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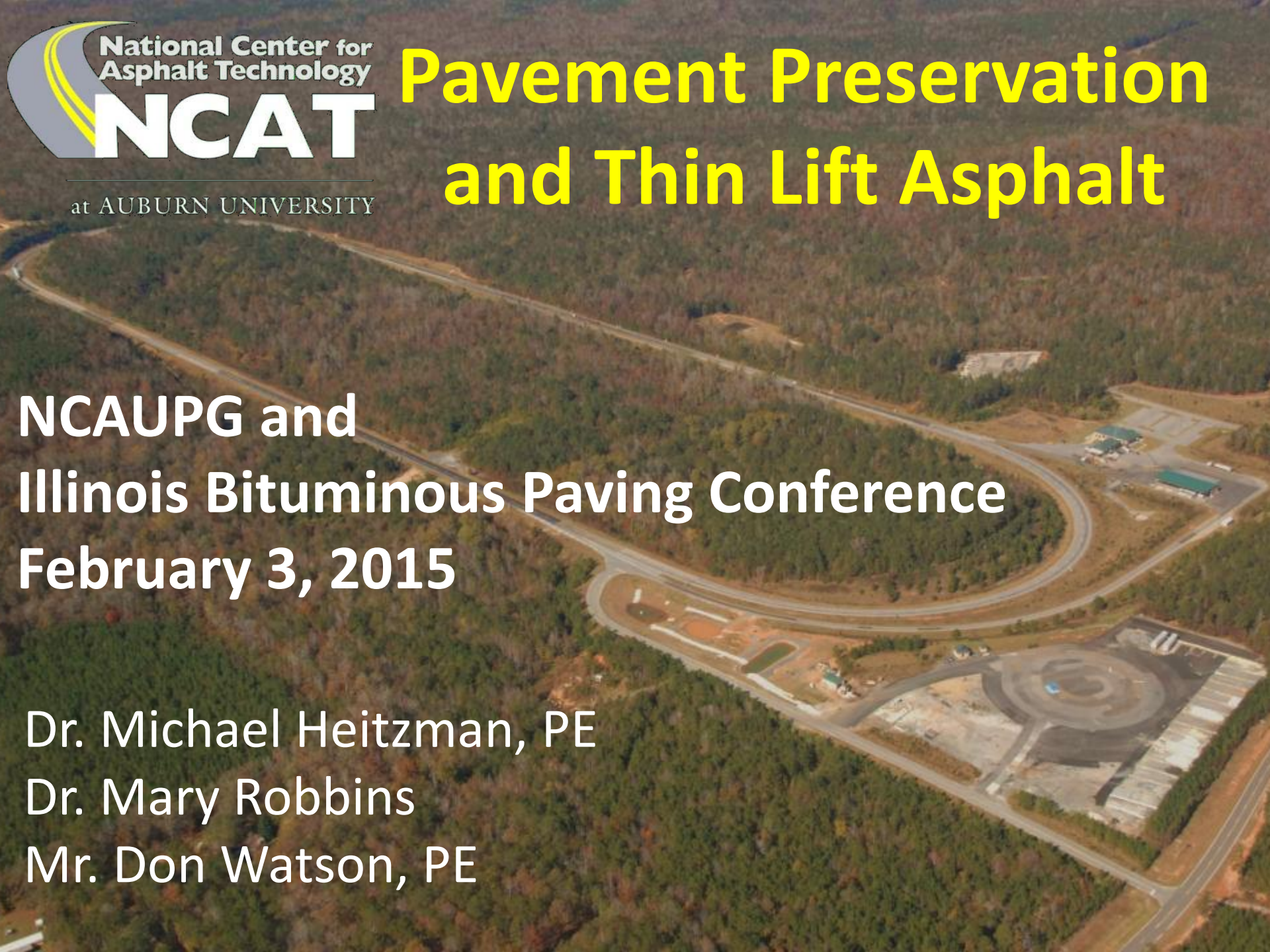
Pavement Preservation and Thin Lift Asphalt



