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California Department of Conservation
California Geological Survey

CALIFORNIA GEOLOGICAL SURVEY
DEPARTMENT OF CONSERVATION

APPLICATION
FOR ASSESSMENT OF GEOLOGIC HAZARD REPORTS

CGS Form 1A (1/2019)

For CGS use only
CGS project number 01-CGS5656
Date received 10-28-2022

In order for CGS to review geologic hazard reports for a proposed school project, as described on Division of the State Architect (DSA) Interpretation of Regulations IR-4 (see http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx), the following material must be submitted to CGS.

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OCT 28 2022
California Geological Survey

1. Upload to Box (https://www.conservation.ca.gov/cgs/upload-school):
   - this form; and site plan; and site data report
   - Geologic Hazard Report(s) and Geotechnical Report(s) to be reviewed
2. Mail to CGS:
   - this form, which will help CGS and the DSA coordinate reviews;
   - TWO *WET-SIGNED COPIES* of the Work Order (below), signed by an authorized representative of the District;
   - a check for $3600 to cover the time and materials needed for CGS review

Address: California Geological Survey
School Review Unit
801 K Street, MS 12-31
Sacramento, CA 95814-3531

Name of School: Napa Valley College	
School District or State Agency: Napa Valley Community College District	
Mailing Address (street, city, zip): 2277 Napa Vallejo Highway, Napa, 94558	
District Superintendent: Torence Powell	
Telephone Number: 707-256-7160	E-mail Address: torence.powell@napavalley.edu
District Director of Facilities: James Reeves	
Telephone Number: 707-256-7175	E-mail Address: james.reeves@napavalley.edu

Scope of Work: Single story new construction of classrooms for the NVC Wine Education Center.		
Applicable Building Code (year): 2019	Community College Project per: ☐ DSA-SS, or ☑ DSA-SS/CC amendments	
This project includes a site-specific ground motion analysis in accordance with: ☐ none ☑ ASCE 7 ☐ ASCE 41		
Project location (Street Address): Building 3200, 2277 Napa Vallejo Highway		
City and Zip Code: Napa, 94558	County: Napa	APN: 046-450-074-000
OPSC Project Tracking Number:	DSA Application Number (if assigned):	

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APPLICATION FOR ASSESSMENT OF GEOLOGIC HAZARDS REPORTS (p. 2 of 2)

Plans, specifications, and related work were prepared by, and observation of construction will be performed by: (per Title 24, Part 1, Section 4-316, of the California Code of Regulations)	
Architect or Engineer in General Responsible Charge: Carl Servais	
Printed Name: Carl Servais	
Firm Name: TLCD Architecture	
Address: 520 3rd Street, Suite 270	
Telephone Number: 707-525-5600	Fax Number: 707-525-5616
California Registration Number: C-32941	E-mail Address: carl.servais@tlcd.com
The following individual is authorized to act as Alternate to the Architect or Engineer named above:	
Printed Name:	
Firm Name:	
Address:	
Telephone Number:	Fax Number:
California Registration Number:	E-mail Address:

Geologic hazards reports must be prepared by a Certified Engineering Geologist and a Geotechnical Engineer: (per Title 24, Part 2, Section 1803A, of the California Code of Regulations)	
Engineering Geologist Name: Curtis "Ed" Hendrick	Geotechnical Engineer Name: Brock Campbell
Firm Name: Allerion Consulting Group, Inc.	Firm Name: Signet Testing Labs
Address: 1050 Melody Land, Suite 160, Roseville, CA 95678	Address: 3526 Breakwater Court, Hayward, CA 94545
Telephone Number: 916-742-5096	Telephone Number: 510-887-8484
Fax Number:	Fax Number: 510-259-1068
E-mail Address: ehendrick@allerionconsulting.com	E-mail Address: BCampbell@signettesting.com
California Registration Number: 1052	California Registration Number: 2995

For Information regarding review of Geologic Hazard Reports for school projects:	
Technical (geology) questions:	Submittal and tracking of reports:
Jennifer Thornburg, PG, CEG, CHG	Margaret Hyland
California Geological Survey	California Geological Survey
801 K Street, MS 12-32, Sacramento, CA 95814-3531	801 K Street, MS 12-32, Sacramento, CA 95814-3531
916.445.5488	916.324.7324
Jennifer.Thornburg@conservation.ca.gov	Margaret.Hyland@conservation.ca.gov

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California Department of Conservation
California Geological Survey

CALIFORNIA GEOLOGICAL SURVEY
DEPARTMENT OF CONSERVATION

01-CGS5656

WORK ORDER
FOR ASSESSMENT OF GEOLOGIC HAZARD REPORTS

CGS Form 1B (1/2019)

The parties to this Work Order are the State of California, Department of Conservation, California Geological Survey (CGS) and Napa Valley Community College (District). The Parties agree to the following terms and conditions:

1. CGS agrees to conduct an independent assessment of District-provided geologic hazard report(s) associated with the District's proposed school construction project to determine whether the reports are technically adequate.

2. The State of California, Department of General Services, Division of the State Architect (DSA) will rely upon the CGS technical assessment in reviewing plans for construction of the District's proposed construction project and permitting the project. Information regarding CGS assessment of district geologic hazard reports and the DSA's instructions to K-12 and community college districts regarding the CGS assessment can be found in DSA Interpretation of Regulation (IR A-4) at http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx

3. The District shall list the specific reports to be reviewed by CGS in the Application (above). The District shall provide copies of the reports to CGS when submitting the signed Work Order and payment, as described below.

4. The District shall provide any additional information determined by CGS to be needed to complete its assessment.

5. The term of this Work Order shall begin upon full execution of the Work Order by both parties and shall end in 365 days or 12 months, whichever occurs first. "Full execution" as used herein means approval by authorized representatives of both Parties and payment to CGS of three thousand, six hundred dollars ($3600) in consideration of the promise by CGS to perform the technical assessment. Payment in full shall accompany two copies of this Work Order, each containing an original signature of a District representative authorized to sign the Work Order. CGS will return a copy of the Work Order containing an original signature of its authorized representative upon execution of the Work Order.

6. Failure of the District to submit the necessary documents or the $3,600 payment will result in termination of this Work Order.

7. No amendment or variation of the terms of this Work Order shall be valid unless made in writing and signed by both Parties. No oral understanding not incorporated into this Work Order is binding on either Party.

8. Either Party, in writing, may terminate this Work Order at any time with 30 days written notice; however, should the District terminate this Work Order after work has been commenced by CGS, CGS will retain the $3,600 payment for any work completed by CGS prior to the notice of termination.

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9. Contact information for each party:

California Geological Survey	**District**
Name: Jennifer Thornburg, PG, CEG, HG	Name: James Reeves
Mailing Address: California Geological Survey 801 K Street, MS 12-32 Sacramento, CA 95814	Mailing Address: 2277 Napa Vallejo Highway Napa, CA 94558
Phone Number: 916-324-7324	Phone Number: 707-256-7175

10. The Parties agree that the agents and employees of the Parties are independent of the other and shall not act as officers or employees or agents of the other Party to this Work Order.

11. During the performance of this Agreement, the Parties shall not discriminate, harass, or allow harassment against any employee or applicant for employment on account of the employee's or applicant's race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status. (Gov. Code, §§ 12900, 12940, 12990.) The Parties shall ensure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. The Parties shall comply with all provisions of the Fair Employment and Housing Act (Gov. Code §12900 et seq.) and the applicable regulations promulgated thereunder (Cal. Code Regs., tit. 2, §§ 11000, 11105, 11122, et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code section 12990, set forth in Chapter 5 of Division 4.1 of Title 2 of the California Code of Regulations, are incorporated into the Agreement by reference and made a part hereof as if set forth in full.

DISTRICT

(Signature) 9/16/22 (Date)

Name: James Reeves

Title: Assistant Superintendent / Vice President, Administrative Services

CALIFORNIA GEOLOGICAL SURVEY

DocuSigned by:
BAAEA8E0BF1949C...
(Signature) 11/1/2022 (Date)

Name: Jeff Newton

Title: Chief Deputy, Operations

TLCDARCHITECTURE
520 Third St. #250
Santa Rosa, CA 95401
o: 707.525.5600
f: 707.525.5616
tlcd.com

Site Data Report
Napa Valley College Wine Education Complex

School District:
Napa Valley College District
2277 Napa-Vallejo Highway
Napa, CA 94558

School:
Napa Valley College
2277 Napa-Vallejo Highway
Napa, CA 94558

Type Of Service:
Community College
- Educational Programs:
  - Wine Industry Viticulture Lab
  - Wine Industry Sensory Classrooms
  - Lab/Sensory Prep space
  - Faculty Offices
  - Restrooms
  - Wine Tasting Education Space

Construction Materials:
Concrete Slab-On-Grade with spread footings; Wood framed construction exterior and interior walls; wood framed roof system; structural steel beams and columns for long span conditions; structural steel side plate moment frames.

Type Of Construction:
New Construction.

Seismic Force Resisting System:
Wood framed shear walls; and special steel moment frames.

Foundation System:
Shallow reinforced concrete spread footings.

Analysis Procedure Used:
2016 American Society Of Civil Engineers Standard 7-16 (Asce 7-16) – Equivalent lateral force procedure.

Building Characteristics:

Number of Stories Above Grade:	1-Stories
Footprint Area At Grade:	8,943 SF
Grade Slope on Site:	< 1.4% Slope

Architect In General Responsible Charge

(Signature)
Carl Servais, AIA
Principal
CA License No. C32941

August 9, 2022
(Date)

NAPA VALLEY COLLEGE
WINE EDUCATION CENTER

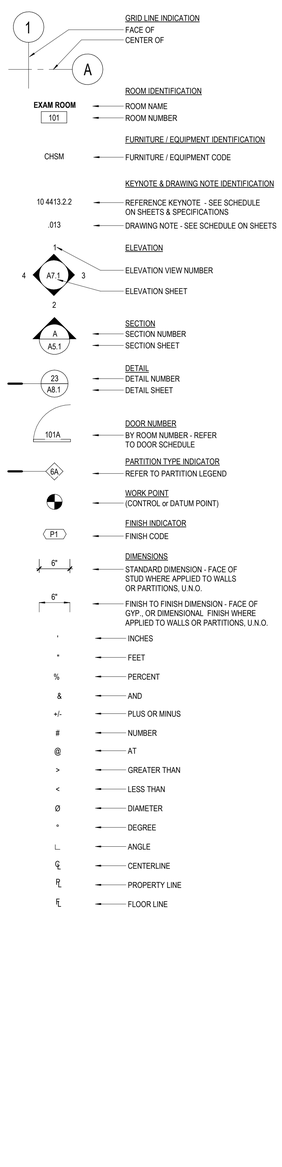
2277 NAPA VALLEJO HWY
NAPA, CA 94558

D.S.A. Application # 01- File # 28-C1

ABBREVIATIONS

CFCI	CONTRACTOR FURNISH CONTRACTOR INSTALL	GA	GAUGE	S	SOUTH
CFOI	CONTRACTOR FURNISH OWNER INSTALL	GALV	GALVANIZED	SAB	SOUND ATTENUATING BATTS
		GB	GRAB BAR	SAD	SEE ARCHITECTURAL DRAWINGS
OFCI	OWNER FURNISH CONTRACTOR INSTALL	GD	GARBAGE DISPOSAL	SAFF	SELF ADHERED FLEXIBLE FLASHING
OFOI	OWNER FURNISH OWNER INSTALL	GE	GRATE ELEVATION		
		GL	GLASS	SASM	SELF ADHERED SHEET MEMBRANE
		GLB	GLUE LAMINATED BEAM		
		GND	GROUND	SBLKG	SOLID BLOCKING
A/C	AIR CONDITIONING	GR	GRADE	SC	SOLID CORE
AB	ANCHOR BOLT	GSM	GALVANIZED SHEET METAL	SCD	SEE CIVIL DRAWINGS
AC	ASPHALT CONCRETE	GYP BD	GYPSUM BOARD	SD	STORM DRAIN
ACC	ACCESSIBLE			SDISP	SOAP DISPENSER
ACOUS	ACOUSTIC	HB	HOSE BIB	SEAL	SEALANT
ACP	ASPHALT CONCRETE PAVING	HC	HOLLOW CORE	SECT	SECTION
ACT	ACOUSTICAL CEILING TILE	HDR	HEADER	SED	SEE ELECTRICAL DRAWINGS
AD	AREA DRAIN	HDWD	HARDWOOD	SF	SQUARE FOOT (FEET)
ADA	AMERICANS W/ DISABILITIES ACT	HDWE	HARDWARE	SHR	SHOWER
		HGT	HEIGHT	SHT	SHEET
ADJ	ADJUSTABLE	HM	HOLLOW METAL	SHTF	SHEET FLOW
AFF	ABOVE FINISHED FLOOR	HORZ	HORIZONTAL	SHTG	SHEATHING
AGG	AGGREGATE	HP	HIGH POINT	SIM	SIMILAR
AHJ	AUTHORITY HAVING JURISDICTION	HR	HOUR	SING	SINGLE
		HSS	HOLLOW STRUCTURAL STEEL	SL	SLIDING
ALT	ALTERNATE	HTG	HEATING	SLD	SEE LANDSCAPE DRAWINGS
ALUM	ALUMINUM	HVAC	HEATING, VENTILATION & AIR CONDITIONING	SLP	SLOPE
APPRO	APPROXIMATE	HW	HOT WATER	SMD	SEE MECHANICAL DRAWINGS
X				SMS	SHEET METAL SCREW
ARCH	ARCHITECT	ID	INSIDE DIAMETER	SOG	SLAB ON GRADE
ASPH	ASPHALT	INSUL	INSULATION	SP	SOUNDPROOF
		INT	INTERIOR	SPEC	SPECIFICATION
BD	BOARD	INV	INVERT	SQ	SQUARE
BFC	BELOW FINISHED CEILING	IRR	IRRIGATION	SS	SANITARY SEWER
BFD	BACK FLOW DEVICE			SSD	SEE STRUCTURAL DRAWINGS
BITUM	BITUMINOUS	JAN	JANITOR	SSTL	STAINLESS STEEL
BLD	BOLLARD	JH	JOIST HANGER	STA	STATION
BLDG	BUILDING	JST	JOIST	STD	STANDARD
BLK	BLOCK	JT	JOINT	STL	STEEL
BLKG	BLOCKING			STO	STORAGE
BM	BEAM	KIT	KITCHEN	STRUC	STRUCTURAL
BOT	BOTTOM			STS	SELF-TAPPING SCREW
BRG	BEARING	LAB	LABORATORY	SUSP	SUSPENDED
BRK	BRICK	LAM	LAMINATE		
BRZ	BRONZE	LAV	LAVATORY	T&B	TOP AND BOTTOM
BTWN	BETWEEN	LB	LAG BOLT	T&G	TONGUE & GROOVE
BUR	BUILT-UP ROOFING	LH	LEFT HAND	TEL	TELEPHONE
		LL	LIVE LOAD	TEMP	TEMPERED
C	COMPACT	LN	LENGTH	TER	TERRAZZO
CAB	CABINET	LP	LOW POINT	THK	THICK
CB	CATCH BASIN	LSL	LAMINATED STRAND LUMBER	TJ	TOOL JOINT
CEM	CEMENT	LT	LIGHT	TKBD	TACKBOARD
CERT	CERAMIC TILE	LTG	LIGHTING	TN	TOE NAIL
CH	CHASE	GL	GLASS	TOC	TOP OF CURB
CI	CAST IRON	LVR	LOUVER	TOPL	TOP OF PLATE
CIR	CIRCLE	LW	LIGHTWEIGHT	TOPVM	TOP OF PAVEMENT
CJ	CONSTRUCTION JOINT			T	
CLG	CEILING	MAT	MATERIAL	TOS	TOP OF STEEL
CLGJ	CEILING JOIST	MAX	MAXIMUM	TOSOG	TOP OF SLAB ON GRADE
CLKG	CAULKING	MB	MACHINE BOLT	TOW	TOP OF WALL
CLO	CLOSET	MC	MEDICINE CABINET	TPD	TOILET PAPER DISPENSER
CLR	CLEAR	MECH	MECHANICAL	TPO	THERMOPLASTIC POLYOLEFIN
CLRSTY	CLERESTORY	MED	MEDIUM	TRN	TRANSOM
CLS	CLOSURE	MFR	MANUFACTURER	TS	TUBE STEEL
CMU	CONCRETE MASONRY UNIT	MH	MANHOLE	TV	TELEVISION
CNTR	COUNTER	MIN	MINIMUM	TYP	TYPICAL
CO	CLEAN OUT	MIR	MIRROR		
COL	COLUMN	MISC	MISCELLANEOUS	UNF	UNFINISHED
COMB	COMBINATION	MO	MASONRY OPENING	UON	UNLESS OTHERWISE NOTED
COMP	COMPOSITION	MOD	MODULAR	UR	URINAL
CONC	CONCRETE	MR	MOISTURE RESISTANT		
CONN	CONNECTION	MTD	MOUNTED	VCT	VINYL COMPOSITION TILE
CONST	CONSTRUCTION	MTL	METAL	VERT	VERTICAL
CONT	CONTINUOUS			VEST	VESTIBULE
COR	CORRIDOR	(N)	NEW	VG	VERTICAL GRAIN
CP	CEMENT PLASTER	N	NORTH	VIF	VERIFY IN FIELD
CPT	CARPET	NAT	NATURAL	VT	VINYL TILE
CPTT	CARPET TILE	NIC	NOT IN CONTRACT	VTR	VENT TO ROOF
CRKT	CRICKET	NO	NUMBER	VWC	VINYL WALL COVERING
CTR	CENTER	NOM	NOMINAL		
CW	COLD WATER	NR	NON-RATED	W	WEST
		NTS	NOT TO SCALE	W	WITH
D	DRAIN			WO	WITHOUT
DBL	DOUBLE	O/	OVER	WAB	WATER RESISTIVE BARRIER
DCA	DOUBLE CHECK VALVE ASSEMBLY	OA	OVERALL	WC	WATER CLOSET
		OBS	OBSCURE	WD	WOOD
DEMO	DEMOLISH	OC	ON CENTER	WDW	WINDOW
DEPT	DEPARTMENT	OD	OUTSIDE DIAMETER	WF	WASH FOUNTAIN
DF	DOUGLAS FIR	OFD	OVERFLOW DRAIN	WH	WATER HEATER
DIA	DIAMETER	OFF	OFFICE	WP	WATER PROOF
DIAG	DIAGONAL	OFS	OUTSIDE FACE OF STUD	WR	WATER RESISTANT
DIM	DIMENSION	OHMS	OVAL HEAD WOOD SCREW	WRB	WATER RESISTIVE BARRIER
DISP	DISPOSAL	OPP	OPPOSITE	WT	WEIGHT
DIV	DIVISION	OVFL	OVERFLOW	WWF	WELDED WIRE FABRIC
DN	DOWN				
DO	DOOR OPENING	P	PAINT	XFMR	TRANSFORMER
DR	DOOR	PCF	POUNDS PER CUBIC FOOT		
DRF	DRINKING FOUNTAIN	PEN	PANEL EDGE NAIL	YD	YARD
DRWR	DRAWER	PERF	PERFORATED		
DS	DOWN SPOUT	PIR	POLYISOCYANURATE		
DT	DRAIN TILE	PIV	POST INDICATOR VALVE		
DTL	DETAIL	PL	PLATE		
DW	DISHWASHER	PLAM	PLASTIC LAMINATE		
DWS	DETECTABLE WARNING STRIP	PLAS	PLASTER		
		PLF	POUNDS PER LINEAR FOOT		
(E)	EXISTING	PLNT	PLANTER		
E	EAST	PLWD	PLYWOOD		
EA	EACH	PMF	PRESSED METAL FRAME		
EB	EXPANSION BOLT	PR	PAIR		
EE	EACH END	PROP	PROPERTY		
EF	EXHAUST FAN	PRFT	PARAPET		
EJ	EXPANSION JOINT	PSF	POUNDS PER SQUARE FOOT		
ELEC	ELECTRICAL	PSI	POUNDS PER SQUARE INCH		
ELEV	ELEVATION	PSL	PARALLEL STRAND LUMBER		
EN	EDGE NAIL	PSTA	PULL STATION		
ENCL	ENCLOSURE	PT	POINT		
EP	EDGE OF PAVEMENT	PTD	PAPER TOWEL DISPENSER		
EQ	EQUAL	PTDF	PRESSURE TREATED DOUGLAS FIR		
EQUIV	EQUIVALENT	PTN	PARTITION		
ES	EACH SIDE	PTR	PAPER TOWER RECEPTACLE		
EVA	EMERGENCY VEHICLE ACCESS	PUR	POLYURETHANE		
EW	EACH WAY	PVC	POLYVINYL CHLORIDE		
EX	EXIT	PVMT	PAVEMENT		
EXP	EXPANSION				
EXPO	EXPOSURE	QT	QUARRY TILE		
EXT	EXTERIOR				
EXTN	EXTENSION	RAD	RADIUS		
		RAH	ROOF ACCESS HATCH		
F	FACE	RB	RESILIENT BASE		
FA	FIRE ALARM	RCP	REFLECTED CEILING PLAN		
FB	FACE BRICK	RD	ROOF DRAIN		
FBD	FIBERBOARD	RDWD	REDWOOD		
FBELL	FIRE BELL	REF	REFERENCE		
FBO	FURNISHED BY OTHER	REFR	REFRIGERATOR		
FCP	FIBER CEMENT PANEL	REINF	REINFORCING		
FD	FLOOR DRAIN	RES	RESILIENT		
FDC	FIRE DEPARTMENT CONNECTION	RGD	RIGID		
		RH	RIGHT HAND		
FDN	FOUNDATION	RHMS	ROUND HEAD METAL SCREW		
FE	FIRE EXTINGUISHER	RHWS	ROUND HEAD WOOD SCREW		
FEC	FIRE EXTINGUISHER CABINET	RO	ROUGH OPENING		
FF	FINISH FLOOR	RW	ROCK WOOL		
FG	FINISH GRADE	RWL	RAIN WATER LEADER		
FGL	FIBERGLASS				
FH	FIRE HYDRANT				
FHMS	FLAT HEAD MACHINE SCREW				
FHORN	FIRE HORN				
FHS	FIRE HOSE STATION				
FHWS	FLAT HEAD WOOD SCREW				
FIN	FINISH				
FIXT	FIXTURE				
FJ	FLOOR JOIST				
FLR	FLOOR				
FLSH	FLASHING				
FN	FACE NAIL				
FNC	FENCE				
FOB	FACE OF BUILDING				
FOC	FACE OF CONCRETE				
FOF	FACE OF FINISH				
FOM	FACE OF MASONRY				
FOS	FACE OF STUD				
FR	FIRE RETARDANT				
FTG	FOOTING				
FUT	FUTURE				

SYMBOLS



APPLICABLE CODES

BUILDING CODES AND STANDARDS as of January 1, 2020*

2019 CALIFORNIA ADMINISTRATIVE CODE (CAC), PART 1, TITLE 24 CCR*

2019 CALIFORNIA BUILDING CODE (CBC), PART 2, TITLE 24 CCR
(2018 INTERNATIONAL BUILDING CODE, VOLUMES 1 & 2, AND 2019 CALIFORNIA AMENDMENTS)

2019 CALIFORNIA ELECTRICAL CODE (CEC), PART 3, TITLE 24 CCR
(2017 NATIONAL ELECTRICAL CODE AND 2019 CALIFORNIA AMENDMENTS)

2019 CALIFORNIA MECHANICAL CODE (CMC), PART 4, TITLE 24 CCR
(2018 IAPMO UNIFORM MECHANICAL CODE AND 2019 CALIFORNIA AMENDMENTS)

2019 CALIFORNIA PLUMBING CODE (CPC), PART 5, TITLE 24 CCR
(2018 IAPMO UNIFORM PLUMBING CODE AND 2019 CALIFORNIA AMENDMENTS)

2019 CALIFORNIA ENERGY CODE (CEC), PART 6, TITLE 24 CCR

2019 CALIFORNIA FIRE CODE (CFC), PART 9, TITLE 24 CCR
(2018 INTERNATIONAL FIRE CODE AND 2019 CALIFORNIA AMENDMENTS)

2019 CALIFORNIA EXISTING BUILDING CODE (CEBC), PART 10, TITLE 24 CCR
(2018 INTERNATIONAL EXISTING BUILDING CODE AND 2019 CALIFORNIA AMENDMENTS)

2019 CALIFORNIA GREEN BUILDING STANDARDS CODE (CALGreen), PART 11, TITLE 24 CCR

2019 CALIFORNIA REFERENCE STANDARDS CODE, PART 12, TITLE 24 CCR

TITLE 19 CCR, PUBLIC SAFETY, STATE FIRE MARSHAL REGULATIONS

NATIONAL REFERENCE STANDARDS

AISC 341-16 SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS

ANSI/AWC NDS-2018 NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION

ACI-318-14 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE

ASCE 7-16 MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES (WITH SUPPLEMENT NO.1)

NFPA 10 - STANDARD FOR PORTABLE FIRE EXTINGUISHERS - 2018 EDITION

NFPA 13 - STANDARD FOR THE INSTALLATION OF FIRE SPRINKLERS (CA AMENDED) - 2016 EDITION

NFPA 14 - STANDARD FOR THE INSTALLATION OF STANDPIPE AND HOSE SYSTEMS (CA AMENDED) - 2016 EDITION

NFPA 17 - STANDARD FOR DRY CHEMICAL EXTINGUISHING SYSTEMS - 2017 EDITION

NFPA 17-A - STANDARD FOR WET CHEMICAL EXTINGUISHING SYSTEMS - 2017 EDITION

NFPA 20 - STANDARD FOR THE INSTALLATION OF STATIONARY PUMPS FOR FIRE PROTECTION - 2016 EDITION

NFPA 22 - STANDARD FOR WATER TANKS FOR PRIVATE FIRE PROTECTION - 2013 EDITION

NFPA 24 - STANDARD FOR THE INSTALLATION OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES (CA AMENDED) - 2016 EDITION

NFPA 72 - NATIONAL FIRE ALARM AND SIGNALING CODE (CA AMENDED) - 2016 EDITION

NFPA 80 - STANDARD FOR FIRE DOORS AND OTHER OPENING PROTECTIVES - 2016 EDITION

NFPA 2001 - STANDARD ON CLEAN AGENT FIRE EXTINGUISHING SYSTEMS (CA AMENDED) - 2015 EDITION

UL 464 - AUDIBLE SIGNALING DEVICES FOR FIRE ALARM AND SIGNALING SYSTEMS, INCLUDING ACCESSORIES - 2003 EDITION

UL 521 - STANDARD FOR HEAT DETECTORS FOR FIRE PROTECTIVE SIGNALING SYSTEMS - 1999 EDITION

UL 1971 - STANDARD FOR SIGNALING DEVICES FOR THE HEARING IMPAIRED - 2002 (R2010)

ADA (AMERICANS WITH DISABILITIES ACT, 1990) 2010 EDITION

ADA STANDARDS FOR ACCESSIBLE DESIGN (APPENDIX A OF 28 CFR PART 36)

SUMMARY OF WORK

NEW BUILDING AND ASSOCIATED SITE WORK.
OCCUPANCY: A-3
CONSTRUCTION: Type VB
SPRINKLERS: YES
APPROX. 8,943 SQ. FT.

PROJECT TEAM

OWNER
NAPA VALLEY COLLEGE
2277 NAPA-VALLEJO HIGHWAY
NAPA, CA 94558
PHONE: 707.256.7584
CONTACT: SAMANTHA MADDOX

CIVIL ENGINEER
BRELJE & RACE CONSULTING ENGINEERS
475 AVIATION COULEVARD, SUITE 120
SANTA ROSA, CA 95403
PHONE: 707.636.3731
CONTACT: RYAN D. GLEASON

MECHANICAL ENGINEER
TEP ENGINEERS
880 SECOND STREET
SANTA ROSA, CA 95404-4610
PHONE: 707.308.4205
CONTACT: TIM SOUZA

AUDIO-VISUAL
SALTER
130 SUTTER STREET, FLOOR 5
SAN FRANCISCO, CA 94104
PHONE: 415.470.5436
CONTACT: KEN GRAVEN

COST ESTIMATOR
TBD CONSULTANTS
6518 LONETREE TLVD. #154
ROCKLIN,CA 95765
PHONE: 415.872.0996
CONTACT: GARY HOLLAND

ARCHITECT
TLCD ARCHITECTURE
520 THIRD ST., SUITE #250
SANTA ROSA, CA 95401
PHONE: 707.525.5600
CONTACT: CARL SERVAIS

STRUCTURAL ENGINEER
ZFA STRUCTURAL ENGINEERS
1212 FOURTH ST, SUITE Z
SANTA ROSA, CA 95404
PHONE: 707.526.0992
CONTACT: CHRIS WARNER

ELECTRICAL ENGINEER
O'MAHONY & MYER, INC
4340 REDWOOD HIGHWAY, #245
SAN RAFAEL, CA 94903
PHONE: 415.492-0420
CONTACT: PAUL CAREY

LANDSCAPE ARCHITECT
RHAA LANDSCAPE ARCHITECTURE & PLANNING
225 MILLER AVE
MILL VALLEY, CA 94941
PHONE: 415.383.7900
CONTACT: BARBARA LUNDBERG

ENERGY
SOLDATA ENERGY CONSULTING, INC
2227 CAPRICORN WAY, SUITE 202
SANTA ROSA, CA 95407
PHONE: 707.545.4440
CONTACT: SARAH PERNULA

DEFERRED APPROVAL ITEMS:

1. CURTAIN WALL SYSTEMS
2.

SHEET INDEX

SHEET TOTAL: 99

PROJECT NOTES

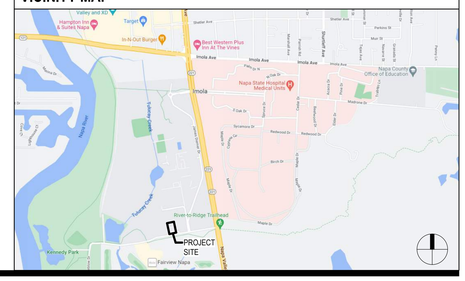
2019 CALIFORNIA CODE OF REGULATIONS (CCR), TITLE 24, PART 1 ADMINISTRATIVE CODE REQUIREMENTS, CHAPTER 4 (PARTIAL LISTING ONLY)

1. A COPY OF CALIFORNIA CODE OF REGULATIONS, TITLE 24, PARTS 1 THROUGH 5, SHALL BE KEPT ON THE JOB SITE AT ALL TIMES.
2. ALL CONSTRUCTION CHANGE DOCUMENTS AND ADDENDA TO BE SIGNED BY THE ARCHITECT, STRUCTURAL ENGINEER (WHEN APPLICABLE), DELEGATED PROFESSIONAL ENGINEER, AND OWNER AND APPROVED BY DSA BEFORE PROCEEDING WITH THE WORK. CCR, TITLE 24, PART 1, SECTION 4-338 AND DSA IR A-6.
3. ALL TESTS TO CONFORM TO THE REQUIREMENTS OF CCR, TITLE 24, PART 1, SECTION 4-335 AND APPROVED FORM DSA 103 "LIST OF REQUIRED STRUCTURAL INSPECTIONS AND SPECIAL INSPECTIONS.
4. TESTS OF MATERIALS AND TESTING LABORATORY SHALL BE IN ACCORDANCE WITH CCR, TITLE 24, PART 1, SECTION 4-335 AND THE DISTRICT SHALL EMPLOY AND PAY THE LABORATORY. COSTS OF RE-TEST MAY BE BACK CHARGED TO THE CONTRACTOR, SEE SPECIFICATIONS.
5. DSA SHALL BE NOTIFIED AT THE START OF CONSTRUCTION AND PRIOR TO THEPLACEMENT OF CONCRETE PER CCR, TITLE 24, PART 1, SECTION 4-331.
6. A DSA "CERTIFIED" PROJECT INSPECTOR SHALL BE APPROVED BY DSA AND EMPLOYED BY THE OWNER. INSPECTION SHALL BE IN ACCORDANCE WITH CCR, TITLE 24, PART 1, SECTIONS 4-333(b) AND 4-342.
7. SUPERVISION OF CONSTRUCTION BY DSA SHALL BE IN ACCORDANCE WITH CCR, TITLE 24, PART 1, SECTION 4-334.
8. CONTRACTOR, INSPECTOR, ARCHITECT, AND ENGINEERS SHALL SUBMIT VERIFIED REPORTS IN ACCORDANCE WITH CCR, TITLE 24, PART 1, SECTIONS 4-336 AND 4-343.
9. THE ARCHITECT AND THE STRUCTURAL ENGINEER SHALL PERFORM THEIR DUTIES IN ACCORDANCE WITH CCR, TITLE 24, PART 1, SECTIONS 4-333(a) AND 4-341.
10. THE CONTRACTOR SHALL PERFORM HIS DUTIES IN ACCORDANCE WITH CCR, TITLE 24, PART 1, SECTION 4-343.
11. THE INTENT OF THE DRAWINGS AND SPECIFICATIONS, AS DESCRIBED IN THE SUMMARY OF WORK, IS TO BE IN ACCORDANCE WITH CCR, TITLE 24, CALIFORNIA CODE OF REGULATIONS. SHOULD ANY CONDITIONS DEVELOP NOT COVERED BY THE CONTRACT DOCUMENTS WHEREIN FINISHED WORK WILL NOT COMPLY WITH CCR, TITLE 24, A CONSTRUCTION CHANGE DOCUMENT DETAILING AND SPECIFYING THE REQUIRED WORK SHALL BE SUBMITTED TO AND APPROVED BY THE DIVISION OF THE STATE ARCHITECT BEFORE PROCEEDING WITH THE WORK (SECTION 4-317(c), PART 1, TITLE 24, CCR).
12. COMPLIANCE WITH CFC CH 33 FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION, AND CBC CH 33 SAFEGUARDS DURING CONSTRUCTION WILL BE ENFORCED. SEE ALSO SPECIFICATON DIV. 1.
13. SUBSTITUTIONS AFFECTING DSA REGULATED ITEMS SHALL BE SUBMITTED AS CONSTRUCTION CHANGE DOCUMENTS OR ADDENDA, AND SHALL BE APPROVED BY DSA PRIOR TO FABRICATION OR INSTALLATION, AS REQUIRED BY SECTION 4-338, PART 1, TITLE 24, CCR.
14. MATERIALS AND THEIR INSTALLATION SHALL COMPLY WITH APPLICABLE CODES, STANDARDS AND MANUFACTURERS RECOMMENDATIONS.
15. PER CBC 11B-104.1 "ALL DIMENSIONS ARE SUBJECT TO CONVENTIONAL INDUSTRY TOLERANCES EXCEPT WHERE THE REQUIREMENT IS STATED AS A RANGE WITH SPECIFIC MINIMUM AND MAXIMUM END POINTS."
16. ALL WORK SHALL CONFORM TO 2019 TITLE 24, CALIFORNIA CODE OF REGULATIONS (CCR).
17. CHANGES TO THE APPROVED DRAWINGS AND SPECIFICATIONS SHALL BE MADE BY AN ADDENDUM OR A CONSTRUCTION CHANGE DOCUMENT (CCD) APPROVED BY THE DIVISION OF THE STATE ARCHITECT, AS REQUIRED BY SECTION 4-338, PART 1, TITLE 24, CCR.
18. A DSA ACCEPTED TESTING LABORATORY DIRECTLY EMPLOYED BY THE DISTRICT (OWNER) SHALL CONDUCT ALL THE REQUIRED TESTS AND INSPECTIONS FOR THE PROJECT.
19. GRADING PLANS, DRAINAGE IMPROVEMENTS, ROAD AND ACCESS REQUIREMENTS AND ENVIRONMENTAL HEALTH CONSIDERATIONS SHALL COMPLY WITH ALL LOCAL ORDINANCES.

ENERGY CODE NOTES:

1. THE CALIFORNIA ENERBY CODE SECTION 10-103 REQUIRES ACCEPTANCE TESTING ON ALL NEWLY INSTALLED LIGHTING CONTROLS, MECHANICAL SYSTEMS, ENVELOPES, AND PROCESS EQUIPMENT AFTER INSTALLATION AND BEFORE PROJECT COMPLETION. AN ACCEPTANCE TEST IS A FUNCTIONAL PERFORMANCE TEST TO HELP ENSURE THAT NEWLY INSTALLED EQUIPMENT IS OPERATING AND IN COMPLIANCE WITH THE ENERGY CODE.
2. LIGHTING CONTROLS ACCEPTANCE TESTS MUST BE PERFORMED BY A CERTIFIED LIGHTING CONTROLS ACCEPTANCE TEST TECHNICIAN.
3. MECHANICAL SYSTEM ACCEPTANCE TESTS MUST BE PERFORMED BY A CERTIFIED MECHANICAL ATT FOR PROJECTS SUBMITTED ON OR AFTER OCTOBER 1, 2021.
4. A LISTING OF CERTIFIED ATT CAN BE FOUND AT: https://www.energy.ca.gov/programs-and-topics/programs/acceptance-test-technician-certification-provider-program/acceptance
5. THE ACCEPTANCE TESTING PROCEDURES MUST BE REPEATED, AND DEFICIENCIES MUST BE CORRECTED BY THE BUILDER OR INSTALLING CONTRACTOR UNTIL THE CONSTRUCTION/INSTALLATION OF THE SPECIFIED SYSTEMS CONFORM AND PASS THE EQUIRED ACCEPTANCE CRITERIA.
6. PROJECT INSPECTORS WILL COLLECT THE FORMS TO CONFIRM THAT THE REQUIRED ACCEPTANCE TESTS HAVE BEEN COMPLETED.

VICINITY MAP



AGENCY APPROVAL STAMP:

TLCDARCHITECTURE
520 Third St. #250
Santa Rosa, CA 95401
o: 707.525.5600
f: 707.525.5616
tlcd.com

CONSULTANT:

STAMP:

REVISIONS:

Number	Date	Description

THE WINE SPECTATOR WINE EDUCATION COMPLEX
2277 NAPA VALLEJO HWY
NAPA, CA 94558

NAPA VALLEY COLLEGE

DSA APPLICATION NUMBER:
01-XXXXXX

TLCD PROJECT NUMBER:
21062.00

DATE:

TITLE SHEET

G-001

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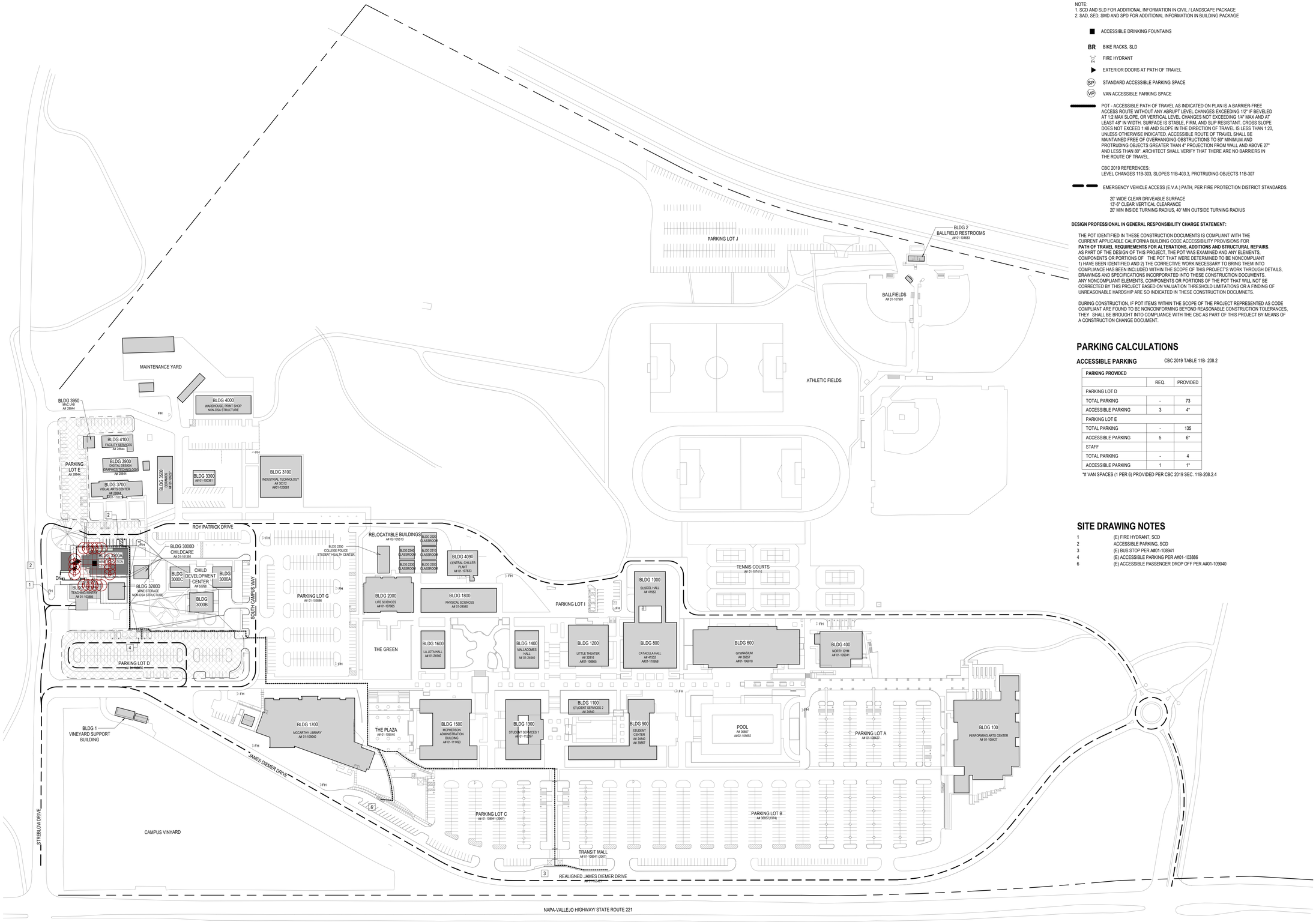

SITE CODE ANALYSIS LEGEND

NOTE:
1. SCD AND SLD FOR ADDITIONAL INFORMATION IN CIVIL / LANDSCAPE PACKAGE
2. SAD, SED, SMD AND SPD FOR ADDITIONAL INFORMATION IN BUILDING PACKAGE

- ACCESSIBLE DRINKING FOUNTAINS
- BR — BIKE RACKS, SLD
- FH — FIRE HYDRANT
- EXTERIOR DOORS AT PATH OF TRAVEL
- SP — STANDARD ACCESSIBLE PARKING SPACE
- VP — VAN ACCESSIBLE PARKING SPACE
- POT - ACCESSIBLE PATH OF TRAVEL AS INDICATED ON PLAN IS A BARRIER-FREE ACCESS ROUTE WITHOUT ANY ABRUPT LEVEL CHANGES EXCEEDING 1/2" IF BEVELED AT 1:2 MAX SLOPE, OR VERTICAL LEVEL CHANGES NOT EXCEEDING 1/4" MAX AND AT LEAST 48" IN WIDTH. SURFACE IS STABLE, FIRM, AND SLIP RESISTANT. CROSS SLOPE DOES NOT EXCEED 1:48 AND SLOPE IN THE DIRECTION OF TRAVEL IS LESS THAN 1:20, UNLESS OTHERWISE INDICATED. ACCESSIBLE ROUTE OF TRAVEL SHALL BE MAINTAINED FREE OF OVERHANGING OBSTRUCTIONS TO 80" MINIMUM AND PROTRUDING OBJECTS GREATER THAN 4" PROJECTION FROM WALL AND ABOVE 27" AND LESS THAN 80" ARCHITECT SHALL VERIFY THAT THERE ARE NO BARRIERS IN THE ROUTE OF TRAVEL.

  CBC 2019 REFERENCES:
  LEVEL CHANGES 11B-303, SLOPES 11B-403.3, PROTRUDING OBJECTS 11B-307
- EMERGENCY VEHICLE ACCESS (E.V.A.) PATH, PER FIRE PROTECTION DISTRICT STANDARDS.

  20' WIDE CLEAR DRIVEABLE SURFACE
  13'-6" CLEAR VERTICAL CLEARANCE
  20' MIN INSIDE TURNING RADIUS, 40' MIN OUTSIDE TURNING RADIUS

DESIGN PROFESSIONAL IN GENERAL RESPONSIBILITY CHARGE STATEMENT:

THE POT IDENTIFIED IN THESE CONSTRUCTION DOCUMENTS IS COMPLIANT WITH THE CURRENT APPLICABLE CALIFORNIA BUILDING CODE ACCESSIBILITY PROVISIONS FOR **PATH OF TRAVEL REQUIREMENTS FOR ALTERATIONS, ADDITIONS AND STRUCTURAL REPAIRS**. AS PART OF THE DESIGN OF THIS PROJECT, THE POT WAS EXAMINED AND ANY ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WERE DETERMINED TO BE NONCOMPLIANT 1) HAVE BEEN IDENTIFIED AND 2) THE CORRECTIVE WORK NECESSARY TO BRING THEM INTO COMPLIANCE HAS BEEN INCLUDED WITHIN THE SCOPE OF THIS PROJECT'S WORK THROUGH DETAILS, DRAWINGS AND SPECIFICATIONS INCORPORATED INTO THESE CONSTRUCTION DOCUMENTS. ANY NONCOMPLIANT ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WILL NOT BE CORRECTED BY THIS PROJECT BASED ON VALUATION THRESHOLD LIMITATIONS OR A FINDING OF UNREASONABLE HARDSHIP ARE SO INDICATED IN THESE CONSTRUCTION DOCUMNETS.

DURING CONSTRUCTION, IF POT ITEMS WITHIN THE SCOPE OF THE PROJECT REPRESENTED AS CODE COMPLIANT ARE FOUND TO BE NONCONFORMING BEYOND REASONABLE CONSTRUCTION TOLERANCES, THEY SHALL BE BROUGHT INTO COMPLIANCE WITH THE CBC AS PART OF THIS PROJECT BY MEANS OF A CONSTRUCTION CHANGE DOCUMENT.

PARKING CALCULATIONS

ACCESSIBLE PARKING CBC 2019 TABLE 11B- 208.2

PARKING PROVIDED		
	REQ.	PROVIDED
PARKING LOT D		
TOTAL PARKING	-	73
ACCESSIBLE PARKING	3	4*
PARKING LOT E		
TOTAL PARKING	-	135
ACCESSIBLE PARKING	5	6*
STAFF		
TOTAL PARKING	-	4
ACCESSIBLE PARKING	1	1*

*# VAN SPACES (1 PER 6) PROVIDED PER CBC 2019 SEC. 11B-208.2.4

SITE DRAWING NOTES

1 (E) FIRE HYDRANT, SCD
2 ACCESSIBLE PARKING, SCD
3 (E) BUS STOP PER A#01-108941
4 (E) ACCESSIBLE PARKING PER A#01-103886
6 (E) ACCESSIBLE PASSENGER DROP OFF PER A#01-109040

1 **CAMPUS PLAN**
1" = 100'-0"

PROJECT NORTH
TRUE NORTH

10/4/2022 1:48:31 PM

AGENCY APPROVAL STAMP:

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520 Third St. #250
Santa Rosa, CA 95401
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THE WINE SPECTATOR WINE EDUCATION COMPLEX

2277 NAPA VALLEJO HWY
NAPA, CA 94558

NAPA VALLEY COLLEGE

DSA APPLICATION NUMBER:
01-XXXXXX

TLCD PROJECT NUMBER:
21062.00

DATE:

FIRE & LIFE SAFETY CODE ANALYSIS

G-002

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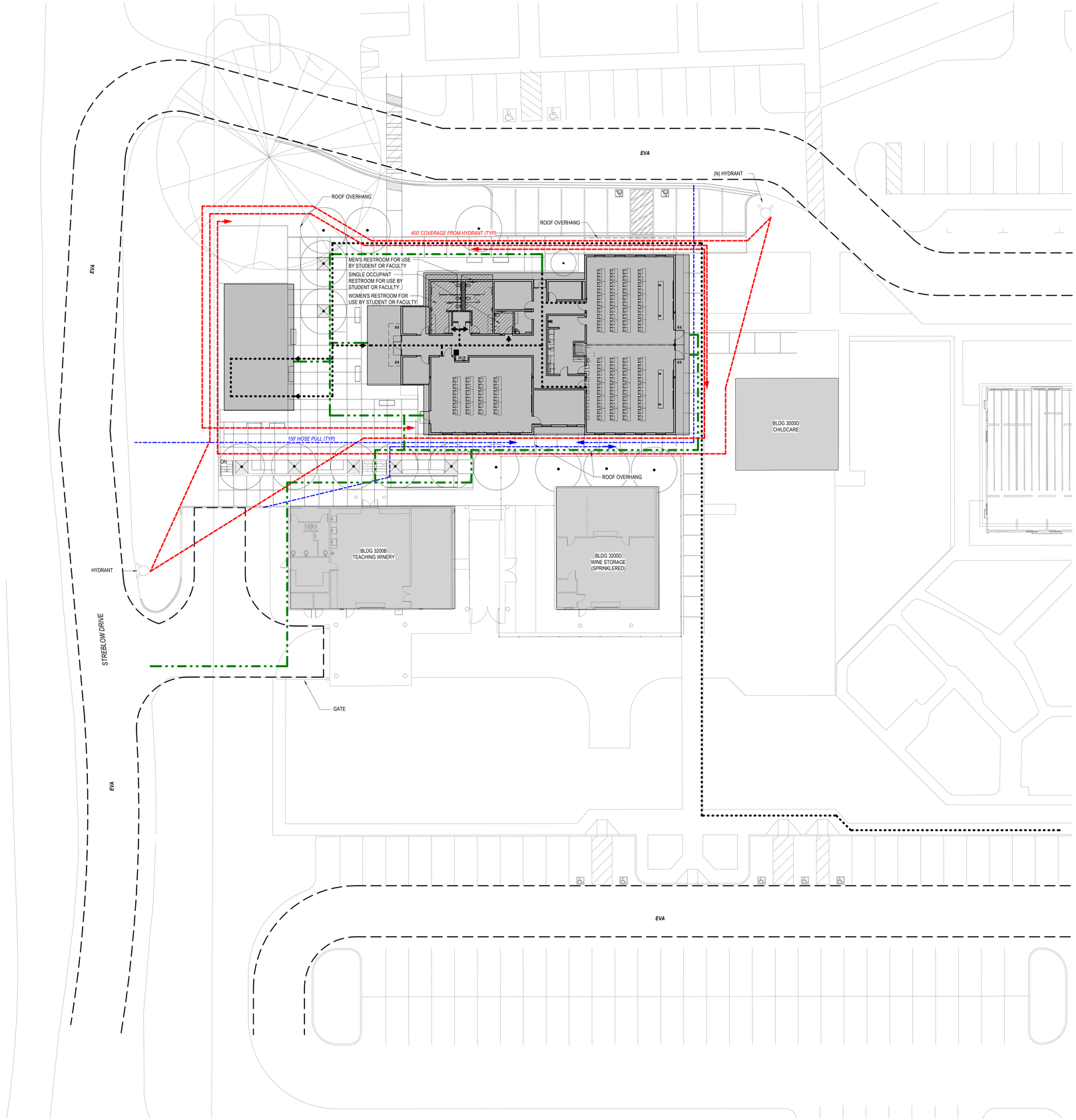

SITE CODE ANALYSIS LEGEND

NOTE:
1. SCD AND SLD FOR ADDITIONAL INFORMATION IN CIVIL / LANDSCAPE PACKAGE
2. SAD, SED, SMD AND SPD FOR ADDITIONAL INFORMATION IN BUILDING PACKAGE

- BUILDING FOOTPRINT
- ACCESSIBLE DRINKING FOUNTAINS
- BR — BIKE RACKS, SLD
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  CBC 2019 REFERENCES:
  LEVEL CHANGES 11B-303, SLOPES 11B-403.3, PROTRUDING OBJECTS 11B-307
- PATH OF EXIT DISCHARGE TO PUBLIC RIGHT OF WAY
- FIRE HOSE PULL LENGTH
- HYDRANT COVERAGE
- EMERGENCY VEHICLE ACCESS (E.V.A.) PATH, PER FIRE PROTECTION DISTRICT STANDARDS.
  NOTE: SEE CIVIL DRAWINGS FOR ADDITIONAL INFORMATION
  20' WIDE CLEAR DRIVEABLE SURFACE
  13'-6" CLEAR VERTICAL CLEARANCE
  20' MIN INSIDE TURNING RADIUS, 40' MIN OUTSIDE TURNING RADIUS

DESIGN PROFESSIONAL IN GENERAL RESPONSIBILITY CHARGE STATEMENT:

THE PATH OF TRAVEL (POT) IDENTIFIED IN THESE CONSTRUCTION DOCUMENTS IS COMPLIANT WITH THE CURRENT APPLICABLE CALIFORNIA BUILDING CODE ACCESSIBILITY PROVISIONS FOR **PATH OF TRAVEL REQUIREMENTS FOR ALTERATIONS, ADDITIONS AND STRUCTURAL REPAIRS**. AS PART OF THE DESIGN OF THIS PROJECT, THE POT WAS EXAMINED AND ANY ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WERE DETERMINED TO BE NONCOMPLIANT 1) HAVE BEEN IDENTIFIED AND 2) THE CORRECTIVE WORK NECESSARY TO BRING THEM INTO COMPLIANCE HAS BEEN INCLUDED WITHIN THE SCOPE OF THIS PROJECT'S WORK THROUGH DETAILS, DRAWINGS AND SPECIFICATIONS INCORPORATED INTO THESE CONSTRUCTION DOCUMENTS. ANY NONCOMPLIANT ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WILL NOT BE CORRECTED BY THIS PROJECT BASED ON VALUATION THRESHOLD LIMITATIONS OR A FINDING OF UNREASONABLE HARDSHIP ARE SO INDICATED IN THESE CONSTRUCTION DOCUMNETS.

