Solving the Problem of Polluted Transportation Infrastructure Stormwater Runoff

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Testimony of

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Introduction

Chairman Cardin, Ranking Member Boozman, and distinguished members of the Subcommittee, thank you for the opportunity to testify today on stormwater issues related to our nation's highways and the need for expanded implementation of green infrastructure for stormwater management.

My name is Dan Medina and I am the National Technical Director for Water at Atkins. We are a global engineering firm serving the needs of our clients in the public and private sectors in all aspects of planning, designing, and enabling urban infrastructure in transportation, water, energy, and the environment. Our headquarters in the United States are located in Tampa, Florida and our 100 offices nationwide house our 2,700 employees in the US. I am here to provide the point of view of the private industry on the subject of this hearing. Highway design and services during construction are one of Atkins' major areas of expertise, constituting an important source of our revenue and engaging a large number of our staff.

Additionally, I am a long serving and active member of the Water Environment Federation (WEF), an industry association representing water agencies and utilities across the United States that deliver clean water to the public while protecting our water resources. In 2012, WEF and the American Society of Civil Engineers published the Manual of Practice for Design of Urban Stormwater Controls, a 750-page handbook on the practice of planning and engineering design of technologies to control runoff from a variety of urban settings, including highways. I had the privilege to serve as the editor for this Manual of Practice. I am also a member of WEF's Stormwater Committee that focuses on fostering innovation and promoting sound policies for the cost-effective management of stormwater. Therefore, in addition to the private industry, I am also here on behalf of WEF as an association of water agencies charged with protection of water quality.

Overview of Stormwater Issues in Urban Infrastructure

According to the US Geological Survey, the most remote wilderness in the lower 48 states is located in Yellowstone National Park—only 22 miles from the nearest road, putting into perspective the omnipresence of our road system in the US. This feat of national infrastructure takes us to our homes and workplaces, and also to those awe-inspiring places in our country to be preserved for our future generations. Therefore, highways should lead the way, literally, in stewardship of the environment. Instead, historically, highway drainage systems have not been designed with sustainability in mind. In most instances, we pay insufficient attention to water quality, impacts on floodplains, water resource protection, and potential for public amenities and habitat enhancement. I hope to demonstrate here today that American engineering has the technology and know-how to improve stormwater management in our highway network in a cost-effective manner.

From my testimony today I would like the Subcommittee to take away four main points. First, highways exert a significant impact on streams and lakes that receive runoff. These bodies of water are under the jurisdiction of municipal agencies that are being forced to apply public funds to address the problems that arise from highway runoff. Second, American engineering has the expertise and technology to mitigate these impacts as new highways are constructed and aging ones are rebuilt. Third, better stormwater management on highways improves road safety. Finally, greener highways do not jeopardize road construction or stall economic growth; on the contrary, green technology for highway runoff management will fuel job creation at all levels in the planning, design, construction, and operation of our highway system.

First, let me provide a brief synopsis of the impacts of impervious surfaces on receiving waterbodies, which have been documented for decades. Road pavement and other impervious surfaces associated with vehicular traffic can contribute as much as 70% of the total impervious areas in an urban watershed (Wong et al., 2000). Under natural conditions, say, a forest, rain soaks into the soil, thus minimizing the volume of runoff that storms generate. Impervious surfaces impede this infiltration process and generate large volumes of runoff. Instead of arriving at streams as slow-moving groundwater seeping through the stream banks, runoff rushes over the pavement and through gutters and stormdrains that swiftly discharge to surface waters and carry sediment, motor oil, heavy metals, salt, pathogens, litter and other contaminants held in the pavement. Many states require that runoff be detained in basins that slowly discharge the water to a nearby stream. This approach can be effective but it doesn't address the increased volume of runoff; therefore, the receiving watercourse is forced to convey more water. The stream adjusts to the new conditions by increasing the size of the channel, which erodes stream beds and banks, resulting in more sediment that the flow of the water must carry (WEF and ASCE, 2012). Moreover, accumulated on a watershed basis, more runoff leads to bigger floodplains and greater economic flood losses, including damages to transportation infrastructure. Uncontrolled runoff that leaves a highway almost always becomes a problem for the municipality that receives that water and has to spend taxpayers' funds in correcting the adverse effects.

Today's urban drainage systems respond to complex interactions of the urban landscape including buildings, roads, sewers, and receiving waterbodies. Highways are an important component. They are part of the problem and must be part of the solution.

