

Project No.
IM-5-094(143)000

PCN
22624

State Line to E Camel Hump Dam - WB



SCOPING REPORT

Prepared by

**NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
BISMARCK, NORTH DAKOTA**

<http://www.dot.nd.gov/>

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23 USC § 409
NDDOT Reserves All Objections

SCOPING REPORT

A. GENERAL INFORMATION

Project Number:

District: Dickinson

Location: State Line to E Camel Hump Dam - WB

Reference Point: RP 0.000 to RP 11.841 – 11.841 miles

Counties: Golden Valley

Legal Description: T140N, R106W, Sec 15 to T140N, R104W, Sec 16

Functional and Funding Roadway Classification: Interstate

Speed Limit: 75 mph

Freight Level: 1

Project Schedule: Proposed to be added to the STIP as Reconstruction.

dTIMS Recommendations: Constrained: Minor Asphalt 2026

Unconstrained: PM Asphalt 2024

B. PURPOSE, NEED, AND IMPROVEMENT

Purpose and Need of Project:

The underlying concrete pavement on this segment is from the original interstate construction completed in 1969. This segment requires regular HMA mill and overlays as well as concrete pavement repair. That work will likely become more frequent and significant as the underlying concrete ages.

Proposed Improvement:

PCC reconstruction is proposed. All safety hardware will be in compliance with MASH performance criteria or NCHRP Report 350 if MASH compliant hardware is not available. All regulatory and warning signs and pavement markings will be verified to comply with current MUTCD standards or brought up to MUTCD standards if necessary.

C. TRAFFIC AND CRASH ANALYSIS

RP 0.000 to RP 11.841

	Year	Pass	Trucks	Total AADT	Flex ESALs	Rigid ESALs
Current Traffic	2019	1,340	605	1,945	555	890
Forecast Traffic	2039	1,920	905	2,825	825	1,330

Crash Analysis:

There was a total of 45 crashes from 8/1/14 to 7/31/19. Four were intersection related and 41 were not. Animal crashes were not included.

Notes/Trends:

-The 2016-2018 Rural Highway Segment Crash Map shows RP 0 to RP 4 is in the low range for weighted crashes per mile and RP 4 to RP 11.8 is in the low-moderate range.

-Nearly 80% of crashes were single vehicle crashes, with 2/3 of them occurring during non-dry conditions (17 ice/snow, 6 wet).

-There were 14 crashes at the Exit 1 (Beach) interchange area, but no patterns/trends were identified.

-There were 6 crashes near RP 11.3, and 5 of 6 involved WB vehicles that lost control during ice/snow conditions and hit guardrail on the north side of the road.

Recommendations:

Install WATCH FOR ICE warning signs for WB traffic approaching Camel Hump Dam (RP 11.3) and/or investigate other possible measures to address area during project development.

D. EXISTING ROADWAY CHARACTERISTICS

	International Roughness Index (IRI)	Distress Score	Rut
Excellent	< =60	≥ 98	< 0.25"
Good	61 – 99	88 – 97	0.25" to 0.375"
Fair	100 – 145	77 – 87	0.376" to 0.50"
Poor	> 145	≤ 76	> 0.50"

Segment 1: RP 0.000 to RP 4.200

Actual Age	IRI	IRI Rating	SI or SCI	Faulting
19	41	Excellent	8	N/A
Effective Age	Distress	Distress Score	Rutting	Rutting Score
15	88	Good	.23	Excellent

