we encountered at the boring locations, we should be afforded the opportunity to review the new information or changed conditions to determine if our conclusions and recommendations must be modified. Mid Pacific Engineering, Inc., should be retained to review the final plans and specifications to verify that the intent of our recommendations has been implemented in those documents.

We emphasize that this report is applicable only to the proposed construction and the investigated site and should not be utilized for construction on any other site. The conclusions and recommendations of this report are considered valid for a period of two years. If design is not completed and construction has not started within two years of the date of this report, the report must be reviewed and updated, as necessary.

Mid Pacific Engineering, Inc.

Martin S. Osier, EIT
Staff Engineer

Daniel E. Kramer, CEG
Engineering Geologist

Daniel C. Smith, GE
Principal Engineer

FIGURES

NOTES: Adapted from USGS *Lodi North Quadrangle, California – San Joaquin County*, 7.5-Minute Series, 2015.

MPE
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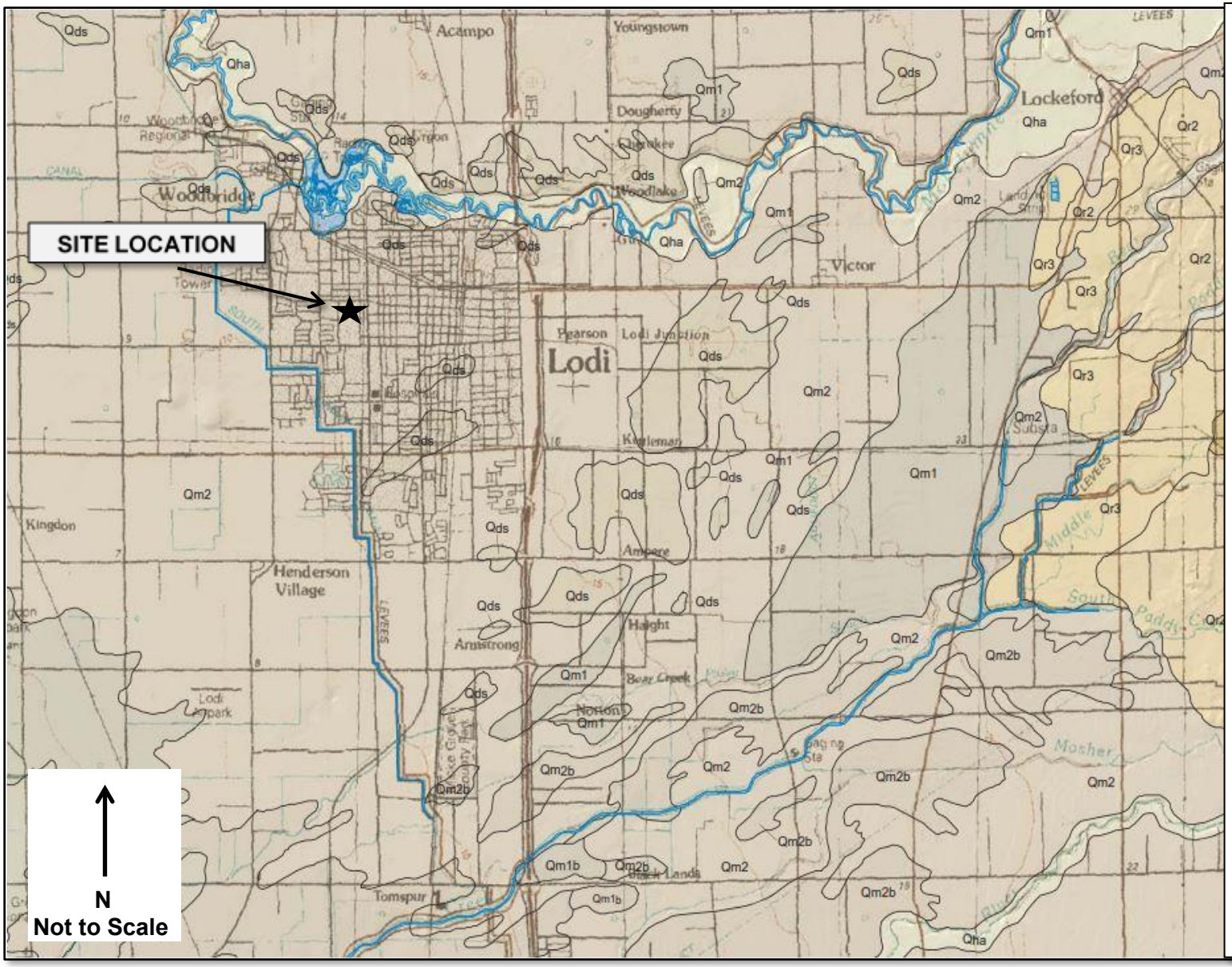
VICINITY MAP
LODI HIGH SCHOOL IMPROVEMENTS
3 South Pacific Avenue
Lodi, California

FIGURE 1
Date: 08/18
MPE No. 03849-01



EXPLANATION

Surficial Deposits

af - Artificial fill

Qhc - Stream channel deposits

Qhbm - Estuarine deposits

Qha - Holocene Alluvium, undivided

Qa - Alluvium

Qhf- Alluvial fan deposits

Qls - Landslide deposits

Modesto Formation

Qm - Undivided

Qm2 - Upper member, undivided alluvium

Qm2b – Upper member, fine-grained

Qm1 – Lower member, undivided alluvium

Qm1b - Lower member, fine-grained

Riverbank Formation

Qr - Undivided

Qr3 - Upper unit

Qr2 - Middle unit

Qr1 - Lower unit

GEOLOGIC MAP SYMBOLS

Geologic contact

Fault

Adapted from the *Preliminary Geologic Map of the Lodi 30 x 60 Minute Quadrangle, California* (Timothy E. Dawson, CGS, 2009).

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REGIONAL GEOLOGIC MAP

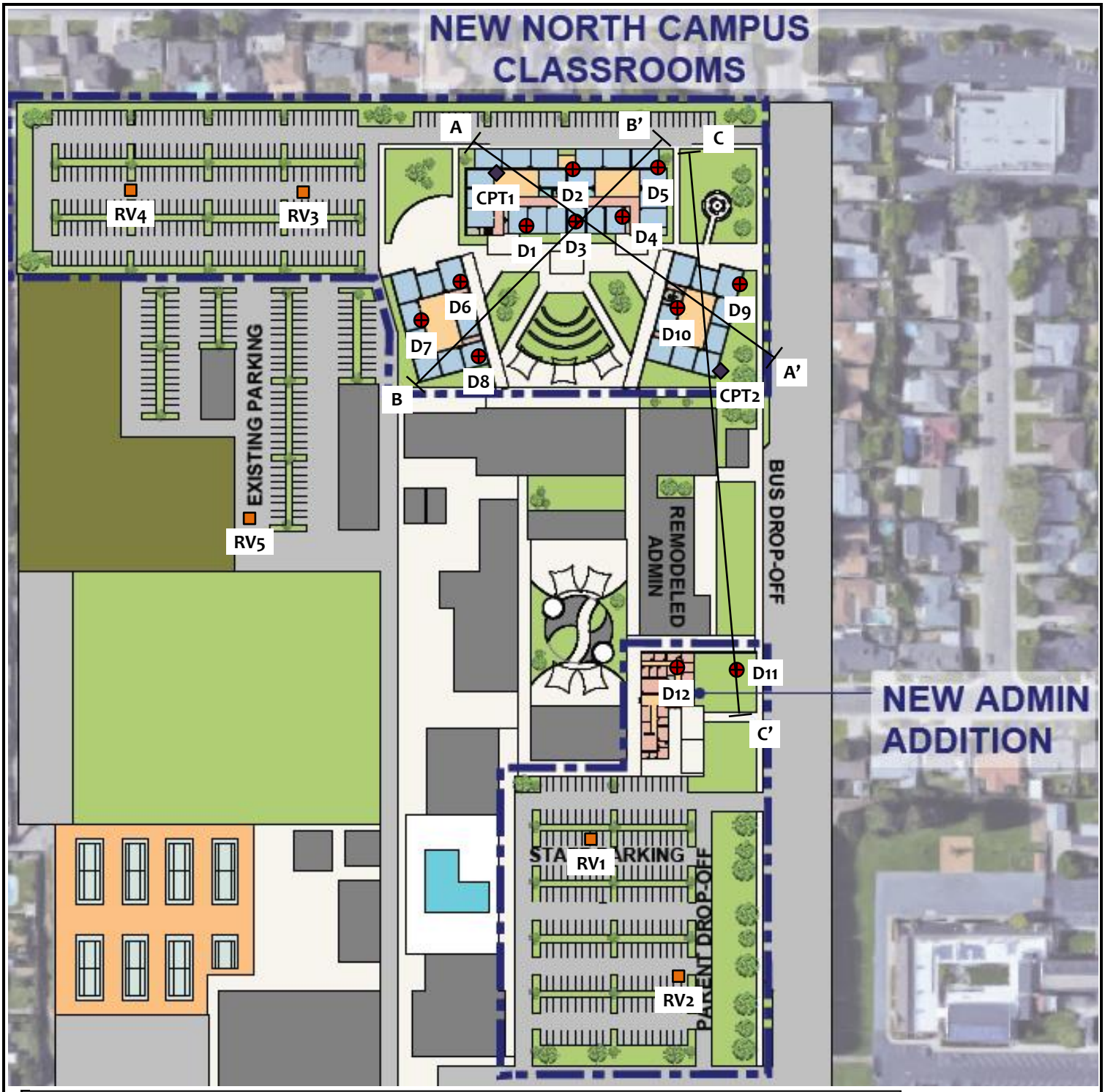
LODI HIGH SCHOOL IMPROVEMENTS

3 South Pacific Avenue
Lodi, California

FIGURE 2

Date: 08/18

MPE No. 03849-01



EXPLANATION

D1 — Approximate Boring Location (MPE 2018)

RV1 — Approximate R-Value Location (MPE 2018)

CPT1 — Approximate CPT Location (MPE 2018)

A A' — Geologic Cross Sections

NORTH
1" = 360'

NOTES: Adapted from the April 6, 2018, *Lodi High School Improvements Proposed Site Plan*, prepared by PBK.

MPE
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SITE PLAN

LODI HIGH SCHOOL IMPROVEMENTS
3 South Pacific Avenue
Lodi, California

FIGURE 2
Date: 08/18
MPE No. 03849-01

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D1 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	16½ Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			2" Asphalt Concrete						
			Brown, moist, loose, silty fine sand (SM)						
					D1-1	6	9.2	93	%-200 42.0
40	5		poorly cemented, medium dense		D1-2	23			
35	10		fine to medium		D1-3	18			%-200 8.5
			Light brown, moist, poorly graded, fine to coarse sand with silt (SP-SM)						
30	15				D1-4	31	3.8	103	
25	20								
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D2 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	15 Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			2" Asphalt Concrete						
			Brown, moist, loose, silty fine sand (SM)						
					D2-1	7	7.4	102	
			increased silt content with depth		D2-2	7	10.2	104	%-200 37.2
40	5								
			orangish/light grayish brown, medium dense		D2-3	19	8.6	99	
			dense		D2-4	45			
35	10								
			with coarse sand, medium dense		D2-5	26			
30	15								
25	20								
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D3 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	20 Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			2" Asphalt Concrete						
			Dark brown, moist, loose, silty fine sand/fine sandy silt (SM)						
					D3-1	8	5.2	100	%-200 29.8
			very loose		D3-2	4	6.6	99	
40	5								
			loose		D3-3	7			Triax Φ=28 C=300
			brown/reddish brown, medium dense, fine to medium sandy		D3-4	30			
35	10								
			brown		D3-5	31			
30	15								
					D3-6	28			
25	20								
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D4 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	16½ Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			2" Asphalt Concrete						
			Brown, moist, loose, silty fine sand (SM)						
					D4-1	7	9.5	109	
40	5				D4-2	11	5.8	106	
			medium dense						
35	10				D4-3	31			%-200 30.0
30	15				D4-4	29	4.2	101	%-200 5.8
			Brown, medium dense, poorly graded fine to medium sand with silt (SP-SM)						
25	20								
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D5 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	26½ Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			2" Asphalt Concrete						
			Brown, moist, loose, silty fine sand (SM), with some clay						
					D5-1	7	11.4	105	
40	5		fine to medium sandy, no clay		D5-2	10	9.1	105	
35	10		slightly clayey, medium dense		D5-3	29			
30	15		with coarse grains		D5-4	25			
			Brown, moist, hard, sandy, clayey silt (ML)						
25	20				D5-5	50/6"			
20	25		light reddish brown, variably cemented		D5-6	61			

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D6 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	21½ Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Light brown, moist, loose, silty fine sand (SM), with some clay						
					D6-1	7	9.7	107	%-200 39.3
40	5		medium dense		D6-2	20			
			no clay						
35	10				D6-3	34			%-200 26.0
30	15		with white mottling		D6-4	30			
			Reddish brown, moist, hard, clayey silt (ML)						
25	20				D6-5	50/6"			
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D7 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	15 Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			2" Asphalt Concrete						
			Brown, moist, loose, silty fine sand (SM)						
					D7-1	10	7.3	102	%-200 27.4
					D7-2	6	9.0	101	
40	5								
			Light brown, moist, medium dense, poorly graded fine sand (SP)						
					D7-3	19	4.5	100	%-200 2.8
35	10								
			grayish/light brown		D7-4	27			
30	15								
25	20								
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D8 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	25 Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			2" Asphalt Concrete						
			Dark brown, moist, loose, silty sand (SM)						
					D8-1	10			%-200 26.2
			brown		D8-2	6	6.4	98	
40	5				D8-3	6			
			less silty		D8-4	14	8.8	98	
35	10								
			Light brown, moist, medium dense, poorly graded fine sand with silt (SP-SM)						
					D8-5	20			%-200 6.7
30	15								
			medium sandy		D8-6	32			
25	20								
			Brown, moist, loose, silty fine sand (SM)						
					D8-7	8	8.7	96	
20	25		Brown, moist, loose, clayey sand (SC)						

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D9 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	15 Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			2" Asphalt Concrete						
			Brown, moist, loose, silty fine sand (SM)						
					D9-1	6	8.8	99	
					D9-2	6	23.5	100	%-200 35.6
40	5				D9-3	12			
					D9-4	12			
35	10								
			light brown, dense		D9-5	50/6"			
30	15								
25	20								
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D10 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	21½ Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			2" Asphalt Concrete, 4" Aggregate Base, 3" Fill						
			Light brown, moist, loose, silty fine sand(SM-FILL)						
			Brown, moist, loose, silty fine sand (SM)						
					D10-1	6	7.7	111	%-200 27.5
40	5		brown		D10-2	13			
35	10		brown/light reddish brown, medium dense		D10-3	35			
			light brown						
30	15				D10-4	25			
			Light brown, moist, dense, fine sandy silt (ML)						
25	20				D10-5	39			
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D11 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	16½ Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Dark brown, very moist, loose, clayey fine sand (SC)						
					D11-1	7	14.3	114	
40	5		brown, medium dense		D11-2	30			
			Light grayish brown, moist, medium dense, silty fine sand (SM)						
35	10				D11-3	31			%-200 27.7
30	15		reddish brown, dense		D11-4	57			
25	20								
20	25								

Project: Lodi High School Improvements Project Location: 3 South Pacific Avenue Lodi, California 95242 MPE Number: 03849-01	LOG OF SOIL BORING D12 Sheet 1 of 1

Date(s) Drilled	7/12/2018	Logged By	SC	Checked By	MSO
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	6 Feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	+ 45 Feet MSL
Groundwater Depth [Elevation], feet	Not Encountered	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, clayey sand (SC)						
40	5		Brown, moist, silty fine sand (SM)						
35	10								
30	15								
25	20								
20	25								

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel - sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM		Silty gravels, gravel - sand - silt mixtures
		GC		Clayey gravels, gravel - sand - silt mixtures
	SANDS (50% or more of coarse fraction < no. 4 sieve size)	SW		Well graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand - silt mixtures
		SC		Clayey sands, sand clay mixtures
FINE GRAINED SOILS (More than 50% of soil < no. 200 sieve size)	SILTS & CLAYS LL< 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL		Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
		OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL ≥ 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler

= Hand Driven Sample

=SPT Sampler

= Initial Water Level

= Final Water Level

= Estimated or gradational material change line

= Observed material change line

Laboratory Tests

PI = Plasticity Index
EI =Expansive Index
UCC = Unconfined Compression Test
TR = Triaxial Compression Test
GR = Gradation Analysis (Sieve)
K = Permeability Test

GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse (c) fine (f)	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse (c) Medium (m) fine (f)	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

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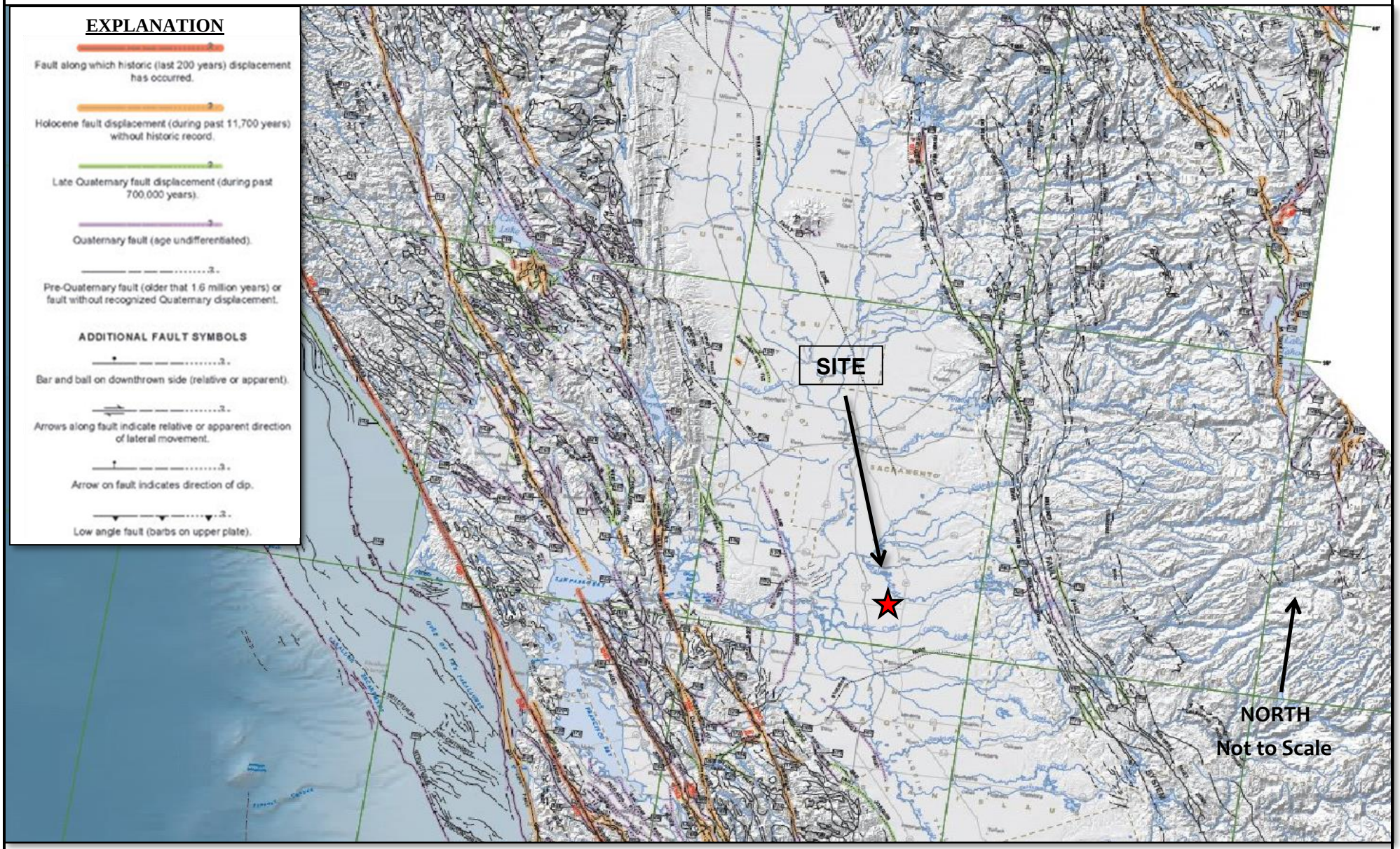
UNIFIED SOIL CLASSIFICATION SYSTEM
LODI HIGH SCHOOL IMPROVEMENTS
3 South Pacific Avenue
Lodi, California

FIGURE 16
Date: 08/18
MPE No. 03849-01



Adapted from: *Fault Activity Map of California 2010.* California Geological Survey, Geologic Data Map No. 6. Compilation and Interpretation by C.W. Jennings and W.A. Bryant

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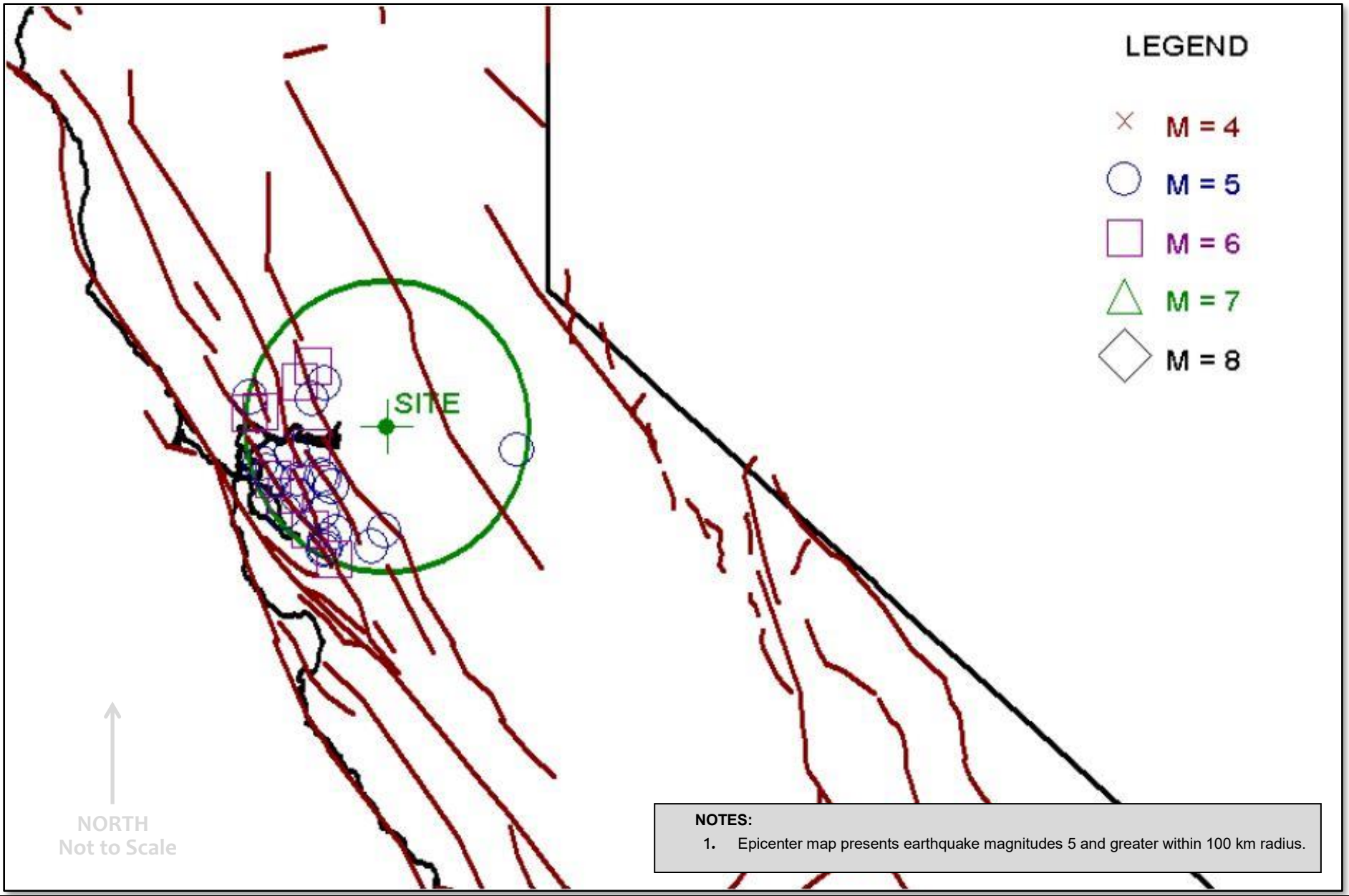
REGIONAL FAULT MAP

LODI HIGH SCHOOL IMPROVEMENTS
3 S. Pacific Avenue
Lodi, California

FIGURE 13
Date: 8/18
MPE No. 03849-01



NOTES:

1. Epicenter map presents earthquake magnitudes 5 and greater within 100 km radius.

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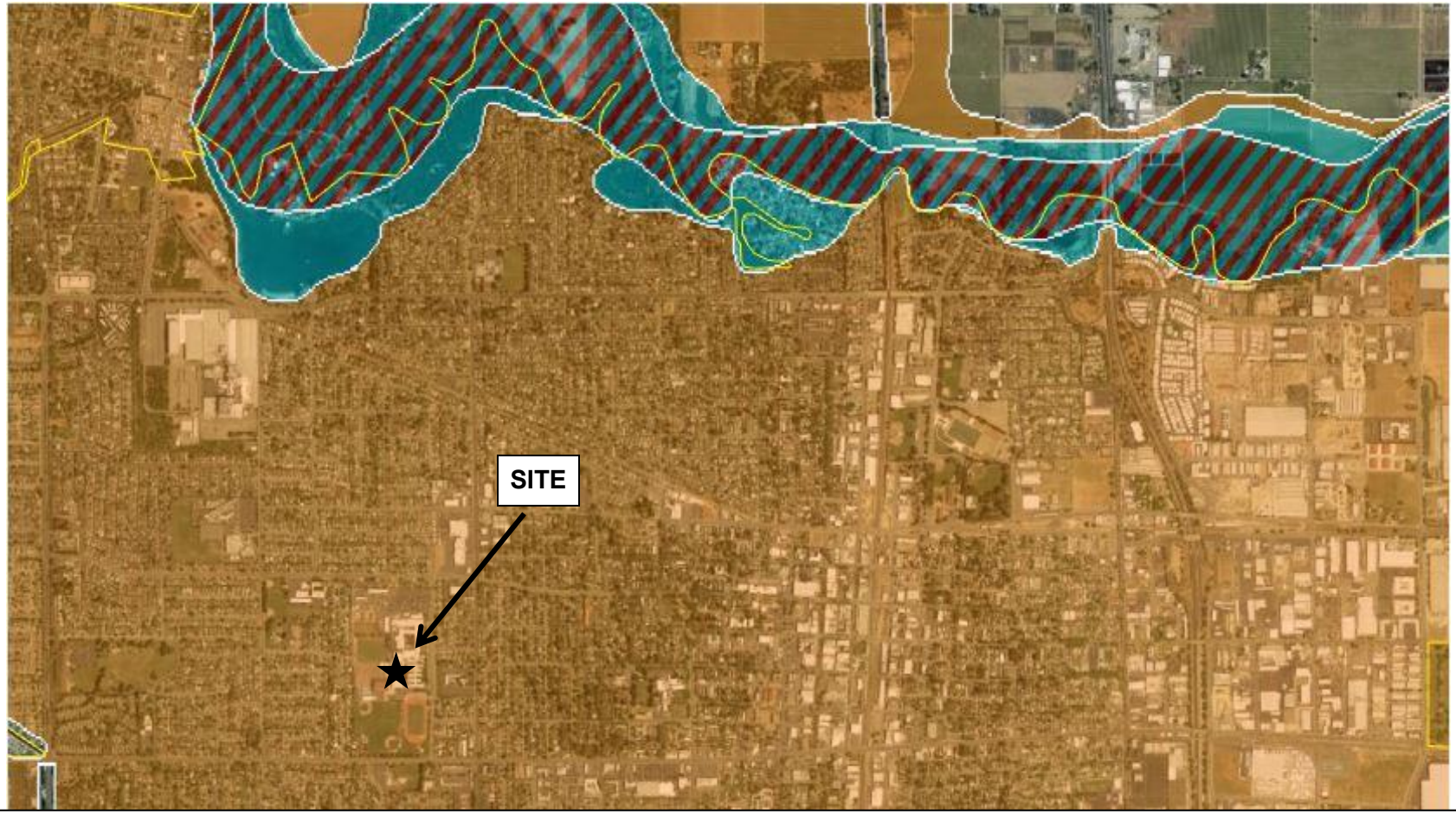
EARTHQUAKE EPICENTER MAP

LODI HIGH SCHOOL IMPROVEMENTS
3 S. Pacific Avenue
Lodi, California

FIGURE 14
Date: 8/18
MPE No. 03849-01



Flood Hazard Areas

1% Annual Chance Flood Hazard
Zone A, AE, A99, AO, AH, AR, V, VE

0.2% Annual Chance Flood Hazard
Zone X

Regulatory Floodway

N
Not to Scale

Adapted from: Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM), Map Number 06077C0168F, dated October 16, 2009

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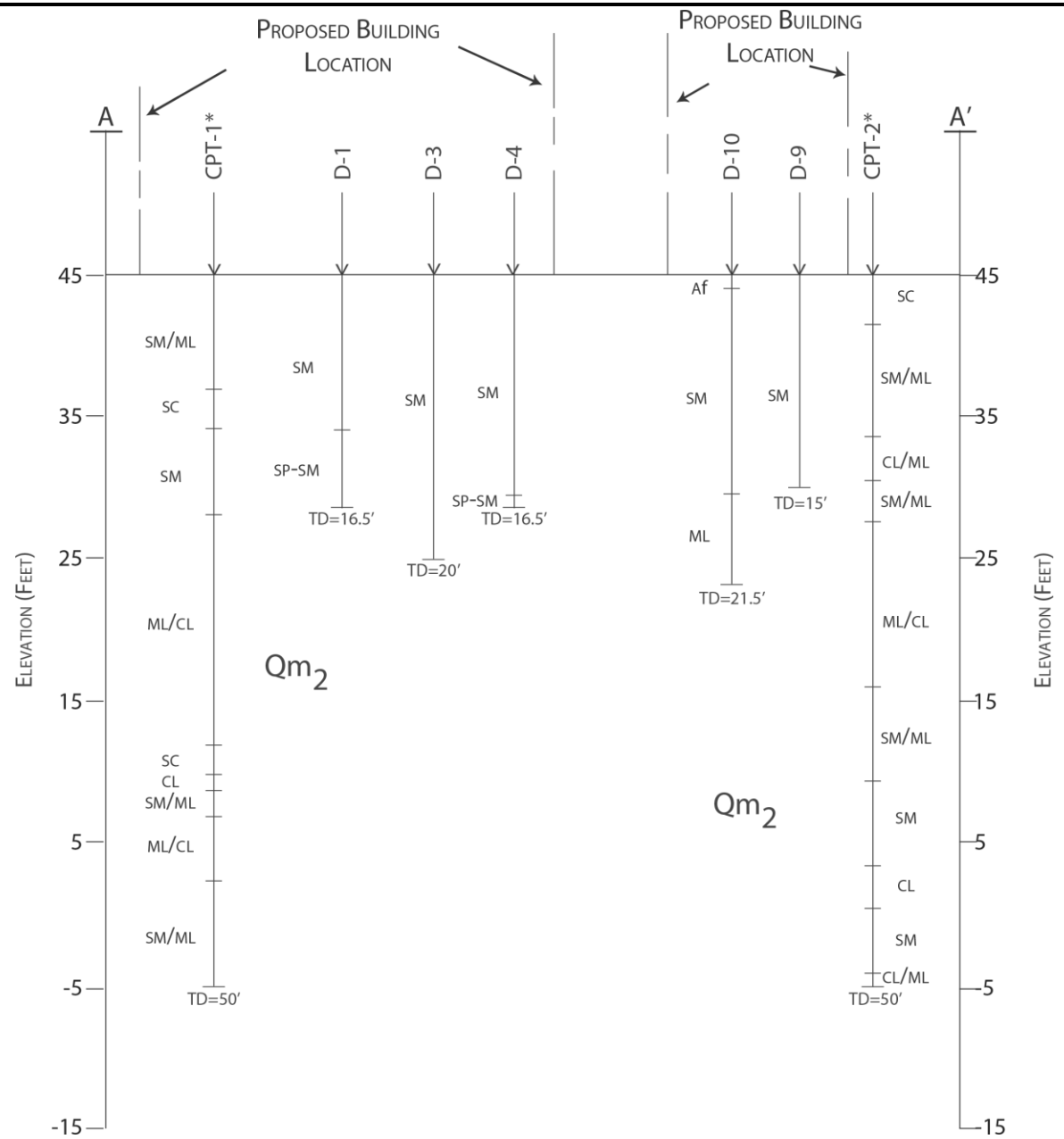
FEMA FLOOD MAP

LODI HIGH SCHOOL IMPROVEMENTS
3 S. Pacific Avenue
Lodi, California

FIGURE 15
Date: 8/18
MPE No. 03849-01



HORIZONTAL
1" = 190'

*** = CPT logs generalized based on grouping similar soils**

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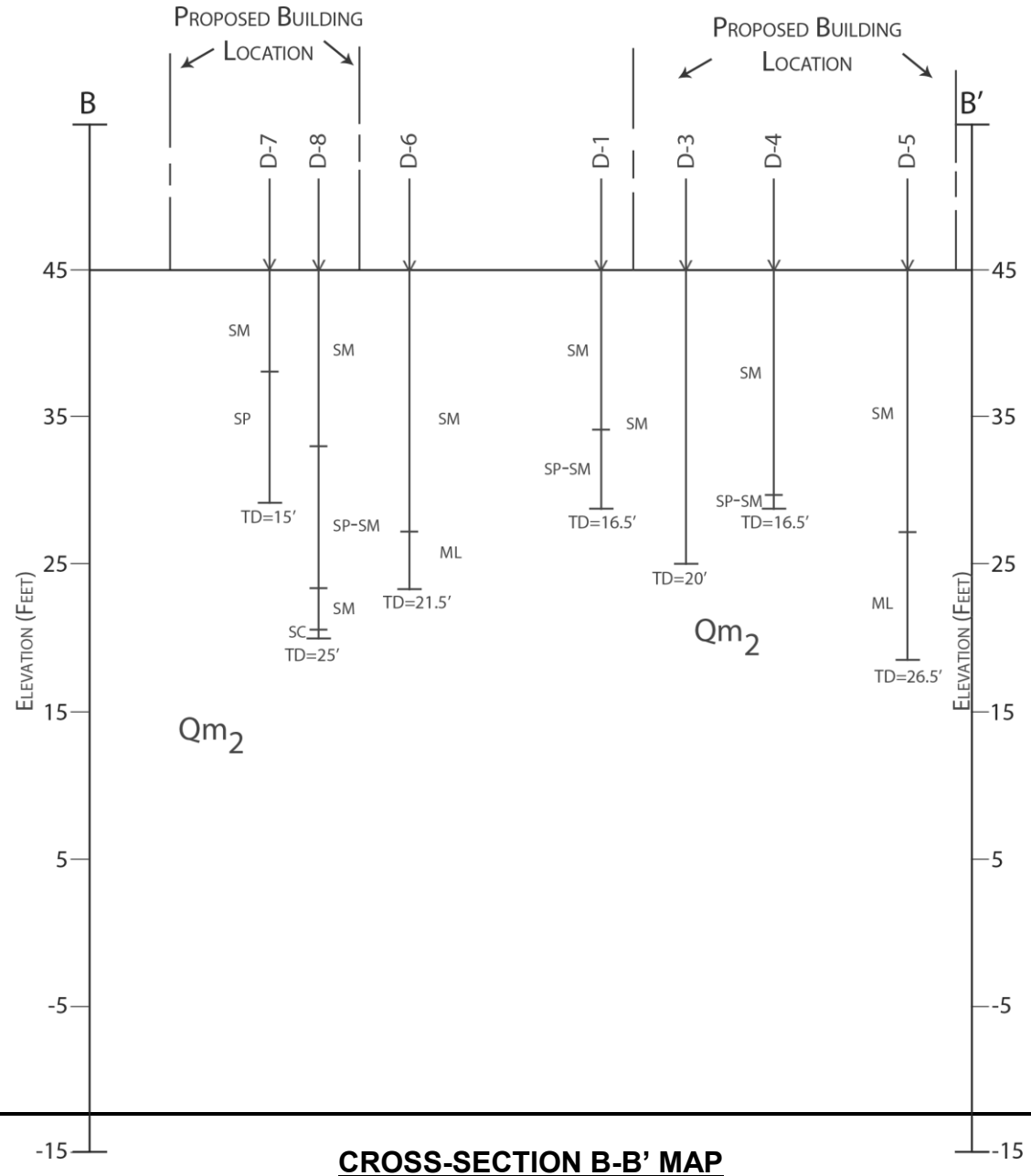
CROSS-SECTION A-A' MAP

LODI HIGH SCHOOL IMPROVEMENTS
3 South Pacific Avenue
Lodi, California

FIGURE 20
Date: 08/18
MPE No. 03849-01



HORIZONTAL
1" = 180'

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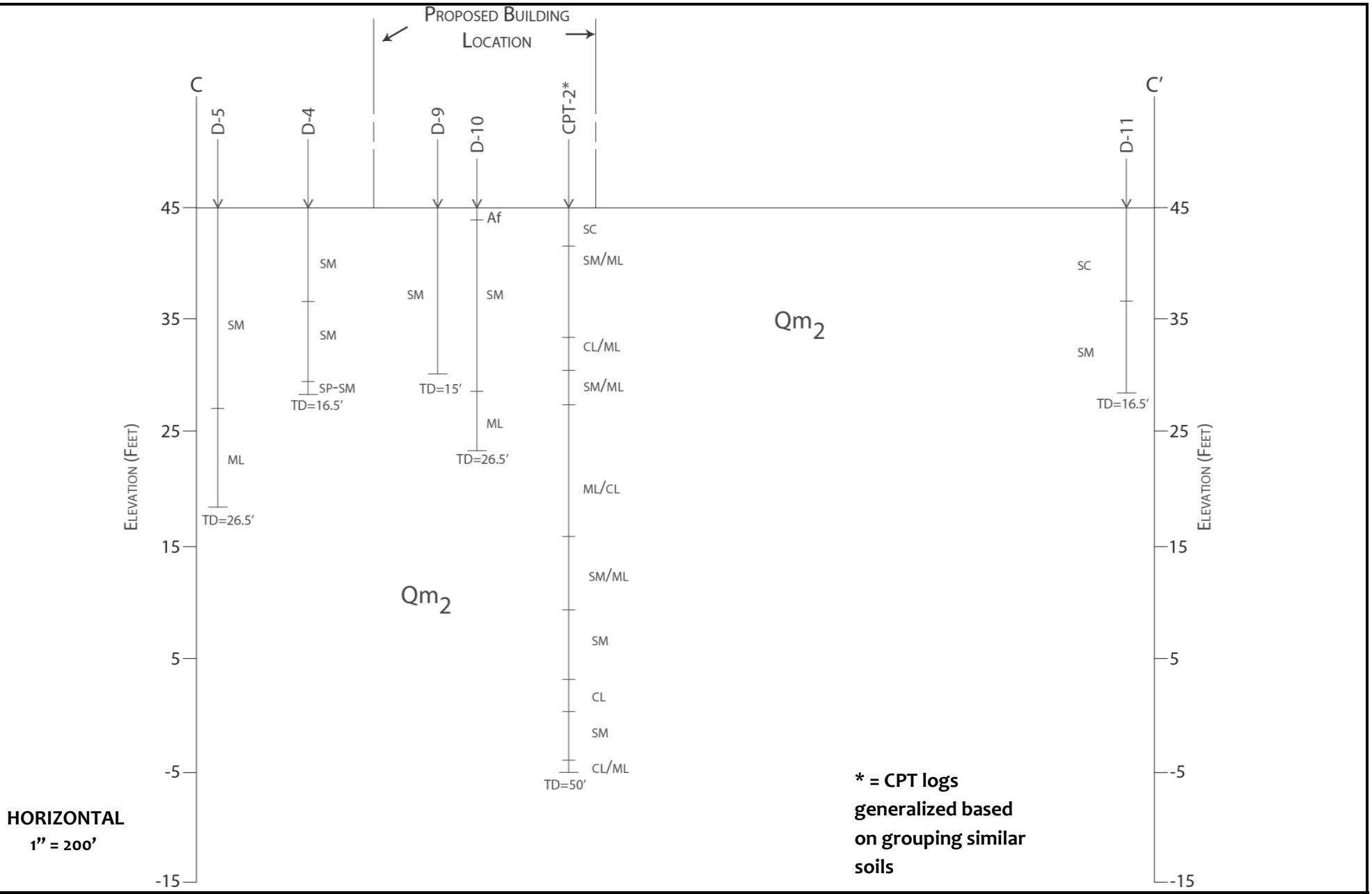
CROSS-SECTION B-B' MAP

LODI HIGH SCHOOL IMPROVEMENTS
3 South Pacific Avenue
Lodi, California

FIGURE 21
Date: 08/18
MPE No. 03849-01



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CROSS-SECTION C-C’ MAP

LODI HIGH SCHOOL IMPROVEMENTS
3 South Pacific Avenue
Lodi, California

FIGURE 22
Date: 08/18
MPE No. 03849-01

APPENDICES

APPENDIX A

APPENDIX A

A. GENERAL INFORMATION

The performance of a Geologic Hazards and Geotechnical Engineering Investigation for the proposed improvements at the existing Lodi High School campus, located at 3 South Pacific Avenue in Lodi, California, was authorized by the June 27, 2018, *Notice to Proceed – Lodi High School Facilities Improvement CEQA and Geotechnical* with the Lodi Unified School District. Authorization was for an investigation as described in our proposal letter of May 25, 2018, sent to our client, Lodi Unified School District (c/o Petralogix Engineering, Inc.), whose mailing address is 26675 Bruella Road, Galt, California 95687; telephone (209) 400-5729.

The Project Manager is Roebbelen Construction Management Services, Inc., whose mailing address is 1241 Hawks Flight Court, El Dorado Hills, California 95762; telephone (916) 939-1120.

The project Architect is PBK Architects, whose mailing address is 2520 Venture Oaks, Suite 440, Sacramento, California 95833; telephone (916) 682-9494

In performing this investigation, we made reference to the Request for Proposal (RFP) documents, dated April 6, 2018.

B. FIELD EXPLORATION

A total of 12 soil borings were drilled and hand augered at the approximate locations indicated on Figure 3.

The drilled soil borings utilized a CME-75 truck-mounted drill rig equipped with eight-inch diameter, solid-stem helical flight augers. The borings were drilled to maximum depths of approximately 15 to 26½ feet below existing site grades. The hand augered boring were excavated with conventional hand auger equipment to a maximum depth of approximately 6 feet below existing grade.

In addition, two Cone Penetration Test (CPT) soundings were performed at the approximate locations indicated on Figure 3, utilizing a 25-ton truck-mounted CPT rig to a maximum depth of approximately 50 feet below existing site grades.

At various intervals, relatively undisturbed soil samples were recovered from the drilled soil borings with a 2½-inch O.D., 2-inch I.D. Modified California sampler (ASTM D3550) driven by an automatic 140-pound hammer freely falling 30 inches. The number of blows of the hammer required to drive the 18-inch long sampler each 6-inch interval was recorded with the sum of the blows required to drive the sampler

the lower 12-inch interval being designated the penetration resistance or "blow count" for that particular drive.

The samples obtained with the modified California sampler were retained in 2-inch diameter by 6-inch long, thin-walled brass tubes contained within the sampler. Immediately after recovery, the field engineer visually classified the soil in the tubes and the ends of the tubes were sealed to preserve the natural moisture contents. Disturbed bulk samples of the surface materials also were obtained at various locations and depths. Soil samples were taken to our laboratory for additional classification (ASTM D2488) and selection of samples for testing.

The Logs of Soil Borings, Figures 4 through 15, contain descriptions of the soils encountered in each boring. A Boring Legend explaining the Unified Soil Classification System and the symbols used on the logs is contained on Figure 16. The results of the CPT soundings are attached in Appendix D.

C. LABORATORY TESTING

Selected undisturbed samples of the soils were tested to determine dry unit weight (ASTM D2937), natural moisture content (ASTM D2216), triaxial compression testing (ASTM D2850) and percent passing the 200 sieve (ASTM D1140). The results of these tests are included on the boring logs at the depth each sample was obtained.

Two bulk samples of the near-surface soils were subjected to an Expansion Index test (ASTM D4829). The results of these tests are presented on Figures A1 and A2.

Two bulk sample of the anticipate pavement subgrade soils was subjected to Resistance ("R-") value testing, which were used in the pavement design, are presented on Figures A3 and A4.

Three samples of near-surface soils were submitted to Sunland Analytical in Rancho Cordova, California, for corrosivity testing in accordance with No. 643 (Modified Small Cell), CT 532, CT 422, and CT 417. The analytical results are presented in the text of the report.

/

EXPANSION INDEX TEST RESULTS
(ASTM D4829)
(UBC 18-2)

Material Description: Brown, silty fine sand (SM)
Location: D5 (1 to 3 feet)

Sample Number	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
D5 (1-3')	7.7	8.4	120	0

CLASSIFICATION OF EXPANSIVE SOIL

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
Above 130	Very High

MPE	**EXPANSION INDEX TEST RESULTS** **LODI HIGH SCHOOL IMPROVEMENTS** 3 South Pacific Avenue Lodi, California	**FIGURE A1** Date: 08/18 MPE No. 03849-01

EXPANSION INDEX TEST RESULTS
(ASTM D4829)
(UBC 18-2)

Material Description: Brown, clayey fine sand (SC)
Location: D11 (1 to 3 feet)

Sample Number	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
D11 (1-3')	6.8	10.9	121	0

CLASSIFICATION OF EXPANSIVE SOIL

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
Above 130	Very High

MPE	**EXPANSION INDEX TEST RESULTS** **LODI HIGH SCHOOL IMPROVEMENTS** 3 South Pacific Avenue Lodi, California	**FIGURE A2** Date: 08/18 MPE No. 03849-01

RESISTANCE VALUE TEST RESULTS
(California Test 301)

Material Description: Brown, silty sand (SM)

Location: Combined sample of RV1 & RV2

Specimen No.	Dry Unit Weight (pcf)	Moisture at Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (psf)	R-Value
1	130.1	8.8	564	13	43
2	126.0	10.1	198	0	27
3	124.4	9.4	435	0	37

R-value at 300 psi exudation pressure = 32

MPE	**RESISTANCE VALUE TEST RESULTS** **LODI HIGH SCHOOL IMPROVEMENTS** 3 South Pacific Avenue Lodi, California	**FIGURE A3** Date: 08/18 MPE No. 03849-01

RESISTANCE VALUE TEST RESULTS
(California Test 301)

Material Description: Brown, silty sand (SM) with fine gravel

Location: Combined sample of RV3 & RV4

Specimen No.	Dry Unit Weight (pcf)	Moisture at Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (psf)	R-Value
1	130.2	8.8	151	0	50
2	130.9	7.4	292	0	77
3	132.0	7.0	350	17	76

R-value at 300 psi exudation pressure = 78

MPE	**RESISTANCE VALUE TEST RESULTS** **LODI HIGH SCHOOL IMPROVEMENTS** 3 South Pacific Avenue Lodi, California	**FIGURE A4** Date: 08/18 MPE No. 03849-01

APPENDIX B

APPENDIX B

GUIDE EARTHWORK SPECIFICATIONS

LODI HIGH SCHOOL IMPROVEMENTS

3 South Pacific Avenue

Lodi, California

MPE No. 03849-01

PART 1: GENERAL

1.1 SCOPE

A. General Description

This item shall include clearing of all surface and subsurface structures associated with previous development of the site, existing buildings and modular, concrete slabs, foundations, asphalt concrete, undocumented fills, utilities to be relocated or abandoned including all associated backfill, fences, trees, vegetation, storm drain inlets and piping, sprinklers, demolition debris, rubble, rubbish and associated items; preparation of surfaces to be filled, filling, spreading, compaction, observation and testing of the fill; and all subsidiary work necessary to complete the grading of the building areas to conform with the lines, grades and slopes as shown on the accepted Drawings.

B. Related Work Specified Elsewhere

1. Trenching and backfilling for sanitary sewer system: Section _____.
2. Trenching and backfilling for storm drain system: Section _____.
3. Trenching and backfilling for underground water, natural gas, and electric supplies: Section _____.

C. Geotechnical Engineer

Where specific reference is made to "Geotechnical Engineer" this designation shall be understood to include either him or his representative.

1.2 PROTECTION

A. Adequate protection measures shall be provided to protect workers and passers-by at the site. Streets and adjacent property shall be fully protected throughout the operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

D. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

E. Surface drainage provisions shall be made during the period of construction in a manner to avoid creating a nuisance to adjacent areas.

F. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.

1.3 GEOTECHNICAL REPORT

A. A Geologic Hazards and Geotechnical Engineering Report (MPE No. 03849-01; dated August 17, 2018) has been prepared for this site by Mid Pacific Engineering, Inc., Geotechnical Engineers. A copy is available for review at the office of Mid Pacific Engineering, Inc., 840 Embarcadero Drive, Suite 20, West Sacramento, California 95605.

B. The information contained in this report was obtained for design purposes only. The Contractor is responsible for any conclusions he/she may draw from this report; should the Contractor prefer not to assume such risk, he/she should employ their own experts to analyze available information and/or to make additional borings upon which to base their conclusions, all at no cost to the Owner.

1.4 EXISTING SITE CONDITIONS

The Contractor shall be acquainted with all site conditions. If unshown active utilities are encountered during the work, the Architect shall be promptly notified for instructions. Failure to notify will make the Contractor liable for damage to these utilities arising from Contractor's operations subsequent to the discovery of such unshown utilities.

1.5 SEASONAL LIMITS

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until field tests indicate that the moisture contents of the subgrade and fill materials are satisfactory.

PART 2: PRODUCTS

2.1 MATERIALS

A. All fill shall be of approved local materials from required excavations, supplemented by imported fill, if necessary. Approved local materials are defined as local soils with a maximum particle size of approximately three inches (3"); free from significant quantities of rubble, rubbish and vegetation; and, having been tested and approved by the Geotechnical Engineer prior to use.

B. Imported fill materials shall be approved by the Geotechnical Engineer; they shall meet the above requirements; shall have plasticity indices not exceeding

fifteen (15), when tested in accordance with ASTM D4318; shall have a maximum Expansion Index not exceeding twenty (20) when tested in accordance with ASTM D4829; and, shall be of three-inch (3") maximum particle size. Import fill shall be clean of contamination with appropriate documentation. All imported materials shall be approved by the Geotechnical Engineer prior to being transported to the site.

C. Asphalt concrete, aggregate base, aggregate subbase, and other paving products shall comply with the appropriate provisions of the *State of California (Caltrans) Standard Specifications* Standards, latest editions.

PART 3: EXECUTION

3.1 LAYOUT AND PREPARATION

Lay out all work, establish grades, locate existing underground utilities, set markers and stakes, set up and maintain barricades and protection of utilities-all prior to beginning actual earthwork operations.

3.2 CLEARING, GRUBBING AND PREPARING BUILDING PADS AND PAVEMENT AREAS

A. The site shall be cleared of existing structures designated for removal including but not limited to, existing buildings and modular, concrete slabs, foundations, asphalt concrete, undocumented fills, utilities to be relocated or abandoned including all associated backfill, fences, trees, vegetation, storm drain inlets and piping, sprinklers, demolition debris, rubble, rubbish and other unsuitable materials. Subsurface utilities to be relocated or abandoned shall be removed from within and to at least five feet beyond the perimeter of the proposed structural areas; remaining piping beyond the structure that is not removed shall be plugged. Trees and shrubs designated to be removed shall include the entire rootball and all roots larger than one-half inch (½") in diameter. Excavations and depressions resulting from the removal of such items, as well as any existing excavations or loose soil deposits, as determined

by the Geotechnical Engineer, shall be cleaned out to firm, undisturbed soil and backfilled with suitable materials in accordance with these specifications.

B. The upper twelve inches (12") of soil subgrades within areas of removed foundations, concrete slabs, pavements, flatwork and trees shall be ripped and cross-ripped to expose any remaining remnants, roots, rubble and debris. All exposed rubble, roots, rubble and debris shall be removed from the subgrades. Hand picking of exposed roots, rubble and debris shall be performed by the Contractor to adequately clear the grades.

C. Over-excavation of the Two-Story Classroom Buildings and Administration Building Addition shall be performed as recommended in the Geotechnical Engineering Report.

D. The surfaces upon which fill is to be placed, as well as at-grade areas or areas achieved by excavation, shall be plowed or scarified to a depth of at least twelve inches (12") until the surface is free from ruts, hummocks or other uneven features which would tend to prevent uniform compaction by the selected equipment.

E. When the moisture content of the subgrade is below that required to achieve the specified density, and that minimum content recommended in the geotechnical report, water shall be added until the proper moisture content is achieved.

F. When the moisture content of the subgrade is too high to permit the specified compaction to be achieved, the subgrade shall be aerated by blading or other methods until the moisture content is satisfactory for compaction.

G. After the foundations for fill have been cleared, plowed or scarified, they shall be disced or bladed until uniform and free from large clods, brought to the proper moisture content and compacted to not less than ninety percent (95%) for the building pad excavations and not less than ninety percent (90%) for other structural areas, of the maximum dry density as determined by the

ASTM D1557-91 Compaction Test. Soils compaction shall be performed using a heavy, self-propelled sheepsfoot compactor (Caterpillar 815 compactor or an equivalent-size compactor). Compaction operations shall be performed in the presence of the Geotechnical Engineer who will evaluate the performance of the materials under compactive load. Unstable soil deposits, as determined by the Geotechnical Engineer, shall be excavated to expose a firm base and grades restored with engineered fill in accordance with these specifications.

3.3 PLACING, SPREADING AND COMPACTING FILL MATERIAL

A. Engineered fills shall be placed in layers which when compacted shall not exceed six inches (6") in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to promote uniformity of material in each layer.

B. When the moisture content of the fill material is below that required to achieve the specified density, and that minimum content recommended in the geotechnical report, water shall be added until the proper moisture content is achieved.

C. When the moisture content of the fill material is too high to permit the specified degree of compaction to be achieved, the fill material shall be aerated by blading or other methods until the moisture content is satisfactory.

D. After each layer has been placed, mixed and spread evenly, soils shall be thoroughly compacted to at least ninety percent (90%) of the ASTM D1557 maximum dry density. Soils compaction shall be performed using a heavy, self-propelled sheepsfoot compactor (Caterpillar 815 compactor or an equivalent-size compactor), to the satisfaction of our on-site representative. Each layer shall be compacted over its entire area until the desired density has been obtained. Each lift of engineered fill shall be benched into adjacent side slopes to remove loose soils and promote uniformity.

E. The filling operations shall be continued until the fills have been brought to the finished slopes and grades as shown on the accepted Drawings.

3.4 FINAL SUBGRADE PREPARATION

A. The upper twelve inches (12") of final soil subgrades supporting buildings, shall be brought to a uniform moisture content of at least above the optimum moisture content and shall be uniformly compacted to at least ninety percent (90%) relative compaction, regardless of whether final subgrade elevations are attained by filling, excavation, or are left at existing grades.

B. The upper six inches (6") of final soil subgrades supporting exterior flatwork, shall be brought to a uniform moisture content of at least above the optimum moisture content and shall be uniformly compacted to at least ninety percent (90%) relative compaction, regardless of whether final subgrade elevations are attained by filling, excavation, or are left at existing grades.

C. The upper six inches (6") of final subgrades supporting pavements shall be brought to a uniform moisture content of at least the optimum moisture content, and shall be uniformly compacted to at least ninety-five (95%) relative compaction, regardless of whether the final subgrade elevations are attained by filling, excavation, or are left at existing grades.

3.5 TRENCH BACKFILL

A. Utility trench backfill shall be placed in lifts of no more than six inches (6") in compacted thickness. Each lift shall be compacted to at least ninety percent (90%) compaction, at a moisture content of at least optimum moisture, as defined by ASTM D1557. Each lift shall be compacted to at least ninety percent (90%) compaction, as defined by ASTM D1557, except that the upper six inches of backfill within pavement areas shall be compacted in accordance with Section 3.4.C.

3.6 TESTING AND OBSERVATION

A. Grading operations shall be observed by the Geotechnical Engineer, serving as the representative of the Owner.

B. Field density tests shall be made by the Geotechnical Engineer after compaction of each layer of fill. Additional layers of fill shall not be spread until the field density tests indicate that the minimum specified density has been obtained.

C. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any aspect of the site earthwork.

D. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, the Contractor shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer and the Project Design Engineer. No deviation from the specifications shall be made except upon written approval of the Geotechnical Engineer or Project Design Engineer.

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APPENDIX C

EQ FAULT OUTPUT

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*                    *
*   E Q F A U L T    *
*                    *
*   Version 3.00     *
*                    *
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DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 03849-01
DATE: 07-17-2018

JOB NAME: LODI HIGH SCHOOL IMPROVEMENTS

CALCULATION NAME: SITE CLASS D

FAULT-DATA-FILE NAME: C:\Program Files\EQFAULT1\CGSFLTE.DAT

SITE COORDINATES:
SITE LATITUDE: 38.1353
SITE LONGITUDE: 121.2912

SEARCH RADIUS: 62 mi

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
DISTANCE MEASURE: cd_2drp
SCOND: 0
Basement Depth: 5.00 km Campbell SSR: Campbell SHR:
COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: C:\Program Files\EQFAULT1\CGSFLTE.DAT

MINIMUM DEPTH VALUE (km): 0.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

Page 1

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT MAXIMUM MAG.(Mw)	PEAK ACCEL. g	EST. SITE INTENSITY MOD.MERC.
FOOTHILLS FAULT SYSTEM 1	23.9(38.4)	6.5	0.127	VIII
GREAT VALLEY 5	25.1(40.4)	6.5	0.122	VII
GREAT VALLEY 7	30.4(49.0)	6.7	0.117	VII
FOOTHILLS FAULT SYSTEM 2	32.1(51.6)	6.5	0.101	VII
MOUNT DIABLO (MTD)	33.9(54.6)	6.7	0.105	VII
GREENVILLE (GN)	34.2(55.0)	6.7	0.086	VII
GREAT VALLEY 4	34.5(55.6)	6.6	0.101	VII
FOOTHILLS FAULT SYSTEM 3	36.7(59.0)	6.5	0.092	VII
GREENVILLE (FLOATING)	37.1(59.7)	6.2	0.064	VI
GREENVILLE (GS)	37.1(59.7)	6.6	0.079	VII
GREENVILLE (GS+GN)	37.1(59.7)	6.9	0.094	VII
CONCORD/GV (FLOATING)	41.3(66.4)	6.2	0.059	VI
CONCORD/GV (CON)	41.3(66.4)	6.3	0.060	VI
CONCORD/GV (CON+GVS)	41.3(66.4)	6.6	0.072	VI
CONCORD/GV (CON+GVS+GVN)	41.3(66.4)	6.7	0.077	VII
CONCORD/GV (GVS+GVN)	43.2(69.5)	6.5	0.066	VI
CONCORD/GV (GVS)	43.2(69.5)	6.2	0.058	VI
CALAVERAS (CS+CC+CN)	44.8(72.1)	6.9	0.081	VII
CALAVERAS (CC+CN)	44.8(72.1)	6.2	0.056	VI
CALAVERAS (FLOATING)	44.8(72.1)	6.2	0.055	VI
CALAVERAS (CN)	44.8(72.1)	6.8	0.075	VII
CONCORD/GV (GVN)	47.2(76.0)	6.0	0.048	VI
GREAT VALLEY 8	49.0(78.8)	6.6	0.077	VII
WEST NAPA	51.8(83.4)	6.5	0.058	VI
HAYWARD (HS+HN+RC)	53.4(85.9)	7.3	0.084	VII

HAYWARD (FLOATING)	53.4(85.9)	6.9	0.069	VI
HAYWARD (HS)	53.4(85.9)	6.7	0.062	VI
HAYWARD (HS+HN)	53.4(85.9)	6.9	0.070	VI
GREAT VALLEY 3	53.6(86.3)	6.9	0.084	VII
HUNTING CREEK - BERRYESSA	53.9(86.7)	7.1	0.077	VII
HAYWARD (HN+RC)	54.4(87.6)	7.1	0.076	VII
HAYWARD (HN)	54.4(87.6)	6.5	0.055	VI
CALAVERAS (CS+CC)	55.3(89.0)	6.4	0.051	VI
CALAVERAS (CC)	55.3(89.0)	6.2	0.047	VI
CALAVERAS (CS+CC FLOATING)	55.3(89.0)	6.2	0.047	VI
ORTIGALITA	59.8(96.2)	7.1	0.071	VI

****

-END OF SEARCH- 36 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE FOOTHILLS FAULT SYSTEM 1 FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 23.9 MILES (38.4 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.1272 g

EQ SEARCH OUTPUT

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*   E Q S E A R C H     *
*                       *
*    Version 3.00       *
*                       *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 03849-01
DATE: 07-17-2018

JOB NAME: LODI HIGH SCHOOL IMPROVMENTS

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
MINIMUM MAGNITUDE: 5.00
MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
SITE LATITUDE: 38.1353
SITE LONGITUDE: 121.2912

SEARCH DATES:
START DATE: 1800
END DATE: 2017

SEARCH RADIUS:
62.0 mi
99.8 km

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
ASSUMED SOURCE TYPE: BT [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
SCOND: 0 Depth Source: A
Basement Depth: 5.00 km Campbell SSR: Campbell SHR:
COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	ACC. g	MM INT.	DISTANCE mi [km]
DMG	38.4000	121.8000	04/30/1892	0 9 0.0	0.0	5.50	0.058	VI	33.1(53.2)
DMG	38.0000	121.9000	05/19/1889	1110 0.0	0.0	6.00	0.074	VII	34.4(55.3)
DMG	38.3000	121.9000	05/19/1902	1831 0.0	0.0	5.50	0.056	VI	34.9(56.2)
BRK	37.8300	121.8100	01/24/1980	19 0 9.0	0.0	5.80	0.065	VI	35.2(56.7)
BRK	37.8100	121.7900	01/24/1980	19 1 2.0	0.0	5.10	0.045	VI	35.2(56.7)
BRK	37.7600	121.7300	01/27/1980	23336.0	0.0	5.40	0.053	VI	35.2(56.7)
DMG	38.5000	121.9000	04/21/1892	1743 0.0	0.0	6.20	0.071	VI	41.5(66.8)
DMG	38.4000	122.0000	04/19/1892	1050 0.0	0.0	6.40	0.077	VII	42.5(68.5)
DMG	37.9700	122.0500	10/24/1955	41044.0	0.0	5.40	0.045	VI	42.8(68.9)
DMG	37.5000	121.3000	07/15/1866	630 0.0	0.0	5.80	0.055	VI	43.9(70.6)
DMG	37.8000	122.0000	07/04/1861	011 0.0	0.0	5.60	0.049	VI	45.0(72.4)
DMG	37.6000	121.8000	06/11/1903	1312 0.0	0.0	5.50	0.045	VI	46.2(74.4)
DMG	37.7000	122.0000	03/05/1864	1649 0.0	0.0	5.70	0.048	VI	48.9(78.7)
GSB	37.4830	121.6900	03/31/1986	115540.0	8.0	5.70	0.047	VI	50.0(80.5)
DMG	37.4000	121.4000	04/10/1881	10 0 0.0	0.0	5.90	0.052	VI	51.1(82.3)
DMG	37.7000	122.1000	10/21/1868	1553 0.0	0.0	6.80	0.080	VII	53.3(85.8)
DMG	37.8000	122.2000	06/10/1836	1530 0.0	0.0	6.80	0.079	VII	54.6(87.9)
DMG	37.8000	122.2000	07/31/1889	1247 0.0	0.0	5.20	0.034	V	54.6(87.9)
DMG	37.5000	121.9000	11/26/1858	835 0.0	0.0	6.10	0.054	VI	55.0(88.5)
GSB	37.4340	121.7740	10/31/2007	030454.8	10.0	5.50	0.039	V	55.1(88.7)
GSB	38.2152	122.3123	08/24/2014	102044.1	11.1	6.02	0.051	VI	55.7(89.6)
MGI	37.8500	122.2500	09/10/1935	2355 0.0	0.0	5.00	0.030	V	55.8(89.7)
DMG	37.9000	122.3000	04/02/1870	1948 0.0	0.0	5.30	0.034	V	57.2(92.1)
T-A	38.0000	120.2500	04/11/1872	12 0 0.0	0.0	5.00	0.029	V	57.4(92.3)
DMG	37.6000	122.1000	05/21/1864	2 1 0.0	0.0	5.30	0.034	V	57.5(92.6)

```
GSB |37.3850|121.7720|06/13/1988|014536.8|  7.0| 5.40| 0.036 |  V | 58.1( 93.4)
DMG |37.3700|121.7800|09/05/1955| 2 118.0|  0.0| 5.50| 0.037 |  V | 59.2( 95.3)
DMG |38.2000|122.4000|03/31/1898| 743 0.0|  0.0| 6.20| 0.053 | VI | 60.4( 97.1)
GSB |37.3200|121.6980|04/24/1984|211519.0|  8.0| 6.20| 0.053 | VI | 60.5( 97.4)
DMG |38.3000|122.4000|10/12/1891| 628 0.0|  0.0| 5.50| 0.036 |  V | 61.2( 98.5)

*******************************************************************************
-END OF SEARCH-   30 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH:   1800  TO  2017

LENGTH OF SEARCH TIME:   218  years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 33.1 MILES (53.2 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 6.8

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.080 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
  a-value=  0.204
  b-value=  0.240
  beta-value=  0.553


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TABLE OF MAGNITUDES AND EXCEEDANCES:
------------------------------------

  Earthquake | Number of Times | Cumulative
   Magnitude |    Exceeded     | No. / Year
  -----------+-----------------+------------
     4.0     |       30        |   0.13761
     4.5     |       30        |   0.13761
     5.0     |       30        |   0.13761
     5.5     |       21        |   0.09633
     6.0     |        9        |   0.04128
     6.5     |        2        |   0.00917
```

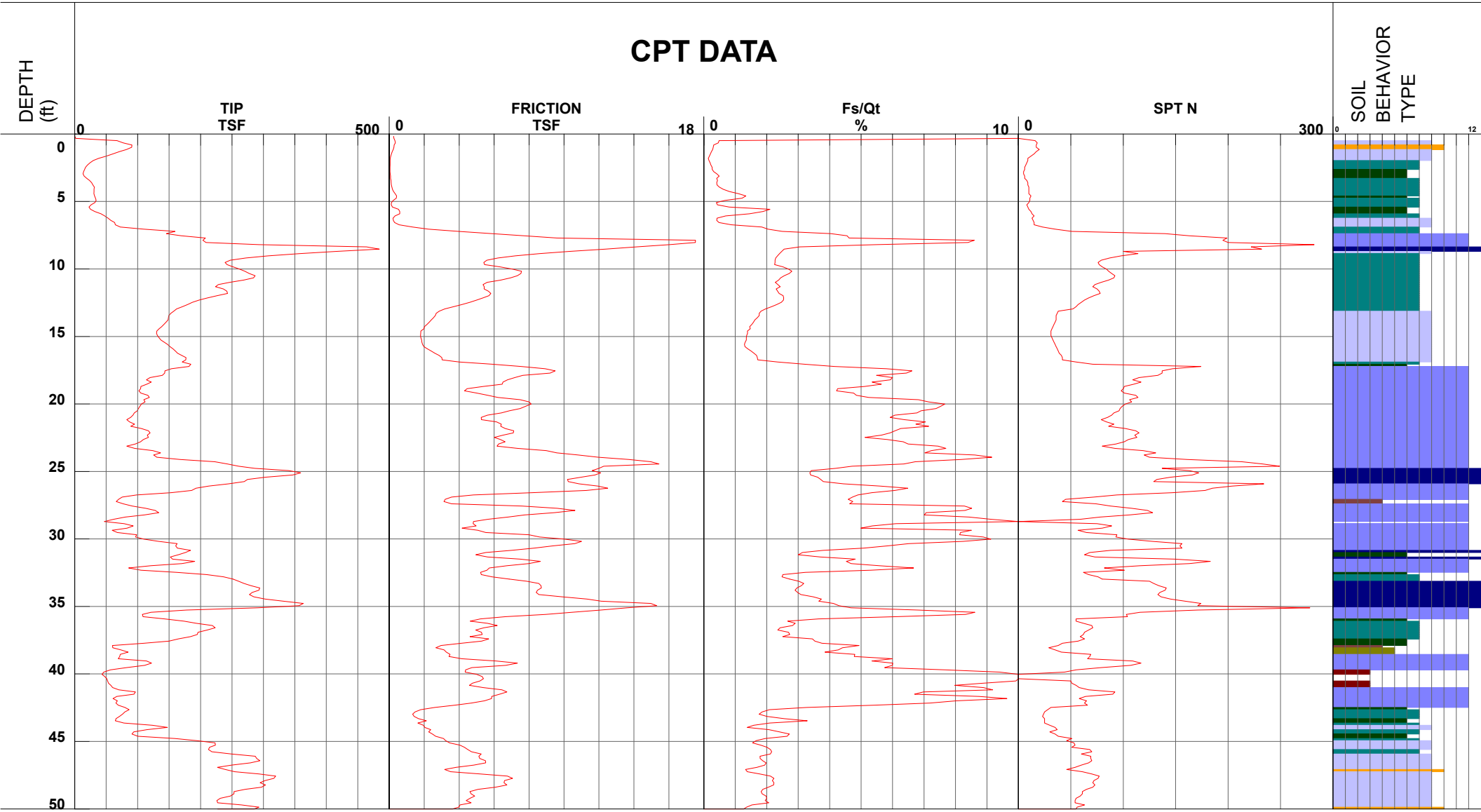
APPENDIX D

CONE PENETRATION TEST RESULTS

Mid Pacific Engineering

Project	Lodi High School Improvements	Operator	RB-JM	Filename	SDF(001).cpt
Job Number	03849.01	Cone Number	DDG1418	GPS	
Hole Number	CPT-01	Date and Time	7/10/2018 8:16:10 AM	Maximum Depth	50.52 ft
EST GW Depth During Test	38.10 ft				

Net Area Ratio .8



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

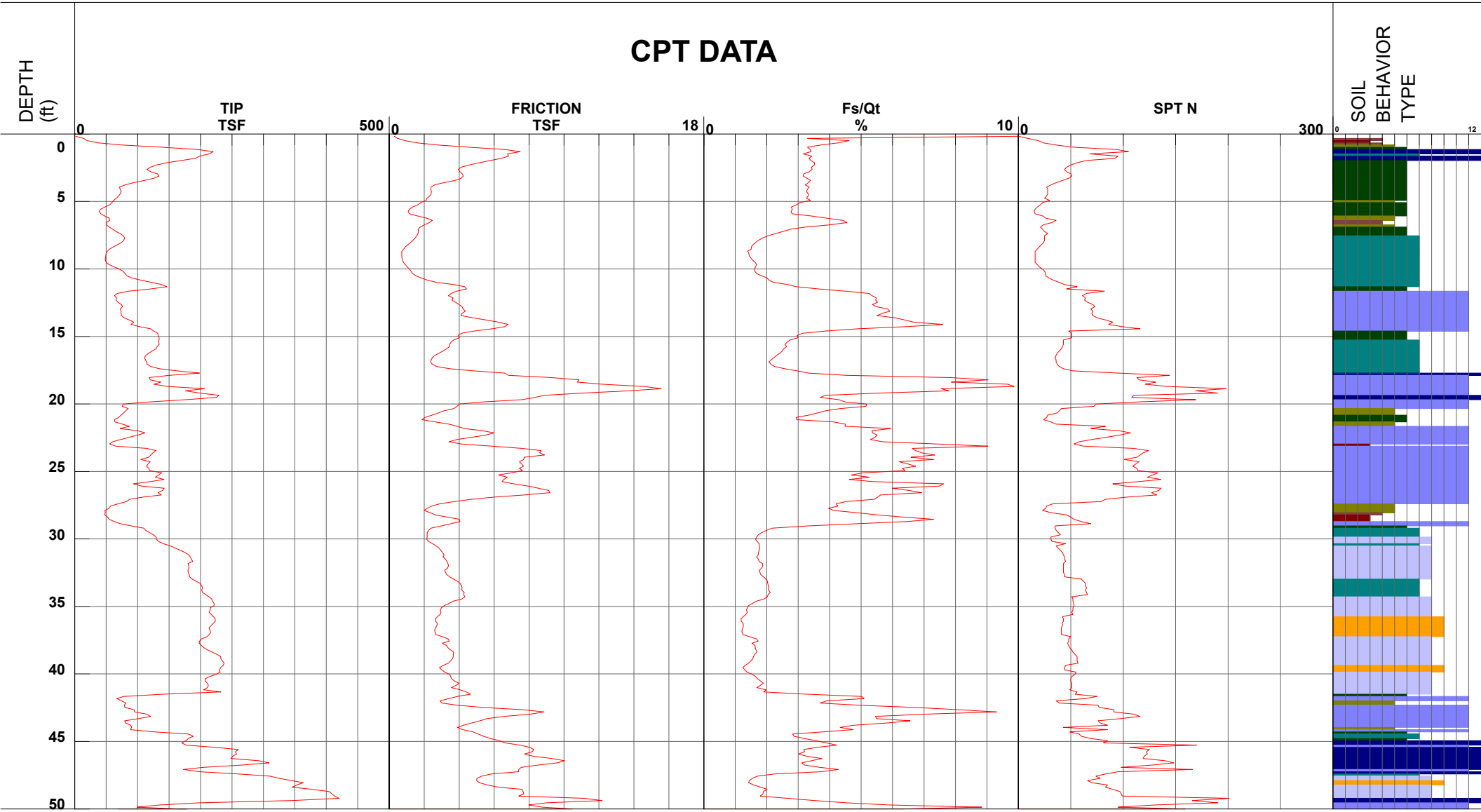
Cone Size 10cm squared

*Soil behavior type and SPT based on data from UBC-1983

Mid Pacific Engineering

Project	Lodi High School Improvements	Operator	RB-JM	Filename	SDF(003).cpt
Job Number	03849.01	Cone Number	DDG1418	GPS	
Hole Number	CPT-02	Date and Time	7/10/2018 10:11:24 AM	Maximum Depth	50.52 ft
EST GW Depth During Test	36.50 ft				

Net Area Ratio .8



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

CLiq OUTPUT

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Merarhias 56
http://www.geologismiki.gr

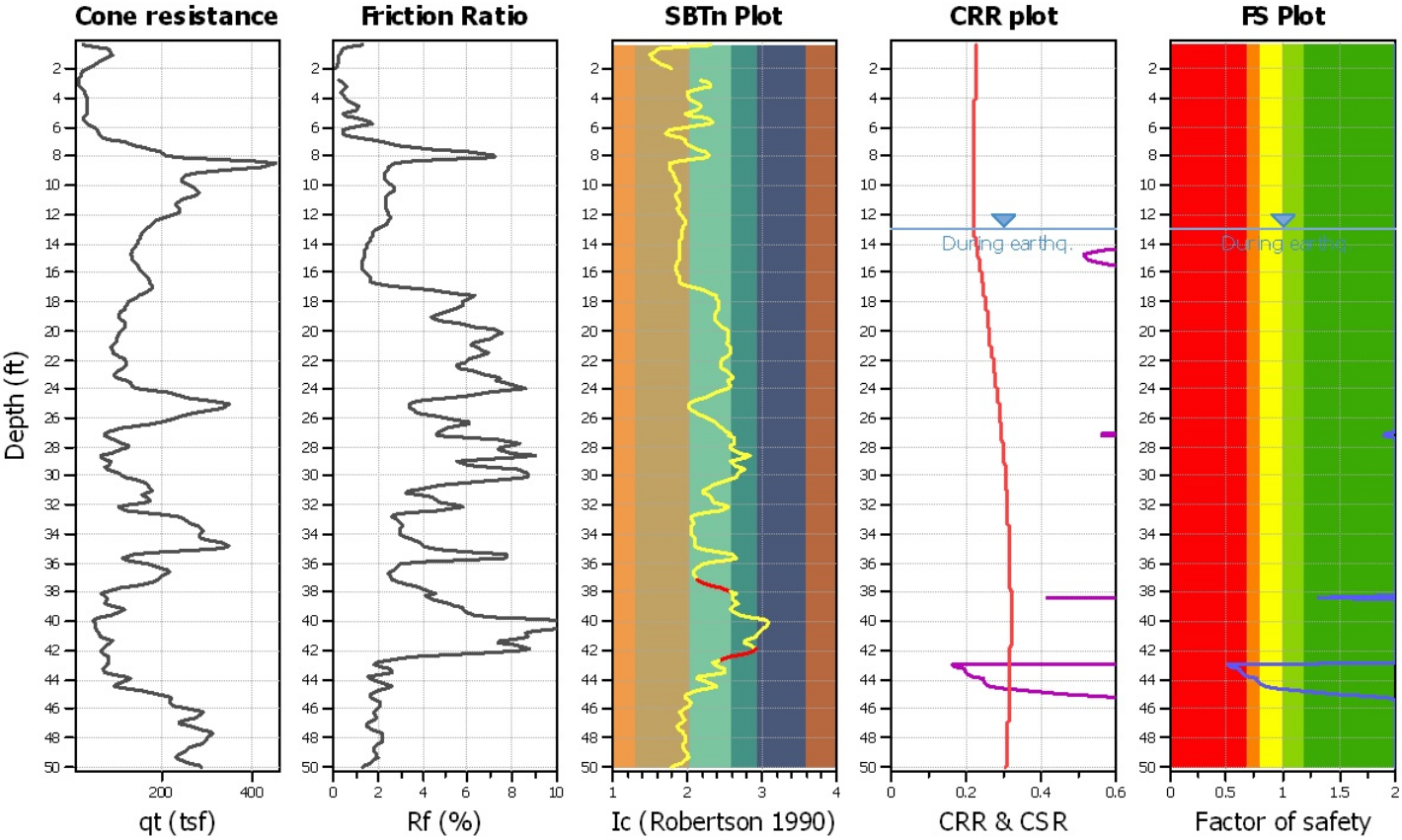
LIQUEFACTION ANALYSIS REPORT

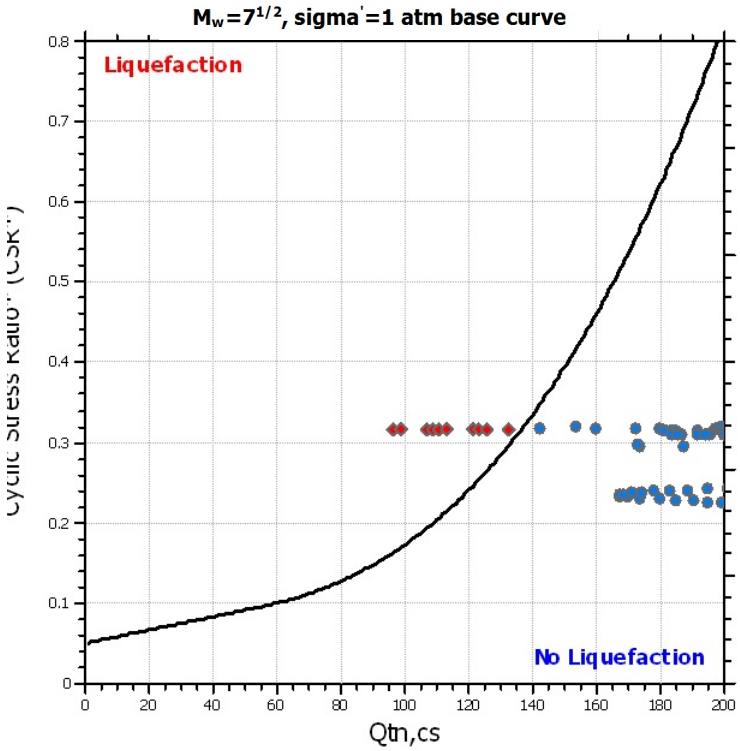
Project title : **Location :**

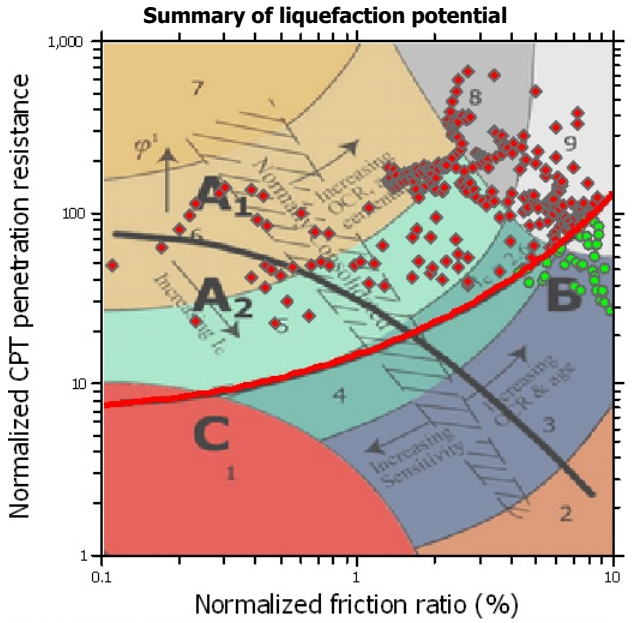
CPT file : CPT-01-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	13.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	13.00 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:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

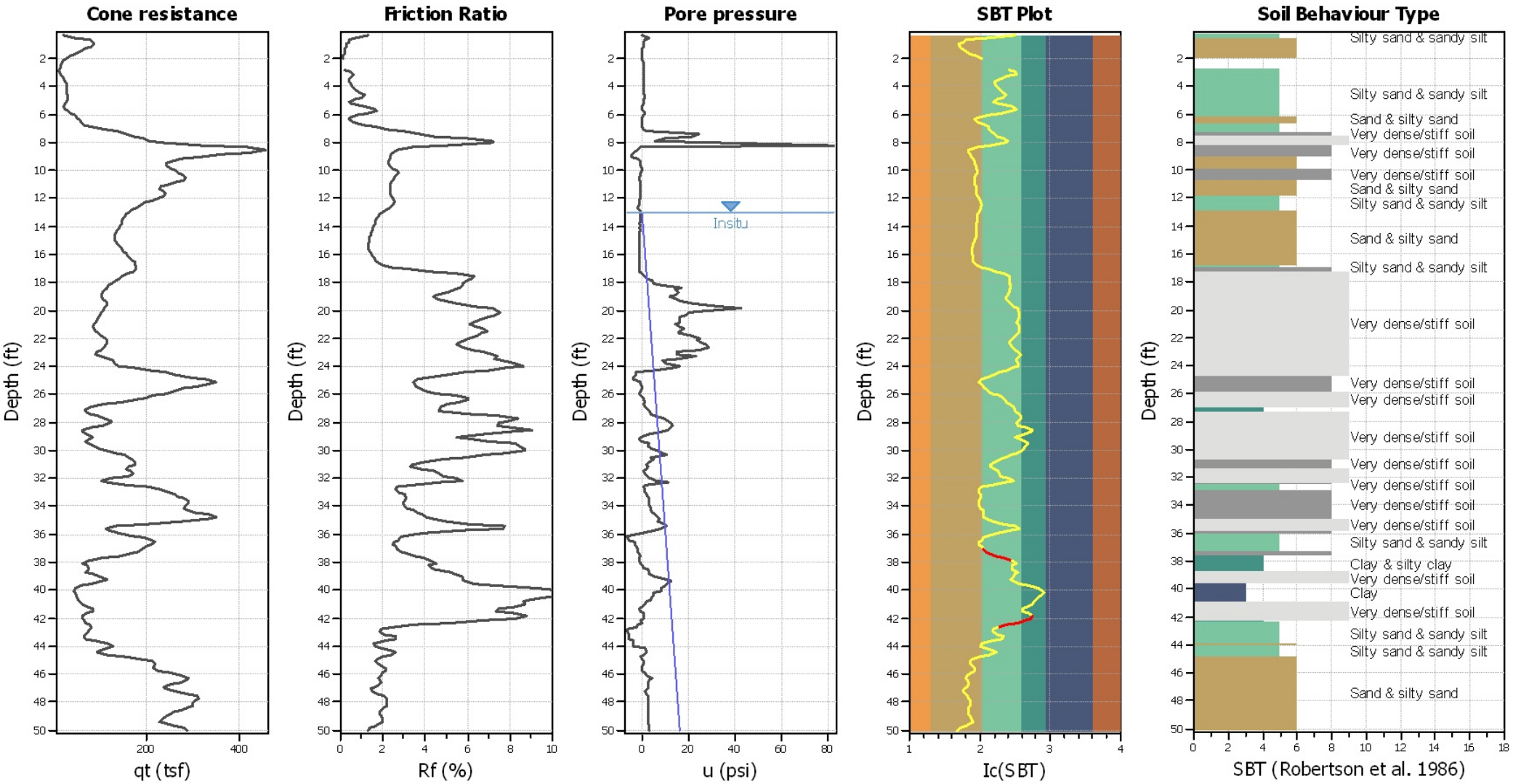






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plo



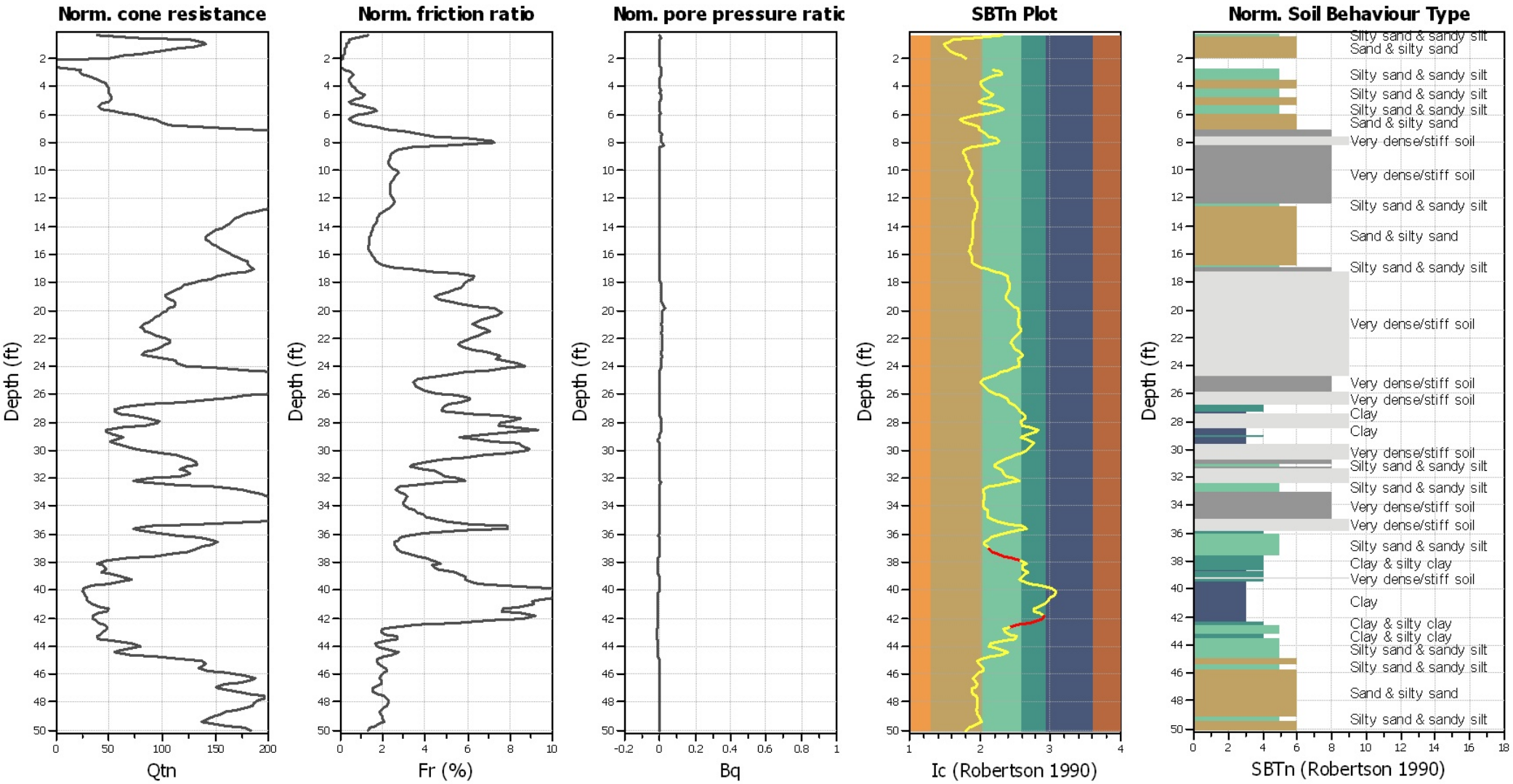
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 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 clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

