2021 River Basin Management Plan

Pollution from water industry wastewater Published: October 2019

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1. Summary

The water industry plays a vital role in providing a safe and reliable wastewater service that protects people and the environment. Properly treating and transporting wastewater is essential for all of us but needs to be done in a way that doesn't harm the natural assets that both companies, and wider society, rely on.

Water pollution in the past severely affected river catchments. But over the last 30 years investment by the industry, better regulation and closer working with communities has changed things. Treated wastewater returned to rivers and streams is now much cleaner. For instance there is 60 per cent less phosphates and 70 per cent less ammonia compared to 1995; overall pollution incidents are steadily declining; 98 per cent of bathing waters now meet minimum standards and businesses and the public are using water more efficiently.

But, the water industry remains one of the main reasons for water bodies not achieving good status in terms of water quality and ecology. The Environment Agency Environment Asset Performance Report (EPA) shows water companies also continue to be responsible for over 50 serious pollution incidents a year.

Water companies face challenges to the future resilience of their services and assets. More extreme weather, increasing urbanisation and population growth means that protecting the current state of the environment is likely to prove as difficult as improving it. New technologies may be required to deal with emerging pressures such as pharmaceutical residues and pollution from plastic and nano-particles.

Climate change remains one of the biggest challenges facing the industry. As the climate changes and water demand rises, so does the long term risk of severe water shortages. More extreme rainfall will increase wastewater with up to 50% more flow

expected through the sewers by 2050. These pressures will heavily influence the decisions and investments that water companies are taking now and in the future.

2. Water industry wastewater pressures

2.1 Discharges to water

The history of the water industry providing sanitation goes back over two hundred years. The water industry collects and treats domestic and trade wastewater. Anything flushed down the toilet; water from baths and showers and water from dish washing or sinks all goes down the waste pipe. Together this waste is called sewage and the water industry play an important role in collecting this sewage and ensuring it is treated before it is discharged to the environment. The water industry also collects rainfall, sometimes separately from wastewater, sometimes mixed with it. This makes the size of sewers complicated to design and the variability in the volume and strength of the sewage difficult to treat.

Wastewater is a problem because of the nutrients, chemicals and pathogens that it contains. These can greatly alter the state of any receiving water. Pathogens can affect bathing and shellfish waters. Further information can be found in the faecal contamination narrative. Phosphorus, is the top reason for water bodies not achieving good ecological status and the main cause of eutrophication in England's rivers and lakes. High concentrations cause excessive algal and plant growth which damages the ecology, quality and uses of waters.

Sanitary pollutant pressures are ammonia, dissolved oxygen (DO) and biochemical oxygen demand (BOD). Unionised ammonia is hazardous due to its toxic and sub-lethal impacts on fish and macroinvertebrates. A reduction in DO can cause stress and lethal effects on aquatic life. BOD is the amount of oxygen that organisms use for respiration. It is used as a measure of organic pollution. The higher the BOD, the greater the potential of organic waste to cause a drop in DO.

Aquatic organisms use DO in water for respiration as they feed on organic matter. In addition, the organic matter also reduces the light that can penetrate into the water (which reduces production of oxygen via photosynthesis). Ammonia is a decay product of nitrogenous organic wastes and of the breakdown of animal and vegetable wastes. The nitrification of ammonia in the aquatic environment contributes to reduce DO in rivers. Sewage, along with animal manure and slurry, is high in organic matter. We work closely with the water industry - and agricultural sector - to manage this pressure.

Wastewater problems aren’t just associated with discharges from sewage treatment works. Throughout the sewer network there are overflows that discharge either surface water or a combination of surface water and sewage during extreme rainfall events. There are approximately 15,000 of the combined sewer overflows (CSOs) and incidents from these have biggest impacts on rivers and coasts. Overflows remain associated with poor water quality at bathing beaches and shellfisheries. While the number sites failing water quality standards each year has dropped significantly wastewater discharges from the water industry continue to contribute to failures.

