Recycling Trends in Regard to Sustainability

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What Is Sustainability?

- Sustainability
  - *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED 1987)*
- What comes to mind?
  - Reuse
  - Recycle
  - Retire
- Be Mindful of:
  - Environmental Impact
  - Cost
  - Performance



Source: FHWA

Sustainability and Pavement Construction

- Where does RAP go?

- Reuse into HMA
- Shoulder Materials
- Fill Material
- Landfill



- Are we capturing maximum value?

Why Pavement Recycling?

Innovation – Quality - Service

- Additional tools in the road construction toolbox
  - FDR: Full Depth Reclamation
  - CIR: Cold In-Place Recycling
  - CCPR: Cold Central Plant Recycling

- Using less resources, proven construction methods

- Engineered processes, engineered technology



RoadResource.org

Pavement Recycling Processes

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Full Depth Reclamation (FDR) Typical Depth: 5 - 12 inches Stabilizer: Emulsified/ Foamed Asphalt or Portland Cement	Cold In-place Recycle (CIR) Typical Depth: 3 – 5 inches Stabilizer: Emulsified/ Foamed Asphalt	Cold Central Plant Recycle (CCPR) Typical Depth: 3 - 6 inches Stabilizer: Emulsified/ Foamed Asphalt
Agency Usage: - Alternate to Reconstruction	Agency Usage: - Alternate to Deeper Mill and Fill	Agency Usage: - Structural Base Layer

Keys for Successful Recycle Projects

- Right road, right time, right treatment
  - Process Selection
- Utilize Engineered Process
  - Project Scoping
  - Pavement Design
  - Stabilizer Selection
  - Mix Design
  - Quality Control



Cold In-place Recycling

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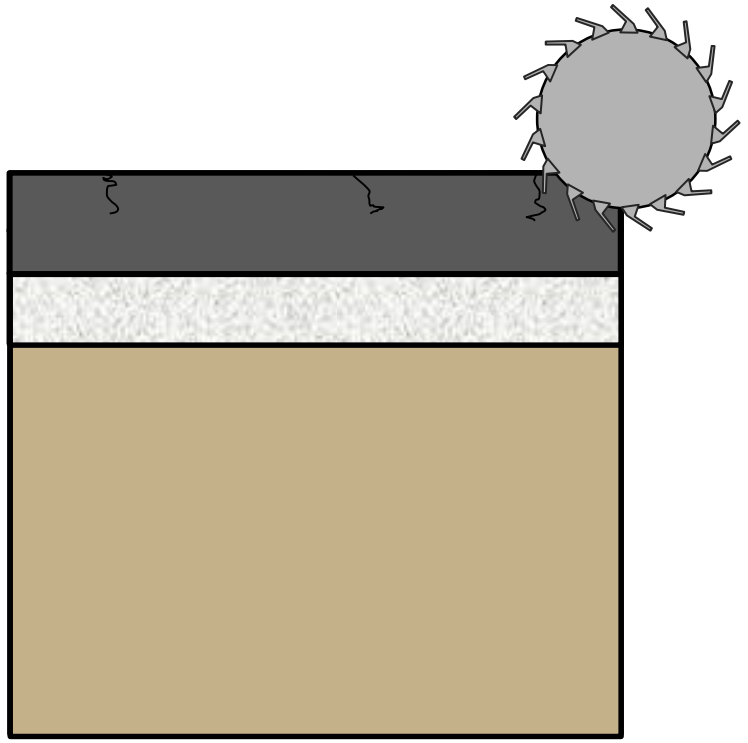

