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Technical Solutions and Sustainable Policies for Material Recycling

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PRESENTATION OUTLINE

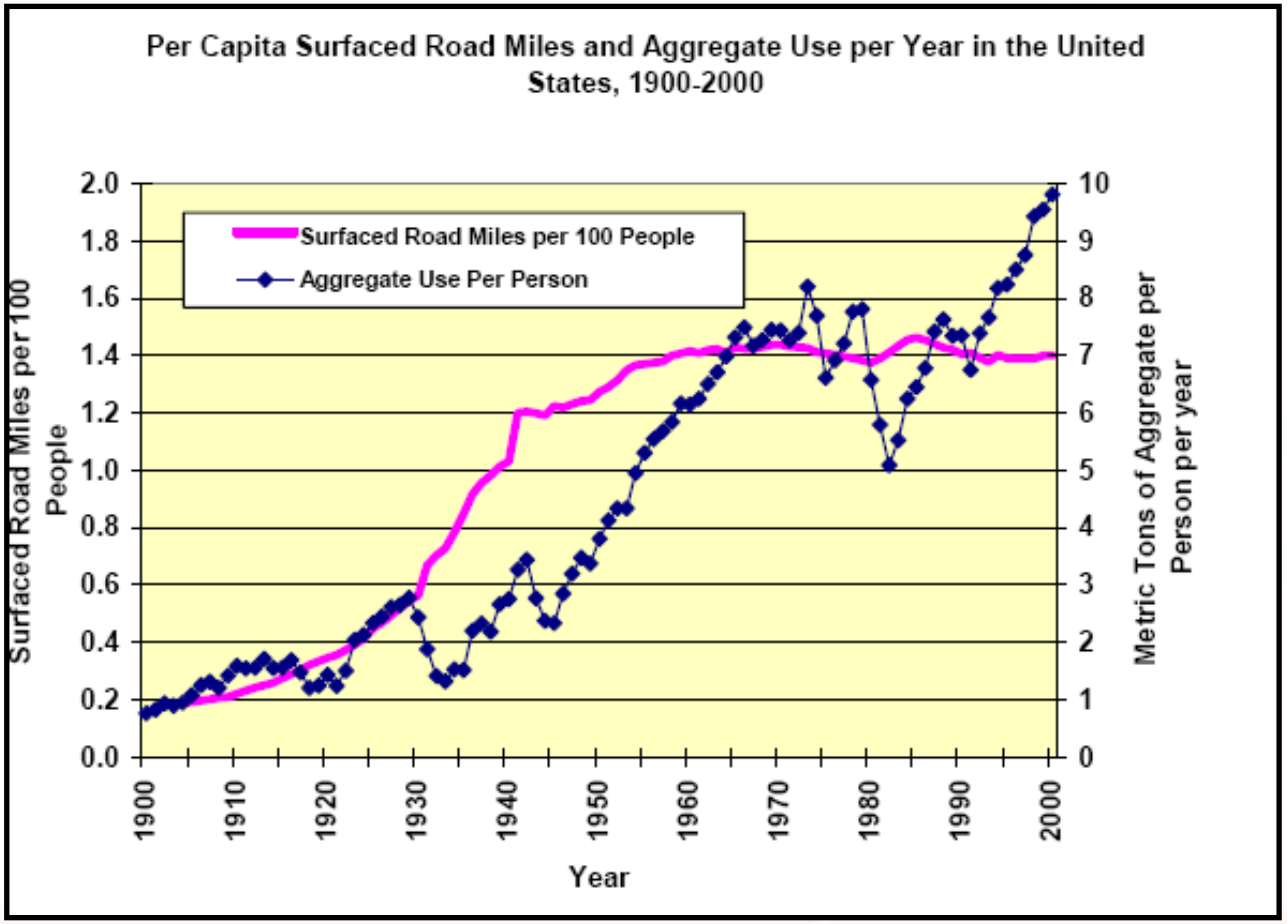
- Why Recycle?
- FHWA Policy
- FHWA Focus
- Current Initiatives

NEED TO RECYCLE

- Need to rehabilitate much of the infrastructure that was built in the 1950's and 1960's.
- Virgin materials are being depleted.
- The cost of virgin materials could increase in the future.
- Need to maximize materials resources.

