LETTING DATE **Mar 16 2027**

RCB Culvert Replacement - Single Box
STPN-009-1(059)--2J-60

LYON COUNTY

INDEX OF SHEETS

IOWA | DOT

REVISIONS

	TOTAL
	..
PROJECT IDENTIFICATION NUMBER	
24-60-009-030	
PROJECT NUMBER	
STPN-009-1(059)--2J-60	
R.O.W. PROJECT NUMBER	
-	
-	
-	

PLANS OF PROPOSED IMPROVEMENT ON THE

PRIMARY ROAD SYSTEM
LYON COUNTY

RCB Culvert Replacement - Single Box

Approx 1.4mi W of Co Rd K60

-

-

SCALES: As Noted

Refer to the Proposal Form for list of applicable specifications.

Value Engineering Saves. Refer to Article 1105.14 of the Specifications.

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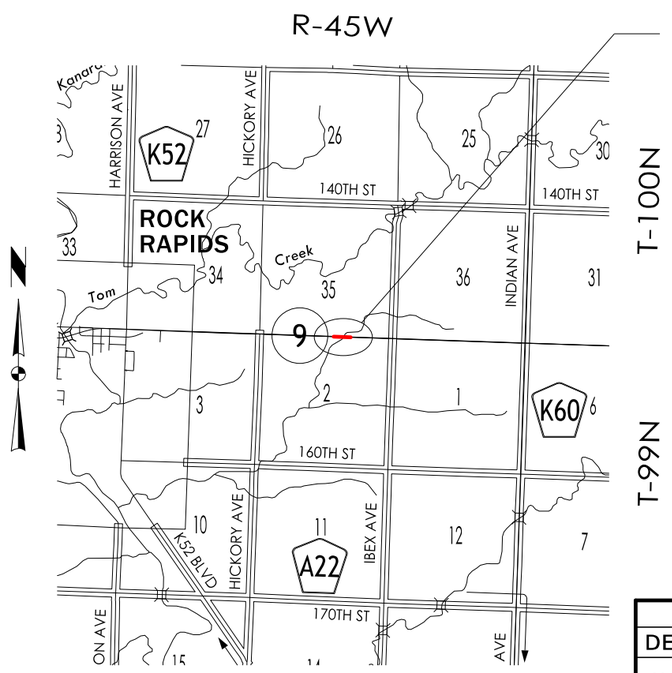


D5 PLAN - Date: 7/25/25
P9 PLAN - Date: 11/19/25
D4 PLAN - Date: 11/17/26

PRELIMINARY PLANS

Subject to change by final design.

D2/D3 PLAN - 6/4/25

DESIGN DATA RURAL

2027	AADT	2800	V.P.D.
2047	AADT	3300	V.P.D.
20 –	DHV	–	V.P.H.
TRUCKS		15	%
Total Design ESALs		–	

INDEX OF SEALS

SHEET NO.	NAME	TYPE	BID QUANTITY SHEETS
A.1	X	Primary Signature Block	X
X	X	X	X

IOWA DEPARTMENT OF TRANSPORTATION

TO OFFICE:	District 3	**DATE:**	January 14, 2025
ATTENTION:	Jessica Felix	**PROJECT:**	Lyon County STPN-009-1(059)--2J-60
FROM:	John E. Bartholomew		PIN: 24-60-009-030
OFFICE:	Design		
SUBJECT:	Project Concept Statement; **(Final, D0)**		

This project involves the replacement of the IA 9 culvert over a drainage ditch approximately 1.4 miles west of county road K60

A concept review was held on September 26th. Those present included Jason Klemme, Darwin Bishop and Shane Tymkowicz, from the District 3 Office; Jim Ellis from the Bridges and Structures Bureau; Mike Carlson, Brock Struecker, Jim Galliart, Shawn Goetz, Marc Solberg and Beth Kramer from the Location and Environment Bureau; Heidi Lane and Jordan Zacny from HTNB; and John Bartholomew, Kevin Patel and Joe Adams from the Design Bureau.

A second concept review was held on October 29th. Those present included Lance Schlumbohm and Darwin Bishop from the District 3 Office; Jim Ellis from the Bridges and Structures Bureau; Jim Galliart, Shawn Goetz, Marc Solberg and Beth Kramer from the Location and Environment Bureau; Heidi Lane and Jordan Zacny from HTNB; and John Bartholomew, Kevin Patel and Joe Adams from the Design Bureau.

The three alternatives considered were:

1. Leave the existing RCB in place and install revetment upstream of the inlet of the existing structure as an erosion protection measure. This was dismissed due to condition of the culvert walls.
2. Remove the existing Twin 5’ x 5’ RCB and replace in kind with a CIP Twin 5’ x 5’ RCB, connecting to the existing extensions and flared headwall sections. This was dismissed due to the condition of the culvert walls.
3. Remove the existing Twin 5’ x 5’ RCB and replace with a 12’ x 4’ x 107’-5” RCB along with application of 45° skew. **Estimated cost $505,800.**

Alternative 3 is the preferred alternative due to improved natural flow and moving away from the existing wellhead and fence line of adjacent property(see attached concept for details). Additional right of way may be required. Traffic will be maintained by an off-site detour.

The Draft Project Concept Statement was sent out for review and comment with concerns to be resolved by Monday, January 13, 2025. Comments received during the review period have been considered and resolved.

JEB:jaa
Attach.
cc:

FINAL PROJECT CONCEPT STATEMENT

IA 9 Culvert over Drainage Ditch

Lyon County
STPN-009-1(059)--2J-60
PIN: 24-60-009-030

Highway Division
Design Bureau

John Bartholomew, P.E.
515-239-1540

January 14, 2025

I. STUDY AREA

A. Project Description

This project involves the replacement of the IA 9 Culvert over a drainage ditch approximately 1.4 miles west of county road K60.

The three alternatives considered were:

1. Leave the existing RCB in place and install revetment upstream of the inlet of the existing structure as an erosion protection measure. This was dismissed due to condition of the culvert walls.
2. Remove the existing Twin 5’ x 5’ RCB and replace in kind with a CIP Twin 5’ x 5’ RCB, connecting to the existing extensions and flared headwall sections. This was dismissed due to the condition of the culvert walls.
3. Remove the existing Twin 5’ x 5’ RCB and replace with a 12’ x 4’ x 107’-5” RCB along with application of 45° skew. **Estimated cost $505,800.**

Alternative 3 is the preferred alternative due to improved natural flow and moving away from the existing wellhead and fence line of adjacent property.

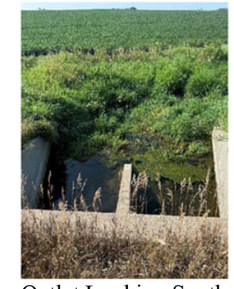
B. Need for Project

This is a 5’x 5’ x 100’ dual opening Reinforced Concrete Box that was built in 1936 and has reached the end of its service life. The RCB has leaching cracks and spalling near the end walls. Due to the overall condition of the culvert, a replacement is recommended.

IA 9 Looking East

Inlet Scour

Inlet Looking North



Outlet Looking South

C. Present Facility

The existing structure is a Twin 5’ x 5’ RCB that was built in 1936, extended in 1995.

IA 9 in the project area is 24’ wide PCC pavement with 6’ wide granular shoulders and 3:1 foreslopes, constructed in 1937, a 4.5” AAC overlay was added in 1991 and Micro surfacing was done in 2017.

D. Traffic Estimates

The 2027 construction year and 2047 design year average daily traffic estimates are

2800 ADT with 14 % trucks and 3300 ADT with 15 % trucks, respectively.

E. Sufficiency Ratings

IA 9 is classified as an access route and is a maintenance service level "C" roadway.

F. Access Control

Access rights will not be acquired for this project.

G. Crash History

During the five-year study period from January 1, 2019 through December 31, 2023, there were no crashes.

II. PROJECT CONCEPT

A. Feasible Alternatives

Alternative #3 - Replace with a 12' x 4'-0 x 107'-5" Single reinforced concrete box culvert utilizing offsite detour.

Replace the existing twin 5'-0" x 5-0' Concrete box culvert with a single 12' x 4'-0 x 107'-5" reinforced concrete box culvert (RCB) with a 45 degree skew.

The typical cross section adjacent to the culvert will consist of a 24' roadway with 6' effective granular shoulders and 3:1 foreslopes.

New pavement will be 9.5" PCC over 12" of modified Subbase.

This culvert will be constructed on the existing vertical and horizontal alignment. An off-site detour will be required during construction.

Apply erosion control and rural seeding and fertilizing to all disturbed areas.

It appears that right away will be required for this project, it is programmed for $10,000.

RCB Items	Estimated Costs
New RCB	$ 192,000
Reinforcing Steel	75,000
Excavation, Class 10	2,000
Revetment	1,200
RCB Removal	500
Mobilization - 10%	27,000
M & C - 20%	59,600
RCB Costs	**$ 357,300**
Roadway Items	
Embankment in Place, Contractor Furnish	$12,200
Excavation Class 13 Waste	2,700
Modified Subbase	5,700
Granular Shld, Type A	1,700
STD/S-F PCC Pav't, 9.5"	16,200
Removal of Pavement	5,100
Erosion Control	50,000
Right of Way	10,000
Seeding and Fertilizing	400
Mobilization - 5%	7,400
Traffic Control - 5%	7,400
M & C - 20%	29,700
Roadway costs	**$ 148,500**
Project Total	**$505,800**

B. Staging Analysis

IA 9 will be closed, and an offsite detour will be utilized. It is anticipated the detour will be in place for approximately 90 days. The detour would follow County Road K60 south at the intersection of IA 9 and County road K60 to County Road A34, then east on County Road A34 to US 75, then north to the intersection of IA 9 and US 75. Out of distance travel is 12 miles. The total distance user cost is anticipated to be $725,760. The cost for county road maintenance will be $37,129 as calculated by the Gas Tax Method. Detour signing costs will be $10,000.

C. Recommendations

It is recommended that the present structure be replaced, as described in Alternative No. 3.

D. Construction Sequence

It is anticipated that all work on this project will be awarded to one prime contractor. The Bridges and Structures Bureau will coordinate the plan preparation with assistance from the Design Bureau.

E. ADA Accommodations

There are no bike paths or sidewalks adjacent to IA 9; therefore, no ADA accommodations are planned in conjunction with this project.

F. Special Considerations

This will not be a traffic critical project.

The ABC Rating Score of 24 is less than the first stage filter threshold of 50, therefore this bridge will not be considered further as a candidate for ABC construction.

No bike path or sidewalk will be required as part of this project.

Waterway is not on a state water trail or paddling route.

Right of Way appears to be required for this project, it is programmed for $10,000.

The Location and Environment Bureau has reviewed this project and based on preliminary desktop observations, has determined that a Section 404 Permit will be required. It is expected that the work will be covered by Nationwide Permit 14.

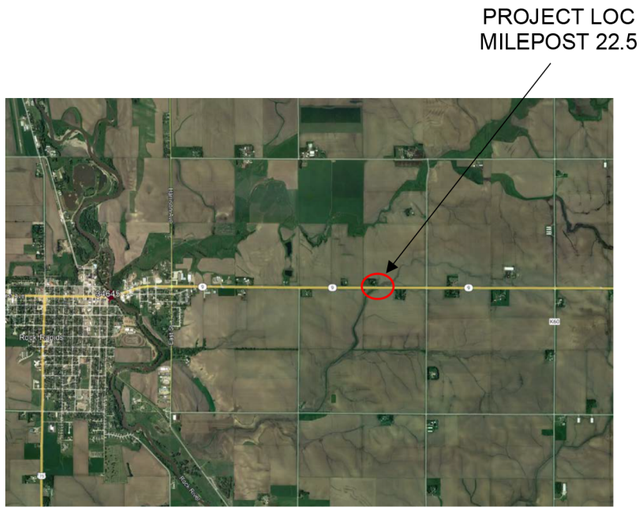
G. Program Status

Site data has been developed by the Design Bureau. This project is listed in the 2025-2029 Iowa Transportation Improvement Program, with $10,000 programmed for right of way in FY 2027, and $400,000 for replacement in FY 2027. Costs for this project may be eligible for bridge replacement funds. A schedule of events will be developed following approval of the Project Concept.

JEB:jaa

C. Purcell	K. D. Nicholson	M. Dell
J. S. Nelson	M. Nop	M. A. Swenson
D. E. Sprengeler	C. C. Poole	S. Majors
A. Poole	K. Brink	D. L. Newell
B. Bradley	J. W. Laaser-Webb	W. A. Sorenson
E. C. Wright	M. E. Ross	A. A. Welch
J. Harris	M. Van Dyke	B. Hofer
G. Karssen	B. Smith	H. Naraghi
S. Anderson	D. Stokes	M. Gillett
J. Ellis	R. Harris	M. Todsen
B. Dolan	T. Lovan	M. Solberg
T. Gustafson	D. Dudley	L. Armstrong
A. Yates	R. Meyer	K. Olson
J. Hauber	S. Sersland	M. E. Khoda
S. Tymkowicz	M. Carlson	J. Becker
T. Huju	M. Thayer	B. Struecker
B. Waltersdorf	C. Schwienebart	FHWA

LYON COUNTY



On IA 9, Approx 1.4 mi W of Co Rd K60
STPN-009-1(059)--2J-60
PIN: 24-60-009-030

60

Bridge Bureau Attachment for Concept Statement

Date: November 8, 2024
By: HNTB
Location: IA-9 approx. 1.4 mi w of Co Rd K60

County: Lyon County
Phase No.: STPN-009-1(059)—2J-60
Project Code: 24-60-009-030

1. Regulatory/Coordination
   a. Iowa DNR Flood Plain permit = No, rural, drainage area 0.77 sq. mi.
   b. Iowa DNR Sovereign Lands permit = No
   c. Local Record of Coordination = No
   d. Flood Insurance Study = No
   e. Drainage District = No
   f. Corps of Engineers Section 408 = No
   g. State Water Trail or Paddling Route = No
   h. Historic Structure = No
   i. Federally owned land in vicinity = No
   j. USGS or Iowa Flood Center (IFC) gage or sensor impacted? No

2. Hydrologic/Hydraulic Analysis/RIDB Dataset
   a. Design discharges determined = Yes (Iowa Runoff Chart)
   b. Hydraulic analysis done = Yes, Iowa DOT Culvert Program
      i. Existing (and potential proposed) weir configurations in upstream headwall were not modeled for concept hydraulics.
   c. If DA > 10 sq. mi. Riverine Infrastructure Database (RIDB) dataset is required with B1 submittal = No

3. Structure/Roadway Layout Considerations
   a. Roadway alignment will not be impacted regardless of selected option.
   b. Existing culvert extensions meet current clear zone requirements.
   c. Embedment is not recommended at this structure due to its unique upstream end condition that will not allow natural streambed to develop inside the structure.

4. Special Construction Issues
   a. Option A:
      i. Remove the original (1936) barrel section of the RCB and replace in-kind with CIP Twin 5’x5’ RCB, connecting to the more recently installed (1995) extensions and flared headwall sections.
      ii. Option A would require saw-cutting at the interface between the original barrel and the extensions (located outside of the pavement limits), retaining the extensions, and doweling in the cast-in-place barrel sections at both ends.
      iii. Existing RCB has very little cover (ranging 0’-1.5’) - if Option A is chosen, the replacement portion of the structure beneath IA-9 would be nearly integral with the

replacement roadway pavement section and may require additional structural considerations. Roadway grade raise would be a viable but likely more costly alternative if adequate cover is desired.

b. Option B:
   i. Full replacement with reduction of box height to allow min cover requirement to be met without a roadway grade raise.
   ii. May require additional right-of-way and/or easements.
   iii. Replacement of upstream existing end condition will require modifications to the existing tile line that currently outlets through the upstream end wall.
   iv. Structural design of a special headwall will be required to accommodate depth of upstream headwall below existing surrounding ground.
   v. Downstream (South) of IA-9, "Do Not Spray" signage and native grasses indicate potential CRP area adjacent to receiving stream.
   vi. Upstream (North) of IA-9 existing headwall sits atop both an electric line (Lyon Co), and a fiber line (Premier Communications).

c. Option C (Preferred Option):
   i. Full replacement with reduction of box height to allow min cover requirement to be met without a roadway grade raise, along with application of 45° skew to better align crossing with natural channel.
   ii. May require additional right-of-way and/or easements.
   iii. Culvert replacement off-alignment will require more substantial modifications to the existing tile line that currently outlets through the existing upstream end wall.
   iv. Structural design of special headwall will be required to accommodate depth of upstream headwall below existing surrounding ground.
   v. Downstream (South) of IA-9, "Do Not Spray" signage and native grasses indicate potential CRP area adjacent to receiving stream. Proposed re-alignment of culvert was strategically selected to require as little downstream grading as possible in the natural channel and established banks.
   vi. Upstream (North) of IA-9 proposed headwall will conflict with both an electric line (Lyon Co), and a fiber line (Premier Communications). Utilities may be shallow enough at proposed culvert headwall location that relocations are required.

