

# **A Treatment for Every Budget**

## ***A Survey of Asphalt Surface Treatment Unit Costs***



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**NW Pavement Management  
Association Conference**

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Portland, Oregon**



PAVEMENT SERVICES, INC.



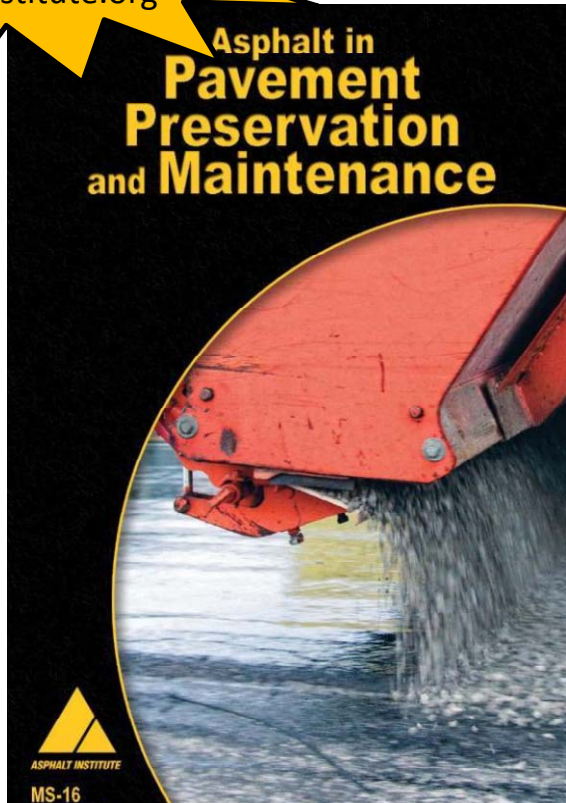
# Outline

- Maintenance and Repair Treatment Review
- Underlying Cost Trends
- Unit Costs for Selected M&R Treatments



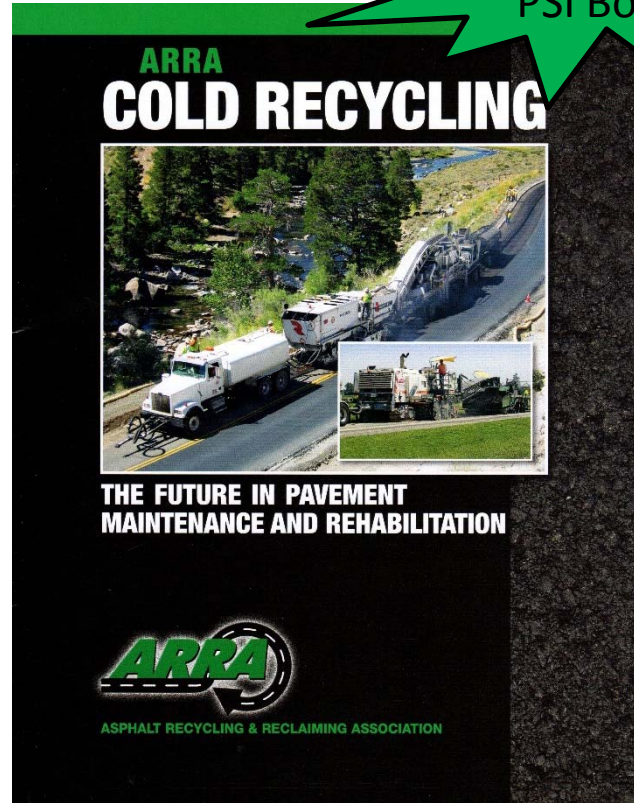
# References

Buy @  
asphaltinstitute.org



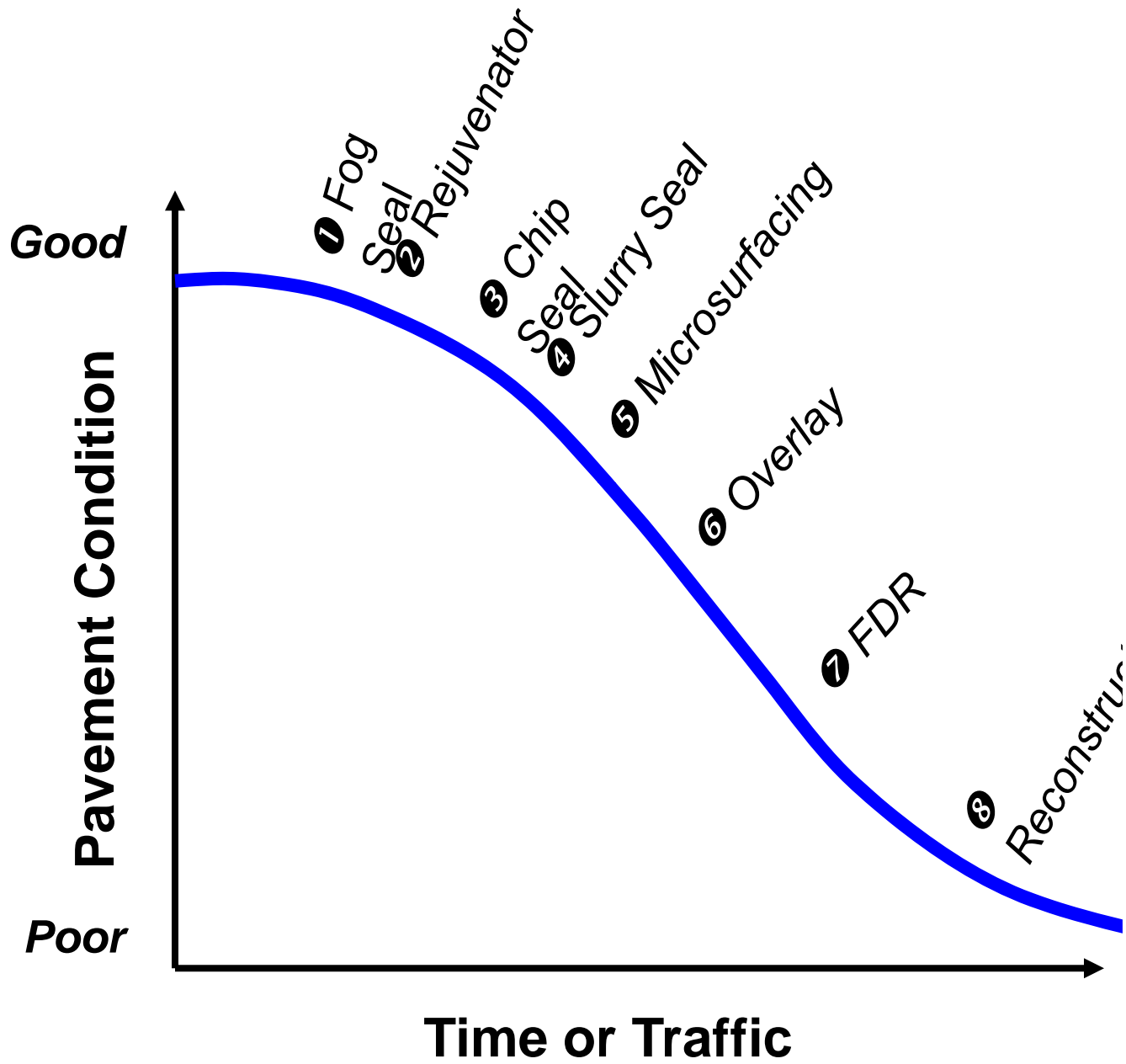
**Asphalt Institute MS-16**  
**ASPHALT IN PAVEMENT PRESERVATION**  
**AND MAINTENANCE**

Free @  
PSI Booth



**ARRA Cold Recycling**  
**ASPHALT RECYCLING AND RECLAIMING**  
**ASSOCIATION**

# Maintenance Treatment Review





# M&R Alternatives

\$ \$



\$

- ⑧ Reconstruction
- ⑦ Full-Depth Reclamation
- ⑥ HMA Overlay
- ⑤ Microsurfacing
- ④ Slurry Seal
- ③ Chip Seal
- ② Rejuvenator
- ① Fog Seal



# 1 FOG SEAL

## Description

Application of diluted asphalt emulsion to a good pavement surface.

