



Howard Gap: Resilience After Landslides

APPENDIX F

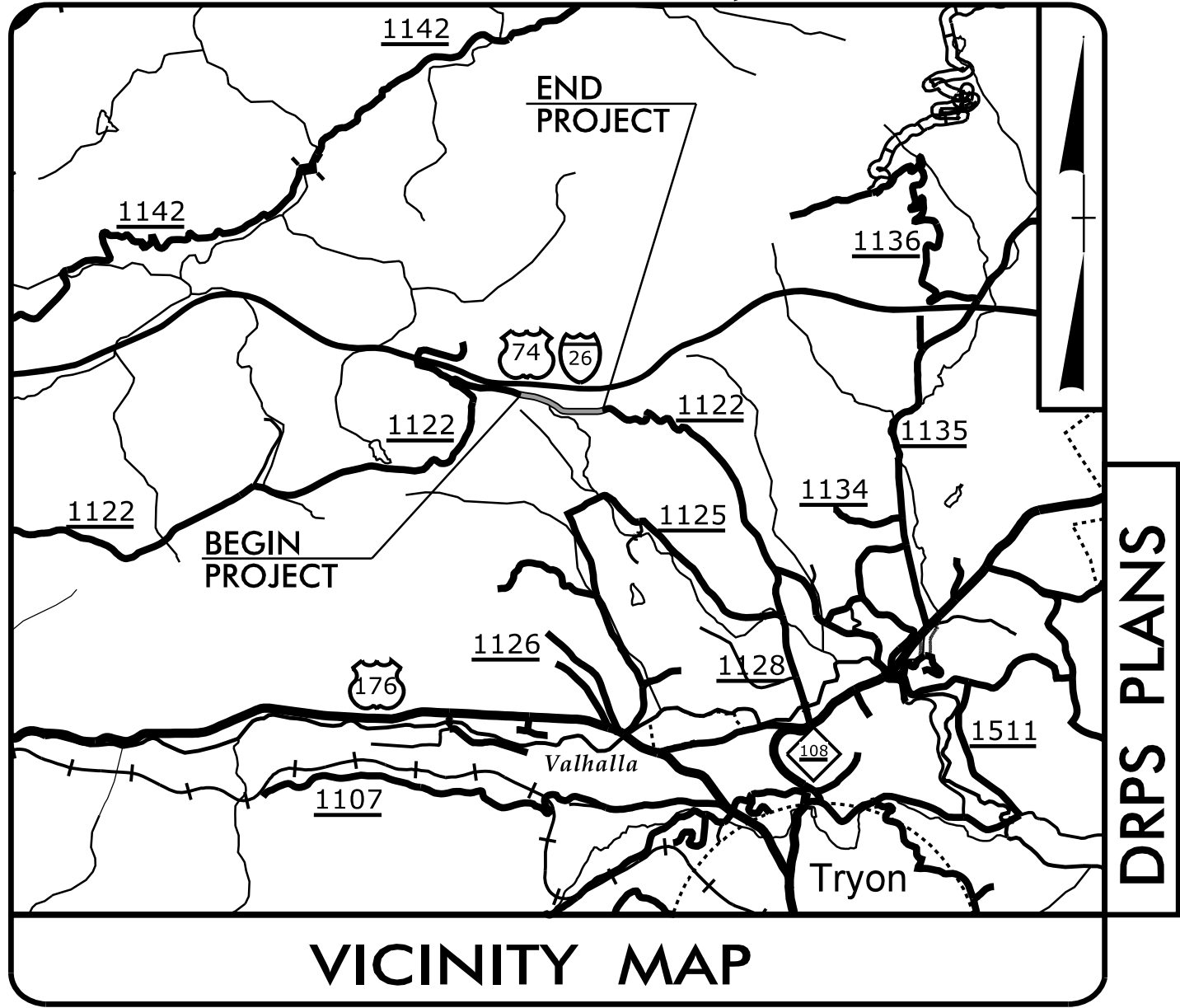
Engineering Plans

9/18/2026
X:\NCDOT\Div 14 Howard Gap Road Rehab\Hydraulics\Redlines\HGR_Rdy_tsh.dgn
User:bhenegar

PROJECT: 82000.05

CONTRACT:

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP

DRPS PLANS

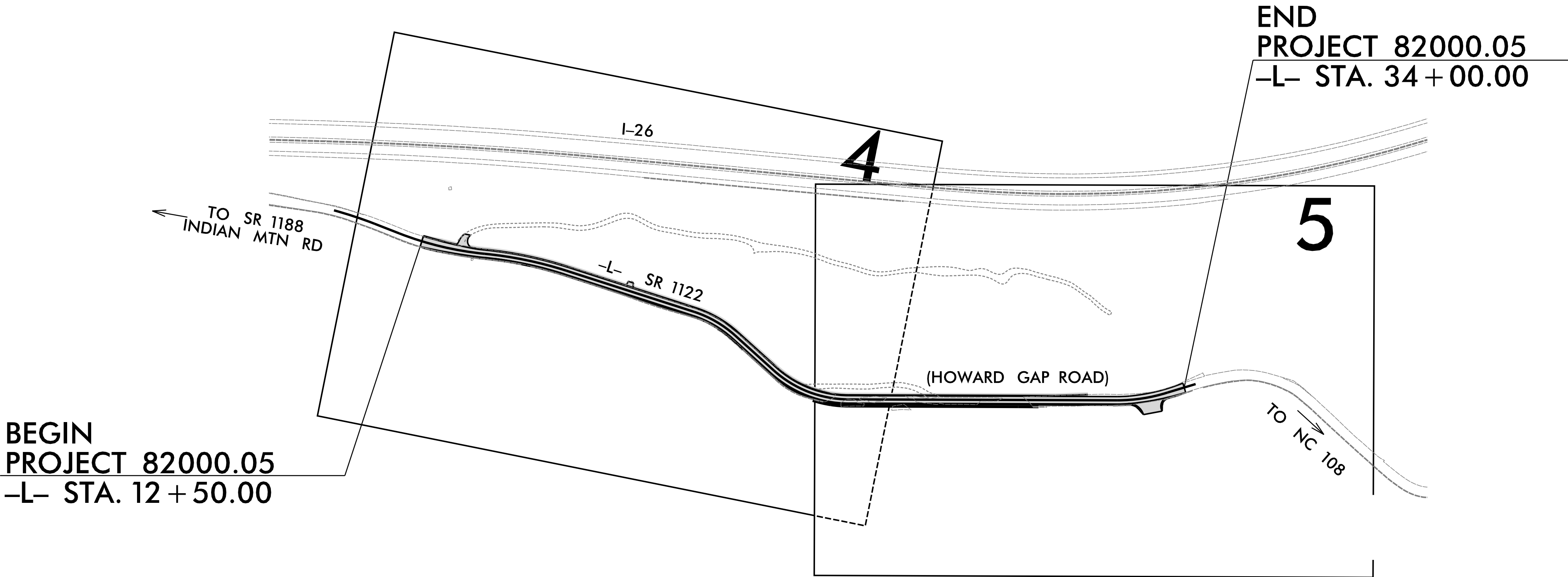
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

POLK COUNTY

LOCATION: SR 1122 (HOWARD GAP ROAD)
APPROX. 0.35 MILES EAST OF INDIAN MOUNTAIN RD

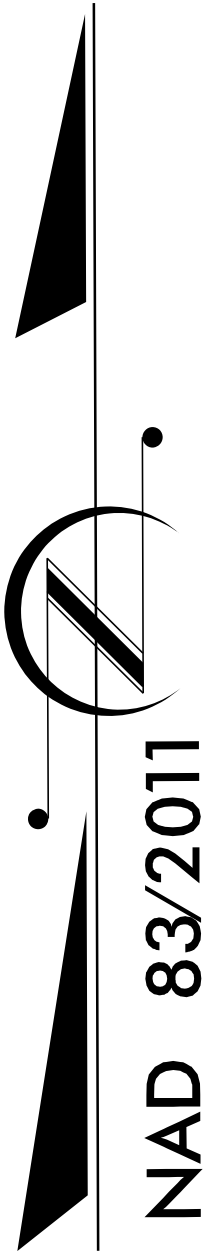
TYPE OF WORK: GRADING, DRAINAGE, PAVING &
RETAINING WALLS

REDLINE DRAINAGE PLANS 9-18-26

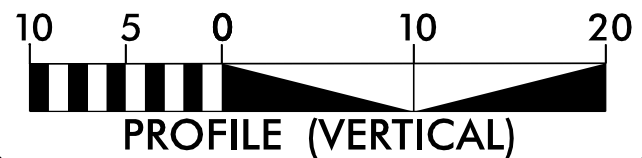


THIS IS NOT A CONTROLLED ACCESS PROJECT.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	82000.05	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
82000.05	N/A	PE	



GRAPHIC SCALES



DESIGN DATA

ADT 2026 = 500
V = 40 MPH

FUNC CLASS =
LOCAL
SUBREGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY PROJECT = 0.407 MILES
TOTAL LENGTH OF PROJECT = 0.407 MILES

NCDOT CONTACT: JEANETTE L. WHITE, PE

PLANS PREPARED BY:
TGS ENGINEERS
201 W. MARION ST.
SUITE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO. C-0275

RIGHT OF WAY DATE:
TBD

LETTING DATE:
TBD

2024 STANDARD SPECIFICATIONS

PLANS PREPARED FOR:
NORTH CAROLINA DEPARTMENT
OF TRANSPORTATION
DIVISION 14
253 WEBSTER RD
SYLVA, NC 28779

JIMMY L. TERRY, PE
PROJECT ENGINEER

KATELYN S. ALMOND
PROJECT DESIGN ENGINEER

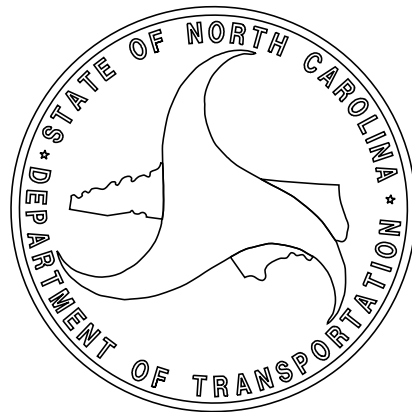
HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN
ENGINEER

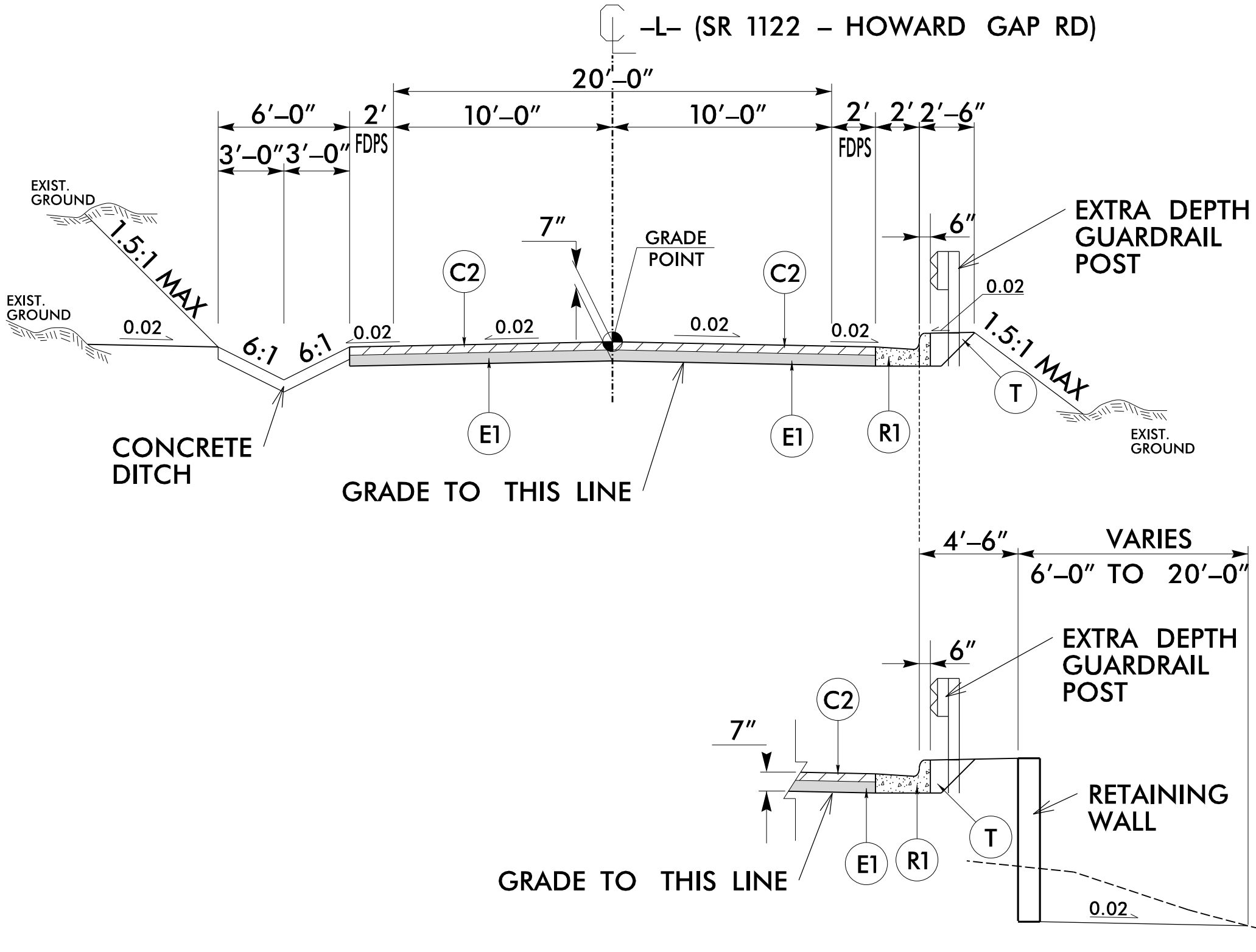
SIGNATURE: P.E.

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



6/2/99
9/18/2026
X:\NORTH\Div 14 Howard Gap Road Rehab\Hydraulics\Redlines\HGR_Rdy_typ.dgn
User:thenegeer

PRELIMINARY PAVEMENT SCHEDULE (May 20, 2026)	
C1	PROP. APPROX. 1½" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD.
C2	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.
E1	PROP. APPROX. 4" ASPHALT CONCRETE BASE COURSE, TYPE B25.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.
R1	2'-6" CONCRETE CURB AND GUTTER
U	EXISTING PAVEMENT
V1	1½" MILLING
T	EARTH MATERIAL
PAVEMENT EDGE SLOPES ARE 1:1 UNLESS OTHERWISE SHOWN.	

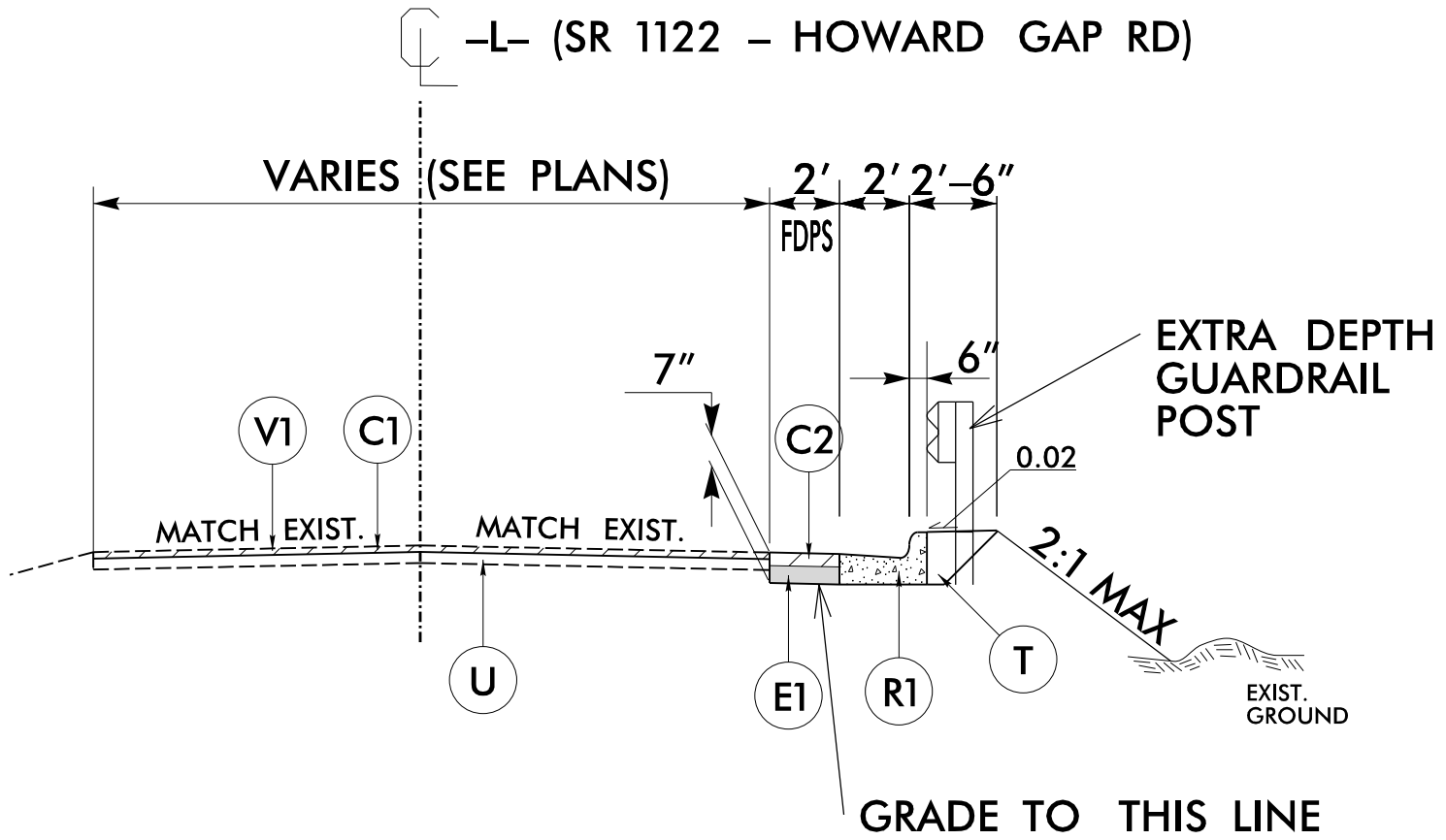


TYPICAL SECTION NO. 1

USE TYPICAL SECTION NO. 1
-L- STA. 12+50.00 TO -L- STA. 31+50.00

PART SECTION NO. 1A

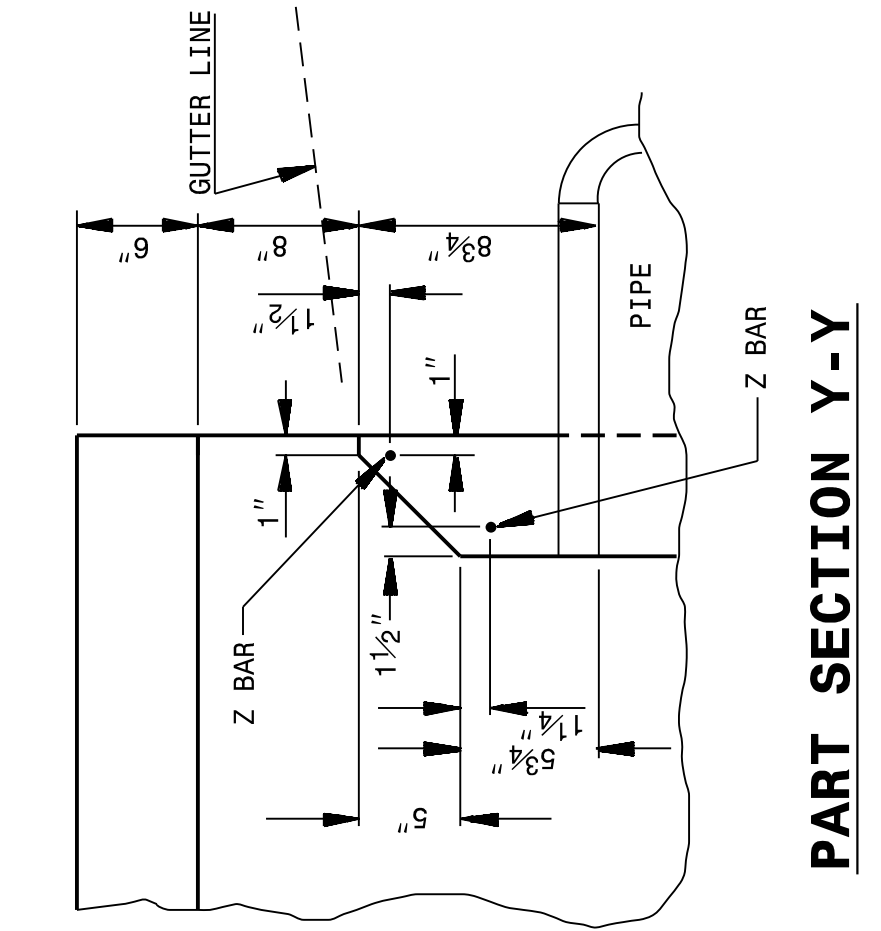
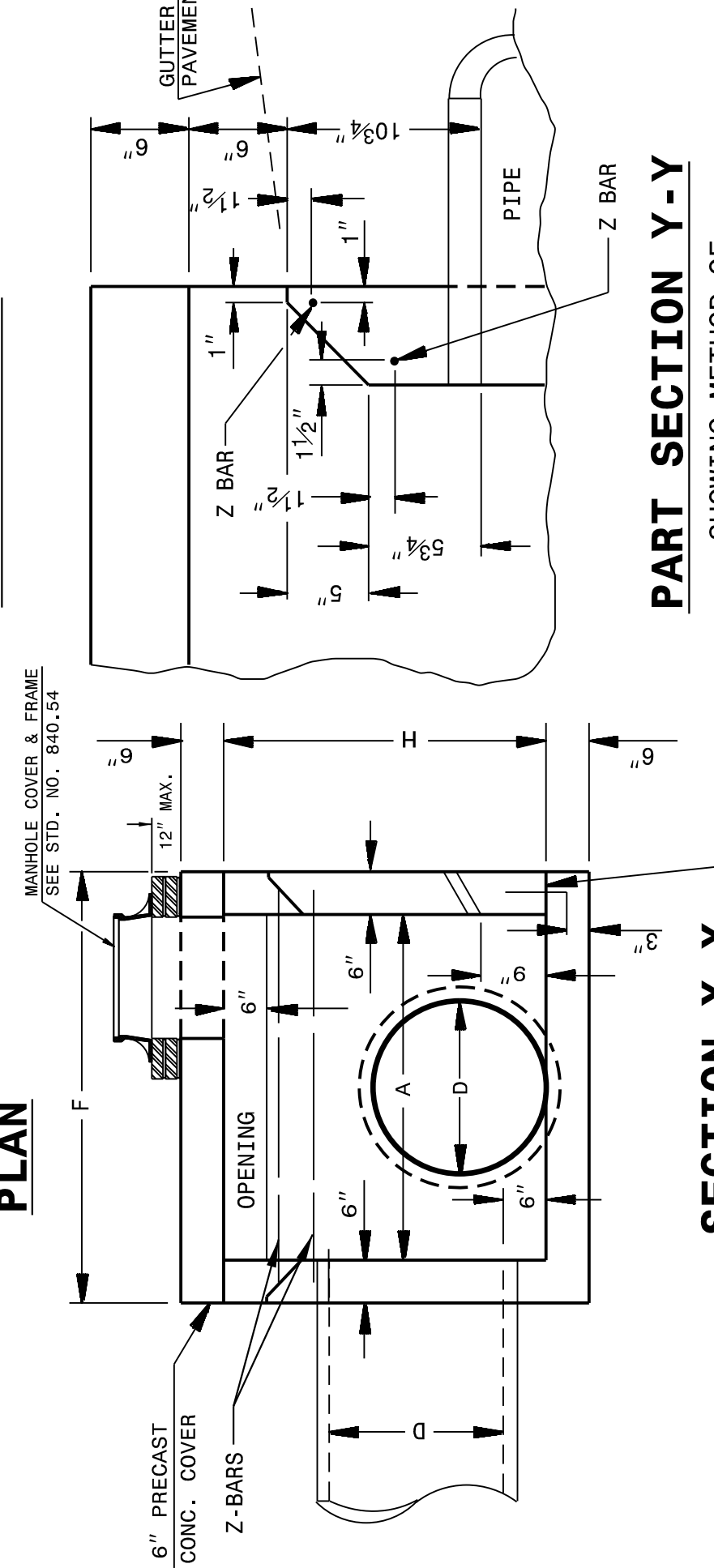
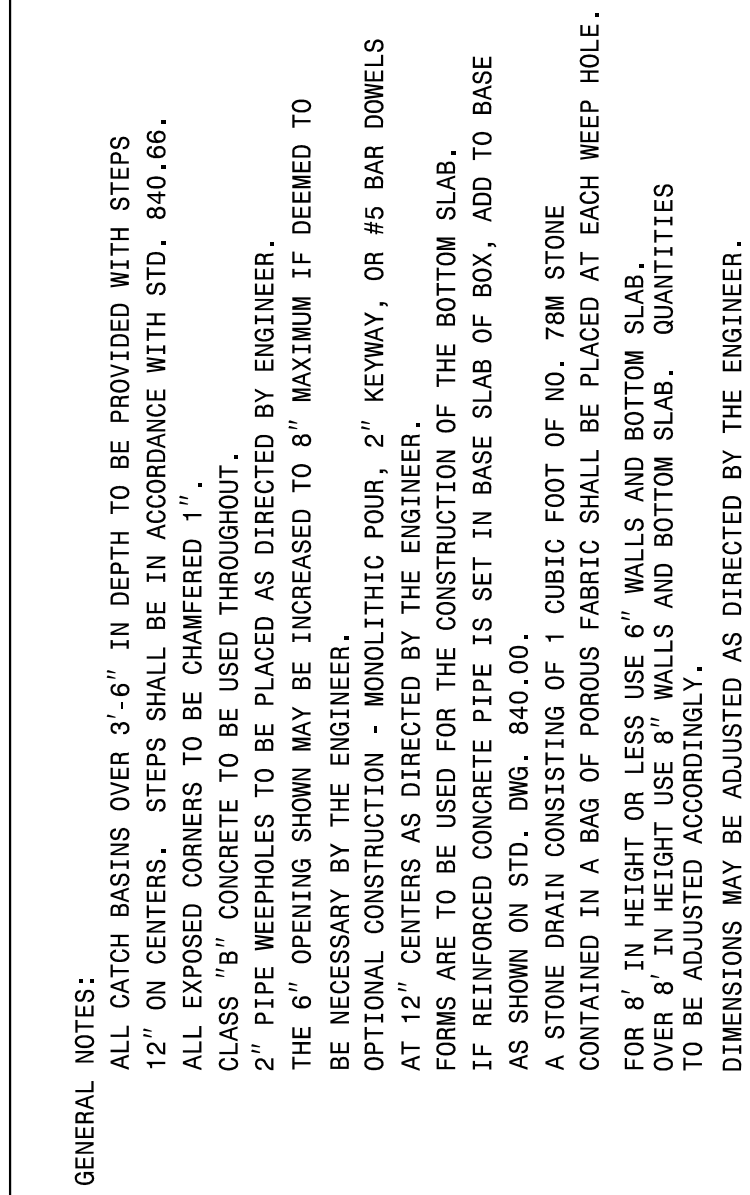
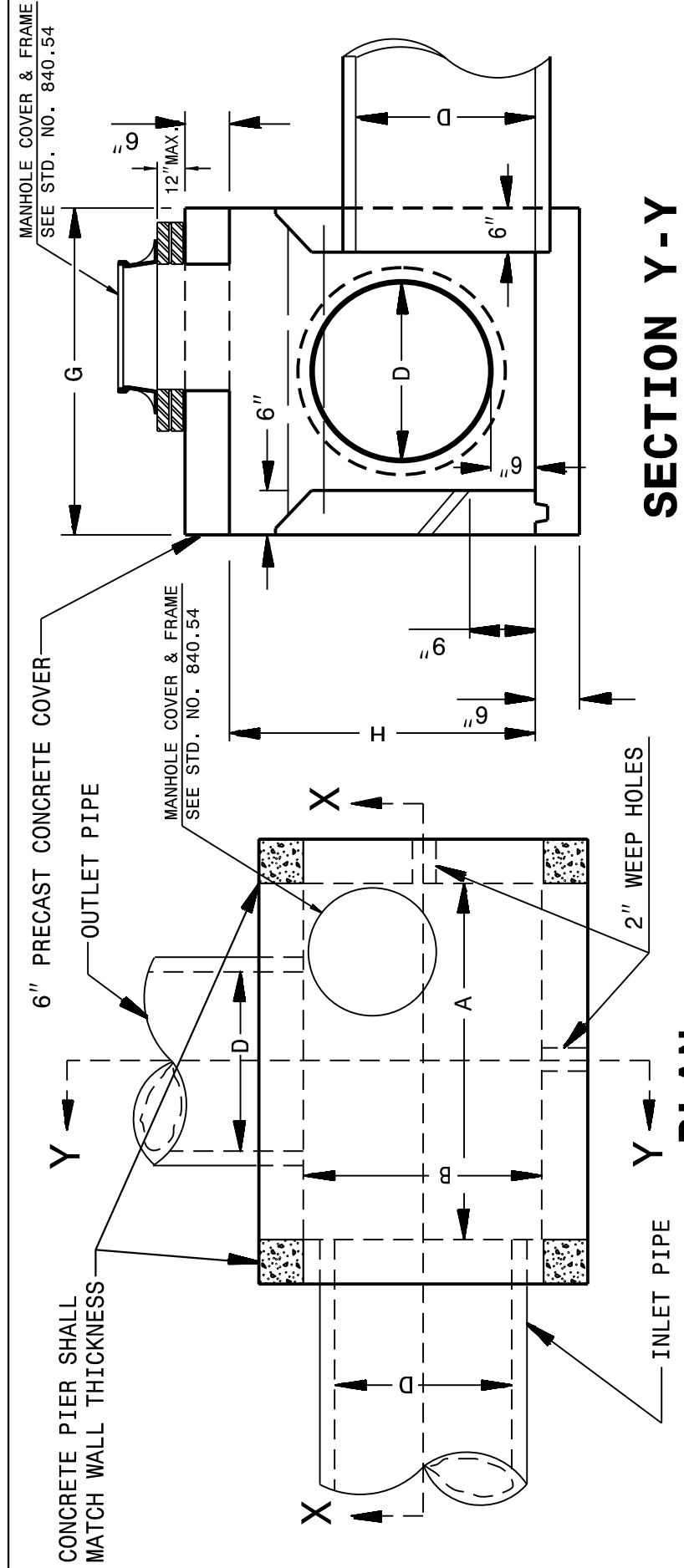
USE PART SECTION NO. 1A
-L- STA. 24+02.74 TO -L- STA. 30+04.71