CONSTRUCTION HISTORY				
Year	Construction	Depth (in)	Width (ft)	Oil
1968	GRADE	-	48.0	-
1968	C-C 84 FEET	-	-	-
1969	AGGREGATE BASE	2.0	27.0	-
1969	CONT - REINF PCC	8.0	24.0	-
1969	PLANT MIX BIT BASE	8.0	12.5,0.0,0.0	85-100
1969	HOT BIT PAVEMENT	2.0	10.0,0.0,0.0	85-100
1979	RECLAMITE	-	10.0,0.0,0.0	-
1983	RECLAMITE	-	0.0,0.0,3.0	-
1991	EDGE DRAIN RETROFIT	-	-	-
1996	RECLAMITE	-	10.0,0.0,3.0	-
1997	INT CONT PATCH-2.0"	-	24.0	120-150
1998	FEDERAL AID SAND SEAL	-	10.0,0.0,3.0	MC-3000P
1999	PREVENTIVE MAINTENANC	-	24.0	-
2001	CONCRETE PAVEMENT REP	9.0	24.0	AE
2001	HBP-SUPERPAVE-FAA 42	2.5	28.0	PG 58-28
2001	HBP-SUPERPAVE-FAA 42	2.2	28.0	PG 58-34
2001	HOT BIT PAVEMENT	4.0	10.0,0.0,0.0	PG 58-28
2003	FEDERAL AID CHIP SEAL	-	24.0	HFMS-2

CONSTRUCTION HISTORY				
Year	Construction	Depth (in)	Width (ft)	Oil
2011	MICROSURFACING	-	24.0	-
2011	FEDERAL AID SAND SEAL	-	-	CRS2P
2015	CONCRETE PAVEMENT REP	-	24.0	-
2015	MILLING	-3.0	24.0	-
2015	HBP-SUPERPAVE-FAA 45	3.0	24.0	PG 64-28
2015	MILLING	-1.0	10.0,0.0,4.0	-
2015	HBP-SUPERPAVE-FAA 45	1.0	10.0,0.0,4.0	PG 64-28
2018	SLURRY SEAL	-	24.0	-
2018	FEDERAL AID SAND SEAL	-	10.0,0.0,4.0	CRS2P

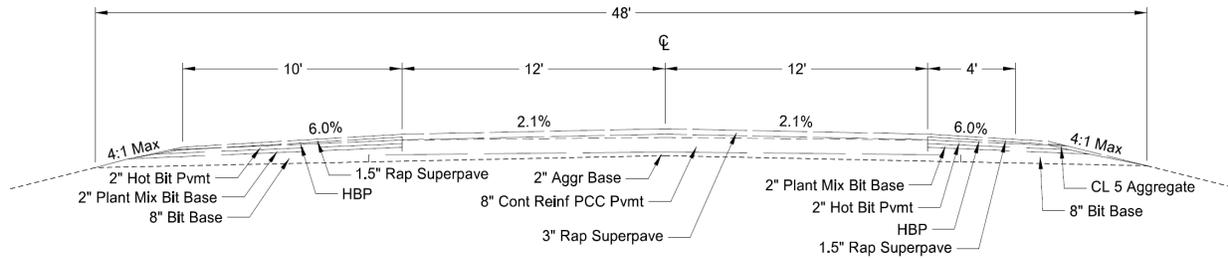
Segment 2: RP 4.200 to RP 11.841

Actual Age	IRI	IRI Rating	SI or SCI	Faulting
19	48	Excellent	7	N/A
Effective Age	Distress	Distress Score	Rutting	Rutting Score
15	87	Fair	.21	Excellent