CIR Operation

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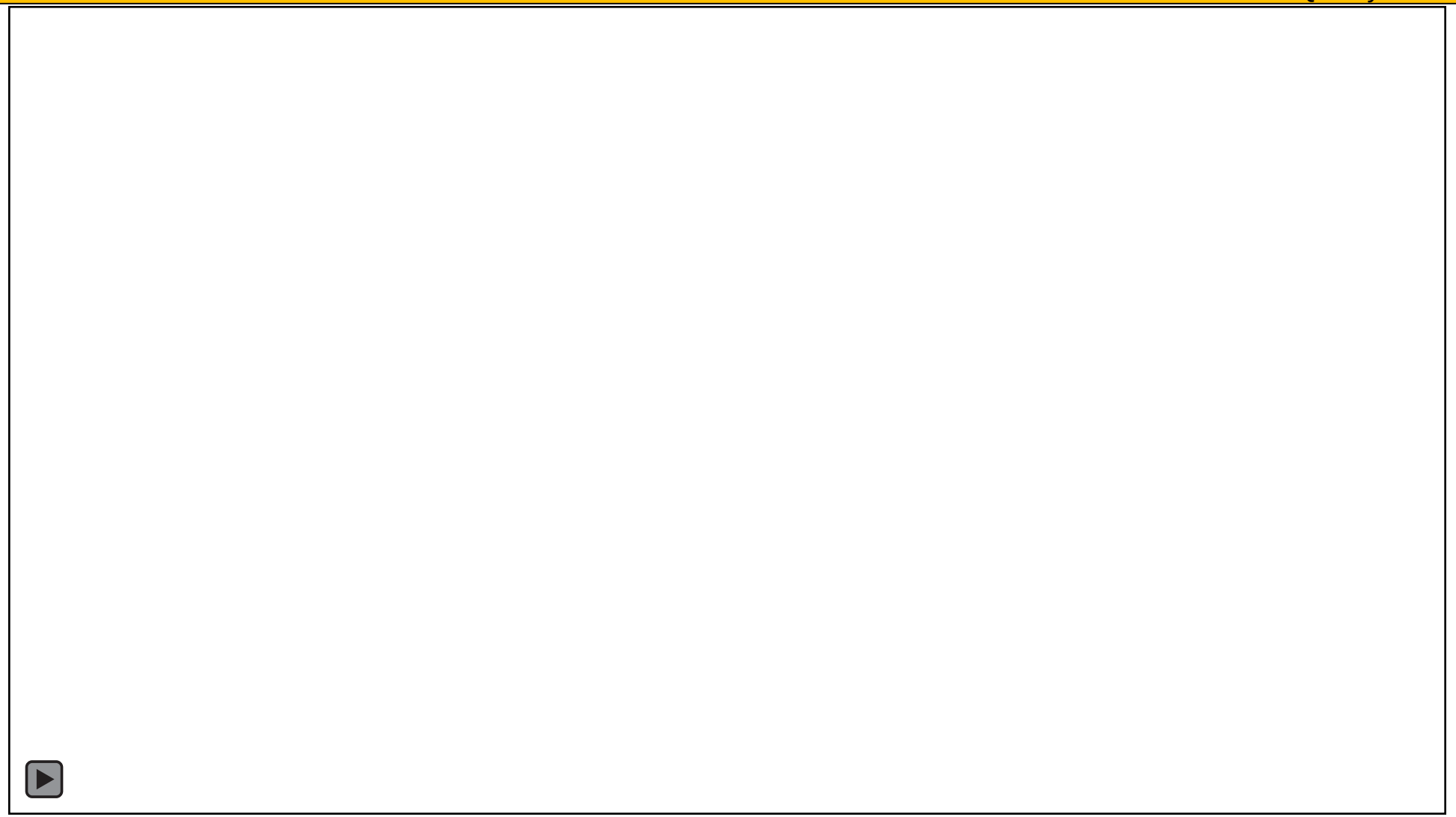

WV DOH – Ravenswood SR 2

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- 4 Lane Divided Highway
- 65/45 mph zone
- Driving Lane impassable
  - Emergency 1.25 inch inlay
- Composite Pavement
- 64k sq. yds of CIR
- Constructed in 2015



WV DOH – Ravenswood SR 2

Innovation – Quality - Service



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Cold Central Plant Recycling

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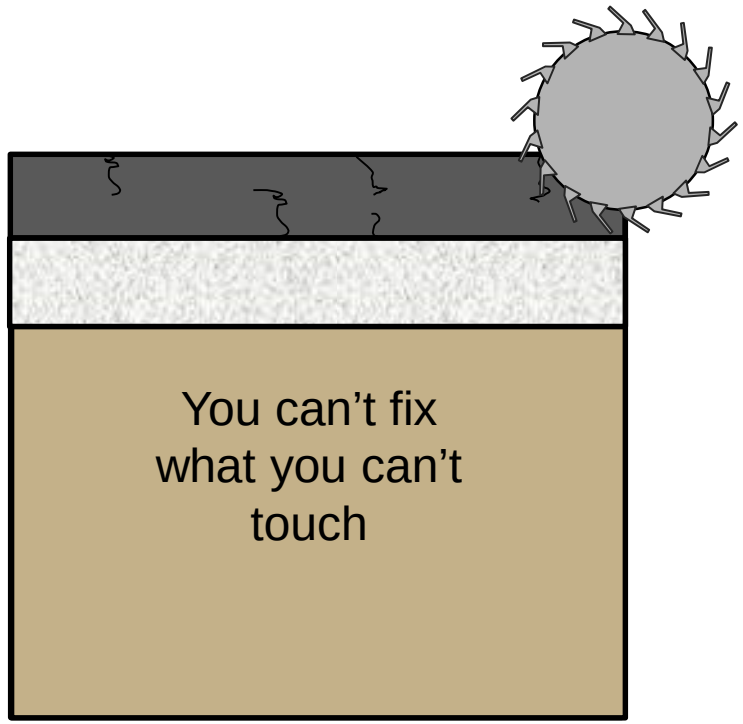