CPT basic interpretation plots (normaliz



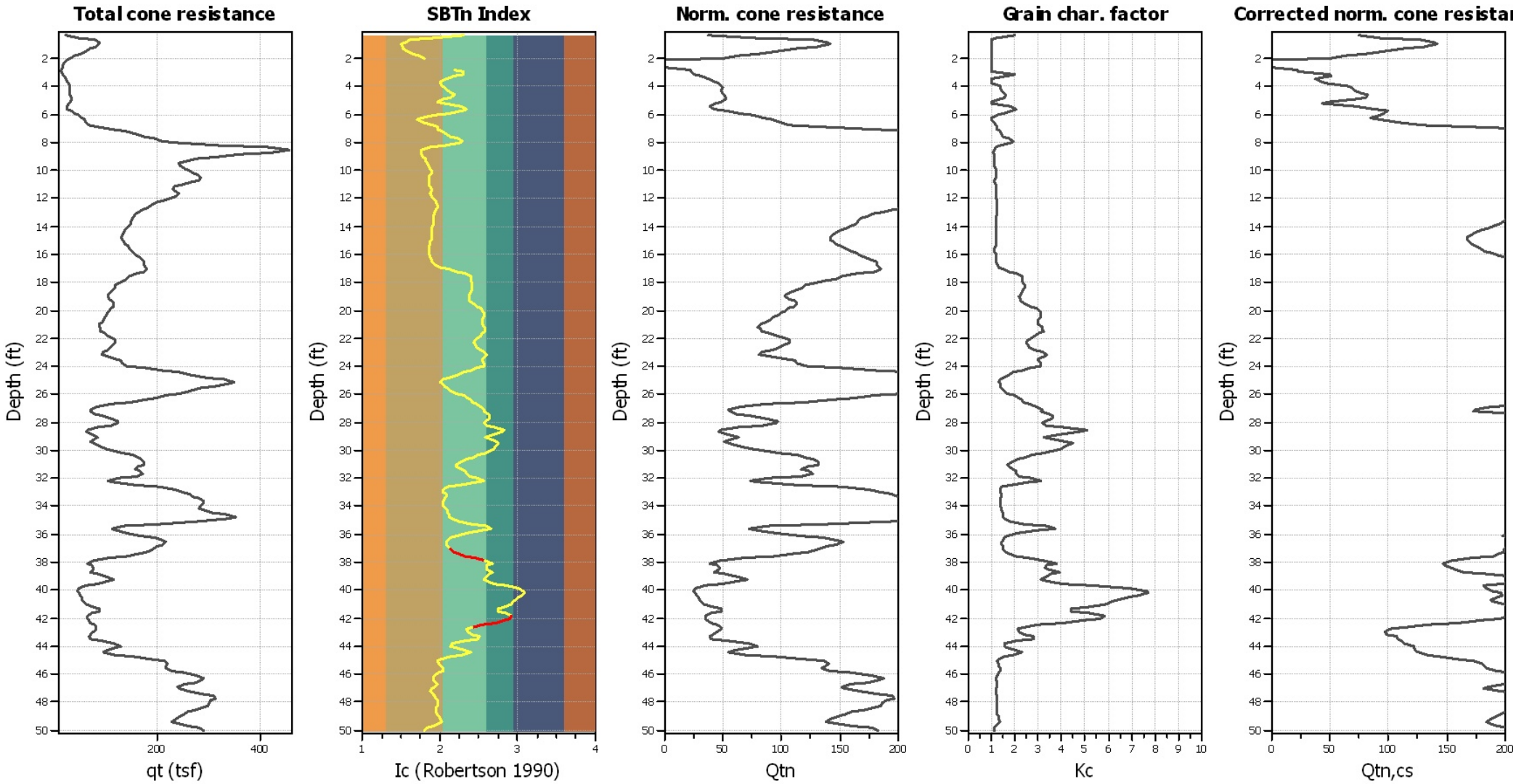
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 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 clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

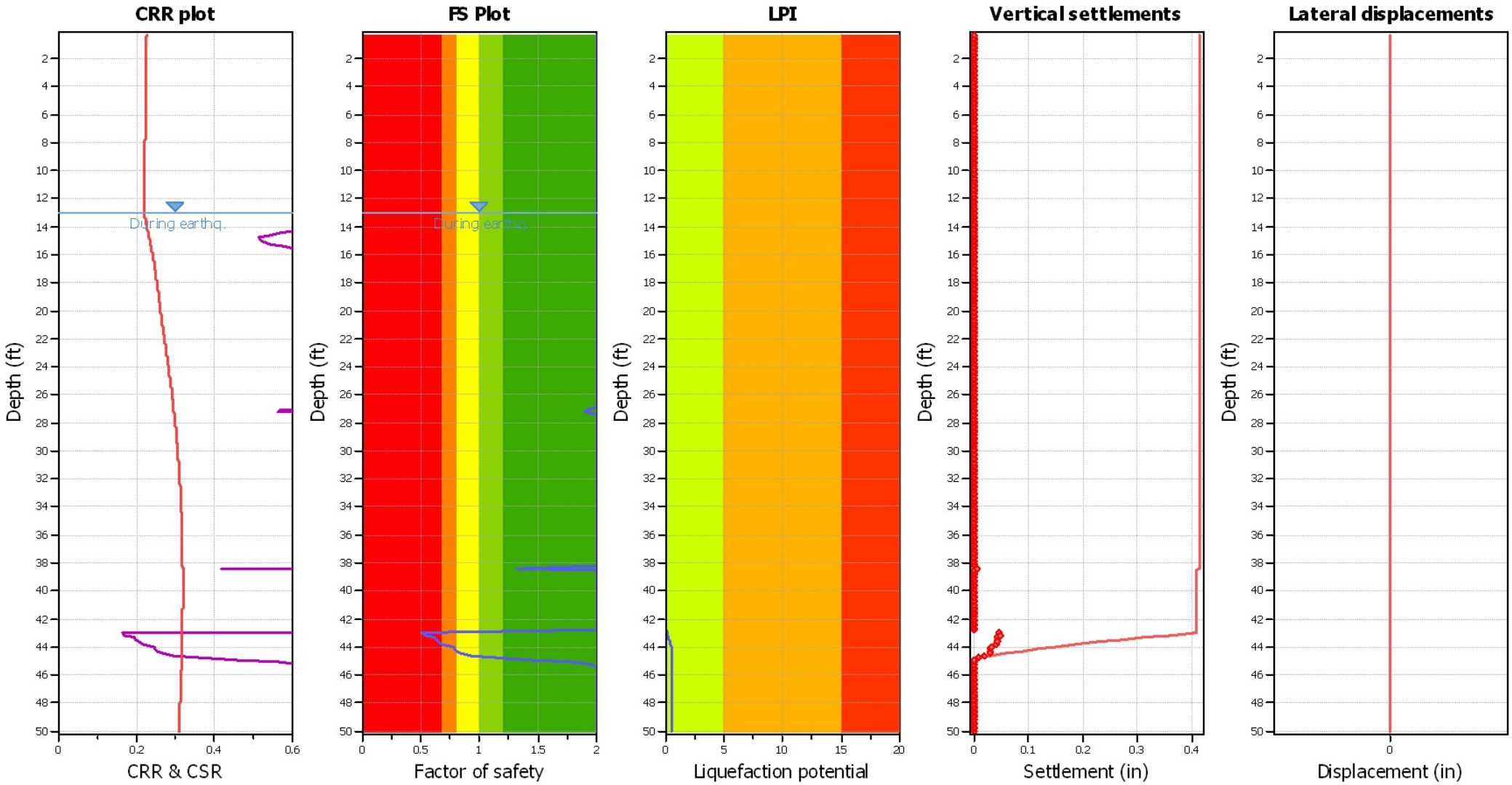
Liquefaction analysis overall plots (intermediate resu



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 ft	Fill height:	N/A	Limit depth:	N/A

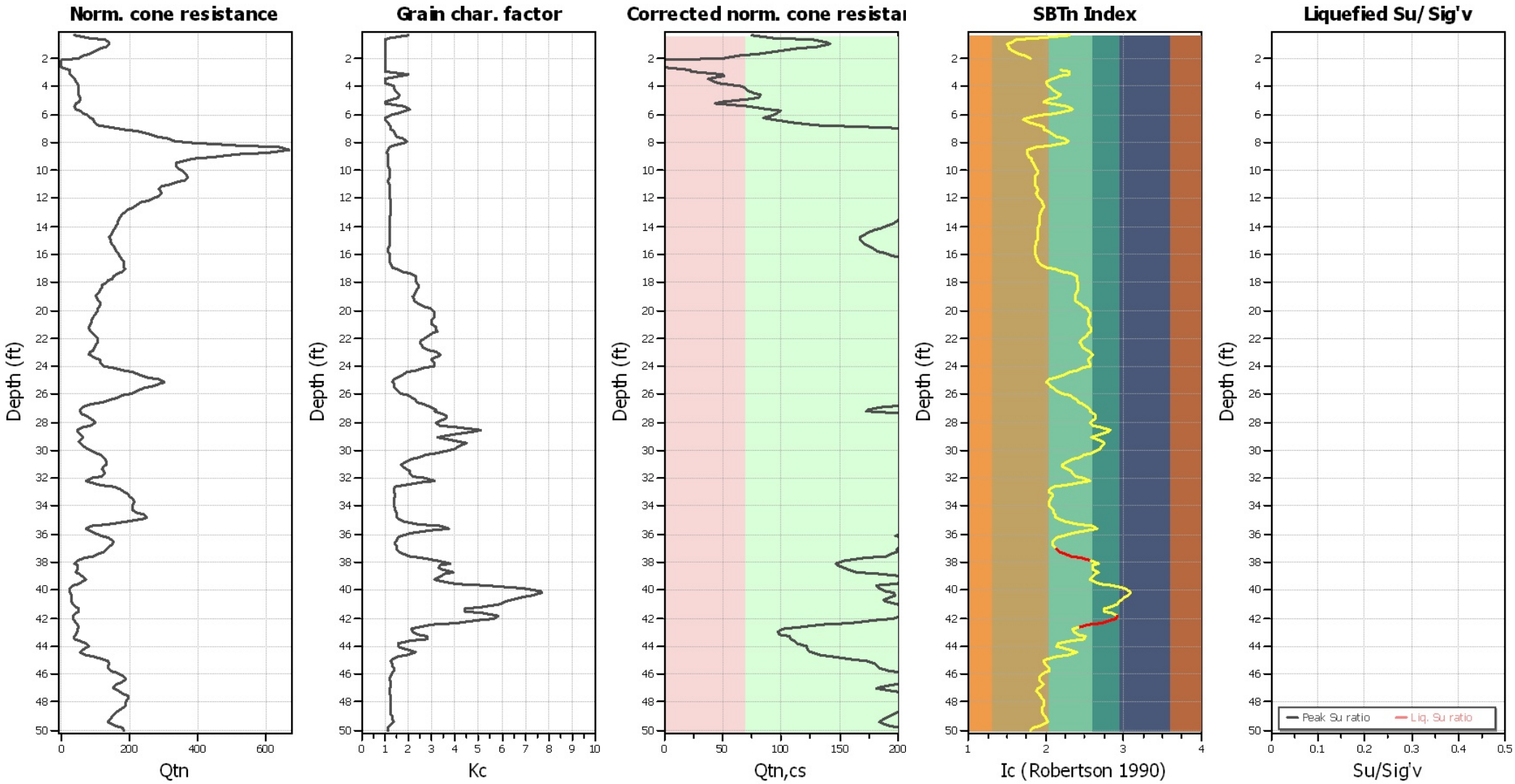
F.S. color scheme

- 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

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

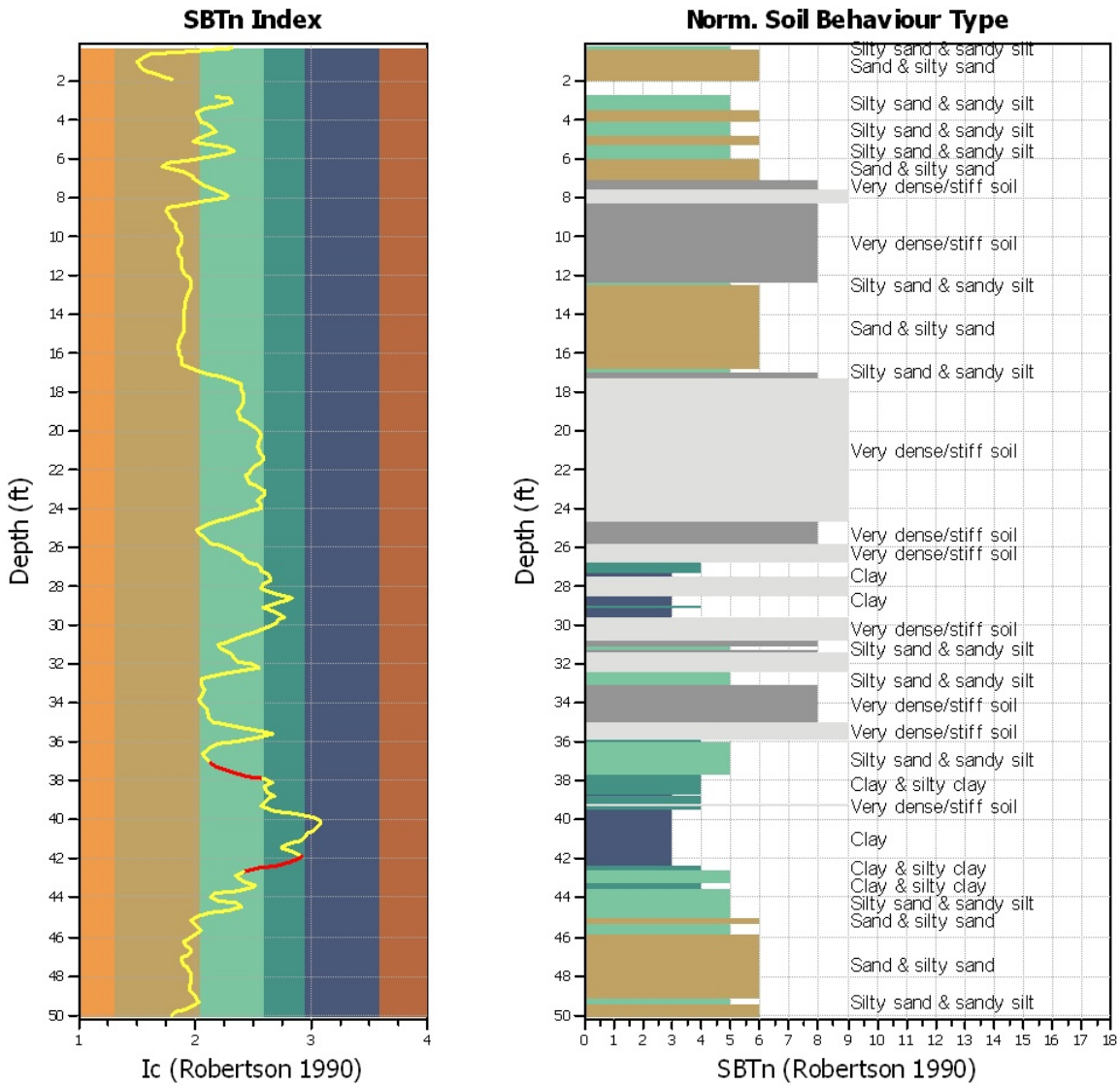
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 ft	Fill height:	N/A	Limit depth:	N/A

TRANSITION LAYER DETECTION ALGORITHM REPORT
Summary Details & Plots

Short description

The software will delete data when the cone is in transition from either clay to sand or vise-versa. To do this the software requires a range of I_c values over which the transition will be defined (typically somewhere between $1.80 < I_c < 3.0$) and a rate of change of I_c. Transitions typically occur when the rate of change of I_c is fast (i.e. delta I_c is small).

The SBT_n plot below, displays in red the detected transition layers based on the parameters listed below the graphs.



Transition layer algorithm properties		General statistics	
I_c minimum check value:	1.70	Total points in CPT file:	304
I_c maximum check value:	3.00	Total points excluded:	12
I_c change ratio value:	0.0250	Exclusion percentage:	3.95%
Minimum number of points in layer:	4	Number of layers detected:	2

Transition layer No	Number of points	Depth	SBT_n number	SBT_n description
Transition layer 1	6	Start depth: 37.24 (ft)	5	Silty sand & sandy silt
		End depth: 38.06 (ft)	4	Clay & silty clay
Transition layer 2	6	Start depth: 42.00 (ft)	3	Clay
		End depth: 42.82 (ft)	5	Silty sand & sandy silt

Start depth: Depth where the transition layer begins
End depth: Depth where the transition layer ends

:: Field input data ::

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	0.33	1.70	0.30	0.00	22.88	109.17
2	0.49	67.30	0.30	3.10	10.32	111.71
3	0.66	77.20	0.40	0.80	4.54	112.88
4	0.82	91.00	0.30	0.10	3.64	113.11
5	0.98	90.70	0.30	0.20	2.76	111.52
6	1.15	82.40	0.20	0.40	3.04	110.35
7	1.31	71.00	0.20	-0.10	3.25	107.57
8	1.48	60.80	0.10	-0.10	4.11	105.54
9	1.64	50.30	0.10	0.00	5.00	102.95
10	1.80	38.10	0.10	-0.10	5.00	99.41
11	1.97	29.60	0.00	0.00	5.00	93.74
12	2.13	24.50	0.00	0.00	N/A	87.36
13	2.30	20.40	0.00	0.20	N/A	87.36
14	2.46	17.30	0.00	0.30	N/A	87.36
15	2.62	15.80	0.00	0.30	N/A	87.36
16	2.79	14.10	0.00	0.30	5.00	91.89
17	2.95	13.30	0.10	0.30	5.00	96.92
18	3.12	15.10	0.10	0.30	22.89	100.16
19	3.28	19.00	0.10	0.40	18.86	100.63
20	3.45	23.50	0.10	0.40	5.00	101.09
21	3.61	26.90	0.10	0.40	5.00	101.41
22	3.77	29.00	0.10	0.40	5.00	103.74
23	3.94	31.20	0.20	0.40	13.74	105.48
24	4.10	30.70	0.20	0.50	14.55	106.86
25	4.27	30.60	0.20	0.60	15.70	107.97
26	4.43	30.50	0.30	0.50	17.36	109.83
27	4.59	31.60	0.40	0.90	18.49	111.36
28	4.76	33.00	0.40	0.90	17.01	110.75
29	4.92	34.00	0.20	0.70	14.37	108.15
30	5.09	32.10	0.10	0.20	5.00	103.88
31	5.25	26.00	0.10	0.20	5.00	103.56
32	5.41	22.80	0.20	-0.10	21.10	108.41
33	5.58	25.10	0.50	0.00	23.94	112.15
34	5.74	31.90	0.60	0.20	21.75	114.64
35	5.91	41.80	0.60	0.90	16.36	114.23
36	6.07	47.70	0.30	0.70	11.38	112.35
37	6.23	52.90	0.20	-0.10	5.00	109.29
38	6.40	57.50	0.20	-0.40	5.00	109.52
39	6.56	63.40	0.30	-0.20	7.69	112.99
40	6.73	64.60	0.60	-0.20	10.80	118.25
41	6.89	72.30	1.30	-0.20	12.32	123.31
42	7.05	109.70	2.20	0.10	12.31	128.52
43	7.22	159.50	4.00	1.80	13.66	132.50
44	7.38	145.70	5.90	24.50	15.29	135.57
45	7.55	169.40	7.70	20.80	16.71	137.28
46	7.71	207.70	9.60	9.90	19.82	137.28
47	7.87	203.80	17.50	5.30	21.93	137.28
48	8.04	208.70	17.50	31.60	21.16	137.28

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	8.20	292.70	16.00	82.60	14.54	137.28
50	8.37	463.90	14.10	-1.10	9.85	137.28
51	8.53	484.20	12.40	-2.20	7.55	137.28
52	8.69	416.90	10.30	-3.70	7.22	137.28
53	8.86	357.70	8.60	-4.60	7.56	137.28
54	9.02	307.50	7.20	-4.60	7.94	137.28
55	9.19	272.00	6.20	-1.90	8.36	137.28
56	9.35	247.10	5.60	-0.80	8.70	136.54
57	9.51	239.00	5.40	-0.70	8.93	136.14
58	9.68	242.30	5.50	-0.70	9.24	136.46
59	9.84	251.60	6.30	-0.50	9.62	137.19
60	10.01	262.00	7.00	-0.40	10.09	137.28
61	10.17	270.40	7.60	-0.80	10.19	137.28
62	10.34	277.40	7.50	-1.00	9.95	137.28
63	10.50	286.80	7.30	-1.30	9.52	137.28
64	10.66	284.40	6.90	-1.40	9.27	137.28
65	10.83	268.40	6.40	-1.10	9.25	137.28
66	10.99	246.60	5.60	-0.90	9.58	136.58
67	11.16	228.30	5.40	-0.80	9.98	135.99
68	11.32	223.80	5.40	-0.80	10.13	135.87
69	11.48	236.40	5.40	-0.80	10.07	136.05
70	11.65	241.80	5.70	-0.80	9.95	136.29
71	11.81	243.10	5.80	-0.80	10.34	136.39
72	11.98	226.40	5.70	-1.00	10.87	136.15
73	12.14	211.10	5.40	-1.20	11.50	135.63
74	12.30	197.80	5.00	-1.30	11.88	134.95
75	12.47	187.10	4.60	-1.70	12.03	134.21
76	12.63	179.30	4.20	-1.80	11.94	133.37
77	12.80	171.20	3.70	-1.20	11.70	132.38
78	12.96	161.90	3.20	-1.10	11.35	131.36
79	13.12	157.60	2.90	-1.00	11.07	130.48
80	13.29	152.90	2.70	-1.00	10.92	129.90
81	13.45	149.60	2.60	-1.00	10.83	129.49
82	13.62	149.00	2.50	-1.10	10.70	129.18
83	13.78	148.50	2.40	-1.20	10.55	128.86
84	13.94	145.20	2.30	-1.10	10.49	128.51
85	14.11	141.80	2.20	-1.20	10.41	128.01
86	14.27	138.20	2.00	-1.10	10.46	127.60
87	14.44	134.30	2.00	-1.20	10.40	127.05
88	14.60	130.50	1.80	-1.20	10.46	126.74
89	14.76	130.00	1.80	-1.20	10.33	126.46
90	14.93	131.50	1.80	-1.30	10.23	126.48
91	15.09	134.00	1.80	-1.50	10.00	126.52
92	15.26	137.10	1.80	-1.50	9.78	126.72
93	15.42	142.20	1.90	-1.50	9.49	126.93
94	15.58	147.50	1.90	-1.50	9.30	127.27
95	15.75	151.50	2.00	-1.50	9.25	127.71
96	15.91	156.10	2.20	-1.50	9.46	128.35

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	16.08	160.00	2.40	-1.50	9.76	129.05
98	16.24	163.70	2.60	-1.60	9.98	129.71
99	16.40	170.00	2.80	-1.60	10.10	130.33
100	16.57	176.90	3.00	-1.60	10.13	130.73
101	16.73	176.50	3.00	-1.60	11.15	131.67
102	16.90	170.90	4.00	-1.60	13.21	133.57
103	17.06	184.50	5.90	-1.60	16.07	135.79
104	17.23	181.60	7.50	-1.50	19.59	137.28
105	17.39	153.70	8.90	-0.20	23.34	137.28
106	17.55	143.40	9.50	0.80	26.26	137.28
107	17.72	142.90	9.20	2.50	26.41	137.28
108	17.88	139.30	7.60	4.10	26.52	137.28
109	18.05	119.70	7.20	5.00	26.86	136.48
110	18.21	114.10	6.80	7.00	27.36	135.98
111	18.37	121.50	6.50	16.70	27.27	135.69
112	18.54	114.50	6.50	14.00	26.89	135.09
113	18.70	105.30	5.40	15.70	26.57	134.13
114	18.87	104.60	4.50	13.90	25.58	132.98
115	19.03	102.10	4.30	11.60	25.26	132.77
116	19.19	105.10	5.00	14.70	25.45	133.42
117	19.36	116.40	5.60	16.10	25.93	134.42
118	19.52	118.60	6.20	22.30	27.61	135.47
119	19.69	109.80	7.50	34.10	29.75	136.30
120	19.85	111.90	8.00	42.50	32.16	136.82
121	20.01	106.00	8.10	26.60	33.00	136.87
122	20.18	103.50	7.80	19.70	33.69	136.63
123	20.34	101.40	7.50	18.70	33.48	136.19
124	20.51	99.60	6.90	16.30	33.31	135.64
125	20.67	94.70	6.40	16.10	32.68	134.87
126	20.83	92.50	5.60	16.40	32.42	134.13
127	21.00	88.80	5.30	14.50	32.69	133.54
128	21.16	82.80	5.30	15.90	33.82	133.71
129	21.33	87.20	6.10	17.80	34.22	134.24
130	21.49	95.20	6.40	16.20	34.57	134.73
131	21.65	89.20	6.40	15.60	33.10	135.09
132	21.82	106.00	6.60	21.40	31.66	135.53
133	21.98	117.10	7.10	24.70	29.67	136.01
134	22.15	119.90	7.10	23.40	28.92	136.04
135	22.31	115.40	6.50	25.60	28.13	135.64
136	22.47	117.30	6.00	27.20	28.45	135.30
137	22.64	109.10	6.40	28.50	29.43	135.26
138	22.80	104.60	6.60	24.20	31.54	135.21
139	22.97	96.40	6.30	14.90	34.00	134.92
140	23.13	82.80	6.20	14.90	35.67	135.10
141	23.30	95.30	7.30	22.70	35.01	136.27
142	23.46	124.20	9.00	15.20	32.67	137.28
143	23.62	136.50	9.60	8.70	32.53	137.28
144	23.79	125.50	10.80	10.00	33.77	137.28

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	23.95	130.60	12.00	16.40	33.68	137.28
146	24.12	167.70	13.70	13.50	29.84	137.28
147	24.28	222.60	15.00	5.00	26.18	137.28
148	24.44	242.80	15.40	-2.90	22.55	137.28
149	24.61	260.50	12.30	-2.60	19.79	137.28
150	24.77	286.20	12.00	-3.70	16.29	137.28
151	24.94	340.20	11.60	-3.90	14.36	137.28
152	25.10	359.30	12.10	-0.60	13.32	137.28
153	25.26	346.70	11.80	-0.60	13.76	137.28
154	25.43	303.00	11.00	-0.10	14.69	137.28
155	25.59	274.60	10.20	-0.50	15.72	137.28
156	25.76	269.50	10.20	-1.00	17.04	137.28
157	25.92	244.70	10.90	-1.30	19.34	137.28
158	26.08	213.00	11.90	-0.90	22.68	137.28
159	26.25	192.80	12.50	0.20	25.11	137.28
160	26.41	185.80	11.30	0.50	26.15	137.28
161	26.58	153.00	8.20	1.00	27.04	137.28
162	26.74	98.40	4.80	0.50	29.09	134.23
163	26.90	75.60	3.60	1.30	32.01	130.89
164	27.07	69.80	3.20	2.20	33.86	129.39
165	27.23	66.10	3.10	2.60	33.71	129.40
166	27.40	77.00	3.60	3.30	36.71	132.33
167	27.56	91.60	7.60	4.90	37.48	135.52
168	27.72	112.80	9.60	9.00	37.44	137.28
169	27.89	128.00	10.60	11.30	34.92	137.28
170	28.05	133.60	9.40	12.60	34.03	137.28
171	28.22	110.80	7.80	12.90	35.65	136.92
172	28.38	80.80	6.80	12.60	40.67	135.05
173	28.54	61.90	5.60	11.00	48.03	133.17
174	28.71	47.10	4.80	8.30	46.12	132.23
175	28.87	78.50	4.80	2.20	40.01	132.31
176	29.04	92.90	5.00	-0.70	34.39	132.38
177	29.20	83.40	4.20	-1.70	37.24	132.34
178	29.36	59.60	5.10	-0.40	41.72	132.32
179	29.53	67.70	5.50	2.90	43.68	134.16
180	29.69	98.30	8.00	2.00	41.67	135.79
181	29.86	96.80	8.60	4.30	40.17	137.28
182	30.02	110.00	10.00	5.90	38.61	137.28
183	30.19	133.60	11.00	8.30	34.27	137.28
184	30.35	163.00	10.60	10.30	30.59	137.28
185	30.51	160.50	9.40	3.80	27.48	137.28
186	30.68	163.20	8.30	4.80	24.44	137.28
187	30.84	184.20	7.00	2.90	21.43	137.03
188	31.01	176.20	5.50	1.80	19.25	135.77
189	31.17	164.90	5.00	2.30	19.65	135.01
190	31.33	151.90	5.60	1.40	22.11	135.76
191	31.50	155.40	7.50	0.30	23.36	137.25
192	31.66	190.90	8.70	0.90	23.95	137.28

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	31.83	170.30	8.00	2.00	25.23	137.28
194	31.99	120.70	6.70	2.70	29.76	136.09
195	32.15	85.80	5.70	6.20	33.31	134.71
196	32.32	105.40	5.60	10.80	28.41	134.38
197	32.48	161.90	5.20	1.30	20.62	134.93
198	32.65	209.70	5.30	0.50	15.80	135.66
199	32.81	236.60	5.90	1.00	14.28	136.71
200	32.97	251.70	6.90	1.20	14.42	137.28
201	33.14	260.40	7.90	1.70	14.96	137.28
202	33.30	269.10	8.60	2.00	15.12	137.28
203	33.47	280.50	8.70	2.80	14.73	137.28
204	33.63	294.10	8.70	3.00	14.21	137.28
205	33.79	292.80	8.50	3.20	14.07	137.28
206	33.96	282.20	8.40	3.10	14.39	137.28
207	34.12	277.80	8.60	3.80	15.16	137.28
208	34.29	284.70	9.90	3.70	15.88	137.28
209	34.45	302.80	11.30	4.30	16.02	137.28
210	34.61	331.80	12.10	5.50	16.15	137.28
211	34.78	363.30	15.00	6.70	16.34	137.28
212	34.94	356.50	15.30	7.50	17.56	137.28
213	35.11	290.50	13.60	6.60	20.95	137.28
214	35.27	177.90	12.10	9.90	27.24	137.28
215	35.43	121.30	10.40	10.30	35.64	137.28
216	35.60	107.50	8.90	8.20	38.28	137.28
217	35.76	108.70	6.70	5.30	32.49	136.11
218	35.93	142.80	5.20	-0.10	24.39	134.83
219	36.09	173.80	4.60	-6.30	19.27	134.76
220	36.26	193.20	5.60	-6.40	17.08	135.56
221	36.42	218.90	6.20	-5.70	16.01	136.11
222	36.58	223.30	5.40	-3.40	15.06	135.87
223	36.75	210.60	4.90	-3.30	15.18	135.38
224	36.91	196.00	5.30	-3.00	16.03	135.22
225	37.08	194.80	5.30	-2.30	16.74	134.96
226	37.24	184.10	4.60	-1.80	18.21	135.02
227	37.40	164.80	5.70	-1.60	20.13	134.81
228	37.57	149.80	5.30	-1.10	23.58	134.17
229	37.73	109.80	4.10	-1.40	28.40	132.04
230	37.90	60.00	3.00	-1.20	34.78	129.52
231	38.06	60.50	2.70	-0.80	38.86	128.31
232	38.22	73.30	3.10	-0.30	35.36	128.85
233	38.39	84.90	3.30	0.50	35.03	129.60
234	38.55	72.40	3.50	2.20	35.82	129.80
235	38.72	71.40	3.40	2.70	39.73	130.24
236	38.88	69.20	4.20	2.80	37.25	132.22
237	39.04	114.20	6.10	5.70	35.59	134.50
238	39.21	122.20	7.30	10.30	33.79	135.78
239	39.37	111.20	6.70	12.10	35.65	135.02
240	39.54	82.30	4.70	10.50	40.56	133.22

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	39.70	56.90	4.40	9.70	48.86	131.29
242	39.86	46.20	4.30	8.00	59.41	130.88
243	40.03	43.50	5.00	7.90	63.82	131.18
244	40.19	47.80	5.30	4.50	63.99	131.80
245	40.36	51.00	5.40	4.70	61.61	132.04
246	40.52	52.40	5.20	4.40	59.30	131.90
247	40.68	53.60	4.80	3.40	56.48	131.60
248	40.85	57.50	4.60	1.70	54.82	131.82
249	41.01	60.40	5.40	1.10	53.13	132.79
250	41.18	70.20	6.40	-0.40	47.96	134.14
251	41.34	96.50	6.70	-1.50	43.60	134.82
252	41.50	94.30	6.30	-0.70	43.61	134.60
253	41.67	67.00	5.90	0.60	48.60	133.92
254	41.83	60.70	5.90	0.60	52.86	133.24
255	42.00	67.80	5.40	0.40	51.72	132.69
256	42.16	65.40	4.70	-0.60	47.09	131.76
257	42.32	69.30	3.80	-0.30	40.73	130.26
258	42.49	79.70	2.60	-1.80	32.63	128.27
259	42.65	86.40	1.80	-3.00	26.80	125.96
260	42.82	79.70	1.50	-6.40	24.20	124.11
261	42.98	76.00	1.30	-6.50	24.90	123.28
262	43.15	71.20	1.40	-6.10	27.27	123.47
263	43.31	65.70	1.70	-5.90	31.16	124.55
264	43.47	64.50	2.10	-5.80	30.66	124.91
265	43.64	78.20	1.60	-4.30	24.40	125.91
266	43.80	123.40	2.00	-3.90	17.71	126.44
267	43.97	147.30	2.00	-3.90	16.91	127.66
268	44.13	114.90	2.40	1.10	19.16	127.80
269	44.29	93.80	2.30	1.50	24.23	127.91
270	44.46	91.00	2.50	1.60	26.12	128.08
271	44.62	100.40	2.70	0.20	22.02	129.33
272	44.79	159.30	3.10	-0.80	17.06	130.55
273	44.95	193.80	3.20	-0.50	13.20	131.76
274	45.11	223.10	3.50	0.30	12.12	132.66
275	45.28	223.70	4.00	0.30	12.47	133.45
276	45.44	214.50	4.30	0.00	13.55	134.01
277	45.61	212.50	4.50	-0.20	14.26	134.38
278	45.77	217.90	4.70	-0.20	14.00	135.03
279	45.93	249.20	5.30	1.10	12.53	135.58
280	46.10	287.00	5.10	1.60	11.30	136.04
281	46.26	289.30	5.20	4.10	10.55	136.26
282	46.43	294.30	5.50	3.10	10.94	136.42
283	46.59	279.20	5.50	2.30	11.50	136.12
284	46.75	249.60	4.80	2.10	11.92	135.08
285	46.92	227.00	3.80	2.30	11.26	133.65
286	47.08	239.40	3.20	2.20	10.18	132.81
287	47.25	254.30	3.50	1.10	9.83	133.94
288	47.41	293.30	5.20	1.90	10.55	136.11

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	47.57	319.50	6.80	2.20	11.26	137.28
290	47.74	316.60	7.00	2.30	11.78	137.28
291	47.90	302.50	6.60	2.40	12.15	137.28
292	48.07	294.70	6.60	2.30	12.28	137.28
293	48.23	303.20	6.70	2.30	12.16	137.28
294	48.39	296.90	6.10	2.50	11.86	137.17
295	48.56	271.00	5.10	2.50	11.72	136.12
296	48.72	253.30	4.60	2.30	11.81	135.30
297	48.89	253.20	4.70	2.30	12.23	135.13
298	49.05	247.50	4.90	2.30	12.77	135.05
299	49.22	231.30	4.60	2.40	13.27	134.81
300	49.38	226.00	4.40	2.40	13.69	134.63
301	49.54	227.20	4.70	2.50	12.47	134.47
302	49.71	265.00	4.10	2.70	10.68	134.47
303	49.87	293.00	4.00	3.00	8.84	133.98
304	50.04	285.50	3.60	3.20	8.17	133.72

Abbreviations

Depth:	Depth from free surface, at which CPT was performed (ft)
q_c:	Measured cone resistance (tsf)
f_s:	Sleeve friction resistance (tsf)
u:	Pore pressure (tsf)
Fines content:	Percentage of fines in soil (%)
Unit weight:	Bulk soil unit weight (pcf)

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data ::

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
1	0.33	0.02	0.00	0.02	1.00	0.215	1.24	0.173	1.00	1.30	2.000	No
2	0.49	0.03	0.00	0.03	1.00	0.215	1.24	0.173	1.00	1.30	2.000	No
3	0.66	0.04	0.00	0.04	1.00	0.215	1.24	0.173	1.00	1.30	2.000	No
4	0.82	0.05	0.00	0.05	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
5	0.98	0.05	0.00	0.05	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
6	1.15	0.06	0.00	0.06	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
7	1.31	0.07	0.00	0.07	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
8	1.48	0.08	0.00	0.08	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
9	1.64	0.09	0.00	0.09	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
10	1.80	0.10	0.00	0.10	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
11	1.97	0.11	0.00	0.11	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
12	2.13	0.11	0.00	0.11	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
13	2.30	0.12	0.00	0.12	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
14	2.46	0.13	0.00	0.13	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
15	2.62	0.13	0.00	0.13	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
16	2.79	0.14	0.00	0.14	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
17	2.95	0.15	0.00	0.15	1.00	0.213	1.24	0.172	1.00	1.30	2.000	No
18	3.12	0.16	0.00	0.16	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
19	3.28	0.17	0.00	0.17	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
20	3.45	0.17	0.00	0.17	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
21	3.61	0.18	0.00	0.18	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
22	3.77	0.19	0.00	0.19	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
23	3.94	0.20	0.00	0.20	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
24	4.10	0.21	0.00	0.21	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
25	4.27	0.22	0.00	0.22	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
26	4.43	0.23	0.00	0.23	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
27	4.59	0.24	0.00	0.24	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
28	4.76	0.24	0.00	0.24	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
29	4.92	0.25	0.00	0.25	0.99	0.212	1.24	0.172	1.00	1.30	2.000	No
30	5.09	0.26	0.00	0.26	0.99	0.212	1.24	0.172	1.00	1.30	2.000	No
31	5.25	0.27	0.00	0.27	0.99	0.212	1.24	0.172	1.00	1.30	2.000	No
32	5.41	0.28	0.00	0.28	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
33	5.58	0.29	0.00	0.29	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
34	5.74	0.30	0.00	0.30	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
35	5.91	0.31	0.00	0.31	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
36	6.07	0.32	0.00	0.32	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
37	6.23	0.33	0.00	0.33	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
38	6.40	0.33	0.00	0.33	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
39	6.56	0.34	0.00	0.34	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
40	6.73	0.35	0.00	0.35	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
41	6.89	0.36	0.00	0.36	0.99	0.211	1.24	0.171	1.00	1.30	2.000	No
42	7.05	0.37	0.00	0.37	0.99	0.211	1.24	0.171	1.00	1.30	2.000	No
43	7.22	0.39	0.00	0.39	0.99	0.211	1.24	0.171	1.00	1.30	2.000	No
44	7.38	0.40	0.00	0.40	0.98	0.211	1.24	0.171	1.00	1.30	2.000	No
45	7.55	0.41	0.00	0.41	0.98	0.211	1.24	0.171	1.00	1.30	2.000	No
46	7.71	0.42	0.00	0.42	0.98	0.211	1.24	0.171	1.00	1.30	2.000	No
47	7.87	0.43	0.00	0.43	0.98	0.211	1.24	0.171	1.00	1.30	2.000	No
48	8.04	0.44	0.00	0.44	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
49	8.20	0.45	0.00	0.45	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
50	8.37	0.46	0.00	0.46	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
51	8.53	0.48	0.00	0.48	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
52	8.69	0.49	0.00	0.49	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
53	8.86	0.50	0.00	0.50	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
54	9.02	0.51	0.00	0.51	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
55	9.19	0.52	0.00	0.52	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
56	9.35	0.53	0.00	0.53	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
57	9.51	0.54	0.00	0.54	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
58	9.68	0.55	0.00	0.55	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
59	9.84	0.56	0.00	0.56	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
60	10.01	0.58	0.00	0.58	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
61	10.17	0.59	0.00	0.59	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
62	10.34	0.60	0.00	0.60	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
63	10.50	0.61	0.00	0.61	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
64	10.66	0.62	0.00	0.62	0.98	0.210	1.24	0.169	1.00	1.30	2.000	No
65	10.83	0.63	0.00	0.63	0.98	0.210	1.24	0.169	1.00	1.30	2.000	No
66	10.99	0.64	0.00	0.64	0.98	0.210	1.24	0.169	1.00	1.30	2.000	No
67	11.16	0.66	0.00	0.66	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
68	11.32	0.67	0.00	0.67	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
69	11.48	0.68	0.00	0.68	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
70	11.65	0.69	0.00	0.69	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
71	11.81	0.70	0.00	0.70	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
72	11.98	0.71	0.00	0.71	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
73	12.14	0.72	0.00	0.72	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
74	12.30	0.73	0.00	0.73	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
75	12.47	0.74	0.00	0.74	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
76	12.63	0.75	0.00	0.75	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
77	12.80	0.77	0.00	0.77	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
78	12.96	0.78	0.00	0.78	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
79	13.12	0.79	0.00	0.78	0.97	0.210	1.24	0.169	1.00	1.30	0.220	No
80	13.29	0.80	0.01	0.79	0.97	0.211	1.24	0.170	1.00	1.30	0.222	No
81	13.45	0.81	0.01	0.79	0.97	0.212	1.24	0.171	1.00	1.30	0.223	No
82	13.62	0.82	0.02	0.80	0.97	0.213	1.24	0.172	1.00	1.30	0.224	No
83	13.78	0.83	0.02	0.81	0.97	0.215	1.24	0.173	1.00	1.30	0.225	No
84	13.94	0.84	0.03	0.81	0.97	0.216	1.24	0.174	1.00	1.30	0.227	No
85	14.11	0.85	0.03	0.82	0.97	0.217	1.24	0.175	1.00	1.30	0.228	No
86	14.27	0.86	0.04	0.82	0.97	0.218	1.24	0.176	1.00	1.30	0.229	No
87	14.44	0.87	0.04	0.83	0.97	0.219	1.24	0.177	1.00	1.30	0.230	No
88	14.60	0.88	0.05	0.83	0.97	0.220	1.24	0.178	1.00	1.30	0.232	No
89	14.76	0.89	0.05	0.84	0.97	0.222	1.24	0.179	1.00	1.30	0.233	No
90	14.93	0.90	0.06	0.84	0.97	0.223	1.24	0.180	1.00	1.30	0.234	No
91	15.09	0.91	0.07	0.85	0.97	0.224	1.24	0.181	1.00	1.30	0.235	No
92	15.26	0.92	0.07	0.85	0.97	0.225	1.24	0.182	1.00	1.30	0.236	No
93	15.42	0.93	0.08	0.86	0.97	0.226	1.24	0.182	1.00	1.30	0.237	No
94	15.58	0.94	0.08	0.86	0.97	0.227	1.24	0.183	1.00	1.30	0.238	No
95	15.75	0.95	0.09	0.87	0.97	0.228	1.24	0.184	1.00	1.30	0.239	No
96	15.91	0.97	0.09	0.87	0.97	0.229	1.24	0.185	1.00	1.30	0.240	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
97	16.08	0.98	0.10	0.88	0.97	0.230	1.24	0.186	1.00	1.30	0.241	No
98	16.24	0.99	0.10	0.89	0.97	0.231	1.24	0.187	1.00	1.30	0.242	No
99	16.40	1.00	0.11	0.89	0.97	0.232	1.24	0.187	1.00	1.30	0.243	No
100	16.57	1.01	0.11	0.90	0.97	0.233	1.24	0.188	1.00	1.30	0.244	No
101	16.73	1.02	0.12	0.90	0.96	0.234	1.24	0.189	1.00	1.30	0.245	No
102	16.90	1.03	0.12	0.91	0.96	0.235	1.24	0.190	1.00	1.30	0.246	No
103	17.06	1.04	0.13	0.91	0.96	0.235	1.24	0.190	1.00	1.30	0.247	No
104	17.23	1.05	0.13	0.92	0.96	0.236	1.24	0.191	1.00	1.30	0.248	No
105	17.39	1.06	0.14	0.93	0.96	0.237	1.24	0.192	1.00	1.30	0.249	No
106	17.55	1.07	0.14	0.93	0.96	0.238	1.24	0.192	1.00	1.30	0.250	No
107	17.72	1.09	0.15	0.94	0.96	0.239	1.24	0.193	1.00	1.30	0.251	No
108	17.88	1.10	0.15	0.94	0.96	0.240	1.24	0.194	1.00	1.30	0.252	No
109	18.05	1.11	0.16	0.95	0.96	0.240	1.24	0.194	1.00	1.30	0.253	No
110	18.21	1.12	0.16	0.96	0.96	0.241	1.24	0.195	1.00	1.30	0.253	No
111	18.37	1.13	0.17	0.96	0.96	0.242	1.24	0.196	1.00	1.30	0.254	No
112	18.54	1.14	0.17	0.97	0.96	0.243	1.24	0.196	1.00	1.30	0.255	No
113	18.70	1.15	0.18	0.97	0.96	0.244	1.24	0.197	1.00	1.30	0.256	No
114	18.87	1.16	0.18	0.98	0.96	0.244	1.24	0.197	1.00	1.30	0.257	No
115	19.03	1.17	0.19	0.99	0.96	0.245	1.24	0.198	1.00	1.30	0.257	No
116	19.19	1.19	0.19	0.99	0.96	0.246	1.24	0.199	1.00	1.30	0.258	No
117	19.36	1.20	0.20	1.00	0.96	0.246	1.24	0.199	1.00	1.30	0.259	No
118	19.52	1.21	0.20	1.00	0.96	0.247	1.24	0.200	1.00	1.30	0.260	No
119	19.69	1.22	0.21	1.01	0.96	0.248	1.24	0.200	1.00	1.30	0.260	No
120	19.85	1.23	0.21	1.02	0.96	0.249	1.24	0.201	1.00	1.30	0.261	No
121	20.01	1.24	0.22	1.02	0.96	0.249	1.24	0.201	1.00	1.30	0.262	No
122	20.18	1.25	0.22	1.03	0.96	0.250	1.24	0.202	1.00	1.30	0.262	No
123	20.34	1.26	0.23	1.03	0.96	0.250	1.24	0.202	1.00	1.30	0.263	No
124	20.51	1.28	0.23	1.04	0.96	0.251	1.24	0.203	1.00	1.30	0.264	No
125	20.67	1.29	0.24	1.05	0.96	0.252	1.24	0.203	1.00	1.30	0.264	No
126	20.83	1.30	0.24	1.05	0.95	0.252	1.24	0.204	1.00	1.30	0.265	No
127	21.00	1.31	0.25	1.06	0.95	0.253	1.24	0.204	1.00	1.30	0.266	No
128	21.16	1.32	0.25	1.06	0.95	0.254	1.24	0.205	1.00	1.30	0.267	No
129	21.33	1.33	0.26	1.07	0.95	0.254	1.24	0.205	1.00	1.30	0.268	No
130	21.49	1.34	0.26	1.08	0.95	0.255	1.24	0.206	1.00	1.30	0.269	No
131	21.65	1.35	0.27	1.08	0.95	0.255	1.24	0.206	0.99	1.30	0.270	No
132	21.82	1.36	0.28	1.09	0.95	0.256	1.24	0.207	0.99	1.30	0.270	No
133	21.98	1.37	0.28	1.09	0.95	0.256	1.24	0.207	0.99	1.30	0.271	No
134	22.15	1.39	0.29	1.10	0.95	0.257	1.24	0.208	0.99	1.30	0.272	No
135	22.31	1.40	0.29	1.11	0.95	0.257	1.24	0.208	0.99	1.30	0.273	No
136	22.47	1.41	0.30	1.11	0.95	0.258	1.24	0.208	0.99	1.30	0.274	No
137	22.64	1.42	0.30	1.12	0.95	0.258	1.24	0.209	0.99	1.30	0.275	No
138	22.80	1.43	0.31	1.12	0.95	0.259	1.24	0.209	0.99	1.30	0.276	No
139	22.97	1.44	0.31	1.13	0.95	0.259	1.24	0.210	0.98	1.30	0.277	No
140	23.13	1.45	0.32	1.14	0.95	0.260	1.24	0.210	0.98	1.30	0.278	No
141	23.30	1.46	0.32	1.14	0.95	0.260	1.24	0.210	0.98	1.30	0.278	No
142	23.46	1.47	0.33	1.15	0.95	0.261	1.24	0.211	0.98	1.30	0.279	No
143	23.62	1.49	0.33	1.15	0.95	0.261	1.24	0.211	0.98	1.30	0.280	No
144	23.79	1.50	0.34	1.16	0.95	0.262	1.24	0.212	0.98	1.30	0.281	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
145	23.95	1.51	0.34	1.17	0.95	0.262	1.24	0.212	0.98	1.30	0.282	No
146	24.12	1.52	0.35	1.17	0.94	0.263	1.24	0.212	0.98	1.30	0.282	No
147	24.28	1.53	0.35	1.18	0.94	0.263	1.24	0.213	0.98	1.30	0.283	No
148	24.44	1.54	0.36	1.18	0.94	0.263	1.24	0.213	0.97	1.30	0.284	No
149	24.61	1.55	0.36	1.19	0.94	0.264	1.24	0.213	0.97	1.30	0.285	No
150	24.77	1.56	0.37	1.20	0.94	0.264	1.24	0.214	0.97	1.30	0.286	No
151	24.94	1.58	0.37	1.20	0.94	0.265	1.24	0.214	0.97	1.30	0.286	No
152	25.10	1.59	0.38	1.21	0.94	0.265	1.24	0.214	0.97	1.30	0.287	No
153	25.26	1.60	0.38	1.22	0.94	0.265	1.24	0.214	0.97	1.30	0.288	No
154	25.43	1.61	0.39	1.22	0.94	0.266	1.24	0.215	0.97	1.30	0.289	No
155	25.59	1.62	0.39	1.23	0.94	0.266	1.24	0.215	0.97	1.30	0.289	No
156	25.76	1.63	0.40	1.23	0.94	0.266	1.24	0.215	0.97	1.30	0.290	No
157	25.92	1.64	0.40	1.24	0.94	0.267	1.24	0.216	0.96	1.30	0.291	No
158	26.08	1.65	0.41	1.25	0.94	0.267	1.24	0.216	0.96	1.30	0.291	No
159	26.25	1.67	0.41	1.25	0.94	0.267	1.24	0.216	0.96	1.30	0.292	No
160	26.41	1.68	0.42	1.26	0.94	0.268	1.24	0.216	0.96	1.30	0.293	No
161	26.58	1.69	0.42	1.26	0.94	0.268	1.24	0.217	0.96	1.30	0.293	No
162	26.74	1.70	0.43	1.27	0.94	0.268	1.24	0.217	0.96	1.30	0.294	No
163	26.90	1.71	0.43	1.28	0.93	0.269	1.24	0.217	0.96	1.30	0.295	No
164	27.07	1.72	0.44	1.28	0.93	0.269	1.24	0.217	0.96	1.30	0.295	No
165	27.23	1.73	0.44	1.29	0.93	0.269	1.24	0.218	0.96	1.30	0.296	No
166	27.40	1.74	0.45	1.29	0.93	0.270	1.24	0.218	0.95	1.30	0.297	No
167	27.56	1.75	0.45	1.30	0.93	0.270	1.24	0.218	0.95	1.30	0.297	No
168	27.72	1.76	0.46	1.30	0.93	0.270	1.24	0.218	0.95	1.30	0.298	No
169	27.89	1.78	0.46	1.31	0.93	0.270	1.24	0.218	0.95	1.30	0.298	No
170	28.05	1.79	0.47	1.32	0.93	0.271	1.24	0.219	0.95	1.30	0.299	No
171	28.22	1.80	0.47	1.32	0.93	0.271	1.24	0.219	0.95	1.30	0.299	No
172	28.38	1.81	0.48	1.33	0.93	0.271	1.24	0.219	0.95	1.30	0.300	No
173	28.54	1.82	0.48	1.34	0.93	0.271	1.24	0.219	0.95	1.30	0.301	No
174	28.71	1.83	0.49	1.34	0.93	0.271	1.24	0.219	0.95	1.30	0.301	No
175	28.87	1.84	0.50	1.35	0.93	0.272	1.24	0.220	0.95	1.30	0.302	No
176	29.04	1.85	0.50	1.35	0.93	0.272	1.24	0.220	0.95	1.30	0.302	No
177	29.20	1.86	0.51	1.36	0.92	0.272	1.24	0.220	0.94	1.30	0.303	No
178	29.36	1.87	0.51	1.36	0.92	0.272	1.24	0.220	0.94	1.30	0.303	No
179	29.53	1.89	0.52	1.37	0.92	0.272	1.24	0.220	0.94	1.30	0.304	No
180	29.69	1.90	0.52	1.38	0.92	0.273	1.24	0.220	0.94	1.30	0.304	No
181	29.86	1.91	0.53	1.38	0.92	0.273	1.24	0.220	0.94	1.30	0.305	No
182	30.02	1.92	0.53	1.39	0.92	0.273	1.24	0.221	0.94	1.30	0.305	No
183	30.19	1.93	0.54	1.39	0.92	0.273	1.24	0.221	0.94	1.30	0.306	No
184	30.35	1.94	0.54	1.40	0.92	0.273	1.24	0.221	0.94	1.30	0.306	No
185	30.51	1.95	0.55	1.41	0.92	0.273	1.24	0.221	0.94	1.30	0.307	No
186	30.68	1.96	0.55	1.41	0.92	0.274	1.24	0.221	0.94	1.30	0.307	No
187	30.84	1.98	0.56	1.42	0.92	0.274	1.24	0.221	0.93	1.30	0.308	No
188	31.01	1.99	0.56	1.43	0.92	0.274	1.24	0.221	0.93	1.30	0.308	No
189	31.17	2.00	0.57	1.43	0.91	0.274	1.24	0.221	0.93	1.30	0.308	No
190	31.33	2.01	0.57	1.44	0.91	0.274	1.24	0.221	0.93	1.30	0.309	No
191	31.50	2.02	0.58	1.44	0.91	0.274	1.24	0.221	0.93	1.30	0.309	No
192	31.66	2.03	0.58	1.45	0.91	0.274	1.24	0.222	0.93	1.30	0.310	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
193	31.83	2.04	0.59	1.46	0.91	0.274	1.24	0.222	0.93	1.30	0.310	No
194	31.99	2.05	0.59	1.46	0.91	0.274	1.24	0.222	0.93	1.30	0.310	No
195	32.15	2.06	0.60	1.47	0.91	0.274	1.24	0.222	0.93	1.30	0.311	No
196	32.32	2.08	0.60	1.47	0.91	0.274	1.24	0.222	0.93	1.30	0.311	No
197	32.48	2.09	0.61	1.48	0.91	0.274	1.24	0.222	0.93	1.30	0.311	No
198	32.65	2.10	0.61	1.49	0.91	0.275	1.24	0.222	0.92	1.30	0.312	No
199	32.81	2.11	0.62	1.49	0.90	0.275	1.24	0.222	0.92	1.30	0.312	No
200	32.97	2.12	0.62	1.50	0.90	0.275	1.24	0.222	0.92	1.30	0.312	No
201	33.14	2.13	0.63	1.50	0.90	0.275	1.24	0.222	0.92	1.30	0.313	No
202	33.30	2.14	0.63	1.51	0.90	0.275	1.24	0.222	0.92	1.30	0.313	No
203	33.47	2.15	0.64	1.52	0.90	0.275	1.24	0.222	0.92	1.30	0.313	No
204	33.63	2.17	0.64	1.52	0.90	0.275	1.24	0.222	0.92	1.30	0.314	No
205	33.79	2.18	0.65	1.53	0.90	0.275	1.24	0.222	0.92	1.30	0.314	No
206	33.96	2.19	0.65	1.53	0.90	0.275	1.24	0.222	0.92	1.30	0.314	No
207	34.12	2.20	0.66	1.54	0.90	0.275	1.24	0.222	0.92	1.30	0.314	No
208	34.29	2.21	0.66	1.55	0.90	0.275	1.24	0.222	0.92	1.30	0.315	No
209	34.45	2.22	0.67	1.55	0.89	0.275	1.24	0.222	0.92	1.30	0.315	No
210	34.61	2.23	0.67	1.56	0.89	0.275	1.24	0.222	0.91	1.30	0.315	No
211	34.78	2.24	0.68	1.56	0.89	0.274	1.24	0.222	0.91	1.30	0.315	No
212	34.94	2.26	0.68	1.57	0.89	0.274	1.24	0.222	0.91	1.30	0.316	No
213	35.11	2.27	0.69	1.58	0.89	0.274	1.24	0.222	0.91	1.30	0.316	No
214	35.27	2.28	0.69	1.58	0.89	0.274	1.24	0.222	0.91	1.30	0.316	No
215	35.43	2.29	0.70	1.59	0.89	0.274	1.24	0.222	0.91	1.30	0.316	No
216	35.60	2.30	0.71	1.60	0.89	0.274	1.24	0.222	0.91	1.30	0.317	No
217	35.76	2.31	0.71	1.60	0.89	0.274	1.24	0.221	0.91	1.30	0.317	No
218	35.93	2.32	0.72	1.61	0.88	0.274	1.24	0.221	0.91	1.30	0.317	No
219	36.09	2.33	0.72	1.61	0.88	0.274	1.24	0.221	0.91	1.30	0.317	No
220	36.26	2.35	0.73	1.62	0.88	0.274	1.24	0.221	0.91	1.30	0.317	No
221	36.42	2.36	0.73	1.63	0.88	0.274	1.24	0.221	0.91	1.30	0.317	No
222	36.58	2.37	0.74	1.63	0.88	0.274	1.24	0.221	0.91	1.30	0.318	No
223	36.75	2.38	0.74	1.64	0.88	0.273	1.24	0.221	0.90	1.30	0.318	No
224	36.91	2.39	0.75	1.64	0.88	0.273	1.24	0.221	0.90	1.30	0.318	No
225	37.08	2.40	0.75	1.65	0.88	0.273	1.24	0.221	0.90	1.30	0.318	No
226	37.24	2.41	0.76	1.66	0.87	0.273	1.24	0.221	0.90	1.30	2.000	Yes
227	37.40	2.42	0.76	1.66	0.87	0.273	1.24	0.221	0.90	1.30	2.000	Yes
228	37.57	2.43	0.77	1.67	0.87	0.273	1.24	0.220	0.90	1.30	2.000	Yes
229	37.73	2.44	0.77	1.67	0.87	0.273	1.24	0.220	0.90	1.30	2.000	Yes
230	37.90	2.46	0.78	1.68	0.87	0.273	1.24	0.220	0.90	1.30	2.000	Yes
231	38.06	2.47	0.78	1.68	0.87	0.272	1.24	0.220	0.90	1.30	2.000	Yes
232	38.22	2.48	0.79	1.69	0.87	0.272	1.24	0.220	0.90	1.30	0.319	No
233	38.39	2.49	0.79	1.69	0.86	0.272	1.24	0.220	0.90	1.30	0.319	No
234	38.55	2.50	0.80	1.70	0.86	0.272	1.24	0.220	0.90	1.30	0.319	No
235	38.72	2.51	0.80	1.71	0.86	0.272	1.24	0.220	0.90	1.30	0.319	No
236	38.88	2.52	0.81	1.71	0.86	0.272	1.24	0.220	0.90	1.30	0.319	No
237	39.04	2.53	0.81	1.72	0.86	0.272	1.24	0.219	0.89	1.30	0.319	No
238	39.21	2.54	0.82	1.72	0.86	0.271	1.24	0.219	0.89	1.30	0.319	No
239	39.37	2.55	0.82	1.73	0.86	0.271	1.24	0.219	0.89	1.30	0.319	No
240	39.54	2.56	0.83	1.74	0.86	0.271	1.24	0.219	0.89	1.30	0.319	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
241	39.70	2.57	0.83	1.74	0.85	0.271	1.24	0.219	0.89	1.30	0.319	No
242	39.86	2.58	0.84	1.75	0.85	0.271	1.24	0.219	0.89	1.30	0.319	No
243	40.03	2.60	0.84	1.75	0.85	0.270	1.24	0.218	0.89	1.30	0.319	No
244	40.19	2.61	0.85	1.76	0.85	0.270	1.24	0.218	0.89	1.30	0.319	No
245	40.36	2.62	0.85	1.76	0.85	0.270	1.24	0.218	0.89	1.30	0.319	No
246	40.52	2.63	0.86	1.77	0.85	0.270	1.24	0.218	0.89	1.30	0.319	No
247	40.68	2.64	0.86	1.77	0.84	0.269	1.24	0.218	0.89	1.30	0.319	No
248	40.85	2.65	0.87	1.78	0.84	0.269	1.24	0.218	0.89	1.30	0.319	No
249	41.01	2.66	0.87	1.79	0.84	0.269	1.24	0.217	0.89	1.30	0.319	No
250	41.18	2.67	0.88	1.79	0.84	0.269	1.24	0.217	0.89	1.30	0.319	No
251	41.34	2.68	0.88	1.80	0.84	0.268	1.24	0.217	0.89	1.30	0.319	No
252	41.50	2.69	0.89	1.80	0.84	0.268	1.24	0.217	0.88	1.30	0.319	No
253	41.67	2.70	0.89	1.81	0.84	0.268	1.24	0.216	0.88	1.30	0.318	No
254	41.83	2.72	0.90	1.82	0.83	0.268	1.24	0.216	0.88	1.30	0.318	No
255	42.00	2.73	0.90	1.82	0.83	0.267	1.24	0.216	0.88	1.30	2.000	Yes
256	42.16	2.74	0.91	1.83	0.83	0.267	1.24	0.216	0.88	1.30	2.000	Yes
257	42.32	2.75	0.91	1.83	0.83	0.267	1.24	0.216	0.88	1.30	2.000	Yes
258	42.49	2.76	0.92	1.84	0.83	0.267	1.24	0.215	0.88	1.30	2.000	Yes
259	42.65	2.77	0.93	1.84	0.83	0.266	1.24	0.215	0.88	1.30	2.000	Yes
260	42.82	2.78	0.93	1.85	0.83	0.266	1.24	0.215	0.88	1.30	2.000	Yes
261	42.98	2.79	0.94	1.85	0.82	0.266	1.24	0.215	0.88	1.30	0.318	No
262	43.15	2.80	0.94	1.86	0.82	0.265	1.24	0.215	0.88	1.30	0.317	No
263	43.31	2.81	0.95	1.86	0.82	0.265	1.24	0.214	0.88	1.30	0.317	No
264	43.47	2.82	0.95	1.87	0.82	0.265	1.24	0.214	0.88	1.30	0.317	No
265	43.64	2.83	0.96	1.87	0.82	0.265	1.24	0.214	0.88	1.30	0.317	No
266	43.80	2.84	0.96	1.88	0.82	0.264	1.24	0.214	0.88	1.30	0.317	No
267	43.97	2.85	0.97	1.88	0.81	0.264	1.24	0.213	0.88	1.30	0.317	No
268	44.13	2.86	0.97	1.89	0.81	0.264	1.24	0.213	0.88	1.30	0.317	No
269	44.29	2.87	0.98	1.90	0.81	0.263	1.24	0.213	0.87	1.30	0.316	No
270	44.46	2.88	0.98	1.90	0.81	0.263	1.24	0.213	0.87	1.30	0.316	No
271	44.62	2.89	0.99	1.91	0.81	0.263	1.24	0.212	0.87	1.30	0.316	No
272	44.79	2.90	0.99	1.91	0.81	0.262	1.24	0.212	0.87	1.30	0.316	No
273	44.95	2.91	1.00	1.92	0.80	0.262	1.24	0.212	0.87	1.30	0.316	No
274	45.11	2.93	1.00	1.92	0.80	0.262	1.24	0.212	0.87	1.30	0.316	No
275	45.28	2.94	1.01	1.93	0.80	0.261	1.24	0.211	0.87	1.30	0.315	No
276	45.44	2.95	1.01	1.94	0.80	0.261	1.24	0.211	0.87	1.30	0.315	No
277	45.61	2.96	1.02	1.94	0.80	0.261	1.24	0.211	0.87	1.30	0.315	No
278	45.77	2.97	1.02	1.95	0.80	0.260	1.24	0.210	0.87	1.30	0.315	No
279	45.93	2.98	1.03	1.95	0.79	0.260	1.24	0.210	0.87	1.30	0.314	No
280	46.10	2.99	1.03	1.96	0.79	0.260	1.24	0.210	0.87	1.30	0.314	No
281	46.26	3.00	1.04	1.96	0.79	0.259	1.24	0.209	0.87	1.30	0.314	No
282	46.43	3.01	1.04	1.97	0.79	0.259	1.24	0.209	0.87	1.30	0.314	No
283	46.59	3.03	1.05	1.98	0.79	0.258	1.24	0.209	0.87	1.30	0.314	No
284	46.75	3.04	1.05	1.98	0.79	0.258	1.24	0.209	0.87	1.30	0.313	No
285	46.92	3.05	1.06	1.99	0.78	0.258	1.24	0.208	0.86	1.30	0.313	No
286	47.08	3.06	1.06	1.99	0.78	0.257	1.24	0.208	0.86	1.30	0.313	No
287	47.25	3.07	1.07	2.00	0.78	0.257	1.24	0.208	0.86	1.30	0.313	No
288	47.41	3.08	1.07	2.01	0.78	0.257	1.24	0.207	0.86	1.30	0.312	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
289	47.57	3.09	1.08	2.01	0.78	0.256	1.24	0.207	0.86	1.30	0.312	No
290	47.74	3.10	1.08	2.02	0.78	0.256	1.24	0.207	0.86	1.30	0.312	No
291	47.90	3.11	1.09	2.02	0.77	0.255	1.24	0.206	0.86	1.30	0.311	No
292	48.07	3.13	1.09	2.03	0.77	0.255	1.24	0.206	0.86	1.30	0.311	No
293	48.23	3.14	1.10	2.04	0.77	0.255	1.24	0.206	0.86	1.30	0.311	No
294	48.39	3.15	1.10	2.04	0.77	0.254	1.24	0.205	0.86	1.30	0.311	No
295	48.56	3.16	1.11	2.05	0.77	0.254	1.24	0.205	0.86	1.30	0.310	No
296	48.72	3.17	1.11	2.06	0.77	0.253	1.24	0.205	0.86	1.30	0.310	No
297	48.89	3.18	1.12	2.06	0.76	0.253	1.24	0.204	0.86	1.30	0.310	No
298	49.05	3.19	1.12	2.07	0.76	0.253	1.24	0.204	0.86	1.30	0.309	No
299	49.22	3.20	1.13	2.07	0.76	0.252	1.24	0.204	0.86	1.30	0.309	No
300	49.38	3.21	1.14	2.08	0.76	0.252	1.24	0.203	0.86	1.30	0.309	No
301	49.54	3.23	1.14	2.09	0.76	0.251	1.24	0.203	0.86	1.30	0.309	No
302	49.71	3.24	1.15	2.09	0.76	0.251	1.24	0.203	0.85	1.30	0.308	No
303	49.87	3.25	1.15	2.10	0.75	0.250	1.24	0.202	0.85	1.30	0.308	No
304	50.04	3.26	1.16	2.10	0.75	0.250	1.24	0.202	0.85	1.30	0.308	No

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
σ_v: Total overburden pressure at test point (tsf)
u_0: Water pressure at test point (tsf)
σ_v': Effective overburden pressure based on GWT during earthquake (tsf)
r_d: Nonlinear shear mass factor
CSR: Cyclic Stress Ratio
MSF: Magnitude Scaling Factor
CSR_{eq}: CSR adjusted for M=7.5
K_σ: Effective overburden stress factor
CSR^*: CSR fully adjusted

:: Cyclic Resistance Ratio (CRR) calculation data ::

