

# Drinking Water 2022

Public supplies England



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# Glossary

Company code with their associated company name

Code	Company Name
AFW	Affinity Water
ALE	Albion Eco Ltd
ALB	Albion Water Ltd
ANH	Anglian Water Services Ltd
BRL	Bristol Water Plc
CAM	Cambridge Water Company Plc
DWR	Dŵr Cymru Welsh Water
ESP	ESP Water Limited
HDC	Hafren Dyfrdwy
ICW	Icosa Water Ltd
IWN	Independent Water Networks
ISC	Isles of Scilly
LNW	Leep Networks Water
NES	Northumbrian, Essex and Suffolk Water
PRT	Portsmouth Water Plc
SES	SES Water
SVT	Severn Trent Water Ltd
SEW	South East Water Plc
SST	South Staffordshire Water Plc
SWB	South West and Bournemouth Water
SRN	Southern Water Services Ltd
TMS	Thames Water Utilities Ltd
UUT	United Utilities Water Plc
VWP	Veolia Water Projects
WSX	Wessex Water Services Ltd
YKS	Yorkshire Water Services Ltd



# Foreword

The strategic objective of the Drinking Water Inspectorate is to protect public health and maintain public confidence in drinking water, and this is achieved by securing sufficient safe and clean drinking water, now and for future generations. This central position is shared by the public, who relate to the service aspects which affect them directly. In recent consumer preferences research, a sample of 302 people ranked the appearance and taste of their drinking water together with a constant and a safe supply as their top priorities.<sup>1</sup>

The UK is one of only six nations in the world with the maximum score possible in the 2022 Environmental Performance Index ([Yale](#)).<sup>2</sup> This measures diseases and deaths from exposure to unsafe sanitation and drinking water, providing countries with independent data on whether water infrastructure is sufficient to maintain public health. The absence of any disease associated with drinking water infrastructure validates the work of the Drinking Water Inspectorate and the companies it regulates in ensuring public health is protected. Whilst this is certainly good news and aligns with the high level of compliance by companies and the actions by the Inspectorate since 1991 to keep drinking water safe in line with consumer expectations, it is critical not to be complacent. To maintain this position the Inspectorate has set out four pillars upon which water company strategic plans will need to focus when considering the water supply for the future based upon current and emerging risks; these are:

- Climate Change
- Continuing and new risks
- Source to Tap Planning
- Supply Resilience

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1 Research on customer preferences: A joint report by CCW and Ofwat [Understanding customers' preferences for Performance Commitments at PR24 – CCW](#)

2 Wolf, M. J, Emerson, J. W., Esty, D. C., de Sherbinin, A., Wendling, Z. A., et al. (2022). 2022 Environmental Performance Index. New Haven, CT: Yale Center for Environmental Law & Policy. [epi.yale.edu](http://epi.yale.edu)

The impacts of climate change range from drought and prolonged periods of dryness to floods coupled with heavy rain. Extreme conditions affect resources by degrading the chemical and biological composition of the catchment and source water through pollutant concentration, increasing the risk to water treatment. These include algae, metals, turbidity, and novel pollutants, which have impacted the ability of treatment works in England to treat and supply water which is wholesome. Catchment risks must be assessed to identify the mitigations necessary in the short and long-term to ensure infrastructure is and remains fit for purpose, adaptable and is planned as a proactive strategy.

This report is accompanied by the raw water data at the points of abstraction in order to highlight the continuing and new risks posed by environmental water used for drinking. The threat of PFAS in raw water sources is evident by the work of the Inspectorate and is published in this report. Water companies must plan to mitigate these risks in their business plans, particularly since understanding of the toxicities remains uncertain. The raw water data highlights challenges such as pesticides, nitrates and other chemicals which may become transferred risks as source waters change, sources are opened or reopened, raw water transfers, recycling and other infrastructure developments. Equally important is the need to scan the horizon for risks which may not be evident now, but become important where changes in the catchment occur, including endocrine disruptors, pharmaceuticals, microplastics and post-industrial solvents. Changes in our environment, demographics, industry, customer expectations, and usage, will put pressure on aging infrastructures which are no longer able to cope or cater for these changes, some of which have been highlighted in the report, as well as difficulties enabling asset inspections, removal from supply, and replacement. The Inspectorate has an enforcement strategy linked to transformation programmes. These are utilised where there are persistent water quality risks, and focus companies on keeping water safe.

Discoloured water remains the most common reason for consumers to contact their supplier with a water quality concern in England. This is caused by resuspension of sediment within the mains, originating either from source water containing metals which pass through the water treatment works and seed the network, or from metals eroding from older iron mains. Significant investment is required to lower margins of treatment control to first remove metals more effectively, but also to replace and remediate these mains to reduce discolouration and avoid events where customers experience unwholesome water.

This year has identified water treatment works failures due to interrupted power supply, a significant cyber security breach, gaps in physical security, and inadequate provision of alternative supplies which has fallen short of minimum expectations. Power generators at treatment works do not in themselves provide complete resilience for supplies, since logic controllers have failed on power surges and pumped distribution systems do not have full coverage of the supply area. The impact of the December 2022 freeze/thaw event has been reported on the Inspectorate website. Whilst the response was better compared to 2018, the response has still fallen short for two companies, where there was a lack of resilience in the system coupled with insufficient headroom to recover the supply/demand balance following burst mains. The high summer demand in hot weather also caused supply interruptions. In one instance in particular, the provision of alternative supplies was well below minimum expectations. The loss of drinking water supply has severe societal impacts and investment in alternative supplies will be necessary to meet the changes of SEMD 2022 and the subsequent gaps identified in risk assessments for alternative supplies.

Finally, we must not forget the significant legacy issue of lead which remains prevalent in our homes. Scientific evidence unequivocally states that there is no safe level of lead in drinking water. Companies should be increasing their strategy, not reducing it, towards eliminating lead.

We cannot stand still, be complacent, or assume drinking water remains of such high quality that no investment above base expenditure or no action is required, because this will result in our failure to protect public health and we consequently won't be in the top six countries in the world for drinking water quality.

I began by stating that for consumers, their priority is a good clean wholesome supply. I urge companies and all involved in drinking water to adopt a balanced and strategic investment strategy for future generations.



**Marcus Rink**  
**Chief Inspector of Drinking Water**



### Introduction

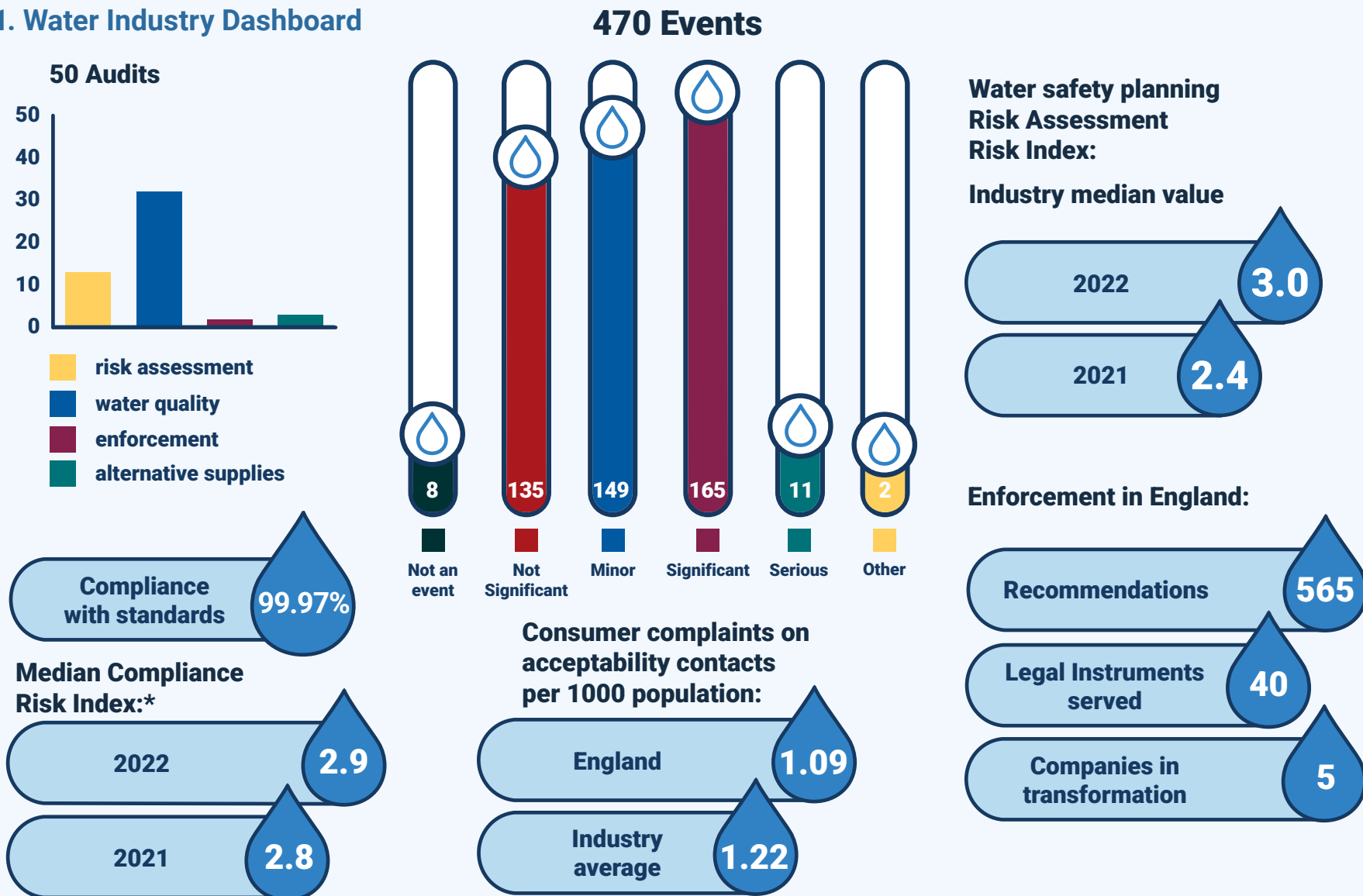
Drinking Water 2022 is the annual publication of the Chief Inspector of Drinking Water for England. It is the 33rd report of the work of the Inspectorate and presents the summary information on drinking water quality for the calendar year of 2022.

The Chief Inspector's report is published as a series of four quarterly reports which cover detailed case studies for industry learning and sharing best practice, and a final summary report for public supplies. A separate report covers the quality of private water supplies, which is available on the Drinking Water Inspectorate's website. The Inspectorate is also the regulator for the Network and Information Systems Direction and the Security and Emergency Measures Direction. Reports are made to Ministers but not published.

This report is the summary of public water supplies for England.

The industry dashboard for England 2022 is shown in summary below. The Inspectorate welcomes feedback on this report at [DWI.Enquiries@defra.gov.uk](mailto:DWI.Enquiries@defra.gov.uk). The inspectorate aims to respond to enquiries within 5 working days, and achieved a 96% success rate against this target in 2022.

Figure 1. Water Industry Dashboard



\* excludes insets and ISC

# Water supplies and testing

Set out in this report are the key facts about the quality of the public water supplies in England, which is served by 23 water companies delivering supplies to over 57 million consumers.

**Table 1.**

## Key facts about public supply arrangements in England

Public supplies	Statistics
Population supplied	57,907,036
Water supplied (L/day)	14,123 million
Abstraction points	2,150
Treatment works	1,077
Service reservoirs	3,789
Water supply zones	1,683
Length of mains pipe (km)	321,363
Surface sources	62%
Groundwater sources	31%
Mixed sources	7%

**Table 2.**

## Key facts about private supply arrangements in England

Private supplies	Statistics
Population supplied	956,429
Water supplied (L/day)	403,227
Number of supplies	34,904
Number of Local Authorities with private supplies	231
Surface influenced sources	43%
Groundwater sources	29%
Mains water	2%
Unknown	26%

Map 1.

Water Industry - England 2022



Companies

AFW - Affinity Water Ltd  
ANH - Anglian Water Services Ltd  
BRL - Bristol Water Plc  
CAM - Cambridge Water Company Plc  
DWR - Dŵr Cymru Welsh Water  
ISC - Isles of Scilly

NES - Northumbrian, Essex & Suffolk Water Ltd  
PRT - Portsmouth Water Plc  
SES - SES Water Plc  
SEW - South East Water Plc  
SRN - Southern Water Services Ltd  
SST - South Staffordshire Water Plc

SVT - Severn Trent Water Ltd  
SWB - South West and Bournemouth Water Ltd  
TMS - Thames Water Utilities Ltd  
UUT - United Utilities Water Plc  
WSX - Wessex Water Services Ltd  
YKS - Yorkshire Water Services Ltd

The area served by each water company (Licenced undertaker) is shown in Map 1.

New appointments and variations (NAVs) are limited companies which provide a water service to customers in an area which was previously provided by the incumbent licenced supplier. NAVs supply water through new assets and compliance with the standards is consequently very good, although there were occasional issues relating to taste and nickel from chrome taps. NAVs are listed in Table 3, with the number of insets and the total population served.

**Table 3.**

### Inset appointments

Company name	Number of insets	Total population served	Geographical spread
Albion Water (ALB)	2	2,710	London Southeast and Central Eastern England
Icosa Water (ICW)	20	4,800	Northern, Central and Eastern, London Southeast, Western England
Independent Water Networks (IWN)	72	45,098	Northern, Central and Eastern, London Southeast, Western England
Leep Networks Water (LNW)	41	67,225	Northern, Central and Eastern, London Southeast, Wales, Western England
Veolia Water Projects (VWP)	1	13,000	Western England

### Sampling

The number of tests carried out by each water company is within Annex 1.

Water companies are required to take samples as specified by the Regulations to demonstrate water is wholesome. Ultimately the purpose is to maintain the confidence of the public in their water supply and protect human health.

Most companies achieved 100% or almost 100% of the target number of compliance tests. Thames Water was an outlier with only 94% of the programmed tests completed, which leaves consumers vulnerable. Verification sampling is an essential element of safe and secure drinking water.

### Thames Water sampling shortfall enforcement case study

Thames Water was notified that it had and was continuing to contravene its obligation to take samples and consequently those samples which were taken were not taken at regular intervals throughout the year. Water companies must take samples at regular intervals as changes in the weather and the environment during the year alter the risk of failures. For instance, pesticides are often applied at specific times of the year, or rain is more likely during winter months. In total the company failed to take thousands of regulatory required samples (24,091 tests), for reasons that were within its control to manage. Sampling is planned the year before, so the number of staff required to take those samples and the analytical requirements are entirely foreseeable. Failure to comply with sampling and analysis requirements under the Regulations is enforceable under regulation 38 of the Water Supply (Water Quality) Regulations 2016 (as amended) and section 18(1) (a) and (6) of the Water Industry Act. As such, this contravention was not considered trivial, and the Inspectorate consulted on and made a final enforcement order in early 2023. Should the company fail to comply with the Order, further action will have to be taken.

# Compliance with standards

The percentage compliance with the standards in the Water Supply (Water Quality) Regulations 2016 is shown in Table 4, and details of all the failures are set out in Annex 3 by site type and by company. The following companies reported no failures during 2022: Cambridge Water, Albion Water, Veolia Projects, Leep Networks Water and ESP Water (who started operating during 2022).

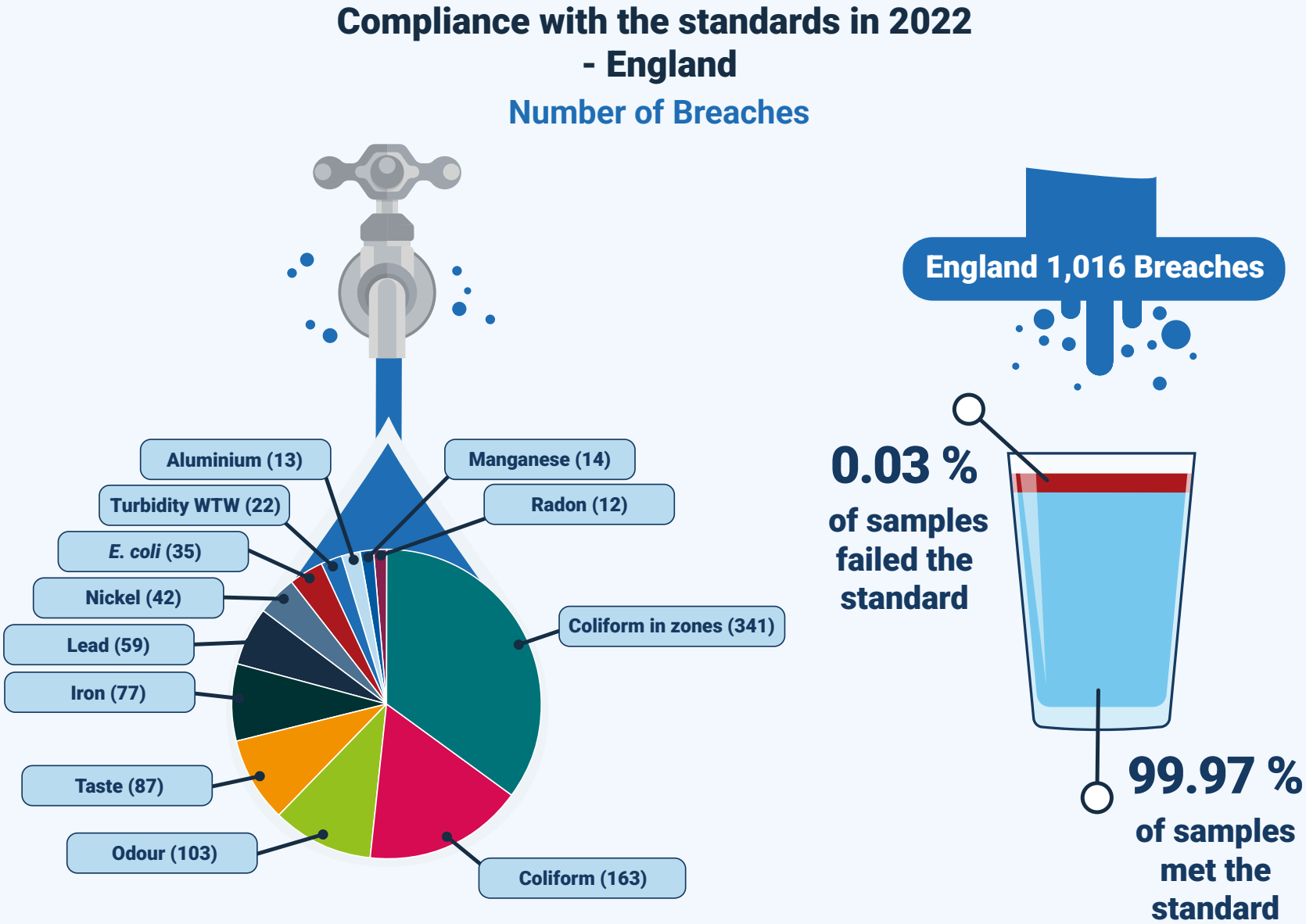
**Table 4.**

## Percentage of samples meeting the standards

Parameter Group	% Compliance
Chemical Parameters	99.94
Indicator Parameters	99.95
Microbiological Parameters	99.99
Pesticides	100
Overall	99.97

The tap and pie chart represent the quality of drinking water received by consumers, and the numbers and parameters which failed to meet the standards in 2022.

