

Avoiding High Costs from Stormwater Sediment Contaminated by Coal Tar-Based Asphalt Sealcoats

Many Wisconsin communities will be facing the cost of sediment removal from stormwater detention ponds in future years. To avoid additional costs related to disposal of PAH contaminated sediment, municipalities should consider eliminating a major source of PAHs to their Municipal Separate Storm Sewer Systems - coal tar-based asphalt sealcoats.

Wisconsin municipalities and private landowners have installed over 10,000 wet detention ponds to manage runoff flows, sediment and nutrients. These basins collect whatever suspended solids flow into them, including asphalt sealcoating that has abraded off parking lots, playgrounds or other surfaces. Coal tar-based sealcoats contain polycyclic aromatic hydrocarbons (PAHs) that can lead to levels of contamination that may require stormwater sediment to be disposed of in a licensed landfill. The following Minnesota case study illustrates the potential economic risks posed by PAH contaminated sediment.

MN Community Saddled with PAH Dredging Costs

Inver Grove Heights is a suburb of St. Paul, Minnesota, population 34,000. The city has 589 stormwater drainage basins, many of which are “internally drained” due to the city’s kettle moraine topography, and typically have a 30 to 40-foot deep bowl-shaped catchment. Beginning in 2009, the city began inspecting its basins as part of routine maintenance required by its Municipal Separate Storm Sewer System (MS4) permit. Inspections revealed that many basins were significantly filled with sediment, reducing their holding capacity.

Permit conditions and awareness of the potential for the accumulated sediments to be contaminated with polycyclic aromatic hydrocarbons (PAHs) led city staff to test sediment in 12 basins. Three of these were found to be contaminated with PAHs, with two having high levels of PAHs. These findings led the city to ban coal tar-based pavement sealcoats in November 2011. The city embarked on its first PAH clean-up effort by targeting the smaller of the 2 basins found to be highly contaminated. This was a small project, requiring removal and landfilling of only 50 yards of sediment at a cost of \$60 per yard, for the modest amount of \$3,000.

The second basin however was a larger pond with heavy sediment accumulation. City staff estimated that a full clean-out would yield 7,000 yards of sediment. At a cost of \$65 per yard, this option would have cost \$455,000 for disposal alone. To reduce this cost, they chose to dredge only the area around the inlet of 2,300 yards of sediment, restoring part of the basin’s capacity for about \$150,000 in disposal cost.

In 2012, the city successfully pursued a Minnesota state grant of \$76,000 to begin the project. The first step was sediment testing (\$3,400) to detect the extent of PAH contamination. This was followed by additional testing (\$15,000) to pinpoint the most contaminated sediment. A licensed landfill within the city limits agreed to accept the contaminated sediment for use as daily cover in a lined cell, reducing disposal costs to \$36 per yard. The close proximity of the landfill also reduced transport costs.

While the project will not fully restore the basin's storage capacity, the final project cost of \$155,000 included:

- Evaluating and testing sediment;
- Engineering, contracting, and work plans;
- Site preparation (including temporary access roads and storage areas);
- Mobilization and overhead;
- Excavating, transport and disposal of sediment;
- Site restoration.



City staff estimate that over 140 basins will show some PAH contamination; with nearly 100 having high levels of contamination. The local landfill will not have enough space to hold these additional sediments, meaning that disposal costs will jump from \$36 to \$65 per ton (or higher) with additional transportation costs. Estimates for removing PAH contamination from all basins in the City range from \$1.5 to \$4.0 million.

Preventing the contamination of stormwater sediment with PAH would also prevent the city from incurring future high sediment disposal costs. Because national and Minnesota research had traced over 50% of PAH sediment contamination to coal tar-based asphalt sealcoats, the 2009 Minnesota legislature passed a law encouraging cities to pass ordinances banning coal tar sealcoats in order to be eligible for state grants to help pay for pond cleanout. To date, twenty eight Minnesota municipalities have banned coal tar-based asphalt sealcoats.

In 2007, Dane County, WI banned the application of coal tar-based asphalt sealcoats to avoid disposal costs like those incurred by Inver Grove Heights. Elsewhere, Texas, New York, Washington, Illinois, Maryland and the District of Columbia have bans in place. But disposal costs are not the only concern, *Coal Tar-Based Asphalt Sealcoats - A Health and Environmental Hazard* (below) describes the health and environmental risks associated with PAHs found in coal tar-based sealcoats.