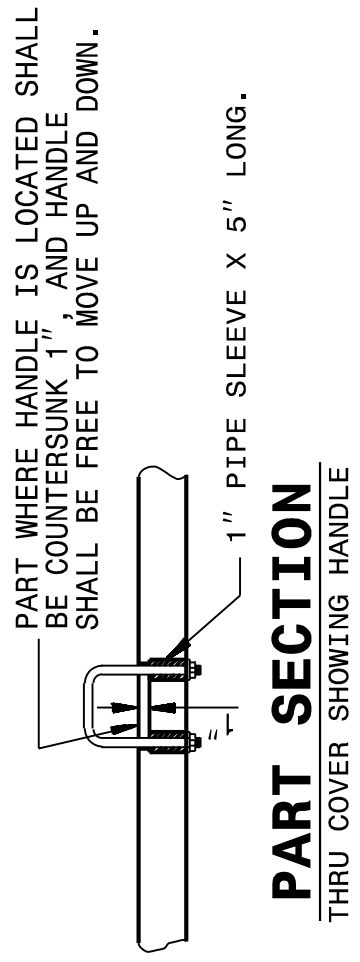
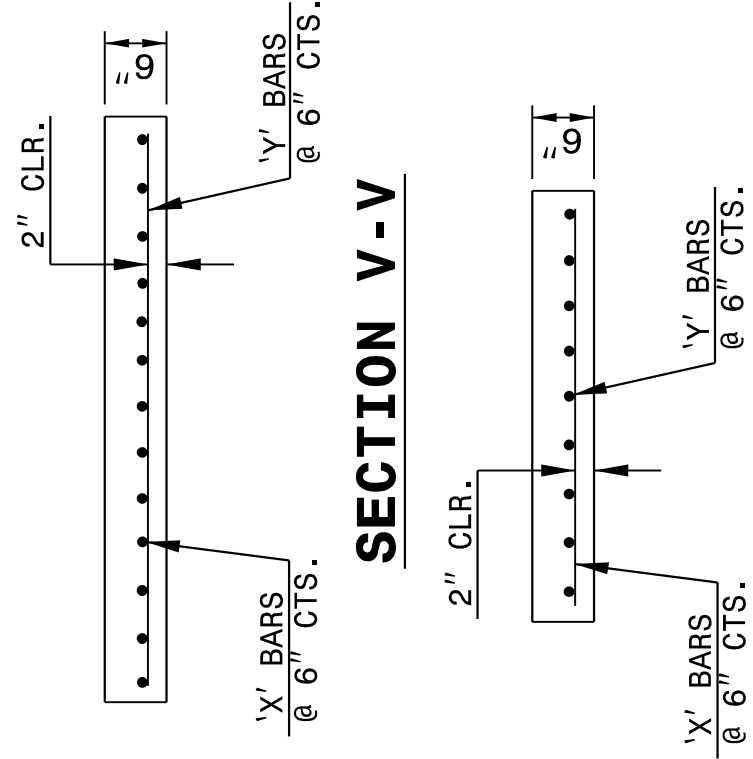
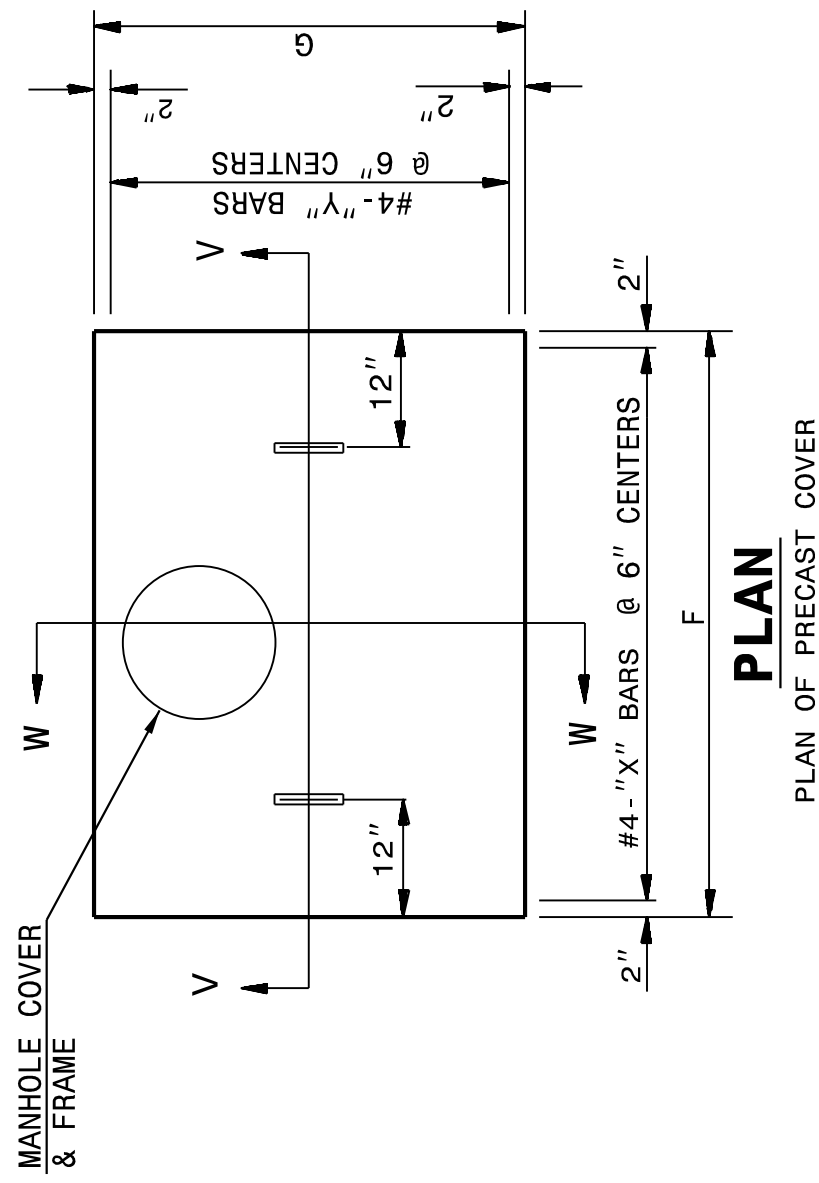
TYPICAL SECTION NO. 2

USE TYPICAL SECTION NO. 2
-L- STA. 31+50.00 TO -L- STA. 34+00.00

PROJECT REFERENCE NO.		SHEET NO.	
82000.05		2A-1	
ROADWAY DESIGN ENGINEER		PAVEMENT DESIGN ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			



MIN. DIMENSIONS AND QUANTITIES FOR CONCRETE CATCH BASIN (BASED ON MIN. HEIGHT, H)																	
DIM'S OF BOX & PIPE				REINFORCING				TOP & BOT. SLAB DIMENSIONS		CU. YDS. CONC. IN BOX		TOTAL QUANTITIES BOX & SLABS		DEDUCTON ONE PIPE		DED ONE 6" THROAT OPENING	
PIPE	SPAN	WIDTH	HEIGHT	BARS - X	BARS - Y	BARS - Z	F	G	TOP SLAB	BOT. SLAB	MULTIPLY BY	U.S. REINF.	10 ³ LIN. FT.	C. S.	R. C.		
D	A	B	H	NO. LENGTH	NO. LENGTH	NO. LENGTH											
12"	3'-6"	2'-3"	1'-10"	4	6	3'-0"	4	4'-6"	3'-3"	0.181	0.271	0.250	27	1.048	0.015	0.032	0.046
15"	3'-6"	2'-3"	2'-1"	4	6	3'-0"	4	4'-6"	3'-3"	0.181	0.271	0.250	27	1.048	0.023	0.036	0.046
18"	4'-0"	2'-8"	2'-4"	5	7	4'-9"	2	5'-0"	3'-6"	0.226	0.340	0.284	35	1.379	0.033	0.049	0.053
24"	4'-0"	2'-10"	3'-5"	5	7	4'-9"	2	5'-0"	3'-6"	0.226	0.340	0.284	35	1.379	0.059	0.085	0.053
30"	4'-0"	3'-6"	3'-4"	5	7	4'-9"	2	4'-9"	4'-6"	0.278	0.417	0.315	43	1.916	0.082	0.127	0.053
36"	4'-6"	4'-0"	3'-10"	5	10	5'-3"	2	5'-3"	5'-0"	0.340	0.510	0.352	51	2.390	0.132	0.178	0.059
42"	5'-0"	4'-6"	4'-4"	5	12	5'-9"	2	5'-9"	6'-0"	0.407	0.611	0.359	64	2.914	0.180	0.243	0.066
48"	5'-0"	5'-0"	4'-10"	5	13	5'-9"	2	5'-9"	6'-0"	0.444	0.666	0.407	68	3.298	0.235	0.317	0.066



840D04

SHEET 2 OF 2
840D04

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

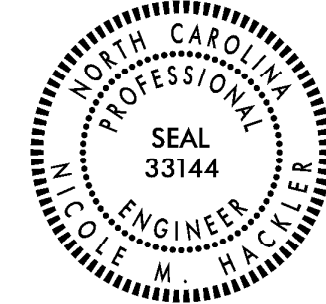
ENGLISH DETAIL DRAWING FOR
CONCRETE CATCH BASIN
(3 OR 4 SIDE OPEN THROAT)
(MANHOLE OPTIONAL)

SEE PLATE FOR TITLE

ORIGINAL BY: _____ DATE: _____
MODIFIED BY: rnbritt DATE: 07-03-2014
CHECKED BY: _____ DATE: _____
FILE SPEC.: details/nbritt/english/hydro/840d04.dgn

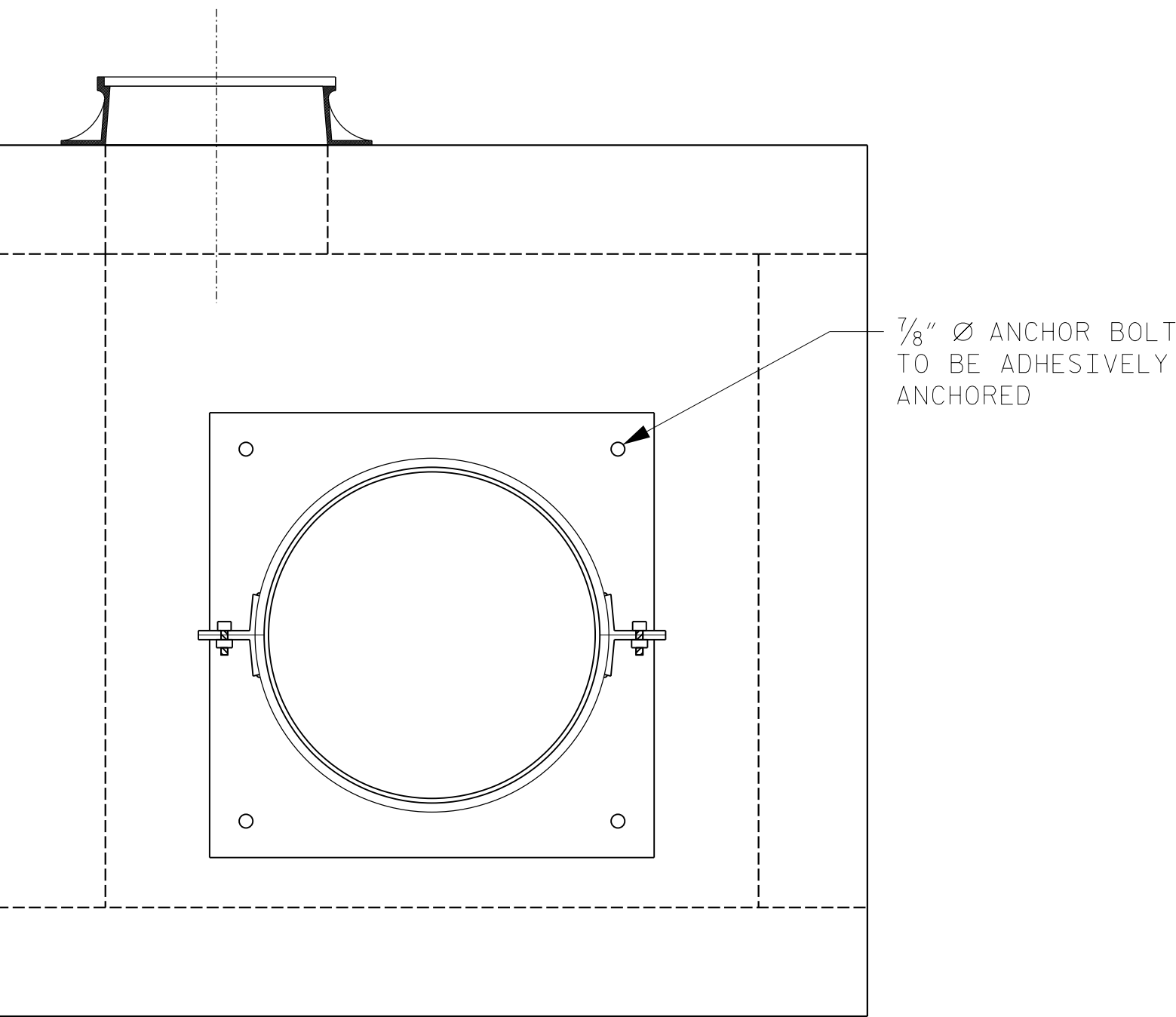
**CONTRACT STANDARDS
AND DEVELOPMENT UNIT**
Office 919-707-6950 FAX 919-250-4119

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

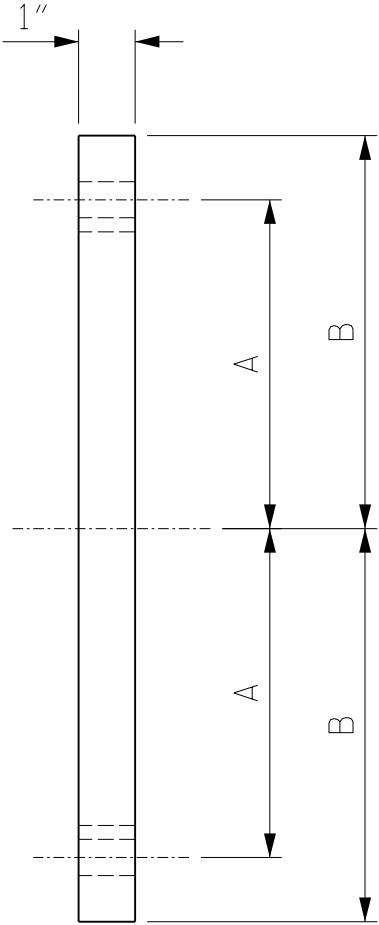


NOTES

- MOUNTING PLATE SHALL BE AASHTO M270 GRADE 36.
- MOUNTING PLATE SURFACES SHALL BE SMOOTH AND STRAIGHT.
- ADHESIVELY ANCHORED BOLTS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS GUIDELINES.
- FOR SPECIAL DESIGN PIPE CONNECTION, SEE SPECIAL PROVISIONS.
- ADHESIVELY ANCHORED BOLTS SHALL BE LEVEL 1 FIELD TESTED AND THE YIELD LOAD OF THE 7/8" Ø BOLT SHALL BE 4 KIPS.

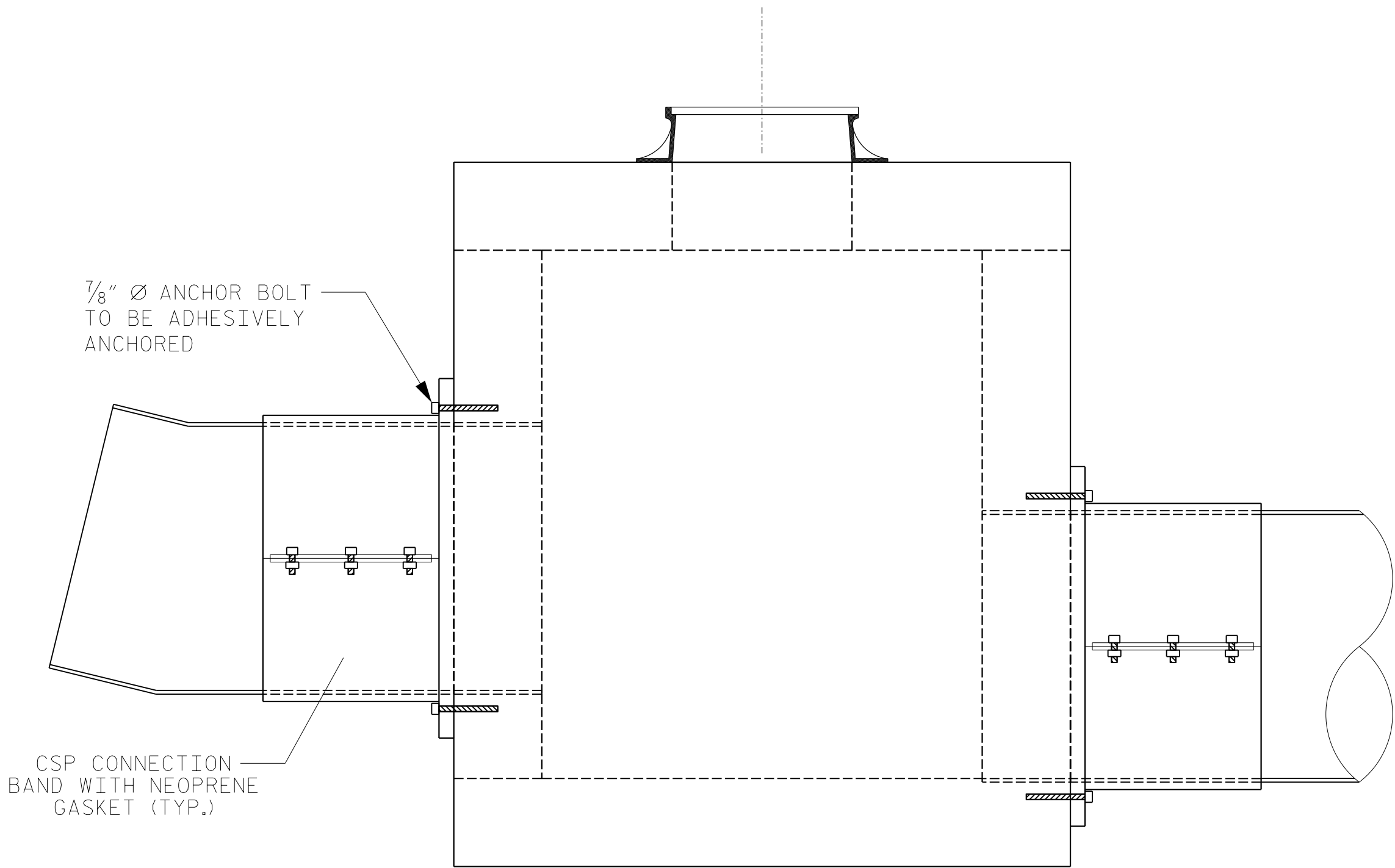
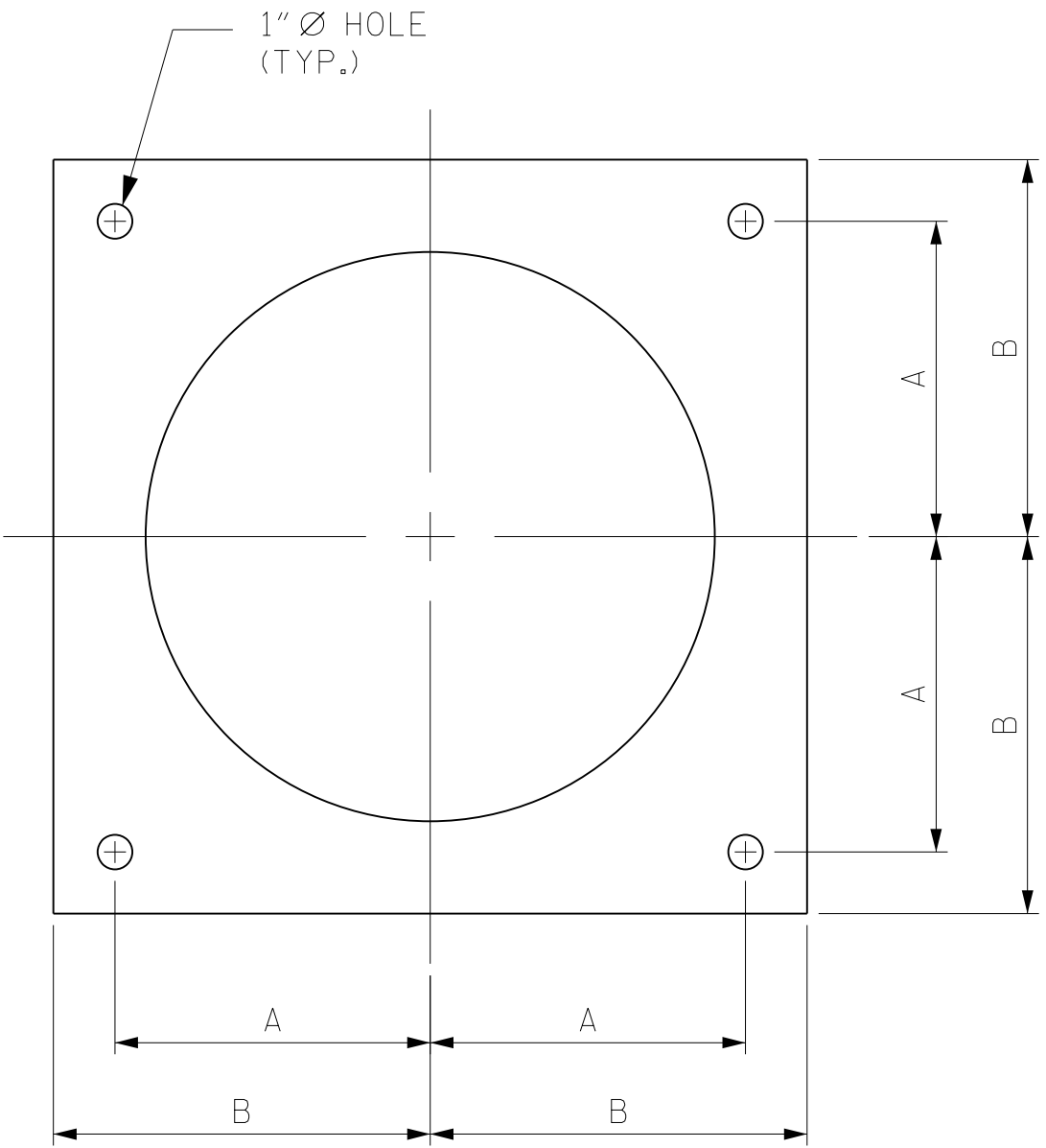


