

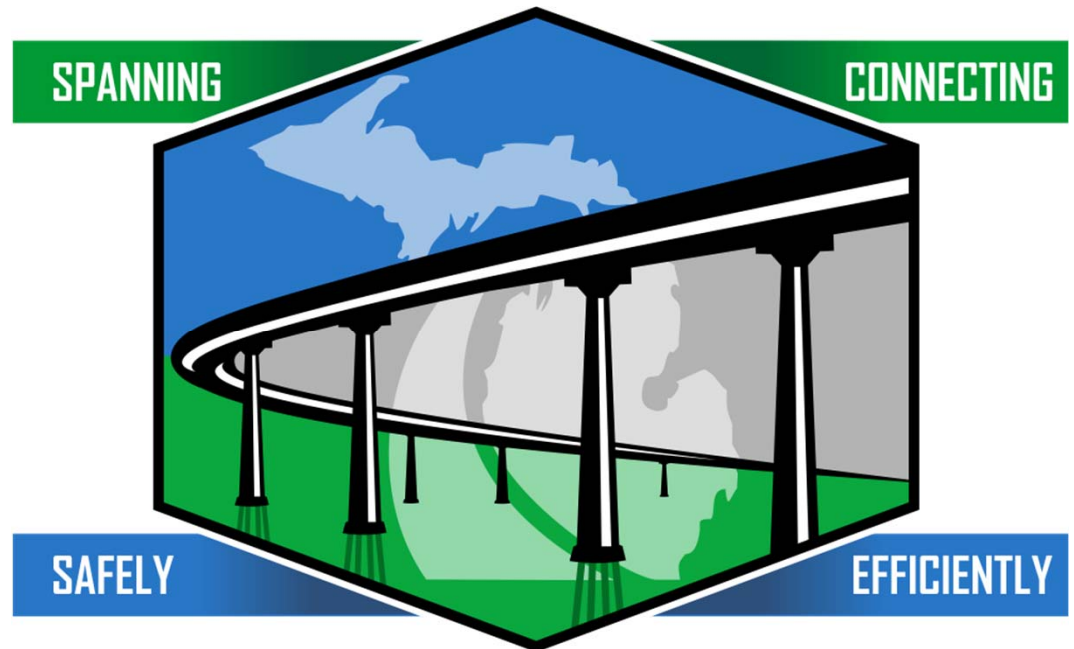
Transportation  
Performance  
Management –  
Michigan’s Bridge  
Target Setting  
Method

Beckie Curtis, MDOT

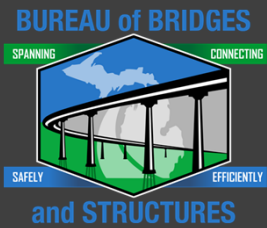
Deputy Chief Bridge Engineer

Bureau of Bridges and Structures

# BUREAU of BRIDGES

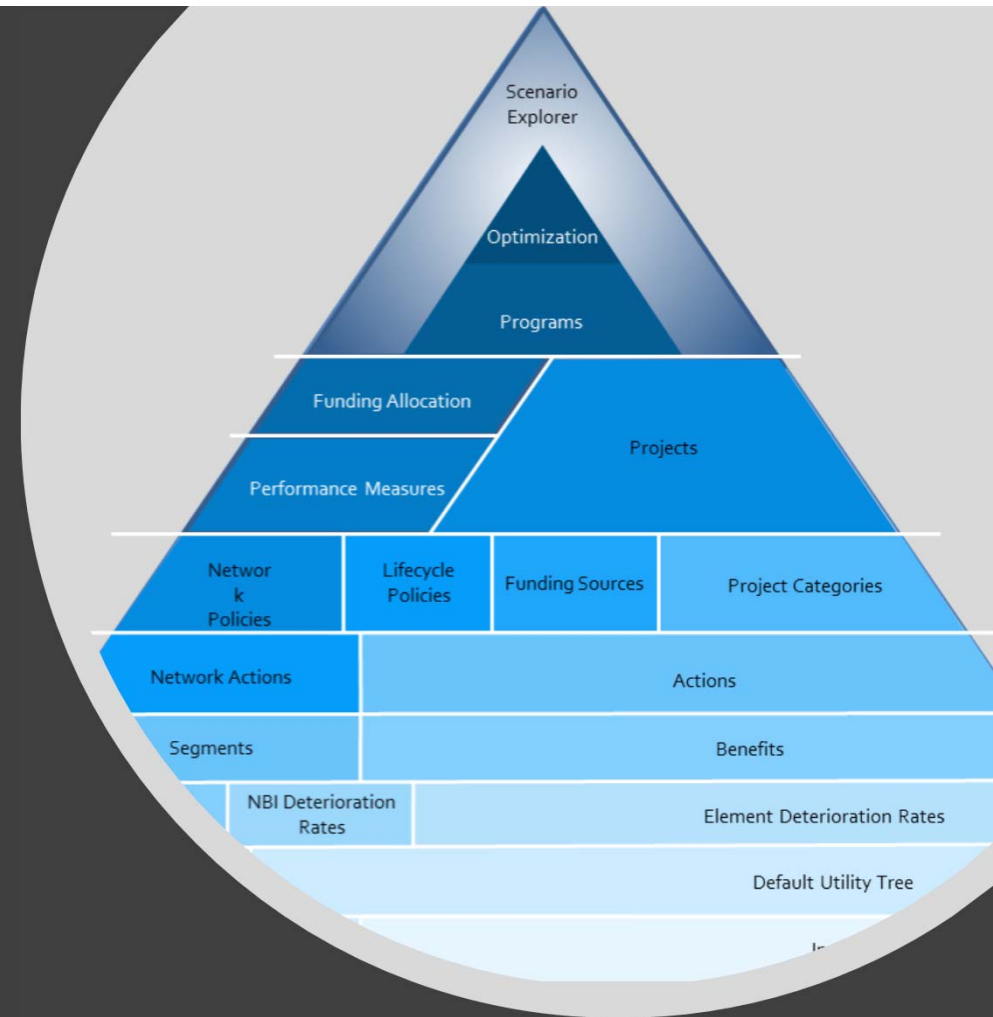


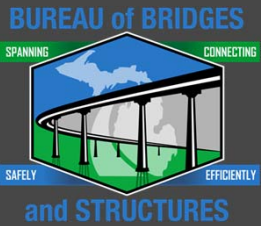
# and STRUCTURES



# Michigan TPM Bridge Target Setting

- Deteriorate bridges
- Improve bridges
- Automate Sharing and Reporting to MPO's and Executives

