

WORKING WITH PENNDOT



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PAAMA CONFERENCE
OCTOBER 30-31, 2024



Pennsylvania
Department of Transportation

Pavement Asset Management at PennDOT



WHAT IS ASSET MANAGEMENT?

23 U.S.C. 101(a)(2):

"*Asset management*" means a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost.



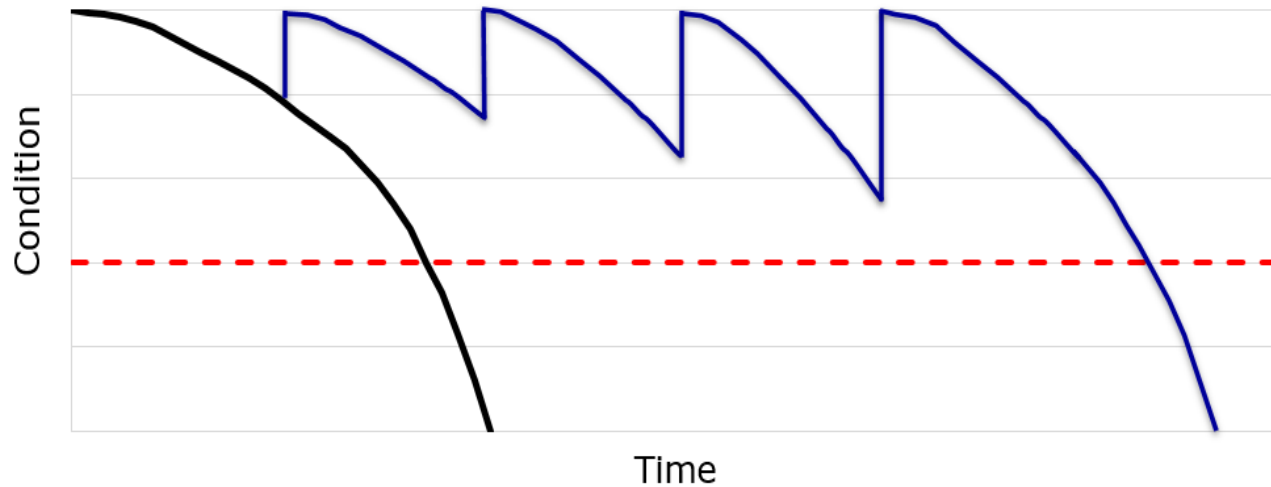
WHAT IS ASSET MANAGEMENT?

- Manage assets over their entire life to maintain a desired condition at minimum cost (lowest life cycle cost).
- Driven by available budget... limited budget does not mean asset management practices cannot be implemented.
- The right treatment to the right asset at the right time.
- Do not focus on poor condition (worst first).



WHAT IS ASSET MANAGEMENT?

- Well-timed preservation activities will extend life for the lowest practicable cost.
- Preservation either maintains or returns an asset to a state of good repair.
- Cannot preserve forever; the added life decreases with each cycle.
- Inadequate funding prevents performing all preservation activities “on cycle”.



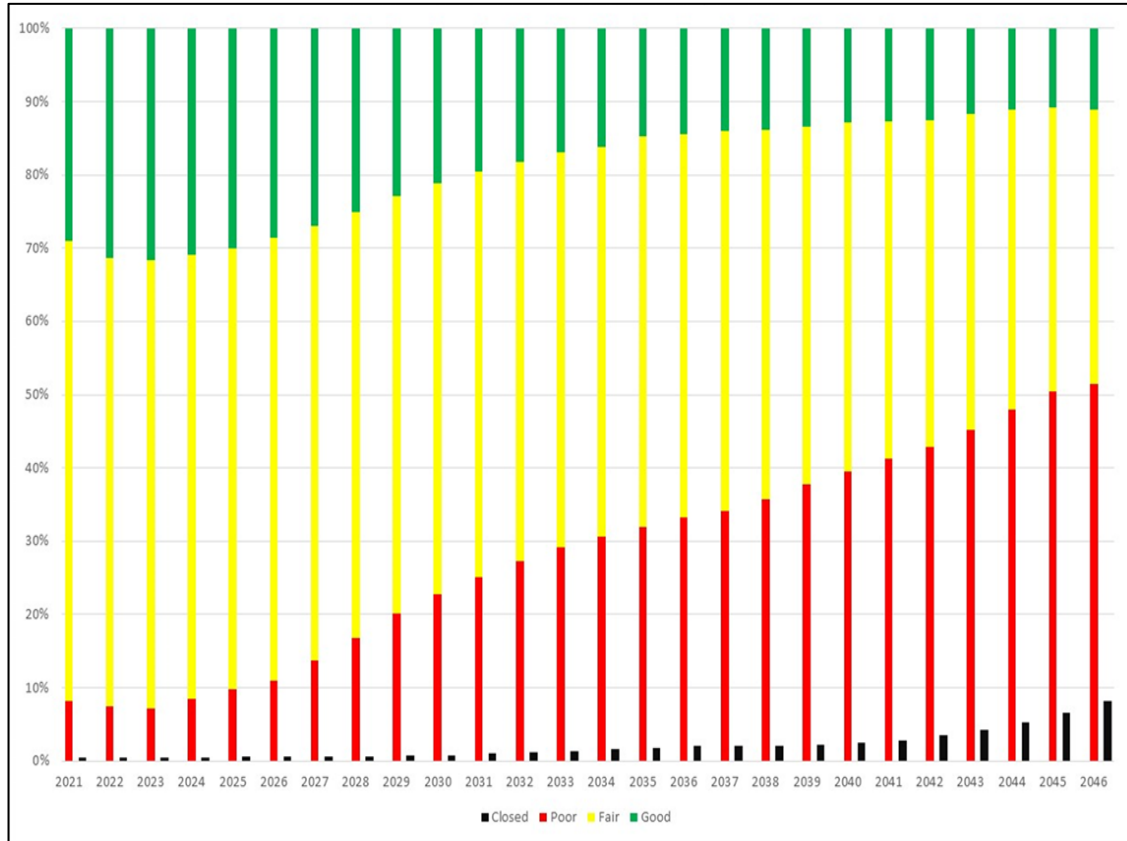
WHAT IS IT NOT?

