

# NCAT Preservation Findings

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# What is the PG Study?

- ▶ Pavement Preservation Group (PG) Study is a long-term pooled fund research effort
  - Currently in Phase II
  - TPF-5(375)
  - Led by MnDOT
- ▶ Objective is to quantify the life-extending benefits of various treatments

# PG Study Timeline

2023 End of Phase II 

2019 **70th Street**  
North cold recycled treatments placed on 70th Street in Albertville/Otsego, MN



2015 **NCAT-MnROAD**  
NCAT-MnROAD partnership is established.  
Test sections placed on high-volume road (US-280) near Opelika, AL



2016 **Northern Sections**  
North Treatments placed on CSAH 8 and US 169 in Pease, MN



2012 **Lee Road 159**  
First test sections placed on low-volume county road in Auburn, AL



# Current Status



145 Test  
Sections



~13 lane  
miles



~90 lane mile-  
years worth of  
data

# Test Sections

## **CRACK SEALING**

### **CHIP SEALS**

- Single layer
- Double layer
- Triple layer
- Single layers with crack sealing
- Fibermat
- Scrub seals\*

## **MICRO SURFACES**

- Single layer
- Double layer
- Single layers with crack sealing
- Fibers
- HiMA

## **FOG SEALS**

- Conventional
- Rejuvenating

# Test Sections

## **THIN OVERLAYS**

- Virgin materials
- RAP/RAS
- Polymer modified binder
- HiMA
- UTBWC
- OGFC

## **COLD RECYCLING**

- Cold In-Place
- Cold Central Plant
- Full Depth Reclamation

## **COMBINATIONS**

# Data Collection

- ▶ Crack mapping
- ▶ Roughness (IRI)
- ▶ Rutting
- ▶ Macrotexture
- ▶ FWD
- ▶ Surface friction
- ▶ Permeability
- ▶ Moisture\*

3 Performance indicators help us see the “big picture”

MAP-21 criteria

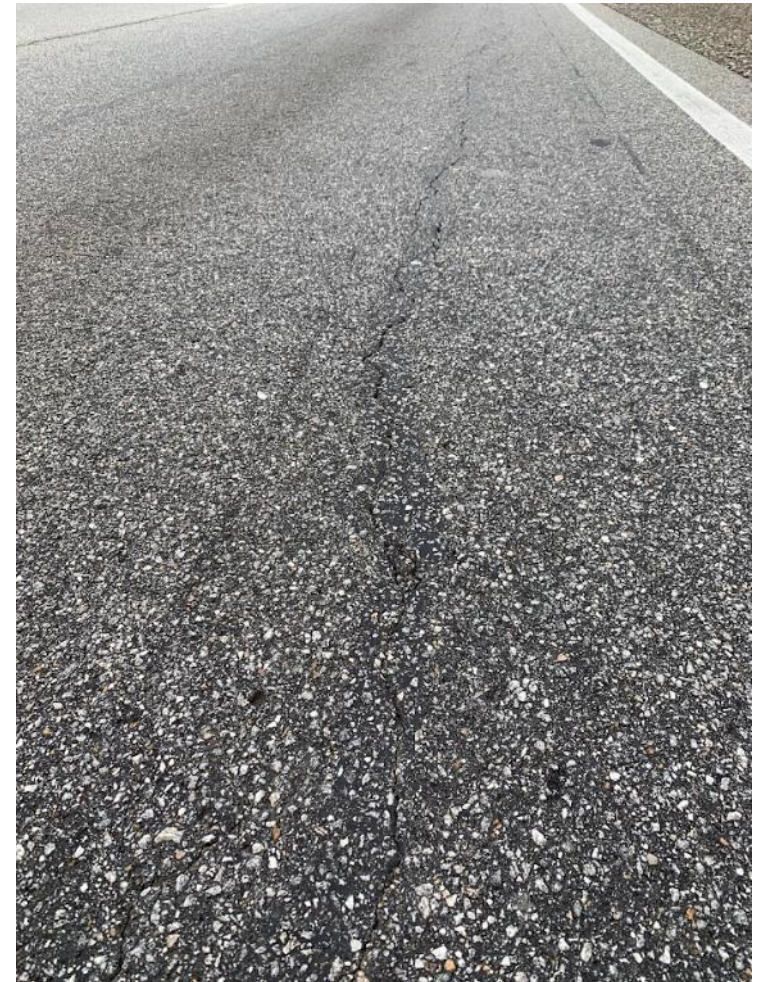
Category	% Cracking	Rutting, mm	IRI, in/mi
Good	< 5	< 5	< 95
Fair	5 – 20	5 – 10	95 – 170
Poor	> 20	> 10	> 170

