



# **MAINTENANCE AND OPERATIONS COMPREHENSIVE REVIEW BRIEFING**

**|** Kevin Gregg, Chief of Maintenance and Operations

October 22, 2024

# Comprehensive Review Update

- **Pavements**
- **Structures**
- **Routine Maintenance**
- **Special Structures**
- **Emergencies**

# VDOT's Maintenance and Operations Program

Maintenance and Operations  
\$2.7 Billion Annually less \$616 Million Localities

**VDOT - \$2.2 Billion Annually**

## MAINTENANCE

Over **\$700**  
million



Pavement

Over **\$215**  
million



Bridges

Over **\$430**  
million



Routine  
Maintenance

Over **\$230**  
million



Roadside

Over **\$220**  
million



Emergency Funds

## TRAFFIC AND OPERATIONS

Over **\$35**  
million



Guardrail

Over **\$20**  
million



Ferries

Over **\$200**  
million



Traffic Items

Over **\$50**  
million



Special Structures  
Daily Operations

Over **\$100**  
million

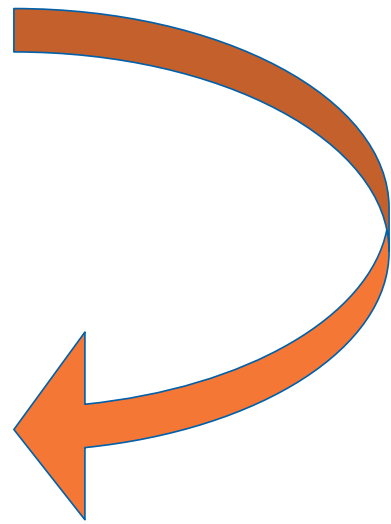


Operations  
Centers

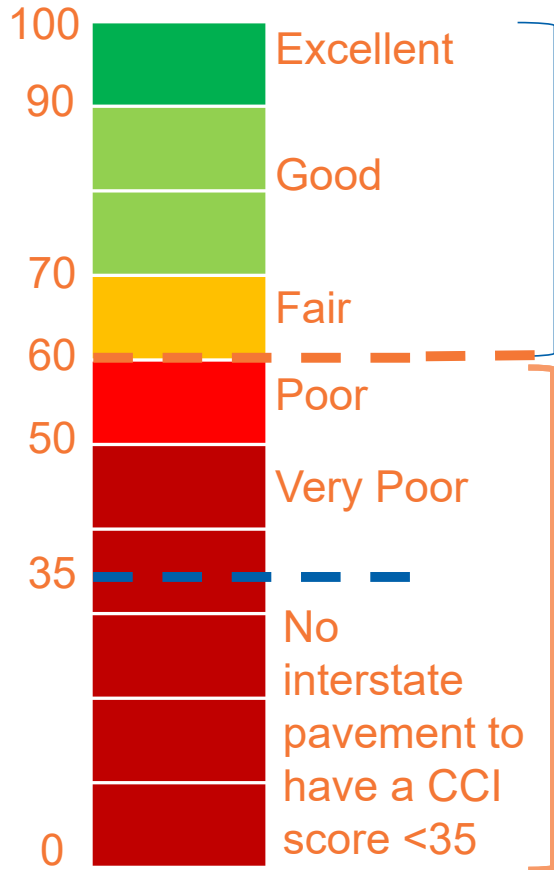
# Pavements

# Pavement Assessment Process

Interstate, Primary, Secondary  $\geq 3500$  – annual  
Secondary  $< 3500$  - 20% annually

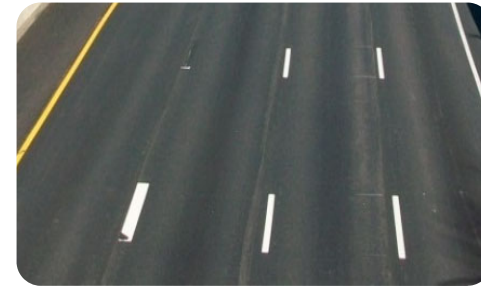


# Pavement Rating – What is Critical Condition Index (CCI)?



**Sufficiency Percentage** is the percentage of lane miles with a CCI score  $\geq 60$

What does CCI look like?



CCI 90-100  
(Excellent)



CCI 50-59  
(Poor)



Asphalt



Concrete

Image shows approximately CCI 35

# Pavement Treatment - Maintenance Activities

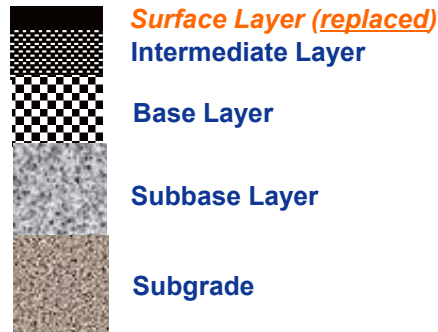
## Preventive (CCI 88-66)\*



Preserves good pavements in good condition at low costs

\* All CCI ranges are for plant mix, across all system categories

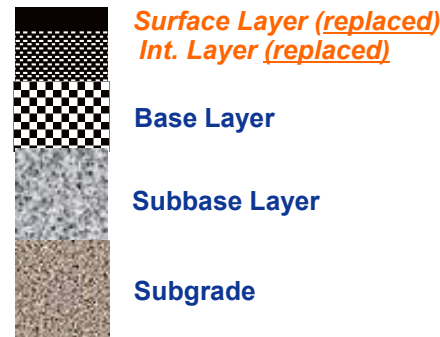
## Corrective (CCI 65-41)\*



Addresses moderate distresses

4 times more expensive than PM

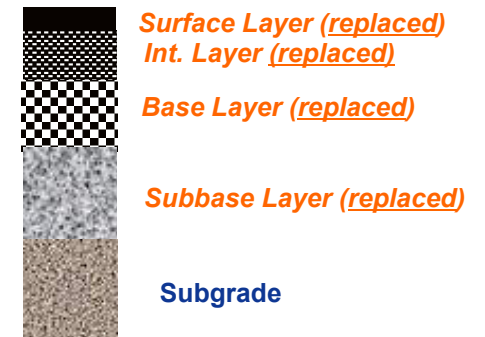
## Restorative (CCI 59-26)\*



Addresses moderate to heavy distresses

2 times more expensive than CM

## Reconstruction (CCI <37)\*



Addresses pavements under heavy distresses or in failed condition

2 times more expensive than RM



# Pavements - Performance Measures

Performance Measure	Current Policy (CTB Approved December 2019) % Sufficiency*
Interstate	82% No Section Critical Condition Index** less than 35
Primary	82% for $\geq$ AADT*** 3,500 75% for $<$ AADT 3,500
Secondary	82% for $\geq$ AADT 3,500 60% for $<$ AADT 3,500

\*% Sufficiency – the percent of the pavement inventory with a CCI of 60 or better

\*\*Critical Condition Index – (CCI) – rating system

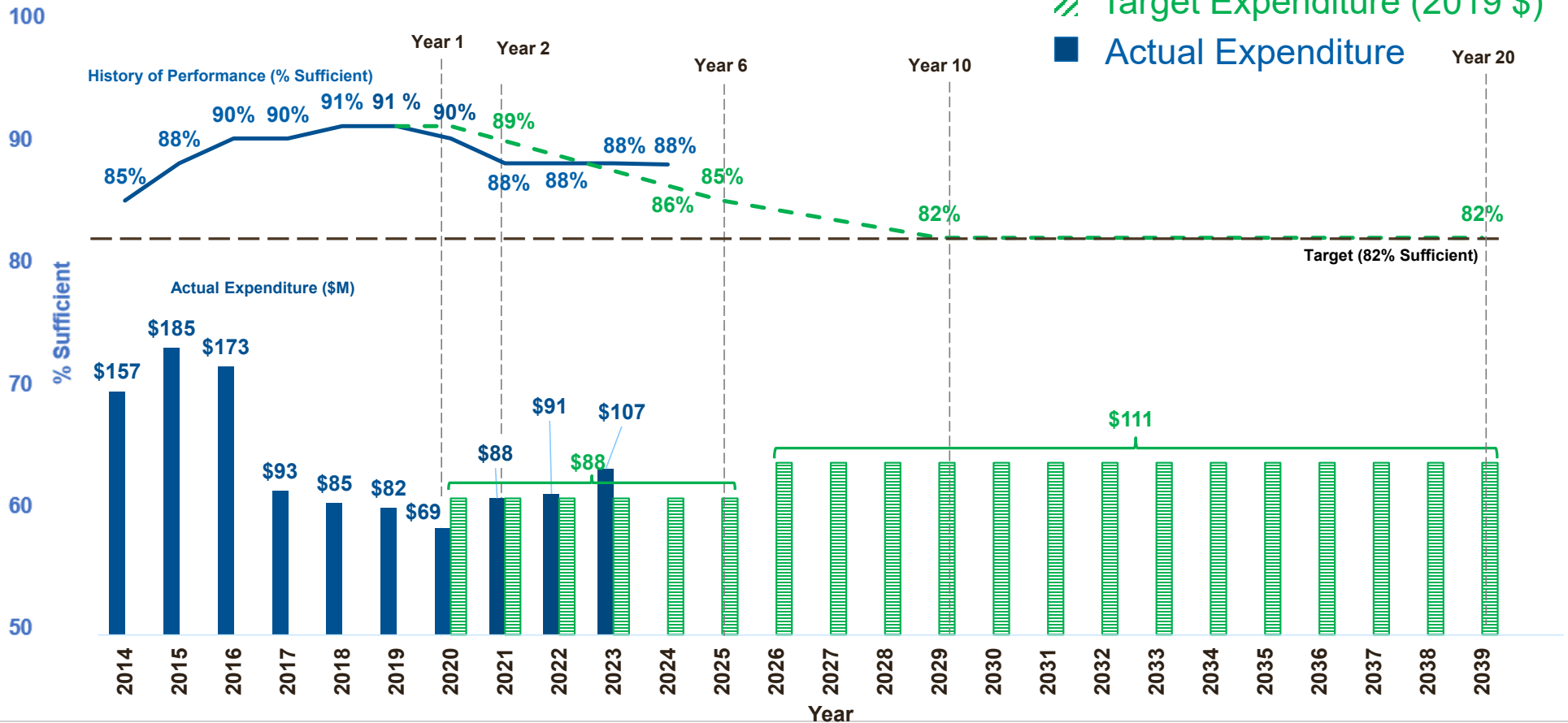
\*\*\*Annual Average Daily Traffic - AADT