Advances in technology allow better process control.

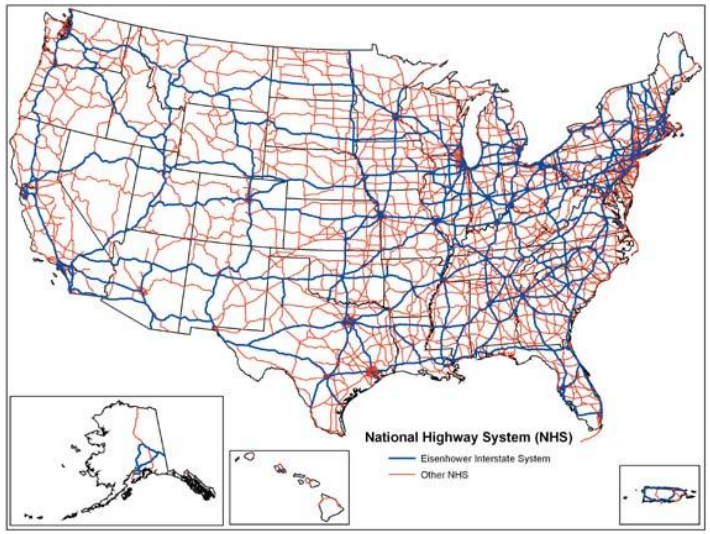
DEMAND FOR AGGREGATES



USGS Report: "Sociocultural Dimensions of Supply and Demand for Natural Aggregates"

