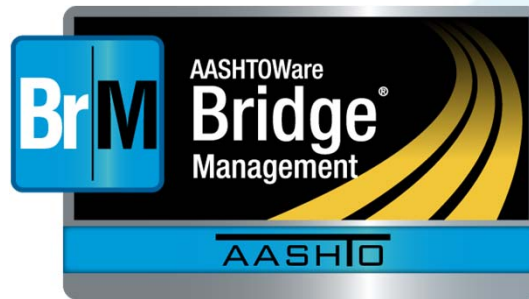


AASHTOWare Bridge Management Update



AASHTOWare Bridge Management

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User Group Priorities

User Group Concern/Priority Description	Priority Level (Points)	Response
Technical Manual for Analysis	1 (419)	✓ The Technical Manual has been release
Expanded Export/Import Options, PONWEB-2902	2 (187)	Draft FDS has been created
Clearance Table / Form / Report, PONWEB-1564	3 (178)	Draft FDS has been created
QC / QA Process , PONWEB-2237	4 (158)	Draft FDS is in progress
Patchable Version of BrM	5 (145)	✓ BrM 6.0 is the patchable version
Improved Projects Functionality, PONWEB-2803	6 (117)	Draft FDS is in progress
General Dashboards, PONWEB-2904	7 (106)	
Update Multimedia PONWEB-2200	8 (90)	Draft FDS has been created
Update tooltip functionality, PONWEB 2205	9 (85)	Draft FDS has been created
Tracking Historical Changes (Auditing changes to all fields of database), PONWEB-2900 (Was PONWEB-2204)	10 (75)	
Enhanced LCCA functionality , PONWEB-2229	11 (72)	Draft FDS has been created
More functionality for viewing Utility Value and Health Index, PONWEB-2727	12 (63)	Draft FDS has been created
Maintain Legacy Primary Keys, PONWEB-2968	13 (55)	
3D modeling Inspections, PONWEB-2198	14 (46)	
Work Candidates for Tunnels , PONWEB-2994	15 (39)	



User Group Priorities 2016

User Group Concern/Priority Description	Priority	Response
More Training on the Pyramid (Optimization), PONWEB-2256	1	✓ The 5.2.3 release will included basic use case examples in the user manual. In addition there is a series of tutorial videos on the website (aashtowarebridge.com).
Error Check Pre-Script (Upgrade script should perform all checks, then all installs. Like a checking pre-script), PONWEB-2179	2	✓ Part of BrM 5.3
Clearance Table / Form / Report, PONWEB-1564	3	Materials will be presented during the 2017 BrMUG and is included in the list for voting by the conclave.
Default data script (Upgrade scripts need to keep user customized data.), PONWEB-2190	4	✓ Part of BrM 5.3
Repsonsiveness of pages to different screens (HTML-5) , PONWEB-2265	5	✓ Part of BrM 5.3 with the rewrite of the condition grid
Cross - Sections Tables / Forms / Reports, PONWEB-1565	6	✓ Part of BrM 5.3
Tracking Historical Changes (Auditing changes to all fields of database), PONWEB-2900 (Was PONWEB-2204)	7	Materials will be presented during the 2017 BrMUG and is included in the list for voting by the conclave.
Screen Needs List Export , Export All Lists (e.g. Needs List) and Graphs, PONWEB-2310	8	✓ Was approved by the TF to be included in the next release.
Load Ratings , PONWEB-2234	9	✓ Part of BrM 5.3
QC / QA Process , PONWEB-2237	10	Materials will be presented during the 2017 BrMUG and is included in the list for voting by the conclave.
JIRA needs some improved filtering	-	This is an issue that is outside the control of the TF. JIRA is the application selected by AASHTO
Update Multimedia PONWEB-2200	11	Materials will be presented during the 2017 BrMUG and is included in the list for voting by the conclave.



User Group Priorities Survey Results

Rank	Total Points	Total Votes	Summary Title
1	596	19	LCCA, Projects and Program Enhancements
2	418	21	QA/QC Module and Track Historical Changes
3	278	16	Expanded Export/Import Options
4	242	10	Work Candidates for Tunnels
5	238	17	Clearance tab
6	237	15	Multimedia interface
7	219	16	Enhanced functionality for viewing Utility and Health Index
8	159	17	General Dashboards
9	118	13	Tool-tip functional update
10	96	12	Task Scheduler
11	82	4	Mobile Inspection Application
12	75	1	Maintenance Records Module
13	74	10	3D Inspection
14	68	2	Multimedia for Tunnels



Bridge Management 5.3

- Released September 2017
- Key Features
 - Element Condition Grid Re-Do
 - New Load Rating Module
 - New Cross Section Module
 - Migration from Cassini to IIS Express (Workstation)
 - Enhanced Rule Builder for Network Policies
 - Updates to Handling of Default Data
 - Error Check Prescript
 - Miscellaneous Small Enhancements/Bug Fixes



Element Condition Grid

Element Conditions Arrow Key Grid Navigation Help

Element: Struct. Unit.: Env.: [Clear Filters](#) Quantity Percent [Add Element](#)

