Route 101

Route 101

PARK BOUNDARY

"G" 78+44.61 BC

"G" 82+69.32 EC

"G" 83+99.60 BC

"G" 95+80.55 EC

"G" 110+12.11 EC

"G" 120+16.48 BC

"G" 130+67.60 EC

"G" 130+72.43 BC

Beg. BRIDGE
"G2" 146+43.11 BC

"G2" 141+57.77 EC

CUT/FILL

DESIGN STUDY ONLY

LAST CHANCE GRADE ALIGNMENT "G2"

SCALE 1"= 200'

L-2

Route 101

"G2" 181+27.64 END

"G2" 175+74.88 BC

END BRIDGE

"G2" 171+83.75 EC

"G2" 167+05.14 BC

"G2" 164+79.94 EC

"G2" 163+05.82 BC

"G2" 159+74.59 EC

PARK BOUNDARY

Beg. BRIDGE

"G2" 152+48.00 EC

"G2" 54+51.72 BC

END BRIDGE

DESIGN STUDY ONLY

LAST CHANCE GRADE
ALIGNMENT "G2"

SCALE 1"= 200'

L-3

DESIGN STUDY ONLY

LAST CHANCE GRADE
ALIGNMENT "A1"

SCALE 1"= 200'

L-1

"A1" 179+14.78 END

END TUNNEL
"A1" 172+80

"A1" 160+98.22 BC

Beg. TUNNEL
"A1" 148+55

END BRIDGE
"A1" 146+54

"A1" 145+83.91 EC

Beg. BRIDGE
"A1" 143+08

"A2"

"A1" 97+38.37 BC

"A1" 110+12.13 EC

"A1" 117+09.81 BC

"A1" 127+14.19 EC

"A1" 133+20.00 BC

CUT/FILL

DESIGN STUDY ONLY

LAST CHANCE GRADE ALIGNMENT "A1"

SCALE 1"= 200'

L-2


Route 101
Route 101
"A1"
"A2" 179+14.78 END
"A2" 177+21.12 EQ
"A2" 172+80.55 BC
"A2" 168+89.89 EQ
"A2" 164+11.27 BC
"A2" 161+86.08 EQ
"A2" 160+11.95 BC
"A2" 156+80.73 EQ
"A2" 151+57.86 BC
"A2" 149+54.13 EQ
"A2" 143+48.64 EQ
"A2" 137+79.89 EQ
"A2" 133+20.00 BC
"A2" 127+14.79 EQ
"A1" 117+09.81 BC
"A1" 110+22.38 EQ
END Bridge
"A2" 172+91
Beg. Bridge
"A2" 161+92
END Bridge
"A2" 148+00
Beg. Bridge
"A2" 143+85
CUT/FILL
DESIGN STUDY ONLY
LAST CHANCE GRADE
ALIGNMENT "A2"
SCALE 1"= 200'
L-1

Route 101

"F" 10+00.00 BEG

"F" 10+65.35 BC

"F" 17+14.15 EC

"F" 31+51.96 BC

"F" 37+19.19 EC

Beg. Tunnel
"F" 23+00

CUT/FILL

DESIGN STUDY ONLY

LAST CHANCE GRADE ALIGNMENT "F"

SCALE 1"= 200'

L-1

CUT/FILL

DESIGN STUDY ONLY

LAST CHANCE GRADE ALIGNMENT "F"

SCALE 1"= 200'

L-2

RFQ Number 03A2996

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
XX	XX	XX	XX		

REGISTERED CIVIL ENGINEER DATE XX-XX

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

REGISTERED PROFESSIONAL ENGINEER
No. XXXXX
Exp XX-XX-XX
CIVIL
STATE OF CALIFORNIA

PRELIMINARY DESIGN FOR REVIEW ONLY

ALIGNMENT "L"

MATCHLINE

7.00%

MATCHLINE

+34.48 POT
Elev 96.20

7.00%

MATCHLINE

SCALE: Horiz 1"=200'
Vert 1"=200'

P-1

795 695 595 495 395 295 195 95

STATION 382+00 383+00 384+00 385+00 386+00 387+00 388+00 389+00 390+00 391+00 392+00 393+00 394+00 395+00 396+00 397+00 398+00 399+00 400+00 401+00 402+00 403+00 404+00 405+00 406+00 407+00 408+00 409+00 410+00 TOTAL

410+00 411+00 412+00 413+00 414+00 415+00 416+00 417+00 418+00 419+00 420+00 421+00 422+00 423+00 424+00 425+00 426+00 427+00 428+00 429+00 430+00 431+00 432+00 433+00 434+00 435+00 436+00 437+00 438+00

CY Exc

Emb

REVISED BY

DATE REVISED

CALCULATED-DESIGNED BY

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FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION DATE PLOTTED => 03-MAY-2019
TIME PLOTTED => 09:54

00-00-00

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
DGN FILE => L extended profileL_New_Alignment.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 00000000001

RFQ Number 03A2996

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO. TOTAL SHEETS
XX	XX	XX	XX	

REGISTERED CIVIL ENGINEER DATE XX-XX

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
No. XXXXX
Exp XX-XX-XX
CIVIL
STATE OF CALIFORNIA

PRELIMINARY DESIGN FOR REVIEW ONLY

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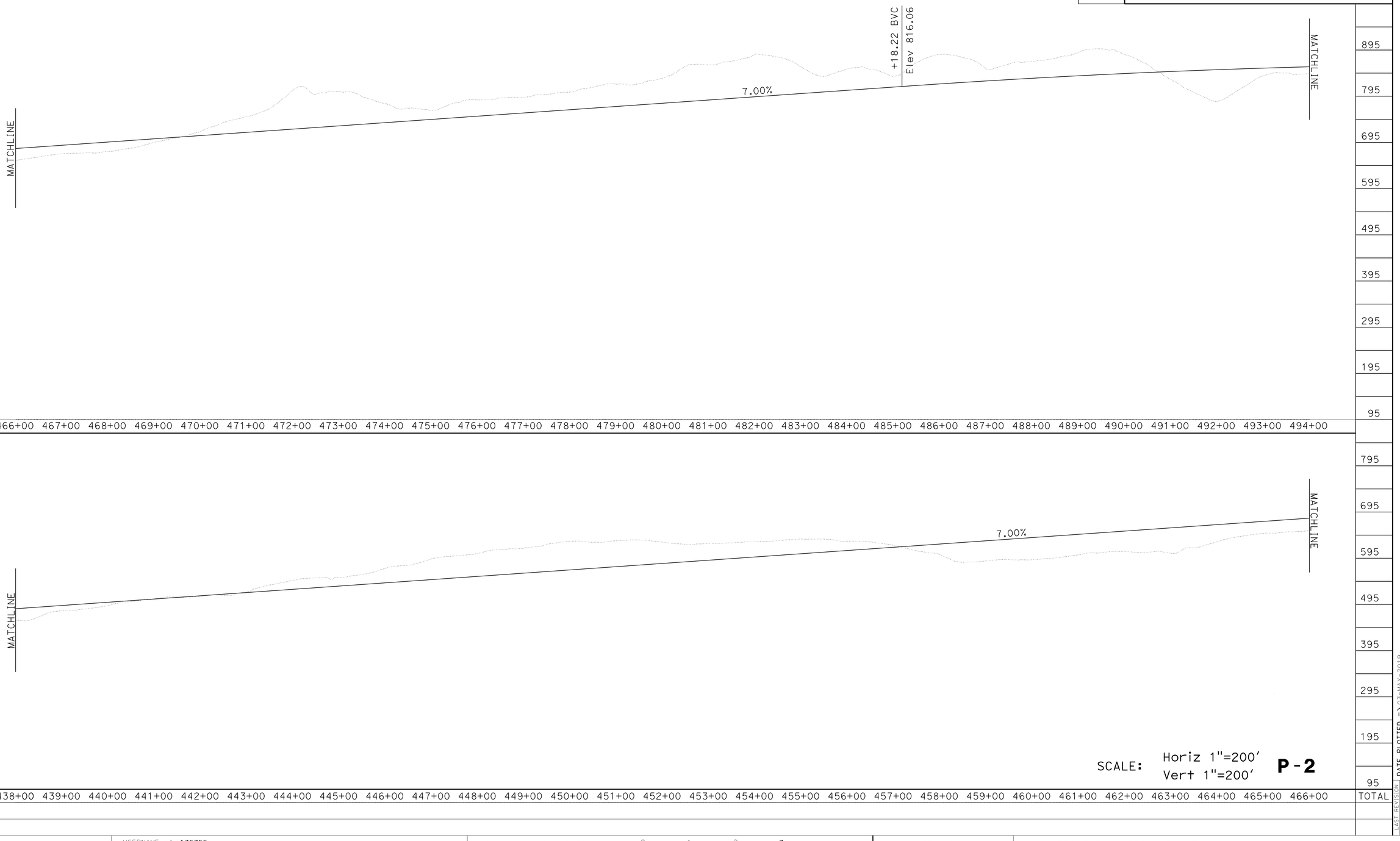

SCALE: Horiz 1"=200'
Vert 1"=200'

P-2

STATION | TOTAL

CY Exc | Emb

REVISED BY | DATE REVISED

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Caltrans

LAST REVISION | DATE PLOTTED => 03-MAY-2019 | TIME PLOTTED => 09:54 | 00-00-00

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
DGN FILE => L extended profileL_New_Alignment.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 00000000001

RFQ Number 03A2996

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO. TOTAL SHEETS
XX	XX	XX	XX	

REGISTERED CIVIL ENGINEER DATE XX-XX

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
No. XXXXX
Exp XX-XX-XX
CIVIL
STATE OF CALIFORNIA

PRELIMINARY DESIGN FOR REVIEW ONLY

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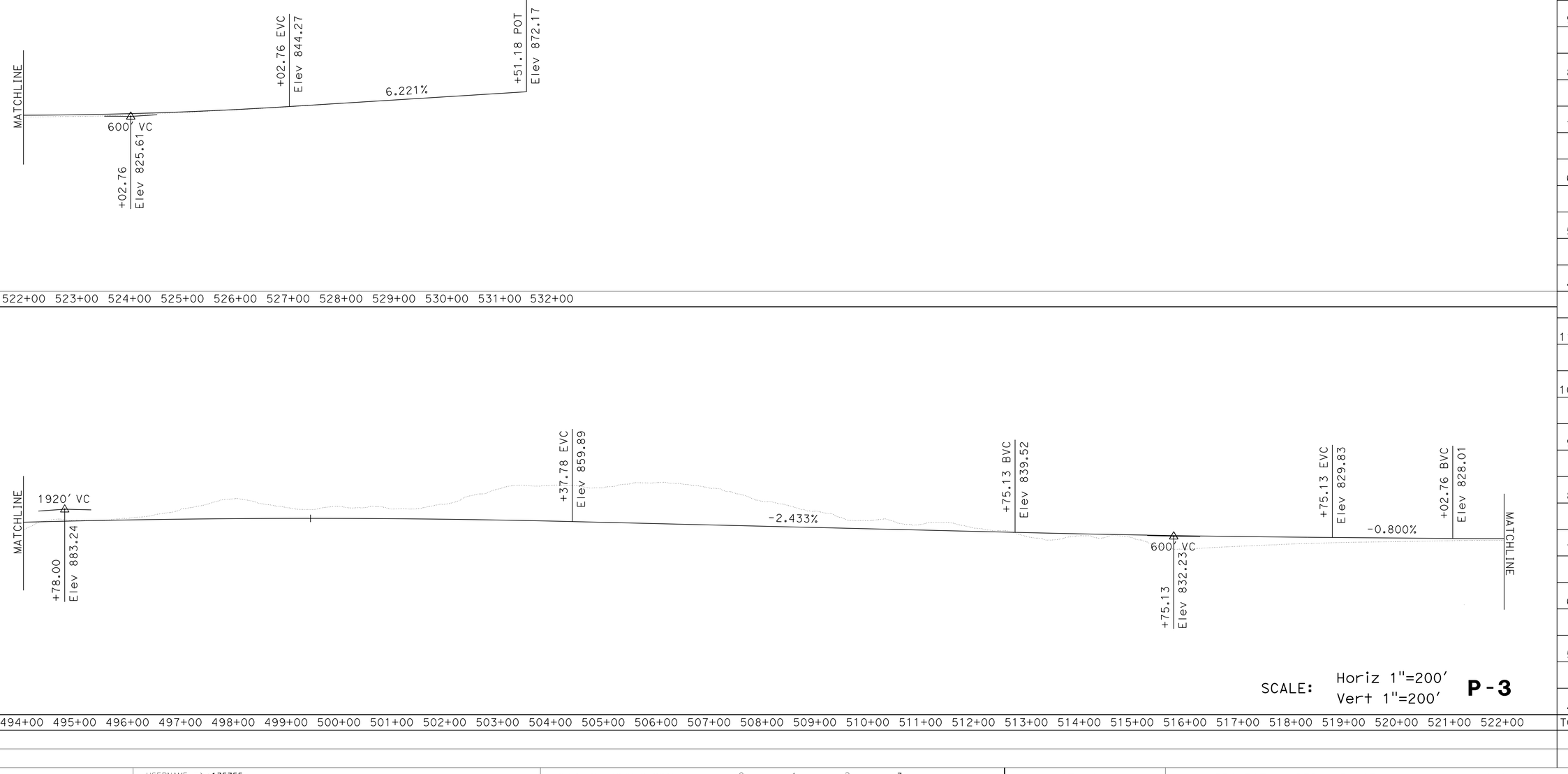

SCALE: Horiz 1"=200'
Vert 1"=200'

P-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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DATE REVISED

STATION | TOTAL

CY Exc

Emb

LAST REVISION | DATE PLOTTED => 03-MAY-2019
00-00-00 | TIME PLOTTED => 09:55

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
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RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 00000000001

RFQ Number 03A2996
Attachment 1.0
Page 1 of 56

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	DN	101	12/15.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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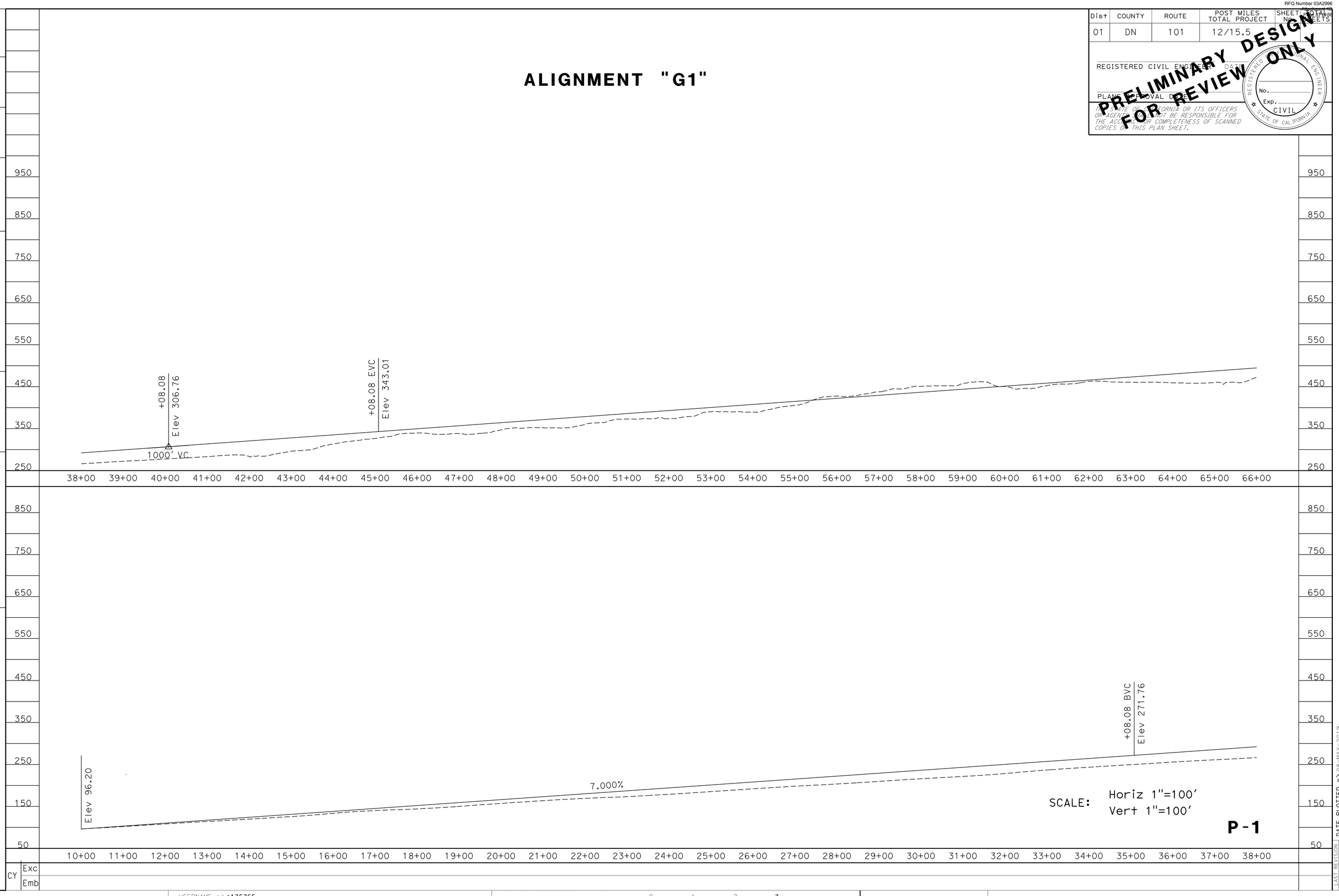

SCALE: Horiz 1"=100'
Vert 1"=100'

P-1

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LAST REVISION DATE PLOTTED => 08-MAY-2019
TIME PLOTTED => 14:22
05/06/19

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
DGN FILE => 0F280 - G Profile Sheets.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0312

PROJECT NUMBER & PHASE 0115000099

RFQ Number 03A2996
Addendum No.
PO Number

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	DN	101	12/15.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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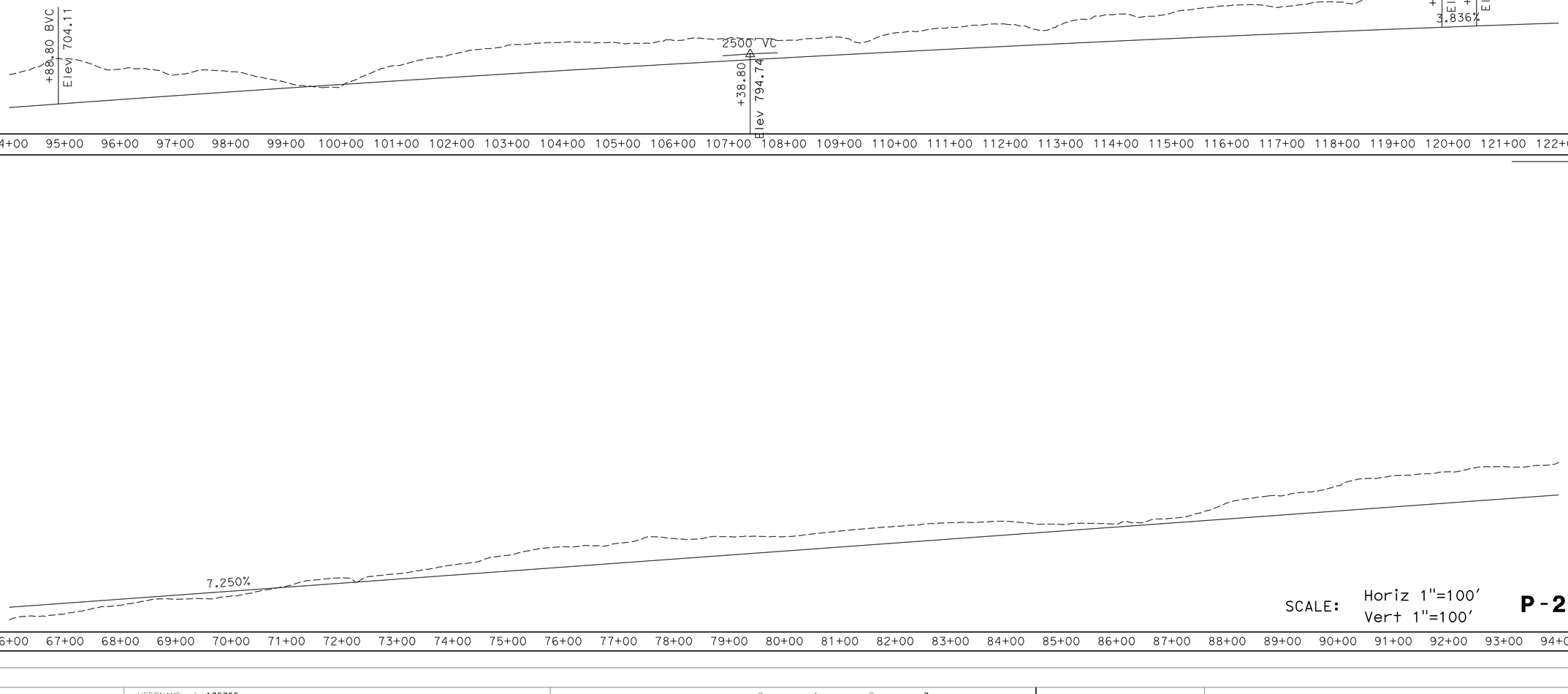

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Vert 1"=100'

P-2

REVISED BY | DATE REVISED

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FUNCTIONAL SUPERVISOR

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CY Exc Emb

LAST REVISION DATE PLOTTED => 08-MAY-2019
TIME PLOTTED => 14:22
05/06/19

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
DGN FILE => 0F280 - G Profile Sheets.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0312

