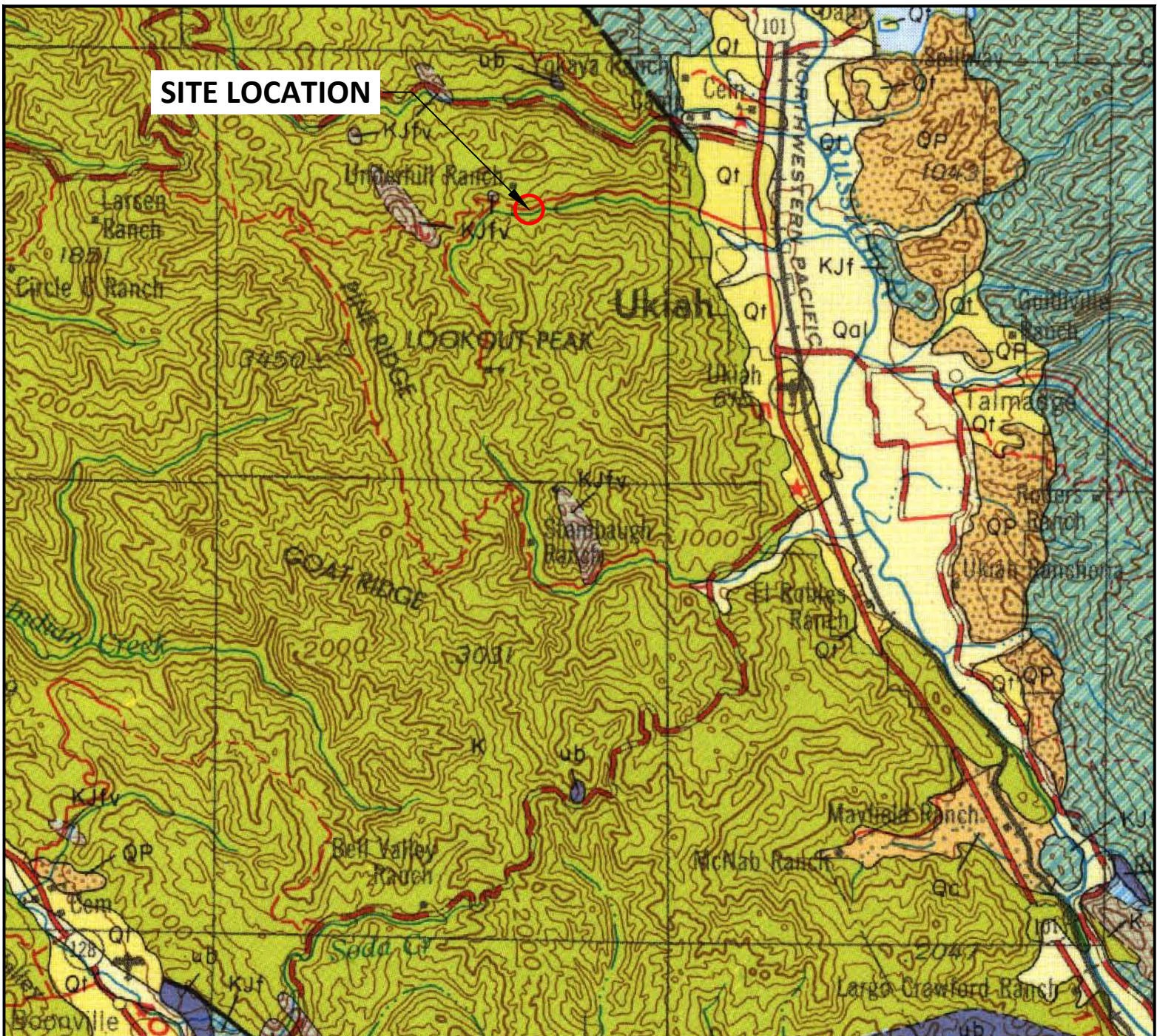


SITE LOCATION



LEGEND

Geologic Formations



Alluvium (Recent) - alluvial materials (sand, silt, clay); valley fill.



Undivided Marine Sedimentary Rocks (Cretaceous) - sandstone, shale, and conglomerate.



Franciscan Volcanic and Metavolcanic Rocks (Jurassic-Cretaceous) - greenstone of the Franciscan Formation



CONTACT

(Dashed where approximately located, gradational or inferred)



FAULT

(Dashed where approximately located)



NORTH

Map Source:

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



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**GEOTECHNICAL INVESTIGATION
LOW GAP ROAD (CR 212)
FAILURE AT MP 19.40**