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MINIMUM REQUIRED FIRE FLOW (CFC APPENDIX BB)

FIRE AREA = 11,943 SF

REQUIRED FIRE FLOW = 3000 GPM @ 20 PSI (CFC TABLE BB 105.1)
REDUCTION IN FIRE FLOW 75% FOR SPRINKLERED BUILDINGS (CFC BB 105.1 EXCEPTION)
= 3000 X 0.25 = 750 GPM @ 20 PSI
= 1500 GPM (MIN GPM ALLOWED)

REQUIRED FIRE FLOW = 1500 GPM @ 20 PSI

ACTUAL FIRE FLOW = XXXX GPM @ 20 PSI
XXXX > 1500 (OKAY)

1 **PARTIAL SITE CODE ANALYSIS**
1/16" = 1'-0"

10/4/2022 1:48:33 PM

AGENCY APPROVAL STAMP:

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Santa Rosa, CA 95401
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f: 707.525.5616
tlcd.com

CONSULTANT:

STAMP:

REVISIONS:

Number	Date	Description

THE WINE SPECTATOR WINE EDUCATION COMPLEX

2277 NAPA VALLEJO HWY
NAPA, CA 94558

NAPA VALLEY COLLEGE

DSA APPLICATION NUMBER:
01-XXXXXX

TLCD PROJECT NUMBER:
21062.00

DATE:

PARTIAL SITE PLAN - CODE ANALYSIS

G-003

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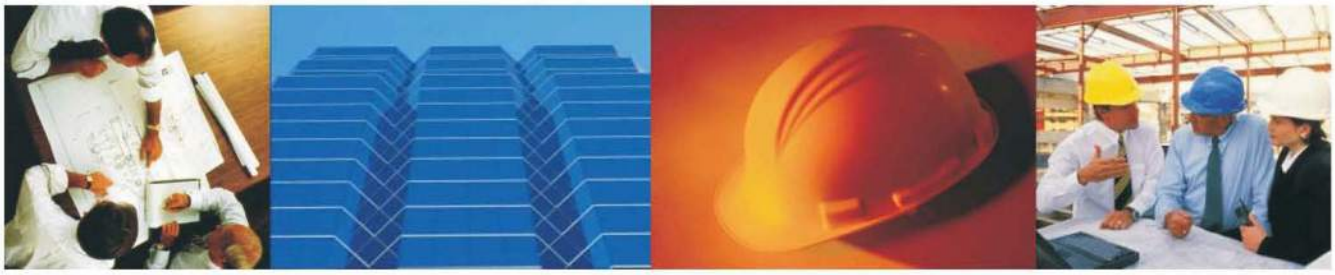


GEOTECHNICAL ENGINEERING INVESTIGATION

FOR

PROPOSED WINE EDUCATION COMPLEX

NAPA VALLEY COLLEGE

NAPA, CA

PREPARED FOR

Ms. Samantha Maddox
Napa Valley College
2277 Napa-Vallejo Hwy
Napa, CA 94558

By

Mr. Brock Campbell, PE, GE
Engineering Manager
Signet Testing Laboratories, Inc.
3526 Breakwater Court
Hayward, California 94545

Project No.: 2407-40
August 5, 2022

SIGNET Testing Labs

SIGNET Testing Labs

August 5, 2022 **File No.: 2407-40**

Ms. Samantha Maddox
Napa Valley College
2277 Napa-Vallejo Hwy
Napa, CA 94558

Subject: **Geotechnical Engineering Investigation**
Proposed Wine Education Complex
Napa Valley College
Napa, CA 94558

Dear Ms. Maddox:

In accordance with your authorization, Signet Testing Laboratories, Inc. (Signet) has performed a geotechnical engineering investigation for the proposed Wine Education Complex project at Napa Valley College located at 2277 Napa-Vallejo Hwy, Napa, California. The purpose of our investigation was to explore and evaluate the subsurface conditions at various locations at the site to develop geotechnical engineering recommendations for use in the project design and construction.

The attached report presents the results of our data review, field exploration, laboratory testing, and engineering analysis. Based on our investigation, it is our professional opinion the proposed project may be constructed at the subject site provided the recommendations contained in the attached report are implemented into project design and construction.

It is imperative that Signet be provided the opportunity to review, in advance of construction, the civil and foundation plans related to grading and building construction to assure the recommendations contained herein are appropriate for the proposed development.

Recommendations provided herein are contingent on the provisions outlined in the ADDITIONAL SERVICES and LIMITATIONS sections of this report. The project Client and Owner should become familiar with these provisions to assess further involvement by Signet and other potential impacts to the proposed project.

Thank you for the opportunity of providing our services for this project. If you have questions regarding this report, please contact our office.

Respectfully Submitted,
Signet Testing Laboratories, Inc.

Brock Campbell

Brock Campbell, PE, GE
Engineering Manager

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED WINE EDUCATION COMPLEX

NAPA VALLEY COLLEGE

NAPA, CA 94558

1. INTRODUCTION

1.1 GENERAL

The proposed Wine Education Complex site is on the Napa Valley College campus located at 2277 Napa-Vallejo Highway in Napa, California. This report contains the results of our geotechnical engineering investigation for the proposed development. The site location relative to the vicinity of the site is shown on Plate 1.

This report includes recommendations related to the geotechnical aspects of project design and construction. Conclusions and recommendations presented in this report are based on the subsurface conditions encountered at the locations of our field exploration and the provisions and requirements outlined in the ADDITIONAL SERVICES and LIMITATIONS sections of this report. Recommendations presented herein should not be extrapolated to other areas or used for other projects without prior review by Signet Testing Laboratories, Inc. (Signet).

1.2 PROPOSED CONSTRUCTION

The existing site consists of two classroom buildings, landscaping, and concrete flatwork on the south end of the campus. Based on a site plan prepared by TLCD Architecture, the project will consist of remodeling Trefethen Building, replacement of the Ag Classroom Building with a new wine tasting building, and the addition of a new sensory lab building. The school is also considering the construction of a single building to replace the two classroom buildings. The structures will be surrounded by paved access roads, concrete flatwork, and landscaping. We assume the structures will be supported by spread foundations and concrete slab-on-grade floors.

1.3 PURPOSE AND SCOPE OF SERVICES

A field investigation was performed to explore and evaluate subsurface conditions at various locations at the site to develop recommendations related to the geotechnical aspects of project design and construction. This report summarizes the results of our services including:

- A description of the proposed project
- A description of the site surface, subsurface and groundwater conditions observed during our field investigation
- Recommendations related to the geotechnical aspects of:
  - Site preparation and earthwork construction
  - Utility trench excavations and backfill
  - Shallow footing design and construction
  - Interior concrete slab-on-grade
  - Exterior concrete sidewalks/flatwork
  - Surface drainage and moisture protection
- An appendix which includes a summary of our field investigation and laboratory testing programs

A Geologic Hazards Analysis in accordance with the California Geological Survey – Note 48 is being prepared by a subconsultant and will be provided under separate cover.

2. FIELD EXPLORATION AND LABORATORY TESTING

2.1 SUBSURFACE EXPLORATION

A subsurface exploration at the site was performed to investigate and sample subgrade soils at the site on June 6 and 21, 2022. Three (3) borings were drilled to depths of approximately 16.5 and 51.5 feet below the existing ground surface. The borings were performed with a truck-mounted drill rig equipped with 6-inch outside diameter (O.D.) solid stem auger, 8-inch O.D. hollow stem auger, and 4-inch diameter mud rotary system. Approximate locations of borings are shown on Plate 2. Borings were pre-marked in the field by visual sighting and/or pacing from existing site

features. Therefore, the location of borings shown on Plate 2 should be considered approximate and may vary from that in the field.

After completion of drilling, boreholes were backfilled with neat cement. The obtained soils were sealed and transported to our Sacramento laboratory for visual examination and testing.

2.2 LABORATORY TESTING

Laboratory tests were performed on selected samples to aid in soil classification and to evaluate physical properties of the soils which may affect the geotechnical aspects of project design and construction. The tests were performed in general accordance with ASTM test methods. Test results are presented in the appendix of this report.

3. SITE CONDITIONS

3.1 SURFACE AND SUBSURFACE CONDITIONS

At the time of our explorations the site consisted of two classroom buildings, landscaping with large trees, and concrete flatwork. The site was surrounded by classroom buildings to the north and east; a parking lot to the west; and Streblow Drive to the south. The near surface soils consisted of hard, lean clay to sandy lean clay that extended to depths of approximately 7.5 to feet below ground surface. An exception was loose, sand encountered from the surface to a depth of approximately 3 feet below existing grade in boring B-1. This sand is most likely import fill soil. The clay soil was underlain by poorly graded and clayey sand and gravel that extended to the maximum depths explored of approximately 16.5 feet in borings B-1 and B-2 and to a depth of approximately 42 feet in boring B-3. The sand and gravel were underlain by lean clay that extended to the maximum depth explored of approximately 51.5 feet.

3.2 GROUNDWATER

Groundwater was encountered in boring B3 at a depth of approximately 20 feet. It should be noted that soil moisture conditions within the site will vary depending on rainfall, adjacent Napa River levels, and/or runoff conditions not apparent at the time of our field investigation. It is common that the soil moisture conditions will change seasonally.

A discussion of the field investigation and laboratory testing programs is presented in Appendix A of this report. Detailed descriptions of the subsurface conditions encountered during our field investigation are presented on the Log of Borings Plates A2, A3, and A4 of the appendix.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

It is our professional opinion the proposed structure may be supported on newly compacted engineered fill or undisturbed competent native soils provided the recommendations contained in the attached report are implemented into project design and construction.

4.2 EXPANSIVE SOILS

Based on visual examination of soil samples obtained at the subject site and experience at other projects on the campus, the site soils are considered to have low to moderate expansion potential. Further recommendations relating to expansive soils can be found in the SITE PREPARATION section.

4.3 SITE PREPARATION

4.3.1 Stripping and Grubbing

Prior to general site grading, existing vegetation, organic topsoil, and any debris should be stripped and disposed of outside the construction limits. Signet recommends any topsoil (less any debris) to be stripped and be stockpiled and reused for landscape purposes; however, this material should not be incorporated into any engineered fill.

4.3.2 Demolition

Should any existing structures and/or utility lines within the area of construction be encountered, they should be removed and disposed of off-site. Existing utility pipelines that extend beyond the limits of the proposed construction and that are to be abandoned in-place should be plugged with cement grout to prevent migration of soil and/or water.

All excavations resulting from removal of these items should be cleaned of loose or disturbed material (including all previously placed backfill) and dish-shaped (with sides sloped 3 (h): 1(v) or flatter) to permit access for compaction equipment.

4.3.3 Removal, Scarification and Compaction

Preparation of the subgrade exposed by excavation and requirements for engineered fill should be in accordance with recommendations provided below (see section ENGINEERED FILL). The bottom of removal areas should be observed and approved by the geotechnical engineer or his representative prior to scarification and compaction. Following site stripping and any required grubbing, removal and/or over-excavation, we recommend that subgrade soils should be scarified and recompacted as described below:

Building Pad - at least 18 inches below the finish design subgrade soil elevation and at least 5 feet beyond the outer edges of footings

Exterior concrete flatwork / sidewalk / pavements - at least 12 inches below the finish design subgrade soil elevation and at least 2 feet beyond the outer edges of concrete flatwork / sidewalk / pavements

Any other areas to receive engineered fill should be scarified to a depth of at least 8 inches; uniformly moisture-conditioned and compacted as required in the ENGINEERED FILL section. After the excavation bottom is approved by the geotechnical engineer, the excavation should be backfilled with engineered fill to the design finish subgrade elevation.

4.4 ENGINEERED FILL

Engineered fill soils (on-site and imported soils) should be nearly-free of deleterious debris, organics, expansive clays and adequately moisture-conditioned during placement as recommended in the COMPACTION CRITERIA section.

4.4.1 On-Site Soils

In general, near-surface, on-site soils similar to those encountered in our borings may be used in engineered fills provided they are free of deleterious debris, organics, and adequately moisture-conditioned during placement as recommended in the COMPACTION CRITERIA section. The soils under the proposed building pad should be replaced with non-expansive fill to a depth of at least 12 inches below the lowest design footing bottom elevation and at least 5 feet beyond the outer edges of footings horizontally.

4.4.2 Imported Soils

All imported fill materials to be used for engineered fill should be sampled and tested by the project Geotechnical Engineer prior to being transported to the site. As a minimum, all imported fills should be free of contamination and be granular with a 3-inch maximum particle size, a Plasticity Index less than 15 and less than 30 percent passing the number 200 sieve; essentially non-plastic. Imported gravel fill should be, as a minimum, washed gravel, free from vegetation and debris, with a 1-inch maximum particle size and less than 5 percent passing the number 200 sieve.

4.4.3 Compaction Criteria

Soils scarified and material to be used for engineered fill should be uniformly moisture-conditioned to near optimum moisture content, placed in horizontal lifts less than 8 inches in loose thickness, and compacted to at least 90 percent relative compaction as determined by the current ASTM D1557. The upper 12 inches of subgrade soils in the parking/driveway areas and aggregate base materials should be compacted to a minimum of 95 percent relative compaction.

4.4.4 Wet Soil Moisture Conditions

Should site grading be performed during or subsequent to wet weather, near-surface site soils may be significantly above the optimum moisture content. Additionally, it is common to encounter wet, unstable soils upon removal of site pavements or flatwork as a result of subsurface moisture becoming trapped beneath asphalt concrete or Portland cement concrete surfaces. This condition could hamper equipment maneuverability and efforts to compact site soils to the recommended compaction criteria. Disking to aerate, chemical treatment, replacement with drier material, stabilization with a geotextile fabric or grid, or other methods may be required to reduce excessive soil moisture and facilitate earthwork operations.

4.5 TEMPORARY EXCAVATION

All excavations must comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the soil information in this report solely as a service to our client. Under no circumstances should the information provided be interpreted to mean that Signet is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

4.6 TRENCH PREPARATION AND BACKFILL

4.6.1 Subgrade Preparation

Prior to placement of utility bedding, the exposed subgrade at the bottom of trench excavations should be examined to detect loose, or unstable areas. Loose materials at trench bottoms resulting from excavation disturbance should be removed to firm material. If loose or unstable areas are encountered, these areas should be over-excavated to a depth of at least 2 feet or to a firm base and be replaced with additional bedding material. Where excavations cross existing trench backfill materials, the need for and extent of over-excavation or stabilization measures should be evaluated by the Geotechnical Engineer on a case-by-case basis.

4.6.2 Backfill Materials

Pipe-zone backfill (i.e., material beneath and in the immediate vicinity of the pipe) should consist of clean washed sand and/or crushed rock. If crushed rock is used for pipe zone backfill, we recommend it should have a maximum particle size less than 1 inch and have less than 5 percent passing No. 200 U.S. sieve. Where crushed rock is used, the material should be completely surrounded by a non-woven filter fabric such as Mirafi 140N or equivalent. Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local codes and/or bedding requirements for specific types of pipes. We recommend the project Civil Engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

Trench-zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of native soil and approved imported fill material that meets the requirements provided above for engineered fill.

4.6.3 Compaction Criteria

All trench backfill should be placed and compacted in accordance with recommendations provided above for engineered fill. Mechanical compaction is recommended; ponding or jetting should not be allowed, especially in areas supporting structural loads or beneath concrete slabs supported-on-grade, pavements, or other improvements.

4.7 SHALLOW FOOTINGS

4.7.1 Allowable Bearing Pressures

We recommend shallow footings constructed of reinforced concrete and founded on newly constructed engineered fills (as recommended in the SITE PREPARATION section) be used for support of the proposed structures. Footings should be a minimum of 12 inches wide and embedded a minimum of 12 inches below the lowest final adjacent subgrade. The structural engineer should evaluate the need for reinforcement of footing based on the anticipated loads. Continuous footings should be reinforced with a minimum of four No. 4 reinforcing bars, placed two each near the top and bottom, to provide structural continuity and allow the foundations to span isolated soil irregularities.

An allowable bearing pressure of 2,000 pounds per square foot (psf) may be used for shallow footings with the above minimum dimensions. The allowable bearing pressure provided above is a net value; therefore, the weight of the footing (which extends below grade) may be neglected when computing dead loads. The allowable bearing pressure applies to dead plus live loads and may be increased by 1/3 for short-term loading due to wind or seismic forces.

Caution should be taken when digging foundations next to the existing foundations and care should be taken to maintain support of the existing foundations. Footing excavations adjacent to existing footings should be hand dug. No more than 20 continuous feet of existing foundation should be exposed at any one time.

4.7.2 Estimated Settlements

Total settlement of an individual footing will vary depending on the plan dimensions of the footing and the actual load supported. Based on anticipated footing dimensions and loads, we estimate maximum settlement of footing designed and constructed in accordance with the preceding recommendations to be less than 1 inch. Differential settlement between similarly loaded, adjacent footings is expected to be less than 1/2 inch. Settlement of all footings is expected to occur rapidly and should be essentially complete shortly after initial application of the loads.

4.7.3 Lateral Resistance

Resistance to lateral loads (including those due to wind or seismic forces) may be provided by frictional resistance between the bottom of concrete footings and the underlying soils, and by passive soil pressure against the sides of the footings. A coefficient of friction of 0.35 may be used between cast-in-place concrete footings and the underlying soil. Additional allowable passive

pressure available in engineered fill or undisturbed native soil may be taken as equivalent to the pressure exerted by a fluid weighing 300 pounds per cubic foot (pcf).

4.7.4 Construction Considerations

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose or soft soil, and water. All footing excavations should be observed by the project Geotechnical Engineer or his representatives just prior to placing steel or concrete to verify the recommendations contained herein are implemented during construction.

4.8 INTERIOR CONCRETE SLABS-ON-GRADE

Conventional concrete slabs-on-grade floors are suitable for the building pad provided excavations and subgrades are prepared as recommended in section titled SITE PREPARATION. Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. However, slabs should be at least 4 inches thick and reinforced with No. 3 reinforcing bars on 18 inches or No. 4 bars on 24 inches center-to-center spacing each way, placed at mid-slab depth. 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.

4.8.1 Subgrade Preparation

Prior to constructing interior concrete slabs-on-grade, surficial soils should be processed as recommended in the SITE PREPARATION and ENGINEERED FILL sections of this report.

4.8.2 Rock Capillary Break

To provide enhanced subgrade support, we recommend the compacted subgrade be overlain with a minimum 4-inch thickness of compacted non-recycled crushed rock. If this layer is desired to also serve as a capillary break, there should be less than 5 percent by weight passing the No. 4 sieve size. A capillary break may reduce the potential for soil moisture migrating upwards toward the slab.

4.8.3 Construction Considerations

Subsurface moisture and moisture vapor naturally migrate upward through the soil and, where the soil is covered by a building or pavement, this subsurface moisture will collect. To reduce the impact of this subsurface moisture and the potential impact of introduced moisture (such as landscape irrigation or plumbing leaks) the current industry standard is to place a vapor retarder

on the compacted non-recycled crushed rock layer (described above). This membrane typically consists of visqueen or polyvinyl plastic sheeting at least ten (10) mil in thickness. The plastic sheet membrane should meet or exceed the minimum specifications for plastic water vapor retarders as outlined in ASTM E1745.

It should be noted that although capillary break and vapor barrier systems are currently the industry standard, this system may not be completely effective in preventing floor slab moisture problems. These systems will not "moisture proof" the floor slab nor will it assure floor slab moisture transmission rates will meet floor-covering manufacturer standards. The design and construction of such systems are dependent on the proposed use and design of the proposed building and all elements of building design and function should be considered in the slab-on-grade floor design. Building design and construction may have a greater role in perceived moisture problems since sealed buildings/rooms or inadequate ventilation may result in excessive moisture in a building and affect indoor air quality.

4.9 EXTERIOR CONCRETE SIDEWALKS AND FLATWORK

Concrete sidewalks and flatwork should be a minimum of 4 inches thick and may be underlain by compacted engineered fills as recommended in the SITE PREPARATION and ENGINEERED FILL sections of this report.

The civil engineer should determine the need of reinforcement in the exterior slab and/or the aggregate base under the slab. Proper control joints should be provided to reduce the potential damage resulting from shrinkage. Subgrade soils should be uniformly moistened prior to placing concrete.

4.10 SITE DRAINAGE AND MOISTURE PROTECTION

Footing, slab-on-grade, and pavement performance depends greatly on how well runoff waters drain from the site. This drainage should be maintained both during construction and over the entire life of the project. The ground surface around structures should be graded so that water flows rapidly away from structures and slopes without ponding. The surface gradient needed to do this depends on the landscaping type. Per the California Building Code, pavement and lawns within five feet of buildings should slope away at gradients of at least two percent. Densely vegetated areas should have minimum gradients of 5 percent away from buildings in the first five feet if it is practical to do so.

Planters should be built so that water exiting from them will not seep into the foundation areas or beneath slabs and pavement. In general, the elevation of exterior grades should not be higher

than the elevation of the subgrade beneath the slab to help prevent water intrusion beneath slabs. In any event, maintenance personnel should be instructed to limit irrigation to the minimum necessary to properly sustain landscaping plants. Should excessive irrigation, waterline breaks, or unusually high rainfall occur, saturated zones and "perched" groundwater may develop. Consequently, the site should be graded so that water drains away readily without saturating the foundation or beneath slabs and pavement. Potential sources of water, such as water pipes, drains, garden sprinklers, and the like, should be frequently examined for signs of leakage or damage. Any such leakage or damage should be promptly repaired.

5. ADDITIONAL SERVICES

5.1 PLANS AND SPECIFICATIONS REVIEW

We recommend that the ninety-five (95) percent complete plans and specifications should be reviewed by the Geotechnical Engineer of Record (GEOR), Signet to assure that our earthwork and foundation recommendations have been properly interpreted and implemented during design.

5.2 CONSTRUCTION OBSERVATION AND TESTING

All earthworks during construction should be monitored by the GEOR or his representatives, including site preparation, placement of all engineered fill, trench backfill, and wall backfill, construction of slab and roadway subgrade, and all foundation excavations. It is essential that the finished subgrade and footing excavation in all areas to receive engineered fill or to be used for the future support of structures, concrete slabs-on-grade or pavement sections be observed and approved by GEOR prior to placement of engineered fill, concrete, or pavement.

The purpose of these services would be to provide GEOR the opportunity to observe the soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

6. LIMITATIONS

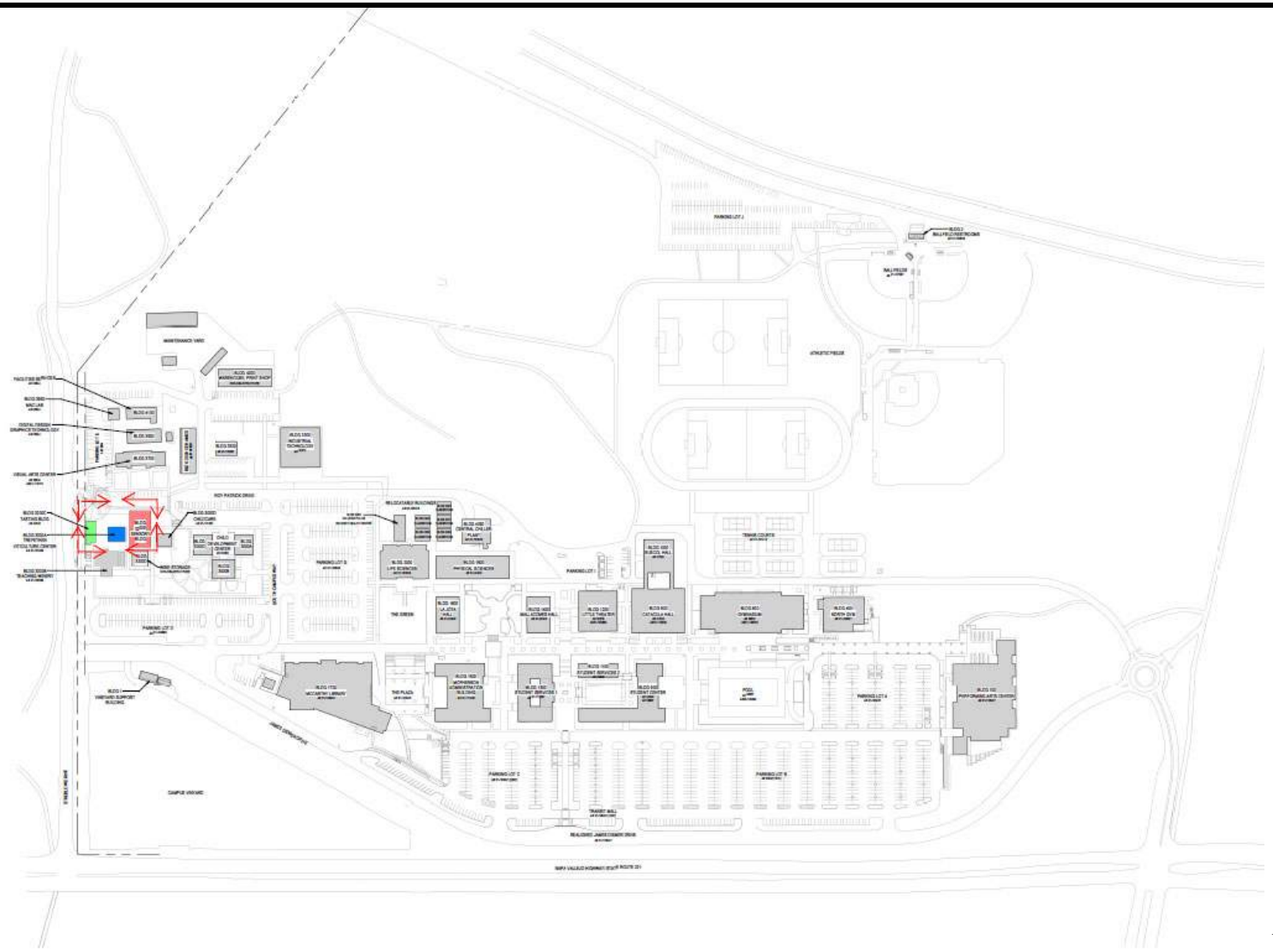
Conclusions and recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil conditions could vary between or beyond the points explored.

If soil conditions are encountered during construction which differ from those described herein, we should be notified immediately in order that a review may be made, and any supplemental recommendations provided. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this report, our recommendations should also be reviewed.

We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty is expressed or implied. The recommendations provided in this report assume that an adequate program of tests and observations will be conducted by Signet or other qualified geotechnical professionals during the construction phase to evaluate compliance with our recommendations. Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the author of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference", as that latter term is used relative to contracts or other matters of law.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Signet of such intended use. Based on the intended use of the report, Signet may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Signet from any liability resulting from the use of this report by any unauthorized party.

As GEOR of the subject project, Signet should review plans and specifications, and perform earthwork construction observation and testing to assure compliance with the recommendations presented in our report. Should the plan and specification review, construction observation and testing be performed by another party, Signet will assume no responsibility for misinterpretation or compliance with our recommendations. It is in the client's interest and responsibility to secure a letter from the substitute testing laboratory/Geotechnical Engineer indicating that it is taking over the role of GEOR from Signet and assumes all responsibilities and liabilities. It should accept Signet's conclusions/recommendations as its own conclusions/recommendations or modify as necessary and assure the construction in compliance with its own recommendations.



Not to Scale

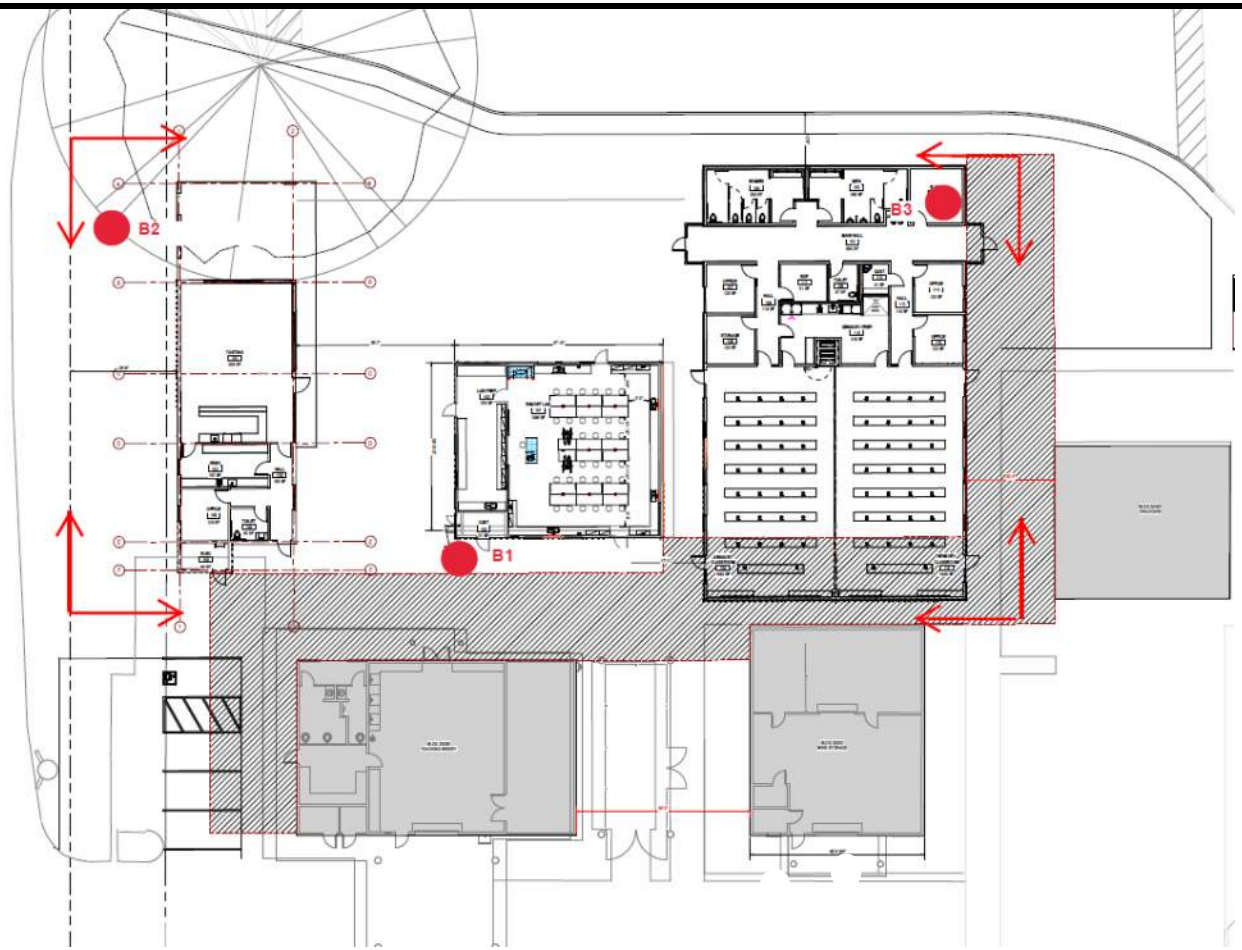
Site Vicinity Map

SIGNET Testing Labs

3256 Breakwater Ct
Hayward, CA 94545
Phone: (510) 887-8484
Fax: (510) 259-1068
www.signettesting.com

Project No.:	2407-40
Project Name:	Proposed Wine Education Complex Napa Valley College
Location:	2277 Napa-Vallejo Highway, Napa, CA 94558
Date:	08/05/2022

Plate 1



Legend:

● **Approximate Boring Location**

B1

Not to Scale

Boring Location Map

SIGNET Testing Labs

3526 Breakwater Court
Hayward, CA 94545
Phone: (510) 887-8484
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www.signettesting.com

Project No.:	2407-40
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Plate
2

APPENDIX A

FIELD INVESTIGATION AND LABORATORY TESTING

FIELD INVESTIGATION

General

The subsurface conditions at the site were explored on June 6 and 21, 2022 by drilling three (3) borings to depths of approximately 16.5 and 51.5 feet below existing ground surface. Borings were drilled using a truck-mounted drill rig equipped with 8-inch outside diameter (O.D.) hollow stem auger and 4-inch diameter mud rotary system. The locations of borings performed for this investigation are shown on Plate 2 of the report.

Borings were marked in the field by visual sighting and/or pacing from existing site features. Therefore, the location of borings shown on Plate 2 should be considered approximate and may vary from that in the field. After completion of drilling, the boreholes were backfilled with neat cement.

Our representative maintained logs of the borings, visually classified soils encountered in accordance with the Unified Soil Classification System (see Plate A1) and obtained relatively undisturbed and bulk samples of the subsurface materials. Logs of Borings are presented on Plates A2, A3, and A4.

Sampling Procedures

Soil samples were obtained from the borings using Modified California and Standard Penetration samplers driven 18 inches or fraction thereof (as noted on the logs) into undisturbed soil using a 30-inch drop of a 140-pound hammer. Blow counts were recorded at 6-inch intervals for each sample attempt and are reported on the logs. Soil samples obtained from the borings were packaged and sealed in the field to reduce moisture loss and disturbance and returned to our laboratory for further testing.

LABORATORY TESTING

General

Laboratory tests were performed on selected samples to aid in soil classification and to evaluate physical properties of the soils which may affect the geotechnical aspects of project design and construction. A description of the laboratory testing program is presented below.

Moisture Content and Dry Unit Weight

Moisture content and dry unit weight tests were performed to evaluate moisture-conditioning requirements during site preparation and earthwork grading. Moisture content was evaluated in general accordance with ASTM (American Society for Testing and Materials) Test Method D2216; dry unit weight was evaluated using procedures ASTM D2937. Results of these tests are presented on the log of Boring.

Sieve Analysis of Soils

The percent of soil less than the number 200 sieve was determined to evaluate the percent of fine grained (silt and clay) material in the samples. The percent soil less than the number 200 sieve was determined using procedures of ASTM D1140. Results of the tests are presented on the log of Boring.

Table A1
-#200 Sieve Analysis

Boring No.	Sample Depth (feet)	Passing #200 Sieve (%)	Soil Classification
B1	10 – 11.5	12.6	Clayey Sand with Gravel (SC)
B2	15 – 16.5	13.9	Clayey Sand with Gravel (SC)
B3	25 – 26.5	16.8	Clayey Sand with Gravel (SC)

Soil Corrosivity

One soil sample was subjected to chemical analysis for corrosion potential assessment. The tests were performed in accordance with California Test Methods 643, 422, and 417 for pH and minimum resistivity, soluble chlorides, and soluble sulfates, respectively. The test results are presented in Table A2. The laboratory test report is attached in this appendix.

Table A2
Soil Corrosivity Test Result

Boring No.	Sample Depth (feet)	pH	Minimum Resistivity (Ohm-Cm)	Water Soluble Chloride (ppm)	Water Soluble Sulfates (ppm)
B1	0-4	5.74	4,820	6.7	13.4

Based on the 2019 Building Code Requirements for Structural Concrete (ACI 318-19), the tested soil sample having a sulfate concentration less than 0.10 percent by weight (1,000 ppm) is assigned a "S0" sulfate Exposure Class where the water-soluble sulfate concentration in contact with concrete is low and injurious sulfate attack is not a concern.

The 2003 California Department of Transportation (Caltrans) Corrosion Guidelines considers a site to be corrosive if water-soluble chloride content is 500 ppm or greater, sulfate concentration is 2,000 ppm or greater, or pH is 5.5 or less. The soil resistivity serves as an indicator parameter for possible presence of soluble salts. A minimum soil resistivity value less than 1,000 ohm-cm indicates the possible presence of higher quantities of soluble salts and a higher corrosion potential.

We have provided the above preliminary corrosion test results. These test results are only indicator parameters of potential soil corrosivity for the sample tested. Other soils found on the site may be more, less, or of a similar corrosive nature.

LIST OF ATTACHMENTS

Plate A1 to A4 Unified Soil Classification System and Log of Borings B1, B2 and B3
Soil Corrosivity Test Summary Report

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

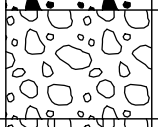
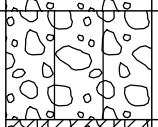
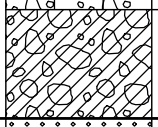
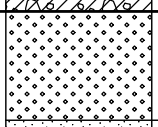
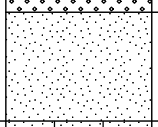
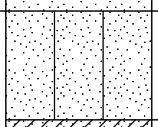
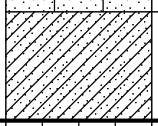
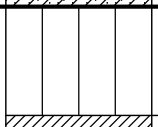
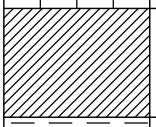
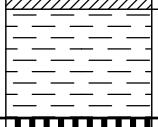
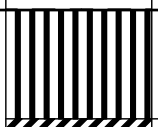
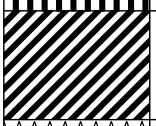
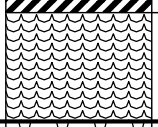
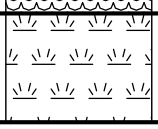
MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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PLATE

A-1

LOG OF BORING

Project Napa Valley College Wine Education Complex				**Sheet no.** 1 of 1	**Hole Number** B1
Site Location 2277 Napa-Vallejo Hwy		**Project Number** 2407-40		**Logged By** AS	**Checked By** BC
Started 6/6/2022	**Completed** 6/6/2022	**Driller** Cal-Nev Geo		**Boring Dia.** 4.5	**Total Depth** 16.5
Drill Equipment CME 55	**Hammer Type** 140lb	**Hammer Drop** 30"	**Auger Type** Solid Stem	**Elevation**	**Depth to Groundwater** N/A
Notes		**Sampler Type** MCal		**Latitude** 38.26987°N	**Longitude** 122.27520°W

SAMPLE NUMBER & Type	BLOWS/6"	MOISTURE (%)	DRY DENSITY (pcf)	-#200 Sieve (%)	DEPTH (feet)	USCS SYMBOLS	SAMPLE DEPTH	DESCRIPTION AND CLASSIFICATION
					0	SP-SC		**Poorly graded Sand with Gravel and Clay (SP-SC)**, brown, moist, fine to coarse grained sand, loose
	9				2		X	
MCal 1A	5 11	18.4	104			CL		**Lean Clay (CL)**, brown, moist, fine to medium grained sand, medium plasticity,firm
					5		X	Below 5 feet dark brown, more sand, fine to coarse grained sand
	8 13							
MCal 2A	26					CL		**Sandy Lean Clay (CL)**, dark brown, moist, fine grained sand, medium plasticity, hard
								Clayey Sand with Gravel (SC), dark brown, moist, fine to coarse grained sand, fine to medium grained gravel, dense
	20 25				10		X	
MCal 3A	21			12.6		SC		
					15		X	
	17 22							
MCal 4A	25							Boring completed at a depth of 16.5 feet and backfilled with neat cement grout. Groundwater not encountered at the time of drilling.
					20			
					25			

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Sacramento, CA 95811
Phone: (916) 375-6700
Fax: (916)447-6702

PLATE **A2**

LOG OF BORING

Project Napa Valley College Wine Education Complex				**Sheet no.** 1 of 1	**Hole Number** B2
Site Location 2277 Napa-Vallejo Hwy		**Project Number** 2407-40		**Logged By** AS	**Checked By** BC
Started 6/6/2022	**Completed** 6/6/2022	**Driller** Cal-Nev Geo		**Boring Dia.** 4.5	**Total Depth** 16.5
Drill Equipment CME 55	**Hammer Type** 145lb	**Hammer Drop** 30"	**Auger Type** Solid Stem	**Elevation**	**Depth to Groundwater** N/A
Notes		**Sampler Type** MCal		**Latitude** 38.26980°N	**Longitude** 122.27550°W

SAMPLE NUMBER & Type	BLOWS/6"	MOISTURE (%)	DRY DENSITY (pcf)	#200 Sieve (%)	DEPTH (feet)	USCS SYMBOLS	SAMPLE DEPTH	DESCRIPTION AND CLASSIFICATION
MCal 1A	9 11 19				2	CL		**Sandy Lean Clay (CL)**, brown, moist, fine to medium grained sand, medium plasticity, hard
MCal 2A	15 32 35				5	CL		**Lean Clay (CL)**, brown, moist, medium to fine grained sand, medium plasticity, hard
MCal 3A	29 26 32				10	GC		**Clayey Gravel with Sand (GC),** brown, moist, fine grained sand, fine grained gravel, dense
MCal 4A	14 18 23			13.9	15	SC		**Clayey Sand with Gravel (SC)**, dark brown, wet, fine to coarse grained sand, dense
					20			Boring completed at a depth of 16.5 feet and backfilled with neat cement grout. Groundwater not encountered at the time of drilling.
					25			

MatriScope Engineering Laboratories, Inc.
601 Bercut Drive
Sacramento, CA 95811
Phone: (916) 375-6700
Fax: (916)447-6702

PLATE
A3

LOG OF BORING

Project Napa Valley College Wine Education Complex				**Sheet no.** 1 of 2	**Hole Number** B3
Site Location 2277 Napa-Vallejo Hwy		**Project Number** 2407-40		**Logged By** AS	**Checked By** BC
Started 6/6/2022	**Completed** 6/21/2022	**Driller** Cal-Nev Geo		**Boring Dia.** 4.5"	**Total Depth** 51.5'
Drill Equipment CME 55	**Hammer Type** 140lb	**Hammer Drop** 30"	**Auger Type** HS/MR	**Elevation**	**Depth to Groundwater** 20'
Notes		**Sampler Type** MCal		**Latitude** 38.270301°N	**Longitude** 122.27544°W

SAMPLE NUMBER & Type	BLOWS/6"	MOISTURE (%)	DRY DENSITY (pcf)	-#200 Sieve (%)	DEPTH (feet)	USCS SYMBOLS	SAMPLE DEPTH	DESCRIPTION AND CLASSIFICATION
MCal 1A	5 13 23	18.4	106.5		2	CL		**Lean Clay (CL)**, brown/light brown, moist, fine grained sand, medium plasticity, hard
MCal 2A	11 19 25				5	CL		**Sandy Lean Clay (CL)**, brown, moist, fine grained sand, medium plasticity, hard
MCal 3A	8 10 22	16.0	101.5		10	SP-SC		**Poorly Graded Sand with Clay (SP-SC),** brown, moist, fine to coarse grained sand, medium dense
MCal 4A	18 20 25				15	SP-SC		**Poorly Graded Sand with Clay and Gravel (SP-SC),** brown, moist, fine to coarse grained sand, fine grained gravel, dense
MCal 5A	15 12 15				20			**Clayey Sand with Gravel (SC),** brown, moist, fine to coarse grained sand, fine grained gravel, medium dense Below 20 feet, wet
MCal 6A	4 4 8			16.8	25			Below 25 feet, loose

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PLATE
A4

LOG OF BORING

Project Napa Valley College Wine Education Complex				**Sheet no.** 2 of 2	**Hole Number** B3
Site Location 2277 Napa-Vallejo Hwy		**Project Number** 2407-40		**Logged By** AS	**Checked By** BC
Started 6/6/2022	**Completed** 6/21/2022	**Driller** Cal-Nev Geo		**Boring Dia.** 4.5"	**Total Depth** 51.5'
Drill Equipment CME 55	**Hammer Type** 140lb	**Hammer Drop** 30"	**Auger Type** HS/MR	**Elevation**	**Depth to Groundwater** 20'
Notes		**Sampler Type** MCal		**Latitude** 38.270301°N	**Longitude** 122.27544°W

SAMPLE NUMBER & Type	BLOWS/6"	MOISTURE (%)	DRY DENSITY (pcf)	#200 Sieve (%)	DEPTH (feet)	USCS SYMBOLS	SAMPLE DEPTH	DESCRIPTION AND CLASSIFICATION
Mcal 7A	7 12 16				30	SP		**Poorly graded Sand with Gravel (SP)**, brown, wet, fine to medium grained sand, medium dense
MCal 8A	27 50/6"				35	SP-SC		**Poorly graded Sand with Clay and Gravel (SP-SC),** brown, wet, fine to coarse grained sand, very dense
MCal 9A	6 20 21				40			Below 40 feet, dense
MCal 10A	13 28 40				45	CL		**Lean Clay (CL)**,gray, moist, medium to high plasticity, hard
MCal 11A	15 22 33				50			
					55			Boring completed at a depth of 51.5 feet and backfilled with neat cement grout. Groundwater encountered at a depth of 20 feet at the time of drilling.

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601 Bercut Drive
Sacramento, CA 95811
Phone: (916) 375-6700
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PLATE
A4

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 06/29/2022
Date Submitted 06/24/2022

To: Albert Spichka
MatriScope, Inc.
601 Bercut
Sacramento, CA 95811

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 2407-40 Site ID : B1 BULK.
Thank you for your business.

* For future reference to this analysis please use SUN # 87654-182278.

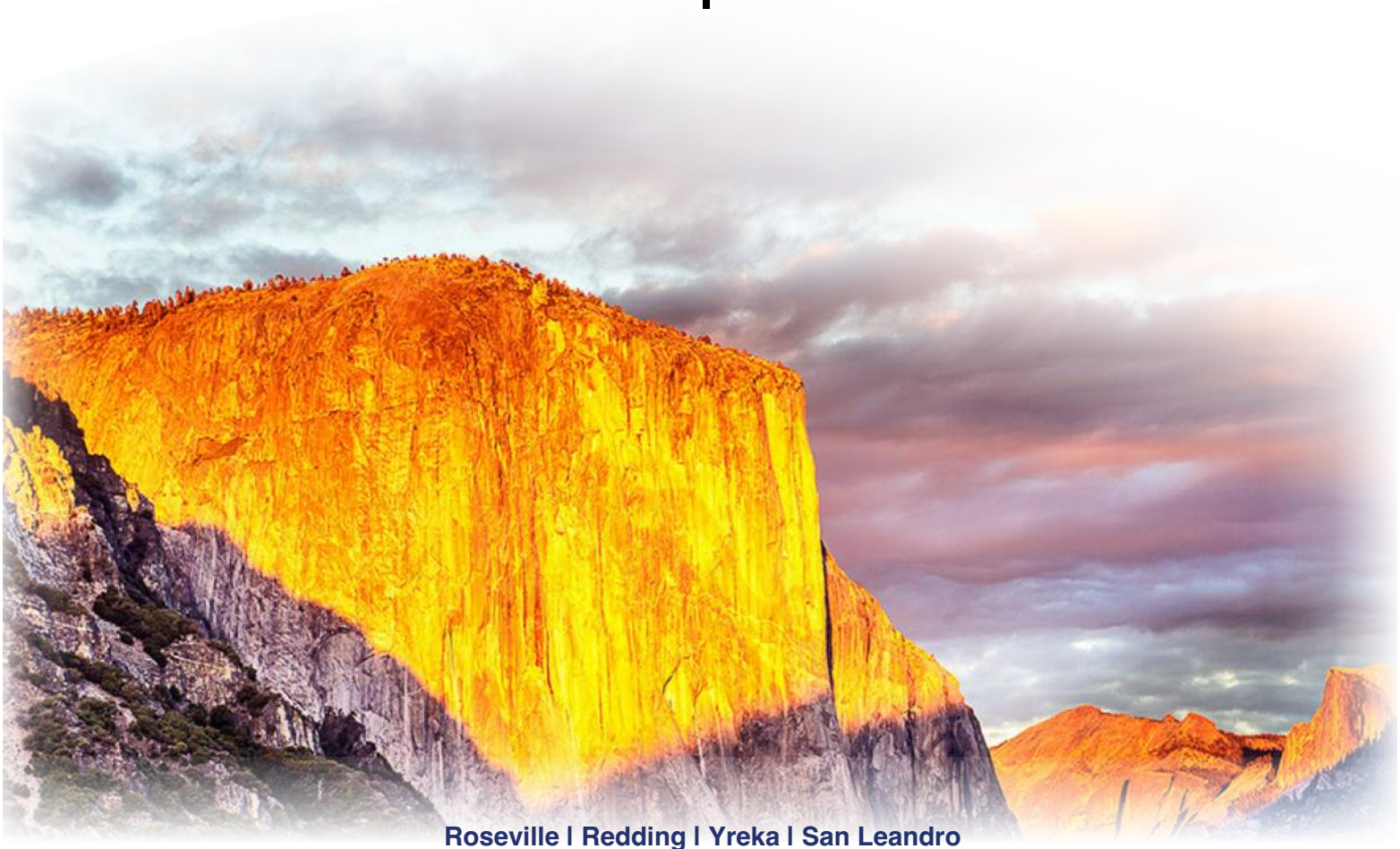
EVALUATION FOR SOIL CORROSION

Soil pH	5.74		
Minimum Resistivity	4.82 ohm-cm (x1000)		
Chloride	6.7 ppm	00.00067	%
Sulfate	13.4 ppm	00.00134	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

Allerion
Consulting Group, Inc.

Services	Geological Hazards Study
Project	Proposed Napa Valley College Viticulture Teaching Winery
Location	Napa, California
Client	Signet Testing Laboratories, Inc.
Project No.	05-22040G
Date	August 5, 2022



Roseville | Redding | Yreka | San Leandro
Geotechnical | Consulting Services | Quality Control Management | Environmental

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Allerion
Consulting Group, Inc.

A Report Prepared for:
Signet Testing Laboratories, Inc.
ATTN: Mr. Brock Campbell
498 N. 3rd Street
Sacramento, California 95811

GEOLOGICAL HAZARDS STUDY
PROPOSED NAPA VALLEY COLLEGE VITICULTURE TEACHING WINERY
2277 NAPA VALLEJO HIGHWAY
NAPA, CALIFORNIA 94558

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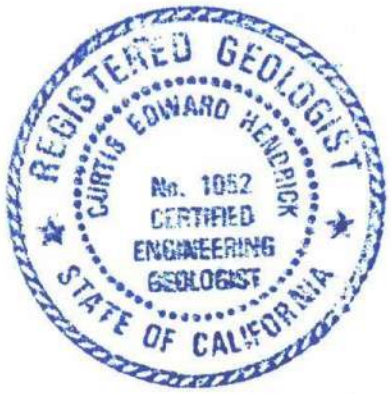

Allerion Consulting Group, Inc.
1050 Melody Lane, Suite 160
Roseville, California 95678

August 5, 2022
Allerion Project No. 05-22040G

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GEOLOGICAL HAZARDS STUDY

PROPOSED NAPA VALLEY COLLEGE VITICULTURE TEACHING WINERY
2277 NAPA VALLEJO HIGHWAY
NAPA, CALIFORNIA 94558

INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this Geologic Hazards Study is to assess potential for geologic hazards at the Napa Valley College located at 2277 Napa Vallejo Highway, Napa, California (APN: 046-450-056-000) (refer to the Vicinity Map, Figure 1, Appendix A). Our geologic hazard study has been performed in general accordance with our proposal dated March 16, 2022, as authorized by Mr. Nicholas Nguy with MatriScope Engineering Laboratories, Inc. (MatriScope), on April 22, 2022.

The scope of services for this Geologic Hazard Report substantially follows the California Geological Survey Note 48 Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings, dated November 2019. A summary of ACG's scope of services included:

- Document Review: included review of historic aerial photography, topographic maps, geologic maps, seismic hazards maps, and Matriscope's boring logs.
- Site Description: included site location and immediate vicinity, site description, the general setting of the area being studied including the location, size, history, topography, drainage, and general surficial soil/geologic conditions observed during our site reconnaissance.
- Proposed Project Information: included a description of the proposed project and other proposed improvements.
- Geologic Hazards Investigation and Engineering Discussions: included a discussion of geologic hazards, geotechnical feasibility of the proposed project, anticipated basic geotechnical problems, and generalized, anticipated mitigation measures. Discussion of the geologic engineering aspects of the site and proposed project: anticipated foundation types for proposed structures (including retaining systems, if any); general grading considerations; estimated

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stability of cut slopes and constructed embankments; potential for settlement of the site and adjacent sites due to existing conditions and proposed construction; and proposed surface and subsurface drainage facilities.

- Opinions and Conclusions, accumulated data and resulting opinions and conclusions are presented in this report.

The scope of service of this report does not include any geotechnical engineering investigations, geotechnical recommendations, geotechnical laboratory tests, environmental testing of potential hazardous materials or biological conditions. MatriScope Engineering Laboratories, Inc**.** performed the Geotechnical Engineering Investigation which will be summitted in a separate report.

PROJECT LOCATION

The project site is located on the campus of Napa Valley College, County of Napa, California. The Napa County Assessor Map APN is 046-450-056-000. Generally, the Project Site is in the central - southern portion of the campus that is occupied by the Viticulture and Winery Technology teaching center (established in September of 2008) comprised of four buildings (Trefethen viticulture center, agriculture lab, wine storage, and childcare) with adjacent paved access/parking, sidewalks, and landscaping.