END ELEVATION



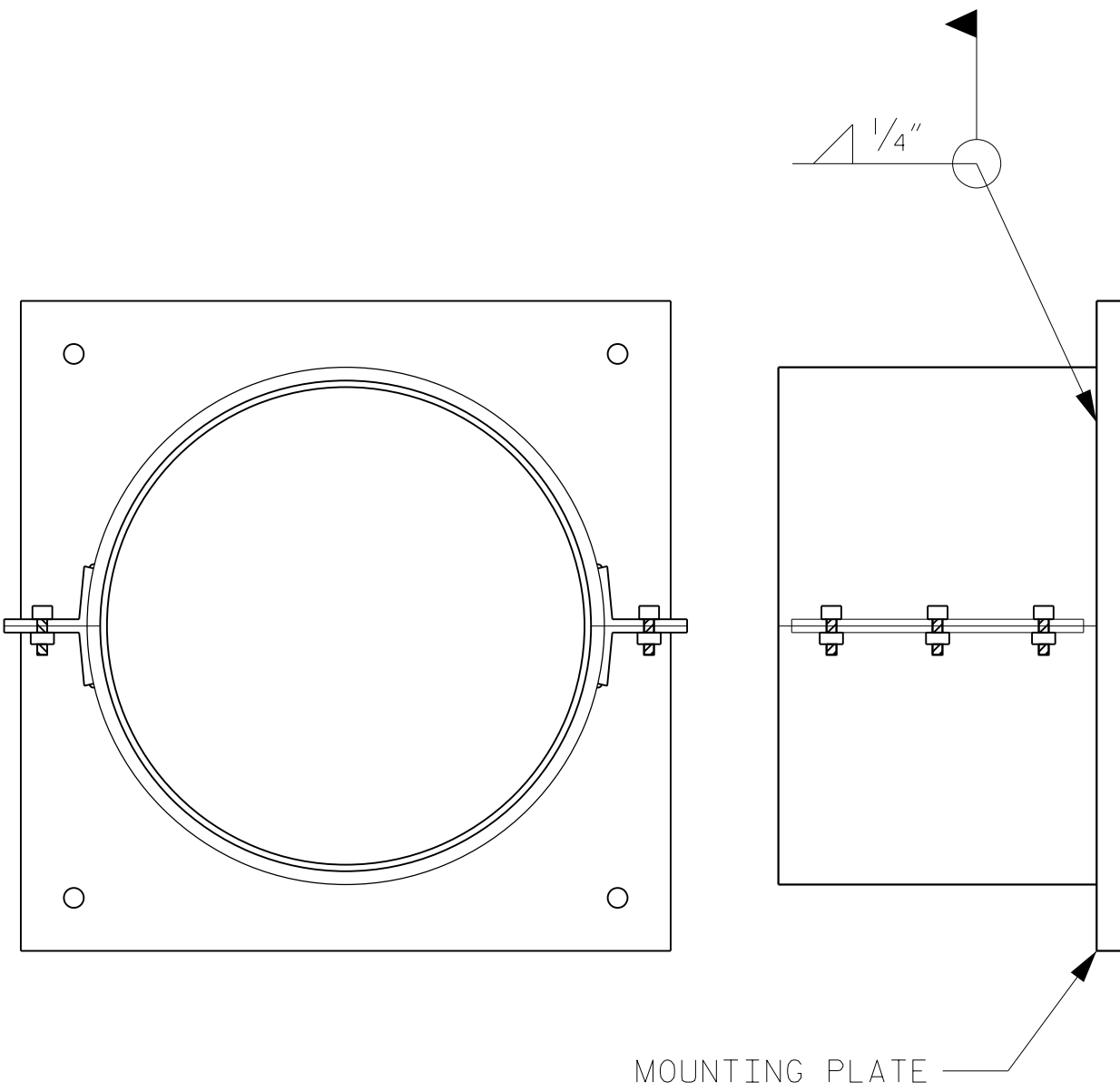
	18" CSP	24" CSP	30" CSP	36" CSP
DIM. A	12"	15"	18"	21"
DIM. B	15"	18"	21"	24"

MOUNTING PLATE



SIDE ELEVATION

ELEVATION SHOWN FOR ILLUSTRATIVE PURPOSES. FOR LOCATIONS OF REQUIRED SPECIAL DESIGN PIPE CONNECTIONS, SEE DRAINAGE SUMMARY SHEETS.



MOUNTING PLATE

CONNECTION BOND TO
MOUNTING PLATE WELD DETAIL

SHEET 1 OF 1

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SPECIAL DESIGN
PIPE CONNECTION

PROJECT REFERENCE NO.
82000.05

SHEET NO.
04

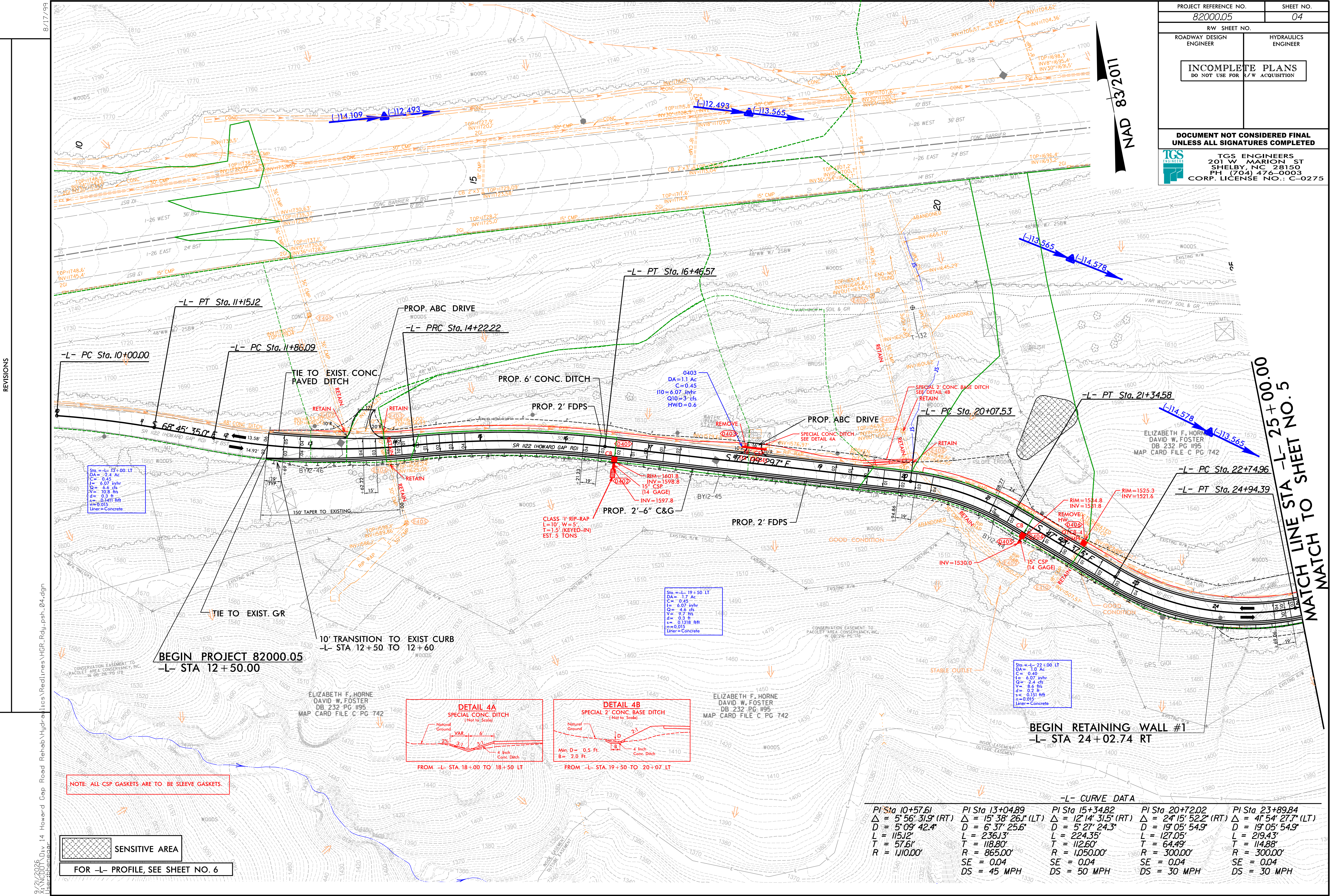
ROADWAY DESIGN
ENGINEER

HYDRAULICS
ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR A/W ACQUISITION

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UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275



-L- CURVE DATA				
PI Sta 10+57.61	PI Sta 13+04.89	PI Sta 15+34.82	PI Sta 20+72.02	PI Sta 23+89.84
$\Delta = 5^\circ 56' 31.9" (RT)$	$\Delta = 15^\circ 38' 26.1" (LT)$	$\Delta = 12^\circ 14' 31.5" (RT)$	$\Delta = 24^\circ 15' 52.2" (RT)$	$\Delta = 4^\circ 54' 27.7" (LT)$
$D = 5^\circ 09' 42.4"$	$D = 5^\circ 37' 25.6"$	$D = 5^\circ 27' 24.3"$	$D = 19^\circ 05' 54.9"$	$D = 19^\circ 05' 54.9"$
$L = 115.12'$	$L = 236.13'$	$L = 224.35'$	$L = 127.05'$	$L = 219.43'$
$T = 57.61'$	$T = 118.80'$	$T = 112.60'$	$T = 64.49'$	$T = 114.88'$
$R = 1,110.00'$	$R = 865.00'$	$R = 1,050.00'$	$R = 300.00'$	$R = 300.00'$
$SE = 0.04$	$SE = 0.04$	$SE = 0.04$	$SE = 0.04$	$SE = 0.04$
$DS = 45 MPH$	$DS = 50 MPH$	$DS = 50 MPH$	$DS = 30 MPH$	$DS = 30 MPH$

MATCH LINE STA -L- 25+00.00
MATCH TO SHEET NO. 4

NAD 83/2011

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

 SENSITIVE AREA

FOR -L- PROFILE, SEE SHEET NO. 7

-L- CURVE DATA

PI Sta 32+84.94
 $\Delta = 17^\circ 54' 22.7''$ (LT)
 $D = 13^\circ 01' 18.4''$
 $L = 137.51'$
 $T = 69.32'$
 $R = 440.00'$
 $SE = 0.04$
 $DS = 35 \text{ MPH}$

END RETAINING WALL #1
-L- STA 30+04.71 RT

FROM -L- STA 31+50.00
TO -L- STA. 34+00.00 MILL
& RESURFACE TO EXIST.
EDGE OF PAVEMENT

Sta. = -L- 30 + 50 - LT
DA = 1.3 Ac
C = 0.39
I = 6.07 in/hr
Q = 3.1 cfs
V = 9.1 ft/s
d = 0.2 ft
s = 0.148 ft/ft
n = 0.015
Liner = Concrete

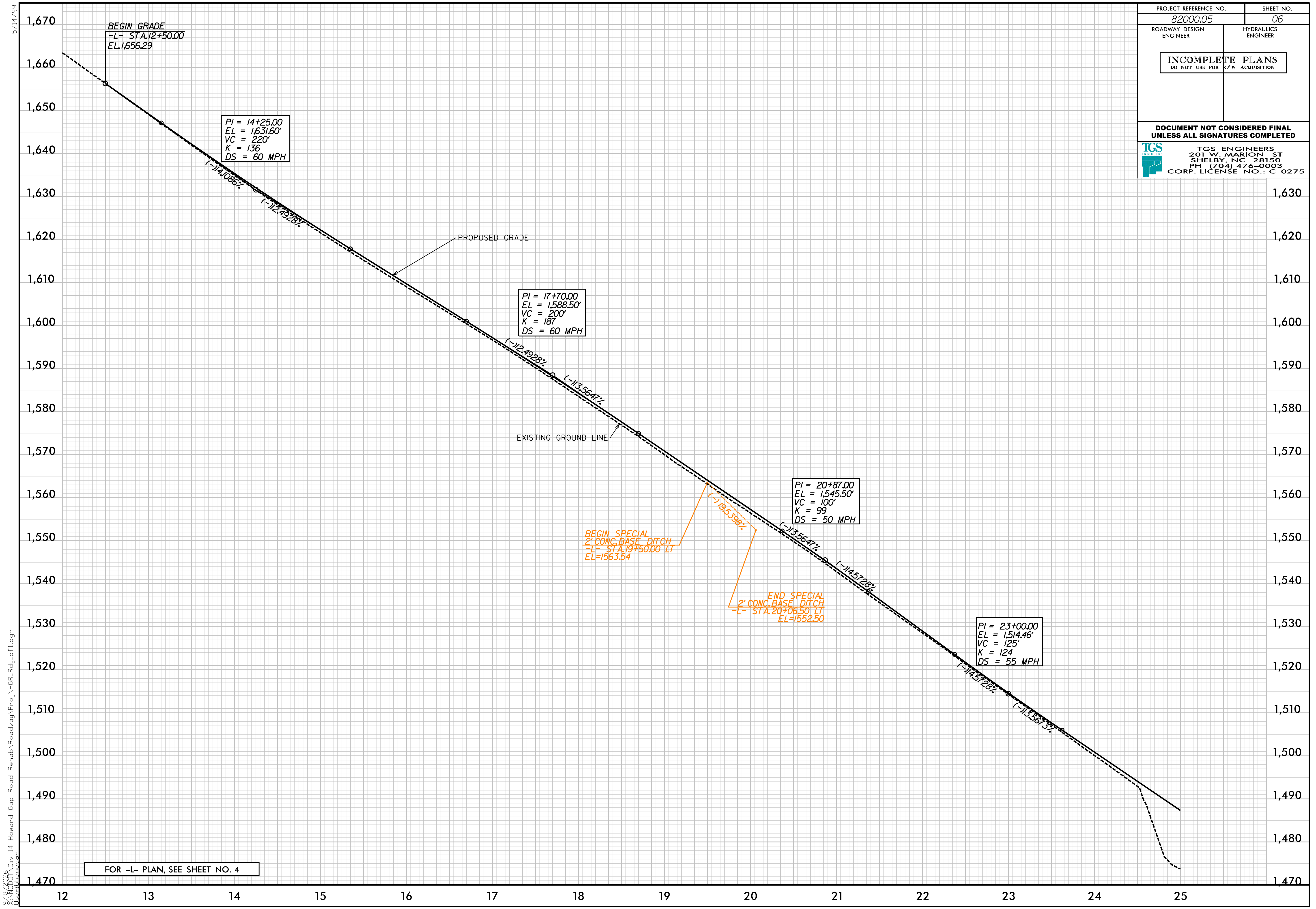
$S_{ra} = -1.31 + 1.03$
 $DA = 2.5 \text{ Acres}$
 $C = 0.37$
 $I = 6.07 \text{ in/hr}$
 $Q = 5.6 \text{ cfs}$
 $V = 10.0 \text{ ft/s}$
 $d = 0.3 \text{ ft}$
 $s = 0.127 \text{ ft/ft}$
 $n = 0.015$
 $\text{Liner} = \text{Concrete}$

Sta. = -L- 33+
DA = 1.4 Ac
C = 0.39
I = 6.07 in/hr
Q = 3.3 cfs
V = 8.9 ft/s
d = 0.3 ft
s = 0.132 ft/ft
n = 0.015
Liner = Concrete

Sto. = -L- 34 + 50 LT
 DA = 2.1 Ac
 C = 0.38
 I = 6.07 in/hr
 Q = 4.8 cfs
 V = 10.3 ft/s
 d = 0.3 ft
 s = 0.152 f/ft
 n = 0.015
 Liner = Concrete

Sta. = -L- 25+50 LT
DA = 3.2 Ac
C = 0.39
I = 6.07 in/hr
Q = 7.5 cfs
V = 11.0 ft/s
d = 0.3 ft
s = 0.135 ft/ft
n = 0.015
Liner = Concrete

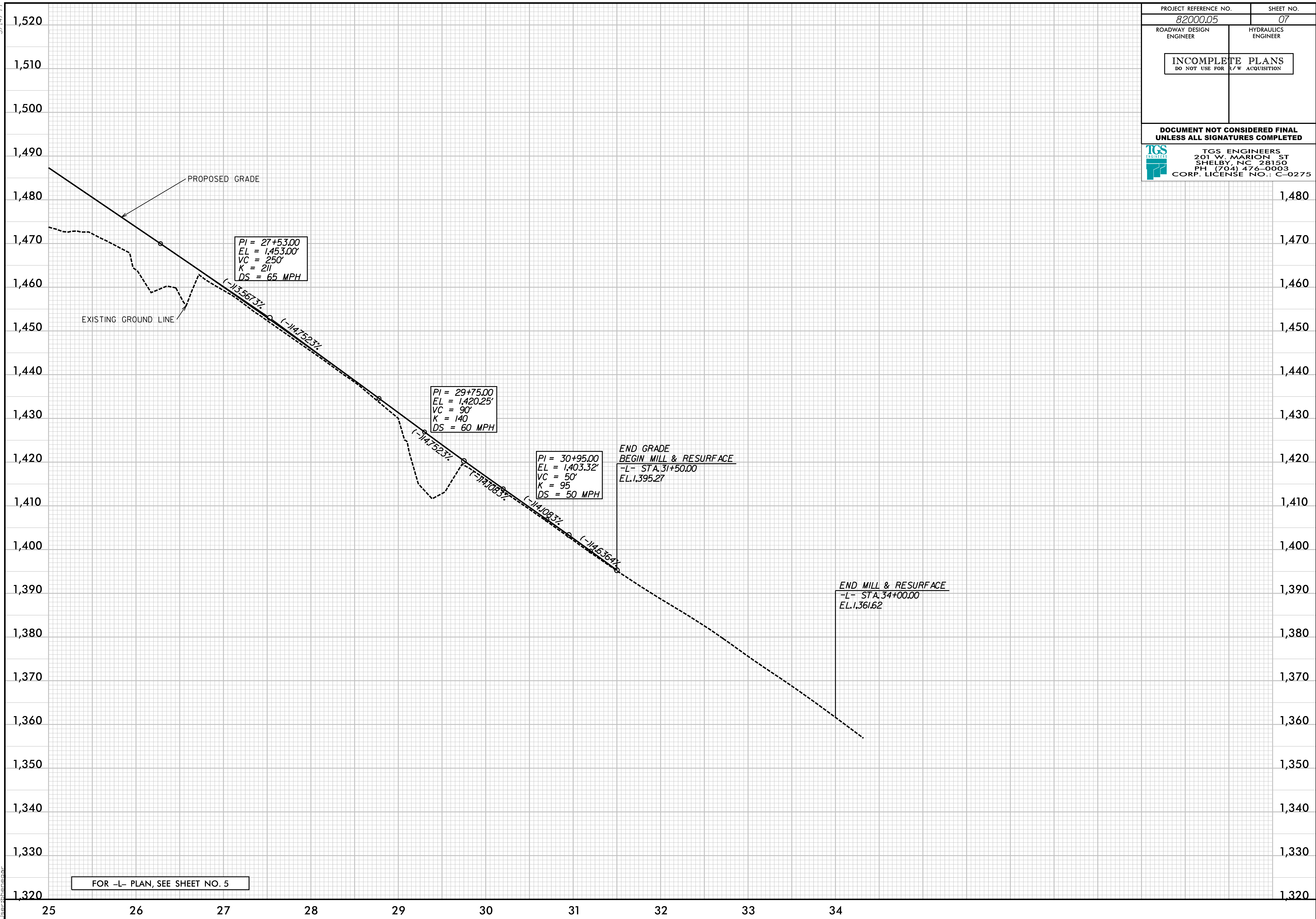
Sta. = -L= 28+00 LT
DA= 3.4 Ac
C= 0.37
I= 6.07 inv/hr
Q= 7.6 cfs
V= 11.3 ft/s
d= 0.3 ft
s= 0.145 ft/ft
n=0.015
Liner= Concrete



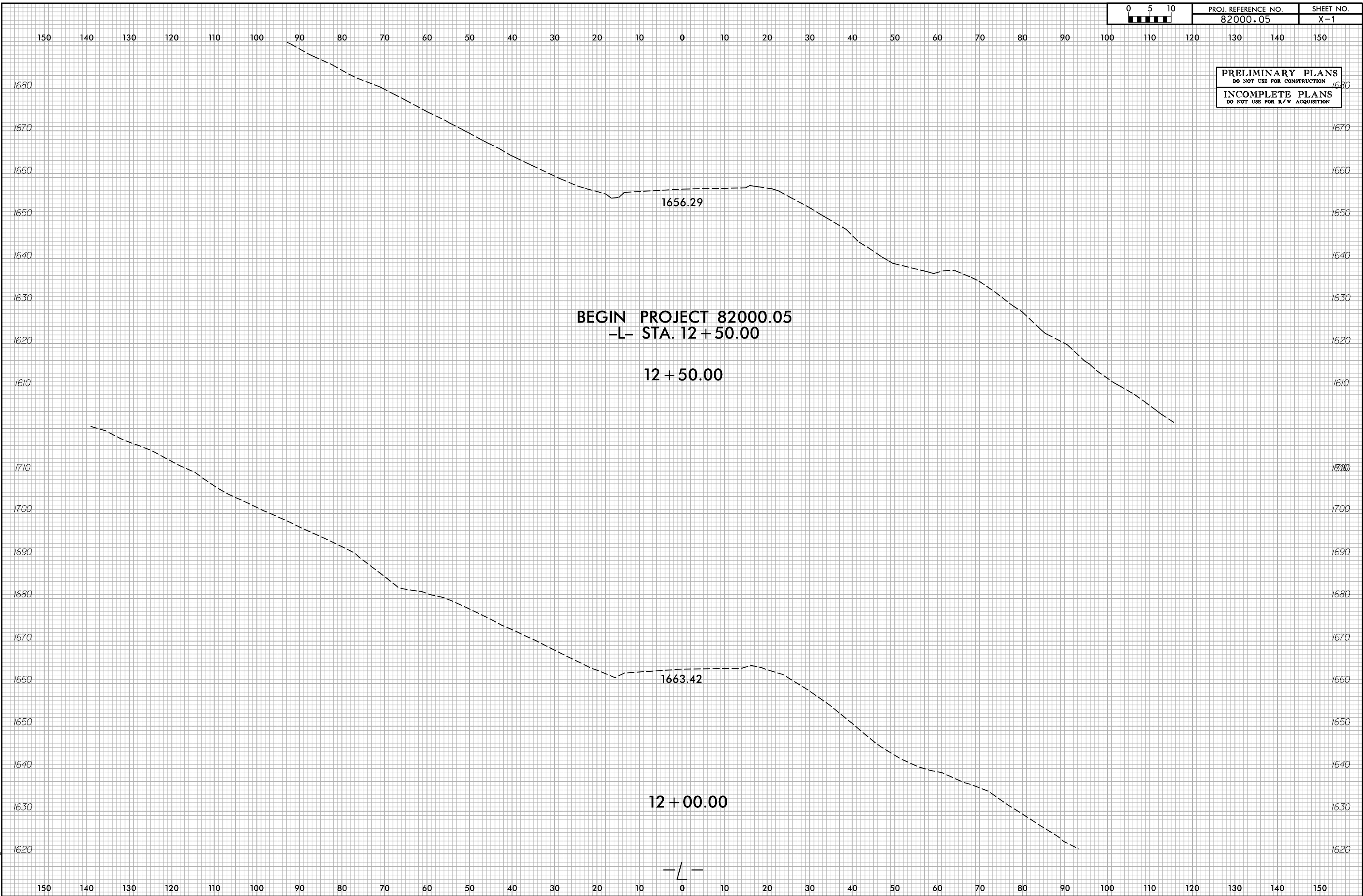
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ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
TGS ENGINEERS 201 W. MARION ST SHELBY, NC 28150 PH (704) 476-0003 CORP. LICENSE NO.: C-0275			

