

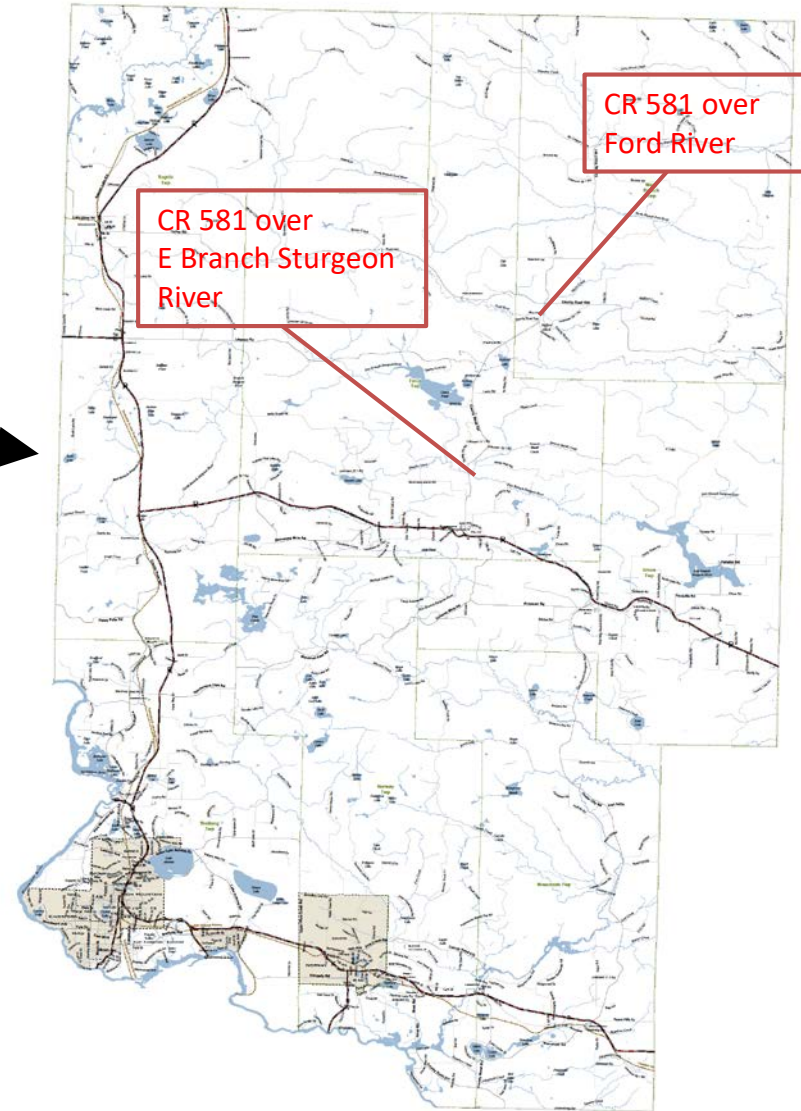
# Anatomy of a Bridge Deck Rehabilitation



