WINTER WORKSHOP 2020: LESSONS LEARNED FROM PAST INNOVATIVE PROJECTS

Featuring BR 3-507 on US113 over Iron Branch

DelDOT Bridge Design
Presented by: Jonathan Karam & Eric Yoder
TIMELINE

1915
Installation of Concrete Encased I-Beams (Southbound)

1946
Addition of Concrete Rigid Frame (Southbound and Median)

1965
Addition of Concrete Rigid Frame (Northbound)

1997
Installation of pipe and scour protection (R-7 Riprap)
The existing structure consists of concrete encased steel beams on concrete abutments that were widened with a concrete frame (twice).
CONDITION OF 1915 CONCRETE ENCASED BEAMS
CONDITION OF 1945 REINFORCED CONCRETE FRAME
CONDITION OF 1965 FRAME
FULL REPLACEMENT
ISSUES/CONCERNS

Possibility of failure if removed in segments
- Large traffic shift due to removal of entire 1915 portion (over 4500 ft)

Drainage Issues (2 large drainage pipes in center of structure)
- Issues setting up stream diversion and keeping work area dry

High A.A.D.T.
- 40,000 cars/day projected

MOT/Lane shifts/Temporary paving Issues
- Very long taper lengths which results in a lot of temporary paving
- Huge public impact to residents and businesses nearby
DESIGN ALTERNATIVES

Single lane closures

Contraflow

Full Closure
CONTRA FLOW TRAFFIC SHIFT IMPACTS

- At a reduced speed of 45mph
- 4500 feet taper length
- 12+ residential driveways impacted
- Very high impact to businesses
PROJECT SCOPE

1915 Concrete Encased Beams

1946 Concrete Frame

1965 Concrete Frame

Limits of Removal/Replacement
<table>
<thead>
<tr>
<th><strong>Traditional</strong></th>
<th><strong>Accelerated</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction time of 6 months+</td>
<td>14 day closure of southbound lanes</td>
</tr>
<tr>
<td>Requires lane closures and shifts to construct temporary paving</td>
<td>Will not require any temporary paving</td>
</tr>
<tr>
<td>Expensive to maintain traffic</td>
<td>Full Detour</td>
</tr>
<tr>
<td>Northbound lanes will be impacted via lane closures and shifts</td>
<td>No disruptions to northbound traffic</td>
</tr>
<tr>
<td>Prolonged impact to local businesses and homeowners</td>
<td>Access to businesses and residences will be maintained</td>
</tr>
<tr>
<td>Workers exposed to traffic</td>
<td>Enclosed workspace promotes safer construction</td>
</tr>
<tr>
<td>Typically cast-in-place foundation and barrier</td>
<td>Pre-cast barrier/elements</td>
</tr>
</tbody>
</table>
CONSTRUCTION FEASIBILITY

- AECOM performs constructability assessment
- Initially planned for 7 days, extended to 9 days

