

TO OFFICE: District 3

ATTENTION: Jessica Felix, DE

FROM: Todd Huju, Staff Engineer

OFFICE: District 3

SUBJECT: FY 2027 3R Concept– DRAFT

DATE: February 28, 2024

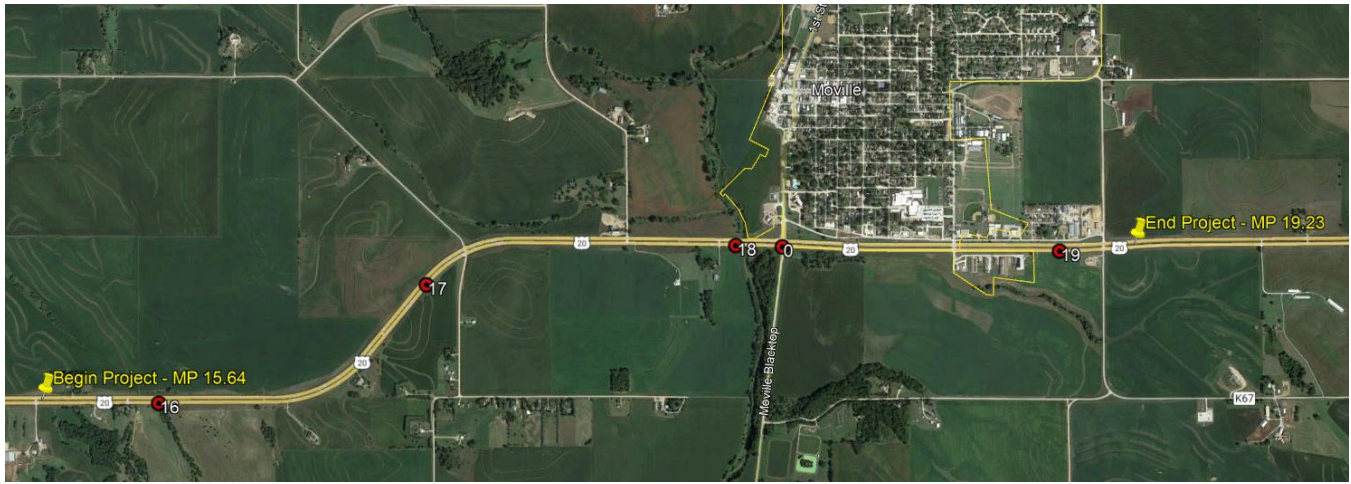
COUNTY: Woodbury

PROJ. NO.: NHSX-020-1(204)—2R-97

PIN: 24-97-020-020

FOLDER: [9702002024](#)

PROJECT LOCATION:



PROJECT DATA:

ROUTE: US 20 from 0.7 mile east of Franklin Ave (MP 15.64) to just east of Humbolt Ave near Merville (MP 19.23).

LENGTH: 3.59 miles

PLANNING CLASSIFICATION: 2 CIN

MAINTENANCE SERVICE LEVEL: B

NHS ROUTE: Yes

TRAFFIC:

LOCATION	SECTION LENGTH	ESTIMATED 2027 ADT	2027 PERCENT TRUCKS	ESTIMATED 2047 ADT	ESTIMATED 2047 DHV	2047 PERCENT TRUCKS
BOP to IA 140	2.51	10055	15%	12092	1249	15%
IA 140 to EOP	1.08	7135	19%	8580	886	190%
TOTAL LENGTH	3.59	9000	16%	10800	1120	16%

PURPOSE AND NEED:

This project is to reconstruct the pavement on US 20 and provide paved shoulders from 0.7 miles east of Franklin Ave to just east of Humbolt Ave near Merville.

RECOMMENDATIONS:

This project is prosed to reconstruct the mainline pavement and provide paved shoulder on US 20 in Woodbury County from 0.7 miles east of Franklin Ave to just east of Humbolt Ave near Merville. The existing vertical and horizontal alignments will be UAC on this project with some minor improvements to bring the vertical alignment of EB and WB closer together where feasible. Existing turn lanes will be replaced, and an additional left turn lane will be provided for WB US 20 to SB Humbolt Ave.

