TO OFFICE: District 2

ATTENTION: Jon Ranney

FROM: Mary Kelly /Tracy Meise

OFFICE: District 2 Design

SUBJECT: FY 2022 Concept Statement - **FINAL**

DATE: November 16, 2020

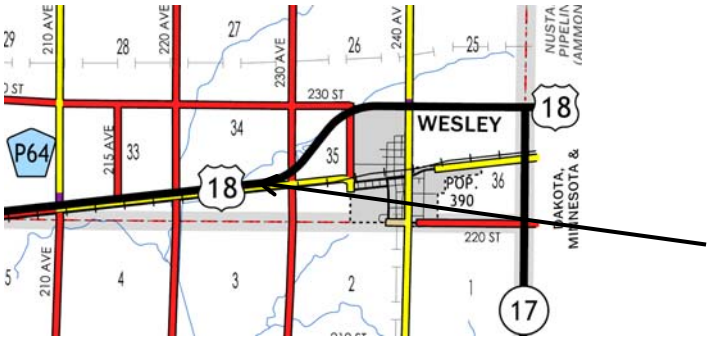
COUNTY: Kossuth/Hancock

PROJ. NO.: NHSX-018-3(111)--3H-55
HMA Resurfacing with Milling
NHSX-018-3(112)--3H-55
HMA Pavement Widening

PIN: 21-55-018-010

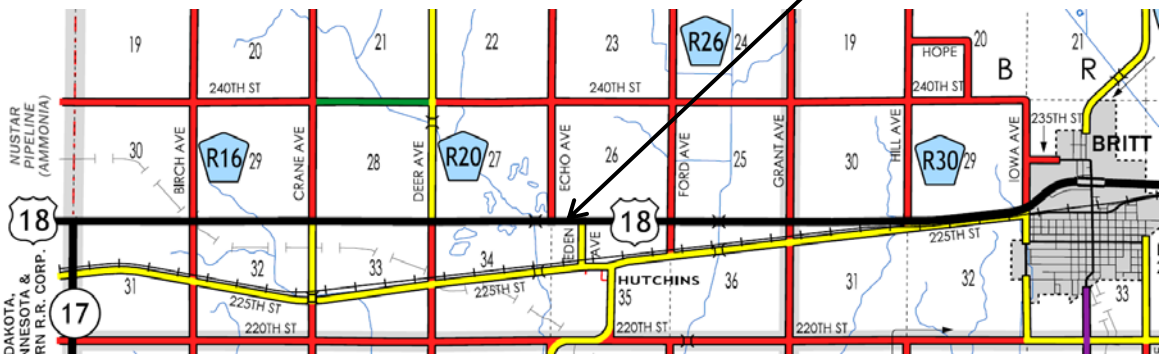
FOLDER: 5501801021

PROJECT LOCATION:



Begin Project
RP 141.24
Kossuth county

End Project
RP 148.01
Hancock county



PROJECT DATA:

ROUTE: US 18
LENGTH: 6.77 miles
PLANNING CLASSIFICATION: 2-Commerical Industrial Network
MAINTENANCE SERVICE LEVEL: B
NHS ROUTE: Yes
TRAFFIC: 2022: 3,000 ADT with 20% Trucks
2042: 3,400 ADT with 21% Trucks

PURPOSE AND NEED:

This project will address the segment from 1.65 miles east of P64 in Kossuth County to the west junction of R26/Eden Ave in Hancock County. US 18 has been identified by the Iowa in Motion 2045

State Transportation Plan (STP) as a candidate for Super 2 corridor enhancements from Spencer to Garner and is under a PEL study. The purpose of the project is to address the Super 2 needs such as turn lanes and passing lanes as identified in the PEL study and improve the surface condition.

FEASIBLE ALTERNATIVES:

1- 1½" to 2" mill with 5" HMA overlay - $8,372,100 ($5,788,700+$2,583,400)
2- Unbonded 6" PCC overlay – Not feasible
3- Crack and seat, 6" HMA overlay - $9,632,300 ($7,048,900+$2,583,400)

RECOMMENDATIONS:

It is recommended to use Alternative 1 for this project. Surface improvements (NHSX-018-3(111)--3H-55) include milling, 5 inch HMA resurfacing, patching, 6 foot HMA paved shoulders, 4 foot granular shoulders, culvert repairs, longitudinal subdrains, bridge approaches, guardrail and edge and centerline rumbles estimated at a cost of $5,788,700. Super 2 improvements (NHSX-018-3(112)--3H-55) includes construction of two passing lanes and turn lane improvements at three intersections, surfacing with 5 inches of HMA, 6 foot paved shoulders, 4 foot granular shoulders, longitudinal subdrains, pipe extensions, grading and erosion control work at a total estimated cost of $2,583,400. The total estimated cost for both projects is $8,372,100.

