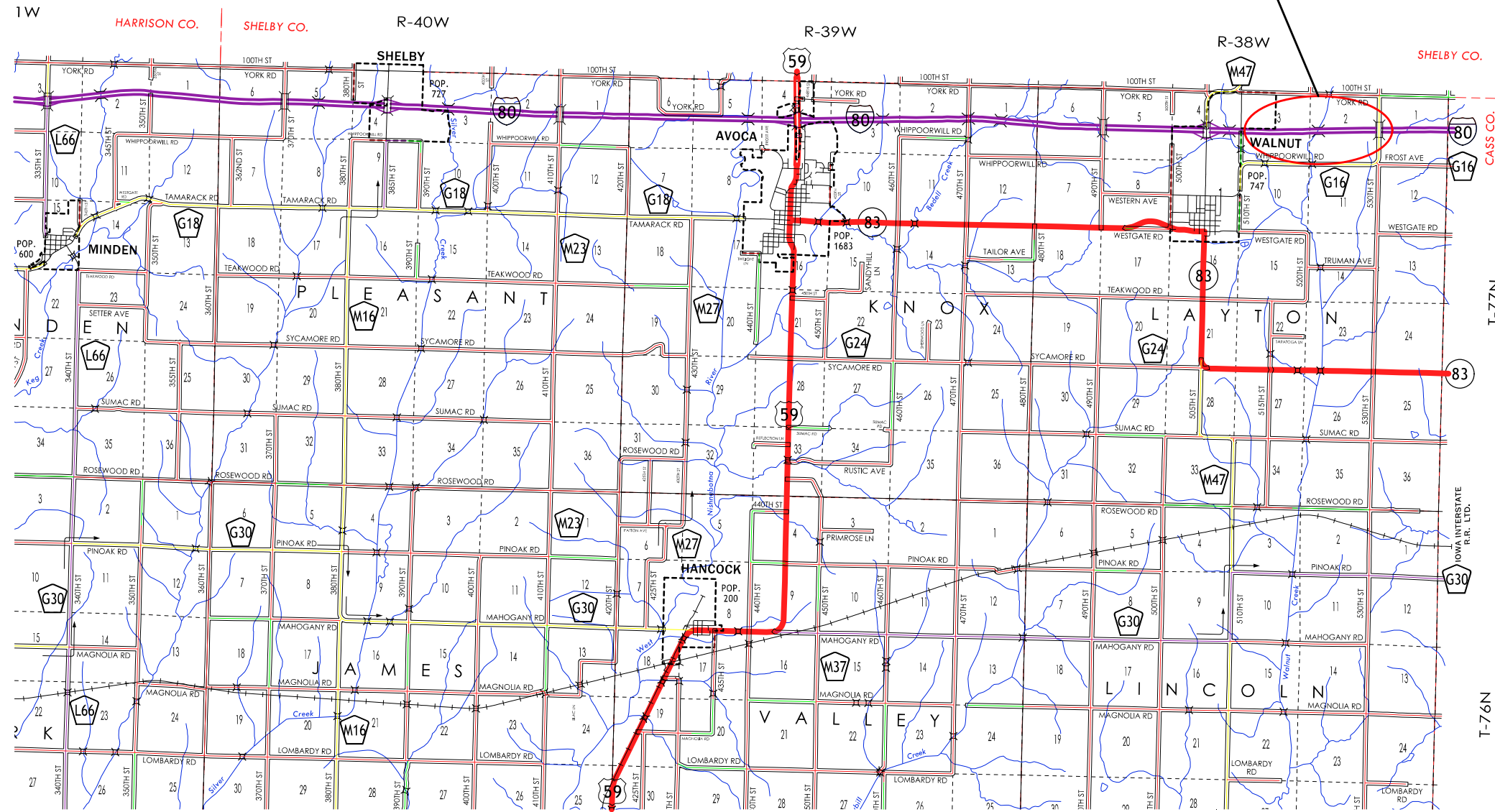
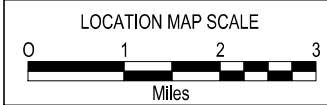
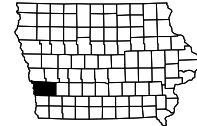


PROJECT LOCATION
 STA. 2052+99.20
 M.P. 47.83
 FHWA No. 45650



7 1 24



IOWA DEPARTMENT OF TRANSPORTATION

To Office District 4 Date September 6, 2023
Attention Wes Mayberry, Assistant District Engineer Ref No. Pottawattamie County
From Casey Faber & Lucas Fatka, WHKS & Co. IMX-080-1(546)48--02-78
Bureau Bridges and Structures Design No. 227
File No. 32387
FHWA No. 45650
Subject Final Concept for Culvert Extension of 12' x 12' x 151' Triple Reinforced Concrete Box
Culvert.
Bridge Maintenance No. 7847.8S080

The culvert under I-80, 1.6 Mi. E of Jct. SR M-47, has been scheduled for an extension to be let on 1/20/2027. The current cost estimate is \$1,119,829 including inflation and a 20 percent contingency presuming a FY 2027 letting. The programmed amount is \$630,000. The culvert field exam on 7/12/2023 was attended by Brad Garside and Travis Malone of the District, as well as Casey Faber and Lucas Fatka of WHKS & Co.

The work type needs to be updated from culvert repair to culvert extension.

The culvert location map and asset information can be viewed in SIIMS using the following link:

https://iowadot-it.bentley.com/bridgedetail.aspx?type=0&as_id=69853

EXISTING CONDITIONS

The culvert was constructed in 1965, Design #563. The culvert is on the NHS system.

There are numerous cracks with leaching in the walls and slab. The leaching is heavy at the ends and adjacent to construction joints. The construction joints are leaking and heavily leaching with significant cracking and staining adjacent to them. There are full-length horizontal cracks at mid-height of the exterior walls that show signs of leaking. The center barrel has up to 4' of silt built up.

The headwalls are in poor condition. There are numerous cracks with heavy leaching and large areas of delamination and spalling with reinforcing exposed primarily on the parapet. There is a 2' drop at the downstream apron. Silt and vegetation restrict the center and west barrels at the inlet.

The posted speed limit is 70 mph and 2022 AADT is 23,600 vehicles per day with 41% trucks (11,800 westbound and 11,800 eastbound).

The approach roadway in each direction is a 2-lane section with 26' PCC pavement, 8' outside HMA shoulders and 6' inside HMA shoulders.

The guardrail meets current design standards. There is one spacer block missing at a damaged post over the north end of the culvert.

Pottawattamie 227 Final Concept
September 6, 2023
Page 2

RECOMMENDATIONS

It is recommended that the following repairs be made:

1. Perform concrete repairs to the deteriorated areas along the construction joints.
2. Perform partial depth repair and installation of a waterstop along the slab and exterior wall construction joints. Drill new weep holes and install a maintainable drain filter, such as a jet filter type product. The cost for two weep holes and filters at each exterior wall construction joint is included in the cost estimate below.
3. Remove and replace barrels 6' at each end to facilitate the culvert extension.
4. Remove the headwalls and extend the culvert 11' at each end (14' min. beyond edge of shoulder).
5. Place engineering fabric and Class E revetment at each end.
6. Excavate and shape the channel at the inlet.
7. Replace the guardrails with high tension cable rails.

Right-of-way is approximately 137' north and south of centerline I-80. Available ROW to the end of new headwalls appears to be at least 20', which should be confirmed in Final Design.

This project is considered a Traffic Critical Project. Traffic control will involve shoulder closure with temporary barrier rail and crash cushions in accordance with modified Standard Road Plan TC-402. Two lanes of traffic in each direction on I-80 will be maintained at all times.

This project does not cross an Iowa DNR paddling route. No action required.

Location and Environment Bureau has reviewed and determined that this project requires a 404 permit. It is expected that the project will be authorized under a Nationwide Permit #3 or #14. Compensatory mitigation will be required if stream impacts exceed 0.03-acre.

The following utilities have been identified by One Call (811):

(ICN) IOWA COMMUNICATIONS NETWORK
Contact Name : Shannon Marlow
Contact Phone: 8005723940
Contact Email: icnoutsideplantiowaonecall@iowa.gov

(M11E) MIDAMER-ELEC
Contact Name : Brett McMains
Contact Phone: 7123664648
Contact Email: brett.mcmains@midamerican.com

(MAW) MIDAMER-WIND
Contact Name : Wind Engineer
Contact Phone: 8006320999
Contact Email: mecdsmdesignlocates@midamerican.com

No utilities were observed during the field exam.