5. Special survey = Yes - See Below

6. Aesthetic enhancements = No

7. Other

   a. The roadway will be closed during construction with traffic placed on an off-site detour.
   b. Option C was deemed the preferred alternative at concept for the following reasons:
      i. Improved culvert alignment relative to the natural flow path through the upstream fields and the downstream receiving channel.

      ii. Increased distance between the construction of the proposed upstream headwall and the existing well on the adjacent private property.
      iii. Increased distance between the construction of the proposed upstream headwall and the adjacent property fence.

Special Survey:

Upstream (North) of IA-9 insurable structures low opening/finished floor elevations along with surrounding land area will need to be surveyed prior to post concept design phases.

Field Visit Photos:

Culvert Inlet and Weirs looking North.

Inlet Scour.

Culvert Outlet looking South.

Right Barrel looking South.

Left Barrel looking South.

Inlet Weir Structure.

Bridge Cost Estimate and Analysis for Concept Statement

Location:

County: Lyon County
Phase No.: STPN-009-1(059)--2J-60
Des. No.: NA
Project Code: 24-60-009-030
Maint. No.: NA
FHWA No.: NA
IA-9 over Unnamed Trib to Rock Riv
Sta.: 207+31.3
Section 2, T-99N, R-45W
Functional Class: Minor Arterial
ADT: 3120 (2023)
By: HNTB
Date: November 8, 2024

Existing Bridge:

Type: RCB
Width x Height: Twin 5'x 5'
Length: 74'- 10
Approach Pavement Width: 24'
Skew: 0 degrees
Drainage Area: 0.77 sq. mi.
New/Reconstructed Roadway Width: 24'

General Comments:

- Existing structure was constructed in 1936 and extended upstream and downstream in 1995. Existing upstream extension includes a multi-stage weir entrance.
- A series of field investigations during concept conducted by both HNTB and IowaDOT staff determined that the original existing structure is in very poor condition and requires replacement, however the more recently constructed extensions and headwalls are in good condition and could be retained if desirable.
- Option A is to remove the original (1936) barrel section of the RCB and replace in-kind with CIP Twin 5'x5' RCB, connecting to the more recently installed (1995) extensions and flared headwall sections.
  - See Section 4. "Special Construction Issues" of the attachment for concept statement for further details.
- Option B is to replace the existing structure on-alignment with a single 12'x4' RCB.
  - See Section 4. "Special Construction Issues" of the attachment for concept statement for further details.
- Option C is to replace the existing structure off-alignment with a single 12'x4' RCB at 45 degree skew to better align the crossing with the natural channel.
  - See Section 4. "Special Construction Issues" of the attachment for concept statement for further details.

Bridge Concept Statement

Lyon County
Project Number STPN-009-1(059)--2J-60

Option A

Type: RCB
Width x Height: Twin 5' x 5'
Length: 38'-5" *
Skew: 0 degrees
Stage Traffic: Off-site detour
*Length represents replacement of original box structure section excluding the more recent extensions.

Costs:

Structural Concrete (RCB), 57 CY @ $1,200/CY	= $	68,400
Reinforcing Steel (Epoxy Coated), 7,222 LB @ $2.36/LB	= $	17,044
Excavation, Class 10, Roadway + Borrow, 166 CY @ $8.40/CY	= $	1,394
Revetment, Class E, 20 ton @ $57.71/ton	= $	1,154
Remove Exist. Structure, 50 sf @ $10/sf	= $	500
Mobilization (10%)	= $	8,849
Contingency and Misc. (20%)	= $	19,468
		========
Total Option A	$	116,810

Option B

Type: RCB
Width x Height: 12' x 4'
Length: 77'-0"
Skew: 0 degrees
Stage Traffic: Off-site detour

Costs:

Structural Concrete (RCB), 134 CY @ $1,200/CY	= $	160,800
Reinforcing Steel (Epoxy Coated), 17,659 LB @ $2.36/LB	= $	41,675
Excavation, Class 10, Roadway + Borrow, 177 CY @ $8.40/CY	= $	1,487
Revetment, Class E, 20 ton @ $57.71/ton	= $	1,154
Remove Exist. Structure, 50 sf @ $10/sf	= $	500
Mobilization (10%)	= $	20,562
Contingency and Misc. (20%)	= $	45,236
		========
Total Option B	$	271,413

Bridge Concept Statement

Lyon County
Project Number STPN-009-1(059)--2J-60

Option C - Preferred

Type: RCB Width x Height: 12' x 4'
Length: 107'-5" Skew: 45° LA
Stage Traffic: Off-site detour

Costs:

Structural Concrete (RCB), 160 CY @ $1,200/CY	= $	192,000
Reinforcing Steel (Epoxy Coated), 31,775 LB @ $2.36/LB	= $	74,989
Excavation, Class 10, Roadway + Borrow, 247 CY @ $8.40/CY	= $	2,075
Revetment, Class E, 20 ton @ $57.71/ton	= $	1,154
Remove Exist. Structure, 50 sf @ $10/sf	= $	500
Mobilization (10%)	= $	27,072
Contingency and Misc. (20%)	= $	59,558
		========
Total Option C	$	357,348

Accelerated Bridge Construction (ABC):

The calculated ABC Rating Score based on Iowa DOT BDM Chapter 8 criteria and 11 miles out of distance travel of is 36.

If ABC Rating Score is Less than 50 - Traditional construction may be appropriate. If issues arise relative to an off-site detour, staging complexities, or upon District request, an accelerated bridge option may be provided for evaluation.

Option A

Hydrology and Hydraulics

IOWA DEPARTMENT OF TRANSPORTATION

File Number:	
Design Number:	
County:	Lyon
Project:	24-60-009-030
Project Number:	STPN-009-1(059)--2J-60
Structure Location (Station):	IA-9 Approx 1.4 mi w of Co Rd K60
Stream:	Unnamed Trib. to Rock River
Designer:	HNTB

IOWA RUNOFF CHART

Drainage Area: 492.8 Acres

Land Use: Permanent Pasture
Slope: Rolling
LF: 0.4

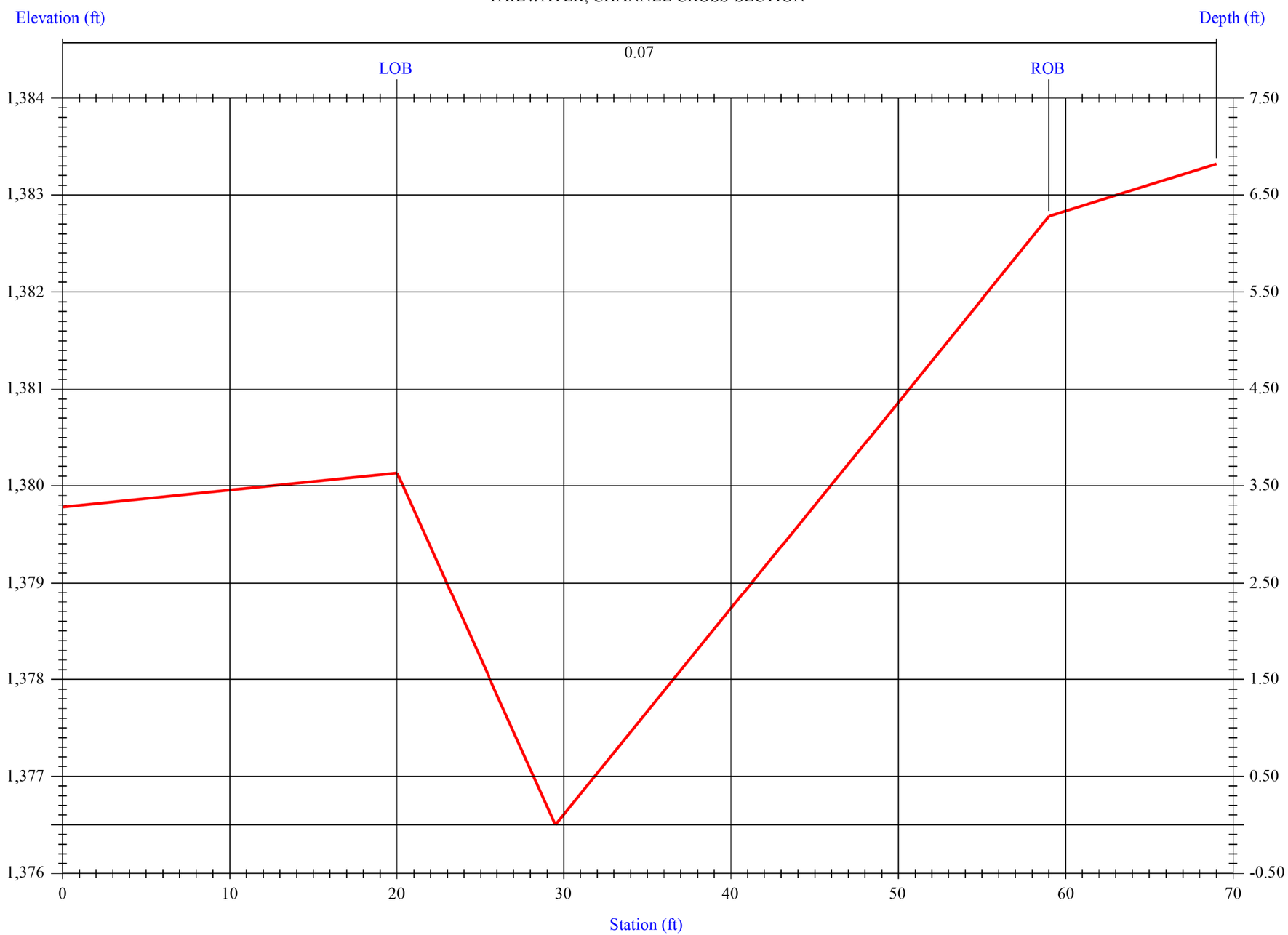
Chart Q: 790 cfs

RESULTS

Return Period (years)	Frequency Factor FF	Q (ft^3/s)
5	0.5	158
10	0.7	221
25	0.8	253
50	1	316
100	1.2	379

County	Project Number	Station
Lyon	STPN-009-1(059)--2J-60	IA-9 Approx 1.4 mi w of Co Rd K60

TAILWATER, CHANNEL CROSS-SECTION



FILE NO. --	ENGLISH	DESIGN TEAM MILLER/RYAN	LYON COUNTY	PROJECT NUMBER STPN-009-1(059)--2J-60	SHEET NUMBER A.12

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County	Project Number	Station
Lyon	STPN-009-1(059)--2J-60	IA-9 Approx 1.4 mi w of Co Rd K60

GENERAL CULVERT DESIGN

Allowable Headwater Elevation (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Culvert Barrel Length (ft)
1383.66*	1377.481	1376.953	77.186

Culvert Type	Inlet Type	Manning n	Ke
RCB: Reinforced Concrete Box	30* to 75* wingwall flares	0.013	0.4

User Defined Size

Barrels	Width (feet)	Height (feet)
Twin	5	5

Return Period (Years)	Q (ft^3/s)	TW Depth (ft)	HW Elev. (ft)	HW H (ft)	Exit Vel. (ft/s)	I.C. HW Elev. (ft)	I.C. H (ft)	O.C. HW Elev. (ft)	O.C. H (ft)	Exit Vel. I.C. (ft/s)	Exit Vel. O.C. (ft/s)	Crit. Depth (ft)	Normal Depth (ft)	Hydraulic Slope
5	158.00	3.11	1,380.70	-1.78	9.46	1,380.63	-1.85	1,380.70	-1.78	9.46	5.08	1.98	1.67	Steep
10	221.00	3.75	1,381.45	-1.03	10.38	1,381.45	-1.03	1,381.21	-1.27	10.38	5.89	2.48	2.13	Steep
25	253.00	3.86	1,381.84	-0.64	10.75	1,381.84	-0.64	1,381.48	-1.00	10.75	6.55	2.71	2.35	Steep
50	316.00	4.06	1,382.56	0.08	11.36	1,382.56	0.08	1,382.07	-0.41	11.36	7.78	3.14	2.78	Steep
100	379.00	4.24	1,383.24	0.76	11.85	1,383.24	0.76	1,382.73	0.25	11.85	8.94	3.55	3.20	Steep

TW: Tailwater, HW Elev.: Headwater elevation at the inlet, HW H: Height of headwater above the inside top of culvert, at the inlet
I.C.: Inlet control, O.C.: Outlet control, Crit.: Critical, Vel.: Velocity

Hydraulic Slope
- Steep: Normal Depth < Critical Depth
- Mild: Normal Depth > Critical Depth
- Critical: Normal Depth = Critical Depth
- Horizontal: Inlet Invert Elevation = Outlet Invert Elevation
- Adverse: Inlet Invert Elevation < Outlet Invert Elevation

Normal Depth
- Undefined(1): Normal depth is not defined for horizontal or adverse slopes.
- Undefined(2): Maximum Q for open channel flow is < Q.

*Allowable headwater elevation is set at the shoulder elevation due to low cover over the culvert.