# Interstate Network – 20 Year Outlook

(Predicted & Actual Performance)

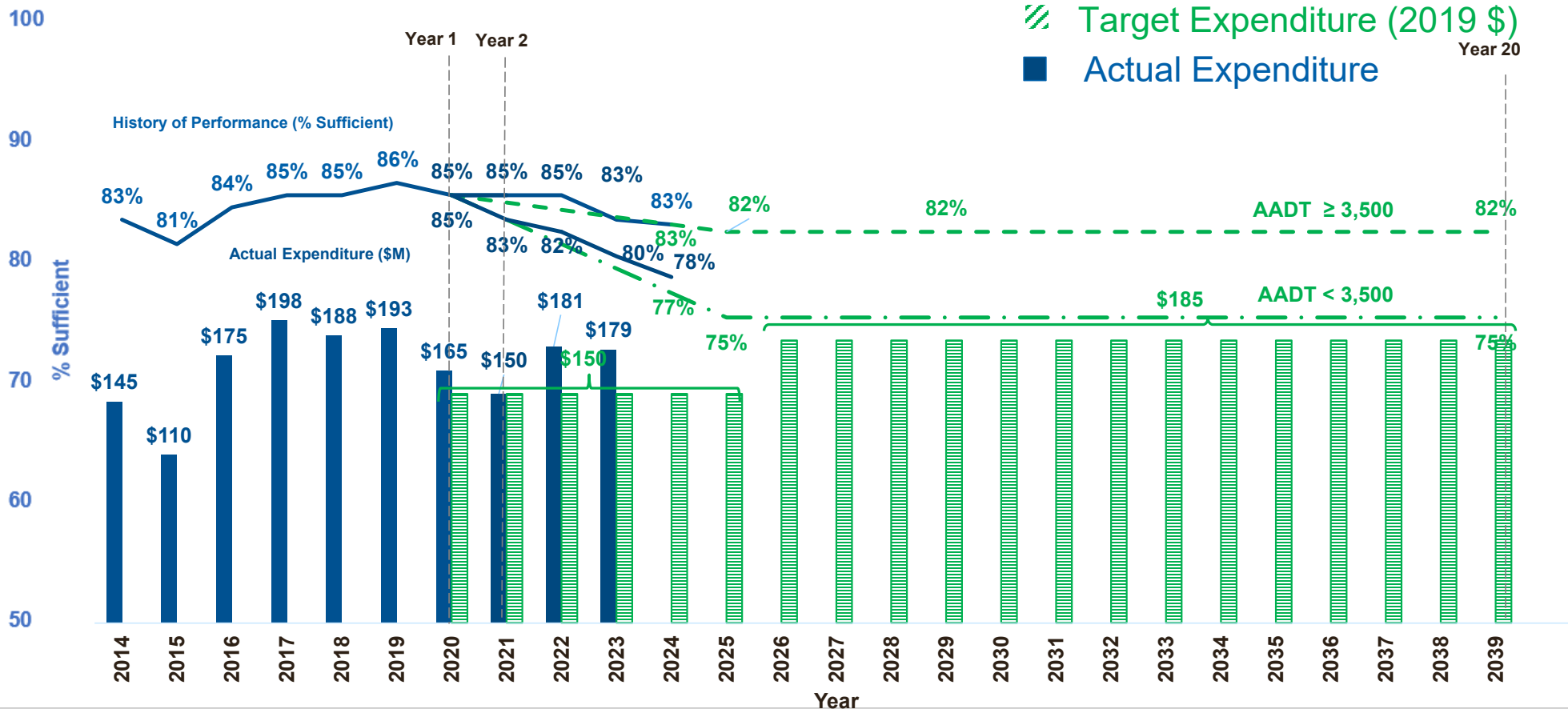
## 5,749 lane miles

- - - Target Performance: 82%
- Actual Performance
- ▨ Target Expenditure (2019 \$)
- Actual Expenditure



# Primary Network – 20 Year Outlook (*Predicted* & *Actual* Performance) 21,938 lane miles

- Target Performance AADT ≥ 3,500: 82%  
14,993 lane miles
- Actual Performance AADT < 3,500: 75%  
6,945 lane miles
- ▨ Target Expenditure (2019 \$)
- Actual Expenditure

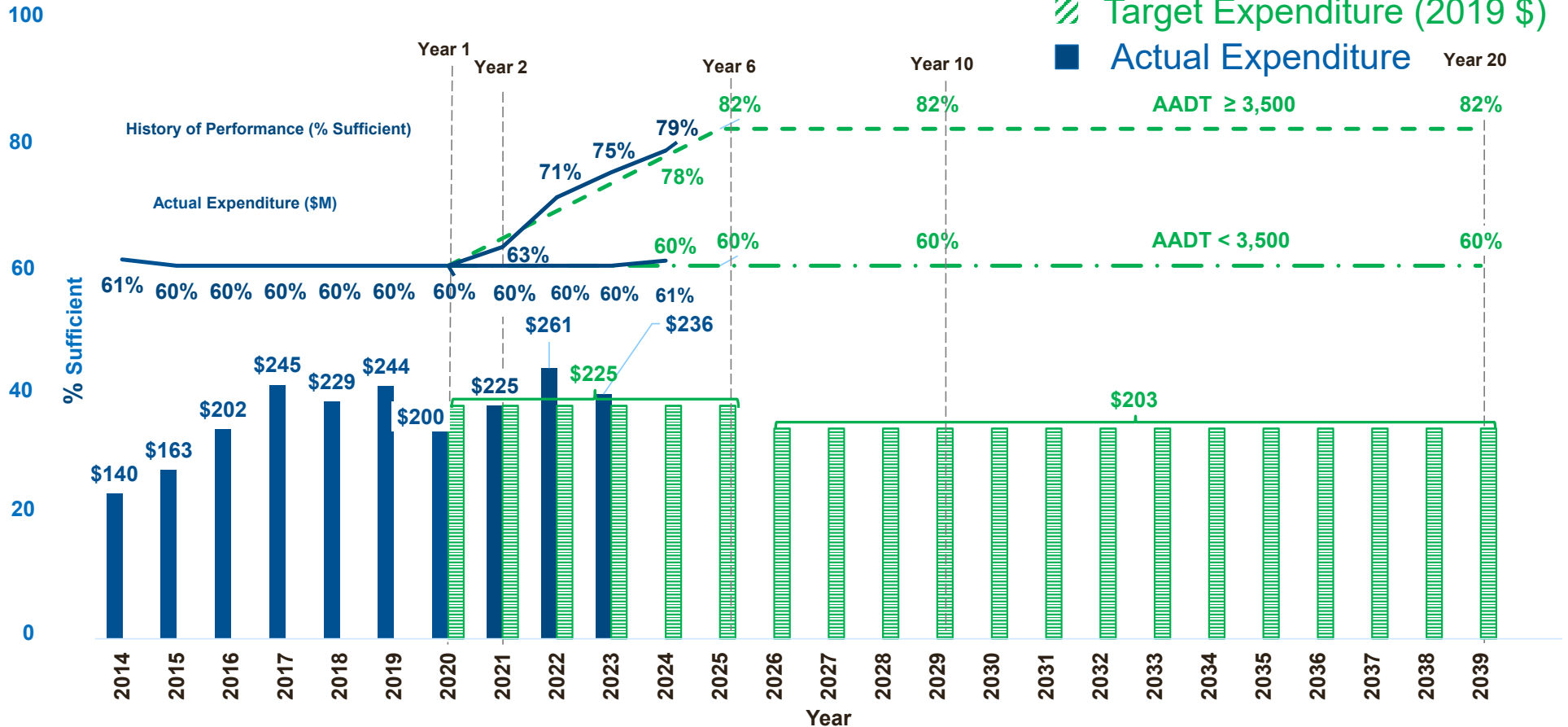


# Secondary Network – 20 Year Outlook

(Predicted & Actual Performance)

