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Is highway runoff causing water pollution in Somerset?

Jo Bradley

Stormwater Shepherds UK

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We are a Charity dedicated to the reduction of pollution from urban surfaces, including microplastics and plastic litter

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We know that highway runoff causes pollution

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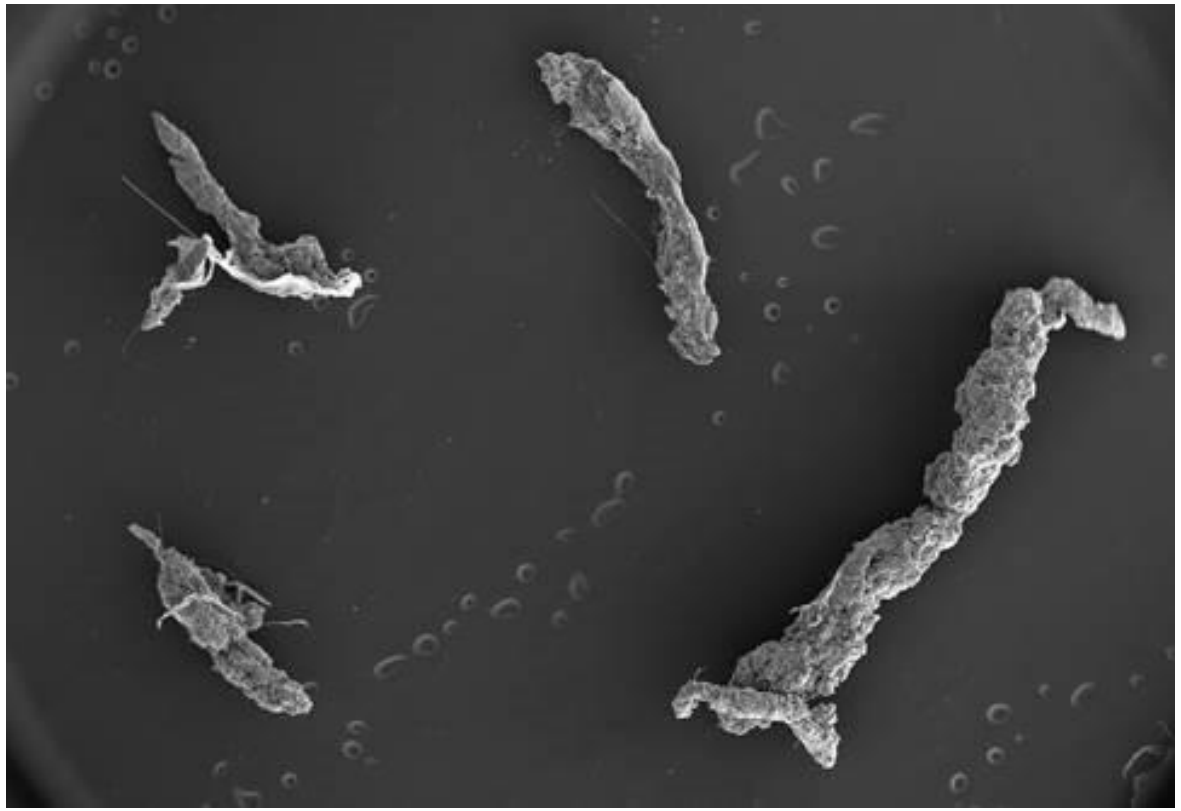
Customer Sample Ref.		Motorway Outfall to R Lostock Spot Sample	River Lostock downstream of outfall	River Lostock Upstream in park 1	Environmenatal Quality Standard	
Analyte	Units				Maxmimum Allowable Concentration µg/l	Annual Average Concentration ug/l
Mercury, Total as Hg	mg/l	N/S	0.00006	N/S	0.07	
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

Don’t forget Faecal Indicator Organisms either

- FIO levels in highway runoff haven’t been investigated much.
- But when they are, the levels are breathtaking.
- So how is that affecting bathing waters?
- Why is no-one investigating this?
- And where are the FIOs coming from?
- Are gully pots creating incubators for these organisms?