## Mechanism

Asphalt seals fine cracks and fills small voids, protecting HMA from elements.

## Details

Apply CSS-1 uniformly to achieve **residual** application rate in the range of 0.03 to 0.08 gal/sy.

## Cost

\$0.20 to \$1.10 per sy

## Expected Service Life

1-2 years



# ② ASPHALT REJUVENATOR

## Description

Application of diluted asphalt emulsion that contains maltenes.

## Mechanism

Same as fog seal + rejuvenators restore maltenes lost due to oxidation.

## Details

Apply rejuvenators uniformly at application rate recommended by supplier.

## Cost

\$1.00 to \$1.25 per sy

## Expected Service Life

2-3 years

### Example Products

Reflex  
GSB-88  
PDC  
RejuvaSeal





# ③ CHIP SEAL

## Description

Spray application of asphalt followed by application of single size cover stone.

## Mechanism

Seals old pavement surface and adds a skid resistant and durable new surface.

## Details

Application rates of asphalt and chips should be designed

## Materials

CRS-2P, HFE-150  
5/8" stone, 3/4" stone

## Cost

\$1.30 to \$2.25 per sy

## Expected Service Life

4-6 years



# Chip Seal Design

**Table 6.3 Quantities of Asphalt and Aggregate for Single Surface Treatments<sup>1,2,3,4</sup>**

Nominal Size of Aggregate	Size No.	Quantity of Aggregate kg/m <sup>2</sup> (lb/yd <sup>2</sup> )	Quantity of Asphalt l/m <sup>2</sup> (gal/yd <sup>2</sup> )	Type and Grade of Asphalt*
19.0 to 9.5 mm (3/4 to 3/8 in.)	6	22-27 (40-50)	1.8-2.3 (0.40-0.50)	RS-2, CRS-2
12.5 to 4.75 mm (1/2 in. to No. 4)	7	14-16 (25-30)	1.4-2.0 (0.30-0.45)	RS-1, RS-2, CRS-1, CRS-2
9.5 to 2.36 mm (3/8 in. to No. 8)	8	11-14 (20-25)	0.9-1.6 (0.20-0.35)	RS-1, RS-2, CRS-1, CRS-2
4.75 to 1.18 mm (No. 4 to No. 16)	9	8-11 (15-20)	0.7-0.9 (0.15-0.20)	RS-1, MS-1, CRS-1, HFRS-2
Sand	AASHTO M-6	5-8 (10-15)	0.5-0.7 (0.10-0.15)	RS-1, MS-1, CRS-1, HFRS-2

\* Including polymer modified versions of these emulsions

<sup>1</sup> These quantities of asphalt cover the average range of conditions that include primed granular bases and old pavement surfaces. The quantities and types of materials may be varied according to local conditions and experience.

<sup>2</sup> The lower application rates of asphalt shown in the above table should be used for aggregate having gradations on the fine side of the specified limits. The higher application rates should be used for aggregate having gradations on the coarse side of the specified limits.

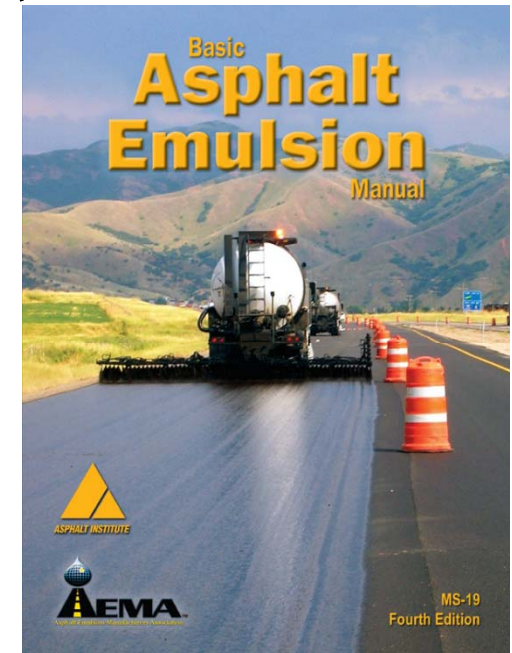
<sup>3</sup> It is important to adjust the asphalt quantity for the surface condition of the road, increasing it if the road is absorbent, badly cracked, or coarse, and decreasing it if the road is flushed with asphalt. (See table below.)

<sup>4</sup> It is important to adjust the asphalt quantity for traffic count and conditions. An increase in traffic will mean a decrease in asphalt content.

### Correction for Surface Condition

Pavement Texture	Correction**	
	L/m <sup>2</sup>	(gal/yd <sup>2</sup> )
Black, flushed asphalt	-0.04 to -0.27	(-0.01 to -0.06)
Smooth, non-porous	0.00	(0.00)
Absorbent – slightly porous, oxidized	0.14	(0.03)
– slightly pocked, porous, oxidized	0.27	(0.06)
– badly pocked, porous, oxidized	0.40	(0.09)

\*\*This correction must be made from observations at the job site.













# ④ SLURRY SEAL

## Description

Mixture of “quick” setting asphalt emulsion, graded fine aggregate, mineral filler, and water

## Mechanism

Seals voids and surface cracks and replaces aggregates lost to weathering and raveling

## Details

Requires a mix design

## Materials

CQS-1H

Type I, II graded aggregate

## Cost

\$1.35 to \$2.25 per sy

## Expected Service Life

5-7 years

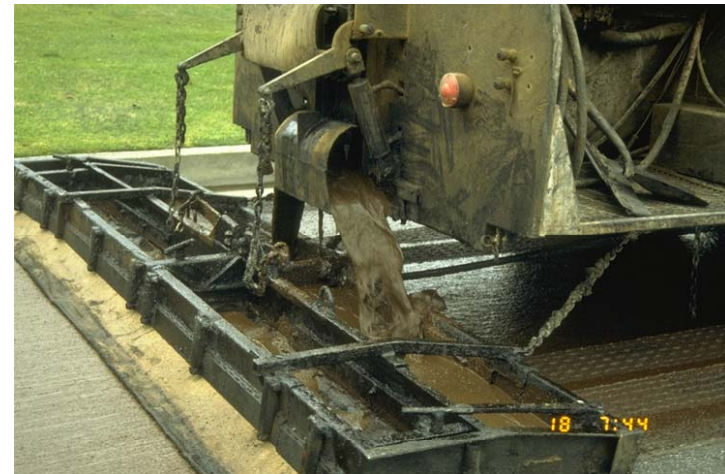
### AGGREGATE GRADATION



**TYPE I**  
(1/8" X 200)

**TYPE II**  
(1/4" X 200)

**TYPE III**  
(3/8" X 200)











# 5 MICROSURFACING

## Description

Mixture of quick set **polymer-modified asphalt emulsion**, graded fine aggregate, mineral filler, water and **other additives**.

## Mechanism

Similar to slurry seal plus tougher aggregates and chemical break.

## Details

Requires a mix design

## Materials

CQS-1H w/polymer  
Type I, II graded aggregate  
Chemical additives

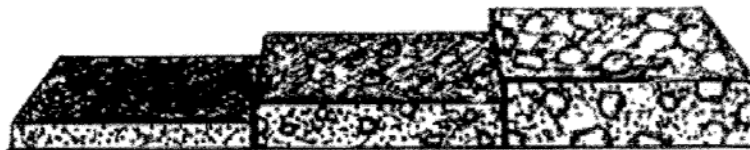
## Cost

\$2.90 to \$4.50 per sy

## Expected Service Life

5-7 years

### AGGREGATE GRADATION



**TYPE I**  
(1/8" X 200)

**TYPE II**  
(1/4" X 200)

**TYPE III**  
(3/8" X 200)





# Microsurfacing Uses

- Fill Ruts
- Re-Profile Pavement
- Treats Flushed Pavements









# ⑥ ASPHALT OVERLAY

## Description

Placement and compaction of hot-mix asphalt to add structural capacity and/or restore functional characteristics.