# Findings



# Crack Sealing

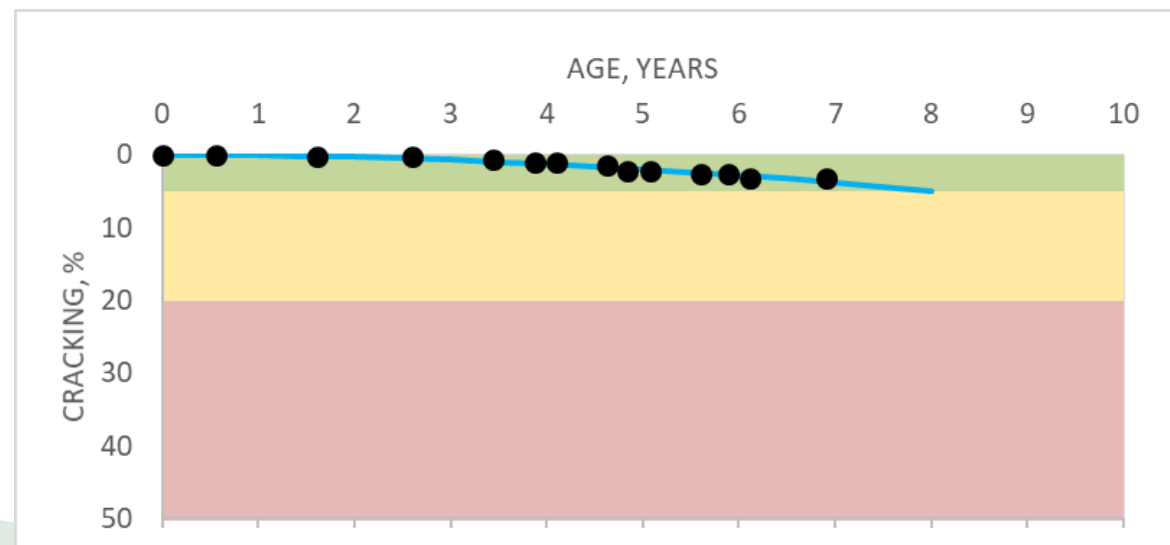
- ▶ Effective as stand-alone or in combination with chip seal, micro surfacing
  - Route & seal better as stand-alone
  - Overband seal better in combination
- ▶ Slow down crack deterioration
- ▶ No sealant failures
- ▶ Some sealed cracks have re-cracked



# Crack Sealing

## ► Time to 20% Cracking

Treatment	Low Traffic	High Traffic
Stand-alone crack sealing	3	8+
Chip seal + crack seal	8	8+
Micro surface + crack seal	5	5



# Adding the benefits



UNTREATED

CRACK SEAL

CRACK SEAL + CHIP SEAL



# Fog Seals

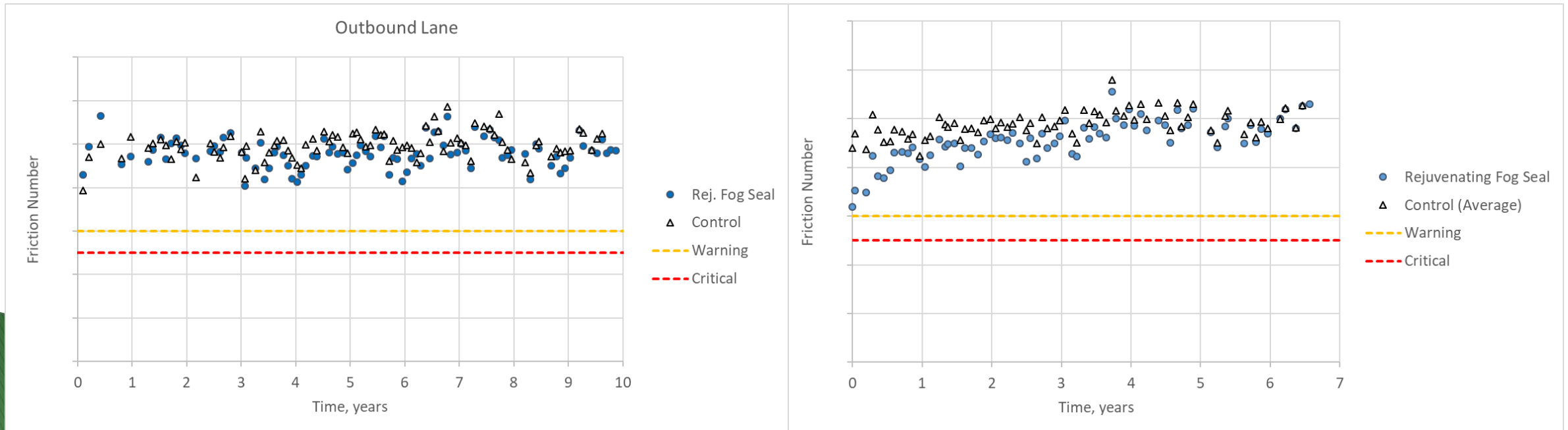
- ▶ Can delay deterioration (cracking), especially for pavements in good condition
  - Application timeline
  - Re-application
- ▶ May experience friction reduction, restored within months



