2017 MID ATLANTIC QA WORSHOP

Hershey Lodge and Convention Center

Asphalt Session

February 8, 2017

Committed to:

- Safe, Smooth, Sustainable, Long Lasting Pavements!

PA Asphalt Pavement Association
Gary L. Hoffman, P.E., Director of Technical Services

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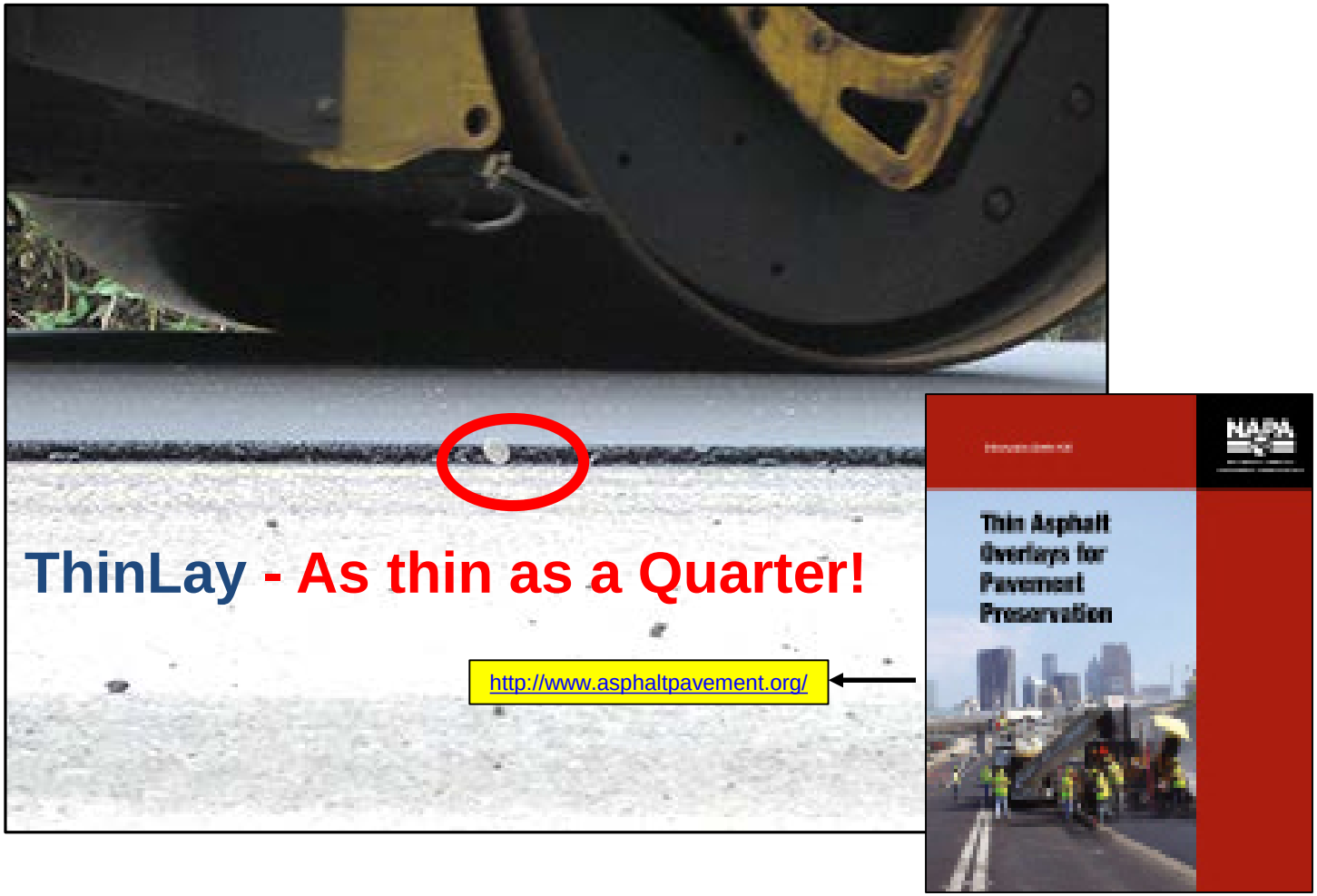
Agenda – ThinLay Presentation

1. **Intro to ThinLay - Thin Lift 6.3 mm WMA Wearing Course, PG 76-22** - ***Gary Hoffman***
2. **Research Findings & Recommendations –** ***Mansour Solaimanian***
3. **Specification Approval & Implementation –** ***Neal Fannin***
4. **HPTO - ThinLay New Jersey Perspective –** ***Tom Bennert***
5. **Questions and Answer Session -** ***All***

ThinLay


ThinLay - As thin as a Quarter!
http://www.asphaltpavement.org/
NAPA
Thin Asphalt Overlays for Pavement Preservation

“Do the Right Treatment At the Right Time”

Includes -

Cost Effective

Preservation Treatment

Use Guidelines

- Only on structurally sound pavement
- Alternate for micro-surfacing

Use Guidelines *(continued)*

- For correcting surface distresses only (raveling, loss of friction, top down cracking)
- Consider grinding PCC first

Thin Lift Task Force

PennDOT

- Districts
- BOMO
- LTS

Industry

- PAPA
- 3 Contractors

Other State Specifications

- Ohio “Smoothseal”
- NY 6.3mm mix
- NJ HPTO

Current ThinLay Special Provision

- 6.3 mm – 100% passing 3/8 in.
- Dense –graded (6 sieve sizes) - SRL
- PG 76-22 polymer modified asphalt
- N design = 75 gyrations
- Design voids = 4.0%
- Min. VMA = 16.5
- No RAP or RAS
- Place at greater than 50 F
- Optimum Rolling Pattern

Tack Coat

- CSS-1h tack coat
- 0.03 to 0.08 Gal/SY residue application rate depending on surface texture

EVALUATION

- 3 Demo Projects
- 4 years
- PSU Task Order
- Considerable Tests

Questions?? & Thank you!!