Figure 2.

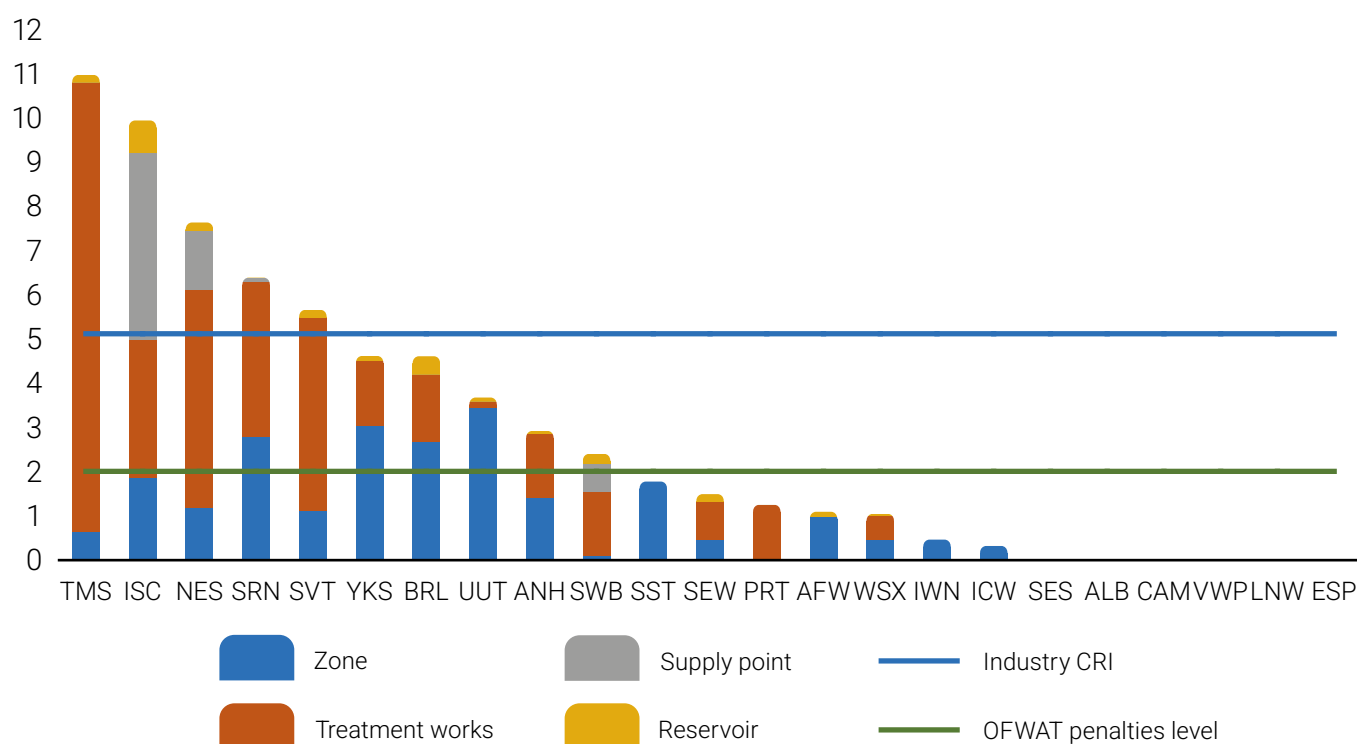


Compliance with the drinking water standards is consistently high in England, but scrutiny of company water safety plans, audits and events reveals underlying risks within the drinking water supply system. The Inspectorate has developed a series of risk indices to identify where companies are failing to address risks to supplies. The Compliance Risk Index measures risks to consumers from non-compliance with the standards, and is shared with the water industry's financial regulator, OFWAT, as a common performance measure. This integrated regulatory strategy is intended to improve water quality in the public interest.

The bar chart below shows the compliance risk index (CRI) for each company operating in England divided into site types, zones (consumer taps), water treatment works, supply points and service reservoirs.

**Figure 3.**

### Compliance Risk Index by company England 2022



Poor asset health is the main reason for companies incurring financial penalties. CRI is weighted to key assets such as water treatment works, where the population potentially at risk from those failures is large, and with added weighting where enforcement action has already been taken.

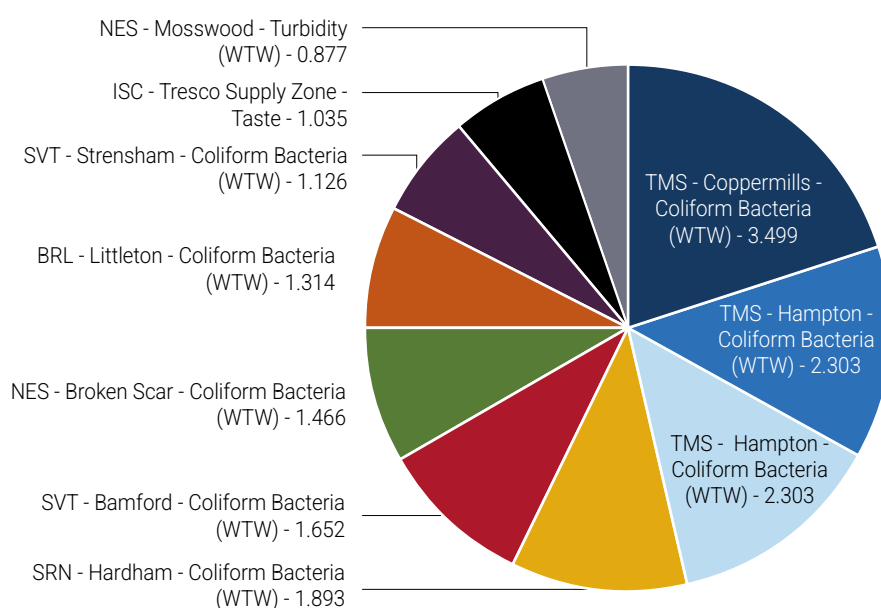
### Thames Water Compliance

Thames Water reported 115 compliance breaches in 2022 which equates to 99.97% compliance demonstrating a high quality of water in supply. However, 12 of these breaches related to enforcement notices to address shortcomings at its treatment works and service reservoirs, and therefore attracted high CRI scores.

Thames Water's Coppermills slow sand water treatment works supplies a large area of northeast London, supplying around 4 million consumers, either directly or indirectly with other supplies, and is a key works. The assessment of a single coliform detection in February concluded a breach of regulation 4 (wholesomeness) had occurred. This failure resulted in the single highest individual CRI score of 2022 reflecting the critical size of the supply. Protective covers for the ammonium sulphate dosing lines into the contact tank were detached and the chamber was flooded causing a significant risk of ingress. Unmitigated risks at significant sites validate the purpose of CRI to ensure companies use proactive risk methodology to keep drinking water safe. The dosing lines have since been repaired and the tanks are to be internally inspected. This site is covered by an enforcement notice.

**Figure 4.**

#### Pie chart illustrating breaches with highest CRI scores 2022



Another key asset is Hampton treatment works which had recurrent detections of coliforms, in the autumn of 2022, the root cause being ingress into the contact tank. This site is covered by an enforcement notice and consequently the CRI for this site is the second highest during 2022. The company has been unable to conduct a thorough internal inspection and repair due to passing valves which have deteriorated over the years coupled with significant risks of supply interruptions which prevent the removal of the tank. As an interim control measure the company has installed a membrane across the roof of the tanks using plastic sheeting until further repairs can be

completed. In spring 2023 the company commenced a repair and maintenance programme to allow the tanks to be isolated and internally inspected. The extent of the work the company has committed to is ambitious and welcomed to keep water quality first, however, companies are reminded that ongoing maintenance of assets should be central to proactively keeping water quality first rather than an afterthought resulting in reactive measures following repeated failures.

The Inspectorate issued new enforcement following a failure at Swinford works linked to poor filter performance. Recommendations were also made associated with 14 other breaches where the company was not fully compliant with the Regulations.

### **Severn Trent Water compliance**

Severn Trent Water's Bamford water treatment works reported a final water sample with 3 coliforms and 19 non-coliforms per 100 mL. The works was performing within expected limits with disinfection criteria met at all times. No raw water deterioration was observed, and no issues with clarification or filtration treatment stages were found. The site investigation team confirmed that the balance tank had a leak which was being pumped away, but as the leak remained under positive pressure it was not considered a contributory factor. The tank was last inspected and flood tested in February 2020, the remotely operated vehicle (ROV) inspection in December 2022 did not identify obvious structural defects. The balance tank was isolated on 7 February 2023 and confirmed not to be cause of the leak. The contact tank's last internal inspection and clean was in September 2022. Contractors were onsite to install flow meters near the final sampling point. The door to the building remained open during the work with dust in the air considered by the company as a potential contributory factor, reminding companies of the need to risk assess the work of any contractor on a live water production site. As a precaution, the installation of dedicated final water sampling kiosk next to and separate to the building was completed.

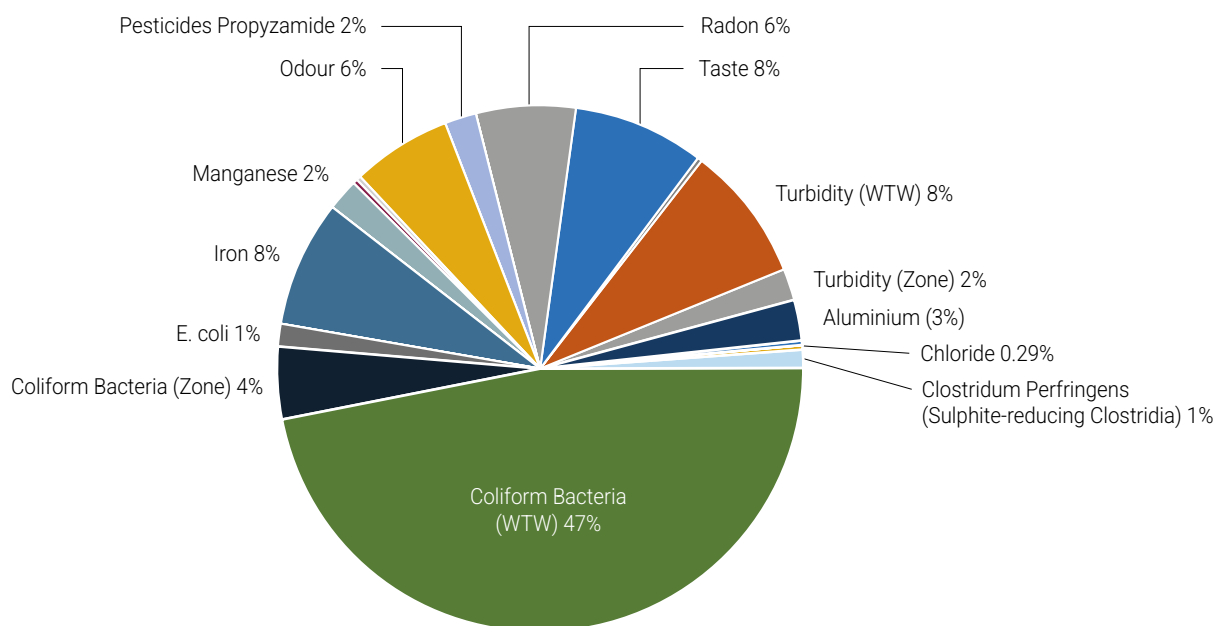
### **Northumbrian Water compliance**

Northumbrian Water's Mosswood water treatment works had five separate compliance breaches for turbidity in 2022. The site is part of the ongoing transformation programme and HazRev (Hazard Review) work is underway to find a long-term solution to problems of sediment in deeply buried pipework and tanks.

Broken Scar water treatment works is under notice for a full inspection of the contact tanks and outlet wells, by December 2022.

**Figure 5.**

**Proportion contributed by different parameters the CRI**



**Ingress and plant failure at water treatment works**

Coliform failures at water treatment works was the largest contribution to CRI, which is consistent with previous years reflecting the purpose of CRI. A number of these breaches were directly attributed to the condition of treated water storage tanks at treatment works. Service reservoirs, treated water tanks, and contact tanks (and any other tanks or vessels containing treated water) that are overdue inspection and cleaning are at particular risk of compliance breaches. All companies should have in place an effective strategic plan to inspect and clean assets and delivery of this plan should be continually reviewed to ensure tanks are inspected within risk-based frequencies.

Southern Water's Hardham water treatment works is covered by a notice. A single coliform was detected in the final treated compliance sample. Several issues were identified including potential ingress into the final High Lift Pump sump, algae present on the clarifiers, and contractor work around the sample kiosk and sample tapping. The company carried out remedial work to repair holes in the roof and gaps into the sump, and a risk assessment was undertaken for mitigating algal risks in the raw water reservoir.

### 95% Coliform compliance at service reservoirs

Five reservoirs failed to meet 95% compliance as required to meet the wholesomeness standard in the Regulations. These were South West and Bournemouth Water; Abbey East (Tresco); Northumbrian Water's Scotts Quarry Old; Thames Water's Hampstead North and Thames Water's Willesden.

Anglian Water's Maidford Reservoir was out of service and only sampled once in the year.

South West and Bournemouth Water considered the third failure at Abbey West service reservoir in Tresco to be the result of poor sampling technique on a rainy and windy day. The tap was flame disinfected, but there was some doubt around how effective this was, as the blow torch used failed to stay alight in the winds. Two further failures during the year coincided with coliform detections at the supplying treatment works. It is difficult for the company to maintain supplies during peak demand periods with the reservoir out of supply. The Inspectorate has issued enforcement notices to address the issues with the reservoir.

Thames Water failed to identify an ingress risk at Hampstead Reservoir following the first failure in August but identified hatch ingress following a subsequent failure three weeks later. The Inspectorate made a recommendation and the reservoir was removed from service for the rest of the year. Thames Water's Willesden service reservoir was removed from service in October following a coliform failure. The site had been out of supply between March and August for structural repairs.

Northumbrian Water's Scotts Quarry service reservoir was removed from supply for repairs twice in 2022 following failures in July and then again in November, on both occasions the company attributed the ingress to heavy rainfall. The quality of the repairs following the first detection must be brought into question by this failure, so soon after returning the tank to service.

### Lead compliance and strategies for Price Review 2024

Lead is a toxic metal that can dissolve into the drinking water when it comes into contact with lead pipes. Consumers are protected to a large extent from exposure by the practice of phosphate dosing at treatment works to reduce plumbosolvency. However, compliance with the lead standard remains a concern with 1 in 200 random customer tap samples failing the lead standard.

Companies are submitting lead reduction strategies as part of their business plans for Price Review 2024 (PR24), with the majority setting a target of lead-free supplies by 2050. No company holds a complete dataset of pipe material, and the number of lead supply pipes and communication pipes are estimated.

South East Water proposes to survey all service pipes (communication and supply) within the company area, this will provide a wealth of information which can be used for future targeted work on replacements.

## Drinking Water 2022 Public supplies England

Companies adopt different action levels when responding to lead sample results. Some aim to respond to detections as low as 3 µg/L. Hafren Dyfrdwy have gone even lower, aiming for completely 'lead-free' supplies at schools in its area. Sutton and East Surrey Water aims to provide a lead-free supply to the point of compliance at schools, nurseries and childminders.

A number of discrete areas have been chosen for trials on phosphate disengagement, following removal of all lead pipes from a zone. These include South East Water's Coombe Water supply zone supplying 4,000 properties. These build on previous targeted disengagement trials carried out by Severn Trent Water and United Utilities. Sutton and East Surrey Water has observed that phosphate dosing has a beneficial effect on minimising nickel failures from taps and fittings in consumers' properties, and so companies need to have a strategy for nickel when considering phosphate disengagement trials.

The addition of phosphoric acid is not the only way in which a water company can reduce plumbosolvency. Companies should formulate strategies to supply stable, non-aggressive water. Few water companies include in their lead reduction strategies relevant parameters such as pH or alkalinity. Northumbrian Water has a stated aim to produce stable waters that are neither aggressive nor scale forming.

### Photograph 1.

#### Domestic lead plumbing after removal



Technological readiness is also a factor, companies are seeking better detection systems for identifying lead pipes to reduce the time taken to find lead pipes. Several companies are also undertaking trials using relining systems, and whilst this is not a permanent solution, it may offer a pragmatic approach for reducing risk where there are shared supplies which cause challenges for ensuring agreement between all parties. Nevertheless, where pipe relining is used, this should be accompanied with the longer-term strategic solution of complete removal as not to do so would represent an ongoing cost for repeated remediation.

The scale of replacement proposed during 2025 to 2030 is substantially less than what will be required to meet the companies own 2050 targets, for example Portsmouth Water will need to be undertaking around 3,200 replacements per year to complete its estimated required 80,000 by 2050, but during the five years from 2025 the company is aiming for a total of 500 replacements. Conversely, the current rate of replacement by Thames Water will see it lead free by 2135, it has a target of 53,000 communication pipe replacements during the AMP, whereas around 48,000 are needed per year to meet the target.

