LEGEND

- B1 — BORINGS
- P1 — DYNAMIC CONE PENETROMETERS
- FAILURE LIMITS

EXPLORATION DATES:
04/06/2018, 04/12/2018, & 04/13/2018

PARSONS CREEK

0+83

0+50

0+00

HA1

B1

B2

B3

P1

CP#1

CP#3

CP#5

1+00

0+00

UNIVERSITY ROAD (CR 116B)

COUNTY R.O.W.

COUNTY R.O.W.

DRAINAGE DITCH

+11.9%

+10.3%

+11.4%

+11.5%

16.56

10.51

30.96

-1.9:1

-1.4:1

-1.6:1

-1.7:1

-1.8:1

-1.5:1

-1.1:1

-0.8:1

-1.0:1

-1.1:1

-2.0:1

-2.0:1

-4.0:1

-1.6:1

18"OAK

14"OAK

16"OAK

12"BAY

6"BAY

14"BAY

10"BAY

16"OAK

12"OAK

12"OAK

14"OAK

8"OAK

8"OAK

14"OAK

12"OAK

1395

1400

1405

1410

1415

1420

1425

1430

1435

1440

A
FIG 5

NORTH

Map and Data Source:
Topographic survey provided by MCDOT via electronic transfer on 02/12/2018. Survey completed by SHN Consulting Engineers & Geologist, Inc., January 2018.

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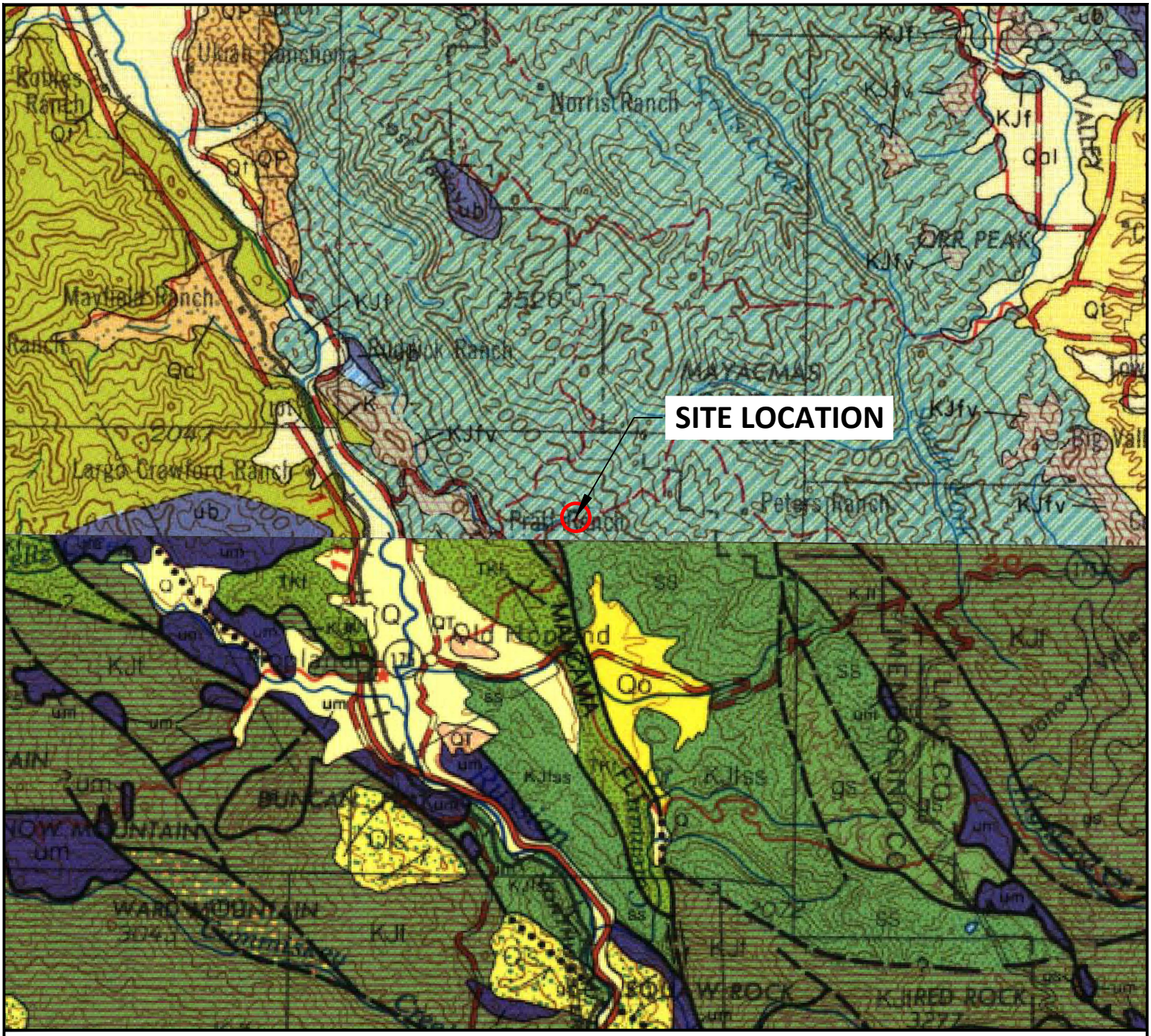
GEOTECHNICAL INVESTIGATION
UNIVERSITY ROAD (CR 116B)
FAILURE AT MP 3.78

HOPLAND, MENDOCINO COUNTY, CA

Figure 2
Exploration Location Map

Prj. No: 16-337.19
Scale: 1" = 10'
Date: 09/28/2018

Path: \\Mac\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.19 University Road (CR 116B) at MP 3.78\CAD\16-337.19-Figures.dwg Plot Date: Sep 27, 2018 at 6:10pm



LEGEND

Geologic Formations

KJf

Ukiah Sheet

Franciscan Formation (Jurassic-Cretaceous) - *sandstone, shale, chert, and conglomerate, with locally small areas of greenstone, limestone, basalt, schist, and related metamorphic rocks.*

KJf
ss
ch
gs
mg

Santa Rosa Sheet

Franciscan Complex (Jurassic-Cretaceous) - ss-*sandstone, shale, conglomerate; ch-chert; gs-greenstone; mg-metagraywacke; Horizontal pattern denotes melange terrain.*

CONTACT
(Dashed where approximately located, gradational or inferred)

FAULT
(Dashed where approximately located)

NORTH

Map Source:

1. *Jennings, C.W. and Strand, R.G., 1960, Geologic Map of California, Ukiah Sheet, California Division of Mines and Geology, Scale 1:250,000*

2. *Wagner, D.L. and Bortugno, E.J., 1982, Geologic Map of the Santa Rosa Quadrangle, California, Regional Geologic Map 2A, California Division of Mines and Geology, Scale 1:250,000*

