

Guidance Note: Long term planning for the quality of drinking water supplies

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1. Purpose

- 1.1. The purpose of this guidance note, henceforth 'the Guidance' is to provide water companies and other stakeholders with direction on long term planning for the quality of drinking water supplies.
- 1.2. The Guidance provides clarity on the expectations of the Drinking Water Inspectorate 'the Inspectorate' as companies prepare their business planning scope and proposals for the next periodic review PR24.
- 1.3. The Guidance also provides advice on how the Inspectorate might assist companies in the periodic review process for setting of prices, led by Ofwat, including details of arrangements for information submissions to the Inspectorate; the Inspectorate's assessment processes; and a timeline for supporting current expectations of PR24 requirements.
- 1.4. The Guidance takes account of the [Strategic Policy Statement \(SPS\)](https://www.gov.uk/government/publications/strategic-policy-statement-to-ofwat-incorporating-social-and-environmental-guidance/february-2022-the-governments-strategic-priorities-for-ofwat) (<https://www.gov.uk/government/publications/strategic-policy-statement-to-ofwat-incorporating-social-and-environmental-guidance/february-2022-the-governments-strategic-priorities-for-ofwat>) to Ofwat from the Defra Secretary of State on strategic priorities and the current draft Welsh Government Strategic Priorities and Objectives Statement to Ofwat from the Welsh Government with a focus on strategic objectives for Wales. The Guidance also has due regard to key policy documents from both the UK government and the Welsh Government where appropriate.
- 1.5. This Guidance note is not intended to be a comprehensive review of water supply practice. There are no new policy initiatives set out herein, and no new legal obligations. The focus is on delivery of existing obligations, including recent and imminent legislative changes, addressing current and emerging matters whilst using current good practice within a long-term planning context.
- 1.6. We will update this document as necessary to take account of developments in legislation, policy and industry good practice and future periodic reviews. The Inspectorate welcomes comments on the document, including suggestions for areas or matters not currently included.

- 1.7. The regulatory framework that sets the context for the Guidance is summarised in our [Guidance on the Regulations](https://www.dwi.gov.uk/water-companies/guidance-and-codes-of-practice/guidance-on-implementing-the-water-supply-water-quality-regulations): Introduction to the Public Water Supply Regulations in England and Wales (<https://www.dwi.gov.uk/water-companies/guidance-and-codes-of-practice/guidance-on-implementing-the-water-supply-water-quality-regulations>).

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3. Principles of approach

- 3.1 The Inspectorate expects all water companies to take a source to tap approach to manage their water supplies to protect the health of their consumers and maintain consumer confidence in the supply and services provided. Central to achieving these objectives is the mandatory use of Water Safety Plans (WSPs) and the inherent approach to assessing and managing risks. The Inspectorate recognises that the water safety planning approach is both national and international best practice for water supply management.
- 3.2 The delivery of this approach should be efficient and sustainable and contribute to a lasting legacy of long-term benefit for both the company and its consumers. To have legitimacy, and to gain the support of the Inspectorate, a company's WSP approach needs to be transparent about the identified challenges and risks, risk management and both the short and long-term investment requirements, for current consumers and future generations.
- 3.3 For all aspects of planning, whether for event management, drought management, water resource management, maintenance management or operations management, it is a fundamental requirement that drinking water quality is always central to, and accounted for, in all cost benefit assessments of options considered. It is expected that companies will always plan to meet their statutory obligations for drinking water quality.
- 3.4 The sustainability and resilience of the quality of supplies are important for consumers and their confidence; hence these aspects need to be an integral part of all planning and delivery functions of a company. It is expected that companies will plan for existing and future needs from a stewardship perspective across generations of consumers. To do so, companies will need to foster and develop their supply chain to enable and retain the knowledge and skills that are the bedrock for building efficient, innovative solutions and services.
- 3.5 In respect of routine operational resilience, it is expected that every company will proactively plan for the resistance to and recovery from potential adverse events that might otherwise impact on consumers, with a view to maintaining levels of drinking water quality protection, confidence, acceptability and services. There are threats to the sector from a range of notable sources such as:

- Extreme weather incidents disrupting supplies (planning, preparation, resilience, and compliance with SEMD requirements)
- Longer term impacts of climate change (temperature changes, risk to water availability, efficacy of some treatment processes etc.)
- Unauthorised IT intrusion and manipulation (impact of data, control systems for example) hence the need for suitable provisions under NIS.

3.6 Given the relative stability of the legislative framework for drinking water quality, and the consistency of approach over time, the Inspectorate expects that companies' operations and maintenance arrangements should consistently, proactively and sustainably meet all statutory obligations, while addressing any localised changes to risk profiles using established risk assessment reporting processes. We believe that this is at the heart of the relationship between a water company and its consumers. It is underpinned by the embedded company culture and staff behaviours that support a level of quality and service that consumers expect, and it underpins how problems are effectively addressed when they arise. By its activities over time, a company demonstrates its trustworthiness, to gain the trust and confidence of its consumers.

3.7 References in this Guidance to the **Act** and the **Regulations** are to the Water Industry Act 1991 (and updates/amendments), and the Water Supply (Water Quality) Regulations 2016 for England and the Water Supply (Water Quality) Regulations 2018 for Wales. Links to these and other relevant key legislation can be found on the Inspectorate's [website](https://www.dwi.gov.uk/water-companies/legislation) (<https://www.dwi.gov.uk/water-companies/legislation>). In addition, references to NIS and SEMD refer to the [Network and Information Systems \(NIS\) regulations \(2018\)](https://www.dwi.gov.uk/the-network-and-information-systems-nis-regulations-2018) (<https://www.dwi.gov.uk/the-network-and-information-systems-nis-regulations-2018>) and the [Security and Emergency Measures \(Water and Sewerage Undertakers and Water Supply Licensees\) \(SEMD\) Direction 2022](https://www.dwi.gov.uk/sem-d) (<https://www.dwi.gov.uk/sem-d>).

4. Climate change and climate resilience

4.1 Climate change adaptation

4.1.1 Climate change represents a major threat to the global environment and test our ability to effectively cope with the changes it brings. All parts of society and industry will in some way have to adapt to maintain broader sustainability in the future. Climate change specific adaptation planning and implementation will be key to the future of water treatment and supply services. The inspectorate recognises that companies have been working to

deliver appropriate planning for climate change and encourages further risk based and prioritised activity to continue.

- 4.1.2 The UK Meteorological Office's latest UK climate change projections (UKCP18) indicate that in England and Wales we will see warmer, wetter winters combined with hotter and drier summers, though summer rainfall events when they occur will be of higher intensity. These 'new' seasonal variations will be challenging for companies, and they will need to use adaptive scenario planning in order to sustain resilient services.

4.2 Playing our part – Drive to net zero

- 4.2.1 The Inspectorate recognises that the effects of climate change present current and ongoing risks to delivering safe and wholesome drinking water. We also know there is a regulatory role to play in facilitating the sector, where appropriate, to respond to both the risks (extreme weather events, water scarcity etc.) and opportunities (innovations to reduce demand, leakage reduction, more energy and chemical efficient treatment processes, low emission vehicles, green employment etc.) that climate change presents.
- 4.2.2 Water UK has published a [net zero route map](https://www.water.org.uk/routemap2030/wp-content/uploads/2020/11/Water-UK-Net-Zero-2030-Routemap.pdf) (<https://www.water.org.uk/routemap2030/wp-content/uploads/2020/11/Water-UK-Net-Zero-2030-Routemap.pdf>), outlining steps to achieving a target of net zero emissions for the water and wastewater operations by 2030. The UK government has a broader societal based goal of achieving net zero emissions from all activities by 2050. Both are stretching targets and the Inspectorate is supportive of both these key initiatives. The priority for effective supply of high-quality drinking water will remain paramount, however where feasible we expect companies to use innovative approaches with net zero as one of the key secondary objectives.

4.3 Energy use and sources

- 4.3.1 Treating and transporting drinking water supplies is a very energy intensive activity. Companies should plan to provide consistent and robust sources of energy for key water treatment applications. In doing so we expect companies to make sustainable energy choices that minimise the production of greenhouse gases and in doing so contribute to climate change mitigation targets.
- 4.3.2 The reliability of power supplies is paramount for water treatment works and the processes therein, hence it may not be feasible and/or desirable to rely on certain types of site based renewable energy sources, which may by their nature have variations in available output. Where renewables do feature in

the overall basket of energy options, we expect companies to include some form of backup and redundancy with alternative supplies available. Companies should also consider arrangements to procure greener electricity supplies from major generators.

- 4.3.3 The reliability of power supplies has been an issue for some companies in recent years, and it is important that designs consider the redundancy of power supplies in general. Power supply resilience is vital for the continuity of almost all water treatment and supply services, and it is expected that companies will work towards improving sites where significant outage risks still exist.

4.4 Extreme weather

- 4.4.1 Climate change is a driver for extreme weather conditions, including low and high temperature events, high intensity and/or prolonged rainfall events increasing the likelihood of flooding.
- 4.4.2 In the period between December 2017 and February 2018 England and Wales and many parts of the wider UK experienced a series of cold weather events that not only brought considerable snowfall but uncharacteristically low temperatures. These conditions impaired logistics for deliveries, staff availability, general operations and impacted some treatment processes. A key notable impact on consumers were significant loss of service events, mainly due to bursts, following the rapid freeze-thaw cycle.
- 4.4.3 Recent high temperature events in 2020 placed significant pressure on the supply availability of some companies. It was notable that the high temperatures were combined with the unusual situation of a population predominantly staying home due to COVID-19 restrictions and further increasing demand for water during an already hot period.
- 4.4.4 Extreme rainfall events can lead to flooding, based both on the intensity of direct rainfall and/or via surface water runoff exceeding the capacity of receiving watercourses. In certain circumstances the rainfall and/or flooding can create ground instability with incidents of landslides. Some extreme rainfall events can have significant adverse impacts on raw water quality such as increased turbidity, reduced quality from overland flow entering source water bodies and the potential for increased discharges from storm overflows.
- 4.4.5 Companies should continue to improve their forecasting capability for how such adverse events may impact their ability to deliver supplies, maintaining

the integrity of their water supply networks and preparing suitable contingency plans to mitigate.

- 4.4.6 It is accepted that such extreme weather events will become more frequent and could be more severe in terms of intensity and length as our climate changes. Companies will need to plan and prepare effective responses to such events that recognise the various ways in which their business delivery may be impacted, and how this can be managed in terms of service continuity and resilience.

4.5 Resilience

- 4.5.1 Ongoing climate change poses a threat to the sectors medium and long-term resilience that could detrimentally impact water supply, water quality and infrastructure asset performance.

- 4.5.2 Having considered extreme weather in the previous section it readily leads to considering the requirements for improving asset and service resilience. In June 2021 the Climate Change Committee published the [Adaptation Committee's Independent Assessment of UK Climate Risk](https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk) (<https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk>). The report highlighted the following (quoted directly from the summary):

- Water infrastructure, such as reservoirs, dams, pipelines, water treatment plants and sewage treatment plants, are all at risk from the impacts of climate change, especially increases in the frequency and intensity of surface water and coastal flooding.
- Water infrastructure assets represent a key element of the UK infrastructure system and could affect, or be affected by, failures of other assets due to extreme weather, such as energy systems, transport and information and communications technology (ICT).
- There are also risks to buried infrastructure, such as water pipelines, with damage potentially becoming more frequent in future due to flooding and subsidence.
- More frequent flooding could also impact on water treatment facilities leading to potential reductions in water quality, in turn impacting upon health.
- Future projections of more frequent and intense dry periods lead to concerns around the availability of public water supplies in future, especially in England and parts of Wales. Private water supplies are also at risk.

