Severn Trent Water

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Dear Mary

Thank you for the opportunity to contribute your ongoing enquiry on the environmental impact of microplastics.

Reponses to the five specific questions posed in your letter are set out below.

1. Q. **Are the standard treatments applied by your water and sewage plants able to trap very small particles such as microplastics?**

   A. Based upon the description of the issue in the paragraph immediately preceding question 1 in your letter of 26th May, we have presumed that this question is specifically referring to sewage treatment plants and have therefore responded accordingly.

   Sewage treatment works are not specifically designed to remove microplastic material. However there is empirical reason to believe that some of the treatment processes employed will be effective at capturing a reasonable proportion of <5mm plastic material entering a works. A key element of the sewage treatment process is solid/liquid separation, so we would expect that existing processes will trap a proportion of incoming microplastic. Effectiveness of removal will be governed by the physical properties of the mircoplastics themselves, such as particle size, shape and density.

   All sewage works will have at least one settlement stage that is specifically designed for solid/liquid separation. Sites with tertiary solids removal processes, such as sand filters, will trap a significant percentage of

microplastics carried over from settlement stages, but not all sites have this level of treatment installed.

Further information on the processes by which microplastics will be captured by existing treatment processes is included in our response to question 3.

2. Q **Do you currently measure plastic pollution in your treatment works?**

   A. We do not routinely measure plastic pollution at our sewage treatment works. However, we are facilitating research in this area that is being carried out by Brunel University by providing access to our Derby sewage works for sampling. Brunel University published research last year on analytical techniques for the identification and quantification of microplastics in wastewater and there is an ongoing research project at Brunel on 'the fate of microplastics in the waste water treatment process'. This is a 3.5 year NERC CASE studentship PhD - lead supervisor Dr JJ Ojeda.

3. Q **What technical challenges are there to capturing and treating microplastics? (E.g. Filtration)**

   As plastics are generally fairly buoyant, some less dense microplastic material is likely to be captured by existing scum removal processes (which essentially skim off floating material) fitted on primary settlement tanks. Also, some denser plastic material may settle out in primary and/or secondary settlement tanks. The closer the material is to being of neutral buoyancy in water, the less effective the settlement tank process will be. Settlement tanks are also unlikely to be effective at trapping micro-fibres.

   Standard tertiary treatment sand filters will capture a high proportion of any remaining mircoplastics carried forward from settlement tanks, although effectiveness will diminish with reducing particle size and they are unlikely to be effective on particles smaller than 50 microns. Other tertiary solids removal processes will also filter out microplastic particles but all will exhibit a similar reduction in effectiveness with declining particle size.

   Whilst the various standard treatment process currently employed will trap a proportion of microplastic material entering a sewage works, capture rates will be below 100%, and a proportion of the material will therefore be entering the aquatic environment.

To effectively capture very small particles, and hence ensure a capture rate approaching 100%, some form of membrane filtration process is likely to be required. This process is considerably more expensive than conventional treatments and will have a much higher energy demand.

It is important to note that the processes employed at a sewage works will not be providing any treatment as such in respect of microplastics. These materials are essentially biologically inert (hence the reason why they are accumulating in the environment) and the limit to what can be achieved within a sewage works is essentially to separate microplastics out of the final effluent stream and transfer them into the sludge treatment and disposal stream.

4. Q **We heard concerns that microplastics in sewage sludge may be spread on to land and may wash back into the rivers and oceans. What methods do you use to prevent captured microplastics from spreading into the rivers/oceans?**

A. 100% of the sludge bioproduct generated by Severn Trent Water is safely recycled to land. Whilst there are no specific measures targeted at preventing microplastics in sludge from washing back into rivers, there is an industry wide code of practice [the DEFRA published Code of Practice for Agricultural Use of Sewage Sludge] in place that covers the recycling of bioproduct to land. This code covers protection of the aquatic environment.

Measures adopted to comply with the code of practice will include not applying bioproduct to land during winter months, when the risk of run off is greater, and not applying sludge in close proximity to watercourses. The practices already in place to protect the environment from any adverse effects of sludge being washed into watercourses should be equally effective at controlling the movement of microplastics.

5. Q **What practices could be taken to tackle the discharge of microplastics? Are you implementing or considering implementing any of these?**

A Where possible, we would advocate that options for source control should be investigated in preference to 'end of pipe' treatment solutions. To this end, we would propose that steps to end the use of microplastics in personal care products be implemented. We understand that legislation to this effect

has recently been enacted in the USA and we would suggest that the UK government / the EU give due consideration to adopting a similar approach.

With regards to control of microfibers, we would suggest that the viability of installing microfiber filters on washing machines is worthy of serious consideration. We would therefore recommend that the government engage with manufacturers to determine if a source control approach could be viable and effective.

Tackling more diffuse sources of microplastic such as from vehicle tyres does present a more significant challenge. With the exception of urban areas that are served by combined foul and surface water sewers, debris from tyres will generally enter watercourses via highway gullies & drains and/or surface water sewers, not through sewage treatment works. Any technical solutions installed on sewage works will therefore be of limited effect when dealing with this source of microplastic. In the first instance, we would suggest that further research be undertaken to understand what effects this type of microplastic has on the environment.

On pages 70 and 73 of our 2015 publication "Charting a Sustainable Course", we make reference to the need to protect our customers from the cost of addressing pollution issues created by other parties through adoption of the 'polluter pays' concept. We believe that the principle of 'polluter pays' should be applied to microplastic control. If 'end of pipe' control proves to be the most effective strategy, we would suggest that due consideration be given to introducing some form of levy on the manufacturers of the various products that contain/give rise to microplastics to help fund the sewage treatment (and highway drainage) improvements that would be required.

In the event that source control options prove to be infeasible, options do exist for installing microplastic removal processes at sewage treatment works. In order to capture the smaller, sub 50 micron particles this is likely to require some form of membrane filtration. Widespread adoption of 'end of pipe' control of microplastics using membrane filtration at sewage works will be very expensive. Capital and operational expenditure costs for membrane filters are high when compared to more conventional treatment and the process also has a high energy demand / carbon footprint. End of pipe treatment could therefore impose a significant cost burden upon our customers.

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We are not currently implementing any specific measures to control the discharge of microplastics in sewage works effluent. However, in the course of implementing environmental legislation such as the Water Framework Directive and the Urban Wastewater Treatment Directive, the number of sewage treatment works equipped with tertiary solids removal has been, and will continue to be, increased. This will drive some reduction in the amount of microplastics discharged to rivers in sewage effluent.

Yours sincerely,

Mark Craig

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