PROJECT NUMBER & PHASE 0115000099

RFQ Number 03A2996
Addendum No.
PO Number

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	DN	101	12/15.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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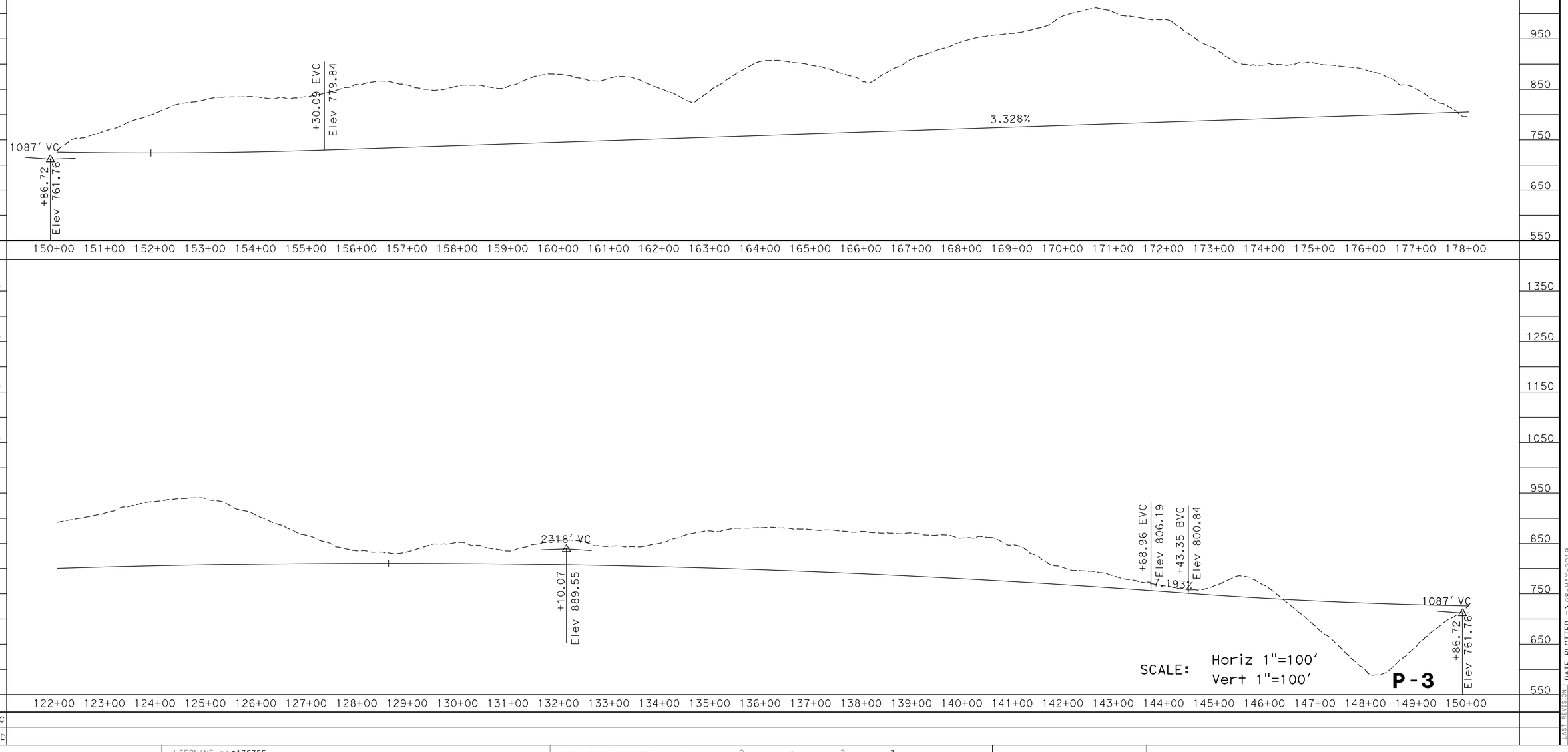

SCALE: Horiz 1"=100'
Vert 1"=100'

P-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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DATE REVISED

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Emb

LAST REVISION DATE PLOTTED => 08-MAY-2019
TIME PLOTTED => 14:23
05/06/19

BORDER LAST REVISED 7/2/2010

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DGN FILE => 0F280 - G Profile Sheets.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0312

PROJECT NUMBER & PHASE 0115000099

RFQ Number 03A2996
Attachment 19
Page 1 of 1

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	DN	101	12/15.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

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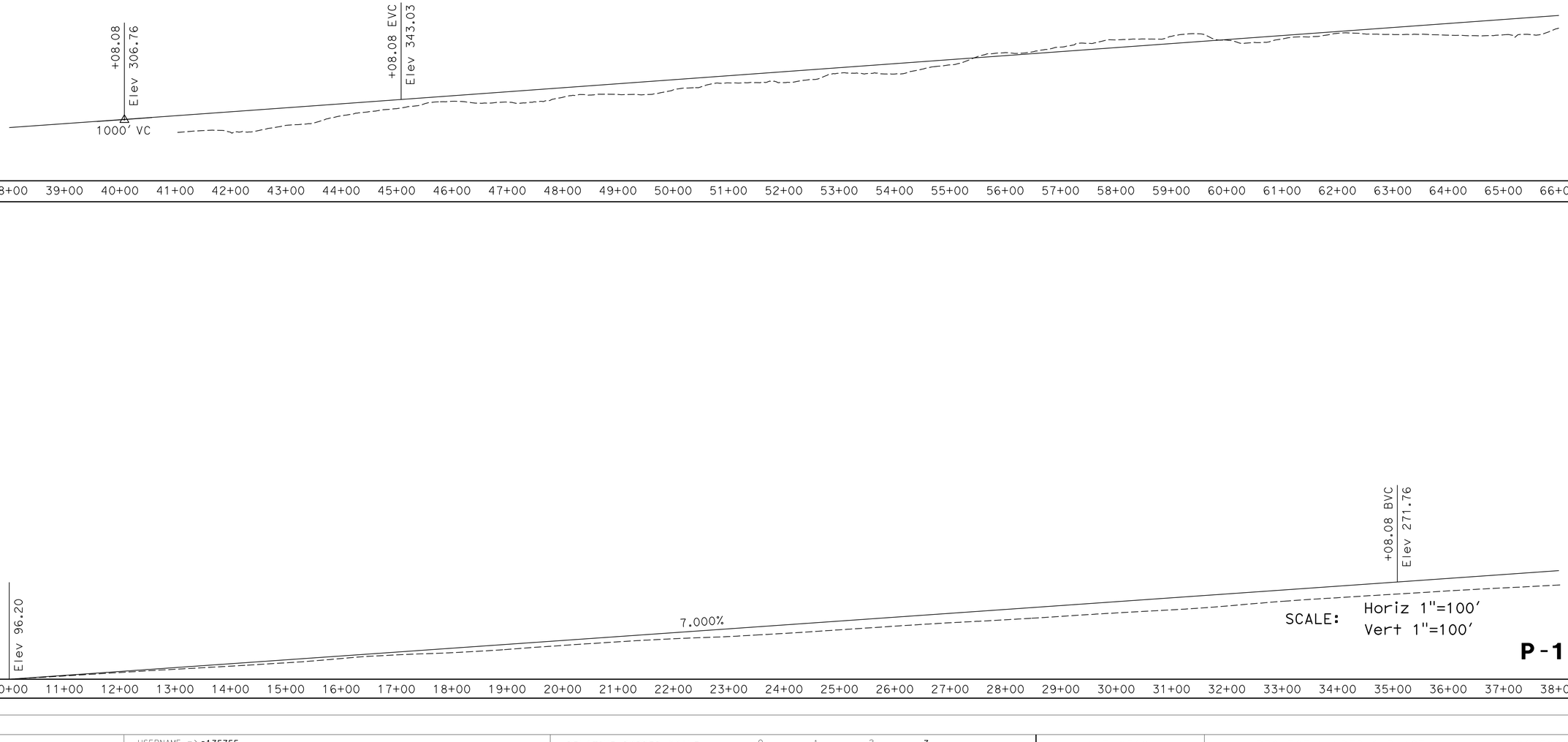

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FUNCTIONAL SUPERVISOR

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LAST REVISION | DATE PLOTTED => 01-JUL-2019
05/06/19 | TIME PLOTTED => 14:31

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DGN FILE => 0F280 - G2 Profile Sheets.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0312

PROJECT NUMBER & PHASE 0115000099

RFQ Number 03A2996
Attachment 1.19
Page 1 of 1

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	DN	101	12/15.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

PRELIMINARY DESIGN FOR REVIEW ONLY

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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ALIGNMENT "G2"

SCALE: Horiz 1"=100'
Vert 1"=100'

P-2

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Emb

LAST REVISION | DATE PLOTTED => 13-MAY-2019
TIME PLOTTED => 15:59
05/06/19

BORDER LAST REVISED 7/2/2010

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DGN FILE => 0F280 - G2 Profile Sheets.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0312

PROJECT NUMBER & PHASE 0115000099

RFQ Number 03A2996
Agreement 1B

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	DN	101	12/15.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

PRELIMINARY DESIGN FOR REVIEW ONLY

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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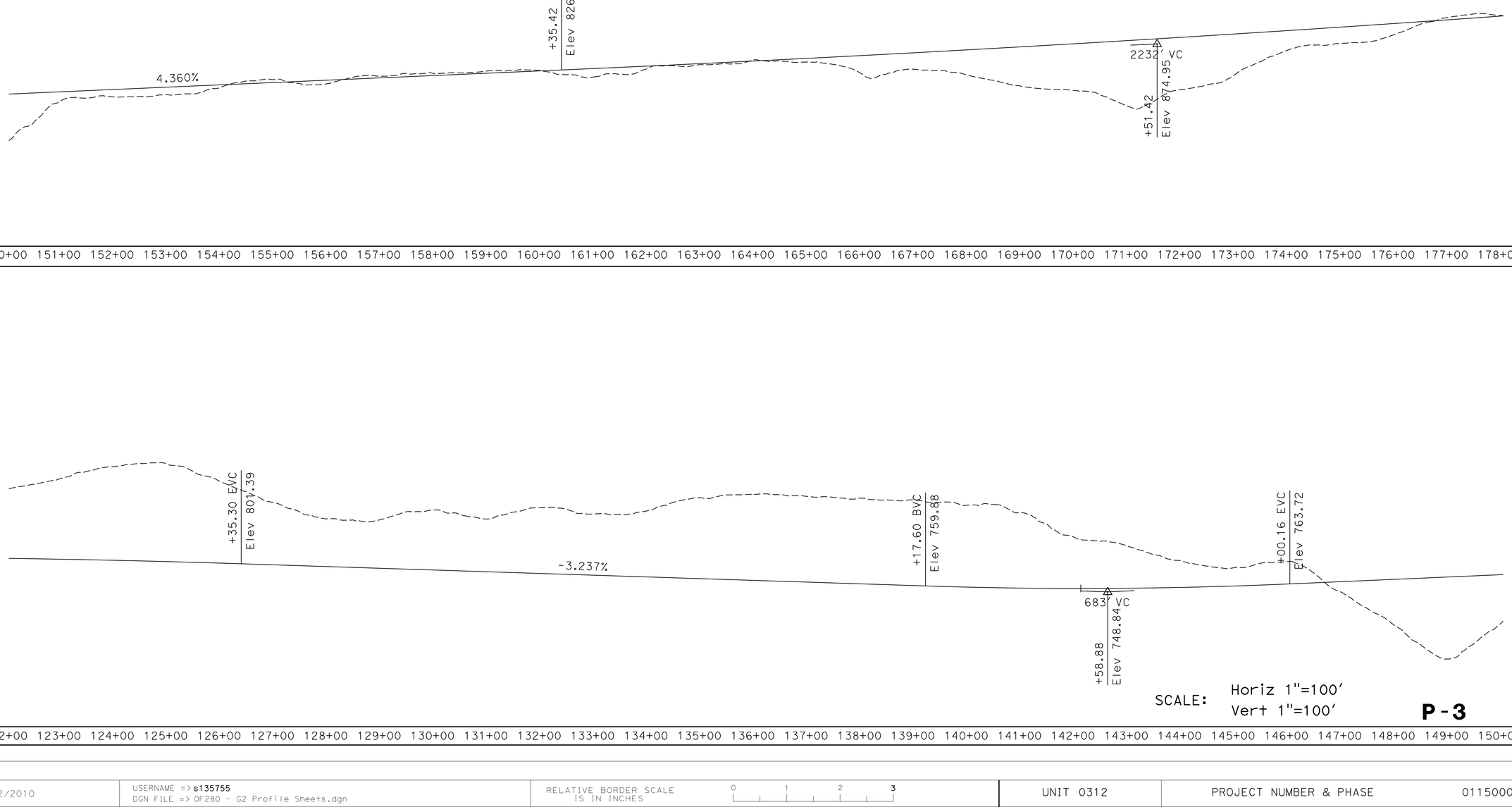

SCALE: Horiz 1"=100'
Vert 1"=100'

P-3

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CY Exc Emb

LAST REVISION | DATE PLOTTED => 13-MAY-2019
05/06/19 | TIME PLOTTED => 15:59

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
DGN FILE => 0F280 - G2 Profile Sheets.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0312

PROJECT NUMBER & PHASE 0115000099

RFQ Number 03A2996
Addendum No. 1

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
XX	XX	XX	XX		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

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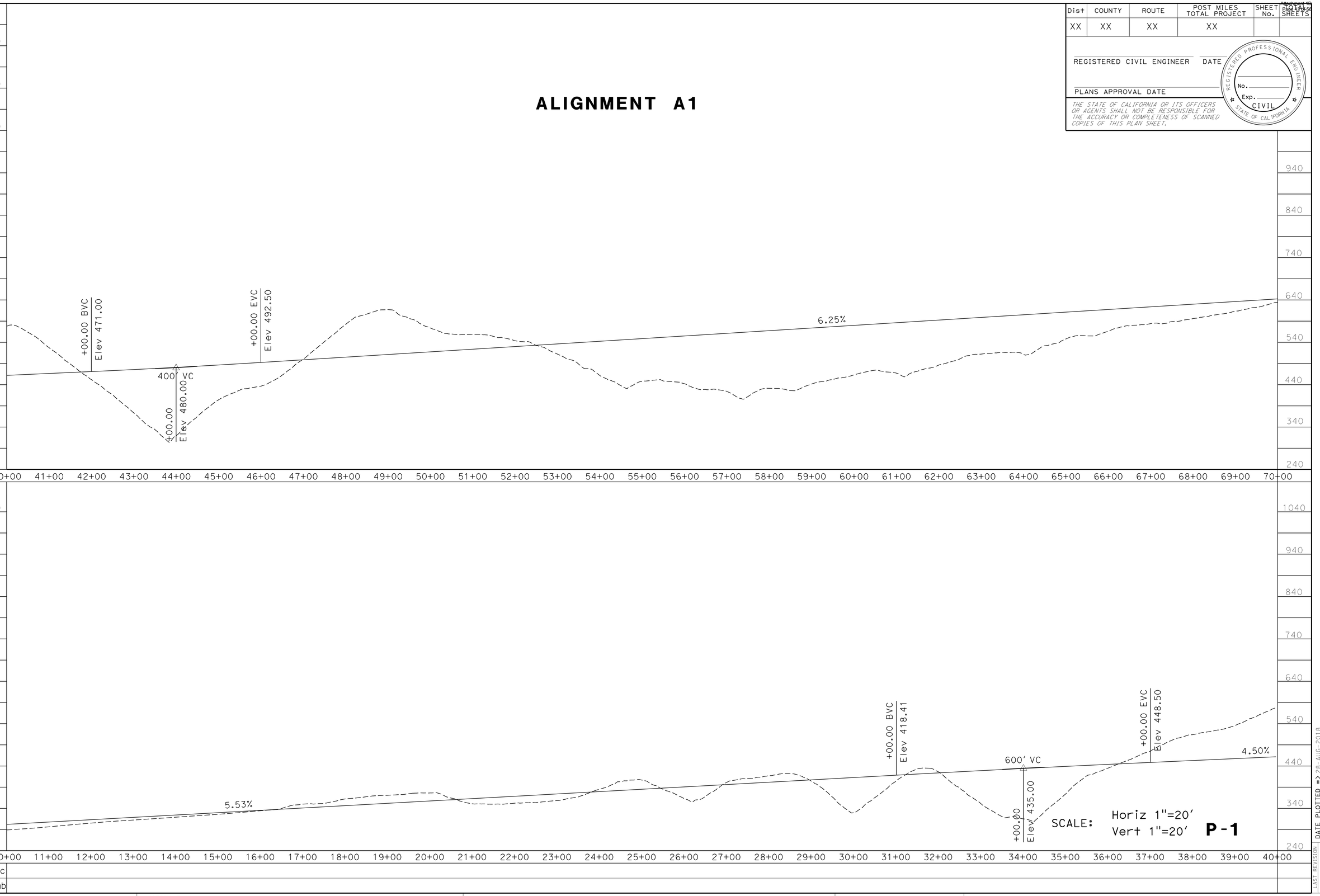

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CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

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CY Exc Emb

LAST REVISION | DATE PLOTTED => 28-AUG-2018 | TIME PLOTTED => 09:52 | 00-00-00

BORDER LAST REVISED 7/2/2010

USERNAME => s147289
DGN FILE => Profile A1 .dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0312

PROJECT NUMBER & PHASE 01 1300 0123

RFQ Number 03A2996
Agreement 19
Page 1 of 1

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
XX	XX	XX	XX		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

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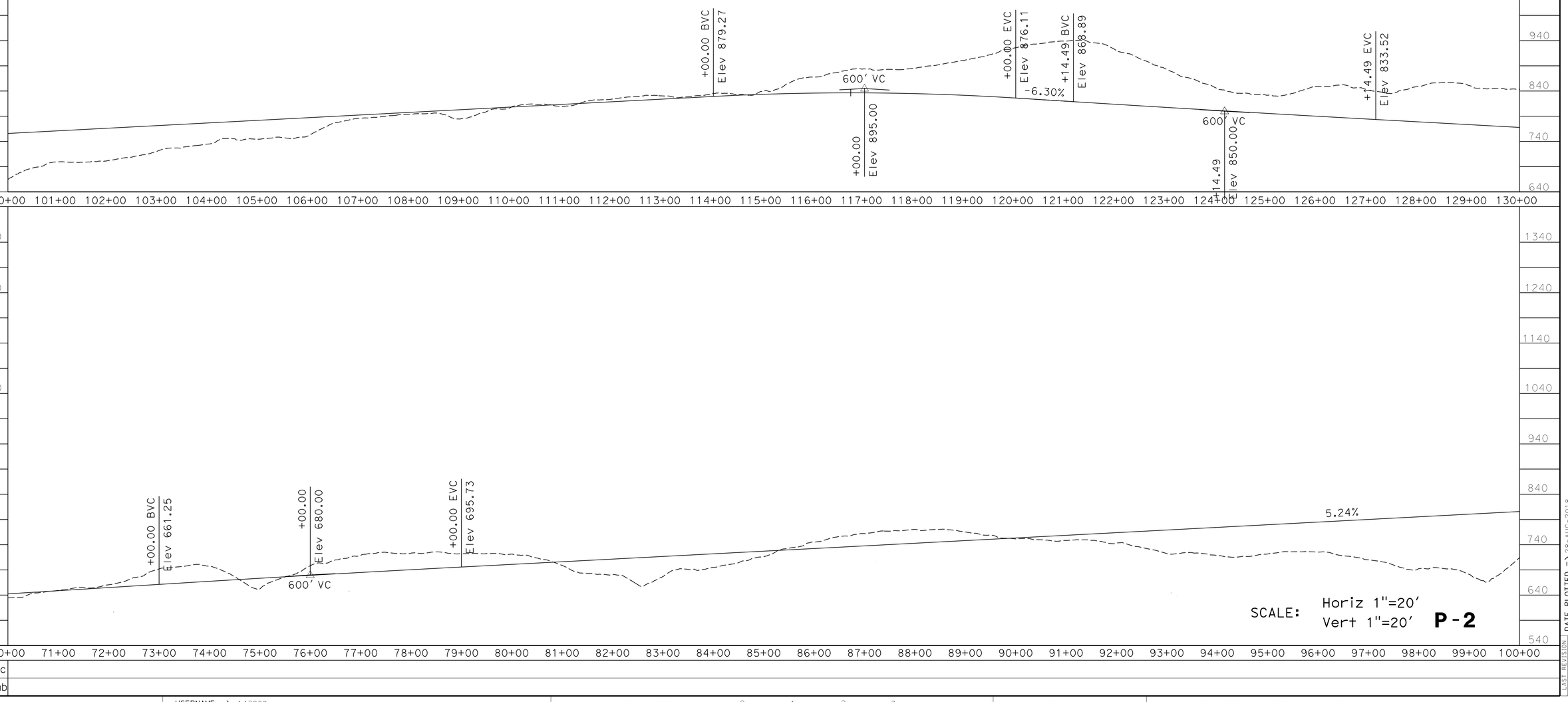
ALIGNMENT A1



SCALE: Horiz 1"=20'
Vert 1"=20' **P-2**

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY | FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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CY Exc
Emb

LAST REVISION | DATE PLOTTED => 28-AUG-2018
00-00-00 | TIME PLOTTED => 09:52

BORDER LAST REVISED 7/2/2010

USERNAME => s147289
DGN FILE => Profile A1 .dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 00000000001

RFQ Number 03A2996
Addendum No.
PO Release

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
XX	XX	XX	XX		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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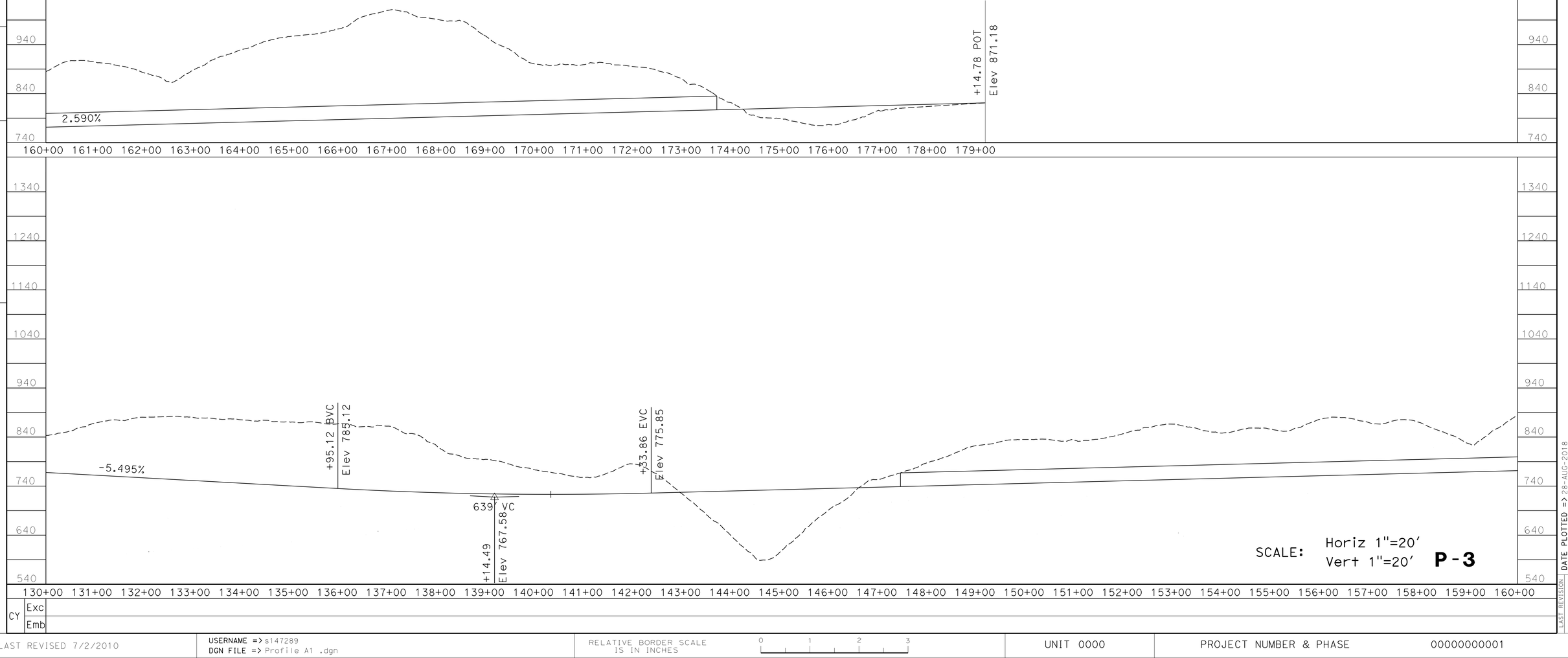