# Fog Seals

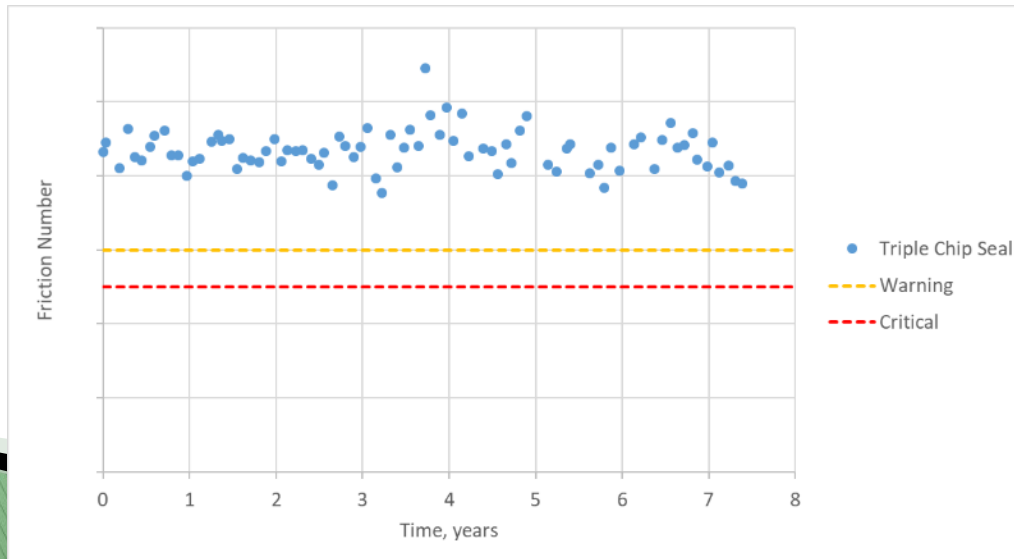
## ► Time to 20% Cracking

Treatment	Low Traffic	High Traffic
Fog seal	N/A	8+
Rejuvenating fog seal	5	8+



# Chip Seals

- ▶ Can delay deterioration, especially for pavements in good condition
  - Cracking
  - Roughness progression
- ▶ Multiple layers may exhibit flushing
  - Friction measurements still safe



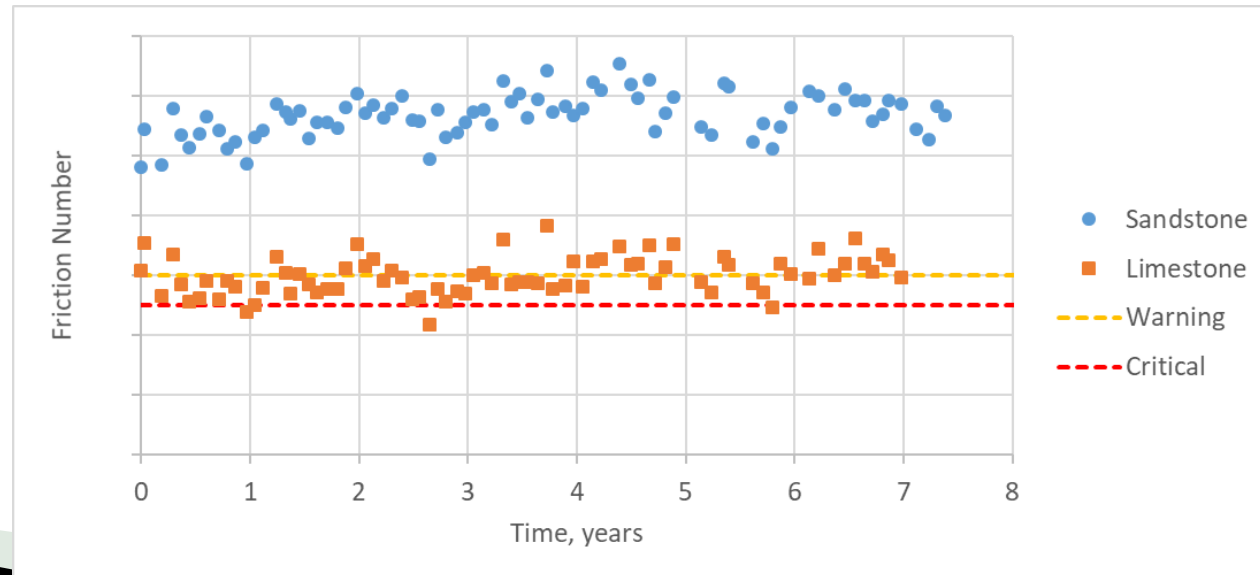
# Chip Seals

## ▶ Time to 20% Cracking

Treatment	Low Traffic	High Traffic
Single chip seal	8	8
Single chip seal + cs	8	8+
Double chip seal	11+	8+
Triple chip seal	11+	8+
Fibermat chip seal	10	8+
Scrub seal	11+	NA

# Micro Surfacing

- ▶ Improved IRI and rutting performance
- ▶ Some sections >20% cracking but still functional
- ▶ Friction performance above warning threshold
  - Caution – limestone aggregate
- ▶ Can withstand significant traffic when project is selected appropriately