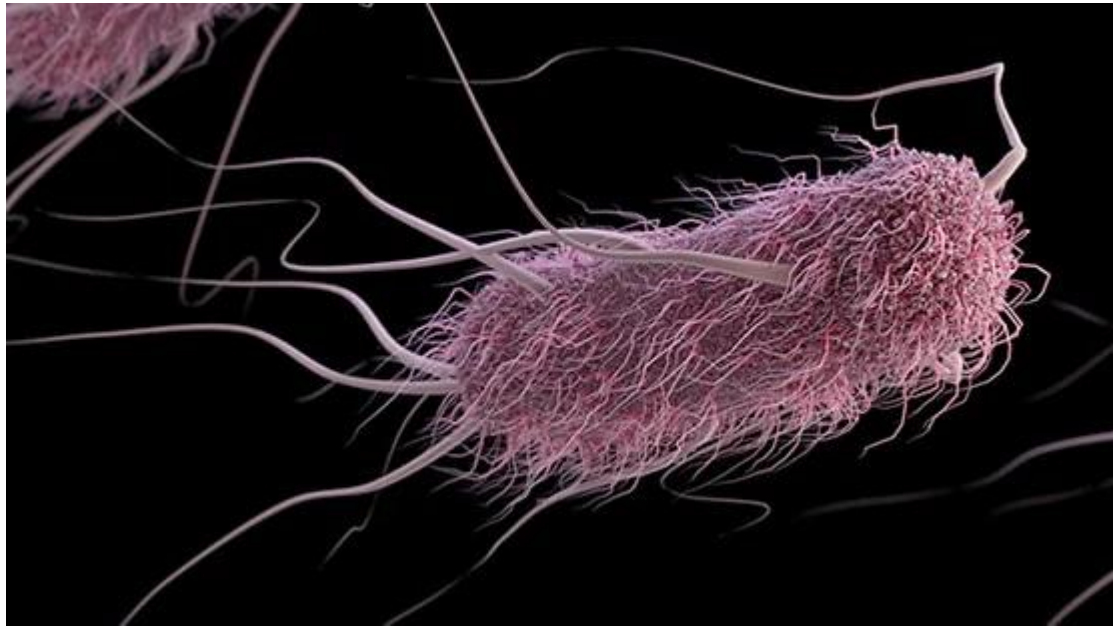
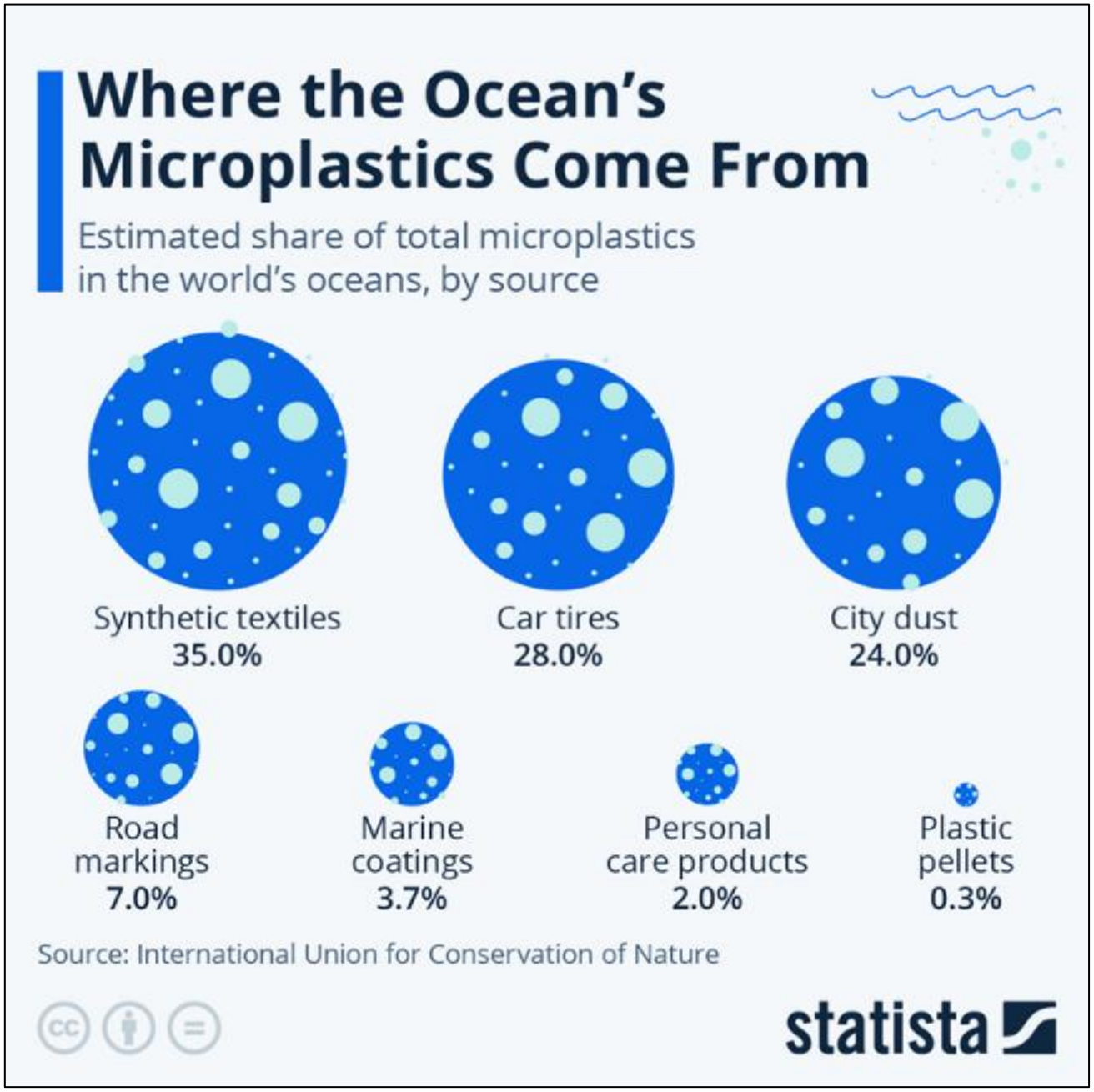


