

# Midwest Bridge Preservation Partnership

## Session 3 – Preservation Actions, Policies, Needs, & Measures



# Performance Measures and Program Support

## Midwest Bridge Preservation Partnership

Thursday October 2<sup>nd</sup>, 2015

Bill Oliva - WisDOT - Bureau of Structures



# The Need for Changes:

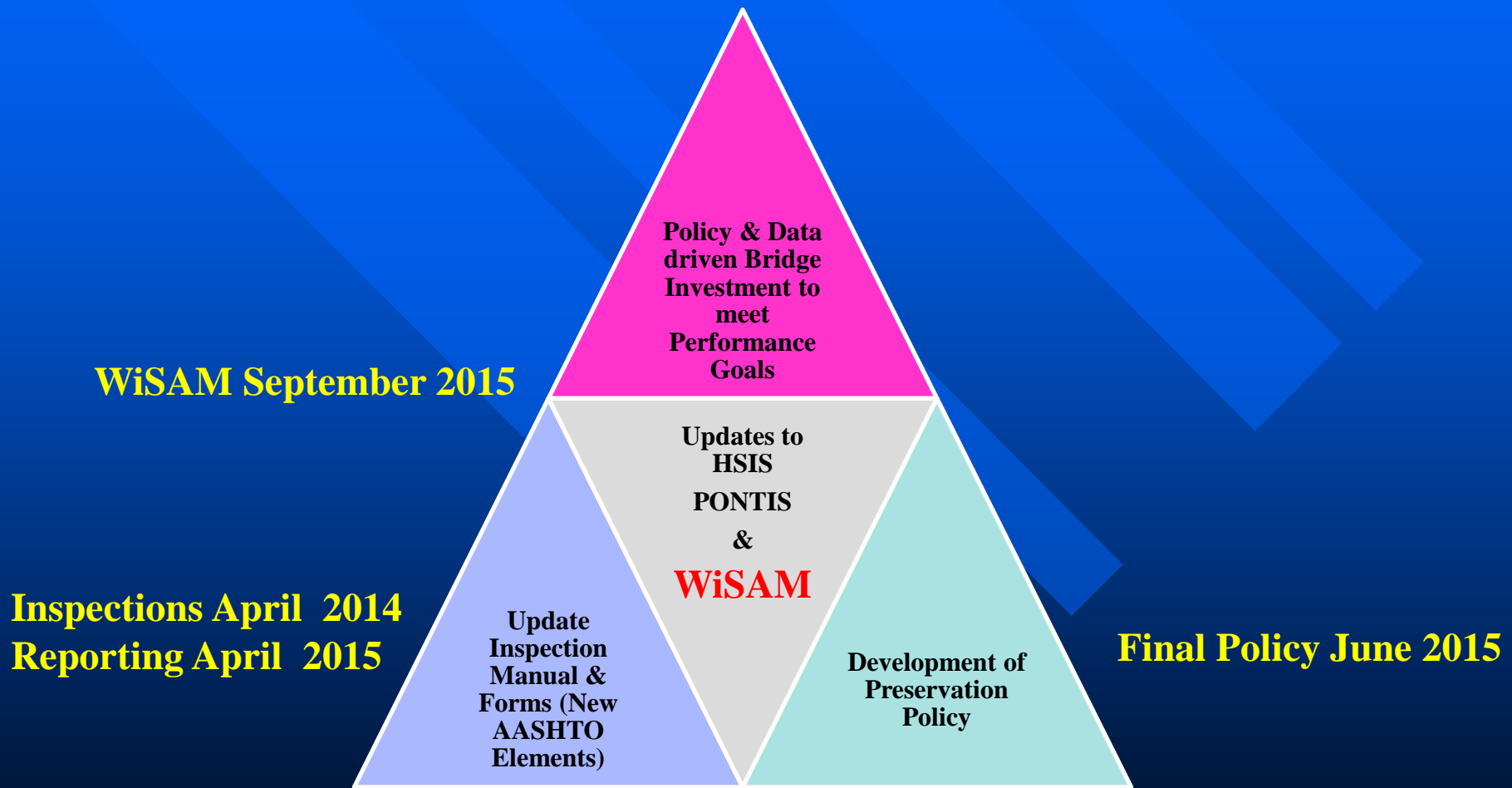
## FHWA & MAP – 21

- Mandate to adopt new bridge management elements
- Condenses Funding Programs – No more Bridge Program
- No more Sufficiency Rating Driven Program
- % Deficient Bridges can effect Funding Level from Feds
- The need to justify Infrastructure Investment
- Data & Performance driven Goals and Approach
- Transportation Asset Management Plan.....

# Bridge Management Next Generation - Team

- Scot Becker – Project Sponsor
- Bill Oliva – Project Manager
- Rick Marz/Dave Genson – Leads on Inspection Element, Manuals, Training, other
- Travis McDaniel – Lead on HSIS
- Shiv Gupta – Lead on Bridge Management
- Joe Barut – Lead on Integration of Information
- Jose Aldayuz – Baker , Research/National

# Bridge Management Next Generation - Builds to the Future



# Challenges – Preservation Policy

- Identify desirable/common **Wisconsin** actions
- Goals, Preservation Rules, and develop Needs
- Identify cost effective Program Level actions
- Develop support and funding (DTIM & FHWA)

# The main goal of a bridge preservation program

- Maximize the useful life of bridges in a cost effective way.
- To meet this goal, many of the strategies are aimed at applying the appropriate bridge preservation treatments and activities at the proper time resulting in longer service life at an optimal life cycle cost.