Thames Water is only focusing on communication pipes and is looking to identify and employ strategies that successfully encourage property owners to replace both their external and internal lead pipework.

Dwr Cymru is developing a lead predictor model in the absence of hard data on pipe material, this also utilises data on age ranges of inhabitants and focuses on the vulnerable groups to prioritise areas for replacement. The company is estimating 180,000 lead pipes will require replacement and its AMP8 target is to replace 7,500 over five years.

Whilst the replacement of every single lead pipe will be of benefit to public health, the target which most companies have set themselves of being lead free by 2050 feels currently out of reach without a colossal effort from AMP9 onwards.

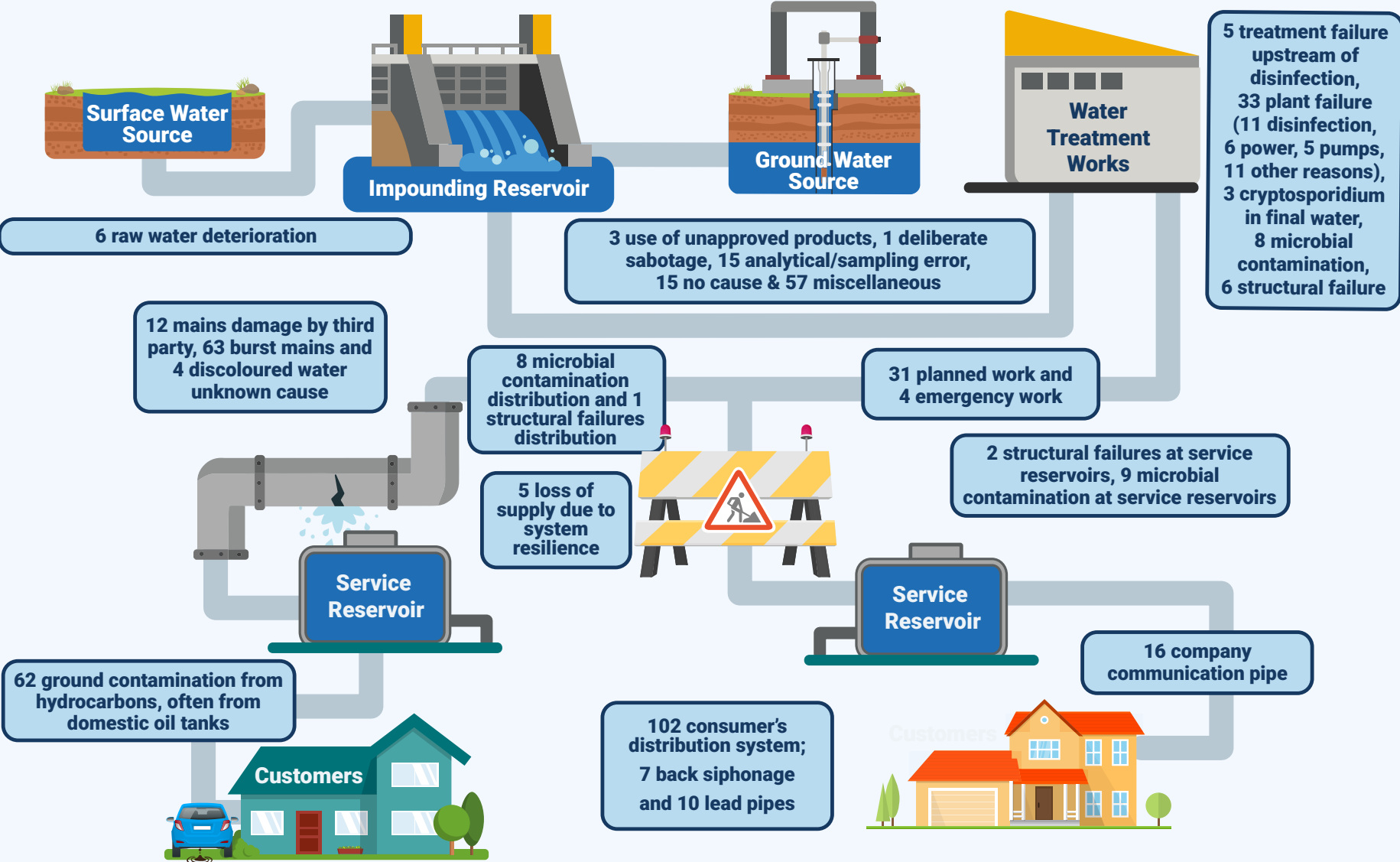
# Water quality events

The Inspectorate was notified of 470 events during 2022, all of which were assessed, and enforcement action taken where necessary. The catchment diagram in Figure 6 illustrates the nature of the events and their impact on the water supply from source to tap.

Alongside the usual network issues such as burst mains and third-party damage which cause discolouration events, there were significant asset failures relating to power supply, structural integrity, treatment processes, and disinfection at water treatment works. Five water quality events occurred where the company was unable to provide a suitable supply to consumers due to a lack of resilience, and the Inspectorate has published its review and lessons learned from the 2022 December freeze/thaw event on the Inspectorate's website.



Figure 6.  
Main causes of drinking water quality events 2022 in England

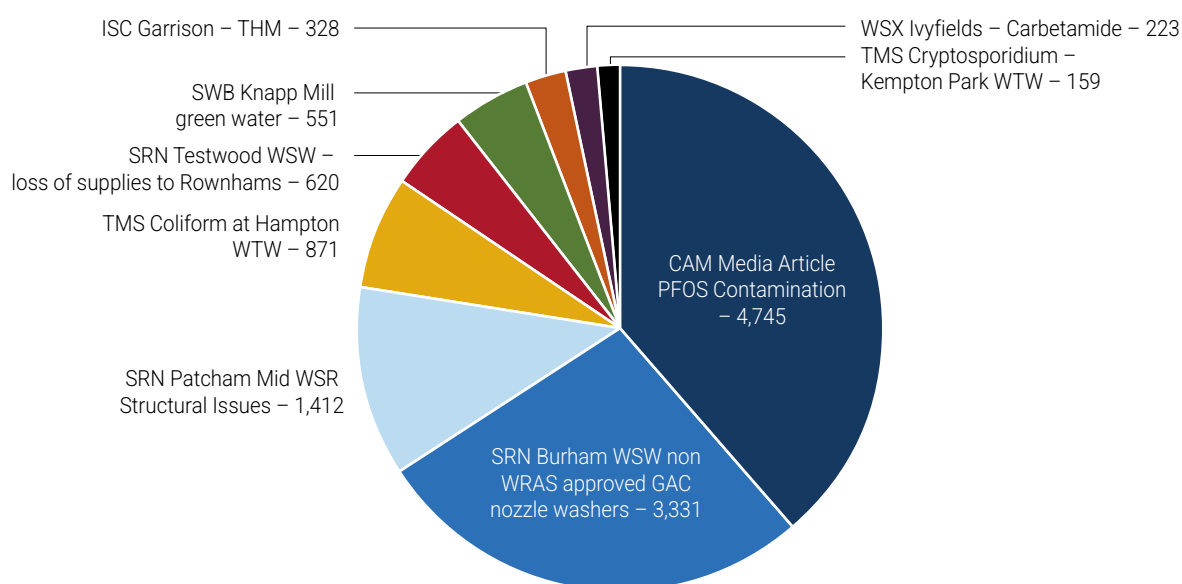


### Highest scoring events

The following pie chart shows the highest scoring events in 2022. The majority occurred at water treatment works, or storage reservoirs, and therefore scored highly, in part due to the large number of consumers at risk.

**Figure 7.**

**Pie chart showing highest scoring events in 2022 (excluding networks and information systems events)**



The Cambridge Water event relating to a Guardian media article on Perfluorooctanesulfonic acid (PFOS) scored highly, representing the negative impact on consumer confidence caused by this event. Full details of the event assessment can be found on the Inspectorate's website;

**[Investigation into the Water Quality Event of PFOS Contamination in Duxford – Drinking Water Inspectorate \(dwi.gov.uk\)](https://www.dwi.gov.uk/investigation-into-the-water-quality-event-of-pfos-contamination-in-duxford)**

Southern Water has three high scoring events relating to the use of unapproved products in the filter nozzles at Burham water treatment works, poor asset health including structural deficits at Patcham Mid service reservoir, and lack of resilience in Rownhams supply zone. Output at Testwood and Otterbourne water treatment works was reduced following a deterioration in raw water quality and this coupled with increased leaks following December's freeze/thaw, meant that the company had to actively shut off supplies to 78,328 properties in the Rownhams supply area.

Thames Water coliform detections at Hampton water treatment works was reported as an event and scored accordingly. Following multiple coliform detections ingress was identified via the contact tank roof wall joint, however the tanks cannot be removed from supply for repairs due to failed valves and interruption to supply risks. The company is working towards a plan to repair the valves on the 'live' system to allow isolation of the contact tanks for further remediation. Due to the

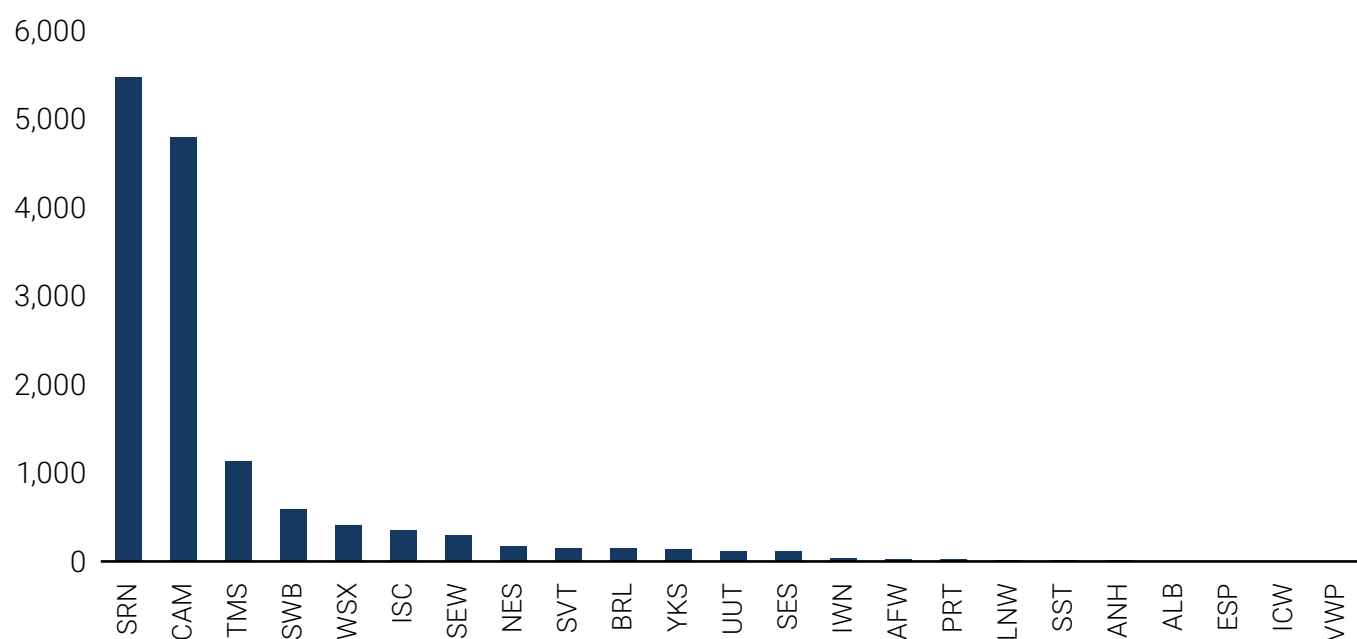
ongoing risks identified at the works a regulation 28(4) enforcement notice had already been issued. The company will need to demonstrate compliance with this notice and repair the tanks. In the short-term the company has installed a temporary membrane over the contact tank to mitigate the ingress risk until long term repairs can be implemented. The Inspectorate is monitoring the progress of the remedial action taken by the company.

### Event Risk Index by company

Every event is assessed by the Inspectorate and given an event risk index (ERI) score to reflect the number of consumers impacted or put at risk, the duration of the event, and the seriousness of the event. The following bar chart shows the relative risk ranking of companies, derived from the sum of all the ERI scores in their supply area.

**Figure 8.**

### Event Risk Index by company



\*At time of publishing.

The 50 most serious events are published on the Inspectorate's website.

# Asset health and service reservoir integrity

During 2022, there were 61 coliforms and two *E. coli* compliance failures at water treatment works. These breaches were in addition to 102 coliform and eight *E. coli* breaches from service reservoirs. Many of these breaches were not attributed to a specific cause, but ingress into contact tanks and service reservoirs is a recurrent problem.

In addition to these compliance breaches, there were 63 water quality events attributable directly to poor asset health and plant failure, including 11 failures of the disinfection system, six failures of the power supply, and eight structural failures of tanks and reservoirs.

The expectation is that companies understand their assets, through a programme of physical inspections, which may be supplemented with inspections by ROV. Physical inspections are necessary because they provide clarity and better resolution than ROVs and allow for cleaning of walls and structures within the reservoir. A maximum interval of 10 years is advised in the **Principles of Water Supply Hygiene TG9** on treated water storage, although the Inspectorate recommends more frequent inspections on a risk-based programme.

**Figure 9.**

**Bar chart of high-risk service reservoirs by company (2022 data return)**

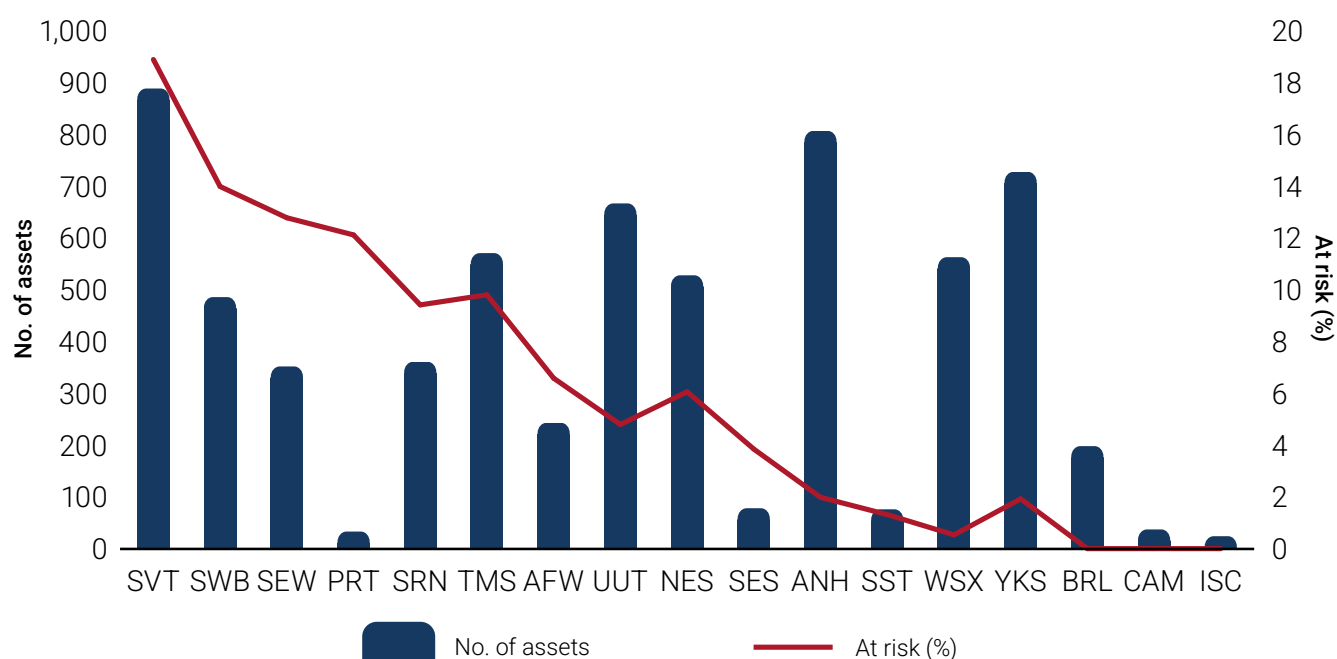


Figure 9 shows the percentage of service reservoirs at risk of failure in each company, defined as structures which have not been inspected for over 10 years.

The Inspectorate considers tanks that hold treated drinking water represent a significant potential risk to the wholesomeness of the water contained therein. That risk increases substantially if the assets are not routinely inspected and maintained.

During 2022, the Inspectorate continued work to achieve a risk-based inspection frequency for tanks, with a maximum gap between inspections of 10 years, across the industry. To that end, enforcement notices that covered multiple tanks were served under regulation 28(4) on Affinity Water, South East Water, Thames Water and Yorkshire Water. These are in addition to the existing tank notices previously served on Northumbrian Water, South West Water, Southern Water and United Utilities as part of those transformation programmes. Notices were also served on Anglian Water, Bristol Water and SES Water early in 2023.

Severn Trent Water was issued a second notice following the 2022 data return for tanks and service reservoirs where it was noted that the company was operating 38 tanks beyond a 10-year inspection frequency, with a further 63 tanks for which the last inspection date was unclear. Since then the company has progressed with the work, but envisages further challenges to meet this objective in the next few years, due to the spacing of its tank cleaning programme.