Image from US centre for disease control and prevention

And we're not even measuring microplastic tyre wear particle pollution. But particles from roads are the largest global terrestrial source of microplastics in our oceans.




Dr Richard Kirby @PlanktonPundit · Oct 8
This must be seen to be believed. An arrow worm in the plankton tries to eat our rubbish and chokes on a plastic microfiber. @zeiss_micro
The arrow worm is eating
the plastic microfiber.
0:43
4
10
2.2K

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?

- 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.

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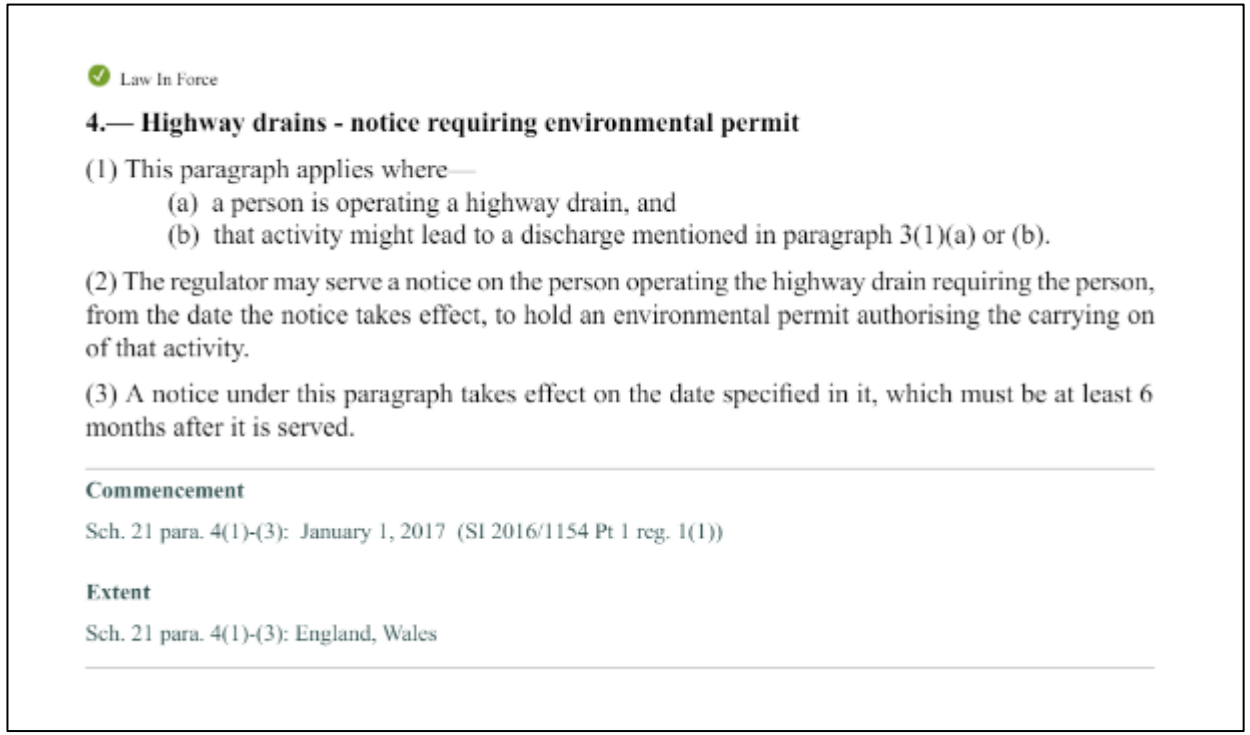
How are they controlled?

- Because these discharges contain levels of priority hazardous substances in excess of the Environmental Quality Standards, they should be monitored and then controlled by a Permit which dictates the levels of pollution that can be present in the discharge.
- This doesn't happen.



Law In Force

4.— Highway drains - notice requiring environmental permit

(1) This paragraph applies where—

(a) a person is operating a highway drain, and

(b) that activity might lead to a discharge mentioned in paragraph 3(1)(a) or (b).

