Review of Environmental Impacts from Coal Tar Based Pavement Sealants

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VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

COMMONWEALTH OF VIRGINIA

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Executive Summary

The Department of Environmental Quality (DEQ) prepared this report in response to seven questions Delegate Tony Wilt asked about coal tar sealants in a letter dated May 31, 2018 (Attachment 1). While this report is responsive to the specific questions asked in the letter it does not address topics beyond the questions asked, such as potential impacts to businesses, consumers, or other stakeholders.

Coal tar, a byproduct from the coal coking process, is the raw material that is further refined for use as a main constituent in Coal Tar Sealant (CTS). The refined coal tar is made up of chemicals known as polycyclic aromatic hydrocarbons (PAHs), which is a contaminant group that includes hundreds of compounds found in the environment as mixtures. Some PAHs are naturally occurring whereas many are derived from burning fossil fuels at high temperatures. PAHs have been identified as pollutants; 11 are listed as Priority Pollutants in the Code of Federal Regulations and 6 are listed as probable carcinogens. An extensive review of the scientific literature supports the negative impact that the PAH component of CTS can have on aquatic life. Once CTS is applied to a paved surface, PAHs can be transported to the environment by volatilizing to the air and then depositing to land or water, or from stormwater runoff that transports the dust caused by vehicular surface abrasion. Once in the environment, PAHs have been documented to increase mortality, stunt growth and development, as well as leading to observed lethargic behavior in a wide array of aquatic organisms.

CTS is a dominant source of PAHs east of the Rocky Mountains. For example, studies conducted in the State of Minnesota and the City of Milwaukee, Wisconsin, identified the percent contribution to be 67% and 77%, respectively. Furthermore, land-use analyses, when compared to associated environmental PAH concentrations, have identified pavement sealed with CTS to be strongly correlated to PAHs and weakly correlated to roadways, where CTS is not applied. States and localities that have imposed bans expect significant reductions in this source of harmful PAHs to the environment. The City of Austin, Texas, the locality that imposed the first ban in the United States, has already experienced a reduction in one-half of the streams it monitored for a long period of time. Knowing that asphalt and latex based products for sealing pavement are readily available, several Chesapeake Bay localities, including the District of Columbia, and three counties in Maryland (Montgomery, Prince Georges, and Anne Arundel) have passed CTS bans. To institute a similar ban in Virginia, two approaches could be considered. The first approach would be to enact legislation to grant Virginia localities the authority to adopt ordinances to implement and enforce a ban on this material. The second approach would be to enact legislation to impose a statewide ban. This latter approach would require additional resources for the state agency tasked with implementing and enforcing such a ban.

I. Introduction

A request, sent by letter dated May 31, 2018 from Delegate Tony Wilt to Director David Paylor, asked the Department of Environmental Quality (DEQ) to examine the potential for environmental impacts from Coal Tar Sealant (CTS) (Attachment 1). The request was a follow-up to HB 1150 which was introduced during the 2018 General Assembly Session. While HB 1150 was not enacted into law, the bill would have prohibited the retail sale or distribution of a pavement sealant containing coal tar in Virginia on or after July 1, 2020, and would have prohibited application of a pavement sealant containing coal tar in Virginia on or after July 1, 2021. The letter included a list of seven questions that led the Department to perform an exhaustive review of the available scientific literature, conduct interviews with personnel from localities in the Chesapeake Bay watershed where CTS bans have successively been implemented, and to investigate CTS bans instituted in other jurisdictions in the continental United States. DEQ's findings are presented below. A complete summary of references examined for this research can be found at the end of this document.

Crude coal tar is a byproduct of the carbonization of coal, otherwise known as the coke making process used for steel manufacturing. The coking coal is baked at high heat (1,100^{o}C) where the volatile mass is driven off. Crude coal tar is a component of that volatile mass and yields 8-12 gallons of tar for each ton of coal coked. The "raw" material is further refined to meet American Society for Testing and Materials specifications and is known in the industry as RT-12 for use in Coal Tar Sealant (CTS) products.

