

ADDENDUM TO HYDRAULIC TECHNICAL MEMORANDUM

I-26 Widening Henderson and Buncombe Counties

STIP Project No. I-4400 / I-4700



Submitted to:

North Carolina Department of Transportation

Prepared by:

HNTB North Carolina, PC

343 East Six Forks Road

Suite 200

Raleigh, NC 27609

November 10, 2014

This addendum to the Approved Hydraulic Technical Memorandum for STIP Project No. I-4400 / I-4700 is in response to NCDOT review comments on the draft functional designs received by HNTB on July 26, 2014. Comments that directly affect the Hydraulics Technical Memorandum are the Begin & End Project Limits and proposed Roadway Typical Sections for the 6-Lane Alternative. Due to the revised Project Limits, Sites 1, 2, 27, & 28 are no longer located within the STIP Project No. I-4400 / I-4700. Analyses and recommendations for Sites 3, 7, 12, 14, 17, 19, 20, 21, 22, 23, and 26 were revised for incorporation of revised typical sections. Detailed descriptions of the required revisions are provided below and revised Roadway Typical Sections and Preliminary Hydraulic Recommendations for Major Crossings Summary (6-lane and 8-lane alternatives) are attached.

Per NCDOT comment "If pavement does not have to be replaced east of US 25, consider beginning the project west of the US 25 structure" the following site revisions are required.

Site 1

Site 1 is no longer located within the project limits.

Site 2

Site 2 is no longer located within the project limits.

Per NCDOT comment "Show full paved shoulders width (12' median, 12' outside) except for under structures, rest areas and weigh stations that are being retained under the 6-lane and hybrid alternatives" the following site revisions are required.

Site 3

For the 6-lane alternative we recommend retaining and extending the existing 1 @ 6' x 6' RCBC and adding a top edge bevel to upstream extension.

Site 7

For the 6-lane alternative we recommend retaining and extending the existing 3 @ 9' x 10' RCBC and adding a top edge bevel to each upstream extension.

Site 12

For the 6-lane alternative we recommend retaining and extending the existing 1 @ 7' x 7' RCBC and adding a top edge bevel to the upstream extension. We also recommend adding bank stabilization at the culvert outlet.

Site 14

For the 6-lane alternative we recommend retaining and extending the existing 2 @ 8' x 8' RCBC and adding a top edge bevel to the upstream extension. We also recommend adding a supplemental pipe and removal of all but 1 foot of sediment from both barrels.

Site 17

For the 6-lane alternative we recommend retaining and extending the existing 3 @ 7' x 7' RCBC and adding a top edge bevel to the upstream extension. We also recommend adding a supplemental pipe and removal of all but 1 foot of sediment from all barrels.

Site 19

For the 6-lane alternative we recommend retaining and extending the 1 @ 6' x 6' RCBC under I-26 to connect with the 1 @ 6' x 6' RCBC under Hidden Creek Road. We also recommend the addition of a supplemental pipe right of existing culverts and the placement of channel and bank stabilization material.

Site 20

For the 6-lane alternative we recommend retaining, lining, and extending the existing 66" SPP upstream and downstream. We also recommend adding a supplemental pipe and relocating the downstream private crossing outside of the NCDOT right-of-way.

Site 21

For the 6-lane alternative we recommend retaining and extending the existing 66" RCP.

Site 22

For the 6-lane alternative we recommend retaining, lining, and extending the existing 66" SPP.

Site 23

For the 6-lane alternative we recommend retaining and extending the existing 2 @ 10' x 10' RCBC and adding a top edge bevel to the upstream extension.

Site 26

For the 6-lane alternative we recommend retaining and extending both the 66" SPP and the 14' x 14' concrete vehicle underpass. We also recommend lining the SPP.

Per comments submitted to HNTB by NCDOT Roadway Project Design Engineer, Steven Kendall, the project limits were revised to tie into STIP Project No. I-5504 (Personal Communication, September 2, 2014). The following site revisions are required.

Site 27

Site 27 is no longer located within the project limits.

Site 28

Site 28 is no longer located within the project limits.

**PRELIMINARY HYDRAULIC RECOMMENDATIONS FOR MAJOR⁽¹⁾ CROSSINGS
(MERGER CP2A)
6-Lane Widening**

DATE: 5/28/14
PROJECT NUMBER: I-4400 / I-4700
WBS ELEMENT #: I-26 Widening
PROJECT DESCRIPTION: I-26 Widening
NAME:

