

# 2010 Northeast & Mid-Atlantic States In-Place Recycling Conference

West Virginia Department of Transportation

David Maner, Pavement Management Engineer  
Travis Ray, Regional Maintenance Engineer

# Demographics

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- 5000 Employees, 7 Agencies
- 36,000 Centerline Miles
- 2009 Construction Projects - 410
- \$500,000,000 Contracted

# WEST VIRGINIA

## National Highway System



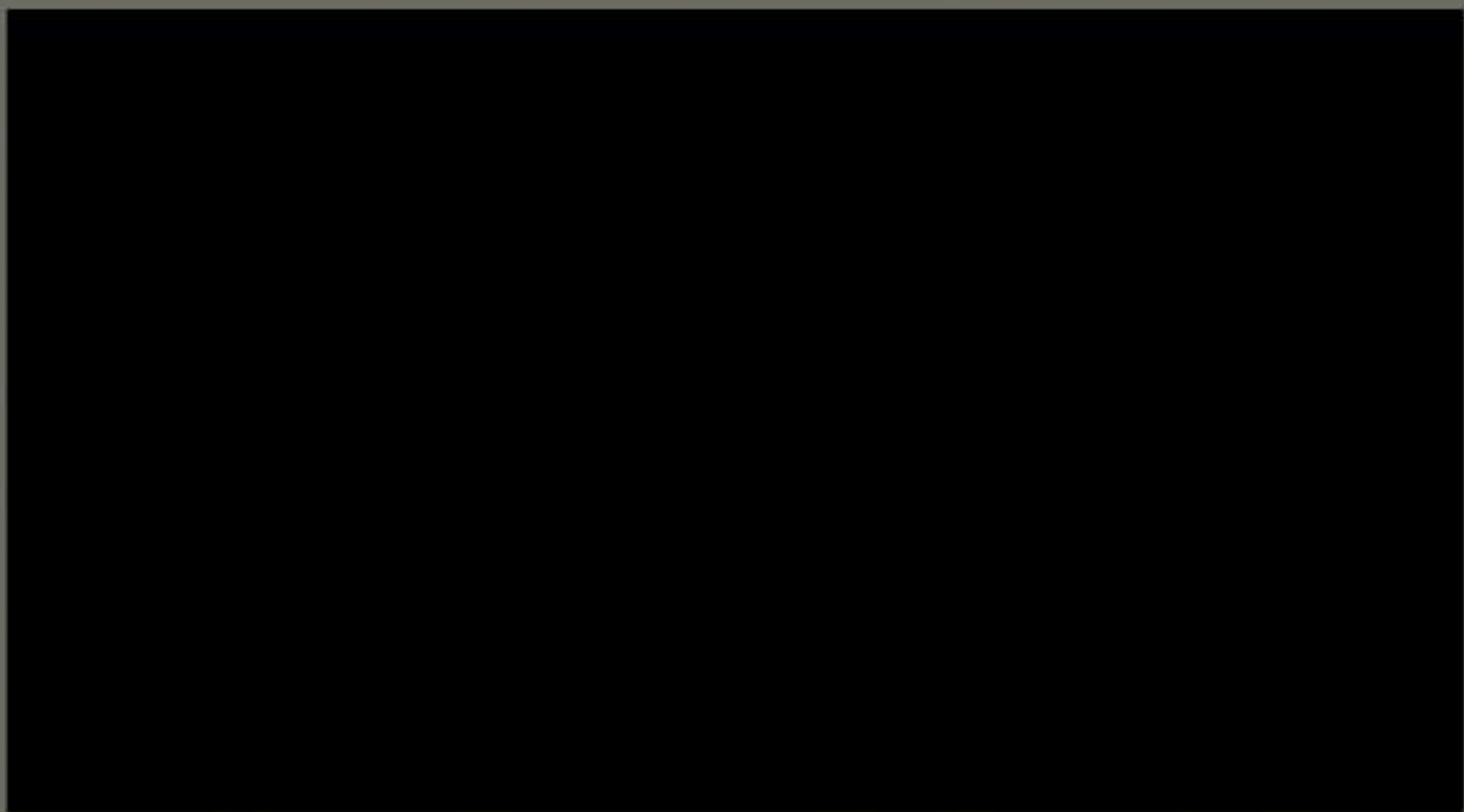
# Experience in In-Place Recycling

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# Why We Chose to Use In-Place Recycling