Fortunately, there are several types of coal tar-free asphalt sealcoat products available to professional applicators: asphalt emulsion-based, Gilsonite (bitumen)-based, or acrylic-based. *Avoiding Coal Tar-Based Asphalt Sealcoats and Finding a Coal Tar-free Sealcoat Applicator* (below) describes how to identify coal tar products, and provides a list of Wisconsin sealcoat applicators that have certified that they do not use coal tar.

For more information on efforts to limit the use of coal tar-based asphalt sealants, visit: [Moving to Safer Alternatives to Coal Tar Sealcoats](#).

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For further information contact:

Madison
UW Extension
610 Langdon Street, Room 317
Madison, WI 53703
608.262.0385 tel
608.262.6250 fax

Milwaukee
UWM UW-Extension
161 West Wisconsin Avenue, Suite 6000
Milwaukee WI 53203
414.227.3160 tel
414.227.3165 fax

Stevens Point
University of Wisconsin
800 Reserve Street
Stevens Point, WI 54481
715.346.2793 tel
715.346.3624 fax

Coal Tar-Based Asphalt Sealcoats - A Health and Environmental Hazard

Asphalt sealcoats are used to improve the appearance and prolong the life of driveways and parking lots. Most of us are familiar with the heady odor and deep black appearance of freshly sealcoated asphalt. However, some sealcoat products contain coal tar, a byproduct of coke manufacturing. This fact sheet discusses the toxicity, health and environmental hazards of coal tar, and suggests ways to reduce risk.



- Van Metre

Coal Tar Toxicity

Coal tar is a complex chemical mixture that includes polycyclic aromatic hydrocarbons (PAHs), a class of chemical known to cause cancer. Preferred by many sealcoat applicators because of its superior pavement bonding properties, coal tar (RT-12) has been blended into asphalt sealcoats for many years. RT-12 coal tar typically contains more than a dozen toxic PAH's that have been determined to be: confirmed human carcinogens (ACGIH); potential occupational carcinogens (NIOSH); known human carcinogens (NTP); and/or carcinogenic to humans (IARC)¹. Types of cancer that may be caused by coal tar used in sealcoats (cited by the manufacturer) include: blood, kidney, liver, lung, scrotal, skin and stomach cancers.

The Health Hazard

The risk from cancer causing chemicals depends on human exposure. Exposure to PAHs in asphalt sealcoats can come in several ways. For example, sealcoat applicators can suffer from occupational exposure when handling or applying coal-tar-based sealcoat products. This exposure is regulated by the National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA).

There is also a need to protect the general public from exposure to PAHs resulting from coal tar-based asphalt sealant dust and vapor. Research² by the United States Geological Survey, Baylor University, Minnesota Pollution Control Agency, City of Austin Texas and University of New Hampshire shows that PAHs in coal tar-based asphalt sealants applied to driveways, parking lots or playgrounds can find their way into schools and homes, potentially exposing children and adults to toxic carcinogens via skin contact, ingestion or inhalation.

The Environmental Hazard

Coal tar-based sealant residue can also find its way into stormwater runoff from deteriorating sealcoat on asphalt parking lots and driveways. PAH contaminated runoff into lakes and streams contaminates aquatic life and can enter the food chain³. PAH contaminated sediment that accumulates in stormwater detention ponds can require removal and disposal as a hazardous material, increasing costs for municipalities and private land owners.

Managing Risk from Coal Tar-Based Sealcoats

Eliminating the use of coal tar-based asphalt sealcoats can (over time) reduce the health and environmental risk from these products, thus communities around the country are banning their use. In Wisconsin, Dane County has prohibited the sale or application of coal tar-based asphalt sealants. Asphalt sealcoat applicators in these communities are able to use alternative sealcoat products that provide similar performance and cost, without coal tar's carcinogenic properties.

Consumers (homeowners, businesses, schools, churches and municipalities) can insist that only non-coal tar-based sealants be used on their asphalt surfaces. Many home improvement stores now offer coal tar-free asphalt sealants. Before you apply asphalt sealant, or contract with a sealcoat applicator, be sure that the sealcoat used is free of coal tar compounds.