# Bridge Preservation & Preventive Maintenance, What is the Difference?



Figure 1 WisDOT Bridge Preservation Actions



# Definitions

## Preventive Maintenance (PM)

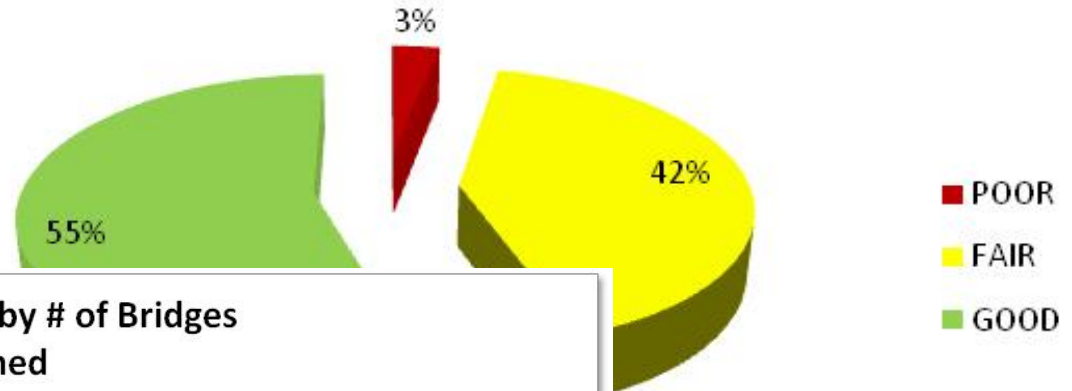
- Retards future deterioration and maintains or improves the functional condition.

## Bridge Preservations

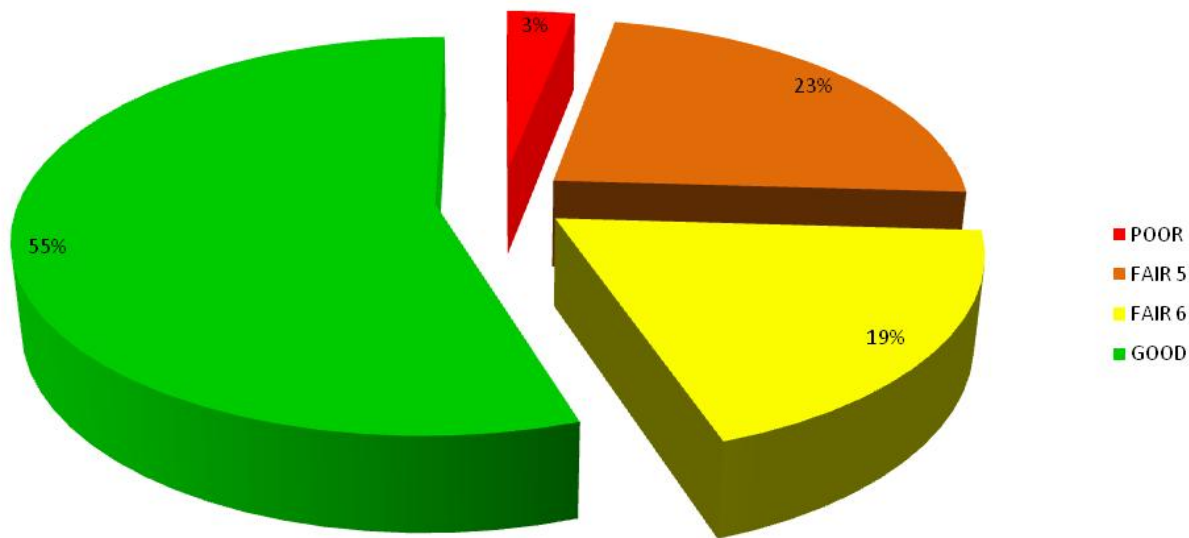
- Prevents Deterioration
- Delays Deterioration
- Reduces Deterioration
- “applying preservation strategies and actions on bridges while they are still in good or fair condition and before the onset of serious deterioration”.

# Taking Control of the Condition

## NBI Condition Rating by # of Bridges State Owned



## NBI Condition Rating by # of Bridges State Owned





# WISCONSIN DEPARTMENT OF TRANSPORTATION

## BUREAU OF STRUCTURES



### Bridge Preservation Policy Guide

Version 1.01

2015



# An Effective Bridge Preservation Program:

- Employs long-term strategies and practices at the network level to preserve the condition of bridges and to extend their useful life
- Has tools and processes to ensure that the appropriate treatments are applied at the appropriate time.
- Has sustained and adequate resources and funding

# Goals

- Maintain bridges in a “state of good repair” using low-cost effective strategies.
- Implement timely preservation treatments on structurally sound bridges.
- Limit adverse impacts to traffic operations and various stakeholders.
- Promote and support budgeting of preventive maintenance activities
- Establish performance goals and monitor progress related to preservation of bridges.
- Optimize the benefits and effectiveness of long-term maintenance investment in achieving bridges in good condition.