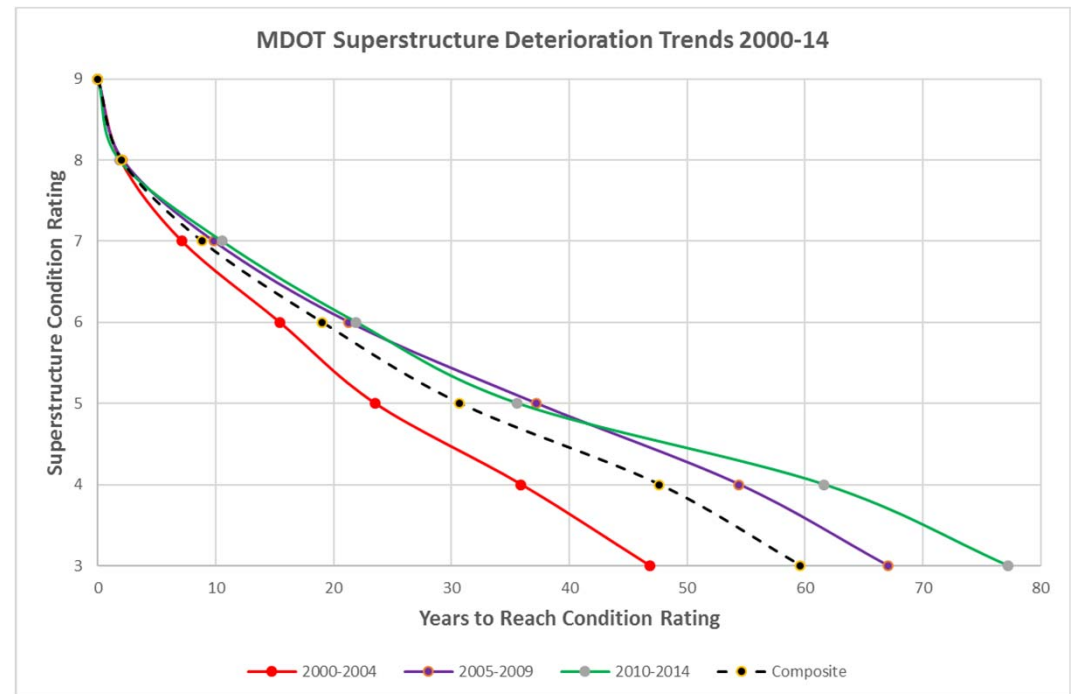


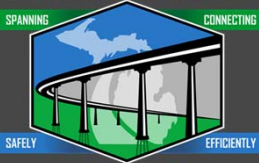


# Deteriorate Bridges

MDOT has an established process through which trends in bridge deterioration rates can be evaluated at regular intervals

[http://www.michigan.gov/documents/mdot/A\\_Process\\_for\\_Systematic\\_Review\\_of\\_Bridge\\_Deterioration\\_Rates\\_522422\\_7.pdf](http://www.michigan.gov/documents/mdot/A_Process_for_Systematic_Review_of_Bridge_Deterioration_Rates_522422_7.pdf)





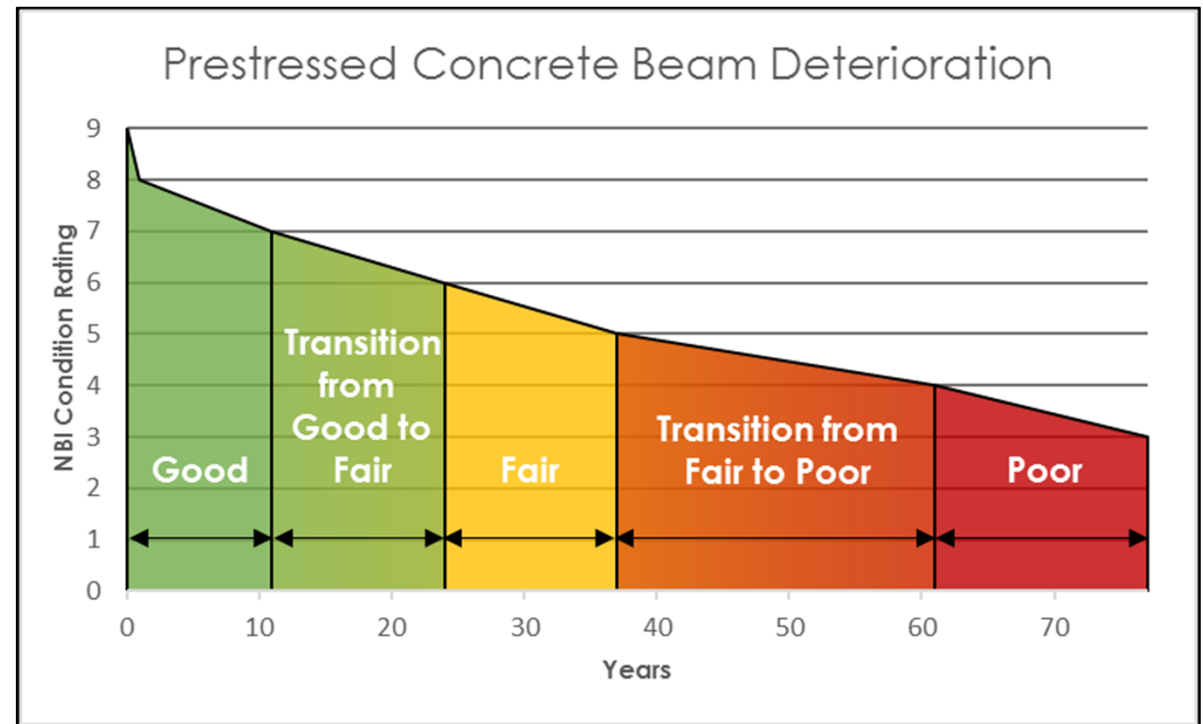
# Deteriorate Bridges

Determine the earliest year that the component was rated 5 or 7.

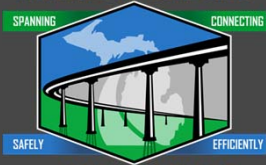
Determine the median time for each component to go from 7 to 6 and from 5 to 4.

Determine the predicted year to turn poor based on the first year at 7 or 5 plus the median time to poor.

For those with multiple components rated 7 or 5, choose the minimum predicted year to turn poor from all such components.