IOWA DEPARTMENT OF TRANSPORTATION

File Number:	
Design Number:	
County:	Lyon
Project:	24-60-009-030
Project Number:	STPN-009-1(059)--2J-60
Structure Location (Station):	IA-9 Approx 1.4 mi w of Co Rd K60
Stream:	Unnamed Trib. to Rock River
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Option B

Hydrology and Hydraulics

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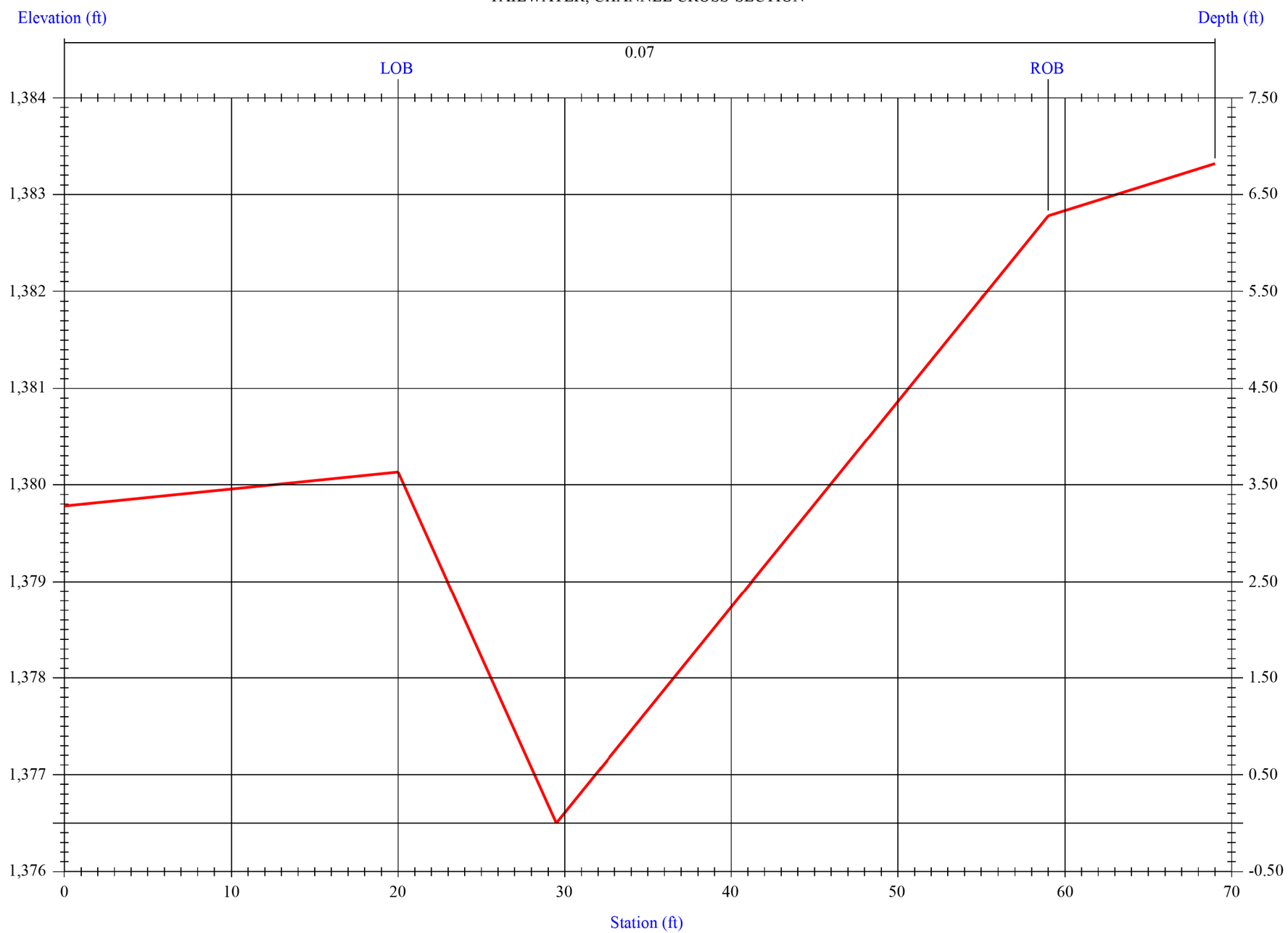

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Culvert Type	Inlet Type	Manning n	Ke
RCB: Reinforced Concrete Box	30* to 75* wingwall flares	0.013	0.4

IDOT Standard Size

Barrels	Width (feet)	Height (feet)
Single	12	4

Return Period (Years)	Q (ft^3/s)	TW Depth (ft)	HW Elev. (ft)	HW H (ft)	Exit Vel. (ft/s)	I.C. HW Elev. (ft)	I.C. H (ft)	O.C. HW Elev. (ft)	O.C. H (ft)	Exit Vel. I.C. (ft/s)	Exit Vel. O.C. (ft/s)	Crit. Depth (ft)	Normal Depth (ft)	Hydraulic Slope
5	158.00	3.11	1,380.34	-1.14	9.97	1,380.28	-1.20	1,380.34	-1.14	9.97	4.23	1.75	1.32	Steep
10	221.00	3.75	1,381.24	-0.24	11.20	1,381.01	-0.47	1,381.24	-0.24	11.20	4.91	2.19	1.64	Steep
25	253.00	3.86	1,381.51	0.03	11.73	1,381.35	-0.13	1,381.51	0.03	11.73	5.46	2.40	1.80	Steep
50	316.00	4.06	1,382.11	0.62	12.64	1,382.00	0.52	1,382.11	0.62	12.64	6.58	2.78	2.08	Steep
100	379.00	4.24	1,383.07	1.59	13.41	1,383.07	1.59	1,382.76	1.28	13.41	7.90	3.14	2.35	Steep

TW: Tailwater, HW Elev.: Headwater elevation at the inlet, HW H: Height of headwater above the inside top of culvert, at the inlet
I.C.: Inlet control, O.C.: Outlet control, Crit.: Critical, Vel.: Velocity

Hydraulic Slope
- Steep: Normal Depth < Critical Depth
- Mild: Normal Depth > Critical Depth
- Critical: Normal Depth = Critical Depth
- Horizontal: Inlet Invert Elevation = Outlet Invert Elevation
- Adverse: Inlet Invert Elevation < Outlet Invert Elevation

Normal Depth
- Undefined(1): Normal depth is not defined for horizontal or adverse slopes.
- Undefined(2): Maximum Q for open channel flow is < Q.

IOWA DEPARTMENT OF TRANSPORTATION

File Number:	
Design Number:	
County:	Lyon
Project:	24-60-009-030
Project Number:	STPN-009-1(059)--2J-60
Structure Location (Station):	IA-9 Approx 1.4 mi w of Co Rd K60
Stream:	Unnamed Trib. to Rock River
Designer:	HNTB

Option C

Hydrology and Hydraulics

IOWA RUNOFF CHART

Drainage Area: 492.8 Acres

Land Use: Permanent Pasture
Slope: Rolling
LF: 0.4

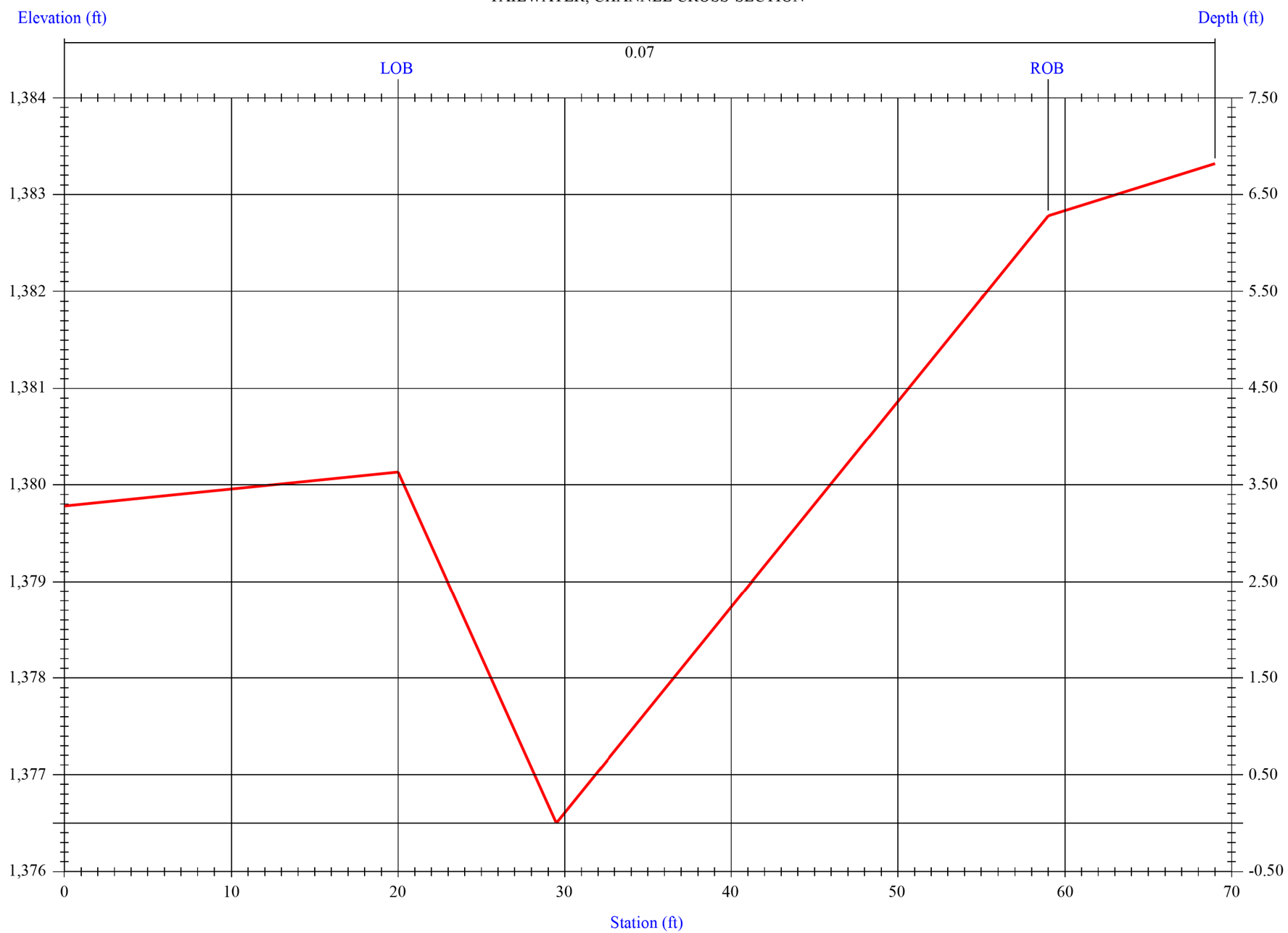
Chart Q: 790 cfs

RESULTS

Return Period (years)	Frequency Factor FF	Q (ft^3/s)
5	0.5	158
10	0.7	221
25	0.8	253
50	1	316
100	1.2	379

County	Project Number	Station
Lyon	STPN-009-1(059)--2J-60	IA-9 Approx 1.4 mi w of Co Rd K60

TAILWATER, CHANNEL CROSS-SECTION



FILE NO. --	ENGLISH	DESIGN TEAM MILLER/RYAN	LYON COUNTY	PROJECT NUMBER STPN-009-1(059)--2J-60	SHEET NUMBER A.20

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County	Project Number	Station
Lyon	STPN-009-1(059)--2J-60	IA-9 Approx 1.4 mi w of Co Rd K60

GENERAL CULVERT DESIGN

Allowable Headwater Elevation (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Culvert Barrel Length (ft)
1383.66	1377.481	1376.953	107.5

Culvert Type	Inlet Type	Manning n	Ke
RCB: Reinforced Concrete Box	30* to 75* wingwall flares	0.013	0.4

User Defined Size

Barrels	Width (feet)	Height (feet)
Single	12	4

Return Period (Years)	Q (ft^3/s)	TW Depth (ft)	HW Elev. (ft)	HW H (ft)	Exit Vel. (ft/s)	I.C. HW Elev. (ft)	I.C. H (ft)	O.C. HW Elev. (ft)	O.C. H (ft)	Exit Vel. I.C. (ft/s)	Exit Vel. O.C. (ft/s)	Crit. Depth (ft)	Normal Depth (ft)	Hydraulic Slope
5	158.00	3.11	1,380.35	-1.13	8.95	1,380.28	-1.20	1,380.35	-1.13	8.95	4.23	1.75	1.47	Steep
10	221.00	3.75	1,381.27	-0.22	10.05	1,381.01	-0.47	1,381.27	-0.22	10.05	4.91	2.19	1.83	Steep
25	253.00	3.86	1,381.55	0.07	10.51	1,381.35	-0.13	1,381.55	0.07	10.51	5.46	2.40	2.01	Steep
50	316.00	4.06	1,382.16	0.68	11.31	1,382.00	0.52	1,382.16	0.68	11.31	6.58	2.78	2.33	Steep
100	379.00	4.24	1,383.07	1.59	11.99	1,383.07	1.59	1,382.85	1.37	11.99	7.90	3.14	2.63	Steep

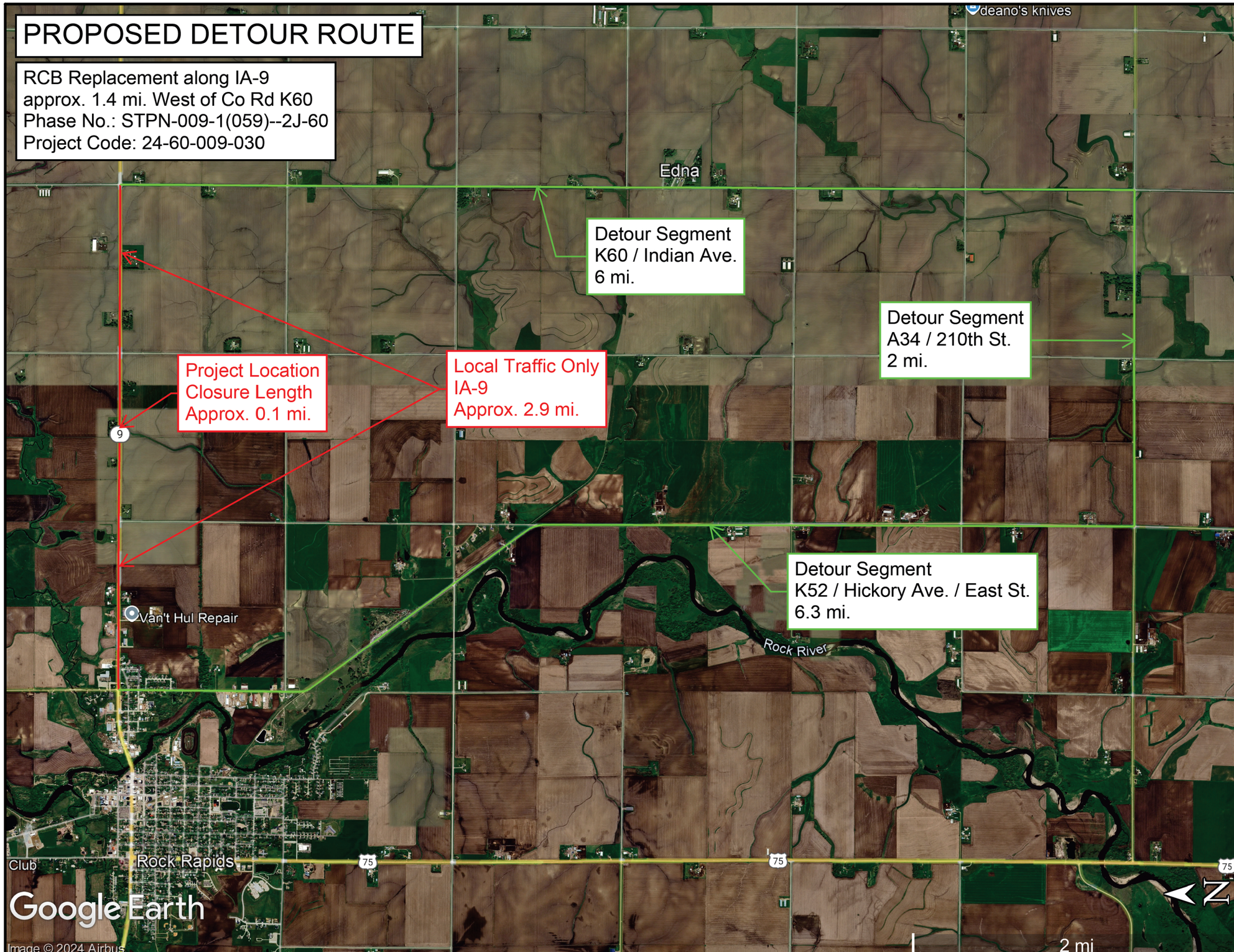
TW: Tailwater, HW Elev.: Headwater elevation at the inlet, HW H: Height of headwater above the inside top of culvert, at the inlet
I.C.: Inlet control, O.C.: Outlet control, Crit.: Critical, Vel.: Velocity

Hydraulic Slope
- Steep: Normal Depth < Critical Depth
- Mild: Normal Depth > Critical Depth
- Critical: Normal Depth = Critical Depth
- Horizontal: Inlet Invert Elevation = Outlet Invert Elevation
- Adverse: Inlet Invert Elevation < Outlet Invert Elevation

Normal Depth
- Undefined(1): Normal depth is not defined for horizontal or adverse slopes.
- Undefined(2): Maximum Q for open channel flow is < Q.

