9th International Conference on MANAGING PAVEMENT ASSETS (ICMPA9)

MAY 18-21, 2015 • Washington D.C.

ICMPA9 • International Conference on Managing Pavement Assets

New Jersey Micro-Surface Pavement Noise Evaluation

John Hencken

The Center for Advanced Infrastructure and Transportation (CAIT)

Rutgers University

AASHTO THE VOICE OF TRANSPORTATION

VirginiaTech Transportation Institute

TRB

U.S. Department of Transportation Federal Highway Administration

WORLD ROAD ASSOCIATION MONDIALE DE LA ROUTE 1909-2009

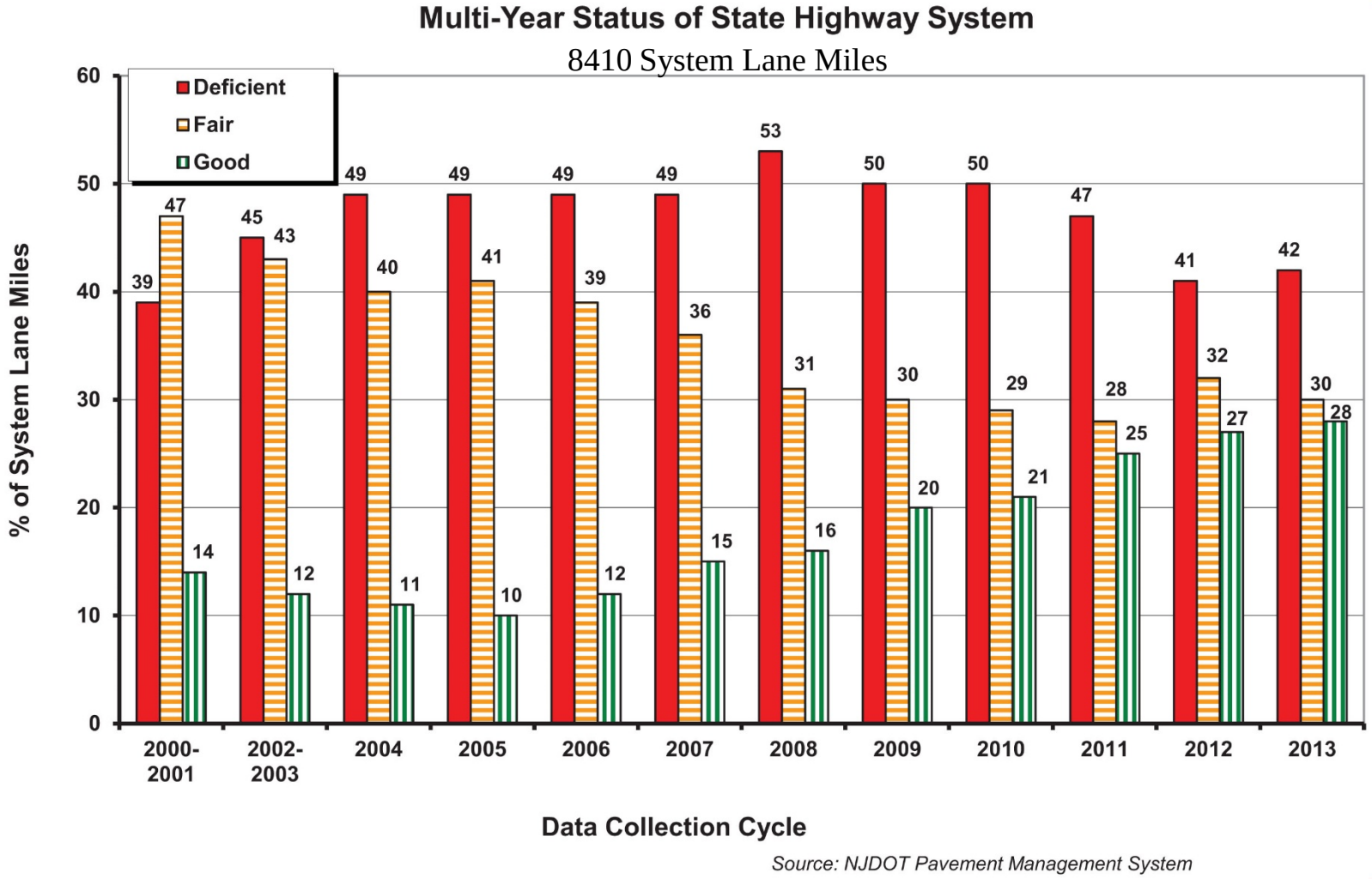
VDOT Virginia Department of Transportation

Outline

- **Impetus for Research**
- **Background of Pavement Selection**
- **Introduction to Micro-Surface**
- **Flexible Micro-Surface Project Description**
- **Micro-Surface OBSI Noise Results**
- **Conclusions**