- Aquifers near the coast could be at greater risk from saltwater intrusion due to sea level rise, though the risk is thought to be low in places where aquifers are important water sources.

The above points are a snapshot overview of the risks the sector faces to deliver effective services and maintaining an operative asset base.

- 4.5.2 The Inspectorate advises companies to pay specific attention to address the risks noted above in all aspects of their business planning towards maintaining safe and wholesome drinking water supplies.
- 4.5.3 Resilience can be delivered in a variety of ways, including for example allowing higher resistance asset designs, greater redundancy of assets, designs for quicker recovery post adverse events and interim measures for supply when primary assets are unavailable.
- 4.5.4 The Inspectorate has issued [IL 01/2022 Guidance of Alternative Supply Operations 2022](https://cdn.dwi.gov.uk/wp-content/uploads/2022/03/21150250/Information-Letter-01_2022-Alternative-Water-Supplies.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2022/03/21150250/Information-Letter-01_2022-Alternative-Water-Supplies.pdf) providing guidance on the requirements expected when providing alternative supply arrangements. In association with the various methods, it is vital that companies have a realistic understanding of the types of risk each part of their asset base may represent, and how these combine into an overall risk to service for consumers. A company's management appetite for carrying such risks should be matched or exceeded by the deployable risk mitigation options.

4.6 Efficacy of treatment processes

- 4.6.1 Current water treatment systems operate in a design window commonly based on the quality of abstracted raw water. Climate change driven changes in raw water quality, outside of the expected design criteria for effective treatment works performance is a risk.
- 4.6.2 Raw surface water sources such as rivers and reservoirs in particular, may be subject to:
 - lower mean and minimum flows that will increase the concentration of some components in the raw water that will reduce overall quality;
 - increased environmental water temperatures that in turn cause increasing eutrophication and excess algal growth reducing raw water quality;

- additionally, the quality of raw water sources may also be compromised by increased sediment or nutrient inputs due to increased run-off extreme rainfall events.

- 4.6.3 In terms of final water quality in supply companies will need to be focused on how increased average, peak temperature and range of temperature fluctuations (day to night, seasonal) may impact water quality. For example, higher temperatures will increase the rate of degradation of chlorine and the overall longevity of the effects dosing in the network. Near or at surface networks, fittings and storage infrastructure will be the most vulnerable to increasing temperature effects. Companies should particularly consider such issues when supporting water supplies for temporary events.
- 4.6.4 Companies should, as part of their catchment management work, take steps to address the issues of deterioration in raw water quality with due regard to the impacts of increasing temperature and run-off.
- 4.6.5 Companies should review their treatment approaches and systems, including technologies and chemicals as to how well these may function under various stress scenarios induced by absolute temperature changes and/or fluctuations. Where appropriate companies should plan to implement improvements and additions to existing processes to address any such issues in advance of them occurring and impacting the ability to supply wholesome drinking water.

5. Broad considerations in planning for the long term

5.1 Recent drinking water quality performance

- 5.1.1 The top issues resulting in notified events were identified in the Inspectorate's [Triennial Report 2017-2019 for England](https://www.gov.uk/government/publications/drinking-water-quality-in-england-2017-to-2019) (https://www.gov.uk/government/publications/drinking-water-quality-in-england-2017-to-2019) and the [Triennial Report 2017-2019 for Wales](https://cdn.dwi.gov.uk/wp-content/uploads/2021/12/22163642/Drinking-water-quality-in-Wales-2017-to-2019-accessible.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2021/12/22163642/Drinking-water-quality-in-Wales-2017-to-2019-accessible.pdf, both published in December 2021. The Inspectorate published two triennial reports, one for England and the other for Wales.
- 5.1.2 The headlines indicated that from the many thousands of samples taken by water companies during 2017 to 2019 approximately 99.95% met the regulatory standards. The majority of controlled substances met the regulatory standards all of the time (100% compliance). Every sample that failed to meet the standards was investigated and, where necessary, specific actions were required of water companies to protect consumers and prevent

recurrence. In England lead and nickel had the poorest performance, with lead (99.38%) and nickel (99.74%), followed by coliforms (99.78%), odour (99.78%), iron (99.82%), and taste (99.90%). In Wales the areas of lowest performance were similar but in a different order as follows; iron (99.52%), followed by odour (99.68%), taste (99.81%), nickel, (99.81%), lead (99.81%), coliforms (99.86%) and manganese (99.88%).

- 5.1.3 Overall, the reports demonstrate the high quality of drinking water in England and Wales over the period. The Inspectorate expects companies to develop and progress performance outcomes via continuous improvement planning. Companies should have due regard to the priority of failures occurring in their own services and addressing the necessary mitigating options with a risk-based approach, to ensure longer term compliance with the regulations.

5.2 Risk assessment

- 5.2.1 It is mandatory for water companies to carry out risk assessments of all of their water supply systems, from source to tap, adopting a drinking water safety plan approach. Companies should give due consideration to the range of risks that may impact both the quality and sufficiency of water at all sources as part of the risk assessment process, with recognition of common hazards and those that may be emerging in the medium to long term. Companies should ensure appropriate attention is given to identifying risks arising from sources of any potential substances that may give rise to unwholesome water or a concern to human health in relation to raw water abstractions.

These risk assessments should account for the full range of recipient properties receiving water supplies including private dwellings, commercial properties, and public buildings. In doing so the risk assessment approach should consider not only the predominant usage in these properties, but also reflect the populations using the water facilities therein.

Where surface abstractions are in the vicinity, and downstream of effluent discharges, particular attention should be given to the following: the geographic relationship of the discharge and abstraction points; the variability of overall effluent quality; the timing and the duration of discharges; seasonality and the temporal conditions in the receiving water body, for example.

The risk assessment reports subsequently submitted to the Inspectorate should identify the hazard (or partially mitigated hazard) and any associated parameters, evidence that the cause of the hazard has been identified and

confirmed and the range of options for mitigation considered including, where appropriate, catchment management measures. There must also be a clear statement of how the benefits delivered by the actions will be measured (to include the scope, frequency and location of monitoring).

- 5.2.2 Companies are required to keep under review, their risk assessments for all their water supplies, and to report updates to the Inspectorate in a timely manner. In doing so, they should have regard to any learning from drinking water quality events and/or near misses that are circulated by the Inspectorate or companies from time to time. Companies should review and learn from water quality event summaries and guidance published on the Inspectorate website. Water safety planning, drinking water quality and delivering sufficiency requirements are all linked in terms of delivering appropriate services to consumers.
- 5.2.3 If a regulatory risk assessment identifies clear actual or potentially significant risks, the company must manage and mitigate the risks from the hazard in a timely, effective and efficient manner to the benefit of consumers. The Inspectorate may consider putting in place legal instruments to ensure that desired outcomes are achieved.

6. Long term planning from source to tap

6.1 Catchment management

- 6.1.1 Our environment and water in the catchment is the first point of consideration when delivering a water quality first approach. It is the first opportunity to consider the hazards, and changes which may impact the quality of drinking water and how these may be mitigated. Drought, flood and source availability as well as anthropogenic activities (such as mining, agricultural, industrial or pleasure activities) will all change the risk, and these must be understood and assessed to keep water safe.
- 6.1.2 Catchment management schemes have been widely used by water companies to address both point source and diffuse pollution. There are many benefits to catchment management approaches that address pollution at source: such as improvements to the wider water environment; reduce the need for, or burden on, water treatment facilities; and provide sustainable, long-term, cost-effective solutions. They should remain the first consideration of all source to tap risk assessments to reduce risks prior to treatment and ultimately mitigate all significant risks to public health, wholesomeness and acceptability of water supplies.

- 6.1.3 The Inspectorate has actively promoted catchment management approaches for many years as a first line of defence, including incorporating their use in legal instruments arising from compliance failures, or identified risks.
- 6.1.4 The likelihood of success of catchment management measures varies depending on the nature of the parameter, the size and nature of the catchment, the origin of the pollution and other factors. Therefore, individual proposals will be assessed on their merits.
- 6.1.5 The accumulation of catchment management improvements gained from a multiplicity of proactive integrated solutions (such as stakeholder engagement at both national and local levels; pollution control; raw water management; abstraction control; and raw and/or treated water blending) may negate or delay the need for new and/or upgraded treatment processes. In addition, catchment management offers protection of the quality of water supplies.
- 6.1.6 It is important that submissions for continuing existing and/or starting new catchment management-based approaches are supported by proposals for monitoring and assessment of their progressive effectiveness and success criteria. To support this, we expect companies to consider investments in catchment based monitoring and real time information systems. These may also be deployed to improve and support timely identification of threats and to increase overall knowledge about catchments to improve risk management.
- 6.1.7 For such solutions to be effective and sustainable, they require the commitment of significant resources and multiple interactions over a prolonged period by companies, and often require the co-ordination of outputs to be delivered by various third parties. Although control of the hazard at source is always the primary objective, where catchment management solutions are specified, we recognise that the full delivery of outcomes via catchment management measures may be uncertain or may prolong the period before benefits accrue to consumers. To ensure that a legal instrument is fit for purpose, the Inspectorate will need to understand these constraints, and the other actions that the company may need to take, or to make provision for, to supplement its catchment management activities. These may include the relative contribution of catchment management activities to outcome delivery, the potential impact on priorities, the timescale for completion and the arrangements for programme recovery, if needed.
- 6.1.8 The Inspectorate will continue to pursue this approach to catchment management and will encourage companies to routinely incorporate

catchment management solutions as a fundamental part of their source to tap management of their water supplies. This approach is consistent with wider environmental considerations and aligns with the UK government 25-year environment planning '[A Green Future: Our 25 Year Plan to Improve the Environment](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf)' (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf) that outlines aspirations for achieving clean and plentiful water. The Inspectorate will support companies, working with the stakeholders and Regulators involved, to find and implement the most cost effective, efficient and sustainable solutions to deliver the required outcomes. The Inspectorate will continue to work with other Regulators to facilitate the scope and specification of catchment solutions where there are synergies with environmental drivers, and we expect companies to liaise with their local environmental Regulator representatives on the development of their catchment management solutions.

- 6.1.9 There are opportunities for companies to work with the Environment Agency and Natural Resources Wales to align the catchment-based aspects of the established Drinking Water Safety Planning (DWSP) approach with the Water Framework Directive regulations' 2017 programme of measures requirements. This includes measures with the aim of avoiding deterioration in the quality of the water, in order to reduce the level of purification treatment required in the production of drinking water. Non-statutory Safeguard Zone Action Plans for Drinking Water Protected Areas (DrWPAs) that are 'at risk' are identified by the Environment Agency. We believe that the cross-over and interaction here will be beneficial to all parties.
- 6.1.10 In support of catchment management opportunities, companies should have consideration of what techniques, real-time catchment-based monitoring and information systems technologies are available to deliver timely data about catchment conditions and links to raw water quality variations. The Inspectorate is supportive of implementing new technology and innovations where these demonstrate clear benefits in support of catchment management outcomes.
- 6.1.11 Whilst the most significant catchment management schemes, from a drinking water quality perspective, will continue to be incorporated within legal instruments, we expect companies to routinely engage in proactive catchment management activity as a matter of good practice for all their water supplies.