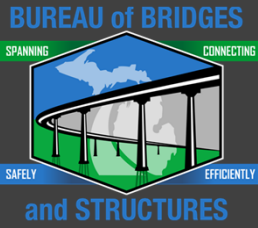
BUREAU of BRIDGES



and STRUCTURES

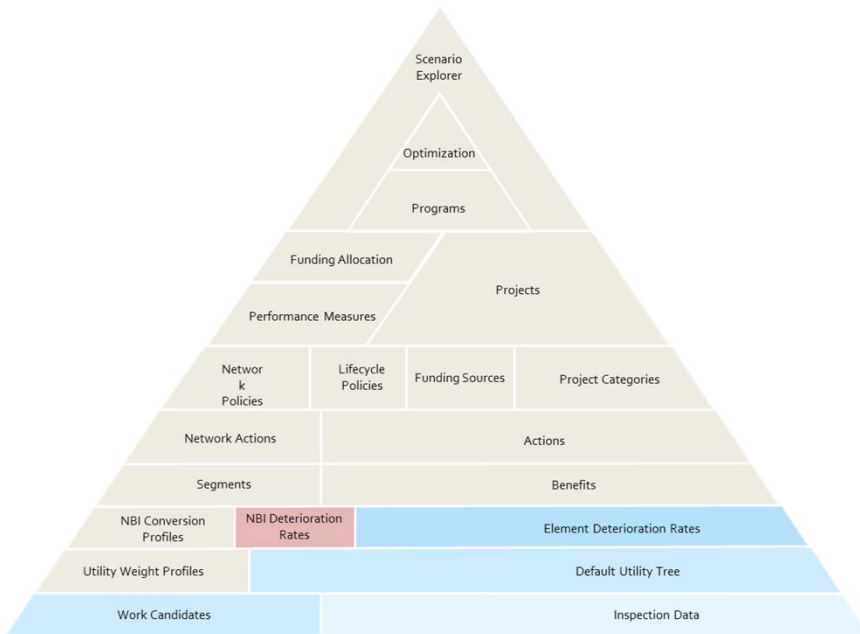
# Deteriorate Bridges Spreadsheet

	A	B	K	L	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	Brkey	Str Num	Area	Item 41	Inspdate	Deck	Super	Subst	Culv	Poor Year	Historic Project?	2018	2020	2022	Period			
218	821821230	11563	10488	A	8/22/2017	7	8	7	N	2018		0	Good	Fair	Fair		1	Good To Fair
219	821821230	11564	40582	A	8/22/2017	7	7	7	N	2019		0	Good	Fair	Fair		1	Good To Fair
220	821821230	11567	23068	A	9/26/2017	7	7	7	N	2016		0	Good	Fair	Fair		1	Good To Fair
221	821821230	11576	32654	A	9/14/2016	7	7	7	N	2020		15	Good	Good	Good		2	Good To Good
222	821821230	11578	23379	A	8/29/2017	8	7	7	N	2024		15	Good	Good	Good		3	
223	821821230	11588	5639	A	10/17/2017	7	8	7	N	2008		0	Good	Fair	Fair		1	Good To Fair
224	821821230	11590	32547	A	10/17/2017	7	7	7	N	2015		0	Good	Fair	Fair		1	Good To Fair
225	821821230	11591	3638	A	10/16/2017	8	8	7	N	2022		0	Good	Good	Good		3	
226	821821230	11592	6599	A	10/17/2017	7	7	7	N	2015		0	Good	Fair	Fair		1	Good To Fair
227	821821230	11593	6583	A	10/17/2017	8	7	7	N	2015		0	Good	Fair	Fair		1	Good To Fair
228	821821230	11594	32633	A	10/17/2017	7	7	7	N	2015		0	Good	Fair	Fair		1	Good To Fair
229	821821230	11595	3309	A	10/31/2017	8	7	7	N	2022		0	Good	Good	Good		3	
230	821821230	11596	4011	A	10/10/2017	8	7	7	N	2019		15	Good	Good	Good		1	Good To Good
231	821821240	11606	26501	A	10/10/2017	7	8	7	N	2018		0	Good	Fair	Fair		1	Good To Fair
232	821821240	11608	20190	A	10/9/2017	7	7	7	N	2017		0	Good	Fair	Fair		1	Good To Fair
233	821821250	11613	25911	A	12/12/2016	7	7	7	N	2021		15	Good	Good	Good		2	Good To Good
234	821821310	11615	20062	A	11/3/2017	8	8	7	N	2028		0	Good	Good	Good		3	
235	821821410	11619	5068	A	10/5/2016	7	7	8	N	2011		15	Good	Good	Good		1	Good To Good
236	821821410	11620	5068	A	10/5/2016	7	7	7	N	2011		15	Good	Good	Good		1	Good To Good
237	821821410	11621	4643	A	9/12/2016	7	8	8	N	2023		15	Good	Good	Good		3	
238	821821410	11622	16552	A	11/8/2017	7	7	7	N	2017		0	Good	Fair	Fair		1	Good To Fair
239	821821410	11623	16552	A	11/8/2017	7	7	7	N	2017		0	Good	Fair	Fair		1	Good To Fair
240	821821910	11629	1748	A	10/25/2016	N	N	N	7	2009		0	Good	Fair	Fair		1	Good To Fair
241	824664382	11635	1256	A	12/6/2016	N	N	N	7	2024		0	Good	Good	Good		3	
242	821821910	11663	50368	A	10/24/2016	7	7	7	N	2021		0	Good	Good	Fair		2	Good To Fair
243	821821910	11666	15001	A	6/9/2016	7	8	7	N	2015		0	Good	Fair	Fair		1	Good To Fair
244	821821910	11667	15075	A	6/9/2016	7	7	7	N	2014		0	Good	Fair	Fair		1	Good To Fair
245	821821910	11668	15315	A	10/14/2016	8	7	7	N	2016		0	Good	Fair	Fair		1	Good To Fair
246	821821910	11669	15126	A	7/8/2016	7	8	7	N	2021		0	Good	Good	Fair		2	Good To Fair
247	821821920	11679	8279	A	11/14/2017	7	7	7	N	2007		0	Good	Fair	Fair		1	Good To Fair
248	821821920	11680	8279	A	11/14/2017	7	7	7	N	2007		0	Good	Fair	Fair		1	Good To Fair