PAPA UPCOMING EVENTS: www.pa-ashalt.org

- **2017 PAPA Regional Meetings – West, Central, East**
  - **West - March 14 Doubletree – Mars, Central - March 15 Toftrees – State College & East - March 16 Holiday Inn - Morgantown**
- **2017 PennDOT PAPA Bus Tour & T^2 Session**
  - **August 1 & 2 - District 6-0**
- **2018 PAPA Annual Conference**
  - **January 15, 16 and 17 – Hotel Hershey**

Please Contact Tina Holtzman @ 717-657-1881 or tina@pa-asphalt.org for more Information!

Quality Performance Through Thin Asphalt Overlays

Mid-Atlantic Quality Assurance Workshop
50th Annual Meeting
February 8, 2017

Mansour Solaimanian
Penn State University

Outline

1. THMAO As A Pavement Preservation Strategy
2. Mix Design and Evaluation
3. Construction
4. Quality Control
5. Performance Evaluation

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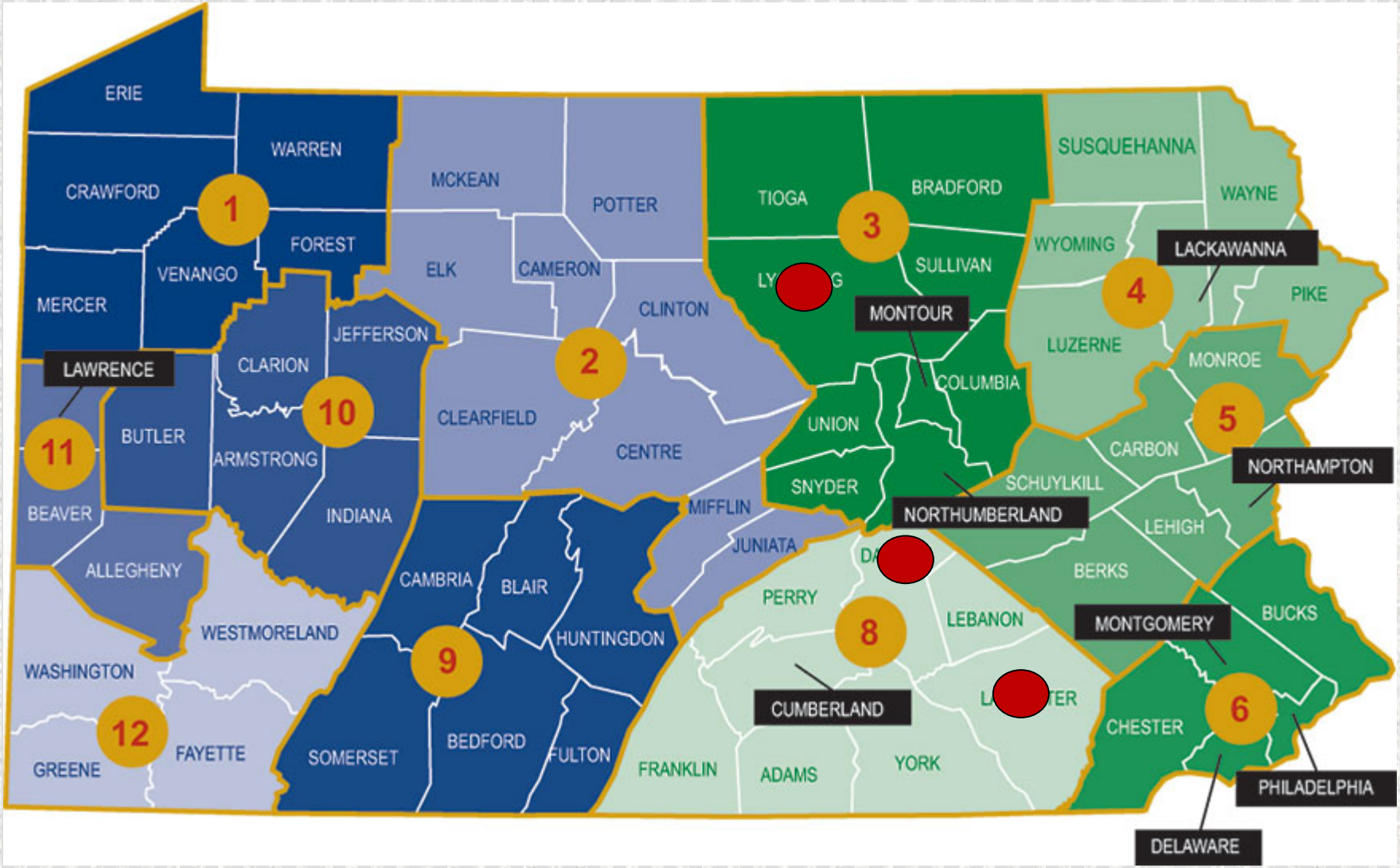
THIN OVERLAYS FOR PAVEMENT PRESERVATION

PennDOT Research Project on THMAO

- **Four Year Project: June 2012 – June 2016**
- **Initiated by PAPA/PennDOT**
- **Included Three Demonstration Projects**
- **Research Team:**
  - **Penn State (Prime Contractor)**
  - **Advanced Infrastructure Design**
  - **Quality Engineering Solutions, Inc.**
  - **Penetradar Corporation**

Pilot Projects



How Thick is Thin Asphalt?

