JOEL KITCHENS

STATE REPRESENTATIVE • 1ST ASSEMBLY DISTRICT

Testimony for the Assembly Committee on Transportation
Assembly Bill 131
Thursday, March 25, 2021

Thank you Chairman Plumer and committee members for holding a public hearing and giving me the opportunity to testify on Assembly Bill 131, legislation recommended by the Speaker's Task Force on Water Quality that prohibits the sale and use of coal tar-based sealant products and sealants that contain high levels of polycyclic aromatic hydrocarbons.

This bill passed the Assembly unanimously last session and passed unanimously out of committee in the Senate. Unfortunately, the pandemic prevented its passage in the full Senate.

Polycyclic aromatic hydrocarbons (PAHs) are persistent organic compounds that come from both natural and man-made sources. Tar-based pavement sealants are a primary source of toxic PAH pollution in Wisconsin.

Research has shown that PAHs are especially harmful to human health and animals that live in our lakes and rivers. Over time, coal tar sealants get worn down by exposure to sunlight and vehicle traffic and, as the sealant wears away, it releases PAHs into the environment.

A large portion of this pollution – which amounts to millions of pounds of PAHs every year – comes in the form of toxic dust and sediment and is carried into homes on shoes and children's toys; settles in the soil of nearby lawns, gardens and playgrounds; or washes off during rainstorms into storm sewers and waterways. The United States Geological Survey also states that coal tar sealants release more airborne PAHs every year than the entire U.S. vehicle fleet.

According to the U.S. Environmental Protection Agency, at least six of the PAHs found in coal tar pavement sealants are probable human carcinogens and one PAH – benzo[a]pyrene – is a known carcinogen. The American Medical Association, which supports a ban on these products, says people exposed to coal tar sealants on a regular basis have a 38 times higher chance of developing cancer.

The EPA has also confirmed that coal tar pavement sealants release hundreds of times more PAHs into the environment than other kinds of sealants. Furthermore, the EPA has issued fact sheets urging consumers and businesses to be aware of the risks these sealants pose and to choose safer alternatives.

In the past 10 years, coal tar has also been cited as a hazardous substance by the Occupational Safety and Health Administration, American Conference of Governmental Industrial Hygienists, U.S. Department of Transportation, National Institute for Occupational Safety and Health,

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National Toxicology Program, International Agency for Research on Cancer and National Fire Protection Agency.

The EPA believes that choosing to ban coal tar sealants may be the most cost-effective way for communities to deal with the pollution impacts of these products.

Under AB 131, the sale of coal tar-based sealant products and sealants that contain high levels of PAHs would be banned starting approximately six months after the legislation is signed into law. A ban on the use of these products would begin approximately one year after the bill takes effect.

I strongly believe a ban is both feasible and needed because there are safer, cost-competitive alternatives to PAH tar-based sealants that are currently available. Modern asphalt-based pavement sealants contain up to 1,000 times lower PAH levels while also having similar life expectancies.

In the past, coal tar sealants were more durable than asphalt based sealants and did not need to be reapplied as frequently. As industry experts who will be testifying here today will clearly state, that is no longer true. While some users cling to this outdated belief, modern asphalt based sealants last as long, if not longer, than coal tar based sealants.

Speaking of that, you will soon be hearing from some opponents of this bill. While I respect that people can disagree on certain things, some groups are trying to defeat this legislation by spreading a lot of misinformation. To counter those claims, Thomas Ennis of Coal Tar Free America has put together a document that I have shared with all of you.

Furthermore, prohibiting these products will not only protect the environment, it will help save a significant amount of taxpayer dollars. Recently, the Environmental Protection Agency ordered the cleanup of the Milwaukee River Estuary to dredge PCB's and PAH's in the sediment. This project is expected to cost more than $300 million. Unlike other similar cleanup projects, there is no business that can be held responsible, so the cost will fall entirely on taxpayers.

A recent study in the Milwaukee area found that 77 percent of PAH pollution in local streambed sediment came from coal tar-based sealants. Undoubtedly, this cleanup project is the tip of the iceberg.

As you can see, there is no acceptable reason why we should allow the continued use of PAH sealants. We should be following the lead of Minnesota, Washington, Maine and Washington, D.C., which have all enacted bans on these sealants. A growing number of municipalities in Wisconsin – Sturgeon Bay, Green Bay, De Pere, Wauwatosa, West Allis, Elm Grove, Milwaukee and Manitowoc among others – already have a ban in place and several others are currently considering similar restrictions. Our bill would ensure that everyone is on a level playing field.

I want to thank you for taking the time to listen to my testimony and I hope you consider supporting AB 131. I would be happy to answer any questions if you have them.

Industry Tries to Derail Wisconsin Ban Legislation

Last week I got this flier which is being circulated around Wisconsin trying to stop the bi-partisan effort to ban coal tar and high polycyclic aromatic hydrocarbon (PAH) asphalt sealers in that state. Last session it passed the State Assembly unanimously before the session ended because of the pandemic.

That was the first time that any state-level chamber unanimously passed coal tar legislation and it is tribute to the work put in by members of both parties who held listening sessions around the state about what can be done to protect Wisconsin water resources.

In order to address these industry comments I have sliced up their document and will address each of their issues. For clarity, the industry comments are in a double-lined border.

ACTIVISTS FALSE ARGUMENTS

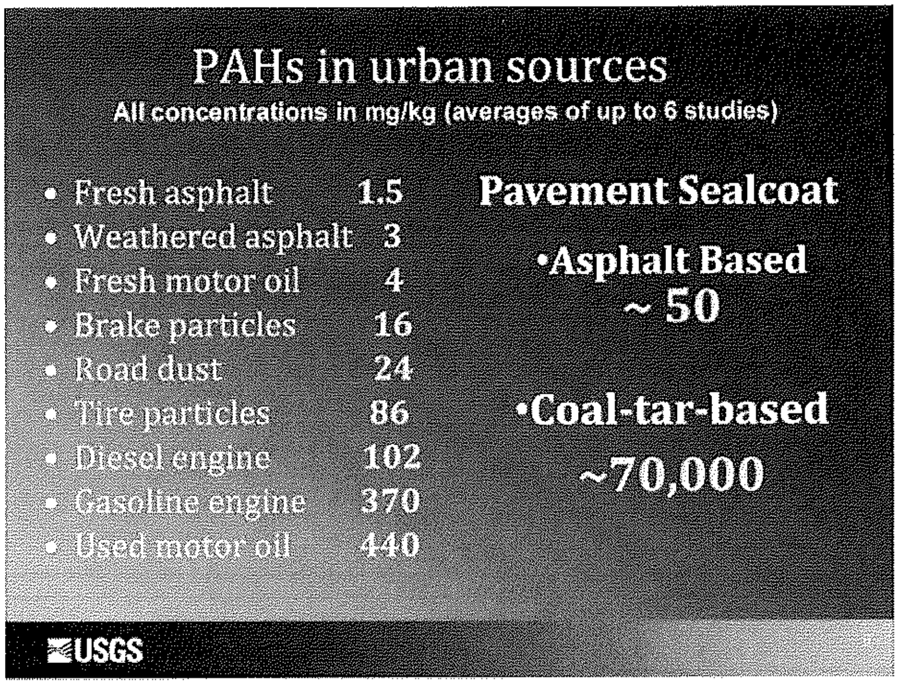
Activists who are campaigning against the use of refined tar-based pavement sealer (RTS) generally make arguments that rely on distortions and discredited interpretations of environmental and health science evidence.

False Argument #1: RTS is the source of a high percentage of compounds known as polycyclic aromatic hydrocarbons (PAHs) in sediments in lakes, streams and storm water retention ponds.

In the case of sediments in the Milwaukee area, the local office of the US Geological Survey (USGS) has published a paper concluding that RTS is a major source of PAHs using circular reasoning. First, sediment samples that contain PAHs that look similar to what were identified as the signature of RTS were found. Then statistical techniques were the used to "prove" that the signature of RTS was the same as those specially selected sediment samples. Statistical manipulation of specially selected samples has been a hallmark of the USGS advocacy-oriented science on the topic of RTS, whether in Milwaukee or Texas or elsewhere. When other common methods are used to identify sources of PAHs, little or no contributions from RTS have been found in most locations. Comprehensive studies of sources of PAHs in New York/New Jersey Harbor and Puget Sound (Seattle) have both found that wood burning from fireplaces and stoves is the largest source of PAHs (about a third in both cases), whereas PAHs from pavement sealants contribute less than 1% of the total.

This is a classic distraction argument. They would like to have an argument over statistical methods to distract from the simple fact that when compared to other mobile sources of PAHs, coal tar pavement sealers are some of the most potent, mobile sources, as you can see in the following table. And they have to be replaced every few years.

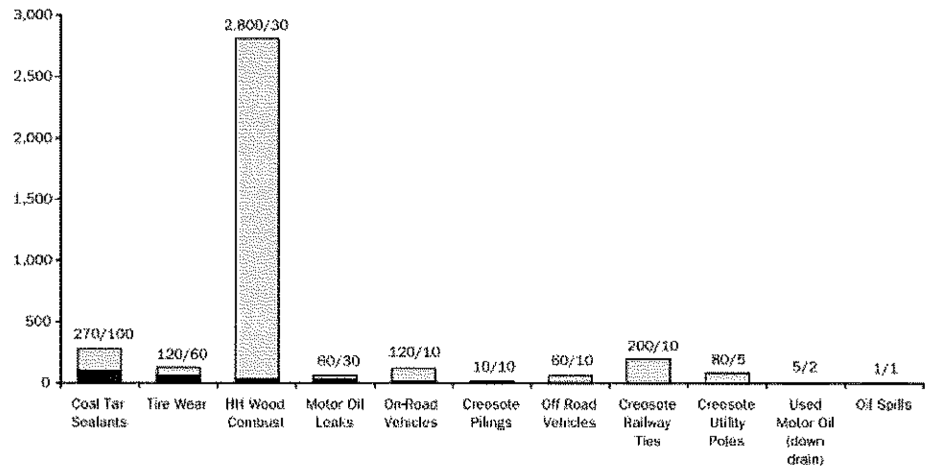
In more than 15 years the sealcoat industry has offered no coherent explanation about where their product goes when it is worn off of pavement, but have actually blamed high PAHs in streams on volcanoes and space dust. [Reference 1]



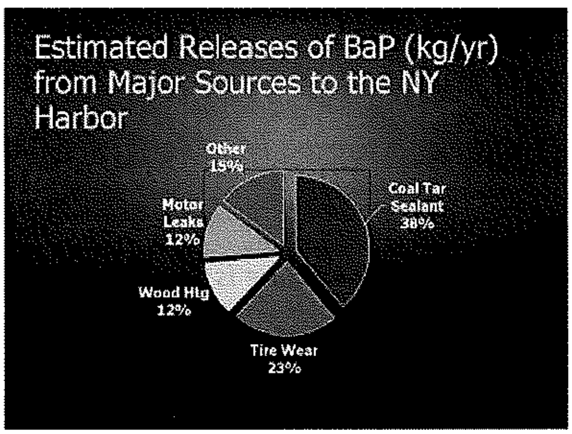
Industry also misquotes the New York Academy of Sciences finding re: the Harbor Study for PAHs in 2007. They cite the level of PAHs emitted (gray bars in graphic below), not the effective loading (black bars in the same graphic) to the Harbor . This image is clipped directly from the report. Note that the largest single source for effective loading is coal tar sealers, not wood burning stoves.

The following pie chart uses this data to more clearly show the loading and differences. The largest single source is coal tar sealers at 38% in the most compact urban area in our nation with the fewest surface parking lots per capita. [Reference 2]

Figure 8. Estimated releases of BAP (kg/yr) from the major sources of PAHs in the Watershed (gray) compared with estimated loadings (black)



9. For more information on PBTs, visit the EPA web site at http://www.epa.gov/pbt/.



False Argument #2: RTS is a health hazard.

Across the two, three and four generation memories of the many family-owned companies in the RTS business, there are no reports of adverse chronic health effects directly attributable to RTS. Expanding the search for possible health hazards to other products made from refined tar, every day millions of people world-wide use coal tar soaps, shampoos and creams approved for over-the-counter sales to treat skin disorders such as eczema, psoriasis and dandruff. A refined tar product is used to coat the inside surfaces of pipes used to distribute drinking water in many areas, with no demonstrable adverse effects on the water-drinking public. The false argument is that, theoretically, there could be health effects based on the classification of constituent ingredients as possible human carcinogens, which classifications in turn are based on exposure of laboratory animals to high concentrations of individual PAH compounds[1]. Studies of actual human exposures to PAH containing materials strongly indicate that the animal-based classification should not be extrapolated to humans. Further, the USGS, which has no expertise in this area, claims that RTS is associated with excess risk. Those claims are based on science that was demonstrated to be wrong 2 decades ago. Health Canada evaluated the

RTS exposure data relied on by the USGS to make its risk claims, and found levels that are of little concern for public health. There is simply **NO** evidence that RTS causes cancer.

Well the most respected group of doctors in the United States, the AMA, says that it should be banned. Do you want to know more than that? [Reference 3]

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PRESS RELEASES

AMA urges legislation to ban dangerous coal-tar sealcoats

NOV 16, 2016

ORLANDO, Fla. — The American Medical Association (AMA) adopted new policy aimed at reducing or ending the use of common coal-tar-based sealcoats that are used and applied on pavement and playgrounds across the country. The new policy advocates for legislation either to ban the use of pavement sealcoats containing polycyclic aromatic hydrocarbons (PAH) or to mandate the use of sealcoat products with minimal PAH. According to the International Agency for Research on Cancer, PAH compounds have been proven to be carcinogenic, mutagenic, and teratogenic to humans.

"Whether they are sending their children to a playground or repairing a driveway, Americans are potentially being exposed to harmful carcinogens in coal-tar-based sealcoats," said AMA Board member Albert J. Osbahr III, M.D. "Even if one's exposure is limited, as sealcoats erode over time, PAHs leach into the water, soil, and air, finding their way into sediment and eventually into aquatic wildlife. We must take action to either eliminate the use of PAH altogether or dramatically reduce its concentration in coal-tar sealcoats."

Studies show that individuals with lifelong exposure to coal-tar sealcoat-treated pavements and playgrounds have a 38-fold higher risk of cancer. Already, Washington, Minnesota, Washington, D.C., and counties, townships and municipalities in many other states, including Michigan, have banned the use of coal-tar sealcoats. Alternatives to coal-tar-based sealcoats, including asphalt, acrylic, or latex sealcoats, have low or no PAHs and are available at a similar cost.

False Argument #3: RTS pollutes water supplies.

The false argument is that PAHs derived from RTS are a threat to water supplies. Even if RTS were an important source of PAHs found in sediments, neither RTS nor PAHs pose any threat to water supplies because RTS and indeed, PAHs in any form, are virtually insoluble in water. Examples of the virtual absence of PAHs in water can be found in every US state's Clean Water Act Section 303(d) reports, in which reports of PAHs as a cause of impairment of water quality are extremely rare. A review of the past several Wisconsin Section 303(d) reports for PAHs as a cause of impairment found that PAHs have NO instance of PAHs identified as a cause of impairment anywhere in the state. Every drinking water system in the US is required to analyze and report chemicals found in water distributed to homes – it is exceedingly rare for drinking water suppliers to find PAHs in drinking water supplies.

This is a classic straw man argument. No one claims that PAHs from coal tar sealers are contaminating water supplies. The biggest risk to the human community is children playing or living near coal tar sealer surfaces. Period.

We consistently argue that the impairment of the ecosystem begins in sediment, not in water. In other words they are trying to counter an argument no one is making.

False Argument #4: RTS is based on a hazardous waste, and banning it is a factor in approval of MS-4 permits.

Neither RTS nor its coal tar base are hazardous wastes because they pass EPA's hazardous waste TCLP test, and so are not subject to Land Disposal Restrictions in federal hazardous waste regulation program. This has been affirmed by federal courts. Disposal is an issue in Minnesota, but only because of Minnesota laws, which are not applicable in Milwaukee. Measures to control PAHs or coal tars are not factors in approval of MS-4 permits. PCTC has challenged EPA to correct misinformation about RTS on its storm water web site.

The old expression is that if it looks like a duck, quacks likes a duck and swims like a duck, then that is what is probably is.

What is the number 1 most common contaminant the United States has cleaned up at hazardous waste facilities?

Coal tar.

What contaminant was responsible for the largest fine in EPA history?

Coal tar.

What contaminant required a special exception from the EPA so that it wouldn't be classified as hazardous waste?

Coal tar.

False Argument #5: There's an alternative product available, so why not just ban RTS?

Asphalt-based pavement sealers (ABS) are indeed an alternative, but they are not a replacement because ABS does not do the same job. Where both are available, RTS is preferred for most applications. This preference is mostly because RTS is resistant to degradation caused by leaks/spills of petroleum-based products (such as gasoline, jet fuel, motor oil, etcetera), to other corrosive materials and because of longevity. ABS needs to be re-applied more often than RTS – depending on the situation, the longevity of RTS can be years longer than ABS. In addition, RTS is manufactured to a standard which, among other things, means its physicochemical properties are predictable. There have been and continue to be attempts to develop standards for ABS manufacture, but there isn't one at this time. The predictability and performance characteristics of RTS are the prime reasons RTS is specified for many situations.

These statements here are full of outdated, false notions.

First of all, Home Depot and Lowes stopped selling coal tar sealers more than a decade ago. In 2007, I worked with the City of Austin team advising the New York Academy of Sciences on PAH pollution in the NY Harbor. At those meetings, the Chief Sustainability Officer for Lowes, Michael Chennard, said that they stopped selling coal tar sealants after learning about it from Austin, based upon a business model. Here's the Lowes' equation:

1. Identify products that have a high potential liability. He said their pockets were now deeper than many of their suppliers, so they have more to lose.

2. Find out if there are suitable alternatives in quality and price.

3. If both the quality and prices are similar, then remove the problematic product from the shelves

The one-time great benefit of coal tar sealer being fuel resistant no longer matters. Fuel resistant, hot mix asphalt is currently being used around the country.[Reference 4]

They mention there is no standard for asphalt based sealcoat. It actually was developed by the Asphalt Sealcoat Manufacturer's Association more than 20 years ago. Below is the heading clipped from that standard. [Reference 5]

N.A.S.M.A Specs

National Asphalt Sealcoating Manufacturing Association

1-3 ASPHALT SEALCOATS

1-3.01 Descriptions

The work covered by this specification includes the design, testing, and quality control required for the proper production of an Asphalt Sealcoat product and all materials, equipment and workmanship required for the application of an Asphalt Sealcoat to an existing asphalt concrete pavement where shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Asphalt sealcoats are recommended for minor repair and maintenance and for the protection of existing asphalt concrete pavements such as low volume city streets, parking lots, highway shoulders, airport taxiways, tarmacs, and aprons, bike paths, driveways, or any asphalt concrete pavement

Most of the companies involved in the RTS industry are small and medium size businesses – just the sort of businesses that are disadvantaged by the rush to regulation that seems to be popular now. RTS manufacturers and suppliers are good corporate citizens, with well paid, often unionized work forces. Recently, the Pavement Coatings Technology Council held a webinar for sealcoating contractors. Of the 265 industry participants who registered for the webinar, 47% were from companies with 10 or fewer employees. Another 32% were from companies with 11 to 35 employees. This reflects the industry, dominated by small to very small local businesses. Contractors in northern states estimate that using ABS rather than RTS reduces their sealcoating season by, at a minimum, 20%, thereby reducing their income by 20% or more.

The main point of this section is the claim that sealcoater's business will drop 20% if a ban goes into effect.

There are two angles to approach this. First, the owner of a franchise sealcoat business with locations in Wisconsin, Michigan, Minnesota, Illinois, South Dakota and 13 other states said that banning coal tar sealer would not affect their business in the long run. Specifically Nick Kelso of Jet-Black said:

"There are pros and cons to both," Kelso said. "We don't think (the bans) will affect business in the long-term." [Reference 6]

Second, the prospects are good for the sealer industry in the US even without coal tar.

A market research company recently confirmed what one CEO of a sealer company said a few years ago: bans really won't hurt the sealcoat business.

In the projected period through 2027, the industry is expected to experience "moderate growth" but "rising bans on coal tar-based sealers, the improved performance of asphalt-based sealers, and competitive pricing are expected to result in the increased consumption of bitumen and asphalt sealers..." [Reference 7]

Train Photo by Mark Loewe on Flickr

References

Reference 1: Industry webinar. https://coaltarfreeusa.com/2013/02/space-junk-volcanoes-and-coal-tar-sealers-industry-webinar-to-stop-bans-has-some-surprises/

Reference 2: Pollution Prevention and Management Strategies for Polycyclic Aromatic Hydrocarbons in the New York/New Jersey Harbor, New York Academy of Sciences, 2007. https://austintexas.gov/sites/default/files/files/Watershed/coaltar/nyas_pah_harbor_study_final.pdf

Reference 3: AMA Press Release 2016: https://www.ama-assn.org/press-center/press-releases/ama-urges-legislation-ban-dangerous-coal-tar-sealcoats

Reference 4: Bob Sikes Airport Installs New Fuel Resistant Asphalt, Airport Improvement Magazine, July-August 2012. https://airportimprovement.com/drupal778/index.php/bob-sikes-airport-installs-new-fuel-resistant-asphalt?q=article/bob-sikes-airport-installs-new-fuel-resistant-asphalt

Reference 5: National Asphalt Sealcoat Manufacturers' Standard Specification. http://www.sealcoatmfg.org/asma-spec.pdf

Reference 6: Quad City Press, March 16, 2011. https://www.presspubs.com/quad/news/tar-sealant-still-ok-for-lino-driveways/article_679065f5-0868-54f6-83ec-b6c9c2f22dbb.html

Reference 7: http://www.transparencymarketresearch.com/north-america-sealers-market.html

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Testimony on 2021 Assembly Bill 131

Senator Robert Cowles
Assembly Committee on Transportation
March 25th, 2021

Thank you, Chairman Plumer and Committee Members, for holding a hearing and allowing me to testify on 2021 Assembly Bill 131. This bill would prohibit the sale and application of coal tar-based sealant products and other high PAH sealants in Wisconsin.

Polycyclic Aromatic Hydrocarbons (PAH) are a group of compounds which are largely naturally occurring during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances such as tobacco. One of the main sources of PAH pollution is coal tar-based sealants which are applied to residential and commercial driveways and parking lots to increase the longevity of the pavement.

Coal tar-based sealants are a primary source of pollution due to the level of PAH ranging from 70,000 to 100,000 parts-per-million (ppm). Other sources of PAH pollution have levels that are much lower, such as fresh asphalt (1.5 ppm), smoke from wood fires (2 to 114 ppm), engine exhaust (102 to 370 ppm), and used motor oil (440 ppm). For reference, the Environmental Protection Agency (EPA) has suggested that taking 0.3 milligrams or less per 2.2 pounds of body weight of certain PAHs into your body each day is not likely to cause harmful health effects. But, because of coal tar-based sealants and less so from other sources, the average total exposure each day among the U.S. population is over 3.0 mg per day per 2.2 pounds of body weight. That's 10-times higher than the suggested maximum exposure.

Overexposure to PAH has been linked to cancer, reproductive problems, and organ damage. Multiple studies by Baylor University and the U.S. Geological Survey have shown that children living in homes near parking lots coated with coal tar-based sealants have a 14-times higher risk of cancer versus children living next to unsealed pavement. Additionally, lifetime exposure leads to a 38-times increased rate of cancer. In a study of ground-floor apartments in Austin, Texas, PAH levels in house dust in apartments near parking lots sealed with a coal tar-based product were 25-times higher than in house dust near parking lots sealed with other surface types.

PAHs accumulate in soils, household dust, and carpets when coal tar-based sealant particles are blown or tracked into buildings. The particles come from sealants being worn down over time by weather, tire abrasion, foot traffic, and improper application. Sealant particles are also washed into waterbodies by precipitation and runoff events. PHAs compounds have been shown to have severe impacts to aquatic wildlife, killing small organisms living on the bottom of lakes, rivers and streams and causing tumors in fish and other large aquatic mammals in those waterbodies. With this testimony, I've included a short flier from the U.S. Geological Survey with more information on the harmful impacts of coal-tar based sealant products.

With all of this background in mind, here's why it matters in Wisconsin. A study recently completed in Milwaukee found that 77% of PAH pollution in local streambed sediment came from coal tar-based sealants. PAH is one of the primary compounds that's lead to the federal Environmental Protection Agency designating

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an Area of Concern (AOC) in the Milwaukee River Estuary. Given that coal tar-based sealant applications are so diffuse but accumulate over time, naming a Responsible Party to pay for remediation costs is impractical, meaning that taxpayers will bore the costs of this $300+ million cleanup project.

The Milwaukee River Estuary AOC is just the first of what's bound to be many cleanup projects required under federal and state law as a result of decades of use of coal tar-based sealant projects, resulting in billions of dollars of costs borne by the taxpayers. While we can't revert from this legacy pollution, we can make a change to prevent future instances of pollution.

Asphalt-based pavement sealants have 1,000-times lower PAH levels than their coal tar-based counterpart and are both cost-competitive and readily available. The longevity of asphalt-based sealants is also comparable. Coal tar-based sealant restrictions have already been enacted in two counties and at least twenty Wisconsin communities, including my hometown of Green Bay. Our neighboring states have also seen the value in placing similar restrictions on coal tar-based sealants, including the State of Minnesota and several communities in Illinois and Michigan. Minnesota's ban came at least in-part after the costs to taxpayers of the cleanup of PAHs in stormwater pond sediment and other waterbodies in the Twin Cities area was estimated to be in the hundreds of millions of dollars. Major retailers including Ace, Home Depot, Lowes, and Menards have stopped selling coal tar-based sealants, and dozens of contractors in Wisconsin have switched to asphalt-based sealants.

We've already made efforts in Wisconsin to reduce PAH exposure from second-hand smoke and through drinking water and air quality standards. Creating a statewide ban on coal tar-based sealants in Wisconsin will further these efforts to help improve the health of our children and residents, protect our waterways and aquatic wildlife, and save the taxpayers' pocketbooks. Assembly Bill 131 prohibits the sale of coal tar-based sealant products and high PAH level sealant products beginning approximately six months after publication, and prohibits the application of such products beginning approximately one year.

This legislation also stipulates that the DNR may grant an exemption upon written request from someone looking to research the effects of coal tar-based sealant products and other high PAH sealant products on the environment or if the use of these products is required for research or development of an alternative technology.

Leading researchers from government agencies and educational institutions along with top health professionals from the American Medical Association all agree that the risk of PAH exposure from coal-tar sealants is too high of a price to pay when common-sense alternatives are available.

As I'm sure many of the Committee Members can sympathize with, I take hesitancy when it comes to banning products. But the deck is stacked against coal tar-based sealants, and while some applicators and groups may be comfortable letting the taxpayers and citizens of this state bear the brunt from use of this product, I am not.

The long-term costs to the state from overexposure to PAH in health care expenses, lost wages leading to lost productivity and tax revenue, reduced aquatic life productivity leading to sport fishing reductions, and environmental remediation expenditures are truly incalculable. Some of these costs can be avoided by following the lead the Wisconsin communities that have moved to restrict the use of coal tar-based sealants by passing Assembly Bill 131. In the process, we can ensure a healthier future for Wisconsin's youth and cleaner waterways for recreation and aquatic wildlife.