6.2 Raw water quality

- 6.2.1 Understanding the quality of water at the point of abstraction remains one of the most important foundations for delivering high quality drinking water to consumers. Companies will be familiar with the approach that requires them to understand and manage the interacting elements from source to tap. Starting from the originating catchment(s) where raw water is sourced; having a good understanding of the catchment attributes, catchment activities (agricultural, industrial and land use variable etc.); through to how water is abstracted, treated, stored and conveyed via the various company managed site and network assets; through to the internal plumbing of consumer properties (both public and private), internal fittings and then to the points of consumption.
- 6.2.2 Companies must be aware of risks at the point of abstraction. These should include not just the risks arising from the catchment covering geogenic and anthropogenic risks as described previously, but also any changes where the source water may have changed through raw water imports, wastewater, recycled or desalinated water which is engineered intentionally or otherwise to augment the source water. These will require a review of existing risk profiles with a water quality approach which may include re-application of a new source under regulation 15.
- 6.2.3 Failure or a likelihood of failure to supply wholesome water because of a deterioration or a change in raw water quality should be identified through a combination of catchment intelligence, raw water monitoring and the risk assessments carried out for each treatment works and its associated supply system. Companies will need to work with stakeholders within catchments and in particular establish and maintain strong engagement with the relevant environmental regulator for example Environment Agency, Natural Resources Wales. Deterioration in this context means a measured reduction/change in raw water quality over time, or demonstrable unmitigated volatility in quality brought about by pollution changes within the catchment, and most frequently arising from diffuse pollution, but also from changing weather patterns for example.
- 6.2.4 Most hazards will be known to companies and featured within existing risk assessment arrangements. However, where a deterioration in raw water quality has been identified and presents a risk to consumers (for example, the existing treatment process is not designed to deal with either the type or level of the contaminant), water companies must investigate the cause of deterioration and take action to protect consumers. This action should primarily focus on investigations in the catchment and, where feasible,

specify actions to control the level of pollution entering the supply at source, although a wide range of other operational interventions, including either short-term or permanent treatment solutions, may be necessary to supplement other based catchment activities.

- 6.2.5 When considering catchment management/control solutions, companies should have regard to specific statutory environmental obligations, and give due consideration where their activities can play a beneficial part. However, the capacity of a company to provide for multiple drivers will depend on the level of risk to drinking water quality and whether a catchment solution could deliver in time to prevent the supply of unwholesome water. In some situations, the catchment may have been subject to other residual risks that may require a treatment solution to be installed to mitigate, and companies will be required to adopt a twin track approach that includes treatment and/or other operational control measures in addition to catchment management actions to mitigate the risks to consumers from raw water deterioration. Companies should especially apply effective adaptive planning and assessment approaches to ensure that respective treatment works are fit-for-purpose and suitable to meet the evolving risks that need to be addressed.
- 6.2.6 Companies also have a statutory duty to undertake monitoring of raw water at every abstraction point as part of their risk assessment of each treatment works and associated supply system. Monitoring is particularly important to improve knowledge of new and emerging risks and understanding where specific attention in risk assessments and associated responses should be implemented.
- 6.2.7 The Inspectorate expects companies to continue to improve their knowledge of both current and historic catchment activities that may impact the ongoing quality of raw water sources. In turn, catchment focused activities by water companies to improve raw water quality will contribute to wider environmental objectives in respect of the protection of areas from which drinking water is abstracted.

6.3 Resource management, planning and transfers

- 6.3.1 As an outcome of managing the predicted impacts of climate change, industrial demands and population changes, companies are planning and/or have put in place resource management plans which include transfers of raw or treated water or initiatives to reduce leakage. All plans should take a water quality first approach to ensure the water supplied is good, clean, and wholesome. It would be beneficial for companies to take a wider strategic

position to achieve synergistic outcomes when considering regulatory objectives.

- 6.3.2 Companies must complete a risk assessment on the potential impacts on public health, wholesomeness and acceptability¹ to consumers of new or altered supply arrangements, including cross-company transfers of raw or treated water, mixing of water and new resource schemes. This must meet the requirements of the Regulations when developing options stemming from the regional plans. Where potential risks are identified, prior to making supply changes, a company must take steps to assess and mitigate those risks.
- 6.3.3 For raw water transfers, the development of the drinking safety plan and risk assessments should consider the risks identified within the existing 'upstream' drinking water safety plans and then identify whether further mitigation is required at the receiving location. Investigation of raw water quality risks may require further monitoring to support the existing available data sets, water quality modelling, and due regard should be given to future risks (including emerging contaminants). Acceptability considerations should be risk assessed including the change of source type which may result in a change in taste, odour or feel of the water to consumers and any impacts on the receiving distribution system such as corrosivity, for example.
- 6.3.4 For wholesome drinking water transfers, consideration should be given to the age of water, whether appropriate mixing is occurring within intermediary storage reservoirs or conveyance infrastructure and risks associated with disinfection by-products, especially if the supply is re-chlorinated. Consideration should also be given to acceptability risks associated with any change of source type or mixing of waters which may result in a change in taste, odour or feel of the water to consumers and any impacts on the receiving water distribution system.
- 6.3.5 This section is of particular importance due to a number of strategic water resource options (SROs) which are being considered as part of the joint Regulators' Alliance for Progressing Infrastructure Development (RAPID) programme. RAPID seeks to deliver a strategic step-change in water resource availability across England and Wales that will deliver more resilient access to water resources from circa 2030 onwards. Some of these schemes involve transferring water not only within their regions but also inter-regionally. Companies remain responsible for their duties to supply wholesome water irrespective of the source of water.

¹ As defined in the Water Supply (Water Quality) Regulations 2016 in England and 2018 in Wales.

- 6.3.6 The Inspectorate has produced an acceptability framework, Table 6.1, to highlight some of the key acceptability considerations for companies when planning transfer schemes. Companies will need to consider the integrity of the receiving network with respect to its long-term behaviour and resistance to the chemistry associated with incoming water as well as the acceptability of the taste, odour and/or feel of 'new' water for consumers.

Table 6.1 Acceptability Framework of principles for potential consequences of introducing new sources, mixing sources, or transferring water

Relevant parameters which may be impacted by proposed action	Other factors which may impact consumers	Timescales of impacts	Possible Mitigating actions – Describe timing and frequency Required mitigating actions dependent on consumer impact and duration Describe evidence for risk and mitigation
Chlorine residual	Consumer complaints of discolouration – brown, black, orange, white	Short term (days)	Consumer engagement – letters
pH		Medium term (weeks)	Consumer engagement – social media
Lead	Consumer complaints – taste and odour	Longer term (months) – temporary	Consumer engagement – texts
Nickel	Consumer Rejection	Longer term (months) – permanent	Consumer engagement – press notices
Iron	Aggressiveness of water		Consumer engagement – radio adverts
Manganese	Changes in pressure		Water conditioning – softening
Aluminium	Regulation 31 compliance		Orthophosphate dosing – lead compliance
Taste	Water treatment to minimise corrosion from pipes (reg 29)		Mains flushing programmes
Odour			Phased introduction or blending of new source
Colour			Measures to ensure regulation 31 compliance
Turbidity			Management of chlorine dosing
Fluoride			Others as appropriate which may cause water to be unwholesome
Pesticides			

For each scheme, the responsible party should consider the potential water quality impacts (whether immediately for consumers or longer-term effects) and in light of the proposed timescale for the change consider a package of mitigating actions that will be implemented together with the project plan for delivery.

6.4 Water recycling and desalination

- 6.4.1 Drinking water is a valuable resource and its availability and resilience is something we have come to expect. However, increasing demand and the impact of climate change means that we must continue to work on demand management and other options to ensure a sufficient supply for the future.
- 6.4.2 One such option that companies are considering is to further develop the capability for water recycling as a promising alternative to supplement traditional supplies. This has already been demonstrated in our ability to 'recycle' water through the processes we use to treat wastewater to a standard where it can be discharged into our watercourses. In future the technical potential for both this 'indirect' type of water recycling could be combined with more 'direct' recycling via water recycling plants prior to their discharges being utilised as sources for traditional water treatment works. Enhanced processes for improved water recycling have the potential to deliver additional water to consumers, however companies should be mindful of the requirement to engage with their consumers regarding expectations and acceptability of such supply methods. The Inspectorate has commissioned an innovative research project to gauge consumer perceptions around water recycling to determine the future acceptability of the various alternative approaches.
- 6.4.3 Another option, already in use at a site in England, is desalination. Desalination is a technically well-known and practiced approach used extensively in many parts of the world where fresh surface water or groundwater supplies are limited, as a significant approach to produce drinking water. There are technical challenges in achieving desalination consistently, such that the characteristics of the water are acceptable to consumers which may require additional treatment options or blending with other water sources.
- 6.4.4 Companies must remain aware of their regulatory responsibilities and duties when considering either or both options for supplementing raw or final water. Water arising from a water recycling or a desalination plant into an environmental buffer supplementing a source changes the source risk and companies must carry out a regulation 15 assessment as the source has fundamentally changed to a new source. In circumstances where a water recycling or desalination plant feed directly into a final water treatment works or is the final water source then it is the point of effective abstraction and regulation 15 would apply (for example, seawater or black/brown water). Regulation 31 applies throughout the process.

- 6.4.5 Companies considering water recycling and/or desalination works are encouraged to engage with the Inspectorate at earliest possible opportunity to discuss outline proposals and elements that are important for successfully delivering acceptable drinking water quality. Companies must ensure that either future water recycling or desalination solutions meet the requirements of regulation 15.

6.5 General water treatment principles

- 6.5.1 The Inspectorate expects water companies to use treatment processes to make water safe and clean, with the aim of proactively mitigating risks to public health, and to the wholesomeness and acceptability of supplies. The processes used should be consistent with the actual and potential hazards to be mitigated and should at a minimum meet modern standards demonstrating verifiable efficacy of treatment. For example, *Cryptosporidium* removal and/or inactivation by a multi-stage process should follow the recommendations of [Badenoch](https://cdn.dwi.gov.uk/wp-content/uploads/2021/10/25144921/Badenoch_Report.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2021/10/25144921/Badenoch_Report.pdf) and [Bouchier](https://cdn.dwi.gov.uk/wp-content/uploads/2021/10/25144909/Bouchier_Report.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2021/10/25144909/Bouchier_Report.pdf) and peer reviewed literature where removal by filtration, inactivation by UV and the return of wash-water take into account turbidity, log-removal, transmissibility/power and volume of return sufficient to mitigate any potential harm to health posed by the source. Verification may well be understood from the risk at source and the outcome at the treated water through an appropriate methodology. This is not an exhaustive list. However, it is essential to the consistent delivery of adequate treatment that treatment facilities operators are aware of any pollution challenges in the catchment which may affect the quality of raw water. This will enable them to maintain the stability and optimisation of treatment conditions. An integrated view of risk management across catchment, abstraction, storage and treatment best secures continuous adequate treatment of water and levels of service to consumers. This should include new and emerging contaminants which may be challenging to remove using current treatment processes and may require additional verification of efficacy of treatment to demonstrate a risk is mitigated.
- 6.5.2 It is also expected that treatment facilities will have the operational flexibility over short, medium and long-term timescales to support resilience, including suitable monitoring and fail-safe arrangements that make provision for containment and/or flow diversion, to prevent the supply of inadequately treated water to consumers. Companies should use adaptive planning techniques to ensure assets have sufficient flexibility and fitness for purpose

in an evolving external environment driven by external factors such as climate change and catchment related risk developments, for example.