SCALE: Horiz 1"=20'
Vert 1"=20'

P-3

REVISED BY | DATE REVISED

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FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CY Exc Emb

LAST REVISION DATE PLOTTED => 28-AUG-2018
TIME PLOTTED => 09:52
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BORDER LAST REVISED 7/2/2010

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RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 00000000001

RFQ Number 03A2996
Agreement 19
Contract 1456

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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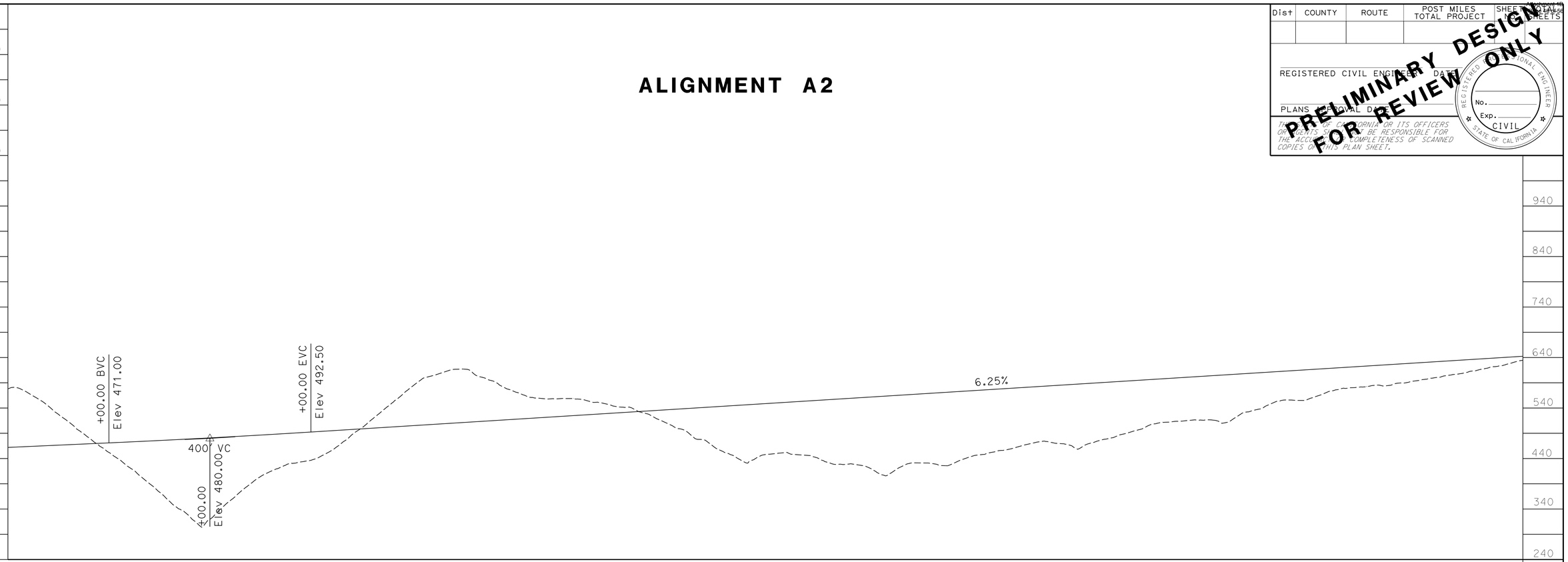
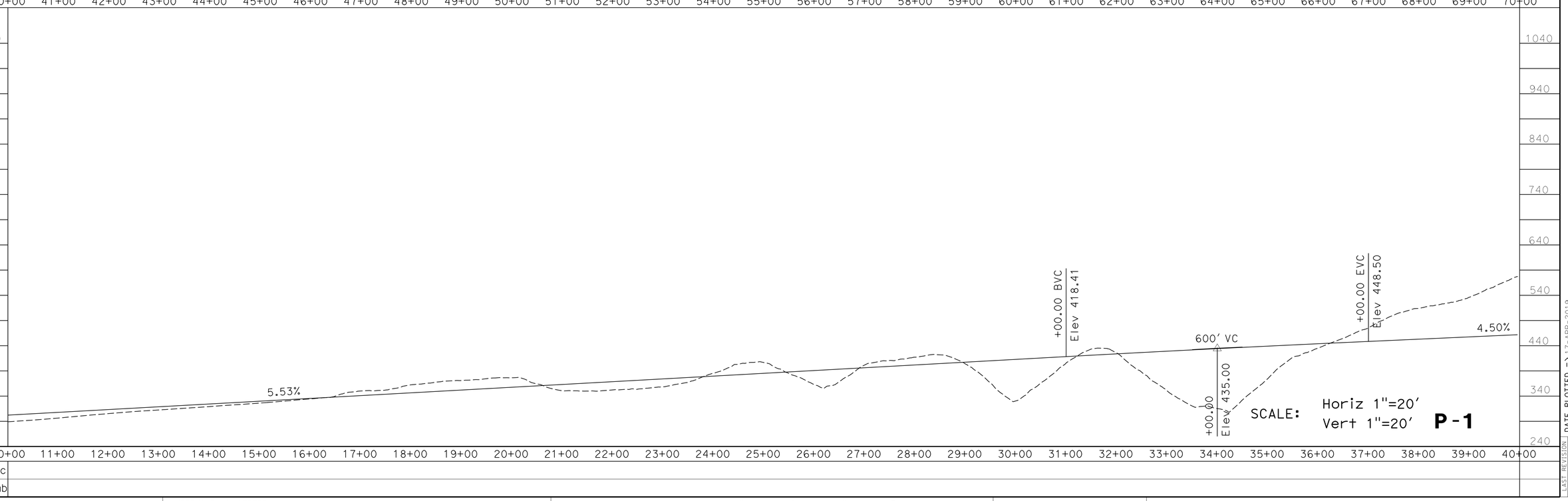
REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

PRELIMINARY DESIGN FOR REVIEW ONLY

ALIGNMENT A2





SCALE: Horiz 1"=20'
Vert 1"=20'

P-1

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CY Exc
Emb

LAST REVISION | DATE PLOTTED => 17-APR-2019
00-00-00 | TIME PLOTTED => 10:51

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
DGN FILE => Profile A2.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0312

PROJECT NUMBER & PHASE 01 1300 0123

RFQ Number 03A2996
Agreement 19
Contract 19

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

PRELIMINARY DESIGN FOR REVIEW ONLY

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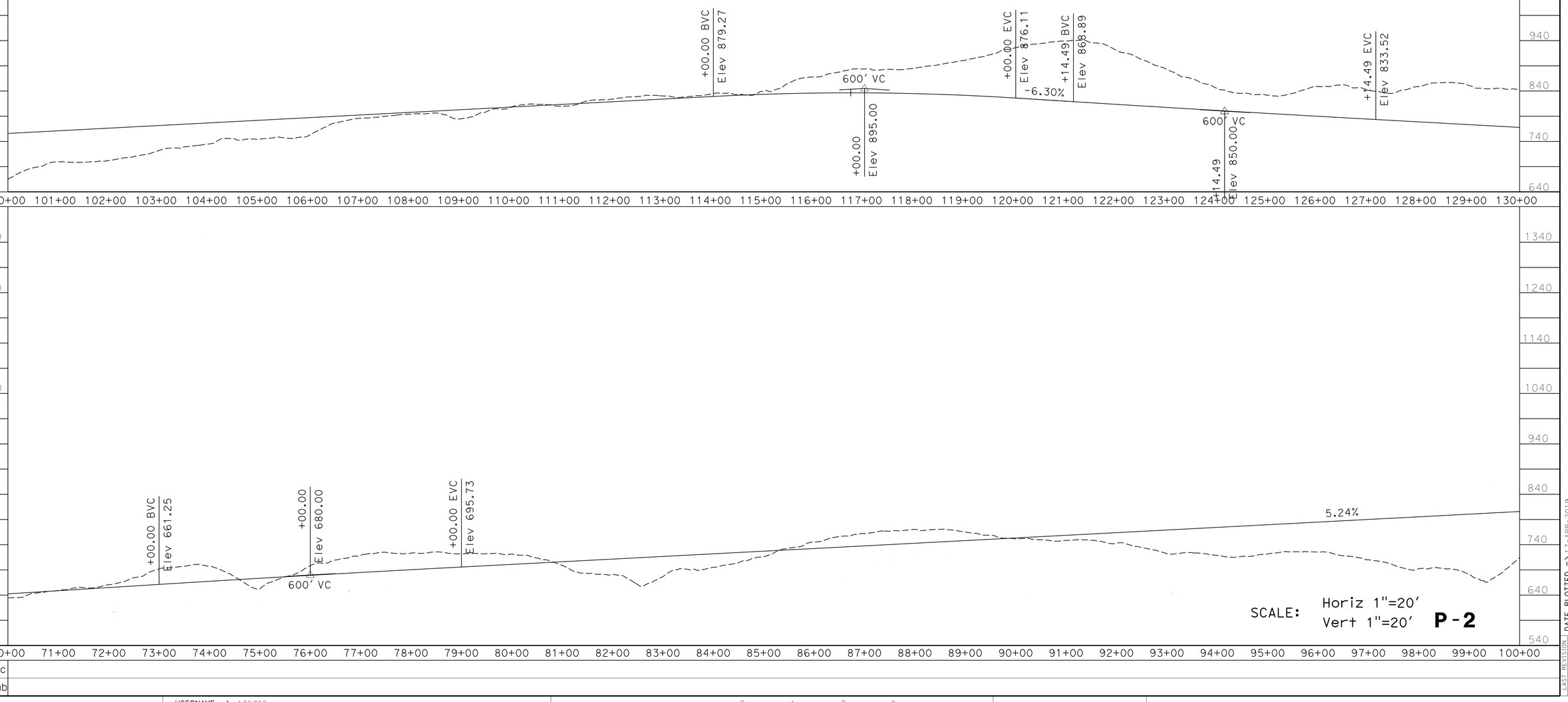

SCALE: Horiz 1"=20'
Vert 1"=20' **P-2**

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY | FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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CY Exc
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LAST REVISION 00-00-00
DATE PLOTTED => 17-APR-2019
TIME PLOTTED => 10:53

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
DGN FILE => Profile A2.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 00000000001

RFQ Number 03A2996
Alternative 1B
Page 1 of 56

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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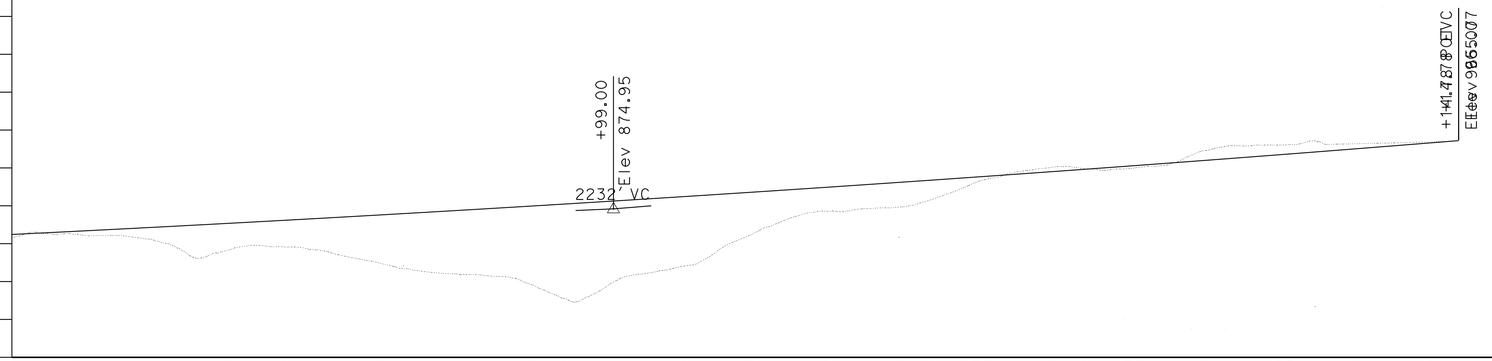
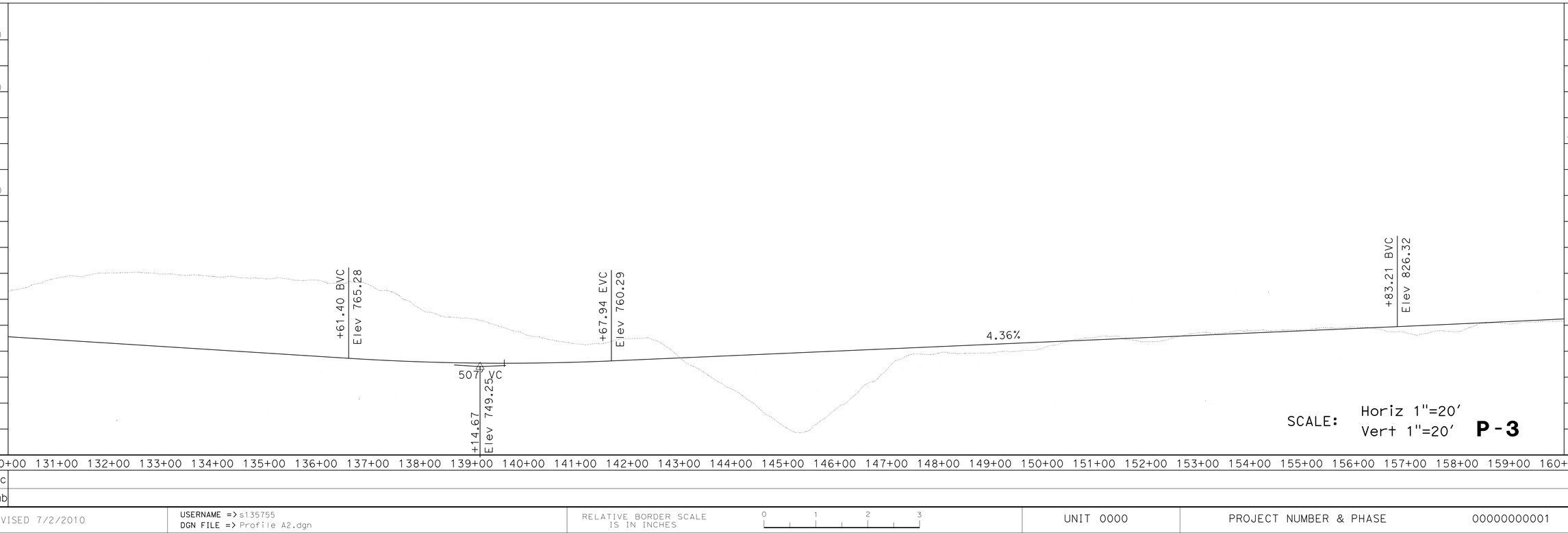
ALIGNMENT A2



160+00 161+00 162+00 163+00 164+00 165+00 166+00 167+00 168+00 169+00 170+00 171+00 172+00 173+00 174+00 175+00 176+00 177+00 178+00 179+00

1640 1540 1440 1340 1240 1140 1040 940 840 740 640



130+00 131+00 132+00 133+00 134+00 135+00 136+00 137+00 138+00 139+00 140+00 141+00 142+00 143+00 144+00 145+00 146+00 147+00 148+00 149+00 150+00 151+00 152+00 153+00 154+00 155+00 156+00 157+00 158+00 159+00 160+00

1340 1240 1140 1040 940 840 740 640 540

SCALE: Horiz 1"=20'
Vert 1"=20' **P-3**

CY	Exc
	Emb

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY | FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

LAST REVISION | DATE PLOTTED => 17-APR-2019
00-00-00 | TIME PLOTTED => 10:53

BORDER LAST REVISED 7/2/2010

USERNAME => s135755
DGN FILE => Profile A2.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

PROJECT NUMBER & PHASE 00000000001

Dist	COUNTY	ROUTE	POST MILES	SHEET NO.
			TOTAL PROJECT	TOTAL SHEETS
XX	XX	XX	XX	

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

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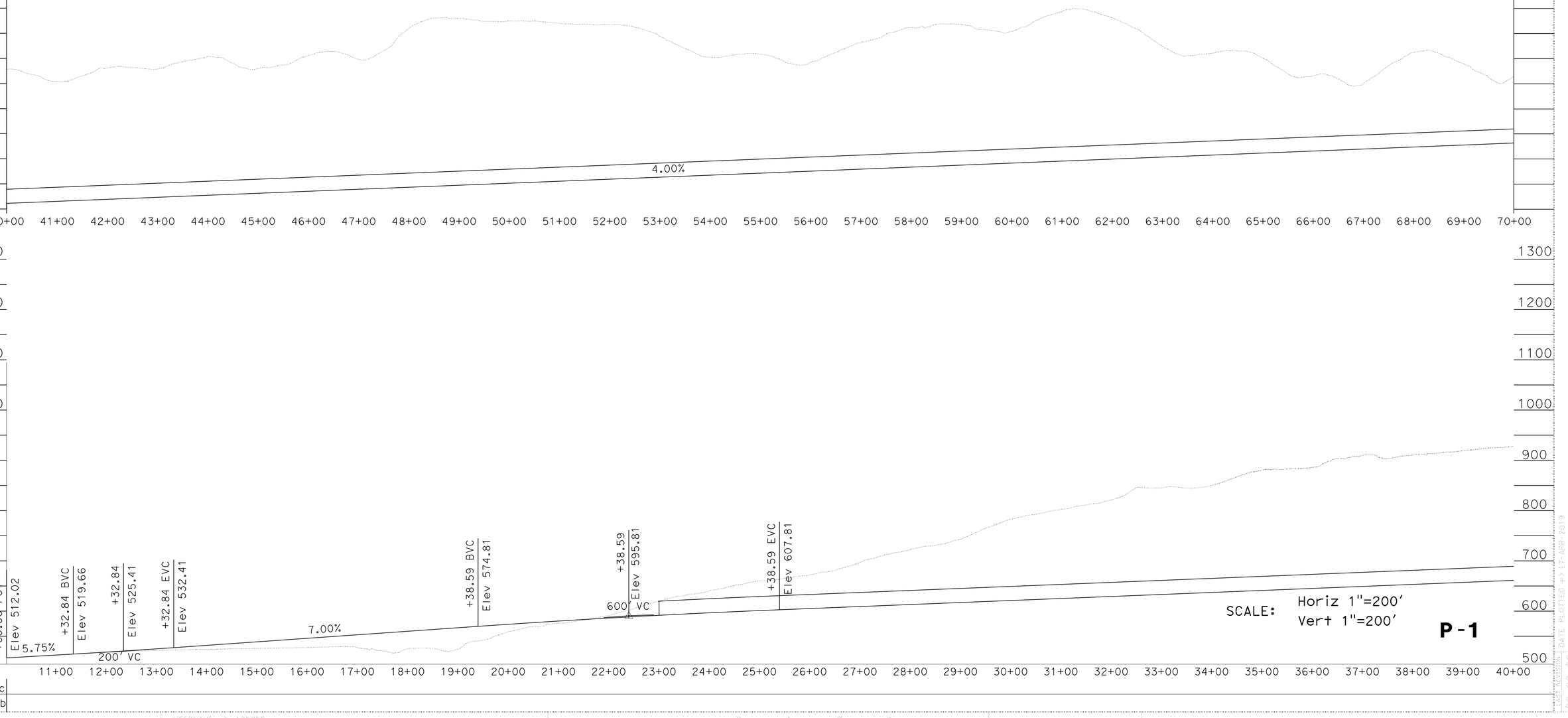

CALCULATED/ DESIGNED BY
DRAWN BY
CHECKED BY
REVISED BY
DATE REVISED
FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

DATE PLOTTED => 17-APR-2018
TIME PLOTTED => 00:00:00

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.
XX	XX	XX	XX	

REGISTERED CIVIL ENGINEER — DATE

PLANS APPROVAL DATE

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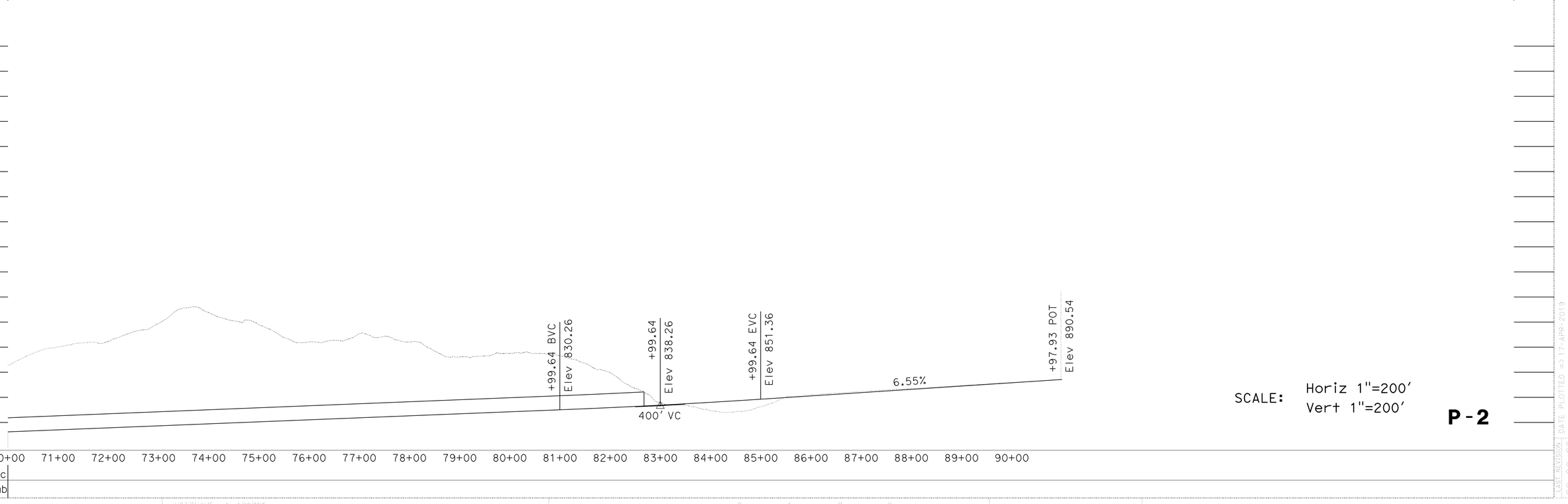