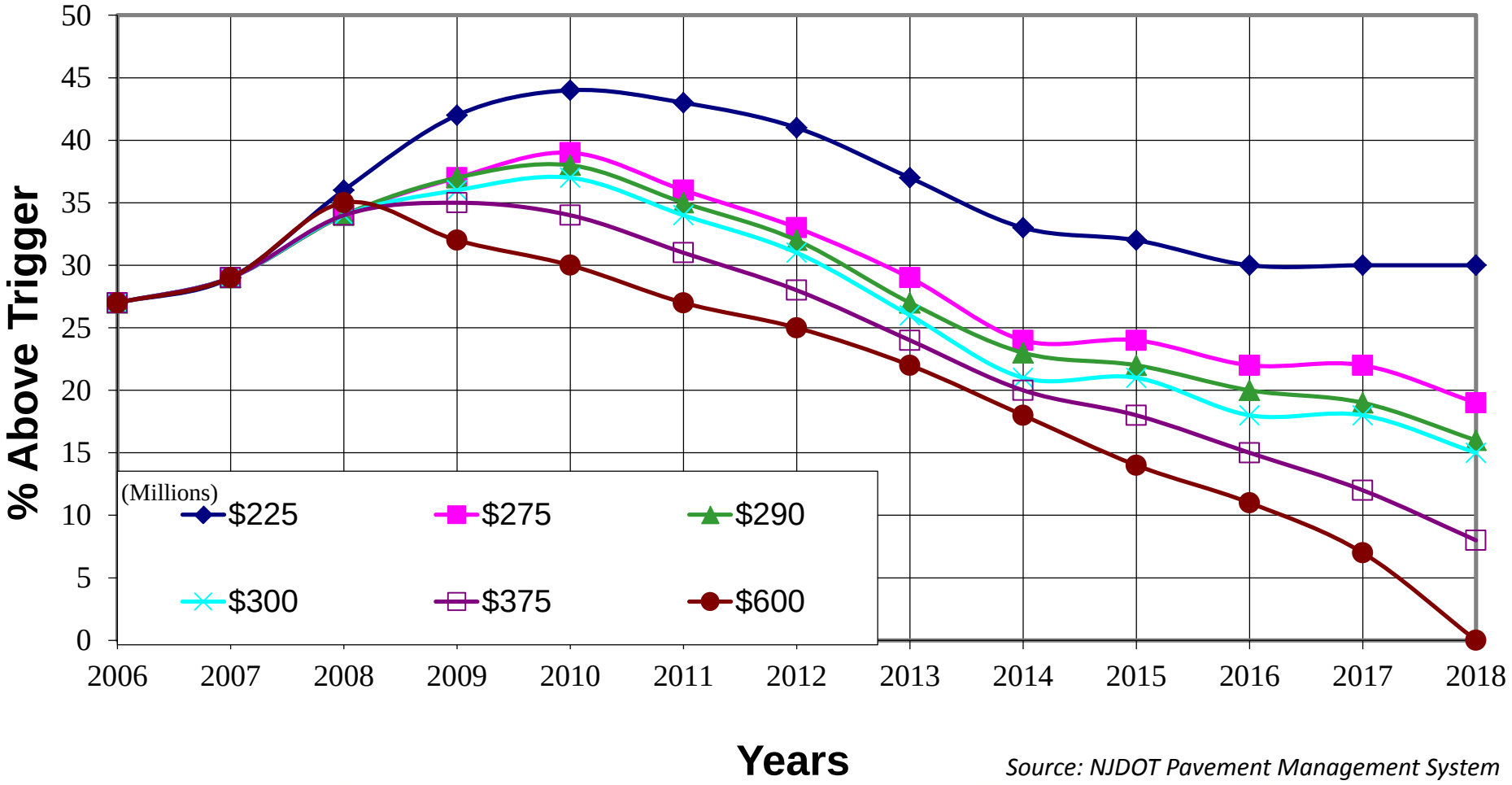
IMPETUS FOR RESEARCH

Distressed Roads in New Jersey



Source: NJDOT Pavement Management System

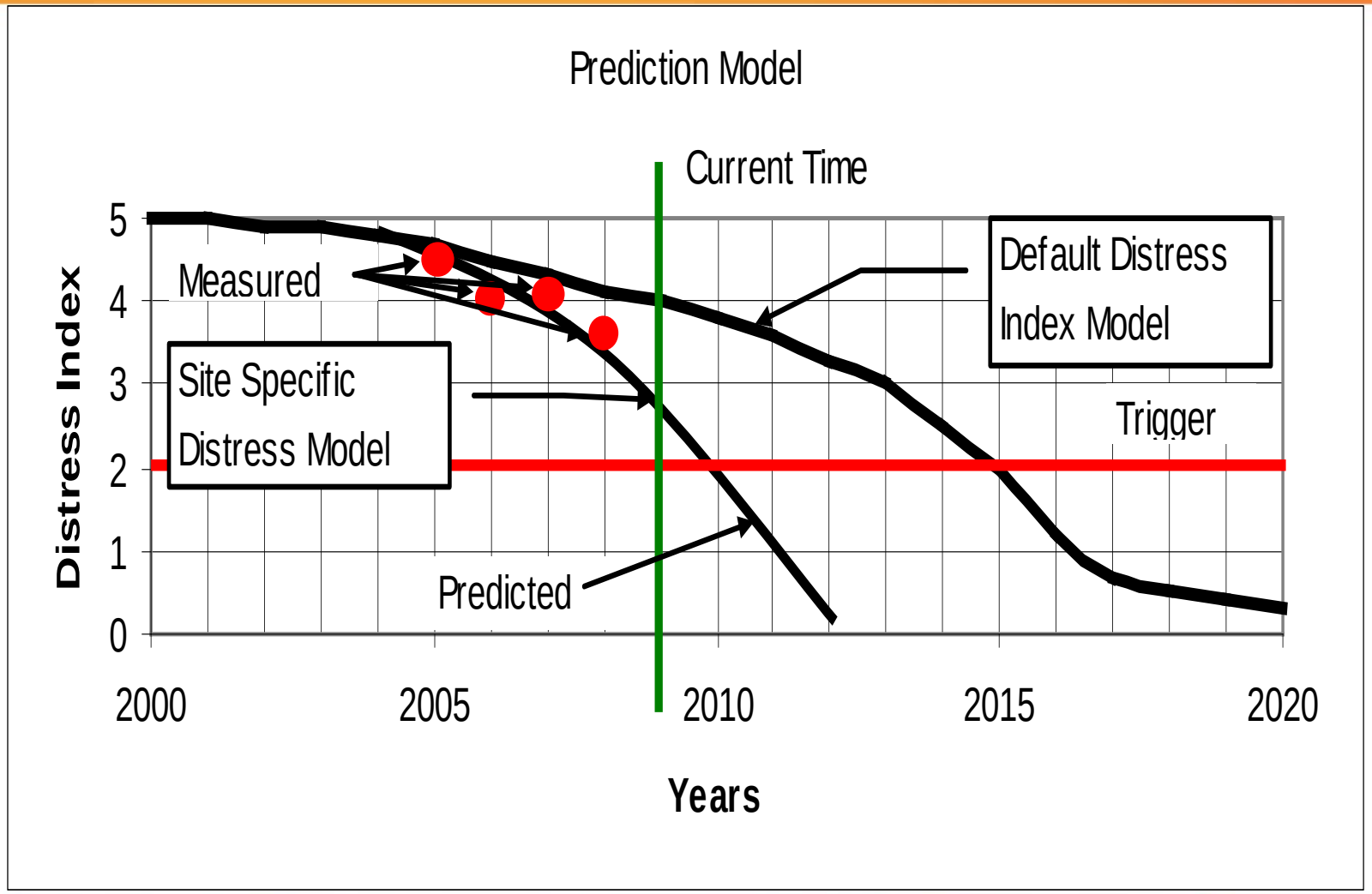
Predicted IRI vs Funding Levels



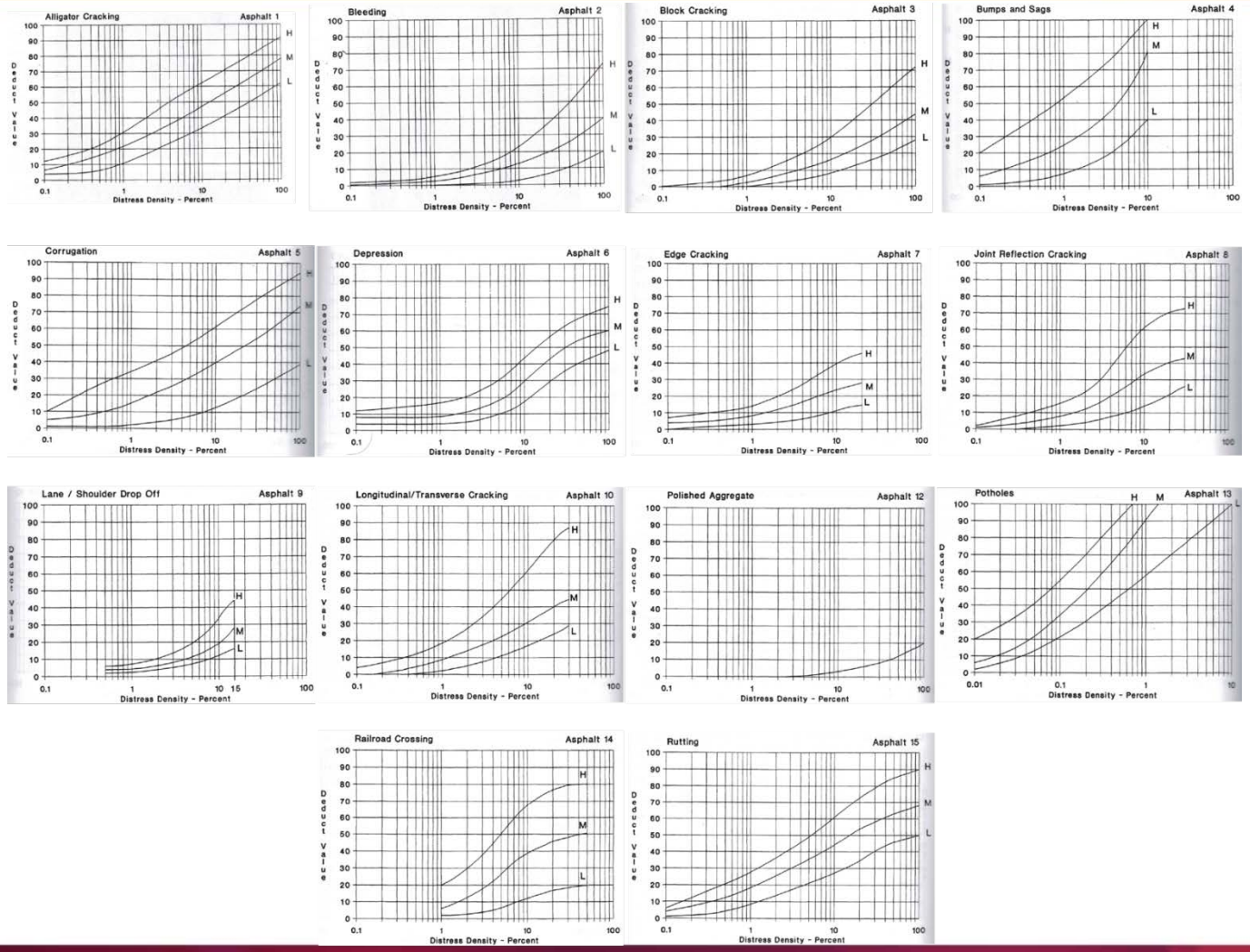
Source: NJDOT Pavement Management System

BACKGROUND OF PAVEMENT SELECTION

Pavement Prediction Model

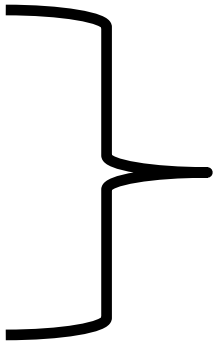


Deduct Value Curves



Where Does Noise Fit?