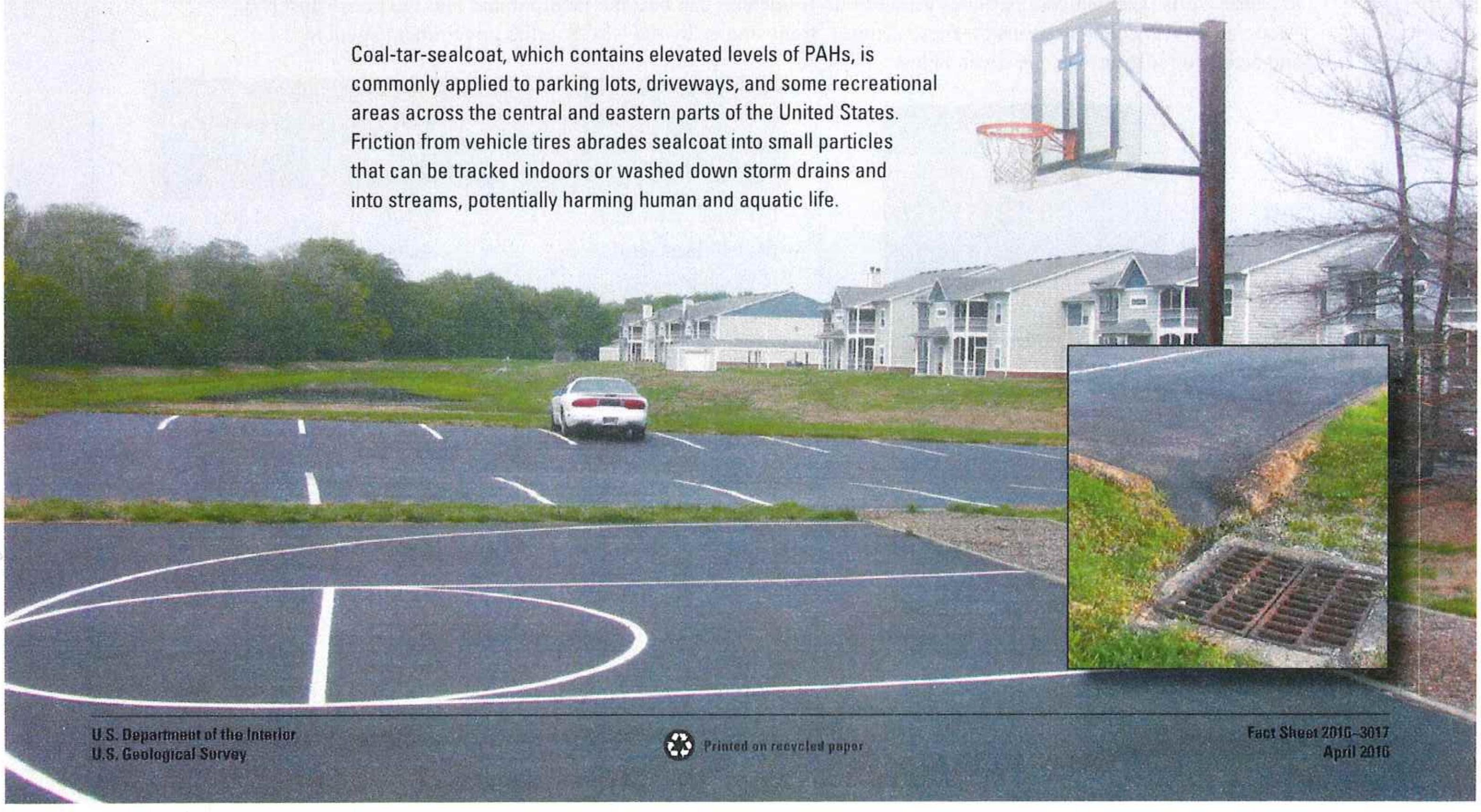
Coal-Tar-Based Pavement Sealcoat—Potential Concerns for Human Health and Aquatic Life

Sealcoat is the black, viscous liquid sprayed or painted on many asphalt parking lots, driveways, and playgrounds to protect and enhance the appearance of the underlying asphalt. Studies by the U.S. Geological Survey (USGS), academic institutions, and State and local agencies have identified coal-tar-based pavement sealcoat as a major source of polycyclic aromatic hydrocarbon (PAH) contamination in urban and suburban areas and a potential concern for human health and aquatic life.[1]

Key Findings:

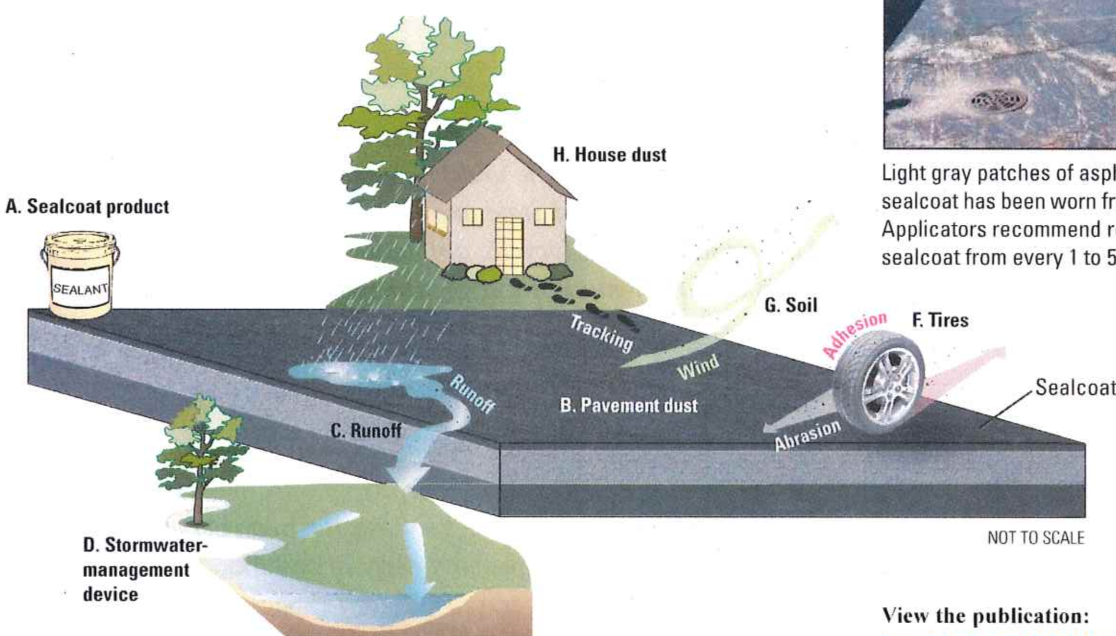
Human Health Concerns—As coal-tar-based sealcoat ages, it wears into small particles with high levels of PAHs that can be tracked into homes and incorporated into house dust. For people who live adjacent to coal-tar-sealcoated pavement, ingestion of PAH-contaminated house dust and soil results in an elevated potential cancer risk, particularly for young children. Exposure to PAHs, especially early in childhood, has been linked by health professionals to an increased risk of lung, skin, bladder, and respiratory cancers.[2]

Aquatic Life Concerns—Runoff from coal-tar-sealcoated pavement, even runoff collected more than 3 months after sealcoat application, is acutely toxic to fathead minnows and water fleas, two species commonly used to assess toxicity to aquatic life. Exposure to even highly diluted runoff from coal-tar-sealcoated pavement can cause DNA damage and impair DNA repair. These findings demonstrate that coal-tar-sealcoat runoff can remain a risk to aquatic life for months after application.



Coal-tar-sealcoat, which contains elevated levels of PAHs, is commonly applied to parking lots, driveways, and some recreational areas across the central and eastern parts of the United States. Friction from vehicle tires abrades sealcoat into small particles that can be tracked indoors or washed down storm drains and into streams, potentially harming human and aquatic life.

As Sealcoat Wears Off, Where Does It Go?



Light gray patches of asphalt show where sealcoat has been worn from the pavement. Applicators recommend reapplication of sealcoat from every 1 to 5 years.[1]

View the publication:
http://dx.doi.org/10.1021/es203699x

Worn particles of coal-tar-based sealcoat containing high concentrations of PAHs and related chemicals are transported by rain, wind, tires, and even our feet from pavement to other environmental settings. Sealcoat product (A), after it dries, gradually abrades to a powder and becomes part of the dust on the pavement (B). Pavement dust is transported by rainfall runoff (C) to stormwater-management devices (D) or to receiving streams and lakes (E). Pavement dust also adheres to tires (F) that track it onto unsealed pavement, and wind and runoff transport the dust to nearby soils (G). Sealcoat particles tracked into residences can become incorporated into the house dust (H). Associated PAH concentrations for these settings, from studies by the USGS, other government agencies, and academic institutions, are given below.

Setting	PAH concentration* (milligrams per kilogram)	
	Coal-tar-sealcoat settings	Non-coal-tar-sealcoat settings
(A) Sealcoat products	66,000	50
(B) Pavement dust	2,200	11
(C) Runoff, particles	3,500	54
Runoff, unfiltered water	62	4
(D) Stormwater-management-device sediment	646	2
(E) Lake sediment	33	0.4
(F) Particles adhered to tires	1,380	3
(G) Soil	105	2
(H) House dust	129	5

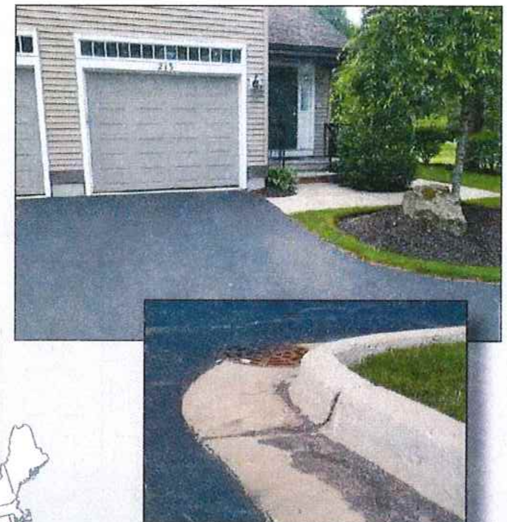
*Concentrations are means or medians. References and additional information are provided in Mahler and others (2012).[1]

PAH Levels in Asphalt-Based and Coal-Tar-Based Sealcoat

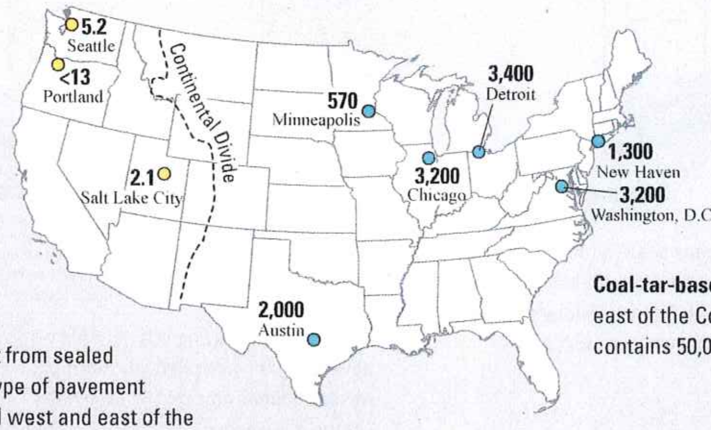
Pavement sealcoat is a commercial product that is applied to many asphalt parking lots, driveways, and playgrounds in North America in an effort to protect and beautify the underlying asphalt. It rarely is used on public roads.

Most sealcoat products are either coal-tar or asphalt emulsion, although some alternative products now are available.[3] Coal tar and coal-tar pitch have extremely high concentrations of PAHs as do coal-tar-based sealcoat products, which typically are 20–35 percent coal tar or coal-tar pitch. Asphalt and asphalt-based sealcoat products have much lower concentrations of PAHs.

For historical and economic reasons, use of asphalt-based sealcoat in the United States is more common west of the Continental Divide and use of coal-tar-based sealcoat is more common east of the Continental Divide, except in States, counties, and municipalities where use of coal-tar-based sealcoat is prohibited.[3]



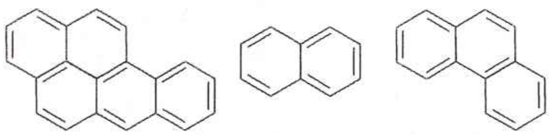
Asphalt-based sealcoat, primarily used west of the Continental Divide, typically contains about 50 mg/kg PAHs.[4]



Coal-tar-based sealcoat, primarily used east of the Continental Divide, typically contains 50,000 to 100,000 mg/kg PAHs.[4]

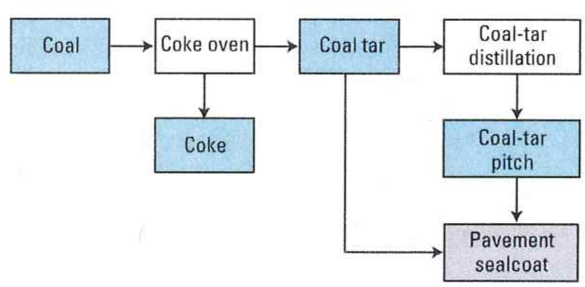
PAH levels in dust swept from sealed parking lots reflect the type of pavement sealcoat commonly used west and east of the Continental Divide.[1] Concentrations, in units of milligrams per kilogram (mg/kg), also referred to as "parts per million" (ppm), shown here are for the sum of the 16 PAHs listed by the U.S. Environmental Protection Agency as Priority Pollutants. Concentrations are for composite samples from multiple parking lots or a median of several individual samples.[5]

Polycyclic aromatic hydrocarbons (PAHs) are a group of chemicals created by heating or burning material that contains carbon. The many sources of PAHs to the urban environment span a wide range of PAH concentrations and include asphalt (2–9 mg/kg), tire particles (84 mg/kg), used motor oil (730 mg/kg), and coal-tar-based sealcoat (34,000–202,000 mg/kg).[6] PAHs are an environmental concern because many cause cancer, mutations, birth defects, or death in fish, wildlife, and invertebrates.[7] Exposure to sunlight greatly intensifies the adverse effects of several PAHs. The U.S. Environmental Protection Agency (EPA) has classified seven PAHs as probable human carcinogens (Class B2) and 16 PAHs as Priority Pollutants. Environmental and health effects depend on which PAHs are present and their concentrations.



PAHs are made up of various arrangements of benzene rings. PAHs commonly occur in the environment as mixtures, which typically include at least some of the PAHs that are classified as probable human carcinogens.

Coal tar is a byproduct of the coking, liquefaction, or gasification of coal and is a complex mixture composed primarily of aromatic hydrocarbons. Coal-tar pitch is the residue that remains after the distillation of coal tar; it is a complex mixture of high molecular weight aromatic hydrocarbons and black carbon solids. The primary use of coal-tar pitch is in electrode manufacturing for the aluminum industry.[8] Coal-tar emulsion pavement sealants contain either crude coal tar (Chemical Abstracts Service [CAS] Registry Number 8007–45–2) or coal-tar pitch (CAS Registry Number 65996–93–2). Coal tar and coal-tar pitch are known human carcinogens.[9]

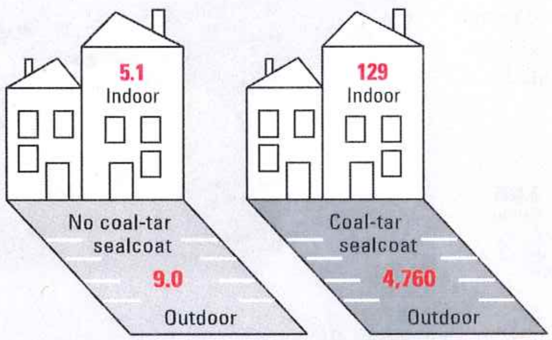


Potential Risks to Human Health

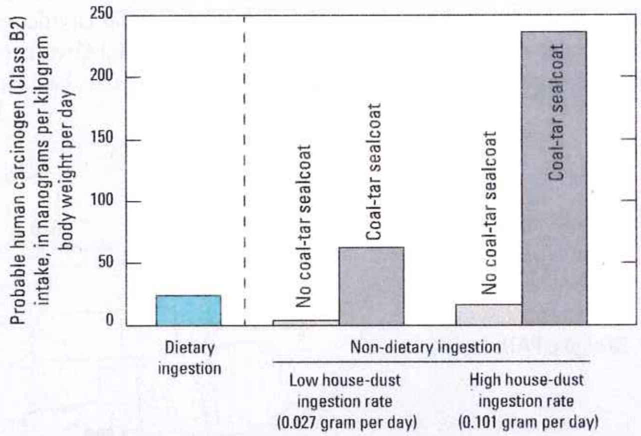
PAHs from coal-tar-based sealcoat contaminate house dust[10]

In a study of 23 ground-floor apartments in Austin, Texas, PAH levels in house dust in apartments with parking lots sealed with a coal-tar-based product were 25 times higher than in house dust in apartments with parking lots with other surface types (concrete, unsealed asphalt, and asphalt-based sealcoat). No relation was found between PAHs in house dust and other possible indoor PAH sources such as tobacco smoking and fireplace use.

. House dust is an important pathway for human exposure to many contaminants, including PAHs. This is particularly true for small children, who spend time on the floor and put their hands and objects into their mouths.



PAH-contaminated dust on coal-tar-sealcoated pavement (right) is tracked indoors.[10] Concentrations shown are median values for the sum of the 16 Priority Pollutant PAHs, in units of milligrams per kilogram, in house dust and parking lot dust.



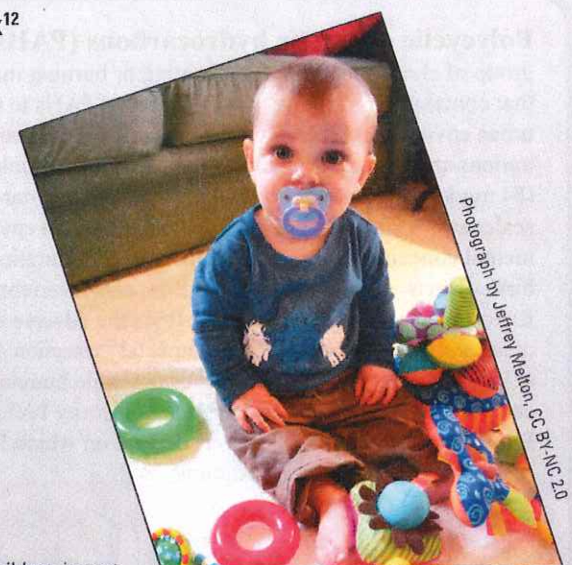
The preschooler living in a residence adjacent to coal-tar-sealed pavement who has relatively low hand-to-mouth activity consumes about 2.5 times more PAHs from house dust than from their diet.[11] For the more active preschooler, whose hand-to-mouth activity is higher, the PAH intake from house dust is nearly 10 times more than the PAH intake from their diet.

View the publication:
http://pubs.acs.org/doi/pdf/10.1021/es902533r

Living adjacent to coal-tar-sealed pavement increases cancer risk[12]

The USGS partnered with a human-health-risk analyst to estimate the excess lifetime cancer risk associated with the ingestion of house dust and soil for people living adjacent to parking lots with and without coal-tar-based sealcoat. Excess cancer risk is the extra risk of developing cancer caused by exposure to a toxic substance. The excess cancer risk for people living adjacent to coal-tar-sealcoated pavement (1.1 cancer incidences for every 10,000 individuals exposed) was 38 times higher, on average (central tendency), than for people living adjacent to unsealed pavement. The central tendency excess cancer risk estimated for people living adjacent to coal-tar-sealcoated pavement exceeds the threshold generally considered by the EPA as making remediation advisable.

The assessment used measured concentrations of the B2 PAHs in house dust and soils adjacent to coal-tar-sealed pavement (adjusted for relative potency to the PAH benzo[*a*]pyrene), established house dust and soil ingestion rates, and the EPA-established slope factor to estimate the excess cancer risk. Much of the estimated excess risk comes from exposures to PAHs in early childhood (that is, 0–6 years of age). The study did not consider the excess cancer risk associated with exposure to the sealcoated pavement itself, which has PAH concentrations 10 or more times greater than in adjacent residence house dust or soils.[5, 10]



Children ingest house dust and soil when they put their hands or objects into their mouth. Much of the estimated excess cancer risk associated with the ingestion of PAH-contaminated soil and house dust is incurred during early childhood.

View the publication:
http://pubs.acs.org/doi/pdf/10.1021/es303371t

Potential Risks to Aquatic Life

Runoff from coal-tar-sealcoated pavement is acutely toxic to aquatic biota[13]

Exposure to runoff from coal-tar-sealed pavement collected as much as 42 days after sealcoat application resulted in 100 percent mortality to two commonly tested laboratory organisms: day-old fathead minnows (*Pimephales promelas*) and water fleas (*Ceriodaphnia dubia*). In contrast, minnows and water fleas exposed to runoff from unsealed pavement experienced no more than 10 percent mortality. When the minnows and water fleas were also exposed to simulated sunlight, which intensifies the toxicity of some PAHs, runoff collected 111 days (more than 3 months) after sealcoat application caused 100 percent mortality to both species, and caused 100 percent mortality to water fleas even when diluted to 10 percent of its original strength.

The USGS collected samples of runoff from 5 hours to 111 days following sealcoat application to pavement by a professional applicator. Total PAH concentrations varied relatively little, as rapid decreases in concentrations of low molecular weight and nitrogen-substituted PAHs were offset by increases in high molecular weight PAHs.[14] These results demonstrate that runoff from coal-tar-sealcoated pavement continues to contain elevated concentrations of PAHs and related compounds long after a 24-hour curing time.

A subsequent study by researchers at the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Fish and Wildlife Service found that coal-tar-sealcoat runoff is acutely lethal to juvenile coho salmon (*Oncorhynchus kisutch*) and causes a wide spectrum of abnormalities to zebrafish (*Danio rerio*) embryos.[15] They also reported that filtration of the runoff through a biorention system substantially reduced toxicity.


Runoff from coal-tar-sealcoated pavement is acutely toxic to fathead minnows (*Pimephales promelas*; left) and water fleas (*Ceriodaphnia dubia*; right).

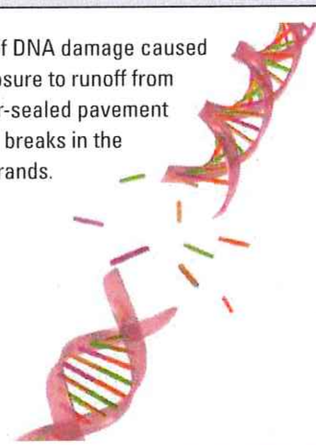
View the publication:
http://pubs.acs.org/doi/abs/10.1021/acs.est.5b00933

Runoff from coal-tar-sealcoated pavement goes down storm drains to receiving water bodies. The runoff contains high concentrations of PAHs and related chemicals that can harm aquatic life.[16]

Runoff from coal-tar-sealcoated pavement damages DNA and impairs DNA repair[17]

Simultaneous exposure to runoff from coal-tar-sealed pavement and simulated sunlight damaged DNA in rainbow trout liver cells, even when the runoff was diluted to 1 percent of its initial concentration. The cells were from a cell line developed to assess the effects of PAHs on DNA. The test assessed two types of DNA damage: strand breaks and alkylated bases.

Although cells can repair some DNA damage, a second experiment demonstrated that cells exposed to the coal-tar-sealcoat runoff had an impaired capacity to perform at least one type of DNA repair. The combination of DNA damage and impaired repair capacity intensifies the potential for long-term damage to cell health. DNA damage has many possible consequences, including aging, cell death, and mutations. Mutations can affect the function of genes and can potentially lead to cancer.



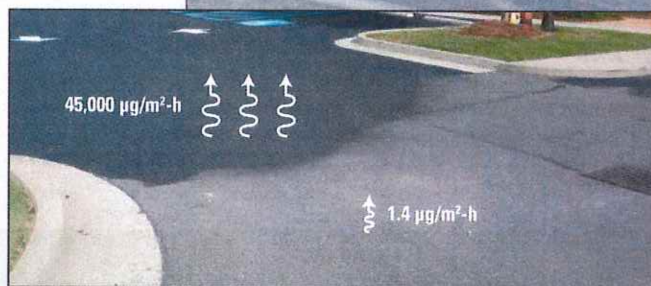
Types of DNA damage caused by exposure to runoff from coal-tar-sealed pavement include breaks in the DNA strands.

(Image from Genetic Science Learning Center, http://learn.genetics.utah.edu.)

Air-Quality Concerns[18, 19]

Although unseen, releases of PAHs to the atmosphere (volatilization) from freshly coal-tar-sealed pavement are tens of thousands of times higher than from unsealed pavement. Volatilization is a potential human-health concern because inhalation is an important pathway for human exposure to PAHs. Although volatilization decreases rapidly over the weeks following application, it nonetheless continues long after application—PAH releases to the atmosphere from parking lots sealed from 3 to 8 years prior to sampling were on average 60 times higher than PAH releases from unsealed pavement.

Nationwide, the combined PAH releases each year from newly applied coal-tar-based sealcoat are estimated to exceed annual vehicle emissions of PAHs.[18] PAH releases shown here are in units of micrograms per meter squared per hour (μg/m²-h).



References Cited

1. Mahler, B.J., Van Metre, P.C., Crane, J.L., Watts, A.W., Scoggins, M., and Williams, E.S., 2012, Coal-tar-based pavement sealcoat and PAHs—Implications for the environment, human health, and stormwater management: Environmental Science and Technology, v. 56, p. 3039–3045.
2. Agency for Toxic Substances and Disease Registry, 1995, Toxicological profile for polycyclic aromatic hydrocarbons: Atlanta, Ga., U.S. Department of Health and Human Services, Public Health Service, accessed November 16, 2015, at http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=122&tid=25.
3. Minnesota Pollution Control Agency, 2014, Choosing alternatives to coal tar-based pavement sealcoats, accessed November 16, 2015, at https://www.pca.state.mn.us/water/stormwater-great-lakes-coal-tar-sealcoat-pah-reduction.
4. City of Austin, 2005, PAHs in Austin, Texas sediments and coal-tar-based pavement sealants polycyclic aromatic hydrocarbons: City of Austin Watershed Protection and Development Review Department, 55 p., accessed January 20, 2016, at http://www.austintexas.gov/department/coal-tar.
5. Van Metre, P.C., Mahler, B.J., and Wilson, J.T., 2009, PAHs underfoot—Contaminated dust from coal-tar sealcoated pavement is widespread in the United States: Environmental Science and Technology v. 43, p. 20–25, accessed January 20, 2016, at http://pubs.acs.org/doi/abs/10.1021/es802119h.
6. Mahler, B.J., Van Metre, P.C., Bashara, T.J., Wilson, J.T., and Johns, D.A., 2005, Parking lot sealcoat—An unrecognized source of urban polycyclic aromatic hydrocarbons: Environmental Science and Technology, v. 39, p. 5560–5566, accessed January 20, 2016, at http://pubs.acs.org/doi/abs/10.1021/es0501565.
7. Eisler, R., 1987, Polycyclic aromatic hydrocarbon hazards to fish, wildlife, and invertebrates—A synoptic review: U.S. Fish and Wildlife Service Biological Report 85(1.11), accessed January 20, 2016, at http://www.pwrc.usgs.gov/oilinla/pdfs/CHR_11_PAHs.pdf.
8. International Agency for Research on Cancer, 2010, Some non-heterocyclic polycyclic aromatic hydrocarbons and some related exposures: IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, v. 92 [working group met in Lyon, France, Oct. 11–18, 2005], accessed January 20, 2016, at http://monographs.iarc.fr/ENG/Monographs/vol92/mono92.pdf.
9. National Toxicology Program, 2014, Report on carcinogens (13th ed.): Research Triangle Park, N.C., U.S. Department of Health and Human Services, Public Health Service, accessed January 20, 2016, at http://ntp.niehs.nih.gov/pubhealth/roc/roc13/.
10. Mahler, B.J., Van Metre, P.C., Wilson, J.T., Musgrove, M., Burbank, T.L., Ennis, T.E., and Bashara, T.J., 2010, Coal-tar-based parking lot sealcoat—An unrecognized source of PAH to settled house dust: Environmental Science and Technology, v. 44, p. 894–900.
11. Williams, E.S., Mahler, B.J., and Van Metre, P.C., 2012, Coal-tar pavement sealants might significantly increase children's PAH exposures: Environmental Pollution, v. 164, p. 40–41, accessed January 20, 2016, at http://www.sciencedirect.com/science/article/pii/S0269749112000279.
12. Williams, E.S., Mahler, B.J., and Van Metre, P.C., 2013, Cancer risk from incidental ingestion exposures to PAHs associated with coal-tar-sealed pavement: Environmental Science and Technology, v. 47, p. 1101–1109.
13. Mahler, B.J., Ingersoll, C.G., Van Metre, P.C., Kunz, J.L., and Little, E.E., 2015, Acute toxicity of runoff from sealcoated pavement to *Ceriodaphnia dubia* and *Pimephales promelas*: Environmental Science and Technology, v. 49, p. 5060–5069.
14. Mahler, B.J., Van Metre, P.C., and Foreman, W.T., 2014, Concentrations of polycyclic aromatic hydrocarbons (PAHs) and azaarenes in runoff from coal-tar- and asphalt-sealcoated pavement: Environmental Pollution, v. 188, p. 81–87, accessed January 20, 2016, at http://www.sciencedirect.com/science/article/pii/S0269749114000141.
15. McIntyre, J.K., Edmunds, R.C., Anulacion, B.F., Davis, J.W., Incardona, J.P., Stark, J.D., and Scholz, N.L., 2015, Severe coal tar sealcoat runoff toxicity to fish is prevented by bioretention filtration: Environmental Science and Technology, v. 50, p. 1570–1578, accessed January 20, 2016, at http://pubs.acs.org/doi/abs/10.1021/acs.est.5b04928.
16. Douben, P.E.T., 2003, PAHs—An ecotoxicological perspective: West Sussex, England, John Wiley & Sons Ltd., 392 p.
17. Kienzler, A., Mahler, B.J., Van Metre, P.C., Schweigert, N., Devaux, A., and Bony, S., 2015, Exposure to runoff from coal-tar-sealed pavement induces genotoxicity and impairment of DNA repair capacity in the RTL-W1 fish liver cell line: Science of the Total Environment, v. 520, p. 73–80, accessed January 20, 2016, at http://www.sciencedirect.com/science/article/pii/S0048969715002703.
18. Van Metre, P.C., Majewski, M.S., Mahler, B.J., Foreman, W.T., Braun, C.L., Wilson, J.T., and Burbank, T., 2012, PAH volatilization following application of coal-tar-based pavement sealant: Atmospheric Environment, v. 51, p. 108–115, accessed January 20, 2016, at http://www.sciencedirect.com/science/article/pii/S135223101200057X.
19. Van Metre, P.C., Majewski, M.S., Mahler, B.J., Foreman, W.T., Braun, C.L., Wilson, J.T., and Burbank, T., 2012, Volatilization of polycyclic aromatic hydrocarbons from coal-tar-sealed pavement: Chemosphere, v. 88, p. 1–7, accessed January 20, 2016, at http://dx.doi.org/10.1016/j.chemosphere.2011.12.072.

By Barbara J. Mahler,* Michael D. Woodside, and Peter C. Van Metre

For more information

Access publications and learn more about PAHs and coal-tar-based pavement sealcoat at http://tx.usgs.gov/sealcoat.html.

