

The Real Value of Pavement Preservation



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The Real Value of Pavement Preservation

Outline

1. Addressing Department Concerns
2. The Pavement Preservation Concept
3. Pavement Preservation Treatments
4. Typical Treatment Costs
5. Determining Your Network Health
6. Trends Impacting Pavement Preservation

Addressing Department Concerns

1. How do I know these treatments are going to work?

- Select a pavement suitable for the treatment being applied.
- Use a nationally approved specification (e.g., AASHTO)
- Require a comprehensive Quality Control Plan
- Agency training is not a bad idea

Addressing Department Concerns

2. Why stick my reputation on something I haven't used?

- Pavement preservation treatments are successfully used throughout the world.
- There are knowledgeable and experienced contractors that provide quality treatments.
- Training is available for each preservation treatment.

Addressing Department Concerns

3. Will there be money left for needed rehabilitation projects?

- Agencies never have enough money.
- Always use a “Mix of Fixes.”
- Stretch dollars into miles.

Addressing Department Concerns

4. Is pavement preservation a way to eliminate our workers jobs?

- Preservation projects support about 25% more jobs compared with construction and rehab projects.
- More dollars go to workers and less dollars go for large amounts of material.

★ The Pavement Preservation Concept

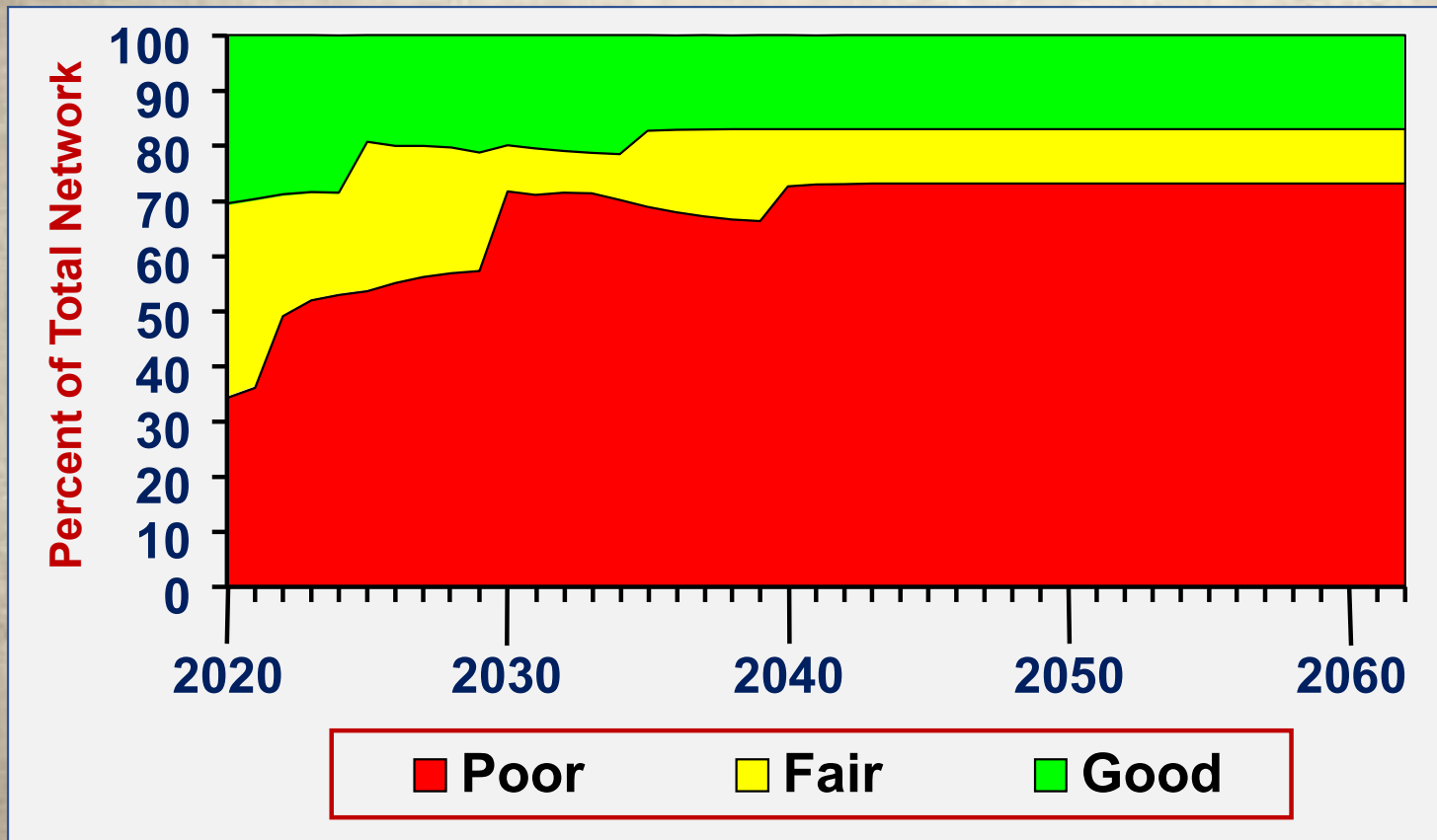


Pavement Preservation Definition

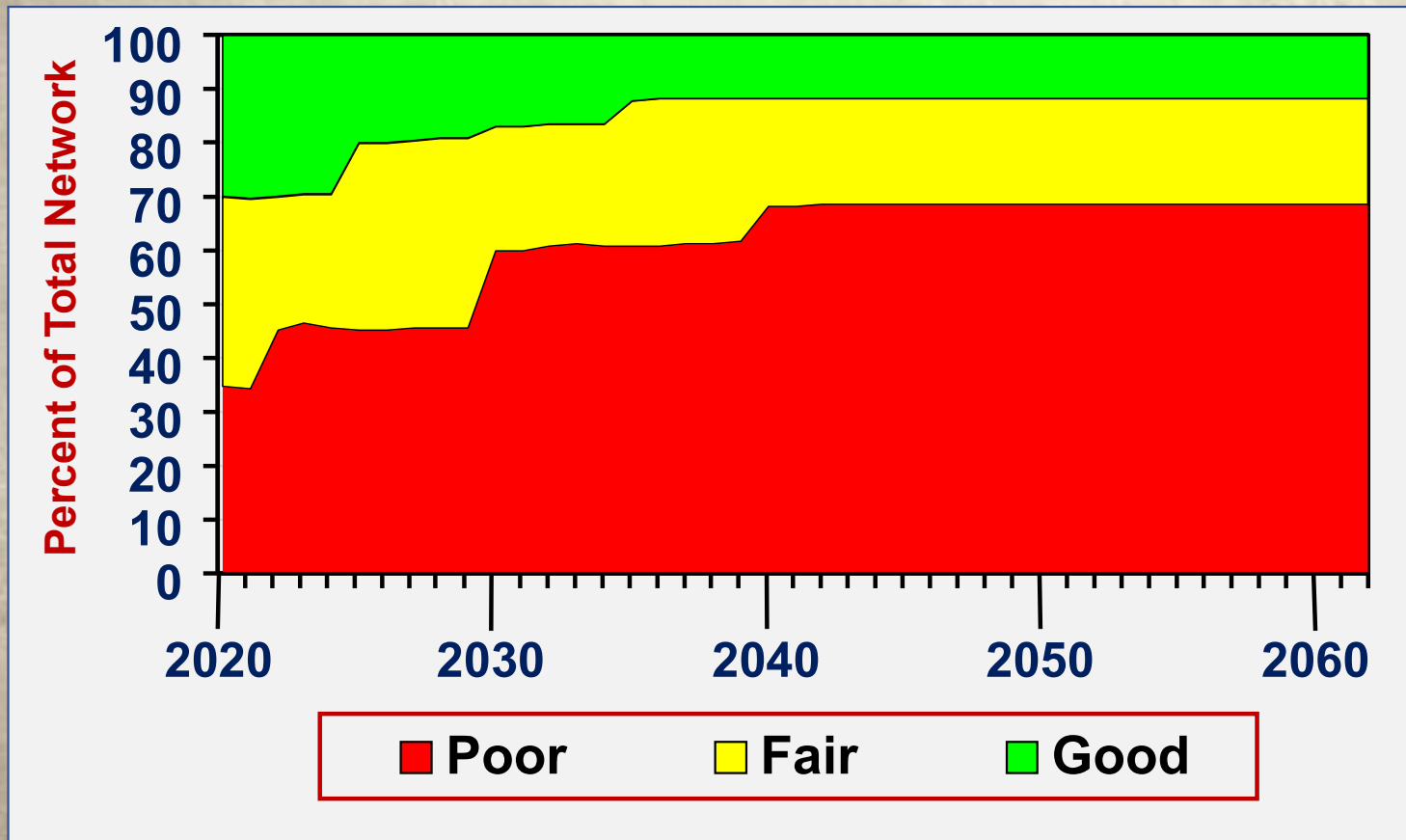
Pavement preservation programs and activities mean programs and activities employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety, and meet road user expectations.