PROPOSED DETOUR ROUTE

RCB Replacement along IA-9
approx. 1.4 mi. West of Co Rd K60
Phase No.: STPN-009-1(059)--2J-60
Project Code: 24-60-009-030



FILE NO. --	ENGLISH	DESIGN TEAM **MILLER/RYAN**	**LYON** COUNTY	PROJECT NUMBER **STPN-009-1(059)--2J-60**	SHEET NUMBER **A.22**

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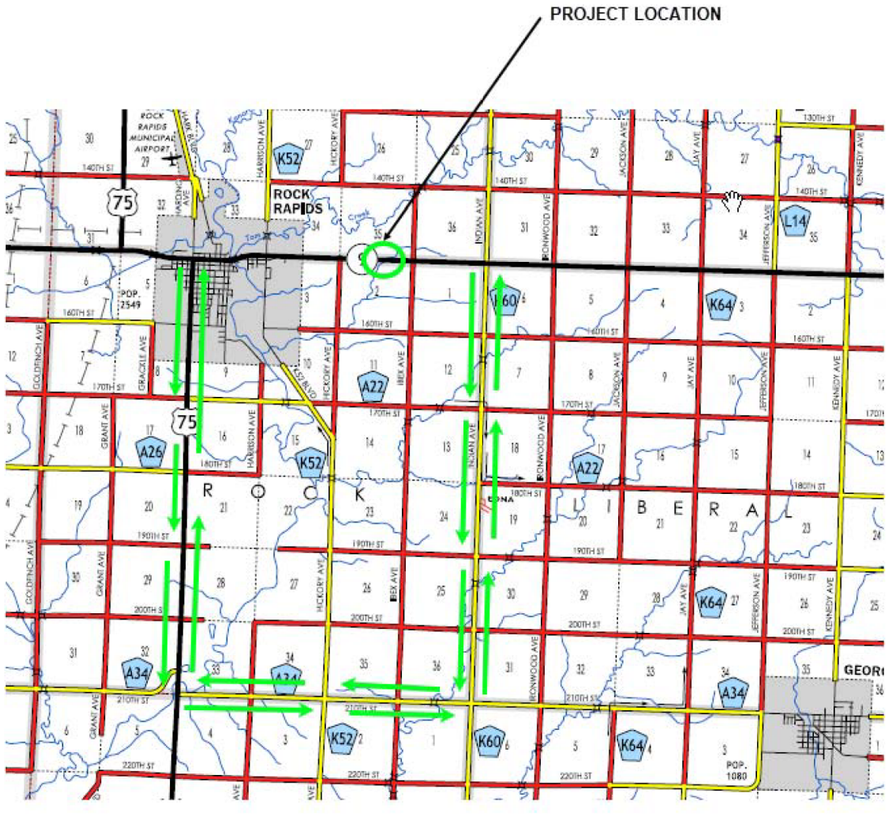


N

Lyon County
Approx 1.4 miles /west of County Road K60
STPN-009-1(059)--2J-60
PIN: 24-60-009-030

DETOUR

60

Utilities

Lyon Rural Electric Coop
Bryan Herum
bherum@lyonrec.coop
712.739.0135

Lyon & Sioux Rural Water
Todd Vandekop
Todd@lsrws.com
712.723.3755

Premier Communications
Jake Van Roekel
jakevr@mypremieronline.com
712.722.3451

Roadway				
PIN Number	24-60-009-030		**Submittal Date**	
Project Number	STPN-009-1(059)--2J-60			**Approval Date**
District	District 3	**Assistant District Engineer**		
County	LYON	**or**		
Route	IA 9	**Office Director**		
Location	Approx 1.4 mi W of Co Rd K60			
Work Type	RCB Culvert Replacement - Single Box			
Segment Manager	Yanxiao Jia			
Designer	Ryan Miller, Jonathan Ryan			

Design Manual Section 1C-1
Last Updated: 04-29-19

Rural Two-Lane Highways (Rural Arterials)

Design Element		Preferred	Acceptable	Project Values
Design speed (mph)		60	50	60
Maximum superelevation rate (Refer to Section 2A-2)		6%	8%	N/A
Design lane width (ft)		12	12	12
Full depth paved width (ft)		12	12	12
Right turn lane (ft)		12	10	N/A
Climbing Lane (ft)		12	12	N/A
Left turn lane (ft)		12	10	N/A
Pavement cross-slope (on tangent sections)	Through lanes	2%	1.5% minimum, 2% maximum	2%
	Auxiliary and turn lanes	3%	3% maximum	N/A
	Crown break at centerline	4%	4% maximum	4%
Shoulder cross-slope (on tangent sections)		4%	Shoulder cross-slope cannot be less than the adjacent lane, 6% max for paved or granular shoulders, 8% max for earth shoulders	4%
Curb type (Refer to Section 3C-2)	Design speed = 50 or 55 mph	6-inch sloped	6-inch standard	N/A
	Design speed ≥ 60 mph	4-inch sloped	6-inch sloped	N/A
Foreslope (For fill areas greater than 40 ft, contact the Soils Design Section for assistance)	Adjacent to shoulder	10:1 for 4' then 6:1	3:1	3:1
	Beyond standard ditch depth and design clear zone	3.5:1	3:1	3:1
	Curbed roadways	2%	not steeper than 3:1	N/A
Backslope (For cut areas greater than 25 feet, contact the Soils Design Section for assistance with backslope benches.)		3:1	2.5:1	3:1
Transverse Slopes	w/ drainage structures	8:1	6:1	N/A
	w/o drainage structures	10:1	6:1	N/A
Ditches (Refer to Section 3G-1)	Outside ditch (depth x width) (ft)	5 x 10	--	5 x 10
Bridge width—new*	Bridge length ≤ 200 ft	design lane widths + effective shoulder widths	design lane widths + effective shoulder widths	N/A
	Bridge length > 200 ft	design lane widths + effective shoulder widths	design lane width + 4' right and left of the design lane widths	N/A
Bridge width—existing*		design lane widths + no less than 2 ft left and right	design lane widths + 2 ft. offset left and right	N/A
Vertical clearance (ft) (above lanes, shoulders and 25 feet left and right of the center of railroad tracks)	Over primary	16.5	16	N/A
	Over non-primary	16.5 at interchange locations, 15 at all other locations	14	N/A
	Over railroad	23.3	23.3	N/A
	Sign trusses and pedestrian bridges	17.5	17	N/A
Structural Capacity		Contact Office of Bridges and Structures	Contact Office of Bridges and Structures	
Level of Service		B	B	

*FHWA notification via email is required if acceptable critera is not met on the NHS system (No formal design exeption is required)

Design year ADT = 3300

Design Manual Section 1C-1
Last Updated: 04-29-19

Effective Shoulder Width and Type for Two-Lane Highways

Preferred (values shown in feet)			Acceptable (values shown in feet)			Project Values
	Rural Roadways	Urban Roadways		Rural Roadways	Urban Roadways	
Turn lanes with shoulders	6	6	Turn lanes with shoulders	6	0	N/A
Turn lanes with curbs	6	See Section 3C-2	Turn lanes with curbs	6	0	N/A
	Effective Shoulder Width	Paved Width		Effective Shoulder Width	Paved Width	
Climbing Lanes	6	4	Climbing Lanes	4	0	N/A
Two-Lane Highways	Effective Shoulder Width	Paved Width	Two-Lane Highways	Effective Shoulder Width	Paved Width	
Routes where bicycles are to be accommodated	10	10	Design year ADT > 2000 vpd	8	0*	6 [1]
On roadways approaching urban areas (due to increased bike traffic)	10	10				
On all curves with a superelevation rate of 7.0% or greater	10	10				
On roadways with design year ADT > 5000	10	6	Design year ADT between 400 - 2000 vpd	6	0*	
On all other NHS	10	6				
On non-NHS routes with design year ADT > 3000	10	6	Design year ADT < 400 vpd	4	0*	
On non-NHS routes with design year ADT < 3000	8	0*				

*Requires safety edge-Refer to Section 3C-6

Curbs should be located beyond the outer edge of the effective shoulder width in rural areas

Refer to Section 3C-2 for curb offsets in urban areas

Notes:

[1] IA 9 at the project location is not on the NHS system. A design exception will not be required.

Roadway Design Speed (mph) = 60

Design Manual Section 1C-1
Last Updated: 04-29-19

Design Criteria for High Speed Roadways

Design Element			Preferred Criteria, Design Speed, mph: 50	55	60	65	70	75	Acceptable Criteria, Design Speed, mph: 50	55	60	65	70	75	Project Values
Stopping sight distance (ft) (Refer to Section 6D-1)			425	495	570	645	730	820	425	495	570	645	730	820	570
Minimum horizontal curve radius (ft) (Refer to Sections 2A-2 and 2A-3)	Method 5 superelevation and side friction distribution	e_{max} = 6%	833	1060	1330	1660	2040	2500	833	1060	1330	1660	2040	2500	N/A
		e_{max} = 8%	--	--	--	--	--	--	758	960	1200	1480	1810	2210	N/A
Minimum vertical curve length (ft) (Refer to Section 2B-1)			150	165	180	195	210	225	150	165	180	195	210	225	400
Minimum rate of vertical curvature (K) (Refer to Section 2B-1)	crest vertical curves		84	114	151	193	247	312	84	114	151	193	247	312	N/A
	sag vertical curves	roadways without fixed source lighting	96	115	136	157	181	206	96	115	136	157	181	206	211
		roadways with fixed-source lighting	96	115	136	157	181	206	54	66	78	91	106	121	N/A
Minimum gradient (%)	(Refer to Section 2B-1)		0.5						0.3% with a curb, 0.0% without a curb						0.8%
Maximum gradient (%)	(Refer to Section 2B-1)	Urban roadways	4		3				7	6	6	–	–	–	N/A
		Rural roadways							5	5	4	4	4	4	1.1%
		Interstates							5	5	4	4	4	4	N/A
Clear zone			See "Preferred Clear Zone" table in Section 8A-2						See "Acceptable Clear Zone" table in Section 8A-2						30

Preferred Clear Zone Distances (feet)
(Based on AASHTO Roadside Design Guide, 4th Edition)

		FORESLOPES			BACKSLOPES		
design speed	design ADT	6:1 or flatter	Steeper than 6:1, up to and including 4:1	Steeper than 4:1	Steeper than 4:1*	4:1 or flatter, up to 6:1	6:1 or flatter
40 mph or less	ADT < 750	10	10	**	10	10	10
	750 ≤ ADT < 1500	12	14	**	12	12	12
	1500 ≤ ADT < 6000	14	16	**	14	14	14
	ADT ≥ 6000	16	18	**	16	16	16
45 – 50 mph	ADT < 750	12	14	**	10	10	12
	750 ≤ ADT < 1500	16	20	**	12	14	16
	1500 ≤ ADT < 6000	18	26	**	14	16	18
	ADT ≥ 6000	22	28	**	16	20	22
55 mph	ADT < 750	14	18	**	10	12	12
	750 ≤ ADT < 1500	18	24	**	12	16	18
	1500 ≤ ADT < 6000	22	30	**	16	18	22
	ADT ≥ 6000	24	32	**	18	22	24
60 mph	ADT < 750	18	24	**	12	14	16
	750 ≤ ADT < 1500	24	32	**	14	18	22
	1500 ≤ ADT < 6000	30	40	**	18	22	26
	ADT ≥ 6000	32	44	**	22	26	28
65 – 70 mph	ADT < 750	20	26	**	12	16	16
	750 ≤ ADT < 1500	26	36	**	16	20	22
	1500 ≤ ADT < 6000	32	42	**	20	24	28
	ADT ≥ 6000	34	46	**	24	30	30

* Backslopes as steep as 2.5:1 can be considered as part of the clear zone, as long as they are relatively smooth and do not contain any fixed objects. Refer to Section 8A-4 of the Design Manual for information regarding backslopes steeper than 2.5:1.

** Since a vehicle traveling on a slope steeper than 4:1 is likely to be diverted to the bottom of the slope, the width of any slope steeper than 4:1 cannot be counted in the clear zone determination. Refer to Section 8A-2 of the Design Manual for information on providing clear recovery areas at the base of steep slopes.

Acceptable Clear Zone Distances (feet)
(Based on AASHTO Roadside Design Guide, 4th edition)

		FORESLOPES			BACKSLOPES		
design speed	design ADT	6:1 or flatter	Steeper than 6:1, up to and including 4:1	Steeper than 4:1	Steeper than 4:1*	4:1 or flatter, up to 6:1	6:1 or flatter
40 mph or less	ADT < 750	7	7	**	7	7	7
	750 ≤ ADT < 1500	10	12	**	10	10	10
	1500 ≤ ADT < 6000	12	14	**	12	12	12
	ADT ≥ 6000	14	16	**	14	14	14
45 – 50 mph	ADT < 750	10	12	**	8	8	10
	750 ≤ ADT < 1500	14	16	**	10	12	14
	1500 ≤ ADT < 6000	16	20	**	12	14	16
	ADT ≥ 6000	20	24	**	14	18	20
55 mph	ADT < 750	12	14	**	8	10	10
	750 ≤ ADT < 1500	16	20	**	10	14	16
	1500 ≤ ADT < 6000	20	24	**	14	16	20
	ADT ≥ 6000	22	26	**	16	20	22
60 mph	ADT < 750	16	20	**	10	12	14
	750 ≤ ADT < 1500	20	26	**	12	16	20
	1500 ≤ ADT < 6000	26	30	**	14	18	24
	ADT ≥ 6000	30	30	**	20	24	26
65 – 70 mph	ADT < 750	18	20	**	10	14	14
	750 ≤ ADT < 1500	24	28	**	12	18	20
	1500 ≤ ADT < 6000	28	30	**	16	22	26
	ADT ≥ 6000	30	30	**	22	26	28

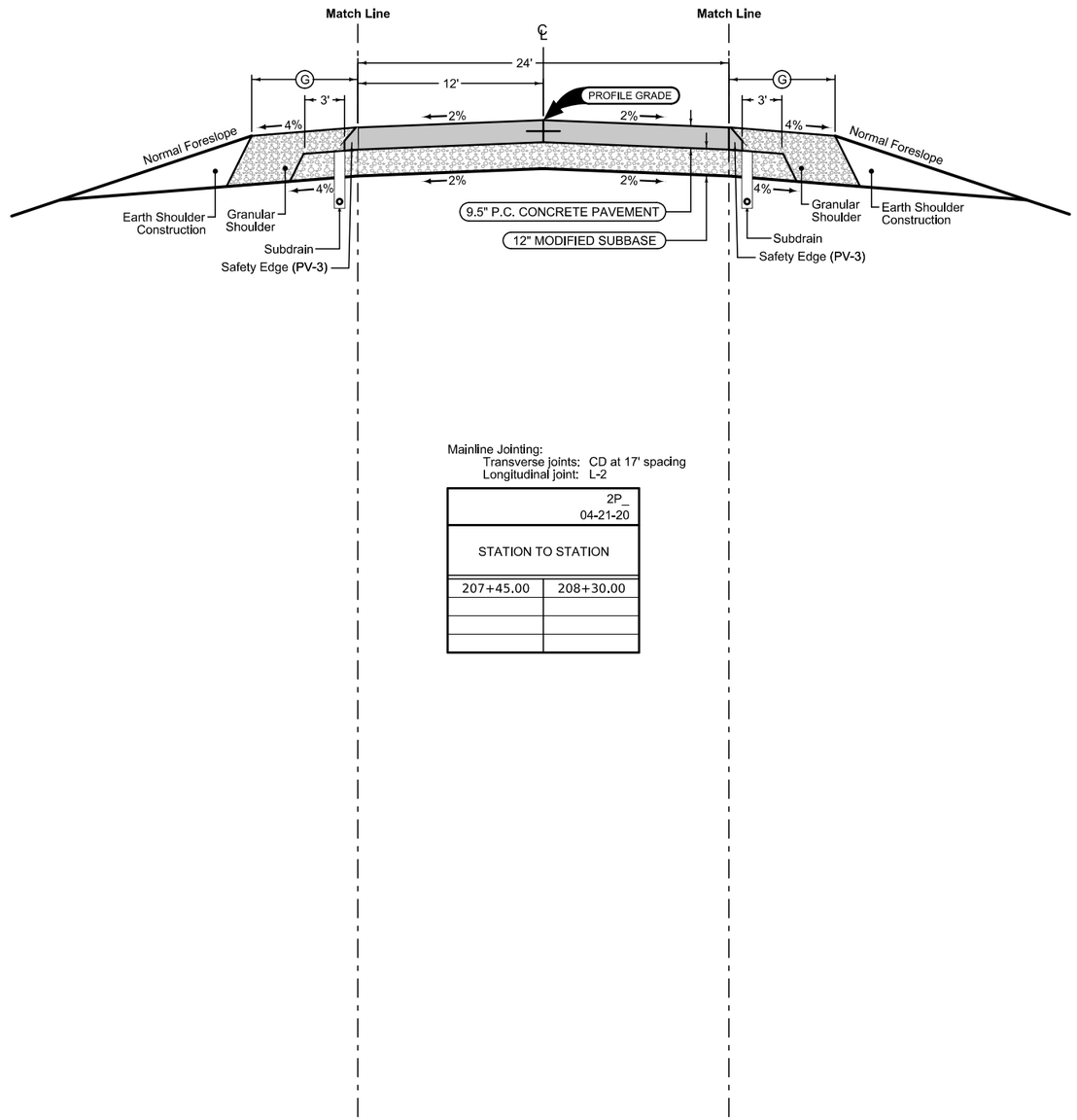
* Backslopes as steep as 2.5:1 can be considered as part of the clear zone, as long as they are relatively smooth and do not contain any fixed objects. Refer to Section 8A-4 of the Design Manual for information regarding backslopes steeper than 2.5:1.