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	0.33	23.58	2.31	1.27	0.76	37.86	1.98	74.96	4.000	No	No	2.00
2	0.49	48.75	1.90	0.68	0.60	78.28	1.19	92.84	4.000	No	No	2.00
3	0.66	78.52	1.61	0.42	0.50	126.09	1.00	126.09	4.000	No	No	2.00
4	0.82	86.31	1.55	0.39	0.50	138.59	1.00	138.59	4.000	No	No	2.00
5	0.98	88.04	1.49	0.30	0.50	141.36	1.00	141.36	4.000	No	No	2.00
6	1.15	81.37	1.51	0.29	0.50	130.63	1.00	130.63	4.000	No	No	2.00
7	1.31	71.40	1.53	0.23	0.50	114.60	1.00	114.60	4.000	No	No	2.00
8	1.48	60.70	1.58	0.22	0.50	97.39	1.00	97.39	4.000	No	No	2.00
9	1.64	49.73	1.65	0.20	0.51	79.76	1.00	79.76	4.000	No	No	2.00
10	1.80	39.33	1.73	0.17	0.53	63.04	1.00	63.04	4.000	No	No	2.00
11	1.97	30.73	1.80	0.11	0.56	49.21	1.00	49.21	4.000	No	No	2.00
12	2.13	24.83	N/A	0.00	1.00	-1.00	1.00	N/A	4.000	No	No	2.00
13	2.30	20.74	N/A	0.00	1.00	-1.00	1.00	N/A	4.000	No	No	2.00
14	2.46	17.84	N/A	0.00	1.00	-1.00	1.00	N/A	4.000	No	No	2.00
15	2.62	15.74	N/A	0.00	1.00	-1.00	1.00	N/A	4.000	No	No	2.00
16	2.79	14.40	2.19	0.23	0.71	22.91	1.00	22.91	4.000	No	No	2.00
17	2.95	14.17	2.30	0.48	0.75	22.53	1.00	22.53	4.000	No	No	2.00
18	3.12	15.80	2.31	0.64	0.76	25.14	1.98	49.79	4.000	No	No	2.00
19	3.28	19.21	2.20	0.53	0.71	30.59	1.66	50.68	4.000	No	No	2.00
20	3.45	23.14	2.09	0.44	0.67	36.90	1.00	36.90	4.000	No	No	2.00
21	3.61	26.47	2.01	0.38	0.64	42.24	1.00	42.24	4.000	No	No	2.00
22	3.77	29.04	2.01	0.46	0.64	46.35	1.00	46.35	4.000	No	No	2.00
23	3.94	30.31	2.03	0.55	0.65	48.37	1.34	64.78	4.000	No	No	2.00
24	4.10	30.84	2.06	0.65	0.66	49.21	1.38	68.02	4.000	No	No	2.00
25	4.27	30.61	2.10	0.77	0.67	48.83	1.45	70.71	4.000	No	No	2.00
26	4.43	30.91	2.15	0.98	0.69	49.30	1.55	76.56	4.000	No	No	2.00
27	4.59	31.71	2.18	1.16	0.71	50.57	1.63	82.46	4.000	No	No	2.00
28	4.76	32.88	2.14	1.02	0.69	52.43	1.53	80.20	4.000	No	No	2.00
29	4.92	33.04	2.05	0.71	0.66	52.68	1.37	72.31	4.000	No	No	2.00
30	5.09	30.71	1.98	0.44	0.63	48.91	1.00	48.91	4.000	No	No	2.00
31	5.25	26.97	2.05	0.50	0.66	42.89	1.00	42.89	4.000	No	No	2.00
32	5.41	24.63	2.26	1.09	0.74	39.13	1.83	71.57	4.000	No	No	2.00
33	5.58	26.60	2.34	1.65	0.77	42.27	2.08	87.72	4.000	No	No	2.00
34	5.74	32.94	2.28	1.74	0.74	52.44	1.88	98.76	4.000	No	No	2.00
35	5.91	40.48	2.12	1.24	0.68	64.53	1.49	96.04	4.000	No	No	2.00
36	6.07	47.47	1.94	0.78	0.61	75.76	1.23	93.11	4.000	No	No	2.00
37	6.23	52.70	1.77	0.45	0.55	84.15	1.00	84.15	4.000	No	No	2.00
38	6.40	57.93	1.72	0.41	0.53	92.53	1.00	92.53	4.000	No	No	2.00
39	6.56	61.83	1.78	0.60	0.55	98.79	1.09	107.89	4.000	No	No	2.00
40	6.73	66.76	1.92	1.10	0.61	106.70	1.21	128.58	4.000	No	No	2.00
41	6.89	82.20	1.98	1.67	0.63	131.48	1.27	167.06	4.000	No	No	2.00
42	7.05	113.84	1.98	2.20	0.63	182.30	1.27	231.55	4.000	No	No	2.00
43	7.22	138.43	2.03	2.92	0.65	221.78	1.34	296.21	4.000	No	No	2.00
44	7.38	158.43	2.08	3.71	0.67	253.90	1.42	361.63	4.000	No	No	2.00
45	7.55	174.53	2.13	4.44	0.69	279.75	1.51	422.62	4.000	No	No	2.00
46	7.71	193.81	2.22	6.00	0.72	310.70	1.73	537.10	4.000	No	No	2.00
47	7.87	206.96	2.28	7.20	0.75	331.82	1.90	629.71	4.000	No	No	2.00
48	8.04	235.64	2.26	7.23	0.74	377.88	1.83	693.10	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
49	8.20	322.31	2.06	4.93	0.66	517.11	1.38	714.59	4.000	No	No	2.00
50	8.37	413.98	1.88	3.43	0.59	635.75	1.17	742.60	4.000	No	No	2.00
51	8.53	454.97	1.77	2.70	0.55	667.65	1.09	725.97	4.000	No	No	2.00
52	8.69	419.55	1.76	2.49	0.54	605.02	1.08	651.06	4.000	No	No	2.00
53	8.86	360.64	1.77	2.42	0.55	515.74	1.09	560.85	4.000	No	No	2.00
54	9.02	312.35	1.79	2.35	0.56	443.55	1.10	488.17	4.000	No	No	2.00
55	9.19	275.50	1.81	2.30	0.57	388.09	1.11	432.65	4.000	No	No	2.00
56	9.35	252.68	1.83	2.27	0.57	353.15	1.13	397.83	4.000	No	No	2.00
57	9.51	242.79	1.84	2.27	0.57	336.25	1.13	381.48	4.000	No	No	2.00
58	9.68	244.29	1.85	2.35	0.58	335.36	1.15	384.19	4.000	No	No	2.00
59	9.84	251.96	1.87	2.49	0.59	343.34	1.16	398.09	4.000	No	No	2.00
60	10.01	261.33	1.89	2.67	0.59	353.50	1.18	416.06	4.000	No	No	2.00
61	10.17	269.92	1.89	2.74	0.60	361.41	1.18	426.77	4.000	No	No	2.00
62	10.34	278.19	1.88	2.69	0.59	367.36	1.17	430.55	4.000	No	No	2.00
63	10.50	282.85	1.86	2.56	0.58	368.07	1.16	425.38	4.000	No	No	2.00
64	10.66	279.85	1.85	2.46	0.58	359.58	1.15	412.38	4.000	No	No	2.00
65	10.83	266.45	1.85	2.37	0.58	338.58	1.15	388.08	4.000	No	No	2.00
66	10.99	247.75	1.87	2.35	0.59	312.49	1.16	361.91	4.000	No	No	2.00
67	11.16	232.89	1.88	2.35	0.59	291.53	1.17	341.96	4.000	No	No	2.00
68	11.32	229.49	1.89	2.36	0.59	284.79	1.18	335.68	4.000	No	No	2.00
69	11.48	233.99	1.89	2.36	0.59	287.46	1.18	338.16	4.000	No	No	2.00
70	11.65	240.42	1.88	2.35	0.59	292.18	1.17	342.41	4.000	No	No	2.00
71	11.81	237.09	1.90	2.43	0.60	286.17	1.19	339.66	4.000	No	No	2.00
72	11.98	226.85	1.92	2.49	0.61	271.98	1.21	328.52	4.000	No	No	2.00
73	12.14	211.75	1.94	2.54	0.62	252.41	1.23	311.51	4.000	No	No	2.00
74	12.30	198.65	1.96	2.53	0.62	235.05	1.25	293.96	4.000	No	No	2.00
75	12.47	188.04	1.97	2.46	0.62	220.49	1.26	277.18	4.000	No	No	2.00
76	12.63	179.18	1.96	2.34	0.62	208.09	1.25	260.82	4.000	No	No	2.00
77	12.80	170.78	1.95	2.18	0.62	196.24	1.24	243.86	4.000	No	No	2.00
78	12.96	163.55	1.94	2.01	0.61	186.01	1.23	228.37	4.000	No	No	2.00
79	13.12	157.45	1.93	1.87	0.61	177.85	1.22	216.26	4.000	No	No	2.00
80	13.29	153.35	1.92	1.79	0.61	172.30	1.21	208.47	4.000	No	No	2.00
81	13.45	150.49	1.92	1.74	0.61	168.29	1.21	202.99	4.000	No	No	2.00
82	13.62	149.02	1.91	1.69	0.60	165.81	1.20	199.11	0.814	No	No	2.00
83	13.78	147.55	1.91	1.64	0.60	163.41	1.20	195.28	0.773	No	No	2.00
84	13.94	145.15	1.90	1.59	0.60	160.05	1.19	190.89	0.727	No	No	2.00
85	14.11	141.72	1.90	1.54	0.60	155.54	1.19	185.04	0.669	No	No	2.00
86	14.27	138.08	1.90	1.51	0.60	150.97	1.19	179.89	0.621	No	No	2.00
87	14.44	134.32	1.90	1.45	0.60	146.19	1.19	173.81	0.568	No	No	2.00
88	14.60	131.58	1.90	1.43	0.60	142.69	1.19	170.02	0.537	No	No	2.00
89	14.76	130.65	1.90	1.39	0.60	141.06	1.19	167.33	0.516	No	No	2.00
90	14.93	131.81	1.89	1.37	0.60	141.72	1.18	167.56	0.518	No	No	2.00
91	15.09	134.18	1.88	1.35	0.59	143.63	1.17	168.57	0.525	No	No	2.00
92	15.26	137.75	1.87	1.34	0.59	146.79	1.17	171.10	0.546	No	No	2.00
93	15.42	142.25	1.86	1.32	0.58	150.91	1.15	174.25	0.572	No	No	2.00
94	15.58	147.05	1.85	1.32	0.58	155.39	1.15	178.36	0.608	No	No	2.00
95	15.75	151.68	1.85	1.35	0.58	159.68	1.15	183.02	0.650	No	No	2.00
96	15.91	155.85	1.86	1.42	0.58	163.62	1.15	188.78	0.706	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
97	16.08	159.91	1.87	1.51	0.59	167.43	1.16	195.03	0.770	No	No	2.00
98	16.24	164.54	1.88	1.59	0.59	171.79	1.17	201.53	4.000	No	No	2.00
99	16.40	170.18	1.89	1.66	0.59	177.10	1.18	208.51	4.000	No	No	2.00
100	16.57	174.44	1.89	1.69	0.59	180.87	1.18	213.16	4.000	No	No	2.00
101	16.73	174.74	1.93	1.92	0.61	180.97	1.22	220.70	4.000	No	No	2.00
102	16.90	177.28	2.01	2.44	0.64	183.69	1.31	241.09	4.000	No	No	2.00
103	17.06	178.98	2.11	3.26	0.68	185.71	1.47	273.13	4.000	No	No	2.00
104	17.23	173.25	2.22	4.32	0.72	179.91	1.71	307.81	4.000	No	No	2.00
105	17.39	159.56	2.32	5.45	0.76	165.69	2.02	334.81	4.000	No	No	2.00
106	17.55	146.68	2.40	6.32	0.79	152.02	2.30	349.21	4.000	No	No	2.00
107	17.72	141.90	2.40	6.23	0.79	146.25	2.31	338.15	4.000	No	No	2.00
108	17.88	134.02	2.40	6.02	0.79	137.38	2.32	319.12	4.000	No	No	2.00
109	18.05	124.44	2.41	5.84	0.79	126.85	2.36	299.10	4.000	No	No	2.00
110	18.21	118.57	2.42	5.82	0.80	120.26	2.41	289.69	4.000	No	No	2.00
111	18.37	116.88	2.42	5.70	0.80	117.93	2.40	282.93	4.000	No	No	2.00
112	18.54	113.99	2.41	5.44	0.79	114.36	2.36	269.92	4.000	No	No	2.00
113	18.70	108.34	2.40	5.10	0.79	108.09	2.33	251.62	4.000	No	No	2.00
114	18.87	104.20	2.38	4.59	0.78	103.32	2.23	230.47	4.000	No	No	2.00
115	19.03	104.13	2.37	4.47	0.78	102.76	2.20	226.01	4.000	No	No	2.00
116	19.19	108.07	2.38	4.65	0.78	106.22	2.22	235.54	4.000	No	No	2.00
117	19.36	113.62	2.39	4.98	0.79	111.22	2.26	251.88	4.000	No	No	2.00
118	19.52	115.28	2.43	5.64	0.80	112.42	2.43	273.69	4.000	No	No	2.00
119	19.69	113.91	2.48	6.42	0.82	110.60	2.66	294.62	4.000	No	No	2.00
120	19.85	109.73	2.53	7.25	0.84	106.07	2.94	311.73	4.000	No	No	2.00
121	20.01	107.56	2.55	7.49	0.85	103.45	3.04	314.23	4.000	No	No	2.00
122	20.18	103.95	2.57	7.60	0.85	99.42	3.12	310.26	4.000	No	No	2.00
123	20.34	101.76	2.56	7.36	0.85	96.82	3.10	299.72	4.000	No	No	2.00
124	20.51	98.81	2.56	7.11	0.85	93.48	3.08	287.51	4.000	No	No	2.00
125	20.67	95.83	2.54	6.66	0.84	90.19	3.00	270.60	4.000	No	No	2.00
126	20.83	92.23	2.54	6.34	0.84	86.33	2.97	256.29	4.000	No	No	2.00
127	21.00	88.26	2.54	6.21	0.84	82.16	3.00	246.54	4.000	No	No	2.00
128	21.16	86.50	2.57	6.54	0.85	80.12	3.14	251.36	4.000	No	No	2.00
129	21.33	88.64	2.58	6.80	0.86	81.72	3.19	260.31	4.000	No	No	2.00
130	21.49	90.77	2.58	7.04	0.86	83.31	3.23	269.04	4.000	No	No	2.00
131	21.65	97.06	2.55	6.76	0.85	88.77	3.05	270.77	4.000	No	No	2.00
132	21.82	104.40	2.52	6.50	0.84	95.14	2.88	274.00	4.000	No	No	2.00
133	21.98	114.67	2.48	6.12	0.82	104.20	2.66	276.65	4.000	No	No	2.00
134	22.15	117.82	2.46	5.93	0.81	106.61	2.57	274.40	4.000	No	No	2.00
135	22.31	117.90	2.44	5.61	0.81	106.25	2.49	264.49	4.000	No	No	2.00
136	22.47	114.32	2.45	5.58	0.81	102.53	2.52	258.65	4.000	No	No	2.00
137	22.64	110.72	2.47	5.79	0.82	98.75	2.63	259.66	4.000	No	No	2.00
138	22.80	103.69	2.52	6.29	0.83	91.90	2.87	263.42	4.000	No	No	2.00
139	22.97	94.86	2.57	6.82	0.86	83.46	3.16	263.66	4.000	No	No	2.00
140	23.13	91.75	2.61	7.31	0.87	80.25	3.37	270.14	4.000	No	Yes	2.00
141	23.30	101.02	2.59	7.53	0.86	88.09	3.28	289.25	4.000	No	No	2.00
142	23.46	118.89	2.54	7.35	0.84	103.58	3.00	310.56	4.000	No	No	2.00
143	23.62	128.90	2.54	7.69	0.84	111.91	2.98	333.79	4.000	No	No	2.00
144	23.79	131.04	2.57	8.34	0.85	113.15	3.13	354.30	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
145	23.95	141.46	2.57	8.69	0.85	121.72	3.12	379.68	4.000	No	No	2.00
146	24.12	173.80	2.48	7.87	0.82	149.64	2.67	400.16	4.000	No	No	2.00
147	24.28	211.11	2.39	7.01	0.79	181.92	2.29	416.46	4.000	No	No	2.00
148	24.44	241.96	2.30	5.92	0.75	208.70	1.95	407.14	4.000	No	No	2.00
149	24.61	263.12	2.22	5.06	0.72	226.94	1.73	391.68	4.000	No	No	2.00
150	24.77	295.58	2.12	4.07	0.68	255.46	1.48	379.14	4.000	No	No	2.00
151	24.94	328.53	2.05	3.64	0.66	283.95	1.37	389.68	4.000	No	No	2.00
152	25.10	348.71	2.01	3.41	0.64	301.06	1.32	396.83	4.000	No	No	2.00
153	25.26	336.33	2.03	3.48	0.65	289.15	1.34	387.61	4.000	No	No	2.00
154	25.43	308.09	2.06	3.59	0.66	263.38	1.39	366.08	4.000	No	No	2.00
155	25.59	282.36	2.10	3.73	0.67	240.00	1.45	347.82	4.000	No	No	2.00
156	25.76	262.92	2.14	3.99	0.69	222.04	1.53	340.15	4.000	No	No	2.00
157	25.92	242.38	2.21	4.57	0.72	203.03	1.69	343.56	4.000	No	No	2.00
158	26.08	216.82	2.30	5.47	0.75	179.78	1.96	352.88	4.000	No	No	2.00
159	26.25	197.20	2.37	6.09	0.78	162.09	2.18	354.15	4.000	No	No	2.00
160	26.41	177.21	2.39	6.08	0.79	144.72	2.29	330.90	4.000	No	No	2.00
161	26.58	145.74	2.42	5.62	0.80	118.12	2.38	280.70	4.000	No	No	2.00
162	26.74	109.01	2.46	5.16	0.81	87.38	2.59	226.51	4.000	No	No	2.00
163	26.90	81.29	2.53	4.86	0.84	64.27	2.92	187.72	0.695	No	No	2.00
164	27.07	70.53	2.57	4.80	0.85	55.21	3.14	173.44	0.565	No	No	1.91
165	27.23	71.01	2.57	4.76	0.85	55.39	3.12	173.02	0.562	No	No	1.90
166	27.40	78.29	2.63	6.23	0.88	60.68	3.50	212.31	4.000	No	Yes	2.00
167	27.56	93.88	2.64	7.53	0.88	72.66	3.60	261.43	4.000	No	Yes	2.00
168	27.72	110.92	2.64	8.49	0.88	85.75	3.59	308.08	4.000	No	Yes	2.00
169	27.89	124.96	2.59	8.01	0.86	96.75	3.27	316.55	4.000	No	No	2.00
170	28.05	124.31	2.57	7.56	0.86	96.01	3.16	303.62	4.000	No	No	2.00
171	28.22	108.58	2.61	7.49	0.87	83.09	3.36	279.49	4.000	No	Yes	2.00
172	28.38	84.68	2.70	8.13	0.91	63.69	4.03	256.37	4.000	No	Yes	2.00
173	28.54	63.42	2.83	9.31	0.96	46.62	5.09	237.19	4.000	No	Yes	2.00
174	28.71	62.60	2.80	8.34	0.94	45.93	4.80	220.62	4.000	No	Yes	2.00
175	28.87	72.88	2.69	6.85	0.90	54.03	3.94	212.61	4.000	No	Yes	2.00
176	29.04	84.93	2.58	5.62	0.86	63.60	3.21	203.92	4.000	No	No	2.00
177	29.20	78.62	2.64	6.21	0.88	58.23	3.57	207.74	4.000	No	Yes	2.00
178	29.36	70.24	2.72	7.22	0.91	51.25	4.17	213.77	4.000	No	Yes	2.00
179	29.53	75.22	2.76	8.45	0.93	54.56	4.45	242.71	4.000	No	Yes	2.00
180	29.69	87.64	2.72	8.59	0.91	63.77	4.16	265.60	4.000	No	Yes	2.00
181	29.86	101.76	2.69	8.88	0.90	74.16	3.96	293.51	4.000	No	Yes	2.00
182	30.02	113.56	2.66	8.84	0.89	82.85	3.75	310.44	4.000	No	Yes	2.00
183	30.19	135.65	2.58	7.88	0.86	99.75	3.19	318.32	4.000	No	No	2.00
184	30.35	152.47	2.50	6.86	0.83	112.83	2.76	311.13	4.000	No	No	2.00
185	30.51	162.32	2.43	5.88	0.80	120.72	2.42	292.33	4.000	No	No	2.00
186	30.68	169.36	2.35	4.92	0.77	126.59	2.12	268.62	4.000	No	No	2.00
187	30.84	174.58	2.27	4.02	0.74	131.28	1.86	243.76	4.000	No	No	2.00
188	31.01	175.13	2.21	3.37	0.72	132.21	1.69	222.80	4.000	No	No	2.00
189	31.17	164.36	2.22	3.31	0.72	123.44	1.72	211.75	4.000	No	No	2.00
190	31.33	157.42	2.29	3.88	0.75	116.86	1.91	223.64	4.000	No	No	2.00
191	31.50	166.08	2.32	4.43	0.76	122.47	2.02	247.68	4.000	No	No	2.00
192	31.66	172.22	2.34	4.74	0.77	126.41	2.08	262.49	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	31.83	160.66	2.37	4.92	0.78	116.95	2.20	256.92	4.000	No	No	2.00
194	31.99	125.65	2.48	5.50	0.82	89.64	2.67	238.93	4.000	No	No	2.00
195	32.15	104.06	2.56	5.88	0.85	73.02	3.07	224.53	4.000	No	No	2.00
196	32.32	117.79	2.45	4.75	0.81	83.69	2.52	210.84	4.000	No	No	2.00
197	32.48	159.06	2.25	3.42	0.73	116.11	1.79	207.93	4.000	No	No	2.00
198	32.65	202.75	2.10	2.72	0.68	150.83	1.45	219.29	4.000	No	No	2.00
199	32.81	232.68	2.05	2.62	0.66	174.03	1.37	238.02	4.000	No	No	2.00
200	32.97	249.59	2.05	2.79	0.66	186.17	1.38	256.02	4.000	No	No	2.00
201	33.14	260.42	2.07	3.02	0.66	193.28	1.41	271.66	4.000	No	No	2.00
202	33.30	270.03	2.08	3.14	0.67	199.79	1.41	282.57	4.000	No	No	2.00
203	33.47	281.27	2.06	3.11	0.66	207.96	1.39	289.58	4.000	No	No	2.00
204	33.63	289.18	2.05	3.01	0.65	213.82	1.36	291.66	4.000	No	No	2.00
205	33.79	289.74	2.04	2.97	0.65	213.84	1.36	290.09	4.000	No	No	2.00
206	33.96	284.32	2.05	3.01	0.66	208.89	1.37	286.93	4.000	No	No	2.00
207	34.12	281.62	2.08	3.21	0.67	205.57	1.42	291.23	4.000	No	No	2.00
208	34.29	288.49	2.10	3.47	0.68	209.32	1.46	305.35	4.000	No	No	2.00
209	34.45	306.50	2.11	3.65	0.68	221.74	1.47	325.42	4.000	No	No	2.00
210	34.61	332.71	2.11	3.87	0.68	240.06	1.48	354.12	4.000	No	No	2.00
211	34.78	350.63	2.12	4.06	0.68	252.13	1.49	374.99	4.000	No	No	2.00
212	34.94	336.87	2.16	4.37	0.70	240.09	1.57	376.07	4.000	No	No	2.00
213	35.11	275.08	2.26	5.01	0.74	192.24	1.82	349.35	4.000	No	No	2.00
214	35.27	196.70	2.42	6.19	0.80	133.24	2.40	319.26	4.000	No	No	2.00
215	35.43	135.70	2.61	7.85	0.87	88.57	3.36	297.81	4.000	No	Yes	2.00
216	35.60	112.61	2.66	7.86	0.89	72.38	3.70	268.11	4.000	No	Yes	2.00
217	35.76	119.73	2.54	5.90	0.84	78.24	2.98	232.98	4.000	No	No	2.00
218	35.93	141.76	2.35	3.94	0.77	95.47	2.12	202.05	4.000	No	No	2.00
219	36.09	169.87	2.21	3.06	0.72	117.03	1.69	197.44	0.796	No	No	2.00
220	36.26	195.21	2.14	2.83	0.69	135.82	1.53	208.41	4.000	No	No	2.00
221	36.42	211.73	2.11	2.74	0.68	147.91	1.47	216.93	4.000	No	No	2.00
222	36.58	217.54	2.07	2.56	0.67	152.43	1.41	215.08	4.000	No	No	2.00
223	36.75	209.92	2.08	2.51	0.67	146.56	1.42	207.75	4.000	No	No	2.00
224	36.91	200.43	2.11	2.61	0.68	138.85	1.47	203.82	4.000	No	No	2.00
225	37.08	191.60	2.13	2.68	0.69	131.80	1.51	199.32	0.816	No	No	2.00
226	37.24	181.21	2.18	2.91	0.70	123.28	1.61	198.58	4.000	Yes	No	2.00
227	37.40	166.21	2.23	3.17	0.73	111.56	1.75	195.50	4.000	Yes	No	2.00
228	37.57	141.45	2.33	3.62	0.76	92.89	2.04	189.71	4.000	Yes	No	2.00
229	37.73	106.52	2.45	3.97	0.81	67.92	2.52	171.04	4.000	Yes	No	2.00
230	37.90	76.75	2.59	4.40	0.86	47.18	3.25	153.53	4.000	Yes	No	2.00
231	38.06	64.59	2.67	4.72	0.89	38.78	3.78	146.63	4.000	Yes	Yes	2.00
232	38.22	72.90	2.60	4.31	0.87	44.38	3.33	147.68	4.000	No	Yes	2.00
233	38.39	76.88	2.59	4.44	0.86	46.80	3.29	153.76	0.418	No	No	1.31
234	38.55	76.26	2.61	4.61	0.87	46.15	3.39	156.21	4.000	No	Yes	2.00
235	38.72	71.04	2.69	5.40	0.90	42.15	3.90	164.29	4.000	No	Yes	2.00
236	38.88	84.99	2.64	5.54	0.88	51.03	3.57	182.10	4.000	No	Yes	2.00
237	39.04	101.96	2.60	5.90	0.87	61.72	3.36	207.11	4.000	No	Yes	2.00
238	39.21	116.00	2.57	5.91	0.85	70.69	3.13	221.47	4.000	No	No	2.00
239	39.37	105.39	2.61	6.06	0.87	63.43	3.36	213.38	4.000	No	Yes	2.00
240	39.54	83.62	2.70	6.50	0.90	48.95	4.01	196.36	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
241	39.70	61.94	2.85	7.52	0.96	34.77	5.21	181.29	4.000	No	Yes	2.00
242	39.86	48.99	3.01	9.84	1.00	26.57	6.90	183.26	4.000	No	Yes	2.00
243	40.03	45.93	3.08	11.23	1.00	24.73	7.64	188.97	4.000	No	Yes	2.00
244	40.19	47.52	3.08	11.65	1.00	25.55	7.67	195.96	4.000	No	Yes	2.00
245	40.36	50.47	3.05	11.08	1.00	27.13	7.27	197.08	4.000	No	Yes	2.00
246	40.52	52.39	3.01	10.32	1.00	28.13	6.88	193.48	4.000	No	Yes	2.00
247	40.68	54.55	2.97	9.38	1.00	29.24	6.42	187.63	4.000	No	Yes	2.00
248	40.85	57.20	2.94	9.04	1.00	30.67	6.15	188.54	4.000	No	Yes	2.00
249	41.01	62.71	2.92	9.10	0.99	33.84	5.88	198.88	4.000	No	Yes	2.00
250	41.18	75.70	2.83	8.44	0.95	41.72	5.08	211.79	4.000	No	Yes	2.00
251	41.34	86.99	2.76	7.67	0.93	48.75	4.44	216.32	4.000	No	Yes	2.00
252	41.50	85.93	2.76	7.57	0.93	47.99	4.44	212.95	4.000	No	Yes	2.00
253	41.67	74.00	2.84	8.46	0.96	40.26	5.17	208.31	4.000	No	Yes	2.00
254	41.83	65.17	2.91	9.18	0.99	34.67	5.83	202.26	4.000	No	Yes	2.00
255	42.00	64.64	2.90	8.61	0.98	34.38	5.65	194.42	4.000	Yes	Yes	2.00
256	42.16	67.50	2.82	7.15	0.95	36.43	4.95	180.25	4.000	Yes	Yes	2.00
257	42.32	71.45	2.71	5.39	0.91	39.47	4.03	159.22	4.000	Yes	Yes	2.00
258	42.49	78.44	2.54	3.61	0.84	44.86	2.99	134.32	4.000	Yes	No	2.00
259	42.65	81.88	2.41	2.49	0.79	48.13	2.35	113.17	4.000	Yes	No	2.00
260	42.82	80.62	2.34	1.97	0.77	47.91	2.10	100.58	4.000	Yes	No	2.00
261	42.98	75.54	2.36	1.92	0.78	44.52	2.17	96.39	0.163	No	No	0.51
262	43.15	70.88	2.42	2.15	0.80	41.05	2.40	98.48	0.169	No	No	0.53
263	43.31	67.05	2.51	2.70	0.83	37.91	2.82	107.00	0.194	No	No	0.61
264	43.47	69.39	2.50	2.70	0.83	39.29	2.77	108.67	0.199	No	No	0.63
265	43.64	88.63	2.35	2.21	0.77	52.20	2.12	110.57	0.206	No	No	0.65
266	43.80	116.24	2.16	1.65	0.70	71.75	1.58	113.08	0.214	No	No	0.68
267	43.97	128.50	2.14	1.70	0.69	79.78	1.52	121.51	0.247	No	No	0.78
268	44.13	118.66	2.20	1.93	0.72	72.27	1.68	121.32	0.246	No	No	0.78
269	44.29	99.92	2.35	2.47	0.77	58.59	2.10	123.17	0.254	No	No	0.80
270	44.46	95.08	2.39	2.71	0.79	54.95	2.28	125.49	0.264	No	No	0.83
271	44.62	116.90	2.29	2.43	0.75	69.44	1.91	132.34	0.296	No	No	0.93
272	44.79	151.16	2.14	2.02	0.69	93.10	1.53	142.74	0.350	No	No	1.11
273	44.95	192.06	2.01	1.73	0.64	122.12	1.31	160.25	0.463	No	No	1.47
274	45.11	213.53	1.97	1.69	0.63	136.97	1.26	172.79	0.560	No	No	1.77
275	45.28	220.44	1.98	1.81	0.63	140.75	1.28	179.79	0.621	No	No	1.97
276	45.44	216.90	2.02	1.99	0.65	136.95	1.33	182.08	0.641	No	No	2.00
277	45.61	214.96	2.05	2.12	0.66	134.63	1.37	183.99	0.659	No	No	2.00
278	45.77	226.54	2.04	2.16	0.65	141.99	1.35	192.13	0.740	No	No	2.00
279	45.93	251.38	1.98	2.03	0.63	159.45	1.28	204.08	4.000	No	No	2.00
280	46.10	275.20	1.94	1.91	0.61	176.34	1.23	216.09	4.000	No	No	2.00
281	46.26	290.24	1.91	1.83	0.60	187.05	1.20	223.56	4.000	No	No	2.00
282	46.43	287.65	1.92	1.90	0.61	184.32	1.21	223.12	4.000	No	No	2.00
283	46.59	274.40	1.94	1.94	0.62	174.47	1.23	215.34	4.000	No	No	2.00
284	46.75	251.97	1.96	1.89	0.62	159.12	1.25	199.31	0.816	No	No	2.00
285	46.92	238.70	1.94	1.67	0.61	151.29	1.22	185.18	0.671	No	No	2.00
286	47.08	240.26	1.89	1.48	0.60	153.65	1.18	181.40	0.635	No	No	2.00
287	47.25	262.36	1.88	1.53	0.59	168.26	1.17	196.41	0.785	No	No	2.00
288	47.41	289.06	1.91	1.81	0.60	183.91	1.19	219.75	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
289	47.57	309.83	1.94	2.06	0.61	195.51	1.22	239.31	4.000	No	No	2.00
290	47.74	312.90	1.96	2.19	0.62	196.10	1.25	244.37	4.000	No	No	2.00
291	47.90	304.63	1.97	2.23	0.63	189.83	1.26	239.73	4.000	No	No	2.00
292	48.07	300.17	1.97	2.23	0.63	186.42	1.27	236.49	4.000	No	No	2.00
293	48.23	298.30	1.97	2.19	0.63	185.12	1.26	233.79	4.000	No	No	2.00
294	48.39	290.40	1.96	2.08	0.62	180.33	1.25	225.39	4.000	No	No	2.00
295	48.56	273.77	1.95	1.95	0.62	169.80	1.24	211.15	4.000	No	No	2.00
296	48.72	259.20	1.96	1.87	0.62	160.22	1.25	199.90	0.823	No	No	2.00
297	48.89	251.37	1.97	1.91	0.63	154.39	1.27	195.52	0.775	No	No	2.00
298	49.05	244.03	1.99	1.97	0.63	148.78	1.29	192.16	0.740	No	No	2.00
299	49.22	234.97	2.01	2.00	0.64	142.23	1.32	187.14	0.690	No	No	2.00
300	49.38	228.20	2.03	2.03	0.65	137.29	1.34	183.52	0.655	No	No	2.00
301	49.54	239.44	1.98	1.86	0.63	145.56	1.28	185.92	0.678	No	No	2.00
302	49.71	261.77	1.91	1.65	0.60	161.94	1.20	194.39	0.763	No	No	2.00
303	49.87	281.21	1.83	1.40	0.57	177.43	1.13	200.76	4.000	No	No	2.00
304	50.04	288.05	1.80	1.31	0.56	182.96	1.11	202.75	4.000	No	No	2.00

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_t: Total cone resistance
I_c: Soil behavior type index
Fr: Normalized friction ratio (%)
n: Stress exponent
Q_{tn}: Normalized cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Normalized and adjusted cone resistance
$CRR_{7.5}$: Cyclic resistance ratio for M_w=7.5
FS: Factor of safety against soil liquefaction

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.33	2.00	0.00	9.95	0.16	0.00	0.49	2.00	0.00	9.93	0.16	0.00
0.66	2.00	0.00	9.90	0.17	0.00	0.82	2.00	0.00	9.88	0.16	0.00
0.98	2.00	0.00	9.85	0.16	0.00	1.15	2.00	0.00	9.82	0.17	0.00
1.31	2.00	0.00	9.80	0.16	0.00	1.48	2.00	0.00	9.77	0.17	0.00
1.64	2.00	0.00	9.75	0.16	0.00	1.80	2.00	0.00	9.73	0.16	0.00
1.97	2.00	0.00	9.70	0.17	0.00	2.13	2.00	0.00	9.68	0.16	0.00
2.30	2.00	0.00	9.65	0.17	0.00	2.46	2.00	0.00	9.63	0.16	0.00
2.62	2.00	0.00	9.60	0.16	0.00	2.79	2.00	0.00	9.57	0.17	0.00
2.95	2.00	0.00	9.55	0.16	0.00	3.12	2.00	0.00	9.52	0.17	0.00
3.28	2.00	0.00	9.50	0.16	0.00	3.45	2.00	0.00	9.47	0.17	0.00
3.61	2.00	0.00	9.45	0.16	0.00	3.77	2.00	0.00	9.43	0.16	0.00
3.94	2.00	0.00	9.40	0.17	0.00	4.10	2.00	0.00	9.38	0.16	0.00
4.27	2.00	0.00	9.35	0.17	0.00	4.43	2.00	0.00	9.32	0.16	0.00
4.59	2.00	0.00	9.30	0.16	0.00	4.76	2.00	0.00	9.27	0.17	0.00
4.92	2.00	0.00	9.25	0.16	0.00	5.09	2.00	0.00	9.22	0.17	0.00
5.25	2.00	0.00	9.20	0.16	0.00	5.41	2.00	0.00	9.18	0.16	0.00
5.58	2.00	0.00	9.15	0.17	0.00	5.74	2.00	0.00	9.13	0.16	0.00
5.91	2.00	0.00	9.10	0.17	0.00	6.07	2.00	0.00	9.07	0.16	0.00
6.23	2.00	0.00	9.05	0.16	0.00	6.40	2.00	0.00	9.02	0.17	0.00
6.56	2.00	0.00	9.00	0.16	0.00	6.73	2.00	0.00	8.97	0.17	0.00
6.89	2.00	0.00	8.95	0.16	0.00	7.05	2.00	0.00	8.93	0.16	0.00
7.22	2.00	0.00	8.90	0.17	0.00	7.38	2.00	0.00	8.88	0.16	0.00
7.55	2.00	0.00	8.85	0.17	0.00	7.71	2.00	0.00	8.82	0.16	0.00
7.87	2.00	0.00	8.80	0.16	0.00	8.04	2.00	0.00	8.77	0.17	0.00
8.20	2.00	0.00	8.75	0.16	0.00	8.37	2.00	0.00	8.72	0.17	0.00
8.53	2.00	0.00	8.70	0.16	0.00	8.69	2.00	0.00	8.68	0.16	0.00
8.86	2.00	0.00	8.65	0.17	0.00	9.02	2.00	0.00	8.63	0.16	0.00
9.19	2.00	0.00	8.60	0.17	0.00	9.35	2.00	0.00	8.58	0.16	0.00
9.51	2.00	0.00	8.55	0.16	0.00	9.68	2.00	0.00	8.52	0.17	0.00
9.84	2.00	0.00	8.50	0.16	0.00	10.01	2.00	0.00	8.47	0.17	0.00
10.17	2.00	0.00	8.45	0.16	0.00	10.34	2.00	0.00	8.42	0.17	0.00
10.50	2.00	0.00	8.40	0.16	0.00	10.66	2.00	0.00	8.38	0.16	0.00
10.83	2.00	0.00	8.35	0.17	0.00	10.99	2.00	0.00	8.33	0.16	0.00
11.16	2.00	0.00	8.30	0.17	0.00	11.32	2.00	0.00	8.27	0.16	0.00
11.48	2.00	0.00	8.25	0.16	0.00	11.65	2.00	0.00	8.22	0.17	0.00
11.81	2.00	0.00	8.20	0.16	0.00	11.98	2.00	0.00	8.17	0.17	0.00
12.14	2.00	0.00	8.15	0.16	0.00	12.30	2.00	0.00	8.13	0.16	0.00
12.47	2.00	0.00	8.10	0.17	0.00	12.63	2.00	0.00	8.08	0.16	0.00
12.80	2.00	0.00	8.05	0.17	0.00	12.96	2.00	0.00	8.02	0.16	0.00
13.12	2.00	0.00	8.00	0.16	0.00	13.29	2.00	0.00	7.97	0.17	0.00
13.45	2.00	0.00	7.95	0.16	0.00	13.62	2.00	0.00	7.92	0.17	0.00
13.78	2.00	0.00	7.90	0.16	0.00	13.94	2.00	0.00	7.88	0.16	0.00
14.11	2.00	0.00	7.85	0.17	0.00	14.27	2.00	0.00	7.83	0.16	0.00
14.44	2.00	0.00	7.80	0.17	0.00	14.60	2.00	0.00	7.77	0.16	0.00
14.76	2.00	0.00	7.75	0.16	0.00	14.93	2.00	0.00	7.72	0.17	0.00
15.09	2.00	0.00	7.70	0.16	0.00	15.26	2.00	0.00	7.67	0.17	0.00
15.42	2.00	0.00	7.65	0.16	0.00	15.58	2.00	0.00	7.63	0.16	0.00
15.75	2.00	0.00	7.60	0.17	0.00	15.91	2.00	0.00	7.58	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
16.08	2.00	0.00	7.55	0.17	0.00	16.24	2.00	0.00	7.53	0.16	0.00
16.40	2.00	0.00	7.50	0.16	0.00	16.57	2.00	0.00	7.47	0.17	0.00
16.73	2.00	0.00	7.45	0.16	0.00	16.90	2.00	0.00	7.42	0.17	0.00
17.06	2.00	0.00	7.40	0.16	0.00	17.23	2.00	0.00	7.37	0.17	0.00
17.39	2.00	0.00	7.35	0.16	0.00	17.55	2.00	0.00	7.33	0.16	0.00
17.72	2.00	0.00	7.30	0.17	0.00	17.88	2.00	0.00	7.28	0.16	0.00
18.05	2.00	0.00	7.25	0.17	0.00	18.21	2.00	0.00	7.22	0.16	0.00
18.37	2.00	0.00	7.20	0.16	0.00	18.54	2.00	0.00	7.17	0.17	0.00
18.70	2.00	0.00	7.15	0.16	0.00	18.87	2.00	0.00	7.12	0.17	0.00
19.03	2.00	0.00	7.10	0.16	0.00	19.19	2.00	0.00	7.08	0.16	0.00
19.36	2.00	0.00	7.05	0.17	0.00	19.52	2.00	0.00	7.03	0.16	0.00
19.69	2.00	0.00	7.00	0.17	0.00	19.85	2.00	0.00	6.97	0.16	0.00
20.01	2.00	0.00	6.95	0.16	0.00	20.18	2.00	0.00	6.92	0.17	0.00
20.34	2.00	0.00	6.90	0.16	0.00	20.51	2.00	0.00	6.87	0.17	0.00
20.67	2.00	0.00	6.85	0.16	0.00	20.83	2.00	0.00	6.83	0.16	0.00
21.00	2.00	0.00	6.80	0.17	0.00	21.16	2.00	0.00	6.78	0.16	0.00
21.33	2.00	0.00	6.75	0.17	0.00	21.49	2.00	0.00	6.72	0.16	0.00
21.65	2.00	0.00	6.70	0.16	0.00	21.82	2.00	0.00	6.67	0.17	0.00
21.98	2.00	0.00	6.65	0.16	0.00	22.15	2.00	0.00	6.62	0.17	0.00
22.31	2.00	0.00	6.60	0.16	0.00	22.47	2.00	0.00	6.58	0.16	0.00
22.64	2.00	0.00	6.55	0.17	0.00	22.80	2.00	0.00	6.53	0.16	0.00
22.97	2.00	0.00	6.50	0.17	0.00	23.13	2.00	0.00	6.47	0.16	0.00
23.30	2.00	0.00	6.45	0.17	0.00	23.46	2.00	0.00	6.42	0.16	0.00
23.62	2.00	0.00	6.40	0.16	0.00	23.79	2.00	0.00	6.37	0.17	0.00
23.95	2.00	0.00	6.35	0.16	0.00	24.12	2.00	0.00	6.32	0.17	0.00
24.28	2.00	0.00	6.30	0.16	0.00	24.44	2.00	0.00	6.28	0.16	0.00
24.61	2.00	0.00	6.25	0.17	0.00	24.77	2.00	0.00	6.23	0.16	0.00
24.94	2.00	0.00	6.20	0.17	0.00	25.10	2.00	0.00	6.17	0.16	0.00
25.26	2.00	0.00	6.15	0.16	0.00	25.43	2.00	0.00	6.12	0.17	0.00
25.59	2.00	0.00	6.10	0.16	0.00	25.76	2.00	0.00	6.07	0.17	0.00
25.92	2.00	0.00	6.05	0.16	0.00	26.08	2.00	0.00	6.03	0.16	0.00
26.25	2.00	0.00	6.00	0.17	0.00	26.41	2.00	0.00	5.98	0.16	0.00
26.58	2.00	0.00	5.95	0.17	0.00	26.74	2.00	0.00	5.92	0.16	0.00
26.90	2.00	0.00	5.90	0.16	0.00	27.07	1.91	0.00	5.87	0.17	0.00
27.23	1.90	0.00	5.85	0.16	0.00	27.40	2.00	0.00	5.82	0.17	0.00
27.56	2.00	0.00	5.80	0.16	0.00	27.72	2.00	0.00	5.78	0.16	0.00
27.89	2.00	0.00	5.75	0.17	0.00	28.05	2.00	0.00	5.73	0.16	0.00
28.22	2.00	0.00	5.70	0.17	0.00	28.38	2.00	0.00	5.67	0.16	0.00
28.54	2.00	0.00	5.65	0.16	0.00	28.71	2.00	0.00	5.62	0.17	0.00
28.87	2.00	0.00	5.60	0.16	0.00	29.04	2.00	0.00	5.57	0.17	0.00
29.20	2.00	0.00	5.55	0.16	0.00	29.36	2.00	0.00	5.53	0.16	0.00
29.53	2.00	0.00	5.50	0.17	0.00	29.69	2.00	0.00	5.48	0.16	0.00
29.86	2.00	0.00	5.45	0.17	0.00	30.02	2.00	0.00	5.42	0.16	0.00
30.19	2.00	0.00	5.40	0.17	0.00	30.35	2.00	0.00	5.37	0.16	0.00
30.51	2.00	0.00	5.35	0.16	0.00	30.68	2.00	0.00	5.32	0.17	0.00
30.84	2.00	0.00	5.30	0.16	0.00	31.01	2.00	0.00	5.27	0.17	0.00
31.17	2.00	0.00	5.25	0.16	0.00	31.33	2.00	0.00	5.23	0.16	0.00
31.50	2.00	0.00	5.20	0.17	0.00	31.66	2.00	0.00	5.18	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
31.83	2.00	0.00	5.15	0.17	0.00	31.99	2.00	0.00	5.12	0.16	0.00
32.15	2.00	0.00	5.10	0.16	0.00	32.32	2.00	0.00	5.07	0.17	0.00
32.48	2.00	0.00	5.05	0.16	0.00	32.65	2.00	0.00	5.02	0.17	0.00
32.81	2.00	0.00	5.00	0.16	0.00	32.97	2.00	0.00	4.98	0.16	0.00
33.14	2.00	0.00	4.95	0.17	0.00	33.30	2.00	0.00	4.93	0.16	0.00
33.47	2.00	0.00	4.90	0.17	0.00	33.63	2.00	0.00	4.87	0.16	0.00
33.79	2.00	0.00	4.85	0.16	0.00	33.96	2.00	0.00	4.82	0.17	0.00
34.12	2.00	0.00	4.80	0.16	0.00	34.29	2.00	0.00	4.77	0.17	0.00
34.45	2.00	0.00	4.75	0.16	0.00	34.61	2.00	0.00	4.73	0.16	0.00
34.78	2.00	0.00	4.70	0.17	0.00	34.94	2.00	0.00	4.68	0.16	0.00
35.11	2.00	0.00	4.65	0.17	0.00	35.27	2.00	0.00	4.62	0.16	0.00
35.43	2.00	0.00	4.60	0.16	0.00	35.60	2.00	0.00	4.57	0.17	0.00
35.76	2.00	0.00	4.55	0.16	0.00	35.93	2.00	0.00	4.52	0.17	0.00
36.09	2.00	0.00	4.50	0.16	0.00	36.26	2.00	0.00	4.47	0.17	0.00
36.42	2.00	0.00	4.45	0.16	0.00	36.58	2.00	0.00	4.43	0.16	0.00
36.75	2.00	0.00	4.40	0.17	0.00	36.91	2.00	0.00	4.37	0.16	0.00
37.08	2.00	0.00	4.35	0.17	0.00	37.24	2.00	0.00	4.32	0.16	0.00
37.40	2.00	0.00	4.30	0.16	0.00	37.57	2.00	0.00	4.27	0.17	0.00
37.73	2.00	0.00	4.25	0.16	0.00	37.90	2.00	0.00	4.22	0.17	0.00
38.06	2.00	0.00	4.20	0.16	0.00	38.22	2.00	0.00	4.18	0.16	0.00
38.39	1.31	0.00	4.15	0.17	0.00	38.55	2.00	0.00	4.12	0.16	0.00
38.72	2.00	0.00	4.10	0.17	0.00	38.88	2.00	0.00	4.07	0.16	0.00
39.04	2.00	0.00	4.05	0.16	0.00	39.21	2.00	0.00	4.02	0.17	0.00
39.37	2.00	0.00	4.00	0.16	0.00	39.54	2.00	0.00	3.97	0.17	0.00
39.70	2.00	0.00	3.95	0.16	0.00	39.86	2.00	0.00	3.93	0.16	0.00
40.03	2.00	0.00	3.90	0.17	0.00	40.19	2.00	0.00	3.88	0.16	0.00
40.36	2.00	0.00	3.85	0.17	0.00	40.52	2.00	0.00	3.82	0.16	0.00
40.68	2.00	0.00	3.80	0.16	0.00	40.85	2.00	0.00	3.77	0.17	0.00
41.01	2.00	0.00	3.75	0.16	0.00	41.18	2.00	0.00	3.72	0.17	0.00
41.34	2.00	0.00	3.70	0.16	0.00	41.50	2.00	0.00	3.68	0.16	0.00
41.67	2.00	0.00	3.65	0.17	0.00	41.83	2.00	0.00	3.63	0.16	0.00
42.00	2.00	0.00	3.60	0.17	0.00	42.16	2.00	0.00	3.57	0.16	0.00
42.32	2.00	0.00	3.55	0.16	0.00	42.49	2.00	0.00	3.52	0.17	0.00
42.65	2.00	0.00	3.50	0.16	0.00	42.82	2.00	0.00	3.47	0.17	0.00
42.98	0.51	0.49	3.45	0.16	0.08	43.15	0.53	0.47	3.42	0.17	0.08
43.31	0.61	0.39	3.40	0.16	0.06	43.47	0.63	0.37	3.38	0.16	0.06
43.64	0.65	0.35	3.35	0.17	0.06	43.80	0.68	0.32	3.32	0.16	0.05
43.97	0.78	0.22	3.30	0.17	0.04	44.13	0.78	0.22	3.27	0.16	0.04
44.29	0.80	0.20	3.25	0.16	0.03	44.46	0.83	0.17	3.22	0.17	0.03
44.62	0.93	0.07	3.20	0.16	0.01	44.79	1.11	0.00	3.17	0.17	0.00
44.95	1.47	0.00	3.15	0.16	0.00	45.11	1.77	0.00	3.13	0.16	0.00
45.28	1.97	0.00	3.10	0.17	0.00	45.44	2.00	0.00	3.07	0.16	0.00
45.61	2.00	0.00	3.05	0.17	0.00	45.77	2.00	0.00	3.02	0.16	0.00
45.93	2.00	0.00	3.00	0.16	0.00	46.10	2.00	0.00	2.97	0.17	0.00
46.26	2.00	0.00	2.95	0.16	0.00	46.43	2.00	0.00	2.92	0.17	0.00
46.59	2.00	0.00	2.90	0.16	0.00	46.75	2.00	0.00	2.88	0.16	0.00
46.92	2.00	0.00	2.85	0.17	0.00	47.08	2.00	0.00	2.83	0.16	0.00
47.25	2.00	0.00	2.80	0.17	0.00	47.41	2.00	0.00	2.77	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
47.57	2.00	0.00	2.75	0.16	0.00	47.74	2.00	0.00	2.72	0.17	0.00
47.90	2.00	0.00	2.70	0.16	0.00	48.07	2.00	0.00	2.67	0.17	0.00
48.23	2.00	0.00	2.65	0.16	0.00	48.39	2.00	0.00	2.63	0.16	0.00
48.56	2.00	0.00	2.60	0.17	0.00	48.72	2.00	0.00	2.58	0.16	0.00
48.89	2.00	0.00	2.55	0.17	0.00	49.05	2.00	0.00	2.52	0.16	0.00
49.22	2.00	0.00	2.50	0.17	0.00	49.38	2.00	0.00	2.47	0.16	0.00
49.54	2.00	0.00	2.45	0.16	0.00	49.71	2.00	0.00	2.42	0.17	0.00
49.87	2.00	0.00	2.40	0.16	0.00	50.04	2.00	0.00	2.37	0.17	0.00

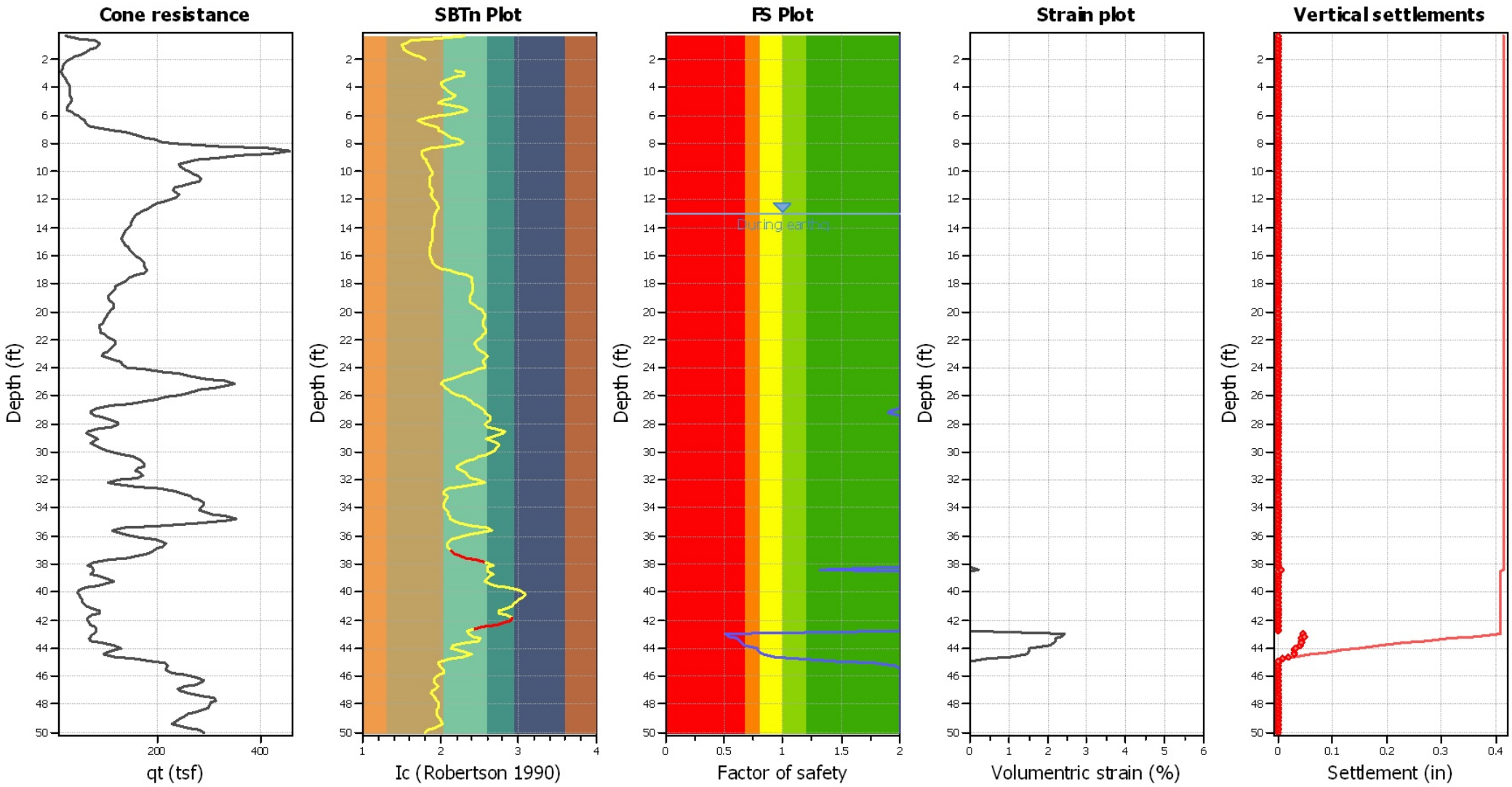
Overall liquefaction potential: 0.55

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
w_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

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)
13.12	216.26	2.00	0.00	1.00	0.00	13.29	208.47	2.00	0.00	1.00	0.00
13.45	202.99	2.00	0.00	1.00	0.00	13.62	199.11	2.00	0.00	1.00	0.00
13.78	195.28	2.00	0.00	1.00	0.00	13.94	190.89	2.00	0.00	1.00	0.00
14.11	185.04	2.00	0.00	1.00	0.00	14.27	179.89	2.00	0.00	1.00	0.00
14.44	173.81	2.00	0.00	1.00	0.00	14.60	170.02	2.00	0.00	1.00	0.00
14.76	167.33	2.00	0.00	1.00	0.00	14.93	167.56	2.00	0.00	1.00	0.00
15.09	168.57	2.00	0.00	1.00	0.00	15.26	171.10	2.00	0.00	1.00	0.00
15.42	174.25	2.00	0.00	1.00	0.00	15.58	178.36	2.00	0.00	1.00	0.00
15.75	183.02	2.00	0.00	1.00	0.00	15.91	188.78	2.00	0.00	1.00	0.00
16.08	195.03	2.00	0.00	1.00	0.00	16.24	201.53	2.00	0.00	1.00	0.00
16.40	208.51	2.00	0.00	1.00	0.00	16.57	213.16	2.00	0.00	1.00	0.00
16.73	220.70	2.00	0.00	1.00	0.00	16.90	241.09	2.00	0.00	1.00	0.00
17.06	273.13	2.00	0.00	1.00	0.00	17.23	307.81	2.00	0.00	1.00	0.00
17.39	334.81	2.00	0.00	1.00	0.00	17.55	349.21	2.00	0.00	1.00	0.00
17.72	338.15	2.00	0.00	1.00	0.00	17.88	319.12	2.00	0.00	1.00	0.00
18.05	299.10	2.00	0.00	1.00	0.00	18.21	289.69	2.00	0.00	1.00	0.00
18.37	282.93	2.00	0.00	1.00	0.00	18.54	269.92	2.00	0.00	1.00	0.00
18.70	251.62	2.00	0.00	1.00	0.00	18.87	230.47	2.00	0.00	1.00	0.00
19.03	226.01	2.00	0.00	1.00	0.00	19.19	235.54	2.00	0.00	1.00	0.00
19.36	251.88	2.00	0.00	1.00	0.00	19.52	273.69	2.00	0.00	1.00	0.00
19.69	294.62	2.00	0.00	1.00	0.00	19.85	311.73	2.00	0.00	1.00	0.00
20.01	314.23	2.00	0.00	1.00	0.00	20.18	310.26	2.00	0.00	1.00	0.00
20.34	299.72	2.00	0.00	1.00	0.00	20.51	287.51	2.00	0.00	1.00	0.00
20.67	270.60	2.00	0.00	1.00	0.00	20.83	256.29	2.00	0.00	1.00	0.00
21.00	246.54	2.00	0.00	1.00	0.00	21.16	251.36	2.00	0.00	1.00	0.00
21.33	260.31	2.00	0.00	1.00	0.00	21.49	269.04	2.00	0.00	1.00	0.00
21.65	270.77	2.00	0.00	1.00	0.00	21.82	274.00	2.00	0.00	1.00	0.00
21.98	276.65	2.00	0.00	1.00	0.00	22.15	274.40	2.00	0.00	1.00	0.00
22.31	264.49	2.00	0.00	1.00	0.00	22.47	258.65	2.00	0.00	1.00	0.00
22.64	259.66	2.00	0.00	1.00	0.00	22.80	263.42	2.00	0.00	1.00	0.00
22.97	263.66	2.00	0.00	1.00	0.00	23.13	270.14	2.00	0.00	1.00	0.00
23.30	289.25	2.00	0.00	1.00	0.00	23.46	310.56	2.00	0.00	1.00	0.00
23.62	333.79	2.00	0.00	1.00	0.00	23.79	354.30	2.00	0.00	1.00	0.00
23.95	379.68	2.00	0.00	1.00	0.00	24.12	400.16	2.00	0.00	1.00	0.00
24.28	416.46	2.00	0.00	1.00	0.00	24.44	407.14	2.00	0.00	1.00	0.00
24.61	391.68	2.00	0.00	1.00	0.00	24.77	379.14	2.00	0.00	1.00	0.00
24.94	389.68	2.00	0.00	1.00	0.00	25.10	396.83	2.00	0.00	1.00	0.00
25.26	387.61	2.00	0.00	1.00	0.00	25.43	366.08	2.00	0.00	1.00	0.00
25.59	347.82	2.00	0.00	1.00	0.00	25.76	340.15	2.00	0.00	1.00	0.00
25.92	343.56	2.00	0.00	1.00	0.00	26.08	352.88	2.00	0.00	1.00	0.00
26.25	354.15	2.00	0.00	1.00	0.00	26.41	330.90	2.00	0.00	1.00	0.00
26.58	280.70	2.00	0.00	1.00	0.00	26.74	226.51	2.00	0.00	1.00	0.00
26.90	187.72	2.00	0.00	1.00	0.00	27.07	173.44	1.91	0.00	1.00	0.00
27.23	173.02	1.90	0.00	1.00	0.00	27.40	212.31	2.00	0.00	1.00	0.00
27.56	261.43	2.00	0.00	1.00	0.00	27.72	308.08	2.00	0.00	1.00	0.00
27.89	316.55	2.00	0.00	1.00	0.00	28.05	303.62	2.00	0.00	1.00	0.00
28.22	279.49	2.00	0.00	1.00	0.00	28.38	256.37	2.00	0.00	1.00	0.00
28.54	237.19	2.00	0.00	1.00	0.00	28.71	220.62	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)
28.87	212.61	2.00	0.00	1.00	0.00	29.04	203.92	2.00	0.00	1.00	0.00
29.20	207.74	2.00	0.00	1.00	0.00	29.36	213.77	2.00	0.00	1.00	0.00
29.53	242.71	2.00	0.00	1.00	0.00	29.69	265.60	2.00	0.00	1.00	0.00
29.86	293.51	2.00	0.00	1.00	0.00	30.02	310.44	2.00	0.00	1.00	0.00
30.19	318.32	2.00	0.00	1.00	0.00	30.35	311.13	2.00	0.00	1.00	0.00
30.51	292.33	2.00	0.00	1.00	0.00	30.68	268.62	2.00	0.00	1.00	0.00
30.84	243.76	2.00	0.00	1.00	0.00	31.01	222.80	2.00	0.00	1.00	0.00
31.17	211.75	2.00	0.00	1.00	0.00	31.33	223.64	2.00	0.00	1.00	0.00
31.50	247.68	2.00	0.00	1.00	0.00	31.66	262.49	2.00	0.00	1.00	0.00
31.83	256.92	2.00	0.00	1.00	0.00	31.99	238.93	2.00	0.00	1.00	0.00
32.15	224.53	2.00	0.00	1.00	0.00	32.32	210.84	2.00	0.00	1.00	0.00
32.48	207.93	2.00	0.00	1.00	0.00	32.65	219.29	2.00	0.00	1.00	0.00
32.81	238.02	2.00	0.00	1.00	0.00	32.97	256.02	2.00	0.00	1.00	0.00
33.14	271.66	2.00	0.00	1.00	0.00	33.30	282.57	2.00	0.00	1.00	0.00
33.47	289.58	2.00	0.00	1.00	0.00	33.63	291.66	2.00	0.00	1.00	0.00
33.79	290.09	2.00	0.00	1.00	0.00	33.96	286.93	2.00	0.00	1.00	0.00
34.12	291.23	2.00	0.00	1.00	0.00	34.29	305.35	2.00	0.00	1.00	0.00
34.45	325.42	2.00	0.00	1.00	0.00	34.61	354.12	2.00	0.00	1.00	0.00
34.78	374.99	2.00	0.00	1.00	0.00	34.94	376.07	2.00	0.00	1.00	0.00
35.11	349.35	2.00	0.00	1.00	0.00	35.27	319.26	2.00	0.00	1.00	0.00
35.43	297.81	2.00	0.00	1.00	0.00	35.60	268.11	2.00	0.00	1.00	0.00
35.76	232.98	2.00	0.00	1.00	0.00	35.93	202.05	2.00	0.00	1.00	0.00
36.09	197.44	2.00	0.00	1.00	0.00	36.26	208.41	2.00	0.00	1.00	0.00
36.42	216.93	2.00	0.00	1.00	0.00	36.58	215.08	2.00	0.00	1.00	0.00
36.75	207.75	2.00	0.00	1.00	0.00	36.91	203.82	2.00	0.00	1.00	0.00
37.08	199.32	2.00	0.00	1.00	0.00	37.24	198.58	2.00	0.00	1.00	0.00
37.40	195.50	2.00	0.00	1.00	0.00	37.57	189.71	2.00	0.00	1.00	0.00
37.73	171.04	2.00	0.00	1.00	0.00	37.90	153.53	2.00	0.00	1.00	0.00
38.06	146.63	2.00	0.00	1.00	0.00	38.22	147.68	2.00	0.00	1.00	0.00
38.39	153.76	1.31	0.21	1.00	0.00	38.55	156.21	2.00	0.00	1.00	0.00
38.72	164.29	2.00	0.00	1.00	0.00	38.88	182.10	2.00	0.00	1.00	0.00
39.04	207.11	2.00	0.00	1.00	0.00	39.21	221.47	2.00	0.00	1.00	0.00
39.37	213.38	2.00	0.00	1.00	0.00	39.54	196.36	2.00	0.00	1.00	0.00
39.70	181.29	2.00	0.00	1.00	0.00	39.86	183.26	2.00	0.00	1.00	0.00
40.03	188.97	2.00	0.00	1.00	0.00	40.19	195.96	2.00	0.00	1.00	0.00
40.36	197.08	2.00	0.00	1.00	0.00	40.52	193.48	2.00	0.00	1.00	0.00
40.68	187.63	2.00	0.00	1.00	0.00	40.85	188.54	2.00	0.00	1.00	0.00
41.01	198.88	2.00	0.00	1.00	0.00	41.18	211.79	2.00	0.00	1.00	0.00
41.34	216.32	2.00	0.00	1.00	0.00	41.50	212.95	2.00	0.00	1.00	0.00
41.67	208.31	2.00	0.00	1.00	0.00	41.83	202.26	2.00	0.00	1.00	0.00
42.00	194.42	2.00	0.00	1.00	0.00	42.16	180.25	2.00	0.00	1.00	0.00
42.32	159.22	2.00	0.00	1.00	0.00	42.49	134.32	2.00	0.00	1.00	0.00
42.65	113.17	2.00	0.00	1.00	0.00	42.82	100.58	2.00	0.00	1.00	0.00
42.98	96.39	0.51	2.41	1.00	0.05	43.15	98.48	0.53	2.37	1.00	0.05
43.31	107.00	0.61	2.21	1.00	0.04	43.47	108.67	0.63	2.18	1.00	0.04
43.64	110.57	0.65	2.15	1.00	0.04	43.80	113.08	0.68	2.07	1.00	0.04
43.97	121.51	0.78	1.53	1.00	0.03	44.13	121.32	0.78	1.53	1.00	0.03
44.29	123.17	0.80	1.50	1.00	0.03	44.46	125.49	0.83	1.46	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)
44.62	132.34	0.93	1.04	1.00	0.02	44.79	142.74	1.11	0.44	1.00	0.01
44.95	160.25	1.47	0.00	1.00	0.00	45.11	172.79	1.77	0.00	1.00	0.00
45.28	179.79	1.97	0.00	1.00	0.00	45.44	182.08	2.00	0.00	1.00	0.00
45.61	183.99	2.00	0.00	1.00	0.00	45.77	192.13	2.00	0.00	1.00	0.00
45.93	204.08	2.00	0.00	1.00	0.00	46.10	216.09	2.00	0.00	1.00	0.00
46.26	223.56	2.00	0.00	1.00	0.00	46.43	223.12	2.00	0.00	1.00	0.00
46.59	215.34	2.00	0.00	1.00	0.00	46.75	199.31	2.00	0.00	1.00	0.00
46.92	185.18	2.00	0.00	1.00	0.00	47.08	181.40	2.00	0.00	1.00	0.00
47.25	196.41	2.00	0.00	1.00	0.00	47.41	219.75	2.00	0.00	1.00	0.00
47.57	239.31	2.00	0.00	1.00	0.00	47.74	244.37	2.00	0.00	1.00	0.00
47.90	239.73	2.00	0.00	1.00	0.00	48.07	236.49	2.00	0.00	1.00	0.00
48.23	233.79	2.00	0.00	1.00	0.00	48.39	225.39	2.00	0.00	1.00	0.00
48.56	211.15	2.00	0.00	1.00	0.00	48.72	199.90	2.00	0.00	1.00	0.00
48.89	195.52	2.00	0.00	1.00	0.00	49.05	192.16	2.00	0.00	1.00	0.00
49.22	187.14	2.00	0.00	1.00	0.00	49.38	183.52	2.00	0.00	1.00	0.00
49.54	185.92	2.00	0.00	1.00	0.00	49.71	194.39	2.00	0.00	1.00	0.00
49.87	200.76	2.00	0.00	1.00	0.00	50.04	202.75	2.00	0.00	1.00	0.00

Total estimated settlement: 0.41

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

:: Strength loss calculation (Robertson (2009) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
0.33	23.58	37.86	1.98	74.96	2.31	N/A	N/A
0.49	48.75	78.28	1.19	92.84	1.90	N/A	N/A
0.66	78.52	126.09	1.00	126.09	1.61	N/A	N/A
0.82	86.31	138.59	1.00	138.59	1.55	N/A	N/A
0.98	88.04	141.36	1.00	141.36	1.49	N/A	N/A
1.15	81.37	130.63	1.00	130.63	1.51	N/A	N/A
1.31	71.40	114.60	1.00	114.60	1.53	N/A	N/A
1.48	60.70	97.39	1.00	97.39	1.58	N/A	N/A
1.64	49.73	79.76	1.00	79.76	1.65	N/A	N/A
1.80	39.33	63.04	1.00	63.04	1.73	N/A	N/A
1.97	30.73	49.21	1.00	49.21	1.80	N/A	N/A
2.13	24.83	-1.00	1.00	-1.00	-1.00	N/A	N/A
2.30	20.74	-1.00	1.00	-1.00	-1.00	N/A	N/A
2.46	17.84	-1.00	1.00	-1.00	-1.00	N/A	N/A
2.62	15.74	-1.00	1.00	-1.00	-1.00	N/A	N/A
2.79	14.40	22.91	1.00	22.91	2.19	N/A	N/A
2.95	14.17	22.53	1.00	22.53	2.30	N/A	N/A
3.12	15.80	25.14	1.98	49.79	2.31	N/A	N/A
3.28	19.21	30.59	1.66	50.68	2.20	N/A	N/A
3.45	23.14	36.90	1.00	36.90	2.09	N/A	N/A
3.61	26.47	42.24	1.00	42.24	2.01	N/A	N/A
3.77	29.04	46.35	1.00	46.35	2.01	N/A	N/A
3.94	30.31	48.37	1.34	64.78	2.03	N/A	N/A
4.10	30.84	49.21	1.38	68.02	2.06	N/A	N/A
4.27	30.61	48.83	1.45	70.71	2.10	N/A	N/A
4.43	30.91	49.30	1.55	76.56	2.15	N/A	N/A
4.59	31.71	50.57	1.63	82.46	2.18	N/A	N/A
4.76	32.88	52.43	1.53	80.20	2.14	N/A	N/A
4.92	33.04	52.68	1.37	72.31	2.05	N/A	N/A
5.09	30.71	48.91	1.00	48.91	1.98	N/A	N/A
5.25	26.97	42.89	1.00	42.89	2.05	N/A	N/A
5.41	24.63	39.13	1.83	71.57	2.26	N/A	N/A
5.58	26.60	42.27	2.08	87.72	2.34	N/A	N/A
5.74	32.94	52.44	1.88	98.76	2.28	N/A	N/A
5.91	40.48	64.53	1.49	96.04	2.12	N/A	N/A
6.07	47.47	75.76	1.23	93.11	1.94	N/A	N/A
6.23	52.70	84.15	1.00	84.15	1.77	N/A	N/A
6.40	57.93	92.53	1.00	92.53	1.72	N/A	N/A
6.56	61.83	98.79	1.09	107.89	1.78	N/A	N/A
6.73	66.76	106.70	1.21	128.58	1.92	N/A	N/A
6.89	82.20	131.48	1.27	167.06	1.98	N/A	N/A
7.05	113.84	182.30	1.27	231.55	1.98	N/A	N/A
7.22	138.43	221.78	1.34	296.21	2.03	N/A	N/A
7.38	158.43	253.90	1.42	361.63	2.08	N/A	N/A
7.55	174.53	279.75	1.51	422.62	2.13	N/A	N/A
7.71	193.81	310.70	1.73	537.10	2.22	N/A	N/A
7.87	206.96	331.82	1.90	629.71	2.28	N/A	N/A
8.04	235.64	377.88	1.83	693.10	2.26	N/A	N/A

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
8.20	322.31	517.11	1.38	714.59	2.06	N/A	N/A
8.37	413.98	635.75	1.17	742.60	1.88	N/A	N/A
8.53	454.97	667.65	1.09	725.97	1.77	N/A	N/A
8.69	419.55	605.02	1.08	651.06	1.76	N/A	N/A
8.86	360.64	515.74	1.09	560.85	1.77	N/A	N/A
9.02	312.35	443.55	1.10	488.17	1.79	N/A	N/A
9.19	275.50	388.09	1.11	432.65	1.81	N/A	N/A
9.35	252.68	353.15	1.13	397.83	1.83	N/A	N/A
9.51	242.79	336.25	1.13	381.48	1.84	N/A	N/A
9.68	244.29	335.36	1.15	384.19	1.85	N/A	N/A
9.84	251.96	343.34	1.16	398.09	1.87	N/A	N/A
10.01	261.33	353.50	1.18	416.06	1.89	N/A	N/A
10.17	269.92	361.41	1.18	426.77	1.89	N/A	N/A
10.34	278.19	367.36	1.17	430.55	1.88	N/A	N/A
10.50	282.85	368.07	1.16	425.38	1.86	N/A	N/A
10.66	279.85	359.58	1.15	412.38	1.85	N/A	N/A
10.83	266.45	338.58	1.15	388.08	1.85	N/A	N/A
10.99	247.75	312.49	1.16	361.91	1.87	N/A	N/A
11.16	232.89	291.53	1.17	341.96	1.88	N/A	N/A
11.32	229.49	284.79	1.18	335.68	1.89	N/A	N/A
11.48	233.99	287.46	1.18	338.16	1.89	N/A	N/A
11.65	240.42	292.18	1.17	342.41	1.88	N/A	N/A
11.81	237.09	286.17	1.19	339.66	1.90	N/A	N/A
11.98	226.85	271.98	1.21	328.52	1.92	N/A	N/A
12.14	211.75	252.41	1.23	311.51	1.94	N/A	N/A
12.30	198.65	235.05	1.25	293.96	1.96	N/A	N/A
12.47	188.04	220.49	1.26	277.18	1.97	N/A	N/A
12.63	179.18	208.09	1.25	260.82	1.96	N/A	N/A
12.80	170.78	196.24	1.24	243.86	1.95	N/A	N/A
12.96	163.55	186.01	1.23	228.37	1.94	N/A	N/A
13.12	157.45	177.85	1.22	216.26	1.93	0.91	0.91
13.29	153.35	172.30	1.21	208.47	1.92	0.91	0.91
13.45	150.49	168.29	1.21	202.99	1.92	0.90	0.90
13.62	149.02	165.81	1.20	199.11	1.91	0.90	0.90
13.78	147.55	163.41	1.20	195.28	1.91	0.90	0.90
13.94	145.15	160.05	1.19	190.89	1.90	0.90	0.90
14.11	141.72	155.54	1.19	185.04	1.90	0.89	0.89
14.27	138.08	150.97	1.19	179.89	1.90	0.89	0.89
14.44	134.32	146.19	1.19	173.81	1.90	0.88	0.88
14.60	131.58	142.69	1.19	170.02	1.90	0.88	0.88
14.76	130.65	141.06	1.19	167.33	1.90	0.88	0.88
14.93	131.81	141.72	1.18	167.56	1.89	0.88	0.88
15.09	134.18	143.63	1.17	168.57	1.88	0.88	0.88
15.26	137.75	146.79	1.17	171.10	1.87	0.88	0.88
15.42	142.25	150.91	1.15	174.25	1.86	0.89	0.89
15.58	147.05	155.39	1.15	178.36	1.85	0.89	0.89
15.75	151.68	159.68	1.15	183.02	1.85	0.90	0.90
15.91	155.85	163.62	1.15	188.78	1.86	0.90	0.90

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
16.08	159.91	167.43	1.16	195.03	1.87	0.90	0.90
16.24	164.54	171.79	1.17	201.53	1.88	0.91	0.91
16.40	170.18	177.10	1.18	208.51	1.89	0.91	0.91
16.57	174.44	180.87	1.18	213.16	1.89	0.91	0.91
16.73	174.74	180.97	1.22	220.70	1.93	0.91	0.91
16.90	177.28	183.69	1.31	241.09	2.01	0.92	0.92
17.06	178.98	185.71	1.47	273.13	2.11	0.92	0.92
17.23	173.25	179.91	1.71	307.81	2.22	0.91	0.91
17.39	159.56	165.69	2.02	334.81	2.32	0.90	0.90
17.55	146.68	152.02	2.30	349.21	2.40	0.89	0.89
17.72	141.90	146.25	2.31	338.15	2.40	0.88	0.88
17.88	134.02	137.38	2.32	319.12	2.40	0.87	0.87
18.05	124.44	126.85	2.36	299.10	2.41	0.86	0.86
18.21	118.57	120.26	2.41	289.69	2.42	0.85	0.85
18.37	116.88	117.93	2.40	282.93	2.42	0.85	0.85
18.54	113.99	114.36	2.36	269.92	2.41	0.85	0.85
18.70	108.34	108.09	2.33	251.62	2.40	0.84	0.84
18.87	104.20	103.32	2.23	230.47	2.38	0.83	0.83
19.03	104.13	102.76	2.20	226.01	2.37	0.83	0.83
19.19	108.07	106.22	2.22	235.54	2.38	0.84	0.84
19.36	113.62	111.22	2.26	251.88	2.39	0.84	0.84
19.52	115.28	112.42	2.43	273.69	2.43	0.84	0.84
19.69	113.91	110.60	2.66	294.62	2.48	0.84	0.84
19.85	109.73	106.07	2.94	311.73	2.53	0.84	0.84
20.01	107.56	103.45	3.04	314.23	2.55	0.83	0.83
20.18	103.95	99.42	3.12	310.26	2.57	0.83	0.83
20.34	101.76	96.82	3.10	299.72	2.56	0.82	0.82
20.51	98.81	93.48	3.08	287.51	2.56	0.82	0.82
20.67	95.83	90.19	3.00	270.60	2.54	0.81	0.81
20.83	92.23	86.33	2.97	256.29	2.54	0.81	0.81
21.00	88.26	82.16	3.00	246.54	2.54	0.80	0.80
21.16	86.50	80.12	3.14	251.36	2.57	0.80	0.80
21.33	88.64	81.72	3.19	260.31	2.58	0.80	0.80
21.49	90.77	83.31	3.23	269.04	2.58	0.80	0.80
21.65	97.06	88.77	3.05	270.77	2.55	0.81	0.81
21.82	104.40	95.14	2.88	274.00	2.52	0.82	0.82
21.98	114.67	104.20	2.66	276.65	2.48	0.83	0.83
22.15	117.82	106.61	2.57	274.40	2.46	0.84	0.84
22.31	117.90	106.25	2.49	264.49	2.44	0.84	0.84
22.47	114.32	102.53	2.52	258.65	2.45	0.83	0.83
22.64	110.72	98.75	2.63	259.66	2.47	0.83	0.83
22.80	103.69	91.90	2.87	263.42	2.52	0.82	0.82
22.97	94.86	83.46	3.16	263.66	2.57	0.80	0.80
23.13	91.75	80.25	3.37	270.14	2.61	5.68	5.68
23.30	101.02	88.09	3.28	289.25	2.59	0.81	0.81
23.46	118.89	103.58	3.00	310.56	2.54	0.83	0.83
23.62	128.90	111.91	2.98	333.79	2.54	0.84	0.84
23.79	131.04	113.15	3.13	354.30	2.57	0.84	0.84

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
23.95	141.46	121.72	3.12	379.68	2.57	0.86	0.86
24.12	173.80	149.64	2.67	400.16	2.48	0.89	0.89
24.28	211.11	181.92	2.29	416.46	2.39	0.92	0.92
24.44	241.96	208.70	1.95	407.14	2.30	0.94	0.94
24.61	263.12	226.94	1.73	391.68	2.22	0.95	0.95
24.77	295.58	255.46	1.48	379.14	2.12	0.97	0.97
24.94	328.53	283.95	1.37	389.68	2.05	0.99	0.99
25.10	348.71	301.06	1.32	396.83	2.01	1.00	1.00
25.26	336.33	289.15	1.34	387.61	2.03	0.99	0.99
25.43	308.09	263.38	1.39	366.08	2.06	0.97	0.97
25.59	282.36	240.00	1.45	347.82	2.10	0.96	0.96
25.76	262.92	222.04	1.53	340.15	2.14	0.95	0.95
25.92	242.38	203.03	1.69	343.56	2.21	0.93	0.93
26.08	216.82	179.78	1.96	352.88	2.30	0.91	0.91
26.25	197.20	162.09	2.18	354.15	2.37	0.90	0.90
26.41	177.21	144.72	2.29	330.90	2.39	0.88	0.88
26.58	145.74	118.12	2.38	280.70	2.42	0.85	0.85
26.74	109.01	87.38	2.59	226.51	2.46	0.81	0.81
26.90	81.29	64.27	2.92	187.72	2.53	0.77	0.77
27.07	70.53	55.21	3.14	173.44	2.57	0.75	0.75
27.23	71.01	55.39	3.12	173.02	2.57	0.75	0.75
27.40	78.29	60.68	3.50	212.31	2.63	4.23	4.23
27.56	93.88	72.66	3.60	261.43	2.64	5.07	5.07
27.72	110.92	85.75	3.59	308.08	2.64	5.97	5.97
27.89	124.96	96.75	3.27	316.55	2.59	0.82	0.82
28.05	124.31	96.01	3.16	303.62	2.57	0.82	0.82
28.22	108.58	83.09	3.36	279.49	2.61	5.76	5.76
28.38	84.68	63.69	4.03	256.37	2.70	4.45	4.45
28.54	63.42	46.62	5.09	237.19	2.83	3.30	3.30
28.71	62.60	45.93	4.80	220.62	2.80	3.24	3.24
28.87	72.88	54.03	3.94	212.61	2.69	3.77	3.77
29.04	84.93	63.60	3.21	203.92	2.58	0.77	0.77
29.20	78.62	58.23	3.57	207.74	2.64	4.04	4.04
29.36	70.24	51.25	4.17	213.77	2.72	3.58	3.58
29.53	75.22	54.56	4.45	242.71	2.76	3.82	3.82
29.69	87.64	63.77	4.16	265.60	2.72	4.45	4.45
29.86	101.76	74.16	3.96	293.51	2.69	5.16	5.16
30.02	113.56	82.85	3.75	310.44	2.66	5.74	5.74
30.19	135.65	99.75	3.19	318.32	2.58	0.83	0.83
30.35	152.47	112.83	2.76	311.13	2.50	0.84	0.84
30.51	162.32	120.72	2.42	292.33	2.43	0.85	0.85
30.68	169.36	126.59	2.12	268.62	2.35	0.86	0.86
30.84	174.58	131.28	1.86	243.76	2.27	0.87	0.87
31.01	175.13	132.21	1.69	222.80	2.21	0.87	0.87
31.17	164.36	123.44	1.72	211.75	2.22	0.86	0.86
31.33	157.42	116.86	1.91	223.64	2.29	0.85	0.85
31.50	166.08	122.47	2.02	247.68	2.32	0.86	0.86
31.66	172.22	126.41	2.08	262.49	2.34	0.86	0.86

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
31.83	160.66	116.95	2.20	256.92	2.37	0.85	0.85
31.99	125.65	89.64	2.67	238.93	2.48	0.81	0.81
32.15	104.06	73.02	3.07	224.53	2.56	0.78	0.78
32.32	117.79	83.69	2.52	210.84	2.45	0.80	0.80
32.48	159.06	116.11	1.79	207.93	2.25	0.85	0.85
32.65	202.75	150.83	1.45	219.29	2.10	0.89	0.89
32.81	232.68	174.03	1.37	238.02	2.05	0.91	0.91
32.97	249.59	186.17	1.38	256.02	2.05	0.92	0.92
33.14	260.42	193.28	1.41	271.66	2.07	0.92	0.92
33.30	270.03	199.79	1.41	282.57	2.08	0.93	0.93
33.47	281.27	207.96	1.39	289.58	2.06	0.94	0.94
33.63	289.18	213.82	1.36	291.66	2.05	0.94	0.94
33.79	289.74	213.84	1.36	290.09	2.04	0.94	0.94
33.96	284.32	208.89	1.37	286.93	2.05	0.94	0.94
34.12	281.62	205.57	1.42	291.23	2.08	0.93	0.93
34.29	288.49	209.32	1.46	305.35	2.10	0.94	0.94
34.45	306.50	221.74	1.47	325.42	2.11	0.95	0.95
34.61	332.71	240.06	1.48	354.12	2.11	0.96	0.96
34.78	350.63	252.13	1.49	374.99	2.12	0.97	0.97
34.94	336.87	240.09	1.57	376.07	2.16	0.96	0.96
35.11	275.08	192.24	1.82	349.35	2.26	0.92	0.92
35.27	196.70	133.24	2.40	319.26	2.42	0.87	0.87
35.43	135.70	88.57	3.36	297.81	2.61	6.00	6.00
35.60	112.61	72.38	3.70	268.11	2.66	4.94	4.94
35.76	119.73	78.24	2.98	232.98	2.54	0.79	0.79
35.93	141.76	95.47	2.12	202.05	2.35	0.82	0.82
36.09	169.87	117.03	1.69	197.44	2.21	0.85	0.85
36.26	195.21	135.82	1.53	208.41	2.14	0.87	0.87
36.42	211.73	147.91	1.47	216.93	2.11	0.88	0.88
36.58	217.54	152.43	1.41	215.08	2.07	0.89	0.89
36.75	209.92	146.56	1.42	207.75	2.08	0.88	0.88
36.91	200.43	138.85	1.47	203.82	2.11	0.87	0.87
37.08	191.60	131.80	1.51	199.32	2.13	0.87	0.87
37.24	181.21	123.28	1.61	198.58	2.18	0.86	0.86
37.40	166.21	111.56	1.75	195.50	2.23	0.84	0.84
37.57	141.45	92.89	2.04	189.71	2.33	0.82	0.82
37.73	106.52	67.92	2.52	171.04	2.45	0.77	0.77
37.90	76.75	47.18	3.25	153.53	2.59	0.73	0.73
38.06	64.59	38.78	3.78	146.63	2.67	2.64	2.64
38.22	72.90	44.38	3.33	147.68	2.60	2.98	2.98
38.39	76.88	46.80	3.29	153.76	2.59	0.73	0.73
38.55	76.26	46.15	3.39	156.21	2.61	3.10	3.10
38.72	71.04	42.15	3.90	164.29	2.69	2.87	2.87
38.88	84.99	51.03	3.57	182.10	2.64	3.44	3.44
39.04	101.96	61.72	3.36	207.11	2.60	4.14	4.14
39.21	116.00	70.69	3.13	221.47	2.57	0.78	0.78
39.37	105.39	63.43	3.36	213.38	2.61	4.25	4.25
39.54	83.62	48.95	4.01	196.36	2.70	3.34	3.34

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
39.70	61.94	34.77	5.21	181.29	2.85	2.44	2.44
39.86	48.99	26.57	6.90	183.26	3.01	1.90	1.90
40.03	45.93	24.73	7.64	188.97	3.08	1.77	1.77
40.19	47.52	25.55	7.67	195.96	3.08	1.82	1.82
40.36	50.47	27.13	7.27	197.08	3.05	1.94	1.94
40.52	52.39	28.13	6.88	193.48	3.01	2.01	2.01
40.68	54.55	29.24	6.42	187.63	2.97	2.09	2.09
40.85	57.20	30.67	6.15	188.54	2.94	2.19	2.19
41.01	62.71	33.84	5.88	198.88	2.92	2.40	2.40
41.18	75.70	41.72	5.08	211.79	2.83	2.91	2.91
41.34	86.99	48.75	4.44	216.32	2.76	3.35	3.35
41.50	85.93	47.99	4.44	212.95	2.76	3.30	3.30
41.67	74.00	40.26	5.17	208.31	2.84	2.81	2.81
41.83	65.17	34.67	5.83	202.26	2.91	2.46	2.46
42.00	64.64	34.38	5.65	194.42	2.90	2.43	2.43
42.16	67.50	36.43	4.95	180.25	2.82	2.53	2.53
42.32	71.45	39.47	4.03	159.22	2.71	2.68	2.68
42.49	78.44	44.86	2.99	134.32	2.54	0.72	0.72
42.65	81.88	48.13	2.35	113.17	2.41	0.73	0.73
42.82	80.62	47.91	2.10	100.58	2.34	0.73	0.73
42.98	75.54	44.52	2.17	96.39	2.36	0.72	0.72
43.15	70.88	41.05	2.40	98.48	2.42	0.71	0.71
43.31	67.05	37.91	2.82	107.00	2.51	0.70	0.70
43.47	69.39	39.29	2.77	108.67	2.50	0.70	0.70
43.64	88.63	52.20	2.12	110.57	2.35	0.74	0.74
43.80	116.24	71.75	1.58	113.08	2.16	0.78	0.78
43.97	128.50	79.78	1.52	121.51	2.14	0.80	0.80
44.13	118.66	72.27	1.68	121.32	2.20	0.78	0.78
44.29	99.92	58.59	2.10	123.17	2.35	0.75	0.75
44.46	95.08	54.95	2.28	125.49	2.39	0.75	0.75
44.62	116.90	69.44	1.91	132.34	2.29	0.78	0.78
44.79	151.16	93.10	1.53	142.74	2.14	0.82	0.82
44.95	192.06	122.12	1.31	160.25	2.01	0.86	0.86
45.11	213.53	136.97	1.26	172.79	1.97	0.87	0.87
45.28	220.44	140.75	1.28	179.79	1.98	0.88	0.88
45.44	216.90	136.95	1.33	182.08	2.02	0.87	0.87
45.61	214.96	134.63	1.37	183.99	2.05	0.87	0.87
45.77	226.54	141.99	1.35	192.13	2.04	0.88	0.88
45.93	251.38	159.45	1.28	204.08	1.98	0.90	0.90
46.10	275.20	176.34	1.23	216.09	1.94	0.91	0.91
46.26	290.24	187.05	1.20	223.56	1.91	0.92	0.92
46.43	287.65	184.32	1.21	223.12	1.92	0.92	0.92
46.59	274.40	174.47	1.23	215.34	1.94	0.91	0.91
46.75	251.97	159.12	1.25	199.31	1.96	0.89	0.89
46.92	238.70	151.29	1.22	185.18	1.94	0.89	0.89
47.08	240.26	153.65	1.18	181.40	1.89	0.89	0.89
47.25	262.36	168.26	1.17	196.41	1.88	0.90	0.90
47.41	289.06	183.91	1.19	219.75	1.91	0.92	0.92

:: Strength loss calculation (Robertson (2009) :: (continued)

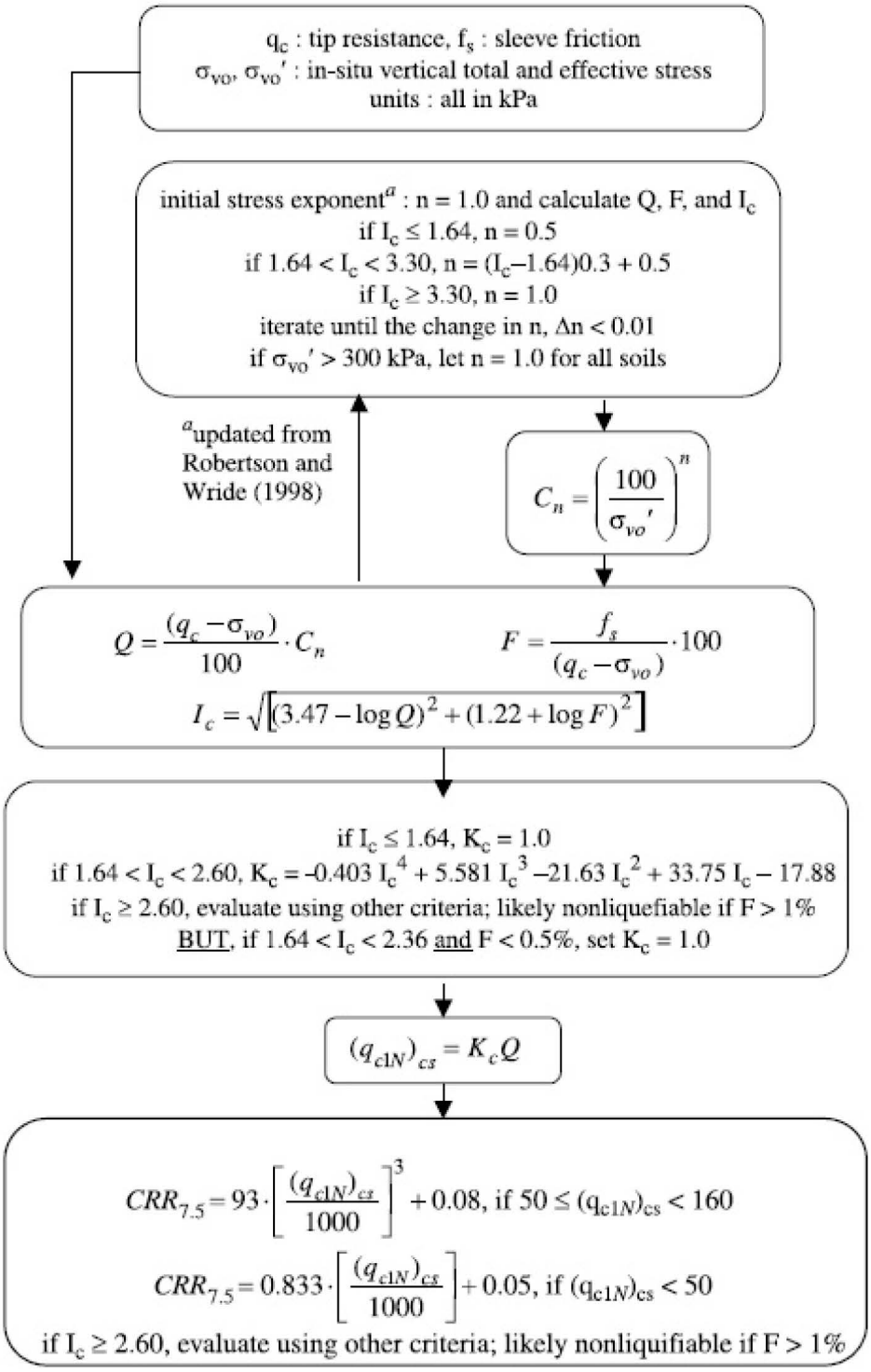
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
47.57	309.83	195.51	1.22	239.31	1.94	0.93	0.93
47.74	312.90	196.10	1.25	244.37	1.96	0.93	0.93
47.90	304.63	189.83	1.26	239.73	1.97	0.92	0.92
48.07	300.17	186.42	1.27	236.49	1.97	0.92	0.92
48.23	298.30	185.12	1.26	233.79	1.97	0.92	0.92
48.39	290.40	180.33	1.25	225.39	1.96	0.91	0.91
48.56	273.77	169.80	1.24	211.15	1.95	0.90	0.90
48.72	259.20	160.22	1.25	199.90	1.96	0.90	0.90
48.89	251.37	154.39	1.27	195.52	1.97	0.89	0.89
49.05	244.03	148.78	1.29	192.16	1.99	0.88	0.88
49.22	234.97	142.23	1.32	187.14	2.01	0.88	0.88
49.38	228.20	137.29	1.34	183.52	2.03	0.87	0.87
49.54	239.44	145.56	1.28	185.92	1.98	0.88	0.88
49.71	261.77	161.94	1.20	194.39	1.91	0.90	0.90
49.87	281.21	177.43	1.13	200.76	1.83	0.91	0.91
50.04	288.05	182.96	1.11	202.75	1.80	0.92	0.92

Abbreviations

q_t:	Total cone resistance
K_c:	Cone resistance correction factor due to fines
$Q_{tn,cs}$:	Adjusted and corrected cone resistance due to fines
I_c:	Soil behavior type index
$S_{u(liq)}/\sigma'_v$:	Calculated liquefied undrained strength ratio
$S_{u(peak)}/\sigma'_v$:	Calculated peak undrained strength ratio

Procedure for the evaluation of soil liquefaction resistance, NCEER (1998)

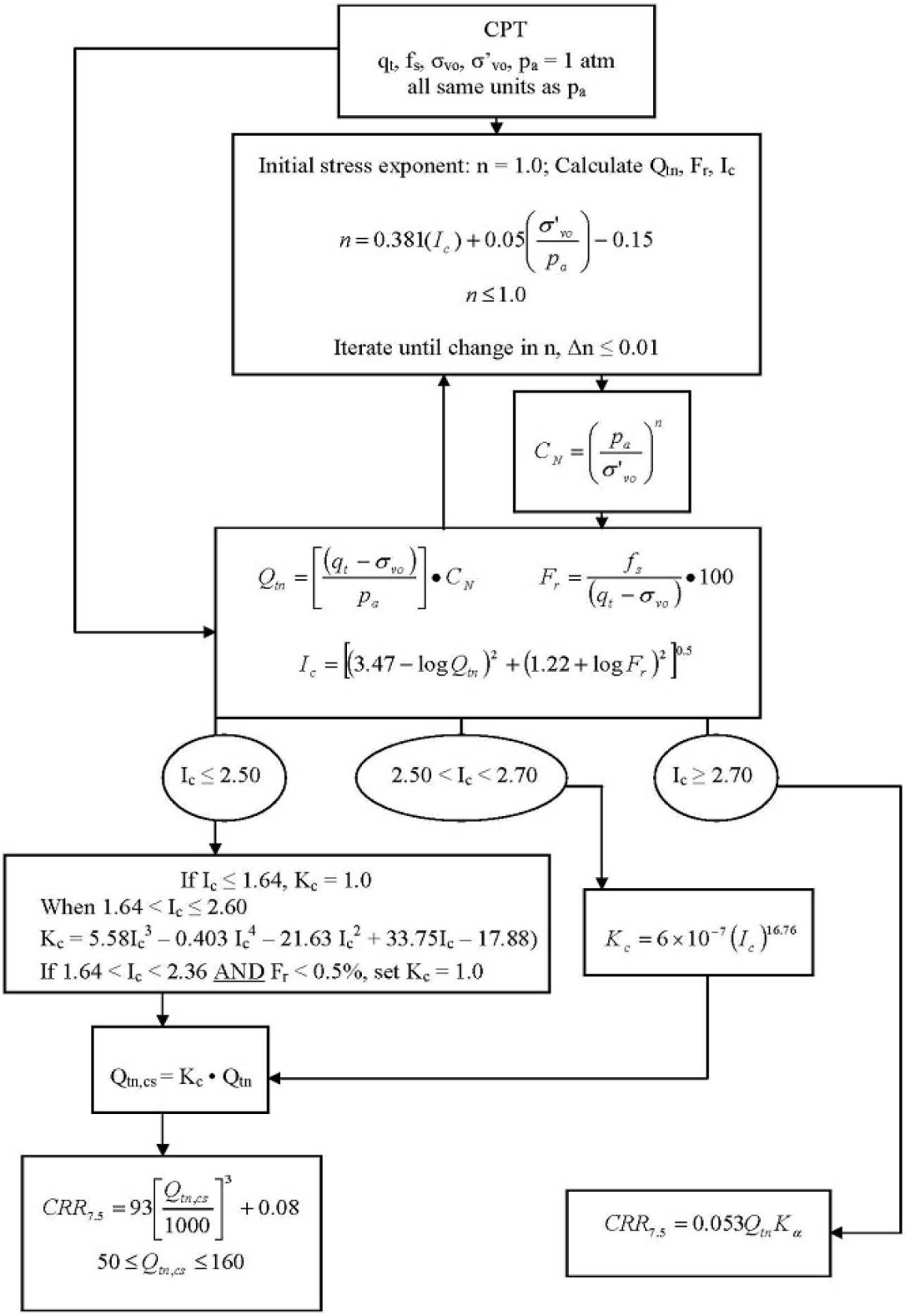
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

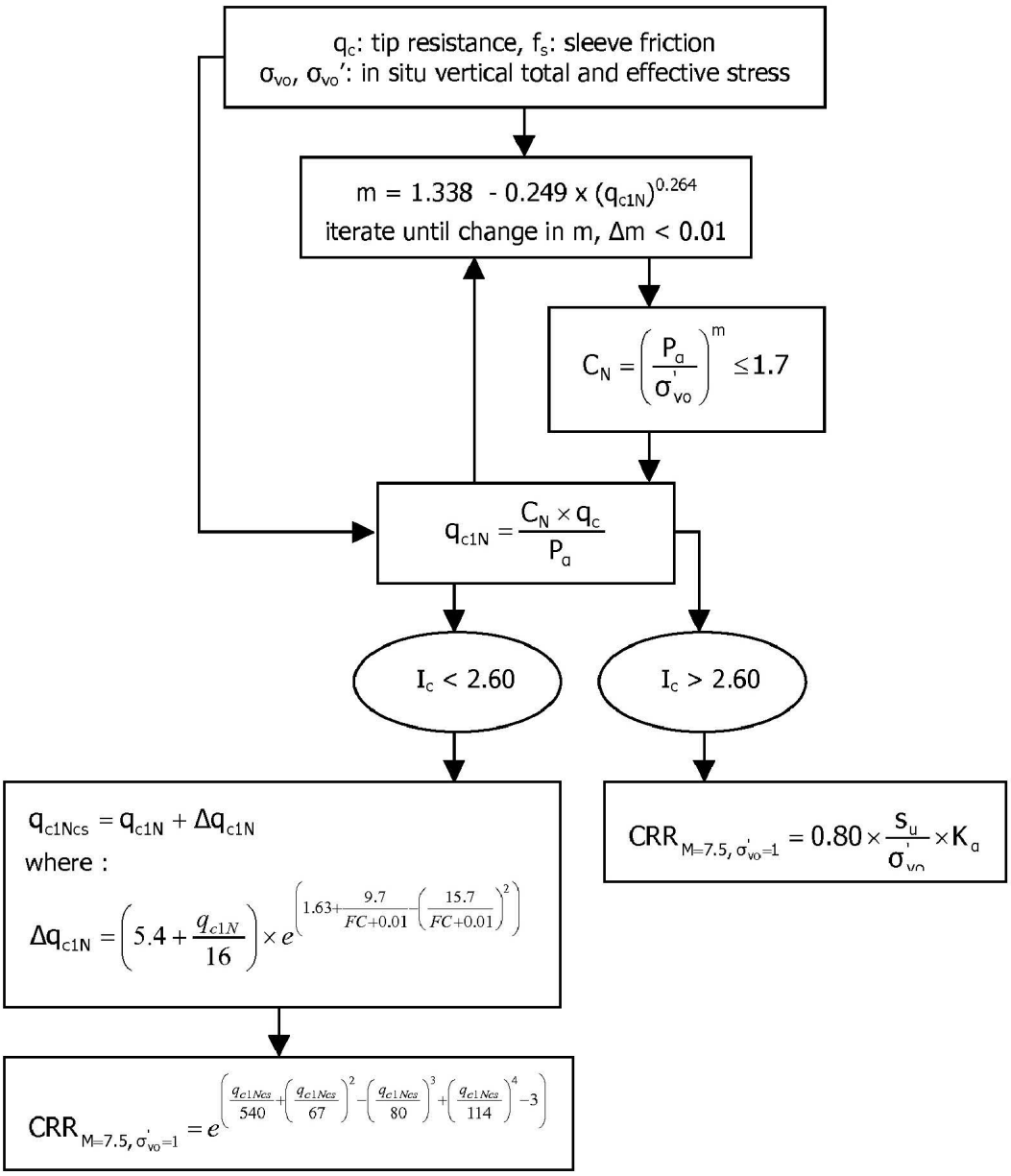
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. This procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:

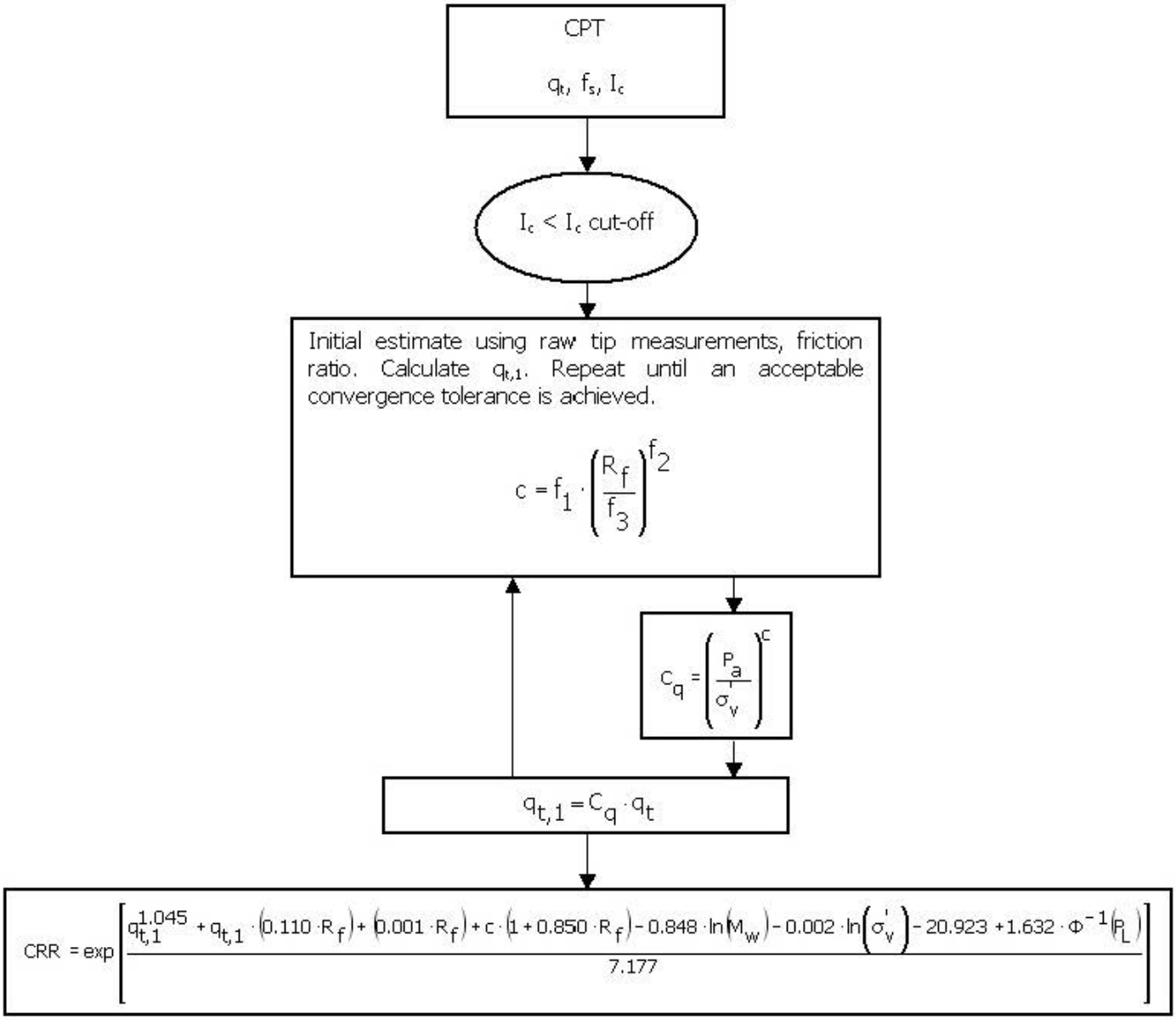


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)

$$FS_{liq} = \frac{CRR_{M=7.5,\sigma'_v=1atm}}{CSR_{M=7.5,\sigma'_v=1atm}}$$

$$CSR_{M=7.5,\sigma'_v=1atm} = 0.65\frac{\sigma_v}{\sigma'_v}\frac{a_{\max}}{g}r_d\frac{1}{MSF}\frac{1}{K_\sigma}$$

$$r_d = \exp\left[\alpha(z)+\beta(z)\cdot M\right]$$

$$\alpha(z) = -1.012-1.126\sin\left(\frac{z}{11.73}+5.133\right)$$

$$\beta(z) = 0.106+0.118\sin\left(\frac{z}{11.28}+5.142\right)$$

$$K_\sigma = 1 - C_\sigma \ln\left(\frac{\sigma'_v}{P_a}\right) \le 1.1$$

$$C_\sigma = \frac{1}{37.3-8.27\left(q_{c1Ncs}\right)^{0.264}} \le 0.3$$

$$MSF = 1+\left(MSF_{max}-1\right)\left(8.64\exp\left(\frac{-M}{4}\right)-1.325\right)$$

$$MSF_{max} = 1.09+\left(\frac{q_{C1Ncs}}{180}\right)^3 \le 2.2$$

σ'_v *and* σ_v *at start of earthquake shaking*

$$CRR_{M=7.5,\sigma'_v=1atm} = \exp\left(\frac{q_{c1Ncs}}{113}+\left(\frac{q_{c1Ncs}}{1000}\right)^2-\left(\frac{q_{c1Ncs}}{140}\right)^3+\left(\frac{q_{c1Ncs}}{137}\right)^4-2.80\right)$$

$$q_{c1Ncs} = q_{c1N}+\Delta q_{c1N}$$

$$\Delta q_{c1N} = \left(11.9+\frac{q_{c1N}}{14.6}\right)\exp\left(1.63-\frac{9.7}{FC+2}-\left(\frac{15.7}{FC+2}\right)^2\right)$$

$$q_{c1N} = C_{Ne}\frac{q_c}{P_a}$$

$$C_{Ne} = \left(\frac{P_a}{\sigma'_v}\right)^m \le 1.7$$

$$m = 1.338-0.249\left(q_{c1Ncs}\right)^{0.264} \quad with \quad 0.264 \le m \le 0.782$$

$$FC = 80\left(I_C+C_{FC}\right)-137 \quad with \quad 0\% \le FC \le 100\%$$

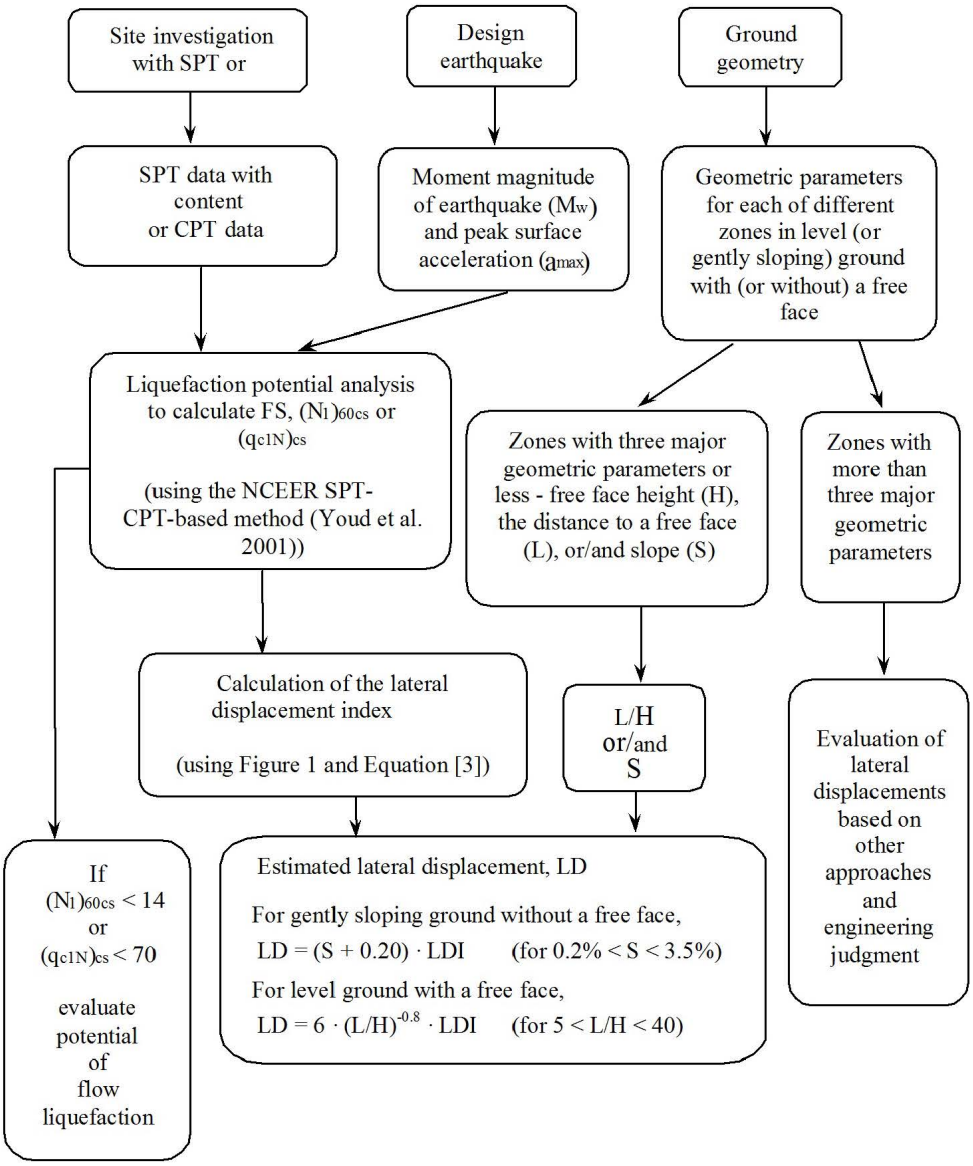
$$I_c = \left[\left(3.47-\log(Q)\right)^2+\left(1.22+\log(F)\right)^2\right]^{0.5}$$

$$Q = \left(\frac{q_c-\sigma_{vc}}{P_a}\right)\left(\frac{P_a}{\sigma'_{vc}}\right)^n \; with\; 0.5 \le n \le 1.0 \; per\; Robertson\;\&\;Wride\,(1998)$$

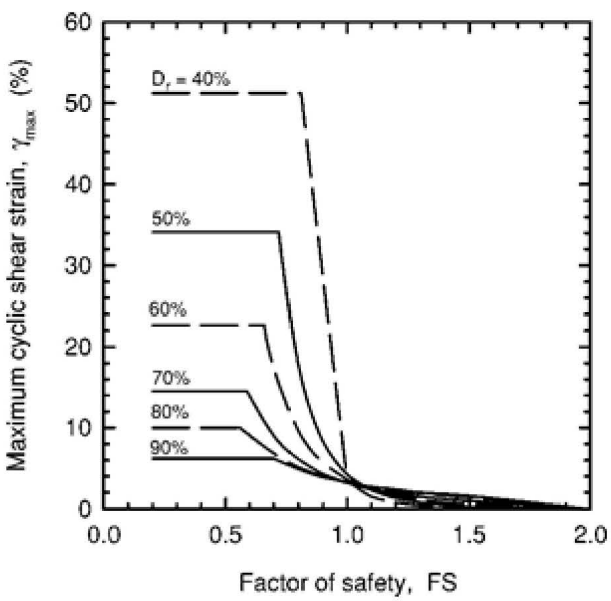
$$F = \left(\frac{f_s}{q_c-\sigma_{vc}}\right)\cdot 100\%$$

σ'_v *at time of CPT sounding*

Procedure for the evaluation of liquefaction-induced lateral spreading displacements



[1] Flow chart illustrating major steps in estimating liquefaction-induced lateral spreading displacements using the proposed approach



[1] **Figure 1**

$$LDI = \int_0^{z_{max}} \gamma_{max} dz$$

[1] **Equation [3]**

[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the estimation of seismic induced settlements in dry sands

Average shear stress, τ_{av}

$$\tau_{av} = CSR^{*} \cdot \sigma_{v0}' = 0.65 \cdot \frac{a_{max}}{g} \cdot \sigma_{v0} \cdot r_a$$

Estimate small shear strain modulus, G_0

$$G_0 = 0.0188 \cdot \left[10^{(0.55 I_c + 1.68)}\right] \cdot (q_t - \sigma_v)$$

Estimate shear strain amplitude, γ

(based on Pradel (1998))

$$\gamma = \left[\frac{1 + \alpha \cdot e^{bR}}{1 + \alpha}\right] \cdot R \cdot 100\ (\%)$$

$$R = \frac{\tau_{av}}{G_0} \text{ (Note } \tau_{av} \text{ and } G_0 \text{ same units)}$$

$$\alpha = 0.0389 \cdot \left(\frac{\sigma_v}{p_a}\right) + 0.124$$

$$b = 6400 \cdot \left(\frac{\sigma_v}{p_a}\right)$$

Estimate volumetric strain in 15 cycles

$$\varepsilon_{vol(15)} = \gamma \cdot \left[\frac{(N_1)_{60,cs}}{20}\right]^{-1.20}$$

$$(N_1)_{60,cs} = \frac{Q_{tn,cs}}{8.5 \cdot \left[1 - \frac{I_c}{4.6}\right]}$$

Volumetric strain in design earthquake

$$\Sigma_{vol} = \varepsilon_{vol(15)} \cdot \left[\frac{N_c}{15}\right]^{0.45}$$

$$N_c = (M - 4)^{2.17}$$

Seismic settlement, s

$$s = 2 \cdot \int_0^{GWT} \Sigma_{vol} \cdot dz$$

Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, Symposium in honor of professor I. M. Idriss, San Diego, CA

Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methology developed by Iwasaki (1982) and is adopted by AFPS.

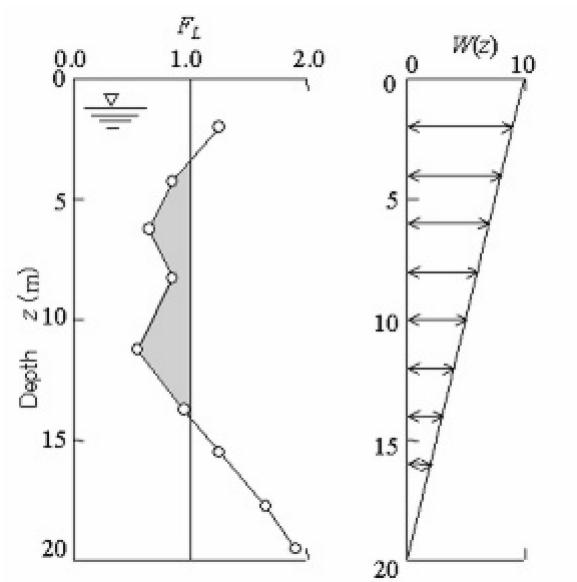
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\textbf{LPI} = \int_0^{20} (10 - 0{,}5_Z) \times F_L \times d_z$$

where:
F_L = 1 - F.S. when F.S. less than 1
F_L = 0 when F.S. greater than 1
z depth of measurment in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- 0 < LPI <= 5 : Liquefaction risk is low
- 5 < LPI <= 15 : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

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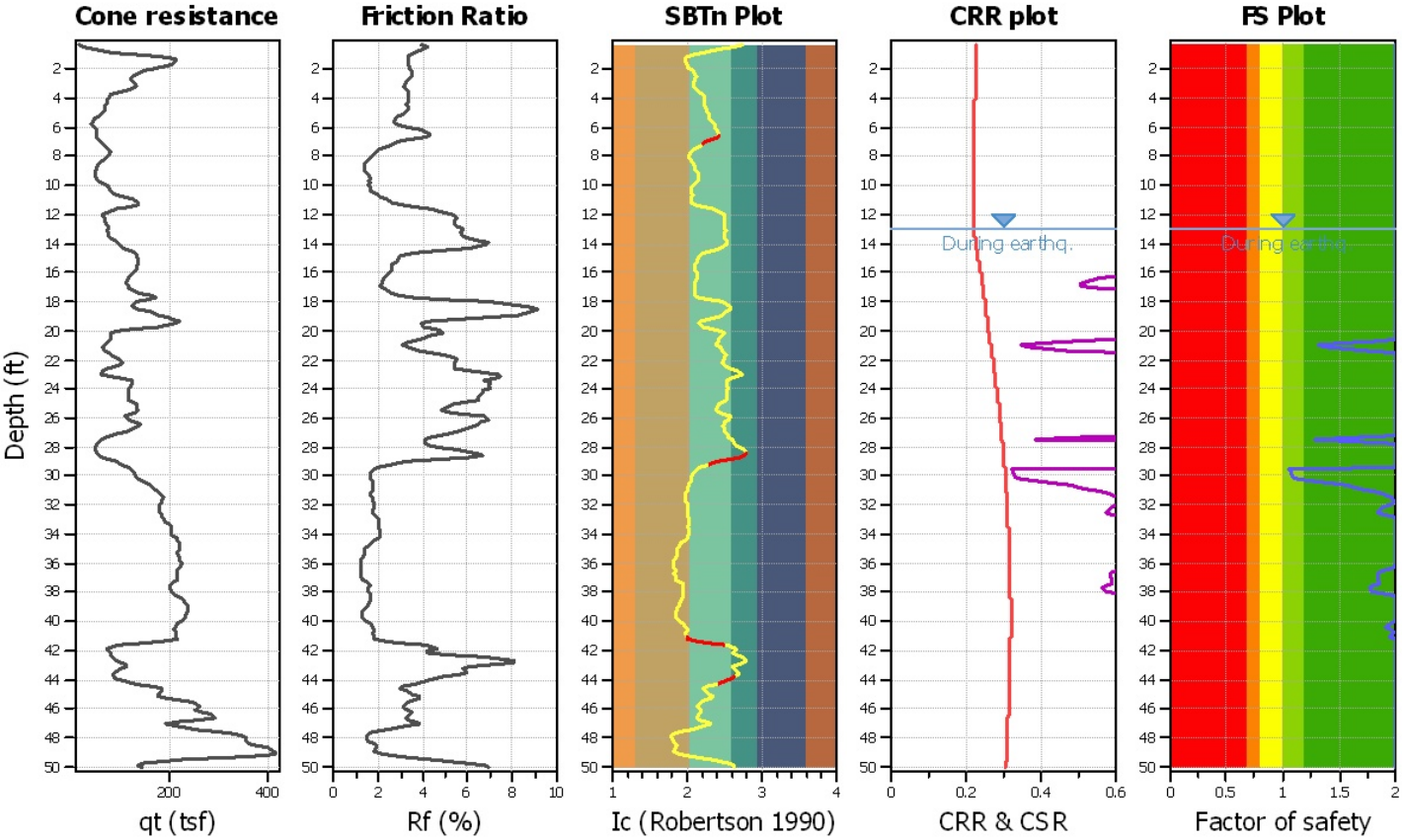
LIQUEFACTION ANALYSIS REPORT

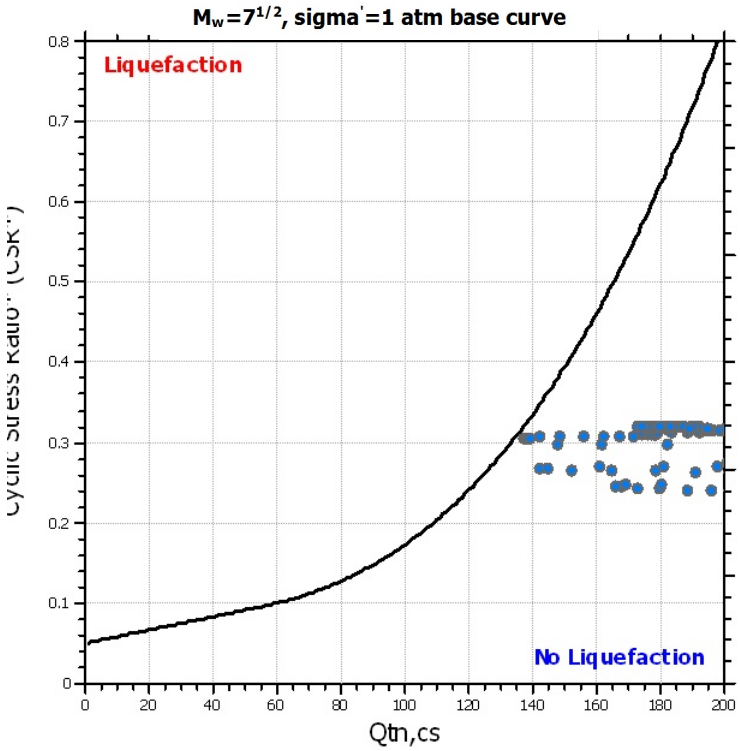
Project title : **Location :**

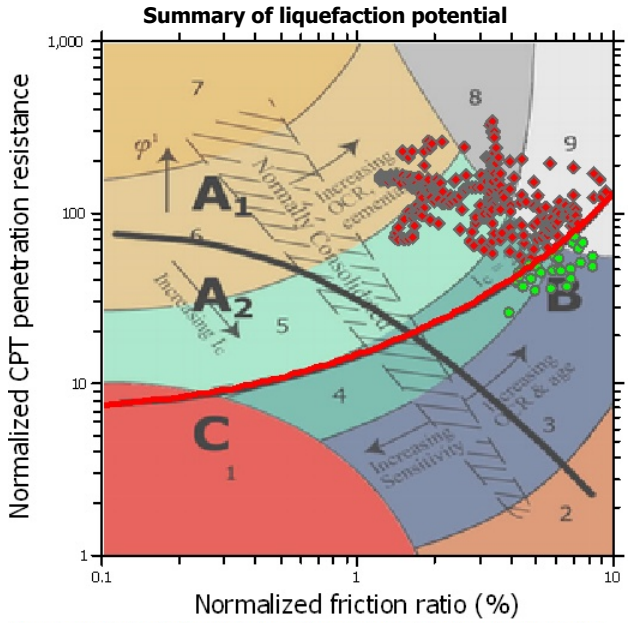
CPT file : CPT-02-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	13.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	13.00 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:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

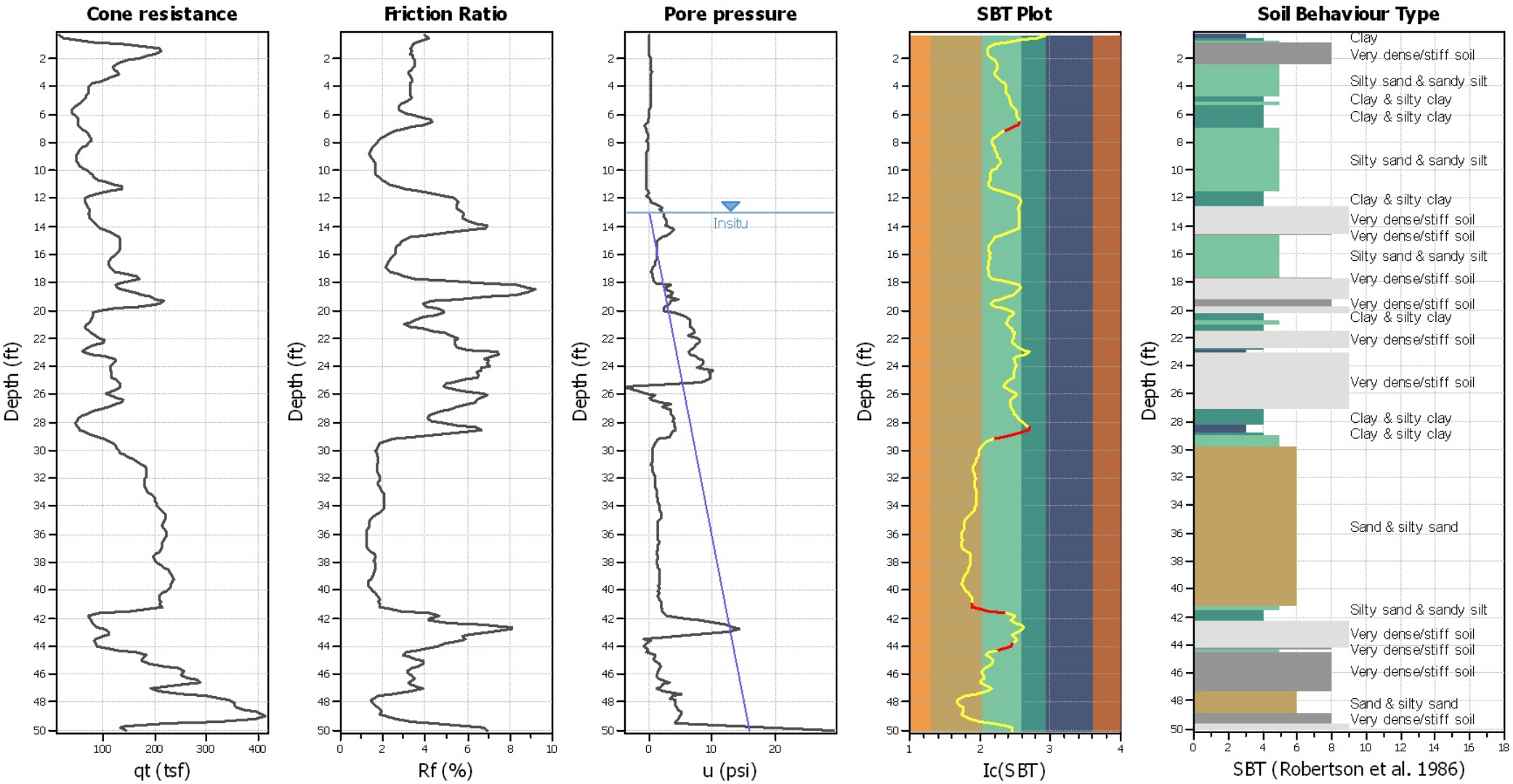






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plo



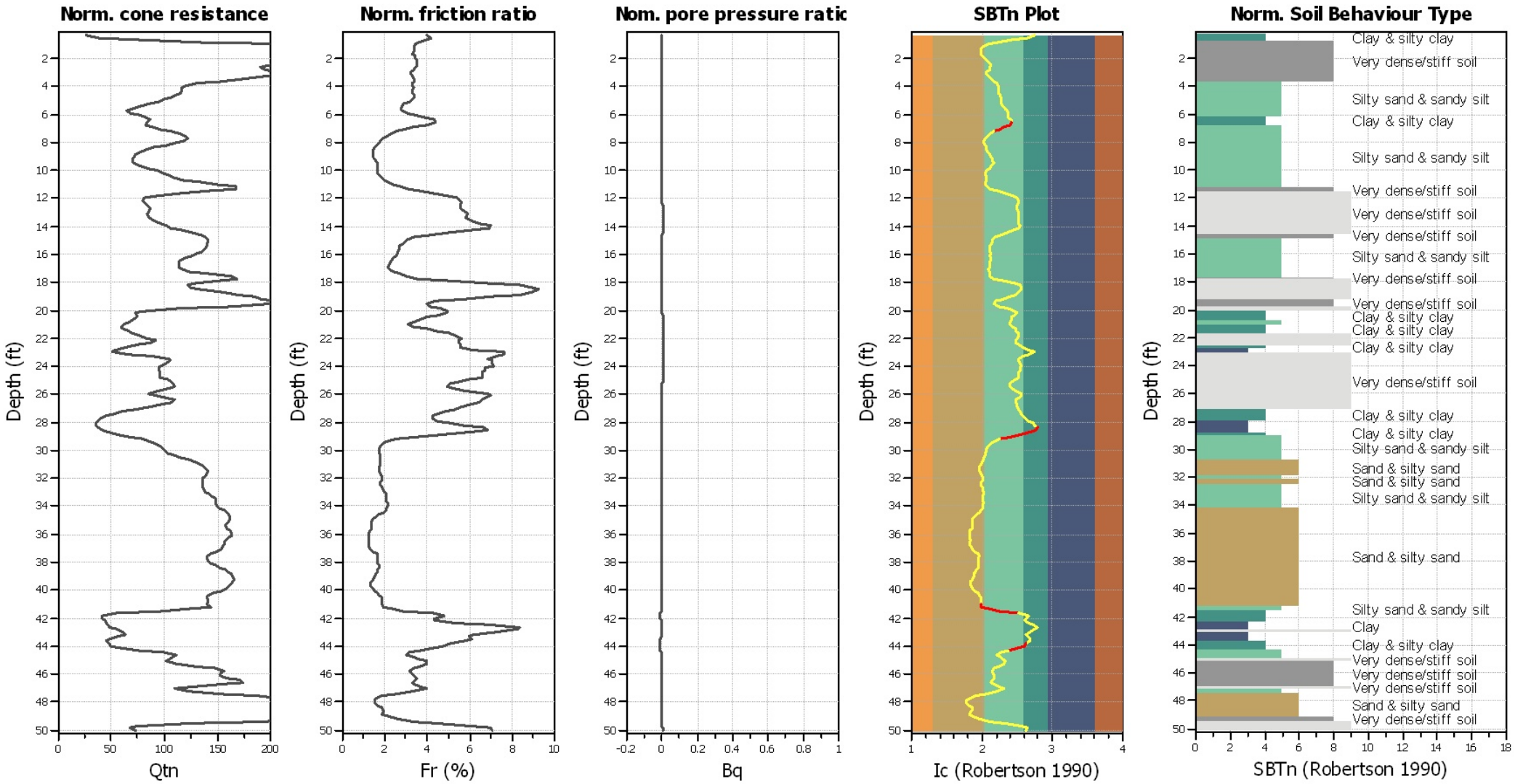
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 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 clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

CPT basic interpretation plots (normaliz



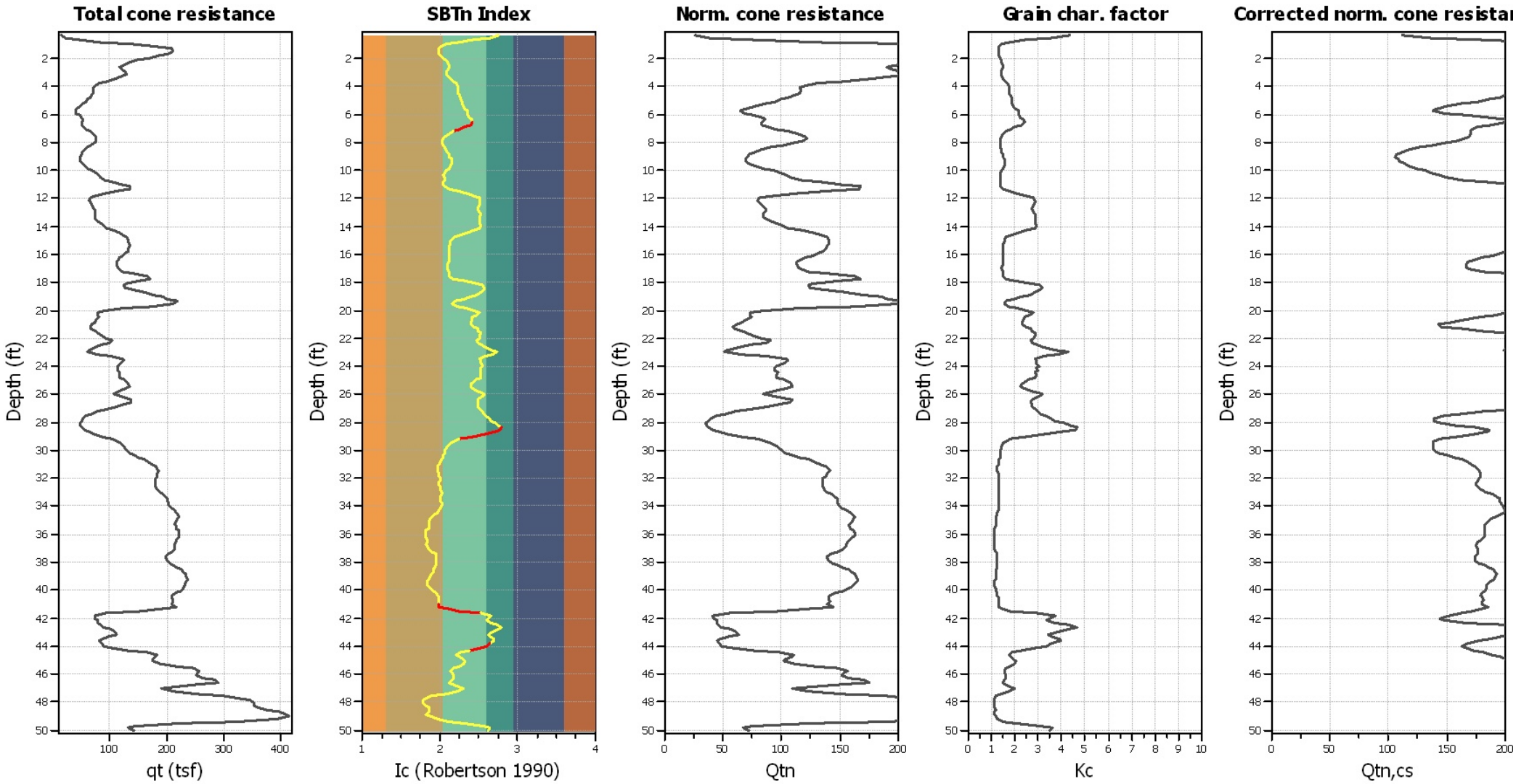
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 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 clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

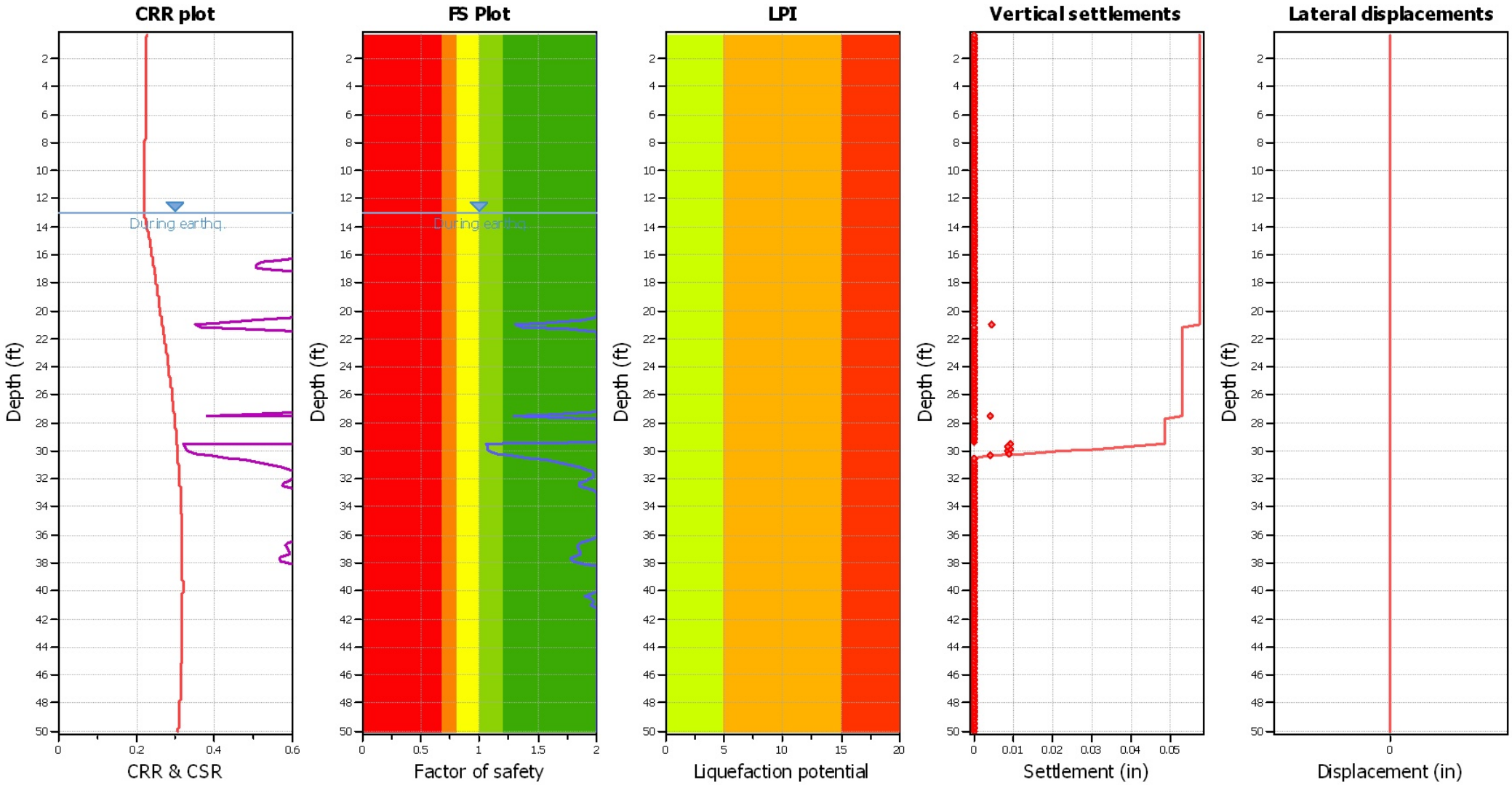
Liquefaction analysis overall plots (intermediate resu



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 ft	Fill height:	N/A	Limit depth:	N/A

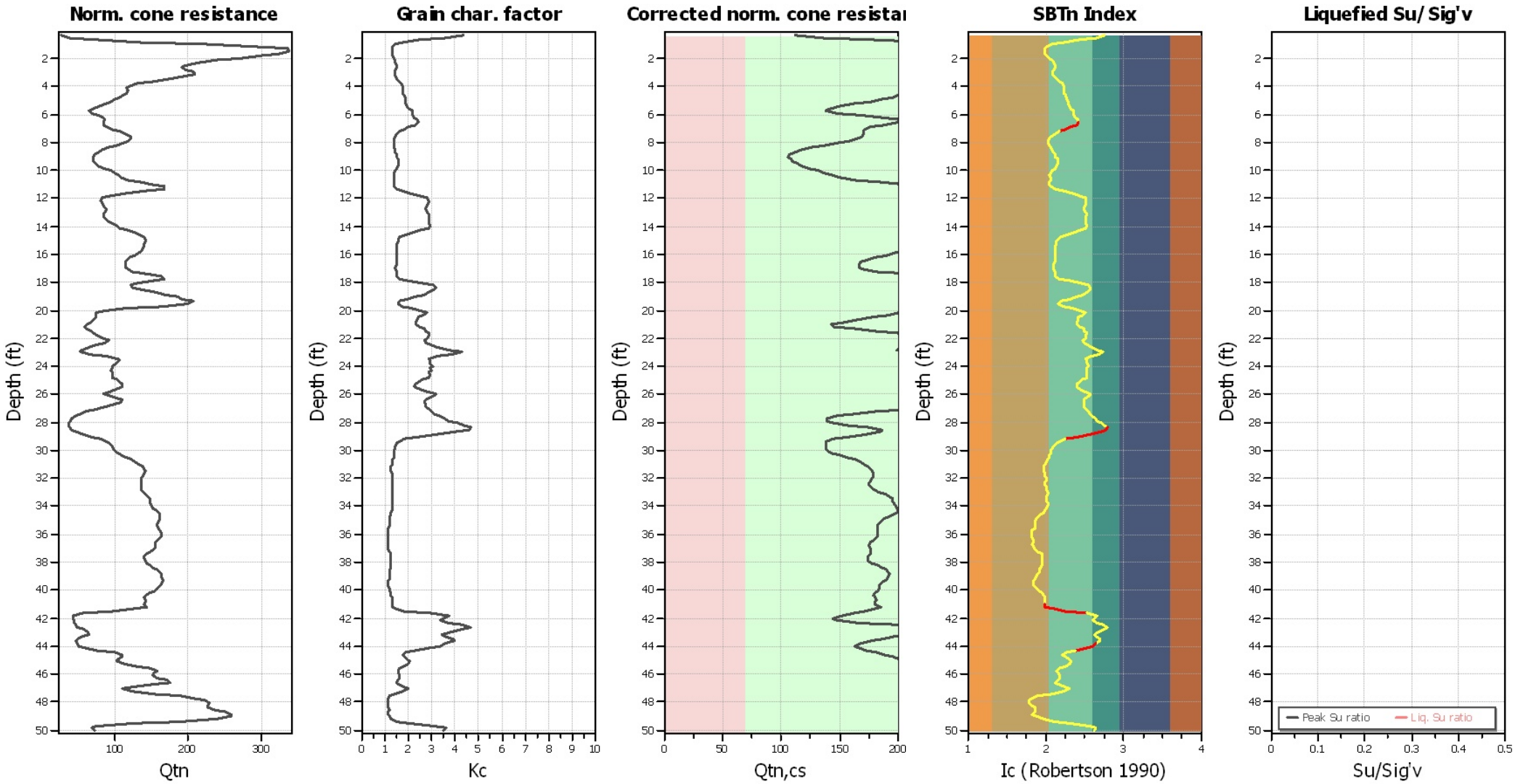
F.S. color scheme

- 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

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

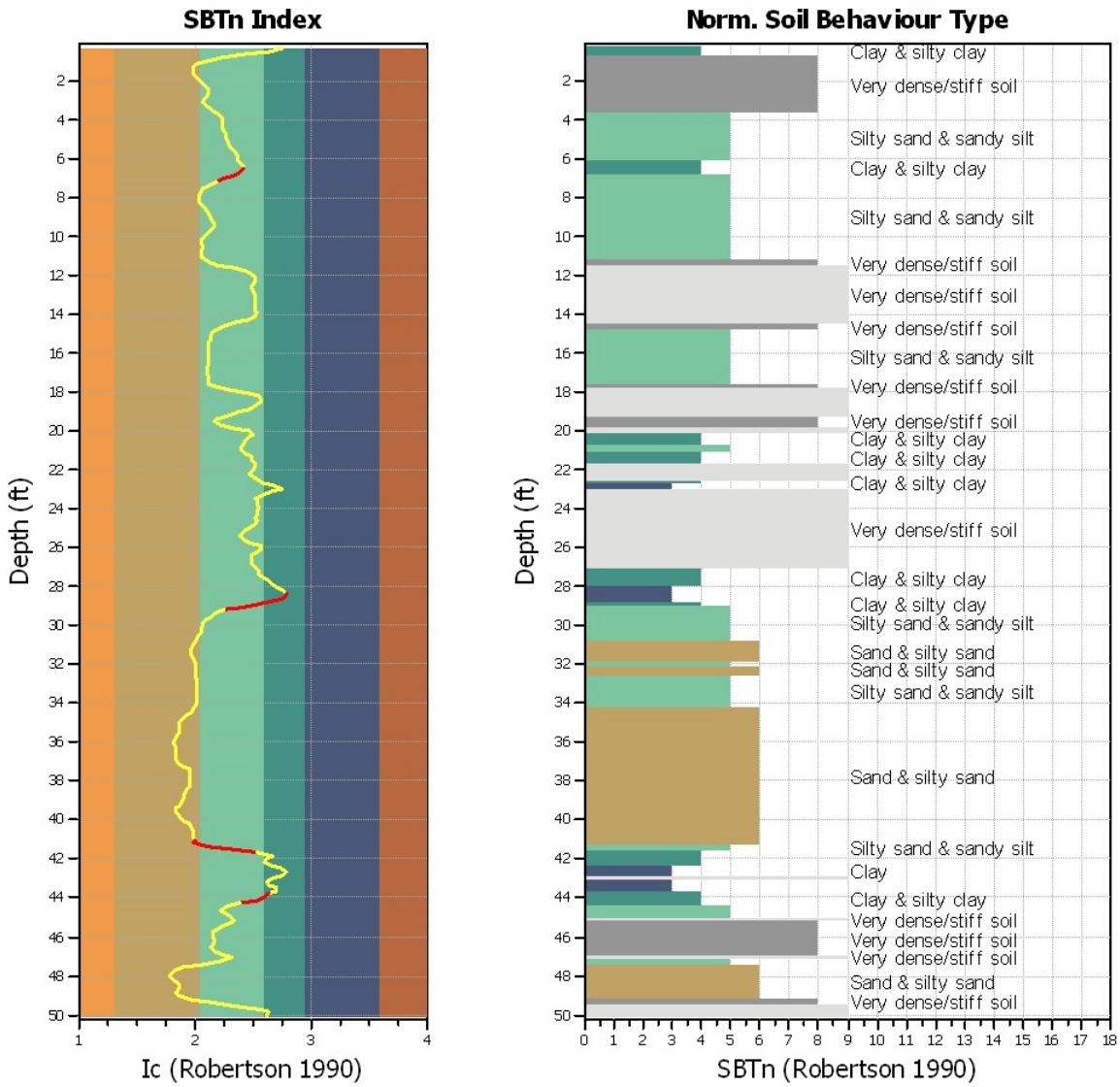
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	13.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.33	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	13.00 ft	Fill height:	N/A	Limit depth:	N/A

TRANSITION LAYER DETECTION ALGORITHM REPORT
Summary Details & Plots

Short description

The software will delete data when the cone is in transition from either clay to sand or vise-versa. To do this the software requires a range of I_c values over which the transition will be defined (typically somewhere between $1.80 < I_c < 3.0$) and a rate of change of I_c. Transitions typically occur when the rate of change of I_c is fast (i.e. delta I_c is small).

The SBT_n plot below, displays in red the detected transition layers based on the parameters listed below the graphs.



Transition layer algorithm properties		General statistics	
I_c minimum check value:	1.70	Total points in CPT file:	304
I_c maximum check value:	3.00	Total points excluded:	20
I_c change ratio value:	0.0250	Exclusion percentage:	6.58%
Minimum number of points in layer:	4	Number of layers detected:	4

Transition layer No	Number of points	Depth	SBT_n number	SBT_n description
Transition layer 1	5	Start depth: 6.73 (ft)	4	Clay & silty clay
		End depth: 7.38 (ft)	5	Silty sand & sandy silt
Transition layer 2	6	Start depth: 28.54 (ft)	3	Clay
		End depth: 29.36 (ft)	5	Silty sand & sandy silt
Transition layer 3	5	Start depth: 41.18 (ft)	6	Sand & silty sand
		End depth: 41.83 (ft)	4	Clay & silty clay
Transition layer 4	4	Start depth: 43.97 (ft)	4	Clay & silty clay
		End depth: 44.46 (ft)	5	Silty sand & sandy silt

Start depth: Depth where the transition layer begins
End depth: Depth where the transition layer ends

:: Field input data ::

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	0.33	14.30	0.50	0.00	42.91	113.70
2	0.49	19.60	0.90	0.00	37.21	118.01
3	0.66	37.70	1.60	0.00	27.97	123.68
4	0.82	75.30	2.80	0.00	19.72	129.12
5	0.98	139.50	4.60	0.00	15.37	133.54
6	1.15	195.30	6.60	0.00	13.28	136.39
7	1.31	220.10	7.50	0.00	12.42	137.28
8	1.48	213.90	6.80	0.00	12.43	137.28
9	1.64	198.90	6.80	0.00	12.61	137.09
10	1.80	191.60	6.40	0.00	13.29	136.53
11	1.97	169.90	5.80	0.20	14.00	135.65
12	2.13	146.40	5.20	0.20	15.04	134.54
13	2.30	130.20	4.60	0.20	15.89	133.41
14	2.46	120.30	4.10	0.20	16.42	132.54
15	2.62	114.80	4.00	0.20	16.37	132.12
16	2.79	120.80	4.00	0.30	15.88	132.26
17	2.95	131.60	4.20	0.40	15.14	132.50
18	3.12	134.00	4.20	0.30	15.03	132.59
19	3.28	125.10	4.10	0.30	15.67	132.22
20	3.45	110.70	3.80	0.30	16.78	131.24
21	3.61	93.40	3.10	0.20	17.99	129.80
22	3.77	80.00	2.60	0.30	19.19	128.27
23	3.94	71.20	2.40	0.30	20.02	127.39
24	4.10	72.40	2.40	0.30	20.28	127.12
25	4.27	73.90	2.40	0.30	20.18	127.14
26	4.43	72.30	2.40	0.20	20.25	127.01
27	4.59	70.00	2.30	0.20	20.70	126.71
28	4.76	66.20	2.20	0.30	21.29	126.26
29	4.92	61.90	2.10	0.30	21.60	125.55
30	5.09	59.10	1.80	0.20	21.67	124.65
31	5.25	55.60	1.60	0.20	21.66	123.30
32	5.41	48.00	1.30	0.20	22.49	121.83
33	5.58	40.80	1.10	0.10	23.73	120.55
34	5.74	39.20	1.10	0.10	24.68	120.21
35	5.91	41.30	1.20	0.00	25.07	121.34
36	6.07	47.40	1.60	0.00	25.11	123.30
37	6.23	54.90	2.10	0.00	25.81	125.25
38	6.40	55.80	2.50	-0.10	26.76	126.08
39	6.56	50.60	2.30	-0.20	27.31	125.91
40	6.73	50.30	2.00	-0.70	26.01	125.09
41	6.89	54.70	1.80	-0.60	23.24	124.48
42	7.05	60.20	1.70	-0.50	20.59	124.29
43	7.22	65.60	1.70	-0.50	18.20	124.23
44	7.38	72.40	1.60	-0.20	16.38	124.28
45	7.55	77.20	1.60	-0.20	14.91	124.13
46	7.71	79.30	1.50	-0.20	14.24	123.87
47	7.87	78.00	1.40	-0.30	13.78	123.16
48	8.04	74.30	1.20	-0.20	13.85	122.29

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	8.20	68.10	1.10	-0.20	14.05	121.03
50	8.37	61.40	0.90	-0.20	14.71	119.82
51	8.53	55.30	0.80	-0.20	15.16	118.46
52	8.69	51.70	0.70	-0.30	15.78	117.65
53	8.86	49.90	0.70	-0.30	16.19	117.22
54	9.02	49.50	0.70	-0.30	16.63	117.17
55	9.19	48.90	0.70	-0.30	17.26	117.50
56	9.35	48.80	0.80	-0.30	17.66	117.83
57	9.51	50.20	0.80	-0.30	17.75	118.54
58	9.68	54.90	0.90	-0.30	16.96	119.31
59	9.84	62.50	1.00	-0.30	16.12	120.61
60	10.01	71.10	1.20	-0.30	15.07	121.55
61	10.17	76.90	1.20	-0.30	14.51	122.37
62	10.34	79.90	1.30	-0.30	14.41	123.06
63	10.50	82.80	1.50	-0.30	14.75	124.22
64	10.66	90.30	1.80	-0.30	14.80	125.75
65	10.83	104.70	2.20	-0.30	14.40	127.52
66	10.99	122.00	2.70	-0.30	14.37	129.69
67	11.16	138.40	3.70	-0.30	14.67	131.55
68	11.32	146.60	4.30	-0.30	16.27	132.62
69	11.48	120.80	4.40	-0.20	19.17	132.40
70	11.65	85.50	3.90	0.10	23.88	131.30
71	11.81	67.50	3.50	-0.30	28.48	130.08
72	11.98	63.30	3.40	0.00	30.73	129.72
73	12.14	66.60	3.70	0.20	31.27	129.76
74	12.30	65.60	3.60	0.30	31.20	130.10
75	12.47	68.80	3.80	1.50	30.71	130.39
76	12.63	74.40	4.00	2.10	30.30	130.88
77	12.80	76.00	4.20	1.70	30.50	131.16
78	12.96	72.30	4.20	2.20	31.19	131.39
79	13.12	73.70	4.40	2.40	31.58	131.36
80	13.29	73.50	4.20	2.40	31.26	131.33
81	13.45	74.50	4.10	2.50	31.23	131.60
82	13.62	78.40	4.80	2.90	31.23	132.43
83	13.78	86.50	5.50	2.90	31.38	133.66
84	13.94	93.80	6.30	2.50	32.09	134.60
85	14.11	89.50	6.80	3.80	31.47	135.16
86	14.27	102.80	6.60	4.00	28.84	135.23
87	14.44	120.60	5.90	3.60	24.74	134.73
88	14.60	125.50	4.90	2.80	20.99	133.80
89	14.76	132.00	4.10	2.20	18.69	132.82
90	14.93	132.60	3.90	1.50	17.51	132.34
91	15.09	134.20	4.00	1.30	17.09	132.11
92	15.26	134.00	3.70	1.30	16.70	131.86
93	15.42	133.70	3.50	1.30	16.26	131.52
94	15.58	134.40	3.50	1.30	16.24	131.37
95	15.75	131.10	3.50	1.20	16.28	131.20
96	15.91	129.30	3.30	1.20	16.44	130.84

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	16.08	123.50	3.10	1.20	16.42	130.22
98	16.24	117.40	2.80	1.20	16.49	129.53
99	16.40	113.30	2.60	1.10	16.48	128.90
100	16.57	110.80	2.50	1.00	16.28	128.49
101	16.73	112.50	2.40	0.90	16.00	128.30
102	16.90	114.20	2.40	0.60	15.80	128.33
103	17.06	115.20	2.50	0.50	15.77	128.68
104	17.23	121.00	2.70	0.30	16.08	129.81
105	17.39	134.50	3.50	0.40	16.24	131.82
106	17.55	162.50	4.80	0.50	16.28	134.45
107	17.72	198.20	6.60	0.70	17.91	136.00
108	17.88	150.60	6.80	0.80	22.57	137.28
109	18.05	118.40	9.30	1.10	29.59	137.28
110	18.21	120.10	10.90	3.40	32.89	137.28
111	18.37	136.70	10.80	2.70	33.93	137.28
112	18.54	125.80	12.20	2.50	33.80	137.28
113	18.70	147.80	14.60	3.80	31.56	137.28
114	18.87	206.30	15.60	3.40	29.55	137.28
115	19.03	176.00	13.70	2.90	25.99	137.28
116	19.19	198.60	11.10	4.60	22.51	137.28
117	19.36	229.40	8.90	3.60	18.63	137.28
118	19.52	225.40	8.30	3.20	17.75	137.28
119	19.69	176.70	7.60	2.50	19.77	137.16
120	19.85	119.10	5.30	2.40	24.34	134.69
121	20.01	77.50	4.00	2.40	28.92	132.11
122	20.18	75.30	3.90	3.90	30.72	130.83
123	20.34	85.10	3.70	5.30	29.19	130.28
124	20.51	81.00	3.10	5.80	27.46	129.51
125	20.67	77.70	2.80	6.50	26.81	128.33
126	20.83	73.50	2.40	6.40	26.28	127.17
127	21.00	69.70	2.00	6.50	26.33	126.03
128	21.16	63.40	1.90	6.60	28.03	126.14
129	21.33	63.90	2.60	6.90	29.91	127.64
130	21.49	75.90	3.40	7.10	30.15	129.56
131	21.65	86.90	3.90	7.10	31.56	130.81
132	21.82	72.10	4.30	6.20	31.24	132.21
133	21.98	100.30	5.40	7.80	30.93	133.48
134	22.15	111.70	6.00	8.10	29.53	134.25
135	22.31	100.00	5.50	7.90	30.21	133.83
136	22.47	86.10	4.70	7.40	32.03	132.47
137	22.64	73.10	3.90	7.20	34.43	130.89
138	22.80	60.40	3.40	6.60	38.31	130.15
139	22.97	55.80	4.10	6.20	42.73	131.23
140	23.13	65.00	5.90	6.60	38.93	133.86
141	23.30	114.70	7.60	7.40	34.58	136.22
142	23.46	129.10	8.70	7.80	31.46	137.28
143	23.62	124.20	8.60	8.50	31.85	137.28
144	23.79	121.10	8.90	8.50	32.17	137.28

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	23.95	117.40	7.70	8.20	33.16	137.14
146	24.12	105.30	7.70	7.70	32.24	136.67
147	24.28	120.10	7.40	10.20	32.28	136.63
148	24.44	116.70	7.60	9.50	31.60	136.70
149	24.61	114.10	7.70	9.70	31.83	136.68
150	24.77	117.90	7.40	9.70	31.70	136.70
151	24.94	119.00	7.60	9.40	29.41	136.63
152	25.10	138.20	7.00	8.30	27.53	136.32
153	25.26	133.30	6.20	4.90	26.41	136.09
154	25.43	128.30	6.80	-3.40	25.94	135.96
155	25.59	141.90	6.60	-3.30	27.03	135.99
156	25.76	120.50	6.50	-1.80	29.80	135.87
157	25.92	93.40	7.10	-0.30	33.98	136.11
158	26.08	106.20	8.00	0.90	33.55	136.92
159	26.25	142.40	8.50	0.00	31.26	137.28
160	26.41	139.80	9.10	0.20	30.20	137.28
161	26.58	132.60	9.20	1.80	30.08	137.28
162	26.74	137.70	7.70	3.60	30.27	136.95
163	26.90	109.00	6.00	2.10	30.46	135.04
164	27.07	87.00	4.70	3.50	31.88	132.80
165	27.23	82.40	3.70	3.50	32.75	130.65
166	27.40	68.90	2.90	3.60	33.34	128.66
167	27.56	57.10	2.40	3.80	34.99	126.97
168	27.72	54.80	2.20	4.00	36.98	125.74
169	27.89	48.10	2.00	3.80	38.66	125.49
170	28.05	48.40	2.30	3.90	41.38	125.81
171	28.22	47.70	2.60	4.00	43.40	127.15
172	28.38	52.40	3.30	4.10	45.33	128.63
173	28.54	54.90	4.00	4.30	44.49	129.82
174	28.71	62.50	4.00	3.80	40.94	130.22
175	28.87	72.20	3.50	3.40	33.89	129.97
176	29.04	90.10	3.00	3.30	26.11	129.22
177	29.20	109.80	2.40	1.50	20.96	128.50
178	29.36	112.80	2.30	1.10	17.89	127.91
179	29.53	118.60	2.20	0.90	16.73	127.80
180	29.69	125.00	2.20	0.70	15.71	127.80
181	29.86	129.50	2.20	0.60	15.02	127.77
182	30.02	129.90	2.10	0.50	14.65	127.82
183	30.19	133.00	2.20	0.40	14.57	128.21
184	30.35	140.70	2.50	0.50	14.38	128.96
185	30.51	151.90	2.70	0.50	13.98	129.68
186	30.68	160.30	2.80	0.50	13.51	130.27
187	30.84	168.00	3.00	0.60	13.00	130.64
188	31.01	175.40	3.00	0.30	12.62	130.99
189	31.17	181.10	3.10	0.50	12.23	131.14
190	31.33	183.70	3.10	0.50	12.13	131.34
191	31.50	185.30	3.20	0.60	12.14	131.52
192	31.66	187.70	3.30	0.70	12.54	131.73

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	31.83	180.00	3.40	0.90	12.86	131.86
194	31.99	181.40	3.40	0.90	13.09	131.83
195	32.15	181.40	3.30	0.90	12.92	131.69
196	32.32	180.00	3.20	1.00	12.79	131.53
197	32.48	180.50	3.20	1.00	12.79	131.54
198	32.65	182.00	3.30	1.00	13.00	131.77
199	32.81	182.70	3.50	1.10	13.27	132.15
200	32.97	186.60	3.70	1.20	13.47	132.61
201	33.14	192.90	3.90	1.20	13.47	133.06
202	33.30	199.30	4.10	1.30	13.34	133.37
203	33.47	201.90	4.10	1.40	13.30	133.59
204	33.63	203.00	4.20	1.50	13.32	133.66
205	33.79	201.90	4.20	1.50	13.45	133.79
206	33.96	203.20	4.30	1.60	13.39	133.86
207	34.12	208.20	4.30	1.70	13.15	133.97
208	34.29	213.70	4.30	1.70	12.69	133.97
209	34.45	218.00	4.20	1.80	11.98	133.66
210	34.61	219.00	3.70	1.80	11.13	133.12
211	34.78	221.50	3.40	1.90	10.22	132.39
212	34.94	221.40	3.10	1.80	9.75	131.85
213	35.11	215.40	3.00	1.50	9.48	131.44
214	35.27	215.60	2.90	1.50	9.59	131.33
215	35.43	213.80	3.00	1.40	9.48	131.25
216	35.60	216.90	2.90	1.50	9.29	131.19
217	35.76	220.70	2.80	1.50	8.74	130.88
218	35.93	223.40	2.60	1.50	8.44	130.72
219	36.09	223.50	2.70	1.50	8.46	130.72
220	36.26	220.30	2.80	1.50	8.70	130.79
221	36.42	217.10	2.70	1.50	8.84	130.66
222	36.58	213.60	2.60	1.60	8.80	130.46
223	36.75	214.70	2.60	1.50	8.74	130.36
224	36.91	216.10	2.60	1.40	8.84	130.45
225	37.08	214.00	2.70	1.40	9.32	130.80
226	37.24	210.50	3.00	1.30	10.40	131.42
227	37.40	201.80	3.40	1.30	11.44	131.90
228	37.57	198.50	3.40	1.40	11.81	131.85
229	37.73	197.80	3.00	1.40	11.74	131.77
230	37.90	201.60	3.30	1.30	11.57	131.80
231	38.06	205.40	3.40	1.20	11.65	132.22
232	38.22	211.00	3.50	1.50	11.55	132.57
233	38.39	218.50	3.70	1.50	11.28	132.85
234	38.55	226.20	3.70	1.60	10.93	133.06
235	38.72	232.10	3.70	1.60	10.55	133.04
236	38.88	232.20	3.60	1.60	10.22	132.94
237	39.04	235.00	3.50	1.60	9.88	132.75
238	39.21	237.70	3.40	1.60	9.42	132.41
239	39.37	236.00	3.10	1.60	9.03	131.95
240	39.54	231.80	2.90	1.60	8.87	131.60

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	39.70	230.30	3.00	1.50	9.07	131.67
242	39.86	231.10	3.20	1.60	9.74	132.11
243	40.03	224.70	3.50	1.50	10.53	132.42
244	40.19	214.30	3.50	1.60	11.46	132.61
245	40.36	207.40	3.60	1.50	12.10	132.68
246	40.52	207.40	3.70	1.50	12.61	133.00
247	40.68	211.10	4.00	1.70	12.65	133.15
248	40.85	212.40	3.80	1.80	12.49	133.10
249	41.01	211.10	3.60	1.90	12.75	133.14
250	41.18	205.10	4.10	2.00	12.69	133.59
251	41.34	232.30	4.40	2.10	15.62	133.89
252	41.50	141.30	4.60	2.20	20.82	133.17
253	41.67	78.10	3.90	2.40	32.08	131.47
254	41.83	67.00	3.40	2.80	38.36	129.70
255	42.00	74.40	2.90	5.70	36.36	129.06
256	42.16	81.30	3.00	8.20	35.49	129.57
257	42.32	78.90	3.90	10.80	38.43	131.23
258	42.49	79.80	5.30	12.20	42.40	133.70
259	42.65	94.30	7.60	13.30	45.20	135.76
260	42.82	95.30	8.90	14.40	43.11	136.94
261	42.98	114.70	8.10	12.60	39.41	136.84
262	43.15	120.50	6.60	7.00	36.12	135.78
263	43.31	101.40	5.60	4.40	37.18	134.38
264	43.47	79.30	5.20	-0.80	40.07	133.19
265	43.64	80.90	4.70	0.30	40.12	132.38
266	43.80	89.20	4.20	-0.50	36.95	131.77
267	43.97	90.30	3.90	-0.80	35.36	131.55
268	44.13	88.50	4.20	-0.50	31.93	132.22
269	44.29	127.00	4.80	-0.20	25.82	133.50
270	44.46	180.30	5.10	-0.40	21.22	134.65
271	44.62	188.30	5.40	1.00	19.64	135.36
272	44.79	180.60	5.80	1.00	20.67	135.87
273	44.95	177.20	6.30	0.80	22.37	136.27
274	45.11	170.00	6.60	0.90	23.74	136.89
275	45.28	177.20	7.50	1.60	22.83	137.28
276	45.44	221.50	8.00	2.00	20.33	137.28
277	45.61	260.20	8.30	1.60	18.23	137.28
278	45.77	255.40	8.20	1.50	17.11	137.28
279	45.93	257.20	7.70	1.40	17.32	137.28
280	46.10	251.20	8.20	1.30	18.07	137.28
281	46.26	248.60	9.30	1.50	18.16	137.28
282	46.43	293.10	10.00	2.00	17.30	137.28
283	46.59	309.20	9.60	3.20	16.60	137.28
284	46.75	264.90	8.50	2.20	17.78	137.28
285	46.92	204.60	7.60	1.80	20.97	137.28
286	47.08	172.90	7.40	1.30	22.99	137.28
287	47.25	198.50	7.40	2.30	19.72	137.28
288	47.41	260.20	5.80	5.10	14.43	137.11

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	47.57	309.70	5.30	3.70	10.44	136.46
290	47.74	325.30	5.00	3.20	8.64	136.31
291	47.90	345.20	5.00	4.30	7.84	136.39
292	48.07	363.50	5.20	4.20	7.78	136.74
293	48.23	353.00	5.60	4.20	8.40	137.28
294	48.39	345.60	6.30	4.40	9.30	137.28
295	48.56	377.80	7.60	4.60	9.48	137.28
296	48.72	404.80	7.70	5.20	9.22	137.28
297	48.89	408.70	7.70	5.10	8.73	137.28
298	49.05	413.20	7.40	4.90	9.76	137.28
299	49.22	420.20	11.10	4.60	12.11	137.28
300	49.38	345.80	12.20	4.30	16.38	137.28
301	49.54	198.70	9.00	4.10	22.89	137.28
302	49.71	136.20	8.00	14.10	33.66	137.28
303	49.87	99.00	8.80	19.20	37.28	137.28
304	50.04	165.70	10.50	29.30	36.53	137.28

Abbreviations

Depth:	Depth from free surface, at which CPT was performed (ft)
q_c:	Measured cone resistance (tsf)
f_s:	Sleeve friction resistance (tsf)
u:	Pore pressure (tsf)
Fines content:	Percentage of fines in soil (%)
Unit weight:	Bulk soil unit weight (pcf)

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data ::

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
1	0.33	0.02	0.00	0.02	1.00	0.215	1.24	0.173	1.00	1.30	2.000	No
2	0.49	0.03	0.00	0.03	1.00	0.215	1.24	0.173	1.00	1.30	2.000	No
3	0.66	0.04	0.00	0.04	1.00	0.215	1.24	0.173	1.00	1.30	2.000	No
4	0.82	0.05	0.00	0.05	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
5	0.98	0.06	0.00	0.06	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
6	1.15	0.07	0.00	0.07	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
7	1.31	0.08	0.00	0.08	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
8	1.48	0.09	0.00	0.09	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
9	1.64	0.10	0.00	0.10	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
10	1.80	0.12	0.00	0.12	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
11	1.97	0.13	0.00	0.13	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
12	2.13	0.14	0.00	0.14	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
13	2.30	0.15	0.00	0.15	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
14	2.46	0.16	0.00	0.16	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
15	2.62	0.17	0.00	0.17	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
16	2.79	0.18	0.00	0.18	1.00	0.214	1.24	0.173	1.00	1.30	2.000	No
17	2.95	0.19	0.00	0.19	1.00	0.213	1.24	0.172	1.00	1.30	2.000	No
18	3.12	0.20	0.00	0.20	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
19	3.28	0.21	0.00	0.21	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
20	3.45	0.23	0.00	0.23	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
21	3.61	0.24	0.00	0.24	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
22	3.77	0.25	0.00	0.25	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
23	3.94	0.26	0.00	0.26	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
24	4.10	0.27	0.00	0.27	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
25	4.27	0.28	0.00	0.28	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
26	4.43	0.29	0.00	0.29	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
27	4.59	0.30	0.00	0.30	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
28	4.76	0.31	0.00	0.31	0.99	0.213	1.24	0.172	1.00	1.30	2.000	No
29	4.92	0.32	0.00	0.32	0.99	0.212	1.24	0.172	1.00	1.30	2.000	No
30	5.09	0.33	0.00	0.33	0.99	0.212	1.24	0.172	1.00	1.30	2.000	No
31	5.25	0.34	0.00	0.34	0.99	0.212	1.24	0.172	1.00	1.30	2.000	No
32	5.41	0.35	0.00	0.35	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
33	5.58	0.36	0.00	0.36	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
34	5.74	0.37	0.00	0.37	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
35	5.91	0.38	0.00	0.38	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
36	6.07	0.39	0.00	0.39	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
37	6.23	0.40	0.00	0.40	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
38	6.40	0.41	0.00	0.41	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
39	6.56	0.42	0.00	0.42	0.99	0.212	1.24	0.171	1.00	1.30	2.000	No
40	6.73	0.43	0.00	0.43	0.99	0.212	1.24	0.171	1.00	1.30	2.000	Yes
41	6.89	0.44	0.00	0.44	0.99	0.211	1.24	0.171	1.00	1.30	2.000	Yes
42	7.05	0.45	0.00	0.45	0.99	0.211	1.24	0.171	1.00	1.30	2.000	Yes
43	7.22	0.46	0.00	0.46	0.99	0.211	1.24	0.171	1.00	1.30	2.000	Yes
44	7.38	0.47	0.00	0.47	0.98	0.211	1.24	0.171	1.00	1.30	2.000	Yes
45	7.55	0.48	0.00	0.48	0.98	0.211	1.24	0.171	1.00	1.30	2.000	No
46	7.71	0.49	0.00	0.49	0.98	0.211	1.24	0.171	1.00	1.30	2.000	No
47	7.87	0.50	0.00	0.50	0.98	0.211	1.24	0.171	1.00	1.30	2.000	No
48	8.04	0.51	0.00	0.51	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
49	8.20	0.52	0.00	0.52	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
50	8.37	0.53	0.00	0.53	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
51	8.53	0.54	0.00	0.54	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
52	8.69	0.55	0.00	0.55	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
53	8.86	0.56	0.00	0.56	0.98	0.211	1.24	0.170	1.00	1.30	2.000	No
54	9.02	0.57	0.00	0.57	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
55	9.19	0.58	0.00	0.58	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
56	9.35	0.59	0.00	0.59	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
57	9.51	0.60	0.00	0.60	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
58	9.68	0.61	0.00	0.61	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
59	9.84	0.62	0.00	0.62	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
60	10.01	0.63	0.00	0.63	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
61	10.17	0.64	0.00	0.64	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
62	10.34	0.65	0.00	0.65	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
63	10.50	0.66	0.00	0.66	0.98	0.210	1.24	0.170	1.00	1.30	2.000	No
64	10.66	0.67	0.00	0.67	0.98	0.210	1.24	0.169	1.00	1.30	2.000	No
65	10.83	0.68	0.00	0.68	0.98	0.210	1.24	0.169	1.00	1.30	2.000	No
66	10.99	0.69	0.00	0.69	0.98	0.210	1.24	0.169	1.00	1.30	2.000	No
67	11.16	0.70	0.00	0.70	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
68	11.32	0.71	0.00	0.71	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
69	11.48	0.72	0.00	0.72	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
70	11.65	0.73	0.00	0.73	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
71	11.81	0.74	0.00	0.74	0.98	0.209	1.24	0.169	1.00	1.30	2.000	No
72	11.98	0.76	0.00	0.76	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
73	12.14	0.77	0.00	0.77	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
74	12.30	0.78	0.00	0.78	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
75	12.47	0.79	0.00	0.79	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
76	12.63	0.80	0.00	0.80	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
77	12.80	0.81	0.00	0.81	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
78	12.96	0.82	0.00	0.82	0.97	0.209	1.24	0.169	1.00	1.30	2.000	No
79	13.12	0.83	0.00	0.83	0.97	0.210	1.24	0.169	1.00	1.30	0.220	No
80	13.29	0.84	0.01	0.83	0.97	0.211	1.24	0.170	1.00	1.30	0.221	No
81	13.45	0.85	0.01	0.84	0.97	0.212	1.24	0.171	1.00	1.30	0.223	No
82	13.62	0.86	0.02	0.84	0.97	0.213	1.24	0.172	1.00	1.30	0.224	No
83	13.78	0.87	0.02	0.85	0.97	0.214	1.24	0.173	1.00	1.30	0.225	No
84	13.94	0.88	0.03	0.85	0.97	0.215	1.24	0.174	1.00	1.30	0.226	No
85	14.11	0.90	0.03	0.86	0.97	0.217	1.24	0.175	1.00	1.30	0.227	No
86	14.27	0.91	0.04	0.87	0.97	0.218	1.24	0.176	1.00	1.30	0.229	No
87	14.44	0.92	0.04	0.87	0.97	0.219	1.24	0.177	1.00	1.30	0.230	No
88	14.60	0.93	0.05	0.88	0.97	0.220	1.24	0.178	1.00	1.30	0.231	No
89	14.76	0.94	0.05	0.88	0.97	0.221	1.24	0.178	1.00	1.30	0.232	No
90	14.93	0.95	0.06	0.89	0.97	0.222	1.24	0.179	1.00	1.30	0.233	No
91	15.09	0.96	0.07	0.90	0.97	0.223	1.24	0.180	1.00	1.30	0.234	No
92	15.26	0.97	0.07	0.90	0.97	0.224	1.24	0.181	1.00	1.30	0.235	No
93	15.42	0.98	0.08	0.91	0.97	0.225	1.24	0.182	1.00	1.30	0.236	No
94	15.58	0.99	0.08	0.91	0.97	0.226	1.24	0.182	1.00	1.30	0.237	No
95	15.75	1.00	0.09	0.92	0.97	0.227	1.24	0.183	1.00	1.30	0.238	No
96	15.91	1.02	0.09	0.92	0.97	0.228	1.24	0.184	1.00	1.30	0.239	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
97	16.08	1.03	0.10	0.93	0.97	0.229	1.24	0.185	1.00	1.30	0.240	No
98	16.24	1.04	0.10	0.94	0.97	0.230	1.24	0.186	1.00	1.30	0.241	No
99	16.40	1.05	0.11	0.94	0.97	0.230	1.24	0.186	1.00	1.30	0.242	No
100	16.57	1.06	0.11	0.95	0.97	0.231	1.24	0.187	1.00	1.30	0.243	No
101	16.73	1.07	0.12	0.95	0.96	0.232	1.24	0.188	1.00	1.30	0.244	No
102	16.90	1.08	0.12	0.96	0.96	0.233	1.24	0.188	1.00	1.30	0.245	No
103	17.06	1.09	0.13	0.96	0.96	0.234	1.24	0.189	1.00	1.30	0.246	No
104	17.23	1.10	0.13	0.97	0.96	0.235	1.24	0.190	1.00	1.30	0.247	No
105	17.39	1.11	0.14	0.97	0.96	0.236	1.24	0.190	1.00	1.30	0.248	No
106	17.55	1.12	0.14	0.98	0.96	0.236	1.24	0.191	1.00	1.30	0.248	No
107	17.72	1.13	0.15	0.99	0.96	0.237	1.24	0.192	1.00	1.30	0.249	No
108	17.88	1.14	0.15	0.99	0.96	0.238	1.24	0.192	1.00	1.30	0.250	No
109	18.05	1.16	0.16	1.00	0.96	0.239	1.24	0.193	1.00	1.30	0.251	No
110	18.21	1.17	0.16	1.00	0.96	0.240	1.24	0.194	1.00	1.30	0.252	No
111	18.37	1.18	0.17	1.01	0.96	0.240	1.24	0.194	1.00	1.30	0.252	No
112	18.54	1.19	0.17	1.02	0.96	0.241	1.24	0.195	1.00	1.30	0.253	No
113	18.70	1.20	0.18	1.02	0.96	0.242	1.24	0.195	1.00	1.30	0.254	No
114	18.87	1.21	0.18	1.03	0.96	0.243	1.24	0.196	1.00	1.30	0.255	No
115	19.03	1.22	0.19	1.03	0.96	0.243	1.24	0.197	1.00	1.30	0.255	No
116	19.19	1.23	0.19	1.04	0.96	0.244	1.24	0.197	1.00	1.30	0.256	No
117	19.36	1.25	0.20	1.05	0.96	0.245	1.24	0.198	1.00	1.30	0.257	No
118	19.52	1.26	0.20	1.05	0.96	0.245	1.24	0.198	1.00	1.30	0.258	No
119	19.69	1.27	0.21	1.06	0.96	0.246	1.24	0.199	1.00	1.30	0.258	No
120	19.85	1.28	0.21	1.07	0.96	0.247	1.24	0.199	1.00	1.30	0.259	No
121	20.01	1.29	0.22	1.07	0.96	0.247	1.24	0.200	1.00	1.30	0.260	No
122	20.18	1.30	0.22	1.08	0.96	0.248	1.24	0.200	1.00	1.30	0.261	No
123	20.34	1.31	0.23	1.08	0.96	0.248	1.24	0.201	0.99	1.30	0.262	No
124	20.51	1.32	0.23	1.09	0.96	0.249	1.24	0.201	0.99	1.30	0.263	No
125	20.67	1.33	0.24	1.09	0.96	0.250	1.24	0.202	0.99	1.30	0.264	No
126	20.83	1.34	0.24	1.10	0.95	0.250	1.24	0.202	0.99	1.30	0.265	No
127	21.00	1.35	0.25	1.10	0.95	0.251	1.24	0.203	0.99	1.30	0.266	No
128	21.16	1.36	0.25	1.11	0.95	0.252	1.24	0.203	0.99	1.30	0.267	No
129	21.33	1.37	0.26	1.11	0.95	0.252	1.24	0.204	0.99	1.30	0.268	No
130	21.49	1.38	0.26	1.12	0.95	0.253	1.24	0.204	0.99	1.30	0.269	No
131	21.65	1.40	0.27	1.13	0.95	0.253	1.24	0.205	0.99	1.30	0.270	No
132	21.82	1.41	0.28	1.13	0.95	0.254	1.24	0.205	0.98	1.30	0.271	No
133	21.98	1.42	0.28	1.14	0.95	0.254	1.24	0.206	0.98	1.30	0.272	No
134	22.15	1.43	0.29	1.14	0.95	0.255	1.24	0.206	0.98	1.30	0.273	No
135	22.31	1.44	0.29	1.15	0.95	0.255	1.24	0.206	0.98	1.30	0.273	No
136	22.47	1.45	0.30	1.15	0.95	0.256	1.24	0.207	0.98	1.30	0.274	No
137	22.64	1.46	0.30	1.16	0.95	0.256	1.24	0.207	0.98	1.30	0.275	No
138	22.80	1.47	0.31	1.17	0.95	0.257	1.24	0.208	0.98	1.30	0.276	No
139	22.97	1.48	0.31	1.17	0.95	0.257	1.24	0.208	0.98	1.30	0.277	No
140	23.13	1.49	0.32	1.18	0.95	0.258	1.24	0.208	0.98	1.30	0.278	No
141	23.30	1.50	0.32	1.18	0.95	0.258	1.24	0.209	0.97	1.30	0.279	No
142	23.46	1.52	0.33	1.19	0.95	0.259	1.24	0.209	0.97	1.30	0.279	No
143	23.62	1.53	0.33	1.20	0.95	0.259	1.24	0.210	0.97	1.30	0.280	No
144	23.79	1.54	0.34	1.20	0.95	0.260	1.24	0.210	0.97	1.30	0.281	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
145	23.95	1.55	0.34	1.21	0.95	0.260	1.24	0.210	0.97	1.30	0.282	No
146	24.12	1.56	0.35	1.21	0.94	0.261	1.24	0.211	0.97	1.30	0.283	No
147	24.28	1.57	0.35	1.22	0.94	0.261	1.24	0.211	0.97	1.30	0.283	No
148	24.44	1.58	0.36	1.23	0.94	0.261	1.24	0.211	0.97	1.30	0.284	No
149	24.61	1.59	0.36	1.23	0.94	0.262	1.24	0.212	0.97	1.30	0.285	No
150	24.77	1.61	0.37	1.24	0.94	0.262	1.24	0.212	0.96	1.30	0.286	No
151	24.94	1.62	0.37	1.24	0.94	0.263	1.24	0.212	0.96	1.30	0.286	No
152	25.10	1.63	0.38	1.25	0.94	0.263	1.24	0.212	0.96	1.30	0.287	No
153	25.26	1.64	0.38	1.26	0.94	0.263	1.24	0.213	0.96	1.30	0.288	No
154	25.43	1.65	0.39	1.26	0.94	0.264	1.24	0.213	0.96	1.30	0.288	No
155	25.59	1.66	0.39	1.27	0.94	0.264	1.24	0.213	0.96	1.30	0.289	No
156	25.76	1.67	0.40	1.27	0.94	0.264	1.24	0.214	0.96	1.30	0.290	No
157	25.92	1.68	0.40	1.28	0.94	0.265	1.24	0.214	0.96	1.30	0.291	No
158	26.08	1.69	0.41	1.29	0.94	0.265	1.24	0.214	0.96	1.30	0.291	No
159	26.25	1.71	0.41	1.29	0.94	0.265	1.24	0.214	0.95	1.30	0.292	No
160	26.41	1.72	0.42	1.30	0.94	0.266	1.24	0.215	0.95	1.30	0.292	No
161	26.58	1.73	0.42	1.31	0.94	0.266	1.24	0.215	0.95	1.30	0.293	No
162	26.74	1.74	0.43	1.31	0.94	0.266	1.24	0.215	0.95	1.30	0.294	No
163	26.90	1.75	0.43	1.32	0.93	0.266	1.24	0.215	0.95	1.30	0.294	No
164	27.07	1.76	0.44	1.32	0.93	0.267	1.24	0.216	0.95	1.30	0.295	No
165	27.23	1.77	0.44	1.33	0.93	0.267	1.24	0.216	0.95	1.30	0.296	No
166	27.40	1.78	0.45	1.33	0.93	0.267	1.24	0.216	0.95	1.30	0.296	No
167	27.56	1.79	0.45	1.34	0.93	0.268	1.24	0.216	0.95	1.30	0.297	No
168	27.72	1.80	0.46	1.34	0.93	0.268	1.24	0.217	0.95	1.30	0.297	No
169	27.89	1.81	0.46	1.35	0.93	0.268	1.24	0.217	0.95	1.30	0.298	No
170	28.05	1.82	0.47	1.35	0.93	0.269	1.24	0.217	0.94	1.30	0.299	No
171	28.22	1.84	0.47	1.36	0.93	0.269	1.24	0.217	0.94	1.30	0.299	No
172	28.38	1.85	0.48	1.37	0.93	0.269	1.24	0.217	0.94	1.30	0.300	No
173	28.54	1.86	0.48	1.37	0.93	0.269	1.24	0.218	0.94	1.30	2.000	Yes
174	28.71	1.87	0.49	1.38	0.93	0.270	1.24	0.218	0.94	1.30	2.000	Yes
175	28.87	1.88	0.50	1.38	0.93	0.270	1.24	0.218	0.94	1.30	2.000	Yes
176	29.04	1.89	0.50	1.39	0.93	0.270	1.24	0.218	0.94	1.30	2.000	Yes
177	29.20	1.90	0.51	1.39	0.92	0.270	1.24	0.218	0.94	1.30	2.000	Yes
178	29.36	1.91	0.51	1.40	0.92	0.270	1.24	0.219	0.94	1.30	2.000	Yes
179	29.53	1.92	0.52	1.40	0.92	0.271	1.24	0.219	0.94	1.30	0.303	No
180	29.69	1.93	0.52	1.41	0.92	0.271	1.24	0.219	0.94	1.30	0.304	No
181	29.86	1.94	0.53	1.41	0.92	0.271	1.24	0.219	0.94	1.30	0.304	No
182	30.02	1.95	0.53	1.42	0.92	0.271	1.24	0.219	0.93	1.30	0.305	No
183	30.19	1.96	0.54	1.43	0.92	0.271	1.24	0.219	0.93	1.30	0.305	No
184	30.35	1.97	0.54	1.43	0.92	0.272	1.24	0.220	0.93	1.30	0.306	No
185	30.51	1.98	0.55	1.44	0.92	0.272	1.24	0.220	0.93	1.30	0.306	No
186	30.68	1.99	0.55	1.44	0.92	0.272	1.24	0.220	0.93	1.30	0.307	No
187	30.84	2.00	0.56	1.45	0.92	0.272	1.24	0.220	0.93	1.30	0.307	No
188	31.01	2.02	0.56	1.45	0.92	0.272	1.24	0.220	0.93	1.30	0.308	No
189	31.17	2.03	0.57	1.46	0.91	0.272	1.24	0.220	0.93	1.30	0.308	No
190	31.33	2.04	0.57	1.46	0.91	0.272	1.24	0.220	0.93	1.30	0.308	No
191	31.50	2.05	0.58	1.47	0.91	0.273	1.24	0.220	0.93	1.30	0.309	No
192	31.66	2.06	0.58	1.48	0.91	0.273	1.24	0.220	0.93	1.30	0.309	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
193	31.83	2.07	0.59	1.48	0.91	0.273	1.24	0.220	0.93	1.30	0.310	No
194	31.99	2.08	0.59	1.49	0.91	0.273	1.24	0.221	0.92	1.30	0.310	No
195	32.15	2.09	0.60	1.49	0.91	0.273	1.24	0.221	0.92	1.30	0.310	No
196	32.32	2.10	0.60	1.50	0.91	0.273	1.24	0.221	0.92	1.30	0.311	No
197	32.48	2.11	0.61	1.50	0.91	0.273	1.24	0.221	0.92	1.30	0.311	No
198	32.65	2.12	0.61	1.51	0.91	0.273	1.24	0.221	0.92	1.30	0.311	No
199	32.81	2.13	0.62	1.52	0.90	0.273	1.24	0.221	0.92	1.30	0.312	No
200	32.97	2.14	0.62	1.52	0.90	0.273	1.24	0.221	0.92	1.30	0.312	No
201	33.14	2.16	0.63	1.53	0.90	0.273	1.24	0.221	0.92	1.30	0.312	No
202	33.30	2.17	0.63	1.53	0.90	0.273	1.24	0.221	0.92	1.30	0.313	No
203	33.47	2.18	0.64	1.54	0.90	0.273	1.24	0.221	0.92	1.30	0.313	No
204	33.63	2.19	0.64	1.54	0.90	0.273	1.24	0.221	0.92	1.30	0.313	No
205	33.79	2.20	0.65	1.55	0.90	0.273	1.24	0.221	0.92	1.30	0.314	No
206	33.96	2.21	0.65	1.56	0.90	0.273	1.24	0.221	0.92	1.30	0.314	No
207	34.12	2.22	0.66	1.56	0.90	0.273	1.24	0.221	0.91	1.30	0.314	No
208	34.29	2.23	0.66	1.57	0.90	0.273	1.24	0.221	0.91	1.30	0.314	No
209	34.45	2.24	0.67	1.57	0.89	0.273	1.24	0.221	0.91	1.30	0.315	No
210	34.61	2.25	0.67	1.58	0.89	0.273	1.24	0.221	0.91	1.30	0.315	No
211	34.78	2.27	0.68	1.59	0.89	0.273	1.24	0.221	0.91	1.30	0.315	No
212	34.94	2.28	0.68	1.59	0.89	0.273	1.24	0.221	0.91	1.30	0.315	No
213	35.11	2.29	0.69	1.60	0.89	0.273	1.24	0.221	0.91	1.30	0.316	No
214	35.27	2.30	0.69	1.60	0.89	0.273	1.24	0.221	0.91	1.30	0.316	No
215	35.43	2.31	0.70	1.61	0.89	0.273	1.24	0.221	0.91	1.30	0.316	No
216	35.60	2.32	0.71	1.61	0.89	0.273	1.24	0.221	0.91	1.30	0.316	No
217	35.76	2.33	0.71	1.62	0.89	0.273	1.24	0.221	0.91	1.30	0.316	No
218	35.93	2.34	0.72	1.63	0.88	0.273	1.24	0.221	0.91	1.30	0.317	No
219	36.09	2.35	0.72	1.63	0.88	0.273	1.24	0.221	0.91	1.30	0.317	No
220	36.26	2.36	0.73	1.64	0.88	0.273	1.24	0.221	0.90	1.30	0.317	No
221	36.42	2.37	0.73	1.64	0.88	0.273	1.24	0.221	0.90	1.30	0.317	No
222	36.58	2.38	0.74	1.65	0.88	0.273	1.24	0.220	0.90	1.30	0.317	No
223	36.75	2.39	0.74	1.65	0.88	0.273	1.24	0.220	0.90	1.30	0.317	No
224	36.91	2.40	0.75	1.66	0.88	0.273	1.24	0.220	0.90	1.30	0.318	No
225	37.08	2.42	0.75	1.66	0.88	0.272	1.24	0.220	0.90	1.30	0.318	No
226	37.24	2.43	0.76	1.67	0.87	0.272	1.24	0.220	0.90	1.30	0.318	No
227	37.40	2.44	0.76	1.68	0.87	0.272	1.24	0.220	0.90	1.30	0.318	No
228	37.57	2.45	0.77	1.68	0.87	0.272	1.24	0.220	0.90	1.30	0.318	No
229	37.73	2.46	0.77	1.69	0.87	0.272	1.24	0.220	0.90	1.30	0.318	No
230	37.90	2.47	0.78	1.69	0.87	0.272	1.24	0.220	0.90	1.30	0.318	No
231	38.06	2.48	0.78	1.70	0.87	0.272	1.24	0.220	0.90	1.30	0.318	No
232	38.22	2.49	0.79	1.70	0.87	0.272	1.24	0.219	0.90	1.30	0.318	No
233	38.39	2.50	0.79	1.71	0.86	0.271	1.24	0.219	0.90	1.30	0.318	No
234	38.55	2.51	0.80	1.72	0.86	0.271	1.24	0.219	0.89	1.30	0.318	No
235	38.72	2.52	0.80	1.72	0.86	0.271	1.24	0.219	0.89	1.30	0.319	No
236	38.88	2.53	0.81	1.73	0.86	0.271	1.24	0.219	0.89	1.30	0.319	No
237	39.04	2.55	0.81	1.73	0.86	0.271	1.24	0.219	0.89	1.30	0.319	No
238	39.21	2.56	0.82	1.74	0.86	0.271	1.24	0.219	0.89	1.30	0.319	No
239	39.37	2.57	0.82	1.74	0.86	0.270	1.24	0.218	0.89	1.30	0.319	No
240	39.54	2.58	0.83	1.75	0.86	0.270	1.24	0.218	0.89	1.30	0.319	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
241	39.70	2.59	0.83	1.76	0.85	0.270	1.24	0.218	0.89	1.30	0.319	No
242	39.86	2.60	0.84	1.76	0.85	0.270	1.24	0.218	0.89	1.30	0.319	No
243	40.03	2.61	0.84	1.77	0.85	0.270	1.24	0.218	0.89	1.30	0.319	No
244	40.19	2.62	0.85	1.77	0.85	0.269	1.24	0.218	0.89	1.30	0.319	No
245	40.36	2.63	0.85	1.78	0.85	0.269	1.24	0.217	0.89	1.30	0.319	No
246	40.52	2.64	0.86	1.78	0.85	0.269	1.24	0.217	0.89	1.30	0.319	No
247	40.68	2.65	0.86	1.79	0.84	0.269	1.24	0.217	0.89	1.30	0.319	No
248	40.85	2.67	0.87	1.80	0.84	0.268	1.24	0.217	0.89	1.30	0.318	No
249	41.01	2.68	0.87	1.80	0.84	0.268	1.24	0.217	0.88	1.30	0.318	No
250	41.18	2.69	0.88	1.81	0.84	0.268	1.24	0.217	0.88	1.30	2.000	Yes
251	41.34	2.70	0.88	1.81	0.84	0.268	1.24	0.216	0.88	1.30	2.000	Yes
252	41.50	2.71	0.89	1.82	0.84	0.267	1.24	0.216	0.88	1.30	2.000	Yes
253	41.67	2.72	0.89	1.83	0.84	0.267	1.24	0.216	0.88	1.30	2.000	Yes
254	41.83	2.73	0.90	1.83	0.83	0.267	1.24	0.216	0.88	1.30	2.000	Yes
255	42.00	2.74	0.90	1.84	0.83	0.267	1.24	0.215	0.88	1.30	0.318	No
256	42.16	2.75	0.91	1.84	0.83	0.266	1.24	0.215	0.88	1.30	0.318	No
257	42.32	2.76	0.91	1.85	0.83	0.266	1.24	0.215	0.88	1.30	0.318	No
258	42.49	2.77	0.92	1.85	0.83	0.266	1.24	0.215	0.88	1.30	0.318	No
259	42.65	2.78	0.93	1.86	0.83	0.266	1.24	0.215	0.88	1.30	0.318	No
260	42.82	2.80	0.93	1.87	0.83	0.265	1.24	0.214	0.88	1.30	0.317	No
261	42.98	2.81	0.94	1.87	0.82	0.265	1.24	0.214	0.88	1.30	0.317	No
262	43.15	2.82	0.94	1.88	0.82	0.265	1.24	0.214	0.88	1.30	0.317	No
263	43.31	2.83	0.95	1.88	0.82	0.264	1.24	0.214	0.88	1.30	0.317	No
264	43.47	2.84	0.95	1.89	0.82	0.264	1.24	0.213	0.88	1.30	0.317	No
265	43.64	2.85	0.96	1.89	0.82	0.264	1.24	0.213	0.87	1.30	0.317	No
266	43.80	2.86	0.96	1.90	0.82	0.263	1.24	0.213	0.87	1.30	0.317	No
267	43.97	2.87	0.97	1.91	0.81	0.263	1.24	0.213	0.87	1.30	2.000	Yes
268	44.13	2.88	0.97	1.91	0.81	0.263	1.24	0.212	0.87	1.30	2.000	Yes
269	44.29	2.89	0.98	1.92	0.81	0.262	1.24	0.212	0.87	1.30	2.000	Yes
270	44.46	2.91	0.98	1.92	0.81	0.262	1.24	0.212	0.87	1.30	2.000	Yes
271	44.62	2.92	0.99	1.93	0.81	0.262	1.24	0.212	0.87	1.30	0.316	No
272	44.79	2.93	0.99	1.94	0.81	0.261	1.24	0.211	0.87	1.30	0.316	No
273	44.95	2.94	1.00	1.94	0.80	0.261	1.24	0.211	0.87	1.30	0.315	No
274	45.11	2.95	1.00	1.95	0.80	0.261	1.24	0.211	0.87	1.30	0.315	No
275	45.28	2.96	1.01	1.95	0.80	0.260	1.24	0.210	0.87	1.30	0.315	No
276	45.44	2.97	1.01	1.96	0.80	0.260	1.24	0.210	0.87	1.30	0.315	No
277	45.61	2.98	1.02	1.97	0.80	0.260	1.24	0.210	0.87	1.30	0.314	No
278	45.77	2.99	1.02	1.97	0.80	0.259	1.24	0.209	0.87	1.30	0.314	No
279	45.93	3.01	1.03	1.98	0.79	0.259	1.24	0.209	0.87	1.30	0.314	No
280	46.10	3.02	1.03	1.98	0.79	0.258	1.24	0.209	0.87	1.30	0.314	No
281	46.26	3.03	1.04	1.99	0.79	0.258	1.24	0.209	0.86	1.30	0.314	No
282	46.43	3.04	1.04	2.00	0.79	0.258	1.24	0.208	0.86	1.30	0.313	No
283	46.59	3.05	1.05	2.00	0.79	0.257	1.24	0.208	0.86	1.30	0.313	No
284	46.75	3.06	1.05	2.01	0.79	0.257	1.24	0.208	0.86	1.30	0.313	No
285	46.92	3.07	1.06	2.02	0.78	0.257	1.24	0.207	0.86	1.30	0.313	No
286	47.08	3.08	1.06	2.02	0.78	0.256	1.24	0.207	0.86	1.30	0.312	No
287	47.25	3.10	1.07	2.03	0.78	0.256	1.24	0.207	0.86	1.30	0.312	No
288	47.41	3.11	1.07	2.03	0.78	0.255	1.24	0.206	0.86	1.30	0.312	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
289	47.57	3.12	1.08	2.04	0.78	0.255	1.24	0.206	0.86	1.30	0.312	No
290	47.74	3.13	1.08	2.05	0.78	0.255	1.24	0.206	0.86	1.30	0.311	No
291	47.90	3.14	1.09	2.05	0.77	0.254	1.24	0.205	0.86	1.30	0.311	No
292	48.07	3.15	1.09	2.06	0.77	0.254	1.24	0.205	0.86	1.30	0.311	No
293	48.23	3.16	1.10	2.06	0.77	0.253	1.24	0.205	0.86	1.30	0.310	No
294	48.39	3.17	1.10	2.07	0.77	0.253	1.24	0.204	0.86	1.30	0.310	No
295	48.56	3.19	1.11	2.08	0.77	0.253	1.24	0.204	0.86	1.30	0.310	No
296	48.72	3.20	1.11	2.08	0.77	0.252	1.24	0.204	0.86	1.30	0.310	No
297	48.89	3.21	1.12	2.09	0.76	0.252	1.24	0.203	0.86	1.30	0.309	No
298	49.05	3.22	1.12	2.10	0.76	0.251	1.24	0.203	0.85	1.30	0.309	No
299	49.22	3.23	1.13	2.10	0.76	0.251	1.24	0.203	0.85	1.30	0.309	No
300	49.38	3.24	1.14	2.11	0.76	0.251	1.24	0.202	0.85	1.30	0.308	No
301	49.54	3.25	1.14	2.11	0.76	0.250	1.24	0.202	0.85	1.30	0.308	No
302	49.71	3.27	1.15	2.12	0.76	0.250	1.24	0.202	0.85	1.30	0.308	No
303	49.87	3.28	1.15	2.13	0.75	0.249	1.24	0.201	0.85	1.30	0.307	No
304	50.04	3.29	1.16	2.13	0.75	0.249	1.24	0.201	0.85	1.30	0.307	No