Stockpile at
“Central Plant”

CCPR Case Study: INDOT SR 101

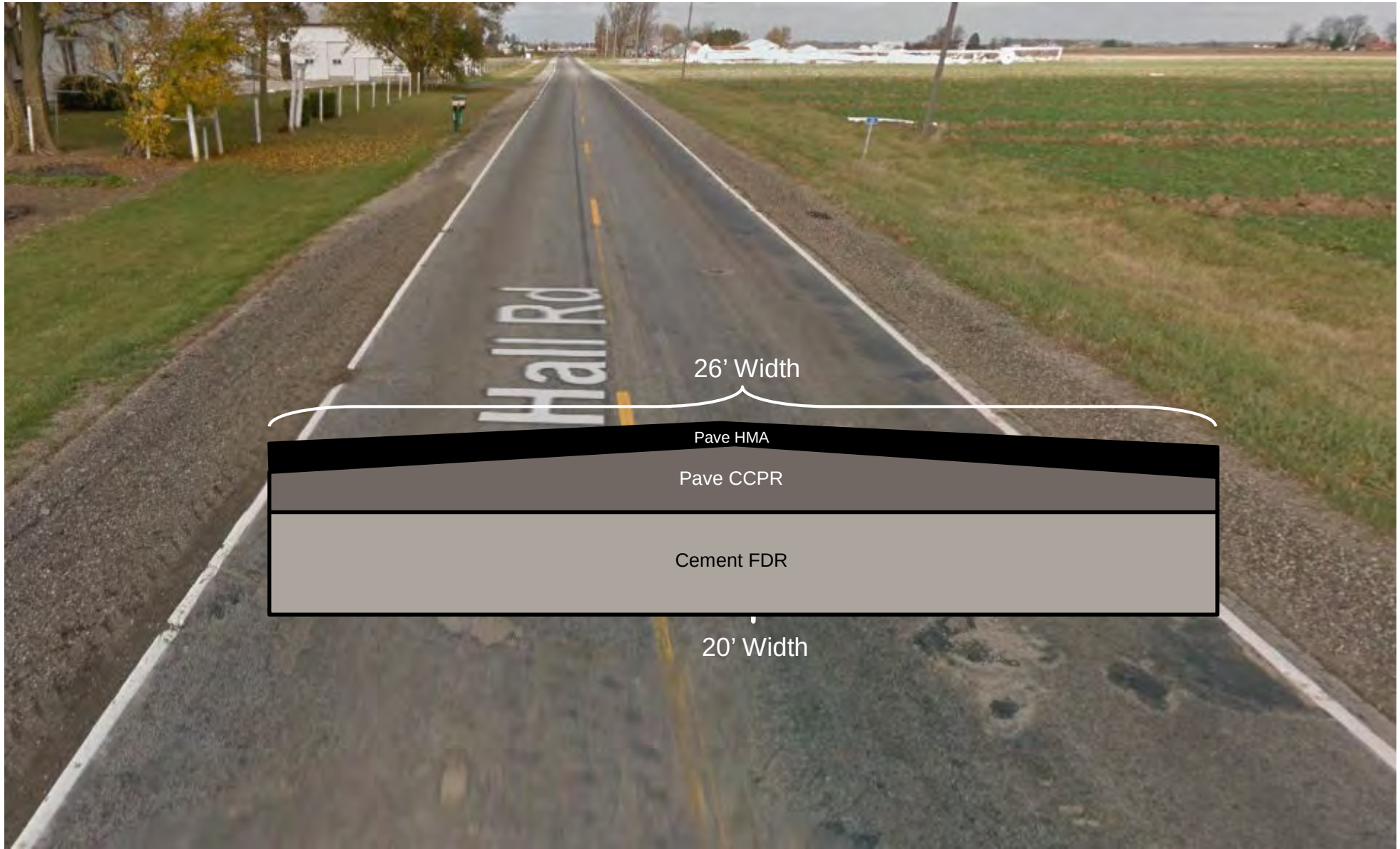
Innovation – Quality - Service

- Project Background
  - 8 Miles in Length
  - Major Collector NE of Fort Wayne
  - HMA over aggregate base over low strength subgrade
  - Narrow travel lanes
- Proposed Solution
  - Widen pavement
    - Safety
  - Increase subgrade strength
  - Combination of recycling techniques