SITE NUMBER	ALT ID ⁽²⁾	ROUTE	STATION	LAT	LONG	STREAM ID	STREAM NAME	FEMA STUDY TYPE	DRAINAGE AREA (Mi ²)	STREAM CLASS	EXISTING STRUCTURE	MINIMUM RECOMMENDED STRUCTURE	Notes
											Number, Size, Structure Type, (Additional Length)	Number, Size, Structure Type, (Additional Length)	
3	-	I-26	-L- 79+09	984574.34510	579028.0539	-	UT to Dunn Creek	None	0.28	C	1 @ 6' x 6' RCBC	1 @ 6' x 6' RCBC	
4	-	I-26	-L- 90+32	984001.24990	579994.0926	6-55-8-1-1	Dunn Creek	Limited	2.58	C	2 @ 8' x 8' RCBC	2 @ 8' x 8' RCBC w/ Supplemental Pipe	Minimum Supplemental Pipe Size = 48".
5	-	SR 1793	-Y4- 16+71	980188.87840	587365.9132	-	UT to Devils Fork	None	0.31	C	1 @ 66" SPP w/ HW	1 @ 66" SPP w/ HW & Supplemental Pipe	Recommend Lining existing 66" SPP. Minimum Supplemental Pipe Size = 48".
6	-	SR 1893	-Y4-2- 13+58	980033.40540	587723.4148	-	UT to Devils Fork	None	0.32	C	1 @ 66" SPP w/ HW	1 @ 66" SPP w/ HW & Supplemental Pipe	Minimum Supplemental Pipe Size = 48".
7	-	I-26	-L- 208+70	978323.86870	590312.0764	6-55-8-2	Devils Fork	Detailed	6.80	C	3 @ 9' X 10' RCBC	3 @ 9' X 10' RCBC	
8	-	SR 1525	-Y4- 34+44	977073.27020	592092.6632	-	UT to Devils Fork	None	0.22	C	1 @ 66" SPP w/ HW	1 @ 66" SPP w/ HW	Recommend Lining existing 66" SPP.
9	-	I-26	-L- 231+67	977275.16950	592615.6113	-	UT to Devils Fork	None	0.21	C	1 @ 66" CMP w/ HW	1 @ 66" SPP w/ HW	Recommend Lining existing 66" SPP.
10	-	I-26	-L- 248+18	976275.36270	593669.2852	-	UT to Devils Fork	None	0.29	C	1 @ 6' x 6' RCBC	1 @ 6' x 6' RCBC	
11	-	I-26	-L- 334+69	970626.40530	599985.8440	6-55-11-(5)	Clear Creek	Detailed	44.30	C	Dual 3 - Span RC Deck Bridges; L = 220.14'	Dual 3 - Span Bridges; L (Min) = 230'	
12	-	I-26	-L- 407+69	966992.48630	606248.2122	-	UT to Mud Creek	None	0.46	C	1 @ 7' x 7' RCBC	1 @ 7' x 7' RCBC	
13	-	I-26	-L- 438+81	965030.75690	608652.8397	6-55-12	Featherstone Creek	Limited	4.09	C	3 @ 8' x 8' RCBC	3 @ 8' x 8' RCBC	
14	-	I-26	-L- 500+94	960792.04680	613087.0524	6-55-13	Byers Creek	None	2.42	C	2 @ 8' x 8' RCBC	2 @ 8' x 8' RCBC w/ Supplemental Pipe	Minimum Supplemental Pipe Size = 48".
15	-	I-26	-L- 570+03	956396.25940	618010.6296	-	UT to Mud Creek	None	0.20	C	1 @ 66" SPP w/ HW	1 @ 66" SPP w/ HW	
16	-	I-26	-L- 669+02	950419.18090	625430.4666	6-57-(9)	Cane Creek	Detailed	83.80	C	Dual 3 - Span RC Deck Bridges; L = 198.25'	Dual 3 - Span Bridges; L (Min) = 210'	
17	-	I-26	-L- 682+68	949732.07990	626629.4280	6-57-22	Kimsey Creek	Detailed	2.49	C	3 @ 7' x 7' RCBC	3 @ 7' x 7' RCBC w/ Supplemental Pipe	Minimum Supplemental Pipe Size = 48".
18	-	SR 1358	-Y12- 11+44	947362.16240	630621.5065	-	UT to French Broad River	None	0.14	B	1 @ 6' x 5' RCBC - 66" RCP w/ HW	1 @ 6' x 5' RCBC - 66" RCP w/ HW	
19	-	I-26	-L- 800+81	945500.79650	637588.0430	-	UT to French Broad River	None	0.36	B	1 @ 6' x 6' RCBC	1 @ 6' x 6' RCBC w/ Supplemental Pipe	Minimum Supplemental Pipe Size = 48".
20	-	I-26	-LBNB47001-826+95	945249.89830	640150.2926	-	French Broad River Tributary 149	Limited	0.24	B	1 @ 66" CMP w/ HW	1 @ 66" CMP w/ HW & Supplemental Pipe	Recommend Lining existing 66" CMP. Minimum Supplemental Pipe Size = 48".
21	-	I-26	-LBNB47001-850+25	944247.32610	642286.3579	-	UT to French Broad River	None	0.17	B	1 @ 66" RCP w/ HW	1 @ 66" RCP w/ HW	
22	-	I-26	-LBNB47001-866+58	943457.42560	643633.1138	-	UT to French Broad River	None	0.12	B	1 @ 66" CMP w/ HW	1 @ 66" CMP w/ HW	Recommend Lining existing 66" CMP.
23	-	I-26	-L47001-897+06	942265.08380	646460.8652	6-62	Powell Creek	None	5.06	C	2 @ 10' x 10' RCBC	2 @ 10' x 10' RCBC	
24	-	I-26	-L47001-931+91	941154.43190	649702.5342	6-63	Ducker Creek	None	0.99	C	1 @ 8' x 8' RCBC	1 @ 8' x 8' RCBC	
25	-	I-26	-L47002-1076+40	933445.26330	660880.8725	6-54.5	French Broad River	Detailed	678.00	B	Dual 6 - Span RC Deck Bridges; L ₁ = 440.9' L ₂ = 453.4'	Dual 6 - Span Bridges; L (Min) = 460'	
26	-	I-26	-L47002-1151+85	929263.58010	666921.5241	6-75	Long Valley Branch	None	0.25	C	1 @ 66" SPP w/ HW	1 @ 66" SPP w/ HW	Recommend Lining existing 66" SPP. This crossing has a RCBC vehicle underpass in the left overbank that should also be retained.

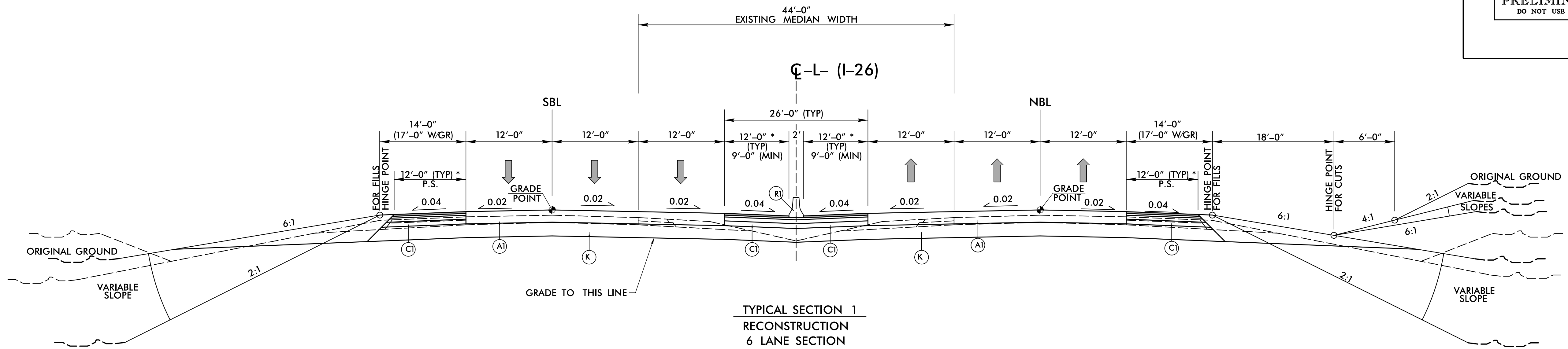
NOTES:
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(MERGER CP2A)
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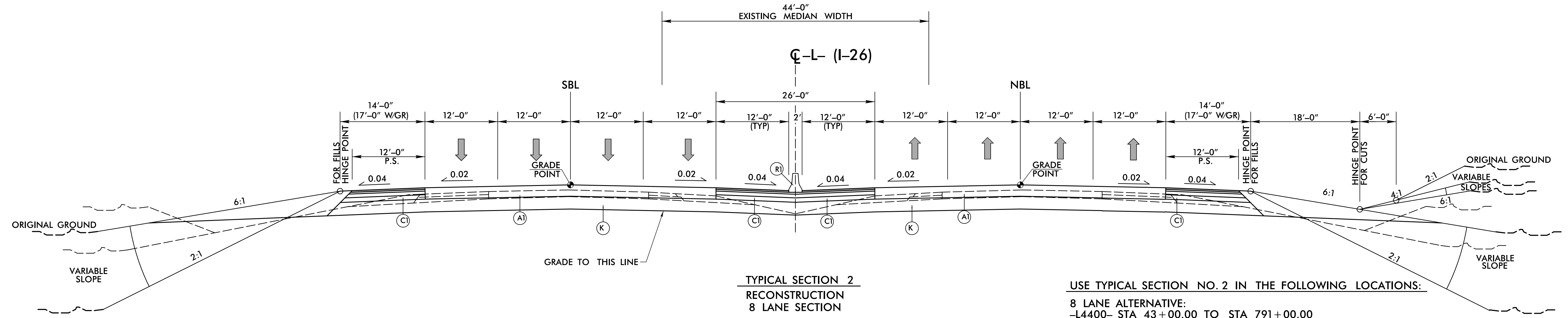


TYPICAL SECTION 1
RECONSTRUCTION
6 LANE SECTION
 * DESIGN EXCEPTION REQUIRED

USE TYPICAL SECTION NO. 1 IN THE FOLLOWING LOCATIONS:
6 LANE ALTERNATIVE:
 -L4400- STA 52+00.00 TO STA 791+00.00
 -L47001- STA 909+00.00 TO STA 991+18.00
 -L47002- STA 1049+91.12 TO STA 1152+82.01
HYBRID ALTERNATIVE:
 -L4400- STA 14+00.00 TO STA 591+00

