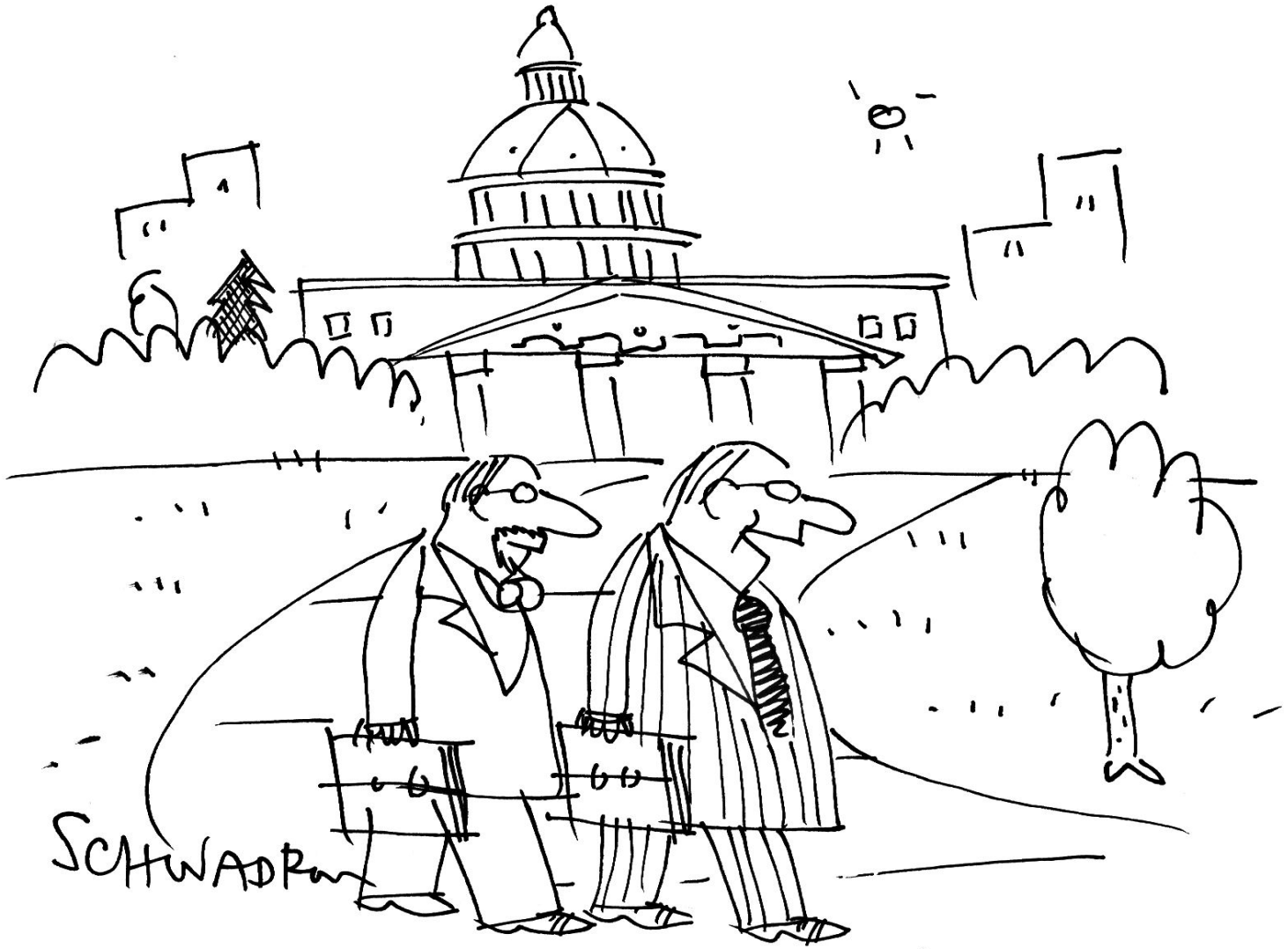
Sealcoating Inc.