## Mechanism

Mixture of high-quality graded aggregates and asphalt binder

## Details

Requires a mix design

## Materials

PG binders + graded aggregates

## Cost

\$70 to \$110 per ton

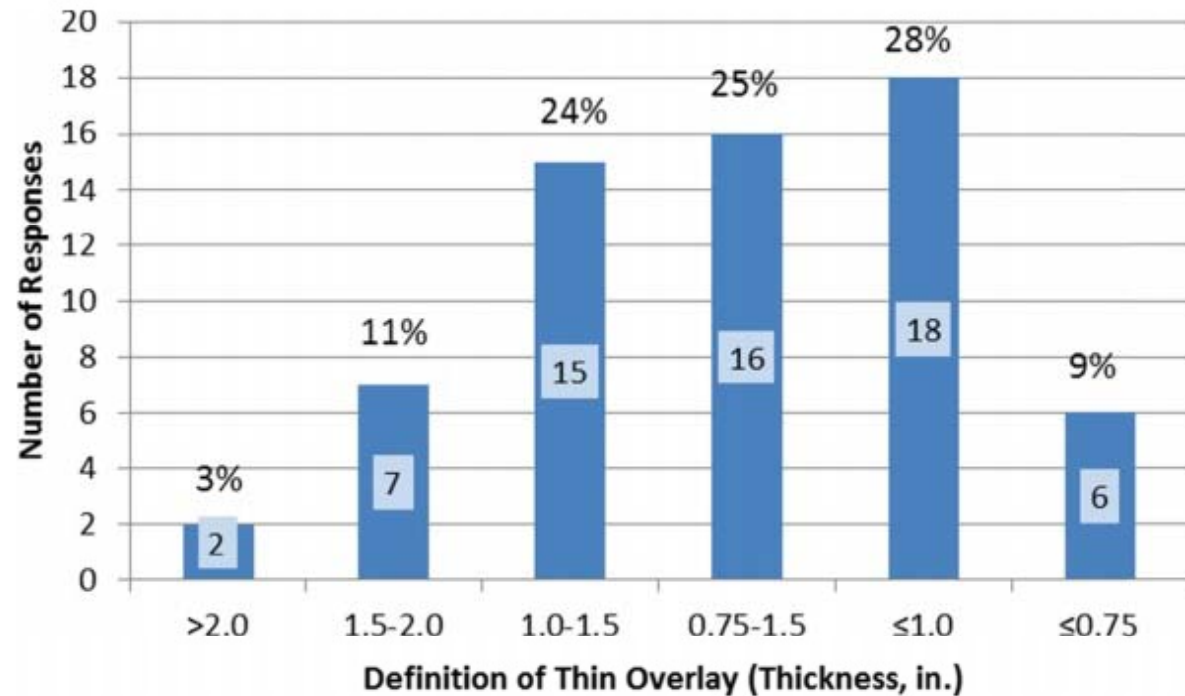
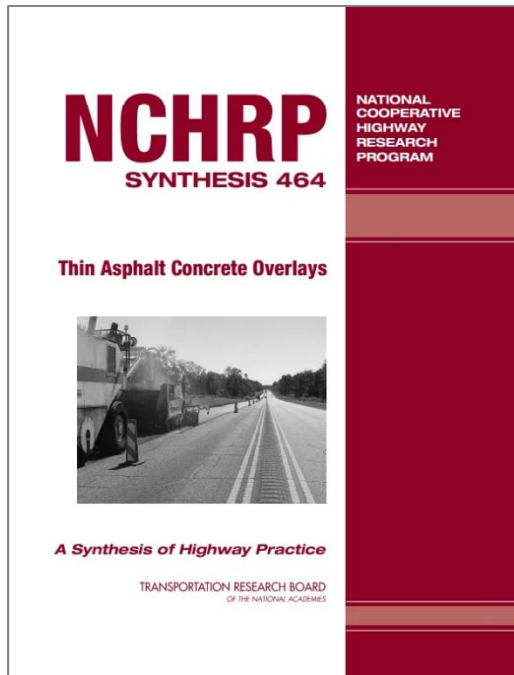
## Expected Service Life

12-15 years



# NCHRP Synthesis 464

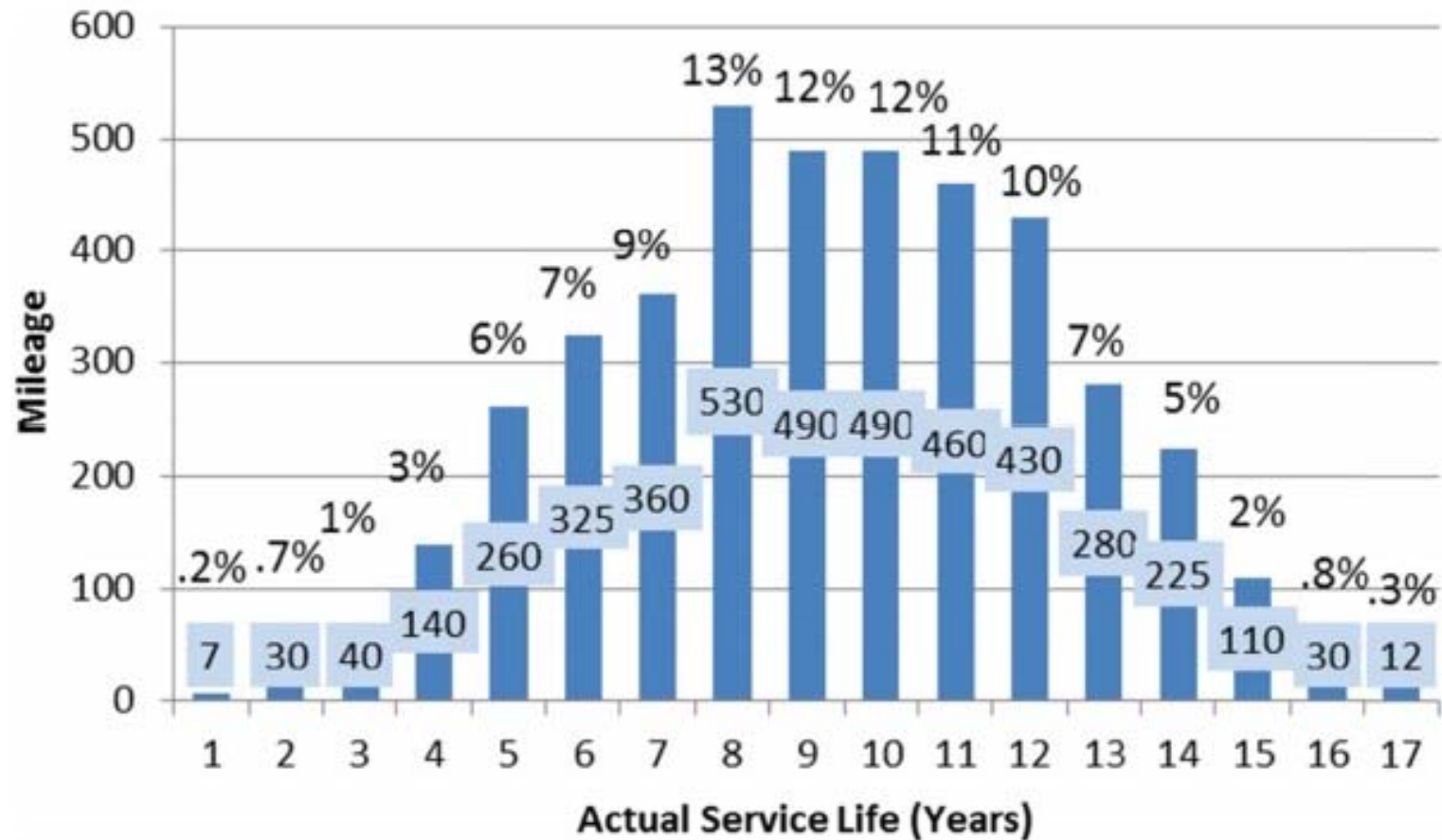
## Thin Asphalt Concrete Overlays





# NCHRP Synthesis 464

## Thin Asphalt Concrete Overlays



# 7 FULL DEPTH RECLAMATION

## Description

Pulverization and blending of existing asphalt, base aggregate, and (in some cases), subgrade soil, with a stabilizing agent to create a new base layer.