## 88,973 lane miles

--- Target Performance AADT ≥ 3,500: 82%  
 5,359 lane miles  
 AADT < 3,500: 60%  
 — Actual Performance 83,614 lane miles



# Pavements – Annual Contract Values

Year	Lane Miles	Amounts (\$ in Millions)*
2020**	3,998	\$435
2021	6,030	\$463
2022	5,876	\$533
2023	5,732	\$523
2024	7,143	estimated \$765
2025	7,461	estimated \$710

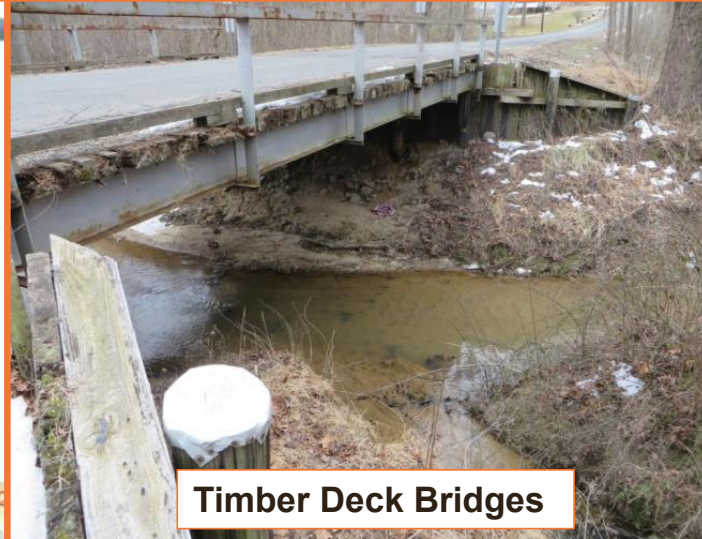
\*Amounts reflected in this chart are the awarded contract amounts which may differ from expenditure amounts due to lag in billings

\*\*Targets approved in December 2019 – this work was already advertised/awarded

# Structures



**Metal Culverts**



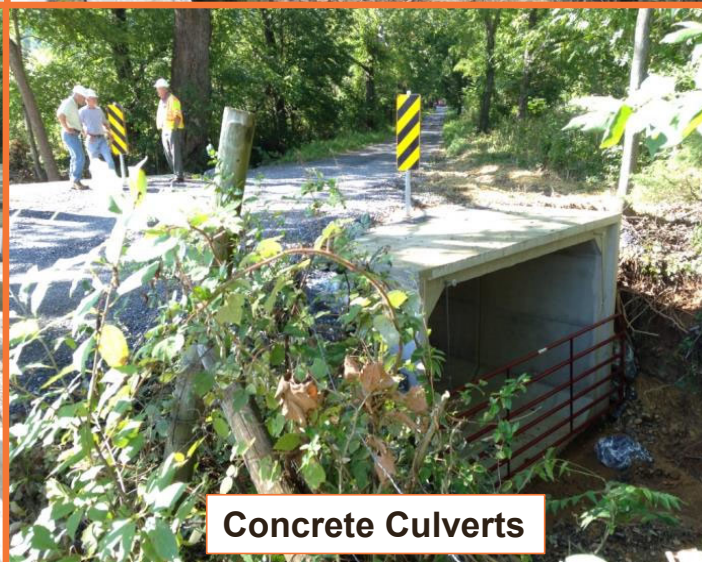
**Timber Deck Bridges**



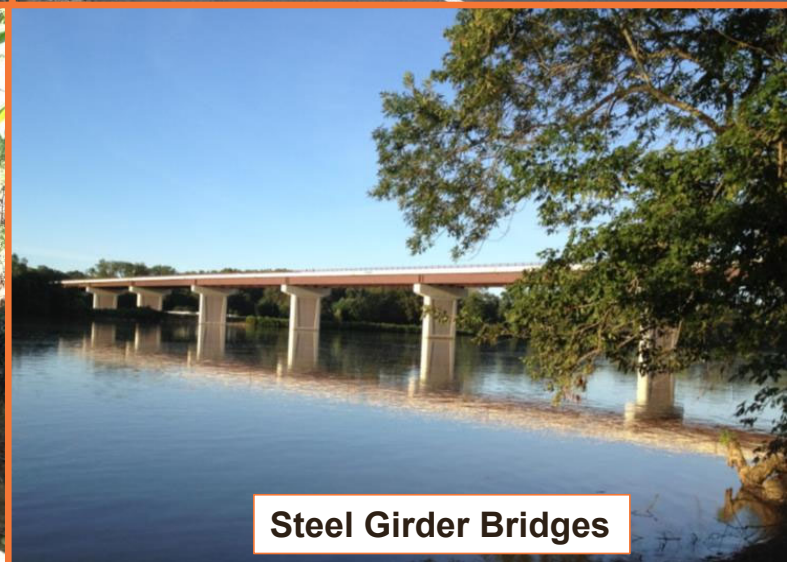
**Concrete Girder Bridges**



**Concrete Slab Bridges**



**Concrete Culverts**



**Steel Girder Bridges**

# Structure Inspection & Assessment Process

FRAZER, BRETT

Bridge: [0416270-000000000] Facility Carried (007): RAMBLE ROAD Inspection: 2016-07-06 (MH5) Type: Regular NBI Metric English



## Inspection > Condition

**Condition Ratings**

Deck (058): N N/A (NBI) Channel (061): 7 Minor Damage  NBI Converter Profile: B/M Default

Superstructure (059): N N/A (NBI) Culvert (062): 8 No Major Problem

Substructure (060): N N/A (NBI) Waterway (071): 8 Equal Desirable

Unrepaired Spalls: \_\_\_\_\_ (SF)

**Element Conditions**

Hide Elem Inspection Details Arrow Key Grid Navigation Help

Element: Elem # or Elem Desc. Struct. Unit.: All Env.: All Clear Filters  Quantity  Percent

Elem.	Str. Unit.	Env.	Element Description	Tot. Qty.	Units	Qty1	Qty2	Qty3	Qty4			
241	1	Low (2)	Re Conc Culvert	76	ft	79,000	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
824	1	Low (2)	RC Wingwall	4	(EA)	4,000	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
831	1	Low (2)	Culvert End/Headwall	2	(EA)	2,000	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
833	1	Low (2)	Roadway Ov. Culv.	1	(EA)	1,000	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
854	1	Low (2)	Channel	1	(EA)	1,000	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2 year cycle