** Since a vehicle traveling on a slope steeper than 4:1 is likely to be diverted to the bottom of the slope, the width of any slope steeper than 4:1 cannot be counted in the clear zone determination. Refer to Section 8A-2 of the Design Manual for information on providing clear recovery areas at the base of steep slopes.

FIELD EXAM QUESTIONS/COMMENTS		FIELD EXAM QUESTIONS/COMMENTS	
A.7	- "Culvert Replacement off-alignment will require substantial modifications to the existing tile line that currently outlets through the existing upstream end wall." - What modifications will be required? - Will any of those modifications be in the Road Sheets?		
J.1	- Detour Signing to be done by the Contractor or by District?		

Granular Shoulder with Safety Edge

		2_G_ 04-21-20
STATION TO STATION		G Feet
207+05.00	208+61.06	6



Mainline Jointing:
Transverse joints: CD at 17' spacing
Longitudinal joint: L-2

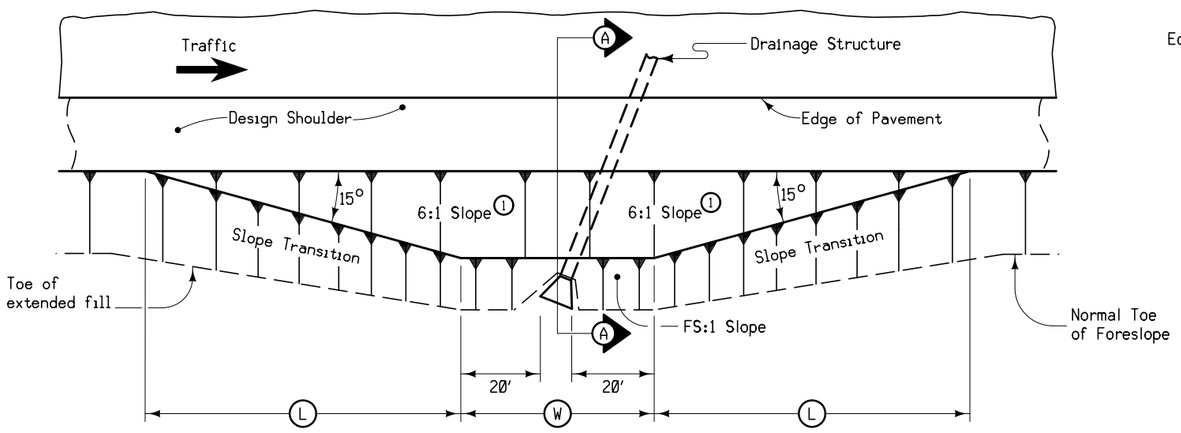
	2P_ 04-21-20
STATION TO STATION	
207+45.00	208+30.00

Granular Shoulder with Safety Edge

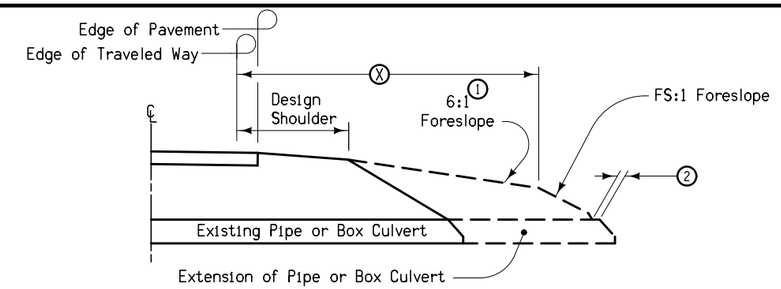
		2_G_ 04-21-20
STATION TO STATION		G Feet
207+05.00	208+30.00	6

IA 9

4312
MODIFIED



PLAN VIEW



SECTION A-A

STRUCTURE LOCATION		W	L	X	FS
STATION (3)	SIDE	Feet	Feet	Feet	
207+86.31	R	73.1	82.2	30	3
207+86.31	L	73.1	82.2	30	3

At locations where an extended or newly constructed drainage structure extends beyond the normal foreslope cover, flatten as indicated so as to cover the structure. Minimum earth cover is 6 inches.

(1) Slope may be flatter than 6:1.

(2) 6 inch minimum for pipe installations or to top of headwall on RCB.

(3) At ℄ of roadway.

(W) = Pipe or RCB opening width plus 20 feet each side.

BARNROOF FORESLOPE AT SKEWED DRAINAGE STRUCTURE

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
- WH Water Hydrant (Rural)
- ST Septic Tank
- C Cistern
- LP L.P. Gas Tank (No Footing)
- UST Underground Storage Tank
- Latrine
- Satellite TV Dish
- WHU Water Hook Up
- RT Radio Tower
- TA Tower Anchor
- Guardrail (Beam or Cable)
- GP Guard Post (one or two)
- Guard Post (over two)
- FP Filler Pipe
- GV Gas Valve
- WV Water Valve
- SL Speed Limit Sign
- MM 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, Lyon County REC - Quality D
Bryan Herum
bherum@lyonrec.coop
712.739.0135

— FO —
FO1D, Premier Communications - Quality D
Jake Van Roekel
jakevr@mypremieronline.com
712.722.3451

— W —
WL1D, Lyon-Sioux Rural Water - Quality D
Todd Vandekop
Todd@lsrws.com
712.723.3755

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

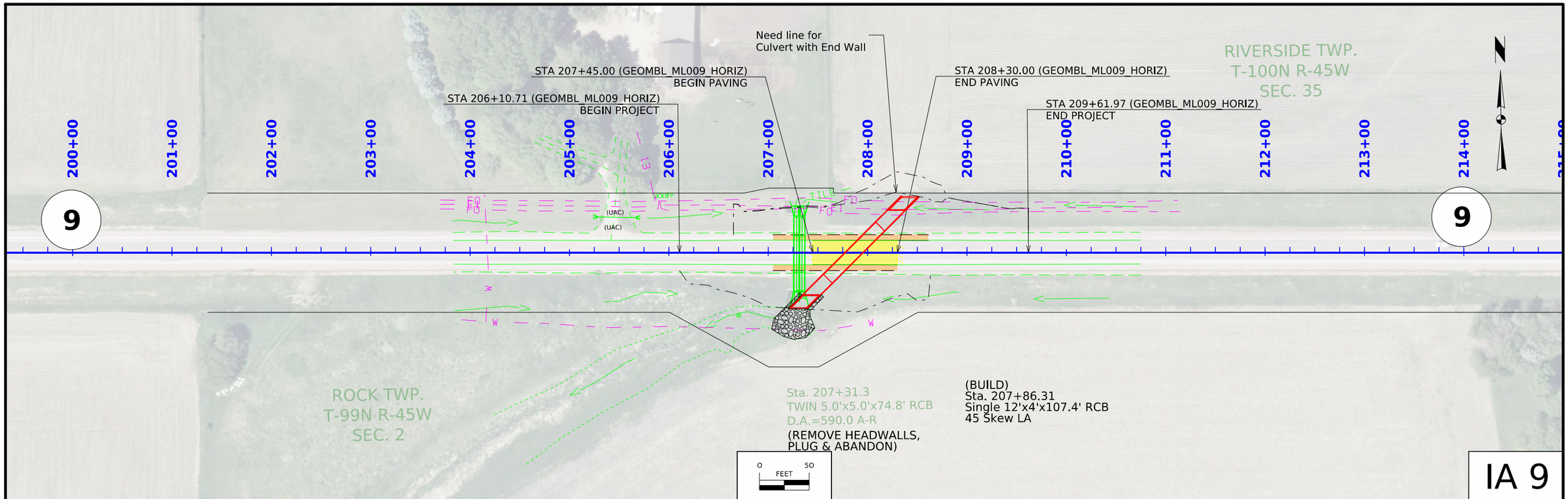
- Reference Point — Station — Survey Line
- Section Corner
- Ground Line Intercept
- Saw Cut
- Guardrail
- Trench Drain
- HighTension Cable Guardrail
- Sheet Pile
- Pavement Removal
- Clearing & Grubbing Area

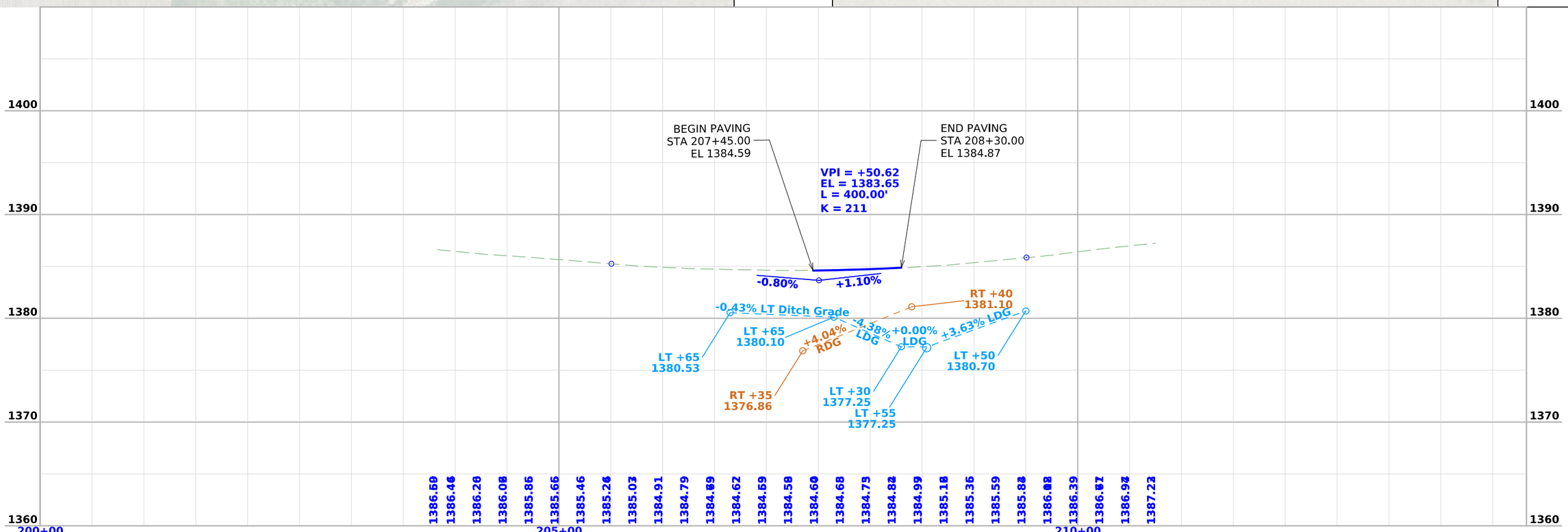
RIGHT-OF-WAY LEGEND

- 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)





FILE NO. --	ENGLISH	DESIGN TEAM MILLER/RYAN	LYON COUNTY	PROJECT NUMBER STPN-009-1(059)--2J-60	SHEET NUMBER D.2

4:24:44 PM 6/3/2025 jryan3 pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Projects\6000903024\Design\CADD_Files\Sheet_Files\SHT_60009059_D01.dgn

SURVEY INDEX

County: Lyon
PIN: 24-60-009-030
Project Number: STPN-009-1(059)--2J-60
Location: Approx 1.4 mi W of Co Rd K60
Type of Work: Culvert
Project Directory: 6000903024

Survey Personnel

Daniel Duncan – Survey Party Chief

Date(s) of Survey

Begin Date	05/01/2024
End Date	05/13/2024

General Information

This survey is for IA Hwy 9 Culvert project. 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 01 (U.S. SURVEY FOOT)
VERTICAL DATUM: NAVD88
GEOID MODEL: 2018u2

Alignment Information

The horizontal alignment for IA. Hwy 9 this survey is a retrace of As-built Plans No. FA-110EB Rock Rapids E 14 Miles Paving. Survey stationing was equated to the plan PI at Sta. 161+65.9 and carried ahead without equation throughout the survey.

Survey stationing relates to as built plan stationing as follows:

PI Sta. 161+65.9 As-built Plans Project No. FA-110EB
Survey PI Sta. 161+65.90

NW Cor. Sec. 2 Sta. 174+93.4 Lt 2.8 ft As-built Plans Project No. FA-110EB
Survey NW Cor. Sec. 2 Sta. 174+92.50 Lt 2.87 ft

N¼ Cor. Sec. 2 Sta. 201+35.2 Lt 2.5 ft As-built Plans Project No. FA-110EB
Survey N¼ Cor. Sec. 2 Sta. 201+35.93 Lt 2.72 ft

NE Cor. Sec. 2 Sta. 227+55.8 Lt 0.7 ft As-built Plans Project No. FA-110EB
Survey NE Cor. Sec. 2 Sta. 227+56.84 Lt 0.70 ft

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 01 (U.S. Survey Foot)

VERT. DATUM: NAVD88 - Geoid Model: 2018u2

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

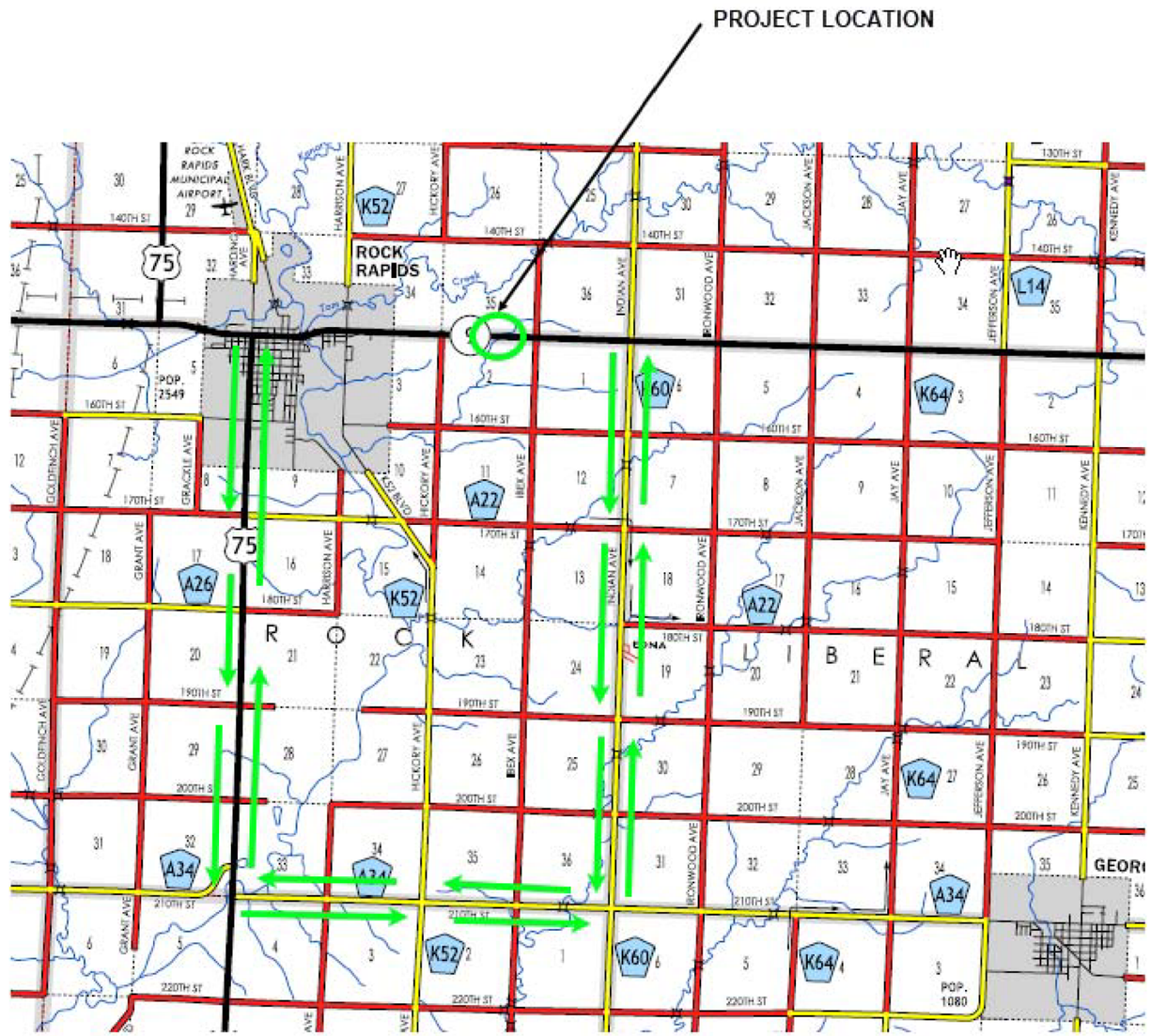
HORIZONTAL AND VERTICAL PROJECT CONTROL COORDINATE LISTING
HORIZ. DATUM: NAD83(2011) for EPOCH 2010.00 (IaRTN 2019 Adjustment)
Ia. Regional Coordinate System Zone 01 (U.S. Survey Foot)
VERT. DATUM: NAVD88
Geoid Model: 2018u2

