SPECIAL REPORT

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Reclaimed Asphalt Pavement (RAP): Stockpile Emissions and Leachate

The asphalt pavement industry is America's biggest recycler. More than 75 million tons of asphalt pavement is reclaimed each year during widening and resurfacing projects, and more than 95 percent of that reclaimed material is reused in new pavement mixes; nearly all of the remainder is used in other road-building activities or stockpiled for future use (Hansen & Copeland, 2017). About 94 percent of the nation's highways and roads are surfaced with asphalt (FHWA, 2016). RAP is incorporated into new pavements, shoulders, and embankments. Recycling is a vital part of the asphalt pavement industry, as it provides great benefits to the general public.

- RAP has economic benefits for taxpayers, as well as environmental benefits. Using RAP results in lower costs because less virgin material is used.
- Research conducted for more than three decades has proven that recycled pavements offer the same durability as pavements constructed with virgin materials, but with significant cost savings to the public and private consumer.
- Milled RAP has the additional benefit of being ready to recycle without extensive processing.
- RAP reduces the amount of new petroleum products and aggregates used in building pavements.
- Until recycling became widespread in the 1970s, RAP was disposed of in landfills. Diverting 75 million tons of RAP from landfills annually is equivalent to 45.4 million cubic feet of landfill space (Newcomb et al., 2016).
- Thanks to recycling, government savings are in excess of $2.4 billion compared to the use of virgin materials (Hansen & Copeland, 2017).

Recycling of asphalt pavement is a well-accepted practice throughout the United States that conserves our precious natural resources while allowing highway agencies to deliver quality pavements to the traveling public in a cost-effective manner.

EPA recognizes that RAP piles are not likely to cause significant fugitive dust problems because the aggregate is coated with asphalt cement (see Harrison & Moody (1996), Section 2.2.1). Also, EPA and other agencies recognize that RAP can be used as an effective control for significantly reducing general fugitive dust emissions from unpaved roads and areas (Koch et al., 2011).

Regarding runoff or leachate from RAP, it is well documented that leachate or runoff from RAP storage is not problematic due to asphalt pavement's inert quality. For example, Kriech et al. (2002) conducted a laboratory study to determine, according to EPA methods, the detectable levels of 29 PAHs in leachate water from six paving asphalt and four roofing asphalt samples. The study found that half of the paving samples leached no detectable level of the 29 PAHs; three samples had detectable levels of naphthalene and phenanthrene, but well below drinking water limits.

Similarly, Townsend & Brantley (1998) performed a series of leaching tests on RAP samples obtained throughout Florida. None of 16 EPA priority pollutant PAHs were detected in the water from of any of the samples tested. These authors pointed out that during normal use of pavement, the asphalt may come in contact with vehicle exhaust, lube oils, gasoline, and metals from brake pads; despite this, no PAHs were detected.

Due to the inert nature of RAP, the material is commonly used as a clean fill material in highway construction activities. In fact, Virginia DOT published a synthesis of studies investigating the leaching potential of RAP (Winter, 2006), finding that: "Results of numerous field studies and standardized tests, including the Toxicity Characteristic Leachate Procedure (TCLP) test, suggest that typical RAP can be used as 'clean fill' without undue negative environmental consequences."

NAPA believes that vital natural resources are preserved through the wise and appropriate use of reclaimed asphalt pavement. We support and encourage thoughtful approaches to environmental protection, and we believe RAP is an important tool for environmental stewardship.

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References

FHWA (2016). Table HM-12: Public Road Length by Type of Surface and Ownership/Functional System. In *Highway Statistics 2015*. Federal Highway Administration, Washington, D.C.

Hansen, K.R., & A. Copeland (2017). Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2015 — 6th Annual Survey. Information Series 138(6e). National Asphalt Pavement Association, Lanham, Maryland.

Harrison, R., & T.K. Moody (1996). Preferred and Alternative Methods for Estimating Air Emissions from Hot-Mix Asphalt Plants: Final Report. Emission Inventory Improvement Program, Vol. 2, Ch. 3. Eastern Research Group Inc., Morrisville, North Carolina.

Koch, S., G. Huntington, & K. Ksaibati (2012). Performance of Reclaimed Asphalt Pavement on Unpaved Roads. Report No. FHWA-WY-11/03F. Wyoming Department of Transportation, Cheyenne, Wyoming.

Kriech, A.J., J.T. Kurek, L.V. Osborn, H.L. Wissel, & B.J. Sweeney (2002). Determination of Polycyclic Aromatic Compounds in Asphalt and in Corresponding Leachate Water. *Polycyclic Aromatic Compounds*, Vol. 22, No. 3–4, pp. 517–535. doi:10.1080/10406630290103708

Newcomb, D.E., J.A. Epps, & F. Zhou (2016). Use of RAP & RAS in High Binder Replacement Asphalt Mixtures: A Synthesis. Special Report 213. National Asphalt Pavement Association, Lanham, Maryland.

Townsend, T.G., & A. Brantley (1998). Leaching Characteristics of Asphalt Road Waste. Report No. 98-2. Florida Center for Solid and Hazardous Waste Management, University of Florida, Gainesville, Florida.

Winter, K. (2006). Leaching Characteristics of Recycled Asphalt Pavement: RAP May Be Suitable as a Fill Material. Research Synthesis Bibliography No. 4. Virginia Department of Transportation, Charlottesville, Virginia.