PAVEMENT SCHEDULE	
A1	PROP. PORTLAND CEMENT CONCRETE PAVEMENT
C1	PROP. ASPHALT CONCRETE PAVEMENT
K	PROP. SUBGRADE STABILIZATION
R1	DOUBLE FACED CONCRETE MEDIAN BARRIER
R2	2'-6" CONCRETE CURB AND GUTTER

TRANSITION FROM TYPICAL SECTION NO. 1 TO TYPICAL NO. 2 IN THE FOLLOWING LOCATIONS:
HYBRID ALTERNATIVE:
 -L4400- STA 591+00 TO STA 594+00

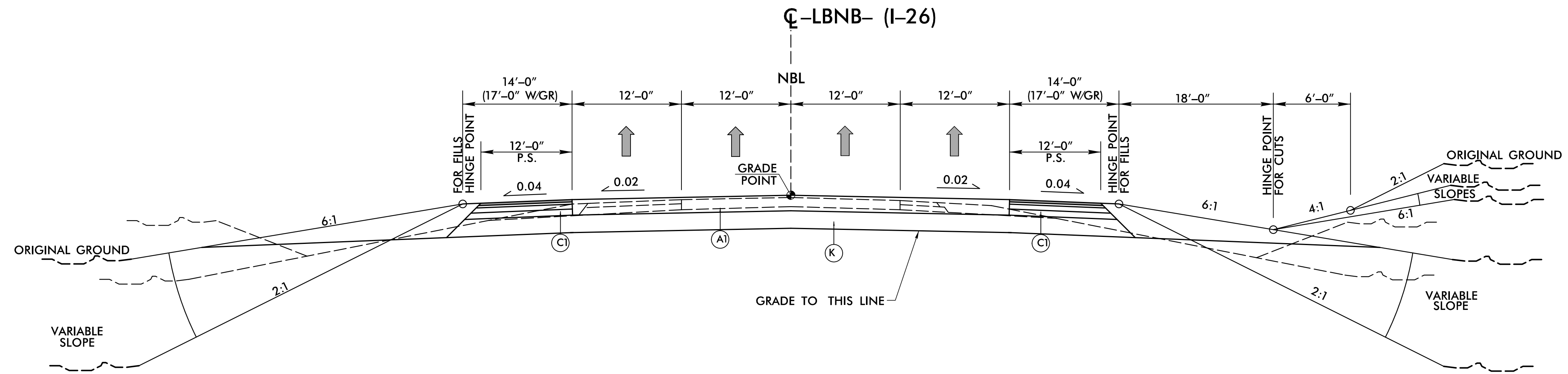


TYPICAL SECTION 2
RECONSTRUCTION
8 LANE SECTION

USE TYPICAL SECTION NO. 2 IN THE FOLLOWING LOCATIONS:
8 LANE ALTERNATIVE:
 -L4400- STA 43+00.00 TO STA 791+00.00
 -L47001- STA 909+00.00 TO STA 991+18.00
 -L47002- STA 1049+91.12 TO STA 1156+82.03
HYBRID ALTERNATIVE:
 -L4400- STA 594+00.00 TO STA 791+00.00
 -L47001- STA 909+00.00 TO STA 991+18.00
 -L47002- STA 1049+91.12 TO STA 1221+00.00

REVISIONS

PROJECT REFERENCE NO. 14400-4700	SHEET NO. 2-B
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

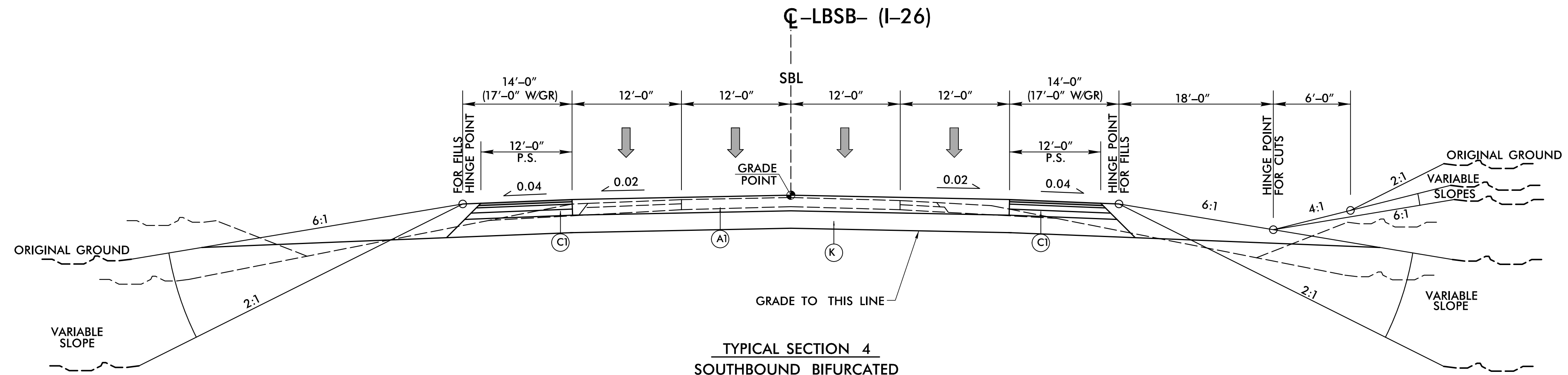


TYPICAL SECTION 3
NORTHBOUND BIFURCATED
8 LANE SECTION

USE TYPICAL SECTION NO. 3 IN THE FOLLOWING LOCATIONS:

8 LANE ALTERNATIVE:
 -LBNB47001- STA 791+00.00 TO STA 908+92.32
 -LBNB47002- STA 991+18.00 TO STA 1049+91.12

HYBRID ALTERNATIVE:
 -LBNB47001- STA 791+00.00 TO STA 908+92.32
 -LBNB47002- STA 991+18.00 TO STA 1049+30.93



TYPICAL SECTION 4
SOUTHBOUND BIFURCATED
8 LANE SECTION

USE TYPICAL SECTION NO. 4 IN THE FOLLOWING LOCATIONS:

8 LANE ALTERNATIVE:
 -LBSB47001- STA 791+00.00 TO STA 908+90.26
 -LBSB47002- STA 991+18.00 TO STA 1049+27.79

HYBRID ALTERNATIVE:
 -LBSB47001- STA 791+00.00 TO STA 908+90.26
 -LBSB47002- STA 991+18.00 TO STA 1049+91.12

PAVEMENT SCHEDULE

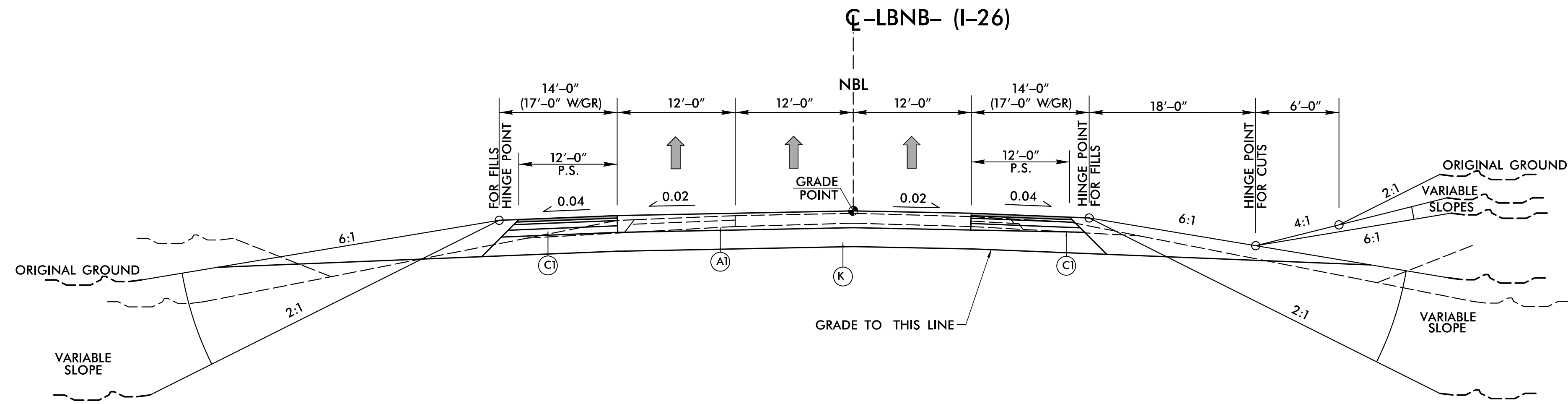
A1	PROP. PORTLAND CEMENT CONCRETE PAVEMENT
C1	PROP. ASPHALT CONCRETE PAVEMENT
K	PROP. SUBGRADE STABILIZATION
R1	DOUBLE FACED CONCRETE MEDIAN BARRIER
R2	2'-6" CONCRETE CURB AND GUTTER

REVISIONS

8/17/99

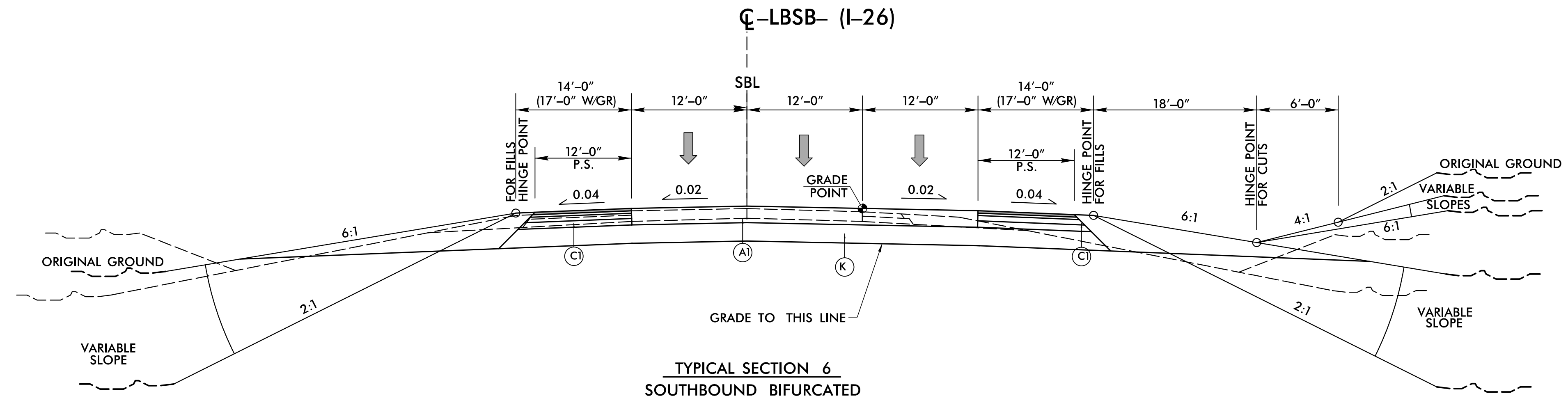
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PROJECT REFERENCE NO.	SHEET NO.
14400-4700	2-C
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



TYPICAL SECTION 5
 NORTHBOUND BIFURCATED
 6 LANE SECTION

USE TYPICAL SECTION NO. 5 IN THE FOLLOWING LOCATIONS:
 6 LANE ALTERNATIVE:
 -LBNB47001- STA 791+00.00 TO STA 908+92.32
 -LBNB47002- STA 991+18.00 TO STA 1049+91.12



TYPICAL SECTION 6
 SOUTHBOUND BIFURCATED
 6 LANE SECTION

USE TYPICAL SECTION NO. 6 IN THE FOLLOWING LOCATIONS:
 6 LANE ALTERNATIVE:
 -LBSB47001- STA 791+00.00 TO STA 908+90.26
 -LBSB47002- STA 991+18.00 TO STA 1049+27.79

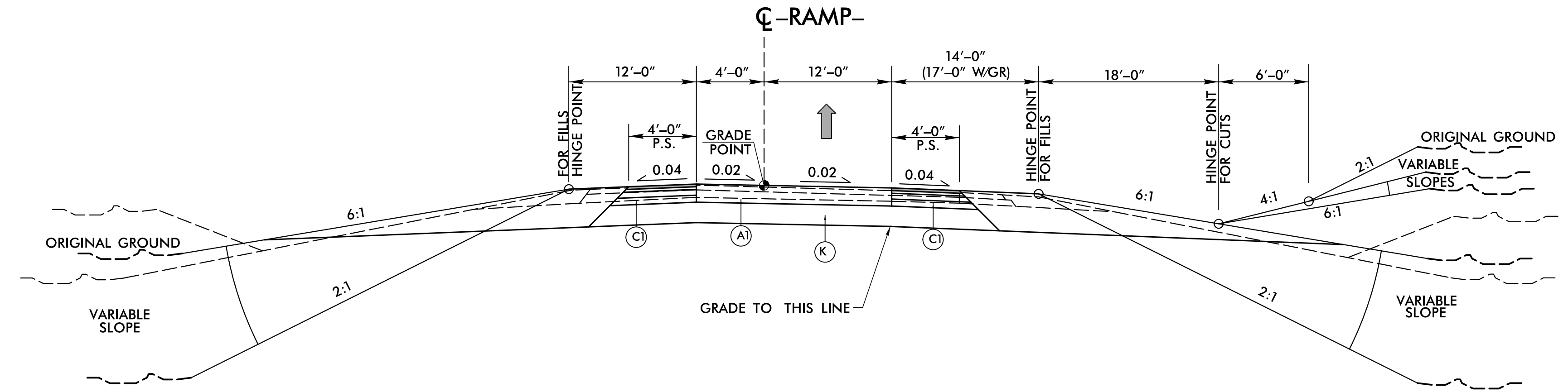
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REVISIONS