UKIAH, MENDOCINO COUNTY, CA

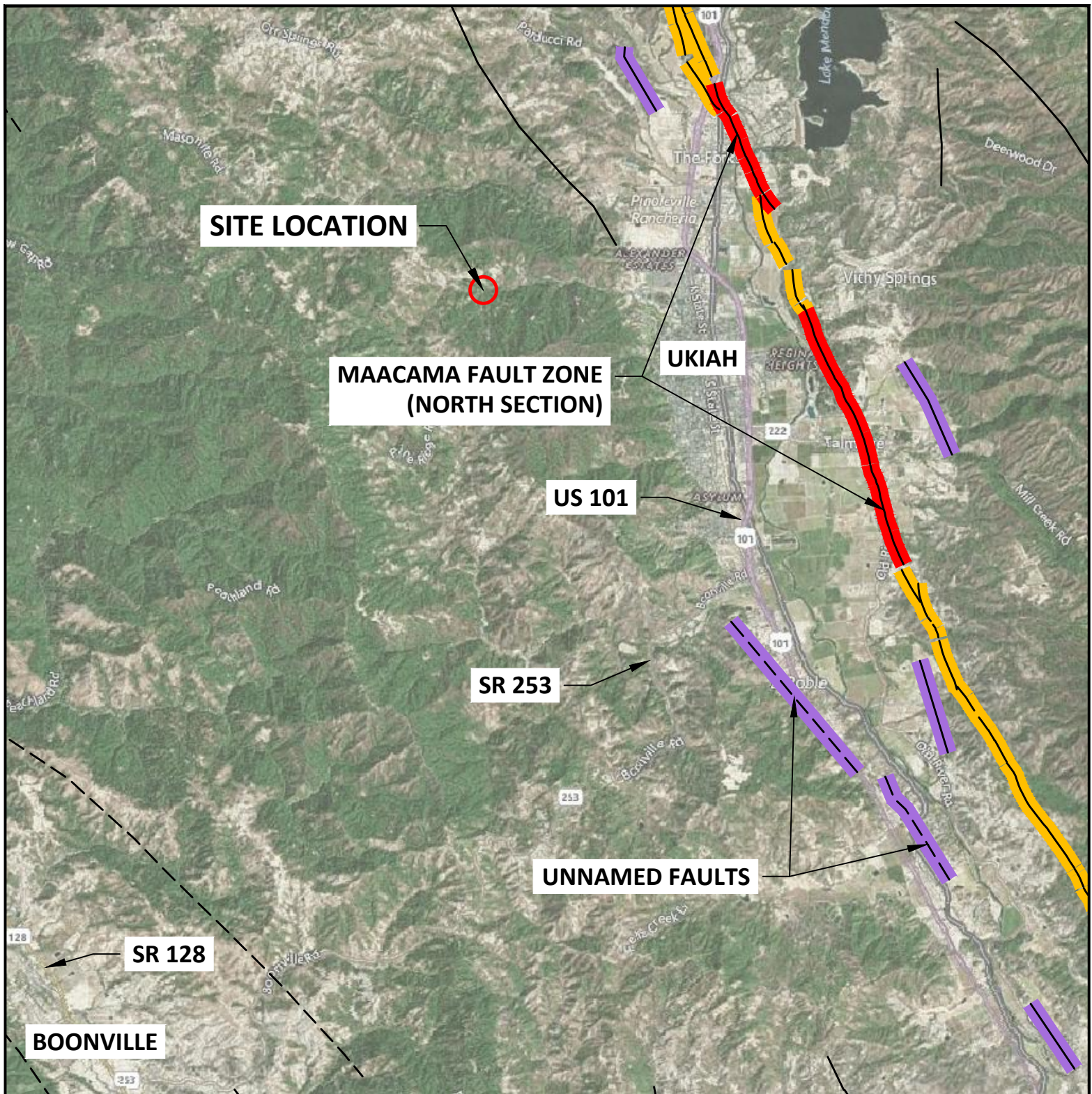
Figure 3

Regional
Geologic Map

Prj. No: 16-337.12

Scale: 1" = 10,000'

Date: 05/11/2018



LEGEND

CGS Faults (Last Activity Age)

- <200 years (Historic)
- <11,700 years (Holocene)
- <700,000 years (Late Quaternary)

CGS Faults (Last Activity Age)

- <1.6 million years (Quaternary)
- >1.6 million years (Pre-Quaternary)

Fault Location

- Certain
- Approx. or Inferred
- 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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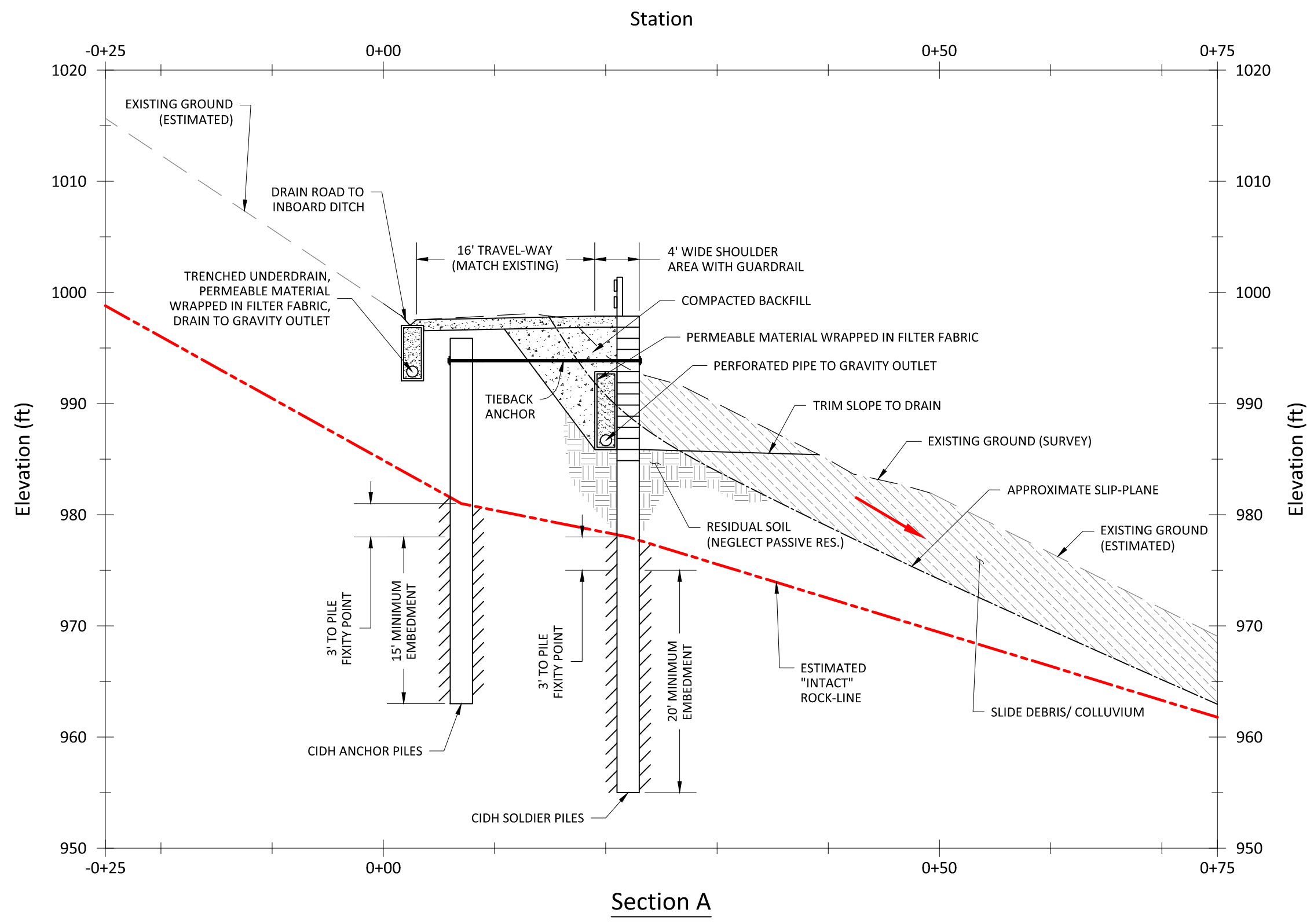
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GEOTECHNICAL INVESTIGATION
LOW GAP ROAD (CR 212)
FAILURE AT MP 19.40