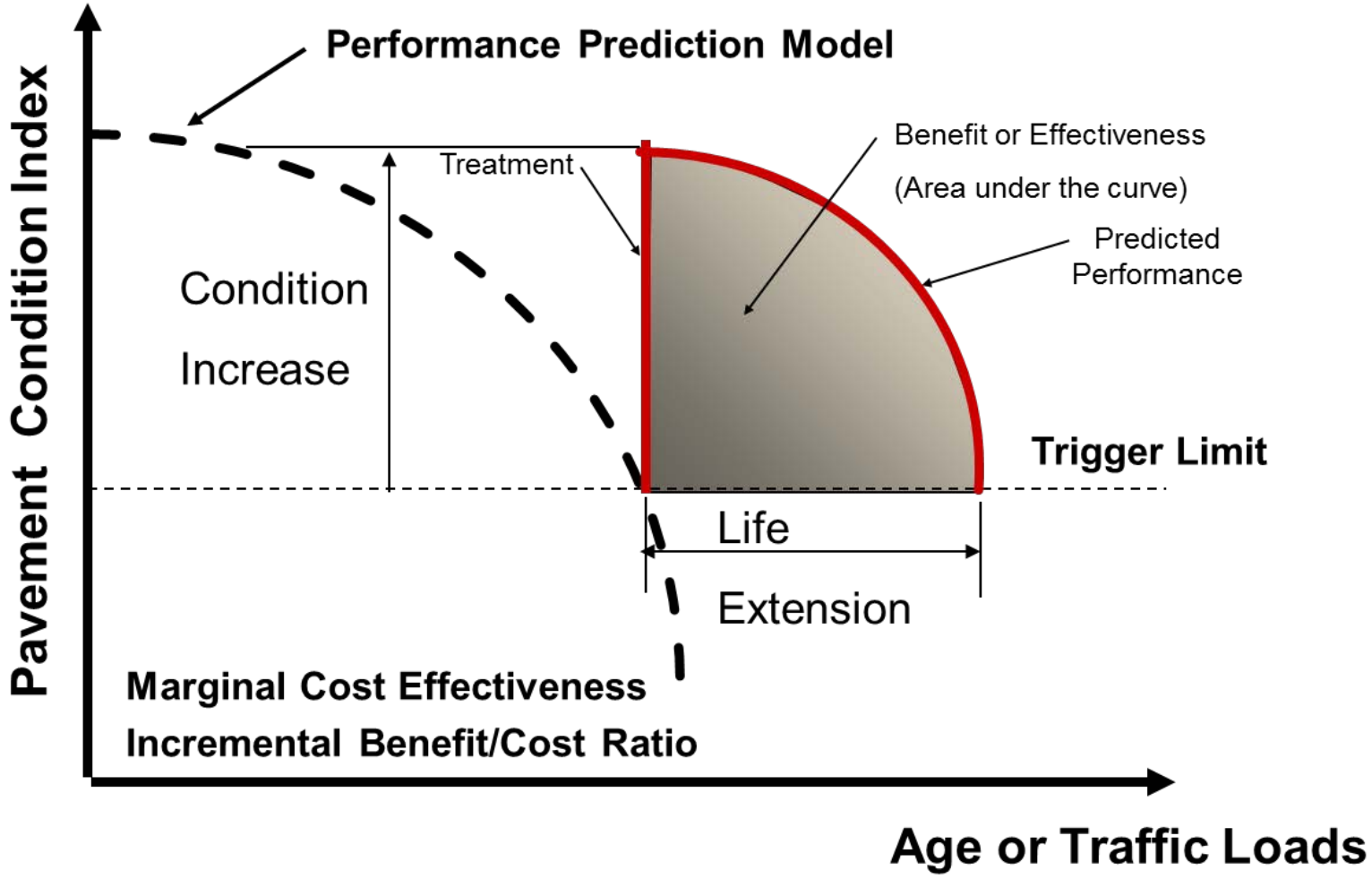
- State Pavement Management System (PMS) Evaluates
  - PCI
  - IRI (Ride Quality)



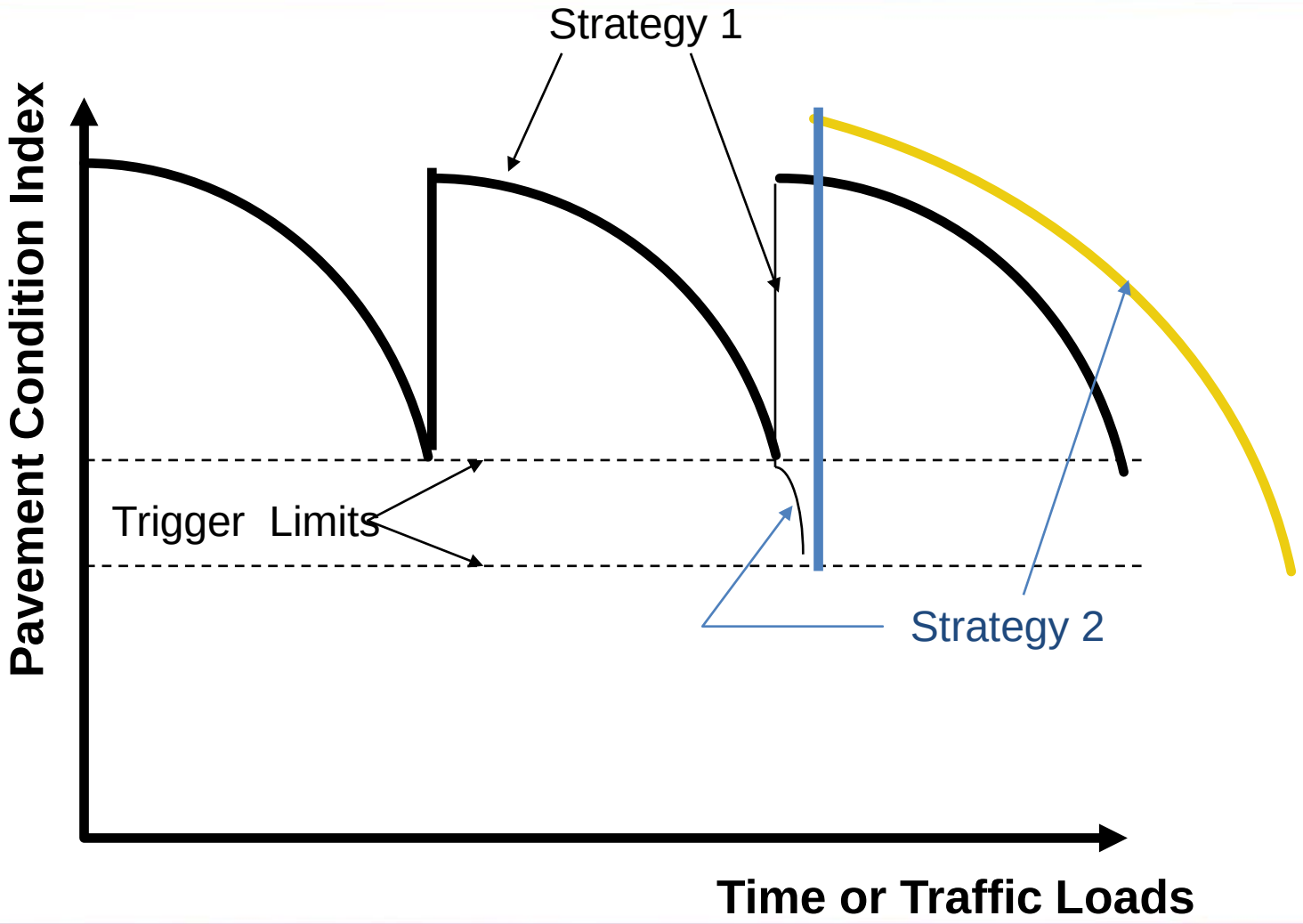
Overall Condition Index (OCI)