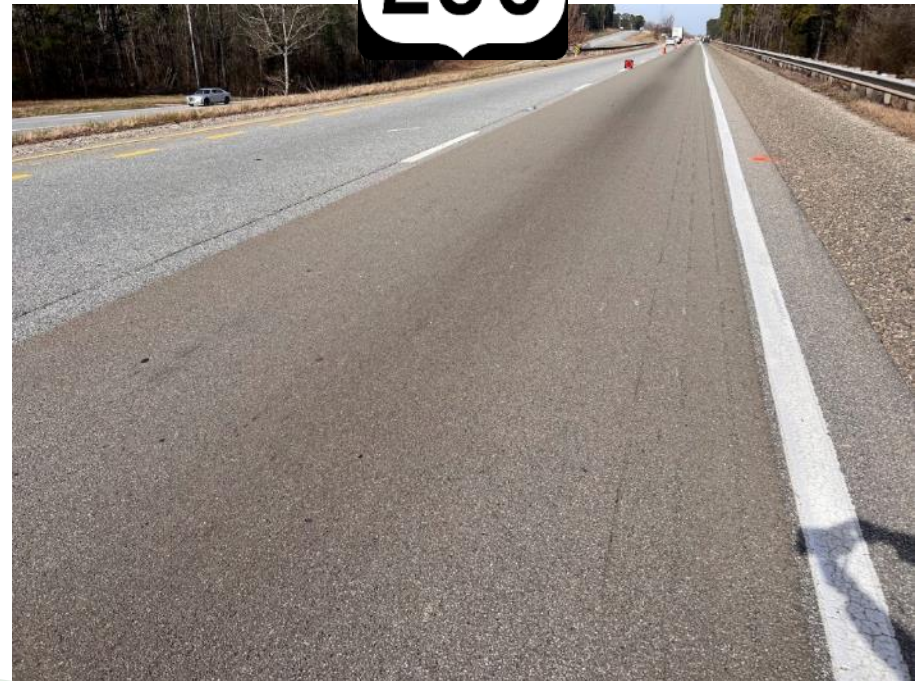
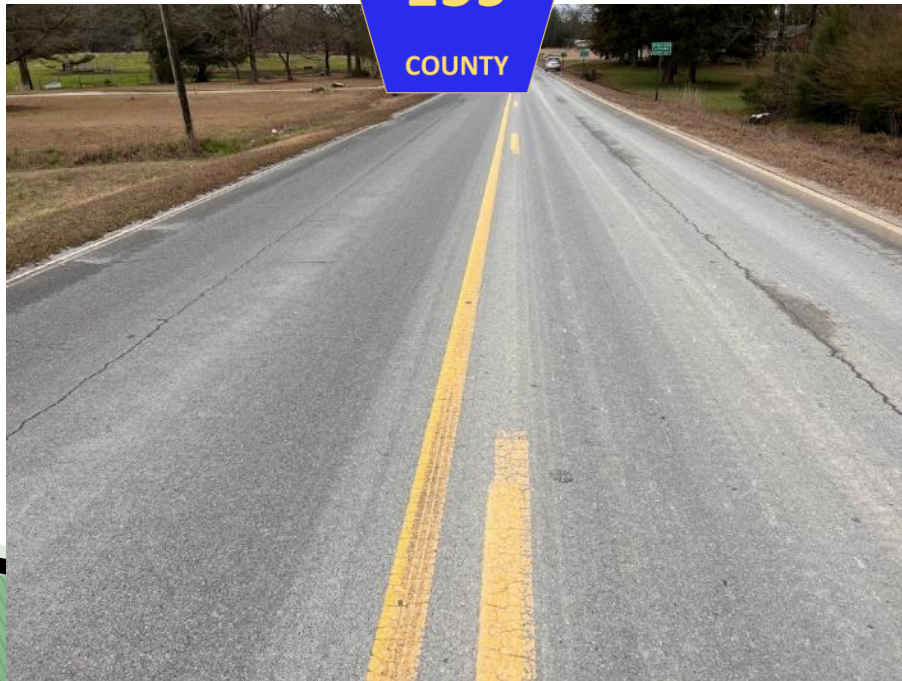