UKIAH, MENDOCINO COUNTY, CA

Figure 4
Fault Activity
Map

Prj. No: 16-337.12
Scale: 1" = 10,000'
Date: 05/11/2018



<p>NORTH</p>	<p>Data Source: Topographic data provided by MCDOT via electronic transfer on 10/31/2017. Survey completed by MCDOT.</p>	<p>Crawford & Associates, Inc. Geotechnical Engineering, Design and Construction Services 1100 Corporate Way Suite 230 Sacramento, CA 95831 (916) 455-4225</p> <p>Taber Since 1954</p>	<p>GEOTECHNICAL INVESTIGATION LOW GAP ROAD (CR 212) FAILURE AT MP 19.40</p> <p>UKIAH, MENDOCINO COUNTY, CA</p>	<p>Figure 5 Typical Section Soldier Pile Tieback Wall</p>
				<p>Prj. No: 16-337.12 Scale: 1" = 10' Date: 09/11/2018</p>

APPENDIX A

BORING LOGS LEGEND

BORING LOGS

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names	Graphic / Symbol	Group Names
	Well-graded GRAVEL Well-graded GRAVEL with SAND		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
	Poorly graded GRAVEL Poorly graded GRAVEL with SAND		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
	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND		SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
	Well-graded GRAVEL with CLAY (or SILTY CLAY) (or SILTY CLAY and SAND)		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
	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND		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
	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		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
	SILTY GRAVEL SILTY GRAVEL with SAND		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
	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		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
	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND		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
	Well-graded SAND Well-graded SAND with GRAVEL		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
	Poorly graded SAND Poorly graded SAND with GRAVEL		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
	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		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
	Well-graded SAND with CLAY (or SILTY CLAY) (or SILTY CLAY and GRAVEL)		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
	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL		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
	Poorly graded SAND with CLAY (or SILTY CLAY) (or SILTY CLAY and GRAVEL)		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
	SILTY SAND SILTY SAND with GRAVEL		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
	CLAYEY SAND CLAYEY SAND with GRAVEL		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
	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		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
	PEAT		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
	COBBLES COBBLES and BOULDERS BOULDERS		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

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).

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					
Descriptor	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		General Characteristics
	Body of Rock	Fracture Surfaces		Texture	Solutioning	
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 or 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)

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

ROCK QUALITY DESIGNATION (RQD)

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

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).

LOG OF BORING P1

PROJECT NO: 16-337.12
 PROJECT: Low Gap Road MP 19.40
 LOCATION: Low Gap Rd (CR 212), Ukiah
 CITY/COUNTY: Mendocino
 CLIENT: MCDOT
 LOGGED BY: MVG
 DEPTH OF BORING: 24.83 (ft)

BEGIN DATE: 3/8/18
 COMPLETION DATE: 3/8/18
 SURFACE ELEVATION: 998.9 (ft)*
 SURFACE CONDITION: Dirt/Gravel
 WATER DEPTH: Not Encountered (ft)
 READING TAKEN: 3/8/18
 HAMMER EFFICIENCY: 80 (%)

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

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	LABORATORY							REMARKS
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)			RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	
998	1															6" HSA used as casing
998	2															
996	3															
996	4															
994	5				12											
994	6				14											
992	7				23											
992	8				27											
990	9				38											
990	10				43											
988	11				33											
988	12				41											
986	13				36											
986	14				40											
984	15				54											
984	16				36											
982	17				43											
982	18				40											
980	19				68											
980	20				80											
978	21				78											
978	22				72											
976	23				65											
976	24				100											
974	25						REFUSAL.									100/10" at 24'
974	26						Bottom of borehole at 24.8 ft bgs									
972	27						Backfilled with bentonite grout (mix 0.5 bags/15 gal. water).									
972	28						*Elevation Reference: CP 1, Elev. 1000.00 feet per MCDOT topographic survey									
970	29															
970	30															



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PROJECT NUMBER: 16-337.12
 PROJECT: Low Gap Road MP 19.40
 BORING: P1
 ENTRY BY: MVG
 CHECKED BY: RRH

SHEET 1 of 1

LOG OF BORING B2

PROJECT NO: 16-337.12
 PROJECT: Low Gap Road MP 19.40
 LOCATION: Low Gap Rd (CR 212), Ukiah
 CITY/COUNTY: Mendocino
 CLIENT: MCDOT
 LOGGED BY: MVG
 DEPTH OF BORING: 61.5 (ft)