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
σ_v: Total overburden pressure at test point (tsf)
u_0: Water pressure at test point (tsf)
σ_v': Effective overburden pressure based on GWT during earthquake (tsf)
r_d: Nonlinear shear mass factor
CSR: Cyclic Stress Ratio
MSF: Magnitude Scaling Factor
CSR_{eq}: CSR adjusted for M=7.5
K_σ: Effective overburden stress factor
CSR^*: CSR fully adjusted

:: Cyclic Resistance Ratio (CRR) calculation data ::

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	0.33	16.07	2.75	3.95	0.92	25.78	4.34	111.85	4.000	No	Yes	2.00
2	0.49	23.87	2.64	4.19	0.88	38.30	3.56	136.47	4.000	No	Yes	2.00
3	0.66	44.20	2.44	4.00	0.80	70.95	2.47	175.39	4.000	No	No	2.00
4	0.82	84.17	2.22	3.57	0.72	135.15	1.72	232.53	4.000	No	No	2.00
5	0.98	136.70	2.09	3.42	0.67	219.53	1.43	313.61	4.000	No	No	2.00
6	1.15	184.97	2.01	3.37	0.64	297.06	1.32	391.03	4.000	No	No	2.00
7	1.31	209.77	1.98	3.32	0.63	336.89	1.27	429.51	4.000	No	No	2.00
8	1.48	210.97	1.98	3.34	0.63	338.80	1.28	432.07	4.000	No	No	2.00
9	1.64	201.47	1.99	3.31	0.63	323.52	1.28	415.30	4.000	No	No	2.00
10	1.80	186.80	2.01	3.39	0.64	299.94	1.32	394.93	4.000	No	No	2.00
11	1.97	169.30	2.04	3.43	0.65	271.80	1.35	367.69	4.000	No	No	2.00
12	2.13	148.84	2.07	3.50	0.67	238.90	1.41	336.86	4.000	No	No	2.00
13	2.30	132.30	2.10	3.51	0.68	212.32	1.46	309.89	4.000	No	No	2.00
14	2.46	121.77	2.12	3.48	0.68	195.38	1.49	291.50	4.000	No	No	2.00
15	2.62	118.64	2.12	3.40	0.68	190.33	1.49	283.37	4.000	No	No	2.00
16	2.79	122.40	2.10	3.33	0.68	196.37	1.46	286.52	4.000	No	No	2.00
17	2.95	128.80	2.08	3.21	0.67	206.63	1.42	292.48	4.000	No	No	2.00
18	3.12	130.24	2.07	3.20	0.67	208.92	1.41	294.42	4.000	No	No	2.00
19	3.28	123.27	2.10	3.28	0.67	197.71	1.45	285.95	4.000	No	No	2.00
20	3.45	109.74	2.13	3.35	0.69	175.95	1.52	266.58	4.000	No	No	2.00
21	3.61	94.70	2.17	3.35	0.70	151.78	1.60	242.15	4.000	No	No	2.00
22	3.77	81.54	2.21	3.32	0.72	130.61	1.68	219.57	4.000	No	No	2.00
23	3.94	74.54	2.23	3.32	0.72	119.34	1.74	208.07	4.000	No	No	2.00
24	4.10	72.50	2.24	3.32	0.73	116.06	1.76	204.77	4.000	No	No	2.00
25	4.27	72.87	2.23	3.31	0.73	116.63	1.76	204.83	4.000	No	No	2.00
26	4.43	72.07	2.24	3.30	0.73	115.33	1.76	203.21	4.000	No	No	2.00
27	4.59	69.50	2.25	3.32	0.73	111.19	1.80	199.82	4.000	No	No	2.00
28	4.76	66.04	2.27	3.35	0.74	105.60	1.84	194.83	4.000	No	No	2.00
29	4.92	62.40	2.27	3.28	0.74	99.75	1.87	186.60	4.000	No	No	2.00
30	5.09	58.87	2.28	3.13	0.74	94.05	1.88	176.49	4.000	No	No	2.00
31	5.25	54.24	2.28	2.91	0.74	86.59	1.88	162.41	4.000	No	No	2.00
32	5.41	48.14	2.30	2.79	0.75	76.78	1.95	149.39	4.000	No	No	2.00
33	5.58	42.67	2.33	2.76	0.76	67.98	2.06	139.78	4.000	No	No	2.00
34	5.74	40.43	2.36	2.83	0.77	64.37	2.14	138.03	4.000	No	No	2.00
35	5.91	42.63	2.37	3.08	0.78	67.89	2.18	148.10	4.000	No	No	2.00
36	6.07	47.87	2.37	3.44	0.78	76.28	2.19	166.70	4.000	No	No	2.00
37	6.23	52.70	2.39	3.95	0.78	84.03	2.25	189.33	4.000	No	No	2.00
38	6.40	53.77	2.41	4.31	0.79	85.72	2.35	201.27	4.000	No	No	2.00
39	6.56	52.23	2.42	4.38	0.80	83.24	2.40	200.04	4.000	No	No	2.00
40	6.73	51.86	2.39	3.95	0.79	82.63	2.27	187.79	4.000	Yes	No	2.00
41	6.89	55.06	2.32	3.36	0.76	87.75	2.01	176.57	4.000	Yes	No	2.00
42	7.05	60.16	2.25	2.90	0.73	95.93	1.79	171.54	4.000	Yes	No	2.00
43	7.22	66.06	2.18	2.54	0.70	105.40	1.61	169.67	4.000	Yes	No	2.00
44	7.38	71.73	2.12	2.29	0.68	114.49	1.49	170.54	4.000	Yes	No	2.00
45	7.55	76.30	2.07	2.07	0.66	120.80	1.40	169.40	4.000	No	No	2.00
46	7.71	78.16	2.05	1.93	0.66	121.31	1.37	165.70	4.000	No	No	2.00
47	7.87	77.20	2.03	1.78	0.65	117.69	1.34	157.87	4.000	No	No	2.00
48	8.04	73.46	2.03	1.69	0.65	110.55	1.34	148.70	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
49	8.20	67.93	2.04	1.58	0.65	101.12	1.36	137.09	4.000	No	No	2.00
50	8.37	61.60	2.06	1.53	0.66	91.01	1.39	126.60	4.000	No	No	2.00
51	8.53	56.13	2.08	1.44	0.67	82.15	1.42	116.36	4.000	No	No	2.00
52	8.69	52.30	2.10	1.42	0.67	76.00	1.45	110.44	4.000	No	No	2.00
53	8.86	50.36	2.11	1.41	0.68	72.49	1.48	107.12	4.000	No	No	2.00
54	9.02	49.43	2.13	1.43	0.69	70.56	1.51	106.21	4.000	No	No	2.00
55	9.19	49.06	2.15	1.51	0.69	69.51	1.55	107.49	4.000	No	No	2.00
56	9.35	49.30	2.16	1.57	0.70	69.25	1.57	108.94	4.000	No	No	2.00
57	9.51	51.30	2.16	1.64	0.70	71.32	1.58	112.64	4.000	No	No	2.00
58	9.68	55.86	2.14	1.63	0.69	76.43	1.53	116.66	4.000	No	No	2.00
59	9.84	62.83	2.11	1.66	0.68	84.65	1.47	124.76	4.000	No	No	2.00
60	10.01	70.16	2.08	1.63	0.67	92.91	1.41	131.17	4.000	No	No	2.00
61	10.17	75.96	2.06	1.64	0.66	99.25	1.38	137.01	4.000	No	No	2.00
62	10.34	79.86	2.05	1.68	0.66	103.20	1.37	141.87	4.000	No	No	2.00
63	10.50	84.33	2.06	1.83	0.66	108.15	1.39	150.73	4.000	No	No	2.00
64	10.66	92.60	2.07	1.99	0.66	117.67	1.40	164.29	4.000	No	No	2.00
65	10.83	105.66	2.05	2.13	0.66	132.65	1.37	182.30	4.000	No	No	2.00
66	10.99	121.70	2.05	2.37	0.66	151.36	1.37	207.77	4.000	No	No	2.00
67	11.16	135.66	2.06	2.64	0.66	167.32	1.39	232.44	4.000	No	No	2.00
68	11.32	135.26	2.12	3.07	0.68	166.51	1.48	246.94	4.000	No	No	2.00
69	11.48	117.63	2.21	3.59	0.72	145.12	1.68	243.80	4.000	No	No	2.00
70	11.65	91.26	2.34	4.34	0.77	113.21	2.07	234.35	4.000	No	No	2.00
71	11.81	72.10	2.45	5.05	0.81	89.62	2.53	226.42	4.000	No	No	2.00
72	11.98	65.80	2.50	5.43	0.83	81.27	2.77	225.46	4.000	No	No	2.00
73	12.14	65.17	2.51	5.54	0.83	79.68	2.84	225.91	4.000	No	No	2.00
74	12.30	67.01	2.51	5.59	0.83	81.01	2.83	229.05	4.000	No	No	2.00
75	12.47	69.62	2.50	5.52	0.83	83.10	2.77	230.32	4.000	No	No	2.00
76	12.63	73.09	2.49	5.53	0.82	86.24	2.73	235.05	4.000	No	No	2.00
77	12.80	74.26	2.50	5.63	0.83	86.67	2.75	238.14	4.000	No	No	2.00
78	12.96	74.03	2.51	5.83	0.83	85.59	2.83	241.88	4.000	No	No	2.00
79	13.12	73.20	2.52	5.90	0.84	84.10	2.87	241.46	4.000	No	No	2.00
80	13.29	73.94	2.51	5.79	0.83	84.39	2.83	239.19	4.000	No	No	2.00
81	13.45	75.50	2.51	5.85	0.83	85.71	2.83	242.61	4.000	No	No	2.00
82	13.62	79.84	2.51	6.08	0.83	90.14	2.83	255.11	4.000	No	No	2.00
83	13.78	86.27	2.52	6.48	0.83	96.95	2.85	276.12	4.000	No	No	2.00
84	13.94	89.98	2.53	6.96	0.84	100.70	2.93	295.08	4.000	No	No	2.00
85	14.11	95.42	2.52	6.95	0.83	106.08	2.86	303.17	4.000	No	No	2.00
86	14.27	104.35	2.46	6.22	0.81	114.93	2.57	294.81	4.000	No	No	2.00
87	14.44	116.35	2.36	5.02	0.77	126.58	2.15	272.11	4.000	No	No	2.00
88	14.60	126.07	2.26	3.97	0.74	135.57	1.82	246.77	4.000	No	No	2.00
89	14.76	130.06	2.19	3.33	0.71	138.60	1.64	227.99	4.000	No	No	2.00
90	14.93	132.96	2.15	3.03	0.70	140.68	1.56	219.81	4.000	No	No	2.00
91	15.09	133.62	2.14	2.91	0.69	140.64	1.53	215.84	4.000	No	No	2.00
92	15.26	133.99	2.13	2.81	0.69	140.28	1.51	211.82	4.000	No	No	2.00
93	15.42	134.05	2.11	2.68	0.68	139.63	1.48	206.95	4.000	No	No	2.00
94	15.58	133.08	2.11	2.65	0.68	138.03	1.48	204.38	4.000	No	No	2.00
95	15.75	131.62	2.12	2.63	0.68	135.90	1.48	201.64	4.000	No	No	2.00
96	15.91	127.98	2.12	2.60	0.68	131.61	1.49	196.54	0.786	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
97	16.08	123.42	2.12	2.51	0.68	126.32	1.49	188.45	0.702	No	No	2.00
98	16.24	118.08	2.12	2.42	0.68	120.35	1.50	180.08	0.623	No	No	2.00
99	16.40	113.85	2.12	2.33	0.68	115.53	1.50	172.84	0.560	No	No	2.00
100	16.57	112.21	2.12	2.25	0.68	113.35	1.48	168.15	0.522	No	No	2.00
101	16.73	112.51	2.11	2.18	0.68	113.17	1.47	165.96	0.505	No	No	2.00
102	16.90	113.98	2.10	2.16	0.68	114.17	1.45	166.01	0.505	No	No	2.00
103	17.06	116.81	2.10	2.19	0.67	116.58	1.45	169.29	0.531	No	No	2.00
104	17.23	123.57	2.11	2.37	0.68	122.93	1.47	180.84	0.630	No	No	2.00
105	17.39	139.34	2.11	2.65	0.68	138.23	1.48	204.68	4.000	No	No	2.00
106	17.55	165.07	2.12	3.03	0.68	163.31	1.48	242.22	4.000	No	No	2.00
107	17.72	170.44	2.17	3.58	0.70	168.15	1.59	267.34	4.000	No	No	2.00
108	17.88	155.75	2.30	4.89	0.75	153.39	1.95	299.58	4.000	No	No	2.00
109	18.05	129.73	2.48	7.00	0.82	127.45	2.65	337.29	4.000	No	No	2.00
110	18.21	125.10	2.55	8.34	0.85	122.43	3.03	370.38	4.000	No	No	2.00
111	18.37	127.57	2.57	8.94	0.85	124.28	3.15	391.53	4.000	No	No	2.00
112	18.54	136.81	2.57	9.24	0.85	132.63	3.13	415.72	4.000	No	No	2.00
113	18.70	160.01	2.52	8.90	0.84	154.44	2.87	443.06	4.000	No	No	2.00
114	18.87	176.75	2.47	8.34	0.82	169.74	2.64	448.39	4.000	No	No	2.00
115	19.03	193.69	2.39	7.00	0.79	185.09	2.27	420.23	4.000	No	No	2.00
116	19.19	201.39	2.30	5.61	0.75	191.51	1.95	372.99	4.000	No	No	2.00
117	19.36	217.85	2.19	4.36	0.71	206.22	1.64	338.22	4.000	No	No	2.00
118	19.52	210.54	2.16	3.95	0.70	198.43	1.58	313.28	4.000	No	No	2.00
119	19.69	173.77	2.22	4.10	0.72	162.87	1.72	280.85	4.000	No	No	2.00
120	19.85	124.47	2.35	4.57	0.77	115.81	2.11	244.60	4.000	No	No	2.00
121	20.01	90.68	2.46	4.92	0.81	83.65	2.57	215.32	4.000	No	No	2.00
122	20.18	79.36	2.50	4.95	0.83	72.71	2.77	201.58	4.000	No	No	2.00
123	20.34	80.54	2.47	4.50	0.81	73.52	2.60	191.32	0.731	No	No	2.00
124	20.51	81.35	2.43	4.00	0.80	73.97	2.42	178.93	0.613	No	No	2.00
125	20.67	77.49	2.41	3.63	0.79	70.14	2.35	165.00	0.498	No	No	1.88
126	20.83	73.73	2.40	3.32	0.79	66.43	2.30	152.72	0.411	No	No	1.55
127	21.00	68.96	2.40	3.11	0.79	61.80	2.30	142.42	0.349	No	No	1.31
128	21.16	65.76	2.44	3.36	0.80	58.61	2.48	145.27	0.365	No	No	1.37
129	21.33	67.83	2.48	3.96	0.82	60.19	2.68	161.39	0.471	No	No	1.76
130	21.49	75.67	2.49	4.44	0.82	67.01	2.71	181.50	0.636	No	No	2.00
131	21.65	78.40	2.52	5.02	0.84	69.13	2.87	198.31	0.805	No	No	2.00
132	21.82	86.53	2.51	5.33	0.83	76.10	2.83	215.50	4.000	No	No	2.00
133	21.98	94.81	2.51	5.60	0.83	83.16	2.80	232.56	4.000	No	No	2.00
134	22.15	104.11	2.47	5.49	0.82	91.11	2.64	240.52	4.000	No	No	2.00
135	22.31	99.38	2.49	5.51	0.82	86.51	2.72	234.91	4.000	No	No	2.00
136	22.47	86.51	2.53	5.53	0.84	74.73	2.92	218.48	4.000	No	No	2.00
137	22.64	73.30	2.58	5.57	0.86	62.74	3.21	201.50	4.000	No	No	2.00
138	22.80	63.20	2.66	6.16	0.89	53.53	3.71	198.45	4.000	No	Yes	2.00
139	22.97	60.49	2.74	7.57	0.92	50.79	4.31	219.01	4.000	No	Yes	2.00
140	23.13	78.60	2.67	7.61	0.89	66.26	3.79	251.09	4.000	No	Yes	2.00
141	23.30	103.04	2.58	7.29	0.86	87.16	3.23	281.55	4.000	No	No	2.00
142	23.46	122.78	2.52	6.84	0.83	103.95	2.86	296.97	4.000	No	No	2.00
143	23.62	124.92	2.53	7.08	0.84	105.29	2.90	305.63	4.000	No	No	2.00
144	23.79	121.02	2.53	7.03	0.84	101.47	2.94	298.26	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
145	23.95	114.72	2.55	7.16	0.85	95.60	3.06	292.27	4.000	No	No	2.00
146	24.12	114.39	2.53	6.74	0.84	95.00	2.95	280.06	4.000	No	No	2.00
147	24.28	114.16	2.54	6.72	0.84	94.40	2.95	278.72	4.000	No	No	2.00
148	24.44	117.11	2.52	6.55	0.84	96.55	2.87	277.43	4.000	No	No	2.00
149	24.61	116.37	2.53	6.59	0.84	95.48	2.90	276.96	4.000	No	No	2.00
150	24.77	117.14	2.52	6.55	0.84	95.74	2.88	276.19	4.000	No	No	2.00
151	24.94	125.16	2.47	5.94	0.82	102.27	2.63	268.61	4.000	No	No	2.00
152	25.10	130.28	2.43	5.39	0.80	106.38	2.43	258.16	4.000	No	No	2.00
153	25.26	133.31	2.40	5.06	0.79	108.67	2.31	251.23	4.000	No	No	2.00
154	25.43	134.49	2.39	4.92	0.79	109.29	2.27	247.56	4.000	No	No	2.00
155	25.59	130.19	2.42	5.16	0.80	105.16	2.37	249.75	4.000	No	No	2.00
156	25.76	118.57	2.48	5.76	0.82	94.83	2.67	253.22	4.000	No	No	2.00
157	25.92	106.69	2.57	6.86	0.85	84.31	3.16	266.06	4.000	No	No	2.00
158	26.08	114.00	2.56	7.00	0.85	89.87	3.10	278.91	4.000	No	No	2.00
159	26.25	129.47	2.51	6.68	0.83	102.19	2.83	289.61	4.000	No	No	2.00
160	26.41	138.28	2.49	6.54	0.82	109.01	2.71	295.91	4.000	No	No	2.00
161	26.58	136.73	2.49	6.42	0.82	107.35	2.70	289.91	4.000	No	No	2.00
162	26.74	126.47	2.49	6.12	0.82	98.78	2.72	268.87	4.000	No	No	2.00
163	26.90	111.28	2.50	5.60	0.83	86.39	2.74	237.04	4.000	No	No	2.00
164	27.07	92.84	2.53	5.27	0.84	71.38	2.91	207.46	4.000	No	No	2.00
165	27.23	79.48	2.55	4.85	0.85	60.60	3.01	182.29	0.643	No	No	2.00
166	27.40	69.52	2.56	4.43	0.85	52.57	3.08	161.85	0.474	No	No	1.60
167	27.56	60.32	2.59	4.27	0.86	45.14	3.28	148.07	0.382	No	No	1.29
168	27.72	53.39	2.63	4.26	0.88	39.51	3.53	139.59	4.000	No	Yes	2.00
169	27.89	50.49	2.67	4.45	0.89	37.03	3.75	139.03	4.000	No	Yes	2.00
170	28.05	48.12	2.72	4.97	0.91	34.94	4.12	144.08	4.000	No	Yes	2.00
171	28.22	49.56	2.75	5.73	0.92	35.75	4.41	157.63	4.000	No	Yes	2.00
172	28.38	51.73	2.79	6.62	0.94	37.11	4.69	173.97	4.000	No	Yes	2.00
173	28.54	56.66	2.77	6.87	0.93	40.68	4.57	185.74	4.000	Yes	Yes	2.00
174	28.71	63.26	2.71	6.24	0.91	45.69	4.06	185.61	4.000	Yes	Yes	2.00
175	28.87	74.98	2.57	4.79	0.85	54.99	3.14	172.95	4.000	Yes	No	2.00
176	29.04	90.74	2.39	3.34	0.79	67.83	2.28	154.85	4.000	Yes	No	2.00
177	29.20	104.26	2.26	2.51	0.74	79.03	1.82	143.67	4.000	Yes	No	2.00
178	29.36	113.75	2.17	2.06	0.70	86.94	1.59	138.11	4.000	Yes	No	2.00
179	29.53	118.81	2.13	1.91	0.69	90.98	1.51	137.53	0.322	No	No	1.06
180	29.69	124.38	2.10	1.80	0.67	95.40	1.45	138.19	0.325	No	No	1.07
181	29.86	128.14	2.07	1.72	0.67	98.32	1.41	138.48	0.327	No	No	1.07
182	30.02	130.81	2.06	1.68	0.66	100.28	1.39	139.21	0.331	No	No	1.09
183	30.19	134.54	2.06	1.71	0.66	102.95	1.38	142.42	0.349	No	No	1.14
184	30.35	141.87	2.05	1.76	0.66	108.45	1.37	148.94	0.387	No	No	1.27
185	30.51	150.97	2.04	1.79	0.65	115.40	1.35	156.02	0.433	No	No	1.41
186	30.68	160.07	2.02	1.79	0.64	122.36	1.33	162.44	0.479	No	No	1.56
187	30.84	167.91	2.00	1.77	0.64	128.39	1.30	167.21	0.515	No	No	1.68
188	31.01	174.84	1.99	1.76	0.63	133.63	1.28	171.61	0.550	No	No	1.79
189	31.17	180.07	1.97	1.72	0.63	137.59	1.27	174.24	0.572	No	No	1.86
190	31.33	183.37	1.97	1.73	0.63	139.86	1.26	176.49	0.591	No	No	1.92
191	31.50	185.58	1.97	1.74	0.63	141.20	1.26	178.20	0.606	No	No	1.96
192	31.66	184.34	1.98	1.81	0.63	139.64	1.28	178.83	0.612	No	No	1.98

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	31.83	183.05	2.00	1.86	0.64	138.07	1.30	178.93	0.613	No	No	1.98
194	31.99	180.95	2.01	1.88	0.64	135.99	1.31	177.70	0.602	No	No	1.94
195	32.15	180.95	2.00	1.85	0.64	135.77	1.30	176.34	0.590	No	No	1.90
196	32.32	180.65	1.99	1.81	0.63	135.28	1.29	174.84	0.577	No	No	1.86
197	32.48	180.85	1.99	1.81	0.63	135.11	1.29	174.62	0.575	No	No	1.85
198	32.65	181.75	2.00	1.86	0.64	135.30	1.30	176.24	0.589	No	No	1.89
199	32.81	183.78	2.01	1.93	0.64	136.32	1.32	179.39	0.617	No	No	1.98
200	32.97	187.42	2.02	2.00	0.64	138.58	1.33	183.68	0.656	No	No	2.00
201	33.14	192.95	2.02	2.04	0.64	142.34	1.33	188.68	0.705	No	No	2.00
202	33.30	198.05	2.01	2.06	0.64	145.89	1.32	192.46	0.743	No	No	2.00
203	33.47	201.42	2.01	2.07	0.64	148.05	1.32	194.97	0.769	No	No	2.00
204	33.63	202.29	2.01	2.08	0.64	148.31	1.32	195.48	0.775	No	No	2.00
205	33.79	202.72	2.02	2.11	0.64	148.17	1.32	196.28	0.783	No	No	2.00
206	33.96	204.46	2.02	2.11	0.64	149.11	1.32	197.11	0.792	No	No	2.00
207	34.12	208.39	2.01	2.09	0.64	151.85	1.31	198.89	0.812	No	No	2.00
208	34.29	213.32	1.99	2.02	0.63	155.48	1.29	200.21	4.000	No	No	2.00
209	34.45	216.93	1.96	1.89	0.62	158.40	1.26	198.84	0.811	No	No	2.00
210	34.61	219.53	1.93	1.73	0.61	160.78	1.22	195.93	0.780	No	No	2.00
211	34.78	220.66	1.89	1.56	0.60	162.17	1.18	191.68	0.735	No	No	2.00
212	34.94	219.46	1.87	1.46	0.59	161.43	1.16	187.95	0.697	No	No	2.00
213	35.11	217.49	1.86	1.39	0.58	159.90	1.15	184.59	0.665	No	No	2.00
214	35.27	214.95	1.87	1.40	0.59	157.58	1.16	182.52	0.645	No	No	2.00
215	35.43	215.45	1.86	1.38	0.58	157.74	1.15	182.09	0.641	No	No	2.00
216	35.60	217.15	1.85	1.35	0.58	158.86	1.15	182.30	0.643	No	No	2.00
217	35.76	220.35	1.83	1.27	0.57	161.55	1.13	182.23	0.643	No	No	2.00
218	35.93	222.55	1.81	1.23	0.57	163.20	1.12	182.38	0.644	No	No	2.00
219	36.09	222.42	1.82	1.23	0.57	162.76	1.12	182.00	0.641	No	No	2.00
220	36.26	220.32	1.83	1.25	0.57	160.58	1.13	180.90	0.631	No	No	1.99
221	36.42	217.02	1.83	1.26	0.57	157.67	1.13	178.41	0.608	No	No	1.92
222	36.58	215.16	1.83	1.24	0.57	156.05	1.13	176.34	0.590	No	No	1.86
223	36.75	214.82	1.83	1.22	0.57	155.55	1.13	175.48	0.582	No	No	1.84
224	36.91	214.95	1.83	1.24	0.57	155.23	1.13	175.65	0.584	No	No	1.84
225	37.08	213.55	1.85	1.31	0.58	153.32	1.15	176.10	0.588	No	No	1.85
226	37.24	208.79	1.90	1.47	0.60	148.37	1.19	176.43	0.591	No	No	1.86
227	37.40	203.62	1.94	1.62	0.62	143.31	1.23	176.47	0.591	No	No	1.86
228	37.57	199.39	1.96	1.66	0.62	139.62	1.25	174.16	0.571	No	No	1.80
229	37.73	199.32	1.95	1.64	0.62	139.35	1.24	173.41	0.565	No	No	1.78
230	37.90	201.62	1.95	1.62	0.62	140.83	1.24	174.20	0.572	No	No	1.80
231	38.06	206.02	1.95	1.67	0.62	143.56	1.24	178.12	0.606	No	No	1.90
232	38.22	211.65	1.95	1.69	0.62	147.33	1.24	182.16	0.642	No	No	2.00
233	38.39	218.59	1.94	1.68	0.61	152.18	1.22	186.37	0.682	No	No	2.00
234	38.55	225.62	1.92	1.66	0.61	157.21	1.21	190.28	0.721	No	No	2.00
235	38.72	230.19	1.91	1.61	0.60	160.54	1.20	191.86	0.737	No	No	2.00
236	38.88	233.12	1.89	1.56	0.60	162.70	1.18	192.31	0.741	No	No	2.00
237	39.04	234.99	1.88	1.51	0.59	164.13	1.17	191.89	0.737	No	No	2.00
238	39.21	236.26	1.86	1.43	0.58	165.30	1.15	190.48	0.723	No	No	2.00
239	39.37	235.19	1.84	1.35	0.58	164.77	1.14	187.54	0.693	No	No	2.00
240	39.54	232.72	1.83	1.30	0.57	162.92	1.13	184.53	0.664	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
241	39.70	231.09	1.84	1.33	0.58	161.18	1.14	183.71	0.657	No	No	2.00
242	39.86	228.72	1.87	1.43	0.59	158.32	1.16	184.26	0.662	No	No	2.00
243	40.03	223.39	1.91	1.54	0.60	153.28	1.19	183.03	0.650	No	No	2.00
244	40.19	215.49	1.94	1.66	0.62	146.42	1.23	180.42	0.626	No	No	1.97
245	40.36	209.72	1.97	1.74	0.63	141.45	1.26	178.27	0.607	No	No	1.90
246	40.52	208.66	1.99	1.83	0.63	139.89	1.28	179.62	0.619	No	No	1.94
247	40.68	210.32	1.99	1.85	0.63	140.69	1.29	180.90	0.631	No	No	1.98
248	40.85	211.56	1.98	1.82	0.63	141.40	1.28	180.72	0.629	No	No	1.97
249	41.01	209.56	1.99	1.85	0.63	139.48	1.29	180.00	0.622	No	No	1.95
250	41.18	216.20	1.99	1.89	0.63	143.71	1.29	185.04	4.000	Yes	No	2.00
251	41.34	192.93	2.09	2.30	0.67	125.10	1.44	180.58	4.000	Yes	No	2.00
252	41.50	150.60	2.25	2.91	0.73	93.91	1.81	169.68	4.000	Yes	No	2.00
253	41.67	95.50	2.53	4.28	0.84	55.47	2.93	162.47	4.000	Yes	No	2.00
254	41.83	73.22	2.66	4.82	0.89	40.92	3.71	151.98	4.000	Yes	Yes	2.00
255	42.00	74.31	2.62	4.33	0.87	41.78	3.45	144.28	4.000	No	Yes	2.00
256	42.16	78.32	2.60	4.32	0.87	44.16	3.34	147.66	4.000	No	Yes	2.00
257	42.32	80.15	2.66	5.25	0.89	44.56	3.72	165.88	4.000	No	Yes	2.00
258	42.49	84.51	2.74	6.85	0.92	46.18	4.27	197.03	4.000	No	Yes	2.00
259	42.65	89.99	2.79	8.33	0.94	48.61	4.67	226.92	4.000	No	Yes	2.00
260	42.82	101.63	2.75	8.30	0.92	55.35	4.37	241.72	4.000	No	Yes	2.00
261	42.98	110.33	2.68	7.32	0.90	60.94	3.85	234.92	4.000	No	Yes	2.00
262	43.15	112.32	2.62	6.18	0.87	62.76	3.42	214.80	4.000	No	Yes	2.00
263	43.31	100.45	2.64	5.94	0.88	55.54	3.56	197.69	4.000	No	Yes	2.00
264	43.47	87.22	2.69	6.12	0.90	47.29	3.94	186.49	4.000	No	Yes	2.00
265	43.64	83.13	2.69	5.85	0.90	44.86	3.95	177.20	4.000	No	Yes	2.00
266	43.80	86.80	2.63	5.08	0.88	47.42	3.53	167.39	4.000	No	Yes	2.00
267	43.97	89.32	2.60	4.74	0.87	49.06	3.33	163.25	4.000	Yes	Yes	2.00
268	44.13	101.93	2.53	4.34	0.84	57.00	2.91	166.00	4.000	Yes	No	2.00
269	44.29	131.93	2.39	3.64	0.78	76.51	2.25	172.40	4.000	Yes	No	2.00
270	44.46	165.20	2.26	3.14	0.74	98.67	1.84	181.48	4.000	Yes	No	2.00
271	44.62	183.07	2.22	3.02	0.72	110.42	1.71	189.34	0.711	No	No	2.00
272	44.79	182.05	2.25	3.26	0.73	108.78	1.79	195.26	0.772	No	No	2.00
273	44.95	175.95	2.30	3.60	0.75	103.70	1.94	200.74	4.000	No	No	2.00
274	45.11	174.82	2.33	3.96	0.76	101.92	2.06	209.60	4.000	No	No	2.00
275	45.28	189.59	2.31	3.95	0.75	111.01	1.98	219.34	4.000	No	No	2.00
276	45.44	219.66	2.24	3.66	0.73	130.70	1.77	231.11	4.000	No	No	2.00
277	45.61	245.72	2.18	3.36	0.70	148.23	1.61	238.98	4.000	No	No	2.00
278	45.77	257.62	2.14	3.17	0.69	156.45	1.54	240.33	4.000	No	No	2.00
279	45.93	254.62	2.15	3.19	0.69	154.03	1.55	238.78	4.000	No	No	2.00
280	46.10	252.35	2.17	3.37	0.70	151.45	1.60	242.42	4.000	No	No	2.00
281	46.26	264.32	2.17	3.51	0.70	158.27	1.61	254.39	4.000	No	No	2.00
282	46.43	283.67	2.15	3.43	0.69	170.70	1.55	264.38	4.000	No	No	2.00
283	46.59	289.10	2.13	3.27	0.69	174.58	1.50	262.45	4.000	No	No	2.00
284	46.75	259.60	2.16	3.34	0.70	154.83	1.58	244.80	4.000	No	No	2.00
285	46.92	214.16	2.26	3.71	0.74	124.21	1.82	225.92	4.000	No	No	2.00
286	47.08	192.03	2.31	3.95	0.76	109.43	1.99	217.75	4.000	No	No	2.00
287	47.25	210.58	2.22	3.31	0.72	122.62	1.72	211.05	4.000	No	No	2.00
288	47.41	256.19	2.05	2.44	0.66	155.65	1.38	214.12	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
289	47.57	298.46	1.90	1.82	0.60	188.27	1.19	224.16	4.000	No	No	2.00
290	47.74	326.79	1.82	1.58	0.57	210.02	1.12	236.16	4.000	No	No	2.00
291	47.90	344.72	1.79	1.48	0.56	223.37	1.10	245.05	4.000	No	No	2.00
292	48.07	353.96	1.78	1.50	0.55	229.18	1.10	250.95	4.000	No	No	2.00
293	48.23	354.09	1.81	1.62	0.57	227.20	1.12	253.60	4.000	No	No	2.00
294	48.39	358.86	1.85	1.83	0.58	227.55	1.15	261.16	4.000	No	No	2.00
295	48.56	376.13	1.86	1.93	0.58	237.68	1.15	274.36	4.000	No	No	2.00
296	48.72	397.17	1.85	1.95	0.58	251.40	1.14	287.82	4.000	No	No	2.00
297	48.89	408.97	1.83	1.87	0.57	259.93	1.13	293.08	4.000	No	No	2.00
298	49.05	414.10	1.87	2.13	0.59	259.70	1.16	302.44	4.000	No	No	2.00
299	49.22	393.13	1.97	2.62	0.63	239.96	1.26	302.53	4.000	No	No	2.00
300	49.38	321.63	2.12	3.38	0.68	188.02	1.49	280.13	4.000	No	No	2.00
301	49.54	227.01	2.31	4.35	0.76	125.41	1.98	248.41	4.000	No	No	2.00
302	49.71	144.81	2.56	6.08	0.85	73.96	3.12	230.55	4.000	No	No	2.00
303	49.87	133.93	2.64	6.96	0.88	66.78	3.57	238.55	4.000	No	Yes	2.00
304	50.04	143.84	2.62	7.07	0.88	71.94	3.47	249.98	4.000	No	Yes	2.00

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_t: Total cone resistance
I_c: Soil behavior type index
Fr: Normalized friction ratio (%)
n: Stress exponent
Q_{tn}: Normalized cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Normalized and adjusted cone resistance
$CRR_{7.5}$: Cyclic resistance ratio for M_w=7.5
FS: Factor of safety against soil liquefaction

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.33	2.00	0.00	9.95	0.16	0.00	0.49	2.00	0.00	9.93	0.16	0.00
0.66	2.00	0.00	9.90	0.17	0.00	0.82	2.00	0.00	9.88	0.16	0.00
0.98	2.00	0.00	9.85	0.16	0.00	1.15	2.00	0.00	9.82	0.17	0.00
1.31	2.00	0.00	9.80	0.16	0.00	1.48	2.00	0.00	9.77	0.17	0.00
1.64	2.00	0.00	9.75	0.16	0.00	1.80	2.00	0.00	9.73	0.16	0.00
1.97	2.00	0.00	9.70	0.17	0.00	2.13	2.00	0.00	9.68	0.16	0.00
2.30	2.00	0.00	9.65	0.17	0.00	2.46	2.00	0.00	9.63	0.16	0.00
2.62	2.00	0.00	9.60	0.16	0.00	2.79	2.00	0.00	9.57	0.17	0.00
2.95	2.00	0.00	9.55	0.16	0.00	3.12	2.00	0.00	9.52	0.17	0.00
3.28	2.00	0.00	9.50	0.16	0.00	3.45	2.00	0.00	9.47	0.17	0.00
3.61	2.00	0.00	9.45	0.16	0.00	3.77	2.00	0.00	9.43	0.16	0.00
3.94	2.00	0.00	9.40	0.17	0.00	4.10	2.00	0.00	9.38	0.16	0.00
4.27	2.00	0.00	9.35	0.17	0.00	4.43	2.00	0.00	9.32	0.16	0.00
4.59	2.00	0.00	9.30	0.16	0.00	4.76	2.00	0.00	9.27	0.17	0.00
4.92	2.00	0.00	9.25	0.16	0.00	5.09	2.00	0.00	9.22	0.17	0.00
5.25	2.00	0.00	9.20	0.16	0.00	5.41	2.00	0.00	9.18	0.16	0.00
5.58	2.00	0.00	9.15	0.17	0.00	5.74	2.00	0.00	9.13	0.16	0.00
5.91	2.00	0.00	9.10	0.17	0.00	6.07	2.00	0.00	9.07	0.16	0.00
6.23	2.00	0.00	9.05	0.16	0.00	6.40	2.00	0.00	9.02	0.17	0.00
6.56	2.00	0.00	9.00	0.16	0.00	6.73	2.00	0.00	8.97	0.17	0.00
6.89	2.00	0.00	8.95	0.16	0.00	7.05	2.00	0.00	8.93	0.16	0.00
7.22	2.00	0.00	8.90	0.17	0.00	7.38	2.00	0.00	8.88	0.16	0.00
7.55	2.00	0.00	8.85	0.17	0.00	7.71	2.00	0.00	8.82	0.16	0.00
7.87	2.00	0.00	8.80	0.16	0.00	8.04	2.00	0.00	8.77	0.17	0.00
8.20	2.00	0.00	8.75	0.16	0.00	8.37	2.00	0.00	8.72	0.17	0.00
8.53	2.00	0.00	8.70	0.16	0.00	8.69	2.00	0.00	8.68	0.16	0.00
8.86	2.00	0.00	8.65	0.17	0.00	9.02	2.00	0.00	8.63	0.16	0.00
9.19	2.00	0.00	8.60	0.17	0.00	9.35	2.00	0.00	8.58	0.16	0.00
9.51	2.00	0.00	8.55	0.16	0.00	9.68	2.00	0.00	8.52	0.17	0.00
9.84	2.00	0.00	8.50	0.16	0.00	10.01	2.00	0.00	8.47	0.17	0.00
10.17	2.00	0.00	8.45	0.16	0.00	10.34	2.00	0.00	8.42	0.17	0.00
10.50	2.00	0.00	8.40	0.16	0.00	10.66	2.00	0.00	8.38	0.16	0.00
10.83	2.00	0.00	8.35	0.17	0.00	10.99	2.00	0.00	8.33	0.16	0.00
11.16	2.00	0.00	8.30	0.17	0.00	11.32	2.00	0.00	8.27	0.16	0.00
11.48	2.00	0.00	8.25	0.16	0.00	11.65	2.00	0.00	8.22	0.17	0.00
11.81	2.00	0.00	8.20	0.16	0.00	11.98	2.00	0.00	8.17	0.17	0.00
12.14	2.00	0.00	8.15	0.16	0.00	12.30	2.00	0.00	8.13	0.16	0.00
12.47	2.00	0.00	8.10	0.17	0.00	12.63	2.00	0.00	8.08	0.16	0.00
12.80	2.00	0.00	8.05	0.17	0.00	12.96	2.00	0.00	8.02	0.16	0.00
13.12	2.00	0.00	8.00	0.16	0.00	13.29	2.00	0.00	7.97	0.17	0.00
13.45	2.00	0.00	7.95	0.16	0.00	13.62	2.00	0.00	7.92	0.17	0.00
13.78	2.00	0.00	7.90	0.16	0.00	13.94	2.00	0.00	7.88	0.16	0.00
14.11	2.00	0.00	7.85	0.17	0.00	14.27	2.00	0.00	7.83	0.16	0.00
14.44	2.00	0.00	7.80	0.17	0.00	14.60	2.00	0.00	7.77	0.16	0.00
14.76	2.00	0.00	7.75	0.16	0.00	14.93	2.00	0.00	7.72	0.17	0.00
15.09	2.00	0.00	7.70	0.16	0.00	15.26	2.00	0.00	7.67	0.17	0.00
15.42	2.00	0.00	7.65	0.16	0.00	15.58	2.00	0.00	7.63	0.16	0.00
15.75	2.00	0.00	7.60	0.17	0.00	15.91	2.00	0.00	7.58	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
16.08	2.00	0.00	7.55	0.17	0.00	16.24	2.00	0.00	7.53	0.16	0.00
16.40	2.00	0.00	7.50	0.16	0.00	16.57	2.00	0.00	7.47	0.17	0.00
16.73	2.00	0.00	7.45	0.16	0.00	16.90	2.00	0.00	7.42	0.17	0.00
17.06	2.00	0.00	7.40	0.16	0.00	17.23	2.00	0.00	7.37	0.17	0.00
17.39	2.00	0.00	7.35	0.16	0.00	17.55	2.00	0.00	7.33	0.16	0.00
17.72	2.00	0.00	7.30	0.17	0.00	17.88	2.00	0.00	7.28	0.16	0.00
18.05	2.00	0.00	7.25	0.17	0.00	18.21	2.00	0.00	7.22	0.16	0.00
18.37	2.00	0.00	7.20	0.16	0.00	18.54	2.00	0.00	7.17	0.17	0.00
18.70	2.00	0.00	7.15	0.16	0.00	18.87	2.00	0.00	7.12	0.17	0.00
19.03	2.00	0.00	7.10	0.16	0.00	19.19	2.00	0.00	7.08	0.16	0.00
19.36	2.00	0.00	7.05	0.17	0.00	19.52	2.00	0.00	7.03	0.16	0.00
19.69	2.00	0.00	7.00	0.17	0.00	19.85	2.00	0.00	6.97	0.16	0.00
20.01	2.00	0.00	6.95	0.16	0.00	20.18	2.00	0.00	6.92	0.17	0.00
20.34	2.00	0.00	6.90	0.16	0.00	20.51	2.00	0.00	6.87	0.17	0.00
20.67	1.88	0.00	6.85	0.16	0.00	20.83	1.55	0.00	6.83	0.16	0.00
21.00	1.31	0.00	6.80	0.17	0.00	21.16	1.37	0.00	6.78	0.16	0.00
21.33	1.76	0.00	6.75	0.17	0.00	21.49	2.00	0.00	6.72	0.16	0.00
21.65	2.00	0.00	6.70	0.16	0.00	21.82	2.00	0.00	6.67	0.17	0.00
21.98	2.00	0.00	6.65	0.16	0.00	22.15	2.00	0.00	6.62	0.17	0.00
22.31	2.00	0.00	6.60	0.16	0.00	22.47	2.00	0.00	6.58	0.16	0.00
22.64	2.00	0.00	6.55	0.17	0.00	22.80	2.00	0.00	6.53	0.16	0.00
22.97	2.00	0.00	6.50	0.17	0.00	23.13	2.00	0.00	6.47	0.16	0.00
23.30	2.00	0.00	6.45	0.17	0.00	23.46	2.00	0.00	6.42	0.16	0.00
23.62	2.00	0.00	6.40	0.16	0.00	23.79	2.00	0.00	6.37	0.17	0.00
23.95	2.00	0.00	6.35	0.16	0.00	24.12	2.00	0.00	6.32	0.17	0.00
24.28	2.00	0.00	6.30	0.16	0.00	24.44	2.00	0.00	6.28	0.16	0.00
24.61	2.00	0.00	6.25	0.17	0.00	24.77	2.00	0.00	6.23	0.16	0.00
24.94	2.00	0.00	6.20	0.17	0.00	25.10	2.00	0.00	6.17	0.16	0.00
25.26	2.00	0.00	6.15	0.16	0.00	25.43	2.00	0.00	6.12	0.17	0.00
25.59	2.00	0.00	6.10	0.16	0.00	25.76	2.00	0.00	6.07	0.17	0.00
25.92	2.00	0.00	6.05	0.16	0.00	26.08	2.00	0.00	6.03	0.16	0.00
26.25	2.00	0.00	6.00	0.17	0.00	26.41	2.00	0.00	5.98	0.16	0.00
26.58	2.00	0.00	5.95	0.17	0.00	26.74	2.00	0.00	5.92	0.16	0.00
26.90	2.00	0.00	5.90	0.16	0.00	27.07	2.00	0.00	5.87	0.17	0.00
27.23	2.00	0.00	5.85	0.16	0.00	27.40	1.60	0.00	5.82	0.17	0.00
27.56	1.29	0.00	5.80	0.16	0.00	27.72	2.00	0.00	5.78	0.16	0.00
27.89	2.00	0.00	5.75	0.17	0.00	28.05	2.00	0.00	5.73	0.16	0.00
28.22	2.00	0.00	5.70	0.17	0.00	28.38	2.00	0.00	5.67	0.16	0.00
28.54	2.00	0.00	5.65	0.16	0.00	28.71	2.00	0.00	5.62	0.17	0.00
28.87	2.00	0.00	5.60	0.16	0.00	29.04	2.00	0.00	5.57	0.17	0.00
29.20	2.00	0.00	5.55	0.16	0.00	29.36	2.00	0.00	5.53	0.16	0.00
29.53	1.06	0.00	5.50	0.17	0.00	29.69	1.07	0.00	5.48	0.16	0.00
29.86	1.07	0.00	5.45	0.17	0.00	30.02	1.09	0.00	5.42	0.16	0.00
30.19	1.14	0.00	5.40	0.17	0.00	30.35	1.27	0.00	5.37	0.16	0.00
30.51	1.41	0.00	5.35	0.16	0.00	30.68	1.56	0.00	5.32	0.17	0.00
30.84	1.68	0.00	5.30	0.16	0.00	31.01	1.79	0.00	5.27	0.17	0.00
31.17	1.86	0.00	5.25	0.16	0.00	31.33	1.92	0.00	5.23	0.16	0.00
31.50	1.96	0.00	5.20	0.17	0.00	31.66	1.98	0.00	5.18	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
31.83	1.98	0.00	5.15	0.17	0.00	31.99	1.94	0.00	5.12	0.16	0.00
32.15	1.90	0.00	5.10	0.16	0.00	32.32	1.86	0.00	5.07	0.17	0.00
32.48	1.85	0.00	5.05	0.16	0.00	32.65	1.89	0.00	5.02	0.17	0.00
32.81	1.98	0.00	5.00	0.16	0.00	32.97	2.00	0.00	4.98	0.16	0.00
33.14	2.00	0.00	4.95	0.17	0.00	33.30	2.00	0.00	4.93	0.16	0.00
33.47	2.00	0.00	4.90	0.17	0.00	33.63	2.00	0.00	4.87	0.16	0.00
33.79	2.00	0.00	4.85	0.16	0.00	33.96	2.00	0.00	4.82	0.17	0.00
34.12	2.00	0.00	4.80	0.16	0.00	34.29	2.00	0.00	4.77	0.17	0.00
34.45	2.00	0.00	4.75	0.16	0.00	34.61	2.00	0.00	4.73	0.16	0.00
34.78	2.00	0.00	4.70	0.17	0.00	34.94	2.00	0.00	4.68	0.16	0.00
35.11	2.00	0.00	4.65	0.17	0.00	35.27	2.00	0.00	4.62	0.16	0.00
35.43	2.00	0.00	4.60	0.16	0.00	35.60	2.00	0.00	4.57	0.17	0.00
35.76	2.00	0.00	4.55	0.16	0.00	35.93	2.00	0.00	4.52	0.17	0.00
36.09	2.00	0.00	4.50	0.16	0.00	36.26	1.99	0.00	4.47	0.17	0.00
36.42	1.92	0.00	4.45	0.16	0.00	36.58	1.86	0.00	4.43	0.16	0.00
36.75	1.84	0.00	4.40	0.17	0.00	36.91	1.84	0.00	4.37	0.16	0.00
37.08	1.85	0.00	4.35	0.17	0.00	37.24	1.86	0.00	4.32	0.16	0.00
37.40	1.86	0.00	4.30	0.16	0.00	37.57	1.80	0.00	4.27	0.17	0.00
37.73	1.78	0.00	4.25	0.16	0.00	37.90	1.80	0.00	4.22	0.17	0.00
38.06	1.90	0.00	4.20	0.16	0.00	38.22	2.00	0.00	4.18	0.16	0.00
38.39	2.00	0.00	4.15	0.17	0.00	38.55	2.00	0.00	4.12	0.16	0.00
38.72	2.00	0.00	4.10	0.17	0.00	38.88	2.00	0.00	4.07	0.16	0.00
39.04	2.00	0.00	4.05	0.16	0.00	39.21	2.00	0.00	4.02	0.17	0.00
39.37	2.00	0.00	4.00	0.16	0.00	39.54	2.00	0.00	3.97	0.17	0.00
39.70	2.00	0.00	3.95	0.16	0.00	39.86	2.00	0.00	3.93	0.16	0.00
40.03	2.00	0.00	3.90	0.17	0.00	40.19	1.97	0.00	3.88	0.16	0.00
40.36	1.90	0.00	3.85	0.17	0.00	40.52	1.94	0.00	3.82	0.16	0.00
40.68	1.98	0.00	3.80	0.16	0.00	40.85	1.97	0.00	3.77	0.17	0.00
41.01	1.95	0.00	3.75	0.16	0.00	41.18	2.00	0.00	3.72	0.17	0.00
41.34	2.00	0.00	3.70	0.16	0.00	41.50	2.00	0.00	3.68	0.16	0.00
41.67	2.00	0.00	3.65	0.17	0.00	41.83	2.00	0.00	3.63	0.16	0.00
42.00	2.00	0.00	3.60	0.17	0.00	42.16	2.00	0.00	3.57	0.16	0.00
42.32	2.00	0.00	3.55	0.16	0.00	42.49	2.00	0.00	3.52	0.17	0.00
42.65	2.00	0.00	3.50	0.16	0.00	42.82	2.00	0.00	3.47	0.17	0.00
42.98	2.00	0.00	3.45	0.16	0.00	43.15	2.00	0.00	3.42	0.17	0.00
43.31	2.00	0.00	3.40	0.16	0.00	43.47	2.00	0.00	3.38	0.16	0.00
43.64	2.00	0.00	3.35	0.17	0.00	43.80	2.00	0.00	3.32	0.16	0.00
43.97	2.00	0.00	3.30	0.17	0.00	44.13	2.00	0.00	3.27	0.16	0.00
44.29	2.00	0.00	3.25	0.16	0.00	44.46	2.00	0.00	3.22	0.17	0.00
44.62	2.00	0.00	3.20	0.16	0.00	44.79	2.00	0.00	3.17	0.17	0.00
44.95	2.00	0.00	3.15	0.16	0.00	45.11	2.00	0.00	3.13	0.16	0.00
45.28	2.00	0.00	3.10	0.17	0.00	45.44	2.00	0.00	3.07	0.16	0.00
45.61	2.00	0.00	3.05	0.17	0.00	45.77	2.00	0.00	3.02	0.16	0.00
45.93	2.00	0.00	3.00	0.16	0.00	46.10	2.00	0.00	2.97	0.17	0.00
46.26	2.00	0.00	2.95	0.16	0.00	46.43	2.00	0.00	2.92	0.17	0.00
46.59	2.00	0.00	2.90	0.16	0.00	46.75	2.00	0.00	2.88	0.16	0.00
46.92	2.00	0.00	2.85	0.17	0.00	47.08	2.00	0.00	2.83	0.16	0.00
47.25	2.00	0.00	2.80	0.17	0.00	47.41	2.00	0.00	2.77	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
47.57	2.00	0.00	2.75	0.16	0.00	47.74	2.00	0.00	2.72	0.17	0.00
47.90	2.00	0.00	2.70	0.16	0.00	48.07	2.00	0.00	2.67	0.17	0.00
48.23	2.00	0.00	2.65	0.16	0.00	48.39	2.00	0.00	2.63	0.16	0.00
48.56	2.00	0.00	2.60	0.17	0.00	48.72	2.00	0.00	2.58	0.16	0.00
48.89	2.00	0.00	2.55	0.17	0.00	49.05	2.00	0.00	2.52	0.16	0.00
49.22	2.00	0.00	2.50	0.17	0.00	49.38	2.00	0.00	2.47	0.16	0.00
49.54	2.00	0.00	2.45	0.16	0.00	49.71	2.00	0.00	2.42	0.17	0.00
49.87	2.00	0.00	2.40	0.16	0.00	50.04	2.00	0.00	2.37	0.17	0.00

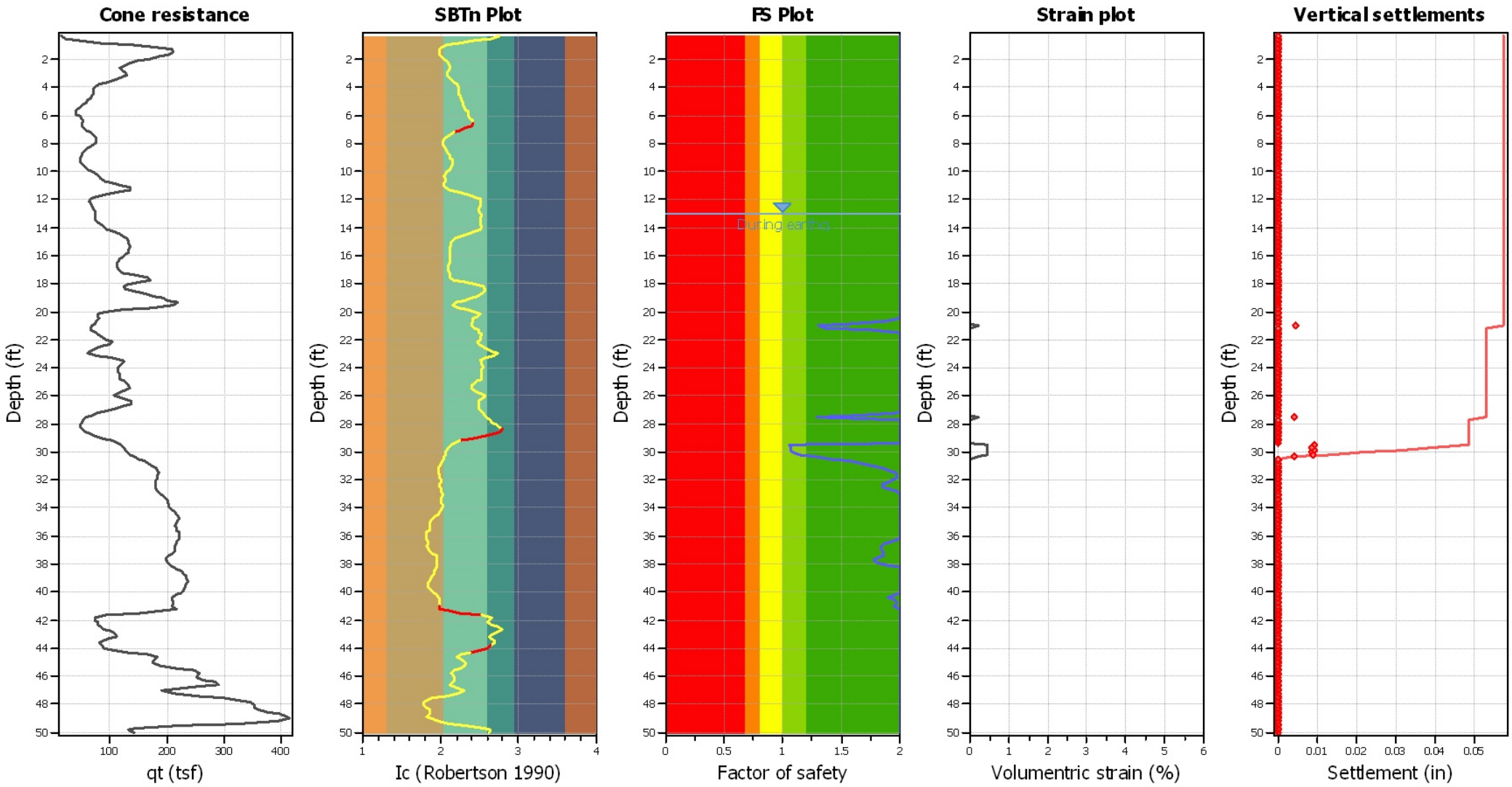
Overall liquefaction potential: 0.00

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
w_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

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)
13.12	241.46	2.00	0.00	1.00	0.00	13.29	239.19	2.00	0.00	1.00	0.00
13.45	242.61	2.00	0.00	1.00	0.00	13.62	255.11	2.00	0.00	1.00	0.00
13.78	276.12	2.00	0.00	1.00	0.00	13.94	295.08	2.00	0.00	1.00	0.00
14.11	303.17	2.00	0.00	1.00	0.00	14.27	294.81	2.00	0.00	1.00	0.00
14.44	272.11	2.00	0.00	1.00	0.00	14.60	246.77	2.00	0.00	1.00	0.00
14.76	227.99	2.00	0.00	1.00	0.00	14.93	219.81	2.00	0.00	1.00	0.00
15.09	215.84	2.00	0.00	1.00	0.00	15.26	211.82	2.00	0.00	1.00	0.00
15.42	206.95	2.00	0.00	1.00	0.00	15.58	204.38	2.00	0.00	1.00	0.00
15.75	201.64	2.00	0.00	1.00	0.00	15.91	196.54	2.00	0.00	1.00	0.00
16.08	188.45	2.00	0.00	1.00	0.00	16.24	180.08	2.00	0.00	1.00	0.00
16.40	172.84	2.00	0.00	1.00	0.00	16.57	168.15	2.00	0.00	1.00	0.00
16.73	165.96	2.00	0.00	1.00	0.00	16.90	166.01	2.00	0.00	1.00	0.00
17.06	169.29	2.00	0.00	1.00	0.00	17.23	180.84	2.00	0.00	1.00	0.00
17.39	204.68	2.00	0.00	1.00	0.00	17.55	242.22	2.00	0.00	1.00	0.00
17.72	267.34	2.00	0.00	1.00	0.00	17.88	299.58	2.00	0.00	1.00	0.00
18.05	337.29	2.00	0.00	1.00	0.00	18.21	370.38	2.00	0.00	1.00	0.00
18.37	391.53	2.00	0.00	1.00	0.00	18.54	415.72	2.00	0.00	1.00	0.00
18.70	443.06	2.00	0.00	1.00	0.00	18.87	448.39	2.00	0.00	1.00	0.00
19.03	420.23	2.00	0.00	1.00	0.00	19.19	372.99	2.00	0.00	1.00	0.00
19.36	338.22	2.00	0.00	1.00	0.00	19.52	313.28	2.00	0.00	1.00	0.00
19.69	280.85	2.00	0.00	1.00	0.00	19.85	244.60	2.00	0.00	1.00	0.00
20.01	215.32	2.00	0.00	1.00	0.00	20.18	201.58	2.00	0.00	1.00	0.00
20.34	191.32	2.00	0.00	1.00	0.00	20.51	178.93	2.00	0.00	1.00	0.00
20.67	165.00	1.88	0.00	1.00	0.00	20.83	152.72	1.55	0.00	1.00	0.00
21.00	142.42	1.31	0.22	1.00	0.00	21.16	145.27	1.37	0.00	1.00	0.00
21.33	161.39	1.76	0.00	1.00	0.00	21.49	181.50	2.00	0.00	1.00	0.00
21.65	198.31	2.00	0.00	1.00	0.00	21.82	215.50	2.00	0.00	1.00	0.00
21.98	232.56	2.00	0.00	1.00	0.00	22.15	240.52	2.00	0.00	1.00	0.00
22.31	234.91	2.00	0.00	1.00	0.00	22.47	218.48	2.00	0.00	1.00	0.00
22.64	201.50	2.00	0.00	1.00	0.00	22.80	198.45	2.00	0.00	1.00	0.00
22.97	219.01	2.00	0.00	1.00	0.00	23.13	251.09	2.00	0.00	1.00	0.00
23.30	281.55	2.00	0.00	1.00	0.00	23.46	296.97	2.00	0.00	1.00	0.00
23.62	305.63	2.00	0.00	1.00	0.00	23.79	298.26	2.00	0.00	1.00	0.00
23.95	292.27	2.00	0.00	1.00	0.00	24.12	280.06	2.00	0.00	1.00	0.00
24.28	278.72	2.00	0.00	1.00	0.00	24.44	277.43	2.00	0.00	1.00	0.00
24.61	276.96	2.00	0.00	1.00	0.00	24.77	276.19	2.00	0.00	1.00	0.00
24.94	268.61	2.00	0.00	1.00	0.00	25.10	258.16	2.00	0.00	1.00	0.00
25.26	251.23	2.00	0.00	1.00	0.00	25.43	247.56	2.00	0.00	1.00	0.00
25.59	249.75	2.00	0.00	1.00	0.00	25.76	253.22	2.00	0.00	1.00	0.00
25.92	266.06	2.00	0.00	1.00	0.00	26.08	278.91	2.00	0.00	1.00	0.00
26.25	289.61	2.00	0.00	1.00	0.00	26.41	295.91	2.00	0.00	1.00	0.00
26.58	289.91	2.00	0.00	1.00	0.00	26.74	268.87	2.00	0.00	1.00	0.00
26.90	237.04	2.00	0.00	1.00	0.00	27.07	207.46	2.00	0.00	1.00	0.00
27.23	182.29	2.00	0.00	1.00	0.00	27.40	161.85	1.60	0.00	1.00	0.00
27.56	148.07	1.29	0.22	1.00	0.00	27.72	139.59	2.00	0.00	1.00	0.00
27.89	139.03	2.00	0.00	1.00	0.00	28.05	144.08	2.00	0.00	1.00	0.00
28.22	157.63	2.00	0.00	1.00	0.00	28.38	173.97	2.00	0.00	1.00	0.00
28.54	185.74	2.00	0.00	1.00	0.00	28.71	185.61	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)
28.87	172.95	2.00	0.00	1.00	0.00	29.04	154.85	2.00	0.00	1.00	0.00
29.20	143.67	2.00	0.00	1.00	0.00	29.36	138.11	2.00	0.00	1.00	0.00
29.53	137.53	1.06	0.45	1.00	0.01	29.69	138.19	1.07	0.45	1.00	0.01
29.86	138.48	1.07	0.45	1.00	0.01	30.02	139.21	1.09	0.44	1.00	0.01
30.19	142.42	1.14	0.44	1.00	0.01	30.35	148.94	1.27	0.22	1.00	0.00
30.51	156.02	1.41	0.00	1.00	0.00	30.68	162.44	1.56	0.00	1.00	0.00
30.84	167.21	1.68	0.00	1.00	0.00	31.01	171.61	1.79	0.00	1.00	0.00
31.17	174.24	1.86	0.00	1.00	0.00	31.33	176.49	1.92	0.00	1.00	0.00
31.50	178.20	1.96	0.00	1.00	0.00	31.66	178.83	1.98	0.00	1.00	0.00
31.83	178.93	1.98	0.00	1.00	0.00	31.99	177.70	1.94	0.00	1.00	0.00
32.15	176.34	1.90	0.00	1.00	0.00	32.32	174.84	1.86	0.00	1.00	0.00
32.48	174.62	1.85	0.00	1.00	0.00	32.65	176.24	1.89	0.00	1.00	0.00
32.81	179.39	1.98	0.00	1.00	0.00	32.97	183.68	2.00	0.00	1.00	0.00
33.14	188.68	2.00	0.00	1.00	0.00	33.30	192.46	2.00	0.00	1.00	0.00
33.47	194.97	2.00	0.00	1.00	0.00	33.63	195.48	2.00	0.00	1.00	0.00
33.79	196.28	2.00	0.00	1.00	0.00	33.96	197.11	2.00	0.00	1.00	0.00
34.12	198.89	2.00	0.00	1.00	0.00	34.29	200.21	2.00	0.00	1.00	0.00
34.45	198.84	2.00	0.00	1.00	0.00	34.61	195.93	2.00	0.00	1.00	0.00
34.78	191.68	2.00	0.00	1.00	0.00	34.94	187.95	2.00	0.00	1.00	0.00
35.11	184.59	2.00	0.00	1.00	0.00	35.27	182.52	2.00	0.00	1.00	0.00
35.43	182.09	2.00	0.00	1.00	0.00	35.60	182.30	2.00	0.00	1.00	0.00
35.76	182.23	2.00	0.00	1.00	0.00	35.93	182.38	2.00	0.00	1.00	0.00
36.09	182.00	2.00	0.00	1.00	0.00	36.26	180.90	1.99	0.00	1.00	0.00
36.42	178.41	1.92	0.00	1.00	0.00	36.58	176.34	1.86	0.00	1.00	0.00
36.75	175.48	1.84	0.00	1.00	0.00	36.91	175.65	1.84	0.00	1.00	0.00
37.08	176.10	1.85	0.00	1.00	0.00	37.24	176.43	1.86	0.00	1.00	0.00
37.40	176.47	1.86	0.00	1.00	0.00	37.57	174.16	1.80	0.00	1.00	0.00
37.73	173.41	1.78	0.00	1.00	0.00	37.90	174.20	1.80	0.00	1.00	0.00
38.06	178.12	1.90	0.00	1.00	0.00	38.22	182.16	2.00	0.00	1.00	0.00
38.39	186.37	2.00	0.00	1.00	0.00	38.55	190.28	2.00	0.00	1.00	0.00
38.72	191.86	2.00	0.00	1.00	0.00	38.88	192.31	2.00	0.00	1.00	0.00
39.04	191.89	2.00	0.00	1.00	0.00	39.21	190.48	2.00	0.00	1.00	0.00
39.37	187.54	2.00	0.00	1.00	0.00	39.54	184.53	2.00	0.00	1.00	0.00
39.70	183.71	2.00	0.00	1.00	0.00	39.86	184.26	2.00	0.00	1.00	0.00
40.03	183.03	2.00	0.00	1.00	0.00	40.19	180.42	1.97	0.00	1.00	0.00
40.36	178.27	1.90	0.00	1.00	0.00	40.52	179.62	1.94	0.00	1.00	0.00
40.68	180.90	1.98	0.00	1.00	0.00	40.85	180.72	1.97	0.00	1.00	0.00
41.01	180.00	1.95	0.00	1.00	0.00	41.18	185.04	2.00	0.00	1.00	0.00
41.34	180.58	2.00	0.00	1.00	0.00	41.50	169.68	2.00	0.00	1.00	0.00
41.67	162.47	2.00	0.00	1.00	0.00	41.83	151.98	2.00	0.00	1.00	0.00
42.00	144.28	2.00	0.00	1.00	0.00	42.16	147.66	2.00	0.00	1.00	0.00
42.32	165.88	2.00	0.00	1.00	0.00	42.49	197.03	2.00	0.00	1.00	0.00
42.65	226.92	2.00	0.00	1.00	0.00	42.82	241.72	2.00	0.00	1.00	0.00
42.98	234.92	2.00	0.00	1.00	0.00	43.15	214.80	2.00	0.00	1.00	0.00
43.31	197.69	2.00	0.00	1.00	0.00	43.47	186.49	2.00	0.00	1.00	0.00
43.64	177.20	2.00	0.00	1.00	0.00	43.80	167.39	2.00	0.00	1.00	0.00
43.97	163.25	2.00	0.00	1.00	0.00	44.13	166.00	2.00	0.00	1.00	0.00
44.29	172.40	2.00	0.00	1.00	0.00	44.46	181.48	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)
44.62	189.34	2.00	0.00	1.00	0.00	44.79	195.26	2.00	0.00	1.00	0.00
44.95	200.74	2.00	0.00	1.00	0.00	45.11	209.60	2.00	0.00	1.00	0.00
45.28	219.34	2.00	0.00	1.00	0.00	45.44	231.11	2.00	0.00	1.00	0.00
45.61	238.98	2.00	0.00	1.00	0.00	45.77	240.33	2.00	0.00	1.00	0.00
45.93	238.78	2.00	0.00	1.00	0.00	46.10	242.42	2.00	0.00	1.00	0.00
46.26	254.39	2.00	0.00	1.00	0.00	46.43	264.38	2.00	0.00	1.00	0.00
46.59	262.45	2.00	0.00	1.00	0.00	46.75	244.80	2.00	0.00	1.00	0.00
46.92	225.92	2.00	0.00	1.00	0.00	47.08	217.75	2.00	0.00	1.00	0.00
47.25	211.05	2.00	0.00	1.00	0.00	47.41	214.12	2.00	0.00	1.00	0.00
47.57	224.16	2.00	0.00	1.00	0.00	47.74	236.16	2.00	0.00	1.00	0.00
47.90	245.05	2.00	0.00	1.00	0.00	48.07	250.95	2.00	0.00	1.00	0.00
48.23	253.60	2.00	0.00	1.00	0.00	48.39	261.16	2.00	0.00	1.00	0.00
48.56	274.36	2.00	0.00	1.00	0.00	48.72	287.82	2.00	0.00	1.00	0.00
48.89	293.08	2.00	0.00	1.00	0.00	49.05	302.44	2.00	0.00	1.00	0.00
49.22	302.53	2.00	0.00	1.00	0.00	49.38	280.13	2.00	0.00	1.00	0.00
49.54	248.41	2.00	0.00	1.00	0.00	49.71	230.55	2.00	0.00	1.00	0.00
49.87	238.55	2.00	0.00	1.00	0.00	50.04	249.98	2.00	0.00	1.00	0.00

Total estimated settlement: 0.06

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

:: Strength loss calculation (Robertson (2009) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
0.33	16.07	25.78	4.34	111.85	2.75	N/A	N/A
0.49	23.87	38.30	3.56	136.47	2.64	N/A	N/A
0.66	44.20	70.95	2.47	175.39	2.44	N/A	N/A
0.82	84.17	135.15	1.72	232.53	2.22	N/A	N/A
0.98	136.70	219.53	1.43	313.61	2.09	N/A	N/A
1.15	184.97	297.06	1.32	391.03	2.01	N/A	N/A
1.31	209.77	336.89	1.27	429.51	1.98	N/A	N/A
1.48	210.97	338.80	1.28	432.07	1.98	N/A	N/A
1.64	201.47	323.52	1.28	415.30	1.99	N/A	N/A
1.80	186.80	299.94	1.32	394.93	2.01	N/A	N/A
1.97	169.30	271.80	1.35	367.69	2.04	N/A	N/A
2.13	148.84	238.90	1.41	336.86	2.07	N/A	N/A
2.30	132.30	212.32	1.46	309.89	2.10	N/A	N/A
2.46	121.77	195.38	1.49	291.50	2.12	N/A	N/A
2.62	118.64	190.33	1.49	283.37	2.12	N/A	N/A
2.79	122.40	196.37	1.46	286.52	2.10	N/A	N/A
2.95	128.80	206.63	1.42	292.48	2.08	N/A	N/A
3.12	130.24	208.92	1.41	294.42	2.07	N/A	N/A
3.28	123.27	197.71	1.45	285.95	2.10	N/A	N/A
3.45	109.74	175.95	1.52	266.58	2.13	N/A	N/A
3.61	94.70	151.78	1.60	242.15	2.17	N/A	N/A
3.77	81.54	130.61	1.68	219.57	2.21	N/A	N/A
3.94	74.54	119.34	1.74	208.07	2.23	N/A	N/A
4.10	72.50	116.06	1.76	204.77	2.24	N/A	N/A
4.27	72.87	116.63	1.76	204.83	2.23	N/A	N/A
4.43	72.07	115.33	1.76	203.21	2.24	N/A	N/A
4.59	69.50	111.19	1.80	199.82	2.25	N/A	N/A
4.76	66.04	105.60	1.84	194.83	2.27	N/A	N/A
4.92	62.40	99.75	1.87	186.60	2.27	N/A	N/A
5.09	58.87	94.05	1.88	176.49	2.28	N/A	N/A
5.25	54.24	86.59	1.88	162.41	2.28	N/A	N/A
5.41	48.14	76.78	1.95	149.39	2.30	N/A	N/A
5.58	42.67	67.98	2.06	139.78	2.33	N/A	N/A
5.74	40.43	64.37	2.14	138.03	2.36	N/A	N/A
5.91	42.63	67.89	2.18	148.10	2.37	N/A	N/A
6.07	47.87	76.28	2.19	166.70	2.37	N/A	N/A
6.23	52.70	84.03	2.25	189.33	2.39	N/A	N/A
6.40	53.77	85.72	2.35	201.27	2.41	N/A	N/A
6.56	52.23	83.24	2.40	200.04	2.42	N/A	N/A
6.73	51.86	82.63	2.27	187.79	2.39	N/A	N/A
6.89	55.06	87.75	2.01	176.57	2.32	N/A	N/A
7.05	60.16	95.93	1.79	171.54	2.25	N/A	N/A
7.22	66.06	105.40	1.61	169.67	2.18	N/A	N/A
7.38	71.73	114.49	1.49	170.54	2.12	N/A	N/A
7.55	76.30	120.80	1.40	169.40	2.07	N/A	N/A
7.71	78.16	121.31	1.37	165.70	2.05	N/A	N/A
7.87	77.20	117.69	1.34	157.87	2.03	N/A	N/A
8.04	73.46	110.55	1.34	148.70	2.03	N/A	N/A

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
8.20	67.93	101.12	1.36	137.09	2.04	N/A	N/A
8.37	61.60	91.01	1.39	126.60	2.06	N/A	N/A
8.53	56.13	82.15	1.42	116.36	2.08	N/A	N/A
8.69	52.30	76.00	1.45	110.44	2.10	N/A	N/A
8.86	50.36	72.49	1.48	107.12	2.11	N/A	N/A
9.02	49.43	70.56	1.51	106.21	2.13	N/A	N/A
9.19	49.06	69.51	1.55	107.49	2.15	N/A	N/A
9.35	49.30	69.25	1.57	108.94	2.16	N/A	N/A
9.51	51.30	71.32	1.58	112.64	2.16	N/A	N/A
9.68	55.86	76.43	1.53	116.66	2.14	N/A	N/A
9.84	62.83	84.65	1.47	124.76	2.11	N/A	N/A
10.01	70.16	92.91	1.41	131.17	2.08	N/A	N/A
10.17	75.96	99.25	1.38	137.01	2.06	N/A	N/A
10.34	79.86	103.20	1.37	141.87	2.05	N/A	N/A
10.50	84.33	108.15	1.39	150.73	2.06	N/A	N/A
10.66	92.60	117.67	1.40	164.29	2.07	N/A	N/A
10.83	105.66	132.65	1.37	182.30	2.05	N/A	N/A
10.99	121.70	151.36	1.37	207.77	2.05	N/A	N/A
11.16	135.66	167.32	1.39	232.44	2.06	N/A	N/A
11.32	135.26	166.51	1.48	246.94	2.12	N/A	N/A
11.48	117.63	145.12	1.68	243.80	2.21	N/A	N/A
11.65	91.26	113.21	2.07	234.35	2.34	N/A	N/A
11.81	72.10	89.62	2.53	226.42	2.45	N/A	N/A
11.98	65.80	81.27	2.77	225.46	2.50	N/A	N/A
12.14	65.17	79.68	2.84	225.91	2.51	N/A	N/A
12.30	67.01	81.01	2.83	229.05	2.51	N/A	N/A
12.47	69.62	83.10	2.77	230.32	2.50	N/A	N/A
12.63	73.09	86.24	2.73	235.05	2.49	N/A	N/A
12.80	74.26	86.67	2.75	238.14	2.50	N/A	N/A
12.96	74.03	85.59	2.83	241.88	2.51	N/A	N/A
13.12	73.20	84.10	2.87	241.46	2.52	0.80	0.80
13.29	73.94	84.39	2.83	239.19	2.51	0.80	0.80
13.45	75.50	85.71	2.83	242.61	2.51	0.81	0.81
13.62	79.84	90.14	2.83	255.11	2.51	0.81	0.81
13.78	86.27	96.95	2.85	276.12	2.52	0.82	0.82
13.94	89.98	100.70	2.93	295.08	2.53	0.83	0.83
14.11	95.42	106.08	2.86	303.17	2.52	0.84	0.84
14.27	104.35	114.93	2.57	294.81	2.46	0.85	0.85
14.44	116.35	126.58	2.15	272.11	2.36	0.86	0.86
14.60	126.07	135.57	1.82	246.77	2.26	0.87	0.87
14.76	130.06	138.60	1.64	227.99	2.19	0.87	0.87
14.93	132.96	140.68	1.56	219.81	2.15	0.88	0.88
15.09	133.62	140.64	1.53	215.84	2.14	0.88	0.88
15.26	133.99	140.28	1.51	211.82	2.13	0.88	0.88
15.42	134.05	139.63	1.48	206.95	2.11	0.88	0.88
15.58	133.08	138.03	1.48	204.38	2.11	0.87	0.87
15.75	131.62	135.90	1.48	201.64	2.12	0.87	0.87
15.91	127.98	131.61	1.49	196.54	2.12	0.87	0.87