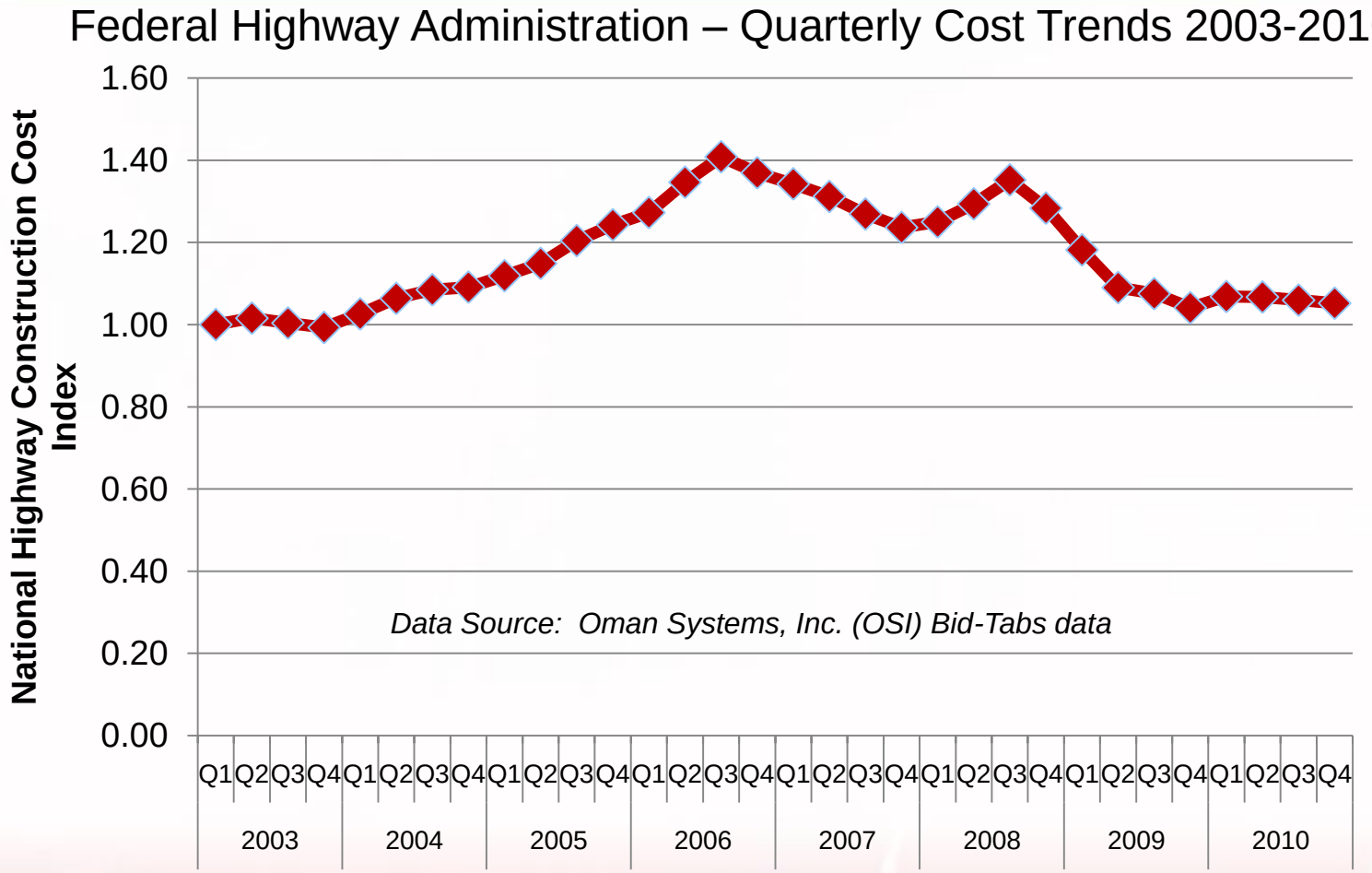
DEMAND FOR MATERIALS

- 160,000 mile National Highway System
- 4 million miles of public roads
- Produce over 600 million tons of HMA & 85+ million SY of concrete for paving annually



- $70 billion capital outlay to maintain pavements
- Demand for aggregates considerable requiring an estimated 700+ million tons to meet annual demand (15%-25% of annual production)

CONSTRUCTION PRICE FLUCTUATIONS



FHWA POLICY - 2002

- Recycled/re-used materials are viable resources.
- Recycled materials should get 1st consideration.
- Consider use of recycled materials early in the planning/design process.
- Economic benefits should be considered in the material selection process.
- Restricting the use of materials should be technically based.
- Material should not adversely impact the environment and should perform as intended.

FHWA INITIATIVES

- Provide Program Policy/Guidance
- Provide Technical Guidance/Assistance
- Conduct & Support Research Efforts
- Advance Promising Technologies
- Assist in Field Trials
- Review & Promote Best Practices
- Support Highway Agencies
- Training and Technology Transfer

Recycled Materials Resource Center

- Created under TEA-21 legislation in Fiscal Year 1999.
- Continued under SAFETEA-LU legislation with FHWA, EPA, State, and Industry contributions.
- Developed several specifications for AASHTO consideration.
- 43 projects with a wide variety of products available online.

Federal Highway Administration

University of New Hampshire

University of Wisconsin Madison

KEY EMPHASIS OF PROGRAM




- Recycled Materials
  - Reclaimed Asphalt Pavement
  - Recycled Concrete as Aggregate
  - Reclaimed Asphalt Shingles
  - In-Place Recycling
- Warm Mix Asphalt
- Two-Lift Concrete Paving

RECLAIMED ASPHALT PAVEMENTS (RAP)