- **Placed up to 1.25 inches in thickness**

- **Ultrathin layers: between 0.5” and 1.0”**

Mat Thickness/NMAS Ratio

NMAS: Nominal Max. Aggregate Size

Aggregate
NMAS

Mat Thickness
0.5 to 1.25 in

3 ≤ Ratio of Thickness to NMAS ≤ 5

Importance of NMAS in Thickness

Table shown with:

Mat Thickness:
from 1.5 inches to 0.50 inches,

and

NMAS:
from 12.5 mm to 4.75 mm

- Good
- Ok
- Avoid

Mat Thickness			
In	mm	NMAS	Ratio
1.50	38.1	12.5	3.0
		9.5	4.0
		6.3	6.0
1.25	31.8	9.5	3.3
		6.3	5.0
		4.75	6.7
1.00	25.4	9.5	2.7
		6.3	4.0
		4.75	5.3
0.75	19.1	6.3	3.0
		4.75	4.0
0.50	12.7	6.3	2.0
		4.75	2.7

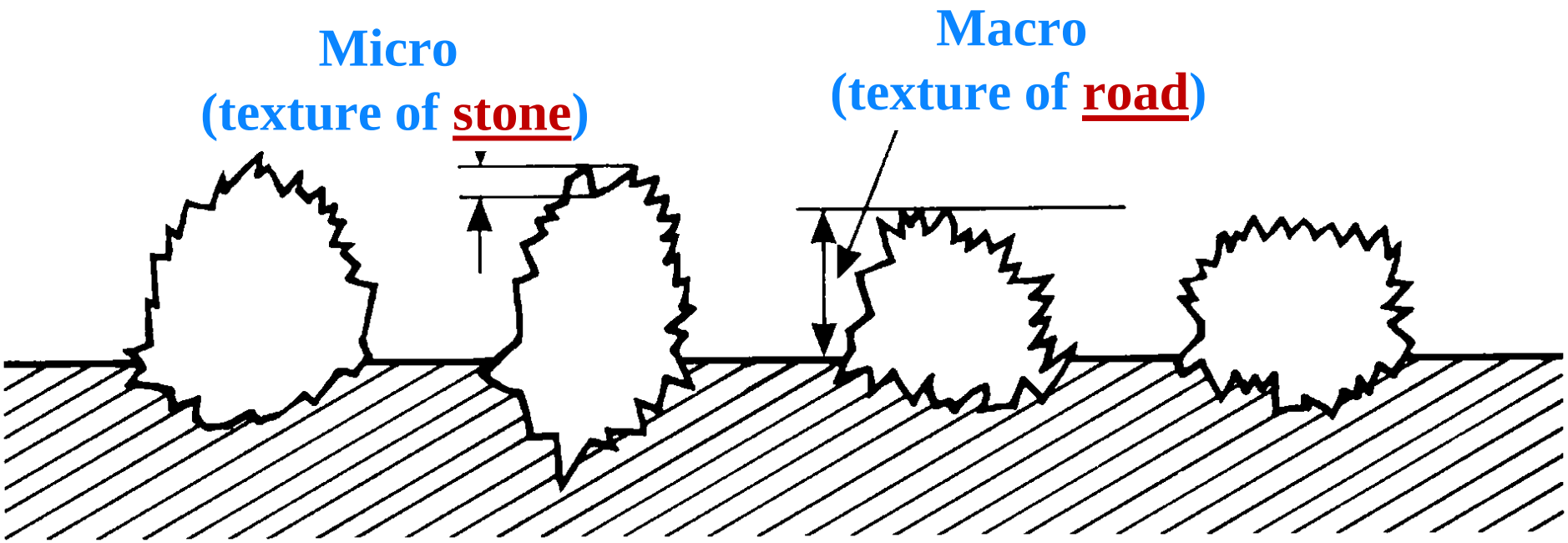
Significance of Aggregate Skid Resistance Level in Thin Asphalt

Two of the Most Important Properties Affecting Friction (Skid Resistance) Are:

1. Aggregate Microtexture

2. Pavement Macrotexture

Significance of SRL in Thin Asphalt



As thickness gets smaller, harder to develop macro and more demand on micro.