Estimated cost of repairs is as follows:

BRIDGE ESTIMATE:				
Item	Quantity	Unit	Rate	Amount
Removals, as per plan	1	LS	\$30,000	\$30,000
Structural Concrete (RCB Culvert)	428	CY	\$1,000	\$428,000
Concrete Repairs	46	SF	\$250	\$11,500
Partial Depth Repairs	360	SF	\$250	\$90,000
Jet Filters	12	EA	\$1,000	\$12,000
Class E Revetment	82	TON	\$75	\$6,150
Engineering Fabric	210	SY	\$5	\$1,050
Temporary Shoring (PE Req.)	1	LS	\$50,000	\$50,000
Temporary Stream Diversion	1	LS	\$10,000	\$10,000
Mobilization	1	LS	10.00%	\$63,870
	Base Cost:			\$702,570
	Contingency:		20%	\$140,514
	3 Years Inflation:		4.5%	\$119,015
	BRIDGE TOTAL:			\$962,099
ROADWAY ESTIMATE:				
Item	Quantity	Unit	Rate	Amount
Removal of Steel Beam Guardrail	760	LF	\$12	\$9,120
High Tension Cable Guardrail	500	LF	\$30	\$15,000
High Tension Cable Guardrail, End Anchor	4	Each	\$4,000	\$16,000
Temporary Barrier Rail, Concrete	1300	LF	\$25	\$32,500
Temp Crash Cushion	2	Each	\$1,500	\$3,000
Traffic Control	1	LS	\$20,000	\$20,000
Additional Roadway Items	1	LS	\$10,000	\$10,000
Mobilization	1	LS	10.00%	\$9,562
	Base Cost:			\$115,182
	Contingency:		20%	\$23,036
	3 Years Inflation:		4.5%	\$19,512
	ROADWAY TOTAL:			\$157,730
	PROJECT TOTAL:			\$1,119,829

CVF/LDF

Distributed to:

Scott Schram, District 4
 Wes Mayberry, District 4

Jason Sallach, District 4
 Dan Redmond, District 4
 Brad Garside, District 4
 Chris Haynes, District 4
 Nathaniel Epperson, District 4
 Todd Frank, District 4
 Austin Yates, District 4 TSMO
 Charlie Purcell, Transportation Development
 Dave Lorenzen, Systems Operations
 Michael Kennerly, Design
 Kent Nicholson, Design
 Stuart Nielson, Design
 Dan Harness, Design
 Dung Ta, Design
 Shawn Majors, Program Management
 Mark A Swenson, Project Scheduling
 Jeremy Vortherms, Project Management
 Brennan Dolan, Location and Environment
 Jacob Woodcock, Location and Environment
 Jill Garton, Location and Environment
 Marc Solberg, Location and Environment
 Claire Asberry, Location and Environment
 DeeAnn Newell, Location and Environment
 Chris Schwake, Location and Environment
 Brad Azeltine, Location and Environment
 Kenneth Brink, Location and Environment
 Greg Cagle, Right of Way
 James Nelson, Bridges and Structures
 Mike Nop, Bridges and Structures
 David Evans, Bridges and Structures
 James Muetzel, Bridges and Structures
 Steve Seivert, Bridges and Structures
 Jim Ellis, Bridges and Structures
 Scott Neubauer, Bridges and Structures
 Joe Stanisz, Bridges and Structures
 Ronald Meyer, Bridges and Structures
 Steven Schroder, Bridges and Structures
 Curtis Carter, Construction and Materials
 Brian Worrel, Construction and Materials
 Dan Sprengeler, Traffic and Safety
 Willy Sorenson, Traffic and Safety

Appendix



South headwall



Southwest corner



Typical construction joint condition



Typical slab construction joint



Storm sewer in west wall



Typical exterior wall (horiz. leaking cracks)



North headwall



Northeast corner



Channel downstream (2' drop)



North headwall (silt/vegetation center and west)



EB roadway looking W at S end of culvert

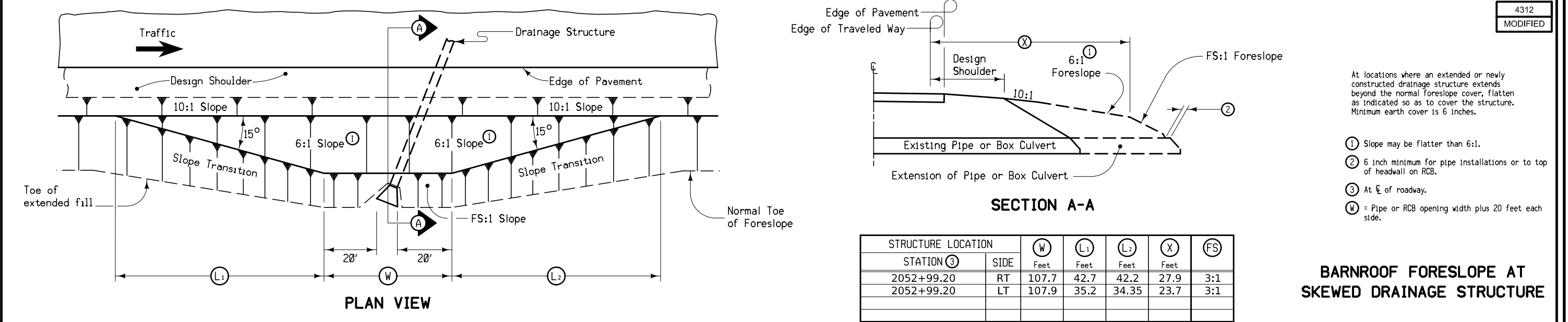
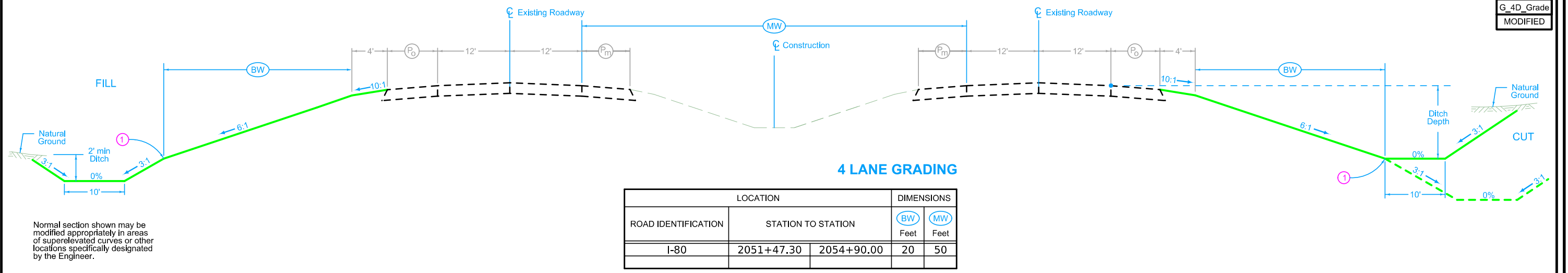
WB roadway looking E at N end of culvert



Damaged post/missing spacer block at N guardrail

FIELD EXAM NOTES/QUESTIONS

FIELD EXAM NOTES/QUESTIONS



SURVEY SYMBOLS

- Interstate Highway Symbol
- U.S. Highway Symbol
- Iowa Highway Symbol
- County Road Highway Symbol
- Evergreen Tree
- Deciduous Tree
- Fruit Tree
- Shrub (Bushes)
- Timber
- Hedge
- Stump
- Swamp
- Rock Outcrop
- Broken Concrete
- Revetment (Rip Rap)
- Cemetery
- Grave
- Cave
- Sink Hole
- Board Fence
- Chain Link or Security Fence
- Wire Fence
- Terrace
- Earth Dam or Dike (Existing)
- Tile Outlet
- Edge of Water
- Existing Drainage
- Right of Way Rail or Lot Corner
- Concrete Monument
- Well
- Windmill
- Beehive Intake
- Existing Intake
- Existing Utility Access (Manhole)
- Fire Hydrant
- Water Hydrant (Rural)
- Septic Tank
- Cistern
- L.P. Gas Tank (No Footing)
- Underground Storage Tank
- Latrine
- Satellite TV Dish
- Water Hook Up
- Radio Tower
- Tower Anchor
- Guardrail (Beam or Cable)
- Guard Post (one or two)
- Guard Post (over two)
- Filler Pipe
- Gas Valve
- Water Valve
- Speed Limit Sign
- Mile Marker Post
- SIGN Sign
- TCB Traffic Signal Control Box
- RRB Rail Road Signal Control Box
- TSB Telephone Switch Box
- EB Electric Box