# Objective and Performance Measures

Objective	Target/Goals
Maintain bridges in good or fair condition	95% of bridges
Maintain bridge decks in good or fair condition	95% of bridge decks
Maintain expansion joints in condition state 2 or better	90% of the overall length of expansion joints
Maintain coated steel surfaces in condition state 2 or better	90% of coated steel surfaces
Maintain bearings in condition state 2 or better	95 % of bearings in condition state 2 or better
Seal eligible concrete decks (nbi rating 6 or higher) with sealant every 4 years	Seal 25% eligible concrete decks

## Table 2 Bridge Preservation Activities

Bridge Component	Bridge Preservation Type	Activity Description	Preventive Maintenance Type	Action Frequency (years)		
All	Preventive Maintenance	Sweeping, power washing, cleaning	Cyclical	1-2		
Deck	Preventive Maintenance	Deck washing	Cyclical	1		
		Deck Sweeping		1		
		Deck Sealing/Crack Sealing		4-5		
		Thin polymer (Epoxy) overlays		10		
		Drainage cleaning/repair		As needed		
		Joint cleaning				
	Preventive Maintenance	Deck Patching	Condition Based	1- 2		
		Chloride extraction		1 -2		
		Asphalt overlay with membrane		12-15		
		Polymer modified Asphalt overlay		6-12		
		Joint seal replacement		10		
		Drainage cleaning/repair		1		
		Repair or Rehab Element		Rigid concrete overlays	Condition Based	As needed
				Structural Reinforced concrete overlay		
Deck joint replacement						
Eliminate joints						

Table 3 - Concrete Deck/Slab Eligibility Matrix

Concrete Deck/Slab	NBI Item 58	Deck Element Distress Area (%) ①	Preservation Activity	Benefit to Deck from action	Application Frequency (in years)
	≥7		Deck Sweeping/Washing	Extend Service Life	1 to 2
			Crack Sealing	Extend Service Life	3 to 5
			Deck Sealing	Service life extended	3 to 5
			Polymer Modified Asphalt Overlay	Service life extended	12 to 15
			Polymer Overlay	Service life extended	8 to 12
	=6		Deck Sweeping/Washing	Extend Service Life	1 to 2
		<20%	Crack Sealing	Extend Service Life	3 to 5
		<20%	Deck Sealing	Service life extended	3 to 5
		<5% ②	Deck Patching	Service life maintained	As needed
<5%		Deck Patching, Cathodic Protection	Extend Service Life	As needed	
<10%		HMA w/ membrane	Improve NBI (58) ≥ 7	8 to 12	
<20%		Polymer Modified Asphalt Overlay	Improve NBI (58) ≥ 7	12 to 15	



# Bridge Elements Eligibility Matrix

NBI Item	Element	NBI Criteria	Defect	Element Condition State Criteria	Repair Action	Potential Benefits to NBI or CS	Anticipated Service Life Years
Super	Steel Elements	Item 59 $\geq$ 5		N/A	Superstructure Washing/Cleaning	NA	1 to 2
			3440	CS $\geq$ 2, Area > 5% ⑥	Painting - Spot	CS = 1	1 to 5
				CS = 3, Area < 25% ⑥	Painting - Zone	CS = 1 ①	5 to 7
				CS = 3, Area > 25% ⑥	Painting - Complete	CS = 1 ②	15 to 20
		Item 59 $\geq$ 4		CS $\geq$ 2	Superstructure Restoration ③	NBI $\geq$ 7	5 to 20
	Bearings	Item 59 $\geq$ 5		CS $\geq$ 3	Bearing Reset/Repair	CS $\leq$ 2	1 to 5
				CS $\geq$ 2	Bearing Cleaning/Painting	CS $\leq$ 2	5 to 7
				CS $\geq$ 3	Bearing Replacement	CS $\leq$ 2	10 to 15

# Program Changes

<u>Existing Structure Work Types</u>
Bridge Replacement
Bridge Elimination
New Bridge
Rehab Deck Overlay
Rehab Deck Replacement
Other

<u>Proposed Structure Work Types</u>
ELIMINATION - BRIDGE OR BOX CULVERT
NEW STRUCTURE - BRIDGE OR BOX CULVERT
OTHER (any "LET" work types which aren't specified elsewhere)
OVERLAY - BITUMINOUS HOT MIX ASPHALT (HMA)
OVERLAY - BITUMINOUS POLYMER MODIFIED ASPHALT (PMA)
OVERLAY - CONCRETE
OVERLAY - CONCRETE, NEW JOINTS
OVERLAY - CONCRETE, NEW RAIL AND JOINTS
OVERLAY - POLYESTER POLYMER
OVERLAY - THIN POLYMER
PAINT (COMPLETE)
PAINT (ZONE OR SPOT)
RAISE STRUCTURE
RAISE STRUCTURE - DECK REPLACEMENT
REPAIR - BOX CULVERT
REPAIR - DECK
REPAIR - JOINTS
REPAIR - RAILING/PARAPET
REPAIR - SCOUR COUNTERMEASURES (RIPRAP OR OTHER)
REPAIR - SUBSTRUCTURE
REPAIR - SUPERSTRUCTURE
REPLACE - DECK
REPLACE - DECK, PAINT (COMPLETE)
REPLACE - DECK, WIDENING
REPLACE - JOINTS
REPLACE - RAILING/PARAPET
REPLACE - STRUCTURE
REPLACE - SUPERSTRUCTURE
REPLACE / REPAIR - BEARINGS
REPLACE / REPAIR - STRUCTURAL APPROACH SLABS
REPLACE / REPAIR - WINGWALLS
SEAL - CONCRETE
WIDEN - BOX CULVERT EXTENSION
WIDEN BRIDGE

**AGREEMENT FOR THE USE OF FEDERAL FUNDS FOR  
PREVENTIVE MAINTENANCE OF STRUCTURES**

This agreement between the Wisconsin Department of Transportation (WisDOT) and the Wisconsin Division of the Federal Highway Administration (FHWA), is intended to implement the use of Federal-aid Highway Funding for Preventive Maintenance activities as authorized in 23 USC 116 (d), "Preventive Maintenance" on all eligible highways in the State of Wisconsin.