(2) The regulator may serve a notice on the person operating the highway drain requiring the person, from the date the notice takes effect, to hold an environmental permit authorising the carrying on of that activity.

(3) A notice under this paragraph takes effect on the date specified in it, which must be at least 6 months after it is served.

Commencement

Sch. 21 para. 4(1)-(3): January 1, 2017 (SI 2016/1154 Pt 1 reg. 1(1))

Extent

Sch. 21 para. 4(1)-(3): England, Wales

Protection of groundwater

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

What can local groups and Catchment Partnerships do to manage this pollution?

- The Catchment Partnerships, Wildlife Trusts, Rivers Trusts, and river action groups are all perfectly placed to gather evidence about this pollution.
- Use that evidence to persuade the Agency to include the pollution in the River Basin Plan.
- Work with highway authorities to deliver treatment schemes.

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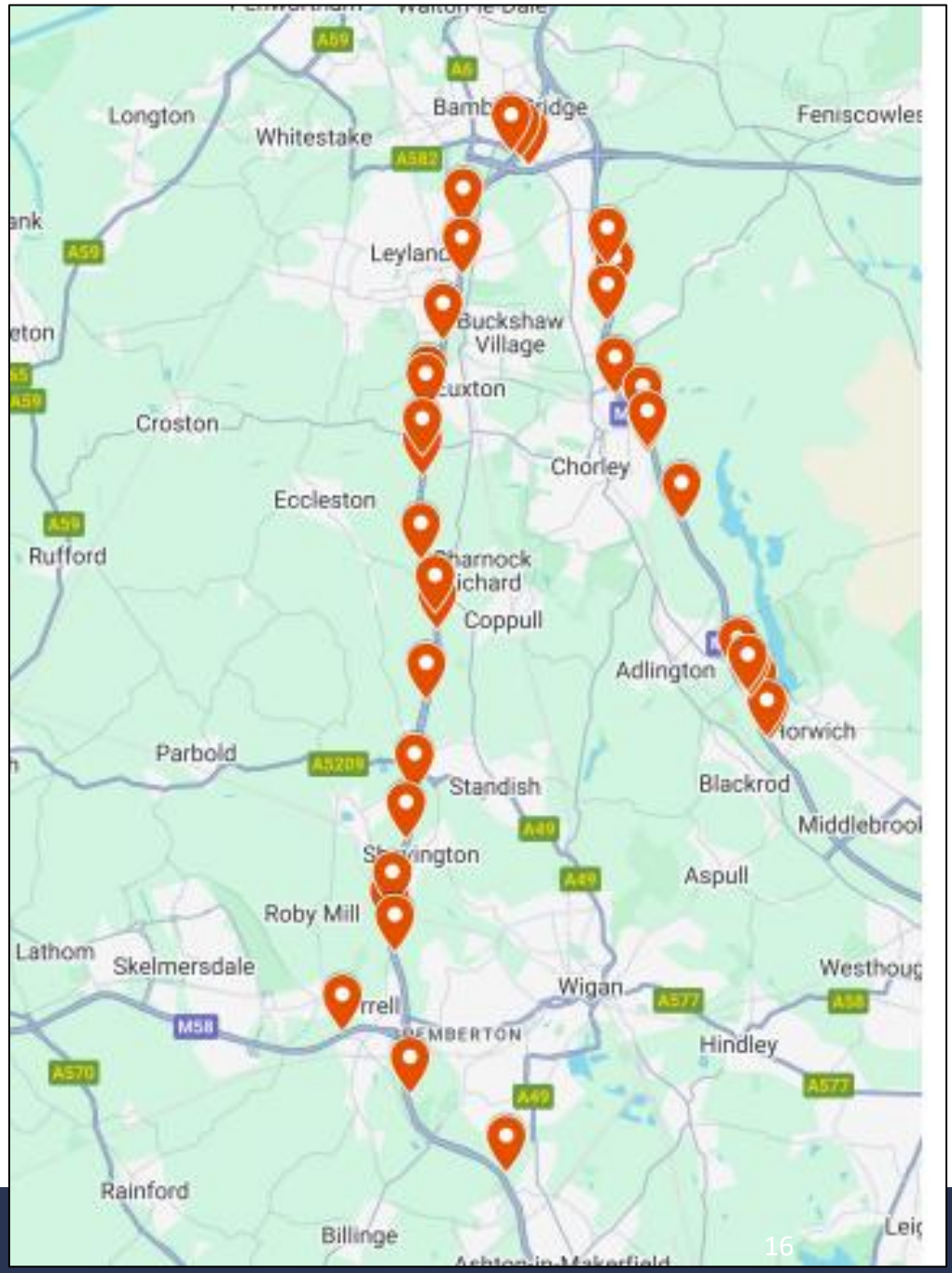
Motorway outfalls on the River Douglas catchment