“Worst First”:

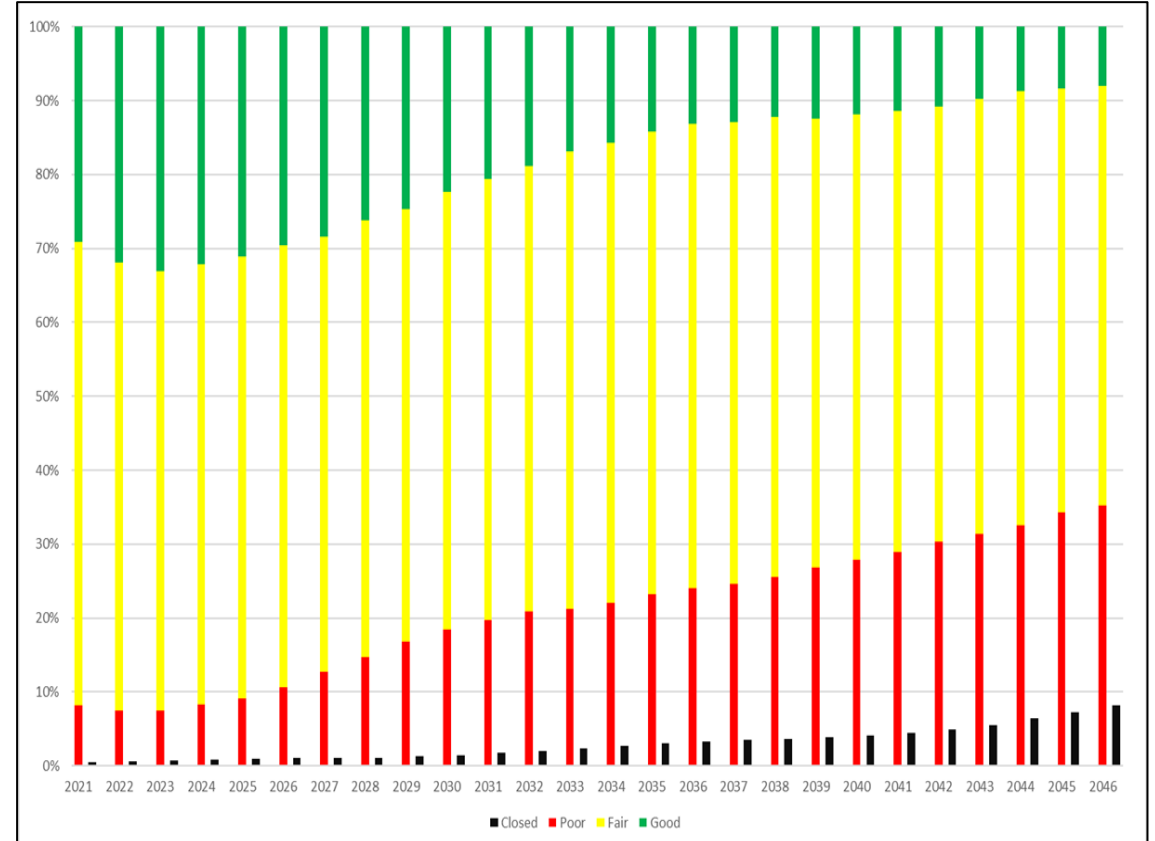
- Targeting assets solely based on poor condition.
- Most expensive approach (poor typically requires more extensive activities)
- Fewest assets touched.
- Rate of other assets becoming “poor” exceeds rate of repair.



WHAT IS ASSET MANAGEMENT?



Worst First



LLCC (Same budget)



WHAT IS REQUIRED?

23 U.S.C. 119(e)(1), 23 U.S.C. 119(e)(8) & 23 CFR 515.7

A State shall develop a **risk-based asset management plan** that describes how the NHS will be managed to **achieve system performance effectiveness and State DOT targets** for asset condition, while managing the risks, in a financially responsible manner, at a **minimum practicable cost over the life cycle of its assets**.



WHAT IS REQUIRED?

23 U.S.C. 119(e)(4)

A State asset management plan shall, **at a minimum**, include:

- (A) a summary listing of the **pavement and bridge assets on the NHS**, including a description of the condition of those assets;
- (B) asset management objectives and measures;
- (C) performance gap identification;
- (D) lifecycle cost and risk management analyses, both of which shall take into consideration extreme weather and resilience;
- (E) a financial plan; and
- (F) investment strategies.