Elem. ▲	Str. Unit. ▲	Env.	Element Description	Tot. Qty.	Units	Qty1	Qty2	Qty3	Qty4			
12	1	Ben. (1)	Re Concrete Deck	74712	sq.ft	14,329.000	58978	1405	0			
1090	1		Exposed Rebar	3	sq.ft	0.000	3	0	0			
1120	1		Efflorescence/Rust Staining	2940	sq.ft	0.000	2940	0	0			
1130	1		Cracking (RC and Other)	31290	sq.ft	0.000	29885	1405	0			
1190	1		Abrasion(PSC/RC)	26150	sq.ft	0.000	26150	0	0			
107	1	Ben. (1)	Steel Opn Girder/Beam	7354	ft	7,344.000	10	0	0			
Element Manual:												
Notes: [edit]												
1000	1		Corrosion	10	ft	0.000	10	0	0			
515	1		Steel Protective Coating	101694	ft	101,644.000	0	50	0			
113	1	Ben. (1)	Steel Stringer	2592	ft	2,592.000	0	0	0			
152	1	Ben. (1)	Steel Floor Beam	1824	ft	1,824.000	0	0	0			
205	1	Ben. (1)	Re Conc Column	22	each	16.000	6	0	0			
215	1	Ben. (1)	Re Conc Abutment	130	ft	130.000	0	0	0			
220	1	Ben. (1)	Re Conc Pile Cap/Ftg	24	ft	0.000	0	24	0			
231	1	Ben. (1)	Steel Pier Cap	146	ft	146.000	0	0	0			
234	1	Ben. (1)	Re Conc Pier Cap	543	ft	387.000	152	4	0			
301	1	Ben. (1)	Pourable Joint Seal	168	ft	0.000	103	65	0			
305	1	Ben. (1)	Assem Jnt Wthut Seal	110	ft	110.000	0	0	0			
311	1	Ben. (1)	Moveable Bearing	66	each	62.000	4	0	0			
313	1	Ben. (1)	Fixed Bearing	24	each	24.000	0	0	0			
321	1	Ben. (1)	Re Conc Approach Slab	1618	sq.ft	205.000	1298	115	0			
330	1	Ben. (1)	Metal Bridge Railing	2265	ft	2,265.000	0	0	0			
331	1	Ben. (1)	Re Conc Bridge Railing	2265	ft	2,256.000	8	1	0			



Load Rating Module

Bridge: 007641

Facility Carried (007): US 82 MP 239.816 (FIX PAF)

Metric English

Inspection > Load Ratings

Rating Event: 5/12/2017 [Create New Load Rating Event](#)

Current & Reported Ratings

Load Rating Review Recommended

Reported Rating

Open / Posted / Closed (041): A Open, no restriction
 Design Load (031): 5 MS 18 (HS 20)
 Posting (070): 5 At/Above Legal Loads

Vehicle	Item 64	Item 66	Rating	Tons	Event	Method 63/65
HS-20 Operating	<input type="checkbox"/>	<input type="checkbox"/>	0.83	0	5/12/2017	6 Load Factor (MS18)
HS-20 Inventory	<input type="checkbox"/>	<input type="checkbox"/>	1.38	0	5/12/2017	6 Load Factor (MS18)
HL-93 Operating	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.73	0	5/12/2017	8 LRFR (HL93)
HL-93 Inventory	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.95	0	5/12/2017	8 LRFR (HL93)
Type 3	<input type="checkbox"/>	<input type="checkbox"/>	1.88	0	5/12/2017	8 LRFR (HL93)
Type 3S2	<input type="checkbox"/>	<input type="checkbox"/>	1.52	0	5/12/2017	8 LRFR (HL93)
Type 3-3	<input type="checkbox"/>	<input type="checkbox"/>	1.53	0	5/12/2017	8 LRFR (HL93)
Notational SHV	<input type="checkbox"/>	<input type="checkbox"/>	1.59	0	5/12/2017	8 LRFR (HL93)
SHV 4	<input type="checkbox"/>	<input type="checkbox"/>	1.7	0	5/12/2017	8 LRFR (HL93)
SHV 5	<input type="checkbox"/>	<input type="checkbox"/>	1.51	0	5/12/2017	8 LRFR (HL93)
SHV 6	<input type="checkbox"/>	<input type="checkbox"/>	1.35	0	5/12/2017	8 LRFR (HL93)
SHV 7	<input type="checkbox"/>	<input type="checkbox"/>	1.22	0	5/12/2017	8 LRFR (HL93)
EV2	<input type="checkbox"/>	<input type="checkbox"/>	1.73	0	5/12/2017	8 LRFR (HL93)
EV3	<input type="checkbox"/>	<input type="checkbox"/>	1.72	0	5/12/2017	8 LRFR (HL93)

Load Rating Reports

Event Name: 5/12/2017 Load Rating Date: 5/12/2017
 Load Rater: Cody Parker, PE, HNTB Reviewer: Mitch Balle, SE, HNTB
 Software used: AASHTOWare BrR Secondary Software: AASHTOWare BrR

6" Asphalt replaced with Thin Bonded Polymer

Wearing Surface / Fill Depth: 0.36 inches Category: Routine

[Add New Rating](#)

