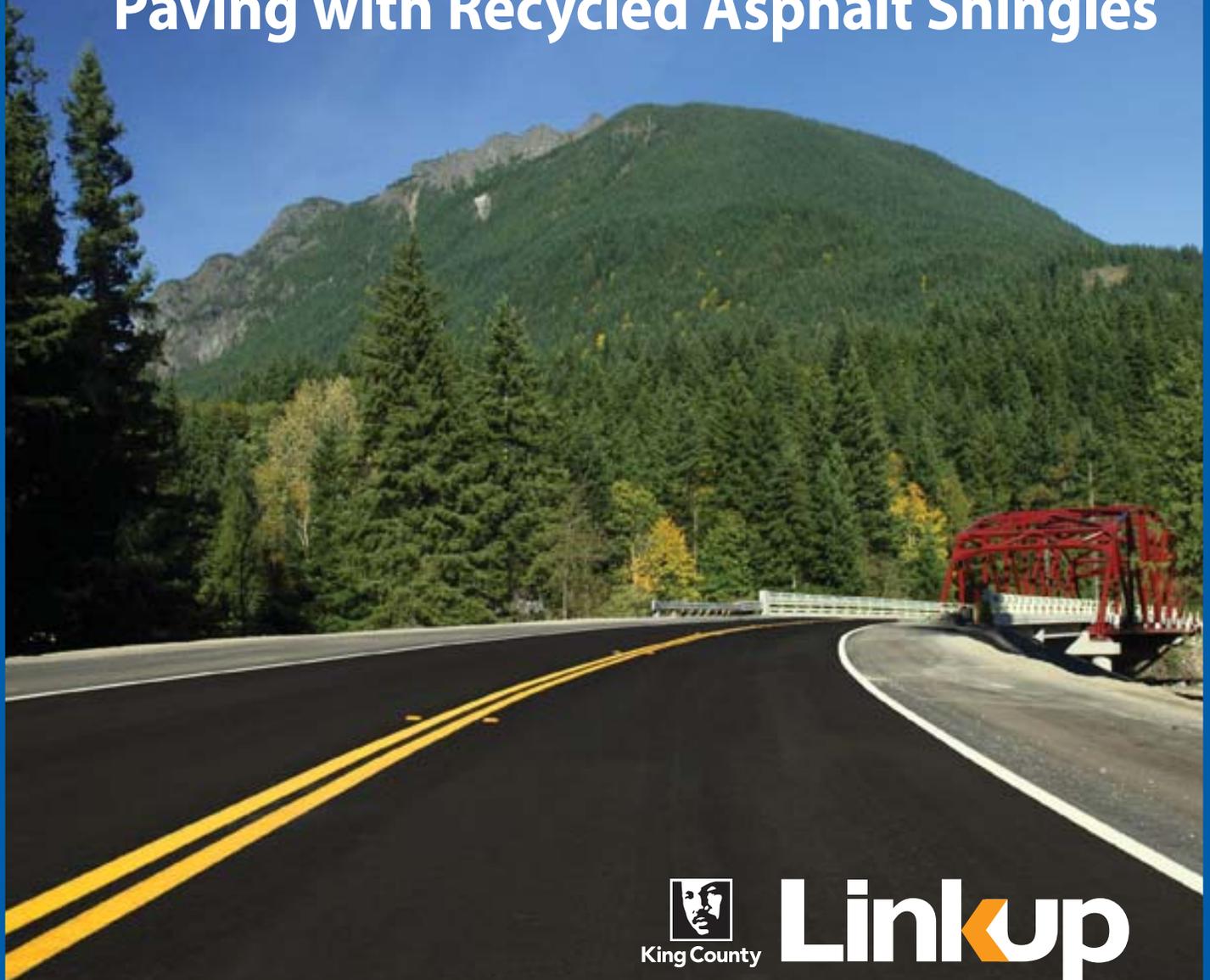


cost competitive  
waste diversion &  
resource recovery  
improved sustainability

## Paving with Recycled Asphalt Shingles



King County

**Linkup**

- **Using recycled asphalt shingles (RAS) in hot mix asphalt pavements is cost competitive, diverts valuable resources from landfills, and advances sustainability goals.**
- **Join the growing list of local and state agencies around the country that are benefiting from using RAS in pavements.**
- **Strengthen the market for RAS in the Puget Sound region by requiring RAS on one or more projects, and including RAS as permissible in bid requests.**

## Cost competitive

In the face of rising oil prices and shrinking paving budgets, the use of RAS can help to contain costs. In Washington State, pavements containing RAS are price competitive with conventional hot mix asphalt (HMA) and the use of RAS may reduce overall paving costs as the market for RAS matures. Transportation departments that are using RAS regularly in their asphalt paving mixes estimate saving millions of dollars each year.