- 6.5.3 Treatment processes and controls should be reviewed in detail to check for hazards as part of a company's risk assessment process. This applies especially to the integration of new or replacement processes and equipment that should be subject to rigorous integration testing, with supplier support and operator training. There is ample evidence from event records to illustrate the unnecessary impact on consumers from relatively minor operational interruptions. Companies are reminded that it is a criminal offence to supply water that is not treated adequately, as required by the Regulations.
- 6.5.4 Compliance with regulation 31 requirements is a key duty of companies when planning, designing, and delivering assets. It is essential that suitable materials, products including chemicals are specified and used in construction that have no detriment to the quality of water at any stage of the treatment process and throughout the water supply system. Where any product is sourced through the supply chain, companies must satisfy themselves - through proper due diligence - that such products are compliant for their intended use before and on receipt. In addition, the storage and use of all chemicals and materials that may come into contact with water throughout the duration of their application and across the whole supply system of the company, must comply specifically with regulation 31, the associated British Standards, and conditions for use. This has been the subject of a recent Court ruling emphasising the wider intent of the regulations to safeguard water quality.
- 6.5.5 The integration of risk management extends to the supply side of treatment facilities. All decisions made by supply controllers or network operators on supply provision should consider implications for the quality of the supply. These considerations should include, as a minimum, the control measures necessary to mitigate any impact on the stability and optimisation of pH, colour, and phosphoric acid dosing for plumbosolvency control; on disinfection and control of disinfection by-products; on fluoridation; on the acceptability of the supply to consumers, including taste and odour, and discolouration. Companies must ensure that operator training is comprehensive and relevant to all processes in the supply chain in this regard.
- 6.5.6 Several water quality event investigations have identified contributing factors to operational errors that were partly linked to the inexperience and/or unfamiliarity of staff with assets. When scheduling operational manning and cover for leave/illness, companies should have due regard for

the experience and capabilities of replacement staff, that are specific to the water treatment works and/or assets they are managing for example.

- 6.5.7 Water treatment is an evolving discipline, the Inspectorate expects companies to deliver innovations in operational technology and control systems and further develop the reliability and use of on-line monitoring systems to improve responsiveness and support use of improved digital monitors and controls. Companies should seek to further understand and quantify the security of both their physical and cyber systems such that they can mitigate risks.

6.6 Water distribution, reservoirs and asset health

- 6.6.1 Without any further treatment, drinking water must be maintained in a safe and secure manner as this is vital to the supply of wholesome water. This means for example that service reservoirs must be maintained in a way that ingress from environmental water is prevented. In the last 10 years there have been a number of instances where microbiological contamination has been detected such as *E. coli* particularly linked to rain and subsequently discovered ingress. Similarly, *Cryptosporidium* has been detected either through broken sub-surface piping or directly through the roof, in one case resulting in one of the most significant drinking water incidents in recent times.
- 6.6.2 In 2021 the Inspectorate conducted a thematic audit programme of water supply service reservoirs. The audits considered the management, monitoring, inspection, and maintenance practices and record keeping. It was found that some companies had multiple reservoir assets that had not been inspected for more than 10 years, with one company having approximately 15% of its service reservoirs in this category. Similarly, the number of reservoirs/tanks significantly over 10 years since inspection is not insignificant with one record showing an inspection had not taken place in 50 years due to the inability to physically remove the tank from supply. There were significant instances of poor record keeping where the evidence for required remedial actions was not recorded clearly or at all and in other instances, tanks which were found to be subsiding without any clear strategic action to mitigate the risk. In response to these and other findings the Inspectorate issued 10 notices (some notices referring to multiple assets) outlining corrective requirements for the issues identified in the audit reports. The Inspectorate expects to see companies delivering significant improvements in this area.
- 6.6.3 Distribution issues contribute to one third of notifiable drinking water quality events every year, with a quarter of these of a duration greater than 48

hours, and with an impact on, typically, some two million consumers. A notable minority of these events are caused or exacerbated by company staff. This suggests that the resilience of distribution service delivery needs to improve substantially to reduce the impact on consumers, and that current operational practice may pose a risk to wholesomeness of supplies in some circumstances.

- 6.6.4 The Inspectorate will continue with this policy and extend its reach to all companies where there is evidence of persistent consumer complaints about the aesthetic quality of the supply. Mitigation actions to reduce such complaints must involve operational planning for strategic and recurring cleaning/maintenance, improved treatment processes and/or permanent solutions to reduce complaints in the long term.
- 6.6.5 Despite significant investments in PR19 across the sector, there remain concerns about the operational performance of a number of water treatment facilities. Companies must be conversant with changing risk profiles that may have impacts at catchment, treatment and supply levels. The Inspectorate expects to see a significant improvement in the operational performance of treatment facilities, aided by consistent good practice in asset maintenance, in particular, for dosing systems, monitoring and control systems, where proactive preventative replacement strategies and/or fail-safe back-up facilities are expected as a minimum requirement. Robust processes for specification and use of controlled substances and products, together with management of the delivery and use of treatment chemicals, are also essential.
- 6.6.6 The distribution risk assessments required from all companies should draw on the accumulation of years of quality data; contact data; and asset specific data, including maintenance and repair history. The mitigations arising should form the basis for a proactive maintenance and operation regime. Repeat events at the same assets require an update of risk assessments, and any resulting mitigations, and may result in enforcement. Use of material and maintenance or renovation histories should enable recognition of any patterns of deterioration that cause quality issues and contribute to recognition of emerging risks. It is not acceptable to accept adverse impacts routinely and passively on the quality of supplies arising from burst mains. and in particular the associated discolouration that often arises from network flow variations caused by such supply interruptions. Recurring impacts of this type should be considered as risks to wholesomeness, and appropriate mitigation, such as flushing to control deposits or replacement of regularly failing mains put in place.

- 6.6.7 The Inspectorate welcomes the developments in network management, such as software aids and improved training for operators to provide ‘calm systems’ approaches and encourage their continuing use as operational tools. However, these do not deal with the underlying root causes of disruptions to consumer service that we expect companies to mitigate. We continue to encourage the use of real-time monitors for routine operational monitoring as investigative tools to provide improved responsiveness to interruptions. These can also deliver more efficient and effective demonstrations of actual benefit in shorter timescales following improvement works.
- 6.6.8 There is an ongoing need for companies to better understand, risk assess and prioritise the status of asset health risk across their asset base and distribution networks more effectively. The Inspectorate welcomed the work undertaken by Ofwat in 2020 to 2021 with companies to support further understanding about asset health/maturity in the water and sewerage sector.
- 6.6.9 The Inspectorate noted that changes in company sampling regimes in 2020 (primarily driven by public health COVID-19 restrictions) highlighted the presence of metals in networks, and this identifies some ongoing challenges associated with treatment works optimisation to reduce concentrations of aluminium, iron and manganese to a minimum in the final water.
- 6.6.10 Discolouration risks within service reservoirs should drive the need for improved risk assessment programmes for inspections and service reservoir cleaning that take account of discolouration risks, coupled with microbial and engineering risks. Companies should combine these to inform a wider operational strategy that includes network discolouration risks within operational risk assessments for networks that are at high risk of discolouration, especially for operations that may result in flow reversals or flow increases. Risk assessment requirements were noted following bursts or due to changes in demand, particularly evident when England and Wales entered COVID-19 lockdowns during 2020. The use of calm network principles is evident in some companies, as are their involvement in research projects that incorporate research results into discolouration management strategies.
- 6.6.11 Companies are aware of the association of discolouration events through standpipe management and training for standpipe hires, including prosecutions for illegal standpipe use and specific hydrants maintained for hire use. This must continue to be a central strategy for which there are some exemplar approaches available as good references. However, consumer contacts are often the first sight of local challenges. Therefore,

detailed investigations following consumer contacts, even with low trigger levels prompting onsite investigations and action/escalation measures should be recognised as a key means to drive future improvement, particularly for those low performing companies.

6.7 Domestic and internal distribution systems

- 6.7.1 The domestic distribution system begins at the supply pipe to the tap. Companies view this part of the system as outside their responsibility; however, compliance is measured at the tap and can be affected by company actions such as changes in source water, leakage initiatives, metering etc, examples of how these are affected by company interventions include aggressive water on galvanised pipes resulting in discolouration, zinc and other metal leaching. Companies cutting into lead piping to fit meters without either opportunistically changing the pipe or even recording the presence of it and/or initiatives to reduce leakage without also targeting lead pipes represent missed opportunities. Companies are reminded that combined synergistic strategies should be considered and appropriately applied when delivering multiple outcomes.
- 6.7.2 Other point of use/consumption considerations include the incorrect use of lead solder on internal water distribution systems. When visiting consumer dwellings to investigate water quality concerns, company operatives should be vigilant when investigating elevated levels of lead to determine the likely source and advise the consumer accordingly.
- 6.7.3 Nickel can be an issue in both recently built and renovated properties where potentially lower quality nickel plated fittings can be a source of elevated nickel in the drinking water.
- 6.7.4 In addition to lead and nickel, other impacts on wholesomeness, for example from copper, can also relate to the effects of consumers' plumbing on the quality of water supplied. The Regulations require water companies to condition their supplies to mitigate such risks to water quality beyond the mains network. Guidance on potential approaches for investigations into copper and nickel failures is available on the Inspectorate's [website](https://cdn.dwi.gov.uk/wp-content/uploads/2022/01/27175834/Part-7-Investigations.pdf) (<https://cdn.dwi.gov.uk/wp-content/uploads/2022/01/27175834/Part-7-Investigations.pdf>).
- 6.7.5 The Inspectorate expects companies to continue to enforce the Water Supply (Water Fittings) regulations 1999 to protect wholesomeness and consumers. It is good practice for every company to have an overarching strategy that includes their lead strategy, and collaborating with other stakeholders, to identify these hazards and mitigate their risks as far as

possible. This may mean removal of hazards (for example, lead communication and supply pipes; lead soldered pipe joints); provision of advice to consumers (for example, flushing; Water Fittings regulations inspections); and training of relevant stakeholders (for example, plumbers; housing associations) to ensure that water quality is maintained at the consumer's tap.

- 6.7.6 When a failure is caused by a private domestic system, and is indicative of a significant risk to health, companies should seek to ensure that the defect is corrected, if necessary, using their powers to prevent contamination under section 75(2) of the Act.
- 6.7.7 In public buildings, companies must consider whether the problem can be adequately addressed through advice to the building occupier or owner, or if action is required by them or the building owner under sections 74 and/or 75 of the Act, if necessary, using their powers of enforcement provided by the Act.

7. Specific considerations

7.1 Matters identified in risk assessments

- 7.1.1 Hazards identified by water companies should be submitted to the Inspectorate as part of company risk assessments. In understanding the profile of risks faced by the sector we have noted that in the last five years the top water quality hazards have been notified with respect to no supply (loss of supply), nitrate (total), metaldehyde (pesticide), *Cryptosporidium*, pesticides (total), endocrine disruptors, fire/flame retardants (due to PFAS compounds), pharmaceuticals and total coliforms.
- 7.1.2 A selection of these identified 'top' hazards are considered below alongside a selection of other notable points for consideration. This list is not exhaustive but identifies some key parameters which would be expected to be addressed in all risk assessments where relevant.

Nitrate – total nitrate remains a key issue arising from agricultural use and practice within source catchments. It is generally recognised in terms of occurrences and locations by companies and where it requires mitigation measures.

Cryptosporidium – There are no particular themes associated with *Cryptosporidium* hazards. Companies must be diligent and thorough in addressing this hazard and defining the root causes. Companies continue

to use a variety of necessary control measures that are site, asset, and catchment specific to address this hazard.