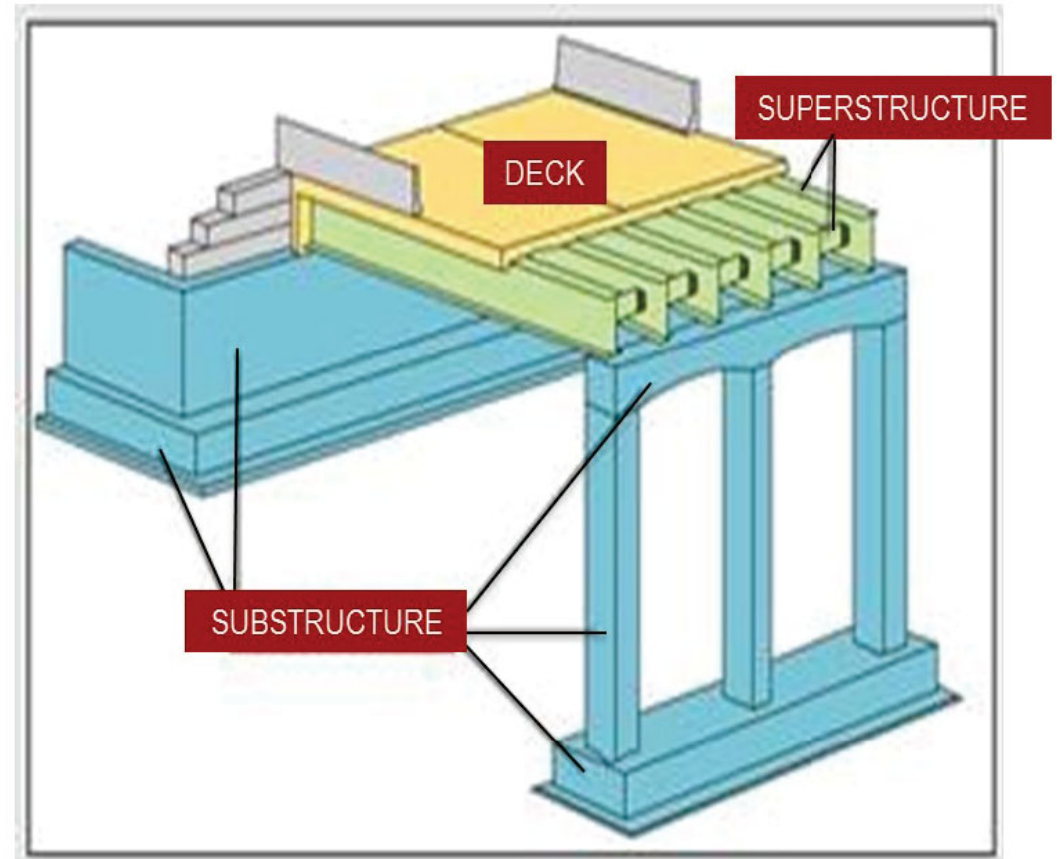




# Bridge Rating - What is a GCR (General Condition Rating)?



Bridge Components

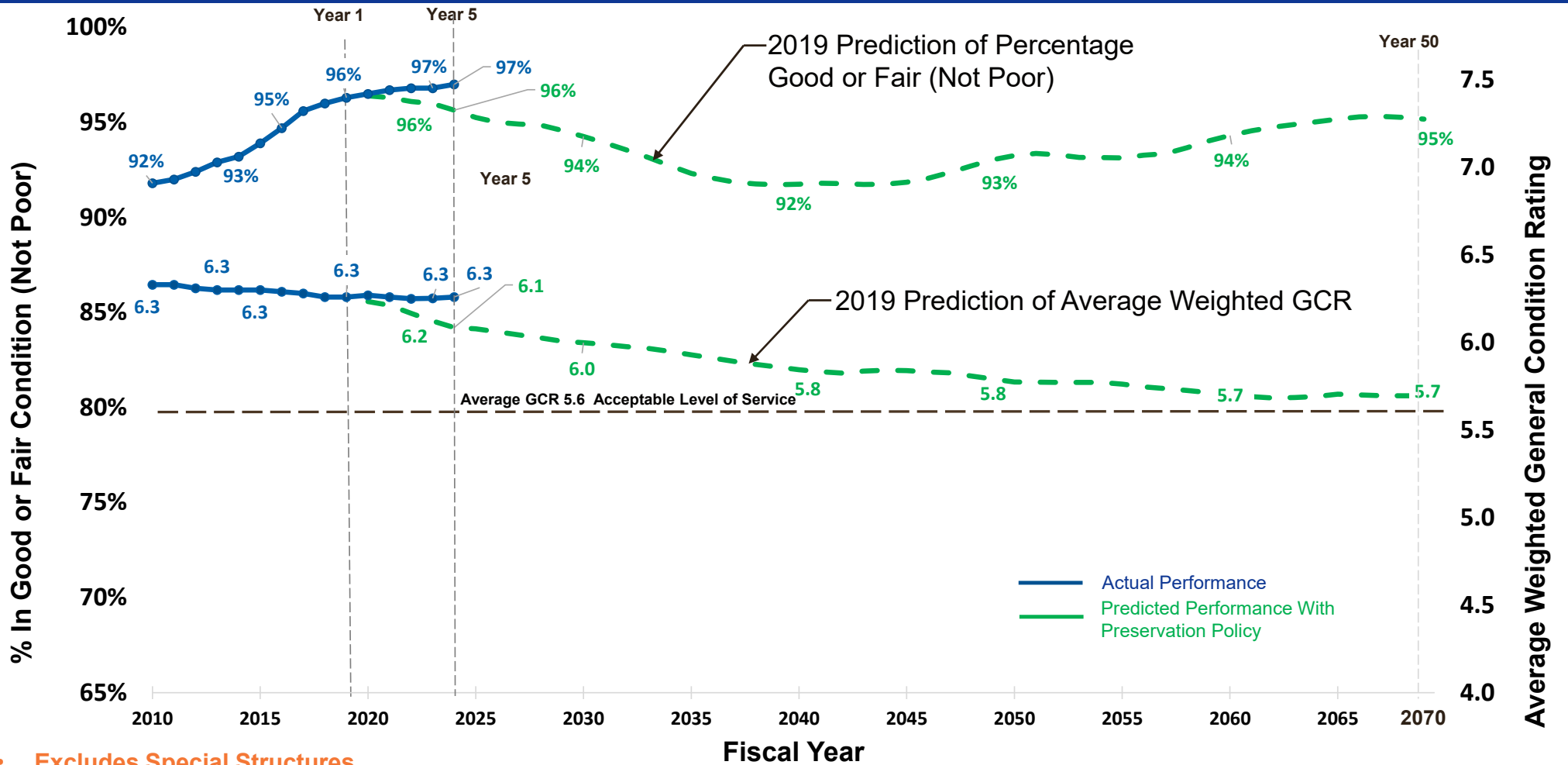


# Structures - Performance Measures

Performance Measure Description	Current Policy Preservation (CTB Approved December 2019)	
	Average General Condition Rating (GCR)	% Not Poor
All Systems	≥ 5.6	N/A
Interstate		97% No Postings
Primary		93%
Secondary		90%

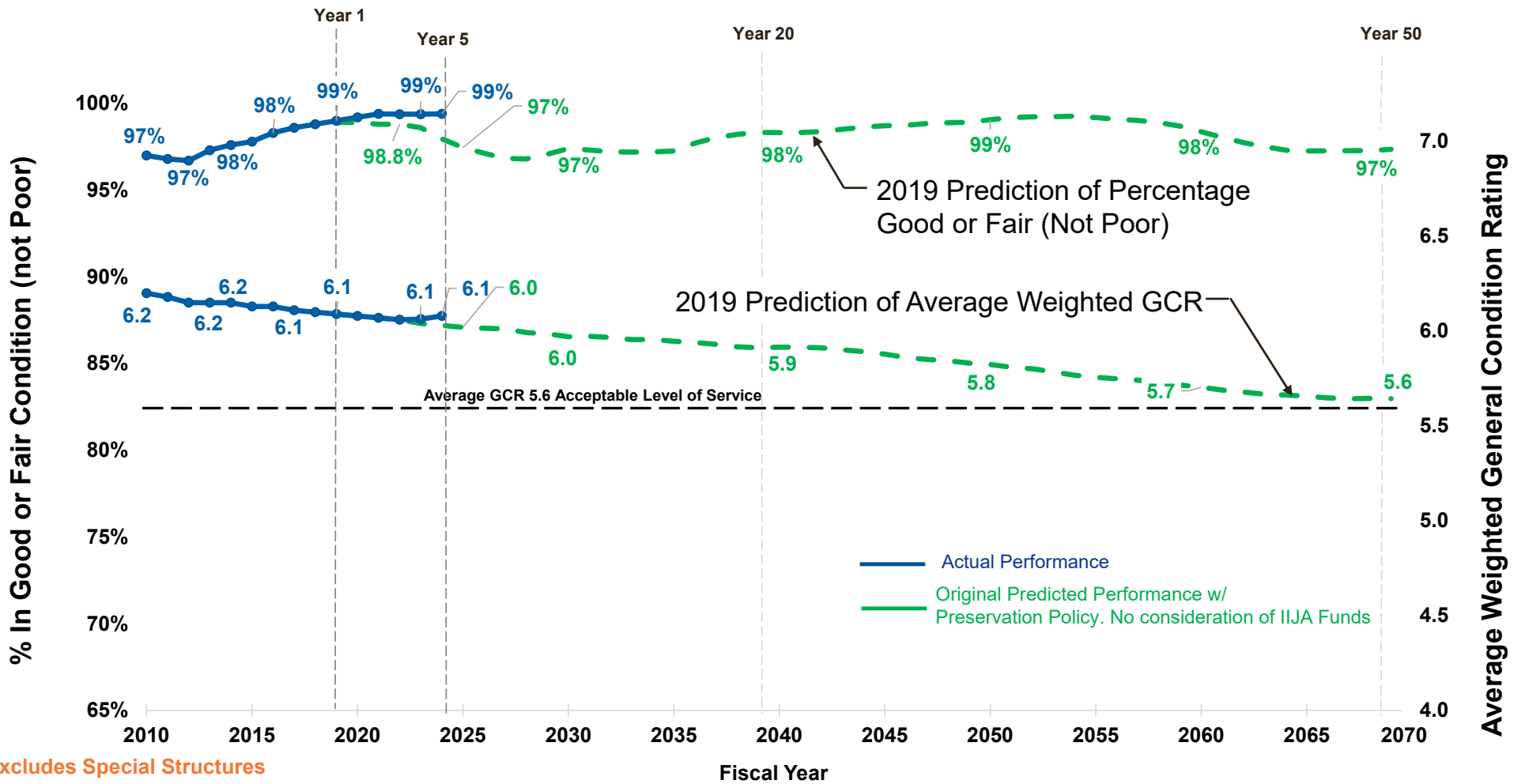
% Not Poor – percentage of structures with a GCR of 5 (Fair) or better