## Mechanism

Up to 100 percent recycling of existing roadway materials.

## Details

Requires careful project selection, laboratory testing, and quality control.

## Materials

Stabilizing agents: portland cement, lime, flyash, emulsified asphalt, or foamed asphalt.

## Cost

\$10 to \$14 per sy

## Expected Service Life

20+ years











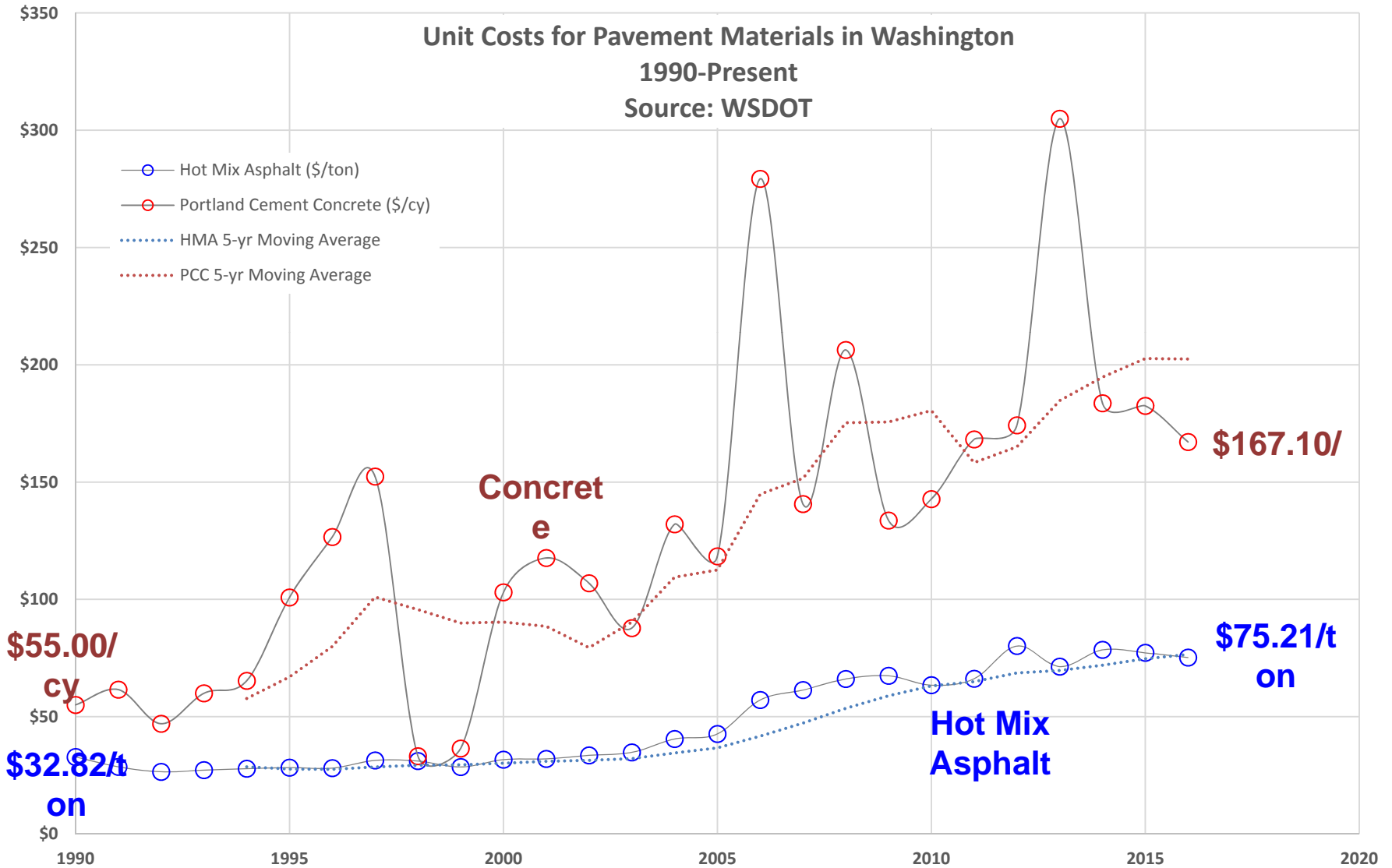




# General Pricing Trends



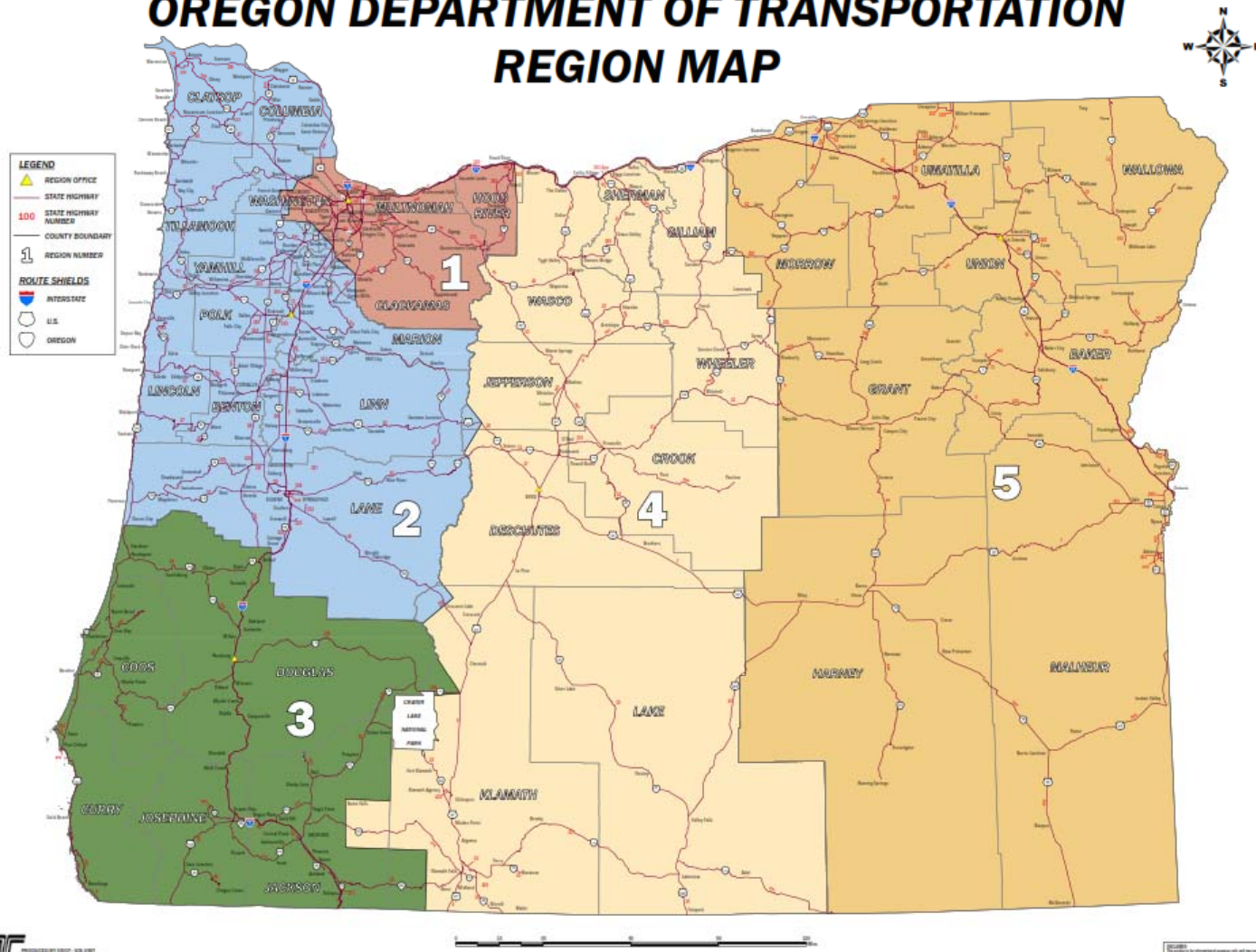
# HMA and PCC



# Regional Variation In Prices

# Cost Variance by ODOT Region

## OREGON DEPARTMENT OF TRANSPORTATION REGION MAP

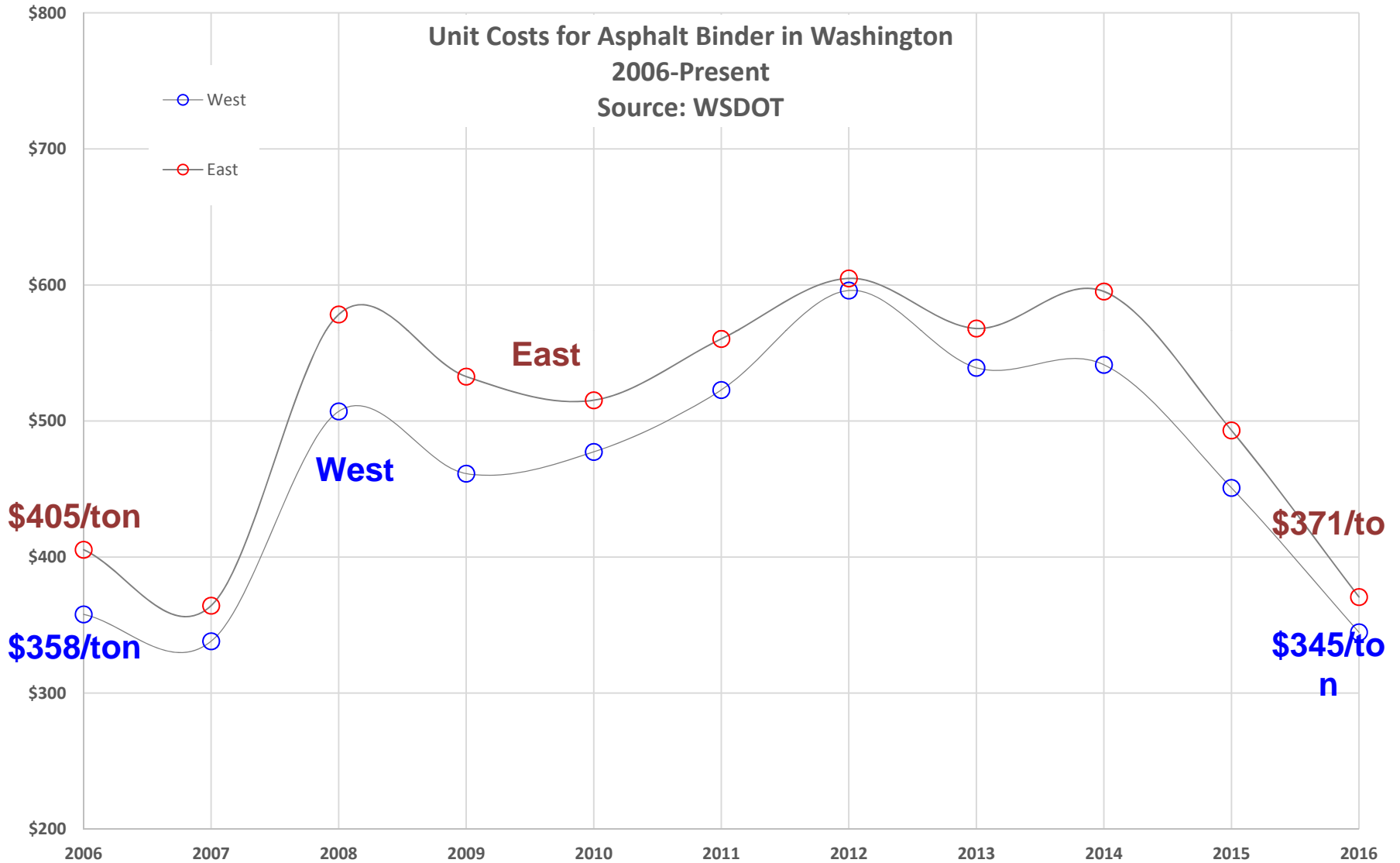




# Oregon Dept of Aviation Study

Description	Unit	Region					Statewide Average
		1	2	3	4	5	
Grooving	lf		\$0.90	\$1.06			\$0.98
			92%	108%			
2-inch HMA Overlay	sy	\$14.00	\$14.00	\$15.00	\$13.00	\$12.00	\$13.60