# Deteriorate Bridges

AASHTOWare BrM – NBI Deterioration Models



Admin > Modeling Config > NBI Deterioration Models

BRIDGES  
TUNNELS  
REPORTS  
ADMIN  
MODELING CONFIG  
ELEMENT SPEC  
ELEMENT-CHILD LINKING  
PROJECT CATEGORIES  
DETERIORATION PROFILES  
ELEMENTS  
ASSESSMENT  
BENEFIT GROUPS  
ACTION DEFS  
COST INDEX  
NETWORK POLICIES  
ADVANCED FORMULAS  
UTILITY

**Components**

Component Name
Superstructure
Substructure
Deck
Culvert

**Component Specification**

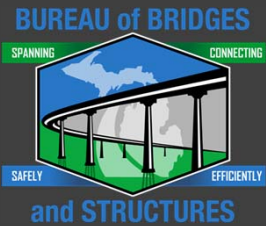
Name: Superstructure  
Description:  
Category: Superstructure  
Table Name: Component  
Column Name:  
Min NBI Value: 1  
Max NBI Value: 9

**Component Deterioration Modeling**

Model

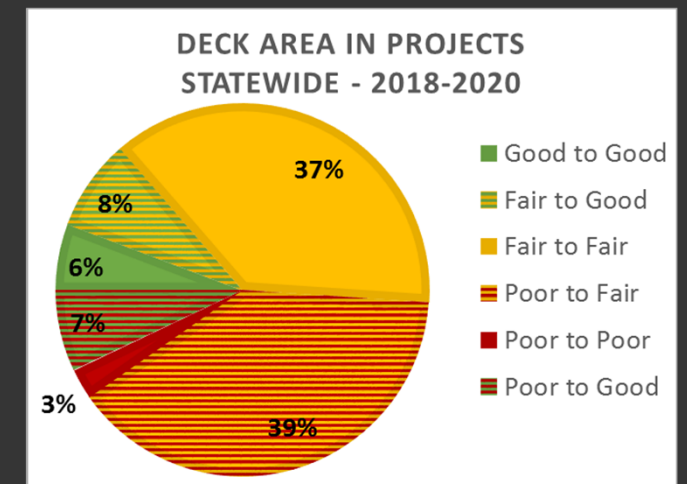
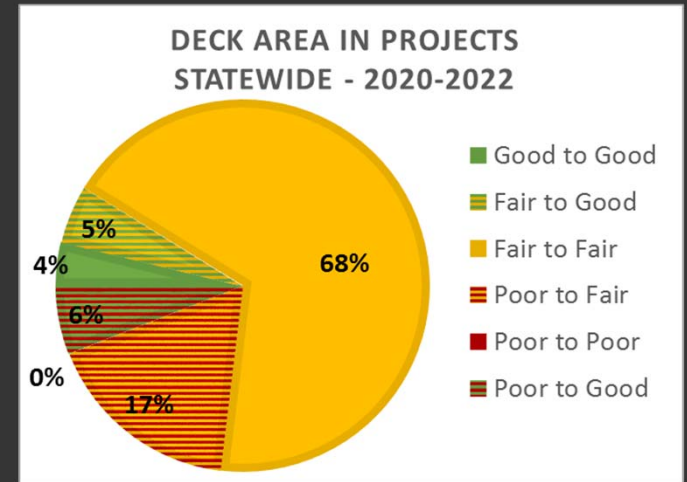
**Model Parameters**

NBI Transition Time in Years 9	1.8
NBI Transition Time in Years 8	8.7
NBI Transition Time in Years 7	10
NBI Transition Time in Years 6	13.7
NBI Transition Time in Years 5	15.7
NBI Transition Time in Years 4	15.6
NBI Transition Time in Years 3	1
NBI Transition Time in Years 2	1
NBI Transition Time in Years 1	1



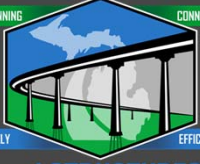
# Improve Bridges

The projects within the Five Year Plan on bridges that carry the NHS were identified. The projects were sorted by the scheduled letting date. It was assumed that projects would require one construction season to be completed and inspected.



BUREAU of BRIDGES

SPANNING CONNECTING



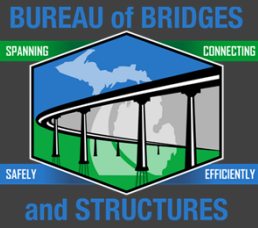
and STRUCTURES

# Improve Bridges Spreadsheet

Introduction: MDOT Statewide  
 Note: Bridge jobs programmed prior to October 2002 will not appear on this report.  
 Report created on 8/27/2018

