Blatnik Bridge Management Study

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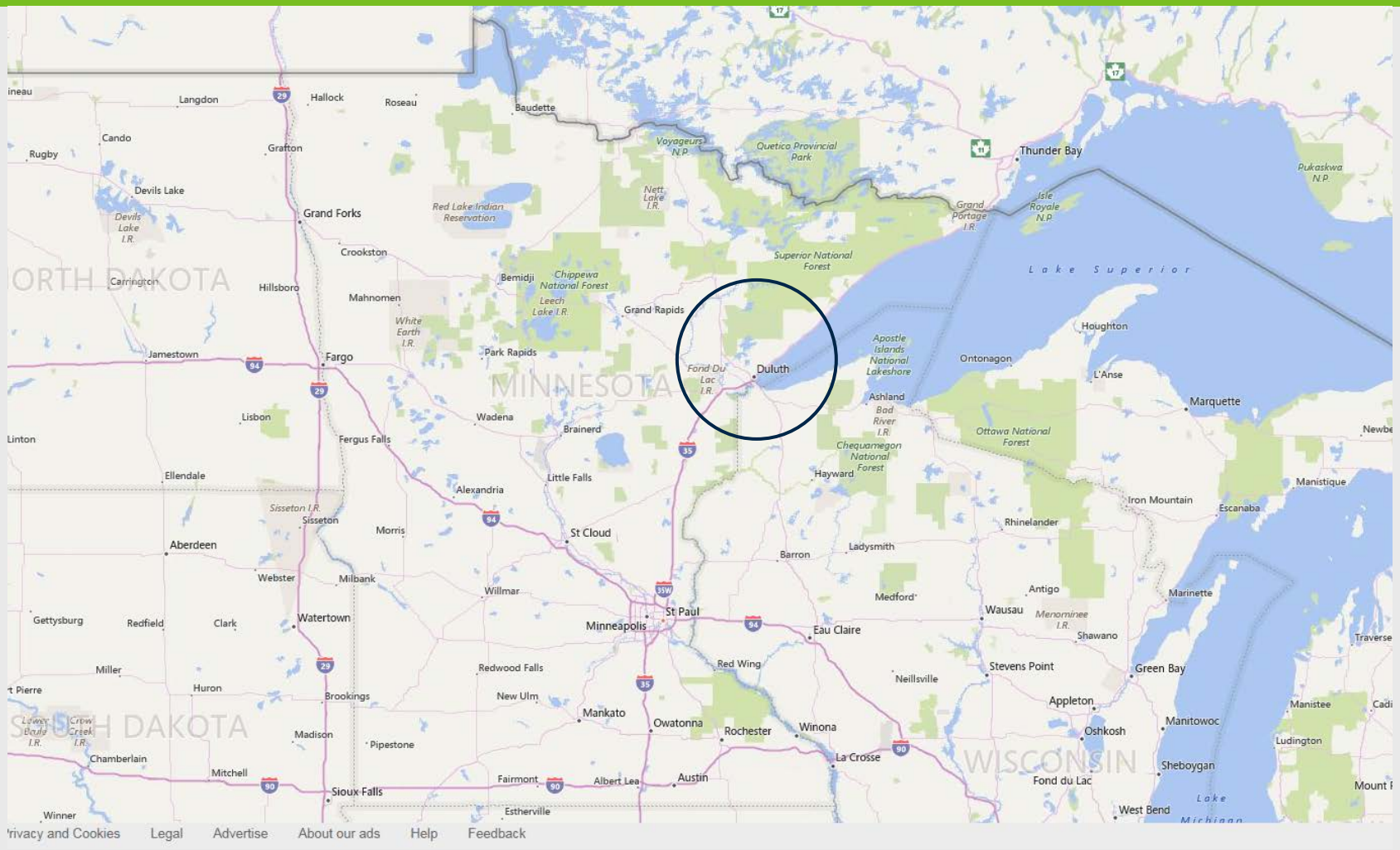
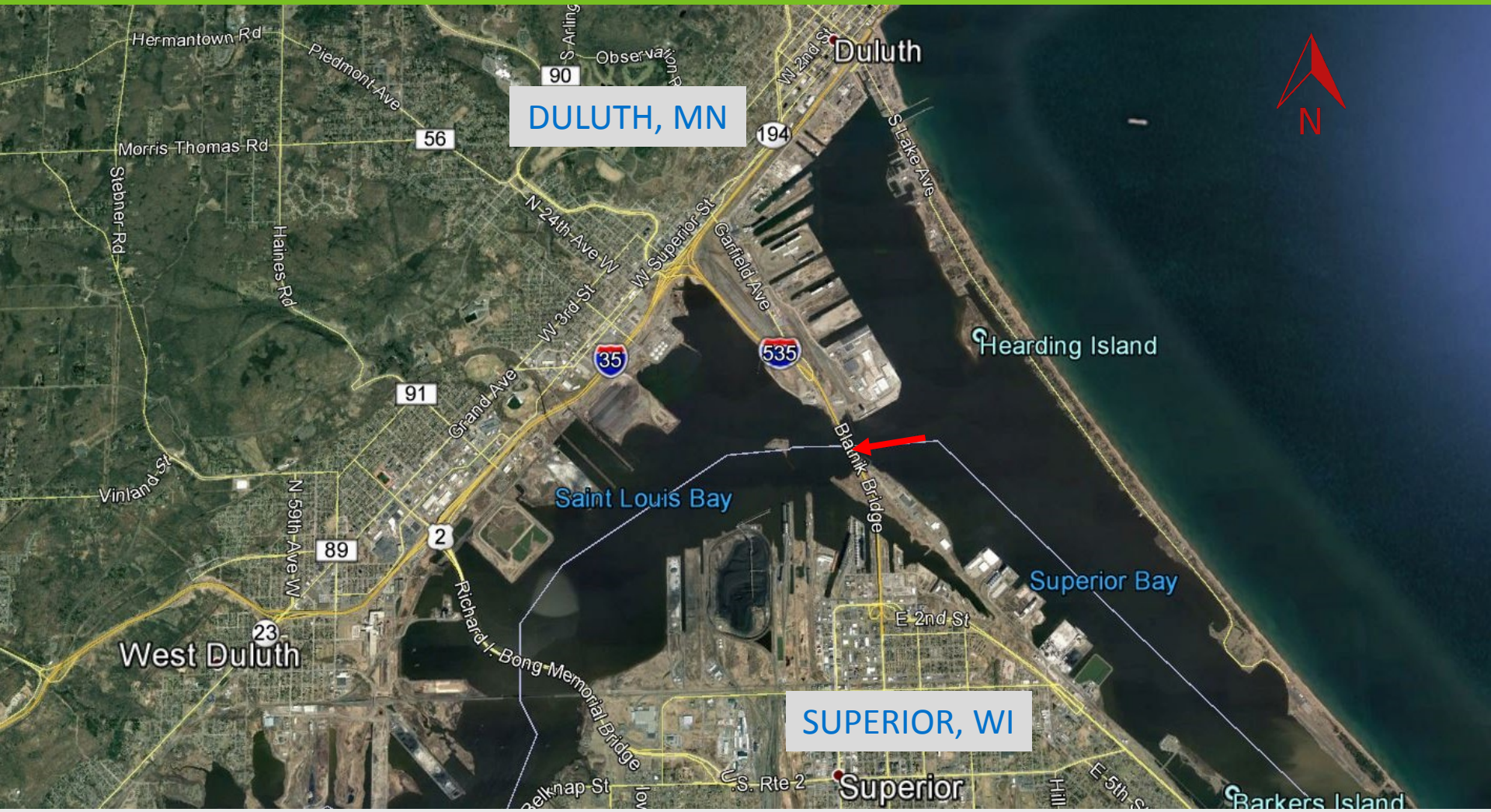
DEPARTMENT OF TRANSPORTATION