Source: MAP-21

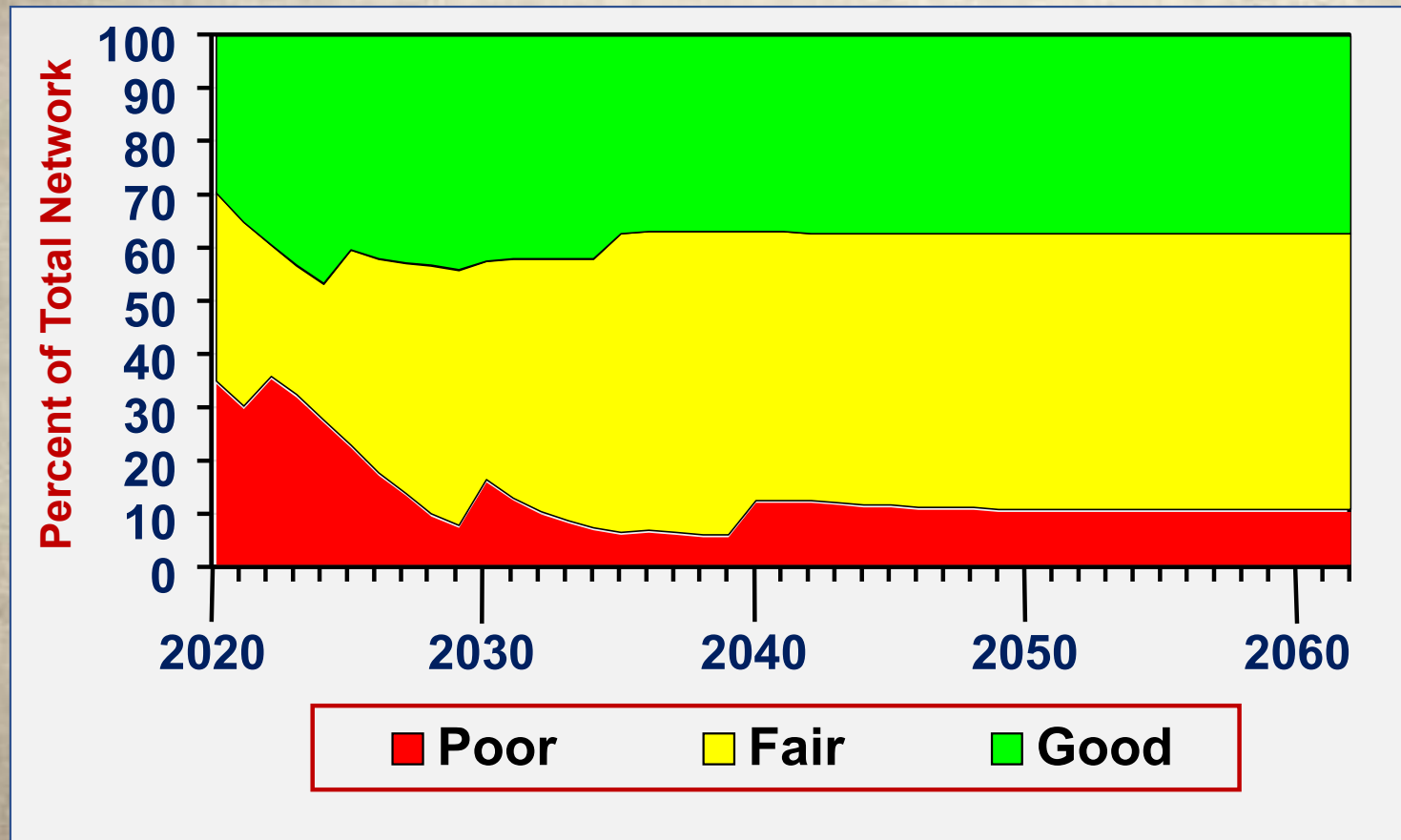
Reconstruction Strategy



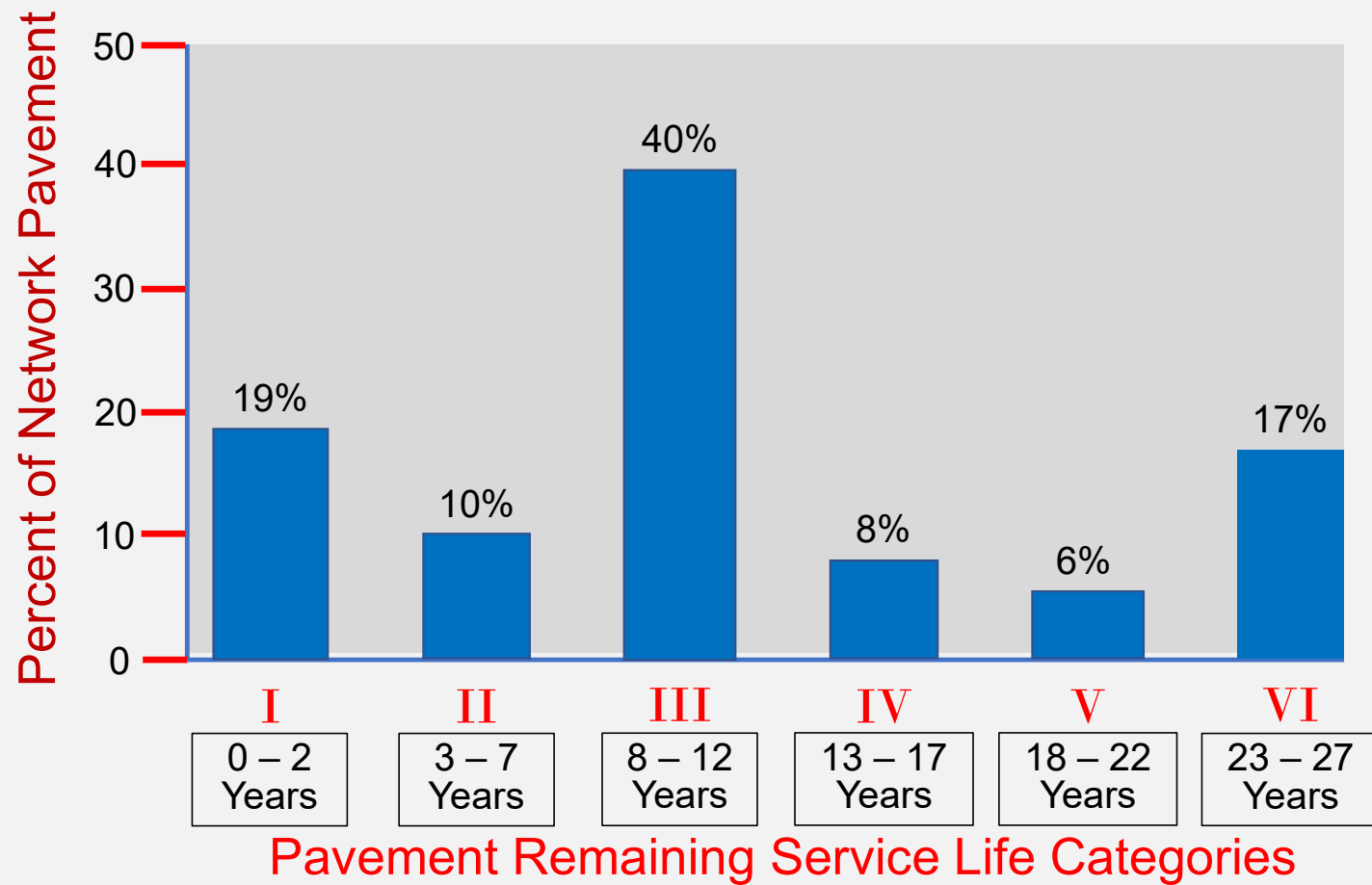
