

STRUCTURAL EVALUATION & TREATMENT SELECTION FOR LOCAL ROADS

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SO YOU THINK YOU HAVE A DIFFICULT INTERSECTION ?













**THE CONDITION OF YOUR
ROADS SHOWS HOW
EFFECTIVELY YOUR
GOVERNMENT IS
RUNNING**

Pavement Preservation

- Why?

- To obtain the longest possible serviceable life at the lowest possible cost.
- To know how many dollars it will take to maintain a roadway system at a desirable condition level.
- To provide motoring public with safe roads.

HOW MUCH IS YOUR ROAD SYSTEM WORTH ?

- TYPICALLY URBAN ROADS ARE WORTH \$3.33 MILLION PER MILE.
- IF YOU HAVE 200 MILES OF ROAD THE CAPITAL VALUE IS \$666 MILLION.
- PROBABLY WORTH MORE THAN EVERYTHING ELSE YOU OWN.
- ARE YOU RUNNING IT LIKE A \$666 MILLION BUSINESS?

History of Pavement Management



- Historically only two criteria existed when deciding which roads received maintenance or rehabilitation.



Worst First



Politics

KEEP YOUR GOOD ROADS GOOD

DO THESE FIRST



DO THESE LAST

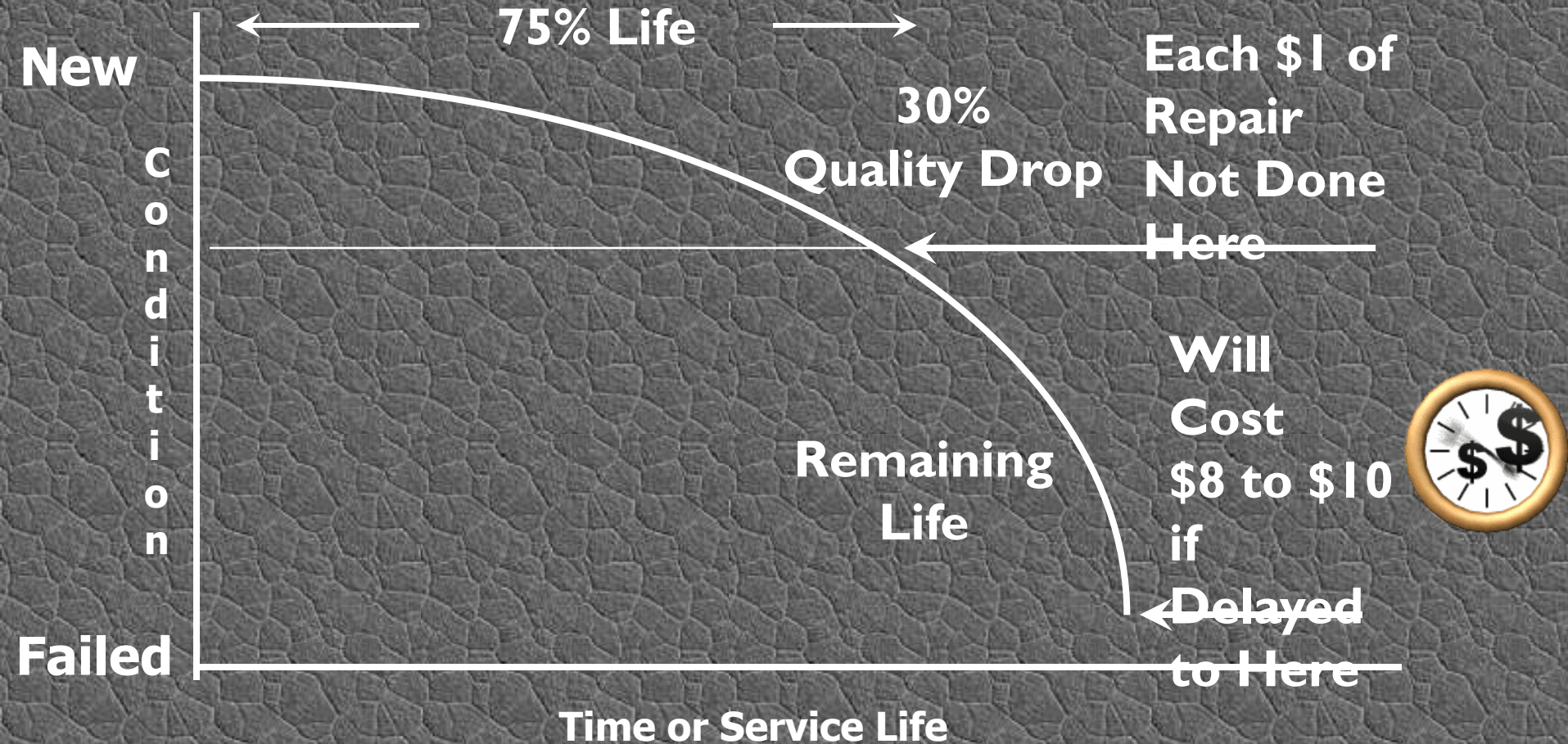


Pavement Preservation

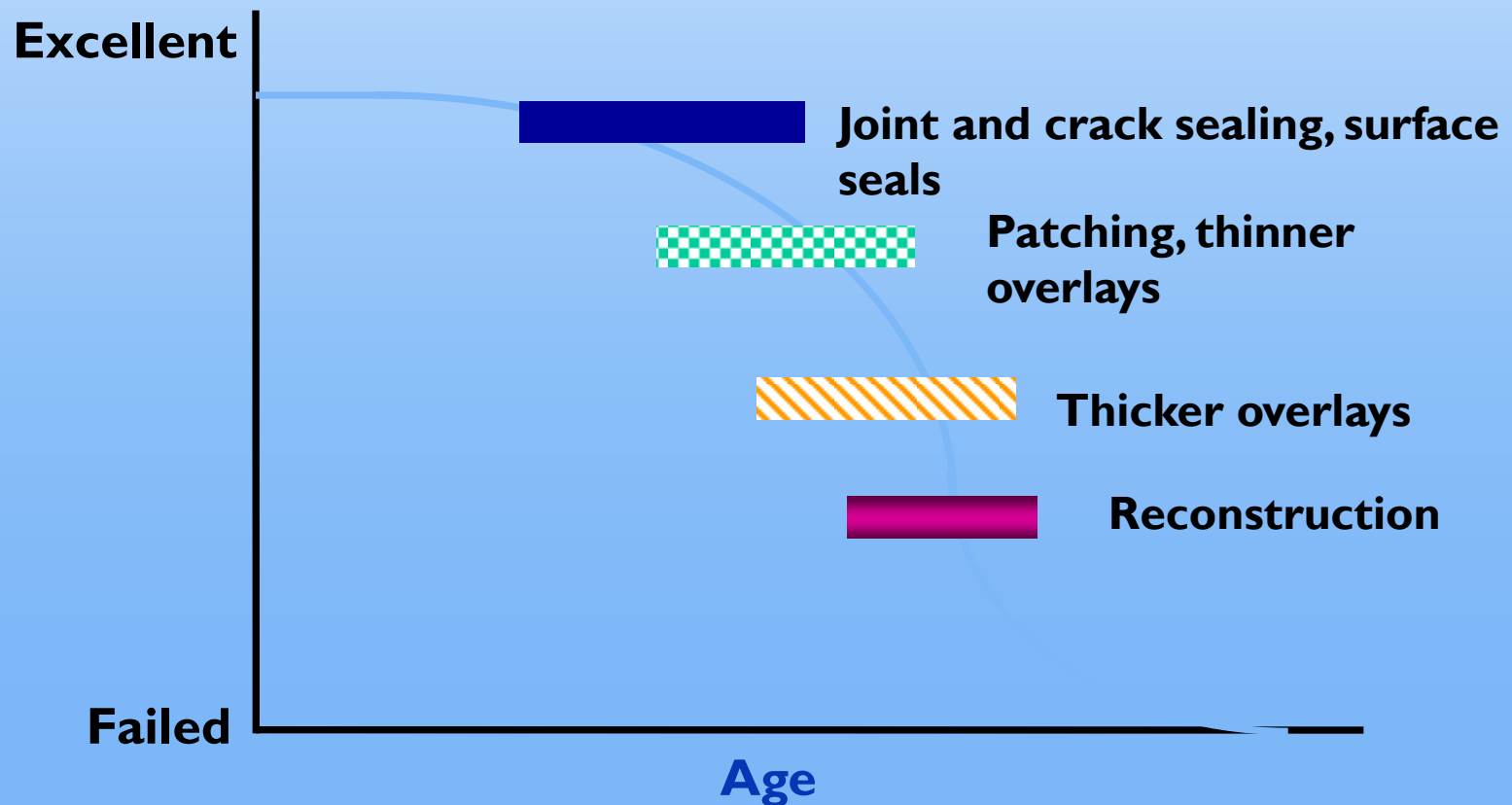
▣ Preserve vs. Reconstruct (worst first)

- ▣ Years of pavement condition data show it is more economical to preserve roads than to delay repairs and reconstruct roads.
- ▣ Studies also show as traffic levels increases, the costs of delaying repair work increase significantly.
- ▣ Repairing the **worst roads first** is a very expensive way to operate a highway system.