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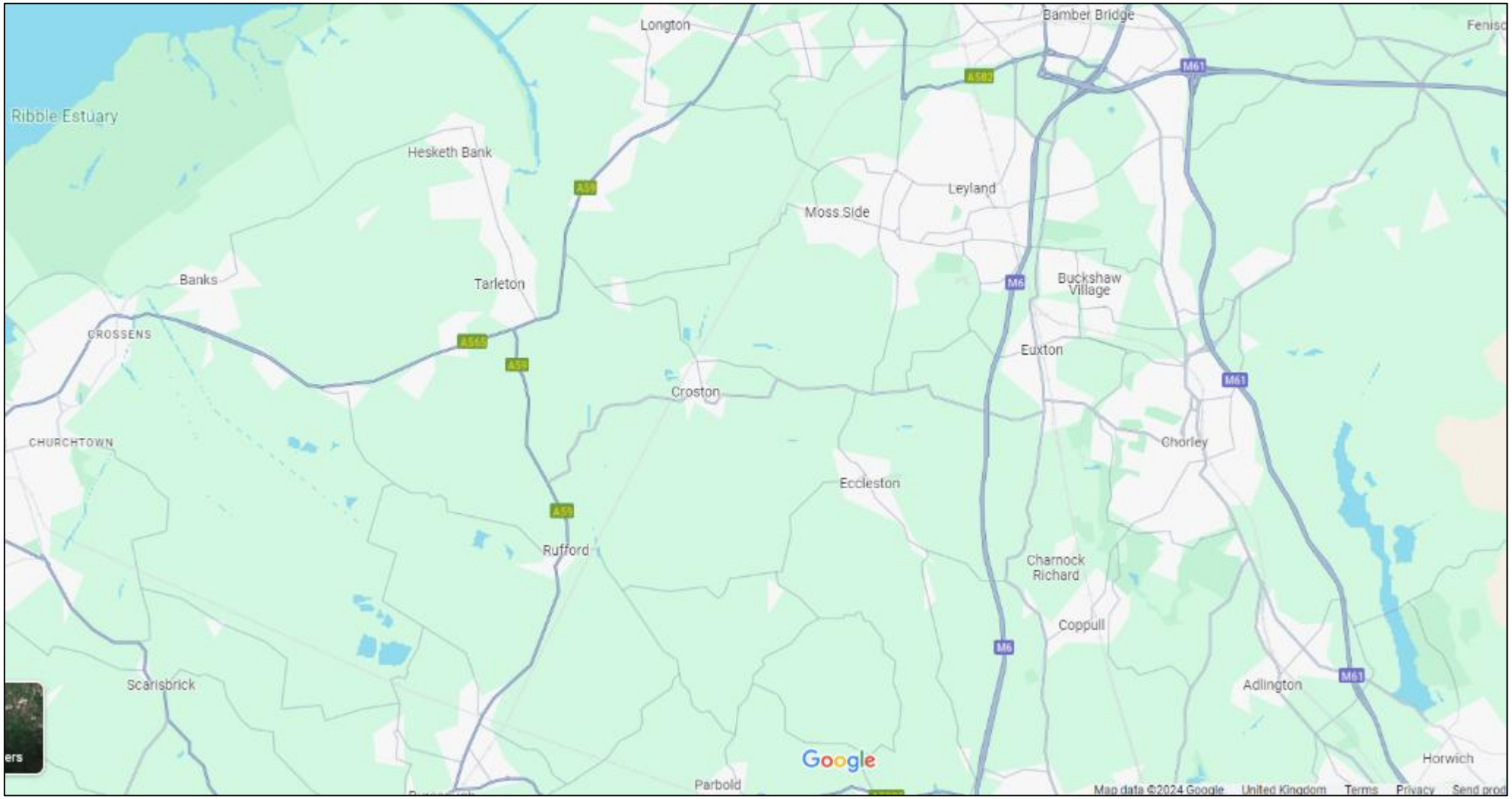
But there are all the other roads too