		103%	103%	110%	96%	88%	
Mobilization	ls		12.1%	8.0%	11.7%	11.5%	10.8%
			112%	74%	108%	106%	
Crack Sealing	lf	\$1.08	\$0.90	\$1.06			\$1.01
		107%	89%	105%			
Paving Fabric	sy		\$2.80	\$1.06			\$1.93
			145%	55%			
AC Milling 4-inches deep	sy		\$4.00		\$3.10	\$2.27	\$3.12
			128%		99%	73%	
Geotextile Fabric	sy	\$0.85	\$0.95	\$1.16	\$1.37	\$1.50	\$1.17
		73%	81%	99%	117%	129%	
Hot Mix Asphalt	ton	\$76.74	\$72.60	\$76.92	\$60.22	\$64.61	\$70.22
		109%	103%	110%	86%	92%	
6-inch Concrete	sy		\$68.00	\$184.97	\$53.00	\$81.00	\$96.74
			70%	191%	55%	84%	
PCC Joint Sealing	lf		\$5.00	\$2.05	\$5.06	\$2.27	\$3.60
			139%	57%	141%	63%	
PCC Spall Repair	sf		\$50.00	\$19.00		\$125.00	\$64.67
			77%	29%		193%	
Slurry Seal	sy		\$1.68	\$1.42	\$1.17	\$1.37	\$1.41
			119%	101%	83%	97%	
Overall Variation		\$0.98	\$1.05	\$0.94	\$0.98	\$1.03	

