Pollution from roads and highways: hidden contaminants from hard surfaces

Jo Bradley

Stormwater Shepherds UK

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We know that highway runoff causes pollution

We have sampled that outfall during rain events

- It is visually very clear that the river is more polluted downstream of the motorway outfall that it is upstream.
- In small streams and rivers, the discolouration and associated pollution can affect the entire width of the river.

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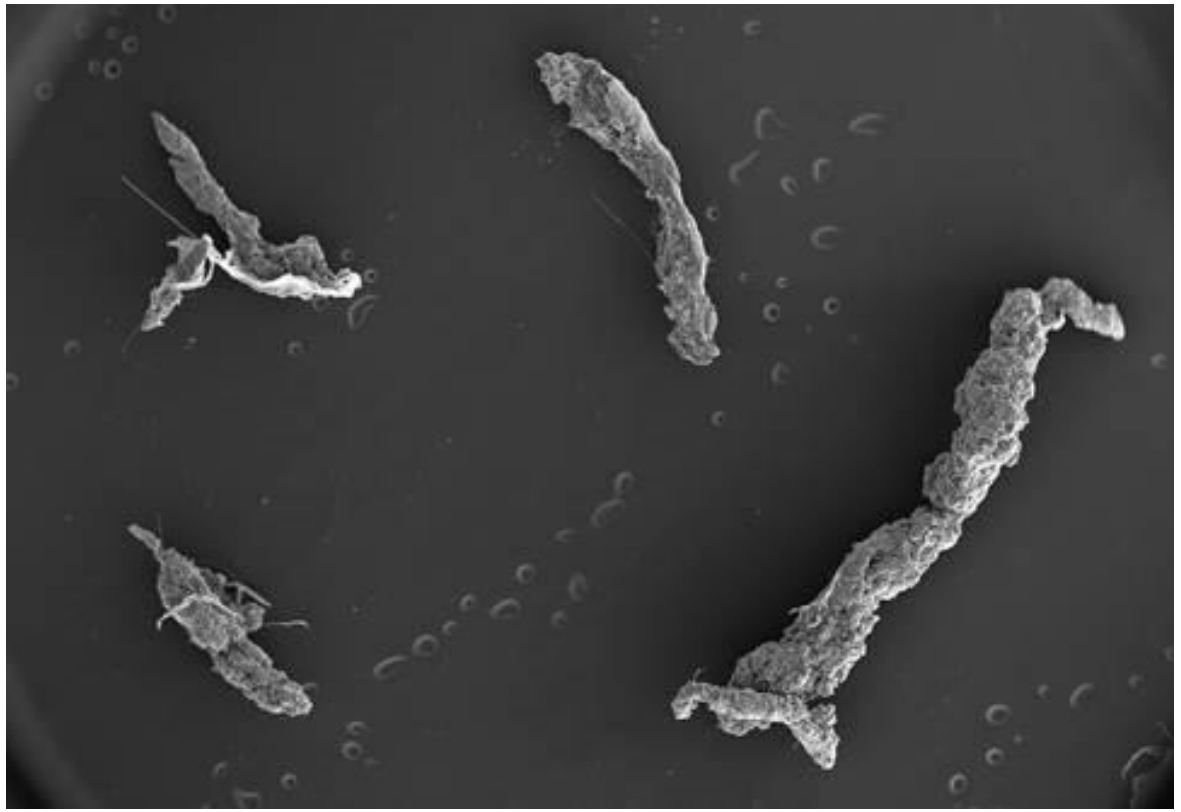
Customer Sample Ref.		Motorway Outfall to R Lostock Spot Sample	River Lostock downstream of outfall	River Lostock Upstream in park 1	Environmenatal Quality Standard	
Analyte	Units				Maxmimum Allowable Concentration µg/l	Annual Average Concentration ug/l
Mercury, Total as Hg	mg/l	N/S	0.00006	N/S	0.07	
Total Suspended Solids	mg/l	490	114	2		
Anthracene	ug/l	0.385	0.0456	0.00657	0.1	
Benzo(a)pyrene	ug/l	2.6	0.353	0.0243	0.27	0.00017
Benzo(b)fluoranthene	ug/l	2.49	0.477	0.0436	0.017	
Benzo(g,h,i)perylene	ug/l	2.35	0.416	0.0188	0.0082	
Benzo(k)fluoranthene	ug/l	1.44	0.216	0.0136	0.017	
Fluoranthene	ug/l	6.01	0.837	0.0886	0.12	
Naphthalene	ug/l	0.119	0.0158	<0.01	130	
Cadmium, filter as Cd (ug/l)	ug/l	0.11	0.05	<0.02	0.9 (Class 4)	
Copper, filter as Cu (ug/l)	ug/l	12	11	<4.0		1 bioavailable
Lead, filter as Pb (ug/l)	ug/l	<0.30	0.45	0.34	14	
Zinc, filter as Zn (ug/l)	ug/l	60	37	5.6		10.9 bioavailable