II. Does DEQ consider coal tar a pollutant based on higher levels of PAH in the substance?

Response: Pollutants are chemicals or matter that contaminate environmental media such as air, water, soil, plants, and animals and have the potential to cause harm to human health or the environment. Coal Tar Sealant (CTS) is a complex combination of polycyclic aromatic hydrocarbons (PAHs), phenols, heterocyclic oxygen, sulfur, and nitrogen compounds of which the main group is PAHs. PAHs are a group comprised of hundreds of ubiquitous environmental contaminants that usually occur as mixtures. Some of these compounds are naturally occurring in part from the breakdown of plant material (phytogenic) whereas many are derived from anthropogenic activities including the incomplete combustion of organic materials such as wood and fossil fuels (pyrogenic). PAHs associated with petroleum are referenced as petrogenic. CTS, which is pyrogenic based as it is derived from the coal coking process, is comprised of total PAH percentages ranging from 0.9% to 8.3% by weight (equivalent to 9,000 parts per million to 83,000 parts per million).

EPA has listed six PAHs as probable carcinogens and one has been identified as a known carcinogen. These chemicals are considered pollutants as several are listed as Priority Pollutants in the Code of Federal Regulations (40 CFR Part 423, Appendix A). Eleven compounds also have nationally recommended criteria for the protection of human health (public water supplies and fish tissue) in the Virginia water quality standards.[1] Once CTS has been applied to a parking lot, driveway, or road, PAHs have the potential to be transferred via volatilization to the air and/or stormwater washoff of dust particles to the environment (air, water, soil or organisms).[2] Once released to the environment, the different PAHs become pollutants that can cause harm depending on the available exposure concentration.

III. If considered a pollutant, what might be the degree to which it is having a negative impact on water quality and aquatic life?

Response: The known toxic components of CTS have demonstrated negative impacts on aquatic life. PAHs are the most studied of the toxic compound groups that make up CTS. In Virginia, eight impairments for fish tissue threshold exceedances are listed identifying PAHs as a likely cause based on fish data from 1996. However, low detection rates (*i.e.*, fish are known to metabolize PAHs and detectable concentrations may not be observed in their tissue) and resource constraints on the Fish Tissue Monitoring Program led DEQ to suspend PAH analysis in fish tissue in the early 2000s. Because the compounds tend to be hydrophobic, they bind to sediment, suspended organic matter, and animal tissue more readily than water. Therefore, the primary modes of contact are through sediment-tissue interaction and ingestion of contaminated food.

On a general level, exposure to CTS compounds can increase mortality, stunt growth and development, increase deformities, and lead to narcosis (lethargic behavior) in fish, aquatic invertebrates, and amphibians.[3] Studies have shown organisms being noticeably affected from 0.018 parts per million (ppm) to 22 ppm and beyond.[4] These effects are more pronounced when CTS compounds are exposed to ultraviolet (UV) radiation and also when the organisms are exposed in an early life-stage. The compounds tend to accumulate in lipid-rich tissues such as the liver. How readily a species accumulates and eliminates CTS compounds can vary by species and compound. Some compounds are mostly eliminated within 2 days of exposure,

[1] 40 CFR Part 423, Appendix A (Priority Pollutants) and 9VAC25-260-140, Part B.
[2] EPA 2011 and Mahler, BJ et al. 2014.

[3] Baldwin et al. 2017, Barron et al. 2004, Bommarito et al. 2010a, Bommarito et al., Breyer et al. 2006, Logan 2007, Mahler et al. 2012, Mahler et al. 2015, Shailaja 2003 and Scoggins et al. 2007.
[4] Mahler et al. 2012 and references therein.

whereas others reside up to 33 days.[5] However PAHs have an established probable effect concentration (PEC) of 22.8 ppm in sediment.[6] A PEC is the concentration at which more often than not adverse effects will be observed.