UTILITY LEGEND

E1 **EL1D, Midamerican Energy - Quality D**

PLAN VIEW COLOR LEGEND OF PLAN AND PROFILE SHEETS

LINEWORK		Design Color No.		
Green	(2)		Existing Topographic Features and Labels	
Blue	(1)		Proposed Alignment, Stationing, Tic Marks, and Alignment Annotation	
Magenta	(5)		Existing Utilities	
SHADING		Design Color No.		Transparency
Pink, Dark	(13)		Temporary Pavement Shading	50%
Yellow	(4)		Proposed Pavement Shading	50%
Orange	(6)		Proposed Granular Shading	50%
Orange	(70)		Proposed Shoulder Granular Shading	50%
Yellow	(68)		Proposed Shoulder Paved Full Depth Shading	50%
Yellow	(132)		Proposed Shoulder Paved Partial Depth Shading	50%
Brown, Light	(236)		Grading Shading	50%
Orange, Light	(134)		Proposed Granular Entrance Shading	50%
Yellow	(220)		Proposed Paved Entrance Shading	50%
Tan	(8)		Proposed Sidewalk Shading	50%
Blue, Light	(230)		Proposed Sidewalk Landing Shading	50%
Pink	(11)		Proposed Sidewalk Ramp Shading	50%
Red	(3)		Proposed Structure Shading	50%
Red	(3)		Delineates Restricted Areas	0%

PROFILE VIEW COLOR LEGEND OF PLAN AND PROFILE SHEETS

LINEWORK		Design Color No.	
Green	(10)		Existing Ground Line Profile
Blue	(1)		Proposed Profile and Annotation
Magenta	(5)		Existing Utilities
Blue, Light	(230)		Proposed Ditch Grades, Left
Black	(0)		Proposed Ditch Grades, Median
Rust	(14)		Proposed Ditch Grades, Right

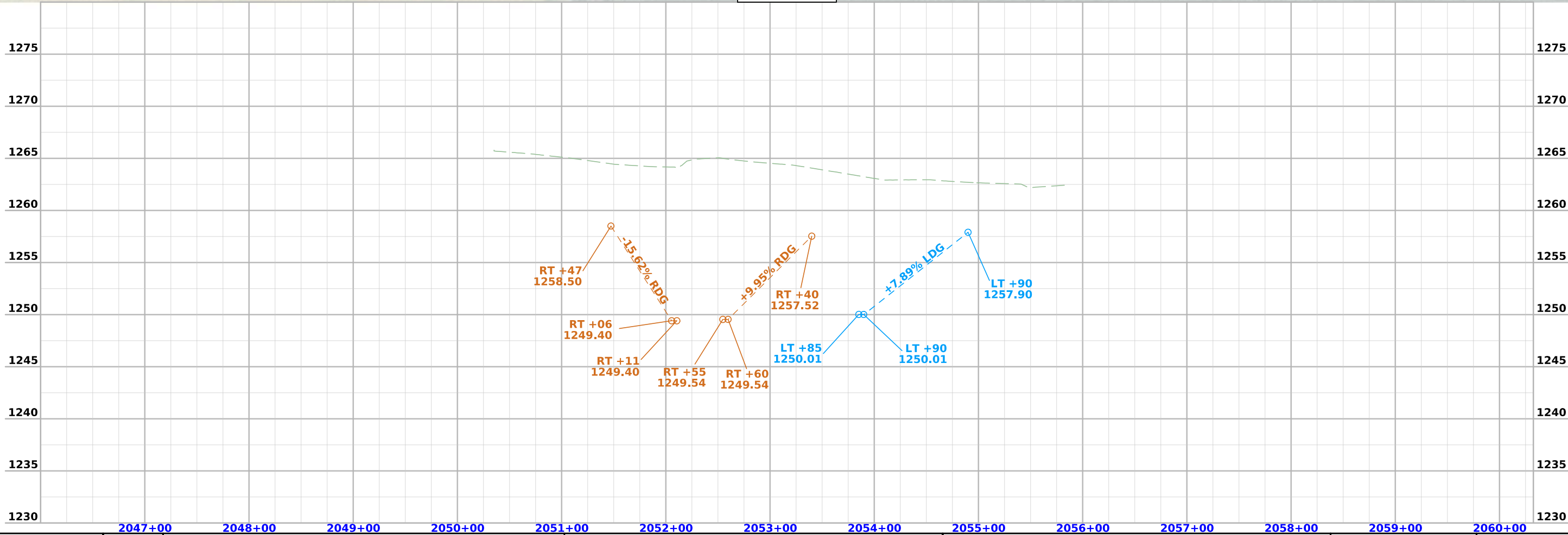
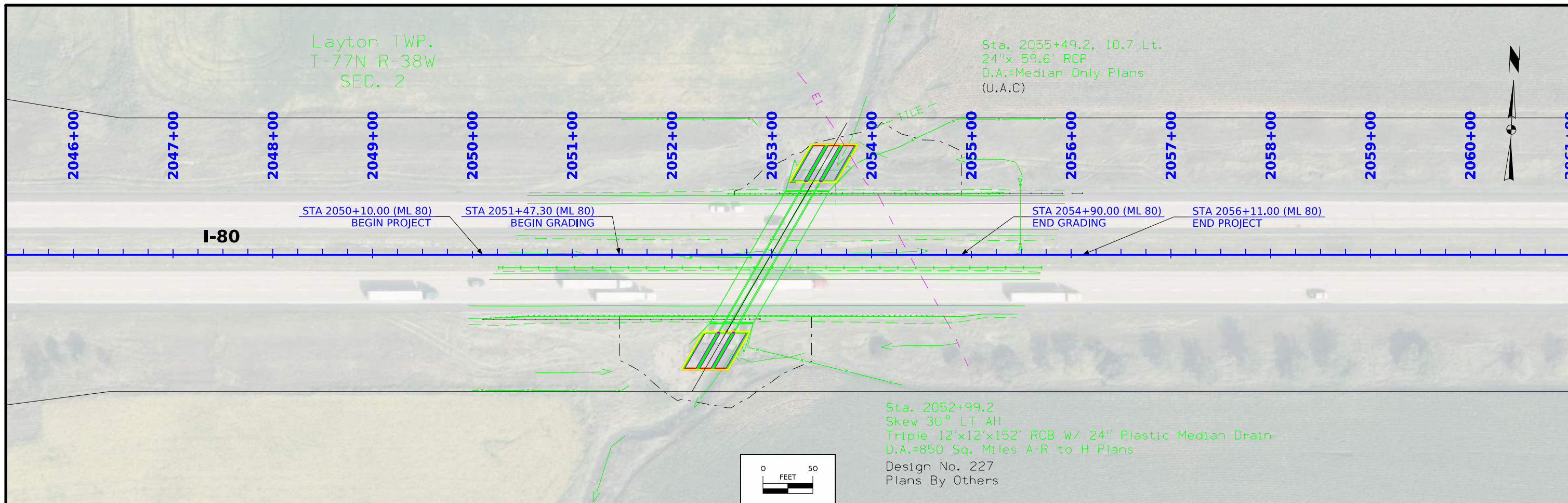
- Reference Point
- Station
- Survey Line
- Section Corner
- Ground Line Intercept
- Saw Cut
- Guardrail
- Trench Drain
- HighTension Cable Guardrail
- Sheet Pile
- Pavement Removal
- Clearing & Grubbing Area

RIGHT-OF-WAY LEGEND

- Proposed Right-of-Way Symbol
- Proposed Right-of-Way Line
- Existing Right of Way
- Existing and Proposed Right-of-Way
- Easement and Existing Right-of-Way
- Easement (Temporary) Symbol
- Easement (Temporary) Line
- Easement
- C/A Access Control
- Property Line Symbol
- Property Line

PLAN AND PROFILE LEGEND AND SYMBOL INFORMATION SHEET

(COVERS SHEET SERIES D, E, F, & K)



Survey Information

SURVEY INDEX

County: Pottawattamie
PIN: 22-78-080-050
Project Number: IMX-080-1(546)48--02-78
Location: Stream 1.6 mi E of Co Rd M47
Type of Work: Culvert Extension
Project Directory: 7808005022

Alignment Information

The horizontal alignment for I80 this survey has been provided by the district 4 survey office.