SCALE: Horiz 1"=200'
Vert 1"=200'

P-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
FUNCTIONAL SUPERVISOR
CALCULATED/DESIGNED BY
CHECKED BY
REVISED BY
DATE REVISED

BORDER LAST REVISED 7/2/2010
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DGN FILE => F_alignment_profile.dgn
RELATIVE BORDER SCALE IS IN INCHES
UNIT 0000
PROJECT NUMBER & PHASE 000000000001

DATE PLOTTED => 17-APR-2018
TIME PLOTTED => 10:00:00

ATTACHMENT C

ALTERNATIVE

DESCRIPTION TABLE

Alternative Comparison Table

Alternative	New Construction										Capital Cost (millions)	Existing Habitat Type		Notes/ Assumptions
	Construct. Length (miles)	Structures			Length in Parks (miles)	Construct. Footprint (acres)	Construct. Schedule (years)	Cut (cubic yards)	Fill (cubic yards)	Excess Material (cubic yards)		Type	Acres	
		Walls	Tunnel	Bridges										
A1	3.4	Unk	1	1	1.0	77	4	3,359,780	3,731,250	-371,500	$672	Coastal scrub/grassland/spruce	7	Slopes: Cut 1:1, Fill 2:1
												Riparian	1	Cut/Fill quantities contingent on use of
												Clear Cut	13	potential structures instead of
												Young Redwood Forest	54	embankment fill in some areas
												Mature Redwood Forest	0	
												Old-growth Redwood Forest	1	
A2	3.5	Unk	0	2	0.9	80	3	4,990,000	3,800,000	1,190,000	$300	Coastal scrub/grassland/spruce	7	Slopes: Cut 1:1, Fill 2:1
												Riparian	1	Cut/Fill quantities contingent on use of
												Clear Cut	13	potential structures instead of
												Young Redwood Forest	56	embankment fill in some areas
												Mature Redwood Forest	0	
												Old-growth Redwood Forest	3	
G1	3.0	Unk	1	1	1.7	53	4	1,900,000	360,000	1,540,000	$672	Coastal scrub/grassland/spruce	21	Slopes: Cut 1.5:1 and 1:1, Fill 2:1
												Riparian	1	7% sustained grade w/ additional climbing
												Clear Cut	2	lane for 1.5 miles.
												Young Redwood Forest	27	Same as A1 alignment for 2nd half
												Mature Redwood Forest	3	
												Old-growth Redwood Forest	1	
G2	3.1	Unk	0	2	0.9	56	3	1,500,000	300,000	1,200,000	$295	Coastal scrub/grassland/spruce	22	Slopes: Cut 1.5:1 and 1:1, Fill 2:1
												Riparian	1	7% sustained grade w/ additional climbing
												Clear Cut	3	lane for 1.5 miles.
												Young Redwood Forest	28	Same as A2 alignment for 2nd half
												Mature Forest	3	
												Old-growth Redwood Forest	3	
L	2.2	1	0	0	2.2	47	3.5	2,084,100	129,100	1,955,000	$300	Coastal scrub/grassland/spruce	28	Slopes: Cut 1.5:1 and 1:1, Fill 2:1
												Riparian	0	7% sustained grade
												Clear Cut	0	Additional climbing lane for 1.6 miles
												Young Redwood Forest	0	High potential for additional retaining
												Mature Forest	18	walls.
												Old-growth Redwood Forest	1	
F	1.5	2	1	0	_	5	7	2,500,000	Negligible	2,250,000	$1100-$2000	Coastal scrub/grassland/spruce	2	Continued Operation costs not included
												Riparian	0	Double bore possibly required (See tunnel
												Clear Cut	0	considerations sheet)
												Young Redwood Forest	0	Double bore would greatly increase
												Mature Redwood Forest	1	footprint at northern portal
												Old-growth Redwood Forest	1	
X	1.1	15	0	0	1.1	20	3.5	575,000	Negligible	570,000	$295	Coastal scrub/grassland/spruce	10	Slopes: Cut 1:1, Fill 2:1
												Riparian	0	Road Geometrics not to full standard
												Clear Cut	0	Assumes 12 existing walls will be
												Young Redwood Forest	0	reconstructed. Potentially 3+ additional
												Mature Forest	10	uphill walls
												Old-growth Redwood Forest	0	

ATTACHMENT D

RISK REGISTER

Risk Register for 01-0F280, Last Chance Grade

Risk Checkpoint:	Post PSR, Before Full Funding
Date:	9/21/2018
Project Nickname:	Last Chance Grade
EA:	01-0F280
Co-Rt, Post Miles:	DN-101, 12.5/15.5
Project Manager:	Jaime Matteoli
FY & Program (SHOPP or STIP):	2018 (SHOPP)
Total Costs (Capital & Support):	$500,000k
RTL Target:	9/2/2030

Phase	Cost Contingency F	
	Optimistic	PERT
0-PA&ED	$3,420	$7,112
1-PS&E	$600	$2,558
2-RW Sup	$0	$0
3-Con Sup	$0	$0
Support Contingency	$4,020	$9,671
9-RW Cap	$0	$0
4-Con Cap	$600	$28,100
Capital Contingency	$600	$28,100
Total Contingency	$4,620	$37,771

Risk Identification								Risk Assessment			Risk Response			
Status	ID #	Type	Category	Title	Risk Statement	Current status / assumptions	Risk Trigger	Probability (P)	Cost Impact Schedule Impact (I)	Cost Score Schedule Score (PxI)	Strategy	Response Actions	Risk Owner	Updated
Active	10	Threat	Geotechnical	**Geotechnical Discoveries Alter Scope**	Because of the complexity and magnitude of the geologic instability, both at the current highway location and surrounding the new proposed alternatives, the geotechnical investigations could lead to discoveries that fundamentally alter project scope: project alternatives could be eliminated, increased in scope, or new possible alternatives could come to light. These project changes would result in major cost increases and major delays to perform rework or to extend studies and preliminary engineering.	Geotechnical Investigations are being performed in stages and will be performed throughout the first few years of the environmental phase. All of the project alternatives are located in areas of active or historic landslides. The Geotechnical team will not be certain that project alternatives meet the purpose and need of the project until these investigations have been completed.	Geotechnical Reports	4-High (51-70%) 60%	16 - Very High (>$1600k) 16 - Very High (>6 months)	64 64	Mitigate	Caltrans is working closely with our partners to facilitate the environmental process for the geotechnical drilling and to reduce risk of delays to this process. The public engagement and partnership efforts will mitigate this risk.	Jaime Matteoli, PM	9/21/2018
Active	10	Threat						4-High (51-70%) 60%	16 - Very High (>$1600k) 16 - Very High (>6 months)	64 64				
Active	20	Threat	Funding	**Funding Uncertainties**	This project costs are well above what is typical for the SHOPP Perrmanant Restoration Program. Achieving full funding for each phase will be a challenge and may require special action on the part of the State or Federal governments. If funding is delayed and project funds are depleted, project development would be delayed. Stops and starts would require rework and other inefficiencies.	The project will be funded by phase. Currently there is partial funding of $10M programmed for 0 phase. It is anticipated that there is an above 50% chance that 0 phase would be fully funded in 2019 if the current funding environment does not change.	Change in Federal or State Funding Environement	3-Moderate (31-50%) 40%	8 - High ($800k - $1600k) 16 - Very High (>6 months)	24 48	Mitigate	Caltrans will work closely with funding partners and elected officials to manage funding needs and communicate needs and risks to the CTC and public at large.	Jaime Matteoli, PM	9/21/2018
Active	30	Threat	Environmental	**Tribal Coordination**	Because of the unique project location within State and National Park Boundaries and within tribal boundaries or ancestral territories of four federally-recognized tribes, if a proper, respectfull, and open relationship is not maintained with tribal governments, the project would be delayed and support costs would increase.	Caltrans cultural team is facilitating a cultural resouce working group with tribal governments and State and National Parks that is proactively working toward a Programmatic Agreement on this project.	Continuous	1-Very Low (1-10%)	2 - Low (<$400k) 16 - Very High (>6	2 16	Mitigate	Caltrans will continue positive engagement with tribal governments before and after any Programatic Agreement is signed.	Tim Keefe, Archealogist	9/21/2018

Risk Identification								Risk Assessment			Risk Response			
Status	**ID #**	**Type**	**Category**	**Title**	**Risk Statement**	**Current status / assumptions**	**Risk Trigger**	**Probability (P)**	**Cost Impact Schedule Impact (I)**	**Cost Score Schedule Score (PxI)**	**Strategy**	**Response Actions**	**Risk Owner**	**Updated**
								5%	months)					
Active	40	Threat	Environmental	**Unique Environmental Issues**	The project is in a uniquely senstive location and the potential impacts are uniquely severe. An estimated 13 agencies will have influence on the project environmental document or permits and a number of interest groups, some with opposing objectives, will be engaged in groundtruthing all documents and public records. If inadequacies are discovered in project documents, agency coordination, or public engagement, major project delays and cost increases could result.	Currently, the history or agency coordination and public engagement has been postitive. However, there is a high likelyhood that some difficulties emerge during the environmental process that affect project cost and schedule.	Environmental Milestones	4-High (51-70%) 60%	16 - Very High (>$1600k) 16 - Very High (>6 months)	64 64	Mitigate	Caltrans will continue to provide open, transparent, and accountable public engagement and agency coordination in support of this project. Caltrans will pursue all resources available to increase awareness and skill in these critical activities by (1) utilizing the statewide public engagement contract and (2) procuring engagement services via on-call or project specific contracts. Caltrans will continue to maintain a project website to a high standard to provide timely updates and receive public feedback and questions.	Jaime Matteoli, PM	9/21/2018
Active	50	Threat	Environmental	**Litigation**	Caltrans projects with much smaller environmental impacts are currently delayed because of lawsuits by local NGOs. If NGOs file lawsuits on this project, major delays and cost increases would occur.	Some NGOs may file a lawsuit if any cutting of old growth redwoods or significant damage to old growth redwoods is proprosed in the preferred alternatives.	Environmental Milestones	2-Low (11-30%) 20%	16 - Very High (>$1600k) 16 - Very High (>6 months)	32 32	Mitigate	The PDT will continue to engage the stakeholders and partners with a high level of openness, transparency, and accountability. Maintaining stakeholder/partner support and understanding their needs is paramount to minimizing this risk of litigation.	Jaime Matteoli, PM	9/25/2018
Active	60	Threat	Geotechnical	**Geotechnical Investigation Delays**	Understanding the underlying geoligic conditions is critical to validateding and refining the project alternatives. If environmental clearance of this work is delayed, any geologic discoveries would occur later in the process and the delays to schedule would be compounded.	Caltrans plans to perform geotechnical investigations in phases. Drilling will occur in 2018, 2019, and 2020.	Geotechnical Permit Applications	3-Moderate (31-50%) 40%	4 - Moderate ($400k - $799.2k) 8 - High (3-6 months)	12 24	Mitigate	Caltrans is working closely with our partners to facilitate the environmental process for the geotechnical drilling and to reduce risk of delays to this process. The public engagement and partnership efforts will mitigate this risk.	Jaime Matteoli, PM	9/28/2018
Active	80	Threat	Environmental	**Mitigation Uncertainty**	Because the mitigation estimates are highly uncertain and the potential environmental impacts are significant, there could be new discoveries about mitigation requirements that greatly increase cost and schedule.	The current mitigation cost estimates are preliminary and based on historic percentages. More information and coordination is needed to develop accurate mitigation cost estimates.	Cost Estimate Updates	3-Moderate (31-50%) 40%	16 - Very High (>$1600k) 16 - Very High (>6 months)	48 48	Mitigate	The PDT will continue to engage the stakeholders and partners to seek out off-system partner oppurtunities and on-system improvements.	Jaime Matteoli, PM	9/28/2018

Risk Identification								Risk Assessment			Risk Response			
Status	ID #	Type	Category	Title	Risk Statement	Current status / assumptions	Risk Trigger	Probability (P)	Cost Impact Schedule Impact (I)	Cost Score Schedule Score (PxI)	Strategy	Response Actions	Risk Owner	Updated
Active	90	Threat	Environmental	**Remove C Alternatives**	As a result of removing the C Alternatives from further environmental study, we run the risk that we may need to add them back into consideration at a futher date. This would lead to considerable delay in PAED and additional costs to the project.	The current information suggests that the C Alternatives do not add benefits over other alternatives that are currently under consideration.	Geologic Reviews of other alternatives	1-Very Low (1-10%)	8 - High ($800k - $1600k)	8	Accept	The PDT will continue to review the other alternatives, and if necessary add the C Alternatives back into consideration. The sooner this happens (if necessary) the lower the impact to schedule.	Jason Meyer, Environmental	11/30/2018
									16 - Very High (>6 months)	16				
								5%						

APPENDIX A6 Phase 1 Boring Records

Borings were originally logged by Caltrans (see Appendix A2) and have been updated for consistency with Phase 2B geologic terminology.

GROUP SYMBOLS AND NAMES

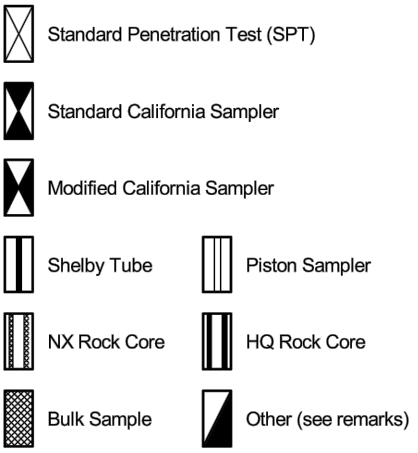
Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or 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

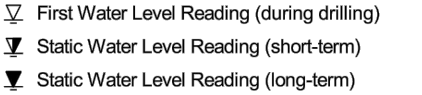
C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS



DRILLING METHOD SYMBOLS

WATER LEVEL SYMBOLS



LAST CHANCE GRADE PERMANENT RESTORATION PROJECT

PRELIMINARY GEOTECHNICAL DATA REPORT
APRIL 2022

BORING RECORD LEGEND

APPENDIX A6 - PHASE 1 BORING RECORDS

PLATE
A6-1

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} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

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.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

ROCK GRAPHIC SYMBOLS

IGNEOUS ROCK

SEDIMENTARY ROCK

METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8 inches to 1 ft
Thinly bedded	1-1/4 to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

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".

RELATIVE STRENGTH OF INTACT ROCK

Descriptor	Uniaxial Compressive Strength (psi)
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

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 1/6 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 hand pressure

CORE RECOVERY CALCULATION (%)

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

RQD CALCULATION (%)

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

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft
Slightly Fractured	Lengths from 1 to 3 ft, few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft, with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
L.W.P.	7-10-18	7-10-18	2478814.161 ft / 5985729.007 ft NAD83	RC-18-001
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services				345.05 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			B-80 Mobile Drill	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")			Auto; 140 lbs / 30-inch drop	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
1.75 in. Standpipe Piezometer			13.7 ft	16.6 ft on 8-28-18	85.25 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description: Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		GRAVELLY SILT (ML); stiff; very dark brown; moist; mostly low plasticity fines; little fine to coarse GRAVEL; trace coarse SAND (FILL) 2.0 feet: becomes soft									
340	5		SILTY SAND with GRAVEL (SM); loose; yellowish brown; moist; mostly fine to ccorse SAND; some low plasticity fines; little fine to coarse GRAVEL (COLLUVIUM/ LANDSLIDE DEPOSIT)		S01	2 2 2	4					
335	10		SEDIMENTARY ROCK (SANDSTONE); fine-grained; very thickly bedded; very dark gray; fresh; moderately hard; slightly fractured (LANDSLIDE DEPOSIT) 10.5 feet: equip HQ core		S02	70		54	21			
330	15		SEDIMENTARY ROCK (ARGILLITE); fine-grained; massive; black; decomposed to GRAVELLY lean CLAY (CL); mostly medium plasticity fines; little fine to coarse GRAVEL; trace fine to coarse SAND (LANDSLIDE DEPOSIT) 15.0 feet: equip punch core		S03	1 2 2	4					
325	20				S04	6 5 7	12					
	25											

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				RC-18-001
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	Del Norte	101	12-15.5	0115000099
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		2-3-22	1 of 4

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (ARGILLITE)*(continued)*		S05	11 15 18	33					
315	30				S06	5 7 8	15					
310	35		SEDIMENTARY ROCK (ARGILLITE); massive; black; decomposed to SILTY GRAVEL with SAND (GM); mostly fine to coarse GRAVEL; some medium to coarse SAND; little low plasticity fines (LANDSLIDE DEPOSIT)		S07	20 27 18	45					
305	40		SEDIMENTARY ROCK (ARGILLITE); massive; black; intensely weathered; soft; very intensely fractured; pervasively sheared ARGILLITE; SANDSTONE clasts (LANDSLIDE DEPOSIT)		S08	19 21 27	48					
300	45				S09	12 24 36	60					
295	50				S10	16 20 22	42					
	55		SEDIMENTARY ROCK (ARGILLITE); massive; black; decomposed to SILTY GRAVEL with SAND (GM); mostly fine to coarse GRAVEL; some medium to coarse SAND; little low plasticity fines (LANDSLIDE DEPOSIT)									

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-001**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE)*(continued)*		S11	11 15 17	32					
285	60				S12	14 12 12	24					
			SEDIMENTARY ROCK (ARGILLITE); massive; black; intensely weathered; soft; very intensely fractured; pervasively sheared ARGILLITE; SANDSTONE clasts (LANDSLIDE DEPOSIT)									
280	65				S13	11 17 20	37					
			SEDIMENTARY ROCK (ARGILLITE); massive; black; intensely weathered; very intensely fractured; pervasively sheared ARGILLITE; boulder sized SANDSTONE clasts									
275	70		SEDIMENTARY ROCK (ARGILLITE); massive; black; decomposed to (SILTY GRAVEL with SAND (GM); mostly fine to coarse GRAVEL; some medium to coarse SAND; little low plasticity fines)		S14	14 22 31	53					
270	75				S15	14 22 24	46					
265	80				S16	20 50/5"	50/5					
			SEDIMENTARY ROCK (ARGILLITE); massive; black; intensely weathered; very intensely fractured; pervasively sheared ARGILLITE; slickensided; SANDSTONE clasts									
	85											

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-001**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		Bottom of borehole at 85.25 ft bgs		S17	50/3"	REF						
255	90												
250	95												
245	100												
240	105												
235	110												
	115												

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-001**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
L. Winker	7-18-18	7-26-18	2485548.148 ft / 5987064.765 ft NAD83	RC-18-003
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services				988.78 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			B-80 Mobile Drill	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			Auto; 140 lbs / 30-inch drop	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
1.75 in. Standpipe Piezometer			14.0 ft	6.0 ft on 7-26-18	100.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		CLAYEY GRAVEL with SAND (GC); medium dense; yellowish brown; dry; mostly fine GRAVEL; some medium plasticity fines; little coarse SAND (FILL)									
			GRAVELLY lean CLAY (CL); stiff; yellowish brown; dry; mostly low plasticity fines; little fine GRAVEL; few SAND (COLLUVIUM)									
985												
	5		5.5 feet: mottled		S01	2 10 13	23					
980												
	10		SEDIMENTARY ROCK (ARGILLITE); massive; black; decomposed; SILT with GRAVEL (ML); stiff; moist; mostly low plasticity fines; little fine to coarse GRAVEL; few coarse SAND		S02	5 6 9	15					
975												
	15		17.0 feet: very stiff		S03	7 14 14	28	0				
970			SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; yellowish brown; intensely weathered; soft; very intensely fractured									
	20				S04	12 50/3.5"	50/4					
965												
	25		Dark gray; fresh; moderately hard; intensely to very intensely fractured; scattered quartz veining									

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				RC-18-003
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	Del Norte	101	12-15.5	0115000099
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		2-3-22	1 of 4

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (SANDSTONE), *(continued)* 25.1 feet: equip HQ core		S05	50/2"	REF	80	0				
960													
	30							63	7				
955													
	35							60	0				
			SEDIMENTARY ROCK (ARGILLITE); massive; black; fresh; very soft to moderately soft; very intensely fractured										
950													
	40		SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark gray; fresh; moderately hard; intensely to very intensely fractured; scattered quartz veining					37	0				
945													
	45		SEDIMENTARY ROCK (ARGILLITE); massive; black; fresh; moderately soft; intensely to very intensely fractured					31	0				
940								42	0				
	50		Moderately hard					42	0				
935													
	55												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-003**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark gray; fresh; moderately hard; intensely fractured; scattered quartz veining					73	27				
								100	0				
930			SEDIMENTARY ROCK (ARGILLITE); massive; black; fresh; moderately hard; intensely to very intensely fractured										
	60							97	0				
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark gray; fresh; moderately hard; moderately to intensely fractured; scattered quartz veining					100	27				
925													
	65		SEDIMENTARY ROCK (ARGILLITE); massive; black; fresh; moderately hard; intensely fractured; general shear fabric: dips 20°					93	0				
								33	0				
920													
	70							33	17				
								13	0				
915													
	75							0	0				
910													
	80							27	0				
								47	0				
905													
	85												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-003**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (SANDSTONE); medium-grained; very thickly bedded; dark bluish gray; fresh; hard; intensely fractured; local ARGILLITE interbeds					40	0				
								67	23				
900			SEDIMENTARY ROCK (ARGILLITE); very thickly bedded; black; fresh; moderately hard; very intensely fractured; general shear fabric: dips 10°; SANDSTONE clasts										
	90							80	0				
								10	0				
895													
	95							67	0				
			96.0 feet: very thickly bedded; intensely weathered; pervasively sheared; trace SAND; trace coarse GRAVEL; trace SANDSTONE clasts (FRANCISCAN COMPLEX)										
								100	0				
890													
	100		Bottom of borehole at 100.0 ft bgs										
885													
	105												
880													
	110												
875													
	115												