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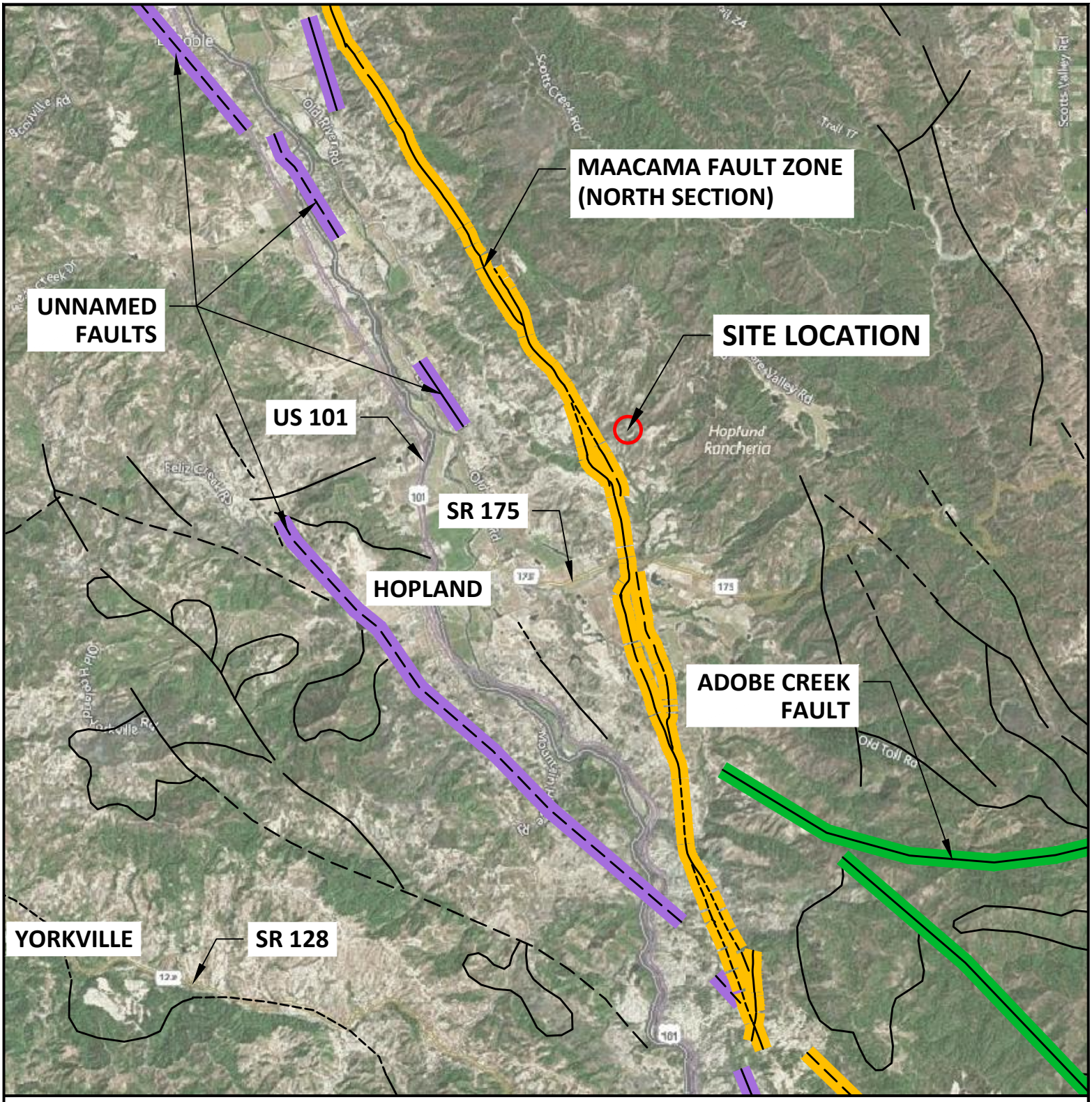
UNIVERSITY ROAD (CR 116B)
FAILURE AT MP 3.78

HOPLAND, MENDOCINO COUNTY, CA

Figure 3
Regional Geologic Map

Prj. No: 16-337.19
Scale: 1" = 10,000'
Date: 06/20/2018



LEGEND

CGS Faults (Last Activity Age)	CGS Faults (Last Activity Age)	Fault Location
<200 years (Historic)	<1.6 million years (Quaternary)	Certain
<11,700 years (Holocene)	>1.6 million years (Pre-Quaternary)	Approx. or Inferred
<700,000 years (Late Quaternary)		Concealed

NORTH

Map and Data Sources:

1. Basemap via AutoCAD Civil 3D geolocation tool

2. Fault data via CGS Fault Activity Map of California 2010 GIS data

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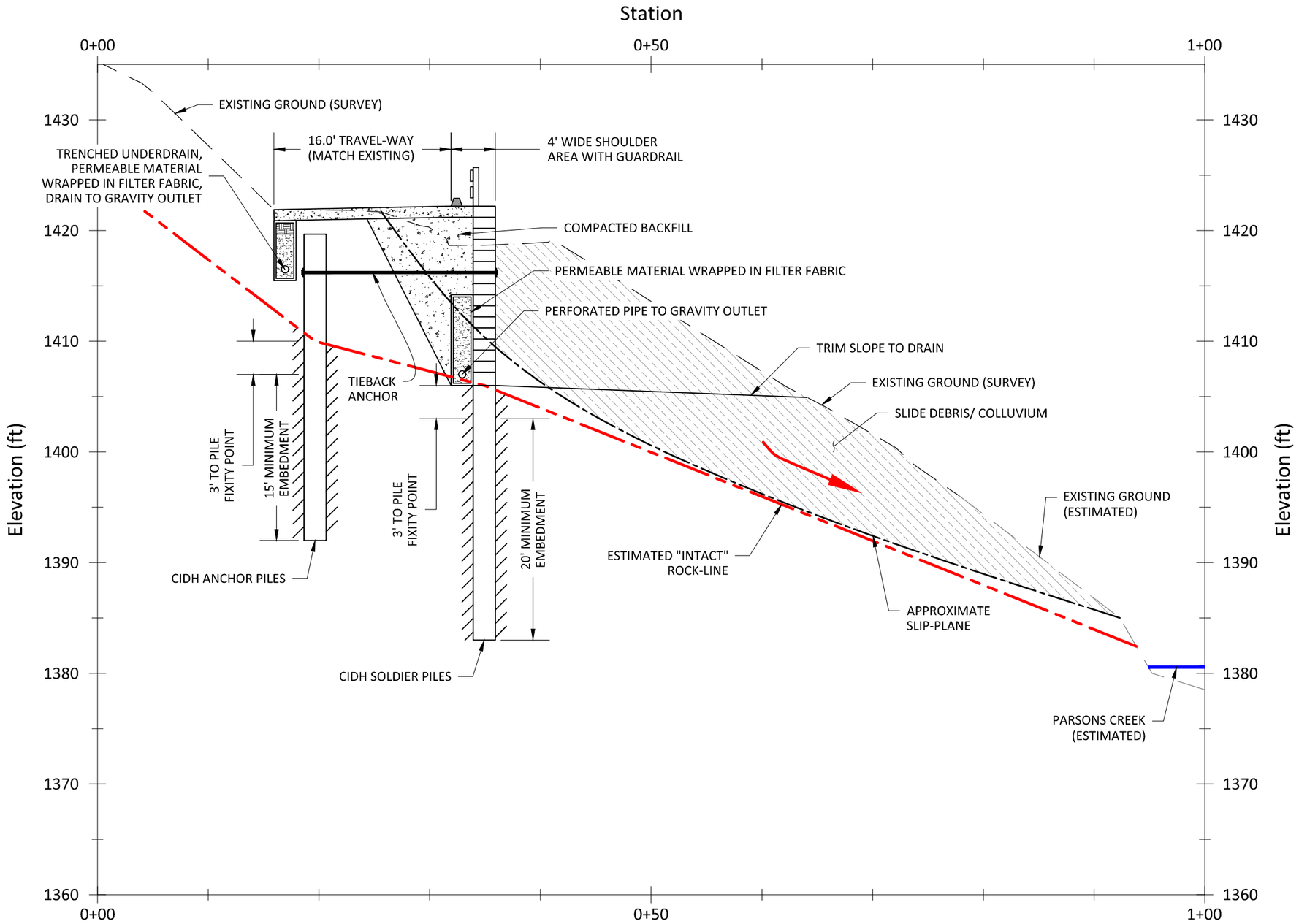
GEOTECHNICAL INVESTIGATION
UNIVERSITY ROAD (CR 116B)
FAILURE AT MP 3.78

HOPLAND, MENDOCINO COUNTY, CA

Figure 4
Fault Activity Map

Prj. No: 16-337.19
Scale: 1" = 10,000'
Date: 06/20/2018

Path: \\psf\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.19 University Road (CR 116B) at MP 3.78\CAD\16-337.19-Figures.dwg Plot Date: Jun 19, 2018 at 5:36pm



Section A

NORTH

Data Source:
Topographic survey provided by MCDOT via electronic transfer on 02/12/2018. Survey completed by SHN Consulting Engineers & Geologist, Inc., January 2018.