  - Texture
  - Skid (Friction)
  - Noise

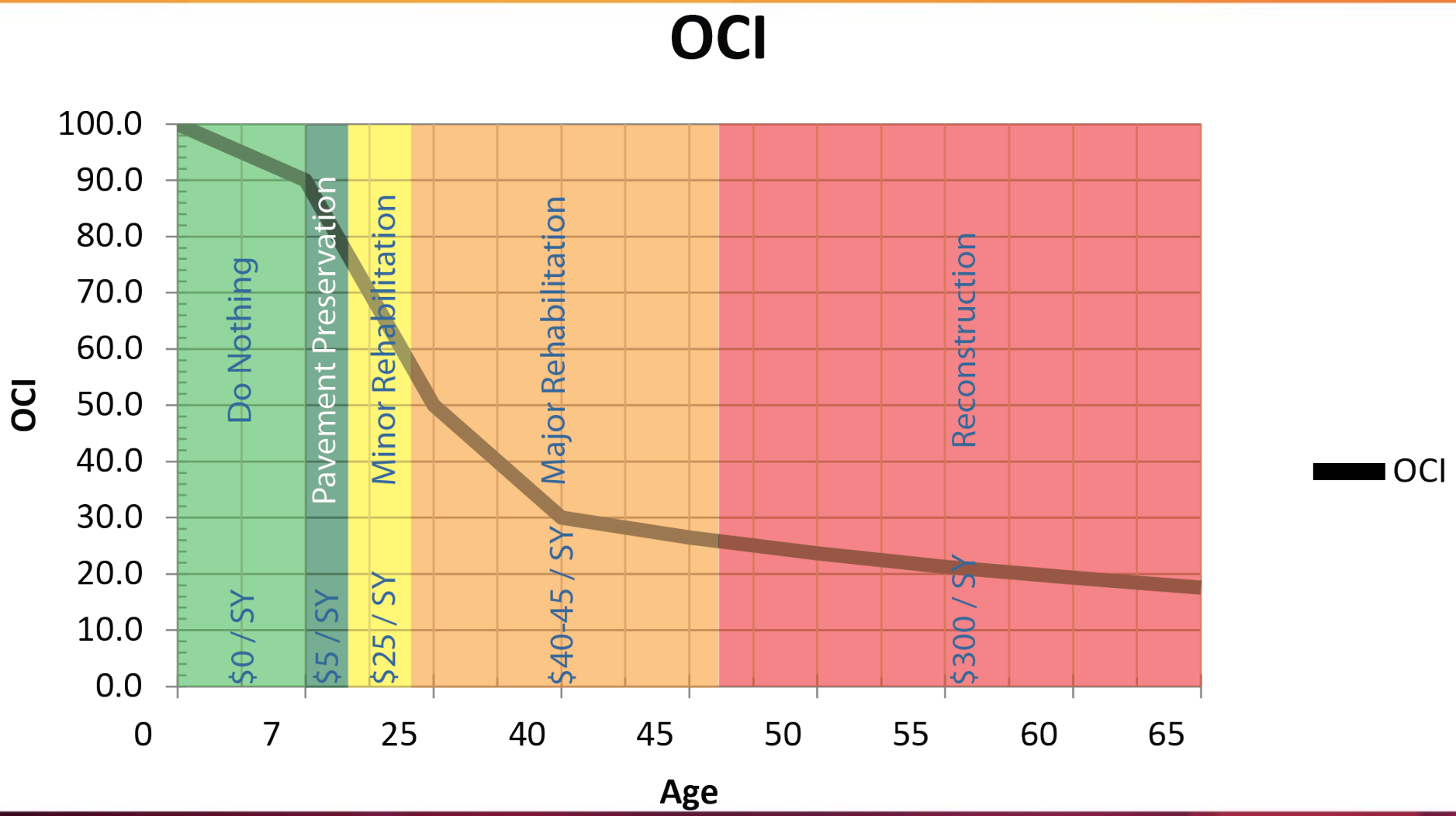
Performance Prediction Model



Selecting a Treatment Strategy (Prevention or Maintenance)



Overall Condition vs. Cost of Maintenance Strategies



Asphalt Pavement Design Uses

Structural Overlay

- HMA Asphalt Pavement
- Rutting Resistance
- Fatigue Resistance
- Crack Resistance

- **Load-Associated Structural Design**

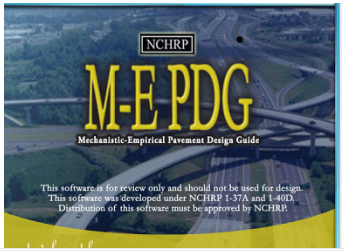
Functional Overlay

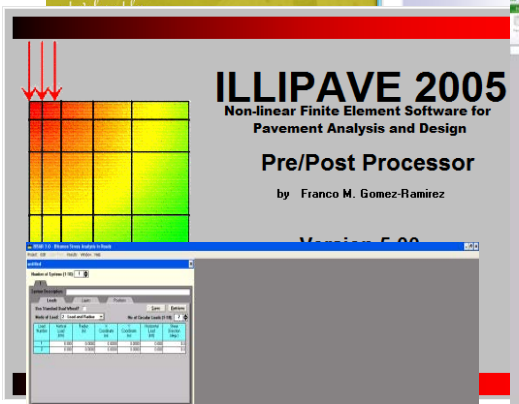
- Preventive Maintenance
- Noise Reduction
- Splash and Spray Reduction
- Increased Skid Resistance

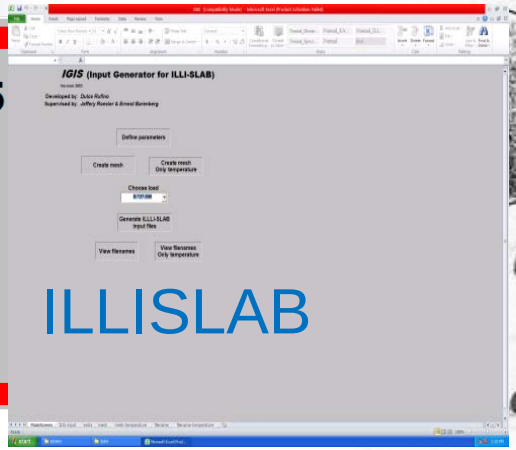
- **No Present Guidelines**

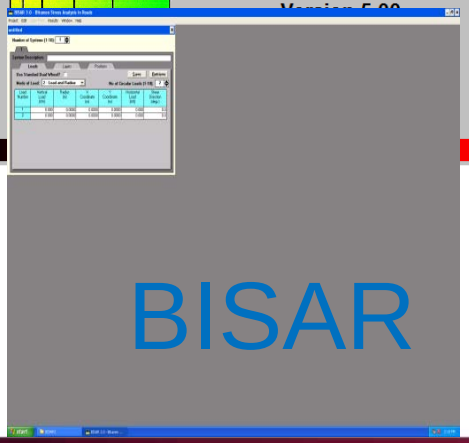
Pavement Selection Process

- Structural









- Functional

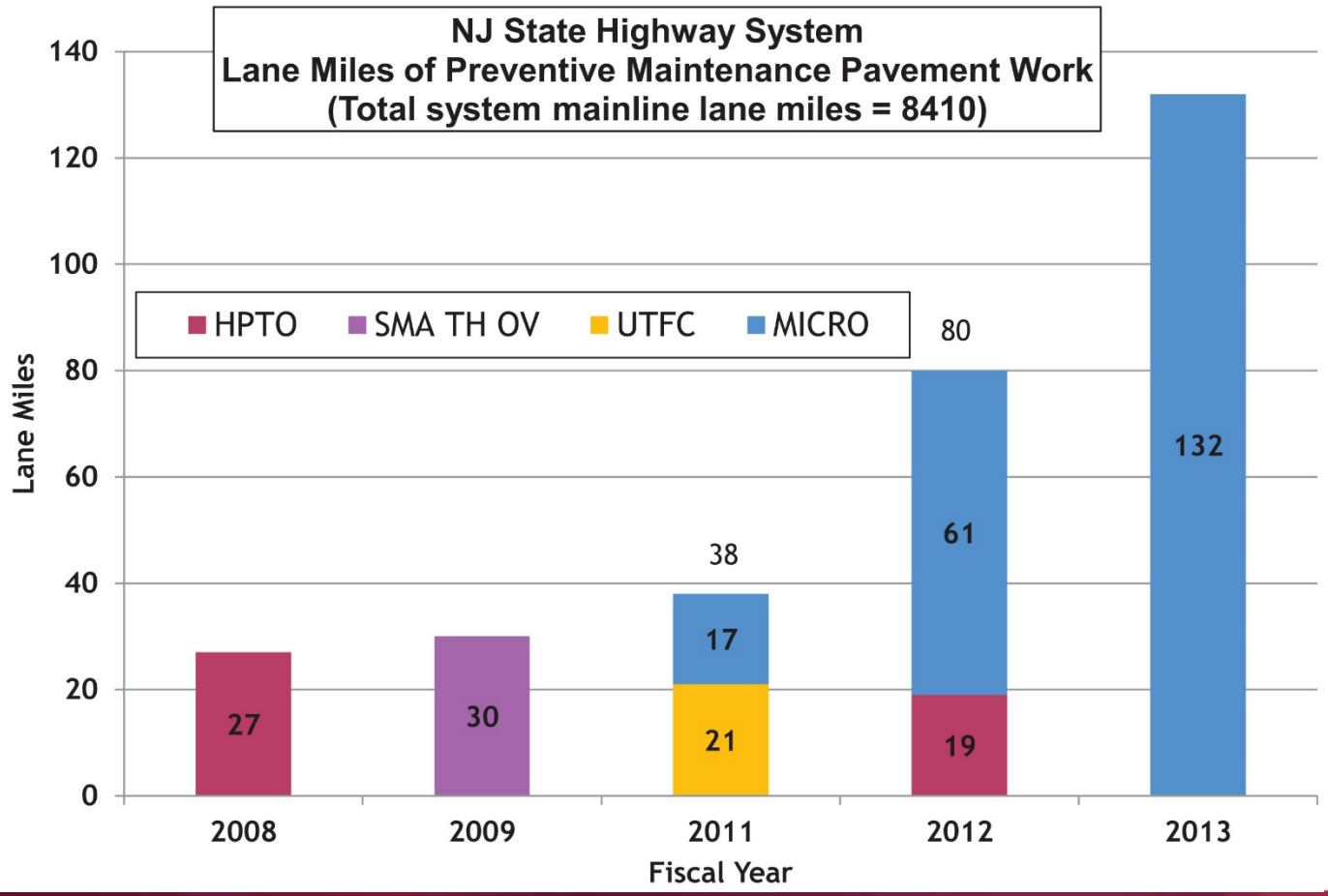
Pavement Preservation Surfaces

Abbreviated List- Pavement Preservation Surfaces

- **Micro-Surface**
- Novachip
- Cape Seal
- AROGFC
- Sandwich Seal
- Chip Seal
- High Performance Thin Overlay (HPTO)
- Sand Seal
- Fog Seal
- Crack Seal