Microbiological contamination (faecal, coliforms, clostridium) – Often root cause issues can be similar to those found with *Cryptosporidium* but also particularly with poor or inadequate asset condition and maintenance. Companies should monitor and record significant change of use activities within source catchments (industrial, agricultural, manufacturing, leisure etc.) that may increase or reduce aspects for risk to raw water quality such that corresponding risk assessments are fit for purpose.

Taste and Odour – reported across the sector for a variety of issues, including:

- Algal growth in water bodies that may have conditions that accelerate growth such as phosphate levels and residence times.
- Hydrocarbons and traces of chemicals such as 2-EDD (2-ethyl-5,5 dimethyl-1,3 dioxolane) and 2-EMD (2-ethyl-4-methyl-1,3 dioxalane) from industrial processes.

Companies must be mindful of addressing/preventing the generation and presence of such occurrences that may not be intrinsically harmful to health at very low levels but could readily lead to significant taste and odour issues for consumers.

Persistent and very persistent mobile toxins (PMTs and VPMTs) – Persistent and very persistent toxic substances/chemicals break down slowly in the environment, are toxic to organisms and can accumulate in both the environment and potentially in species such as various animals or humans. Companies should be aware of raw water abstraction sites that are in catchments associated with former and/or current industrial use where such compounds may be elevated. The Inspectorate reported research findings on [Persistent, Mobile and Toxic Substances - Hazards to Drinking Water in England and Wales](https://cdn.dwi.gov.uk/wp-content/uploads/2021/09/08152716/DWI70-2-323.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2021/09/08152716/DWI70-2-323.pdf) in January 2020. Compounds such as legacy chromium-6 arising from many different uses are a known risk reported in the Inspectorate research findings in [Understanding the significance of chromium in drinking water 2015 – Ref: Defra-8930.04](https://www.dwi.gov.uk/research/completed-research/risk-assessment-chemical/understanding-the-significance-of-chromium-in-drinking-water) (https://www.dwi.gov.uk/research/completed-research/risk-assessment-chemical/understanding-the-significance-of-chromium-in-drinking-water).

Personal care products and domestic care products – Personal care products (PCPs) and Domestic Cleaning products (DCPs) contain a wide range of chemicals, according to their intended purpose. Patterns of use between different PCPs and/or DCPs also differ and, as a consequence, the duration and levels of human exposure to the chemicals present can vary significantly. PCPs are categorised by their use and include ‘leave-on’ products such as cosmetics, moisturisers, body sprays and deodorants, ‘rinse-off’ products including shampoos, soaps, shower gels and shaving gels, and ‘oral care’ products such as toothpaste and mouthwashes. DCPs are classed as those used for ‘laundry/dish care’ including dishwasher tablets/powders, washing up liquids and laundry powders, ‘surface cleaning’ such as kitchen and bathroom spray cleaners, ‘air care’ including air fresheners and fragrances, and ‘floor care’ such as hard surface cleaners and carpet shampoo. Importantly, the majority of PCPs/DCPs used in the home are disposed of down the drain, thus entering the sewerage system with the potential to reach drinking water supplies via wastewater effluent discharges and/or raw sewage in storm overflows. The Inspectorate commissioned research into risks to drinking water quality associated with both PCPs and DCPs summarised in the report [Personal Care Products and Domestic Cleaning Products – Toxicological Assessment of Prioritised List of Chemicals \(Ref: DWI 70/2/331\)](https://cdn.dwi.gov.uk/wp-content/uploads/2021/01/05120230/DWI70-2-331.pdf) (<https://cdn.dwi.gov.uk/wp-content/uploads/2021/01/05120230/DWI70-2-331.pdf>). This research based risk assessment concluded that for the chemicals of interest the levels potentially present in drinking water due to normal use of PCPs and DCPS are not anticipated to pose an appreciable risk to public health.

Pharmaceuticals – The main sources of trace pharmaceuticals in the water environment arise from a combination of raw sewage, disperse occurrence from veterinary use caused manure spreading and wastewater effluents. The concern arises where our environmental raw water is also a source of our drinking water supplies. In 2012 the [WHO](https://apps.who.int/iris/bitstream/handle/10665/44630/9789241502085_eng.pdf;jsessionid=A5D35872110AEA0EBE3025FB11616888?sequence=1) (https://apps.who.int/iris/bitstream/handle/10665/44630/9789241502085_eng.pdf;jsessionid=A5D35872110AEA0EBE3025FB11616888?sequence=1) reported that adapting the water safety plan approach to the context of pharmaceuticals means that preventing them from entering the water supply cycle during their production, consumption (ie excretion) and disposal would be a pragmatic and effective means of risk management. This approach requires a joint effort of collaboration between stakeholders to address the various parts of the life cycle of pharmaceuticals. Water companies should be ready to play a part in terms of wastewater treatment and drinking water treatment practices where there are emerging concerns to public health. The Inspectorate

commissioned research into the [Toxicological evaluation for pharmaceuticals in drinking water](https://cdn.dwi.gov.uk/wp-content/uploads/2020/10/27111256/DWI70-2-295.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2020/10/27111256/DWI70-2-295.pdf) considering a selected range of pharmaceuticals published in 2014. Based on the collective evidence there is no appreciable risk to human health from the trace levels of pharmaceuticals that may be present in drinking water supplies. However, companies should be prepared with an awareness of viable treatment technologies and other mitigations, should an increase in potential risks emerge from further global studies.

- 7.1.3 Other key hazards such as PFAS, pesticides, lead, phosphates and radioactivity are addressed in more detail in the following sections.

7.2 PFAS compounds

- 7.2.1 PFAS compounds are a group of man-made perfluorinated chemicals that are commercially available in the form of salts, derivatives and various polymers. Some PFAS have been identified as being persistent, bio-accumulative in the environment and potentially toxic in terms of human health. PFAS have been used widely for a range of purposes from industrial to household products and have had or continue to have widespread use in England and Wales.
- 7.2.2 There has been growing scientific awareness of the attributes of PFAS and this has raised a keen interest in better understanding their potential impact on the environment and their toxicity. Currently there are no specific standards listed in the Regulations for any PFAS compounds.
- 7.2.3 In January 2021 the Inspectorate issued guidance for the subset of PFAS chemicals, PFOS and PFOA, that were identified as compounds of interest due to indications of their potential toxicity to human health in drinking water in England and Wales. This guidance recommended trigger values in a four-tiered approach for treated drinking water.
- 7.2.4 In October 2021 the Inspectorate issued an Information letter [IL 05/2021](https://cdn.dwi.gov.uk/wp-content/uploads/2021/10/04203217/Information-Letter-PFAS-Monitoring.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2021/10/04203217/Information-Letter-PFAS-Monitoring.pdf) advising that the four-tiered guidance should also be applied in parallel to raw water sources (abstracted for the purpose of drinking water) as part of risk assessments.
- 7.2.5 In July 2022 the Inspectorate issued Information letter [IL 03/2022](https://cdn.dwi.gov.uk/wp-content/uploads/2022/07/08101653/IL_03-2022_PFAS_Guidance-4-1.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2022/07/08101653/IL_03-2022_PFAS_Guidance-4-1.pdf) with further guidance on risk assessments, expectations, and progressive amendments to the PFAS tiered approach to

risks and required actions. This Information Letter and associated guidance may be subject to updates as information becomes available and companies should familiarise themselves with the latest versions.

7.2.6 The approach recognises that in most cases specific PFAS removal/reduction measures are not yet explicitly included in the drinking water treatment cycle; whilst also acknowledging that some existing treatment practices can already reduce their concentration in treated water. The Inspectorate recognises that this is a precautionary approach but considers it appropriate given the uncertainty or absence of specific treatment technologies to reliably remove/reduce PFAS.

7.2.7 For compounds such as PFAS where no statutory standard is set, the Inspectorate seeks advice from the UK Health Security Agency (UKHSA) and, if appropriate, other independent toxicological experts to determine a level at which drinking water does not constitute a potential danger to human health, and therefore could be regarded as wholesome. In [IL 03/2022](https://cdn.dwi.gov.uk/wp-content/uploads/2022/07/08101653/IL_03-2022_PFAS_Guidance-4-1.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2022/07/08101653/IL_03-2022_PFAS_Guidance-4-1.pdf) and the upcoming Inspectorate guidance, expected in quarter three/quarter four 2022, the drinking water wholesomeness recommendation is set at 0.1 µg/L for all PFAS compounds, and this will be reviewed periodically. Companies should operationally plan not to breach this level in treated water supplies at any time. To achieve this companies should seek to have:

- An appropriate understanding about PFAS sources in catchments contributing to raw water sources
- An appropriate understanding of PFAS concentrations in all raw water sources used for drinking water abstractions
- Regular monitoring and analytical programmes for all raw water abstraction sources
- Regular monitoring and analytical programmes that are representative of consumer supply zones and/or where PFAS concentrations have an elevated trend.
- Secure and verifiable methods for managing the supply of treated water (for example, via blending and/or specific treatment processes) such that wholesomeness is ensured at all times.
- To have a plan in place to maintain wholesomeness should a review in the future require a reduction of the level of one or more PFAS based upon expert advice.

- Where GAC treatment approaches are used to reduce PFAS, particular care must be taken in understanding the risk and the efficacy of removal for each substance and when the GAC is regenerated prior to further use, its subsequent efficacy. Company protocols should allow for off-line testing, to ensure that there are no residual by-products or contaminating elements present in the regenerated cells, before returning them into the active treatment cycle.

7.3 Pesticides

- 7.3.1 There are approximately 20 undertakings in place that address various circumstances of non-compliance with standards for pesticides. These are predominantly still in place for metaldehyde in particular; though it is anticipated with the statutory end of use of metaldehyde in March 2022 these will successively be closed in the coming years as concentrations reduce. Other pesticides of interest, also with undertakings, include clopyralid, carbetamide and propyzamide.
- 7.3.2 Table 7.1 shows there are several other pesticides that are being recorded in raw water in significant numbers. However, their individual presence is more prevalent at certain sites than others, so may not necessarily be regarded as sector wide issues. However, companies must remain vigilant in assessing the sources of such pesticides that may still have significant current or legacy risk.

Table 7.1 Top 10 reported pesticides in raw water 2020-21

Rank	2020	2021
1	Metaldehyde	MCPA (Total) 4-chloro-o-tolyloxyacetic acid
2	Clopyralid (Total)	Metaldehyde
3	MCPA (Total) 4-chloro-o-tolyloxyacetic acid	2 4-D (Total)
4	MCPP(Mecoprop) (Total)	MCPP(Mecoprop) (Total)
5	Propyzamide (Total)	Triclopyr (Total)
8	Fluroxypyr	Clopyralid (Total)
7	2 4-D (Total)	Fluroxypyr
8	Bentazone (Total)	Chlortoluron (Total)
9	Triclopyr (Total)	Bentazone (Total)
10	Chlortoluron (Total)	Isoproturon (Total)

- 7.3.3 Some pesticides can be very difficult and expensive to remove via treatment processes and a key part of their control is via at source measures implemented across catchments, working closely with stakeholders. Companies have continued to conduct stakeholder engagement at a national level (pesticides manufacturers, suppliers, and representatives of the agriculture sector) and at local level (individual farmers, agricultural contractors, and their advisors) to mitigate the pollution of raw water sources by pesticides. We expect companies to build on the measurably good outcomes from such cooperative engagement during AMP8 and beyond.
- 7.3.4 The Inspectorate recognises that these programmes of work will continue to require engagement between stakeholders, and we are committed to supporting these activities. We believe this collaborative and measured approach builds consistently on current arrangements and activities; and will continue to deliver the outcomes that consumers expect at a cost that is manageable.
- 7.3.5 Where the voluntary catchment management initiatives do not demonstrate the improvements required, the Inspectorate will advise Ministers on the other options available to them to protect consumers, including the consideration of further targeted regulatory actions.
- 7.3.6 The Inspectorate recognises the challenges that pesticides contamination brings to other areas of companies' activities, in particular, abstraction management; water resource planning; and building resilience capacity. However, these constraints will continue to apply until the risks to consumers from non-compliance with pesticides standards are mitigated satisfactorily.