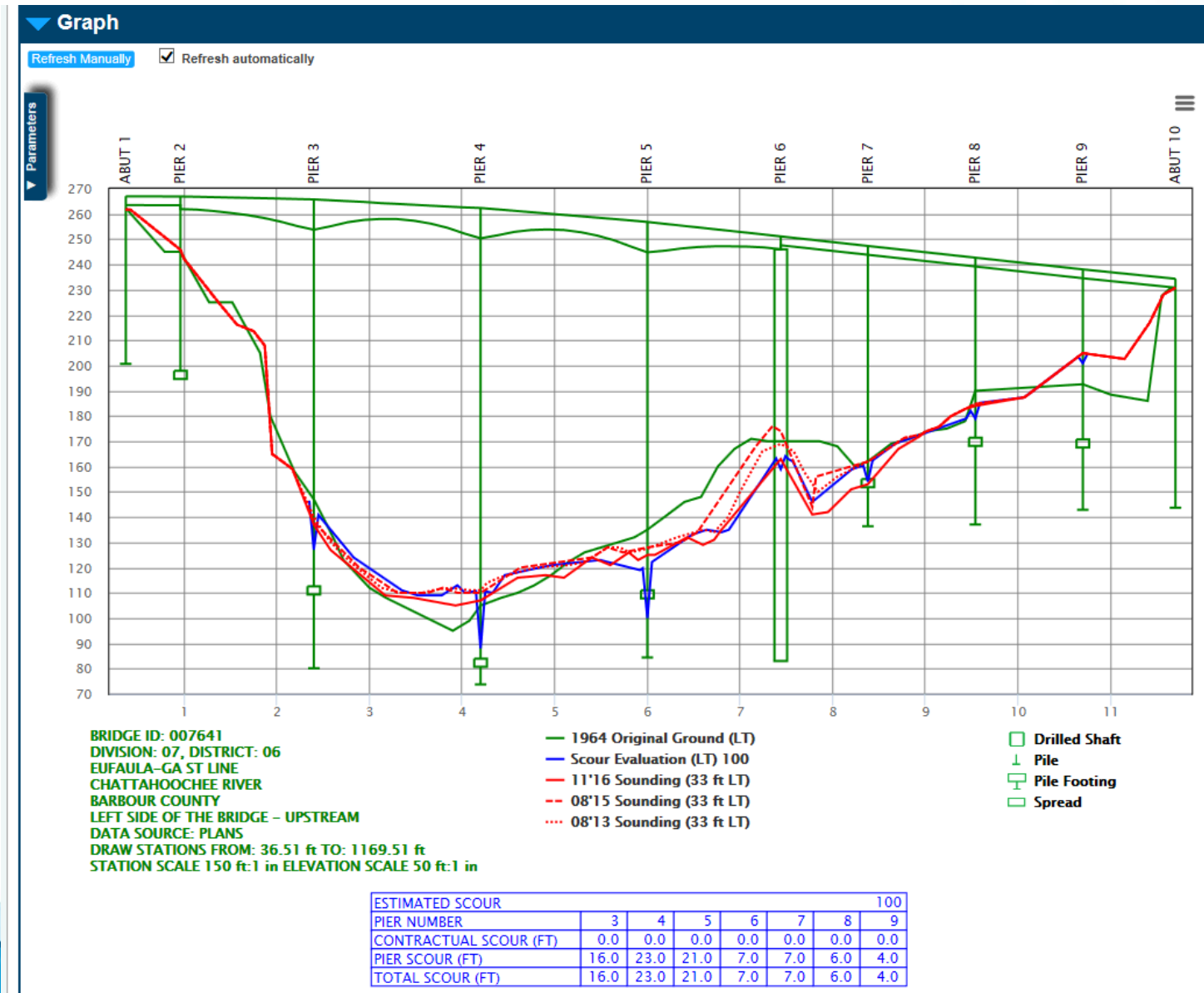
Vehicle	Current	Rating	Tons	Method	Analysis Type	Limit State	Location	Notes
HS-20 Operating	<input checked="" type="checkbox"/>	0.83	0	6 Load Factor (MS18)	Design	NA		
Nov 22, 2011 - 11/22/2011		0.69	0	6 Load Factor (MS18)	Design	NA		
HS-20 Inventory	<input checked="" type="checkbox"/>	1.38	0	6 Load Factor (MS18)	Design	NA		
Nov 22, 2011 - 11/22/2011		1.15	0	6 Load Factor (MS18)	Design	NA		
HL-93 Operating	<input checked="" type="checkbox"/>	0.73	0	8 LRFR (HL93)	Design	NA		
Nov 22, 2011 - 11/22/2011		0.67	0	8 LRFR (HL93)	Design	NA		
HL-93 Inventory	<input checked="" type="checkbox"/>	0.95	0	8 LRFR (HL93)	Design	NA		
Nov 22, 2011 - 11/22/2011		0.87	0	8 LRFR (HL93)	Design	NA		
Type 3	<input checked="" type="checkbox"/>	1.88	0	8 LRFR (HL93)	Legal	NA		
Type 3S2	<input checked="" type="checkbox"/>	1.52	0	8 LRFR (HL93)	Legal	NA		
Type 3-3	<input checked="" type="checkbox"/>	1.53	0	8 LRFR (HL93)	Legal	NA		
Notational SHV	<input checked="" type="checkbox"/>	1.59	0	8 LRFR (HL93)	Permit	NA		
SHV 4	<input checked="" type="checkbox"/>	1.7	0	8 LRFR (HL93)	Permit	NA		
SHV 5	<input checked="" type="checkbox"/>	1.51	0	8 LRFR (HL93)	Permit	NA		
SHV 6	<input checked="" type="checkbox"/>	1.35	0	8 LRFR (HL93)	Permit	NA		
SHV 7	<input checked="" type="checkbox"/>	1.22	0	8 LRFR (HL93)	Permit	NA		
EV2	<input checked="" type="checkbox"/>	1.73	0	8 LRFR (HL93)	Permit	NA		
EV3	<input checked="" type="checkbox"/>	1.72	0	8 LRFR (HL93)	Permit	NA		

