

**2016 Road Conference:  
Pavement Management Best Practices, Lowest Cost**

**Summary of a Technology Transfer Event Organized and Conducted By:**

Isaac L. Howard – Mississippi State University  
Dan Cordell – Civil-Link, LLC  
Darryl Gardner – Ergon Asphalt & Emulsions, Inc.  
Tim Harrawood – Vance Brothers, Inc.  
Mark Holley – Mississippi Department of Transportation (MDOT)  
Mike Morgan – Greenberg Farrow/First Step Pavement Management  
Earl Stone – Kimes & Stone Construction Co., Inc.  
Mike Tagert – MDOT Northern District Transportation Commissioner  
Larry Tomkins – Ergon Asphalt & Emulsions, Inc.  
Amy Walker – Ergon Asphalt & Emulsions, Inc.  
Stacy Williams – University of Arkansas  
Stan Williams – Ergon Asphalt & Emulsions, Inc.

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## Acknowledgements

Greenberg Farrow and Ergon Asphalt & Emulsions, Inc. provided financial support to this event. Merri Kilpatrick of Mississippi State University assisted with several planning and logistical activities ahead of the event.

## Road Conference Summary

The Road Conference was held on March 23, 2016 at The Mill Conference Center in Starkville, MS. The event was hosted by the Mississippi State University (MSU) Construction Materials Research Center (CMRC). A conference announcement was circulated widely within Mississippi and somewhat in surrounding states. For example, the ASCE Mississippi Section sent the conference announcement to all their members. The first announcement of this conference was mid-December of 2015.

Figure 1 provides some general photos taken at the Road Conference. For example, door prizes were given out throughout the day (Figure 1e). Attendees were able to earn 4 PDH's for attending all activities, which are summarized in Table 1. Interior televisions mounted throughout the conference center scrolled photos and pavements information throughout the day. At the time this document was completed, a video of this event was available at the following link. <https://www.youtube.com/watch?v=PvsWv8cbQAg&feature=youtu.be>. The remainder of this document provides information on attendance, individual presentations (9:30 AM to 1:30 PM), the panel discussion, and concludes with the slides used by presenters when giving individual presentations.

**Table 1. Road Conference Schedule of Activities**

<b>Time</b>	<b>Title</b>	<b>Speaker or Participants</b>
9:30 to 9:50 AM	Opening Remarks	Isaac L. Howard, Commissioner Mike Tagert
9:50 to 10:50 AM	Pavement Preservation, Concepts / Conditions	Stacy Williams, Michael G. Morgan
10:50 to 11:00 AM	Break	---
11:00 to 12:00	Best Practice, Lowest Cost / Case Study	Dan Cordell, Darryl Gardner
12:00 to 1:00	Lunch	---
1:00 to 1:30	Pavement Preservation in Mississippi	Larry Tomkins
1:30 to 3:00	Panel Discussion	Isaac L. Howard (moderator), Mark Holley, Tim Harrawood, Earl Stone, Stacy Williams, Michael G. Morgan, Dan Cordell

## Attendance

A total of 180 attendees could be accounted for via sign-up sheets, photographs taken, and similar, which are described in Table 2. It is believed that slightly over 180 were actually in attendance, though there are no records to verify more than 180 attendees. The website [www.eventbrite.com](http://www.eventbrite.com) was used for registration, and a total of 228 tickets were either sold (\$25 registration fee), or were complimentary to, for example, program participants. Note that during opening remarks that a registered attendance of 227 was reported, but there was one additional registrant just before the event. A sign-up sheet was at the registration desk and was sent around during the program, which is how all but a few of the 180 documented attendees were identified, but it is believed that everyone did not have an opportunity to sign this sheet.

Most attendees did not have an opportunity to sign the sheet during registration due to the large volume of attendees at the desk. Registration was not handled in a way that tickets could always be identified to an individual. In several cases, one person registered multiple people, and they did not always indicate who they were registering. The Eventbrite system generated a ticket, which was how attendees were allowed into the event. In summary, the event was well attended, and a minimum of 180 attendees were present including representatives from 11 counties, 16 consulting firms, 5 material suppliers, 10 cities, 7 contractors, 2 roadway services groups, 2 universities, the Mississippi Department of Transportation (MDOT), and the US Army Corps of Engineers (USACE) – United States Air Force (USAF).

**Table 2. Estimated Attendance Summary**

Category	Number of Different Groups Within Category (Where Applicable)	Total Attendance of Category
County Representatives	11	40
Engineering or Architectural Consultants	16	37
MDOT	---	25
USACE or USAF	---	17
Material Supplier	5	17
City Representatives	10	15
Contractor	7	9
State Aid or Park Services	2	9
Other	---	7
Academia	2	4
<b><i>All Identified Attendees</i></b>	<b>---</b>	<b>180</b>

--Note that these categories are best estimates, but in some cases judgments were made (e.g. a group that is a material supplier and a contractor was put into one category or the other). Note that in some cases the individuals in attendance may not have been there representing the group where they were placed in this table.

## **Individual Presentations**

Figure 2 provides photographs of the seven individuals that gave presentations during the 9:30 AM to 1:30 PM time frame. These presentations are provided beginning on page 8 of this report. Each of these presentations was intended to complement each other, while collectively providing an overall picture of what is needed to manage a pavement network (large or small network). The content presented during individual presentation was recorded and used to produce the video mentioned previously.

## **Panel Discussion**

A panel discussion was held from 1:30 to 3:00 PM that was not recorded to encourage more open dialogue between the panel and attendees. There were 6 panel members (Mike Morgan, Stacy Williams, Dan Cordell, Mark Holley, Tim Harrawood, Earl Stone), a moderator (Isaac L. Howard), and two facilitators (Larry Tomkins and Stan Williams). Figure 3 provides photographs of the panel discussion. Questions and comments were taken from the audience, which filled the majority of the time. During periods where there was not a question or comment initiated by the audience, the moderator had a set of questions that were asked during those periods. An email requesting questions from attendees ahead of the event was sent out, and questions were provided by conference participants. Overall, the panel discussion addressed several topics ranging from policy, financing, material selection, suitable techniques for given distresses, decision making, and setting priorities.



a) Welcome Sign Beside Registration Desk



b) Overall View of Audience



c) Local View of Audience (1 of 2)



d) Local View of Audience (2 of 2)



e) Stan Williams (left) and Mike Morgan Awarding a Door Prize



f) Outdoor View of The Mill Conference Center

**Figure 1. Venue, Overall Views of Audience, and Door Prizes**



a) *Opening Remarks From Mike Tagert (Standing) and Isaac L. Howard*



b) *Pavement Preservation Concepts Presented by Stacy Williams*



c) *Pavement Preservation Conditions and First Step Principles Presented by Mike Morgan*



d) *Case Study Presented by Dan Cordell*



e) *Best Practice, Lowest Cost Concepts Presented by Darryl Gardner*



f) *Pavement Preservation in Mississippi Presented by Larry Tomkins*

**Figure 2. Opening Remarks and Presentations on Individual Topics**



a) Overall View of Panel and Moderator



b) Panel Member Mark Holley



c) Panel Members (From Left to Right) Earl Stone, Mike Morgan, and Dan Cordell



d) Panel Members (From Left to Right) Stacy Williams and Tim Harrawood



e) Moderator Isaac L. Howard (Standing) Interacting With Audience



f) Attendee Joe Lauderdale Discussing Pavements with Panel and Audience

**Figure 3. Panel Discussion**



# **2016 Road Conference: Pavement Management Best Practices, Lowest Cost**

*March 23, 2016  
Starkville, MS*

**Host:**

**Isaac L. Howard, PhD, PE**

*Materials and Construction Industries Chair  
Civil and Environmental Engineering Dept.*

*Mississippi State University*

*662-325-7193, [ilhoward@cee.msstate.edu](mailto:ilhoward@cee.msstate.edu)*



# Welcome to Starkville!

## (Home of Mississippi State University)

- Who is here?
  - Registered Attendance: 227
  - City/County Engineers/Representatives
  - DOT/USACE
  - Contractors
  - Material Suppliers
  - Research/University
  - Consultants
  - Other
- Welcoming Remarks by MDOT Northern District Transportation Commissioner Mike Tagert

# Today's Goals

1. **Introduce** overall picture of managing a pavement network
2. **Present** a philosophy founded on:
  1. Understanding your current pavement condition
  2. Understanding your current and projected finances
  3. Understanding maintenance/preservation treatment options
  4. Making use of this understanding toward informed decisions
3. **Explain** pavement preservation treatments (e.g. chip seals, crack sealing, micro/slurry, scrub seals, thin-overlays, others....)
4. **Facilitate** conversations between attendees (to be successful, this needs to be a two way event)

# Key Points For Today's Conference

- **Myths:**

- A Pavement Management Plan will fix all my roads
- Any Pavement Management Plan will suit my needs

- **Facts:**

- Pavement Management is a set of tools to help set priorities and optimize spending of available maintenance or rehabilitation funds
- Pavement Management tools improve over time, but you must start somewhere to gain any benefits

# Key Points for Today's Conference

- Today's Program Goals:

- Provide information to help develop cost-effective tools that assist the client with decision making
- Focus information toward:
  1. what do we have?
  2. what do we know?
  3. how do we start?

- Not Today's Program Goals:

- To focus too much on any one part of this process, or on any one treatment
- To leave you with the belief that there is one right answer to all pavement preservation questions

# Schedule

Time	Title	Speaker or Participants
9:30 to 9:50 AM	Opening Remarks	Isaac L. Howard and Commissioner Mike Tagert
9:50 to 10:50 AM	Pavement Preservation, Concepts / Conditions	Dr. Stacy Williams and Michael G. Morgan
10:50 to 11:00 AM	Break	---
11:00 to 12:00	Best Practice, Lowest Cost / Case Study	Dan Cordell and Darryl Gardner
12:00 to 1:00	Lunch	---
1:00 to 1:30	Pavement Preservation in Mississippi	Larry Tomkins
1:30 to 3:00	Panel Discussion	Isaac L. Howard (moderator), Mark Holley, Tim Harrawood, Earl Stone, Dr. Stacy Williams, Michael G. Morgan, Dan Cordell, Larry Tomkins

# Logistics and Reminders

1. Please remember to silence phones
2. Restrooms located just outside meeting room
3. The Mill Open (no password) for internet access
4. PDH certificates are available at the front desk along with sign up sheets (we want to have a record of attendance with contact information)
5. Presentations from 9:50 AM to 1:30 PM are being videoed [panel discussion not videoed]
6. Photos are being taken throughout the event
7. Check CMRC website a few weeks after event for downloadable content posted from today (<http://www.cee.msstate.edu/cmrc/>)

Thanks to Our Sponsors!  
(Let's Have A Good Discussion)

**GreenbergFarrow**

 **Ergon Asphalt  
& Emulsions, Inc.**  
*a company that works™*

Begin Presentation by Dr. Stacy Williams and  
Michael G. Morgan



# PAVEMENT MANAGEMENT CONCEPTS

STACY G. WILLIAMS, PH.D., P.E.  
UNIVERSITY OF ARKANSAS



2016 Road Conference – Pavement Management | Starkville, MS 03.23.16

# LEVELS OF DECISION MAKING

- **Crystal Ball**
  - Strategic Level Planning
  - Decisions may be based on speculation or politics
- **Bird's Eye View**
  - The BIG picture with real data
- **Project Level**
  - Family Groups
  - Individual Projects



**We need tools to help set priorities and optimize maintenance \$\$\$**

# FIRST STEP

## PAVEMENT MANAGEMENT



**1**

• **What do we have?**

**2**

• **What do we know?**

**3**

• **How do we Start?**

# REINVENT THE WHEEL?

- **Common Platforms**
  - Existing maps (state, regional, county)
  - Emergency Services
  - Political Zones
- **Use Existing Resources**
  - Coordination
  - Establish responsibilities (updates, etc.)
- **Document Existing Knowledge**



# EXISTING KNOWLEDGE

## MAP OF ROAD NETWORK



Planning Development Districts

**What do we have?**

**What do we know?**

**How do we Start?**

# DOCUMENT EXISTING KNOWLEDGE

## ROADWAY DATABASE / ROAD BOOK

ROAD NAME	SURFACE TYPE	MILES	WIDTH	STATE AID	ZC
TIMBER LAKE EST	ASPHALT	0.5	20'		
HICKORY RIDGE RD	SEALED	0.5	21'		
RIVER RD N (S SIDE)	ASPHALT	0.8	20'		
WESTLAKE DR	ASPHALT	0.3	21'		
ARBUCKLE ISLAND RD	GRAVEL / SEALED	1.2	22'		1
CASON BOTTOMS RD	ASPHALT / GRAVEL / SEALED	1.0	20'	STATE AID - PART	1
COURTHOUSE SLOUGH RD	GRAVEL	0.9			1
HICKMAN BLUFF RD (S SIDE)	ASPHALT	0.5	23'	STATE AID	1
KHILLING RD	GRAVEL / SEALED	1.0	20'	STATE AID	1
LAKEHILL DR	ASPHALT	0.2	21'		
NIXON RD	ASPHALT	0.7	20'	STATE AID	
PARK RD	ASPHALT	1.3	20'	STATE AID - PAR	1
RIVER RD S	ASPHALT	1.2	23'	STATE AID	1
WESTHILLS DR	ASPHALT	0.3	21'		1
18TH ST N	SEALED	1.1	20'		1
BIG CREEK BEND	SEALED	0.3	20'		1
BLOOMER RD	SEALED	1.5	21'		1
BOYS RANCH RD	SEALED	1.0	24'	STATE AID	1
BUGSCUFFLE RD	ASPHALT	1.9	22'	STATE AID	1
BURKETT LN	SEALED	0.5	23'		1
CEDARLAKES CIR	ASPHALT	0.2	24'		1
CHAPMAN CT	SEALED	0.7	20'		1



**What do we know?**

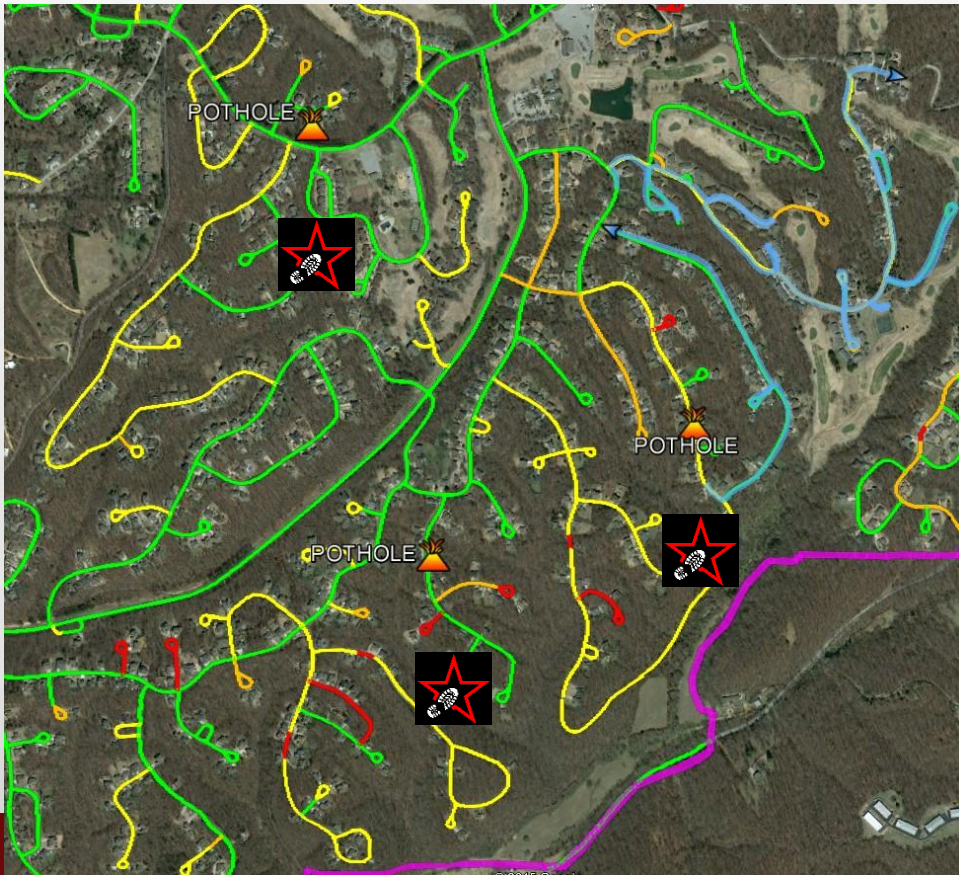
**How do we Start?**

# INVENTORY

- Roads, streets, segments?
- Route designation – ownership?
  - New subdivisions
  - Private drives
- Segment Length
- Pavement Width, # Lanes
- Pavement Type / Surface
- Shoulder Type / Width
- Political Zone
- Construction History
  - Date of Construction
  - Layer type / thickness
  - Material properties
  - Subgrade type
  - Cost data
- Traffic
  - Traffic counts / level
  - % Trucks