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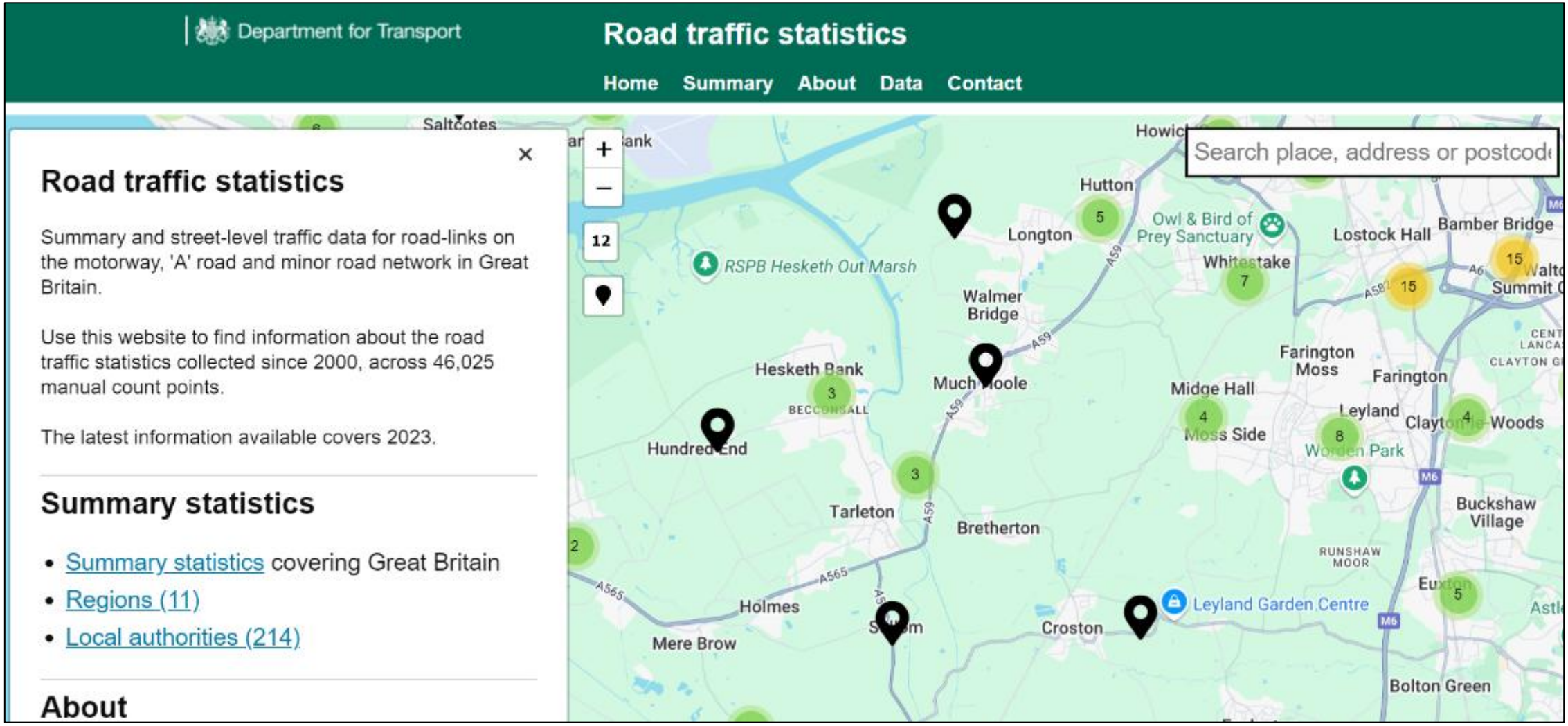
Find out the traffic density



https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints

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Annual Average daily flow

Year	Count method	Pedal cycles	Two wheeled motor vehicles	Cars and taxis	Buses and coaches	Light goods vehicles	Heavy goods vehicles	All motor vehicles
2019	Estimated using previous year's AADF on this link	81	175	18774	138	3220	910	23217
2018	Manual count	67	163	18733	140	3231	908	23174
2017	Estimated using previous year's AADF on this link	106	188	19877	187	3909	1162	25322

M6 to River Lostock

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M6 to Syd Brook

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Sampling at Grimeford Lane

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Cumulative effect every time it rains

- There are roughly 40 motorway outfalls and scores of local authority highway outfalls.
- Together they all discharge a significant load of pollutants into our rivers and streams every time it rains.
- The pollutants build up in the sediments in the river and are mobilised when it rains.
- Some of the toxins degrade, but other don’t; they build up in the sediment and the associated ecosystem.

Measuring pollution

- The Environment Agency don't have any monitoring points that are located specifically to measure pollution from highway runoff.
- They don't routinely monitor for Polyaromatic Hydrocarbons in many waterbodies.
- Many of the WFD classification monitoring points are far downstream of the highway outfalls.
- Monitoring will only detect this pollution if it is carried out during rainfall.