NCAUPG and
Illinois Bituminous Paving Conference
February 3, 2015

Dr. Michael Heitzman, PE
Dr. Mary Robbins
Mr. Don Watson, PE

Pavement Preservation

"A program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that **extend pavement life**, improve safety and meet motorist expectations"

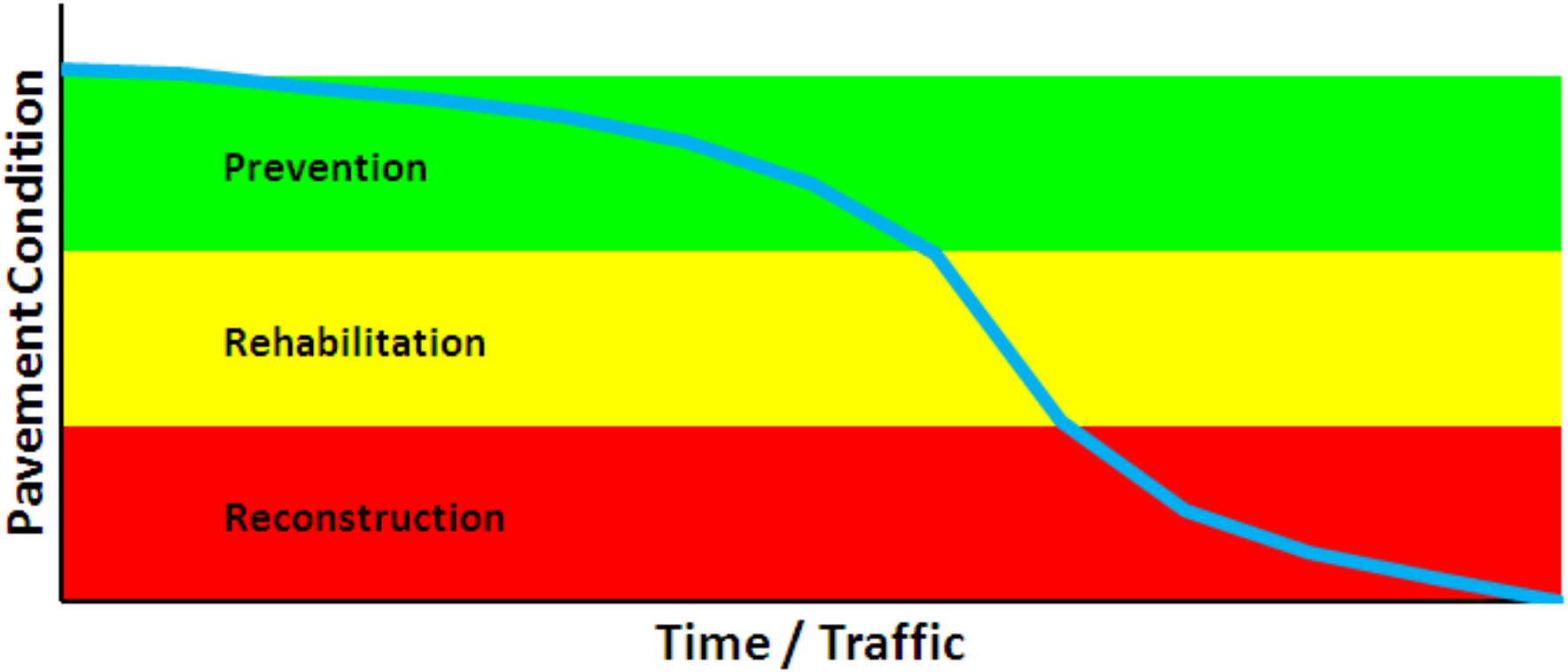
- FHWA Pavement Preservation Expert Task Group