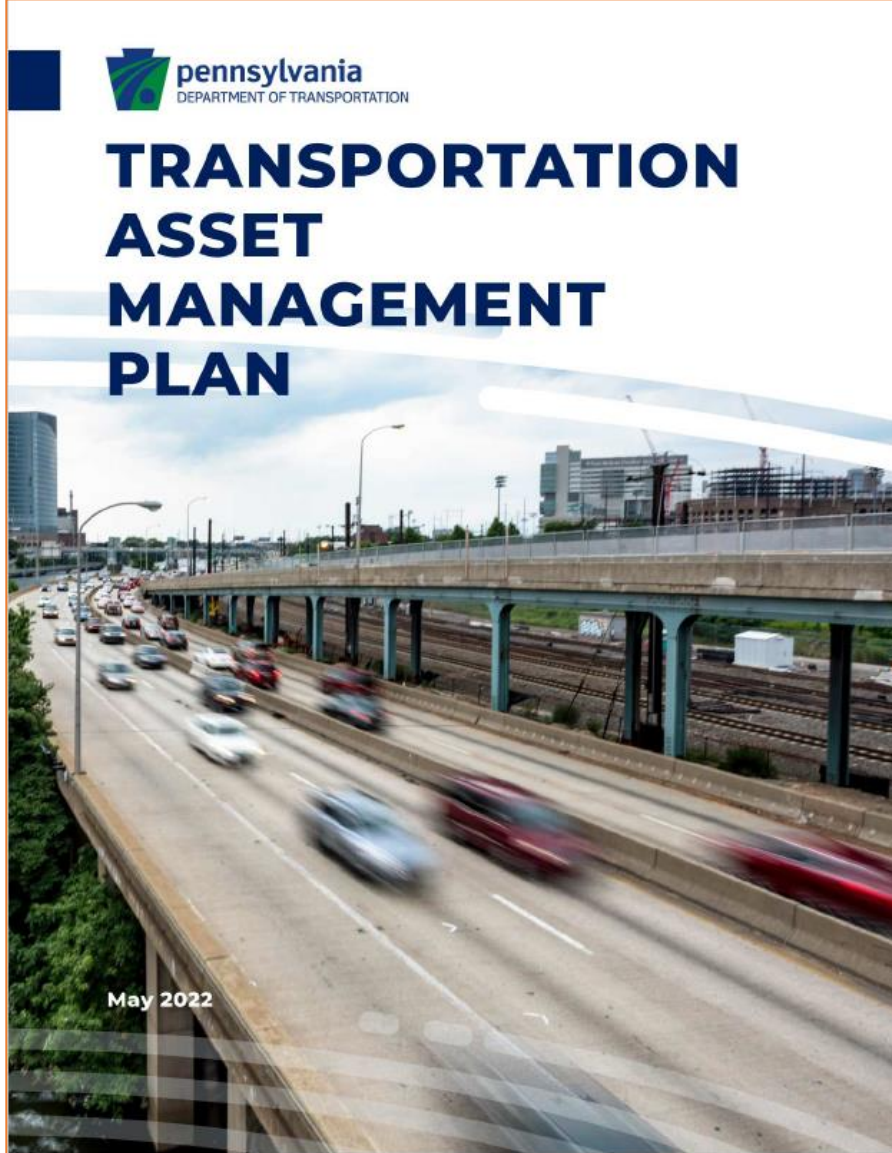
WHAT IS REQUIRED?

23 U.S.C. 119 & 23 CFR Part 515

If a State DOT has not developed and implemented a TAMP, the **maximum Federal share for NHPP projects** and activities carried out by the State DOT in that fiscal year will be **reduced to 65 percent** for that fiscal year. The reduction remains in place for the entire fiscal year.



TRANSPORTATION ASSET MANAGEMENT PLAN



Final submitted December 29, 2022

Certified by FHWA, March 31, 2023



WHAT HAVE WE DONE?

The screenshot shows the PennDOT website homepage. The navigation menu is open, displaying the following items: Projects & Programs, Construction, Planning, Road Design & Environment, Bridges, Posted And Bonded Roadways, Research And Testing, Public-Private Partnerships, Multimodal Program, Digital Delivery Directive '25, and Asset Management (which is highlighted in blue). The main content area features a yellow banner with the text "Winter Could Impact Career" and "PennDOT is hiring for winter" with a "Learn More" button. The URL in the browser is <https://www.pennDOT.pa.gov/ProjectAndPrograms/Asset-Management/Pages/default.aspx>.

Asset Management

Asset Management is defined by the Federal Highway Administration (FHWA) as:

"A strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair (SOGR) over the life cycle of the assets at minimum practicable cost (23 CFR 515.5)."

The Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation Act (FAST Act) require each state department of transportation to develop and implement a risk-based asset management plan in accordance with [23 U.S.C. 119](#).

The intent is to encourage states to achieve and sustain a state of good repair over the life cycle of transportation assets—regardless of ownership—and to preserve or improve the condition of the NHS.

The Pennsylvania Transportation Asset Management Plan (TAMP):

- Establishes targets for NHS pavement and bridge condition
- Summarizes Pennsylvania's inventory of NHS pavement and bridge assets by structure type, class, owner, and condition
- Forecasts NHS asset condition by year for at least a 12-year planning horizon at current funding levels
- Outlines PennDOT's asset management practices, which are integrated into long-range planning, project programming, financial planning, and risk assessment processes

Projects & Programs Doing Business

Resources

- [2022 Transportation Asset Management Plan](#) (PDF)
- [PennDOT BridgeCare Deterioration Modeling 2022](#) (PDF)
- [PennDOT BridgeCare Treatment Criteria and Consequences](#) (PDF)
- [Lowest Life Cycle Cost Infographic](#) (PDF)
- [Data Quality Management Program Report - May 2018](#) (PDF)





OUT WITH THE OLD, IN WITH THE NEW



★ My scenarios (21) 🔄 Shared with me (20) 🚦 General work queue (0)

🔍 Search in scenarios

Search

Filter

Create new scenario

Scenario	Creator	Owner	Network	Date Created	Date Last Modified	Date Last Run	Status	Run Time	Report Status	Action
NB Test 92424	naboyer	naboyer	PAMS 2023 Section Data Update	9/24/2024	9/24/2024	9/24/2024	Simulation output saved to database	00:20:20	Report generation completed	⋮
Test 92324	naboyer	naboyer	PAMS 2023 Section Data Update	9/23/2024	9/23/2024	9/23/2024	Simulation output saved to database	00:01:20	Report generation completed	⋮
NB Statewide Test New Deterioration Models 91824	naboyer	naboyer	PAMS 2023 Section Data Update	9/18/2024	9/19/2024	9/19/2024	Simulation output saved to database	01:32:44	Report generation completed	⋮
Statewide 12 year Constrained	naboyer	naboyer	PAMS 2023 Section Data	9/9/2024	9/10/2024	9/10/2024	Simulation output saved to database	01:40:09	Report generation completed	⋮
CentreCounty 2025-2036	naboyer	naboyer	PAMS 2023 Section Data	9/3/2024	9/3/2024	9/3/2024	Simulation output saved to database	00:02:59	Report generation completed	⋮

Items per page: 5 1-5 of 21 ⏪ ⏩





- PAMS and BAMS on the AssetFox platform
- AssetFox is a freeware software providing flexibility and removing roadblocks such as license renewals and contracts
- AssetFox was developed by PennDOT and ARA which means it better captures our needs with Federal requirements and information we utilize in our decision making
- Huge benefit same results between pavement and bridge and future assets we chose to put on the freeware allow for comparable and good for decision making