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GEOTECHNICAL INVESTIGATION
UNIVERSITY ROAD (CR 116B)
FAILURE AT MP 3.78

HOPLAND, MENDOCINO COUNTY, CA

Figure 5
Typical Section
Soldier Pile
Tieback Wall

Prj. No:	16-337.19
Scale:	1" = 10'
Date:	09/28/2018

Path: \\Mac\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.19 University Road (CR 116B) at MP 3.78\CAD\16-337.19-Figures.dwg Plot Date: Sep 29, 2018 at 5:56pm

APPENDIX A

BORING LOGS LEGEND
BORING LOGS

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435)
CL	Collapse Potential (ASTM D 4546)
CP	Compaction Curve (CTM 216)
CR	Corrosion, Sulfates, Chlorides (CTM 643, CTM 417, CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
DR	Drained Residual Shear Strength (ASTM D 6467)
DS	Direct Shear (ASTM D 3080)
EI	Expansion Index (ASTM D 4829)
M	Moisture Content (ASTM D 2216)
OC	Organic Content (ASTM D 2974)
P	Permeability (CTM 220)
PA	Particle Size Analysis (ASTM D 422)
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89, AASHTO T 90)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T 100)
SW	Swell Potential (ASTM D 4546)
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 7012-C)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 7263)

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler (ID 2.5 in.)
- Modified California Sampler (ID 2.0 in.)
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010) with Errata Sheet (2015).

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Boring Record Legend

Soil Legend

CONSISTENCY OF COHESIVE SOILS				
Descriptor	**Unconfined Compressive Strength (tsf)**	**Pocket Penetrometer (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS	
Descriptor	**SPT N_{60} (blows / 12 inches)**
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

MOISTURE	
Descriptor	**Criteria**
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS	
Descriptor	**Criteria**
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE		
Descriptor		**Size**
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS	
Descriptor	**Criteria**
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION	
Descriptor	**Criteria**
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

ROCK GRAPHIC SYMBOLS


IGNEOUS ROCK


SEDIMENTARY ROCK


METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 ft - 10 ft
Thickly bedded	1 ft - 3 ft
Moderately bedded	4 in - 1 ft
Thinly bedded	1 in - 4 in
Very thinly bedded	1/4 in - 1 in
Laminated	< 1/4 in

WEATHERING DESCRIPTORS FOR INTACT ROCK

	Diagnostic Features					
	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		
Descriptor	Body of Rock	Fracture Surfaces		Texture	Solutioning	General Characteristics
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull	Minor to complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened.
Decomposed	Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregated)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

Note: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

PERCENT CORE RECOVERY (REC)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

ROCK QUALITY DESIGNATION (RQD)

$$\frac{\Sigma \text{ Length of intact core pieces} > 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100$$

Note: RQD* indicates soundness criteria not met

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/16 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light manual pressure.

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Core lengths greater than 3 ft.
Slightly Fractured	Core lengths mostly from 1 ft. to 3 ft.
Moderately Fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely Fractured	Core lengths mostly from 1 in. to 4 in.
Very Intensely Fractured	Mostly chips and fragments.

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

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Boring Record Legend

Rock Legend

LOG OF BORING B1

PROJECT NO: 16-337.19
PROJECT: University Road MP 3.78
LOCATION: Univ. Rd. (CR 116B), Hopland
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: MVG
DEPTH OF BORING: 50.25 (ft)

BEGIN DATE: 4/12/18
COMPLETION DATE: 4/12/18
SURFACE ELEVATION: 1418.8 (ft)*
SURFACE CONDITION: Dirt/Gravel
WATER DEPTH: Not Encountered (ft)
READING TAKEN: 4/12/18
HAMMER EFFICIENCY: 80 (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
DRILLING METHOD: Hollow-Stem Auger (6" OD, 2.25" ID)
DRILL RIG: Deeprock - DR5K (Truck)
HAMMER TYPE: Automatic, 140 lbs, 30" drop
SAMPLER TYPE & SIZE: SPT (ID 1.4")
BOREHOLE DIAMETER: 6"
BACKFILL METHOD: Cement Grout

FIELD									LABORATORY							
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
1418	0							SANDY lean CLAY with GRAVEL (CL); dark brown; moist; about 15% fine, subangular to subrounded GRAVEL, max. 3/4 in. dia.; about 15% medium to fine SAND; medium plasticity, low to medium toughness fines [FILL].									
1416	5		1	7 10 18	28	>4.50			33				5	100.9			
1414	10		2	14 15 12	27			SEDIMENTARY ROCK (GRAYWACKE), medium sand to fine sand, thinly to moderately bedded, gray, intensely to moderately weathered, moist [FRANCISCAN FORMATION].	0								Driller reports drilling through fractured rock at 10'
1412	15		3	7 14 20	34	>4.50		SEDIMENTARY ROCK (SHALE), clay, dark gray, decomposed, moderately indurated; (Lean CLAY with SAND (CL), hard, moist).	67				8.3	131.6			
1410	20		4	46 20 20	40	>4.50		With Graywacke fragments <1" (hard, fresh).	67				5.3	140			
1408	25		5	17 15 14	29	>4.50		Thinly bedded, dark gray, very intensely weathered, interbedded with moderately weathered Graywacke and Serpentinte CLAY lenses <2"; (Lean CLAY (CL), hard, moist).	39				4	148.9			
1406	30		6	14 30 40	70	>4.50			67								
1404	33																
1402																	
1400																	
1398																	
1396																	
1394																	
1392																	
1390																	
1388																	
1386																	

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PROJECT NUMBER: 16-337.19
PROJECT: University Road MP 3.78
BORING: B1
ENTRY BY: MVG
CHECKED BY: RRH

ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: LIQUID LIMIT	LABORATORY: PLASTIC LIMIT	LABORATORY: MOISTURE (%)	LABORATORY: D. DENSITY (PCF)	LABORATORY: % PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
	33							SEDIMENTARY ROCK (Shale) *(continued)*.									
	34																
1384	35		7	15 32 50/5"	82/11	>4.50			76								
	36												3.6	139.4			
1382	37																
	38																
1380	39																
	40		8	45 50/3"	50/3	>4.50		Intensely weathered, moderately soft to moderately hard.	100								
1378	41																
	42																
1376	43																
	44																
1374	45																
	46																
1372	47																
	48																
1370	49																
	50		9	50/3"	REF			Bottom of borehole at 50.3 ft bgs	100								
1368	51							Backfilled with 6.5, 94lbs bag of portland cement grout and 60 gal of water.									
	52																
1366	53							*Elevation Reference: CP#1, Elev. 1428.07 feet (NAVD88) per SHN topographic survey									
	54																
1364	55																
	56																
1362	57																
	58																
1360	59																
	60																
1358	61																
	62																
1356	63																
	64																
1354	65																
	66																
1352	67																
	68																
1350	69																
	70																
1348	71																
	72																

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PROJECT NUMBER: 16-337.19
PROJECT: University Road MP 3.78
BORING: B1
ENTRY BY: MVG
CHECKED BY: RRH

LOG OF BORING B2

PROJECT NO: 16-337.19
PROJECT: University Road MP 3.78
LOCATION: Univ. Rd. (CR 116B), Hopland
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: MVG
DEPTH OF BORING: 65 (ft)