WSP | PARSONS BRINCKERHOFF

Blatnik Bridge Location



Blatnik Bridge Location (Cont)



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

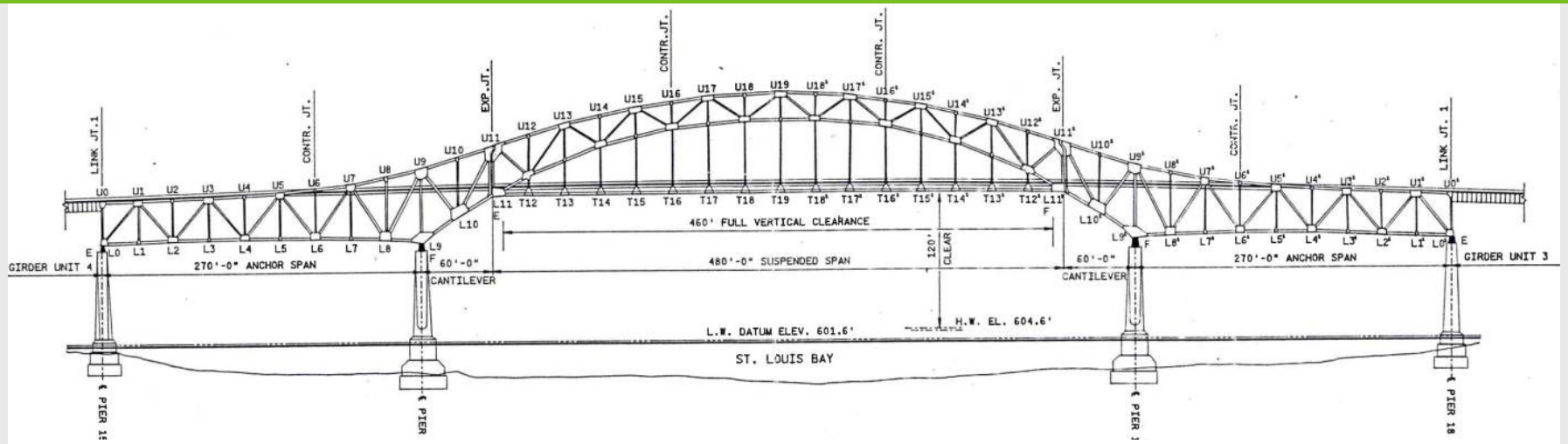
Blatnik Bridge Location (Cont)