5/14/99

9/18/2006
X:\Roadwork\Div 14 Howard Gap Road Rehab\Roadway\Proj\HGR_Rdy.pfl.dgn
User: hmcgovern



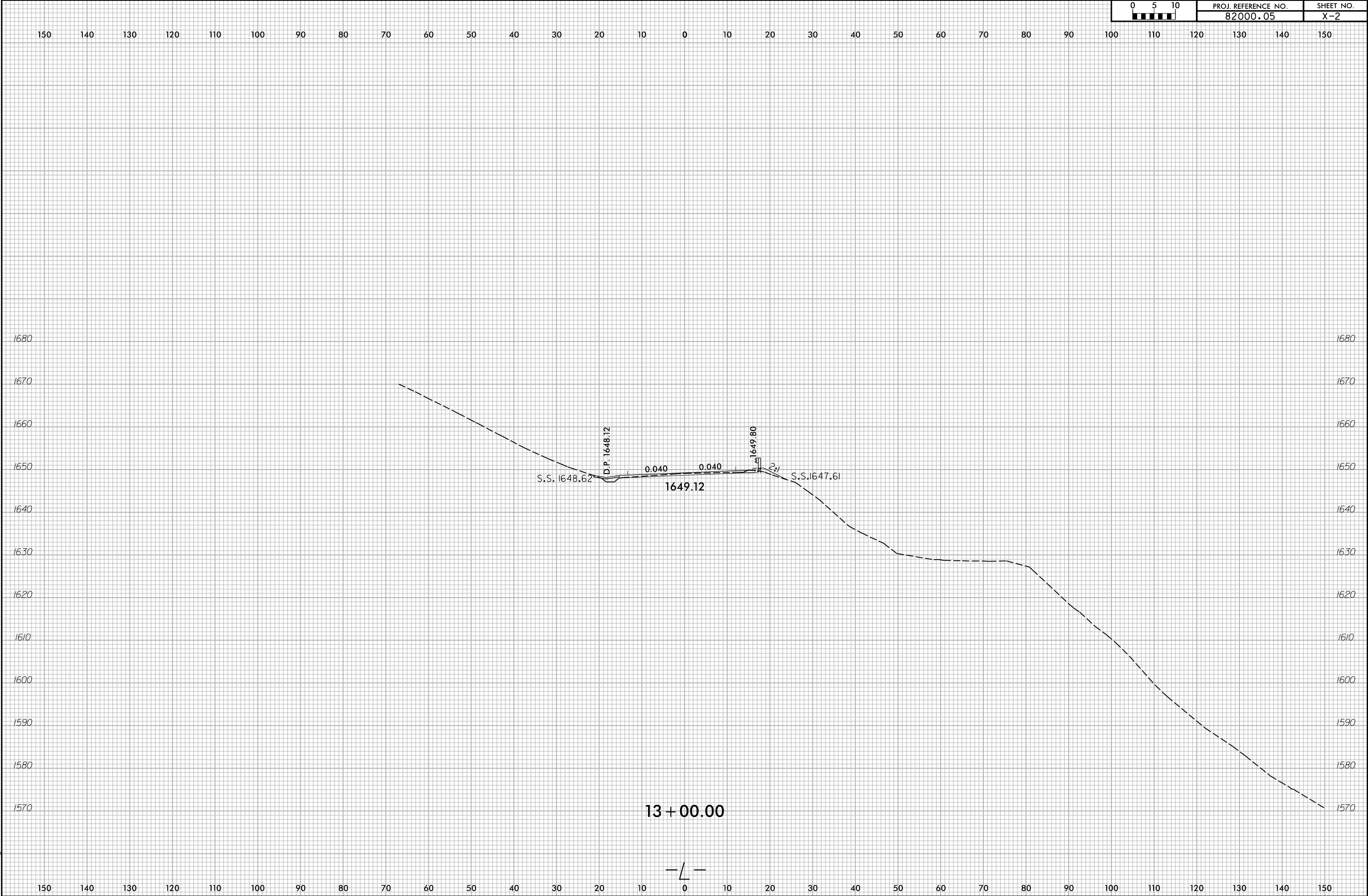
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INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			
 TGS ENGINEERS 201 W. MARION ST SHELBY, NC 28150 PH (704) 476-0003 CORP. LICENSE NO.: C-0275			



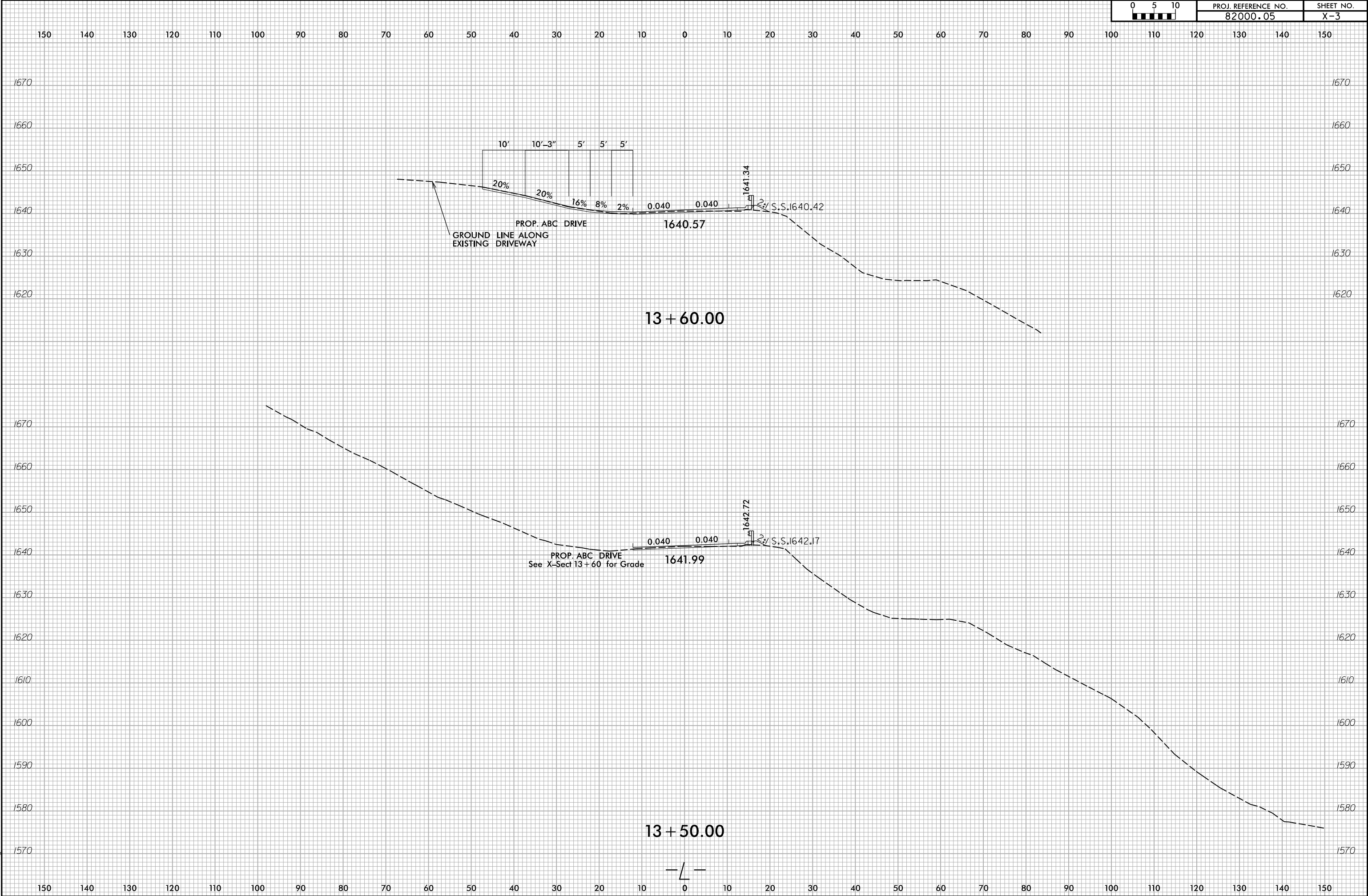
6/23/16

9/18/2026
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User:benegor

0510	PROJ. REFERENCE NO.	SHEET NO.
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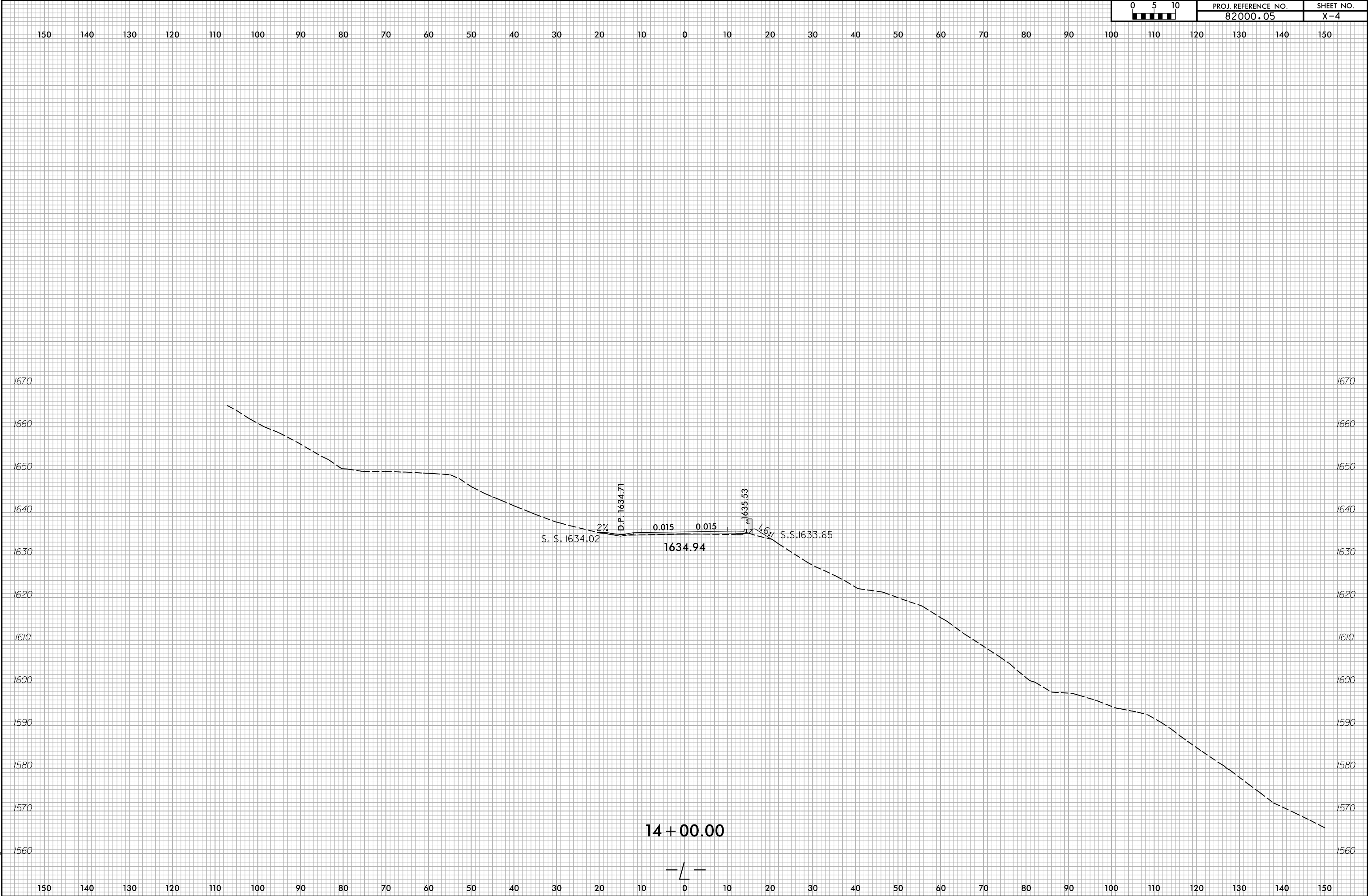
6/23/16



6/23/16

9/18/2026
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User: bhenegar

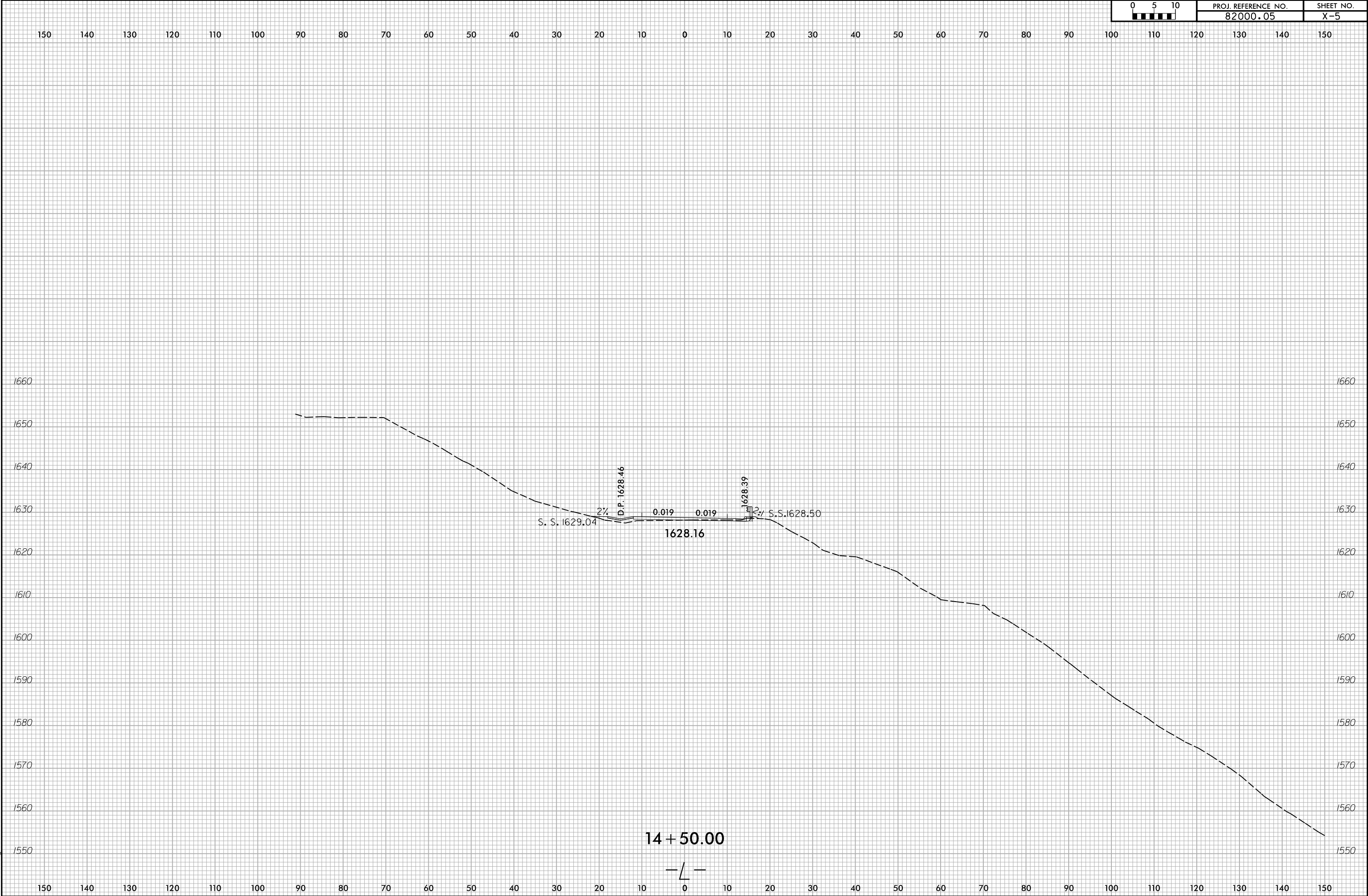
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6/23/16

9/18/2026
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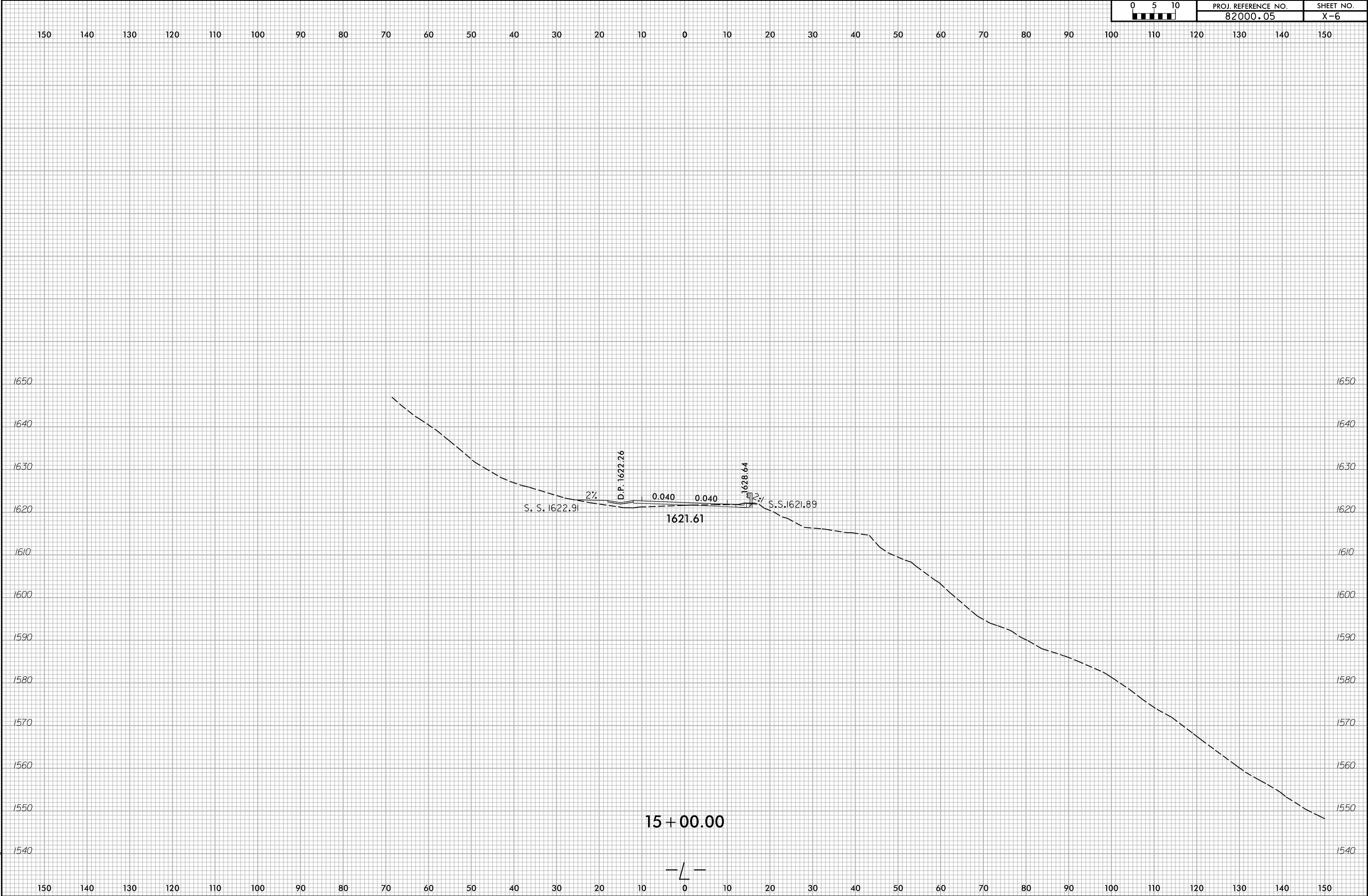
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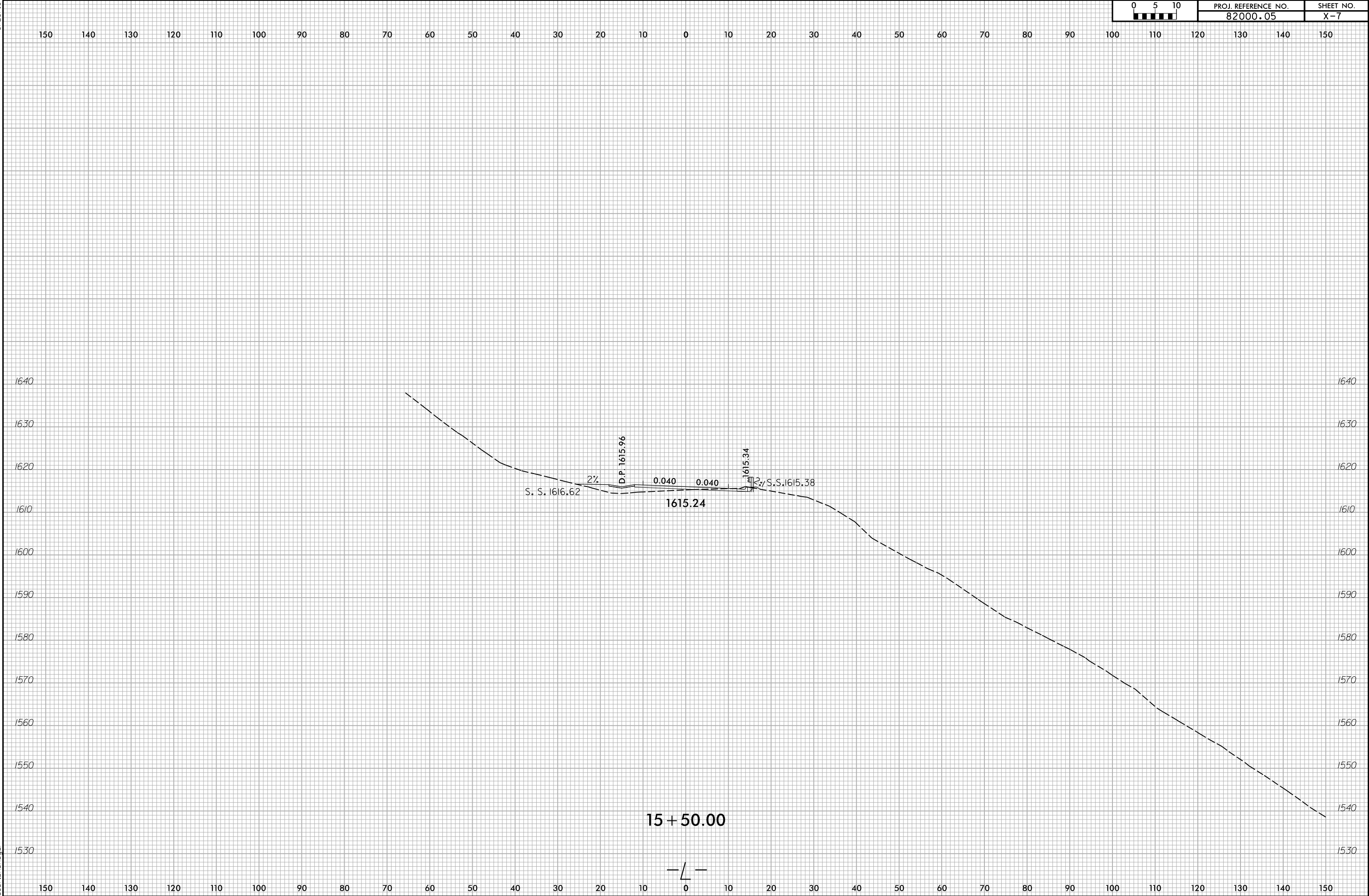
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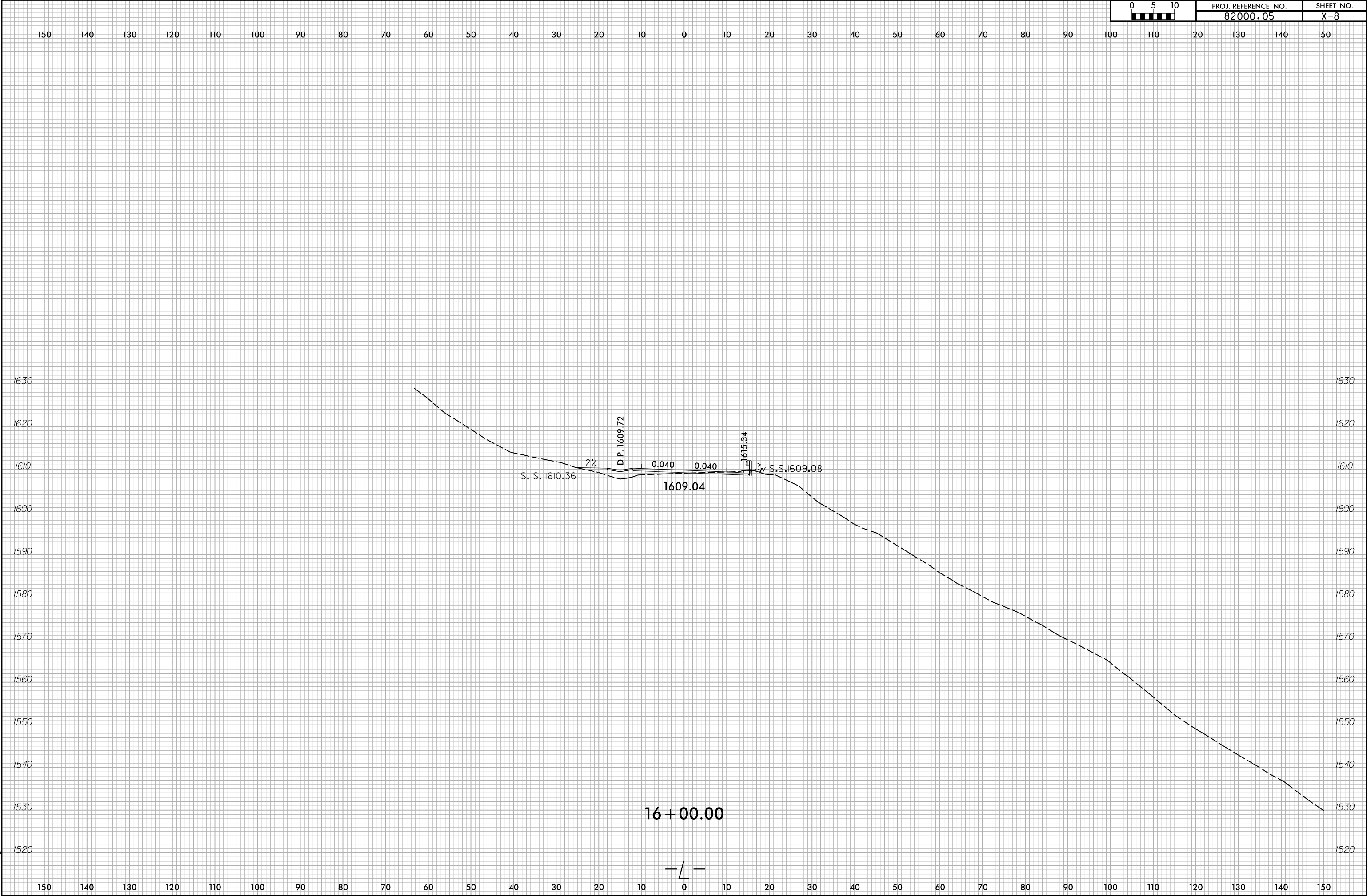
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User:benegor