For more information on preventing the use of coal tar-based sealants

[Dane County, WI Ordinance 80.08 – Regulation of the Application and Sale of Sealcoat Products Containing Coal Tar](http://pdf.countyofdane.com/ordinances/ord080.pdf)

<http://pdf.countyofdane.com/ordinances/ord080.pdf>

[USEPA's coal tar-based asphalt sealant and stormwater webpage](http://cfpub2.epa.gov/npdes/courseinfo.cfm?program_id=0&outreach_id=645&schedule_id=1169)

http://cfpub2.epa.gov/npdes/courseinfo.cfm?program_id=0&outreach_id=645&schedule_id=1169

[Thinking about Sealcoating your Driveway? Get the Facts!](http://www.unh.edu/unhsc/sites/unh.edu.unhsc/files/UNHSC%20Seagrant%20sealcoat%20fact%20sheet.pdf)

<http://www.unh.edu/unhsc/sites/unh.edu.unhsc/files/UNHSC%20Seagrant%20sealcoat%20fact%20sheet.pdf>

[Coal Tar-Based Pavement Sealcoat, Polycyclic Aromatic Hydrocarbons \(PAHs\), and Environmental Health](http://pubs.usgs.gov/fs/2011/3010/pdf/fs2011-3010.pdf)

<http://pubs.usgs.gov/fs/2011/3010/pdf/fs2011-3010.pdf>

References

1. Koppers Inc.- Material Safety Data sheet #00228325, Pavement Sealer Base (PSB; K-364; RT-12): American Conference of Industrial Hygienists, The National Institute for Occupational Safety and Health, National Toxicology Program, International Agency For Research On Cancer
2. Williams et al, Coal Tar Pavement Sealants Might Substantially Increase Children's PAH Exposure, Environmental Pollution, 164 (2012) pg. 40-41

LaVista and Mahler, Coal Tar Sealcoats a Major Source of PAHs to Air and to Children Living Nearby, United States Geological Survey, February 13, 2012

Mahler et al, Coal Tar-Based Pavement Sealcoat and PAHs: Implications for the Environment, Human Health, and Stormwater Management, Environmental Science and Technology (2012), Vol. 46, 3039-3045

Mahler et al, Coal Tar-Based Parking Lot Sealcoat: an Unrecognized Source of PAH to Settled House Dust, Environmental Science and Technology (2010), Vol. 44 No. 3, pg. 894-900

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3. Yaning et al, Influence of Coal Tar Sealcoat and Other Carbonaceous Materials on Polycyclic Aromatic Hydrocarbon Loading in an Urban Watershed, Environmental Science and Technology (2010), Vol. 44, pg. 1217-1223

Bryer et al, Coal Tar-Based Pavement Sealant Toxicity to Freshwater Macroinvertebrates, Environmental Pollution (2010) Vol. 158, pg. 1932-1937

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Murakami et al, Modeling of Runoff Behavior of Particle-Bound Polycyclic Aromatic Hydrocarbons (PAHs) from Roads and Roofs, Water Research (2004), Vol.38 pg. 4475-4483

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For further information contact:

Madison
UW Extension
610 Langdon Street, Room 317
Madison, WI 53703
608.262.0385 tel
608.262.6250 fax

Milwaukee
UWM UW-Extension
161 West Wisconsin Avenue, Suite 6000
Milwaukee WI 53203
414.227.3160 tel
414.227.3165 fax

Stevens Point
University of Wisconsin
800 Reserve Street
Stevens Point, WI 54481
715.346.2793 tel
715.346.3624 fax

Avoiding Coal Tar-Based Asphalt Sealcoats and Finding a Coal Tar-free Sealcoat Applicator

There are several types of asphalt sealcoat products available to professional applicators. The most commonly used are: coal tar-based, asphalt emulsion-based, Gilsonite (bitumen)-based, or acrylic-based. Of these, coal tar-based products or blends contain the greatest amounts of Polycyclic Aromatic Hydrocarbons (PAHs), which have been found to cause cancer.

The table below¹ shows the amount of PAHs typically found in one brand of coal-tar (RT-12) used for blending asphalt sealcoats. The PAHs that have been highlighted are "reasonably anticipated to be human carcinogens" according to the *12th Report on Carcinogens* by the National Toxicology Program².