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Assembly Committee on Transportation

2021 Assembly Bill 131
Prohibiting the sale and use of coal tar-based sealants and high PAH sealant products
March 25, 2021

Good morning Chair Plumer and members of the Committee. My name is Kate Strom Hiorns, and I am the Recycling and Solid Waste Section Chief with the Wisconsin Department of Natural Resources. Thank you for the opportunity to testify in support of Assembly Bill 131 (AB 131).

Coal tar-based sealant is a substance sprayed or painted on top of asphalt pavement—including parking lots, driveways, and some playgrounds—to protect the underlying asphalt. The primary danger associated with these sealants is that they contain polycyclic aromatic hydrocarbons (PAHs), substances that have harmful impacts to humans and the environment. PAHs move from a coal tar-based sealant into the environment by stormwater runoff, adhesion to tires, wind, and even foot traffic. A 2016 study by the U.S. Geological Survey indicated coal tar sealant as the primary source of PAHs in Milwaukee-area streambeds.

Like the provision included in the governor's proposed budget, AB 131 prohibits the sale and use of coal tar-based sealant products and high PAH sealant products beginning one year after the effective date of the bill. The bill would extend statewide a ban that has been in place in Dane County and several Wisconsin municipalities. In addition, the states of Minnesota and Washington and Washington D.C. have banned coal tar-based sealants, along with many other local governments nationwide. There are widely used alternatives to coal tar-based sealants that are significantly lower in PAHs, including asphalt-based sealants. In addition, alternative pavement options, such as permeable asphalt, do not require sealants.

The bill also directs that, upon written request, the DNR may grant an exemption to the prohibitions to a person researching the environmental effects of a coal tar-based sealant product or high PAH sealant or to a person doing research to develop an alternative technology. The Minnesota statute prohibiting the sale and use of coal tar sealant in that state contains a similar exemption and the DNR would likely consult with our Minnesota counterparts on their experiences implementing the exemption.

In closing, the department is supportive of AB 131, which will have a positive impact on municipalities statewide and on the DNR's efforts to reduce water quality degradation and the potential need for remediation.

On behalf of the DNR, I would like to thank you for your time today. I would be happy to answer any questions you may have.

clean wisconsin
YOUR ENVIRONMENTAL VOICE SINCE 1970

Carly Michiels, Government Relations Director
Clean Wisconsin
Testimony – Assembly Bill 131 prohibiting the sale or use of coal-tar-based and PAH sealant products
Assembly Committee on Transportation

Thank you for the opportunity to testify in support of Assembly Bill (AB) 131 prohibiting the sale or use of toxic coal tar-based and high-PAH sealant products. We appreciate the authors, Senator Cowles and Representative Kitchens, prioritizing PAH pollution with this bipartisan bill again this session.

Clean Wisconsin is a non-profit environmental advocacy organization focused on clean water, clean air, and clean energy issues. We were founded over fifty years ago and have more than 20,000 members and supporters around the state. We have been working on water pollution issues in Wisconsin since our founding, and while some of the particulars have changed Wisconsin remains a state with abundant water resources but also abundant challenges in restoring and protecting those waters. Clean Wisconsin employs scientists, policy experts, and legal staff to bring all the tools at our disposal to protect and improve both our air and water resources.

Pavement sealants are used to darken and protect the underlying asphalt in driveways, parking lots, and playgrounds. Coal-tar-based pavement sealants contain extremely high concentrations of toxic compounds known as polycyclic aromatic hydrocarbons (PAHs). Research in Wisconsin and across the country shows these pavement sealants are the primary source of PAH pollution in urban landscapes. The problem is the sealants break down over time, and particles are either carried by wind or shoes into our buildings and yards or run off with stormwater into our waterways affecting water quality. Due to this weathering, sealants are reapplied every few years, providing a steady source of PAHs.

Dane County was the second place in the nation to prohibit the use of coal-tar-based sealants back in 2007. For the last four years, Clean Wisconsin has worked with local communities along Wisconsin's Great Lakes coasts to raise awareness about the source and impacts of PAH pollution and encourage proactive action to protect residents and local waterways. Now, 24 local communities from Port Washington to Ashland passed similar local protections. Thanks to these local actions roughly 1.7 million (almost 30%) of Wisconsin's residents are already protected from this source of PAH pollution. This bill will extend those protections to the rest of our residents and waterways.

AB 131 protects public health, the environment, and local taxpayers. We found in working with local communties that the benefits far outweighed the continued costs and future costs of cleanup.

- **Protecting public health:** Public health experts like the American Medical Association have concluded that this is an issue to address. The coal tar used in tar-based sealants is a known carcinogen due to its PAH content, it is a public health threat. Sealants break down over time, and children ingest it through contact in yards and playgrounds, or when we track particles from our driveways right into our homes, where children who play on the floor can ingest them. Studies have shown that children who grow up near parking lots treated with high-PAH pavement sealants have a lifetime cancer risk that is 14 times higher than those living near unsealed parking lots or lots sealed with asphalt emulsion alternatives. In addition to increasing the risk for cancer, exposure to PAHs has been found to impair cognitive development and cause birth defects.

  The risk to young children is greatest because kids are ingesting directly into their body from dust and dirt particles on an every-day basis. The notion that some cosmetic products contain limited levels of PAHs somehow means this chemical is any less toxic in pavement sealants is misleading and misinformed. There is a difference between the involuntary continual exposure children get from ingestion and the voluntary limited external exposure from something like shampoo.

- **Protecting the environment:** PAHs are a common waterbody contaminant in Wisconsin. PAHs accumulate in the sediment, creating a toxic environment for aquatic life. Clean Wisconsin conducted sampling in rivers in Sheboygan, Manitowoc, Algoma, Green Bay, Stevens Point, Bayfield and Ashland, with testing conducted by a UW-Oshkosh lab, which showed levels of PAHs high enough to cause adverse impacts to fish and other wildlife. Research shows that runoff from surfaces sealed with high-PAH sealants harms or kills a wide variety of aquatic life, including insects, amphibians, and fish, and impairs the overall health of the waterbody. Here in Wisconsin, a US Geological Survey (USGS) study found the majority of waterway sediments sampled in the Milwaukee area contained PAH levels in excess of a toxic threshold, and that pavement sealants were the source of over 75% of the PAHs. Most recently, a joint EPA/USGS study released last summer found similar results throughout the Great Lakes basin, including numerous other Wisconsin watersheds.

  Additionally, in response to a demand by the Pavement Coatings Technology Council (PCTC) the EPA evaluated the USGS research and found that it was of sufficient quality, objective, and transparent – and numerous external experts have also reviewed this work as part of the peer review publication process and agree it is sound science. This research has been replicated by other governmental and academic researchers who have similar findings. The only group disputing the science and impacts to the environment and health are the chemical industry.

- **Protecting local taxpayers:** PAH pollution can be a significant burden to taxpayers. Wet detention ponds manage runoff flows, sediment, and nutrients. These basins collect whatever suspended solids flow into them, including asphalt sealcoating from places like parking lots. High-PAH sealcoats can lead to levels of contamination that may require the stormwater sediment to be disposed of in a licensed landfill. Leaving municipalities on the hook for cleaning up the contaminated sediment.

  In the Minneapolis metro area, the PAH cleanup from tar-based sealants is estimated to cost taxpayers hundreds of millions of dollars. This led to numerous local ordinances and finally statewide action. If we do not stop using these products across Wisconsin, those costs in the future will only increase.

Today, widely available alternative products have comparable performance and are cost competitive. This is the way the market is moving – big national and regional retailers that no longer sell high-PAH products include Ace Hardware, Home Depot, Lowes, Menards, and United Hardware. There are many applicators working in this industry in Wisconsin who do not to use high-PAH sealants. Most state Departments of Transportation (DOT) have stopped using coal-tar pavement sealants due to high levels of PAHs. Specifically, Wisconsin DOT restricts pavement sealers to asphalt emulsions only (DOT's Standard Specifications Part 4, Section 475) and has not used the high-PAH product in their maintenance projects for over a decade.

Taking action clearly improves water quality and reduces the threat to public health. We have many complex water quality problems in Wisconsin that have and will continue to cost significant resources to address. On the contrary, preventing coal tar-based sealants from further polluting our waterways and impacting public health is straightforward and will save money. It implements what 24 communities and two counties in Wisconsin have already done to protect their residents and is the direction the market has been moving.

Clean Wisconsin supports AB 131 and we thank the authors for their leadership on preventing further PAH contamination in Wisconsin. This is a win for public health, our natural resources, and local communities and taxpayers.

Thank you.

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Wisconsin Local Governmental Units with Adopted Ordinances Regarding High-PAH Pavement Sealant Products:

Bans on the sale and use of high-PAH pavement sealant products:

1. Dane County and all municipalities within the County (2008)

---- 2017 ----

2. Milwaukee
3. Glendale
4. Franklin
5. Brown Deer
6. Elm Grove
7. Shorewood

---- 2018 ----

8. Whitefish Bay
9. Port Washington
10. Greenfield
11. West Allis
12. Hales Corners
13. Wauwatosa
14. Bayside
15. Greendale

---- 2019 ----

16. Sheboygan
17. St. Francis
18. Manitowoc
19. Racine
20. Oak Creek
21. Sturgeon Bay
22. Plymouth

---- 2020 ----

23. Green Bay
24. Ashland
25. De Pere

Policies restricting the use of high-PAH sealants on County-owned projects and properties:

1. Milwaukee County (2019)
2. Kewaunee County (2019)

Updated 2-03-2021

Health Effects of Coal Tar Sealant and Specific Vulnerabilities of Children
Testimony to Assembly Committee on Transportation

Elizabeth J. Neary, MD, MS, FAAP
Wisconsin Environmental Health Network

March 25, 2021

Good morning, Chairman Plumer and committee members. My name is Dr. Elizabeth J. Neary and I am a pediatrician. I am Co-President of the Wisconsin Environmental Health Network, a group of health professionals dedicated to addressing environmental issues that directly affect human health. I am also the WI representative to the Pediatric Environmental Health Specialty Units (a joint venture of the American Academy of Pediatrics and the EPA). Today, I am speaking only on behalf of the Wisconsin Environmental Health Network in support of AB 131 to prevent the sale and use of coal tar-based sealants and high PAH sealant products.

The International Agency for Research on Cancer, National Toxicology Program (NIH) and the National Cancer Institute all state that coal tar and coal tar pitch are known human carcinogens. "Coal tar and coal-tar pitch are KNOWN to be human carcinogens based on sufficient evidence of carcinogenicity from studies in humans. Both coal tars and coal-tar pitches contain a number of known and potential carcinogens, including benzene, naphthalene, and other polycyclic aromatic hydrocarbons (PAHs)." (Ref 4)

According to the National Cancer Institute, coal tar and coal-tar pitch is associated with increased risk of the skin, lung, bladder, kidney and digestive tract cancers. (Ref 5)

"Coal tar and coal-tar pitch, both used in sealcoat products, have extremely high concentrations of PAHs, and both are classified as known human carcinogens," according to the US Geological Survey.

Children are mainly exposed to this carcinogen through their mouth. The sealcoat breaks down, creating particles that can travel by air, wind, rain, friction from car tires and our own feet. These cancer-causing particles can enter the household via shoes and pets' paws, become embedded in carpeting and household dust. Because toddlers crawl on the floor and often put their fingers in their mouth, they are directly ingesting it. The average child puts their hand to their mouth 35 times/hour (but up to 129 times/hour) (Ref. 2) A study of house dust of ground-floor apartments with parking lots sealed with a coal-tar-based product had levels of PAH that were 25 times higher than in house dust of apartments with parking lots sealed with other surface types. (Ref 1) (See sketch on page 2). Older children are exposed by playing on this surface- riding bikes, skating, drawing with chalk. It gets on their fingers and eventually their mouths. On hot summer days, PAH's heat up, are released into the air and children can inhale them. PAH's are also known to trigger asthma.

The US Geological Survey (USGS) partnered with a human-health-risk analyst to estimate the excess lifetime cancer risk associated with the ingestion of house dust and soil for people living adjacent to parking lots with and without coal-tar based sealcoat. It was found to be 38 times higher for those living near parking lots with coal-tar based sealcoats. Much of the estimated excess risk comes from exposures to PAHs in early childhood (0–6 years of age)

Some critics have cited the use of coal tar as a topical treatment for patients with psoriasis. However, the concentration of coal tar in shampoos and creams is very small (0.06 – 7%) compared with a concentration of 20-25% of coal tar or coal tar pitch in sealcoat products. Caution is advised with use coal tar shampoos – They are NOT to be used on mucous membranes and other sensitive body parts. They have been banned in Europe because of link to skin cancer.

In summary, this proven carcinogen has detrimental effect on the health of children because of the smaller size of child, higher absorption rates and their organs are in a rapid state of growth and development.

To ban the sale of these known carcinogens is a prudent and reasonable approach to protect human health, especially to protect the health of the most vulnerable - our children.

1) Mahler, B.J., Woodside, M.D., and VanMetre, P.C., 2016, Coal-tar-based pavement sealcoat—Potential concerns for human health and aquatic life: U.S. Geological Survey Fact Sheet 2016–3017, 6 p., http://dx.doi.org/10.3133/fs20163017.

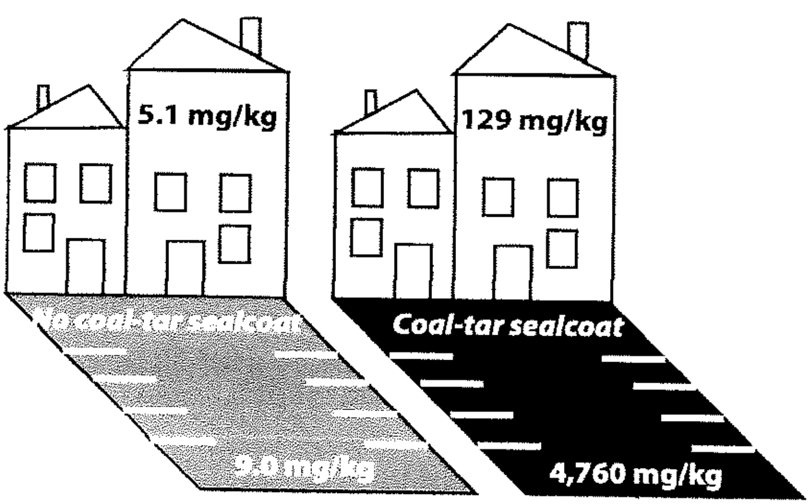
2) Ko, S et al. Video assessments of touching and mouthing behaviors. Journal of Exposure Science and Environmental Epidemiology (2007)17, 47–57.

3) Mahler BJ, Metre PC, Crane JL, Watts AW, Scoggins M, Williams ES. Coal-tar-based pavement sealcoat and PAHs: implications for the environment, human health, and stormwater management. *Environ Sci Technol.* 2012;46(6):3039–3045. doi:10.1021/es203699x

4) **National Toxicology Program**, Department of Health and Human Services. **National Toxicology Program**, Department of Health and Human Services. **Report on Carcinogens**, Thirteenth Edition. NIH Coal Tars and Coal Tar Pitch https://ntp.niehs.nih.gov/ntp/roc/content/profiles/coaltars.pdf

5) National Cancer Institute https://www.cancer.gov/about-cancer/causes-prevention/risk/substances/coal-tar

PAH's found in house dust of apt near lots with coal tar is 25 times that of other surface (Ref 1)



Wisconsin
Counties
Association

MEMORANDUM

TO: Honorable Members of the Assembly Committee on Transportation

FROM: Daniel J. Fedderly P.E.; P.L.S. Wisconsin County Highway Association, Executive Director

Daniel Bahr, Wisconsin Counties Association, Government Affairs Associate

DATE: March 25, 2021

SUBJECT: Opposition to AB 131

The Wisconsin Counties Association (WCA) and the Wisconsin County Highway Association (WCHA) oppose Assembly Bill (AB) 131, relating to prohibiting the sale and use of coal tar-based sealants and high PAH sealant products.

AB 131 seeks to address the problem of groundwater contamination and we applaud the intent and the sprit in which the bill has been authored. However, it is the opinion of our respective organizations that this particular issue can best be addressed at the local level. Many of our hundreds of county professionals, including engineers, highway commissioners and land use professionals are most qualified to determine if this product is economical and or if in fact its use poses a danger to the public health.

It is important to note that PAH sealant products have been used in a productive and safe manner in the past when applied correctly by accredited professionals. With many new technologies becoming available, the reliance on that PAH sealants has been dramatically reduced. Making a blanket and unilateral determination regarding a product used at the local level limits local government decision making in favor of a one size fits all standard.

With the COVID-19 pandemic strapping county budgets and limited resources at our disposal, it is necessary to preserve every potential "tool in the tool box" for proper use by local experts. Many local governments have made the decision to not use PAH sealant products, while others may occasionally utilize the product. Regardless, if the decision is made by a local entity to not use a PAH sealant, it is our view that such a decision should be made by experts at the local level.

Again, WCA and WCHA opposes AB 131. Thank you for considering our comments.

LEAGUE OF WISCONSIN MUNICIPALITIES

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To: Assembly Committee on Transportation
From: Curt Witynski, J.D., Deputy Director, League of Wisconsin Municipalities
Toni Herkert, Government Affairs Director, League of Wisconsin Municipalities
Date: March 25, 2021
Re: AB 131 Relating to prohibiting the sale and use of coal tar-based and high PAH sealants

The League of Wisconsin Municipalities supports AB 131, which prohibits the sale and use of coal tar-based sealants and high polycyclic Aromatic Hydrocarbons (PAH) sealant products. We thank the bill's authors, Representative Kitchens and Senator Cowles, for their continued leadership in addressing the contamination and public health concerns associated with these products with readily available substitutions.

Last session, the same authors introduced AB 797, identical to AB 131 except for the effective date, as part of the Speaker's Task Force on Water Quality. AB 797 passed the Assembly and received a unanimous vote by the Senate Natural Resources and Energy Committee but failed to pass the full Senate when they did not return for their last day of session due to the pandemic.

AB 131 reflects the momentum already occurring within the private sector. Major retailers like Home Depot, Lowe's, and Ace have discontinued the sale of coal-tar based sealants and dozens of contractors in Wisconsin are pledging to switch to other safer sealant products. Retailers and contractors are not the only entities modifying their practices. At least 25 local governments have passed a coal-tar sealant ban. In addition, three counties in Wisconsin and three states including Minnesota, in 2013, have passed coal-tar sealant product bans. Local and state governments are making these decisions to protect the health of their residents and the overall community and because remediation costs are excessive. Sixteen PAH compounds are on the EPA's priority pollutant list and overexposure has been linked to cancer, reproductive problems, and organ damage. In Minnesota, the taxpayer bill to clean up coal-tar contamination in the sediment of a stormwater pond was estimated in the hundreds of millions of dollars.

There is no need to risk the health and safety of our citizens and create the potential for exorbitant clean-up costs when a perfectly viable alternative already exists. Asphalt-based sealants have 1,000-times lower PAH levels than their coal-tar counterparts and are cost competitive. Commercial costs of asphalt sealants are $9-$10 per five gallons compared to coal-tar at $12-$13. In the retail sector asphalt-based products are typically between $3-$8 per gallon and coal-tar is generally $4-$6 per gallon. When properly mixed and applied, most asphalt sealcoat can be expected to last as long as or longer than a coal tar sealcoat. Asphalt has the tendency to expand and contract based on weather and temperature. Coal tar sealants, while hard, does not expand or contract which can cause complications in Wisconsin's weather climate.

We urge the committee to recommend passage of AB 131. Thank you for your time and consideration of our comments.

YOUR VOICE. YOUR WISCONSIN.

To whom it may concern,

My name is Pat DeJardin, sole owner of DeJardin Asphalt Maintenance, a small business located in Kewaunee County. I am writing in to show my support in the banning of Coal Tar based asphalt sealant products in my industry. I was able to talk in front of the assembly in 2020, before Covid paused the country, and regrettably I cannot make the 2021 hearing and will try and keep it brief.

Some of the main counter-arguments that are brought up by those against the coal tar ban are that small businesses will be hurt, the substitute products aren't as good, and that it poses no risk to the people. As a person who used Coal Tar (CT) based products for 3 years as well as their up and coming replacement, Asphalt Emulsion (AE) based products, for 10 years, I have some hands on input.

First, this ban will NOT hurt small businesses. Case in point, my father runs Jay's Asphalt Maintenance, and it was where I have worked up until 2020, where I started my own business. He was very successful in using AE products, successful enough to give the confidence to start a brand new company using strictly AE products. As a business with 3 employees (including myself) how is banning CT products going to hurt me? The fact is it will not. Many companies around me are already preparing for the change; the switch is literally as simple as a new filter and some tricks, all of which are provided by the manufacturers typically at no charge. If anything, unregistered/scamming companies utilize CT products more than professional companies. I believe banning CT products would actually weed out those who bring a bad name to the industry, bringing more work to us small, professional businesses.

Second, performance wise I prefer AE products over CT. Asphalt Emulsion refreshes pavement, has the same if not longer life, and has been requested more and more by a number of customers, residential and commercial alike. Counter arguments are made that AE users have shorter seasons, also a false claim. I can seal to temps almost to freezing with safe additives to my sealer, with no product performance change. Within the last few years, science has made strides in low temp options for sealers and I have no season cut short. My company seals everything, such as schools, gas stations, private roads, to traditional driveways, with no issues. I can promise you, I apply AE with confidence of its performance, protection, appearance, and longevity to match or exceed CT products.

Third, when using Coal Tar, the precautions that needed to be taken to utilize it to be "safe" was absurd. How can a product *not* be harmful to people or society when those using it need to wear either protective skin gel to prevent "sealer burn", full body suits, and if you're doing it prolonged, goggles? I have spent many days with bloodshot eyes and burning pain on my face and arms from just being around Coal Tar when it was being applied. I have pictures from my last day ever handling the product, where I was rinsing out our tank, with clean water, of the remnants of CT. I had chemical related burns for almost a week and a half on half my arm. Now, AE in comparison, can be applied free of any kind of protection. It's essentially harmless to the applicants, and if you're thinking about kids and the elderly that could be exposed to sealants, AE is hands down the safer option.

In conclusion, I urge you to take the same initiative in 2021 as was taken in 2020 to get these harmful products off the market. Lead and asbestos were banned for good reason, and I believe Coal Tar falls in the same category. And with perfect substitutes, there is no reason to keep holding on.

March 2021

To: Honorable Members of Wisconsin's State Legislature

From: Wisconsin Applicators and Contractors Coalition

Regarding: Support Assembly Bill 131/Senate Bill 152 prohibiting the sale and use of coal tar-based sealants and other high PAH sealant products.

We are writing to support Assembly Bill 131/Senate Bill 152 prohibiting the sale and use of coal tar-based sealants and other high PAH sealant products. There are alternative, low- or no-PAH products that do a better job protecting paved surfaces at a similar cost. There is no reason why coal-tar sealants should remain on the market given their detrimental impact on public health and the environmental quality.

- We are aware of the scientific research showing that coal-tar sealants contribute large quantities of toxic PAHs to the environment

- Currently-available alternative, low-PAH sealants have comparable, or even superior, performance to coal-tar sealants.

- Personally, we prefer working with non-coal tar products since they do not cause the same chemical burns and rashes, nor do they have the same noxious fumes. Employee morale has improved since we stopped using coal-tar sealants.

- Furthermore, our businesses have not suffered due to our not using coal tar sealants.

- In fact, more and more customers are requesting low-PAH sealants as information becomes available about the health and environmental dangers of coal-tar sealants.

- We applaud the efforts of communities around the state that have already adopted local ordinances restricting the use of coal-tar and other high-PAH sealants. Uniformity around the state would create a level playing field for those who want to do the responsible thing and use products that are safer for public health and the environment.

We encourage you to adopt Assembly Bill 131/Senate Bill 152 prohibiting the use and sale of high-PAH pavement sealant products anywhere in the state. This will ensure that <u>all</u> Wisconsinites and all of our lakes and rivers are protected from this threat for the long term.

Thank you for your consideration of this important public health and water quality issue.

Sincerely,

Jay DeJardin, Jay's Asphalt Maintenance (Luxemburg)

Patrick DeJardin, DeJardin Asphalt Maintenance, LLC (Luxemburg)

Robbie Klein, Klein Asphalt (Manitowoc)

Kai Kempen, Northland Sealcoating & Asphalt Repair (Manitowish Waters)

(over)

Mathew Maier, Envirosealers LLC (Oshkosh)

Dean Schilling, Asphalt Maintenance and Paving Inc. (Spring Valley)

John Schneider and Bryan Earlywine, Mix-Tek Pavement Solutions (Necedah)

Wil Calkins, Empire SealCoating (Sparta)

Jerry Walls, Property Revival LLC (Madison)

Denny Fingerson, Midwest Sealcoating (Dodgeville)

Isaac Sailer, Sailer Sealcoating (River Falls/Hudson)

Dan Sealy, Senn Blacktop (Chippewa Falls/Eau Claire)

Jason Fink, Renu Sealcoating (Mount Horeb)

Jake Abernathy, Doctor Asphalt LLC (Madison)

Jim Hellenbrand, All Size Blacktop Sealing (Lodi)

(over)

March 25, 2021

Members of the Assembly Transportation Committee

Testimony in Support of Assembly Bill 131

Wisconsin's Green Fire supports Assembly Bill 131 and we ask that the Assembly Committee on Transportation pass the bill.

Tar-based pavement sealants are the primary source of toxic PAH pollution in urban landscapes. Those PAHs are harmful to human health and hurt fish and other aquatic life in our lakes and rivers. AB 131 bans the use of these sealants in Wisconsin.

Pavement sealants are the jet-black coatings homeowners and contractors apply to residential, commercial, and industrial driveways and parking lots. There are two main types of pavement sealants on the market today: tar-based sealants (also called "coal tar-based"), and asphalt-based sealants. The problem with tar-based pavement sealants is that they contain polycyclic aromatic hydrocarbons (PAHs), which are toxic compounds that can cause cancer and developmental problems in children. The American Medical Association and other public health groups have urged local and state governments to ban tar-based sealants due to their harmful health effects.

Wisconsin's Green Fire urges you to pass AB 131 and remove these harmful chemicals from our environment. If you have any questions feel free to contact Paul Heinen, Wisconsin's Green Fire's Legislative Liaison at 608-692-0279 or at pheinen@wigreenfire.org .

March 25, 2021

Wisconsin Assembly
Committee on Transportation
Hearing on Assembly Bill 131

Testimony of the
Pavement Coatings Technology Council
Anne P. LeHuray, Executive Director

Thank you, Mr. Chairman and members of the Committee, for this opportunity to speak in opposition to AB 797. My name is Anne LeHuray and I am the Executive Director of the Pavement Coatings Technology Council (known as PCTC), a trade association made up of manufacturers of pavement sealant products and their suppliers. PCTC is opposed to this bill, which seeks to ban a product that has been safely used for decades, because it is based on unreproducible science, seeks to disrupt an industry based on hypothetical low risks that have not occurred in the real world, and will have a devastating impact on many very small, seasonal businesses throughout the state. In short, banning refined coal tar-based pavement sealants is a solution in search of a problem.

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It's almost impossible to be a small business in the era of big government. An era when conclusions based on selective inclusion and exclusion of data are called "science," and deemed credible by public officials because the so-called science was generated by government employees. An era when Non-Governmental Organizations promote bans on products that have been safely used for decades to demonstrate their successful activism to their members. An era when politicians in towns and cities and counties and yes, even states, seek to burnish their environmentalist credentials by banning products without regard to either science or the lives behind the small businesses that are devastated. An era when thoroughly documented evidence presented by business – especially small business - is disregarded as inherently corrupted by self-interest. These days, it is commonly asked why government at all levels is so distrusted. The experience of PCTC members is one illustration.

To begin, I want to point out a curious feature of the bill. The word "pavement" does not appear in the bill. Instead, the word used is "sealant." Products described as sealants are commonly used in many applications beyond pavements. Coal tar and high PAH products are, for example, a feature of the roofing industry, of enamels used to protect metal and concrete in a variety of industries. The

Committee should consider whether the language of the bill might have unintended consequences on other Wisconsin businesses.

Let's talk about the science of pavement sealants in the environment. Government employees who work for a science agency have said that refined coal tar-based pavement sealants are a, if not *the* most, significant source of a class of naturally occurring chemical compounds called Polycyclic Aromatic Hydrocarbons (PAHs) in urban stream sediments. Not in water – PAHs are highly insoluble in water – but in sediments. Independent studies and studies commissioned by PCTC have shown that pavement sealants are not a significant source, and also highlight that PAHs are not much of a problem in sediments. This is illustrated by the Clean Water Act reports every state – including Wisconsin - must submit to the US Environmental Protection Agency (EPA) every two years. These are called 303(d) reports. In them, states report "causes of impairment" to water bodies covered by the Clean Water Act. In Wisconsin, as in other states, PAHs are almost never reported as a "cause of impairment." Yes, PAHs have been a problem in a few locations around the country where there are oil spills, but PAHs have also been identified as a "cause of impairment" in wilderness areas. That's because PAHs are produced by heating organic matter, whether by human activity or forest fires or decaying leaf litter in remote wetlands. In fact, independent studies have shown that the number one source of PAHs in sediments throughout the country are wood-burning fireplaces and stoves.

Beyond the Clean Water Act, under the federal Safe Drinking Water Act every source – every single one - of drinking water in the United States is routinely tested for PAHs. They are almost never found.