CONSTRUCTION HISTORY				
Year	Construction	Depth (in)	Width (ft)	Oil
1968	GRADE	-	48.0	-
1968	C-C 84 FEET	-	-	-
1969	AGGREGATE BASE	2.0	27.0	-
1969	CONT - REINF PCC	8.0	24.0	-
1969	BITUMINOUS BASE	6.0	12.5,0.0,6.7	SM-K
1969	PLANT MIX BIT BASE	2.0	11.2,0.0,4.9	85-100
1969	HOT BIT PAVEMENT	2.0	10.0,0.0,3.0	85-100
1979	RECLAMITE	-	10.0,0.0,0.0	-
1983	RECLAMITE	-	0.0,0.0,3.0	-
1991	EDGE DRAIN RETROFIT	-	24.0	-
1996	RECLAMITE	-	10.0,0.0,3.0	-
1997	INT CONT PATCH-2.0"	-	24.0	120-150
1998	FEDERAL AID SAND SEAL	-	10.0,0.0,3.0	MC-3000P
1999	PREVENTIVE MAINTENANC	-	24.0	-
2001	CONCRETE PAVEMENT REP	9.0	24.0	AE
2001	HBP-SUPERPAVE-FAA 42	2.5	28.0	PG 58-28
2001	HBP-SUPERPAVE-FAA 42	2.2	28.0	PG 58-34
2001	HOT BIT PAVEMENT	4.0	10.0,0.0,0.0	PG 58-28
2003	FEDERAL AID CHIP SEAL	-	24.0	HFMS-2
2011	MICROSURFACING	-	24.0	-
2011	FEDERAL AID SAND SEAL	-	10.0,0.0,4.0	CRS2P
2015	CONCRETE PAVEMENT REP	-	24.0	-
2015	MILLING	-3.0	24.0	-
2015	HBP-SUPERPAVE-FAA 45	3.0	24.0	PG 64-28
2015	MILLING	-1.0	10.0,0.0,4.0	-
2015	HBP-SUPERPAVE-FAA 45	1.0	10.0,0.0,4.0	PG 64-28
2018	SLURRY SEAL	-	24.0	-
2018	FEDERAL AID SAND SEAL	-	10.0,0.0,4.0	CRS2P

Existing Foreslopes: 4:1 - 6:1

Existing Typical Section:



E. EXISTING GEOMETRY

Horizontal Curves: Use AASHTO Standards. The horizontal curves are listed in the table below. All of the curves meet the minimum required radius, but none meet the minimum required superelevations for a 75 mph design speed.

Location	Radius (ft)		Superelevation (%)	
	Existing	Required	Existing	Required
RP 0.132	5116	2500	0.0	4.1
RP 0.287	5730	2500	2.1	3.7
RP 2.220	5730	2500	2.1	3.7
RP 2.744	11459	2500	0.0	2.1
RP 4.859	14324	2500	0.0	2.0
RP 5.235	12456	2500	0.0	2.0
RP 6.543	5730	2500	2.1	3.7
RP 8.795	5730	2500	0.0	3.7
RP 9.692	14324	2500	0.0	2.1
RP 10.707	5730	2500	0.0	3.7

Vertical Curves: Use stopping sight distance for crest curve design and comfort curve design for sag curves. The required value of K for 75 mph is 312. All curves meet requirements.

Location	Curve Length (ft)	Existing K/ Required L
RP 0.114	800 SAG	L = 82
RP 0.341	800 SAG	L = 150
RP 0.859	1,250 CREST	K = 402
RP 1.481	800 CREST	K = 531
RP 2.042	800 SAG	L = 362
RP 2.510	800 SAG	L = 50
RP 2.832	1,100 CREST	K = 1,915
RP 3.363	800 SAG	L = 37
RP 3.931	800 SAG	L = 9

Location	Curve Length (ft)		Existing K/ Required L
RP 4.404	800	CREST	K = 2,728
RP 4.783	800	SAG	L = 150
RP 5.023	800	SAG	L = 91
RP 5.636	800	CREST	K = 475
RP 6.579	800	CREST	K = 585
RP 6.964	800	SAG	L = 498
RP 7.561	2,270	CREST	K = 397
RP 8.216	1,000	SAG	L = 625
RP 8.820	1,750	CREST	K = 383
RP 9.157	800	CREST	K = 1,204
RP 9.419	800	SAG	L = 417
RP 9.703	1,000	CREST	K = 465
RP 10.214	800	CREST	K = 529
RP 10.498	800	SAG	L = 242
RP 10.782	800	SAG	L = 8
RP 10.934	800	SAG	L = 13
RP 11.083	800	CREST	K = 7,742
RP 11.265	800	SAG	L = 248
RP 11.606	800	SAG	L = 248