**CONDITION?**

# NETWORK LEVEL CONDITION ASSESSMENT

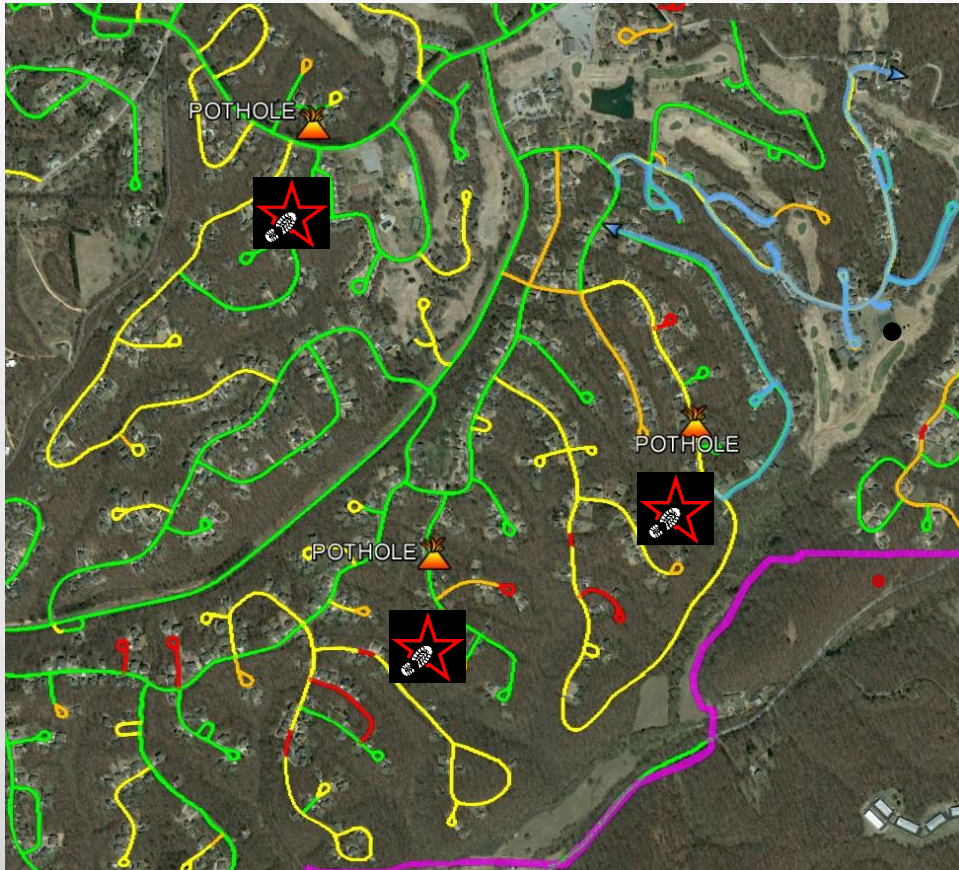


**How do we Start?**





# DISTRESS DATA



## TYPE OF DISTRESS

**SURFACE CRACKING**  
**STRUCTURAL DISTRESS**  
**POTHOLES / EDGE FAILURES**  
**RIDE QUALITY**

## SEVERITY OF DISTRESS

## AMOUNT OF DISTRESS

## **HEALTH, SAFETY & WELFARE ITEMS**

## ADDITIONAL INVENTORY ITEMS

**BRIDGES**  
**STRIPING**

**ROAD SIGNS**  
**DRAINAGE**



# HOW DO I GET THIS DATA?

## Pavement Condition Index (PCI)

GOOD

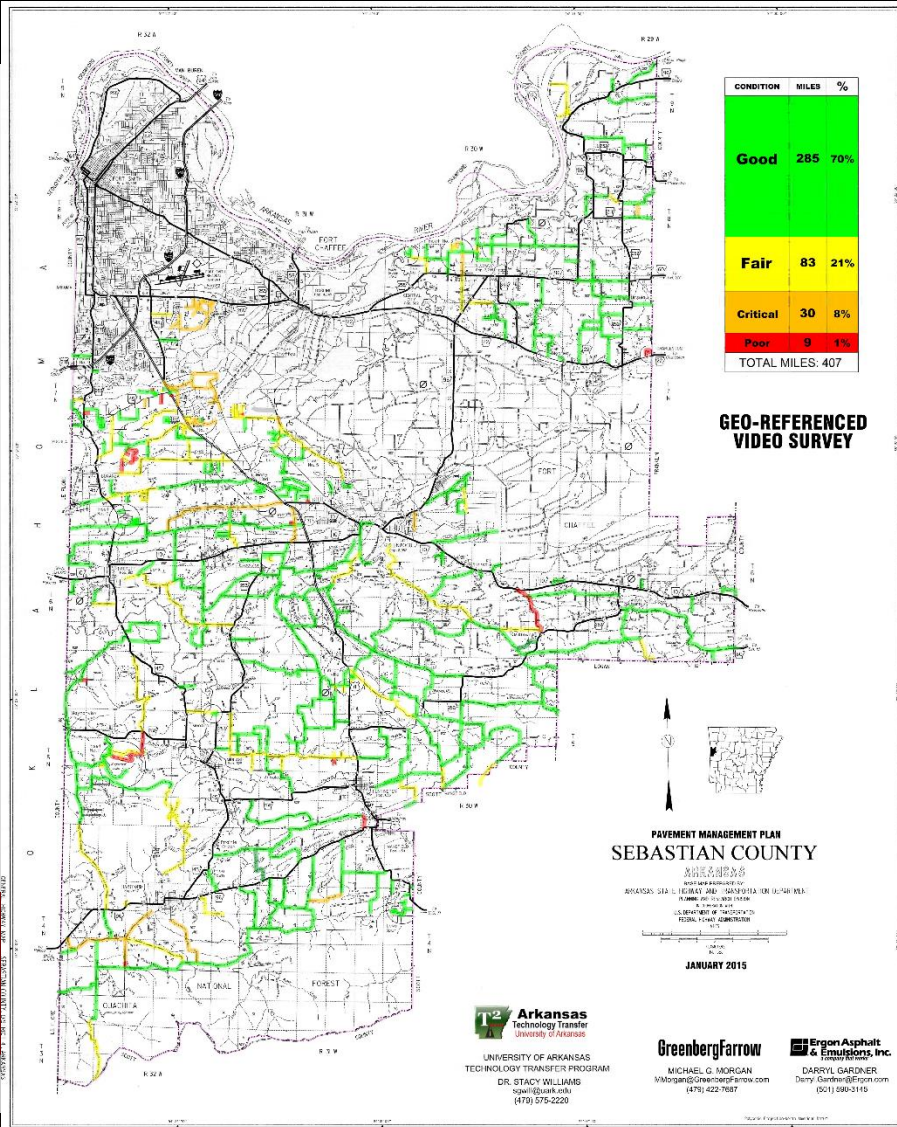
FAIR

CRITICAL

POOR

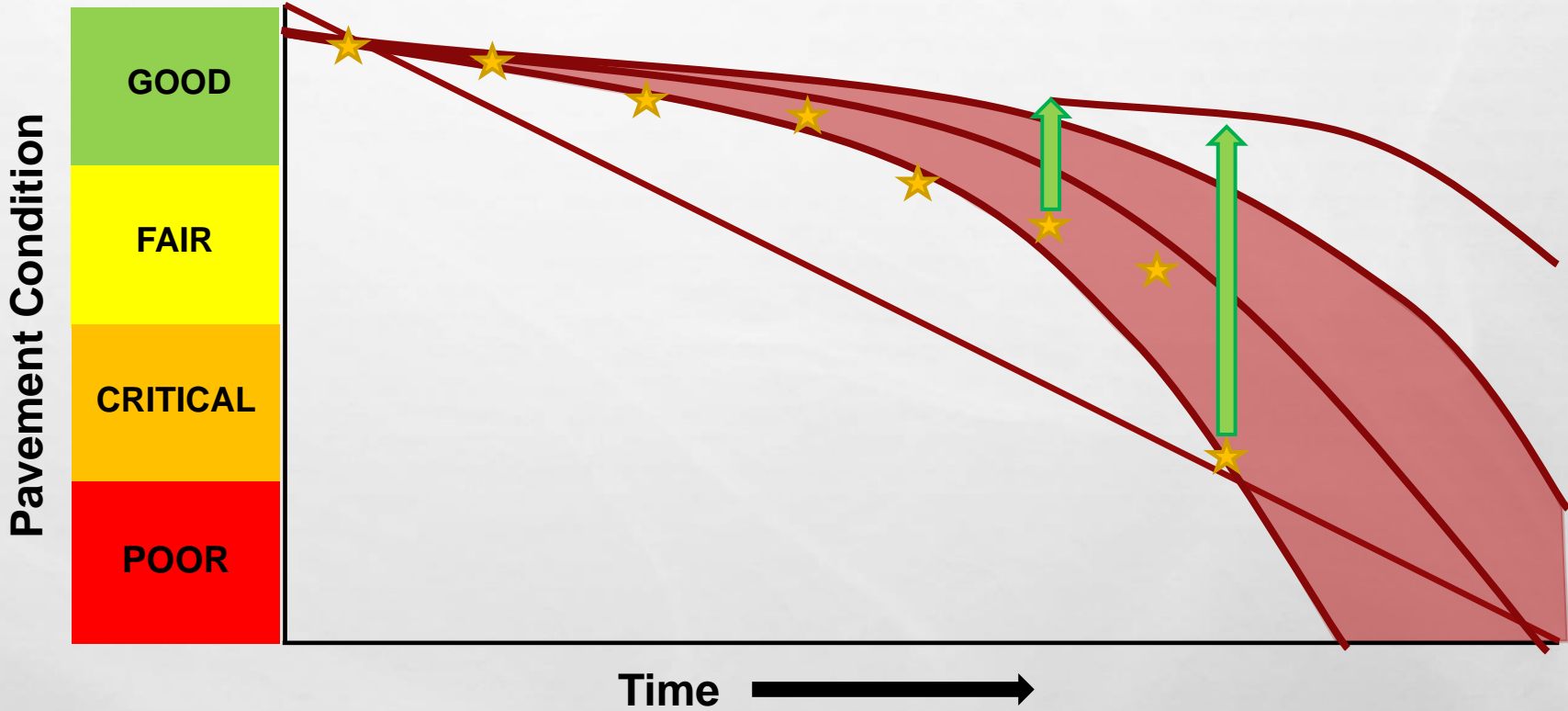


# FIRST STEP PAVEMENT MANAGEMENT



**(FIRST STEP IS COMPLETE)**

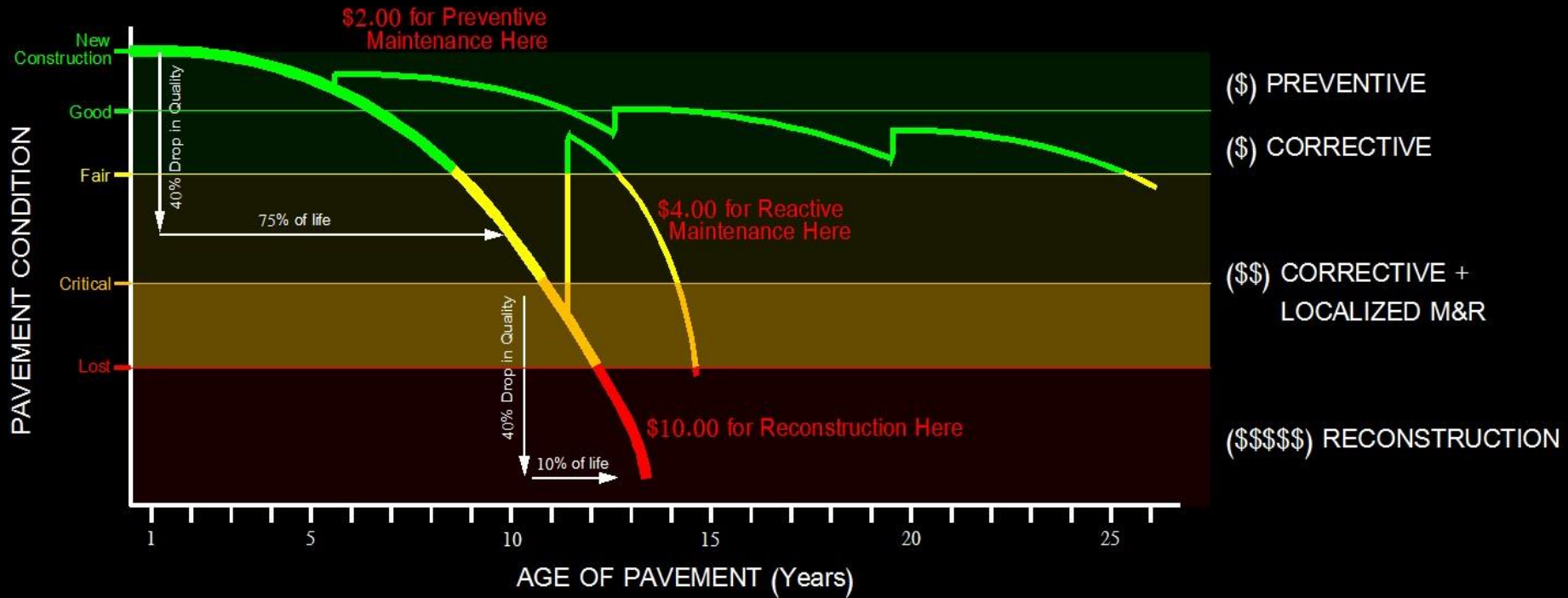
# PAVEMENT DETERIORATION



**Major Factors: Traffic and Weather Conditions**

# PAVEMENT DETERIORATION

KEEP GOOD ROADS IN GOOD CONDITION



# REMAINING LIFE

- Each year, every mile in the network loses 1 year of remaining service life
  - OR – Every year, we ‘spend’ 1 year of pavement life
- To ‘break even’, we must generate 1 year of pavement life for every mile
  - Every year.
- Dollars ≠ Years
  - Every maintenance treatment has a cost and a benefit
  - Cost is a function of the treatment
  - Benefit is largely a function of timing

**Maintain: to keep in an existing state; preserve from failure**

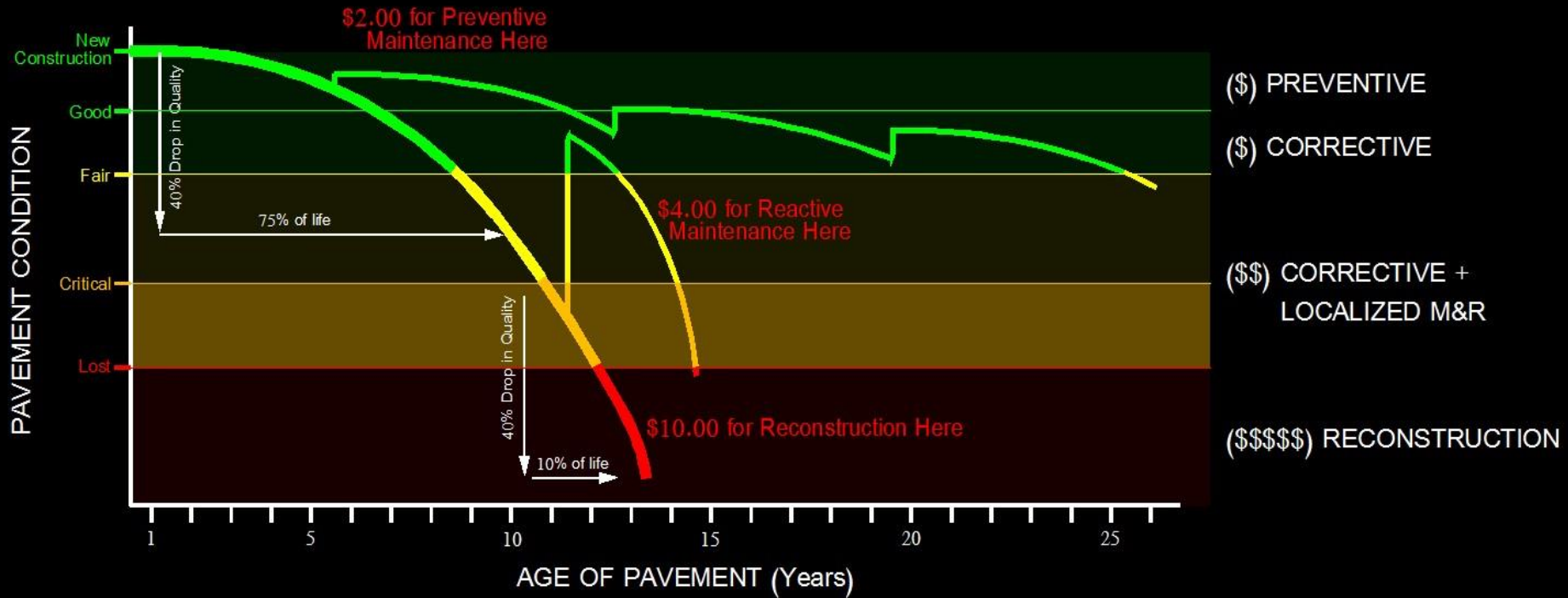
# HOW TO CHOOSE?