Combined Reconstruction & Rehabilitation Strategies



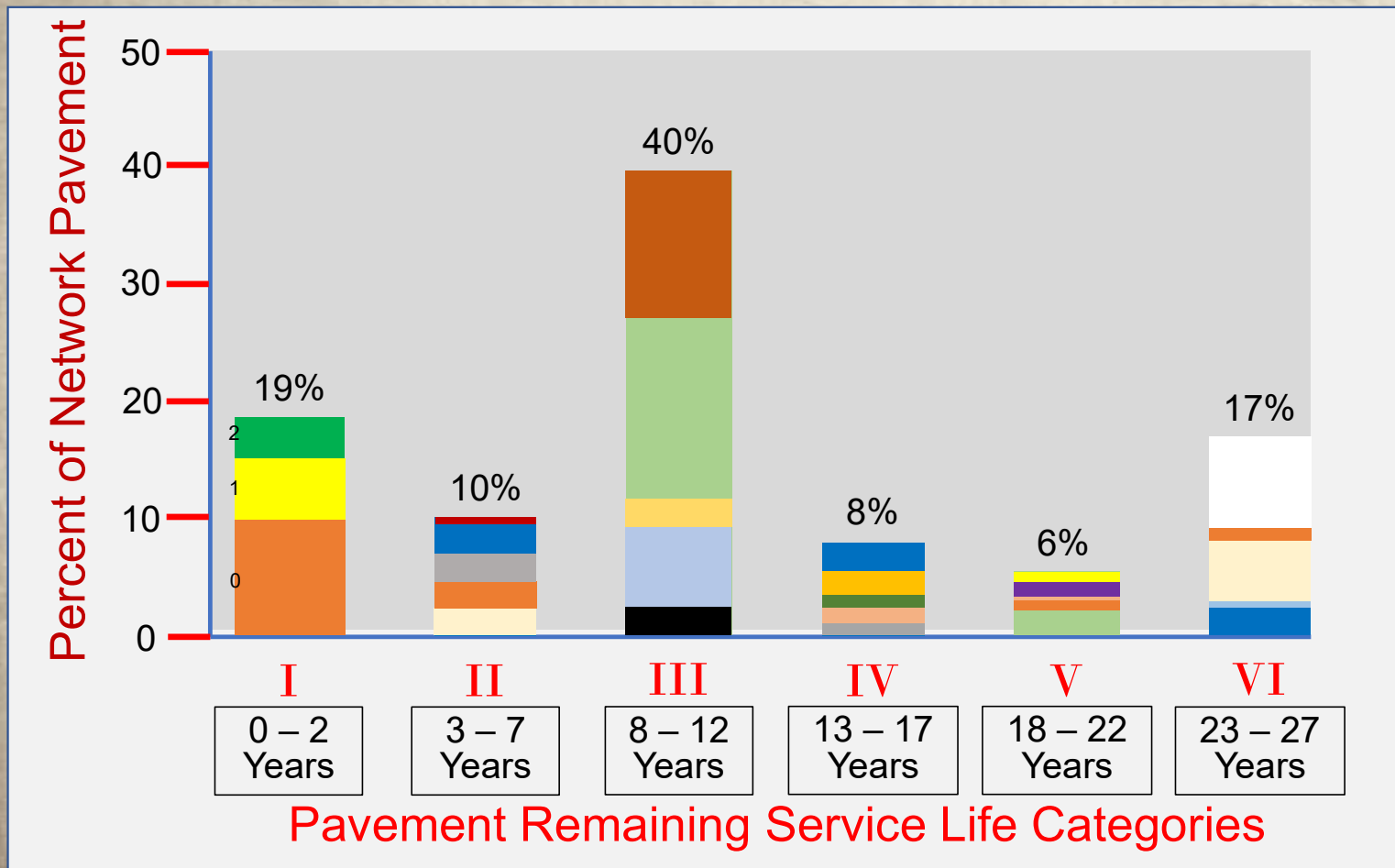
Combined Reconstruction, Rehabilitation, Preservation