SINGLE



DOUBLE



# Micro Surfacing

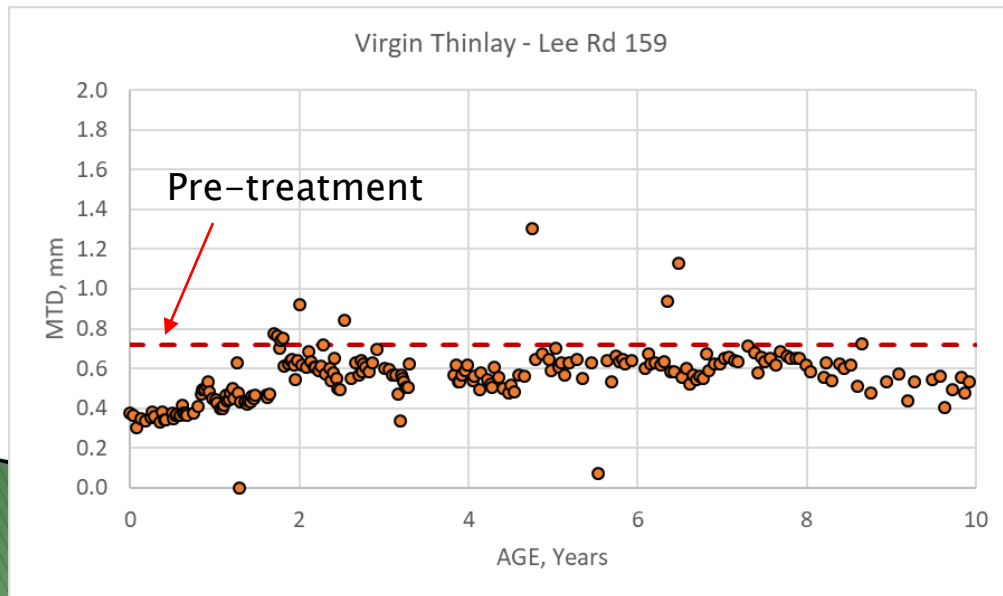
## ▶ Time to 20% Cracking

Treatment	Low Traffic	High Traffic
Single micro surface	5	5
Single micro surface + cs	5	5
Double micro surface	11+	8+
Micro surface w/ fibers	NA	6
HiMA micro surface	NA	8+

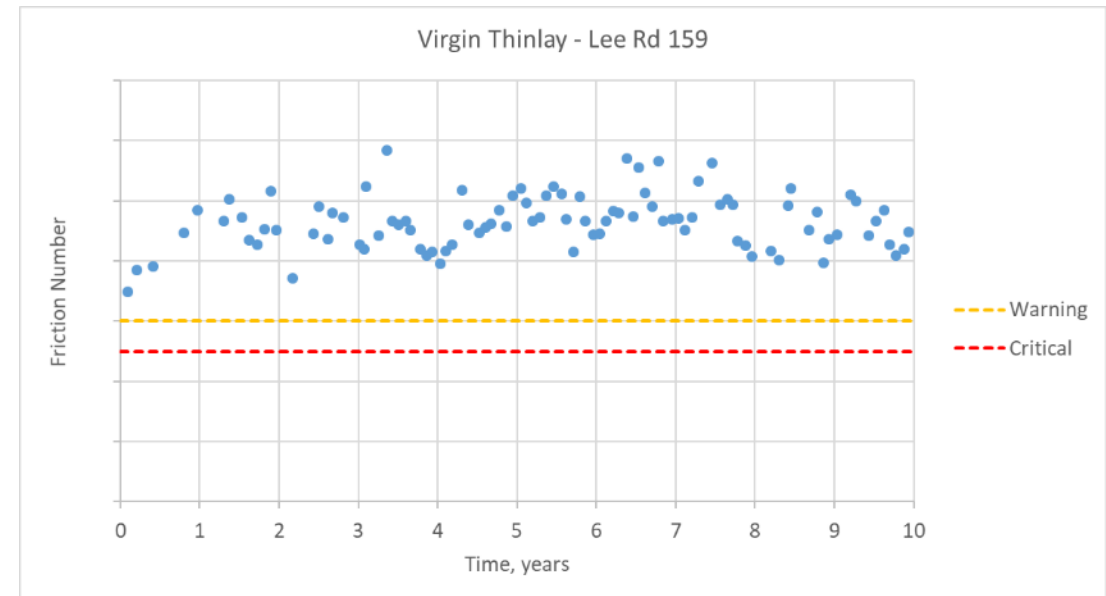
# Thinlays

- ▶ Improved IRI and rutting performance
- ▶ Some sections  $>20\%$  cracking but still functional
  - BMD allowed using recycled materials with better performance
- ▶ Friction performance above warning threshold

## MACROTEXTURE



## FRICITION



VIRGIN



HIGH  
RAP/RAS



ABR



# Thinlays

## ▶ Time to 20% Cracking

Treatment	Low Traffic	High Traffic
Virgin Thinlay	11+	8+
ABR Thinlay	NA	8
ABR Thinlay with Delta S	NA	NA
50% RAP Thinlay	7	NA
5% RAS Thinlay	7	NA
HiMA Thinlay	11+	NA

# UTBWC & OGFC Thinlays

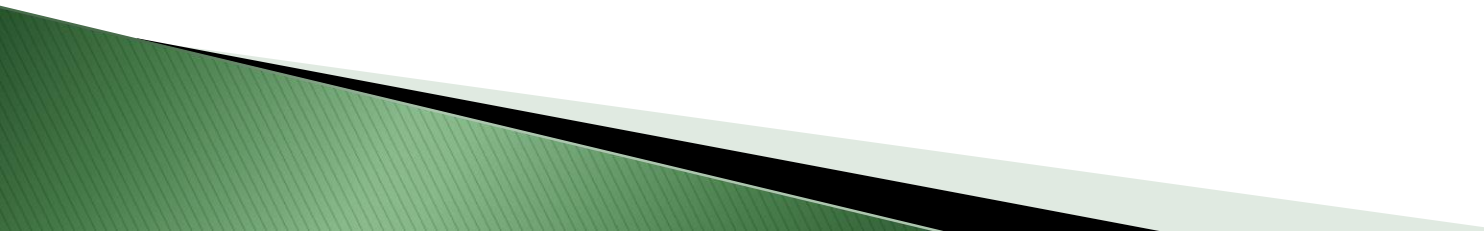
## UTBWC

- ▶ Can be durable, effective treatments
- ▶ As with all treatments, site conditions will affect performance
- ▶ “Good” rutting, IRI performance
- ▶ No raveling
- ▶ Friction above “warning” threshold