As my second point to illustrate today, American engineers have the expertise and technology to mitigate these impacts. The conventional approach to road drainage has followed the principle of conveying water as quickly as possible away from the road to reduce the perceived risk of deterioration in strength of the subgrade. However, this fast-drainage approach contributes to the degradation of our waterways as I mentioned earlier. But it doesn't have to be like that. Our industry has a proven approach to mitigate these impacts known as green infrastructure (GI) for stormwater management. Over the past 30 years, from its inception in Prince George's County, Maryland, we have applied GI successfully to virtually every type of urban development from neighborhoods to ports to military bases, but rarely for highways. GI is a blend of planning and engineering measures to restore the balance and manage rain within the urban environment to minimize the impacts of development on the quality and quantity of runoff, while protecting the surrounding natural resources and enhancing their value to society. GI seeks to take advantage of vegetation and soil to put rain back in the ground where it can follow its natural pathways toward receiving watercourses. GI technologies currently in use in urban development include permeable pavement, vegetated swales, infiltration basins, and stormwater wetlands. In addition to local benefits, GI can be instrumental in reducing flood damages to the nation. A study that Atkins is conducting for the Environmental Protection Agency reveals that GI implementation at a watershed scale can reduce flood losses nationwide by as much as $5 billion dollars between 2020 and 2040 (Atkins, 2014).

Vigorous research and lessons learned from three decades of GI implementation have taught us what we need to know about performance, cost, and operation and maintenance of these facilities. In addition, we know the experiences of other countries that have embraced the application of GI to highways. In the United Kingdom, the application of GI is mandatory through existing legislation, and nearly every highway project in Australia includes consideration of GI. A notable example is EastLink, a six-lane, 23-mile motorway near Melbourne featuring 17 interchanges, 4 miles of toll-free bypasses, 88 bridges, and twin one-mile long, three-lane tunnels. The project's GI stormwater controls include 70 wetlands that treat road runoff and create habitat for wildlife. In the US a few state transportation agencies are leading the way notably Maryland, Washington, and Oregon, as exemplified by the experience that Oregon DOT shares with us at this hearing today.

My third observation for today is the link between smarter stormwater management and highway safety. Permeable friction courses (PFCs) are a type of pavement that has been used in the United States since the 1950s. This asphalt mix creates a pavement with a large fraction of air voids, which allows water to pass through it and increases friction needed for vehicle braking during storms. Because water soaks into the pavement, PFCs reduce the dangers of splash, spray, and hydroplaning. In addition, PFCs are generally quieter than conventional pavements. PFCs boast water quality benefits and thus are part of the GI toolbox for highways. Researchers at the University of Texas, Austin and North Carolina State University showed that concentrations of total suspended solids from PFCs are more than 90 percent lower than from conventional pavement. The researchers also observed lower pollutant concentrations for total amounts of phosphorus, copper, lead, and zinc (Eck et al., 2012). PFCs are not applicable in every road but where they are, the combination of improved safety and water quality benefits is a significant benefit of GI that is unique to highways.

My fourth and final comment relates to economic aspects associated with the application of GI to highways. Higher cost of "green" highways is often an argument cited against GI. Yet, experience in Scotland suggests that GI can reduce construction costs between 15 and 25 percent (WSP, 2008). Excessive and costly maintenance is another argument against GI deployment in highways. However, properly selected GI devices may be maintained easily as part of road maintenance programs and the cost is comparable to or lower than that associated with maintenance of conventional road drainage (CIRIA, 2003). A fair evaluation of GI projects needs to be based on a whole-cost analysis that considers capital expenditures and operation and maintenance. Moreover, there are other benefits of the GI approach that are more difficult to quantify but are no less real, for instance, better water quality, stream protection, ecosystem improvement, recreation, and aesthetics.

A common sense, tiered approach offers a cost-effective framework to improving our highways with GI. New highways can be designed and built with our current GI know-how; existing highways can be retrofitted as part of reconstruction or resurfacing efforts. In highways where GI is not feasible or cost-effective, allowance of GI projects outside of the right-of-way will offset the impacts.

GI application to highways also represents job creation for a variety of occupations including transportation planners experienced in sustainability, engineers with expertise in GI, contractors trained in installation of GI devices, and maintenance crews knowledgeable of the proper procedures applicable to

GI. These skills already exist in the industry, are constantly honed, and are waiting for the opportunity to expand to highways.

Conclusion

In conclusion, runoff from roads contributes to the problems that other urban development causes on our streams and lakes but the United States has the technology and expertise to improve this aspect of our highway system. GI is a proven approach that we can bring to bear on our highways to enable cleaner water, safer roads, and fewer economic losses due to flooding.

The highway reauthorization bill presents an excellent opportunity to promote sustainable practices in highway runoff management. These practices will not increase the cost of transportation projects or delay their implementation, and will lead to job creation and better and more durable infrastructure.

On behalf of Atkins and the Water Environment Federation, I thank Chairman Cardin, Ranking Member Boozman, and the Subcommittee for the opportunity to testify today. I welcome any questions you may have.

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