The restoration of the CR 581 bridges  
in Dickinson County



# PROJECT LOCATION MAP





# Existing Conditions



CR 581 over Ford River

# Existing Conditions



CR 581 over East Branch Sturgeon River



# Existing Conditions



CR 581 over Ford River



# Existing Conditions



CR 581 over East Branch Sturgeon River



# Existing Conditions



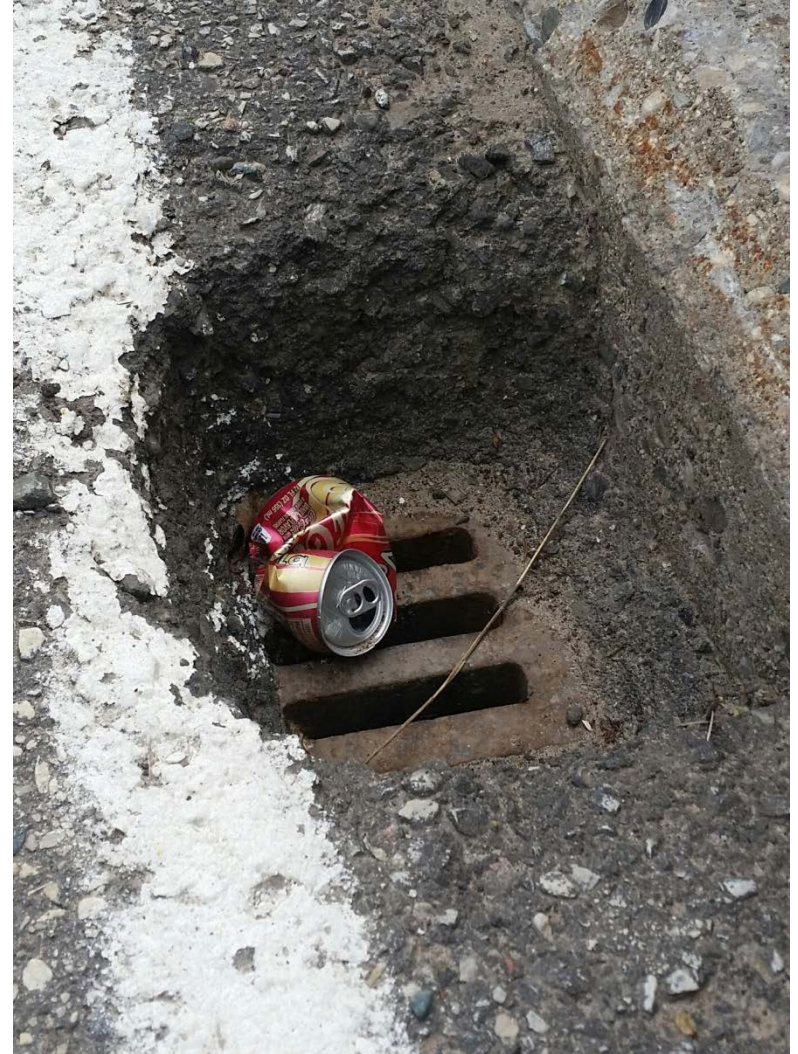
CR 581 over Ford River



# Existing Conditions



CR 581 over Ford River