- Time
- Condition
- Complaints



# PAVEMENT DETERIORATION

KEEP GOOD ROADS IN GOOD CONDITION



Do the RIGHT TREATMENT at the RIGHT TIME



# SECOND STEP PAVEMENT MANAGEMENT



ROAD NAME	SURFACE TYPE	CONDITION	MILES	WIDTH	STATE AID	ZONE
TIMBER LAKE EST	ASPHALT	CRITICAL	0.5	20'		1
HICKORY RIDGE RD	SEALED	FAIR	0.5	21'		3
RIVER RD N (S SIDE)	ASPHALT	FAIR	0.8	20'		5
WESTLAKE DR	ASPHALT	GOOD	0.3	21'		1
ARBUCKLE ISLAND RD	GRAVEL / SEALED	POOR	1.2	22'		1
CASON BOTTOMS RD	ASPHALT / GRAVEL / SEALED	FAIR	1.0	20'	STATE AID - PART	4
COURTHOUSE SLOUGH RD	GRAVEL	CRITICAL	0.9			1
HICKMAN BLUFF RD (S SIDE)	ASPHALT	GOOD	0.5	23'	STATE AID	2
KHILLING RD	GRAVEL / SEALED	POOR	1.0	20'	STATE AID	2
LAKEHILL DR	ASPHALT	GOOD	0.2	21'		1
NIXON RD	ASPHALT	FAIR	0.7	20'	STATE AID	3
PARK RD	ASPHALT	FAIR	1.3	20'	STATE AID - PART	2
RIVER RD S	ASPHALT	GOOD	1.2	23'	STATE AID	1
WESTHILLS DR	ASPHALT	GOOD	0.3	21'		1
18TH ST N	SEALED	POOR	1.1	20'		4
BIG CREEK BEND	SEALED	CRITICAL	0.3	20'		6
BLOOMER RD	SEALED	GOOD	1.5	21'		1
BOYS RANCH RD	SEALED	GOOD	1.0	24'	STATE AID	5
BUGSCUFFLE RD	ASPHALT	FAIR	1.9	22'	STATE AID	5
BURKETT LN	SEALED	FAIR	0.5	23'		1
CEDARLAKES CIR	ASPHALT	FAIR	0.2	24'		2
CHAPMAN CT	SEALED	POOR	0.7	20'		1

# SECOND STEP PAVEMENT MANAGEMENT



ROAD NAME	SURFACE TYPE	CONDITION	MILES	WIDTH	STATE AID	ZONE
WESTLAKE DR	ASPHALT	GOOD	0.3	21'		1
HICKMAN BLUFF RD (S SIDE)	ASPHALT	GOOD	0.5	23'	STATE AID	2
LAKEHILL DR	ASPHALT	GOOD	0.2	21'		1
RIVER RD S	ASPHALT	GOOD	1.2	23'	STATE AID	1
WESTHILLS DR	ASPHALT	GOOD	0.3	21'		1
BLOOMER RD	SEALED	GOOD	1.5	21'		1
BOYS RANCH RD	SEALED	GOOD	1.0	24'	STATE AID	5
HICKORY RIDGE RD	SEALED	FAIR	0.5	21'		3
RIVER RD N (S SIDE)	ASPHALT	FAIR	0.8	20'		5
CASON BOTTOMS RD	ASPHALT / GRAVEL / SEALED	FAIR	1.0	20'	STATE AID - PART	4
NIXON RD	ASPHALT	FAIR	0.7	20'	STATE AID	3
PARK RD	ASPHALT	FAIR	1.3	20'	STATE AID - PART	2
BUGSCUFFLE RD	ASPHALT	FAIR	1.9	22'	STATE AID	5
BURKETT LN	SEALED	FAIR	0.5	23'		1
CEDARLAKES CIR	ASPHALT	FAIR	0.2	24'		2
TIMBER LAKE EST	ASPHALT	CRITICAL	0.5	20'		1
COURTHOUSE SLOUGH RD	GRAVEL	CRITICAL	0.9			1
BIG CREEK BEND	SEALED	CRITICAL	0.3	20'		6
ARBUCKLE ISLAND RD	GRAVEL / SEALED	POOR	1.2	22'		1
KHILLING RD	GRAVEL / SEALED	POOR	1.0	20'	STATE AID	2
18TH ST N	SEALED	POOR	1.1	20'		4
CHAPMAN CT	SEALED	POOR	0.7	20'		1

# - PAVEMENTS IN CRITICAL CONDITION

PREVENT FROM BECOMING LOST.  
GENERALLY THE HIGHEST IMPORTANCE.

ROAD NAME	SURFACE TYPE	CONDITION
TIMBER LAKE EST	ASPHALT	CRITICAL
COURTHOUSE SLOUGH RD	GRAVEL	CRITICAL
BIG CREEK BEND	SEALED	CRITICAL

HIGHEST RISK

# - PAVEMENTS IN GOOD TO FAIR CONDITION

PREVENTIVE MAINT FOR PAVEMENTS IN GOOD CONDITION.  
CORRECTIVE MAINT FOR PAVEMENTS IN FAIR CONDITION.

ROAD NAME	SURFACE TYPE	CONDITION
WESTLAKE DR	ASPHALT	GOOD
HICKMAN BLUFF RD (S SIDE)	ASPHALT	GOOD
LAKEHILL DR	ASPHALT	GOOD
HICKORY RIDGE RD	SEALED	FAIR
RIVER RD N (S SIDE)	ASPHALT	FAIR
CASON BOTTOMS RD	ASPHALT / GRAVEL / SEALED	FAIR

LOWEST COST

# - LOST PAVEMENTS

REQUIRE FULL RECONSTRUCTION.  
A LOST PAVEMENT WILL BE LOST NEXT YEAR (A LOW PRICE FOR DELAYING ACTION).  
KEEP SAFE, BUT LOST PAVEMENTS ARE EXPENSIVE TO RECONSTRUCT (BUDGET KILLERS).

ROAD NAME	SURFACE TYPE	CONDITION
ARBUCKLE ISLAND RD	GRAVEL / SEALED	POOR
KHILLING RD	GRAVEL / SEALED	POOR
18TH ST N	SEALED	POOR

HIGHEST COST

# REMAINING LIFE 'ACCOUNT'

*Lane miles × Added Life (yrs) = Lane mile years*

(Assume 10 LM network)

<b>GOOD</b>	Preventive Trmt @ \$3,000/mi., adds 3 yrs 10 LM x 3 Y = 30 LMY @ \$30,000	<b>\$1,000/LMY</b>	\$
<b>FAIR</b>	Corrective Trmt @ \$4,000/mi., adds 3 yrs 10 LM x 3 Y = 30 LMY @ \$40,000	<b>\$1,333/LMY</b>	\$
<b>CRITICAL</b>	Correct/Repair Trmt @ \$60,000/mi., adds 8 yrs 10 LM x 8 Y = 80 LMY @ \$600,000	<b>\$7,500/LMY</b>	\$\$
<b>POOR</b>	Reconstruct @ \$150,000/mi., adds 12 yrs 10 LM x 12 Y = 120 LMY @ \$1,500,000	<b>\$12,500/LMY</b>	\$\$\$ \$\$

**Must make some 'deposits' in this account every year!**

# HOW TO FIX IT?

- **Best Practices**

- Match the treatment to the distress
- Must know what caused the distress
- Drainage, Drainage, Drainage
- Right treatment – right time
- Weather conditions, upcoming projects

- **Other Decision Points**

- What are the alternatives?
- Equipment and expertise?
- In-house work or contract?

## **Rutting:**

- **Mixture**
- **Subgrade**

## **Cracking:**

- **Fatigue**
- **Thermal**
- **Base Failure**

## **Drainage:**

- **Roadside Features**
- **Underground Springs**
- **Water Lines**

# EXAMPLE

- Alligator Cracking
- Options
  - Do nothing
  - Crack sealing
  - Mass crack treatment
  - Divert water
  - Overlay
  - Remove & Replace



- Deterioration curve
  - Preventive won't add much time
- Upcoming projects
- Traffic Level

# TRAINING OPPORTUNITIES

[www.cttp.org/t2](http://www.cttp.org/t2)

The screenshot displays the website for the Center for Training Transportation Professionals (CTTP) at the University of Arkansas. The page features a navigation menu with categories like Technician Certification, Online Training, and Technology Transfer. The main content area is titled 'Request a Class' and includes a search bar, a breadcrumb trail, a photo of construction workers, and a form for local agency contact information. Below the form, there are sections for 'Courses Requested' with checkboxes for Infrastructure & New Technology, Safety, and Workforce.

**UNIVERSITY OF ARKANSAS**  
Center for Training Transportation Professionals

search  
This site uark.edu

CTTP TECHNICIAN CERTIFICATION ONLINE TRAINING LAB CERTIFICATION TECHNOLOGY TRANSFER

Request a Class

U of A / cttp / Technology Transfer / Request a Class

**T<sup>2</sup> Arkansas**

**Local Agency Contact Information**

Agency name  Contact person   
Phone number  Title   
Email

(These classes are free to city and county employees and paid for by The Federal Highway Administration and The Arkansas State Highway and Transportation Department.)

**Courses Requested**

Infrastructure & New Technology (Select all that apply)	Safety (Select all that apply)	Workforce (Select all that apply)
<input type="checkbox"/> 3D Modelling in Construction	<input type="checkbox"/> Backhoe Loader Safety	<input type="checkbox"/> Access

Center for Training Transportation Professionals  
Department of Civil Engineering  
University of Arkansas  
700 W. Research Center Blvd.  
Fayetteville, AR 72701  
Phone: 479-575-3997

# ~~SECOND STEP~~ YOUR PAVEMENT MANAGEMENT



- **Tools**
  - Manual / digital – paper & pencil, Excel spreadsheet, database, etc.
  - Geo-referenced video and mapping
  - Distress identification (manual, automated, semi-automated)
  - Roughness measurements
- **Policy Tables – list preferred actions for specific distresses**
  - Identify root cause of distresses
  - Match distresses to appropriate treatments
  - Timing – when to get greatest benefit / best practices for treatments
  - Determine benefit of keeping good pavements in good condition

**Avoid 'Worst-First' approach!**



# ~~SECOND STEP~~ YOUR PAVEMENT MANAGEMENT



- Think about a reasonable timeline (Not a quick process!)
  - Identify projects
  - Create estimates
  - In-house work or contract?
  - Create bid documents – new specs needed?
  - Legal Review
  - Choose Contractor
  - Acquire equipment / Order materials
  - Permits and approvals
  - Establish QA/QC procedures
  - Weather Interruptions



**Fall Planning for Spring / Summer Construction**

# ~~SECOND STEP~~ YOUR PAVEMENT MANAGEMENT



- **Public Perception**
  - Have a Plan – Publicize the Plan (but not too much?)
- **Evaluate**
  - Document Successes and Failures
  - Search for root cause of issues
  - Increase knowledge of roadway network
- **Leave a Legacy**
  - It's OK to start small – the system will grow over time.
  - Done right, the system will last longer than we do!

# **2016 Road Conference: Pavement Management Best Practices, Lowest Cost**

*March 23, 2016  
Starkville, MS*

**Michael G. Morgan**

**First Step Pavement Management**

*Inventory & Condition Mapping*

*GreenbergFarrow Architects, Inc.*

[MMorgan@GreenbergFarrow.com](mailto:MMorgan@GreenbergFarrow.com)

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# FIRST STEP PAVEMENT MANAGEMENT



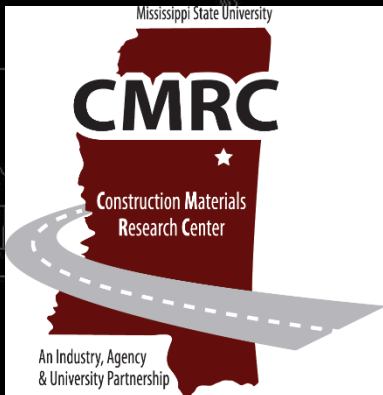
## Not a Company – YOUR Pavement Management Team