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Name</th>
<th>Original Duration</th>
<th>Start</th>
<th>Finish</th>
<th>Predecessors</th>
<th>Successors</th>
<th>Total Float</th>
<th>Calendar</th>
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<tbody>
<tr>
<td>A1009</td>
<td>Implement M&amp;P for Phase 2</td>
<td>6h</td>
<td>Apr-08-19</td>
<td>Apr-08-19</td>
<td>A1109</td>
<td>A1209</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1010</td>
<td>Excavate/Remove Existing Roadway Pavement to Subgrade</td>
<td>12h</td>
<td>Apr-08-19</td>
<td>Apr-08-19</td>
<td>A1000</td>
<td>A1020</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
</tr>
<tr>
<td>A1020</td>
<td>Install SDE North/South Sides (only @ East end)</td>
<td>12h</td>
<td>Apr-08-19</td>
<td>Apr-08-19</td>
<td>A1010</td>
<td>A1030</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1030</td>
<td>Layback, Install Stone/Dewatering</td>
<td>24h</td>
<td>Apr-08-19</td>
<td>Apr-08-19</td>
<td>A1020</td>
<td>A1040, A1050</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
</tr>
<tr>
<td>A1040</td>
<td>Sawcut/Demo Existing Box Culvert/Feetings</td>
<td>12h</td>
<td>Apr-10-19</td>
<td>Apr-10-19</td>
<td>A1030</td>
<td>A1060</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1050</td>
<td>Layback Culvert Bottom (Downstream)</td>
<td>6h</td>
<td>Apr-10-19</td>
<td>Apr-10-19</td>
<td>A1030</td>
<td>A1060</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1060</td>
<td>Locate Rent/Drill Dovels InExisting Culvert</td>
<td>6h</td>
<td>Apr-10-19</td>
<td>Apr-10-19</td>
<td>A1040, A1050</td>
<td>A1070</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1070</td>
<td>Excavate for PC Footings/Partially Remove Rip-Rap</td>
<td>6h</td>
<td>Apr-10-19</td>
<td>Apr-10-19</td>
<td>A1060</td>
<td>A1080</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1080</td>
<td>Install Agg/Base/Install PC Footings/Form Flg. Closure/Backfill</td>
<td>12h</td>
<td>Apr-11-19</td>
<td>Apr-11-19</td>
<td>A1070</td>
<td>A1090</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1090</td>
<td>Install D3D on Gutterline</td>
<td>6h</td>
<td>Apr-11-19</td>
<td>Apr-11-19</td>
<td>A1080</td>
<td>A1100, A1110</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1100</td>
<td>Install Rigid Frame/Wingwall/Grout at Base</td>
<td>24h</td>
<td>Apr-11-19</td>
<td>Apr-11-19</td>
<td>A1090</td>
<td>A1120</td>
<td>0h</td>
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<tr>
<td>A1110</td>
<td>Form for Closure Pour</td>
<td>12h</td>
<td>Apr-11-19</td>
<td>Apr-12-19</td>
<td>A1090</td>
<td>A1120</td>
<td>12h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1120</td>
<td>Pour Closure Pour w/ UHPVC</td>
<td>6h</td>
<td>Apr-12-19</td>
<td>Apr-13-19</td>
<td>A1109, A1110</td>
<td>A1130</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1130</td>
<td>Cure Closure Pour</td>
<td>12h</td>
<td>Apr-13-19</td>
<td>Apr-13-19</td>
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<td>A1140</td>
<td>0h</td>
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<tr>
<td>A1140</td>
<td>Strip Closure Pour</td>
<td>6h</td>
<td>Apr-13-19</td>
<td>Apr-13-19</td>
<td>A1130</td>
<td>A1150</td>
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<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1150</td>
<td>Backfill to Subgrade</td>
<td>6h</td>
<td>Apr-14-19</td>
<td>Apr-14-19</td>
<td>A1140</td>
<td>A1160</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
</tr>
<tr>
<td>A1160</td>
<td>Remove SDE North/South Sides</td>
<td>12h</td>
<td>Apr-14-19</td>
<td>Apr-14-19</td>
<td>A1150</td>
<td>A1170</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
</tr>
<tr>
<td>A1170</td>
<td>Prepare Subbase to Grade/Install Dr-MP/Prep for Pave</td>
<td>12h</td>
<td>Apr-15-19</td>
<td>Apr-15-19</td>
<td>A1160</td>
<td>A1180</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1180</td>
<td>Pave to Limits</td>
<td>30h</td>
<td>Apr-15-19</td>
<td>Apr-16-19</td>
<td>A1170</td>
<td>A1190</td>
<td>0h</td>
<td>7 Day-12 Hour/2 shifts per day</td>
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<tr>
<td>A1190</td>
<td>Install GRM</td>
<td>Signage/Remove F2 M/P</td>
<td>Open Road</td>
<td>6h</td>
<td>Apr-16-19</td>
<td>Apr-16-19</td>
<td>A1180</td>
<td>0h</td>
</tr>
</tbody>
</table>
PROPOSED PLAN

Phase 1: M.O.T. Plan and Repair of Detour

Phase 2: Installation of Stream Diversion

Phase 3: Closure of U.S. 113 Southbound and replacement of BR 3-507

Phase 4: Removal of Stream Diversion and completion of grading/paving
PUBLIC OUTREACH

- Multiple Town Hall Meetings
  - Legislators
  - Senators
  - City Council
  - Chief of Police

- Public Workshop

- Interviews with various newspapers/TV stations

- Brochures
  - Hand-delivered over 1000 brochures to business and residences along US113

This brochure provides information about Bridge 3-507, located on US113 Southbound in Millsboro, which will need to be replaced due to age and generally poor condition.

The Delaware Department of Transportation has determined that only a portion of this bridge will need to be impacted, so only the southbound lanes of US113 at this location will be temporarily closed so that this work can be completed with minimal impact.

Public Feedback Requested:
This bridge project has been determined to be necessary due to several factors listed in this informational brochure.