The criteria used to develop this agreement are based on the FHWA guidance issued by FHWA on March 21, 1996 ("Preventive Maintenance, Revision to 23 USC 116", issued by the Director Office of Engineering), and current AASHTO guidance on Preventive Maintenance.

This agreement is limited to Preventive Maintenance (PM) activities on Structures. It does not cover PM activities on Roadways. A separate agreement has been developed for PM activities on Roadways.

By signing this agreement, WisDOT and the FHWA incorporate by reference the laws, regulations, policies, standards, and procedures which govern or are applicable to Federal-aid projects. WisDOT certifies that it will comply with all provisions of 23 USC 133, "Surface Transportation Program," for non-National Highway System PM projects.

Nothing in this agreement shall be construed to relieve WisDOT from ultimate accountability for compliance with Federal Laws and regulations with respect to the expenditure of Federal-aid highway funds for PM activities in the State of Wisconsin, including those funds used for local government projects.


This agreement shall become effective August 1, 2003. It may be canceled or modified at any time by mutual agreement of WisDOT and the FHWA.

**Wisconsin Department of Transportation**

  
Kevin Chesnik, Administrator  
Division of Transportation Infrastructure Development

8/21/03  
Date

**Federal Highway Administration**

  
Bruce E. Matzke, Division Administrator  
Wisconsin Division

8/25/03  
Date

**We will need to  
revise the FDM  
Chapter 3-1  
Exhibit 5.2**

**Agreement for the  
use of Federal  
Funds for  
Preventative  
Maintenance of  
Structures**

# Goals of “Bridge Management – Next Generation”

## Include

- Program level Investment based on Preservation Policy and Modeling
- Project level identification to support Regional Planning, Funding, and Implementation



# Question?



# Performance Measures and Program Support

## Midwest Bridge Preservation Partnership



Friday October 3<sup>rd</sup>, 2015



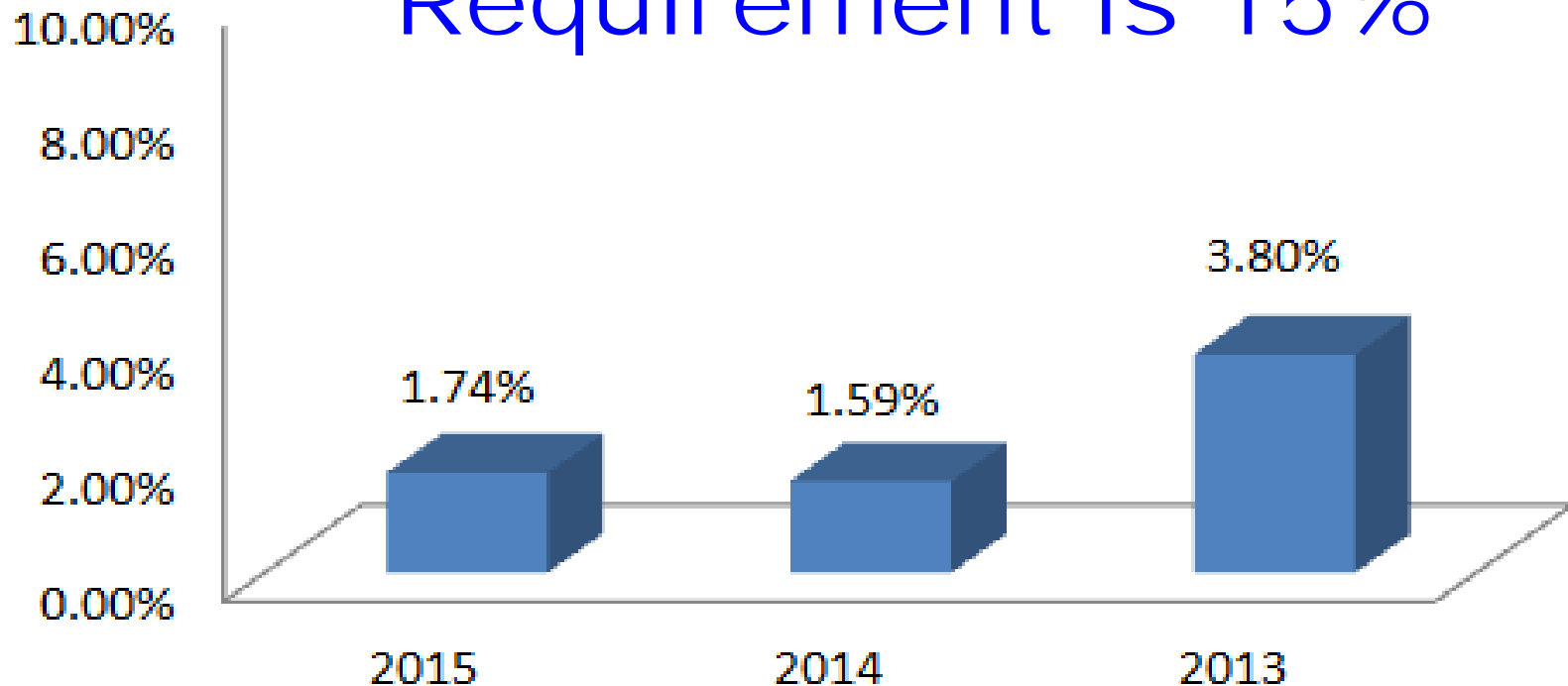
Bill Oliva - WisDOT - Bureau of Structures