Point Name	Northing	Easting	Elevation	Code-Description
600090217	9686205.04	11263403.61	1431.24	CP FND IA DOT ROW RAIL SET DIMPLE IN BALL 0.25 MI WEST OF IA 9 AND HICKORY AVE INTERSECTION
600090224	9686153.15	11266921.99	1388.84	CP SET FENO MON 3IN DEEP 0.4 MI EAST OF IA 9 AND HICKORY AVE INTERSECTION
600090229	9686116.95	11269919.15	1403.89	CP SET FENO MON 3IN DEEP IN THE NW CORNER OF IA 9 AND IBEX AVE INTERSECTION
ROCKPORT	9693140.99	11253155.68	1357.63	CP FND NGS THIRD ORDER HORIZONTAL PRIMARY AIRPORT AZIMUTH MARK AS DESCRIBED

108_23A
8/15/22

TRAFFIC CONTROL PLAN

Traffic on IA 9 will be maintained at all times via an off-site detour. Refer to J.2 for Detour Route.



DETOUR

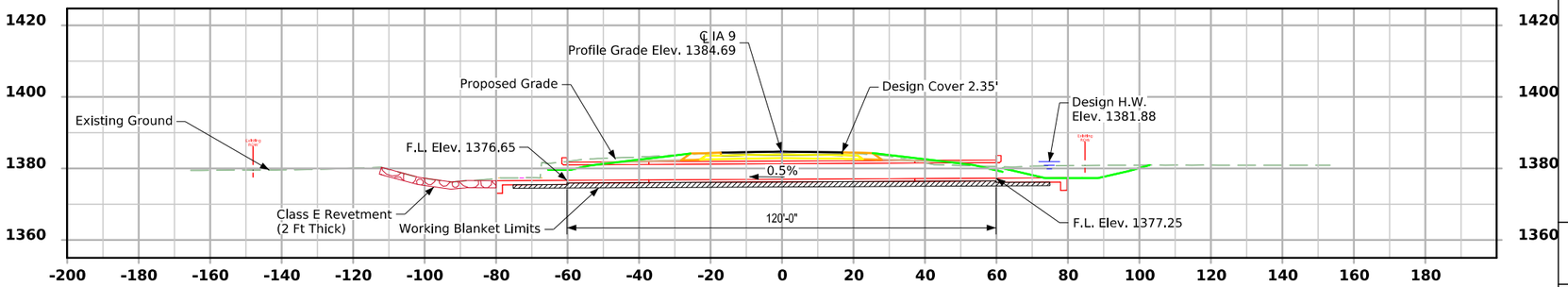
Lyon County

Approx 1.4 miles /west of County Road K60
STPN-009-1(059)--2J-60
PIN: 24-60-009-030

60

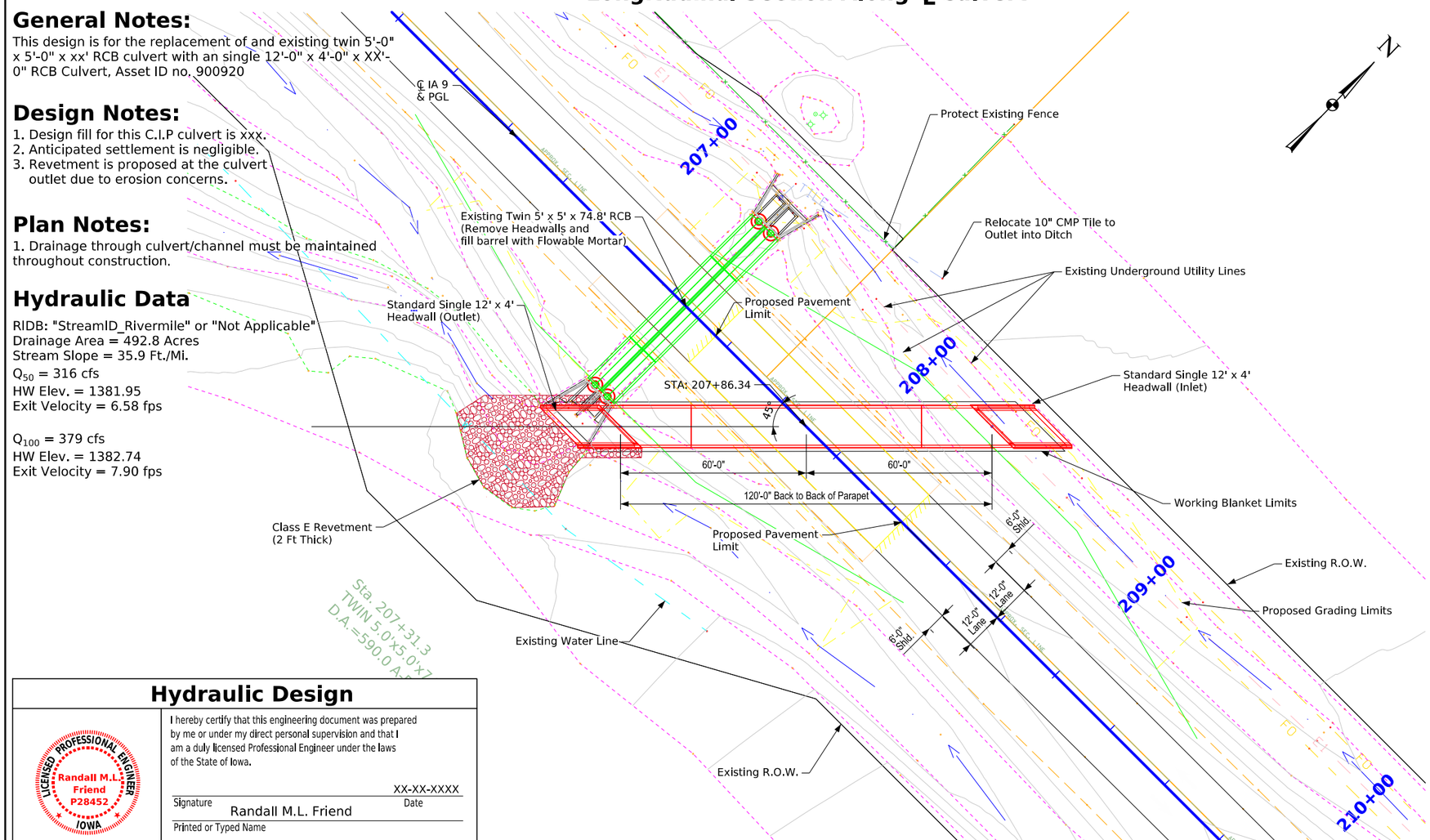
FILE NO. --	ENGLISH	DESIGN TEAM **MILLER/RYAN**	**LYON** COUNTY	PROJECT NUMBER **STPN-009-1(059)--2J-60**	SHEET NUMBER **J.2**

Control Point: 600090217,Cp Fnd Ia Dot Row Rail Set Dimple In Ball 0.25 Mi West Of Ia 9 And Hickory Ave Intersection Elev. 1431.239, N.9686205.42, E.11263403.610



STA 207+86.22

Longitudinal Section Along ℄ Culvert



General Notes:

This design is for the replacement of and existing twin 5'-0" x 5'-0" x xx' RCB culvert with an single 12'-0" x 4'-0" x XX'-0" RCB Culvert, Asset ID no. 900920

Design Notes:

1. Design fill for this C.I.P culvert is xxx.
2. Anticipated settlement is negligible.
3. Revetment is proposed at the culvert outlet due to erosion concerns.

Plan Notes:

1. Drainage through culvert/channel must be maintained throughout construction.

Hydraulic Data

RIDB: "StreamID_Rivermile" or "Not Applicable"
Drainage Area = 492.8 Acres
Stream Slope = 35.9 Ft./Mi.
Q_{50} = 316 cfs
HW Elev. = 1381.95
Exit Velocity = 6.58 fps

Q_{100} = 379 cfs
HW Elev. = 1382.74
Exit Velocity = 7.90 fps

Hydraulic Design

LICENSED PROFESSIONAL ENGINEER
Randall M.L. Friend
P28452
IOWA

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: Randall M.L. Friend — Date: XX-XX-XXXX

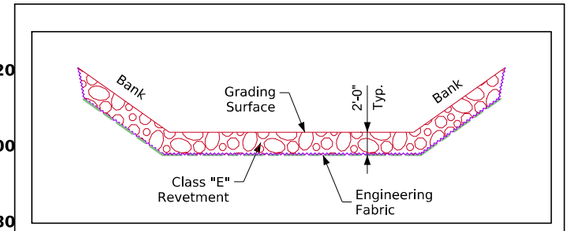
Printed or Typed Name

My license renewal date is December 31, 2026

Pages or sheets covered by this seal: V.1 and V.2

P28452

Situation Plan



Typical Channel Protection

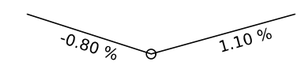
Estimated Revetment Quantities Included With Road Plans

Location	Revetment Class "E" (Ton)	Engineering Fabric (SY)	CL. 10 Channel Excavation (CY)
Inlet	-	-	-
Outlet	121	129	86
Totals	121	129	86

Excavation quantity calculated from grading surface. Excavation quantity is for embedded revetment core out only, and does not include excavation to the grading surface. Excavation quantity to the grading surface is determined by Road Design and included in the Road Plans. Quantities shown for information only. See Road Sheets.

VPC Sta. = 205+50.62
VPC Elev. = 1385.25

VPT Sta. = 209+50.62
VPT Elev. = 1385.85



VPI Sta. = 207+50.62
VPI Elev. = 1383.65
LVC = 400.00

Proposed Profile Grade IA 9

Location

IA-9 over Unnamed Trib to Rock RIver
T-99N R-45W
Section 2
Rock Township
Lyon County
Bridge Maint. No. 6022.6B009
Asset ID No. 900920
Latitude 43.432828°
Longitude -91.123586°

Traffic Estimate

2027 AADT	2800	V.P.D.
2047 AADT	3300	V.P.D.
20?? DHV	-	V.P.H.
TRUCKS	14	%
Total Design ESALs	-	

Utilities Note:

Utilities shown on this sheet are for information only.See Road Design sheets for utility information.

General Utility Symbols:

E - Electric Line
G - Gas Line
SAN. - Sanitary Sewer
T - Telephone Line
W - Water Line
FO - Fiber Optic Line
GHP - Gas High Pressure
ST S - Storm Sewer
TV - TV
- Power Poles

Design For 45° Left Ahead

Single 12'-0" x4'-0" x 120'-0" Reinforced Concrete Box Culvert

Situation Plan - C.I.P.

STA. 207+86.34 (IA 9)

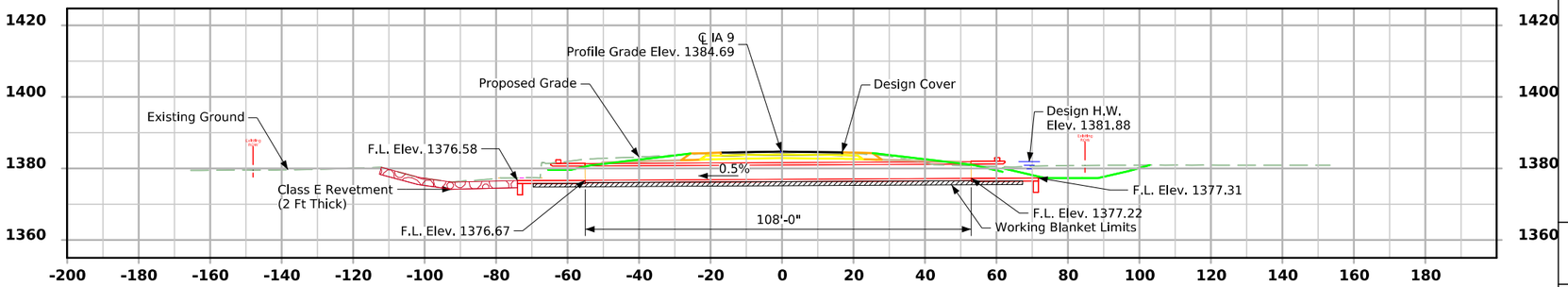
Turn-in Date: May 2025

Lyon County

IOWA DEPARTMENT OF TRANSPORTATION

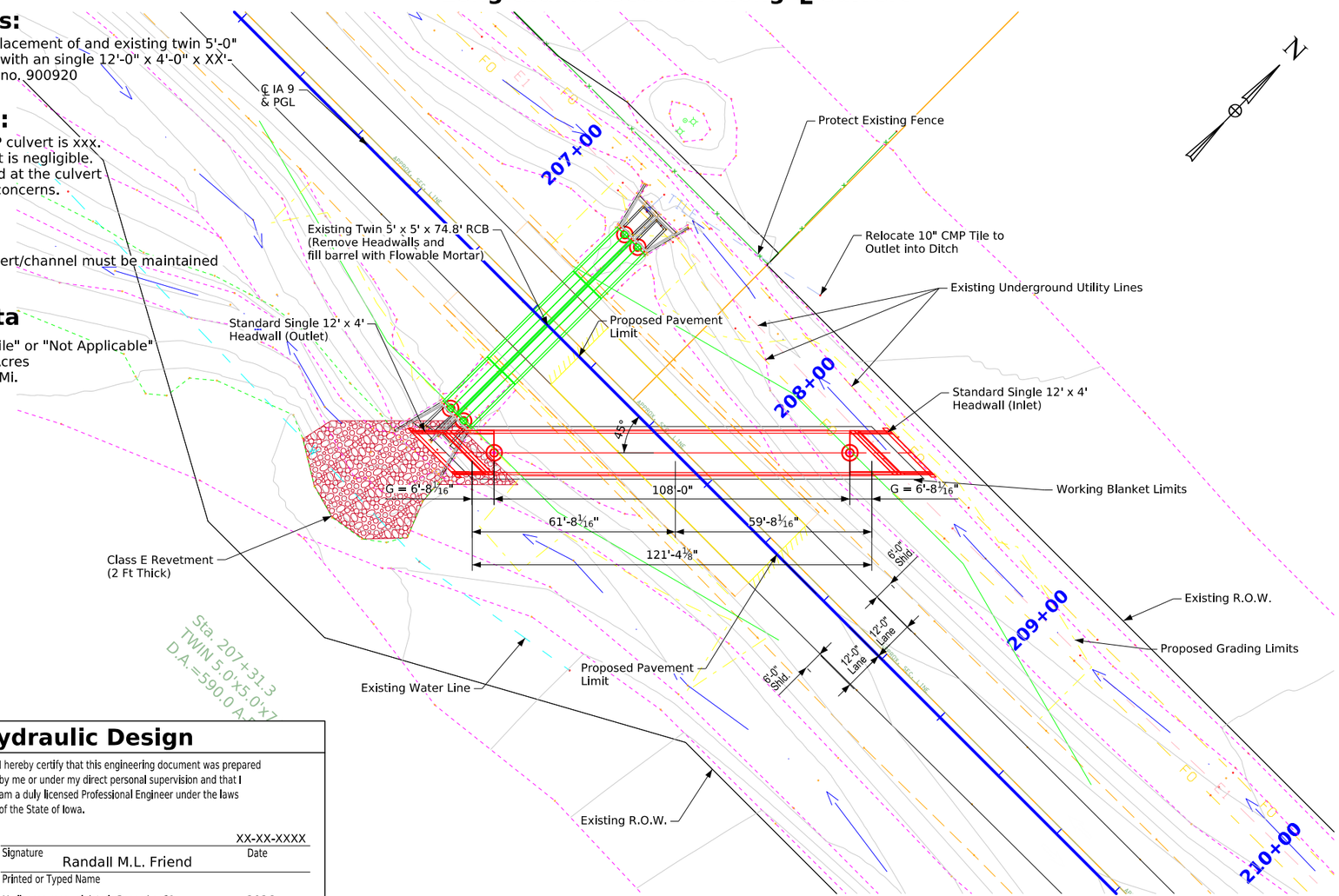
Design No. 0127 | Design Sheet No. 1 of 1 | FHWA/Asset 900920