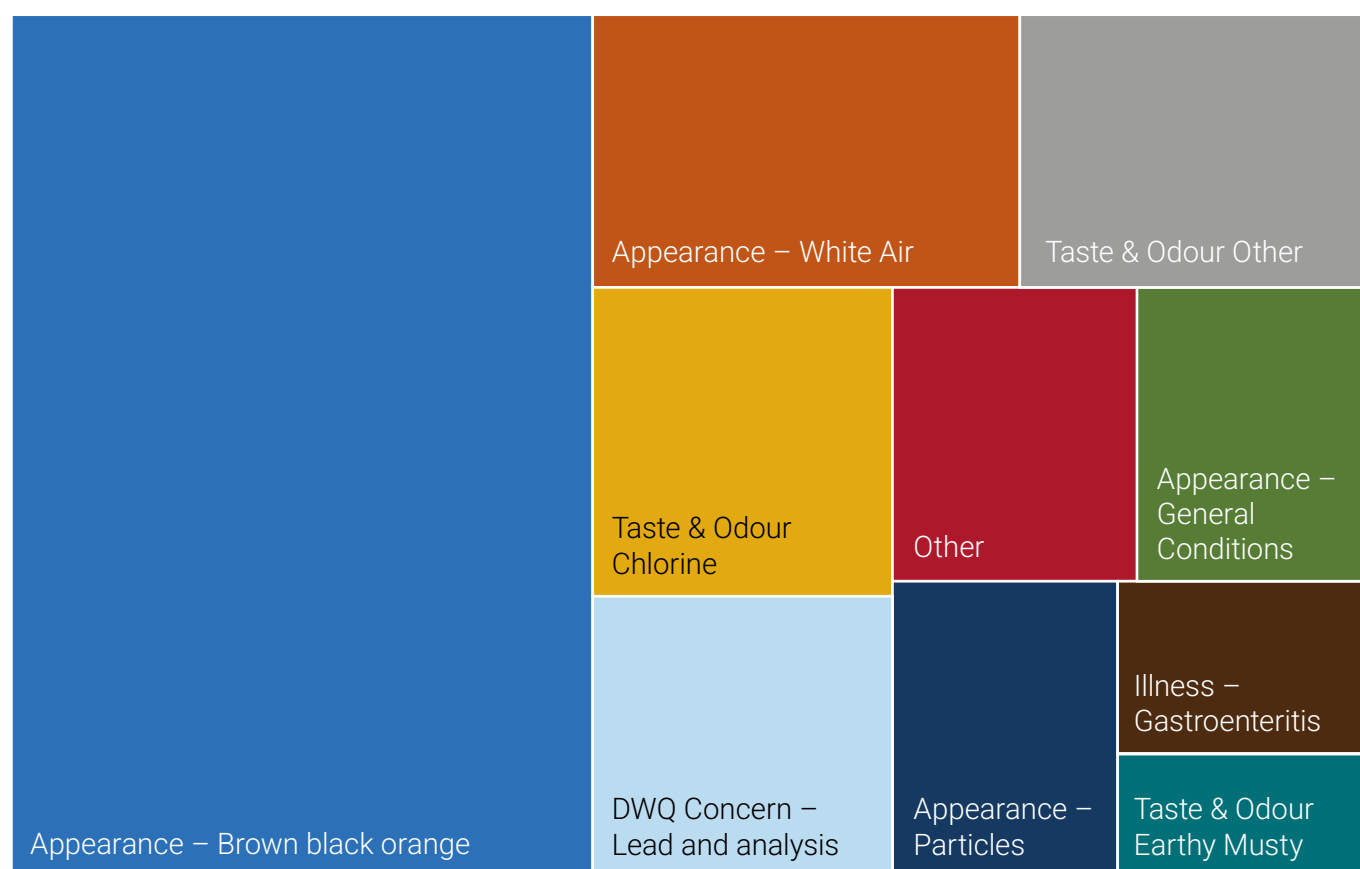
United Utilities successfully completed the delivery of its tanks notice and has achieved a full risk-based inspection programme for all of its tanks. The company is also able to isolate any of its reservoirs from supply for inspection and cleaning. This is a significant achievement, and the company is to be commended for it.

# Acceptability of drinking water – consumer complaints

In 2022, there were a total of 62,928 consumer contacts in England regarding acceptability of drinking water, with a contact rate of 1.08 per 1,000 population. The most common reasons for contacting companies in relation to water quality are shown in the following treemap.

**Figure 10.**

**Treemap demonstrating 'proportion' of consumers' complaints with regards to water quality descriptors**



### Discoloured water

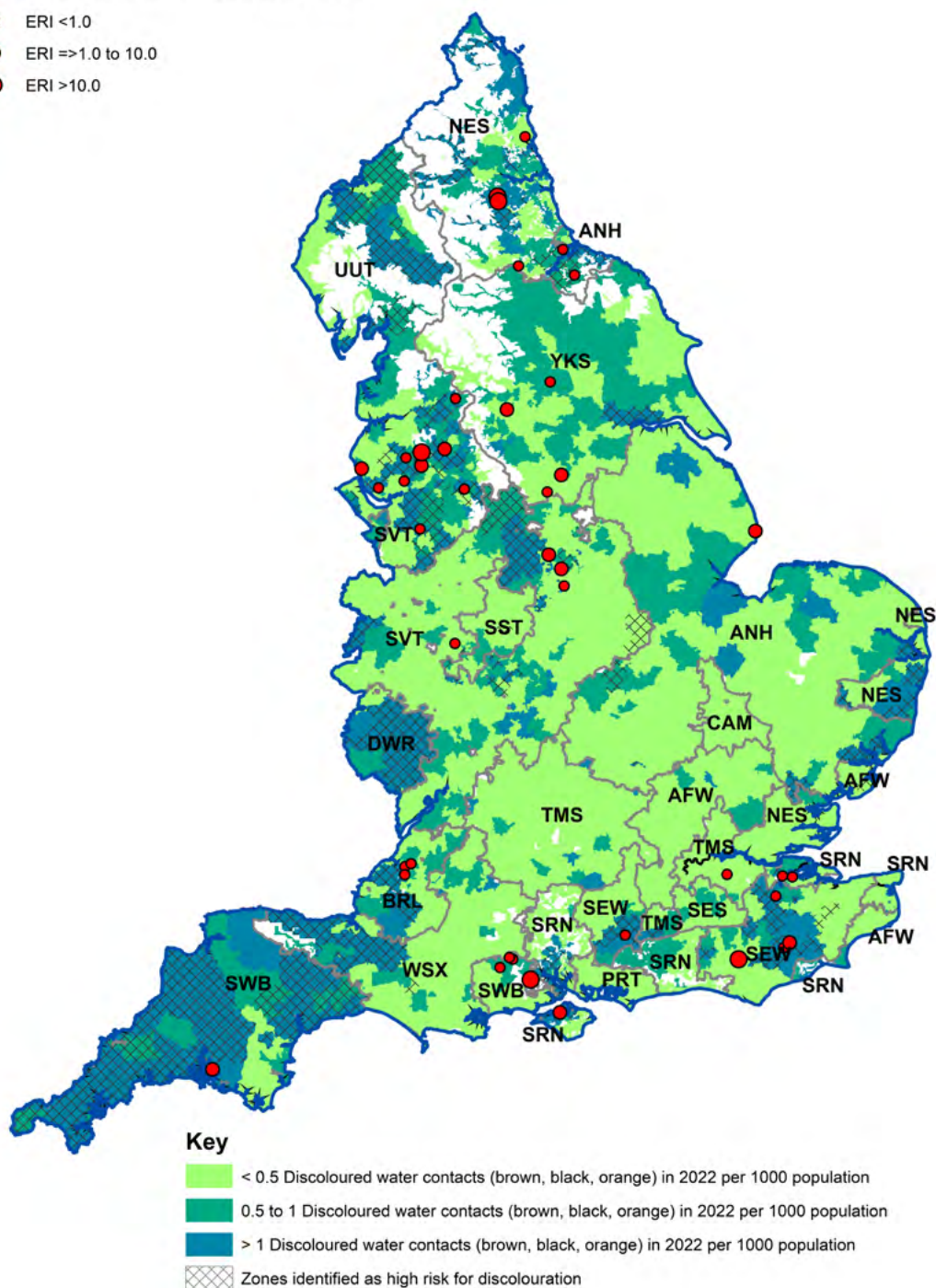
The Inspectorate reviews consumer contact data for discoloured water contacts on an annual basis. Companies whose performance is poorer than the industry average are investigated, and enforcement action taken where necessary.

#### Map 2.

**The following map shows the areas most affected by discoloured water in 2022, with events with discoloured water contacts identified by red dots**

Discolouration events with discoloured water contacts

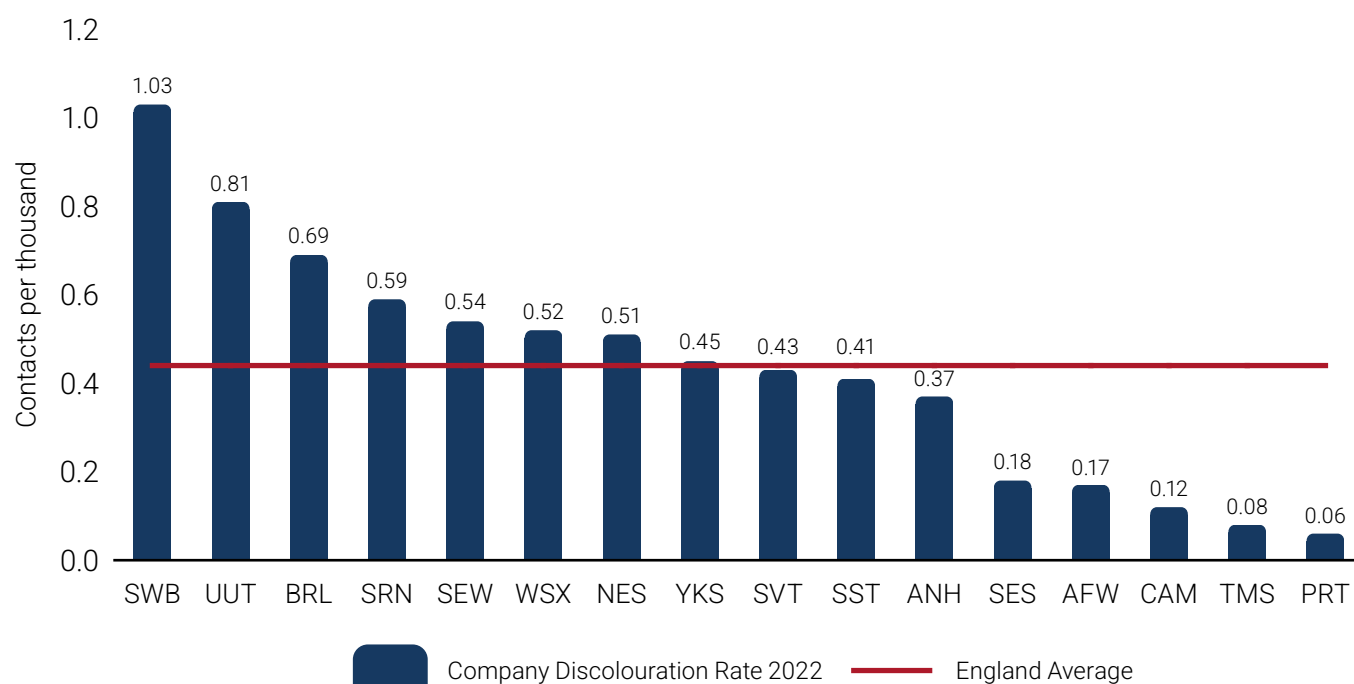
- ERI <1.0
- ERI =>1.0 to 10.0
- ERI >10.0



The number of consumers reporting a black/orange/brown colour to the water supply has steadily reduced since 2013, and is now approximately 0.44 per 1,000 population across England.

**Figure 11.**

### Rate of discolouration complaints by company in 2022 (excluding ISC)



### Good practice for reducing discoloured water

Discoloured water is caused by iron, aluminium and manganese sediment in the mains. Resuspension of sediment can be minimised by operating networks under calm network principles, employing standpipe management, minimising illegal hydrant use, cooperation with the fire services and other hydrant users and by the use of modelling and risk assessment to inform network operations. Consideration could be given to inlet monitoring of service reservoirs for iron, manganese and aluminium to provide additional information on metal residuals in treated water storage.

Novel, innovative and water saving approaches to network flushing are being employed to make further improvements. Drought poses a challenge to annual flushing programmes, and companies must look to innovative water saving approaches. Where possible, companies should bring forward mains flushing to avoid delay or incompleteness of annual flushing programmes during the warmer months. Severn Trent was able to complete its annual flushing programme for 2022 early, to prevent non completion due to restrictions.

Other examples of good practice include contact cluster analysis to determine root causes, mains conditioning programmes, network flow optimisation, mains replacement, catchment management initiatives to improve raw water quality, and optimisation of water treatment processes to reduce residual metals in treated water; these have all been shown to have a beneficial impact. Ensuring treatment works do not seed the downstream network with iron and manganese will prevent recurrence of the problem.

Companies should be considering longer-term solutions to discoloured water, and not relying solely on network flushing programmes or filter installation on supply pipes as mitigation for individual consumer complaints.

### **United Utilities case study**

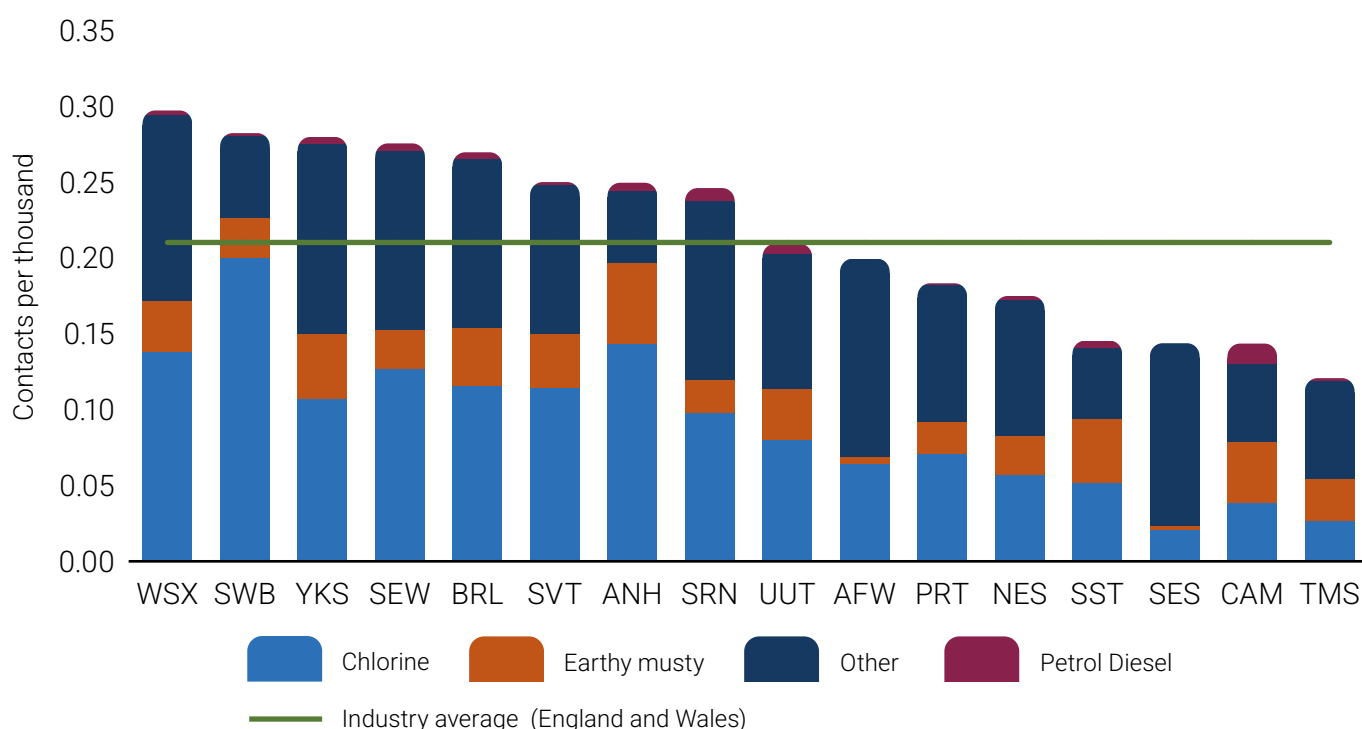
United Utilities has a company-wide discolouration enforcement notice which has been in place since 2021 and has seen a significant reduction in its company contact rate from 1.10 in 2021 to 0.81 in 2022. This has been achieved by catchment initiatives to improve raw water quality, consistently low final water metal residuals, improvements in metal monitoring at works, mains conditioning and various network flushing programmes carried out by a dedicated flushing team, replacement of cast iron distribution mains, water quality training as part of the company's Water Quality First programme, action relating to third party misuse of hydrants including the issue of warning letters and installation of hydrant caps and proactive consumer updates. The company is also working with WRc (Water Research Centre) to develop a model which will identify areas for mains rehabilitation to reduce discolouration risk.

### **Taste and Odour**

Similar to discoloured water contacts, the contact rate for total taste and odour contacts for the industry has also gradually reduced year on year. The company contact rates are shown in Figure 12.

**Figure 12.**

**Company taste and odour contact rates**



**Wessex Water Newton Tony Prosecution**

During a three-week period from the end of March 2021 consumers in the Amesbury area of Wiltshire complained of an unacceptable taste to their tap water which made the water undrinkable. The cause for the objectionable taste was due to the company failing to undertake the required checks on filters containing carbon media which, if completed, would have identified the presence of iodinated organic compounds leaving the treatment works.

A Granular Activated Carbon (GAC) filter was brought back into supply at the Newton Tony water treatment works supplying drinking water to approximately 17,000 consumers in the Amesbury, Wiltshire area. The GAC filter had been out of supply as the media had been removed and regenerated. Removal and regeneration of GAC media is a routine maintenance operation. On return to supply of the GAC filter, the testing and analysis of the GAC filter had been inadequate, the company did not correctly follow its own internal procedure, which required certain tests to be completed which would have identified the presence of the iodinated compounds. Following consumers complaints about the taste of their drinking water and reactive sampling and analysis by the company, iodinated compounds were detected in the supply from the GAC adsorber at the water treatment works, downstream service reservoirs and at properties in the area supplied. The company promptly removed the water treatment works and a service reservoir from supply and undertook extensive flushing and sampling of the affected area. Bottled water was supplied to consumers on request. Iodinated compounds have a low taste threshold and are therefore readily detected. Although there was no direct health risk to consumers, the taste issues caused concern,

media and social media interest. The company has experience of similar events within their operating region from sites which use carbon treatment, yet the lessons learnt from these previous events did not prevent this issue from happening. Since this event the company has taken corrective measures including strengthening its own internal procedures which cover returning carbon filters to supply.