## Waste diversion & resource recovery

Replacing virgin asphalt with recycled asphalt takes advantage of local supplies of materials that would otherwise go to waste. An estimated 50,000 tons of asphalt shingles are generated and disposed annually in Seattle and King County, alone. However, increasing amounts of this material resource are being locally processed and used in pavements.

With asphalt shingles comprising approximately 10-12 percent of the construction and demolition (C&D) waste being disposed, this material represents a key waste diversion opportunity. Plus, with an average landfill fee of over \$100 per ton, the construction industry could benefit from substantial savings due to reduced fees for recycling.



*The Missouri Department of Transportation (MODOT), which has allowed RAS in paving mixes since 2008, reports that RAS has played a critical role in helping the department control the cost of asphalt paving mixtures. While the average price of asphalt binder has nearly doubled since 2005, the average price MODOT pays has only increased by 16 percent.*

*"There is a lot of oil in those shingles. It's a shame that it often goes to a landfill. This is a valuable resource – don't throw it away, it's usable in another form."*

— **Bob Rea, Nebraska  
Department of Roads  
Flexible Pavement Engineer**

*"Missouri is in the top 10 among states in terms of bridges and road miles, while our gas tax rate is 46 out of 50, so our funding is tight. We need to do anything we can to stretch our dollars. The use of recycled materials like RAS is what's allowing us to keep doing as much paving as we can with the resources we have."*

— **Brett Trautman, MO DOT  
Field Materials Engineer**





## North Carolina DOT

*In 2011, the North Carolina Department of Transportation (NCDOT) adopted a specification allowing recycled residential roof shingles in the production of asphalt pavement. NCDOT estimates that if all shingles in the state were diverted from landfills for use in paving, the annual cost savings would be about \$32 million. NCDOT's new policy is preventing a portion of these shingles from entering landfills statewide, and helping the department to cut costs at the same time.*

*"This practice allows us to take roof shingles that would otherwise be filling up landfills and reuse them to make our roads safer and smoother," says NCDOT Communications Director Greer Beaty. "It's a way to save money in a challenging economy while making a positive environmental impact."*

**Source: AASHTO News Release,  
April 2012**

## Improved sustainability

In addition to reducing waste, using recycled asphalt shingles conserves non-renewable resources and reduces greenhouse gas emissions.

In 2011, 1.19 million tons of asphalt shingles were recycled. According to the National Asphalt Pavement Association, "[a]ssuming a conservative asphalt content of 20 percent for the RAS, this represents 380,000 tons (2.2 million barrels) of asphalt binder conserved."<sup>1</sup>

By recycling the estimated 50,000 tons of asphalt shingles generated in Seattle and King County each year, we could achieve a reduction in greenhouse gas emissions equivalent to the consumption of more than 15,000 barrels of oil, 727,000 gallons of gasoline, or the electricity use of 970 homes for one year.<sup>2</sup>