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# Why In-Place Recycling is not Used More in Our State





# Suggestions to the Industry

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- Contact WV DOH Management

# State Animal





# Northeast / Mid-Atlantic In-Place Recycling Conference



## Delaware Overview

Greg Hainsworth, P.E.  
Assistant Materials Engineer  
DelDOT Materials and Research

# Delaware Demographics

- DelDOT maintains 89% of the road network
- Approximately 13,400 lane miles of road
- Estimated 9.4 million vehicle miles travelled on the network (2007)
- Most Travelled Road: I-95 [174,000 Veh/day]
- 49<sup>th</sup> state by area / 45<sup>th</sup> state by population

# Delaware Pavement Management Program

- In-place recycling practices
  - FDR and CIR are predominant technology used
  - DE has no local coarse aggregate sources

Year	Centerline LF	Total \$	% Change
2008	110,970	\$6,401,324.10	-/-
2009	162,585	\$11,458,326.06	+79%
2010	90,665	\$7,872,566.48	-31%

# FDR Usage

- includes MOT, widening, shoulders, wearing surface, etc.

Year	# Locations	Centerline LF	\$ Spent	% Change
2008	8	92,770	\$4,828,505.93	-/-
2009	9	99,135	\$5,932,812.55	+23%
2010	8	82,820	\$5,253,104.18	-11%

# FDR Usage

- Design for 6-inch depth of treated material
  - Occasionally treated to 8-inches
- Typically 5% by weight Portland Cement
  - >500 psi – reflective cracking is possible
- Wearing surface options:
  - 2-inch layer of HMA
  - 2 shots of tar & chip
  - T&C followed by Micro-surface

# FDR Mix Designs

- Replication of mechanical action in a laboratory environment?





# FDR Mix Designs

**Field Core**



**Laboratory specimen**



# When does DelDOT consider FDR

- 15% of road requires patching
  - FDR is cost effective over patching
- Structure is adequate for traffic but surface is aged beyond repair
- Any ADT road, but typically used on lesser roads because there isn't enough existing pavement to use CIR

# FDR – Keys to Success

- Curing method
  - Emulsion tack coat
  - Discontinued 'wet curing' due to poor contractor execution
- Water, water, water – keep it wet, be aware of evaporation rates and target optimum %M
- Depth Control
- Stronger is not always better
  - 200 psi @ 7 days

# CIR Usage

Year	# Locations	Centerline LF	\$ Spent	% Change
2008	1	18,200	\$1,572,818.17	-/-
2009	4	63,450	\$5,525,513.51	+251%
2010	1	7,845	\$2,619,462.30	-53%

NOTE: 2010 spending is 66% greater than 2008.

# CIR Usage

- Typically 4 – inch depth
- Target 7% residual AC content
- Usually completed with a new wearing surface
  - WMA
  - $\frac{3}{4}$  - inch ultrathin overlay
  - Conventional HMA surface course

# When does DelDOT consider CIR

- Existing HMA structure to recycle without taking the entire pavement structure
- No PCC patches
- 15% of pavement requires patching
- Season of work
- Typically higher ADT roads but can be used anywhere that there is sufficient structure available
  - RT 273 – 35,000 ADT (2010)



# CIR stumbles

- Weather and season restrictions
  - % RH, average daily temperature, moist sub grade
- HMA structure available? Shoulders?
  - Cores, cores, cores
- PCC patches
- Pump calibration
- Adequate Mixing



# Obstacles to In Place recycling

- Challenges facing the DOT:
  - Competition within the industry
  - Traffic volumes
  - Seasons
  - Proper execution of the process / QC
  - Funding

