Shingles in Paving Demonstration Project
King County, Washington

4th Asphalt Shingle Recycling Forum
Michelle Caulfield, Cascadia Consulting Group
November 6, 2009
Building partnerships to expand markets for recycled materials

- Market development through reliable suppliers
- Evaluating technologies and markets
- Providing resources and information
- Assisting with material and product testing
- Marketing and communications assistance
- 2009 focus on asphalt shingles, polystyrene, and mattresses.
Valuable resource sent to landfill
- 17,000 tons generated annually in King County
- Only 1,000 tons are recycled

Limited recycling markets
- Road base
- Fuel
- Hot-mix asphalt (HMA)
- Cold Patch
Shingles in Paving Demonstration

Two year effort to demonstrate the use of tear-off RAS in HMA
• Exclusive focus on HMA
• Partner with KCDOT
• Identify a major road
• Pave the wear course
• Test RAS with RAP

Cost-effective product that:
• Meets specifications
• Performs over time
• Minimizes risk
• Diverts significant tonnages from landfills

Design considerations:
• Minimize risk
• Performance over time
• Health, environmental and safety standards
• Recognition by industry and public agencies
• Broad application of results
Laying the Groundwork

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
Core Project Team

Kris Beatty
KCSWD

Joe Karahuta and Kevin Kelsey
KC Materials Lab

Frank Overton
KC Roads

Tim Shearer and John Grisham
Woodworth & Company

Paul Moore
KC Roads

Joe DeVol
WSDOT Materials Lab
# Road Selection and Test Design

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

<table>
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<tr>
<th>1000 tons/day</th>
<th>Test Section #1</th>
<th>Test Section #2</th>
<th>Test Section #3</th>
<th>Test Section #4</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ mile</td>
<td>HMA Mix with 15% RAP</td>
<td>HMA Mix with 3% RAS and 15% RAP</td>
<td>HMA Mix with 3% RAS and 15% RAP</td>
<td>HMA Mix with 15% RAP</td>
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<tr>
<td>Lane 1</td>
<td></td>
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</tr>
<tr>
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<td>HMA Mix with 3% RAS and 15% RAP</td>
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<tr>
<td>Lane 2</td>
<td>HMA Mix with 15% RAP</td>
<td>HMA Mix with 3% RAS and 15% RAP</td>
<td>HMA Mix with 3% RAS and 15% RAP</td>
<td>HMA Mix with 15% RAP</td>
</tr>
</tbody>
</table>
Specifications and Testing

Designed to ensure a **high quality product that performs** and meets health, safety, and environmental standards
- Stiffness, cracking – asphalt content
- Extraneous materials
- Asbestos
- Other regulatory (stormwater, air quality, safety, solid waste handling)

**Collaborative process** with leading transportation and regulatory agencies

**Involvement of private industry** to ground requirements in reality
- Product samples
- Specification review
- Outcome-oriented approach

**Clear responsibilities** for KCDOT, WSDOT, and contractor

**RAS SPECIFICATIONS**
- Asphalt shingles only
- Extraneous waste up to 3%
- Moisture content up to 5%
- Gradation 100% ½”, 95% 3/8”
- Sampling per AASHTO
- Asbestos testing
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 – we had hits with TEM testing
- Presorted to remove suspect materials such as felt paper, mastic, built up roofing, and shingles with patching or aluminum coating
PAVING AT LAST!

Two-mile stretch of SE 416th Street in South King County

• King County Department of Transportation is the sponsor

• Washington State Department of Transportation provided mix design and laboratory testing

• 3% RAS and 15% RAP; 4 test sections; 2 control sections

• Woodworth & Company processed RAS and paved the road

Four days of paving completed in September 2009
Materials and Performance Testing

Current roadway conditions
• Visual inspections by walking
• Paving profile with survey van
• Cores and borings – surface and subsurface conditions
• Deflectometer for structural testing

Materials testing & paving QA/QC
• Joe DeVol to discuss

Post-construction testing
• Paving profile with survey van
• Deflectometer for structural testing
• Skid resistance
• Full report on initial performance data

Three year monitoring
• Annual pavement condition rating
• Paving profile with survey van (year 3)
• Skid resistance (year 3)
• Report and long-term predicted performance (year 3)
A King County road paved with RAS!

High level of commitment by KC Roads, WSDOT, Woodworth & Company
- Survived budget cuts
- Survived asbestos hits (TEM)
- Survived contracting and procurement

Demonstrated trust and adaptability
- Modified procurement process
- Changed asbestos protocol midstream
- Adjusted HMA mix design on the fly
- Contractor willingness to open up their operations; go above and beyond for project success

KC Roads committed to long-term testing and monitoring

Expressed interest in a future RAS specification

What does success look like?
Lessons Learned, Further Questions

- **Partnerships** take time, but pay off
- **Everything takes longer than you think** – except paving!
- **The art of balancing rigor with realities in the field** – focus on outcomes
- **Importance of upstream visual inspections and pre-sorting** for acceptable and suspect material

- **Need for additional research and guidance on asbestos sampling and testing**
  - Testing on the roof, incoming loads, before the grind, after the grind
  - Appropriateness of PLM and TEM tests for shingles
  - How friable are shingles? What are the health risks?
More Information

King County LinkUp website
www.kingcounty.gov/linkup

Shingles Recycling website
www.shinglerecycling.org

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