Pavement Preservation –

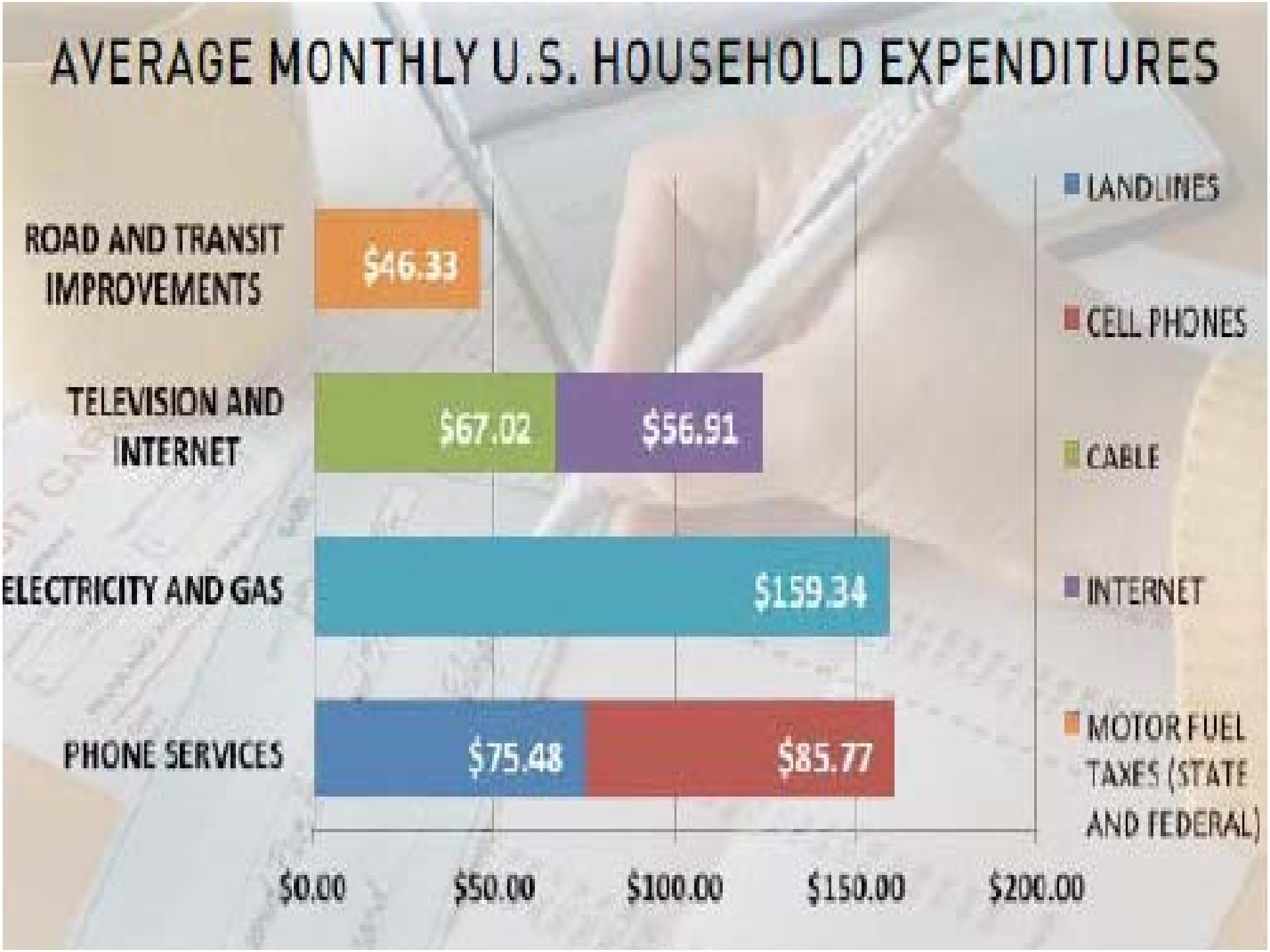
Your Key to Pavement Management Success!

(a local practitioner's perspective)

Upton, MA *July 16, 2013* *Dan Patenaude, P.E.*



"I MISS THE OLD DAYS WHEN WE COULD JUST THROW MONEY AT PROBLEMS."


AVERAGE MONTHLY U.S. HOUSEHOLD EXPENDITURES
ROAD AND TRANSIT IMPROVEMENTS
$46.33
TELEVISION AND INTERNET
$67.02
$56.91
ELECTRICITY AND GAS
$159.34
PHONE SERVICES
$75.48
$85.77
LANDLINES
CELL PHONES
CABLE
INTERNET
MOTOR FUEL TAXES (STATE AND FEDERAL)
$0.00
$50.00
$100.00
$150.00
$200.00

Pavement Preservation

- *What is it?*
- *Why is it important?*
- *How do you do it?*
- *How do you sell it?*

Pavement Preservation

- *a planned system of treating pavements to maximize their useful life as cost-effectively as possible*

Key Concepts of Pavement Preservation

*- a **planned system** of treating pavements to maximize their useful life as cost-effectively as possible*

- proactive & progressive, **not** reactive
- can be simple or more complex
- managers have strong control

Key Concepts of Pavement Preservation

- a planned system of ***treating pavements to maximize their useful life*** *as cost-effectively as possible*

- heavy emphasis on preventive maintenance
- early intervention is essential
- ultimate goal: keep good roads in good condition!

Key Concepts of Pavement Preservation

- a planned system of treating pavements to maximize their useful life ***as cost-effectively as possible***