Wessex Water Services Limited pleaded guilty to an offence under section 70 of the Water Industry Act 1991 for the supply of water unfit for human consumption. The Inspectorate was critical that the company did not correctly follow its own internal testing procedures which would have identified the presence of the taste causing compounds. There were some issues reported with the communication given to consumers and provision of alternative water supplies.

At Swindon Magistrates court on 31 May 2023, Wessex Water Services Limited was fined £280,000 plus a £190 victim surcharge. Costs of £21,656.60 were agreed out of court.

# Water safety planning and risk assessment

Following World Health Organisation (WHO) guidelines, the Inspectorate has adopted a water safety planning approach for drinking water quality. Companies are legally required to carry out adequate risk assessments of each supply system and submit this data to the Inspectorate (regulation 27 and 28). Hazards are identified and risks are assessed from source to tap (catchment, abstraction, treatment, storage, and distribution) and actions are put in place to maintain safe and secure supplies and prevent problems from occurring.

## Raw water risk assessments

### Raw water sampling data targeted at hazards

As part of the water safety plans, raw (untreated) water data is submitted annually to the Inspectorate. Sampling is targeted at hazards to understand the presence and severity of the hazard. The data are used to inform work on catchment management and the design and operation of treatment processes. The raw water summary data is provided on the Inspectorate website. The data show a continuing pressure from nitrate in raw water abstractions, and this is reflected in 34 PR24 scheme submissions to address this issue, including catchment management to reduce nitrate concentrations from agriculture, blending supplies and the introduction of additional nitrate removal processes by ion exchange treatment or other. Pesticides continue to be detected in surface water abstractions, and companies should ensure their pesticide analysis suite reflects current and legacy pesticide usage in their catchments. [Pesticide usage data](#) for different crops and areas is available from the Food and Environment Research Agency (FERA).

### Working with the Environment Agency

Drinking water abstractions above 10 cubic metres per day are protected under the Water Environment (Water Framework Directive) (England & Wales) Regulations 2017 to ensure they are not polluted. Sources need to be protected to avoid or minimise the need for additional purification treatment which can be costly and resource intensive. Water companies and the Environment Agency identify drinking water areas that are 'at risk' of deterioration and establish safeguard zones. These are non-statutory areas where measures will be targeted to address contamination, identifying impacts, sources, actions, and measures in action plans which are periodically reviewed and updated. The raw water data provided by water companies to the Inspectorate contributes to the assessment of drinking water protected areas and safeguard zones, which are published by the Environment Agency [River Basin Management Plans](#).

### Perfluoroalkyl and polyfluoroalkyl substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that have been widely used in various industries since the 1950s. They are often found in products such as non-stick cookware, waterproof clothing, carpets, food packaging, and firefighting foam.

The dangers of PFAS have become a growing concern due to their persistence in the environment, ability to accumulate in the human body, and potential health effects. In collaboration with the Environment Agency, the Inspectorate has identified 47 compounds of particular interest which companies should be monitoring (Information Letter 02/2021).

The Inspectorate uses a risk-based approach to PFAS, with escalating actions based on a tier system. In July 2022 the Inspectorate expanded its guidance to cover any PFAS, in final water. We reported on the risk assessment work by companies in CIR Quarter 2.

**Table 5.**

#### Tiered actions for controlling risks from PFAS

Tier	Results or Result Risk Assessment	Escalating actions
Tier 1	<0.01 µg/l	Risk assessment and monitoring
Tier 2	<0.1 µg/l	Risk control and consultation
Tier 3	≥0.1 µg/l	Risk reduction and notification

During 2022, the water industry in England submitted around 310,700 test results to start building a picture of PFAS risk in supply systems, although some test results were attributed to multiple points along a supply from catchment to tap. Companies were asked to prioritise raw water which may be a higher risk of the presence of PFAS. Consequently, data should be viewed as being a worse case analysis due to purposeful and repeated sampling methodology.

PFAS were detected in 11,853 or 3.8% of the test results. In the other samples no PFAS were detected, and the tests recorded an analytical result which was below the limit of detection.

Table 6 shows the 14 compounds with concentrations detected in the raw water above 0.01 µg/l. Of the 47 substances which required testing, 35 were detected and a further additional PFAS compound was also found. This suggests that environmental contamination covers a wide spectrum of substances and reinforcing that this is a wider problem not easily solved by just changing the PFAS in formulations.

**Table 6.**

### Most prevalent PFAS with the maximum concentration detected in the raw water

PFAS name	Maximum concentration in raw water µg/l
Perfluorooctane Sulfonate	1.86
PFPeA	0.253
THPFOS	0.218
Perfluorooctane Acid	0.149
PFHxS	0.09
PFBA	0.072
PFHxA	0.0596
FHxSA	0.0289
PFODA	0.027
PFBS	0.023
PFHpA	0.0123
PFPeS	0.011
FOSA	0.0107
FBSA	0.0105

A number of companies and laboratory service providers are developing in-house analytical capability, and research into treatment technologies is ongoing.

The most recent **Information Letter 02/2023** sets out expectations for companies to submit PFAS strategies for investigating risk, setting trigger levels, and taking action to mitigate PFAS risk from source to tap. Companies are required to offer section 19 undertakings to deliver their PFAS strategies over AMP8, where there is an identified current or future risk.

Tables 7 and 8 show the number of PFAS test results submitted by each company, with the number of results in each tier. Table 7 shows raw water and table 8 shows treated water, although in some cases the sample point would be the same.

**Table 7.**

### The number of test results from raw water PFAS monitoring

Company	Total raw water tests analysed	Results below LOD	Tier 1 - <0.01 µg/l	Tier 2 - <0.1 µg/l	Tier 3 - ≥0.1 µg/l
AFW	10,652	9,999	14	566	73
ANH	121,732	116,951	4,474	285	22
BRL	2,115	1,987	113	15	0
CAM	2,822	2,807	15	0	0
ISC	799	771	21	7	0
NES	4,136	3,704	418	14	0
PRT	4,608	4,477	119	12	0
SES	366	299	66	1	0
SEW	10,976	10,610	280	86	0
SRN	12,462	11,958	406	98	0
SST	7,627	9,684	295	59	0
SVT	2,538	2,518	20	0	0
SWB	1,739	1,730	9	0	0
TMS	1,037	728	300	9	0
UUT	5,290	4,996	271	23	0
VWP	57	57	0	0	0
WSX	1,116	1,067	43	6	0
YKS	12,403	12,195	206	2	0

At Tier 2, companies are required to monitor raw and final water, and review their control measures in consultation with health authorities and the Inspectorate. The Tier 3 results at Affinity are from 5 sites which are subsequently blended, and the Tier 3 results from Anglian are from two groundwater boreholes, which are also subsequently blended.

Some companies submitted treated water monitoring data and the results are in Table 8.

**Table 8.**

### Number of treated water samples in Tiers 1, 2 and 3 by company

Company	Total treated water tests analysed	Results below LOD	Tier 1 - <0.01 µg/l	Tier 2 - <0.1 µg/l	Tier 3 - ≥0.1 µg/l	Tier 3 in supply
AFW	4,118	3,966	9	143	0	-
ANH	120	14	106	0	0	-
BRL	752	634	83	35	0	-
CAM	1,977	1,971	6	0	0	-
ISC	470	454	14	2	0	-
NES	4,535	3,712	774	49	0	-
SES	636	499	136	1	0	-
SRN	83,868	82,067	1,688	111	2	0
SST	6,091	3,567	190	37	0	-
SVT	376	368	8	0	0	-
SWB	2,492	2,486	6	0	0	-
UUT	2,790	2,571	199	20	0	-

Southern Water reported two treated water samples within Tier 3. But these were subsequently blended in a service reservoir with a tenfold dilution, and the dilution was verified by sampling post blending.

### Risk assessment national data

The Inspectorate received approximately 1.6 million (1,613,244) lines of regulation 28 data for England. The Inspectorate has seen a reduction in data lines submitted by companies this year due to changes in how some companies have assessed their hazards, with some moving to parameter only reporting, and others using new reporting systems. Most of this data for England (95.43%) indicates that risks are either being effectively mitigated or fall into categories that indicate mitigations are not currently required, with approximately 4.57% requiring further mitigation or where mitigation is being delivered.

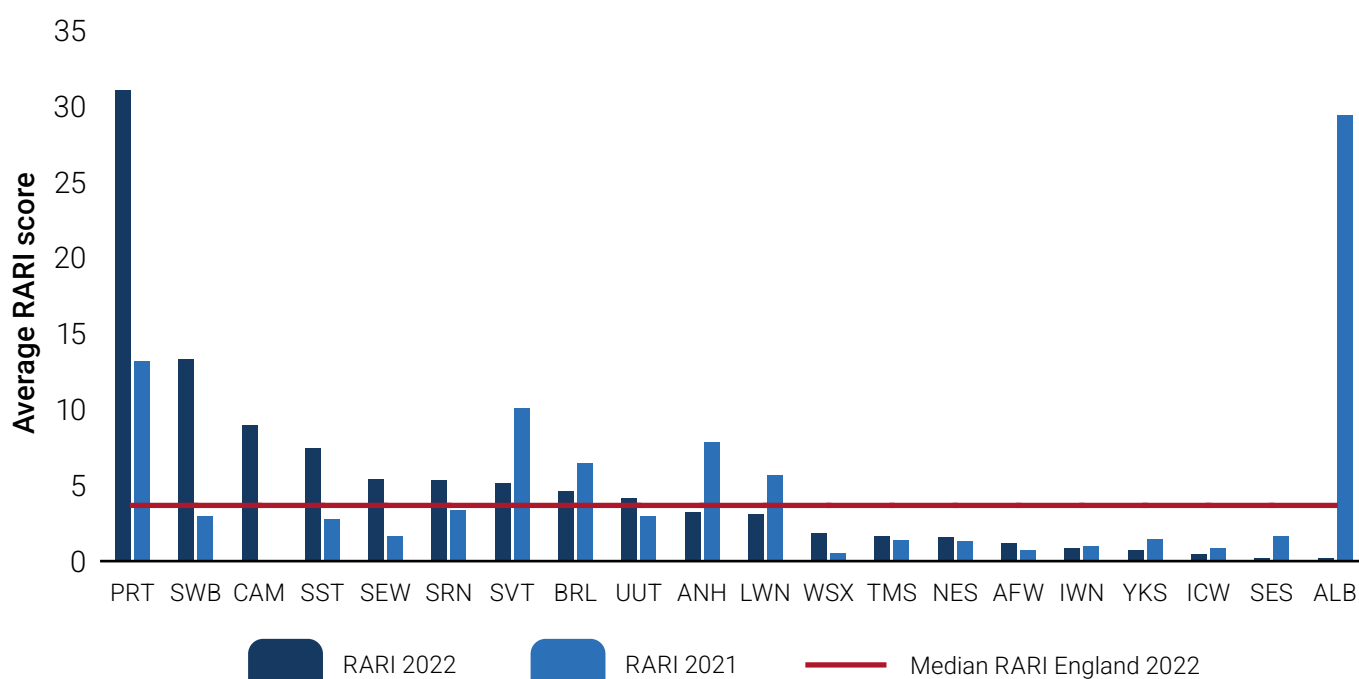
### Risk Assessment Risk Index

Risks identified by water companies in their water safety plans, and reported to the Inspectorate, are classified according to whether they require action, and whether the action (mitigation) is in progress. Each risk is assigned a value according to the length of time that the risk remains partially or wholly unmitigated, and the Risk Assessment Risk Index (RARI) represents an indicator of the active risks for each company.

The Inspectorate's programme of work to collaborate with the industry to understand and resolve the differences in the way companies carry out drinking water safety plans continued throughout 2022. This has contributed to drafting of new guidance to drive consistency in water safety planning and regulation 28 reporting. This guidance should be published in late 2023, following industry review and consultation.

**Figure 13.**

#### RARI by company for England in 2021 and 2022 (excluding ISC, ALE and VWP)



There were two main outliers, Veolia Water Projects and Isles of Scilly, and these are not shown in the chart to allow for visibility of the remaining companies. Veolia remains an outlier due to the relatively small number of overall risks reported and is not shown in the graph for this reason. Isles of Scilly remains an outlier due to the number of risks requiring additional mitigations whilst work is undertaken to reduce the risks of saline intrusion, microbiological contamination, and radon.

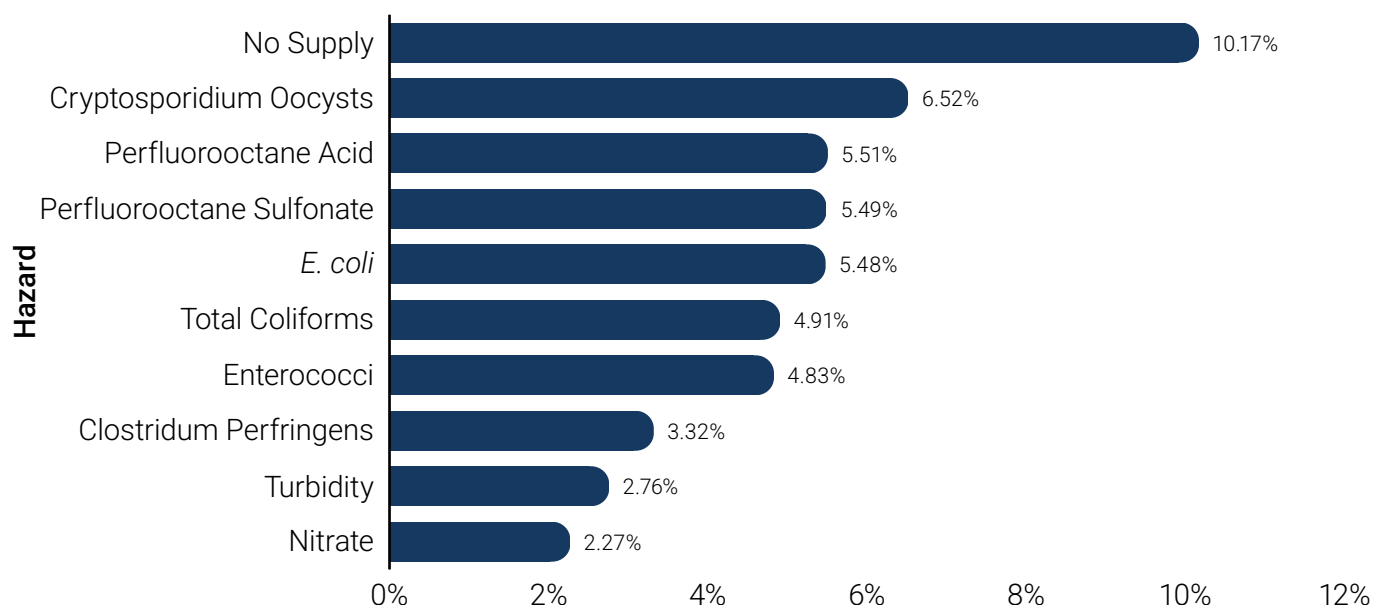
The purpose of RARI is to enable tracking of risks from an unmitigated to mitigated status. This is important to inform strategic action to proactively keep water safe. As such, it is not a measure but an information tool. As examples of best use, both Portsmouth Water and South West and Bournemouth Water have recorded the largest score increases in 2022. Portsmouth Water continues to focus on identifying risks as part of its change programme and carries its risk categories downstream, which provides an elevated risk score when compared to other companies. The company increased its risk lines reported by more than 300% with a considerable increase of categories C (additional or enhanced control measures which will reduce risk are being delivered) to E (risk under investigation), reflecting the company's efforts to identify and report new risks and investment requirement. Nitrate and *Cryptosporidium* risks carried from upstream treatment works form the highest scoring hazards.

South West and Bournemouth Water has an increased score as a result of the use of category E on most of its PFAS risk lines, especially for the PFAS group, Perfluorooctane Acid and Perfluorooctane Sulfonate individual hazards.

Cambridge Water had the lowest RARI score in 2021, therefore the company had the highest increase rate in the industry in 2022. This is, however, a good sign, as it demonstrates the company report is now reflecting current risk status, which may have proactively identified the risks posed by PFOS at Duxford.

**Figure 14.**

### Top 10 highest scoring industry risks



### Industry top hazards

The highest scoring risk across the industry during 2022 was 'no supply'. The mitigations required, or being implemented, include mains renewals to reduce bursts and improvements in asset and network resilience.

There was significant use of 'mutual aid' during the summer of 2022 which saw record breaking temperatures and drought being declared across the country with areas in the South West and East officially remaining in drought well into 2023. The severity of these extreme weather events, both in terms of record temperatures and freeze / thaw events, demonstrated that there is an overall lack of preparedness for these extreme weather conditions as a result of climate change, across the industry. The industry has much to do to address this shortcoming in resilience.

The second highest scoring hazard is *Cryptosporidium*. This increased risk is likely to be a result of companies identifying and including additional risks in their drinking water safety plans (DWSP). There is ongoing work across the industry on a range of mitigations, including further catchment work to reduce the upstream risk. Turbidity remains a significant ongoing risk at water treatment works in 2022, despite improvement since 2021.

Perfluorooctane Acid (PFOA) and Perfluorooctane Sulfonate (PFOS) were the third and fourth highest risks and this represents a significant swing in risk understanding, following the requirement by the Inspectorate for companies to monitor supplies. Companies are now routinely monitoring for 47 PFAS parameters in raw and treated water. This increased risk score signals the need for companies to strategically plan mitigations and record these in their DWSPs to keep drinking water safe.

# Audit programme completed by Inspectorate

The Inspectorate's audit programme and results are covered in detail in the Quarterly reports. The programme for England is in Table 9 with key findings from the water quality audits summarised.

