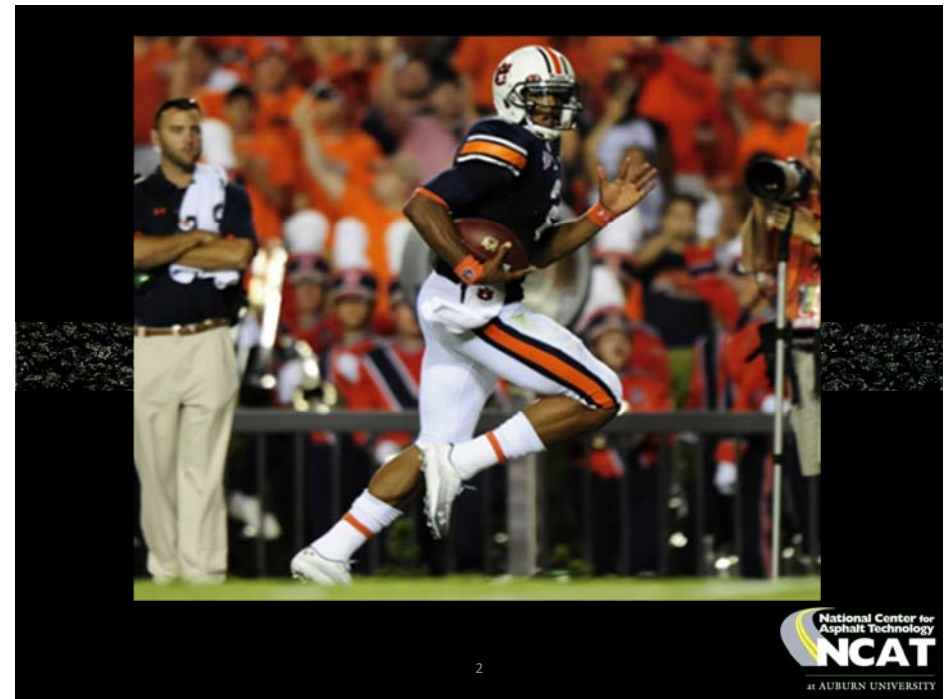


# Warm Mix Asphalt +



## NCAT Pavement Test Track

- Evolution of mix design systems
  - Superpave implementation (Hveem and Marshall)
  - Coarse versus fine (versus gap graded) blends
  - Binder optimization (grade and content)

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  - Coarse versus fine (versus gap graded) blends
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- Evolution of pavement structural design
  - Interim recalibration of layer coefficients
  - M-E validation/calibration and perpetual design
  - Implementation of new technologies

## Accelerated Performance Testing (APT)



## Track Research Program

- Optimize pavement thickness design

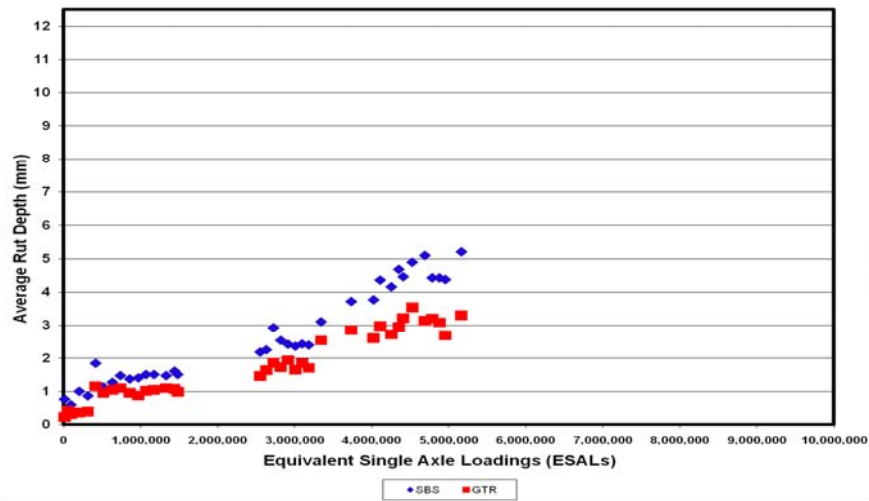
## Track Research Program

- Optimize pavement thickness design
- Identify ideal mixes, materials, methods, etc.