Ramps:

Requirements: Degree of Curve = 4° Max; Acceleration Taper = 50:1; Deceleration Taper = 40:1

Interchange and Ramp Location	Degree of Curve	Acceleration Taper	Deceleration Taper
Beach Interchange – NE Ramp	4°	---	40:1
Beach Interchange – NW Ramp	4°	50:1	---
Home on the Range Interchange – NE Ramp	4°	---	40:1
Home on the Range Interchange – NW Ramp	4°	50:1	---
Sentinel Butte Interchange – NE Ramp	4°	---	40:1
Sentinel Butte Interchange – NW Ramp	4°	50:1	---

F. EXISTING STRUCTURES

Required Clearance = 16'6"

Bridge No.	Name	Vertical Clearance	Length (ft)	Width (ft)	Rating			
					Deck	Super-Structure	Sub-Structure	Culvert
0094-001.849	Beach Interchange	16'7"	265	29.9	6	6	7	N/A
Recommendation: Do nothing.								
0094-002.234	Quad, 12X12X158' RCB	-	50	-	N/A	N/A	N/A	7
Recommendation: Extend box. \$160,000								

Bridge No.	Name	Vertical Clearance	Length	Width	Rating			
			(ft)	(ft)	Deck	Bridge No.	Name	Vertical Clearance
0094-004.170	Triple, 8X10X160' RCB	-	25	-	N/A	N/A	N/A	7
Recommendation: Joint Repair \$40,000								
0094-004.829	East Beach Separation	16'3"	240	28	6	6	6	N/A
Recommendation: E-Rail retrofit & spall repair. \$50,000								
0094-007.368 L	Home on the Range Interchange	-	140	37	6	6	7	N/A
Recommendation: Deck overlay & replace approach slabs. \$360,000								
0094-010.478	Sentinel Butte Interchange	16'6"	240	28	8	7	7	N/A
Recommendation: Rail spall repair \$25,000								

Centerline Culverts:

A pipe survey and hydraulic study should be conducted. All pipes needing extensions and upgrades should have cost effective solutions applied. For the cost estimate, it is assumed that half of the centerline pipes will be replaced.

G. LAND INTERESTS

Small Community: Beach, Population 1,064, Exit 1
Reservation: None
Public Land: None
Refuge: Camel Hump Lake Wildlife Management Area
Adjacent Land Usage: Agricultural, Commercial

H. ISSUES AND APPURTENANCES CHECKLIST

- 1. Curb and Gutter? Yes ___ No X
- 2. Sidewalk? Yes ___ No X
- 3. Multi-Use Path? Yes ___ No X
- 4. Curb Ramps? Yes ___ No X
- 5. Detectable Warning Panels? Yes ___ No X
- 6. Lighting? Yes X No ___

The existing lighting at the Beach Interchange from RP 1.55 to RP 2.23 is approximately 25 years old and nearing the end of its life. There is also lighting at a Highway Patrol Inspection Site at RP 1.00 on EB of unknown age. The interchange lighting should be replaced, and the inspection site lighting should be evaluated for LED upgrades or replacement with the WB project as the EB project will not have other lighting work.

- 7. Signals? Yes ___ No X

- 8. Storm Sewer? Yes No
- 9. Manholes? Yes No
- 10. Other Underground Work? Yes No
- 11. Parking Facilities? Yes No
- 12. Frontage Roads? Yes No
- 13. Utility Issues? Yes No

There are numerous utility crossings including telephone, electric, and water lines.

- 14. Landscaping? Yes No

There are living snow fences along this segment. No suggested improvements.

- 15. Approach or Ditch Block Flattening? Yes No
- 16. T Intersection Recovery Approaches? Yes No
- 17. Fence? Yes No

There are numerous original wood fence posts that need to be replaced. There are also several locations where fencing was placed in the ditch bottom rather than along the ROW line on a hill slope. The district has requested that the fence be moved back onto the slope where feasible. Replacement of 25% of the fence has been included in the estimate.