BEGIN DATE: 3/8/18
 COMPLETION DATE: 3/8/18
 SURFACE ELEVATION: 997.6 (ft)*
 SURFACE CONDITION: Dirt/Gravel
 WATER DEPTH: 18 (ft)
 READING TAKEN: 3/8/18
 HAMMER EFFICIENCY: 80 (%)

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

FIELD							GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY						REMARKS
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)					LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	
0			A					CLAYEY SAND with GRAVEL (SC); yellowish brown; dry; about 35% coarse to fine, subrounded GRAVEL, max. 1 in. dia.; about 35% coarse to fine SAND; medium plasticity, medium toughness fines [FILL].	100	37	20			30	Chemical Analysis pH = 6.02 Min. Res. = 1070 ohm-cm Chloride = 138.5 ppm Sulfate = 6.7 ppm		
996	1																
	2																
	3																
994	4																
	5																
992	6	X	1	10 10 9	19	2.25		Lean CLAY with SAND (CL); very stiff; yellowish brown; moist; about 25% medium to fine SAND; medium plasticity, medium toughness fines [RESIDUAL SOIL].	33								
	7																
990	8																
	9							SANDY lean CLAY (CL); very stiff; reddish yellow; moist; about 40% coarse to fine SAND; medium plasticity, medium toughness fines.									
988	10																
	11	X	2	3 4 6	10	2.25			83			16.1	117.1				
986	12																
	13																
984	14																
	15																
982	16	X	3	10 16 19	35	4.50			33			12.1	106.8	21			
	17							CLAYEY SAND with GRAVEL (SC); dense; olive variegated w/ reddish yellow; moist; about 30% coarse, angular to subangular GRAVEL, max. 1.5 in. dia.; about 49% medium to fine SAND; medium plasticity, medium toughness fines; GRAVEL is hard Shale fragments [DECOMPOSED BEDROCK].									
980	18																
	19																
978	20	X	4	18 25 14	39	3.25		Very dense; olive gray.	17								
976	21																
	22																
974	23							Lean CLAY (CL); hard; gray; moist; about 5% coarse to fine, subangular GRAVEL, max. 1 in. dia.; about 5% medium to fine SAND; medium plasticity, medium toughness fines.									
	24																
972	25	X	5	17 22 23	45	>4.50			33			8.1	143.3				
	26																
970	27													Near auger bit refusal at 27'			
	28																
	29																
968	30							SEDIMENTARY ROCK (SHALE), clay, very thinly bedded, dark gray, very intensely weathered, very soft to soft, open, thin fracture spacing filled with calcite and CLAY; (Lean CLAY (CL), hard) [UNDIVIDED MARINE FORMATION].						Driller reports soft material at 29'			
	31	X	6	4 7 9	16	4.50			17			7.5	143.6				
966	32																
	33																



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PROJECT NUMBER: 16-337.12
 PROJECT: Low Gap Road MP 19.40
 BORING: B2
 ENTRY BY: MVG
 CHECKED BY: RRH

SHEET 1 of 2

ELEV (ft)	DEPTH (ft)	FIELD					GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY						REMARKS
		SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)					LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	
964	33							SEDIMENTARY ROCK (Shale) (continued).									
962	35	X	7	7 11 12	23			Decomposed, moderately hard, (Lean CLAY (CL), very stiff).	50								
	36					2.50											
960	37																
	38																
958	39																
	40	X	8	41 17 22	39			(Lean CLAY (CL), stiff).	28								
956	41					1.75		0.3" lense of Poorly-graded SAND with SILT (SP-SM).					9.7	143			
	42																
	43																
954	44																
	45	X	9	50/3"	REF			Intensely to moderately weathered, moderately soft.	100								
952	46																
	47																
950	48																
	49																
948	50	X	10	14 24 29	53				28								
	51					>4.50											
946	52							METAMORPHIC ROCK (SERPENTINITE), fine-grained, pale green, decomposed, very soft, moderately open, moderately thin fracture spacing filled w/ filled calcite; (SILTY SAND to SANDY SILT (SM/ML), very dense).									
	53																
944	54																
	55																
942	56							SEDIMENTARY ROCK (SHALE), clay, thinly to moderately bedded, dark gray, decomposed, soft, interbedded with poorly graded SAND with SILT (SP-SM) lenses ~1"; (Lean CLAY with SAND (CL), hard).									
	57																
940	58																
	59																
938	60	X	11	12 13 18	31				67								
	61					4.50											
936	62							Bottom of borehole at 61.5 ft bgs									
	63							Backfilled with 94lbs bags of portland cement grout (mix 8 bags/80 gal. water) and 2 bags of bentonite grout.									
934	64																
	65							*Elevation Reference: CP 1, Elev. 1000.00 feet per MCDOT topographic survey									
932	66																
	67																
930	68																
	69																
928	70																
	71																
926	72																

LOG OF BORING B3

PROJECT NO: 16-337.12
PROJECT: Low Gap Road MP 19.40
LOCATION: Low Gap Rd (CR 212), Ukiah
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: MVG
DEPTH OF BORING: 61.5 (ft)

BEGIN DATE: 3/8/18
COMPLETION DATE: 3/8/18
SURFACE ELEVATION: 996.8 (ft)*
SURFACE CONDITION: Dirt/Gravel
WATER DEPTH: 55 (ft)
READING TAKEN: 3/8/18
HAMMER EFFICIENCY: 80 (%)