Pavement Preservation Use in NJ

NJ PREVENTIVE MAINTENANCE



Summary of Benefits of Pavement Preservation

- **Financial Incentive**
  - **Less time for construction**
  - **Less manpower for construction**
  - **Less engineering/design costs and testing***
  - **Less materials**

- **Elevated Public Acceptance**
  - **Less time lanes are closed to paving operations**
  - **More “new and improved” surfaces to drive on**
  - **Sense of entitlement for having freshly paved roads**
  - **Less complaints about potholes/roughness**

INTRODUCTION TO MICRO-SURFACE

Micro-Surface

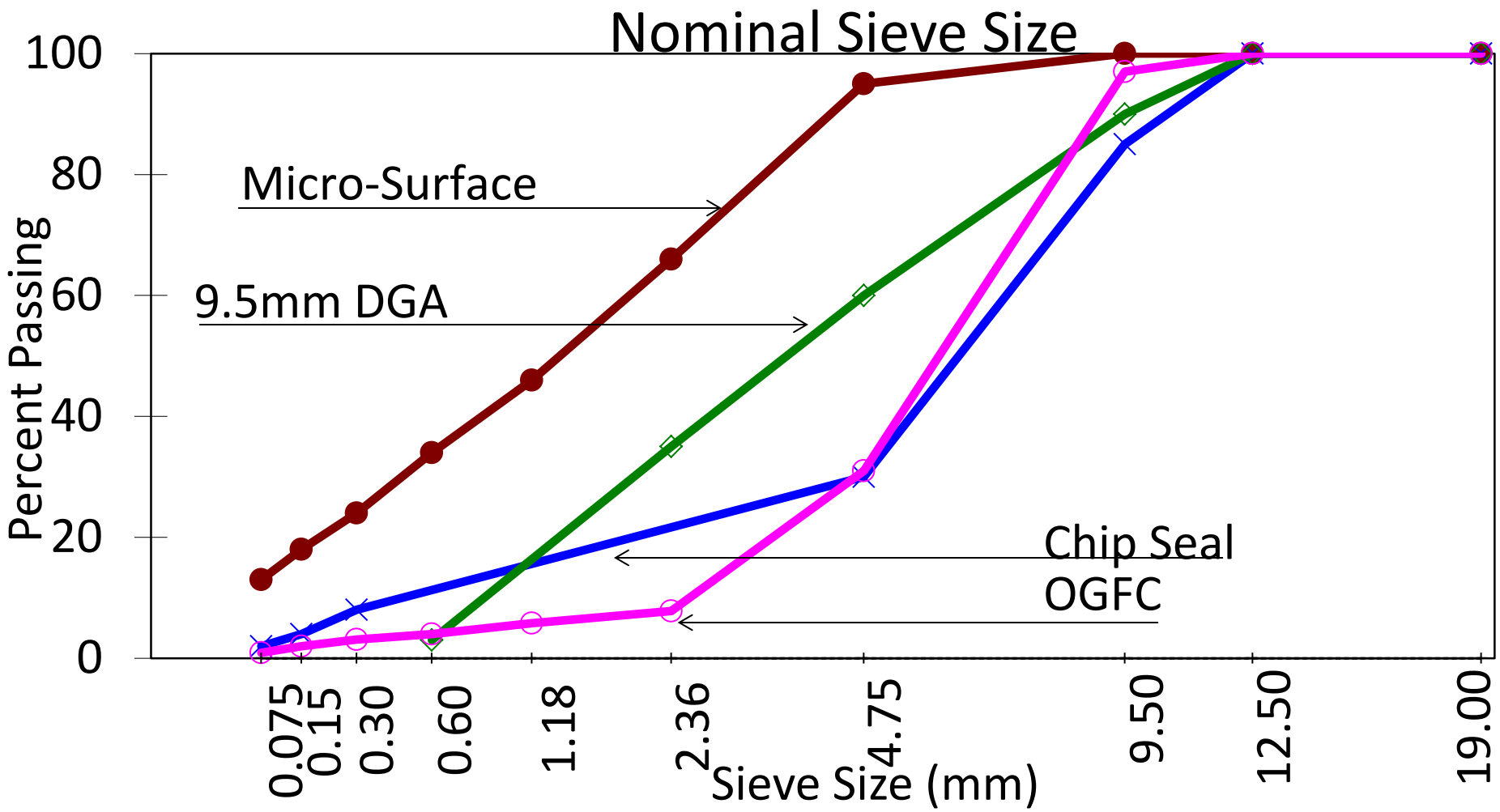
Components/Design:

- Polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, properly proportioned mixed and spread on a pavement.

Micro-Surface Paving Process

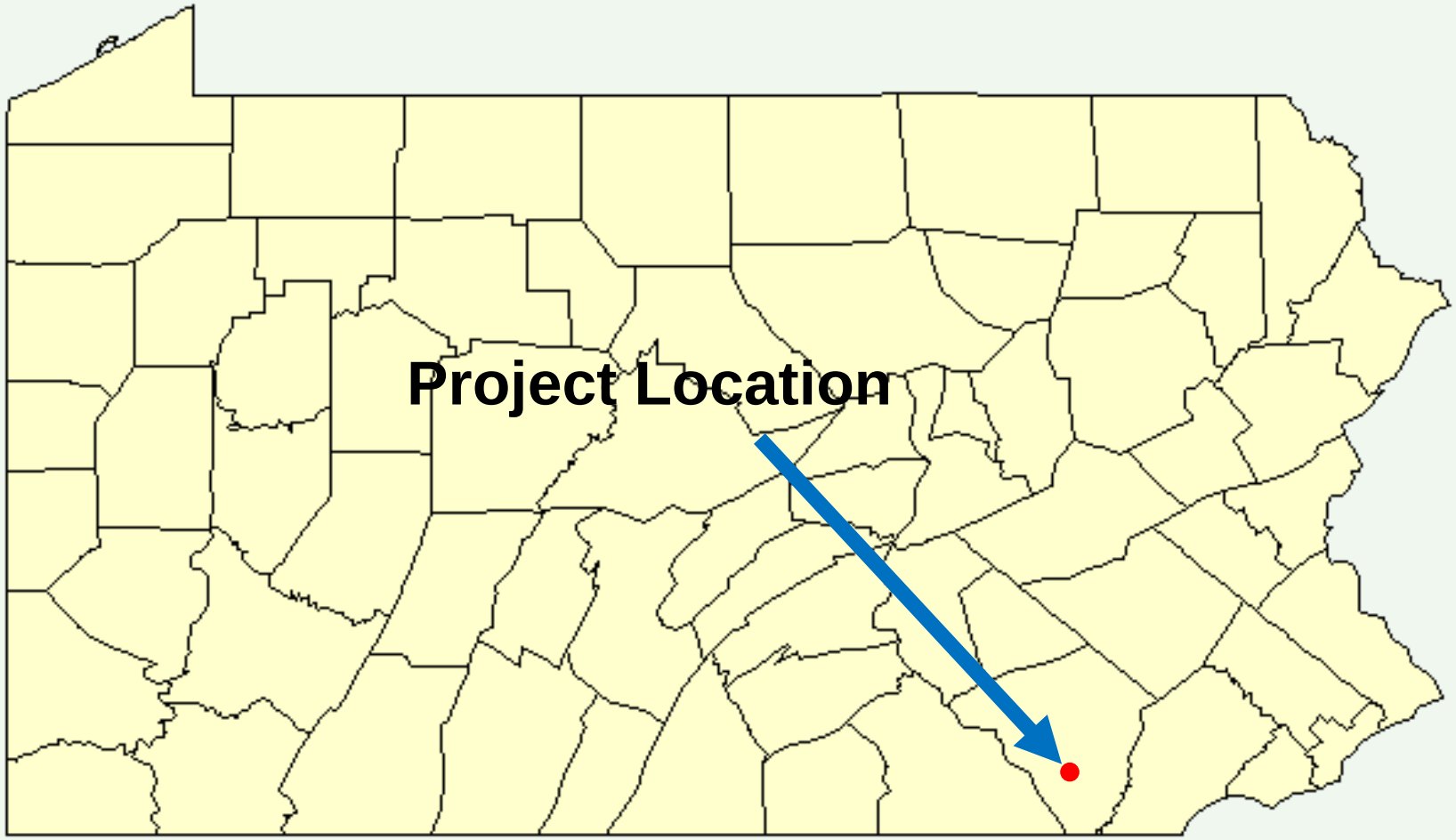
Source: http://www.asphaltpavingsystems.com/