# MAP – 21 Measure - % Deck Area

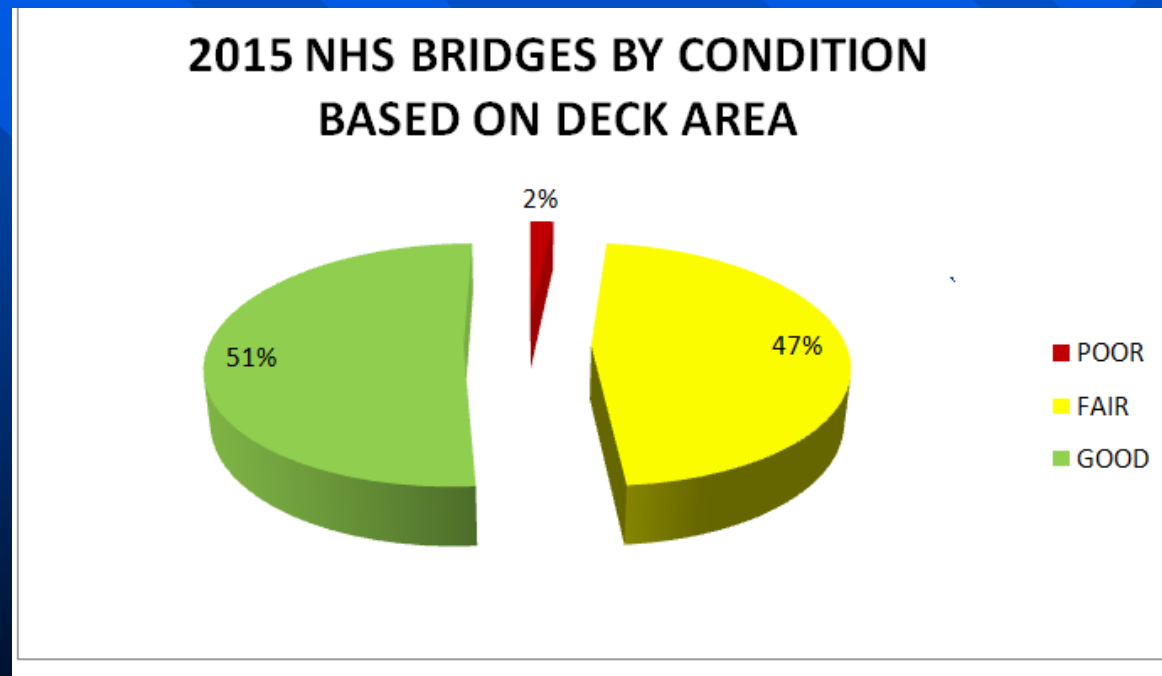
## PERCENT OF NHS BRIDGES THAT ARE STRUCTURALLY DEFICIENT

Requirement is 15%



# MAP 21 - Performance Measure

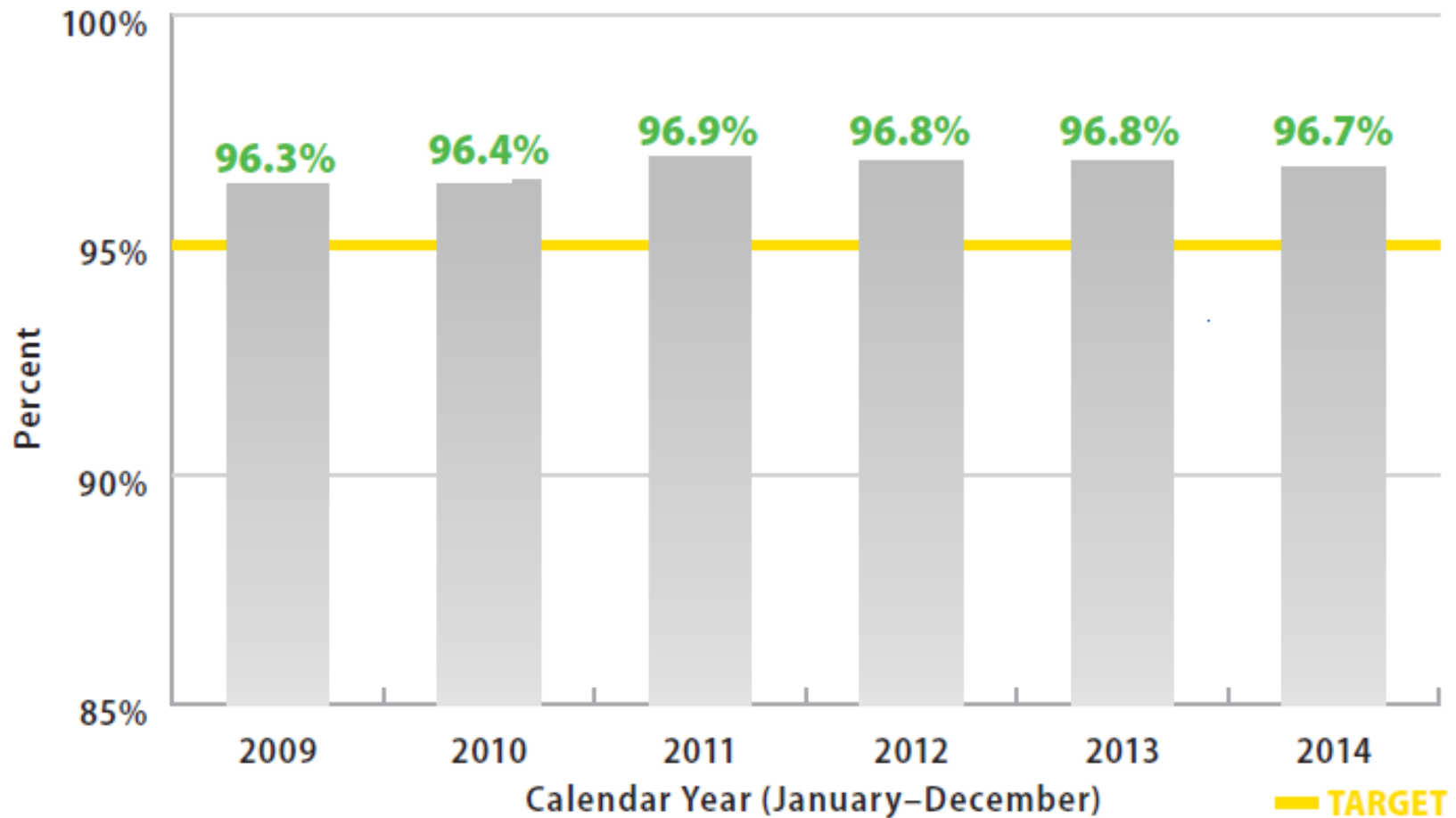
- **Measure 2: NHS Bridges in Good, Fair and Poor Condition based on Deck Area**
- Targets for this measure are currently being developed.
- This measure will promote an asset management approach to management of the NHS bridge inventory.