The project site is located on the south side of the campus, adjacent to Streblow Drive, and comprises 1.2+/- acre of the 108.44+/- acres campus (approximately 38.270216° North Latitude, -122.275226° West Longitude). The general area around the campus is mixed-use with residential and commercial properties, agricultural land, and vacant land. The project site is bounded by Streblow Drive to the south, and to the west, north and east by buildings, parking lots, and sidewalks of the Napa Valley College Campus. James Diemer Drive, campus vineyard and State Highway 221 are further to the east. The site is indicated by Google Earth to have an approximate elevation of 26 feet above Mean Sea Level (MSL). Surface drainage trended southerly and westerly.

PROPOSED PROJECT INFORMATION

In preparing this report we reviewed preliminary site plans by TLCD Architecture “The Wine Spectator Wine Education Complex” (Sheets A-101, G-002, and G-003, undated); MatriScope Engineering Laboratories, Inc. (Matriscope) June 6, 2022, Boring logs B1 through B3 and boring location map; and,

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Google Earth aerial photography (10/21/2020) related to the proposed site. Based on the site plans, the proposed project consists of design and construction of two (2) single-story, wood frame buildings and one (1) building remodel. The proposed buildings and the remodeled building have concrete slab-on-ground first floors, maximum heights of up to 24½ feet, with a combined footprint area of approximately 9,677 square feet (Figure 8, Appendix A). The proposed improvements also include concrete sidewalks and landscaped areas.

PREVIOUS SITE USE

Napa Valley College was established in 1941. In 1962 the college moved to the subject site that had been occupied by the Napa State Hospital. The campus property was originally part of a Mexican Land Grant, Rancho Tulucay, owned by Cayetano Juarez who sold it to the State of California in 1872. The Napa State Hospital began operations in 1875 (*Historic Preservation & the North Site Development Project*, n.d.).

FINDINGS

SITE HISTORICAL BACKGROUND

Historic Google Earth aerial photographs of the site and general vicinity were reviewed for the period from 1993 to present. Google Earth imagery of 1993 shows the project site to be vacant land within the college campus. A July 2002 Google Earth Image shows the project site occupied by three buildings labeled as Teaching Winery, Trefethen Viticulture Center and Agriculture Lab. Google Earth June 2007 Imagery shows the current Wine Storage building under construction. Google Earth imagery of May 2008 shows the project site occupied by four structures labeled as Wine Storage, Teaching Winery, Trefethen Viticulture Center, and Agriculture Lab as indicated in the Site Description section below.

SITE DESCRIPTION

The subject site is located approximately 750 feet westerly from California State Route 221, and approximately 400 feet westerly from the intersection between Streblow Drive and James Diemer Drive in Napa, California (Figure 2, Appendix A). At the time of ACG's reconnaissance on May 12, 2022, the site was occupied by four wood frame structures that comprise the Napa Valley Viticulture Teaching Winery. The site was relatively flat with minor changes in surface elevation. The buildings were

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surrounded by concrete walkways, raised and ground-level landscaped areas, small olive orchard, and paved driveways and parking lots. Surface drainage of the site trended southerly and westerly towards Tulucay Creek and the adjacent Napa Golf Course, respectively.

During our site reconnaissance observations were made of the exposed geology in the immediate vicinity of the site. There were no outcrops of bedrock located on the subject site or accessible properties in the immediate vicinity.

The immediate area northerly of the subject site was occupied by Napa Valley College, with commercial and retail properties further to the north. The area easterly of the subject site was occupied by a vineyard, State Route 221 (Napa Vallejo Highway), the Napa State Hospital, and beyond that by a residential subdivision. Southerly and southwesterly of the subject site the area was occupied by Kennedy Park and Kennedy Park Golf Course, Tulucay Creek, and the Napa River. There were no surface features observed in the immediate vicinity to indicate that flooding has occurred on Tulucay Creek or the Napa River that would affect the subject site.

REGIONAL GEOLOGY

The site is located within the northern section of California's Coast Ranges Geomorphic Province, a series of parallel ranges and hills that trend north-northwest and south-southeast along the coast of California and subparallel to an approximately 500 mile (804 km)-long segment of the active San Andreas fault. The Coast Ranges are predominantly composed of thick late Mesozoic and Cenozoic (251 million years ago to present) sedimentary rocks.

According to the California Geological Survey (CGS) "Geologic Map of the Napa and Bodega Bay 30'x 60' Quadrangle, California" (2017; scale 1:100,000), the site is indicated to be underlain by Pleistocene-aged alluvial deposits (old) (Qoa) (Figure 3). The total thickness of the formation was not determined and is beyond the scope of this study. ACG considers the native earth materials discovered in Matriscope's explorations are consistent with the mapped earth materials (see following Earth Materials Conditions). Geologic Cross Sections based on Matriscope's boring logs are presented on Figures 9, 10 and 11 in Appendix A.

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EARTH MATERIAL CONDITIONS

On June 6, 2022, Matriscope advanced three exploratory borings at the subject site to depths between 16½ and 51½ feet below existing ground surface (begs). As shown on Matriscope's Exploratory Logs (Appendix B), the subsurface earth material conditions varied somewhat. The uppermost soil encountered consisted of firm to hard, moist, light brown to dark brown, Sandy Lean CLAY to Lean CLAY (Unified Soil Classification: CL) and loose, moist, brown, fine to coarse SAND with Gravel and Clay (SP-SC) to depths varying from approximately 7½ to 11 feet below existing ground surface (begs). The earth materials encountered below the uppermost layers consisted of interlayered medium dense to dense (occasionally loose), moist to wet, light brown to dark brown, SAND with varying ratios of Gravel and Clay (SP, SC, GC, SP-SC) to depths of approximately 16½ to 42 feet begs. Below these layers, the earth material found was hard, moist, gray, Lean CLAY (CL) to the maximum explored depth of approximately 51½ feet begs.

Since the earth material profile is generalized, the reader is advised to consult the Explorations Logs contained in Appendix B, if the earth material conditions at a specific depth and location are desired. The logs contain a more detailed earth material description regarding color, earth material type, and Unified Soil Classification System (USCS) symbol.

Earth material conditions cannot be fully determined by surface and subsurface explorations and earth material sampling. Hence, unexpected earth material conditions might be encountered during construction. If earth material conditions are encountered during construction which vary from earth materials described above, then modified/additional evaluations may be made.

CONCLUSIONS AND DISCUSSIONS

SITE SUITABILITY AND GEOLOGICAL CONSIDERATIONS

From a geological standpoint, the site is considered suitable for the proposed construction provided the conclusions and discussions presented in this report are incorporated into the design and construction of the project.

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Preliminary, we consider the proposed structures could be supported upon isolated and/or continuous spread footings supported on approved earth material that could be undisturbed native soils and/or engineered fill materials, or deep foundation system -- which will be determined per Matriscope's Geotechnical Engineering Study.

SEISMIC HAZARDS

Seismic ground shaking of the earth materials underlying the site can cause ground failures, including fault rupture, liquefaction and densification, lateral spreading, landsliding, and tsunamis / seiches. The following sections discuss our conclusions / opinions regarding these conditions based on our findings and literature review.

Fault Rupture

Fault rupture hazards are important near active faults and tend to reoccur along the surface traces of previous fault movements. The site is not located within an Alquist-Priolo Special Studies Zone. No indications of surface rupture or fault-related surface disturbance were observed at the site during our site reconnaissance. Based on review of available seismic maps, no known active or potentially active faults are shown in currently available geologic maps as crossing the site (Figure 4). However, a search of the California Geological Survey's (CGS) *Fault Activity Map of California* (2015) revealed a pre-quaternary concealed fault that extends under the subject site. This fault does not have recognized displacement in Holocene time (within last 11,700 years) and is not identified as an Alquist-Priolo Earthquake Fault Zone by the CGS. We consider the potential for fault rupture, damage from fault displacement, or fault movement directly below the site to be very low. However, the site is located within an area where shaking from earthquake generated ground motion waves should be considered likely.

ACG utilized the *USGS National Seismic Hazard Maps* website tool (2008) to prepare Table 1, presented below, which contains faults and fault systems within approximately 100 kilometers (62 miles) of the subject site that are considered capable of generating significant earthquakes. The nearest of these faults are the West Napa Fault Zone located approximately 1.68 miles to the west, and the Green Valley Fault located approximately 6.60 miles to the north. Additionally, the

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Hunting Creek-Berryessa Fault Zone is located approximately 13.04 miles to the southwest. The USGS estimates that there is a 33% chance of magnitude 6.7 or greater earthquake on the Hayward/Rodgers Creek fault over the 30-year period between 2014 and 2043.

Table 1: Faults Considered Influential to the Site

Fault / Fault Zone Name	Distance		Maximum Magnitude
	Miles	Kilometers	
West Napa	1.68	2.7	6.7
Green Valley Connected	6.60	10.62	6.8
Hunting Creek-Berryessa	13.04	20.99	7.1
Hayward-Rodgers Creek	13.99	22.5	7.33
Great Valley Pittsburg Kirby Hills	16.24	26.14	6.7
Mount Diablo Thrust Fault	30.24	48.67	6.7
Maacama-Garberville	30.8	49.57	7.4
Great Valley 3, Mysterious Ridge	31.20	46.4	6.78
N. San Andreas	32.36	52.08	7.86
Calaveras	34.66	55.78	6.87
Greenville Connected	36.01	57.95	7.0
Point Reyes	38.08	61.28	6.9
San Gregorio Connected	39.58	63.70	7.5
Collayomi	41.23	66.35	6.7
Bartlett Springs	47.15	75.88	7.3

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Great Valley 7	55.32	89.03	6.9
Monte-Vista-Shannon	57.71	92.88	6.5

Seismic Ground Shaking

The mapped and design spectral response accelerations (refer to Appendix B) presents seismic design criteria for the subject project site obtained from the SEAOC/OSHPD Seismic Design Maps (https://seismicmaps.org) that are based on data provided by ASCE 7-16 and are for use with the 2019 California Building Code (CBC). Site Class D was selected based on the soil conditions per Matriscope's boring logs. The values for spectral response accelerations with a Risk Category of II and III are summarized on the following tables. The Risk Category (II or III) should be assigned per 2018 International Building Code (IBC) Table 1604.5 based on the building occupancy load (to be determined by the Architectural Design Engineer).

Table 2: Mapped and Design Spectral Accelerations

Description	Value
Site Latitude, Longitude	38.270216, -122.275226
Site Soil Classification[1]	D
Risk Category	II or III
S_S - Spectral Acceleration for a Short Period	2.013 g
S_1 - Spectral Acceleration for a 1-Second Period	0.706 g
S_{MS} - MCE_R, 5% damped Spectral Acceleration for a Short Period	2.013 g
S_{M1} - MCE_R, Spectral Acceleration for a 1-Second Period[1]	1.2 g
S_{DS} - design, 5% damped, Spectral Acceleration for a Short Period	1.342 g
S_{D1} - design, 5% damped, Spectral Accel. for a 1-Second Period[1]	0.8 g
Seismic Design Category[2]	D
T_L	8
PGA	0.832 g
PGA_M	0.916 g
F_{PGA}	1.1

[1] The *2019 CBC* requires an earth material profile determination extending to a depth of 100 feet for site soil classification. Based on the boring logs provided by MatriScope Engineering Laboratories, Inc., the explorations extended to depth of about 51.5 feet begs, and Exception 2 of ASCE 7-16 Section 11.4.8 for Site Class D is used to calculate S_{M1} and S_{D1}. [2] In general accordance with the 2019 CBC (refers to *ASCE 7-16*) Seismic Design Category is based on spectral acceleration for a 1-sec Period, short & 1-sec period response acceleration parameters (S_1, S_{DS} & S_{D1}, respectively) and corresponding Risk Category. Please refer to ASCE/SEI 7-16 Section 11.4.8 for base shear (V) calculations. Please refer to Appendix C for the U.S. Seismic Design Maps.

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Historical Seismicity

Seismological data for significant historical earthquakes that have potential to affect the subject site was obtained using the Northern California Earthquake Data Center's California Earthquake Catalog Search (https://www.ncedc.org/ncedc/catalog-search.html). Table 3 presents magnitude and median peak accelerations experienced in Napa County for several major earthquakes (>5.0) that affected the subject site.

Table 3: HISTORICAL SEISMICITY – NAPA COUNTY

Name	Date	Magnitude	Median Peak Acceleration
South Napa	8/4/2014	6.0	0.18 g
Yountville	9/3/2000	5.0	0.06 g
Loma Prieta	10/17/89	6.9	0.65 g
Great San Francisco	4/18/1906	8.3	0.10 g
Mare Island	3/30/1898	6.2	0.07 g
Hayward	10/21/1868	6.8	0.04 g

Figure 5, Appendix A, presents the epicenters, dates, and magnitudes of several historic earthquakes that have affected the region. The Yountville earthquake (9/3/2000, M5.0) provided data specific to the subject site. This earthquake occurred on a previously unmapped fault approximately 9 miles northwest of Napa. California Strong Motion Instrumentation Program (CSMIP) had instrumentation (Station No. 68150) on campus at Napa Valley College. This instrument recorded a peak ground horizontal acceleration of 0.337 g. No damage was reported to any buildings or infrastructure on campus (Miranda et al., n.d.).

Naturally Occurring Asbestos

Naturally occurring asbestos is commonly associated with ultramafic rock types of the Franciscan Complex which underlies much of the San Francisco Bay Area. ACG reviewed *A General Location*

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Guide for Ultramafic Rocks in California – Areas More Likely to Contain Naturally Occurring Asbestos, CGS Open-File Report 2000-19 (Chruchill and Hill, 2000) for the potential of NOA affecting the subject site. The CGS "Geologic Map of the Napa and Bodega Bay 30'x 60' Quadrangle, California" (2017; scale 1:100,000), indicates the site to be underlain by Pleistocene-aged alluvial deposits (old) (Qoa). We consider it is unlikely for naturally occurring asbestos to be encountered at the site.

Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands and/or silts lose their physical strength temporarily during earthquake induced shaking and behave as a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with water level, soil type, material gradation, relative density, and probable intensity and duration of ground shaking.

The California Geological Survey (CGS) has designated certain areas within California as potential liquefaction hazard zones. These are areas considered at risk of liquefaction-related ground failure during a seismic event based upon mapped surficial deposits and the depth to the area groundwater table. The subject site is not currently mapped for potential liquefaction hazard by the CGS (refer to CGS website: https://www.conservation.ca.gov/cgs/earthquakes). Additionally, ACG reviewed the Napa County General Plan (2008) Safety Element for liquefaction susceptibility analysis for the site. Figure SAF-13 of General Plan shows the subject site as being located in an area of very low susceptibility to liquefaction.

Subsurface information by Matriscope's investigation indicates the site is predominately underlain by firm to hard sandy lean clay and lean clays (CL), dense to very dense clayey sand with gravel (SC) and sand with gravel (SP) to the maximum depth explored of approximately 50½ feet below existing ground surface (begs) with interlayers of loose to medium dense clayey sand with gravel (SC) and Sand with Gravel (SP) encountered at Boring B3 between approximately 18 to 33 feet begs. Groundwater is indicated in Matriscope's subsurface explorations at a depth of about 20 feet begs. Highest ground water is estimated to be approximately 16 feet begs.

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Based on the information for this study, it is our opinion that dynamic settlement due to an earthquake event might affect the proposed improvements. Loose to medium dense clayey sand with gravel (SC) and Sand with Gravel (SP) encountered between approximately 16 to 33 feet begs are considered the most susceptible to liquefaction. The liquefaction analysis is part of Matriscope's work scope and their results will be included in their geotechnical report.

The consequences of one-dimensional seismic induced settlement may be largely mitigated by the presence of a relatively thick non-liquefied hard/dense layer above the potentially liquefiable soils (Ishihara 1985). It is our opinion that the presence of the uppermost relatively thick dense or hard soil layer may act as a bridging layer that redistributes stresses and therefore results in more uniform ground surface settlement beneath the proposed structures, as well as decreasing the amount of potential seismic induced settlement.

Ground Lurching

Ground lurching is a result of the rolling motion imparted to the ground surface due to seismic waves released by an earthquake that can cause cracks in weaker soils. The potential for cracking at this site is considered low based on the anticipated soil conditions discovered at the site but should be confirmed in Matriscope's Geotechnical Engineering Investigation report.

Earthquake Induced Landsliding

Based on information available on the CGS website, the subject site has not been evaluated for seismically induced landsliding. ACG reviewed the USGS's U.S. Landslide Inventory Map for potential landslides near the subject site (https://usgs.maps.arcgis.com). The closest landslide to the Subject Site is shown to be approximately one-half mile easterly (Figure 6). Google Earth Aerial Photography shows the site elevations between 20 feet and 27 feet above Mean Sea Level. Due to the very low topographic relief of the Subject Site and the distance to the nearest historic landslides, seismically induced and/or other landslides are not considered a significant hazard at the site.

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Tsunamis and Seiche Evaluation

The site is not located near large bodies of water and the site is located at elevation of approximately 24 feet above MSL. Based on the geometry of the site, the potential for tsunami damage or damage caused by oscillatory waves (Seiche) is considered unlikely at the site.

GEOLOGIC HAZARDS

Flooding

A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, panel 060207 for Napa County, California (FEMA, 2016), shows the site is located in an area designated as an "Area of Minimal Flood Hazard", Zone X (Figure 7). ACG also reviewed the City of Napa's Map of Flood Inundation Areas (https://www.cityofnapa.org/313/Map-of-Flood-Inundation-Areas) which show the City's areas of greatest flood risk. The subject site is mapped adjacent to, but not within, a Flood Risk Area.

Dam Inundation

ACG reviewed the Safety Element of the Napa County General Plan to assess the possibility of the Subject Site being inundated by flood waters from a dam failure. Napa County has not mapped the subject site within a dam failure inundation zone. We consider the risk of dam failure inundation is considered low.

Volcanic Hazards

The closest active volcanic area to the subject site is the Clear Lake Volcanic Field and Mount Konocti which lies approximately 80 miles northerly. The USGS reports the last eruptions of Mount Konocti occurred about 11,000 years ago; however, the area experiences occasional volcanic-type earthquakes and contains multiple hot springs and volcanic gas seeps (https://www.usgs.gov/volcanoes/clear-lake-volcanic-field). This earthquake and geothermal activity indicate the potential for future eruptions. We consider the potential for volcanic hazards to be low based on the distance of the volcanic area to the site.

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Radon-222 Gas

Radon gas is a naturally occurring gas that is colorless, odorless, and radioactive. It is produced by the radioactive decay of uranium that is found in nearly all soil types. Per Environmental Protections Agency (EPA), hazards associated with Radon gas may develop as it moves through the soil into the air and through cracks or small openings in building foundations, allowing it to collect inside the building.

ACG reviewed the EPA's Map of Radon Zones, which categorizes every county in the United States according to predicted average screening levels. The subject site is located within Napa County, which is mapped as Zone 3. Counties designated as Zone 3 have a predicted average screening level of less than 2 PCi/L (picocuries per liter).

ACG reviewed the California Department of Public Health's (CDPH) database of indoor air radon levels by zip code for 94558, the zip code that contains Napa Valley College. Total of 89 tests reported to CDPS, 9 test exceeded the residential standard of 4 PCi/L. The maximum reported radon level was 17.7 PCi/L. ACG recommends testing the indoor air of the new buildings for radon levels.

POTENTIAL SLOPE STABILITY

No significant landslides, slumps, or other indications of slope instabilities were observed in the relatively flat-lying site area during our site reconnaissance. The potential for slope instability is considered negligible.

LIMITATIONS

This report contains statements regarding opinions, conclusions, and recommendations, all of which involve certain risks and uncertainties. These statements are often, but are not always, made through the use of words or phrases such as "anticipates", "intends", "estimates", "plans", "expects", "we believe", "we consider", "it is our opinion", "mitigation or mitigate", "suggest", "may be", "expected", "predicated", "advised", and similar words or phrases, or future or conditional verbs such as "will", "would", "should", "potential", "can continue", "could", "may", or similar expressions. Actual results

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may differ significantly from the expectations contained in the statements. Among the factors that may result in differences are the inherent uncertainties associated with earth material conditions, groundwater, project development activities, regulatory requirements, and changes in the planned development.

The analysis and recommendations submitted in this report are based, in part, upon the data from Matriscope including the subsurface explorations at the indicated locations. The nature and extent of subsurface variations between the subsurface explorations across the site (or due to the modifying effects of weather and/or man) may not become evident until further exploration or during construction. If variations then appear evident, then the conclusions, opinions, and recommendations in this report shall be considered invalid, unless the variations are reviewed and the conclusions, opinions, and recommendations are modified or approved in writing.

This report was prepared to assist the client in the evaluation of the site and to assist the architect and/or engineer in the design of the improvements. This firm should be provided the opportunity for a general review of final plans and specifications to determine that the recommendations of this report have been properly interpreted and implemented in the plans and specifications.

If there are any significant changes in the project as described herein, then the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and conclusions and recommendations modified or verified in writing.

This report is issued for the client's use only. In addition, it is his responsibility to ensure that the information and recommendations contained herein are called to the attention of the designer for the project; and, that necessary steps are taken to implement the recommendations during construction.

The findings in this report were developed on the date(s) indicated. Changes in the conditions of the property can occur with the passage of time, whether they are due to natural processes or the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or from the broadening of knowledge. Accordingly, the findings in this report might be invalidated, wholly or partially, by changes outside of our control.

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Therefore, this report and the findings on which it is based are subject to our review at the onset of and during construction, or within two years, whichever first occurs.

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

No warranties, either expressed or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. If any changes in the nature, design, or location of the project as outlined in this report are planned, the conclusion and recommendations contained in this report shall not be considered valid unless ACG reviews the changes, and either verifies or modifies the conclusions of this report in writing.

This report is applicable only for the project and site studied and should not be used for design and/or construction on any other site.

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

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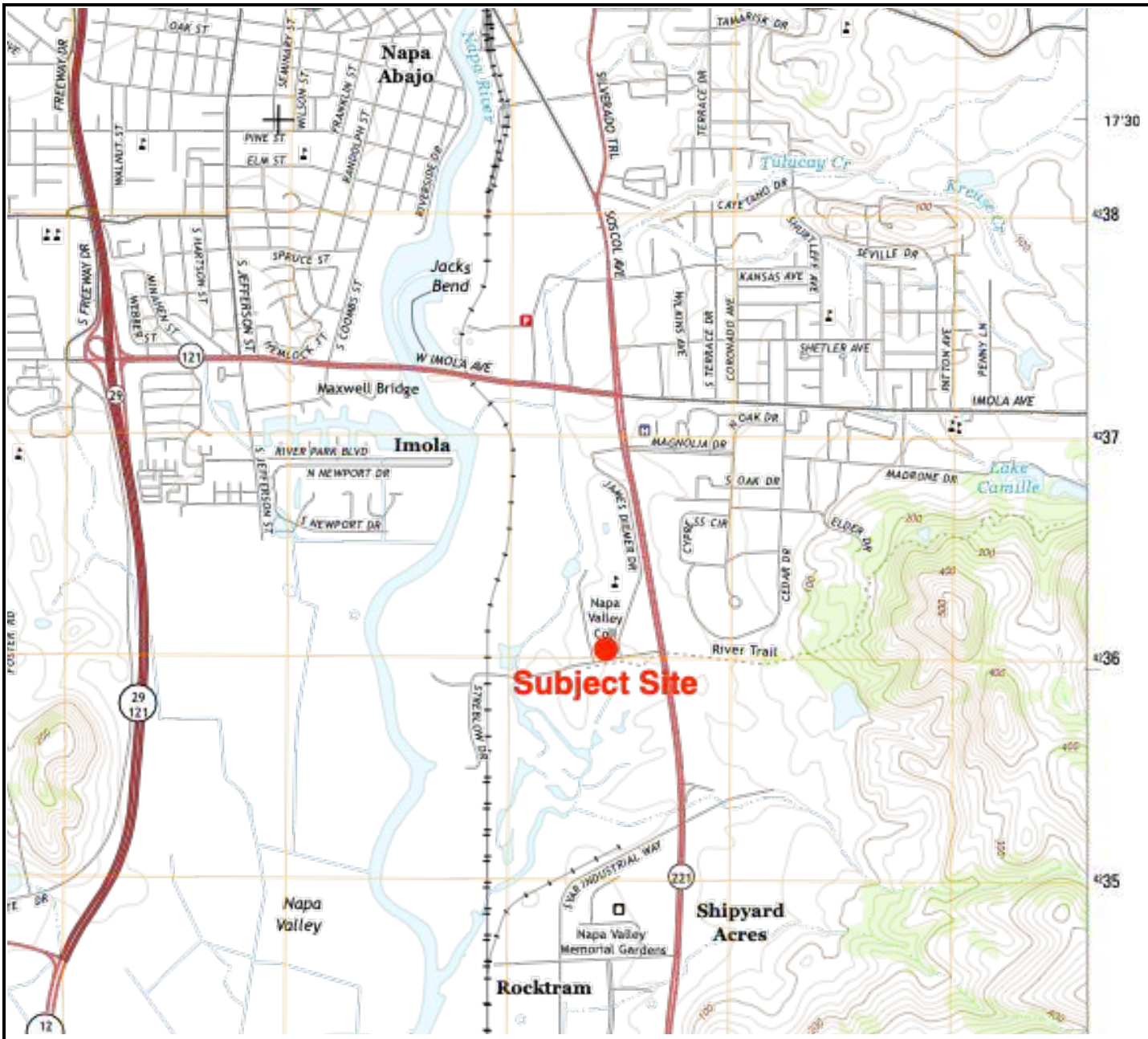
APPENDICES

APPENDIX A

VICINITY MAP
LOCATION MAP
GEOLOGIC MAP
USGS QATERNERY FAULTS MAP
USGS HISTORICAL EARTHQUAKES
USGS LANDSLIDE MAP
FEMA FLOOD INSURANCE RATE MAP
EXPLORATION MAP
GEOLOGIC CROSS SECTION A-A'
GEOLOGIC CROSS SECTION B-B'
GEOLOGIC CROSS SECTION C-C'



Notes:

Location of site (designated by red circle) is approximate.

Source for base map: Imagery from USGS Napa Quadrangle (2015)

ALLERION CONSULTING GROUP, INC. 1050 Melody Lane, Suite 160 Roseville, CA 95678 Phone: 916-742-5096	**VICINITY MAP** **Geological Hazards Study** **Proposed Napa Valley College Viticulture Teaching Winery** **2277 Napa Vallejo Highway** **Napa, California**	**ACG JOB NO.** 05-22040G **DATE** 08/05/2022 **FIGURE** 1

Notes:

Location of site (designated by yellow border) is approximate.

Source for base map: Imagery from Google Earth 2022©.

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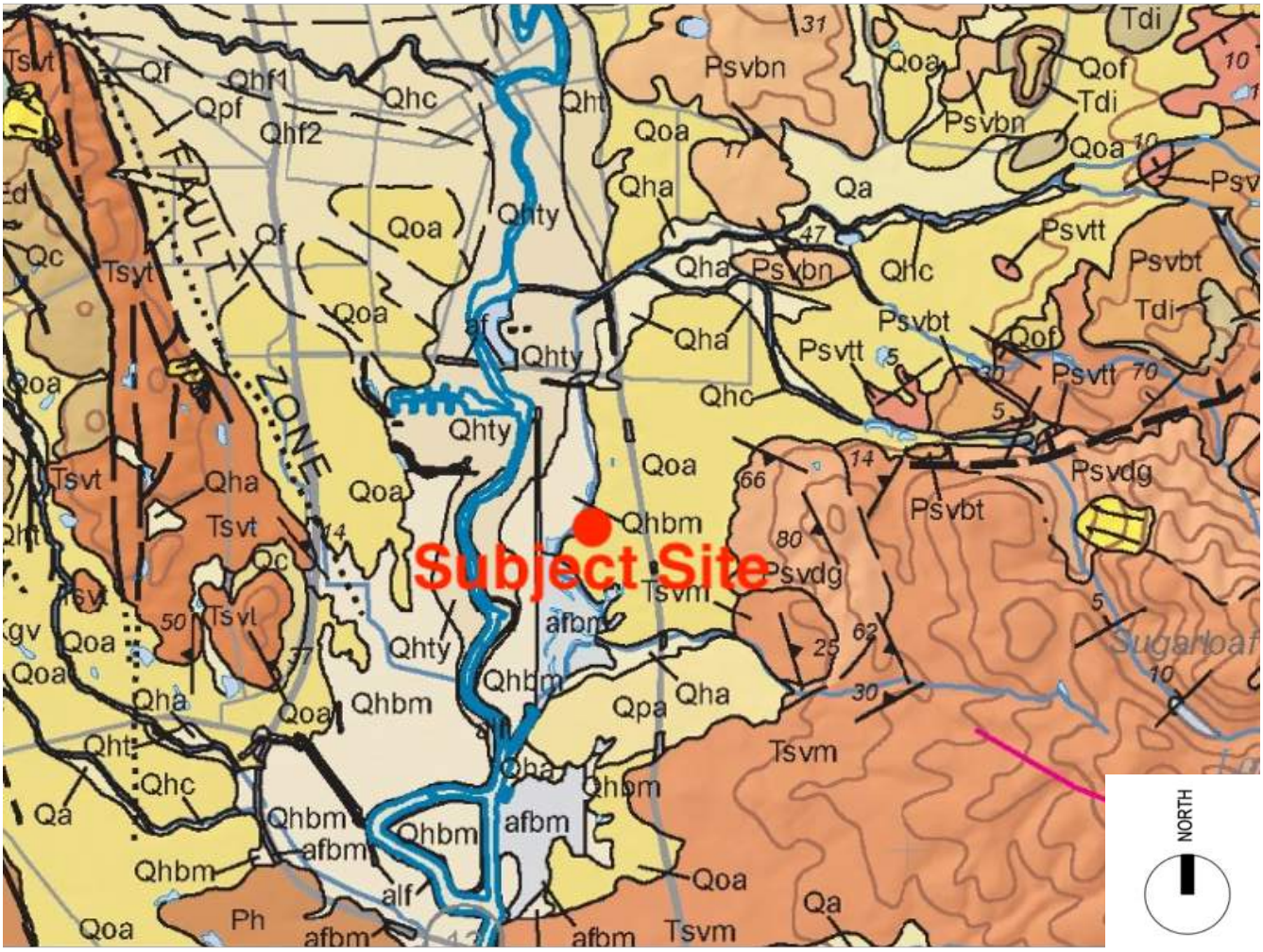
LOCATION MAP

Geological Hazards Study
Proposed Napa Valley College Viticulture Teaching Winery
2277 Napa Vallejo Highway
Napa, California

ACG JOB NO.	05-220040G
DATE	08/05/2022
FIGURE	2



NOTES:

Location of site (designated by red circle) is approximate.

Source for base map: United States Geological Survey (USGS) "Preliminary Geologic Map of the Napa and Bodega Bay 30' x 60' Quadrangle, California" (2017; scale 1:100,000), by Wagner, D.L., and Guiterrez, C.I.

LEGEND:

Qhbm – Holocene Bay Mud (Quaternary)
Qha – Holocene Alluvium (Quaternary).
Qa – Alluvium (Undivided)
Qpa – Pleistocene Alluvium (Undivided)
Qoa – Alluvial Deposits (Old) – Subject Site
afbm – Artificial Fill Placed Over Bay Mud (Quaternary)
Qhty – Latest Holocene Stream Terrace Deposits (Quaternary)
Psvtt – Andesitic Tuff and Tuffaceous agglomerate of Tulucay Creek (Pliocene)
Psvbt – Basalt of Tulucay Creek (Pliocene)
Psvbm – Mafic Flows of Bennett Mountain
Tsvm – Mafic Lava Flows and Intrusions of Sugarloaf Ridge (Undivided)
Tsvt – Tuff and Sediments (Undivided)

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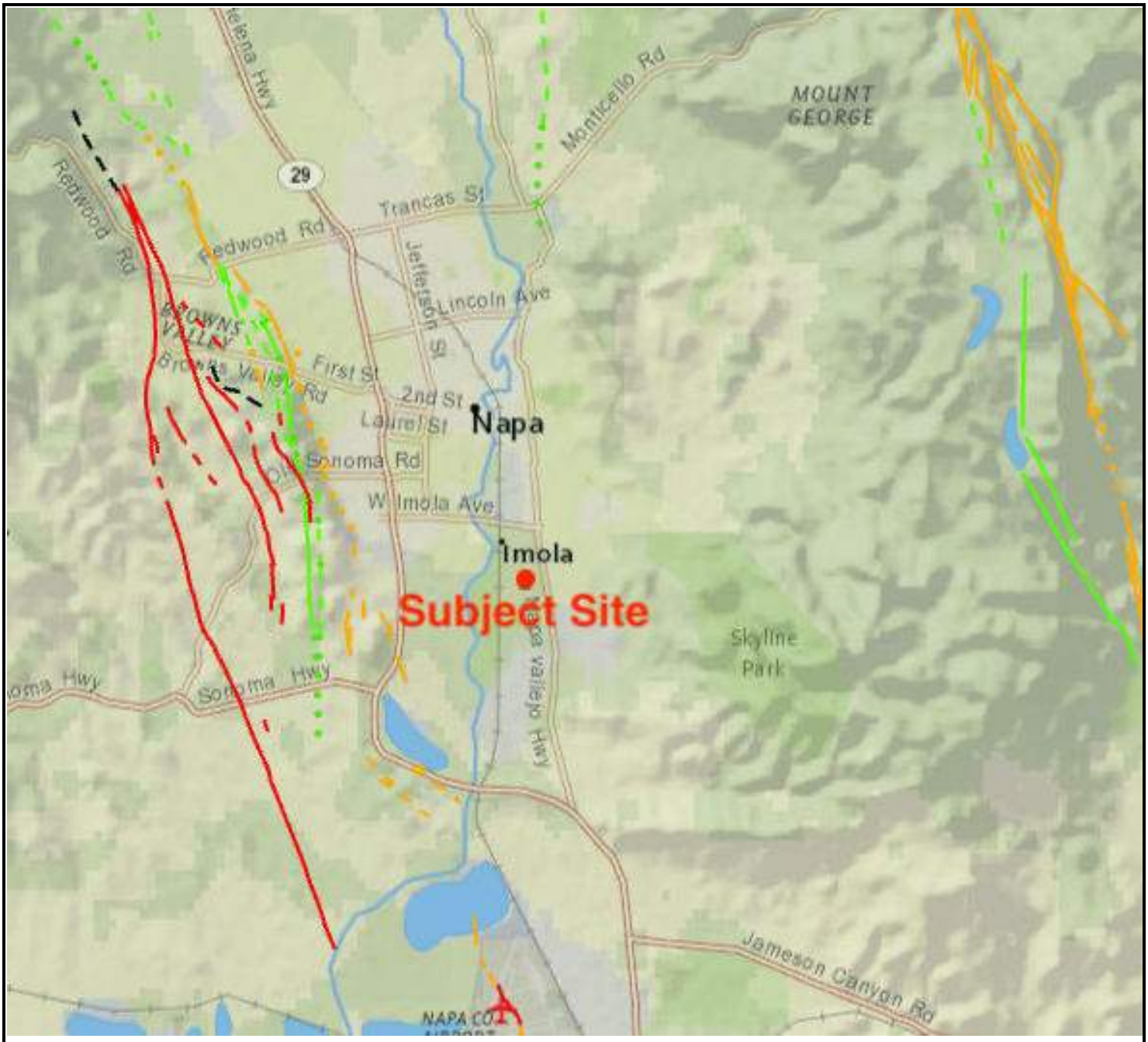
GEOLOGIC MAP
Geological Hazards Study
Proposed Napa Valley College Viticulture Teaching Winery
2277 Napa Vallejo Highway
Napa, California

ACG JOB NO. 05-22040G
DATE 08/05/2022
FIGURE 3



NOTES:

Location of site (designated by red circle) is approximate.

Source for base map: USGS National Seismic Hazard Maps, (2008)

NORTH

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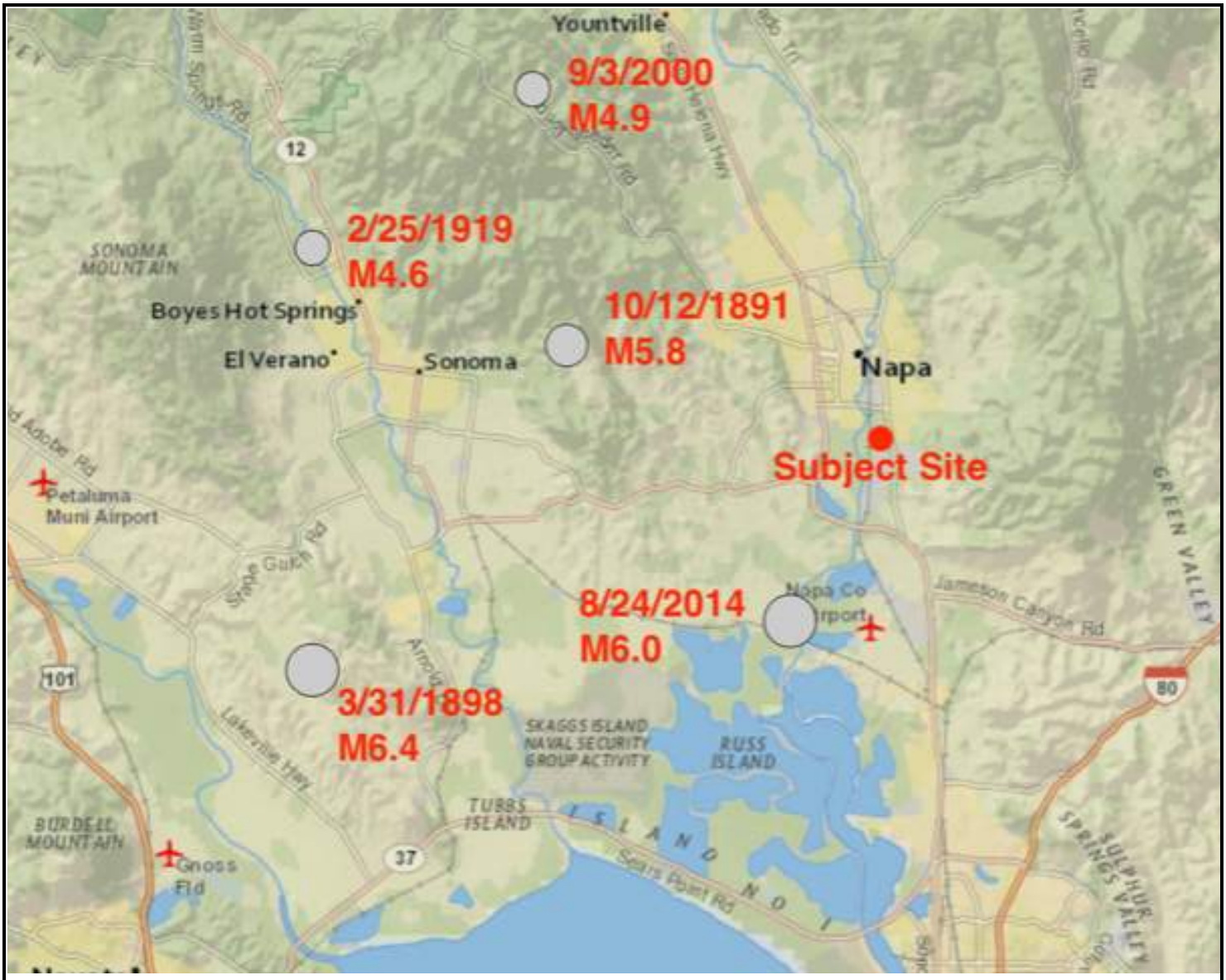
USGS QATERNERY FAULTS MAP

Geological Hazards Study
Proposed Napa Valley College Viticulture Teaching Winery
2277 Napa Vallejo Highway
Napa, California

ACG JOB NO.	05-22040G
DATE	08/05/2022
FIGURE	4



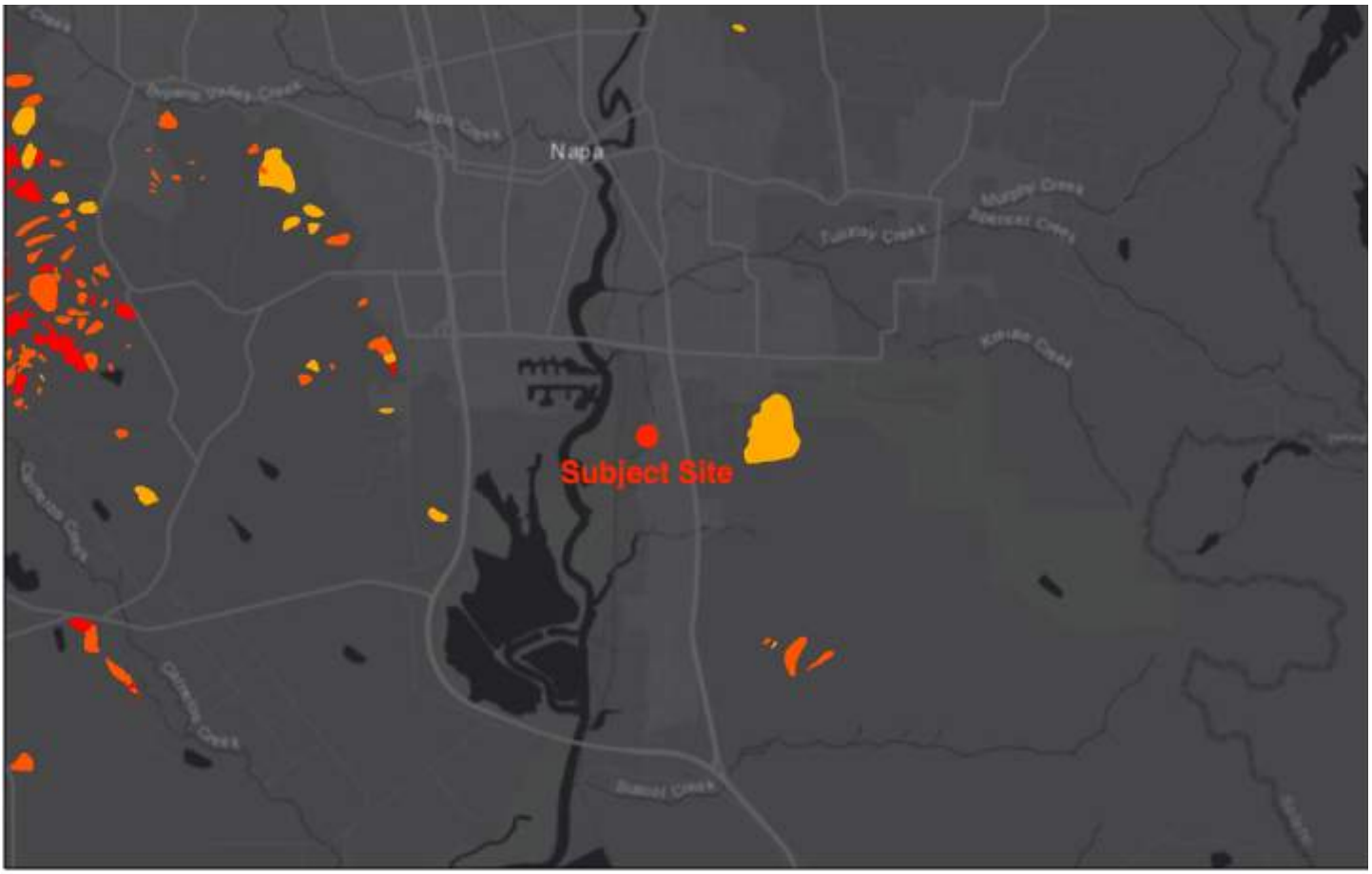
NOTES:

Location of site (designated by red circle) is approximate.

Source for base map: USGS Earthquake Catalog, n.d.

NORTH

ALLERION CONSULTING GROUP, INC. 1050 Melody Lane, Suite 160 Roseville, CA 95678 Phone: 916-742-5096	**USGS Historical Earthquakes** **Geological Hazards Study** **Proposed Napa Valley College Viticulture Teaching Winery** **2277 Napa Vallejo Highway** **Napa, California**	**ACG JOB NO.** 05-22040G **DATE** 08/05/2022 **FIGURE** **5**



NOTES:

Location of site (designated by red circle) is approximate.

Source for base map: USGS U.S. Landslide Inventory and Interactive Map, n.d.

NORTH

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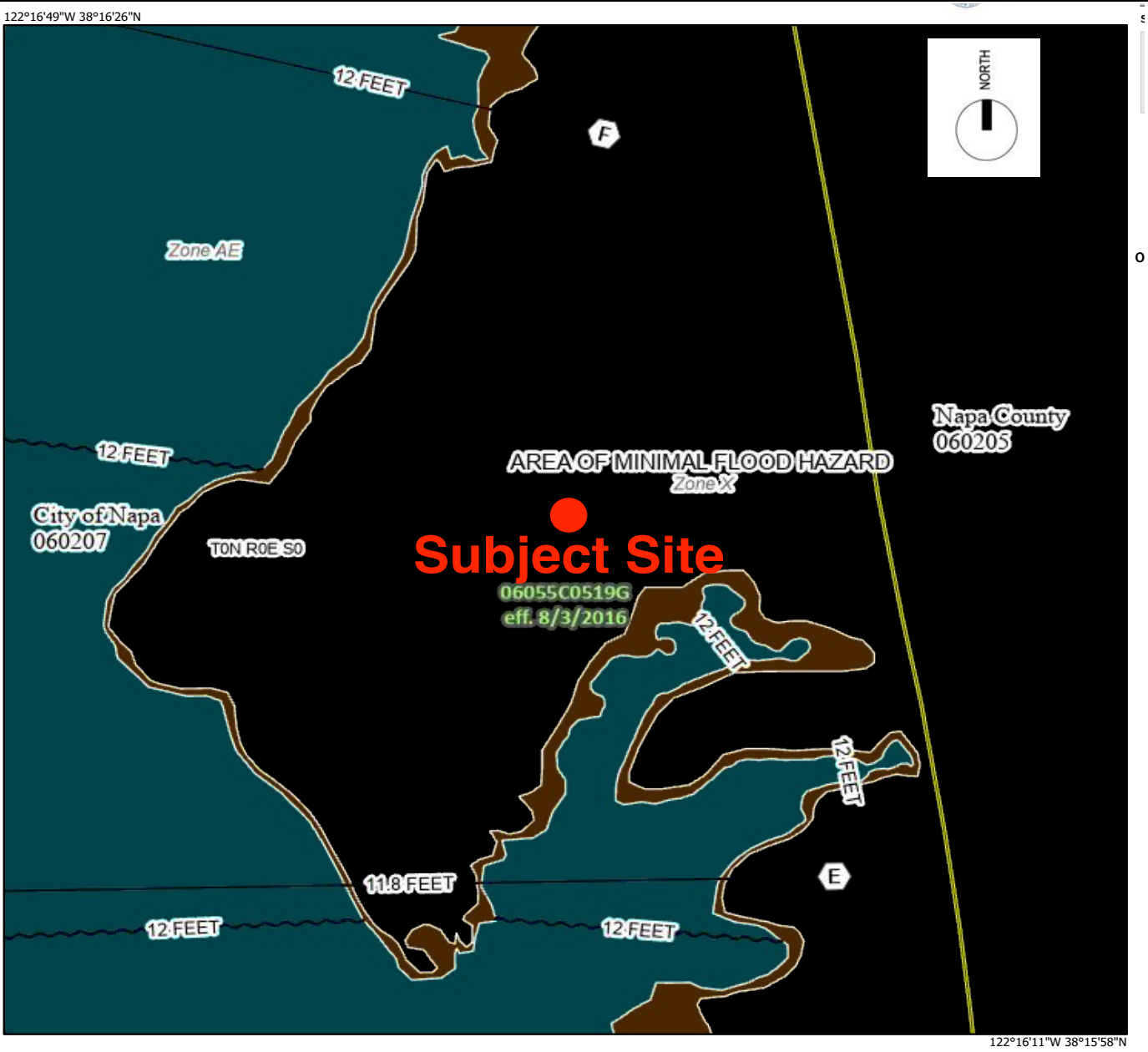
USGS Landslide Map
Geological Hazards Study
Proposed Napa Valley College Viticulture Teaching Winery
2277 Napa Vallejo Highway
Napa, California

ACG JOB NO. 05-22040G

DATE 08/05/2022

FIGURE 6



NOTES:

Location of site (designated by yellow circle) is approximate.
Source for base map: FEMA Flood Map Service Center (2021)

LEGEND:

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one sqware mile

Without Base Flood Elevation (BFE) Zones AV, A99, with BFE or Depth

(No Screen) Area of Minimal Flood Hazard (Zone X)

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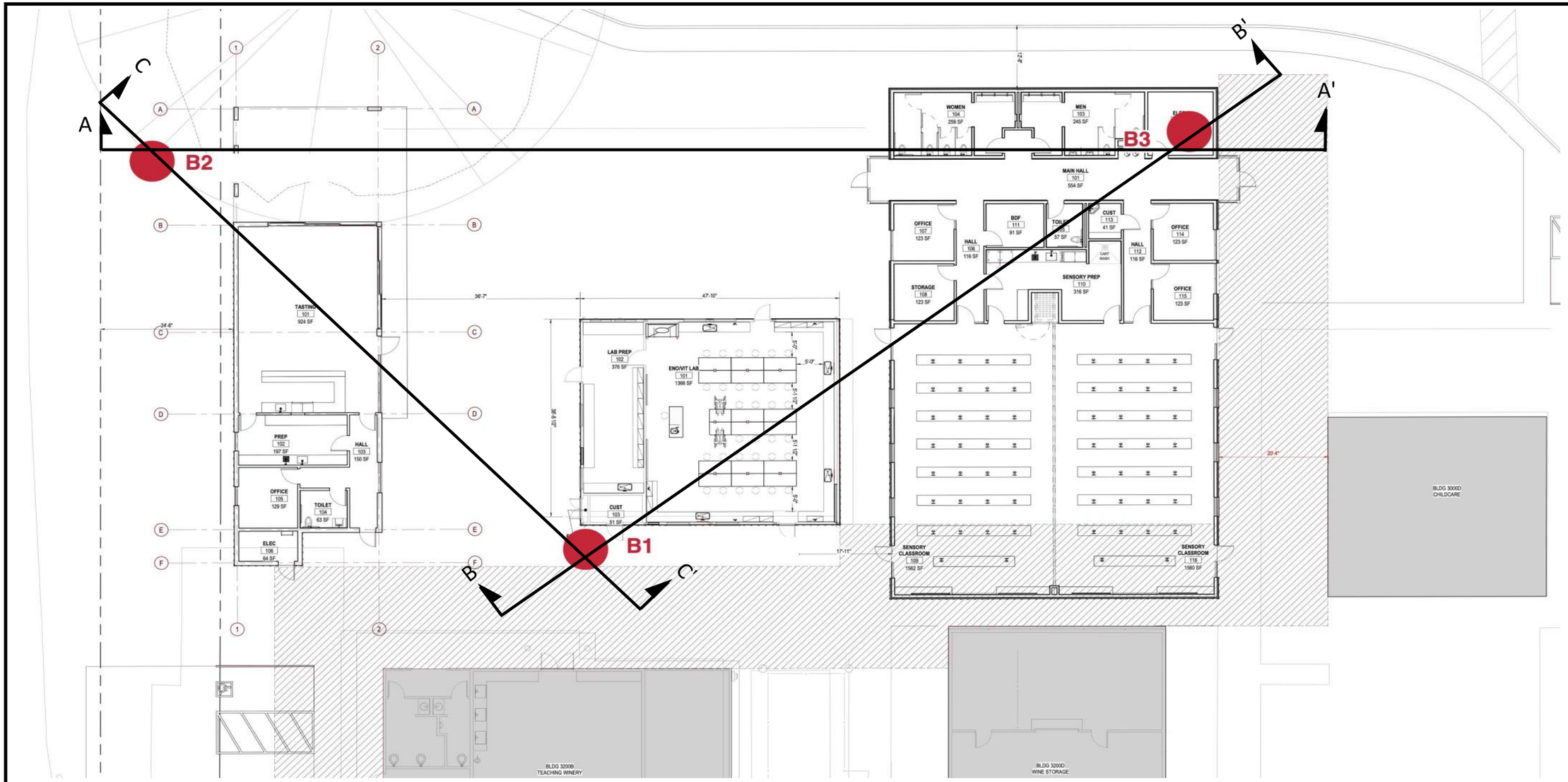
FEMA FLOOD INSURANCE RATE MAP

Geological Hazards Study
Proposed Napa Valley College Viticulture Teaching Winery
2277 Napa Vallejo Highway
Napa, California

ACG JOB NO. 05-22040G

DATE 08/05/2022

FIGURE 7



LEGEND:

Bx - Approximate Location of Boring

SITE PLAN

SCALE 1'=20'

NOTES:

Source for base map: "The Wine Spectator Wine Education Complex", TLCD Architecture, undated.