CAS	Component	Percent (weight)
65996-93-2	HIGH TEMPERATURE COAL TAR PITCH	100
-	The above listed complex substance contains the constituents listed below	-
85-01-8	PHENANTHRENE	1.85-2.7
206-44-0	FLUORANTHENE	1.50-2.35
129-00-0	PYRENE	1.02-1.59
91-20-3	NAPHTHALENE	0.87-1.32
120-12-7	ANTHRACENE	0.75-0.99
56-55-3	BENZ(A)ANTHRACENE	0.65-0.84
193-39-5	INDENO(1,2,3-CD)PYRENE	0.48-0.81
83-32-9	ACENAPHTHENE	0.47-0.74
218-01-9	CHRYSENE	0.56-0.73
205-99-2	BENZO(B)FLUORANTHENE	0.30-0.70
86-73-7	FLUORENE	0.50-0.70
192-97-2	BENZO(E)PYRENE	0.40-0.70
50-32-8	BENZO(A)PYRENE	0.47-0.69
132-64-9	DIBENZOFURAN	0.49-0.68
191-24-2	BENZO(G,H,I)PERYLENE	0.37-0.68
86-74-8	CARBAZOLE	0.40-0.60
90-12-0	1-METHYLNAPHTHALENE	0.00-0.60
189-64-0	DIBENZO(A,H)PYRENE	0.27-0.58
205-82-3	BENZO(J)FLUORANTHENE	0.22-0.56
207-08-9	BENZO(K)FLUORANTHENE	0.21-0.52
243-17-4	BENZO(B)FLUORENE	0.20-0.50
238-84-6	BENZO(A)FLUORENE	0.30-0.40
192-65-4	DIBENZO(A,E)PYRENE	0.00-0.30
217-59-4	TRIPHENYLENE	0.10-0.20
92-52-4	DIPHENYL	0.00-0.20
224-42-0	DIBENZ(A,J)ACRIDINE	0.07-0.19
91-22-5	QUINOLINE	0.00-0.16
53-70-3	DIBENZO(A,H)ANTHRACENE	0.07-0.11
226-36-8	DIBENZ(A,H)ACRIDINE	0.00-0.06
208-96-8	ACENAPHTHYLENE	0.01-0.04
194-59-2	7H-DIBENZO(C,G)CARBAZOLE	0.00-0.01

Products with PAH containing coal tar normally have Material Safety Data Sheets (MSDS), container labels or technical bulletins that reference Chemical Abstracts Service (CAS) numbers 65996–93–2, 65996-89-6 or 8007-45-2, and/or use the words: coal tar; refined coal tar; refined tar; refined coal tar pitch; coal tar pitch volatiles; and/or RT-12.

Coal tar-free sealcoat applicators

This is a list of Wisconsin asphalt sealcoat applicators that have certified that they do not use coal tar-based sealcoats:

A1 Seal Coating - Irma, Osceola,
ABBS Paving - Baraboo
Asphalt Maintenance & Paving - Eau Claire, Spring Valley
Asphalt Services - Rochester
Badger Asphalt - Madison
Beaver Companies - Beaver Dam
Blackline Asphalt - Wausau
Brew City Asphalt Maintenance - New Berlin
Directional Striping Company - Sun Prairie
Fahrner Asphalt Sealers - Plover, Eau Claire, Kaukauna, Waunakee, Frederic
Fond Du Lac Asphalt Paving - Fond du Lac
Grade-Tech Pavers - Ixonia
Hallman Asphalt & Sealing - Sun Prairie
Jet Black Sealcoating - Somerset
Klein Asphalt Maintenance - Manitowoc
Midwest Sealcoat - Dodgeville
Purpose Contracting - Franksville
Rochester Asphalt - Byron, MN
Roy's Sealcoating - Minong
Sailer Sealcoating - Hudson
SealKing - Somerset
Wisconseal Pavement Maintenance - Chippewa Falls

Other sealcoat applicators may also be coal tar-free, or be willing to apply asphalt emulsion, Gilsonite or latex based sealcoats. When specifying or contracting for asphalt sealcoating, require that the coating product be free from coal tar; refined coal tar; refined tar; refined coal tar pitch; coal tar pitch volatiles; and/or RT-12.

For more information on non-coal tar asphalt sealcoating see:

Moving to safer alternatives to coal tar sealcoats <http://www.pca.state.mn.us/ahx9qrk>

Notes:

1. Source: Koppers Inc.- Material Safety Data sheet #00228325, *Pavement Sealer Base* PSB; K-364; RT-12
2. [12th Report on Carcinogens, National Toxicology Program](http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf), <http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf>

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For further information contact:

Madison
UW Extension
610 Langdon Street, Room 317
Madison, WI 53703
608.262.0385 tel
608.262.6250 fax

Milwaukee
UWM UW-Extension
161 West Wisconsin Avenue, Suite 6000
Milwaukee WI 53203
414.227.3160 tel
414.227.3165 fax

Stevens Point
University of Wisconsin
800 Reserve Street
Stevens Point, WI 54481
715.346.2793 tel
715.346.3624 fax