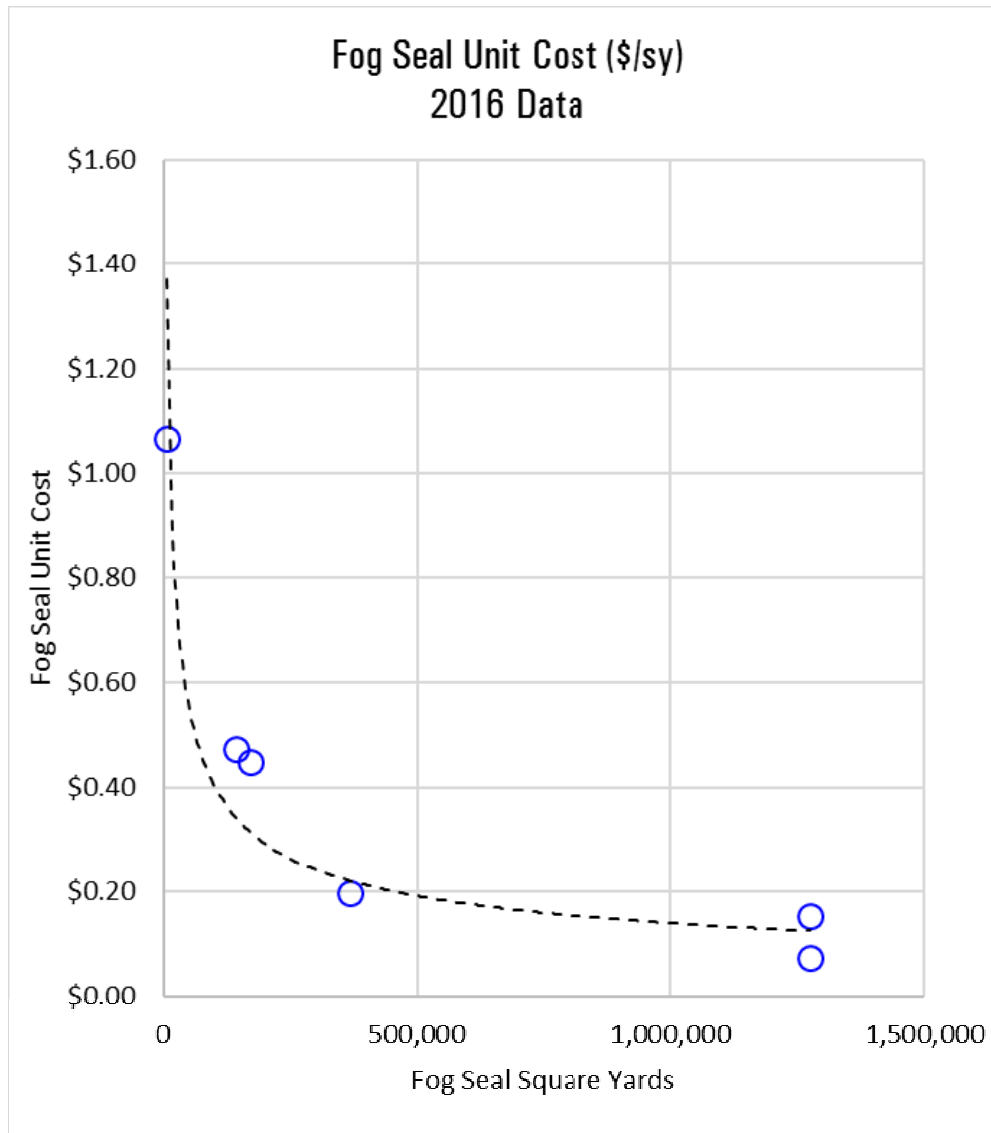
# Asphalt Binder



# **Variation In Bid Prices Based on Project Quantities**



# 1 FOG SEAL



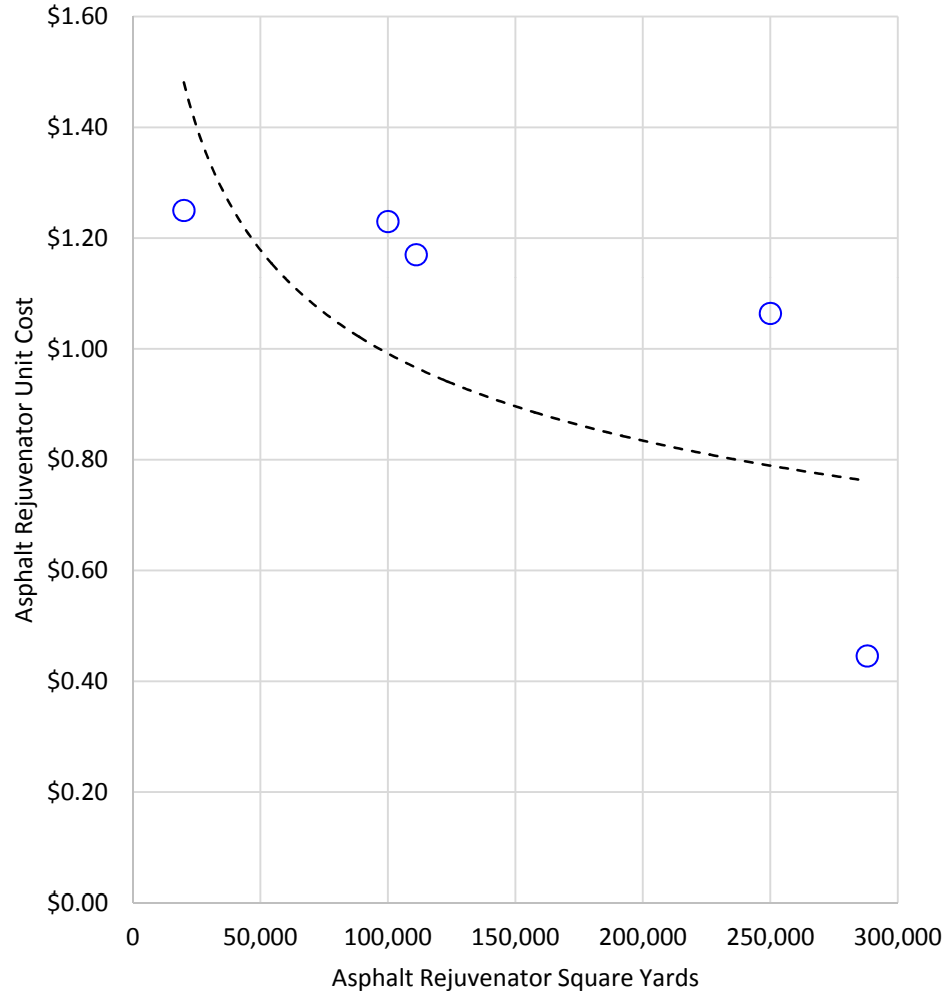
## Participating Agencies

- Oregon DOT
- Washington DOT
- City of Portland
- Snohomish County



# 2 ASPHALT REJUVENATOR

Asphalt Rejuvenator Unit Cost (\$/sy)  
2016 Data

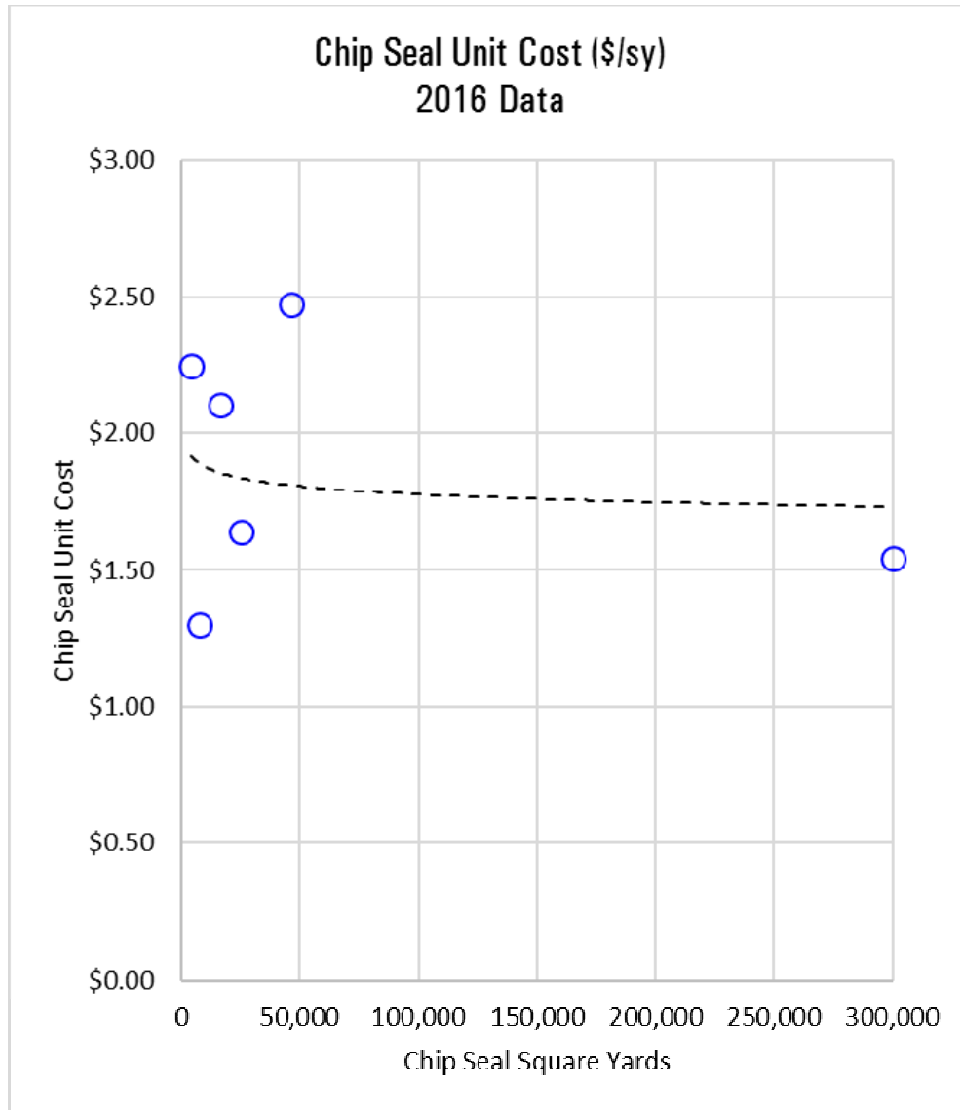


## Participating Agencies

- City of Pocatello
- City of South Jordan
- Indian Summer HOA



# ③ CHIP SEAL



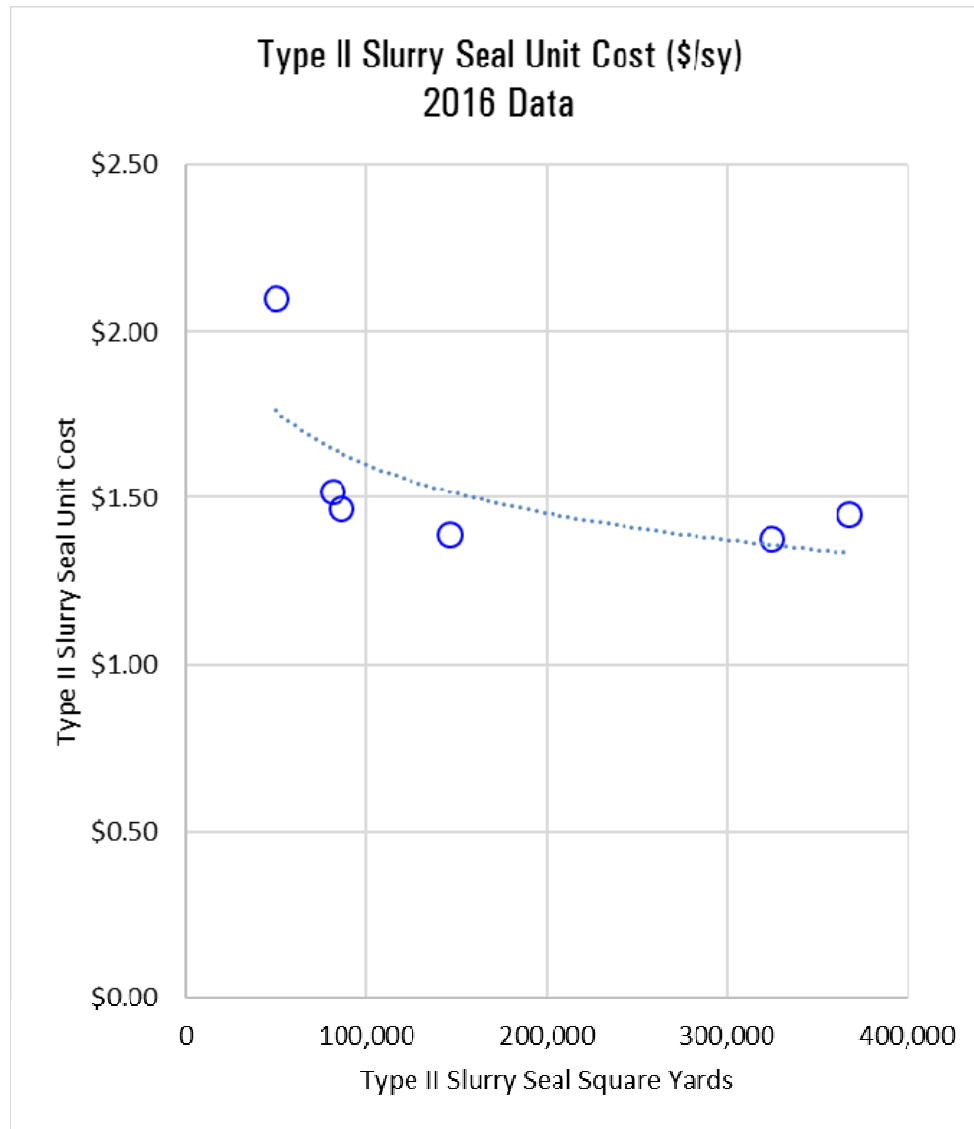
## Participating Agencies

- City of Olympia
- City of Grants Pass