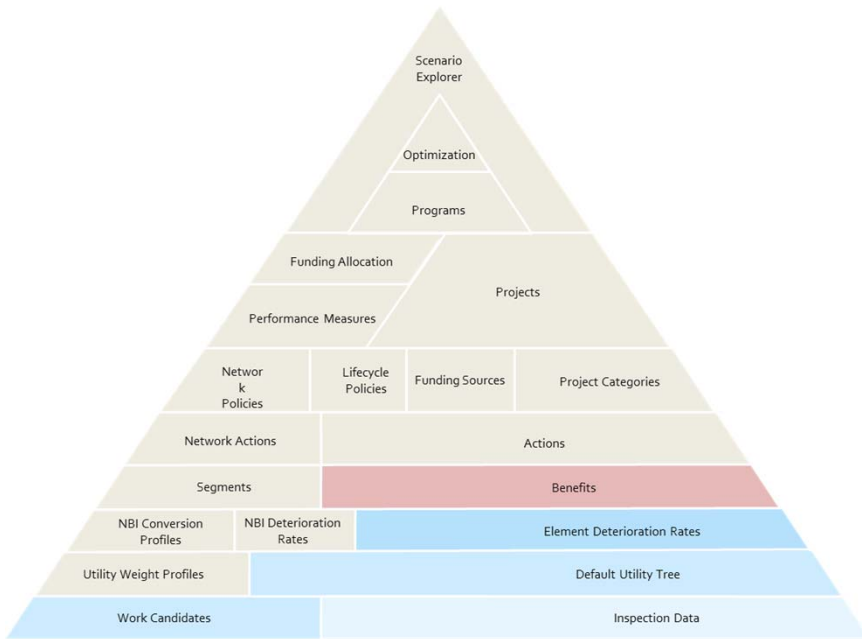
Number	Bridge ID	Deck Area (sq ft)	Date	Structure Condition BEFORE	Structure Condition AFTER	Structure Condition Improvement	Deck and Rtg	Sub-structure Rtg	Super-structure Rtg	Cost	Work Description (E)	Date	Letting Date	Category of Work	Job Template	Cost	Code	Rating
35	100000000000	2250	5/30/07	Fair	4	6	Fair	Fair	4	4	Deck Replacement, Bridge Approach, Parking Complex, Stone Protection, Culvert, Clearing	10/20/00	10/05/01	Bridge Replacement	Bridge Replacement	\$30,960	NA	4.5A
44	100000000000	2642	5/30/07	Fair	1	1	Fair	Fair	1	1	Deck Replacement, Bridge Approach, Bridge Barrier Repair, Right-of-Way, Parking - Full Depth, Substructure Repair, Drainage, Repair, Concrete	10/20/00	10/05/01	Bridge Rehabilitation	Bridge Preservation	\$133,770	NA	4.5A
89	100000000000	1008	5/30/07	Good	1	1	Good	Good	1	1	Overlook, Culvert, Right-of-Way	10/20/00	10/05/01	Bridge Rehabilitation	Bridge Rehabilitation	\$128,200	NA	5B
94	100000000000	4104	5/30/07	Fair	1	1	Good	Fair	1	1	Concrete Deck, Bridge Approach, Bridge Barrier Repair, Concrete Surface, Parking Deck, Parking - Full Depth, Stone Protection, Substructure, Parking	10/20/00	10/05/01	Bridge Rehabilitation	Bridge Preservation	\$102,280	NA	5B
107	100000000000	5390	5/30/06	Fair	1	1	Fair	Fair	1	1	Concrete Deck, Bridge Approach, Bridge Barrier Repair, Concrete Surface, Parking Deck, Parking - Full Depth, Stone Protection, Substructure, Parking	10/20/00	10/05/01	Bridge Rehabilitation	Bridge Preservation	\$142,050	NA	5B
401	100000000000	2000	5/30/06	Fair	5	6	Fair	Fair	5	6	Clear Protection, Substructure, Pathway	10/20/00	10/05/01	Bridge CMW	Bridge Preservation	\$11,760	NA	5.7
402	100000000000	800	5/30/06	Fair	5	6	Fair	Fair	5	6	Clear Protection	10/20/00	10/05/01	Bridge CMW	Bridge Preservation	\$12,000	NA	5.7
431	100000000000	1830	5/30/06	Fair	5	6	Fair	Fair	5	6	Deck Replacement, Bridge Approach, Bridge Barrier Repair, Right-of-Way, Parking - Full Depth, Joint Repair	10/20/00	10/05/01	Bridge CMW	Bridge Preservation	\$81,244	NA	5C
432	100000000000	4310	5/30/06	Fair	1	1	Fair	Fair	1	1	Deck Replacement, Bridge Approach, Bridge Barrier Repair, Right-of-Way, Parking - Full Depth, Joint Repair	10/20/00	10/05/01	Bridge CMW	Bridge Preservation	\$15,750	NA	5.5
433	100000000000	4310	5/30/06	Fair	5	6	Fair	Fair	5	6	Deck Replacement, Bridge Approach, Bridge Barrier Repair, Right-of-Way, Parking - Full Depth, Joint Repair	10/20/00	10/05/01	Bridge CMW	Bridge Preservation	\$70,000	NA	5.2
434	100000000000	5341	5/30/06	Fair	5	6	Fair	Fair	5	6	Deck Replacement, Bridge Approach, Bridge Barrier Repair, Right-of-Way, Parking - Full Depth, Joint Repair	10/20/00	10/05/01	Bridge CMW	Bridge Preservation	\$41,000	NA	5B
507	100000000000	1980	5/30/07	Fair	1	1	Fair	Fair	1	1	Concrete Deck, Bridge Approach, Bridge Barrier Repair, Concrete Surface, Parking Deck, Parking - Full Depth, Stone Protection, Substructure, Parking, Drainage, Repair, Drainage	10/20/00	10/05/01	Bridge Rehabilitation	Bridge Preservation	\$12,000	NA	5.5
601	100000000000	5124	5/30/07	Fair	4	1	Fair	Fair	4	1	Deck Replacement, Bridge Approach, Concrete, Substructure, Pathway	10/20/00	10/05/01	Bridge Rehabilitation	Bridge Rehabilitation	\$1,000,000	NA	5.5A





# Improve Bridges

## AASTHOWare BrM – Benefits



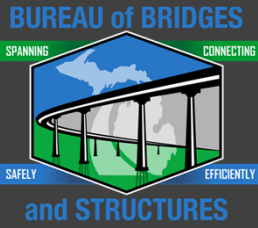
USER: POKTIS Admin > Modeling Config > Benefit Groups

Table Name	Column Name	New Value	Increment
insprevnt	suprating	8	

Fields (1)