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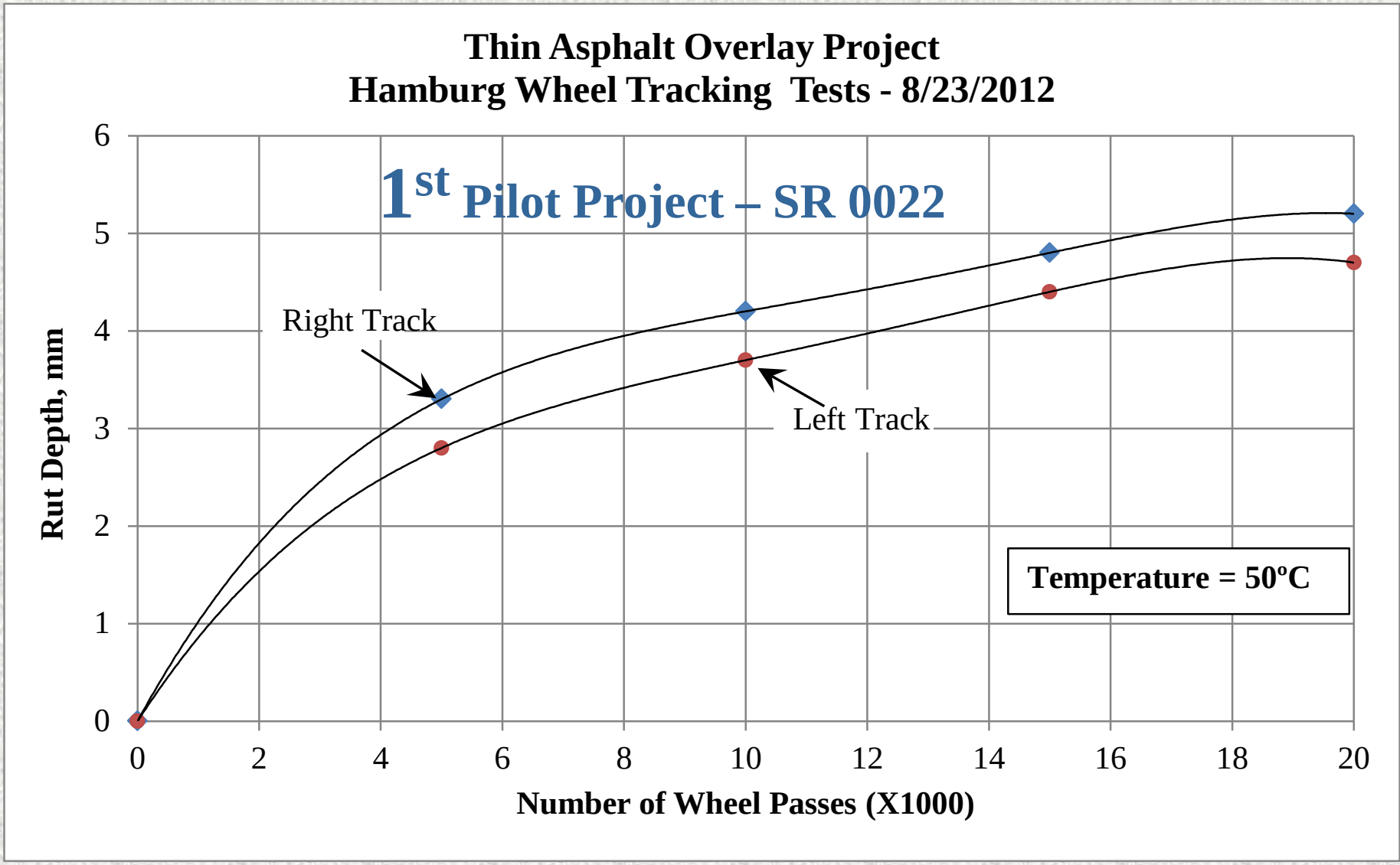
MIX DESIGN AND EVALUATION

6.3 mm NMAS Mix
Placed at 1 inch thickness

Aggregate: Skid Resistance Level (SRL): E
Polymer Modified Binder: PG 76-22 (for heavier traffic)
Gyration Level: 75
Design Air Void: 4%, Min. Design VMA: 16.5%
Design Binder Content: 6.7%; 7.0%; 6.9%
NO RAP/RAS

Performance Evaluation - HWTD



Performance Evaluation – Overlay Tester

Test Temperature: 25ºC
# of load cycles: 1000
Or until load reduced to 93% of original

- **Repeated loading (triangular form) under constant deformation**
- **Deformation magnitude per load cycle: 0.025 inches (0.6 mm)**
- **Duration of each load cycle: 10 seconds**

Cycles to failure > 500

Good Performance

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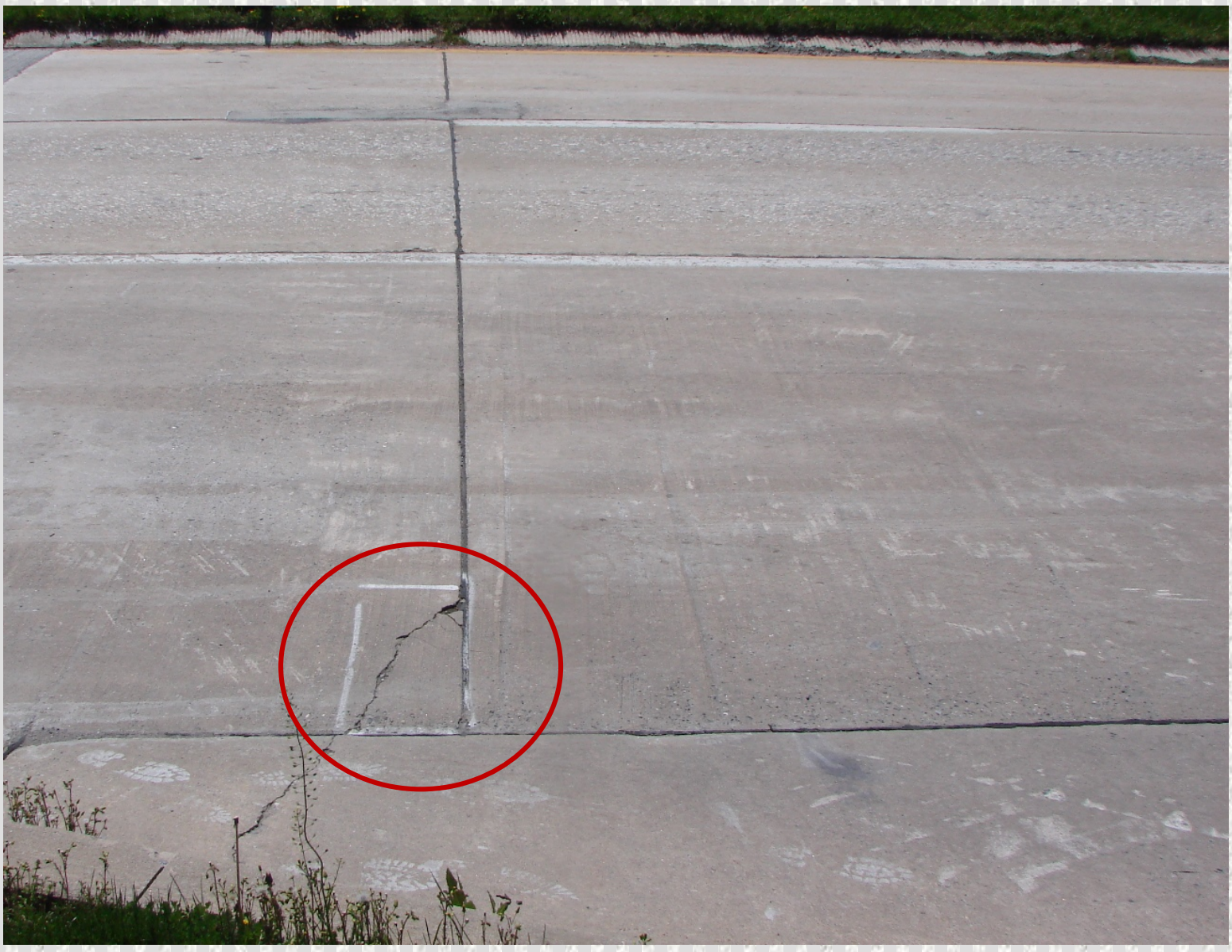
CONSTRUCTION OF THIN OVERLAYS