**Table 9.**

## Audits completed by the Inspectorate in 2022

Regulatory Driver	Audit Type	Number of audits
Risk Assessment	PFAS Risk Assessment	10
	Drinking Water Safety Plans	3
Water Quality	Asset Health	9
	Management of Contractors	10
	Event Follow Up	6
	Lead	2
	PFAS	1
	Legal Instrument	1
	Competence	3
Enforcement	Regulation 27	2
Security and Emergencies Direction	Provision of alternative supplies and service to vulnerable consumers	3
<b>Total</b>		<b>50</b>

## **Quarter 1 – Lead failure response and plumbosolvency control**

Variation between companies in their response to lead exceedances was found as part of this series of audit, and this included the use of different trigger values and stagnation sampling. Most critically, health protection advice to consumers was also variable despite access to the same health information which states any detected level of lead has a health impact. For instance, some companies would issue do not drink advice if flushed samples remained above 10 µg/L whilst others did not. Many company investigations included identification of lead pipe material inside and outside of the home, including water fittings inspections and the use of lead solder test kits. Information from meter installations could be better utilised to feed into risk assessments and inform future lead strategies or identify hot spots, it is a missed opportunity to not gather this data, particularly since uncertainty exists around exactly how many lead connections remain in existence. It is perhaps also concerning that installation of meters into existing lead pipes does not join up the opportunity of completing two tasks in one job. Lead communication pipe replacement was found to have varying service level agreements. One company contributes £2,000 to the cost of replacing the consumer-owned supply pipe and this proactive initiative is encouraged across the industry. Some company websites were easy to navigate and provided good information on lead, whilst others were largely hidden from view. Lead information should be easy to find, with the offer of a free lead test clearly stated.

Concerns were raised around the control philosophy of phosphate dosing for plumbosolvency control. There were a small number of works where the company had run out of phosphate, despite the zonal risk assessment for lead requiring phosphate to be dosed at all times. The lack of telemetry visibility, alarms and safeguards on dosing rigs was a concern, considering that research indicates leaching can begin in as little as 24 hours after phosphate dosing stops (UKWIR 2016). Companies who are found not to be dosing phosphate as required by the regulations may be subject to enforcement action.



### Quarter 2 – Asset health audits focussed on water treatment works

There were problems with asset health at most of the sites audited. Current standards mean that some older sites are no longer compliant and will require investment. For instance, outdated construction standards with rapid gravity filters (RGF) directly above a contact tank, or lack of safe access to parts of the treatment process presenting unmitigated risks of by-passing treatment if the RGF floor leaks, or the inability for companies to maintain inaccessible areas which are found to have ingress. Other issues reflected asset maintenance with evidence of poor condition of internal structures and borehole headworks where external water could access through unsealed or missing fittings. Issues with general housekeeping were observed, with poor condition of dosing pumps and unsatisfactory storage of chemicals. The condition of sample taps was noted to be of a poor standard at several of the sites visited, including leaking taps. Simple ongoing maintenance of grounds is critical since this prevents overgrowth and the risk of root damage and vermin. For instance, growth of shrubs and weeds were found near built structures, and in one case, on the roof of a treated water tank. A vermin control fence protecting a wash water recovery tank was damaged and had not been repaired, and one company was unable to locate an overflow pipe from a treated water tank.

Several of the sites audited have been subject to a HazRev process, in which every stage of the process is reviewed to identify where there are risks to drinking water quality. The Inspectorate welcomes the Hazard Review approach as a systematic way to understand the general condition and operating risks at company assets. The process can help identify where investment is needed and inform planning to ensure assets are sufficiently maintained. Companies should record these risks in their drinking water safety plans, which should feed into the company investment plans, so that investment is appropriately targeted.

### Quarter 3 – Contractor supervision and communication

The Inspectorate was pleased to find some examples of good practice related to communication and supervision of contractors, although training and procedures were variable. Regulation 31 training should be completed for contractors and subcontractors to avoid offences. Several misconnections could have been avoided if basic water quality checks had been completed by the contractor when the connection was made. Many companies did not have effective supplier audit programmes to verify that contractors were operating in accordance with good practice and to protect water quality and public health. In all cases, recommendations were made for improvement.

# Enforcement, transformation programmes and recommendations

## Legal Instruments served in 2022

A summary of the Legal Instruments issued in 2022 is below, and thirty-seven legal instruments were closed in 2022. Current legal Instruments are published on the Inspectorate website.

**Table 10.**

### Legal instruments issued in England, in 2022

Type of legal instrument	Number served	Companies
Regulation 27(4) notice for improvements to water safety plans	4	Affinity Water, Anglian Water, United Utilities, Veolia Water Projects
Regulation 28(4) notice relating to risks identified in water safety plans	35	Affinity Water, Anglian Water (3), Bristol Water, Portsmouth Water, SES Water, South East Water (3), Southern Water (2), South Staffordshire Water, Severn Trent Water (2), South West and Bournemouth Water (4), Thames Water (8), United Utilities, Wessex Water, Yorkshire Water (6)
Enforcement order under section 18 of the Water Industry Act 1991.	1	Southern Water

### Audit strategy reviews and guidance given

Most of the legal instruments the Inspectorate serves (for example, all of the regulation 28(4) notices and section 18 enforcement orders served and the section 19 undertakings) require the company to develop and maintain an audit strategy. This is a fundamental part of delivering the legal instrument successfully and should not merely be regarded as a report to produce for the Inspectorate's benefit. The purpose of the audit strategy is to outline how the company will monitor the success of measures being delivered, as well as to monitor the effectiveness of the interim mitigation measures put into place. It should include (as a minimum) the following sections:

- Governance – for example, a defined governance structure with board level visibility and sign off, to ensure measures within a notice are delivered on time and as required under the legal instrument.
- Ownership – specific requirements outlined in the audit strategy should have named personnel/ job roles responsible for delivery of measures. This is to aid clarity and provide accountability of delivering measures.
- Monitoring – monitoring can include enhanced sampling, consumer contact tracking, online monitoring. Monitoring should be clearly defined and tracked by the company to ensure sampling is not missed or sampling rescheduled where applicable.
- Measures of success – the audit strategy should define what successful delivery of the measures and successful mitigation of the original risk(s) looks like.
- Continuous review – the audit strategy should be a dynamic document which the company uses, reviews and updates throughout the lifetime of the legal instrument.

The Inspectorate recognised there was a divergence in the standards of audit strategies between companies and so, during 2022, completed an audit of the audit strategies submitted by companies. Where audit strategies were found to be poor, the Inspectorate sought to engage with companies, to educate and guide, following which required a review and resubmission of the affected audit strategies. The Inspectorate was pleased with the response from companies in rising to this challenge and has seen substantial improvements to these essential tools since.

Any company that would like a guidance session on audit strategies, please feel free to contact the Enforcement Team so arrangements can be made.

### Transformation programmes progress report

Where a company carries persistent risks with respect to water quality, the Inspectorate may implement a transformation programme. These programmes are aimed at achieving a company-wide change in the level of water quality risks being carried by a company. Part of these programmes is a series of enforcement in the form of legal instruments, targeting improvements in specific areas of a company's operation. They are bespoke for the risks observed at each of these companies. There were five transformation programmes in place at the end of 2022. These

were with Northumbrian, Essex and Suffolk Water, Southern Water, South West and Bournemouth Water, Thames Water and United Utilities Water. Portsmouth Water is also within a legally defined change programme, akin to a smaller version of a transformation programme. Throughout the latter half of 2022 and continuing on into 2023, the Inspectorate is investigating, in cooperation with the company, the level of risk carried by South East Water and the potential need for transformation. A progress summary is provided below.

### **United Utilities Water transformation programme**

United Utilities was taken out of transformation in early 2023. Since the transformation programme was instigated in 2016, the company has invested considerable effort, time and money into improving its assets. This has included improvements to site specific disinfection policies, disinfection arrangements, chemical dosing and monitoring, and taste and odour. Recently, the company achieved significant milestones with their service reservoirs notice. The Inspectorate welcome this positive action by the company in putting water quality first and all staff should be commended.

Now that the company is formally out of transformation, the focus will be on maintaining the new standard and ensuring water quality first remains at the heart of its operation.

### **Northumbrian, Essex and Suffolk Water transformation programme**

The company has continued to deliver its transformation notices. The company has achieved significant milestones with the first tranches of HazRev reports produced. HazRevs are key to a company thoroughly understanding the risks it is carrying at its treatment works and identifying where improvements are required to mitigate those risks. The challenge for the company will now be to ensure the required improvements are captured in its business planning for AMP8 and beyond.

### **Southern Water transformation programme**

Southern Water has made disappointing progress with some aspects of its transformation programme. The company repeatedly failed to deliver its obligations under notices at Testwood, Otterbourne, Burham, Hardham, Timsbury and Twyford treatment works. This necessitated the Inspectorate initiating further enforcement action in the form of final enforcement orders under section 18 of the Water Industry Act. The serving of six final enforcement orders on a single company by the Inspectorate is unprecedented and represents the seriousness of these failures to deliver. The company must now make a concerted effort to deliver these improvements successfully and on time, in order to mitigate the significant risks to drinking water quality.

Late in the year, the company notified the Inspectorate that it was unlikely to achieve the requirement, within a notice, of mains replacement in Hampshire and on the Isle of Wight, to reduce the risk of consumers experiencing discoloured water. The target was for 110 km to be replaced by 31 December 2025. At the time of notification, the company had replaced just 3.97 km of mains. The Inspectorate will be pursuing this further with the company, to ensure customers benefit from the improvements that are due.

Part of the original Southern Water transformation programme was a notice served under regulation 27(4), requiring all catchment risk assessments to be reviewed and revised. At the time the notice was served, the company undertook very little catchment management and there was a disconnection between catchment management and the drinking water safety plans. The company has invested in its catchment team, with a team of experts now proactively engaged in catchment risk assessments, as well as other catchment activities. Inspectors auditing the catchment risk assessment process in 2022 were pleased by the progress made by the company. It is important that the company sustain this position, as understanding catchment risks is fundamental to understanding the risks to the further supply systems.

### **South West and Bournemouth Water transformation programme**

South West and Bournemouth Water continue to make progress with its transformation programme. South West and Bournemouth Water entered transformation in 2021 with three transformation notices served for its service reservoir inspections, hazard review of maintenance and resilience at water treatment works, and for scientific investigations.

The company is progressing well with the transformation notices. The hazard review or maintenance and resilience notice is on track to be completed by 2025 with a number of site-specific reviews (MOTs) having been completed in 2022 and reviews for the outstanding works have been planned for 2023 and 2024. An extension for the submission of the milestone for the review and reissue of site-specific disinfection policies has been granted for the scientific investigations notice, however, this will not affect the overall delivery of the notice. The tank cleaning and inspection notice is also on track with the notice being updated on a biannual basis, with tanks being removed from the notice as tank inspection, repair (if required) and cleaning is completed and tanks are added to the notice if they exceed the required inspection frequency.

As part of the original transformation programme discussions, the Inspectorate was concerned over shortcomings with the company's training records, procedures and document control. These shortcomings were considered as a theme for a potential transformation programme notice.

In 2022 the Inspectorate completed a training and management audit of South West and Bournemouth Water. The purpose of the audit was to provide the company with an opportunity to demonstrate and evidence the improvements that have been made since the initial transformation programme discussions and to help inform the Inspectorate's assessment of whether a formal notice was required.

The audit found South West and Bournemouth Water has made good progress and has clear objectives for its People and Culture programme, with the Quality First scheme forming an integral element of embedding the prioritisation of water quality throughout the company. The company is also introducing the requirement for treatment works operators to achieve a Level 3 qualification and for network operatives there is a progression scheme, which also requires Level 2 and 3 qualifications to be held.

The audit also concluded that the company appears to have a satisfactory document control procedure and system in place, however, there had been some instances where document control procedures did not appear to have been followed when the documents have been reviewed and updated. As site procedures act as control measures to reduce the risk of failures, the Inspectorate recommended the company should ensure that the document control procedures are followed in full.

Overall, however, the assessors concluded that, due to the progress made already with the company's People and Culture Programme as part of the Quality First initiative and the current document control systems in place, a formal enforcement notice was not required. The company will be submitting regular formal updates to the Inspectorate throughout the delivery of the programme to ensure it remains on track and the objectives to put water quality at the heart of company culture is met.

### Thames Water transformation programme

During 2022 the Thames Water transformation team saw considerable changes due to company restructures. The transformation programme was amalgamated into the company's public health plan. The new public health driver has brought focus to projects such as 'one version of the truth' to ensure messages are consistent across the company, and the digital twinning programme whereby the company's assets are captured in high digital detail, creating a remote tool that can be used to support planned and unplanned activities and monitor the condition of assets over time. Equally, the changes have naturally caused disruption and uncertainty to the programme for example, the role of a dedicated manager of the transformation programme was removed in 2022. The company has since seen the benefits of the dedicated role and reintroduced the role in early 2023. Notably throughout this period of turbulence has been the consistent high quality of reports for the transformation programme notices.

Continuing on from 2021, the company entered the next phase of its work to mitigate the risk from turbidity, to ensure compliance with regulation 26(1)(b) and 26(6)(b), that water leaving the company's treatment works has received sufficient preliminary treatment to prepare it for disinfection. As a result of this ongoing work, five individual sites were brought into individual notices for turbidity to allow a greater level of focus on the risk at these sites.

Thames Water's Hazrev investigations are nearing completion. All high and medium risk assets are completed, immediate risks found and dealt with, and now the company must manage the medium and lower risks identified. It was identified in 2022 that the company has insufficient risk management and tracking of jobs. The company has put in place improvements, however, the Inspectorate will continue to observe and respond to the company's mitigation of these risks during 2023, to understand whether the Hazrev notice needs to be adapted to the management of the risks now identified.

Work on the company's notice to mitigate the risk at slow sand filter sites was completed in 2022. The company has completed several actions to mitigate the risks seen from its slow sand filters. This has included critical reviews of its operation and maintenance, perimeter fencing to prevent animal access, turbidity monitoring and training. This culmination in effort has resulted in a downward projection of risk, with significantly fewer slow sand related events seen now since before the notice was served. The Hazrev's of these sites has identified some site-specific risks at these sites; the Inspectorate will continue to observe and respond to the company's mitigations of these risks, to ensure effective mitigation of risk.

The work under two of the company's management and training notices was completed towards the end of 2022/beginning of 2023, similar to the above. In 2023 the Inspectorate will be looking to see if a phase 2 of this programme is required, to address any aspects of the programme that were less successful as others (for example, the format for the 'licence to operate' training programme was not suited to network teams and requires bespoke remodelling to suit the needs of the team) or whether the systems successfully implemented under the programme are able to effectively integrate these issues into a 'business as usual' model to address.

As described previously, the Inspectorate conducted an audit of audit strategies in 2022 that identified significant weaknesses. Thames Water requested the Inspectorate's guidance on audit strategies which was given, resulting in purposeful audit strategies. As part of the company's 'first line assurance' work, it has created a mobile app that is used to audit itself against compliance with its own policies. This was used to audit the implementation of audit strategies for legal instruments, which identified useful learning (such as making it simpler for staff to evidence compliance with policies; where staff were compiling the evidence but were frustrated, they could store this in a transparent way for all to see). Considering the weaknesses found with the industry audit strategies, Thames Water's development of an app to audit its own compliance with audit strategies, would appear to be industry leading.

### Portsmouth Water change programme

Core to the company's change programme is its management and training notice. In 2022 significant work was completed under this notice, which is still in the review stages. The company has taken the time to systematically plan and build the mechanism to identify all risks, and to track and address those risks that are identified. This is being made possible thanks to the additional resource committed to the programme in 2021 by the board, following a business case from the company's water quality team, bolstered by the legal instruments served. The Inspectorate looks forward to seeing how the company progress into the next phase of this notice in 2023.

### South East Water

In June 2022, the Inspectorate wrote to South East Water concerning its failure to comply with the requirements of legal instruments. The letter outlined that compliance with legal instruments is not optional. The Inspectorate offered the company support to improve; however, significant improvements must be seen, or the Inspectorate would escalate enforcement.

Deficiencies included:

- Failure to meet defined deadlines for information;
- Delays to six notices (notification of some delays not received until the day before reporting deadlines);
- Poor quality milestone reports;
- Failure to take the required audit enhanced sampling, which was only discovered after the Inspectorate's enquiries; and
- Audit strategies lacking key information.

In addition to these, the Inspectorate has identified themes of risks within the company that are akin to corner stones of most transformation programmes:

- Culture of high tolerance of water quality risks
- Management and training deficiencies
- Weaknesses with policies and procedures
- Identification of risk and reporting thereof
- Failure to mitigate the risk from turbidity, to ensure compliance with regulation 26(1)(b) and 26(6)(b), that water leaving the company's treatment works has received sufficient preliminary treatment to prepare it for disinfection.

In addition, the company has seen numerous resilience related events (burst mains, power interruptions and lack of capacity to meet increased demand during extreme weather events) in 2022 that have led to water quality incidents. The company accepts that it is significantly behind the industry with implementation of a risk-based programme of tank inspections and is not planning to accelerate action to address this.

The Inspectorate is working with the company to identify the extent of the risks within each theme and the need for further enforcement action to holistically transform the company's performance.

### **Failure to deliver legal instruments**

At the end of 2022, Anglian Water was notified of the Inspectorate's intention to take further enforcement action in the form of an enforcement order under section 18 of the Act, due to repeated failures to deliver a notice under regulation 28(4).

The Inspectorate served a notice under regulation 28(4) on the company for its Great Wrattling water treatment works and Keddington water treatment works in 2020, requiring that specified measures be carried out in order to prevent the deterioration in the quality of water supplied. The notice included specific milestones that the company was required to achieve and included deadlines by which they were required to be completed. Both the milestones and dates were agreed through negotiation between the company and the Inspectorate and were understood by both parties as being realistic and achievable. The milestones were designed to mitigate the risks of metaldehyde, total pesticides, manganese and iron, taste and odour of water to zones supplied by the two treatment works.

The notice went through several version changes as work progressed in delivery. However, the final commissioning was delayed on several occasions, causing the company to submit repeated change applications to the Inspectorate.