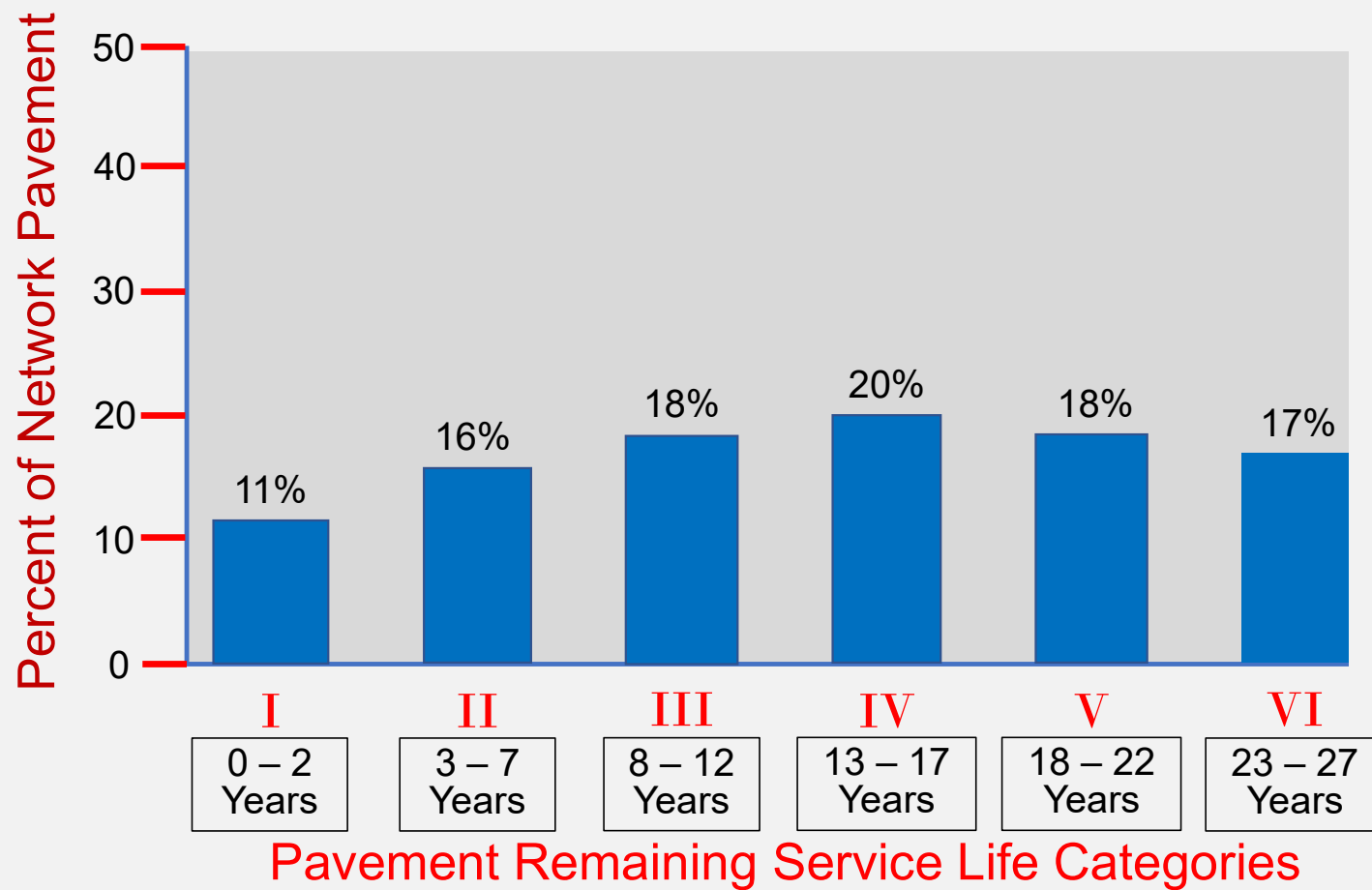
Current Network Condition



Network Distribution by Year

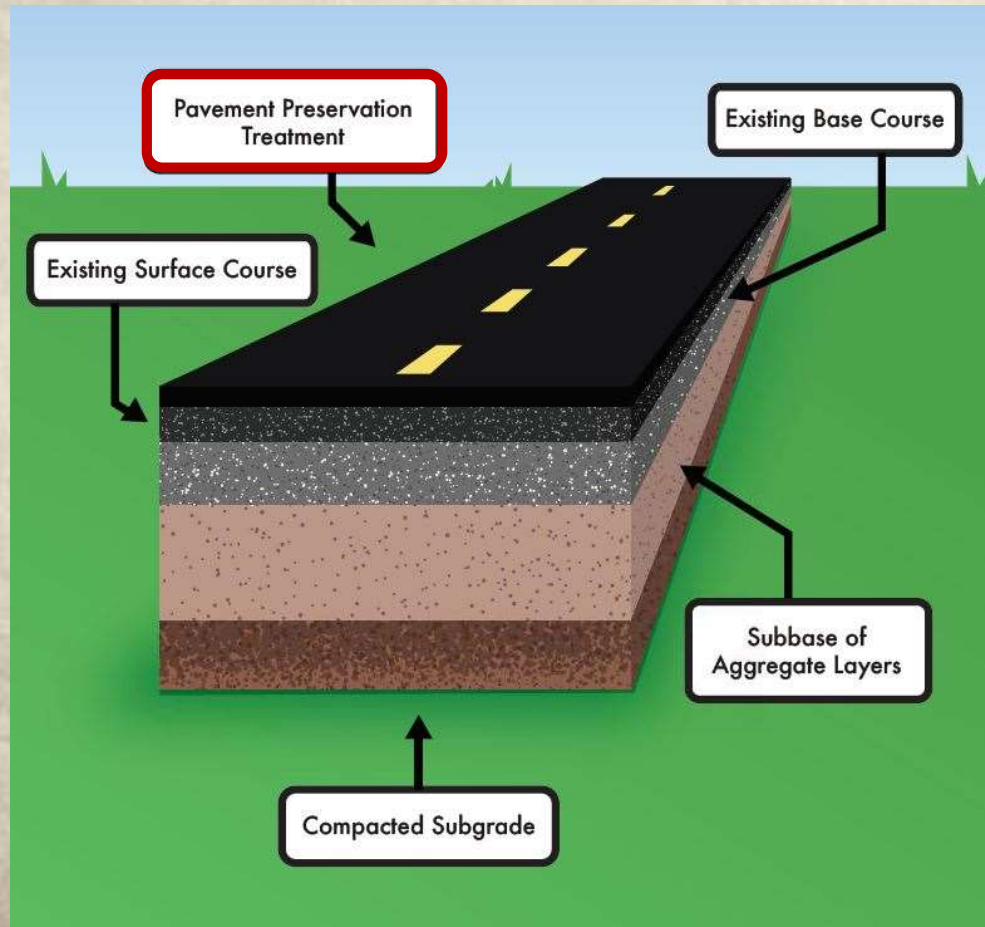


Ideal Network Condition





Pavement Preservation Treatments



Pavement Preservation Treatments

Noteworthy Benefits

- Preserving the pavement reduces the need for costly reconstruction
- Requires substantially less energy than for reconstruction or rehabilitation
- Generates less greenhouse gas emissions than reconstruction and rehabilitation.