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Cross Section Module



Rule Builder for Network Policies

USER, PONTIS

Admin > Modeling Config > Network Policies



- BRIDGES ▾
- TUNNELS ▾
- REPORTS ▾
- ADMIN ▴
- SECURITY ▾
- GENERAL CONFIG ▾
- MAPPING ▾
- MODELING CONFIG ▴
- ELEMENT SPEC
- ELEMENT-CHILD LINKING
- PROJECT CATEGORIES
- DETERIORATION PROFILES
- ELEMENTS
- ASSESSMENT
- BENEFIT GROUPS
- ACTION DEFS
- COST INDEX
- NETWORK POLICIES
- ADVANCED FORMULAS
- UTILITY
- WEIGHTS PROFILE
- NBI DETERIORATION MODELS
- NBI CONVERSION PROFILES

Network Policy Editor

Network Policy: Replace Deck ▾ Create New

Network Policy Details

Network Policy Name:

Actions

- ▣ Replace Deck - Network
 - Do Nothing
 - ▣ Replace Super - Network
 - Do Nothing
 - Rehab Sub - Network
 - ▣ Repaint Super/Sub - Network
 - Do Nothing
 - Rehab Sub - Network
 - ▣ Rehab Super - Network
 - Do Nothing
 - Rehab Sub - Network

Details

Action: Replace Deck - Network ▾ Project Category: Select a project category ▾

Action Conditional Rule

Summary

(Column 'dkrating' of Table 'inspevnt' is In Set '1 Imminent failure, 2 Critical, 3 Serious, 4 Poor, 5 Fair, 6 Satisfactory')

Rule Builder

Add Condition

Type: Is Null
Bridge Health Index
Element Health Index
Category Health Index
Material Health Index
Type Health Index
Element Condition State
Column Value In Param Set
Column Value

Table: inspevnt ▾ Column: dkrating ▾ Value Is: In ▾ Set: Unknown (NBI)
0 Failed
 1 Imminent failure
Test
 2 Critical
 3 Serious
 4 Poor
 5 Fair
NBI test
 6 Satisfactory

Remove Condition

Follow-up Actions

- Replace Super - Network ▾ ✗
- Repaint Super/Sub - Net ▾ ✗
- Rehab Sub - Network ▾ ✗
- Rehab Super - Network ▾ ✗
- Select an action ▾ Add Action

**Indicates an action is no longer a network level action. These actions can be can be changed, selected, or deleted, but once saved cannot be re-added.

Rule Builder for Network Policies

USER, PONTIS

Admin > Modeling Config > Network Policies

- BRIDGES ▾
- TUNNELS ▾
- REPORTS ▾
- ADMIN ▴
- SECURITY ▾
- GENERAL CONFIG ▾
- MAPPING ▾
- MODELING CONFIG ▴
- ELEMENT SPEC
- ELEMENT-CHILD LINKING
- PROJECT CATEGORIES
- DETERIORATION PROFILES
- ELEMENTS
- ASSESSMENT
- BENEFIT GROUPS
- ACTION DEFS
- COST INDEX
- NETWORK POLICIES
- ADVANCED FORMULAS
- UTILITY
- WEIGHTS PROFILE
- NBI DETERIORATION

Network Policy Editor
 Network Policy: Replace Deck Create New

Network Policy Details
 Network Policy Name: Replace Deck

Actions

- [-] Replace Deck - Network
 - Do Nothing
 - [-] Replace Super - Network
 - Do Nothing
 - Rehab Sub - Network
 - [-] Repaint Super/Sub - Network
 - Do Nothing
 - Rehab Sub - Network
 - Rehab Sub - Network
 - [-] Rehab Super - Network
 - Do Nothing
 - Rehab Sub - Network

Details
 Action: Replace Deck - Network Project Category: Select a project category

Action Conditional Rule

Summary
 (Percent Condition State '4' of Element '12 - Re Concrete Deck' Must Equal Number Value 25)

Rule Builder

Add Condition
Add Group

Type: Element Condition State ▾
 Percent Condition State 4 ▾ of Element 12 - Re Concrete Deck ▾ Must Be

Equal To
 Not Equal To
 Less Than
 Less Than or Equal To
 Greater Than
 Greater Than or Equal To