CCPR Case Study: INDOT SR 101

Innovation – Quality - Service



CCPR Case Study: INDOT SR 101

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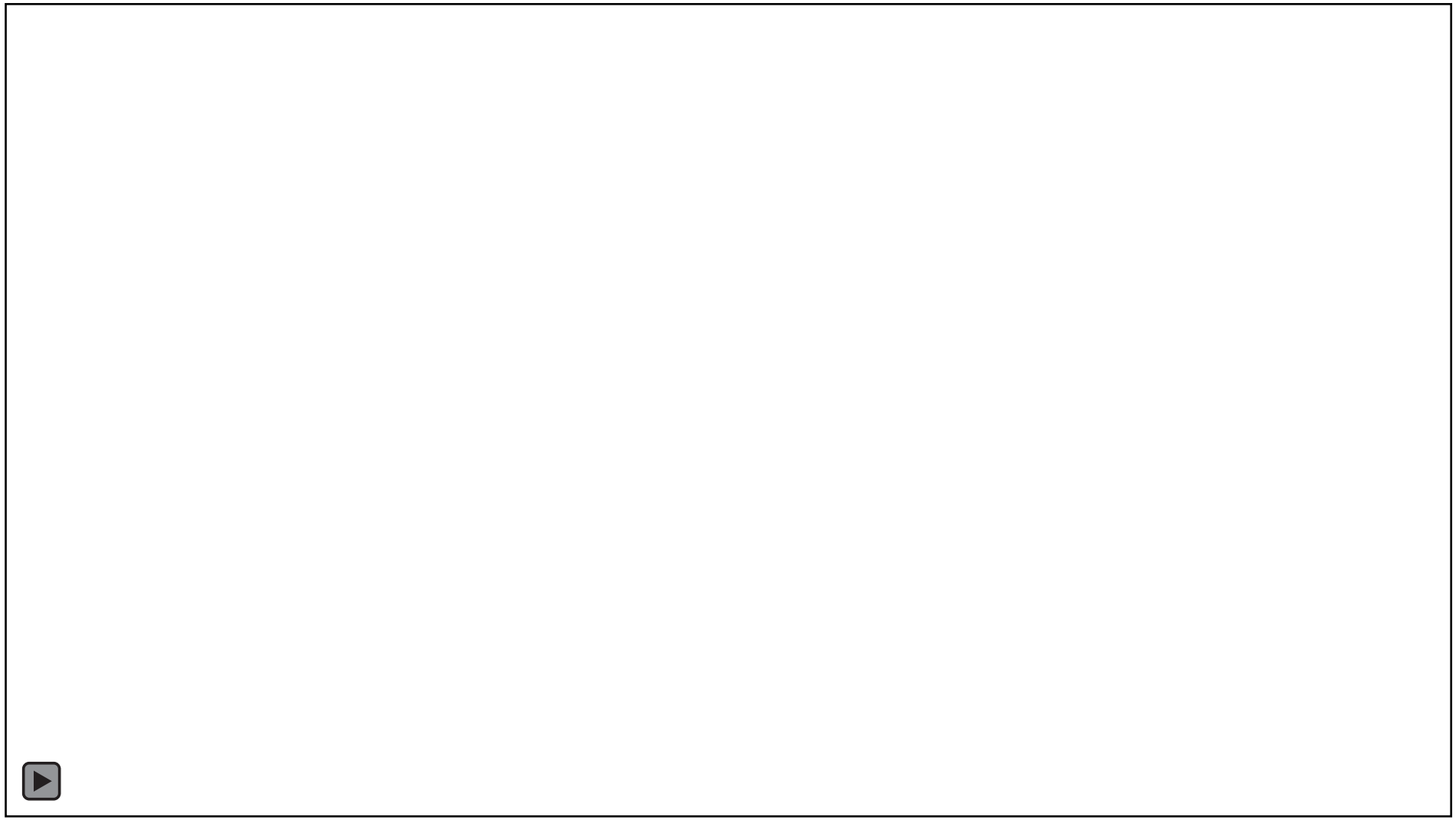