Despite the ability of fish to metabolize PAHs and other CTS compounds, CTS compounds still exhibit acute and chronic toxic effects. Fish are exposed through contact with contaminated sediment and consumption of invertebrates and other organisms that have been exposed to CTS compounds. For example, rainbow trout fingerlings and shortnose sturgeon can be exposed to CTS compounds via sediment-tissue contact leading to increased mortality. In addition, rainbow trout exposed to CTS compounds formed cataracts. Other effects include fin erosion, liver abnormalities, skin tumors, and increased susceptibility to disease and death.[7] There are anecdotal stories of CTS particles covering and coating the gill plates in fish leading to suffocation, but those stories appear to be unsupported by any studies. However, when rainfall occurs less than 24 hours after the application of CTS, fish kills have been reported.[8]

Amphibians have been shown to experience sub-lethal and lethal effects in laboratory studies. For example, spotted salamanders exposed to CTS over a 28 day period experienced sub-lethal effects like slowed growth, reduced liver enzyme activity, and a diminished swimming ability.[9] Another common Virginia amphibian, the eastern newt, experienced similar effects in laboratory experiments that compared the effects of CTS and asphalt-based sealants.[10] Both studies demonstrated that the effects of CTS compounds were magnified by exposure to UV radiation. A study using the African clawed frog, often used as a surrogate amphibian species, demonstrated 100% mortality when the frogs were exposed to high levels of PAHs (300 ppm).[11]

The current standard for sealant application is to allow at least 24-72 hours of curing time. However, a study has shown that CTS components were found in runoff up to 111 days after the initial application. Interestingly, the total concentration of CTS compounds did not appear to show a diminishing trend over that period. This is due in part to volatilization and abrasion caused by use (*i.e.*, vehicles driving on sealant).[12]

[5] Logan 2007.
[6] MacDonald et al. 2000.
[7] Logan 2007, Mahler et al. 2012 and 2015.
[8] RiverFox911, 2010.
[9] Bommatiro et al. 2010a.
[10] Bommatiro et al. 2010b.
[11] Mahler et al. 2012.
[12] Mahler et al. 2014.

IV. What portion of PAH might be from others sources besides coal tar containing sealants?

Response: PAHs occur in three general forms, some of which are formed naturally. Phytogenic PAHs are formed from the natural breakdown of plant material. Petrogenic PAHs are formed slowly (on a geologic timescale) under low heat and include unprocessed fossil fuels like coal, natural gas, and petroleum. Pyrogenic PAHs are formed quickly under high heat and include by-products of forest/grass fires, petroleum-based exhausts, coal-fired plants, creosote, and coal tar. These can be transported to aquatic environments by atmospheric deposition, wastewater discharges, and runoff from streets, parking lots, or rooftops.[13]

Several studies have found CTS to be the dominant source of PAHs in watersheds east of the Continental Divide though the percentages may vary by location.[14] The Minnesota Pollution Control Agency (MCPA) found that the largest sources in a metropolitan area were coal tar sealant (67%), vehicle emissions (29.5%) and burned pine wood (3.5%).[15] A recent study performed in Milwaukee, Wisconsin concluded that CTS contributed 77% of total PAHs to the majority of streambed samples.[16] It was also the most likely dominant source in Austin, Texas, Springfield, Missouri, and Conodoguinet Creek in Pennsylvania.[17] A study conducted in the New York-New Jersey Harbor suggests CTS is a minor source, contributing 12% of PAH loading each year. Oil leaks (33%), creosote (21%) and tire wear (18%) were estimated to contribute more to the harbor. However, the authors note that they could not quantify low-weight PAHs volatized from sealed lots and that their estimates were based on data from Austin, Texas and therefore do not take into account the effect snow and snow removal (*i.e.*, salting and plowing) would have on loading.[18]

Land-use analyses have found that PAH concentrations do not correlate well with impervious surfaces if roadways are included. However, if roadways are separated out, PAH concentration continues to correlate weakly with roadways and much more strongly with other types of impervious surface (*i.e.*, parking lots). The inference the studies have made is that roadways are not typically sealed and that vehicle emissions are not the major contributor.[19]

[13] Baldwin et al. 2017a.
[14] U.S. Geological Survey 2016.
[15] Minnesota Pollution Control Agency (MCPA) 2010.
[16] Baldwin et al. 2017a.
[17] Pavlowsky, 2012, Stout & Graan, 2014 , Van Metre & Mahler 2010 and 2014, Witter et al. 2014.
[18] Valle et al. 2007.
[19] Baldwin et al. 2017a and Witter et al. 2014.