2.2 Managing deposits of sludge to land

All water companies produce sludge as part of their sewage treatment processes. This sludge can often be put to good use, for example as a soil conditioner or fertiliser on agricultural land. Its storage and spreading, however, requires careful control as misuse can result in damage to the environment. The treatment of wastewater to remove Phosphorus can make the sewage sludge produced more difficult to handle.

Water companies operate a variety of waste facilities to deal with the sludge produced, ranging from bio-waste treatment, landfill, biogas combustion, sludge incineration and transfer stations. The Urban Waste Water Treatment Regulations (UWWTR) requires reuse of sludge where practicable. We expect to see the development of new markets and the wider use of sludge, including renewable energy production via advanced anaerobic digestion (AAD).

The management of sewage sludge treatment and re-use should not cause pollution and must follow the Environmental Permitting Regulations (EPR) and/or the Sludge (Use in Agriculture) Regulations, as applicable. The activity should be done in accordance with the Defra Code of Practice for the Agriculture use of Sludge. It is important that sludge disposal and reuse is fully accounted for and integrated into farm nutrient budgeting to ensure proper reuse and to minimise pollution risk

Awareness, by the Environment Agency and others, has grown around changes in the complexity of both sludge generated by the water industry's treatment of wastewater treatment and their onward treatment and use of sludge. This has resulted in a current suspension of the EPA's Satisfactory Sludge Use/Disposal measure. The Environment Agency is working on developing a Sludge Strategy in order to address these changes and to manage a possible need for amendment to the regulatory framework used for the treatment and use of sludge. This use includes the final agricultural use of treated sludge (biosolids).

3. Addressing the challenges

3.1 How water companies protect and improve the environment

All those associated with the water industry, including most customers, are aware of how water company activities can affect the environment. Because of the risks, the industry is one of the most regulated sectors in the country. The three industry regulators: the Environment Agency, Ofwat and the Drinking Water Inspectorate, have different responsibilities but all have a duty to ensure that water companies' operations are sustainable and do not harm the water environment.

The licensed monopoly status of the water companies means there are strict controls on the services they provide. The prices they charge and the investments they make are determined through the business plans they produce every five years. These are influenced by what customers want and by what the companies must do to meet their environmental obligations. The Environment Agency supports the process by advising companies on their environmental obligations (Water Industry Strategic Environmental Requirements / WISER) and by producing a programme of environmental measures that companies include in their plans. This Water Industry National Environment Programme (WINEP) includes actions to investigate, monitor and reduce the impacts on the environment of discharges from sewage treatment works and from CSOs.

Water and sewerage company performance is reported on each year in the EPA. We will be revising our EPA reporting for 2021 -2025 to report against companies' achievement of WISER and in future we will be expanding our reporting to include metrics on water resources, waste treatment and flooding.

Having effective controls in place and a clear funding mechanism means there is a high degree of certainty that companies will complete their environmental programmes of work. However, the programmes themselves can be large scale, expensive and complicated. The 2015 river basin management plans estimate the cost to water companies and their customers of meeting the water body objectives at £10.5 billion. The majority of this relates to improvements needed to minister the impacts of wastewater.

In the updated 2015 river basin management plans we identified 42 water bodies at risk of being adversely impacted by pollution from sanitary determinands, 68 probably at risk and 70 probably not at risk. As a result of this planning, these identified pressures have been subsequently been addressed by water company measures implemented during PR14 (2015-2020). Table 1 shows the good match between planning and delivery, with improvement measures taking place at more than 90% of water bodies that were assessed as either at risk or probably at risk:

Table 1: 2015 assessment of the risk of sanitary pollution in water bodies and the action taken by the water companies as a result

Risk Categories	Water bodies	PR14 Measures
At Risk	42	38
Probably at Risk	68	64
Probably Not at Risk	70	11
Not at Risk	3596	8

The 2020-2025 WINEP contains some but not all of the measures that companies need to complete to help achieve river basin management plan objectives. A similar programme of work will be required for 2025-2030 if all of their obligations are to be meet.