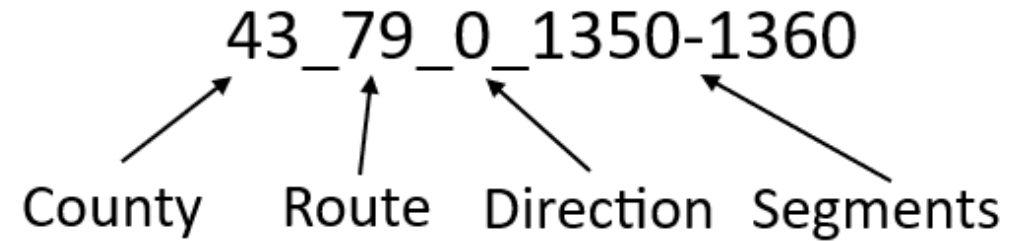


PAMS EXPECTED BENEFITS

- Project optimization based on funding
- Future prediction of deterioration and benefits from proposed projects
- Bring together data from multiple systems for analysis and reporting



CRS SECTION



- County Route Direction Segment
- District Defined special field in RMS and Formula for break points
- When a committed project affects a portion of a CRS sections, but not the entirety, the project will be then applied to the whole CRS sections



DETERIORATION MODELS

- New deterioration models have been developed due to the time frame from the last update
- The previous models had some gaps and did not account for depth of pavement, which we found to be a strong factor in performance outcomes
- New families were developed (family break outs on next slide)
- Models are intended to be updated every 3 years to remain current



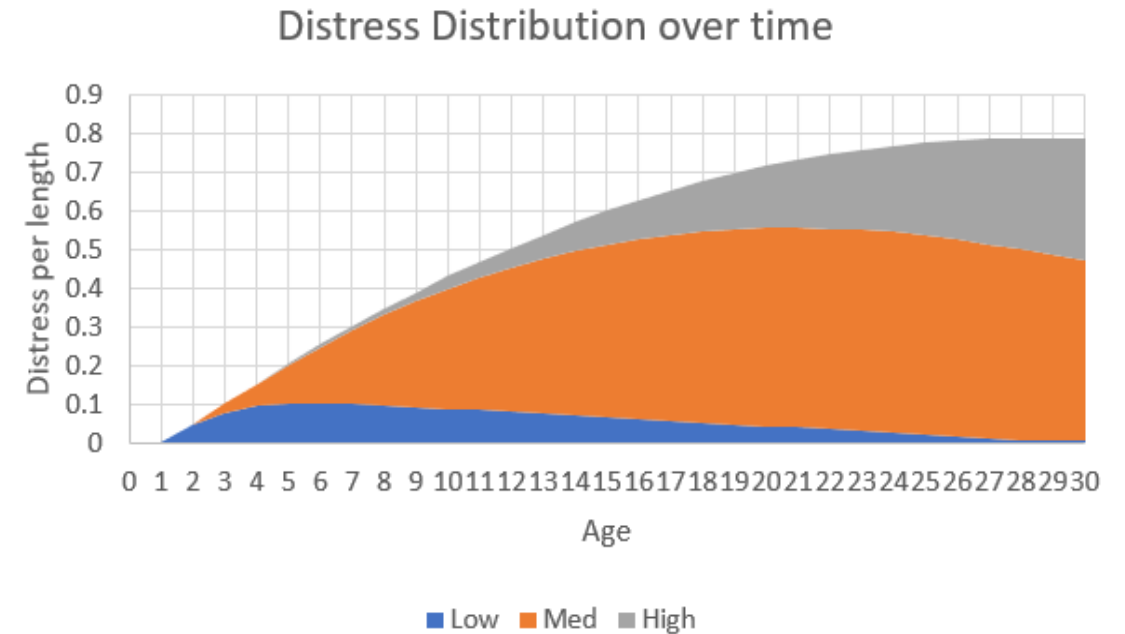
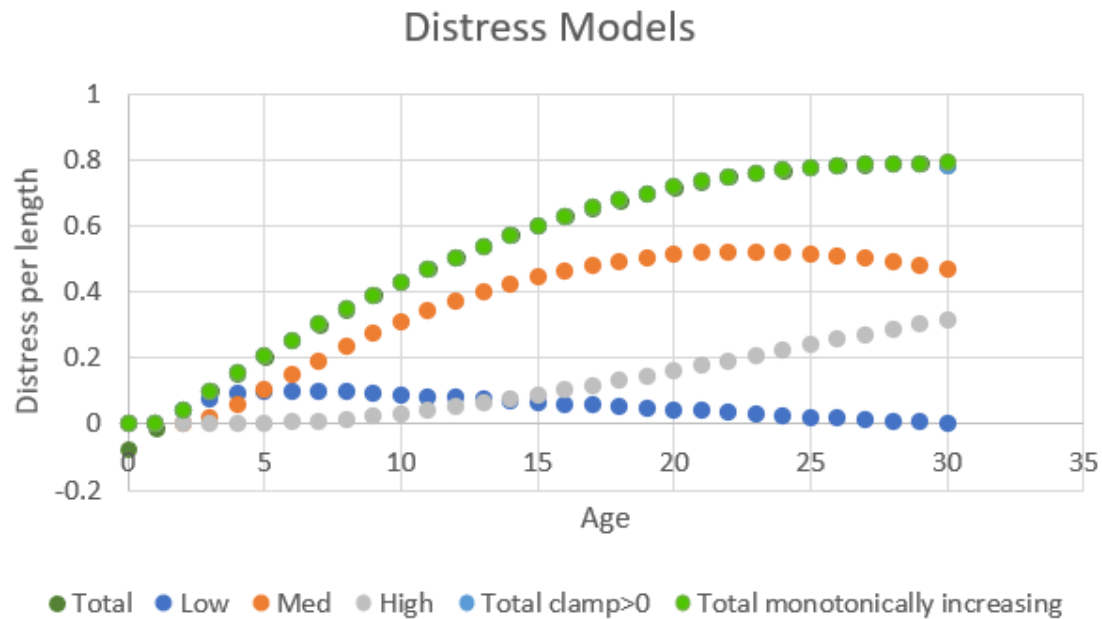
NEW FAMILIES