The Cost of Pavement Deterioration



Treatment Rules



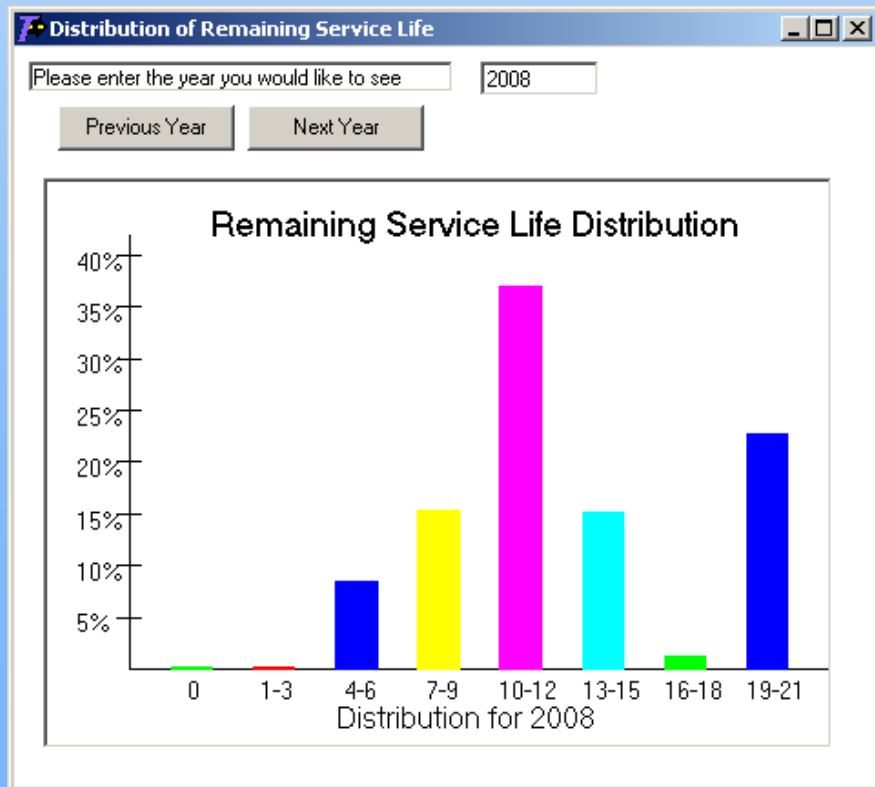
COST OF PAVEMENT TREATMENTS AND ADDED YEARS OF LIFE

Treatment Type	Maintenance Category	Cost (\$/SqYd)	Remaining Service Life Categories (years)							
			0	1-3	4-6	7-9'	10-12	13-15	16-18	19-21
Crack Seal	Routine	\$0.30	0	0	0	0	1	2	3	2
Digout and Hot Patch	Routine	\$0.45	0	0	0	0	0	0	0	0
Fog Coat	Routine	\$0.45	0	0	0	1	1	2	2	2
High Mineral Asphalt Emulsion	Seal Coats	\$1.20	0	0	0	1	2	3	5	5
Sand Seal	Seal Coats	\$0.65	0	0	0	1	2	2	2	2
Scrub Seal	Seal Coats	\$1.00	0	1	3	4	5	5	5	5
Single Chip Seal	Seal Coats	\$1.30	0	1	3	4	5	5	5	5
Slurry Seal	Seal Coats	\$1.75	0	1	3	4	5	5	5	5
Microsurfacing	Seal Coats	\$2.40	0	2	3	4	7	7	7	7
Bonded Wearing Course	Rehabilitation	\$6.00	0	3	4	5	7	7	7	7
Cold In-place Recycling (2 in with chip seal)	Rehabilitation	\$5.00	0	3	4	5	6	7	7	7
Thin Hot Mix Overlay (<2 in)	Rehabilitation	\$6.75	0	4	6	7	7	7	7	7
HMA (leveling) & Overlay (<2 in.)	Rehabilitation	\$7.50	0	4	6	8	8	8	8	8
Hot Surface Recycling	Rehabilitation	\$5.00	0	3	5	7	8	8	8	8
Rotomill & Overlay (<2 in)	Rehabilitation	\$8.40	0	4	7	8	8	8	8	8
Cold In-place Recycling (2/2 in.)	Reconstruction	\$10.30	15	15	15	15	15	15	15	15
Thick Overlay (3 in.)	Reconstruction	\$10.00	12	12	12	12	12	12	12	12
Rotomill & Thick Overlay (3 in.)	Reconstruction	\$11.00	12	12	12	12	12	12	12	12
Base Repair/Pavement Replacement	Reconstruction	\$12.00	16	16	16	16	16	16	16	16
Cold Recycling & Overlay (3/3 in.)	Reconstruction	\$11.15	14	14	14	14	14	14	14	14
Full Depth Reclamation& Overlay (3/3 in.)	Reconstruction	\$13.25	20	20	20	20	20	20	20	20
Base/Pavement Replacement (3/3/6 in.)	Reconstruction	\$19.00	20	20	20	20	20	20	20	20

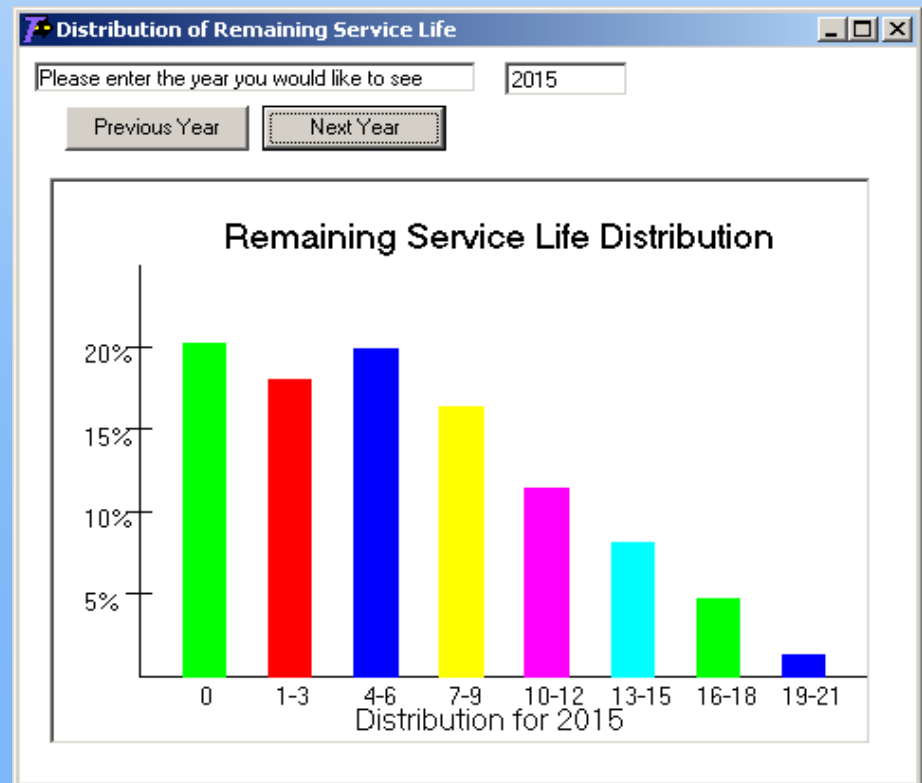
*Fit the current RSL into the RSL category along the top row and then move downward to the applied treatment to find the additional RSL that will be achieved from the selected treatment.
 (2/2 in.) Means 2" overlay with 2" recycle (3/3/6) Means 3" HMA over 3" Road Base over 6" Base