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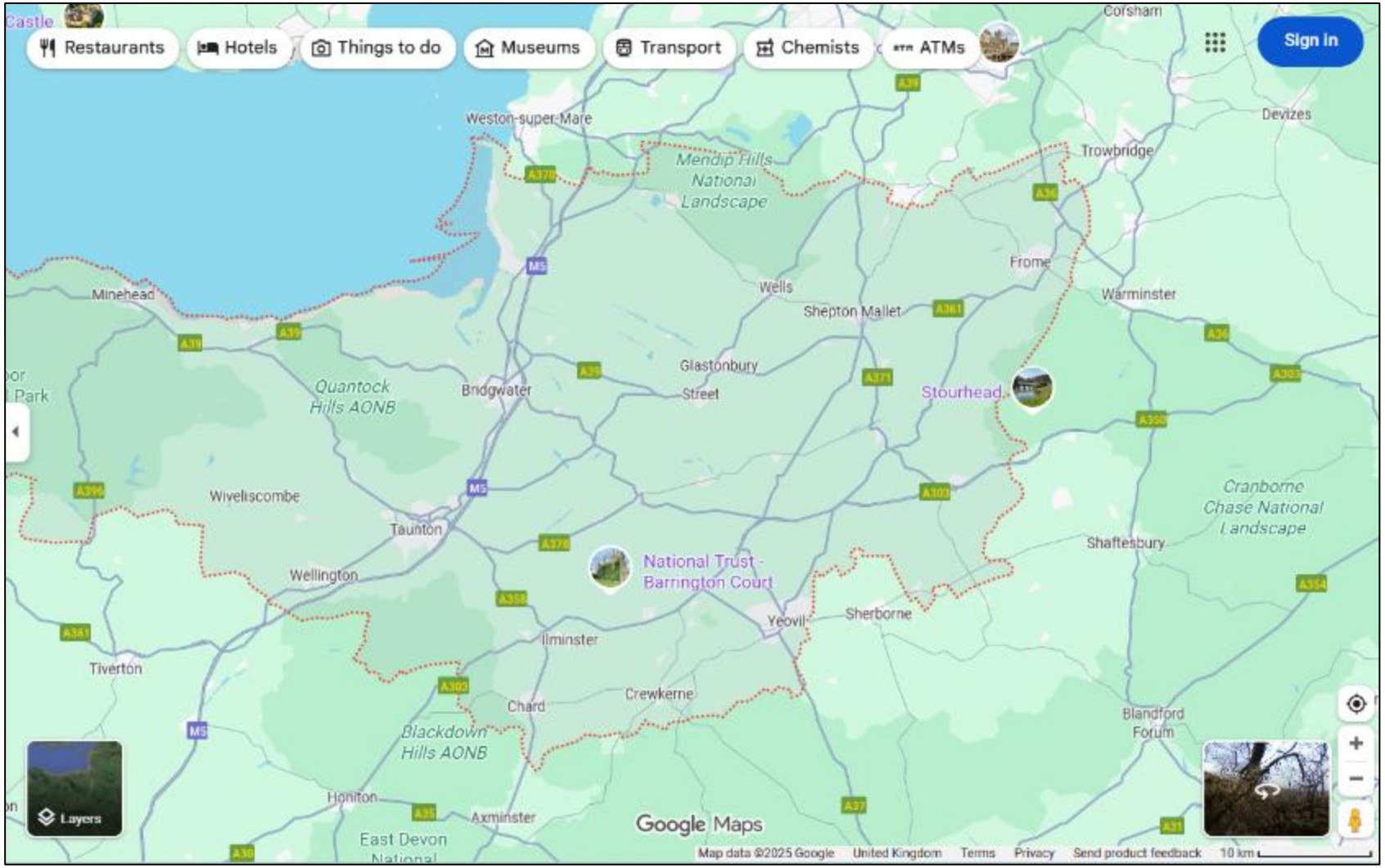
So how is this affecting Somerset?



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The M5 is a significant source of pollution

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Some stretches show multiple outfalls like this

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Others show clusters round a river.

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And some are marked in red as high risk outfalls (although that may be out of date)