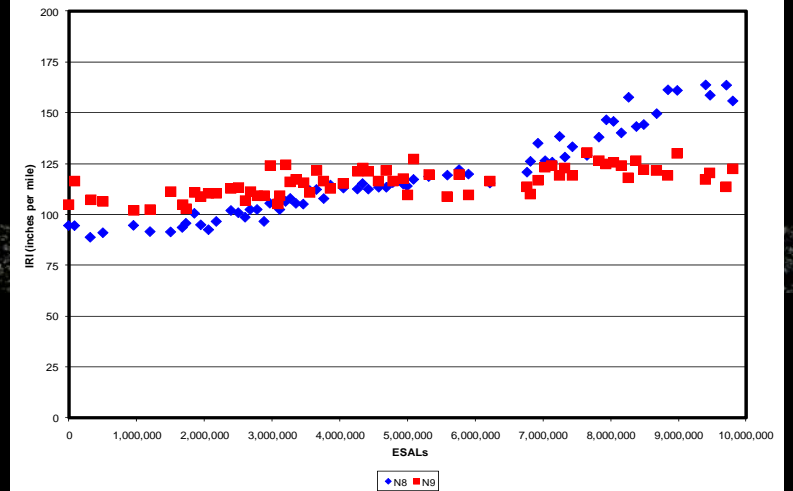
## Performance Measures

- Rutting
- Roughness
- Texture
- Density
- Cracking
- Permeability
- Noise
- Friction
- Reflectivity
  
- High-speed response

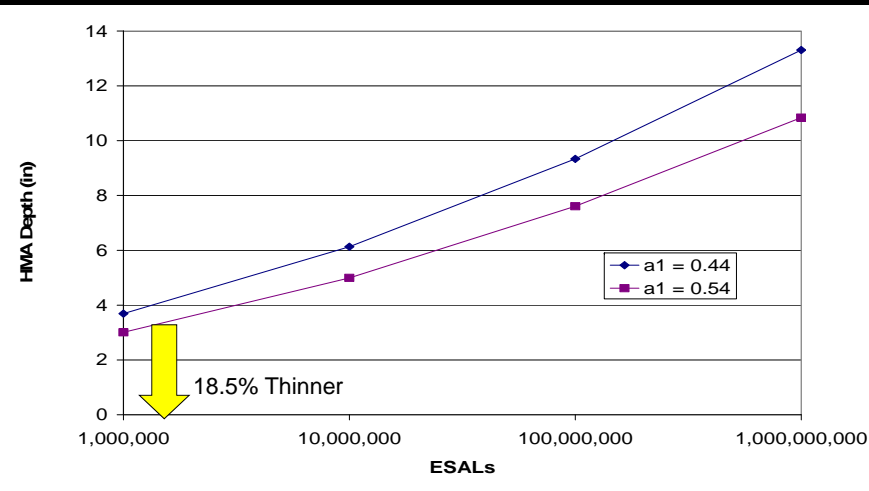
# Rutting (SBS vs GTR Mill/Inlay)