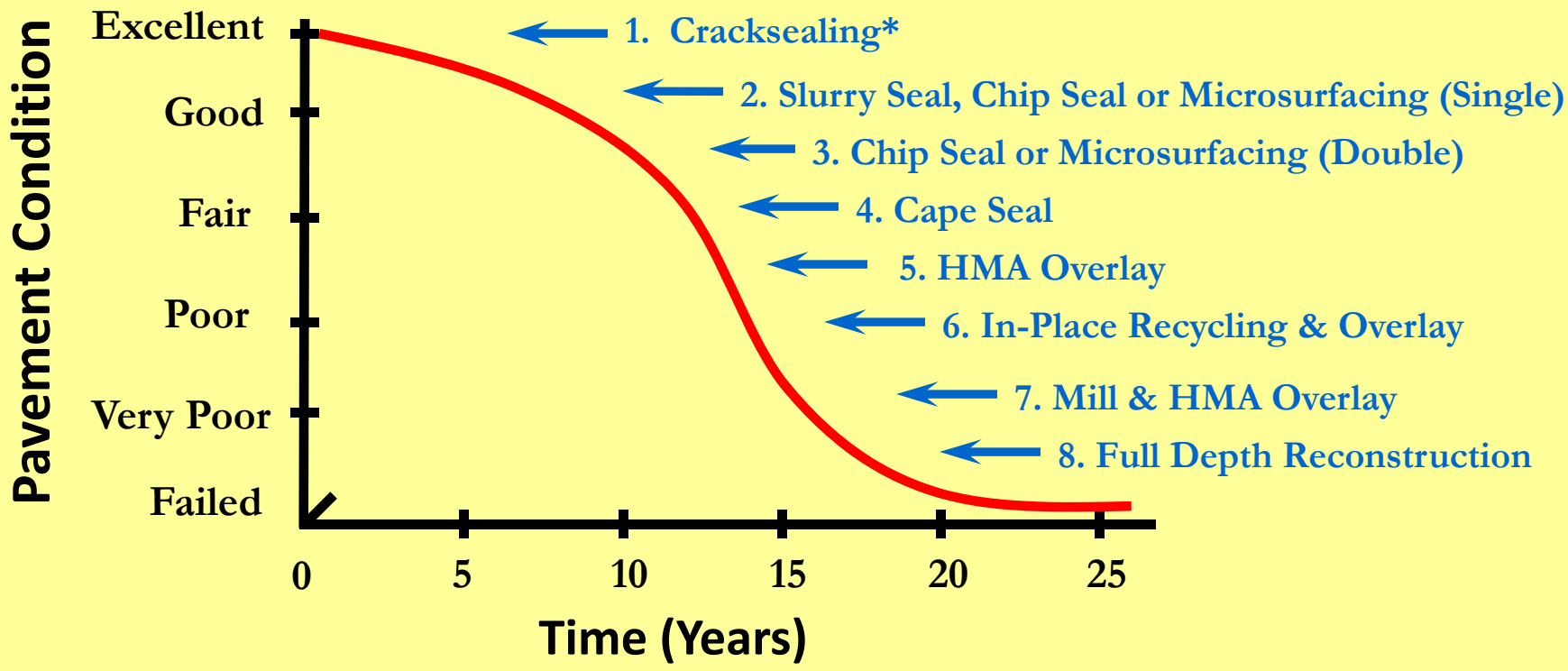
Proactive pavement managers analyze alternative treatment costs and service lives to generate "Equivalent Annual Costs", or

EAC = $/SY/year

Asphalt Deterioration Curve

(An Unfortunate Fact of Life)

Applying the Right Treatment, to the Right Road, at the Right Time…



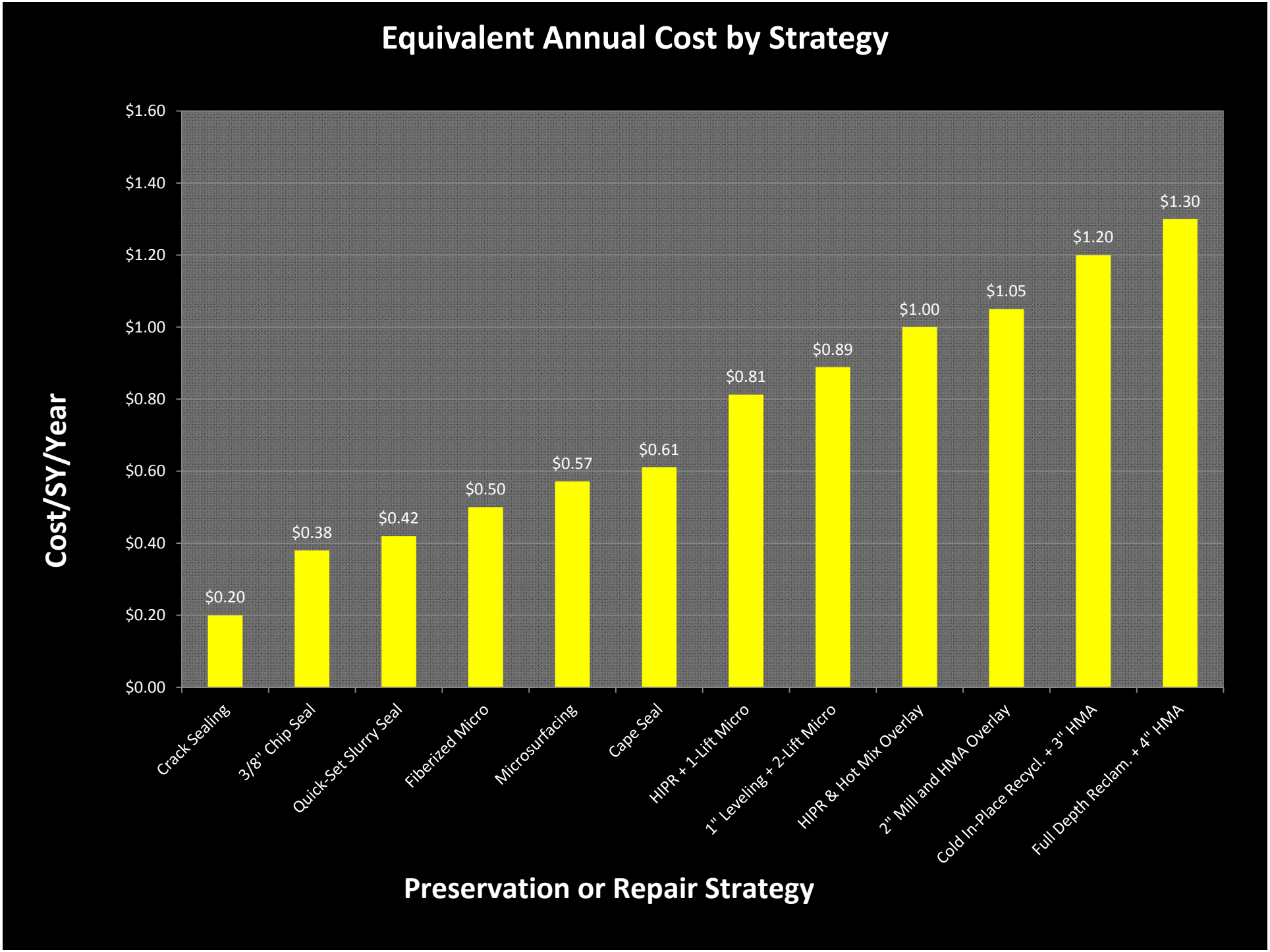
* Cracksealing to also be used in conjunction with other applications and as needed