The existing pavement and shoulders will be removed and for the purposes of the concept the new typical section will be 24' wide, 10" thick PCC pavement on 12" Modified Subbase with full depth 4' wide paved & 2' granular on the median and 6' wide paved & 4' granular on the outside. The pavement determination will be completed at a future date by the Pavement Design section.

WB lanes:**MP 15.64 to MP 19.23:**

Estimated Cost (Mainline and Shoulder) = \$10,537,000 (Funded by 3R Pavement Replacement Program)

EB lanes:**MP 15.64 to MP 19.23:**

Estimated Mainline Cost = \$6,399,000 (Funded by District 3 allocation of 3R)

Estimated Shoulder Cost = \$3,525,000 (Funded by HSIPX up to \$4,010,000 for 4' of paved shoulder)

The costs estimated above are based on FY 2024 dollars (not inflated to the program year).

Funds Programmed:

This project is not yet in the 5 year-program but is in the proposed Pavement Replacement Program for FY 2027 and the District 3 Draft 3R program and HSIPX programs.

PROJECT IMPACTS:

Designed by: Design Bureau or Consultant

Design Impact	Assistance Requested (Y/N)	Remarks
ADA:	N	
Agreements/Notification Letters:	Y	Woodbury County for side road approach paving
Bridges and Structures:	N	
Consultant:	Unknown	

Contracts:	Y	Letting
Design/Methods:	Y	Project Design
Location and Environment:	Y	Project Clearance
Maintenance: (Shop Location)	N	Sioux City & Correctionville
Project Management:	Unknown	May be Consultant Design
Railroad:	N	
RCE: (Office Name)	N	Sioux City RCE
Right of Way:	N	
Soils:	N	
Survey/Photogrammetry:	Y	
Systems Planning:	N	
Traffic and Safety:	N	
Utilities:	Unknown	
Other:		

Cc:	B. Hofer	S. J. Gent	M. J. Kennerly
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	B. Bradley	K. K. Patel	K. Brink
	J. E. Laaser-Webb	C. Poole	N. Pohlen
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	M. Nop	S. P. Anderson	D. Stokes
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	D. T. Ta	J. E. Bartholomew	G. Cagle
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	D. Williams	D. Schultz	K. Mulvihill
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	J. Profera	A. Schwarz	A. Crosgrove
	J. Klemme	R. Gleiser	T. Clouse

CONCEPT ANALYSIS & SUPPORTING DATA:

Date of Field Review:

04/27/2023

Participants:

District 3 – Shane Tymkowicz, Jason Klemme, Mike Malchow, Aaron, Schwarz, Joe Profera, Ron Gleiser, Todd Huju

PAVEMENT:

Existing Conditions:

This roadway is a 4-lane divided highway with 6' median and 10' outside shoulders. From MP 16.2 to MP 17.4 the shoulders are paved 4' median and 6' outside, with the remaining width being granular. Outside of this station range, the shoulders are granular.

The 1995 HMA surface is oxidized with loss of fines in some areas. The joints and cracks have been filled and the centerline has been strip sealed by local maintenance forces. There is moderate to severe spalling of the longitudinal joints and cracks which has led to significant spall patching along the longitudinal joints. The PCC pavement in the WB lanes between Lawton and Merville has moderate faulting and moderate spalling at the transverse joints. The PCC pavement in the EB lanes east of IA 140 to the EOP has moderate to severe cracking and spalling at the transverse joints and moderate to severe faulting.

Several cores were taken in the composite pavement areas at or near the centerline joint at locations where there was existing spalling and/or oil and chip repairs completed by local maintenance forces. The cores indicate that the lower layer of HMA at the joints is deteriorating and causing the joint concerns. Also, some deterioration of the original PCC at the joint is evident.