- 18. Railroad Crossings? Yes No
- 19. Detours? Yes No
- 20. Automatic Traffic Recorder Locations? Yes No
- 21. Weigh-In-Motion Sites? Yes No
- 22. ITS (Deicing, Snow Gates, VMS, RWIS, etc.)? Yes No

Replacing the interstate closure system with new advanced warning signs, beacons, and gates is included in the estimate.

There is an active camera site at RP 11.34. The district has requested that sensors be added to make this an environmental site. An option has been provided to include the sensors as part of the project.

- 23. Highway Patrol/Truck Pullouts or Rest Areas? Yes No
- 24. Additional Right of Way? Yes No

25. Drainage Issues? Yes X No _____

The State Water Commission believes that the pipe in the south ditch (EB) by Camel Hump Dam has separated or has a hole in it causing sink holes immediately adjacent to the dam. They have requested the NDDOT repair this as soon as possible to ensure the continued safety of the dam. It is proposed to include this work with the WB reconstruction to comply with the State Water Commission request sooner as the district would like WB constructed first.

There are several asphalt flumes along this corridor that were placed to prevent erosion. Most of them have broken up, been undercut, or have washed away. These flumes should be removed.

East of the Beach Interchange does not drain well.

Home on the Range interchange underpass does not drain well and ponds water around the bridge piers.

Box culverts at RP 2.234 and 4.170 have a large amount of silt in them and should be cleaned out.

Cattle Pass at RP 9.47 also drains the median and currently holds water. Replacement or removal should be investigated.

Costs have been included in the estimate to address all these issues except for the cattle pass at RP 9.47.

26. Snow Impact Areas? Yes X No _____

The district noted some problems with snow along this segment, including RP 11.3, the location of several crashes. Possible measures to address issues should be investigated during project development.

27. Subgrade Issues? Yes X No _____

The district noted issues with settlement or soft spots on the WB Beach off ramp and just west of Boys Ranch interchange structure. They also have subgrade issues with the badlands soils towards the east end of the project.

28. Noise Analysis: Type I Project? Yes _____ No X Maybe _____

29. Maintenance Issues? Yes _____ No X

A structural plate pipe @ RP 4.91 has minimal cover and typically heaves. The hydraulic study should determine if pipe is oversized and options to address issue should be investigated.

Several hills sides have sloughed off into the interstate ditch and the ROW fencing has been moved to border the slides. The limited ditch section remaining is more difficult to maintain. The district has requested the ditch section be reestablished and the fence be moved back to the ROW line where feasible.

The district noted that the radius is too small for the Beach Interchange WB on-ramp and crossroad intersection and truck trailers often go off of the pavement.

30. Guardrail? Yes X No _____

Type	RP	L/R	Length (ft)
Blocked Out "W" Beam	2.218	L	335
Blocked Out "W" Beam	4.823	L	285
Blocked Out "W" Beam	7.368	R	307
Blocked Out "W" Beam	7.368	L	257
Blocked Out "W" Beam	10.474	L	227
Blocked Out "W" Beam	11.065	L	1543

A cost item to replace guardrails is included in the cost estimate.

Guardrail at RP 2.218 should no longer be needed with the extension of the box culvert at that location.

There is no guardrail on the crossroad of Bridge 0094-004.829

The district requested that guardrail be removed under the Home on the Range Interchange and curb & gutter be placed instead as was done at the Buffalo Gap Interchange (RP17). This should be investigated during project development.

31. Milling? Yes X No _____

Crossroads.