- 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

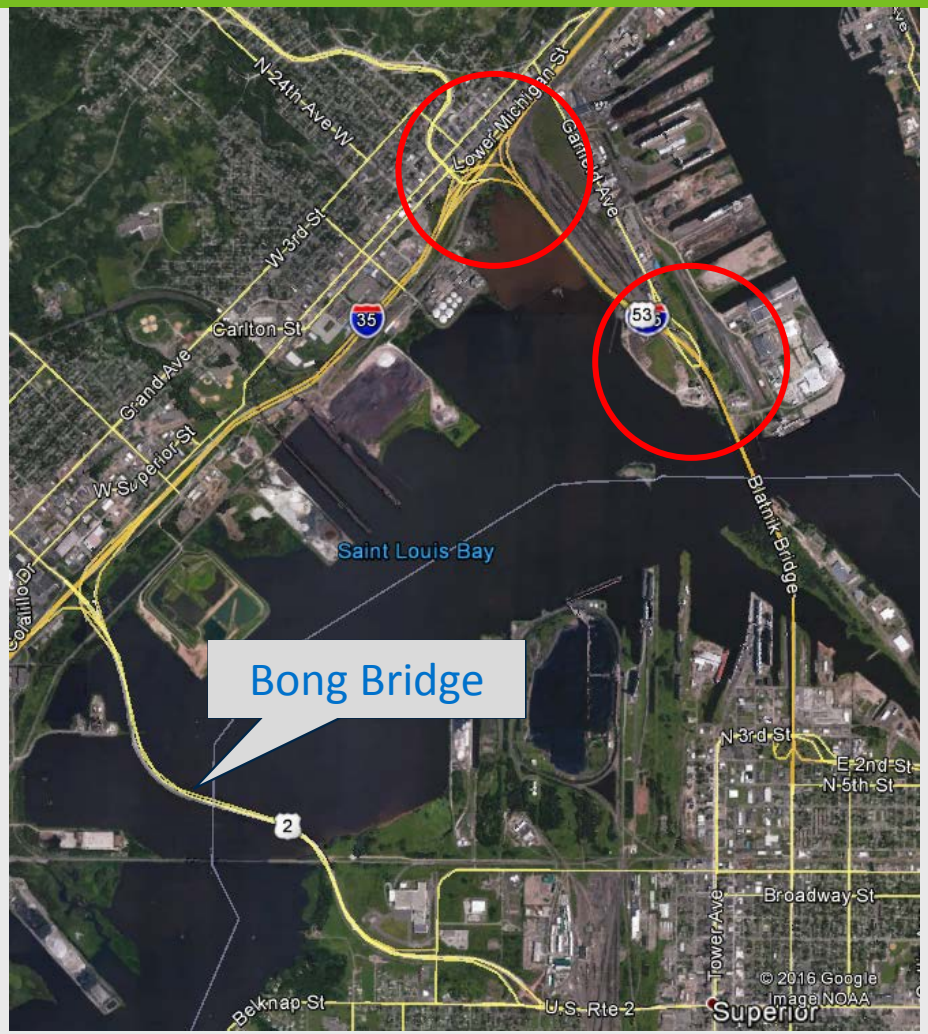
- Construction began in 1958
- Opened to traffic in 1961 ($15M)
- Approach span widening, new deck, lighting – 1993-1994
- Complete repaint – 1995-1998
- Steel repair and spot paint – 2008
- Suspender cable evaluation and replacement – 2010
- Structural repairs, exp joints and partial painting – 2012 ($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