FUNDS PROGRAMMED:

It is proposed that this project be funded with a combination of NR and 3R funds in FY 2022 in addition to the anticipated FY 2022 RPA funding of $700,000.

PROJECT IMPACTS:

Designed by: District

Design Impact	Assistance Requested (Y/N)	Remarks
ADA:	N	
Agreements:	Y	Notification: City of Wesley Agreements: Kossuth and Hancock counties
Bridges and Structures:	Y	Plan sheets for RCB extensions, bridge end posts
Consultant:	N	
Contracts:	N	
Design/Methods:	Y	Methods review of passing lane placement
Location and Environment:	N	
Maintenance:		Algona/Garner
Project Management:	N	
Railroad:	N	South of project, outside of limits
RCE:		Mason City
Right of Way:	Y	Widening locations, culvert extensions
Soils:	Y	Subdrain location
Survey/Photogrammetry:	Y	Survey will be completed by District

Systems Planning:	N	
Traffic and Safety:	Y	Review of passing lane placement
Utilities:	Y	Utilities relocation in pavement widening areas
Other:		

CC:

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J. Bartholomew
H. Beach
K. Billhorn
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J. Vortherms
B. Walls
J. Weber
A. Welch
R. Welper
C. Wood
E. Wright
B. Younie
G. Zittergruen

CONCEPT ANALYSIS & SUPPORTING DATA:

Date of Concept Review: September 17, 2020

Participants: Scott Loge, Jason Ruter, Mary Kelly, Tracy Meise, Nick Humpal, Dwaine Berte, Kevin Rauk, Tom Lovan and Michael Delp

PAVEMENT:

Existing Conditions:

The existing roadway is a two lane rural section with effective ten foot wide granular shoulders. Originally constructed in 1961, as a 24-foot wide, 10 inch PCC pavement, it was resurfaced in 1988 or 1994 with overlays ranging from two to five inches thick. There are 15 sideroads (both paved and granular). Foreslopes are generally 3:1. Several driveways have full shoulder width paved fillets.

Cores done within the project limits showed very poor PCC condition. Maintenance notes that there is heaving of joints which is reflected in the IRI values ranging from 149-174. At several locations from RP 141.24 to RP 142.93, the existing asphalt is spalling off. There is low to moderate reflective cracking of most longitudinal and transverse joints. No fatigue cracking or block cracking is in this segment. The rutting ranges from 0.1 to 0.3 inches in depth.

Pavement History:

RP 141.24 to 142.93
Original Pavement: 10 inch PCC
Coarse Aggregate Source: Garner north, crushed limestone, Class 1, VL 94AC MP
Year Constructed: 1961
Project: F-94(9)
Resurfaced: 1994, 2 inch AAC
Project: MP-18-2(700)138-76-55

RP 142.93 to 143.85
Original Pavement: 10 inch PCC
Coarse Aggregate Source: Garner north, crushed limestone, Class 1, VL 94AC MP
Year Constructed: 1961
Project: F-94(9)
Resurfaced: 1988, 1.5 inch surface, 3.5 inch base
Project: F-18-3(62)-20-55

RP 143.85 to 147.98
Original Pavement: 8 inch PCC
Coarse Aggregate Source: Mason City, Gravel, Class 2
Year Constructed: 1922
Project: FA-94
Resurfaced and Widened: 1961, 3 inch surface AAC
Project: FN-94
Resurfaced: 1988, 5 inch surface AAC, Garner, crushed limestone
Project: F-18-3(62)—20-55

PMIS Data:
Link to the PMIS Report: PMIS-141.24-147.98.pdf

RP to RP	Dir	Type	Ave Structure	80% Str No	Rut Depth	PCI	IRI	K value
141.24 to 142.93	B	CMP (3)	7.66	6.17	0.1	61	173.98	218
142.93 to 143.85	B	CMP (3)	4.92	3.25	0.3	62	169.69	108
143.85 to 147.98	B	CMP (3)	5.05	3.16	0.29	66	148.98	126

Pavement Design & dTIMS Recommendation:
The dTIMS recommendations were reviewed in RAMS. With a standard budget, a major structural rehab 1 in 2028 and a CIR in 2024/2028 is recommended from RP 141.24 to 142.93 and RP 142.93 to 147.98, respectively.