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-003**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
E. Wilson	7-25-18	7-25-18	2487047.846 ft / 5986721.643 ft NAD83	RC-18-004
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services				908.40 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			B-80 Mobile Drill	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			Auto; 140 lbs / 30-inch drop	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
1.75 in. Standpipe Piezometer			15.0 ft	44.6 ft on 10-21-18	100.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description: Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		SANDY SILT with GRAVEL (ML); very stiff; dark yellowish brown; moist; mostly low plasticity fines; some fine SAND; little fine to coarse GRAVEL up to 2 inches;(SANDSTONE fragments); (FILL)		B01							
905			SANDY lean CLAY with GRAVEL (CL); stiff; dark yellowish brown with pale olive mottling; moist; mostly medium plasticity fines; little SAND grading from fine to coarse; little fine to coarse GRAVEL (SANDSTONE fragments); (COLLUVIUM)					17				
	5				S02	5 2 5	7	78				
								57				
900			CLAYEY GRAVEL with SAND (GC); medium dense; dark grayish brown; mostly fine to coarse GRAVEL (ARGILLITE fragments); some coarse SAND; little low plasticity fines; (RESIDUAL SOIL)									
	10				S03	7 7 8	15	44				
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; light yellowish brown; intensely weathered; moderately soft; intensely fractured					100	0			
895												
	15		SEDIMENTARY ROCK (ARGILLITE); massive; light olive brown; intensely weathered; soft; very intensely fractured		S04	11 12 15	27	89				
								71	0			
890			18.0 to 19.0 feet: decomposed to (SANDY lean CLAY (CL); very stiff) Dark bluish gray									
	20				S05	14 10 11	21	61				
								38	0			
885												
	25											

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				RC-18-004
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	Del Norte	101	12-15.5	0115000099
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		2-3-22	1 of 4

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (ARGILLITE)*(continued)*		S06	9 13 19	32	83					
880								55	0				
	30				S07	8 14 20	34	33					
875			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; decomposed to (SANDY lean CLAY with Gravel (CL); very stiff; moist; mostly medium plasticity fines; some SAND grading from fine to coarse; little fine GRAVEL (ARGILLITE fragments))					52	0				
	35		35.0 feet: massive; intensely weathered; soft; very intensely fractured		S08	18 45 46	91	83					
870								29	0				
	40				S09	16 25 28	53	50					
865			SEDIMENTARY ROCK (ARGILLITE); massive; very dark gray; intensely weathered; soft; very intensely fractured; pervasively sheared; SANDSTONE clasts					48	0				
	45				S10	18 34 36	70	78					
860			48 to 50.5 feet: SANDSTONE clast					21					
	50		50.0 feet: equip HQ core					100	0				
855								80	0				
	55												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-004**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE)*(continued)* SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark gray; moderately weathered; moderately hard; intensely fractured; calcite veining up to 0.1" thick					70	0				
850													
	60		SEDIMENTARY ROCK (ARGILLITE); massive; very dark gray; intensely weathered; soft; very intensely fractured; pervasively sheared; SANDSTONE clasts					70	0				
845													
	65		SEDIMENTARY ROCK (SANDSTONE); fine-grained; very thickly bedded; slightly weathered; hard; intensely fractured					90	0				
840													
			SEDIMENTARY ROCK (ARGILLITE); massive; very dark gray; intensely weathered; soft; very intensely fractured; pervasively sheared; SANDSTONE clasts										
	70							27	0				
835													
	75		SEDIMENTARY ROCK (SANDSTONE); fine-grained; very thickly bedded; dark gray; slightly weathered; hard; intensely fractured					60	23.3				
830								80	0				
	80		79.9 to 80.5 feet: ARGILLITE interbed					13	0				
825								23	0				
	85												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-004**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (SANDSTONE), *(continued)*					80	0				
820								80	0				
	90		SEDIMENTARY ROCK (ARGILLITE); thickly bedded; black; slightly weathered; moderately hard; very intensely fractured					78	0				
815			SEDIMENTARY ROCK (SANDSTONE); fine-grained; thickly bedded; dark gray; slightly weathered; intensely fractured; layers/seams of sheared ARGILLITE up to 6" thick					100	0				
	95							73	0				
810			SEDIMENTARY ROCK (ARGILLITE); thickly bedded; dark gray; decomposed to (GRAVELLY lean CLAY (CL); very stiff; mostly low plasticity fines; some fine to coarse GRAVEL up to 3"; few COBBLE and BOULDERS)					33	0				
	100		Bottom of borehole at 100.0 ft bgs										
805													
	105												
800													
	110												
795													
	115												

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-004**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
E. Wilson	**8-1-18**	**8-1-18**	**2484939.341 ft / 5986714.499 ft NAD83**	**RC-18-005**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services				**883.60 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			**B-80 Mobile Drill**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			**Auto; 140 lbs / 30-inch drop**	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Inclinometer; cement bentonite grout			**13.0 ft** / **7.0 ft on 8-7-18**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		GRAVELLY lean CLAY with SAND (CL); soft; variegated brownish yellow and dark yellowish brown; moist; mostly low plasticity fines; little fine to coarse GRAVEL; little SAND grading from fine to coarse; trace wood fragments;(FILL)					25				
880												
	5				S01	2 2 2	4	28				
								43				
875												
	10		SANDY lean CLAY with GRAVEL (CL); medium stiff; mottled gray and olive gray; moist; mostly medium plasticity fines; little fine to coarse GRAVEL; little SAND grading from fine to coarse; trace roots; (COLLUVIUM)		S02	2 2 3	5	11				
								57				
870												
	15		Lean CLAY (CL); hard; light olive brown with olive yellow mottling; dry; mostly medium plasticity fines; trace GRAVEL consisting of decomposed ARGILLITE fragments; weak rock structure; (RESIDUAL SOIL)		S03	22 30 27	57	50				
								45				
865												
	20				S04	3 4 9	13	28				
			CLAYEY GRAVEL with SAND (GC); medium dense; dark gray; moist; mostly fine to coarse GRAVEL up to 3" consisting of angular, fresh SANDSTONE; little medium to coarse SAND; little medium plasticity fines; (RESIDUAL SOIL)					0				
860												
	25											

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**1 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		(CLAYEY GRAVEL with SAND) *(continued*		S05	9 9 14	23	6					
								0	0				
855			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; intensely weathered; soft; very intensely fractured; pervasively sheared; SANDSTONE clasts										
	30				S06	14 17 25	42	72					
								0	0				
850													
	35				S07	58 33 22	55	50					
								26	0				
845													
	40				S08	17 26 26	52	61					
								57	0				
840													
	45				S09	99 26 28	54	83					
								71					
835													
	50		SEDIMENTARY ROCK (ARGILLITE); massive; very dark gray; intensely weathered; soft; very intensely fractured; pervasively sheared ARGILLITE and SANDSTONE clasts		S10	43 19 44	63	56					
								74	0				
830													
	55												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE), *(continued)*					100	0				
825													
	60							82	0				
820													
	65							72	0				
815													
	70							72	0				
810													
	75							60	0				
								83	0				
805													
	80							45	0				
800													
	85												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (ARGILLITE), *(continued)*					0	0				
795								0	0				
	90							77	0				
790								97	0				
	95							100	0				
785			SEDIMENTARY ROCK (ARGILLITE); fine-grained; massive; very dark gray; decomposed to (CLAYEY SAND with GRAVEL (SC); very stiff; moist; mostly SAND grading from fine to coarse; some fine to coarse GRAVEL; little low plasticity fines)					93	0				
	100		Bottom of borehole at 100.0 ft bgs										
780													
	105												
775													
	110												
770													
	115												

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE **BORING RECORD**				HOLE ID **RC-18-005**
DIST. **01**	COUNTY **Del Norte**	ROUTE **101**	POSTMILE **12-15.5**	EA **0115000099**
PROJECT OR BRIDGE NAME **Last Chance Grade Bypass**				
BRIDGE NUMBER	PREPARED BY **D. Ross**		DATE **2-3-22**	SHEET **4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
L. Winker-Prims	8-14-18	8-14-18	2483971.008 ft / 5986322.437 ft NAD83	RC-18-007
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services				777.56 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			B-80 Mobile Drill	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			Auto; 140 lbs / 30-inch drop	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Inclinometer; cement bentonite grout			7.0 ft / 11.0 ft on 8-15-18	100.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		GRAVELLY lean CLAY (CL); yellowish brown; moist; mostly low plasticity fines; some fine to coarse GRAVEL; few medium to coarse SAND (FILL)									
775			Lean CLAY (CL); soft; yellowish brown with reddish brown mottling; moist; mostly medium plasticity fines; trace coarse SAND (FILL)									
	5		4.5 feet: trace fine roots and wood fragments		S01	2 1 2	3					
770												
	10		9.5 feet: trace wood fragments Lean CLAY (CL); very soft; gray; moist; mostly medium plasticity fines; few coarse angular GRAVEL (COLLUVIUM)		S02	0 0 1	1				
765			Lean CLAY with SAND (CL); stiff; light brownish gray; moist; mostly medium plasticity fines; little medium to coarse SAND; few fine to coarse GRAVEL (COLLUVIUM)									
	15				S03	1 6 9	15					
760			16.5 feet: no circulation return Lean CLAY (CL); stiff; light brownish gray; moist; mostly medium plasticity fines; trace coarse SAND (COLLUVIUM/RESIDUAL SOIL)									
	20		SEDIMENTARY ROCK (ARGILLITE); massive; very dark gray; decomposed to Lean CLAY With SAND (CL); stiff; moist; mostly medium plasticity fines; little medium to coarse SAND; few fine to coarse GRAVEL		S04	8 9 27	36					
755												
	25											

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				RC-18-007
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	Del Norte	101	12-15.5	0115000099
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		2-3-22	1 of 4

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (ARGILLITE)*(continued)*		S05	10 10 8	18						
750													
	30				S06	50/2.5"	REF						
745													
	35				S07	22 19 16	35						
740													
	40				S08	11 11 29	40						
735			44.0 to 45.0 feet: rig chatter										
	45		SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; intensely weathered; soft; very intensely fractured; pervasively sheared; SANDSTONE clasts 45.1 feet: equip HQ core		S09	50/2"	REF	17	0				
730													
	50							58	0				
725								33	13				
	55												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-007**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE); massive; very dark gray; decomposed to (SANDY lean CLAY (CL); moist; mostly medium plasticity fines; some coarse SAND; trace fine to coarse GRAVEL)					50	0				
720													
	60							33	0				
715								47	0				
	65		SEDIMENTARY ROCK (ARGILLITE); very thickly bedded; black; fresh; hard; intensely fractured; few fine SILTSTONE and quartzite GRAVEL clasts; trace quartz veining up to 0.5" thick					95	0				
710													
	70		SEDIMENTARY ROCK (ARGILLITE); very thickly bedded; dark gray; decomposed to (SANDY lean CLAY (CL); mostly low plasticity fines; some coarse SAND)					18	0				
705			SEDIMENTARY ROCK (ARGILLITE); very thickly bedded; black; fresh; hard; intensely fractured; trace quartz and calcite veining up to 0.25" thick; limestone lenses										
	75							83	0				
700								67	13				
	80							100	0				
695								90	0				
	85												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-007**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (ARGILLITE); very thickly bedded; dark gray; decomposed to (GRAVELLY lean CLAY With SAND (CL); mostly low plasticity fines; some fine to coarse GRAVEL up to 3"; little SAND grading from fine to coarse)					37	0				
690								53	0				
	90							77	0				
685								100	0				
	95		SEDIMENTARY ROCK (ARGILLITE); massive; black; fresh; hard; intensely fractured					70	0				
680								33	0				
	100		Bottom of borehole at 100.0 ft bgs										
675													
	105												
670													
	110												
665													
	115												

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-007**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
E. Wilson	8-28-18	8-28-18	2483490.640 ft / 5986606.048 ft NAD83	RC-18-009
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services				704.02 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			B-80 Mobile Drill	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			Auto; 140 lbs / 30-inch drop	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Inclinometer; cement bentonite grout			Not Determined	101.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description: Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		SILTY GRAVEL with SAND (GM); dark brownish gray; moist; mostly fine to coarse GRAVEL up to 3"; little SAND grading from fine to coarse; little low plasticity fines (FILL)		G01							
			CLAYEY GRAVEL (GC); variegated brownish yellow and dark yellowish brown; moist; mostly fine to coarse GRAVEL up to 3"; some medium plasticity fines (FILL)		G02							
700												
	5		Lean CLAY with SAND (CL); very stiff; strong brown; moist; mostly low plasticity fines; few fine to coarse SAND (COLLUVIUM)		S03	1 6 8	14	78				
								17				
695												
	10				S04	9 10 11	21	0				
								88				
690												
	15		CLAYEY SAND with GRAVEL (SC); medium dense; light olive brown; moist; mostly coarse SAND; some fine GRAVEL consisting of intensely weathered ARGILLITE; little low plasticity fines; faint relic rock structure (RESIDUAL SOIL)		S05	4 4 6	10	100				
								55				
685												
	20				S06	4 3 3	6	56				
								24				
680												
	25											

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				RC-18-009
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	Del Norte	101	12-15.5	0115000099
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		2-3-22	1 of 4

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		CLAYEY SAND with GRAVEL (SC); medium dense; light olive brown; moist; mostly coarse SAND; some fine GRAVEL consisting of intensely weathered ARGILLITE; little low plasticity fines; weak rock structure (RESIDUAL SOIL)		S06	5 6 9	15	89					
								12	0				
			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; decomposed to (GRAVELLY lean CLAY (CL); very stiff; dark gray)										
675	30				S07	62 23 21	44	67					
								0	0				
670	35				S08	6 9 9	18	50					
								0	0				
665	40				S09	5 5 9	14	0					
								21	0				
660			43.0 to 45.0 feet: rig chatter										
	45				S10	20 9 11	20	11					
								0	0				
655	50				S11	7 11 14	25	67					
								14	0				
650	55												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-009**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE)*(continued)*		S12	5 5 10	15	44					
								33	0				
645													
	60				S13	11 13 20	33	56					
			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; intensely weathered; moderately soft; very intensely fractured; pervasively sheared; SANDSTONE clasts to 3"					29	0				
640													
	65				S14	10 21 47	68	94					
								0	0				
635													
	70				S15	13 25 41	66	67					
								0	0				
630													
	75		SEDIMENTARY ROCK (ARGILLITE); massive; decomposed to (CLAYEY GRAVEL with SAND (GC); very stiff; mostly fine to coarse GRAVEL up to 3"; some coarse SAND; little low plasticity fines)		S16	13 20 20	40	67					
								36	0				
625													
	80				S17			17					
								0	0				
			83.0 to 84.0 feet: rig chatter										
620													
	85		SEDIMENTARY ROCK (ARGILLITE); massive; dark gray;										

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-009**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
620	85		intensely weathered; moderately soft; very intensely fractured; pervasively sheared; SANDSTONE clasts to 12"		S18	27 52 64/2"	116/8	83					
								0	0				
615	90				S19	37 107/3"	107/3	50					
								0	0				
610	95				S20	109/4"	REF	75					
								0	0				
605	100				S21	23 27 43	70	78					
			Bottom of borehole at 101.5 ft bgs										
600	105												
595	110												
590	115												

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-009**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
E. Wilson	**9-18-18**	**9-18-18**	**2480799.138 ft / 5988376.845 ft NAD83**	**RC-18-011**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services				**554.66 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			**B-80 Mobile Drill**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			**Auto; 140 lbs / 30-inch drop**	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Inclinometer; cement bentonite grout			**8.0 ft**	**Not Encountered**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		CLAYEY GRAVEL with SAND (GC); dark yellowish brown; moist; mostly fine to coarse GRAVEL consisting of intensely weathered angular SANDSTONE and ARGILLITE rock fragments; some low plasticity fines; little SAND grading from fine to coarse; heterogenous texture (FILL)		G01						
			Lean CLAY with GRAVEL (CL); very soft; light yellowish brown; moist; mostly low plasticity fines; little fine GRAVEL; few medium to coarse SAND (COLLUVIUM)		G02						
550	5				S03	5 8 14	22	100				
								0				
545	10		SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; decomposed to (SANDY lean CLAY (CL); stiff; moist; mostly low plasticity fines; little coarse SAND)		S04	0 5 6	11	44				
								0				
540	15				S05	11 20 11	31	100				
								0				
535	20				S06	4 3 4	7	39				
			21.5 feet: very soft drilling					0				
530	25											

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-011**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**1 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (ARGILLITE)*(continued)* 25.5 feet: very soft drilling		S07	10 11 8	19	11					
								29	0				
			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; decomposed to (GRAVELLY lean CLAY (CL); stiff; moist; mostly low plasticity fines; some fine to coarse GRAVEL; few coarse SAND)										
525	30				S08	8 7 9	16	0					
								71	0				
520	35				S09	5 6 9	15	0					
								40	0				
515	40				S10	10 15 17	32	22					
			41.5 feet: very soft drilling					57	0				
510	45				S11	5 11 14	25	72					
			46.5 feet: soft drilling					21	0				
505	50				S12	10 21 25	46	67					
			51.5 feet: soft drilling					0	0				
500	55												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-011**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE)*(continued)* 55.0 feet: soft drilling		S13	6 17 14	31	89					
								0	0				
495	60				S14	65 50/1"	50/1	28					
			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; intensely weathered; very intensely fractured; pervasively sheared; SANDSTONE clasts to 3" 62.0 to 64.0 feet: rig chatter					0	0				
490	65				S15	19 17 23	40	100					
								0	0				
485	70				S16	16 20 28	48	0					
			SEDIMENTARY ROCK (ARGILLITE); massive; decomposed to (GRAVELLY lean CLAY (CL) with Sand; very stiff; mostly low plasticity fines; some fine to coarse GRAVEL up to 3"; little coarse SAND)					12	0				
480	75				S17	14 20 26	46	50					
								24	0				
475	80				S18	19 25 24	49	44					
								7	0				
470	85												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-011**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (ARGILLITE)*(continued)*		S19	16 15 27	42	67					
			87.0 to 89.0 feet: rig chatter					0	0				
465	90				S20	32 49 33	82	50					
								0	0				
460	95				S21	26 41 26	67	44					
								5	0				
455	100		Bottom of borehole at 100.0 ft bgs										
450	105												
445	110												
440	115												

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-011**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
E. Wilson	9-27-18	9-27-18	2479383.309 ft / 5988423.191 ft NAD83	RC-18-013
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans Drilling Services				618.81 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			B-80 Mobile Drill	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			Auto; 140 lbs / 30-inch drop	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Inclinometer; cement bentonite grout			Not Determined	Not Determined	100.0 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		SANDY SILT with GRAVEL (ML); grayish brown; moist; mostly low plasticity fines; some SAND grading from fine to coarse; little to few fine to coarse GRAVEL; (FILL)		G01							
					G02							
			SILT with SAND (ML); dark yellowish brown; moist; mostly low plasticity fines; little fine to coarse SAND; trace GRAVEL; (FILL)		G03							
615					G04							
	5		SILTY SAND (SM); medium dense; yellowish brown; moist; mostly fine SAND; some non-plastic fines; (COLLUVIUM)		S05	4 4 9	13					
610												
	10		Lean CLAY (CL); stiff; yellowish brown with very dark brown and light olive brown mottling and variegation; moist; mostly medium plasticity fines; few fine to coarse SAND; faint relic rock structure; (RESIDUAL SOIL)		S06	5 10 12	22					
605												
	15				S07	25 50/3"	50/3	0				
600												
	20				S08	18 41 50/3"	91/9					
595			CLAYEY SAND (SC); very dense; yellowish brown; moist; mostly fine SAND; little low plasticity fines; few fine GRAVEL; weak rock structure; (RESIDUAL SOIL)									
	25											

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				RC-18-013
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	Del Norte	101	12-15.5	0115000099
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		2-3-22	1 of 4

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		(CLAYEY SAND)*(continued)*		S09	7 28 50/.5"	78/						
590													
	30				S10	20 50/1"	50/1						
585													
	35				S11	50/5"	REF						
580													
	40				S12	50/3.5"	REF						
			SEDIMENTARY ROCK (SANDSTONE); medium-grained; massive; light yellowish brown with black oxide fracture coatings; intensely weathered; soft; intensely to very intensely fractured 40.3 feet: equip HQ core										
575													
	45		SEDIMENTARY ROCK (SANDSTONE); medium-grained; massive; light yellowish brown with black oxide fracture coatings; intensely weathered; soft; intensely to very intensely fractured					100	0				
570													
	50							57	0				
565													
	55		54.5 feet: moderately soft										

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE **BORING RECORD**				HOLE ID **RC-18-013**	
DIST. **01**	COUNTY **Del Norte**	ROUTE **101**	POSTMILE **12-15.5**	EA **0115000099**	
PROJECT OR BRIDGE NAME **Last Chance Grade Bypass**					
BRIDGE NUMBER	PREPARED BY **D. Ross**		DATE **2-3-22**	SHEET **2 of 4**	

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (SANDSTONE), *(continued)*					73	25				
560													
	60		SEDIMENTARY ROCK (SANDSTONE); medium-grained; massive; light yellowish brown with black oxide fracture coatings; moderately weathered; moderately soft; moderately to intensely fractured;					80	0				
555													
	65		65.0 feet: moderately hard					90	16.7				
550													
	70							88	0				
545													
	75							100	31.7				
540			SEDIMENTARY ROCK (SANDSTONE); medium-grained; massive; light yellowish brown with black oxide fracture coatings; moderately weathered; moderately hard; moderately to intensely fractured;										
	80							100	28				
535													
	85												

(continued)

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-013**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (SANDSTONE), *(continued)*					100	20				
530													
	90							100	0				
525													
	95							100	33				
520													
	100		Bottom of borehole at 100.0 ft bgs										
515													
	105												
510													
	110												
505													
	115												

Note: Boring originally logged by Caltrans personnel; boring record was subsequently modified by Kleinfelder to include project-specific geologic terminology consistent with the 2019-2021 boring records.

REPORT TITLE				HOLE ID
BORING RECORD				**RC-18-013**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-3-22**	**4 of 4**

APPENDIX A7 Phase 2A Boring Records

Borings were originally logged by Caltrans and have been updated for consistency with Phase 2B geologic terminology.

GROUP SYMBOLS AND NAMES

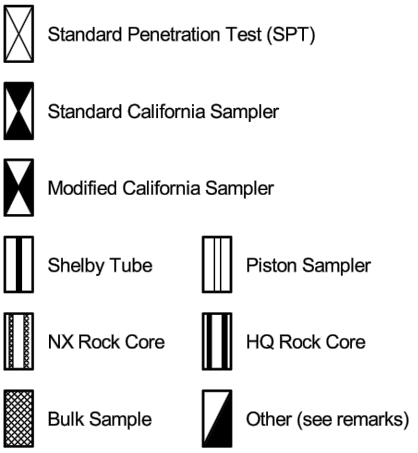
Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or 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

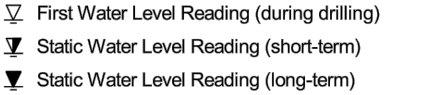
C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS



DRILLING METHOD SYMBOLS

WATER LEVEL SYMBOLS



LAST CHANCE GRADE PERMANENT RESTORATION PROJECT

PRELIMINARY GEOTECHNICAL DATA REPORT
APRIL 2022

BORING RECORD LEGEND

APPENDIX A7 - PHASE 2A BORING RECORDS

PLATE
A7-1

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} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

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.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

ROCK GRAPHIC SYMBOLS


IGNEOUS ROCK


SEDIMENTARY ROCK


METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8 inches to 1 ft
Thinly bedded	1-1/4 to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

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".