# Roughness (Structural Sections)



# Interim Layer Coefficient Recalibration

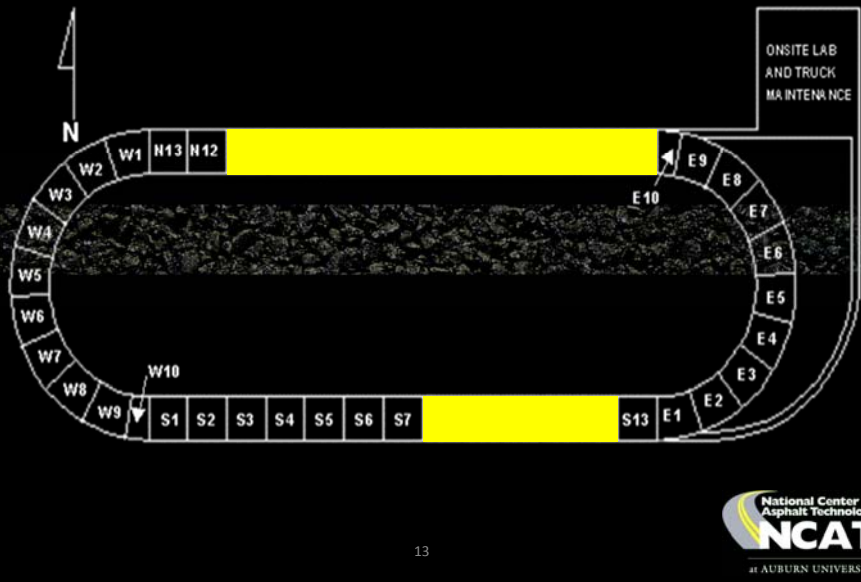


# 2000 Track Surface Mix Performance



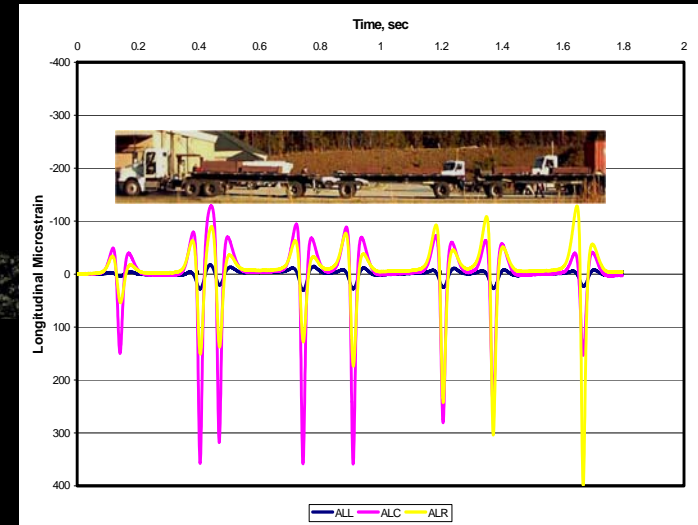


# 2009 Thinner Structural Test Sections



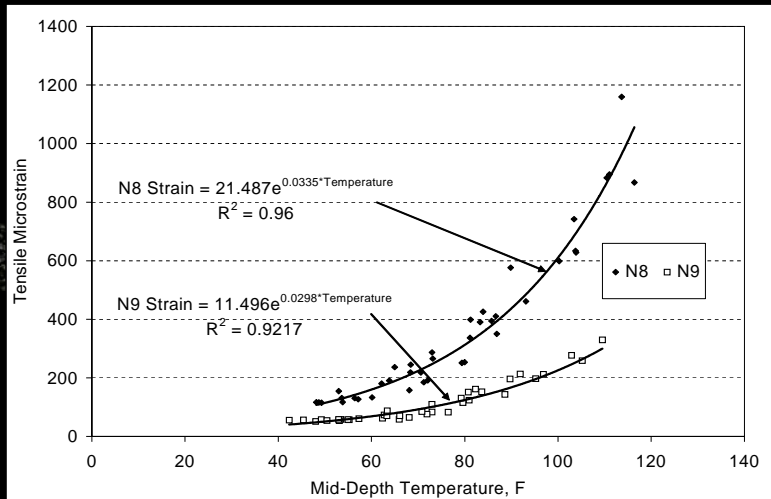
13

# High-Speed Pavement Response



14

# Effect of Thickness on Strain Response



15

# Perpetual Pavement on Soft Clay

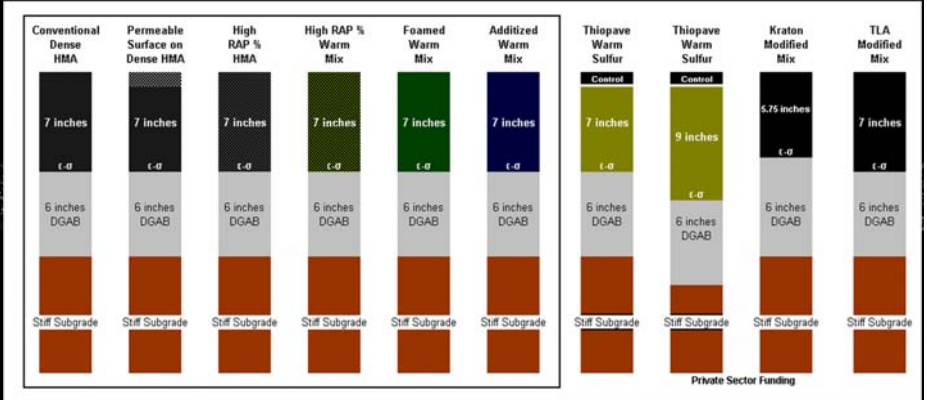