Road Analyzer App link: https://rams.dot.int.lan/tds/apps/ra/#/pmis/S001920018E/141.240/147.980

Subdrains:
Project length is approximately 36,310 LF. Existing subdrains were installed in 1987 under a project that provided 30,325 LF. To achieve 100% coverage, 6,000 LF will need to be installed. Often 33-year-old subdrain needs repair. Maintenance will be contacted to see how well the existing subdrain is functioning. For the purpose of the concept, it will be assumed that five percent (1,550 LF) will need to be repaired and cost will be included in the estimate. New subdrains will be required at new passing lanes (8,016 LF) which is in addition to the 7,550 LF noted above.

Patching:
Patching is anticipated. A patch tabulation will be obtained from the Mason City Construction Office to be incorporated into the plans.

ADA/Sidewalk/Trails:
No pedestrian facilities exist within the project limits with on plan to add any. The proposed six foot wide paved shoulders with rumbles will provide a four foot wide accommodation for bicyclists.

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	**55**
Minimum Vertical Curve (mph)	65/55	35	25	15	5	**50**
Maximum Horizontal Curve (degrees)	3	6	8	14	28	**2**
Maximum Gradient	3%	6%	7%	10%	13%	**Ex. max 1.9%**
Lane Width (feet)	12	12	11	11	11	**12**
Parking Lane Width (feet)	--	--	8	8	8	**NA**
Shoulder Width (feet)	10/6	6	4	4	2	**10**
Foreslopes	3:1	3:1	3:1	--	--	**3:1**
Transverse Slopes	6:1	6:1	6:1	--	--	
Horizontal Clearance (feet)						**24-30***
Bridge Width	Approach Lanes + Shoulder Width			Approach Lanes + Offset		**NA**
Vertical Clearance - Over NHS (feet)	16.5	16.5	16.5	16.5	16.5	**NA**
Vertical Clearance - Over Local (feet)	14.5	14.5	14.5	14.5	14.5	**NA**

*Recovery area will be provided in the ditch bottom

Crash Analysis:

ICAT quick report and intersection diagrams link: ICAT email

Corridor Crash History:

There was a total of 9 crashes reported from January 1, 2015 to August 31, 2020. Crash Severity was defined by the following: 1 Fatal, 2 Possible/Unknown and 6 Property Damage Only. Major Cause: 2 lost control, 1 equipment failure, 1 crossed center, 3 ran off road right and 2 other.

The crash rate for this corridor is 20.7 crashes/hundred million vehicle miles which compares with a statewide average of 84 crashes/hundred million vehicle miles on a rural US highway.

The fatal crash occurred between Deer Avenue and Echo Avenue when an east bound vehicle crossed center line and hit head on a west bound vehicle.

Intersection Crash History:

230th Ave

There was a total of 3 reportable crashes for the time period. Crash Severity: 3 property damage only. Major Cause: 1 lost control, 2 ran off road right.

The crash rate for this intersection is 0.54 crashes/million entering vehicles which compares with the statewide average of 0.80 crashes/million entering vehicles on a rural US highway.

234th Ave
No reportable crashes in time period.

R14/240th St
No reportable crashes in time period.

IA 17/250th Ave
No reportable crashes in time period.

R16/Birch Ave
No reportable crashes in time period.

Crane Ave
No reportable crashes in time period.

R20/Deer Ave
There was 1 reportable crash for the time period. Crash Severity: Property damage only. Major Cause: other.

The crash rate for this intersection is 0.17 crashes/million entering vehicles which compares with the statewide average of 0.80 crashes/million entering vehicles entering on a rural US highway.

Echo Ave
There were 3 reportable crashes for the time period. Crash Severity: 2 possible/unknown and 1 Property damage only. Major Cause: 1 Lost Control, 1 Ran off road-right and 1 other.

The crash rate for this intersection is 0.53 crashes/million entering vehicles which compares with the statewide average of 0.80 crashes/million entering vehicles on a Rural US highway.

Intersection Analysis:
An intersection analysis was completed by the Location and Environment Bureau in conjunction with the Super 2 PEL Study with the following recommendations:

R-14/240th Ave: WB traffic: existing minor right turn warranted, upgrade to major offset right turn
EB traffic: existing minor right turn warranted, upgrade to major offset right turn
Upgrade intersection to include left turn lanes
IA 17/250th Ave: EB traffic: existing minor right turn warranted, upgrade to major offset right turn
Upgrade existing bypass lane to left turn lane for WB
R-16/Birch Ave: no turn lanes warranted
Crane Ave: no turn lanes warranted
R-20/Deer Ave: WB traffic: existing minor right turn warranted, upgrade to major offset right turn

Passing Lanes:
As part of the Super 2 improvements, passing lane will be added for eastbound traffic from just west of R-16/Birch Avenue intersection to the box culvert at STA 1520+95 and for westbound traffic from Crane Ave to R-20/Deer Ave.