RELATIVE STRENGTH OF INTACT ROCK

Descriptor	Uniaxial Compressive Strength (psi)
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

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 1/6 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 hand pressure

CORE RECOVERY CALCULATION (%)

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

RQD CALCULATION (%)

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

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft
Slightly Fractured	Lengths from 1 to 3 ft, few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft, with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

LAST CHANCE GRADE PERMANENT RESTORATION PROJECT

PRELIMINARY GEOTECHNICAL DATA REPORT
APRIL 2022

BORING RECORD LEGEND

APPENDIX A7 - PHASE 2A BORING RECORDS

PLATE
A7-3

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Richmond	**8-19-19**	**8-22-19**	**2482261.577 ft / 5984418.516 ft NAD83**	**RC-19-001**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Gregg Drilling				**538.78 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger/Rotary Core			**CME-850**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/California (2.4")/HQ Core (2.5")			**Auto; 140 lbs / 30-inch drop**	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Inclinometer; cement bentonite grout			**12.0 ft**	**Not Encountered**	**98.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		ASPHALT CONCRETE; (12")										
			Poorly-graded GRAVEL with SILT and SAND (GP-GM); medium dense; brown and grayish brown; moist; mostly subangular to subrounded fine to coarse GRAVEL; some fine to coarse SAND; few SILTY fines (FILL)										
535													
	5		5.0 feet: brown to yellowish brown; few SILTY to CLAYEY fines		S01	41 13 13	26	83					
					S02	11 11 7	18	83					
530													
	10		10.5 feet: yellow orange brown; mostly subangular fine to coarse GRAVEL		S03	12 9 12	21	89					
					S04	4 10 41	51	77					
			13.0 feet: possible large clast										
525			Poorly-graded GRAVEL with SILT and SAND (GP-GM); medium dense; yellow orange brown; moist; mostly subangular fine to coarse GRAVEL; some fine to coarse SAND; few SILTY fines (FILL)										
	15				S05	5 5 13	18	89					
					S06	17 15 8	23	50					
520													
	20				S07	13 23 21	44	33					
					S08	9 10 9	19	66					
			Poorly-graded GRAVEL with SILT and SAND (GP-GM); medium dense; yellow orange brown; moist; mostly subangular fine to coarse GRAVEL; some fine to coarse SAND; few SILTY fines (FILL)										
515			22.0 feet: advance HWT casing to 22.0 feet; equip HQ core		C09			17	0				
	25		24.0 feet: circulation loss										

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-001**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-21-22**	**1 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		(POORLY GRADED GRAVEL with SAND AND SILT), *(continued)*		C09			17	0				
			Lean to Fat CLAY (CL-CH); very stiff; olive brown with orange mottling; mostly CLAY; trace fine to medium SAND (COLLUVIUM/LANDSLIDE DEPOSIT)		S10	5 5 7	12	83					
510					C11			NR					
	30												
			Lean CLAY (CL); stiff to very stiff; olive gray, yellowish brown, and brown; moist; mostly Lean CLAY; trace fine to coarse SAND (LANDSLIDE DEPOSIT), iron oxide mottling present (PP = 2.5 fsf)		S12	9 6 9	15	66					
			33.0 feet: circulation return										
505					C13			NR					
	35												
			37.0 feet: abundant subrounded rock fragments to 1"		S14	4 7 9	16	100					
			SEDIMENTARY ROCK (ARGILLITE); yellowish brown and orange brown; decomposed; pervasively sheared to:(SANDY lean CLAY (CL): very stiff, moist, mostly lean clay, some fine to coarse sand) (LANDSLIDE DEPOSIT)										
500					C15			5	0				
	40												
					S16	7 9 10	19	NR					
495					C17			8	0				
	45												
			47.0 feet: angular 2" SANDSTONE clast		S18	8 15 22	37	33					
			SEDIMENTARY ROCK (ARGILLITE); dark gray, with orange brown iron oxide weathering; decomposed; very soft to soft; pervasively sheared to: (SANDY lean CLAY (CL): very stiff; moist; mostly lean clay; some fine to coarse sand) (LANDSLIDE DEPOSIT)										
490					C19			23	0				
	50												
					S20	9 4 25	29	61					
485					C21			22	0				
	55												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-001**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-21-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE)*(continued)* 55.0 ft.: SANDSTONE clasts up to 2"		C21			22	0			
			SEDIMENTARY ROCK (ARGILLITE); moderately bedded with thin interbeds of SANDSTONE; ARGILLITE: dark gray; decomposed; pervasively sheared to: (SANDY lean CLAY (CL): very stiff; mostly Lean CLAY; some fine to coarse sand); SANDSTONE: fine grained; gray; slightly weathered; hard (LANDSLIDE DEPOSIT)		S22	46 15 27	42	28				
480					C23			18	0			
	60		61.0 ft.: recovered washed out SANDSTONE clasts		C24			50	0			
					S25	11 16 16	32	66				
475					C26			NR				
	65				S27	19 26 25	51	22				
470					C28			35	0			
	70		Recovered washed out SANDSTONE fragments and local ARGILLITE matrix/remnants									
			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray to black; decomposed; very soft to soft; pervasively sheared to: (SANDY lean CLAY (CL): very stiff; mostly Lean CLAY; some fine to coarse sand) (FRANCISCAN COMPLEX) 73.5 feet: equip tricone bit		S29	13 27 37	64	77	0			
465	75											
460			79.0 feet: trace thin SANDSTONE bed remnants		S30	20 27 50	77	72	0			
	80											
455					S31	25 50/2"	50/2	100	0			
	85											

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-001**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-21-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (ARGILLITE)*(continued)*										
450					S32	27 30 39	69	83	0				
	90												
445			93.5 feet: trace to no SANDSTONE bed remnants, dominantly ARGILLITE, pervasively sheared to (SANDY lean CLAY (CL); very stiff)		S33	19 32 50	82	83	0				
	95												
440			Bottom of borehole at 98.5 ft bgs										
	100												
435													
	105												
430													
	110												
425													
	115												

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REPORT TITLE **BORING RECORD**				HOLE ID **RC-19-001**
DIST. **01**	COUNTY **Del Norte**	ROUTE **101**	POSTMILE **12-15.5**	EA **0115000099**
PROJECT OR BRIDGE NAME **Last Chance Grade Bypass**				
BRIDGE NUMBER	PREPARED BY **D. Ross**		DATE **2-21-22**	SHEET **4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
E. Wilson	**8-26-19**	**8-26-19**	**2490263.921 ft / 5984408.803 ft NAD83**	**RC-19-002**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Gregg Drilling				**957.50 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger/Rotary Core			**CME-850**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			**Auto; 140 lbs / 30-inch drop**	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
VWP; Inclinometer; cement bentonite grout			**Not Determined**	**Not Determined**	**101.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		ASPHALT CONCRETE; (10")										
			Well-graded GRAVEL with SILT (GW-GM); dark gray; dry; mostly fine to coarse GRAVEL up to 2 in.; some fine to coarse SAND; few non-plastic fines (FILL)										
955			Lean CLAY with SAND (CL); strong brown; moist; mostly medium plasticity fines; few fine SAND; trace decomposed SANDSTONE clasts (COLLUVIUM)		G01								
	5		5.0 feet: equip punch core		S02	6 10 15	25	77					
950					S03	6 6 8	14	94					
	10							21					
945			SEDIMENTARY ROCK (ARGILLITE); massive; dark reddish brown; soft; decomposed to: (Lean CLAY with SAND (CL); hard) (LANDSLIDE DEPOSIT)			3 4 6	10	NR					
	15							28					
940			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; intensely weathered; very soft; very intensely fractured/pervasively sheared; (LANDSLIDE DEPOSIT)		S04	7 8 18	26	77					
	20							12					
935					S05	4 6 9	15	61					
	25							33					

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-002**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-23-22**	**1 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (ARGILLITE)*(continued)*					33				
930					S06	5 17 20	37	83				
	30											
					S08	46 50/4"	50/4	100				
925			32.1 feet: moderately weathered; moderately hard; very intensely fractured					24				
	35		34.4 feet: intensely weathered; soft; very intensely fractured									
			36.3 feet: dark gray; decomposed (Lean CLAY with SAND (CL); very stiff)		S09	8 15 23	38	55				
920								14				
	40											
					S10	9 9 17	26	66				
915								66				
	45											
			46.5 feet: few to little coarse SAND to COBBLE sized SANDSTONE porphyroclast in sheared shale matrix		S11	27 50/5"	50/5	100				
910								24				
	50											
					S12	34 50/2"	50/2	100				
905								19				
	55											

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-002**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-23-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE)*(continued)*					19					
					S13	50/3"	REF	100					
900			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; moderately weathered; moderately hard; very intensely fractured; (FRANCISCAN COMPLEX)					21					
	60												
					S14	50 50/3"	50/3	100					
895								NR					
	65												
					S15	50/3"	REF	100					
890								23					
	70												
			SEDIMENTARY ROCK (ARGILLITE); massive; black; fresh; hard; intensely fractured; weakly foliated; quartz/calcite veining up to 0.25"; few rounded SANDSTONE clasts up to 0.5" (FRANCISCAN COMPLEX)					37	0				
885			71.5 feet: equip HQ core										
	75		SEDIMENTARY ROCK (ARGILLITE); fine-grained; massive; moderately weathered; very intensely fractured/pervasively sheared coarse SAND to boulder sized SANDSTONE clasts (FRANCISCAN COMPLEX)					50	32				
880			77.5 to 79 feet; SANDSTONE clasts; fresh; hard; slightly fractured; abundant contorted or offset quartz veins up to 0.25"										
	80												
								56	0				
875													
	85												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-002**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-23-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (ARGILLITE)*(continued)*					56	0				
870								97	32				
	90		89.8 feet: fresh; hard; moderately fractured										
865			91.9 feet: moderately weathered; soft; very intensely fractured					100	18				
	95		94.4 feet: fresh; hard; intensely fractured 95.5 feet: moderately weathered; soft; very intensely fractured										
860								43	0				
	100		97.2 feet: decomposed to SANDY lean CLAY with GRAVEL; dark gray, pervasively sheared Lean CLAY matrix contains some coarse SAND to GRAVEL sized clasts										
855			Bottom of borehole at 101.5 ft bgs										
	105												
850													
	110												
845													
	115												

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-002**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-23-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
E. Wilson	**9-9-19**	**9-18-19**	**2488625.819 ft / 5983552.735 ft NAD83**	**RC-19-003**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Gregg Drilling				**840.47 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			**CME-850**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/HQ Core (2.5")			**Auto; 140 lbs / 30-inch drop**	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
VWP; inclinometer; cement bentonite grout			**Not Determined**	**Not Determined**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
840	0		SILTY GRAVEL with SAND (GM); dark grayish brown; dry; mostly fine to coarse GRAVEL consisting of subangular to subrounded SANDSTONE; some fine to coarse SAND; little non-plastic fines (FILL)									
835	5				S01	50/2"	REF	NR				
			SANDY SILT (ML); soft; dark grayish brown; wet; mostly low plasticity fines; some fine to medium SAND; trace to few wood fragments (COLLUVIUM)		S02	2 2 3	5	44				
830	10		10.0 feet: equip punch core					5				
			14.0 feet: mostly organics and wood fragments in lower 12"									
825	15		SEDIMENTARY ROCK (SANDSTONE); medium-grained; massive; dark bluish gray; slightly weathered; hard; very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION)		S03	20 25 35	60					
			16.5 feet: equip HQ core					100	0			
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; gray; moderately weathered; soft; pervasively crushed and sheared; argillite interbed remnants (FRANCISCAN COMPLEX: BROKEN FORMATION)						0			
820	20				S04	48 50/2"	50/2	89				
			21.5 feet: circulation loss						0			
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark bluish gray; fresh; very hard; very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION)									
	25		24.5 feet: possible argillite interbeds									

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-003**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-24-22**	**1 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
815	25		SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark bluish gray; fresh; very hard; very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION)		S05	30 50/1"	50/1	83					
810	30				S06	50/3"	REF	100					
805	35		40.0 feet: equip tricone bit due to difficult drilling										
			40.0 feet: equip HQ core										
800	40		40.0 feet: moderately fractured		S07	50/1"	REF	42 42	35				
795	45		45.0 feet: intensely fractured					71	0				
			47.5 to 48 feet: sheared ARGILLITE seam					66	0				
790	50							10	0				
	55												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-003**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-24-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
785	55		SEDIMENTARY ROCK (ARGILLITE); very thickly bedded; black; fresh; hard; intensely fractured to very intensely fractured; subhorizontal laminations (FRANCISCAN COMPLEX: BROKEN FORMATION)					29	0				
								NR	0				
780	60		SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark bluish gray; fresh; very hard; intensely and very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION) 60.0 feet: advance HWT casing to 60.0'					100	0				
								90	0				
775	65							97	7				
770	70		68.8 to 74.0 feet: interbed; ARGILLITE; fresh; very hard to hard; intensely and very intensely fractured					149	0				
765	75		75.0 feet: intensely fractured 77.5 feet: dark gray 78.2 feet: 2" ARGILLITE; interbed; black; fresh; hard to very hard; very intensely fractured					100	0				
760	80		80.5 feet: dark gray; intensely and very intensely fractured					50	0				
	85												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-003**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-24-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
755	85		SEDIMENTARY ROCK (SANDSTONE), *(continued)*					100	8				
750	90		90.0 feet: gray; moderately fractured 91.4 feet: intensely fractured					96	26				
745	95		94.5 feet: very dark gray and black; 0.5' zone, intensely weathered; soft; (Poorly-graded GRAVEL With SAND (GP); wet; mostly fine angular GRAVEL; little coarse SAND; few fines; weak to moderate cementation) Very dark gray; fresh; very hard; intensely fractured SEDIMENTARY ROCK (ARGILLITE); black and very dark gray; intensely weathered; soft; intensely fractured/pervasively sheared to: (Poorly-graded GRAVEL with SILT (GP-GM); moist; mostly coarse angular GRAVEL; some fine angular GRAVEL; little low plasticity fines) (FRANCISCAN COMPLEX: BROKEN FORMATION)					100	0				
740	100		SEDIMENTARY ROCK (SANDSTONE); fine-grained; dark gray; fresh; intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION) 98.4 to 99.4 feet: BRECCIA Bottom of borehole at 100.0 ft bgs										
735	105												
730	110												
	115												

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-003**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-24-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Klamecki	**9-23-19**	**9-25-19**	**2478050.638 ft / 5985899.659 ft NAD83**	**RC-19-004**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Gregg Drilling			**42' Rt.**	**289.39 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger/Rotary Core			**CME-850 Track rig**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4")/Punch Core (2.4")/HQ Core (2.5")			**Auto; 140 lbs / 30-inch drop**	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
cement grout				**Not Determined**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		SILTY SAND with GRAVEL (SM); medium dense; dark brown; moist; mostly fine to coarse SAND; some fine subangular GRAVEL; some fines; few rootlets (COLLUVIUM/LANDSLIDE DEPOSIT)		S01	4 7 6	13						
					S02	7 5 4	9						
285	5		SILTY SAND (SM); medium dense; mottled dark gray and dark grayish brown; moist; mostly fine to coarse SAND; some non-plastic fines; few subangular GRAVEL (COLLUVIUM/LANDSLIDE DEPOSIT)		S03	4 5 4	9						
			SANDY lean CLAY with GRAVEL (CL); medium stiff; very dark grayish brown; moist; mostly fines; little fine to medium SAND; little fine subangular and angular GRAVEL (COLLUVIUM/LANDSLIDE DEPOSIT)		S04	3 4 5	9						
280	10		10.0 feet: wet; equip punch core PP=1.0 tsf		S05	4 6 12	18						
			SILTY SAND with GRAVEL (SM); medium dense; very dark gray; wet; mostly fine to medium SAND; little low plasticity fines; little fine angular GRAVEL (COLLUVIUM/LANDSLIDE DEPOSIT)					30					
275	15				S06	6 9 10	19						
								10					
270	20		19.5 feet: 6" zone of CLAYEY SAND (SC); very dark gray; wet; mostly fine and medium SAND; few fine angular GRAVEL; low plasticity fines		S07	5 7 9	16						
								0					
265	25												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-004**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-25-22**	**1 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method / Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		(SILTY SAND with GRAVEL), *(continued)*		S08	15 19 30	49					
								20	0			
260			SEDIMENTARY ROCK (ARGILLITE); very dark gray; decomposed and intensely weathered; soft and very soft;(CLAYEY SAND with GRAVEL (SC); very dense; moist; mostly fine to coarse SAND; little fine angular and subangular GRAVEL; little low plasticity fines); local hard gravel sized clasts of ARGILLITE (LANDSLIDE DEPOSIT)									
	30				S09	16 39 40	79					
								0				
255												
	35		35.0 feet: very hard SANDSTONE clasts; equip HQ core		S10	43 46 48	94	19				
250												
	40		40.0 feet: pervasively sheared to: (SILTY SAND (SM); very dense; very dark gray to black; moist; some medium angular SAND; little fine SAND; few coarse subangular and angular SAND; little fines)		S11	15 33 28	61					
								0	0			
245												
	45				S12	33 29 28	57					
								58	0			
240			SEDIMENTARY ROCK (ARGILLITE); very dark gray; decomposed; soft to very soft; pervasively sheared to: (CLAYEY SAND (SC); very dense; dark gray; moist; mostly fine SAND; few medium SAND; few fine and coarse subangular GRAVEL; little high plasticity fines) (FRANCISCAN COMPLEX)									
	50				S13	50/4"	REF					
								30	0			
								85	0			
235			54.0 feet: intensely weathered; soft to moderately soft									
	55											

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-004**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-25-22**	**2 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (ARGILLITE), *(continued)*		S14	23 35 40	75	44					
								33	0				
230	60		60.0 feet: hard ARGILLITE clasts; sheared to: (CLAYEY SAND With GRAVEL (SC); mostly medium SAND; little fine SAND; few coarse SAND; little fine to coarse subangular GRAVEL)		S15	50/4"	REF	26	0				
								0	0				
225	65				S16	50/3"	REF	72	8				
			66.4 feet: 1.4' SANDSTONE clast: bluish gray; fresh; hard to very hard; intensely fractured										
			68.1 feet: 1.7' SANDSTONE clast; fresh; hard to very hard; intensely fractured										
220	70		70.0 feet: intensely weathered; soft to moderately soft; fine to coarse hard ARGILLITE clasts					46	0				
								30	0				
215	75		75.0 feet: fresh; hard to very hard; intensely fractured					100	0				
			77.0 feet: 0.7' zone; intensely weathered; soft; with coarse angular hard ARGILLITE clasts sheared to: (SILTY SAND with GRAVEL (SM); very dark gray to black; moist; mostly medium and fine SAND; few coarse SAND; some coarse GRAVEL; little fines)					100	9				
210	80		79.2 feet: 3.5' SANDSTONE clast; fresh; hard to very hard; moderately and slightly fractured					100	70				
205	85												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-004**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-25-22**	**3 of 4**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (ARGILLITE), *(continued)* 85.0 feet: soft to moderately hard; fine to coarse, hard to very hard SANDSTONE and ARGILLITE clasts					100	0				
200	90							80	0				
			92.0 feet: 1.2' SANDSTONE clast; fresh; hard to very hard; intensely fractured					100	20				
195	95		95.0 feet: fresh to intensely weathered; moderately hard to hard to soft; very intensely fractured; fine to coarse, hard to very hard SANDSTONE and ARGILLITE clasts					80	0				
			97.0 feet: intensely weathered; moderately soft										
			98.0 feet: moderately weathered; moderately soft to moderately hard					98	0				
190	100		Bottom of borehole at 100.0 ft bgs										
185	105												
180	110												
175	115												

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-004**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**2-25-22**	**4 of 4**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Klamecki	**10-1-19**	**10-11-19**	**2479336.951 ft / 5987594.602 ft NAD83**	**RC-19-005**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Gregg Drilling				**624.73 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			**CME-850 Track rig**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
HQ Core (2.5")			**Auto; 140 lbs / 30-inch drop**	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Inclinometer; VWP; cement bentonite grout			**Not Determined**	**Not Determined**	**199.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		Organic matter		C01			40	0				
620	5		SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; grayish brown; slightly weathered to decomposed; hard and very soft; intensely to very intensely fractured; (Poorly-graded SAND with GRAVEL (SP); moist; mostly fine SAND; little medium SAND; few coarse SAND; little fine and coarse subangular GRAVEL (FRANCISCAN COMPLEX: BROKEN FORMATION)		C02			0					
615	10				C03			26	0				
610	15				C04			10	0				
605	20		20.0 feet: advance HWT casing to 20.0'		C05			4	0				
600	25				C06			0					

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross			**1 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C06			0					
			26.0 feet: slightly weathered 26.6 feet: 1' zone; slightly weathered; hard; intensely fractured		C07			84	44				
595	30												
					C08			20	0				
590	35												
			36.0 feet: decomposed; very soft		C09			0					
585	40												
			41.0 feet: very dark grayish brown		C10			15	0				
580	45												
			46.0 feet: decomposed to: (Poorly-graded SAND with GRAVEL (SP); grayish brown; mostly coarse angular SAND; little medium SAND; little fine and coarse angular GRAVEL) 47.0 feet: slightly weathered; hard; very intensely to intensely fractured 49.0 feet: decomposed; very soft; (Poorly-graded GRAVEL with SILT and SAND (GP-GM); grayish brown; fine angular GRAVEL; little fine to coarse SAND)		C11			64	9				
575	50												
					C12			70	0				
570	55		53.0 feet: slightly weatherd to decomposed; hard and very soft; intensely to very intensely fractured; decomposed zones washed out										

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross			**2 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C12			70	0				
			53.0 feet: slightly weathered to decomposed; matrix washed out					15	0				
565	60				C13								
			63.5 feet: 1 ft. zone, slightly weathered; hard; intensely fractured		C14			28					
560	65		66.0 feet: slightly weathered; hard to very hard; intensely to very intensely fractured					100	7				
555	70				C15								
			71.6 feet: 8" interbed of ARGILLITE; slightly weathered; moderately hard to hard; very intensely and intensely fractured					100	0				
550	75		73.7 feet: 1.3' interbed of ARGILLITE; decomposed; very soft; (Poorly-graded SAND with SILT (SP-SM); dark gray; mostly medium SAND; little fine SAND		C16								
			76.0 feet: dark gray; intensely fractured					96	19				
545	80		80.0 feet: circulation loss; advance HWT casing to 80.0' 80.4 feet: fresh; moderately fractured		C17								
			82.0 feet: intensely fractured					88	20				
540	85				C18								