Even though it is known that PAHs are ubiquitous on Earth and throughout the universe – NASA calls them "the building blocks of life" – PCTC has continuously re-evaluated our conclusions that pavement sealants are not a major source of PAHs in the environment, commissioning subject-area experts to evaluate publications in the environmental science literature that identify pavement sealants as a source and to make their findings public. Our conclusions have not changed – the "science" produced by the government employees is not reproducible. And as any scientist worth their salt will tell you, if the conclusions aren't reproducible, they aren't valid. I have submitted a document called a *Science Review* that lists the scientific papers PCTC has considered.

Well, you might ask, is exposure to coal tar a health risk so that reducing PAHs in the environment even a little bit is an improvement. Last night, I went to a drug store across the street from the Wisconsin state capital building and bought an example of a dandruff shampoo and psoriasis skin cream in which the active ingredient is PAH-containing coal tar. Based on nearly a century of use, the US Food & Drug Administration has classified coal tar as "safe and effective for use" to control dandruff and psoriasis. For this purpose, millions of people in the US apply coal tar directly to their skin every day. Still, there have been questions about health effects related to exposure to PAHs. In the 1970s – the early days of environmental regulation – there was a lack of data and PAHs were treated as more toxic than we know them to be today. Because PAHs found in coal tar are highly insoluble, they are not very accessible biologically to either human or non-human creatures. Biologically inaccessible means PAHs are not broken down and absorbed in the body. Today, EPA estimates risks that could be related to exposure to PAHs based on biologically available concentrations. Studies of PAHs in different materials have shown that PAHs in coal tar are among the *least* biologically available of the substances tested. Using data generated by US government employees, Health Canada quantified health risks potentially associated with exposure to pavement sealant dust in homes. Health Canada found the risk to be at levels recognized as a low level of concern in European Union regulation and in World Health Organization guidance. PCTC members are not surprised – sealant manufacturers are mostly small, multi-generation family-owned businesses. If working with refined coal tar-base sealants was a significant risk, it would have shown up in the families of PCTC members. Not only have persistent health problems not been observed in the families, but PCTC is not aware of lawsuits that have been brought by employees or others alleging such problems.

I'm often asked, "there are alternatives, so what's the problem with taking a precautionary approach to refined coal tar-based products?" PCTC members manufacture both asphalt-based and coal tar-based pavement sealants. Research & development has resulted in improved asphalt-based sealants, but there continue to be issues to overcome. Some of these are:

- Because of variability in petroleum refining, the asphalt available to sealant manufacturers has inconsistent physical-chemical properties, resulting in inconsistent end products that, unlike the refined tar-based product, must be continuously tested to ensure specifications and performance measures;
- The protective properties of asphalt-base sealants are not yet as robust as the effective protection of refined tar-based sealants vis-à-vis oil spills, road salt, environmental oxidation, and other factors that influence the longevity of asphalt pavements; and

- The season for contractors using asphalt-based sealant is considerably shorter than for tar-based products.

This last issue is of particular concern in northern states such as Wisconsin. Refined coal tar-based sealant can be successfully applied at lower temperatures than asphalt-based products. A ban on coal tar-based sealant would result in an application season 20 to 40% shorter. There are tens of thousands of very small businesses in the US that rely on sealant application for their annual revenue. A large number of very small Wisconsin businesses will be devastated by the proposed ban.

Thank you for your attention. I'd be happy to try to answer questions.

ACTIVISTS FALSE ARGUMENTS

Activists who are campaigning against the use of refined tar-based pavement sealer (RTS) generally make arguments that rely on distortions and discredited interpretations of environmental and health science evidence.

False Argument #1: RTS is the source of a high percentage of compounds known as polycyclic aromatic hydrocarbons (PAHs) in sediments in lakes, streams and storm water retention ponds.

In the case of sediments in the Milwaukee area, the local office of the US Geological Survey (USGS) has published a paper concluding that RTS is a major source of PAHs using circular reasoning. First, sediment samples that contain PAHs that look similar to what were identified as the signature of RTS were found. Then statistical techniques were the used to "prove" that the signature of RTS was the same as those specially selected sediment samples. Statistical manipulation of specially selected samples has been a hallmark of the USGS advocacy-oriented science on the topic of RTS, whether in Milwaukee or Texas or elsewhere. When other common methods are used to identify sources of PAHs, little or no contributions from RTS have been found in most locations. Comprehensive studies of sources of PAHs in New York/New Jersey Harbor and Puget Sound (Seattle) have both found that wood burning from fireplaces and stoves is the largest source of PAHs (about a third in both cases), whereas PAHs from pavement sealants contribute less than 1% of the total.

False Argument #2: RTS is a health hazard.

Across the two, three and four generation memories of the many family-owned companies in the RTS business, there are no reports of adverse chronic health effects directly attributable to RTS. Expanding the search for possible health hazards to other products made from refined tar, every day millions of people world-wide use coal tar soaps, shampoos and creams approved for over-the-counter sales to treat skin disorders such as eczema, psoriasis and dandruff. A refined tar product is used to coat the inside surfaces of pipes used to distribute drinking water in many areas, with no demonstrable adverse effects on the water-drinking public. The false argument is that, theoretically, there could be health effects based on the classification of constituent ingredients as possible human carcinogens, which classifications in turn are based on exposure of laboratory animals to high concentrations of individual PAH compounds[1]. Studies of actual human exposures to PAH-containing materials strongly indicate that the animal-based classification should not be extrapolated to humans. Further, the USGS, which has no expertise in this area, claims that RTS is associated with excess risk. Those claims are based on science that was demonstrated to be wrong 2 decades ago. Health Canada evaluated the

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[1] PAHs are never found as individual compounds in nature and are rarely isolated for commercial purposes. Individual PAH compounds are artificially isolated for laboratory testing. RTS is a mixture of clays, sand and refined tar that itself is a mixture that includes PAHs..

RTS exposure data relied on by the USGS to make its risk claims, and found levels that are of little concern for public health. There is simply **NO** evidence that RTS causes cancer.

False Argument #3: RTS pollutes water supplies.

The false argument is that PAHs derived from RTS are a threat to water supplies. Even if RTS were an important source of PAHs found in sediments, neither RTS nor PAHs pose any threat to water supplies because RTS and indeed, PAHs in any form, are virtually insoluble in water. Examples of the virtual absence of PAHs in water can be found in every US state's Clean Water Act Section 303(d) reports, in which reports of PAHs as a cause of impairment of water quality are extremely rare. A review of the past several Wisconsin Section 303(d) reports for PAHs as a cause of impairment found that PAHs have **NO** instance of PAHs identified as a cause of impairment anywhere in the state. Every drinking water system in the US is required to analyze and report chemicals found in water distributed to homes – it is exceedingly rare for drinking water suppliers to find PAHs in drinking water supplies.

False Argument #4: RTS is based on a hazardous waste, and banning it is a factor in approval of MS-4 permits.

Neither RTS nor its coal tar base are hazardous wastes because they pass EPA's hazardous waste TCLP test, and so are not subject to Land Disposal Restrictions in federal hazardous waste regulation program. This has been affirmed by federal courts. Disposal is an issue in Minnesota, but only because of Minnesota laws, which are not applicable in Milwaukee. Measures to control PAHs or coal tars are not factors in approval of MS-4 permits. PCTC has challenged EPA to correct misinformation about RTS on its storm water web site.

False Argument #5: There's an alternative product available, so why not just ban RTS?

Asphalt-based pavement sealers (ABS) are indeed an alternative, but they are not a replacement because ABS does not do the same job. Where both are available, RTS is preferred for most applications. This preference is mostly because RTS is resistant to degradation caused by leaks/spills of petroleum-based products (such as gasoline, jet fuel, motor oil, etcetera), to other corrosive materials and because of longevity. ABS needs to be re-applied more often than RTS – depending on the situation, the longevity of RTS can be years longer than ABS. In addition, RTS is manufactured to a standard which, among other things, means its physicochemical properties are predictable. There have been and continue to be attempts to develop standards for ABS manufacture, but there isn't one at this time. The predictability and performance characteristics of RTS are the prime reasons RTS is specified for many situations.

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Most of the companies involved in the RTS industry are small and medium size businesses – just the sort of businesses that are disadvantaged by the rush to regulation that seems to be popular now. RTS manufacturers and suppliers are good corporate citizens, with well paid, often unionized work forces. Recently, the Pavement Coatings Technology Council held a webinar for sealcoating contractors. Of the 265 industry participants who registered for the webinar, 47% were from companies with 10 or fewer employees. Another 32% were from companies with 11 to 35 employees. This reflects the industry, dominated by small to very small local businesses. Contractors in northern states estimate that using ABS rather than RTS reduces their sealcoating season by, at a minimum, 20%, thereby reducing their income by 20% or more.

Pavement Coating Technology Council

REVIEW OF SCIENCE RELEVANT TO POTENTIAL ENVIRONMENTAL IMPACTS OF REFINED COAL TAR-BASED SEALCOAT (RTS)

For more than a decade the Pavement Coatings Technology Council (PCTC) has sought input from scientists with different expertise to evaluate concerns raised about health, safety, and environmental aspects of the use of RTS. These scientists have consistently found the published science to be unreproducible, lacking in transparency, and based on models that use unverified data. These conclusions are documented in papers published in scientific journals and in publicly available project and peer review reports.

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In 2005, hydrologists at the U.S. Geological Survey (USGS) and co-authors who worked with the City of Austin, Texas, published a paper in *Environmental Science & Technology* (ES&T; Mahler et al., 2005) speculating that "runoff from sealed parking lots could account for the majority of stream PAH loads." The study had been undertaken in cooperation with the City of Austin, which had previously consulted other state and federal agencies seeking confirmation of the City's theory that sealants were the predominant – or at least a significant - source of polycyclic aromatic hydrocarbons (PAHs) in sediments in the City.[1] Shortly after the paper was published, the City banned the sale and use of refined coal tar-based pavement sealant (RTS).

In response to the implication that a sealant product may be a source of PAHs in the environment, member companies of the Pavement Coatings Technology Council (PCTC), a 501(c)(6) trade association for the pavement coatings industry, tasked the association with both improving its understanding of the potential environmental impacts allegedly associated with sealcoating and evaluating the scientific studies addressing this issue. This memorandum briefly summarizes those efforts.

[1] The City had consulted with the Texas Commission on Environmental Quality (TCEQ), the Texas Department of Health which brought in the U.S. Public Health Service, and the U.S. Environmental Protection Agency (EPA) Region 6.

To carry out its mandate of improving understanding of environmental impacts, PCTC consulted with and commissioned reviews by scientists who are recognized as experts in their respective fields. Their conclusions were ultimately published and/or presented in peer reviewed papers, in comments and letters to the editors of journals which had published competing studies involving sealcoat, in technical memoranda, and at various scientific meetings and public hearings.

It has been PCTC's practice to make these evaluations public. Public access has been accomplished by commissioning preparation of manuscripts for submission to peer reviewed science journals, through public posting of post-publication peer reviews (PPPR) on the PubPeer (and/or the no-longer-supported PubMed Commons) web site, and through making PPPR documents available on PCTC's Scribd.com site. Some of these publications are listed in the attached Appendix 1 titled "Science Commissioned by PCTC." The remaining appendices contain reviews and evaluations of science publications related to RTS. They are organized as follows:

Appendix 2: Reviews of four papers relied on by EPA in 2 disseminated publications,
Appendix 3: Reviews of papers that identify RTS as a significant source of PAHs in sediment,
Appendix 4: Review of papers concerning RTS in stormwater runoff,
Appendix 5: Reviews of papers that identify RTS as a significant source of air emissions,
Appendix 6: Reviews of papers on the effectiveness of bans,
Appendix 7: Reviews of human exposure and health risk assessment papers, and
Appendix 8: Reviews of ecological risk assessment papers.

Taken together, these reviews and evaluations show that restrictions on the use of RTS are based on science that has been shown to be unreproducible, lacking in transparency, and based on models that use unverified data.

Appendix 1: Science Commissioned by PCTC

Appendix 1.1: Field Studies

As described in the introduction to this document, the conclusion reached by Mahler et al. (2005) was speculation that "runoff from sealed parking lots could account for the majority of stream PAH loads." This conclusion was based on comparisons between PAH signatures in solids suspended in simulated parking lot runoff and PAHs signatures in samples collected in prior years from a single location in Austin, TX, and three locations in Fort Worth, TX, which is about 200 miles from Austin. PCTC commissioned a field study of PAH signatures in sediment in various water bodies in Austin, TX, to test the validity of Mahler et al.'s speculation. Sampling was conducted in October and November, 2005, and again at many of the same locations in April, 2008.

A comprehensive report documenting the 2005 sampling event and resulting analyses was made available (Environ, 2006), and an evaluation of the full study was published in a peer reviewed journal (DeMott et al., 2010). The conclusion of the field study was that speculation that runoff from sealcoated parking lots is a, if not the, predominant source of PAHs in sediment in Austin or other urban areas was not justified by actual sediment data.

DeMott, R.P., Gauthier, T.D., Wiersema, J.M. and Crenson, G. (2010). PAHs in Austin Sediments after a Ban on Pavement Sealers. *Environmental Forensics*, 11:4, 372-382. https://doi.org/10.1080/15275922.2010.526520

Abstract: Polycyclic aromatic hydrocarbon (PAH) concentrations were measured in stream sediments collected before and after a municipal ban on the use of coal-tar–based pavement sealers in Austin, Texas. Samples were collected in October 2005, prior to the ban, and again in April, 2008, approximately 2 years after the ban. Differences in total PAH concentrations between samples collected before and after the ban show no net change in PAH levels in Austin stream sediments. Results of hydrocarbon fingerprinting reveal subtle differences in PAH profiles that appear to reflect the effects of weathering rather than a change in PAH sources.

Environ (2006). Polycyclic Aromatic Hydrocarbon (PAH) Characteristics for Sediments Collected from Creeks and Streams in Austin, Texas. Report prepared for the Pavement Coatings Technology Center. 63 p. Available at https://www.scribd.com/document/343808345/Polycyclic-Aromatic-Hydrocarbon-PAH-Characteristics-for-Sediments-Collected-from-Creeks-and-Streams-in-Austin-Texas

Executive Summary: This report presents an analysis of polycyclic aromatic hydrocarbon (PAH) concentrations measured in sediment samples collected from creeks and streams in the Austin, Texas area in October-November, 2005. The purposes of this study were to characterize the levels of PAHs found in Austin area sediments, compare PAH inputs from various sources and assess the hypothesized dominance of coal tar-derived pavement sealer products as sources of PAHs to Austin stream sediments.

Polycyclic aromatic hydrocarbons are a large and diverse group of chemical compounds formed primarily during combustion of carbon-based materials. PAHs are widely distributed in the environment because releases via combustion processes enter the atmosphere, promoting widespread dispersion, and ultimately end up on the land surface and transported to streams. Because of their chemical properties, PAHs in waterways are predominantly found in sediments. PAHs are also found in fossil fuels, explaining their association with pavement sealer products formulated from refined coal tar or asphalt. Coal tar has higher PAH levels than asphalt and this relationship carries through to the formulation of sealers from refined coal tar.

Given their association with combustion of fuels, higher PAH levels are frequently associated with dense human populations and traffic. Given the variety of potential sources, the widely accepted scientific consensus for decades has been that urban PAHs reflect complex mixtures related to vehicles, power generation, home heating and cooling, and consumer products. A recently published study challenged this explanation, hypothesizing based on sampling residues washed off of parking lots and test plots freshly coated with sealer products that PAHs from coal tar-derived pavement sealer products dominate the inputs to streams in Austin. This survey set out to characterize both overall conditions in Austin and the strength of this hypothesis using actual stream sediment samples.

Stream sediments were collected from diverse areas across metropolitan Austin, capturing the progression of population and traffic density from the suburban fringe through increasingly urbanized areas to urban downtown. These samples are expected to reflect PAHs from vehicles, atmospheric deposition and runoff from parking lots coated with pavement sealer products. Samples were also collected from direct roadway drainage features where pavement sealer-related PAHs are not expected to be contributing since these products are not used on roads.

The stream and streambed characteristics prevalent in Austin turned out to be important to interpreting sediment conditions and PAH transport for the area. Stream sediments and deposition patterns for Austin urban streams are dissimilar from those in other studies that characterized urban sediment quality using bed sediments from less dynamic waterways like lakes. This survey demonstrates that there are substantial uncertainties and limitations associated with attempting to evaluate urban PAH conditions based on stream sediments from Austin. While stream sediments serve as a useful snapshot of conditions across Austin, the spatial and temporal transience of sediment for many of the stream reaches create substantial uncertainties in attempting to characterize long-term urban conditions with this type of sample.

PAH concentrations measured in stream sediments were demonstrated to be both similar to urban areas in which coal tar-derived pavement sealers are not used and highly variable in response to the flushing effects of rain events. Further, since roadway drainage PAH concentrations alone corresponded to substantially more than half of the concentrations found in the urban portions of the streams, it appears that the hypothesis that the dominant source could be coal tar-derived pavement sealers will be difficult to substantiate.

Appendix 1.2: Forensic Analyses, Modeling, and Literature Reviews Published in Peer Reviewed Science Journals

Driscoll, S. K., Kulacki, K. and Marzooghi, S. (2019), A Review of the Literature on Potential Effects of Runoff from Refined Coal-Tar-Based Sealant Coating on Aquatic Organisms. *Integr Environ Assess Manag.* 16:1, 17-27 doi:10.1002/ieam.4210

Abstract: Pavement sealants are frequently applied to parking lots and driveways to improve their appearance and protect the integrity of the underlying asphalt. We performed a comprehensive literature review to summarize the potential impacts of refined coal-tar-based sealant (RCTS) runoff to aquatic organisms and to evaluate the strengths and weaknesses of the lines of evidence presented in the literature. The studies reviewed included both laboratory and field exposures, with and without exposure to ultraviolet light, and measured effects on multiple endpoints associated with bacteria, benthic macroinvertebrates, and fish. Several studies demonstrated that constituents in RCTS runoff can affect survival, growth, behavior, development, and molecular responses of aquatic organisms under controlled laboratory settings. However, translating effects observed in the laboratory to field settings, where runoff is diluted and constituents interact with particulate and dissolved stream constituents (e.g., organic matter), has proven difficult. In this review, we identify the strengths and weaknesses of the existing literature and provide recommendations for study designs and methods to fill the most critical data gaps in understanding the risk of this material to aquatic organisms. Our review highlights the need for environmentally relevant study designs that demonstrate cause-effect relationships under field conditions.

O'Reilly, K., Ahn, S., Pietari, J. and Boehm, P. (2015). Use of Receptor Models to Evaluate Sources of PAHs in Sediments. *Polycyclic Aromatic Compounds*. 35:1, 41-56. https://doi.org/10.1080/10406638.2014.907817

Abstract: Receptor models are mathematical procedures for resolving one or more of these parameters in a mixed chemical system: (1) the number of sources, (2) their chemical characteristics, and (3) the relative contribution of each source in environmental samples. These models are being used increasingly to evaluate sources of polycyclic aromatic hydrocarbons (PAHs) in sediments. As with any mathematical model, understanding the underlying assumptions is critical in interpreting the output. Three assumptions that raise particular challenges when applying receptor models to evaluate multiple sources of pyrogenic PAHs are (1) identification of all important sources, (2) stability of source profiles, and (3) linear independence of each profile. Variability within source types, and similarities among the PAH profiles of different sources, create uncertainties that must be considered when evaluating the results of receptor models. Various procedures for evaluating uncertainties have been applied in the literature, but validation and standardization of such methods are often lacking. Using a case study, this article demonstrates how a more detailed evaluation of model output can produce conclusions that differ from those initially published. While not eliminating uncertainty, we recommend a multiple-lines-of-evidence approach that includes both mixing and unmixing receptor models, along with other environmental forensic techniques.

O'Reilly, K. T., Pietari, J. and Boehm, P. D. (2014), Parsing pyrogenic polycyclic aromatic hydrocarbons: Forensic chemistry, receptor models, and source control policy. *Integr Environ Assess Manag*, 10:279–285. https://doi.org/10.1002/ieam.1506

Abstract: A realistic understanding of contaminant sources is required to set appropriate control policy. Forensic chemical methods can be powerful tools in source characterization and identification, but they require a multiple-lines-of-evidence approach. Atmospheric receptor models, such as EPA's Chemical Mass Balance (CMB), are increasingly being used to evaluate sources of pyrogenic polycyclic aromatic hydrocarbons (PAHs) in sediments. This paper describes the assumptions underlying receptor models and discusses challenges in complying with these assumptions in practice. Given the variability within, and the similarity among pyrogenic PAH source types, model outputs are sensitive to specific inputs, and parsing among some source types may not be possible. While still useful for identifying potential sources, it is critical that the technical specialist applying these methods describe both the results and their inherent uncertainties in a way that is understandable to non-technical policy makers. We present an example case study concerning an investigation of class of parking-lot sealers as a significant source of PAHs in urban sediment. In this paper, principal component analysis is used to evaluate published CMB model inputs and outputs. Targeted analyses of two areas where bans have been implemented are included. The results do not support the claim that parking-lot sealers are a significant source of PAHs in urban sediments.

O'Reilly, K., Pietari, J. and Boehm, P. (2012). Forensic Assessment of Coal Tar Sealants as a Source of Polycyclic Aromatic Hydrocarbons in Urban Sediments. *Environmental Forensics,* 13:185-196 https://doi.org/10.1080/15275922.2012.676598

Abstract: Atmospheric deposition of particles and their subsequent transport by stormwater are a major source of polycyclic aromatic hydrocarbons (PAHs) in urban sediments. Recently, the results of forensic analysis have been used to promote a hypothesis that

refined tar-based pavement sealers (RT-sealers) are another significant source. To evaluate this hypothesis, a suite of forensic methods was applied to a wider range of PAH data for this study. Sediments PAH profiles are no more similar to RT-sealers than they are to a number of other environmental inputs. While RT-sealers were not eliminated as a potential source in some locations, forensic methods did not differentiate their contribution from other sources of PAHs, indicating RT-sealers are not a unique or readily quantifiable source of PAHs to the urban environment.

Appendix 1.3: Post-Publication Peer Reviews, Letters to the Editor, & Responses Published in Peer Reviewed Science Journals

O'Reilly, K.T., and Edwards, M. (2019). Letter to the Editor: Comment on Norris & Henry (2019). *Science of the Total Environment*. 704:135248.[2] https://doi.org/10.1016/j.scitotenv.2019.135248

O'Reilly, K., and Ahn, S. (2017). Letter commenting on "Primary sources and toxicity of PAHs in Milwaukee-area streambed sediment"—To the editor: *Environmental Toxicology and Chemistry*, v. 36, p. 1978-1980. https://doi.org/10.1002/etc.3825

Magee, B. H., & Forsberg, N. D. (2016). Correspondence on Identification and Toxicological Evaluation of Unsubstituted PAHs and Novel PAH Derivatives in Pavement Sealcoat Products. *Environmental Science & Technology Letters, 3*(11), 404-405. https://pubs.acs.org/doi/pdfplus/10.1021/acs.estlett.6b00360

LeHuray, A. (2015) Letter to the Editor in response to Bales. *Integr Environ Assess Manag*. 11(2):185-187. https://doi.org/10.1002/ieam.1619

Gauthier, T.D. and DeMott, R.P. (2015). Comment on "Coal-tar pavement sealant use and polycyclic aromatic hydrocarbon contamination in urban stream sediments." *Physical Geography*. 36(1) pp 84-86 http://dx.doi.org/10.1080/02723646.2014.981779

O'Reilly, K. (2015). Letter to the Editor concerning "Source apportionment and distribution of polycyclic aromatic hydrocarbons, risk considerations, and management implications for urban stormwater pond sediments in Minnesota, USA." *Archives of Environmental Contamination and Toxicology*. 68(1) pp 1-3. https://doi.org/10.1007/s00244-014-0094-7 .[2]

DeMott, R.P.; Gauthier,T.D. (2014) Comment on "PAH Concentrations in Lake Sediment Decline Following Ban on Coal-Tar-Based Pavement Sealants in Austin, Texas." *Environ. Sci. Technol. 48* (23), pp 14061–14062 http://dx.doi.org/10.1021/es5046088.

O'Reilly, K., Pietari, J. and Boehm, P. (2014). Author's Reply to Van Metre and Mahler's Letter to the Editor on "Parsing pyrogenic polycyclic aromatic hydrocarbons: Forensic chemistry, receptor models, and source control policy." *Integr Environ Assess Manag*. 10(4):489-491. https://doi.org/10.1002/ieam.1556.

[2] Letter to the editor was subject to the journal's peer review process.

O'Reilly, K., Pietari, J. and Boehm, P. (2014). Author's Reply to Crane's Letter to the Editor on "Parsing pyrogenic polycyclic aromatic hydrocarbons: Forensic chemistry, receptor models, and source control policy." . *Integr Environ Assess Manag*. 10:325–326. https://doi.org/10.1002/ieam.1548

O'Reilly, Kirk (2014). Response to authors' reply on "Coal-tar-based sealcoated pavement: A major PAH source to urban stream sediments" *Environmental Pollution* 191:264-265. http://dx.doi.org/10.1016/j.envpol.2014.03.036

O'Reilly, Kirk (2014). Article Title Misstates the Role of Pavement Sealers. Letter to the Editor of *Environmental Pollution* 191:260-261 http://dx.doi.org/10.1016/j.envpol.2013.11.029

Magee, Brian and Janet Keating-Connolly (2014). Comment on "Cancer Risk from Incidental Ingestion Exposures to PAHs Associated with Coal-Tar-Sealed Pavement". *Environmental Science & Technology*, *48* (1), pp 868–869. https://doi.org/10.1021/es404184q

O'Reilly, K., Pietari, J. and Boehm, P. (2011). Comment on "PAHs Underfoot: Contaminated Dust from Coal-Tar Sealcoated Pavement is Widespread in the U.S." *Environ. Sci. Technol.*, **2011**, *45* (7), pp 3185–3186. https://pubs.acs.org/doi/pdfplus/10.1021/es200240g

DeMott, R.P.; Gauthier,T.D. (2006) Comment on "Parking lot sealcoat: An unrecognized source of urban polycyclic aromatic hydrocarbons." *Environ. Sci. Technol.* 2006, *40*(11), 3657-3658. https://doi.org/10.1021/es060326t

Appendix 1.4: Post-Publication Peer Review Reports

O'Reilly, K. and Edwards, M. (2019). *Technical review comments on Norris and Henry, 2019*. Technical memorandum prepared for the Pavement Coatings Technology Council July 29, 2019. Available at https://www.scribd.com/document/430786734/Technical-review-comments-on-Norris-and-Henry-2019

Exponent (2019). Review of Valentyne et al. (2018) "Polycyclic aromatic hydrocarbon contamination and source profiling in watersheds serving three small Wisconsin, USA cities." Report prepared for the Pavement Coatings Technology Council. Available at https://www.scribd.com/document/412388615/Post-Publication-Peer-Review-of-Valentyne-et-al-2018

Exponent (2016a). *Summary of McIntyre et al. 2016. "Severe Coal Tar Sealcoat Runoff Toxicity to Fish Is Prevented by Bioretention Filtration."* Report prepared for the Pavement Coatings Technology Council. Available at https://www.scribd.com/document/343915511/Post-publication-peer-review-of-McIntyre-et-al-2016 . Condensed version published as a comment on PubMed Commons at https://www.ncbi.nlm.nih.gov/myncbi/kirk.o'reilly.1/comments/

Magee, BH, and Forsberg, ND (2016). *Critical Review of Titaley et al. (2016).* Technical memorandum prepared for the Pavement Coatings Technology Council. August 4, 2016. Available at https://www.scribd.com/document/343808947/Peer-Review-of-Coal-Tar-Sealed-Pavement-Risk-Assessment . Condensed version published as a comment in Environmental Science & Technology Letters (Magee & Forsberg, 2016).

Exponent (2016b) *Evaluation of USGS's Assessment of PAH Sources in Sediments of the San Antonio River Watershed.* Report prepared for the Pavement Coatings Technology Council. Available at https://www.scribd.com/document/344996085/Post-publication-peer-review-of-USGS-San-Antonio-Report-Wilson-et-al-2011 .

Exponent (2015a). *Review of: Acute Toxicity of Runoff from Sealcoated Pavement to Ceriodaphnia dubia and Pimephales promelas (Mahler et al., 2015).* Report prepared for the Pavement Coatings Technology Council. Available at https://www.scribd.com/document/343911349/Post-publication-peer-review-of-Mahler-et-al-2015

Exponent (2015b). *Review of: Exposure to Runoff from Coal-Tar-Sealed Pavement Induces Genotoxicity and Impairment of DNA Repair Capacity in the RTL-W1 Fish Liver Cell Line (Keinzler et al., 2015).* Prepared for the Pavement Coatings Technology Council. 5p. Available at https://www.scribd.com/document/343911904/Post-publication-peer-review-of-Kienzler-et-al-2015

O'Reilly, K. (2014) *Comment on Van Metre and Mahler 2014: "PAH Concentrations in Lake Sediment Decline Following Ban on Coal-Tar-Based Pavement Sealants in Austin, Texas."* Available at https://www.scribd.com/document/343814884/O-Reilly-K-2014-Comment-on-Van-Metre-and-Mahler-2014-PAH-Concentrations-in-Lake-Sediment-Decline-Following-Ban-on-Coal-Tar-Based-Pavement-Seala .