Pavement History:

MP 15.64 to 18.0 Desc: BOP from ECL Lawton to Merville

Original Pavement: 10" PCC

Year Constructed: 1964

PCC Coarse Aggregate Source: Hawarden North- Gravel 2

Years Resurfaced: 1995 5" HMA

Years Reconstructed: N/A

MP 18.0 to 19.23 Desc: EB From Merville to EOP

Original Pavement: 10" PCC

Year Constructed: 1958

PCC Coarse Aggregate Source: Correctionville Gravel 2

Years Resurfaced: N/A

Years Reconstructed: N/A

MP 15.64 to 17.7 Desc: WB from BOP to W of Merville

Original Pavement: 9.5" PCC

Year Constructed: 1954

PCC Coarse Aggregate Source: Hawarden N - Gravel 2 & Correctionville - Gravel 2

Years Resurfaced: Curves - 1998 6" HMA

Years Reconstructed: N/A

MP 17.7 to 19.23 Desc: WB from W of Merville to EOP

Original Pavement: 10" PCC

Year Constructed: 1958

PCC Coarse Aggregate Source: Correctionville Gravel 2

Years Resurfaced: 1995 5" HMA

Years Reconstructed: N/A

PMIS Data:

2022 PMIS Data MP to MP	Dir.	Type	Avg. Str. No.	80% Str. No.	Jt. Str. Ratio	PCI	IRI	K Value	(F)ault (R)ut (mm)
EB 15.64 to 18.0	1	comp	7.02	5.40		52	129	213	0.22
EB 18.0 to 19.23	1	PCC	4.58	3.81	83	26	209	122	0.12
WB 16.64 to 17.7	2	PCC	4.71	3.35	79	63	140	118	0.04
WB 17.7 to 19.23	2	comp	7.06	5.36		49	128	203	0.27

Pavement Design & dTIMS Recommendation:

Based on the 2020 traffic information provided for an adjacent project in the same pavement sections, the Pavement Design Section recommends 1/2" HMA on the composite sections and 6.0" HMA on the PCC sections to provide a 20 year service life. No additional structure is needed based on the mechanistic pavement design method. Due to the narrow median and existing shoulder widths raising the profile by 6" is not a feasible option.

Subdrains:

The route currently has subdrains but it is expected the subdrains will be damaged or destroyed by the pavement removal and grading to provide for the new pavement section. The existing subdrains should be removed and new subdrains provided throughout the project.

Patching/Curb Repairs:

N/A

ADA/Sidewalk/Trails:

There are no trails or sidewalks or trails within the project limits. The outside shoulders will be constructed 6' wide so a complete streets analysis is not necessary.

SAFETY:**3R Design Criteria:**

Acceptable Values for 3R Roadway Features						Project Values
DESIGN ELEMENT	FREEWAY	NON-FREEWAY				
Regulatory Speed (mph)	65/55	55	45	35	25	65/55
Minimum Vertical Curve (mph)	65/55	35	25	15	5	40 UAC
Maximum Horizontal Curve (degrees)	3	6	8	14	28	UAC
Maximum Gradient	3%	6%	7%	10%	13%	UAC
Lane Width (feet)	12	12	11	11	11	12
Parking Lane Width (feet)	--	--	8	8	8	N/A
Shoulder Width (feet)	10/6	6	4	4	2	10/6
Foreslopes	3:1	3:1	3:1	--	--	UAC
Transverse Slopes	6:1	6:1	6:1	--	--	UAC
Horizontal Clearance (feet)						UAC
Bridge Width	Approach Lanes + Shoulder Width			Approach Lanes + Offset		UAC
Vertical Clearance - Over NHS (feet)	16.5	16.5	16.5	16.5	16.5	N/A
Vertical Clearance - Over Local (feet)	14.5	14.5	14.5	14.5	14.5	N/A

Crash Analysis:

The five-year crash study period from January 2019 to December 2023 included 51 total crashes within the project limits. Of the 51 crashes there were 2 fatal, 1 involving serious injury, 9 involving minor injury, and 7 involving a possible or unknown injury. There were 16 animal related crashes, 7 ran Stop Sign or FTY a yield sign or uncontrolled intersection, 7 ran off the road (Rt or Lt), 4 were swerving or evasive action, 5 were driving too fast for conditions, 6 lost control or were operating in a reckless/erratic manner. 11 of the crashes occurred on wet, snow, slush, or ice/frost covered roads. 3 of the crashes were drug or alcohol related.