# IN-PLACE RECYCLING ACTIVITIES IN NEW JERSEY

Northeast States Regional In-Place Recycling  
Conference

August 24 - 26

Harrisburg, PA



Robert Sauber  
Supervising Engineer II  
Bureau of Materials Engineering & Testing  
New Jersey Department of Transportation





## SEDIMENTARY ROCKS

## GENOZONE

■ Mesozoic  
■ Cretaceous sand, silt, clay

PALEOZOIC

■ Cambrian: limestone, sandstone

## MESOTONG

PRECAMBRIAN

Limit of late Wisconsinan glaciation

SCALE 1 (0-100) mm



## NEW JERSEY ROADWAYS

### MAINLINE MILEAGE DISTRIBUTION BY JURISDICTION

Type Roadway	Centerline (CL) Miles	Percent of Total Centerline Miles	Factor to Convert CL Mi. to Lane Mi. (if estimated)	Lane Miles of Mainline Roadway	Percent of Total Lane Miles
NJDOT Maintained Roads	2,316	6.01%	Actual	8,410	9.43%
Municipal Roads	28,539	74.00%	2	57,078	63.99%
County Roads	6,649	17.24%	3	19,947	22.36%
NJ Turnpike	149	0.39%	Actual	1,039	1.16%
Garden State Parkway	173	0.45%	Actual	1,068	1.20%
Atlantic City Expressway	46	0.12%	Actual	183	0.21%
Palisades Interstate Parkway	12	0.03%	Actual	46	0.05%
Bridge Authorities	33	0.09%	4	132	0.15%
Parks	649	1.68%	2	1,298	1.46%
<b>Total</b>	<b>38,566</b>	<b>100%</b>		<b>89,201</b>	<b>100%</b>