BEGIN DATE: 4/6/18
COMPLETION DATE: 4/6/18
SURFACE ELEVATION: 1421.8 (ft)*
SURFACE CONDITION: Dirt/Gravel
WATER DEPTH: Not Encountered (ft)
READING TAKEN: 4/6/18
HAMMER EFFICIENCY: 80 (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
DRILLING METHOD: Hollow-Stem Auger (6" OD, 2.25" ID)
DRILL RIG: Deeprock - DR5K (Truck)
HAMMER TYPE: Automatic, 140 lbs, 30" drop
SAMPLER TYPE & SIZE: BULK, SPT (ID 1.4")
BOREHOLE DIAMETER: 6"
BACKFILL METHOD: Cement Grout

FIELD									LABORATORY							
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
1420	0		0					CLAYEY GRAVEL with SAND (GC); light brown; dry; about 36% coarse to fine, subangular to subrounded GRAVEL, max. 1 in. dia.; about 31% coarse to fine SAND; medium plasticity, medium to high toughness fines [FILL].	100		52	20			33		Chemical Analysis pH = 7.14 Min. Res. = 2250 ohm-cm Chloride = 2.0 ppm Sulfate = 98.2 ppm
1418	5		1	6 8 3	11	0.75		SANDY lean CLAY (CL); medium stiff; variegated pale green, yellowish brown, and dark brown; about 5% fine, subangular to subrounded GRAVEL; about 30% coarse to fine SAND; medium plasticity, low toughness fines.	61				10	114.6			
1416	10		2	7 8 9	17	4.25		SEDIMENTARY ROCK (SHALE), clay, dark gray, decomposed, (Lean CLAY with GRAVEL (CL), hard, moist) [FRANCISCAN FORMATION].	78				11.6	126.3	51		
1414	15		3	7 12 14	26	4.50			78				4.5	128.9			UC = 1901 psf
1412	20		4	9 11 14	25	3.50		(very stiff).	83				7.9	72.5			Chemical Analysis pH = 7.01 Min. Res. = 1580 ohm-cm Chloride = 6.9 ppm Sulfate = 140.9 ppm
1410	25		5	8 8 14	22			1.5" white Quartz rock fragment.	6								
1408	30		6	8 10 12	22	3.25		With few, very thin veinlets of Serpentitized CLAY.	89				7.9	127.7			UC = 5083 psf
1406	33																

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ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
	33							SEDIMENTARY ROCK (Shale) *(continued)*.									Driller reports hard drilling at 33'
1388	34																
	35		7	11 43 50/4"	93/10	2.00			38				8.1	88.3			
1386	36																
	37																
1384	38																
	39																
1382	40		8	14 26/6"	26/6	>4.50		Moderately weathered, moderately soft to moderately hard, interbedded with Graywacke lenses <3".	100				3.9	122.6			Auto-hammer breakdown at 41', cannot sample
	41																
1380	42																Hard drilling effort from 42' to 44'
	43																
1378	44																Normal drilling effort from 44' to 57'
	45																
1376	46																
	47																
1374	48																
	49																
1372	50																
	51																
1370	52																
	53																
1368	54																
	55																
1366	56																
	57																Hard drilling effort from 57' to 62'
1364	58																
	59																
1362	60																
	61																
1360	62																Normal drilling effort from 62' to 63.5'
	63																
1358	64							(Drill cuttings from 40' to 65' are dark gray shale chips and rock dust, which can be molded into CLAY).									Hard drilling effort, auger chatter from 63.5' to 65'
	65							Bottom of borehole at 65.0 ft bgs									
1356	66							Backfilled with 8, 94lbs bag of portland cement grout and 80 gal of water.									
	67																
1354	68							*Elevation Reference: CP#1, Elev. 1428.07 feet (NAVD88) per SHN topographic survey									
	69																
1352	70																
	71																
1350	72																

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PROJECT NUMBER: 16-337.19
PROJECT: University Road MP 3.78
BORING: B2
ENTRY BY: MVG
CHECKED BY: RRH

LOG OF BORING B3

PROJECT NO: 16-337.19
PROJECT: University Road MP 3.78
LOCATION: Univ. Rd. (CR 116B), Hopland
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: MVG
DEPTH OF BORING: 38.08 (ft)

BEGIN DATE: 4/13/18
COMPLETION DATE: 4/13/18
SURFACE ELEVATION: 1426.4 (ft)*
SURFACE CONDITION: Dirt/Gravel
WATER DEPTH: 15 (ft)
READING TAKEN: 4/13/18
HAMMER EFFICIENCY: 80 (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
DRILLING METHOD: Hollow-Stem Auger (6" OD, 2.25" ID)
DRILL RIG: Deeprock - DR5K (Truck)
HAMMER TYPE: Automatic, 140 lbs, 30" drop
SAMPLER TYPE & SIZE: SPT (ID 1.4")
BOREHOLE DIAMETER: 6"
BACKFILL METHOD: Cement Grout

ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: LIQUID LIMIT	LABORATORY: PLASTIC LIMIT	LABORATORY: MOISTURE (%)	LABORATORY: D. DENSITY (PCF)	LABORATORY: % PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
1426	0							CLAYEY GRAVEL with SAND (GC); brown; moist; about 60% coarse to fine, subangular to subrounded GRAVEL, max. 2 in. dia.; about 15% medium to fine SAND; low to medium plasticity, medium toughness fines [FILL].									
1424	2																
1422	4																
	5		1	8 13 18	31	>4.50		Fat CLAY with GRAVEL (CH); hard; variegated dark brown, green, and white; moist; about 20 to 25% fine, subangular to subrounded GRAVEL, max. 1 in. dia.; trace medium to fine SAND; medium to high plasticity, medium to high toughness fines; moderately indurated [RESIDUAL SOIL].	33		52	19					
1420	6																
1418	8																
1416	10		2	40 40 50	90	>4.50		SEDIMENTARY ROCK (SHALE), clay to silt, thinly to moderately bedded, intensely weathered, moderately soft to moderately hard, interbedded with Graywacke [FRANCISCAN FORMATION].	72				1.9	121.8			
1414	12																
1412	14																
	15 ▼		3	50/4"	REF	4.50		Very intensely weathered, (Lean CLAY with SAND (CL), hard, wet).	100								Driller reports softer material at 18'
1410	16																
1408	18																
1406	20		4	13 12 16	28			(GRAVELLY Lean CLAY (CL), dark gray, wet).	0								Used sand catcher to retrieve disturbed sample at 20'
1404	22																
1402	24							METAMORPHIC ROCK (SERPENTINITE), fine-grained, thinly to moderately bedded, intensely to moderately weathered, moderately soft to moderately hard, very thin fractures filled with Calcite and/or CLAY, interbedded with Shale.									Driller reports hard material at 23.5'
	25		5	54/6"	REF				100								
1400	26																
1398	28							SEDIMENTARY ROCK (SHALE), clay, dark gray, slightly weathered, moderately hard.									
1396	30		6	50/0"	REF				0								Material obtained from sampler shoe at 30'
1394	32																
	33																

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PROJECT NUMBER: 16-337.19
PROJECT: University Road MP 3.78
BORING: B3
ENTRY BY: MVG
CHECKED BY: RRH

ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
								SEDIMENTARY ROCK (Shale) *(continued)*.										
1392	34																	
	35		7	50/2"	REF			Slightly weathered to fresh, moderately hard to hard.	100									
1390	36																	Hard drilling and rig chatter at 36'
	37																	
1388	38		8	50/1"	REF			Fresh.	100									Auger refusal at 38'
								Bottom of borehole at 38.1 ft bgs										
								Backfilled with 5, 94lbs bag of portland cement grout and 50 gal of water.										
								*Elevation Reference: CP#1, Elev. 1428.07 feet (NAVD88) per SHN topographic survey										
1386	40																	
1384	42																	
1382	44																	
1380	46																	
1378	48																	
1376	50																	
1374	52																	
1372	54																	
1370	56																	
1368	58																	
1366	60																	
1364	62																	
1362	64																	
1360	66																	
1358	68																	
1356	70																	
1354	72																	