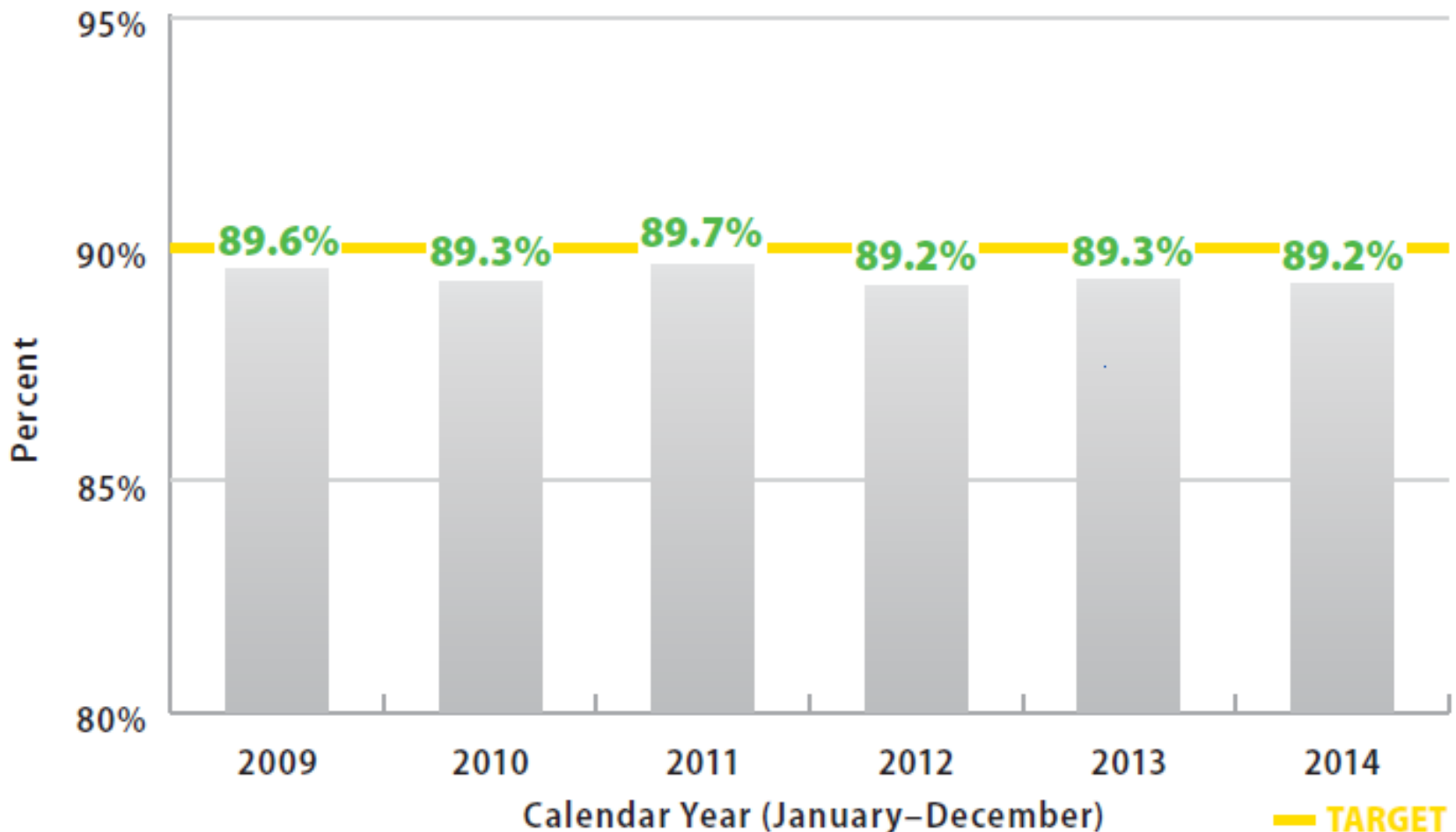
# Percent of State Bridges Rated as Good and Fair