Coal tar sealant industry groups contend that these studies are unscientific.[20] Studies that have suggested CTS as the primary PAH contributor have been criticized for using only one or two lines of evidence, or on the basis that some of the lines of evidence cannot identify CTS as the primary source of PAHs in a watershed. They also suggested that the studies used weathered profiles of CTS instead of freshly applied CTS.[21] Such criticism may overlook that while each line of evidence has certain limitations, in combination they provide a strengthened conclusion especially when they all suggest a common outcome. And the use of weathered profiles may be more appropriate since the chemical makeup of CTS changes in the days and months after it is initially applied due to volatilization of lower-weight molecular compounds.[22] This "weight of evidence" principle is common and is used in Virginia's Reduction of Toxics in State Waters Report.[23] One study that used four different lines of evidence evaluated sources of PAHs in post-1990 sediments in cores from 40 lakes in urban areas across the United States.[24] PAH sources included several coal- and vehicle-related sources, wood combustion, and fuel–oil combustion. The four best modeling scenarios all indicated coal tar sealant is the largest PAH source when averaged across all 40 lakes, contributing about one-half of PAH in sediment, followed by vehicle-related sources and coal combustion. A previously mentioned study by the United States Geological Survey (USGS) and Milwaukee Sewerage District used seven lines of evidence to determine the contribution of different sources. Each line of evidence resulted in CTS being the primary contributor to PAH concentrations in streambed sediment. The study also notes that products using creosote are an unlikely present-day source in the area, even in areas with a legacy of creosote use (*i.e.*, Superfund sites and railways).[25]

V. Would regulation or elimination of the product realize any measurable improvement in water quality and aquatic life?

Response: Several studies performed around the country have shown elevated levels of PAHs in sediments that are directly related to CTS.[26] In each case, the elevated PAH concentrations were associated with specific land uses, including urban, commercial and residential uses, where CTS is frequently applied to parking lots and driveways. As identified above, studies have shown that PAHs associated with CTS dust, once mobilized and conveyed via stormwater to nearby streams, have the potential to be acutely and/or chronically toxic to aquatic life. In fact, research has shown that for several PAHs the potential for toxicity increases in the presence of UV light as a subset of these PAH compounds are phototoxic. The amount of available organic

[20] The Truth about Coal Tar 2006.
[21] O'Reilly & Ahn 2017.
[22] Baldwin et al. 2017a and 2017b.
[23] VA DEQ 2017.
[24] Van Metre & Mahler 2010.
[25] Baldwin et al. 2017a.
[26] Baldwin et al 2017a , City of Austin, TX 2005, MPCA, 2010, Van Metre & Mahler, 2010; Witter et al. 2014.

carbon can be a mitigating factor that affects the bioavailability of PAHs from sediment to the biota but is site-specific (*e.g.*, total organic carbon content).

Based on the review of the available information, the states and localities that have imposed CTS bans would expect that the elimination of this source of harmful PAHs will significantly reduce the accumulation of this pollutant in the environment. In fact, the elimination of a product that often contains PAHs at levels that can exceed the protective sediment threshold by a factor of 300 would benefit any aquatic system. The City of Austin, Texas, which was the first location where CTS was banned, has experienced a PAH reduction in almost half of the long term monitoring stations. The expectations in the District of Columbia, which is discussed in greater detail below, are that its ban imposed in 2009 will eventually result in reduced PAH concentrations to impaired waters. A study performed for the City of Springfield, Missouri, concluded that a CTS ban could decrease PAHs found in stream and pond sediments by 80-90%.[27]

In another example, the state of Minnesota banned coal tar sealants in 2014 to protect against contamination of stormwater retention ponds that are designed to capture sediment within its municipal separate storm sewer system (MS4) from entering lakes.[28] Like all best management practices (BMPs), over time the ponds significantly filled with sediment thus reducing their storage capacity. As part of the routine maintenance required by a particular MS4 permit near the Twin Cities, sediment had to be removed.[29] Prior to removing the sediment, 12 retention ponds were evaluated for contamination. Three of the ponds were found to contain elevated levels of PAHs and disposal costs of the contaminated sediment increased significantly. The effort described here was the beginning of a broad problem recognized in the Twin Cities area and in other Minnesota localities. The Minnesota Pollution Control Agency (MPCA) subsequently investigated this problem, which included source identification using fingerprinting analysis.[30] The study indicated the main source of the PAHs in the retention ponds originated from CTS at an average contribution rate of 67%. This served as the impetus for the CTS ban in Minnesota. There have been similar experiences in Montgomery County, Maryland where elevated concentrations of PAHs made disposal of sediment from a stormwater retention BMP much more difficult.[31] In light of the experiences in Minnesota and other areas, the maintenance dredging of retention ponds found within Virginia's MS4s that receive PAH inputs that include CTS runoff could also become a financial burden.