Control Point: 600090217,Cp Fnd Ia Dot Row Rail Set Dimple In Ball 0.25 Mi West Of Ia 9 And Hickory Ave Intersection Elev. 1431.239, N.9686205.42, E.11263403.610



STA 207+86.22

Longitudinal Section Along ℄ Culvert



Situation Plan

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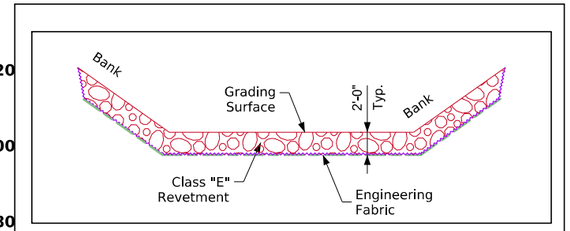

Typical Channel Protection

Estimated Revetment Quantities Included With Road Plans

Location	Revetment Class "E" (Ton)	Engineering Fabric (SY)	CL. 10 Channel Excavation (CY)
Inlet	-	-	-
Outlet	136	144	96
Totals	136	144	96

Excavation quantity calculated from grading surface. Excavation quantity is for embedded revetment core out only, and does not include excavation to the grading surface. Excavation quantity to the grading surface is determined by Road Design and included in the Road Plans. Quantities shown for information only. See Road Sheets.

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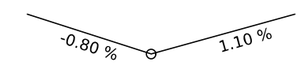

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VPI Elev. = 1383.65
LVC = 400.00

Proposed Profile Grade IA 9

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IA-9 over Unnamed Trib to Rock RIver
T-99N R-45W
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Bridge Maint. No. 6022.6B009
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Design ESALs		

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W - Water Line
FO - Fiber Optic Line
GHP - Gas High Pressure
ST S - Storm Sewer
TV - TV
- Power Poles

Hydraulic Design

LICENSED PROFESSIONAL ENGINEER
Randall M.L. Friend
P28452
IOWA

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: Randall M.L. Friend — Date: XX-XX-XXXX
Printed or Typed Name
My license renewal date is December 31, 2026
Pages or sheets covered by this seal: V.1 and V.2
P28452

Design For 45° Left Ahead

Single 12'-0" x 4'-0" x 121'- 41/8" Reinforced Concrete Box Culvert

Situation Plan - P.C

STA. 207+86.22 (IA 9)
Turn-in Date: May. 2025

Lyon County
IOWA DEPARTMENT OF TRANSPORTATION
Design No. 0127 | Design Sheet No. 2 of 2 | FHWA/Asset 900920

CROSS SECTION VIEW COLOR LEGEND

Design Color No.	Feature
Aggregate	
(64)	Choke Stone
(42)	Engineering Fabric
(8)	Flooded Backfill
(92)	Macadam Stone
(20)	Modified
(12)	Plowing Shaping
(14)	Porous Backfill
(8)	Revetment Class A
(6)	Revetment Class B
(62)	Revetment Class C
(188)	Revetment Class D
(28)	Revetment Class E
(12)	Shoulder Special Backfill
(12)	Special Backfill
(20)	Subbase
(20)	Subbase Lower
(20)	Subbase Upper
(118)	Subgrade Treatment
Asphalt	
(207)	HMA Base Course
(207)	HMA Interim Course
(207)	HMA Surface Course
Bridge	
(0)	Bridge
Concrete	
(0)	Barrier Concrete
(0)	Barrier Concrete Footing
(0)	Curb Gutter
(48)	Flowable Mortar
(0)	Median Concrete
(0)	PCC Pavement
(0)	Sidewalk
Existing	
(0)	Existing Pavement
Shoulder	
(209)	Shoulder HMA
(0)	Shoulder PCC
(6)	Shoulder Granular
Structural	
(112)	Noise Wall
(112)	Noise Wall Footing
(112)	Retaining Wall Back
(112)	Retaining Wall Back Excavate
(112)	Retaining Wall Face
(112)	Retaining Wall Front Excavate
(112)	Retaining Wall Front Footing
(112)	Retaining Wall MSE Gutter
(112)	Retaining Wall Reinforced Earth

Design Color No.	Feature
Grading	
(8)	Behind Curb Cut
(6)	Granular
(13)	Granular Back Fill
(48)	Rock Undercut
(8)	Shoulder Earth Fill
(2)	Side Slopes
(226)	Side Slopes Dressing
Substrata	
(128)	Boulder
(209)	Boulder Removed
(48)	Broken Weathered
(210)	Broken Weathered Removed
(3)	Core Out
(115)	Core Out Remove Only
(195)	Core Out Remove and Replace
(203)	Existing Pavement
(184)	Existing Pavement Remove Only
(200)	Existing Pavement Remove and Replace
(6)	Loam
(211)	Loam Removed
(80)	Rock
(212)	Rock Removed
(4)	Select Sand
(214)	Select Sand Removed
(3)	Shale
(215)	Shale Removed
(10)	Topsoil
(2)	Topsoil Remove Only
(4)	Topsoil Remove and Replace
Unsuitable / Waste	
(3)	Unsuitable Type A
(216)	Unsuitable Type A Removed
(13)	Unsuitable Type B
(217)	Unsuitable Type B Removed
(11)	Unsuitable Type C
(218)	Unsuitable Type C Removed
(3)	Waste
(219)	Waste Removed

NOTES:

Text

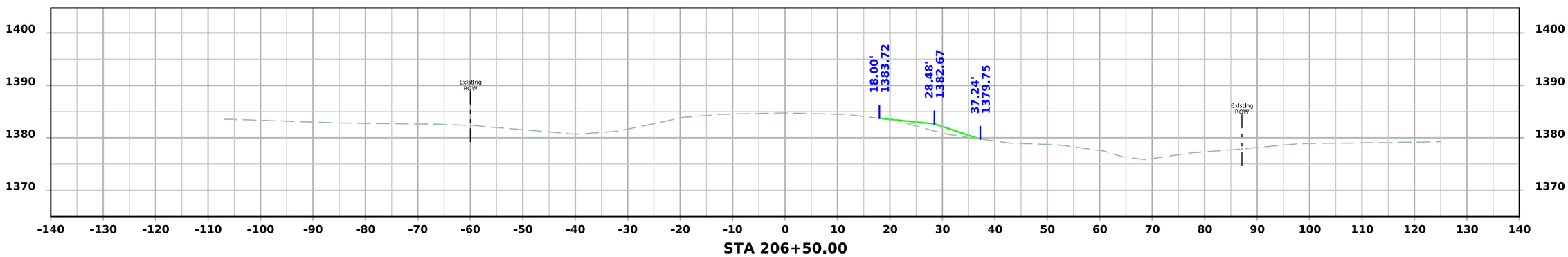
NOTES:

Text

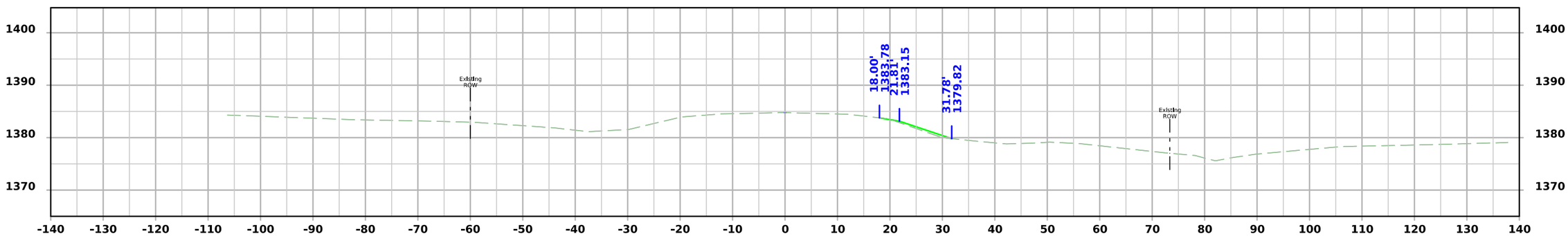
CROSS SECTIONS
LEGEND AND INFORMATION SHEET

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

ML - IA 9



STA 206+50.00



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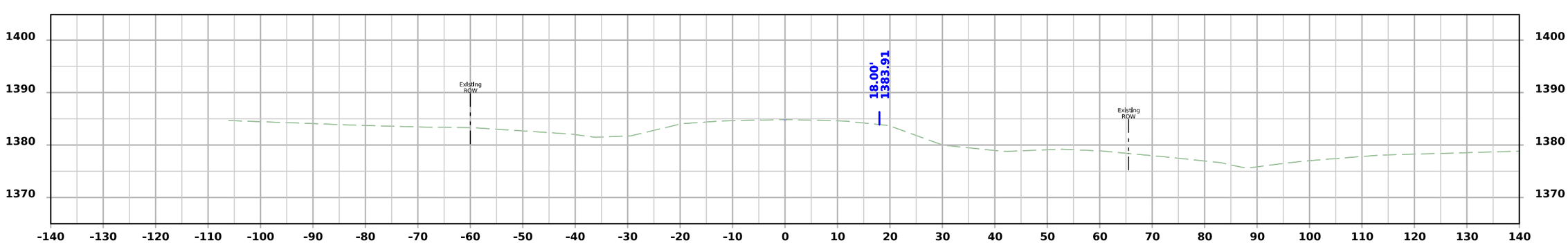

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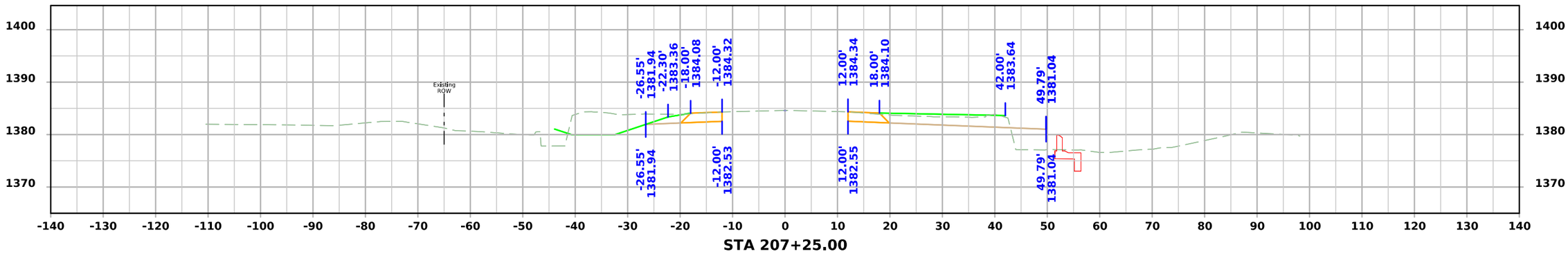
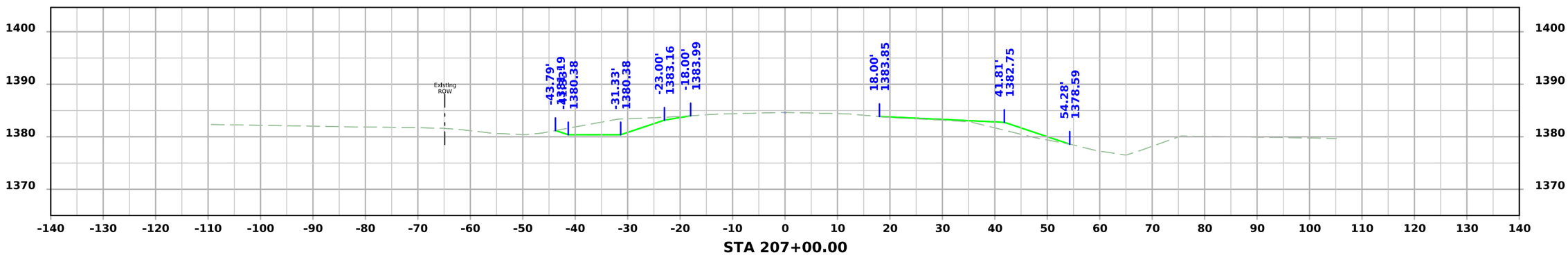
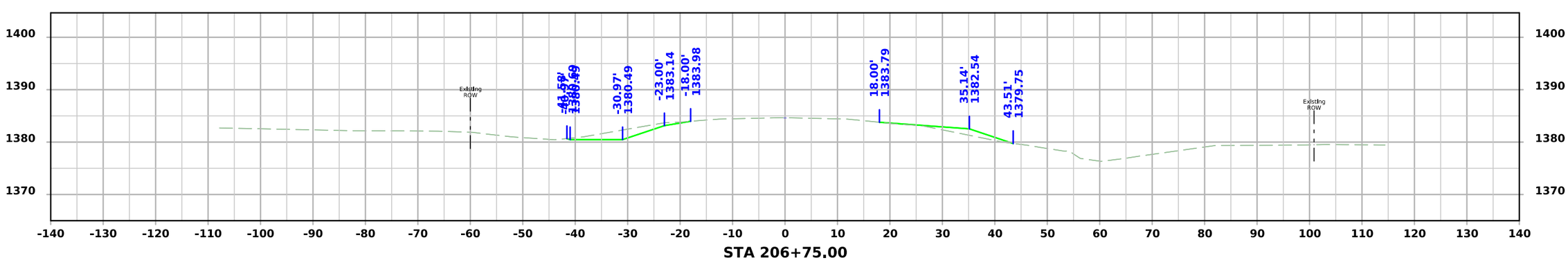
ML - IA 9