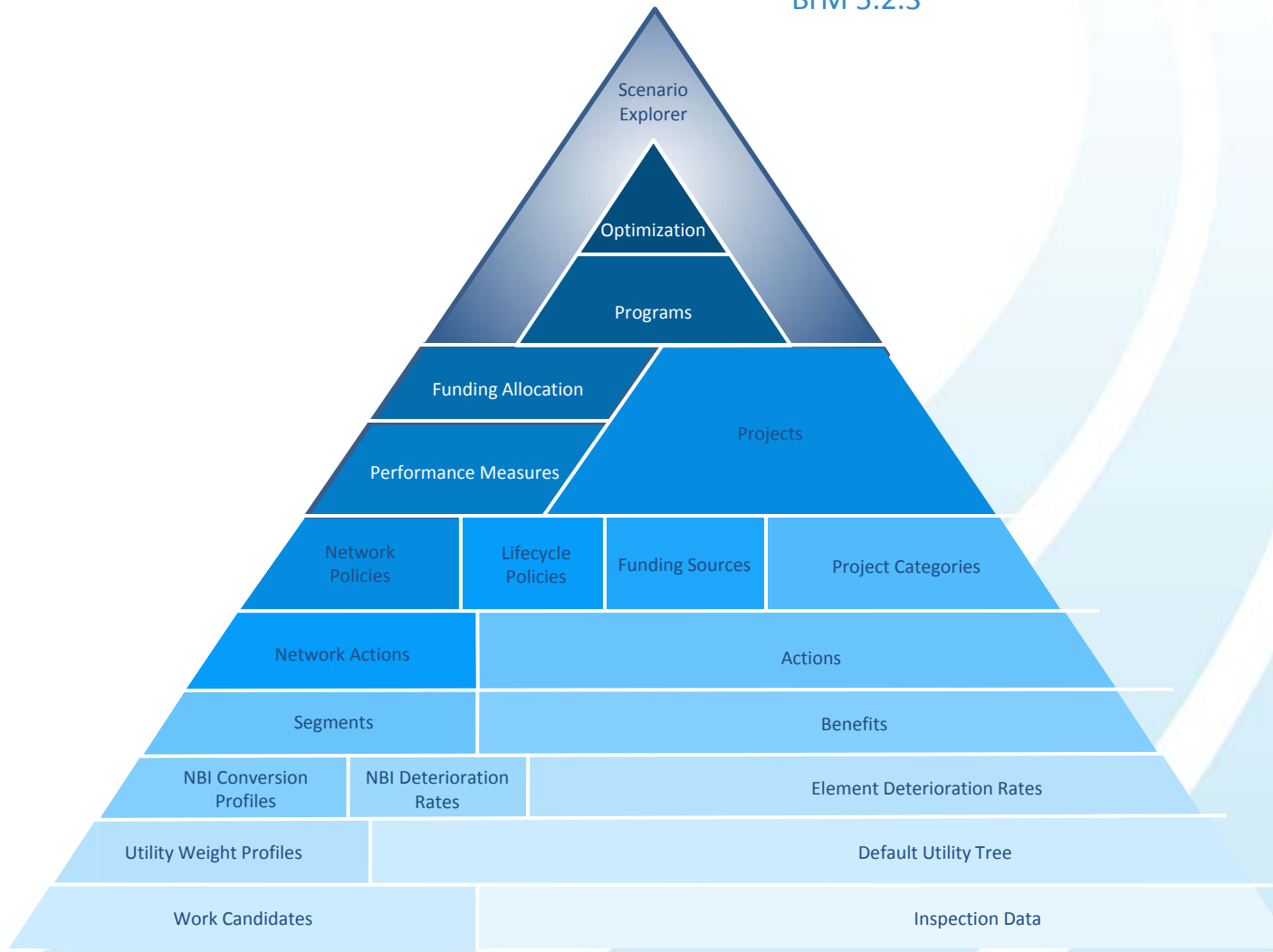
 Type: Number Value ▾
 Number Value 25 Remove Condition

Follow-up Actions

- Replace Super - Network ▾ ✗
- Repaint Super/Sub - Net ▾ ✗
- Rehab Sub - Network ▾ ✗
- Rehab Super - Network ▾ ✗
- Select an action ▾ Add Action

**Indicates an action is no longer a network level action. These actions can be can be changed, selected, or deleted, but once saved cannot be re-added.