2012 Equivalent Annual Pavement Management Costs

last revised: March 13, 2013

Treatment Alternative	2012 Approximate Unit Costs ($/lane-mile)*	2012 Approximate Unit Costs ($/s.y.)	Estimated Service Life (years)	Equivalent Annual Cost ($/s.y./year)
Crack Sealing (PCRM)	$2,816	$0.40	2	$0.20
3/8" Chip Seal (CRS-2 emulsion)	$13,376	$1.90	5	$0.38
20 lbs./s.y. Quick-Set Slurry Seal (single)	$14,784	$2.10	5	$0.42
Fiber-reinforced Microsurfacing (double)	$31,680	$4.50	9	$0.50
32 lbs./s.y. Microsurfacing (double)	$28,160	$4.00	7	$0.57
Cape Seal (3/8" chip seal, plus 28 lbs./s.y. micro)	$38,720	$5.50	9	$0.61
Hot In-Place Recycling, plus 1-Lift Microsurfacing	$45,760	$6.50	8	$0.81
1" HMA Leveling Course, plus 2-Lift Microsurfacing	$56,320	$8.00	9	$0.89
Hot In-Place Recycling, plus 1.5" HMA Overlay	$77,440	$11.00	11	$1.00
2" Mill and HMA Overlay	$73,920	$10.50	10	$1.05
Cold In-Place Recycling, plus 3" HMA Overlay	$126,720	$18.00	15	$1.20
Full Depth Reclamation, plus 4" HMA Overlay	$183,040	$26.00	20	$1.30

**based on 12 foot lane widths*


Equivalent Annual Cost by Strategy
Cost/SY/Year
$1.60
$1.40
$1.20
$1.00
$0.80
$0.60
$0.40
$0.20
$0.00
$0.20
$0.38
$0.42
$0.50
$0.57
$0.61
$0.81
$0.89
$1.00
$1.05
$1.20
$1.30
Crack Sealing
3/8" Chip Seal
Quick-Set Slurry Seal
Fiberized Micro
Microsurfacing
Cape Seal
HIPR + 1-Lift Micro
1" Leveling + 2-Lift Micro
HIPR & Hot Mix Overlay
2" Mill and HMA Overlay
Cold In-Place Recycl. + 3" HMA
Full Depth Reclam. + 4" HMA
Preservation or Repair Strategy

NHDOT - Pavement Management Section
2011/2012 Equivalent Annual Costs

Treatment Alternative	2011/2012 Approx. Costs ($/lane-mile)	2011/2012 Approx. Costs ($/SY)	Estimated Service Life (years)	Equivalent Annual Cost ($/SY/year)
Micro or 4.75mm HMA	$ 22,810	$ 3.24	6	$ 0.54
Double Chip Seal	$ 28,301	$ 4.02	7	$ 0.57
3/4" Paver Shim	$ 25,281	$ 3.59	6	$ 0.60
1" HBP Overlay	$ 33,708	$ 4.79	8	$ 0.60
Chip Seal	$ 21,120	$ 3.00	5	$ 0.60
15% AR Chip Seal	$ 35,482	$ 5.04	8	$ 0.63
Nova Chip (PPST)	$ 44,352	$ 6.30	10	$ 0.63
1-1/2" HBP Overlay	$ 50,561	$ 7.18	10	$ 0.72
1-1/2" ARGG Overlay	$ 70,786	$ 10.05	13	$ 0.77
1-1/2" HBP Inlay	$ 67,457	$ 9.58	10	$ 0.96
FDR with 4" HBP	$ 147,502	$ 20.95	15	$ 1.40
2" TW Inlay with 1-1/2" FW Overlay	$ 134,872	$ 19.16	13	$ 1.47
4" CIP with 3" HBP Overlay	$ 156,035	$ 22.16	15	$ 1.48

Notes:

1. Costs per lane lane mile based on 12-foot lane width.
2. Costs shown here include a 20% multiplier to account for fixed costs.

Pavement Preservationist's Goal

Manage your network **maximizing** the utilization of treatments with lower Equivalent Annual Costs!

Example

Network Centerline Mileage = 70 miles

Average Roadway Paved Width = 20.55 feet

Network Pavement Area = +/- 844,000 square yards

Rehab/Reconstruct ("Worst First") Strategy:

844,000 s.y. x $1.17/SY/year = $987,480/year

(avg. EAC)

Pavement Preservation ("Keep Good Roads Good") Strategy:

844,000 s.y. x $0.61/SY/year = $514,840/year

(avg. EAC)

Preservation Strategy Savings = $472,640/year!