Micro-Surface Gradation



FLEXIBLE MICRO-SURFACE PROJECT DESCRIPTION

Project Opportunity for Noise Testing in PA



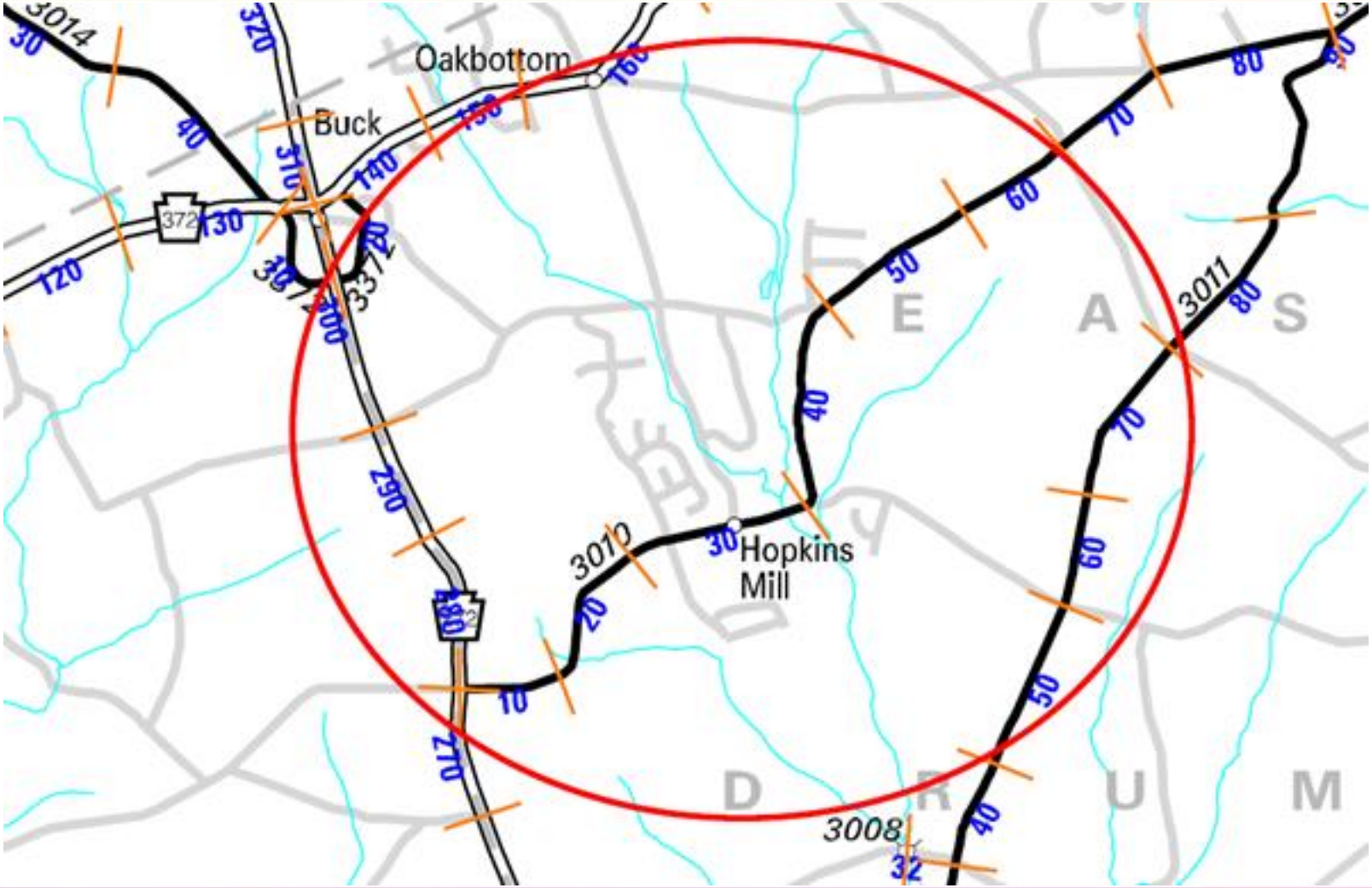
Original Road Surface- Good Candidate for PA Trial Project

Project Characteristics

- History
  - 1934 – Original (type unknown) wearing course
  - 1975 – New base course
  - 1978 – 2” (50.8mm) wearing course
  - 1999 – 4’ (1.2m) widening each side 1 inch (25mm) depth
  - 2000 – ¾” (19mm) leveling and 1” (25mm) asphalt overlay
  - 2013 – Micro-surface project

  - 2013 Micro-surface project
    - 45 MPH (72.4 km/h) minor arterial
    - Design Speed – 50 mph (80.5 km/h)
    - ADT – 1347 (2013) AND 1660 (2033 projected)
    - Truck Traffic – 9% throughout

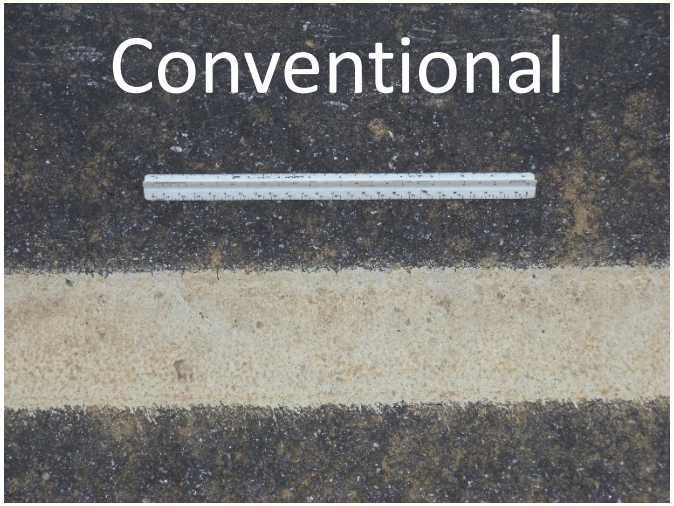
4 Test Sections Selected and Paved in 2013

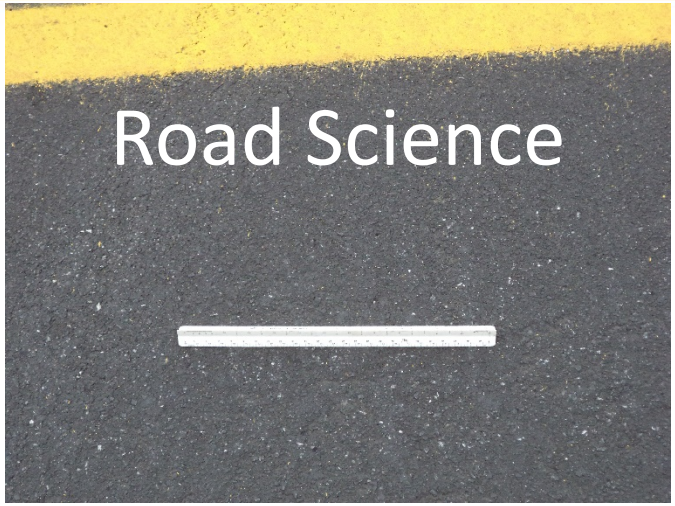


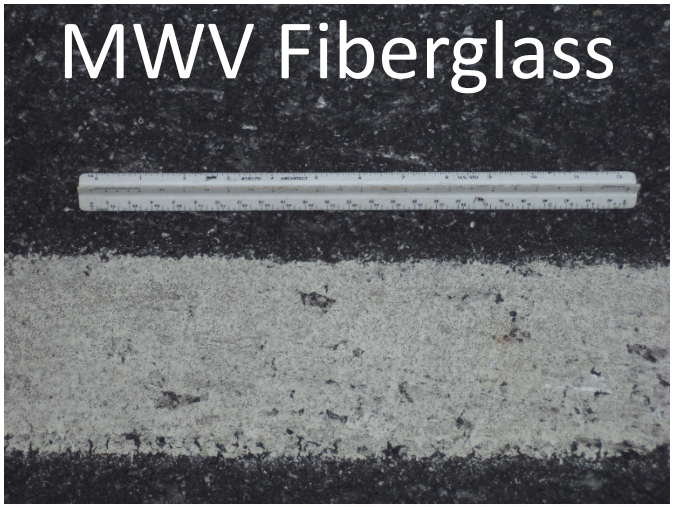
Micro-surface Types Utilized

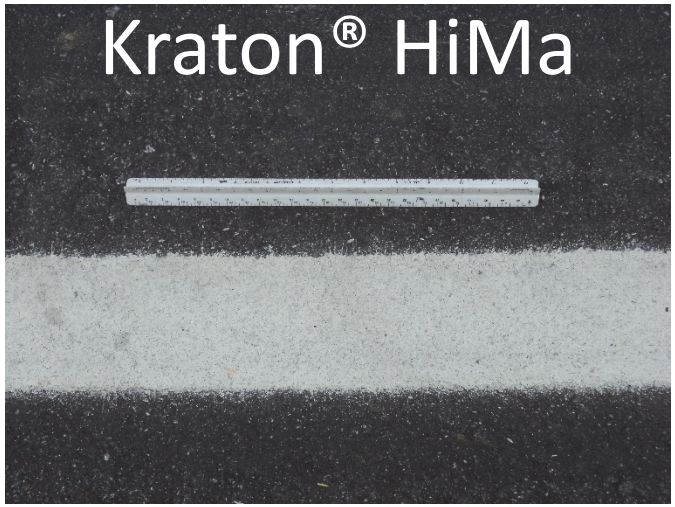
- **PA Conventional**
  - Standard Type II Micro-surface
- **Kraton® HiMA**
  - Type II with a polymer modified binder
- **Road Science**
  - Type II with rubber modified binder
- **MWV Fiberglass**
  - Type II with fiberglass strands