BrM 5.2.3

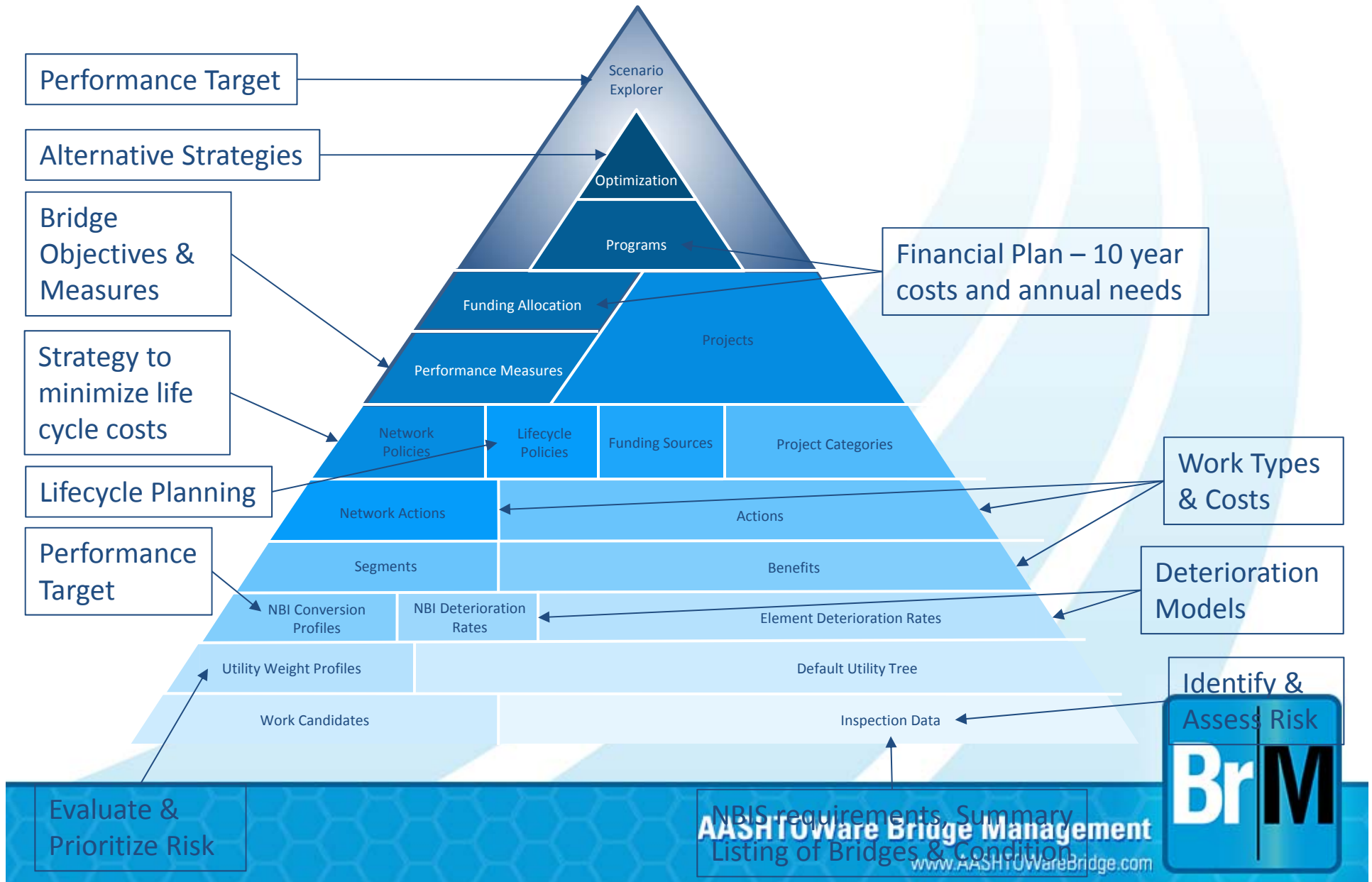


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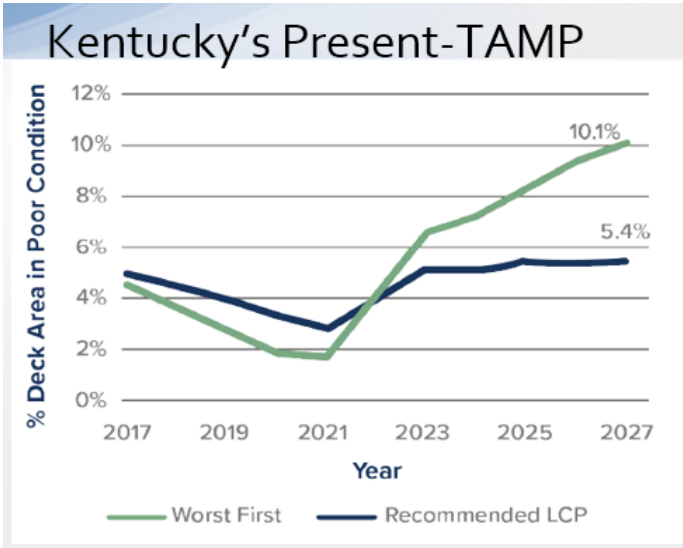
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Investment Strategies & Plans



Kentucky Data-Driven Decisions



Michigan TPM Target Setting

Component Deterioration Modeling

Model

Model Parameters

NBI Transition Time in Years 9 :

NBI Transition Time in Years 8 :

NBI Transition Time in Years 7 :

NBI Transition Time in Years 6 :

NBI Transition Time in Years 5 :

NBI Transition Time in Years 4 :

NBI Transition Time in Years 3 :

NBI Transition Time in Years 2 :

NBI Transition Time in Years 1 :

USER, PONTIS

Admin > Modeling Config > Benefit Groups

▶	Superstructure - Replace	Superstructure - Replace	Replace Super - Network, Superstructure Replace	Yes		
▶	TPM - Culvert - Fair	Make NBI Culvert Fair	TPM - Culvert - 5	Yes	1	
▶	TPM - Culvert - Good	Make NBI Culvert Good	TPM - Culvert - 7	Yes	1	
▶	TPM - Deck - Fair	Make NBI Deck Fair	TPM - Deck - 5	Yes	1	
▶	TPM - Deck - Good	Make NBI Deck Good	TPM - Deck - 7	Yes	1	
▶	TPM - Sub - Fair	Make NBI Sub Fair	TPM - Sub - 5	Yes	1	
▶	TPM - Sub - Good	Make NBI Sub Good	TPM - Sub - 7	Yes	1	
▶	TPM - Super - Fair	Make NBI Super Fair	TPM - Super - 5	Yes	1	
▼	TPM - Super - Good	Make NBI Super Good	TPM - Super - 7	Yes	1	

Expand Group Details Collapse Group Details

▶ Child Benefit Groups (0)

Alabama Deterioration Models

Alabama DOT bridge deterioration modeling study

Decision on final deterioration model Group: **CD** Concrete Deck (4840 pairs)