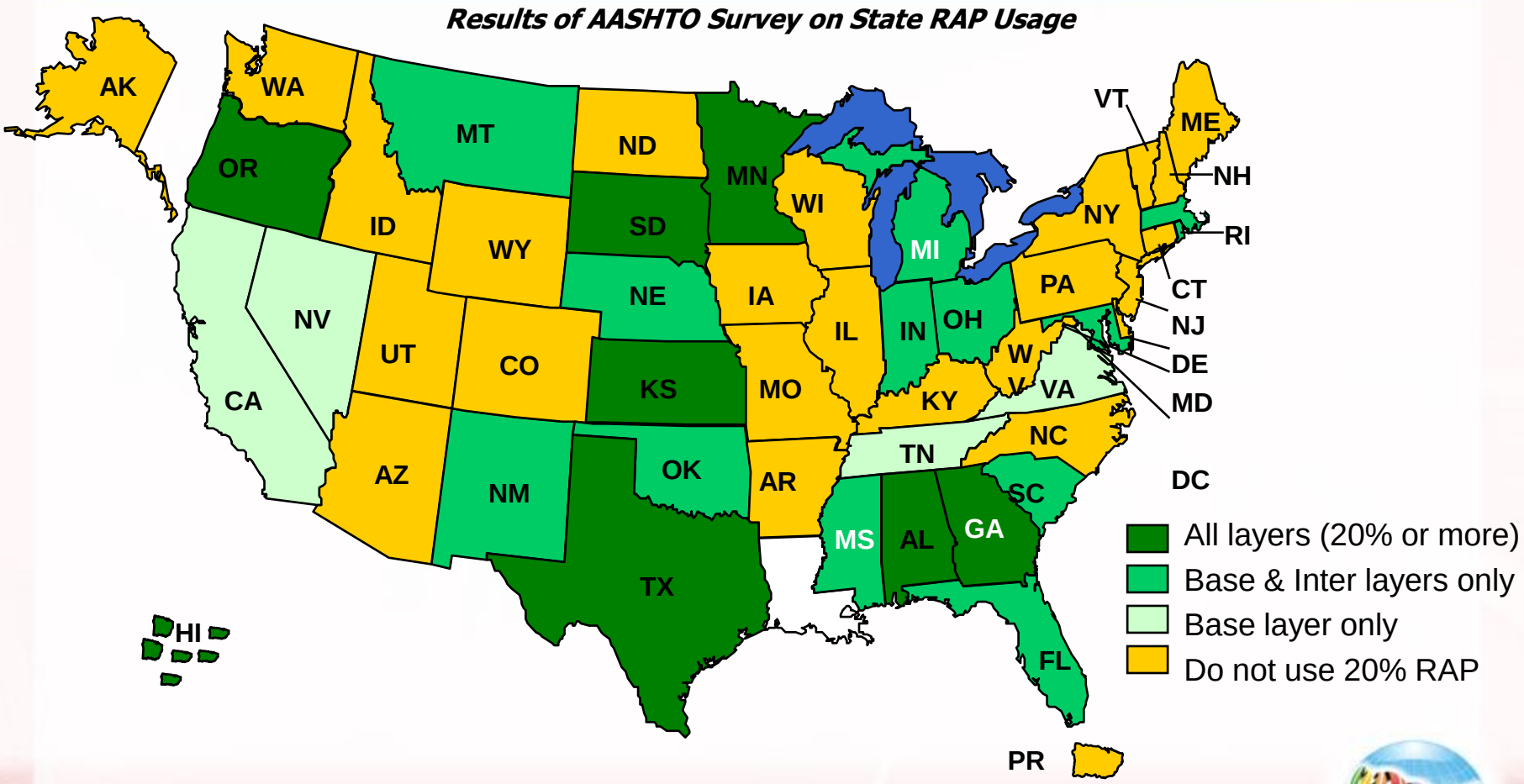
Sources of RAP

- Milling
- Pavement removal
- Plant waste

Most Common Uses

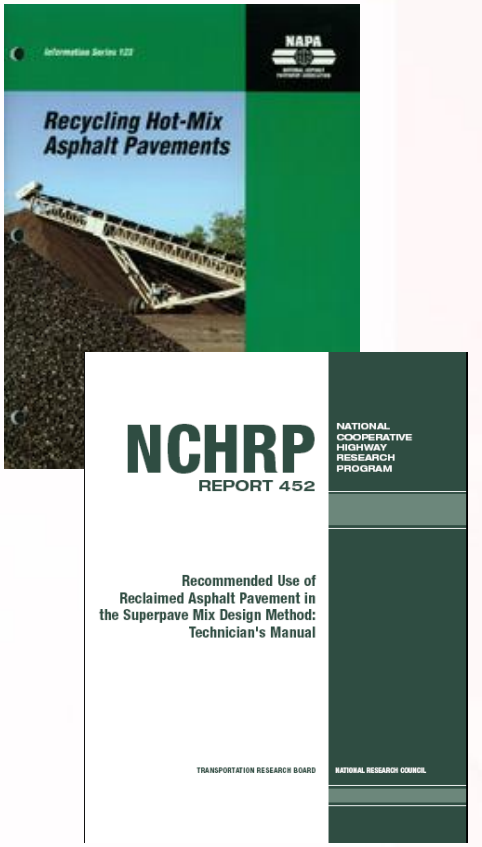
- Addition to HMA
- Aggregate in cold-mix
- Granular base
- Fill or embankment material