Pavement Preservation

- *a planned system of treating pavements to maximize their useful life as cost-effectively as possible*

Benefits of Pavement Preservation

1. Financial

2. Environmental

3. User Satisfaction

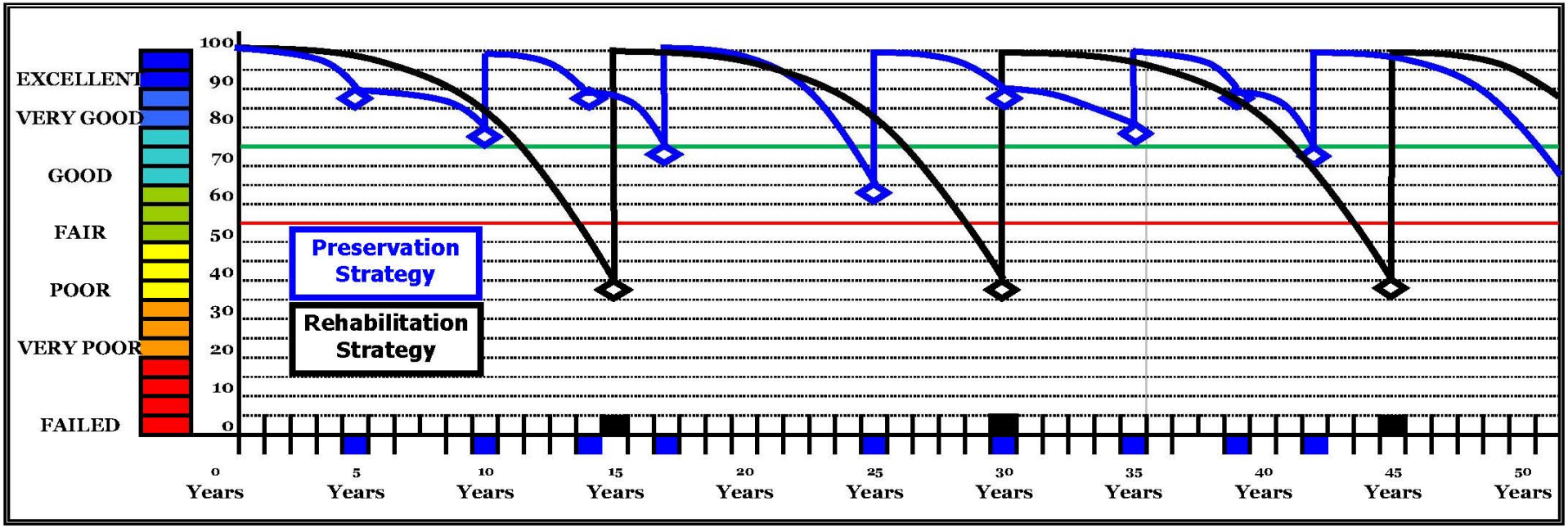
Benefits of Pavement Preservation

Financial -

- extending pavement life to preserve earlier investments
- more predictable system maintenance costs – fewer bad surprises
- significantly lower life-cycle costs (think long term!)

Progressive Pavement Management

Preservation vs. Rehabilitation



PRESERVATION STRATEGY:

Years 5, 14, 30 & 39: Crack Sealing

Years 10 & 35: Microsurfacing (Double)

Years 17 & 42: Cape Seal

Year 25: Mill & Pave

TOTAL COST/SY OVER 50 YEARS = $31.10

REHABILITATION STRATEGY:

Year 15: FDR plus 4" Hot Mix Overlay

Year 30: FDR plus 4" Hot Mix Overlay

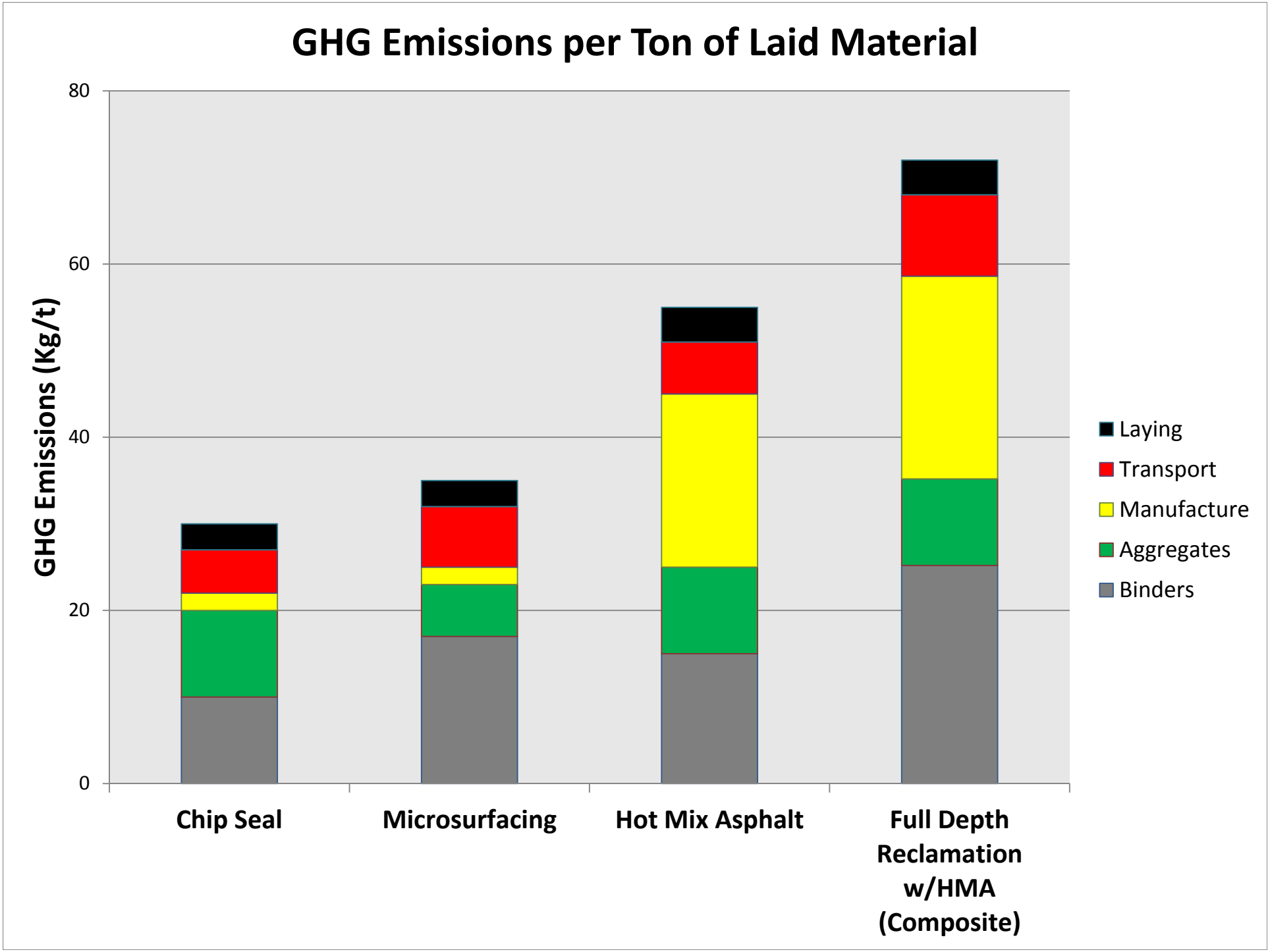
Year 45: FDR plus 4" Hot Mix Overlay

TOTAL COST/SY OVER 50 YEARS = $60.00

Benefits of Pavement Preservation

Environmental –

- requires fewer natural resources (petroleum and aggregate)
- less energy consumption
- less greenhouse gas emissions


GHG Emissions per Ton of Laid Material
GHG Emissions (Kg/t)
80
60
40
20
0
Chip Seal
Microsurfacing
Hot Mix Asphalt
Full Depth Reclamation w/HMA (Composite)
Laying
Transport
Manufacture
Aggregates
Binders

Greenhouse Gas Emissions

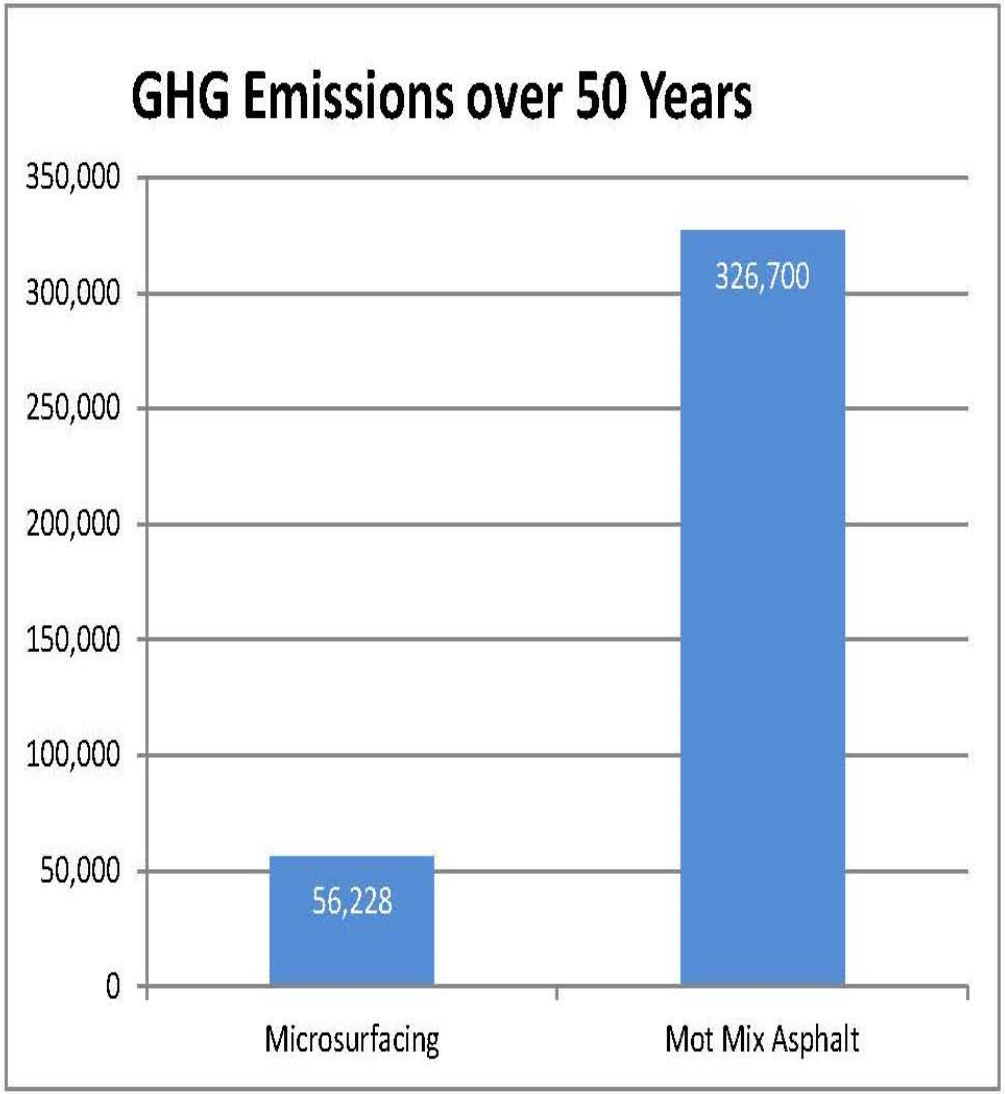
Microsurfacing vs. HMA

For 1 Mile of Highway (2 Lanes) - 1 application each

Method	Tons	GHG(kg/tn)	Total*
Microsurfacing	225	35/ton	7,875
Hot Mix Asphalt	1,188	55/ton	65,340
Advantage of Preservation			57,465
a reduction of (per application)			87.95%