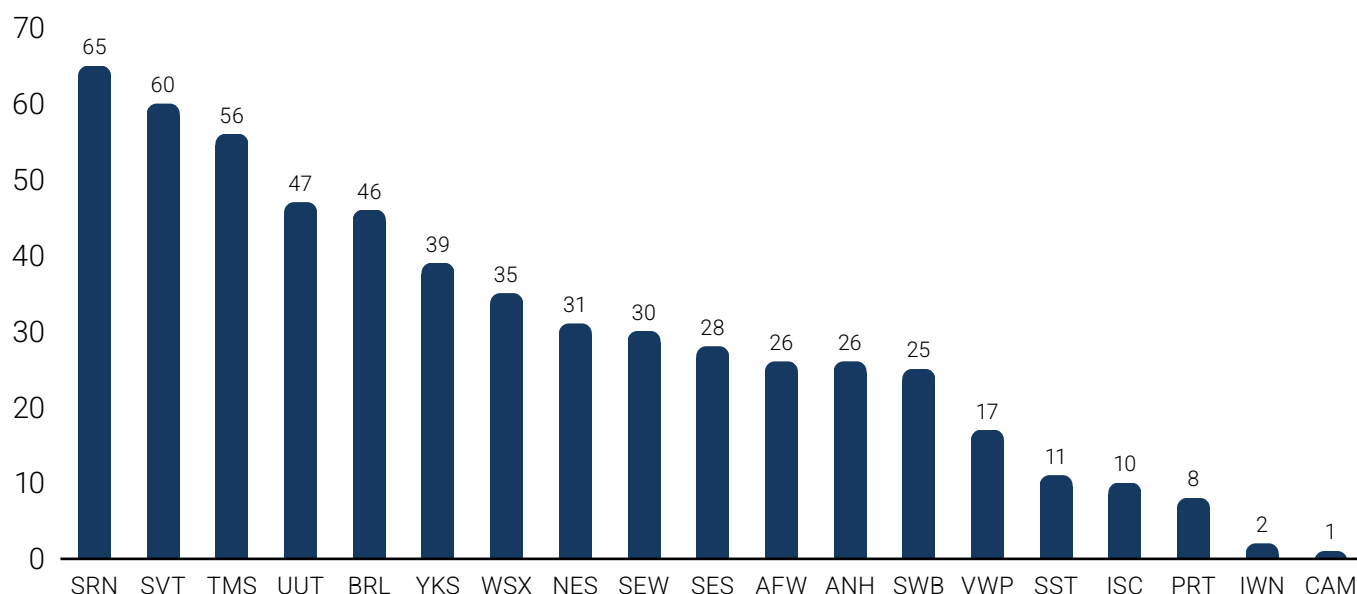
The company finally completed work on the final day of the enforcement order consultation, avoiding the need for the Inspectorate to make the order. The Inspectorate takes the delivery of legal instruments seriously. Whilst the Inspectorate accepts that a degree of flexibility is vital and operates a change process accordingly, further enforcement will be pursued where there are repeated failures to deliver as demonstrated in this case and the Southern Water cases described previously.

### Recommendations

The Inspectorate made 565 recommendations to companies operating in England during 2022 relating to breaches of the Regulations, or risk of breaching the Regulations. The number of recommendations issued to each company is shown in the following bar chart.

**Figure 15.**

#### Number of recommendations by company in 2022

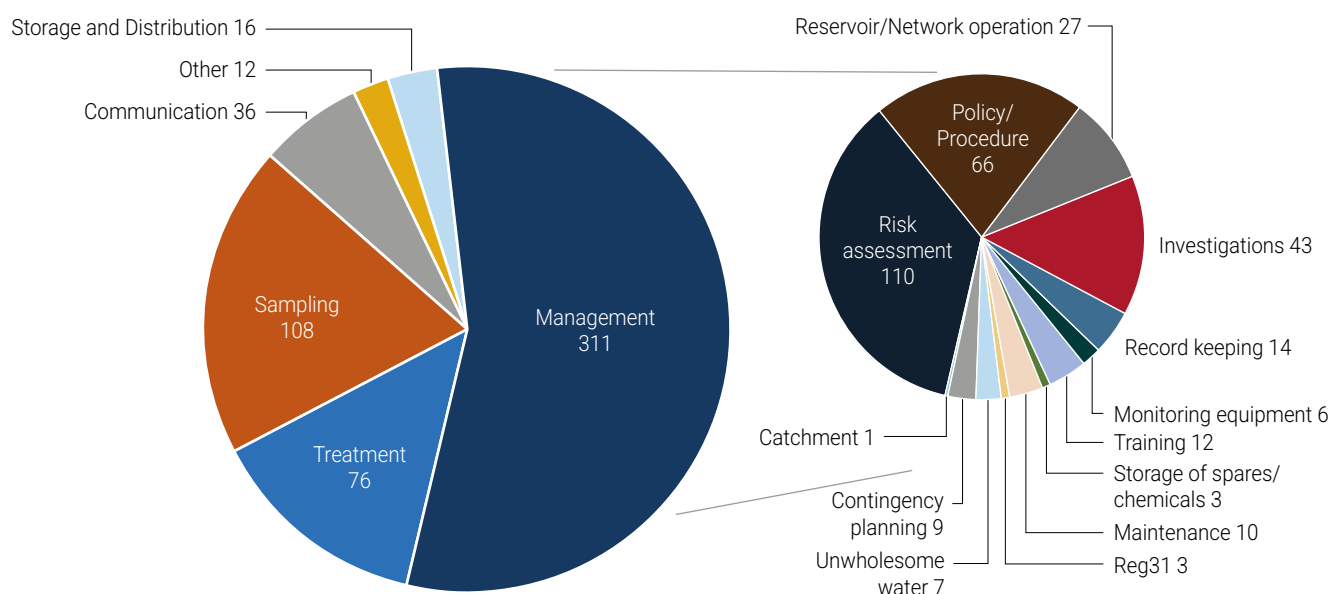


Southern Water received the highest number of recommendations, followed by Thames Water, Severn Trent Water and United Utilities. Southern Water and Thames Water are in transformation programmes with the Inspectorate, to improve performance.

The nature of the recommendations are illustrated in the following pie charts. The pie chart on the left shows the broad categories of recommendation, with most relating to deficiencies in management. The management deficiencies are further broken down in the pie chart on the right. Inadequate risk management within company DWSPs remains the largest cause of recommendations, followed by company policy and procedures, reservoir and network operations, and inadequate company investigations.

**Figure 16.**

## Recommendations by type in 2022



## Recommendations about company drinking water safety plans

A total of 110 recommendations made during 2022 in England were associated with deficiencies in company risk assessments with Bristol Water and United Utilities receiving the most recommendations for drinking water safety plans at 17 and 16 respectively.

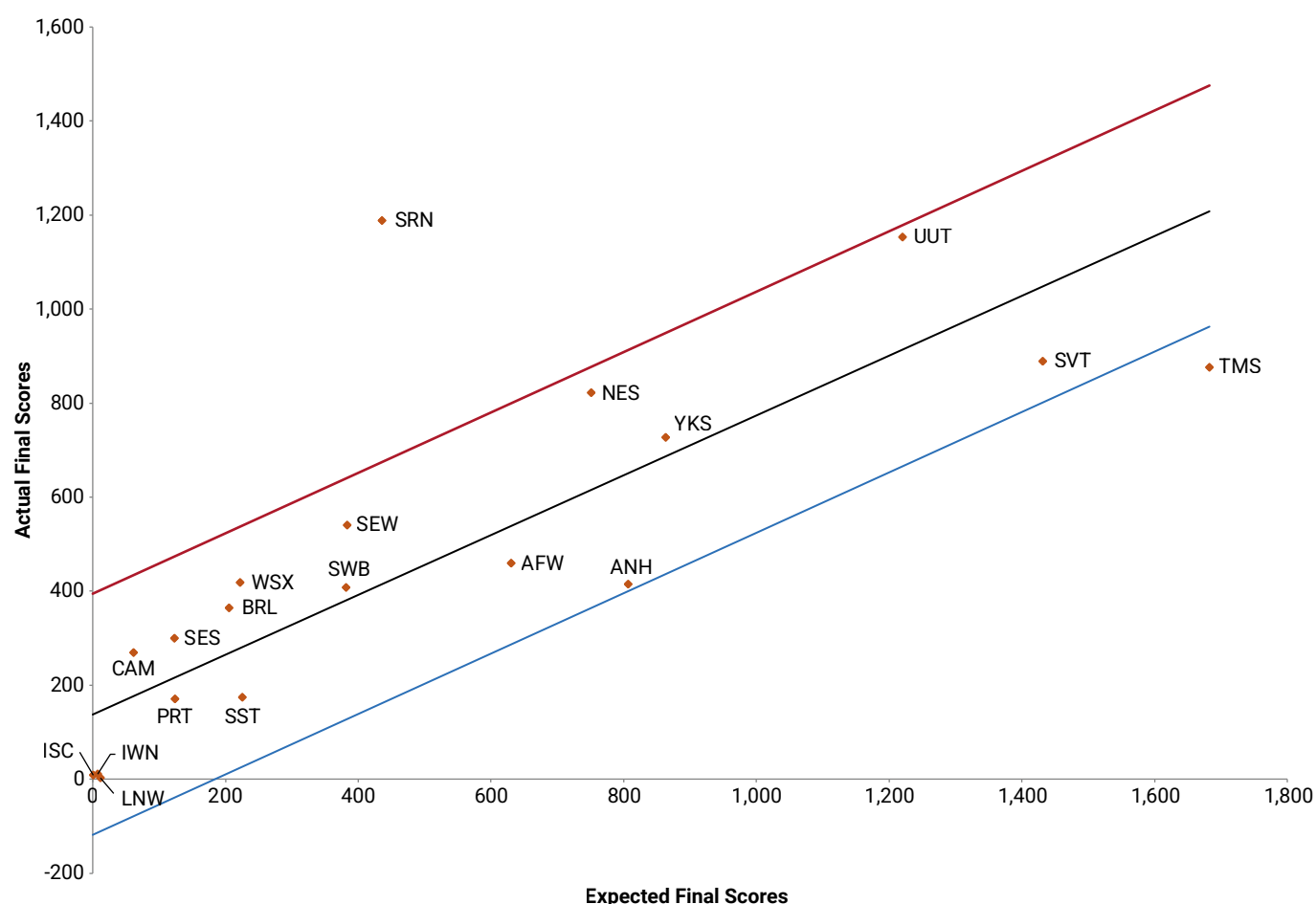
Where Lloyds Register Quality Assurance provide accreditation of a company's drinking water safety plan methodology, the audits carried out by the Inspectorates' Risk Assessment Team ensure that these methodologies are being followed and that the risks and hazards identified by the company, are classified appropriately. The audit team also ensures that companies' methodologies are in line with industry best practice and WHO guidance.

## Recommendations Risk Index

The Recommendations Risk Index measures all companies' performance in recommendations against the industry. Recommendations are the first level of regulatory intervention, in line with the Better Regulation framework. For the purposes of discussion, an equal distribution of recommendations by company size (population served) is assumed. Regression analysis can be seen in Figure 17 as the central black line. A position below this line means a company is receiving fewer recommendations and/or lower scores attached to those recommendations than would be expected. A position above the black line means the opposite. Any measure has a degree of uncertainty, as such a 95% confidence interval is applied either side of the black line, represented by the red and blue lines. Southern Water is the only company showing above the tramlines which reflects the extensive amount of regulatory focus on the performance of this company.

**Figure 17.**

### Recommendation risk index by company in 2022



### Security and Emergencies Measures Direction (SEMD)

The Inspectorate regulates the security and emergency measures direction (SEMD) on behalf of the Secretary of State. After consultation with the industry, the direction was updated to a more risk-based approach.

The Inspectorate has been working with companies during a pilot year to set out expectations and drive improvement. Several companies are reviewing their reasonable worst case planning scenario, which is beneficial for the consumer. The pilot year ended in March 2023. The Inspectorate will continue to work with the industry to drive improvement, and where necessary, take enforcement action in line with the SEMD enforcement policy.

**Photograph 2.**

**Bottled water collection point (photo courtesy of Water Direct)**



Two main challenges faced by the industry in 2022 included the summer drought and the freeze / thaw experienced in December. Both events demonstrated the challenge to make available minimum quantities of alternative supplies to consumers. The Inspectorate completed four audits in the year, focusing on alternative water supplies and vulnerable consumers. Six recommendations were made to ensure companies have tested emergency plans and carry out emergency exercises. [\*\*The full report for the freeze/thaw event can be found on the Inspectorates website.\*\*](#)

# Products in contact with drinking water (regulation 31)

During 2022, the Inspectorate continued to receive and process applications for approval of products in contact with drinking water (under regulation 31). The volume of applications processed was:

- 2022 – 145 total (32 new applications, 62 changes and 51 reapprovals)
- 2021 – 146 applications (23 new applications, 62 changes and 60 renewals)

During 2022, the team have been working with the Inspectorate's IT partners, to design and build a new regulation 31 database. The system will replace the current Word document application forms, which are emailed into the team, with online, interactive application forms that will guide applicants in providing all the necessary information for an approval to be considered. The online process will have the benefit of meeting accessibility standards thereby making them available to more people. The next phase of the project will see the approved products list transformed from a monthly, published pdf document to an interactive, searchable website which is updated in real-time. This will effectively become a live, online catalogue of approved products.

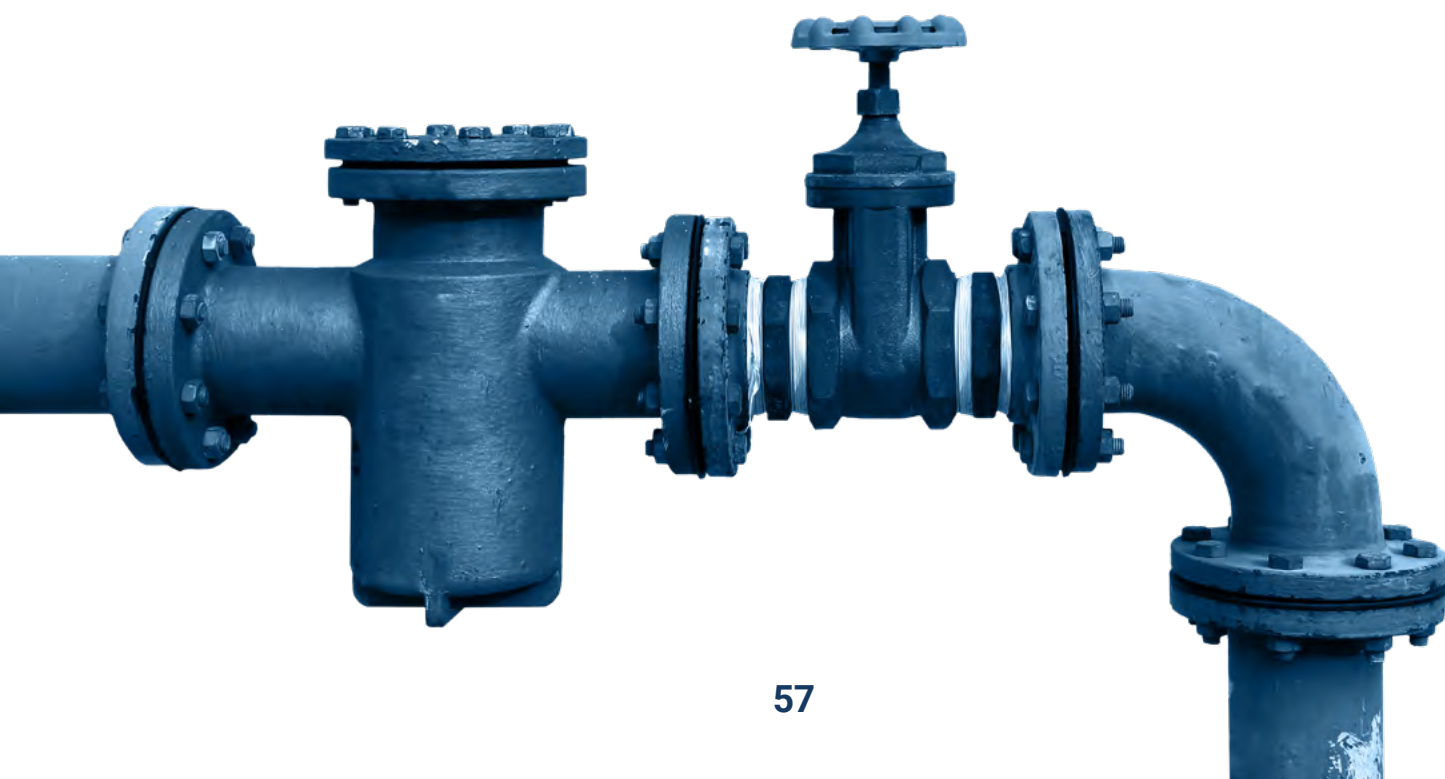
Laboratory capacity issues continue to be experienced, with the sole approved regulation 31 testing laboratory temporarily closing its doors to samples in order to relocate. However, in more positive news, both NSF and ALS have made significant progress towards becoming recognised laboratories for product approval, with the hope that testing facilities will be available again in the near future.

During the year the Inspectorate has seen drinking water quality events caused by the inappropriate use of repair materials. A key part of the regulation 31 approval process is the assessment of the manufacturer's instructions for use (IFU), which must be provided when the product is supplied as a condition of approval. The IFU is a vital source of information to the end user of the product in using it correctly and appropriately, to prevent risks to drinking water quality. Where applicable, compatible repair materials and repair techniques will be specified within the IFU. It is not appropriate to apply any other product as a repair material, even a separate, existing approved product. The interactions between the products will be unknown and untested and could have an impact on drinking water quality.