### Reducing Greenhouse Gas Emissions

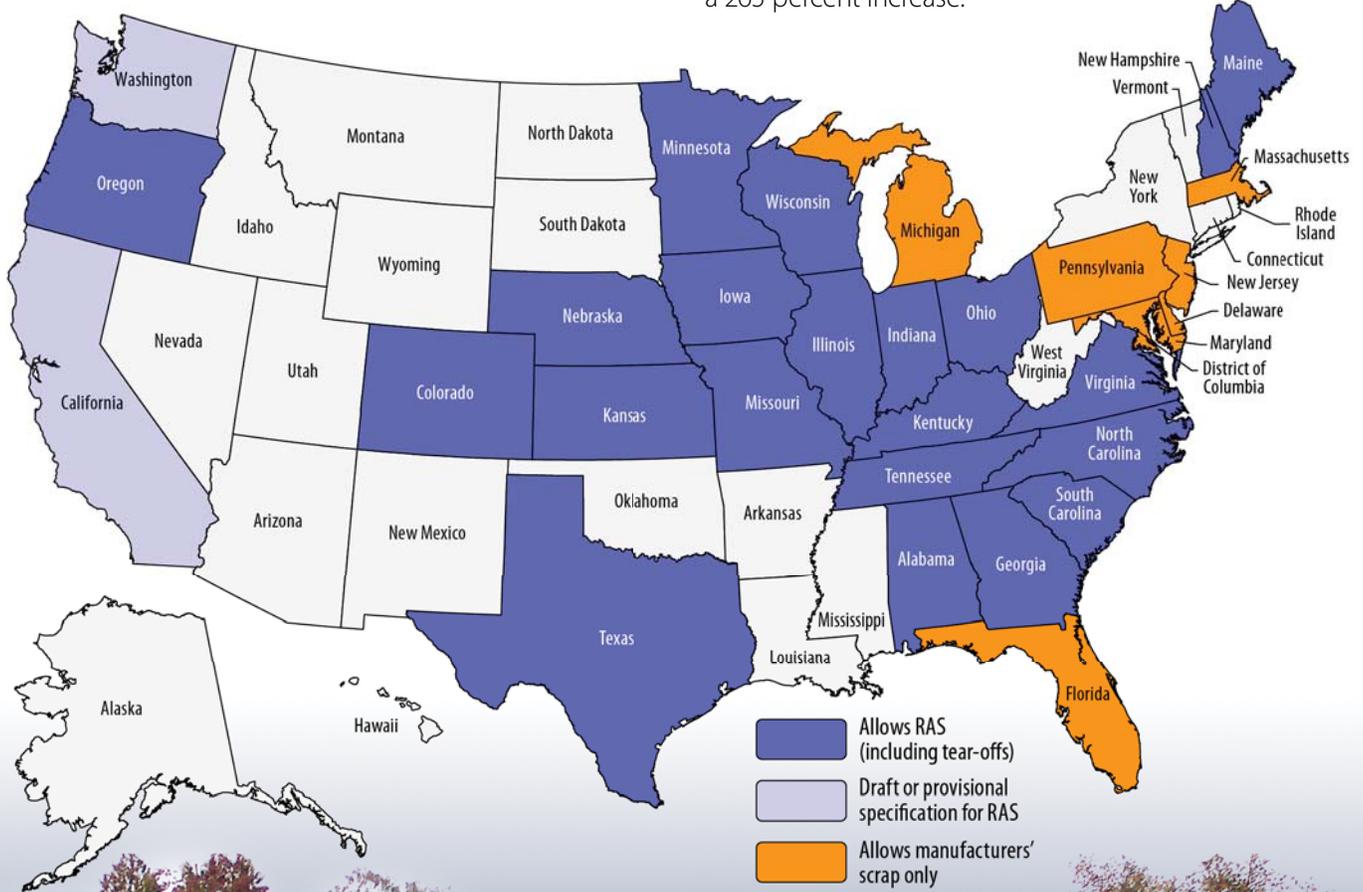
*According to the U.S. EPA, recycling one ton of shingles reduces greenhouse gas (GHG) emissions by 287 lbs. of carbon dioxide equivalents (CO<sub>2</sub>e). The Texas Department of Transportation estimates that for each ton of hot mix asphalt produced with 5 percent recycled asphalt shingles, it can reduce the GHG emissions impact of the paving mix by approximately 7 percent.<sup>3</sup>*

## Jurisdictions across the country are using RAS

Today, 30 states are using RAS in asphalt pavements, including 21 states that allow the use of post-consumer (or “tear off”) asphalt shingles as part of their standard specifications and 2 states that allow tear offs on a provisional basis. Most states allow RAS at levels ranging

from 3-5 percent of the total mix, or 20-30 percent of the asphalt binder used.

Nationally, use of RAS has increased from 701,000 tons in 2009 to 1.86 million tons in 2012, a 265 percent increase.<sup>4</sup>





### WSDOT allows RAS on state roadways

The Washington State Department of Transportation (WSDOT) has a new General Special Provision allowing the use of RAS on state roadways, and a number of local agencies have already used recycled asphalt shingles in paving projects, including:

- King County Road Services Division – 2009 SE 416th Street Overlay: Shingles in Paving Demonstration
- King County Solid Waste Division – Bow Lake Recycling and Transfer Station and required in all maintenance paving
- Metro Transit – busway test section
- King County Parks Division – Aquatic Center parking lot
- City of Bellevue – section of pavement for 2012 overlay

## King County Road Services Division Developing Special Provisions for Use of Shingles in Paving

In assessing the third year pavement performance on its Shingles in Paving Demonstration Project—a controlled experimental study of the use of RAS in conjunction with recycled asphalt pavement (RAP) in HMA—the King County Road Services Division Materials Lab found that “the entire surface of the roadway is in excellent condition” and that “test results continue to indicate that there is no significant effect, favorable or detrimental, on pavement performance when incorporating a maximum of 3 percent RAS by total weight to HMA.”