7.4 Lead

- 7.4.1 The point of compliance measurement for lead is at the consumer's tap, and action is mandatory in response to every analytical result that exceeds the standard to protect consumers.
- 7.4.2 The Defra [Strategic Policy Statement \(SPS\)](https://www.gov.uk/government/publications/strategic-policy-statement-to-ofwat-incorporating-social-and-environmental-guidance/february-2022-the-governments-strategic-priorities-for-ofwat) (https://www.gov.uk/government/publications/strategic-policy-statement-to-ofwat-incorporating-social-and-environmental-guidance/february-2022-the-governments-strategic-priorities-for-ofwat) to Ofwat for England supports action by industry to trial approaches to reducing exposure of lead to customers from drinking water, from a public health perspective. It is therefore expected that companies should investigate and develop trial

projects to better understand how they can deliver further reductions on lead in drinking water effectively and efficiently.

- 7.4.3 The Welsh Government's Strategic Policies Statement for Wales is expected to ask Ofwat to challenge companies to deliver best value solutions (as opposed to lowest cost solutions) through their regulatory framework, encouraging investment that responds to multiple drivers (for example, investment that addresses leakage, asset health, discolouration, and lead simultaneously) or has multiple benefits and takes account of outcomes and wider environmental and social value of solutions. In Wales, companies should also seek to deliver the requirements of the Wales Water Strategy, help deliver the goals of the Well-being of Future Generations (Wales) Act 2015, and to liaise with the Water Health Partnership for Wales on the development of lead reduction policy. Companies in Wales should therefore seek synergistic strategies to reduce lead in the long term for future generations.
- 7.4.4 Where there is a risk of exceedances of the 10 ug/l standard, depending on circumstances, companies are required to take steps to maintain wholesomeness by treatment to reduce potential concentrations via plumbosolvency, providing public health advice and replacing their communications pipes by request when the supply pipe is also replaced. The treatment must be optimised (ie, optimum dose, with regard to water aggressivity parameters), and networks operated to maintain stability and consistency of blends in supply, for greatest effectiveness at the point of use throughout the distribution system. In the case of public buildings, a company must exercise its powers to prevent lead contamination and if necessary, achieve this by enforcement under s75 of the Water Industry Act 1991.
- 7.4.5 Water companies have implemented risk-based strategies to achieve compliance with the prevailing lead standard for many years. Companies are expected to continue to apply this approach to managing compliance with lead as part of their ongoing activities. Companies should keep their risk assessments under constant review and identify an appropriate integrated package of measures to mitigate any risks identified. These measures would be expected to extend beyond the regulatory minimum specified in 7.4.4 to improve societal outcomes. Examples of this would include understanding where lead is, risk profiling of zones, opportunistic replacement when for instance installing meters or tackling leakage or carrying out work in zones, identifying high risk buildings such as schools and liaising with health and local authorities.

- 7.4.6 In January 2021 in collaboration with WRc, the Inspectorate published the [Long-term Strategies to Reduce Lead Exposure from Drinking Water](https://cdn.dwi.gov.uk/wp-content/uploads/2021/02/08150815/DWI70-2-320.pdf) (<https://cdn.dwi.gov.uk/wp-content/uploads/2021/02/08150815/DWI70-2-320.pdf>) research report. The report provides compelling and significant evidence of the economic implications of exposure to lead through reduced societal intellectual capacity and physiological health. This has demonstrated via cost-benefit analyses that removing lead from drinking water has a significant overall economic benefit. Therefore the long term objective is to reduce exposure to lead in drinking water as there is no safe level of human exposure to lead ([WHO](https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health)) (<https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health>).
- 7.4.7 The challenge to remove lead to achieve the outcome in 7.4.6 is complex not least because lead was commonly used to connect properties to the mains water network in properties before 1970. As a result, there are estimated to be around eight million properties (both private dwellings and public buildings) in the UK that still have some form of lead-based material in the drinking water system. This can only be successful through a long-term strategy over the coming decades aimed at removing lead. Strategically this should be founded on a clear understanding of how this can be achieved.
- 7.4.8 As part of the UK Government Green Economic Recovery initiative in 2021, two water companies were selected to undertake lead replacement programmes at scale to better understand the practical costs at scale, the technical implications of different methods and importantly the best methods for achieving good consumer engagement with subject of lead and the need to exclude historic lead supply pipes from the drinking water supply infrastructure in homes.
- 7.4.9 The Inspectorate expects all companies to strategically plan for the future by taking suitable approaches towards reducing lead levels in the upcoming AMP8 period and successive periods by developing and gaining experience through implementation companies should aspire to achieving positive reductions of lead in drinking water. Information which companies have gained through ongoing strategies outlined in 7.4.5 will permit effective strategies when replacing lead. For instance, replacement may be targeted at high-risk zones where there are schools, hospitals, and other vulnerable populations in a high lead density area.
- 7.4.10 The Inspectorate is supportive of innovation with respect to developing technologies, initiatives and efficiencies for the benefit of future generations. Companies are encouraged to think of the wider strategies which may impact decision making either through design or consequence. For instance, in developing strategies for the removal of lead planning for reduction of

phosphate dosing is a sensible outcome. This benefits the environment through reduction in waste, together with efficiencies in reducing an increasingly costly and diminishing resource. Working towards a chemical free supply synergistically reduces our carbon footprint and net zero.

- 7.4.11 Conversely, where companies are considering innovation, such as relining of pipes they should also balance this decision with the consequence that they must also plan for longer-term replacement. Current lining technologies, by their nature will inevitably deteriorate with age this may in turn see a return to lead level exposure and other associated new issues with the lining deterioration. Since this option is a medium-term solution which would require further intervention, this will need be coupled to an undertaking to replace the affected lead supply pipes within a formally committed period prior to deterioration in the future
- 7.4.12 In considering any lead strategy, companies must communicate this effectively to consumers with particular regard to vulnerable consumers and be mindful of the overall efficiency of their approaches.

7.5 Phosphates

- 7.5.1 Phosphates retain an interesting and unique place in both drinking water distribution and in wastewater management. We have discussed in the previous section the importance of progressively reducing consumers' exposure to lead in drinking water for public health reasons.
- 7.5.2 For many years companies have been able to effectively manage lead levels in drinking water to varying degrees by orthophosphate dosing in supplied water to minimise dissolution of lead from lead communication and lead supply pipes. Some companies have been rigorous in removing and replacing lead communication pipework (under their ownership) while consumers have, more often than not, retained their original lead supply pipes.
- 7.5.3 Orthophosphate dosing has therefore been a necessity in many areas to keep lead levels below the statutory limit of 10 ug/L where there remains customer-side lead pipework and older lead solder used in fittings. Older homes and public buildings constructed pre-1970 are more likely to have such legacy lead pipework remaining if they have not been significantly refurbished since construction.
- 7.5.4 There are however some current and emerging downsides with orthophosphate dosing that mean it can no longer be seen as a longer term, sustainable or optimal management solution for lead as noted below:

- a) Phosphate dosing has its limitations in its actual performance. It is unlikely that it will be a suitable primary control measure to deliver future reductions in lead levels beyond the current the parametric value. The DWI\WRc research report [Long-term Strategies to Reduce Lead Exposure from Drinking Water 2021 Ref DWI14372.2](https://cdn.dwi.gov.uk/wp-content/uploads/2021/02/08150815/DWI70-2-320.pdf) (<https://cdn.dwi.gov.uk/wp-content/uploads/2021/02/08150815/DWI70-2-320.pdf>) has already indicated that achieving 5 µg/L consistently while lead supply pipes remain in place, is unlikely to be achievable if relying on plumbosolvency measures alone.
- b) Phosphates are heavily used in fertilisers for their nutrient properties to support crop growth. However, this property becomes very problematic when the same phosphates find their way into water bodies such as streams, rivers and lakes where their presence creates eutrophication (excess nutrients) that accelerates harmful algal growth and other unwanted flora that damage the ecosystem balance. Phosphates used in water supply dosing are a small fraction of that occurring in the environment (the majority arising from agricultural run-off and effluent discharges), but the dosing component does contribute to the overall phosphate loading unless successfully removed from wastewater effluent. Phosphates in drinking water are also known to be mobilised into the environment via network leakage and can also remain as one minor component of overall loading in wastewater effluent. Defra published a [Consultation on environmental targets](https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/supporting_documents/Environment%20Targets%20Public%20Consultation.pdf) (https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets/supporting_documents/Environment Targets Public Consultation.pdf) in May 2022, which proposed targets to reduce overall phosphorus loadings from treated wastewater by 80% by 2037 against a 2020 baseline.
- c) Lastly Phosphate is a naturally occurring but non-renewable resource that is predominantly sourced from rock phosphate deposits. Phosphates are therefore generally imported for continued use in all UK sectors. The supply chain and costs associated with importing phosphates are expected to become much more difficult and costly in the future as its availability decreases. Therefore, phosphate-based compounds should not be considered as a far future control measure for lead in drinking water.

7.5.5 The situation with phosphate sources and dosing has not reached a critical point, however the indications are that it is not a solution for managing lead

levels in the very long term. The Inspectorate recommends that companies undertake research to look at scenarios where they may need to reduce and rationalise phosphate dosing in response to lower long term availability and/or temporary unavailability to understand the risks and mitigate them. Associated with this, companies should also consider the future of phosphate dosing in the round, such that planning is synergised with other more maintainable initiatives for lead reduction and controls to comply with current and future drinking water limits.

7.6 Radioactivity

- 7.6.1 Regulations require water companies to continue to monitor for radioactivity parameters.
- 7.6.2 There is provision in the legislation for an exemption from monitoring for radioactivity parameters. In August 2021 the Inspectorate issued an Information Letter [IL 03/2021](https://cdn.dwi.gov.uk/wp-content/uploads/2021/08/27102506/Radioactivity-IL-03-2021.pdf) (<https://cdn.dwi.gov.uk/wp-content/uploads/2021/08/27102506/Radioactivity-IL-03-2021.pdf>) and associated guidance on the process for these exemptions is included in [Annex A](https://cdn.dwi.gov.uk/wp-content/uploads/2021/08/27102503/Annex-A-Conditions-and-Requirements-for-Radioactivity-Exemption-Applications.pdf) (<https://cdn.dwi.gov.uk/wp-content/uploads/2021/08/27102503/Annex-A-Conditions-and-Requirements-for-Radioactivity-Exemption-Applications.pdf>).
- 7.6.3 Companies are not expected to provide monitoring data for surface water supplies and groundwaters in low-risk radon hazard areas but should still confirm in their reports that a risk assessment has been carried out and that there is a low risk of radon being detected with activity levels above 100 Bq/l. Companies should demonstrate that the risk for the site has been adequately assessed and these sites will require a radioactivity notice to vary compliance monitoring frequencies. During the period the notice is in effect, we recommend that companies carry out an operational monitoring programme to demonstrate that there has been no significant change to the circumstances relating to the issue of the notice.
- 7.6.4 Gross alpha and gross beta remain the indicators for the measurement of indicative dose. Investigations into breaches of either gross alpha or gross beta should trigger a re-evaluation of the indicative dose calculation if there have been significant changes in the normal measured values.
- 7.6.5 Tritium remains the indicator parameter for man-made radioactive parameters and an exceedance in this parameter should trigger an investigation into man-made radionuclides.