Survey Personnel

Clayton Henningsen – Survey Party Chief
Jason Arn – Survey Party Chief

Date(s) of Survey

Begin Date 03/14/2024
End Date 03/31/2024

General Information

This survey is for I-80 culvert extension at location 1.6 mi E of Co Rd M47. This survey request was for the I-80 corridor only. This project is a Full Field DTM survey.

Utility Information

For logging data and other utility details see Utility Survey and Ownership Report in the Utility folder of the PrelimSurvey project directory.

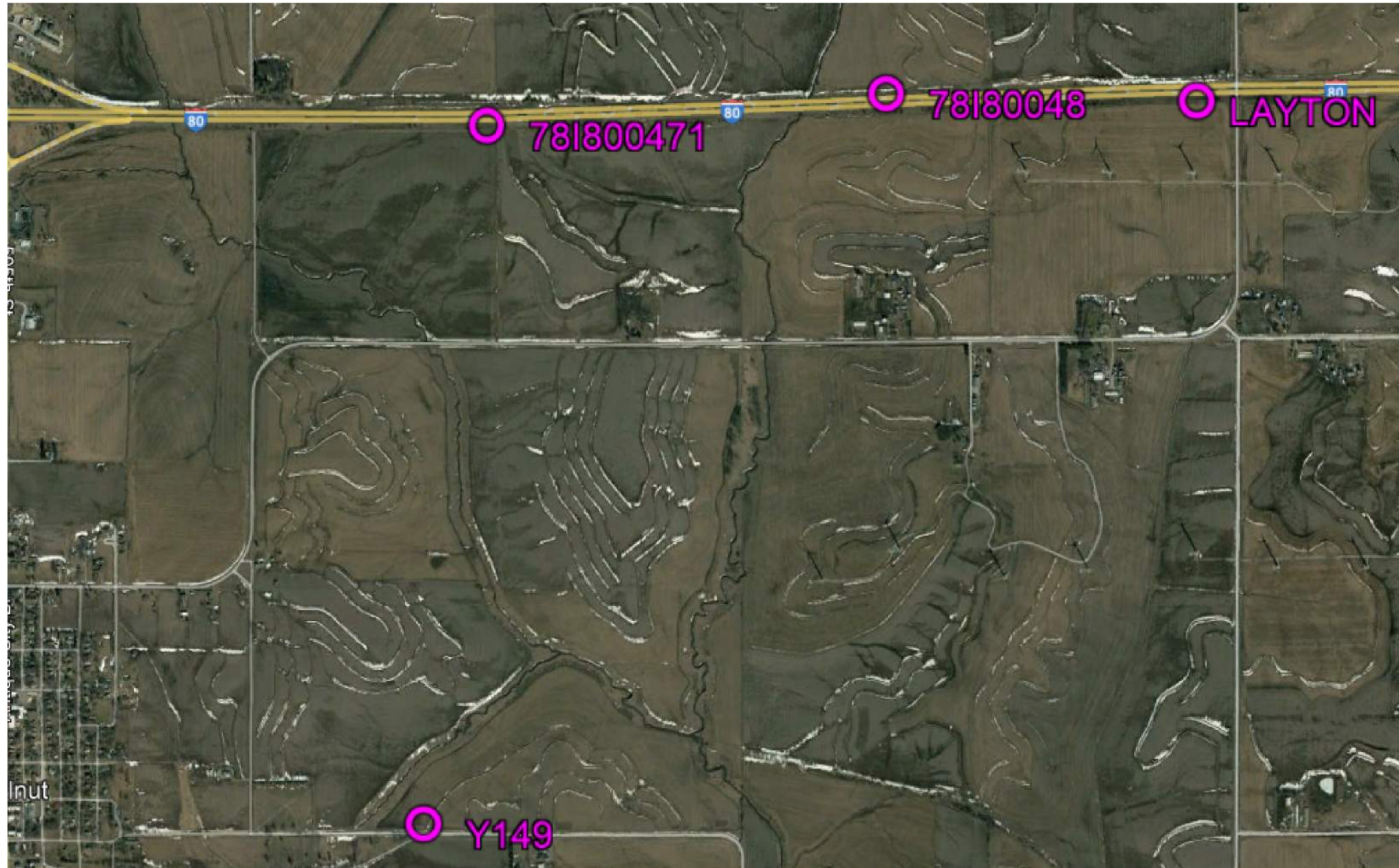
Project Control

Coordinates were determined for primary project control points by conducting concurrent six-hour static observations. Post processing is constrained to nearby Iowa Real Time Network reference stations. For additional details of the control survey, contact the Preliminary Survey department.

PROJECT DATUM: NAD83(2011) for EPOCH 2010.00 (IaRTN 2019 ADJUSTMENT)
COORDINATE SYSTEM: IOWA REGIONAL COORDINATE SYSTEM ZONE 06
(U.S. SURVEY FOOT)
VERTICAL DATUM: NAVD88
GEOID MODEL: 2018u3

CONTROL POINT VICINITY MAP

This map is a guide to the vicinity of the primary project control points. Primary control is for use with RTK base stations and for RTN validation. Future surveys will use primary project control to establish temporary control as needed for construction or other surveying applications.



HORIZ. DATUM: NAD83(2011) for EPOCH 2010.00 (IaRTN 2019 Adjustment) - Iowa RCS Zone 06 (U.S. Survey Foot)

VERT. DATUM: NAVD88 - Geoid Model: 2018u3

Coordinate listing from next sheet will be used with IaRTN for monument recovery. No other reference ties are given.

HORIZONTAL AND VERTICAL PROJECT CONTROL COORDINATE LISTING
 HORIZ. DATUM: NAD83(2011) for EPOCH 2010.00 (IaRTN 2019 Adjustment)
 Ia. Regional Coordinate System Zone 06 (U.S. Survey Foot)
 VERT. DATUM: NAVD88
 Geoid Model: 2018u3

<u>Point Name</u>	<u>Northing</u>	<u>Easting</u>	<u>Elevation</u>	<u>Feature Definition-Description</u>
78I80048	7055169.09	16649505.15	1266.92	CP SET FENO MONUMENT IN NORTH ROW I-80 APPROX 15 FT NORTH OF MILE MARKER 48 & 60 FT SOUTH OF ROW FENCE
78I800471	7054765.44	16645023.53	1331.60	CP SET FENO MONUMENT IN SOUTH ROW I-80 APPROX 20 FT NORTH OF ROW FENCE & 58 FT SOUTH OF EDGE AC SHOULDER
LAYTON	7055075.42	16652731.41	1343.92	CP NGS MONUMENT AS DESCRIBED IN GOOD CONDITION
Y149	7047265.73	16644620.36	1277.48	CP NGS MONUMENT AS DESCRIBED IN GOOD CONDITION

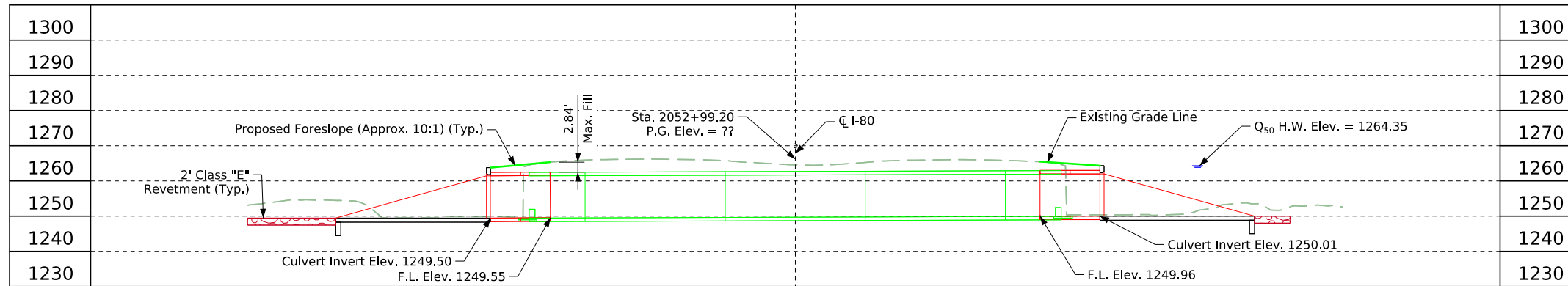
TRAFFIC CONTROL PLAN

108_23A
8/15/22

This project is considered a Traffic Critical Project. Traffic control will involve shoulder closure with temporary barrier rail and crash cushions in accordance with modified Standard Road Plan TC-402.