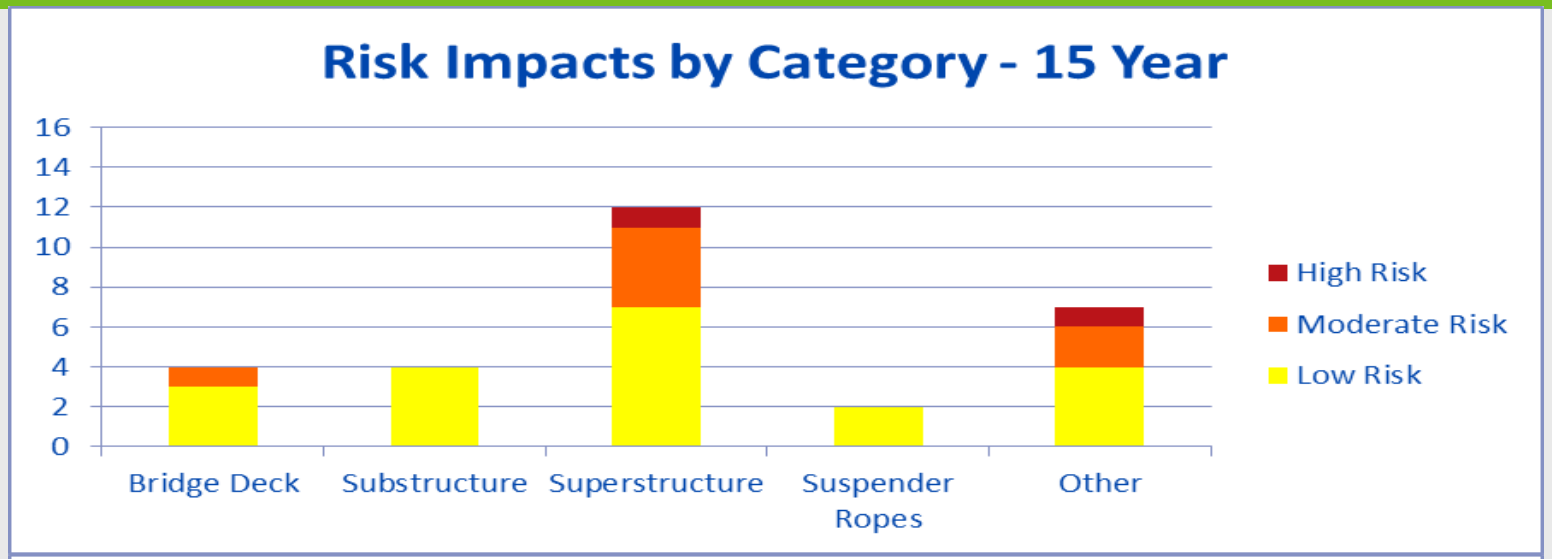
Data Review

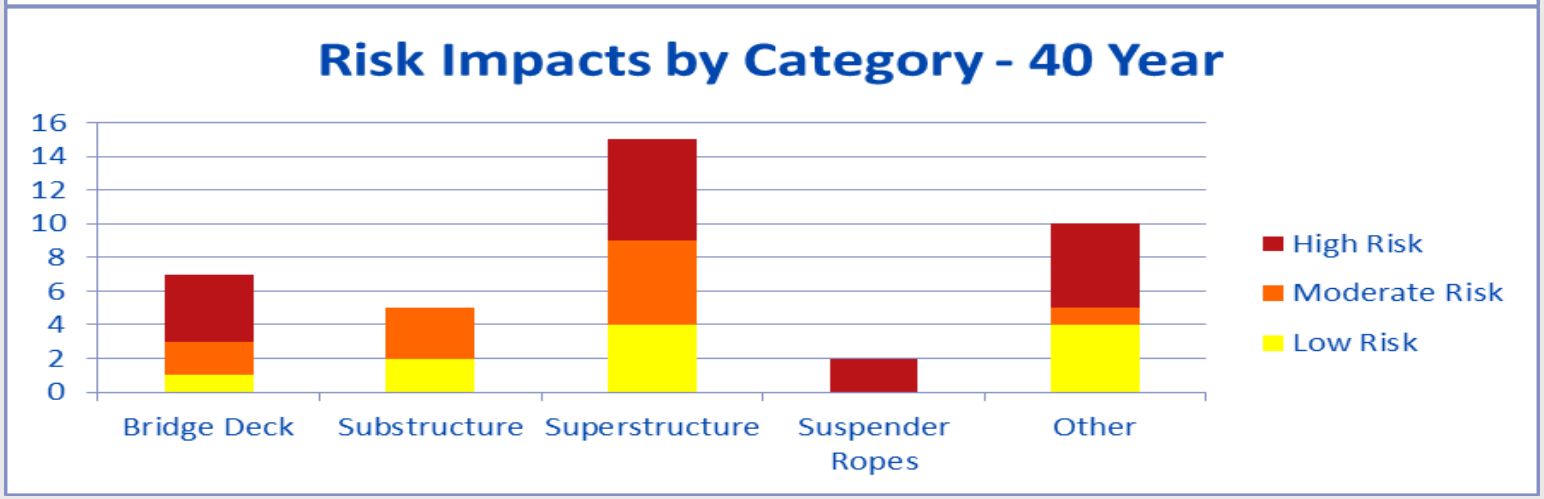
- Compile and archive existing bridge data
- Determine conditions only using existing data
  - Existing inspection reports (Routine, FC and UW)
  - Plans and specs – original, rehabilitations, and widening
  - Historical special investigations
- Identify information gaps in existing data
- Recommend 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)