## OGFC

- ▶ Sections with similar performance
- ▶ Bond strength above minimum for all sections
- ▶ Functionality has decreased for all
  - Loss of permeability, increased noise
  - Good friction performance

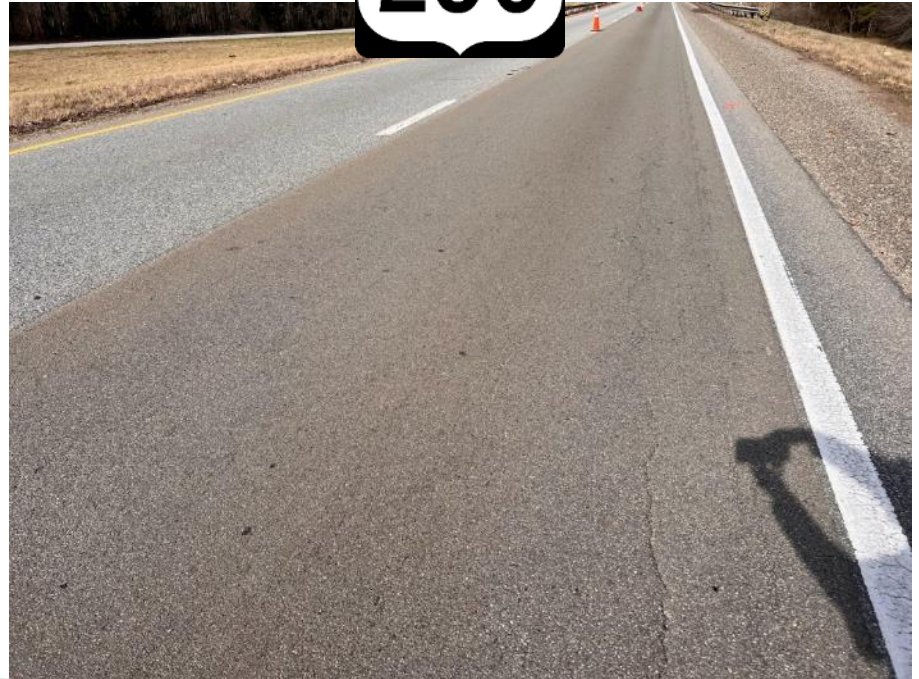
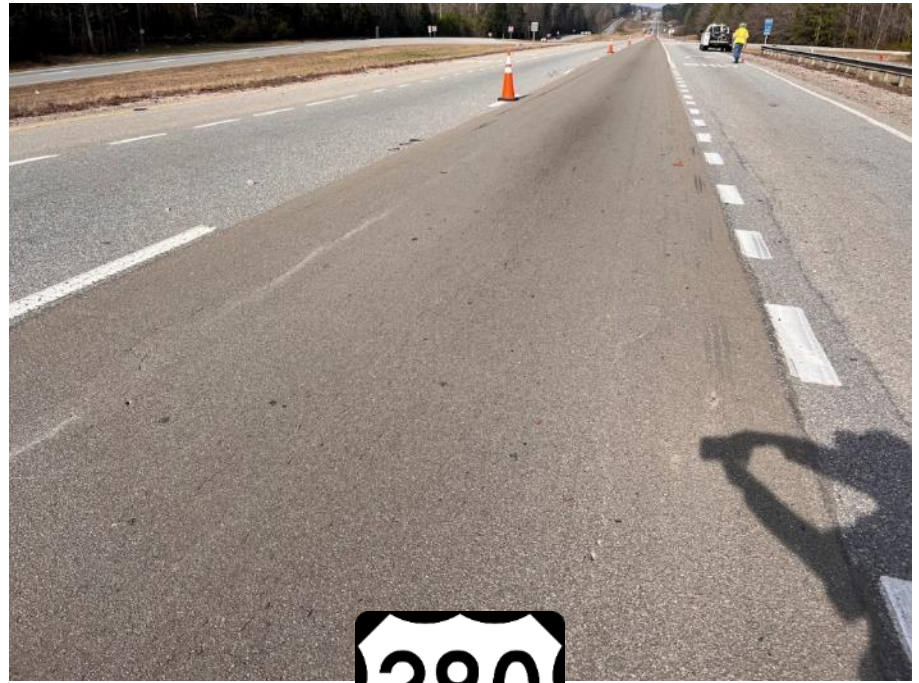
# Combinations

- ▶ Low traffic sections benefited the most
  - ▶ High traffic still functional, but may require attention soon
  - ▶ Micro surfacing helps restore friction
- 