Current Life Extension Based on Ranges

Treatment	Reported Extended Service Life Range (Years)
Thin Overlay	3-23
Chip Seal	3-8
Microsurfacing	3-8
Crack Sealing	0-4
Mill and Resurfacing	4-20
Hot In-place Recycling	3-8
Slurry Seal	4-7
Fog Seal	4-5
Cold In-place Recycling	4-17
Full Depth Reclamation	10-20
Structural Overlay (Mill and Fill)	6-17
Whitetopping	3-17

FHWA-HIF-10-020, January 2010

Pavement Preservation



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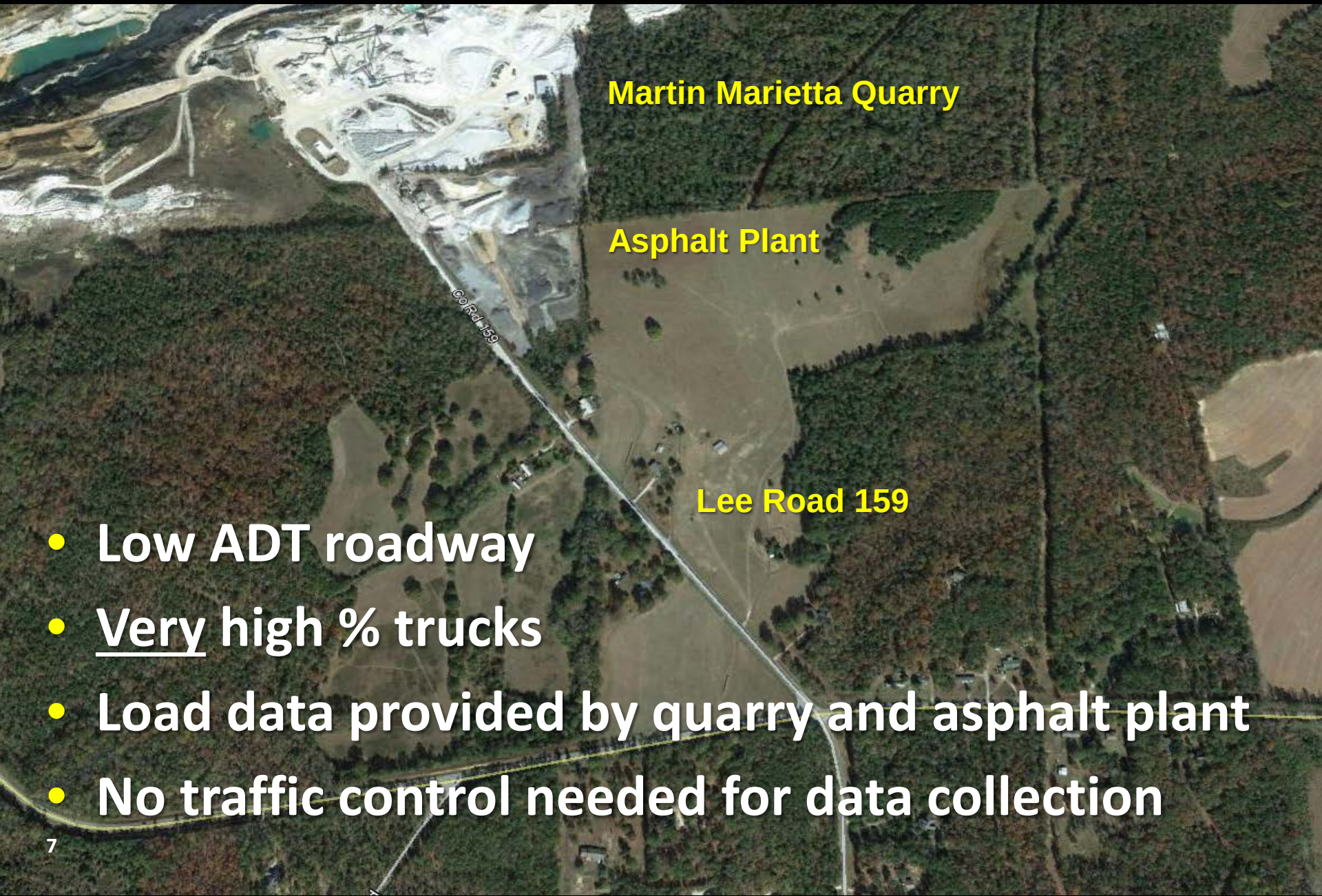
2012 Preservation Group Study