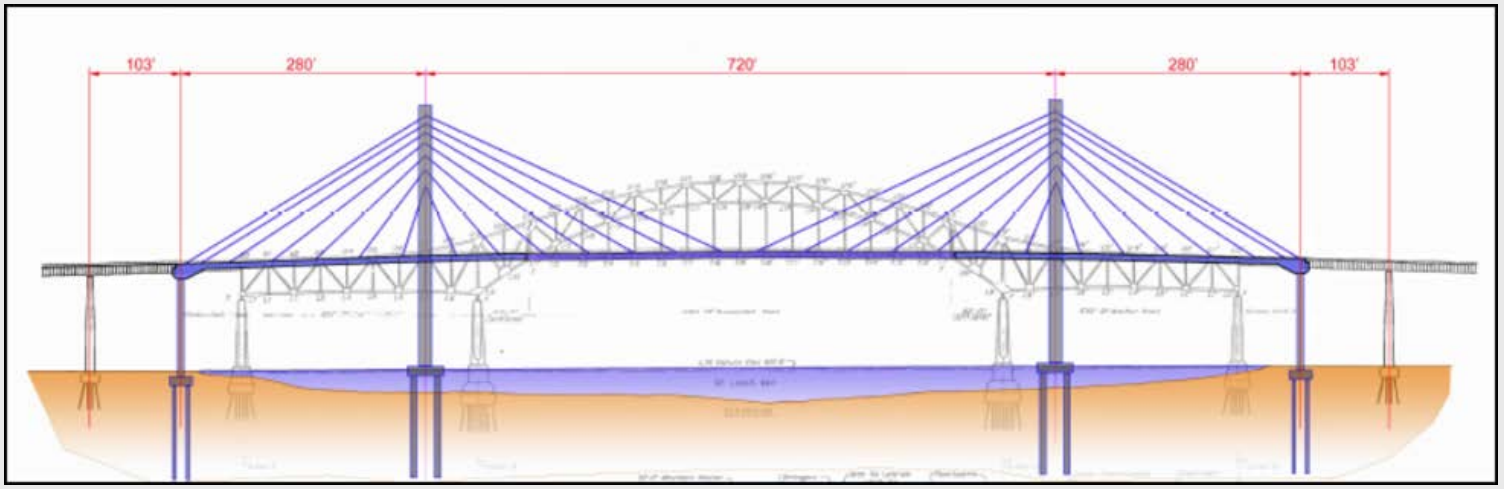
Develop Study Options

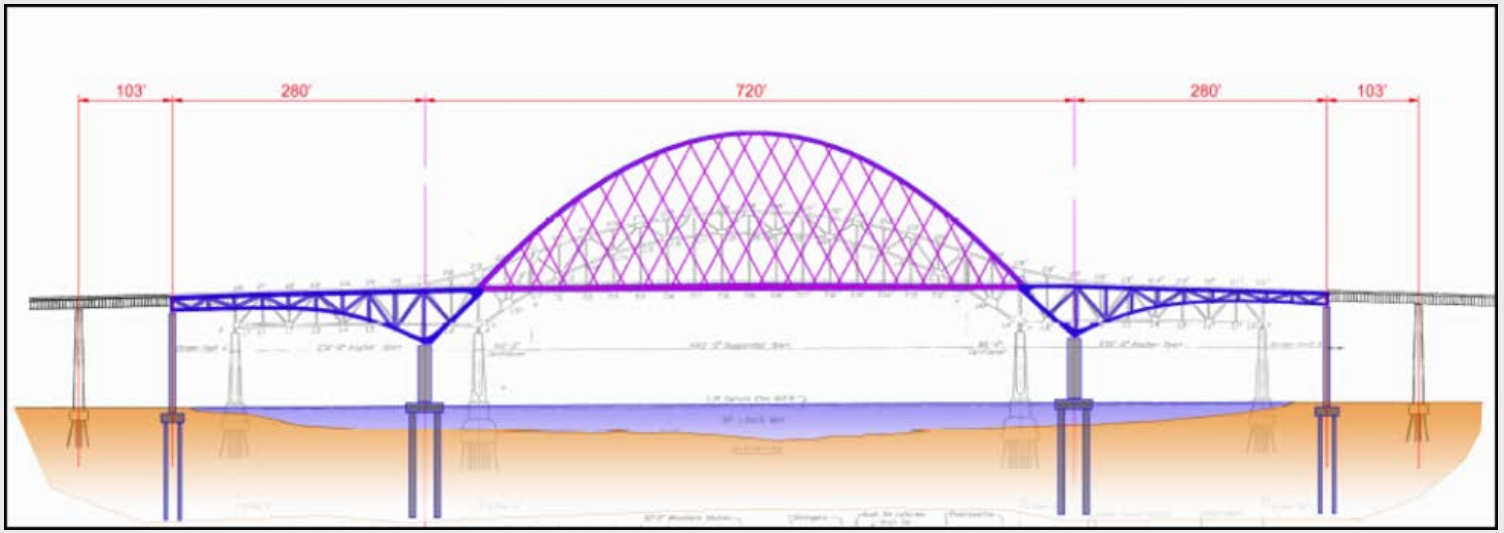
- Recommendations and associated costs
  - Maintenance recommendations
  - Rehabilitation recommendations
  - Replacement options
- Scenarios developed for 15 to 40 year service life
- Earliest major project date 15 years in future
- Project study limited to 40 years into future
- 100 Year service life 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