8/17/99

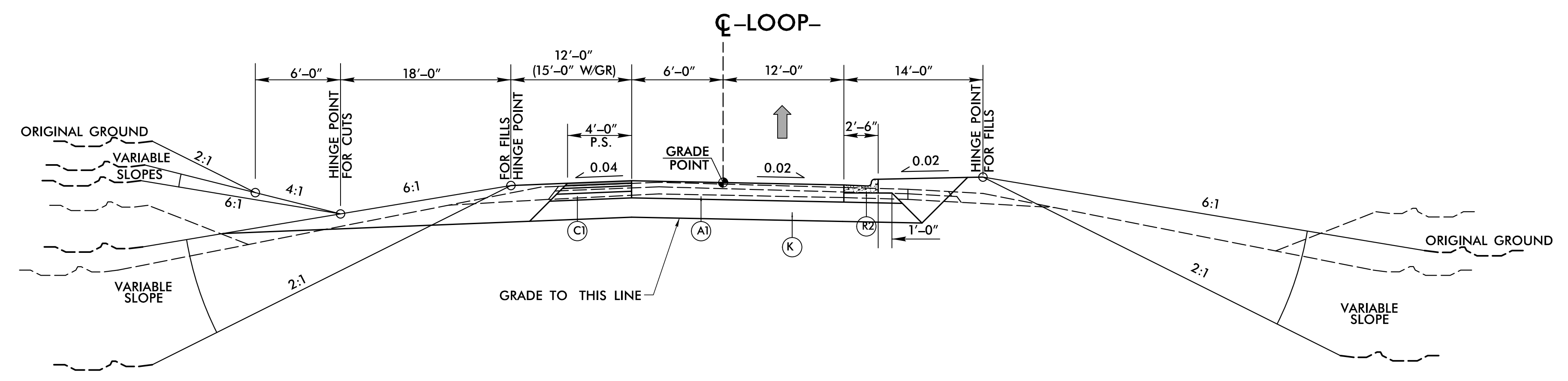
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PROJECT REFERENCE NO. 14400-4700	SHEET NO. 2-D
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



TYPICAL SECTION 7
RAMPS: REVERSE FOR QUADRANTS B&C

- USE TYPICAL SECTION NO. 7 IN THE FOLLOWING LOCATIONS:**
- Y1- RAMP A, B AND C (US 25)
 - Y3- RAMP A, B, C AND D (UPWARD RD)
 - Y6- RAMP A, B, C AND D (US 64)
 - WS1- RAMP A, B, C AND D (WEIGH STATION)
 - Y10- RAMP A, B, C AND D (US 25)
 - REST1- RAMP A, B, C AND D (REST AREA)
 - Y13- RAMP A, B, C AND D (NC 280)
 - Y15- RAMP A, B, C AND D (NC 146)



TYPICAL SECTION 8
LOOPS: REVERSE FOR QUADRANTS B&C

- USE TYPICAL SECTION NO. 8 IN THE FOLLOWING LOCATIONS:**
- Y1- LOOP D (US 25)
 - Y3- LOOP A, B, C AND D (US 64)

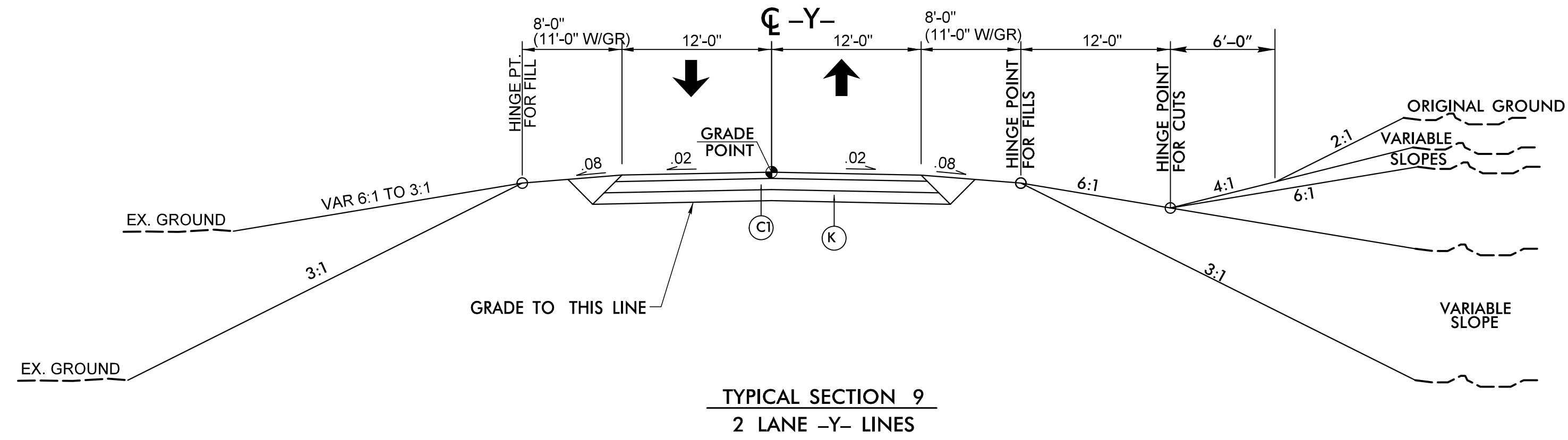
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REVISIONS

8/17/99

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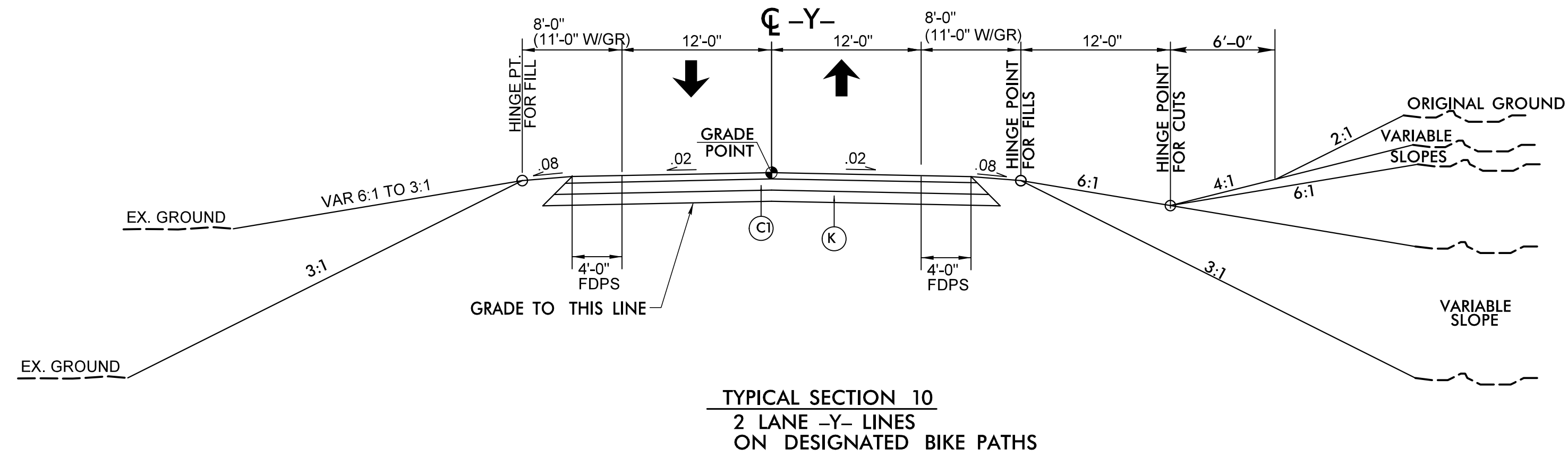
PROJECT REFERENCE NO.	SHEET NO.
14400-4700	2-E
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



TYPICAL SECTION 9
2 LANE -Y- LINES

USE TYPICAL SECTION NO. 9 IN THE FOLLOWING LOCATIONS:

- Y5- SR1525 (DANA RD.)
- Y7- SR1503 (CLEAR CREEK RD.)
- Y9- SR1534 (NAPLES RD.)



TYPICAL SECTION 10
2 LANE -Y- LINES
ON DESIGNATED BIKE PATHS

USE TYPICAL SECTION NO. 10 IN THE FOLLOWING LOCATIONS:

- Y2- SR1803 (CREST RD.)
- Y4- SR1793 (TRACEY GROVE RD.)
- Y8- SR1528 (BROOKSIDE CAMP RD.)
- Y11- SR1345 (BUTLER BRIDGE RD.)
- Y12- SR3539 (FANNING BRIDGE RD.)