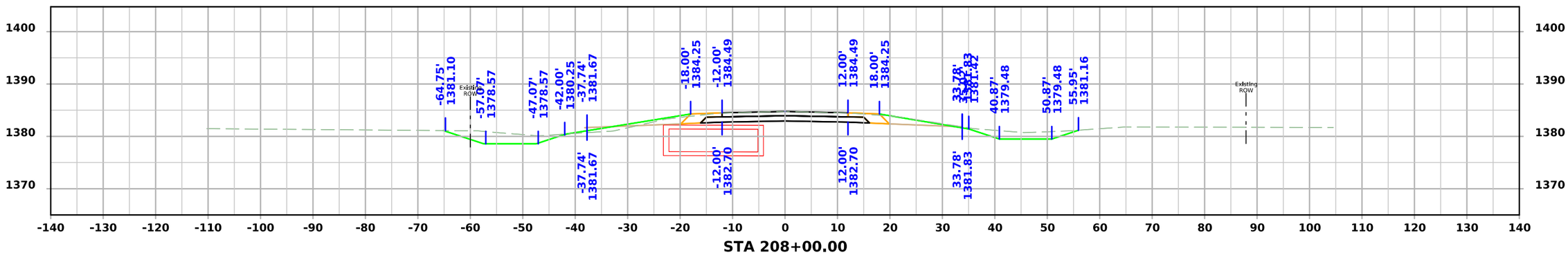


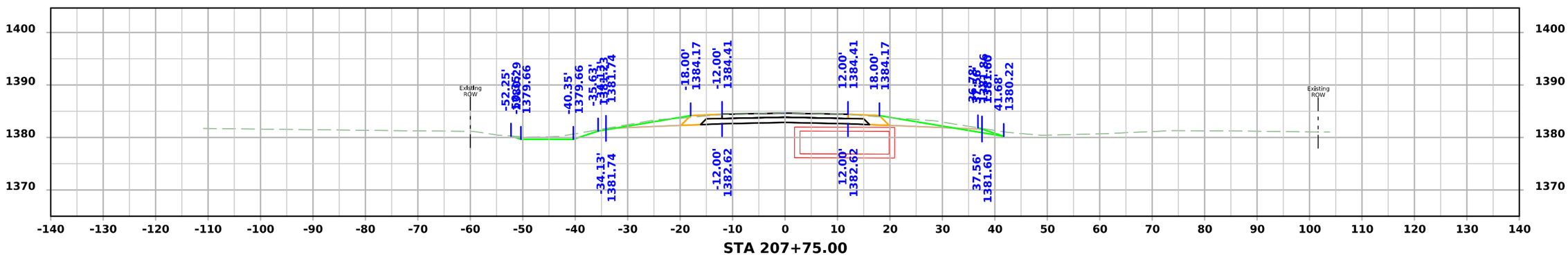


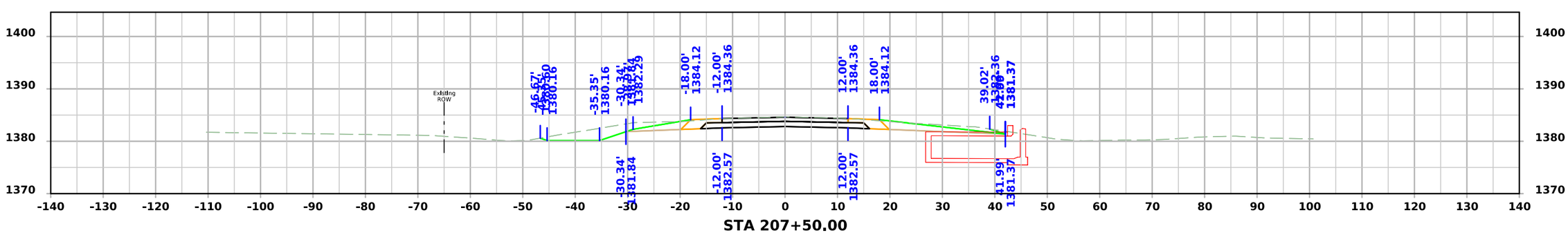


FILE NO. --	ENGLISH	DESIGN TEAM MILLER/RYAN	LYON COUNTY	PROJECT NUMBER STPN-009-1(059)--2J-60	SHEET NUMBER W.3

ML - IA 9

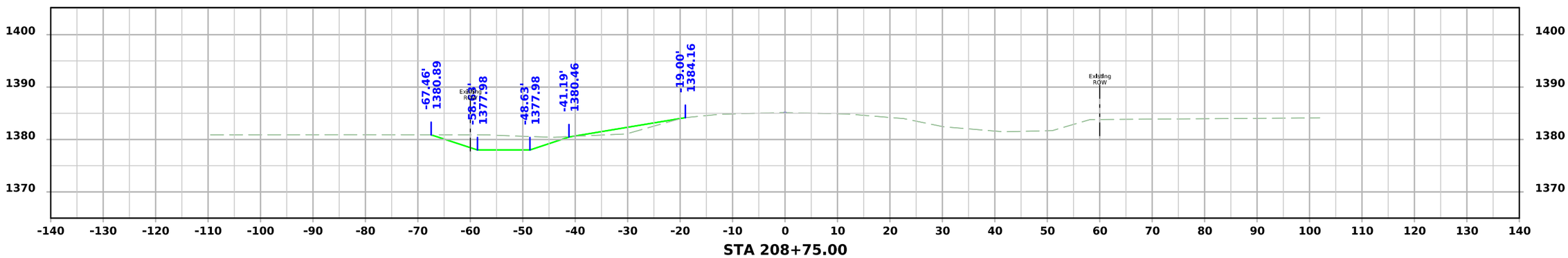






FILE NO. --	ENGLISH	DESIGN TEAM MILLER/RYAN	LYON COUNTY	PROJECT NUMBER STPN-009-1(059)--2J-60	SHEET NUMBER W.4

ML - IA 9



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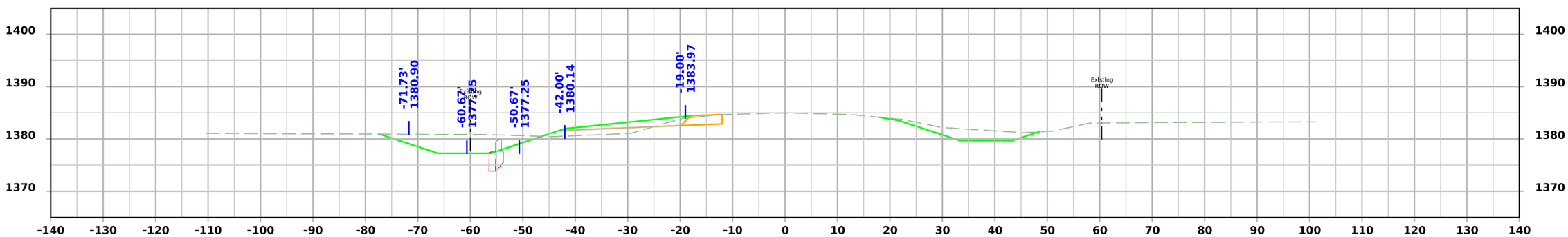
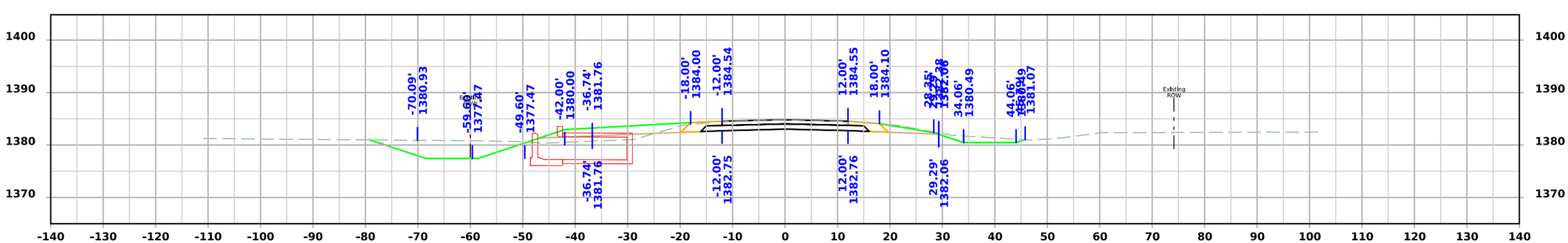


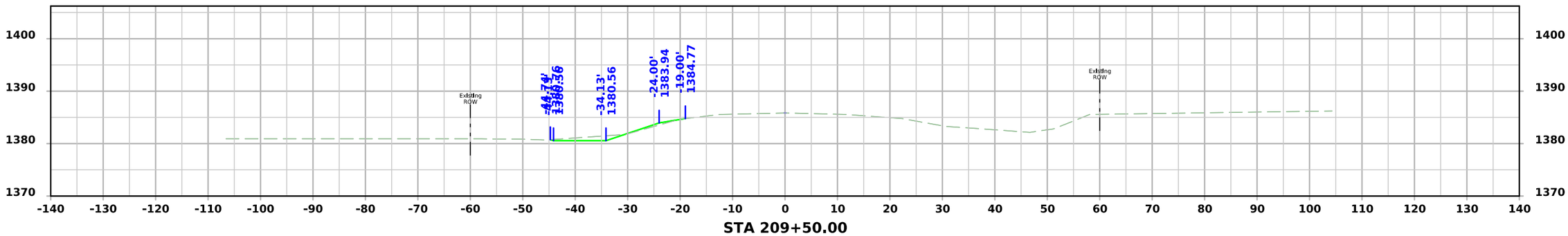
STA 208+50.00

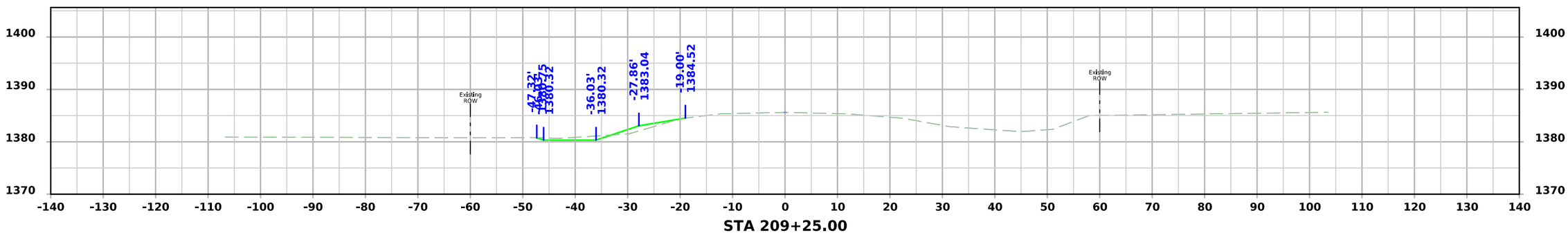


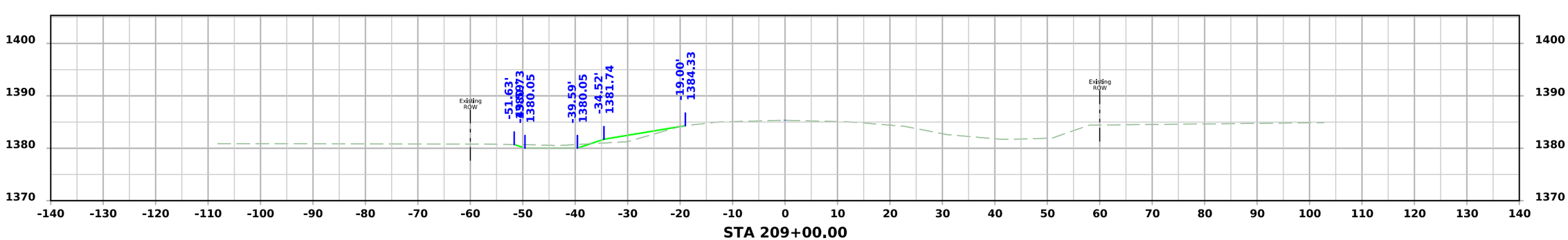
STA 208+25.00

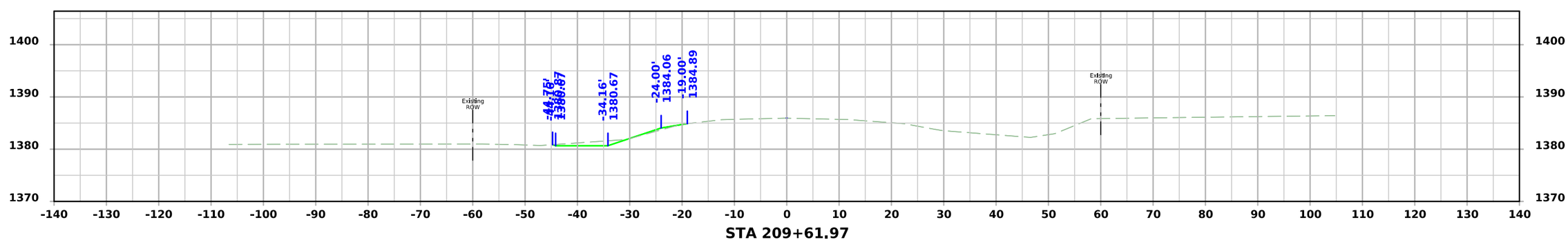
FILE NO. --	ENGLISH	DESIGN TEAM MILLER/RYAN	LYON COUNTY	PROJECT NUMBER STPN-009-1(059)--2J-60	SHEET NUMBER W.5

ML - IA 9


1400
1390
1380
1370
Existing ROW
-44.71'
1380.36
-34.13'
1380.56
-24.00'
1383.94
-19.00'
1384.77
Existing ROW
-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
STA 209+50.00

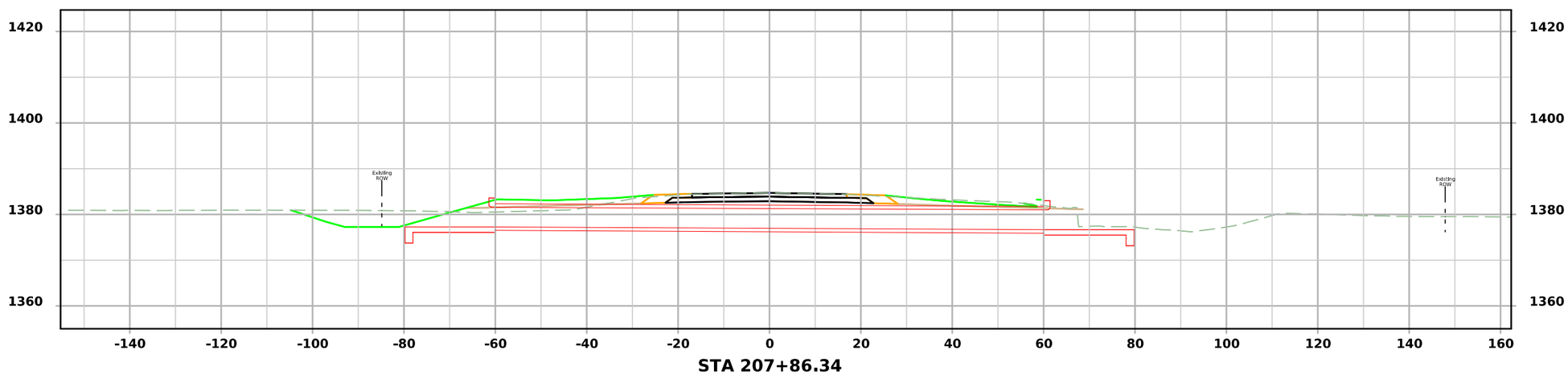

1400
1390
1380
1370
Existing ROW
-47.32'
1380.32
-36.03'
1380.32
-27.86'
1383.04
-19.00'
1384.52
Existing ROW
-140 -130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140
STA 209+25.00


1400
1390
1380
1370
Existing ROW
-51.63'
1380.05
-39.59'
1380.05
-34.52'
1381.74
-19.00'
1384.33
Existing ROW
-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
STA 209+00.00


1400
1390
1380
1370
Existing ROW
-44.76'
1380.87
-34.16'
1380.67
-24.00'
1384.06
-19.00'
1384.89
Existing ROW
-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
STA 209+61.97

ML - IA 9

Cross Section at Skewed Culvert



FILE NO. --	ENGLISH	DESIGN TEAM MILLER/RYAN	LYON COUNTY	PROJECT NUMBER STPN-009-1(059)--2J-60	SHEET NUMBER W.8

12:49:03 PM 6/5/2025 jryan3 pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Projects\6000903024\Design\CADD_Files\Sheet_Files\SHT_60009059_W01.dgn