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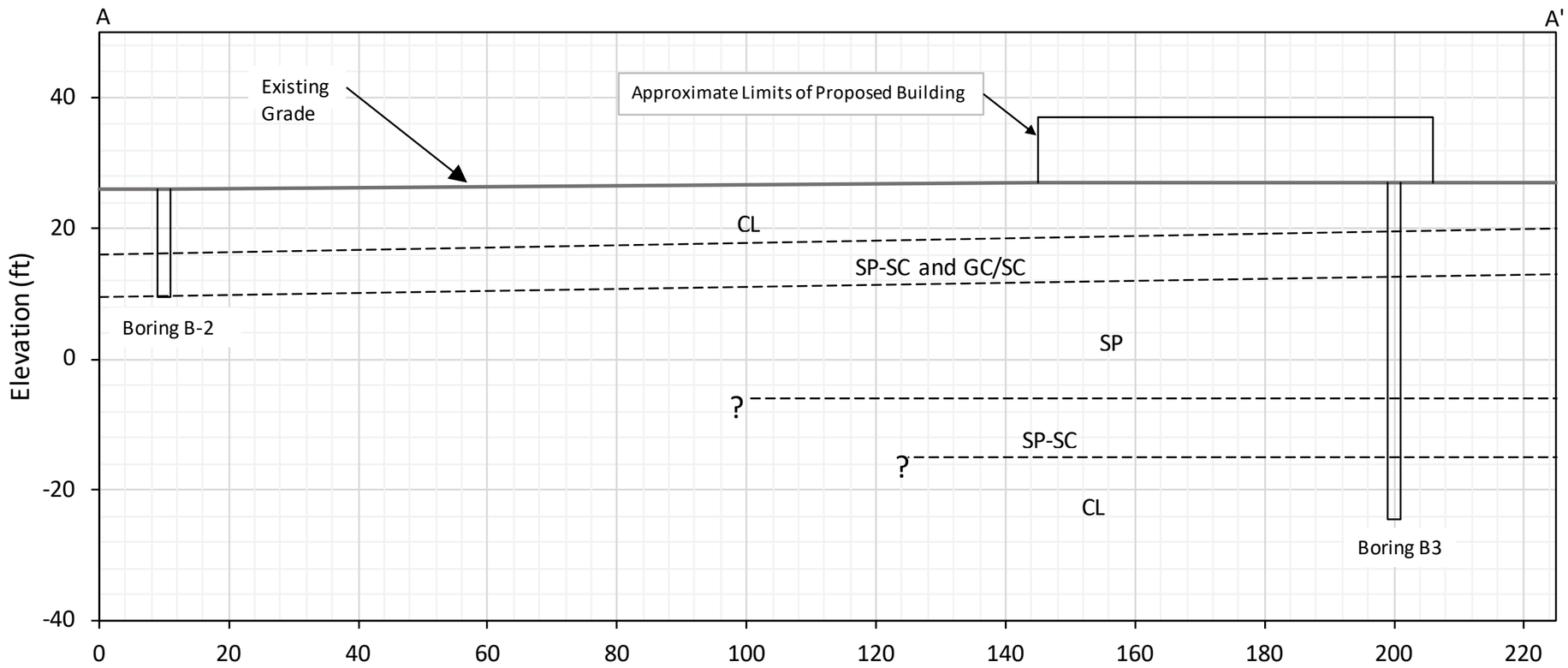
EXPLORATIONS MAP
Napa Valley College
2277 Napa Vallejo Highway
Napa, California 94558

ACG JOB NO.
05-22040G

DATE
8/5/2022

FIGURE
8



LEGEND:

CL	Lean Clay and Sandy Lean Clay
SP-SC	Sand with Clay
GC/SC	Clayey Gravel with Sand
SP	Sand with Gravel

SECTION A-A'
Scale: 1"=20'

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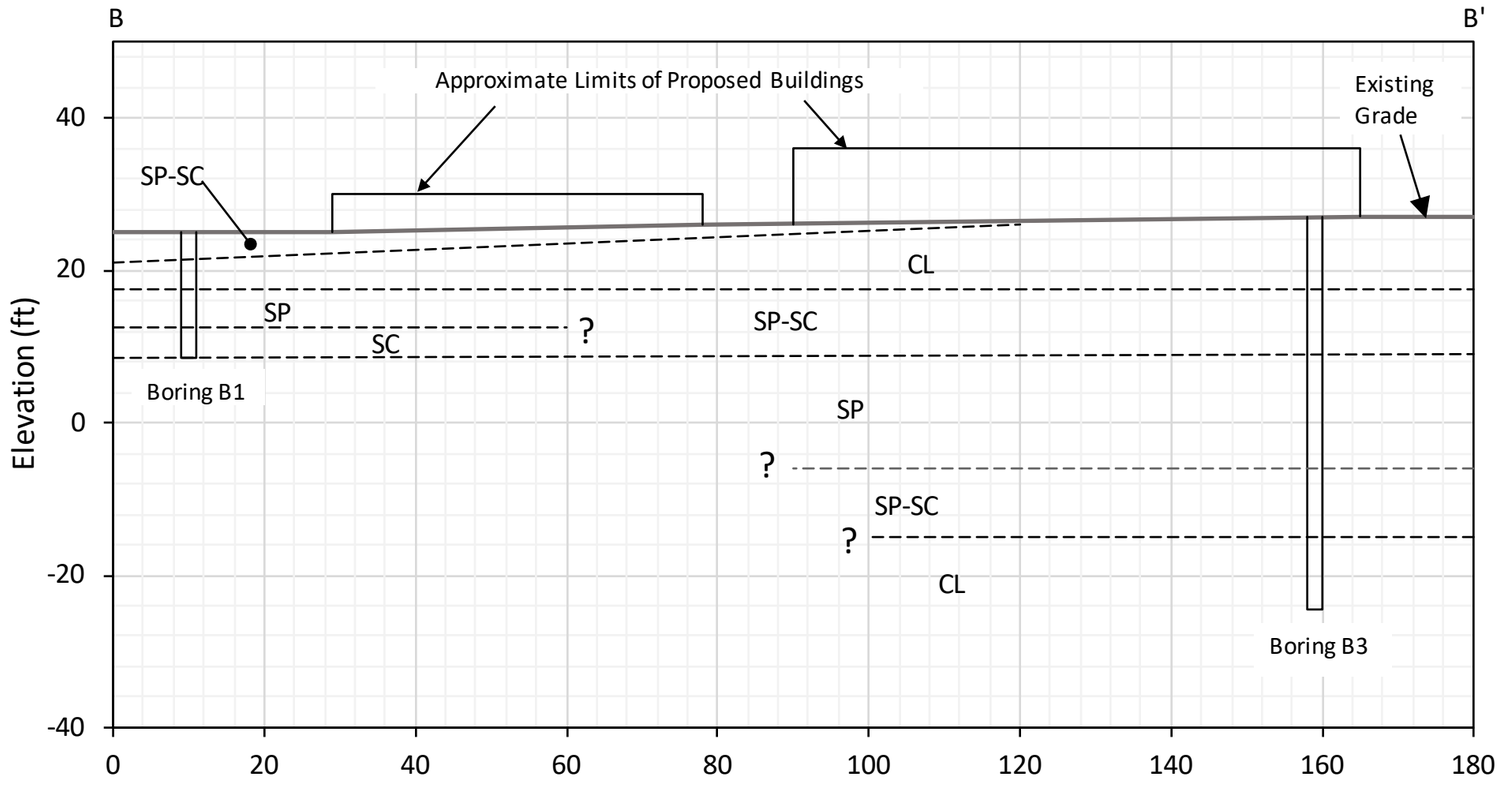
GEOLOGIC CROSS SECTION A-A'
Napa Valley College
2277 Napa Vallejo Highway
Napa, California 94558

ACG JOB NO.
05-22040G
DATE
8/5/2022
FIGURE
9



LEGEND:

CL	Lean Clay and Sandy Lean Clay
SP-SC	Sand with Clay
SP	Sand with Gravel
SC	Clayey Sand with Gravel

SECTION B-B'
Scale: 1"=20'

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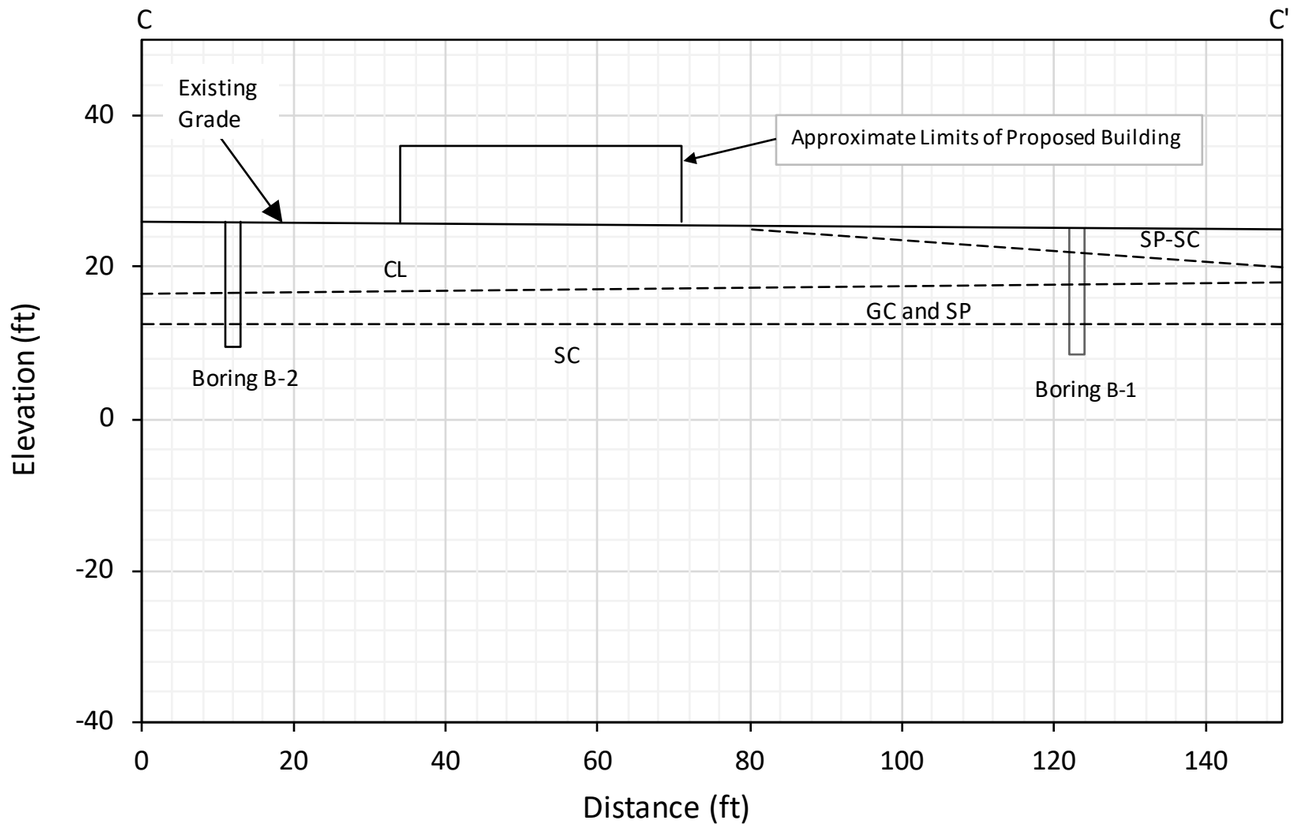
Napa, California 94558

ACG JOB NO.
05-22040G
DATE
8/5/2022
FIGURE
10



LEGEND:

CL	Lean Clay and Sandy Lean Clay
SC	Clayey Sand with Gravel
GC	Clayey Gravel with Sand
SP	Sand with Gravel

SECTION C-C'
Scale: 1"=20'

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GEOLOGIC CROSS SECTION C-C'
Napa Valley College
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Napa, California 94558

ACG JOB NO.
05-22040G
DATE
8/5/2022
FIGURE
11

APPENDIX B

Matriscope's Boring Logs

LOG OF BORING

Project Napa Valley College Wine Education Complex				**Sheet no.** 1 of 1	**Hole Number** B1
Site Location 2277 Napa-Vallejo Hwy		**Project Number** 2407-40		**Logged By** AS	**Checked By** BC
Started 6/6/2022	**Completed** 6/6/2022	**Driller** Cal-Nev Geo		**Boring Dia.** 4.5	**Total Depth** 16.5
Drill Equipment CME 55	**Hammer Type** 145lb	**Hammer Drop** 30"	**Auger Type** Solid Stem	**Elevation**	**Depth to Groundwater** N/A
Notes		**Sampler Type** MCal		**Latitude** 38.26987°N	**Longitude** 122.27520°W

SAMPLE NUMBER & Type	BLOWS/6"	MOISTURE (%)	DRY DENSITY (pcf)	-#200 Sieve (%)	DEPTH (feet)	USCS SYMBOLS	SAMPLE DEPTH	DESCRIPTION AND CLASSIFICATION
						SP-SC		**Poorly graded Sand with Gravel and Clay (SP-SC)**, brown, moist, fine to coarse grained sand, loose
MCal 1A	9 5 11				2			
						CL		**Lean Clay (CL)**, brown, moist, fine to medium grained sand, medium plasticity,firm
					5			Below 5 feet dark brown, more sand, fine to coarse grained sand
MCal 2A	8 13 26					CL		**Sandy Lean Clay (CL)**, dark brown, moist, fine grained sand, medium plasticity, hard
						SP		**Poorly graded Sand with gravel (SP)**, dark brown, moist, fine to coarse grained sand, fine to medium grained gravel, dense
MCal 3A	20 25 21				10			
						SC		**Clayey Sand with Gravel (SC)**, dark brown, wet, fine to coarse grained sand, dense
MCal 4A	17 22 25				15			
					20			
					25			

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Sacramento, CA 95811
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Fax: (916)447-6702

PLATE A2

LOG OF BORING

Project Napa Valley College Wine Education Complex				**Sheet no.** 1 of 1	**Hole Number** B2
Site Location 2277 Napa-Vallejo Hwy		**Project Number** 2407-40		**Logged By** AS	**Checked By** BC
Started 6/6/2022	**Completed** 6/6/2022	**Driller** Cal-Nev Geo		**Boring Dia.** 4.5	**Total Depth** 16.5
Drill Equipment CME 55	**Hammer Type** 145lb	**Hammer Drop** 30"	**Auger Type** Solid Stem	**Elevation**	**Depth to Groundwater** N/A
Notes		**Sampler Type** MCal		**Latitude** 38.26980°N	**Longitude** 122.27550°W

SAMPLE NUMBER & Type	BLOWS/6"	MOISTURE (%)	DRY DENSITY (pcf)	-#200 Sieve (%)	DEPTH (feet)	USCS SYMBOLS	SAMPLE DEPTH	DESCRIPTION AND CLASSIFICATION
MCal 1A	9 11 19				2	CL		**Sandy Lean Clay (CL)**, brown, moist, fine to medium grained sand, medium plasticity, hard
MCal 2A	15 32 35				5	CL		**Lean Clay (CL)**, brown, moist, medium to fine grained sand, medium plasticity, hard
MCal 3A	29 26 32				10	GC		**Clayey Gravel with Sand (GC),** brown, moist, fine grained sand, fine grained gravel, dense
MCal 4A	14 18 23				15	SC		**Clayey Sand with Gravel (SC)**, dark brown, wet, fine to coarse grained sand, dense
					20			
					25			

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PLATE
A3

LOG OF BORING

Project Napa Valley College Wine Education Complex				**Sheet no.** 1 of 2	**Hole Number** B3
Site Location 2277 Napa-Vallejo Hwy		**Project Number** 2407-40		**Logged By** AS	**Checked By** BC
Started 6/6/2022	**Completed** 6/6/2022	**Driller** Cal-Nev Geo		**Boring Dia.** 4.5"	**Total Depth** 35'
Drill Equipment CME 55	**Hammer Type** 145lb	**Hammer Drop** 30"	**Auger Type** HS/MR	**Elevation**	**Depth to Groundwater** 20'
Notes		**Sampler Type** MCal		**Latitude** 38.270301°N	**Longitude** 122.27544°W

SAMPLE NUMBER & Type	BLOWS/6"	MOISTURE (%)	DRY DENSITY (pcf)	#200 Sieve (%)	DEPTH (feet)	USCS SYMBOLS	SAMPLE DEPTH	DESCRIPTION AND CLASSIFICATION
MCal 1A	5 13 23				2	CL		**Lean Clay (CL)**, brown/light brown, moist, fine grained sand, medium plasticity, hard
MCal 2A	11 19 25				5	CL		**Sandy Lean Clay (CL)**, brown, moist, fine grained sand, medium plasticity, hard
MCal 3A	8 10 22				10	SP-SC		**Poorly Graded Sand with Clay (SP-SC),** brown, moist, fine to coarse grained sand, medium dense
MCal 4A	18 20 25				15	SP-SC		**Poorly Graded Sand with Clay and Gravel (SP-SC),** brown, moist, fine to coarse grained sand, fine grained gravel, dense
MCal 5A	15 12 15				20			**Clayey Sand with Gravel (SC),** brown, moist, fine to coarse grained sand, fine grained gravel, medium dense Below 20 feet, wet
MCal 6A	4 4 8				25			Below 25 feet, loose

MatriScope Engineering Laboratories, Inc.
601 Bercut Drive
Sacramento, CA 95811
Phone: (916) 375-6700
Fax: (916)447-6702

PLATE A4

LOG OF BORING

Project Napa Valley College Wine Education Complex				**Sheet no.** 2 of 2	**Hole Number** B3
Site Location 2277 Napa-Vallejo Hwy		**Project Number** 2407-40		**Logged By** AS	**Checked By** BC
Started 6/6/2022	**Completed** 6/6/2022	**Driller** Cal-Nev Geo		**Boring Dia.** 4.5"	**Total Depth** 35'
Drill Equipment CME 55	**Hammer Type** 145lb	**Hammer Drop** 30"	**Auger Type** HS/MR	**Elevation**	**Depth to Groundwater** 20'
Notes		**Sampler Type** MCal		**Latitude** 38.270301°N	**Longitude** 122.27544°W

SAMPLE NUMBER & Type	BLOWS/6"	MOISTURE (%)	DRY DENSITY (pcf)	#200 Sieve (%)	DEPTH (feet)	USCS SYMBOLS	SAMPLE DEPTH	DESCRIPTION AND CLASSIFICATION
Mcal 7A	7 12 16				30	SP		**Poorly graded Sand with Gravel (SP)**, brown, wet, fine to medium grained sand, medium dense
MCal 8A	27 50/6"				35	SP-SC		**Poorly graded Sand with Clay and Gravel (SP-SC),** brown, wet, fine to coarse grained sand, very dense
MCal 9A	6 20 21				40			Below 40 feet, dense
MCal 10A	13 28 40				45	CL		**Lean Clay (CL)**,gray, moist, medium to high plasticity, hard
MCal 11A	15 22 33				50			
					55			Boring completed at a depth of 51.5 feet and backfilled with neat cement grout. Groundwater encountered at a depth of 20 feet at the time of drilling.

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PLATE
A4

APPENDIX C

SEAOC/OSHPD U.S. Seismic Hazard Maps

Latitude, Longitude: 38.270216, -122.275226

Date	7/6/2022, 10:49:14 AM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.013	MCE_R ground motion. (for 0.2 second period)
S_1	0.706	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.013	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.342	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.832	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.916	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.091	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.29	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.013	Factored deterministic acceleration value. (0.2 second)
S1RT	0.754	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.826	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.706	Factored deterministic acceleration value. (1.0 second)
PGAd	0.832	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.913	Mapped value of the risk coefficient at short periods
C_{R1}	0.913	Mapped value of the risk coefficient at a period of 1 s

DISCLAIMER

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Latitude, Longitude: 38.270216, -122.275226

Date	7/6/2022, 10:50:57 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.013	MCE_R ground motion. (for 0.2 second period)
S_1	0.706	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.013	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.342	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.832	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.916	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.091	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.29	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.013	Factored deterministic acceleration value. (0.2 second)
S1RT	0.754	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.826	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.706	Factored deterministic acceleration value. (1.0 second)
PGAd	0.832	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.913	Mapped value of the risk coefficient at short periods
C_{R1}	0.913	Mapped value of the risk coefficient at a period of 1 s

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Building Envelope | Geotechnical | Environmental | Firestop Systems

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James Reeves
Director of Facilities
Napa Valley Community College District
2277 Napa Vallejo Highway
Napa, CA 94558

May 2, 2023

Subject: **Fourth Engineering Geology and Seismology Review for Napa Valley College – Wine Education Complex 2277 Napa Vallejo Hwy, Napa, CA CGS Application No. 01-CGS5656**

Dear Mr. Reeves:

In accordance with your request and transmittal of additional documents received on April 18, 2023, the California Geological Survey (CGS) has reviewed the engineering geology and seismology aspects of the consulting reports prepared for the subject project at Napa Valley College. It is our understanding that this project involves construction of the Wine Education Center which includes classrooms, laboratories, faculty offices, restrooms, and a wine tasting space for a combined footprint of 8,943 sq.ft. This review was performed in accordance with Title 24, California Code of Regulations, 2019 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following report for this additional review of the project:

> **Response to Third CGS Review, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California:** Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated April 18, 2023, 1 page, 1 attachment.

In addition, we previously reviewed the following reports:

> **Response to CGS Review, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California:** Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated February 22, 2023, 1 page, 3 attachments.
>
> **Response to CGS Review Comment 13, Geologic Hazards Study, Proposed Napa Valley College Viticulture Teaching Winery, 2277 Napa Vallejo Highway, Napa, California:** Allerion Consulting Group Inc., 1050 Melody Lane, suite 160, Roseville, CA, 95678, California; company Project No. 05-22040G, report dated January 20, 2023, 1 page.
>
> **Response to CGS Review, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California:** Signet Testing Labs, 3526 Breakwater

Court, Hayward, California; company File No. 2407-40, report dated January 20, 2023, 1 page.

Geological Hazards Study, Proposed Napa Valley College Viticulture Teaching Winery, 2277 Napa Vallejo Highway, Napa, California: Allerion Consulting Group Inc., 1050 Melody Lane, suite 160, Roseville, CA, 95678, California; company Project No. 05-22040G, report dated August 5, 2022, 18 pages, 3 appendices.

Geotechnical Engineering Investigation, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California: Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated August 5, 2022, 11 pages, 2 plates, 1 appendix.

CGS previously submitted our findings regarding this project in a third review letter dated April 10, 2023 in which the consultants were requested to provide revised liquefaction analysis data. In addition, the consultants were requested to report differential settlement in terms of the vertical settlement over a horizontal distance, or as an angular distortion, as is required in ASCE 7-16, Section 12.13.9.

Discussion of Liquefaction Analysis

The consultants previously presented two liquefaction results from two different campus locations: 1) a site located approximately 500 feet northwest of the proposed improvement (Building 3100) and, 2) the current site-specific improvement location. Results from the two sites yielded significantly different seismic settlement values; the site-specific analysis determined twice the seismic settlement as those calculated the neighboring site (Building 3100). This discrepancy between the liquefaction analyses indicates the site-specific boring data (B-3) is recommended to be the controlling analysis. Furthermore, CGS noted a typo within the input data for the field blow count and that historic high groundwater level was inconsistent with the depth recommended by Allerion Consultants.

In their most recent response letter, dated April 18, 2023, the consultants report that the site-specific boring data should be utilized as the controlling liquefaction analysis and seismic settlement values. Additionally, the consultants revised their liquefaction analysis to correct the typo and accurately represent the site conditions. They report a **total seismic settlement of 5.23 inches and differential seismic settlement of 3.48 inches over a distance of 50** feet based on their revised analysis, which appears reasonable. CGS notes the consultants did not state whether the proposed foundational design (shallow footings embedded into engineered fill) is adequate to mitigate reported seismic settlement values per ASCE 7-16, §12.13.9.

Review of Seismic Design Parameters

CGS noted the project's seismic parameters were not re-reviewed in our subsequent review letter following the confirmation of the Site Class by the consultants in their second response dated February 7, 2023. The consultants report the following parameters derived from a map-based analysis, which appear reasonable:

S_S = 2.013 and S_1 = 0.706
S_{DS} = 1.342 (and S_{D1} = 0.8, for the purpose of calculating T_s)
T_s was not provided but can be calculated as S_{D1}/S_{DS}

These seismic parameters are acceptable **provided that C_s is calculated as required in 11.4.8, Exception 2, and that $T<1.5T_S$.** If otherwise, then a site-specific ground motion hazard analysis should be prepared and submitted for CGS review.

Based on this fourth review, the consultants have now provided a sufficient evaluation of engineering geology and seismology issues with respect to the proposed improvements. The principal concerns identified by the consultants are the potential for strong ground shaking, liquefaction-induced seismic settlement, and indoor radon levels. **The consultants report a maximum seismic settlement of 5.23 inches and differential settlement to be 3.48 inches over 50 feet.** The consultants recommend design spectral acceleration parameter of **S_{DS} = 1.342*g***, which is considered reasonable provided that the provisions of Exception 2 in ASCE 7, Section 11.4.8, are applied in structural design. The consultants also **recommend testing the radon levels within the new building.**

In conclusion, ***the engineering geology and seismology issues at this site are adequately assessed in the referenced reports, and no further information is requested***. If you have any further questions about this review letter, please contact the primary reviewer at (650) 339-6460 or Tyler.Ladinsky@conservation.ca.gov.

Respectfully submitted,

Tyler Ladinsky
Engineering Geologist
PG 9299, CEG 2682

Concur:

Jennifer Thornburg
Senior Engineering Geologist
PG 5746, CEG 2240

Copies to:

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Allerion Consulting Group Inc., 1050 Melody Lane, suite 160, Roseville, CA 95678 California

Brock Campbell, *Registered Geotechnical Engineer*
Signet Testing Labs, 3526 Breakwater Court, Hayward, California

Carl Servais, *Architect*
520 3rd, Suite 250, Santa Rosa, CA 95401

Karen Van Dorn, *Senior Architect*
Division of State Architect, 1515 Clay Street, Suite 1201, Oakland, CA 94612

James Reeves
Director of Facilities
Napa Valley Community College District
2277 Napa Vallejo Highway
Napa, CA 94558

April 10, 2023

Subject: **Third Engineering Geology and Seismology Review for Napa Valley College – Wine Education Complex 2277 Napa Vallejo Hwy, Napa, CA CGS Application No. 01-CGS5656**

Dear Mr. Reeves:

In accordance with your request and transmittal of additional documents received on February 7, 2023, the California Geological Survey (CGS) has reviewed the engineering geology and seismology aspects of the consulting reports prepared for the subject project at Napa Valley College. It is our understanding that this project involves construction the Wine Education Center which includes classrooms, laboratories, faculty offices, restrooms, and a wine tasting space for a combined footprint of 8,943 sq.ft. This review was performed in accordance with Title 24, California Code of Regulations, 2019 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following report for this additional review of the project:

Response to CGS Review, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California: Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated February 22, 2023, 1 page, 3 attachments.

In addition, we previously reviewed the following reports:

Response to CGS Review Comment 13, Geologic Hazards Study, Proposed Napa Valley College Viticulture Teaching Winery, 2277 Napa Vallejo Highway, Napa, California: Allerion Consulting Group Inc., 1050 Melody Lane, suite 160, Roseville, CA, 95678, California; company Project No. 05-22040G, report dated January 20, 2023, 1 page.

Response to CGS Review, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California: Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated January 20, 2023, 1 page.

Geological Hazards Study, Proposed Napa Valley College Viticulture Teaching Winery, 2277 Napa Vallejo Highway, Napa, California: Allerion Consulting Group Inc.,

1050 Melody Lane, suite 160, Roseville, CA, 95678, California; company Project No. 05-22040G, report dated August 5, 2022, 18 pages, 3 appendices.

Geotechnical Engineering Investigation, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California: Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated August 5, 2022, 11 pages, 2 plates, 1 appendix.

CGS previously submitted our findings regarding this project in a second review letter dated February 14, 2023 in which the consultants were requested to provide supplemental liquefaction analysis data to substantiate their seismic settlement values. In addition, the consultants were requested to demonstrate their liquefaction analysis is relevant and applicable to the subsurface conditions at the proposed improvement site if they utilize borings from another location at the school campus.

Discussion of Liquefaction Analysis

The consultants report the site may be subject to liquefaction during an earthquake based on the presence of loose granular material between depths of 16 to 33 feet bgs. Subsequently the consultants reported seismic settlement values without providing supplemental materials of their liquefaction analysis. Additionally, they report their seismic settlement values and liquefaction analysis were based on a CPT completed for a prior project approximately 500 feet northwest of the proposed improvements.

In our second review letter CGS requested the consultants: 1) provide all pertinent liquefaction analysis data for CGS review including: seismic settlement and liquefaction calculations (or software output files), laboratory testing results, boring logs and respective boring locations and, 2) demonstrate the subsurface data is relevant and applicable to the subsurface conditions at the proposed improvement site, if the consultants utilize borings from another location at the school campus for their liquefaction analysis.

In their recent response letter, dated February 22, 2023, the consultants provided supplemental data from the previous liquefaction analysis performed for an adjacent site (Building 3100) on the campus and a site plan showing the approximate CPT locations. However, no scale was provided on the site plan; hence the estimated distance between the two project sites cannot be verified. In addition, the consultant also completed a site-specific liquefaction analysis based on boring B-3 from the currently proposed wine education complex.

Based on the supplemental data provided, the consultant's liquefaction analysis using the site-specific subsurface data (B-3) incorporated a seismic acceleration of 0.916g and earthquake magnitude of 7.0, which appear reasonable. **CGS notes preliminary seismic settlement results from the site-specific analysis are twice as those calculated from the CPT data at the neighboring site (Building 3100).** This discrepancy between the liquefaction analyses indicates the site-specific boring data (B-3) is recommended to be the controlling analysis.

In reviewing the consultant's liquefaction analysis of B-3, CGS noted an apparent typo in the input parameters for the field blow count data. Specifically, at the first liquefiable layer, 25' bgs, the field blow count is input by the consultant as 37. However, the reported field blow count (MCal 5A) from the boring logs is 27. **Hence it appears the reported seismic settlement values derived from calculations using this blow count value underestimate the liquefaction potential of this layer.** Additionally, it appears the consultants modeled the

historical high groundwater level to be 18 feet bgs, which is incongruent with the conclusion reported by Allerion Consulting Group (2022), which reports historical high groundwater is approximately 16 feet bgs.

Overall CGS recommends the following:

1. The discrepancy between the two liquefaction analyses, CPT 2-1 (Building 3100) and B-3, indicates the site-specific boring data (B-3) should be used to calculate the potential liquefaction settlement at this project site.
2. The consultants should revise their liquefaction analysis with the corrected field blow count data and historic high groundwater.
3. Report the total and differential seismic settlement for the project.
4. Differential settlement should be reported in terms of the vertical settlement over a horizontal distance, or as an angular distortion. Reporting in these terms is required in consideration of ASCE 7-16, Section 12.13.9.

Based on this third review, our concerns regarding seismic settlement and liquefaction for the proposed improvements are still not adequately addressed. Hence, additional information is requested as discussed above.

In conclusion, ***the engineering geology and seismology issues at this site are not adequately assessed in the referenced reports***. It is recommended that additional information be provided as requested in this letter. The consultants are reminded that all supplemental documents should include the CGS application number and should be uploaded directly to CGS at this link: https://www.conservation.ca.gov/cgs/upload-school. If you have any further questions about this review letter, please contact the primary reviewer at (650) 339-6460 or Tyler.Ladinsky@conservation.ca.gov.

Respectfully submitted,

Tyler Ladinsky
Engineering Geologist
PG 9299, CEG 2682

Concur:

Brian Olson
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PG 7923, CEG 2428

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Brock Campbell, *Registered Geotechnical Engineer*
Signet Testing Labs, 3526 Breakwater Court, Hayward, California

Carl Servais, *Architect*
520 3rd, Suite 250, Santa Rosa, CA 95401

Karen Van Dorn, *Senior Architect*
Division of State Architect, 1515 Clay Street, Suite 1201, Oakland, CA 94612

James Reeves
Director of Facilities
Napa Valley Community College District
2277 Napa Vallejo Highway
Napa, CA 94558

February 14, 2023

Subject: **Second Engineering Geology and Seismology Review for Napa Valley College – Wine Education Complex 2277 Napa Vallejo Hwy, Napa, CA CGS Application No. 01-CGS5656**

Dear Mr. Reeves:

In accordance with your request and transmittal of additional documents received on February 7, 2023, the California Geological Survey (CGS) has reviewed the engineering geology and seismology aspects of the consulting reports prepared for the subject project at Napa Valley College. It is our understanding that this project involves construction the Wine Education Center which includes classrooms, laboratories, faculty offices, restrooms, and a wine tasting space for a combined footprint of 8,943 sq.ft. This review was performed in accordance with Title 24, California Code of Regulations, 2019 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following report for this additional review of the project:

Response to CGS Review Comment 13, Geologic Hazards Study, Proposed Napa Valley College Viticulture Teaching Winery, 2277 Napa Vallejo Highway, Napa, California: Allerion Consulting Group Inc., 1050 Melody Lane, suite 160, Roseville, CA, 95678, California; company Project No. 05-22040G, report dated January 20, 2023, 1 page.

Response to CGS Review, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California: Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated January 20, 2023, 1 page.

In addition, we previously reviewed the following reports:

Geological Hazards Study, Proposed Napa Valley College Viticulture Teaching Winery, 2277 Napa Vallejo Highway, Napa, California: Allerion Consulting Group Inc., 1050 Melody Lane, suite 160, Roseville, CA, 95678, California; company Project No. 05-22040G, report dated August 5, 2022, 18 pages, 3 appendices.

Geotechnical Engineering Investigation, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California: Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated August 5, 2022, 11 pages, 2 plates, 1 appendix.

CGS previously submitted our findings regarding this project in a review letter dated December 14, 2022 in which the consultants were requested to provide a rationale for their Site Class determination as per ASCE 7-16 Section 20.3.3 and Table 20.3-1. In addition, further information was requested to adequately characterize the potential liquefaction and seismic settlement hazard.

Discussion of Site Class

In their initial report, the consultants classified the site soil profile as Site Class D, Stiff Soil. However, the consultants did not provide a rationale for their Site Class determination as per ASCE 7-16 Section 20.3.3 and Table 20.3-1; hence, CGS requests the consultants provide a rationale for the Site Class determination per ASCE 7-16.

In their response letter, Allerion reports the Site Class determination is based on the average field standard penetration resistance which is consistent with Site Class D per ASCE 7-16 Table 20.3-1. CGS notes that Table 20.3-1 references ASTM D1586 in which blow count values should be converted to the equivalent SPT blow counts for the standard 2 inch diameter SPT sampler. Hence the blow count data provided by the consultants need to be converted based on the reference sampler utilized (modified cal sampler). Overall, the consultants site class determination appears reasonable based on the blow count data provided. In the future, the consultants should discuss the converted the blow count data since the samplers are larger than 2 -inch diameter (modified cal sampler) to be consistent with ASCE 7-16 Table 20.3-1 and ASTM D1586.

Discussion of Liquefaction Analysis

Previously CGS noted the consultants report the site may be subject to liquefaction during an earthquake based on the presence of loose granular material between depths of 16 to 33 feet bgs. However, no liquefaction analysis was provided for CGS to review. Therefore, CGS requested the consultants to provide a liquefaction and seismic settlement analysis for the proposed improvements.

In their response letter, Signet Testing Labs report liquefaction settlement values based on another project at Napa Valley College located about 500 feet northwest of the project site. **However, the consultants did not discuss whether the subsurface materials between the projects are similar or provide corroborative data (i.e borings logs). Further, no liquefaction or seismic settlement output results were provided.** Therefore, **CGS does not consider the liquefaction analysis and seismic settlement values to be adequate** and requests the consultants provide all pertinent liquefaction analysis data for CGS review including: seismic settlement and liquefaction calculations (or software output files), laboratory testing results, boring logs and respective boring locations. If the consultants utilize borings from another location at the school campus for their liquefaction analysis, the consultants should demonstrate the subsurface data is relevant and applicable to the subsurface conditions at the proposed improvement site.

In addition, the consultants should report total and differential settlement. And differential settlement should be reported in terms of the vertical settlement over a horizontal distance, or as an angular distortion. Reporting in these terms is required in consideration of ASCE 7-16, Section 12.13.9.

Based on this second review, the consultants have provided a rationale for their Site Class determination. However, our concerns regarding seismic settlement and liquefaction for the proposed improvements are still not adequately addressed. Hence, additional information is requested as discussed above.

In conclusion, ***the engineering geology and seismology issues at this site are not adequately assessed in the referenced reports***. It is recommended that additional information be provided as requested in this letter. The consultants are reminded that all supplemental documents should include the CGS application number, and should be uploaded directly to CGS at this link: https://www.conservation.ca.gov/cgs/upload-school. If you have any further questions about this review letter, please contact the primary reviewer at (650) 339-6460 or Tyler.Ladinsky@conservation.ca.gov.

Respectfully submitted,

Tyler Ladinsky
Engineering Geologist
PG 9299, CEG 2682

Concur:

Jennifer Thornburg
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520 3rd, Suite 250, Santa Rosa, CA 95401

Karen Van Dorn, *Senior Architect*
Division of State Architect, 1515 Clay Street, Suite 1201, Oakland, CA 94612

James Reeves
Director of Facilities
Napa Valley Community College District
2277 Napa Vallejo Highway
Napa, CA 94558

December 14, 2022

Subject: **Engineering Geology and Seismology Review for Napa Valley College – Wine Education Complex 2277 Napa Vallejo Hwy, Napa, CA CGS Application No. 01-CGS5656**

Dear Mr. Reeves:

In accordance with your request and transmittal of documents received on October 28, 2022, the California Geological Survey (CGS) has reviewed the engineering geology and seismology aspects of the consulting report prepared for the subject project at Napa Valley College. It is our understanding that this project involves construction the Wine Education Center which includes classrooms, laboratories, faculty offices, restrooms, and a wine tasting space for a combined footprint of 8,943 sq.ft. This review was performed in accordance with Title 24, California Code of Regulations, 2019 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following report:

Geological Hazards Study, Proposed Napa Valley College Viticulture Teaching Winery, 2277 Napa Vallejo Highway, Napa, California: Allerion Consulting Group Inc., 1050 Melody Lane, suite 160, Roseville, CA, 95678, California; company Project No. 05-22040G, report dated August 5, 2022, 18 pages, 3 appendices.

Geotechnical Engineering Investigation, Proposed Wine Education Complex, Napa Valley College, 2277 Napa Vallejo Highway, Napa, California: Signet Testing Labs, 3526 Breakwater Court, Hayward, California; company File No. 2407-40, report dated August 5, 2022, 11 pages, 2 plates, 1 appendix.

Based on our review, the data and reports presented by Allerion Consulting Group and Signet Testing Labs, have not adequately addressed the seismic and geologic issues of the site. Specifically, the consultants' conclude the project site may be subject to liquefaction during an earthquake; however, no liquefaction analysis and seismic settlement values were provided. Additional information is provided in the attached Checklist Comments.

In conclusion, ***the engineering geology and seismology issues at this site are not adequately assessed in the referenced reports***. It is recommended that additional information be provided as requested in the attached Note 48 Checklist Review Comments portion of this letter. The consultants are reminded that one copy of all supplemental documents should be submitted, should include the CGS application number, and should be uploaded directly to CGS at this link: https://www.conservation.ca.gov/cgs/upload-school. If you have any further questions about this review letter, please contact the primary reviewer at (650) 339-6460 or Tyler.Ladinsky@conservation.ca.gov

Respectfully submitted,

Tyler Ladinsky
Engineering Geologist
PG 9299, CEG 2682

Concur:

Jennifer Thornburg
Senior Engineering Geologist
PG 5476, CEG 2240

Enclosures:

Note 48 Checklist Review Comments
Keyed to: *Note 48 - Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings*

Copies to:

Curtis "Ed" Hendrick, *Certified Engineering Geologist*,
Allerion Consulting Group Inc., 1050 Melody Lane, suite 160, Roseville, CA 95678 California

Bruce Hicks, *Registered Geotechnical Engineer*
Signet Testing Labs, 3526 Breakwater Court, Hayward, California

Carl Servais, *Architect*
520 3rd, Suite 250, Santa Rosa, CA 95401

Karen Van Dorn, *Senior Architect*
Division of State Architect, 1515 Clay Street, Suite 1201, Oakland, CA 94612

Note 48 Checklist Review Comments

In the numbered paragraphs below, this review is keyed to the paragraph numbers of California Geological Survey Note 48 (November, 2019 edition), *Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings.*

Project Location

1. Site Location Map, Street Address, County Name: Adequately addressed.
2. Plot Plan with Exploration Data with Building Footprint: Adequately addressed.
3. Site Coordinates: Adequately addressed. Latitude and Longitude provided in report: 38.270216°N, 122.275226°W

Engineering Geology/Site Characterization

4. Regional Geology and Regional Fault Maps: Adequately addressed.
5. Geologic Map of Site: Not addressed by consultants, and therefore not reviewed.
6. Geologic Hazard Zones: Adequately addressed. The consultants report the site is not located within an Alquist-Priolo Earthquake Fault zone. Currently, no hazard zonation map has been released by CGS to date for the Napa Quadrangle. Hence, the site should not be precluded from the possibility of being impacted by liquefaction or seismically induced landsliding.
7. Subsurface Geology: Adequately addressed. The consultants report the onsite soils are composed of alluvial deposits that predominately consist of sand, sandy clay, and clay. Their subsurface investigation was completed by MatriScope Engineering Laboratories and included three hollow-stem borings (B1, B2, B3) to a maximum depth of 51.5 below ground surface (bgs). Groundwater was encountered in boring B3 at a depth of 20 feet bgs.
8. Geologic Cross Sections: Adequately addressed.
9. Geotechnical Testing of Representative Samples: Marginally addressed.
10. Consideration of Geology in Geotechnical Engineering Recommendations: Adequately addressed. **The consultants recommend the proposed buildings be supported on shallow footings embedded into engineered fill**.
11. Conditional Geotechnical Topics: Not applicable.

Seismology & Calculation of Earthquake Ground Motion

12. Evaluation of Historic Seismicity: Adequately addressed. The consultants provide a summary of historical seismicity in the region.
13. Classify the Geologic Subgrade (Site Class): **Additional information is requested**. The consultants classify the site soil profile as Site Class D, Stiff Soil. **However, the consultants did not provide a rationale for their Site Class determination as per ASCE 7-16 Section 20.3.3 and Table 20.3-1**. Therefore, CGS requests the consultants provide a rationale for the Site Class determination per ASCE 7-16.
14. General Procedure Ground Motion Analysis: Additional information may be needed. The consultants report the following parameters derived from a map-based analysis, which appear reasonable:
    S_S = 2.013 and S_1 = 0.706
15. Site-Specific Ground Motion Hazard Analysis: Not applicable.

16. Deaggregated Seismic Source Parameters: Not applicable.
17. Time Histories of Earthquake Ground Motion: Not applicable.

Fault Rupture Hazard Evaluation

18. Active Faulting & Coseismic Deformation Across Site: Adequately addressed. The consultants report they found no evidence indicative of surface fault rupture during their site reconnaissance. Overall, they conclude the potential for fault rupture or damage from fault displacement below the site is considered very low. Their conclusion appears reasonable based on the data presented.

Liquefaction/Seismic Settlement Analysis

19. Geologic Setting for Occurrence of Liquefaction: Adequately addressed. Allerion Consulting Group report the site may be subject to liquefaction during an earthquake based on the presence of loose granular material between depths of 16 to 33 feet bgs. Additionally, they estimate historical high groundwater to be 16 feet bgs. Overall, their conclusions appear reasonable based on the data presented.
20. Seismic Settlement Calculations: **Additional information is requested**. Allerion Consulting report the liquefaction analysis and corresponding seismic settlement calculations were to be provided by Matriscope's geotechnical report. **However, no such geotechnical report or liquefication analysis was provided for CGS to review.** Therefore, CGS requests the consultants provide a liquefaction analysis for the proposed improvements.
21. Other Liquefaction Effects: Additional information may be needed.
22. Mitigation Options for Liquefaction/Seismic Settlement: Additional information may be needed.

Slope Stability Analysis

23. Geologic Setting for Occurrence of Landslides: Adequately addressed. The consultants report they did not observe any features indicative of slope instability during their site reconnaissance, and they consider the potential for slope instability to be negligible. Their conclusion appears reasonable based on the data presented.
24. Determination of Static and Dynamic Strength Parameters: Not applicable.
25. Determination of Pseudo-Static Coefficient (K_{eq}): Not applicable.
26. Identify Critical Slip Surfaces for Static and Dynamic Analyses: Not applicable.
27. Dynamic Site Conditions: Not applicable.
28. Mitigation Options for Landsliding/Other Slope Failure: Not applicable.

Other Geologic Hazards or Adverse Site Conditions

29. Expansive Soils: Marginally addressed. The consultants report that the surficial soils are considered to have a low to moderate expansion potential based on a visual inspection and their experience at other campus locations. CGS notes no laboratory data was completed to assess soil plasticity of the project site. In the future, CGS recommends the consultants provide pertinent laboratory testing results.

30. Corrosive/Reactive Geochemistry of the Geologic Subgrade: Marginally addressed. The consultants report that the sulfate concertation of the onsite soils is low and not a concern based on laboratory testing. While the consultants completed corrosivity laboratory testing as well, no recommendations or conclusions were provided. In the future, CGS recommends the consultants providing conclusions from the laboratory results.
31. Conditional Geologic Assessment: Selected geologic hazards addressed by the consultant are listed below:
    E. Radon Gas: Adequately addressed. **The consultants recommend testing the radon levels within the new building** based on their review of the California Department of Public Health's databased of indoor air radon levels within the project region.

Report Documentation

32. Geology, Seismology, and Geotechnical References: Adequately addressed.
33. Certified Engineering Geologist: Adequately addressed.
    Curtis Hendrick, Certified Engineering Geologist #2021
34. Registered Geotechnical Engineer: Adequately addressed.
    Brock Campbell, Registered Geotechnical Engineer #2995

April 11, 2023 **File No.: 2407-40**

Ms. Samantha Maddox
Napa Valley College
2277 Napa-Vallejo Hwy
Napa, CA 94558

Subject: **Response to CGS Review**
Proposed Wine Education Complex
Napa Valley College
Napa, CA 94558
CGS Application No. 01-CGS5656

Reference: **Geotechnical Engineering Investigation dated August 5, 2022**
Response to CGS Review dated January 20, 2023
Response to CGS Review dated February 22, 2023

Dear Ms. Maddox:

The California Geological Survey (CGS) prepared a Third Engineering Geology and Seismology Review for the subject project dated April 10, 2023. The following is a response to the comments regarding the referenced geotechnical investigation report and response letter.

Discussion of Liquefaction Analysis: The soils encountered in the Cone Penetration Tests (CPT) performed for CGS Application No. 01-CGS5290 were accepted by CGS as similar to the soils encountered in the borings for the subject project however, the liquefaction settlement calculated based on the boring for this project is larger and should be the controlling settlement. The groundwater level and blow counts for the boring have been revised in the calculation spreadsheet to accurately represent the site conditions. The total calculated liquefaction settlement at the site is 5.23 inches and the differential settlement is 3.48 inches. A revised spreadsheet detailing liquefaction settlement calculation for the site based on boring B-3 is attached.

Thank you for the opportunity of continuing to provide our services for this project. If you have questions regarding this report, please contact our office.

Respectfully Submitted,
Signet Testing Laboratories, Inc.

Brock Campbell

Brock Campbell, PE, GE
Engineering Manager

REGISTERED PROFESSIONAL ENGINEER
BROCK ELAN CAMPBELL
No. 2995
GEOTECHNICAL
STATE OF CALIFORNIA

Attachments **Liquefaction Settlement Calculation**

Project Name - Wine Education Complex, Napa Valley College, Napa, CA By: Brock Campbell Job No. 2407-40 Date: 4/11/23

LIQUEFACTION ANALYSIS FOR BORING B3

Liquefaction analysis is performed following Seed's Procedure

a_{max} = 0.916 g (Peak Ground Acceleration)

References: G.R. Martin & M. Lew (1999) / I.M. Idriss and R.W. Boulanger (2008)

M_W = 7.00

$(N_1)_{60} = N_m C_N C_E C_B C_R C_S$ $(N_1)_{60,CS} = \alpha+\beta(N_1)_{60}$

Corrected cyclic resisting ratio (CRR_M) = $CRR_{7.5\ 1\ atm}$ x MSF x K_σ

where:

where: MSF = Magnitude Scaling Factor 1.19

C_N = Correction fo overburden pressure = $(P_a/\sigma'_{vo})^{0.5}$, where P_a = 1.044 tsf; CN<=2

K_σ = Correction factor for high overburden pressure

C_E = Emean/E60 = Correction for Energy Ratio to correct to standard 60% Energy

$CRR_{7.5\ 1\ atm}$ = CRR for magnitude 7.5 earthquakes and σ'v at 1 atm.

C_B = Correction for borehole diameter; C_R = Correction for Rod Length; C_S = Correction for sampling method

Borehole 8 in C_B = 1.15

C_E = 1.05

Cs = 1.0

Induced cyclic stress ratio (CSR_M) = 0.65 x a_{max} x σv x r_d / σ'v

where: r_d = stress reduction factor

ΔN = SPT blow counts correction for silty sand (based on estimated percentage of fines)

Factor of Safety (FS) = CRR_M / CSR_M

Lateral Displacement (YES/NO) = NO

Acceptable Factor of Safety = 1.3

Surcharge on top of the ground = 0 psf 0 =top of ground el. -16 =water table El. (worst case est.)

BASE OF LAYER ELEV. (ft.)	TOP OF LAYER ELEV. (ft.)	SOIL TYPE	LIQUEF. SOIL? (YES/NO)	FINES (%)	LAYER THICK-NESS (ft.)	TOTAL UNIT WEIGHT (pcf)	TOTAL PRESS. (tsf)	EFFEC. PRESS. (tsf)	DEPTH BELOW GROUND (ft)	OVER-BURDON CORRECT C_N	SAMPLER TYPE 1=SPT 2=MC	FIELD BLOW COUNT N_m	C_R	CORR. BLOW COUNT $(N_1)_{60}$	CORR. BLOW COUNT $(N_1)_{60,CS}$	$CRR_{7.5}$	STRESS REDUC. COEFF. r_d	OVER-BURDEN CORR. K_σ	CSR_M	FACTOR OF SAFETY FS
-5	0	CL	NO		5.0	126	0.16	0.16	2.50	2.00	2	36	0.75	N/P	N/P	N/P	0.994	1.00	0.592	ABOVE GW
-7.5	-5	CL	NO		2.5	110	0.38	0.38	6.25	1.65	2	44	0.75	N/P	N/P	N/P	0.985	1.00	0.587	ABOVE GW
-15	-7.5	SP-SC	NO		7.5	118	0.67	0.67	11.25	1.24	2	32	0.75	N/P	N/P	N/P	0.974	1.00	0.580	ABOVE GW
-18	-15	SP-SC	YES	10	3.0	120	0.99	0.94	16.50	1.05	2	45	0.85	31	32	0.500	0.962	1.00	0.601	0.99
-25	-18	SC	YES	20	7.0	120	1.29	1.08	21.50	0.98	2	27	0.95	19	24	0.272	0.950	0.99	0.672	0.48
-30	-25	SC	YES	17	5.0	120	1.65	1.26	27.50	0.91	2	12	0.95	8	11	0.123	0.936	0.96	0.730	0.19
-33	-30	SP	YES	12	3.0	120	1.89	1.37	31.50	0.87	2	28	0.95	18	20	0.214	0.918	0.95	0.752	0.32
-40	-33	SP-SC	YES	12	7.0	120	2.19	1.51	36.50	0.83	2	100	1.00	63	67	0.500	0.877	0.93	0.753	0.73
-42	-40	SP-SC	YES	5	2.0	120	2.46	1.64	41.00	0.80	2	41	1.00	25	25	0.280	0.840	0.91	0.747	0.41
-47	-42	CL	NO	70	5.0	115	2.66	1.74	44.50	0.77	2	68	1.00	N/P	N/P	N/P	0.812	0.90	0.739	NOT LIQ
-51.5	-47	CL	NO	70	4.5	115	2.93	1.86	49.25	0.75	2	55	1.00	N/P	N/P	N/P	0.773	0.89	0.724	NOT LIQ

BASE OF LAYER ELEV. (ft.)	TOP OF LAYER ELEV. (ft.)	SOIL TYPE	LAYER THICK-NESS (ft.)	CORRECT BLOW COUNT $(N_1)_{60,CS}$	FACTOR OF SAFETY FS	DRY SAND SHEAR STRAIN γ_c	LIMITING SHEAR STRAIN γ_{min}	PARA-METER Fσ	MAX SHEAR STRAIN γ_{max}	LDI (ft)	VERTICAL VOL. STRAIN	SETT. (in)	SOIL LIQ?
-5	0	CL	5.0	N/P	ABOVE GW	0.00E+00	N/P	N/P	N/P	N/P	0.000E+00	0.000	NO
-7.5	-5	CL	2.5	N/P	ABOVE GW	0.00E+00	N/P	N/P	N/P	N/P	0.000E+00	0.000	NO
-15	-7.5	SP-SC	7.5	N/P	ABOVE GW	0.00E+00	N/P	N/P	N/P	N/P	0.000E+00	0.000	NO
-18	-15	SP-SC	3.0	32	0.99	N/P	0.034	-0.241	0.034	N/P	6.243E-03	0.225	YES
-25	-18	SC	7.0	24	0.48	N/P	0.097	0.274	0.097	N/P	1.946E-02	1.635	YES
-30	-25	SC	5.0	11	0.19	N/P	0.406	0.880	0.406	N/P	3.453E-02	2.072	YES
-33	-30	SP	3.0	20	0.32	N/P	0.163	0.530	0.163	N/P	2.326E-02	0.837	YES
-40	-33	SP-SC	7.0	67	0.73	N/P	0.000	-3.005	0.000	N/P	0.000E+00	0.000	YES
-42	-40	SP-SC	2.0	25	0.41	N/P	0.090	0.241	0.090	N/P	1.906E-02	0.458	YES
-47	-42	CL	5.0	N/P	NOT LIQ	N/P	0.000	0.948	0.000	N/P	0.000E+00	0.000	NO
-51.5	-47	CL	4.5	N/P	NOT LIQ	N/P	0.000	0.948	0.000	N/P	0.000E+00	0.000	NO

Volumetric Strain Ratio, CN= 0.90
(For Dry Sand)

Estimated Total Seismic Induced Settlement = 5.23 inches

Estimated Differential Seismic Induced Settlem = 3.48 inches

Estimated Lateral Displacement Index = 0.00 ft

SIGNET Testing Labs

February 22, 2023 **File No.: 2407-40**

Ms. Samantha Maddox
Napa Valley College
2277 Napa-Vallejo Hwy
Napa, CA 94558

Subject: **Response to CGS Review**
Proposed Wine Education Complex
Napa Valley College
Napa, CA 94558
CGS Application No. 01-CGS5656

Reference: **Geotechnical Engineering Investigation dated August 5, 2022**
Response to CGS Review dated January 20, 2023

Dear Ms. Maddox:

The California Geological Survey (CGS) prepared a Second Engineering Geology and Seismology Review for the subject project dated February 14, 2023. The following is a response to the checklist comments regarding the referenced geotechnical investigation report and response letter.