# All Networks Combined – 50 Year Outlook - 21,199 Structures



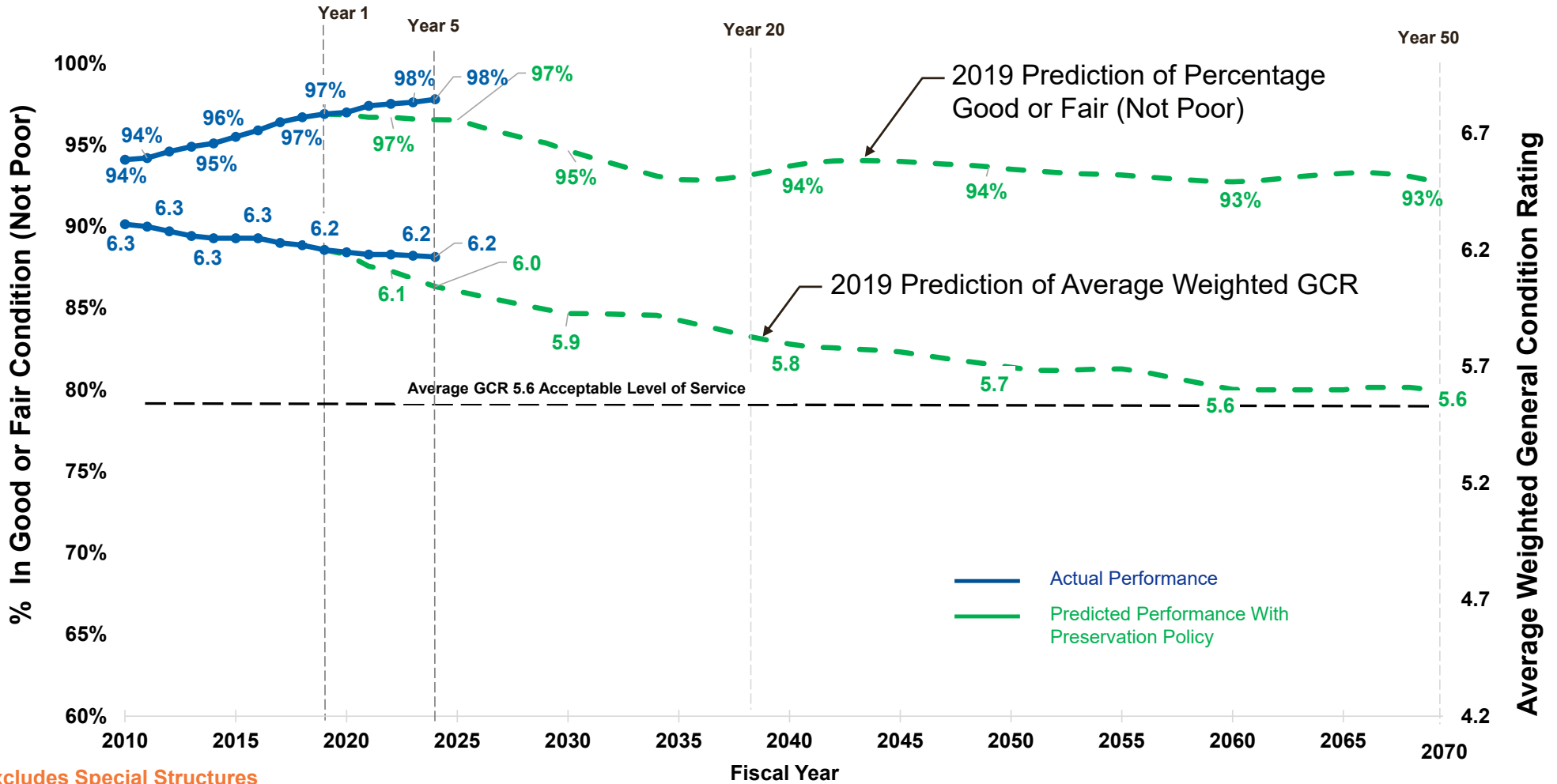
• Excludes Special Structures

# Interstate Network – 50 Year Outlook - 2,436 Structures



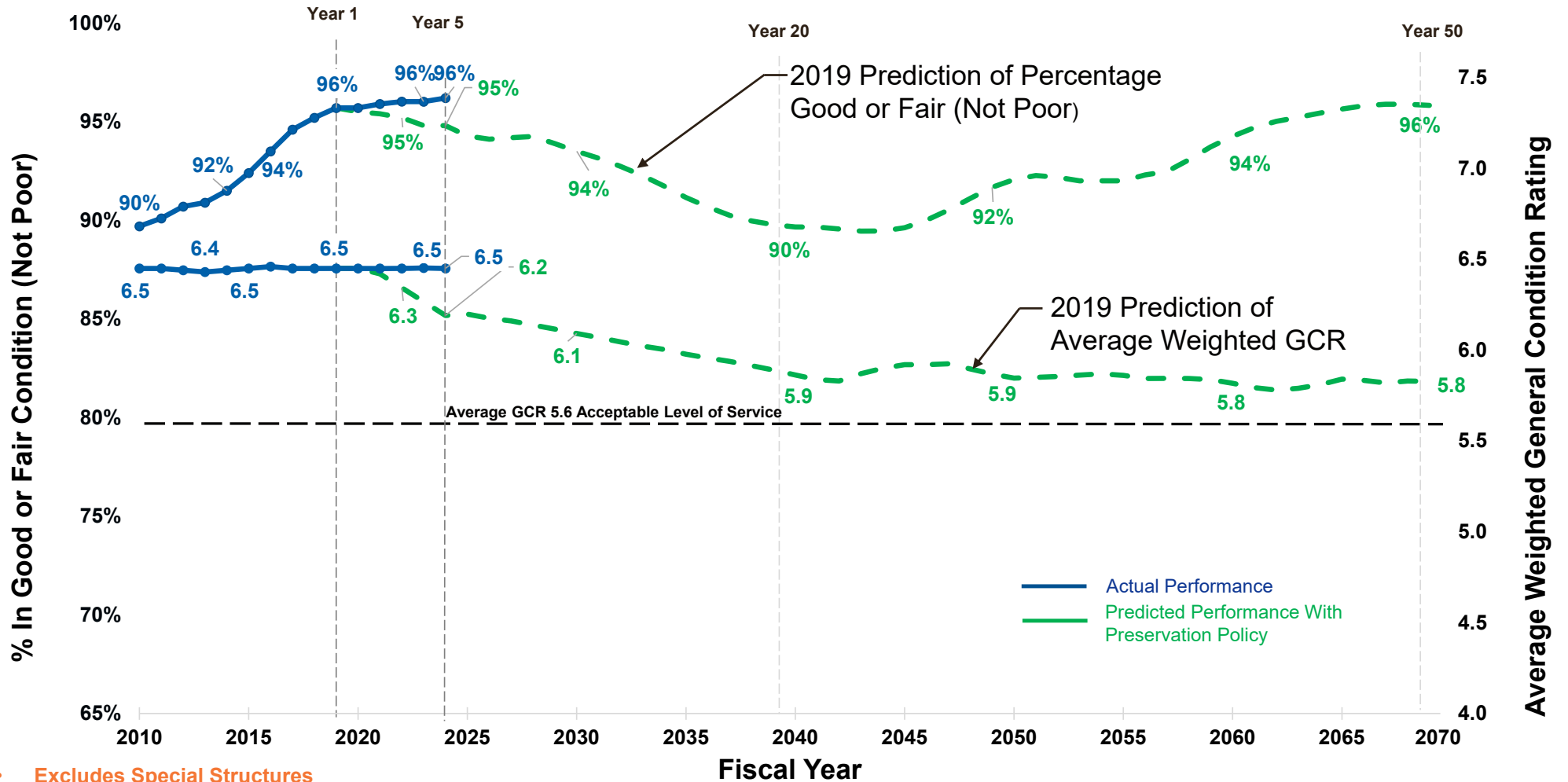
• Excludes Special Structures

# Primary Network – 50 Year Outlook - 5,758 Structures



• Excludes Special Structures

# Secondary Network – 50 Year Outlook - 13,005 Structures



• Excludes Special Structures

# Routine Maintenance

# Routine Maintenance – Performance Metrics

Asset	2019 Interim Target		FY 2023 Frequency Avg. / yr	FY 2024 Frequency Avg. / yr
	Frequency	Quantity		
Turf (Mowing)	IS: 3 times / yr PR: 3 times / yr SC: 2 times/ yr	340,600 acres	IS: 2 times / yr PR: 3 times / yr SC: 2 times/ yr	IS: 2 times / yr PR: 3 times / yr SC: 2 times/ yr
Trees	6% of inventory	8,200 shoulder miles	23%	19%
Pipes	10% of inventory	33,900 each	10%	25%
SWM Facilities	2 times / yr	4,400 each	3 times / yr	3 times / yr
Ditches	5% of inventory	4,400 ditch miles	3%	8%
Unpaved Roads	4 times / yr	25,500 center line miles	5 times / yr	5 times / yr
Unpaved Shoulders	20% of inventory	14,800 shoulder miles	29%	24%
Signs	5% of inventory	47,300 each	4%	5%
Signals	20% of inventory	630 each	14%	14%
Pavement Marking	70% of inventory	50,800 miles	66%	57%



# TREES: Bristol District



**Before**



**After**

# SWM BASINS: Salem District



# DITCHES: Bristol District

## Interstate Maintenance Operations

### Interstate Zone Efforts

Ditch Cleaning – Additional Funding

Before



After



# PIPES: Salem District



Pipe 1 Wildwood Rd



Pipe 1 Wildwood Rd

# UNPAVED SHOULDERS: Salem District



# SOUNDWALLS: Hampton Roads District



# Special Structures

# Special Structures – Health Index

- **Unique Health Index Developed for Each Category**
  - Movable Bridges (introduced in 2021)
  - Tunnels (introduced in 2021)
  - Fixed-Span Structures (introduced in 2022)
- **Current Briefing**
  - 3 Year of progress on movable bridge health index
  - 3 Year of progress on tunnel health index
  - 2 Year of progress on fixed-span structure index



# Special Structures – Health Index

- **Measures the Overall Health from 0 (Worst) to 100 (Best)**
  - **Assesses individual structures and systems within a structure**

**Good (70 -100)**

**Fair (40-70)**

**Poor (20 - 40)**

**Severe (10 - 20)**

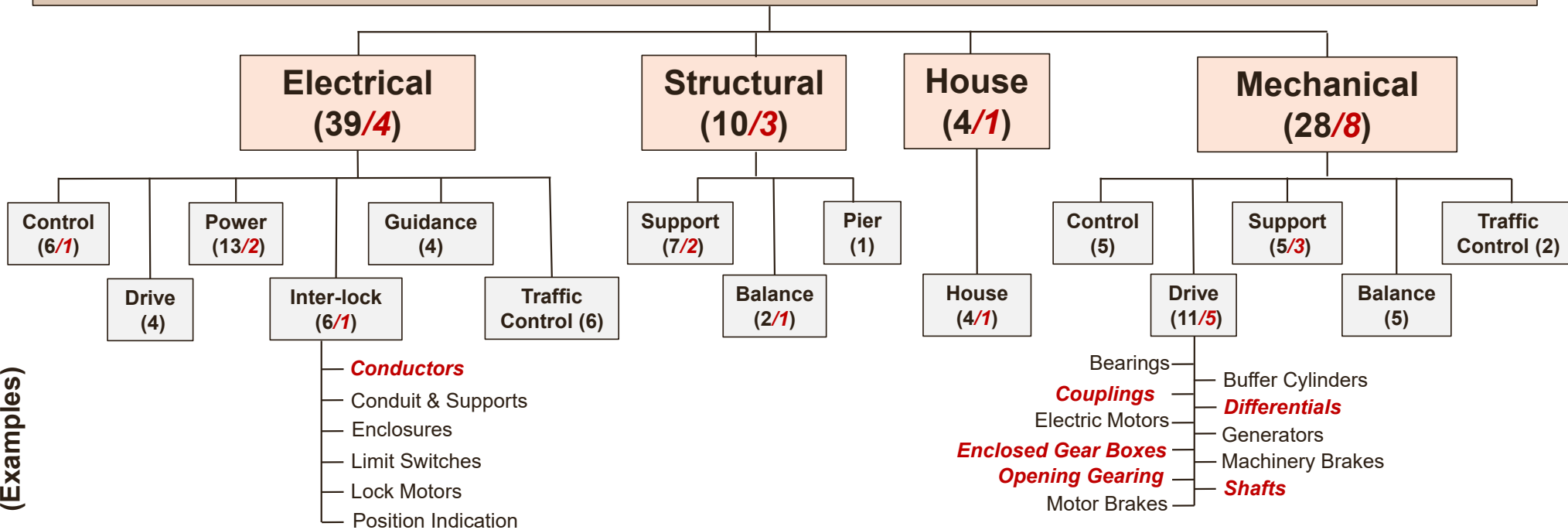
- **Data Collection and Inspection**

- **Each element on each structure evaluated**
- **Assigned “condition states”, which can vary from Good to Severe**
- **Inspected every 2 years**

- **Health Index Calculated by Weighting Elements by Safety & Risk**