- 14" pavement looks great after 15.5 million ESALs

16

# Perpetual Pavement on Soft Clay

- 14" pavement looks great after 15.5 million ESALs
- 10" pavement recently rehabilitated for 2<sup>nd</sup> time
  - In need of 1<sup>st</sup> rehabilitation after 10 million ESALs
  - 5" mill/inlay failed again after 3.5 million ESALs
  - 1 million ESALs on 5-3/4" high polymer inlay (stay tuned)

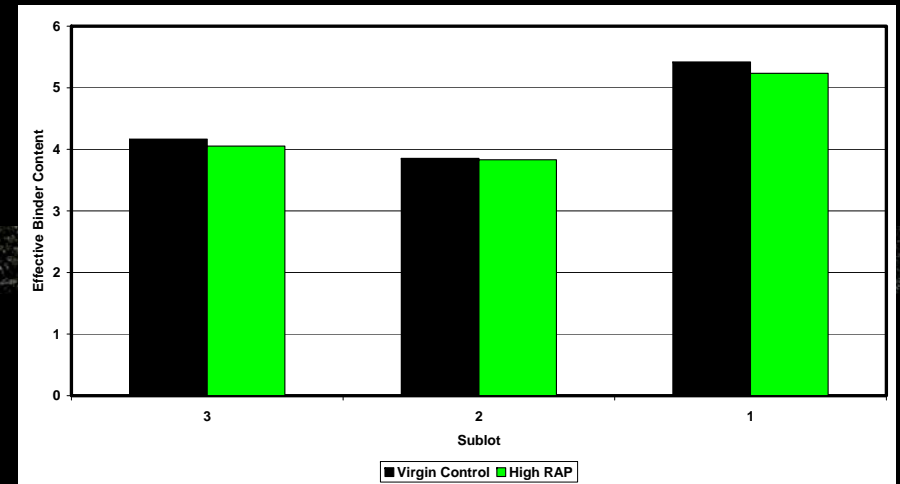
# 2009 Group Experiment (+)