Planning  
Development  
Districts



and  
Local GIS  
Resources





# FIRST STEP PAVEMENT MANAGEMENT

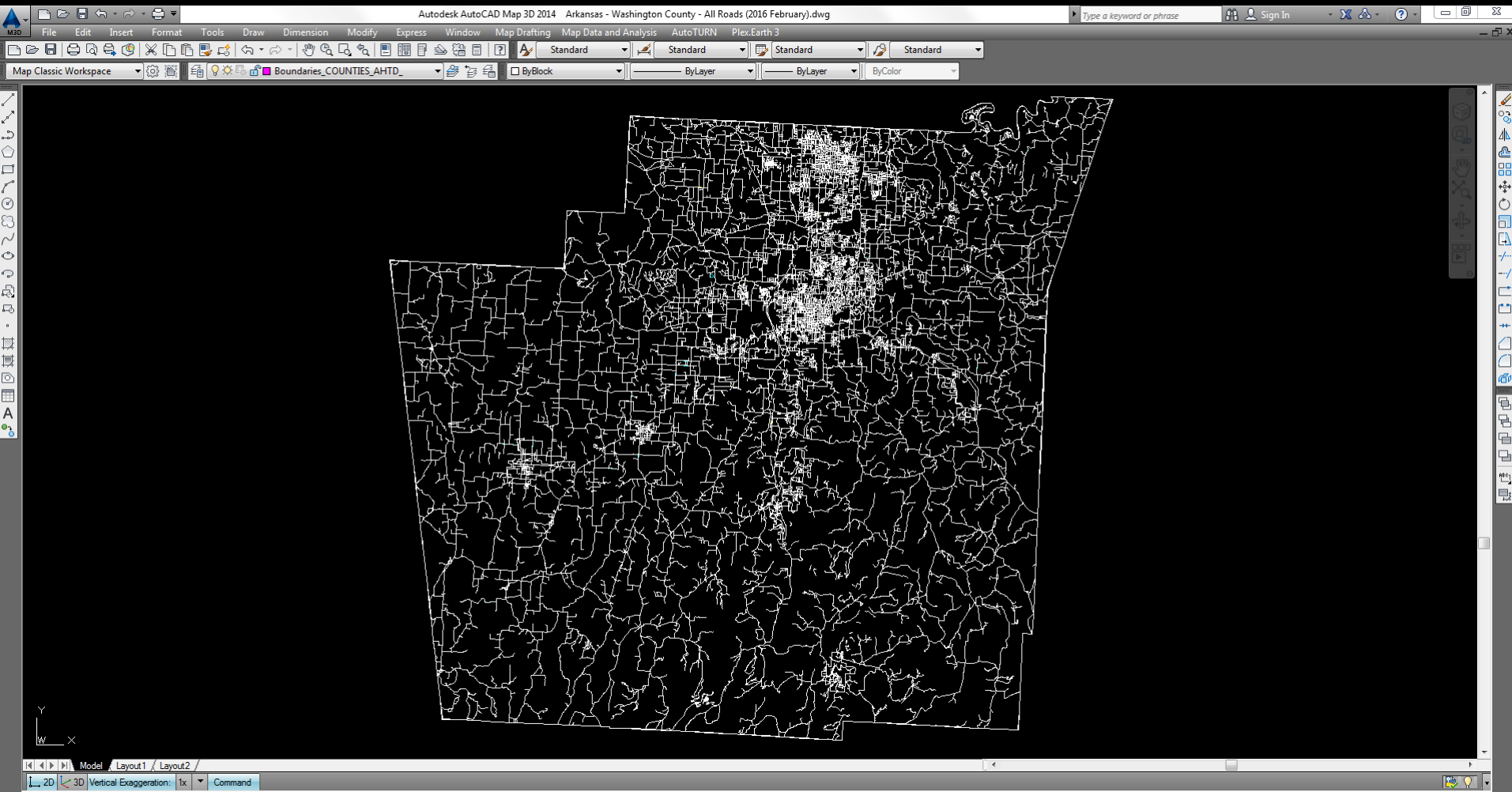


Planning  
Development  
Districts

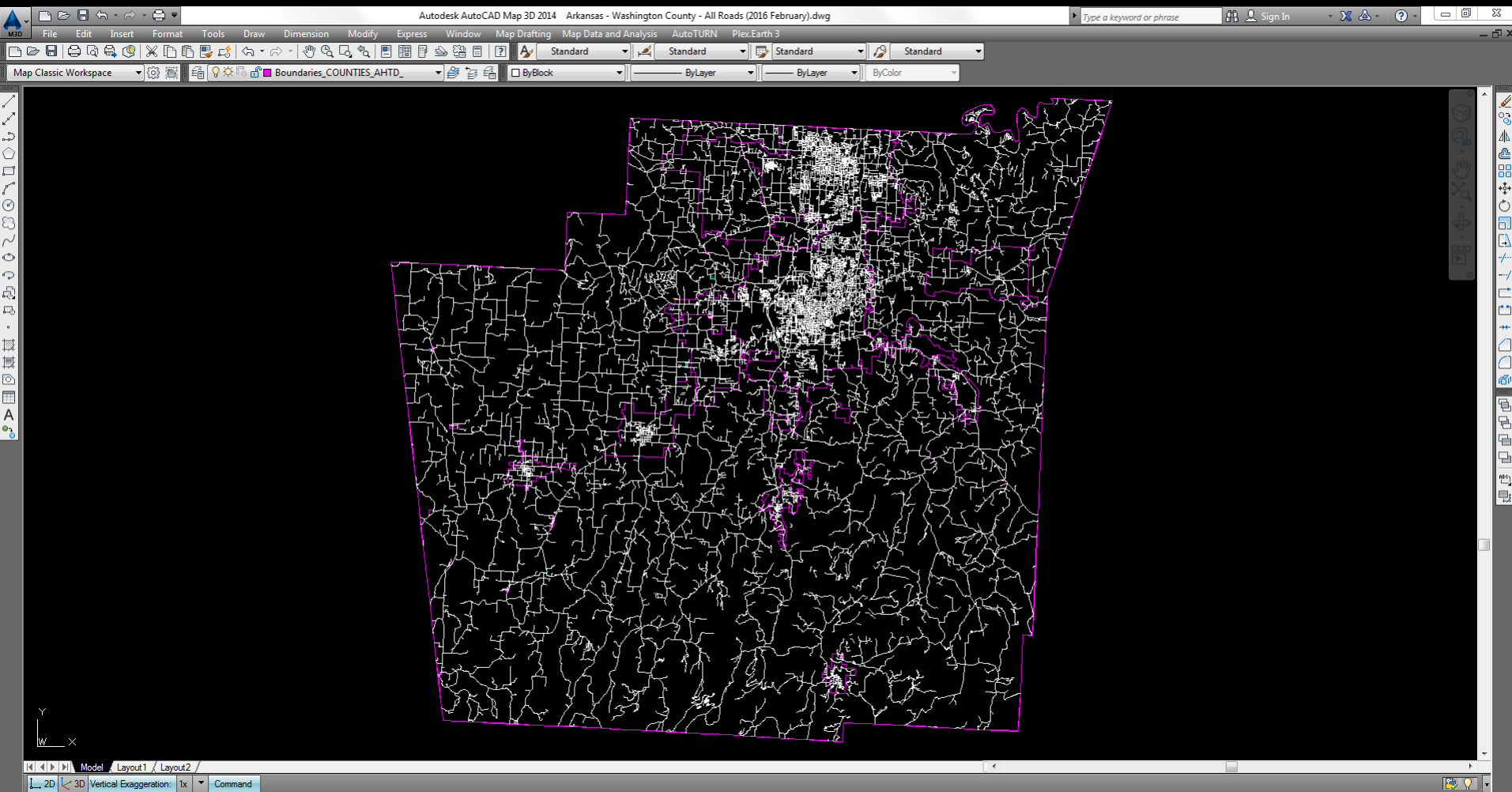


and  
Local GIS  
Resources

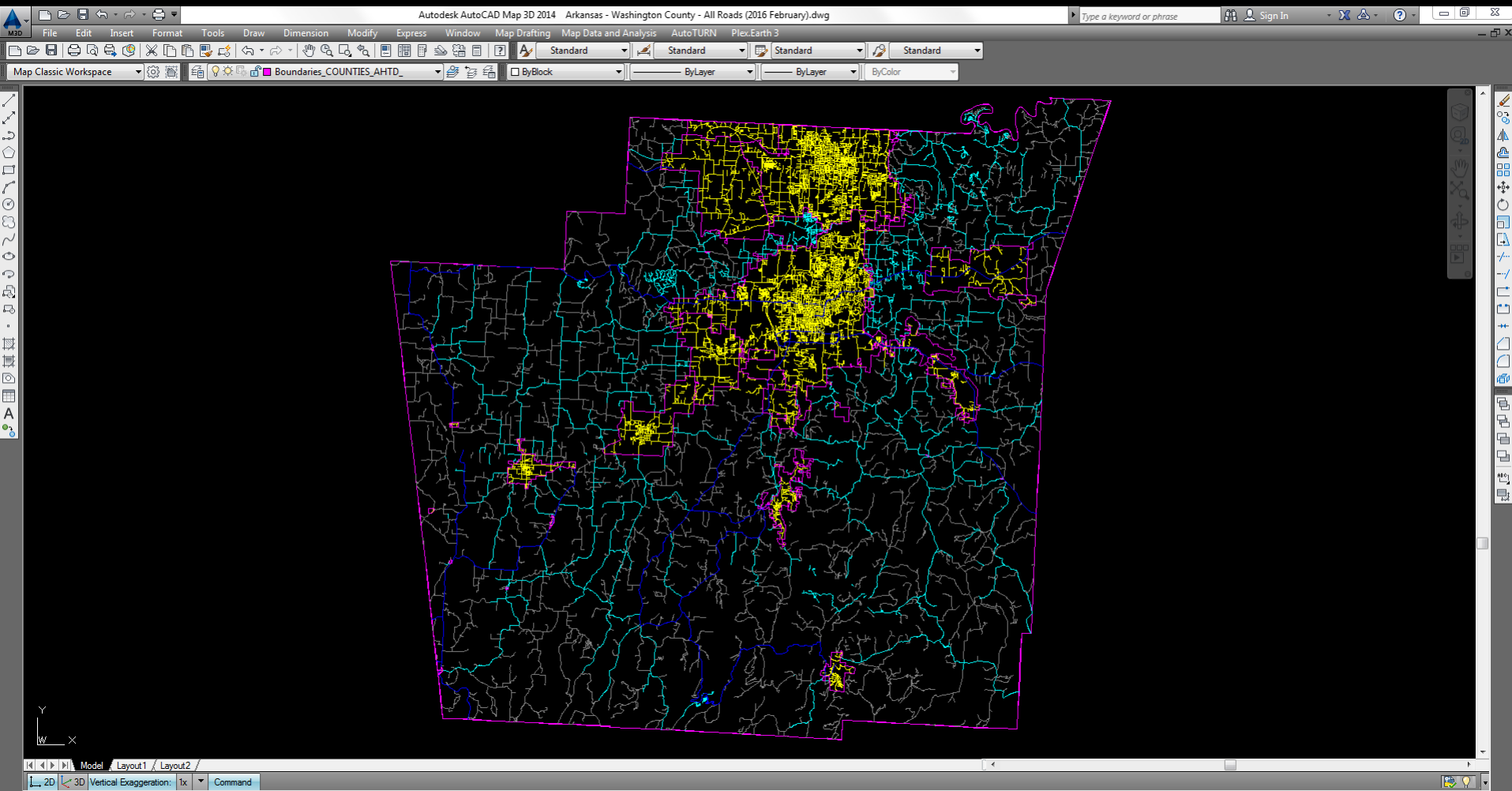
## Base Map – Road Inventory



## Base Map – Road Inventory

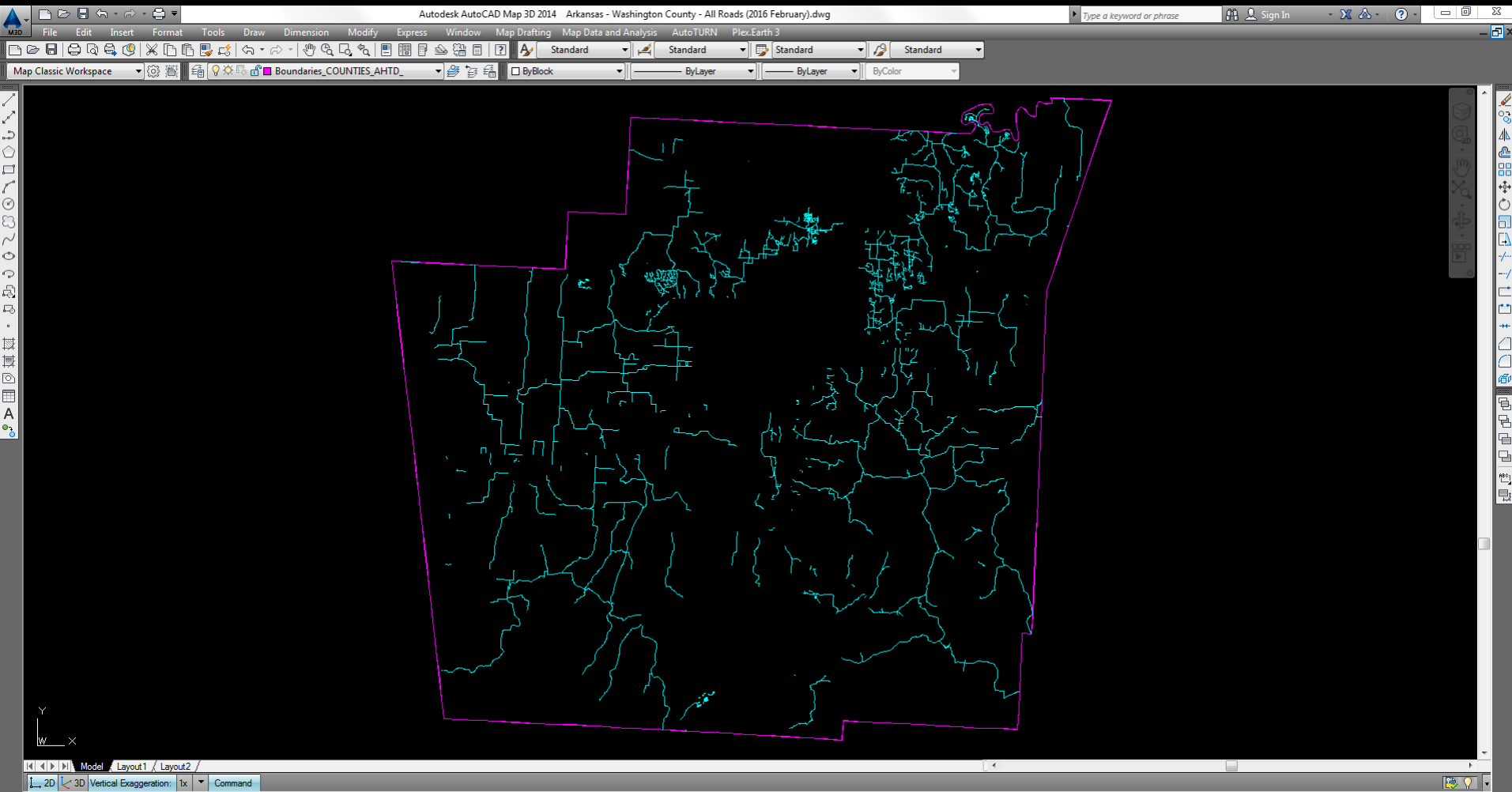


## Base Map – Road Inventory

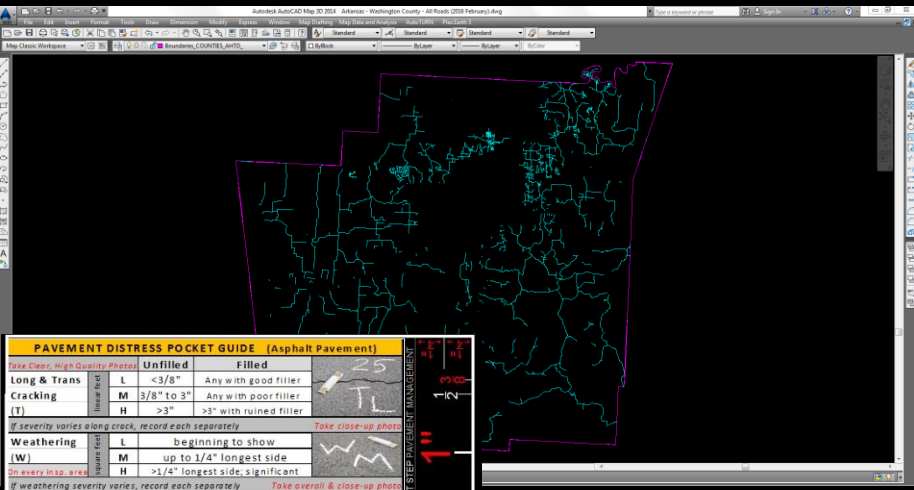


## Base Map – Road Inventory





## Base Map – Road Inventory



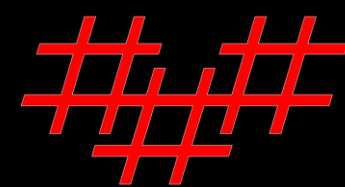
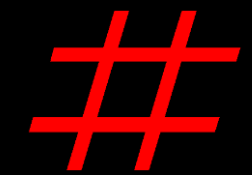
**PAVEMENT DISTRESS POCKET GUIDE (Asphalt Pavement)**

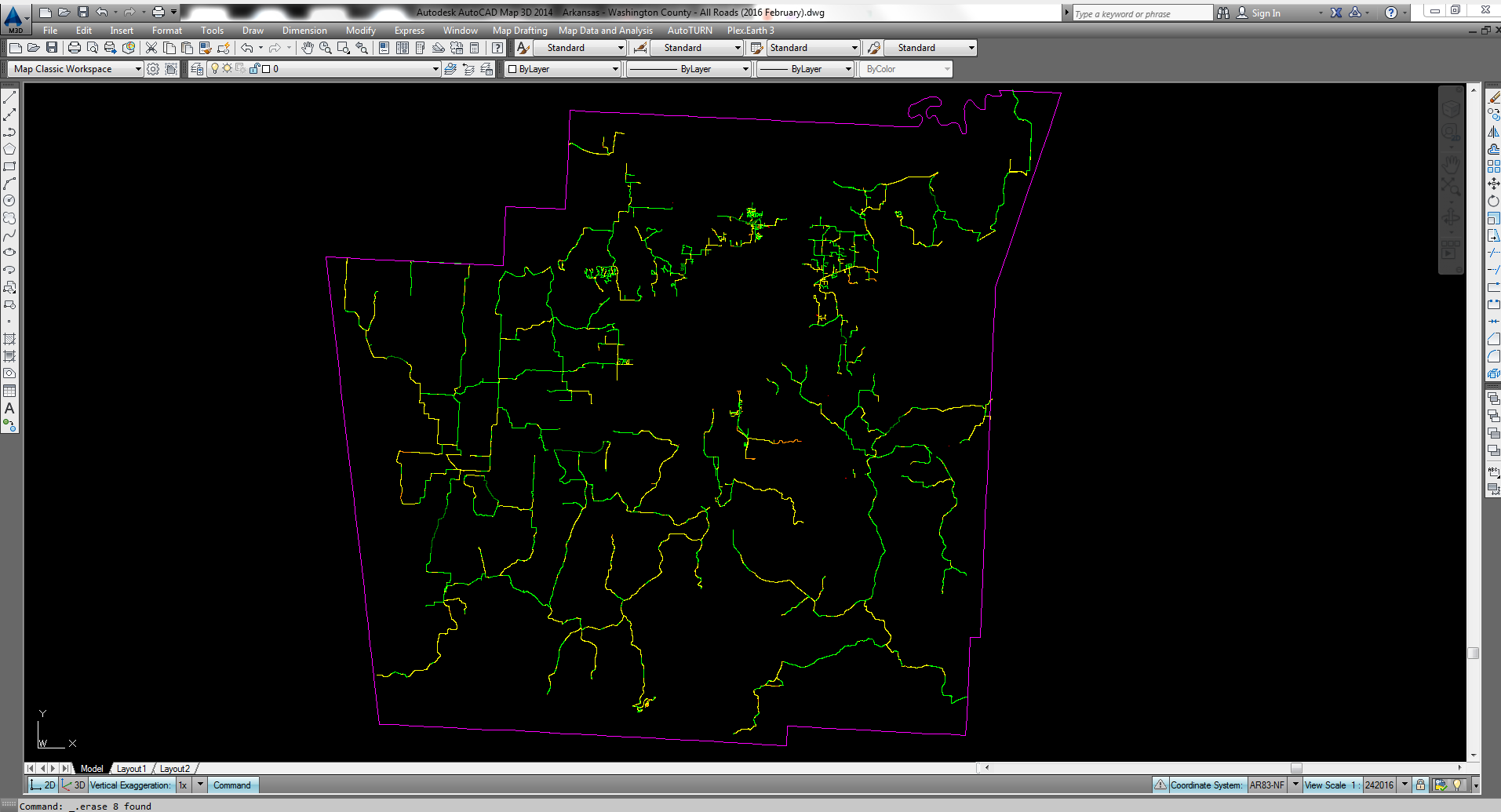
Distress	Severity	Unfilled	Filled	Photo	
Long & Trans Cracking (T)	L	<3/8"	Any with good filler		
	M	3/8" to 3"	Any with poor filler		
	H	>3"	>3" with ruined filler		
Weathering (W)	L	beginning to show			
	M	up to 1/4" longest side			
Alligator Cracking (A)	L	Parallel fine/hairlike cracks			
	M	Defined network			
	H	Defined network with spalled edges			
Block Cracking (B)	L	Widespread low severity cracks			
	M	Widespread med severity cracks			
	H	Widespread high severity cracks			
Raveling (R)	M	Considerable aggregate loss			
	H	Complete aggregate loss (rare)			
Rutting (Rt)	L	1/4" to 1/2" avg depth			
	M	1/2" to 1" avg depth			
Depression (D)	L	1/2" to 1" avg depth			
	M	1" to 2" avg depth			
Edge Cracking (E)	L	Low severity cracks with no breakup			
	M	Med severity cracks with low breakup			
Patching (P)	L	Good condition and ride quality			
	M	Med condition and ride quality			
Pothole (P)	Max Depth				
	L	4" to 8"	8" to 18"		
	L	1/2" to 1"	L		M
	L	1" to 2"	M		H
		>2"	M	M	H

ASTM-6433

**STRESS GUIDE**

Distress	Severity	Concrete Slab	Photo
<2' long	L	Depth 5xStol.2x12	
	M	<1"	
	L	>1" to 2"	
	M	>2"	
Shoulder Drop	L	Low Severity Crack	
	M	Med Severity Crack	
	H	High Severity Crack	
Divided Slab	Severity		
	L	4 to 5	
	L	6 to 8	
	M	8+	
Shrinkage Crack	L	<6" long, hairlike (<1/8")	
	M	No degrees of severity; Must be significant	
Polished Aggregate	L	One complete slab when counted	
	M	No degrees of severity; Must be significant	
Popouts	L	1" to 4" wide and 1/2" to 2" deep	
	M	No degrees of severity; Must be significant	