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
16.08	123.42	126.32	1.49	188.45	2.12	0.86	0.86
16.24	118.08	120.35	1.50	180.08	2.12	0.85	0.85
16.40	113.85	115.53	1.50	172.84	2.12	0.85	0.85
16.57	112.21	113.35	1.48	168.15	2.12	0.85	0.85
16.73	112.51	113.17	1.47	165.96	2.11	0.84	0.84
16.90	113.98	114.17	1.45	166.01	2.10	0.85	0.85
17.06	116.81	116.58	1.45	169.29	2.10	0.85	0.85
17.23	123.57	122.93	1.47	180.84	2.11	0.86	0.86
17.39	139.34	138.23	1.48	204.68	2.11	0.87	0.87
17.55	165.07	163.31	1.48	242.22	2.12	0.90	0.90
17.72	170.44	168.15	1.59	267.34	2.17	0.90	0.90
17.88	155.75	153.39	1.95	299.58	2.30	0.89	0.89
18.05	129.73	127.45	2.65	337.29	2.48	0.86	0.86
18.21	125.10	122.43	3.03	370.38	2.55	0.86	0.86
18.37	127.57	124.28	3.15	391.53	2.57	0.86	0.86
18.54	136.81	132.63	3.13	415.72	2.57	0.87	0.87
18.70	160.01	154.44	2.87	443.06	2.52	0.89	0.89
18.87	176.75	169.74	2.64	448.39	2.47	0.90	0.90
19.03	193.69	185.09	2.27	420.23	2.39	0.92	0.92
19.19	201.39	191.51	1.95	372.99	2.30	0.92	0.92
19.36	217.85	206.22	1.64	338.22	2.19	0.93	0.93
19.52	210.54	198.43	1.58	313.28	2.16	0.93	0.93
19.69	173.77	162.87	1.72	280.85	2.22	0.90	0.90
19.85	124.47	115.81	2.11	244.60	2.35	0.85	0.85
20.01	90.68	83.65	2.57	215.32	2.46	0.80	0.80
20.18	79.36	72.71	2.77	201.58	2.50	0.78	0.78
20.34	80.54	73.52	2.60	191.32	2.47	0.78	0.78
20.51	81.35	73.97	2.42	178.93	2.43	0.79	0.79
20.67	77.49	70.14	2.35	165.00	2.41	0.78	0.78
20.83	73.73	66.43	2.30	152.72	2.40	0.77	0.77
21.00	68.96	61.80	2.30	142.42	2.40	0.76	0.76
21.16	65.76	58.61	2.48	145.27	2.44	0.75	0.75
21.33	67.83	60.19	2.68	161.39	2.48	0.76	0.76
21.49	75.67	67.01	2.71	181.50	2.49	0.77	0.77
21.65	78.40	69.13	2.87	198.31	2.52	0.78	0.78
21.82	86.53	76.10	2.83	215.50	2.51	0.79	0.79
21.98	94.81	83.16	2.80	232.56	2.51	0.80	0.80
22.15	104.11	91.11	2.64	240.52	2.47	0.81	0.81
22.31	99.38	86.51	2.72	234.91	2.49	0.81	0.81
22.47	86.51	74.73	2.92	218.48	2.53	0.79	0.79
22.64	73.30	62.74	3.21	201.50	2.58	0.76	0.76
22.80	63.20	53.53	3.71	198.45	2.66	3.78	3.78
22.97	60.49	50.79	4.31	219.01	2.74	3.60	3.60
23.13	78.60	66.26	3.79	251.09	2.67	4.68	4.68
23.30	103.04	87.16	3.23	281.55	2.58	0.81	0.81
23.46	122.78	103.95	2.86	296.97	2.52	0.83	0.83
23.62	124.92	105.29	2.90	305.63	2.53	0.83	0.83
23.79	121.02	101.47	2.94	298.26	2.53	0.83	0.83

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
23.95	114.72	95.60	3.06	292.27	2.55	0.82	0.82
24.12	114.39	95.00	2.95	280.06	2.53	0.82	0.82
24.28	114.16	94.40	2.95	278.72	2.54	0.82	0.82
24.44	117.11	96.55	2.87	277.43	2.52	0.82	0.82
24.61	116.37	95.48	2.90	276.96	2.53	0.82	0.82
24.77	117.14	95.74	2.88	276.19	2.52	0.82	0.82
24.94	125.16	102.27	2.63	268.61	2.47	0.83	0.83
25.10	130.28	106.38	2.43	258.16	2.43	0.84	0.84
25.26	133.31	108.67	2.31	251.23	2.40	0.84	0.84
25.43	134.49	109.29	2.27	247.56	2.39	0.84	0.84
25.59	130.19	105.16	2.37	249.75	2.42	0.83	0.83
25.76	118.57	94.83	2.67	253.22	2.48	0.82	0.82
25.92	106.69	84.31	3.16	266.06	2.57	0.80	0.80
26.08	114.00	89.87	3.10	278.91	2.56	0.81	0.81
26.25	129.47	102.19	2.83	289.61	2.51	0.83	0.83
26.41	138.28	109.01	2.71	295.91	2.49	0.84	0.84
26.58	136.73	107.35	2.70	289.91	2.49	0.84	0.84
26.74	126.47	98.78	2.72	268.87	2.49	0.83	0.83
26.90	111.28	86.39	2.74	237.04	2.50	0.81	0.81
27.07	92.84	71.38	2.91	207.46	2.53	0.78	0.78
27.23	79.48	60.60	3.01	182.29	2.55	0.76	0.76
27.40	69.52	52.57	3.08	161.85	2.56	0.74	0.74
27.56	60.32	45.14	3.28	148.07	2.59	0.72	0.72
27.72	53.39	39.51	3.53	139.59	2.63	2.74	2.74
27.89	50.49	37.03	3.75	139.03	2.67	2.58	2.58
28.05	48.12	34.94	4.12	144.08	2.72	2.44	2.44
28.22	49.56	35.75	4.41	157.63	2.75	2.51	2.51
28.38	51.73	37.11	4.69	173.97	2.79	2.61	2.61
28.54	56.66	40.68	4.57	185.74	2.77	2.86	2.86
28.71	63.26	45.69	4.06	185.61	2.71	3.19	3.19
28.87	74.98	54.99	3.14	172.95	2.57	0.75	0.75
29.04	90.74	67.83	2.28	154.85	2.39	0.77	0.77
29.20	104.26	79.03	1.82	143.67	2.26	0.79	0.79
29.36	113.75	86.94	1.59	138.11	2.17	0.81	0.81
29.53	118.81	90.98	1.51	137.53	2.13	0.81	0.81
29.69	124.38	95.40	1.45	138.19	2.10	0.82	0.82
29.86	128.14	98.32	1.41	138.48	2.07	0.82	0.82
30.02	130.81	100.28	1.39	139.21	2.06	0.83	0.83
30.19	134.54	102.95	1.38	142.42	2.06	0.83	0.83
30.35	141.87	108.45	1.37	148.94	2.05	0.84	0.84
30.51	150.97	115.40	1.35	156.02	2.04	0.85	0.85
30.68	160.07	122.36	1.33	162.44	2.02	0.86	0.86
30.84	167.91	128.39	1.30	167.21	2.00	0.86	0.86
31.01	174.84	133.63	1.28	171.61	1.99	0.87	0.87
31.17	180.07	137.59	1.27	174.24	1.97	0.87	0.87
31.33	183.37	139.86	1.26	176.49	1.97	0.88	0.88
31.50	185.58	141.20	1.26	178.20	1.97	0.88	0.88
31.66	184.34	139.64	1.28	178.83	1.98	0.88	0.88

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
31.83	183.05	138.07	1.30	178.93	2.00	0.87	0.87
31.99	180.95	135.99	1.31	177.70	2.01	0.87	0.87
32.15	180.95	135.77	1.30	176.34	2.00	0.87	0.87
32.32	180.65	135.28	1.29	174.84	1.99	0.87	0.87
32.48	180.85	135.11	1.29	174.62	1.99	0.87	0.87
32.65	181.75	135.30	1.30	176.24	2.00	0.87	0.87
32.81	183.78	136.32	1.32	179.39	2.01	0.87	0.87
32.97	187.42	138.58	1.33	183.68	2.02	0.87	0.87
33.14	192.95	142.34	1.33	188.68	2.02	0.88	0.88
33.30	198.05	145.89	1.32	192.46	2.01	0.88	0.88
33.47	201.42	148.05	1.32	194.97	2.01	0.88	0.88
33.63	202.29	148.31	1.32	195.48	2.01	0.88	0.88
33.79	202.72	148.17	1.32	196.28	2.02	0.88	0.88
33.96	204.46	149.11	1.32	197.11	2.02	0.88	0.88
34.12	208.39	151.85	1.31	198.89	2.01	0.89	0.89
34.29	213.32	155.48	1.29	200.21	1.99	0.89	0.89
34.45	216.93	158.40	1.26	198.84	1.96	0.89	0.89
34.61	219.53	160.78	1.22	195.93	1.93	0.90	0.90
34.78	220.66	162.17	1.18	191.68	1.89	0.90	0.90
34.94	219.46	161.43	1.16	187.95	1.87	0.90	0.90
35.11	217.49	159.90	1.15	184.59	1.86	0.90	0.90
35.27	214.95	157.58	1.16	182.52	1.87	0.89	0.89
35.43	215.45	157.74	1.15	182.09	1.86	0.89	0.89
35.60	217.15	158.86	1.15	182.30	1.85	0.89	0.89
35.76	220.35	161.55	1.13	182.23	1.83	0.90	0.90
35.93	222.55	163.20	1.12	182.38	1.81	0.90	0.90
36.09	222.42	162.76	1.12	182.00	1.82	0.90	0.90
36.26	220.32	160.58	1.13	180.90	1.83	0.90	0.90
36.42	217.02	157.67	1.13	178.41	1.83	0.89	0.89
36.58	215.16	156.05	1.13	176.34	1.83	0.89	0.89
36.75	214.82	155.55	1.13	175.48	1.83	0.89	0.89
36.91	214.95	155.23	1.13	175.65	1.83	0.89	0.89
37.08	213.55	153.32	1.15	176.10	1.85	0.89	0.89
37.24	208.79	148.37	1.19	176.43	1.90	0.88	0.88
37.40	203.62	143.31	1.23	176.47	1.94	0.88	0.88
37.57	199.39	139.62	1.25	174.16	1.96	0.88	0.88
37.73	199.32	139.35	1.24	173.41	1.95	0.87	0.87
37.90	201.62	140.83	1.24	174.20	1.95	0.88	0.88
38.06	206.02	143.56	1.24	178.12	1.95	0.88	0.88
38.22	211.65	147.33	1.24	182.16	1.95	0.88	0.88
38.39	218.59	152.18	1.22	186.37	1.94	0.89	0.89
38.55	225.62	157.21	1.21	190.28	1.92	0.89	0.89
38.72	230.19	160.54	1.20	191.86	1.91	0.90	0.90
38.88	233.12	162.70	1.18	192.31	1.89	0.90	0.90
39.04	234.99	164.13	1.17	191.89	1.88	0.90	0.90
39.21	236.26	165.30	1.15	190.48	1.86	0.90	0.90
39.37	235.19	164.77	1.14	187.54	1.84	0.90	0.90
39.54	232.72	162.92	1.13	184.53	1.83	0.90	0.90

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
39.70	231.09	161.18	1.14	183.71	1.84	0.90	0.90
39.86	228.72	158.32	1.16	184.26	1.87	0.89	0.89
40.03	223.39	153.28	1.19	183.03	1.91	0.89	0.89
40.19	215.49	146.42	1.23	180.42	1.94	0.88	0.88
40.36	209.72	141.45	1.26	178.27	1.97	0.88	0.88
40.52	208.66	139.89	1.28	179.62	1.99	0.88	0.88
40.68	210.32	140.69	1.29	180.90	1.99	0.88	0.88
40.85	211.56	141.40	1.28	180.72	1.98	0.88	0.88
41.01	209.56	139.48	1.29	180.00	1.99	0.88	0.88
41.18	216.20	143.71	1.29	185.04	1.99	0.88	0.88
41.34	192.93	125.10	1.44	180.58	2.09	0.86	0.86
41.50	150.60	93.91	1.81	169.68	2.25	0.82	0.82
41.67	95.50	55.47	2.93	162.47	2.53	0.75	0.75
41.83	73.22	40.92	3.71	151.98	2.66	2.75	2.75
42.00	74.31	41.78	3.45	144.28	2.62	2.78	2.78
42.16	78.32	44.16	3.34	147.66	2.60	2.93	2.93
42.32	80.15	44.56	3.72	165.88	2.66	2.99	2.99
42.49	84.51	46.18	4.27	197.03	2.74	3.15	3.15
42.65	89.99	48.61	4.67	226.92	2.79	3.35	3.35
42.82	101.63	55.35	4.37	241.72	2.75	3.78	3.78
42.98	110.33	60.94	3.85	234.92	2.68	4.10	4.10
43.15	112.32	62.76	3.42	214.80	2.62	4.17	4.17
43.31	100.45	55.54	3.56	197.69	2.64	3.70	3.70
43.47	87.22	47.29	3.94	186.49	2.69	3.19	3.19
43.64	83.13	44.86	3.95	177.20	2.69	3.03	3.03
43.80	86.80	47.42	3.53	167.39	2.63	3.15	3.15
43.97	89.32	49.06	3.33	163.25	2.60	3.24	3.24
44.13	101.93	57.00	2.91	166.00	2.53	0.75	0.75
44.29	131.93	76.51	2.25	172.40	2.39	0.79	0.79
44.46	165.20	98.67	1.84	181.48	2.26	0.83	0.83
44.62	183.07	110.42	1.71	189.34	2.22	0.84	0.84
44.79	182.05	108.78	1.79	195.26	2.25	0.84	0.84
44.95	175.95	103.70	1.94	200.74	2.30	0.83	0.83
45.11	174.82	101.92	2.06	209.60	2.33	0.83	0.83
45.28	189.59	111.01	1.98	219.34	2.31	0.84	0.84
45.44	219.66	130.70	1.77	231.11	2.24	0.87	0.87
45.61	245.72	148.23	1.61	238.98	2.18	0.88	0.88
45.77	257.62	156.45	1.54	240.33	2.14	0.89	0.89
45.93	254.62	154.03	1.55	238.78	2.15	0.89	0.89
46.10	252.35	151.45	1.60	242.42	2.17	0.89	0.89
46.26	264.32	158.27	1.61	254.39	2.17	0.89	0.89
46.43	283.67	170.70	1.55	264.38	2.15	0.91	0.91
46.59	289.10	174.58	1.50	262.45	2.13	0.91	0.91
46.75	259.60	154.83	1.58	244.80	2.16	0.89	0.89
46.92	214.16	124.21	1.82	225.92	2.26	0.86	0.86
47.08	192.03	109.43	1.99	217.75	2.31	0.84	0.84
47.25	210.58	122.62	1.72	211.05	2.22	0.86	0.86
47.41	256.19	155.65	1.38	214.12	2.05	0.89	0.89

:: Strength loss calculation (Robertson (2009) :: (continued)

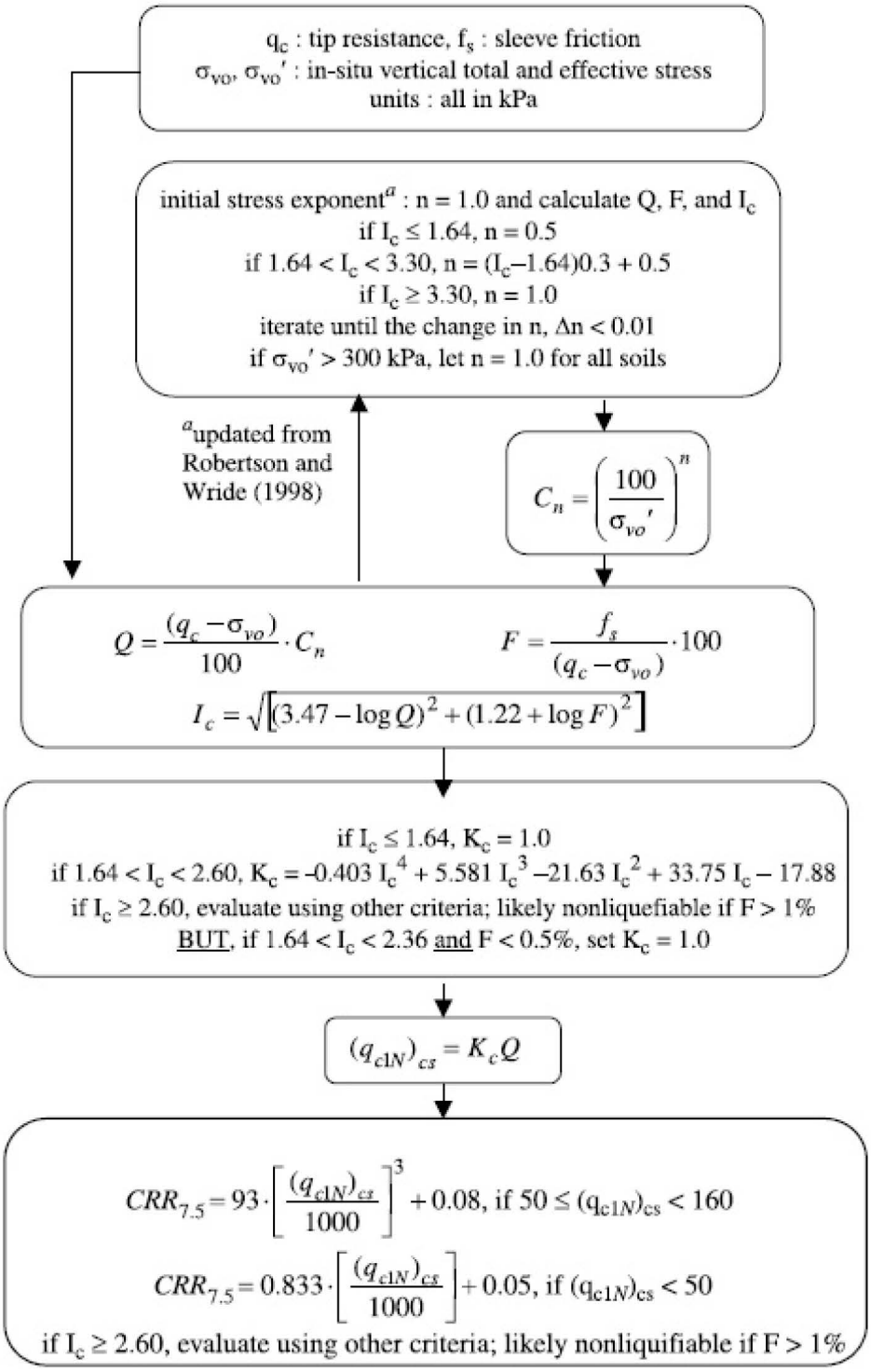
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
47.57	298.46	188.27	1.19	224.16	1.90	0.92	0.92
47.74	326.79	210.02	1.12	236.16	1.82	0.94	0.94
47.90	344.72	223.37	1.10	245.05	1.79	0.95	0.95
48.07	353.96	229.18	1.10	250.95	1.78	0.95	0.95
48.23	354.09	227.20	1.12	253.60	1.81	0.95	0.95
48.39	358.86	227.55	1.15	261.16	1.85	0.95	0.95
48.56	376.13	237.68	1.15	274.36	1.86	0.96	0.96
48.72	397.17	251.40	1.14	287.82	1.85	0.97	0.97
48.89	408.97	259.93	1.13	293.08	1.83	0.97	0.97
49.05	414.10	259.70	1.16	302.44	1.87	0.97	0.97
49.22	393.13	239.96	1.26	302.53	1.97	0.96	0.96
49.38	321.63	188.02	1.49	280.13	2.12	0.92	0.92
49.54	227.01	125.41	1.98	248.41	2.31	0.86	0.86
49.71	144.81	73.96	3.12	230.55	2.56	0.79	0.79
49.87	133.93	66.78	3.57	238.55	2.64	4.39	4.39
50.04	143.84	71.94	3.47	249.98	2.62	4.71	4.71

Abbreviations

q_t:	Total cone resistance
K_c:	Cone resistance correction factor due to fines
$Q_{tn,cs}$:	Adjusted and corrected cone resistance due to fines
I_c:	Soil behavior type index
$S_{u(liq)}/\sigma'_v$:	Calculated liquefied undrained strength ratio
$S_{u(peak)}/\sigma'_v$:	Calculated peak undrained strength ratio

Procedure for the evaluation of soil liquefaction resistance, NCEER (1998)

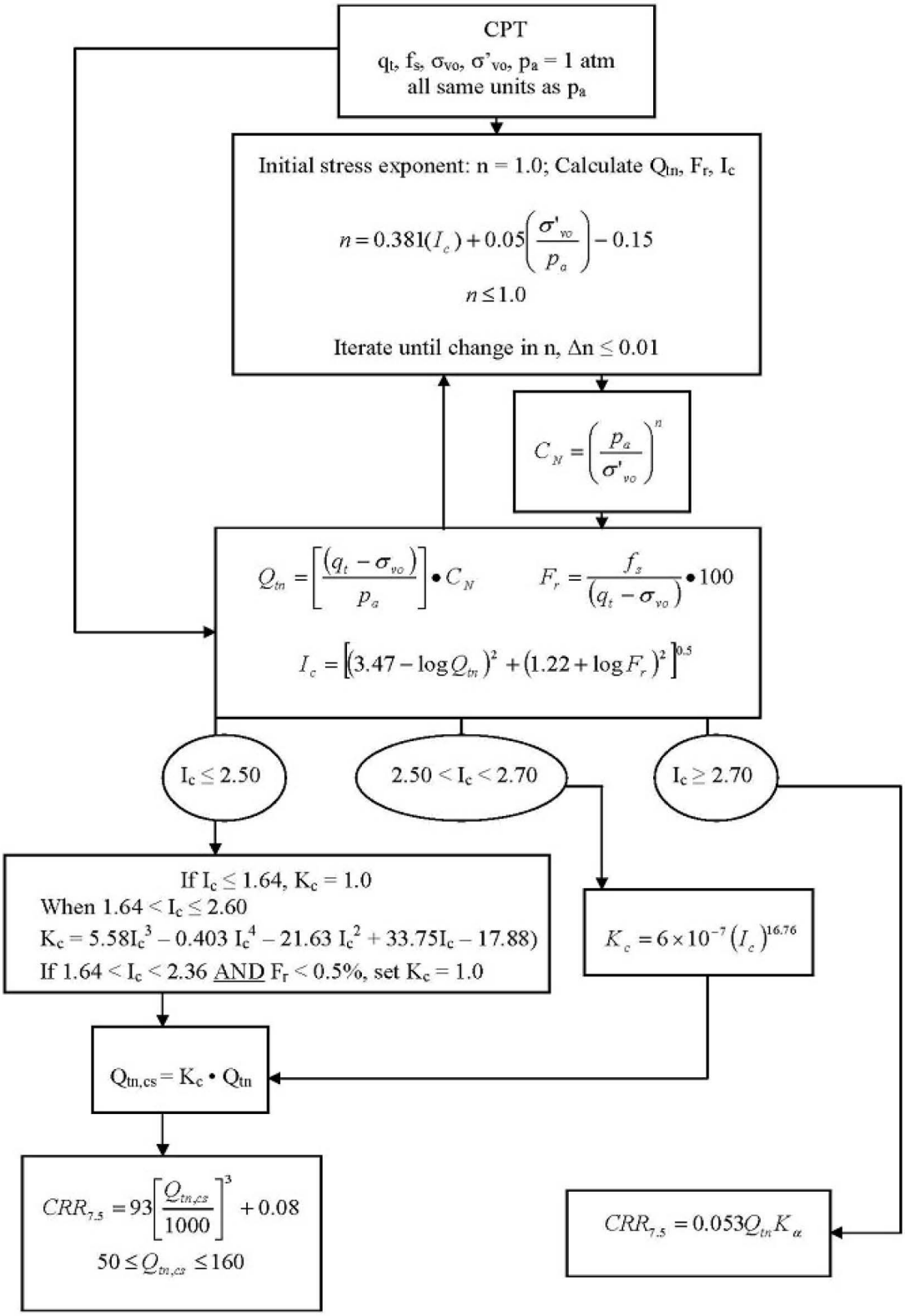
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

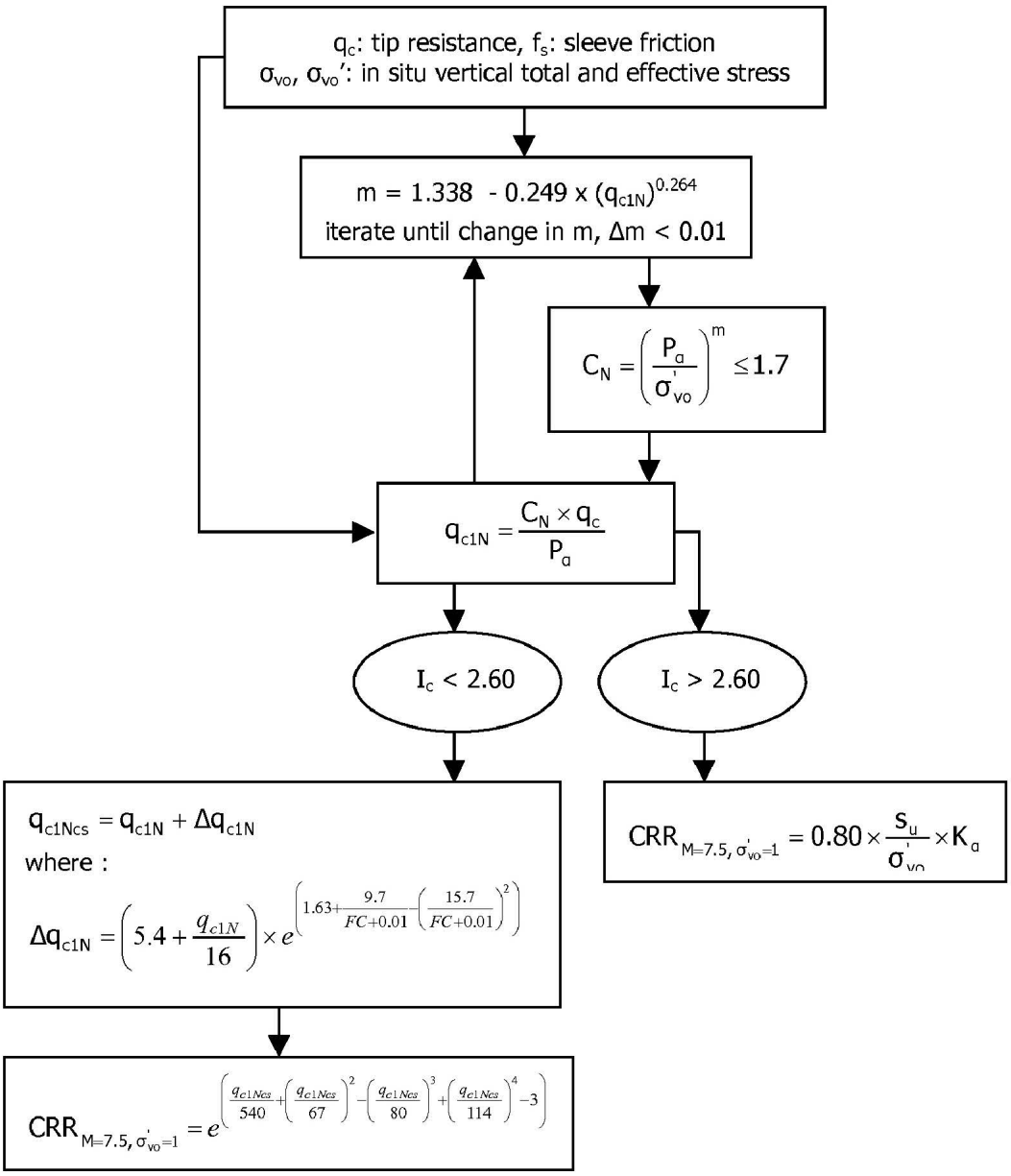
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. This procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:

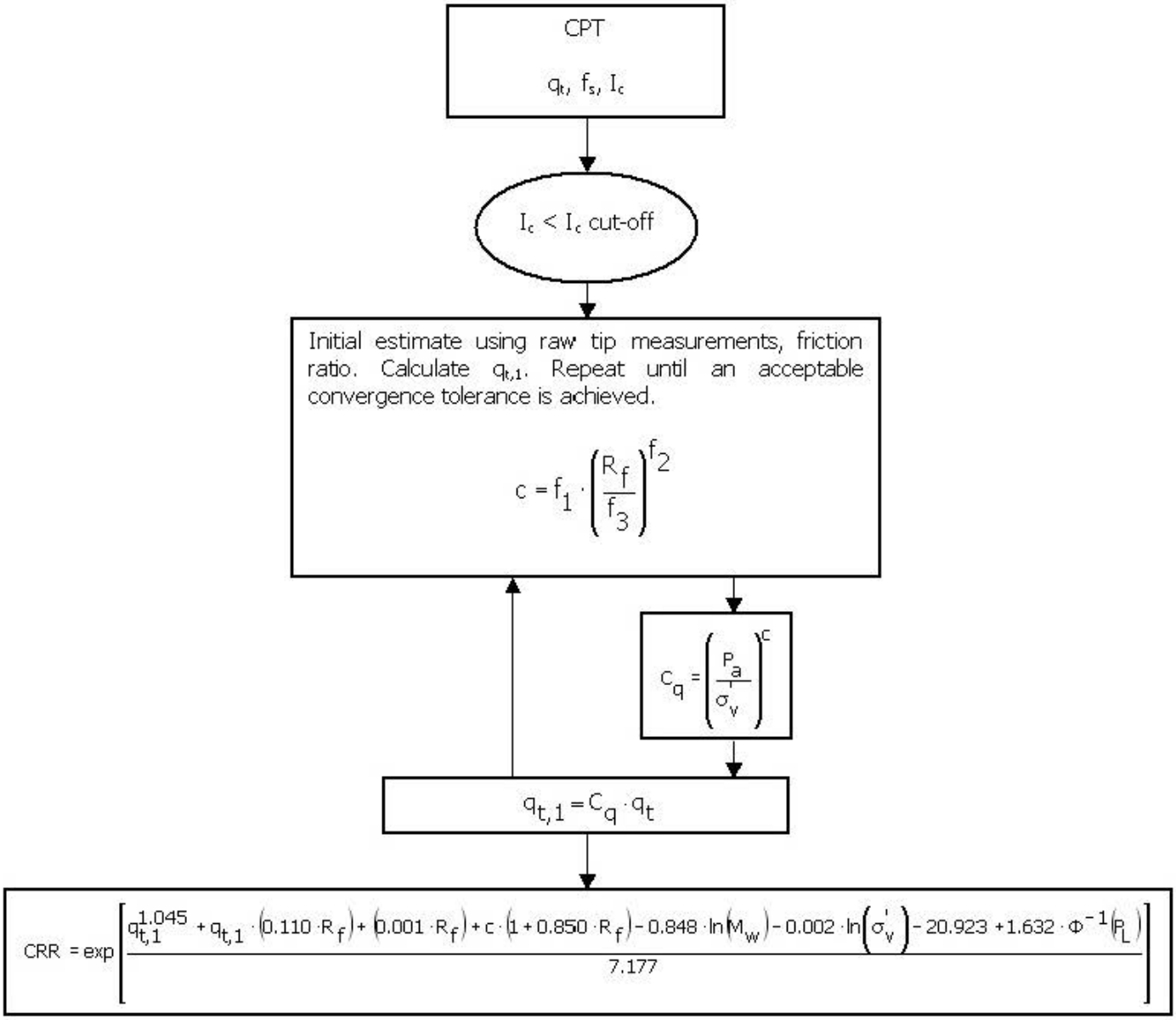


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)

$$FS_{liq} = \frac{CRR_{M=7.5,\sigma'_v=1atm}}{CSR_{M=7.5,\sigma'_v=1atm}}$$

$$CSR_{M=7.5,\sigma'_v=1atm} = 0.65\frac{\sigma_v}{\sigma'_v}\frac{a_{\max}}{g}r_d\frac{1}{MSF}\frac{1}{K_\sigma}$$

$$r_d = \exp\left[\alpha(z)+\beta(z)\cdot M\right]$$

$$\alpha(z) = -1.012-1.126\sin\left(\frac{z}{11.73}+5.133\right)$$

$$\beta(z) = 0.106+0.118\sin\left(\frac{z}{11.28}+5.142\right)$$

$$K_\sigma = 1 - C_\sigma \ln\left(\frac{\sigma'_v}{P_a}\right) \le 1.1$$

$$C_\sigma = \frac{1}{37.3-8.27\left(q_{c1Ncs}\right)^{0.264}} \le 0.3$$

$$MSF = 1+\left(MSF_{max}-1\right)\left(8.64\exp\left(\frac{-M}{4}\right)-1.325\right)$$

$$MSF_{max} = 1.09+\left(\frac{q_{C1Ncs}}{180}\right)^3 \le 2.2$$

σ'_v *and* σ_v *at start of earthquake shaking*

$$CRR_{M=7.5,\sigma'_v=1atm} = \exp\left(\frac{q_{c1Ncs}}{113}+\left(\frac{q_{c1Ncs}}{1000}\right)^2-\left(\frac{q_{c1Ncs}}{140}\right)^3+\left(\frac{q_{c1Ncs}}{137}\right)^4-2.80\right)$$

$$q_{c1Ncs} = q_{c1N}+\Delta q_{c1N}$$

$$\Delta q_{c1N} = \left(11.9+\frac{q_{c1N}}{14.6}\right)\exp\left(1.63-\frac{9.7}{FC+2}-\left(\frac{15.7}{FC+2}\right)^2\right)$$

$$q_{c1N} = C_{Ne}\frac{q_c}{P_a}$$

$$C_{Ne} = \left(\frac{P_a}{\sigma'_v}\right)^m \le 1.7$$

$$m = 1.338-0.249\left(q_{c1Ncs}\right)^{0.264} \quad with \quad 0.264 \le m \le 0.782$$

$$FC = 80\left(I_C+C_{FC}\right)-137 \quad with \quad 0\% \le FC \le 100\%$$

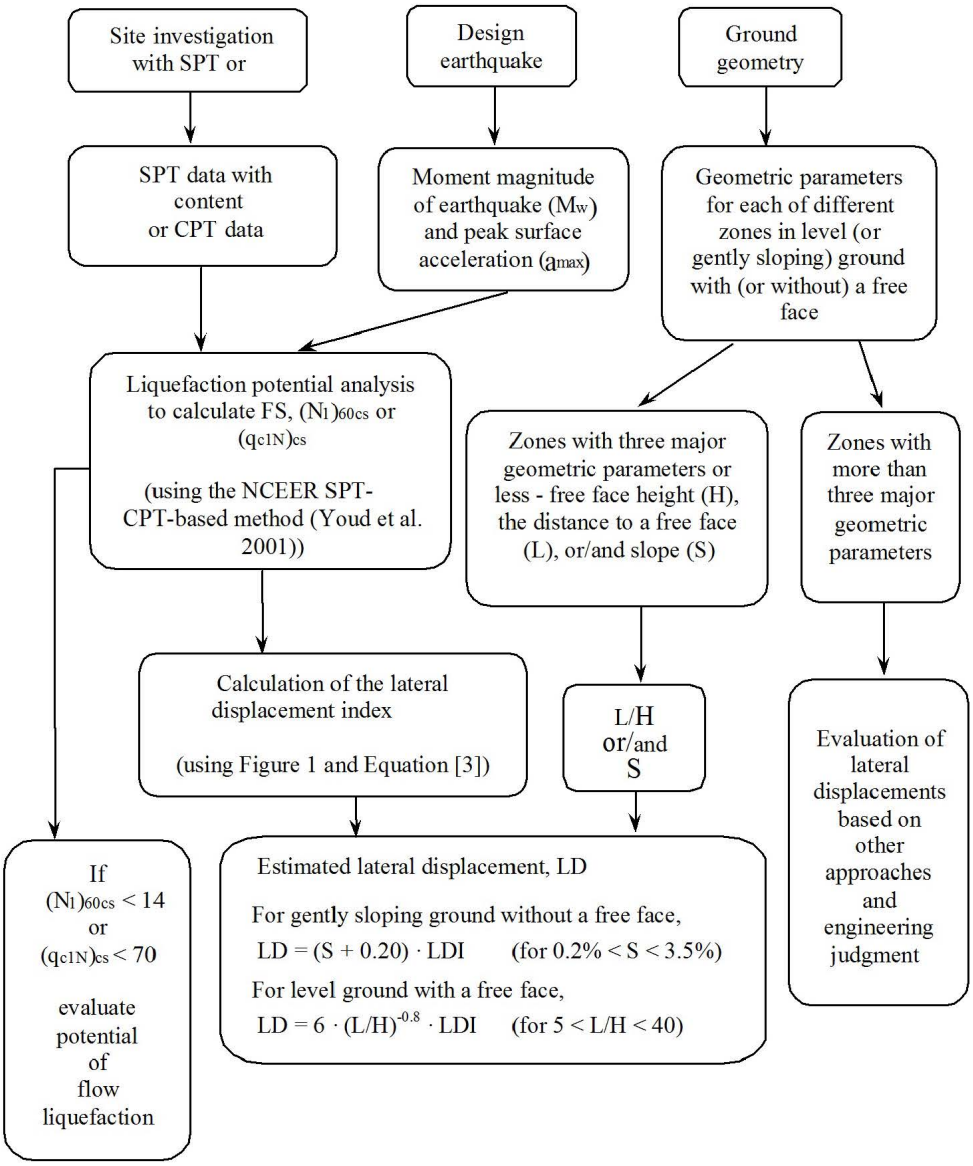
$$I_c = \left[\left(3.47-\log(Q)\right)^2+\left(1.22+\log(F)\right)^2\right]^{0.5}$$

$$Q = \left(\frac{q_c-\sigma_{vc}}{P_a}\right)\left(\frac{P_a}{\sigma'_{vc}}\right)^n \; with\; 0.5 \le n \le 1.0 \; per\; Robertson\;\&\;Wride\,(1998)$$

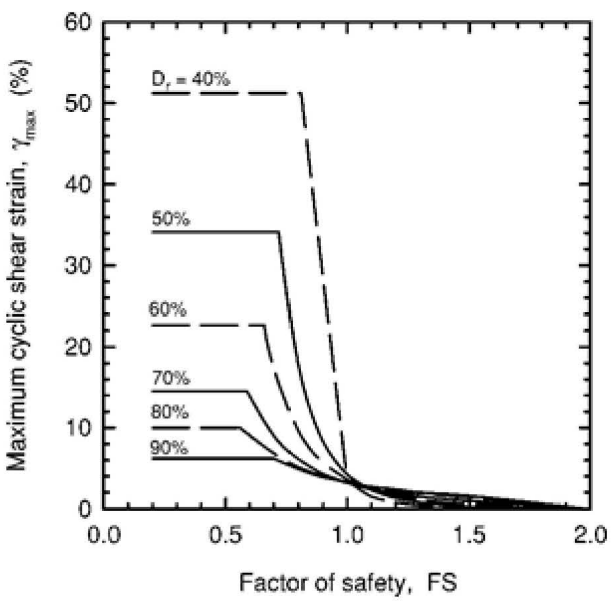
$$F = \left(\frac{f_s}{q_c-\sigma_{vc}}\right)\cdot 100\%$$

σ'_v *at time of CPT sounding*

Procedure for the evaluation of liquefaction-induced lateral spreading displacements



[1] Flow chart illustrating major steps in estimating liquefaction-induced lateral spreading displacements using the proposed approach



[1] **Figure 1**

$$LDI = \int_0^{z_{max}} \gamma_{max} dz$$

[1] **Equation [3]**

[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the estimation of seismic induced settlements in dry sands

Average shear stress, τ_{av}

$$\tau_{av} = CSR^{*} \cdot \sigma_{v0}' = 0.65 \cdot \frac{a_{max}}{g} \cdot \sigma_{v0} \cdot r_a$$

Estimate small shear strain modulus, G_0

$$G_0 = 0.0188 \cdot \left[10^{(0.55 I_c + 1.68)}\right] \cdot (q_t - \sigma_v)$$

Estimate shear strain amplitude, γ

(based on Pradel (1998))

$$\gamma = \left[\frac{1 + \alpha \cdot e^{bR}}{1 + \alpha}\right] \cdot R \cdot 100\ (\%)$$

$$R = \frac{\tau_{av}}{G_0} \text{ (Note } \tau_{av} \text{ and } G_0 \text{ same units)}$$

$$\alpha = 0.0389 \cdot \left(\frac{\sigma_v}{p_a}\right) + 0.124$$

$$b = 6400 \cdot \left(\frac{\sigma_v}{p_a}\right)$$

Estimate volumetric strain in 15 cycles

$$\varepsilon_{vol(15)} = \gamma \cdot \left[\frac{(N_1)_{60,cs}}{20}\right]^{-1.20}$$

$$(N_1)_{60,cs} = \frac{Q_{tn,cs}}{8.5 \cdot \left[1 - \frac{I_c}{4.6}\right]}$$

Volumetric strain in design earthquake

$$\Sigma_{vol} = \varepsilon_{vol(15)} \cdot \left[\frac{N_c}{15}\right]^{0.45}$$

$$N_c = (M - 4)^{2.17}$$

Seismic settlement, s

$$s = 2 \cdot \int_0^{GWT} \Sigma_{vol} \cdot dz$$

Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, Symposium in honor of professor I. M. Idriss, San Diego, CA

Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methology developed by Iwasaki (1982) and is adopted by AFPS.

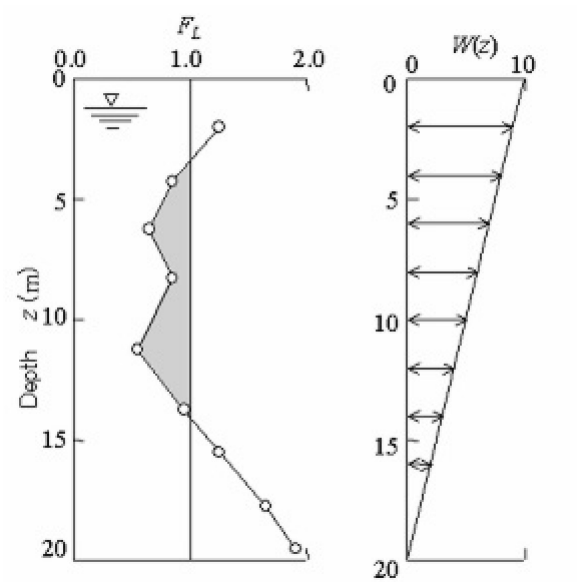
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\textbf{LPI} = \int_0^{20} (10 - 0{,}5_Z) \times F_L \times d_z$$

where:
F_L = 1 - F.S. when F.S. less than 1
F_L = 0 when F.S. greater than 1
z depth of measurment in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- 0 < LPI <= 5 : Liquefaction risk is low
- 5 < LPI <= 15 : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

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APPENDIX E

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SITE LEASE

For all or a portion of the following Site:

Lodi High School Modular Project Increment 1 Site Work
3 S. Pacific Ave.
Lodi, CA 95242
APN: _____

By and between

Lodi Unified School District
1305 E. Vine Street
Lodi, CA 95240

And

[Developer]
[Address]

Dated as of _____, 2018

SITE LEASE

This site lease ("Site Lease") dated as of _____, 2018 ("Effective Date"), is made and entered into by and between the Lodi Unified School District, a school district duly organized and validly existing under the laws of the State of California, as lessor ("District"), and [Developer], a [California corporation] duly organized and existing under the laws of the State, as lessee ("Developer") (together, the "Parties").

RECITALS

WHEREAS, the District currently owns a parcel of land located at 3 S. Pacific Ave., Lodi, CA 95242, known as Lodi High School, as more particularly described in **Exhibit A** and shown on **Exhibit B** attached hereto and incorporated herein by this reference ("School Site"); and

WHEREAS, the District desires to provide for the development and construction of certain work to be performed on portions of the School Site ("Project Site") and that work will include construction of improvements to be known as Lodi High School Modular Project Increment 1 Site Work ("Project"); and

WHEREAS, District desires to have the construction of the Project completed and to lease it back, as more particularly described in the facilities lease between the Parties dated as of the Effective Date whereby the Developer agrees to lease the Project Site back to the District and perform the work of the Project ("Facilities Lease"), which Facilities Lease is incorporated herein by this reference; and

WHEREAS, the Governing Board of the District ("Board") has determined that it is in the best interests of the District and for the common benefit of the citizens residing in the District to construct the Project by leasing the Project Site to Developer and by immediately entering into the Facilities Lease under which District will lease back the Project from Developer; and

WHEREAS, the District further determines that it has entered into this Site Lease and the Facilities Lease pursuant to Education Code section 17406 as the best available and most expeditious means for the District to satisfy its substantial need for the facilities to be provided by the Project and to accommodate and educate District students; and

WHEREAS, this Site Lease and Facilities Lease are awarded based a competitive solicitation process pursuant to Education Code section 17406 and in compliance with the required procedures and guidelines for evaluating the qualifications of proposers adopted and published by the Board to the proposer providing the best value to the school district, taking into consideration the proposer's demonstrated competence and professional qualifications necessary for the satisfactory performance of the services required; and

WHEREAS, the selection of the Developer was conducted in a fair and impartial manner; and

WHEREAS, based on the above findings, the District is authorized under Education Code section 17406 to lease the Project Site to Developer and to have Developer develop and cause the construction of the Project thereon and lease the Project Site back to the District by means of the Facilities Lease, and the Board has duly authorized the execution and delivery of this Site Lease in order to effectuate the foregoing; and

WHEREAS, the Parties have performed all acts, conditions and things required by law to exist, to have happened, and to have been performed prior to and in connection with the execution and entering into this Site Lease, and those conditions precedent do exist, have happened, and have been performed in regular and due time, form, and manner as required by law, and the Parties hereto are now duly authorized to execute and enter into this Site Lease; and

WHEREAS, Developer as lessee is authorized and competent to lease the Project Site from District and to develop and cause the construction of the Project on the Project Site, and has duly authorized the execution and delivery of this Site Lease.

NOW, THEREFORE, in consideration of the promises and of the mutual covenants contained herein, and other valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties hereto do hereby agree as follows:

1. Definitions

Unless the context clearly otherwise requires, all words and phrases defined in the Facilities Lease shall have the same meaning in this Site Lease.

2. Exhibits

The following Exhibits are attached to and by reference incorporated and made a part of this Site Lease.

2.1. Exhibit A - Legal Description of the School Site: The description of the real property constituting the School Site

2.2. Exhibit B - Description of the Project Site: The map or diagram depiction of the Project Site

3. Lease of the Project Site

The District hereby leases to the Developer, and the Developer hereby leases from the District the Project Site, subject only to Permitted Encumbrances, in accordance with the provisions of this Site Lease, to have and to hold for the term of this Site Lease. This Site Lease shall only take effect if the Facilities Lease is executed by the District and Developer within three (3) days of execution of this Site Lease.

4. Leaseback of the Project Site

The Parties agree that the Project Site will be leased back to the District pursuant to the Facilities Lease for the term thereof.

5. Term

The term of this Site Lease shall commence as of the Effective Date and shall terminate on the last day of the Term of the Facilities Lease, provided the District has paid to the Developer, or its assignee, all payments which may be due under the Facilities Lease, and

provided this Site Lease has not been terminated pursuant to the termination provisions of the Facilities Lease.

6. Payment

In consideration for the lease of the Project Site by the District to the Developer and for other good and valuable consideration, the Developer shall pay One Dollar ($1.00) to the District upon execution of this Site Lease.

7. Termination

7.1. Termination Upon Purchase of Project

If the District exercises its option to purchase the Project pursuant to the Facilities Lease, then this Site Lease shall terminate concurrently with the District's buy out and termination of the Facilities Lease.

7.2. Termination Due to Default by Developer

If Developer defaults pursuant to the provision(s) of the Facilities Lease and the District terminates the Facilities Lease pursuant to the Facilities Lease provision(s) allowing termination, then the Developer shall be deemed to be in default of this Site Lease and this Site Lease shall also terminate at the same time as the Facilities Lease.

7.3. Termination Due to Default by District

If District defaults pursuant to the provision(s) of the Facilities Lease, the Developer, or its assignee, will have the right, for the then remaining term of this Site Lease, to:

7.3.1. Take possession of the Project Site;

7.3.2. If it deems it appropriate, cause appraisal of the Project Site and a study of the then reasonable uses thereof;

7.3.3. Re-let the Project Site; and

7.3.4. Stop all Work associated with the Site Lease.

8. Title to School Site

During the term of this Site Lease, the District shall hold fee title to the School Site, including the Project Site, and nothing in this Site Lease or the Facilities Lease shall change, in any way, the District's ownership interest in the School Site.

9. Improvements

Title to all improvements made on the Project Site during the term hereof shall be held, vest and transfer pursuant to the terms of the Facilities Lease.

10. No Merger

The leaseback of the Project Site by the Developer to the District pursuant to the Facilities Lease shall not effect or result in a merger of the estates of the District in the Project Site, and the Developer shall continue to have a leasehold estate in the Project Site pursuant to this Site Lease throughout the term hereof.

11. Right of Entry

The District reserves the right for any of its duly authorized representatives to enter upon the Project Site at any reasonable time to inspect the same, provided the District follows all safety precautions required by the Developer.

12. Quiet Enjoyment

Subject to any rights the District may have under the Facilities Lease (in the absence of an Event of Default) to possession and enjoyment of the Project Site, the District hereby covenants and agrees that it will not take any action to prevent the Developer from having quiet and peaceable possession and enjoyment of the Project Site during the term hereof and will, at the request of the Developer, to the extent that it may lawfully do so, join in any legal action in which the Developer asserts its right to such possession and enjoyment.

13. Waste

The Developer agrees that at all times that it is in possession of the Project Site, it will not commit, suffer or permit any waste on the Project Site, and that it will not willfully or knowingly use or permit the use of the Project Site for any illegal purpose or act.

14. Further Assurances and Corrective Instruments

The Parties shall, from time to time, execute, acknowledge and deliver, or cause to be executed, acknowledged and delivered, such supplements hereto and such further instruments as may reasonably be required for correcting any inadequate or incorrect description of the Project Site hereby leased or intended so to be or for carrying out the expressed intention of this Site Lease and the Facilities Lease.

15. Representations of the District

The District represents, covenants and warrants to the Developer as follows:

15.1. Due Organization and Existence

The District is a school district, duly organized and existing under the Constitution and laws of the State of California.

15.2. Authorization

The District has the full power and authority to enter into, to execute and to deliver this Site Lease, and to perform all of its duties and obligations hereunder, and has duly authorized the execution of this Site Lease.

15.3. No Violations

To the best of the District's actual knowledge, neither the execution and delivery of this Site Lease nor the Facilities Lease, nor the fulfillment of or compliance with the terms and conditions hereof or thereof, nor the consummation of the transactions contemplated hereby or thereby, conflicts with or results in a breach of the terms, conditions or provisions of any restriction or any agreement or instrument to which the District is now a party or by which the District is bound, or constitutes a default under any of the foregoing, or results in the creation or imposition of any lien, charge or encumbrance whatsoever upon any of the property or assets of the District, or upon the Project Site, except Permitted Encumbrances.

15.4. CEQA Compliance

The District has complied with all assessment requirements imposed upon it by the California Environmental Quality Act (Public Resource Code Section 21000 *et seq.* ("CEQA") in connection with the Project, and no further environmental review of the Project is necessary pursuant to CEQA before the construction of the Project may commence.

15.5. Condemnation Proceedings

15.5.1. District covenants and agrees, but only to the extent that it may lawfully do so, that so long as this Site Lease remains in effect, the District will not seek to exercise the power of eminent domain with respect to the Project so as to cause a full or partial termination of this Site Lease and the Facilities Lease.

15.5.2. If for any reason the foregoing covenant is determined to be unenforceable or in some way invalid, or if District should fail or refuse to abide by such covenant, then, to the extent they may lawfully do so, the Parties agree that the financial interest of Developer shall be as indicated in the Facilities Lease.

15.6. Use and Zoning

To the best of the District's actual knowledge, the Project Site is properly zoned for its intended purpose and the use or activities contemplated by this Site Lease will not conflict with local, state or federal law.

15.7. Taxes

To the best of the District's actual knowledge, all taxes and assessments are paid current and such taxes and assessments will continue to be paid to the extent that the District is not exempt.

16. Representations of the Developer

The Developer represents, covenants and warrants to the District as follows:

16.1. Due Organization and Existence

The Developer is a California company duly organized and existing under the laws of the State of California, has power to enter into this Site Lease and the Facilities Lease; is possessed of full power to lease, leaseback, and hold real and personal property; and has duly authorized the execution and delivery of all of the aforesaid agreements.

16.2. Authorization

The Developer has the full power and authority to enter into, to execute and to deliver this Site Lease, and to perform all of its duties and obligations hereunder, and has duly authorized the execution of this Site Lease.

16.3. No Violations

Neither the execution and delivery of this Site Lease or the Facilities Lease, nor the fulfillment of or compliance with the terms and conditions hereof or thereof, nor the consummation of the transactions contemplated hereby or thereby, conflicts with or results in a breach of the terms, conditions or provisions of any restriction or any agreement or instrument to which the Developer is now a party or by which the Developer is bound, or constitutes a default under any of the foregoing, or results in the creation or imposition of any lien, charge or encumbrance whatsoever upon any of the property or assets of the Developer, or upon the Project Site, except for Permitted Encumbrances.

16.4. No Bankruptcy

Developer is not now nor has it ever been in bankruptcy or receivership.

16.5. No Litigation

There is no pending or, to the knowledge of Developer, threatened action or proceeding before any court or administrative agency which will materially adversely affect the ability of Developer to perform its obligations under this Site Lease or the Facilities Lease.

17. Insurance and Indemnity

The Developer and the District shall comply with the insurance requirements and the indemnity requirements as indicated in the Facilities Lease.

18. Assignment and Subleasing

This Site Lease may be assigned and/or the Project Site subleased, as a whole or in part, by the Developer only upon the prior written consent of the District to such assignment or sublease, which shall not be unreasonably withheld.

19. Restrictions on District

The District agrees that it will not mortgage, sell, encumber, assign, transfer or convey the Project Site or any portion thereof during the term of this Site Lease in any way that would interfere with or diminish Developer's interests indicated in this Site Lease.

20. Liens and Further Encumbrances

Developer agrees to keep the Project Site and every part thereof free and clear of any and all encumbrances and/or liens, including without limitation, pledges, charges, encumbrances, claims, mechanic liens and/or other liens for or arising out of or in connection with work or labor done, services performed, or materials or appliances used or furnished for or in connection with the Project Site or the Project. Pursuant to the Facilities Lease, Developer further agrees to pay promptly and fully and discharge any and all claims on which any encumbrance and/or lien may or could be based, and to save and hold District free and harmless from any and all such liens, mortgages, and claims of liens and suits or other proceedings pertaining thereto. This subsection does not apply to Permitted Encumbrances.

21. Notices

All notices, certificates or other communications hereunder shall be sufficiently given and shall be deemed to have been received five (5) days after deposit in the United States mail in registered or certified form with postage fully prepaid or one (1) business day after deposit with an overnight delivery service with proof of actual delivery:

If to District:

Lodi Unified School District
1305 E. Vine Street
Lodi, CA 95240
Attn: Warren Sun, Senior Director of Operations

With a copy to:

Samuel Santana, Esq.
Dannis Woliver Kelley
115 Pine Ave, Suite 500
Long Beach, CA 90802

If to Developer:

[Developer]
[Address]
Attn: [Name, Title]

With a copy to:

The Developer and the District, by notice given hereunder, may designate different addresses to which subsequent notices, certificates or other communications will be sent.

22. Binding Effect

This Site Lease shall inure to the benefit of and shall be binding upon the Developer and the District and their respective successors and assigns.

23. No Additional Waiver Implied by One Waiver

In the event any agreement contained in this Site Lease should be breached by either party and thereafter waived by the other party, such waiver shall be limited to the particular breach so waived and shall not be deemed to waive future compliance with any term hereof or any other breach hereunder.

24. Severability

In the event any provision of this Site Lease shall be held invalid or unenforceable by any court of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provision hereof, unless elimination of such invalid provision materially alters the rights and obligations embodied in this Site Lease or the Facilities Lease.

25. Amendments, Changes and Modifications

Except as to the termination rights of both Parties as indicated in the Facilities Lease, this Site Lease may not be amended, changed, modified, altered or terminated without the written agreement of both Parties hereto.

26. Obligations Absolute

The Developer agrees that the obligations of the Developer are absolute and unconditional and not subject to any charges or setoffs against the District whatsoever.

27. Execution in Counterparts

This Site Lease may be executed in several counterparts, each of which shall be an original and all of which shall constitute one and the same instrument.

28. Developer and District Representatives

Whenever under the provisions of this Site Lease approval by the Developer or the District is required, or the Developer or the District is required to take some action at the request of the other, such approval or such request shall be given for the Developer by the Developer Representative and for the District by the District Representative, and any party hereto shall be authorized to rely upon any such approval or request.

29. Applicable Law

This Site Lease shall be governed by and construed in accordance with the laws of the State of California, and venued in the County within which the School Site is located.

30. Attorney's Fees

If either party brings an action or proceeding involving the School Site or to enforce the terms of this Site Lease or to declare rights hereunder, each party shall bear the cost of its own attorneys' fees.

31. Captions

The captions or headings in this Site Lease are for convenience only and in no way define, limit or describe the scope or intent of any provisions or sections of this Site Lease.

32. Prior Agreements

This Site Lease and the corresponding Facilities Lease collectively contain all of the agreements of the Parties hereto with respect to any matter covered or mentioned in this Site Lease and no prior agreements or understanding pertaining to any such matter shall be effective for any purpose.

33. Further Assurances

Parties shall promptly execute and deliver all documents and instruments reasonably requested to give effect to the provisions of this Site Lease.

34. Recitals Incorporated

The Recitals set forth at the beginning of this Site Lease are hereby incorporated into its terms and provisions by this reference.

35. Time of the Essence

Time is of the essence with respect to each of the terms, covenants, and conditions of this Site Lease.

36. Force Majeure

A party shall be excused from the performance of any obligation imposed in this Site Lease and the exhibits hereto for any period and to the extent that a party is prevented from performing such obligation, in whole or in part, as a result of delays caused by the other party or third parties, a governmental agency or entity, an act of God, war, terrorism, civil disturbance, forces of nature, fire, flood, earthquake, strikes or lockouts, and such non-performance will not be a default hereunder or a grounds for termination of this Site Lease.

37. Interpretation

None of the Parties hereto, nor their respective counsel, shall be deemed the drafters of this Site Lease or the Facilities Lease for purposes of construing the provisions of each. The language in all parts of this Site Lease shall in all cases be construed according to its fair meaning, not strictly for or against any of the Parties hereto.

IN WITNESS WHEREOF, the Parties have caused this Site Lease to be executed by their respective officers who are duly authorized, as of the Effective Date.

ACCEPTED AND AGREED on the date indicated below:

Dated: _____, 2018

Lodi Unified School District

By: _____
Name: _____
Title:_____

Dated: _____, 2018

[Developer]

By: _____
Name: _____
Title:_____

EXHIBIT A

LEGAL DESCRIPTION OF SCHOOL SITE

Attached is the Legal Description for:

Lodi High School Modular Project Increment 1 Site Work
3 S. Pacific Ave.
Lodi, CA 95242

<INSERT>

EXHIBIT B

DESCRIPTION OF PROJECT SITE

Attached is a map or diagram showing the location of the School Site that is subject to this Site Lease and upon which Developer will construct the Project.

<INSERT>

FACILITIES LEASE

For all or a portion of the following Site:

Lodi High School Modular Project Increment 1 Site Work
3 S. Pacific Ave.
Lodi, CA 95242
APN: _____

By and between

Lodi Unified School District
1305 E. Vine Street
Lodi, CA 95240

And

[Developer]
[Address]

Dated as of _____, 2018

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Exhibits A - G

FACILITIES LEASE

This facilities lease ("Facilities Lease"), dated as of _____, 2018 ("Effective Date"), is made and entered into by and between [Developer] ("Developer"), a [California corporation] duly organized and existing under the laws of the State of California, as sublessor, and Lodi Unified School District, a school district duly organized and validly existing under the laws of the State of California, as sublessee ("District") (together, the "Parties").

RECITALS

WHEREAS, the District is authorized under Section 17406 of the Education Code of the State of California to lease a site to a developer and to have that developer develop and construct the project on the site and to lease back to the District the site and the completed project; and

WHEREAS, the District desires to provide for the development and construction of certain work to be performed on portions of the School Site which will include construction of improvements to be known as the Lodi High School Modular Project Increment 1 Site Work ("Project"); and

WHEREAS, on the date hereof, the District has leased to Developer, a parcel of land located at 3 S. Pacific Ave., Lodi, CA 95242, known as Lodi High School, as more particularly described in **Exhibit A** and shown on **Exhibit B** attached hereto and incorporated herein by reference ("School Site"); and

WHEREAS, District and Developer have executed a site lease at the same time as this Facilities Lease whereby the District is leasing the Project Site to the Developer ("Site Lease"); and

WHEREAS, District has retained [Architect] ("Architect") to prepare plans and specifications for the Project ("Plans and Specifications") and to act as the Design Professional in General Responsible Charge for the Project; and

WHEREAS, the Governing Board of the District ("Board") has determined that it is in the best interests of the District and for the common benefit of the citizens residing in the District to construct the Project by leasing the Project Site to Developer and by simultaneously entering into this Facilities Lease under which the District will lease back the Project Site and the Project from Developer and make Lease Payments, as described herein; and

WHEREAS, the District further acknowledges and agrees that it has entered into the Site Lease and the Facilities Lease pursuant to Education Code Section 17406 as the best available and most expeditious means for the District to satisfy its substantial need for the facilities to be provided by the Project and to accommodate and educate District students and to utilize its facilities proceeds expeditiously; and

WHEREAS, this Site Lease and Facilities Lease are awarded based a competitive solicitation process pursuant to Education Code section 17406 and in compliance with the required procedures and guidelines for evaluating the qualifications of proposers adopted and published by the Board to the proposer providing the best value to the school district, taking into consideration the proposer's demonstrated competence and professional qualifications necessary for the satisfactory performance of the services required; and

WHEREAS, the selection of the Developer was conducted in a fair and impartial manner; and

WHEREAS, Developer has reviewed the Lease Documents; and

WHEREAS, Developer represents that it has the expertise and experience to perform the services set forth in this Facilities Lease; and

WHEREAS, the Parties have performed all acts, conditions and things required by law to exist, to have happened and to have been performed precedent to and in connection with the execution and entering into of this Facilities Lease and all those conditions precedent do exist, have happened and have been performed in regular and due time, form and manner as required by law, and the Parties hereto are now duly authorized to execute and enter into this Facilities Lease; and

WHEREAS, Developer is authorized to lease the Project Site as lessee and to develop the Project and to have the Project constructed on the Project Site and to lease the Project and the Project Site back to the District, and has duly authorized the execution and delivery of this Facilities Lease.

NOW, THEREFORE, in consideration of the above recitals and of the mutual covenants hereinafter contained, the Parties hereto do hereby agree as follows:

1. **Definitions**

In addition to the terms and entities defined above or in subsequent provisions, and unless the context otherwise requires, the terms defined in this section shall, for all purposes of this Facilities Lease, have the meanings herein specified.

1.1 "**Developer**" or "**Lessor**" means [Developer], a [California corporation], organized and existing under the laws of the State of California, Contractor's license number [insert number] issued by the State of California, Contractors' State License Board, in accordance with division 3, chapter 9, of the Business and Professions Code, and its successors and assigns.

1.2 "**Developer's Representative**" means the Managing Member of Developer, or any person authorized to act on behalf of Developer under or with respect to this Facilities Lease.

1.3 "**Contract Documents**" are defined in **Exhibit "D"** to this Facilities Lease.

1.4 "**District**" or "**Lessee**" means the Lodi Unified School District, a school district duly organized and existing under the laws of the State of California.

1.5 "**District Representative**" means the Superintendent of the District, or any other person authorized by the Board of Education of the District to act on behalf of the District under or with respect to this Facilities Lease.

1.6 "**Permitted Encumbrances**" means, as of any particular time:

1.6.1 Liens for general ad valorem taxes and assessments, if any, not then delinquent, or which the District may permit to remain unpaid;

1.6.2 The Site Lease.

1.6.3 This Facilities Lease.

1.6.4 Easements, rights of way, mineral rights, drilling rights and other rights, reservations, covenants, conditions or restrictions which exist of record as of the date of this Facilities Lease.

1.6.5 Easements, rights of way, mineral rights, drilling rights and other rights, reservations, covenants, conditions or restrictions established following the date of recordation of this Facilities Lease and to which Developer and the District consent in writing which will not impair or impede the operation of the Project Site.

2. **Exhibits**

The following Exhibits are attached to and by reference incorporated and made a part of this Facilities Lease:

2.1 **Exhibit A - Legal Description of the School Site**: The descriptions of the real property constituting the School Site.

2.2 **Exhibit B - Description of the Project Site**: The map or diagram depiction of the Project Site.

2.3 **Exhibit C - Guaranteed Maximum Price and Other Project Cost, Funding, and Payment Provisions:** A detailed description of the Guaranteed Maximum Price and the provisions related to the payment of that amount to the Developer, including Attachment 3, the Schedule of Lease Payments and Payoff Dates and Amounts.

2.4 **Exhibit D - General Construction Provisions:** The provisions generally describing the Project's construction.

2.5 **Exhibit D-1 – Special Conditions Provisions**: The provisions describing conditions specific to the Project's construction.

2.6 **Exhibit E - Memorandum of Commencement Date:** The Memorandum which will memorialize the commencement and expiration dates of the Lease Term.

2.7 **Exhibit F - Construction Schedule**

2.8 **Exhibit G – Schedule of Values**

3. **Lease of Project and Project Site**

3.1 Developer hereby leases the Project and the Project Site to the District, and the District hereby leases said Project and Project Site from Developer upon the terms and conditions set forth in this Facilities Lease.

3.2 The leasing by Developer to the District of the Project Site shall not affect or result in a merger of the District's leasehold estate pursuant to this Facilities

Lease and its fee estate as lessor under the Site Lease. Developer shall continue to have and hold a leasehold estate in the Project Site pursuant to the Site Lease throughout the term thereof and the term of this Facilities Lease.

3.3 As to the Project Site, this Facilities Lease shall be deemed and constitute a sublease.

4. **Term**

4.1 **Facilities Lease is Legally Binding**

This Facilities Lease is legally binding on the Parties upon execution by the Parties and the District Board's approval of this Facilities Lease. The Term of this Facilities Lease for the purposes of District's obligation to make Lease Payments shall commence on the earlier of the following two (2) events, whichever occurs first ("Commencement Date"):

4.1.1 The date the District takes beneficial occupancy of the Project; or

4.1.2 The date when Developer delivers possession of the Project to District and when all improvements to be provided by Developer are determined by the District to be completed as set forth in **Exhibits D and D-1** to this Facilities Lease.

Unless earlier terminated pursuant to the provisions of the Contract Documents, the Term of this Facilities Lease for the purposes of District's obligations to make Lease Payments shall terminate one (1) year thereafter or upon payment of the final lease payment.

4.2 After Developer has completed construction of the Project and the District has accepted the Project, the Parties shall execute the Memorandum of Commencement Date attached hereto as **Exhibit E** to memorialize the commencement date of the Lease Payments and expiration date of the Term. Notwithstanding this Term, the Parties hereby acknowledge that each has obligations, duties, and rights under this Facilities Lease that exist upon execution of this Facilities Lease and prior to the beginning of the Lease Payment obligations.

4.3 The Term may be extended or shortened upon the occurrence of the earliest of any of the following events, which shall constitute the end of the Term:

4.3.1 An Event of Default by District as defined herein and Developer's election to terminate this Facilities Lease as permitted herein, or

4.3.2 An Event of Default by Developer as defined herein and District's election to terminate this Facilities Lease as permitted herein, or

4.3.3 Consummation of the District's purchase option pursuant to the Guaranteed Maximum Price and Other Project Cost, Funding, and Payment Provisions indicated in **Exhibit C** ("Guaranteed Maximum Price Provisions").

4.3.4 A third-party taking of the Project under Eminent Domain, only if the Term is ended as indicated more specifically herein.

4.3.5 Damage or destruction of the Project, only if the Term is ended as indicated more specifically herein.

5. **Payment**

In consideration for the lease of the Project Site by the Developer back to the District and for other good and valuable consideration, the District shall make all necessary payments pursuant to the Guaranteed Maximum Price Provisions indicated in **Exhibit C.**

6. **Title**

6.1 During the Term of this Facilities Lease, the District shall hold fee title to the School Site, including the Project Site, and nothing in this Facilities Lease or the Site Lease shall change, in any way, the District's ownership interest.

6.2 During the Term of this Facilities Lease, Developer shall have a leasehold interest in the Project Site pursuant to the Site Lease.

6.3 During the Term of this Facilities Lease, the Developer shall hold title to the Project improvements provided by Developer which comprise fixtures, repairs, replacements or modifications thereto.

6.4 If the District exercises its Purchase Option pursuant to the Guaranteed Maximum Price Provisions indicated in **Exhibit C** or if District makes all necessary payments under the Guaranteed Maximum Price Provisions indicated in **Exhibit C**, all right, title and interest of Developer, its assigns and successors in interest in and to the Project and the Project Site shall be transferred to and vested in the District at the end of the Term. Title shall be transferred to and vested in the District hereunder without the necessity for any further instrument of transfer; provided, however, that Developer agrees to execute any instrument requested by District to memorialize the termination of this Facilities Lease and transfer of title to the Project.

7. **Quiet Enjoyment**

Upon District's possession of the Project, Developer shall thereafter provide the District with quiet use and enjoyment of the Project, and the District shall during the Term peaceably and quietly have and hold and enjoy the Project, without suit, trouble or hindrance from Developer, except as otherwise may be set forth in this Facilities Lease. Developer will, at the request of the District and at Developer's cost, join in any legal action in which the District asserts its right to such possession and enjoyment to the extent Developer may lawfully do so. Notwithstanding the foregoing, Developer shall have the right to inspect the Project and the Project Site as provided herein.

8. Representations of the District

The District represents, covenants and warrants to the Developer as follows:

8.1 Due Organization and Existence

The District is a school district, duly organized and existing under the Constitution and laws of the State of California.

8.2 Authorization

The District has the full power and authority to enter into, to execute and to deliver this Facilities Lease, and to perform all of its duties and obligations hereunder, and has duly authorized the execution of this Facilities Lease.

8.3 No Violations

Neither the execution and delivery of this Facilities Lease nor the Site Lease, nor the fulfillment of or compliance with the terms and conditions hereof or thereof, nor the consummation of the transactions contemplated hereby or thereby, conflicts with or results in a breach of the terms, conditions or provisions of any restriction or any agreement or instrument to which the District is now a party or by which the District is bound, or constitutes a default under any of the foregoing, or results in the creation or imposition of any lien, charge or encumbrance whatsoever upon any of the property or assets of the District, or upon the Project Site, except Permitted Encumbrances.

8.4 Condemnation Proceedings

8.4.1 District covenants and agrees, but only to the extent that it may lawfully do so, that so long as this Facilities Lease remains in effect, the District will not seek to exercise the power of eminent domain with respect to the Project so as to cause a full or partial termination of this Facilities Lease.

8.4.2 If for any reason the foregoing covenant is determined to be unenforceable or in some way invalid, or if District should fail or refuse to abide by such covenant, then, to the extent it may lawfully do so, District agrees that the financial interest of Developer shall be as indicated in this Facilities Lease.

9. Representations of the Developer

The Developer represents, covenants and warrants to the District as follows:

9.1 Due Organization and Existence

The Developer is a California company duly organized and existing under the laws of the State of California, has the power to enter into this Facilities Lease and the Site Lease; is possessed of full power to lease, lease back, and hold real and personal property and has duly authorized the execution and delivery of all of the aforesaid agreements.

9.2 **Authorization**

Developer has the full power and authority to enter into, to execute and to deliver this Facilities Lease, and to perform all of its duties and obligations hereunder, and has duly authorized the execution of this Facilities Lease.

9.3 **No Violations**

Neither the execution and delivery of this Facilities Lease and the Site Lease, nor the fulfillment of or compliance with the terms and conditions hereof or thereof, nor the consummation of the transactions contemplated hereby or thereby, conflicts with or results in a breach of the terms, conditions or provisions of any restriction or any agreement or instrument to which Developer is now a party or by which Developer is bound, or constitutes a default under any of the foregoing, or results in the creation or imposition of any lien, charge or encumbrance whatsoever upon any of the property or assets of Developer, or upon the Project Site, except Permitted Encumbrances.

9.4 **No Bankruptcy**

Developer is not now nor has it ever been in bankruptcy or receivership.

9.5 **No Encumbrances**

Developer shall not pledge any District payments of any kind, related to the Site Lease, this Facilities Lease, or in any way derived from the Project Site, and shall not mortgage or encumber the Project Site, except as may be specifically permitted pursuant to the provisions of this Facilities Lease related to Developer's financing the construction of the project.

9.6 **Continued Existence**

Developer shall not voluntarily commence any act intended to dissolve or terminate the legal existence of Developer, at or before the latest of the following:

9.6.1 Two (2) years following completion of the Project.

9.6.2 One (1) year following expiration or earlier termination of the Term.

9.6.3 After dismissal and final resolution of any and all disputes between the Parties and/or any third-party claims related, in any way, to the Project.

While the lease documents are in effect, Developer shall give District one hundred twenty (120) days written notice prior to dissolving or terminating the legal existence of Developer.

10. Preconstruction Services

10.1 Scope of the Preconstruction Services

Developer shall perform management and coordination services, plan and specification constructability reviews, provide value-engineering reviews and recommendations and other reviews as necessary to verify that the drawings and specifications are clear and reasonably accurate to minimize the need for changes during the construction phase of the project, including but not limited to the following:

10.1.1 General Services

10.1.1.1 Developer shall attend regular meetings during Project development between the Architect, the District, District site personnel, and any other applicable consultants of the District as required to discuss the Project, including budget, scope and schedule.

10.1.1.2 Developer shall assist the Architect with making formal presentations to the governing board of District. Such assistance is anticipated to include floor plans and elevations necessary for any architectural presentation.

10.1.1.3 Developer shall prepare a rough schedule in Microsoft PROJECT and update as necessary.

10.1.1.4 Developer shall prepare and update the components of the Guaranteed Maximum Price and shall be primarily responsible for ensuring that the Project can and is constructed for no more than that amount.

10.1.1.5 While the Architect is anticipated to provide primary assistance, Developer shall assist District with City land use issues;

10.1.1.6 Architect shall act as lead and Developer will assist District and Architect with DSA review, input, and timeframe for same;

10.1.1.7 Architect shall act as lead and Developer will assist with review and comment upon geotechnical / soils investigation and report;

10.1.1.8 Architect shall act as lead and Developer will assist with review and comment upon survey of the Project site;

10.1.2 Review of Design Documents.

10.1.2.1 Review Project design and budget with the District and the Architect based on the Design Development Documents, 50% Construction Documents, and the 100% Construction Documents submitted to DSA to:

10.1.2.1.1 Provide recommendations on site use and improvements, selection of materials, building systems and equipment and methods of Project delivery;

10.1.2.1.2 Provide recommendations on relative feasibility of construction methods, availability of materials and labor, time requirements for procurement, installation and construction of the Project and subparts thereof if requested, and factors relating to cost including, but not limited to, construction costs of alternate designs of materials, preliminary budgets and possible economics that could be achieved through alternate methods or substitutions;

10.1.2.1.3 Provide interim design phase estimates to establish and maintain the Project budget and scheduled costs; and

10.1.2.1.4 Provide plan review.

10.1.2.1.5 **Value-engineering.** Prepare a value-engineering report for District review and approval that:

10.1.2.1.5.1 Details areas of cost saving (e.g. construction processes/procedures, specified materials and equipment, and equipment or other aspects of the design documents that can be modified to reduce costs and/or the time for achieving final completion of the Project and/or to extend life-cycle and/or to reduce maintenance/operations costs, without diminution in the quality of materials/equipment/workmanship, scope or intended purposes of the Project);

10.1.2.1.5.2 Provides detailed estimate for proposed value-engineering items;

10.1.2.1.5.3 Defines methodology or approaches that maximize value; and

10.1.2.1.5.4 Identifies design choices that can be more economically delivered.

10.1.2.1.6 **Constructability Review.** Prepare detailed interdisciplinary constructability review within Fourteen (14) days of receipt of the plans from the District that:

10.1.2.1.6.1 Ensures construction documents are well coordinated and reviewed for errors;

10.1.2.1.6.2 Identifies to the extent known, construction deficiencies and areas of concern;

10.1.2.1.6.3 Back-checks design drawings for inclusion of modifications;

10.1.2.1.6.4 Provides the District with written confirmation that:

10.1.2.1.6.4.1 Requirements noted in the design documents prepared for the Project are consistent with and conform to the District's Project requirements and design standards.

10.1.2.1.6.4.2 Various components have been coordinated and are consistent with each other so as to minimize conflicts within or between components of the design documents.

10.1.2.2 Confirm Modifications to Design Drawings. If the District accepts Developer's comments, including the value-engineering and/or constructability review comments, review the design documents to confirm that those comments are properly incorporated into the final design documents.

10.1.3 **Budget of Project Costs**.

10.1.3.1 At each stage of plan review indicated above, Developer will update and refine the budget of the Guaranteed Maximum Price based on the most recent set of design documents. Developer shall also advise the District and the Architect if it appears that the total construction costs may exceed the Guaranteed Maximum Price established by the District and shall make recommendations for corrective action. Developer will further provide input to the District and Architect relative to value of construction, means and methods for construction, duration of construction of various building methods and constructability.

10.1.3.2 In each budget of the Guaranteed Maximum Price, Developer shall include values of scopes of work subdivided into component parts in sufficient detail to serve as the basis for progress payments during construction. This budget of the Guaranteed Maximum Price shall include, at a minimum, the following information divided into at least the following categories for each site:

10.1.3.2.1 Overhead and profit;

10.1.3.2.2 Supervision;

10.1.3.2.3 General conditions;

10.1.3.2.4 Layout & Mobilization (not more than 1%)

10.1.3.2.5 Submittals, samples, shop drawings (not more than 3%);

10.1.3.2.6 Bonds and insurance (not more than 2%);

10.1.3.2.7 Close-out documentation (not less than 3%);

10.1.3.2.8 Demolition;

10.1.3.2.9 Installation;

10.1.3.2.10 Rough-in;

10.1.3.2.11 Finishes;

10.1.3.2.12 Testing;

10.1.3.2.13 Owner and Maintenance Manuals;

10.1.3.2.14 Punchlist and acceptance.

10.1.4 **Construction Schedule and Phasing Plan**

Developer shall prepare a preconstruction schedule to guide the design team through to bid dates. That schedule shall show the multiple phases and interrelations of design, constructability review, and estimating. Developer shall also prepare a full construction schedule for the Project detailing the phasing and construction activities. Developer shall further investigate, recommend and prepare a schedule for the District's purchase of materials and equipment requiring long lead time procurement, and coordinate the schedule with the early preparation of portions of the Contract Documents by the Architect.

10.1.5 **Construction Planning and Bidding**

10.1.5.1 For all of Developer's activities relating to construction planning and bidding, Developer shall comply with all applicable legal requirements, including but not limited to those set forth in Education Code section 17406.

10.1.5.2 Consult with District staff in relation to the existing site. Developer should make site visits, as needed to review the current site conditions. During this evaluation, Developer may make recommendations relating to soils investigations and utility locations and capacities, in order to minimize unforeseen conditions.

10.1.5.3 Attend meetings at the Project site with the Architect and the design team every two (2) weeks, until plans are ready for submittal to DSA (approximately 6 to 8 weeks, meeting duration is approximately 2 hours).

10.1.5.4 Provide plan review and constructability services with an emphasis on ensuring that the Project can be completed within the established schedule and within the available budget.

10.1.5.5 Provide a detailed analysis of all major Project systems with an emphasis on possible value engineering possibilities.

10.1.5.6 Prepare and distribute specifications and drawings provided by District to facilitate bidding to Developer's subcontractors.

10.1.5.7 Review the drawings and specifications to eliminate areas of conflict and overlapping in the work to be performed by various subcontractors, and with a view to eliminating change order requests by the Architect or subcontractors.

10.1.5.8 Conduct pre-bid conferences. Coordinate with District and the Architect in responding to subcontractor questions or providing clarification to all subcontractors.

10.1.5.9 DSA approved plans shall be utilized to receive subcontractor bids and develop the final GMP in accordance with the lease-leaseback agreement forms. The District representative shall be present during the receipt of bids from subcontractors.

10.1.5.9.1 Developer shall engage in competitive bidding for subcontractors for all scopes of work on the Project that constitute more than one-half of one percent (0.5%) of the total GMP.

10.1.5.9.2 Developer shall provide public notice of availability of work to be subcontracted in accordance with the publication requirements applicable to the competitive bidding process of the District, including a fixed date and time on which qualifications statements, bids, or proposals will be due.

10.1.5.9.3 Developer shall establish reasonable qualification criteria and standards.

10.1.5.9.4 The District representative shall be present during the receipt of bids from subcontractors. Developer shall provide all bids received from all subcontractors to the District.

10.1.5.9.5 Developer shall award the subcontract either on a best value basis or to the lowest responsible bidder.

10.1.5.9.6 Developer is required to receive at least three (3) bona fide bids from subcontractors for all scopes of work, or seek the District's prior approval if it wishes to provide fewer than the minimum number of bona fide bids from subcontractors.

10.1.5.9.7 The process may include prequalification or short-listing.

10.1.5.9.8 This process shall not apply to subcontractors listed in the original proposal.

10.1.5.10 The GMP shall be presented to the District in the following manner within a three-ring binder as well as electronically on an external memory device such as a CD, USB drive, or other comparable device:

10.1.5.10.1 Cover sheet, signed by the Developer indicating the GMP dollar amount with a certification, indicating that the GMP is all inclusive per the plans, specifications and addenda (contract documents). Also include certification stating, "Developer hereby certifies that they have reviewed all subcontractor proposals and whether the subcontractor excluded portions of their scope the Developer has included all costs for a complete GMP in accordance with plans, specifications and addenda."

10.1.5.10.2 A bid tabulation sheet indicating the breakdown by subcontractor/trade along with the appropriate general condition amount, other fees (as submitted with the response to the RFQ/P).

10.1.5.10.3 Behind the bid tabulation sheet should be a sheet that indicates what is included in the general conditions, which should match what was submitted in the response to the RFQ/P.

10.1.5.10.4 Copies of all subcontractor bids received divided by trade that corresponds to the final spread sheet with a cover sheet indicating the scope and subcontractors that provided bids as well as those that were asked to bid, but did not submit a proposal. This sheet should have the dollar amounts for each subcontractor that provided a bid with the first column being the proposed subcontractor for that trade.

10.1.5.10.5 Behind the final spread sheet, described above, should be the bids for that trade with the proposed

subcontractor bid on top and the other subcontractor bids in descending dollar order.

10.1.5.11 Produce detailed construction CPM schedules to be incorporated into the Project documents including identification of the Project critical path and agency approvals.

10.1.5.12 Plan the phases and staging of construction, staging areas, temporary fencing, office trailer placement, access, etc. as required.

10.1.5.13 Any other services that are reasonable and necessary to control the budget and schedule. List those areas where subconsultants will be required and where the Developer has in-house expertise. Provide resumes of persons providing each of these services and for key personnel assigned to the Project, not previously provided to the District.

10.2 **Schedule**

Preconstruction services outlined above will commence on the date the District issues a Notice to Proceed with Preconstruction Services, and conclude upon approval of the amendment to the Facilities Lease by District's Board or termination of this Agreement by either party per the Agreement's terms. Construction will commence on the date the District issues a Notice to Proceed with Construction. Any extension shall be subject to reasonable approval in writing by the parties.

10.3 **Ownership of Records**

It is mutually agreed that all materials prepared by Developer under this Agreement shall become the property of the District and Developer shall have no property right therein whatsoever. Developer hereby assigns to District any copyrights associated with the materials prepared pursuant to the Agreement.

10.4 **Open Book Policy**

There will be an open book policy with Developer and its construction team. District shall have access to all subcontractor bids, value engineering back-up, contingency breakdown & tracking, and Developer fees.

10.5 **Compensation to Developer for Preconstruction Services**

District agrees to reimburse Developer in the total amount not to exceed [Amount in Words] Dollars ($[Amount in Numbers]), for the performance of preconstruction services contemplated by this Agreement. Developer shall be paid monthly for the actual fees and allowed costs and expenses for all time and materials required and expended for work requested and specified by the District as completed. Said amount shall be paid within thirty (30) days upon submittal to and verification by the District of a monthly billing statement

showing completion of the tasks for that month on a line item basis. In the event Developer and District enter into an amendment to the Facilities Lease for the construction of the Project, this compensation for services rendered will be included as part of the Guaranteed Maximum Price ("GMP") to be paid to Developer by District.

Developer shall be responsible for any and all costs and expenses incurred by Developer, including but not limited to the costs of hiring sub-consultants, contractors and other professionals, review of the Project's Plans and Specifications, review and preparation of necessary documentation relating to the development of the Project, all travel-related expenses, as well as for meetings with District and its representatives, long distance telephone charges, copying expenses, salaries of Developer staff and employees working on the Project, overhead, and any other reasonable expenses incurred by Developer in performance of the preconstruction services contemplated by this Agreement.

10.6 **Termination before Construction Phase**

10.6.1 Before the Notice to Proceed with Construction is issued by the District, this Agreement may be terminated at any time without cause by District upon fourteen (14) days written notice to Developer. In the event of such a termination by District, the District shall pay Developer for all undisputed services performed and expenses incurred per this Agreement, supported by documentary evidence, including, but not limited to, payroll records, invoices from third parties retained by Developer pursuant to this Agreement, and expense reports up until the date of notice of termination plus any sums due Developer for Board-approved extra services. In ascertaining the services actually rendered hereunder up to the date of termination of this Agreement, consideration shall be given to completed work and work in process that would best serve the District if a completed product was presented.