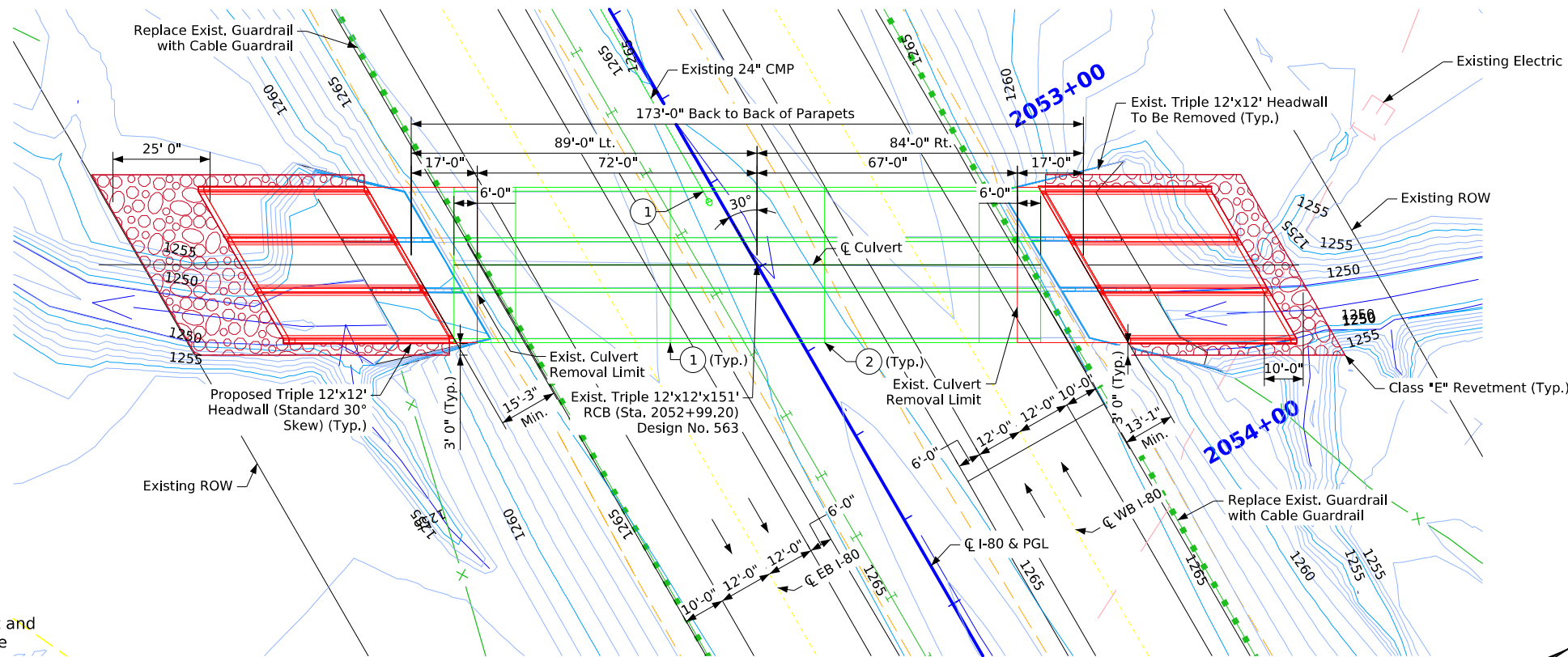
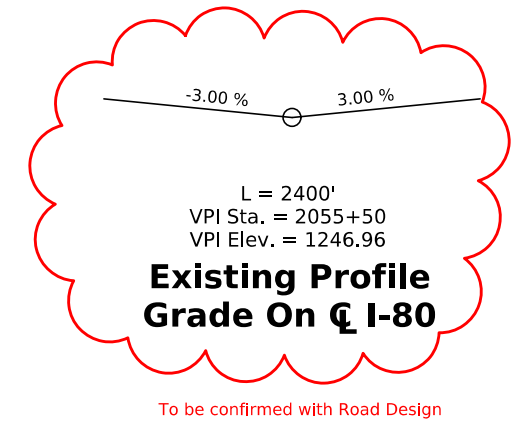
Two lanes of traffic in each direction on I-80 will be maintained at all times.

Control Point: 78180048 CP SET FENO MONUMENT IN NORTH ROW I-80 APPROX 15 FT NORTH OF MILE MARKER 48 & 60 FT SOUTH OF ROW FENCE, N=7055169.087, E=16649505.145, EL.=1266.918
 781800471 CP SET FENO MONUMENT IN SOUTH ROW I-80 APPROX 20 FT NORTH OF ROW FENCE & 58 FT SOUTH OF EDGE AC SHOULDER, N=7054765.442, E=16645023.525, EL.=1331.599



Longitudinal Section Along C Culvert

Design Fill = 3'-0"
 Anticipated Settlement = Negligible



Plan Notes:

- Headwalls shall be placed level.
- Limits of easements to be determined.
- Revetment is proposed at the culvert inlet and outlet per concept statement and due to the outlet velocity exceeding policy limits.
- Class E revetment stone is embedded.
- Revetment shall uniformly transition from ends of culvert to natural stream section.

General Notes:

--This design is for the extension of the existing Triple 12'x12' Reinforced Concrete Box Culvert, Pottawattamie Design No. 563, FHWA No. 45650, Maint. No. 7847.85080.

Utilities Note:

Utilities shown on this sheet are for information only. See Road Design sheets for utility information. Conflicts with existing utilities and need for potential relocations to be confirmed in Final Design.

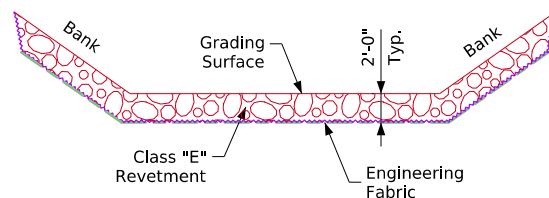
General Utility Symbols:

E - Electric Line

Traffic Data

2022 AADT	23,600	V.P.D.	
TRUCKS			41 %

Situation Plan



Inlet & Outlet Protection

Location:

I-80 Over Drainage Ditch
 T-77N R-38W
 Section 2
 Layton Township
 Pottawattamie County
 FHWA No. 45650 (Existing)
 Maint. No. 7847.85080
 Latitude: 41.497481
 Longitude: -95.190927

Hydraulic Design

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: **Brian J. Birkland** Date: _____
 Printed or Typed Name: **Brian J. Birkland**
 My license renewal date is December 31, **2024**

Pages or sheets covered by this seal: **V.1**

Hydraulic Data

RIDB: Not Applicable
 Drainage Area = 8.77 Sq. Mi.
 Site Stream Slope = 0.11% (5.8 ft./mi.)
 Per USGS Report 2015-5055, Discharges Are From USGS Report 2013-5086 Region 3 Single Variable Regression Equations

Q₅₀ (Design) = 3,960 cfs
 Headwater (HW) El. = 1264.35
 Exit Velocity = 8.9 Ft./s.

- 1 Perform concrete repairs to deterioration around the CMP culvert inlet and at construction joints.
- 2 Perform partial depth repair and installation of a waterstop along the slab and exterior wall construction joints. Drill new weep holes and install a maintainable drain filter, such as a jet filter type product.