[27] Pavlowsky 2012.
[28] MCPA 2014.
[29] MCPA 2010.
[30] Ibid.
[31] Personal communication with Stan Edwards, Montgomery County, MD Division of Environmental Policy and Compliance.

Virginia Experiences

Virginia has numerous waterbodies that are impaired for aquatic life and are located near land uses comprised of urban, commercial and suburban areas. For these impairments there are likely a multitude of stressors causing the observed benthic degradation. To identify the causal effect of the impacted aquatic life is often very difficult. A recent study that occurred in the heavily industrialized Baltimore Harbor using sediment that contained multiple contaminants, including elevated PAHs, was in agreement with similar studies that contained multiple contaminants.[32] While a portion of the toxicity could be attributed to PAHs, heavy metals also contributed to the observed effect. In essence, toxicity is often expressed from the compounding or additive effects of complex contaminant mixtures. That is not to say there would be little or no benefit from the elimination of PAHs from a source such as CTS.

For aquatic life impaired waters in Virginia, a Stressor Identification Analysis is a first step in the total maximum daily load (TMDL) development process and is designed to hone in on the cause of the impairment through the process of elimination. The categories applied in this analysis consist of Non-Stressors, Possible Stressors, and Most Probable Stressors. While the Stressor Identification approach works well in certain waterbodies with minimal pollutants (*i.e.*, rural areas), it is less certain in more complex watersheds that receive drainage from urban or commercial land uses and may be compromised by multiple stressors. Additionally, the collection of organic pollutant data within sediment is most often insufficient due to cost. Thus, data are often lacking in determining if PAHs are present at concentrations indicative as the most probable cause for degraded aquatic life. Other stressors that can be a factor in urban stream impairments include hydromodification, sediment, nutrients, heavy metals, ions including chloride, and other organic constituents such as pesticides.

VI. What does the evidence suggest in States and localities that have instituted some form of ban on coal tar based sealant?

Response: To date, research focused on the United States has shown that CTS bans have been instituted or are in the process of being instituted in five states (Illinois, Michigan, Minnesota, New York and Washington), four large metropolitan areas (Washington D.C., Austin and San Antonio, Texas, and Milwaukee, Wisconsin), and multiple counties, several of which overlap with large metropolitan areas (Anne Arundel, Montgomery, and Prince Georges counties in Maryland; Suffolk County, New York (includes Long Island); Van Buren Township in Michigan;

[32] Unger 2018.

and Dane County, Wisconsin).[33] Numerous states also have imposed CTS restrictions, including: California, Connecticut, Kansas, Massachusetts, Missouri, North Carolina, South Carolina, Texas, and Wisconsin.[34] For example, in Connecticut coal tar sealant use is prohibited on state and local highways.[35] As noted earlier, there is a minimal relationship with PAHs originating from roadways. The oldest bans include Austin, Texas (2005) and Washington D.C. (2009), whereas other CTS bans identified in this report were instituted after 2011. It is important to note that the identification of bans or restrictions in this report may not be exhaustive as new bans may be imposed and may not show-up during initial on-line research. For example, while researching the ban in Milwaukee, Wisconsin it was discovered that a ban had been instituted in Barrington, Illinois (which pre-dated the Illinois statewide ban).[36]