Pavement Preservation Treatments



Petroleum-Based Rejuvenator



Emulsified Asphalt Fog Seal

Pavement Preservation Treatments



Crack Sealing



Chip Seal

Pavement Preservation Treatments



Slurry Seal



Micro Surfacing

Pavement Preservation Treatments



Cape Seal



Scrub Seal

Pavement Preservation Treatments



**Ultra-Thin Bonded Wearing Course
(UTBWC)**



Ultra-Thin Hot Mix

Pavement Preservation Treatments



1½" Hot Mix Asphalt Overlay



Hot In-place Recycling (HIR)

Treatment Life versus Life Extension

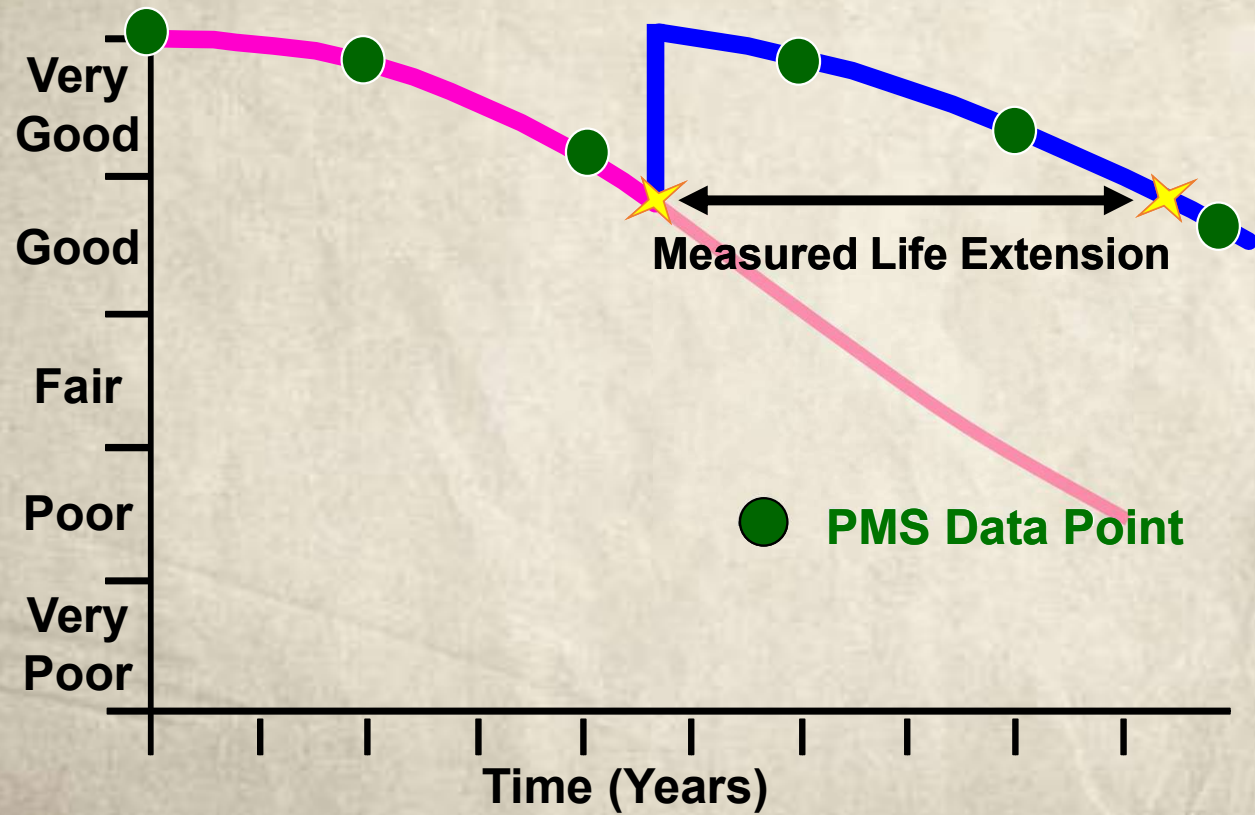
Treatment Life

The expected performance of the treatment.

Pavement Life Extension

The extended life is the elapsed time (years) from application of treatment until pavement reverts to condition at time of treatment.

Pavement Life Extension



Pavement Life Extension



Guidelines for the Preservation of High-Traffic-Volume Roadways

SHRP 2 Report S2-R26-RR-2

Transportation Research Board, Washington, DC, 2011

(Rural Roadways > 5,000 ADT) (Urban Roadways > 10,000 ADT)

Pavement Preservation Life Extensions

Treatment	Treatment Life (yr.)	Life Extension (yr.)
Rejuvenator*	NA	3 - 5
Asphalt Fog Seal	0 - 1	2 - 4
Crack Sealing	3 - 8	2 - 4
Crack Filling	2 - 4	1 - 3
Slurry Seal	4 - 5	3 - 5
Micro Surfacing – Single	3 – 6	3 - 5
Micro Surfacing – Double	4 - 7	4 - 6
Chip Seal – Single	3 – 7	5 - 6
Chip Seal – Double	5 – 10	8 - 10
Ultra-thin Bonded Wearing	7 – 12	6 - 8
Dense Graded Thin HMA	5 - 12	NA
Open Graded Thin HMA	6 - 12	NA
Hot In-place Recycling	6 - 15	NA
Cold In-place Recycling	6 - 15	NA

Typical Life Extensions by Condition

Treatment	Good Condition (PCI=80)	Fair Condition (PCI=60)	Poor Condition (PCI=40)
Fog Seal	2 - 4	0 - 2	0
Chip Seal	5 - 6	3 - 5	0 - 3
Slurry Seal	3 - 5	1 - 3	0 - 1
Micro Surfacing	4 - 6	3 - 4	1 - 3
Thin HMA	5 - 10	3 - 7	2 - 3



Pavement Costs



Typical Preservation Treatment Costs

Based on 2020 Costs

Treatment	Avg. Cost per Square Yard	12' Lane Mile Cost	Avg. Life Extension
Rejuvenator	\$ 1.00	\$ 7,040	4
Asphalt Fog Seal	\$ 1.10	\$ 7,710	3
Crack Sealing	\$ 0.25	\$ 1,760	3
Micro Milling	\$ 1.59	\$ 11,200	—
Scrub Seal w/Another Treatment	\$ 1.70	\$ 11,968	—
Chip Seal	\$ 1.77	\$ 12,460	5
Slurry Seal	\$ 2.69	\$ 18,940	4
Micro Surfacing (Single)	\$ 3.50	\$ 24,640	4
Micro Surfacing (Double)	\$ 4.65	\$ 32,740	5