For 50 Years of Maintenance

Method	Times Needed	Total*
Microsurfacing	7.14	56,228
Hot Mix Asphalt	5.00	326,700
Advantage of Preservation		270,473
a reduction of (over 50 years)		82.79%



*GHG Emissions are Measured in Kilograms and include CO2 and other miscellaneous greenhouse gases.

Benefits of Pavement Preservation

User Satisfaction –

- better overall network condition
- reduced vehicle damage and construction delays
- enhanced professional image

Good Roads = Happy Taxpayers

How Do You Do a Pavement Preservation Program?

<u>2 Keys to Success:</u>

1.) Fill up your toolbox

2.) Commit to a Pavement Management System (PMS)

Pavement Preservation

<u>Key # 1:</u>

It takes more than 1 or 2 tools to do the job right!

Pavement Preservation Tools

- Crack Sealing
- Chip Seal
- Quick-Set Slurry
- Microsurfacing
- Cape Seal
- Single Course HMA
- In-Place Recycling

Pavement Preservation

Key #2:

Pavement Management System (PMS)

A PMS helps you assign the right "tool" or treatment to the right road at the right time, and also helps you **maximize** your network's overall pavement condition with allowable funds.

Pavement Preservation

With new tools in our toolbox and a plan (PMS) on where to use them, let's get started!

Pavement Preservation

IMPORTANT STEP

"Selling" the Pavement Preservation Plan!

Pavement Preservation

Pavement Preservation ≠ Worst First

"Why are you working on this street when the one I live on is in much worse condition?

Don't you have any clue about what you're doing?"

Selling Pavement Preservation

You need to constantly educate and communicate the benefits of the new approach!

- Staff (top to bottom)
- Governing Council
- Public (use the media)

Implementing Pavement Preservation

Simple (but effective) planning, education and communication tool:

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

Available at: www.fhwa.dot.gov/preservation/library.cfm

A Quick Check of Your Highway Network Health

- based on the **Remaining Service Life** (RSL) concept
- every roadway segment in a network has a **Remaining Service Life**
- if you have 140 lane–miles of pavements in your network and do <u>no</u> repairs or maintenance in a given year, the network will lose 140 lane–mile–years of **Remaining Service Life**
- work with your governing board to develop annual work plans to achieve the agency's pavement condition goals (outcome-based budgeting)

Worst First vs. Progressive

- 70 centerline miles (140 lane-miles)
- $600K pavement management budget
- 2.5 miles (5 lane-miles) of poor roads

What's the best annual work program?

Pothole City, Massachusetts

NETWORK EVALUATION WORKSHEET

Management Strategy: "Worst First"

Total Network Lane-Miles: 140

Pavement Management Budget: $600,000

Reconstruction Projects:

Reconstruction Method	Design Life		Lane-Miles		Lane-Mile-Years	Lane-Mile Cost	Total Cost
Full Depth Reclaim + 4" HMA	20	X	2	=	40	$183,040	$366,080
		X		=			
		X		=			
		Totals:	2		40		$366,080

Rehabilitation Projects:

Rehabilitation Method	Design Life		Lane-Miles		Lane-Mile-Years	Lane-Mile Cost	Total Cost
HIP Recycle + 1.5" HMA Overlay	11	X	2	=	22	$77,440	$154,880
2" Mill-and-Fill with HMA	10	X	1	=	10	$73,920	$73,920
		X		=			
		X		=			
		Totals:	3		32		$228,800

Pavement Preservation Projects:

Preservation Method	Life Extension		Lane-Miles		Lane-Mile-Years	Lane-Mile Cost	Total Cost
		X		=			
		X		=			
		X		=			
		X		=			
		X		=			
		Totals:	0		0		$0

Network Trend:

Programmed Activity	**Lane-Mile Years**	**Total Cost**
Reconstruction	40	$366,080
Rehabilitation	32	$228,800
Preservation	0	$0
Totals:	72	$594,880

Strategy Summary:

Programmed Activity (Lane-Mile-Years) =	72
Total Network (Lane-Mile-Years) =	140
Gain (+) / Deficit (-) =	**(68)**

Pothole City's Work Plan Outcomes:

- All 5 lane-miles of poor roads fixed ("worst first" strategy)
- Only a total of 5 lane-miles treated (less than 4% of network)
- EAC of treatments used = +/- $8,200/lane-mile/year (+/- $1.17/SY/year)
- Program yielded a net **deficit** of 68 lane-mile-years

The overall network condition rating suffered major decline!

http://www.fairfieldct.org/dpw-PavementPres.pdf

Progressivetown, Massachusetts

NETWORK EVALUATION WORKSHEET

Management Strategy: Proactive Pavement Preservation

Total Network Lane-Miles: 140

Pavement Management Budget: $600,000

Reconstruction Projects:

Reconstruction Method	Design Life		Lane-Miles		Lane-Mile-Years	Lane-Mile Cost	Total Cost
Full Depth Reclaim + 4" HMA	20	X	1	=	20	$183,040	$183,040
		X		=			
		X		=			
		Totals:	1		20		$183,040