PAVEMENT SCHEDULE

A1	PROP. PORTLAND CEMENT CONCRETE PAVEMENT
C1	PROP. ASPHALT CONCRETE PAVEMENT
K	PROP. SUBGRADE STABILIZATION
R1	DOUBLE FACED CONCRETE MEDIAN BARRIER
R2	2'-6" CONCRETE CURB AND GUTTER

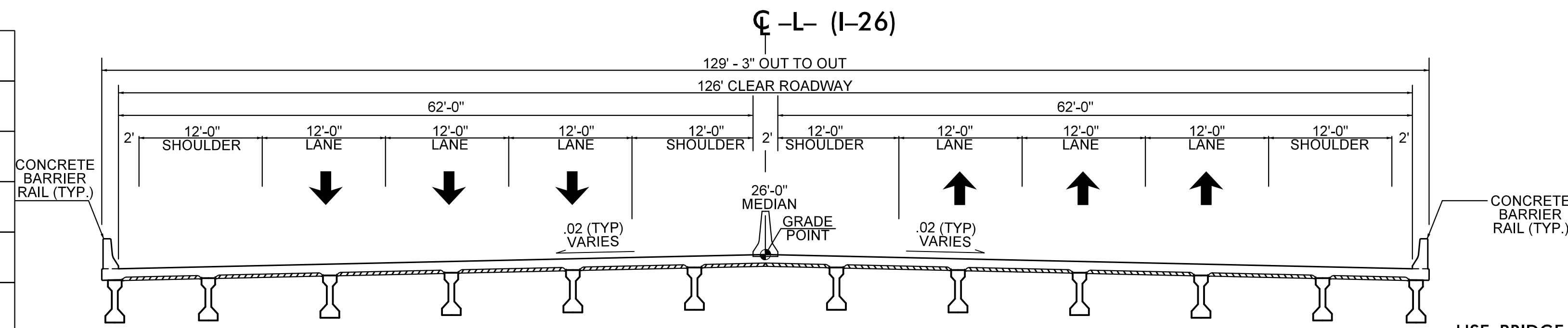
REVISIONS

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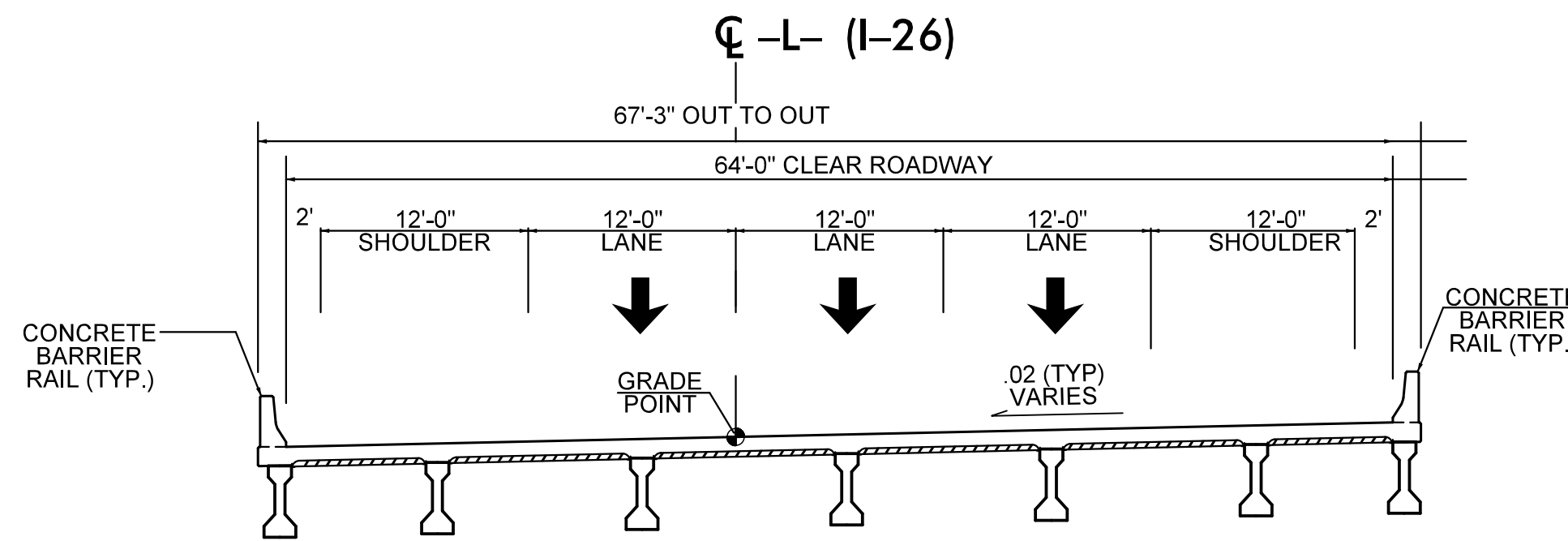
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14400-4700	2-F
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

PAVEMENT SCHEDULE	
A1	PROP. PORTLAND CEMENT CONCRETE PAVEMENT
C1	PROP. ASPHALT CONCRETE PAVEMENT
K	PROP. SUBGRADE STABILIZATION
R1	DOUBLE FACED CONCRETE MEDIAN BARRIER
R2	2'-6" CONCRETE CURB AND GUTTER



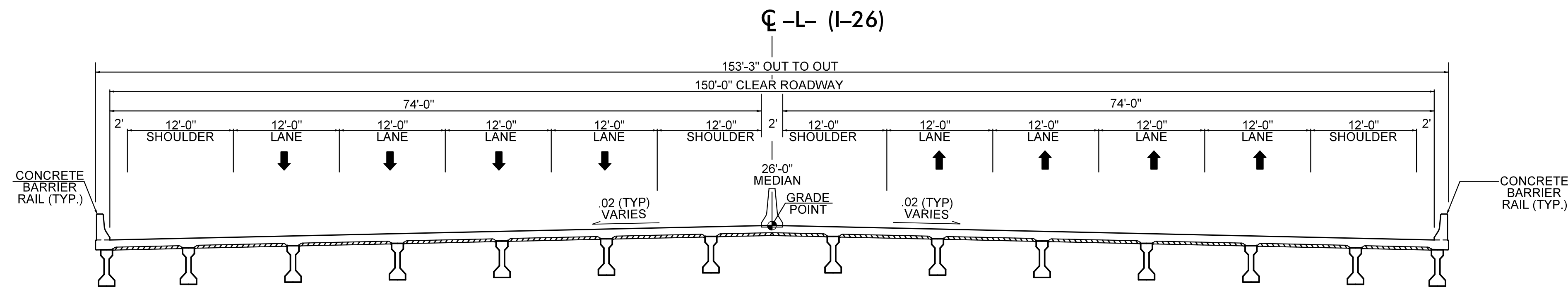
BRIDGE TYPICAL SECTION 1
RECONSTRUCTION
6 LANE SECTION

USE BRIDGE TYPICAL SECTION NO. 1 IN THE FOLLOWING LOCATIONS:
 -L4400- STA 333+00 TO STA 336+00
 -L4400- STA 571+00 TO STA 574+00
 -L4400- STA 667+50 TO STA 670+50
 -L47001- STA 962+50 TO STA 964+50
 -L47002- STA 1073+00 TO STA 1078+75