Over the past twenty years water quality has been steadily improving in England and Wales, mainly through investment by water companies. Based on 2016 classification data, approximately nine per cent of assessed water bodies in England and Wales do not achieve good or high status for ammonia while just under 20 per cent of assessed water bodies in England and Wales do not achieve good or high status for dissolved oxygen.

Figure 1 shows loads discharged from water company sewage treatment works over the period 1995 to 2027. Measured data is included for the period 1995 to 2015 with planned estimates for 2020 and 2027 based on measures included in the PR14 and PR19 Water Industry National Environment Programmes. Between 1995 and 2027 the reduction in the phosphorus (P) load discharged will be over 85 per cent.

The reduction in P load has resulted in a significant decrease in river concentration for orthophosphate. The plot below displays annual average river total reactive phosphorus (TRP) concentrations over the period 1974 to 2018. The data are from the Harmonised Monitoring Scheme sampling points, mainly at the tidal limits of rivers across England, pooling all the results. You can see from the plot the reductions in the river concentrations achieved since 1997. Reducing from about 0.5 mg/l in 1997 to about 0.1 mg/l in 2018.

Figure 1. Loads discharged to rivers from water company sewage treatment works in England and Wales between 1995 and 2027

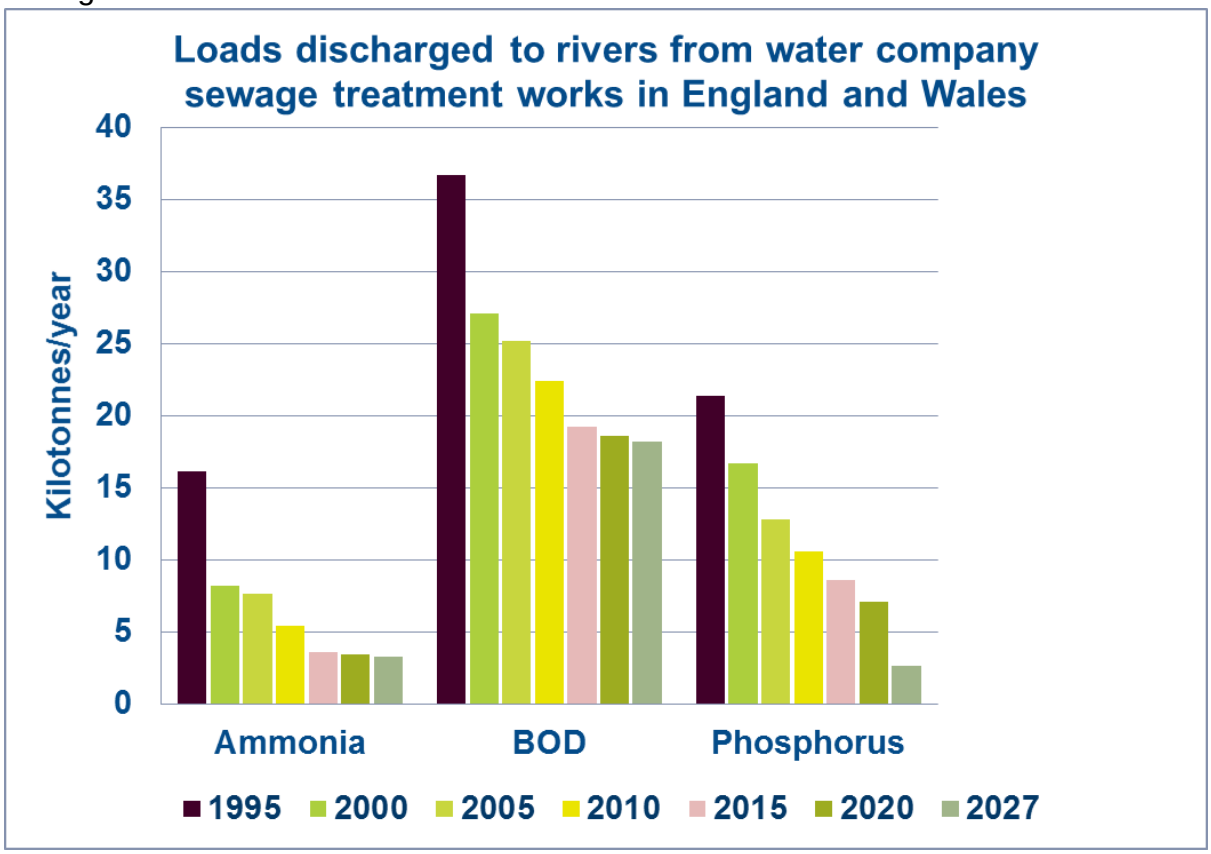
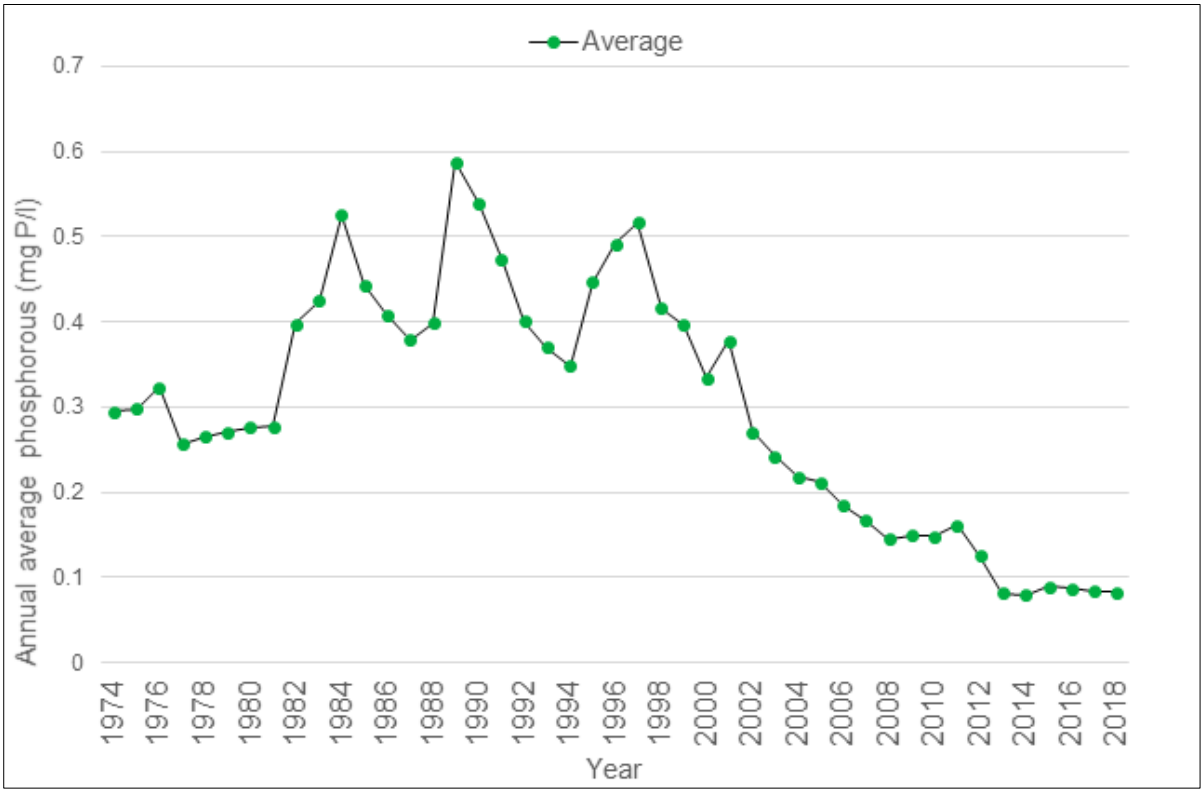