In considering the experience of areas with existing CTS bans, the locality that appears to be most appropriate for evaluation is the City of Austin, Texas because its ban was instituted in 2005. A PAH study entitled "Polycyclic Aromatic Hydrocarbon Monitoring through 2016: Ten Years after the Coal Tar Sealant Ban" was completed in 2017. Sediment samples were collected and analyzed at 13 site locations where the summed value of 16 PAH compounds had historically (beginning in 1996) exceeded the applicable Probable Effect Concentration (PEC) sediment PAH threshold of 22.8 ppm.[37] The recent results that included an analysis of the same 16 compounds, along with a temporal trend analysis, revealed a decrease in PAH levels below the sediment threshold at six sites. Three other stations also had decreases but the results were less certain; four locations remained high. An analysis used to determine prospective sources applied PAH ratios derived from sample results against ratios that would be expected from CTS and asphalt based sealants, respectively, suggested that coal tar is still a major source for sediment pollution. The six sites that have routinely yielded concentrations below the PEC will no longer be studied while more intensive investigation was recommended for the other sites. It was suspected that a legacy component may still exist along with a contribution of CTS from areas outside the City's jurisdictional ban.

In 2014, the United States Geological Survey (USGS) released a paper that examined sediment from Lady Bird Lake, a major receiving water body for urban runoff in Austin, Texas. The USGS found that since the ban, concentrations of PAH in the lake have decreased but that coal tar is still a large portion of the pollution in the lake's sediments.[38]

[33] Anne Arundel, MD 2015, BACOG 2018, City of Austin, TX 2006, City of Milwaukee, WI 2017, City of San Antonio, TX 2016, Illinois 2017, Michigan 2017, Minnesota 2013, Montgomery,MD 2010, Morrison 2015, New York 2017, Prince Georges, MD 2015, Suffolk, NY 2011, Washington 2012.
[34] Morrison 2015.
[35] Connecticut 2017.
[36] BACOG 2018, Pavin 2016.
[37] City of Austin, TX 2017 and MacDonald et al. 2000 (sediment PEC value determination).
[38] Van Metre & Mahler 2014.

The District of Columbia has the second oldest ban (2009).[39] While correlated to high PAH concentrations in the Anacostia River, the incidence of tumors in the brown bullhead have decreased over time although it is not believed to be a direct relationship with the CTS ban.[40] However, clean-up of the Anacostia River is a multi-pronged effort in which the CTS ban is one of the management actions that have been implemented to address the contamination.[41]

VII. To what extent, if any, has regulating coal tar based sealant been discussed or considered as a means to meet pollution control goals in the Chesapeake Bay states?

Response: The 2014 Chesapeake Bay Watershed Agreement includes a Toxics Contaminants Goal that has an objective to "[e]nsure the Bay and its rivers are free of effects of toxic contaminants on living resources and human health." Road sealants have been identified in the Goal's Toxic Contaminants Research Outcome Management Strategy as a contributing source of PAHs to localized areas of the Bay watershed. Five PAHs are also listed on the EPA's Toxics of Concern list, which is referenced in Virginia's Water Quality Monitoring, Information and Restoration Act (Virginia Code § 62.1-44.19:4). The restricted use or outright ban of CTS is in line with the overarching goal of the Chesapeake Bay Watershed Agreement.

Regarding actions related to CTS taken by Chesapeake Bay jurisdictions, the District of Columbia instituted a CTS ban in 2009. With mounting scientific evidence established by the USGS studies mentioned previously that CTS is a contributing source of PAHs to sediment, and knowing the Anacostia River and numerous smaller tributaries in the District's drainage area were impaired for water quality problems and PAHs were identified as one of the "Toxic Organic" contributing stressors, the District banned the use of CTS. The ban was enacted through the Comprehensive Stormwater Management Enhancement Amendment Act of 2008.[42] Provisions in the law specify that it is illegal to sell, use, or permit the use of coal tar pavement products in the District of Columbia. Violators of this ban may be subject to a daily fine of up to $2,500. The Washington D.C. Department of Energy and Environment (DOEE) actively inspects up to 60 lots per year and utilizes a qualitative field method with follow-up laboratory analysis when necessary. Whereas the original ban specified a PAH content of 1% (10,000 mg/kg), the District is in the process of amending the code to set the revised PAH content to 0.1% (1,000 mg/kg). This is necessary as other products that meet the regulatory requirements still contain elevated PAHs levels and are not referred to as CTS. An example is a sealant known as Ethylene Cracker Residue (ECR).