- 7.6.6 Radon is a more recent parameter of interest and reports to date suggest that this is unlikely to be of concern in public supplies in most occurrences. Where Radon is present companies should consider the level of risk and where appropriate initiate and maintain effective mitigation.
- 7.7 Other enduring or emerging risks
- 7.7.1 We would draw companies' attention to some enduring or emerging risks for drinking water quality at a limited number of sites that may require provisions within risk assessment reports. Additionally, there are evident weather-related risks for turbidity issues and associated tastes and odours caused by Methyl-Isoborneol (MIB) and geosmin.
- 7.7.2 The compliance standard for nitrate remains at 50 mg/l. Any increasing trend of nitrate concentrations in groundwater should be accompanied by catchment source interventions and control measures, in the first instance, and treatment solutions should be considered as a last resort, supported by written confirmation from the relevant environmental regulator that potential catchment management solutions are exhausted.
- 7.7.3 Based on recent research on chromium VI, and advice that exposure should be as low as reasonably practical, the Inspectorate has provided [advice](https://www.dwi.gov.uk/water-companies/guidance-and-codes-of-practice/guidance-on-implementing-the-water-supply-water-quality-regulations) on the need for action to protect consumers (<https://www.dwi.gov.uk/water-companies/guidance-and-codes-of-practice/guidance-on-implementing-the-water-supply-water-quality-regulations>). Companies are reminded to review their circumstances and to put in place measures to mitigate levels that occur above 3 µg/l.
- 7.7.4 Geosmin and MIB are naturally occurring organic compounds. They are noticeable to consumers at certain concentrations and present with an earthy/musty taste and odour; current evidence suggests they are not toxic to humans. Increased levels of these compounds in raw water at some sites can cause taste and odour issues in ongoing water supplies. Risks to the quality of water supplies presented by both geosmin and MIB are generally well understood, and company mitigation measures should be included in risk assessments.
- 7.7.5 Microplastics are ubiquitous in the environment according to the World Health Organization (WHO) technical report [Microplastics in drinking Water \(August 2019\)](https://www.who.int/publications/i/item/9789241516198) (<https://www.who.int/publications/i/item/9789241516198>). Evidence confirms their presence in both marine and freshwater bodies including those used for drinking water supply abstractions. The presence of microplastics in raw water sources is mainly driven by diffuse or point source discharges such as surface water run-off, effluent discharges, sewer

overflows and degraded plastic waste. Their occurrence and concentration in drinking water is still a topic of research and is not particularly well understood; current indications suggest their presence is extremely low and incidental.

- 7.7.6 However microplastics are of some concern given their longevity in the environment, the capacity for biofilms to develop on them (albeit at very low levels) and the potential for nano-particle sized microplastics to accumulate in biological tissue. The Inspectorate would welcome further research and company investigations that consider microplastics. In the interim the Inspectorate considers some, no regrets, precautionary action is appropriate.
- 7.7.7 It is recommended that companies consider the removal of microplastics from both raw water sources and drinking water prior to supply. In terms of raw water reduction/removal the best approach would be effective wastewater treatment prior to effluent discharge to prevent this potential source from entering the environment. Existing water treatment approaches should be optimised, using current treatment technologies that are known to effectively remove microplastic particles.
- 7.7.8 Endocrine Disrupting Chemicals (EDCs) are a diverse group of chemicals that have the potential to alter the normal functioning of hormonal systems across a wide range of wildlife and in humans (especially during early development). Their presence in a variety of applications and direct pathways for release into the environment means that EDCs could reach drinking water through typical use of EDC containing products. Continuous domestic release of many of these chemicals (particularly to wastewater systems) gives rise to pseudo-persistence in the environment, and they have frequently been found within the sewerage system and rivers. EDCs have been identified as a potential cause for concern for human health by the WHO in the report [State of Science Endocrine Disrupting Chemicals 2012](https://www.who.int/publications/i/item/state-of-the-science-of-endocrine-disrupting-chemicals) (<https://www.who.int/publications/i/item/state-of-the-science-of-endocrine-disrupting-chemicals>). Peer-reviewed and grey literature verifies the occurrence of 17-Beta-estradiol (E2), Nonyl phenol (NP) and Bisphenol A (BPA) in both surface and groundwater. Our Inspectorate research has highlighted these three EDCs as of particular interest in terms of human health and have proposed recommendations for limits in drinking water. The rate of incidence of these three EDCs in wide scale surface/groundwater monitoring programmes such as the Chemical Investigation Programme (CIP) and British Geological Survey (BGS) surveys suggests that their occurrence could be expected at low levels in drinking water sources across England and Wales. Limited information is currently available on concentrations of these substances in source/treated water or their removal using advanced drinking

water treatment technologies. The Inspectorate commissioned specific research into [Likelihood of three endocrine disrupting substances reaching drinking water – Ref DWI 70/2/328 \(25853\)](https://cdn.dwi.gov.uk/wp-content/uploads/2021/07/07110203/DWI70-2-328.pdf) (<https://cdn.dwi.gov.uk/wp-content/uploads/2021/07/07110203/DWI70-2-328.pdf>) that should be considered. Although no high levels of the three EDCs were noted that would be of concern, the fact that E2, NP and BPA were all found, suggests that they should all continue to be monitored on a routine basis by water companies.

- 7.7.9 As noted in the pharmaceuticals, personal care products and domestic care products sections emerging and enduring risks should be considered as having the potential to impact drinking water quality and companies should maintain an awareness and knowledge of the research relating to the impact such existing products and those that may come to market for use.

8. Supporting development of business plans for periodic reviews

8.1 Context

- 8.1.1 The Inspectorate's strategic objectives are that water suppliers provide drinking water to consumers that is safe and clean, and that the public have confidence in their water supply.
- 8.1.2 In addition, The UK government has set out its priorities for Ofwat's regulation of the water industry in England². Ministerial guidance from the Welsh Government will be provided to Ofwat on its strategic priorities and objectives.
- 8.1.3 Companies should work towards improvements in cybersecurity generally and with regard to operational control systems, in particular for compliance with the Network and Information Systems (NIS) regulations 2018.
- 8.1.4 Companies will also be required to understand their obligations to comply with Security and Emergency Measures (Water and Sewerage Undertakers and Water Supply Licensees) Direction (SEMD). The Inspectorate, on behalf of the Secretary of State and Welsh Ministers, is responsible for the regulation of the SEMD for companies who are wholly or mainly in England and Wales.

² February 2022: The government's [strategic priorities for Ofwat](https://www.gov.uk/government/publications/strategic-policy-statement-to-ofwat-incorporating-social-and-environmental-guidance/february-2022-the-governments-strategic-priorities-for-ofwat)
<https://www.gov.uk/government/publications/strategic-policy-statement-to-ofwat-incorporating-social-and-environmental-guidance/february-2022-the-governments-strategic-priorities-for-ofwat>).

- 8.1.5 There is specific Inspectorate [guidance](https://cdn.dwi.gov.uk/wp-content/uploads/2022/05/06172210/NIS-and-SEMD-PR24-Guidance-7.pdf) (https://cdn.dwi.gov.uk/wp-content/uploads/2022/05/06172210/NIS-and-SEMD-PR24-Guidance-7.pdf) on NIS and SEMD for PR24 published.
- 8.1.6 Companies should consider synergistic opportunities to deliver multiple benefits to achieve long term improvements that benefit drinking water quality.
- 8.1.7 The Inspectorate's Compliance Risk Index (CRI) has been included in Ofwat's list of mandatory performance commitments (PCs) since 2019. Our expectation, in collaboration with Ofwat, is that CRI will be retained as general PC when the draft PR24 Methodology is published in Summer 2022. The Inspectorate is in ongoing discussions with Ofwat about how CRI could be used most effectively and fairly going forward. Consumer complaints are not included in the list of PCs but companies should be aware that the Inspectorate will still be collecting consumer complaint data and may look for improved performance.
- 8.1.8 The Inspectorate has developed and has been implementing the Event Risk Index (ERI) for several years. The ERI is a transparent means of capturing the performance of companies when dealing with unplanned and unexpected events that could or do adversely impact drinking water quality. ERI may also be incorporated in some form of measure to gauge company performance with respect to events, though this may not necessarily be along the lines of a mandatory PC. Discussions on the use of ERI for PR24 performance monitoring are ongoing between the Inspectorate and Ofwat.

8.2 Routine arrangements

- 8.2.1 The requirements of primary legislation and the Regulations relating to drinking water quality are routinely discharged by water companies and overseen by the Inspectorate. However, periodic reviews provide companies with an opportunity to review their arrangements, and, in particular, enable companies to revisit and update in their revised business plans as necessary, their long-term planning requirements for the supply of drinking water.
- 8.2.2 The core framework for drinking water quality reviews is already in place in the form of risk assessments based on a company's water safety planning processes, which are used to inform risk assessment reports to the Inspectorate. Outputs from these processes continuously inform the risk management arrangements of the company for each of its water treatment works and supply systems, both upstream and downstream. These risk assessments identify all the relevant hazards in the catchment; in the water treatment works; in distribution systems; at the point of use; and in a

company's operations and maintenance arrangements that could potentially impact on a company's ability to supply wholesome drinking water.

Wholesomeness is defined in the Regulations by reference to drinking water quality standards and any other substance or organism alone or in combination with another substance that would constitute a potential danger to human health and acceptability to consumers. The minimum statutory requirement is 100% compliance with these standards.

- 8.2.3 The risk assessments should already consider the short, medium and long-term control mechanisms required to address each hazard and assess whether there is a need for additional control measures in the catchment at abstraction points, at the treatment works or in the associated supply system to ensure that drinking water is wholesome at the consumers' taps and that risks to human health are appropriately mitigated. These measures may need investment in existing assets or in maintaining existing control measures already in place, where these are deficient. It should be recognised that many risks may be managed already through operational and/or communications control measures, and the case for investment may relate to improving the performance, reliability, resilience, and/or sustainability of such controls.
- 8.2.4 Our approach provides flexibility for companies to develop solutions to deliver required outcomes and encourages innovation by companies by recognising, and making provision for, uncertainty in outcome delivery and in the duration of scheme delivery of the solutions adopted. This is especially relevant for catchment management schemes, for new technology and for innovative solutions. In agreeing to such proposals for outcome delivery, the Inspectorate will need a clear understanding of the company's provisions for all aspects of outcome delivery recovery, if needed. Where legal instruments are put in place, mitigation steps may include investigative or modelling actions to facilitate identification or confirmation of the optimum solution.
- 8.2.5 The change application process that is already in place will continue to be applied for revisions to agreed proposals, where applicable. This enables companies to propose alternative solutions where these have been identified and can be shown to deliver benefits over and above the original proposal, or because changed circumstances require an alternative solution. This change application process is intended for genuine unforeseen circumstances and will only be granted if deemed appropriate by the Inspectorate. In all circumstances, prompt communication with the Inspectorate is encouraged as soon as any delays are foreseen. No alternative solutions will be permitted if they are not formally accepted by

the Inspectorate prior to implementation through the change application process.