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PROJECT NUMBER: 16-337.19
PROJECT: University Road MP 3.78
BORING: B3
ENTRY BY: MVG
CHECKED BY: RRH

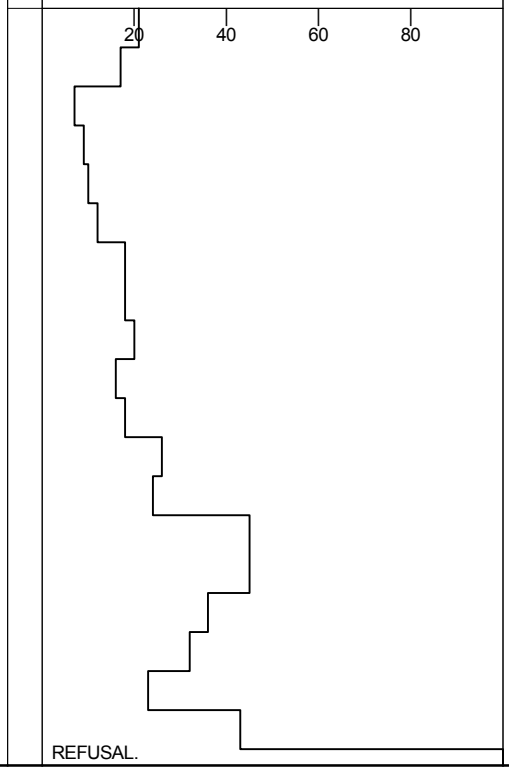
LOG OF BORING P1

PROJECT NO: 16-337.19
PROJECT: University Road MP 3.78
LOCATION: Univ. Rd. (CR 116B), Hopland
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: MVG/RRH
DEPTH OF BORING: 24.42 (ft)

BEGIN DATE: 4/13/18
COMPLETION DATE: 4/13/18
SURFACE ELEVATION: 1424.3 (ft)*
SURFACE CONDITION: Dirt/Gravel
WATER DEPTH: Not Encountered (ft)
READING TAKEN: 4/13/18
HAMMER EFFICIENCY: 80 (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
DRILLING METHOD: Dynamic Cone Penetrometer (2" OD)
DRILL RIG: Deeprock - DR5K (Truck)
HAMMER TYPE: Automatic, 140 lbs, 30" drop
SAMPLER TYPE & SIZE: N/A
BOREHOLE DIAMETER: 2"
BACKFILL METHOD: Cement Grout

FIELD									LABORATORY								
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
1424	0																
1422	2																HSA used as casing
1420	4																
1418	6				21												
1416	8				17												
1414	10				7												
1412	12				9												
1410	14				10												
1408	16				12												
1406	18				18												
1404	20				18												
1402	22				20												
1400	24				16												
1398	26				18												
1396	28				26												
1394	30				24												
1392	32				45												
	33				45												
					36												
					32												
					23												
					43												
					100			REFUSAL.									100/5" at 24'



Bottom of borehole at 24.4 ft bgs

Backfilled with 1, 94lbs bag of portland cement grout and 10 gal of water.

*Elevation Reference: CP#1, Elev. 1428.07 feet (NAVD88) per SHN topographic survey

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PROJECT NUMBER: 16-337.19
PROJECT: University Road MP 3.78
BORING: P1
ENTRY BY: MVG
CHECKED BY: RRH SHEET 1 of 1

LOG OF BORING HA1

PROJECT NO: 16-337.19
PROJECT: University Road MP 3.78
LOCATION: Univ. Rd. (CR 116B), Hopland
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: MVG
DEPTH OF BORING: 4 (ft)

BEGIN DATE: 4/12/18
COMPLETION DATE: 4/12/18
SURFACE ELEVATION: 1400 (ft)*
SURFACE CONDITION: Dirt/Grass
WATER DEPTH: Not Encountered (ft)
READING TAKEN: 4/12/18
HAMMER EFFICIENCY: N/A (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
DRILLING METHOD: Hand Auger (3" OD)
DRILL RIG: N/A
HAMMER TYPE: N/A
SAMPLER TYPE & SIZE: BULK
BOREHOLE DIAMETER: 3"
BACKFILL METHOD: Cuttings

FIELD									LABORATORY								
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
1400	0																	
	1		0					SANDY lean CLAY (CL); dark brown; moist; about 5% coarse to fine, subangular to subrounded GRAVEL, max. 2 in. dia.; about 25% medium to fine SAND; medium plasticity, medium toughness fines [COLLUVIUM].	100									
1398	2							Lean CLAY with SAND (CL); soft to medium stiff; dark brown; moist; about 5 to 10% coarse to fine, angular to subangular GRAVEL; about 10% medium to fine SAND; medium plasticity, medium toughness fines; with platy Shale chips.										
	3																	
1396	4																	Hand auger refusal at 4' due to cobbles
	5							Bottom of borehole at 4.0 ft bgs										
1394	6							Backfill with native soil cuttings.										
	7							*Elevation Reference: CP#1, Elev. 1428.07 feet (NAVD88) per SHN topographic survey										
1392	8																	
	9																	
1390	10																	
	11																	
1388	12																	
	13																	
1386	14																	
	15																	
1384	16																	
	17																	
1382	18																	
	19																	
1380	20																	
	21																	
1378	22																	
	23																	
1376	24																	
	25																	

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PROJECT NUMBER: 16-337.19
PROJECT: University Road MP 3.78
BORING: HA1
ENTRY BY: MVG
CHECKED BY: RRH

APPENDIX B

LABORATORY AND FIELD TEST SUMMARY

Job: **University Road MP 3.78**
Job No: **16-337.19**
Date: **9/25/18**

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Laboratory and Field Test Summary

	Boring I.D.	Top of Sampling Depth (ft)	Sample I.D.	Retained Sample Depths (ft)	USCS Class.	Field Blows N (bpf)	SPT Blows N_{60} (bpf)	Moisture/Density			Classification						Strength		Chemical Analysis			
											Atterberg Limits											
								Dry Density (pcf)	Moist. Content (%)	In-Situ Density (pcf)	Liquid Limit	Plastic Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Pocket Pent. (tsf)	Uncon. Comp. (psf)	pH	Minimum Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
Road-level Borings	B1	5.0	1	6.0-6.5	W. ROCK	28	37	100.9	5.0	105.9							+4.50					
	B1	10.0	2	None	W. ROCK	27	36										-					
	B1	15.0	3	15.5-16.5	W. ROCK	34	45	131.6	8.3	142.5							+4.50					
	B1	20.0	4	20.5-21.5	W. ROCK	40	53	140.0	5.3	147.4							+4.50					
	B1	25.0	5	26.0-26.5	W. ROCK	29	39	148.9	4.0	154.9							+4.50					
	B1	30.0	6	30.5-31.5	W. ROCK	70	93										+4.50					
	B1	35.0	7	35.5-36.4	W. ROCK	82/11"	-	139.4	3.6	144.4							+4.50					
	B1	40.0	8	40.0-40.8	W. ROCK	50/3"	-										+4.50					
	B1	50.0	9	50.0-50.3	W. ROCK	REF	-										-					
	B2	0.0	0	0.0-5.0	GC	N/A	-				52	20	32	36	31	33	-		7.14	2,250	2.0	98.2
	B2	5.0	1	5.5-6.5	CL	11	15	114.6	10.0	126.1							0.75					
	B2	10.0	2	10.5-11.5	CL	17	23	126.3	11.6	141.0						51	4.25					
	B2	15.0	3	15.5-16.5	W. ROCK	26	35	128.9	4.5	134.7							4.50	1,901				
	B2	20.0	4	20.5-21.5	W. ROCK	25	33	72.5	7.9	78.2							3.50		7.01	1,580	6.9	140.9
	B2	25.0	5	None	W. ROCK	22	29										-					
	B2	30.0	6	30.5-31.5	W. ROCK	22	29	127.7	7.9	137.8							3.25	5,083				
	B2	35.0	7	35.0-35.5	W. ROCK	93/10"	-	88.3	8.1	95.5							2.00					
	B2	40.0	8	40.0-41.0	W. ROCK	26/6"	-	122.6	3.9	127.4							+4.50					
	B3	5.0	1	5.5-6.5	CH	31	41				52	19	33				+4.50					
	B3	10.0	2	10.5-11.5	W. ROCK	90	120	121.8	1.9	124.1							+4.50					
	B3	15.0	3	15.0-15.3	W. ROCK	REF	-										4.50					
	B3	20.0	4	None	W. ROCK	28	37										-					
	B3	25.0	5	25.0-25.5	W. ROCK	REF	-										-					
	B3	30.0	6	None	W. ROCK	REF	-										-					
	B3	35.0	7	35.0-35.2	W. ROCK	REF	-										-					
	B3	38.0	8	38.0-38.1	W. ROCK	REF	-										-					
	HA1	0.5	0	0.5-4.0	CL	N/A	-										-					