O'Reilly, K. (2014). *Technical Evaluation of Van Metre and Mahler 2010.* Report prepared for PavementCouncil.org by Exponent. Available at https://www.scribd.com/document/343815559/Technical-Evaluation-of-Van-Metre-and-Mahler-2010

Gauthier, T. (2014). *Review of Pavlowsky 2013.* Report prepared for PavementCouncil.org by Environ. Available at https://www.scribd.com/document/343890840/Post-publication-peer-review-of-Pavlowsky-2013 Condensed version published as a comment in Physical Geography (Gauthier and DeMott, 2015).

Magee, B. (2014). *PAH Vapor Emissions from Coal Tar Pavement Sealers.* Technical memorandum prepared by ARCADIS for the Pavement Coatings Technology Council, dated July 30. 5 p. Available at https://www.scribd.com/document/343894751/PAH-Vapor-Emissions-from-Coal-Tar-Pavement-Sealers

Magee, B. and Keating-Connolly, J. (2013). *Peer Review of Coal-Tar-Sealed Pavement Risk Assessment.* Report prepared for PavementCouncil.org by ARCADIS. Available at https://www.scribd.com/document/343808947/Peer-Review-of-Coal-Tar-Sealed-

Pavement-Risk-Assessment. Condensed version published as a comment in Environmental Science & Technology (Magee and Keating-Connolly, 2013).

DeMott, Robert, Thomas Gauthier and Michael Masonjones (2013). *Volatilization of PAHs from Coal-Tar-Sealed Parking Lots*. Report prepared for PavementCouncil.org by Environ. Available at https://www.scribd.com/document/343894120/Post-publication-peer-review-of-Van-Metre-et-al-2012a-2012b

Environ International (2010). Review of "Coal-Tar-Based Parking Lot Sealcoat: An Unrecognized Source of PAH to Settled House Dust" by Mahler et al., published in Environmental Science and Technology, January 2010. Report prepared for PavementCouncil.org by Environ. Available at https://www.scribd.com/document/343811412/Review-of-Coal-Tar-Based-Parking-Lot-Sealcoat-An-Unrecognized-Source-of-PAH-to-Settled-House-Dust-by-Mahler-et-al-published-in-Environmental-Scie

Environ (2006). Polycyclic Aromatic Hydrocarbon (PAH) Characteristics for Sediments Collected from Creeks and Streams in Austin, Texas. Report prepared for the Pavement Coatings Technology Center. 63 p. Available at https://www.scribd.com/document/343808345/Polycyclic-Aromatic-Hydrocarbon-PAH-Characteristics-for-Sediments-Collected-from-Creeks-and-Streams-in-Austin-Texas

Appendix 2: Reviews of Four Papers Relied on by EPA in 2 Disseminated Publications

In 2012, EPA disseminated information concerning RTS in two different forms. In July 2012, EPA disseminated information titled *Pavement sealants & PAHs*[3] as an example of potential impacts of urbanization on water/sediment quality in the Agency's *Causal Analysis/Diagnosis Decision Information System (CADDIS)*. Citing Mahler et al. (2005), the CADDIS document includes the statement "…these sealants can be significant sources of PAHs." The document also cites Scoggins et al. (2007), a survey of benthic macroinvertebrate assemblages in selected reaches of streams near parking lots to imply that RTS has "…adversely affect[ed] stream biota." Later that year, in November 2012, EPA issued a "Fact Sheet" titled *Stormwater Best Management Practice: Polycyclic Aromatic Hydrocarbons, Coal-Tar Sealcoat, and Stormwater Pollution*[4]. In these two publications concerning RTS, EPA cited the following four papers:

Mahler, B. J., Van Metre, P., Bashara, T. J., Wilson, J. T., & Johns, D. A. (2005). Parking Lot Sealcoat: An Unrecognized Source of Urban Polycyclic Aromatic Hydrocarbons. *Environmental Science & Technology, 39*(15), 5560 - 5566. https://doi.org/10.1021/es0501565

Mahler, B. J., Van Metre, P., Crane, J., Watts, A. W., Scoggins, M., & Williams, E. S. (2012). Coal-tar-based pavement sealcoat and PAHs: Implications for the environment, human health, and stormwater management. *Environmental Science & Technology, 46*(6), 3039- 3045. https://doi.org/10.1021/es203699x

Scoggins, M., McClintock, N. L., Gosselink, L., & Bryer, P. (2007). Occurrence of polycyclic aromatic hydrocarbons below coal-tar-sealed parking lots and effects on stream benthic macroinvertebrate communities. *Journal of the North American Benthological Society, 26*(4), 694-707. https://doi.org/10.1899/06-109.1

Van Metre, P., & Mahler, B. J. (2010). Contribution of PAHs from coal–tar pavement sealcoat and other sources to 40 U.S. lakes. *Science of the Total Environment, 409*, 334 - 344. https://doi.org/10.1016/j.scitotenv.2010.08.014

Following dissemination of the CADDIS document and "Fact Sheet," PCTC pursued available mechanisms to urge EPA to more thoroughly evaluate the science relied on by the Agency to develop these two documents. On April 16, 2014, PCTC submitted a Request for Correction (RfC) of the two documents, pursuant to EPA's Information Quality Guidelines. EPA designated

[3] As of this writing, the URL is https://www.epa.gov/caddis-vol2/caddis-volume-2-sources-stressors-responses-urbanization-water-and-sediment-quality . A copy of the information disseminated in July 2012 is included as an exhibit in Information Quality Request for Correction #RFC 14003 available at https://www.epa.gov/quality/epa-information-quality-guidelines-requests-correction-and-requests-reconsideration#14003

[4] The November 2012 version of the "Fact Sheet" is available at https://www.scribd.com/document/433159716/EPA-Stormwater-BMP-Concerning-RTS-Nov-2012-Version-superceded-Jan-2018

the request RFC #14003. On January 20, 2016, EPA responded, substantially denying the RfC. Subsequently, PCTC submitted a Request for Reconsideration (RfR) on April 13, 2016. The RfR requested both reconsideration of the RfC and a Scientific Integrity complaint, asking that the Agency's Science Integrity Officer review the science underlying the disseminated information. The Agency responded to the RfR on February 2, 2018, by re-affirming the previous substantial denial of the RfC. As is Agency procedure, information concerning the RfC and RfR is publicly available.[5]

In addition to EPA's formal responses to the RfC and RfR, on January 11, 2018, the Office of the Science Advisor addressed PCTC's Scientific Integrity complaint as follows:

> EPA's Scientific Integrity Program does not arbitrate scientific disputes when there are differing scientific opinions, nor does it evaluate the quality and reproducibility of the scientific literature. Accordingly, this is not a violation of EPA's Scientific Integrity Policy.[6]

This letter mischaracterizes PCTC's complaint as a mere disagreement reflecting "different scientific opinion." To better understand published claims of environmental impacts of sealants, PCTC has expended significant resources consulting scientists with recognized subject area expertise. PCTC has also pursued release of data underlying the studies on which EPA has relied through Freedom of Information Act (FOIA) requests to the U.S. Geological Survey (USGS) and other means.[7]

In response to the communication with the ACS Committee on Ethics, the USGS released information on some of the data used in one of the papers (Mahler et al., 2005). This data and an email obtained in response to the FOIA request from Dr. Mahler to her co-authors and others strongly suggest that the data used to represent urban sediment PAH chemistry were specifically chosen to implicate RTS as the source of PAHs in the study area. Multiple subsequent studies funded by industry and separately by the City of Austin, Texas, demonstrate that the urban sediment samples used in Mahler et al. (2005) are not representative of urban sediment in the study area or elsewhere, resulting in conclusions that are not reproducible.

The USGS has chosen not to release other data requested by PCTC. In an attempt to obtain the data, PCTC filed a lawsuit[8] that has yet to be resolved.

[5] RfC #14003, the subsequent RfR, and EPA correspondence concerning the requests are available at https://www.epa.gov/quality/epa-information-quality-guidelines-requests-correction-and-requests-reconsideration#14003

[6] Letter from Vincent Cogliano to Anne LeHuray dated January 11, 2018.

[7] Including a letter dated July 8, 2013, to the Committee on Ethics of the American Chemistry Society (ACS), publisher of the journal *Environmental Science and Technology* (ES&T).

[8] PCTC v. USGS. 2014. Complaint for injunctive relief. DDC Case 1:14-cv-01200KBJ, Washington DC.

PCTC presented the details of the lack of transparency and irreproducibility of the four papers EPA relied on to develop the "Fact Sheet" and the CADDIS document in a March 15, 2018, letter to EPA.[9] A copy is included here as Attachment A.

Reviews of each of the four papers have also been made publicly available on PubPeer, a website dedicated to PPPR of science publications in any discipline. Links to the PPPR are as follows:

Mahler et al. (2005) https://pubpeer.com/publications/62730EDFFC17A5F85CA9EB7FD04C24#fb42729
Scoggins et al. (2007) https://pubpeer.com/publications/747B19A6260CA08B9CA4908177268A
Van Metre & Mahler (2010) https://pubpeer.com/publications/BEE4406AC9EF33CF9E3E6C238F0EDF
Mahler et al. (2012) https://pubpeer.com/publications/6B3C87FE52546C043F20BAC50ECFAC

The four papers relied on by the Agency in its dissemination of information about RTS were published in the scientific literature. It is a feature of such publications, however, that the same authors continuously publish additional papers that rely on their earlier and, in this case, unwarranted conclusions. Hence, the irreproducible results based on non-transparent data contained in the four cited papers have propagated to almost all subsequent scientific literature on the topic.

[9] Letter from Anne LeHuray to Vincent Cogliano dated March 15, 2018. (Attachment A)

Appendix 3: Reviews of Papers that Identify RTS as a Significant Source of PAHs in Sediment

Van Metre, P., Mahler, B., & Wilson, J. (2009). PAHs underfoot: contaminated dust from sealcoated pavements is widespread in the United States. *Environ Sci Technol, 43*, 20-25. DOI: 10.1021/es802119h

Published Comment https://doi.org/10.1021/es200240g

PPPR https://pubpeer.com/publications/C3ADDD65D7FDDD9D8F3E06EC0B9A2A

Pavlowsky, R. T. (2013). Coal-tar pavement sealant use and polycyclic aromatic hydrocarbon contamination in urban stream sediments. *Physical Geography, 34*(4-05), 392-415. DOI: http://dx.doi.org/10.1080/02723646.2013.848393

Published Comment http://dx.doi.org/10.1080/02723646.2014.981779

PPPR https://pubpeer.com/publications/F886AEF6529AA9843114E710B1AC2D

Crane, J. L. (2014). Source Apportionment and Distribution of Polycyclic Aromatic Hydrocarbons, Risk Considerations, and Management Implications for Urban Stormwater Pond Sediments in Minnesota, USA. *Arch Environ Contam Toxicol, 66*, 176–200. DOI: 10.1007/s00244-013-9963-8

Published Comment O'Reilly, K. (2015). Letter to the Editor concerning "Source apportionment and distribution of polycyclic aromatic hydrocarbons, risk considerations, and management implications for urban stormwater pond sediments in Minnesota, USA." *Archives of Environmental Contamination and Toxicology*. 68(1) pp 1-3. https://doi.org/10.1007/s00244-014-0094-7 .[10]

PPPR https://pubpeer.com/publications/1BC1FF805A0E9DE96ADBA73AC443AD#fb43811

Witter, A. E., Nguyen, M. H., Baidar, S., & Sak, P. B. (2014). Coal-tar-based sealcoated pavement: A major PAH source to urban stream sediments. *Environmental Pollution, 185*(0), 59-68. DOI: http://dx.doi.org/10.1016/j.envpol.2013.10.015

Published Comment O'Reilly, Kirk (2014). Response to authors' reply on "Coal-tar-based sealcoated pavement: A major PAH source to urban stream sediments" *Environmental Pollution* 191:264-265. http://dx.doi.org/10.1016/j.envpol.2014.03.036

Published Comment O'Reilly, Kirk (2014). Article Title Misstates the Role of Pavement Sealers. Letter to the Editor of *Environmental Pollution* 191:260-261 http://dx.doi.org/10.1016/j.envpol.2013.11.029

PPPR https://pubpeer.com/publications/C95FA81213FD9D30144C36DD6D3DF9#fb44076

Wilson, J. T. (2011). *Assessment of selected contaminants in streambed- and suspended-sediment samples collected in Bexar County, Texas, 2007–09*. Retrieved from http://pubs.usgs.gov/sir/2011/5097/

PPR Report https://www.scribd.com/document/344996085/Post-publication-peer-review-of-USGS-San-Antonio-Report-Wilson-et-al-2011

[10] Letter to the editor was subject to the journal's peer review process.

Appendix 5: Reviews of Papers that Identify RTS as a Significant Source of Air Emissions

Van Metre, P., Majewski, M. S., Mahler, B., Foreman, W. T., Braun, C. L., Wilson, J. T., & Burbank, T. L. (2012). Volatilization of polycyclic aromatic hydrocarbons from coal-tar-sealed pavement. *Chemosphere, 88*(1), 1 - 7. doi:10.1016/j.chemosphere.2011.12.072

PPR Report https://www.scribd.com/document/343894120/Post-publication-peer-review-of-Van-Metre-et-al-2012a-2012b

Additional Evaluation of Air Emissions
https://www.scribd.com/document/343894751/PAH-Vapor-Emissions-from-Coal-Tar-Pavement-Sealers

PPPR https://pubpeer.com/publications/456CA525683D444D8AE75DB9E88554

Van Metre, P. C., Majewski, M. S., Mahler, B. J., Foreman, W. T., Braun, C. L., Wilson, J. T., & Burbank, T. L. (2012). PAH volatilization following application of coal-tar-based pavement sealant. *Atmospheric Environment, 51*, 108-115. doi:10.1016/j.atmosenv.2012.01.036

PPR Report https://www.scribd.com/document/343894120/Post-publication-peer-review-of-Van-Metre-et-al-2012a-2012b

Additional Evaluation of Air Emissions
https://www.scribd.com/document/343894751/PAH-Vapor-Emissions-from-Coal-Tar-Pavement-Sealers

PPPR https://pubpeer.com/publications/CA40960B6C69C2994FF752D7460484

Appendix 6: Reviews of papers on the Effectiveness of Bans

Van Metre, P. C., & Mahler, B. J. (2014b). PAH Concentrations in Lake Sediment Decline Following Ban on Coal-Tar-Based Pavement Sealants in Austin, Texas. *Environmental Science & Technology*. doi:10.1021/es405691q

Published Comment http://dx.doi.org/10.1021/es5046088

Additional Comment https://www.scribd.com/document/343814884/O-Reilly-K-2014-Comment-on-Van-Metre-and-Mahler-2014-PAH-Concentrations-in-Lake-Sediment-Decline-Following-Ban-on-Coal-Tar-Based-Pavement-Seala

PPPR https://pubpeer.com/publications/DEC6835FF61E589EB95C8597944A7F

Appendix 7: Reviews of Human Exposure and Health Risk Assessment Papers

Mahler, B. J., Van Metre, P., Wilson, J. T., Musgrove, M., Burbank, T. L., Ennis, T. E., & Bashara, T. J. (2010). Coal-tar-based parking lot sealcoat: an unrecognized source of PAH to settled house dust. *Environmental Science & Technology, 44*, 894 - 900. doi:10.1021/es902533r

PPR Report https://www.scribd.com/document/343811412/Review-of-Coal-Tar-Based-Parking-Lot-Sealcoat-An-Unrecognized-Source-of-PAH-to-Settled-House-Dust-by-Mahler-et-al-published-in-Environmental-Scie

PPPR https://pubpeer.com/publications/F7AA69C873AB96CA862322CF1929BF#fb42838

Williams, E. S., Mahler, B. J., & Van Metre, P. (2013). Cancer Risk from Incidental Ingestion Exposures to PAHs Associated with Coal-Tar-Sealed Pavement. *Environmental Science & Technology, 47*, 1101 - 1109. doi: dx.doi.org/10.1021/es303371t

Published Comment https://doi.org/10.1021/es404184q

PPR Report https://www.scribd.com/document/343808947/Peer-Review-of-Coal-Tar-Sealed-Pavement-Risk-Assessment

PPPR https://pubpeer.com/publications/5EBEB3ACD53C7F2FF65624EC6DDA58

Appendix 8: Reviews of Ecological Risk Assessment Papers

Bommarito T, Sparling DW, and Halbrook RS. 2010a. Toxicity of coal-tar pavement sealants and ultraviolet radiation to *Ambystoma maculatum*. *Ecotoxicology*. 19:1147–1156.
Published Literature Review https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4210

Bommarito T, Sparling DW, Halbrook RS. 2010b. Toxicity of coal-tar and asphalt sealants to eastern newts, *Notophthalmus viridescens*. *Chemosphere*. 81:187–193.
Published Literature Review https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4210

Bryer PJ, Scoggins M, McClintock NL. 2010. Coal-tar based pavement sealant toxicity to freshwater macroinvertebrates. *Environmental Pollution*. 158:1932–1937.
Published Literature Review https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4210

Kienzler, A., Mahler, B. J., Van Metre, P. C., Schweigert, N., Devaux, A., & Bony, S. (2015). Exposure to runoff from coal-tar-sealed pavement induces genotoxicity and impairment of DNA repair capacity in the RTL-W1 fish liver cell line. *Science of The Total Environment, 520*(0), 73-80. http://dx.doi.org/10.1016/j.scitotenv.2015.03.005
Published Literature Review https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4210
PPR Report https://www.scribd.com/document/343911904/Post-publication-peer-review-of-Kienzler-et-al-2015
PPPR https://pubpeer.com/search?q=10.1016%2Fj.scitotenv.2015.03.005

Mahler, B. J., Ingersoll, C. G., Van Metre, P. C., Kunz, J. L., & Little, E. E. (2015). Acute Toxicity of Runoff from Sealcoated Pavement to *Ceriodaphnia dubia* and *Pimephales promelas*. *Environmental Science & Technology, 49*(8), 5060-5069. doi:10.1021/acs.est.5b00933
Published Literature Review https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4210
PPR Report https://www.scribd.com/document/343911349/Post-publication-peer-review-of-Mahler-et-al-2015
PPPR https://pubpeer.com/publications/CA5E52B5AD1819E468B800DB24D261

McIntyre, J. K., Edmunds, R. C., Redig, M. G., Mudrock, E. M., Davis, J. W., Incardona, J. P., . . . Scholz, N. L. (2016). Confirmation of Stormwater Bioretention Treatment Effectiveness Using Molecular Indicators of Cardiovascular Toxicity in Developing Fish. *Environmental Science & Technology, 50*(3), 1561-1569. doi:10.1021/acs.est.5b04786
Published Literature Review https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4210
PPR Report https://www.scribd.com/document/343915511/Post-publication-peer-review-of-McIntyre-et-al-2016
PPPR https://pubpeer.com/publications/C88B631B21F39FC5D2BC017A6473A0

Scoggins, M., McClintock, N. L., Gosselink, L., & Bryer, P. (2007). Occurrence of polycyclic aromatic hydrocarbons below coal-tar-sealed parking lots and effects on stream benthic macroinvertebrate communities. *Journal of the North American Benthological Society, 26*(4), 694-707. https://doi.org/10.1899/06-109.1
Published Literature Review https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4210

PPPR https://pubpeer.com/publications/747B19A6260CA08B9CA4908177268A

Titaley, I. A., Chlebowski, A., Truong, L., Tanguay, R. L., & Massey Simonich, S. L. (2016). Identification and Toxicological Evaluation of Unsubstituted PAHs and Novel PAH Derivatives in Pavement Sealcoat Products. *Environmental Science & Technology Letters*. doi:10.1021/acs.estlett.6b00116

Published Literature Review https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4210

Published Comment https://pubs.acs.org/doi/pdfplus/10.1021/acs.estlett.6b00360

PPPR https://www.scribd.com/document/344420340/Post-publication-peer-review-of-Titaley-Et-Al-2016-Aug-4-2016

ATTACHMENT A

Letter to Dr. V. Cogliano (EPA Office of the Science Advisor) from Dr. A. LeHuray (Pavement Coatings Technology Council) dated Marcy 15, 2018

Baldwin, A. K., Corsi, S. R., Lutz, M. A., Ingersoll, C. G., Dorman, R., Magruder, C., & Magruder, M. (2016). Primary sources and toxicity of PAHs in Milwaukee-area streambed sediment. *Environmental Toxicology and Chemistry, 36*, 1622-1635. DOI:10.1002/etc.3694

Published Comment O'Reilly, K., and Ahn, S. (2017). Letter commenting on "Primary sources and toxicity of PAHs in Milwaukee-area streambed sediment"—To the editor: *Environmental Toxicology and Chemistry*, v. 36, p. 1978-1980. https://doi.org/10.1002/etc.3825

Valentyne, A., Crawford, K., Cook, T., & Mathewson, P. D. (2018). Polycyclic aromatic hydrocarbon contamination and source profiling in watersheds serving three small Wisconsin, USA cities. *Science of The Total Environment, 627*, 1453-1463. DOI: https://doi.org/10.1016/j.scitotenv.2018.01.200

PPR Report https://www.scribd.com/document/412388615/Post-Publication-Peer-Review-of-Valentyne-et-al-2018

Norris, G, Henry R. 2019. Unmix Optimum analysis of PAH sediment sources. *Sci Tot Environ.* 673:831-838. DOI : https://doi.org/10.1016/j.scitotenv.2019.03.227

Published Comment O'Reilly, K.T., and Edwards, M. (2019). Letter to the Editor: Comment on Norris & Henry (2019). *Science of the Total Environment*. 704:135248.[2] https://doi.org/10.1016/j.scitotenv.2019.135248

PPR Report https://www.scribd.com/document/430786734/Technical-review-comments-on-Norris-and-Henry-2019

Appendix 4: Reviews of Papers Concerning RTS in Stormwater Runoff

Watts, A. W., Ballestero, T. P., Roseen, R. M., & Houle, J. P. (2010). Polycyclic Aromatic Hydrocarbons in Stormwater Runoff from Sealcoated Pavements. *Environmental Science & Technology, 44*, 8849 - 8854. doi: 10.1021/es102059r

PPPR https://pubpeer.com/publications/D11E6D8EA68C093ACB155A821E5DFB

Mahler, B. J., Ingersoll, C. G., Van Metre, P. C., Kunz, J. L., & Little, E. E. (2015). Acute Toxicity of Runoff from Sealcoated Pavement to *Ceriodaphnia dubia* and *Pimephales promelas*. *Environmental Science & Technology, 49*(8), 5060-5069. doi:10.1021/acs.est.5b00933

PPR Report https://www.scribd.com/document/343911349/Post-publication-peer-review-of-Mahler-et-al-2015

PPPR https://pubpeer.com/publications/CA5E52B5AD1819E468B800DB24D261

Kienzler, A., Mahler, B. J., Van Metre, P. C., Schweigert, N., Devaux, A., & Bony, S. (2015). Exposure to runoff from coal-tar-sealed pavement induces genotoxicity and impairment of DNA repair capacity in the RTL-W1 fish liver cell line. *Science of The Total Environment, 520*(0), 73-80. http://dx.doi.org/10.1016/j.scitotenv.2015.03.005

PPR Report https://www.scribd.com/document/343911904/Post-publication-peer-review-of-Kienzler-et-al-2015

PPPR https://pubpeer.com/search?q=10.1016%2Fj.scitotenv.2015.03.005

PCTC

THE USE OF REFINED COAL TAR-BASED SEALANTS (RTS) IN EPA'S 2021 INDUSTRIAL STORMWATER GENERAL PERMIT IS NOT RESTRICTED

Highlights

- As in EPA's 2015 Multi-Sector General Permit (MSGP), there are no restrictions on the use of RTS in the 2021 MSGP.
- EPA's decision to exclude restrictions was made "following consideration of the comments" received from the public on the draft MSGP.
- EPA received 61 comments from both individual and coalitions of public and private sector entities opposing the restriction and 6 in support.
- In its summary of legal, scientific, cost, and policy considerations that influenced its decision, EPA highlighted the continued lack of sound data that indicates a problem that needs to be solved.

The federal Clean Water Act authorizes EPA and the states to set requirements for stormwater discharges from industrial facilities. Since 1995 EPA has reviewed and renewed its Multi-Sector General Permit (MSGP), which covers a large number of different types of industrial facilities, every 5 years. The MSGP issued by EPA is directly applied in a small number of states, territories, and federal facilities and is often used as a model for permits issued by states that issue their own permits.

In comments submitted to EPA during the process of renewing the 2015 MSGP, a coalition of Environmental Non-Governmental Organizations (ENGOs) asked EPA to include a restriction on the use of RTS at industrial facilities. EPA declined to do so for several reasons, including that EPA had (1) no data about the use of RTS at covered facilities, (2) no data that indicate RTS use was associated with exceedances of water quality standards, (3) RTS is typically used on parking lots, and stormwater discharges from parking lots are not included in the definition of "industrial activity" that are regulated under EPA's industrial stormwater program, (4) if discharges from covered facilities that may use RTS exceed water quality standards, the facility is already required to address the exceedances, and, (5) for non-storm water discharges, EPA does not have the authority under its current industrial stormwater program to regulate such discharges from parking lots at industrial facilities.

After the 2015 MSGP was issued, several ENGOs filed challenges resulting in 2016 in a settlement agreement with EPA. One of the clauses of the settlement agreement required EPA "to propose for comment a condition of eligibility that operators who, during their coverage under the next MSGP, will use coal tar sealant to initially seal or to re-seal pavement and thereby discharge polycyclic aromatic hydrocarbons (PAHs) in stormwater are not eligible for coverage under the MSGP and must either eliminate such discharge or apply for an individual permit."

As agreed, in 2020 EPA requested comment from the public on whether the MSGP should include an eligibility criterion related to the application of coal-tar sealcoat to paved areas where industrial activities are located.

As it had in 2015, EPA did not include the proposed eligibility restriction in its 2021 MSGP. EPA's decision was based on its consideration of comments received from the public, most of which opposed the restriction.

PCTC

Appendix B
Science-Related Comments

I. Refined Coal-Tar Sealcoat (RTS) Is Not a Significant Source of PAHs in the Aquatic Environment, and Its Use Does Not Present Risks to Aquatic Life or Humans. Thus, There Is No Rational Basis for EPA's Proposed RTS Eligibility Restriction.

The Fact Sheet lays out the asserted logic behind EPA's proposed eligibility restriction as to RTS:

- Polycyclic aromatic hydrocarbons (PAHs) are toxic;
- RTS has a high level of PAHs;
- Stormwater causes PAHs to be transported from surfaces sealed with RTS into freshwater; and
- That PAH contribution from RTS is significant, and causes toxicity to aquatic life.

Each of these claims is either false or misleading. As we explain below:

- While some individual PAHs may be toxic in isolation, PAHs occur in the environment in complex mixtures and substances that are largely inert.
- RTS contains a relatively small amount of PAHs.
- Once applied in accordance with industry standards,[59] RTS does not readily yield PAHs, and those that are released soon after application remain bound to organic material in sediments.
- PAHs are also hydrophobic (*i.e.*, virtually insoluble in water). As a result, PAHs from RTS are not a significant source of the PAHs found in aquatic environments.
- PAHs from RTS are not a source of significant toxicity in those environments.

Thus, the proposed eligibility criterion will not produce any meaningful change in the abundance or health of aquatic species in the United States.

The proposed exclusion is based on a collection of claims leading to the assertion that releases of stormwater from RTS-treated surfaces cause aquatic toxicity and pose risk to humans. But, EPA has failed to directly link PAH releases from RTS applications to aquatic toxicity. The reasons for this lack of cause and effect relationship between RTS products and aquatic impacts are numerous and are discussed in detail below.[60]

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[59] ASTM D3423 requires that RTS not be applied unless there is no rainfall expected within 24 hours. ASTM standard section 2015.

[60] It should be noted that in nearly all research conducted on this topic where the study duration exceeds 24 hours, researchers have not taken into account the impact of photolysis, a form of weathering caused by sunlight, on the PAHs contained within RTS. The transformative properties of sunlight and its ability to change the type and quantity of PAHs available at the surface of an RTS-coated parking lot has been thoroughly documented at the chemical level and in the similarity of pyrogenic PAHs from different sources in the environment.

The Administrative Procedure Act requires an agency to show a rational connection between the facts and the agency's conclusion. *FERC v. Electric Power Supply Ass'n*, 136 S. Ct. 760, 782 (2016). The best available science shows that EPA's asserted connections are unfounded. EPA's proposed ban of RTS is therefore irrational and illegal.

A. Refined Coal Tar Sealcoat Is Not a Significant Source of Biologically Available PAHs in the Aquatic Environment.

1. EPA's own CWA guidance acknowledges that, in natural aquatic environments, PAHs strongly adsorb to organic materials and are not bioavailable—and, thus, require specialized risk assessment techniques.

Part 1.1.8 of the Fact Sheet notes that 16 PAHs have been designated as Priority Pollutants, and that "[s]everal PAHs have been shown to be extremely toxic to and bioaccumulate in fish and aquatic invertebrates, and are known or probable human carcinogens."[61] However, EPA's Priority Pollutant List, and much related characterization of PAHs, was developed in the 1970s, when scientific understanding of the environmental chemistry, toxicology, fate, and transport of the PAHs was minimal. In the decades since, our understanding of PAHs in the natural environment has improved greatly. That increased understanding has informed EPA's evaluation of PAHs in other CWA contexts. In particular, EPA guidance from 2003 and 2012 specifically aimed at evaluating PAHs in sediment clearly states—and is premised on—several key facts:

- *Outside laboratory settings, there is almost no exposure to individual PAH compounds.* This is because:
  - In the natural environment, PAHs occur in mixtures containing variable concentrations of PAH and non-PAH compounds.
  - PAHs and PAH-containing materials are hydrophobic. Thus, whether in naturally occurring or anthropogenic materials, PAHs partition strongly to the solid phase, where they have been found to be tightly bound to organic materials in complex mixtures containing dozens or hundreds of PAH and non-PAH compounds. In highly carbonized materials such as soot and coal tar pitch, PAHs can be strongly to irreversibly bound to the solid phase.
  - Reflecting their very low aqueous solubility, PAHs are very rarely detected in aqueous matrices.
- *Because of these physical/chemical properties, risk assessments of exposures to PAHs associated with PAH-containing solids demonstrate that these materials are not very bioavailable or bioaccessible.*[62]

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[61] Fact Sheet at 21.