Close-Ups









OBSI Testing

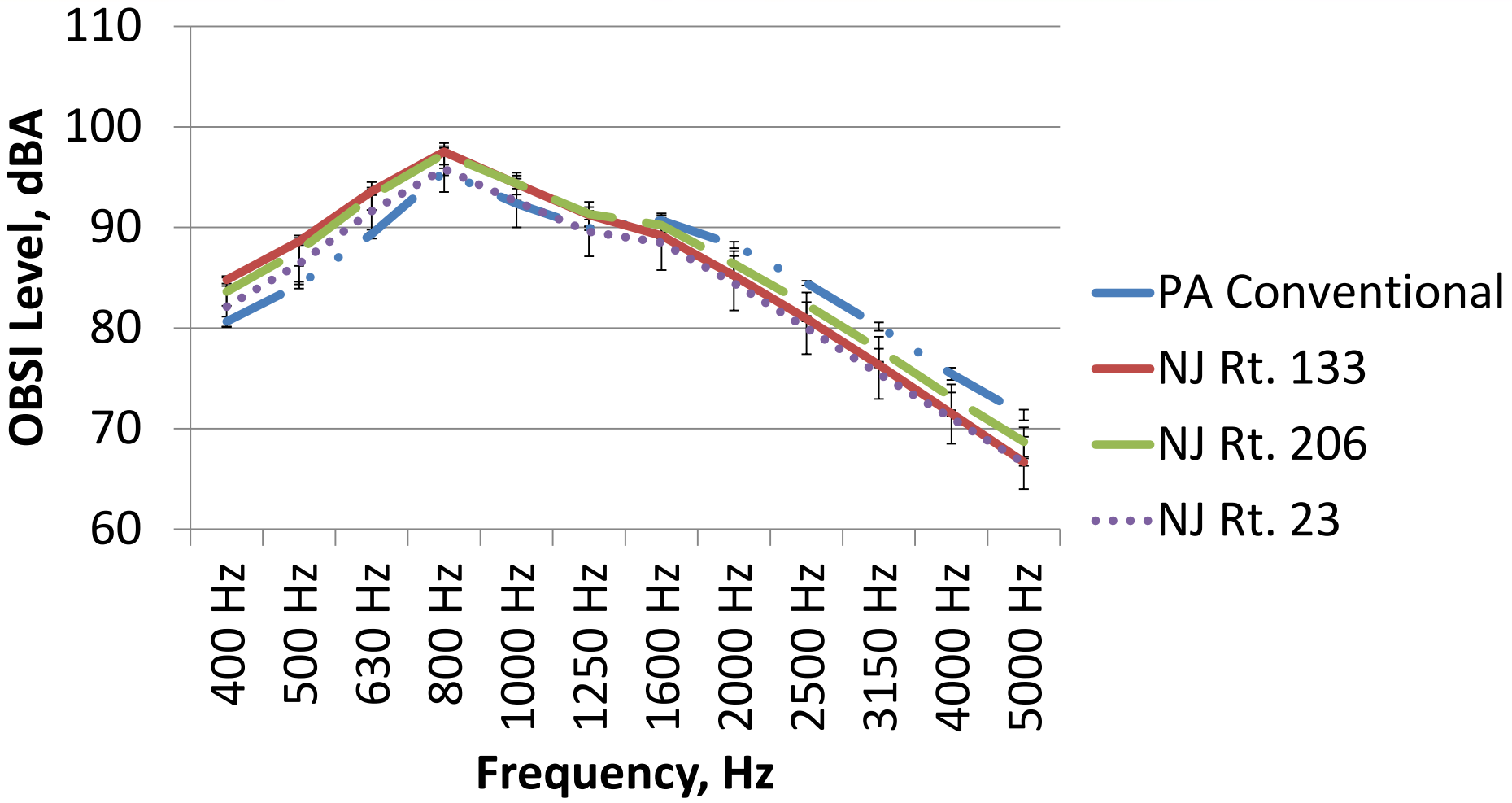

SPEED LIMIT 45
SR 3010
60
IMPALA
New Jersey
SG29920
STATE GOVT

MICRO-SURFACE OBSI NOISE RESULTS

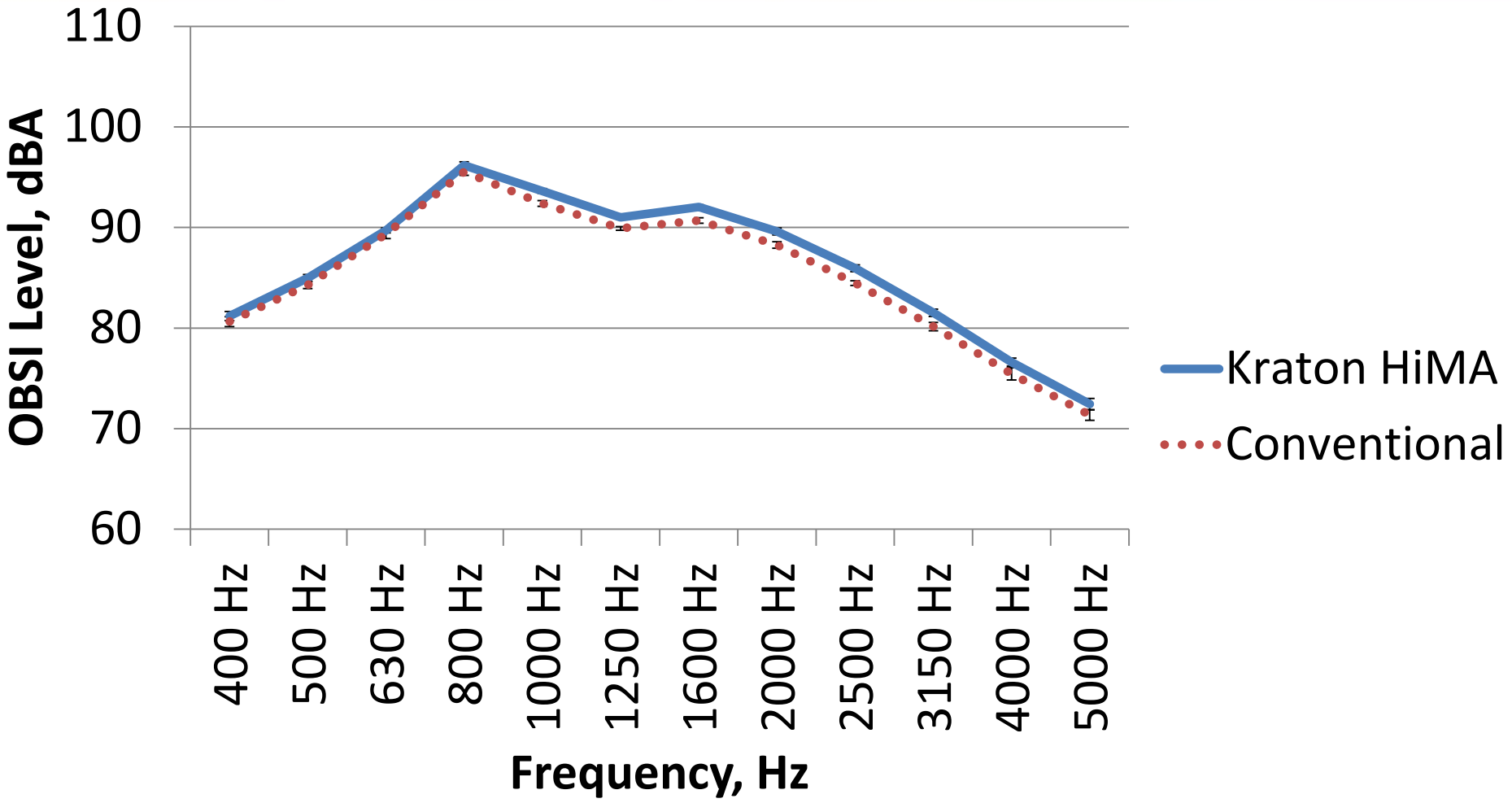
Results

Material	dBA	St Dev
Kraton HiMa	100.89	0.18
MWV Fiberglass	100.03	0.14
Road Science	100.77	0.18
PA Conventional	99.95	0.21
NJ Rt. 206	101.52	1.10
NJ Rt. 133	101.58	0.36
NJ Rt. 23	99.90	2.33