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross			**3 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C18			88	20				
			85.9 feet: 2.5' decomposed zone; very soft (CLAYEY GRAVEL with SAND (GC); dark gray; fine angular GRAVEL; some fine SAND; little high plasticity CLAY)					52	7				
			88.0 feet: 3" brecciated zone		C19								
535	90		90.4 feet: 1.2' interbed of ARGILLITE; slightly weathered; hard; very intensely fractured					100	20				
			91.0 feet: very intensely to moderately fractured		C20								
530	95												
					C21			98	0				
525	100												
			SEDIMENTARY ROCK (SILTY SANDSTONE); fine-grained; massive; very dark gray; fresh; hard; very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION)		C22			28	0				
520	105												
					C23			32	0				
515	110												
					C24			50	0				
510	115		SEDIMENTARY ROCK (SANDSTONE); fine-grained; thickly bedded; dark gray; fresh; hard to very hard; intensely fractured; (FRANCISCAN COMPLEX; BROKEN FORMATION)										

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross			**4 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	115		114.1 feet: 0.5" seam of ARGILLITE; soft; striated 114.8 feet: 0.5" interbed of SILTSTONE; very dark gray; decomposed to intensely weathered; moderately soft to very soft; very intensely fractured; (Poorly Graded GRAVEL with SAND (GP); mostly fine subangular GRAVEL) Very intensely fractured 117.0 feet: advance HWT casing to 117.0'		C24			50	0				
					C25			50	0				
505	120												
500	125				C26			53	0				
			128.0 feet: 2' interbed of Sandy SILTSTONE; thickly bedded; very dark gray; fresh; hard to very hard; very intensely to intensely fractured		C27			0	0				
495	130		130.5 feet: intensely fractured		C28			100	45				
					C29			90	0				
490	135				C30			90	0				
					C31			60	0				
			137.0 feet: very intensely fractured; possible decomposed zone; washed fine GRAVEL		C32			15	0				
485	140												
			142.0 feet: 1" seam of ARGILLITE; black; decomposed to intensely weathered; very soft		C33			49	0				
480	145												

(continued)

KLEINFELDER
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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross			**5 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	145		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C33			49	0				
			145.5 feet: 7" zone, decomposed; very soft; (Fat CLAY with GRAVEL (CH); stiff; very dark gray; wet; little fine subangular GRAVEL; PP=1.5 tsf) 146.1 feet: very intensely fractured		C34			65	0				
475	150				C35			100	0				
			152.0 feet: intensely fractured		C36			100	0				
470	155				C37			100	0				
			155.7 feet: 7" interbed of SILTSTONE; very dark gray; fresh; hard to very hard; very intensely fractured		C38			85	0				
			158.0 feet: 1' interbed of SANDY SILTSTONE; very dark gray; fresh; intensely to very intensely fractured		C39			85	0				
465	160												
			161.0 feet: 1' interbed of SILTSTONE; very dark gray to black; fresh; hard to very hard; very intensely to intensely fractured		C40			60	0				
460	165				C41			95	0				
					C42			100	0				
455	170				C43			100	0				
					C44			70	0				
450	175				C45			100	0				

(continued)

KLEINFELDER
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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-005**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross			**6 of 7**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	175		174.9 feet: very intensely fractured SEDIMENTARY ROCK (SANDSTONE), *(continued)* 175.6 feet: 0.25" seam of ARGILLITE; black; decomposed; very soft; slicken-sided 175.8 feet: 0.5" seam of ARGILLITE; black; decomposed; very soft; slicken-sided 175.9 feet: moderately to intensely fractured		C45			100	0				
					C46			100	0				
445	180		180.5 feet: intensely to very intensely fractured		C47								
			182.9 feet: 2" interbed of ARGILLITE; black; fresh; hard; very intensely fractured; slicken-sided 184.0 feet: intensely fractured		C48								
440	185				C49			100	0				
					C50			60	0				
435	190				C51			100	0				
					C52			100	0				
430	195		194.5 feet: intensely to very intensely fractured		C53			100	0				
					C54			60	0				
425	200		Bottom of borehole at 199.0 ft bgs										
420	205												

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REPORT TITLE **BORING RECORD**				HOLE ID **RC-19-005**
DIST. **01**	COUNTY **Del Norte**	ROUTE **101**	POSTMILE **12-15.5**	EA **0115000099**
PROJECT OR BRIDGE NAME **Last Chance Grade Bypass**				
BRIDGE NUMBER	PREPARED BY **D. Ross**		DATE	SHEET **7 of 7**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
J. Klamecki	**10-15-19**	**12-5-19**	**2485093.229 ft / 5983690.036 ft NAD83**	**RC-19-006**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Gregg Drilling				**673.39 ft NAVD88**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			**Fraste Mito-40**	**4.5 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
HQ Core (2.5")				
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING	AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Inclinometer; cement bentonite grout			**Not Determined**	**Not Determined**	**300.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; very dark gray; slightly weathered; hard; intensely to very intensely fractured; (LANDSLIDE DEPOSIT)		C01			43	0				Boring Inclination: 30°
								54	19				
			3.5 feet: intensely fractured		C02								
	5												
			6.0 feet: fresh; hard to very hard; intensely fractured					70	0				
670					C03								
			8.8 feet: 0.5' very intensely fractured 9.5 feet: intensely fractured										
	10												
								68	0				
			13.5 feet: ARGILLITE rip-up clasts to 0.5"		C04								
	15												
665								40	0				
					C05								
	20		SEDIMENTARY ROCK (ARGILLITE); massive; very dark gray; fresh; hard; intensely fractured; (LANDSLIDE DEPOSIT) 21.0 feet: decomposed to: (SANDY lean CLAY with GRAVEL (CL); dark gray; fine to coarse SAND; few fine and coarse SAND; few fine and coarse GRAVEL; moderate plasticity)					10	0			
					C06								
	25												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**1 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (ARGILLITE)*(continued)*		C06			10	0				
660					C07			8	0				
					C08			8	0				
					C09			40	0				
	30				C10			7	0				
			31.0 feet: circulation loss										
			SEDIMENTARY ROCK (SANDSTONE); massive; very dark gray; fresh; hard to very hard; predominantly intensely fractured to very intensely fractured (LANDSLIDE DEPOSIT)		C11			100	0				
			32.5 feet: circulation return		C12			100	0				
	35												
655					C13			100	0				
			37.5 feet: 0.5' ARGILLITE interbed; hard; very intensely fractured										
	40				C14			100	0				
					C15			40	0				
	45				C16			15	0				
650			SEDIMENTARY ROCK (ARGILLITE); very thickly bedded; dark gray to very dark gray; fresh; hard; very intensely fractured; (LANDSLIDE DEPOSIT)		C17			57	0				
	50												
			51.0 feet: intensely fractured		C18			75	0				
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; thickly bedded; gray; fresh to slightly weathered; hard; moderately to intensely fractured; (LANDSLIDE DEPOSIT)		C19			54	13				
	55												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**2 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (SANDSTONE), *(continued)* 55.5 feet: 4" ARGILLITE interbed; very intensely fractured		C19			54	13				
645			56.5 feet: intensely fractured laminated ARGILLITE interbeds 58.0 feet: slightly to moderately weathered; very intensely fractured; oxidation on fracture surfaces		C20			94	0				
	60				C21			100	0				
			62.3 feet: 4" ARGILLITE interbed; oxidation on fracture surfaces		C22			92	0				
	65												
640			66.0 feet: fine to coarse grained; very intensely fractured; ARGILLITE clasts to 0.1"		C23			80	0				
			68.5 feet: fine to medium grained; slightly weathered to fresh; intensely fractured		C24			100	37				
	70												
			71.0 feet: moderately to intensely fractured		C25			100	52				
	75												
635					C26			100	32				
	80												
					C27			100	0				
					C28			92	46				
	85												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**3 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C28			92	46				
630								100	30				
			88.0 feet: medium to coarse-grained; intensely fractured		C29								
	90							97	0				
			93.0 feet: ARGILLITE clasts; intensely to very intensely fractured		C30								
	95												
625			96.0 feet: fine to medium grained; fresh; moderately to intensely fractured		C31			100	27				
	100		100.0 feet: very intensely fractured		C32			83	0				
			101.2 feet: intensely to very intensely fractured		C33			100	0				
			103.5 feet: very intensely fractured		C34			42	0				
	105												
			105.8 feet: 0.5" ARGILLITE interbed		C35			70	27				
620													
			108.5 feet: very intensely fractured		C36			100	0				
	110												
			111.0 feet: intensely to very intensely fractured		C37			87	0				
					C38			100	0				
	115												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**4 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	115		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C38			100	0				
615								100	8				
					C39								
	120												
								89	0				
			122.5 feet: 4" ARGILLITE clast		C40								
								100	0				
	125				C41								
			125.5 feet: fine to medium grained 126.0 feet: ARGILLITE clasts to 0.5"										
610								100	42				
					C42								
	130												
					C43			100	50				
								27	0				
					C44								
	135		SEDIMENTARY ROCK (ARGILLITE); very thickly bedded; dark gray to very dark gray; fresh; hard; very intensely fractured; (LANDSLIDE DEPOSIT)										
605								53	0				
					C45								
								83	0				
	140		140.0 feet: borehole collapse; grouted to 105.0'		C46								
								0	0				
					C47								
	145												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**5 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	145		SEDIMENTARY ROCK (ARGILLITE)*(continued)*		C47			0	0				
600					C48			32	0				
	150												
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; very thickly bedded; gray; fresh; hard; intensely fractured; quartz/calcite veining (FRANCISCAN COMPLEX: BROKEN FORMATION)		C49			43	0				
	155												
595					C50			92	31				
			SEDIMENTARY ROCK (ARGILLITE); thickly bedded; very dark gray to black; fresh; hard; very intensely fractured; quartz/calcite veining; weak foliation/lamination (FRANCISCAN COMPLEX: BROKEN FORMATION)										
	160		SEDIMENTARY ROCK (SANDSTONE); fine-grained; very thickly bedded; gray; fresh; hard; intensely fractured; quartz/calcite veining (FRANCISCAN COMPLEX: BROKEN FORMATION)		C51			57	0				
					C52			0	0				
	165		SEDIMENTARY ROCK (ARGILLITE); massive; very dark gray to black; slightly weathered; moderately soft; very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION)		C53			0					
590													
			169.0 feet: borehole collapse; borehole grouted; advance casing to 191.0'										
	170												
			173.0 feet: 1' hard zone										
			174.0 feet: 1' moderately soft zone										
	175												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**6 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	175		SEDIMENTARY ROCK (ARGILLITE)*(continued)* 175.0 feet: hard										
585													
	180												
	185												
580													
	190												
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; very thickly bedded; gray; fresh to slightly weathered; hard; intensely to very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION)		C54			21	0				
	195												
					C55			88	0				
575			198.0 feet: 1" very intensely fractured zone: dips 25° SEDIMENTARY ROCK (ARGILLITE); decomposed/ sheared to: (Fat CLAY (CH); very stiff to hard SANDSTONE clasts to 1") (FRANCISCAN COMPLEX: BROKEN FORMATION)										
	200		SEDIMENTARY ROCK (SANDSTONE); fine-grained; very thickly bedded; gray; fresh to slightly weathered; hard; intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION)		C56			70	0				
			202.7 feet: moderately fractured; dark gray ARGILLITE inclusions; calcite/quartz veining to 0.1"		C57			100	57				
	205												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**7 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	205		SEDIMENTARY ROCK (SANDSTONE), *(continued)*										
			SEDIMENTARY ROCK (ARGILLITE); moderately bedded; dark gray; decomposed/sheared to: (Fat CLAY (CH); medium stiff; SANDSTONE clasts to 0.5") (FRANCISCAN COMPLEX: BROKEN FORMATION)		C58			33	0				
570													
	210		SEDIMENTARY ROCK (SANDSTONE); fine-grained; thickly bedded; gray; fresh to slightly weathered; hard; intensely to very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION) 210 feet: 2" ARGILLITE interbed		C59			56	0				
			213.0 feet: gray; moderately to intensely fractured		C60			100	33				
	215				C61			75	0				
565					C62			0	0				
	220		220 feet: very intensely fractured		C63			20	0				
	225		225.0 feet: advance casing to 225.0'		C64			100	0				
			226.0 feet: fine-grained; dark gray		C65			17	0				
560	230				C66			0	0				
	235				C67			0	0				

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**8 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	235		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C67			0	0				
555					C68			25	0				
	240				C69			25	0				
					C70			70	0				
			243.5 feet: intensely fractured		C71			6	0				
	245				C72			0	0				
550					C73			0	0				
	250		251.0 feet: very intensely fractured		C74			31	0				
	255		255.0 feet: dark gray to gray		C75			100	0				
545			256.0 feet: dark gray		C76			63	0				
					C77			0	0				
					C78			100	0				
	260				C79			89	0				
			261.0 feet: calcite/quartz veining to 0.5" 261.7 feet: moderately to intensely fractured		C80			83	17				
			263.0 feet: very intensely fractured		C81			83	0				
	265												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**9 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	265		SEDIMENTARY ROCK (ARGILLITE); thickly bedded; dark gray; fresh; moderately soft; very intensely fractured; SANDSTONE interbeds to 1" (FRANCISCAN COMPLEX: BROKEN FORMATION)		C82			100	33				
540			SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark gray; fresh; moderately hard to hard; very intensely fractured; (FRANCISCAN COMPLEX: BROKEN FORMATION)		C83			71	0				
					C84			100	0				
					C85			0	0				
	270		269.5 feet: 1" ARGILLITE interbed		C86			58	0				
					C87			0	0				
			272.0 feet: fine to medium-grained; gray; moderately to intensely fractured; calcite/quartz veining		C88			100	21				
			274.0 feet: very intensely fractured										
	275		275.0 feet: intensely fractured		C89			67	0				
535					C90			96	21				
			277.7 feet: moderately fractured										
			278.0 feet: medium to coarse, dark gray ARGILLITE clasts; very intensely fractured		C91			75	0				
			279.0 feet: moderately to intensely fractured		C92			100	25				
	280		280.5 feet: calcite/quartz veining										
			281.0 feet: very intensely fractured		C93			38	0				
	285				C94			83	0				
530					C95			100	0				
					C96			100	0				
			288.5 feet: intensely fractured		C97			89	0				
	290		289.5 feet: very intensely fractured		C98			100	0				
			290.5 feet: intensely fractured		C99			83	0				
					C100			100	0				
					C101			100	0				
	295							72	0				

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				**RC-19-006**
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-7-22**	**10 of 11**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	295		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C102			72	0				
			295.5 feet: dark gray ARGILLITE clasts to 2"		C102								
			296.0 feet: intensely fractured					100	0				
525					C103								
			297.5 feet: very intensely fractured					78	0				
					C104								
								94	0				
					C105								
	300		Bottom of borehole at 300.0 ft bgs										
	305												
520													
	310												
	315												
515													
	320												
	325												

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REPORT TITLE **BORING RECORD**				HOLE ID **RC-19-006**
DIST. **01**	COUNTY **Del Norte**	ROUTE **101**	POSTMILE **12-15.5**	EA **0115000099**
PROJECT OR BRIDGE NAME **Last Chance Grade Bypass**				
BRIDGE NUMBER	PREPARED BY **D. Ross**		DATE **3-7-22**	SHEET **11 of 11**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
M. Porter/J. Annand	1-6-20	1-30-20	2485835.490 ft / 5983413.964 ft NAD83	RC-20-001
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Gregg Drilling				698.52 ft NAVD88
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Rotary Core			Fraste Mito-40	4.5 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
HQ Core (2.5")			Auto; 140 lbs / 30-inch drop	
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING: Not Determined; AFTER DRILLING (DATE): Not Determined	TOTAL DEPTH OF BORING
N/A				171.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	0		SILT (ML); dark brown; moist; mostly low plasticity fines; trace fine SAND (COLLUVIUM/ LANDSLIDE DEPOSITS)										
695			3.0 feet: few fine to coarse angular GRAVEL										
	5												
			Lean CLAY with GRAVEL (CL); reddish brown; moist; mostly fines; little fine to coarse angular to subangular GRAVEL (COLLUVIUM/LANDSLIDE DEPOSIT)										
690													
	10												
			GRAVELLY lean CLAY (CL); reddish brown; moist; mostly fines; some fine to coarse angular to subangular GRAVEL (COLLUVIUM/LANDSLIDE DEPOSIT)										
			SILTY SAND (SM); yellowish brown; moist; mostly fine to medium SAND; some low plasticity fines; (COLLUVIUM/LANDSLIDE DEPOSIT)										
685													
	15		SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; dark yellowish brown; slightly weathered; hard; intensely fractured; (LANDSLIDE DEPOSIT)		C01			100	0				
					C02			100	0				
680													
	20				C03			90	0				
					C04			54	0				
675													
	25												

(continued)

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REPORT TITLE				HOLE ID
BORING RECORD				RC-20-001
DIST.	COUNTY	ROUTE	POSTMILE	EA
01	Del Norte	101	12-15.5	0115000099
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		3-4-22	1 of 6

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	25		SEDIMENTARY ROCK (SANDSTONE), *(continued)*										
			SEDIMENTARY ROCK (ARGILLITE); massive; dark gray; slightly weathered; hard; intensely fractured (LANDSLIDE DEPOSIT)		C05			53	0				
670					C06			70	0				
	30				C07			100	0				
					C08			18	0				
665													
	35				C09			35	0				
660					C10			60	0				
	40				C11			90	0				
					C12			42	0				
655													
	45				C13			43	0				
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; massive; yellowish brown; slightly weathered; moderately hard; intensely fractured; (LANDSLIDE DEPOSIT)										
650													
	50				C14			0					
					C15			0					
			51.7 feet: ARGILLITE clasts										
					C16			28	0				
645													
	55												

(continued)

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REPORT TITLE				HOLE ID
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DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-4-22**	**2 of 6**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	55		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C16			28	0				
					C17			100	0				
					C18			85	0				
640													
	60				C19			77					
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; thickly bedded; gray; moderately weathered; moderately hard; very intensely fractured; (LANDSLIDE DEPOSIT)										
635					C20			53	7				
	65		65.3 feet: intensely fractured										
					C21			50	0				
630													
	70		70.3 feet: intensely to very intensely fractured		C22			100	0				
					C23			100	0				
			72.3 feet: moderately to slightly weathered		C24			79	0				
625													
					C25			100	0				
	75		74.5 feet: 24" ARGILLITE interbed; intensely fractured		C26			100	0				
					C27			100	0				
620													
					C28			100	0				
	80		80.0 feet: advance HWT casing to 80.0'										
					C29			83	0				
			81.2 feet: quartz and calcite veining; ARGILLITE clasts up to 0.5" 82.0 feet: intensely to very intensely fractured 82.8 feet: 16" ARGILLITE interbed, intensely fractured										
615					C30			100	33				
	85				C31			0					

(continued)

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DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-4-22**	**3 of 6**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	85		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C32			0					
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; thickly bedded; gray; moderately to slightly weathered; moderately hard to hard; intensely to very intensely fractured; quartz and calcite veining; ARGILLITE clasts up to 0.5" (LANDSLIDE DEPOSIT)		C33			67	0				
610					C34			88	0				
	90		90.0 feet: intensely to moderately fractured; advance casing to 90.0' 90.8 to 92 feet: very intensely fractured		C35			100	33				
			SEDIMENTARY ROCK (SANDSTONE); fine-grained; thickly bedded; gray; slightly weathered; very hard; intensely fractured; quartz and calcite veining (LANDSLIDE DEPOSIT)		C36			90	0				
605					C37			100	0				
	95				C38			0					
					C39			100	100				
					C40			0					
600					C41			0					
	100				C42			83	0				
595					C43			95					
	105				C44			100	45				
590					C45								
	110				C46			0					
585					C47			25	0				
	115												

(continued)

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DIST.	COUNTY	ROUTE	POSTMILE	EA
01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-4-22**	**4 of 6**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	115		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C48			100	0				
580													
	120				C49			78	0				
575													
	125				C50			63	0				
					C51								
570					C52								
	130				C53			0					
565													
	135				C54								
560													
	140				C55			14	0				
555													
					C56			83	0				
	145		143.8 to 144.8 feet: very intensely fractured										

(continued)

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01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-4-22**	**5 of 6**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample/Run#	Uncorr. Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Drilling Method	Casing Depth	Discontinuity Description Fracture Identification: (Depth), Dip, Width, Infilling Composition, Weathering, Hardness, Healing, Roughness
	145		SEDIMENTARY ROCK (SANDSTONE), *(continued)*		C57			100	21				
					C58			81	11				
550	150		149.9 feet: 2" ARGILLITE interbed		C59			100	0				
			152.6 to 153.2 feet: very thin ARGILLITE interbeds		C60			92	0				
545	155		154.5 to 155 feet: moderately weathered; moderately soft 155 to 158.4 feet: very intensely fractured		C61			100	0				
					C62			100	0				
			FAILURE ZONE (SANDSTONE); sheared to: (CLAYEY GRAVEL With SAND (GC); gray; moist; mostly fine to coarse gravel; some medium plasticity fines; little sand)		C63			100	0				
540			SEDIMENTARY ROCK (SANDSTONE); fine-grained; thickly bedded; gray; slightly weathered; very hard; intensely fractured; quartz and calcite veining (LANDSLIDE DEPOSIT)		C64			100	0				
	160		159.5 feet: intensely to very intensely fractured 160.7 feet: 1" ARGILLITE interbed		C65			100	0				
					C66			100	0				
					C67			100	0				
535					C68			100	17				
	165				C69			100	0				
			166.9 feet: 2" ARGILLITE interbed		C70			100	17				
530													
	170				C71			67	0				
					C72			100	0				
			Bottom of borehole at 171.5 ft bgs										
525	175												

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01	**Del Norte**	**101**	**12-15.5**	**0115000099**
PROJECT OR BRIDGE NAME				
Last Chance Grade Bypass				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	D. Ross		**3-4-22**	**6 of 6**

APPENDIX A8 *Final Value Analysis Study Report, D-1 Del Norte 101 Last Chance Grade*

(Value Management Strategies, Inc., 2018)

Final Value Analysis Study Report

D-1 Del Norte 101 Last Chance Grade

PN 0115000099

01-DN-101-PM 12.0-15.5

Contract No. 53A0208

Task Order No. 1045

October 2018

Prepared by

Value Management Strategies, Inc.

Value Management Strategies, Inc.

CORPORATE OFFICE:
900 Canterbury Place, Suite 330
Escondido, CA 92025
T: 760 741 5518 | F: 760 741 5617

Date: October 11, 2018

To: Jaime Matteoli, Project Manager

Subject: Final VA Study Report (Task Order 1058)
D-1 Del Norte 101 Last Chance Grade

Value Management Strategies, Inc. is pleased to submit this Final VA Study Report for the referenced project. This report summarizes the results and events of the study conducted September 27-31, 2018 in District 1 offices in Eureka, California.