[62] *See* U.S. EPA (2003). *Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures.* EPA/600/R-02/013. November 2003; U.S. EPA (2012). *Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Procedures for the Determination of the Freely Dissolved Interstitial Water Concentrations of Nonionic Organics.* U.S. EPA/600/R-02/012. December 2012. *See also* Ruby et al. (2016). Oral Bioavailability, Bioaccessibility, and Dermal Absorption of PAHs from Soil—State of the Science. *Environmental Science & Technology, 50*(5), 2151-2164. doi:10.1021/acs.est.5b04110.

The virtual insolubility of PAHs is the likely reason PAHs are only rarely identified as a "cause of impairment" (COI) in Clean Water Act (CWA) Section 303(d) lists of impaired and threatened waters.[63] Furthermore, some COI designations based on PAHs are in remote areas, where local sources of anthropomorphic PAHs, much less RTS applications, are few. This further indicates that RTS discharges of PAHs are not significant.[64]

In light of these unique characteristics of PAHs in the environment, the EPA guidance regarding sediment benchmarks recommends an equilibrium partitioning (EqP) approach to developing benchmarks for PAHs in sediments that are protective of benthic organisms. This guidance on Equilibrium Partitioning Sediment Benchmarks (ESBs) also recognizes that bioavailability can vary in different sediments, resulting in variable biological effects concentrations. None of the literature cited in the Fact Sheet to support an eligibility restriction on RTS based on possible PAH releases to water bodies reflects any of EPA's guidance on developing ESB benchmarks for PAHs.

Experience since the 1970s has also led EPA to conclude, in other CWA contexts, that measurement of sediment concentrations of chemicals on the Priority Pollutants List alone is insufficient either to predict the toxicity of sediments or to identify which chemicals are causative when toxicity is observed. The problem is multi-faceted. Toxicity may be:

- related to the presence of unmeasured chemicals;
- correlated with a chemical that is not causative;
- influenced by the relative bioavailability of different sediment constituents; or
- mediated by synergism or antagonism of the chemicals or mixtures present.

To address these problems, EPA has developed guidance on conducting a Toxicity Identification Evaluation (TIE) to "characterize, identify, and confirm the causes of measured toxicity."[65]

Again, none of the literature cited in the Fact Sheet to support the proposed RTS eligibility restriction reflects any of EPA's TIE guidance—nor any other method of identifying toxicity or the causes of measured toxicity in sediments in the real world.

As discussed below, the proposed eligibility criterion is arbitrary and capricious, due to its failure to acknowledge and address the weight of current scientific evidence and current best practices in sediment risk assessment. This failure is particularly glaring given that the Agency's CWA guidance demonstrates that EPA does, in fact, understand the nature of PAHs in the environment and the best practices for assessing related risks.

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[63] LeHuray, A. (2014). PAHS are Rarely Causes of Impairment in U.S. Clean Water Act Section 303(D) Reports. Presentation at the 35th Annual Meeting of the Society of Environmental Toxicology and Chemistry (SETAC) Vancouver, BC November 10, 2014

[64] *Id.*

[65] US EPA (2007) Sediment Toxicity Identification Evaluation (TIE): Phases I, II, III Guidance Document. EPA/600/R-07/080. September 2007.

2. PAHs in coal tar sealcoat particles bond particularly strongly and are particularly not bioavailable.

EPA's development of guidance on ESBs and TIEs was grounded in EPA's recognition that, outside the laboratory, exposure to individual PAH compounds is limited by the physical-chemical characteristics of PAHs discussed above:

- PAHs occur in mixtures containing variable concentrations of PAH and non-PAH compounds;
- PAHs are hydrophobic compounds that, in highly carbonized materials such as soot and coal tar pitch, can be strongly-to-irreversibly bound to the solid phase; and
- PAHs bound in highly carbonized materials are not very available or accessible to biological systems.

These facts about PAHs generally are equally true of the PAHs in RTS.[66]

The tendency of PAHs to strongly-to-irreversibly bond to highly carbonized particles is illustrated in Figure 1 below:

[66] The Fact Sheet errs in asserting that RTS "typically contains 20 to 35% coal tar pitch which is made up of 50% or more PAHs by weight (Mahler, Van Metre, Bashara, Wilson, and Johns, 2005)." *Id.* at 21. This presentation of PAH content is misleading. RTS is manufactured and applied according to a specific set of materials and methods specified in a series of ASTM International performance standards. The base material used to manufacture sealants is called RT-12, which is a controlled distillation fraction pulled from the coal tar pitch refinery column at a specified temperature and viscosity. ASTM D490-92(2016), Standard Specification for Road Tar, 2016. RT-12 is a UVCB (Chemical Substance of Unknown or Variable Composition, Complex Reaction Products and Biological Materials) that typically contains about 50% PAHs by weight. Undiluted RTS is a physical mixture of RT-12, emulsifier, clay, water, and sand, resulting in 5% to 8% total PAHs by weight in the product delivered to applicators, as described in the ASTM standards (ASTM D4866/D4866M-88(2017)e1, Standard Performance Specification for Coal Tar Pitch Emulsion Pavement Sealer Mix Formulations Containing Mineral Aggregates and Optional Polymeric Admixtures, 2017; ASTM D5727/D5727M-00(2017)e1, Standard Specification for Emulsified Refined Coal Tar (Mineral Colloid Type), 2017; ASTM D6945-03, Standard Specification for Emulsified Refined Coal-Tar (Ready to Use, Commercial Grade), 2013; ASTM D6946-13, Standard Specification for Emulsified Refined Coal-Tar (Driveway Sealer, Ready to Use, Primary Residential Grade), 2013). Before application, the sealant is further diluted with water and additional sand, resulting in a typical total PAH content of 3% to 6% by weight in as-applied sealant. ASTM D3423 / D3423M-84(2015)e1, Standard Practice for Application of Emulsified Coal-Tar Pitch (Mineral Colloid Type), 2015. All these ASTM standards are available at www.astm.org.

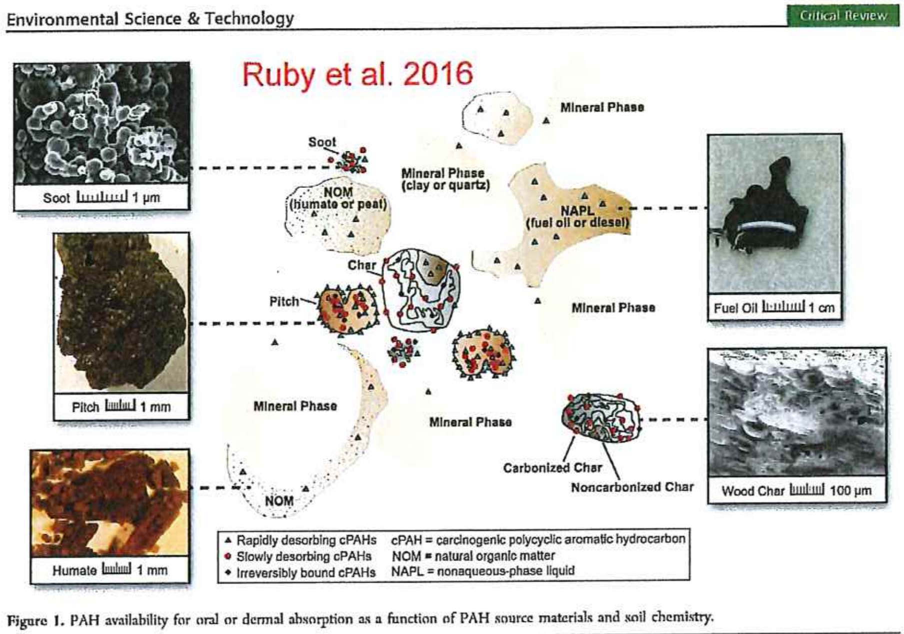

Figure 1. PAH availability for oral or dermal absorption as a function of PAH source materials and chemistry.

That tendency was also documented in a Department of Defense Strategic Environmental Research and Development Program (SERDP) multi-disciplinary study to better understand how the bioavailability of PAHs impacts exposure risks. The study found that:

> The source of PAH contamination is the primary factor controlling the portioning behavior of PAHs from soil. PAHs that enter soil as part of a matrix that is rich in black carbon (BC), such as within soot or coal tar pitch, are much less bioavailable than PAHs that are spiked to soil in the laboratory or that enter soil within fuel oil. Mineral characteristics of the soil (e.g., type of content of clay, presence of humic acids) have much less influence on the binding of PAHs.[67]

The implications of relative biological inaccessibility of PAHs in coal tar pitch particles in soil also apply to PAHs contained in sediment particles, as reflected in EPA's ESB guidance for PAHs.[68]

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[67] Lowney, Y. W. et al. (2017). *PAH Interactions with Soil and Effects on Bioaccessibility and Bioavailability to Humans.* Department of Defense SERDP Project ER-1743.

[68] The situation is even more complex when considering materials such as coal tar pitch particles that are present in a soil or sediment matrix that can adsorb PAHs from other sources. Hypothetically, PAH concentrations of pitch particles may increase over time as PAHs from other sources are adsorbed. From the concept of PAH partitioning and sorption, it can be inferred that PAHs adsorbed to the surface of pitch particles during weathering are more readily desorbed than PAHs that are intrinsic to the particles, which remain strongly-to-irreversibly bound. Ruby et al. 2016; Khalil et al. 2006; Xia, H., Gomez-Eyles, J. L., & Ghosh, U. (2016). Effect of PAH source materials and soil components on partitioning and dermal uptake. *Environmental Science & Technology, 50*(7), 3444-3452. doi:10.1021/acs.est.5b06164.

3. Surfaces sealed with RTS do not contribute significant amounts of PAHs to aqueous environments.

a) Simulation studies typically focus on unrealistic experimental conditions. Mahler et al. 2005 is also deeply flawed.

The Fact Sheet relies crucially on two studies in which experimenters used hoses to attempt to simulate stormwater runoff from newly sealcoated lots: Mahler et al. 2005 and Rowe & O'Conner 2011. Neither of these studies supports the proposed ineligibility criterion.

We discuss Mahler et al. at great length below, for several reasons. On the one hand, it is a highly influential work, as it gave rise to the entire literature attempting to connect RTS to the presence of PAHs in environmental media. On the other hand, other scientists have been unable to replicate its results, and still other scientists have faulted its logic. Finally, but most importantly, correspondence by the studies' authors released in response to Freedom of Information Act (FOIA) requests reveal that the study violated fundamental principles of scientific integrity and is unreliable.

We then address Rowe & O'Conner, which shows very low levels of PAHs from RTS-sealed surfaces, even under unrealistic experimental conditions. Finally, we discuss McIntyre et al. 2016, which explains why, in light of the characteristics of PAHs discussed above, runoff from RTS-sealed surfaces in the real world does not produce PAH contamination of surface waters.

(1) Mahler et al. 2005

The authors of the Mahler paper claimed to have shown that RTS "could indeed be the dominant source of PAHs to watersheds with residential and commercial development." The authors based this claim on a forensic analysis. First, they collected samples of suspended solid particles from "simulated runoff" from RTS-sealed parking lots in the Austin, Texas area. Then, they analyzed those particles and plotted the ratios of selected individual PAHs (for example, the concentration of fluoranthene against the concentration of pyrene). They concluded that those ratios were the diagnostic "signature" of RTS. Next, they compared those ratios with ratios derived from 20 samples they claimed were representative of PAH concentrations in Austin-area streams. They concluded that the overlap between the plots of those two ratios showed that RTS runoff "could be dominating PAH loadings" to urban sediments.

However, in a glaring violation of the scientific method, the 20 samples they claimed to represent PAHs in Austin-area streams were not even collected as part of the run-off study. Most did not even come from the Austin area. Rather, the authors (two U.S. Geological Survey scientists) searched their files until they found stream sediments with similar PAH "signatures."

In Figure 2 below, the red squares show the locations where the simulated run-off samples were collected.[69]

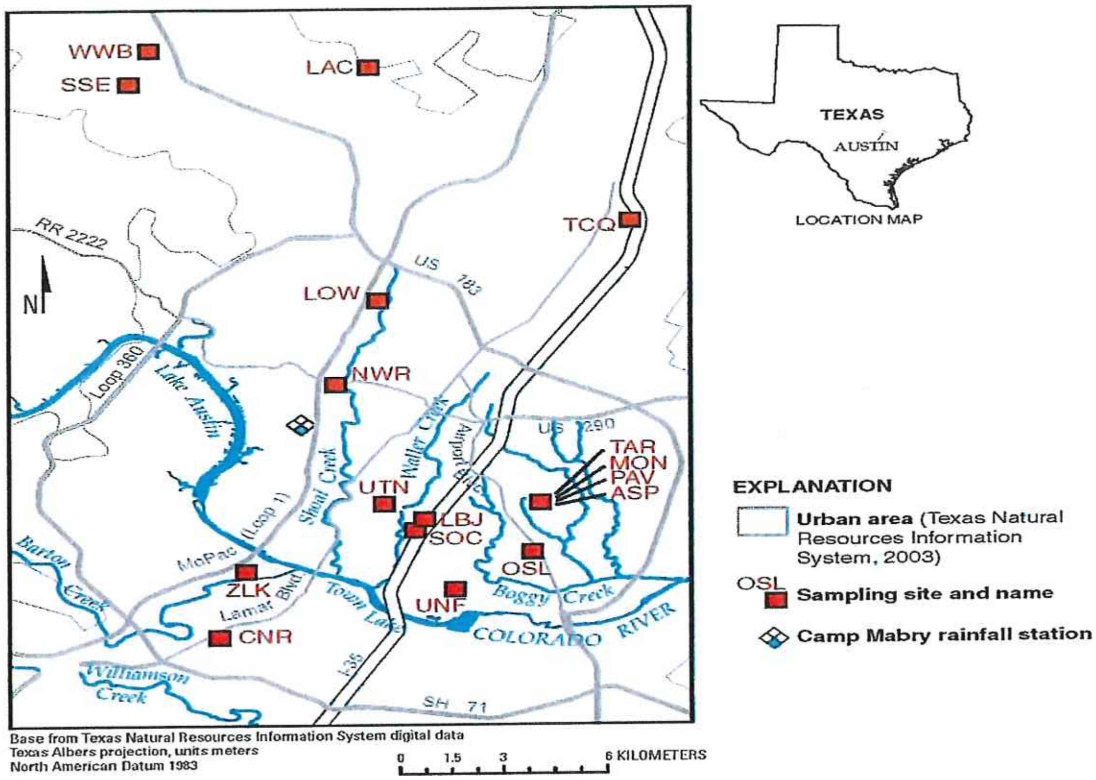

Figure 1. Location of parking lots for sampling of simulated runoff, Austin, Texas, 2003.

Figure 2. Location of parking lots for sampling of simulated runoff, Austin, Texas, 2003.

At the bottom edge of Figure 2 is a stream called Williamson Creek. Eight of the 20 samples used to represent Austin's sediments were collected over time from a single Williamson Creek sampling location shown in Figure 3 below.[70,71] As can be seen from Figure 3 below, Williamson Creek is in a different streamshed than the run-off study locations shown in Figure 2 above.

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[69] Mahler, B. J. et al. (2004 [revised 2007]). *Concentrations of polycyclic aromatic hydrocarbons (PAHs) and major and trace elements in simulated rainfall runoff from parking lots, Austin, Texas, 2003 (version 3):* U.S. Geological Survey Open-File Report 2004–1208, 87 p. [Online only].

[70] Sample locations identified in a letter from William G. Wilber (USGS) to Anne LeHuray (PCTC) dated July 22, 2013.

[71] Figure from Mahler et al. 2004 [revised 2007].

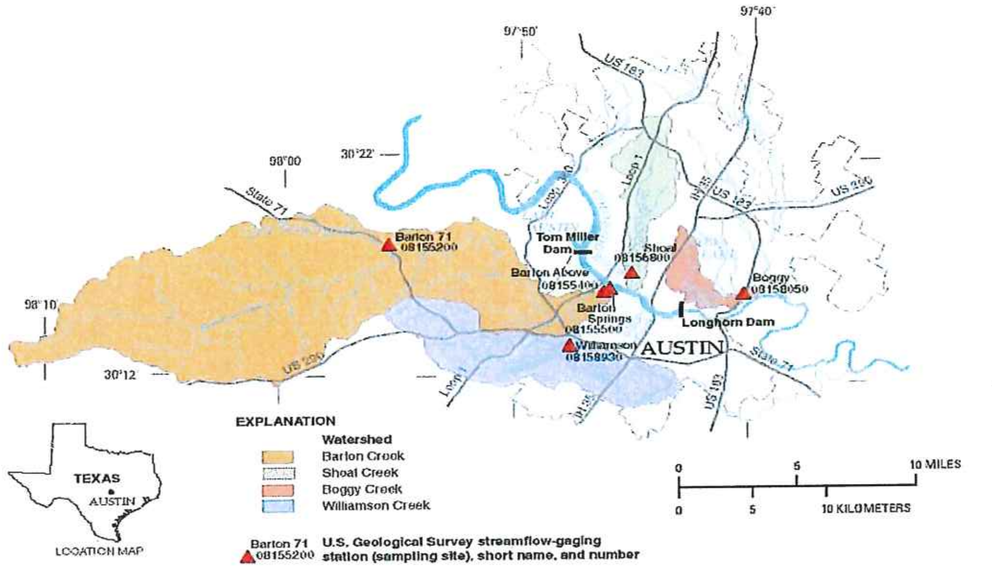

Figure 1. Sampling sites and associated watersheds, Austin, Texas.

Figure 3. Sampling sites and associated watersheds, Austin, Texas.

To complete the picture, 12 of the 20 samples used to represent sediment PAHs in Austin streams were collected from three locations in three streams in Fort Worth, about 200 miles from Austin.[72] The Fort Worth locations are shown in Figure 4 below.[73]

[72] Letter from Wilber to LeHuray, 2013.

[73] Van Metre, P. C., et al. (2003). *Occurrence, trends, and sources in particle-associated contaminants in selected streams and lakes in Fort Worth, Texas*. USGS Water Investigations Report 03-4169.

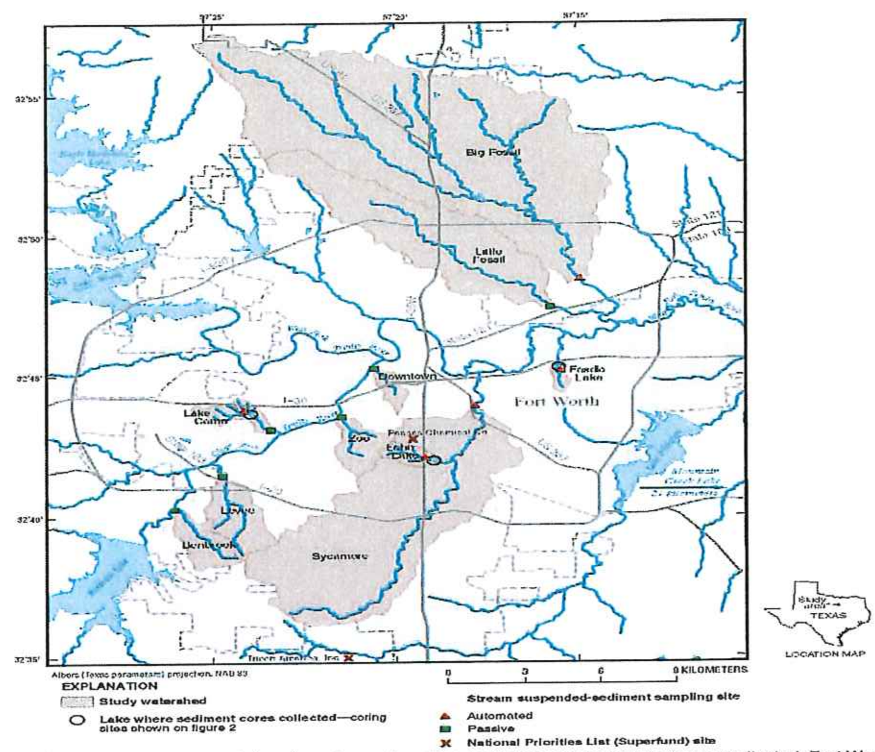

Figure 1. Locations of suspended-sediment sampling sites and lakes where sediment cores collected, Fort Worth, Texas.

INTRODUCTION 3

Figure 4. Locations of suspended sediment sampling sites and lakes where sediment cores collected, Fort Worth, Texas.

Why did the authors choose those particular locations to derive data supposedly representative of "urban sediment" in Austin? Email correspondence obtained via FOIA reveals that the authors chose the particular stream sediment samples precisely because they matched the claimed PAH signature of RTS and thus "confirmed" the authors' hypothesis. When a colleague asked: "Could you guys fill me in again on what PAH ratios had looked kind of hopeful to differentiate PAH sources?" one of the authors wrote in response:

> When the Williamson Creek suspended sediment data was plotted on the same graph, they tended to group with the sealed parking lots as opposed to with the unsealed (asphalt pavement or cement) parking lots. Suspended sediment data from three small urban watersheds in Fort Worth were similar.

The scientific way to test the hypothesis that RTS runoff contributes to PAH concentrations in streams would have been to collect sediments from streams in the vicinity of the parking lots used to generate the simulated runoff—and then to compare them. Instead, however, the USGS scientists found sediment samples that had the matching ratios, and then claimed that these supported their hypothesis. This sort of backward reasoning from conclusions to data is circular logic, not science. It violates basic principles of scientific integrity.

Not surprisingly, other scientists with similar expertise have been unable to reproduce the same diagnostic double ratio plots presented in the USGS scientists' article:

> In conclusion, we were unable to replicate the computations and identify values from cited sources for a number of the data points represented in Figures 4–6 of Mahler et al. (2005). With regard to the PAH ratio analysis, we could not identify the source of the values presented for stream sediment samples, and the values that we could identify from the City of Austin appear to contradict the interpretation developed by the authors. With regard to the mass balance analysis, we could not identify the source for values from one watershed, the values presented for the other watersheds do not appear to match those from the cited sources, and the previously published values suggest the relative contribution of PAHs from parking lot sources is substantially less than the "majority" source suggested by the authors. Because these uncertainties relate to the two lines of argument indicated to support a conclusion that parking lot sealcoat could be a dominant source of PAHs in urban streams, clarification is important for understanding the strength of the conclusions of this paper.[74]

Scientists who have collected actual stream sediment samples from areas near where Mahler et al.'s simulated runoff samples were collected have found that their PAH ratios did not match. For example, Figure 5 below is drawn using the data from DeMott et al. 2010:[75]

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[74] DeMott RP, Gauthier TD. 2006. Comment on "Parking Lot Sealcoat: An Unrecognized Source of Urban Polycyclic Aromatic Hydrocarbons." Environ. Sci. Technol. 40(11):3657–3658. *See generally* O'Reilly 2020 (Appendix E) at 3-5.

[75] DeMott, R.P. et al. (2010). PAHs in Austin Sediments after a Ban on Pavement Sealers. *Environmental Forensics*, 11:4, 372-382. https://doi.org/10.1080/15275922.2010.526520

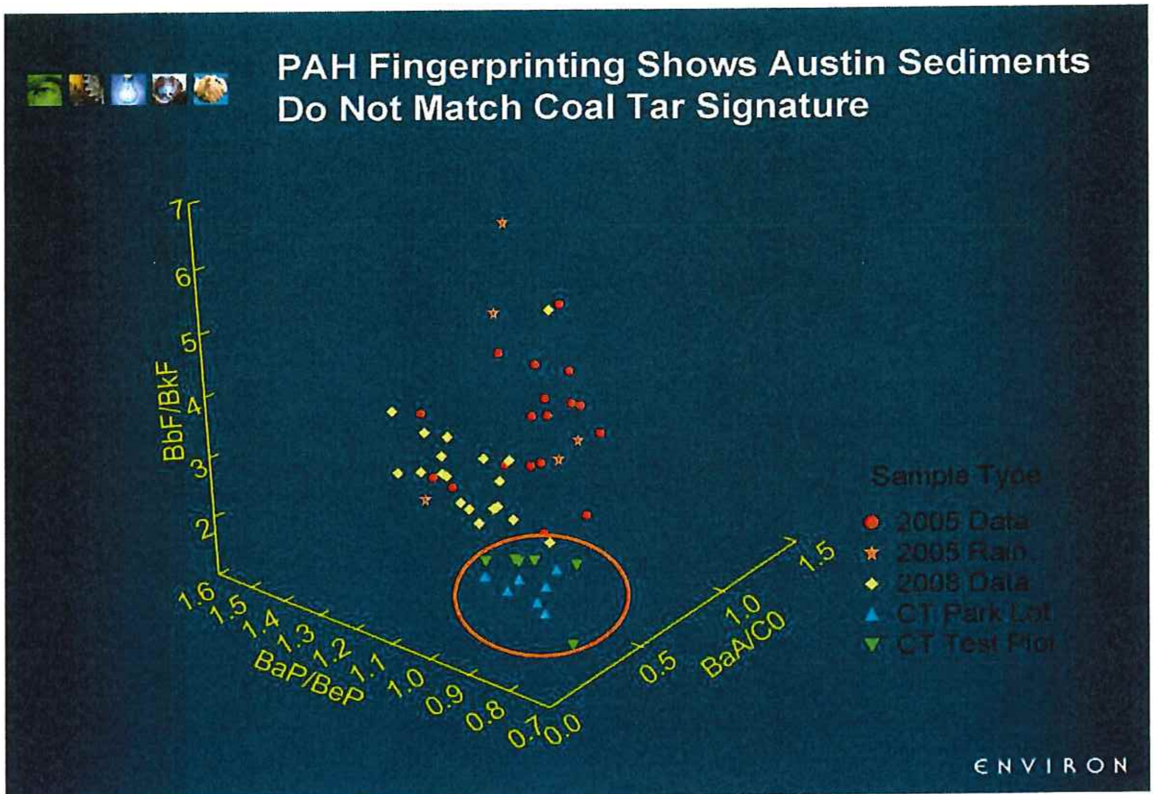

Figure 5. PAH fingerprinting shows Austin sediments do not match coal tar signature. CT Park Lot and CT Test Plot data from Mahler et al. 2005. All other data from DeMott et al. 2010.

Scoggins et al. (2007) attempted to relate PAH concentrations in Austin stream sediments to RTS-coated parking lots following the method of Mahler *et al.* (2005),[76] using PAH diagnostic ratio comparisons and also using spatial relationships. They were unsuccessful, in part due to another intrinsic feature of PAHs that undermines the sort of forensics that Mahler *et al.* attempted: PAH ratios in environmental media are as much a function of weathering[77] as they are of source,

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[76] Mahler, B. J. et al. (2005). Parking Lot Sealcoat: An Unrecognized Source of Urban Polycyclic Aromatic Hydrocarbons. *Environmental Science & Technology, 39*(15), 5560 - 5566. https://doi.org/10.1021/es0501565

[77] Photolysis—transformation by sunlight—is a particularly important weathering process for PAHs. PAHs with four or more rings, such as benzo(a)pyrene, are generally expected to be resistant to biodegradation (Valerio et al., 1990. Intern J Environ Chem 38: 343-9). However, benzo(a)pyrene is susceptible to direct photolysis on soil surfaces exposed to sunlight, with a measured half-life of 0.48 hours in water following exposure to mid-summer sunlight. Half-lives of benzo(a)pyrene adsorbed onto clean glass-fiber filters and two dust loaded filters (0.23 and 0.69 mg/sq cm) and exposed to a UV lamp were 37, 199, and 428 minutes, respectively (Picel et al., 1985 Polynucl Aromat Hydrocarbons. Cooke, Dennis, eds. Battelle Press. 8: 1013-28). The photolysis half-life of benzo(a)pyrene on spruce needle surfaces exposed to full sunlight in Munich, Germany in July 2001 was 33 hours (Niu et al., 2003. Environ Pollut 123: 39-45). Dibenz(a,h)anthracene absorbs strongly at wavelengths >290 nm (Valerio et al., 1990) and is therefore expected to be susceptible to direct photolysis by sunlight. The photolysis of dibenz(a,h)anthracene sorbed to the surface of spruce needles follows first-order kinetics with a half-life of 15 hours under sunlight irradiation(Picel et al., 1985); therefore, photolysis on soil surfaces exposed to sunlight may be an important fate process (Niu et al., 2003).

and PAHs from many diverse sources tend to have increasingly similar diagnostic ratios as they age. The Scroggins et al. report states as follows:

> We attempted to identify the sources of PAH in the sediments of our study streams using ratio methods, but we were unsuccessful and found no significant clustering of field data with known source data.... Our inability to associate PAH contamination in our study streams with coal-tar sealant might have been because we analyzed only the 16 EPA priority PAHs in field sediments or because extensive weathering and mixing with other materials occurs as the coal-tar sealant abrades and moves from parking lots to stream systems.
>
> We attempted to explain the magnitude of PAH contamination at the downstream study sites with spatial data. Neither total area of sealed parking lot nor its proximity to sampling locations were significantly correlated with PAH concentrations in the sediments at the downstream sites. A complex mix of age of sealant applied, amount of traffic on lots, local rainfall patterns, flow paths, local stream hydrology, and sediment deposition patterns probably contributes to high variability in the movement of PAHs from parking lots to stream sediments. [78]

The inability to reproduce the relationship between PAHs in sediments in Austin stream beds and in RTS was also reported by Environ (2006).[79]

(2) Rowe & O'Conner 2011

In the Rowe and O'Conner study, EPA scientists conducted a study of runoff from paved surfaces (with no traffic) sealed with RTS and asphalt-based sealant (ABS), with an unsealed lot as a control.[80] Runoff from simulated rain was collected over 30 days after sealcoat application and again after six months. The results, depicted in Figure 6 below, show that the samples collected within the first week after application contained the highest—albeit declining—concentrations of Total PAHs. By the 30th day of the study, concentrations in runoff appear to have reached a steady state, with approximately the same concentrations for each surface on day 160 as day 30. Total PAH concentrations were highest for the RTS-coated surface, but the highest Total PAH concentration for that surface was less than 500 μg/L (about 0.5 ppm), and the highest concentration for benzo(a)pyrene was 2.08 μg/L (~2.1 ppb), rapidly dropping to less than 0.1 μg/L, which is less than the drinking water standard for benzo(a)pyrene (0.2 μg/L, or 0.2 ppb). The

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[78] Scoggins et al. 2007. Occurrence of polycyclic aromatic hydrocarbons below coal-tar-sealed parking lots and effects on stream benthic macroinvertebrate communities. J North Amer Benthol Soc 26:694–707. Scoggins et al. go on to imply that the failure to reproduce the Mahler et al. finding was probably just a matter of not having the correct data. The possibility that RTS was not the primary source of PAHs in Austin-area streams was not considered as an explanation of the data.