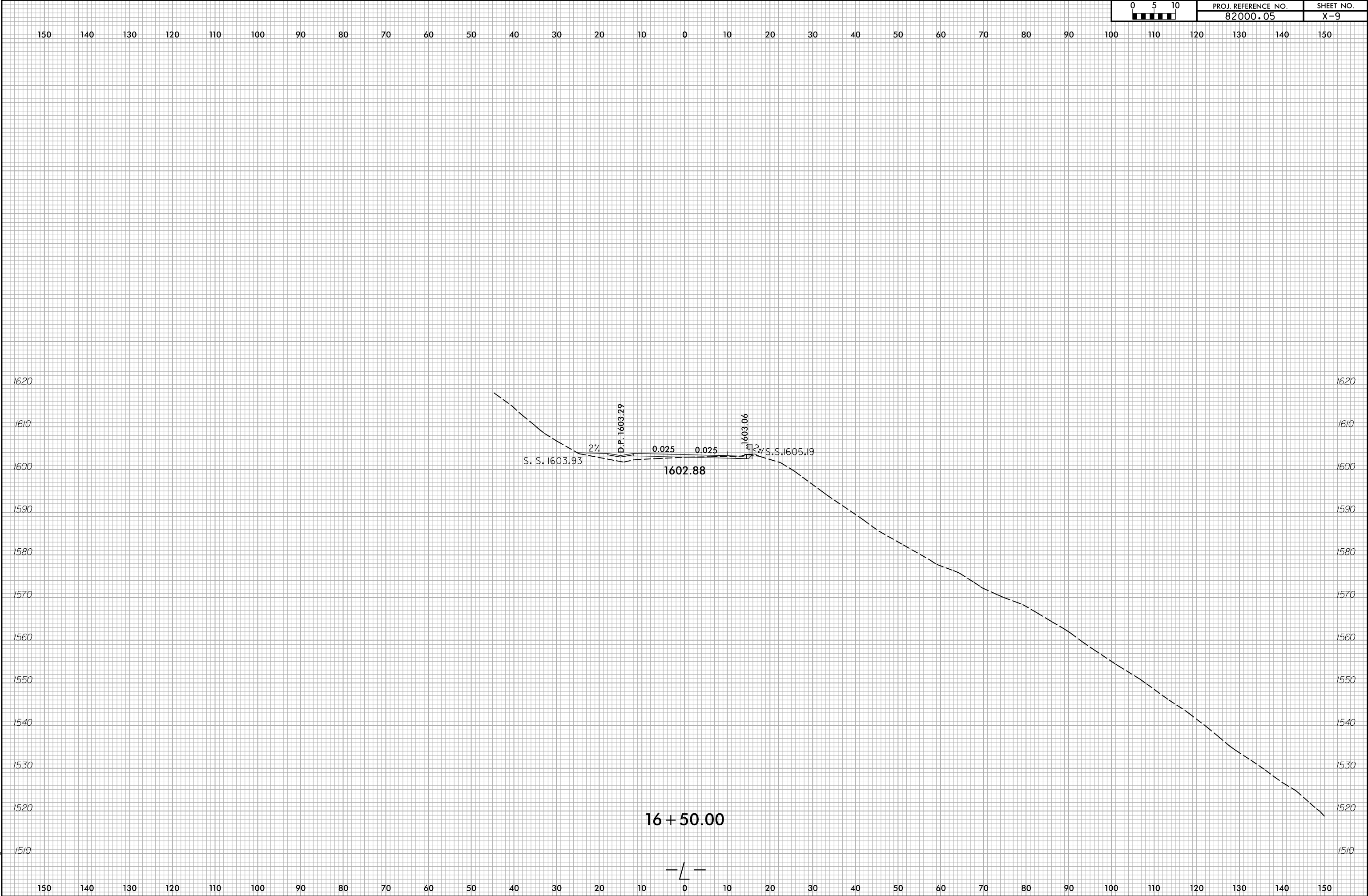
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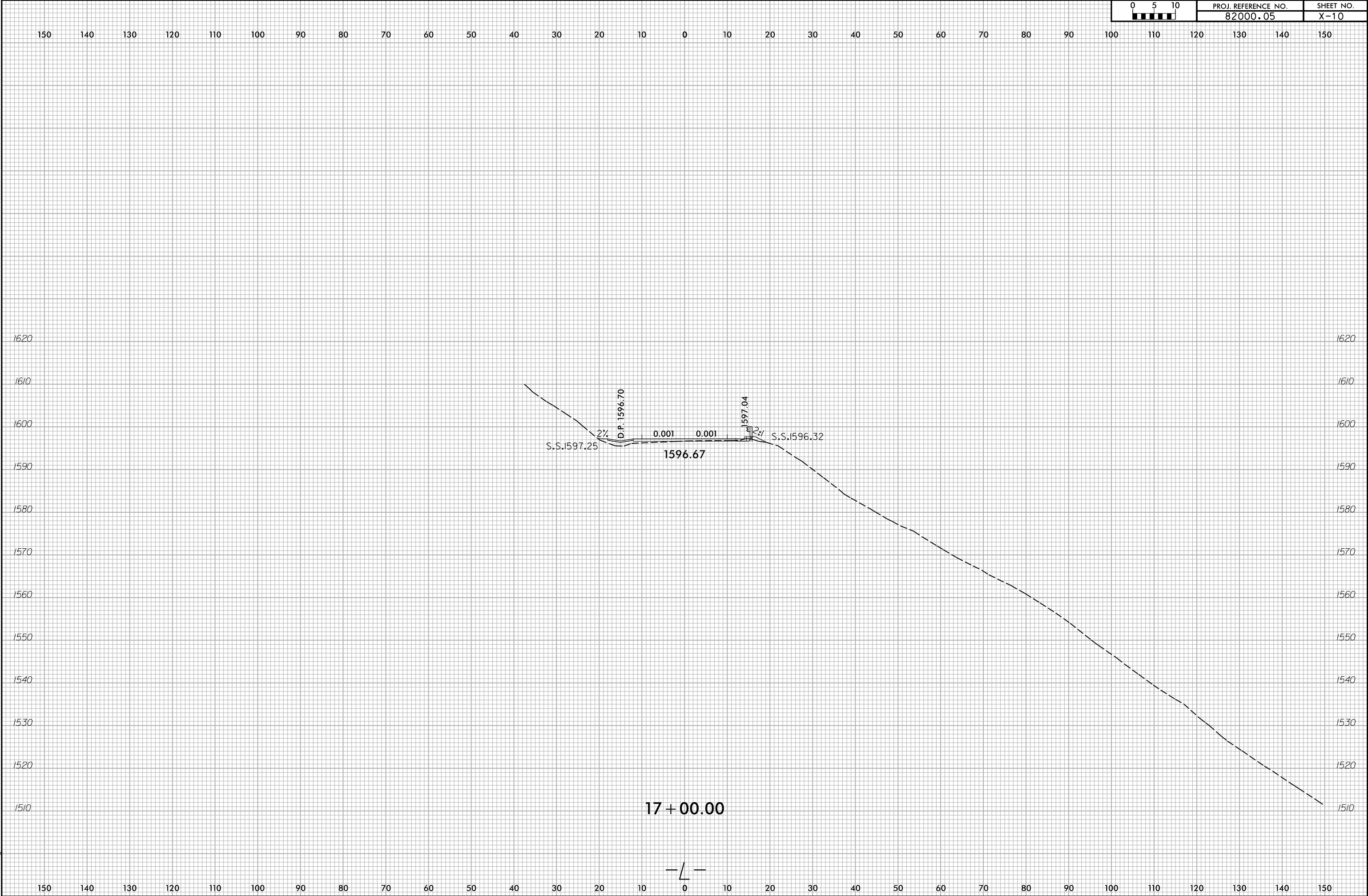
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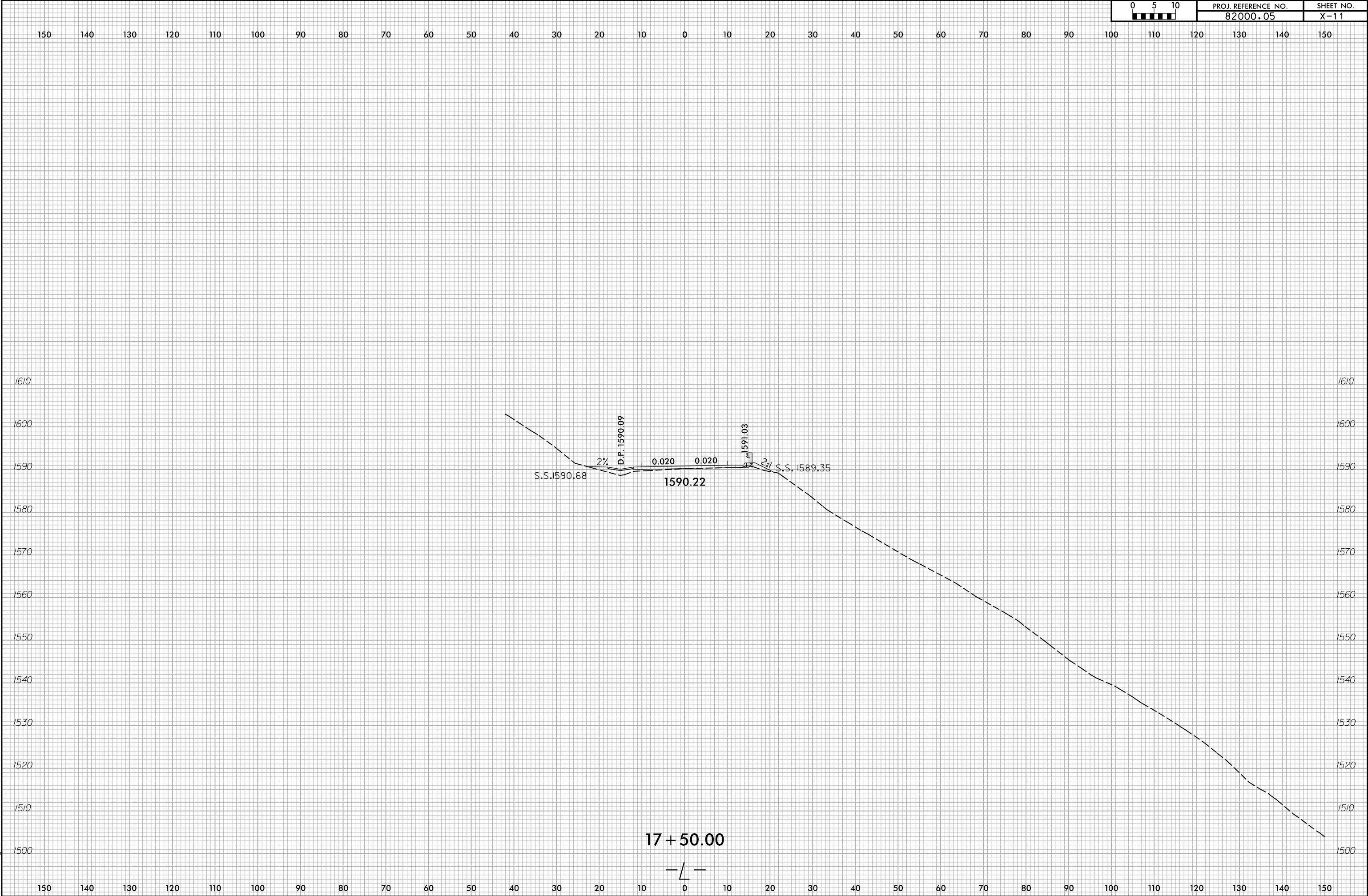




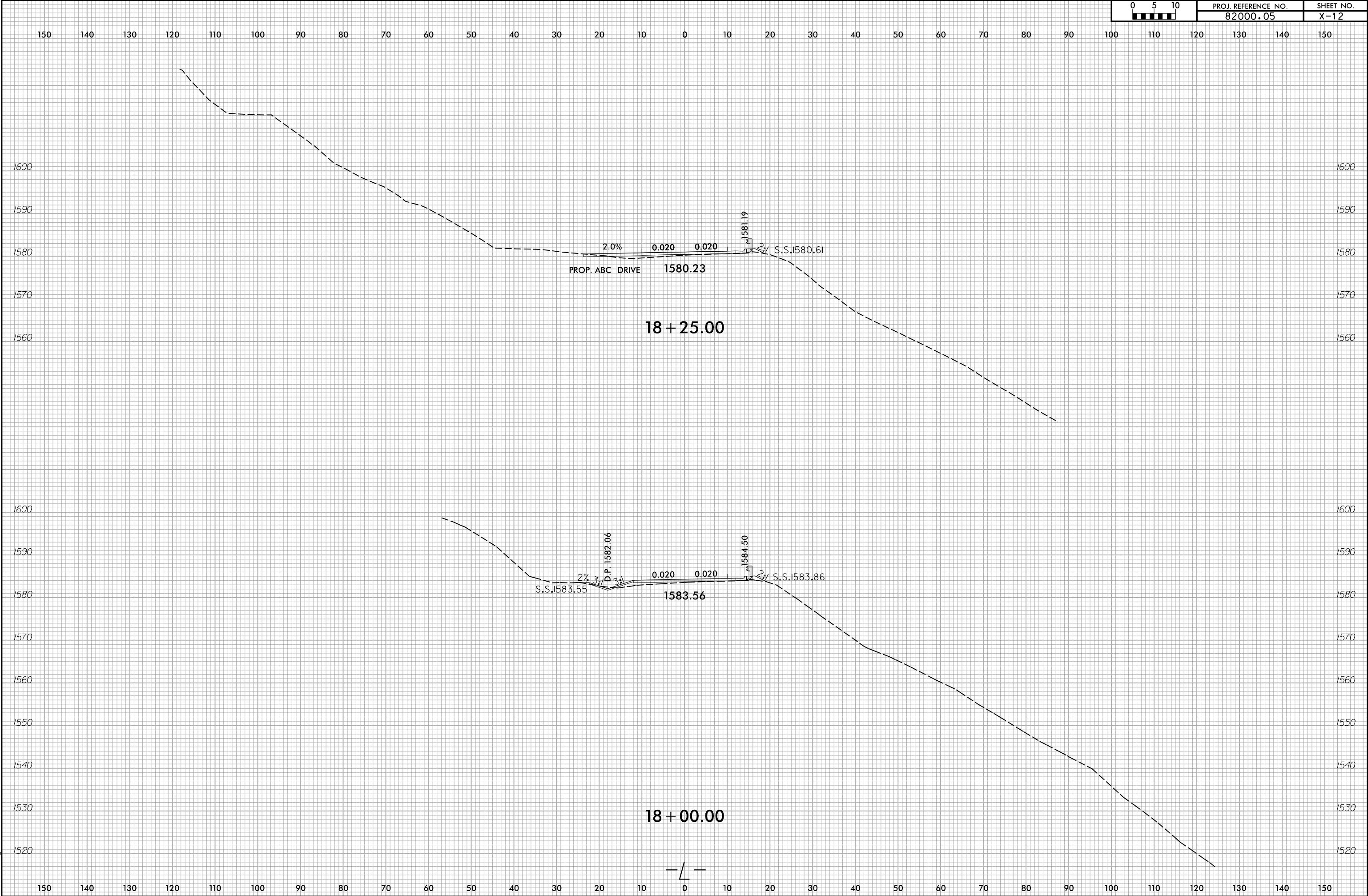
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6/23/16



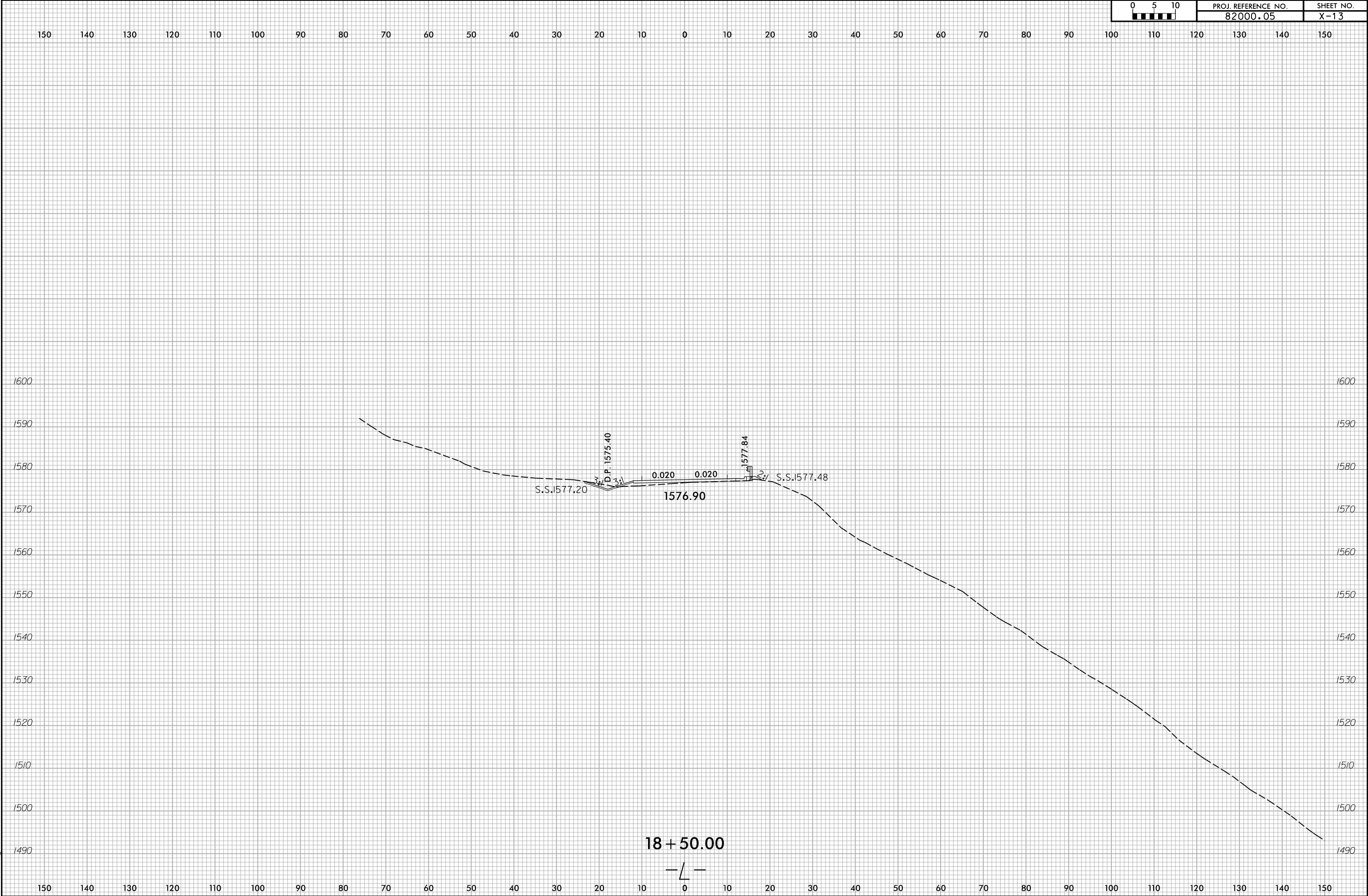
6/23/16



6/23/16

9/18/2026
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User:benegor

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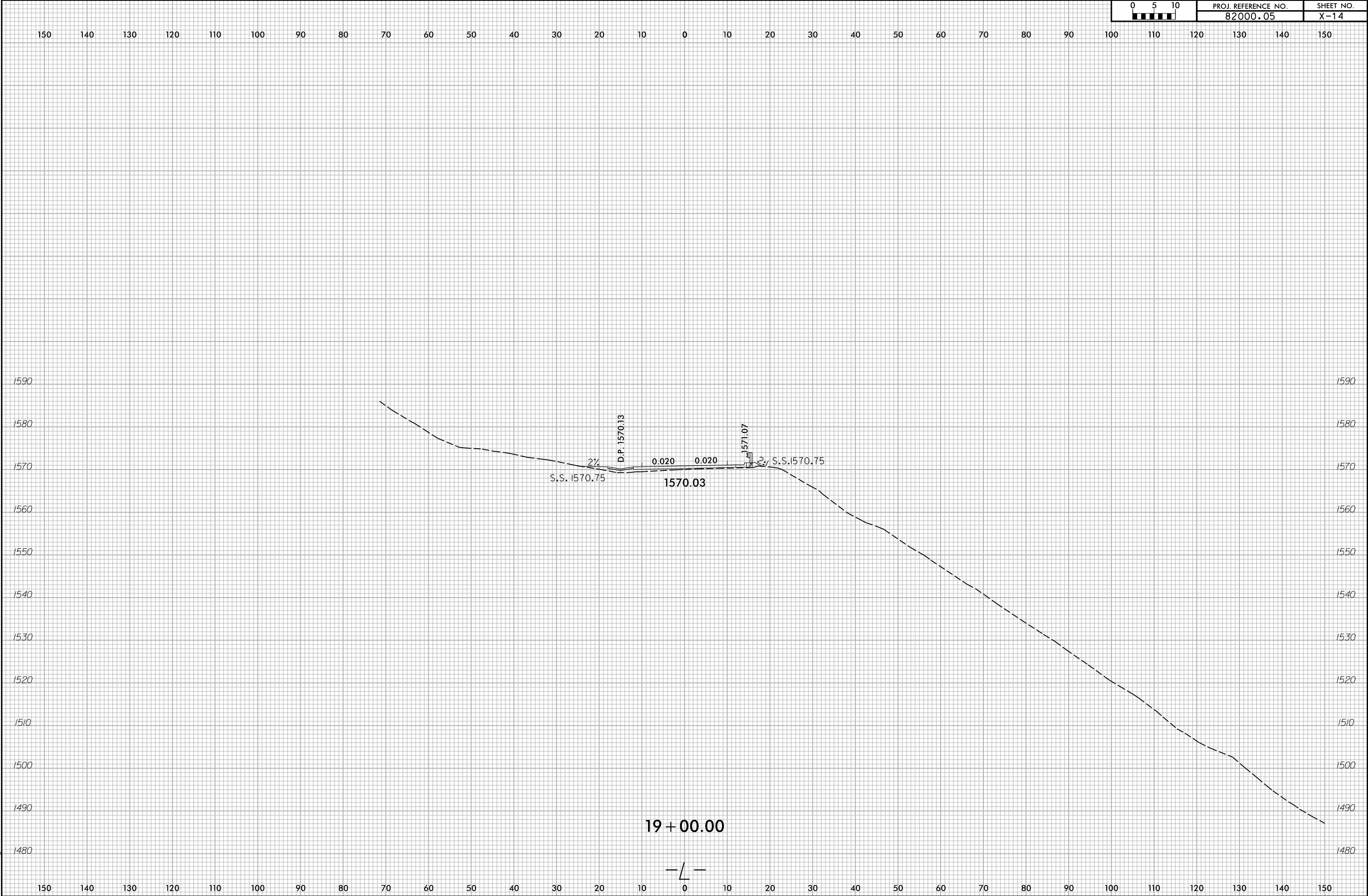
18 + 50.00



6/23/16

9/18/2026
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User:benegor

0510	PROJ. REFERENCE NO.	SHEET NO.
	82000.05	X-14



6/23/16

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

1580

1570

1560

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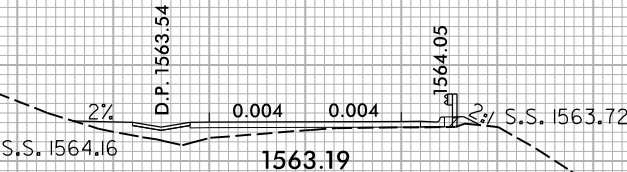
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1490