STATES THAT *USE* MORE THAN 20% RAP IN HMA LAYERS



RAP GUIDANCE DOCUMENTS

- National Asphalt Pavement Association (NAPA) Publications
- Asphalt Institute's (AI) MS-2: *Mix Design Methods for Asphalt*
  - Section on using RAP
- *Recommended Use of RAP in the Superpave Mix Design Method: Technician's Manual*
  - National Cooperative Highway Research Program (NCHRP) Report 452
- Reclaimed Asphalt Pavement in Asphalt Mixtures: State of The Practice
  - http://www.fhwa.dot.gov/publications/research/infrastructure/pavements/11021/index.cfm



RAP Expert Task Group (ETG)

- Composed of representatives from federal and state DOTs, private industry, and academia.
- Provides guidance and technical support.
- Targeting low RAP usage States.

RECLAIMED ASPHALT SHINGLES (RAS)

- Reclaimed Asphalt Shingles (RAS)
  - Crushed/ground and screened
  - Used in hot mix asphalt
  - High beneficial reuse

- 11 million tons of waste asphalt roofing shingles are generated in the US per year
  - Manufacturing Waste ~ 1 million
  - Roofing tear-offs ~ 10 million

USING RECLAIMED ASPHALT SHINGLES (RAS)

- Benefits include
  - Economic Savings
  - Reduced landfill waste

- Concerns
  - Environmental concerns
  - QC/QA during sourcing, processing, and use of shingles in HMA
  - Use of tear-off shingles

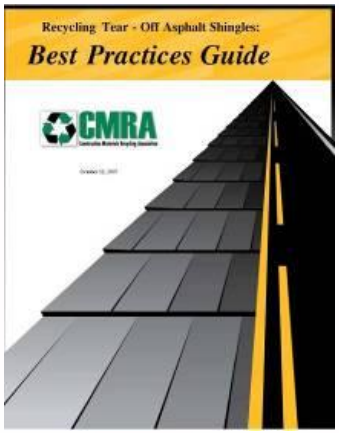
GUIDANCE FOR USING RAS IN HMA

- AASHTO Specification MP15 – Use of Reclaimed Asphalt Shingle as an Additive in HMA

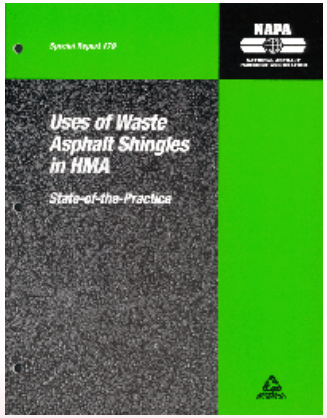
- AASHTO Specification PP53 – Design Considerations When Using Reclaimed Asphalt Shingles in New HMA

GUIDANCE FOR USING SHINGLES

- Best Practices for Recycling Asphalt Shingles from Construction Materials Recycling Association (CMRA)
  - Source and Sorting
  - Processing
  - End Uses



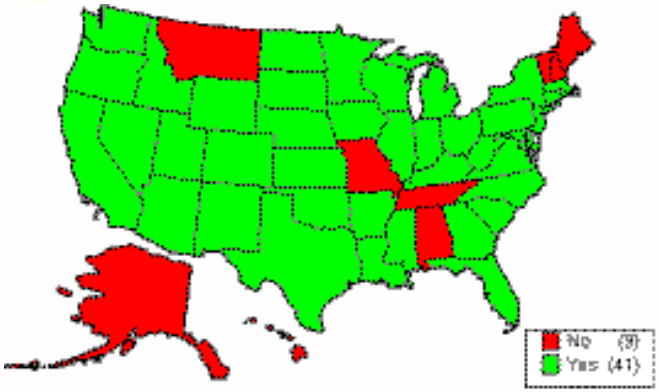
- Uses of Waste Asphalt Shingles in HMA: State-of-the-Practice (NAPA)
  - Sources
  - Mix Design Considerations
  - Equipment Modifications
  - Studies