[79] Environ (2006). Polycyclic Aromatic Hydrocarbon (PAH) Characteristics for Sediments Collected from Creeks and Streams in Austin, Texas. Report prepared for the Pavement Coatings Technology Center. 63 p. Available at https://www.scribd.com/document/343808345/Polycyclic-Aromatic-Hydrocarbon-PAH-Characteristics-for-Sediments-Collected-from-Creeks-and-Streams-in-Austin-Texas

[80] Rowe, AA and O'Connor, TP 2011. Assessment of Water Quality of Runoff from Sealed Asphalt Surfaces. EPA/600/R-10/178

finding—that initial flushing with water of a surface recently coated with a coal tar-based product is rapidly followed by stabilization at concentrations that meet drinking water standards—is consistent with the findings in drinking water pipes lined with coal tar enamel in The Netherlands.[81]

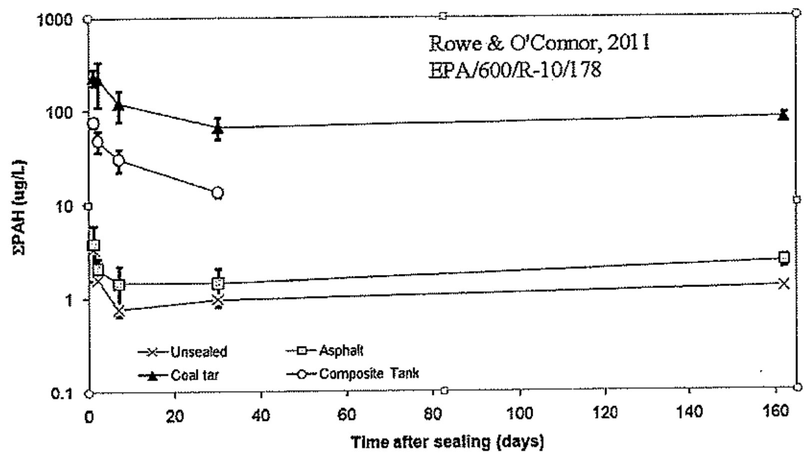

Figure 14. The sum of the polycyclic aromatic hydrocarbon concentrations (ΣPAH) in runoff for the five sampling events of full-scale study (ΣPAH =17).

Figure 6. The sum of PAH (□PAH) in runoff for the five sampling events of full-scale study (□PAH=17)

Several other findings from Rowe & O'Conner 2011 are relevant for assessing environmental impacts of RTS. First, the study report indicates that its results reflect only chemical analyses of "dissolved" load in samples of runoff.[82] Second, in the 2020 Proposed MSGP Fact Sheet, EPA requested comment on the correlation between PAHs and chemical oxygen demand (COD; Request for Comment 20). Values for COD and another water quality parameter, total organic carbon (TOC), are described in Rowe & O'Conner 2011 as typical of values found in urban runoff. Comparing the bar chart in Figure 7 below with the total PAH graphs in Figure 6 above, it is evident that, in this study, PAH concentrations attributable to RTS did not correlate with COD. Additionally, RTS is not associated with elevated levels of either COD or TOC.

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[81] Blokker, E. J. M., et al. (2013). Health Implications of PAH Release from Coated Cast Iron Drinking Water Distribution Systems in the Netherlands. *Environmental Health Perspectives*, 30. doi:http://dx.doi.org/10.1289/ehp.1205220

[82] The focus on PAHs in samples of runoff that had been filtered to remove most suspended solids can be inferred from the statement on p. 29 that "[t]his study indicates that there is increased risk in the period immediately after sealant curing when the PAHs may not be associated with sediments."

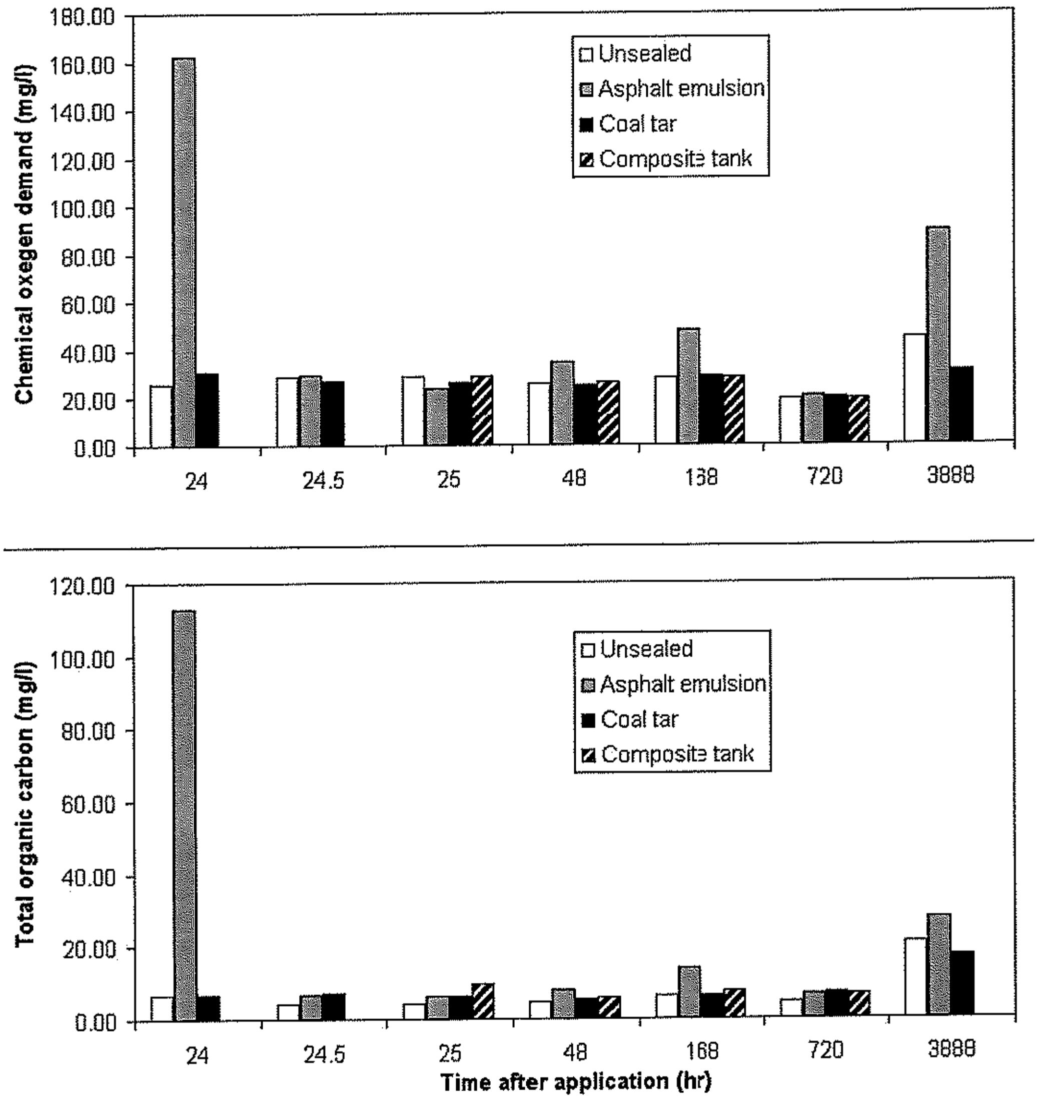

Figure 18. Total organic carbon and chemical oxygen demand concentrations in runoff for full-scale study.

Figure 7. Total organic carbon and chemical oxygen demand concentration in runoff for full-scale study.

(3) McIntyre et al. 2016

The Fact Sheet acknowledges that "research studying the particular effects of coal-tar sealcoat in runoff in controlled laboratory tests may overestimate potential adverse effects in the field (Driscoll et al, 2019)."[83] Indeed, the crucial shortcoming of Rowe & O'Conner 2011 is its apparent focus on the possible impacts of sealcoating on unnaturally isolated clean water. The study by McIntyre et al.[84] was expressly designed to study the toxicity of runoff from RTS-coated surfaces before and after the runoff encounters a mix of soil-organic matter materials—as occurs

[83] Fact Sheet at 23–24.

[84] McIntyre et al. 2016. Soil bioretention protects juvenile salmon and their prey from the toxic impacts of urban stormwater runoff. Chemosphere 132:213–219.

in the real world. The study used an engineered soil mix—called a "bioretention system"—that mimics organic-rich natural soils.

For the McIntyre et al. study, whole runoff samples (that is, waterincluding suspended particulates) were collected. The terms "unfiltered" and "filtered" refer, respectively, to samples that were or were not routed through columns containing the bioretention mix. To illustrate, in the photograph (Figure 8) below,[85] the bottle containing clearer water has not been passed through the bioretention system and is, in the language of the study, "unfiltered," whereas the bottle containing brown water has passed through the soil mix and is, therefore, called "filtered."

Figure 8. Samples of "unfiltered" (clearer liquid) runoff and runoff "filtered" (brownish liquid) through a sand-organic matter bioretention system. Photo from a presentation by J. McIntyre. Used with permission.

Similar to the EPA runoff study, the McIntyre et al. study reported that total PAH concentrations in the runoff decreased over four sampling events, conducted about two hours after the sealcoat was applied and 7, 13, and 207 days after application (see Figure 9 below). The maximum total PAH concentration[86] was about 1,300 µg/L (about 1.3 ppm) in unfiltered runoff on Day 0, declining to a plateau at about 100 µg/L (about 0.1 ppm) on days 7, 13, and 207. After

[85] Figures 8 and 9 are from a presentation by J. McIntyre and are used with her permission.
[86] The total concentration of 19 PAHs plus 6 alkyl-PAHs.

filtration in organic-rich simulated soil, however, PAH concentrations were less than 10 μg/L (0.01 ppm) in all samples.

McIntyre et al.'s finding that PAHs in runoff are reduced by virtually 100% upon contact with an organic-rich soil matrix (the study mix was about 60% sand and 40% organic material) is consistent with the strong partitioning of PAHs to the solid phase and virtual insolubility (discussed in Section II.A of this Appendix) that EPA recognized in its guidance on developing ESBs.

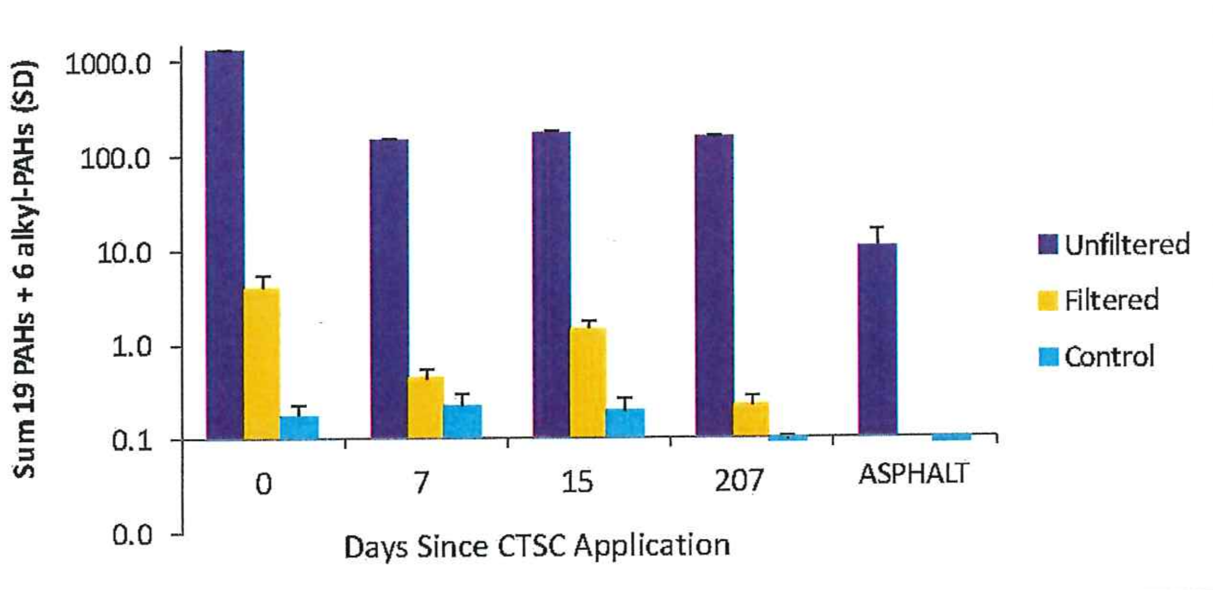

Figure 9. Sum of measureds PAH concentrations in unfiltered, filtered (through a simulated soil bioretention system), and control runoff.

In addition to demobilizing the PAHs, filtration through the sand-organic material soil mixture reduced the toxicity of the runoff by over 90%. Toxicity reduction in the real environment comports with EPA's guidance that the causes of sediment toxicity should be identified using TIE methods, and supports the conclusion that toxicity testing of runoff should reflect conditions representative of the real world.[87]

b) Sediment PAH concentrations have not declined as a result of RTS bans by local and state governments.

(1) Austin, Texas

Austin was the first community to ban RTS, effective January 1, 2006. As noted in the Fact Sheet, a study that compared sediment PAH concentrations in Austin waterways before and

[87] Kane Driscoll et al. 2020 (Appendix D to these comments).

after the ban on the use of RTS went into effect found no significant difference.[88] In a 2014 paper, Mahler et al. 2005 reported a decline in the PAH concentrations in Lady Bird Lake in central Austin.[89] Post-publication peer reviewers have, however, questioned the history and statistical analysis onwhich that paper relied, as well as the attribution of the source of PAHs to RTS.[90,91,92]

Importantly, Mahler and Van Metre have consistently failed to note that Lady Bird Lake (formerly known as Town Lake) was constructed in the late 1950s as a source of cooling water for the Holly Street power plant, a fossil fuel-powered electrical generation plant (see Figure 10 below). After a history of fuel oil spills and fires, the City of Austin closed the plant in 2007, the year after the RTS ban went into effect. Possible impacts on PAHs concentrations in lake sediments from elimination of fuel oil spills and fires have never been studied, but they present a much more likely explanation for any decrease of PAH concentrations between 2006 and 2014.

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88 DeMott et al. 2010. The sampling events occurred in October 2005 and April 2008.

89 Van Metre, P. and Mahler, B. 2014. PAH concentrations in lake sediment decline following ban on coal tar-based pavement sealants in Austin, Texas. Environ. Sci Technol., 48, pp. 7222-7228.

90 DeMott, R.P.; Gauthier,T.D. (2014) Comment on "PAH Concentrations in Lake Sediment Decline Following Ban on Coal-Tar-Based Pavement Sealants in Austin, Texas." *Environ. Sci. Technol. 48* (23), pp 14061–14062 http://dx.doi.org/10.1021/es5046088.

91 O'Reilly, K. (2014) Comment on Van Metre and Mahler 2014: "PAH Concentrations in Lake Sediment Decline Following Ban on Coal-Tar-Based Pavement Sealants in Austin, Texas." Available at https://www.scribd.com/document/343814884/O-Reilly-K-2014-Comment-on-Van-Metre-and-Mahler-2014-PAH-Concentrations-in-Lake-Sediment-Decline-Following-Ban-on-Coal-Tar-Based-Pavement-Seala .

92 LeHuray, AP 2016. PPPR of Van Metre and Mahler (2014). https://pubpeer.com/publications/DEC6835FF61E589EB95C8597944A7F

Source: Austin Chronicle.

Figure 10. Aerial photograph of the Holly Street power plant adjacent to the plant's cooling pond, called Lady Bird Lake (formerly known as Town Lake). City of Austin, Texas.

The City of Austin issued an analysis of PAH concentrations in its monitoring data in 2012.[93] DeMott and Gauthier summarized this analysis as follows:

> Researchers from the City of Austin (COA) found no significant difference in ΣPAH16 concentrations in stream sediments collected from 50 of Austin's largest watersheds when grouped by sample date with date ranges of 1996–1999, 2000–2002, 2003–2005, 2006–2008, and 2009–2010. Only when 3-ringed and 4-ringed PAHs were considered separately, were significant decreases reported from the 1996–1999 time frame to more recent time intervals. Thus, any apparent decrease was found to have started years before the ban and there has been no significant change in PAH levels since the ban.[94]

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[93] Richter, A. Monitoring Polycyclic Aromatic Hydrocarbon Concentrations in Austin, TX, After the Coal Tar Sealant Ban; City of Austin, Watershed Protection Department, Environmental Resource Management Division. SR-12–06. March, 2012.

[94] DeMott and Gauthier, 2014. ES&T 48:14061-14062. http://dx.doi.org/10.1021/es5046088

(2) District of Columbia

Following Austin's lead, the District of Columbia banned the use of RTS effective July 1, 2009. A study conducted afterward found no difference in sediment PAH concentrations at the sampling locations between 2000 and 2015.[95]

c) The scientific consensus is that the great majority of PAHs in the environment come from atmospheric deposition from combustion sources.

Characterizing sources of PAHs in the environment has been an active field of research for many years.[96] There is widespread consensus that, as noted in Appendix E, "combustion processes are responsible for the vast majority of the PAHs that enter the environment."[97]

Efforts to evaluate the contributions of PAH sources—including earlier work by Mahler and Van Metre—have consistently identified atmospheric deposition as a significant source to stormwater, soils, paved areas, and sediments in most urban environments.[98] Specifically, the higher molecular-weight PAHs typical of combustion-derived particulate matter—consistent with motor exhaust, coal combustion products, or wood smoke—have been found to dominate PAH profiles in sediments that are impacted by "urban background" sources.[99] A 2007 EPA review concluded: "Atmospheric deposition of pollutants, including PAHs, is recognized as a significant contributor in many locations to water quality problems. PAH are organic compounds primarily formed from the incomplete combustion of organic materials, such as coal and wood."[100]

A number of studies have demonstrated a link between atmospheric emission sources and PAHs in urban environments. Evaluations of PAH chemistry in sediments from lakes, creeks, and reservoirs from across the United States report temporal links between changes in PAH concentrations and increased automobile use and vehicle emissions.[101] In the upper Midwest, the mass and chemistry of PAHs in lake sediment could be linked to specific atmospheric sources associated with activities such as steel production and motor vehicle use.[102] Automotive emissions have been shown to be a major source of particulate PAHs in aquatic systems in the Los Angeles basin and San Francisco Bay area.[103] The dominance of coal-fired power plants in the eastern

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[95] Pinkney, A. E. et al. (2019). Trends in Liver and Skin Tumor Prevalence in Brown Bullhead (*Ameiurus nebulosus*) from the Anacostia River, Washington, DC, and Nearby Waters. *Toxicologic Pathology, 47*(2), 174-189. doi:10.1177/0192623318823150.

[96] Blumer and Youngblood 1975; Youngblood and Blumer 1975.

[97] *See also* O'Reilly 2020 (Appendix E) at 1-2.

[98] Hwang and Foster 2006; Li et al. 2003; Mastral and Callén 2000; Simcik et al. 1999; Stein et al. 2006; Su et al. 2000; Van Metre et al. 2000; U.S. EPA 2007; Yunker et al. 2002.

[99] Stout et al. 2004.

[100] U.S. EPA 2007.

[101] Simcik et al. 1999; Stein et al. 2006; Su et al. 2000; Van Metre et al. 2000.

[102] Su et al. 2000; Simcik et al. 1999.

[103] Stein et al. 2006; Tsai et al. 2002.

United States and gas-fired power plants in the west is a potential explanation for the regional differences in sediment PAH concentrations.[104]

Two studies found combustion sources to be major contributors of PAHs in urban watersheds. An investigation led by the New York Academy of Sciences (NYAS) found that air-based emissions accounted for about 98% of the PAHs released to the environment in the New York–New Jersey Harbor watershed, with residential wood smoke being the source of about 35% of PAHs in harbor sediments. Only about 1.5% of PAHs were released directly to the land, with the remaining releases linked to water-based sources.[105] PCTC/COETF believe that the PAH emissions estimates and usage assumptions used for some of the sources, including those used for RTS, significantly overestimate the extent of RTS use in the New York–New Jersey harbor drainage area. Even with likely overestimation, however, NYAS concluded that PAHs from RTS contributed less than 1% of the total PAHs in harbor sediments.

Washington State's Department of Ecology (WDOE) conducted a similar study of the sources of PAHs in Puget Sound sediments. The methods used were similar to the New York–New Jersey harbor study. As with NYAS, WDOE found about one third of sediment PAHs were the result of wood smoke, and less than 1% were attributed to RTS.[106]

d) It is difficult to distinguish the PAH "signature" of RTS from other combustion sources of PAHs in the environment.

Among scientists whose research is focused on source apportionment, it is generally recognized that it is difficult to distinguish PAHs from widely diverse combustion sources (that is, pyrogenic PAHs), because PAH chemical profiles from those sources are so similar. Zou et al. describe the issue this way:

> Different PAH sources may exhibit relatively stable and exclusive PAH fingerprints. This is the basis of fingerprints-based PAH source identification. For example, combustion emissions have significantly higher fractions of 4-ring and above PAHs. In contrast, petroleum products (gasoline and diesel) have very high fraction of Nap, minor fractions of 3-ring PAHs, but very low fractions of other PAHs. . . . It seems reasonable to distinguish PAH sources by these differences. However, the picture is getting fuzzier when taking into account a big variety of PAH sources. For example, the PAH fingerprints from low rank coals (lignite A), some of the wood combustion, coal combustion soot (residential), coal-tar, and

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[104] Mahler et al. 2009.

[105] Valle, S., Panero, M. A., and Shor, L. 2007. Pollution Prevention and Management Strategies for Polycyclic Aromatic Hydrocarbons in the New York/New Jersey Harbor. NYAS. 170p.s.

[106] WDOE 2011. Control of Toxic Chemicals in Puget Sound: Assessment of Selected Toxic Chemicals in the Puget Sound Basin, 2007-2011. Ecology Publication No. 11-03055.

some of the tunnel air particles are highly similar to each other. . . . The similarities between multiple PAH sources make the differentiation difficult.[107]

Indeed, one of the flaws in the line of research conducted by Mahler and Van Metre is that they regularly attribute to RTS all environmental PAHs exhibiting the widespread signature of pyrogenic PAHs—particularly weathered pyrogenic PAHs—resulting in the mistaken conclusion that RTS is the source material for a substantial fraction of the pyrogenic PAHs in the environment.[108]

Zou et al. subjected PAHs in sediment collected from the Peoria Pool of the Illinois River to a Baysian chemical mass balance (CMB) analysis, involving PAH chemical signatures ("fingerprints") from 138 different possible sources of PAHs. Their results indicated that PAHs from RTS contributed no more than a few percent of the total.[109]

e) Modeling efforts to apportion PAHs among sources are unreliable, as they rely on a PAH "signature" for RTS that was not generated for that purpose and has never been validated.

The difficulty in distinguishing between sources of PAHs based on their chemical signatures or fingerprints is complicated by the fact that many publications on the topic have relied on a "signature" for RTS that was never intended for this purpose and has never been validated. The Fact Sheet frankly acknowledges this problem:

> [T]here has been some acknowledgement that the variability of PAH concentrations in different sources is a challenge for all source apportionment models because these models assume PAH source compositions are relatively constant, even though source composition can change between the source and where the concentration measurement is taken (the receptor) (Norris and Henry, 2019). A recent letter to the editor has raised questions on the validity of the source profiles used in some source apportionment studies (O'Reilly and Edwards, 2019). A recent paper noted the challenges with PAH source apportionment to coal-tar sealcoat given the variety of PAH sources in the environment (Zou, Wang, and Christensen, 2015).

As discussed in detail in Appendix E to these comments,[110] receptor models are mathematical procedures for resolving one or more of the following parameters in a mixed chemical system: 1) the number of sources, 2) their chemical characteristics, and 3) the relative contribution of each source in environmental samples. As with use of any mathematical model, understanding the assumptions that underlie the model is critical to interpreting the model results. Key assumptions of least squares-based receptor models, such asEPA's CMB model which was configured by Van Metre and Mahler, are that:

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[107] Zou, Y. et al. 2015. Problems in the fingerprints based polycyclic aromatic hydrocarbons source apportionment analysis and a practical solution. *Environmental Pollution, 205*, 394-402.: http://dx.doi.org/10.1016/j.envpol.2015.05.029

[108] *See* O'Reilly 2020 (Appendix E) at 5-6.

[109] Zou et al. 2015

[110] See O'Reilly 2020 (Appendix E) at 5.

1. All potential sources have been identified;
2. Source profiles are known and stable;
3. The number of sources is less than the number of fitting species;
4. Source profiles are linearly independent of each other; and
5. Measurement uncertainties are random, uncorrelated, and normally distributed.

As stated in the CMB guidance manual,[111] these assumptions are fairly restrictive. While some deviations can be tolerated, they do raise some critical issues that should be considered in interpreting the results. There is an inherent conflict between the first assumption, which seeks to broaden the number of individual source types considered, and the third, which highlights the models' inability to accurately allocate among similar source profiles. Including all important sources is critical, as the model can assign the contribution of missing sources to others used as inputs. The issue of collinearity of compound concentrations raised in the fourth assumption can be a particular challenge with pyrogenic PAHs, because different sources can have generally similar profiles.[112]

The ubiquitous nature of PAHs and the wide range of historical and ongoing combustion sources make it impossible to include all individual sources. As a result, source types are often grouped,[113] although grouping requires selection of a chemical profile that adequately represents the group.[114] PAH profiles are not unique, due to both intersource similarities and intrasource variability. Even at the point of emission or release, PAH chemistry varies with fuel type, oxygen levels, and combustion temperature. Furthermore, seasonal variations in emissions and atmospheric processes challenge the assumption of stability for atmospheric sources.[115] Because both particle-specific PAH ratios and deposition rates differ by particle size, as well as because of photolytic reactions, atmospheric PAH profiles of an individual source shift with distance from an emission source.

Most of the source profiles used by Van Metre and Mahler (2010) and others (Baldwin et al. 2017; Norris and Henry 2019) were initially published in Li et al. (2003) and have not been validated as accurately representing the sources claimed.[116] The purpose of Li's paper was to demonstrate how a receptor model could be applied at a specific site, not to generate profiles that should or could be generally applicable in all locations. Li used an untested multistep approach to combine multiple published data types in an attempt to construct PAH source profiles. Much of the underlying data were not originally published in a way that provided accurate information on PAH profiles. Because the published studies reported analyses of different combinations of PAHs, the data sources for each profile varied between profile and PAHs. Such an approach loses information on the relative concentrations among PAHs that is a critical component of forensic analysis. The median coefficient of variation (standard deviation/mean) of individual PAHs in

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[111] US EPA 2004. CMB 8.2 users' manual. EPA-452/R-04-011.
[112] O'Reilly et al. 2012.
[113] E.g., Li et al. 2003.
[114] Galarneau 2008.
[115] Khairy and Lohmann 2013.
[116] O'Reilly et al. 2014, 2015, 2020.

Li's profiles is about 80%, suggesting that the final profiles may not represent any actual source. An Environment and Climate Change Canada researcher questioned the use of such source profiles without sufficient validation.[117] As noted by Li,

> [A] definitive signature of a combustion process may not exist due to the complexity of the combustion process. Emissions of PAHs depend on numerous factors which may vary significantly even during a single combustion process. In addition, sampling methods differ, introducing additional differences among published source signatures.