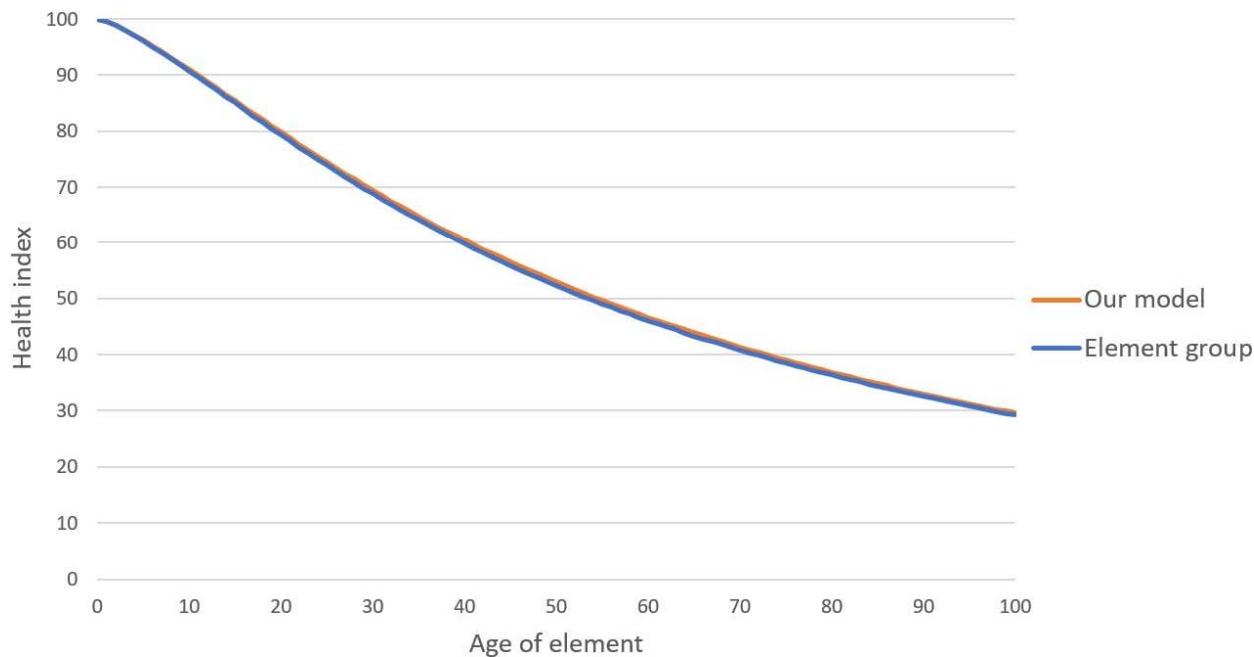
3

Transition times in years

Based on element inspections (From state → To state)				
Aggregation level	1 → 2	2 → 3	3 → 4	1 → 4
Concrete Deck	20	28	75	150
All Deck elements	16	21	58	118
All Concrete elements	29	25	104	191
Our decision	20	28	75	151
After 20 years	50%	40%	9%	1%
After 50 years	10%	45%	37%	7%

Based on NBI conditions (From state → To state)				
Aggregation level	7 → 6	6 → 5	5 → 4	7 → 4
Concrete Deck	26	19	113	186
All Deck elements	17	12	32	79
All Concrete elements	27	21	26	96

Health index over time for a typical bridge



Egroup	Name
CA	Concrete Appr Slab
CC	Concrete Culvert
CD	Concrete Deck
CR	Concrete Railing
CS	Concrete Super
CU	Concrete Substr
MB	Misc Bearing
MC	Misc Culvert
MJ	Misc Joint
MP	Misc Paint
MU	Misc Substr
MW	Misc Wearing
PD	Prestress Deck
PS	Prestress Super
SB	Steel Bearing
SC	Steel Culvert
SD	Steel Deck
SJ	Steel Joint
SR	Steel Railing
SS	Steel Super
SU	Steel Substr
TD	Timber Deck
TS	Timber Super
TU	Timber Substr

Life Thresholds

Elements:	50%
NRI:	50%

Alabama Deterioration Models

Element: (12) Re Concrete Deck

Model Parameters

Median years in CS1: Median years in CS2: Median years in CS3: Shaping parameter:

Element Assumptions

Environment: Protective system(s):

Element: (12) Re Concrete Deck

Model Parameters

Median years in CS1: Median years in CS2: Median years in CS3: Shaping parameter:

Element Assumptions

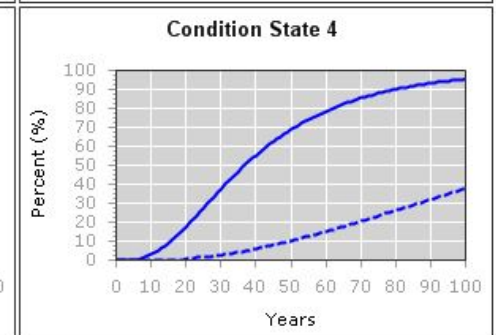
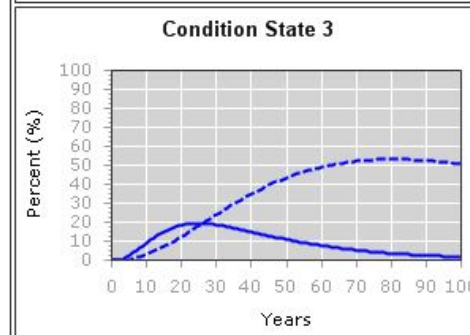
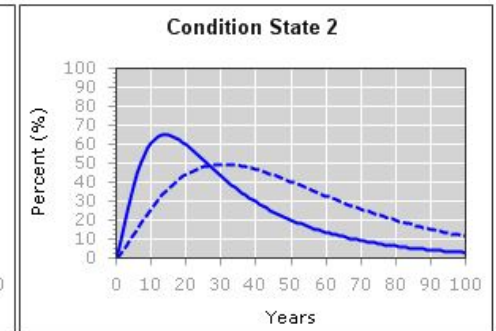
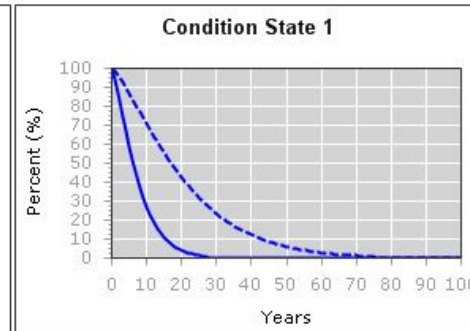
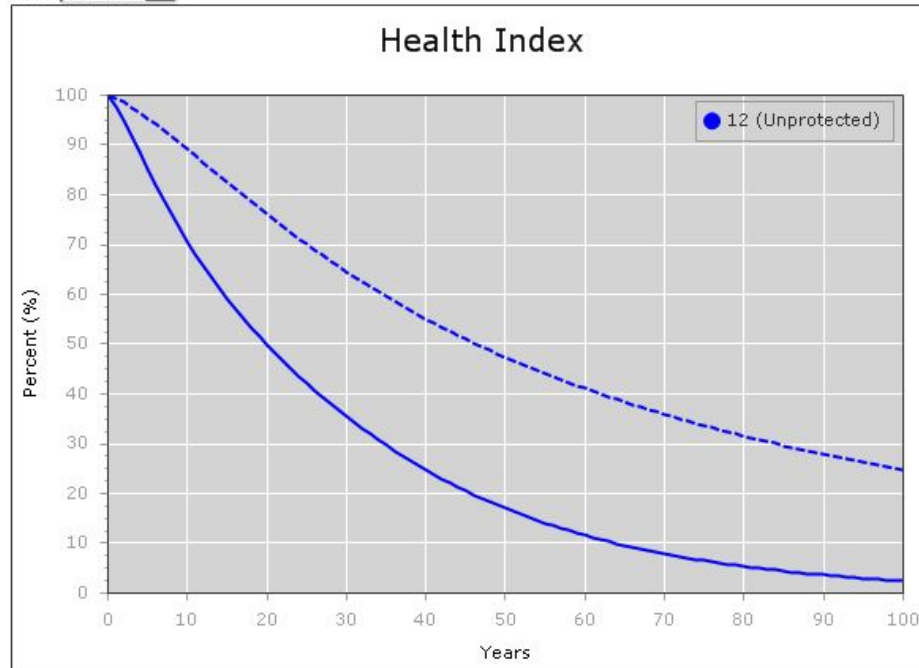
Environment: Protective system(s):