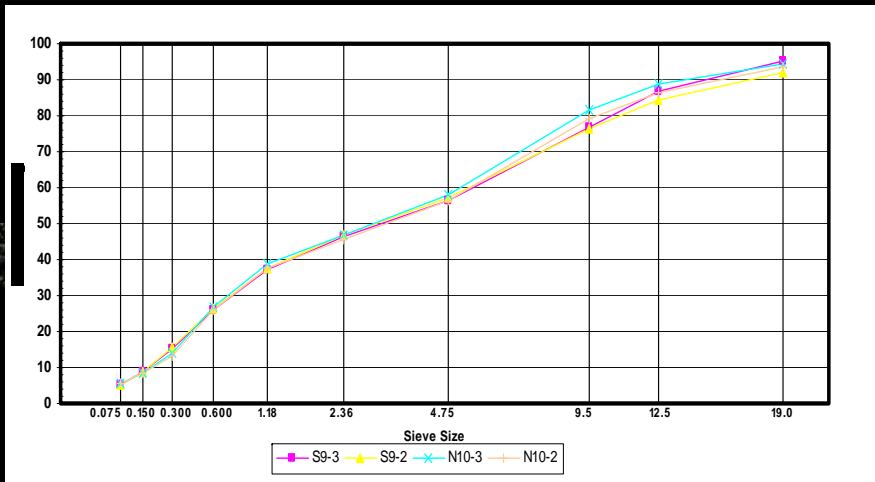
# High Recycled Content Mixes



# Effective Asphalt Contents



# Gradations of Base/Binder Mixes



# www.pavetrack.com

Performance

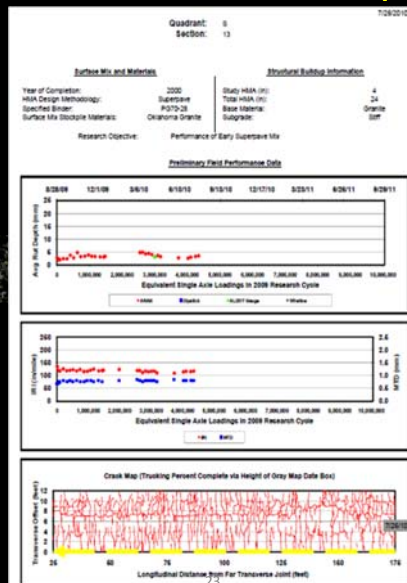
Click here for the official NCAT web site, Tracks in US, or Tracks Worldwide

Performance data for each section can be viewed by positioning your mouse over the section in question and left-clicking. Based on feedback from our research sponsors, the performance reports have been revised to include crack maps. The 2009 performance reports are now a fully integrated and active part of the web presentation.

NO T1 track to download PAVE reports, review upcoming NCAT training courses, query historical weather data, view current color radar, or preview local forecast

1,438, 802 ESALs as of 2300 hours on December 5.

# Web Performance Reports



# WMA in the United States

- Technology imported from European practice
- Reduced production energy and emissions
- Better compactability (at lower temperatures)
- Reduced short term binder aging
- May be key to higher RAP percentages in future

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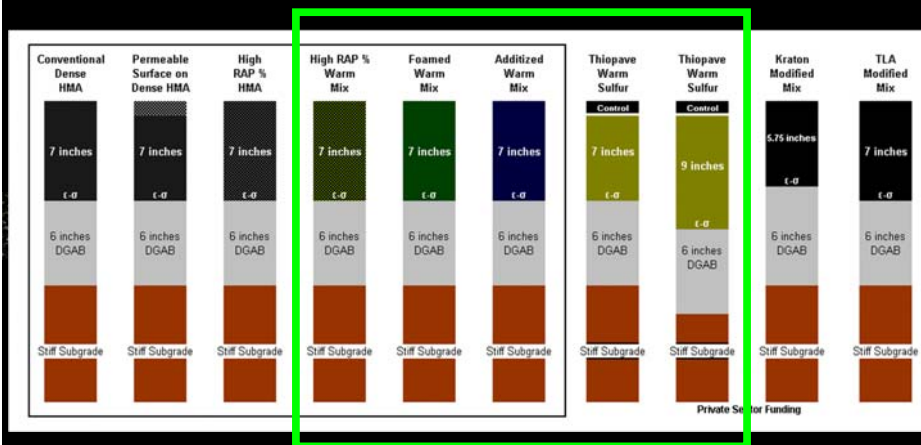
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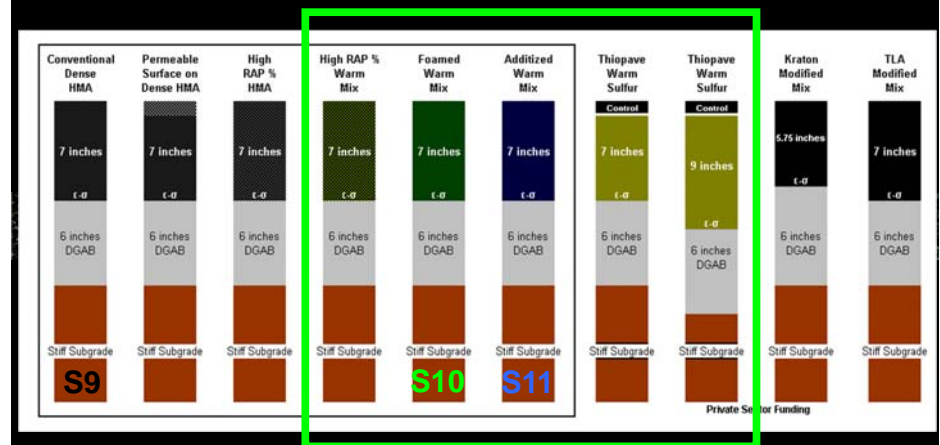
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  - Thiopave sulfur replacement WMA package