- HMA – BPN 1
- HMA – BPN 2 – Rural
- HMA – BPN 2 – Urban
- HMA – BPN 3 – Thick <5 – Rural
- HMA – BPN 3 – Thick <5 – Urban
- HMA – BPN 3 – Thick >10 – Rural
- HMA – BPN 3 – Thick >10 – Urban
- HMA – BPN 3 – Thick 5 to 10 – Rural
- HMA – BPN 3 – Thick 5 to 10 – Urban
- HMA – BPN 4 – Thick <5
- HMA – BPN 4 – Thick <5 – FDR
- HMA – BPN 4 – Thick >10
- HMA – BPN 4 – Thick 5 to 10
- HMA – BPN 4 – Thick 5 to 10 – FDR
- Composite – BPN 1
- Composite – BPN 2 – ADTT ≤500 – Rural
- Composite – BPN 2 – ADTT ≤500 – Urban
- Composite – BPN 2 – ADTT >500 – Rural
- Composite – BPN 2 – ADTT >500 – Urban
- Composite – BPN 3 – Rural
- Composite – BPN 3 – Urban
- Composite – BPN 4
- Jointed Concrete – BPN 1
- Jointed Concrete – BPN 2 – Rural
- Jointed Concrete – BPN 2 – Urban
- Jointed Concrete – BPN 3
- Jointed Concrete – BPN 4



DETERIORATION MODELS EXAMPLES

- Asphalt Pavement – BPN 3 – Thickness 5 to 10 - Rural



TREATMENTS

Treatments have been preloaded into PAMS

The screenshot displays the PAMS web application interface. At the top, there is a navigation bar with the Pennsylvania Department of Transportation logo, the user name 'naboyer', and a notification icon. The main navigation menu includes 'Scenarios', 'Libraries', 'Raw Data', 'Administration', 'Inventory', and 'News'. The 'Libraries' section is active, showing a list of treatment libraries on the left and a detailed view of the selected 'Asphalt Spall Repair-4\"



TREATMENT - COSTS

Treatment Details Costs Consequences Supersede

Equation



```
(((CLNGCRK2)+[CTRNJNT2]+[CLNGJNT3])*[QWIDTH])/36)*276.11 +  
(((SEGMENT_LENGTH)*[WIDTH])/9)*70.05
```

Add Cost Equation - Use Max() to enforce minimum costs

Equation Editor



Equation Piecewise Time In Rating

Attributes: Click to add

AADT
AGE
AGE_CALCULATED
ALANE
BAFTICR_SUM
BEDGDTR_SUM
BEDGDTR_Total

Formulas: Click to add

Abs()
Acos()
Asin()
Atan()
Atan(,
Ceiling()
Cos()



```
(((CLNGCRK2)+[CTRNJNT2]+[CLNGJNT3])*[QWIDTH])/36)*276.11 + (((SEGMENT_LENGTH)*  
[WIDTH])/9)*70.05
```

Check Equation

Cancel

Save



TREATMENT - CONSEQUENCES

Treatment Details Costs Consequences Supersede

Attribute	Change Value	Equation		Criteria		Actions
<u>AGE</u>	_____					
<u>BTRNSCT1</u>	_____					
<u>CBRKSLB_Total</u>	_____					
<u>CBRKSLB1</u>	_____					
<u>CBRKSLB2</u>	_____					

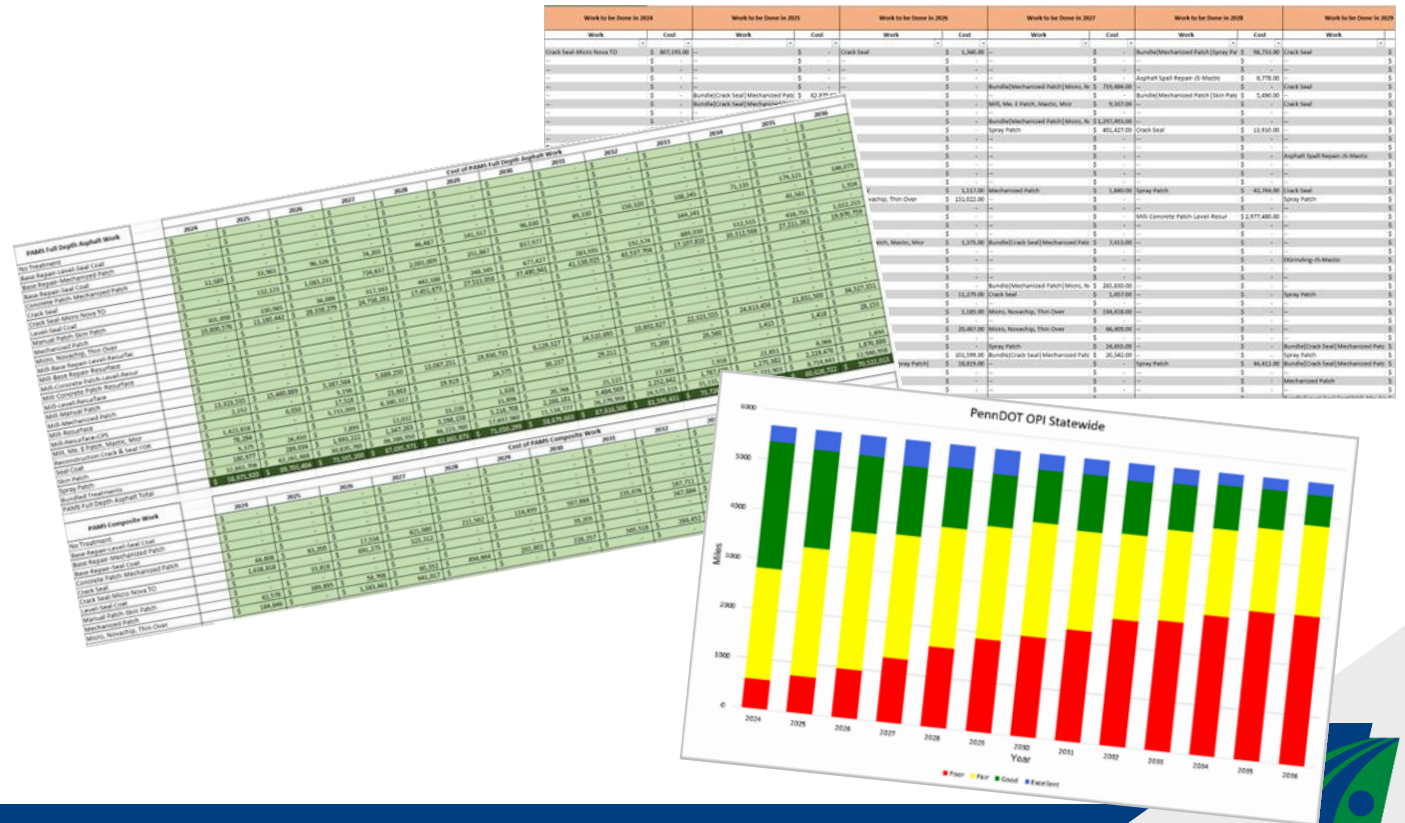
Treatment Consequences are treatment reset rules