SCRUB  
CAPE SEAL



FIBERMAT  
CHIP SEAL  
+  
THINLAY





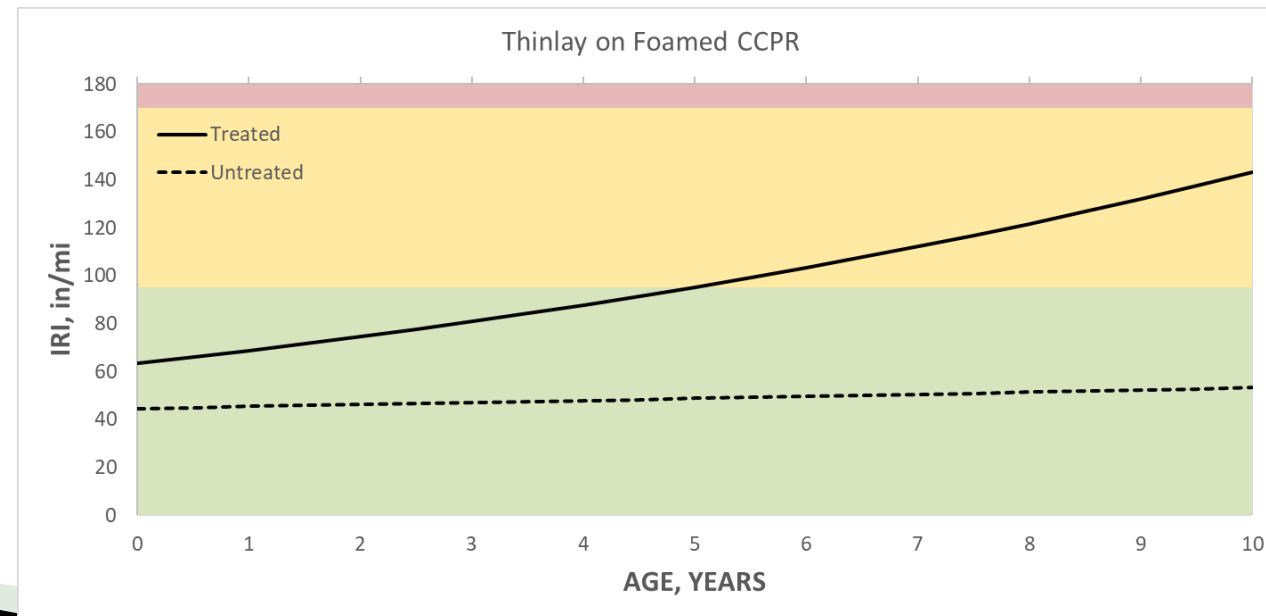
# Combinations

## ▶ Time to 20% Cracking

Treatment	Low Traffic	High Traffic
Cape Seal	10+	7
Fibermat Cape Seal	10+	6
Scrub Cape Seal	10+	5
Thinlay on Chip Seal	NA	6
Thinlay on Fibermat Chip Seal	10+	6
Thinlay on Scrub Seal	NA	6
Micro on Thinlay	NA	7

# Cold Recycling

- ▶ Can withstand high/heavy traffic with only a thin overlay surface
- ▶ Structural coefficients in 0.25 – 0.35 range
- ▶ More susceptible to rutting, roughness

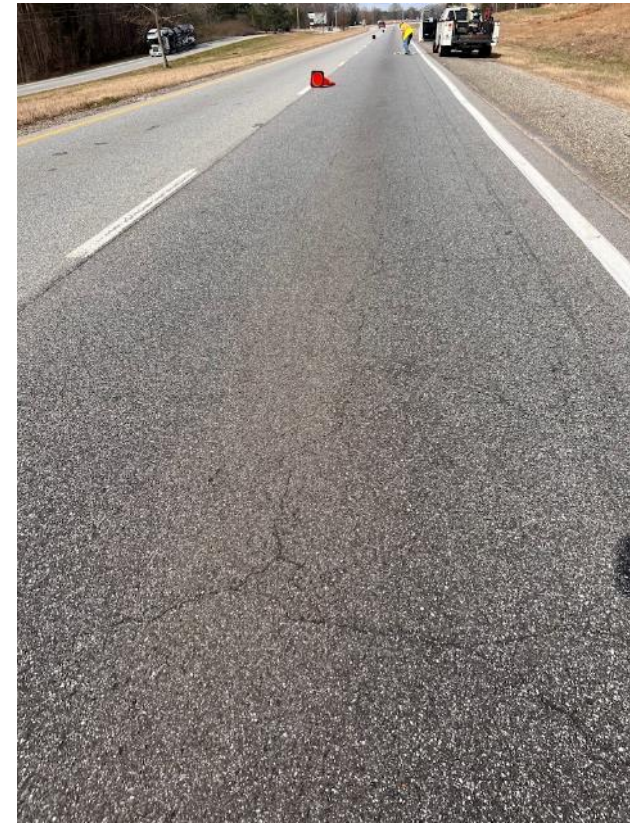


CCPR – FOAM

CCPR – EMULSION

CIR – FOAM

CIR – EMULSION



# Cold Recycling

## ▶ Time to 20% Cracking

Treatment	Low Traffic	High Traffic
CCPR – foam	10+	8+
CCPR – emulsion	NA	8+
CIR – foam	NA	8+
CIR – emulsion	NA	8+

# Observed Performance - Lee Road 159

The data shown below is preliminary and subject to change.