The pollutants in highway runoff

- The pollutants of concern include:
  - Toxic metals, particularly Copper and Zinc
  - Microplastic tyre wear particles
  - Polyaromatic hydrocarbons
- These pollutants cause harm to aquatic organisms that live in rivers and streams.
- They can also cause harm to human health.



Tyre wear particles Credit: Parker-Jurd et al 2020 and Plymouth Electron Microscopy Centre

But these pollutants cause harm to river health

- They cause mutations and deformities that affect survival and growth
- They disrupt cardiac function
- They affect bone & liver metabolism
- They prevent effective reproduction, they can cause abortion and they prevent embryos from developing.
- They are carcinogenic and lead to failure to mature.
- They can cause death.

They affect the river ecosystem

- The insects that live in our rivers and streams are an essential part of the ecosystem of the British countryside.
- These insects hatch out in Spring as birds and bats are feeding their young, and if the insect populations crash, the birds and bats suffer.
- This contributes to the wider problem of biodiversity collapse.

Image credit: Paul Marfell Flikr

Protection of groundwater

- This pollution is taking place in groundwater too, but it isn’t being measured.
- The effects of this pollution on groundwater isn’t properly understood.
- Some roads, including motorways, drain directly into the ground and there has been too little research into the fate of these pollutants.

For more detail, read our recent report

Stormwater Shepherds UK and CIWEM recently published a comprehensive report on pollution from highway runoff. The creation of the report was kindly sponsored by the Rees Jeffrey's Road Fund.

You can download the report here, free of charge: https://www.stormwatershepherds.org.uk/2024/05/08/bold-new-report-on-pollution-from-highway-runoff-to-raise-awareness-of-the-problem-and-possible-solutions/

Rees Jeffreys Road Fund

What is the legislative framework in England?

- The discharge of poisonous matter into a river is a strict liability criminal offence.
- One of the defences against this offence is that the discharge is made in accordance with a Permit to Discharge.
- The Permit conditions would identify the levels of pollutants that could persist in the discharge whilst preventing pollution downstream of the outfall. But the regulators do not control these discharges using Permits.
- If they did, that would drive the installation of treatment schemes at thousands of outfalls and reduce river & ocean pollution.

How should they be controlled across Europe?

- Because these discharges contain levels of priority hazardous substances in excess of the Environmental Quality Standards, all the environmental regulators should be controlling these discharges so that their waterbodies meet the EQS|MAC at all times.
- This doesn't happen.
- MAC = Maximum Allowable Concentration

How should it work?

- We should measure for this pollution where we know it might be a problem.
- Then reflect the pollution in the River Basin Plan.
- Then serve notice on the worst outfalls so that they have to apply for a Permit.
- Use the Permit to dictate the amount of treatment needed.
- Monitor compliance with the Permit and operation of the treatment system.
- If every European country did this, we could see our rivers recover.

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- Feel free to call me if you have any questions
- Please follow me on Twitter  @ stormwater_jo
- And on LinkedIn 
- Visit our website, and maybe make a donation stormwatershepherds.org.uk
- jo.bradley@stormwatershepherds.org
- Tel: 07799 380 523