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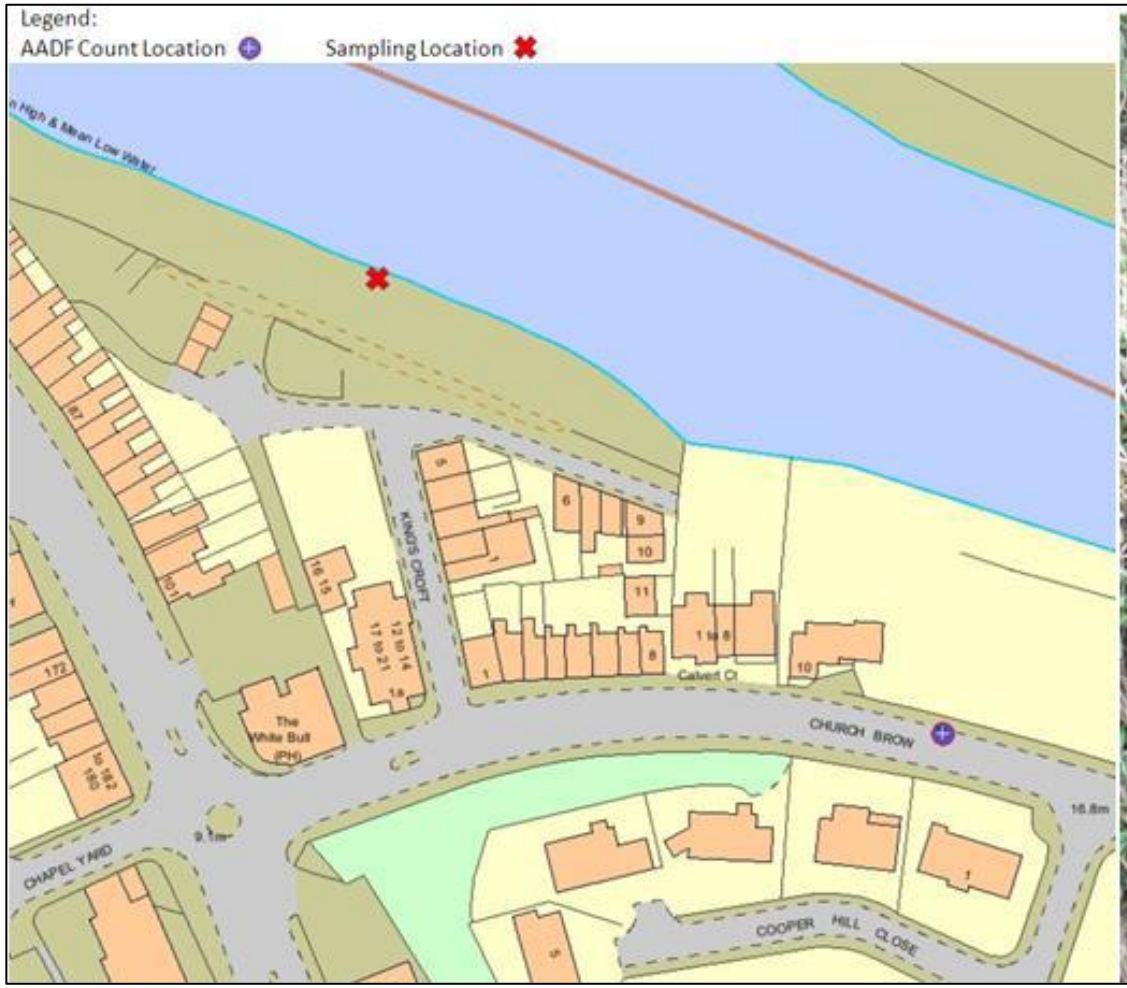
Church Brow, Walton-le-Dale



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And this is what really matters

Date/Time		12/04/2024:11.30am	12/04/2024: 12.40am	15/04/2024: 10.20am	15/04/2024: 1200pm
Site number/location		1; u/s Town Lane	2; Cuerden Valley park	3; Stag Lodge access	4; Todd Lane
Caddis Flies	Caseless	0	6	4	0
	Cased	7	10	12	0
Upwinged Flies	Baetidae (Olives)	50	20	35	15
	Ephemeridae (Mayfly)	0	20	2	0
	Ephemerelleidae (B.W.O)	12	0	0	0
	Heptageniidae (Yellow May	50	50	75	40
Stoneflies	Stoneflies	2	0	0	0
Shrimps	Shrimps (Gammarus)	0	2	1	0
Leeches	Leeches	6	4	2	1
Snails	Snails	0	0	1	0
Hog Louse	Hog Louse	1	0	0	0
Saucer Bugs	Saucer Bugs	0	0	0	0
Score		**8**	**10**	**9**	**4**

If we want to restore river health across the catchment, we have to reduce this pollutant load

- There is loads of work going on across the Douglas catchment to restore river habitats, to remove barriers to fish, to reduce sewage pollution and to engage with local people.
- This has to be ‘underwritten’ by improvements in water quality and control of toxic discharges, or it won’t successfully restore the river.
- We need to work out the pollutant load from highway outfalls, find the ones that can be fixed most readily, find the money and get on with it.

How can the Rivers Trusts and Citizen Scientists help?

- Collecting evidence of pollution, even just visually, is excellent.
- Riverfly surveys can identify harm.
- Chemical samples can identify illegal levels of hazardous substances
- Local knowledge can start to identify locations and opportunities for solutions.
- Use membership of Catchment Partnerships to influence inclusion of highway outfalls in River Basin Plans.
- We have written a short guide – message me if you'd like a copy.

We know how to treat the pollution from highway runoff. We just need to get on with it!

Retrofit raingardens are excellent for treating road runoff from low and (sometimes) medium risk surfaces.

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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