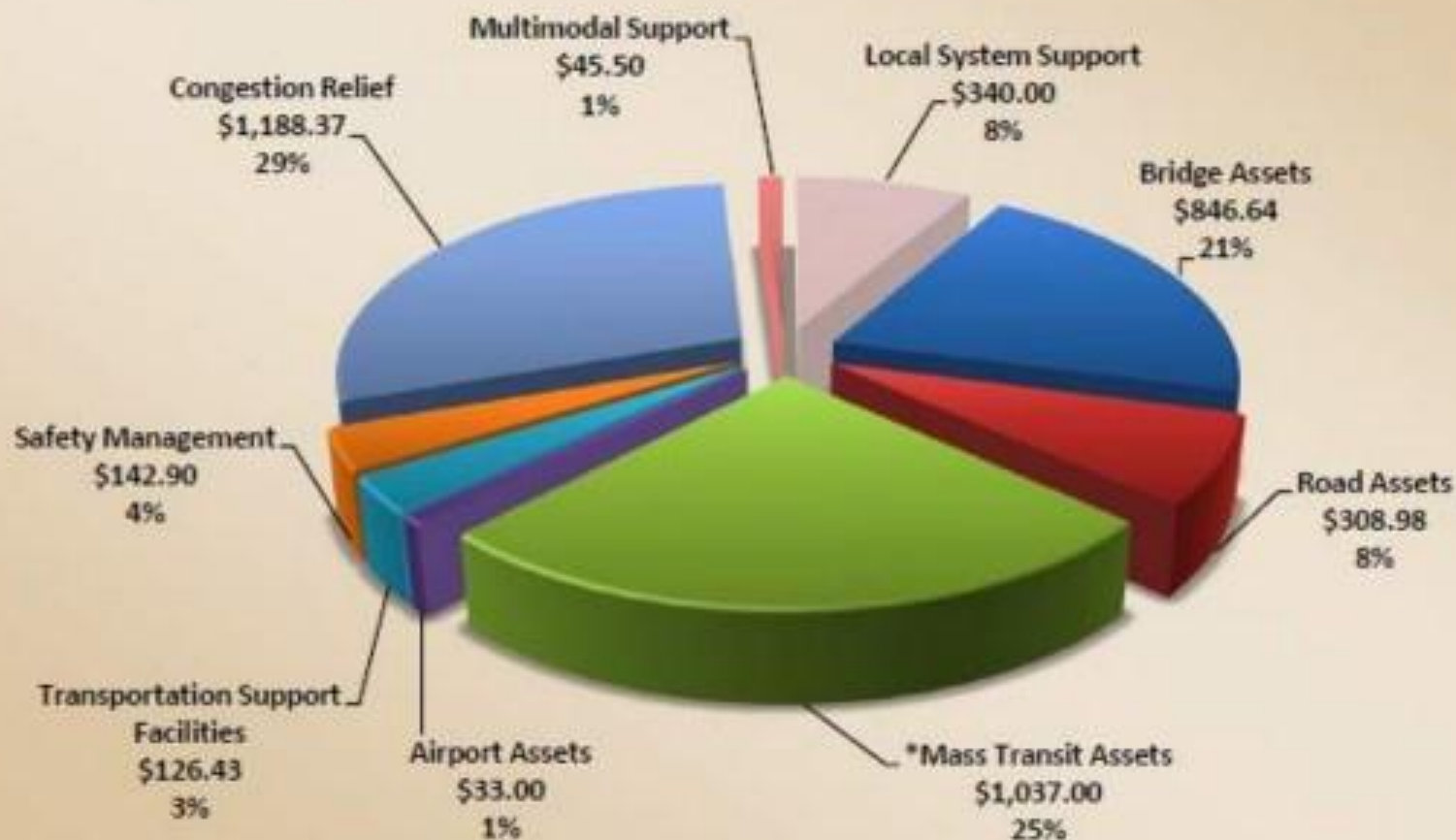
## NJ STATE MAINTAINED HIGHWAY SYSTEM

Type Roadway	Lineal Miles (Sum of both directions)	Lane Miles
Mainline Travel Lanes	4,665	8,410
Outer Shoulders (full width)	3,994	
Inner Shoulders (full width)	92	
Ramps	563	
Total	9,314	13,059



