Blatnik Bridge Location
Blatnik Bridge Location (Cont)

DULUTH, MN

SUPERIOR, WI
Blatnik Bridge Location (Cont)

• Connects Duluth, MN and Superior, WI
• Carries I 535 and US 53
• Crosses the St. Louis River
• Wisconsin end terminates downtown area (surface)
• Minnesota end terminates at interchange
Blatnik Bridge Location (Cont)

- Second longest bridge in Minnesota
- Duluth Port is largest on Great Lakes
  - 900 vessel visits & 35M short tons of cargo
Blatnik Bridge Description

• Carries 4 traffic lanes (2 in each direction)
• 33,900 vehicles a day (2013)
• 120 foot navigational clearance
• 52 spans with total length of 7,980 feet
• 49 approach spans - built-up and rolled multi-girders
• 58’-70’ variable roadway width
• Pin and hanger assemblies in approach spans & truss
Blatnik Bridge Description (Cont)

- Two cantilevered deck trusses (270’ each)
- One through arch truss – cable supported deck
- Main span length = 600 feet
- 9” Reinforced concrete deck & LS overlay
- Longitudinal and transverse PT in pier caps (widening)
Blatnik Bridge Description (Cont)
Blatnik Bridge History

- Construction began in 1958
- Opened to traffic in 1961 ($15M)
- Steel repair and spot paint – 2008
- Suspender cable evaluation and replacement – 2010
- Structural repairs, exp joints and partial painting – 2012 ($13M)
- Structural repairs – 2016 ($2M)
Reasons for the Study

• Significant deterioration developed in truss elements
• Actions required at increasing frequency
• Increased levels of road user delays
• Increasing projects leads to negative public perception
• MnDOT wanted more comprehensive strategy – options?
• Replacement will be expensive!
Future of the Area

- Duluth Port Authority expects shipping increase
- I 35/I 535/US 53 (TPI)
  - Permit restricted, structural issues, poor geometrics
  - 2019-24 / FASTLANE App?
- Bong Bridge (US 2)
  - Built mid-80’s
  - Redeck 2031-35
- Blatnik 2030 +/-?
Study & Assumptions

- Study based upon additional 15 to 40 years of service
- Any replacement options must use same alignment
- Identified investments must maintain:
  - Better than structurally deficient state
  - Continue to allow Minnesota C permit loads (159K)
- Minimal service interruptions for study options
- Provide framework for other MN bridge studies
Study Goals

• Develop a series of strategies to maintain the crossing
• Identify actions and investments to support strategies
• Quantify the effects of traffic interruptions
• Identify and quantify risk factors
• Each strategy is evaluated by life cycle cost analysis
• Provide tool for MnDOT in future decision making
• Investigate option for truss-only replacement
Study Guidance

• Technical Advisory Committee
  • MnDOT
  • WisDOT
  • FHWA
  • Meet 10 times during development of study
  • Review and comment on deliverables

• Stakeholder Advisory Committee
  • Provide input on local Non-DOT related issues
  • Provide review comments on findings
Data Review

- Compile and archive existing bridge data
- Determine conditions only using existing data
  - Existing inspection reports (Routine, FC and UW)
  - Plans and specs – original, rehabilitations, and widening
  - Historical special investigations
- Identify information gaps in existing data
- Recommend actions to address information gaps
- Documentation provided in a technical memorandum
Risk Assessment

- Distributed questionnaire to collect risks
- MnDOT & WisDOT familiar with condition and actions
- Facilitated Risk workshop to collect risk magnitudes
- Additional risks considered from other stakeholders
- Risks classified per additional 15 to 40 year service life
- Results collected in a risk register and risk report
Risk Assessment (Cont)

Risk Impacts by Category - 15 Year

Risk Impacts by Category - 40 Year
Develop Study Options

- Recommendations and associated costs
  - Maintenance recommendations
  - Rehabilitation recommendations
  - Replacement options
- Scenarios developed for 15 to 40 year service life
- Earliest major project date 15 years in future
- Project study limited to 40 years into future
- 100 Year service life used for bridge elements
Develop Study Options (Cont)

• Replacement options along the same alignment
• 12 different scenarios developed and evaluated
• Road user costs generated for each scenario
• Life cycle cost analysis performed and NPV generated
• Results of study presented in a final report
• Tool for MnDOT use to guide future actions
• Allows MnDOT to compare costs of different actions
Replacement Options
Road User Costs

- Model based on user costs provided by MnDOT
- Most recent available AADT used
- Assumed 0.25% growth rate per MnDOT
- QuickZone 2.0 program used for modeling
## Replacement & Rehab Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Replace Main Span</th>
<th>Replace Approaches</th>
<th>Rehabilitation Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Year 15</td>
<td>Year 15</td>
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<td>2</td>
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<tr>
<td>3</td>
<td>Year 15: Network Arch</td>
<td>Year 25</td>
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<tr>
<td>4</td>
<td>Year 15: Cable Stay</td>
<td>Year 30</td>
<td>Year 15: Mill/Overlay Approaches</td>
</tr>
<tr>
<td>5</td>
<td>Year 15: Network Arch</td>
<td>Year 30</td>
<td>Year 15: Mill/Overlay Approaches</td>
</tr>
<tr>
<td>6</td>
<td>Year 15: Cable Stay</td>
<td>Year 40</td>
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<td>7</td>
<td>Year 15: Network Arch</td>
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<td>Year 15: Re-deck Approaches</td>
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## Replacement & Rehab Scenarios (Cont)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Replace Main Span</th>
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<tr>
<td>9</td>
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<td>11</td>
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<td>Year 15: Mill/Overlay Entire Bridge and Truss Upgrades</td>
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<td>2</td>
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<tr>
<td>SCENARIO 1</td>
<td>MAINTENANCE &amp; REHAB</td>
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<td>SCENARIO 6</td>
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<td>SCENARIO 9</td>
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<td>SCENARIO 10</td>
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<td>SCENARIO 11</td>
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<td>SCENARIO 12</td>
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## Scenario Cost Comparison

<table>
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<tr>
<th>Scenario</th>
<th>Maintenance Costs (2016 $000s)</th>
<th>Rehabilitation Costs (2016 $000s)</th>
<th>Replacement Costs (2016 $000s)</th>
<th>Road User Costs (2016 $000s)</th>
<th>Salvage Value (2016 $000s)</th>
<th>Total Cost Estimate (2016 $000s)</th>
<th>Total Cost Estimate (NPV $000s)</th>
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Risk Mitigation
Thank you!

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