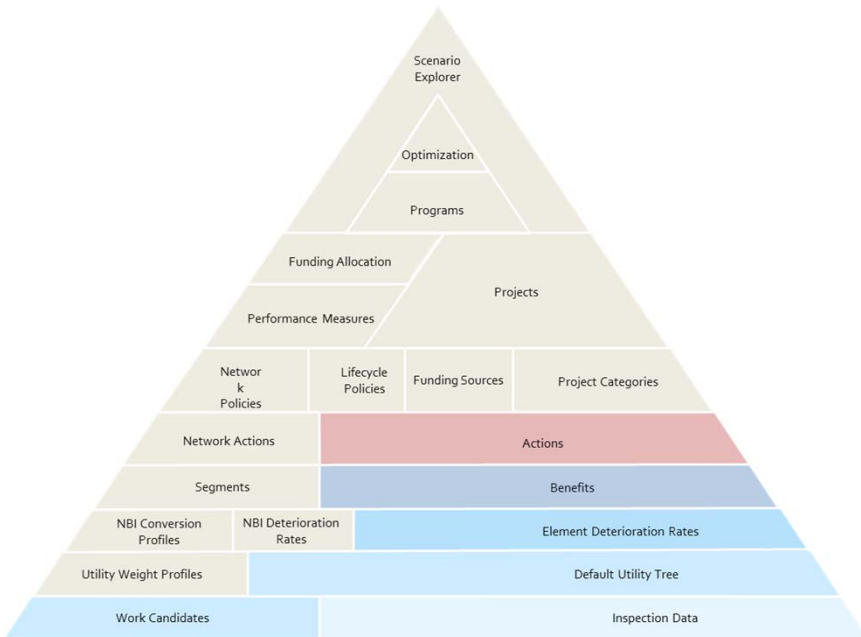
Total Records: 00

Items per page: 13  
Records Matching



# Improve Bridges

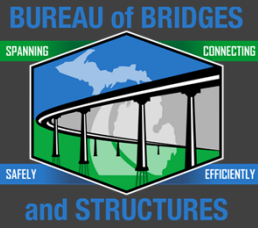
## AASHTOWare BrM – Actions



Admin > Modeling Config > Action Defs

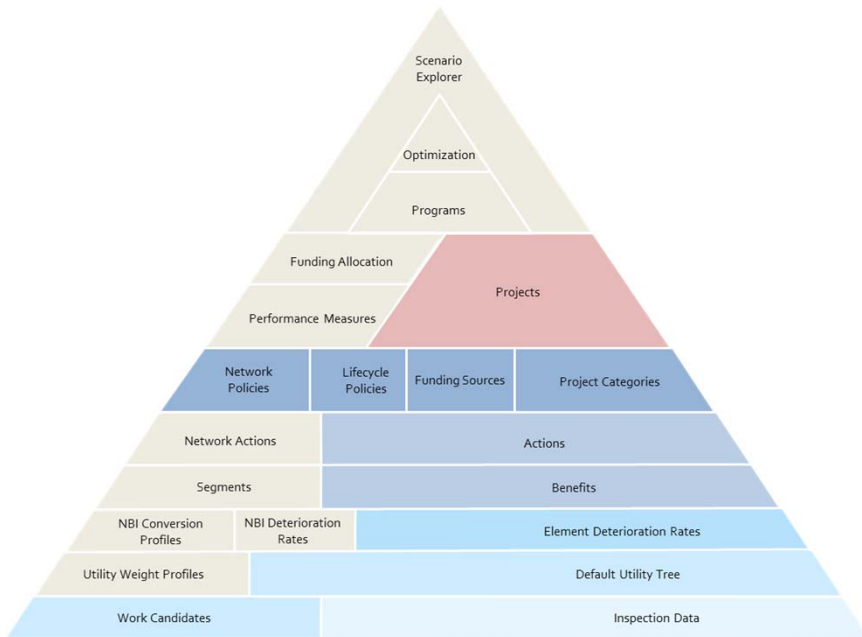
Name	Description	Notes	Order	Network Level	Bridge Replace	Required Minimum Cost	Action Type	Active
TPM - Culvert - Fair	Make Culvert NBI Fair							
TPM - Culvert - Good	Make Culvert NBI Good		1					
TPM - Deck - Fair	Make Deck NBI Fair		1					
TPM - Deck - Good	Make Deck NBI Good		1					
TPM - Sub - Fair	Make Sub NBI Fair		1					
TPM - Sub - Good	Make Sub NBI Good		1					
TPM - Super - Fair	Make Super NBI Fair		1					
TPM - Super - Good	Make Super NBI Good		1					
Deep Overlay - Network	Deep Overlay		999					
Epoxy Overlay - Network	Epoxy Overlay		999					
Healer Sealer - Network	Healer Sealer		999					
HMA Cap - Network	HMA Cap		999					
Paint Sub - Network	First Painting	Example	999				Network	
Paint Super - Network	First Painting	Example	999				Network	
Place Wearing Surface - Network	First Wearing Surface	Example	999				Network	

Associated Benefit Groups for Action TPM - Culvert - Fair



# Improve Bridges

AASHTOWare BrM – Projects



Projects > Project List > Select All

Filter: BrM - None    Layout: Project Default    Jump to Project: TPM 2018

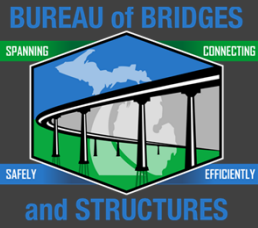
AI ID	Name	Start Date	Add Cost	Create Date	Status	First Name	Project Category
TPM 2018			0	4/5/2018	0	Portis	Bridge Rail
TPM 2019			0	4/5/2018	0	Portis	Bridge Rail
TPM 2020			0	4/5/2018	0	Portis	Bridge Rail
TPM 2021			0	4/5/2018	0	Portis	Bridge Rail

Total Projects: 8174    Matching Filter: 8184    Selected: 1

Bridge ID	District	County	Facility Carried	Feature Intersected	Deck	Superstructure	Substructure	Culvert	Health Index
00000000011714	07	163	M-102 EB	M-39	8 Very Good	7 Good	7 Good	N/A (NBI)	99.84
00000000011715	07	163	M-102 WB	M-39	8 Very Good	7 Good	7 Good	N/A (NBI)	99.6
00000000011716	07	163	I-75	ROUGE R/DEARBORN ST & RR	4 Poor	7 Good	6 Satisfactory	N/A (NBI)	

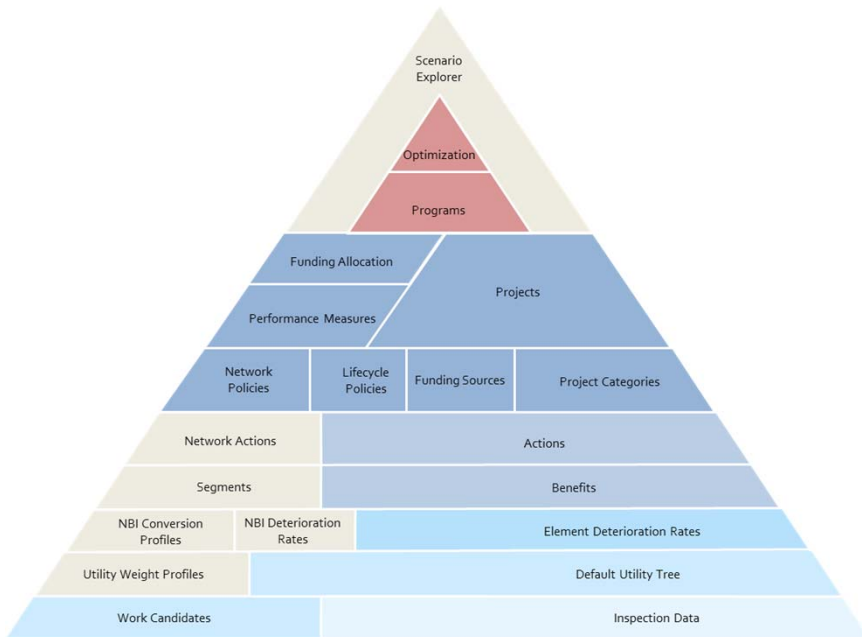
Action	Work Item	Base Utility	New Utility	Utility Change	Estimated Cost	Benefit / Cost (\$k)	Cost (\$k) / Benefit	Target Year	
TPM - Deck - Fair	(11716) TPM - Deck - Fair	44.33	58	13.67	\$0		\$0	2018	
00000000011717	07	163	I-75 NB OFF RAMP	RR AND MAINT RD	6 Satisfactory	8 Very Good	7 Good	N/A (NBI)	96.39
00000000011718	07	163	I-75 SB ON RAMP	ROUGE RIVER & PLEASANT S	4 Poor	8 Very Good	7 Good	N/A (NBI)	93.61
00000000011734	07	163	I-75	FORT ST	4 Poor	6 Satisfactory	4 Poor	N/A (NBI)	82.48
00000000011756	07	163	RMP I-96 TO I-75N	I-96 WB	8 Very Good	8 Very Good	7 Good	N/A (NBI)	99.90
00000000011760	07	163	14TH ST	I-75	5 Fair	5 Fair	4 Poor	N/A (NBI)	99.06
00000000011786	07	163	M-85 SB	MARSH CREEK	5 Fair	5 Fair	6 Satisfactory	N/A (NBI)	95.69
00000000011800	07	163	MADISON AVE RAMP	I-375	5 Fair	7 Good	5 Fair	N/A (NBI)	96.33