Alabama Deterioration Models

Deterioration Curves

Scale: 100 years



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Alabama Deterioration Models

Year	Pct. 1	Pct. 2	Pct. 3	Pct. 4	Health Index
1	98.27	1.73	0.00	0.00	99.42
2	95.80	4.15	0.05	0.00	98.58
3	92.99	6.84	0.17	0.00	97.61
4	89.97	9.66	0.36	0.00	96.54
5	86.83	12.53	0.64	0.01	95.39
6	83.61	15.39	0.99	0.01	94.20
7	80.36	18.20	1.42	0.02	92.96
8	77.09	20.94	1.93	0.04	91.70
9	73.84	23.59	2.51	0.06	90.41
10	70.63	26.13	3.16	0.09	89.10
11	67.46	28.54	3.87	0.12	87.78
12	64.36	30.83	4.65	0.16	86.46
13	61.32	32.98	5.49	0.21	85.14
14	58.36	34.99	6.37	0.27	83.81
15	55.48	36.87	7.31	0.34	82.50
16	52.70	38.60	8.29	0.42	81.19
17	50.00	40.18	9.31	0.51	79.89
18	47.40	41.63	10.36	0.61	78.61
19	44.89	42.95	11.44	0.72	77.33
20	42.48	44.13	12.55	0.85	76.08
21	40.16	45.18	13.68	0.98	74.84
22	37.94	46.10	14.83	1.13	73.62
23	35.81	46.90	15.99	1.29	72.41
24	33.78	47.59	17.17	1.46	71.23
25	31.84	48.16	18.35	1.65	70.07



New Technical Manual

- > Chapter 1 | Introduction
- > Chapter 2 | Installation
- > Chapter 3 | Database System
- > Chapter 4 | Modeling System
 - 4.1 Introduction
 - > 4.2 Methodology
 - 4.2.1 Multi-Objective Decision-Making
 - 4.2.2 Utility Theory
 - 4.2.3 Trade-offs
 - 4.2.4 Application of Methodology
 - 4.2.5 Utility Value in BrM
 - 4.2.6 Utility Value Calculations
 - > 4.3 Project Selection Framework
 - 4.3.1 . Incremental Benefit Costs
 - 4.3.2 Network Policies
 - 4.3.3 Structure Weights
 - 4.3.4 Program Simulation Algorithm Flowcharts
 - > 4.4 Deterioration Modeling
 - 4.4.1 Markovian Model
 - 4.4.2 Shaping Parameter
 - 4.4.3 Protection Factors



AASHTOWare BRIDGE MANAGEMENT

Technical Manual
BrM Release 6.0
August 31, 2018



AASHTOWare Bridge Management

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Bridge Management 6.0

- Released September 2018
- Key Features
 - 'Patchable Version'
 - Mapping Feature Enhancements to reference the more precise latitude and longitude values
 - NBE Import for the National Bridge Elements from the NBE file submitted to the FHWA
 - Work Candidates may be excluded from optimization
 - Improved export for all screen lists and graphs
 - Improved Reports
 - Bugs reported in JIRA as of April 11, 2018 have been fixed



Bridge Management 6.0 (First Patch)

- Planned Release for Later 2018
- Key Features
 - Actions can have the cost vary by condition state
 - Network Policies can have rules on a combination of condition states
 - Lifecycle Policies can have rules on a combination of condition states
 - Benefits Page overhaul (Usability Enhancement)



Bridge Management 6.0 (First Patch)

- Key Features
 - Optimizer Work Repetition exclusion rule
 - Analysis page dealing with work candidates whose date has passed
 - Item 10 and 47 conversion errors over 100 feet
 - Show/Hide inactive benefits
 - Bugs reported in JIRA after April 11, 2018 will be fixed



Questions?

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