10.6.2 In the event that the parties do not reach an agreement on the GMP, this Agreement will be terminated at that time. In the event of such a termination, the District shall pay Developer no more than the not to exceed amount in Section 10.5 above.

10.7 **Construction Phase**

Developer shall not commence any construction work before DSA approval of the Plans and Specifications.

11. **<u>Construction of Project</u>**

11.1 **Construction of Project**

11.1.1 Developer agrees to cause the Project to be developed, constructed, and installed in accordance with the terms hereof and the Construction Provisions set forth in **Exhibit D**, including those things reasonably inferred from the Contract Documents as being

within the scope of the Project and necessary to produce the stated result even though no mention is made in the Contract Documents.

11.1.2 **Contract Time / Construction Schedule**

It is hereby understood and agreed that the Contract Time for this Project shall be _____ (_____) calendar days, commencing on the date of the Notice to Proceed with Construction ("Contract Time"). The Construction Schedule must be approved by the District.

11.1.3 **Schedule of Values**

The Developer has provided a schedule of values, approved by the District, which will be attached hereto as **Exhibit G** ("Schedule of Values"). The Schedule of Values must be approved by the District.

11.1.4 **Liquidated Damages**

Time is of the essence for all work Developer must perform to complete the Project. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage that the District will sustain in the event of and by reason of Developer's delay; therefore, Developer agrees that it shall pay to the District the sum of _____ Dollars ($_____) per day as liquidated damages for each and every day's delay beyond the Contract Time.

11.1.4.1 It is hereby understood and agreed that this amount is not a penalty.

11.1.4.2 In the event any portion of the liquidated damages is not paid to the District, the District may deduct that amount from any money due or that may become due the Developer under this Facilities Lease. The District's right to assess liquidated damages is as indicated herein and in **Exhibit D**.

11.1.4.3 The time during which the construction of the Project is delayed for cause as hereinafter specified may extend the time of completion for a reasonable time as the District may grant.

11.1.5 **Guaranteed Maximum Price**

Developer will cause the Project to be constructed within the Guaranteed Maximum Price as set forth and defined in the Guaranteed Maximum Price Provisions in **Exhibit C,** and Developer will not seek additional compensation from District in excess of that amount.

11.1.6 **Modifications**

If the DSA requires changes to the Contract Documents submitted by District to Developer, and those changes change the construction costs and/or construction time for the Project, then those changed costs or time will be handled as a modification pursuant to the provisions of **Exhibit D**.

11.1.7 **Labor Compliance Monitoring and Enforcement by Department of Industrial Relations**

This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and Title 8 of the California Code of Regulations. Developer specifically acknowledges and understands that it shall perform the Work of this Contract while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code.

12. **Maintenance**

Following delivery of possession of the Project by Developer to District, the repair, improvement, replacement and maintenance of the Project and the Project Site shall be at the sole cost and expense and the sole responsibility of the District, subject only to all punch list items and warranties against defects in materials and workmanship of Developer as provided in **Exhibit D**. The District shall pay for or otherwise arrange for the payment of the cost of the repair and replacement of the Project resulting from ordinary wear and tear. The District waives the benefits of subsections 1 and 2 of Section 1932 of the California Civil Code, but such waiver shall not limit any of the rights of the District under the terms of this Facilities Lease.

13. **Utilities**

Following delivery of possession of the Project by Developer to District, the cost and expenses for all utility services, including, but not limited to, electricity, natural gas, telephone, water, sewer, trash removal, cable television, janitorial service, security, heating, water, internet service, data transmission, and all other utilities of any type shall be paid by District.

14. **Taxes and Other Impositions**

All ad valorem real property taxes, special taxes, possessory interest taxes, bonds and special lien assessments or other impositions of any kind with respect to the Project, the Project Site and the improvements thereon, charged to or imposed upon either Developer or the District or their respective interests or estates in the Project, shall at all times be paid by District. In the event any possessory interest tax is levied on Developer, its successors and assigns, by virtue of this Facilities Lease or the Site Lease, District shall pay such possessory interest tax directly, if possible, or shall reimburse Developer, its successors and assigns for the full amount thereof within forty-five (45) days after presentation of proof of payment by Developer.

15. **Insurance**

15.1 **Developer's Insurance**

The Developer shall comply with the insurance requirements as indicated here and in **Exhibit D-1.**

15.2 **District's Insurance**

15.2.1 **Rental Interruption Insurance**

District shall at all times from and after District's **acceptance** of the Project, for the benefit of District and Developer, as their interests may appear, maintain rental interruption insurance to cover loss, total or partial, of the use of the Project due to damage or destruction, in an amount at least equal to the maximum estimated Lease Payments payable under this Facilities Lease during the current or any future twenty-four (24) month period. This insurance may be maintained as part of or in conjunction with any other insurance coverage carried by the District, and such insurance may be maintained in whole or in part in the form of participation by the District in a joint powers agency or other program providing pooled insurance. This insurance may not be maintained in the form of self-insurance. The proceeds of this insurance shall be paid to the Developer.

15.2.2 **Property Insurance**

District shall at all times from and after District's acceptance of the Project, carry and maintain in force a policy of property insurance for 100% of the insurable replacement value with no coinsurance penalty, on the Project Site and the Project, together with all improvements thereon, under a standard "all risk" contract insuring against loss or damage. Developer shall be named as additional insureds or co-insureds thereon by way of endorsement. District shall not be relieved from the obligation of supplying any additional funds for replacement of the Project and the improvements thereon in the event of destruction or damage where insurance does not cover replacement costs. District shall have the right to procure the required insurance through a joint powers agency or to self-insure against such losses or portion thereof as is deemed prudent by District.

16. **Indemnification and Defense**

16.1 To the fullest extent permitted by California law, Developer shall indemnify, keep and hold harmless the District and its respective Board Members, officers, representatives, employees, consultants, the Architect and Construction Manager in both individual and official capacities and their consultants ("Indemnitees"), against all suits, claims, damages, losses, and expenses, including but not limited to attorney's fees and costs, caused by, arising out of, resulting from, or incidental to, the performance of the Work under this Contract by the Developer or its Subcontractors, vendors and/or

suppliers, including any suit, claim, damage, loss, or expense attributable to, without limitation, bodily injury, sickness, disease, death, alleged patent violation or copyright infringement, or injury to or destruction of tangible property (including damage to the Work itself) and including the loss of use resulting therefrom, except to the extent caused wholly by the active negligence or willful misconduct of the Indemnitees, and/or defects in design furnished by the Architect, as found by a court or arbitrator of competent jurisdiction, in which case the Developer's indemnification and hold harmless obligation shall be reduced by the proportion of the Indemnitees' and/or Architect's liability. This indemnification and hold harmless obligation includes, but is not limited to, any failure or alleged failure by Developer to comply with any law and/or provision of the Contract Documents, including, without limitation, any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the California Department of Industrial Relations.

16.2 Developer shall also defend, at its own expense, Indemnitees against all suits, claims, allegations, damages, losses, and expenses, including but not limited to attorneys' fees and costs, caused by, arising out of, resulting from, or incidental to, the performance of the Work under this Contract by Developer, its Subcontractors, vendors, or suppliers, except to the extent caused by the sole negligence, active negligence, or willful misconduct of the Indemnitees, and/or defects in design furnished by the Architect, as found by a court or arbitrator of competent jurisdiction, in which case the Developer's defense obligation shall be reduced by the proportion of the Indemnitees' and/or Architect's liability. The District shall have the right to accept or reject any legal representation that Developer proposes to defend the Indemnitees. If the Indemnitees provide their own defense due to failure to timely respond to tender of defense, rejection of tender of defense, or conflict of interest of proposed counsel, Developer shall reimburse Indemnitees for any expenditures, including reasonable attorney's fees and costs. This defense obligation includes, but is not limited to, any failure or alleged failure by Developer to comply with any provision of law, any failure or alleged failure to timely and properly fulfill all of its obligations under the Contract Documents in strict accordance with their terms, and without limitation, any failure or alleged failure of Developer's obligations regarding any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the California Department of Industrial Relations. This agreement and obligation of the Developer shall not be construed to negate, abridge, or otherwise reduce any right or obligation of defense that would otherwise exist as to any party or person described herein.

16.3 The Developer shall give prompt notice to the District in the event of any injury (including death), loss, or damage included herein. Without limitation of the provisions herein, if the Developer's agreement to indemnify and hold harmless the Indemnitees or its agreement to defend Indemnitees as provided herein against liability for damage arising out of bodily injury to persons or damage to property caused by or resulting from the negligence of any of the Indemnitees shall to any extent be or be determined to be void or unenforceable, it is the intention of the parties that these circumstances shall not otherwise affect the validity or enforceability of the Developer's agreement to indemnify, defend, and hold harmless the rest of the Indemnitees, as provided herein, and in the case of any such suits, claims,

damages, losses, or expenses caused in part by the default, negligence, or act or omission of the Developer, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, and in part by any of the Indemnitees, the Developer shall be and remain fully liable on its agreements and obligations herein to the fullest extent permitted by law.

16.4 In any and all claims against any of the Indemnitees by any employee of the Developer, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the Developer's indemnification obligation herein shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Developer or any Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

16.5 The District may retain so much of the moneys due to the Developer as shall be considered necessary, until disposition of any such suit, claims or actions for damages or until the District, Architect and Construction Manager have received written agreement from the Developer that Developer will unconditionally defend the District and its respective Board Members, officers, representatives, employees, consultants, the Architect and Construction Manager and their sub-consultants and pay any damages due by reason of settlement or judgment.

16.6 The indemnification and defense obligations hereunder shall survive the completion of Work, including the warranty/guarantee period, and/or the termination of the Contract.

17. <u>Eminent Domain</u>

17.1 Total Taking After Project Delivery

If, following delivery of possession of the Project by Developer to District, all of the Project and the Project Site is taken permanently under the power of eminent domain, the Term shall cease as of the day possession shall be so taken.

17.1.1 The financial interest of Developer shall be limited to the amount of principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C that are then due or past due together with all remaining and succeeding principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C for the remainder of the original Term. For example, if all of the Project and the Project Site is taken at the end of the third year of the Term, Developer shall be entitled to receive from the eminent domain award the sum of all principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C that would have been owing for the fourth year through the end of the Term had there been no taking.

17.1.2 The balance of the award, if any, shall be paid to the District.

17.2 **Total Taking Prior to Project Delivery**

If all of the Project and the Project Site is taken permanently under the power of eminent domain and the Developer is still performing the work of the Project and has not yet delivered possession of the Project to District, the Term shall cease as of the day possession shall be so taken. The financial interest of Developer shall be the amount Developer has expended to date for work performed on the Project, subject to documentation reasonably satisfactory to the District.

17.3 **Partial Taking.**

If, following delivery of possession of the Project by Developer to District, less than all of the Project and the Project Site is taken permanently, or if all of the Project and the Project Site or any part thereof is taken temporarily, under the power of eminent domain.

17.3.1 This Facilities Lease shall continue in full force and effect and shall not be terminated by virtue of that partial taking and the Parties waive the benefit of any law to the contrary, and

17.3.2 There shall be a partial abatement of any principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C as a result of the application of the net proceeds of any eminent domain award to the prepayment of those payments hereunder. The Parties agree to negotiate, in good faith, for an equitable split of the net proceeds of any eminent domain award and a corresponding reduction in the payments required pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C.

18. **Damage and Destruction**

If, following delivery of possession of all or a portion of the Project by Developer to District, the Project is totally or partially destroyed due to fire, acts of vandalism, flood, storm, earthquake, Acts of God, or other casualty beyond the control of either party hereto, the Term shall end and District shall no longer be required to make any payments required pursuant to the Guaranteed Maximum Price Provisions indicated in **Exhibit C** that are then due or past due or any remaining and succeeding principal payments pursuant to the Guaranteed Maximum Price Provisions indicated in **Exhibit C** for the remainder of the original Term. Nothing in this section shall relieve District of its obligations, nor deny Developer its rights, under section 15.2

19. **Abatement**

19.1 If, after the Parties have executed the Memorandum of Commencement Date attached hereto as **Exhibit E,** the Project becomes destroyed or damaged beyond repair, the District may determine its use of the Project abated. Thereafter, the District shall have no obligation to make, nor shall the Developer have the right to demand, the Lease Payments as indicated in the Guaranteed Maximum Price Provisions indicated in **Exhibit C** to this Facilities Lease. The Term shall cease at that time. Nothing in this section shall relieve District of its obligations, nor deny Developer its rights, under section 15.2.

19.2 The Parties hereby agree that the net proceeds of the District's rental interruption insurance that the District must maintain during the Term, as required herein, shall constitute a special fund for the payment of the Lease Payments indicated in the Guaranteed Maximum Price Provisions indicated in **Exhibit C**.

19.3 The District shall as soon as practicable after such event, apply the net proceeds of its insurance policy intended to cover that loss ("Net Proceeds"), either to:

19.3.1 Repair the Project to full use.

19.3.2 Replace the Project, at the District's sole cost and expense, with property of equal or greater value to the Project immediately prior to the time of the destruction or damage, and that replacement, once completed, shall be substituted in this Facilities Lease by appropriate endorsement; or

19.3.3 Exercise the District's purchase option as indicated in the Guaranteed Maximum Price Provisions indicated in Exhibit C to this Facilities Lease.

19.4 The District shall notify the Developer of which course of action it desires to take within thirty (30) days after the occurrence of the destruction or damage. The Net Proceeds of all insurance payable with respect to the Project shall be available to the District and shall be used to discharge the District's obligations under this Section.

20. Access

20.1 By Developer

Developer shall have the right at all reasonable times to enter upon the Project Site to construct the Project pursuant to this Facilities Lease. Following the acceptance of the Project by District, Developer may enter the Project at reasonable times with advance notice and arrangement with District for purposes of making any repairs required to be made by Developer.

20.2 By District

The District shall have the right to enter upon the Project Site at all times. District shall comply with all safety precautions and procedures required by Developer.

21. Assignment, Subleasing

21.1 Assignment and Subleasing by the District

Any assignment or sublease by District shall be subject to all of the following conditions:

21.1.1 This Facilities Lease and the obligation of the District to make the payments required pursuant to the Guaranteed Maximum Price

Provisions indicated in Exhibit C shall remain obligations of the District; and

21.1.2 The District shall, within thirty (30) days after the delivery thereof, furnish or cause to be furnished to Developer a true and complete copy of any assignment or sublease.

21.2 **Assignment by Developer**

Developer may assign its right, title and interest in this Facilities Lease, in whole or in part to one or more assignees, only after the written consent of District, which District will not unreasonably withhold. No assignment shall be effective against the District unless and until the District has consented in writing. Notwithstanding anything to the contrary contained in this Facilities Lease, no consent from the District shall be required in connection with any assignment by Developer to a lender for purposes of financing the Project as long as there are not additional costs to the District.

22. **Termination, Default And Suspension**

22.1 **Termination; Lease Terminable Only As Set Forth Herein**

22.1.1 Except as otherwise expressly provided in this Facilities Lease, this Facilities Lease shall not terminate, nor shall District have any right to terminate this Facilities Lease or be entitled to the abatement of any necessary payments pursuant to the Guaranteed Maximum Price Provisions in Exhibit C or any reduction thereof. The obligations hereunder of District shall not be otherwise affected by reason of any damage to or destruction of all or any part of the Project; the taking of the Project or any portion thereof by condemnation or otherwise; the prohibition, limitation or restriction of District's use of the Project; the interference with such use by any private person or contractor; the District's acquisition of the ownership of the Project (other than pursuant to an express provision of this Facilities Lease); any present or future law to the contrary notwithstanding. It is the intention of the Parties hereto that all necessary payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C shall continue to be payable in all events, and the obligations of the District hereunder shall continue unaffected unless the requirement to pay or perform the same shall be terminated or modified pursuant to an express provision of this Facilities Lease.

22.1.2 Nothing contained herein shall be deemed a waiver by the District of any rights that it may have to bring a separate action with respect to any Event of Default by Developer hereunder or under any other agreement to recover the costs and expenses associated with that action. The District covenants and agrees that it will remain obligated under this Facilities Lease in accordance with its terms.

22.1.3 Following completion of the Project, the District will not take any action to terminate, rescind or avoid this Facilities Lease,

notwithstanding the bankruptcy, insolvency, reorganization, composition, readjustment, liquidation, dissolution, winding-up or other proceeding affecting Developer or any assignee of Developer in any such proceeding, and notwithstanding any action with respect to this Facilities Lease which may be taken by any trustee or receiver of Developer or of any assignee of Developer in any such proceeding or by any court in any such proceeding. Following completion of the Project, except as otherwise expressly provided in this Facilities Lease, District waives all rights now or hereafter conferred by law to quit, terminate or surrender this Facilities Lease or the Project or any part thereof.

22.1.4 District acknowledges that Developer may assign an interest in some or all of the necessary payments pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C to a lender in order to obtain financing for the cost of constructing the Project and that the lender may rely on the foregoing covenants and provisions in connection with such financing.

22.2 **District's Right to Terminate Developer for Cause**

22.2.1 **Grounds for Termination**

The District, in its sole discretion, without prejudice to any other right or remedy, may terminate the Site Lease and Facilities Lease and/or terminate the Developer's right to perform the work of the Facilities Lease based upon any of the following:

22.2.1.1 Developer refuses or fails to execute the Work or any separable part thereof; or

22.2.1.2 Developer fails to complete said Work within the time specified or any extension thereof; or

22.2.1.3 Developer persistently fails or refused to perform Work or provide material of sufficient quality as to be in compliance with the Facilities Lease; or

22.2.1.4 Prior to completion of the Project, Developer is adjudged a bankrupt, files a petition for relief as a debtor, or a petition is filed against the Developer without its consent, and the petition not dismissed within sixty (60) days; or

22.2.1.5 Prior to the completion of the Project, Developer makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency; or

22.2.1.6 Developer persistently or repeatedly refuses and/or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials to complete the Work in the time specified; or

22.2.1.7 Developer fails to make prompt payment to Subcontractors, or for material, or for labor; or

22.2.1.8 Developer persistently disregards laws, or ordinances, or instructions of District as indicated in **Exhibit D**, or otherwise in violation of **Exhibit D**; or

22.2.1.9 Developer fails to supply labor, including that of Subcontractors, that is sufficient to prosecute the Work or that can work in harmony with all other elements of labor employed or to be employed on the Work; or

22.2.1.10 Developer or its Subcontractor(s) is/are otherwise in breach, default, or in substantial violation of any provision of this Facilities Lease, including but not limited to a lapse in licensing or registration for Developer or any tier of Subcontractor.

22.2.2 **Notification of Termination**

22.2.2.1 Upon the occurrence at District's sole determination of any of the above conditions, or upon Developer's failure to perform any material covenant, condition or agreement in this Facilities Lease, District may, without prejudice to any other right or remedy, serve written notice upon Developer and its Surety of District's termination of this Facilities Lease and/or the Developer's right to perform the work of this Facilities Lease. This notice will contain the reasons for termination.

22.2.2.1.1 Unless, within fifteen (15) days after the service of the notice, any and all condition(s) shall cease, and any and all violation(s) shall cease, or arrangement satisfactory to District for the correction of the condition(s) and/or violation(s) be made, this Facilities Lease and the Site Lease shall cease and terminate.

22.2.2.1.2 If the failure stated in the notice cannot be corrected within fifteen (15) days after the service of notice, District may consent to an extension of time, provided Developer instituted and diligently pursued corrective action within the applicable fifteen (15)-day period and until the violation is corrected. Upon District determination, Developer shall not be entitled to receive any further payment until the entire Work is finished.

22.2.2.2 Upon Termination, District may immediately serve written notice of tender upon Surety whereby Surety shall have the right to take over and perform this Facilities Lease only if Surety:

22.2.2.2.1 Within three (3) days after service upon it of the notice of tender, gives District written notice of Surety's intention to take over and perform this Facilities Lease; and

22.2.2.2.2 Commences performance of this Facilities Lease within three (3) days from date of serving of its notice to District.

22.2.2.3 Surety shall not utilize Developer in completing the Project if the District notifies Surety of the District's objection to Developer's further participation in the completion of the Project. Surety expressly agrees that any developer which Surety proposes to fulfill Surety's obligations is subject to District's approval.

22.2.2.4 If Surety fails to notify District or begin performance as indicated herein, District may take over the Work and execute the Work to completion by any method it may deem advisable at the expense of Developer and/or its Surety. Developer and its Surety shall be liable to District for any excess cost or other damages the District incurs thereby. Time is of the essence in this Facilities Lease. If the District takes over the Work as herein provided, District may, without liability for so doing, take possession of and utilize in completing the Work all materials, appliances, plan, and other property belonging to Developer as may be on the Site of the Work, in bonded storage, or previously paid for.

22.2.3 **Effect of Termination**

22.2.3.1 If District terminates the Site Lease and the Facilities Lease pursuant to this section, the Project Site and any improvements built upon the Project Site shall vest in District upon termination of the Site Lease and Facilities Lease, and District shall thereafter be required to pay only the principal amounts then due and owing pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C, less any damages incurred by District due to Developer's default, acts, or omissions.

22.2.3.2 The District shall retain all rights it possesses pursuant to this Facilities Lease including, without limitation.

22.2.3.2.1 The right to assess liquidated damages due because of any project delay; and

22.2.3.2.2 All rights the District holds to demand performance pursuant to the Developer's required performance bond.

22.2.3.3 Developer shall, only if ordered to do so by the District, immediately remove from the Site all or any materials and personal property belonging to Developer that have not been incorporated in the construction of the Work, or which are not in place in the Work. The District retains the right, but not the obligation, to keep and use any materials and personal property belonging to Developer that have not been incorporated in the construction of the Work, or which are not in place in the Work. The Developer and its Surety shall be liable upon the performance bond for all damages caused the District by reason of the Developer's failure to complete the Work under this Facilities Lease.

22.2.3.4 In the event that the District shall perform any portion of, or the whole of the Work, pursuant to the provisions of the General Conditions, the District shall not be liable nor account to the Developer in any way for the time within which, or the manner in which, the Work is performed by the District or for any changes the District may make in the Work or for the money expended by the District in satisfying claims and/or suits and/or other obligations in connection with the Work.

22.2.3.5 In the event that the Site Lease and Facilities Lease are terminated for any reason, no allowances or compensation will be granted for the loss of any anticipated profit by the Developer or any impact or impairment of Developer's bonding capacity.

22.2.3.6 If the expense to the District to finish the Work exceeds the unpaid Guaranteed Maximum Price, Developer and Surety shall pay difference to District within twenty-one (21) days of District's request. District may apply any amounts otherwise due to Developer to this difference.

22.2.3.7 The District shall have the right (but shall have no obligation) to assume and/or assign to a replacement contractor or construction manager, or other third party who is qualified and has sufficient resources to complete the Work, the rights of the Developer under its subcontracts with any or all Subcontractors. In the event of an assumption or assignment by the District, no Subcontractor shall have any claim against the District or third party for Work performed by Subcontractor or other matters arising prior to termination of the Facilities Lease. The District or any third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after assumption or assignment.

Should the District so elect, the Developer shall execute and deliver all documents and take all steps, including the legal assignment of its contractual rights, as the District may require, for the purpose of fully vesting in the District the rights and benefits of its Subcontractors under Subcontracts or other obligations or commitments. Developer must include this assignment provision in all of its Facilities Leases with its Subcontractors.

22.2.3.8 All payments due the Developer hereunder shall be subject to a right of offset by the District for expenses, damages, losses, costs, claims, or reimbursements suffered by, or due to, the District as a result of any default, acts, or omissions of the Developer.

22.2.3.9 The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to District.

22.3 **Termination of Developer for Convenience**

22.3.1 District in its sole discretion may terminate the Facilities Lease upon five (5) days written notice to the Developer. Under a termination for convenience, the District retains the right to all the options available to the District if there is a termination for cause. In case of a termination for convenience, the Developer shall have no claims against the District except:

22.3.1.1 The actual cost for labor, materials, and services performed that is unpaid and adequately documented through timesheets, invoices, receipts, or otherwise; and

22.3.1.2 Five percent (5%) of the total cost of work performed as of the date of termination, or five percent (5%) of the value of the Work yet to be performed, whichever is less. This five percent (5%) amount shall be full compensation for all Developer's and its Subcontractor(s)' mobilization and/or demobilization costs and any anticipated lost profits resulting from termination of the Developer for convenience.

22.4 Developer Remedies Upon District Default

22.4.1 Events of Default by District Defined

The following shall be "Events of Default" of the District under this Facilities Lease. The terms "Event of Default" and "Default," whenever they are used as to the District in the Site Lease or this Facilities Lease, shall only mean one or more of the following events:

22.4.1.1 Failure by the District to pay payments required pursuant to the Guaranteed Maximum Price Provisions in Exhibit C, and the continuation of this failure for a period of forty-five (45) days.

22.4.1.2 Failure by the District to perform any material covenant, condition or agreement in this Facilities Lease and that failure continues for a period of forty-five (45) days after Developer provides District with written notice specifying that failure and requesting that the failure be remedied; provided, however, if the failure stated in the notice cannot be corrected within the applicable period, Developer shall not withhold its consent to an extension of time if corrective action is instituted by the District within the applicable period and diligently pursued until the default is corrected.

22.4.2 Remedies on District's Default

If there has been an Event of Default on the District's part, the Developer may exercise any and all remedies granted pursuant to this Facilities Lease; provided, however, there shall be no right under any circumstances to accelerate any of the payments required pursuant to the Guaranteed Maximum Price Provisions in **Exhibit C** or otherwise declare those payments not then past due to be immediately due and payable.

22.4.2.1 Developer may rescind its leaseback of the Project Site to the District under this Facilities Lease and re-rent the Project Site to another lessee for the remaining Term for no less than the fair market value for leasing the Project Site, which shall be:

22.4.2.1.1 An amount determined by a mutually-agreed upon appraiser; or

22.4.2.1.2 If an appraiser cannot be agreed to, an amount equal to the mean between a District appraisal and a Developer appraisal for the Project Site, both prepared by MAI-certified appraisers.

22.4.2.2 District's obligation to make the payments required pursuant to the Guaranteed Maximum Price Provisions indicated in Exhibit C shall be:

22.4.2.2.1 Increased by the amount of costs, expenses, and damages incurred by the Developer in re-renting the Project Site; and

22.4.2.2.2 Decreased by the amount of rent Developer receives in re-letting the Project Site.

22.4.2.3 The District agrees that the terms of this Facilities Lease constitute full and sufficient notice of the right of Developer to re-rent the Project Site in the Event of Default without effecting a surrender of this Facilities Lease, and further agrees that no acts of Developer in re-renting as permitted herein shall constitute a surrender or termination of this Facilities Lease, but that, on the contrary, in the event of an Event of Default by the District the right to re-rent the Project Site shall vest in Developer as indicated herein.

22.4.3 **District's Continuing Obligation**

Unless there has been damage, destruction, a Taking, or the Developer has acted, failed to act, or is in default as indicated above providing District with the right to terminate for cause, the District shall continue to remain liable for the payments required pursuant to the Guaranteed Maximum Price Provisions in **Exhibit C** and those amounts shall be payable to Developer at the time and in the manner therein provided.

22.4.4 **No Remedy Exclusive**

No remedy herein conferred upon or reserved to Developer is intended to be exclusive and every such remedy shall be cumulative and shall be in addition to every other remedy given under this Facilities Lease or now or hereafter existing at law or in equity. No delay or omission to exercise any right or power accruing upon any Default shall impair any such right or power or shall be construed to be a waiver thereof, but any such right and power may be exercised from time to time and as often as may be deemed expedient. In order to entitle Developer to exercise any remedy reserved to it in this article, it shall not be necessary to give any notice, other than such notice as may be required in this Article or by law.

22.5 **Suspension of Work**

22.5.1 District in its sole discretion may suspend, delay or interrupt the Work in whole or in part for such period of time as the District may determine upon three (3) days written notice to the Developer.

22.5.1.1 An adjustment may be made for changes in the cost of performance of the Work caused by any suspension, delay or interruption. No adjustment shall be made to the extent:

22.5.1.1.1 That performance is, was or would have been so suspended, delayed or interrupted by another cause for which Developer is responsible; or

22.5.1.1.2 That an equitable adjustment is made or denied under another provision of the Site Lease or the Facilities Lease; or

22.5.1.1.3 That the suspension of Work was the direct or indirect result of Developer's failure to perform any of its obligations hereunder.

22.5.1.2 Any adjustments in cost of performance may have a fixed or percentage fee as provided in the section on Format for Proposed Change Order in Exhibit D. This amount shall be full compensation for all Developer's and its Subcontractor(s)' changes in the cost of performance of the Facilities Lease caused by any such suspension, delay or interruption.

23. **Notices**

All notices, certificates or other communications hereunder shall be sufficiently given and shall be deemed to have been received five (5) days after deposit in the United States mail in registered or certified form with postage fully prepaid or one (1) business day after deposit with an overnight delivery service with proof of actual delivery:

If to District:

Lodi Unified School District
1305 E. Vine Street
Lodi, CA 95240
Attn: Warren Sun, Senior Director of Operations

If to Developer:

[Developer]
[Address]
Attn: [Name, Title]

With a copy to:

Samuel Santana, Esq.
Dannis Woliver Kelley
115 Pine Ave, Suite 500
Long Beach, CA 90802

The Developer and the District, by notice given hereunder, may designate different addresses to which subsequent notices, certificates or other communications will be sent.

24. **Binding Effect**

This Facilities Lease shall inure to the benefit of and shall be binding upon Developer and the District and their respective successors, transferees and assigns.

25. **No Additional Waiver Implied by One Waiver**

In the event any agreement contained in this Facilities Lease should be breached by either party and thereafter waived by the other party, such waiver shall be limited to the particular breach so waived and shall not be deemed to waive any other breach hereunder.

26. **Severability**

In the event any provision of this Facilities Lease shall be held invalid or unenforceable by any court of competent jurisdiction, that holding shall not invalidate or render unenforceable any other provision hereof, unless elimination of the invalid provision materially alters the rights and obligations embodied in this Facilities Lease or the Site Lease.

27. **Amendments, Changes and Modifications**

Except as to the termination rights of both Parties as indicated herein, this Facilities Lease may not be amended, changed, modified, altered or terminated without the written agreement of both Parties hereto.

28. **Net-Net-Net Lease**

This Facilities Lease shall be deemed and construed to be a "net-net-net lease" and the District hereby agrees that all payments it makes pursuant to the Guaranteed Maximum Price Provisions in **Exhibit C** shall be an absolute net return to Developer, free and clear of any expenses, charges or set-offs.

29. **Execution in Counterparts**

This Facilities Lease may be executed in several counterparts, each of which shall be an original and all of which shall constitute one and the same instrument.

30. **Developer and District Representatives**

Whenever under the provisions of this Facilities Lease the approval of Developer or the District is required, or Developer or the District is required to take some action at the request of the other, the approval or request shall be given for Developer by Developer's

Representative and for the District by the District's Representative, and any party hereto shall be authorized to rely upon any such approval or request.

31. **Applicable Law**

This Facilities Lease shall be governed by and construed in accordance with the laws of the State of California, and venued in the County within which the School Site is located.

32. **Attorney's Fees**

If either party brings an action or proceeding involving the Property or to enforce the terms of this Facilities Lease or to declare rights hereunder, each party shall bear the cost of its own attorneys' fees.

33. **Captions**

The captions or headings in this Facilities Lease are for convenience only and in no way define, limit or describe the scope or intent of any provisions or sections of this Facilities Lease.

34. **Prior Agreements**

This Facilities Lease and the corresponding Site Lease collectively contain all of the agreements of the Parties hereto with respect to any matter covered or mentioned in this Facilities Lease and no prior agreements or understanding pertaining to any matter shall be effective for any purpose.

35. **Further Assurances**

Parties shall promptly execute and deliver all documents and instruments reasonably requested to give effect to the provisions of this Facilities Lease.

36. **Recitals and Exhibits Incorporated**

The Recitals set forth at the beginning of this Facilities Lease and the attached Exhibits are hereby incorporated into its terms and provisions by this reference.

37. **Time of the Essence**

Time is of the essence with respect to each of the terms, covenants, and conditions of this Facilities Lease.

38. **Force Majeure**

A party shall be excused from the performance of any obligation imposed in this Facilities Lease and the exhibits hereto for any period and to the extent that a party is prevented from performing that obligation, in whole or in part, as a result of delays caused by the other party or third parties, a governmental agency or entity, an act of God, war, terrorism, civil disturbance, forces of nature, fire, flood, earthquake, strikes or lockouts, and that non-performance will not be a default hereunder or a grounds for termination of this Facilities Lease.

39. **Interpretation**

None of the Parties hereto, nor their respective counsel, shall be deemed the drafters of this Facilities Lease for purposes of construing the provisions thereof. The language in all parts of this Facilities Lease shall in all cases be construed according to its fair meaning, not strictly for or against any of the Parties hereto.

IN WITNESS WHEREOF, the Parties have caused this Facilities Lease to be executed by their respective officers who are duly authorized, as of the Effective Date.

ACCEPTED AND AGREED on the date indicated below:

Dated: _____, 2018	Dated: _____, 2018
Lodi Unified School District	[Developer]
By: _____	By:_____
Name: _____	Name: _____
Title: _____	Title: _____

EXHIBIT A

LEGAL DESCRIPTION OF SCHOOL SITE

Attached is the Legal Description for:

Lodi High School Modular Project Increment 1 Site Work
3 S. Pacific Ave.
Lodi, CA 95242

<INSERT>

EXHIBIT B

DESCRIPTION OF PROJECT SITE

Attached is a diagram of the School Site that is subject to this Facilities Lease and upon which Developer will construct the Project.

<INSERT>

EXHIBIT C

GUARANTEED MAXIMUM PRICE AND

OTHER PROJECT COST, FUNDING, AND PAYMENT PROVISIONS

Attached are the terms and provisions related to Site Lease payments, the Facilities Lease, the Guaranteed Maximum Price and other related cost, funding, and payment provisions.

EXHIBIT D

GENERAL CONSTRUCTION PROVISIONS

Attached are the general construction terms and conditions for the Project.

EXHIBIT D-1

SPECIAL CONDITIONS

Attached are the special terms and conditions for the Project.

EXHIBIT E

MEMORANDUM OF COMMENCEMENT DATE

This MEMORANDUM OF COMMENCEMENT DATE is dated _____, 201__, and is made by and between [Developer] ("Developer"), as Lessor, and the Lodi Unified School District ("District"), as Lessee.

1. Developer and District have previously entered into a Facilities Lease dated as of _____, 2018, (the "Lease") for the leasing by Developer to District of the Project Site and Project in Lodi, California, referenced in the Lease.

2. District hereby confirms the following:

A. That all construction of the Project required to be performed pursuant to the Facilities Lease has been completed by Developer in all respects;

B. That District has accepted and entered into possession of the Project and now occupies same; and

C. That the term for the Lease Payments under the Facilities Lease commenced on _____, 20__ and will expire at 11:59 P.M. on _____, 20__.

THIS MEMORANDUM OF COMMENCEMENT DATE IS ACCEPTED AND AGREED on the date indicated below:

Dated: _____ __ , 201__	Dated: _____ __ , 201__
Lodi Unified School District	[Developer]
By: _____	By: _____
Name: _____	Name: _____
Title: _____	Title: _____

EXHIBIT F

CONSTRUCTION SCHEDULE

Attached is a detailed Project Construction Schedule with a duration no longer than the Contract Time, and with specific milestones that Developer shall meet.

[To Be Attached.]

EXHIBIT G

SCHEDULE OF VALUES

Attached is a detailed Schedule of Values that complies with the requirements of the Construction Provisions (Exhibit "D") and that has been approved by the District.

[To Be Attached.]

LODI UNIFIED SCHOOL DISTRICT

LODI HIGH SCHOOL NEW NORTH CAMPUS

SCHEMATIC DESIGN

OCTOBER 16TH, 2018

MEP ENGINEER

LP CONSULTING ENGINEERS
CONTACT: SEAN POURVAKIL, PE
1209 PLEASANT GROVE BLVD
ROSEVILLE, CA 95678
t: 916-771-0778

STRUCTURAL ENGINEER

KPFF
CONTACT: TIM MATHEWSON, SE
2250 DOUGLAS BLVD.
SUITE 200
ROSEVILLE, CA 95661
t: 916-772-7688

CIVIL ENGINEER

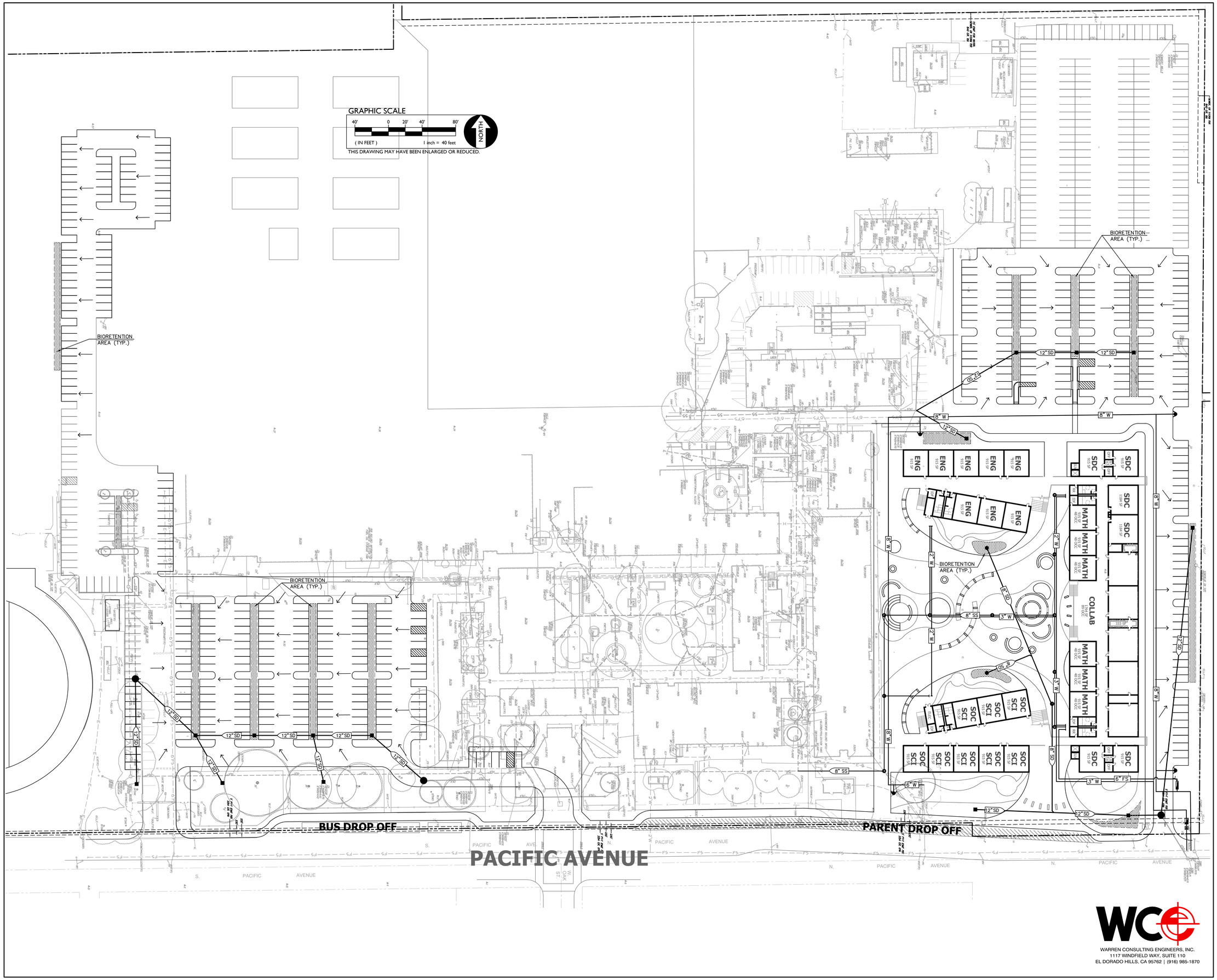
WARREN CONSULTING ENGINEERS
CONTACT: JIM STEPHENS, PE
1117 WINDFIELD WAY,
SUITE 110
EL DORADO HILLS, CA 95762
t: 916-985-1870

LANDSCAPE ARCHITECT

YAMASAKI LANDSCAPE ARCHITECTURE
CONTACT: JEFF AMBROSIA, ASLA
1223 HIGH STREET
AUBURN, CA 95603
t: 530-885-0040
f: 530-885-0042

CONSULTANT

BEAM PROFESSIONALS
CONTACT: PAUL PISCORAN
2520 VENTURE OAKS WAY
SUITE 440
SACRAMENTO, CA 95833
t: 916-682-9494
f: 916-682-0990



WARREN CONSULTING ENGINEERS, INC.
1117 WINDFIELD WAY, SUITE 110
EL DORADO HILLS, CA 95762 | (916) 985-1870

PBK

ARCHITECTURE
SACRAMENTO
2520 Venture Oaks Way, Suite 440
Sacramento, CA 95833
916-682-9494 P
PBK.com

CIVIL

STRUCTURE

MECHANICAL/PLUMBING

ELECTRICAL

LODI HIGH SCHOOL NEW NORTH CAMPUS

3 SOUTH PACIFIC AVENUE
LODI, CA 95242

KEY PLAN

PLAN NORTH

FILE NO.
IDENTIFICATION STAMP
DIV. OF THE STATE
ARCHITECT
APPL.
ACS _____ FLS _____ SS
DATE _____

ARCHITECT	ENGINEER

CLIENT
LODI USD
PROJECT NUMBER
18206
DATE: 08.03.2018
DRAWN BY: -
CHECKED BY: JS
REVISIONS

No.	Description	Date

SITE UTILITYPLAN

SDC1

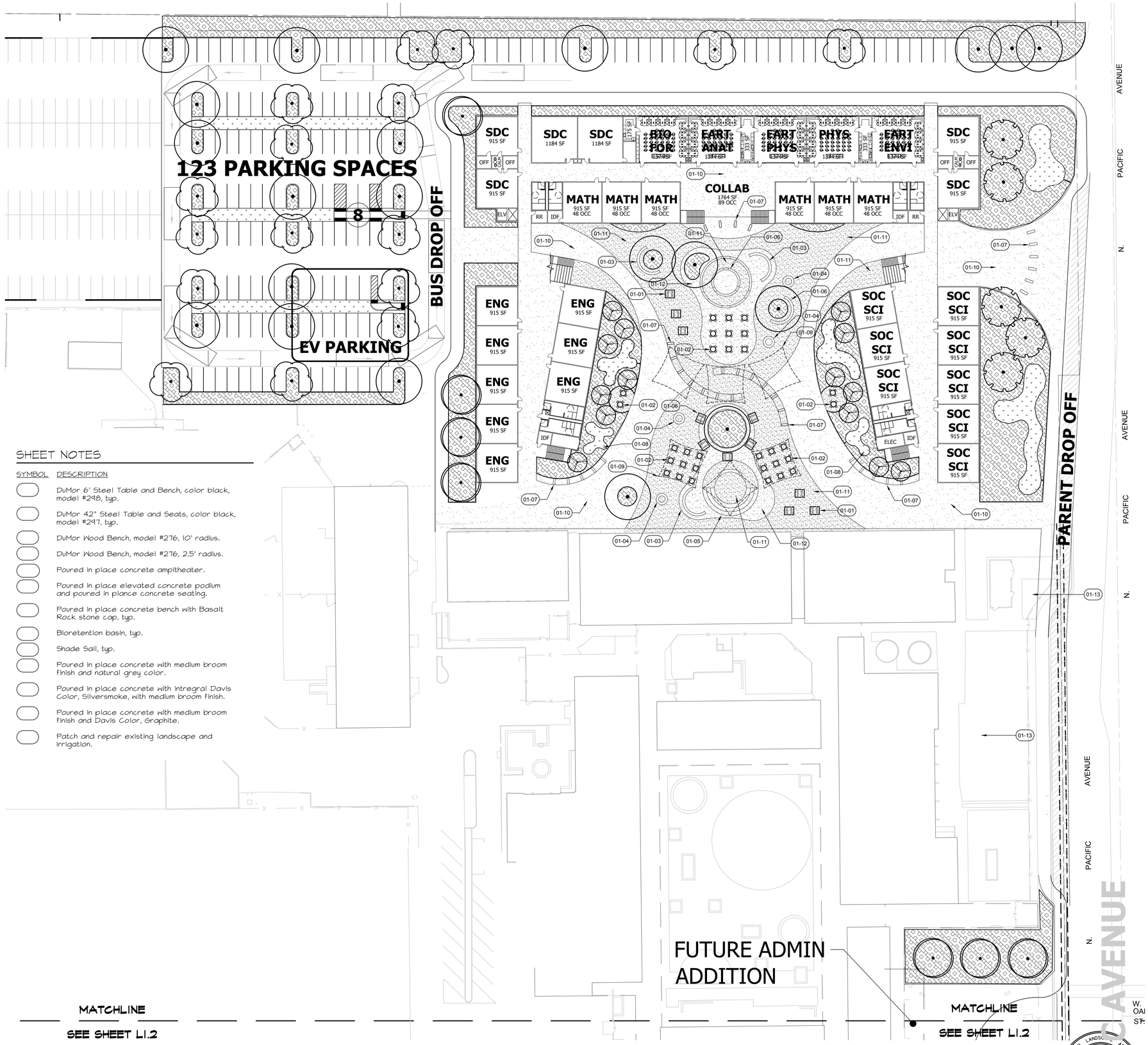
FILENAME: I:\18-083\CIVIL\DWG\UTILITY18-083 C1.1.DWG

PLANT SCHEDULE

TREES	COMMON NAME
	Autumn Blaze Red Maple
	Crape Myrtle
	Keith Davey Chinese Pistache
	London Plane Tree
	Purple-leaf Plum
	True Green Elm

SHRUBS	COMMON NAME
	Rutherfordiana Azalea
	Dwarf Weeping Bottlebrush
	Camellia
	Kramer's Supreme Camellia
	Leather Leaf Sedge
	Crimson Spot Rockrose
	Rockrose Sageleaf
	Bush Morning Glory
	Bearberry Cotoneaster
	Fortnight Lily
	Golden Daisy Bush
	Grevillea
	Blue Oat Grass
	Daylily
	Compact Texas Ranger
	Pink Muhly
	Dwarf Heavenly Bamboo
	New Zealand Flax
	Dwarf Green Flax
	Variegated New Zealand Flax
	Photinia
	Variegated Mock Orange
	Shrubby Yew
	California Coffeeberry
	Yedda Hawthorn
	Rosemary
	Germander
	Chinese Star Jasmine
	Variegated Periwinkle

GROUND COVERS	COMMON NAME
	Drought Tolerant Fescue Blend



SHEET NOTES

SYMBOL	DESCRIPTION
	DuMor 6' Steel Table and Bench, color black, model #298, typ.
	DuMor 42" Steel Table and Seats, color black, model #297, typ.
	DuMor Wood Bench, model #276, 10' radius.
	DuMor Wood Bench, model #276, 2.5' radius.
	Poured in place concrete ampitheater.
	Poured in place elevated concrete podium and poured in plance concrete seating.
	Poured in place concrete bench with Basalt Rock stone cap, typ.
	Bioretention basin, typ.
	Shade Sail, typ.
	Poured in place concrete with medium broom finish and natural grey color.
	Poured in place concrete with intregral Davis Color, Silversmoke, with medium broom finish.
	Poured in place concrete with medium broom finish and Davis Color, Graphite.
	Patch and repair existing landscape and irrigation.

PARTIAL SITE PLAN

0' 30' 60' 120'
SCALE: 1"=30'
NORTH

YAMASAKI
LANDSCAPE ARCHITECTURE
1223 HIGH STREET, AUBURN, CA 95603
(530) 885-0040
FAX (530) 885-0042

LICENSED LANDSCAPE ARCHITECT
JEFFREY M. AMBROSIA 4057
12/19
09/28/18
STATE OF CALIFORNIA

PBK

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916-682-0990 F
PBK.com

LODI HIGH SCHOOL
NEW NORTH CAMPUS
3 SOUTH PACIFIC AVENUE
LODI, CA 95242
SCHEMATIC DESIGN

Lodi Unified School District

KEY PLAN
PLAN NORTH
TRUE NORTH

FILE NO. 00-00
IDENTIFICATION STAMP
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APPL. 00-000000
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DATE ____

ENGINEER

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Registration No. XXXX.
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CLIENT
LODI UNIFIED SCHOOL DISTRICT
PROJECT NUMBER
18206
DATE: AUGUST 30TH, 2018
DRAWN BY: BP
CHECKED BY: JMA
REVISIONS

No.	Description	Date

SCHEMATIC DESIGN

PRELIMINARY LANSCAPE PLAN

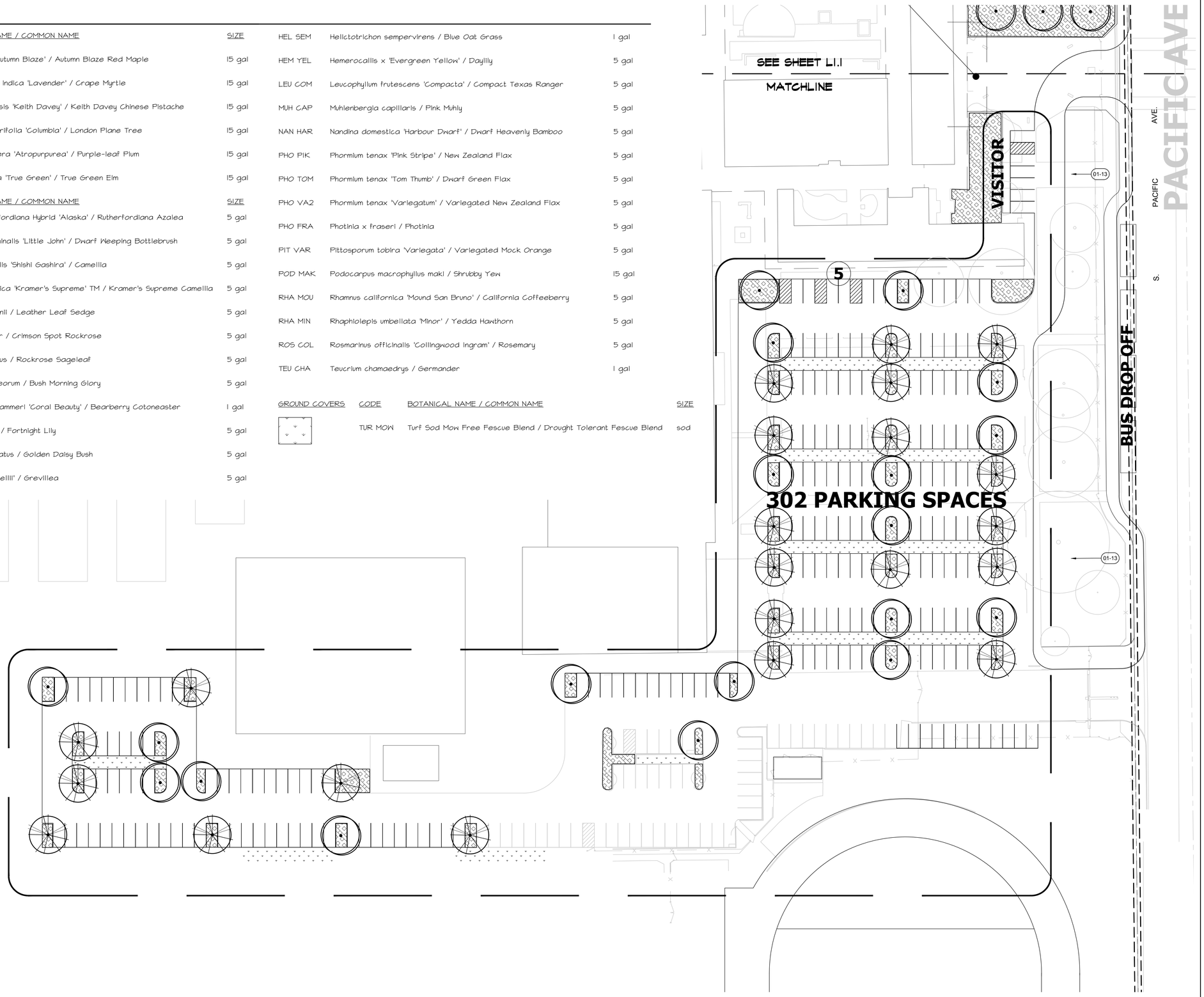
L1.1

PLANT SCHEDULE

TREES	CODE	BOTANICAL NAME / COMMON NAME	SIZE
	ACE AUT	Acer rubrum 'Autumn Blaze' / Autumn Blaze Red Maple	15 gal
	LAG LAV	Lagerstroemia indica 'Lavender' / Crape Myrtle	15 gal
	PIS KEI	Pistacia chinensis 'Keith Davey' / Keith Davey Chinese Pistache	15 gal
	PLA COL	Platanus x acerifolia 'Columbia' / London Plane Tree	15 gal
	PRU ATR	Prunus cerasifera 'Atropurpurea' / Purple-leaf Plum	15 gal
	ULM TRU	Ulmus parvifolia 'True Green' / True Green Elm	15 gal

SHRUBS	CODE	BOTANICAL NAME / COMMON NAME	SIZE
	AZA RUT	Azalea Rutherfordiana Hybrid 'Alaska' / Rutherfordiana Azalea	5 gal
	CAL DWA	Callistemon viminalis 'Little John' / Dwarf Weeping Bottlebrush	5 gal
	CAM HIE	Camellia hiemalis 'Shishi Gashira' / Camellia	5 gal
	CAM SUP	Camellia japonica 'Kramer's Supreme' TM / Kramer's Supreme Camellia	5 gal
	CAR BUC	Carex buchananii / Leather Leaf Sedge	5 gal
	CIS LAD	Cistus ladanifer / Crimson Spot Rockrose	5 gal
	CIS SAL	Cistus salvifolius / Rockrose Sageleaf	5 gal
	CON CNE	Convolvulus cneorum / Bush Morning Glory	5 gal
	COT BEA	Cotoneaster dammeri 'Coral Beauty' / Bearberry Cotoneaster	1 gal
	DIE BIC	Dietes bicolor / Fortnight Lily	5 gal
	EUR PEC	Euryops pectinatus / Golden Daisy Bush	5 gal
	GRE NOE	Grevillea x 'Noellii' / Grevillea	5 gal
	HEL SEM	Helictotrichon sempervirens / Blue Oat Grass	1 gal
	HEM YEL	Hemerocallis x 'Evergreen Yellow' / Daylily	5 gal
	LEU COM	Leucophyllum frutescens 'Compacta' / Compact Texas Ranger	5 gal
	MUH CAP	Muhlenbergia capillaris / Pink Muhly	5 gal
	NAN HAR	Nandina domestica 'Harbour Dwarf' / Dwarf Heavenly Bamboo	5 gal
	PHO PIK	Phormium tenax 'Pink Stripe' / New Zealand Flax	5 gal
	PHO TOM	Phormium tenax 'Tom Thumb' / Dwarf Green Flax	5 gal
	PHO VA2	Phormium tenax 'Variegatum' / Variegated New Zealand Flax	5 gal
	PHO FRA	Photinia x fraseri / Photinia	5 gal
	PIT VAR	Pittosporum tobira 'Variegata' / Variegated Mock Orange	5 gal
	POD MAK	Podocarpus macrophyllus maki / Shrubby Yew	15 gal
	RHA MOU	Rhamnus californica 'Mound San Bruno' / California Coffeeberry	5 gal
	RHA MIN	Rhaphiolepis umbellata 'Minor' / Yedda Hawthorn	5 gal
	ROS COL	Rosmarinus officinalis 'Collingwood Ingram' / Rosemary	5 gal
	TEU CHA	Teucrium chamaedrys / Germander	1 gal

GROUND COVERS	CODE	BOTANICAL NAME / COMMON NAME	SIZE
	TUR MOW	Turf Sod Mow Free Fescue Blend / Drought Tolerant Fescue Blend	sod



PARTIAL SITE PLAN

0' 30' 60' 120'

SCALE: 1"=30'

NORTH

YAMASAKI
LANDSCAPE ARCHITECTURE
1223 HIGH STREET, AUBURN, CA 95603
(530) 885-0040
FAX (530) 885-0042

LICENSED LANDSCAPE ARCHITECT
JEFFREY M. AMBROSIA
12/18
04/28/18
STATE OF CALIFORNIA

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LODI HIGH SCHOOL
NEW NORTH CAMPUS
3 SOUTH PACIFIC AVENUE
LODI, CA 95242
SCHEMATIC DESIGN

Lodi Unified School District

KEY PLAN — PLAN NORTH — TRUE NORTH

FILE NO. **00-00**
IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APPL. **00-000000**
ACS ____ FLS ____ SS ____
DATE _____

ENGINEER

ARCHITECT
SEAL AND REGISTRATION NUMBER HERE
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Registration No. XXXX.
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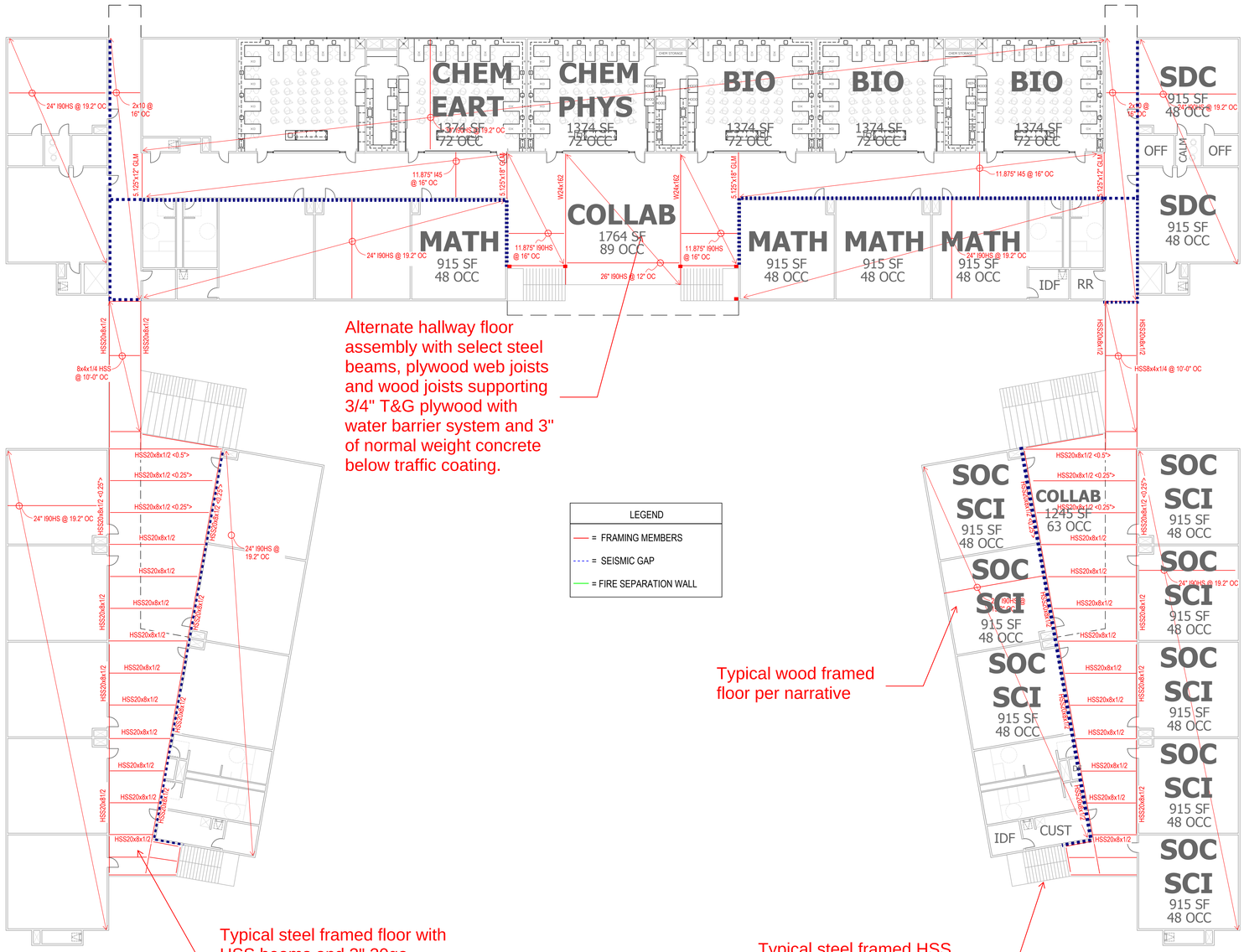
CLIENT
LODI UNIFIED SCHOOL DISTRICT
PROJECT NUMBER
18206
DATE: AUGUST 30TH, 2018
DRAWN BY: BP
CHECKED BY: JMA
REVISIONS

No.	Description	Date

SCHEMATIC DESIGN

PRELIMINARY LANDSCAPE PLAN

L1.2



Alternate hallway floor assembly with select steel beams, plywood web joists and wood joists supporting 3/4" T&G plywood with water barrier system and 3" of normal weight concrete below traffic coating.

LEGEND
= FRAMING MEMBERS
= SEISMIC GAP
= FIRE SEPARATION WALL

Typical wood framed floor per narrative

Typical steel framed floor with HSS beams and 3" 20ga acoustical deck with 3.5" of NWC fill

Typical steel framed HSS stringer stairs with concrete filled treads

MARKUP BY: RRM

PBK

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LODI HIGH SCHOOL
NEW NORTH CAMPUS
3 SOUTH PACIFIC AVENUE
LODI, CA 95242
SCHEMATIC DESIGN

Lodi Unified School District

KEY PLAN
PLAN NORTH
TRUE NORTH

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PROJECT NUMBER
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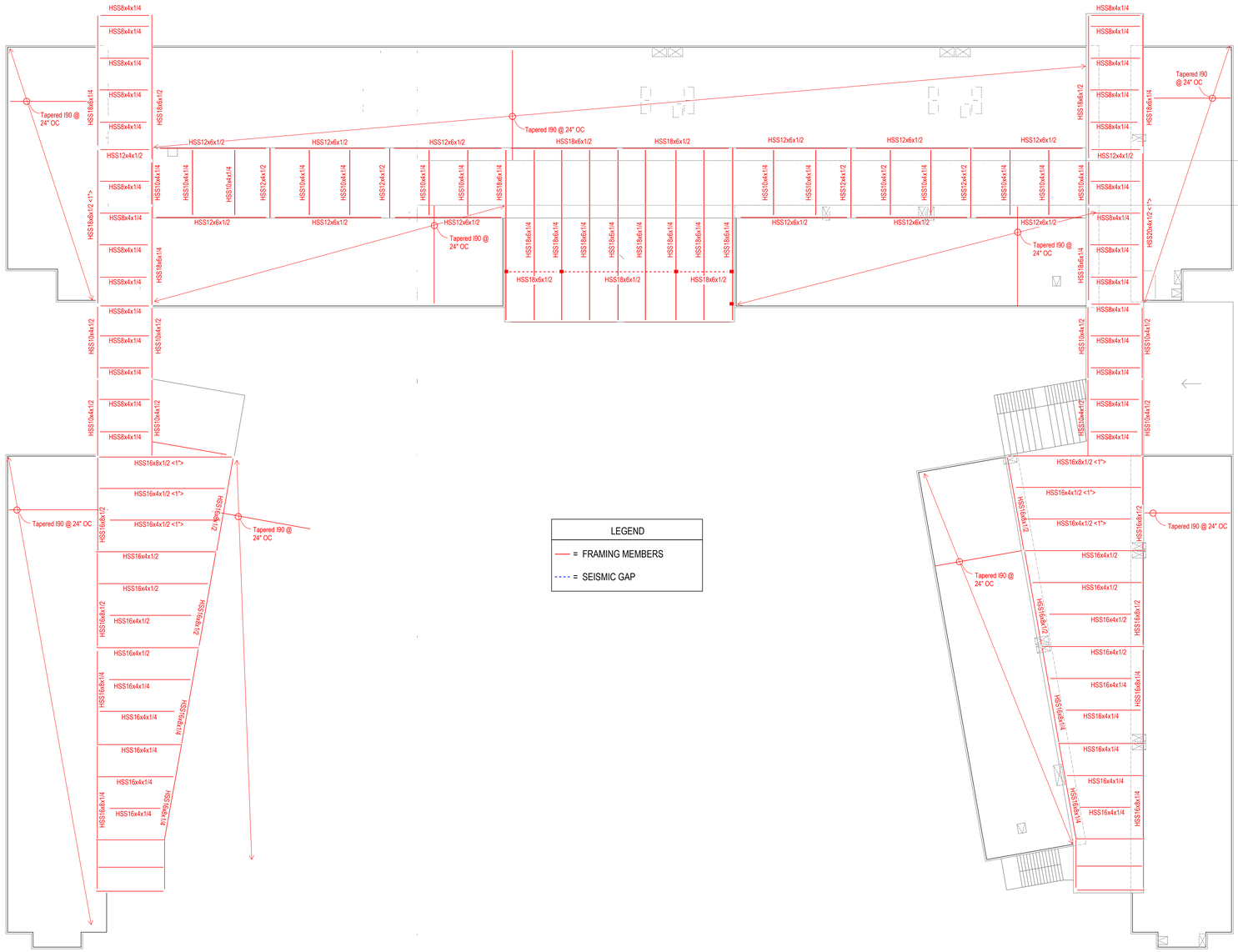
CHECKED BY: Checker
REVISIONS

No.	Description	Date

SCHEMATIC DESIGN

STRUCTURAL SECOND FLOOR PLAN

S2.01



LEGEND	
——	= FRAMING MEMBERS
- - - -	= SEISMIC GAP

MARKUP BY: RRM

PBK

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LODI, CA 95242
SCHEMATIC DESIGN

Lodi Unified School District

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LODI UNIFIED SCHOOL DISTRICT

PROJECT NUMBER
18206

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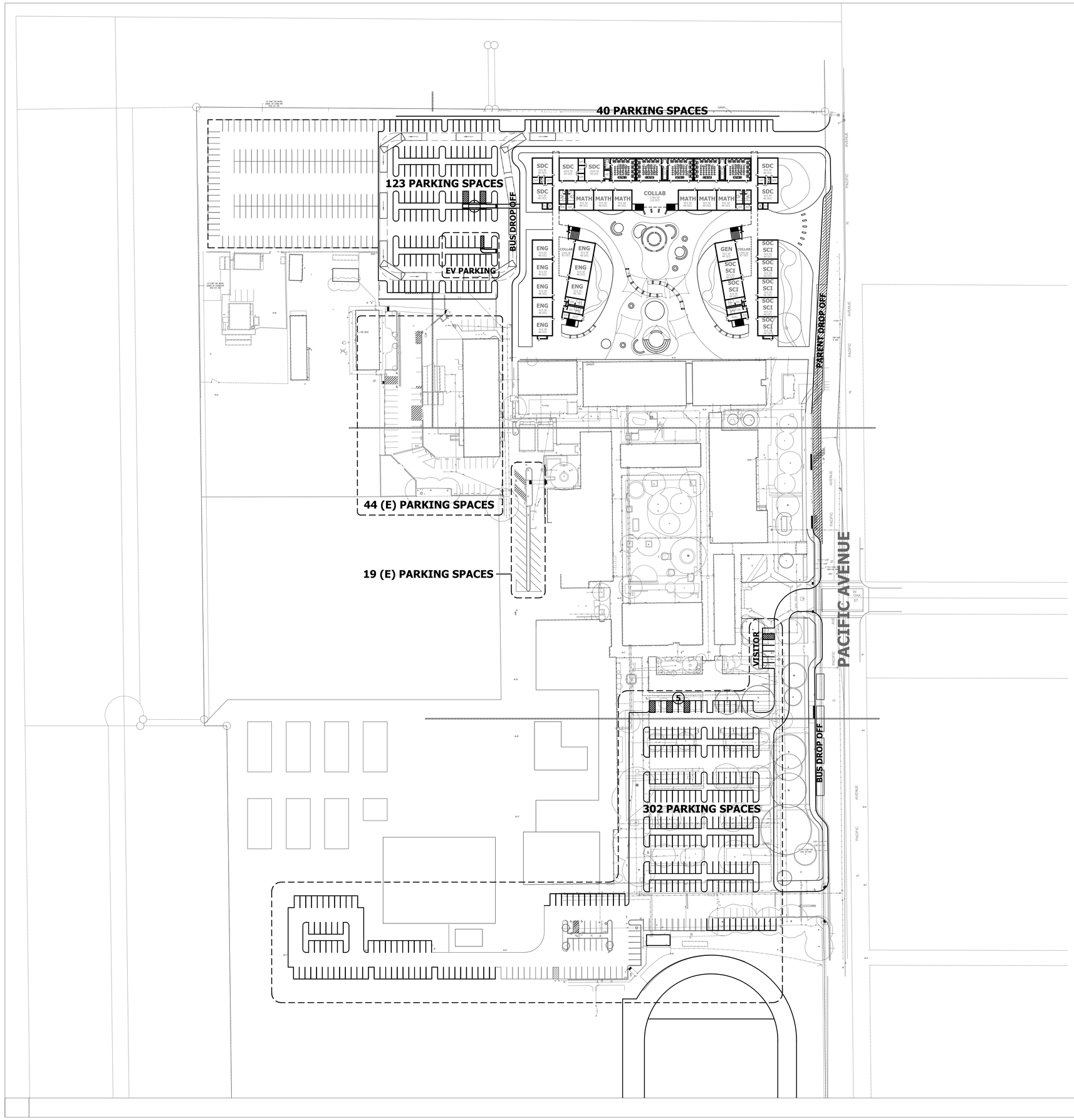
REVISIONS

No.	Description	Date

SCHEMATIC DESIGN

STRUCTURAL ROOF PLAN

S3.00



			15,360
SOCIAL SCIENCE	960 SF	15	14,400
MATH	960 SF	13	12,480
GENERAL	960 SF	1	960
SCIENCE			
BIOLOGY	1440 SF	3	4,320
BIOLOGY/FORENSICS	1440 SF	1	1,440
CHEMESTRY/PHYSICS	1440 SF	1	1,440
CHEMISTRY/EARTH SCI	1440 SF	2	2,880
PHYSICS	1440 SF	1	1,440
EARTH SCIENCE/PHYSICS	1440 SF	2	1,440
EARTH SCIENCE/ANATOMY	1440 SF	1	1,440
EARTH/ENVIRONMENTAL SCI	1440 SF	1	1,440
SDC	960 SF	8	7,680
SDC SEVERE	1,080 SF	2	2,160
TOTAL CLASSROOM	-	**66**	**68,880**
SUPPORT SPACES			
CIRCULATION	-		13,000
SCIENCE STORAGE/PREP	360 SF	6	2,160
COLLABORATION	-	-	4,254
RESTROOMS	-	8	4,152
STAFF/GUEST RESTROOMS	100 SF	4	400
SDC OFFICES/CALM ROOMS	320 SF	5	1,600
ELECTRICAL ROOM/MISC	220 SF	4	880
IDF ROOMS	100 SF	6	600
TOTAL SUPPORT AREAS			27,046
TOTAL NET AREA	-	3	95,926
FIRE RISER ROOMS	50 SF		150
MISCELLANEOUS		-	2,000
TOTAL GROSS AREA			98,076

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CIVIL

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El Dorado Hills, CA 95762
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LANDSCAPE

YAMASAKI LANDSCAPE ARCHITECTURE
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Auburn, CA 95603
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530-885-0042 F

STRUCTURAL

KPFF
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Roseville, CA 95661
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BUILDING ENVELOPE

BEAM PROFESSIONALS
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Sacramento, CA 95833
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LODI HIGH SCHOOL
NEW NORTH CAMPUS
3 SOUTH PACIFIC AVENUE
LODI, CA 95242
SCHEMATIC DESIGN

Lodi Unified School District

KEY PLAN
PLAN NORTH
TRUE NORTH

DSA STAMP

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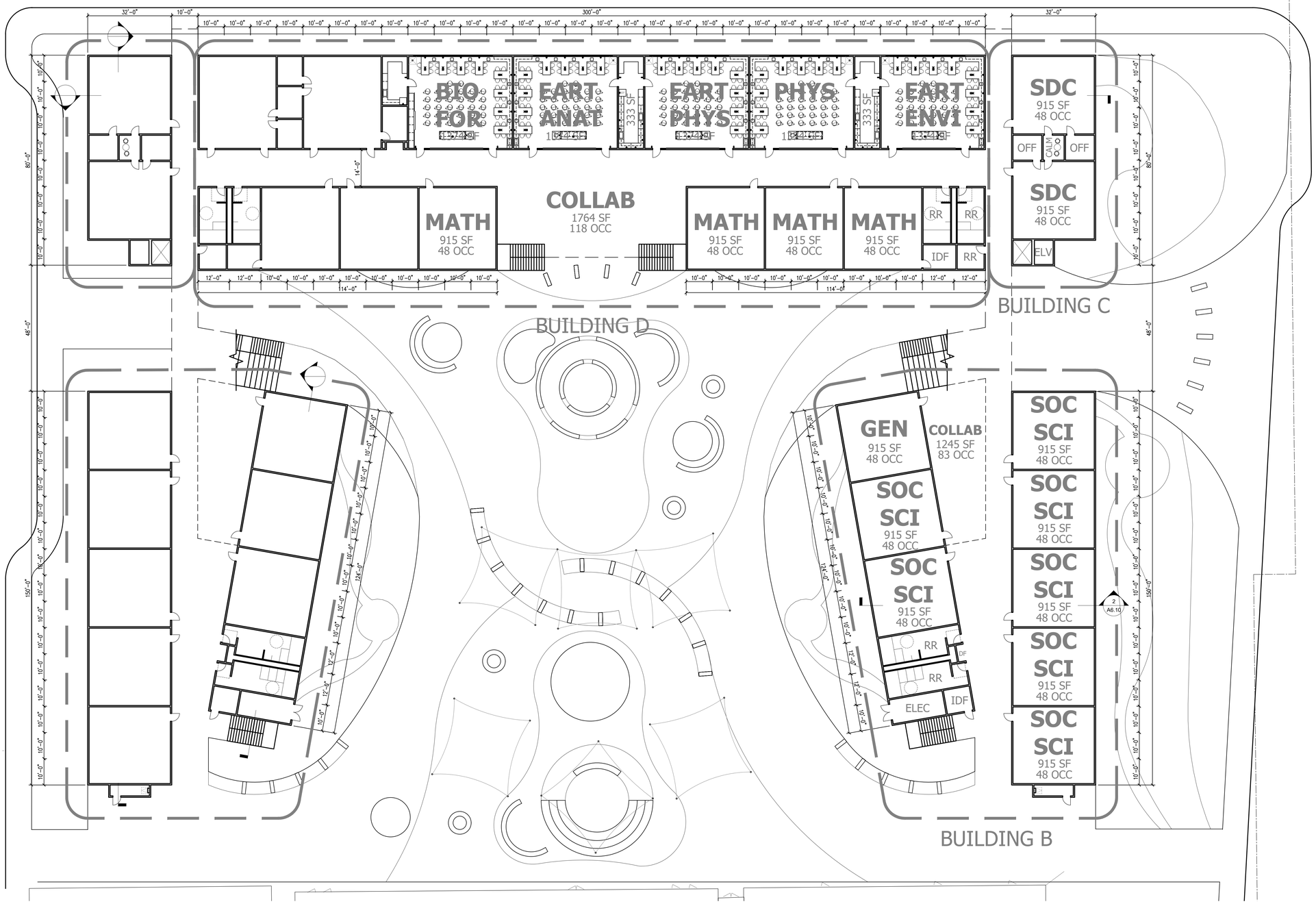
CLIENT
LODI UNIFIED SCHOOL DISTRICT
PROJECT NUMBER
18206
DATE: 10/16/18
DRAWN BY: JE
CHECKED BY: KJ
REVISIONS

No.	Description	Date

SCHEMATIC DESIGN

ARCHITECTURAL SITE PLAN

A1.01



OCCUPANT LOADS

PROGRAM	AREA	OLF	OCCUPANTS	QTY	TOTAL
CLASSROOM	960 SF	20	72	53	2,544
CLASSROOM	1440 SF	20	54	11	792
CLASSROOM	1080 SF	20	83	2	108
ASSEMBLY	1245 SF	15	118	4	332
ASSEMBLY	1764 SF	15	2	2	236
OFFICE	110 SF	100		10	20
TOTAL					4,032

PLUMBING FIXTURE CALCULATION

OCCUPANCY: 76,328

OCCUPANT LOAD FACTOR PER CPC TABLE A: 50

TOTAL OCCUPANTS: 1,527

	OCCUPANTS	WC	URINALS	LAVATORIES	DRINKING FOUNTAINS
MALE	764	16	-	19	
FEMALE	764	26	8		
TOTAL	1527	42		38	10

0' 10' 20' 40' 80'

N

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CIVIL

WARREN CONSULTING ENGINEERS
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El Dorado Hills, CA 95762
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LANDSCAPE

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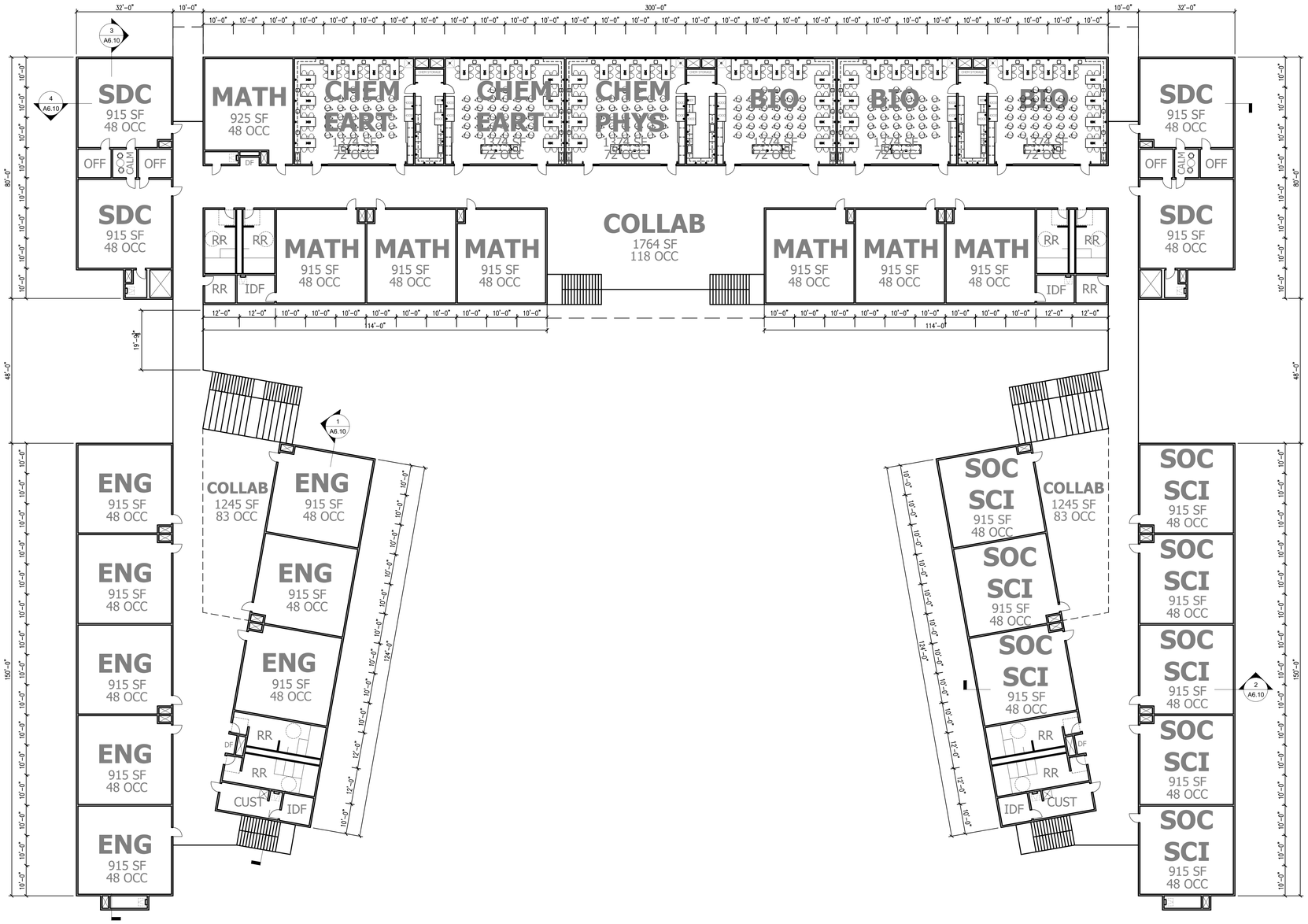
REVISIONS

No.	Description	Date

SCHEMATIC DESIGN

ARCHITECTURAL FIRST FLOOR PLAN

A2.00



1 OVERALL SECOND FLOOR PLAN
1/16" = 1'-0"

0' 10' 20' 40' 80'

N

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ARCHITECTURE
SACRAMENTO
2520 Venture Oaks Way, Suite 440
Sacramento, CA 95833
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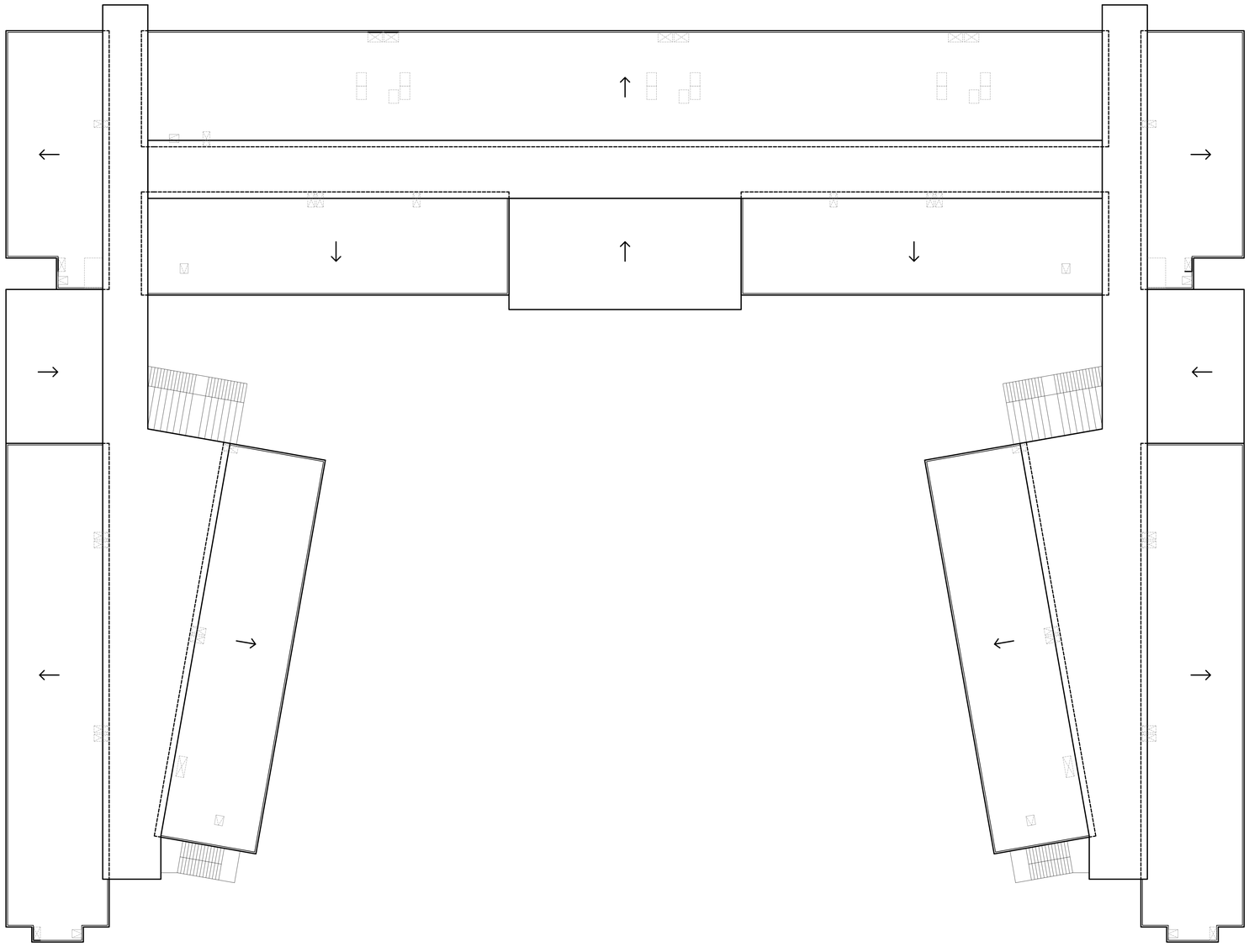
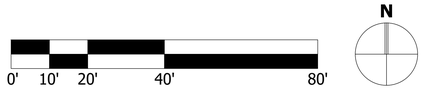
ARCHITECTURAL SECOND FLOOR PLAN

A2.01





1 OVERALL ROOF PLAN
1/16" = 1'-0"

PBK

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Sacramento, CA 95833
916-682-9494 P
916-682-0990 F
PBK.com

CIVIL
WARREN CONSULTING ENGINEERS
1117 Windfield Way, Suite 110
El Dorado Hills, CA 95762
916-985-1870 P

LANDSCAPE
YAMASAKI LANDSCAPE ARCHITECTURE
1223 High Street
Auburn, CA 95603
530-885-0040 P
530-885-0042 F

STRUCTURAL
KPFF
2250 Douglas Boulevard, Suite 200
Roseville, CA 95661
916-772-7688 P

MEP
LP CONSULTING ENGINEERS
1209 Pleasant Grove Boulevard
Roseville, CA 95678
916-771-0778 P

BUILDING ENVELOPE
BEAM PROFESSIONALS
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LODI HIGH SCHOOL
NEW NORTH CAMPUS
3 SOUTH PACIFIC AVENUE
LODI, CA 95242

SCHEMATIC DESIGN

Lodi Unified School District

KEY PLAN
PLAN NORTH
TRUE NORTH

DSA STAMP

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LODI UNIFIED SCHOOL DISTRICT