Figure 2. Annual average concentration of total reactive phosphorus in rivers, 1974 to 2018. Courtesy of Professor Fred Worrall, Durham University

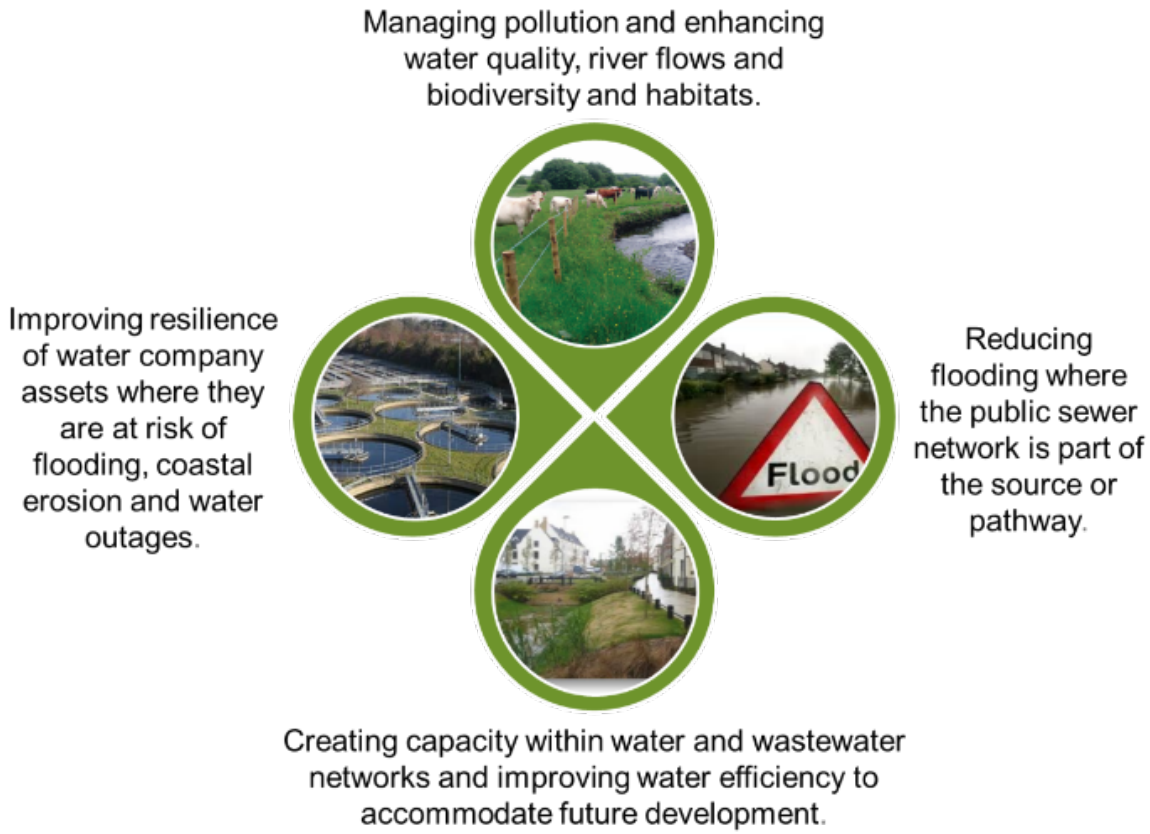


3.2 Opportunities for collaboration and partnership

Many water companies host, or are active members of, catchment partnerships These partnerships recognise that water is a shared resource with many beneficiaries and they financially support a range of interventions from river restoration to measures to protect bathing and shellfish waters.