Remaining Service Life (RSL) Distribution

2008-current

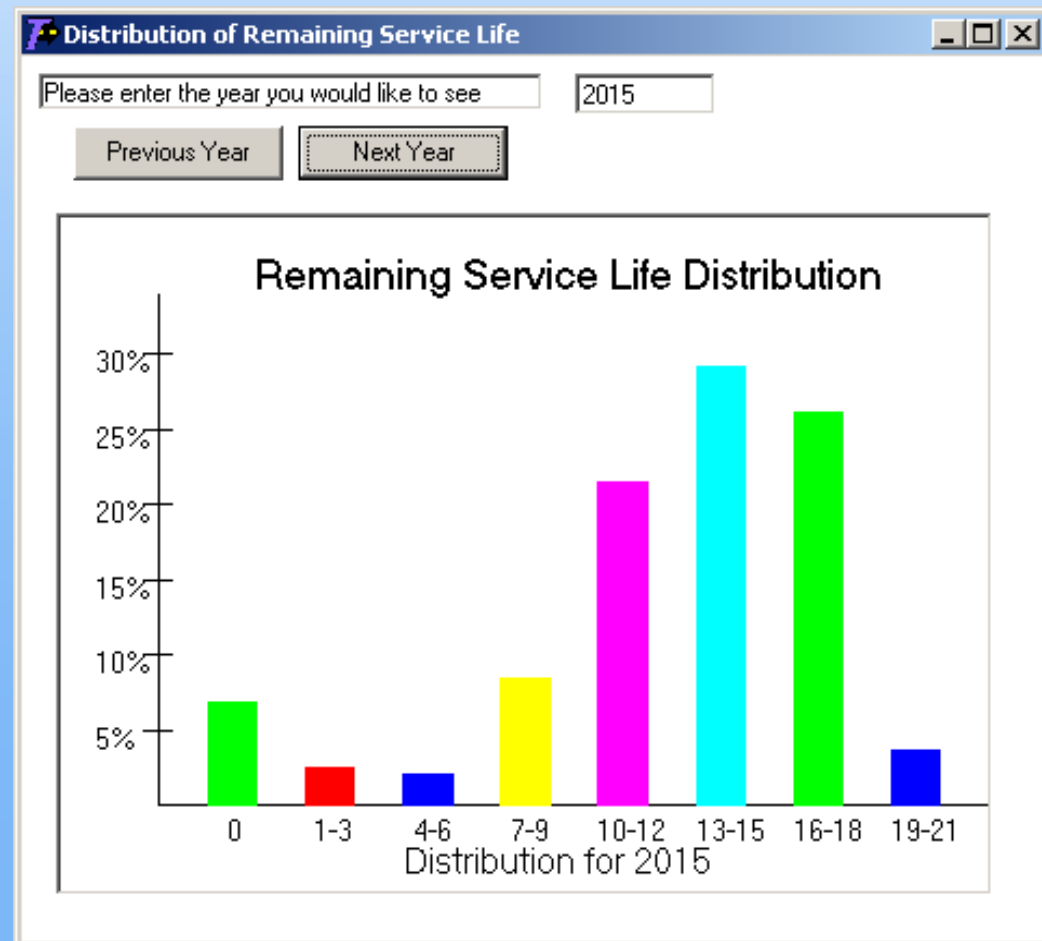


2015-no maintenance



Remaining Service Life (RSL) Distribution

2015 – Recommended maintenance strategy of \$1.1 million per year. This strategy maintains most streets at a high level of serviceability while limiting only 7% that need reconstruction.



Pavement Deterioration-- Causes

The environment

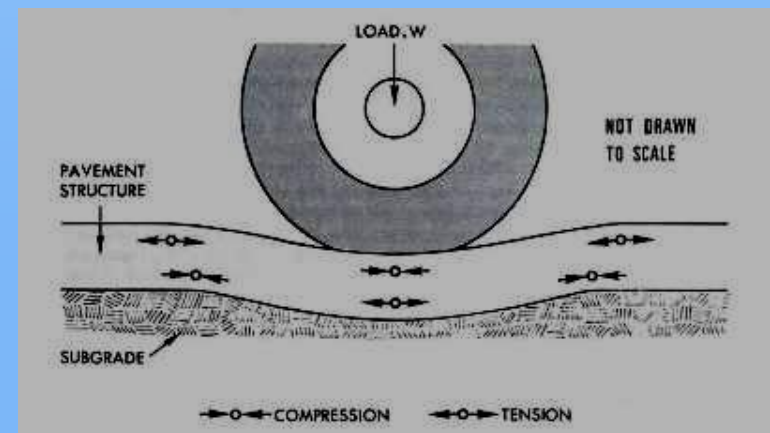
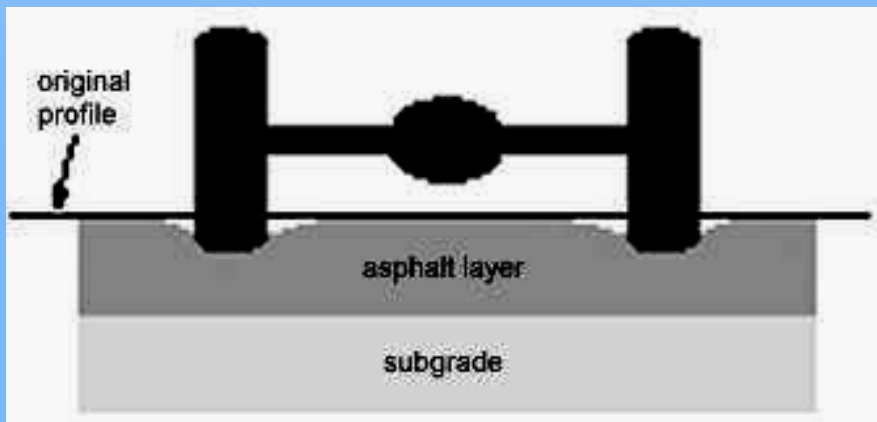
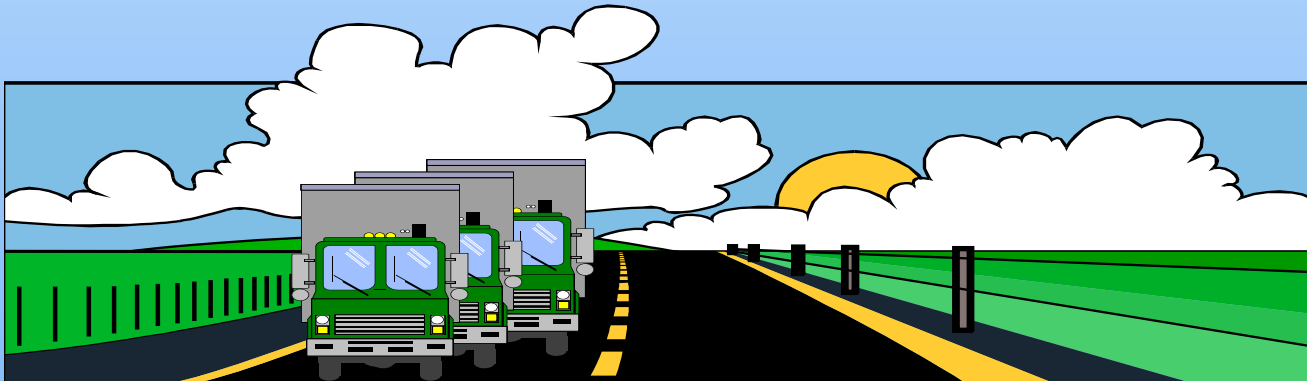
- ▣ Sunshine (ultraviolet rays)
 - ▣ Oxidation
- ▣ Water penetration
 - ▣ Hydraulic action
- ▣ Temperature and moisture
 - ▣ Expansion and contraction (freeze / thaw)