OUTPUTS

Outputs

- Roadway specific information;
 - District, County, Route, Start and End Segment, Length, Width, Depth, Surface Type, Year Built, Year Resurface, Year Last Structural Overlay, ADT, Truck %, etc.
- Recommended Projects and Costs
- Pavement Work Summary
- Pavement Work Summary by Budget
- IRI and OPI Graphs



Work to be Done in 2004	Work to be Done in 2005	Work to be Done in 2006	Work to be Done in 2007	Work to be Done in 2008	Work to be Done in 2009
Crack Seal Miles New TO	Cost	Work	Cost	Work	Cost
...

Pavement Work	Cost of PAVES Composite Work						
	2004	2005	2006	2007	2008	2009	2010
Full Depth Asphalt Work
...



MOVING FORWARD

- PAMS (AssetFox version 3.2.2) is available by Central Office to run scenarios and reports
- PAMS (Asset Fox version 3.2.3) current under development, with bug fixes and speed enhancements
- PAMS (Asset Fox version 3.2.3) Production release February 2025
- Assemble District Advisory Board
- Training



COUNTY MAINTENANCE AND SYSTEM PRESERVATION



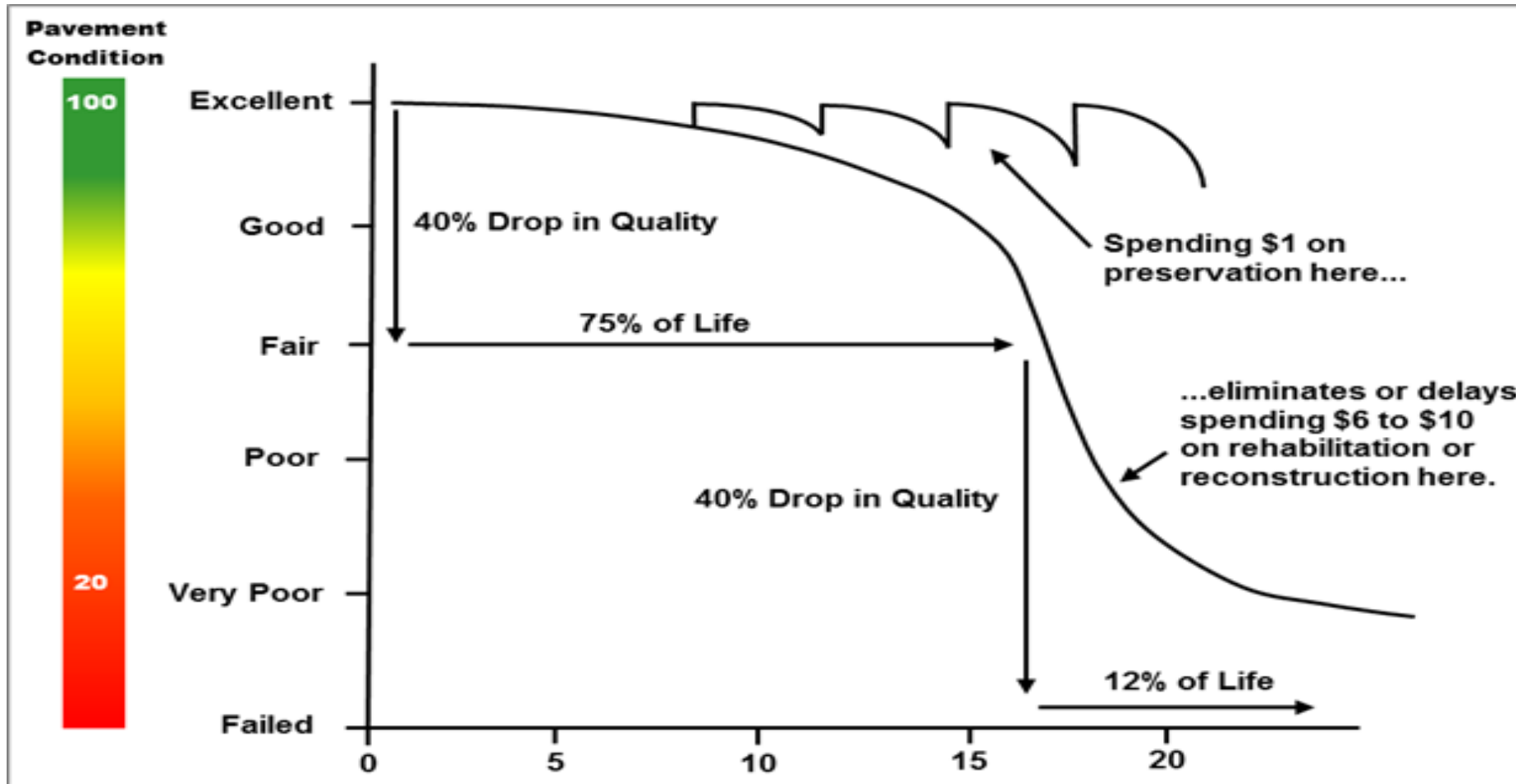
Pennsylvania
Department of Transportation