[39] D.C. 2008.
[40] Personal communication with Fred Pickney, USFWS.
[41] Personal communication with Lillian Powers, Watershed Protection Division, DOEE, 2018.
[42] D.C. 2008.

Urban areas draining Montgomery County, Maryland also contribute toxic contaminants to the same water quality ("Toxic Organic") impaired areas of the District of Columbia. Knowing the Washington D.C. Department of Energy and Environment (DOEE) laid the foundation for its 2009 CTS ban by performing significant outreach, the Montgomery County Council passed a CTS ban in 2012.[43] The Montgomery County Council noted that with what it described as preponderance of evidence suggesting CTS is a major source of PAHs to suburban and urban land use areas, the ban was considered an "easy" way to improve water quality especially since asphalt and latex based sealants are readily available. Furthermore, it concluded that contractual jobs associated with the application of road sealant products would not be compromised. The county has provided extensive educational outreach but does not have resources to enforce the ban, and instead relies on the input from citizens.[44]

For reasons that mirror Montgomery County's, the Prince Georges County, Maryland implemented a ban in 2015.[45] The bill establishing the ban prohibited the use and sale of coal tar pavement products, and provided for alternatives as well as outreach. Studies performed by the USGS were identified by the Prince Georges County Council as providing supporting information relative to CTS being a major source of PAHs in urban areas. Violators may be required to remediate the surface and can be punished by a fine not to exceed $1,000 per day.

In 2015, Anne Arundel County, Maryland passed County Council Bill 104-15-Stormwater Management – Coal Tar Pavement Products Prohibition. The ban stipulates that contractors or property owners found in violation are required to remediate the surface and may be fined up to $1,000 for the first violation, $5,000 for the second and up to $10,000 for the third. Fifteen alternative pavement sealant products are presented on the county's website.[46]

CTS bans have not been identified in West Virginia or Pennsylvania, although a study was performed in South-Central Pennsylvania that correlated coal tar sealant dust within urban sediments. A conclusion of the study suggested CTS is an important urban PAH source in the Conodoguinet Creek watershed linked to residential and commercial/residential land use.[47] Suffolk County, New York has also banned CTS but this area in New York does not drain into the Chesapeake Bay.[48] Legislation was proposed during New York's 2017 General Assembly but has not been adopted.[49]

[43] Montgomery County, MD 2010.
[44] Personal communication with Stan Edwards, Division of Environmental Policy and Compliance.
[45] Prince Georges County, MD 2015.
[46] Anne Arundel, MD 2015.
[47] Witter et al. 2014.
[48] Suffolk, NY 2011.
[49] New York 2017.

VIII. What would be the most appropriate model for doing so if Virginia were to regulate the substance?

Response: Two options are provided as possible models if Virginia were to regulate CTS.

1) The first approach would be to enact legislation providing localities with the ability to adopt ordinances to implement Coal Tar Sealant bans or restrictions. Virginia localities that might be interested in imposing a CTS ban or restrictions would require a grant of legal authority by the Virginia legislature in order to do so. Upon receiving that authority, localities would have the opportunity to develop ordinances to enforce these bans or restrictions at the local level. Examples of legislative approaches that could be considered include the District of Columbia and the states of Illinois, Minnesota, and Washington.[50]

2) The second approach would be to enact legislation that would impose a statewide CTS ban that would require oversight from applicable Virginia state agencies such as the Virginia Department of Agriculture and Consumer Services or the Department of Environmental Quality. The statewide ban would mimic that used to ban the sale of deicing agents that contain urea, nitrogen or phosphorus intended for application to parking lots, roadways, and sidewalks or other paved surfaces in the Commonwealth. This legislation was included in HB 1831 that passed during the 2011 Legislative Session and is now codified in Virginia Code § 3.2-3607.2.[51] If this option were to be enacted, resources would be necessary for regulatory oversight as this would be a new activity for either agency.