Pavement Deterioration--

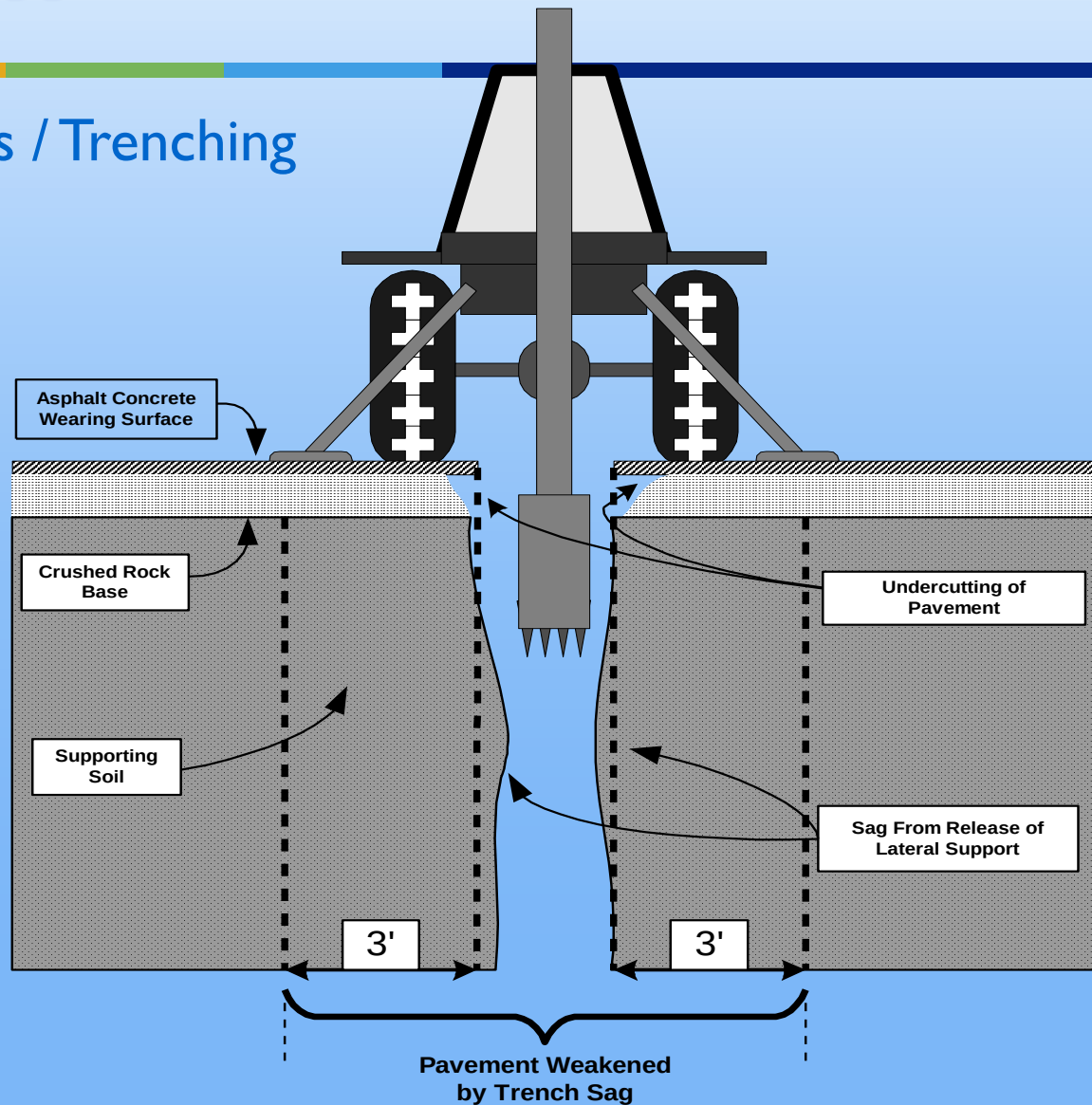
Causes

▣ Traffic Loading



Pavement Deterioration-- Causes

Utility Cuts / Trenching





Preventive Maintenance Objectives

- ▣ Prevent or address pavement functional deficiencies
- ▣ Slow the rate of deterioration