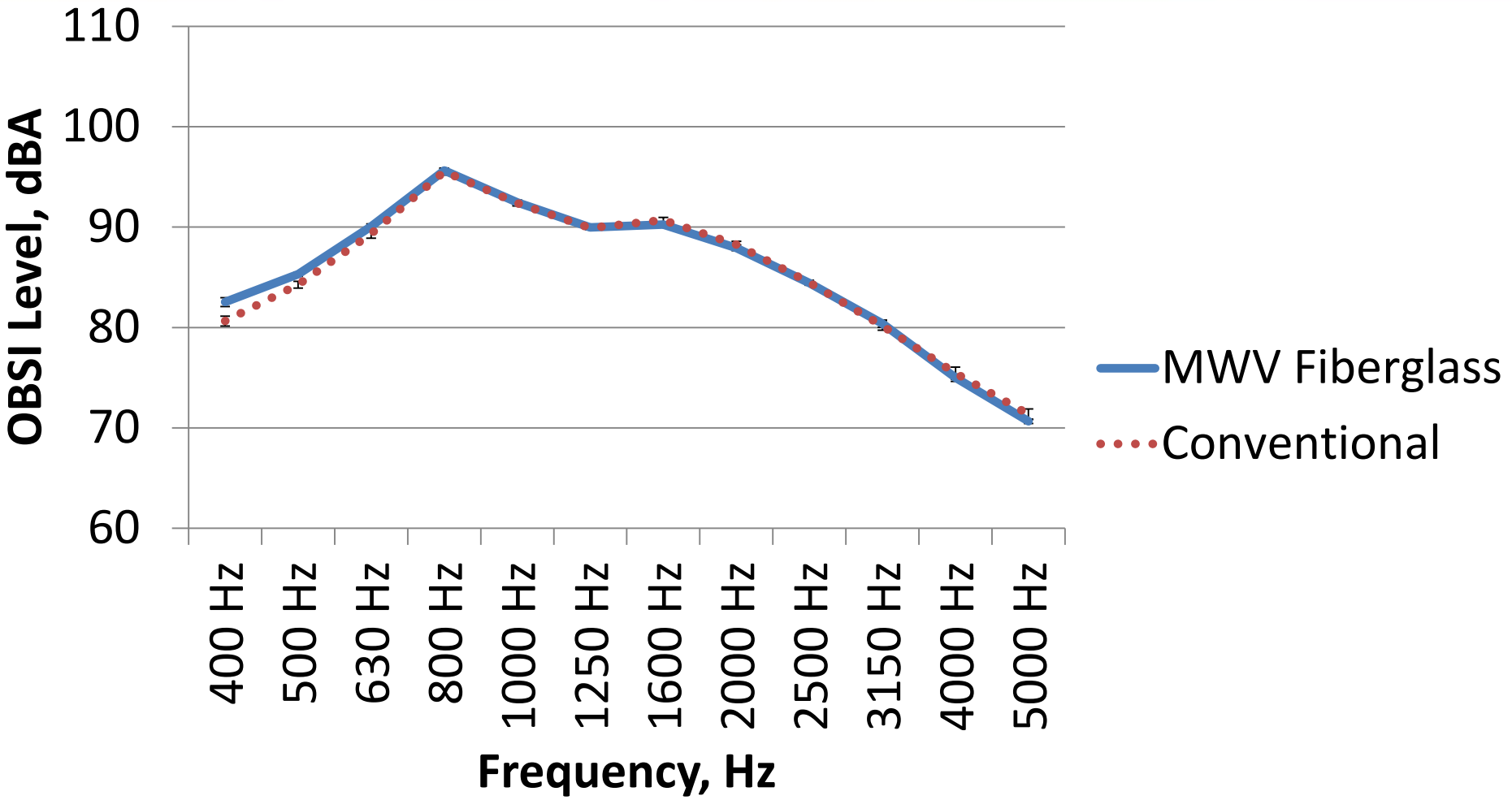
Conventional Type II Mixes NJ and PA



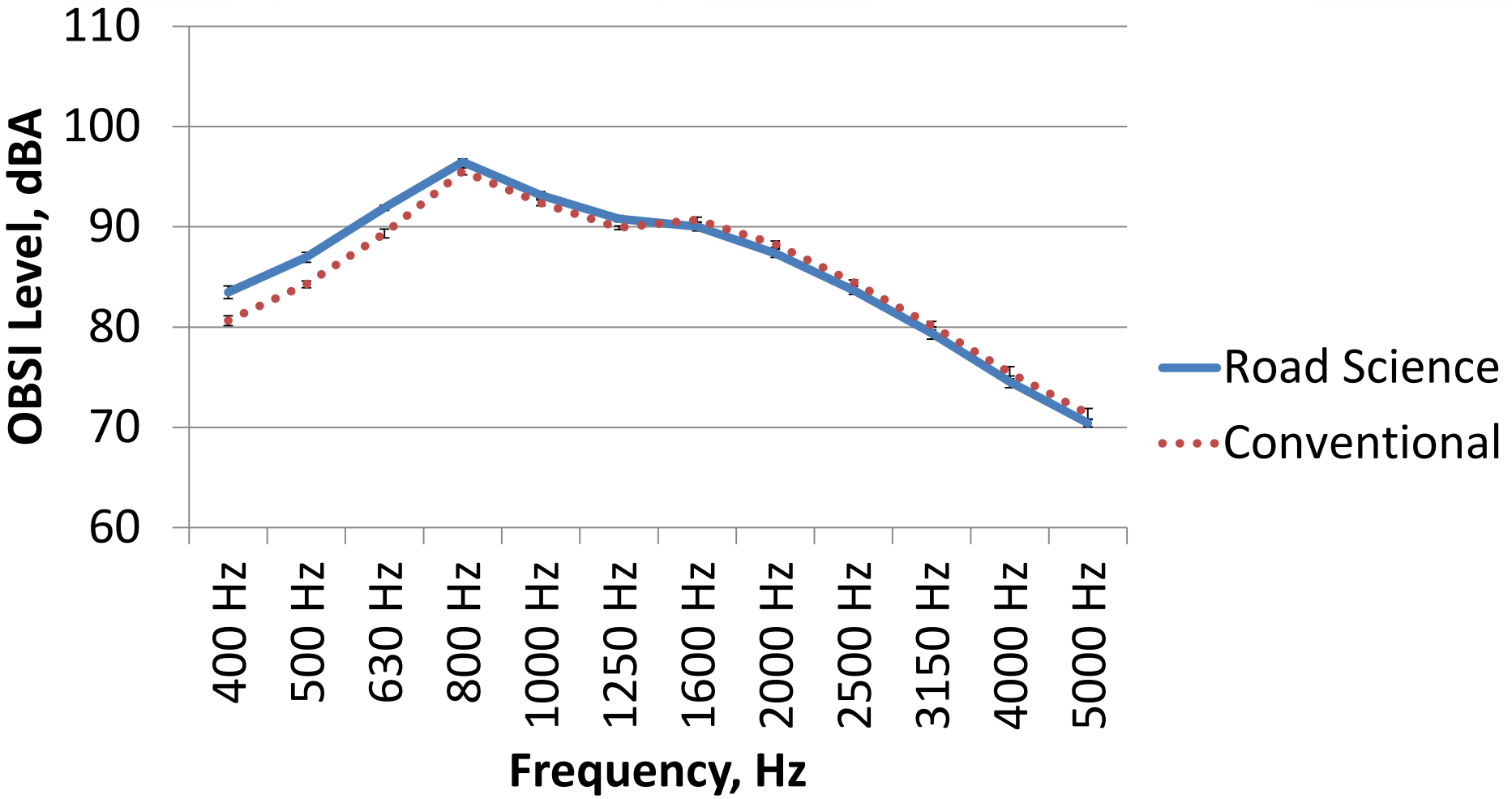
Kraton®HiMA vs. PA Conventional



MWV Fiberglass vs. PA Conventional



Road Science vs. PA Conventional



CONCLUSIONS

Summary

- Financial benefits to utilizing functional overlays are significant.
- Every micro-surface mix tested so far has been fairly similar.
- Each of the micro-surface mixes tested so far (both NJ and PA) have been loud compared to other conventional NJ functional pavements.
- The NJDOT is increasing the amount of Pavement Preservation Surfaces but the current standard mix is a loud alternative to some of the other functional overlays or even conventional mixes.

Conclusions

- The PA conventional Type II mix was quieter than the NJ mix from 400 Hz to 1250 Hz but louder in the high frequencies, which could be related to different construction techniques or different aggregate source properties.
- MWV Fiberglass and Road Science were louder in the low frequencies which is likely due to positive macro-texture created from the additives used in the mix which slightly changed the surface during construction.
- Kraton® HiMA was louder than the Conventional micro-surface, notably from 800-5000 Hz, which indicates that it was a smoother pavement surface.
- Not enough of a notable benefit noticed from the initial noise quality of the flexible micro-surfaces to suggest utilizing them in NJ. Longevity of the mixes has not been tested yet to determine if there were either noise or pavement quality benefits over the lifespan compared to standard NJ mixes.

Contact Information

John Hencken
Research Engineer
Center for Advanced Infrastructure and Transportation (CAIT)

100 Brett Road
Piscataway, NJ 08854

732.445.7938 – office
908.872.8051 – cell
jhenck57@rci.rutgers.edu