CR 581 over E. Br. Sturgeon River



# Existing Conditions



CR 581 over Ford River

# Existing Conditions





# Be sure to do a thorough inspection



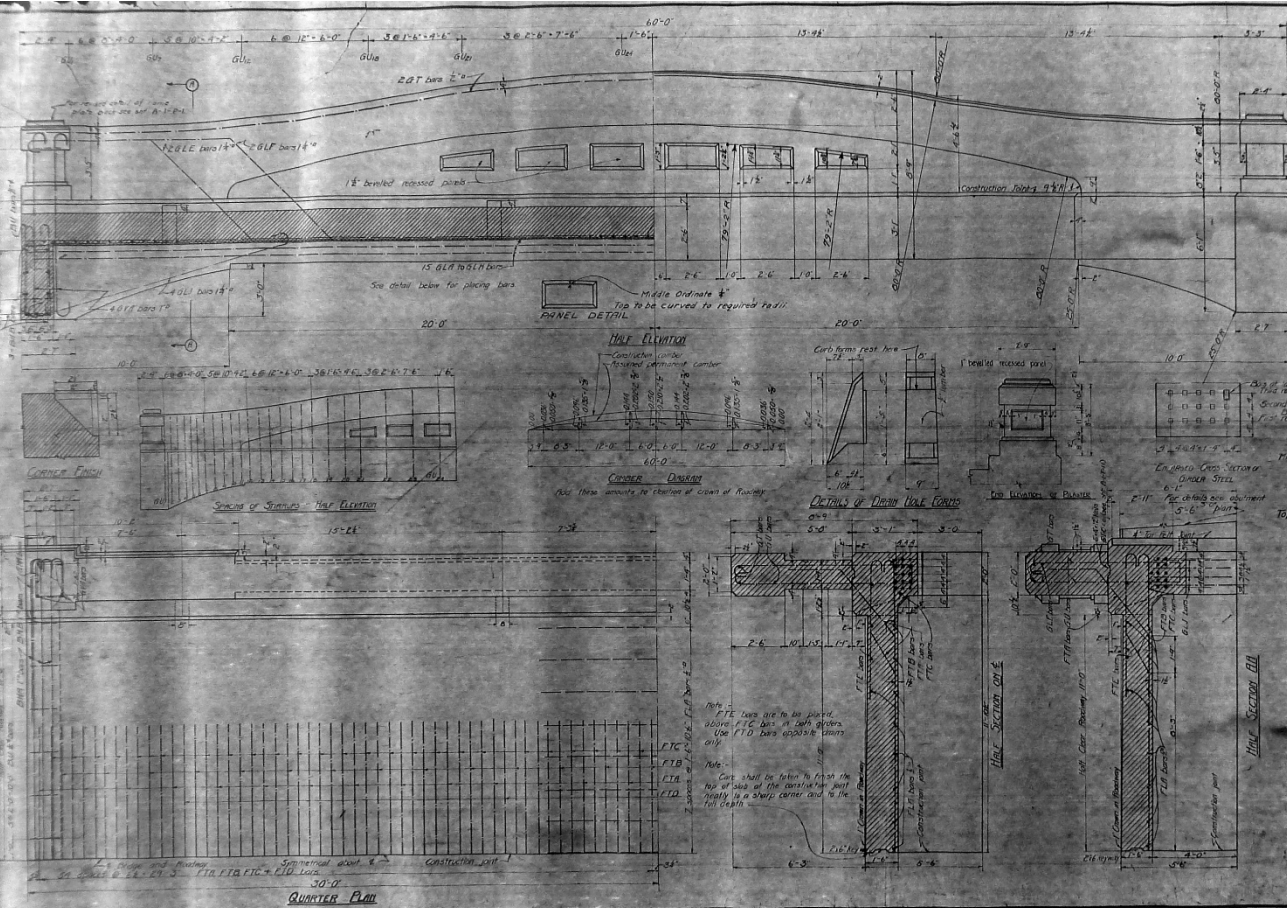
# Inspectors Report

- Bad wearing surface.
- Undersized deck drains without downspouts.
- Approach settlement.
- Surface sounds hollow when hit with hammer.



# Applied for Critical Bridge Funds

- Rehabilitation project as we believe through girders are very sturdy bridges.