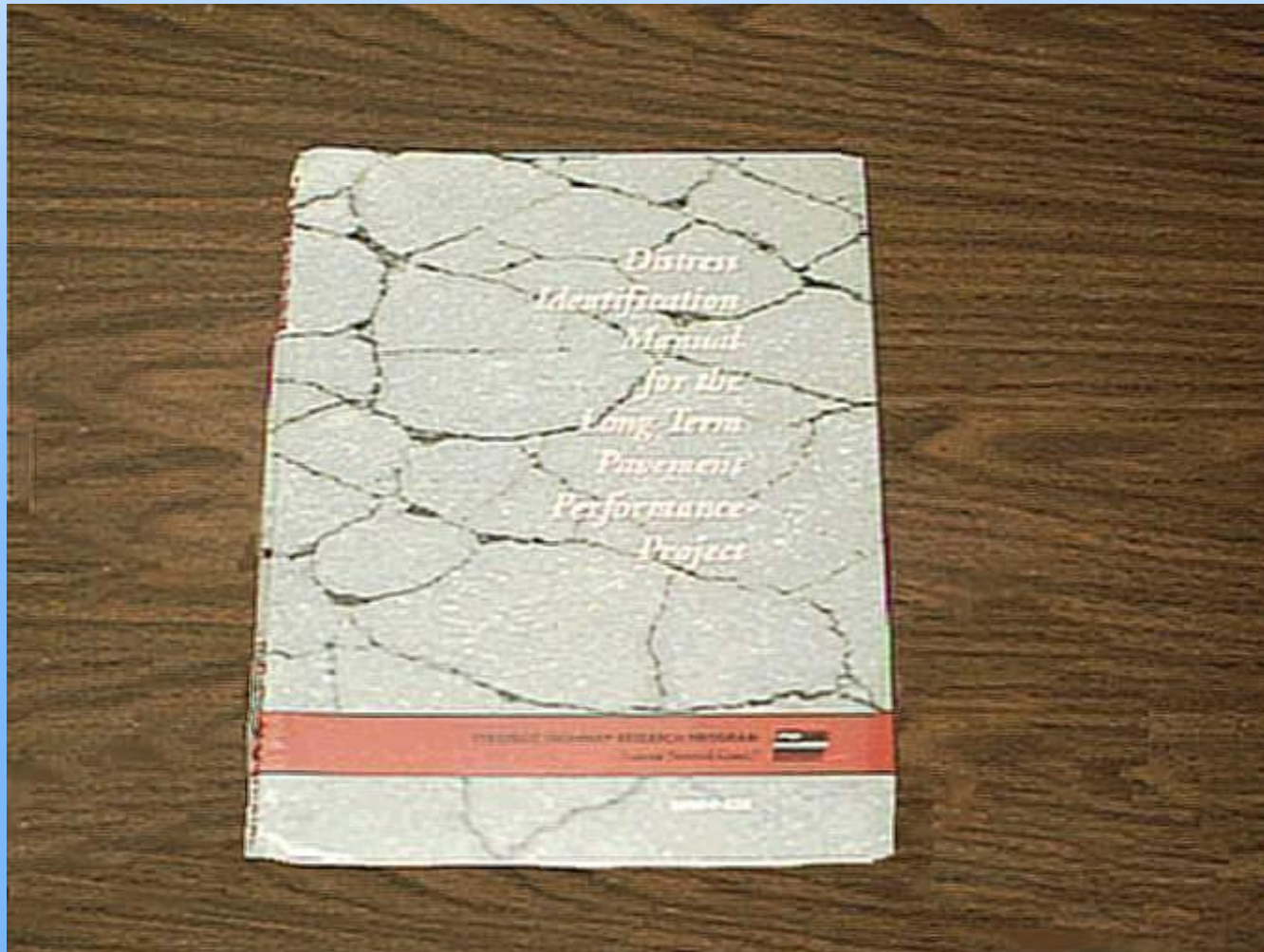


Distress Surveys

Characterization of distress by

- **Type**
- **Severity**
- **Extent**

Distress Identification Manual



Pavement Deterioration from Bad to Worse



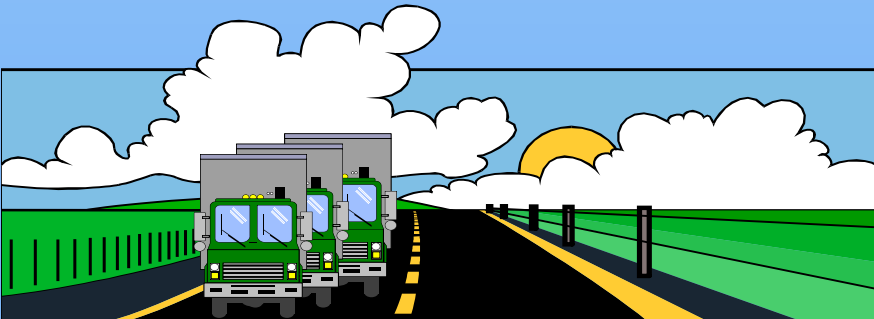
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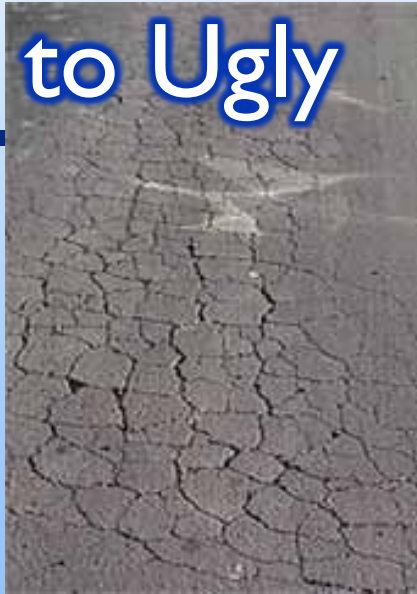
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Pavement Deterioration from Worse to Ugly



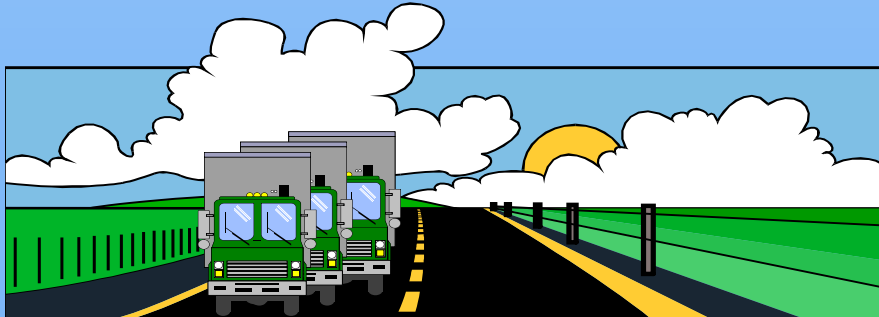
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Rating Criteria

FATIGUE CRACKING

Severity	Extent		
	Low	Medium	High
0 None	1 Crack WP or 1' off C&G Length	2 Cracks WP or 1'-2' off C&G Length	>10% of Surface Area or Length
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

BLOCK CRACKING

Severity	Extent		
	Low	Medium	High
0 None	> 1500 sq. ft.	1500-1000 sq. ft.	< 1000 sq. ft.
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

LONGITUDINAL CRACKING

Severity	Extent		
	Low	Medium	High
0 None	1 Crack Full Length	2 Cracks Full Length	> 2 Cracks Full Length
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

UTILITY CUTS

Severity	Extent		
	Low	Medium	High
0 None	0-10% of Length	10-30% of Length	> 30% of Length
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

Note: to rate potholes use the same form with the following changes to the severity: Low is <1" deep, Med is 1"-2" deep and High is >2"

TRANSVERSE CRACKING

Severity	Extent		
	Low	Medium	High
0 None	> 100' between Cracks	100-50' between Cracks	< 50' between Cracks
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

EDGE CRACKING

Severity	Extent		
	Low	Medium	High
0 None	0-10% of Length	10-30% of Length	> 30% of Length
Low 0-4" from Crk	1	2	3
Medium 4-10" from Crk	4	5	6
High 10" from Crk	7	8	9

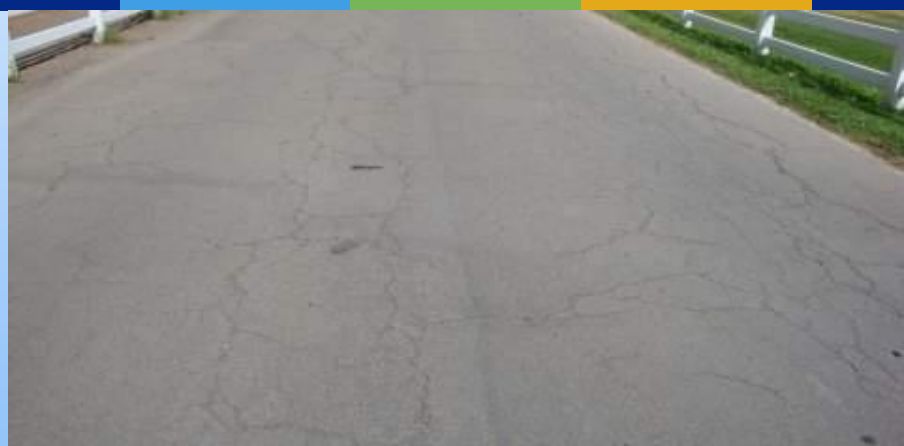
Drainage / Roughness

Excellent	Good	Fair	Poor
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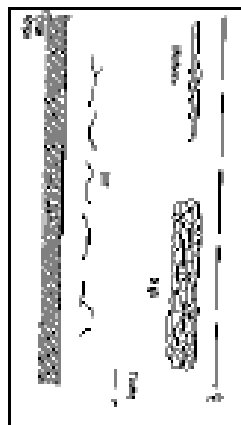
Rutting

Excellent	Low	Med	High
0	<3/8"	1/2"-3/4"	>3/4"

Fatigue / Map Cracking



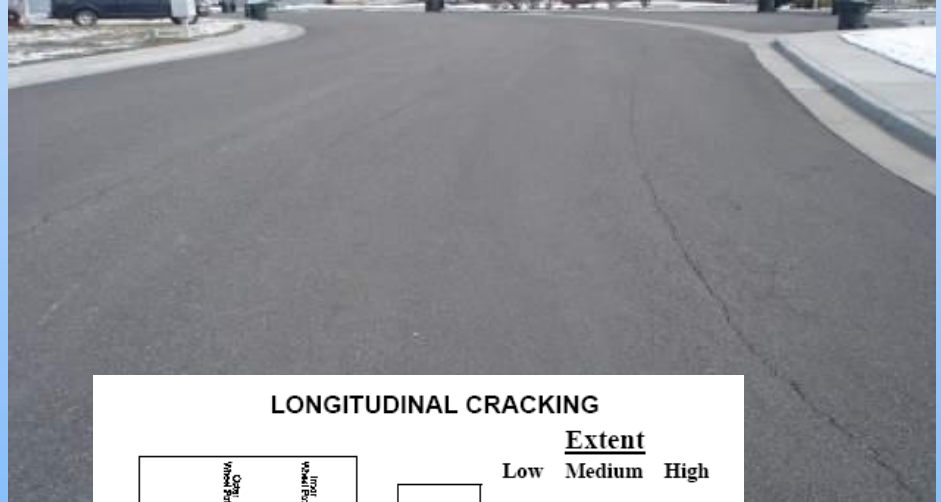
FATIGUE CRACKING



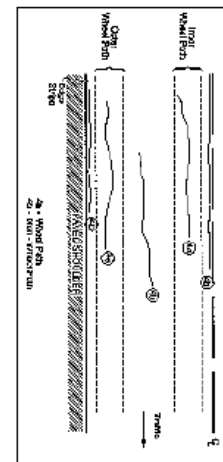
	Extent		
	Low	Medium	High
0 None	1 Crack WP or 1' off C&G Length		
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9