Water companies also collaborate with local authorities and other risk management authorities to reduce flood risk. This can involve using sustainable drainage and natural flood management to slow, store and filter flood water. These types of innovations provide a cost-effective way of keeping surface water out of sewers and increasing the resilience of networks.

Innovation is also be used to help companies meet environmental objectives. Catchment Nutrient Balancing is an example of one such approach. In 2018 we introduced a catchment nutrient balancing position statement encouraging water companies to think more flexibly about alternative solutions to hard engineering at wastewater treatment works. In line with the paid ecosystems services approach, Catchment Nutrient Balancing (CNB) can be used by one sector to pay others to change behaviours and implement measures to reduce P or N. Balancing in this way means that water companies do not need to invest in expensive technologies and treatments to achieve the required nutrient reductions.



A natural capital approach aims to get better value for money by adopting an integrated, natural capital-based approach to water, flood risk and land management in a catchment. Since nutrient balancing delivers wider benefits than those from hard

engineering approaches such as nutrient stripping at a sewage treatment works it is considered a natural capital approach. When used appropriately, catchment nutrient balancing has the potential to reduce cost and achieve more for water quality than conventional approaches to permitting through integrated catchment solutions which provide multiple benefits.

The approach gives water companies flexibility in developing an appropriate solution. Techniques such as nutrient trading and reverse auctions are delivery options that can be considered. We are working with the water companies to consider alternative solutions, such as catchment nutrient balancing, for up to 100 sewage treatment works within the WINEP. Catchment Nutrient Balancing is a new and exciting approach. By linking the requirements into discharge permits we can regulate water company performance. The approach will also lead to potential cost savings, estimated to be in the region of £100 million. We hope that as experience in catchment nutrient balance increases we will see an increased take up of innovative solutions by water companies.

Interest is growing in phosphorus stewardship, making better use of phosphorus as a non-renewable resource, as well as protecting the environment. Traditional wastewater treatment to remove phosphorus from sewage involves dosing with iron salts. This locks up the phosphorus in the sewage sludge, making it difficult to recover, and may reduce its value in agronomy. The water industry should explore alternative approaches to phosphorus removal and phosphorus recycling and re-use in agriculture and other applications.

The pressures on sewerage capacity from population and climate are growing. Traditional techniques of increasing capacity (supply of bigger pipes) to meet these demands can often be expensive and disruptive, but there is still a good case for this type of solution where more sustainable alternatives aren't available. There is need to better address the demands on sewerage through applying sustainable drainage solutions (SuDS) to new builds and to retrofit sustainable surface water management by diverting surface water flows away from combined sewers (sewers that take both surface water and wastewater). This twin track approach of managing the supply and the demand on sewerage is similar to the approach taken in Water Resources. Managing surface water in this way requires the water and sewerage companies to work with other professional partners such as drainage and planning authorities and local communities. The DWMP framework approach is one of the key tools facilitating this shift.

The expense of additional treatment means that several companies are exploring the use of alternative catchment management solutions. These typically involve paying farmers to change how they manage the land to reduce the overall amount of nutrients entering rivers and lakes. Such approaches provide additional biodiversity benefits as well as potential wider benefits such as protecting communities from flooding.

When analysing what water companies can do to better protect river catchments it is easy to overlook the role that water customers can play. Surveys suggest customers attach a high importance to the environment and strongly support investment in

these areas. But customers can directly contribute themselves by reducing the amount of water they use and by not disposing of items, such as wet wipes, nappies, fats and oils that can block sewers and lead to pollution incidents.

4. Future challenges and actions

4.1 Managing future water industry challenges

Looking after the environment is essential for the long term success of the water industry and for the customers it serves. This means having infrastructure that is resilient to a changing climate and increasing population. Hotter drier summers, milder wetter winters, rising sea levels and more extreme weather events are expected in future due to a changing climate.

