

SOLVING POLLUTION PROBLEMS

Eastern High is a new school for secondary and further education in Cardiff and is the first site in the UK to use SDS Aqua-Filter™ separation and filtration units.



Daventry International Rail Freight Terminal (DIRFT) is the UK's largest rail-linked logistics development and features multiple SDS Aqua-Swirl™ hydrodynamic vortex separators.

London Luton Airport is equipped with SDS Aqua-Swirl™ AS-8 separators, the largest units supplied to date by SDS.



POLLUTION TREATMENT SOLUTIONS



The Knowledge



Among the pollutants that wash away from roads are polyaromatic hydrocarbons

Getting to Grips with... highway pollution



JO BRADLEY
MARKET DEVELOPMENT MANAGER
SDS LTD

Pollution from urban highways, trunk roads and motorways poses significant risks to the environment from toxic metals and hydrocarbons that are carried in surface water runoff. The risks are well-documented and the regulatory tools are in place, yet outfalls are inconsistently monitored and controlled. Here, we look at tools and techniques available to tackle the problem.

HIGHWAY RUNOFF Q&A

Q: How does road runoff affect water quality?

A: Rainwater washes pollutants from the road surface into the drainage network and, during peak and prolonged rainfall, into the receiving rivers and streams. Although highway runoff is frequently considered as diffuse pollution, it's more often point-source outfalls that lead to cumulative, chronic pollution and build-up at the bottom of rivers and streams.

Q: What causes the pollution?

A: The pollution is caused by tyre erosion, dust from brake and clutch pads, engine wear, exhaust emissions, and oil and fuel leakages. Suspended solids settle out in rivers and streams, blocking up gravel where fish spawn and limiting light penetration. Hazardous

pollutants are bound to the sediment and dissolved in the surface water.

The pollutants of most concern for the aquatic environment and also for human health are metals, particularly copper and zinc, and a spectrum of chemicals known as polyaromatic hydrocarbons (PAHs), including benzo[a]pyrene.

A WRc monitoring study, conducted between 1997 and 2002 on behalf of the Highways Agency (now Highways England) together with the Environment Agency (EA), established a list of 'significant pollutants' in highway runoff and, in Europe, the Water Framework Directive sets out Environmental Water Quality Standards (EQSs) for some of these significant pollutants. The data from the WRc monitoring study revealed that the EQSs are often exceeded in runoff from busy trunk roads and motorways.

The Knowledge Getting to Grips with... highway pollution



Motorway outfalls mean that highway run-off can often be a point source, rather than a diffuse, pollution problem

Q: What is the extent of the water pollution?

A: A key challenge is that the data used to show levels of current pollution is limited and there is little evidence of its cumulative effects. For example, in England the EA does not routinely monitor for benzo[a]pyrene in the water environment. However, the Highways Agency Water Risk Assessment Tool (HAWRAT) was developed as a model to remove the need for expensive and time-consuming monitoring and to indicate a risk of failure of water quality thresholds. HAWRAT concludes that more than 2500 outfalls in England pose a very high or high risk of pollution. Assuming the outputs from the model are reliable, the risk of water pollution is very real and extensive.

Q: Who is responsible?

A: Ownership of highway outfalls in the UK is spread across Highways England, Transport Scotland, the Welsh Government, Transport Northern Ireland, local highways authorities, private land owners and Water and Sewerage Companies (WASCs). In urban areas, runoff from local authority roads frequently ends up in a surface water sewer owned by the WASC. Vehicle manufacturers, road users and governments all have a responsibility to take steps to reduce the pollution being generated in the first place. The introduction of hybrid and electric vehicles, for example, will reduce the levels of pollution from hydrocarbons.

Q: How effective is regulation?

A: There is a patchwork of regulations covering the devolved regions of the UK, which is enforced to a lesser, or greater, degree. Scotland is the most advanced, and successful, in applying Sustainable Drainage Systems (SuDS) under the Water Environment (Controlled Activities) Regulations (2011). SuDS are common on runoff outfalls and there is an extensive network of filter drains across the road network.

In England and Wales, the Environmental Permitting Regulations (2016) give the regulators powers to require highways authorities to apply for a permit where there is a risk of water or groundwater pollution. In practice, the regulators mostly rely on voluntary improvements and, while it's encouraging that treatment schemes are being introduced on the highest risk outfalls without permits, such interventions are limited and

inconsistent and no monitoring is taking place to see if they are adequate.

Q: What treatment solutions are available?

A: When people think of SuDS, they tend to think of vegetative, above-ground features. However, a well-designed SuDS scheme for highway runoff will include a selection of SuDS devices which encompass a toolbox of above and below-ground components, engineered to meet the water volumes, flows and level of pollution appropriate to the site. SuDS designs should consider vegetative devices initially because of the advantages to biodiversity. Features like filter drains, ponds, swales and detention basins can sometimes be effective in slowing flows and capturing pollutants individually but, in other cases, a management train of SuDS components may be needed.

For example, where the highway runoff is grossly polluted, or where space is at a premium, manufactured devices, such as vortex separators, address high concentrations of gross pollution including litter, debris and high sediment loads. They can facilitate the use of vegetative devices and protect their efficient operation. For example, installing an SDS Aqua-Swirl prevents ponds from filling with contaminated sediment and protects

sediment forebays at the inlet from clogging.

Q: How much maintenance is required?

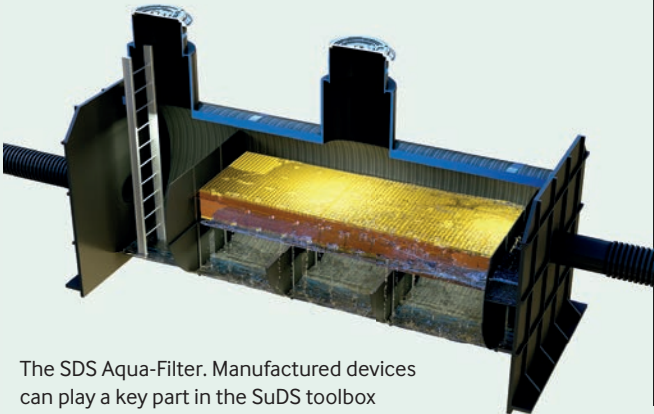
A: Insufficient maintenance can be the 'Achilles heel' of SuDS and it is essential that every device, whether vegetative or manufactured, is maintained and operated properly, or it will quickly become ineffective. Manufactured devices offer the advantage of predictable maintenance regimes as well as measured and proven performance. Under field test conditions completed in 2012, the SDS Aqua-Swirl achieved 80% removal of total suspended solids, where a large unit was installed to allow for infrequent, large storm events.

When smaller units are installed to treat more frequent, smaller rainfall events, removal efficiencies of 50% total suspended solids are achieved and offer a significant improvement in runoff quality. On more challenging sites, or where space is at a premium, a hydrodynamic vortex separation and filtration system, such as the SDS Aqua-Filter, can be installed to reduce the copper and zinc pollutant load.

Q: What happens next?

A: While Westminster has been preoccupied with legislating for SuDS in new development through planning, more stringent regulation and penalties are routinely applied to control water quality discharges by WASCs from wastewater treatment. As we move towards developing a new legal framework and a 25-year plan for the environment post-Brexit, improved monitoring and control of highways must be a priority.

► **About the author:** Before joining SDS, Jo Bradley worked for much of her 25-year career at the Environment Agency, identifying and preventing pollution in highway run-off.



The SDS Aqua-Filter. Manufactured devices can play a key part in the SuDS toolbox