MAINTENANCE BUSINESS MODEL

Achieving Success in Winter Operations

Prioritizing Core Cyclical Maintenance Activities

Efficiency & Effectiveness of Remaining Capacity



NETWORK IDENTIFICATION

High and Low Level Networks

High Level (primarily BPN's 1 & 2)

- Typically a higher level of pavement structure
- Higher ADT/%Trucks (#Esals)
- Network preservation is crack sealing, microsurfacing

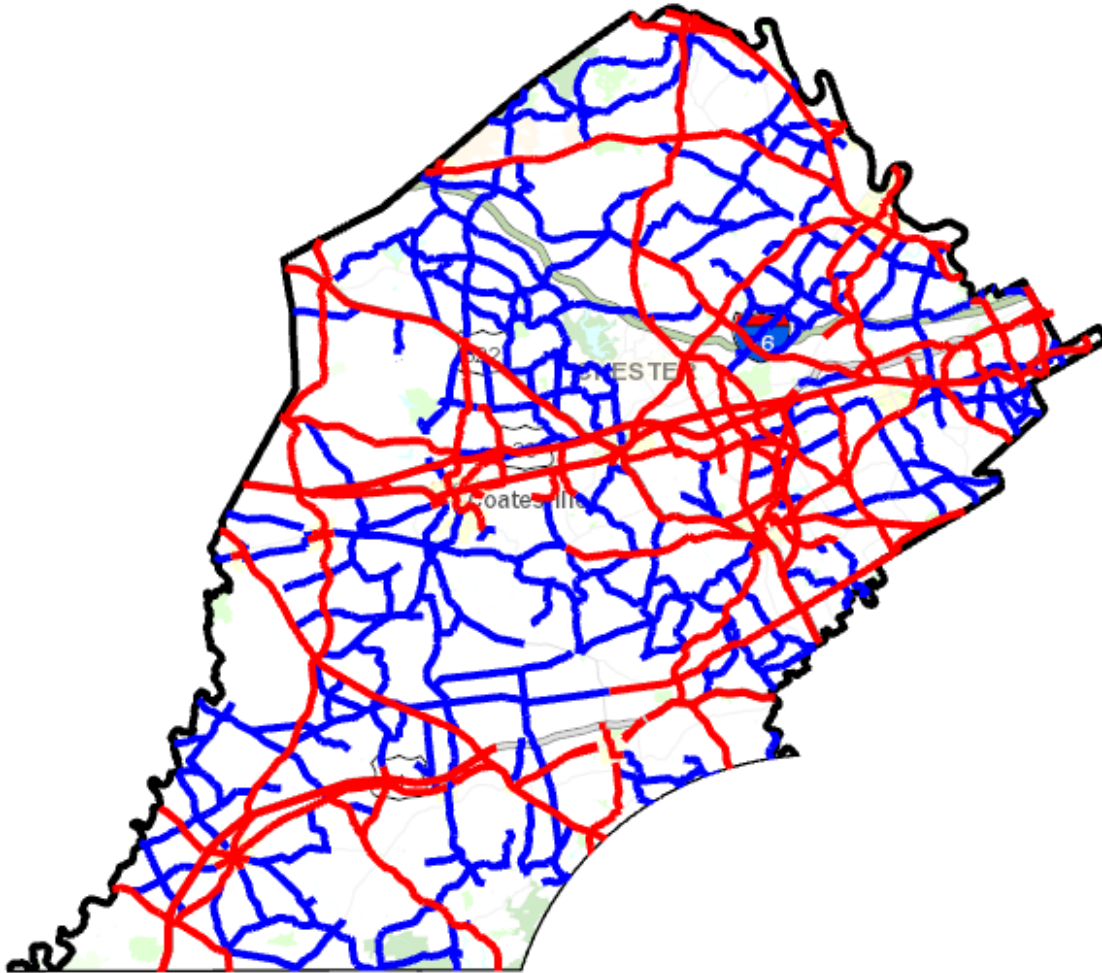
Low Level (primarily BPN 4, some 3)

- Typically a lower level of pavement structure
- Low ADT/%Trucks (#Esals)
- Network preservation is seal coat