Longitudinal Cracking



LONGITUDINAL CRACKING



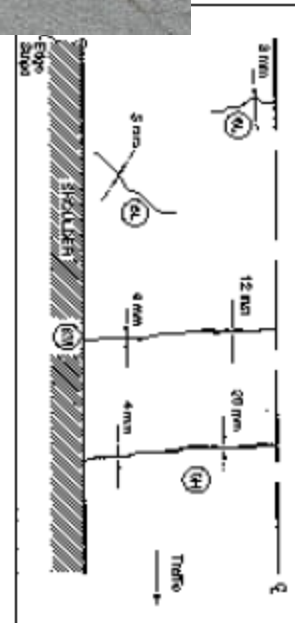
Severity

	Extent		
	Low	Medium	High
0 None	1 Crack Full Length	2 Cracks Full Length	> 2 Cracks Full Length
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

Transverse Cracking



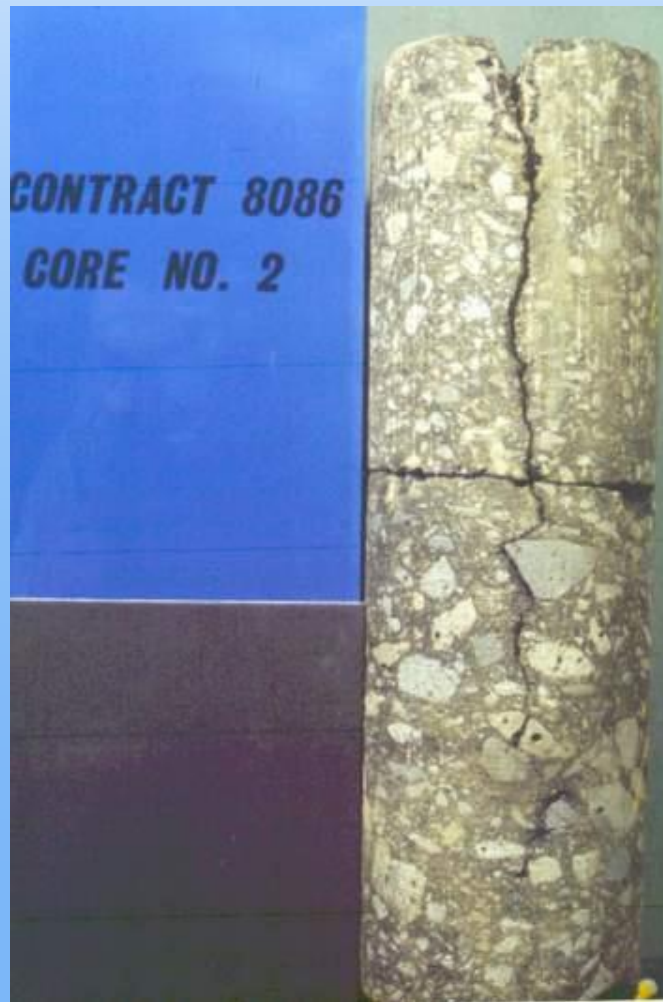
TRANSVERSE CRACKING



Severity

	<u>Extent</u>		
	Low	Medium	High
0 None	> 100' between Cracks	100'-20' between Cracks	< 20' between Cracks
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

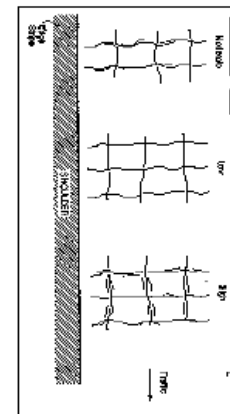
Transverse Crack - Medium Severity



Block Cracking



BLOCK CRACKING

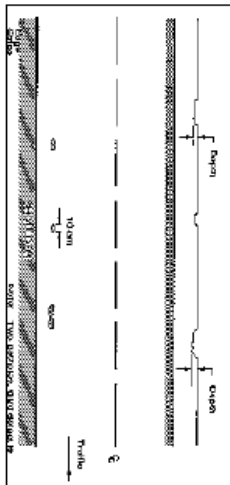


Severity

	<u>Extent</u>		
	Low	Medium	High
0 None	> 15'x15' Squares	15'-10'x Squares	< 10'x10' Squares
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

Utility Cuts / Potholes

UTILITY CUTS



Severity

	<u>Extent</u>		
	Low	Medium	High
0 None	0-10% of Length	10-30% of Length	>30% of Length
Low Cracks < 1/4"	1	2	3
Medium Cracks 1/4" to 3/4"	4	5	6
High Cracks > 3/4"	7	8	9

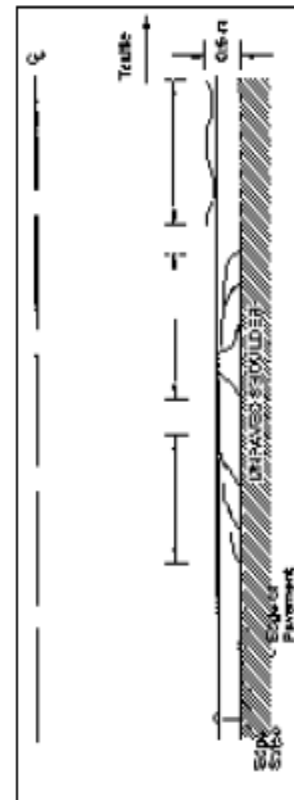
Note: to rate potholes use the same form with the following changes to the severity: **Low** is <1" deep, **Med** is 1"-2" deep and **High** is >2"



Edge Cracking



EDGE CRACKING



	<u>Extent</u>		
	Low	Medium	High
0 None	0-10% of Length	10-30% of Length	> 30% of Length
Low 0-6" from Curb	1	2	3
Medium 6-18" from Curb	4	5	6
High 18" from Curb	7	8	9

Rutting

Rutting			
Excellent 0	Low <3/8"	High >3/4"	Med 1/2"-3/4"



Sealed Cracks

Properly sealed cracks are not rated as cracks.



Photo 4. Poor Surface Drainage



Photo 5. Failed Pavement RSL=0 years



Photo 6. Poor Pavement RSL=4 years



Photo 7. Fair Pavement RSL=8 years



Low to medium severity distress covers 10-30% of surface, some possible drainage issues; more preventative treatments necessary

AUG 5 2008

Photo 8. Good Pavement RSL=12 years



Photo 9. Excellent Pavement RSL=20 years



Remaining Service Life
0 years



Remaining Service Life
8 years



Full Course 151101 Pavement

Preservation - 4

5-43

Preventive Maintenance

The Treatments



Preventive Maintenance *The Treatments*

■ Fog Seal

- Diluted asphalt emulsion
- Protects against environmental impacts
- Prevents ravel

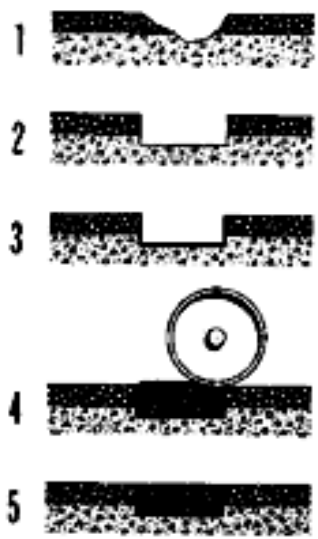
High Mineral
Content
Asphalt
Emulsion.

Protects from UV
weathering



Pavement Correction

- Requires extensive surface preparation
 - Plug patching and localized base repairs
 - Localized milling or grinding
 - Crack sealing



Preventive Maintenance *The Treatments*

- Slurry Seal
 - Includes asphalt emulsion, aggregate, latex fibers
 - Protects asphalt surface against oxidation and ravel.
 - Restores skid resistance, seals emerging cracks, improves appearance.