One of the fatal crashes occurred when a Single Unit truck ran a stop sign (WB at the IA 140 intersection) and crashed with a pickup truck on dry roads in clear conditions during daylight. The second fatal crash occurred when a pickup was driving too fast for conditions on slush covered road during daylight in freezing rain/drizzle conditions trying to negotiate a curve in the roadway.

The serious injury crash occurred when a motor home/RV ran a stop sign (EB at the IA 140 intersection) and crashed with a pickup during daylight on dry road with cloudy weather conditions.

The crashes are distributed throughout the corridor with a slight concentration of crashes just west of the Little Sioux River bridges. At the IA 140 intersection and the Fair St. intersection. Outside and median shoulder rumble strips will be placed in the paved shoulders.

Corridor Crash History:

The road segment from Lawton to Merville is listed on the Potential for Crash Reduction (PCR) map as a high value of PCR for severe crashes and medium for all crashes. The segment east of IA 140 is shown as negligible for all crashes and medium for Severe crashes. The paved shoulders with rumble strips should help to improve the rural crash statistics.

Intersection Crash History:

All the intersections except IA 140/K64 are shown as negligible for both categories. The 4-way stop controlled intersection at IA 140/K64 is shown as medium PCR for severe crashes and negligible for all crashes. A request for intersection evaluation to improve the safety and operations of the IA 140/K64 is in process for possible improvements to this intersection. If an improved intersection type is programmed it should include a tied lighting project.

Intersection Analysis:

A WB left turn lane will be constructed at Humbolt Ave. If a differing intersection type (such as a Round-A-Bout or Reduced Conflict intersection) is not proposed by the requested evaluation at the IA 140/Co Rd K64 intersection, the left and right turn lanes will need to be considered for construction. No other turn lanes are proposed to be added with this project. The "T" intersection at Grundy Ave should have a safety ramp constructed to the south of US 20.

Railroads:

There are no railroads within the vicinity of this project.

Additional Safety & Operation Considerations:

The foreslopes west of Merville were constructed as 3:1 on both EB and WB outside and median foreslopes; the outside WB foreslopes were constructed as 2:1 on fills over 6'; the outside EB foreslopes were constructed as 2.5:1 on fills over 10'. From IA 140 east the median slopes were constructed as 4:1 and outside slopes constructed as 3:1 with 2.5:1 as shown in plans on deep fills. The CL-to-CL median width west of Merville is 74'; The CL-to-CL median width from Merville east is 84'. There are narrow median shoulders, particularly in HMA sections. Median crossing slopes were constructed as 4:1. Survey is needed to improve the foreslopes to 4:1 where feasible to do so within the existing ROW. The median foreslopes should be improved to 4:1 except where the EB and WNB lanes have differing profiles.

There is one horizontal curve greater than 3° within the project limits. The curve was resurfaced, had the superelevation corrected, and signs upgraded with a safety project in 2005. The horizontal alignment will be UAC.

STRUCTURES and DRAINAGE:**Bridges:**

There are three bridges located within the project limits: Br. Nos. 9718.0R020 and 9718.0L020, FHWA Nos. 52921 and 52931, and Br No 9718.1A020, FHWA No. 53190, is a twin 10' x 10'RCB under K64 near the US 20 ROW. All 3 bridges will be UAC on this project The approaches will be UAC and the guardrail will be upgraded to current standards.

Culverts/Pipes:

All median drain culverts should be replaced with this project.