# NJDOT 2011-2020 CIS

## Annual Statewide Constrained Investment Targets \$4.1 Billion Total Millions



# NJDOT 2011-2020 CIS

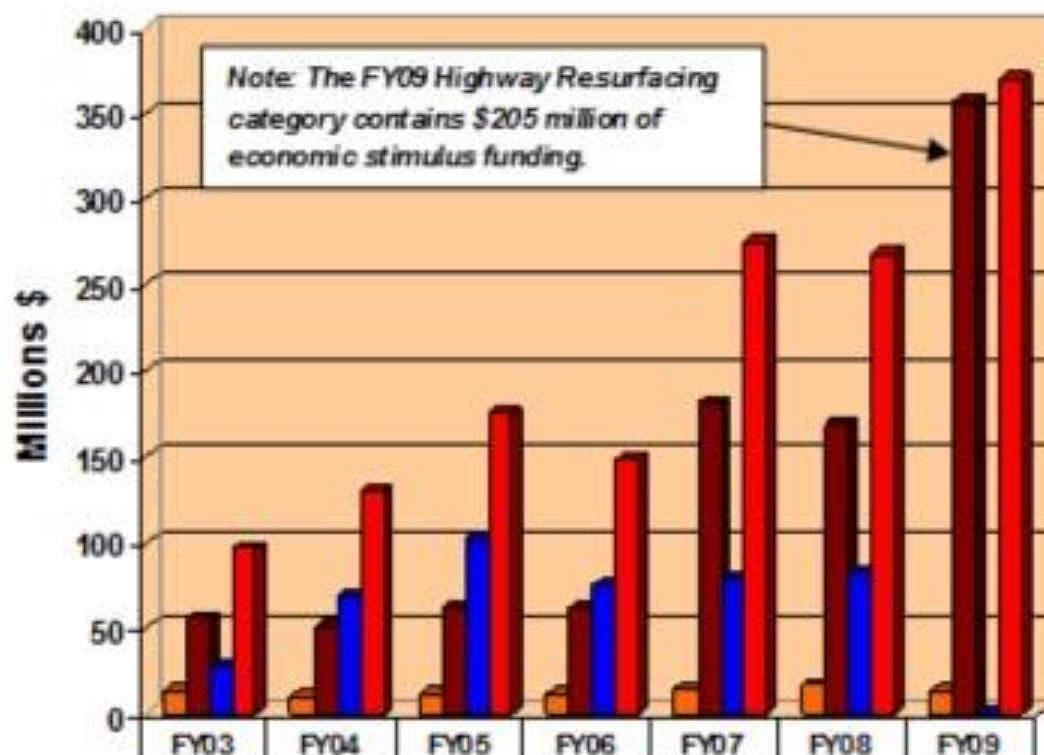
## Summary

Statewide Investment Targets (Millions)	
Categories	Recommended Constrained Investment Targets
Bridge Assets	\$846.64
Road Assets	\$308.98
Mass Transit Assets	\$1,037.00
Airport Assets	\$33.00
Transportation Support Facilities	\$126.43
Safety Management	\$142.90
Congestion Relief	\$1,188.37
Multimodal Support	\$45.50
Local System Support	\$340.00
Statewide Total	\$4,068.82



# NJDOT Pavement Funding

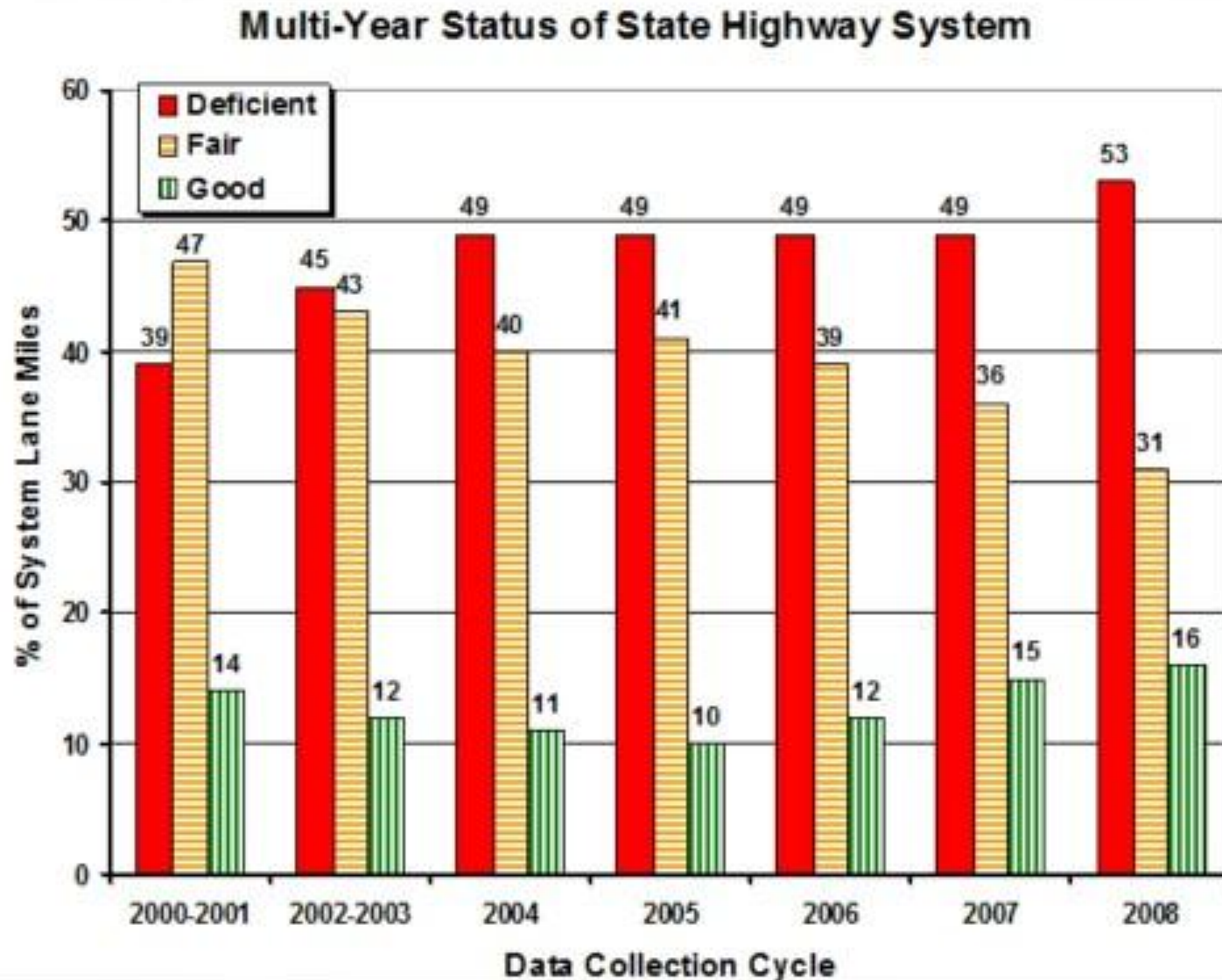
## Pavement Preservation Funding History