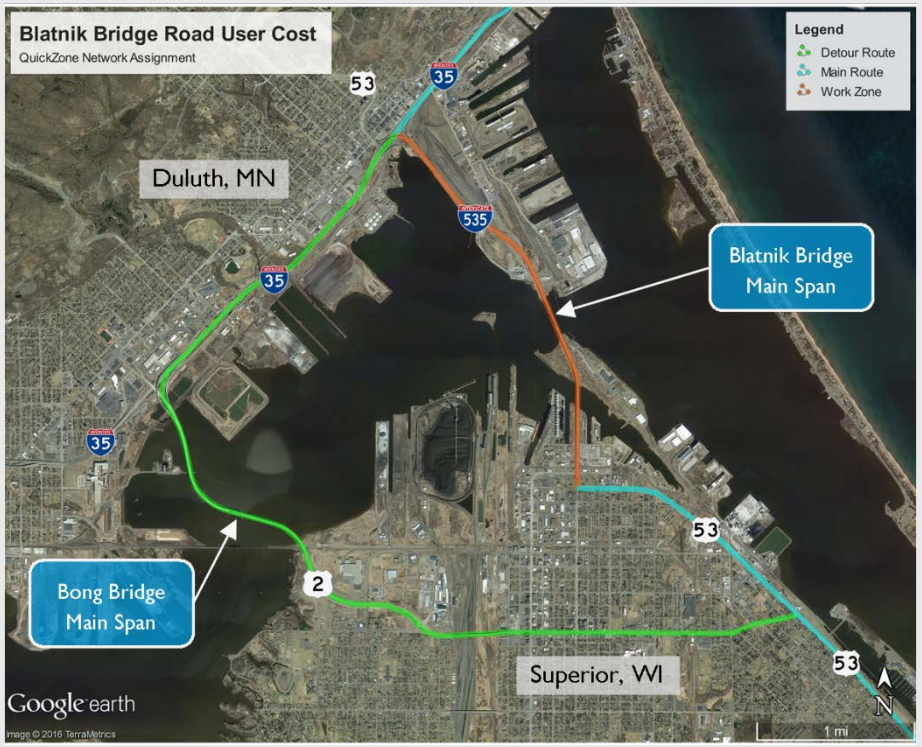
Replacement Options





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



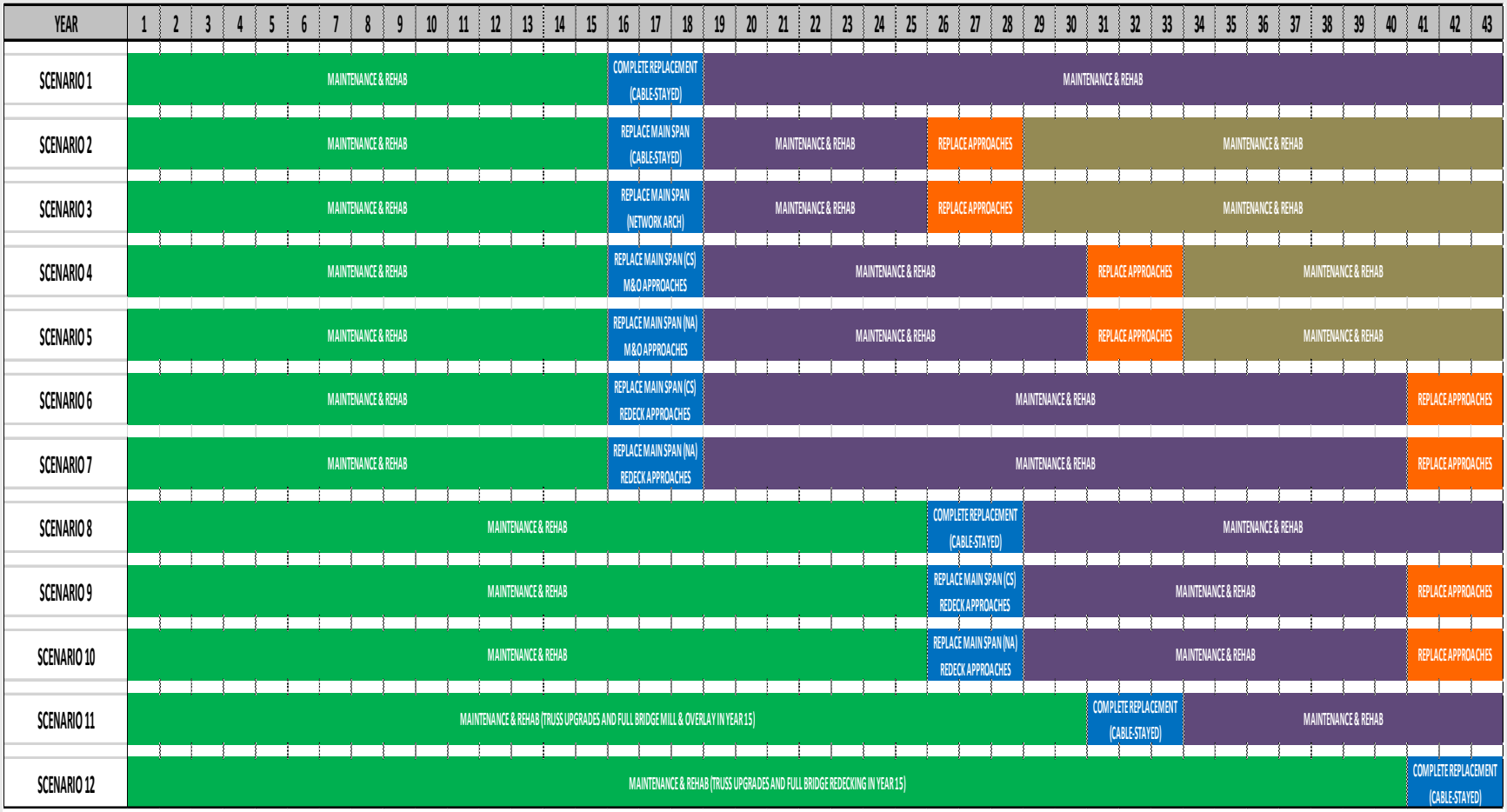
Replacement & Rehab Scenarios

Scenario	Replace Main Span	Replace Approaches	Rehabilitation Activity
1	Year 15	Year 15	NA
2	Year 15 Cable Stay	Year 25	NA
3	Year 15: Network Arch	Year 25	NA
4	Year 15: Cable Stay	Year 30	Year 15: Mill/Overlay Approaches
5	Year 15: Network Arch	Year 30	Year 15: Mill/Overlay Approaches
6	Year 15: Cable Stay	Year 40	Year 15: Re-deck Approaches
7	Year 15: Network Arch	Year 40	Year 15: Re-deck Approaches

Replacement & Rehab Scenarios (Cont)

Scenario	Replace Main Span	Replace Approaches	Rehabilitation Activity
8	Year 25	Year 25	NA
9	Year 25: Cable Stay	Year 40	Year 25: Re-deck Approaches
10	Year 25: Network Arch	Year 40	Year 25: Re-deck Approaches
11	Year 30	Year 30	Year 15: Mill/Overlay Entire Bridge and Truss Upgrades
12	Year 40	Year 40	Year 15: Re-deck Entire Bridge and Truss Upgrades