Repair/Prepare the Base



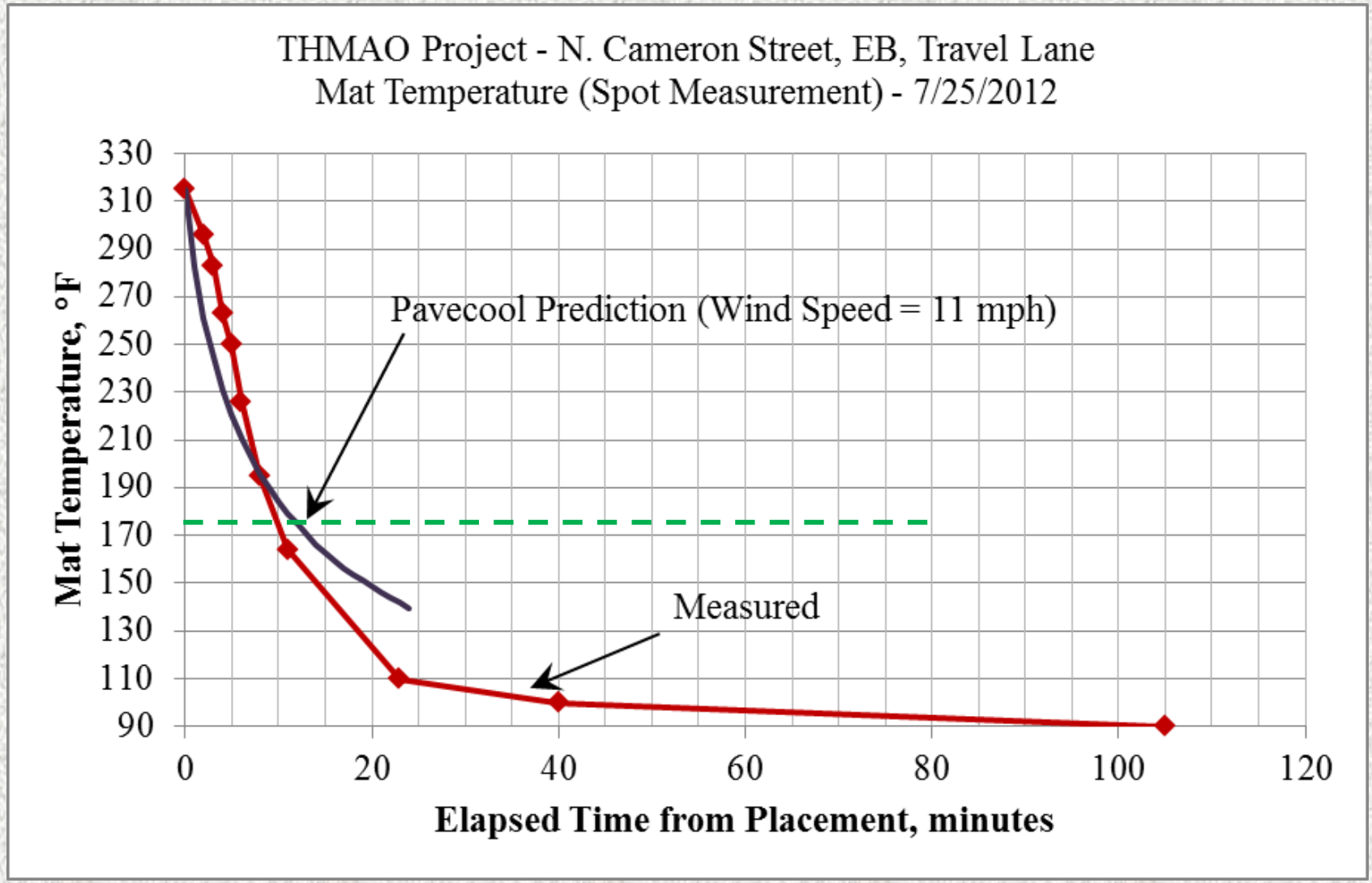
Repair/Prepare the Base

Emulsion Tack Coat Application

Rollers Follow Paver Closely

Concern with Mat Temperature

Mat Temperature



SR 220 – Finished Overlay

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QUALITY CONTROL OF THIN OVERLAYS

Thermal Segregation

$\Delta T \leq 25$ ºF	$25 < \Delta T \leq 50$ ºF	$\Delta T > 50$ ºF
Mild	Moderate	Severe