Preventive Maintenance

The Treatments

- Chip Seal
 - Aggregate evenly spread and embedded onto emulsion
 - Protects asphalt surface against oxidation and ravel.
 - Restores skid resistance, seals emerging cracks, improves appearance.



Preventive Maintenance *The Treatments*

- Cape Seal
 - Includes chip seal followed by a slurry seal.
 - Protects asphalt surface against oxidation and ravel.
 - Restores skid resistance, seals emerging cracks, improves appearance.



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Pavement Preservation

The Treatments



Cape

Slurry Only

Pavement Correction

The Treatments

- Chip Seal
 - Single or double layer
- Cape Seal
- Thin Overlay



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FLEXIBLE MICRO SURFACING



BONDED WEARING COURSE



FULL DEPTH RECLAMATION

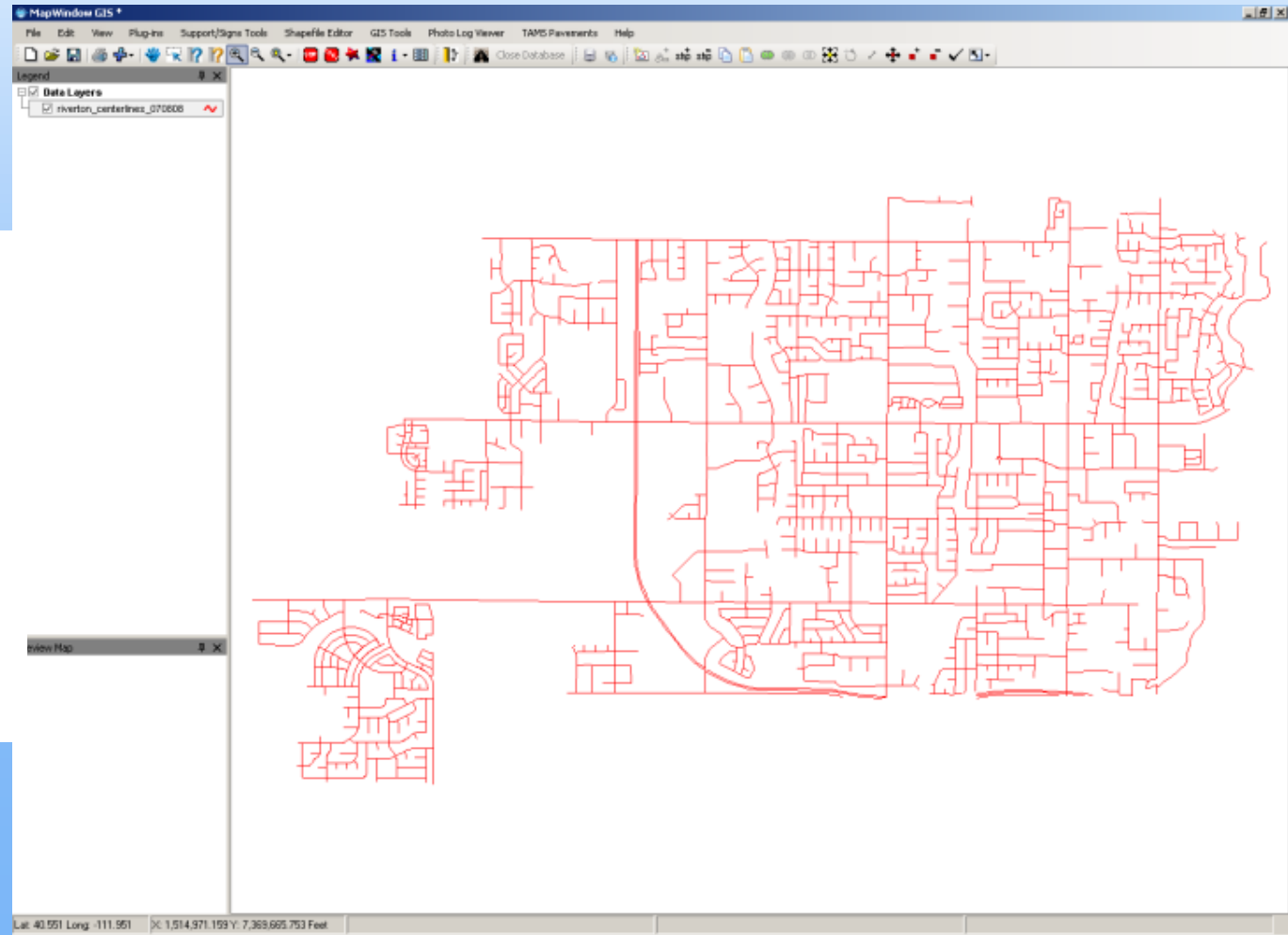


COST OF PAVEMENT TREATMENTS AND ADDED YEARS OF LIFE

Treatment Type	Maintenance Category	Cost (\$/SqYd)	Remaining Service Life Categories (years)							
			0	1-3	4-6	7-9'	10-12	13-15	16-18	19-21
Crack Seal	Routine	\$0.30	0	0	0	0	1	2	3	2
Digout and Hot Patch	Routine	\$0.45	0	0	0	0	0	0	0	0
Fog Coat	Routine	\$0.45	0	0	0	1	1	2	2	2
High Mineral Asphalt Emulsion	Seal Coats	\$1.20	0	0	0	1	2	3	5	5
Sand Seal	Seal Coats	\$0.65	0	0	0	1	2	2	2	2
Scrub Seal	Seal Coats	\$1.00	0	1	3	4	5	5	5	5
Single Chip Seal	Seal Coats	\$1.30	0	1	3	4	5	5	5	5
Slurry Seal	Seal Coats	\$1.75	0	1	3	4	5	5	5	5
Microsurfacing	Seal Coats	\$2.40	0	2	3	4	7	7	7	7
Bonded Wearing Course	Rehabilitation	\$6.00	0	3	4	5	7	7	7	7
Cold In-place Recycling (2 in with chip seal)	Rehabilitation	\$5.00	0	3	4	5	6	7	7	7
Thin Hot Mix Overlay (<2 in)	Rehabilitation	\$6.75	0	4	6	7	7	7	7	7
HMA (leveling) & Overlay (<2 in.)	Rehabilitation	\$7.50	0	4	6	8	8	8	8	8
Hot Surface Recycling	Rehabilitation	\$5.00	0	3	5	7	8	8	8	8
Rotomill & Overlay (<2 in)	Rehabilitation	\$8.40	0	4	7	8	8	8	8	8
Cold In-place Recycling (2/2 in.)	Reconstruction	\$10.30	15	15	15	15	15	15	15	15
Thick Overlay (3 in.)	Reconstruction	\$10.00	12	12	12	12	12	12	12	12
Rotomill & Thick Overlay (3 in.)	Reconstruction	\$11.00	12	12	12	12	12	12	12	12
Base Repair/Pavement Replacement	Reconstruction	\$12.00	16	16	16	16	16	16	16	16
Cold Recycling & Overlay (3/3 in.)	Reconstruction	\$11.15	14	14	14	14	14	14	14	14
Full Depth Reclamation& Overlay (3/3 in.)	Reconstruction	\$13.25	20	20	20	20	20	20	20	20
Base/Pavement Replacement (3/3/6 in.)	Reconstruction	\$19.00	20	20	20	20	20	20	20	20

*Fit the current RSL into the RSL category along the top row and then move downward to the applied treatment to find the additional RSL that will be achieved from the selected treatment.
 (2/2 in.) Means 2" overlay with 2" recycle (3/3/6) Means 3" HMA over 3" Road Base over 6" Base

