

Shingles in Paving Demonstration

NWPMA's Shrinking Budgets & Creative Management

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Shingles in Paving Demonstration

Establish a local paving end market for recycled asphalt shingles (RAS) that captures the resource value of shingles and diverts this material from landfills

Develop RAS and HMA specifications

Pave wear course with 3% RAS with 15% RAP

Collect local engineering data; conduct performance testing

Design considerations:

- Minimize risk
- Performance over time
- Health, environmental and safety standards
- Recognition by industry and public agencies

Shingles in Paving Project Overview

2006-2007: Background Research

- Identify shingles as a priority
- Explore potential end markets
- Research local and national efforts
- Engage stakeholders

2007-2009: Paving Demonstration

- Establish team, secure sponsor
- Select roadway, design study
- Establish specifications
- Procure RAS and HMA
- Install pavement
- Conduct initial testing

2010 and Beyond: Next Steps

- Complete Final Report
- Share results
- Carryout research
- Conduct annual pavement testing
- Implement another demonstration?

Asphalt Shingles Priority Material

- Large quantity of shingles is generated in King County and disposed in landfills
- Limited end use markets
- Local recycling infrastructure is not firmly established (though growing)
- Shingles are recycled in other parts of the country



Hot Mix Asphalt

National Precedent

- Pooled Fund study
- 11 states have specifications and procedures that allow for RAS in HMA
- American Association of State Highway and Transportation Officials specifications for using RAS in HMA

Drivers

- Costs: asphalt and landfill
- Sustainability: Zero Waste, C&D waste stream, GHG emissions, LEED, Greenroads

Regional Developments

- Shingles in HMA is an acceptable use (Ecology)
- Shingles no longer on suspect ACM list (PSCAA)
- Metro Vancouver pilot
- Oregon State University/ODOT mix design research
- Local jurisdictions expressing interest



Alabama

Georgia

Iowa

Minnesota

Missouri

Pennsylvania

South Carolina

Texas

Virginia

Wisconsin

Illinois

RAS Market Research

- **Purpose:** Understand current use, opportunities, and barriers to using RAS in HMA in Washington State
- **Methodology:** Phone interviews conducted with 11 pavers and 17 haulers/recyclers in May 2010
- **Results: High interest, need for specifications**
 - Three pavers using RAS; several recyclers handling shingles
 - Paving benefits cited were cost savings and comparable performance
 - Concerns were lack of permissive specifications, environmental/safety issues, and shingles storage requirements
 - Need for more pilots, permissive specs, relaxed storage requirements, roofer outreach



Implementing the Demonstration



Connected with the national experience

- Specification development
- Environmental issues and regulatory protocols
- Research memos and conferences

Engaged stakeholders, kept them engaged

- 100 representatives of recyclers, paving contractors, transportation agencies, health departments, regulatory agencies and solid waste agencies
- 18-member project advisory group to guide and steer the design and development

Recruited key transportation agency partners

- King County Department of Transportation
- Washington State Department of Transportation



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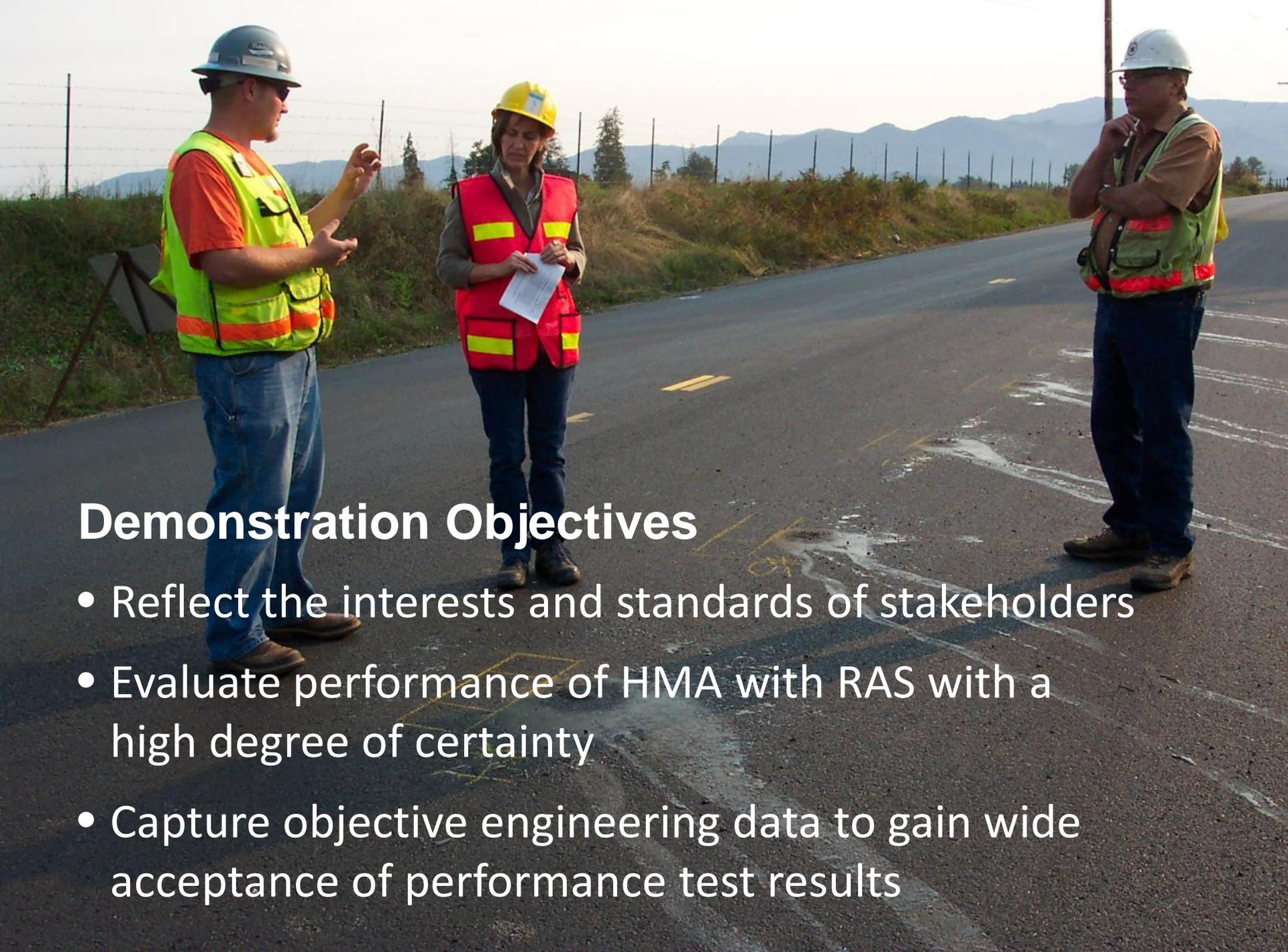
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Core Project Team