Less Temp. Variation ⟷ More Temp. Variation

More Uniformity ⟷ More Variability

Pave-IR™
for thermal profiling
09.06.2013 11:44

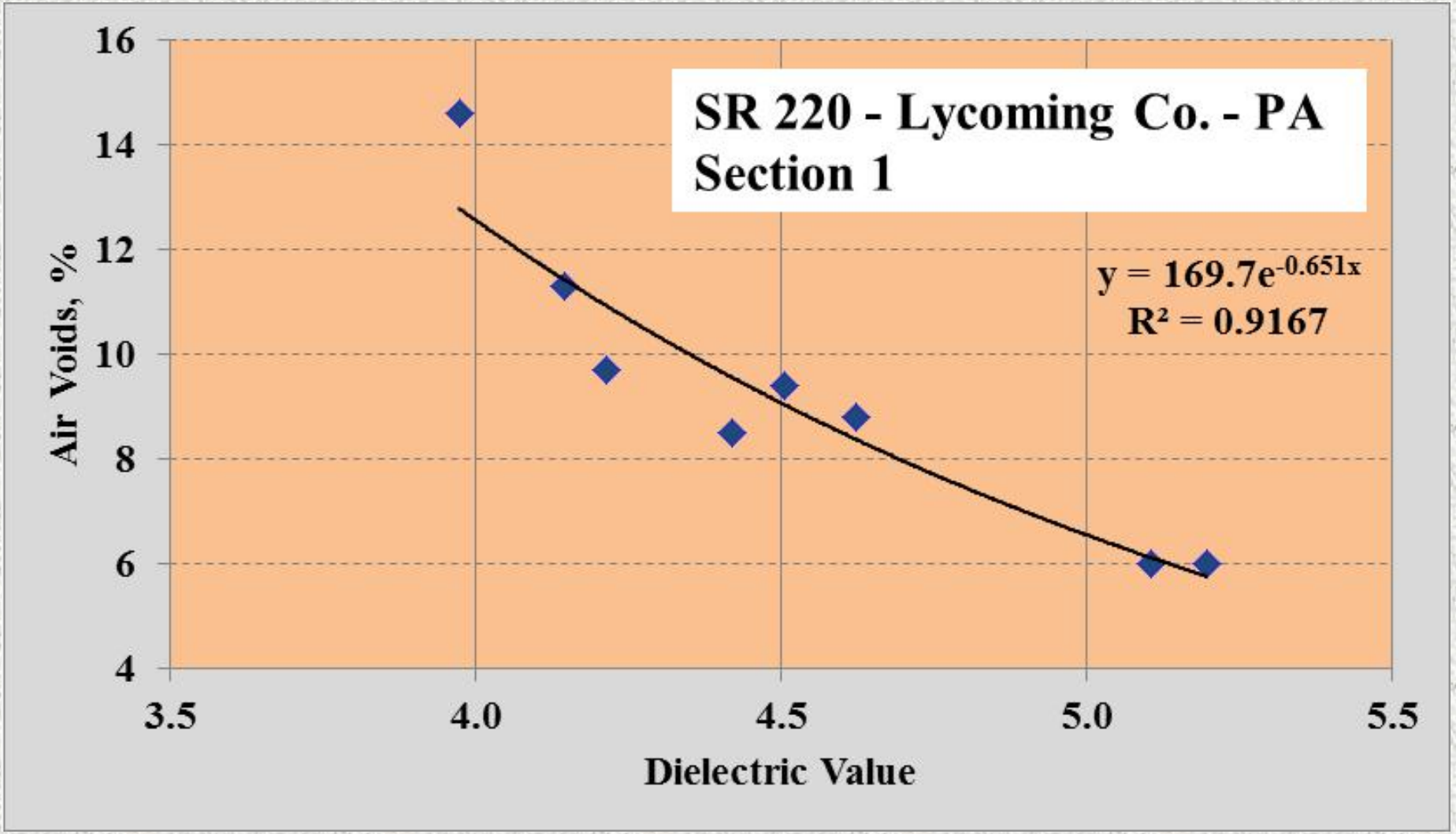
Coring for Density & Lab Testing

Ground Penetrating Radar

AID Integrated Testing Vehicle
Courtesy of Advanced Infrastructure Design, Inc.

Can GPR provide a reliable estimate of mat density?

GPR Dielectric-Air Void Relationship



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PERFORMANCE OF THIN OVERLAYS