Highway Capital Maintenance	13.47	10.00	11.30	11.30	15.00	17.00	13.00
Highway Resurfacing	56.00	51.00	62.00	62.00	181.00	169.00	356.00
Highway Rehab and Recon	27.45	69.00	101.70	75.14	79.00	82.00	0.00
Pavement Preservation Total	96.92	130.00	175.00	148.44	275.00	268.00	369.00



# NJDOT Pavement Condition History





# NJDOT's in place recycling experience

## Rubblization

- ▣ Route I-295 Burlington & Camden County
  - Contractor: RE Pierson
- ▣ Route I-78 Essex & Union Counties (Contract A,B,C)
  - Contractor: various
- ▣ Route I-295 Gloucester County
  - Contractor: RE Pierson
- ▣ Route I-295 Burlington County
  - Contractor: H&K / Intercounty (joint venture)
- ▣ All pavements were 78' long x 12' wide, 9" thick JRCF over 12" granular subbase





# *Why Rubblization?*

## ▣ Rubblization Saves Time

- Typical rubblization process recycles one lane mile per day, with no material hauling
- 4X faster than breaking, excavating, hauling and placing DGA using traditional methods

## ▣ Rubblization Saves Money

- Approximately 50% cost savings compared to reconstruction with PCCP
- Approximately 33% cost saving compared to reconstruction with HMA

*NJ 1-78 MP 54 Sept '06*





# New Jersey Facts & Trivia

- ▣ NJDOT has approximately 3350 FTE's
- ▣ New Jersey has the highest population density in the U.S. An average 1,030 people per sq. mi., which is 13 times the national average.
- ▣ New Jersey has the highest percent urban population in the U.S. with about 90% of the people living in an urban area.
- ▣ New Jersey has the most dense system of highways and railroads in the U.S.
- ▣ New Jersey has 108 toxic waste dumps. Which is the most in any one state in the nation.
- ▣ New Jersey has the largest petroleum containment area outside of the Middle East countries.

# NJ State Animal

The horse was named the state animal in 1977. A horse's head is on the state seal symbolizing strength to New Jerseyans.



More than 7,000 horse farms and 600,000 horses owned by people in this small state. The U.S. Olympic Equestrian Team trains in New Jersey. People here also enjoy the sport of horse racing.