Demonstration Objectives

- Reflect the interests and standards of stakeholders
- Evaluate performance of HMA with RAS with a high degree of certainty
- Capture objective engineering data to gain wide acceptance of performance test results

SE 416th Street Overlay Exploration Map

Station 10 + 20

Station 36 + 50

Station 63 + 10

Station 89 + 66

Station 116 + 00

212th Ave SE

218th Ave SE

222nd Ave SE

228th Ave SE

236th Ave SE

244th Ave SE

TEST SECTION # 1

TEST SECTION # 2

TEST SECTION # 3

TEST SECTION # 4

SE 416th St

ENUMCLAW



King County Materials Laboratory
SE 416th Street Overlay
Shingles in Paving Demonstration
SITE EXPLORATION MAP

- ▲ Approximate Boring Location
- Approximate Core Location
- Station Line
- Street Network
- City



January 7, 2010

File Name:
KG T\Development\ArcMap\ArcMapProjects\SE_416th_St_exploration_map.mxd
Data Sources:
Standard King County datasets used include: trans_network, City
Roads Datasets Include: SE416thSt_stationing, Boring_Location, Core_Location

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Road Selection and Study Design

Road selection criteria

- Overlay paving
- Two miles in length
- Consistent pavement and subsurface conditions
- Two-lane, relatively straight with limited variable surface conditions

	Test Section #1	Test Section #2	Test Section #3	Test Section #4
1000 tons/day	½ mile	½ mile	½ mile	½ mile
Lane 1 (eastbound)	HMA Mix with 15% RAP	HMA Mix with 3% RAS and 15% RAP	HMA Mix with 3% RAS and 15% RAP	HMA Mix with 15% RAP
Lane 2 (westbound)	HMA Mix with 15% RAP	HMA Mix with 3% RAS and 15% RAP	HMA Mix with 3% RAS and 15% RAP	HMA Mix with 15% RAP

RAS Specification

- Designed to ensure a high quality product that performs and meets health, safety, and environmental standards
- Guidance from national research and the American Association of State Highway and Transportation Officials (AASHTO)
- Collaborative process with leading transportation and regulatory agencies
- Involvement of private industry to ground requirements in reality
 - Product samples
 - Specification review
 - Outcome-oriented approach

Specification

- **Asphalt shingles only**
- **Extraneous waste up to 3%**
- **Moisture content up to 5%**
- **Gradation 100% ½", 95% 3/8"**
- **Sampling per AASHTO**
- **Asbestos sampling and testing on incoming shingles**
- **Other regulatory issues**

Environmental, Health, and Safety Standards

Key agencies, regulations and rules

- Washington State Department of Ecology – solid waste handling and storage
- Washington State Department of Labor & Industries – workplace safety rules
- Puget Sound Clean Air Agency – asbestos testing and handling
- Local Health Department(s) – general compliance, notification of grinding

Took asbestos issue seriously

- Restricted supply to asphalt shingles only
- Inspections of incoming loads
- Rigorous sampling and testing standards confirmed no asbestos in shingles
 - *Suspect materials include felt paper, mastic, built up roofing, and shingles with patching or aluminum coating*



HMA Specifications

- Design considerations
 - Use of recycled asphalt pavement (RAP)
 - Estimated binder replacement from RAS
 - Amount of RAS
- Design process
 - AASHTO guidance
 - RAS samples
 - Testing and team discussions



HMA mix design & testing

- Preliminary testing of RAS
- Mix design testing and approval of volumetric properties of the mix
- Quality Assurance during construction





Paving completed in South King County in September, 2009

Results from extensive initial material engineering tests indicate that using RAS in HMA has no negative impact on pavement performance.

- All but one Test Section substantially met project specifications and materials standards.
- The finished roadway surface is in near perfect visual condition.
- Skid resistance testing shows no noticeable change in resistance.
- Further testing, analysis, and documentation will continue to verify the impact on using RAS on public roadways.

Pavement Condition Indices (PCI) • Pavement Structural Condition (PSC) • Pavement Rutting Condition (PRC) • International Roughness Index (IRI) • Coring • Subsurface Boring • Falling Weight Deflectometer (FWD) • Skid Resistance/Drag Factors



Thank You and Questions

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Shingle Recycling.Org www.shinglerecycling.org