Note: Lane Mile Costs include 5" paint striping, traffic control, and miscellaneous items

Typical Preservation Treatment Costs

Based on 2020 Costs

Treatment	Avg. Cost per Square Yard	12' Lane Mile Cost	Life Extension
Thin 4.75 Overlay (90#) (\$86/T)	\$ 4.60	\$ 32,380	4
Scrub Seal w/Single Micro	\$ 5.04	\$ 35,480	—
Scrub Seal w/Double Micro	\$ 6.19	\$ 43,580	—
UTBWC	\$ 6.50	\$ 45,760	7
Scrub Seal w/ HMA 4.75 mm (90#)	\$ 6.66	\$ 46,890	—
HMA Overlay 1.5"	\$ 10.48	\$ 73,780	10
HIR (2") w/1.5" HMA	\$ 12.48	\$ 87,860	12
CIR (2"-4") w/1.5" HMA	\$ 14.55	\$ 102,432	15

Note: Lane Mile Costs include 5" paint striping, traffic control, and miscellaneous items

Typical Capital Costs

Based on National Average Costs

Rehabilitation & Construction	Cost per Square Yard	12' Lane Mile Cost	Average Design Life
Mill & Resurface (4")	\$ 36.87	\$ 259,570	12
Crush & Shape ^w /Structural Overlay	\$ 67.47	\$ 474,985	15
New Construction Urban (2-Lane)		\$ 2,000,000	25
New Construction Urban (4-Lane)		\$ 2,250,000	25
New Construction Urban (6-Lane)		\$ 1,840,000	25

Annual Cost by Life Extension

Activity	Life Extension Years	12' Lane Mile Cost	Annualized Cost
Rehabilitation Mill & Resurface (4")	15*	\$ 259,570	\$ 17,305
Preservation HMA Overlay 1.5"	10	\$ 73,780	\$ 7,378
Preservation UTBWC	7	\$ 45,760	\$ 6,537
Preservation Micro Surfacing (Double)	5	\$ 32,740	\$ 6,548
Preservation Slurry Seal	4	\$ 18,940	\$ 4,735
Preservation Chip Seal (Single)	5	\$ 12,460	\$ 2,492
Preservation Rejuvenator	4	\$ 7,040	\$ 1,760
Preservation Crack Sealing	3	\$ 1,760	\$ 587

* Design Life



User Delay Cost



Estimated User Delay Cost Rates

Vehicle Class	Example of Dollar Value Per Vehicle Hour
Passenger Vehicles	\$ 21.89
Single-Unit Trucks	\$ 23.06
Combination Trucks	\$ 29.65

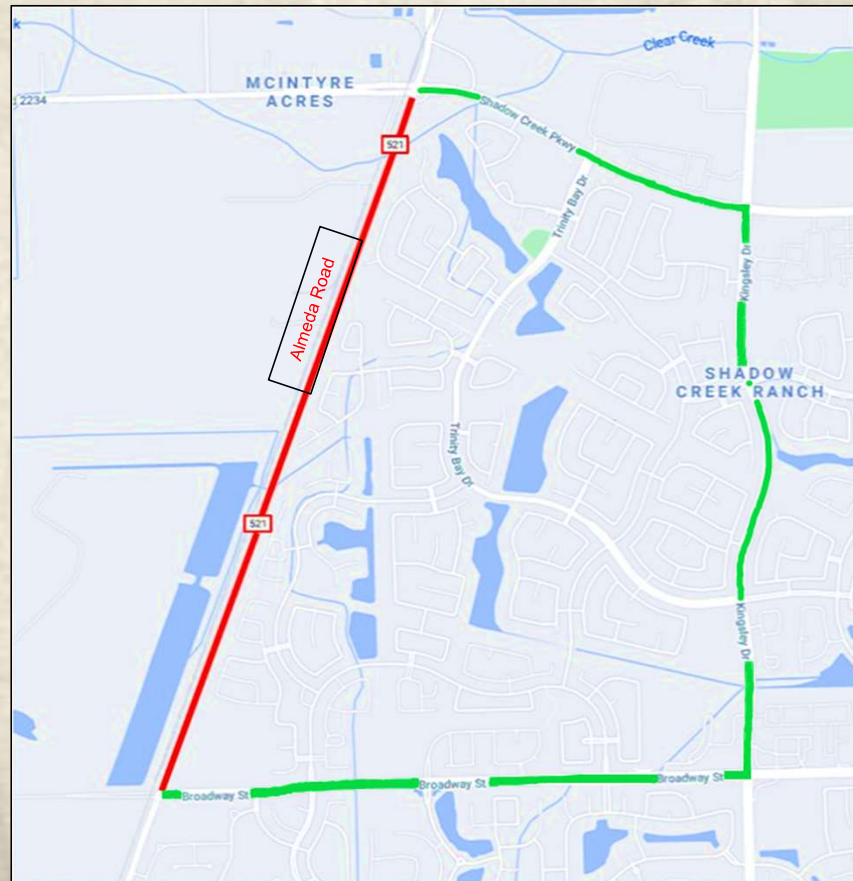
Reference: Work Zone Road User Costs – Concepts and Applications
(FHWA-HOP-12-005 – December 2011)

Simplified User Delay Example

Alameda Road Project

Project Length 1.98 miles
Urban Arterial – 2 lane
3,500 AADT 20% Commercial
Speed Limit: 45 mph

Detour Route 4.0 miles
Urban Collector – 2 lane
1,700 AADT 2% Commercial
Speed Limit: 35 mph