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

FIELD							GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY						DRILL METHOD	CASING DEPTH	REMARKS
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)					LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE				
996	1							SILTY GRAVEL (GM); brown; moist; about 50% coarse to fine, subrounded GRAVEL, max. 1 in. dia.; about 30% medium to fine SAND; low plasticity fines [FILL].											
994	3							ASPHALT (8"-9").											
	4							SILTY GRAVEL (GM); brown; moist; about 50% coarse to fine, subrounded GRAVEL, max. 1 in. dia.; about 30% medium to fine SAND; low plasticity fines.											
992	5								33										
	6	X	1	4 5 5	10	4.25		ASPHALT (2"-3").											
990	7							GRAVELLY lean CLAY (CL); hard; reddish brown; moist; about 40% coarse to fine, subangular GRAVEL, max. 1 in. dia.; about 10% medium to fine SAND; medium plasticity, medium toughness fines; GRAVEL is Sandstone, moderately hard, medium sand, oxidized / tan..											
988	9																		
	10							CLAYEY GRAVEL (GC); medium dense; reddish brown; moist; about 70% coarse to fine GRAVEL; about 10% medium to fine SAND; medium plasticity fines.	33										
986	11	X	2	11 11 9	20	4.50		Lean CLAY (CL); hard; tan variegated w/ yellowish red.; dry; about 10% medium to fine SAND; medium plasticity, medium toughness fines; moderately indurated [RESIDUAL SOIL].				13							
984	13																		
	14																		
982	15	X	3	2 2 3	5				0									Driller reports very soft material at 14'-17'	
980	17																		
	18																		
978	19																		
	20							SEDIMENTARY ROCK (GRAYWACKE), fine sand, gray with oxidized tan fracture faces, very intensely weathered, moderately hard, partially decomposed; (SILTY SAND (SM), dense) [UNDIVIDED MARINE FORMATION].	0									Driller reports hard drilling, auger grinding at 19'	
976	21		4	50/2"	REF														
	22																		
974	23																	Drilling reports very hard material at 22', but once through this layer rods began to skip and drop downhole, suspected void area	
	24																		
972	25	X	5	12 14 18	32				33										
	26											4.3	116.6						
970	27																		
	28																		
968	29																		
	30																		
966	31	X	6	13 14 16	30	1.75		Very thinly bedded, decomposed, moderately soft to moderately hard, (SANDY lean CLAY (CL), stiff).	33										
	32																		
964	33																		

FIELD							GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY						DRILL METHOD	CASING DEPTH	REMARKS
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)					LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE				
33								SEDIMENTARY ROCK (Graywacke) (continued).											
962	35	X	7	16 12 18	30				33				3.7	107.7					
960	37																		
958	39							Lean CLAY with SAND (CL); hard; brown; moist; about 25% medium to fine SAND; medium plasticity, medium toughness fines [DECOMPOSED BEDROCK].											
956	41	X	8	30 26 24	50	4.50			67				1.5	135.9					
954	43							METAMORPHIC ROCK (SERPENTINITE), clay, dark gray with pale green, decomposed, soft, (Lean CLAY with SAND (CL), hard, moist) [UNDIVIDED MARINE FORMATION].											
952	45		9	50/2"	REF			METAMORPHIC ROCK (META-SANDSTONE), fine sand, thickly bedded, dark grayish green, intensely to moderately weathered, moderately hard.	100										
948	49							METAMORPHIC ROCK (SERPENTINITE), medium-grained to fine-grained, moderately bedded, green with dark gray, decomposed, very soft, some platy rock fragments (Schistose); (Lean CLAY (CL), very stiff).	55										
946	51	X	10	32 50/5"	50/5	2.00													
942	55	X	11	14 18 22	40	2.50		Thinly to moderately bedded, interbedded with Shale, dark gray, moderately hard.	33										
936	61	X	12	23 24 30	54	4.50		Pale green, very soft to soft, moderately open, moderately thin fracture spacing filled with calcite.	33										
934	63							Bottom of borehole at 61.5 ft bgs											
932	65							Backfilled with 94lbs bags of portland cement grout (mix 12 bags/90 gal. water) and 2 bags of bentonite grout.											
930	67							*Elevation Reference: CP 1, Elev. 1000.00 feet per MCDOT topographic survey											
928	69																		
926	71																		
	72																		

LOG OF BORING HA1

PROJECT NO: 16-337.12
 PROJECT: Low Gap Road MP 19.40
 LOCATION: Low Gap Rd (CR 212), Ukiah
 CITY/COUNTY: Mendocino
 CLIENT: MCDOT
 LOGGED BY: MVG
 DEPTH OF BORING: 5 (ft)

BEGIN DATE: 3/9/18
 COMPLETION DATE: 3/9/18
 SURFACE ELEVATION: 985.6 (ft)*
 SURFACE CONDITION: Dirt
 WATER DEPTH: Not Encountered (ft)
 READING TAKEN: 3/9/18
 HAMMER EFFICIENCY: N/A (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
 DRILLING METHOD: Hand Auger (3" OD)
 DRILL RIG: Deeprack - DR5K (Truck)
 HAMMER TYPE: N/A
 SAMPLER TYPE & SIZE: Bulk
 BOREHOLE DIAMETER: 3"
 BACKFILL METHOD: Bentonite Chips

FIELD							RECOVERY (%)	LABORATORY							REMARKS
ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)		LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	
984	0		A				100								Hand auger refusal at 5' due to caving of gravel layer
982	1														
980	2														Hand auger refusal at 5' due to caving of gravel layer
978	3														
976	4		B				100								Hand auger refusal at 5' due to caving of gravel layer
974	5														
972	6														Hand auger refusal at 5' due to caving of gravel layer
970	7														
968	8														Hand auger refusal at 5' due to caving of gravel layer
966	9														
964	10														Hand auger refusal at 5' due to caving of gravel layer
962	11														
960	12														Hand auger refusal at 5' due to caving of gravel layer
958	13														
956	14														Hand auger refusal at 5' due to caving of gravel layer
954	15														
952	16														Hand auger refusal at 5' due to caving of gravel layer
950	17														
948	18														Hand auger refusal at 5' due to caving of gravel layer
946	19														
944	20														Hand auger refusal at 5' due to caving of gravel layer
942	21														
940	22														Hand auger refusal at 5' due to caving of gravel layer
938	23														
936	24														Hand auger refusal at 5' due to caving of gravel layer
934	25														