I. PERFORMANCE GUIDELINES

Design Speed: 75 mph
Clear Zone (from edge of driving lane): 32'
Shoulder Surface: Paved

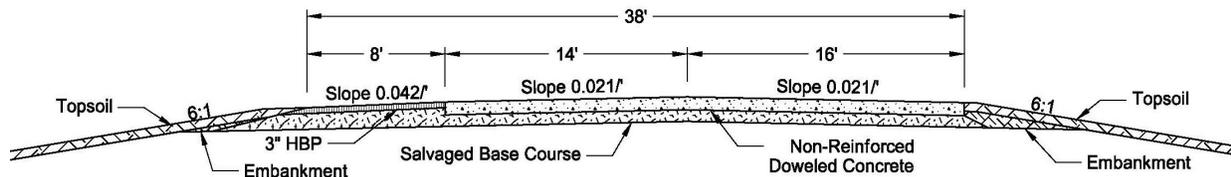
Ride/Distress Goal: Excellent
Operational Reliability: High
Minimum Roadway Width: 38'
Foreslopes: 6:1

J. PROPOSED IMPROVEMENTS

PCC reconstruction is proposed. All safety hardware will be in compliance with MASH performance criteria or NCHRP Report 350 if MASH compliant hardware is not available. All regulatory and warning signs and pavement markings will be verified to comply with current MUTCD standards or brought up to MUTCD standards if necessary.

Proposed Typical Section:

Proposed typical section used for estimating purposes only.



Ramps, Crossroads, and Rest Areas:

Exit 1 Beach Interchange – Address the subgrade issue on the WB off-ramp, provide a larger radius for WB on-ramp and overlay ramps. Construct a NB to EB (shorter than standard) right turn lane as recommended by Traffic Operations.

RP 4.829 East Beach Separation – Overlay crossroad.

Exit 7 Home on the Range Interchange – Seal ramps and overlay crossroad.

Exit 10 Sentinel Butte Interchange – Seal ramps.

K. ADDITIONAL COMMENTS

District Engineer:

L. COST ESTIMATE

(Inflation factor of 4% was used to estimate costs for bid year)

Item	Estimated Cost
Contract Bond & Mobilization	\$1,200,000
Removals	\$1,850,000
Dirt work	\$650,000
Aggregate	\$1,450,000
HMA	\$1,575,000
Concrete	\$11,500,000
Structures	\$635,000
Pipe/Drainage Issues	\$450,000
Striping/Signing/Guardrail/Lighting	\$530,000
Erosion Control	\$575,000
Trees/Landscaping/Fencing	\$65,000
Field Office/Labs	\$50,000
Work Zone Traffic Control/Crossovers/Ramp Connections	\$1,700,000
Subtotal=	\$22,230,000
Inflation=	\$3,750,000
Engineering=	\$4,446,000
Estimated Total Cost =	\$30,426,000

M. DECISIONS

1. Should this project advance as Reconstruction?

Yes **Estimated Cost of \$30,426,000?**

No

2. Which option(s) should advance with the project at an additional cost?

ITS

* Add environmental sensors to the camera site at RP 11.34.
Estimated Cost: \$50,000

Advance as an option to the Environmental Document.

Beach Interchange (Exit 1)

Address the subgrade issue on the WB off-ramp, provide a larger radius for WB on-ramp and overlay ramps. **Estimated Cost: \$420,000**

Construct NB to EB right turn lane **Estimated Cost: \$30,000**

Advance as options to the Environmental Document

East Beach Separation (RP 4.829)

Overlay crossroad
Estimated Cost: \$80,000

Advance as an option to the Environmental Document

Boys Ranch Interchange (Exit 7)

Seal ramps and overlay crossroad.
Estimated Cost: \$150,000

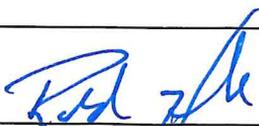
Advance as an option to the Environmental Document

Sentinel Butte Interchange (Exit 10)

Seal ramps
Estimated Cost: \$70,000

Advance as an option to the Environmental Document

DDE Comments: *The district should work with Maintenance Division to request a separate ITS project.



Deputy Director for Engineering

6/29/2020

Date