## Base Map – Road Inventory + Conditions



# FIRST STEP PAVEMENT MANAGEMENT



Planning  
Development  
Districts

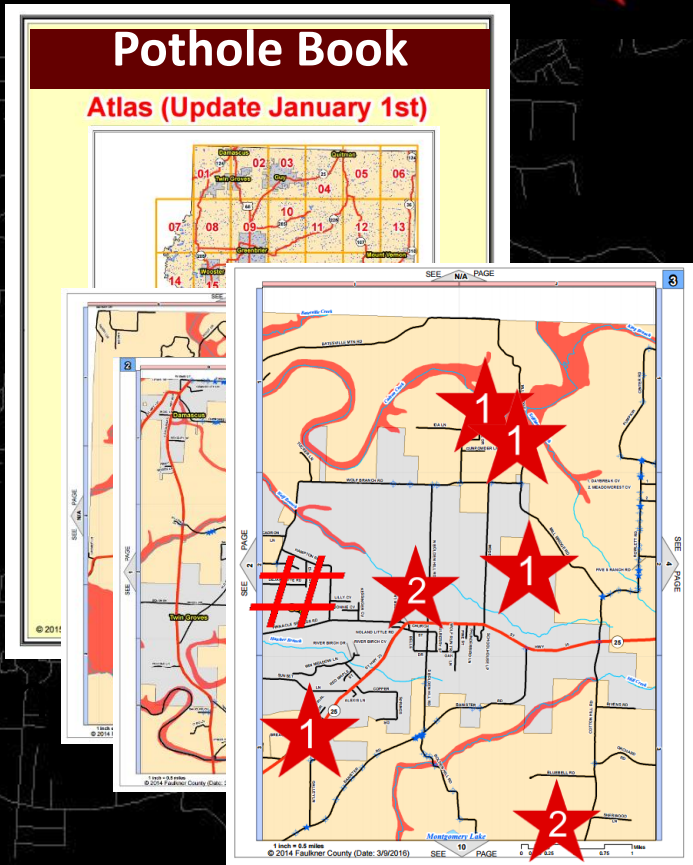
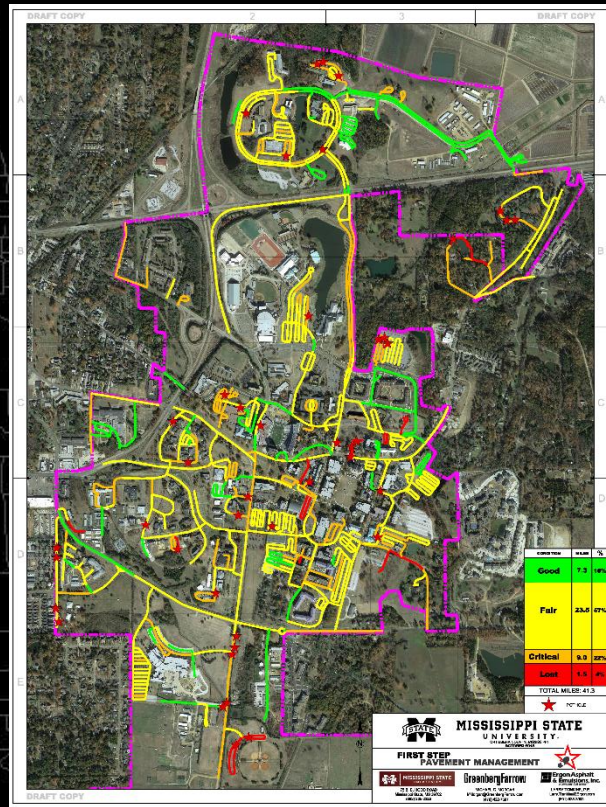
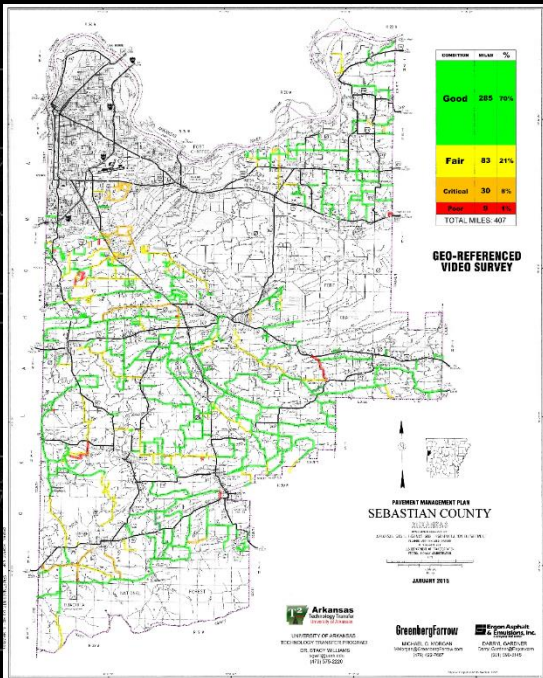


and  
Local GIS  
Resources

## Shared Information



# FIRST STEP PAVEMENT MANAGEMENT





# **CITY OF SOUTHAVEN'S PAVEMENT PRESERVATION PROGRAM**

# DANNY CORDELL

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**PRINCIPLE**

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5779 Getwell Road  
Southaven, MS

# BARRETT BURNWORTH

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**GIS MANAGER**

[bburnworth@civil-link.com](mailto:bburnworth@civil-link.com)

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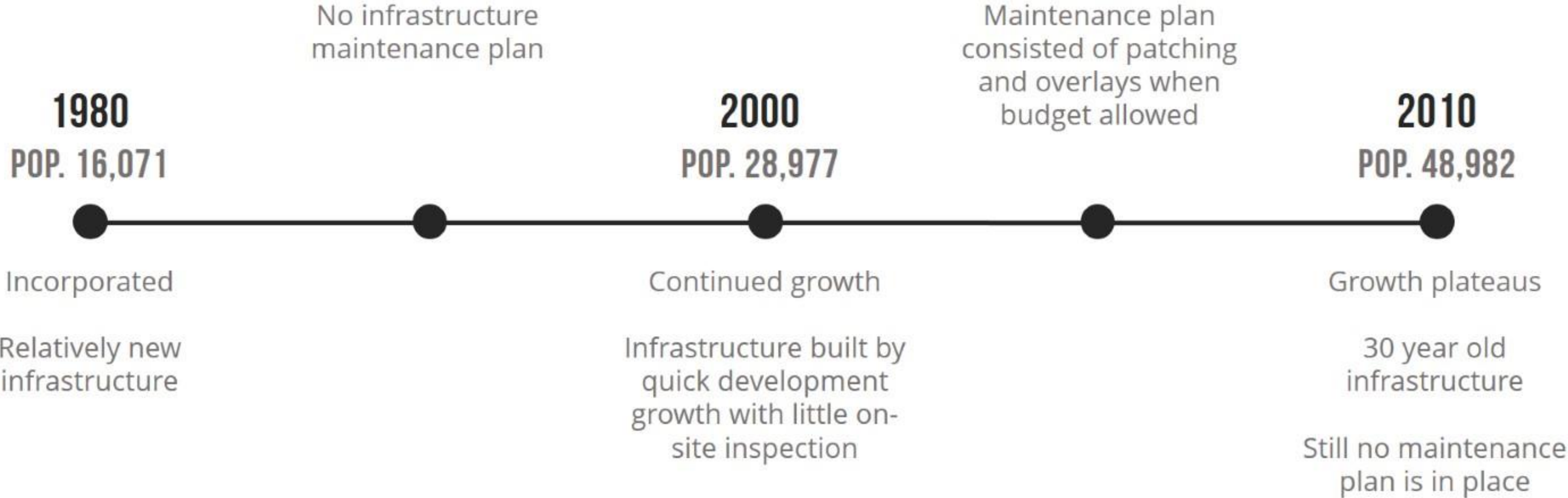
5779 Getwell Road  
Southaven, MS



**PRESENTATION BY**

# ROADWAY BACKGROUND

## RAPID GROWTH OVER 30 YEARS



INFO



# ANNUAL PAVEMENT OVERLAY INITIATIVE

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MAINTENANCE PROGRAM STARTED IN 2014



## EVALUATION

Roads are chosen based on visual inspections by the street department and also by citizen complaints



## BUDGET

Initiative is budgeted \$1,000,000 annually



## REPAIRS

Program includes base repairs, patching and pavement overlays



## INSPECTION

Very little on-site inspection and oversight by city representatives



# PROGRAM EVALUATION & REFORM

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## BETTER THAN NOTHING BUT IMPROVEMENTS STILL NEEDED

By late 2014 two main problems with the program had surfaced. The program was going over budget while at the same time the work was not going as far as the City wanted.

The Public Works department requested that Civil-Link evaluate the program. We agreed to evaluate and help with the program. We recommended continuing the existing plan of work to the end of that budget year. We held off implementing any changes until the next program cycle.

The initial request for evaluation was out of concern for the poor performance of the program. We did find areas for improvement on the ground. However, our evaluation also led us to expand and improve the underlying approach, or strategy, of the program.

With a limited budget we needed to make our dollar cover as much ground as it could and the existing plan was not doing that very well. We worked to find a strategy that would improve our roads but also let us 'catch-up' and get ahead with maintenance in order to keep the entire roadway system well maintained.

We believe that a successful roadway maintenance program requires BOTH quality work on the ground and a solid approach.



INFO

# STRATEGY

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## HOW CAN WE ACHIEVE LONG TERM GOALS

The initial implementation of the program was reactive and typically focused on the worst which are the most expensive to rehab. If we wanted to get serious about a road maintenance plan we needed to plan ahead. Establishing a proactive maintenance plan would require more forethought than just reacting to citizen complaints.

We took a city-wide road condition inventory of the existing road infrastructure. Using this as a starting point we could then plan ahead our future work.

# IMPLEMENTATION

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## HOW CAN WE IMPROVE WHAT IS DONE

Our evaluation determined that we could improve in two main areas on the ground: oversight/inspection and treatment choices.

Better oversight and inspection of the work will allow the City to be aware of any major issues that may come up and will help us keep an eye on the program's budget.

We also explored more treatment options for the program as a whole. Pavement overlay has its place but so do crack/joint seals and seal coats. These other options can also help extend the life of our roads while at the same time allowing us to impact more road miles than we could with just a pavement overlay.



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# IMPROVING OUR STRATEGY

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## CREATING A SOLID FOUNDATION

The first year of the program we started with **a list of 32 roads** to maintain. We soon realized that we had no real concept of the actual size of Southaven's road infrastructure.

# SOUTHAVEN HAS OVER 1100 NAMED ROADS

We hired **Greenberg-Farrow** to video assess and inventory the existing roads city-wide. We requested that they survey potholes and structural problems along with the general condition of the roads. A trained inspector evaluated and reviewed each city street and classified it based on the condition of the road.

This survey was vital for us by providing an unbiased look at the existing conditions of the road infrastructure as a whole. From here we could plan and make informed decisions to maintain and improve our roadways. This initial survey gave us the information we needed to look ahead and revamp our long-term strategy.



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# EXPANDING OUR OPTIONS

## A NEW PLAN OF ACTION

We can impact more road miles by tailoring specific treatments to the condition of the road. This is a very effective way for the City to be scrupulous with its road maintenance budget.

The better condition a road is in the cheaper it is to maintain.

This is the key for Southaven to get ahead with its road maintenance.



\* Estimated Costs



INFO

# FORECASTING OUR NEEDS

## IMPACT DOWN THE ROAD

Using the estimated costs of treatments we assigned a ratio of money across all four condition categories. We found that we were lacking in funds to keep good and fair roads on a maintainable schedule.

Using the street condition inventory from Greenberg-Farrow as a planning tool allowed us see potential shortcomings in our existing budget. We can plan our budget increases to help prevent the majority of our good and fair roads from becoming critical and lost.

Taking proactive steps now will help save the City a lot of money in the future.

CONDITION	TOTAL MILES	BUDGET ALLOCATED	MILES MAINTAINED / YEARLY ROTATION
GOOD	69	\$50,000	5 MILES / 14 YEARS
FAIR	274	\$250,000	8 MILES / 34 YEARS
CRITICAL	44	\$500,000	6 MILES / 7 YEARS
LOST	4	\$200,000	.67 MILES / 6 YEARS
		<b>\$1,000,000</b>	<b>NOT ON THE SAME SCHEDULE</b>



INFO

# PROPOSED PROGRAM CHANGES

## WE NEED MORE MONEY IN THE FUTURE

To keep our roads on a sustainable maintenance plan we need to meet the demands of our infrastructure. We have to be able to maintain the 343 miles of good and fair roads that we currently have. The budget allocations that we are currently working with just won't stretch that far.

We want the Street Department to take over crack/joint seals as part of their maintenance activities.

We want to find another \$1,000,000 to help tackle the total mileage of fair roads.

CONDITION	TOTAL MILES	PROPOSED BUDGET	MILES MAINTAINED / YEARLY ROTATION
GOOD	69	\$0 – STREETS DEPT.	0 MILES
FAIR	274	\$1,300,000	41 MILES / 7 YEARS
CRITICAL	44	\$500,000	6 MILES / 7 YEARS
LOST	4	\$200,000	.67 MILES / 6 YEARS
		\$2,000,000	6-7 YEAR SCHEDULE



INFO

# POTHOLE REPAIRS

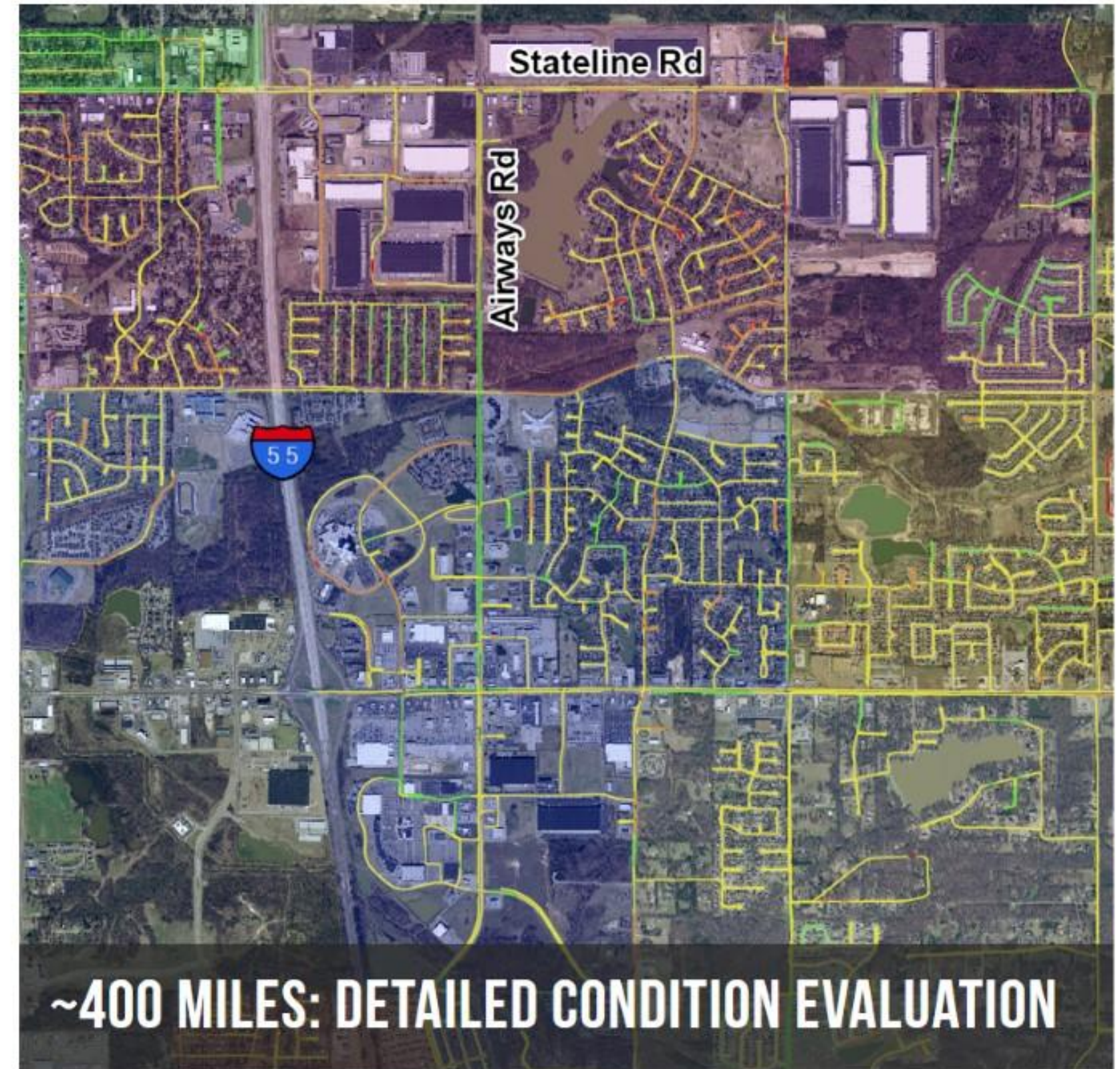
## MORE MONEY FOR MAINTENANCE

As an added benefit we have a city-wide pothole database which can be integrated into the yearly overlay program.

Work-orders and maps can be generated for the Street Department's road crews to systematically repair potholes across the city. We can specifically target those roads that will see treatment next. This allows road crews to prepare those roads in advance of treatment.

By getting road crews out in front of the treatments we have effectively shifted overlay program money that would have been spent repairing potholes into the street department's routine maintenance activities.

This is one more way we have helped to stretch the City's overlay budget.



INFO





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**ANY QUESTIONS?**



INFO

# CONTACT INFO

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LET US HELP



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FACEBOOK/CIVIL-LINK



INFO

# *2016 Road Conference:* **Pavement Management Best Practices, Lowest Cost**

## ***Project Prioritization Toolbox***

*Darryl Gardner, Ergon A & E, Inc.*



# A PAVEMENT MANAGEMENT PROGRAM

Typically has 3 Parts:

1. A system to regularly collect road condition data
2. A database to store and sort the collected road data
3. An analytical program to evaluate pavement preservation strategies and suggest cost-effective projects to maintain road conditions.

# A PAVEMENT MANAGEMENT PROGRAM

Typically has 3 Parts:

1. A system to regularly collect pavement condition data
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# A PAVEMENT MANAGEMENT PROGRAM

An analytical program to evaluate pavement preservation strategies and suggest cost-effective projects to maintain road conditions.

- MAKING SENSE OF WHAT WE SEE AND HAVING A PLAN TO DO SOMETHING ABOUT IT



# A PAVEMENT MANAGEMENT PROGRAM

An analytical program to evaluate pavement preservation strategies and suggest cost-effective projects to maintain road conditions.