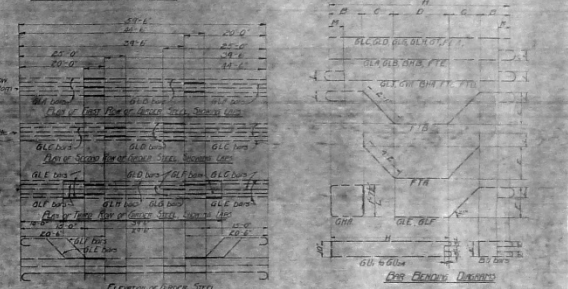


**STRIP TABLE**

Strip	Area	Perimeter	Volume
1	1.1	1.1	1.1
2	1.1	1.1	1.1
3	1.1	1.1	1.1
4	1.1	1.1	1.1
5	1.1	1.1	1.1
6	1.1	1.1	1.1
7	1.1	1.1	1.1
8	1.1	1.1	1.1
9	1.1	1.1	1.1
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11	1.1	1.1	1.1
12	1.1	1.1	1.1
13	1.1	1.1	1.1
14	1.1	1.1	1.1
15	1.1	1.1	1.1
16	1.1	1.1	1.1
17	1.1	1.1	1.1
18	1.1	1.1	1.1
19	1.1	1.1	1.1
20	1.1	1.1	1.1
21	1.1	1.1	1.1
22	1.1	1.1	1.1
23	1.1	1.1	1.1
24	1.1	1.1	1.1
25	1.1	1.1	1.1
26	1.1	1.1	1.1
27	1.1	1.1	1.1
28	1.1	1.1	1.1
29	1.1	1.1	1.1
30	1.1	1.1	1.1
31	1.1	1.1	1.1
32	1.1	1.1	1.1
33	1.1	1.1	1.1
34	1.1	1.1	1.1
35	1.1	1.1	1.1
36	1.1	1.1	1.1
37	1.1	1.1	1.1
38	1.1	1.1	1.1
39	1.1	1.1	1.1
40	1.1	1.1	1.1
41	1.1	1.1	1.1
42	1.1	1.1	1.1
43	1.1	1.1	1.1
44	1.1	1.1	1.1
45	1.1	1.1	1.1
46	1.1	1.1	1.1
47	1.1	1.1	1.1
48	1.1	1.1	1.1
49	1.1	1.1	1.1
50	1.1	1.1	1.1
51	1.1	1.1	1.1
52	1.1	1.1	1.1
53	1.1	1.1	1.1
54	1.1	1.1	1.1
55	1.1	1.1	1.1
56	1.1	1.1	1.1
57	1.1	1.1	1.1
58	1.1	1.1	1.1
59	1.1	1.1	1.1
60	1.1	1.1	1.1
61	1.1	1.1	1.1
62	1.1	1.1	1.1
63	1.1	1.1	1.1
64	1.1	1.1	1.1
65	1.1	1.1	1.1
66	1.1	1.1	1.1
67	1.1	1.1	1.1
68	1.1	1.1	1.1
69	1.1	1.1	1.1
70	1.1	1.1	1.1
71	1.1	1.1	1.1
72	1.1	1.1	1.1
73	1.1	1.1	1.1
74	1.1	1.1	1.1
75	1.1	1.1	1.1
76	1.1	1.1	1.1
77	1.1	1.1	1.1
78	1.1	1.1	1.1
79	1.1	1.1	1.1
80	1.1	1.1	1.1
81	1.1	1.1	1.1
82	1.1	1.1	1.1
83	1.1	1.1	1.1
84	1.1	1.1	1.1
85	1.1	1.1	1.1
86	1.1	1.1	1.1
87	1.1	1.1	1.1
88	1.1	1.1	1.1
89	1.1	1.1	1.1
90	1.1	1.1	1.1
91	1.1	1.1	1.1
92	1.1	1.1	1.1
93	1.1	1.1	1.1
94	1.1	1.1	1.1
95	1.1	1.1	1.1
96	1.1	1.1	1.1
97	1.1	1.1	1.1
98	1.1	1.1	1.1
99	1.1	1.1	1.1
100	1.1	1.1	1.1

**Bill of Steel Bars**

Location	Bar	Area	Perimeter	Volume
1	1.1	1.1	1.1	1.1
2	1.1	1.1	1.1	1.1
3	1.1	1.1	1.1	1.1
4	1.1	1.1	1.1	1.1
5	1.1	1.1	1.1	1.1
6	1.1	1.1	1.1	1.1
7	1.1	1.1	1.1	1.1
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9	1.1	1.1	1.1	1.1
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25	1.1	1.1	1.1	1.1
26	1.1	1.1	1.1	1.1
27	1.1	1.1	1.1	1.1
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56	1.1	1.1	1.1	1.1
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94	1.1	1.1	1.1	1.1
95	1.1	1.1	1.1	1.1
96	1.1	1.1	1.1	1.1
97	1.1	1.1	1.1	1.1
98	1.1	1.1	1.1	1.1
99	1.1	1.1	1.1	1.1
100	1.1	1.1	1.1	1.1



**Notes:**

All material and workmanship to be in accordance with Michigan State Highway Department Specifications for Steel and Concrete Bridges, 1924 Edition.

All sections shall be detailed into one continuous run.

To be used for the superstructure.

The top of the floor slab is to be finished and trenched to provide a smooth bearing surface for the tracks shown.

The reinforcing steel in the girders is to be supported on metal bar, bars of one diameter within spaced not more than 18 in. apart in any direction.

**Michigan State Highway Department**

STRIPED 60 FT. RC. GIRDERS. 22 FT. JOINTS.

Correct: *[Signature]*  
Rail Bridge Engineer

Approved: *[Signature]*  
Superintendent

Revised: 11-2-1932  
T.R.C.