There are no small culverts marked with object markers. The following culverts will need some repairs:

Station	Size & Type	Location	Comments
1046+99	30" RCP	Lt	Separated joints
1049+46	4'x5.5' Cattle Pass	Lt & Rt	Headwall 13' from edge of pavement Rt & 15' from edge of pavement Lt – Extend both
1065+68	30" RCP	Lt	Separated joints
1076+07	36" RCP	Lt	Separated joints & electric cable runs through the culvert
1096+50	48" RCP	Lt	Separated joints & electric cable runs through the culvert
1126+30 B = 21+52 A	48" RCP	Median, Lt & Rt	Separated joints throughout culvert, consider sliplining or trenchless construction for replacement
26+47	54" RCP	Median, Lt & Rt	Separated joints throughout culvert, consider sliplining or trenchless construction for replacement
34+30	30" RCP	Lt	Separated joints
49+17	30" RCP	Lt	Separated joints
59+20	24" RCP	Lt & Rt	Separated joints

Guardrail:

There is cable guardrail protecting slopes as follows: 665 ft of cable EB at MP 16.0 Rt & 455 ft of cable EB at MP 16.3 Rt. These sections of cable should be replaced with high tension cable barrier.

Drainage District:

N/A

PROJECT IMPACTS:

Impacts Map:

There are no known environmental, cultural, or historical property impacts within the limits of this project. The Little Sioux River is a Paddling Route but this project will not impact the river. The project does pass through the designated Loess Hills area near milepost 16 to milepost 16.6.

Environmental:

Clearing and grubbing may be needed at some the culvert repair work areas. This will need to be evaluated during further project development prior to completion of the field exam.

TSMO/Traffic Control:

This project is not a traffic critical project. Traffic control will consist of head-to-head traffic in the EB lanes while the WB lanes are being constructed and then head to head on the newly constructed WB lanes while the EB lanes are constructed. The IA 140/Co Rd K64 intersection will need to be staged or temporary pavement used to always provide access to IA 140 and to Co Rd K 64 during construction. The existing crossover just west of Ida Ave/D22 will be used to switch traffic at the east end of project. A new median crossover will need to be constructed near the west end of the project.

ROW:

There is no new ROW (permanent or temporary) anticipated to be required for this project.

Agreements/Notification Letters:

Woodbury County has asked for the gravel side road returns to be paved. It is expected that an agreement will be needed for such a request on this project. A notification letter will be sent to the City of Merville.

Project Coordination:

N/A

RECOMMENDATION:

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The existing pavement and shoulders will be removed and for the purposes of the concept the new typical section will be 24' wide, 10" thick PCC pavement on 12" Modified Subbase with full depth 4' wide paved & 2' granular on the median and 6' wide paved & 4' granular on the outside. The pavement determination will be completed at a future date by the Pavement Design section. All signs along the corridor should be replaced with this project.

WB lanes: NHSX-020-1(204)—3H-97

MP 15.64 to MP 19.23:

Estimated Cost (Mainline and Shoulder) = \$10,537,000 (Funded by 3R Pavement Replacement Program)

EB lanes:**MP 15.64 to MP 19.23:**

Estimated Mainline Cost = \$6,399,000 (Funded by District 3 allocation of 3R) NHSX-020-1(205)—3H-97

Estimated Shoulder Cost = \$3,525,000 (Funded by HSIPX up to \$4,010,000 for 4' of paved shoulder) HSIPX-020-1(206)—3L-97

The costs estimated above are based on FY 2024 dollars (not inflated to the program year). Project numbers NHSX-020-1(205)—3H-97 and HSIPX-020-1(206)—3L-97 are for fund tracking purposes only.

Funds Programmed:

This project is not yet in the 5 year-program but is in the proposed Pavement Replacement Program for FY 2027 and the District 3 Draft 3R program and HSIPX programs.

Development Schedule:

D00 – 02/02/2024

D01 – 03-01-2024

D02 – 05/03/2024

D03 – 06/07/2024

B02 – 09-06-2024

D05 – 10-04-2024

P09 – 03/05/2025

S03 – 12/05/2025

P08 – 06/19/2026

DM5 – 06/30/2026

D08 – 08/04/2026

L03 – 10/20/2026