## 2009 Group Experiment (+)

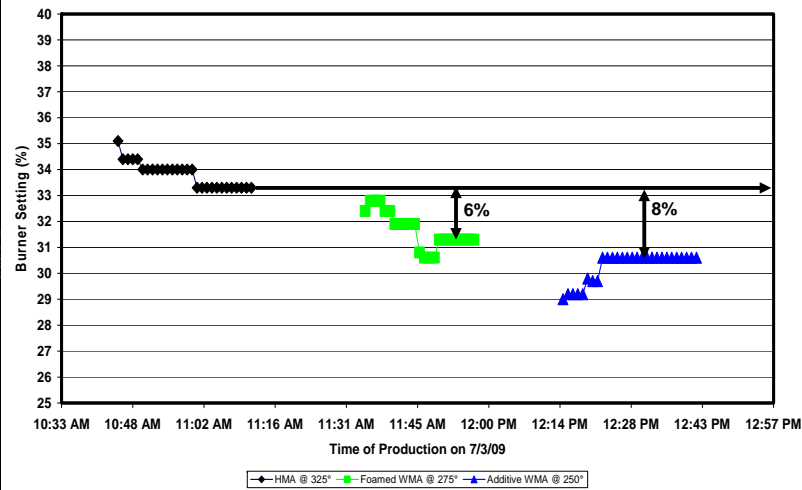


## 2009 Group Experiment (+)

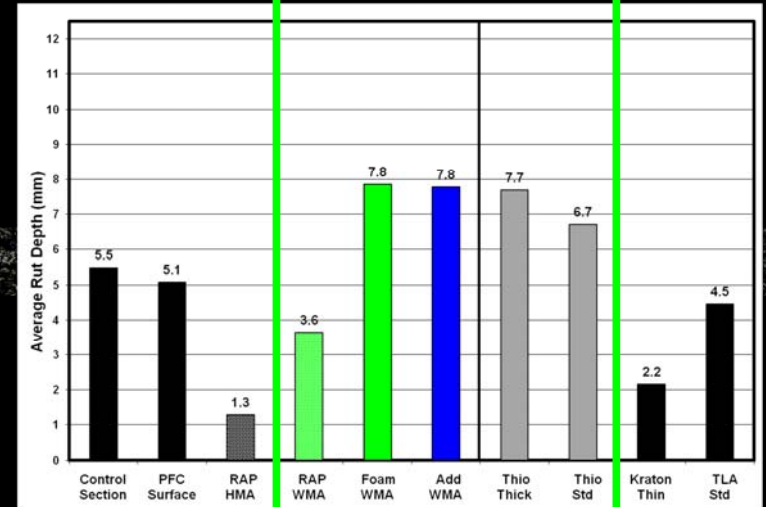




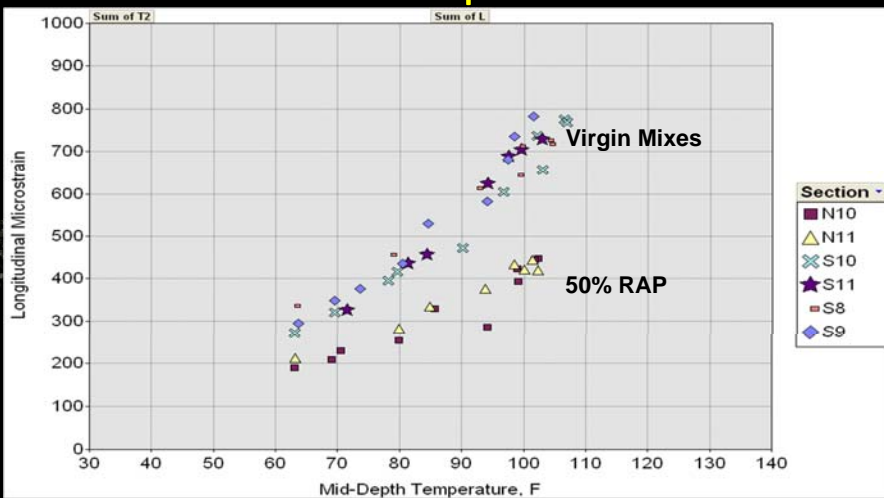
# HMA vs WMA<sub>foam</sub> vs WMA<sub>additive</sub>



# Less Short Term Aging of WMA



# Similar Strain Response for WMA



# Current WMA New Process Approval

- Many states eager to approve new technologies
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- Process is often repeated in every state
- Much of the Track available for testing

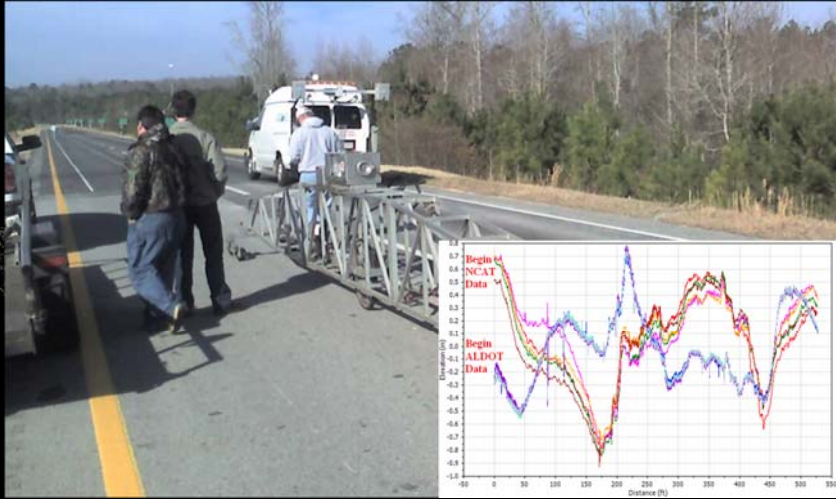
## National WMA Certification Program

- 9.5 mm coarse granite PG67-22 mix (TSR  $\approx$  0.3!)
- Laboratory performance of plant produced mix
  - Flow number, dynamic modulus, APA
  - IDT, overlay tester, bond strength, PG grading
  - TSR, stripping via boiling, Hamburg (aged & unaged)
- Field performance on Pavement Test Track
  - Hot-mix control, immediate traffic (1 year thereafter)
  - Weekly rutting, roughness, macrotexture
  - Final report within 18 months of commitment

## WMA Certification Endorsements

- Alabama
- Arizona
- Colorado
- Delaware
- Florida
- Indiana
- New Hampshire
- South Carolina
- Texas
- Washington

# Profiler Certification Program



# Erosion Control Product Evaluations



# Questions ?