Assessments using the UK Climate Projections data indicate that for the period of the 2050s (2040s-2060s) we could see a +20% increase in daily extreme rainfall. For the period of the 2080s (2070s - 2090s) we could see a 40% increase in daily extreme rainfall intensity. Values taken from a change in extreme rainfall intensity in small and urban catchments, upper end estimate for total potential change anticipated based on daily extreme rainfall events compared to a 1961 to 1990 baseline. Water companies are already investing extra to ensure services are resilient to the effects of extreme weather and climate change and this is likely to increase.

One area companies are focussing on is the resilience of their wastewater systems. Water companies are developing Drainage and Wastewater Management Plans which will set out how they maintain, improve, and increase capacity of their drainage network and wastewater services over the next 25 years. For the first time these plans will put the planning of drainage and wastewater services on a level footing with the planning they undertake for water resources. The timescales established for the development of the Drainage and Wastewater Management plans (DWMPs) mean that the final DWMPs will be produced in autumn 2023 which will enable water companies to embed them within their PR24 business plans for Ofwat. We expect that there will be a strong link between the development of the DWMPs and the RBMP process. Water companies and Water and Sewerage companies should undertake consultation on the development of their DWMPs and many of the consultees are likely to be those interested in RBMPs.

The development of the DWMP framework was one of a cluster of products developed by the 21st Century Drainage Programme, led by WaterUK, with significant contributions from the Environment Agency and Defra. Other products include a new Capacity Assessment Framework (CAF) for combined and foul sewerage - a standard way to assess how much capacity is available in drainage systems now, and what capacity might be available in the future.

In order to understand what drainage capacity is required, factors, such as population growth and urban creep, have been considered along with the potential 20-40% uplift in daily extreme rainfall due to future climate impacts. The CAF has used a number of pilot catchments to identify the risks, such as where pipes are under capacity, likely spillage and how much overflow could reach rivers. Maps have then been used to clearly identify where future capacity improvements are needed – with focus on the biggest risks.

These are key factors in developing robust drainage plans. The programme also

considered how behavioral issues around “unflushables” can provide significant wins for environment, supporting campaigns on labelling of and disposing of wet wipes down the toilet as well as developing a water industry specification “fine to flush” for labelling of products, which have potential to be flushed.

Example: Fine to Flush.

Research into the composition of sewer blockage material showed that the majority of the material recovered comprised of non-flushable wipes that were not designed to be flushed and should not have been disposed of via the WC. Baby wipes accounted for over 75% by weight of identifiable products. This evidence supports Water and Sewerage Companies campaigns to influence behaviours and their links to water quality, sewer flooding and operational expenditure. The water industry have developed their “Fine to Flush” water industry specification, setting out is expectations of manufacturers to designing and labelling products that are at risk of being flushed.

Awareness, by the Environment Agency and others, has grown around changes in the complexity of both sludge generated by the water industry’s treatment of wastewater treatment and their onward treatment and use of sludge. This has resulted in a current suspension of the EPA’s Satisfactory Sludge Use/Disposal measure. The Environment Agency is working on developing a Sludge Strategy in order to address these changes and to manage a possible need for amendment to the regulatory framework used for the treatment and use of sludge. This use includes the final agricultural use of treated sludge (biosolids).

Emerging issues do present a risk for the water environment. We work collaboratively with the water industry on these risks. We are working collaboratively with the water industry to investigate the potential impact of chemicals in their discharges on the water environment. We are also supporting the water industry in their trials of new technologies to reduce chemicals in their discharges. We have planned work with the water industry to look at anti-microbial resistance within discharges.

5. Choices

Question 1: What can be done to address pollution from water industry wastewater?

Question 2: What opportunities exist for water companies to collaborate with other sectors and organisations on measures to improve the water environment?

6. Contacts

If you have any feedback or comments on the evidence contained in the summary then please contact:

enquiries@environment-agency.gov.uk

7. References

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