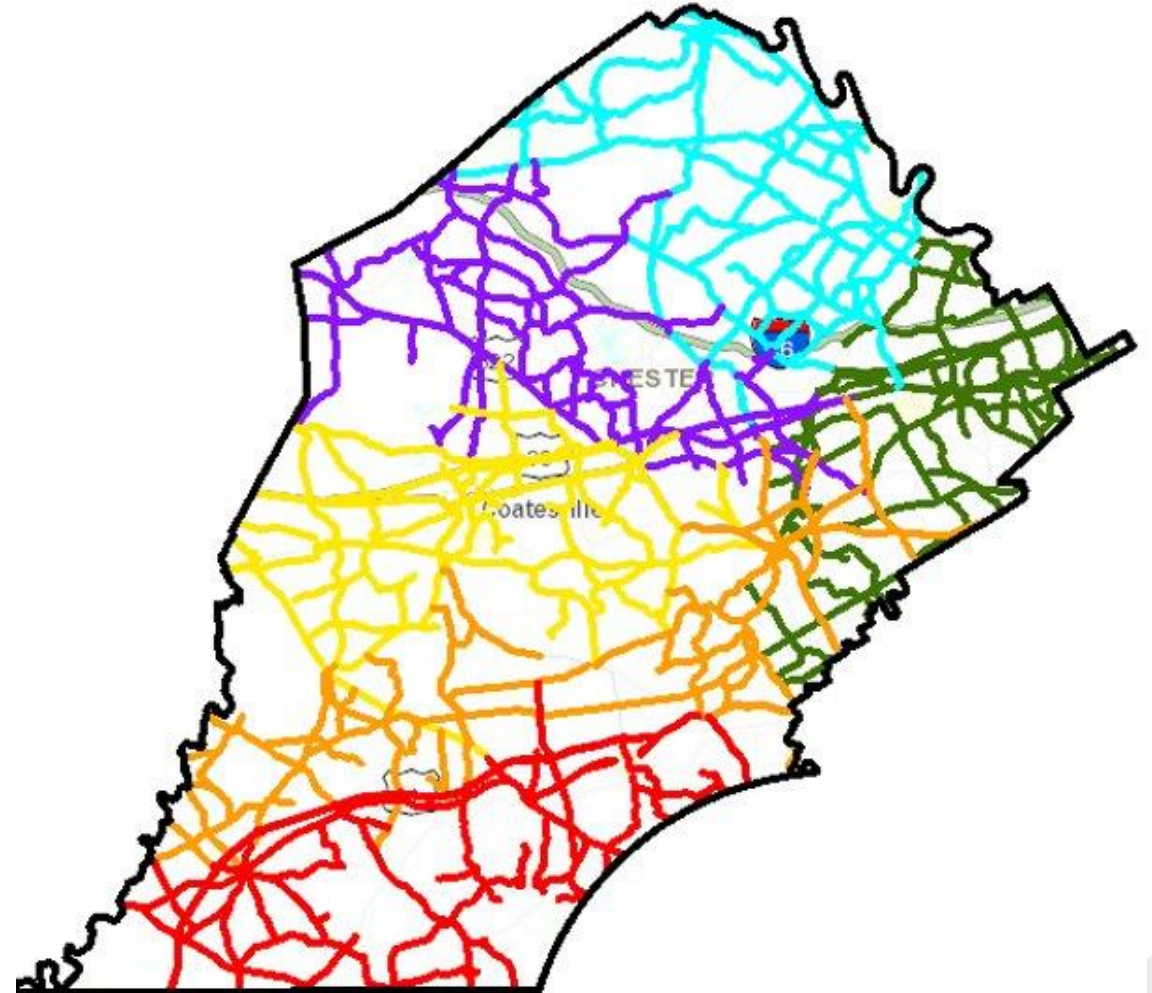


COUNTY BREAKDOWN

High Level / Low Level Map



Sectional Map



MAINTENANCE PLANNING –KEY COMPONENTS

Condition Maintenance

Standards Of Care

Cycle Maintenance

Prep Work

Contingency Plan



SECTIONAL CYCLE MAINTENANCE

Section	*Starting Program - 2023	2024	2025	2026	2027	2028	2029	2030
	22-3 and 23-1	23-3 and 24-1	24-3 and 25-1	25-3 and 26-1	26-3 and 27-1	27-3 and 28-1	28-3 and 29-1	29-3 and 30-1
1	Flush Pipes, Tail Ditch, Replace Pipes, Shoulder Cut, Side Doze, Patch, Crack Seal (LL), Base Repair	Seal Coat		Shoulder Cut, Side Doze	Flush Pipes, Tail Ditch (Complete Pipe Inspections)	Replace Pipes, Ditch/Tail Ditch	Patch, Crack Seal (LL), Base Repair (DF/Contract)	Seal Coat
2	Flush Pipes, Tail Ditch, Replace Pipes, Shoulder Cut, Side Doze	Patch, Crack Seal (LL), Base Repair (DF/Contract)	Seal Coat		Shoulder Cut, Side Doze	Flush Pipes, Tail Ditch (Complete Pipe Inspections)	Replace Pipes, Ditch/Tail Ditch	Patch, Crack Seal (LL), Base Repair (DF/Contract)
3	Flush Pipes, Tail Ditch (Complete Pipe Inspections)	Shoulder Cut, Side Doze, Replace Pipes, Ditch/Tail Ditch	Patch, Crack Seal (LL), Base Repair (DF/Contract)	Seal Coat		Shoulder Cut, Side Doze	Flush Pipes, Tail Ditch (Complete Pipe Inspections)	Replace Pipes, Ditch/Tail Ditch
4	Shoulder Cut, Side Doze	Flush Pipes, Tail Ditch (Complete Pipe Inspections)	Replace Pipes, Ditch/Tail Ditch	Patch, Crack Seal (LL), Base Repair (DF/Contract)	Seal Coat		Shoulder Cut, Side Doze	Flush Pipes, Tail Ditch (Complete Pipe Inspections)
5		Shoulder Cut, Side Doze	Flush Pipes, Tail Ditch (Complete Pipe Inspections)	Replace Pipes, Ditch/Tail Ditch	Patch, Crack Seal (LL), Base Repair (DF/Contract)	Seal Coat		Shoulder Cut, Side Doze
6			Shoulder Cut, Side Doze	Flush Pipes, Tail Ditch (Complete Pipe Inspections)	Replace Pipes, Ditch/Tail Ditch	Patch, Crack Seal (LL), Base Repair (DF/Contract)	Seal Coat	

2024 COMPLETED WORK



Cyclical Maintenance					
Activity	Seal Coat		Crack Seal	Shoulder Cutting	Side Dozing
	Miles	Gallons	Lane Miles	Miles	Miles
Dept Force	3,255	17,958,492	6,912	10,217	390
Contract	310	1,364,446	1,773	0	0
Total	3,565	19,322,938	8,685	10,217	390

Preservation Treatments

Activity	Micro	Hot Pour Mastics	Cold Recycling		Fog Seal
			Central Plant	Cold In Place	
	Miles	Miles	Miles	Miles	Miles
Dept Force	0	321	11	101	194
Contract	128	0	0	0	105
Total	128	321	11	101	299



2025 ESTIMATED WORK

Cyclical Maintenance

Activity	Seal Coat		Crack Seal	Shoulder Cutting	Side Dozing
	Miles	Gallons	Lane Miles	Miles	Miles
Dept Force	4,948	16,900,517	9,052	12,678	1,569
Contract	224	1,326,760	1,921	0	0
Total	5,172	18,227,277	10,973	12,678	1,569



Preservation Treatments

Activity	Micro	Hot Pour Mastics	Cold Recycling		Fog Seal
			Central Plant	Cold In Place	
	Miles	Miles	Miles	Miles	Miles
Dept Force		18	6	15	24
Contract	168	9		4	0
Total	168	27	6	19	24



WHERE TO GO FROM HERE



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QUESTIONS?

Halley Cole P.E.

Chief, Pavement Testing and Asset Management Section

halcole@pa.gov

Andy Firment

Chief, Operations and Performance

afirment@pa.gov