1480

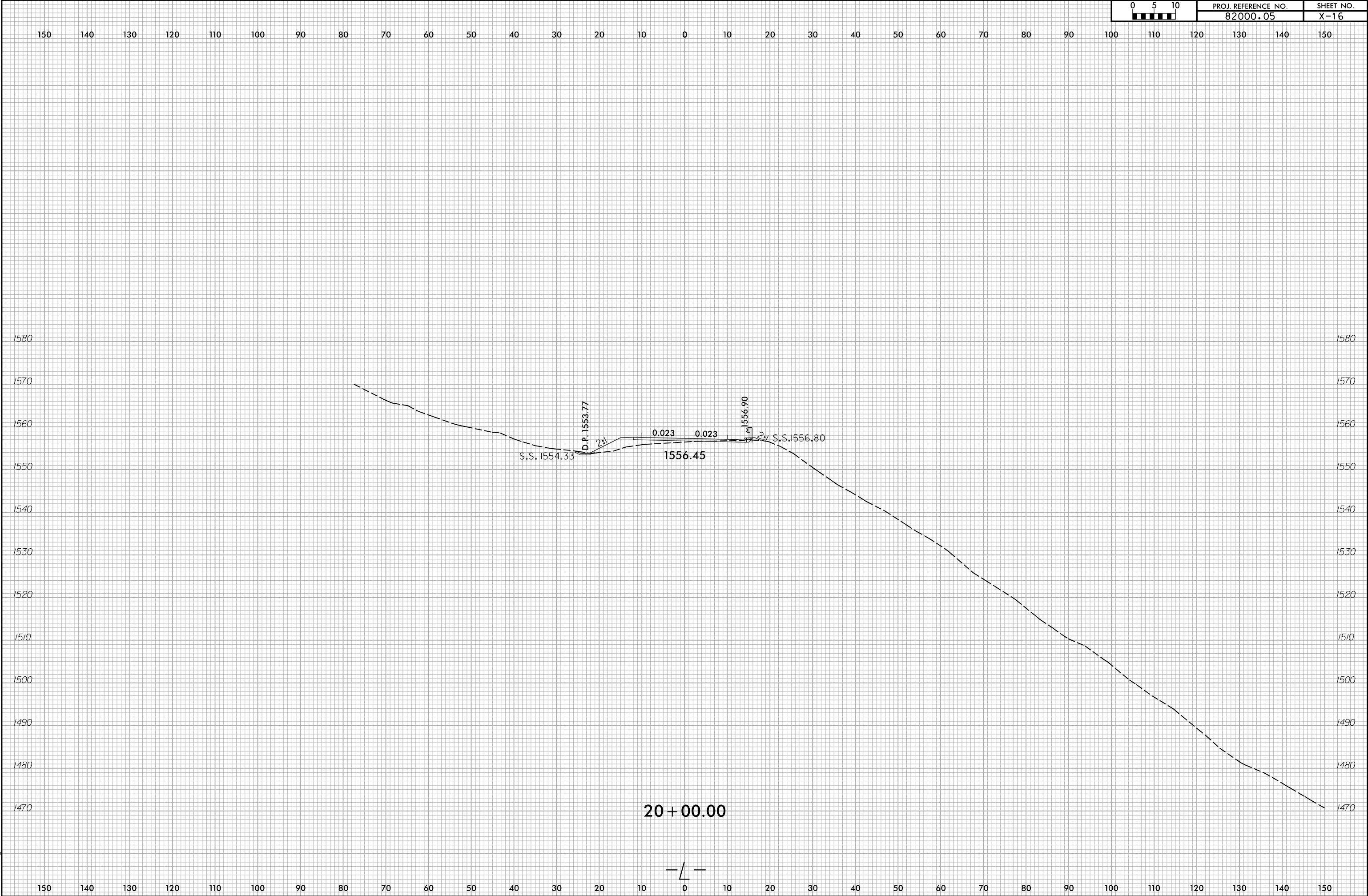
1470

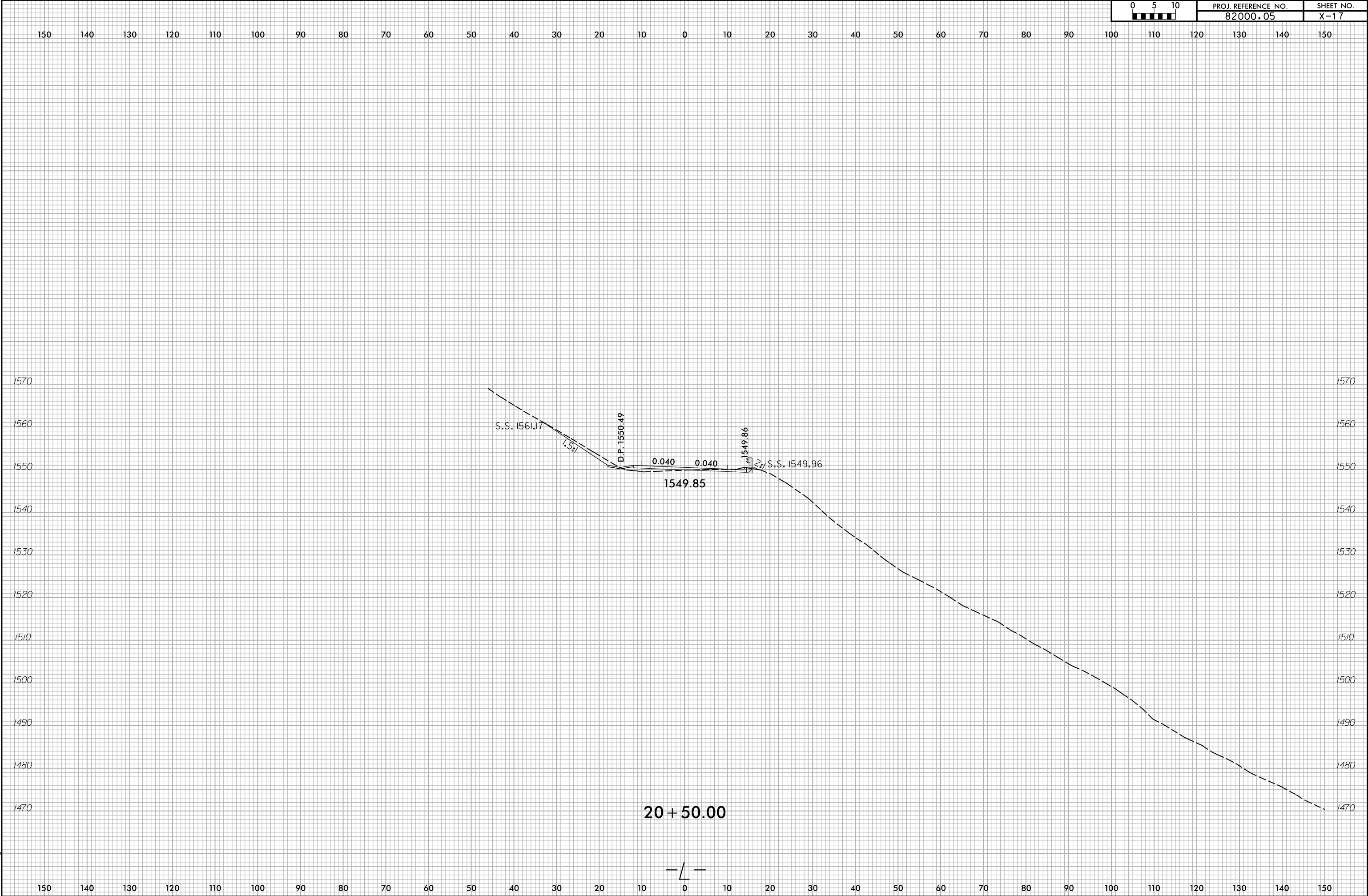


19 + 50.00

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6/23/16





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150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

1570

1560

1550

1540

1530

1520

1510

1500

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1480

1470

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1570

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1550

1540

1530

1520

1510

1500

1490

1480

1470

1460

S.S. 1572.91

1.5:1

D.P. 1543.52

0.040

0.040

1542.90

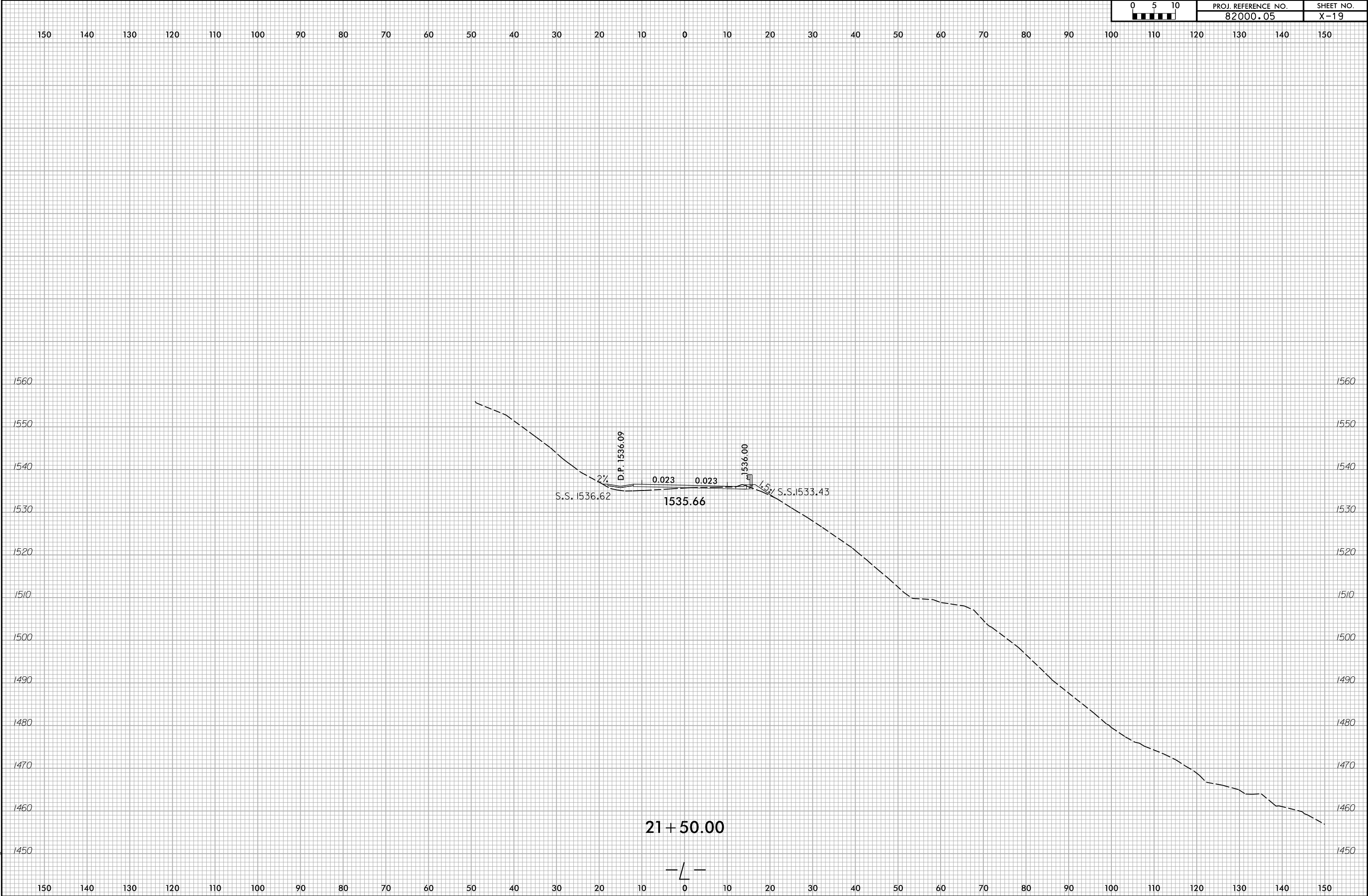
2' S.S. 1542.93

1542.84

21+00.00



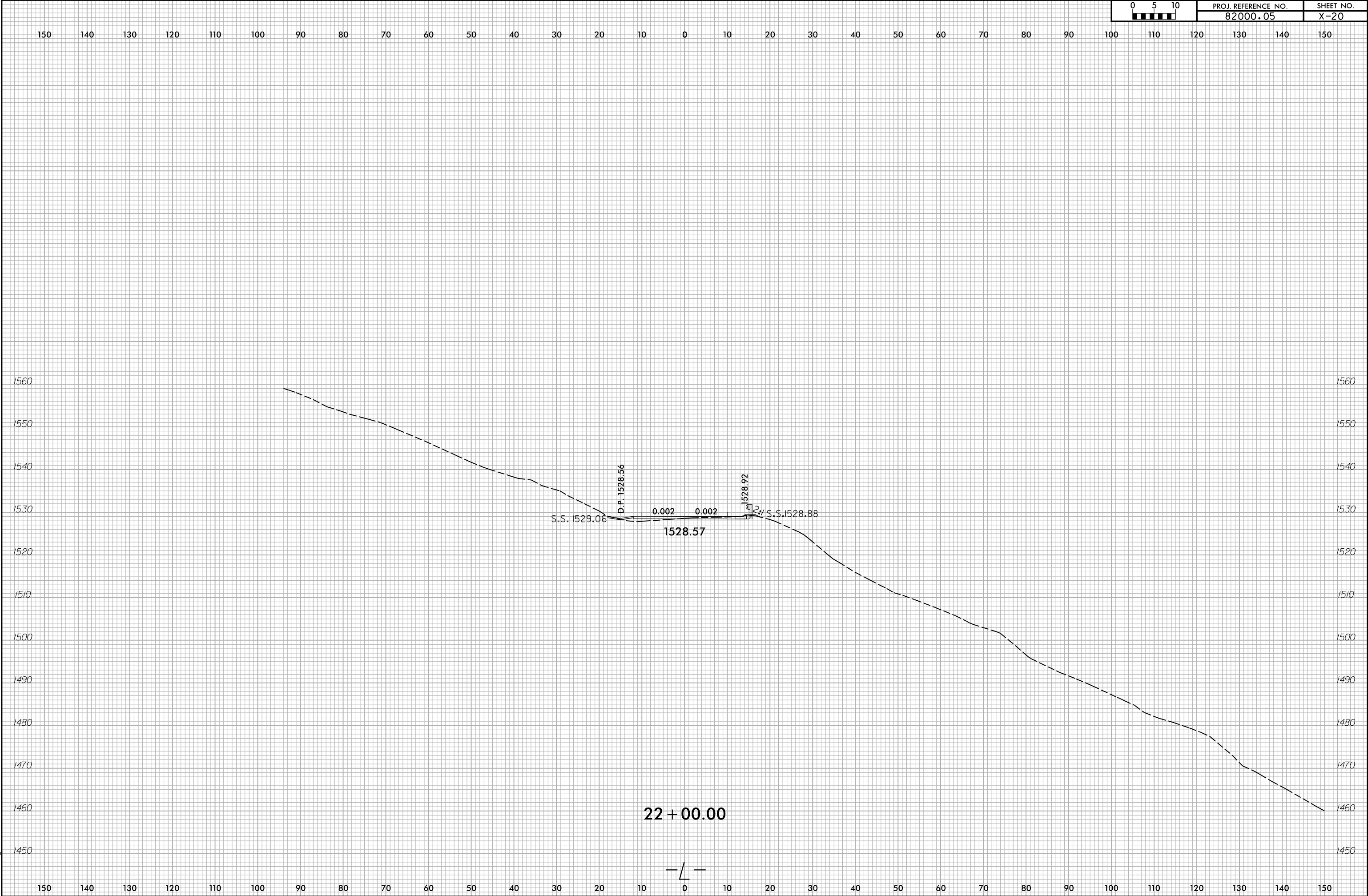
6/23/16



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9/18/2026
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User:benegor

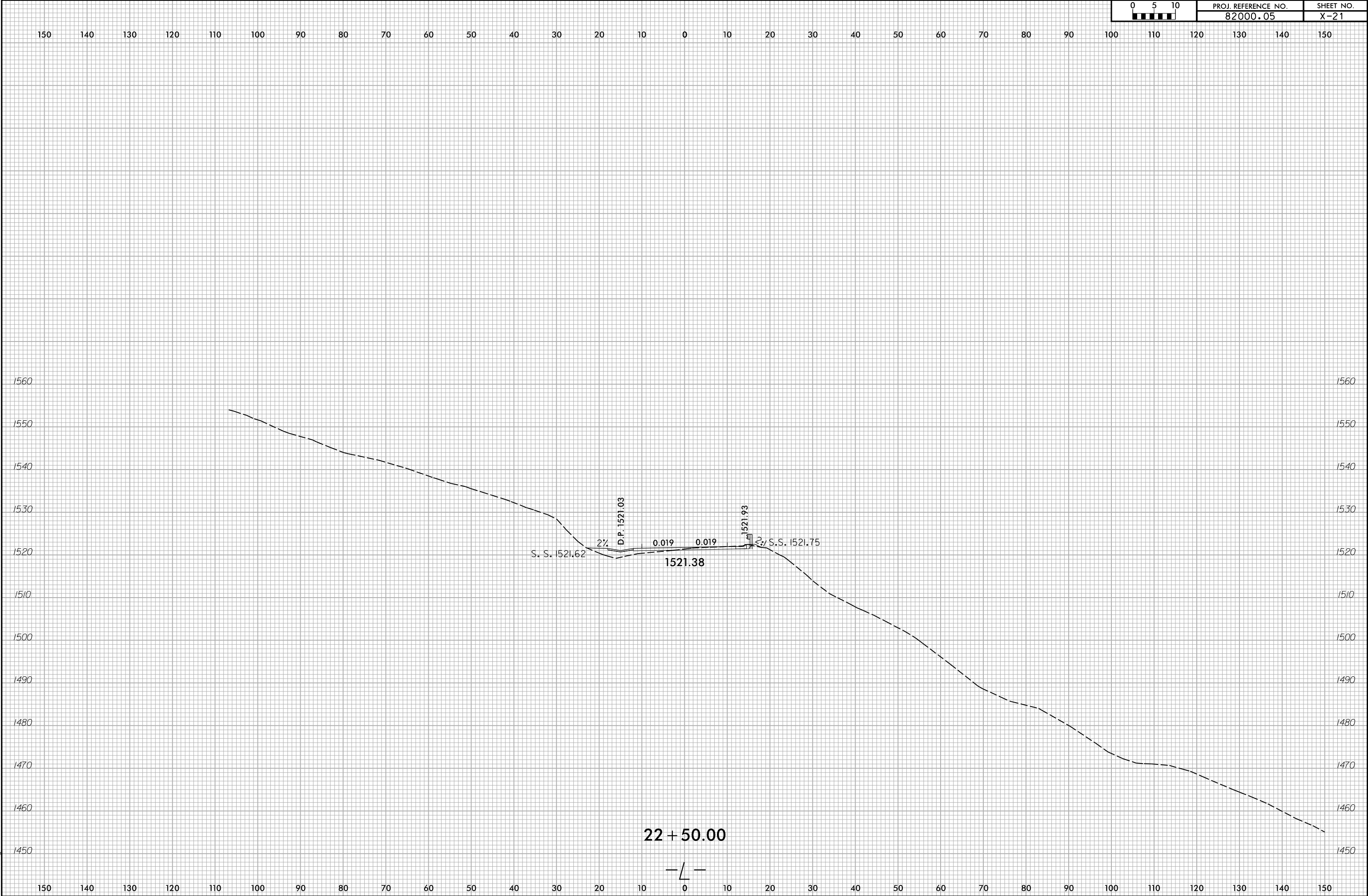
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	82000.05	X-20



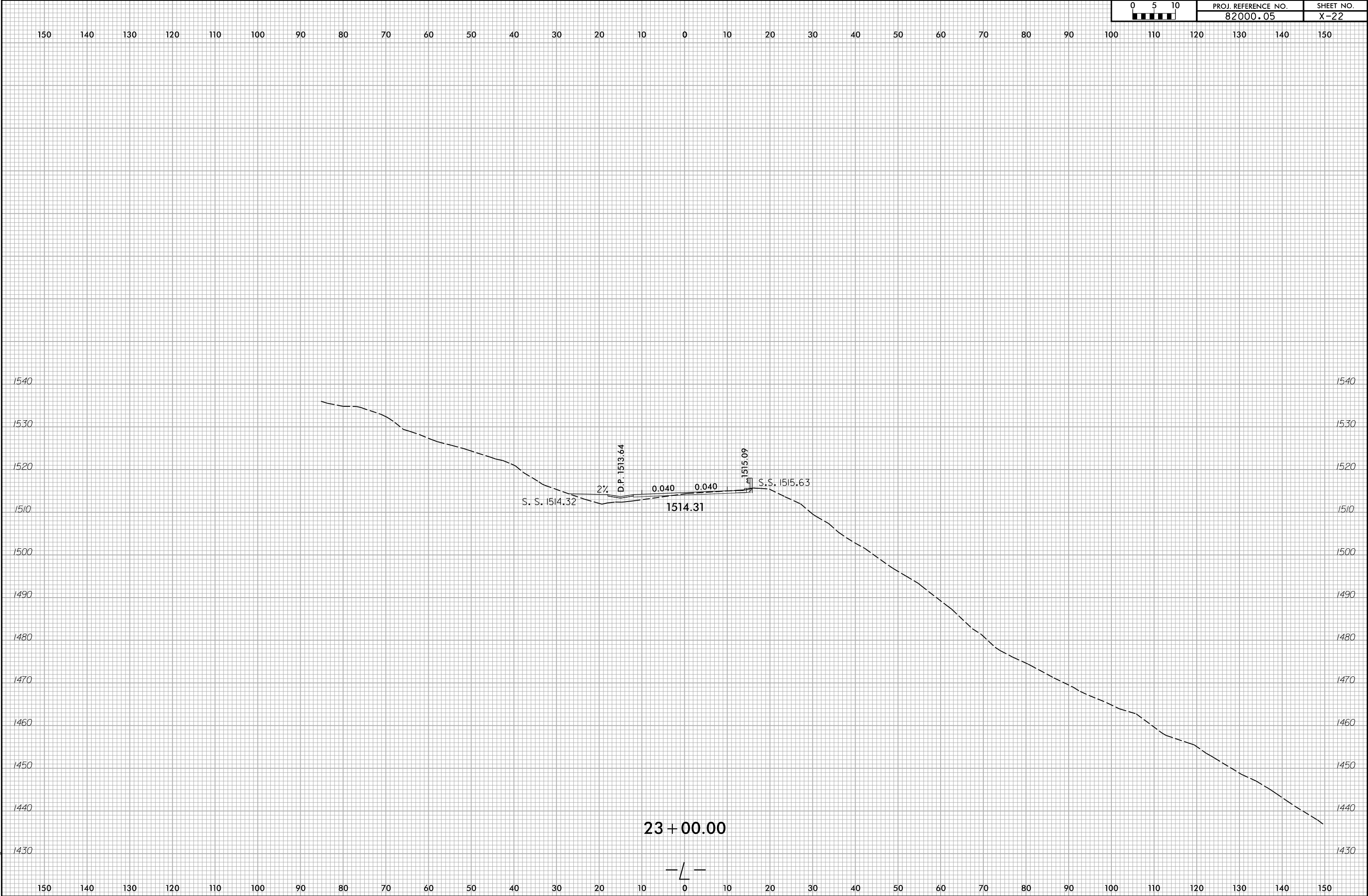
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9/18/2026
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User:benegor