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Project Name: University Road MP 3.78
CAInc File No: 16-337.19
Date: 7/13/18
Technician: AC

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B1-1A	B1-3A	B1-4A	B1-5A	B1-7A
USCS Symbol	W.Rock	W.Rock	W.Rock	W.Rock	W.Rock
Depth (ft.)	6	16	21	26	36
Sample Length (in.)	5.155	5.242	4.193	5.372	4.686
Diameter (in.)	1.415	1.412	1.402	1.394	1.396
Sample Volume (ft^3)	0.00469	0.00475	0.00375	0.00474	0.00415
Total Mass Soil+Tube (g)	359.9	439.6	383.1	466.4	404.4
Mass of Tube (g)	134.5	132.9	132.6	133.2	132.5
Tare No.	G9	E7	A17	C7	F6
Tare (g)	13.5	13.8	13.7	13.7	13.6
Wet Soil + Tare (g)	64.3	72.5	69.3	67.2	74.5
Dry Soil + Tare (g)	61.9	68.0	66.5	65.2	72.4
Dry Soil (g)	48.4	54.2	52.8	51.5	58.7
Water (g)	2.4	4.5	2.8	2.1	2.1
Moisture (%)	**5.0**	**8.3**	**5.3**	**4.0**	**3.6**
Dry Density (pcf)	**100.9**	**131.6**	**140.0**	**148.9**	**139.4**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: University Road MP 3.78
CAInc File No: 16-337.19
Date: 7/13/18
Technician: AC

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B2-1A	B2-2A	B2-3A	B2-4A	B2-6A
USCS Symbol	CH	CH	W.Rock	W.Rock	W.Rock
Depth (ft.)	6	11	16	21	31
Sample Length (in.)	4.464	5.250	3.361	5.467	3.169
Diameter (in.)	1.416	1.405	1.410	1.407	1.375
Sample Volume (ft^3)	0.00407	0.00471	0.00304	0.00492	0.00272
Total Mass Soil+Tube (g)	352.5	431.3	185.6	304.8	170.2
Mass of Tube (g)	119.9	130.1	0.0	130.4	0.0
Tare No.	C19	1004	D5	G9	A2
Tare (g)	13.9	125.4	13.9	13.6	13.9
Wet Soil + Tare (g)	56.2	381.9	59.5	54.0	57.4
Dry Soil + Tare (g)	52.3	355.2	57.6	51.1	54.2
Dry Soil (g)	38.5	229.8	43.7	37.5	40.3
Water (g)	3.9	26.7	2.0	3.0	3.2
Moisture (%)	**10.0**	**11.6**	**4.5**	**7.9**	**7.9**
Dry Density (pcf)	**114.6**	**126.3**	**128.9**	**72.5**	**127.7**

Notes:

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Project Name: University Road MP 3.78
CAInc File No: 16-337.19
Date: 7/13/18
Technician: AC

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B2-7A	B2-8A	B3-2A		
USCS Symbol	W.Rock	W.Rock	W.Rock		
Depth (ft.)	35	40.5	11		
Sample Length (in.)	4.885	4.340	5.595		
Diameter (in.)	1.420	1.410	1.414		
Sample Volume (ft^3)	0.00448	0.00392	0.00508		
Total Mass Soil+Tube (g)	320.5	361.3	420.0		
Mass of Tube (g)	126.7	134.7	133.8		
Tare No.	D3	C20	F7		
Tare (g)	13.7	13.6	13.8		
Wet Soil + Tare (g)	70.3	77.5	74.3		
Dry Soil + Tare (g)	66.1	75.1	73.1		
Dry Soil (g)	52.4	61.5	59.4		
Water (g)	4.2	2.4	1.1		
Moisture (%)	**8.1**	**3.9**	**1.9**		
Dry Density (pcf)	**88.3**	**122.6**	**121.8**		

Notes:

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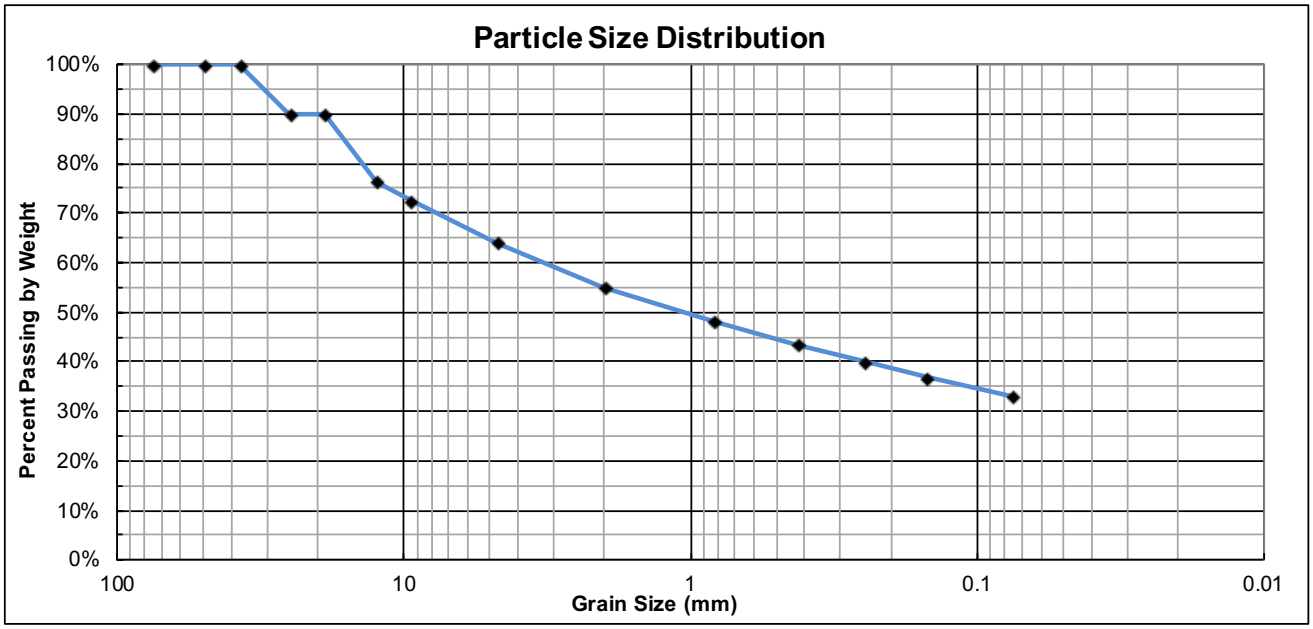
Project Name: University Road MP 3.78
CAInc File No: 16-337.19
Date: 7/20/18
Technician: AC
Sample ID: B2-Bulk
Depth (ft): 0-5
USCS Classification: CLAYEY GRAVEL with SAND (GC)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt/Clay
	10	26	9	12	11	
0	**36**		**31**			**33**