# Health Index Sample Methodology- Movable Bridges

## Movable Bridge Example (4 Systems, 15 Subsystems, 81 Elements & **16 Critical Elements**)



Elements  
(Examples)

# Movable Bridge Health Index: Changes 2023 - 2024

2023 Summary of Health Index for Each System or Component on Each Movable Bridge

Bridge	Movable Span Systems					Approach (Fixed) Span Components			
	Electrical	House*	Mechanical	Structural	Overall HI Movable Bridge	Deck	Super-structure	Sub-structure	Overall HI Approach Spans
Benjamin Harrison	Orange	Yellow	Orange	Yellow	Orange	Yellow	Yellow	Yellow	Yellow
Berkley EBL	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Yellow	Yellow
Berkley WBL	Orange	Yellow	Orange	Yellow	Orange	Yellow	Yellow	Yellow	Yellow
Chincoteague	Green	Yellow	Green	Yellow	Green	Green	Green	Yellow	Green
Coleman	Yellow	Yellow	Yellow	Orange	Yellow	Yellow	Yellow	Green	Yellow
Eltham	Yellow	Green	Green	Green	Yellow	Yellow	Yellow	Green	Yellow
Gwynn's Island	Orange	Yellow	Orange	Red	Orange	Green	Green	Yellow	Yellow
High Rise	Yellow	Yellow	Yellow	Orange	Yellow	Green	Yellow	Yellow	Yellow
James River	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

2023 Percentage & Number of Systems in Each Condition Category	
Good	30% (19)
Fair	51% (32)
Poor	17% (11)
Severe	2% (1)

2024 Summary of Health Index for each System or Component on Each Movable Bridge

Bridge	Movable Span Systems					Approach (Fixed) Span Components				
	Electrical	House System Elements Have Been Recategorized with the Publication of New AASHTO Element Data Definitions	Mechanical	Structural	Overall HI Movable Bridge	Deck	Super-structure	Sub-structure	Overall HI Approach Spans	
Benjamin Harrison	Yellow ↑		Yellow ↑	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Berkley EBL	Red ↓		Yellow ↑	Yellow	Orange	Yellow	Green	Yellow	Yellow	Yellow
Berkley WBL	Orange		Yellow	Yellow ↑	Orange	Yellow	Green	Yellow	Yellow	Yellow
Chincoteague	Green		Green	Green	Green	Green	Green	Green	Yellow	Green
Coleman	Yellow		Yellow	Yellow	Yellow ↑	Yellow	Yellow	Green	Yellow	Yellow
Eltham	Yellow		Green	Green	Green	Yellow	Yellow	Yellow	Green	Yellow
Gwynn's Island	Yellow ↑		Green	Green ↑	Green ↑	Yellow ↑	Green	Green	Yellow	Yellow
High Rise	Yellow		Orange ↓	Orange ↓	Yellow ↑	Yellow	Green	Yellow	Yellow	Yellow
James River	Orange		Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

2024 Percentage & Number of Systems in Each Condition Category	
Good	32% (17)
Fair	59% (32)
Poor	7% (4)
Severe	2% (1)

## Improvement (8)

Severe to Fair: **Gwynn's Island** - Structural  
 Poor to Good: **Gwynn's Island** - Mechanical  
 Poor to Fair: **Gwynn's Island** - Electrical; **High Rise** - Structural; **Benjamin Harrison** - Electrical & Mechanical; **Coleman** - Structural; **Berkley WBL** - Structural