# In-Place Recycling in Maryland

August 24 – 26, 2010



Nate Moore, PE  
Pavement and Geotechnical Division  
Maryland State Highway Administration

August 24, 2010



# Maryland DOT Structure



MDOT

Maryland Transportation Authority (Toll)

State Highway Administration

5,175 Employees

Maryland Aviation Administration

Maryland Port Administration

Motor Vehicle Administration

23 Counties Administration

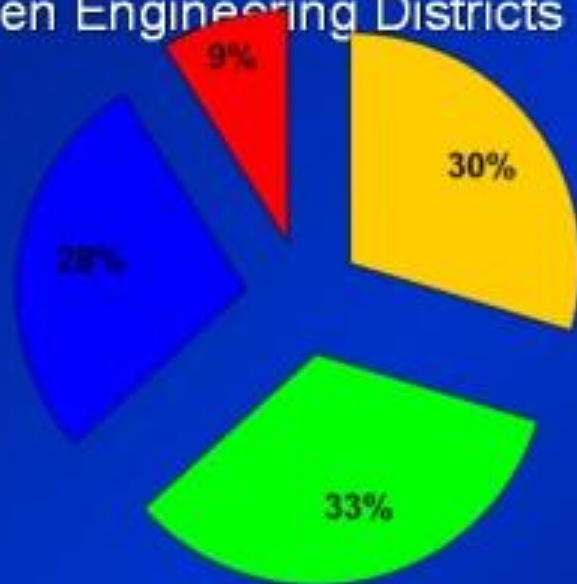
157 Municipalities



# MDSHA Pavement Network

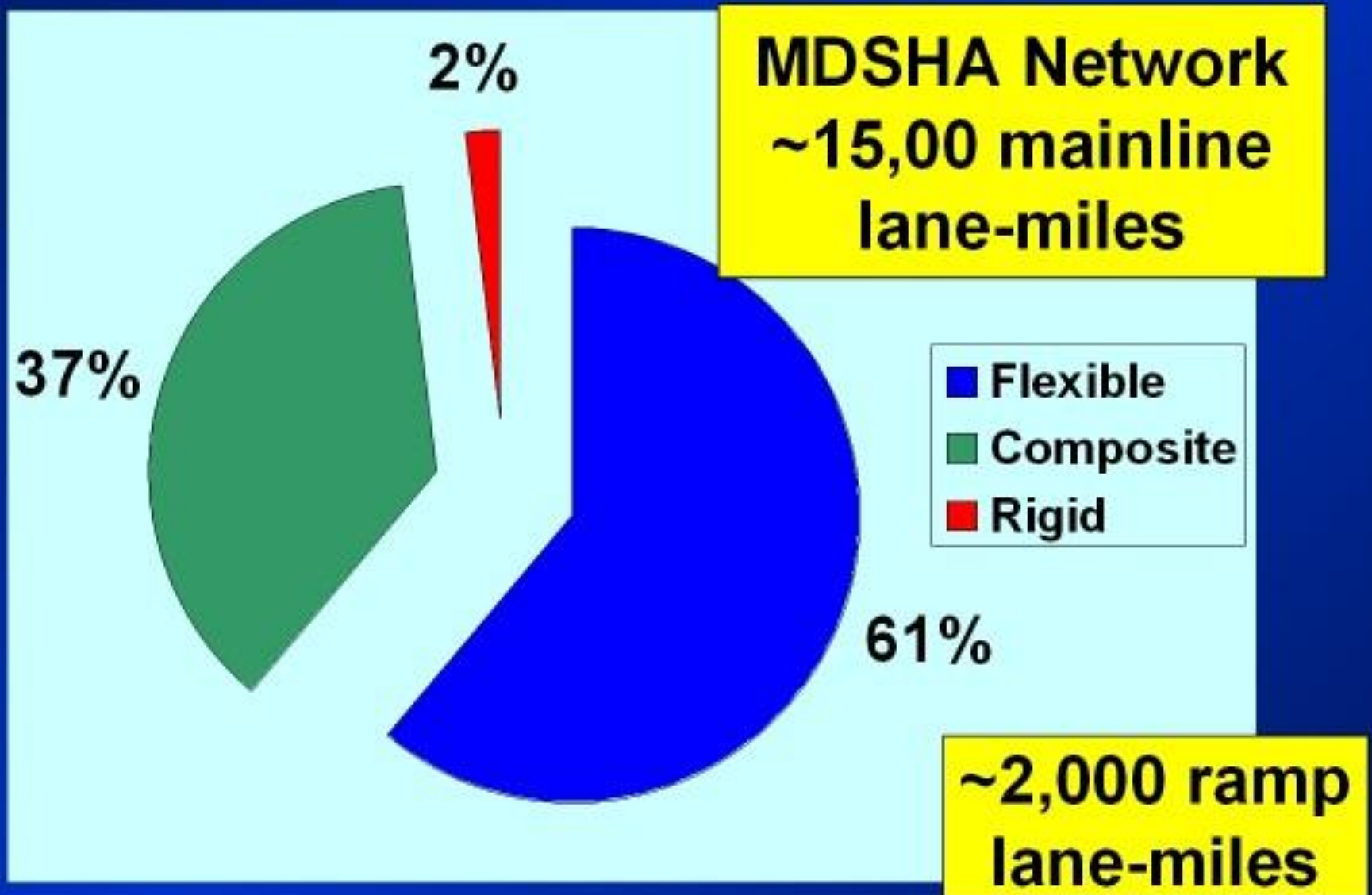
## Network Facts

17,000 lane-miles of pavement  
in the State  
Seven Engineering Districts



■ <5000   ■ 5000-20000   ■ 20000-50000   ■ >50000

# MDSHA Pavement Network





# FY 2009 Paving Projects

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- 148 System Preservation Paving Projects
- \$140M FY09 Construction Funding
- ~\$1M per project



# Maryland State Bird

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Oriole

# Maryland State Crustacean

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Maryland Blue Crab

# In-Place Recycling

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- **No Experience on MD SHA Roads**
  - One unstabilized FDR candidate being considered



- **Some County CIR Experience**
  - Baltimore County
  - Harford County
  - Frederick County



# **Obstacles to SHA In-Place Recycling**

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- **Fear of Inconvenience**
  - Maintenance of Traffic
  - Profile grade changes (drainage and bridges)
  - Aggregate in windshields
- **Lack of Familiarity**
  - No specifications
  - No design procedure
- **Lack of Connections**
  - Uncertain contractor availability
  - No scheduled industry interaction (so far)

# Conclusion/Questions

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## Contact:

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Team Leader, Pavement & Geotechnical Division