- Quantify life extending benefit of study treatments
  - **Time/traffic to return to pretreatment condition(s)**
  - Test sections on the Track and Lee Road 159

Preservation Group Experiment

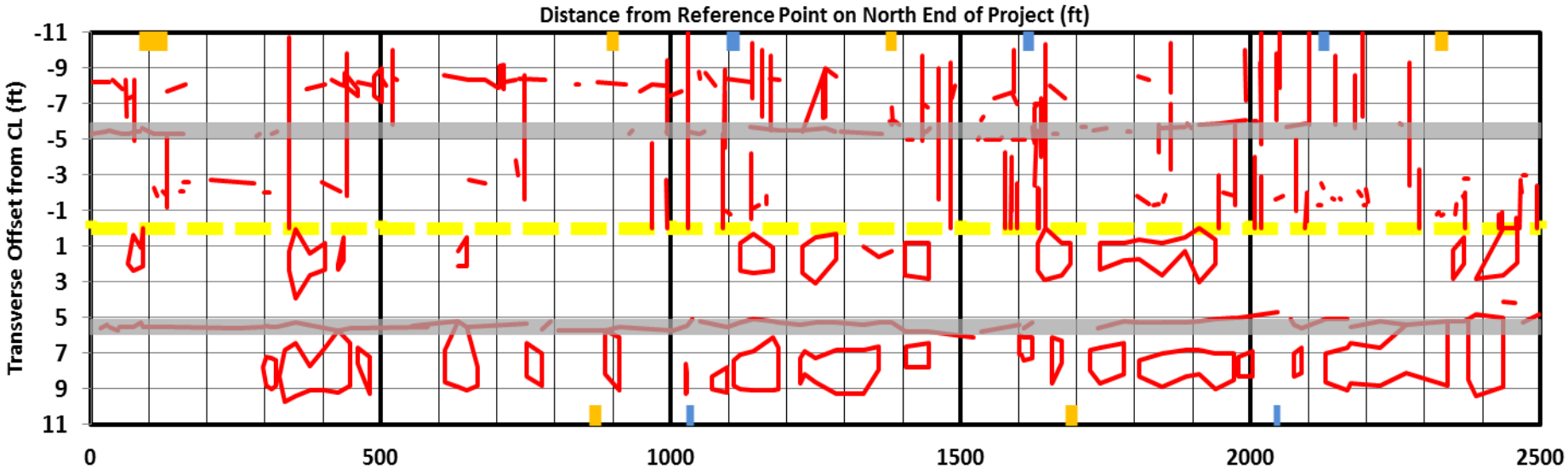
- 25 sections on local county road (Lee Road 159)
  - ≈5½” thick paved access road to quarry/asphalt plant
  - 2 control, 22 sections with treatments/combinations, 1 demonstration section
  - Pretreatment condition varied by WP and direction
- 14 sections on the NCAT Pavement Test Track
  - 7” pavements placed in the summer of 2009
  - PFC sections, DGA sections (virgin, high RAP)
  - >10 million ESALs

PG Sections on Lee Road 159



- Low ADT roadway
- Very high % trucks
- Load data provided by quarry and asphalt plant
- No traffic control needed for data collection