It was a pleasure working with Caltrans District 1 on this project, and I look forward to the next one. If you have any questions or comments concerning this final report, please do not hesitate to contact me at (206) 679-8029 or EricT@vms-inc.com.

Sincerely,

VALUE MANAGEMENT STRATEGIES, INC.

Eric Trimble, CVS, MBA, PMP, ENV SP
VA Study Team Leader

Copy: (PDF) Addressees
(2 copies/PDF) Kevin Espinoza, District 1 VA Coordinator
(PDF) Joy Keller-Weidman, Senior Program Manager – Udall Foundations
(PDF) Erika Barrick, HQ VA Program Manager

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FINAL

VA STUDY SUMMARY REPORT

FINAL RESULTS

VA Study Summary Report – Final Results

D-1 Del Norte 101 Last Chance Grade

01-DN-101
PN 0115000099
(PM 12.0 – 15.3)

A Value Analysis (VA) study, sponsored by Caltrans and facilitated by Value Management Strategies, Inc., was conducted for the District 1 Del Norte 101 Last Chance Grade Project. The VA study was conducted August 27-31, 2018 in the Caltrans District 1 offices in Eureka, California. This *VA Study Summary Report – Final Results* provides an overview of the project, key findings, and the initial VA alternatives developed by the VA team for future consideration by the project team.

PROJECT SUMMARY

The proposed project is located on a segment of US 101 known as Last Chance Grade (LCG), which is in southern Del Norte County, between Wilson Creek and Crescent City (PM 12.0 – 15.5). A geologic study conducted for Caltrans by the California Geological Survey in 2000 mapped over 200 historical and active landslides (both deep-seated and shallow) within this corridor. The project will address the landslides and road failures at LCG which have required Caltrans to perform a considerable number of construction projects and maintenance activities in the LCG area to keep the roadway open. Since 1981, landslide mitigation projects, including retaining walls, drainage improvements, and roadway repairs, have cost over $54 million ($33 million Emergency Response Projects and $21 million Non-Emergency Response Projects).

The project is currently considering several alternatives that provide a more reliable connection, reduce maintenance costs, and protect the economy, natural resources, and cultural landscapes. The recent PSR proposed seven alternatives (M, A1, A2, C3, C4, C5, and F) in response to landslides and roadway failures at LCG, which have caused damage for decades. Six of the seven proposed alternatives would include realignment of US 101 with the goal of avoiding the unstable portions of LCG. One of the proposed alternatives (M – No Build) to maintain the existing roadway on its current alignment does not meet the purpose and need of the project, but is included to provide a baseline

for comparison. An additional two Alignment Alternatives (X and L) were included in an update to the Preliminary Environmental Analysis Report (PEAR).

The Realignment Alternatives (A1, A2, C3, C4, C5, F, X, and L) vary between 1 mile and 14 miles in length and range in expected cost of construction from $250 million to $2 billion. Depending on the Alignment Alternative selected, the project is anticipated to be completed between October 2034 and October 2039.

PROJECT PURPOSE AND NEED

The purpose of this project is to develop a permanent solution to the instability and potential roadway failure at LCG. A long-term sustainable solution at LCG is needed for many reasons, including the following:

- Economic ramifications of a long-term failure and closure
- Risk of delay / detour to traveling public
- Increasing maintenance and emergency project costs
- Increase in frequency and severity of large storm events caused by climate change

This segment of US 101 was constructed in 1937. LCG has a history of geologic instability, including deep seated landslides and slipouts, which presents a long-term challenge with roadway stability and maintenance costs. Surveys conducted by Caltrans have shown the landslides have shifted the roadway centerline by over 40 feet horizontally from the original roadway centerline constructed in 1937.

The process to study and environmentally clear a realignment of US 101 at this location is very important. Contributing to the sense of urgency for a realignment project are the accelerating movement of the roadway, toe erosion impacts to the nested landslides, frequency of repairs, lack of geometric resiliency, and increasing risk and concerns of the traveling public. Important project elements and facility deficiencies that the project needs to address include soil and slope instability, existing geometrics, structures, vehicle traffic data, and collision data.

VA STUDY TIMING

The VA study was conducted early in the PA&ED phase of the study, which is to be completed in February 2026. The project is scheduled for Ready to List (RTL) in September 2030.

VA STUDY OBJECTIVES

The VA study was tasked with analyzing the potential Alignment Alternatives that optimize project scope to meet the project need and purpose while addressing the long list of constraints and challenges. The VA study objectives were therefore to:

1. Analyze the current project design options, cost estimate, and schedule.

2. Provide direction in the determination of a preferred alternative.

3. Provide possible cost, schedule, and/or performance improvement recommendations which consider current and innovative new solutions.

KEY PROJECT ISSUES

The items listed below are the key drivers, constraints, or issues being addressed by the project and considered during this VA study to identify the most appropriate Alignment Alternatives and possible project improvements.

Environmental Considerations – The project will need to address many critical environmental concerns, including the minimization of impacts to old growth redwood trees, the protection of native species and sensitive habitat, as well as the preservation of cultural resources. The project will need to avoid disturbance to these where possible and appropriately mitigate where it cannot.

Geotechnical Risks – The project will need to address the multiple slide areas within the project limits and determine the most appropriate alignment that will minimize impacts to the ongoing operation of the facility and reduce the future maintenance needs and life-cycle costs (LCC).

Project Feasibility – The project will need to consider overall feasibility in terms of funding constraints, stakeholder acceptance, permit considerations, duration of implementation, and overall alignment constructability.

EVALUATION OF ALIGNMENT ALTERNATIVES

Performance Attributes
Mainline Operations
Temporary Impacts
Permanent Impacts
Maintainability

During the course of the VA study, a number of analytical tools and techniques were applied to develop a better understanding of the project and the Alignment Alternatives. A major component of this analysis was Value Metrics which seeks to assess the elements of cost, performance, time, and risk as they relate to overall project value. These elements required a deeper level of analysis, the results of which are detailed in the *Project Analysis* section of this report. The key performance attributes identified for the project are listed in the table, "Performance Attributes." A summary of the major observations and conclusions identified during the evaluation of the Alignment Alternatives led the stakeholders and VA team to identify which Alignment Alternatives to move forward with and to develop the VA alternatives recommended in this report.

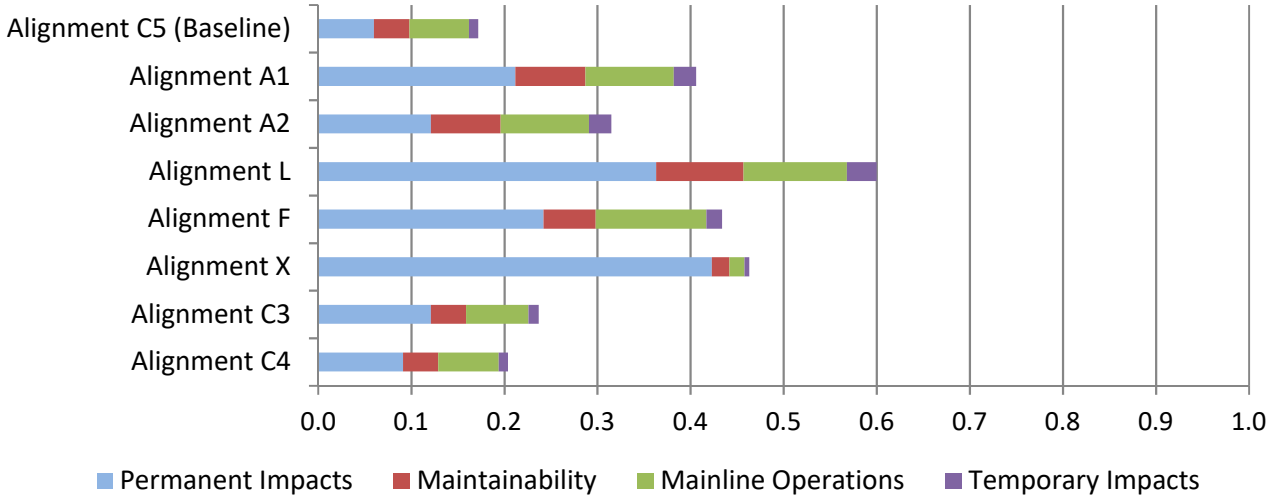
The stakeholders rated each of the performance attributes through a paired comparison process and found that Permanent Impacts (*or Environmental Impacts*) was of the utmost importance to the project with a relative weight of 60%. Maintainability and Mainline Operations were weighted the next highest at 19% and 16%, respectively. Temporary Impacts (*or Construction Impacts*) was weighted lowest – scoring only 5% – but was still seen as being an important consideration for overall project success.

The stakeholders then provided initial evaluations for each of the current Alignment Alternatives using these performance attributes and how each accomplished the project's stated purpose and need.

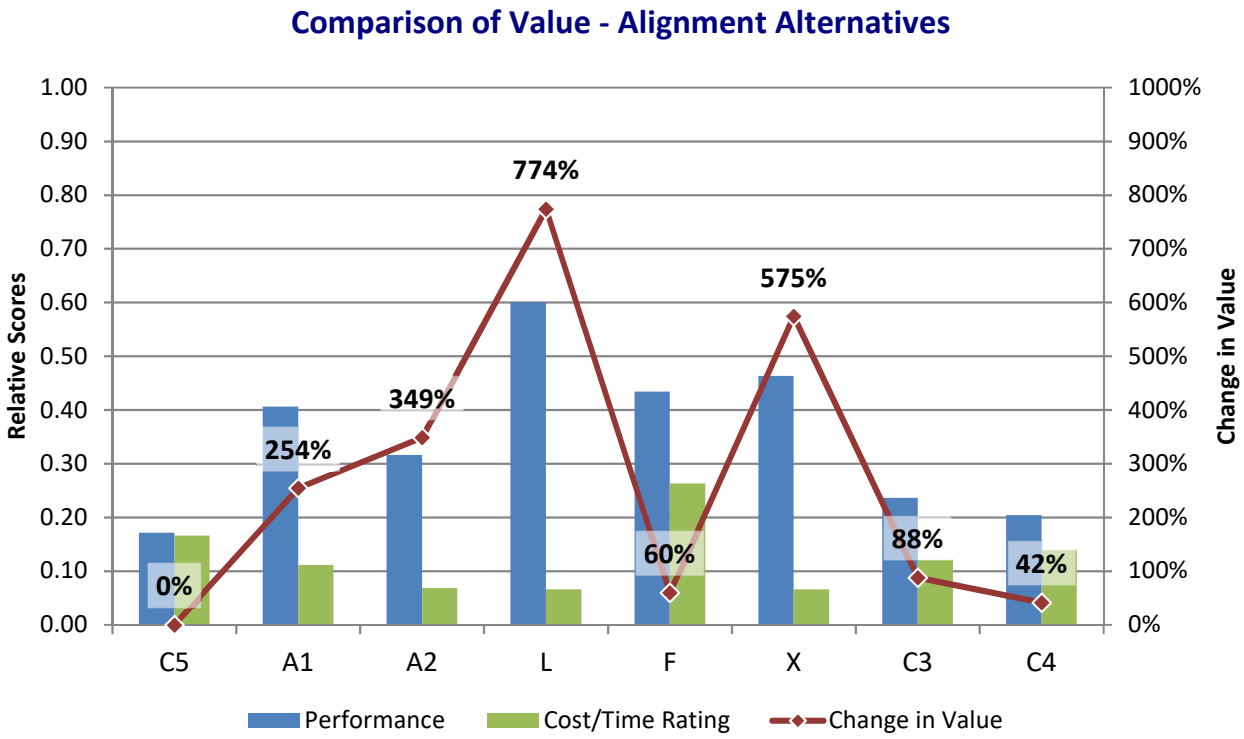
Although each of the alignment options were developed by the design team to address the specific goals of the project, it became clear through this exercise that the unique ways in which each Alignment Alternative would deliver the project led to a very wide range of performance outcomes in terms of the individual performance attribute scores for each alignment option and the stakeholder input on performance attribute weight as described above. The following chart demonstrates the variations between the Alignment Alternatives in which it becomes clear that Alignment Alternatives C3, C4, and C5 do not perform favorably when compared to the others – and most notably due to the large Permanent Impacts to the environment that each of these represents.

Note that for comparison purposes, Alignment Alternative C5 was used as the project baseline as it was identified as such in the PSR at this early stage of the project and reflects one of the most conservative approaches to project scope in terms of schedule and budget.

Comparison of Alignment Alternatives Performance



The next step was to add the initial cost and schedule components into the comparison to provide a more holistic approach to determining overall project value. The graphic below demonstrates that when these data points are integrated into the project value equation, Alignment Alternatives C3, C4, C5, and F deliver the lowest value to overall project benefit for the resources expended. Due in part to this analysis and validation through discussion, it was recommended that Alignments C3, C4, and C5 be removed from consideration as the project moves towards the Environmental Study phase. Please refer to the *Project Analysis* and *Appendices* sections of the report for a detail of the value metrics calculations and stakeholder input for alignment performance scoring.



VA ALTERNATIVES

Although the project has not yet identified a preferred alternative with which to move forward with, the VA team was tasked with identifying and developing concepts that may prove effective in adding value to one or more of the alignments under consideration using current or innovative new solutions to address project concerns.

The VA team developed 11 VA alternatives which provide potential improvement to the project. The following are the alternatives identified, along with their associated Alignment Alternative, potential additional capital cost impact, performance attribute focus, and a brief discussion of each.

Note: The Cost Impact column reflects the likely initial project cost addition to the baseline estimate. As the project cost data is in a very preliminary state, and the VA alternatives can relate to several design alternatives – with wide initial cost ranges – and multiple design alternative estimates, the cost impact information for each VA alternative is depicted using approximate values:

- *$ ≈ between $0 and $5M*
- *$$ ≈ between $5 and $50M*
- *$$$ ≈ between $50M and $100M*
- *$$$$ ≈ between $100M and $200M (or more)*

Note: The Performance Impact column refers to the following performance attributes:

- *Mainline = Mainline Operations*
- *Perm = Permanent Impacts*
- *Maint = Maintainability*

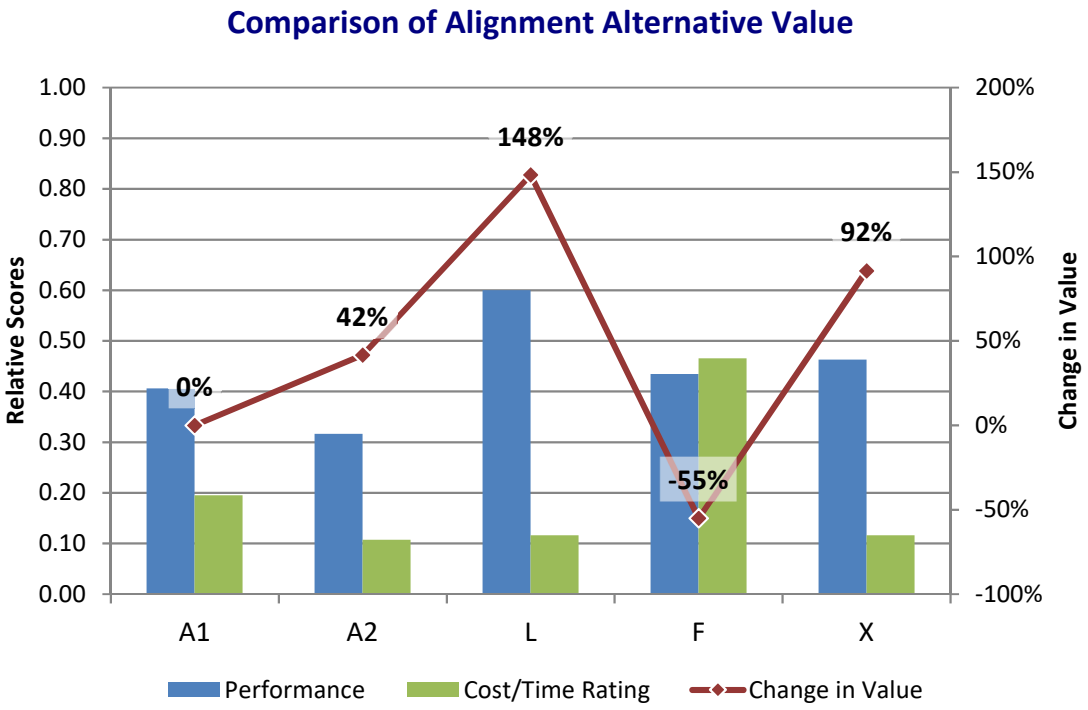
Alternative No. and Description	Associated Alignment Alt	Cost Impact	Performance Focus
1.0 Use mechanically stabilized earth / reinforced soil for slopes	**A1, A2, L**	**$$**	**Perm**
The initial design concept for the affected alternatives (A1, A2, and L) would incorporate use of 2:1 fills for the full extent of the project limits. The alternative concept would use steeper fills (1.5:1 or steeper) to reduce the project footprint and fill volumes. This concept uses steel or geosynthetic reinforcement strategies to mechanically stabilize or reinforced the soil slopes.			
2.0 Use catchment areas to protect roadway	**A1, A2, X, L**	**$**	**Maint**
The initial design concept for the affected alternatives (A1, A2, X, and L) would incorporate use of a standard shoulder width where possible for the full extent of the project limits. The alternative concept would target the use of catchment areas at designated slide-prone areas to provide additional debris and drainage management.			
3.0 Provide wider alignment where appropriate	**X**	**$$**	**Mainline**
The initial design concept for Alternative X proposes to use standard shoulder widths (8 feet for two-lane facilities) for the full extent of the project limits. The alternative concept would increase the width of paved shoulders (in excess of 8 feet) at targeted locations to enhance mobility and improve maintainability on the facility.			
4.0 Minimize fill through alternative alignment	**A1, A2**	**$**	**Perm**
There are two alignments proposed (A1 and A2) that bypass a portion of the existing alignment to avoid the LCG slide complex. The alternative concept would use a steeper alternate alignment to reduce the length of the proposed facility and the overall footprint of the southern part of the A1 and A2 alignments.			
5.0 Use retaining walls and bridges to reduce footprint	**A1, A2, L**	**$$$**	**Perm**
The initial design concept for the affected alternatives (A1, A2, and L) would incorporate use of 2:1 fills for the full extent of the project limits. The alternative concept would use structures (bridges and retaining walls) to reduce the project footprint and fill volumes.			
6.0 Incorporate wildlife bypass structures	**A1, A2, L**	**$$**	**Perm**
The initial alternative concepts for A1, A2, and L, while providing some degree of wildlife connectivity, do not include standalone wildlife bypass structures. The alternative concept would include specifically designed wildlife bypass structures at appropriate locations.			
7.0 Incorporate thicker AC segment to reduce maintenance / repair work	**All**	**$$**	**Maint**
The baseline concept proposes to use a standard AC thickness (6 inches) for all alignments throughout the project limits. The alternative concept would use thicker pavement sections (minimum 2 feet) in targeted locations to reduce maintenance and repair activities.			

Alternative No. and Description	Associated Alignment Alt	Cost Impact	Performance Focus
8.0 Incorporate K-rail in lieu of MBGR to reduce maintenance / repair work	**X**	**$**	**Maint**
The initial design concept for Alternative X proposes to use guard rail for the full extent of the project limits. The alternative concept would target use of K-rail at designated slide-prone areas to provide improved maintainability.			
9.0 Use stacked alignment to reduce roadway width	**A2**	**$$$$**	**Perm**
The baseline concept proposes to use conventional roadway and single deck structures for Alternatives A1 and A2 for the full project length. The alternative concept would use a stacked bridge alignment for the structures through the old growth tree section of each of these design alternatives. Note that this concept could include sections of the roadway that are not currently depicted as structure.			
10.0 Use independent alignments for northbound and southbound directions	**A2**	**$$$$**	**Perm**
The proposed A2 alignment combines the northbound and southbound directions on the same elevation and alignment in the conventional manner. The alternative concept would separate the northbound and southbound directions to reduce impacts to old growth trees.			
11.0 Incorporate tunnel maintenance structure into tunnel	**F**	**$$$$**	**Perm**
Alternative F would require a conventional standalone tunnel maintenance facility to support the proposed tunnel. The alternative concept would incorporate / integrate a tunnel maintenance facility below ground to support the tunnel and reduce permanent project impacts.			

VA STUDY RESULTS

With input from the project stakeholders, the VA team recommends that Alignment Alternatives C3, C4, and C5 be removed from further consideration. These alternatives were initially proposed to bypass the LCG landslide complex and avoid impact to the very important old growth redwood resource. Despite some of the benefits that they provide to roadway stability, low temporary impacts, and low future maintenance concerns, the stakeholders determined that these three alignments would have the greatest project footprints of those under consideration, which is directly related to the amount of old growth redwood tree and wildlife impacted in the National Park, the substantial additional right of way and roadway construction required, and the amount of cubic yardage of excess material (cut) that will need disposal. Additionally, the geotechnical expert-based risk assessment by BGC Engineering USA found that the risk to long-term performance of these Alignment Alternatives is very high.

When C3, C4, and C5 are removed from the calculation, and Alternative A1 is used as the new baseline, the value metric comparison graphic resembles the following:



With the elimination of these three alignments, the project can move more efficiently into the Environmental Study phase of the project. All remaining alignments (A1, A2, X, L, and F) should continue to be analyzed and studied and should not be eliminated unless it is clear that they no longer meet the project's purpose and need objectives or are determined to be outside of the scope of the project. It should be noted that this recommendation includes Alignment Alternative F (the Full Tunnel alignment), which has a very low value score due to its initial tunnel construction estimate and project duration assumption. That said, the VA team would recommend that this alignment remain in consideration at this time as it has one of the least impactful alignments in relation to limiting Permanent Impacts.

As the project moves forward, it is anticipated that the developed VA alternatives (and VA design suggestions) can be integrated in full or part into one or more of the Alignment Alternatives. The VA team recommends that these concepts continue to be studied to provide additional project efficiency and/or project performance benefit to aid in the successful identification of a preferred Alignment Alternative and the successful delivery of this valuable project to all stakeholders.

VA TEAM

VA Study Team

Name	Organization	Title / Role
Eric Trimble	VMS, Inc.	VA Study Facilitator
Charlie Narwold	Caltrans District 1	Geotechnical Services Manager
Arvin Lal	Caltrans District 1	Construction
Melinda Molnar	Caltrans District 1	Environmental
Todd Lark	Caltrans District 1	Design
Daniel Sessions	Caltrans District 1	Structures Design
Matt Smith	Caltrans District 1	Design
David Roemer	Redwood National Park	Stakeholder Representative
Scott Anderson	BGC Engineering	Geotechnical / Risk

Key Project Contacts

Name	Organization	Title
Kevin Espinoza	Caltrans District 1	District VA Coordinator
Jaime Matteoli	Caltrans District 1	Project Manager
Joy Keller-Weidman	Udall Foundation	Senior Program Manager