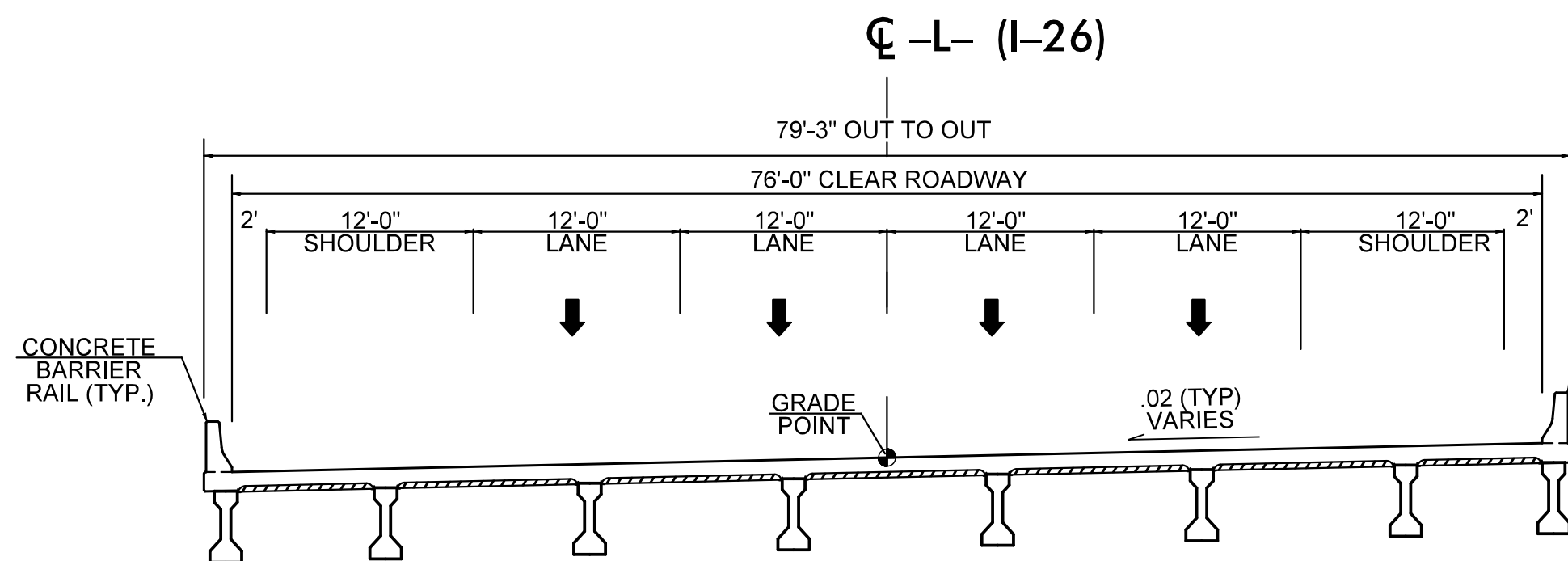
BRIDGE TYPICAL SECTION 2
RECONSTRUCTION
6 LANE SECTION (BIFURCATED)

USE BRIDGE TYPICAL SECTION NO. 2 IN THE FOLLOWING LOCATIONS:
 -LBNB47001- STA 825+00+00 TO STA 827+00
 -LBSB47001- STA 824+00+00 TO STA 826+00



TYPICAL SECTION 3
RECONSTRUCTION
8 LANE SECTION

USE BRIDGE TYPICAL SECTION NO. 3 IN THE FOLLOWING LOCATIONS:
 -L4400- STA 333+00 TO STA 336+00
 -L4400- STA 571+00 TO STA 574+00
 -L4400- STA 667+50 TO STA 670+50
 -L47001- STA 962+50 TO STA 964+50
 -L47002- STA 1073+00 TO STA 1078+75



BRIDGE TYPICAL SECTION 4
RECONSTRUCTION
8 LANE SECTION (BIFURCATED)

USE BRIDGE TYPICAL SECTION NO. 4 IN THE FOLLOWING LOCATIONS:
 -LBNB47001- STA 825+00+00 TO STA 827+00
 -LBSB47001- STA 824+00+00 TO STA 826+00

REVISIONS

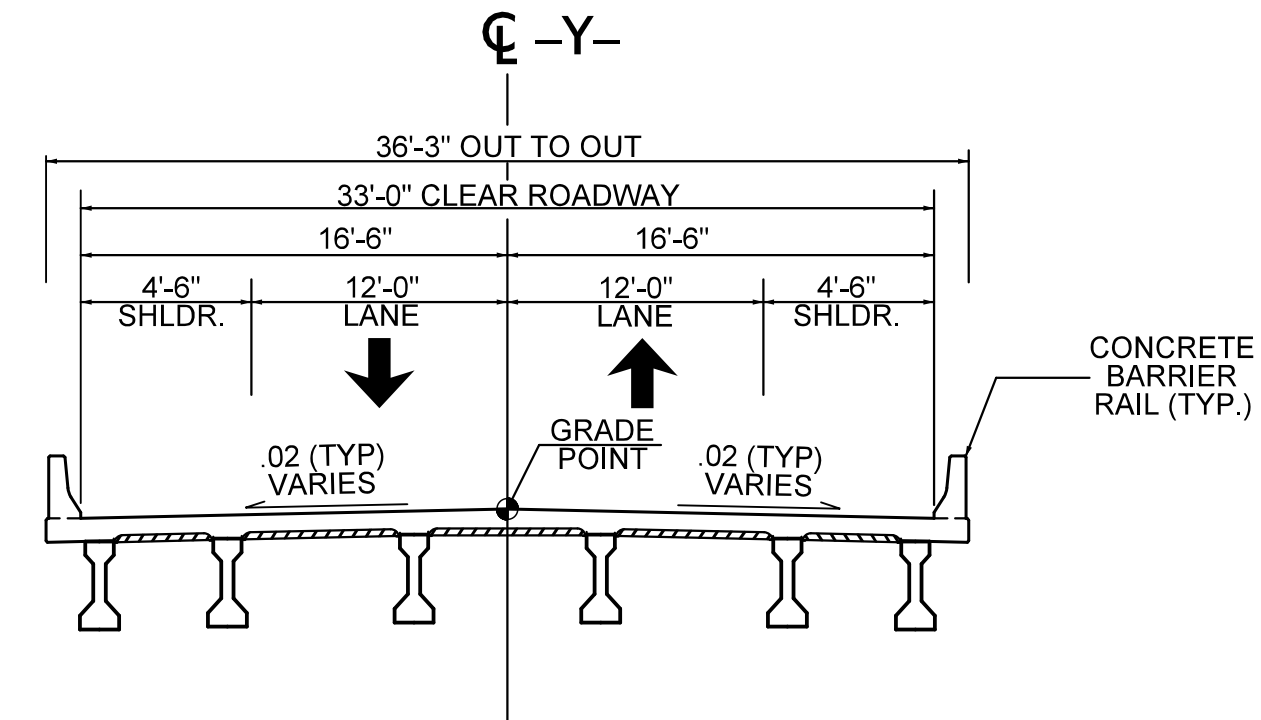
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8/17/99

PAVEMENT SCHEDULE	
A1	PROP. PORTLAND CEMENT CONCRETE PAVEMENT
C1	PROP. ASPHALT CONCRETE PAVEMENT
K	PROP. SUBGRADE STABILIZATION
R1	DOUBLE FACED CONCRETE MEDIAN BARRIER
R2	2'-6" CONCRETE CURB AND GUTTER