\*Use the Treatment, Condition, and Time menus to filter the results based on treatment type, existing pavement condition, and time period of interest.

$$\begin{aligned} \text{LEB} &= 7.7 - 4.5 \\ &= 3.2 \text{ years} \end{aligned}$$

## Treatment

- Single layer chip seal ✓
- Rejuvenating fog seal
- Crack sealing only
- Single layer chip seal with crack sealing
- Triple layer chip seal

## Condition

- Good ✓ 0.0
- Fair 0.5
- Poor 1.0
- 1.5
- 2.0

Help

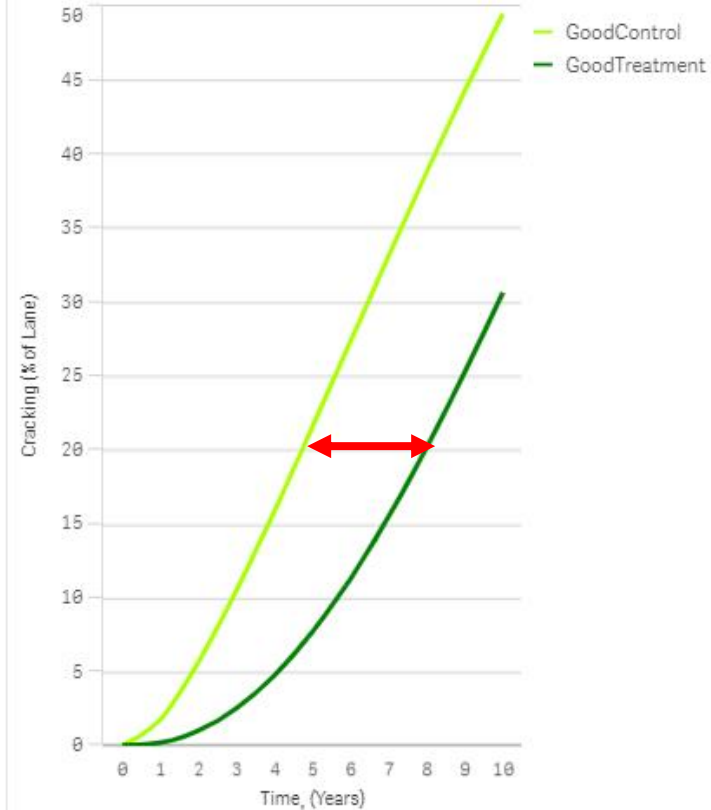
Treatments Location (Google Maps)

Single layer chip ... IRI (in/mile) for Treatm... Rutting (mm) for Treatm...



Treatment to Control Comparison

## Treatment to Control Comparison



[aub.ie/PG-tool](http://aub.ie/PG-tool)

Overall Section Condition

FAIR

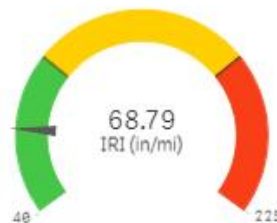
Cracking % of Area



Rutting (mm)



IRI (in/mile)



# Pavement Preservation Webinars

The NCAT-MnRoad PG Study Findings Webinar series is designed to discuss the construction, performance, and conclusions from our test sections, with a focus on implementation of findings. Below are the recordings of past webinars.

Crack Seal Webinar

NCAT & MnROAD presents

PG Study Findings Webinar Series

TOPIC: **CRACK SEAL**

for more information visit our websites  
www.ncat.us  
www.dot.state.mn.us/mnroad

Watch on YouTube

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[aub.ie/PG-webinars](http://aub.ie/PG-webinars)

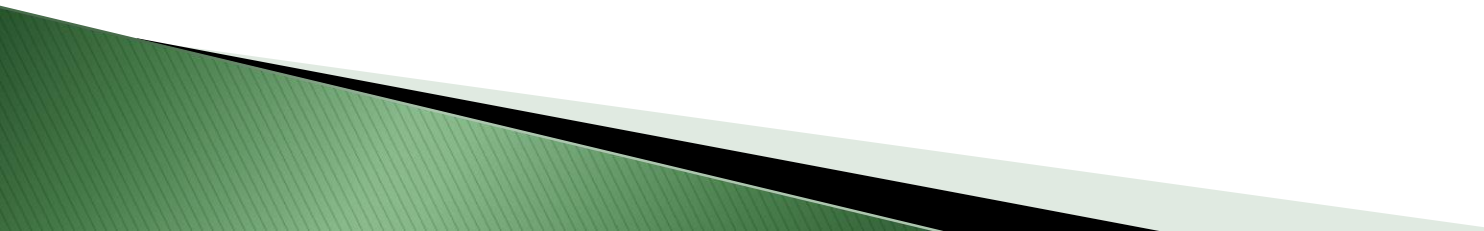
Fog Seal Webinar

NCAT & MnROAD presents

PG Study Findings Webinar Series

TOPIC: **FOG SEAL**

# Final Thoughts

- ▶ Treatments continue to be effective
  - ▶ If “poor” condition is the threshold, many sections still far from target
  - ▶ Benefit is evident and can be quantified using relevant parameter
  - ▶ Continued monitoring and analysis in Phase III
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# Thanks!

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