- Wallowa County
- Franklin County





# 4 SLURRY SEAL

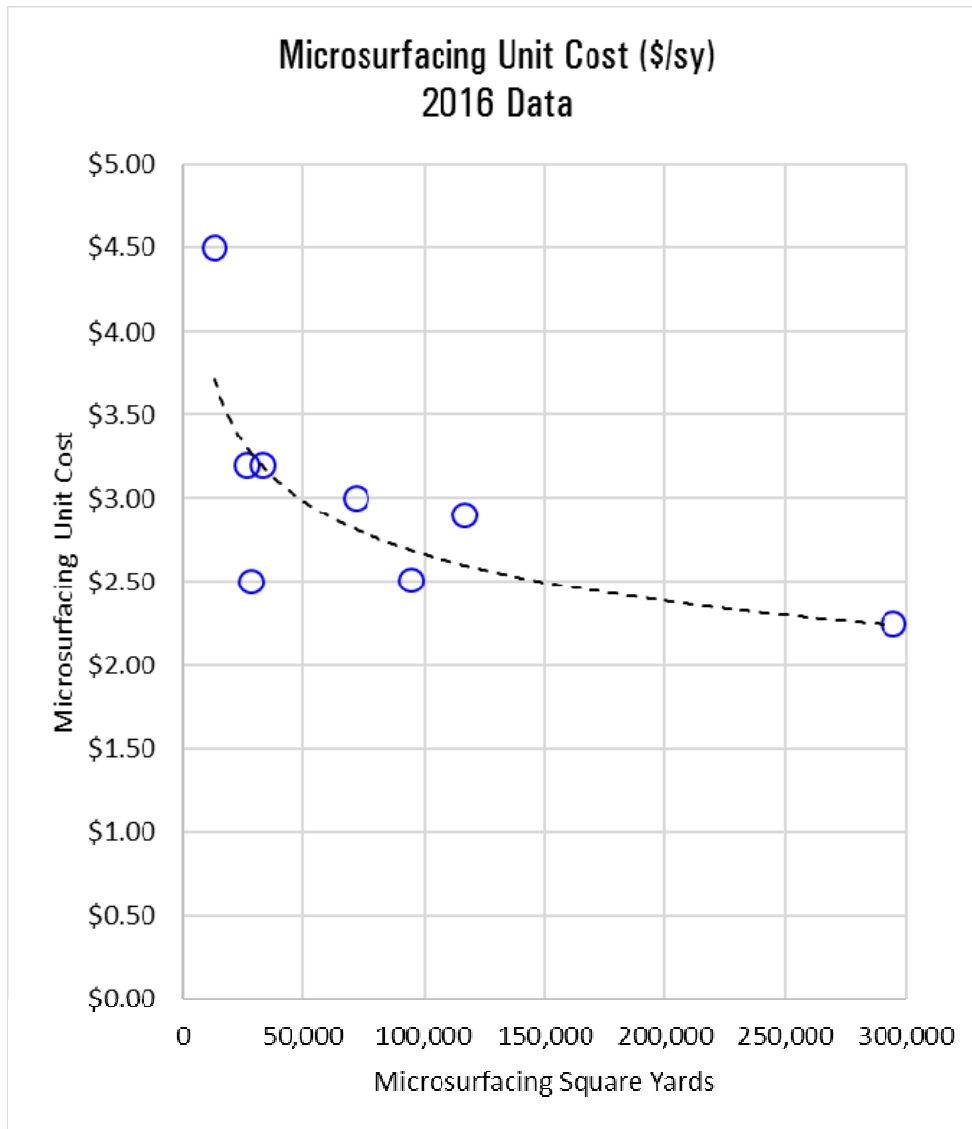


## Participating Agencies

- City of Hillsboro
- City of Vancouver
- City of Lewiston



# 5 MICROSURFACING



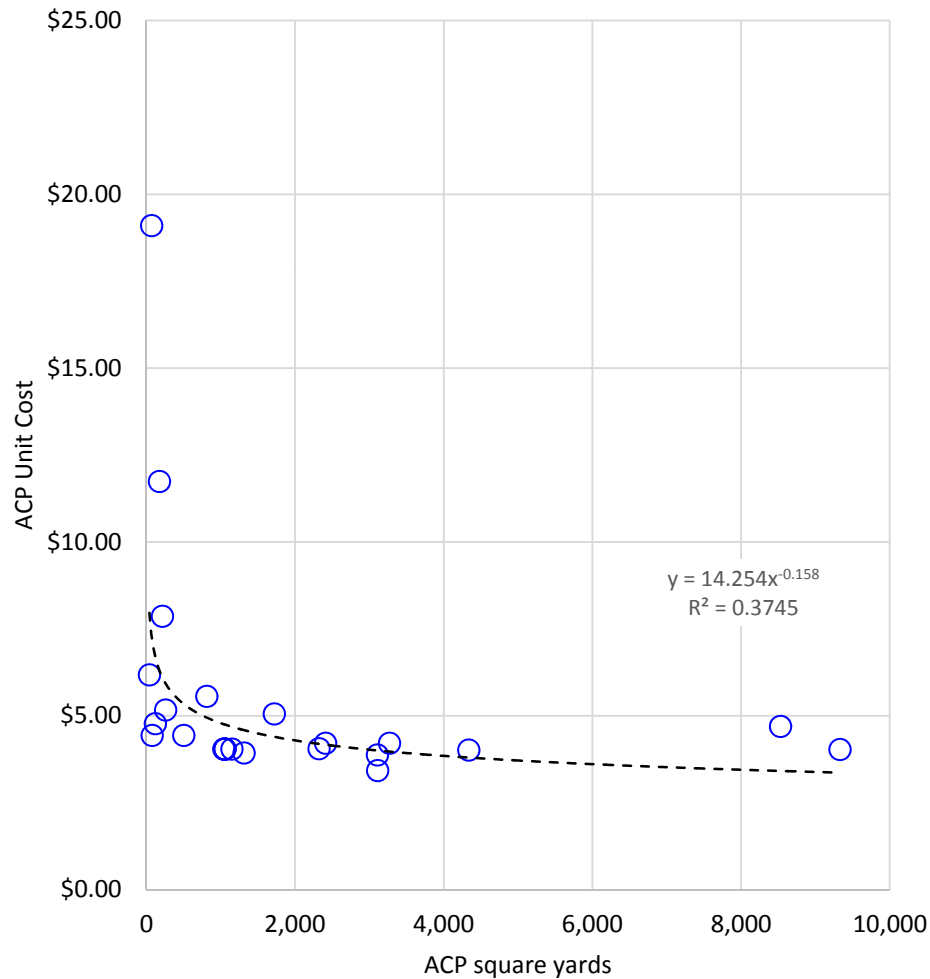
## Participating Agencies

- City of Hillsboro
- City of Pasco
- Davis County, Utah
- Weber County, Utah



# ⑥ ASPHALT OVERLAY

2-inch Asphalt Concrete Unit Cost (\$/sy)  
2016 Data



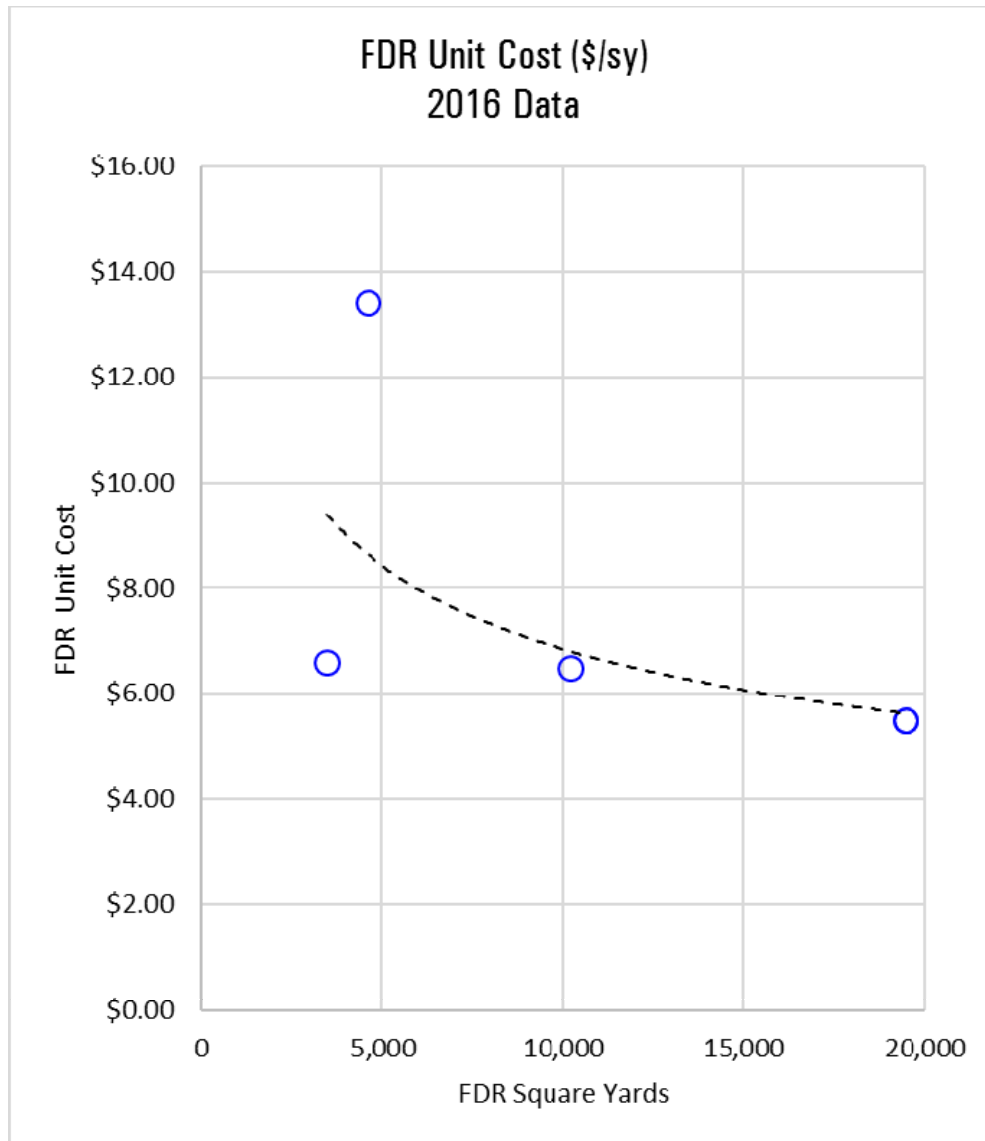
## Participating Agencies

- Oregon DOT
- Washington DOT
- City of Hillsboro
- City of Tukwila





# 7 FULL DEPTH RECLAMATION



## Participating Agencies

- City of Raymond
- Klickitat County
- Yuba County, California



# Summary Comparison Unit Cost and Service Life

<b>Treatment</b>	<b>Unit Cost</b>	<b>Service Life (Yr)</b>
Fog Seal	\$0.20 to \$1.10	1-2
Asphalt Rejuvenator	\$1.00 to \$1.25	2-3
Chip Seal	\$1.30 to \$2.25	4-6
Slurry Seal	\$1.35 to \$2.25	5-7
Microsurfacing	\$2.90 to \$4.50	5-7
2" AC Overlay	\$4.00 to \$6.25	12-15
FDR (Base Only)	\$6.00 to \$14.00	20+



# **A Treatment for Every Budget**

## ***A Survey of Asphalt Surface Treatment Unit Costs***

**Thank You!**

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PAVEMENT SERVICES, INC.