## – Project Prioritization Tools

- Equivalent Annual Cost (EAC)
- Cost Benefit Value (CBV)
- Remaining Service Life (RSL)

## – This repair job requires not just one tool, but all of them

- Recommend using EAC & CBV within the framework of RSL
- Plan should be repeatable and long-term
- It will get better over time.

# A PAVEMENT MANAGEMENT PROGRAM

An analytical program to evaluate pavement preservation strategies and suggest cost-effective projects to maintain road conditions.

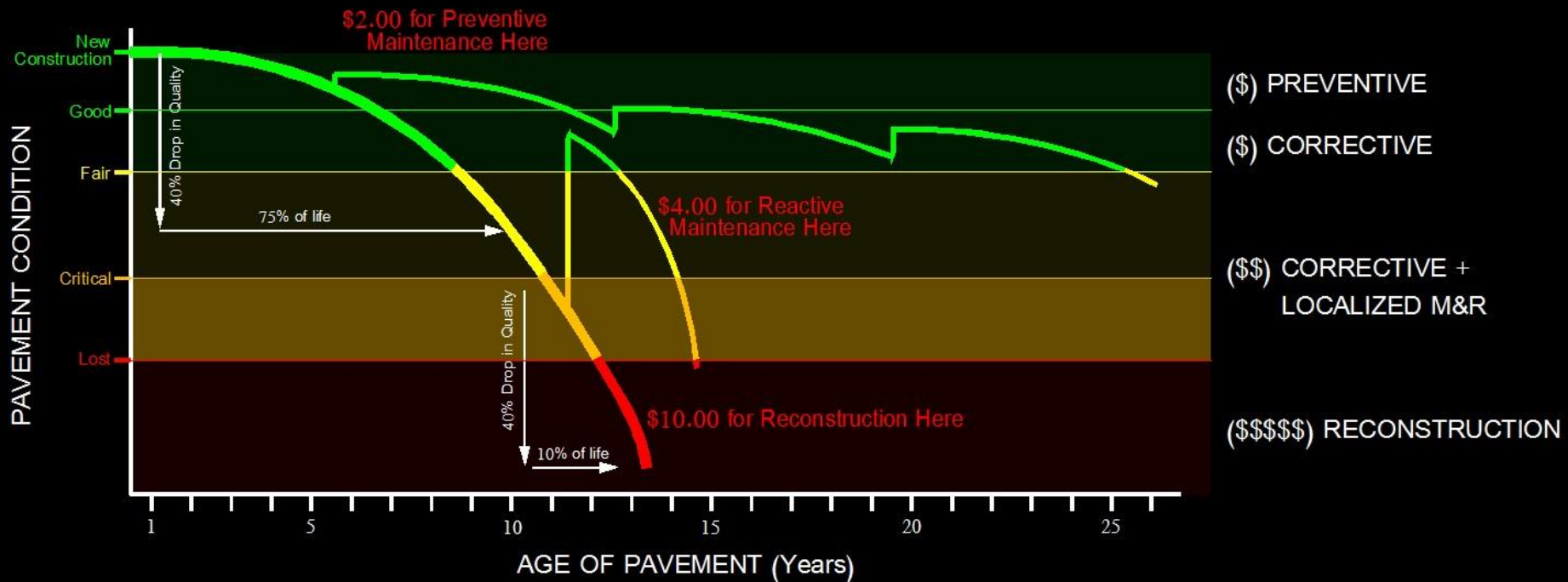
- Project Prioritization Tools
  - **Equivalent Annual Cost (EAC)**
  - Cost Benefit Value
  - Remaining Service Life



# A PAVEMENT MANAGEMENT PROGRAM

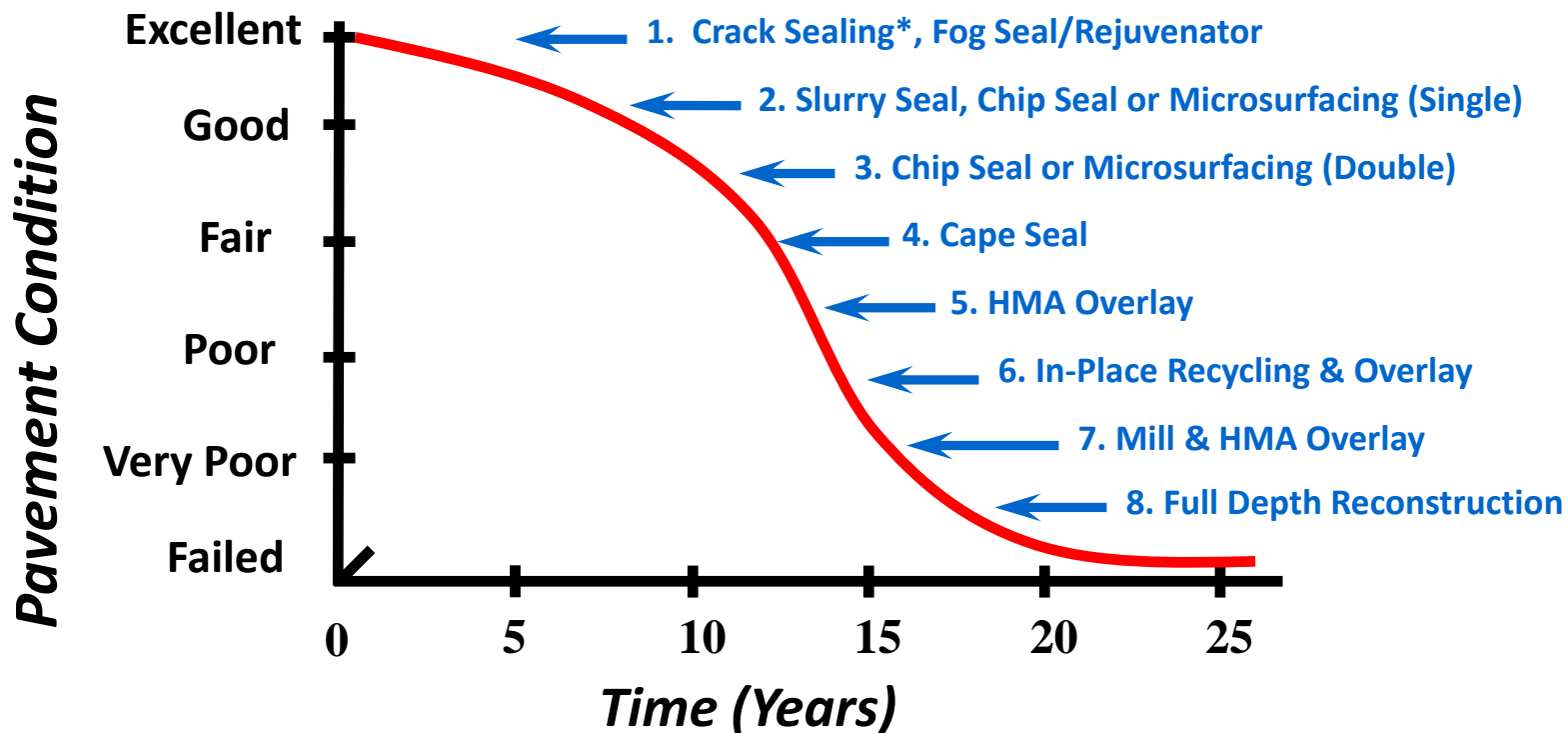
## TYPICAL PAVEMENT LIFE REGRESSION CURVE

KEEP GOOD ROADS IN GOOD CONDITION



# A PAVEMENT MANAGEMENT PROGRAM

Always match the treatment to the distress...right treatment to the right road at the right time.



\* Crack Sealing to also be used in conjunction with other applications and as needed

# A PAVEMENT MANAGEMENT PROGRAM

## EQUIVALENT ANNUAL COST (EAC)

Treatment Alternative	(\$/Lane-Mile) *	(\$/SY)	Estimated Service Life (years)	EAC (\$/SY/Year)
Crack Seal	\$3,520	\$0.50	2	\$0.25
Fog Seal	\$7,040	\$1.00	3	\$0.33
Single Chip Seal	\$14,080	\$2.00	5	\$0.40
Double Chip Seal	\$29,920	\$4.25	8	\$0.53
Thin Overlays	\$49,280	\$7.00	10	\$0.70
Mill-and-Fill	\$84,480	\$12.00	12	\$1.00
Rehabilitation	\$119,680	\$17.00	15	\$1.13
Reconstruction	\$176,000	\$25.00	20	\$1.25

\* Based on 12' Lane Width

Based on EAC, our goal should be to devote more of our time to the upper end of the right column because it costs us less per SY/Year. This means we can reach more of our pavement network. Spending the majority of our budget on the lower end of the column is a “budget killer” and gives us the least amount of reach with our budget.

# A PAVEMENT MANAGEMENT PROGRAM

An analytical program to evaluate pavement preservation strategies and suggest cost-effective projects to maintain road conditions.

## — Project Prioritization Tools

- Equivalent Annual Cost
- **Cost Benefit Value**
- Remaining Service Life

# A PAVEMENT MANAGEMENT PROGRAM

## COST BENEFIT VALUE (CBV)

- A project prioritization tool that gives a value score to each potential project so that the decision makers can discern how to best spend the limited dollars.
- Uses Average Daily Traffic, Service Life Extension, Treatment Cost, and Pavement Condition Index as priority coefficients.
- Can be utilized to compare values of both similar & different types of project treatments.

# A PAVEMENT MANAGEMENT PROGRAM

COST BENEFIT VALUE (CBV)

CBV =

$$\frac{(\text{Traffic}) \times (\text{Service})}{(\$/\text{SY}) \times (\text{PCI})}$$



# A PAVEMENT MANAGEMENT PROGRAM

COST BENEFIT VALUE (CBV)

$$\text{CBV} = \frac{\text{Traffic} \times \text{Service}}{(\$/\text{SY}) \times (\text{PCI})}$$

The equation is presented with 'Traffic' underlined in yellow. To the right of the fraction, there is a red upward-pointing arrow above the 'Service' term and a red downward-pointing arrow below the denominator terms.



If the service life extension, cost, and pavement condition were the same on two projects, we would get more value by tending to the project with the **most traffic**.

# A PAVEMENT MANAGEMENT PROGRAM

COST BENEFIT VALUE (CBV)

$$\text{CBV} = \frac{(\text{Traffic}) \times (\text{Service})}{(\$/\text{SY}) \times (\text{PCI})}$$


If the traffic count, cost, and pavement condition were the same on two projects, we would get more value doing the project with the **highest service life extension**.



# A PAVEMENT MANAGEMENT PROGRAM

COST BENEFIT VALUE (CBV)

CBV =

(Traffic) x (Service)

(\$/SY) x (PCI)



If the traffic count, service life extension, and PCI were the same on two projects, we would get more value by doing the job with the **lowest cost**.

# A PAVEMENT MANAGEMENT PROGRAM

COST BENEFIT VALUE (CBV)

CBV =

(Traffic) x (Service)

(\$/SY) x (PCI)



If the traffic count, service life extension, and cost were the same on two projects, and *the PCI was in the same classification range*, we would get more value by working on the project with the **lower PCI**.

# Worst-First Prioritization Approach

Street Name	PCI	Recommended Repair Type	Unit \$	ADT	Service Life of Repair (years)
State Road	30.2	Full-Depth Reclamation	\$25.00	300	20
Bulldog Ave	30.5	Full-Depth Reclamation	\$25.00	5000	20
	59.7	Mill and Overlay	\$12.00	700	12
Beach Street	60	Mill and Overlay	\$12.00	4000	12
Williams Ave.	71.1	Double Surface Treatment	\$4.25	500	8
Adams Street	71.4	Double Surface Treatment	\$4.25	3500	8
Thom Avenue	87.9	Crack Seal	\$0.50	800	2
Midway Road	88.1	Crack Seal	\$0.50	5000	2

Street Name	PCI	Recommended Repair Type	Unit \$	ADT	Service Life of Repair (years)	Cost Benefit Value
State Road	30.2	Full-Depth Reclamation	\$25.00	300	20	8
Bulldog Ave	30.5	Full-Depth Reclamation	\$25.00	5000	20	131
	59.7	Mill and Overlay	\$12.00	700	12	12
Beach Street	60	Mill and Overlay	\$12.00	4000	12	67
Williams Ave.	71.1	Double Surface Treatment	\$4.25	500	8	13
Adams Street	71.4	Double Surface Treatment	\$4.25	3500	8	92
Thom Avenue	87.9	Crack Seal	\$0.50	800	2	36
Midway Road	88.1	Crack Seal	\$0.50	5000	2	227

## CBV Prioritization Approach

Street Name	PCI	Recommended Repair Type	Unit \$	ADT	Service Life of Repair (years)	Cost Benefit Value
Midway Road	88.1	Crack Seal	\$0.50	5000	2	227
Bulldog Ave	30.5	Full-Depth Reclamation	\$25.00	5000	20	131
Adams Street	71.4	Double Surface Treatment	\$4.25	3500	8	92
Beach Street	60	Mill and Overlay	\$12.00	4000	12	67
Thom Avenue	87.9	Crack Seal	\$0.50	800	2	36
Williams Ave.	71.1	Double Surface Treatment	\$4.25	500	8	13
	59.7	Mill and Overlay	\$12.00	700	12	12
State Road	30.2	Full-Depth Reclamation	\$25.00	300	20	8

# A PAVEMENT MANAGEMENT PROGRAM

An analytical program to evaluate pavement preservation strategies and suggest cost-effective projects to maintain road conditions.

## — Project Prioritization Tools

- Equivalent Annual Cost
- Cost Benefit Value
- **Remaining Service Life**

— EAC and CBV are GREAT tools to help us prioritize treatments/repair choices, and value. The final consideration, RSL attempts to answer the question, *“How do we know that when we do the right thing to the right road at the right time that we are doing **enough** to maintain our entire pavement network?”*

# A PAVEMENT MANAGEMENT PROGRAM

## REMAINING SERVICE LIFE

- Every pavement in a network has a remaining service life, expressed as a “Lane-Mile-Year.” Lane-miles are utilized since many pavement networks have multiple lanes routes. 100 miles of 2-lane pavement = 200 lane-miles.
- If nothing was done to preserve a 200 lane-mile system in a given year, the system would lose 200 lane-mile-years.
- Within a given budget, our projects must add back into the system the same amount of lane-mile-years that we lose if we are to maintain the current PCI of our network.  
(like a bank account)

# A PAVEMENT MANAGEMENT PROGRAM

## REMAINING SERVICE LIFE (RSL)

### 2016 Lane Mile Year Project Planning

#### Gardner County Road & Bridge

Budget: \$4,000,000

Lane Miles: 1,600

#### EXAMPLE A

Road Name	Length (miles)	Lanes	Lane Miles	Condition	Treatment	Life Extension Years	Lane Mile Years Extension	Contract/Internal?	Cost/Lane Mile	Total Cost
Apple St	2.4	2	4.8	Good	Rejuvenating Fog	3	14.4	Internal	\$1,600	\$7,680
Plum St	2.2	2	4.4	Good	High Perf Fog	3	13.2	Internal	\$1,600	\$7,040
Kiwi St	2.5	2	5.0	Fair	UTBWC	10	50.0	Contract	\$32,000	\$160,000
Orange St	3.4	2	6.8	Fair	Double Chip & Fog	8	54.4	Contract	\$23,000	\$156,400
Peach St	3.6	2	7.2	Fair	Chip Seal	5	36.0	Contract	\$13,000	\$93,600
Watermelon St	2.9	2	5.8	Fair	Chip Seal	7	40.6	Internal	\$7,000	\$40,600
Cantelope St	7.5	2	15.0	Critical	Scrub & ACHM	15	225.0	Contract	\$57,500	\$862,500
Grape St	3.1	3	9.3	Critical	Scrub & Fog	5	46.5	Internal	\$9,000	\$83,700
Pear St	4.1	3	12.3	Critical	ACHM	12	147.6	Contract	\$50,000	\$615,000
Banana St	3.9	2	7.8	Poor	Reconstruction	15	117.0	Contract	\$125,000	\$975,000
Blackberry St	4.0	2	8.0	Poor	Reconstruction	15	120.0	Contract	\$125,000	\$1,000,000
	<b>39.6</b>		<b>86.4</b>							