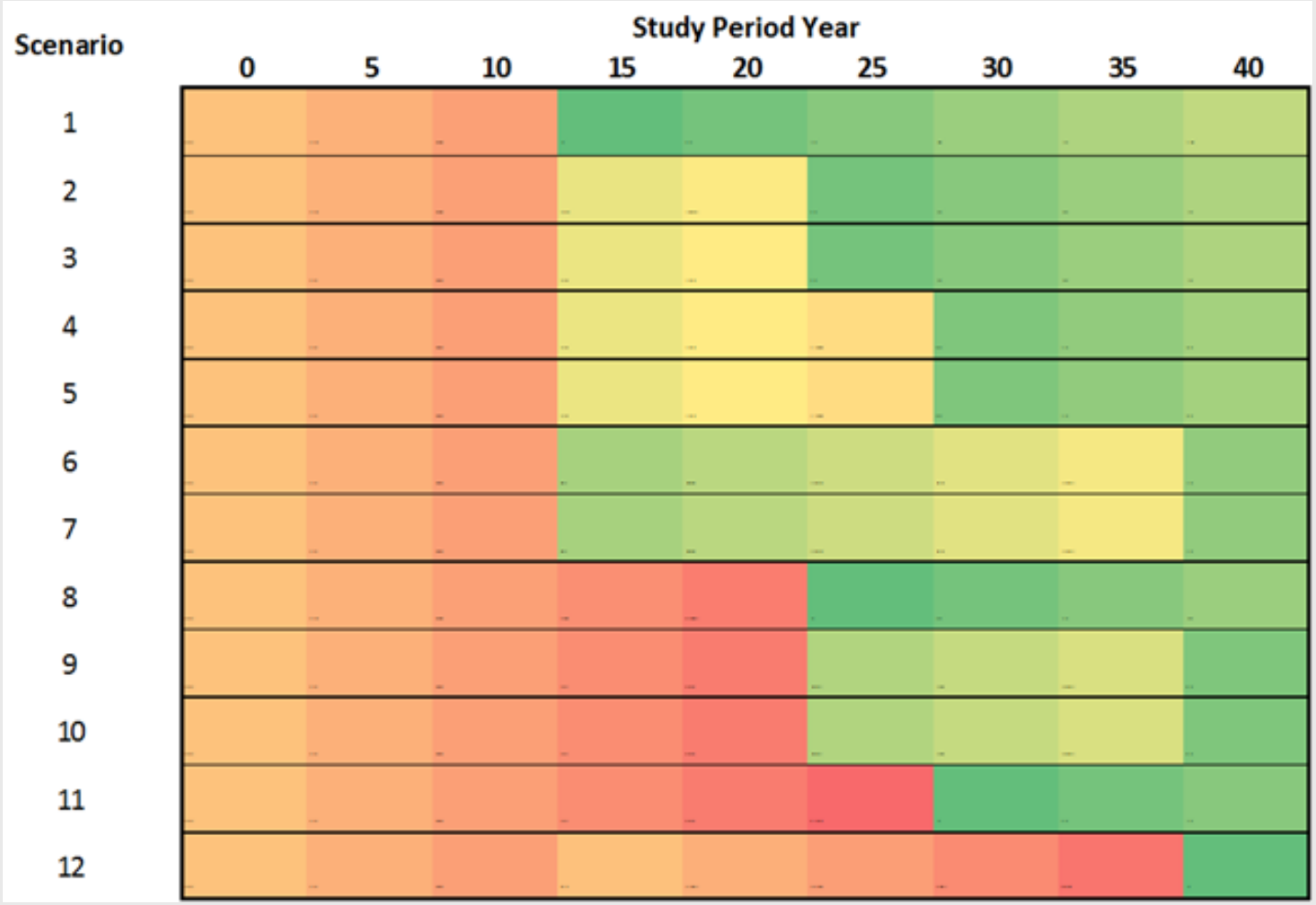
Replacement & Rehab Scenarios (Cont)



Scenario Cost Comparison

Scenario	Maintenance Costs (2016 $000s)	Rehabilitation Costs (2016 $000s)	Replacement Costs (2016 $000s)	Road User Costs (2016 $000s)	Salvage Value (2016 $000s)	Total Cost Estimate (2016 $000s)	Total Cost Estimate (NPV $000s)
1	$ 13,405	$ 36,290	$ 230,978	$ 80,630	$ (173,234)	$ 188,070	$ 193,071
2	$ 17,875	$ 61,940	$ 222,766	$ 123,502	$ (179,470)	$ 246,614	$ 219,632
3	$ 17,875	$ 61,940	$ 201,653	$ 87,146	$ (163,635)	$ 204,979	$ 182,724
4	$ 21,595	$ 65,730	$ 222,766	$ 125,422	$ (185,667)	$ 249,846	$ 210,670
5	$ 21,595	$ 65,730	$ 201,653	$ 89,616	$ (169,832)	$ 208,762	$ 174,192
6	$ 28,185	$ 125,630	$ 222,766	$ 130,069	$ (198,062)	$ 308,588	$ 235,567
7	$ 28,185	$ 125,630	$ 201,653	$ 94,963	$ (182,227)	$ 268,204	$ 199,630
8	$ 23,315	$ 73,840	$ 230,978	$ 87,073	$ (196,332)	$ 218,875	$ 189,835
9	$ 37,195	$ 158,190	$ 222,766	$ 134,502	$ (207,944)	$ 344,709	$ 243,601
10	$ 37,195	$ 158,190	$ 201,653	$ 97,762	$ (189,998)	$ 304,802	$ 214,429
11	$ 32,590	$ 85,150	$ 230,978	$ 89,492	$ (207,880)	$ 230,330	$ 182,875
12	$ 44,340	$ 168,720	$ 230,978	$ 95,860	$ (230,978)	$ 308,920	$ 211,922

Risk Mitigation



Thank you!

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