APPENDIX B

LABORATORY AND FIELD TEST SUMMARY

Job: Low Gap Road MP 19.40
 Job No: 16-337.12
 Date: 9/4/18

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			
								Dry Density (pcf)	Moist. Content (%)	In-Situ Density (pcf)	Atterberg Limits			Gravel (%)	Sand (%)	Fines (%)	Pocket Pent. (tsf)	Uncon. Comp. (psf)	pH	Minimum Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
											Liquid Limit	Plastic Limit	Plasticity Index									
Road-level Borings	B2	0.0	A	0.0-5.0	SC	N/A	-				37	20	17	35	35	30	-		6.02	1,070	138.5	6.7
	B2	5.0	1	6.0-6.5	CL	19	25										2.25					
	B2	10.0	2	10.5-11.5	CL	10	13	117.1	16.1	136.0							2.25					
	B2	15.0	3	16.0-16.5	SC	35	47	106.8	12.1	119.7				30	49	21	4.50					
	B2	20.0	4	21.0-21.5	SC	39	52										3.25					
	B2	25.0	5	26.0-26.5	CL	45	60	143.3	8.1	154.9							+4.50					
	B2	30.0	6	31.0-31.5	W. ROCK	16	21	143.6	7.5	154.4							4.50					
	B2	35.0	7	36.0-36.5	W. ROCK	23	31										2.50					
	B2	40.0	8	41.0-41.5	W. ROCK	39	52	143.0	9.7	156.9							1.75					
	B2	45.0	9	45.0-45.3	W. ROCK	REF	-										-					
	B2	50.0	10	51.0-51.5	W. ROCK	53	71										+4.50					
	B2	60.0	11	60.5-61.5	W. ROCK	31	41										4.50					
	B3	5.0	1	6.0-6.5	CL	10	13										4.25					
	B3	10.0	2	11.0-11.5	CL	20	27		13.0								4.50					
	B3	15.0	3	None	CL	5	7										-					
	B3	20.0	4	None	W. ROCK	REF	-										-					
	B3	25.0	5	26.0-26.5	W. ROCK	32	43	116.6	4.3	121.6							-					
	B3	30.0	6	31.0-31.5	W. ROCK	30	40										1.75					
	B3	35.0	7	36.0-36.5	W. ROCK	30	40	107.7	3.7	111.7							-					
	B3	40.0	8	40.5-41.5	CL	50	67	135.9	1.5	137.9							4.50					
	B3	45.0	9	None	W. ROCK	REF	-										-					
	B3	50.0	10	50.5-50.9	W. ROCK	50/5"	-										2.00					
	B3	55.0	11	56.0-56.5	W. ROCK	40	53										2.50					
	B3	60.0	12	61.0-61.5	W. ROCK	54	72										4.50					
Slope	HA1	0.0	A	0.0-4.0	CL	N/A	-										-					
	HA1	4.0	B	4.0-5.0	GW	N/A	-										-					
	-		Scarp		CL	N/A	-										-					

Project Name: Low Gap Road MP 19.40

CALnc File No: 16-337.12

Date: 6/20/18

Technician: KE/AC

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B2-2A	B2-3A	B2-5A	B2-6A	B2-8A
USCS Symbol	SC	RX	RX	RX	RX
Depth (ft.)	11	16	26	31	41
Sample Length (in.)	5.988	4.548	1.945	2.623	3.195
Diameter (in.)	1.400	1.402	1.421	1.413	1.419
Sample Volume (ft ³)	0.00533	0.00406	0.00178	0.00238	0.00292
Total Mass Soil+Tube (g)	451.3	351.7	125.3	297.6	341.6
Mass of Tube (g)	122.1	131.2	0.0	131.0	133.5
Tare No.	H7	R18	C14	D2	D13
Tare (g)	13.2	130.4	21.0	13.9	13.8
Wet Soil + Tare (g)	68.2	376.7	101.2	85.3	86.0
Dry Soil + Tare (g)	60.5	350.2	95.2	80.3	79.6
Dry Soil (g)	47.3	219.8	74.3	66.5	65.8
Water (g)	7.6	26.5	6.0	5.0	6.4
Moisture (%)	16.1	12.1	8.1	7.5	9.7
Dry Density (pcf)	117.1	106.8	143.3	143.6	143.0

Notes:



Project Name: Low Gap Road MP 19.40

CALnc File No: 16-337.12

Date: 6/20/18

Technician: KE/AC

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B3-2A	B3-5A	B3-7A	B3-8A	
USCS Symbol	CL	RX	RX	RX	
Depth (ft.)	16	26	36	41	
Sample Length (in.)	-	4.287	3.872	4.832	
Diameter (in.)	-	1.401	1.409	1.401	
Sample Volume (ft ³)	-	0.00382	0.00349	0.00431	
Total Mass Soil+Tube (g)	-	346.2	311.8	399.5	
Mass of Tube (g)	-	135.1	134.9	129.9	
Tare No.	D15	C2	G1	B13	
Tare (g)	13.8	20.8	13.5	13.8	
Wet Soil + Tare (g)	64.8	86.9	84.7	96.2	
Dry Soil + Tare (g)	59.0	84.1	82.2	94.9	
Dry Soil (g)	45.2	63.4	68.7	81.1	
Water (g)	5.9	2.7	2.5	1.2	
Moisture (%)	13.0	4.3	3.7	1.5	
Dry Density (pcf)	-	116.6	107.7	135.9	