LMY Extension Need: 1,600.00

Total LM Extension: 627.70

LMY Need Gain/Deficit: -972.30

\$4,001,520

# A PAVEMENT MANAGEMENT PROGRAM

## Remaining Service Life (RSL)

### EXAMPLE B

Road Name	Length (miles)	Lanes	Lane Miles	Condition	Treatment	Life Extension Years	Lane Mile Years Extension	Contract/Internal?	Cost/Lane Mile	Total Cost
Apple St	2.4	2	4.8	Good	Rejuvenating Fog	3	14.4	Internal	\$1,600	\$7,680
Bean St	18.4	3	55.2	Good	Rejuvenating Fog	3	165.6	Internal	\$1,600	\$88,320
Black St	2.3	2	4.6	Good	High Perf Fog	3	13.8	Internal	\$1,600	\$7,360
Blueberry St	8.9	2	17.8	Good	High Perf Fog	3	53.4	Internal	\$1,600	\$28,480
Brown St	5.0	2	10.0	Good	High Perf Fog	3	30.0	Internal	\$1,600	\$16,000
Carrot St	9.2	2	18.4	Good	Rejuvenating Fog	3	55.2	Internal	\$1,600	\$29,440
Pickle St	9.3	2	18.6	Good	High Perf Fog	3	55.8	Internal	\$1,600	\$29,760
Plum St	2.2	2	4.4	Good	High Perf Fog	3	13.2	Internal	\$1,600	\$7,040
Potato St	11.0	2	22.0	Good	High Perf Fog	3	66.0	Internal	\$1,600	\$35,200
Red St	1.9	2	3.8	Good	Rejuvenating Fog	3	11.4	Internal	\$1,600	\$6,080
Blue St	3.8	2	7.6	Fair	Chip Seal	5	38.0	Internal	\$7,000	\$53,200
Cyan St	3.3	2	6.6	Fair	Chip Seal	5	33.0	Internal	\$7,000	\$46,200
Green St	6.7	3	20.1	Fair	Chip Seal	7	140.7	Internal	\$7,000	\$140,700
Kiwi St	2.5	2	5.0	Fair	UTBWC	10	50.0	Contract	\$32,000	\$160,000
Orange St	3.4	2	6.8	Fair	Double Chip & Fog	8	54.4	Contract	\$23,000	\$156,400
Peach St	2.4	2	4.8	Fair	Microsurface	8	38.4	Contract	\$18,000	\$86,400
Purple St	12.5	2	25.0	Fair	Crack Seal & eFlex	7	175.0	Contract	\$27,500	\$687,500
Tomato St	14.4	3	43.2	Fair	Chip Seal & Fog	6	259.2	Internal	\$9,000	\$388,800
Watermelon St	2.9	2	5.8	Fair	Chip Seal	7	40.6	Internal	\$7,000	\$40,600
White St	7.6	3	22.8	Fair	Fog & Crack Seal	3	68.4	Internal	\$4,000	\$91,200
Yellow St	8.9	3	26.7	Fair	Chip Seal & Fog	6	160.2	Internal	\$9,000	\$240,300
Cantelope St	7.5	2	15.0	Critical	Scrub & Micro	7	105.0	Contract	\$57,500	\$862,500
Grape St	3.1	3	9.3	Critical	Scrub & Fog	5	46.5	Internal	\$9,000	\$83,700
Pear St	4.1	3	12.3	Critical	Scrub & ACHM	12	147.6	Contract	\$57,500	\$707,250
	<b>153.7</b>		<b>370.6</b>							

LMY Extension Need: 1,600.00

\$4,000,110

Total LM Extension: 1,835.80

LMY Need Gain/Deficit: 235.80



# A PAVEMENT MANAGEMENT PROGRAM SUMMARY

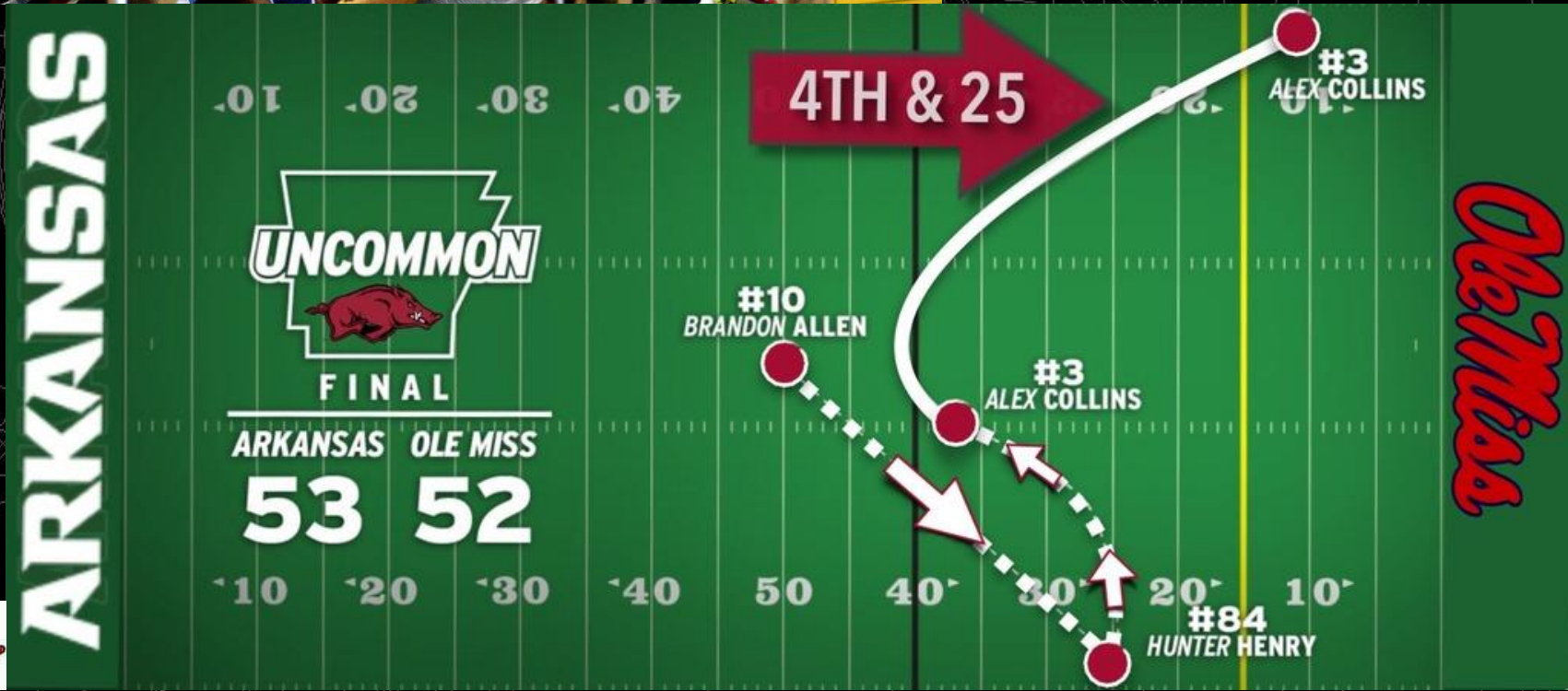
1. Collect condition data
2. Keep a database to sort data
3. Use project prioritization tools
  - Equivalent Annual Cost
  - Cost Benefit Value
  - Remaining Service Life
4. Update and improve



Know where you're going?



THANK YOU!



# Pavement Preservation Treatments

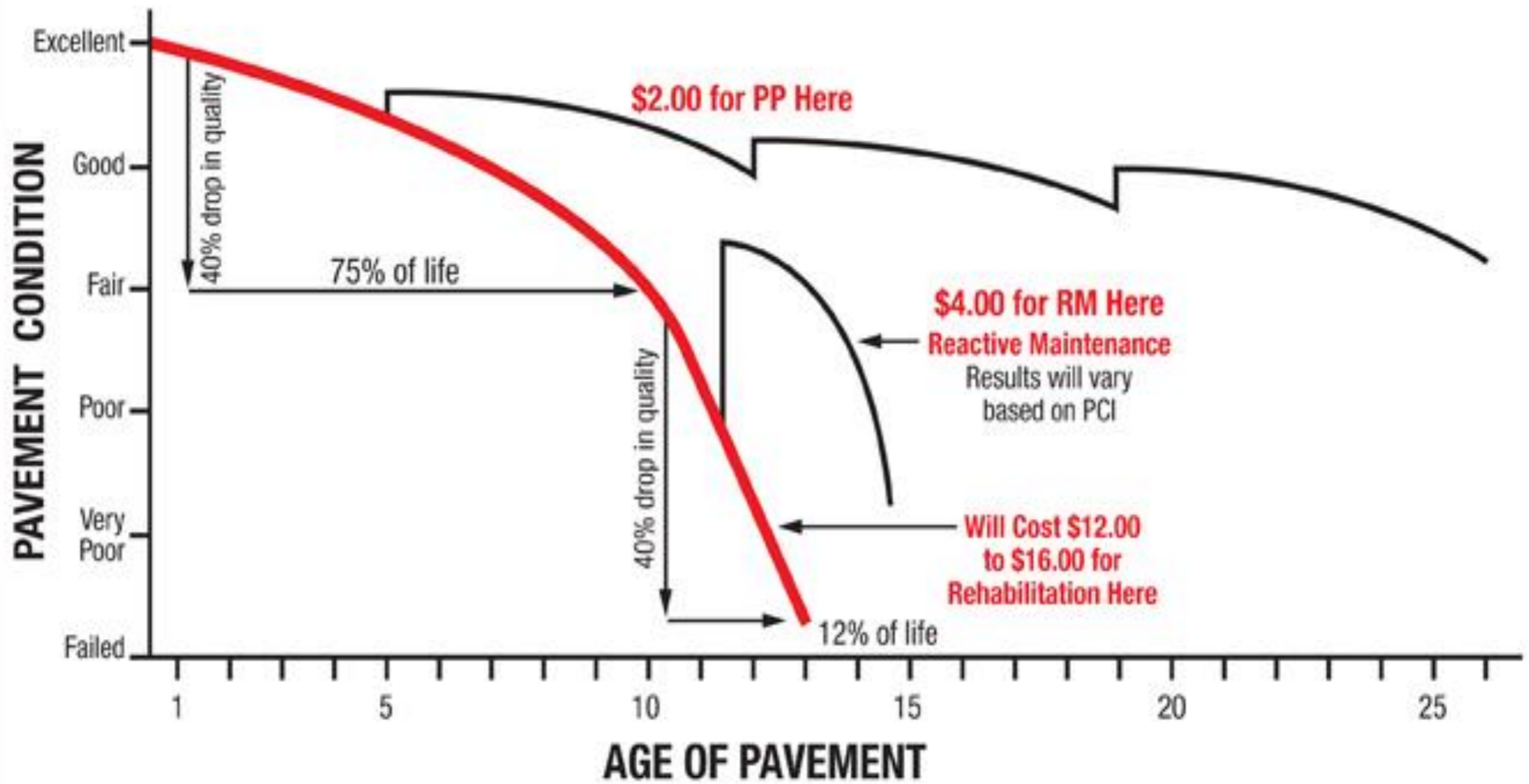
**March 23, 2016**

**Presented by:  
Larry Tomkins, P.E.**



# PAVEMENT PRESERVATION TREATMENTS

# PAVEMENT CONDITION INDEX



PP = Pavement Preservation RM = Reactive Maintenance

# SOME PREVENTIVE MAINTENANCE TREATMENTS

Crack Treatments  
Construction Joint Seals  
Fog Seals  
Chip Seals  
Scrub Seals  
Slurry Seals and Micro-surfacing  
Thin Lift Overlays  
Cape Seals  
Combination Treatments



**Preservation Candidate?**



**Preservation Candidate?**



# Crack Treatments

Eliminates moisture intrusion  
into base

Maintains flexible seal of crack  
if surface fractures

Cost effective combination.  
Surface Treatments alone are  
thin, brittle overlays w/little  
crack penetration









# Fog Seals

Light application of diluted, slow-setting asphalt emulsion used without cover aggregate

## Purpose

Seal the pavement

Inhibit raveling

Enrich hardened/oxidized asphalt

Provide delineation with shoulder





# Rejuvenating Fog Seal

Polymer

Durable

Medium setting emulsion (CMS-1PF)

Same site criteria as conventional fog

Diluted 50/50

Application rate same as conventional

Life span 2-3 years, can re-apply

Great for shoulders and OGFCs



# Chip Seals

Uniform application of asphalt binder on a sound surface followed by placement of cover aggregate then seated with roller

## Purpose

Protect from water intrusion  
Seal cracks  
Polymer modified for quicker return to traffic & increased chip retention  
Can be placed in multiple layers using different sized aggregate





# Traditional Spray Application





# Double Chip Seal Benefits



# Keys for a Successful Project

Weather  
Aggregate  
Binder  
Equipment  
Sequence of Construction

# Scrub Seal

## Description

Application of sand or small-sized aggregate on a broomed layer of polymer-modified asphalt

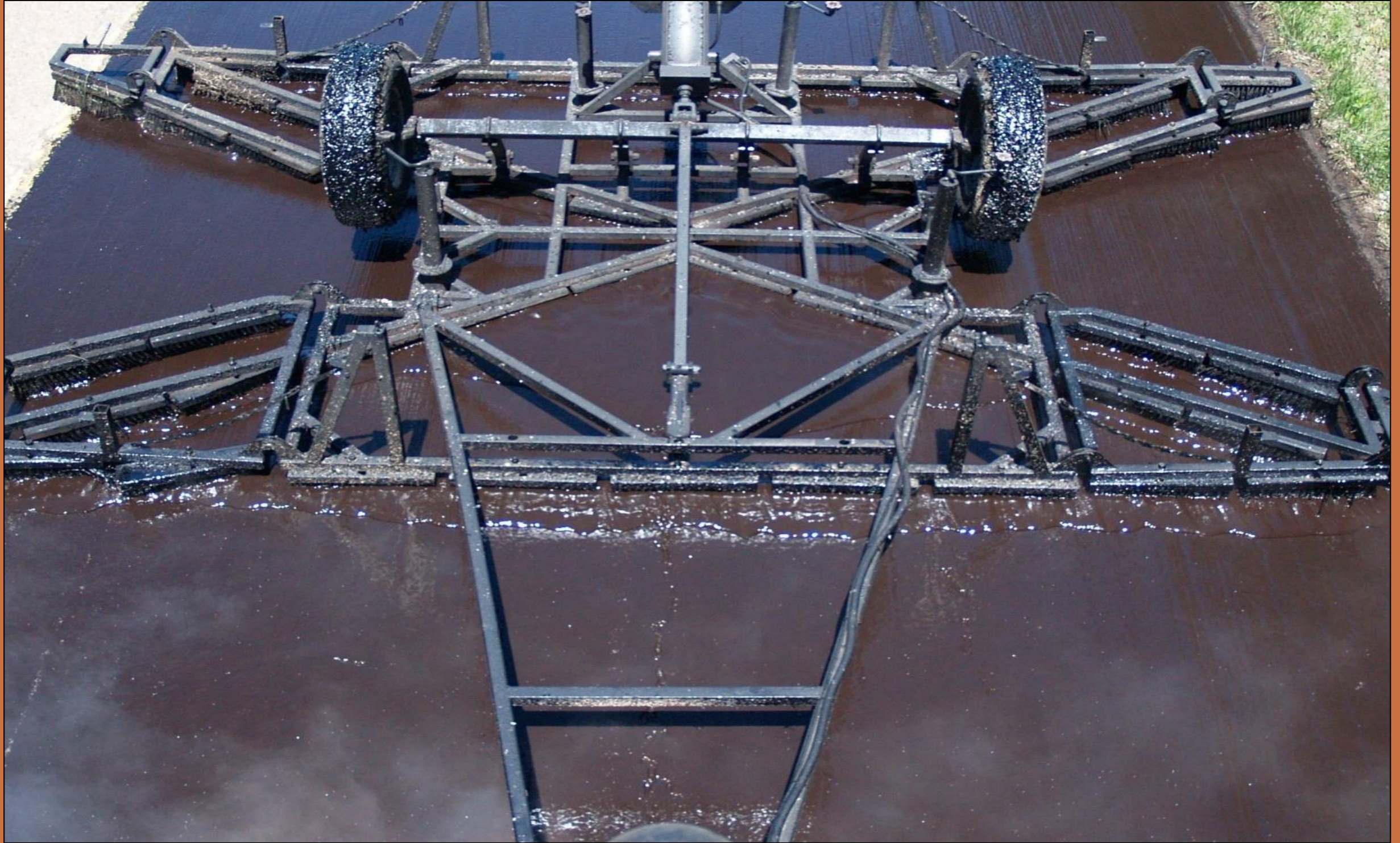


## Purpose

- Fill and seal small cracks and voids
- Enrich hardened/oxidized asphalt
- Preparation for another treatment



# Emulsion Wave



Original Pavement



After Emulsion is Sprayed





Before Scrub Broom



After Scrub Broom



# Mississippi Hwy 35 Scrub Seal

Stand alone wearing course

Scrub Seal BOP





**Mississippi Hwy 35**  
**Scrub Seal =**  
**Stand alone wearing course**

A photograph of a two-lane asphalt road with significant cracking and discoloration. The road is marked with double yellow lines in the center and a white curb on the left. In the background, there is a grassy area, a house with a porch, and trees. The lighting suggests it's either early morning or late afternoon.