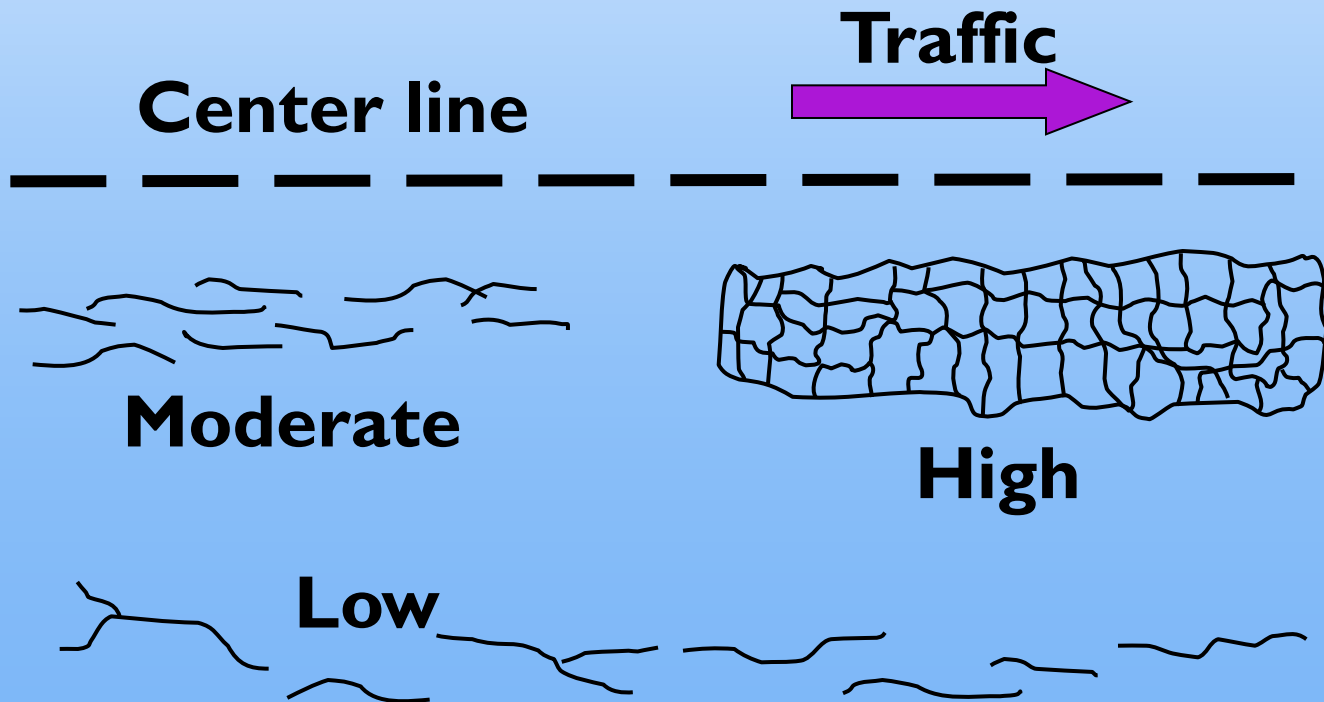
GIS Based Pavement Management System



Pavement Evaluation Form

Edit Inventory Information	
File Menu	
Segment Number	11001692
Road Name	12600 S
From Address	4105 W
To Address	PASTURE RD
Number of Travel Lanes	2
Road Width	91 ft
Segment Length	419 ft
Speed Limit	35 mph
Surface Type	Asphalt
Owner	City
Importance	Medium-High
Functional Classification	Major Arterial
District	District 1
Drainage Type	Concrete Curb and Gutt
AADT	0
Date Inventoried	10/11/2008
Photo #	1956
Update Location Information	
View Picture	
Enter Comment	
Distress Rating Sheet	
Fatigue	0 (0-9)
Longitudinal	0 (0-9)
Transverse	0 (0-9)
Block	0 (0-9)
Patching/Potholes	0 (0-9)
Edge	0 (0-9)
Rutting	0 (0-3)
Roughness	0 (0-3)
Drainage	0 (0-3)
Inventory Date	10/11/2008
RSL	20
Optimal Treatment	No Maintenance
☐ RSL based on Date	Add New Distress Information
Suggested Treatment No Maintenance	
Enter Work Done	
View History	
Exit	

Fatigue Severity

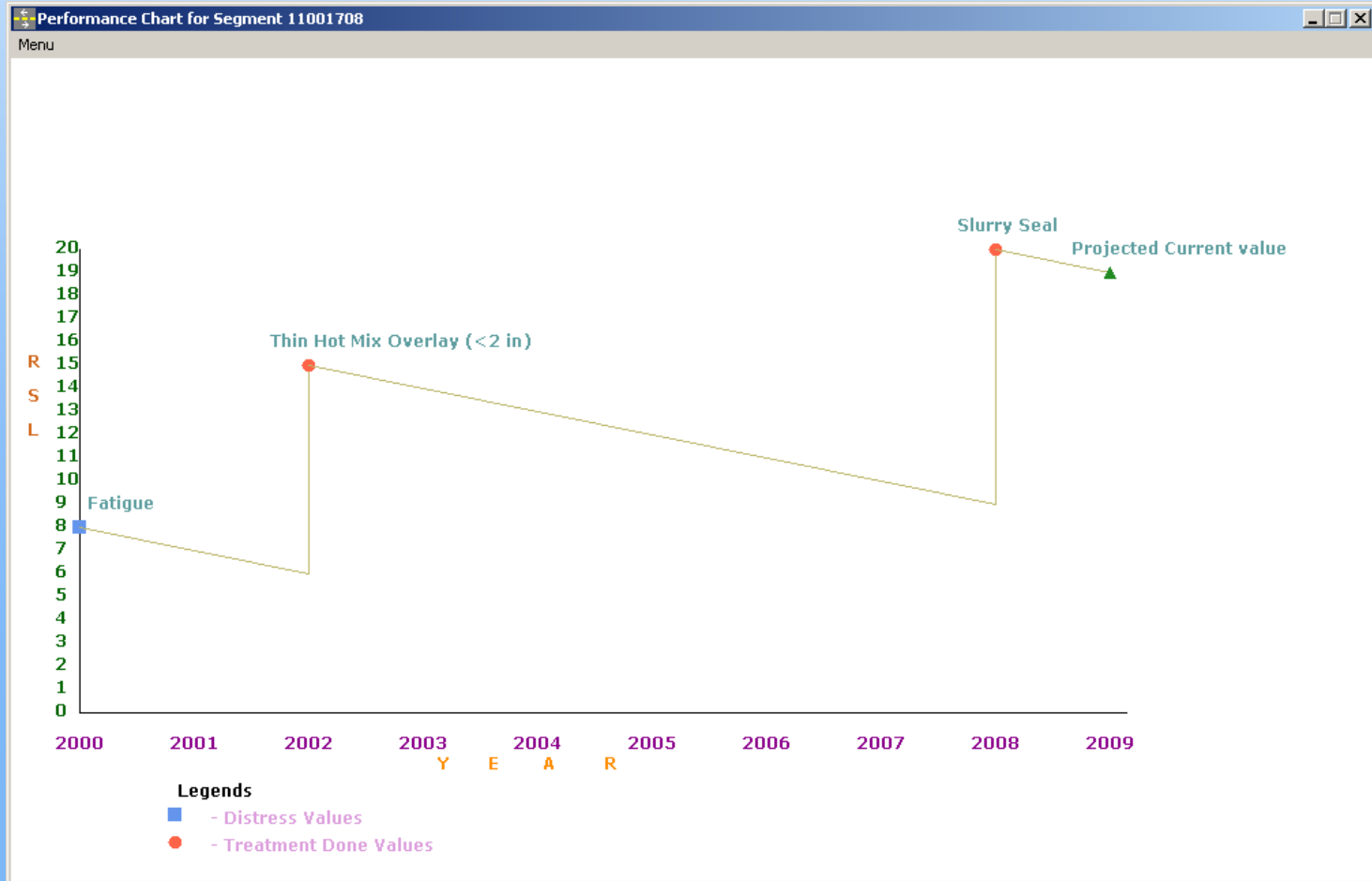


Shoulder

Benefits of a pavement preservation system:

- Updated records of pavement condition***
- Track pavement performance***
- Budget allocation***

Track & Monitor Pavement Performance



Suggested Optimal Timing

- Fog seals, 1 to 3 years
- Crack seals, 2 to 4 years
- Chip seals, 5 to 7 years
- Slurry seals, 5 to 7 years
- Thin overlays, 5 to 10 years

Good Pavement Management



Questions?