Notes:

Project Name: Low Gap Rpad MP 19.40

CAInc File No: 16-337.12

Date: 6/25/18

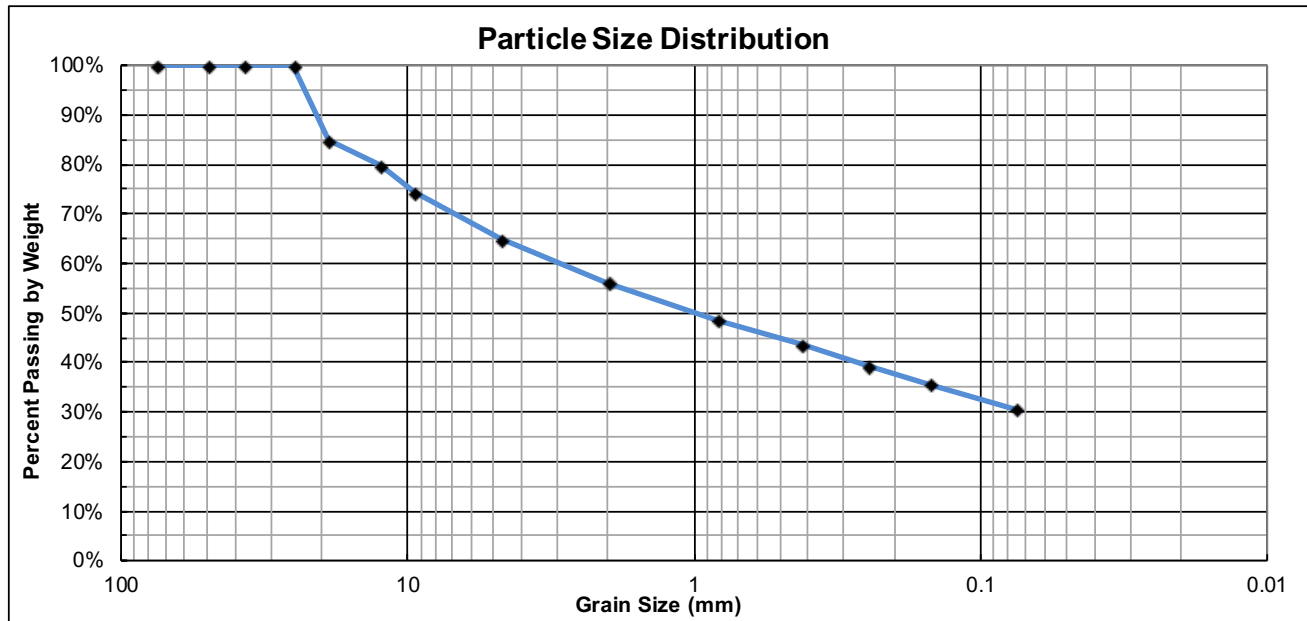
Technician: GL

Sample ID: B2-Bulk

Depth (ft): 0-5

USCS Classification: CLAYEY SAND with GRAVEL (SC)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines Silt/Clay
	Coarse	Fine	Coarse	Medium	Fine	
	15	20	9	12	14	
0	35		35			30

		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	0.0	100%
		3/4"	19.0	74.3	85%
	Fine	1/2"	12.5	99.3	80%
		3/8"	9.50	125.6	74%
		#4	4.75	171.2	65%
Sand	Coarse	#10	2.00	214.4	56%
	Medium	#20	0.825	250.9	49%
		#40	0.425	274.8	44%
	Fine	#60	0.250	295.9	39%
		#100	0.150	315.0	35%
		#200	0.075	339.5	30%