## Deterioration (2)

Fair to Poor: **High Rise** - Mechanical  
 Poor to Severe: **Berkley EBL** - Electrical



## Work Recently Completed On:

- Gwynn's Island
- Benjamin Harrison
- Berkley WBL
- High Rise

Health index expected to improve as work is completed

# Tunnel Health Index: Changes 2023 - 2024

2023 Summary of Health Index for Each System on Each Tunnel

Tunnel	Civil	Electrical	Fire/Life Safety/Security	Mechanical	Structural	Overall HI
Big Walker	Green	Yellow	Yellow	Yellow	Green	Yellow
East River	Green	Orange	Yellow	Orange	Green	Yellow
Hampton Roads EBL	Yellow	Green	Green	Yellow	Yellow	Yellow
Hampton Roads WBL	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Monitor Merrimac	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Rosslyn	Green	Yellow	Yellow	Orange	Yellow	Yellow
I-564	Green	Green	Green	Green	Green	Green

2023 Percentage & Number of Systems in Each Condition Category

Good	34% (12)
Fair	57% (20)
Poor	9% (3)
Severe	0% (0)

2024 Summary of Health Index for Each System on Each Tunnel

Tunnel	Civil	Electrical	Fire/Life Safety/Security	Mechanical	Structural	Overall HI
Big Walker	Green	Yellow	Yellow	Yellow	Green	Yellow
East River	Green	Orange	Yellow	Orange	Green	Yellow
Hampton Roads EBL	Yellow	↓	↓	Yellow	Yellow	Yellow
Hampton Roads WBL	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Monitor Merrimac	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Rosslyn	Green	Yellow	Yellow	Orange	Yellow	Yellow
I-564	Green	Green	Green	Green	Green	Green

2024 Percentage & Number of Systems in Each Condition Category

Good	28% (10)
Fair	63% (22)
Poor	9% (3)
Severe	0% (0)

Improvement - None

Deterioration – (2)

Good to Fair: Hampton Roads EBL: Electrical,  
Good to Fair: Hampton Roads EBL: Fire/Life Safety/Security



**Notable Elements of 10 Year Plan**

- Work is underway on:
  - Big Walker
  - East River (On Virginia side only)
  - Rosslyn
  - HRBT
  - MMMBT

Health index expected to improve as work is completed

# Fixed Span Bridge\* Health Index: Changes 2023 - 2024

2023 Summary of Health Index for Each Component on Each Fixed Span Bridge				
Bridge Name	Deck	Superstructure	Substructure	Overall
460 Connector Bridges	Green	Green	Green	Green
HRBT** Approaches	Yellow	Yellow	Yellow	Yellow
MMMBT*** Approaches	Green	Yellow	Green	Green
Norris Bridge	Green	Yellow	Yellow	Yellow
Smart Road Bridge	Green	Yellow	Green	Green
Varina Enon Bridge	Green	Yellow	Orange	Yellow
Willoughby Bay Bridges	Yellow	Yellow	Yellow	Yellow

2023 Percentage & Number of Components in Each Condition Category	
Good	43% (9)
Fair	52% (11)
Poor	5% (1)
Severe	0% (0)

2024 Summary of Health Index for Each Component on Each Fixed Span Bridge				
Bridge Name	Deck	Superstructure	Substructure	Overall
460 Connector Bridges	Green	Green	Green	Green
HRBT Approaches	Yellow	Yellow	Yellow	Yellow
MMMBT Approaches	Green	Yellow	Green	Green
Norris Bridge	Green	Yellow	Yellow	Yellow
Smart Road Bridge	Green	Yellow	Green	Green
Varina Enon Bridge	Green	Yellow	Orange	Yellow
Willoughby Bay Bridges	Yellow	Yellow	Yellow	Yellow

2024 Percentage & Number of Components in Each Condition Category	
Good	43% (9)
Fair	52% (11)
Poor	5% (1)
Severe	0% (0)

- Notable Elements of 10 Year Plan**
- HRBT Approaches and Willoughby Bay Bridges will be complete
  - Preservation emphasis for:
    - Varina-Enon
    - James River Approaches
    - MMMBT Approaches
  - Norris construction starts after the 10 year window

\*Condition information for High Rise Bridge Approach Spans & James River Bridge Approach Spans is provided on the Movable Bridge Health Index slide

\*\*Hampton Roads Bridge Tunnel

\*\*\*Monitor Merrimac Memorial Bridge-Tunnel

**Improvements - None**

**Deterioration - None**



# Special Structures - Accomplishments

# Berkley Emergency Generator

- CN contract award value: \$9,388,000
- Project delivery: ASD through Capital Outlay
- Replaced obsolete generators on the bridge with new landside facility to improve reliability and meet current design criteria
- New utility feed reducing demand on existing tunnel utility



# High Rise Emergency Generator

- CN contract award value: \$2,987,972
- Project delivery: ASD
- Replaced obsolete generator on the bridge with new landside elevated platform to improve reliability and meet current design criteria
- New transformer on elevated pad to increase resiliency to flooding
- Tied in navigation and bridge lighting from new bridge





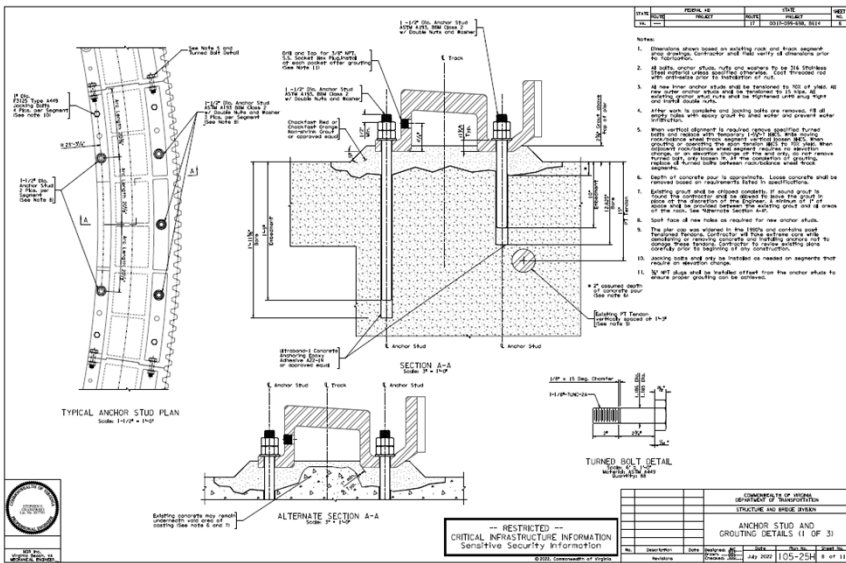
# High Rise Grid Deck Replacement

- CN contract award value:
  - \$3,787,447 (material incl. change orders)
  - \$5,632,379 (installation incl. change orders)
- Project delivery: ASD (material) / Tier 1 RAAP (installation)
- Replaced deteriorated steel grid deck and stringer repairs
- Coordinated with I-64 widening project during traffic shift to new bridge



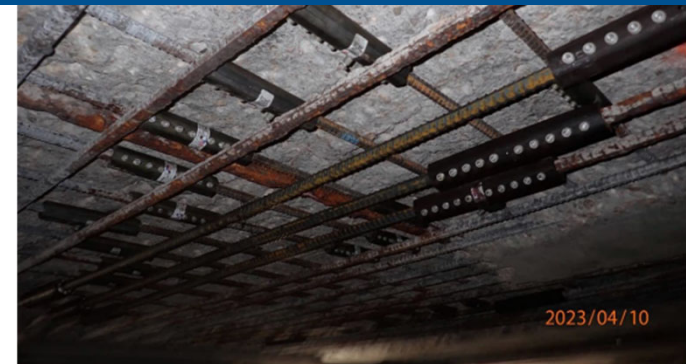
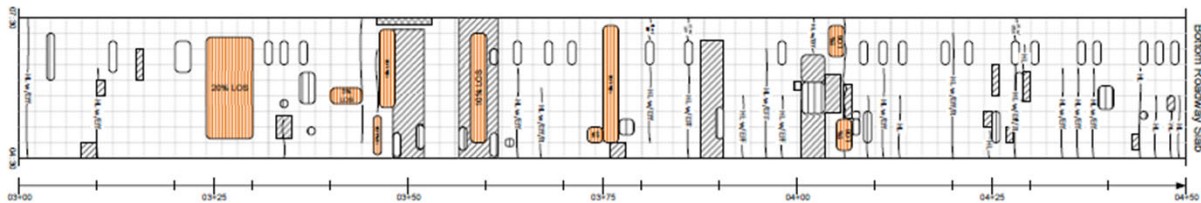
# Coleman Balance Wheel Track Repairs