DelDOT understands that closures of this type can and do present an inconvenience to motorists and local residents. We strive to lessen any inconvenience to the public while still maintaining a safe and reliable transportation infrastructure for all users. While we appreciate your patience during any project, we also value your input.

For additional project information, please visit our website via either link below:

Scan QR Code for more information

Or, access this information online here:
https://www.delidot.gov/information/projects/bridges/us113_BR3-507/

We welcome any questions, comments or concerns that you may have regarding the temporary road closure or this project.
Thank You!
PRE-CONSTRUCTION PREPARATIONS

- INCENTIVES & DISINCENTIVES ($12,000/DAY)
- WEATHER
- PRE-BID MEETING
- PRE-CONSTRUCTION MEETING
- ON-SITE DESIGN SUPPORT
CONTRACT AWARDED

• Mumford and Miller won the contract as the lowest bidder

• Estimated cost of construction = $1,260,000

• Low bid = $1,195,815.30

• Lone bidder

• Includes incentives/disincentives based on RUC ($12,000/day)
CONSTRUCTION BEGINS

Portion of Rt 113 over Iron Branch Bridge to close this fall

DelDOT alerts motorists to Route 113 bridge work in Millsboro
Both southbound lanes will be closed for two weeks starting Nov. 3

DeIDOT announces closures to Route 113 for bridge replacement beginning next month

US 113 Southbound Lane Closed for Bridge Construction

Businesses brace for losses ahead of US 113 southbound closure
PHASE 1

• Paving of detour
• M.O.T.

PHASES 2, 3, & 4

• Stream Diversion (#2)
• Replacement of BR 3-507 (#3)
• Remove Stream Diversion and M.O.T. (#4)
PHASE 2: STREAM DIVERSION
PHASE 3: CLOSURE OF US113 - DAY 1

- Demolition begins!
- Initial excavation of pavement
• Sawcut, demolition, and excavation
DAY 2

- Top of frame removed
- Breaking up and excavating abutments
- Frame to remain and sump pit
• Wire Sawing Operation
• Excavation to final grade
• Challenges with groundwater
DAY 4

- Final elevation reached
- Dowel into existing frame
DAY 5

- Extra large crane for 25 ton pieces
- Shopping plaza used for staging
- Placement of footers
- Frame assembly
Come-along used to tighten frame

Closure pour
DAY 6

- Post tensioning of frame segments
- Set precast barrier/moment slab
- Closure pour utilizing high early strength concrete
DAY 7

• Drive sheet piles for excavation support

• Set wingwalls

• Groundwater still an issue

• Finish backfilling main structure
• Placement of SW wingwall

• Backfill/compaction
DAY 8

- Backfill wingwalls
- Finalize road grading
• Inspecting inside the frame

• Grading side slopes and swales
• Paved and striped through the night
OPEN TO TRAFFIC !!!
FINAL INSPECTION
OPEN Dupont Blvd in Millsboro SOUTH BOUND LANES now open after bridge replacement complete.

This was truly a record for quickest road work (in my opinion lol).

Thanks for the good news!!

That was quick! Thank you!!

Thanks for the update and huge thanks to them for being so quick!!!!

Patience? That took, what, a little over a month? That was fast! Good thing it wasn't the company contracted to do Laurals bridge. Fantastic job, and major props to the company!

9 days. I'm actually impressed, deldot knocked it out.

Yea, not even close to a month. Road closed starting 11/04 and it was expected to be closed for two weeks so this is great news.

actually it closed 11/03. Sunday morning. Worked 24 hours a day. I live in the closed zone. It went off without a hitch!!
LESSONS LEARNED

✓ Add item in contract for Pre-construction Planning Meeting
✓ Plan on additional space for staging/equipment
✓ Material availability/procurement during 24/7 operations
✓ Availability of Subcontractors during 24/7 operations
✓ Additional room may be needed for alternate stream diversion
✓ Public prefers 24/7 construction when needed

✓ Accelerated Bridge Construction is the future
THANK YOU!!!

<table>
<thead>
<tr>
<th>Group 3 Construction</th>
<th>Traffic Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millsboro PD</td>
<td>Town of Millsboro</td>
</tr>
<tr>
<td>Mumford &amp; Miller</td>
<td>KCI inspection</td>
</tr>
<tr>
<td>Craig, Jason, Nick, Mike G</td>
<td>Jerry (Brochures)</td>
</tr>
</tbody>
</table>
QUESTIONS?