Based on these results, the Road Services Division has formed a committee to develop special provisions for the use of RAS in HMA and to begin its limited use on public roadways in King County. Once complete, the special provisions will allow RAS to be used in a portion of County’s 2015 overlay paving project.



Photo: RAS Pavement at King County Solid Waste Division Bow Lake Recycling & Transfer Station

## Paving contractors in the region are also using RAS in private construction

- Since 2005, Lakeside Industries has successfully used RAS in HMA mixes for some of its commercial customers. In that time, the company estimates that it has produced roughly 250,000 tons of HMA containing RAS for use on streets, roads, and parking lots in Washington and Oregon, including the central Puget Sound area. Initially introducing RAS to mixes at one of its HMA plants, Lakeside has now expanded use of the material to seven additional plants in Western Washington.
- Miles Resources has been recycling shingles and using RAS in private paving projects and commercial mixes for nearly 20 years, and has a WSDOT approved mix design that includes RAS, which was successfully used on a state highway in Edgewood, Wash. In addition to the company's use of RAS in standard pavements, other regional applications include use in porous and impervious pavements, where the properties of RAS help to improve pavement mixes.

Indiana  
DOT

The Indiana Department of Transportation (INDOT) began allowing the use of RAS for up to 25 percent of total binder in all asphalt paving mixtures

in April 2010. By 2012, the department found that RAS was included in 29 percent of all mix designs, with a total of 30,000 tons of RAS used in state paving that year. INDOT estimates the net cost savings of RAS use in 2012 at approximately \$2.4 million.

*"We were motivated to adopt a specification allowing RAS in paving to reduce cost without sacrificing quality," says Asphalt Engineer Matt Beeson. "We are pleased with the performance of the mixtures and have had no reported problems with RAS mixtures."*

*Today, local agencies across Indiana are following INDOT's example and encouraging RAS use in paving. INDOT expects RAS use to grow statewide, delivering additional cost savings in future years.*



## Let us assist you

Since 2006, King County LinkUp has been working with asphalt producers and paving contractors, recyclers, local and state transportation departments, and other public agencies to support the use of RAS in local asphalt pavements. If you are interested in encouraging the use of RAS by your jurisdiction or agency, King County LinkUp can help. We have technical experts and resources to support the use of recycled asphalt shingles in paving, including:

- Information about Washington State DOT's General Special Provision for RAS.
- A listing of local and regional recyclers and pavers that are collecting and processing asphalt shingles for road paving applications.
- Technical reports and data from testing and studies of RAS mixes and paving performance conducted by transportation departments and researchers around the country.
- Contacts with materials engineers who can speak about their experience testing and using RAS in hot mix asphalt.
- Industry publications that highlight the growing use of RAS in pavements nationwide.

To discuss how your jurisdiction or agency can get started with using recycled asphalt shingles in paving projects, contact Kris Beatty with the King County Solid Waste Division at [kris.beatty@kingcounty.gov](mailto:kris.beatty@kingcounty.gov) or 206-477-4620 or visit: [www.kingcounty.gov/linkup](http://www.kingcounty.gov/linkup).



### Footnotes:

1. Information Series 138, *2nd Annual Asphalt Pavement Industry Survey on Reclaimed Asphalt Pavement, Reclaimed Asphalt Shingles, Warm-mix Asphalt Usage: 2009-2011*. National Asphalt Pavement Association, April 2013.
2. Greenhouse gas emissions savings derived from U.S. EPA Waste Reduction Model (WARM), version 12, 2/12; consumption equivalencies derived from U.S. EPA Greenhouse Gas Equivalencies Calculator, updated April 2013.
3. *Paving the Way for the future of Texas: Reducing Green House Gas Emissions in Asphalt Paving Operations*. Texas Asphalt Pavement Association.
4. Information Series 138, *3rd Annual Asphalt Pavement Industry Survey on Reclaimed Asphalt Pavement, Reclaimed Asphalt Shingles, Warm-mix Asphalt Usage: 2009-2012*. National Asphalt Pavement Association, December 2013.



[www.kingcounty.gov/linkup](http://www.kingcounty.gov/linkup)

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