A-2-G-17



**Dumb But Revealing:  
A contractor successfully parked a  
full size excavator on the deck of a  
camelback bridge after the  
load-bearing girders  
were removed!**



Picture from Historic Bridges Encyclopedia  
[HistoricBridges.Org](http://HistoricBridges.Org)

# Applied for Critical Bridge Funds

- Rehabilitation project as we believe through girders are very sturdy bridges.
- Application listed both bridges as one project since the work was similar and getting a contractor may be difficult.
- Application was successful and we were awarded funding.
- Next we needed an RFP to find help.
  - Awarded a contract to U.P. Engineers of Iron Mountain for design, inspection, & testing.



# Design Process

- Field Work
  - CHAIN DRAG
    - Method used to determine limits of deck delamination
    - Heavy steel chain pulled by hand across bridge deck surface longitudinally and transversely
    - Hollow sound indicates delamination
    - High pitched “pingy” sound indicates solid condition
    - Areas measured and recorded
  - HAMMER SOUNDING
    - Used around deck drains and areas with excess dirt

# After Chain Drag





# Design Process

- Field Work
  - PICTURES
  - GUARDRAIL INSPECTION
    - Damage inspection
    - Up to standard?
      - Terminals, transitions, anchorage, posts, side slopes

# Substandard Guardrail Terminal

(not SRT or EAT, but good side slopes)





# Design Process

- Plan Development
  - Plan sheets showing:
    - Limits of Chipping & Patching
    - Asphalt removal and proposed limits
    - Guardrail removal and proposed
    - Drain casting removal and proposed
    - Typical sections
    - Detour Route
    - Estimates of quantities

# LEGEND

- REMOVED HMA SURFACE, 10" /
- CONCRETE CURBING AND PAVING /
- REMOVED IMPROVED WATERPROOFING AND HMA LSP /
- HMA LSP /

**LOCATION OF CONCRETE CURB**  
THE EXISTING CURB IS A 34.5" TYP. BRIDGE SPAN. CONCRETE CURB (TYP.) WITH A 2" HMA WEARING SURFACE, 22" FT. CLEAR WIDTH BETWEEN CONCRETE BRIDGE SLABS, CONCRETE ABUTMENTS AND WEIRWALLS.

**OWNER: FENNELLA YODENHINE COMPANY**  
P.O. BOX 90  
CANNON, MI 49822  
ATTN: BEN HANCOCK  
PH: (505)632-5000

\* REMOVE ONLY QUADRANT, DO NOT REMOVE ALL FOUR QUADRANTS. REPLACE WITH GRASS. Approach Terminal, Type 10.



**ENGINEERING**  
**ARCHITECTURE**  
**PLANNING**  
**SURVEYING**  
**ENVIRONMENTAL**

100 POSTAGE STREET  
BIRMINGHAM, AL 35202  
(205) 455-4400  
400 1/2 1ST STREET  
BIRMINGHAM, AL 35202  
(205) 455-4400  
2000 MOUNTAIN VIEW DRIVE  
BIRMINGHAM, AL 35202  
(205) 455-4400  
701 ARDEN STREET  
DAULTON, MA 01920  
(508) 355-0071  
100 CALAPAR AVENUE  
HAINESVILLE, TN 37058  
(615) 554-0000