		Sieve #	Opening mm	Cummulative Mass Retained (g)	% Passing %
Cobbles		**3"**	75	0.0	100%
Gravel	Coarse	**2"**	50	0.0	100%
		1-1/2"	37.5	0.0	100%
		1"	25.0	33.8	90%
		3/4"	19.0	33.8	90%
	Fine	**1/2"**	12.5	80.5	76%
		3/8"	9.50	93.2	73%
		#4	4.75	122.2	64%
Sand	Coarse	**#10**	2.00	152.7	55%
	Medium	**#20**	0.825	176.0	48%
		#40	0.425	191.9	44%
	Fine	**#60**	0.250	204.1	40%
		#100	0.150	214.6	37%
		#200	0.075	228.0	33%

Coefficient of Uniformity	Coefficient of Curvature
Cu = NA	Cc = NA

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: University Road MP 3.78
CAInc File No: 16-337.19
Date: 7/16/18
Technician: AC

200 Wash - ASTM D1140

Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	B2-2A				
USCS Symbol	CH				
Depth (ft.)	11				
Tare No.	1004				
Tare (g)	125.4				
Dry Soil + Tare (g)	355.2				
Dry Mass before (g)	229.8				
Dry Mass after (g)	111.6				
Percent Fines (%)	51				

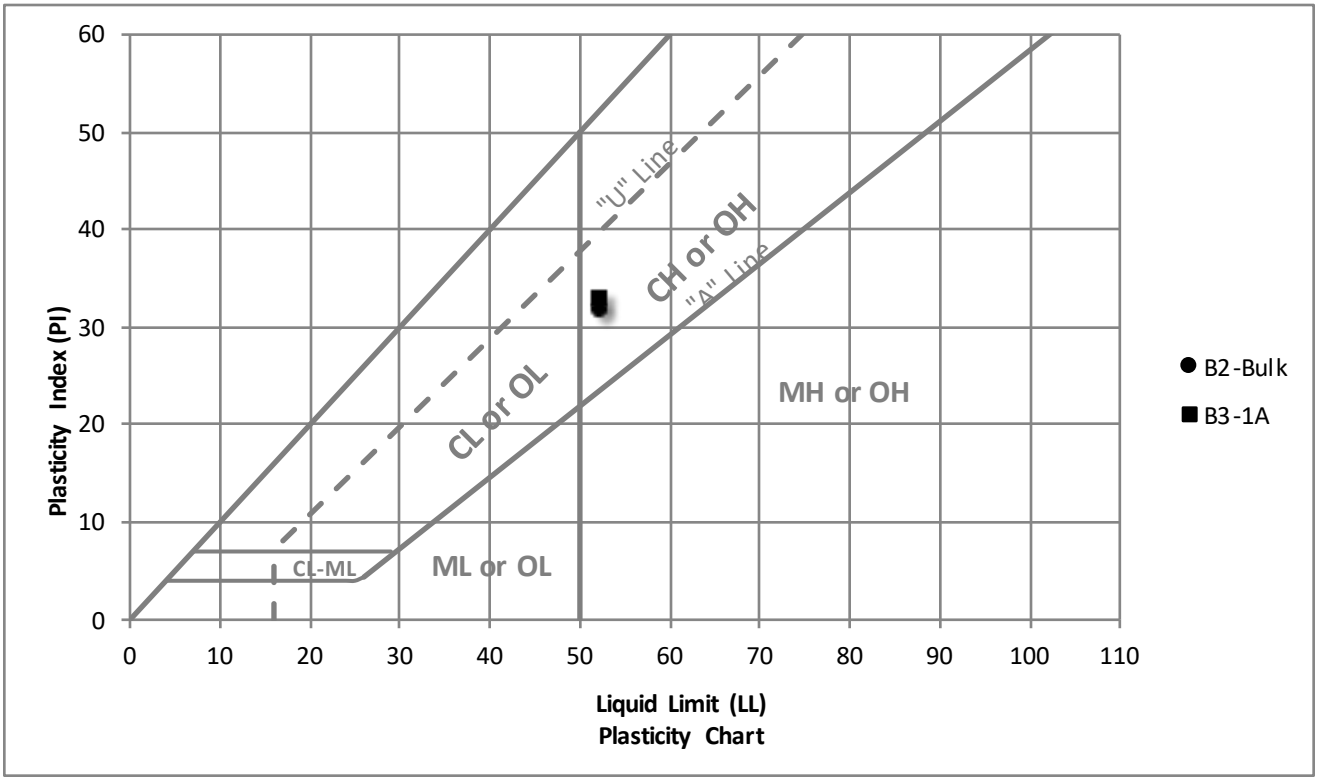
Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: University Road MP 3.78
CAInc File No: 16-337.19
Date: 7/17/18
Technician: GL

Plastic Index - ASTM D4318

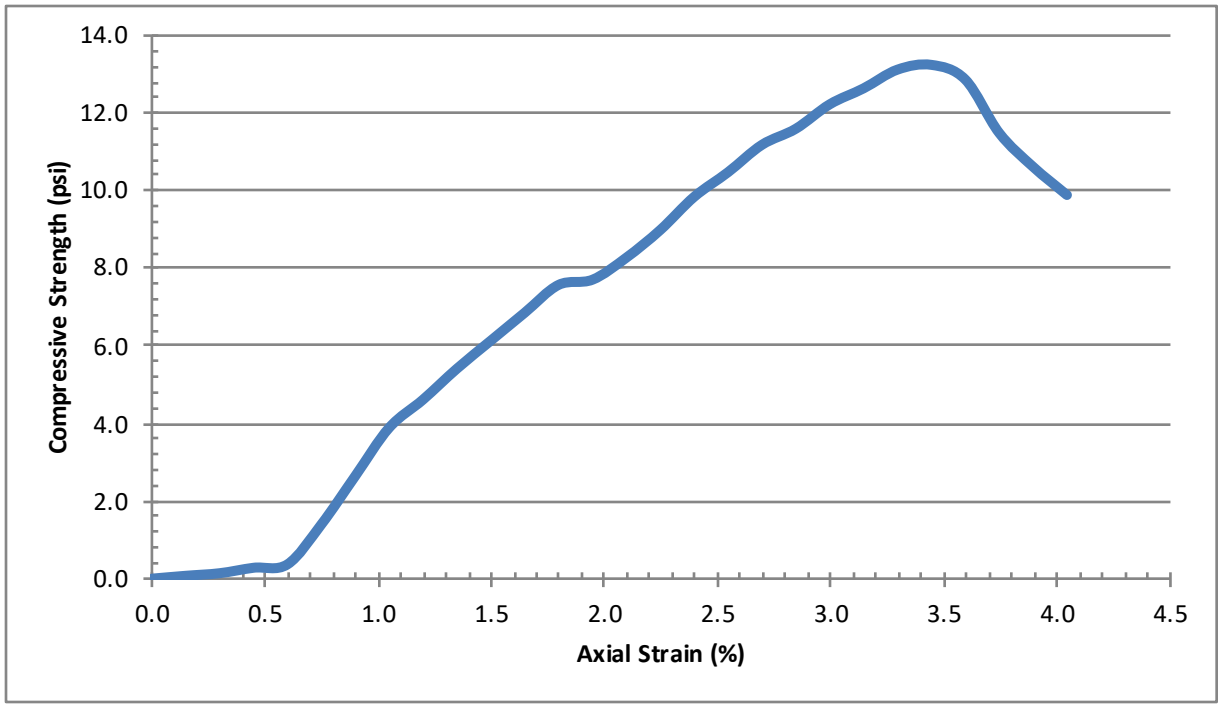
Sample ID	Depth (ft)	Liquid Limit	Plastic Limit	PI
B2-Bulk	0-5	52	20	32
B3-1A	6	52	19	33