Maryland State Highway Administration

443-572-5073

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## **Virginia In-Place Pavement Recycling Overview**

August 25, 2010

**Brian Diefenderfer, PhD, PE**

Research Scientist, Virginia Transportation Research Council



## VDOT by the numbers

- **6,800 employees**
  - was 9,000+ 2 years ago
- **Maintain 126,000 lane miles**
  - 5,200 interstate, 21,300 primary
  - 18.5 miles per employee
- **Number of projects under award**
  - 50, Total Cost \$1.58 billion
- **VDOT annual budget**
  - **\$3.32 billion for FY2011**
    - \$1.3 billion maintenance
    - \$980 million highway construction

# In-Place Recycling Experience

- **3 FDR demo sites in 2008**
  - **1 site, asphalt emulsion & foamed asphalt**
    - 1.1 lane miles
  - **2 sites, portland cement**
    - 7.5 lane miles each
- **2010 and beyond**
  - 1 FDR with portland cement, completed
  - 2 contracts for CIR (emulsion) on the street
  - others?
- **Total costs to date \$8 million**

# Why VDOT Chose to Use In-Place Recycling





# Why Does VDOT Not Do More In-Place Recycling?

1. Fear of the unknown
2. Requires a change in thinking
3. Do we trust others experiences?

How are we working towards doing more?

- Research & education
  - performance of demo sites & lab specimens
  - estimate expected service-life
  - develop criteria to determine suitable locations
  - promote concept by showing what we could do

## Suggestions to Industry

1. Do we all speak the same language?
  2. Mechanistic-based testing
  3. Be careful not to oversell
    - the proof is in the pudding
- 
- In-place recycling industry has been very helpful
  - Traditional paving industry
    - looking to expand opportunities



## State Animal

- Cardinal
- American Fox Hound
- Tiger Swallowtail Butterfly
- Brook Trout



**Contact info:**

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