Lee Road 159



- Preventive maintenance
- Routine maintenance
- Minor rehabilitation

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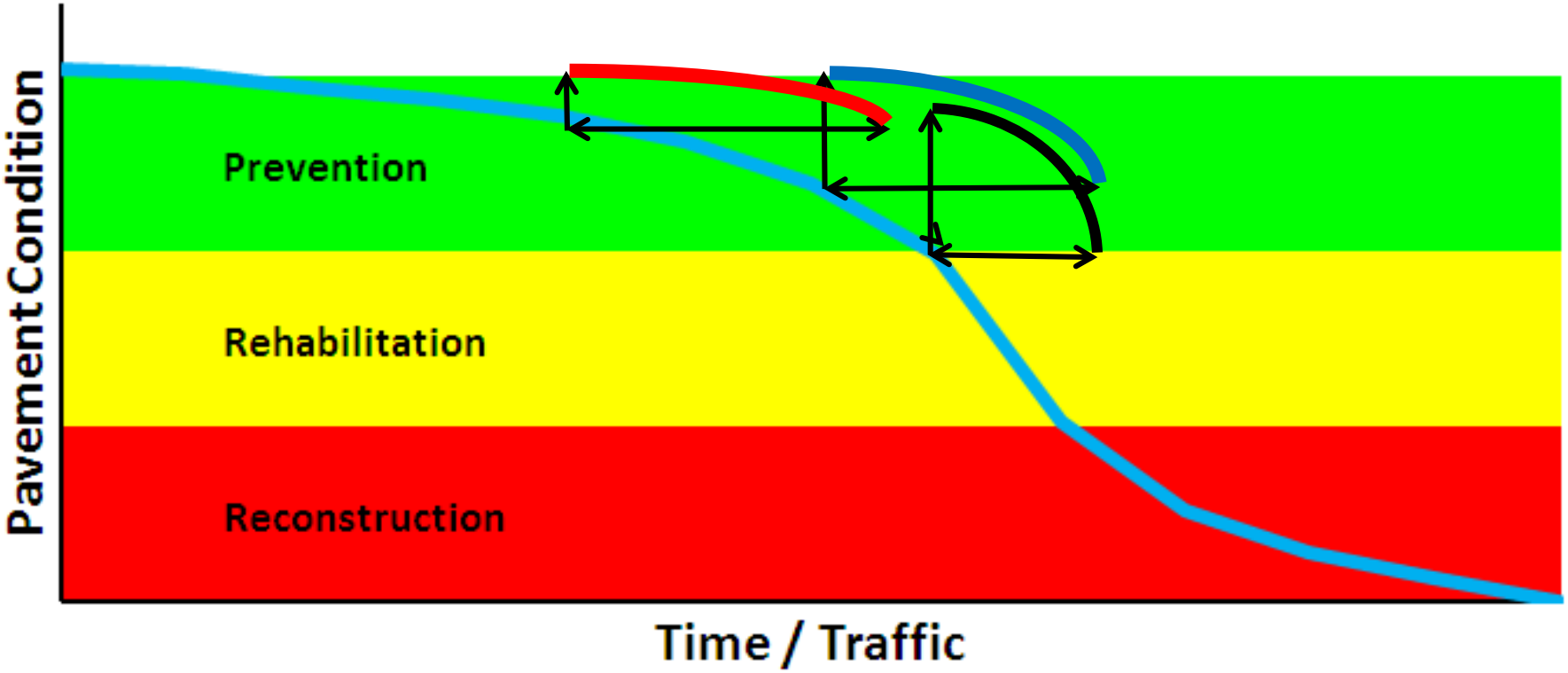
1. Rejuvenating Fog Seal
2. Fibermat Chip Seal
3. Control
4. Control
5. Crack Seal (CS)
6. Single Layer Chip Seal
7. CS + Single Layer Chip Seal
8. Triple Layer Chip Seal
9. Double Layer Chip Seal
10. Single Chip + Microsurfacing (Cape)
11. Microsurfacing
12. CS + Microsurfacing
13. Double Layer Microsurfacing
14. Fibermat Chip + Microsurfacing (Cape)
15. Scrub Seal + Microsurfacing (Cape)
16. Scrub Seal
17. Distress Demo Section
18. Fibermat Chip + HMA thinlay (Cape)
19. HMA Thinlay (PG 67-22)
20. 100% Foamed Recycle Inlay + thinlay
21. HMA Thinlay (PG 76-22)
22. Ultra Thin Bonded Wearing Course
23. HMA Thinlay (50% RAP)
24. HMA Thinlay (5% PCRAS)
25. HMA Thinlay (High Polymer)