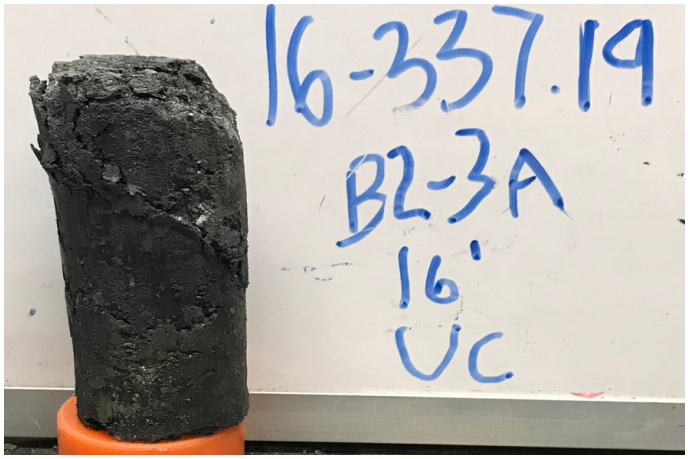
Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: University Road MP 3.78
CAInc File No: 16-337.19
Date: 7/5/18
Technician: HFW
Sample ID: B2-3A Depth (ft): 16.0
USCS Classification: W. Rock

UNCONFINED COMPRESSION TEST - D2166



Dry Density (pcf)	**129.0**
Water Content (%)	**4.5**
Unconfined Compressive Strength (psi)	**13.2**
Unconfined Compressive Strength (psf)	**1901**
Shear Strength (psf)	**950.4**
Average Height (in)	3.360
Average Diameter (in)	1.410
Rate of strain (%)	0.5
Strain at Failure (%)	3.4

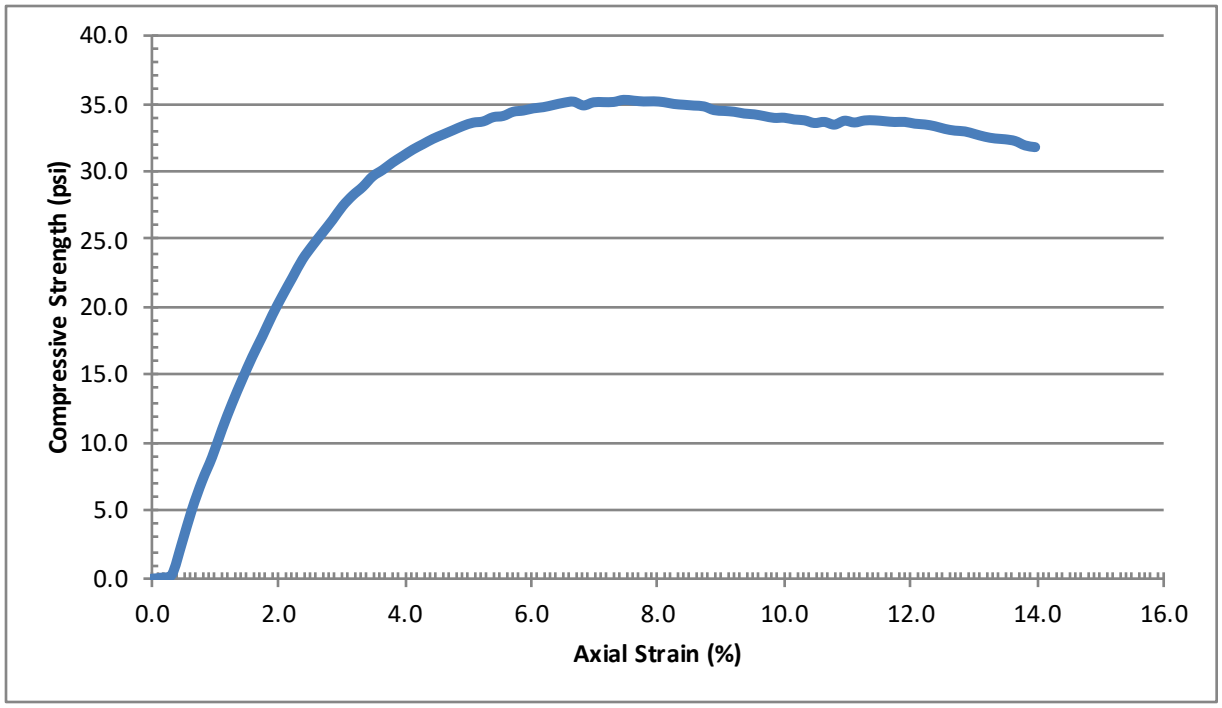


Notes:

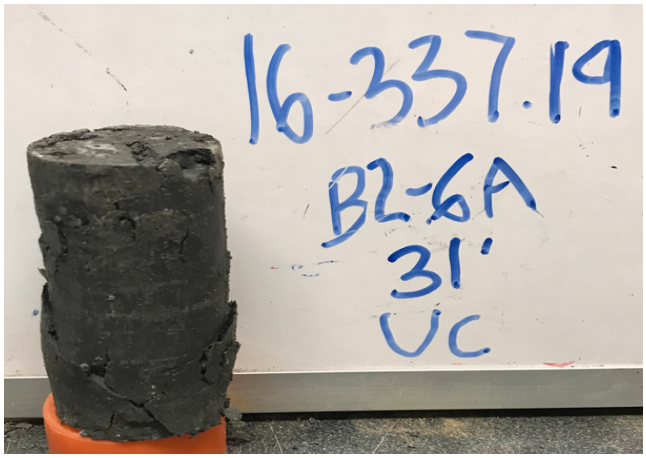
Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: University Road MP 3.78
CAInc File No: 16-337.19
Date: 7/5/18
Technician: HFW
Sample ID: B2-6A Depth (ft): 31.0
USCS Classification: W. Rock

UNCONFINED COMPRESSION TEST - D2166



Dry Density (pcf)	**127.7**
Water Content (%)	**7.9**
Unconfined Compressive Strength (psi)	**35.3**
Unconfined Compressive Strength (psf)	**5083**
Shear Strength (psf)	**2541.6**
Average Height (in)	3.169
Average Diameter (in)	1.375
Rate of strain (%)	0.5
Strain at Failure (%)	7.5



Notes:

Sunland Analytical

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

Date Reported 06/29/2018
Date Submitted 06/26/2018

To: Hailey Wagenman
Crawford & Associates, Inc.
1100 Corporate Way STE. 230
Sacramento, CA 95831-6120

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

The reported analysis was requested for the following location:
Location : 16-337.19 Site ID : B2-BULK.
Thank you for your business.

* For future reference to this analysis please use SUN # 77365-161502.

EVALUATION FOR SOIL CORROSION

Soil pH	7.14	
Minimum Resistivity	2.25 ohm-cm (x1000)	
Chloride	2.0 ppm	00.00020 %
Sulfate	98.2 ppm	00.00982 %

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

Sunland Analytical

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

Date Reported 06/29/2018
Date Submitted 06/26/2018

To: Hailey Wagenman
Crawford & Associates, Inc.
1100 Corporate Way STE. 230
Sacramento, CA 95831-6120

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

The reported analysis was requested for the following location:
Location : 16-337.19 Site ID : B2-4A.
Thank you for your business.

* For future reference to this analysis please use SUN # 77365-161503.

EVALUATION FOR SOIL CORROSION

Soil pH	7.01		
Minimum Resistivity	1.58 ohm-cm (x1000)		
Chloride	6.9 ppm	00.00069	%
Sulfate	140.9 ppm	00.01409	%

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