Preliminary

Design For 30 Degree LA
Triple 12'x12' Reinforced Concrete Box Culvert Extension

Situation Plan

STA. 2052+99.20 (I-80) Turn-in Date: September, 2024

Pottawattamie County

IOWA DEPARTMENT OF TRANSPORTATION
 Design No. 227 Design Sheet No. 001 of 1 FHWA/Asset 45650

CROSS SECTION VIEW COLOR LEGEND

Design Color No.	Feature	Design Color No.	Feature
Aggregate			
(64)	Choke Stone	(8)	Behind Curb Cut
(42)	Engineering Fabric	(6)	Granular
(8)	Flooded Backfill	(13)	Granular Back Fill
(92)	Macadam Stone	(48)	Rock Undercut
(20)	Modified	(8)	Shoulder Earth Fill
(12)	Plowing Shaping	(2)	Side Slopes
(14)	Porous Backfill	(226)	Side Slopes Dressing
(8)	Revetment Class A	Substrata	
(6)	Revetment Class B	(128)	Boulder
(62)	Revetment Class C	(209)	Boulder Removed
(188)	Revetment Class D	(48)	Broken Weathered
(28)	Revetment Class E	(210)	Broken Weathered Removed
(12)	Shoulder Special Backfill	(3)	Core Out
(12)	Special Backfill	(115)	Core Out Remove Only
(20)	Subbase	(195)	Core Out Remove and Replace
(20)	Subbase Lower	(203)	Existing Pavement
(20)	Subbase Upper	(184)	Existing Pavement Remove Only
(118)	Subgrade Treatment	(200)	Existing Pavement Remove and Replace
Asphalt			
(207)	HMA Base Course	(6)	Loam
(207)	HMA Interim Course	(211)	Loam Removed
(207)	HMA Surface Course	(80)	Rock
Bridge			
(0)	Bridge	(212)	Rock Removed
Concrete			
(0)	Barrier Concrete	(4)	Select Sand
(0)	Barrier Concrete Footing	(214)	Select Sand Removed
(0)	Curb Gutter	(3)	Shale
(48)	Flowable Mortar	(215)	Shale Removed
(0)	Median Concrete	(10)	Topsoil
(0)	PCC Pavement	(2)	Topsoil Remove Only
(0)	Sidewalk	(4)	Topsoil Remove and Replace
Unsuitable / Waste			
(0)	Existing Pavement	(3)	Unsuitable Type A
Shoulder			
(209)	Shoulder HMA	(216)	Unsuitable Type A Removed
(0)	Shoulder PCC	(13)	Unsuitable Type B
(6)	Shoulder Granular	(217)	Unsuitable Type B Removed
Structural			
(112)	Noise Wall	(11)	Unsuitable Type C
(112)	Noise Wall Footing	(218)	Unsuitable Type C Removed
(112)	Retaining Wall Back	(3)	Waste
(112)	Retaining Wall Back Excavate	(219)	Waste Removed
(112)	Retaining Wall Face		
(112)	Retaining Wall Front Excavate		
(112)	Retaining Wall Front Footing		
(112)	Retaining Wall MSE Gutter		
(112)	Retaining Wall Reinforced Earth		

NOTES:

Text

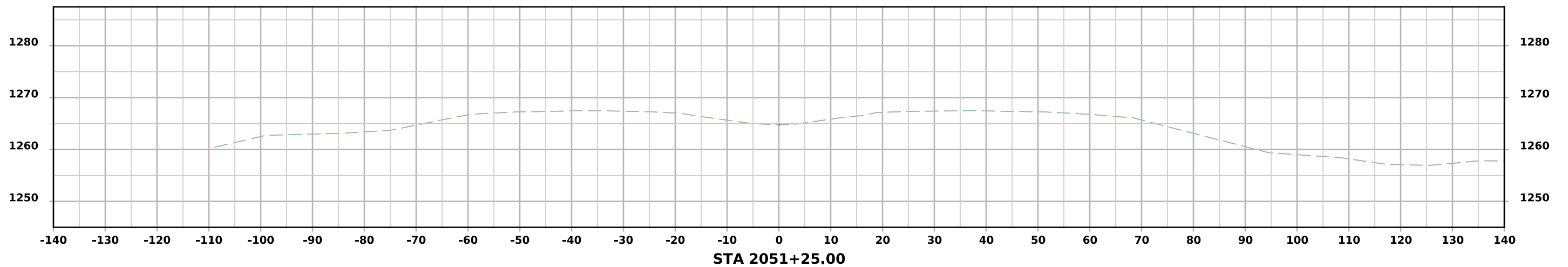
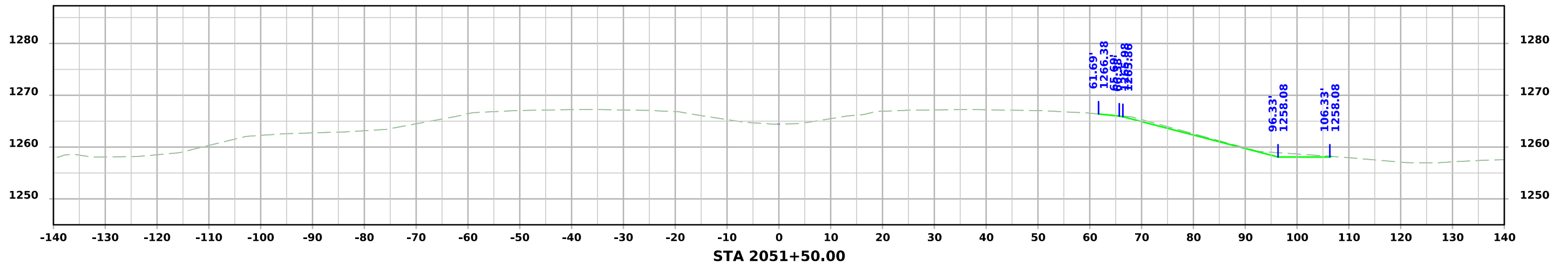
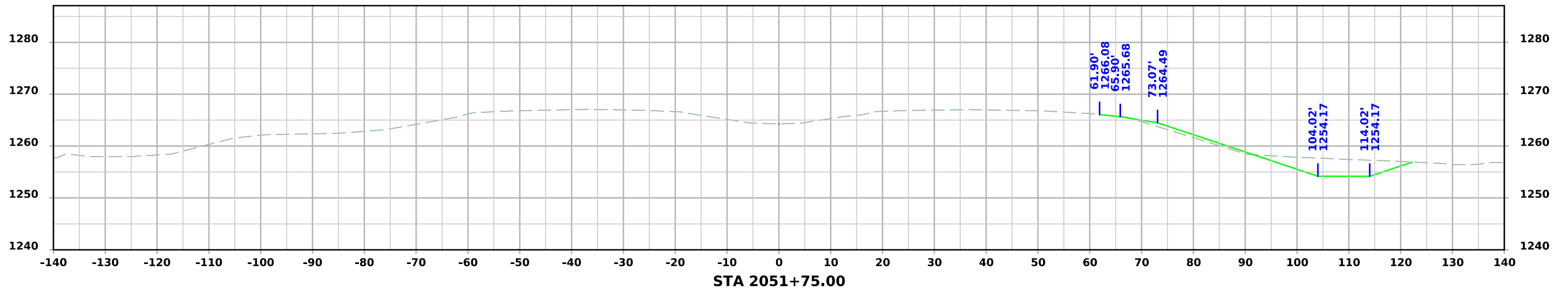
NOTES:

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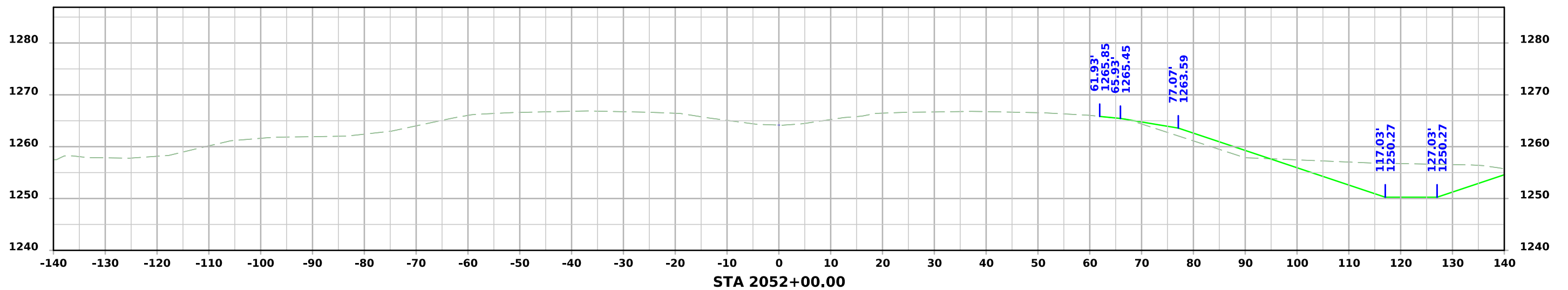
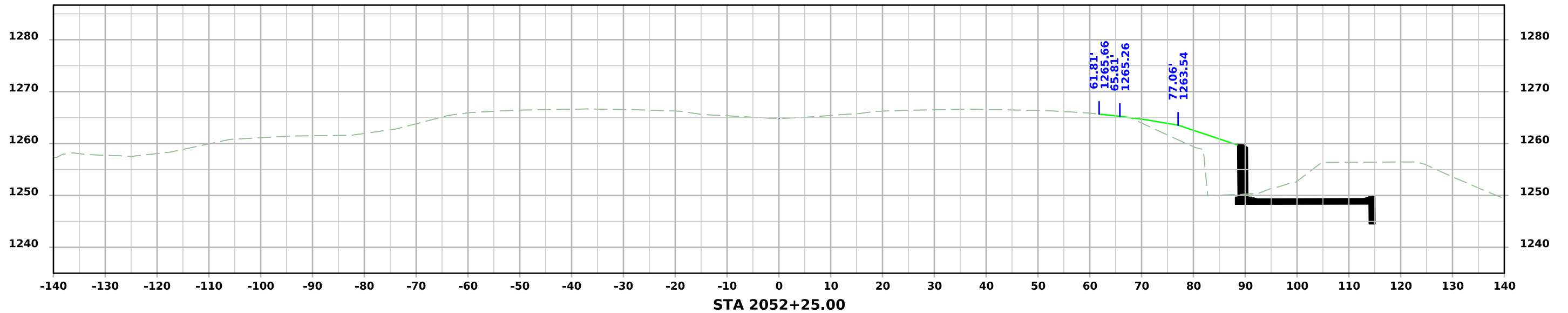
CROSS SECTIONS LEGEND AND INFORMATION SHEET