**Figure:** Percent of Bridges Rated Fair or Above



# Percent of Local Bridges Rated as Good and Fair

**Figure:** Percent of Local Bridges Rated Fair or Above

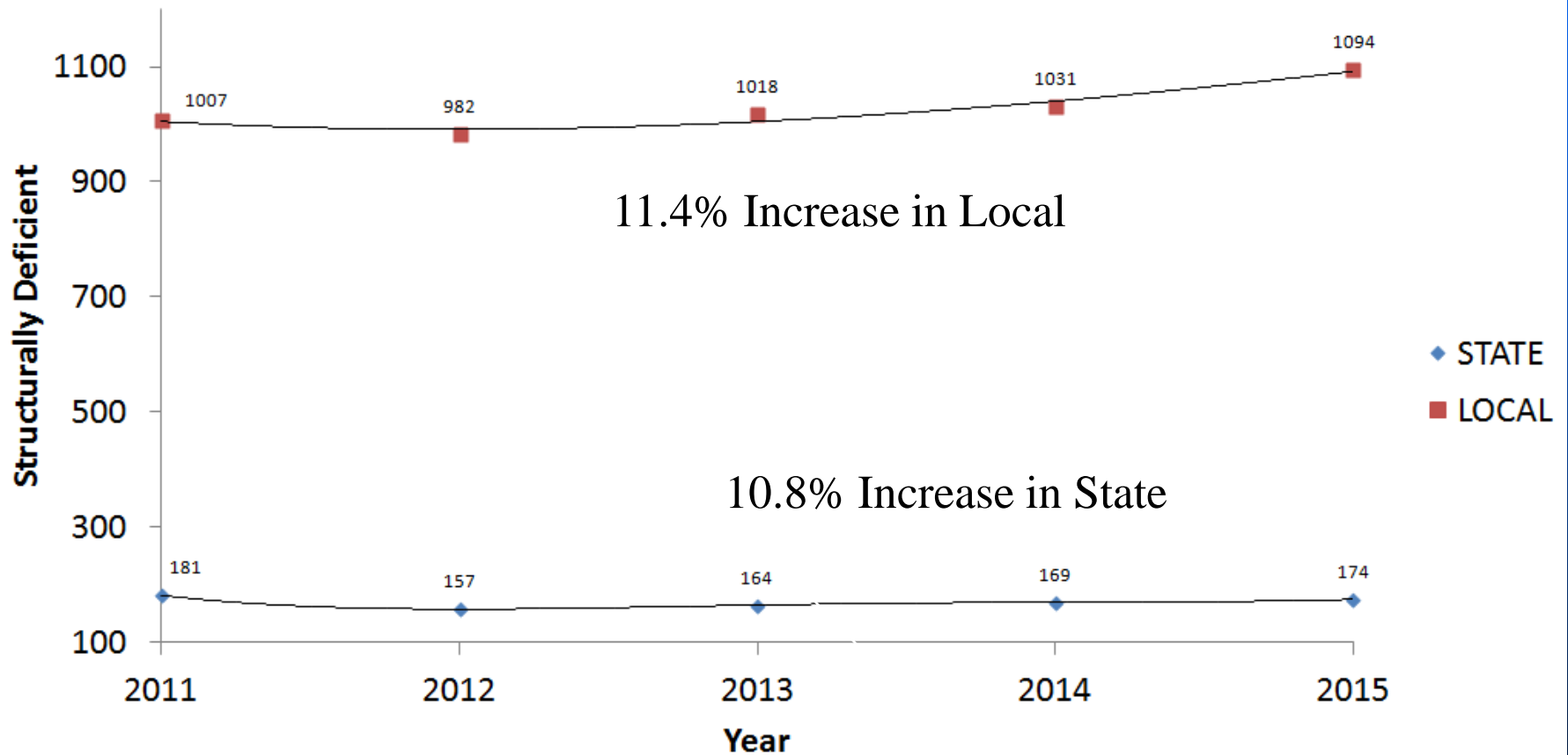


# Good and Fair Bridges

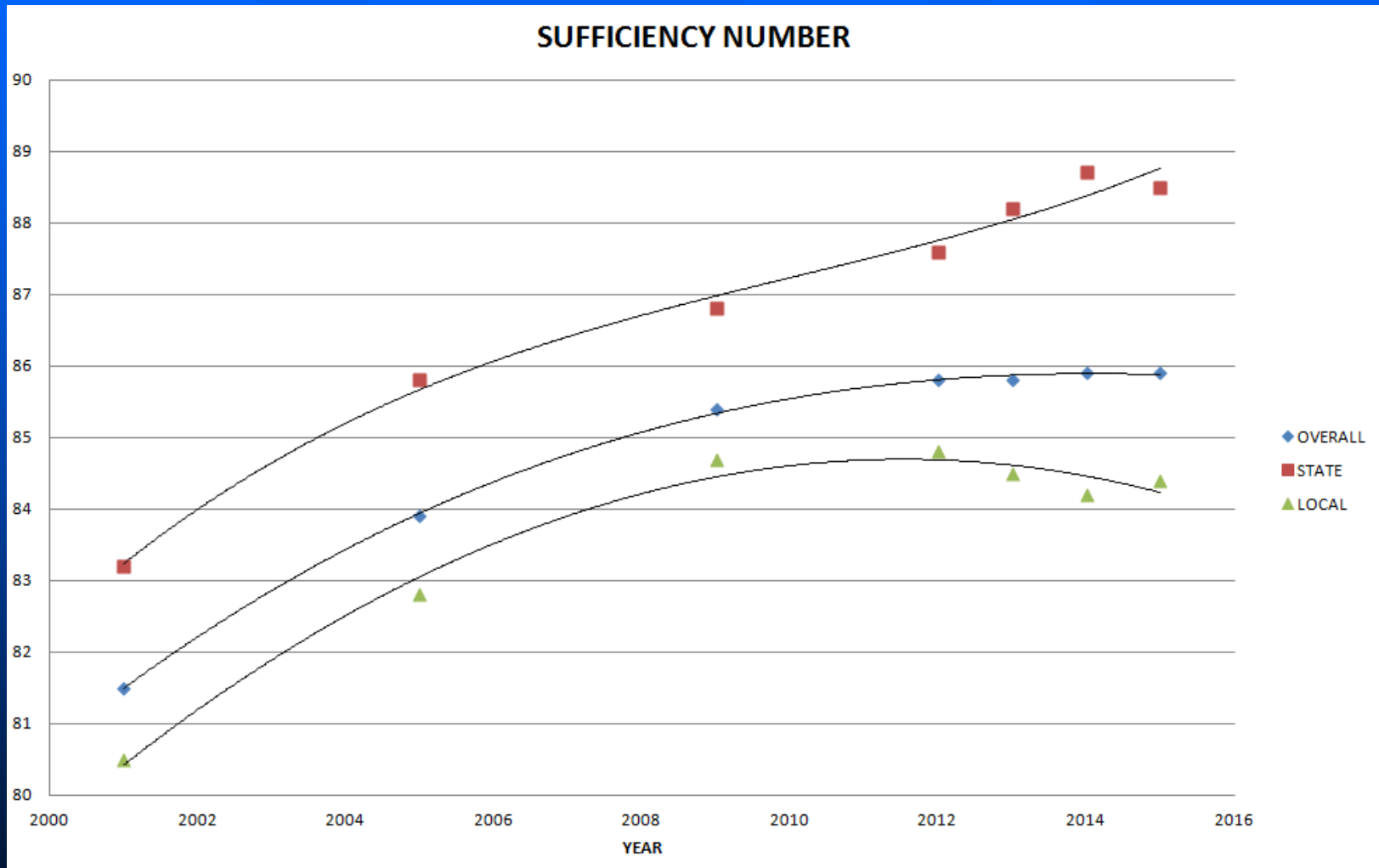
- When including Wisconsin's 8,843 local bridges, the good/fair bridge condition rating drops to **91.6 %**
- National average of approximately **89.5%**

# Recent Trend in Structurally Deficient Bridges

STRUCTURALLY DEFICIENT TRENDLINES FOR PAST 5 YEARS



# New Measures (Draft)





# Question?





# Wisconsin Structure Asset Management (WiSam )

- **WiSam brings WisDOT a new, simple, practical method to determine optimal work candidates for improving the condition of structures.**
- **These work candidates include rehabilitating or replacing structure elements as well as replacing structures entirely.**
- **The new method relies on historical bridge inspection data. It also relies on user-refined eligibility criteria applied to work candidates.**



# WiSam

- Data import from HSI, FIIPS, and other storage locations (costs, deterioration data, etc.)
- Analysis of optimal work candidates based on existing bridge age and condition
- Calculation of the cost of selected work items
- Calculation of the Condition Assessment Index (CAI) of the bridge prior to and after work candidate.

# WiSam

- Deterioration of NBI values and Elements for a given window of time.
- Analysis of programmed work items (FIIPS), showing benefit of work to CAI