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

Project Name: Low Gap Rpad MP 19.40

CAInc File No: 16-337.12

Date: 6/25/18

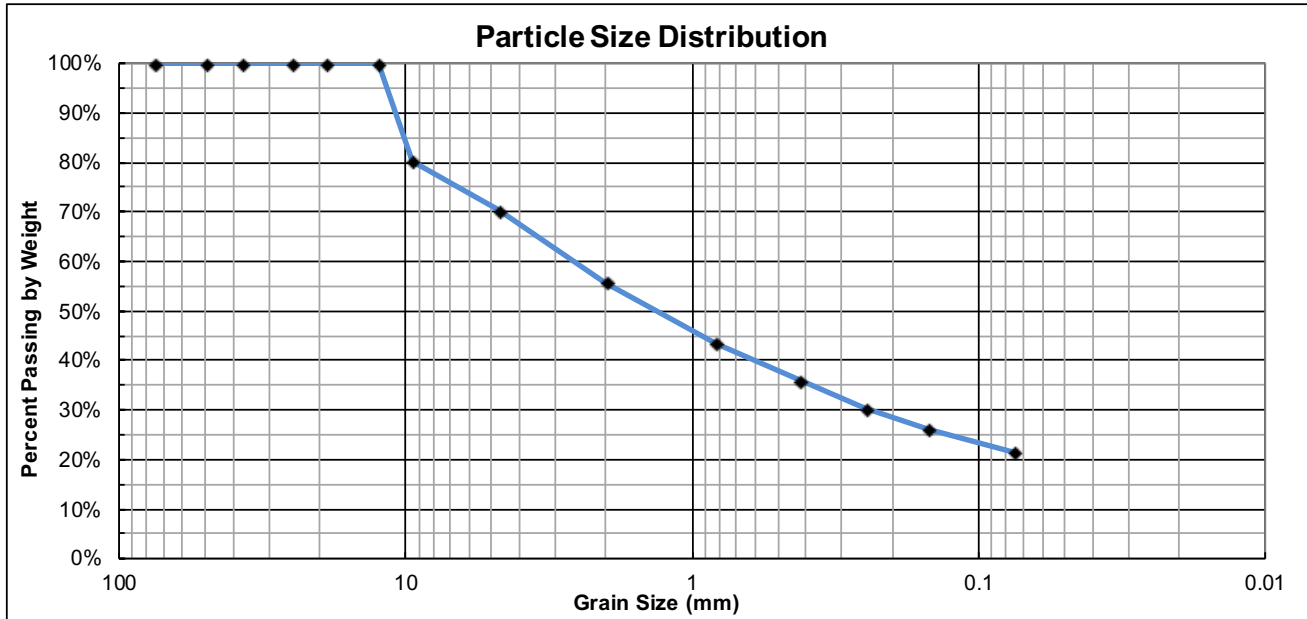
Technician: GL

Sample ID: B2-3A

Depth (ft): 16

USCS Classification: CLAYEY SAND with GRAVEL (SC)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines Silt/Clay
	Coarse	Fine	Coarse	Medium	Fine	
	0	30	15	20	15	
0	30		49			21

		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	0.0	100%
		3/4"	19.0	0.0	100%
	Fine	1/2"	12.5	0.0	100%
		3/8"	9.50	43.2	80%
		#4	4.75	65.3	70%
Sand	Coarse	#10	2.00	97.4	56%
	Medium	#20	0.825	124.4	43%
		#40	0.425	140.6	36%
	Fine	#60	0.250	153.1	30%
		#100	0.150	162.3	26%
		#200	0.075	172.7	21%

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

Project Name: Low Gap Rpad MP 19.40

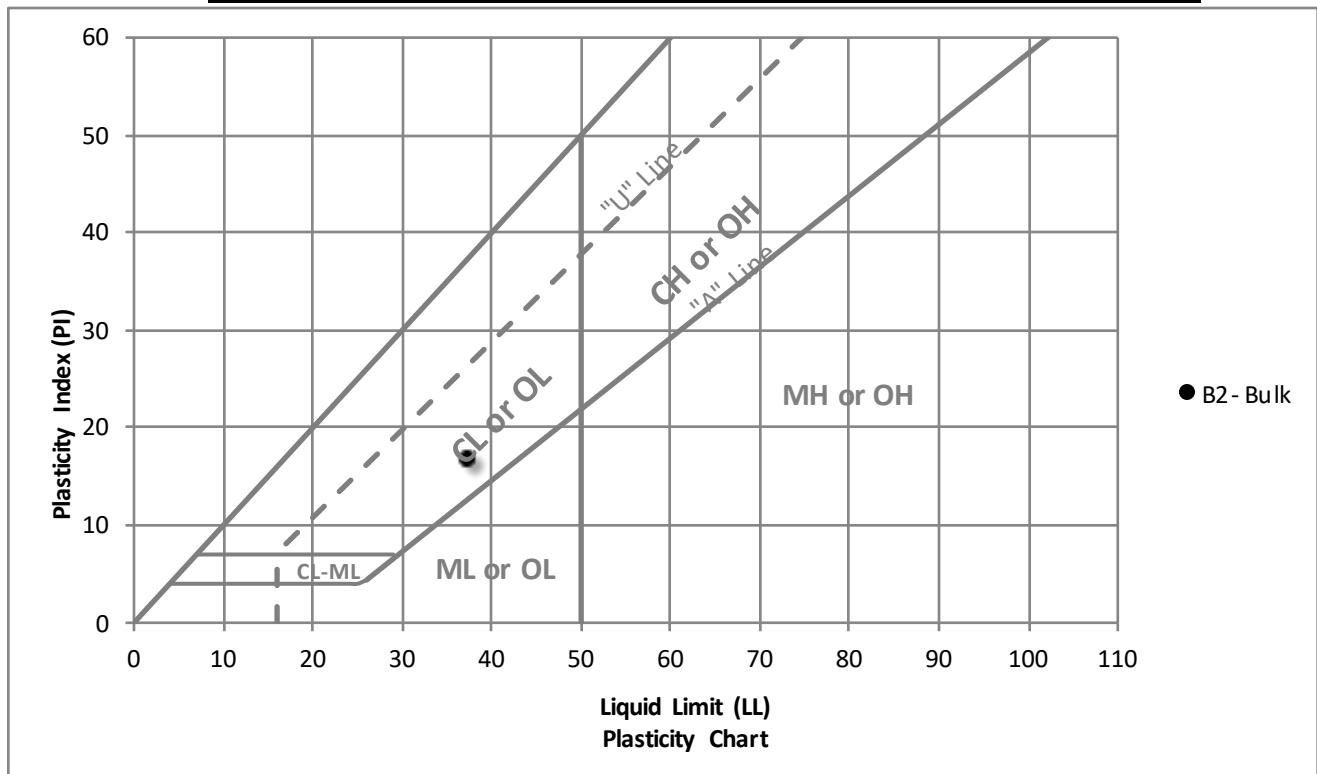
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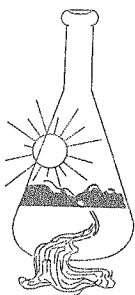
Date: 6/15/18

Technician: AC

Plastic Index - ASTM D4318

Sample ID	Depth (ft)	Liquid Limit	Plastic Limit	PI
B2- Bulk	0-5	37	20	17





Sunland Analytical

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

Date Reported 06/20/2018
Date Submitted 06/15/2018

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 : 16-337.12 19.40 Site ID : B2-BULK.
Thank you for your business.

* For future reference to this analysis please use SUN # 77251-161249.

EVALUATION FOR SOIL CORROSION

Soil pH	6.02		
Minimum Resistivity	1.07	ohm-cm (x1000)	
Chloride	138.5 ppm	00.01385	%
Sulfate	6.7 ppm	00.00067	%

METHODS

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