Receptor models assume that source concentration profiles are stable and do not change over time. This is not true with PAHs. "Weathering" is a term used to describe a change in a chemical mixture due to its exposure to the environment. Volatilization, photoreactivity, and biological degradation cause PAHs to change concentrations at different rates, resulting in shifts in the chemical profile.[118] Li's source profiles were generated from the analysis of unweathered samples collected at the point of emission, while the parking-lot dust samples Van Metre and Mahler (2010) used to represent sealer source profiles had been exposed to weathering in the environment for an unknown amount of time. As described in O'Reilly et al. (2012), the use of weathered sealer samples and unweathered emission-source samples as CMB inputs may have skewed the output toward a higher estimated sealer contribution. If the sealer-receptor model input is replaced with the PAH profile of a fresh sealer sample, its source contribution drops to a few percent.[119]

The PAH profile used by Van Metre and Mahler to represent sealer is not unique to weathered sealer and may instead merely represent urban background.[120] The profiles identified as "sealcoat" are also essentially indistinguishable from urban soil, road runoff, or roof dust.[121] Van Metre and Mahler (2003) presented data for seven PAHs from 22 samples collected from an Austin, Texas stream, rooftop runoff, and roadside dust. The median correlation between profiles was r=0.99 and the lowest was r=0.91. Correlations between the nine roof-dust samples and the coal-tar sealcoat profiles used by Van Metre and Mahler (2003) and Norris and Henry (2019) ranged from r=0.93 to 0.99. These findings suggest that a receptor model could not distinguish between the contributions of these sources.[122]

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[117] Galarneau, E. (2008). Source specificity and atmospheric processing of airborne PAHs: Implications for source apportionment. *Atmospheric Environment, 42*(35), 8139-8149.
[118] *See* O'Reilly 2020 (Appendix E) at 7.
[119] O'Reilly et al. 2014; Zou et al. 2015.
[120] O'Reilly 2020 at 7-8.
[121] Kay 2003; Selbig 2009; Van Metre and Mahler 2003.
[122] The Fact Sheet states that "[t]he Norris and Henry (2019) study alone was not integral to EPA's inclusion of the eligibility requirement on the use of coal-tar sealcoat." Id. at 23. The final MSGP should eliminate any references to the paper, which is an example of regulatory and scientific "hide the ball." The two coauthors were an EPA scientist (Norris) and a professor (Henry). According to a June 10, 2019 email from Rebecca Clausen, EPA, to Anne LeHuray, PCTC, while the two authors have "been collaborating . . . for the past 20 years," the crucial, EPA-funded "Unmix Optimum" model underlying their paper resides with Dr. Henry. As a result, "[t]here is . . . no associated documentation about the format of model input and output that EPA has, or could provide[, and a]ppropriated funds would be required for EPA to contract

B. Coal Tar Sealcoat Is Not a Significant Source of Aquatic or Human Toxicity.

The Fact Sheet states that "[m]any PAHs can have impacts on humans and the environment. Several PAHs have been shown to be extremely toxic to and bioaccumulate in fish and aquatic invertebrates, and are known or probable human carcinogens."[123] In fact, as explained below, PAHs in the natural environment are not particularly toxic to either aquatic life or humans, and no field study has shown otherwise. Thus, the proposed eligibility criterion would not reduce risks to either.

1. The studies cited in the Fact Sheet do not rely on EPA's own guidance for assessing the aquatic toxicity of PAHs.

a) The physical/chemical properties of PAHs require specialized approaches developed by EPA.

As explained in Sections II.A. of this Appendix, PAHs in the environment partition strongly to the solid phase, becoming tightly bound to organic materials in complex mixtures. Because of these physical/chemical properties, PAH-containing solids are not very bioavailable or bioaccessible. As a result, sediment PAH concentrations have not been found to correlate with observed toxicity. In recognition of these facts, EPA developed both its ESB and TIE guidance documents so that evaluation of risks for exposures to PAHs in the aquatic environment would more closely reflect their actual toxicity.

EPA's 2003 ESB guidance recommended a procedure using measurements of sediment concentrations of PAHs and Total Organic Carbon (TOC). EPA's subsequent (2012) ESB guidance referred to this as the "one-carbon model." The one-carbon model assumes a simple binary partitioning factor between aqueous and solid phases, with the effective (i.e., bioavailable) concentration of PAHs being represented by the concentrations estimated to be present in potential pore water (i.e., the water immediately surrounding the solid particles where the balance of the PAHs would be bound). The guidance calculates these pore water concentrations using solid-aqueous phase partition coefficients and the organic carbon content of the sediment. Using TOC and PAH concentration data, along with appropriate partitioning factors, the method results in an estimate of freely dissolved—and, presumably, bioavailable—PAH concentrations that can be used to develop an "Interstitial Water Toxic Unit" (IWTU) for the sediment sample.

However, even the one-carbon model has been found to routinely overestimate potential risk. This is because use of TOC concentrations alone results in overestimated pore water PAH concentrations that, in turn, result in overestimated IWTUs. More accurate predictions of freely dissolved PAH concentrations have been found to result from calculations that include additional

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with Dr. Henry to develop a version of the code that could be distributed for peer review." This is not consistent with EPA's Information Quality Guidelines, which state: "It is important that analytic results for influential information have a higher degree of transparency regarding (1) the source of the data used, (2) the various assumptions employed, [and] (3) the analytic methods applied . . . ." EPA, Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency, EPA/260R-02-008 (Oct. 2002), § 6.3, pp. 20-21.

[123] Fact Sheet at 21.

partitioning to the solid phase related to the presence of other adsorptive materials in the sediment, particularly black carbon and weathered coal tar pitch particles.[124] EPA's 2012 ESB guidance calls this the "two-carbon model." A study of real-world sediments at a former manufactured gas plant (MGP) that calculated concentrations and IWTU values using both the one- and two-carbon methods found, as follows:

> Although both the one-phase and two-phase models accurately predicted concentrations of PAHs that were not toxic to aquatic invertebrates, the two-phase model was more often in agreement with results of sediment toxicity tests. While the bioavailability and toxicity of PAHs may vary at other sites, the two-phase model correctly predicted that sediments from these sites with concentrations of total PAHs as high as 52 mg/kg were not toxic to invertebrates.[125]

b) Properly-conducted field studies of PAHs have not found toxicity.

Consistent with the foregoing, field studies of PAHs in aqueous environments that employ EPA's recent guidance have not observed them to be toxic; indeed, no field study has found otherwise.[126]

The Southern California Coastal Water Research Center (SCCWRC) has conducted studies using TIE and passive sampler (IWTU) methods to identify chemicals in sediments associated with measured toxicity. A study of parking-lot runoff found that every runoff tested had toxic effects, and that chemicals in the dissolved phase were the likely principal cause of toxicity; PAHs were not present in the dissolved phase at concentrations associated with toxicity.[127]

An SCCWRC study of sediments in a California estuary used TIE methods to identify causes of toxicity related to whole sediment and pore water concentrations of a variety of compounds. Toxicity was found to be widespread but highly variable. PAHs were identified in pore waters at concentrations that were thought to be unlikely contributors to the observed toxicity.[128]

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[124] Khalil, M. F., et al. (2006). Role of Weathered Coal Tar Pitch in the Partitioning of Polycyclic Aromatic Hydrocarbons in Manufactured Gas Plant Site Sediments. *Environmental Science & Technology, 40*(18), 5681-5687. doi:10.1021/es0607032.

[125] Kane Driscoll, S. B. et al. (2009). Predicting Sediment Toxicity at Former Manufactured Gas Plants Using Equilibrium Partitioning Benchmarks for PAH Mixtures. *Soil and Sediment Contamination: An International Journal, 18*(3), 307-319. doi:10.1080/15320380902799508.

[126] *See* Kane Driscoll 2020 (Appendix D) at 1.

[127] Greenstein, D. et al. (2004). Toxicity of Parking Lot Runoff After Application of Simulated Rainfall. *Archives of Environmental Contamination and Toxicology, 47*(2), 199-206. doi:10.1007/s00244-004-3018-0.

[128] Greenstein, D. J et al., (2013). The use of sediment toxicity identification evaluation methods to evaluate clean up targets in an urban estuary. *Integrated Environmental Assessment and Management*, doi:10.1002/ieam.1512

For example, Figure 11 below is from a study of sediments at four manufactured gas plant (MGP) sites. The study found that some sediment samples were toxic to the common test species *H. Azteca*, but that the toxicity did not correlate with sediment PAH concentration.[129]

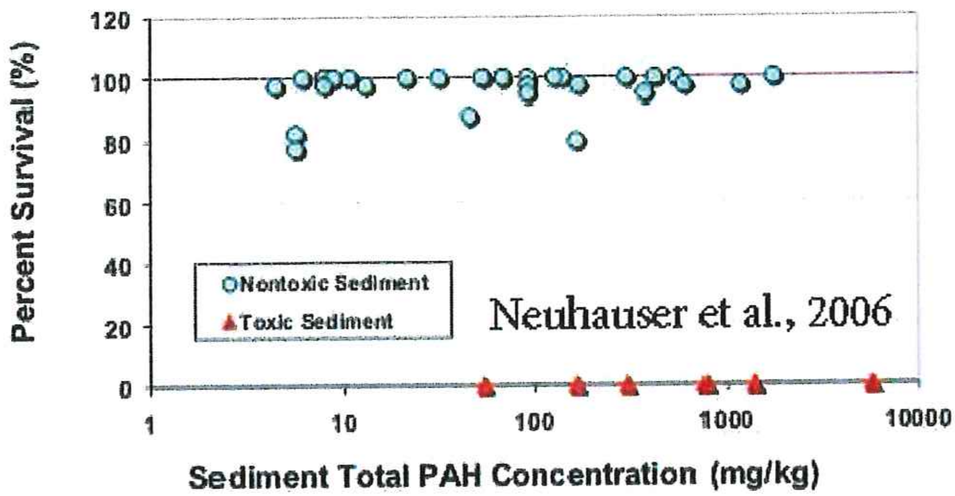

FIGURE 1. CHRONIC TOXICITY TO *H. AZTECA* (28-DAY) CANNOT BE PREDICTED FROM TOTAL PAH CONCENTRATION IN MGP SEDIMENT

Figure 11. Chronic toxicity to *H. Azteca* (28-day) cannot be predicted from total PAH concentration in MGP sediment.

The U.S. Department of Defense Environmental Security Technology Certification Program (ESTCP) funded a demonstration project to determine whether pore-water PAH concentrations in sediments more accurately reflected observed toxicity than whole-sediment concentrations, and whether EPA's EqP guidance regarding ecological risk might be applied at DoD facilities.[130] Similar to findings in sediments at MGP sites and at a variety of locations studied by the Sediment Contaminant Bioavailability Alliance (SCBA), no correlation was observed between PAH concentrations in sediments collected from the Anacostia River near the Navy Yard and toxicity. Figure 12 below illustrates the Anacostia River data, along with SCBA results from many different locations.

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[129] Neuhauser, E. et al. (2006). Bioavailability and toxicity of PAHs at MGP sites. Land Contam. Reclam. 14:261-266.

[130] Geiger, S. C. (2011). *The Determination of Sediment Polycyclic Aromatic Hydrocarbon Bioavailability Using Direct Pore Water Analysis by Solid-Phase Microextraction.* US Dept. of Defense ESTCP Report ER-200709.

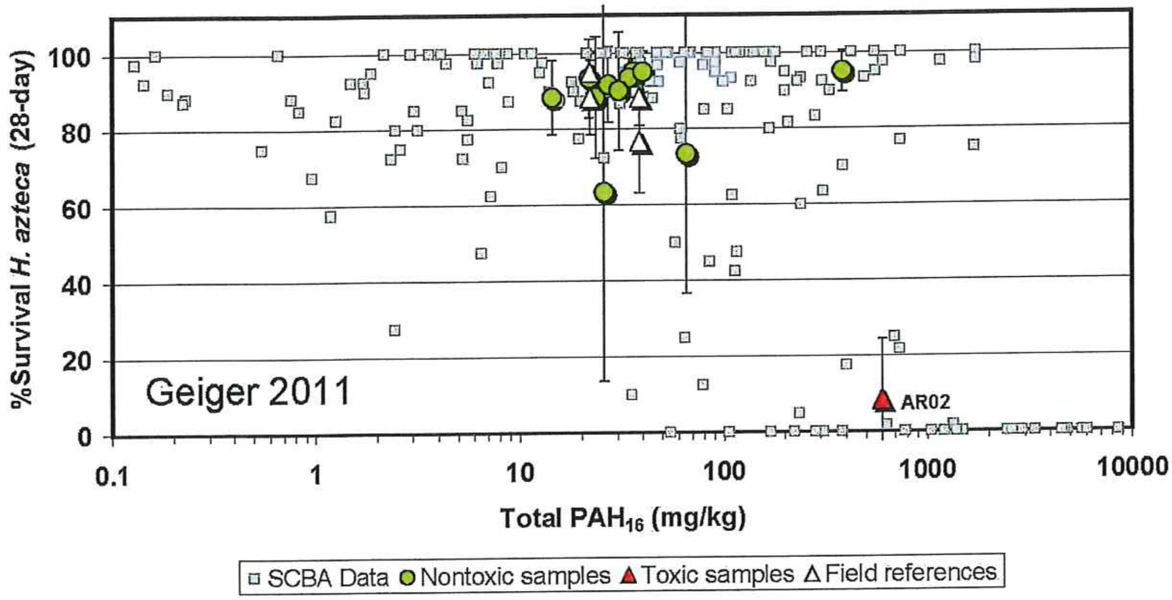

Figure 5-2. Bulk Sediment PAH_{16} Compared to *H. azteca* Survival.

Figure 12. Bulk sediment concentration of PAH_{16} compared to *H. Azteca* survival in Anacostia River (larger symbols with error bars) and SCBA sediment samples illustrating that PAH concentration is not a predictor of toxicity.

These are just a few examples of the large body of scientific research[131] demonstrating that sediment PAH concentrations are not a predictor of toxicity. Among the insights gained by this research is that, as stated in the ESTCP report of the Anacostia River demonstration project:

> [U]se of the TEL [threshold effect level] and PEL [probable effect level] screening values (1.6 and 22.8 mg/kg, respectively) would result in almost all of the PAH16 samples exceeding the screening values, and all of the PAH34 samples exceeding the screening values.[132]

Findings such as these are why EPA and others no longer recommend using TEL and PEL values as generic PAH screening concentrations, instead relying on values generated by EPA's more sophisticated ESB and TIE guidance documents. For this reason, application of EPA's ESB and TIE guidance to regulation of sediment PAHs is not only a more scientifically defensible approach, but also a means of ensuring that EPA focuses resources on problems that actually exist.

c) The literature cited by the Fact Sheet relies almost exclusively on outdated approaches.

Unfortunately, with one exception, the Fact Sheet exclusively cites literature that reflects none of the scientific advances embodied in the ESB and TIE guidance—guidance which

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[131] *See also* Bryer 2010; Bommarito et al. 2010a, b. See generally Kane Driscoll 2020 (Appendix D) at 2.

[132] *See* Geiger 2011 at 48

demonstrates that the appropriate measure of PAHs in sediment is freely-dissolved concentrations suitable for calculation of IWTU. Rather, the Fact Sheet cites literature that relies on PEL values, without any citation to the bioavailability literature.[133]

The one exception is Weinstein et al. 2010,[134] which is not a primary source of information about the physico-chemical behavior or risk factors of PAHs, but a screening-level ecological and human health risk assessment. This study compared real world data (measurements of PAHs in sediments collected from 19 stormwater detention ponds in South Carolina) with already available criteria and calculated IWTUs. For the ecological screening assessment sediment, PAH concentrations were evaluated using two methods: (1) comparison of concentrations normalized to 1% TOC with TEL and PEL values, and (2) calculation of ESB values using EPA's one-carbon model (but not the two-carbon model).

Of the 19 ponds evaluated, one was located in a low-density residential area and all four were located in industrial areas containing PAH concentrations calculated to exceed the criterion of >1 IWTUs. (Interestingly, both methods gave similar results.) However, the study did not include an evaluation of the actual ecological health of the detention ponds, which prevents an assessment of whether the screening assessment was an accurate under- or overestimation of actual ecological risks.

In the peer-reviewed literature, there have been few studies that include a quantitative assessment of the health of an ecosystem combined with a study to determine how ecosystem impairment may be associated with the extent and characteristics of PAHs in sediment. Most studies of sediment PAHs compare concentrations with sediment quality thresholds, such as the TEL or PEL consensus standards, rather than with IWTU values.

Studies conducted mostly in the Chesapeake Bay, its tributaries (especially the Anacostia and Potomac Rivers), and in the Great Lakes have focused on bottom-feeding fish, particularly Brown Bullhead catfish. Bottom feeding involves oral and dermal exposure to chemicals in sediments and, conceivably, pore water. Over decades, associations between sediment PAH concentrations and liver or skin tumors in these catfish have been proposed and, at least in the case of skin tumors, invalidated.[135] In a recent update on Brown Bullheads in the Anacostia, a significant decrease in the prevalence of liver tumors was noted between 1996 and 2016. The concentrations of PAHs in sediments at the sampling locations did not change between 2000 and 2015, but PCB and DDT concentrations did decline in fish fillets between 1996 and 2013. The

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[133] *See* Fact Sheet at 21 (citing IRIS 2014; NRC 2019; Scoggins et al. 2007; U.S. Department of Health and Human Services 2014).

[134] Weinstein, J. E. et al. (2010). Screening-level ecological and human health risk assessment of polycyclic aromatic hydrocarbons in stormwater detention pond sediments of Coastal South Carolina, USA. *Journal of Hazardous Materials, 178*, 906-916,

[135] Pinkney, A. E., et al. (2011). Tumor prevalence and biomarkers of genotoxicity in brown bullhead (*Ameiurus nebulosus*) in Chesapeake Bay tributaries. *Science of the Total Environment*, 248–257. doi:10.1016/j.scitotenv.2011.09.035

authors proposed a complex interaction between PAHs, PCBs, and DDT as a potential explanation of the decline in liver tumor prevalence.[136]

Some researchers have focused instead on *in vitro* studies of cells or cellular extracts exposed to PAHs.[137] Such studies are useful in identifying modes of toxic action. However, they are less useful than studies designed to establish the concentrations of sealant runoff that *could* cause adverse effects to aquatic organisms, or that examine whether sealant runoff *has* caused adverse effects to aquatic organisms in the field.

2. The toxicity of PAHs to humans was widely overestimated until recently—a fact not recognized by the Fact Sheet.

The limited bioavailability of PAHs in the environment also complicates the process of assessing potential human health risks from PAH exposures. This complication is exacerbated by the tendency of human health risk assessments of PAHs to rely on one or both of two outdated documents: a provisional PAH guidance issued almost 30 years ago[138] and an oral slope factors for benzo(a)pyrene established by EPA's IRIS program almost 40 years ago.[139]

For example, the Fact Sheet notes that Weinstein 2010 found that four commercial ponds, one low density residential pond, and one golf course pond had sediment PAH concentrations that exceeded preliminary remediation goals (PRGs) promulgated in 2009 by EPA Region IX.[140] Even assuming that PRGs developed using the long-term exposure scenarios mandated by EPA for hazardous waste site risk assessments are an appropriate screening tool for detention pond sediments, the PRGs were developed based on the 1984 IRIS cancer slope factor for benzo(a)pyrene.[141]

However, the 1984 IRIS value for benzo(a)pyrene was superseded by a revised IRIS value finalized in 2017.[142] The 2017 value resulted in a reduction of the cancer slope factor by almost an order of magnitude. For benzo(a)pyrene,which was used by EPA as the index compound for PAHs, the slope factor was reduced from 7.3 mg/kg-day to 1 mg/kg-day. The 2017 IRIS update

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[136] Pinkney, A. E. et al. (2019).
[137] Kienzler et al. (2015); Titaley et al. (2016).
[138] U.S. EPA 1993. *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*. EPA/600/R-93/089.
[139] U.S. EPA/540/1-86/022, NTIS PB86134335 (1984).
[140] Fact Sheet at 21.
[141] Weinstein 2010.
[142] U.S. EPA (2017). Toxicological Review of Benzo(a)Pyrene. EPA/635/R-17/003Fa.

was, therefore, EPA's Agency-wide recognition that PAHs are not as significant a human health risk as had been thought in the early development of quantitative risk estimates.[143,144]

EPA engaged in a years-long effort to revise its 1993 provisional PAH risk assessment guidance,[145] which is based on the concept of relative potency factors (RPFs). In February 2010, EPA submitted a draft RPF guidance document[146] to EPA's Science Advisory Board (SAB) for review. The SAB found that the RPF approach of additive toxicity of individual PAH compounds results in highly misleading estimates of risks associated with exposures to whole PAH mixtures in the real world. In March 2011, the SAB recommended

> that EPA consider developing a whole mixtures approach for PAHs. This approach could validate the RPF approach and in the future, could replace the RPF approach. The Agency should set this as a strategic initiative, with a specific timeline and benchmarks, that lays the foundation for an underlying concerted research program.[147]

In response, in May 2011, the Administrator agreed with the SAB's recommendation.[148]

EPA's efforts to set human health benchmarks for PAHs have since shifted to the Toxic Substances Control Act (TSCA) program. In its 2014 update to the TSCA Work Plan,[149] EPA announced that:

> EPA believes this chemical [benzo(a)pyrene] and other PAHs should be assessed as a category rather than as individual chemical substances.[150]

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143 The 2017 value was derived from a comparison of the tumors induced by coal tar and benzo[a]-pyrene in a two-year bioassay. See Culp, S. et al. 1998. Carcinogenesis 19(1):117–124. The study found that forestomach tumors were induced by benzo(a)pyrene in all three groups of mice. Not only were forestomach tumors not observed in the coal tar bioassays, but the relevance of observations in the rodent forestomach to humans—who do not have forestomach organs – remains a source of uncertainty.

144 U.S. EPA makes available "generic tables" combining the most recent risk-based screening values developed by each regional EPA office. The generic tables includes PAH values updated for the 2017 IRIS assessment of benzo(a)pyrene. Adding together the residential soil screening level (1 in 1 million risk or hazard quotient = 1) for the 17 listed PAHs (including naphthalene), and assuming each compound is present at equal concentrations, yields a screening value of about 33,000 mg/kg (over 3%) total PAHs.

145 U.S. EPA 1993.

146 Development of a Relative Potency Factor (RPF) Approach for Polycyclic Aromatic Hydrocarbon (PAH) Mixtures (February 2010 Draft). EPA/635/R-08/012A.

147 Letter to U.S. EPA Administrator Lisa Jackson from U.S. EPA's SAB, March 17, 2011. EPA-SAB-11-004.

148 Letter from Lisa Jackson to EPA SAB, May 17, 2011.

149 U.S. EPA, TSCA Work Plan for Chemical Assessments: 2014 Update. Office of Pollution Prevention and Toxics, October 2014. The status of this Work Plan and subsequent plans for IRIS assessments is addressed in Appendix A.

150 *Id.* at 7; *see also* Appendix A for more current discussion of EPA's research plans.

EPA is currently using the list of Work Plan chemicals as the principal source of substances to be evaluated pursuant to the revised TSCA legislation. Thus, one can expect that, in the coming decade, EPA will be conducting a risk evaluation of PAHs as a group.

For decades, the U.S. FDA has recognized coal tar as "generally recognized as safe and effective" (GRASE) for use as an over-the-counter topical medication for skin conditions such as dandruff, seborrheic dermatitis, or psoriasis.[151] Because it is used in pharmaceutical applications, coal tar has long been included in FDA's safety surveillance program, known as the FDA Adverse Event Reporting System (FAERS).[152] Thus, human exposure via the skin can be assessed directly. For the years included in the online FAERS database, from 1975 to 2019, there were 74 case reports involving coal tar medicinal products. The reported effects including pruritis (itching, the most common reported effect, 10 of 74), ineffectiveness (7 of 74), hypersensitivity (6 of 74), and a variety of diverse reactions with 5 or fewer reports.

In 2016, the Ministers of Environment and Climate Change Canada and Health Canada published for public comment[153] proposed risk management measures for coal tars and coal tar distillates. The scientific basis for the risk management scope proposed for RTS included calculation of margins of exposure (MOE) for risks potentially related to exposure to PAHs in house dust said to be related to the use of RTS on parking lots using data for residential dust reported by Mahler et al. (2010).[154] The screening assessment reported a lifetime adjusted MOE value of 15,500. By comparison, the United Nations World Health Organization's Joint Expert Committee on Food Additives, the Scientific Committee of the European Food Safety Agency[155] (EFSA), and the UK Committee on Carcinogenicity[156] recommend use of MOE > 10,000 as an indicator of low concern for public health. The EFSA Scientific Committee concluded:

> The Scientific Committee is of the view that in general a margin of exposure of 10,000 or higher, if it is based on the $BMDL_{10}$ from an animal study, and taking into account overall uncertainties in the interpretation, would be of low concern from a public health point of

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151 21 C.F.R. § 358

152 FAERS: https://www.fda.gov/drugs/drug-approvals-and-databases/fda-adverse-event-reporting-system-faers

153 Canada Gazette, Part I, Vol. 150, June 11, 2016. *Risk Management Scope for Coal Tars and their Distillates* based on scientific findings detailed in the document entitled *Draft Screening Assessment, Petroleum Sector Approach: Coal Tars and Their Distillates*. As of this writing (4/27/2020), these documents have not been finalized.

154 Mahler, B. J. et al. (2010). Coal-tar-based parking lot sealcoat: An unrecognized source of PAH to settled house dust. Environ. Sci. Technol. 2010, 44, 894–900. This paper and others related to RTS cited by ECCC in the risk management scope document have been subjected to detailed PPPR.

155 Opinion of the EFSA Scientific Committee (2005) on a request from EFSA related to A Harmonised Approach for Risk Assessment of Substances Which are both Genotoxic and Carcinogenic. doi:10.2903/j.efsa.2005.282.

156 United Kingdom Committee on Carcinogenicity (2012). Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment: Risk Characterization Methods. COC/G 06 – Version 1.0 (2012). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/315883/Risk_characterisation_methods.pdf

view and might be reasonably considered as a low priority for risk management actions. (EFSA, 2005, p. 20/31).

In summary, the practice of estimating human health risks that could be associated with exposure to PAH-containing substances based on bioassays of animals exposed to substances in forms that do not occur outside the laboratory—that is, exposures to individual PAH compounds—has been found to be unrepresentative of exposures to PAHs in the environment and to lead to unreliable predictions of toxicity. Factors controlling bioavailability variations introduce additional uncertainties. Since publication of the results of bioassays of benzo(a)pyrene and two MGP-type coal tars in the 1990s,[157] the actual risks related to human exposure to PAH-containing materials have been recognized as likely to be considerably lower than if they were calculated using EPA's provisional guidance.[158] This constitutes a perception problem that was addressed for individual PAH compounds via EPA's 2017 IRIS assessment of benzo(a)pyrene,[159] but has yet to be resolved for coal tar and other PAH-containing mixtures.

C. An RTS Ban May Actually Cause Environmental Harm

The asserted basis for the proposed RTS eligibility criterion is that it will reduce the discharge of PAHs from RTS-sealed surfaces and thus reduce toxic impacts to receiving waters. As explained above, both elements of that claim are unfounded. But worse, it is likely that an RTS ban will actually cause greater environmental impacts than the status quo. Appendix C of these describes the economic impacts of an RTS ban. The most widely-available substitute for RTS, asphalt-based sealcoat, is more short-lived and requires more frequent application to maintain the integrity of a paved surface. Many pavement owners, faced with this increased cost, will simply stop maintaining their asphalt surfaces and just replace them when required by pavement degradation.

Many facilities use first flush and complete containment zones to capture and/or divert storm water runoff and incidental spillage in "high impact" areas to treatment systems. Adequate maintenance of paved surfaces is critical to these strategies, as it allows for efficient and effective dry cleanup methods to be used in the event of a spill. Reduced pavement maintenance and repair activities would likely result in significant cracking in paved surfaces, as well as voids in and under paved surfaces. This could degrade pollution prevention practices related to storm water collection and/or diversion of runoff to treatment systems or away from "high impact" areas. This could also result in accumulation of sediment, dusts, debris and liquids that can contain pollutants and degrade the overall effectiveness of dry cleanup and/or spill cleanup. Therefore, the RTS ban in the 2020 Proposed MSGP may result in significant adverse impacts and degradation of storm water runoff quality related to other constituents of concern. These other constituents of concern may pose a much greater risk to storm water runoff and/or receiving water quality than those posed by RTS.

[157] Culp et al. 1998.
[158] U.S. EPA 1993.
[159] U.S. EPA 2017.

D. The Proposed Rule Does Not Have a Rational Basis.

The foregoing demonstrates that EPA's asserted basis for the proposed rule is unfounded. In the natural environment, PAHs bond tightly to organic materials and are not bioavailable in toxic amounts. This generalization holds true for PAHs from RTS. As a result, storm events do not result in PAHs being transported from RTS-sealed surfaces to the aquatic environment in quantities that are toxicologically significant. Additionally, where bans of RTS have been imposed, levels of PAHs have not declined—or, any declines are more logically associated with other events.

The weight of the best available science and evidence indicates that PAHs from RTS are not a cause of aquatic toxicity and do not pose risks to humans. As a result, the proposed eligibility criterion would not reduce risks.

The APA requires the agency to show a rational connection between the facts and the agency's conclusion. *FERC v. Electric Power Supply Ass'n*, 136 S. Ct. 760, 782 (2016). The best available science shows that EPA's asserted connections are unfounded, and that EPA's proposed ban would not accomplish the agency's goal. The proposed eligibility criterion is, thus, irrational and illegal under the APA.