PROJECT NUMBER
18206

DATE: 10/16/18
DRAWN BY: JE
CHECKED BY: KJ

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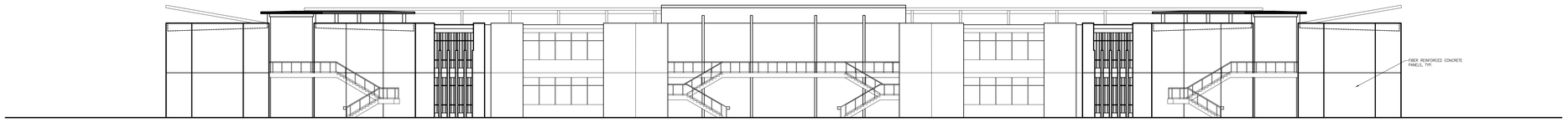
No.	Description	Date

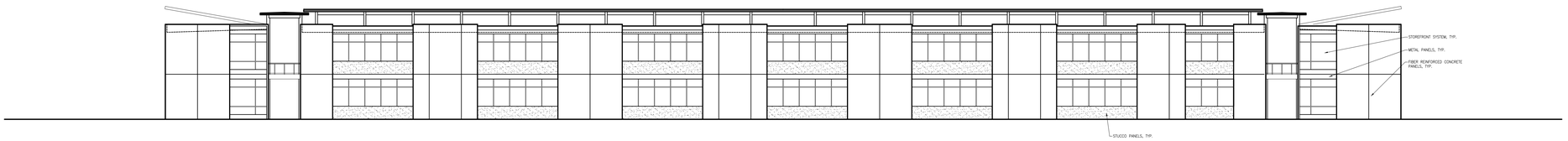
SCHEMATIC DESIGN

ARCHITECTURAL ROOF PLAN

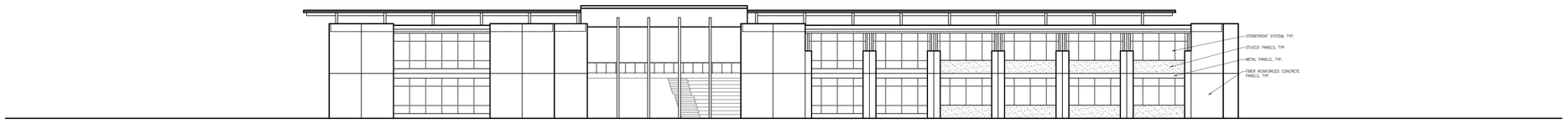
A3.00



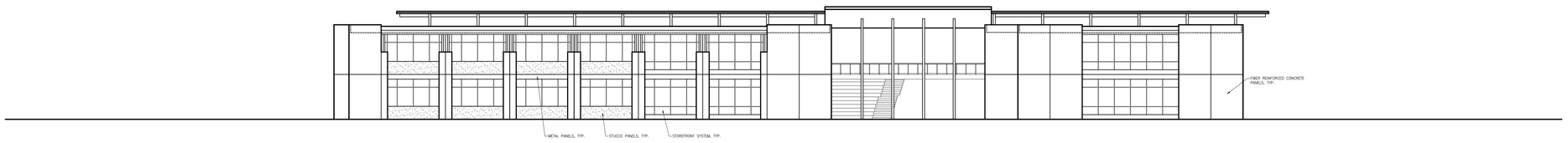
4 SOUTH ELEVATION
1/16" = 1'-0"



3 NORTH ELEVATION
1/16" = 1'-0"



2 WEST ELEVATION
1/16" = 1'-0"



1 EAST ELEVATION
1/16" = 1'-0"

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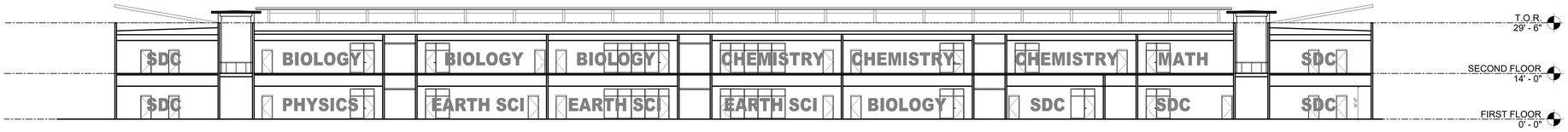
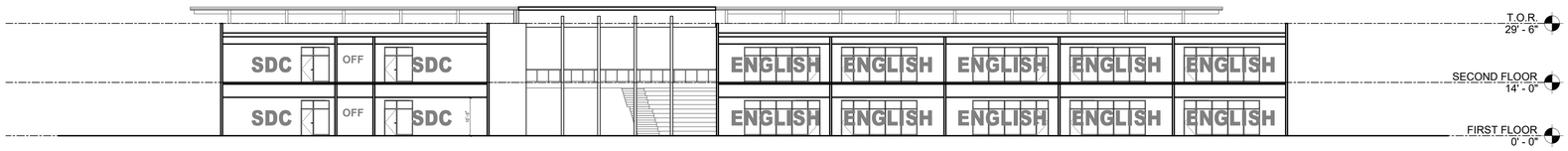
ARCHITECTURAL EXTERIOR ELEVATIONS

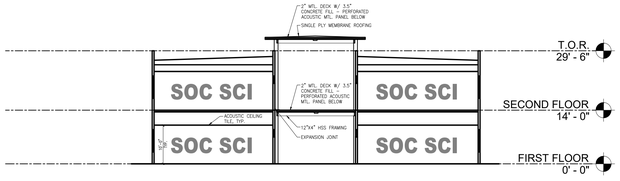
A6.01



4 SECTION
1/16" = 1'-0"



3 SECTION
1/16" = 1'-0"



2 SECTION
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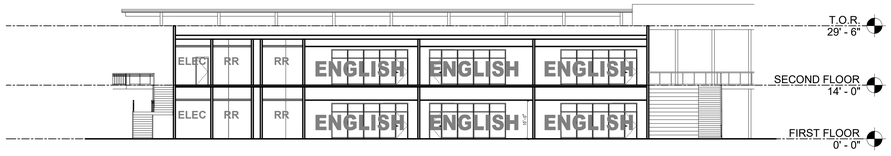

1 SECTION
1/16" = 1'-0"

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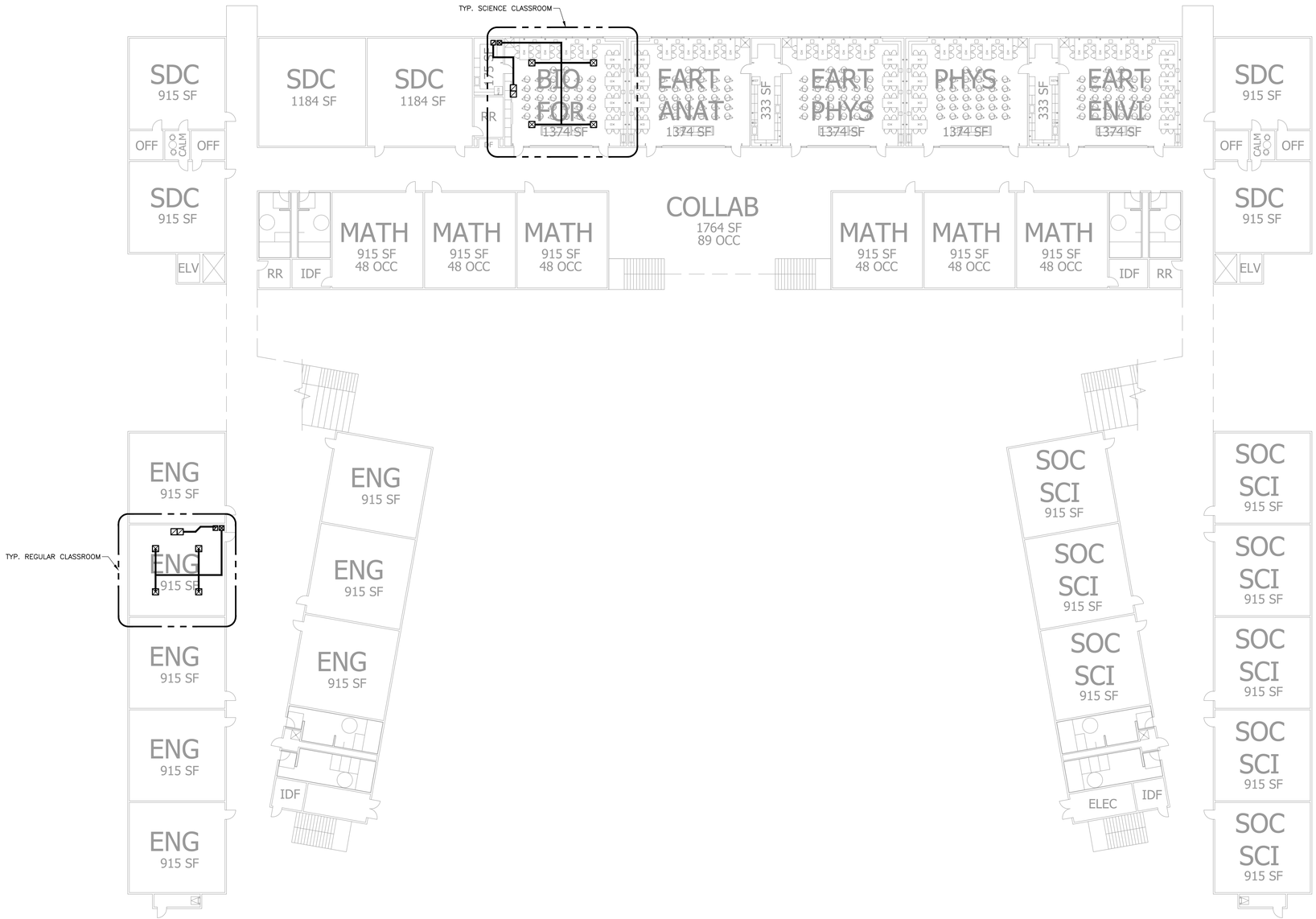
ARCHITECTURAL SECTIONS

A6.10



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PLAN NORTH

TRUE NORTH

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18206

DATE: AUGUST 30TH, 2018

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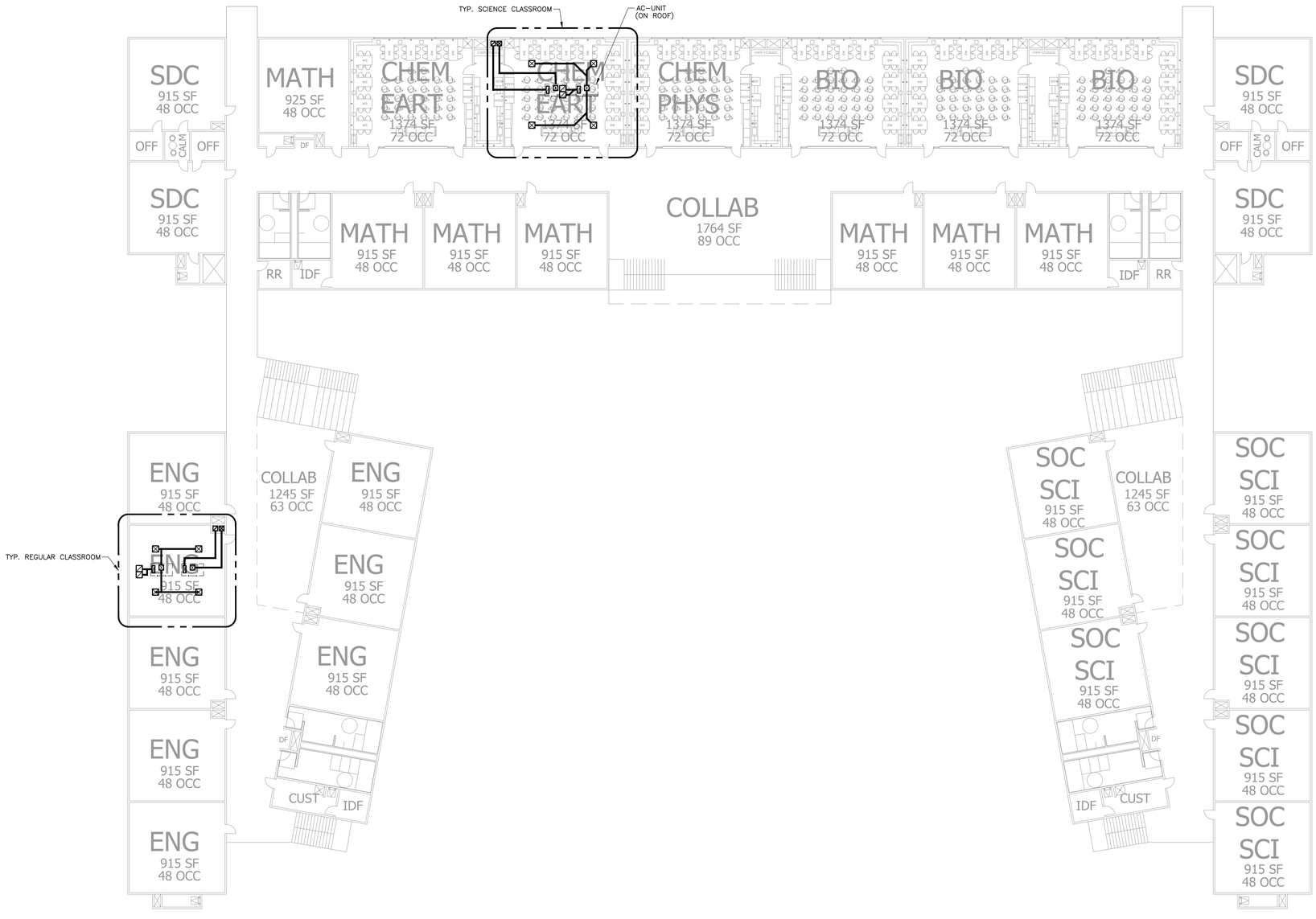
REVISIONS

No.	Description	Date

SCHEMATIC DESIGN

MECHANICAL FIRST FLOOR PLAN

M2.00



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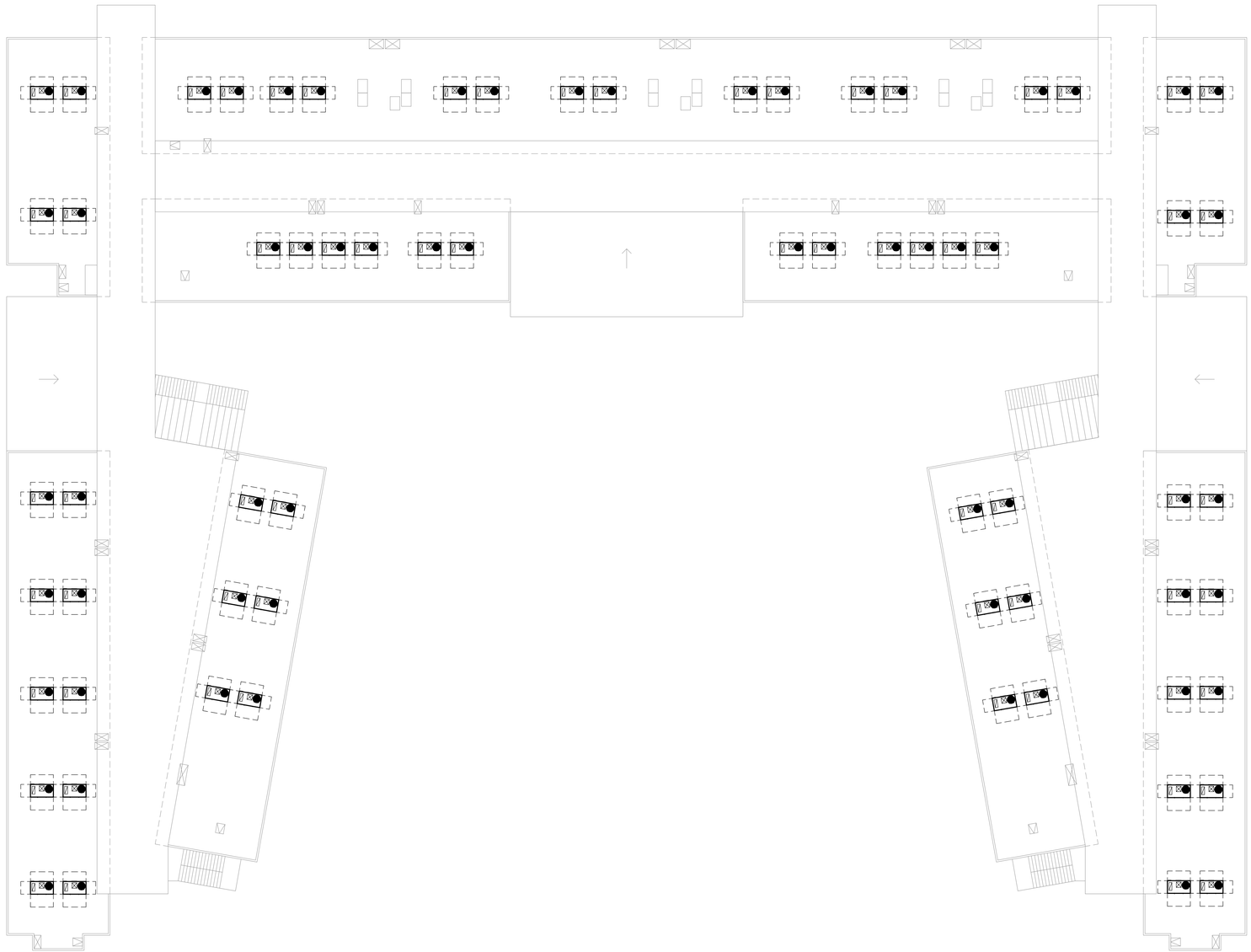
No.	Description	Date

SCHEMATIC DESIGN

MECHANICAL SECOND FLOOR PLAN

M2.01



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SCHEMATIC DESIGN

MECHANICAL ROOF PLAN

M3.00

ELECTRICAL SYMBOL LEGEND

ALL SYMBOLS SHOWN IN THIS LEGEND ARE NOT NECESSARILY USED ON PLANS IF NOT REQUIRED.

SYMBOL	DESCRIPTION
	LIGHTING
	FLUORESCENT/LED LUMINAIRE – T–BAR LAY–IN
	FLUORESCENT/LED LUMINAIRE – RECESSED IN GYPBOARD
	FLUORESCENT/LED LUMINAIRE – SURFACE FLUORESCENT/LED LUMINAIRE – SUSPENDED
	FLUORESCENT/LED DIRECT/INDIRECT LUMINAIRE – T–BAR LAY–IN
	FLUORESCENT/LED DIRECT/INDIRECT LUMINAIRE – RECESSED IN GYPBOARD
	FLUORESCENT/LED STRIP LIGHT – SURFACE OR SUSPENDED
	DOWNLIGHT LUMINAIRE – RECESSED
	WALLWASH LUMINAIRE – RECESSED
	LUMINAIRE – SURFACE
	LUMINAIRE – WALL
	LUMINAIRE – PENDANT
	TRACK LIGHT – SUSPENDED OR SURFACE MOUNTED
	CONTINUOUS LINEAR LED TAPE OR LED COVE LIGHT
EM EM EM	HATCHED LUMINAIRE WITH "EM" ABBREVIATION INDICATES AN EMERGENCY LUMINAIRE WITH EMERGENCY POWER CONNECTION (UNSWITCHED).
	SINGLE FACE EXIT SIGN. SEE LIGHTING FIXTURE SCHEDULE FOR SPECIFICATION. DIRECTIONAL ARROW AS INDICATED ON PLANS. (CEILING OR WALL)
	DOUBLE FACE EXIT SIGN. SEE LIGHTING FIXTURE SCHEDULE FOR SPECIFICATION. DIRECTIONAL ARROW AS INDICATED ON PLANS. (CEILING OR WALL)
	COMBINATION EMERGENCY EXIT SIGN WITH DUAL HEAD LIGHTS WITH EMERGENCY BATTERY BACK–UP.
	BATTERY POWERED EMERGENCY EGRESS LUMINAIRE – SURFACE MOUNTED
	SPOT/FLOOD LUMIANIRE – CEILING
	SPOT/FLOOD LUMINAIRE – ABOVE GROUND
	EXTERIOR POLE FIXTURE – SINGLE HEAD
	EXTERIOR POLE FIXTURE – TWIN HEAD
	EXTERIOR PATHWAY POLE FIXTURE
	BOLLARD FIXTURE
	STEP LUMINAIRE
	LIGHTING CONTROLS
$	SINGLE POLE TOGGLE SWITCH, 20A, 120–277V @ +46" TO TOP OF BOX, UNO.
$3	THREE WAY TOGGLE SWITCH 20A,120–277V @ +46" TO TOP OF BOX, UNO.
$a,b,c	SUBSCRIPTS "a,b,c" DESIGNATE THE QUANTITY OF SWITCHES AT EACH LOCATION (TYPICAL FOR ALL SWITCH TYPES).
$T	THERMAL OVERLOAD SWITCH
$M	MOTOR RATED SWITCH
$K	SINGLE POLE KEYED TOGGLE SWITCH 20A, 120–277 @ +46" TO TOP OF BOX, UNO.
	PUSH BUTTON
	WALL MOUNTED DECORA IN LIEU OF ROCKER SWITCH
	WALL MOUNTED DIMMER SWITCH
/	WALL SWITCH VACANCY/OCCUPANCY SENSOR
	WALL MOUNTED DIGITAL DIMMER CONTROL
	WALL MOUNTED DIGITAL SCENE SWITCH
	PIR WALL SWITCH OCCUPANCY SENSOR
	PIR DIMMING WALL SWITCH OCCUPANCY SENSOR
	DUAL TECH WALL SWITCH OCCUPANCY SENSOR
	DIGITAL WALL CONTROL (OVERRIDE SWITCH). RUN CABLING BACK TO LIGHTING CONTROL PANEL.
/	CORNER/CEILING MOTION SENSOR
/	DUAL TECH CORNER/CEILING SENSOR
/	PIR CORNER/CEILING SENSOR
/	ULTRASONIC CORNER/CEILING SENSOR
PC	PHOTO SENSOR
DS	SKYLIGHT PHOTOCONTROL SENSOR
OC	OPEN LOOP PHOTOCONTROL SENSOR
CC	CLOSED LOOP PHOTOCONTROL SENSOR
	CEILING EXHAUST FAN
	POWER
	MAIN SWITCHBOARD OR DISTRIBUTION PANEL,AS NOTED
	RECESSED MOUNTED LIGHTING OR DISTRIBUTION PANEL
	SURFACE MOUNTED LIGHTING OR DISTRIBUTION PANEL
	RECESSED TERMINAL CABINET W/ ¾"C PLYWOOD BACKBOARD, DUPLEX RECEPTACLE & #6 CU GND, UON.
	SURFACE MOUNTED TERMINAL CABINET W/ ¾"C PLYWOOD BACKBOARD, DUPLEX RECEPTACLE & #6 CU GND, UON.
T	DISTRIBUTION TRANSFORMER, MOUNTING AND SIZE AS NOTED
	NON–FUSED DISCONNECT SWITCH
	ENCLOSED CIRCUIT BREAKER DISCONNECT SWITCH
	FUSED DISCONNECT SWITCH; SIZE DISCONNECT AND FUSES PER UNIT LABEL
	NON–FUSED/FUSED DISCONNECT; SEE DISCONNECT SWITCH SCHEDULE
	MOTOR STARTER/CONTROLLER
	COMBINATION CIRCUIT BREAKER DISCONNECT/MOTOR STARTER.
	COMBINATION FUSIBLE DISCONNECT/MOTOR CONTROLLER; PROVIDE FUSES PER MANUFACTURERE'S REQUIREMENTS. N.F. INDICATES NON–FUSED.
	MOTOR
	POWER CONNECTION
	DUPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO.
	DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER TOP
	ISOLATED GROUND DUPLEX RECEPTACLE, 20A, 120V @ +16" TO BOTTOM OF BOX, UNO.
	DEDICATED DUPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO.
	GFCI DUPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO.
	GFCI DUPLEX RECEPTACLE OUTLET MOUNTED ABOVE COUNTER TOP AND/OR SINK BACKSPLASH
	ISOLATED GROUND GFCI DUPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO.
	DEDICATED GFCI DUPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO
	FOURPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO.
	ISOLATED GROUNDED FOURPLEX RECEPTACLE 20A, 120V @ +16" TO BOTTOM OF BOX, UNO.
	DEDICATED FOURPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO.

SYMBOL	DESCRIPTION
	GFCI FOURPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO.
	GFCI FOURPLEX RECEPTACLE OUTLET MOUNTED ABOVE COUNTER TOP AND/OR SINK BACKSPLASH
	ISOLATED GROUND GFCI FOURPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO.
	DEDICATED GFCI FOURPLEX RECEPTACLE OUTLET 20A, 120V, @ +16" TO BOTTOM OF BOX, UNO
	CONTROLLED/UNCONTROLLED FOURPLEX RECEPTACLE
	CONTROLLED/UNCONTROLLED FOURPLEX RECEPTACLE MOUNTED ABOVE COUNTER TOP
	SPECIAL RECEPTACLE OUTLET, SIZE AND NEMA CONFIGURATION AS NOTED, MOUNTED @ +16" TO BOTTOM OF BOX, UNO.
	FLOOR MOUNTED DUPLEX RECEPTACLE, 20A, 125V FLUSH IN FINISHED FLOOR
	FLOOR MOUNTED FOURPLEX RECEPTACLE, 20A, 125V FLUSH IN FINISHED FLOOR
	CEILING MOUNTED DUPLEX RECEPTACLE, 20A, 125V
	CEILING MOUNTED FOURPLEX RECEPTACLE, 20A, 125V
	JUNCTION BOX – SIZE AS REQUIRED BY CODE. (WALL MOUNTED AND REGULAR)
	JUNCTION BOX (FLOOR MOUNTED) – SIZE AS REQUIRED BY CODE.
	PLUGMOLD
	POWER POLE
	POWER AND TELEPHONE POKE THROUGH FOR PARTITION FURNITURE
	FLOOR MOUNTED COMBO DUPLEX RECEPTACLE/TELEPHONE/DATA
	FLOOR MOUNTED COMBO FOURPLEX RECEPTACLE/TELEPHONE/DATA
	TELECOM
1	TELEPHONE OUTLET, 4–11/16" SQ. x 2–1/8" DEEP BOX W/ SINGLE DEVICE RING & PLATE @ +16" TO BOTTOM OF BOX & ¾" CONDUIT STUB UP TO ACCESSIBLE CEILING SPACE, UNO
3	DATA OUTLET, 4–11/16" SQ. x 2–1/8" DEEP BOX W/ SINGLE DEVICE RING & PLATE @ +16" TO BOTTOM OF BOX & ¾" CONDUIT STUB UP TO ACCESSIBLE CEILING SPACE, UNO
1/3	TELE/DATA OUTLET, 4–11/16" SQ. x 2–1/8" DEEP BOX W/ SINGLE DEVICE RING & PLATE @ +16" TO BOTTOM OF BOX & (2) ¾" CONDUIT STUB UP TO ACCESSIBLE CLG SPACE, UNO
1/3	TELE/DATA OUTLET, 4–11/16" SQ. x 2–1/8" DEEP BOX W/ SINGLE DEVICE RING & PLATE ABOVE COUNTER AND (2) ¾" CONDUIT STUB UP TO ACCESSIBLE CEILING SPACE, UNO
2	FLOOR MOUNTED DATA OUTLET, FLUSH IN FINISHED FLOOR – SIZE PER PLAN
1	FLOOR MOUNTED TELEPHONE OUTLET, FLUSH IN FINISHED FLOOR – SIZE PER PLAN
1/3	FLOOR MOUNTED TELEPHONE/DATA OUTLET, FLUSH IN FINISHED FLOOR – SIZE PER PLAN
2	CEILING MOUNTED DATA OUTLET, 4" SQ. BOX WITH SINGLE DEVICE RING & PLATE
	NUMBER BY DEVICE SYMBOL PARENTHESIS INDICATES NUMBER OF REQUIRED ACTIVE JACKS FOR VOICE/DATA OUTLETS. THE FIRST NUMBER REPRESENTS THE # OF VOICE PORTS AND THE SECOND NUMBER REPRESENTS THE # OF DATA PORTS.
WAP	WIRELESS ACCESS POINT
	TELEPHONE TERMINAL BACKBOARD
TV	COAXIAL CABLE OUTLET. PROVIDE 4" SQUARE BACK BOX WITH 1 GANG RING AND STUB 1/2" CONDUIT ONLY WITH PULL ROPE UP TO ACCESSIBLE CEILING SPACE.
	CLOCK
	INTERCOM SPEAKER AND CLOCK COMBINATION
S	CEILING MOUNTED SPEAKER
S	WALL MOUNTED SPEAKER
	SURVEILLANCE CAMERAS
	360 DEGREES CAMERA
	FIXED POSITION CAMERA
WP	WEATHERPROOF FIXED POSITION CAMERA
	ACCESS CONTROL
CR	CARD READER
EL	ELECTRONIC LOCK
	INTRUSION ALARM
KP	KEYPAD
	WALL/CEILING MOUNTED FIXED POSITION INTRUSION SENSOR
	CEILING MOUNTED 360 DEGREES INTRUSION SENSOR
	DOOR CONTACT
	GLASS BREAK
P	POPPIT
	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FAPS	FIRE ALARM POWER SUPPLY
ANN	FIRE ALARM ANNUNCIATOR
B	FIRE ALARM BELL
	HEAT DETECTOR
A	ABOVE CEILING HEAT DETECTOR
	SMOKE DETECTOR
	DUCT SMOKE DETECTOR
	MANUAL PULL STATION
	END OF LINE RESISTOR
TS	TAMPER SWITCH
FS	WATERFLOW SWITCH
MM	MONITOR MODULE
CM	CONTROL MODULE
PIV	POST INDICATOR VALVE
FSD	FIRE SMOKE DAMPNER
	HORN SPEAKER
X1–1 XXXcd	WALL MOUNTED SPEAKER STROBE (15cd, 30cd, 75cd, 110cd) "cd" IS CANDELA. X1–1 RESEMBLES THE NAC CIRCUIT AND QUANTITY ON THAT CIRCUIT.
X1–1 C XXXcd	CEILING MOUNTED SPEAKER STROBE (15cd, 30cd, 75cd, 110cd) "cd" IS CANDELA. X1–1 RESEMBLES THE NAC CIRCUIT AND QUANTITY ON THAT CIRCUIT.
X1–1 XXXcd	WALL MOUNTED STROBE (15cd, 30cd, 75cd, 110cd) "cd" IS CANDELA. X1–1 RESEMBLES THE NAC CIRCUIT AND QUANTITY ON THAT CIRCUIT.
X1–1 C XXXcd	CEILING MOUNTED STROBE (15cd, 30cd, 75cd, 110cd) "cd" IS CANDELA. X1–1 RESEMBLES THE NAC CIRCUIT AND QUANTITY ON THAT CIRCUIT.

SYMBOL	DESCRIPTION
	CIRCUITS
	ARROW
	STUB
	STUB AND ARROW
	CONTINUATION
	CONDUIT RISER – UP
	CONDUIT DROP – DOWN
	CONDUIT CONCEALED IN CEILING OR WALL.
	CONDUIT CONCEALED IN FLOOR OR UNDERGROUND
	EXISTING CONDUIT TO REMAIN.
	CONDUIT & CONDUCTORS FOR LOW VOLTAGE MOTION SENSORS
	EXISTING CONDUIT AND/OR CONDUCTORS TO BE REMOVED. UNDERGROUND CONDUIT MAY BE ABANDONED IN PLACE.
	HOMERUN TO PANELBOARD OR TERMINAL CABINET W/ CONDUCTORS AS NOTED
#	CIRCUIT CONDUTORS: LONG DASH INDICATES NEUTRAL CONDUCTOR; SHORT DASHES INDICATE PHASE CONDUCTORS; CURVED DASH INDICATES EQUIPMENT GROUNDING CONDUCTOR; ADDITIONAL CURVED DASH INDICATES ISOLATED GROUNDING CONDUCTOR. NUMBER BY DASHES INDICATE WIRE GAUGE OTHER THAN 12 AWG CU. NO DASHES INDICATE 2#12 CU, 1#12 CU GND, IN ½" CONDUIT. OTHERS AS NOTED ON PLAN.
	FLEXIBLE CONDUIT, 6'–0" LONG MAX. w/ #12 CU GROUND UON.
	TAGS AND LEADERS
	BRACKET
	LEADERS
X	KEY NOTE SHOWN ON SAME SHEET
X	LIGHT FIXTURE TAG
X	FEEDER DESIGNATION TAG
X	KITCHEN EQUIPMENT DESIGNATION TAG
n Ex.1	DETAIL DESIGNATION: TOP LETTER INDICATES DETAIL, BOTTOM LETTER/NUMBER INDICATES SHEET
REF x	MECHANICAL EQUIPMENT I.D. TAG – MP&S
	ONE LINE DIAGRAM
(N) PANEL "X" 100A	PANEL IDENTIFICATION
100A 3P	CIRCUIT BREAKER
100A 3P	FUSED SWITCH
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
	GROUND
	UNDERGROUND TERMINATION SERVICE LUG
M	UTILITY METER
M	UTILITY METER WITH C.T. COMPARTMENT METER SOCKET
	TRANSFORMER WITH GROUND
	UFER GROUND
	BOND TO COLD WATER PIPE, GAS PIPE, BUILDING STEEL
	AUTOMATIC TRANSFER SWITCH
	NEUTRAL LINK
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
	NURSE CALL
	DOME LIGHT MOUNTED OVER DOOR. PROVIDE 4–11/16" BACK BOX WITH 2 GANG RING AND STUB 3/4" CONDUIT ONLY WITH PULL ROPE UP TO ACCESSIBLE CEILING SPACE
	MINI MASTER STATION. PROVIDE 4" SQUARE BACK BOX WITH 1 GANG RING.
	EMERGENCY PULL CORD STATION WALL MOUNTED AT +48". PROVIDE 4" SQUARE BACK BOX WITH 1 GANG RING AND STUB 1/2" CONDUIT ONLY WITH PULL ROPE UP TO ACCESSIBLE CEILING SPACE.
	EMERGENCY PUSH BUTTON – STAFF EMERGENCY WALL MOUNTED AT +48". PROVIDE 4" SQUARE BACK BOX WITH 1 GANG RING AND STUB 1/2" CONDUIT ONLY WITH PULL ROPE UP TO ACCESSIBLE CEILING SPACE.
	EMERGENCY PUSH BUTTON – STAFF EMERGENCY/CODE BLUE WALL MOUNTED AT +48". PROVIDE 4" SQUARE BACK BOX WITH 1 GANG RING AND STUB 1/2" CONDUIT ONLY WITH PULL ROPE UP TO ACCESSIBLE CEILING SPACE.
	SINGLE BED PATIENT STATION W/ CODE BLUE AND STAFF EMERGENCY WALL MOUNTED AT +48". PROVIDE 4 GANG BACK BOX (RACO #698 OR SIMILAR) AND STUB 3/4" CONDUIT ONLY WITH PULL ROPE UP TO ACCESSIBLE CEILING SPACE.
NCPC	NURSE CALL CONTROLLER AND TERMINAL CABINET (36"x24"x6" METAL BOX WITH LOUVERED DOOR) BY OTHERS. PROVIDE 120V, 20A CIRCUIT PER ELECTRICAL PLANS.
PSTC	POWER SUPPLY TERMINAL CAN (18"x22"x6" METAL BOX WITH LOUVERED DOOR) BY OTHERS. PROVIDE 120V, 20A CIRCUIT PER ELECTRICAL PLANS.

ELECTRICAL ABBREVIATIONS

SYMBOL	DESCRIPTIONS	SYMBOL	DESCRIPTIONS	SYMBOL	DESCRIPTIONS	SYMBOL	DESCRIPTIONS
A/AMP	AMPERES	EC	EMPTY CONDUIT	KW	KILOWATTS	PNL	PANELBOARD
AC	ALTERNATING CURRENT	EM	EMERGENCY	LTG	LIGHTING	PVC	POLYVINYL CHLORIDE CONDUIT (SCHEDULE 40)
AFF	ABOVE FINISHED FLOOR	EMT	ELECTRICAL METALLIC TUBING	MCA	MINIMUM CIRCUIT AMPACITY	(R)	RELOCATE/RELOCATED
AFC	ABOVE FINISHED CEILING	FACP	FIRE ALARM CONTROL PANEL	MCB	MAIN CIRCUIT BREAKER	RECEP	RECEPTACLE
AFG	ABOVE FINISHED GRADE	FLA	FULL LOAD AMPS	MLO	MAIN LUGS ONLY	RGSC	RIGID GALVANIZED STEEL CONDUIT
AIC	AMPERES INTERRUPTING CAPACITY (SYMMETRICAL)	FLEX	FLEXIBLE METALLIC CONDUIT	MTD	MOUNTED	TOF	TOP OF FIXTURE
		GFCI	GROUND FAULT CIRCUIT INTERRUPTER	(N)	NEW	UNO	UNLESS NOTED OTHERWISE
C	CONDUIT			N	NEUTRAL CONDUCTOR (GROUNDED CKT. CONDUCTOR)	V	VOLTAGE OR VOLTS
CCT	CIRCUIT	GND/G	GROUND			W	WATTS
CKT	CIRCUIT	HP	HORSEPOWER	N.I.E.S.	NOT IN ELECTRICAL SCOPE OR SPECIFICATIONS	WP	WEATHERPROOF
D	DEDICATED CIRCUIT	IG	ISOLATED GROUND			WPU	WEATHERPROOF WHILE IN USE
DC	DIRECT CURRENT	J–BOX	JUNCTION BOX	NL	NIGHT LIGHT	(X)	REMOVE
(E)	EXISTING TO REMAIN	KVA	KILOVOLT–AMPS	PH/P	PHASE OR POLE	XFMR	TRANSFORMER

ELECTRICAL SHEET INDEX

SHEET NO.	SHEET TITLE
E0.00	ELECTRICAL ABBREVIATIONS, LEGEND AND SHEET INDEX
E1.00	ELECTRICAL SITE PLAN
E2.01	ELECTRICAL FIRST FLOOR PLAN
E2.02	ELECTRICAL SECOND FLOOR PLAN
E3.01	LIGHTING ENLARGED PLANS
E3.02	ELECTRICAL ENLARGED PLANS

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LODI HIGH SCHOOL
NEW NORTH CAMPUS
3 SOUTH PACIFIC AVENUE
LODI, CA 95242

Lodi Unified School District

SCHEMATIC DESIGN

KEY PLAN — PLAN NORTH — TRUE NORTH

FILE NO. **00-00**
IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APPL. **00-000000**

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CLIENT
LODI UNIFIED SCHOOL DISTRICT

PROJECT NUMBER
18206

DATE: AUGUST 30TH, 2018
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CHECKED BY: RE

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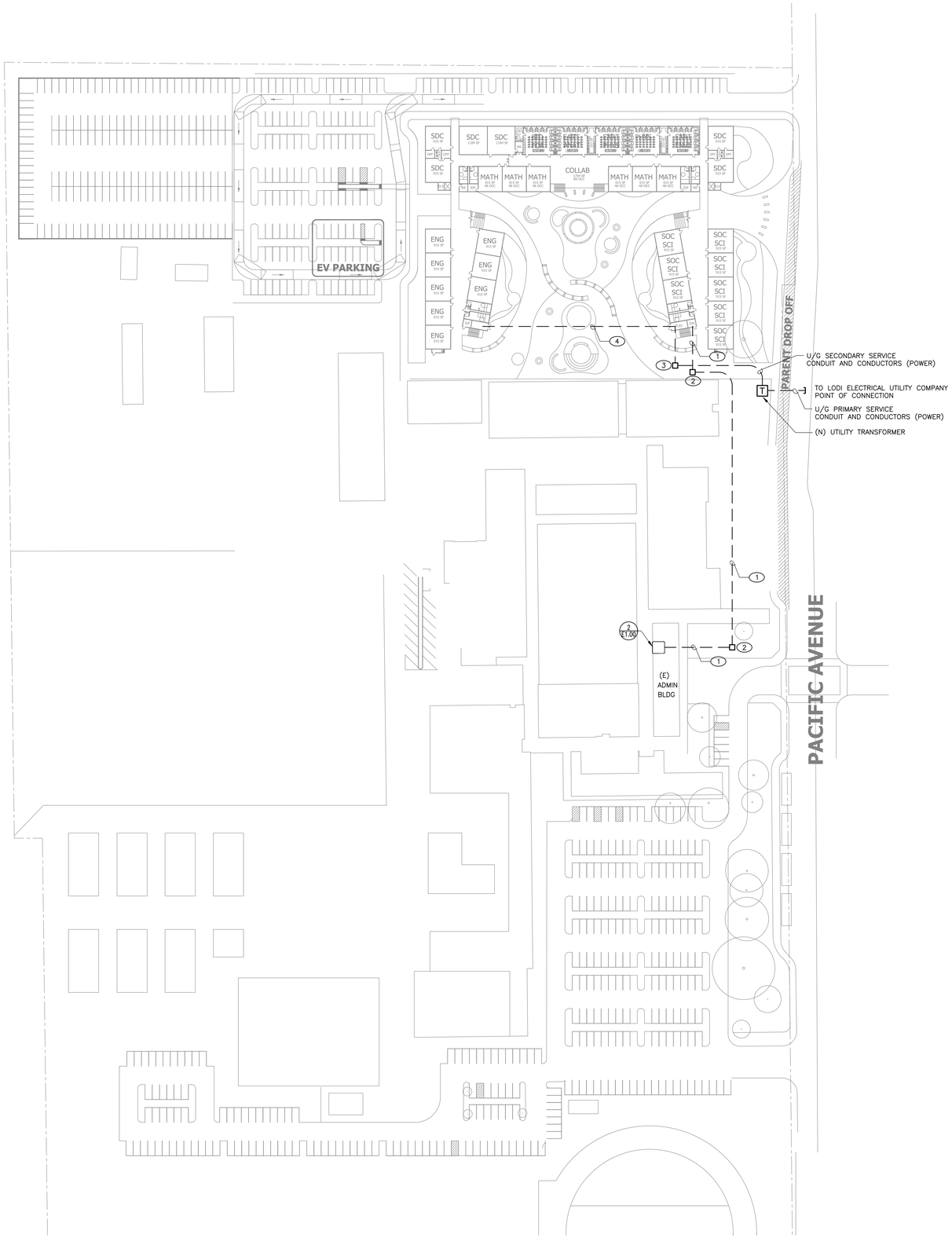
SCHEMATIC DESIGN

ELECTRICAL ABBREVIATIONS, LEGEND AND SHEET INDEX

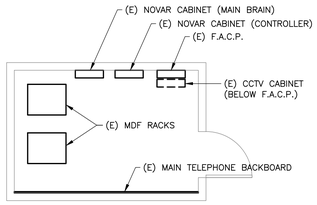
E0.00

KEY NOTES

1. NEW SIGNAL/COMMUNICATION CONDUIT AND CABLE (DATA, FIRE ALARM, TELEPHONE, INTRUSION, CCTV, ACCESS CONTROL, CLOCK BELL).
2. NEW UNDERGROUND PULL BOX (SIGNAL/COMMUMNICATION).
3. NEW UNDERGROUND PULL BOX (POWER).
4. COMMON TRENCH (POWER SIGNAL/COMMUNICATIOMN, WIRE/CABLE).



1 ELECTRICAL SITE PLAN
1" = 60'-0"



2 EXISTING IT ROOM ENLARGED ELECTRICAL PLAN
NTS

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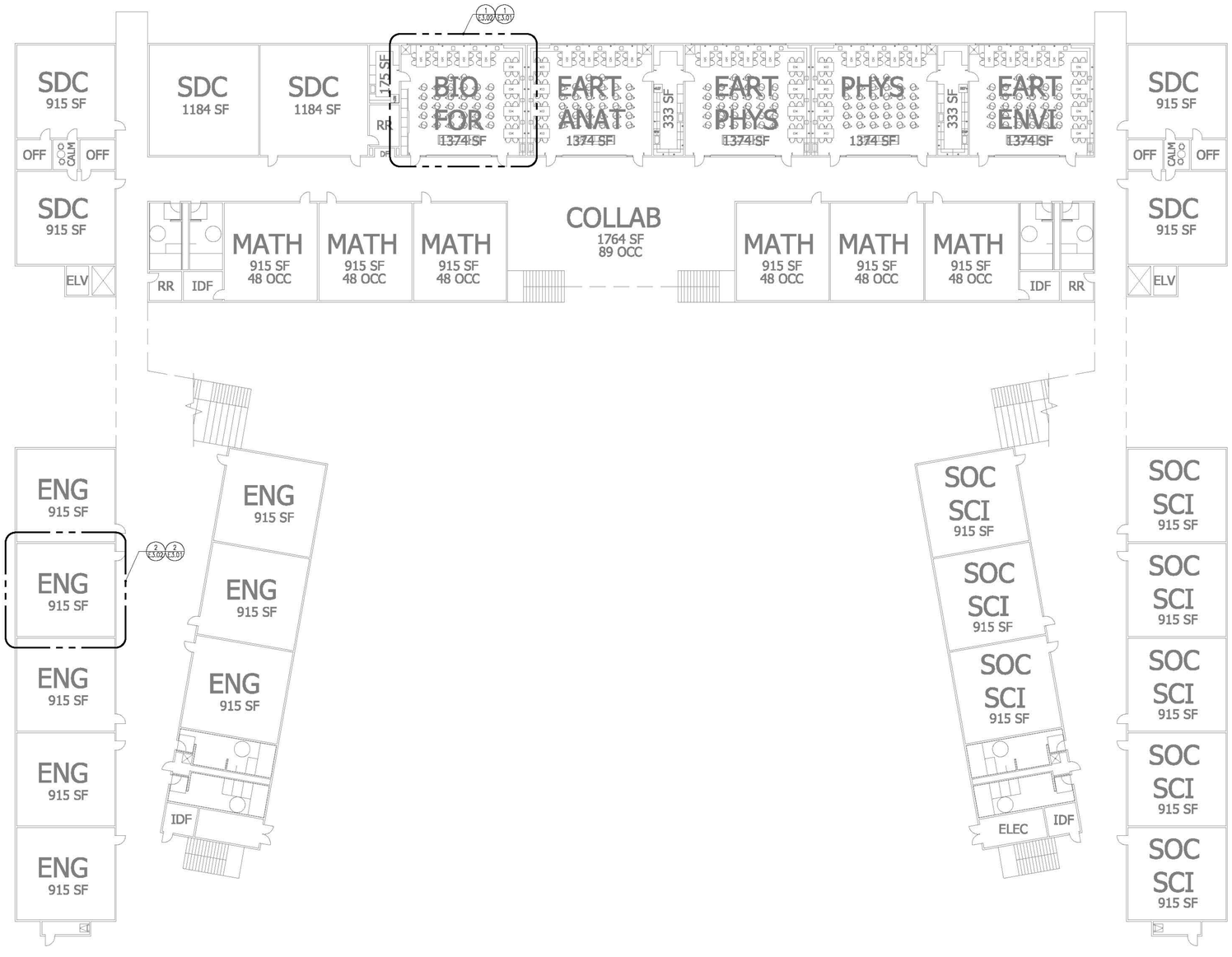
ELECTRICAL SITE PLAN

E1.00



1 ELECTRICAL FIRST FLOOR PLAN
1/16" = 1'-0"

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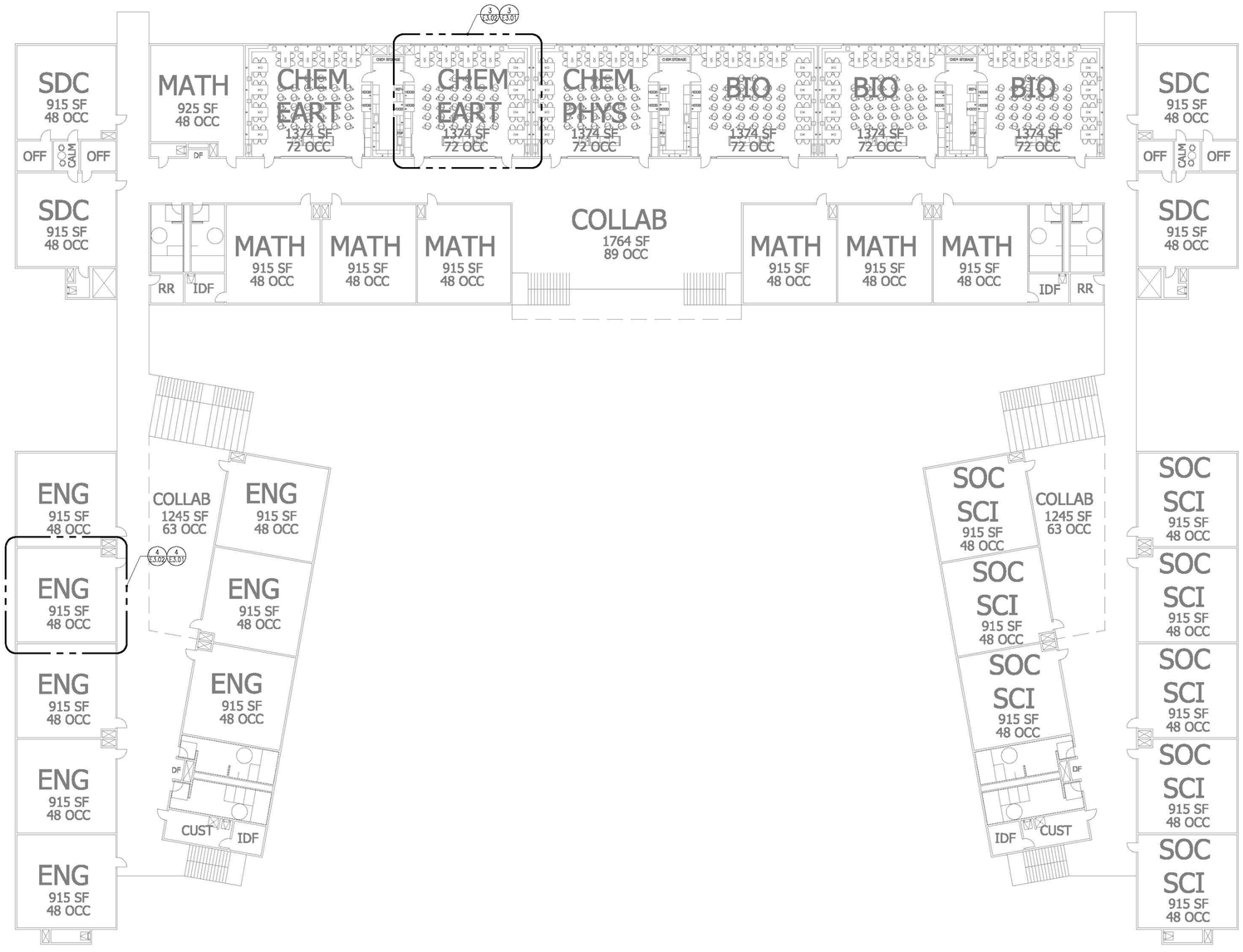
SCHEMATIC DESIGN

ELECTRICAL FIRST FLOOR PLAN

E2.01



1 ELECTRICAL SECOND FLOOR PLAN
1/16" = 1'-0"

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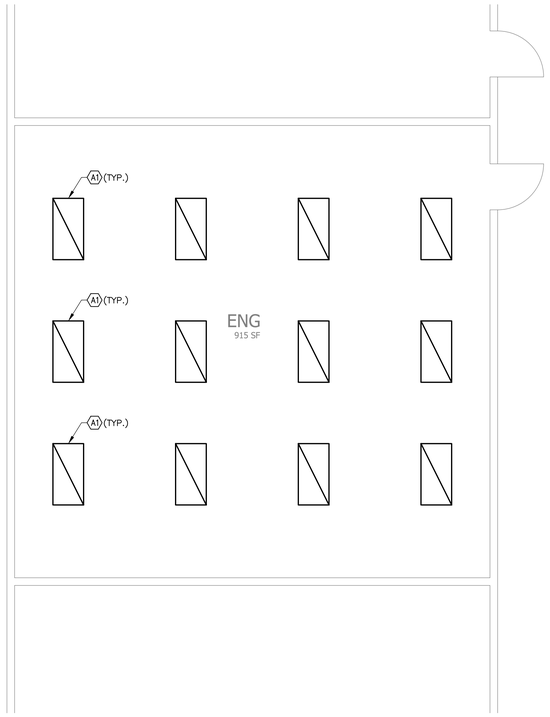
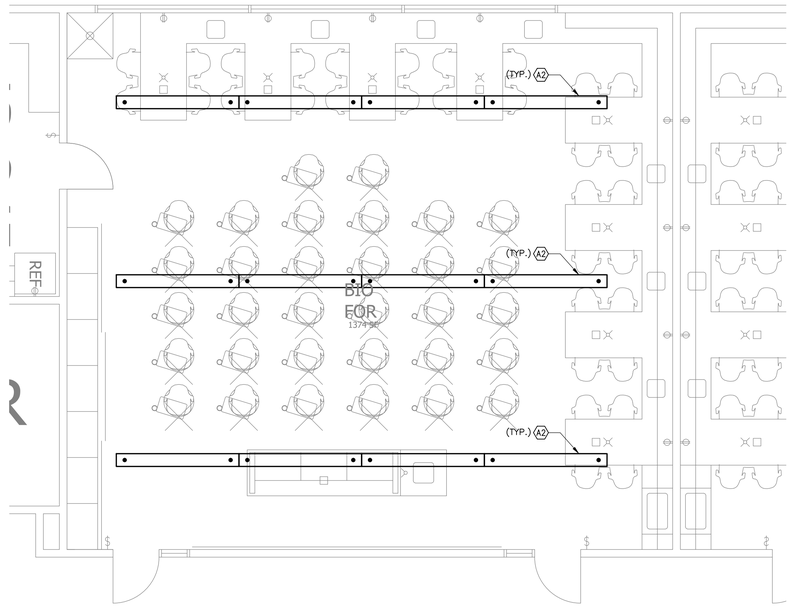
ELECTRICAL SECOND FLOOR PLAN

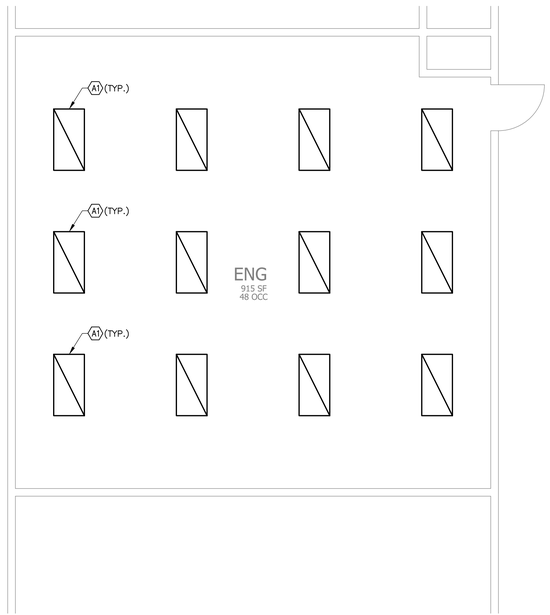
E2.02



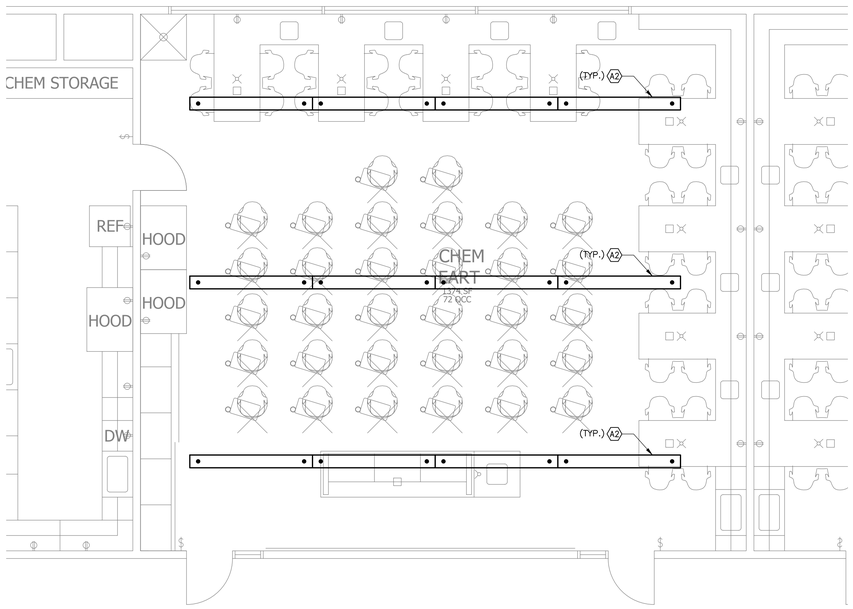
2 FIRST FLOOR ENG CLASSROOM LIGHTING PLAN
1/4" = 1'-0"



1 FIRST FLOOR BIO FOR ROOM LIGHTING PLAN
1/4" = 1'-0"



4 SECOND FLOOR ENG CLASSROOM LIGHTING PLAN
1/4" = 1'-0"



3 SECOND FLOOR CHEM EART LIGHTING PLAN
1/4" = 1'-0"

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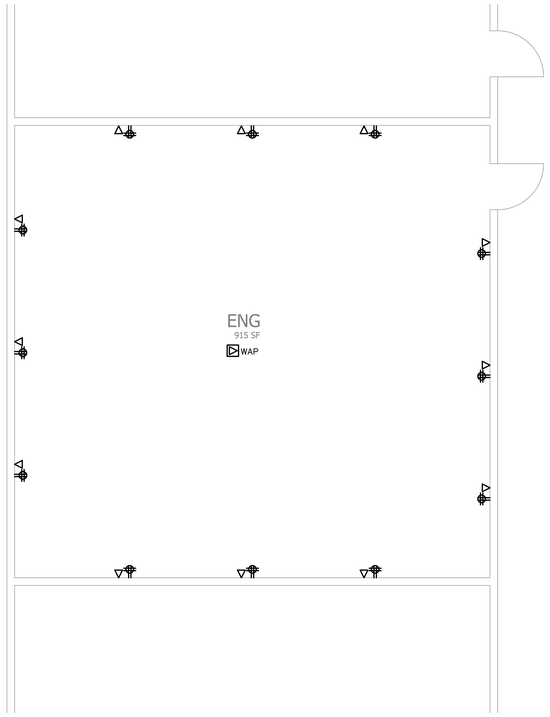
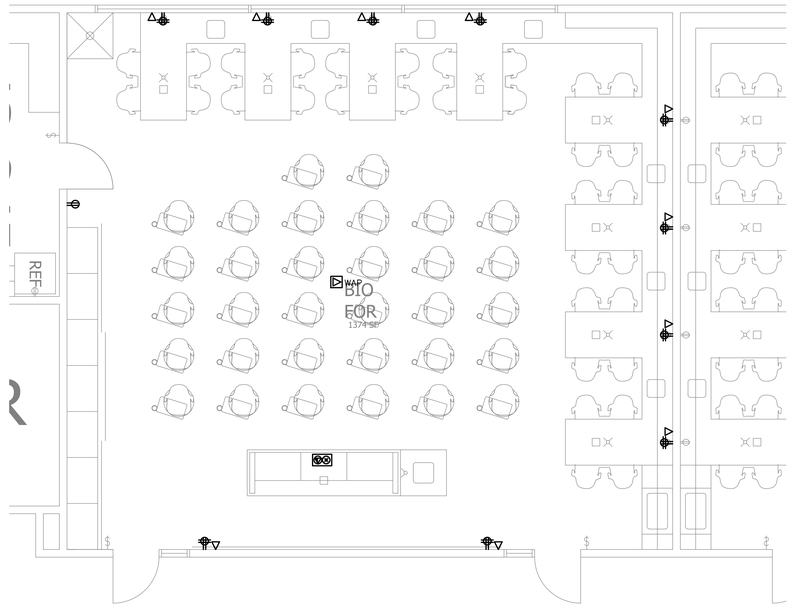
LIGHTING ENLARGED PLANS

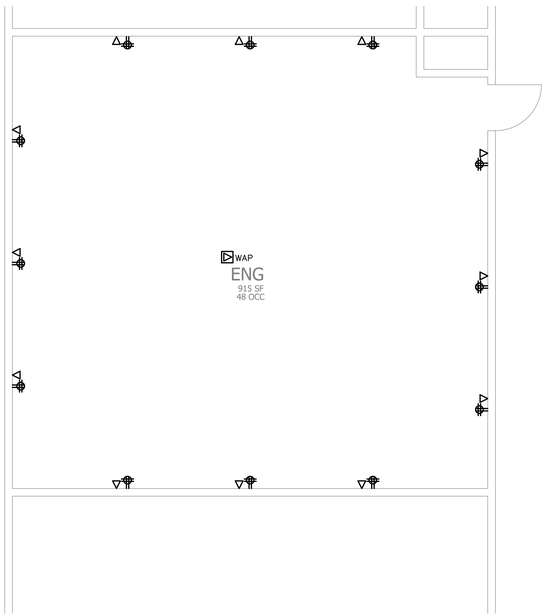
E3.01



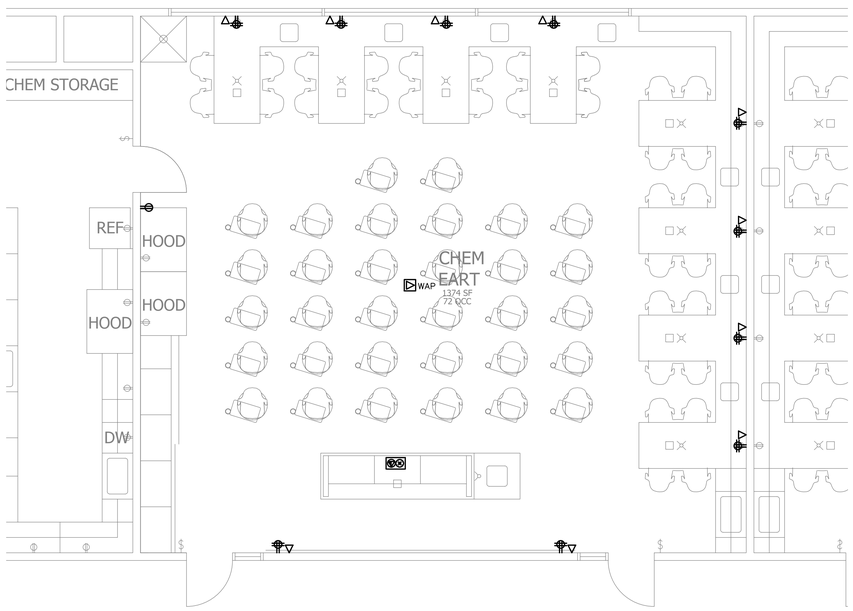
2 FIRST FLOOR ENG CLASSROOM ELECTRICAL PLAN
1/4" = 1'-0"



1 FIRST FLOOR BIO FOR ROOM ELECTRICAL PLAN
1/4" = 1'-0"



4 SECOND FLOOR ENG CLASSROOM ELECTRICAL PLAN
1/4" = 1'-0"



3 SECOND FLOOR CHEM EART ELECTRICAL PLAN
1/4" = 1'-0"

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3 SOUTH PACIFIC AVENUE
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SCHEMATIC DESIGN

Lodi Unified School District

KEY PLAN — PLAN NORTH — TRUE NORTH

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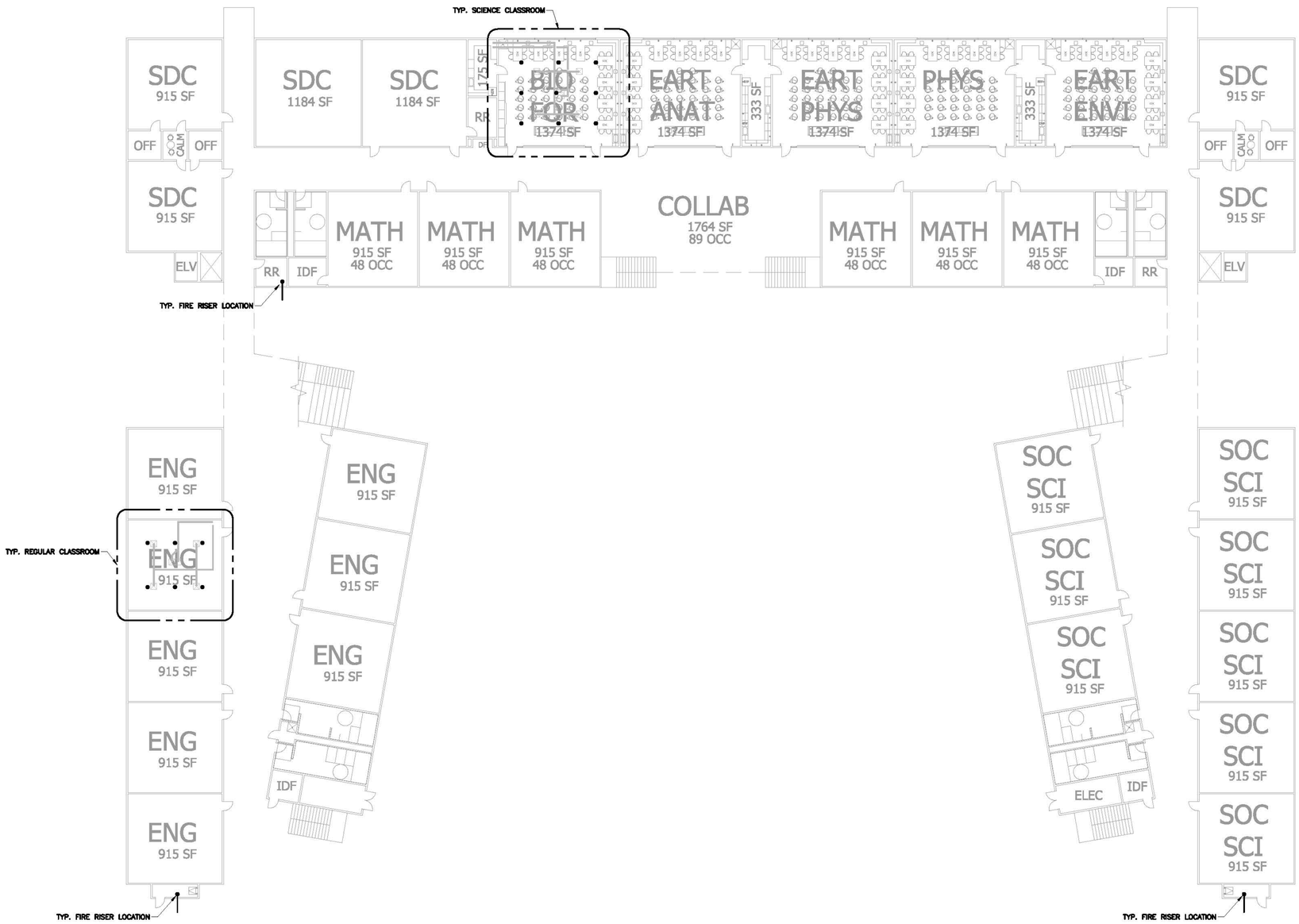
SCHEMATIC DESIGN

ELECTRICAL ENLARGED PLANS

E3.02



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SCHEMATIC DESIGN

FIRE SPRINKLER FIRST FLOOR PLAN

FP2.00

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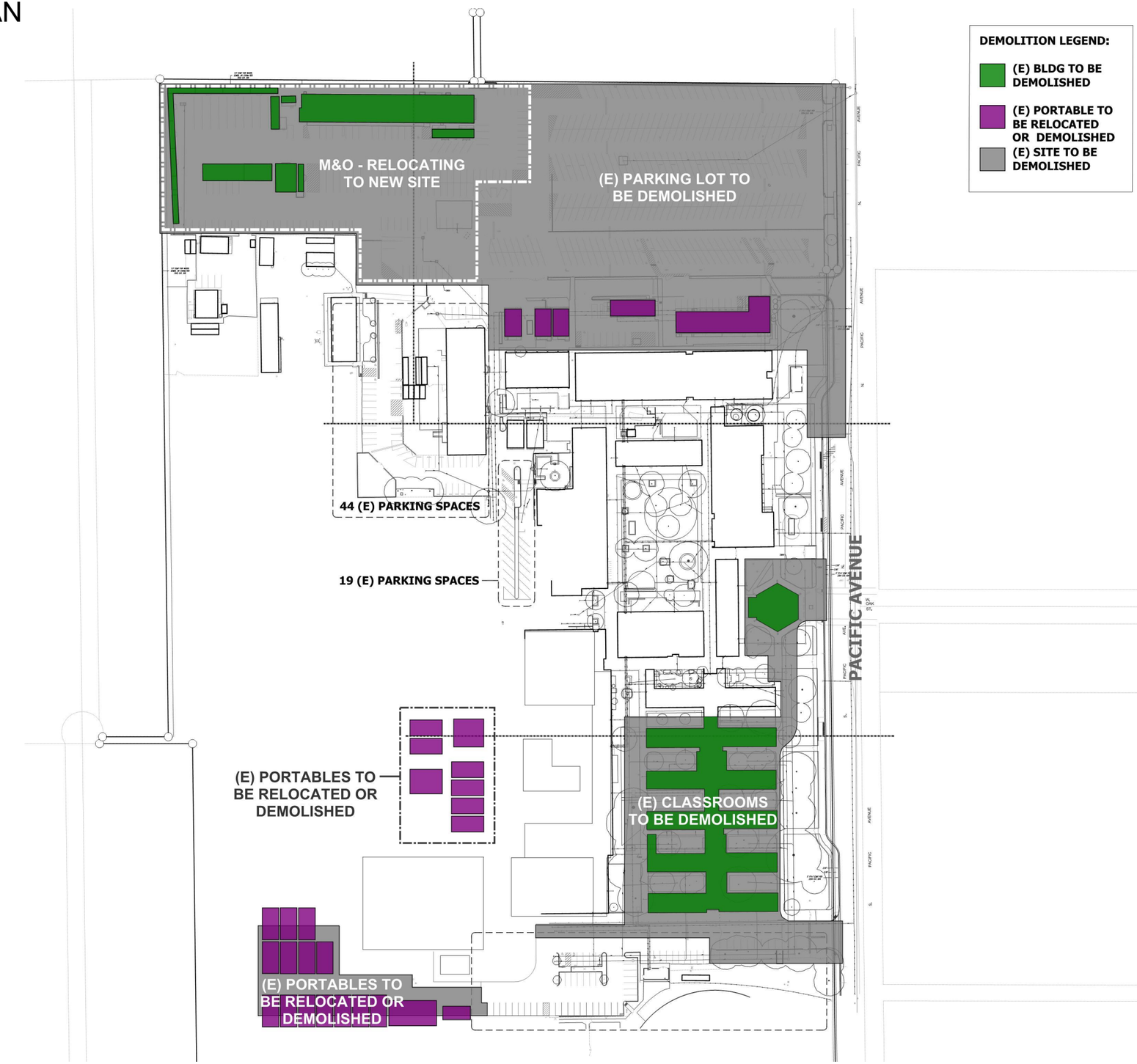
Lodi High School

Lodi Unified School District \\ Lodi California

Schematic Design Presentation

January 15, 2019

DEMOLITION SITE PLAN

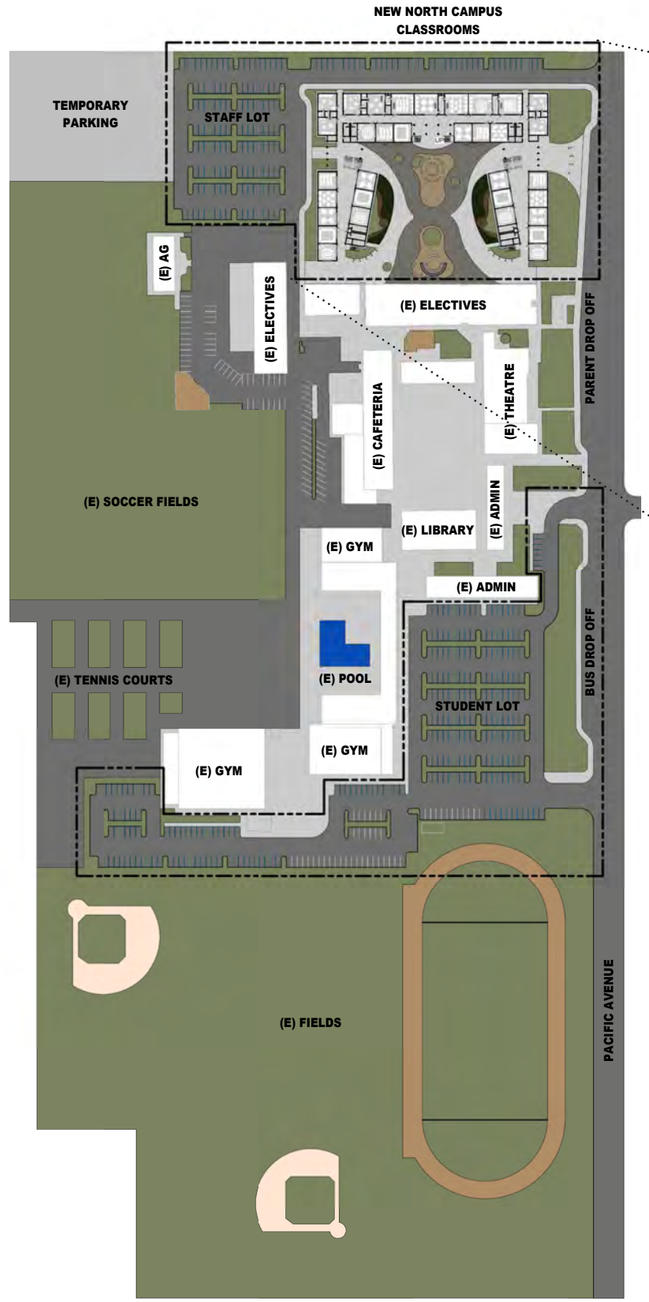


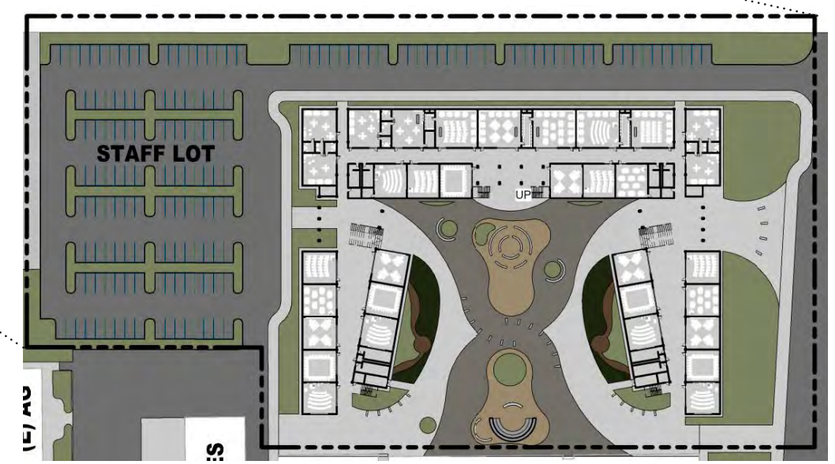
SITE PLAN

The overall site plan incorporates new defined parking lots for both staff and students/visitors to the North and South, respectively. The location of the new campus to the North allows for the elongation of the parent drop off area, and further separation of the bus drop off to the South. A new driveway at the current three-way stop at Pacific and Oak allows for regulated circulation. A traffic study has been utilized to review the impacts of changes to the traffic flow and is found in the Appendix.

North Campus Site Layout

The North Campus plan takes advantage of maximizing natural daylight from north and south orientations while minimizing heat gain from east and west orientations. Careful thought has been given to the daylighting and views of all classroom spaces by aligning them to face a north-south orientation as much as possible while also maintaining a strong visual presence to the front door of the school along the Pacific Avenue, which will be the main vehicular and pedestrian access to the site. The flex space provided within each classroom wing allows for collaboration and group work outside of the typical classroom space. A balance between open connectivity and security is provided by solid corridor walls with inter-mixed view windows.

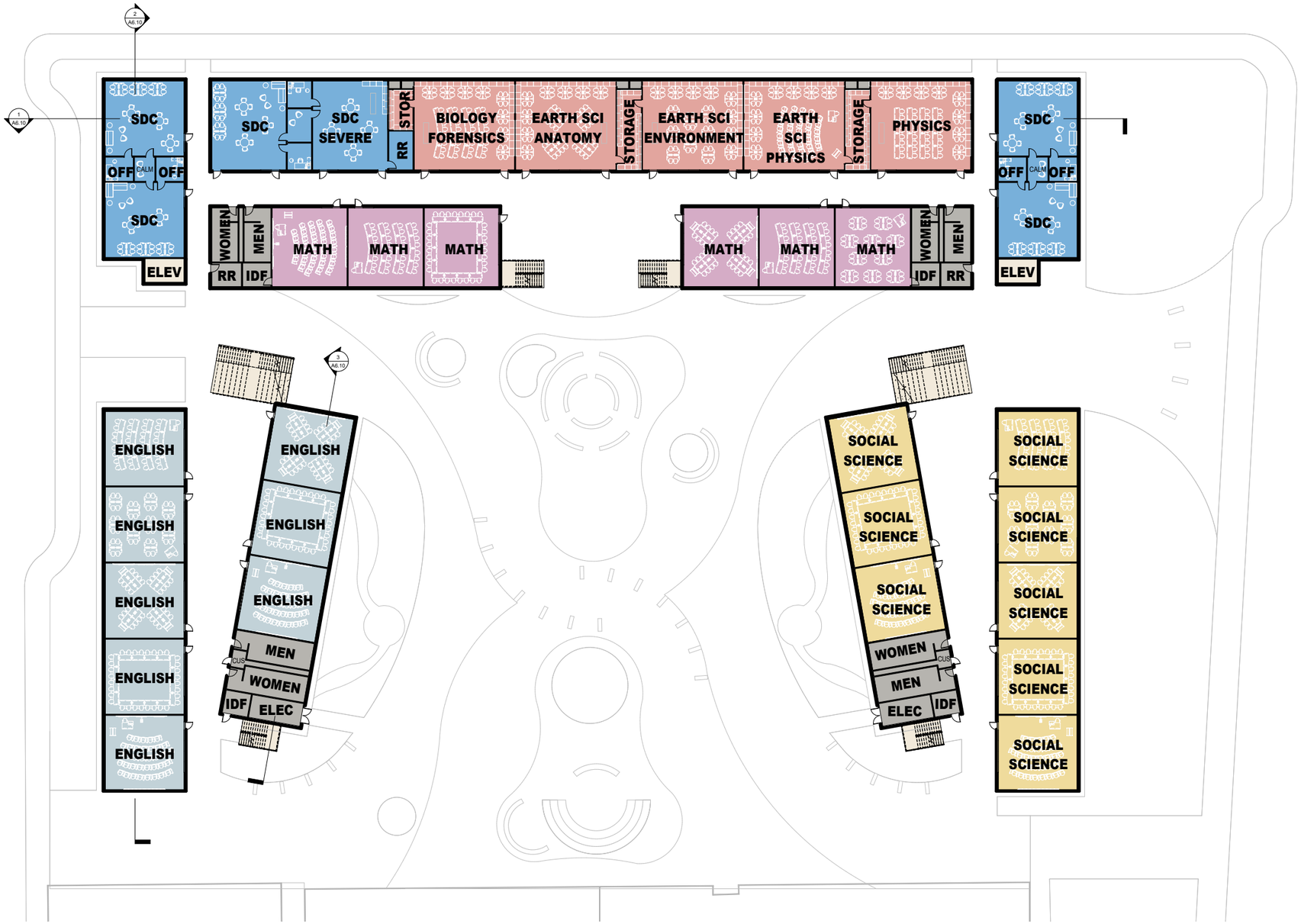




AERIAL VIEW OF OVERALL SITE

VIEW OF LEARNING COURTYARD

COMPOSITE FIRST FLOOR PLAN



CODE ANALYSIS

LOCATION:	Lodi, California 95242
AGENCY INFORMATION:	Lodi High Unified School District
RESPONDING FIRE DEPARTMENT:	Lodi Fire Department
AUTHORITIES HAVING JURISDICTION:	Division of the State Architect City of Lodi
ARCHITECT:	PBK Architects, Inc.

APPLICABLE CODES

The facilities are being designed to comply with the codes as listed below:

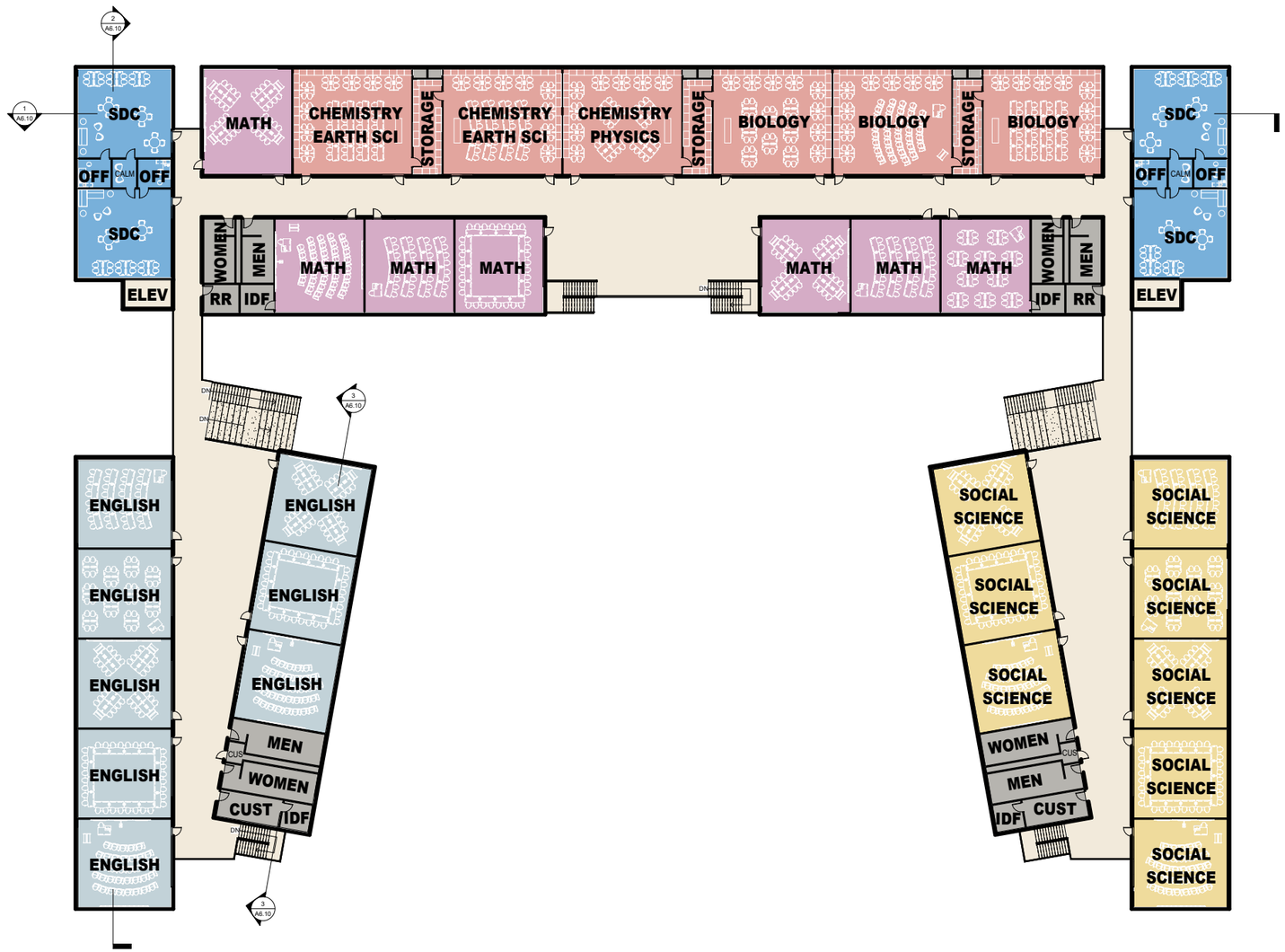
2016 California Administrative Code (CAC)
2016 California Building Code (CBC)
2016 California Electrical Code (CEC)
2016 California Mechanical Code (CMC)
2016 California Plumbing Code (CPC)
2016 California Energy Code (CEC)
2016 California Fire Code (CFC)
2016 California Green Building Standards Code
2016 California Referenced Standards Code
Title 19 CCR, Public Safety, State Fire Marshall Regulations
Americans with Disabilities Act (Public Law 101-336, Title II)

CODE DATA:

CONSTRUCTION TYPE:	Construction Type V-B, 100% Fully-Sprinklered (Wet Pipe System)
SQUARE FOOTAGE:	
Total Net Area:	88, 280 S.F.
Total Building (Gross):	**90,430 S.F.**
Parking Requirements:	1.5 Spaces/Classroom

66 Classrooms x 1.5 Spaces = 99 Required Parking Spaces
Approximately 125 parking spaces provided

COMPOSITE SECOND FLOOR PLAN



BUILDING HEIGHTS AND AREAS:

Basic Allowable Area E Occupancy:

Standard Allowable
Square Footage: 28,500 S.F.

Actual Square Footage (Gross):

Building 'A' First Floor - 12,072 SF
Building 'A' Second Floor - 12,072 SF
Building 'A' Total - 24,144 SF

Building 'B' First Floor - 12,072 SF
Building 'B' Second Floor - 12,072 SF
Building 'B' Total - 24,144 SF

Building 'C' First Floor - 3,220 SF
Building 'C' Second Floor - 3,220 SF
Building 'C' Total - 6,440 SF

Building 'D' First Floor - 24,063 SF
Building 'D' Second Floor - 24,063 SF
Building 'D' Total - 48,1266 SF

Building 'E' First Floor - 3,220 SF
Building 'E' Second Floor - 3,220 SF
Building 'E' Total - 6,440 SF

Basic Allowable Height:

Allowable Stories: 2
Actual Stories: 2
Allowable Height: 60 Ft.
Actual Height: 35 Ft.

OCCUPANT LOADS

PROGRAM	AREA	OLF	OCCUPANTS	QTY	TOTAL
CLASSROOM	960 SF	20	48	53	2,544
CLASSROOM	1440 SF	20	72	11	792
CLASSROOM	1080 SF	20	54	2	108
ASSEMBLY	1245 SF	15	83	4	332
ASSEMBLY	1764 SF	15	118	2	236
OFFICE	110 SF	100	2	10	20
TOTAL					4,032

NIGHT RENDERING OF MAIN ENTRY

ENTRY VIEW

LEARNING COURTYARD VIEWS

NIGHT RENDERING OF LEARNING COURTYARD AREA

COLLABORATION STAIR

INTERIOR RENDERINGS

Collaboration Spaces

The flex space provided within each classroom wing allows for collaboration and group work outside of the typical classroom.

Classroom Spaces

The classrooms are designed to be flexible, adaptable and technology-rich. A balance between open connectivity and security is provided by solid corridor walls with inter-mixed operable partitions and view windows.