Discussion of Liquefaction Analysis: The soils encountered in the Cone Penetration Tests (CPT) performed for CGS Application No. 01-CGS5290 were accepted by CGS as similar to the soils encountered in the borings for the subject project. A spreadsheet detailing liquefaction settlement calculations for the site based on borings and CPT are attached.

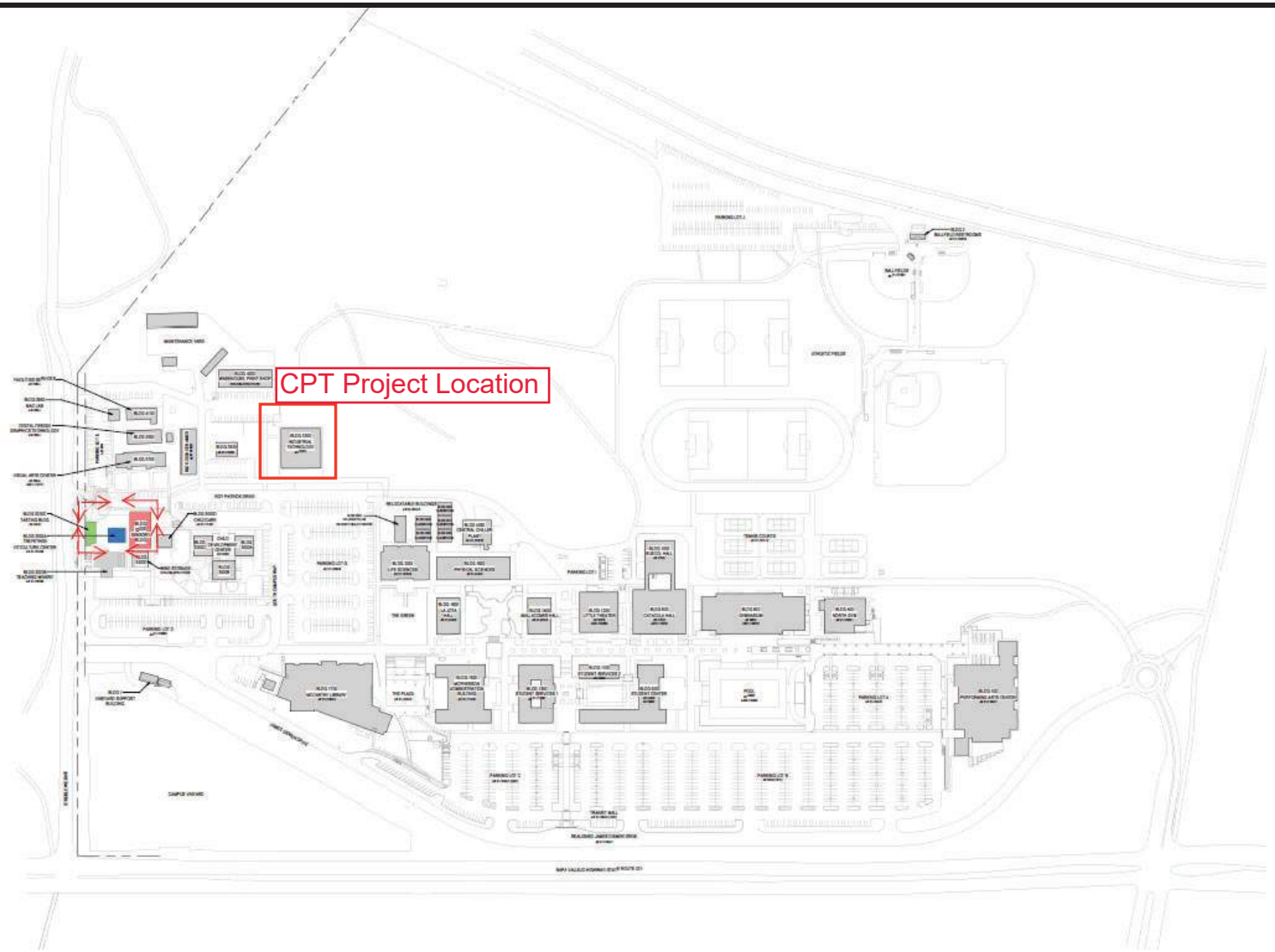
Thank you for the opportunity of continuing to provide our services for this project. If you have questions regarding this report, please contact our office.

Respectfully Submitted,
Signet Testing Laboratories, Inc.

Brock Campbell

Brock Campbell, PE, GE
Engineering Manager

Attachments **Site Plan with CPT Locations**
CPT Data
Liquefaction Settlement Calculations



Exploration Location

SIGNET Testing Labs
3256 Breakwater Ct
Hayward, CA 94545
Phone: (510) 887-8484
Fax: (510) 259-1068
www.signettesting.com

Project No.:	2407-40
Project Name:	Proposed Wine Education Center Napa Valley College
Location:	2277 Napa-Vallejo Highway, Napa, CA 94558
Date:	07/06/2022

Plate
1

Terraphase Engineering Inc
1300 Clay Street, Suite 1000
Oakland, California 94612
http://www.terraphase.com

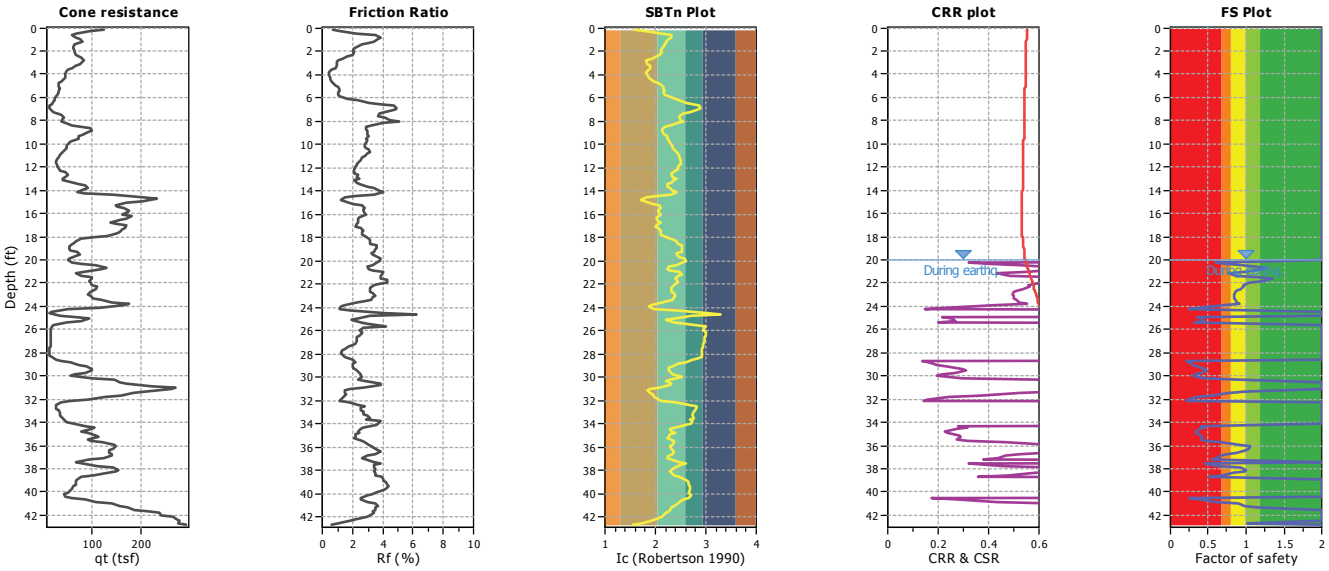
LIQUEFACTION ANALYSIS REPORT

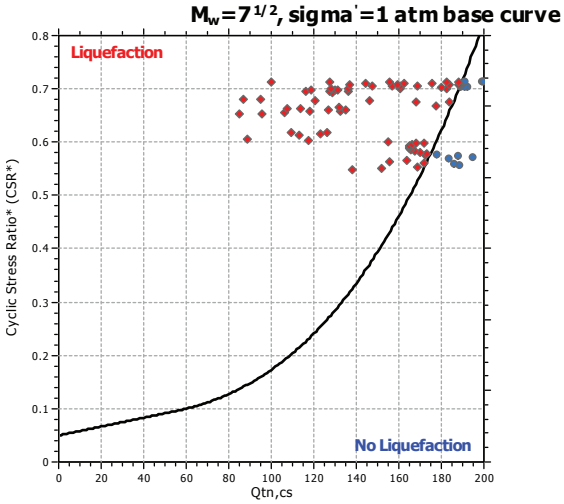
Project title : Napa Valley College Building 3100 **Location : Napa, California**

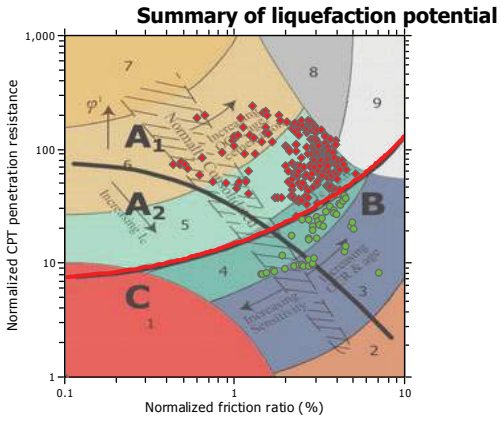
CPT file : CPT-2-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	20.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	20.00 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:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	1.01	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

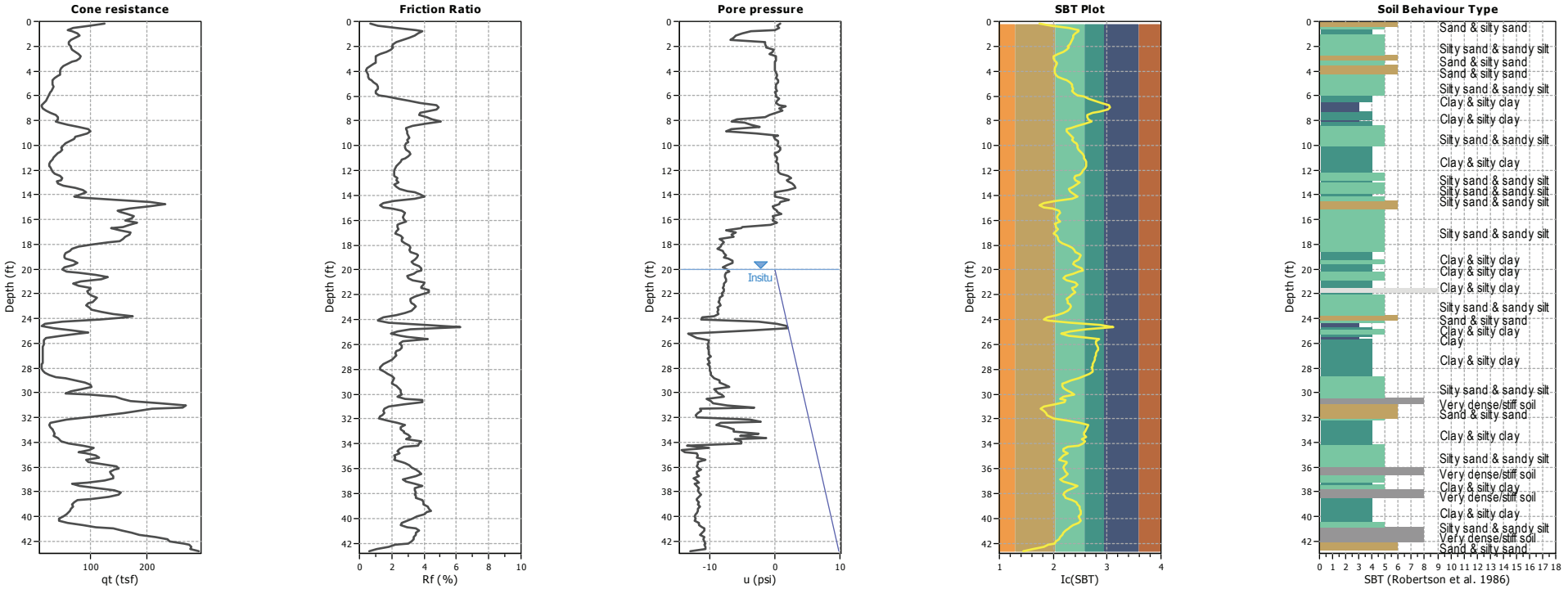






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



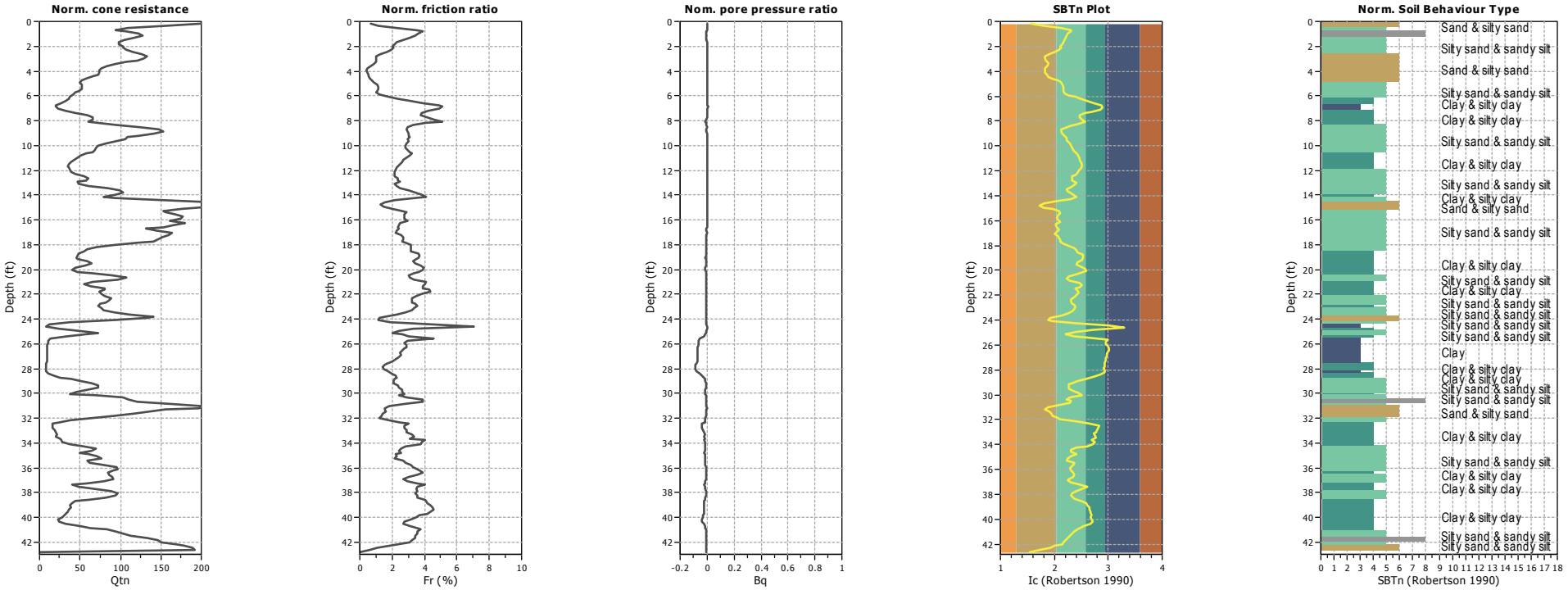
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.01	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	20.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



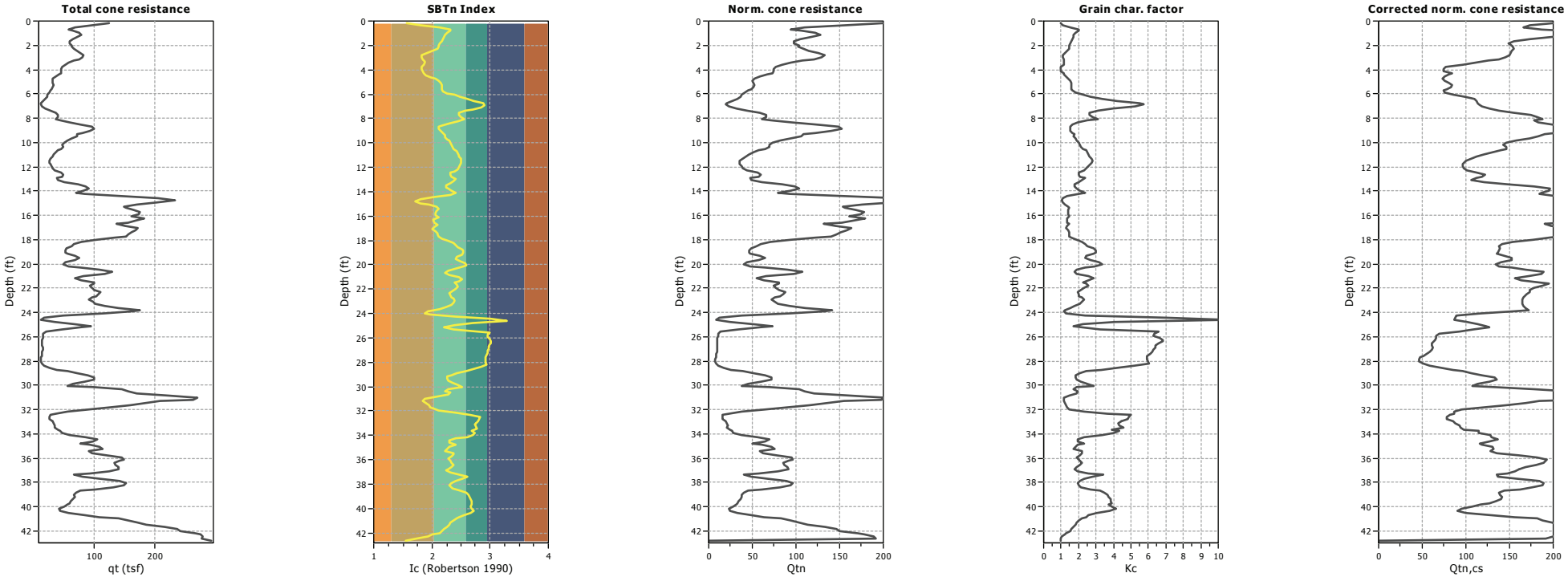
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.01	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	20.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

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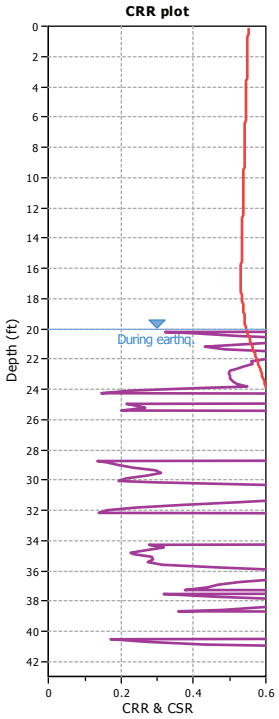
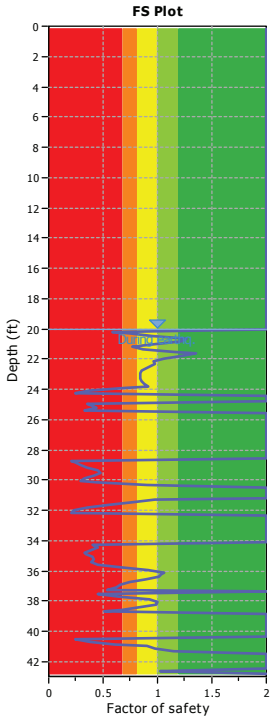
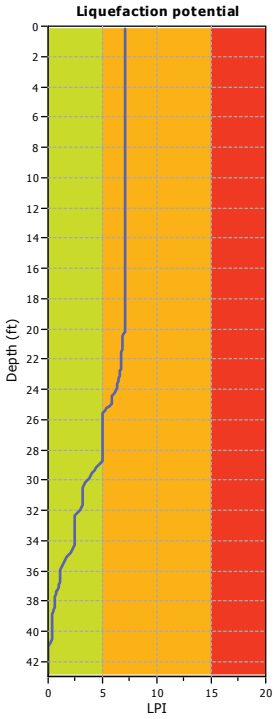
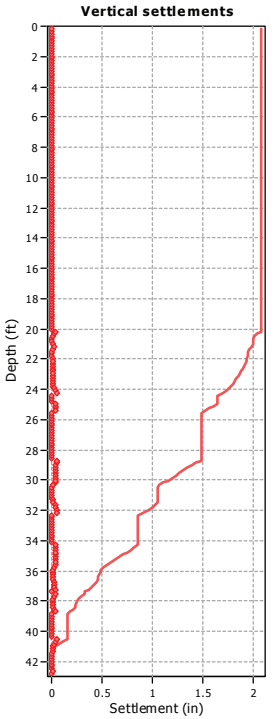
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.01	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	20.00 ft	Fill height:	N/A	Limit depth:	N/A

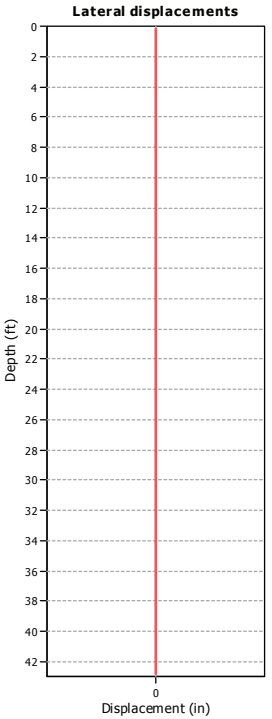
Liquefaction analysis overall plots











Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.01	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	20.00 ft	Fill height:	N/A	Limit depth:	N/A

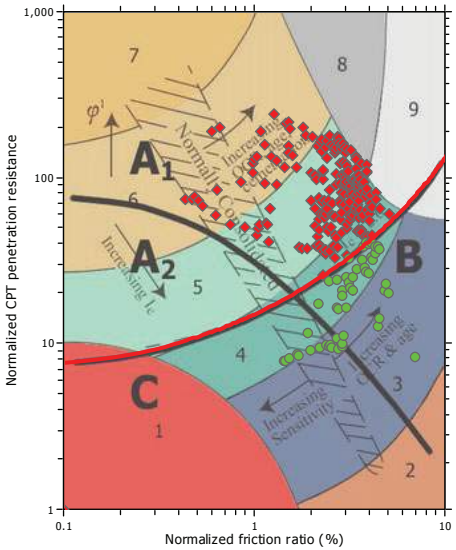
F.S. color scheme

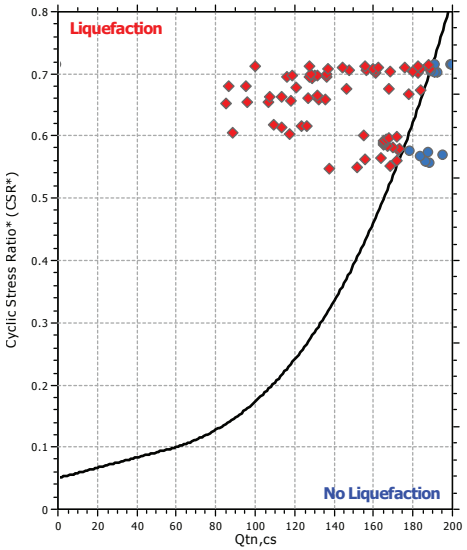
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

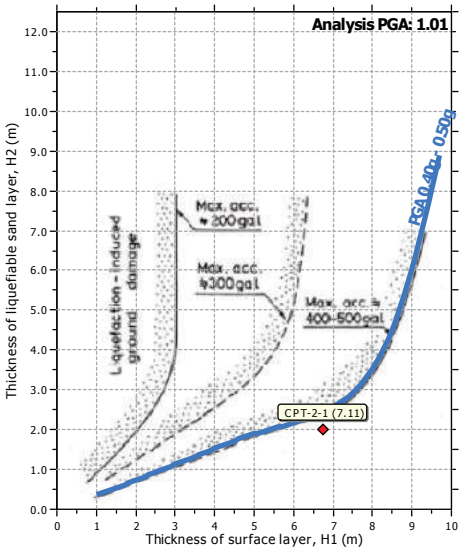
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



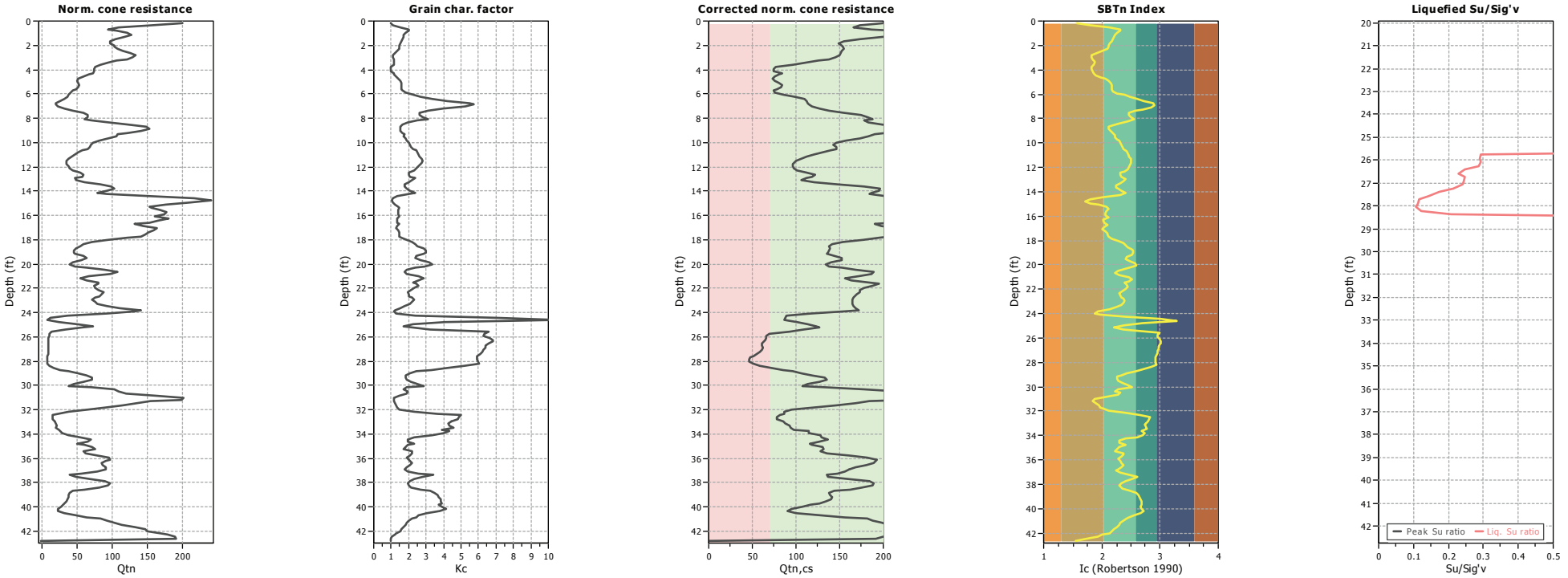




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.01	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	20.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.01	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	20.00 ft	Fill height:	N/A	Limit depth:	N/A

:: Field input data ::

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	0.16	138.96	0.69	0.77	3.84	120.63
2	0.33	94.72	1.10	0.34	8.17	122.13
3	0.49	58.33	1.51	0.74	16.88	123.87
4	0.66	51.06	2.11	0.01	22.97	125.35
5	0.82	65.71	2.46	-3.77	23.04	127.37
6	0.98	81.78	3.11	-5.11	20.95	128.30
7	1.15	80.65	2.75	-6.05	19.76	128.32
8	1.31	77.20	2.36	-6.32	19.27	126.58
9	1.48	60.85	1.57	-6.80	18.79	124.58
10	1.64	58.74	1.33	-1.45	17.83	122.72
11	1.80	63.37	1.28	-1.48	17.07	122.11
12	1.97	60.10	1.24	-1.38	16.17	122.41
13	2.13	69.71	1.41	-1.33	16.42	122.53
14	2.30	62.63	1.35	-0.09	15.48	122.62
15	2.46	69.72	1.23	-0.33	13.35	121.97
16	2.63	83.22	1.00	-0.77	10.74	121.08
17	2.79	82.39	0.85	0.16	8.72	119.96
18	2.95	83.62	0.74	0.11	8.67	119.36
19	3.12	75.80	0.82	0.23	9.03	118.56
20	3.28	66.68	0.65	0.03	10.00	117.40
21	3.45	57.59	0.50	0.01	10.07	115.05
22	3.61	51.75	0.34	-0.07	9.40	111.89
23	3.77	47.31	0.16	0.01	5.00	109.01
24	3.94	45.03	0.19	0.05	5.00	107.85
25	4.10	46.43	0.25	0.12	5.00	108.44
26	4.27	47.28	0.21	0.26	9.35	108.91
27	4.43	43.31	0.24	0.30	10.26	108.47
28	4.59	36.27	0.23	0.17	12.46	108.30
29	4.76	30.99	0.23	0.48	14.72	108.45
30	4.92	31.51	0.28	0.51	16.51	109.37
31	5.09	32.00	0.33	0.12	17.54	110.96
32	5.25	33.90	0.42	0.22	17.90	111.75
33	5.41	33.83	0.38	0.15	18.26	111.60
34	5.58	29.76	0.32	0.26	18.01	110.30
35	5.74	28.85	0.26	0.02	18.84	109.28
36	5.91	26.24	0.28	0.19	21.17	109.60
37	6.07	23.12	0.38	0.22	25.92	111.37
38	6.23	22.16	0.54	0.63	30.06	113.43
39	6.40	24.13	0.69	0.32	35.72	114.37
40	6.56	15.36	0.68	0.15	41.81	114.04
41	6.73	11.96	0.57	0.68	50.63	113.20
42	6.89	12.51	0.64	1.66	52.13	113.13
43	7.05	13.92	0.68	0.66	48.98	114.17
44	7.22	17.19	0.77	1.19	40.26	116.27
45	7.38	29.54	1.04	0.24	33.67	118.69
46	7.55	36.73	1.31	-0.88	29.34	121.41
47	7.71	45.36	1.77	-1.53	29.43	123.33
48	7.87	42.91	2.08	-5.79	30.76	123.86

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	8.04	35.71	1.72	-6.77	33.59	123.96
50	8.20	36.15	1.99	-4.63	28.42	123.85
51	8.37	61.57	1.71	-3.64	22.20	125.21
52	8.53	82.13	2.20	-2.31	18.29	126.85
53	8.69	89.28	2.86	-6.78	16.50	128.80
54	8.86	116.86	3.18	-7.52	16.56	129.44
55	9.02	95.03	2.83	-2.92	17.38	128.79
56	9.19	67.33	2.31	0.45	18.78	127.49
57	9.35	79.99	2.16	-0.16	20.13	126.57
58	9.51	69.56	2.21	0.05	19.82	126.09
59	9.68	64.87	1.91	0.47	21.30	125.13
60	9.84	56.58	1.60	0.57	22.19	123.53
61	10.01	46.80	1.29	0.41	23.17	122.35
62	10.17	48.28	1.34	0.90	23.79	121.95
63	10.34	50.35	1.43	0.90	24.34	122.31
64	10.50	47.61	1.48	0.57	25.64	122.16
65	10.66	40.93	1.32	0.05	27.60	121.27
66	10.83	35.09	1.10	-0.01	28.52	119.98
67	10.99	35.79	0.96	0.26	29.08	118.60
68	11.16	31.19	0.83	0.33	29.29	117.40
69	11.32	28.33	0.71	0.22	30.54	116.17
70	11.48	26.51	0.65	0.43	31.01	115.19
71	11.65	26.01	0.60	0.57	30.72	114.77
72	11.81	27.70	0.61	0.47	29.96	114.92
73	11.98	29.65	0.66	0.55	28.84	115.23
74	12.14	31.11	0.64	0.57	27.93	115.70
75	12.30	33.31	0.69	0.89	26.37	116.91
76	12.47	42.10	0.93	1.96	23.43	119.39
77	12.63	61.12	1.30	2.44	23.43	120.84
78	12.80	45.47	1.23	1.79	23.92	120.43
79	12.96	36.64	0.78	1.96	26.91	118.93
80	13.12	36.76	0.86	2.63	25.19	118.37
81	13.29	49.75	0.99	3.08	23.02	121.16
82	13.45	69.95	1.70	3.17	20.20	125.08
83	13.62	100.54	2.73	1.97	20.71	128.13
84	13.78	90.02	3.35	-0.04	21.83	129.68
85	13.94	85.00	3.36	-0.06	24.12	129.35
86	14.11	73.63	2.63	0.07	26.92	128.26
87	14.27	52.70	2.50	0.77	23.01	128.82
88	14.44	126.09	3.51	2.20	13.42	130.62
89	14.60	250.89	3.25	0.89	8.18	131.56
90	14.76	241.38	2.57	0.72	6.40	131.49
91	14.93	205.73	3.05	-0.37	8.05	131.22
92	15.09	166.24	3.29	-0.18	11.81	131.75
93	15.26	136.55	3.87	0.26	15.21	132.35
94	15.42	143.28	4.41	0.39	16.04	133.27
95	15.58	176.87	4.75	1.07	15.09	133.77
96	15.75	174.40	4.42	-0.39	14.51	134.31

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	15.91	177.08	5.13	-0.23	14.88	134.35
98	16.08	170.53	4.89	-0.38	16.04	134.03
99	16.24	138.05	4.13	0.26	13.56	134.01
100	16.40	238.74	4.55	-0.66	13.78	132.98
101	16.57	131.08	3.40	-5.11	14.29	132.16
102	16.73	101.73	3.12	-5.25	15.60	130.94
103	16.90	178.75	3.28	-7.54	14.28	131.47
104	17.06	173.48	3.80	-6.08	13.14	132.54
105	17.22	163.37	4.25	-6.76	14.65	133.36
106	17.39	168.57	4.69	-6.41	15.64	133.39
107	17.55	153.17	4.03	-8.48	15.75	133.00
108	17.72	150.15	3.69	-8.02	16.02	132.65
109	17.88	153.81	4.23	-7.82	17.98	131.84
110	18.05	95.93	3.27	-8.27	21.70	130.15
111	18.21	61.70	2.16	-8.41	24.92	127.60
112	18.37	80.82	2.02	-8.81	27.10	125.91
113	18.54	58.74	2.08	-8.01	28.00	125.36
114	18.70	50.34	1.82	-7.86	31.74	125.12
115	18.87	58.28	2.08	-7.51	32.40	124.85
116	19.03	53.56	1.92	-7.92	32.38	124.72
117	19.19	49.78	1.73	-7.18	31.37	124.82
118	19.36	64.61	2.08	-6.50	27.67	126.55
119	19.52	94.40	2.95	-6.46	26.96	127.71
120	19.69	70.41	2.64	-7.38	29.81	127.27
121	19.85	40.01	1.90	-8.09	34.10	125.33
122	20.01	51.55	1.68	-7.36	35.36	124.45
123	20.18	57.62	2.09	-6.98	32.01	125.47
124	20.34	64.93	2.42	-7.55	27.00	127.88
125	20.51	111.67	3.29	-7.70	21.58	130.27
126	20.67	150.04	3.96	-7.70	20.08	132.19
127	20.83	128.14	4.60	-7.49	22.15	131.91
128	21.00	76.47	3.20	-7.57	29.08	129.78
129	21.16	42.45	2.12	-7.82	31.37	127.83
130	21.33	86.67	2.77	-7.82	28.92	129.04
131	21.49	109.08	4.19	-7.99	26.08	131.35
132	21.65	104.86	4.57	-7.87	27.55	132.16
133	21.82	87.76	4.10	-7.93	28.63	131.46
134	21.98	87.08	3.31	-8.28	26.54	130.93
135	22.15	114.83	3.59	-7.97	24.78	130.65
136	22.31	100.57	3.53	-8.60	22.68	130.94
137	22.47	116.61	3.42	-8.49	23.01	130.65
138	22.64	105.63	3.28	-8.64	23.57	130.37
139	22.80	89.25	3.26	-8.51	25.14	130.04
140	22.97	94.76	3.20	-8.39	26.19	129.89
141	23.13	93.58	3.22	-8.87	24.93	130.11
142	23.29	105.45	3.37	-8.65	23.89	130.26
143	23.46	108.66	3.25	-8.94	20.69	130.67
144	23.62	140.70	3.31	-8.75	16.73	130.86

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	23.79	171.92	3.06	-9.36	11.01	129.99
146	23.95	213.75	1.56	-11.23	9.93	127.80
147	24.11	106.68	1.39	-11.46	12.24	123.86
148	24.28	28.75	0.98	-2.57	27.03	119.16
149	24.44	15.03	0.36	0.27	59.93	115.53
150	24.61	12.44	0.97	1.89	80.16	114.85
151	24.77	10.92	1.06	2.01	40.95	119.68
152	24.93	81.41	1.29	-3.54	25.86	123.86
153	25.10	109.20	2.38	-10.05	19.36	125.92
154	25.26	95.69	1.91	-13.45	25.07	125.95
155	25.43	28.64	1.71	-12.76	34.44	122.11
156	25.59	18.24	0.56	-12.05	57.69	116.91
157	25.76	17.38	0.41	-10.25	55.98	111.53
158	25.92	16.05	0.41	-10.21	55.59	110.65
159	26.08	16.70	0.42	-10.36	57.94	110.49
160	26.25	14.85	0.41	-10.29	58.88	110.08
161	26.41	14.43	0.35	-10.36	59.04	109.43
162	26.58	15.38	0.33	-10.21	57.51	109.10
163	26.74	15.62	0.35	-10.25	56.35	109.15
164	26.90	15.69	0.35	-10.28	56.35	109.32
165	27.07	15.79	0.35	-9.89	55.82	108.98
166	27.23	15.53	0.31	-10.32	55.28	108.18
167	27.40	14.71	0.25	-10.24	54.63	106.87
168	27.56	14.02	0.21	-10.08	53.52	105.32
169	27.72	13.88	0.17	-10.42	53.52	104.12
170	27.89	12.84	0.17	-10.01	53.40	103.32
171	28.05	12.99	0.16	-10.11	53.66	103.49
172	28.22	13.98	0.18	-10.12	54.07	105.43
173	28.38	15.64	0.30	-9.91	48.53	108.98
174	28.54	25.63	0.47	-9.86	41.88	113.67
175	28.71	37.95	0.83	-9.48	35.00	117.84
176	28.87	51.84	1.20	-9.46	27.88	121.10
177	29.04	77.90	1.41	-8.63	23.93	123.54
178	29.20	87.79	1.80	-8.49	21.12	125.65
179	29.36	104.46	2.26	-7.70	21.13	127.63
180	29.53	110.11	2.85	-7.09	21.66	127.99
181	29.69	88.53	2.14	-9.38	24.53	126.70
182	29.86	56.39	1.45	-9.09	28.36	124.28
183	30.02	52.54	1.45	-8.68	31.33	122.89
184	30.18	58.86	1.50	-8.28	21.88	127.63
185	30.35	184.63	4.02	-7.95	19.62	132.72
186	30.51	192.26	6.76	-10.61	22.83	135.72
187	30.68	91.04	7.29	-9.94	21.89	136.62
188	30.84	229.77	5.75	-9.58	15.45	136.77
189	31.00	349.48	5.45	-7.31	9.96	135.50
190	31.17	232.14	3.39	-3.23	8.83	134.06
191	31.33	208.99	3.24	-11.62	10.34	131.71
192	31.50	187.56	2.83	-11.32	11.70	130.81

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	31.66	158.61	2.65	-11.86	12.15	128.63
194	31.82	131.77	1.32	-12.29	13.52	125.73
195	31.99	89.92	0.96	-12.05	16.08	121.95
196	32.15	55.49	0.99	-3.91	26.39	119.98
197	32.32	25.47	0.99	-2.10	37.80	118.39
198	32.48	33.19	0.73	-8.45	47.57	116.59
199	32.64	24.76	0.63	-9.06	46.53	115.65
200	32.81	23.82	0.72	-7.36	46.07	115.74
201	32.97	34.48	0.75	-6.32	43.84	117.70
202	33.14	37.73	1.15	-6.37	42.22	118.43
203	33.30	31.24	0.92	-2.45	43.04	119.51
204	33.47	38.28	1.16	-5.41	44.36	119.59
205	33.63	35.01	1.21	-1.35	39.67	120.63
206	33.79	50.03	1.22	-6.23	42.82	123.32
207	33.96	46.83	2.63	-5.24	40.69	123.67
208	34.12	44.64	1.33	-5.15	35.78	126.10
209	34.28	91.56	2.67	-13.52	26.42	127.41
210	34.45	121.99	3.08	-10.15	22.56	128.81
211	34.61	104.81	2.24	-14.42	22.70	127.62
212	34.78	69.56	1.64	-13.88	26.50	125.72
213	34.94	60.92	1.92	-12.06	22.61	126.45
214	35.11	148.52	2.49	-11.94	20.93	128.14
215	35.27	116.79	2.82	-12.00	19.85	128.38
216	35.43	79.21	2.02	-10.70	25.11	127.66
217	35.60	79.37	2.32	-11.98	25.27	128.67
218	35.76	131.85	3.74	-11.94	23.65	131.66
219	35.93	154.38	5.20	-12.07	22.14	133.81
220	36.09	153.01	5.26	-11.73	22.99	134.65
221	36.25	142.10	5.35	-11.36	24.07	134.48
222	36.42	134.24	5.09	-12.12	25.48	134.21
223	36.58	127.00	5.01	-12.00	24.04	133.59
224	36.75	146.36	4.04	-11.77	21.52	132.72
225	36.91	148.86	3.36	-12.56	20.37	132.01
226	37.07	127.26	3.87	-12.00	22.88	131.48
227	37.24	98.42	3.67	-11.77	29.00	129.89
228	37.40	55.23	2.11	-12.37	35.89	127.60
229	37.57	50.37	2.07	-12.09	31.25	128.43
230	37.73	137.06	4.12	-11.76	26.54	131.55
231	37.89	147.44	5.23	-11.92	23.79	134.12
232	38.06	143.70	5.61	-11.75	22.59	134.66
233	38.22	170.40	4.86	-11.38	23.28	134.61
234	38.39	135.60	5.25	-11.81	24.84	133.39
235	38.55	90.79	3.78	-12.12	30.01	131.60
236	38.71	77.95	2.85	-12.08	34.62	129.11
237	38.88	63.38	2.62	-11.77	36.36	128.14
238	39.04	68.93	2.90	-11.93	37.90	128.22
239	39.21	71.16	3.04	-11.64	38.22	128.46
240	39.37	64.70	2.88	-11.96	39.20	128.27

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	39.53	62.18	2.77	-11.95	39.38	127.42
242	39.70	61.43	2.22	-12.11	39.68	126.56
243	39.86	54.98	2.14	-12.16	38.45	125.26
244	40.03	55.19	1.69	-12.43	39.67	123.65
245	40.19	43.01	1.22	-12.19	41.55	121.20
246	40.35	31.12	0.91	-12.42	38.87	120.48
247	40.52	58.90	1.30	-11.66	33.18	123.09
248	40.68	85.86	2.25	-11.74	29.05	127.91
249	40.85	111.73	4.04	-11.19	27.84	131.45
250	41.01	128.60	5.07	-10.95	25.18	134.30
251	41.18	180.74	6.31	-10.89	23.30	134.98
252	41.34	158.29	4.96	-11.29	22.14	135.97
253	41.50	178.76	6.79	-11.56	20.83	136.48
254	41.67	223.50	7.10	-10.91	19.39	137.28
255	41.83	248.01	8.06	-11.12	17.86	137.28
256	42.00	241.33	7.61	-10.94	17.07	137.28
257	42.16	235.96	6.25	-10.78	13.02	136.95
258	42.32	322.48	3.99	-10.82	11.00	135.85
259	42.49	266.68	4.96	-10.76	6.70	132.01
260	42.65	248.79	0.00	-10.81	3.62	127.67
261	42.82	315.25	0.00	-13.10	N/A	87.36