Performance – SR 0022

Before paving

Nov. , 2013
≈ 15 months
afer paving

Performance – SR 0022

Performance – SR 0022

SR 230 – Before THMAO

SR 230 – Performance

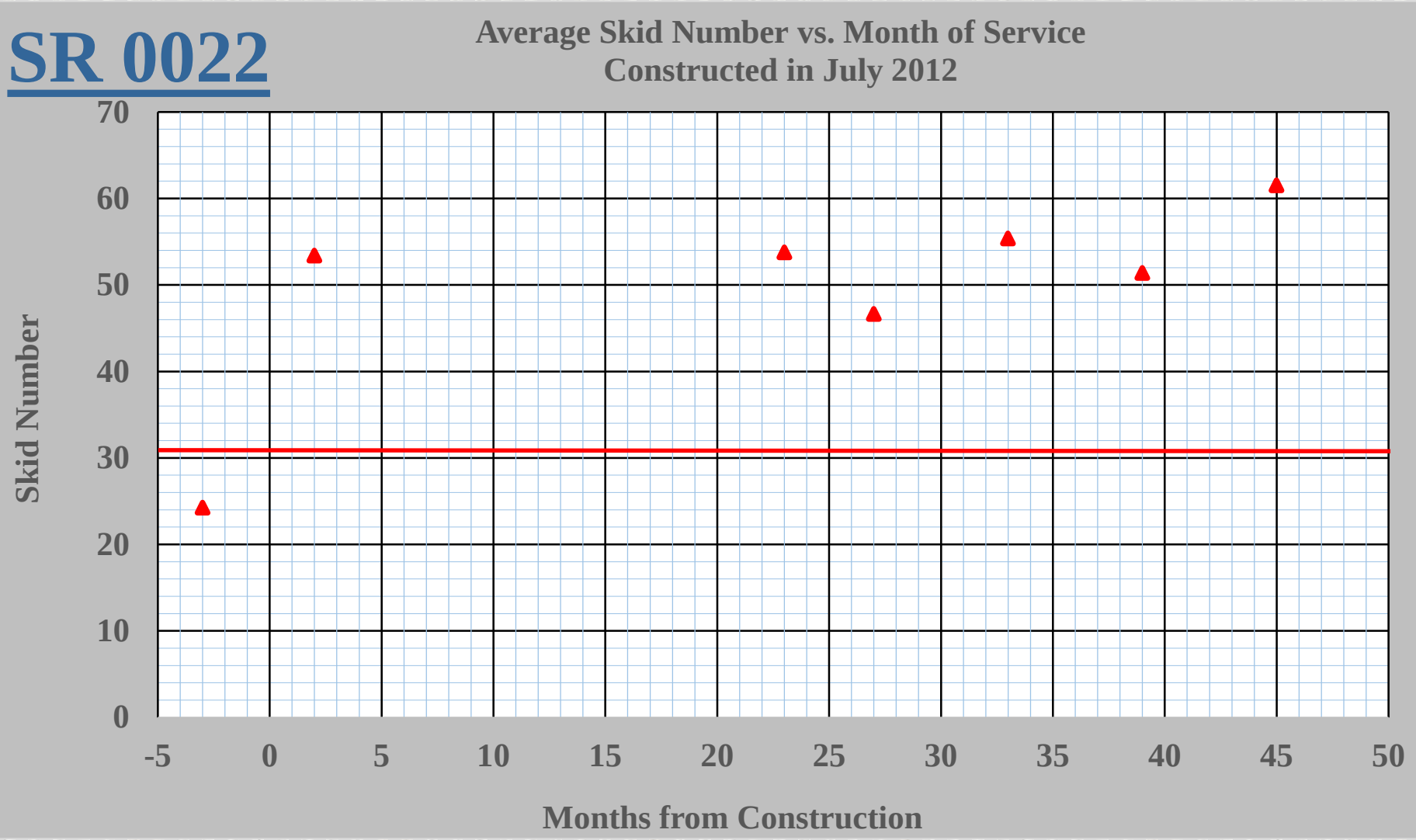
SR 220 – Performance

32 months
after paving

SR 220 – Performance

Friction Improvement

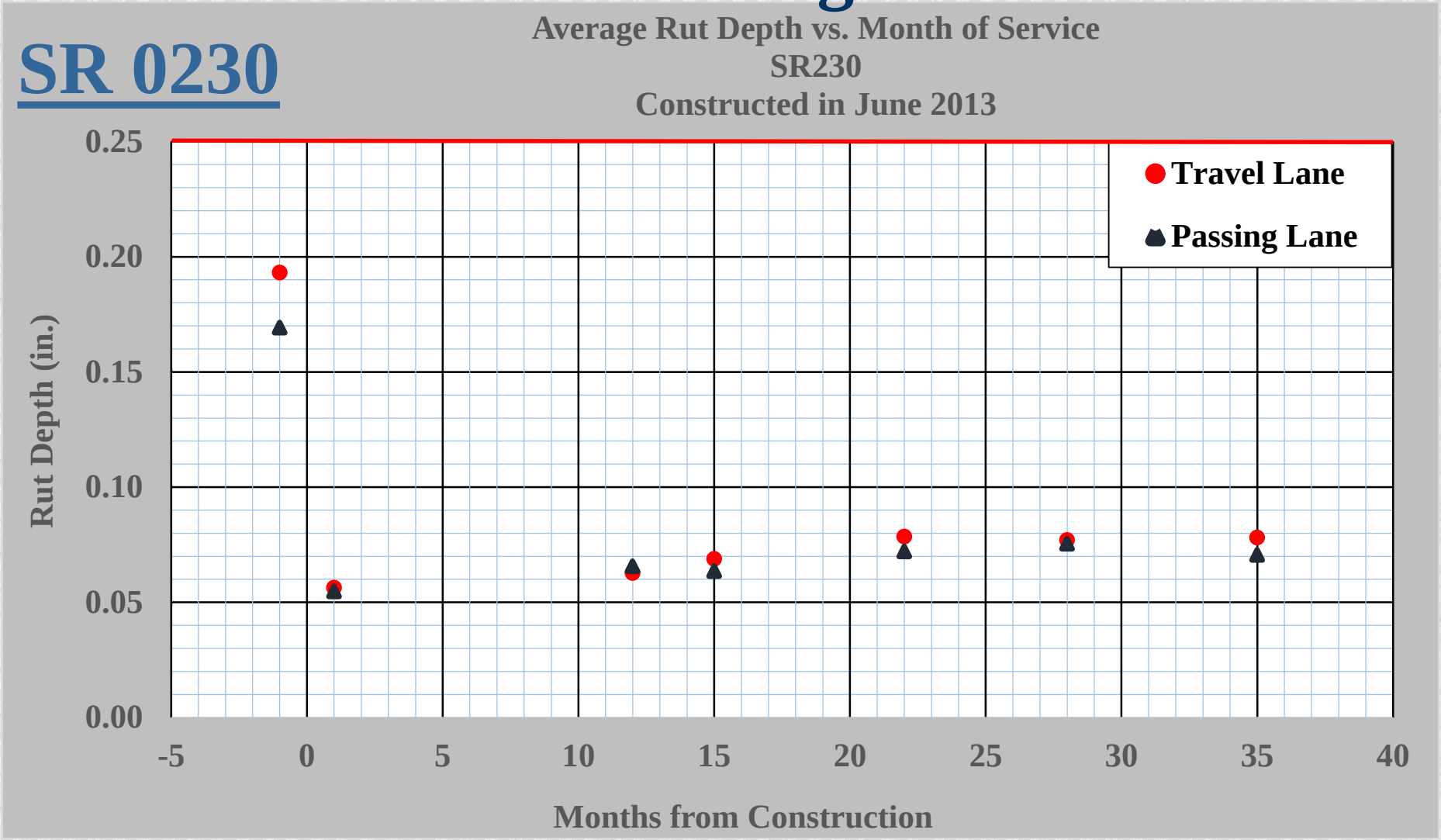
SR 0022



Data: Courtesy of PennDOT BOMO

Rutting

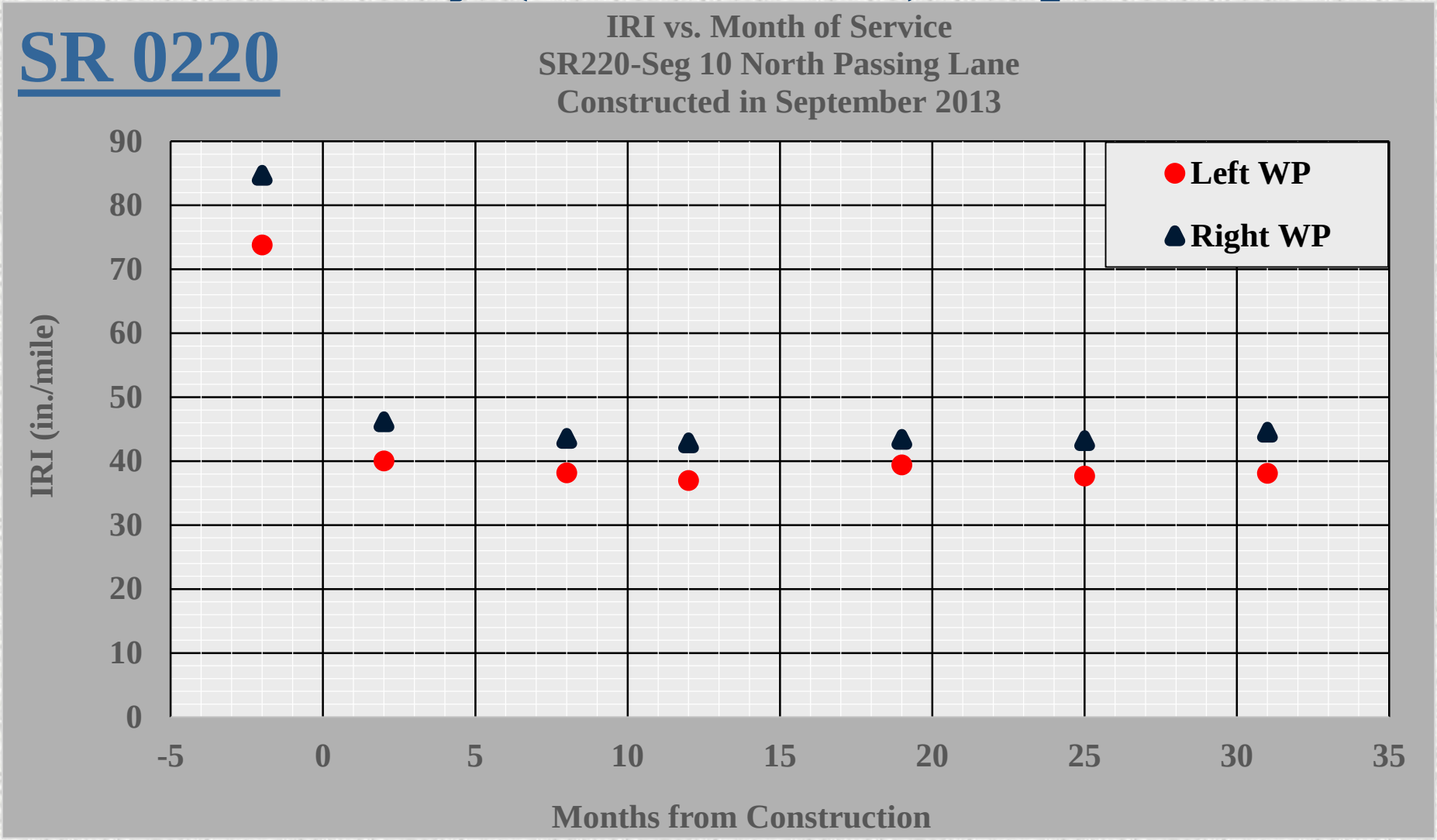
SR 0230



Data: Courtesy of PennDOT BOMO

Ride Quality (Smoothness) Improvement

SR 0220



Data: Courtesy of PennDOT BOMO

Summary

- Thin Asphalt A Good Tool for Surface Treatment
- Proper Base Repair is a <u>MUST</u>
- Improved Ride and Friction
- Improved Ride and Friction Maintained
- Minimal Rutting Observed

Summary

- **Concerns:**
  - Rapid Mat Cooling
  - Reflection of cracks is a challenge on jointed or cracked pavement
- **Advanced Tech for Quality Control:**
  - GPR-Density results are promising
  - Thermal Imaging
- **Good Mix Lab Performance:**
  - Rutting and Moisture Resistance (HWTD)
  - Crack Resistance (Texas Overly Test)

Thank You!