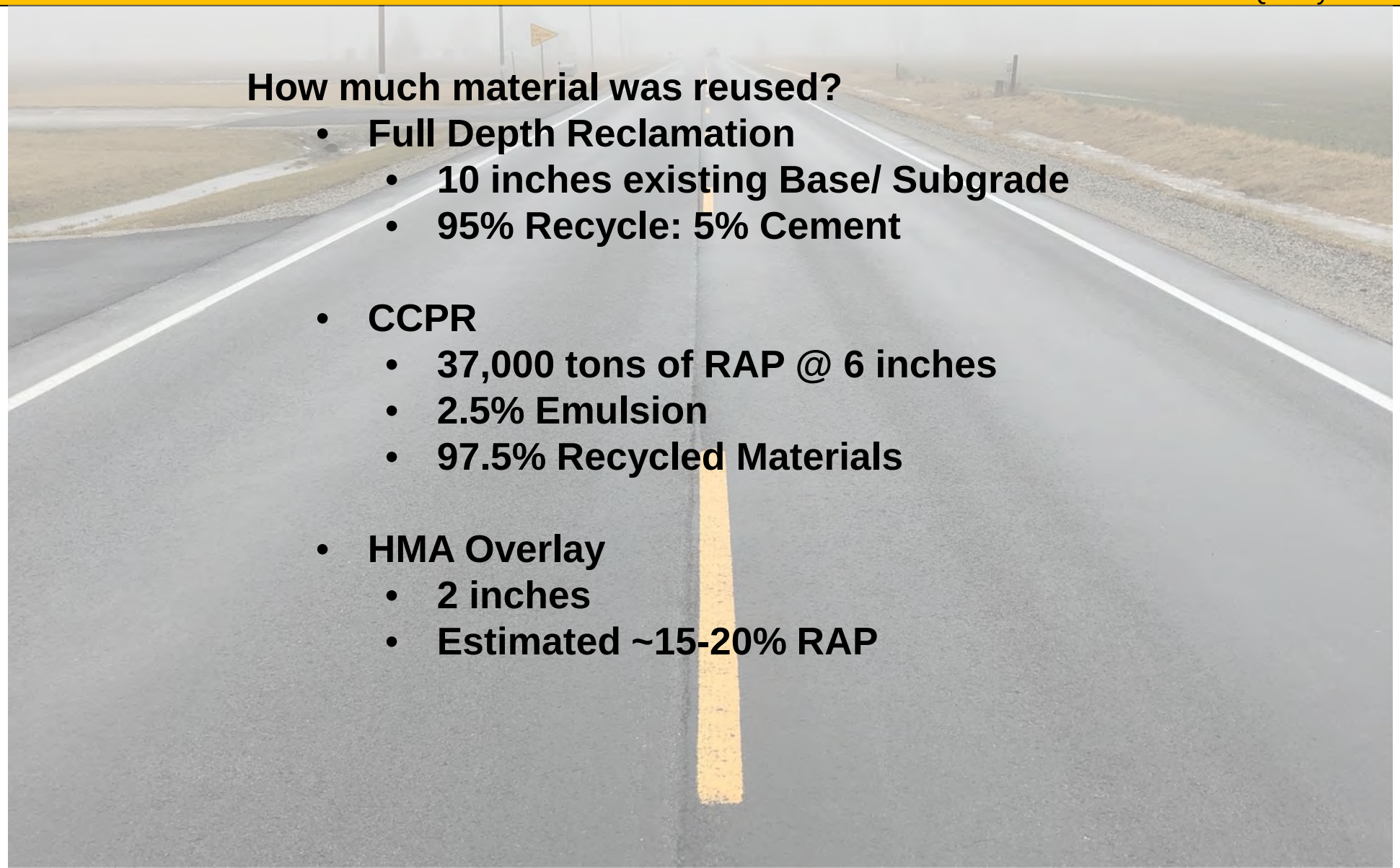

How much material was reused?