(COVERS SHEET SERIES W, X, Y, & Z)

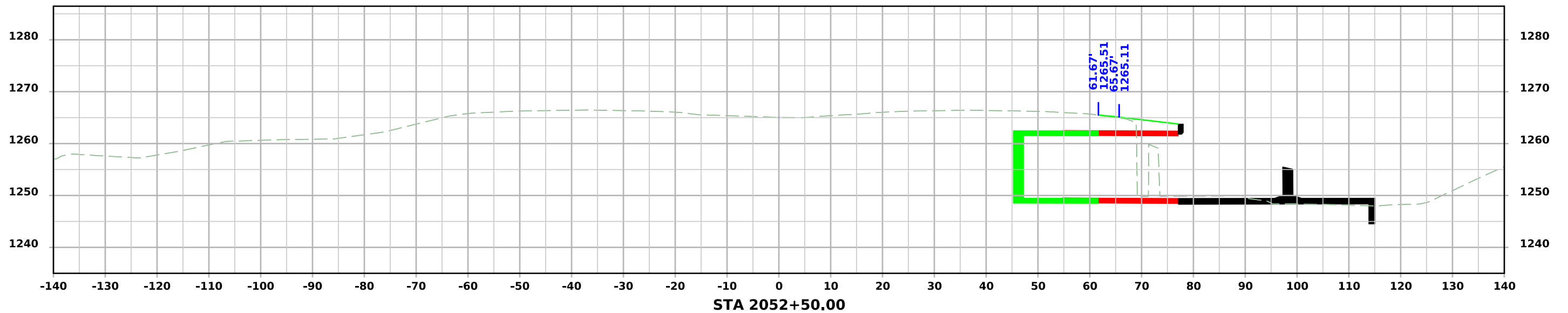
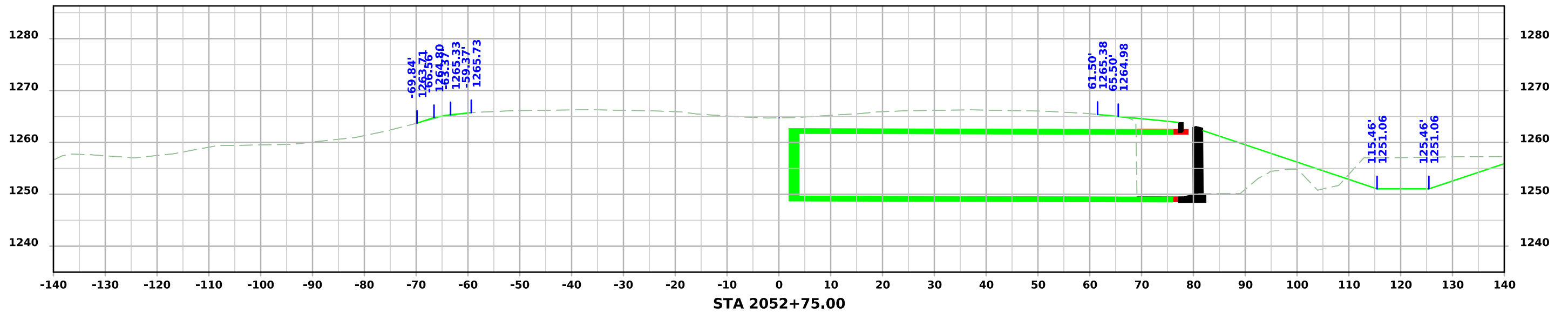
ML - I-80



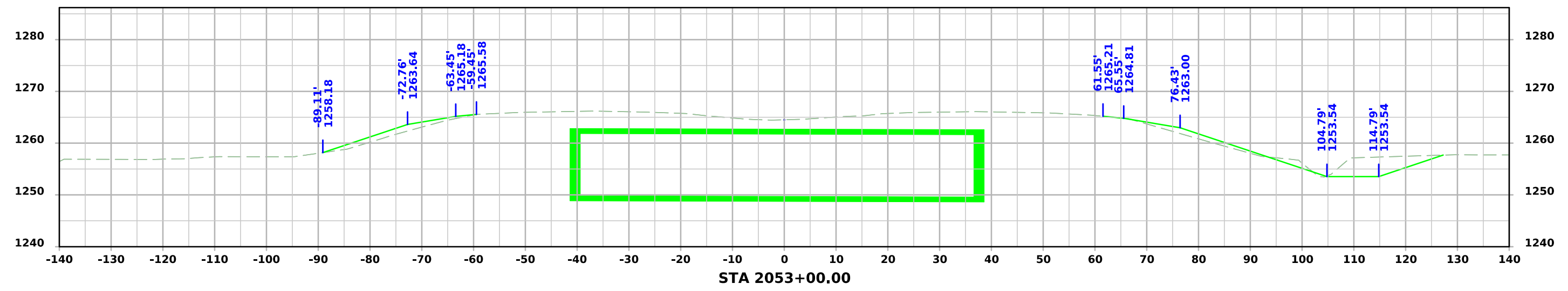
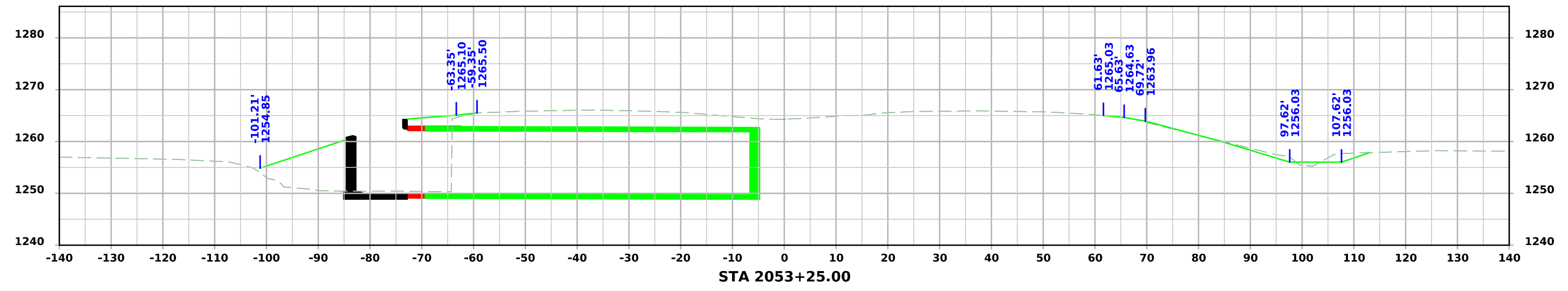
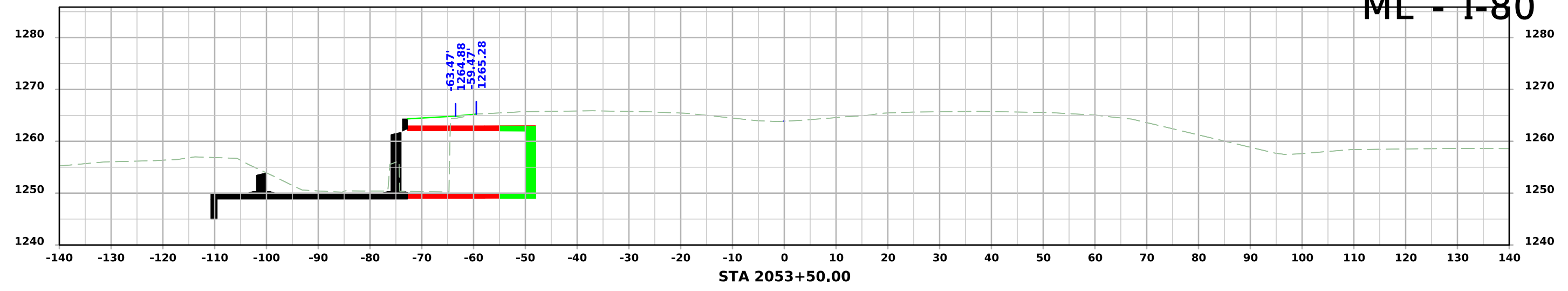
ML - I-80