**PROJECT TITLE:**  
**COUNTY ROAD 581**  
**OVER E. BRANCH**  
**STURGEON RIVER**

**OWNER:**  
**DICKINSON**  
**COUNTY ROAD**  
**COMMISSION**

**PROJECT LOCATION:**  
**FELCH TWP.,**  
**DICKINSON**  
**COUNTY, MICHIGAN**

## GENERAL NOTES:

- THE WORK COVERED BY THESE PLANS INCLUDES: REMOVAL OF HMA WEARING SURFACE, BRIDGE DECK REPAIRS, WATERPROOF AND REPAIR BRIDGE DECK, CONCRETE APPROACHES TO THE BRIDGE, TRAFFIC CONTROL INCLUDING CONSTRUCTION SIGNS AND BARRICADES.
- THE PROPOSED PROJECT WILL BE CLOSED TO TWO TRAFFIC LANE TRAFFIC TO BE MAINTAINED OVER THE EXISTING BRIDGE. THE CONTRACTOR SHALL PROVIDE ALL SIGNS AND SIGN MAINTENANCE AS OUTLINED IN THE SPECIAL PROVISIONS, TRAFFIC MAINTENANCE AND CONTROL. THESE SIGNS SHALL REMAIN IN PLACE AND THE ROAD CLOSED TO TWO TRAFFIC LANE TRAFFIC UNTIL SUCH TIME AS THE EXISTING APPROACHES OPENING THE ROAD TO TRAFFIC.
- REPAIRS SHALL BE TAKEN TO PREVENT EROSION FROM FALLING FROM THE STRUCTURE. IF EROSION FALLS INTO THE WATERWAY, IT SHALL BE REMOVED WITHIN 24 HOURS. TEMPORARILY STORED EXCAVATED MATERIAL SHALL NOT BE ALLOWED TO DRIFT INTO THE WATERCOURSE.

## REMOVAL SITE PLAN (STRUCTURE NO. 2198)

SCALE: 1" = 10'

## PROPOSED SITE PLAN (STRUCTURE NO. 2198)

SCALE: 1" = 10'

**BIDDING:** 11/19/2015  
**REVIEW:** 9/26/2015  
**ISSUED FOR:** DATE

**PROJECT NO:** D06-14529  
**DESIGNED BY:** GJ  
**DRAWN BY:** JA  
**CHECKED:** GJ  
**APPROVED:** NH

**GENERAL PLAN**  
**(STRUCTURE 2198)**

4

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# Bid Letting

- Letting Date: January 8, 2016
- Project Schedule:
  - Flexible (Early Spring 2016; May/June)
    - Didn't know who would bid
    - Remote area
- 20 working day contract
- 3 contractors bid on the work.
  - **Low bid was 30% higher than engineer's estimate**
    - **ENGINEER'S ESTIMATE: \$108,638**
    - **BID PRICE: \$141,779**
    - **Justification: small project, remote area, few locals do this type of work**

# Project Awarded to: **Grand River Construction, Inc.**

- Contractor out of Grand Rapids, Michigan
  - LOW BIDDER
- Other bids were 30-40% higher
  - Reasons: too small of a project, Hebert had a workload
    - Hebert Construction
    - Florence Cement Company
- Start date was controlled by the contractor
- Point of interest:
  - Minor traffic devices priced very high
    - Bid: **\$33,249** vs. Engineer's Estimate: **\$2,000**
    - Due to the 10% cap on mobilization?



# Detour Route

- County Road 581 to Turner Road to M-95 to M-69
- Total Length → approx. 37 miles, 52 minutes
- Long route, but only route
- Bridges too narrow for lane closure





# CONSTRUCTION

- Sequence:
  - Remove asphalt overlays
  - Chip off bad concrete
  - Pour new concrete
  - Install membrane
  - Repair approaches
  - New HMA wearing surface
  - New guardrail where required
  - Site restoration

## Subcontractors:

- Give 'Em a Brake
- G&J Silt Fence
- PK Contracting
- Superior Paving

# Remove Asphalt Surface





# Cleaned Deck Ready for Inspection





# Chip off Bad Concrete





# Pour Deck Repairs





# Install Membrane





# Repair Approaches





# Repair Approaches





# New Wearing surface





# New Guardrail – MGS Energy Absorbing Terminals



# Project Summary

- Completed in 17.5 working days.
- Locals and truck drivers very happy to get project completed (long detour)
- Overall a fast and successful project!

# Project Costs

- Bid Price: \$141,778
- Actual Price: \$134,353
- Overruns in HMA since approaches had 9" of asphalt
- Decrease in patching and forming costs



# Final project





# Final project



# Q & A



Lance Malburg, P.E.  
Dickinson County Road Commission  
Phone (906)774-1162  
Email: [Lance@Dickinsoncrc.com](mailto:Lance@Dickinsoncrc.com)



Gust Junttila, P.E.  
U.P. Engineers & Architects, Inc.  
Phone (906)779-0937  
Email: [gjunttila@UPEA.com](mailto:gjunttila@UPEA.com)