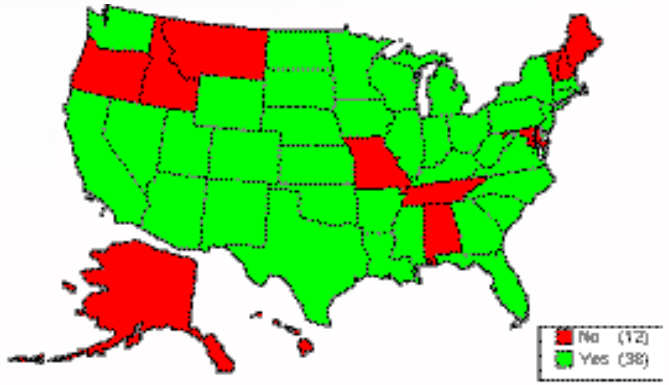
RECYCLED CONCRETE AS AGGREGATE

- FHWA Technical Advisory
- Use of Recycled Concrete as Aggregate
  - 5 State Review of Best Practices
- RMRC
  - Development of AASHTO Specifications
  - Recycled Aggregate Durability
  - PCC Pavement Recycling Machines
  - RCA Concrete Pavement Outreach

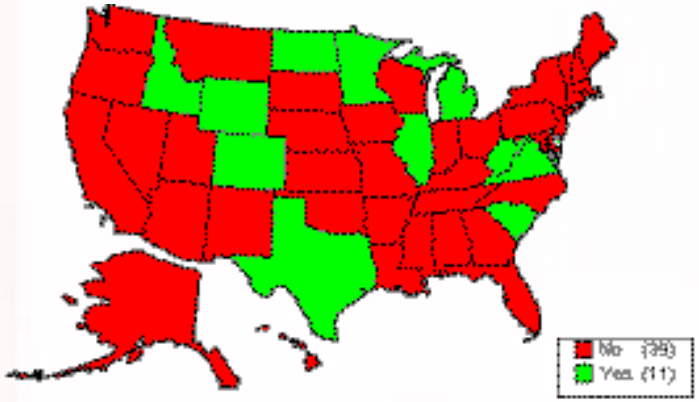
USE OF RCA IN HIGHWAYS



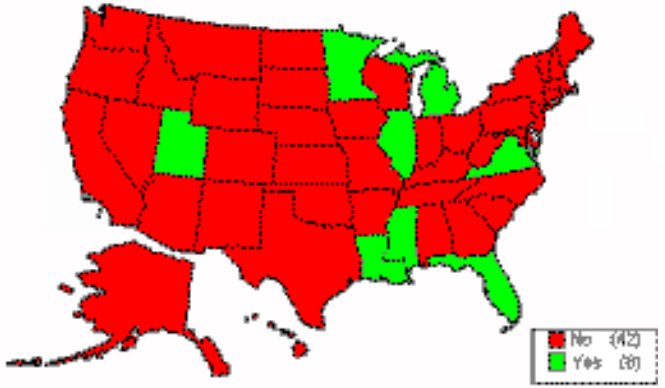
Allow RC as Aggregate



Allow RCA as Pavement Base



Allow RCA as PCC Aggregate



Allow RCA as HMA Aggregate

RCA AND 2-LIFT CONCRETE PAVING

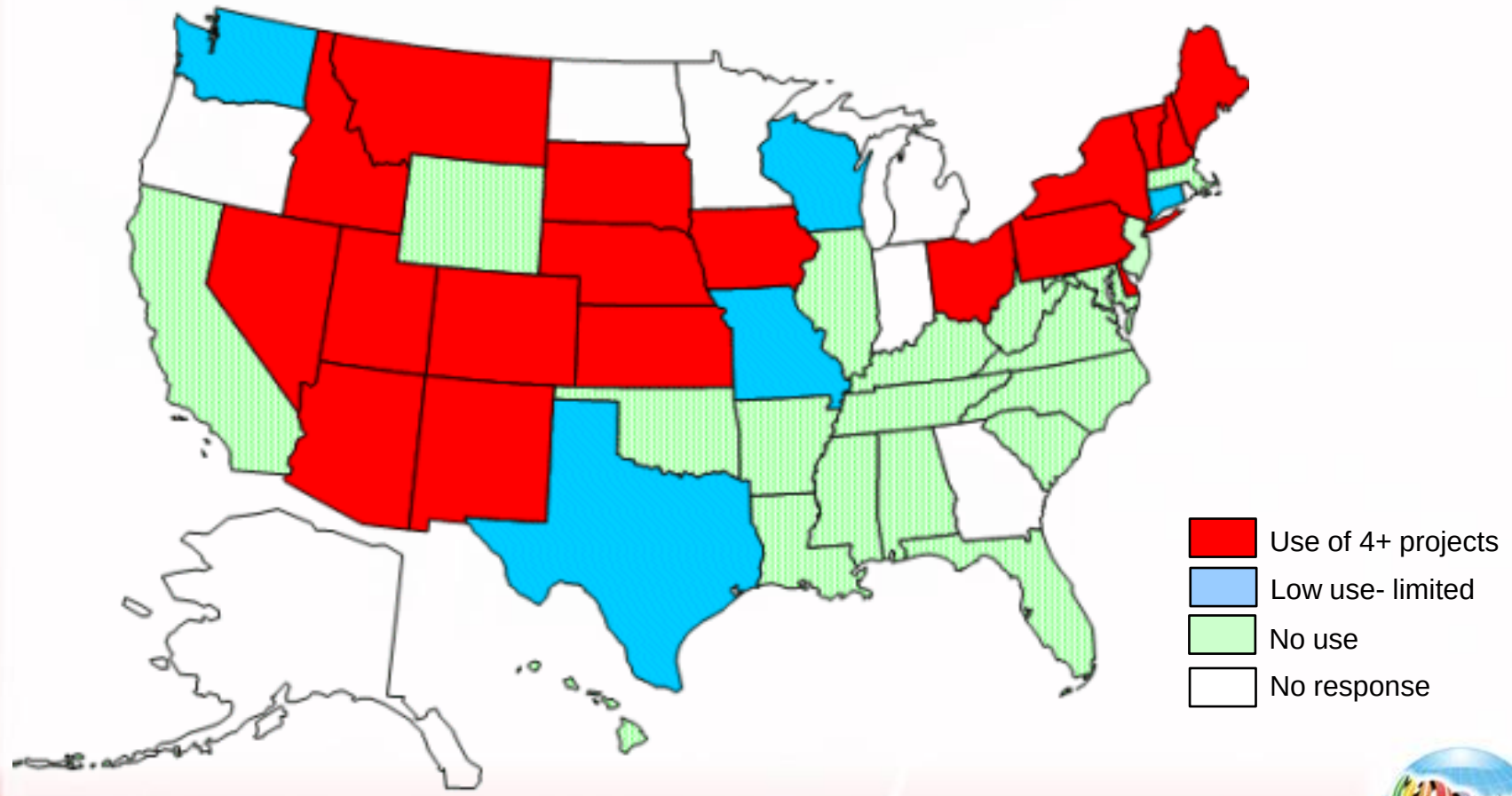
- 2-Lift concrete pavement construction allows us to maximize the use of RCA in the pavement structure
- RCA can be used in the bottom lift because it will not be exposed to pavement surface wear
- Potential cost savings by using RCA in lower lift

FHWA TECHNICAL ADVISORY

Use of Recycled Concrete Pavement as Aggregate in Hydraulic-Cement Concrete Pavement

- Processing of reclaimed concrete pavement
- Recycled concrete aggregate quality requirements
- Concrete properties with recycled concrete aggregate
- Pavement design
- Mixture design
- Production issues
- Construction issues
- Cost Impacts

USE OF COLD-IN PLACE RECYCLING (CIR)



CIR – Barriers / Issues

- No nationally recognized mix design
- Acceptance testing protocols needed
- Requires specialized skills
- Perceived reluctance to use technology
- Curing times when emulsions are used
- Need to document long term performance
- Use of mineral fillers on performance
- More education and support

TOOLS

Federal Highway Administration, U.S. Department of Transportation

Sustainable Highways Self-Evaluation Tool

- INVEST - “Infrastructure Voluntary Self-Evaluation Tool”
- A web-based self evaluation tool for measuring sustainability over the life-cycle of a transportation project or program
- Consider sustainability for:
  - System and Project Planning
  - Design/Construction
  - Operations and Maintenance
- Includes credits for use of recycled and re-used materials

https://www.sustainablehighways.org/

QUESTIONS

More Information:

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www.fhwa.dot.gov/pavement/recycling

www.rmrc.unh.edu

www.greenhighways.org

www.tfhrc.gov/hnr20/recycle/waste/index.htm