- CN contract award value: \$3,485,000
- Project delivery: Tier 1 RAAP
- Several anchor bolts with crack indications based on UT
- Replaced all grout beneath balance wheel track and top of both pivot piers in 20" sections so bridge could remain operational
- Installed and tensioned new anchor bolts
- Shimmed and leveled balance wheel assemblies



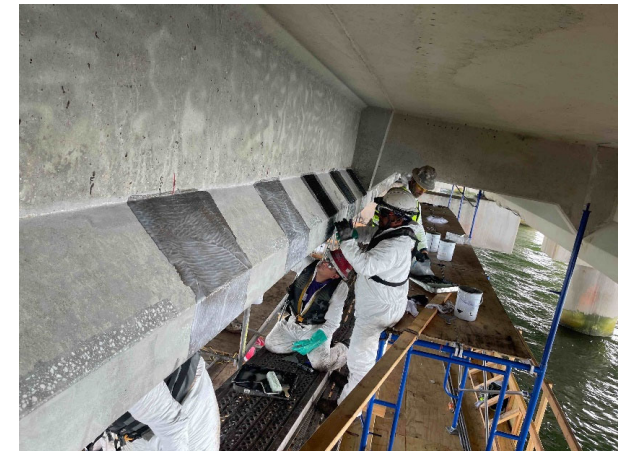
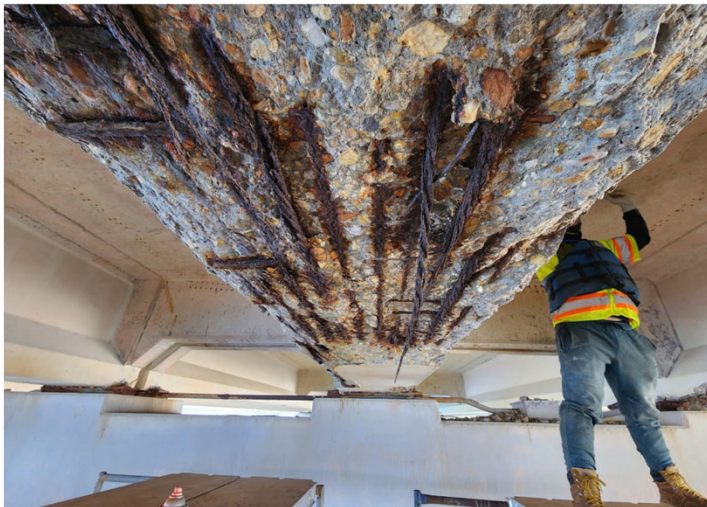
# Hampton Roads Bridge Tunnel Invert Slab Repairs

- CN contract award value: \$9,000,000
- Project delivery: On-call term contract
- Concrete repair to underside of EB roadway slab in lower supply duct
- Improved 7,300 SF of Condition State (CS3 to CS2) of tunnel element
- Mitigate risk of load posting tunnel facility



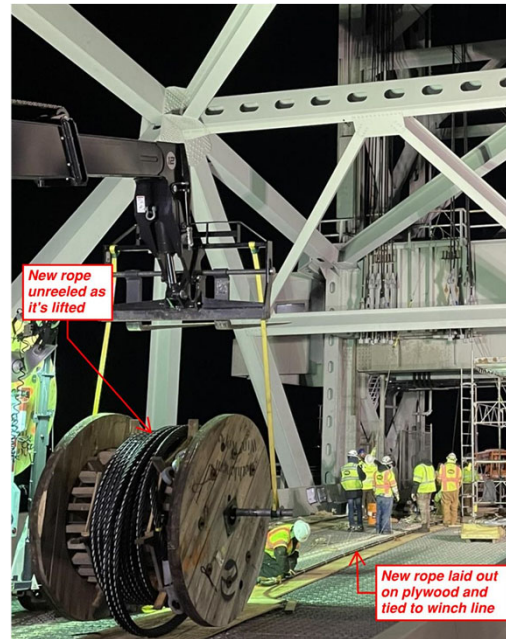
# James River Bridge Beam Strengthening

- CN contract award value: \$4,242,340
- Project delivery: Tier 1 RAAP
- Repaired 29 deteriorated prestressed beams on the south approach trestle
- Carbon fiber reinforced polymer (CFRP) to restore capacity
- Mitigate risk of load posting major water crossing route



# James River Bridge Lifting Cable Replacement

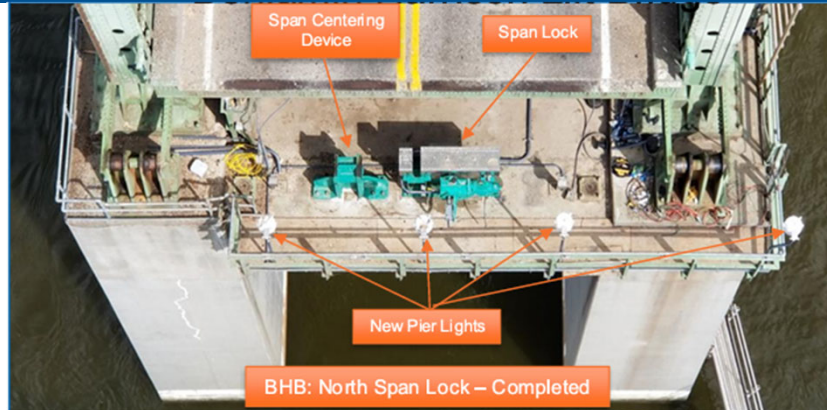
- CN contract award value:
  - \$2,067,366 (material)
  - \$3,490,000 (installation)
- Project delivery: ASD (material) / Tier 1 RAAP (installation)
- Replaced all (80) original main counterweight wire ropes and auxiliary ropes (8)
- Extensive public outreach and stakeholder coordination
- Two full operational outages 4 days ea. (100 hrs)
  - First outage completed in 88 hrs
  - Second outage competed in 71 hrs



# Varina Enon Bridge & Benjamin Harrison Movable Bridge

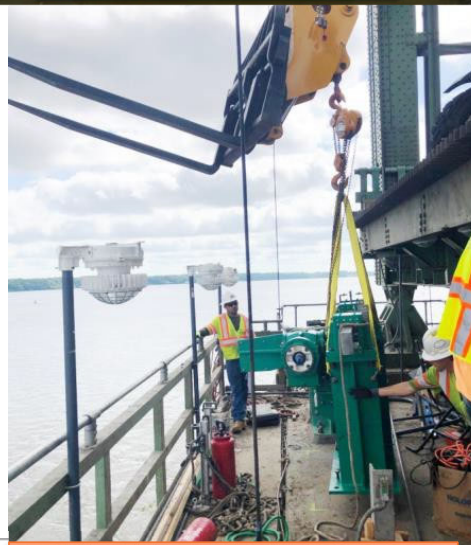


Installation of weather sensor

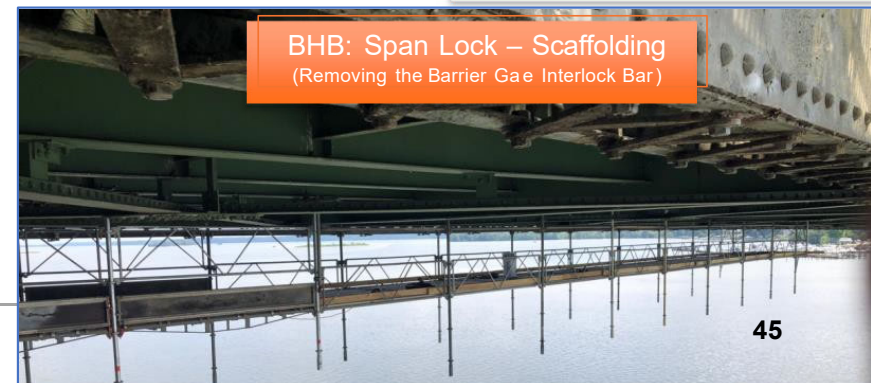


Installation of new scuppers

VEB: Bundled Project



BHB: Span Lock - Installation (South Pier)



# Benjamin Harrison Movable Bridge



# Emergencies



# Maintenance and Operations Program - Flexibility

## Emergencies

- **Extreme weather events**
  - Snow and ice
  - Hurricanes
  - Floods
- **Unexpected events**
  - Bridge hits
  - Sinkhole



*Need to Retain Flexibility*

## Next

- **Special Structures 50-Year Long Term Plan approval**
  - **Draft resolution and plan**
  - **CTB only approves plan every 2 years**
- **Proposed Routine Maintenance Metrics**