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	0.16	0.01	0.00	0.01	1.00	0.657	1.19	0.551	1.00	1.00	2.000	No
2	0.33	0.02	0.00	0.02	1.00	0.657	1.19	0.551	1.00	1.00	2.000	No
3	0.49	0.03	0.00	0.03	1.00	0.657	1.19	0.551	1.00	1.00	2.000	No
4	0.66	0.04	0.00	0.04	1.00	0.657	1.19	0.551	1.00	1.00	2.000	No
5	0.82	0.05	0.00	0.05	1.00	0.656	1.19	0.550	1.00	1.00	2.000	No
6	0.98	0.06	0.00	0.06	1.00	0.656	1.19	0.550	1.00	1.00	2.000	No
7	1.15	0.07	0.00	0.07	1.00	0.656	1.19	0.550	1.00	1.00	2.000	No
8	1.31	0.08	0.00	0.08	1.00	0.656	1.19	0.550	1.00	1.00	2.000	No
9	1.48	0.09	0.00	0.09	1.00	0.656	1.19	0.550	1.00	1.00	2.000	No
10	1.64	0.10	0.00	0.10	1.00	0.655	1.19	0.549	1.00	1.00	2.000	No
11	1.80	0.11	0.00	0.11	1.00	0.655	1.19	0.549	1.00	1.00	2.000	No
12	1.97	0.12	0.00	0.12	1.00	0.655	1.19	0.549	1.00	1.00	2.000	No
13	2.13	0.13	0.00	0.13	1.00	0.655	1.19	0.549	1.00	1.00	2.000	No
14	2.30	0.14	0.00	0.14	1.00	0.654	1.19	0.549	1.00	1.00	2.000	No
15	2.46	0.15	0.00	0.15	1.00	0.654	1.19	0.548	1.00	1.00	2.000	No
16	2.63	0.16	0.00	0.16	1.00	0.654	1.19	0.548	1.00	1.00	2.000	No
17	2.79	0.17	0.00	0.17	1.00	0.654	1.19	0.548	1.00	1.00	2.000	No
18	2.95	0.18	0.00	0.18	1.00	0.653	1.19	0.548	1.00	1.00	2.000	No
19	3.12	0.19	0.00	0.19	0.99	0.653	1.19	0.547	1.00	1.00	2.000	No
20	3.28	0.20	0.00	0.20	0.99	0.653	1.19	0.547	1.00	1.00	2.000	No
21	3.45	0.21	0.00	0.21	0.99	0.652	1.19	0.547	1.00	1.00	2.000	No
22	3.61	0.22	0.00	0.22	0.99	0.652	1.19	0.547	1.00	1.00	2.000	No
23	3.77	0.23	0.00	0.23	0.99	0.652	1.19	0.547	1.00	1.00	2.000	No
24	3.94	0.24	0.00	0.24	0.99	0.652	1.19	0.546	1.00	1.00	2.000	No
25	4.10	0.25	0.00	0.25	0.99	0.651	1.19	0.546	1.00	1.00	2.000	No
26	4.27	0.26	0.00	0.26	0.99	0.651	1.19	0.546	1.00	1.00	2.000	No
27	4.43	0.26	0.00	0.26	0.99	0.651	1.19	0.546	1.00	1.00	2.000	No
28	4.59	0.27	0.00	0.27	0.99	0.651	1.19	0.546	1.00	1.00	2.000	No
29	4.76	0.28	0.00	0.28	0.99	0.650	1.19	0.545	1.00	1.00	2.000	No
30	4.92	0.29	0.00	0.29	0.99	0.650	1.19	0.545	1.00	1.00	2.000	No
31	5.09	0.30	0.00	0.30	0.99	0.650	1.19	0.545	1.00	1.00	2.000	No
32	5.25	0.31	0.00	0.31	0.99	0.650	1.19	0.545	1.00	1.00	2.000	No
33	5.41	0.32	0.00	0.32	0.99	0.649	1.19	0.545	1.00	1.00	2.000	No
34	5.58	0.33	0.00	0.33	0.99	0.649	1.19	0.544	1.00	1.00	2.000	No
35	5.74	0.34	0.00	0.34	0.99	0.649	1.19	0.544	1.00	1.00	2.000	No
36	5.91	0.35	0.00	0.35	0.99	0.649	1.19	0.544	1.00	1.00	2.000	No
37	6.07	0.36	0.00	0.36	0.99	0.648	1.19	0.544	1.00	1.00	2.000	No
38	6.23	0.36	0.00	0.36	0.99	0.648	1.19	0.543	1.00	1.00	2.000	No
39	6.40	0.37	0.00	0.37	0.99	0.648	1.19	0.543	1.00	1.00	2.000	No
40	6.56	0.38	0.00	0.38	0.99	0.648	1.19	0.543	1.00	1.00	2.000	No
41	6.73	0.39	0.00	0.39	0.99	0.647	1.19	0.543	1.00	1.00	2.000	No
42	6.89	0.40	0.00	0.40	0.99	0.647	1.19	0.543	1.00	1.00	2.000	No
43	7.05	0.41	0.00	0.41	0.99	0.647	1.19	0.542	1.00	1.00	2.000	No
44	7.22	0.42	0.00	0.42	0.99	0.647	1.19	0.542	1.00	1.00	2.000	No
45	7.38	0.43	0.00	0.43	0.98	0.647	1.19	0.542	1.00	1.00	2.000	No
46	7.55	0.44	0.00	0.44	0.98	0.646	1.19	0.542	1.00	1.00	2.000	No
47	7.71	0.45	0.00	0.45	0.98	0.646	1.19	0.542	1.00	1.00	2.000	No
48	7.87	0.46	0.00	0.46	0.98	0.646	1.19	0.541	1.00	1.00	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	8.04	0.47	0.00	0.47	0.98	0.646	1.19	0.541	1.00	1.00	2.000	No
50	8.20	0.48	0.00	0.48	0.98	0.645	1.19	0.541	1.00	1.00	2.000	No
51	8.37	0.49	0.00	0.49	0.98	0.645	1.19	0.541	1.00	1.00	2.000	No
52	8.53	0.50	0.00	0.50	0.98	0.645	1.19	0.541	1.00	1.00	2.000	No
53	8.69	0.51	0.00	0.51	0.98	0.645	1.19	0.540	1.00	1.00	2.000	No
54	8.86	0.52	0.00	0.52	0.98	0.644	1.19	0.540	1.00	1.00	2.000	No
55	9.02	0.53	0.00	0.53	0.98	0.644	1.19	0.540	1.00	1.00	2.000	No
56	9.19	0.54	0.00	0.54	0.98	0.644	1.19	0.540	1.00	1.00	2.000	No
57	9.35	0.55	0.00	0.55	0.98	0.644	1.19	0.540	1.00	1.00	2.000	No
58	9.51	0.56	0.00	0.56	0.98	0.643	1.19	0.539	1.00	1.00	2.000	No
59	9.68	0.57	0.00	0.57	0.98	0.643	1.19	0.539	1.00	1.00	2.000	No
60	9.84	0.58	0.00	0.58	0.98	0.643	1.19	0.539	1.00	1.00	2.000	No
61	10.01	0.59	0.00	0.59	0.98	0.643	1.19	0.539	1.00	1.00	2.000	No
62	10.17	0.60	0.00	0.60	0.98	0.643	1.19	0.539	1.00	1.00	2.000	No
63	10.34	0.61	0.00	0.61	0.98	0.642	1.19	0.539	1.00	1.00	2.000	No
64	10.50	0.62	0.00	0.62	0.98	0.642	1.19	0.538	1.00	1.00	2.000	No
65	10.66	0.63	0.00	0.63	0.98	0.642	1.19	0.538	1.00	1.00	2.000	No
66	10.83	0.64	0.00	0.64	0.98	0.642	1.19	0.538	1.00	1.00	2.000	No
67	10.99	0.65	0.00	0.65	0.98	0.641	1.19	0.538	1.00	1.00	2.000	No
68	11.16	0.66	0.00	0.66	0.98	0.641	1.19	0.538	1.00	1.00	2.000	No
69	11.32	0.67	0.00	0.67	0.98	0.641	1.19	0.537	1.00	1.00	2.000	No
70	11.48	0.68	0.00	0.68	0.98	0.641	1.19	0.537	1.00	1.00	2.000	No
71	11.65	0.69	0.00	0.69	0.98	0.641	1.19	0.537	1.00	1.00	2.000	No
72	11.81	0.70	0.00	0.70	0.98	0.640	1.19	0.537	1.00	1.00	2.000	No
73	11.98	0.71	0.00	0.71	0.97	0.640	1.19	0.537	1.00	1.00	2.000	No
74	12.14	0.72	0.00	0.72	0.97	0.640	1.19	0.536	1.00	1.00	2.000	No
75	12.30	0.73	0.00	0.73	0.97	0.640	1.19	0.536	1.00	1.00	2.000	No
76	12.47	0.74	0.00	0.74	0.97	0.639	1.19	0.536	1.00	1.00	2.000	No
77	12.63	0.75	0.00	0.75	0.97	0.639	1.19	0.536	1.00	1.00	2.000	No
78	12.80	0.76	0.00	0.76	0.97	0.639	1.19	0.536	1.00	1.00	2.000	No
79	12.96	0.77	0.00	0.77	0.97	0.639	1.19	0.535	1.00	1.00	2.000	No
80	13.12	0.78	0.00	0.78	0.97	0.638	1.19	0.535	1.00	1.00	2.000	No
81	13.29	0.79	0.00	0.79	0.97	0.638	1.19	0.535	1.00	1.00	2.000	No
82	13.45	0.80	0.00	0.80	0.97	0.638	1.19	0.535	1.00	1.00	2.000	No
83	13.62	0.81	0.00	0.81	0.97	0.638	1.19	0.535	1.00	1.00	2.000	No
84	13.78	0.82	0.00	0.82	0.97	0.638	1.19	0.535	1.00	1.00	2.000	No
85	13.94	0.83	0.00	0.83	0.97	0.637	1.19	0.534	1.00	1.00	2.000	No
86	14.11	0.84	0.00	0.84	0.97	0.637	1.19	0.534	1.00	1.00	2.000	No
87	14.27	0.85	0.00	0.85	0.97	0.637	1.19	0.534	1.00	1.00	2.000	No
88	14.44	0.86	0.00	0.86	0.97	0.637	1.19	0.534	1.00	1.00	2.000	No
89	14.60	0.87	0.00	0.87	0.97	0.636	1.19	0.534	1.00	1.00	2.000	No
90	14.76	0.88	0.00	0.88	0.97	0.636	1.19	0.533	1.00	1.00	2.000	No
91	14.93	0.90	0.00	0.90	0.97	0.636	1.19	0.533	1.00	1.00	2.000	No
92	15.09	0.91	0.00	0.91	0.97	0.636	1.19	0.533	1.00	1.00	2.000	No
93	15.26	0.92	0.00	0.92	0.97	0.635	1.19	0.533	1.00	1.00	2.000	No
94	15.42	0.93	0.00	0.93	0.97	0.635	1.19	0.533	1.00	1.00	2.000	No
95	15.58	0.94	0.00	0.94	0.97	0.635	1.19	0.532	1.00	1.00	2.000	No
96	15.75	0.95	0.00	0.95	0.97	0.635	1.19	0.532	1.00	1.00	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
97	15.91	0.96	0.00	0.96	0.97	0.635	1.19	0.532	1.00	1.00	2.000	No
98	16.08	0.97	0.00	0.97	0.97	0.634	1.19	0.532	1.00	1.00	2.000	No
99	16.24	0.98	0.00	0.98	0.97	0.634	1.19	0.532	1.00	1.00	2.000	No
100	16.40	0.99	0.00	0.99	0.97	0.634	1.19	0.531	1.00	1.00	2.000	No
101	16.57	1.00	0.00	1.00	0.97	0.634	1.19	0.531	1.00	1.00	2.000	No
102	16.73	1.02	0.00	1.02	0.96	0.633	1.19	0.531	1.00	1.00	2.000	No
103	16.90	1.03	0.00	1.03	0.96	0.633	1.19	0.531	1.00	1.00	2.000	No
104	17.06	1.04	0.00	1.04	0.96	0.633	1.19	0.531	1.00	1.00	2.000	No
105	17.22	1.05	0.00	1.05	0.96	0.633	1.19	0.530	1.00	1.00	2.000	No
106	17.39	1.06	0.00	1.06	0.96	0.632	1.19	0.530	1.00	1.00	2.000	No
107	17.55	1.07	0.00	1.07	0.96	0.632	1.19	0.530	1.00	1.00	2.000	No
108	17.72	1.08	0.00	1.08	0.96	0.632	1.19	0.530	1.00	1.00	2.000	No
109	17.88	1.09	0.00	1.09	0.96	0.632	1.19	0.530	0.99	1.00	2.000	No
110	18.05	1.10	0.00	1.10	0.96	0.631	1.19	0.529	0.99	1.00	2.000	No
111	18.21	1.11	0.00	1.11	0.96	0.631	1.19	0.529	0.99	1.00	2.000	No
112	18.37	1.12	0.00	1.12	0.96	0.631	1.19	0.529	0.99	1.00	2.000	No
113	18.54	1.13	0.00	1.13	0.96	0.631	1.19	0.529	0.98	1.00	2.000	No
114	18.70	1.14	0.00	1.14	0.96	0.630	1.19	0.528	0.98	1.00	2.000	No
115	18.87	1.15	0.00	1.15	0.96	0.630	1.19	0.528	0.98	1.00	2.000	No
116	19.03	1.16	0.00	1.16	0.96	0.630	1.19	0.528	0.98	1.00	2.000	No
117	19.19	1.17	0.00	1.17	0.96	0.630	1.19	0.528	0.98	1.00	2.000	No
118	19.36	1.18	0.00	1.18	0.96	0.629	1.19	0.528	0.97	1.00	2.000	No
119	19.52	1.20	0.00	1.20	0.96	0.629	1.19	0.527	0.97	1.00	2.000	No
120	19.69	1.21	0.00	1.21	0.96	0.629	1.19	0.527	0.97	1.00	2.000	No
121	19.85	1.22	0.00	1.22	0.96	0.628	1.19	0.527	0.97	1.00	2.000	No
122	20.01	1.23	0.00	1.23	0.96	0.628	1.19	0.527	0.97	1.00	0.545	No
123	20.18	1.24	0.01	1.23	0.96	0.631	1.19	0.529	0.97	1.00	0.548	No
124	20.34	1.25	0.01	1.24	0.96	0.633	1.19	0.531	0.96	1.00	0.550	No
125	20.51	1.26	0.02	1.24	0.96	0.635	1.19	0.533	0.96	1.00	0.553	No
126	20.67	1.27	0.02	1.25	0.96	0.638	1.19	0.535	0.96	1.00	0.555	No
127	20.83	1.28	0.03	1.25	0.95	0.640	1.19	0.536	0.96	1.00	0.558	No
128	21.00	1.29	0.03	1.26	0.95	0.642	1.19	0.538	0.96	1.00	0.560	No
129	21.16	1.30	0.04	1.26	0.95	0.644	1.19	0.540	0.96	1.00	0.563	No
130	21.33	1.31	0.04	1.27	0.95	0.646	1.19	0.542	0.96	1.00	0.565	No
131	21.49	1.32	0.05	1.28	0.95	0.648	1.19	0.544	0.96	1.00	0.567	No
132	21.65	1.33	0.05	1.28	0.95	0.650	1.19	0.545	0.96	1.00	0.570	No
133	21.82	1.34	0.06	1.29	0.95	0.653	1.19	0.547	0.96	1.00	0.572	No
134	21.98	1.35	0.06	1.29	0.95	0.655	1.19	0.549	0.96	1.00	0.575	No
135	22.15	1.36	0.07	1.30	0.95	0.657	1.19	0.550	0.95	1.00	0.577	No
136	22.31	1.38	0.07	1.30	0.95	0.659	1.19	0.552	0.95	1.00	0.579	No
137	22.47	1.39	0.08	1.31	0.95	0.660	1.19	0.554	0.95	1.00	0.582	No
138	22.64	1.40	0.08	1.31	0.95	0.662	1.19	0.555	0.95	1.00	0.584	No
139	22.80	1.41	0.09	1.32	0.95	0.664	1.19	0.557	0.95	1.00	0.586	No
140	22.97	1.42	0.09	1.33	0.95	0.666	1.19	0.559	0.95	1.00	0.588	No
141	23.13	1.43	0.10	1.33	0.95	0.668	1.19	0.560	0.95	1.00	0.590	No
142	23.29	1.44	0.10	1.34	0.95	0.670	1.19	0.562	0.95	1.00	0.593	No
143	23.46	1.45	0.11	1.34	0.95	0.672	1.19	0.563	0.95	1.00	0.595	No
144	23.62	1.46	0.11	1.35	0.95	0.673	1.19	0.565	0.95	1.00	0.597	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	23.79	1.47	0.12	1.35	0.95	0.675	1.19	0.566	0.94	1.00	0.599	No
146	23.95	1.48	0.12	1.36	0.95	0.677	1.19	0.568	0.94	1.00	0.601	No
147	24.11	1.49	0.13	1.36	0.94	0.679	1.19	0.569	0.94	1.00	0.603	No
148	24.28	1.50	0.13	1.37	0.94	0.680	1.19	0.570	0.94	1.00	0.605	No
149	24.44	1.51	0.14	1.37	0.94	0.682	1.19	0.572	0.94	1.00	0.607	No
150	24.61	1.52	0.14	1.38	0.94	0.684	1.19	0.573	0.94	1.00	0.609	No
151	24.77	1.53	0.15	1.38	0.94	0.685	1.19	0.575	0.94	1.00	0.611	No
152	24.93	1.54	0.15	1.39	0.94	0.687	1.19	0.576	0.94	1.00	0.613	No
153	25.10	1.55	0.16	1.39	0.94	0.689	1.19	0.577	0.94	1.00	0.615	No
154	25.26	1.56	0.16	1.40	0.94	0.690	1.19	0.579	0.94	1.00	0.617	No
155	25.43	1.57	0.17	1.40	0.94	0.692	1.19	0.580	0.94	1.00	0.619	No
156	25.59	1.58	0.17	1.41	0.94	0.693	1.19	0.581	0.94	1.00	0.621	No
157	25.76	1.59	0.18	1.41	0.94	0.695	1.19	0.583	0.94	1.00	0.623	No
158	25.92	1.60	0.18	1.41	0.94	0.697	1.19	0.584	0.94	1.00	0.624	No
159	26.08	1.61	0.19	1.42	0.94	0.698	1.19	0.585	0.93	1.00	0.626	No
160	26.25	1.62	0.19	1.42	0.94	0.700	1.19	0.587	0.93	1.00	0.628	No
161	26.41	1.63	0.20	1.43	0.94	0.701	1.19	0.588	0.93	1.00	0.630	No
162	26.58	1.64	0.21	1.43	0.94	0.703	1.19	0.589	0.93	1.00	0.631	No
163	26.74	1.64	0.21	1.43	0.94	0.704	1.19	0.590	0.93	1.00	0.633	No
164	26.90	1.65	0.22	1.44	0.93	0.705	1.19	0.591	0.93	1.00	0.635	No
165	27.07	1.66	0.22	1.44	0.93	0.707	1.19	0.593	0.93	1.00	0.636	No
166	27.23	1.67	0.23	1.45	0.93	0.708	1.19	0.594	0.93	1.00	0.638	No
167	27.40	1.68	0.23	1.45	0.93	0.710	1.19	0.595	0.93	1.00	0.640	No
168	27.56	1.69	0.24	1.45	0.93	0.711	1.19	0.596	0.93	1.00	0.641	No
169	27.72	1.70	0.24	1.46	0.93	0.712	1.19	0.597	0.93	1.00	0.643	No
170	27.89	1.71	0.25	1.46	0.93	0.714	1.19	0.598	0.93	1.00	0.644	No
171	28.05	1.71	0.25	1.46	0.93	0.715	1.19	0.600	0.93	1.00	0.646	No
172	28.22	1.72	0.26	1.47	0.93	0.717	1.19	0.601	0.93	1.00	0.648	No
173	28.38	1.73	0.26	1.47	0.93	0.718	1.19	0.602	0.93	1.00	0.649	No
174	28.54	1.74	0.27	1.47	0.93	0.719	1.19	0.603	0.93	1.00	0.651	No
175	28.71	1.75	0.27	1.48	0.93	0.720	1.19	0.604	0.93	1.00	0.652	No
176	28.87	1.76	0.28	1.48	0.93	0.721	1.19	0.605	0.93	1.00	0.654	No
177	29.04	1.77	0.28	1.49	0.93	0.722	1.19	0.606	0.92	1.00	0.655	No
178	29.20	1.78	0.29	1.49	0.92	0.724	1.19	0.607	0.92	1.00	0.657	No
179	29.36	1.79	0.29	1.50	0.92	0.725	1.19	0.607	0.92	1.00	0.658	No
180	29.53	1.80	0.30	1.50	0.92	0.726	1.19	0.608	0.92	1.00	0.660	No
181	29.69	1.81	0.30	1.51	0.92	0.727	1.19	0.609	0.92	1.00	0.661	No
182	29.86	1.82	0.31	1.52	0.92	0.728	1.19	0.610	0.92	1.00	0.663	No
183	30.02	1.83	0.31	1.52	0.92	0.729	1.19	0.611	0.92	1.00	0.664	No
184	30.18	1.84	0.32	1.53	0.92	0.729	1.19	0.612	0.92	1.00	0.665	No
185	30.35	1.85	0.32	1.53	0.92	0.730	1.19	0.612	0.92	1.00	0.667	No
186	30.51	1.87	0.33	1.54	0.92	0.731	1.19	0.613	0.92	1.00	0.668	No
187	30.68	1.88	0.33	1.54	0.92	0.732	1.19	0.614	0.92	1.00	0.669	No
188	30.84	1.89	0.34	1.55	0.92	0.733	1.19	0.614	0.92	1.00	0.671	No
189	31.00	1.90	0.34	1.56	0.92	0.734	1.19	0.615	0.92	1.00	0.672	No
190	31.17	1.91	0.35	1.56	0.91	0.734	1.19	0.616	0.91	1.00	0.673	No
191	31.33	1.92	0.35	1.57	0.91	0.735	1.19	0.616	0.91	1.00	0.675	No
192	31.50	1.93	0.36	1.57	0.91	0.736	1.19	0.617	0.91	1.00	0.676	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	31.66	1.94	0.36	1.58	0.91	0.736	1.19	0.617	0.91	1.00	0.677	No
194	31.82	1.95	0.37	1.58	0.91	0.737	1.19	0.618	0.91	1.00	0.678	No
195	31.99	1.96	0.37	1.59	0.91	0.738	1.19	0.619	0.91	1.00	0.679	No
196	32.15	1.97	0.38	1.59	0.91	0.739	1.19	0.619	0.91	1.00	0.680	No
197	32.32	1.98	0.38	1.60	0.91	0.739	1.19	0.620	0.91	1.00	0.682	No
198	32.48	1.99	0.39	1.60	0.91	0.740	1.19	0.621	0.91	1.00	0.683	No
199	32.64	2.00	0.39	1.61	0.91	0.741	1.19	0.621	0.91	1.00	0.684	No
200	32.81	2.01	0.40	1.61	0.90	0.741	1.19	0.622	0.91	1.00	0.685	No
201	32.97	2.02	0.40	1.62	0.90	0.742	1.19	0.622	0.91	1.00	0.686	No
202	33.14	2.03	0.41	1.62	0.90	0.743	1.19	0.623	0.91	1.00	0.687	No
203	33.30	2.04	0.41	1.62	0.90	0.743	1.19	0.623	0.91	1.00	0.688	No
204	33.47	2.05	0.42	1.63	0.90	0.744	1.19	0.624	0.91	1.00	0.689	No
205	33.63	2.06	0.43	1.63	0.90	0.744	1.19	0.624	0.90	1.00	0.690	No
206	33.79	2.07	0.43	1.64	0.90	0.745	1.19	0.625	0.90	1.00	0.691	No
207	33.96	2.08	0.44	1.64	0.90	0.745	1.19	0.625	0.90	1.00	0.692	No
208	34.12	2.09	0.44	1.65	0.90	0.746	1.19	0.625	0.90	1.00	0.693	No
209	34.28	2.10	0.45	1.65	0.90	0.746	1.19	0.626	0.90	1.00	0.693	No
210	34.45	2.11	0.45	1.66	0.89	0.747	1.19	0.626	0.90	1.00	0.694	No
211	34.61	2.12	0.46	1.67	0.89	0.747	1.19	0.626	0.90	1.00	0.695	No
212	34.78	2.13	0.46	1.67	0.89	0.747	1.19	0.627	0.90	1.00	0.696	No
213	34.94	2.14	0.47	1.68	0.89	0.748	1.19	0.627	0.90	1.00	0.697	No
214	35.11	2.15	0.47	1.68	0.89	0.748	1.19	0.627	0.90	1.00	0.698	No
215	35.27	2.16	0.48	1.69	0.89	0.748	1.19	0.627	0.90	1.00	0.698	No
216	35.43	2.17	0.48	1.69	0.89	0.749	1.19	0.628	0.90	1.00	0.699	No
217	35.60	2.18	0.49	1.70	0.89	0.749	1.19	0.628	0.90	1.00	0.700	No
218	35.76	2.19	0.49	1.70	0.89	0.749	1.19	0.628	0.90	1.00	0.701	No
219	35.93	2.21	0.50	1.71	0.88	0.749	1.19	0.628	0.90	1.00	0.701	No
220	36.09	2.22	0.50	1.71	0.88	0.749	1.19	0.628	0.89	1.00	0.702	No
221	36.25	2.23	0.51	1.72	0.88	0.749	1.19	0.628	0.89	1.00	0.703	No
222	36.42	2.24	0.51	1.73	0.88	0.749	1.19	0.628	0.89	1.00	0.703	No
223	36.58	2.25	0.52	1.73	0.88	0.749	1.19	0.628	0.89	1.00	0.704	No
224	36.75	2.26	0.52	1.74	0.88	0.750	1.19	0.628	0.89	1.00	0.704	No
225	36.91	2.27	0.53	1.74	0.88	0.750	1.19	0.628	0.89	1.00	0.705	No
226	37.07	2.28	0.53	1.75	0.88	0.750	1.19	0.628	0.89	1.00	0.706	No
227	37.24	2.29	0.54	1.76	0.87	0.750	1.19	0.628	0.89	1.00	0.706	No
228	37.40	2.30	0.54	1.76	0.87	0.750	1.19	0.629	0.89	1.00	0.707	No
229	37.57	2.31	0.55	1.77	0.87	0.750	1.19	0.629	0.89	1.00	0.707	No
230	37.73	2.32	0.55	1.77	0.87	0.750	1.19	0.628	0.89	1.00	0.708	No
231	37.89	2.34	0.56	1.78	0.87	0.750	1.19	0.628	0.89	1.00	0.708	No
232	38.06	2.35	0.56	1.78	0.87	0.749	1.19	0.628	0.89	1.00	0.708	No
233	38.22	2.36	0.57	1.79	0.87	0.749	1.19	0.628	0.89	1.00	0.709	No
234	38.39	2.37	0.57	1.80	0.86	0.749	1.19	0.628	0.89	1.00	0.709	No
235	38.55	2.38	0.58	1.80	0.86	0.749	1.19	0.628	0.88	1.00	0.710	No
236	38.71	2.39	0.58	1.81	0.86	0.749	1.19	0.628	0.88	1.00	0.710	No
237	38.88	2.40	0.59	1.81	0.86	0.749	1.19	0.628	0.88	1.00	0.710	No
238	39.04	2.41	0.59	1.82	0.86	0.749	1.19	0.628	0.88	1.00	0.711	No
239	39.21	2.42	0.60	1.82	0.86	0.748	1.19	0.627	0.88	1.00	0.711	No
240	39.37	2.43	0.60	1.83	0.86	0.748	1.19	0.627	0.88	1.00	0.711	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	39.53	2.44	0.61	1.83	0.86	0.748	1.19	0.627	0.88	1.00	0.712	No
242	39.70	2.45	0.61	1.84	0.85	0.748	1.19	0.627	0.88	1.00	0.712	No
243	39.86	2.46	0.62	1.84	0.85	0.748	1.19	0.627	0.88	1.00	0.712	No
244	40.03	2.47	0.62	1.85	0.85	0.747	1.19	0.627	0.88	1.00	0.712	No
245	40.19	2.48	0.63	1.85	0.85	0.747	1.19	0.626	0.88	1.00	0.713	No
246	40.35	2.49	0.64	1.86	0.85	0.747	1.19	0.626	0.88	1.00	0.713	No
247	40.52	2.50	0.64	1.86	0.85	0.747	1.19	0.626	0.88	1.00	0.713	No
248	40.68	2.51	0.65	1.87	0.84	0.746	1.19	0.626	0.88	1.00	0.713	No
249	40.85	2.52	0.65	1.87	0.84	0.746	1.19	0.625	0.88	1.00	0.713	No
250	41.01	2.54	0.66	1.88	0.84	0.745	1.19	0.625	0.88	1.00	0.713	No
251	41.18	2.55	0.66	1.89	0.84	0.745	1.19	0.625	0.88	1.00	0.713	No
252	41.34	2.56	0.67	1.89	0.84	0.745	1.19	0.624	0.87	1.00	0.714	No
253	41.50	2.57	0.67	1.90	0.84	0.744	1.19	0.624	0.87	1.00	0.714	No
254	41.67	2.58	0.68	1.90	0.84	0.744	1.19	0.623	0.87	1.00	0.714	No
255	41.83	2.59	0.68	1.91	0.83	0.743	1.19	0.623	0.87	1.00	0.714	No
256	42.00	2.60	0.69	1.92	0.83	0.743	1.19	0.623	0.87	1.00	0.714	No
257	42.16	2.61	0.69	1.92	0.83	0.742	1.19	0.622	0.87	1.00	0.714	No
258	42.32	2.63	0.70	1.93	0.83	0.741	1.19	0.622	0.87	1.00	0.714	No
259	42.49	2.64	0.70	1.93	0.83	0.741	1.19	0.621	0.87	1.00	0.714	No
260	42.65	2.65	0.71	1.94	0.83	0.740	1.19	0.621	0.87	1.00	0.714	No
261	42.82	2.65	0.71	1.94	0.83	0.740	1.19	0.621	0.87	1.00	0.714	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	0.16	124.22	1.57	0.66	0.50	199.56	1.00	199.56	4.000	No	No	2.00
2	0.33	97.35	1.80	1.13	0.56	156.37	1.11	173.29	4.000	No	No	2.00
3	0.49	68.04	2.13	2.31	0.69	109.27	1.52	166.22	4.000	No	No	2.00
4	0.66	58.35	2.31	3.47	0.76	93.69	1.99	186.22	4.000	No	No	2.00
5	0.82	66.14	2.31	3.87	0.76	106.18	1.99	211.71	4.000	No	No	2.00
6	0.98	75.97	2.26	3.65	0.73	121.97	1.82	221.66	4.000	No	No	2.00
7	1.15	79.79	2.22	3.43	0.72	128.08	1.72	220.78	4.000	No	No	2.00
8	1.31	72.81	2.21	3.06	0.72	116.84	1.69	197.14	4.000	No	No	2.00
9	1.48	65.53	2.19	2.68	0.71	105.13	1.65	173.66	4.000	No	No	2.00
10	1.64	60.94	2.16	2.29	0.70	97.74	1.58	154.87	4.000	No	No	2.00
11	1.80	60.72	2.14	2.12	0.69	97.37	1.53	149.35	4.000	No	No	2.00
12	1.97	64.37	2.11	2.04	0.68	103.23	1.48	152.45	4.000	No	No	2.00
13	2.13	64.13	2.12	2.08	0.68	102.83	1.49	153.42	4.000	No	No	2.00
14	2.30	67.34	2.09	1.98	0.67	107.97	1.43	154.94	4.000	No	No	2.00
15	2.46	71.85	2.01	1.66	0.64	115.19	1.32	152.00	4.000	No	No	2.00
16	2.63	78.44	1.91	1.31	0.60	125.76	1.20	151.23	4.000	No	No	2.00
17	2.79	83.07	1.83	1.04	0.57	133.19	1.13	150.14	4.000	No	No	2.00
18	2.95	80.61	1.83	1.00	0.57	129.21	1.13	145.43	4.000	No	No	2.00
19	3.12	75.37	1.84	0.98	0.58	120.78	1.14	137.48	4.000	No	No	2.00
20	3.28	66.69	1.88	0.98	0.59	106.83	1.17	125.38	4.000	No	No	2.00
21	3.45	58.67	1.89	0.85	0.59	93.93	1.18	110.48	4.000	No	No	2.00
22	3.61	52.22	1.86	0.64	0.58	83.54	1.15	96.20	4.000	No	No	2.00
23	3.77	48.03	1.83	0.48	0.57	76.80	1.00	76.80	4.000	No	No	2.00
24	3.94	46.26	1.82	0.43	0.57	73.94	1.00	73.94	4.000	No	No	2.00
25	4.10	46.25	1.83	0.47	0.57	73.91	1.00	73.91	4.000	No	No	2.00
26	4.27	45.68	1.86	0.51	0.58	72.97	1.15	83.91	4.000	No	No	2.00
27	4.43	42.29	1.89	0.53	0.60	67.52	1.18	79.92	4.000	No	No	2.00
28	4.59	36.86	1.98	0.63	0.63	58.78	1.28	75.07	4.000	No	No	2.00
29	4.76	32.93	2.06	0.75	0.66	52.45	1.39	73.00	4.000	No	No	2.00
30	4.92	31.51	2.12	0.90	0.68	50.15	1.50	75.12	4.000	No	No	2.00
31	5.09	32.47	2.16	1.07	0.70	51.69	1.57	80.90	4.000	No	No	2.00
32	5.25	33.25	2.17	1.16	0.70	52.92	1.59	84.11	4.000	No	No	2.00
33	5.41	32.50	2.18	1.17	0.70	51.70	1.61	83.45	4.000	No	No	2.00
34	5.58	30.82	2.17	1.05	0.70	48.98	1.60	78.21	4.000	No	No	2.00
35	5.74	28.29	2.20	1.03	0.71	44.90	1.66	74.33	4.000	No	No	2.00
36	5.91	26.07	2.26	1.20	0.74	41.33	1.84	75.85	4.000	No	No	2.00
37	6.07	23.84	2.39	1.72	0.78	37.74	2.26	85.44	4.000	No	No	2.00
38	6.23	23.14	2.49	2.37	0.82	36.60	2.70	98.76	4.000	No	No	2.00
39	6.40	20.56	2.61	3.17	0.87	32.42	3.37	109.35	4.000	No	Yes	2.00
40	6.56	17.16	2.73	3.87	0.91	26.95	4.18	112.75	4.000	No	Yes	2.00
41	6.73	13.29	2.88	4.89	0.97	20.72	5.49	113.65	4.000	No	Yes	2.00
42	6.89	12.81	2.90	5.09	0.98	19.94	5.72	114.03	4.000	No	Yes	2.00
43	7.05	14.56	2.85	4.93	0.96	22.73	5.23	118.90	4.000	No	Yes	2.00
44	7.22	20.23	2.70	4.21	0.90	31.82	3.97	126.30	4.000	No	Yes	2.00
45	7.38	27.82	2.56	3.81	0.85	44.01	3.12	137.23	4.000	No	No	2.00
46	7.55	37.20	2.47	3.74	0.82	59.06	2.62	154.69	4.000	No	No	2.00
47	7.71	41.63	2.47	4.18	0.82	66.16	2.63	173.93	4.000	No	No	2.00
48	7.87	41.26	2.50	4.55	0.83	65.55	2.78	182.08	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	8.04	38.17	2.56	5.12	0.85	60.58	3.11	188.30	4.000	No	No	2.00
50	8.20	44.40	2.45	4.12	0.81	70.57	2.52	177.85	4.000	No	No	2.00
51	8.37	59.90	2.29	3.31	0.75	95.45	1.92	183.35	4.000	No	No	2.00
52	8.53	77.60	2.18	2.93	0.71	123.37	1.62	199.38	4.000	No	No	2.00
53	8.69	96.01	2.12	2.88	0.68	148.30	1.50	222.04	4.000	No	No	2.00
54	8.86	100.31	2.12	2.96	0.69	152.88	1.50	229.52	4.000	No	No	2.00
55	9.02	93.03	2.15	3.00	0.69	140.74	1.55	218.75	4.000	No	No	2.00
56	9.19	80.77	2.19	3.03	0.71	121.77	1.65	201.11	4.000	No	No	2.00
57	9.35	72.30	2.23	3.10	0.73	108.49	1.75	190.15	4.000	No	No	2.00
58	9.51	71.48	2.22	2.95	0.72	105.58	1.73	182.50	4.000	No	No	2.00
59	9.68	63.68	2.27	3.02	0.74	93.65	1.85	172.88	4.000	No	No	2.00
60	9.84	56.09	2.29	2.88	0.75	81.73	1.92	156.91	4.000	No	No	2.00
61	10.01	50.56	2.32	2.82	0.76	73.07	2.01	146.57	4.000	No	No	2.00
62	10.17	48.49	2.33	2.83	0.76	69.38	2.06	143.00	4.000	No	No	2.00
63	10.34	48.76	2.35	2.95	0.77	69.09	2.11	145.92	4.000	No	No	2.00
64	10.50	46.30	2.38	3.10	0.78	65.18	2.24	145.76	4.000	No	No	2.00
65	10.66	41.21	2.43	3.21	0.80	57.72	2.43	140.51	4.000	No	No	2.00
66	10.83	37.27	2.45	3.08	0.81	51.68	2.53	130.75	4.000	No	No	2.00
67	10.99	34.03	2.46	2.89	0.81	46.63	2.59	120.79	4.000	No	No	2.00
68	11.16	31.77	2.47	2.69	0.82	42.99	2.61	112.39	4.000	No	No	2.00
69	11.32	28.68	2.50	2.61	0.83	38.45	2.75	105.82	4.000	No	No	2.00
70	11.48	26.96	2.51	2.49	0.83	35.72	2.81	100.20	4.000	No	No	2.00
71	11.65	26.75	2.50	2.37	0.83	34.99	2.77	97.01	4.000	No	No	2.00
72	11.81	27.79	2.48	2.30	0.82	35.88	2.69	96.43	4.000	No	No	2.00
73	11.98	29.49	2.46	2.21	0.81	37.56	2.57	96.35	4.000	No	No	2.00
74	12.14	31.37	2.44	2.17	0.80	39.43	2.47	97.31	4.000	No	No	2.00
75	12.30	35.52	2.40	2.17	0.79	44.05	2.31	101.67	4.000	No	No	2.00
76	12.47	45.54	2.32	2.17	0.76	55.56	2.03	112.70	4.000	No	No	2.00
77	12.63	49.59	2.32	2.36	0.76	59.97	2.03	121.67	4.000	No	No	2.00
78	12.80	47.77	2.34	2.35	0.77	57.25	2.07	118.73	4.000	No	No	2.00
79	12.96	39.65	2.41	2.46	0.79	47.32	2.36	111.82	4.000	No	No	2.00
80	13.12	41.09	2.37	2.18	0.78	48.33	2.19	105.95	4.000	No	No	2.00
81	13.29	52.20	2.31	2.31	0.76	60.65	1.99	120.85	4.000	No	No	2.00
82	13.45	73.45	2.24	2.49	0.73	84.18	1.76	147.99	4.000	No	No	2.00
83	13.62	86.86	2.25	3.01	0.73	98.90	1.80	177.79	4.000	No	No	2.00
84	13.78	91.86	2.28	3.45	0.74	103.95	1.89	196.40	4.000	No	No	2.00
85	13.94	82.88	2.34	3.79	0.77	93.31	2.09	195.21	4.000	No	No	2.00
86	14.11	70.45	2.41	4.06	0.79	78.88	2.36	186.44	4.000	No	No	2.00
87	14.27	84.15	2.31	3.46	0.76	92.71	1.99	184.66	4.000	No	No	2.00
88	14.44	143.25	2.02	2.17	0.64	153.41	1.32	202.98	4.000	No	No	2.00
89	14.60	206.14	1.80	1.51	0.56	216.00	1.11	239.46	4.000	No	No	2.00
90	14.76	232.67	1.72	1.27	0.53	240.79	1.05	252.35	4.000	No	No	2.00
91	14.93	204.45	1.80	1.46	0.56	211.21	1.10	233.21	4.000	No	No	2.00
92	15.09	169.51	1.96	2.02	0.62	175.41	1.25	218.83	4.000	No	No	2.00
93	15.26	148.69	2.08	2.61	0.67	153.64	1.42	218.07	4.000	No	No	2.00
94	15.42	152.24	2.11	2.87	0.68	156.30	1.47	229.60	4.000	No	No	2.00
95	15.58	164.86	2.08	2.76	0.67	167.73	1.41	236.97	4.000	No	No	2.00
96	15.75	176.12	2.06	2.72	0.66	177.71	1.38	245.31	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
97	15.91	174.00	2.07	2.78	0.66	174.30	1.40	244.16	4.000	No	No	2.00
98	16.08	161.88	2.11	2.93	0.68	161.07	1.47	236.54	4.000	No	No	2.00
99	16.24	182.44	2.02	2.49	0.65	179.83	1.33	239.25	4.000	No	No	2.00
100	16.40	169.26	2.03	2.39	0.65	165.61	1.34	222.19	4.000	No	No	2.00
101	16.57	157.13	2.05	2.37	0.66	152.63	1.37	208.84	4.000	No	No	2.00
102	16.73	137.10	2.09	2.40	0.67	132.21	1.44	190.68	4.000	No	No	2.00
103	16.90	151.23	2.05	2.26	0.66	144.82	1.37	198.10	4.000	No	No	2.00
104	17.06	171.77	2.01	2.21	0.64	163.43	1.31	213.94	4.000	No	No	2.00
105	17.22	168.38	2.06	2.54	0.66	159.13	1.39	220.91	4.000	No	No	2.00
106	17.39	161.60	2.09	2.69	0.67	151.63	1.44	219.01	4.000	No	No	2.00
107	17.55	157.19	2.10	2.65	0.67	146.43	1.45	212.54	4.000	No	No	2.00
108	17.72	152.26	2.11	2.64	0.68	140.82	1.47	206.65	4.000	No	No	2.00
109	17.88	133.18	2.17	2.83	0.70	122.12	1.60	194.78	4.000	No	No	2.00
110	18.05	103.70	2.28	3.14	0.74	94.05	1.88	176.73	4.000	No	No	2.00
111	18.21	79.36	2.36	3.18	0.78	71.11	2.17	154.09	4.000	No	No	2.00
112	18.37	66.97	2.42	3.17	0.80	59.34	2.38	141.32	4.000	No	No	2.00
113	18.54	63.18	2.44	3.18	0.80	55.48	2.48	137.35	4.000	No	No	2.00
114	18.70	55.67	2.52	3.65	0.84	48.29	2.89	139.54	4.000	No	No	2.00
115	18.87	53.95	2.54	3.68	0.84	46.38	2.97	137.61	4.000	No	No	2.00
116	19.03	53.76	2.54	3.63	0.84	45.87	2.96	135.98	4.000	No	No	2.00
117	19.19	55.88	2.52	3.49	0.83	47.39	2.85	134.94	4.000	No	No	2.00
118	19.36	69.50	2.43	3.29	0.80	58.97	2.44	143.95	4.000	No	No	2.00
119	19.52	76.38	2.41	3.40	0.79	64.49	2.37	152.73	4.000	No	No	2.00
120	19.69	68.17	2.48	3.73	0.82	56.86	2.67	151.87	4.000	No	No	2.00
121	19.85	53.88	2.57	3.94	0.86	44.19	3.17	140.09	4.000	No	No	2.00
122	20.01	49.62	2.60	3.91	0.87	40.26	3.33	133.99	4.000	No	Yes	2.00
123	20.18	57.93	2.53	3.64	0.84	47.19	2.92	137.83	0.324	No	No	0.59
124	20.34	77.97	2.41	3.39	0.80	64.06	2.37	151.94	0.406	No	No	0.74
125	20.51	108.77	2.27	3.00	0.74	90.22	1.87	168.64	0.526	No	No	0.95
126	20.67	129.84	2.23	3.07	0.73	107.82	1.75	188.52	0.703	No	No	1.27
127	20.83	118.11	2.29	3.36	0.75	97.28	1.92	186.48	0.683	No	No	1.22
128	21.00	82.24	2.46	4.09	0.81	66.42	2.59	172.06	0.554	No	No	0.99
129	21.16	68.42	2.52	4.02	0.83	54.69	2.85	155.68	0.431	No	No	0.77
130	21.33	79.29	2.46	3.88	0.81	63.55	2.57	163.55	0.487	No	No	0.86
131	21.49	100.09	2.39	3.89	0.79	80.59	2.28	183.72	0.657	No	No	1.16
132	21.65	100.45	2.43	4.32	0.80	80.38	2.43	195.22	0.772	No	No	1.35
133	21.82	93.12	2.45	4.35	0.81	74.02	2.54	188.16	0.700	No	No	1.22
134	21.98	96.44	2.40	3.86	0.79	76.72	2.33	178.42	0.608	No	No	1.06
135	22.15	100.71	2.36	3.50	0.77	80.15	2.15	172.60	0.558	No	No	0.97
136	22.31	110.55	2.30	3.22	0.75	88.17	1.96	173.03	0.562	No	No	0.97
137	22.47	107.48	2.31	3.21	0.76	85.35	1.99	169.98	0.537	No	No	0.92
138	22.64	103.71	2.33	3.24	0.76	81.94	2.04	167.32	0.516	No	No	0.88
139	22.80	96.42	2.37	3.42	0.78	75.60	2.19	165.39	0.501	No	No	0.85
140	22.97	92.41	2.39	3.55	0.79	71.99	2.29	164.91	0.497	No	No	0.85
141	23.13	97.81	2.36	3.39	0.78	76.22	2.17	165.23	0.500	No	No	0.85
142	23.29	102.44	2.34	3.25	0.77	79.80	2.07	165.24	0.500	No	No	0.84
143	23.46	118.14	2.25	2.84	0.73	92.64	1.80	166.38	0.508	No	No	0.85
144	23.62	140.30	2.13	2.31	0.69	111.09	1.51	167.97	0.521	No	No	0.87

:: 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	23.79	175.32	1.93	1.52	0.61	141.41	1.21	171.63	0.550	No	No	0.92
146	23.95	163.96	1.88	1.23	0.59	132.42	1.17	155.07	0.427	No	No	0.71
147	24.11	116.27	1.97	1.14	0.63	92.50	1.27	117.20	0.230	No	No	0.38
148	24.28	50.09	2.42	1.88	0.80	37.41	2.37	88.85	0.145	No	No	0.24
149	24.44	18.74	3.02	4.49	1.00	12.55	6.98	87.62	4.000	No	Yes	2.00
150	24.61	12.82	3.29	7.08	1.00	8.20	10.55	86.51	4.000	No	Yes	2.00
151	24.77	34.93	2.71	3.32	0.91	24.77	4.06	100.64	4.000	No	Yes	2.00
152	24.93	67.12	2.39	2.40	0.78	50.11	2.26	113.16	0.215	No	No	0.35
153	25.10	95.30	2.21	1.98	0.72	72.76	1.69	123.23	0.254	No	No	0.41
154	25.26	77.67	2.37	2.63	0.78	57.94	2.18	126.39	0.268	No	No	0.43
155	25.43	47.34	2.58	3.05	0.86	33.96	3.21	109.11	0.201	No	No	0.32
156	25.59	21.25	2.99	4.55	1.00	13.98	6.61	92.45	4.000	No	Yes	2.00
157	25.76	17.07	2.96	2.98	1.00	10.97	6.33	69.47	4.000	No	Yes	2.00
158	25.92	16.56	2.96	2.76	1.00	10.57	6.27	66.31	4.000	No	Yes	2.00
159	26.08	15.72	2.99	2.92	1.00	9.94	6.65	66.16	4.000	No	Yes	2.00
160	26.25	15.18	3.01	2.90	1.00	9.53	6.81	64.89	4.000	No	Yes	2.00
161	26.41	14.74	3.01	2.77	1.00	9.19	6.84	62.83	4.000	No	Yes	2.00
162	26.58	15.00	2.99	2.58	1.00	9.34	6.58	61.49	4.000	No	Yes	2.00
163	26.74	15.42	2.97	2.50	1.00	9.60	6.39	61.39	4.000	No	Yes	2.00
164	26.90	15.55	2.97	2.53	1.00	9.67	6.39	61.80	4.000	No	Yes	2.00
165	27.07	15.52	2.96	2.42	1.00	9.61	6.31	60.64	4.000	No	Yes	2.00
166	27.23	15.20	2.95	2.24	1.00	9.36	6.22	58.19	4.000	No	Yes	2.00
167	27.40	14.61	2.94	1.99	1.00	8.93	6.12	54.60	4.000	No	Yes	2.00
168	27.56	14.06	2.92	1.70	0.99	8.54	5.94	50.72	4.000	No	Yes	2.00
169	27.72	13.43	2.92	1.55	0.99	8.09	5.94	48.02	4.000	No	Yes	2.00
170	27.89	13.09	2.92	1.44	0.99	7.83	5.92	46.33	4.000	No	Yes	2.00
171	28.05	13.12	2.93	1.47	0.99	7.82	5.96	46.64	4.000	No	Yes	2.00
172	28.22	14.06	2.93	1.73	0.99	8.43	6.03	50.80	4.000	No	Yes	2.00
173	28.38	18.27	2.84	1.92	0.96	11.40	5.16	58.89	4.000	No	Yes	2.00
174	28.54	26.27	2.73	2.18	0.91	17.11	4.19	71.75	4.000	No	Yes	2.00
175	28.71	38.34	2.59	2.28	0.86	25.89	3.28	84.97	0.137	No	No	0.21
176	28.87	55.76	2.44	2.13	0.80	38.89	2.46	95.78	0.162	No	No	0.25
177	29.04	72.38	2.34	2.08	0.77	51.37	2.07	106.56	0.193	No	No	0.29
178	29.20	89.93	2.26	2.07	0.74	64.60	1.83	118.30	0.234	No	No	0.36
179	29.36	100.67	2.26	2.33	0.74	72.28	1.83	132.39	0.296	No	No	0.45
180	29.53	100.92	2.28	2.44	0.74	72.11	1.88	135.26	0.310	No	No	0.47
181	29.69	84.89	2.35	2.59	0.77	59.66	2.13	127.08	0.271	No	No	0.41
182	29.86	65.69	2.45	2.63	0.81	45.16	2.51	113.49	0.216	No	No	0.33
183	30.02	55.80	2.51	2.72	0.83	37.71	2.84	107.20	0.195	No	No	0.29
184	30.18	98.56	2.28	2.40	0.74	69.60	1.89	131.81	0.293	No	No	0.44
185	30.35	145.12	2.22	2.86	0.72	103.74	1.71	177.76	0.602	No	No	0.90
186	30.51	155.84	2.31	3.91	0.75	109.76	1.98	216.80	4.000	No	No	2.00
187	30.68	170.88	2.28	3.90	0.75	120.55	1.89	228.37	4.000	No	No	2.00
188	30.84	223.30	2.09	2.78	0.67	162.01	1.43	232.24	4.000	No	No	2.00
189	31.00	270.37	1.88	1.81	0.59	201.96	1.17	236.73	4.000	No	No	2.00
190	31.17	263.43	1.83	1.54	0.57	197.72	1.13	223.68	4.000	No	No	2.00
191	31.33	209.44	1.90	1.52	0.60	155.05	1.19	184.00	0.659	No	No	0.98
192	31.50	184.89	1.95	1.59	0.62	135.29	1.24	168.10	0.522	No	No	0.77

:: 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	31.66	159.14	1.97	1.44	0.63	115.68	1.26	146.08	0.370	No	No	0.55
194	31.82	126.59	2.02	1.32	0.65	90.82	1.33	120.63	0.243	No	No	0.36
195	31.99	92.26	2.11	1.21	0.68	64.78	1.47	95.29	0.160	No	No	0.24
196	32.15	56.87	2.40	1.78	0.79	37.57	2.31	86.78	0.141	No	No	0.21
197	32.32	37.98	2.65	2.51	0.88	23.63	3.64	86.02	4.000	No	Yes	2.00
198	32.48	27.71	2.83	3.05	0.95	16.38	5.02	82.19	4.000	No	Yes	2.00
199	32.64	27.14	2.81	2.76	0.95	16.01	4.86	77.86	4.000	No	Yes	2.00
200	32.81	27.58	2.80	2.73	0.94	16.26	4.80	77.98	4.000	No	Yes	2.00
201	32.97	31.91	2.76	2.91	0.93	19.08	4.47	85.30	4.000	No	Yes	2.00
202	33.14	34.41	2.73	2.90	0.92	20.71	4.24	87.83	4.000	No	Yes	2.00
203	33.30	35.68	2.75	3.19	0.92	21.41	4.36	93.27	4.000	No	Yes	2.00
204	33.47	34.80	2.77	3.34	0.93	20.71	4.55	94.14	4.000	No	Yes	2.00
205	33.63	41.04	2.69	3.07	0.90	24.93	3.89	96.98	4.000	No	Yes	2.00
206	33.79	43.90	2.74	4.03	0.92	26.42	4.33	114.28	4.000	No	Yes	2.00
207	33.96	47.09	2.70	3.84	0.91	28.54	4.03	114.94	4.000	No	Yes	2.00
208	34.12	60.90	2.61	3.76	0.87	37.78	3.38	127.69	4.000	No	Yes	2.00
209	34.28	85.93	2.40	2.81	0.79	55.66	2.31	128.74	0.278	No	No	0.40
210	34.45	105.94	2.30	2.56	0.75	69.94	1.95	136.53	0.317	No	No	0.46
211	34.61	98.60	2.30	2.40	0.75	64.79	1.96	127.27	0.272	No	No	0.39
212	34.78	78.24	2.40	2.54	0.79	50.13	2.32	116.36	0.227	No	No	0.33
213	34.94	92.82	2.30	2.22	0.75	60.63	1.96	118.64	0.235	No	No	0.34
214	35.11	108.57	2.26	2.27	0.73	71.57	1.82	129.94	0.284	No	No	0.41
215	35.27	114.67	2.23	2.17	0.72	75.90	1.73	131.36	0.291	No	No	0.42
216	35.43	91.62	2.37	2.67	0.78	58.69	2.18	128.22	0.276	No	No	0.39
217	35.60	96.64	2.37	2.85	0.78	61.78	2.20	135.95	0.314	No	No	0.45
218	35.76	121.69	2.33	3.14	0.76	78.55	2.05	160.92	0.468	No	No	0.67
219	35.93	146.24	2.29	3.29	0.75	95.13	1.92	182.23	0.643	No	No	0.92
220	36.09	149.66	2.31	3.57	0.76	96.71	1.99	192.44	0.743	No	No	1.06
221	36.25	142.95	2.34	3.72	0.77	91.58	2.09	191.12	0.729	No	No	1.04
222	36.42	134.28	2.38	3.90	0.78	85.13	2.22	189.08	0.709	No	No	1.01
223	36.58	135.69	2.34	3.53	0.77	86.41	2.08	180.11	0.623	No	No	0.89
224	36.75	140.57	2.27	2.99	0.74	90.47	1.86	168.67	0.526	No	No	0.75
225	36.91	140.65	2.24	2.71	0.73	90.86	1.77	160.94	0.468	No	No	0.66
226	37.07	124.67	2.31	2.97	0.76	79.12	1.98	156.65	0.437	No	No	0.62
227	37.24	93.46	2.46	3.53	0.81	57.09	2.58	147.41	0.378	No	No	0.54
228	37.40	67.83	2.61	4.00	0.87	39.76	3.39	134.96	4.000	No	Yes	2.00
229	37.57	80.71	2.51	3.53	0.83	48.36	2.83	137.01	0.319	No	No	0.45
230	37.73	111.45	2.40	3.49	0.79	68.61	2.33	159.54	0.458	No	No	0.65
231	37.89	142.56	2.33	3.55	0.76	89.15	2.06	183.77	0.657	No	No	0.93
232	38.06	153.68	2.30	3.46	0.75	96.57	1.95	188.74	0.705	No	No	1.00
233	38.22	149.73	2.32	3.55	0.76	93.46	2.02	188.38	0.702	No	No	0.99
234	38.39	132.09	2.36	3.57	0.77	81.40	2.16	175.76	0.585	No	No	0.82
235	38.55	101.27	2.48	4.00	0.82	60.37	2.69	162.57	0.480	No	No	0.68
236	38.71	77.20	2.58	4.12	0.86	44.62	3.23	144.34	0.360	No	No	0.51
237	38.88	69.91	2.62	4.13	0.87	39.88	3.45	137.73	4.000	No	Yes	2.00
238	39.04	67.65	2.65	4.38	0.89	38.19	3.65	139.55	4.000	No	Yes	2.00
239	39.21	68.09	2.66	4.48	0.89	38.29	3.70	141.52	4.000	No	Yes	2.00
240	39.37	65.84	2.68	4.57	0.90	36.73	3.83	140.55	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	39.53	62.60	2.68	4.36	0.90	34.73	3.85	133.74	4.000	No	Yes	2.00
242	39.70	59.36	2.69	4.18	0.90	32.73	3.89	127.33	4.000	No	Yes	2.00
243	39.86	57.02	2.66	3.69	0.89	31.46	3.73	117.21	4.000	No	Yes	2.00
244	40.03	50.88	2.69	3.47	0.90	27.71	3.89	107.76	4.000	No	Yes	2.00
245	40.19	42.93	2.72	3.14	0.91	22.92	4.15	95.07	4.000	No	Yes	2.00
246	40.35	44.17	2.67	2.74	0.89	23.82	3.78	90.10	4.000	No	Yes	2.00
247	40.52	58.45	2.55	2.65	0.85	32.72	3.06	100.10	0.173	No	No	0.24
248	40.68	85.33	2.46	3.05	0.81	49.27	2.59	127.51	0.273	No	No	0.38
249	40.85	108.57	2.43	3.57	0.80	63.33	2.46	155.69	0.431	No	No	0.60
250	41.01	140.20	2.37	3.73	0.78	83.18	2.19	182.31	0.644	No	No	0.90
251	41.18	155.72	2.32	3.56	0.76	93.32	2.02	188.24	0.700	No	No	0.98
252	41.34	172.43	2.29	3.54	0.75	103.96	1.92	199.18	0.815	No	No	1.14
253	41.50	186.69	2.25	3.41	0.73	113.32	1.81	204.87	4.000	No	No	2.00
254	41.67	216.60	2.21	3.42	0.72	132.64	1.70	224.93	4.000	No	No	2.00
255	41.83	237.46	2.17	3.23	0.70	146.74	1.59	232.82	4.000	No	No	2.00
256	42.00	241.61	2.14	3.06	0.69	149.83	1.53	229.82	4.000	No	No	2.00
257	42.16	266.43	2.00	2.26	0.64	170.30	1.30	221.96	4.000	No	No	2.00
258	42.32	274.88	1.92	1.86	0.61	178.55	1.21	216.58	4.000	No	No	2.00
259	42.49	279.16	1.73	1.08	0.53	189.29	1.06	200.31	4.000	No	No	2.00
260	42.65	276.74	1.55	0.60	0.50	191.31	1.00	191.31	0.731	No	No	1.02
261	42.82	292.92	N/A	0.00	1.00	-1.00	1.00	N/A	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
$CRR_{7.5}$: Cydic 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
0.16	2.00	0.00	9.98	0.16	0.00	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	0.16	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	9.83	0.16	0.00	1.31	2.00	0.00	9.80	0.16	0.00
1.48	2.00	0.00	9.78	0.16	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	9.67	0.16	0.00	2.30	2.00	0.00	9.65	0.16	0.00
2.46	2.00	0.00	9.62	0.16	0.00	2.63	2.00	0.00	9.60	0.16	0.00
2.79	2.00	0.00	9.57	0.16	0.00	2.95	2.00	0.00	9.55	0.16	0.00
3.12	2.00	0.00	9.52	0.16	0.00	3.28	2.00	0.00	9.50	0.16	0.00
3.45	2.00	0.00	9.47	0.16	0.00	3.61	2.00	0.00	9.45	0.16	0.00
3.77	2.00	0.00	9.42	0.16	0.00	3.94	2.00	0.00	9.40	0.16	0.00
4.10	2.00	0.00	9.38	0.16	0.00	4.27	2.00	0.00	9.35	0.16	0.00
4.43	2.00	0.00	9.33	0.16	0.00	4.59	2.00	0.00	9.30	0.16	0.00
4.76	2.00	0.00	9.28	0.16	0.00	4.92	2.00	0.00	9.25	0.16	0.00
5.09	2.00	0.00	9.23	0.16	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	0.16	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	0.16	0.00	6.56	2.00	0.00	9.00	0.16	0.00
6.73	2.00	0.00	8.97	0.16	0.00	6.89	2.00	0.00	8.95	0.16	0.00
7.05	2.00	0.00	8.92	0.16	0.00	7.22	2.00	0.00	8.90	0.16	0.00
7.38	2.00	0.00	8.87	0.16	0.00	7.55	2.00	0.00	8.85	0.16	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	8.78	0.16	0.00	8.20	2.00	0.00	8.75	0.16	0.00
8.37	2.00	0.00	8.73	0.16	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	0.16	0.00
9.02	2.00	0.00	8.63	0.16	0.00	9.19	2.00	0.00	8.60	0.16	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	8.53	0.16	0.00	9.84	2.00	0.00	8.50	0.16	0.00
10.01	2.00	0.00	8.47	0.16	0.00	10.17	2.00	0.00	8.45	0.16	0.00
10.34	2.00	0.00	8.42	0.16	0.00	10.50	2.00	0.00	8.40	0.16	0.00
10.66	2.00	0.00	8.37	0.16	0.00	10.83	2.00	0.00	8.35	0.16	0.00
10.99	2.00	0.00	8.32	0.16	0.00	11.16	2.00	0.00	8.30	0.16	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	0.16	0.00	11.81	2.00	0.00	8.20	0.16	0.00
11.98	2.00	0.00	8.18	0.16	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	0.16	0.00
12.63	2.00	0.00	8.08	0.16	0.00	12.80	2.00	0.00	8.05	0.16	0.00
12.96	2.00	0.00	8.03	0.16	0.00	13.12	2.00	0.00	8.00	0.16	0.00
13.29	2.00	0.00	7.98	0.16	0.00	13.45	2.00	0.00	7.95	0.16	0.00
13.62	2.00	0.00	7.93	0.16	0.00	13.78	2.00	0.00	7.90	0.16	0.00
13.94	2.00	0.00	7.87	0.16	0.00	14.11	2.00	0.00	7.85	0.16	0.00
14.27	2.00	0.00	7.82	0.16	0.00	14.44	2.00	0.00	7.80	0.16	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	0.16	0.00	15.09	2.00	0.00	7.70	0.16	0.00
15.26	2.00	0.00	7.67	0.16	0.00	15.42	2.00	0.00	7.65	0.16	0.00
15.58	2.00	0.00	7.62	0.16	0.00	15.75	2.00	0.00	7.60	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
15.91	2.00	0.00	7.58	0.16	0.00	16.08	2.00	0.00	7.55	0.16	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	7.48	0.16	0.00	16.73	2.00	0.00	7.45	0.16	0.00
16.90	2.00	0.00	7.43	0.16	0.00	17.06	2.00	0.00	7.40	0.16	0.00
17.22	2.00	0.00	7.38	0.16	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	0.16	0.00
17.88	2.00	0.00	7.27	0.16	0.00	18.05	2.00	0.00	7.25	0.16	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	0.16	0.00	18.70	2.00	0.00	7.15	0.16	0.00
18.87	2.00	0.00	7.12	0.16	0.00	19.03	2.00	0.00	7.10	0.16	0.00
19.19	2.00	0.00	7.07	0.16	0.00	19.36	2.00	0.00	7.05	0.16	0.00
19.52	2.00	0.00	7.02	0.16	0.00	19.69	2.00	0.00	7.00	0.16	0.00
19.85	2.00	0.00	6.98	0.16	0.00	20.01	2.00	0.00	6.95	0.16	0.00
20.18	0.59	0.41	6.93	0.16	0.14	20.34	0.74	0.26	6.90	0.16	0.09
20.51	0.95	0.05	6.88	0.16	0.02	20.67	1.27	0.00	6.85	0.16	0.00
20.83	1.22	0.00	6.83	0.16	0.00	21.00	0.99	0.01	6.80	0.16	0.00
21.16	0.77	0.23	6.78	0.16	0.08	21.33	0.86	0.14	6.75	0.16	0.05
21.49	1.16	0.00	6.72	0.16	0.00	21.65	1.35	0.00	6.70	0.16	0.00
21.82	1.22	0.00	6.67	0.16	0.00	21.98	1.06	0.00	6.65	0.16	0.00
22.15	0.97	0.03	6.62	0.16	0.01	22.31	0.97	0.03	6.60	0.16	0.01
22.47	0.92	0.08	6.57	0.16	0.03	22.64	0.88	0.12	6.55	0.16	0.04
22.80	0.85	0.15	6.52	0.16	0.05	22.97	0.85	0.15	6.50	0.16	0.05
23.13	0.85	0.15	6.47	0.16	0.05	23.29	0.84	0.16	6.45	0.16	0.05
23.46	0.85	0.15	6.43	0.16	0.05	23.62	0.87	0.13	6.40	0.16	0.04
23.79	0.92	0.08	6.38	0.16	0.03	23.95	0.71	0.29	6.35	0.16	0.09
24.11	0.38	0.62	6.33	0.16	0.20	24.28	0.24	0.76	6.30	0.16	0.24
24.44	2.00	0.00	6.28	0.16	0.00	24.61	2.00	0.00	6.25	0.16	0.00
24.77	2.00	0.00	6.23	0.16	0.00	24.93	0.35	0.65	6.20	0.16	0.20
25.10	0.41	0.59	6.18	0.16	0.18	25.26	0.43	0.57	6.15	0.16	0.17
25.43	0.32	0.68	6.12	0.16	0.21	25.59	2.00	0.00	6.10	0.16	0.00
25.76	2.00	0.00	6.07	0.16	0.00	25.92	2.00	0.00	6.05	0.16	0.00
26.08	2.00	0.00	6.02	0.16	0.00	26.25	2.00	0.00	6.00	0.16	0.00
26.41	2.00	0.00	5.97	0.16	0.00	26.58	2.00	0.00	5.95	0.16	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	0.16	0.00	27.23	2.00	0.00	5.85	0.16	0.00
27.40	2.00	0.00	5.83	0.16	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	0.16	0.00
28.05	2.00	0.00	5.73	0.16	0.00	28.22	2.00	0.00	5.70	0.16	0.00
28.38	2.00	0.00	5.68	0.16	0.00	28.54	2.00	0.00	5.65	0.16	0.00
28.71	0.21	0.79	5.63	0.16	0.22	28.87	0.25	0.75	5.60	0.16	0.21
29.04	0.29	0.71	5.58	0.16	0.20	29.20	0.36	0.64	5.55	0.16	0.18
29.36	0.45	0.55	5.52	0.16	0.15	29.53	0.47	0.53	5.50	0.16	0.15
29.69	0.41	0.59	5.47	0.16	0.16	29.86	0.33	0.67	5.45	0.16	0.18
30.02	0.29	0.71	5.42	0.16	0.19	30.18	0.44	0.56	5.40	0.16	0.15
30.35	0.90	0.10	5.37	0.16	0.03	30.51	2.00	0.00	5.35	0.16	0.00
30.68	2.00	0.00	5.32	0.16	0.00	30.84	2.00	0.00	5.30	0.16	0.00
31.00	2.00	0.00	5.27	0.16	0.00	31.17	2.00	0.00	5.25	0.16	0.00
31.33	0.98	0.02	5.23	0.16	0.01	31.50	0.77	0.23	5.20	0.16	0.06