- Calculation of a priority index for doing work on a particular structure, and a ranking of projects (by county for local program).
- Calculation of the Risk assessment, and potential benefits to the risk equation if rehabilitation/replacement work occurs.

# Optimal work candidates by year

STRC_ID	YEAR	OPTIMAL WORK CANDIDATE	CONDITION ASSESSMENT INDEX	CONDITION ASSESSMENT RESET
B110040	2015	OVERLAY DECK	80.4	88
B110040	2016	OVERLAY DECK	80.2	88
B110040	2017	OVERLAY DECK	79.9	88
B110040	2018	OVERLAY DECK	79.5	88
B110040	2019	OVERLAY DECK	78.7	88
B110040	2020	REPLACE SUPERSTRUCTURE	68.5	100
B110040	2021	REPLACE SUPERSTRUCTURE	60.4	100
B110040	2022	REPLACE SUPERSTRUCTURE	57.9	100
B110040	2023	REPLACE SUPERSTRUCTURE	57.4	100
B110040	2024	REPLACE SUPERSTRUCTURE	55.2	100

# Programmed Work Candidates

Bridge ID	Year	Improvement Type	Condition Assessment Index (CAI)
B130025	2015		54.4
B130025	2016		52.9
B130025	2017		49.9
B130025	2018	Deck Replacement	75.4
B130025	2019		74.2
B130025	2020		73.8
B130025	2021		72.9

# Needs Analysis

STRC_ID	YEAR	OPTIMAL WORK CANDIDATE	CONDITION ASSESSMENT INDEX	ESTIMATED PROJECT COST
B110040	2015	DO NOTHING	80.4	
B110040	2016	OVERLAY DECK	<b>88</b>	<b>\$42,500</b>
B110040	2017	DO NOTHING	83	
B110040	2018	DO NOTHING	78	
B110040	2019	DO NOTHING	73	
B110040	2020	DO NOTHING	68	
B110040	2021	DO NOTHING	63	
B110040	2022	DO NOTHING	58	
B110040	2023	DO NOTHING	53	
B110040	2024	DO NOTHING	48	
B110040	2025	REPLACE DECK	<b>90</b>	<b>\$125,000</b>