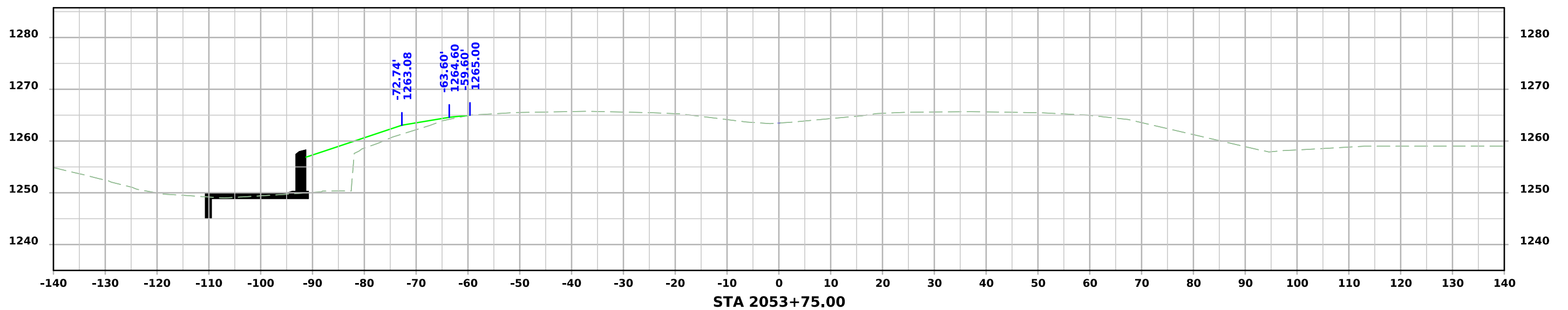
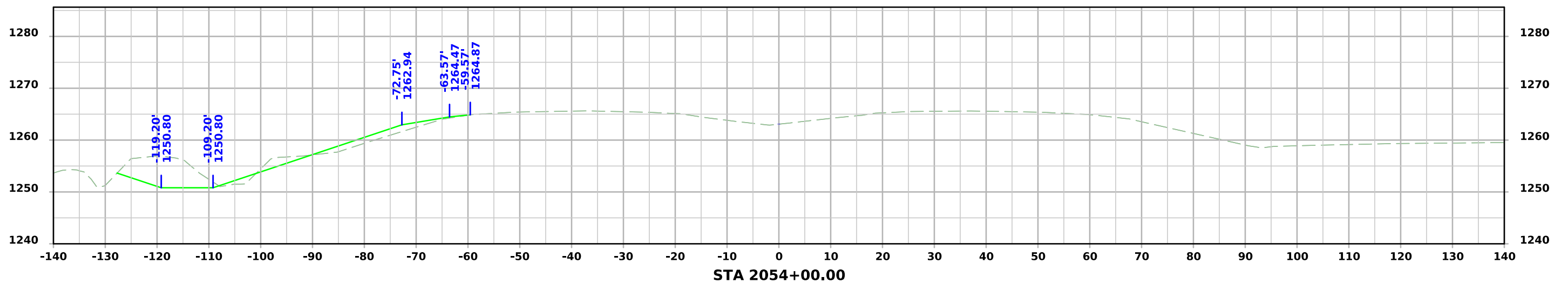
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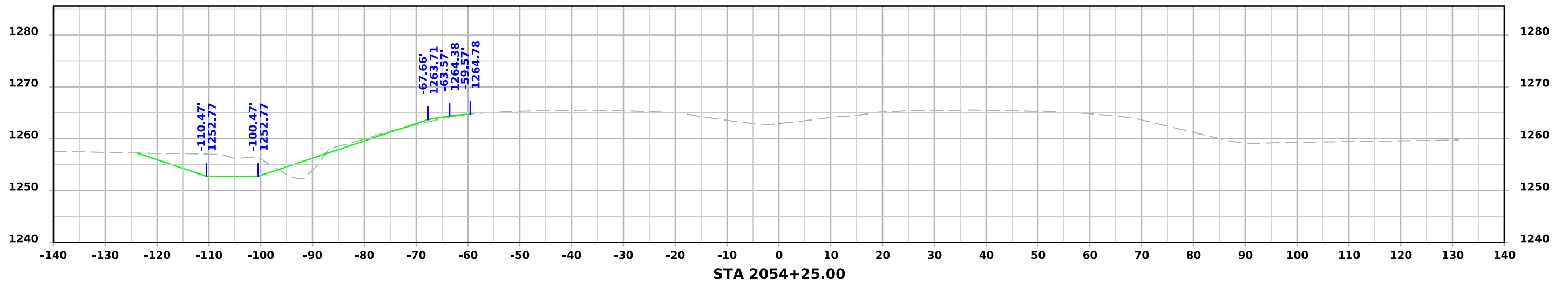
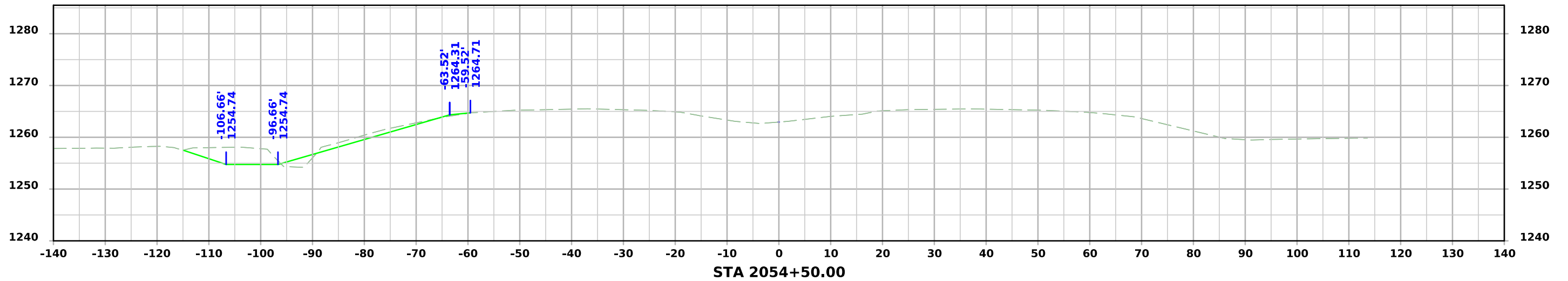
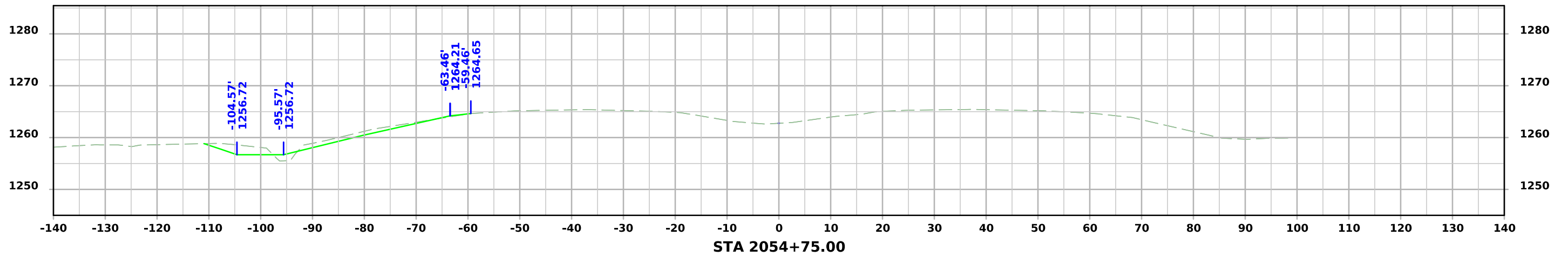
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