Simplified User Delay Cost Example

80% Passenger Vehicles = 2,800

14% Single-Unit Trucks = 490

6% Combination Trucks = 210

Detour Route Driving Time = 7 minutes

Alameda Road Driving Time = 3 minutes

Additional Driving Time = 4 minutes

Passenger Vehicles $\frac{4}{60}$ hr. X \$21.89/hr. X 2,800/day = \$4,086/day

Single-Unit Trucks $\frac{4}{60}$ hr. X \$23.60/hr. X 490/day = \$ 771/day

Combination Trucks $\frac{4}{60}$ hr. X \$29.65/hr. X 210/day = \$ 415/day

Total Daily User Cost = \$ 5,272/day

Simplified User Delay Cost Example

Delay Cost /Reconstruction Detour

6 weeks X 7 days/week X \$5,272/day = \$221,424

Delay Cost /Rehabilitation Detour

4 weeks X 7 days/week X \$5,272/day = \$147,616

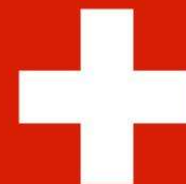
Delay Cost of Preservation Detour

4 days X \$5,272/day = \$ 21,088

3 days X \$5,272/day = \$ 15,816

2 days X \$5,272/day = \$ 10,544

1-day X \$5,272/day = \$ 5,272



A Quick Check of Your Highway Network Health

**by Larry Galehouse, Director,
National Center for Pavement Preservation
*and***

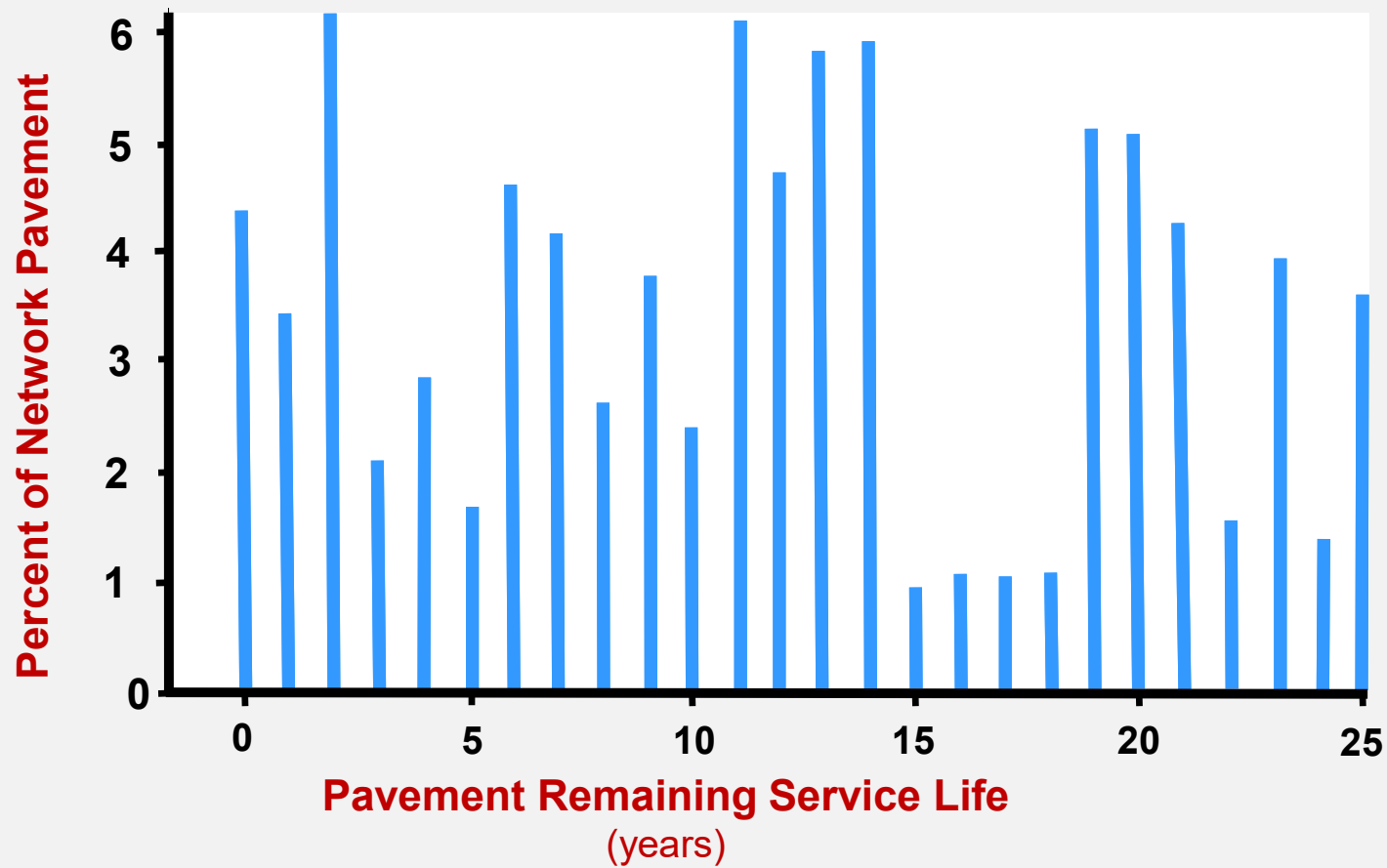
**Jim Sorenson, Team Leader,
FHWA Office of Asset Management**

Example:

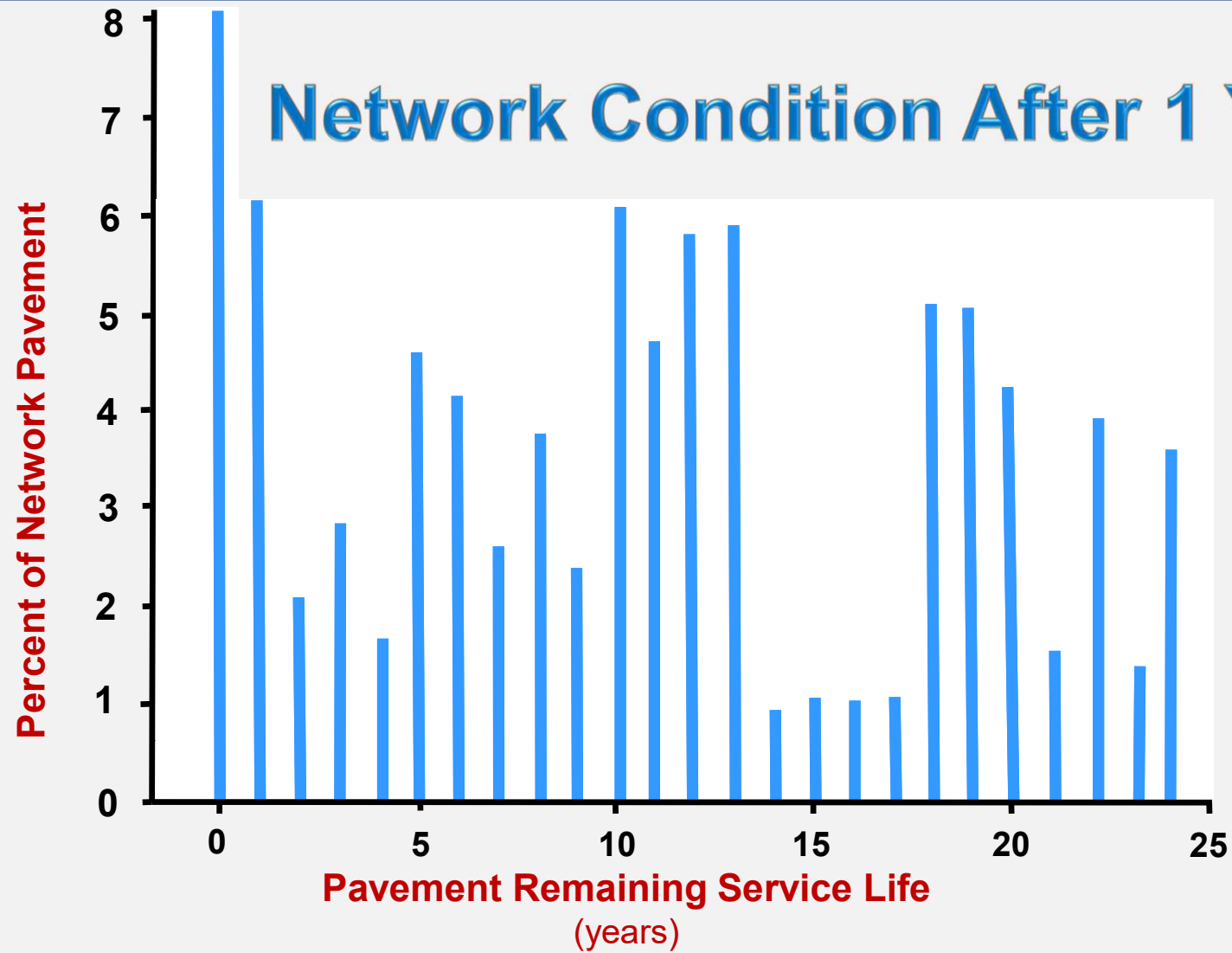
Municipal Street Network

Network Size = 4,356 lane miles

Current Network Condition



Network Condition After 1 Year



**Municipal Street Network =
4,356 lane miles**

Each year the network will lose

4,356 lane mile years

Reconstruction Evaluation

Project	Lane Miles	Design Life	Lane Mile Years	Lane Mile Costs	Total Cost
# 1	22	25 yrs	550	\$463,425	\$10,195,350
# 2	18	30 yrs	540	\$556,110	\$10,009,980
Total = 1,090					\$20,205,330

Rehabilitation Evaluation

Project	Lane Miles	Design Life	Lane Mile Years	Lane Mile Costs	Total Cost
# 3	22	18 yrs	396	\$263,268	\$5,791,896
# 4	28	15 yrs	420	\$219,390	\$6,142,920
# 5	32	12 yrs	384	\$115,848	\$3,707,136
Total = 1,200					\$15,641,952

Pavement Preservation Evaluation

Project	Lane Miles	Life Ext.	Lane Mile Years	Lane Mile Costs	Total Cost
# 101	12	2 yrs	24	\$2,562	\$30,744
# 102	22	3 yrs	66	\$7,743	\$170,346
# 103	26	5 yrs	130	\$13,980	\$363,480
# 104	16	7 yrs	112	\$29,750	\$476,000
# 105	8	10 yrs	80	\$54,410	\$435,280
Total = 412					\$1,475,850

Network Trend

Required: 4,356 lane mile years

Programmed Activity	Lane Mile Years	Total Cost
Reconstruction (40 lane miles) \$\$\$\$	1,090	\$20,205,330
Rehabilitation (82 lane miles) \$\$\$	1,200	\$15,641,952
Pavement Preservation (84 lane miles) \$	412	\$1,475,850
Total = 2,702		\$37,323,132

Network Needs Summary

Network Size (<i>needs</i>)	4,356 <i>(lane mile years)</i>
Programmed Activity	2,702 <i>(lane mile years)</i>
Deficit = 1,654 <i>(lane mile years)</i>	

Steps to Address Minimal Needs

Required: 4,356 lane mile years

Programmed Activity	Lane Mile Years
Reconstruction (31 lane miles)	
Rehabilitation (77 lanes miles)	1,200
Pavement Pre ()	412
Total = 2,702	

Savings = \$ 6.1 M

Program Modification

Savings = \$ 6,101,940 Needs = 1,999 LMY

<i>Preservation Treatment</i>	<i>Life Ext</i>	<i>Lane Miles</i>	<i>Lane Mile Years</i>	<i>Total Cost</i>
Concrete Reseal	4 yrs	31	124	\$ 979,600
Thin HMA Overlay	10 yrs	16	160	\$ 870,560
Micro Surfacing	7 yrs	44	308	\$ 1,309,000
Chip Seal	5 yrs	79	395	\$ 1,104,420
Crack Seal	2 yrs	506	1,012	\$ 1,296,372
			1,999	\$ 5,559,952

Revised Network Strategy

Required: 4,356 lane mile years

Programmed Activity	Lane Mile Years
Reconstruction (31 lane miles)	820
Rehabilitation (77 lane miles)	1,125
Pavement Preservation (2,083 lane miles)	2,411
Total = 4,356	

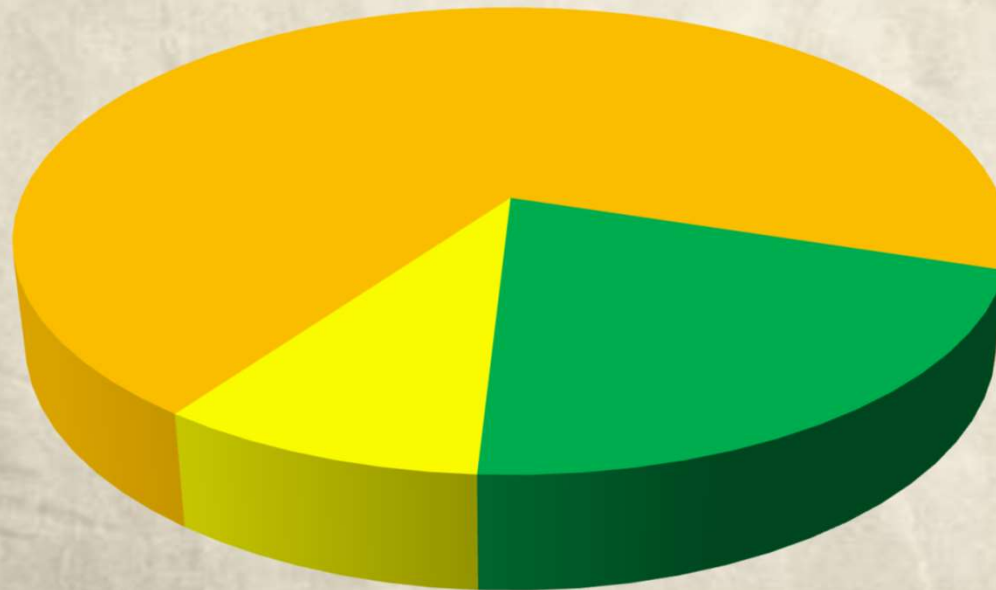
Net Savings = \$ 541,988

Quick Assessment Method

- **Establishes Network Need**
- **Evaluates**
 - Reconstruction
 - Rehabilitation
 - Pavement Preservation
- **Incorporates**
 - Design Life
 - Life Extensions

★ Trends Impacting Pavement Preservation

Certain contractor and agency employees need to be certified for the treatments they construct and inspect.



■ Workmanship - 66% ■ Design Deficiency - 21% ■ Material Failure - 9% ■ Natural Disaster - 4%

Trends Impacting Pavement Preservation

Certain pavement preservation projects will include incentives and penalty clauses in specifications.



Summary

- No single treatment works for every pavement condition.
- Build a preservation toolbox of many treatments.
- Every highway agency faces budget constraints.
- Improving the pavement network requires a mix of fixes.
- The real value of pavement preservation is to the taxpayer.

*Every accomplishment starts
with a decision to try.*



Thank You