In conclusion, legislative efforts to ban CTS in other states and localities appear to be gaining momentum. Throughout the country numerous states and local jurisdictions have imposed CTS bans. To date, two states (Minnesota and Washington) have passed legislation that impose bans within their boundaries and three states have pending legislation (Illinois, Michigan and New York). In addition the District of Columbia and three other large cities, including Austin and San Antonio, Texas, and Milwaukee Wisconsin, along with numerous towns, cities and counties all over the country have implemented bans.[52] Additionally, big box retail stores (*e.g.*, Lowes,

[50] D.C. 2008 and 2013, Illinois 2017, Minnesota 2013, Washington 2012.

[51] Virginia 2011.

[52] Anne Arundel, MD 2015, City of Austin, TX 2006, City of Chicago, IL 2013, City of Milwaukee, WI 2017, City of San Antonio, TX 2016, D.C. 2013, Greenville, SC 2013, Illinois 2017, Michigan 2017, Minnesota 2013, Montgomery,MD 2010, New York 2017, Prince Georges, MD 2015, Washington 2012.

Home Depot, and Ace Hardware) have banned CTS based products and instead carry asphalt and latex based sealants.[53]

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X. Attachment 1: May 31, 2018 Letter from Delegate Wilt

COMMONWEALTH OF VIRGINIA
HOUSE OF DELEGATES
RICHMOND

TONY O. WILT
POST OFFICE BOX 1425
HARRISONBURG, VIRGINIA 22803

TWENTY-SIXTH DISTRICT

COMMITTEE ASSIGNMENTS:
COUNTIES, CITIES AND TOWNS
AGRICULTURE, CHESAPEAKE AND NATURAL RESOURCES
MILITIA, POLICE AND PUBLIC SAFETY

May 31, 2018

Virginia Department of Environmental Quality
David Paylor, Director
P.O. Box 1105
Richmond, VA 23218

Dear Director Paylor:

As you may recall, during the 2018 General Assembly Session you indicated a willingness for the Department to review the issue of potential negative environmental impacts from coal-tar based pavement sealants. This was in response to the consideration of HB 1150. My apologies for the delay in making the formal request, but I hope your offer for the Department to examine this issue still stands.

The legislation attempted to phase out the use of pavement sealant that is coal-tar based. This sealant contains high levels of polycyclic aromatic hydrocarbons (PAH), which some evidence suggests may have negative impacts on aquatic life and human health. After significant concerns were expressed by those in the pavement coatings industry and it became clear the legislation was unlikely to advance, I agreed to strike the bill.

In considering the conflicting information from the industry and those that wish to see the product eliminated, I'm hopeful the Department can weigh in on the degree to which, if any, this product may have a negative impact on our waterways, aquatic life and the health of the Chesapeake Bay. I have listed out more specific points for your consideration below.

- Does DEQ consider coal-tar based sealant a potential pollutant, based on the higher levels of PAH in the substance?
- If it is considered a pollutant, what might be the degree to which it is having a negative impact on water quality and aquatic life?
- If PAH's are cause for concern, what portion of this might be from other sources besides pavement sealants (burnt wood, cosmetics, etc.)?
- Would the regulation or elimination of this product in Virginia likely realize any measurable improvements in water quality and aquatic life?
- What does the evidence suggest in states and localities that have instituted some form of a ban on coal-tar based sealant?
- Among the states and localities within the Chesapeake Bay Watershed, to what extent, if any, has regulating coal-tar based pavement sealants been discussed or considered as a means to meet pollution goals?
- If Virginia were to regulate the substance, what may be the most appropriate model for doing so?

Given the limited time frame and resources, I certainly understand that the Department will be unable to conduct any extensive in-house research, but I hope there can be a good-faith effort to review the existing evidence and resources to reach some general conclusions on this issue. In conducting this review, I would encourage consultation with other state agencies who may provide helpful insight. While not an exhaustive list, these might include the Marine Resources Commission, Department of Agriculture and Consumer Services, Department of Health and Virginia's public universities.

Thank you again for your willingness to examine this issue. In order to allow for the possibility of legislation during the 2019 General Assembly Session, it would be my hope that your review can be completed and a summary of your findings presented to me by December 3, 2018. If my office can answer any questions or be of any assistance in providing resources or communications we gathered when contemplating HB 1150, please do not hesitate to contact us.

Sincerely,

Tony Wilt