**Mississippi Hwy 35**  
**8 years old**

# Slurry Seal Systems

- Blend of crushed aggregate, asphalt emulsion, water, & other additives
- Three (3) types of systems available depending on aggregate size.
- Mixed and spread in a mobile operation as thin wearing surface
- Mix design is required



# Benefits of Slurry Systems

- Extending Pavement Service Life
- Decreasing Pavement Permeability
- Improving Surface Friction
- Correcting Moderate Bleeding/flushing (in Chip Seals)
- Leveling and Rut Filling

# Key Differences

## Slurry Seals

- ▶ Anionic or cationic
- ▶ Slow set (evaporative) or quick set
- ▶ Conventional or modified
- ▶ Three Gradations of aggregate (I, II, III)
- ▶ No night work
- ▶ One stone thickness

## Micro Surfacing

- ▶ Always Cationic
- ▶ Always Quick set
- ▶ Always Polymer modified
- ▶ Requires more robust application equipment
- ▶ Two Gradations of aggregate (II & III)
- ▶ Faster Return to Traffic
- ▶ Night Work
- ▶ Stone stacking ability
- ▶ Can repair larger deviations

# Micro-surfacing







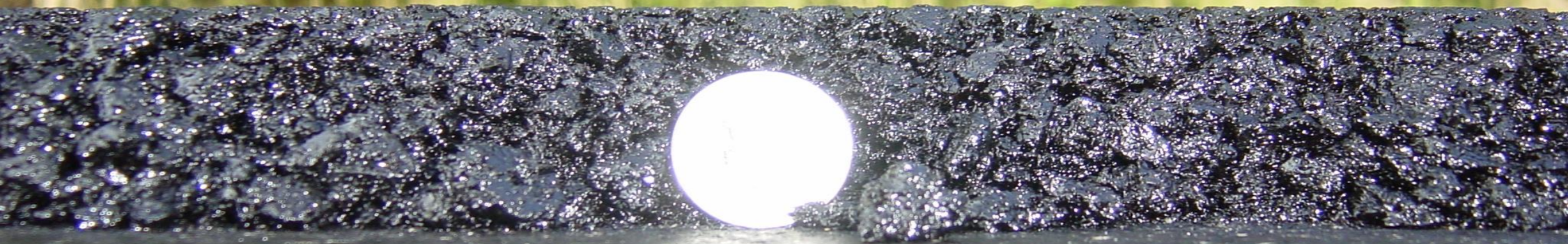




# Thin HMA Overlays

- Non-structural overlays
  - Thin Bonded Wearing Course
  - 4.75 mm HMA
  - 1 " or less
  - Mixture for low volume roads
  
- Place on prepared surface
  - Micro Milled
  - Crack sealed
  - Rut Filled w/Microsurfacing
  - Option for local contractor/supplier





MAY 20 2004



Before

SR 370 Lee/Prentiss  
 $\frac{3}{4}$  Inch



3 Month



15 Month



Before

# SR 371 Prentiss 1 Inch



3 Month



15 Month

# Combination Treatments

- ▶ Chip/Scrub Seal with fog seal application
- ▶ Stress Absorbing Membrane Interlayer (SAMI)
- ▶ Cape Seal- A surface treatment application consisting of a chip seal or scrub seal followed by a final surface treatment of a Slurry/Micro or Thin Lift
- ▶ Minimum of 24 hours (3 days preferably) cure time before placing 2<sup>nd</sup> phase of the combination treatment.





# Chip Seal with Fog Seal

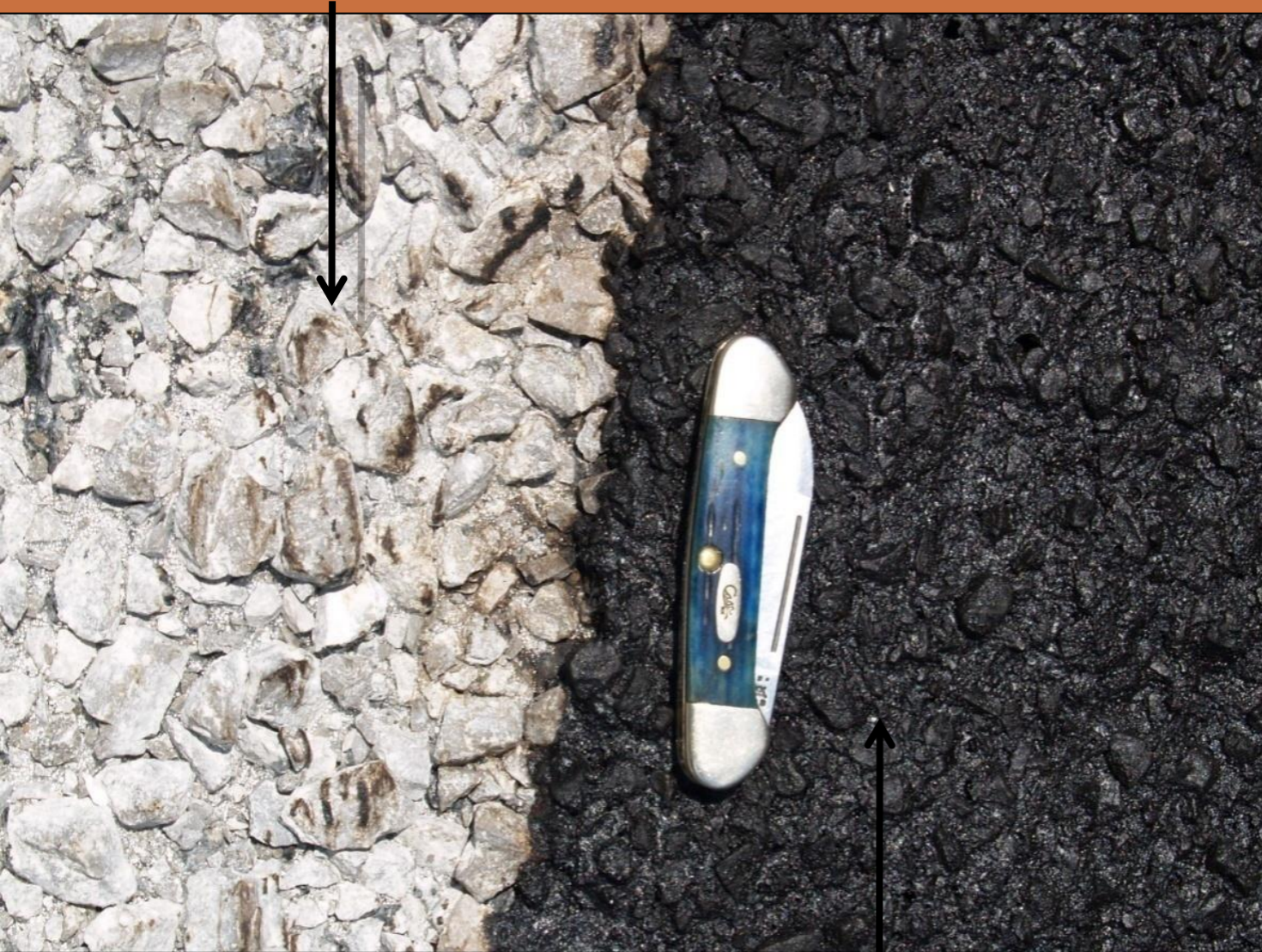


# SAMI on Hwy 98 (Hattiesburg, MS)

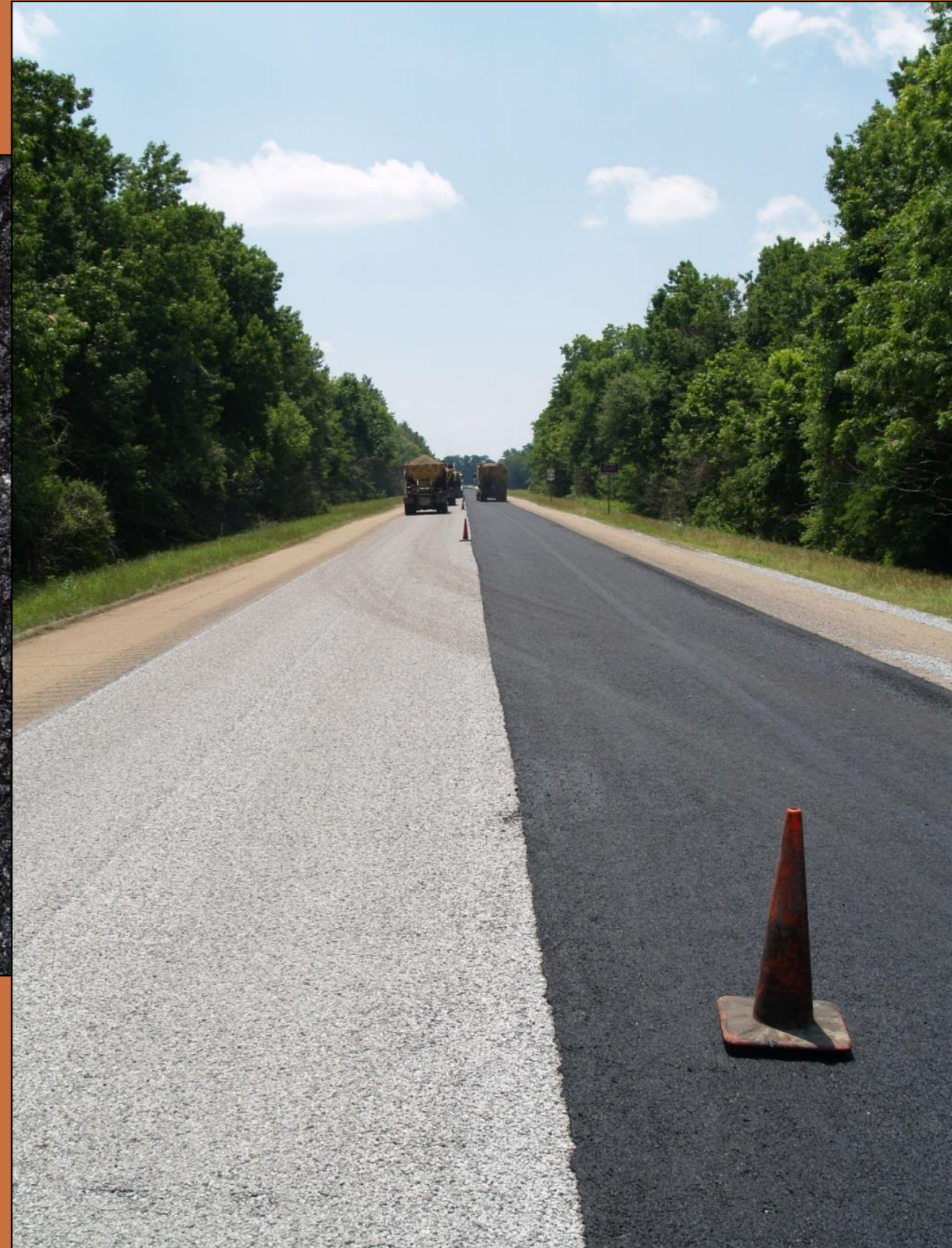


# Cape Seal

**Chip Seal**



**Microsurfacing**



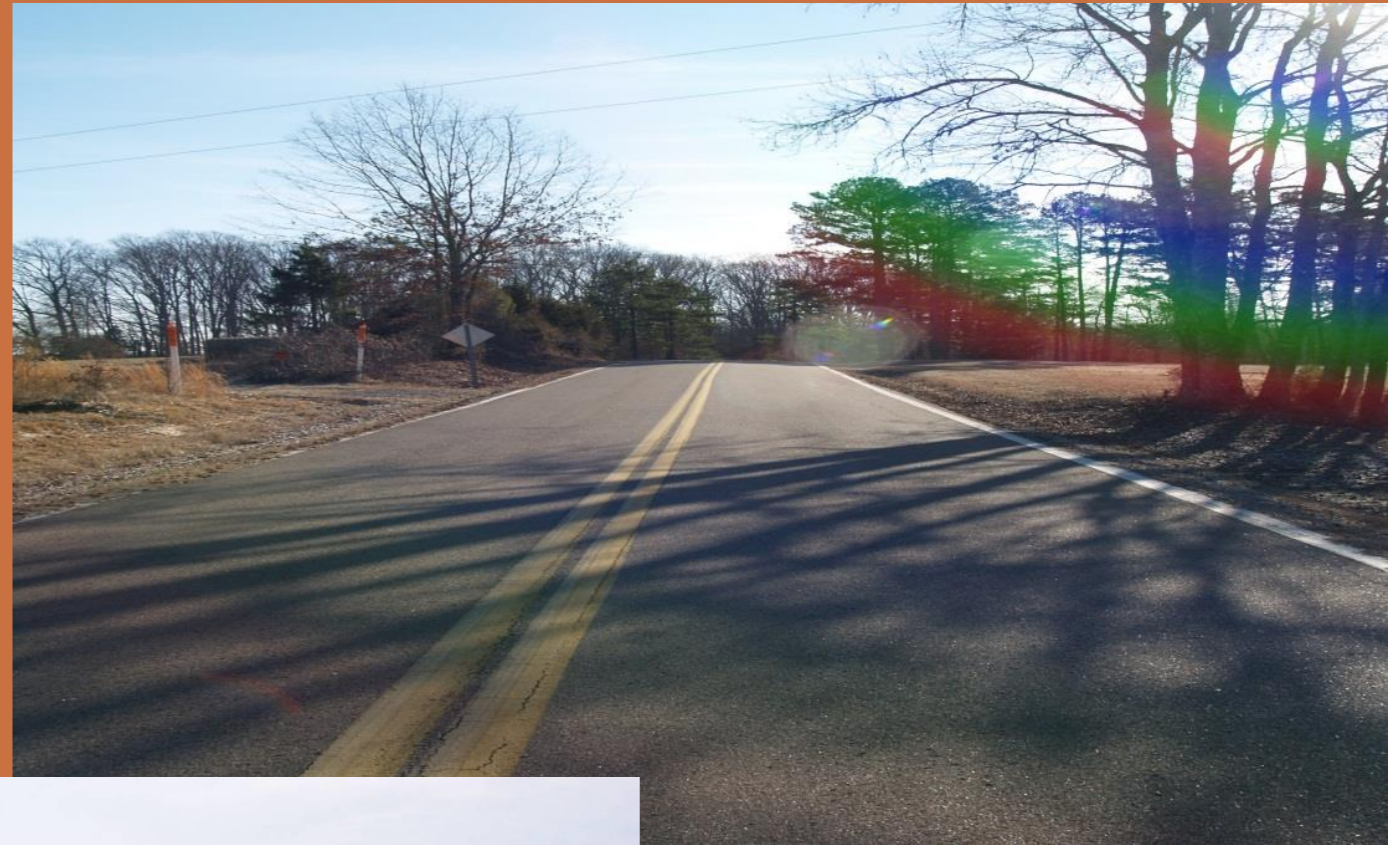
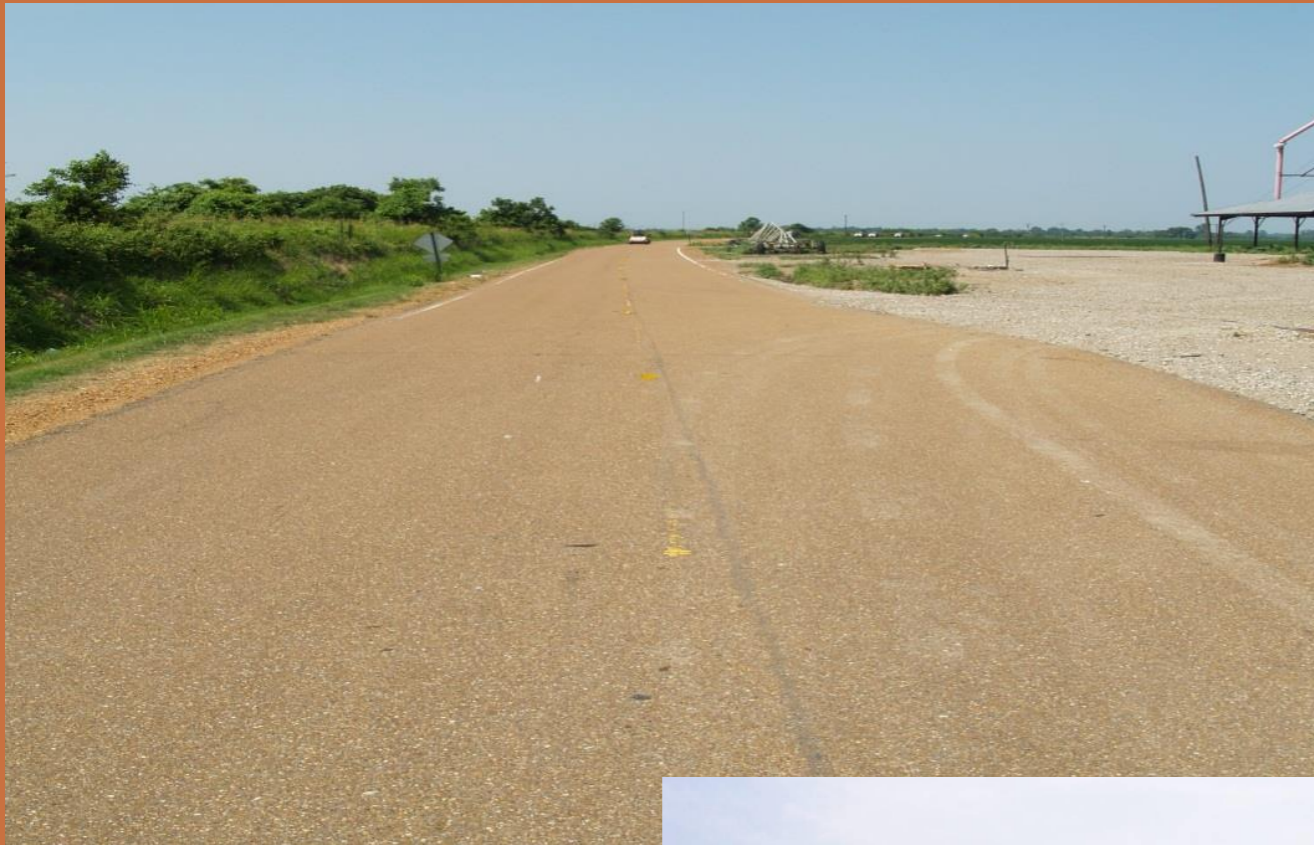


# Pavement Preservation

# Not Good Candidates for Preservation



# Good Candidates for Preservation

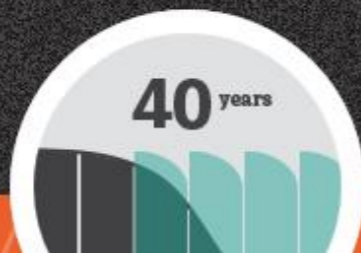


# The industry resource for pavement preservation

Welcome to the premier educational site for agency and consulting engineers, roadway planners and contractors looking to expand their knowledge of pavement preservation. Here you'll find facts and statistics about pavement treatments as well as product recommendations to best solve road challenges and preemptively protect the overall health of your roadway network.

## Learn how to:

Get 40 years of life from your roads



Plan roadway budgets



Balance needs and resources



**Any Questions?**