LR 159 Testing Overview

- Weekly
  - Inertial Profiler (roughness, texture)
  - Visual inspections with notes/pictures
- Monthly
  - Video for crack mapping
  - Rut depth
  - Falling weight deflectometer (FWD)
  - Subgrade moisture readings
- Other
  - Locked wheel skid trailer friction
  - Ground penetrating radar (GPR)



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Thin Lift Asphalt (Thinlays)

- Surface preservation
- Smaller NMAS, thinner lift thickness – lower cost
- Good rut resistance
- Impermeable surface

- Selection conditions:
  - Smooth pavement
  - Good friction fine aggregate in mix (for high speed routes)
  - Cool weather paving (thin lift)
  - Modified mix design / construction criteria

Advantages of Thin Overlays

- Pavement preservation tool (no cure, no loose stone)
- Provides long service life (when placed over structurally sound pavements)
- Provides good riding surface(site dependent)
- Reduces noise (fine-graded mixes)
- Maintains grade and slope geometry
- Is recyclable
- Uses a surplus aggregate (if required quality)

2003 NCAT Test Track Cycle

- Mississippi DOT 4.75 mm mix
- ¾ in thick
- 92.2% Theoretical Density
- PG 76-22
- Aggregate
  - 69% Limestone
  - 19% Gravel
  - 12% Natural Sand
- After 30 million ESALs, 7 mm rut

2003 NCAT Test Track Cycle

- 9.5 mm mix
- 1 in thick
- 93.7% Theoretical Density
- PG 76-22
- Aggregate
  - 19% Natural Sand
- After 30 million ESALs, 5 mm rut

NCHRP Synthesis of Thin Overlays

- 9.5 and 12.5mm dense graded
- 9.5 and 12.5mm SMA
- 4.75mm dense graded and SMA
- UTBWC (ultra-thin bituminous wearing coarse)
- OGFC/PFC

PennDOT Use of Thin Overlays

Where Not To Use Thin Overlays

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Performance Measures

(Purdue Study)

Performance Indicator	Roughness (IRI)	Condition (PCR)	Rut Depth
Threshold Used	110 in/mi (1.74 m/km)	85	0.25 in (6 mm)
Expected Life (Yrs.)	7 - 10	7 - 11	8 - 11

Service Life

- LTPP Data (Liu, 2013)
  - 341 Thin Overlay Sections
  - 40 States, 8 Canadian Provinces
- Median life expectancy – 7 to 9.5 years

Explanations for Range in Service Life

Environmental Differences

Explanations for Range in Service Life

Construction Quality Standards - Interstate versus Secondary

Explanations for Range in Service Life

Variation in material quality

Explanations for Range in Service Life

Temporary Fix

NCAT Pavement Preservation Study

Section	18	19	20	21	22	23	24	25
Surface	4.75/PG 67-22	4.75/PG 67-22	4.75/PG 76-22	4.75/PG 76-22	UTBWC	4.75 50% RAP	4.75 5% Shingles	4.75 PG 88-22
Subsurface	Fibermat	Existing	Full-Depth Reclamation	Existing	Existing	Existing	Existing	Existing

Conclusions

- Agencies need to define performance for pavement preservation
- Thin overlays routinely used as preservation tool
- Thin overlays extend life of pavements
  - Success depends on existing distresses
  - Service life generally in 7 – 11 year range

Lee Road 159

Pavement Preservation Experiment

to Reduce the Cost to Maintain Your Roads

Funding Provided by:

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