:: 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
31.66	0.55	0.45	5.18	0.16	0.12	31.82	0.36	0.64	5.15	0.16	0.17
31.99	0.24	0.76	5.13	0.16	0.20	32.15	0.21	0.79	5.10	0.16	0.20
32.32	2.00	0.00	5.08	0.16	0.00	32.48	2.00	0.00	5.05	0.16	0.00
32.64	2.00	0.00	5.03	0.16	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	0.16	0.00
33.30	2.00	0.00	4.92	0.16	0.00	33.47	2.00	0.00	4.90	0.16	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	0.16	0.00	34.12	2.00	0.00	4.80	0.16	0.00
34.28	0.40	0.60	4.77	0.16	0.14	34.45	0.46	0.54	4.75	0.16	0.13
34.61	0.39	0.61	4.72	0.16	0.14	34.78	0.33	0.67	4.70	0.16	0.16
34.94	0.34	0.66	4.67	0.16	0.15	35.11	0.41	0.59	4.65	0.16	0.14
35.27	0.42	0.58	4.63	0.16	0.13	35.43	0.39	0.61	4.60	0.16	0.14
35.60	0.45	0.55	4.58	0.16	0.13	35.76	0.67	0.33	4.55	0.16	0.08
35.93	0.92	0.08	4.53	0.16	0.02	36.09	1.06	0.00	4.50	0.16	0.00
36.25	1.04	0.00	4.48	0.16	0.00	36.42	1.01	0.00	4.45	0.16	0.00
36.58	0.89	0.11	4.43	0.16	0.03	36.75	0.75	0.25	4.40	0.16	0.06
36.91	0.66	0.34	4.38	0.16	0.07	37.07	0.62	0.38	4.35	0.16	0.08
37.24	0.54	0.46	4.32	0.16	0.10	37.40	2.00	0.00	4.30	0.16	0.00
37.57	0.45	0.55	4.27	0.16	0.12	37.73	0.65	0.35	4.25	0.16	0.08
37.89	0.93	0.07	4.22	0.16	0.02	38.06	1.00	0.00	4.20	0.16	0.00
38.22	0.99	0.01	4.17	0.16	0.00	38.39	0.82	0.18	4.15	0.16	0.04
38.55	0.68	0.32	4.12	0.16	0.07	38.71	0.51	0.49	4.10	0.16	0.10
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	4.03	0.16	0.00	39.37	2.00	0.00	4.00	0.16	0.00
39.53	2.00	0.00	3.98	0.16	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	0.16	0.00
40.19	2.00	0.00	3.88	0.16	0.00	40.35	2.00	0.00	3.85	0.16	0.00
40.52	0.24	0.76	3.83	0.16	0.14	40.68	0.38	0.62	3.80	0.16	0.12
40.85	0.60	0.40	3.78	0.16	0.07	41.01	0.90	0.10	3.75	0.17	0.02
41.18	0.98	0.02	3.72	0.16	0.00	41.34	1.14	0.00	3.70	0.16	0.00
41.50	2.00	0.00	3.67	0.16	0.00	41.67	2.00	0.00	3.65	0.16	0.00
41.83	2.00	0.00	3.62	0.16	0.00	42.00	2.00	0.00	3.60	0.16	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	0.16	0.00	42.65	1.02	0.00	3.50	0.16	0.00
42.82	2.00	0.00	3.47	0.16	0.00						

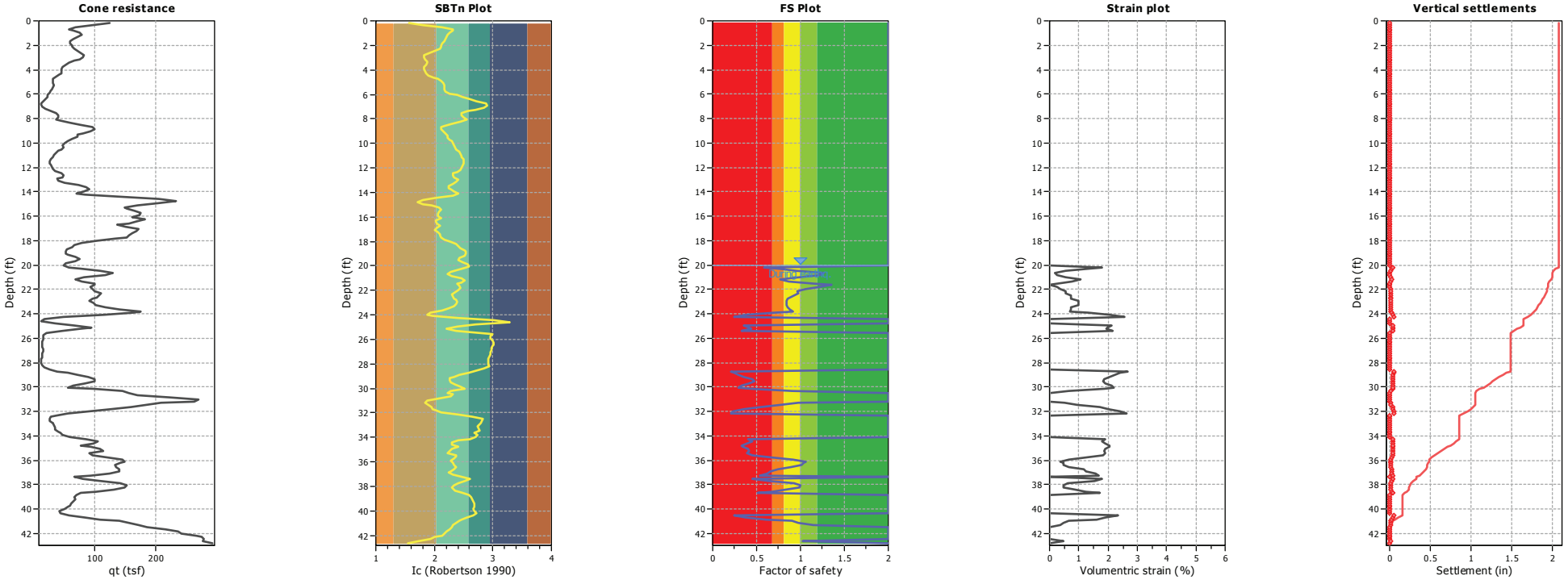
Overall liquefaction potential: 7.11

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)
20.01	133.99	2.00	0.00	1.00	0.00	20.18	137.83	0.59	1.80	1.00	0.04
20.34	151.94	0.74	1.36	1.00	0.03	20.51	168.64	0.95	0.54	1.00	0.01
20.67	188.52	1.27	0.18	1.00	0.00	20.83	186.48	1.22	0.26	1.00	0.01
21.00	172.06	0.99	0.53	1.00	0.01	21.16	155.68	0.77	1.06	1.00	0.02
21.33	163.55	0.86	0.76	1.00	0.01	21.49	183.72	1.16	0.27	1.00	0.01
21.65	195.22	1.35	0.00	1.00	0.00	21.82	188.16	1.22	0.26	1.00	0.01
21.98	178.42	1.06	0.38	1.00	0.01	22.15	172.60	0.97	0.53	1.00	0.01
22.31	173.03	0.97	0.53	1.00	0.01	22.47	169.98	0.92	0.72	1.00	0.01
22.64	167.32	0.88	0.73	1.00	0.01	22.80	165.39	0.85	0.74	1.00	0.01
22.97	164.91	0.85	0.98	1.00	0.02	23.13	165.23	0.85	0.98	1.00	0.02
23.29	165.24	0.84	0.98	1.00	0.02	23.46	166.38	0.85	0.74	1.00	0.01
23.62	167.97	0.87	0.73	1.00	0.01	23.79	171.63	0.92	0.70	1.00	0.01
23.95	155.07	0.71	1.32	1.00	0.03	24.11	117.20	0.38	2.05	1.00	0.04
24.28	88.85	0.24	2.57	1.00	0.05	24.44	87.62	2.00	0.00	1.00	0.00
24.61	86.51	2.00	0.00	1.00	0.00	24.77	100.64	2.00	0.00	1.00	0.00
24.93	113.16	0.35	2.11	1.00	0.04	25.10	123.23	0.41	1.97	1.00	0.04
25.26	126.39	0.43	1.93	1.00	0.04	25.43	109.11	0.32	2.18	1.00	0.04
25.59	92.45	2.00	0.00	1.00	0.00	25.76	69.47	2.00	0.00	1.00	0.00
25.92	66.31	2.00	0.00	1.00	0.00	26.08	66.16	2.00	0.00	1.00	0.00
26.25	64.89	2.00	0.00	1.00	0.00	26.41	62.83	2.00	0.00	1.00	0.00
26.58	61.49	2.00	0.00	1.00	0.00	26.74	61.39	2.00	0.00	1.00	0.00
26.90	61.80	2.00	0.00	1.00	0.00	27.07	60.64	2.00	0.00	1.00	0.00
27.23	58.19	2.00	0.00	1.00	0.00	27.40	54.60	2.00	0.00	1.00	0.00
27.56	50.72	2.00	0.00	1.00	0.00	27.72	48.02	2.00	0.00	1.00	0.00
27.89	46.33	2.00	0.00	1.00	0.00	28.05	46.64	2.00	0.00	1.00	0.00
28.22	50.80	2.00	0.00	1.00	0.00	28.38	58.89	2.00	0.00	1.00	0.00
28.54	71.75	2.00	0.00	1.00	0.00	28.71	84.97	0.21	2.67	1.00	0.05
28.87	95.78	0.25	2.42	1.00	0.05	29.04	106.56	0.29	2.22	1.00	0.04
29.20	118.30	0.36	2.04	1.00	0.04	29.36	132.39	0.45	1.86	1.00	0.04
29.53	135.26	0.47	1.82	1.00	0.04	29.69	127.08	0.41	1.92	1.00	0.04
29.86	113.49	0.33	2.11	1.00	0.04	30.02	107.20	0.29	2.21	1.00	0.04
30.18	131.81	0.44	1.86	1.00	0.04	30.35	177.76	0.90	0.67	1.00	0.01
30.51	216.80	2.00	0.00	1.00	0.00	30.68	228.37	2.00	0.00	1.00	0.00
30.84	232.24	2.00	0.00	1.00	0.00	31.00	236.73	2.00	0.00	1.00	0.00
31.17	223.68	2.00	0.00	1.00	0.00	31.33	184.00	0.98	0.50	1.00	0.01
31.50	168.10	0.77	0.95	1.00	0.02	31.66	146.08	0.55	1.71	1.00	0.03
31.82	120.63	0.36	2.00	1.00	0.04	31.99	95.29	0.24	2.43	1.00	0.05
32.15	86.78	0.21	2.62	1.00	0.05	32.32	86.02	2.00	0.00	1.00	0.00
32.48	82.19	2.00	0.00	1.00	0.00	32.64	77.86	2.00	0.00	1.00	0.00
32.81	77.98	2.00	0.00	1.00	0.00	32.97	85.30	2.00	0.00	1.00	0.00
33.14	87.83	2.00	0.00	1.00	0.00	33.30	93.27	2.00	0.00	1.00	0.00
33.47	94.14	2.00	0.00	1.00	0.00	33.63	96.98	2.00	0.00	1.00	0.00
33.79	114.28	2.00	0.00	1.00	0.00	33.96	114.94	2.00	0.00	1.00	0.00
34.12	127.69	2.00	0.00	1.00	0.00	34.28	128.74	0.40	1.90	1.00	0.04
34.45	136.53	0.46	1.81	1.00	0.04	34.61	127.27	0.39	1.92	1.00	0.04
34.78	116.36	0.33	2.06	1.00	0.04	34.94	118.64	0.34	2.03	1.00	0.04
35.11	129.94	0.41	1.89	1.00	0.04	35.27	131.36	0.42	1.87	1.00	0.04
35.43	128.22	0.39	1.91	1.00	0.04	35.60	135.95	0.45	1.82	1.00	0.04

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

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
35.76	160.92	0.67	1.25	1.00	0.02	35.93	182.23	0.92	0.65	1.00	0.01
36.09	192.44	1.06	0.36	1.00	0.01	36.25	191.12	1.04	0.48	1.00	0.01
36.42	189.08	1.01	0.49	1.00	0.01	36.58	180.11	0.89	0.66	1.00	0.01
36.75	168.67	0.75	1.17	1.00	0.02	36.91	160.94	0.66	1.25	1.00	0.02
37.07	156.65	0.62	1.58	1.00	0.03	37.24	147.41	0.54	1.70	1.00	0.03
37.40	134.96	2.00	0.00	1.00	0.00	37.57	137.01	0.45	1.80	1.00	0.04
37.73	159.54	0.65	1.54	1.00	0.03	37.89	183.77	0.93	0.64	1.00	0.01
38.06	188.74	1.00	0.49	1.00	0.01	38.22	188.38	0.99	0.49	1.00	0.01
38.39	175.76	0.82	0.89	1.00	0.02	38.55	162.57	0.68	1.23	1.00	0.02
38.71	144.34	0.51	1.73	1.00	0.03	38.88	137.73	2.00	0.00	1.00	0.00
39.04	139.55	2.00	0.00	1.00	0.00	39.21	141.52	2.00	0.00	1.00	0.00
39.37	140.55	2.00	0.00	1.00	0.00	39.53	133.74	2.00	0.00	1.00	0.00
39.70	127.33	2.00	0.00	1.00	0.00	39.86	117.21	2.00	0.00	1.00	0.00
40.03	107.76	2.00	0.00	1.00	0.00	40.19	95.07	2.00	0.00	1.00	0.00
40.35	90.10	2.00	0.00	1.00	0.00	40.52	100.10	0.24	2.33	1.00	0.05
40.68	127.51	0.38	1.91	1.00	0.04	40.85	155.69	0.60	1.60	1.00	0.03
41.01	182.31	0.90	0.64	1.00	0.01	41.18	188.24	0.98	0.49	1.00	0.01
41.34	199.18	1.14	0.35	1.00	0.01	41.50	204.87	2.00	0.00	1.00	0.00
41.67	224.93	2.00	0.00	1.00	0.00	41.83	232.82	2.00	0.00	1.00	0.00
42.00	229.82	2.00	0.00	1.00	0.00	42.16	221.96	2.00	0.00	1.00	0.00
42.32	216.58	2.00	0.00	1.00	0.00	42.49	200.31	2.00	0.00	1.00	0.00
42.65	191.31	1.02	0.48	1.00	0.01	42.82	-1.00	2.00	0.00	1.00	0.00

Total estimated settlement: 2.07

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	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
0.16	124.22	199.56	1.00	199.56	1.57	N/A	N/A
0.33	97.35	156.37	1.11	173.29	1.80	N/A	N/A
0.49	68.04	109.27	1.52	166.22	2.13	N/A	N/A
0.66	58.35	93.69	1.99	186.22	2.31	N/A	N/A
0.82	66.14	106.18	1.99	211.71	2.31	N/A	N/A
0.98	75.97	121.97	1.82	221.66	2.26	N/A	N/A
1.15	79.79	128.08	1.72	220.78	2.22	N/A	N/A
1.31	72.81	116.84	1.69	197.14	2.21	N/A	N/A
1.48	65.53	105.13	1.65	173.66	2.19	N/A	N/A
1.64	60.94	97.74	1.58	154.87	2.16	N/A	N/A
1.80	60.72	97.37	1.53	149.35	2.14	N/A	N/A
1.97	64.37	103.23	1.48	152.45	2.11	N/A	N/A
2.13	64.13	102.83	1.49	153.42	2.12	N/A	N/A
2.30	67.34	107.97	1.43	154.94	2.09	N/A	N/A
2.46	71.85	115.19	1.32	152.00	2.01	N/A	N/A
2.63	78.44	125.76	1.20	151.23	1.91	N/A	N/A
2.79	83.07	133.19	1.13	150.14	1.83	N/A	N/A
2.95	80.61	129.21	1.13	145.43	1.83	N/A	N/A
3.12	75.37	120.78	1.14	137.48	1.84	N/A	N/A
3.28	66.69	106.83	1.17	125.38	1.88	N/A	N/A
3.45	58.67	93.93	1.18	110.48	1.89	N/A	N/A
3.61	52.22	83.54	1.15	96.20	1.86	N/A	N/A
3.77	48.03	76.80	1.00	76.80	1.83	N/A	N/A
3.94	46.26	73.94	1.00	73.94	1.82	N/A	N/A
4.10	46.25	73.91	1.00	73.91	1.83	N/A	N/A
4.27	45.68	72.97	1.15	83.91	1.86	N/A	N/A
4.43	42.29	67.52	1.18	79.92	1.89	N/A	N/A
4.59	36.86	58.78	1.28	75.07	1.98	N/A	N/A
4.76	32.93	52.45	1.39	73.00	2.06	N/A	N/A
4.92	31.51	50.15	1.50	75.12	2.12	N/A	N/A
5.09	32.47	51.69	1.57	80.90	2.16	N/A	N/A
5.25	33.25	52.92	1.59	84.11	2.17	N/A	N/A
5.41	32.50	51.70	1.61	83.45	2.18	N/A	N/A
5.58	30.82	48.98	1.60	78.21	2.17	N/A	N/A
5.74	28.29	44.90	1.66	74.33	2.20	N/A	N/A
5.91	26.07	41.33	1.84	75.85	2.26	N/A	N/A
6.07	23.84	37.74	2.26	85.44	2.39	N/A	N/A
6.23	23.14	36.60	2.70	98.76	2.49	N/A	N/A
6.40	20.56	32.42	3.37	109.35	2.61	N/A	N/A
6.56	17.16	26.95	4.18	112.75	2.73	N/A	N/A
6.73	13.29	20.72	5.49	113.65	2.88	N/A	N/A
6.89	12.81	19.94	5.72	114.03	2.90	N/A	N/A
7.05	14.56	22.73	5.23	118.90	2.85	N/A	N/A
7.22	20.23	31.82	3.97	126.30	2.70	N/A	N/A
7.38	27.82	44.01	3.12	137.23	2.56	N/A	N/A
7.55	37.20	59.06	2.62	154.69	2.47	N/A	N/A
7.71	41.63	66.16	2.63	173.93	2.47	N/A	N/A
7.87	41.26	65.55	2.78	182.08	2.50	N/A	N/A

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
8.04	38.17	60.58	3.11	188.30	2.56	N/A	N/A
8.20	44.40	70.57	2.52	177.85	2.45	N/A	N/A
8.37	59.90	95.45	1.92	183.35	2.29	N/A	N/A
8.53	77.60	123.37	1.62	199.38	2.18	N/A	N/A
8.69	96.01	148.30	1.50	222.04	2.12	N/A	N/A
8.86	100.31	152.88	1.50	229.52	2.12	N/A	N/A
9.02	93.03	140.74	1.55	218.75	2.15	N/A	N/A
9.19	80.77	121.77	1.65	201.11	2.19	N/A	N/A
9.35	72.30	108.49	1.75	190.15	2.23	N/A	N/A
9.51	71.48	105.58	1.73	182.50	2.22	N/A	N/A
9.68	63.68	93.65	1.85	172.88	2.27	N/A	N/A
9.84	56.09	81.73	1.92	156.91	2.29	N/A	N/A
10.01	50.56	73.07	2.01	146.57	2.32	N/A	N/A
10.17	48.49	69.38	2.06	143.00	2.33	N/A	N/A
10.34	48.76	69.09	2.11	145.92	2.35	N/A	N/A
10.50	46.30	65.18	2.24	145.76	2.38	N/A	N/A
10.66	41.21	57.72	2.43	140.51	2.43	N/A	N/A
10.83	37.27	51.68	2.53	130.75	2.45	N/A	N/A
10.99	34.03	46.63	2.59	120.79	2.46	N/A	N/A
11.16	31.77	42.99	2.61	112.39	2.47	N/A	N/A
11.32	28.68	38.45	2.75	105.82	2.50	N/A	N/A
11.48	26.96	35.72	2.81	100.20	2.51	N/A	N/A
11.65	26.75	34.99	2.77	97.01	2.50	N/A	N/A
11.81	27.79	35.88	2.69	96.43	2.48	N/A	N/A
11.98	29.49	37.56	2.57	96.35	2.46	N/A	N/A
12.14	31.37	39.43	2.47	97.31	2.44	N/A	N/A
12.30	35.52	44.05	2.31	101.67	2.40	N/A	N/A
12.47	45.54	55.56	2.03	112.70	2.32	N/A	N/A
12.63	49.59	59.97	2.03	121.67	2.32	N/A	N/A
12.80	47.77	57.25	2.07	118.73	2.34	N/A	N/A
12.96	39.65	47.32	2.36	111.82	2.41	N/A	N/A
13.12	41.09	48.33	2.19	105.95	2.37	N/A	N/A
13.29	52.20	60.65	1.99	120.85	2.31	N/A	N/A
13.45	73.45	84.18	1.76	147.99	2.24	N/A	N/A
13.62	86.86	98.90	1.80	177.79	2.25	N/A	N/A
13.78	91.86	103.95	1.89	196.40	2.28	N/A	N/A
13.94	82.88	93.31	2.09	195.21	2.34	N/A	N/A
14.11	70.45	78.88	2.36	186.44	2.41	N/A	N/A
14.27	84.15	92.71	1.99	184.66	2.31	N/A	N/A
14.44	143.25	153.41	1.32	202.98	2.02	N/A	N/A
14.60	206.14	216.00	1.11	239.46	1.80	N/A	N/A
14.76	232.67	240.79	1.05	252.35	1.72	N/A	N/A
14.93	204.45	211.21	1.10	233.21	1.80	N/A	N/A
15.09	169.51	175.41	1.25	218.83	1.96	N/A	N/A
15.26	148.69	153.64	1.42	218.07	2.08	N/A	N/A
15.42	152.24	156.30	1.47	229.60	2.11	N/A	N/A
15.58	164.86	167.73	1.41	236.97	2.08	N/A	N/A
15.75	176.12	177.71	1.38	245.31	2.06	N/A	N/A

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
15.91	174.00	174.30	1.40	244.16	2.07	N/A	N/A
16.08	161.88	161.07	1.47	236.54	2.11	N/A	N/A
16.24	182.44	179.83	1.33	239.25	2.02	N/A	N/A
16.40	169.26	165.61	1.34	222.19	2.03	N/A	N/A
16.57	157.13	152.63	1.37	208.84	2.05	N/A	N/A
16.73	137.10	132.21	1.44	190.68	2.09	N/A	N/A
16.90	151.23	144.82	1.37	198.10	2.05	N/A	N/A
17.06	171.77	163.43	1.31	213.94	2.01	N/A	N/A
17.22	168.38	159.13	1.39	220.91	2.06	N/A	N/A
17.39	161.60	151.63	1.44	219.01	2.09	N/A	N/A
17.55	157.19	146.43	1.45	212.54	2.10	N/A	N/A
17.72	152.26	140.82	1.47	206.65	2.11	N/A	N/A
17.88	133.18	122.12	1.60	194.78	2.17	N/A	N/A
18.05	103.70	94.05	1.88	176.73	2.28	N/A	N/A
18.21	79.36	71.11	2.17	154.09	2.36	N/A	N/A
18.37	66.97	59.34	2.38	141.32	2.42	N/A	N/A
18.54	63.18	55.48	2.48	137.35	2.44	N/A	N/A
18.70	55.67	48.29	2.89	139.54	2.52	N/A	N/A
18.87	53.95	46.38	2.97	137.61	2.54	N/A	N/A
19.03	53.76	45.87	2.96	135.98	2.54	N/A	N/A
19.19	55.88	47.39	2.85	134.94	2.52	N/A	N/A
19.36	69.50	58.97	2.44	143.95	2.43	N/A	N/A
19.52	76.38	64.49	2.37	152.73	2.41	N/A	N/A
19.69	68.17	56.86	2.67	151.87	2.48	N/A	N/A
19.85	53.88	44.19	3.17	140.09	2.57	N/A	N/A
20.01	49.62	40.26	3.33	133.99	2.60	2.82	2.82
20.18	57.93	47.19	2.92	137.83	2.53	0.73	0.73
20.34	77.97	64.06	2.37	151.94	2.41	0.77	0.77
20.51	108.77	90.22	1.87	168.64	2.27	0.81	0.81
20.67	129.84	107.82	1.75	188.52	2.23	0.84	0.84
20.83	118.11	97.28	1.92	186.48	2.29	0.82	0.82
21.00	82.24	66.42	2.59	172.06	2.46	0.77	0.77
21.16	68.42	54.69	2.85	155.68	2.52	0.75	0.75
21.33	79.29	63.55	2.57	163.55	2.46	0.77	0.77
21.49	100.09	80.59	2.28	183.72	2.39	0.80	0.80
21.65	100.45	80.38	2.43	195.22	2.43	0.80	0.80
21.82	93.12	74.02	2.54	188.16	2.45	0.79	0.79
21.98	96.44	76.72	2.33	178.42	2.40	0.79	0.79
22.15	100.71	80.15	2.15	172.60	2.36	0.80	0.80
22.31	110.55	88.17	1.96	173.03	2.30	0.81	0.81
22.47	107.48	85.35	1.99	169.98	2.31	0.81	0.81
22.64	103.71	81.94	2.04	167.32	2.33	0.80	0.80
22.80	96.42	75.60	2.19	165.39	2.37	0.79	0.79
22.97	92.41	71.99	2.29	164.91	2.39	0.78	0.78
23.13	97.81	76.22	2.17	165.23	2.36	0.79	0.79
23.29	102.44	79.80	2.07	165.24	2.34	0.80	0.80
23.46	118.14	92.64	1.80	166.38	2.25	0.82	0.82
23.62	140.30	111.09	1.51	167.97	2.13	0.84	0.84

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
23.79	175.32	141.41	1.21	171.63	1.93	0.88	0.88
23.95	163.96	132.42	1.17	155.07	1.88	0.87	0.87
24.11	116.27	92.50	1.27	117.20	1.97	0.82	0.82
24.28	50.09	37.41	2.37	88.85	2.42	0.70	0.70
24.44	18.74	12.55	6.98	87.62	3.02	0.90	0.90
24.61	12.82	8.20	10.55	86.51	3.29	0.59	0.59
24.77	34.93	24.77	4.06	100.64	2.71	1.73	1.73
24.93	67.12	50.11	2.26	113.16	2.39	0.73	0.73
25.10	95.30	72.76	1.69	123.23	2.21	0.78	0.78
25.26	77.67	57.94	2.18	126.39	2.37	0.75	0.75
25.43	47.34	33.96	3.21	109.11	2.58	0.69	0.69
25.59	21.25	13.98	6.61	92.45	2.99	1.00	1.00
25.76	17.07	10.97	6.33	69.47	2.96	0.29	0.78
25.92	16.56	10.57	6.27	66.31	2.96	0.29	0.76
26.08	15.72	9.94	6.65	66.16	2.99	0.29	0.71
26.25	15.18	9.53	6.81	64.89	3.01	0.29	0.68
26.41	14.74	9.19	6.84	62.83	3.01	0.25	0.66
26.58	15.00	9.34	6.58	61.49	2.99	0.23	0.67
26.74	15.42	9.60	6.39	61.39	2.97	0.25	0.69
26.90	15.55	9.67	6.39	61.80	2.97	0.25	0.69
27.07	15.52	9.61	6.31	60.64	2.96	0.24	0.69
27.23	15.20	9.36	6.22	58.19	2.95	0.21	0.67
27.40	14.61	8.93	6.12	54.60	2.94	0.18	0.64
27.56	14.06	8.54	5.94	50.72	2.92	0.14	0.61
27.72	13.43	8.09	5.94	48.02	2.92	0.12	0.58
27.89	13.09	7.83	5.92	46.33	2.92	0.11	0.56
28.05	13.12	7.82	5.96	46.64	2.93	0.11	0.56
28.22	14.06	8.43	6.03	50.80	2.93	0.12	0.60
28.38	18.27	11.40	5.16	58.89	2.84	0.21	0.80
28.54	26.27	17.11	4.19	71.75	2.73	1.19	1.19
28.71	38.34	25.89	3.28	84.97	2.59	0.65	0.65
28.87	55.76	38.89	2.46	95.78	2.44	0.70	0.70
29.04	72.38	51.37	2.07	106.56	2.34	0.74	0.74
29.20	89.93	64.60	1.83	118.30	2.26	0.77	0.77
29.36	100.67	72.28	1.83	132.39	2.26	0.78	0.78
29.53	100.92	72.11	1.88	135.26	2.28	0.78	0.78
29.69	84.89	59.66	2.13	127.08	2.35	0.76	0.76
29.86	65.69	45.16	2.51	113.49	2.45	0.72	0.72
30.02	55.80	37.71	2.84	107.20	2.51	0.70	0.70
30.18	98.56	69.60	1.89	131.81	2.28	0.78	0.78
30.35	145.12	103.74	1.71	177.76	2.22	0.83	0.83
30.51	155.84	109.76	1.98	216.80	2.31	0.84	0.84
30.68	170.88	120.55	1.89	228.37	2.28	0.85	0.85
30.84	223.30	162.01	1.43	232.24	2.09	0.90	0.90
31.00	270.37	201.96	1.17	236.73	1.88	0.93	0.93
31.17	263.43	197.72	1.13	223.68	1.83	0.93	0.93
31.33	209.44	155.05	1.19	184.00	1.90	0.89	0.89
31.50	184.89	135.29	1.24	168.10	1.95	0.87	0.87

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
31.66	159.14	115.68	1.26	146.08	1.97	0.85	0.85
31.82	126.59	90.82	1.33	120.63	2.02	0.81	0.81
31.99	92.26	64.78	1.47	95.29	2.11	0.77	0.77
32.15	56.87	37.57	2.31	86.78	2.40	0.70	0.70
32.32	37.98	23.63	3.64	86.02	2.65	1.61	1.61
32.48	27.71	16.38	5.02	82.19	2.83	1.15	1.15
32.64	27.14	16.01	4.86	77.86	2.81	1.12	1.12
32.81	27.58	16.26	4.80	77.98	2.80	1.13	1.13
32.97	31.91	19.08	4.47	85.30	2.76	1.32	1.32
33.14	34.41	20.71	4.24	87.83	2.73	1.43	1.43
33.30	35.68	21.41	4.36	93.27	2.75	1.48	1.48
33.47	34.80	20.71	4.55	94.14	2.77	1.44	1.44
33.63	41.04	24.93	3.89	96.98	2.69	1.70	1.70
33.79	43.90	26.42	4.33	114.28	2.74	1.82	1.82
33.96	47.09	28.54	4.03	114.94	2.70	1.96	1.96
34.12	60.90	37.78	3.38	127.69	2.61	2.55	2.55
34.28	85.93	55.66	2.31	128.74	2.40	0.75	0.75
34.45	105.94	69.94	1.95	136.53	2.30	0.78	0.78
34.61	98.60	64.79	1.96	127.27	2.30	0.77	0.77
34.78	78.24	50.13	2.32	116.36	2.40	0.73	0.73
34.94	92.82	60.63	1.96	118.64	2.30	0.76	0.76
35.11	108.57	71.57	1.82	129.94	2.26	0.78	0.78
35.27	114.67	75.90	1.73	131.36	2.23	0.79	0.79
35.43	91.62	58.69	2.18	128.22	2.37	0.76	0.76
35.60	96.64	61.78	2.20	135.95	2.37	0.76	0.76
35.76	121.69	78.55	2.05	160.92	2.33	0.79	0.79
35.93	146.24	95.13	1.92	182.23	2.29	0.82	0.82
36.09	149.66	96.71	1.99	192.44	2.31	0.82	0.82
36.25	142.95	91.58	2.09	191.12	2.34	0.81	0.81
36.42	134.28	85.13	2.22	189.08	2.38	0.80	0.80
36.58	135.69	86.41	2.08	180.11	2.34	0.81	0.81
36.75	140.57	90.47	1.86	168.67	2.27	0.81	0.81
36.91	140.65	90.86	1.77	160.94	2.24	0.81	0.81
37.07	124.67	79.12	1.98	156.65	2.31	0.79	0.79
37.24	93.46	57.09	2.58	147.41	2.46	0.75	0.75
37.40	67.83	39.76	3.39	134.96	2.61	2.66	2.66
37.57	80.71	48.36	2.83	137.01	2.51	0.73	0.73
37.73	111.45	68.61	2.33	159.54	2.40	0.78	0.78
37.89	142.56	89.15	2.06	183.77	2.33	0.81	0.81
38.06	153.68	96.57	1.95	188.74	2.30	0.82	0.82
38.22	149.73	93.46	2.02	188.38	2.32	0.82	0.82
38.39	132.09	81.40	2.16	175.76	2.36	0.80	0.80
38.55	101.27	60.37	2.69	162.57	2.48	0.76	0.76
38.71	77.20	44.62	3.23	144.34	2.58	0.72	0.72
38.88	69.91	39.88	3.45	137.73	2.62	2.66	2.66
39.04	67.65	38.19	3.65	139.55	2.65	2.56	2.56
39.21	68.09	38.29	3.70	141.52	2.66	2.57	2.57
39.37	65.84	36.73	3.83	140.55	2.68	2.48	2.48

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

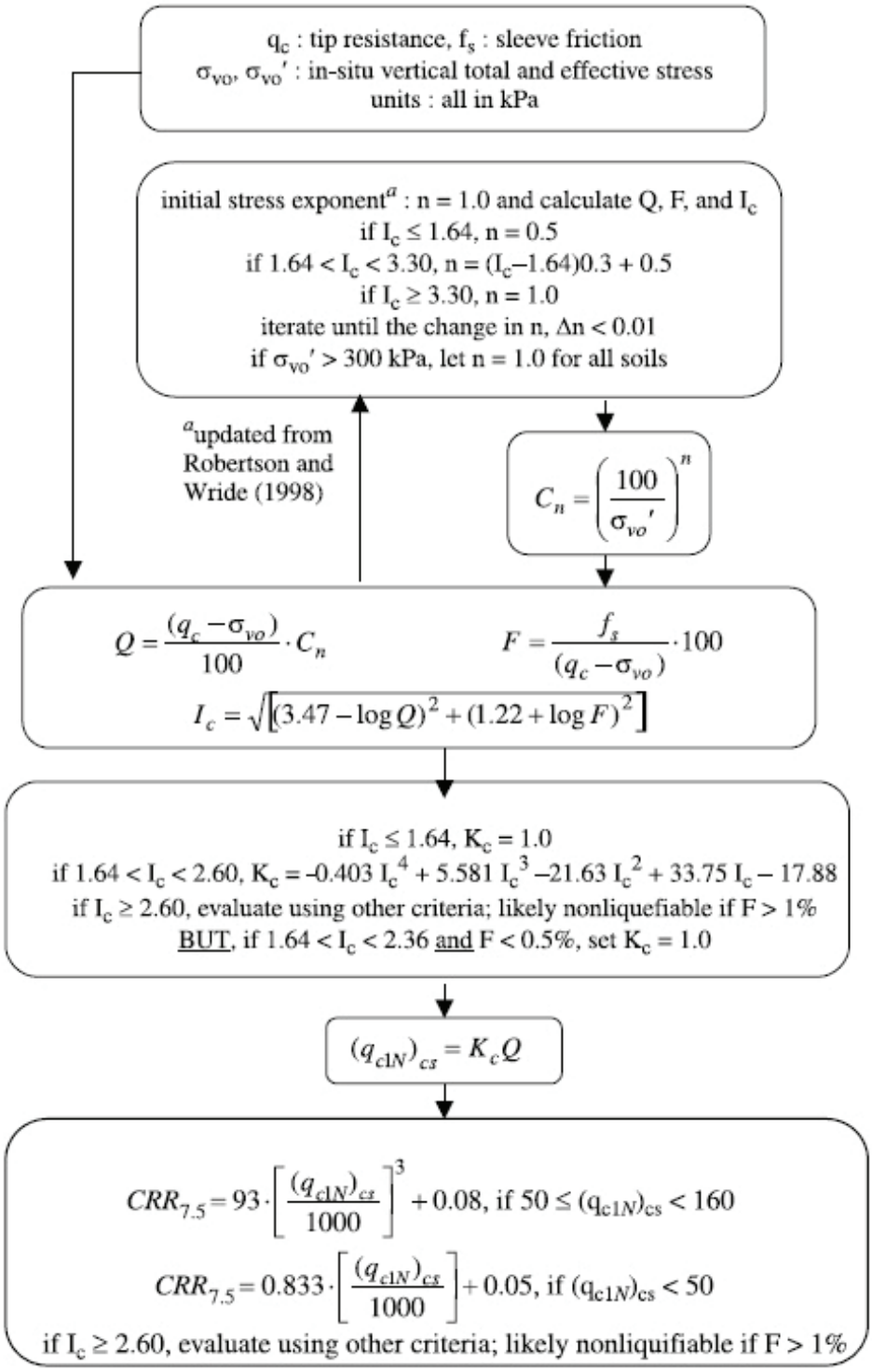
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
39.53	62.60	34.73	3.85	133.74	2.68	2.34	2.34
39.70	59.36	32.73	3.89	127.33	2.69	2.21	2.21
39.86	57.02	31.46	3.73	117.21	2.66	2.11	2.11
40.03	50.88	27.71	3.89	107.76	2.69	1.87	1.87
40.19	42.93	22.92	4.15	95.07	2.72	1.56	1.56
40.35	44.17	23.82	3.78	90.10	2.67	1.60	1.60
40.52	58.45	32.72	3.06	100.10	2.55	0.68	0.68
40.68	85.33	49.27	2.59	127.51	2.46	0.73	0.73
40.85	108.57	63.33	2.46	155.69	2.43	0.77	0.77
41.01	140.20	83.18	2.19	182.31	2.37	0.80	0.80
41.18	155.72	93.32	2.02	188.24	2.32	0.82	0.82
41.34	172.43	103.96	1.92	199.18	2.29	0.83	0.83
41.50	186.69	113.32	1.81	204.87	2.25	0.84	0.84
41.67	216.60	132.64	1.70	224.93	2.21	0.87	0.87
41.83	237.46	146.74	1.59	232.82	2.17	0.88	0.88
42.00	241.61	149.83	1.53	229.82	2.14	0.89	0.89
42.16	266.43	170.30	1.30	221.96	2.00	0.90	0.90
42.32	274.88	178.55	1.21	216.58	1.92	0.91	0.91
42.49	279.16	189.29	1.06	200.31	1.73	0.92	0.92
42.65	276.74	191.31	1.00	191.31	1.55	0.92	0.92
42.82	292.92	-1.00	1.00	-1.00	-1.00	N/A	N/A

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)

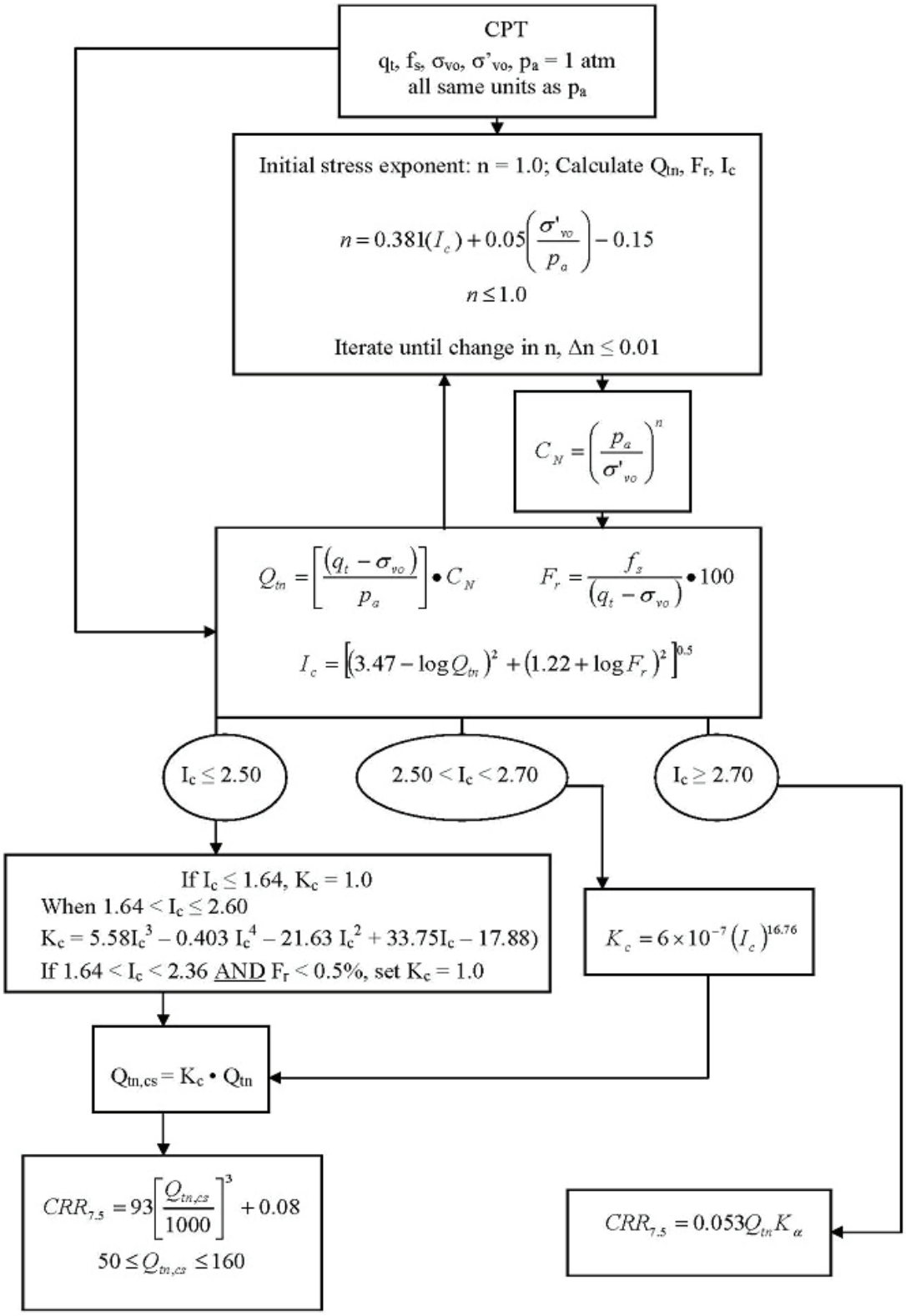
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of 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

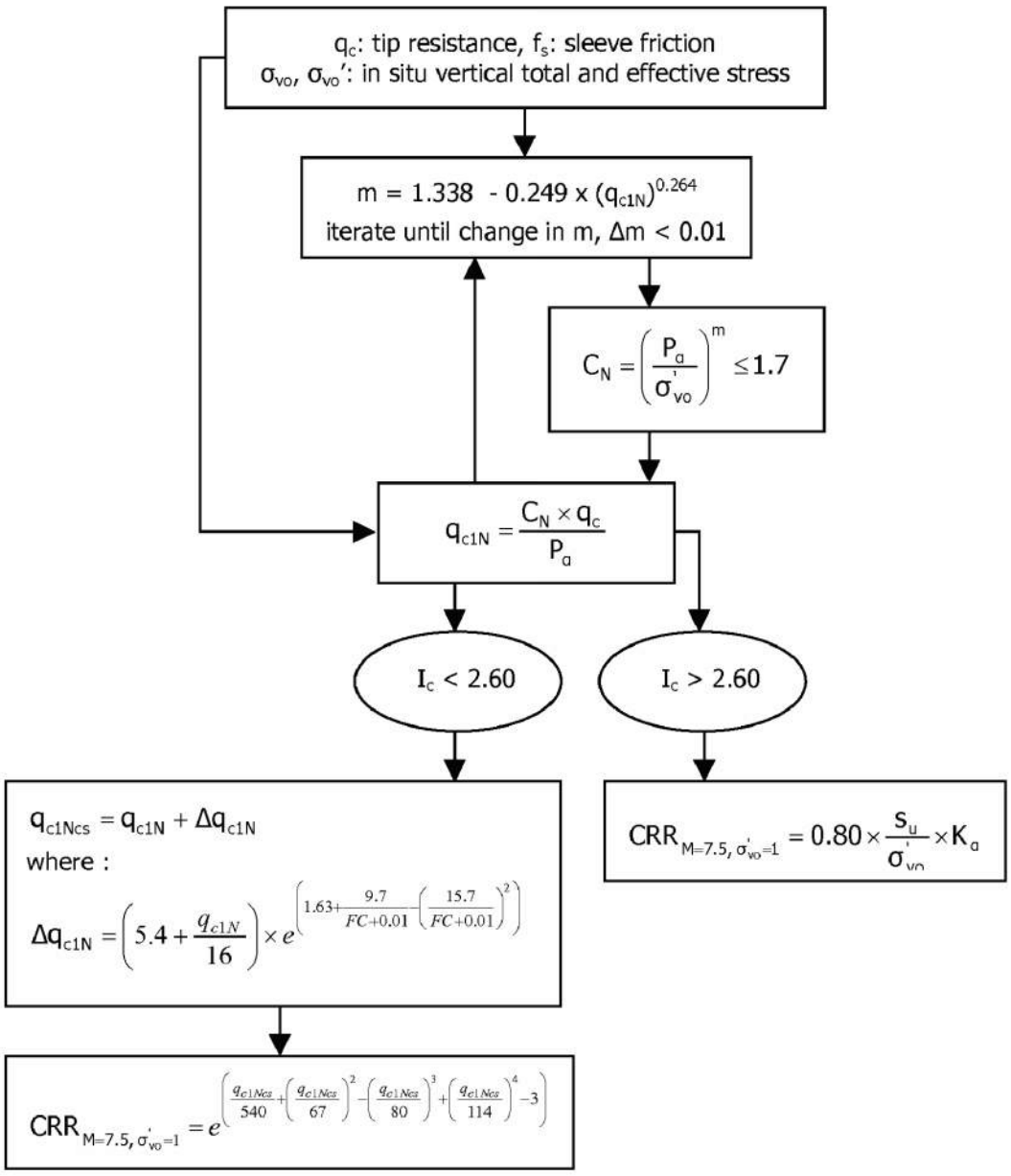
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

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]:

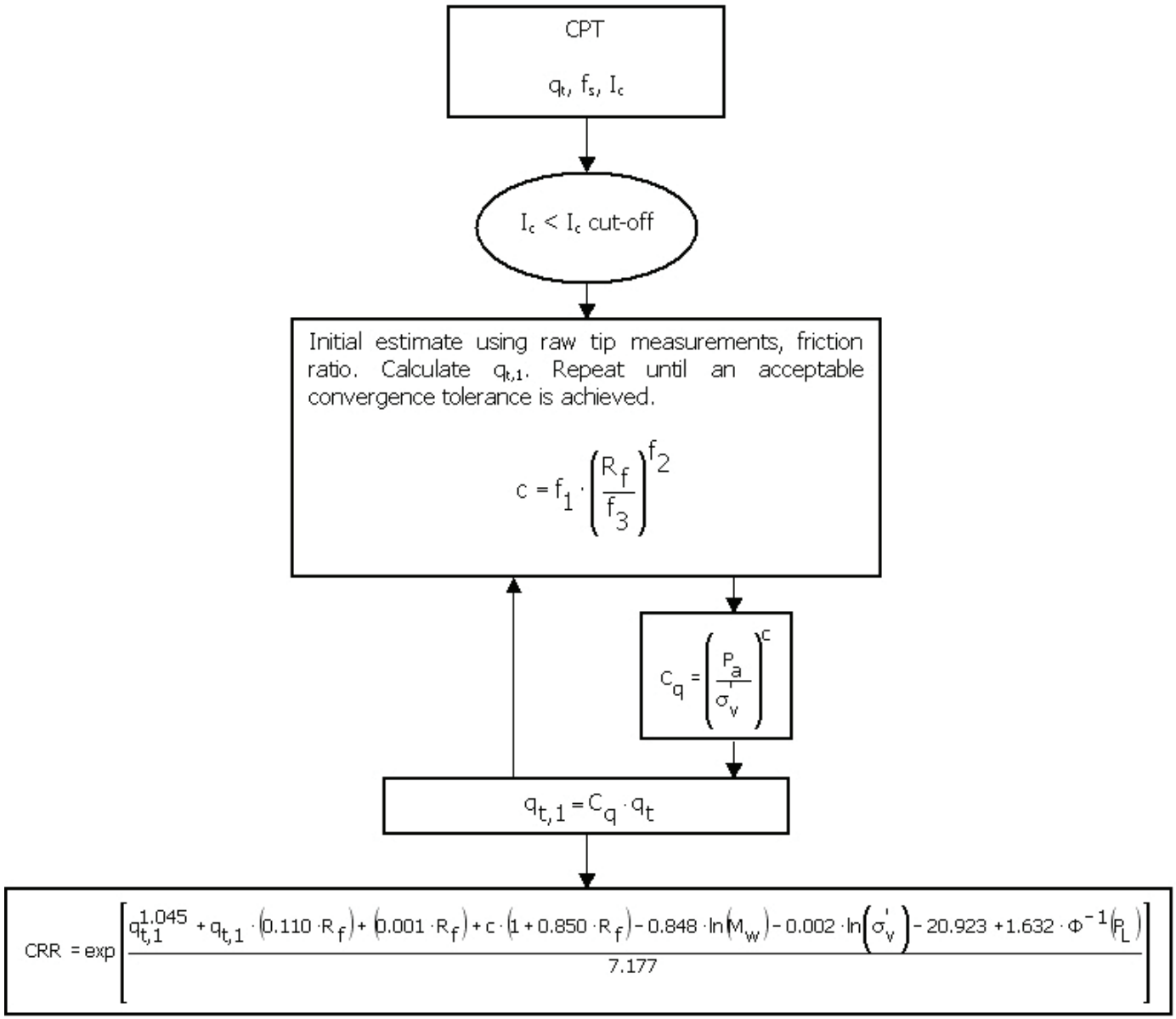


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

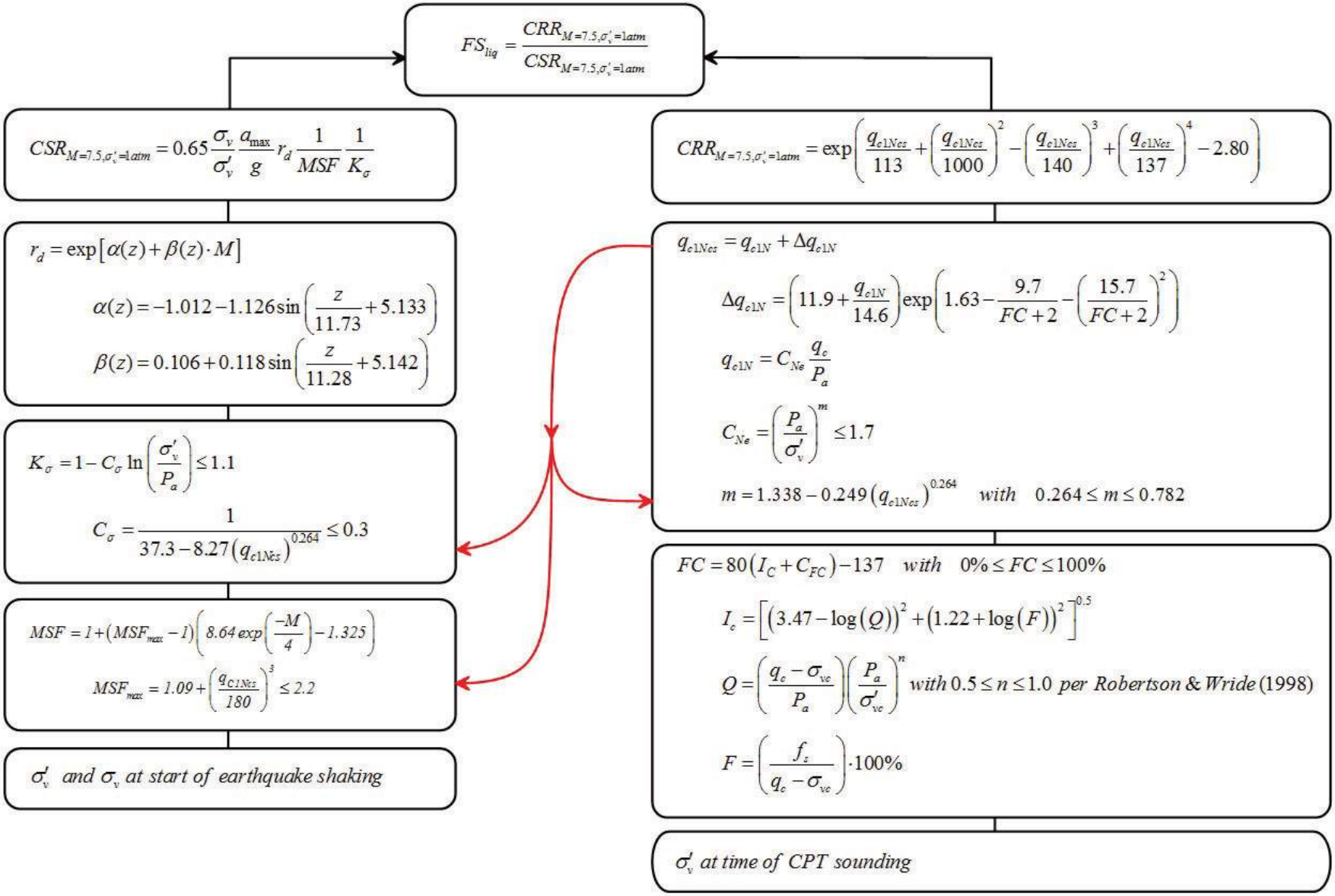
Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



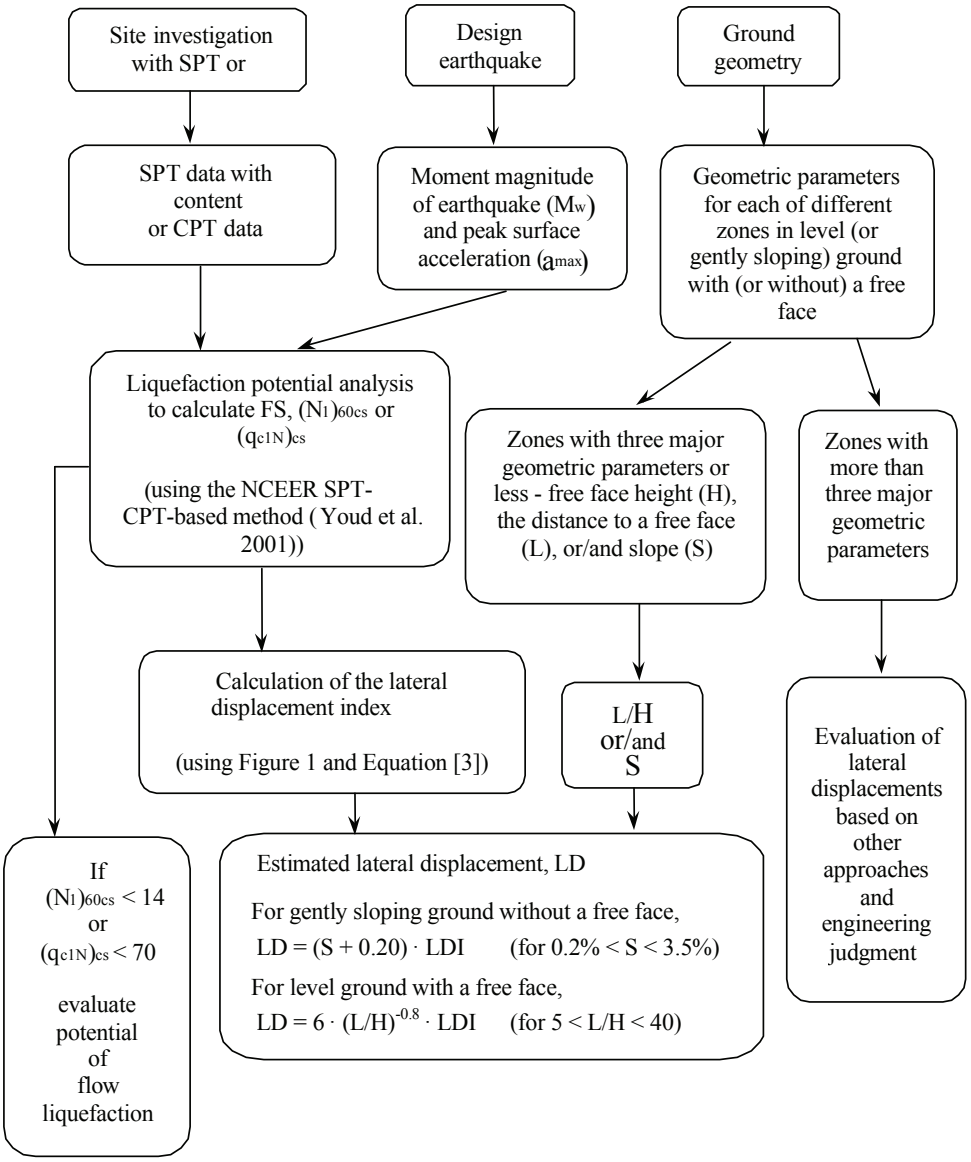
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



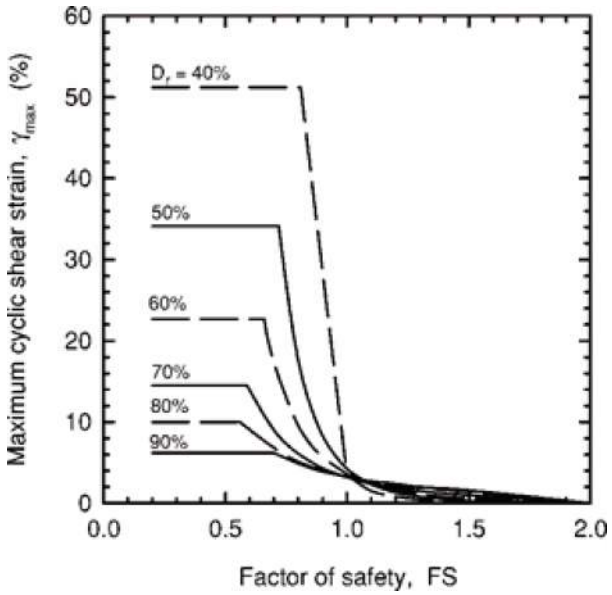
Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)



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



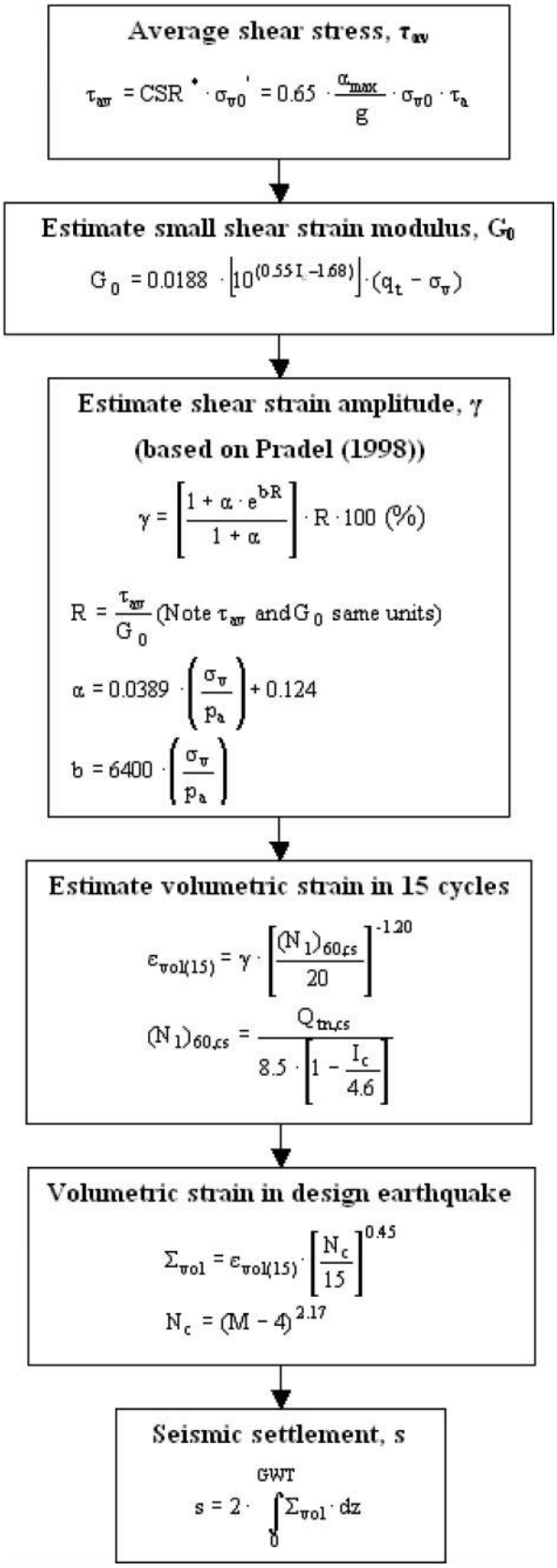
[1] **Figure 1**

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

[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



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.

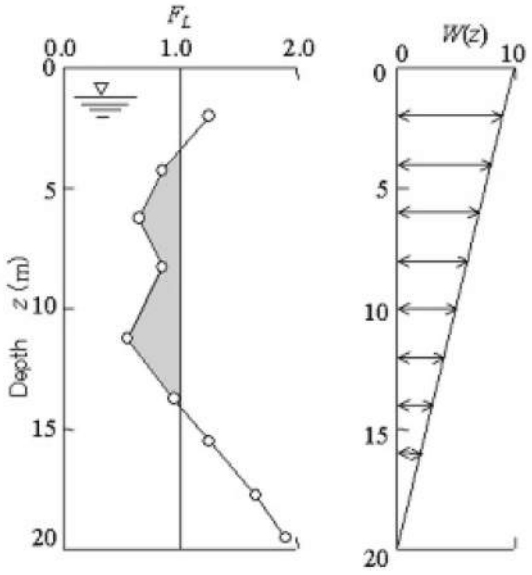
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\mathbf{LPI} = \int_0^{20} (10 - 0{,}5z) \times F_L \times dz$$

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

Shear-Induced Building Settlement (Ds) calculation procedure

The shear-induced building settlement (Ds) due to liquefaction below the building can be estimated using the relationship developed by Bray and Macedo (2017):

$$Ln(Ds) = c1 + c2 * LBS + 0.58 * Ln\left(Tanh\left(\frac{HL}{6}\right)\right) + 4.59 * Ln(Q) - 0.42 * Ln(Q)^2 - 0.02 * B + 0.84 * Ln(CAVdp) + 0.41 * Ln(Sa1) + \varepsilon$$

where Ds is in the units of mm, c1= -8.35 and c2= 0.072 for LBS ≤ 16, and c1= -7.48 and c2= 0.014 otherwise. Q is the building contact pressure in units of kPa, HL is the cumulative thickness of the liquefiable layers in the units of m, B is the building width in the units of m, CAVdp is a standardized version of the cumulative absolute velocity in the units of g-s, Sa1 is 5%-damped pseudo-acceleration response spectral value at a period of 1 s in the units of g, and ε is a normal random variable with zero mean and 0.50 standard deviation in Ln units. The liquefaction-induced building settlement index (LBS) is:

$$LBS = \sum W * \frac{\varepsilon_{shear}}{z} dz$$

where z (m) is the depth measured from the ground surface > 0, W is a foundation-weighting factor wherein W = 0.0 for z less than Df, which is the embedment depth of the foundation, and W = 1.0 otherwise. The shear strain parameter (ε_shear) is the liquefaction-induced free-field shear strain (in %) estimated using Zhang et al. (2004). It is calculated based on the estimated Dr of the liquefied soil layer and the calculated safety factor against liquefaction triggering (FSL).

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Project Name - Wine Education Complex, Napa Valley College, Napa, CA By: Brock Campbell Job No. 2407-40 Date: 1/19/23

LIQUEFACTION ANALYSIS FOR BORING B3

Liquefaction analysis is performed following Seed's Procedure

a_{max} = 0.916 g (Peak Ground Acceleration)

References: G.R. Martin & M. Lew (1999) / I.M. Idriss and R.W. Boulanger (2008)

M_W = 7.00

$(N_1)_{60} = N_m C_N C_E C_B C_R C_S$ $(N_1)_{60,CS} = \alpha+\beta(N_1)_{60}$

Corrected cyclic resisting ratio (CRR_M) = $CRR_{7.5\ 1\ atm}$ x MSF x K_σ

where:

where: MSF = Magnitude Scaling Factor 1.19

C_N = Correction fo overburden pressure = $(P_a/\sigma'_{vo})^{0.5}$, where P_a = 1.044 tsf; CN<=2

K_σ = Correction factor for high overburden pressure

C_E = Emean/E60 = Correction for Energy Ratio to correct to standard 60% Energy

$CRR_{7.5\ 1\ atm}$ = CRR for magnitude 7.5 earthquakes and σ'v at 1 atm.

C_B = Correction for borehole diameter; C_R = Correction for Rod Length; C_S = Correction for sampling method

Borehole 8 in C_B = 1.15

C_E = 1.05

Cs = 1.0

Induced cyclic stress ratio (CSR_M) = 0.65 x a_{max} x σv x r_d / σ'v

where: r_d = stress reduction factor

ΔN = SPT blow counts correction for silty sand (based on estimated percentage of fines)

Factor of Safety (FS) = CRR_M / CSR_M

Lateral Displacement (YES/NO) = NO

Acceptable Factor of Safety = 1.3

Surcharge on top of the ground = 0 psf 0 =top of ground el. -20 =water table El. (worst case est.)

BASE OF LAYER ELEV. (ft.)	TOP OF LAYER ELEV. (ft.)	SOIL TYPE	LIQUEF. SOIL? (YES/NO)	FINES (%)	LAYER THICK-NESS (ft.)	TOTAL UNIT WEIGHT (pcf)	TOTAL PRESS. (tsf)	EFFEC. PRESS. (tsf)	DEPTH BELOW GROUND (ft)	OVER-BURDON CORRECT C_N	SAMPLER TYPE 1=SPT 2=MC	FIELD BLOW COUNT N_m	C_R	CORR. BLOW COUNT $(N_1)_{60}$	CORR. BLOW COUNT $(N_1)_{60,CS}$	$CRR_{7.5}$	STRESS REDUC. COEFF. r_d	OVER-BURDEN CORR. K_σ	CSR_M	FACTOR OF SAFETY FS
-5	0	CL	NO		5.0	126	0.16	0.16	2.50	2.00	2	36	0.75	N/P	N/P	N/P	0.994	1.00	0.592	ABOVE GW
-7.5	-5	CL	NO		2.5	110	0.38	0.38	6.25	1.65	2	44	0.75	N/P	N/P	N/P	0.985	1.00	0.587	ABOVE GW
-15	-7.5	SP-SC	NO		7.5	118	0.67	0.67	11.25	1.24	2	32	0.75	N/P	N/P	N/P	0.974	1.00	0.580	ABOVE GW
-18	-15	SP-SC	NO		3.0	120	0.99	0.99	16.50	1.03	2	45	0.85	N/P	N/P	N/P	0.962	1.00	0.572	ABOVE GW
-25	-18	SC	YES	20	7.0	120	1.29	1.18	21.50	0.94	2	37	0.95	25	31	0.500	0.950	0.97	0.618	0.94
-30	-25	SC	YES	17	5.0	120	1.65	1.35	27.50	0.88	2	12	0.95	8	11	0.120	0.936	0.95	0.680	0.20
-33	-30	SP	YES	12	3.0	120	1.89	1.46	31.50	0.84	2	28	0.95	17	19	0.207	0.918	0.93	0.704	0.33
-40	-33	SP-SC	YES	12	7.0	120	2.19	1.61	36.50	0.81	2	100	1.00	61	65	0.500	0.877	0.92	0.710	0.77
-42	-40	SP-SC	YES	5	2.0	120	2.46	1.74	41.00	0.78	2	41	1.00	24	24	0.270	0.840	0.90	0.707	0.41
-47	-42	CL	NO	70	5.0	115	2.66	1.83	44.50	0.75	2	68	1.00	N/P	N/P	N/P	0.812	0.89	0.702	NOT LIQ
-51.5	-47	CL	NO	70	4.5	115	2.93	1.96	49.25	0.73	2	55	1.00	N/P	N/P	N/P	0.773	0.88	0.690	NOT LIQ

BASE OF LAYER ELEV. (ft.)	TOP OF LAYER ELEV. (ft.)	SOIL TYPE	LAYER THICK-NESS (ft.)	CORRECT BLOW COUNT $(N_1)_{60,CS}$	FACTOR OF SAFETY FS	DRY SAND SHEAR STRAIN γ_c	LIMITING SHEAR STRAIN γ_{min}	PARA-METER $F\sigma$	MAX SHEAR STRAIN γ_{max}	LDI (ft)	VERTICAL VOL. STRAIN	SETT. (in)	SOIL LIQ?
-5	0	CL	5.0	N/P	ABOVE GW	0.00E+00	N/P	N/P	N/P	N/P	0.000E+00	0.000	NO
-7.5	-5	CL	2.5	N/P	ABOVE GW	0.00E+00	N/P	N/P	N/P	N/P	0.000E+00	0.000	NO
-15	-7.5	SP-SC	7.5	N/P	ABOVE GW	0.00E+00	N/P	N/P	N/P	N/P	0.000E+00	0.000	NO
-18	-15	SP-SC	3.0	N/P	ABOVE GW	0.00E+00	N/P	N/P	N/P	N/P	0.000E+00	0.000	NO
-25	-18	SC	7.0	31	0.94	N/P	0.041	-0.144	0.039	N/P	7.581E-03	0.637	YES
-30	-25	SC	5.0	11	0.20	N/P	0.419	0.888	0.419	N/P	3.510E-02	2.106	YES
-33	-30	SP	3.0	19	0.33	N/P	0.174	0.560	0.174	N/P	2.384E-02	0.858	YES
-40	-33	SP-SC	7.0	65	0.77	N/P	0.000	-2.837	0.000	N/P	0.000E+00	0.000	YES
-42	-40	SP-SC	2.0	24	0.41	N/P	0.098	0.282	0.098	N/P	1.955E-02	0.469	YES
-47	-42	CL	5.0	N/P	NOT LIQ	N/P	0.000	0.948	0.000	N/P	0.000E+00	0.000	NO
-51.5	-47	CL	4.5	N/P	NOT LIQ	N/P	0.000	0.948	0.000	N/P	0.000E+00	0.000	NO

Volumetric Strain Ratio, CN= 0.90
(For Dry Sand)

Estimated Total Seismic Induced Settlement
= 4.07 inches
Estimated Differential Seismic Induced Settlem
= 2.71 inches
Estimated Lateral Displacement Index
= 0.00 ft

January 20, 2023 **File No.: 2407-40**

Ms. Samantha Maddox
Napa Valley College
2277 Napa-Vallejo Hwy
Napa, CA 94558

Subject: **Response to CGS Review**
Proposed Wine Education Complex
Napa Valley College
Napa, CA 94558
CGS Application No. 01-CGS5656

Reference: **Geotechnical Engineering Investigation dated August 5, 2022**

Dear Ms. Maddox:

The California Geological Survey (CGS) prepared an Engineering Geology and Seismology Review for the subject project dated December 14, 2022. The following is a response to the checklist comments regarding the referenced geotechnical investigation report.

Comment 20: A liquefaction analysis based on data obtained from boring B-3 at the site. The analysis also utilized peak ground acceleration and earthquake magnitude values from the project geologic hazards study dated August 5, 2022. Total settlement was calculated to be 4.1 inches using methods developed by Martin & Lew (1999) and Idriss & Boulanger (2008). The Southern California Earthquake Center (1999) recommends that the building should be designed to accommodate 2/3 of the total settlement or 2.7 inches between columns. The liquefaction occurs in clayey sand and poorly graded sand with clay between depths of approximately 18 and 42 feet.

Liquefaction settlement was calculated to be 2.1 inches utilizing data from a Cone Penetration Test (CPT) performed for another project at Napa Valley College located about 500 feet northwest of the project site. The CPT produces more precise data regarding layer thickness which correlated to the reduction in total settlement due to liquefaction from CPT data.

Ground improvement methods can be evaluated if the settlement due to liquefaction is determined to be excessive.

Thank you for the opportunity of continuing to provide our services for this project. If you have questions regarding this report, please contact our office.

Respectfully Submitted,
Signet Testing Laboratories, Inc.

Brock Campbell

Brock Campbell, PE, GE
Engineering Manager

Allerion
Consulting Group, Inc.

January 20, 2023 Project No. 05-22040G

MatriScope Engineering Laboratories, Inc.
Attn: Mr. Brock Campbell
601 Bercut Drive,
Sacramento, California 95811

Sent via email: Brock Campbell < bcampbell@matriscope.com >

Subject: Response to CGS Review Comment 13
Geological Hazards Study
Proposed Wine Education Center
Napa Valley College
2277 Napa Vallejo Highway, Napa, California 94558

Dear Mr. Campbell,

Allerion Consulting Group, Inc. (ACG) prepared a "Geological Hazards Study" dated August 5, 2022, for the subject project site. This letter is ACG's response to the California Department of Conservation Geological Survey (CGS) review letter of December 14, 2022, comment 13, below.

CGS Comment 13: "Classify the Geologic Subgrade (Site Class): **Additional information is requested**. The consultants classify the site soil profile as Site Class D, Stiff Soil. **However, the consultants did not provide a rationale for their Site Class determination as per ASCE 7-16 Section 20.3.3 and Table 20.3-1**. Therefore, CGS requests the consultants provide a rationale for the Site Class determination per ASCE 7-16."

Response: We reviewed ACG's report and the Signet Testing Labs, August 5, 2022, "Geotechnical Engineering Investigation" (File No. 2407-40). ACG's report indicated the site is underlain by Pleistocene Epoch alluvial deposits (old) (Qoa). The Site Class D referenced in ACG's report is based on the average field standard penetration resistance per Signet's boring log's N values in accordance with ASCE 7-16, Section 20.3.3, Table 20.3-1, and Section 20.4.2.

Should you have any questions or need further information then please do not hesitate to contact this office.

Respectfully Submitted,
Allerion Consulting Group, Inc.

Ed Hendrick

Ed Hendrick, P.E., G.E., P.G., C.E.G.
GE 002021, CEG 1052
Principal Geotechnical Engineer/Engineering Geologist

PHOENIX *Geotechnical*
Consulting Engineers

May 16, 2006

Project Number 764-7

Napa Valley College
Campus Planning and Construction
Attention: Dan TerAvest
2277 Napa-Vallejo Highway
Napa, CA 94559

RE: Geotechnical Study
Napa Valley College
Winery Storage Building

Introduction

This presents the results of our geotechnical study for the proposed winery storage building at the Napa Valley College in Napa, California. The storage building will be sited north of the existing winery building (1700C) on Streblow Drive. The project includes construction of a single story, wood frame structure 40 X 48 feet in plan dimension with a slab-on-grade floor. The building will have rooms for general and case storage and a small office. The interior floor and exterior concrete apron slabs will have forklift traffic. The existing adjacent pavement will be overlaid. The building layout is shown on the site/floor plan by TLCD Architecture. The structural siting and site improvements are shown on the Preliminary Civil Plans by Bartelt Engineering, 3 Sheets, dated April 2006. We anticipate loads will be typical for the type of structure proposed.

Herzog Geotechnical prepared a Geotechnical Investigation and Geologic Hazards Evaluation for the adjacent winery, dated August 30, 2001. That investigation encountered weak and potentially expansive near surface soils which were judged not suitable for the support of the winery structure. The report recommended removal of the surface soils and replacement with select imported fill. It was also recommend to support of the structure with conventional spread footing foundations in the import fill.

The purpose of this study is to supplement the Herzog report and to evaluate the near surface conditions at the storage building site to provide geotechnical recommendations for design and construction of the structure and site improvements.

Our scope included data review, subsurface exploration with test pits and preparation of this report.

Site Investigation

On May 3, 2006 we explored the subsurface conditions in the area of the proposed structure with 4 test pits excavated to depths of 3.0 feet below existing grade. The test pits were excavated with a rubber tired backhoe at the approximate locations shown on Plate 2, Exploration Plan. The test pit locations were determined approximately by measuring their distance from existing features as shown on the site plan provided. Our Geotechnical Engineer located the test pits, logged the conditions encountered and obtained samples of the materials encountered for visual classification.

Representative undisturbed and bulk samples of surface soils at anticipated pavement subgrade were taken from the test pits. The logs of test pits, showing the materials encountered, are presented on the Test Pit Data Summary, Plate 3. The soils are described in accordance with the Unified Soil Classification System, presented on Plate 4.

The test pit logs show our interpretation of subsurface soil conditions at the date and locations indicated. Soil conditions may vary at other locations and times. Our interpretation is based on visual inspection of test pit walls and soil samples and laboratory test results. The location of the soil boundaries should be considered approximate. The transition between soil types may be gradual.

Site Conditions

Surface

The proposed storage building is located approximately 40 feet north of the existing winery building on Streblow Drive. The site location is shown on Plate 1. The structure and improvements will be sited within an existing relatively level, bark covered landscape area. An existing storage container within the limits of the structure will be removed.

Subsurface

The test pits encountered a surface layer of gravelly clay fill to depths of one to one and one-half feet underlain by moderately dense, porous, clayey sands to two to three feet. Clays of moderate to high plasticity were then encountered to the depths explored. Moderate to high plasticity is an indicator of moderate to high expansion potential.

Groundwater

Free groundwater was not encountered in the test pits, although soils were generally wet. Fluctuations in the groundwater level at the site will probably occur due to variations in rainfall and other factors.

Faulting and Seismicity

Faulting and seismicity are discussed in detail in the Herzog Geotechnical report.

The site is within the Coast Range Province which is considered seismically active. Data presented by the Working Group on California Earthquake Probabilities (USGS, 2003) estimates the chance of one or more large earthquakes (Magnitude 6.7 or greater) in the San Francisco Bay region within the next 30 years to be 62 percent. Consequently, we judge that the site will likely be subject to strong earthquake shaking during the life of the improvements. The site is approximately 2 kilometers from the mapped location of the West Napa Fault (Type B) as defined in the "Maps of Known Active Fault Near Source Zones in California and Nevada (ICBO, UBC 1998). The nearest Type A fault is the Rodgers Creek at approximately 17 kilometers distant.

The site is not within an Alquist Priolo Special Studies Zone and our literature review did not indicate that an active fault trace extends through the site. Therefore, we believe that there is little risk of ground rupture along a fault trace at the site.

Conclusions

The findings of our field exploration confirm the presence of fills, porous soils and expansive soils within depths which could adversely impact the support of structural foundations and the performance of slabs-on-grade if left in the present condition. We recommend that the surface soils be removed to a depth of 3 feet below pad grade (slab subgrade) and replaced with select, import, engineered fill of low expansion potential. The excavation should extend at least five feet beyond the structure and two feet beyond the concrete apron, excepting where it joins the existing asphalt pavement. The structure may be supported on conventional, continuous and isolated spread footings founded in the engineered, import fill. The footings should be underlain by at least one foot of select fill.

Geotechnical engineering recommendations for use in design and construction of the proposed improvements are presented in the subsequent sections of this report. All conclusions and recommendations presented in this report are contingent upon Phoenix Geotechnical being retained to review the soil engineering aspects of the final grading and foundation plans prior to construction and, to observe construction of the project as outlined below under the "Supplemental Services" section of this report.

Seismic Design

Based on the location of the West Napa fault (Type B) at 2 km from the site, we recommend that the following seismic design criteria be used in accord with the Uniform Building Code (1997):

Seismic Zone Factor of	0.4
Seismic Source Type	"B"
Soil Profile Type	S_D
Near Source Factor N_a	1.3
Near Source Factor N_v	1.6
Seismic Coefficient C_a	0.57
Seismic Coefficient C_v	1.02

The nearest Type A Fault is The Rodgers Creek at approximately 17 kilometers.

Site Preparation and Grading

The site should be stripped of the upper few inches of soil containing organic matter. The strippings should be removed, or if suitable, stockpiled for re-use as topsoil in landscaping. Following initial site preparation and where slabs-on-grade are to be constructed or where foundations will be supported by the fill pad, the soils should be excavated for at least 3 feet below existing grade or deeper, as necessary, to permit at least 1 foot of compacted fill below footings. The actual depth of excavation should be determined by the geotechnical engineer in the field. The over-excavation should extend laterally to five feet beyond the building footprint and to two feet beyond the limits of the concrete apron slab, excepting where it abuts the existing asphalt pavement. The subgrade exposed after excavation should be scarified, moisture conditioned to at least 2 percent above optimum moisture content and compacted to at least 90 percent relative compaction per ASTM test specification D-1557. The excavation should be level and result in a uniform depth of import fills over the limits of the building pad. The subgrade should be firm and unyielding and should be maintained in a moist condition until the placement of select fill.

After compaction of the bottom of the excavation, select fill of low expansion potential should be placed as necessary to achieve design pad grade. The fill should be moisture conditioned per the above requirements, placed in thin lifts and compacted to at least 90 percent relative compaction per ASTM Test Procedure D-1557.

Select imported fill should have a low expansion potential and have a plasticity index of 12 or less and a liquid limit of not more than 40. The imported fill material should be free of organic matter and of rocks or lumps larger than four inches in diameter. Imported fill should have not less than 20 percent nor more than 40 percent passing the No. 200 sieve and should have a UBC Expansion

index in the very low range (0 to 20). Materials proposed for imported fill should be approved by the geotechnical engineer prior to delivery to the site.

Prior to the placement of any fill, our field technician should collect representative samples of the native excavation subgrade and of select import that will be used as fill. The samples should be laboratory tested and compaction curves established to determine their maximum dry densities. The maximum dry densities may then be compared to the in place field densities obtained during construction testing to evaluate the relative compaction of the fill.

Generally, grading is most economically performed during the summer months when on-site soils are usually dry of optimum moisture content. Delays should be anticipated in site grading performed during the rainy season or early spring due to excessive moisture in on-site soils. Special and relatively expensive construction procedures should be anticipated if grading must be completed during the winter and early spring.

Spread Footing Foundations

Provided grading is performed as recommended herein, the structures may be supported on conventional continuous and isolated spread footing foundations that bear on engineered fill of select imported fill of low expansive potential.

Continuous spread footings for the structures should be at least 15 inches wide and should extend at least 18 inches below pad grade (slab subgrade). The actual depth should be determined by the geotechnical engineer during excavation and prior to forming or placing steel or concrete. Footing depth should be measured from pad grade (slab subgrade). Footings founded in engineered import fill should be underlain by at least one foot of fill. Footings installed in accordance with these recommendations may be designed using allowable bearing pressures of 2000 pounds per square foot (psf) for dead plus code live loads with a 1/3 increase for short term loads (including wind and seismic).

Resistance to lateral pressures can be obtained from passive earth pressures against the footing and soil friction along the base of the footing. A passive equivalent fluid pressure of 300 pcf in compacted fill and a friction factor of 0.30 may be used. The upper one foot of passive resistance should be ignored unless confined by slabs or pavements.

Footing excavations should be level and stepped as necessary. The bottoms of all footing excavations should be cleaned of loose material and maintained in a moist condition prior to placement of concrete.

If spread footings are installed in accordance with the recommendations in this report, we estimate post construction settlements will be on the order of one-half inch.

Slab-On-Grade

Interior slabs-on-grade should be underlain by select, imported, engineered fill of low expansive potential. Slab-on-grade subgrade should be rolled to produce a dense, uniform surface. Interior and exterior slab on grade subgrade should be prepared according to the Site Preparation and Grading section of this report.

Slab thickness and reinforcing should be specified by the structural engineer.

Interior slab subgrade should be at least 6 inches above surrounding adjacent grade. If not, positive underslab drainage should be provided. The slab subgrade should be graded to a low spot and a collector pipe installed and outletted by gravity to daylight. As an alternative to sloping the slab subgrade, a slab underdrain may consist of perforated pipe trenched into the slab subgrade and surrounded by drain rock connected to the slab rock. The pipe should outlet by gravity to daylight. The pipe should be PVC or ABS with a SDR of 35. Corrugated flexible pipe should not be used.

Concrete slabs-on-grade can be subject to moisture penetration resulting from continued capillary rise and the termination of normal evapotranspiration. To decrease the likelihood of problems related to damp slabs, suitable moisture protection measures should be used where moisture sensitive floor coverings or other factors warrant.

Slabs should be provided with a capillary break consisting of at least 4 inches of ¾ inch x ¼ inch crushed rock and a vapor retarder at least 10 mils thick conforming to the requirements of ASTM E 1745 Class A Underslab Vapor Retarders. The vapor barrier should be compatible with the capillary break for puncture resistance. Specification of the slab section above the capillary break including the vapor barrier, placement of granular material or not above the vapor barrier and water proofing of the slab should be specified by the architect/structural engineer to provide for the level of moisture protection required.

Exterior slabs-on-grade should be supported by at least 18 inches of select, imported engineered fill of low expansive potential constructed according to Site Preparation and Grading section of this report. Exterior slabs supporting traffic should be supported by at least 6 inches of Caltrans Class 2 Aggregate base compacted to 95 percent relative compaction in addition to the select imported fill.

Geotechnical Drainage

Surface water should be diverted away from foundations and edges of slabs and pavements. Surface drainage gradients within 5 feet of building foundations should be constructed with a minimum slope of 2 percent for paved areas and 4 percent for unpaved areas. The structure should be provided with gutters, and the downspouts should be connected to closed conduits discharging away from foundations. Roof downspouts and surface drains must be maintained entirely separate from foundation drains, retaining wall backdrains, crawl space drains and subdrains. All water from

downspouts, area drains, subdrains etc. should be collected in rigid, non-perforated pipes and discharged away from foundations into erosion resistant dissipators at the base of adjacent slopes. The pipe should be PVC or ABS with an SDR of 35. Corrugated flexible pipe should not be used. Slab underdrains should be provided per the slab-on-grade section.

Supplemental Services

Phoenix Geotechnical recommends that they be retained to provide input during plan development as necessary and to review the project plans and specifications, including the geotechnical elements of the structural and grading plans, to determine if they are consistent with our recommendations. This review should be done prior to the start of construction so that any modifications may be incorporated into the design. In addition, we should be retained to provide observation and testing services during construction, particularly site excavations, placement and compaction of fill, and excavation of spread footing foundations. We can provide a recommended scope of services during construction after review of the final plans.

Our services during construction are limited to the observation of soil and bedrock conditions, depth of excavations and the condition of foundation excavation prior to concrete placement. Our services do not include observation and/or approval of steel, concrete, or asphalt. Nor do they include establishing or verifying construction lines and grades. Field verification of grades and recommended slope inclinations should be performed by the contractor or Civil Engineer during construction. The presence of our field representative at the site is to provide professional opinions and recommendations based upon the field representative's observations of the contractor's work and does not include any superintending, supervision or direction of the actual work of the contractor or the contractor's workmen. Job site safety, the stability of temporary construction cut slopes and the location of underground utility lines and structures is the sole responsibility of the contractor. Upon completion of the geotechnical portion of the project, we should perform a final site visit and summarize the results of our construction services in a final report.

If, during construction, subsurface conditions different from those encountered in the explorations are observed, or appear to be present beneath excavations, we should be advised at once so that these conditions may be reviewed and our recommendations reconsidered. The recommendations made in this report are contingent upon our notification and review of the changed conditions.

These supplemental services are performed on an as-requested basis and are in addition to this geotechnical investigation. We should be provided with 48 hours notice before the start of construction and resumption after interruptions for those items requiring our observation or testing. We cannot approve or provide comment on items we have not been requested to observe or test. We recommend a preconstruction meeting be held with the contractor to discuss the project, the intent of our recommendations and co-ordination of our services during construction.

Limitations

This report has been prepared by Phoenix Geotechnical for the exclusive use of Napa Valley College and their consultants for development of the proposed project described in this report.

Our services consist of professional opinions and conclusions of a Geotechnical Engineer developed in accordance with generally accepted geotechnical engineering principles and practices. We provide no other warranty, either express or implied. Our conclusions and recommendations are based on the information provided to us regarding the proposed construction, the results of our field exploration, laboratory testing programs, and professional judgement. Verification of our conclusions and recommendations is subject to our review of the project plans and specifications, and our observation of construction.

The test pits represent subsurface conditions at the locations and on the dates indicated. It is not warranted that they are representative of such conditions elsewhere or at other times. Site conditions described in the text of this report are those existing at the time of our field exploration on May 3, 2006, and may not necessarily be the same or comparable at other times.

The scope of our services did not include an environmental assessment or an investigation of the presence or absence of hazardous, toxic or corrosive materials in the soil, surface water, groundwater or air on, below or around this site.

If more than 18 months have elapsed between the submission of this report and the start of work at the site, or if conditions have changed because of natural causes or construction operations at, or adjacent to, the site, the recommendations made in this report may no longer be valid or appropriate. In such case, we recommend that we review this report to determine the applicability of the conclusions and recommendations considering the time lapsed or changed conditions. The recommendations made in this report are contingent upon such review.

We trust this provides the information you require at this time. If you have any questions, please call us at (707) 224-8674.

Yours Very Truly

Robert D. Broadhurst P.E.
Geotechnical Engineer 165

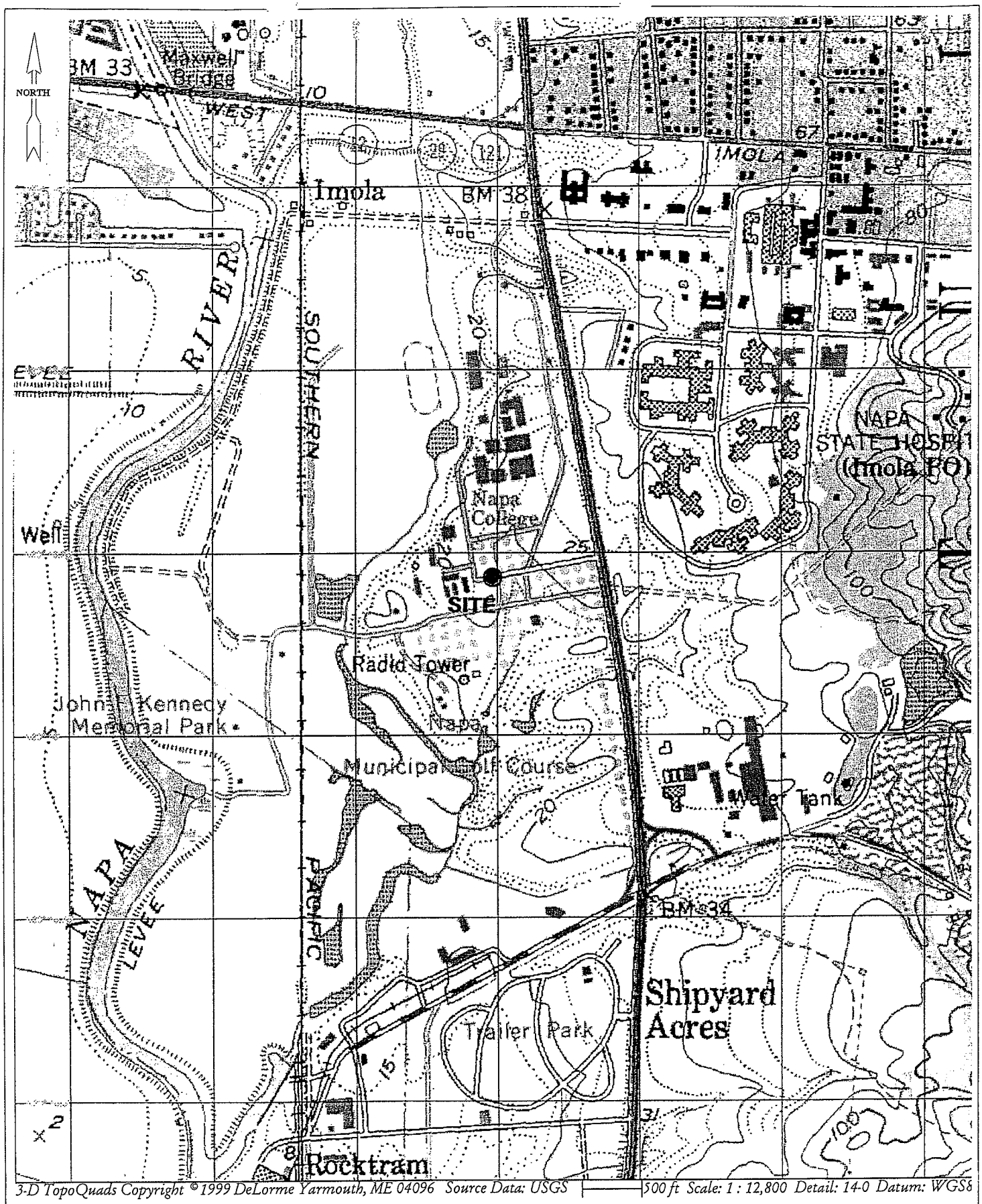
Attachment: Plate 1 - Site Location Map
Plate 2 - Exploration Plan
Plate 3 - Test Pit Data Summary
Plate 4 - Soil Classification Chart and Key to Test Data

cc: TLCD Architecture
Attn: Guy Messick

Dasse Design
Attn: Jon Kiland

Bartelt Engineering
Attention: Mike Muelrath

RDB:mnb(Z5L-764-7.001)



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS | 500 ft Scale: 1 : 12,800 Detail: 14-0 Datum: WGS8

PHOENIX *Geotechnical*

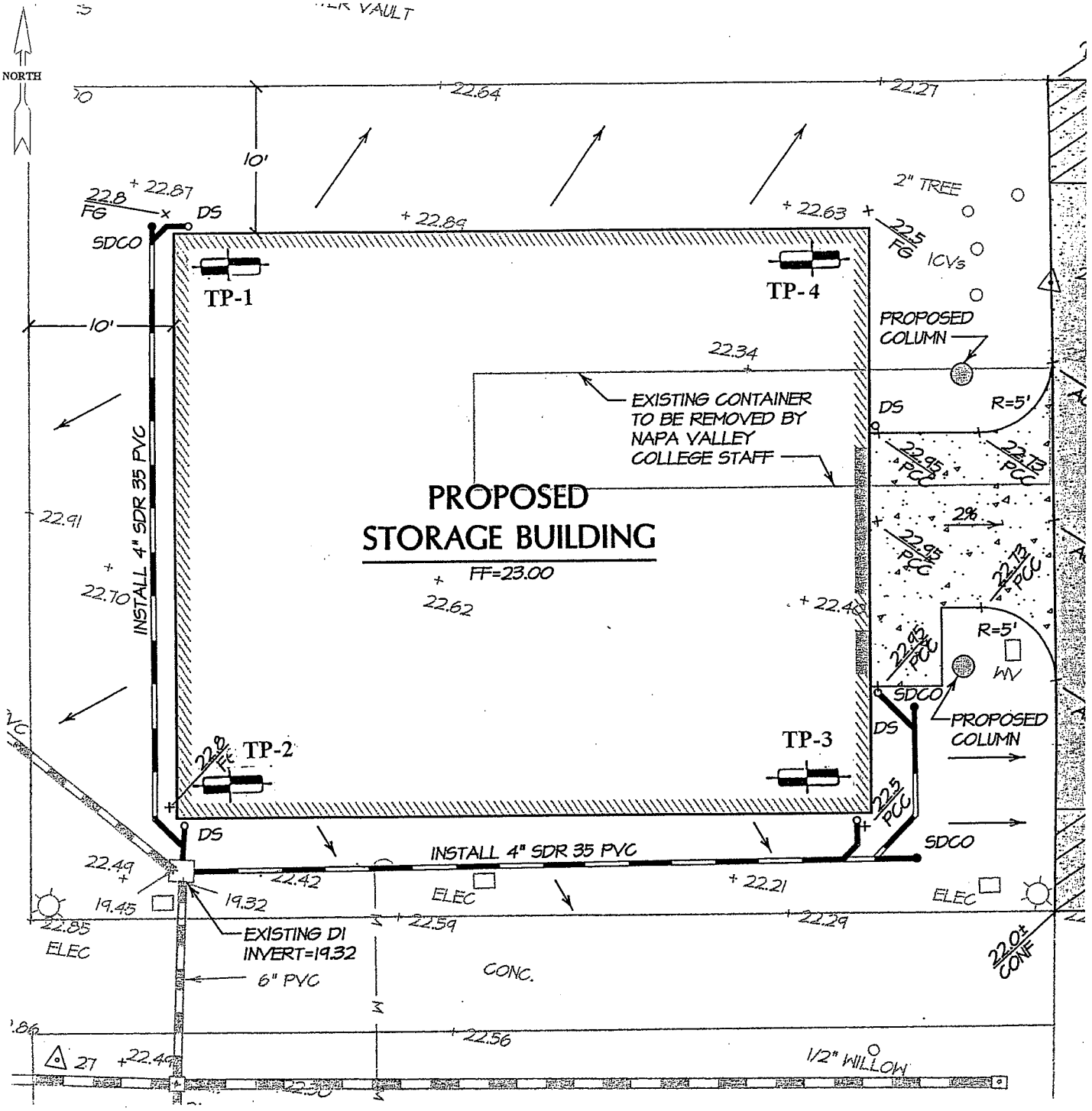
Project #: 764-7
Reviewed:
Date: June 2006

SITE LOCATION MAP

NVC WINERY STORAGE BUILDING

NAPA COUNTY, CALIFORNIA

PLATE 1



TEST PIT LOCATION

SCALE: 1" = 10'

Reference: Bartelt Engineering, 4-06; Napa Valley College Winery Grading and Drainage Plan, Sheet 2.

PHOENIX *Geotechnical* Project #: 764-7 Reviewed: Date: June 2006	**EXPLORATION PLAN** NVC WINERY STORAGE BUILDING NAPA COUNTY, CALIFORNIA	PLATE 2

TEST PIT	DEPTH INCHES	DESCRIPTION
1	0 - 10/12	Brown to Gray-Brown Gravelly Sandy Clay (CL); medium stiff to stiff, moist to wet, (Fill).
	10/12 - 24	Brown Clayey Sand (SC); medium dense, moist, slightly porous.
	24 - 36	Red-Brown Sandy Clay (CH); medium stiff, wet.
2	0 - 10/12	Brown to Gray-Brown Gravelly Sandy Clay (CL); medium stiff to stiff, moist to wet, (Fill).
	10/12 - 21	Brown Clayey Sand (SC); medium dense, moist, slightly porous, less dense below 18".
	21 - 36	Yellow-Brown Sandy Clay (CH); stiff, wet.
	36	Yellow-Brown Clayey Sand (SC); medium dense to dense, wet.
3	0 - 16	Brown to Gray-Brown Sandy Clay (CL); with gravel, medium stiff, wet, (Fill)
	16 - 28	Brown to Dark Brown Clayey Sand (SC); medium dense, moist to wet.
	28 - 36	Mottled Yellow-Brown and Orange-Brown Sandy Clay (CH); with some gray mottling, stiff, wet.
4	0 - 18	3" to 4" layers of Yellow-Brown, Dark Brown and Gray-Brown Sandy Clay (CL); with gravel, stiff, wet, (Fill).
	18 - 34	Brown to Dark Brown Clayey Sand (SC); medium dense, wet, porous.
	34 - 36	Yellow-Brown Sandy clay (CH); stiff to very stiff, wet.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS More than Half > #200 sieve	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POOORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half < #200 sieve	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

KEY TO TEST DATA

			Shear Strength (psf) / Confining Pressure (psf)	
Consol	Consolidation	Txuu	2630 (240)	Unconsolidated Undrained Triaxial
LL	Liquid Limit (%)	Tx sat	2100 (575)	Unconsolidated Undrained Triaxial, pre-saturated
PL	Plastic Limit (%)	DS	3740 (960)	Consolidated Drained Direct Shear
PI	Plasticity Index	FVS	1320	Field Vane Shear
Gs	Specific Gravity	UC	4200	Unconfined Compression
SA	Sieve Analysis	LVS	500	Laboratory Vane Shear
■	Undisturbed Sample	SS	Shrink Swell	
⊠	Bulk or Disturbed Sample	EI	Expansion Index	
⊠	Standard Penetration Test	P	Permeability	
⊘	Sample Attempt - No Recovery	SE	Sand Equivalent	

PHOENIX *Geotechnical*

Project #: 764-7

Date: June 2006

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

NVC WINERY STORAGE BUILDING

NAPA COUNTY, CALIFORNIA

PLATE 4