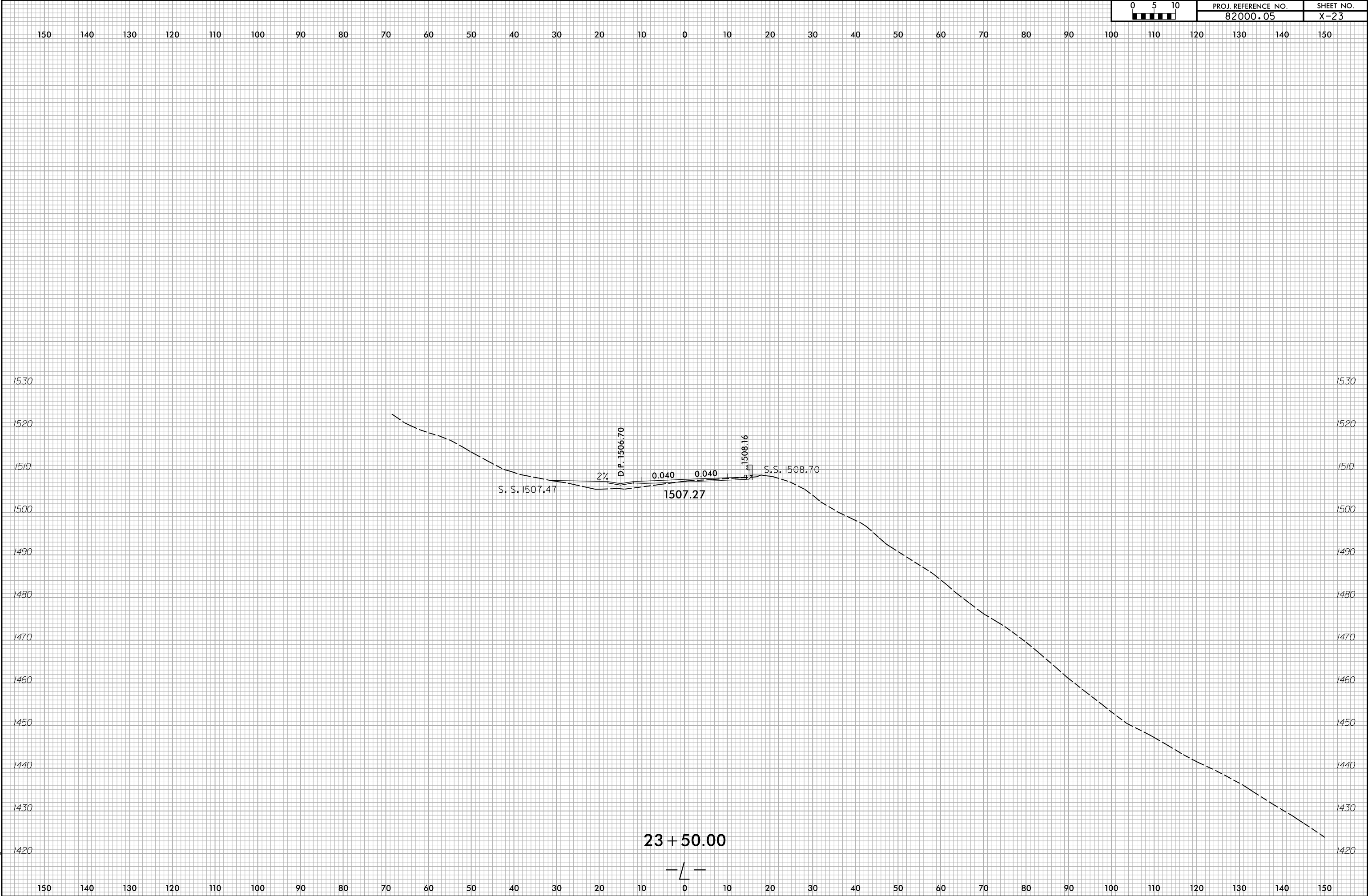
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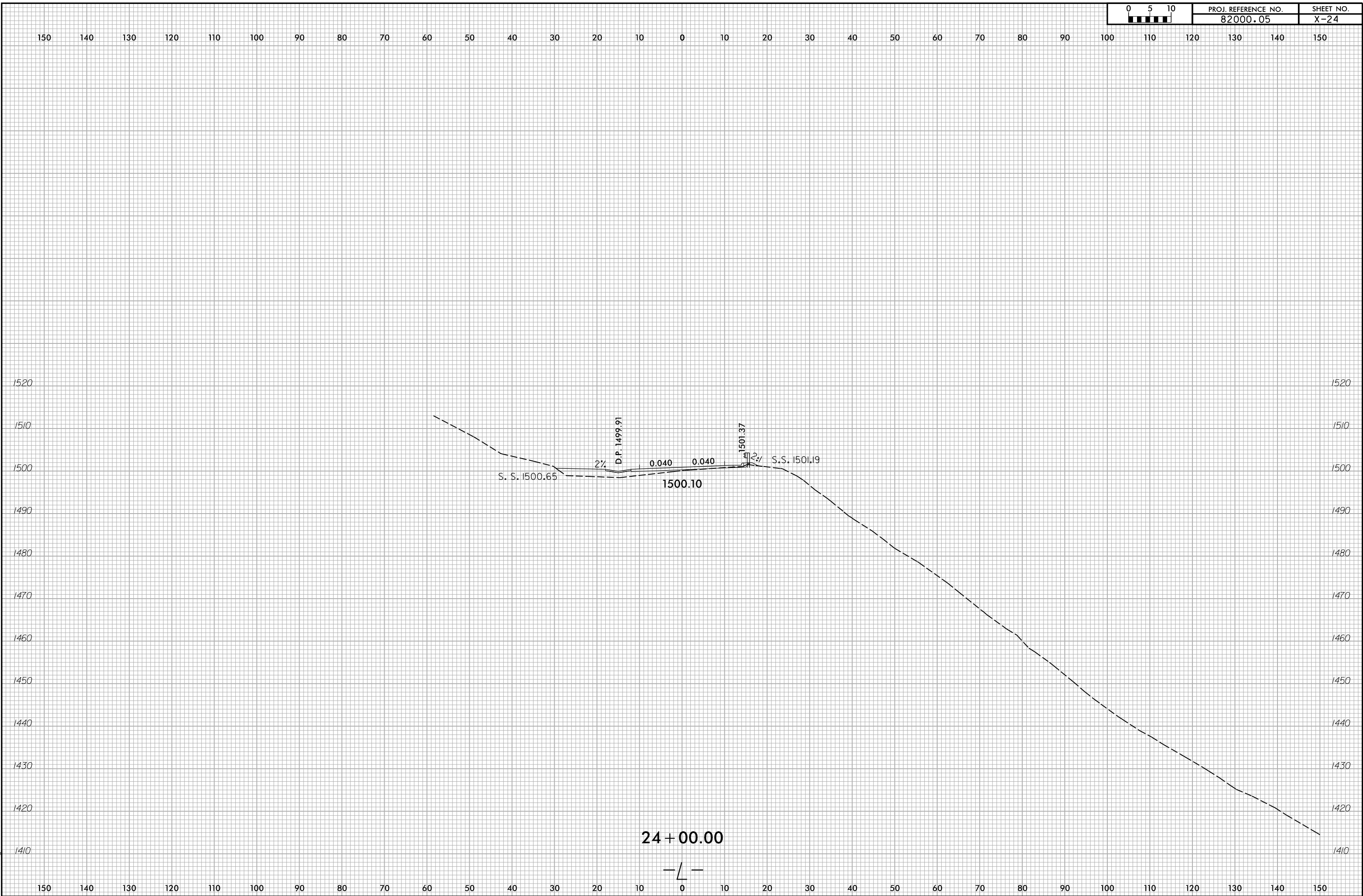


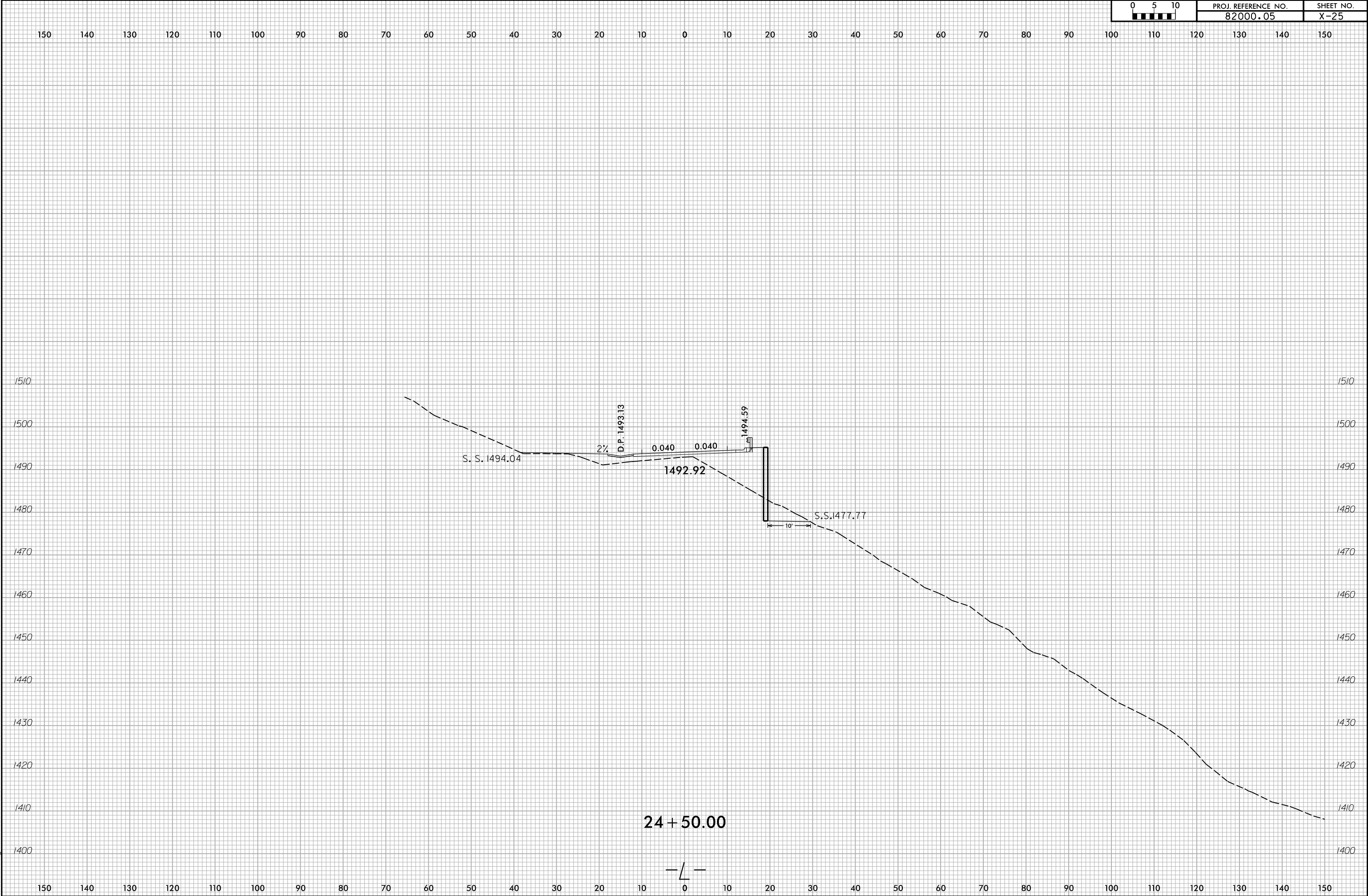
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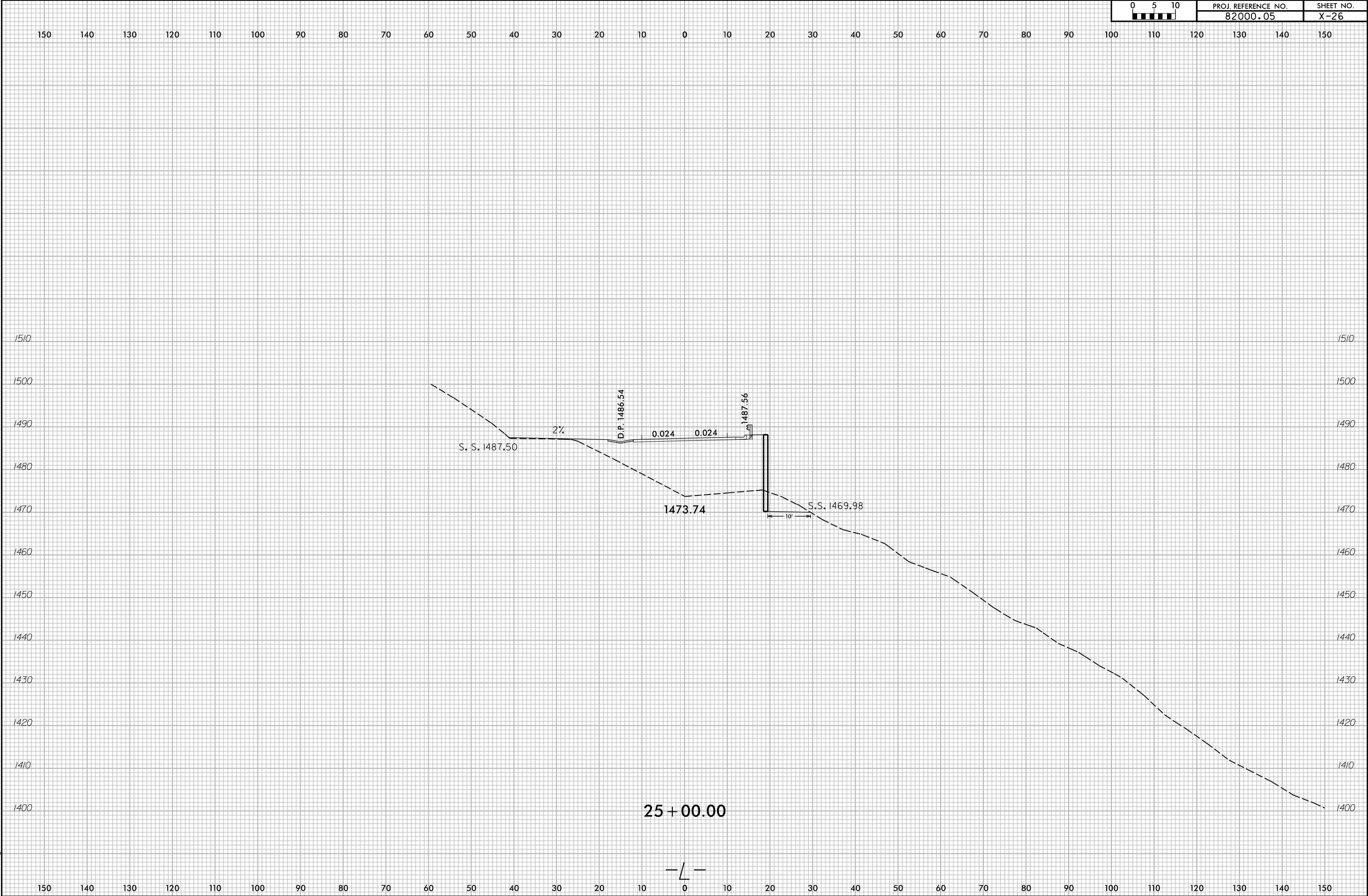


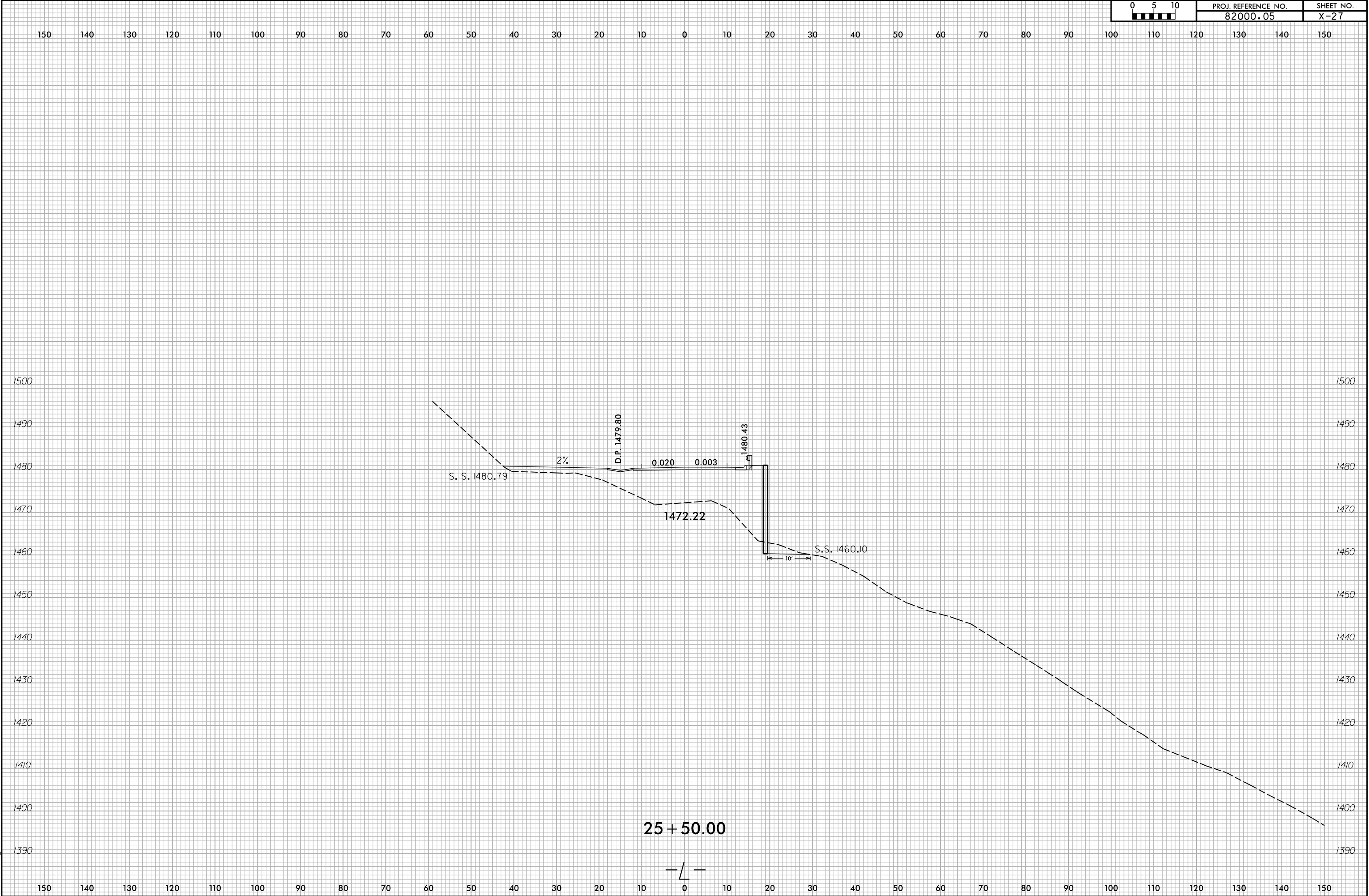
6/23/16











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0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	82000.05	X-28

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

1490

1480

1470

1460

1450

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1400

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1380

1490

1480

1470

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1440

1430

1420

1410

1400

1390

1380

S.S. 1449.73

2%

D.P. 1473.02

0.020

0.020

1473.40

1463.95

S.S. 1451.35

10'

26 + 00.00

—/—

6/23/16

9/18/2026
X:\NG001\Div. 14 Howard Gap Road Rehab\Roadway\XSC\HGR_Rdy_xpl.dgn
User:benegor

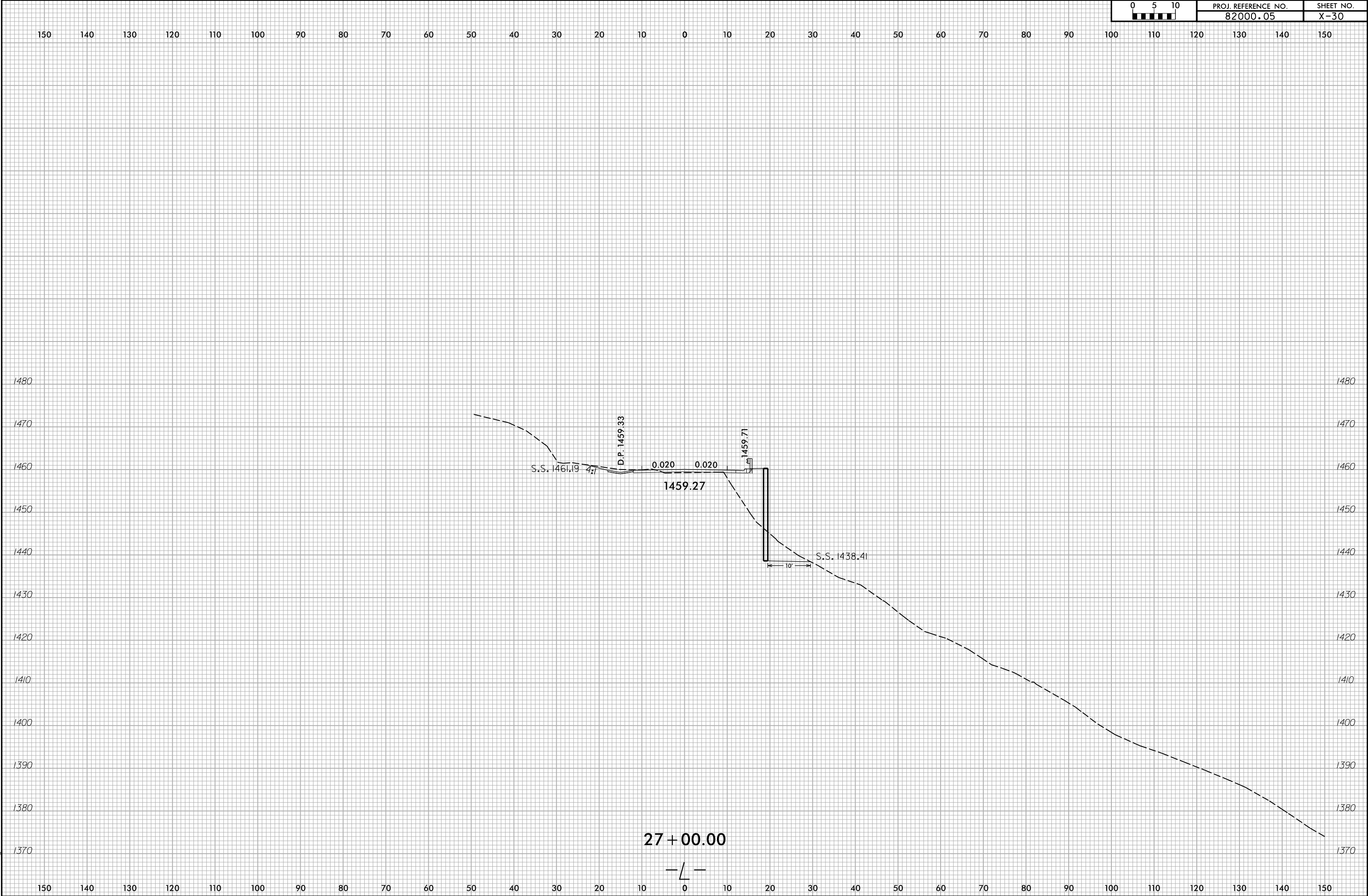
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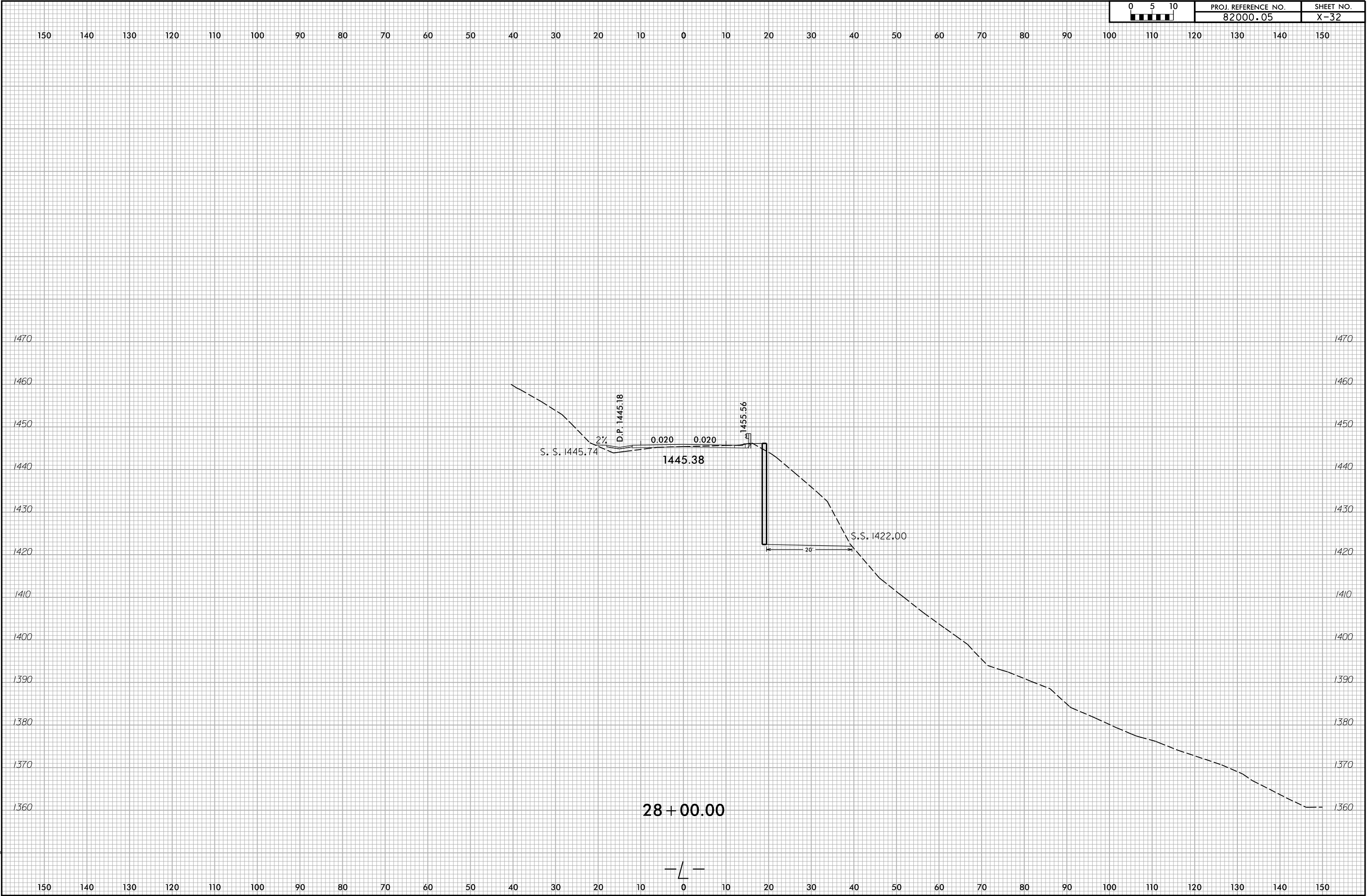
6/23/16