Railroads:
There are no RR crossings within the project limits, but the Canadian Pacific is just south of US 18 at the start of the project.

Additional Safety & Operation Considerations:
In review of the District Road Safety Plan, there is not a project worksheet for this segment of roadway. However, this segment is on the ">50% segment" list provided by Traffic and Safety Bureau.

The existing granular shoulder is ten feet wide. According to the design manual two lane rural highway on NHS route should have six foot paved shoulders. This project will include six foot paved shoulders with four foot granular shoulders for an effective total shoulder width of ten feet. The grade will raise three inches with the HMA overlay which may require earth shoulder construction.

Milled centerline and shoulder rumble strips will be installed on this project.

The existing curbed stop islands will be removed and be replaced with a painted island with stop sign and barrel at four locations.

The bridge approaches will be removed, replaced, and new EF joints installed at the bridge FHWA No. 26770. Location of the EF joints will be reviewed to determine if they should be closer to the bridge. They are currently 125 LF feet from the bridge end.

STRUCTURES and DRAINAGE:

Bridges:

FHWA No.	Maint. No.	Size/Type	Year Built	BDO/Rehab Year	Bridge Rail Height	End Post Type	Vertical Clearance	Future Projects
81032841	4145.4B018	8' x 6'x 46' Conc slab culvert w PCC sheet pile walls and wings	1967	NA	NA	NA	NA	NA
26770	4147.3S018	30' x 90' CCS	1959	1983		B	NA	NA

Guardrail:

The structure at STA 1520+95, west of Crane Avenue, has an existing guardrail on the south side of the road only. As per Traffic and Safety recommendation, guardrail we be re-installed on the south side only to the current standards. A future project will be scoped with proposed construction in 5-10 years for a replacement structure to eliminate the need for guardrail and improve the snow drift and water overtopping the roadway.

West of Echo Avenue, there is guardrail at the bridge structure. Guardrail will be updated to current standards and include bridge rail end section replacement.

Culverts/Pipes:

There are 26 mainline pipes ranging in size from 18 inches to 54 inches. There are also three box culverts within the project limits. Several pipes show separation between joints and will require removal and reinstallation along with tying joints. With passing lane and turn lane additions, at least nine mainline pipes will have to be extended (four-24", two-30", two-48", one-6'x4' RCB).

Maintenance indicated there is a drainage problem at the concrete slab culvert located at STA 1520+95 and the twin 30-inch diameter RCP at STA 1529+68. Water encroaches into the roadway at both locations requiring occasional lane closure with flaggers. Preliminary Bridge Design reviewed these two locations. An additional 30-inch pipe will be added at STA 1529+68 as part of this project. The structure at STA 1520+95 will have improvements under a separate project in the future.

Maintenance indicated some ditches needed to be cleaned, not really because of drainage, but snow drifting. It is anticipated that ditch cleaning will be minimal and some of issues will be corrected because of the passing lane construction.

Entrances pipes will be reviewed for current 3R guidelines and improved as needed.

Drainage District:

No drainage districts in Kossuth county are within the project limits. There are two drainage districts within the project limits in Hancock County; DD #10 and DD# 10, Lat 3. In addition to the drainage district tiles, there are several private lines that appear to cross the roadway with several intakes draining into them.

PROJECT IMPACTS:

Impacts Map:

There are no Hot Spots within the project limits on the location and environment map. This project is not located in an Outstanding Iowa Watershed. The Hillside Golf Course is located near the end of the project within a half mile of the project corridor. It is recommended to be avoided or impacts minimized to it.

Environmental:
No historic or cultural resources were identified on this project. Several wetlands abut the project limits. At the west end of the project, wildlife corridors are noted along the existing railroad tracks. The City of Wesley has their wastewater lagoons on the northwest side of the road east of 230th Ave. A Leaking Underground Storage Tank site is located at the east end of the project, south side.

Traffic Control:
There should not be any special traffic control requirements for the resurfacing of the roadway. Work can be done under traffic with pilot car and flaggers. A lane closure with signals and TBR should be used for the bridge approach replacement. An intermittent contract period should be included to have a detour posted during the installation of a 30 inch roadway culvert. It is estimated that the detour will be needed for approximately two weeks. No restricted hours are anticipated.

ROW:
Minimal permanent ROW is anticipated for this project for turn lane improvements and passing lanes.