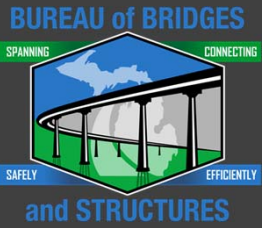
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# Improve Bridges

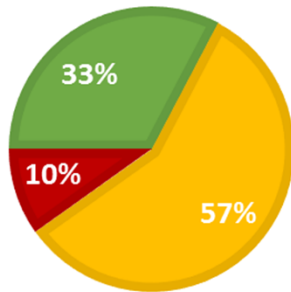
AASHTOWare BrM – Programs





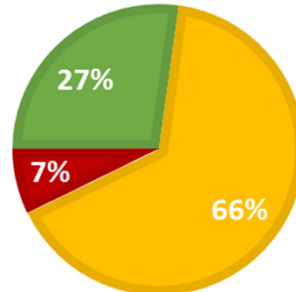
# Report and Share Information

**BASELINE**  
PERCENT BY NHS DECK AREA



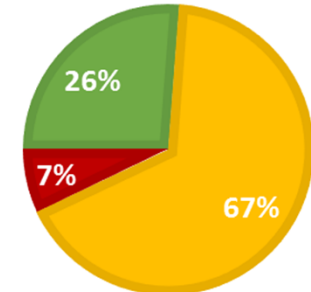
■ Good ■ Fair ■ Poor

**TWO-YEAR**  
PERCENT BY NHS DECK AREA



■ Good ■ Fair ■ Poor

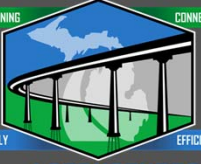
**FOUR-YEAR**  
PERCENT BY NHS DECK AREA



■ Good ■ Fair ■ Poor

BUREAU of BRIDGES

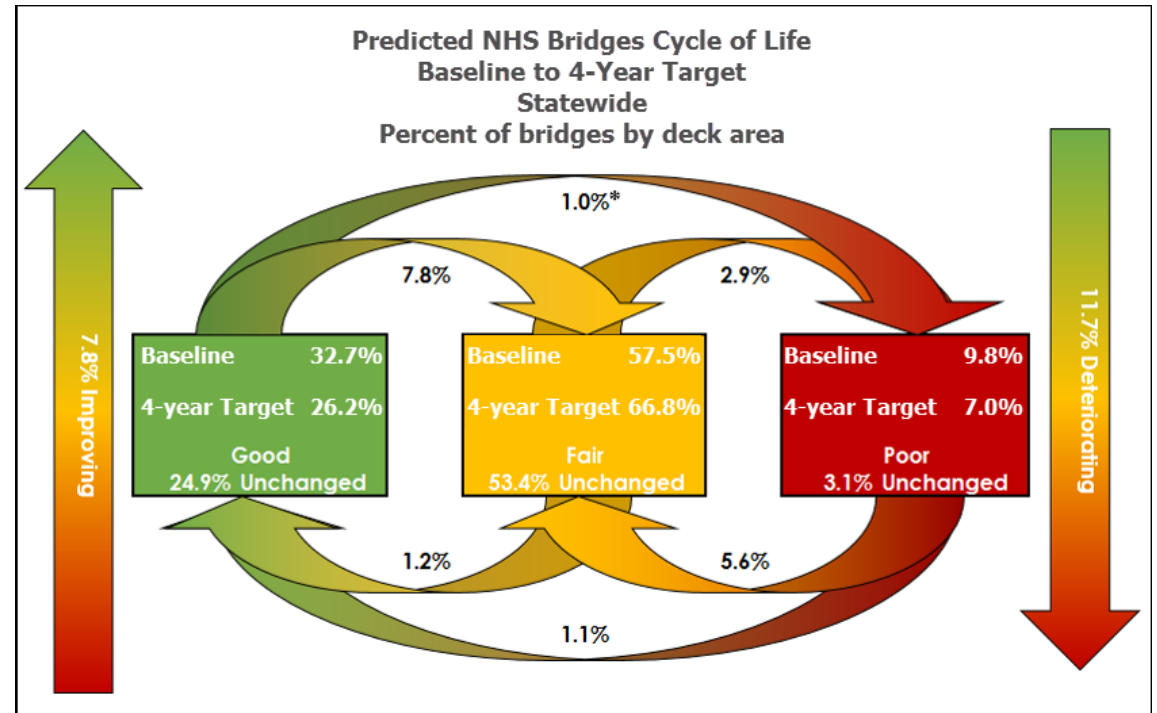
SPANNING CONNECTING



SAFELY EFFICIENTLY

and STRUCTURES

# Report and Share Information



BUREAU of BRIDGES

SPANNING CONNECTING



SAFELY EFFICIENTLY and STRUCTURES

# Report and Share Information

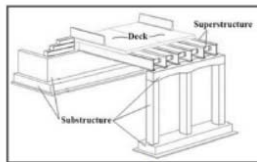
Using BrM to do the TPM Target Setting will allow automating reporting through Crystal Reports to provide highly informative, standardized reports for our MPO's

## TRANSPORTATION PERFORMANCE MANAGEMENT

### BRIDGE PERFORMANCE MANAGEMENT

#### BRIDGE CONDITION

Federal law, outlined in the National Bridge Inspection Standards (NBIS), defines a bridge as a structure carrying traffic with a span greater than 20 feet and requires that all bridges be inspected every two years to monitor and report condition ratings. The FHWA requires that for each applicable bridge, the performance measures for determining condition be based on the minimum values for substructure, superstructure, deck, and culverts. The FHWA further requires counting this condition by the respective deck area of each bridge and express condition totals as a percentage of the total deck area of bridges in a state.