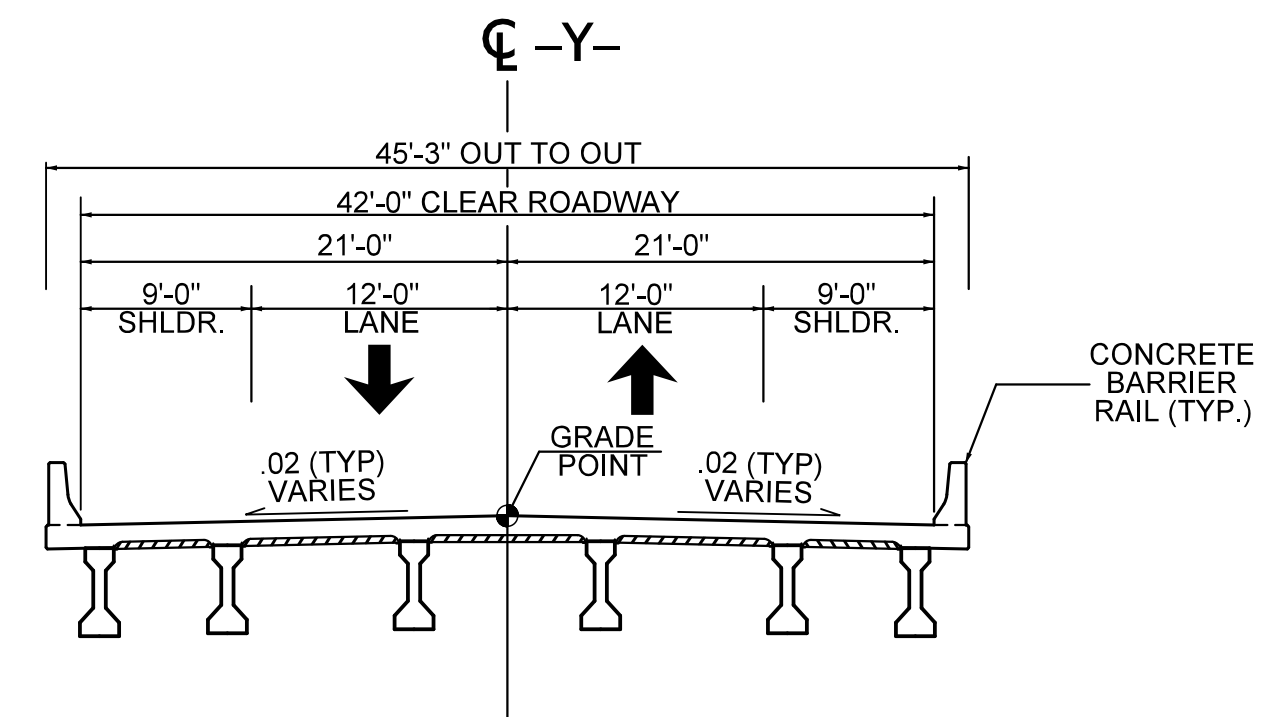
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RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



BRIDGE TYPICAL SECTION 5
RECONSTRUCTION
2 LANE SECTION

USE TYPICAL SECTION NO. 5 IN THE FOLLOWING LOCATIONS:

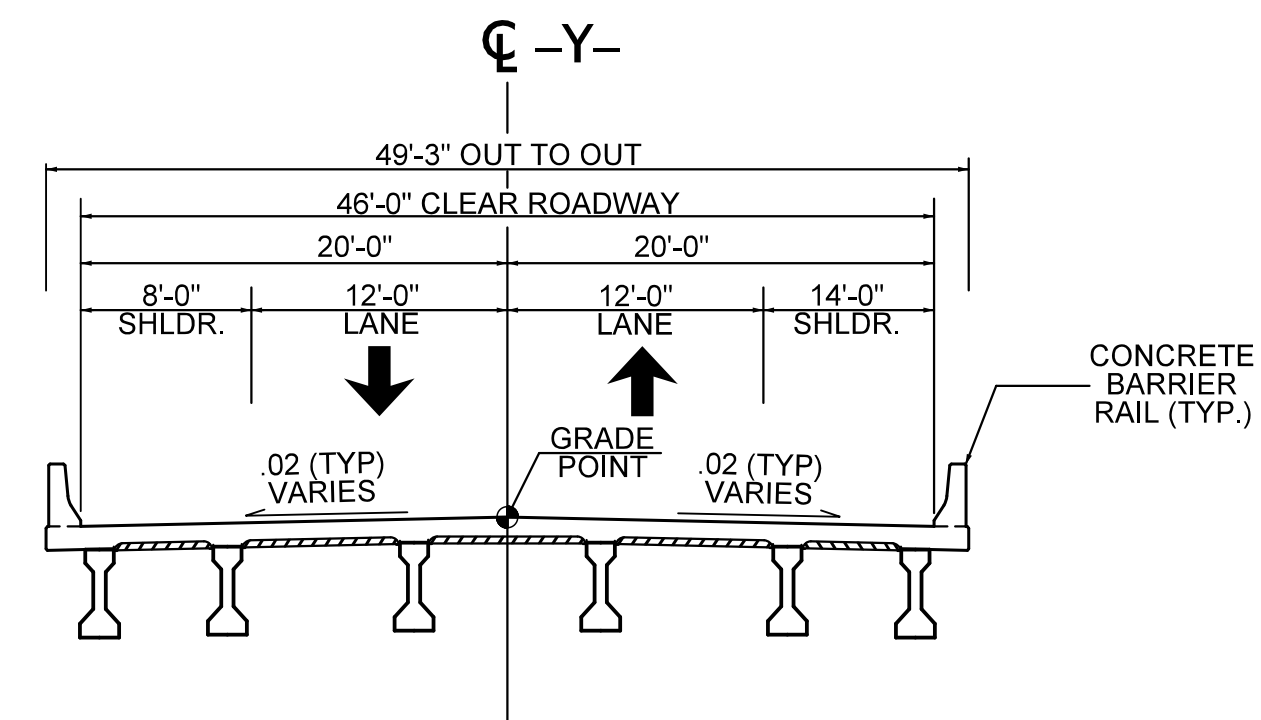
- Y2- SR1803 (CREST RD.) STA 18+50 TO STA 21+10
- Y4- SR1793 (TRACEY GROVE RD.) STA 21+30 TO STA 24+15
- Y8- SR1528 (BROOKSIDE CAMP RD.) STA 33+05 TO STA 35+70
- Y12- SR3539 (FANNING BRIDGE RD.) STA 21+75 TO STA 24+38



BRIDGE TYPICAL SECTION 6
RECONSTRUCTION
2 LANE SECTION

USE TYPICAL SECTION NO. 6 IN THE FOLLOWING LOCATIONS:

- Y5- SR1525 (DANA RD.) STA 34+80 TO STA 37+45
- Y7- SR1503 (CLEAR CREEK RD.) STA 19+05 TO STA 21+85
- Y9- SR1534 (NAPLES RD.) STA 37+20 TO STA 40+05



BRIDGE TYPICAL SECTION 7
RECONSTRUCTION
2 LANE SECTION

USE TYPICAL SECTION NO. 7 IN THE FOLLOWING LOCATIONS:

- Y11- SR1345 (BUTLER BRIDGE RD.) STA 16+55 TO STA 19+00