8.3 Accommodating business plan reviews

- 8.3.1 In support of routine processes, the Inspectorate is content to consider any new or revised requirements for improvements for drinking water quality reasons that might arise from a company's review of its current risk assessments as part of its business planning process. The outcomes from risk assessments referred to above should provide the supporting information for any drinking water quality proposals to achieve identified outcomes that water companies wish to include in their business plans. Any such proposals will be scrutinised for justification of need, in accordance with our usual procedures. If proposals for control measures are supported, they will be incorporated into legal instruments that specify the solutions and timescales to be delivered, together with arrangements for monitoring progress and confirming completion and outcome delivery.
- 8.3.2 Although current periodic reviews span a five-year period, the Inspectorate expects that companies will need to take clear strategic long-term views on their planning needs to ensure that their risk management strategies are coherent, effective, efficient and ultimately sustainable with due regard for resilient services to consumers.
- 8.3.3 To provide assurance that risk assessments include a long-term view, the Inspectorate requires all water companies to prepare and submit to the Inspectorate, by the end of January 2023, a concise statement that sets out significant new future risk mitigation measures that a company considers it will need to provide for. New measures are those that are beyond routine provisions for current risk mitigation for all of a company's supplies from source to tap, insofar as they affect the quality of drinking water supplies. Items of relevance might include, but not be confined to:
- Significant costs for the sustainability of long-term catchment management provisions.
 - One-off, or 'lumpy', existing asset replacement for water treatment or storage facilities.
 - Additional risk mitigation at water treatment works.
 - Activities on the supply network that might include maintenance/replacement of trunk mains.
 - Dealing with discolouration.

- Material or condition driven activity (for example, on epoxy resin lined pipework, asbestos cement mains, and lead pipe connections); and
- Network resilience measures.

The Inspectorate recognises that this is not only an important matter but a significant task for companies to complete; however, it is emphasised that the submission is envisaged as a concise summary to enable future engagement and discussion around the details if necessary.

8.3.4 For consistency and comparison, requirements should be considered from 1 April 2025, for a duration of a minimum of 25 years or more. Duration will vary with the specific driver and companies should be mindful of the affordability and impact on customer bills when considering the implementation period. Contributions to delivery within the AMP8 period should be clearly identified. The statement should state the item for which provision is required; its location or scale; the planned timing and duration of action by the company; and an estimate of the total and annual costs involved. Appendix A is available to download from the Inspectorate's website ([Price review process - Drinking Water Inspectorate \(dwi.gov.uk\)](https://www.dwi.gov.uk/price-review-process)). The template should be completed and returned electronically to dwipricereview@defra.gov.uk by 31 January 2023.

8.3.5 Transparency about, and availability of, this information is required by the Inspectorate to inform its discussions with each company, on the adequacy of its planning for future requirements to maintain the quality of drinking water supplies to consumers. Additionally, for Welsh companies, the information will be relevant to demonstrating that both Ministerial priorities and strategic objectives and the requirements of the Wellbeing and Future Generations Act 2015 are met. For English companies, the information is relevant for demonstrating alignment with Ministerial priorities and strategic objectives on transparency in long term planning and intergenerational fairness and consistency with the objectives of the UK government's plan [A Green Future: Our 25 Year Plan to Improve the Environment](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf) (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf).

8.4 Evidence to justify need

8.4.1 Water companies seeking technical support for new improvement schemes from the Inspectorate will need to demonstrate the need for each proposal. The case for justification of need must be accompanied by the evidential information which justifies the need for action, and demonstration that the risk is significant enough to act at this time, including:

- a) how the company has derived the most appropriate technical and cost-effective options to mitigate each named hazard and thereby achieve compliance with the regulatory requirements.
 - b) summary details of the capital costs and the net additional operating costs, as part of the overall total expenditure (totex), of each of the options considered.
 - c) identification of the preferred option and the rationale for choosing that option and reasons for discounting all other possible options and
 - d) evidence that the preferred option will adequately mitigate the risk and deliver the required outcome within an appropriate timescale, and that the solution is sustainable, and improves resilience.
- 8.4.2 The Inspectorate will expect companies to provide detailed supporting evidence that the preferred option will mitigate the risk of the hazard occurring or, where the hazard already exists, reduce the risk to an acceptable level (ie, compliance with any relevant standard or guideline value for unlisted parameters) within a prescribed timescale. The Inspectorate will not consider submissions for individual schemes that are not accompanied by supporting evidence of the process employed by the company to assess and determine the most appropriate technical and cost-effective solutions, and specific supporting evidence of the appropriateness of the preferred option.
- 8.4.3 Companies' analyses should include an assessment of all relevant benefits including the benefits of provision for protection of public health, and maintenance of public confidence in drinking water supplies. These benefits should be assessed qualitatively, quantitatively and where possible, monetised, in order to demonstrate that the proposed solution is needed, has a clear driver, will deliver the required outcome within the prescribed timescale, is sustainable in the long-term and is cost-effective. We will seek confirmation from companies that proposals are consistent with their long-term strategies for delivering water supply outcomes, and that these outcomes are consistent with their consumer and stakeholder research.
- 8.4.4 Companies should ensure that they review their compliance returns, event assessment letters, audit letters and commentaries in the Chief Inspector's reports to ensure that issues are addressed in their business plan submissions. The Inspectorate will make use of information available to it from compliance assessments, event assessments, consumer complaints and operational audits to be assured that companies are investing in areas where there is evidence of need.

8.4.5 The information requirements to support and justify preliminary submissions for individual proposals to the Inspectorate are provided in Appendix B, which is available to download from the Inspectorate's [website](https://www.dwi.gov.uk/water-companies/price-review-process/) (<https://www.dwi.gov.uk/water-companies/price-review-process/>). Submissions that are not accompanied with an up-to-date regulation 28 risk assessment report and comprehensive supporting information as detailed in the Appendix B will be rejected. Submissions should be sent electronically to the Inspectorate's Price Review mailbox: dwipricereview@defra.gov.uk, according to the timescales explained in paragraph 8.7.

8.5 Decision letters and legal instruments

- 8.5.1 The Inspectorate will formally confirm or decline to support the proposal in a Final Decision Letter sent to a company's board level contact, copied to the day-to-day contact and the Chair of its CCG. The Letter will also indicate whether or not a legal instrument will be put in place to implement a statutory programme of work.
- 8.5.2 We anticipate that some proposals, in particular catchment schemes, may be submitted for regulatory support which will deliver longer-term improvements to raw water quality, but are not included by the Inspectorate in a specific drinking water quality scheme, or are not included in the environmental regulators' programmes of work. In these cases, the making of a legal instrument for drinking water quality is unlikely to be appropriate, but the proposal may be commended by the Inspectorate in the Final Decision Letter, which will also confirm that a legal instrument will not be put in place.
- 8.5.3 The transposition of supported proposals into formal programmes of work will reflect the regulatory position as set out in the Regulations and the relevant sections of the Act. Where there is evidence of current, or a likelihood of future, failures of a standard for a parameter linked to a hazard identified through the risk assessments, the Inspectorate will put in place notices confirming the statutory requirements.
- 8.5.4 All legal instruments will continue to include a demonstration of benefits stage, to provide evidence to the Inspectorate that the required outcome has been achieved following completion of the programme of work. Companies may wish to ensure that their procurement arrangements are consistent with this requirement. We will arrange meetings with companies to discuss proposals where additional actions are necessary, and also to discuss companies' proposals for maintaining and operating their water supply assets to prevent future non-compliance.

8.6 Customer and Inspectorate Engagement

8.6.1 Engagement for PR24 will be conducted via a different method than previous price reviews. The backbone of engagement with customers will be facilitated via collaborative centralised research conducted by Ofwat and CCW. Ofwat has indicated that this collaborative research will focus on three key themes:

- Research on common performance commitments.
- Outcome delivery incentive (ODI) rates research.
- Acceptability and affordability testing.

Companies will be expected to supplement the centralised research by leading their own focused customer research to gain insights through specific forums, but also by interpreting their business-as-usual contacts with customers to garner some understanding of preferences and by, for example, employing willingness-to-pay research.

8.6.2 The Inspectorate will not be directly involved with either aspect of the centralised or company led research. However, we will seek to engage at a high level with Ofwat and, where appropriate, directly with companies to discuss how drinking water quality is explicitly accounted for and to provide feedback on the emerging research outcomes. It should be noted that the Inspectorate does see a necessity to have regular engagement directly with each company on business planning for drinking water quality. This Guidance is prepared to highlight the key areas that companies should have regard, though this should not be considered a comprehensive guide for every eventuality. The Inspectorate will be available to engage with companies as necessary to provide feedback on developing drinking water proposals towards producing their business plans.

In addition to the January 2023 statement that sets out significant new future risk mitigation measures, companies should preferably follow this with submission of their draft business plans for drinking water quality investment to the Inspectorate by end of March 2023. This will allow sufficient opportunity for the Inspectorate to provide feedback ahead of the submission of Business Plans to Ofwat in Autumn 2023.

8.6.3 Companies should be able to demonstrate to the Inspectorate that their business plans include sufficient provision for operations and maintenance activities to ensure that compliance with the Act and the Regulations is maintained; that the quality of drinking water does not deteriorate; and, where it is deficient, it is improved. Companies are also expected to consider

more generic risks to resilience, for example, power outages, flooding, drought, security of supply for treatment chemicals, analytical capacity, and system issues such as critical telemetry, SCADA, NIS and other IT systems.

- 8.6.4 The Inspectorate expects companies to have a sustainable and integrated asset management strategy for all water supply assets, that is designed to minimise the risk to consumers by proactive mitigation of the risks from drinking water quality events and non-compliance with the standards. This reflects the general duties of water companies to maintain an efficient and economical system of water supply. Risk-based asset maintenance strategies are regarded by the Inspectorate as an integral part of companies' risk assessment and risk management approaches using water safety plan methodology.
- 8.6.5 Asset maintenance strategies that prevent problems with drinking water quality by proactive intervention should be applied to all water treatment and distribution assets, in particular treatment works and service reservoirs. If a company does not have an adequate asset management strategy in place, then there will be a risk of future non-compliance with the statutory water quality standards and a greater likelihood of a deterioration in the aesthetic quality of drinking water as measured by consumer contacts reporting discolouration or an objectionable taste or odour.
- 8.6.6 Water asset management strategies must be informed by a comprehensive review of information about recent water quality incidents, breaches of standards and the number of consumer complaints because these data may be the only reliable evidence that points to systemic and persistent underperformance of existing assets.

8.7 Timeline for PR24 engagement

- 8.7.1 The Inspectorate's timetable for PR24 has been developed to assist companies that are required to prepare a business plan for submission to Ofwat by Autumn 2023. We would encourage companies to submit their business plan proposals for drinking water quality as early as possible, and it is advised that companies start any detailed engagement with the Inspectorate no later than September 2022 onwards.
- 8.7.2 We will accept submissions up to the end of March 2023, with a view to Final Decision Letters being issued by 31 August 2023. All submissions must be accompanied by up-to-date risk assessment reports. If the risk assessment report is a revised version with different risks to the version previously submitted, it would be helpful if these could be sent at least four weeks in advance of the PR24 submission, with changes clearly highlighted, to allow

the Inspectorate time to review the revised risk assessment and to consider whether enforcement action may be appropriate.

- 8.7.3 We have set a target date of the end of February 2024 to have all necessary legal instruments in place to allow time for further planning before business plan submissions in Autumn 2024 and Ofwat's final determinations at the end of 2024.