Rehabilitation Projects:

Rehabilitation Method	Design Life		Lane-Miles		Lane-Mile-Years	Lane-Mile Cost	Total Cost
HIP Recycle + 1.5" HMA Overlay	11	X	1	=	11	$77,440	$77,440
2" Mill-and-Fill with HMA	10	X	0.5	=	5	$73,920	$36,960
		X		=			
		X		=			
		Totals:	1.5		16		$114,400

Pavement Preservation Projects:

Preservation Method	Life Extension		Lane-Miles		Lane-Mile-Years	Lane-Mile Cost	Total Cost
CMCR Crack Sealing	2	X	16	=	32	$2,816	$45,056
3/8" Chip Seal	5	X	4	=	20	$13,376	$53,504
Quick-Set Slurry Seal (20 #/s.y.)	5	X	2	=	10	$14,784	$29,568
Microsurfacing (32 #/s.y.)	7	X	3.5	=	24.5	$28,160	$98,560
Cape Seal (chip seal + micro)	9	X	2	=	18	$38,720	$77,440
		Totals:	27.5		104.5		$304,128

Network Trend:

Programmed Activity	**Lane-Mile Years**	**Total Cost**
Reconstruction	20	$183,040
Rehabilitation	16	$114,400
Preservation	104.5	$304,128
Totals:	140.5	$601,568

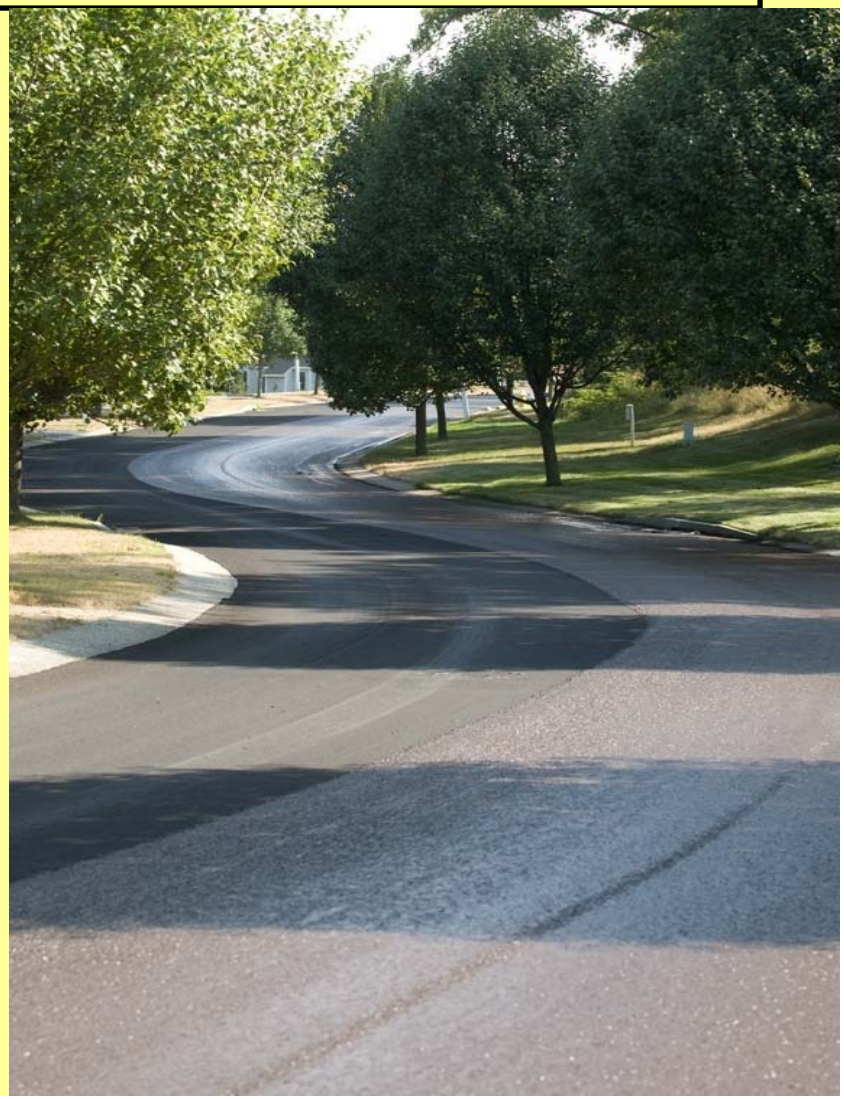
Strategy Summary:

Programmed Activity (Lane-Mile-Years) =	140.5
Total Network (Lane-Mile-Years) =	140
Gain (+) / Deficit (-) =	0.5

Progressivetown's Work Plan Outcomes:

- Half of the bad roads fixed
- 30 lane-miles treated (21% of network)
- EAC of treatments used = +/- $4,300/lane-mile/year (+/- $0.61/SY/year)
- Program yielded a net **gain** of 0.5 lane-mile-years

The overall network condition rating was improved!



Additional Resources

- The National Center for Pavement Preservation (www.pavementpreservation.org)
- The Foundation for Pavement Preservation (www.fp2.org)
- Federal Highway Administration (www.fhwa.dot.gov/pavement/pres.cfm)

Summary

In these challenging economic times where all levels of government are being asked to "*do more with less*", utilize a pavement preservation approach to maximize your Community's roadway conditions.

Microsurfacing in Sandwich, MA
30
THANK YOU
Sealcoating Inc.