9/18/2026
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User:benegor

05 0 5 10	PROJ. REFERENCE NO.	SHEET NO.
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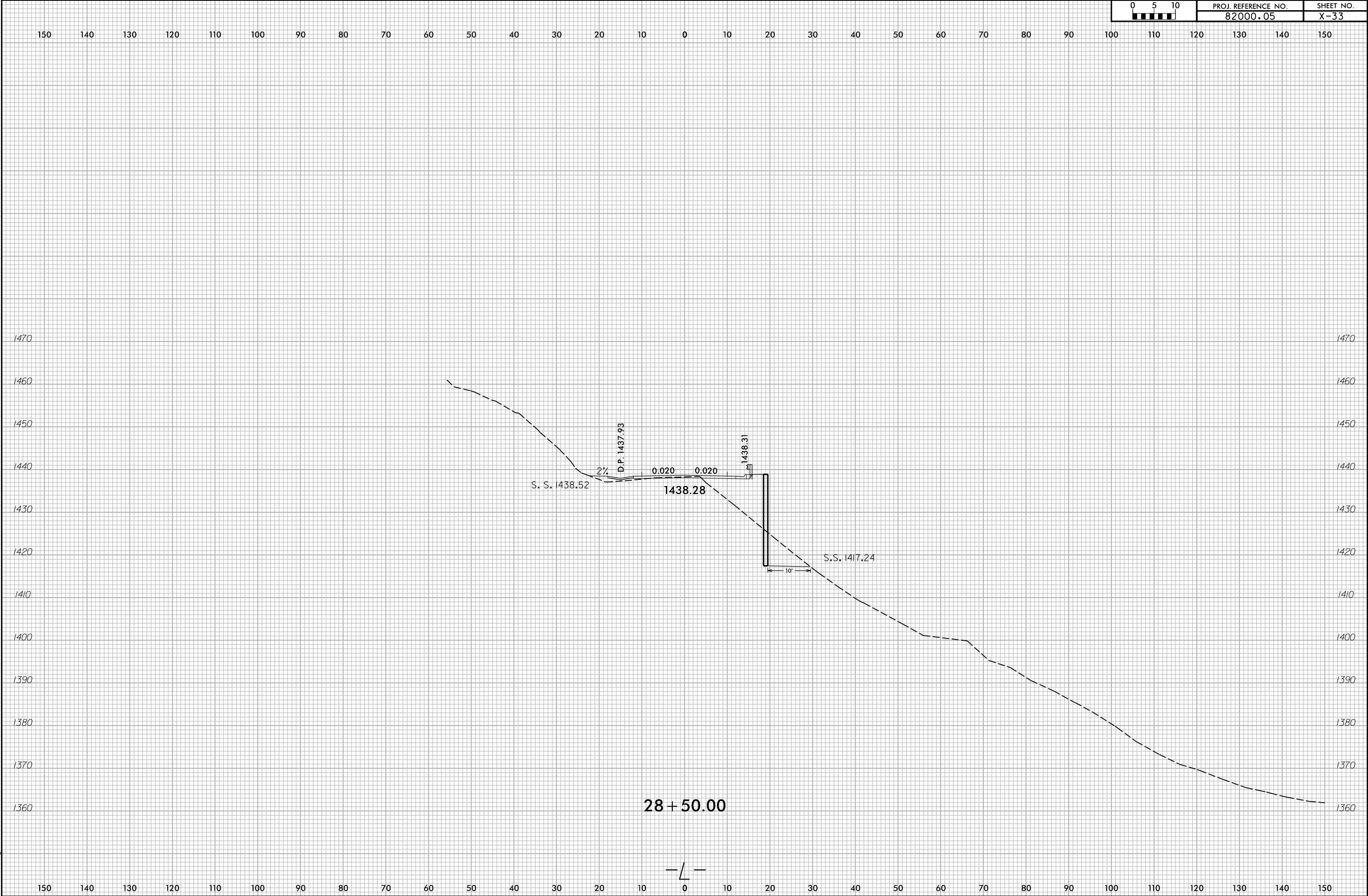




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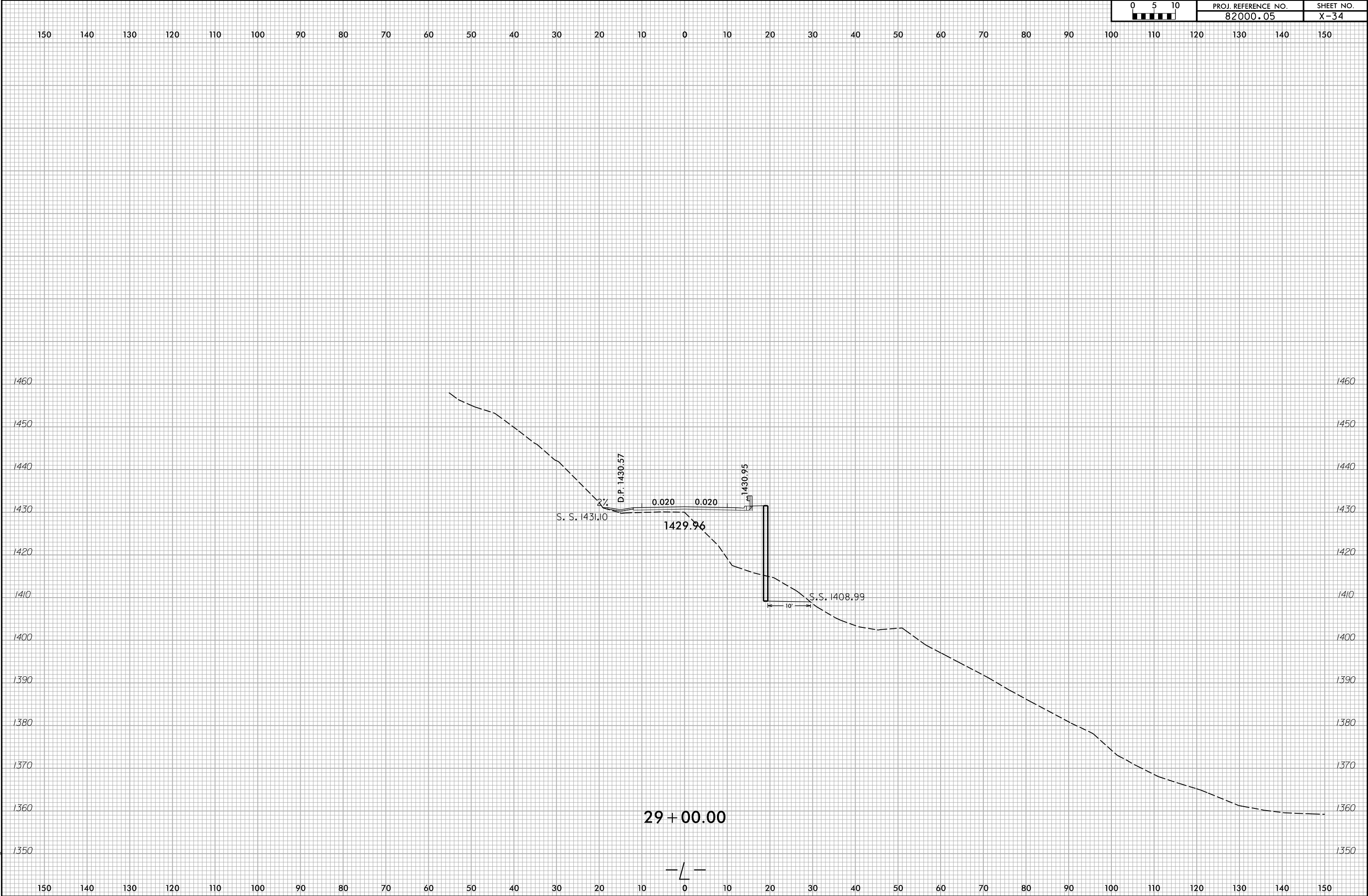
9/18/2026
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05 0 5 10	PROJ. REFERENCE NO.	SHEET NO.
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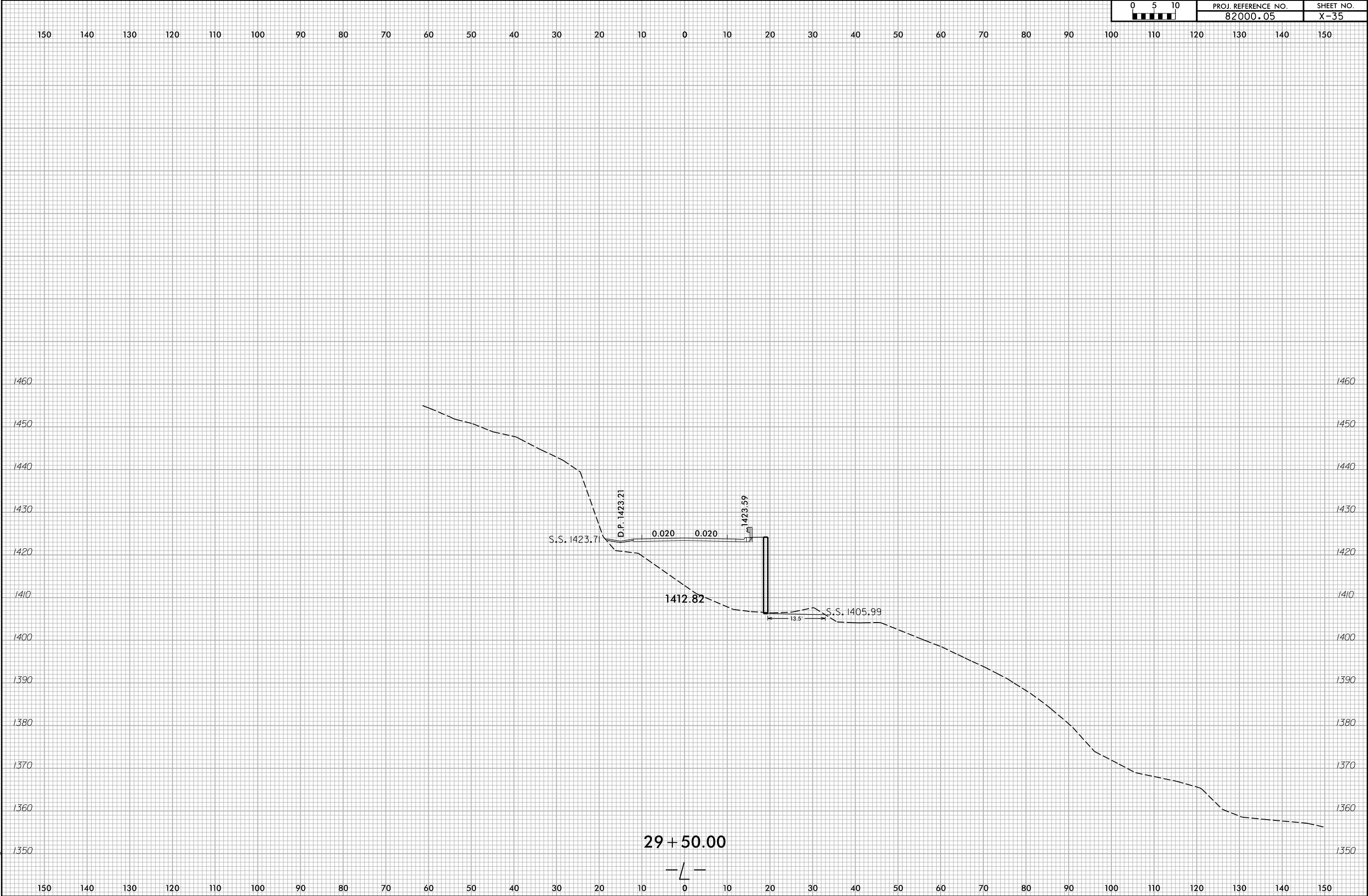


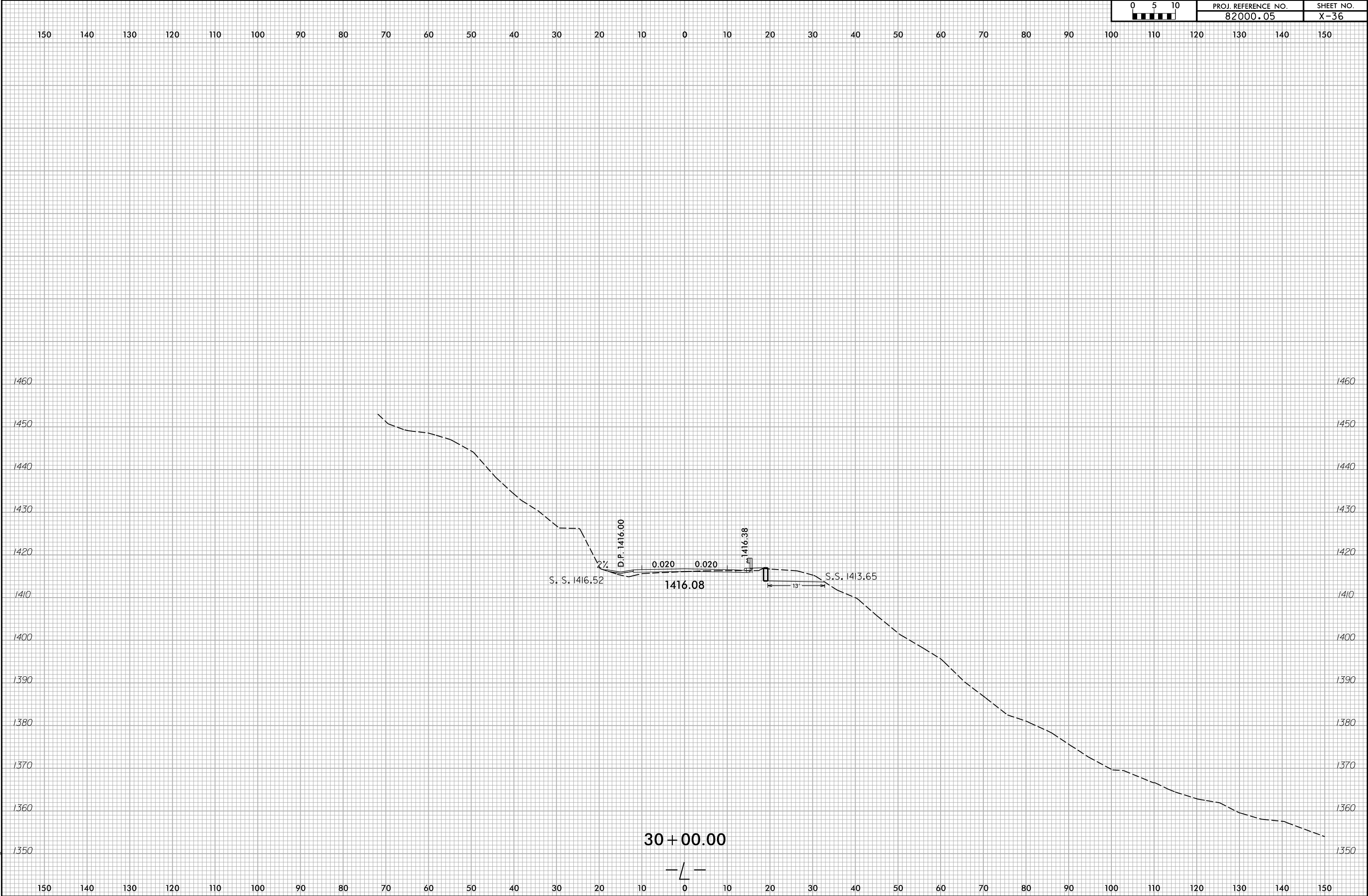
28 + 50.00

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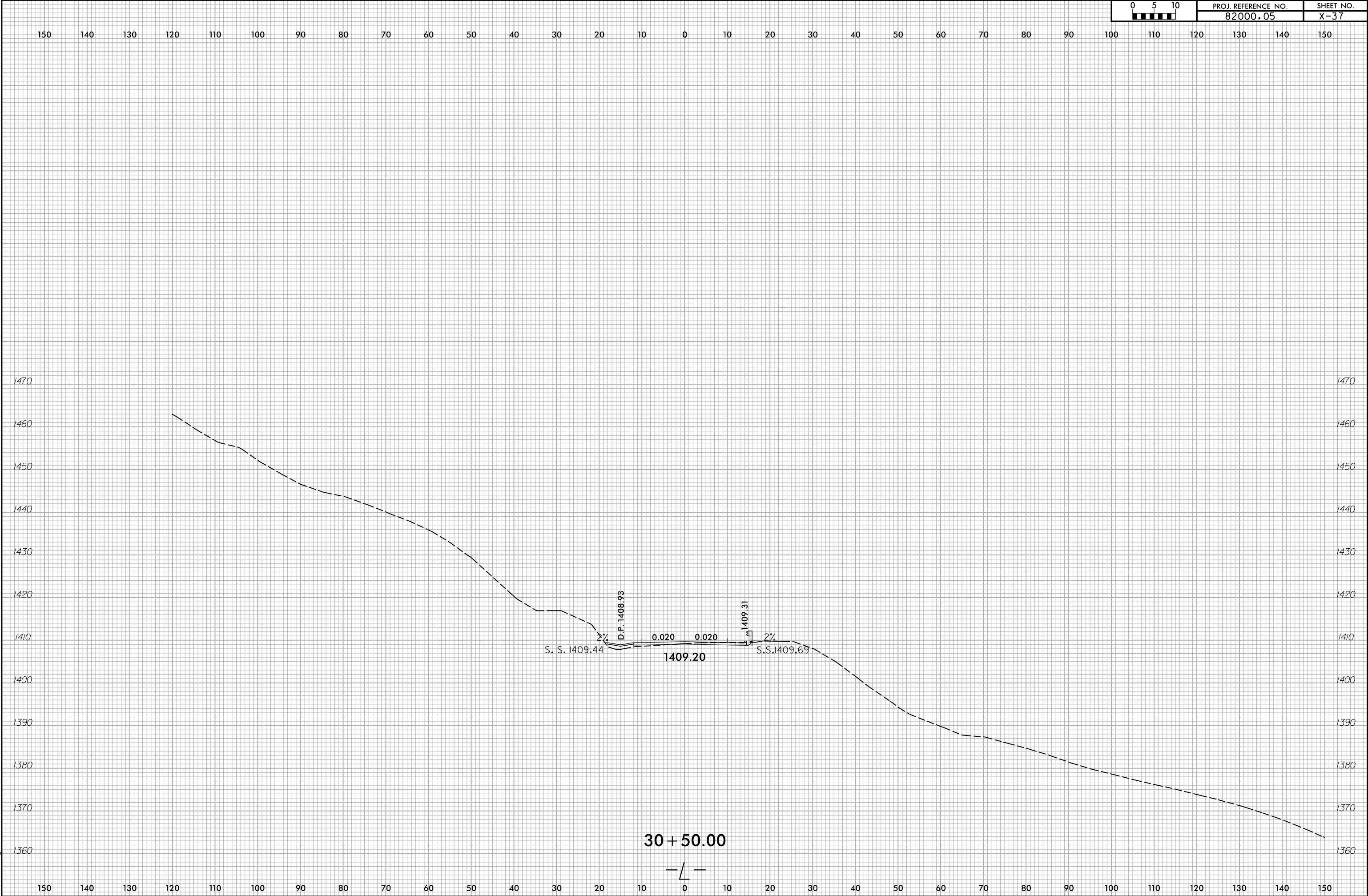




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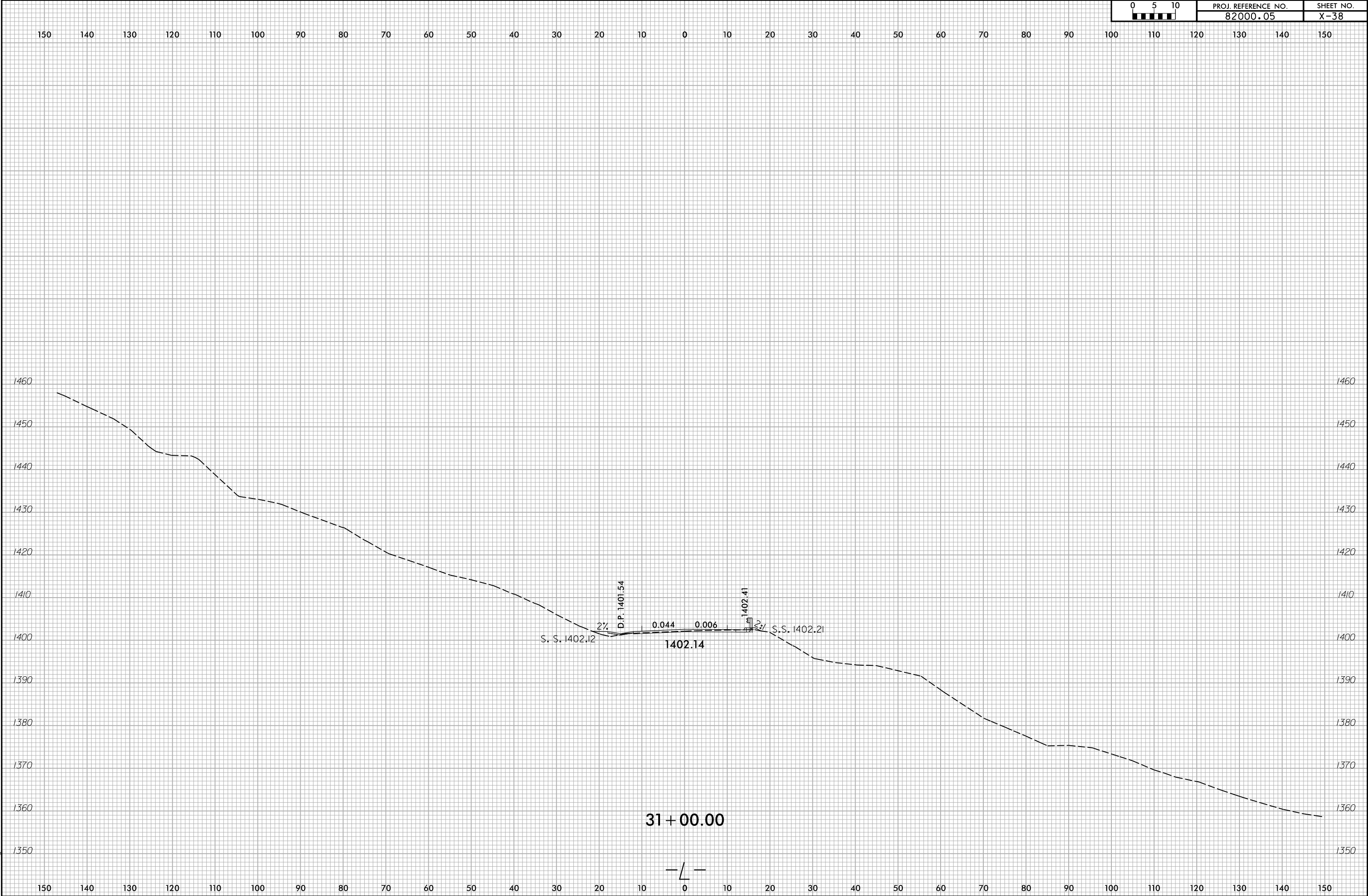
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6/23/16

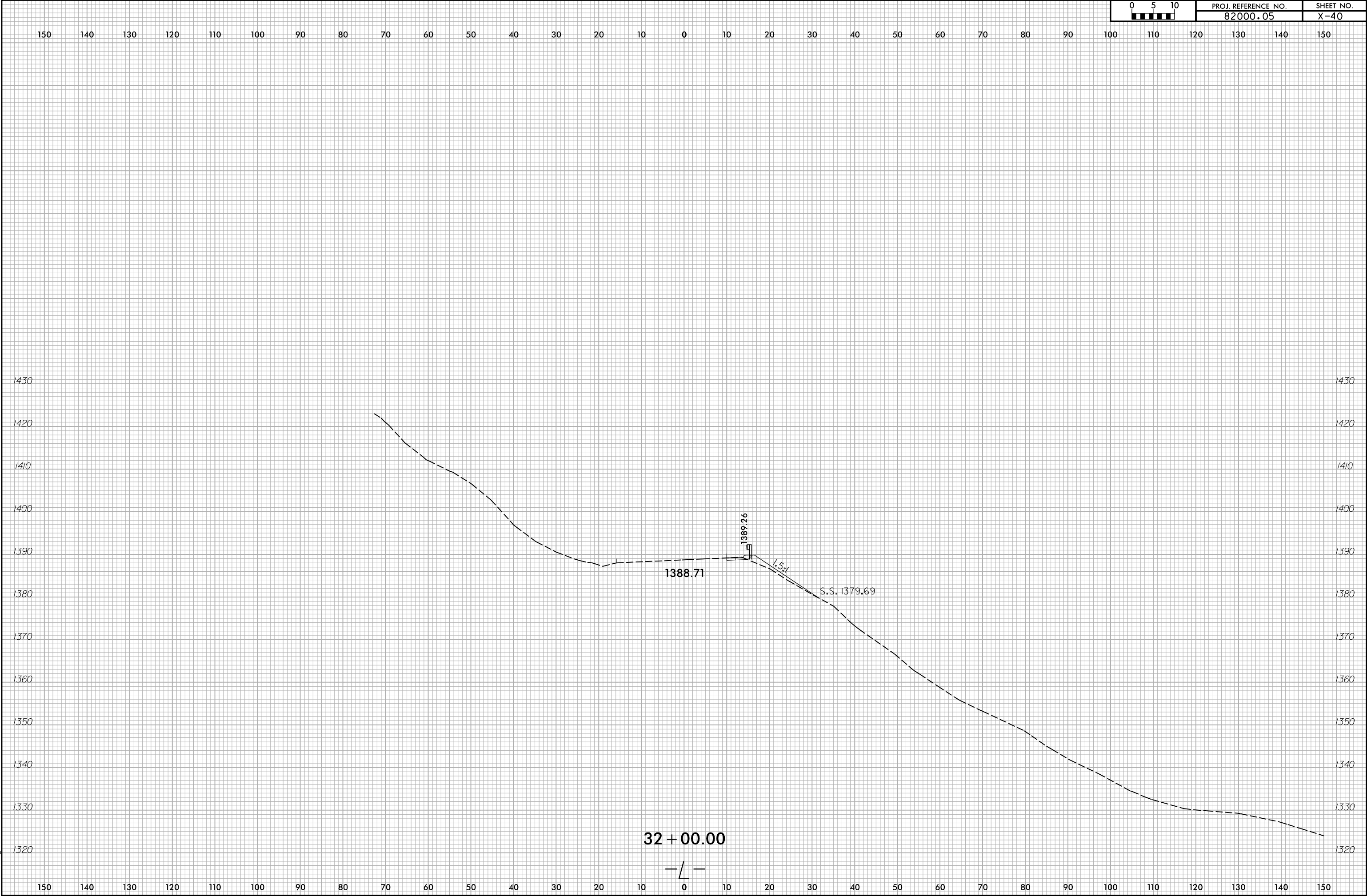
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0510	PROJ. REFERENCE NO.	SHEET NO.
	82000.05	X-38



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