ANATOMY OF A BRIDGE

Condition ratings are based on a 0-9 scale and assigned for each culvert, or the deck, superstructure and substructure of each bridge. These ratings are recorded in the National Bridge Inventory (NBI) database. Condition ratings are an important tool for transportation asset management, as they are used to identify preventative maintenance needs, and to determine rehabilitation and replacement projects that require funding.

NBI Condition Ratings		
7-9	Good Condition	Routine maintenance candidate.
5-6	Fair Condition	Preventative maintenance and minor rehabilitation candidate.
4	Poor Condition	Poor
3-4		Serious or Critical
0-3		Imminent Failure or Failed
		Major rehabilitation or replacement candidate. <b>Bridge is closed to traffic.</b>

#### REPORTING ON BRIDGE CONDITION

The FHWA requires that State DOT's establish 2-year and 4-year targets for a 4-year performance period for the condition of infrastructure assets. State DOT's will establish their first statewide targets on **May 20th, 2018**. State DOT's are required to submit three performance reports to FHWA within the 4-year performance period.

- Baseline Performance Report  
-October 1st, 2018
- Mid-Performance Period Progress Report  
-October 1st, 2020
- Full Performance Period Progress Report  
-October 1st, 2022

The two performance measures for assessing bridge condition are:

- % of NHS bridges in Good Condition; and
- % of NHS bridges in Poor Condition.

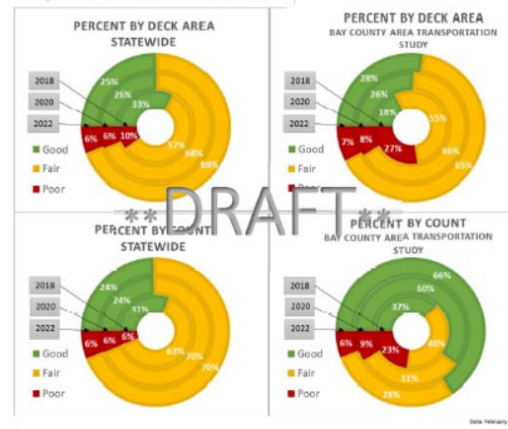
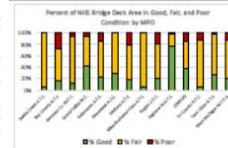
The MPO's will establish targets by either supporting a State DOT's statewide target, or defining a target unique to the metropolitan area each time State DOT's establish a target. As part of the Full Performance Period Progress Report, MPO's will report their established targets, performance, progress, and achievement of the targets to their respective state DOT in a manner that is agreed upon by both parties and documented in the Metropolitan Planning Agreement. The MPO's are not required to provide separate reporting to the FHWA. However, State DOT's and MPO's will need to coordinate and mutually agree to a target establishment reporting process. The minimum penalty threshold requires that no more than 10% of NHS bridges measured by deck area be classified as structurally deficient.

## BAY COUNTY AREA TRANSPORTATION STUDY

### Target Setting Facts for MPO's:

- All targets below are still in draft form, including 2018 values. 2018 values will be finalized on March 15th.
- Condition Improvement is estimated based on projects programmed through the MDOT capital program, both MDOT and local agency. The Improvement is applied the year after the date of letting.
- Deterioration is estimated based on comparing network wide deterioration rates to the age and condition of each major component of each structure.
- The significant increase in statewide deck area condition between 2018 and 2020 is primarily due to the deck replacement of the I-75 over the Rouge River bridge, which represents nearly 4% of the NHS deck area statewide.
- The targets are highly dependent on the deck area of bridges that fall to poor, and so the smaller the inventory considered, the higher potential for a single bridge to skew results. The statewide targets are assumed to be less variable than an individual MPO.

Number of NHS Bridges by Condition (Feb 2018)			
	Good	Fair	Poor
Statewide	916	166	178
Bay County Area Transportation Study			
MDOT	12	13	7
Local	1	1	1



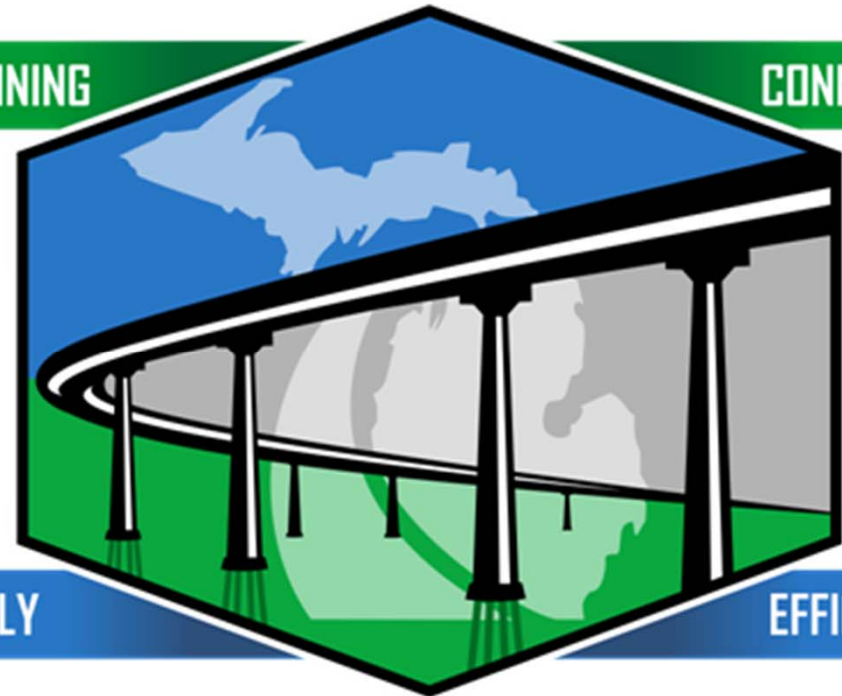
Questions?

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# BUREAU of BRIDGES

SPANNING

CONNECTING



SAFELY

EFFICIENTLY

# and STRUCTURES