- **Full Depth Reclamation**
  - **10 inches existing Base/ Subgrade**
  - **95% Recycle: 5% Cement**

- **CCPR**
  - **37,000 tons of RAP @ 6 inches**
  - **2.5% Emulsion**
  - **97.5% Recycled Materials**

- **HMA Overlay**
  - **2 inches**
  - **Estimated ~15-20% RAP**

Additional Resources

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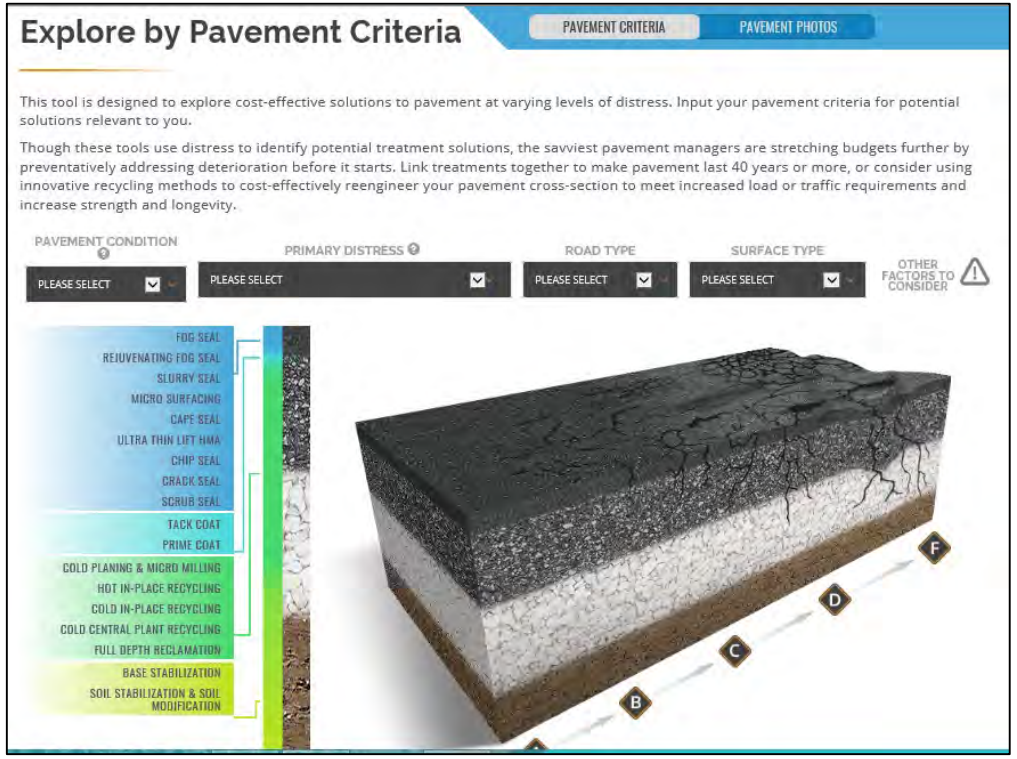
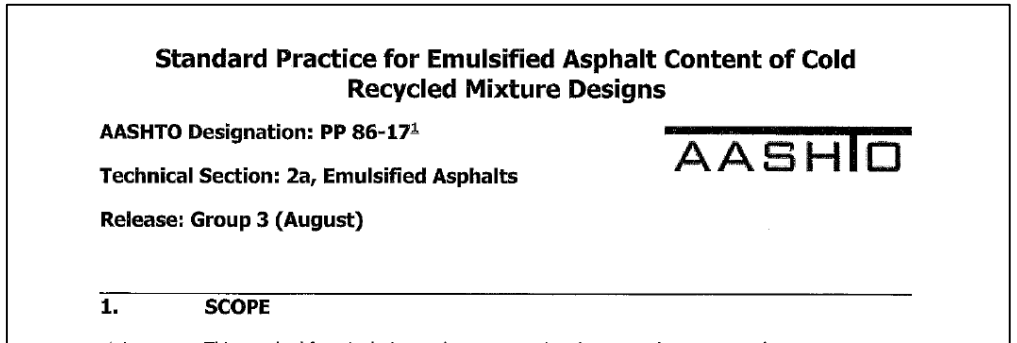
- Ongoing Research
  - NCHRP 9-62
  - NCAT US 280 Sections
  - Virginia DOT Interstate Work
- RoadResource.org
  - AEMA/ISSA/ARRA
  - Information on All Treatments
- AASHTO Specifications
- Training





Standard Practice for Emulsified Asphalt Content of Cold Recycled Mixture Designs

AASHTO Designation: PP 86-17[1]

Technical Section: 2a, Emulsified Asphalts

Release: Group 3 (August)

AASHTO

1. SCOPE

Pavement Recycling and Sustainability

- Right road, right time, right treatment
  - Process Selection
- Utilize Engineered Process
  - Performance
- Cost Savings Realized by Agencies
- Less Impact on Resources
  - Reuse
  - Reduced Trucking



Thank you!

Heritage Research Group

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- Questions or Comments?