Agreements:
Kossuth and Hancock counties will be contacted to determine if they would want to include extending the paving on the side roads, paved or gravel. There are ten gravel road intersections. An agreement would need to be executed to address the work if the counties decide to extend pavement beyond the DOT scope.

Project Coordination:
The project has two project numbers, one for the Super 2 improvements and one for the mainline project work. These projects will be tied and bid together.

Future Projects List:
US 18 from Spencer to Garner is identified as a Super 2 Corridor. Additional work is anticipated in the future.

FEASIBLE ALTERNATIVES & RECOMMENDATION:

FEASIBLE ALTERNATIVES:

Alternative 1: 1½" to 2" Mill with 5" HMA Overlay NHSX-018-3(111)--3H-55-D0-Alt 1.pdf
Mill nominal 24 feet wide, 1½ to 2 inches deep; add 6 foot HMA paved shoulders on each side; full depth patching; repair/extend roadway culverts; subdrain installation; pave 5 inches HMA overlay; earth shoulder construction with erosion control.

HMA, (inc binder)	$2,874,900
Milling	$ 109,000
Paved shoulders	$ 296,400
Patching	$ 39,500

Granular shoulders	$ 506,500
Bridge approach	$ 101,100
Guardrail	$ 29,500
Subdrains	$ 48,300
Pipe work	$ 87,300
Pavement markings	$ 28,200
Rumble strips	$ 25,300
Sideroads	$ 161,000
Traffic control (inc flagger/pilot)	$ 101,600
Mobilization	$ 94,100
Incentives	$ 123,800
Unquantified	$1,162,200
Total	$5,788,700

Alternative 2: Unbonded 6" PCC overlay

This option was originally recommended but when the pavement cores were reviewed, to place a PCC overlay, all poor joints would need to be patched prior to overlay. After these recommendations, this alternative was not considered feasible.

Alternative 3: Crack and Seat, 6" HMA overlay NHSX-018-3(111)--3H-55-D0-Alt 3.pdf

Mill; crack and seat nominal 24 feet wide; add 6-foot HMA paved shoulders on each side; full depth patch; repair roadway culvert; install subdrain for the full length of project; install 6 inches HMA along with erosion control.

HMA, (inc binder)	$ 3,702,100
Mill	$ 107,000
Crack and seat	$ 84,000
Paved shoulders	$ 296,400
Patching	$ 34,700
Granular shoulders	$ 506,500
Approach	$ 101,100
Guardrail	$ 29,400
Subdrains	$ 69,900
Pipe work	$ 106,100
Pavement markings	$ 28,800
Rumble strips	$ 21,900
Sideroads	$ 161,000
Traffic control (inc flagger/pilot)	$ 129,000
Mobilization	$ 106,200
Incentive	$ 150,600
Unquantified	$1,414,200
Total	$7,048,900

NHSX-018-3(112)--3H-55: 10.5" HMA Super 2 Improvements NHSX-018-3(112)--3H-55-D0.pdf

Construct two passing lanes; left turn lanes at two intersections; extend minor turn lanes to major offset right turn lanes; extend roadway culverts; install subdrain; pave 5 inches HMA over 5.5 inches of HMA base; place 4-foot granular shoulders; earth shoulder construction with erosion control.

HMA, (inc binder)	$ 918,500
Earthwork	$ 893,300
Granular shoulders	$ 96,300
Subdrains	$ 108,200
Pipe work	$ 39,200
Pavement markings	$ 19,600
Traffic control	$ 10,000
Mobilization	$ 52,100
Incentives	$ 55,500
Unquantified	$ 390,700
Total	$2,583,400

Recommendation:

The recommended method of rehabilitation for this project is Alternative 1. This alternative includes milling of existing surfaces with a 5-inch HMA overlay, paved shoulders, patching, culvert repairs/extensions, subdrain installation, construction of passing lanes and improvements to existing turn lanes, milled shoulder and edge rumble strips and erosion control. The estimated cost is $5,788,700.

For the purpose of this estimate, an HMA option was used to calculate the cost of the turn lane improvements and passing lanes construction. The estimated cost is $2,583,400. When letting the project, the district will consider including an option to allow for PCC to be used for the turn lane improvements and passing lanes construction.

Tons HMA: 57,135 Tons

Funds Programmed:

It is proposed that $7,375,000 of this project be funded with a combination of NR and 3R funds in FY 2022 in addition to the anticipated FY 2022 RPA funding in the amount of $700,000. Total project costs are in the amount of $8,372,100.

Development Schedule:

D02: February 2021
D07: September 2021
L02: November 16, 2021