# Research publications

Four research projects were completed and published in 2022. The full research reports can be accessed on the Inspectorate's website at [Research – Drinking Water Inspectorate \(dwi.gov.uk\)](https://www.dwi.gov.uk)

- Organophosphorus Flame Retardants (OPFRs) – Risk to Drinking Water in England and Wales
- Method for the Determination of Concentrations of Perfluoroalkyl Substances (PFAS) in Drinking Water
- Research on Removal of Microplastics by Drinking Water Treatment Processes
- Public Perception of Water Recycling for Drinking Water Use



# Regulators' Alliance for Progressing Infrastructure Development in Water – RAPID

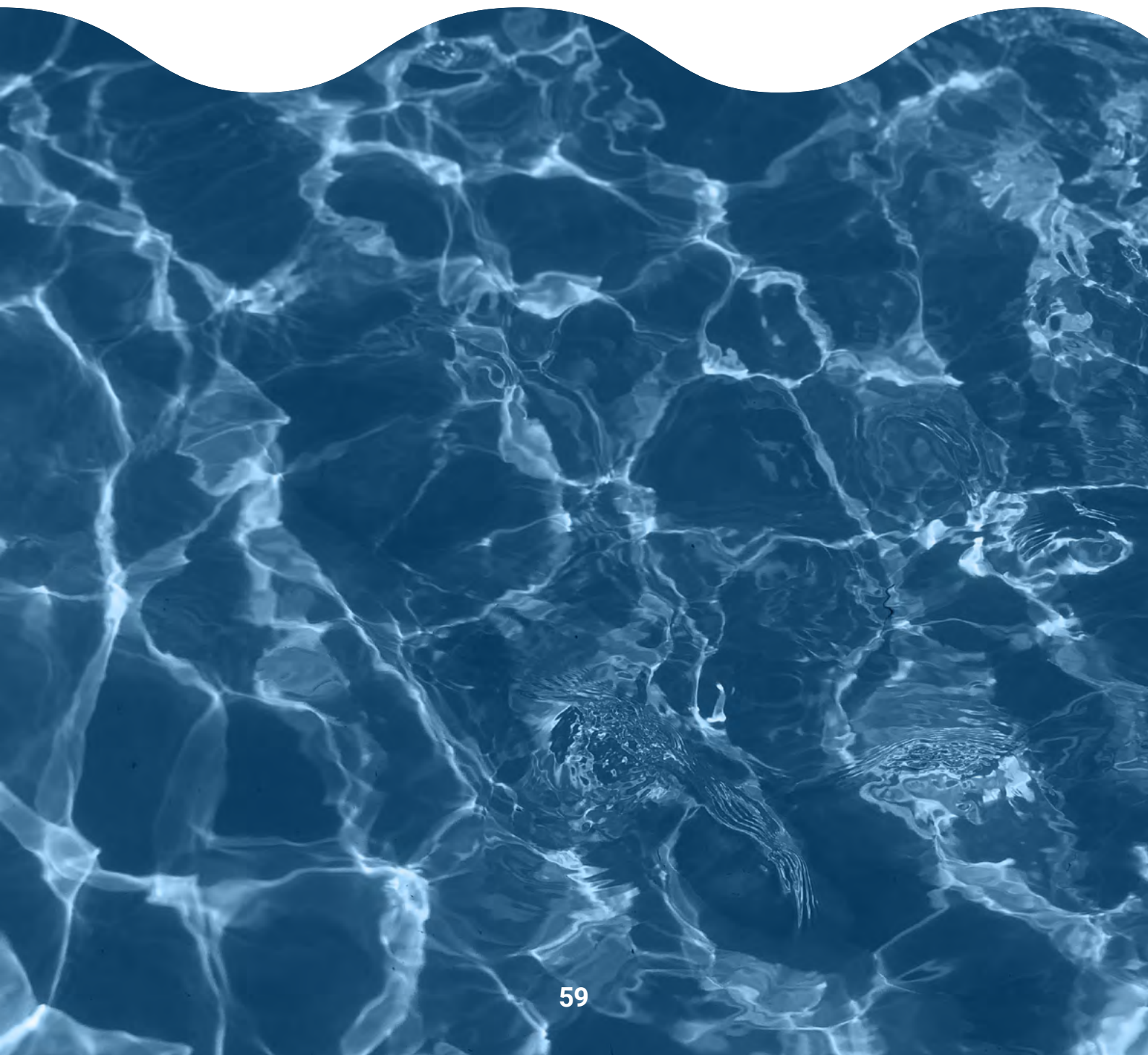
The Regulators' Alliance for Progressing Infrastructure Development in Water (RAPID) was established to coordinate development and delivery of large-scale water resources infrastructure schemes, some of which will cross company boundaries, and improve resilience of supplies. Regional planning will inform water company water resource management plans in 2024, and companies should use the planning guidance published on the Inspectorate's website to ensure risks to water quality are considered during the planning stages for all water resource schemes.

During 2022 the Inspectorate has continued to support RAPID to liaise with the Strategic Resource Options (SRO) sponsor companies, to ensure that all drinking water quality risks are being appropriately considered as the schemes are being progressed.

The Inspectorate worked with RAPID on the drinking water quality components during the publication of the draft and final decision documents for the accelerated Gate 2 and two new Gate 1 SROs, which were published in the first half of the year. In the second half of the year, the Inspectorate completed the assessment of 14 standard timeframe Gate 2 submissions which included the following drinking water quality considerations:

- Confirmation that company Water Quality teams have been engaged
- Solutions are clearly explained, and options set out
- Drinking water quality considerations for each option have been identified
- Confirmation that key DWSP risks have been identified (catchment, source water, treatment, distribution, acceptability, materials in contact with drinking water, operability)
- Forward plan for investigation of key risks and further development of DWSPs including monitoring programmes
- Confirmation as to how and when the Inspectorate will be engaged.

The assessments of the drinking water quality components feed into the cross-regulator assessment on progress of the solutions. The Inspectorate will continue to work with the SRO sponsor water companies and partner regulators throughout the gated process, to ensure the solutions are appropriately identifying drinking water quality risks and putting suitable mitigation in place, to ensure they can provide wholesome supplies.



# Whistleblowers contacting the Inspectorate in 2022

On 15 December 2022 the Chief Inspector of Drinking Water and Inspectors appointed under section 86(1) of the Water Industry Act 1991 became 'prescribed persons' under the Prescribed Persons Order 2014 as amended (the Order).

Whilst the Inspectorate has historically received information from concerned employees, contractors or ex-employees of potential or known wrongdoing, by becoming a prescribed person, somebody who is making a disclosure to the Inspectorate will be afforded certain protections under the Order and the Employment Rights Act 1996. In general terms, a person passing on information concerning wrongdoing (referred to as whistleblowing) should not suffer detriment or victimisation from their employers.

The type of disclosure that would typically qualify as a protected disclosure under the Order would be if it relates to the quality and sufficiency of water supplied by the water industry and the security of network and information systems within the supply and distribution sector. This will likely be information pertaining to a breach or potential breach of the Water Supply (Water Quality) Regulations 2016 (as amended), the Network and Information Systems Regulations 2018 or the company not meeting its obligations relating to water quality or sufficiency, or potentially committing an offence under the Water Industry Act 1991.

Any persons who are wishing to report a concern or potential concern regarding suspected or known wrongdoing which the Inspectorate can investigate should do so by contacting the DWI Enquiries line ([dw.enquiries@defra.gov.uk](mailto:dw.enquiries@defra.gov.uk) or 0330 041 6501).

The Inspectorate treats all disclosures made by whistleblowers sensitively and seriously and follows up each disclosure with an appropriate investigation. The Inspectorate will protect the identity of an individual making an allegation wherever possible. However, in certain circumstances the Inspectorate may be required to reveal the identity, if required by law.

The Inspectorate will report the number of disclosures made in the reporting year (1 April – 31 March) annually in the Chief Inspector’s Report and from the number of the disclosures where the Inspectorate investigated further and if further action was taken, a summary of the type of action taken (such as enforcement). The report will ensure that the anonymity of the whistleblower is protected and details of the company they work for is not reported.

**Table 11.**

**Summary of disclosures made for the period 15 December 2022 – 31 March 2023**

Number of disclosures made	Number of disclosures investigated further	Summary of action taken
0	0	N/A

# Annex 1 Number of tests carried out by companies

**Table 12.**

## Tests carried out by companies

Company	Water treatment works (number of works)	Service reservoirs (number of reservoirs)	Consumer taps (zones)	Number of tests per company	Target number of tests
Affinity Water	68,776 (92)	30,258 (157)	88,191 (89)	187,225	187,259
Albion Water	0 (0)	0 (0)	689 (2)	689	689
Anglian Water	134,102 (131)	80,454 (323)	162,816 (164)	377,372	378,237
Bristol Water	20,709 (14)	39,909 (158)	34,449 (27)	95,067	95,141
Cambridge Water	12,111 (17)	5,884 (31)	8,452 (9)	26,447	26,657
Dŵr Cymru Welsh Water (ENG)	3,519 (5)	5,522 (16)	5,751 (6)	14,792	15,111
Icosa Water Ltd	0 (0)	0 (0)	3,303 (21)	3,303	3,303
ESP Water	0	0	63 (1)	63	63
Independent Water Networks	0 (0)	0 (0)	8,921 (72)	8,921	9,043
Isles of Scilly	1,637 (9)	2,146 (9)	1,834 (5)	5,617	5,661

## Drinking Water 2022 Public supplies England

Company	Water treatment works (number of works)	Service reservoirs (number of reservoirs)	Consumer taps (zones)	Number of tests per company	Target number of tests
Leep Networks Water (ENG)	0 (0)	0 (0)	8,081 (41)	8,081	8,087
Northumbrian, Essex and Suffolk Water	59,653 (56)	70,279 (306)	135,891 (123)	265,823	266,057
Portsmouth Water	18,868 (16)	7,060 (29)	19,128 (15)	45,056	45,230
SES Water	12,492 (8)	7,248 (35)	19,685 (21)	39,425	39,425
Severn Trent Water	116,274 (130)	91,118 (448)	220,184 (213)	427,576	428,568
Southern Water	76,515 (84)	54,326 (215)	88,928 (76)	219,769	219,855
South Staffordshire Water	21,489 (20)	6,524 (34)	36,977 (28)	64,990	65,036
South East Water	70,643 (85)	57,279 (227)	82,394 (72)	210,316	210,391
South West and Bournemouth Water	53,223 (37)	69,760 (276)	86,713 (44)	209,696	210,676
Thames Water Utilities Ltd	92,920 (96)	77,225 (386)	231,689 (258)	401,834	425,925
United Utilities	96,093 (86)	89,060 (355)	197,439 (229)	382,592	383,405
Veolia Water Projects	796 (2)	1,248 (6)	576 (1)	2,620	2,620
Wessex Water Services Ltd	52,379 (72)	80,679 (316)	47,449 (77)	180,507	181,369
Yorkshire Water	86,992 (55)	88,420 (345)	172,979 (89)	348,391	348,548
<b>Region overall</b>	<b>999,151 (1015)</b>	<b>864,399 (3672)</b>	<b>1,662,519 (1682)</b>	<b>3,526,109</b>	<b>3,556,293</b>

Note: Numbers in brackets reflect the number of works, reservoirs or zones operated by that company in the region in 2021. Some companies are permitted to carry out some tests on samples taken from supply points rather than from consumers' taps.

# Annex 2 Compliance with standards

Table 13.

## Microbiological compliance at water treatment works

Parameter	Standard	Total number of tests	Number of tests not meeting the standard	Company
<i>E. coli</i>	0/100 mL	173,499	2	YKS (2)
Coliform bacteria	0/100 mL	173,500	61	ANH (8), BRL (3), ISC (4), NES (4), SVT (13), SEW (3), SWB (3), SRN (5), TMS (10), UUT (2), WSX (1), YKS (5)
<i>Clostridium perfringens</i>	0/100 mL	23,977	6	SRN (1), SVT (2), NES (3)
Turbidity Turbidity is a critical control parameter for water treatment and disinfection.	1 NTU	173,459	22	ANH (1), NES (5), PRT (3), SVT (2), SEW (3), SWB (1), SRN (1), TMS (5), WSX (1)

**Table 14.**
**Microbiological compliance at service reservoirs**

Parameter	Standard	Total number of tests	Number of tests not meeting the standard	Company
<i>E. coli</i>	0/100 mL	184,526	8	SEW (1), SVT (1), TMS (1), NES (2), UUT (1), BRL (1), YKS (1)
Coliform bacteria	0/100 mL in 95% of samples	184,501	102	ANH (7), ISC (6), SRN (1), SEW (6), SVT (12), SWB (6), TMS (7), NES (13), UUT (6), WSX (5), AFW (3), BRL (13), YKS (17)  Five reservoirs failed to meet the 95% compliance rule: ANH Maidford Reservoir, ISC Abbey East (Tresco), NES Scotts Quarry Old, TMS Hampstead North, TMS Willesden

**Table 15.**
**Microbiological compliance at consumers' taps (water supply zones)**

Parameter	Standard	Total number of tests	Number of tests not meeting the standard	Company
<i>E. coli</i>	0/100 mL	145,904	25	ANH (4), SVT (12), TMS (2), NES (4), UUT (2), BRL (1)
Enterococci	0/100 mL	12,387	2	ANH (2)

**Table 16.**
**Detection of *E. coli* and Enterococci at treatment works, service reservoirs and consumers' taps, by company**

Company	<i>E.coli</i> in water leaving treatment works	<i>E.coli</i> in water leaving service reservoirs	<i>E.coli</i> at consumers' taps	Enterococci at consumers' taps
Affinity Water	0 – 13,533	0 – 7,564	0 – 9,677	0 – 677
Albion Water	0 – 0	0 – 0	0 – 24	0 – 8
Anglian Water	0 – 21,518	0 – 16,105	4 – 13,408	2 – 1,319
Bristol Water	0 – 3,426	1 – 7,981	1 – 3,169	0 – 227
Cambridge Water	0 – 2,395	0 – 1,471	0 – 1,033	0 – 71
Dŵr Cymru Welsh Water	0 – 583	0 – 1,104	0 – 493	0 – 45
Icosa Water	0 – 0	0 – 0	0 – 149	0 – 53
Independent Water Networks	0 – 0	0 – 0	0 – 499	0 – 201
Isles of Scilly	0 – 270	0 – 431	0 – 37	0 – 16
Leep Networks Water	0 – 0	0 – 0	0 – 418	0 – 143
Northumbrian, Essex and Suffolk Water	0 – 10,018	2 – 15,132	4 – 11,582	0 – 882
Portsmouth Water	0 – 3,123	0 – 1,410	0 – 1,898	0 – 115
SES Water	0 – 2,082	0 – 1,812	0 – 1,874	0 – 168
Severn Trent Water	0 – 22,841	1 – 22,417	12 – 22,042	0 – 1,609
Southern Water	0 – 12,629	0 – 10,848	0 – 6,774	0 – 550
South Staffordshire Water	0 – 4,265	0 – 1,631	0 – 3,523	0 – 267
South East Water	0 – 11,672	1 – 11,458	0 – 5,985	0 – 576
South West and Bournemouth Water	0 – 8,634	0 – 13,952	0 – 5,940	0 – 501
Thames Water Utilities Ltd	0 – 17,668	1 – 19,297	2 – 21,018	0 – 1,937
United Utilities	0 – 15,895	1 – 17,765	2 – 19,594	0 – 1,792
Veolia Water Projects	0 – 156	0 – 312	0 – 36	0 – 8
Wessex Water Services Ltd	0 – 8,660	0 – 16,151	0 – 3,735	0 – 510
Yorkshire Water	2 – 14,130	1 – 17,684	0 – 12,996	0 – 712
<b>Region overall</b>	<b>2 – 173,498</b>	<b>8 – 184,525</b>	<b>25 – 145,904</b>	<b>2 – 123,87</b>

Note: Results are shown as the number of positive tests – the total number of tests.

Table 17.

## Failures of the standards for chemical parameters

Parameter	Current standard or specified concentration <sup>1</sup>	Total number of tests	Number of tests not meeting the standard	Number of tests not meeting the standard per company
<b>Aesthetic parameters</b>				
– colour	20 mg/L Pt/Co scale	53,179	0	
– odour		53,139	103	AFW (3), ANH (16), BRL (2), DWR (1), NES (13), PRT (2), SVT (5), SEW (15), SST (7), SWB (1), SRN (6), UUT (20), WSX (1), YKS (11)
– taste	No abnormal change	53,045	88	AFW (1), ANH (7), BRL (3), DWR (1), ICW (1), IWN (3), ISC (2), NES (4), PRT (1), SVT (9), SWB (1), SRN (18), UUT (22), WSX (3), YKS (12)
1,2-dichloroethane	3 µg/L	10,082	0	
Aluminium	200 µg/L	49,001	18	AFW (3), ANH (2), BRL (1), NES (2), SVT (1), TMS (2), UUT (6), YKS (1)
Ammonium	0.5mg NH <sub>4</sub> /L	36,683	0	
Antimony	5 µg/L	12,194	0	
Arsenic	10 µg/L	12,195	1	SEW (1)
Benzene	1 µg/L	10,083	0	
Benzo(a)pyrene	0.01 µg/L	12,360	3	AFW (1), WSX (1), SWB (1)
Boron	1 µg/L	10,132	0	
Bromate	10 µg/L	10,919	0	
Cadmium	5 µgCd/L	12,235	0	
Chloride	250 mgCl/L	10,233	6	ISC (6)
Chlorine – residual (free) <sup>2</sup>	2 mg/L	107,935	0	

Parameter	Current standard or specified concentration <sup>1</sup>	Total number of tests	Number of tests not meeting the standard	Number of tests not meeting the standard per company
Chlorine – residual (total) <sup>2</sup>	2 mg/L	123,796	0	
Chromium	50 µgCr/L	12,389	0	
Conductivity	2500 µS/cm at 20°C	62,435	0	
Copper	2 mg/L	12,303	2	DWR (1), SVT (1)
Cyanide	50 µgCN/L	7,642	0	
Fluoride	1.5 mg/L	10,227	0	0
Iron	200 µg/L	49,437	81	AFW (2), ANH (7), BRL (2), DWR (4), NES (7), SRN (2), SVT (11), SEW (3), TMS (5), UUT (27), WSX (2), YKS (9)
Lead	10 µg/L	11,285	59	AFW (5), ANH (5), ISC (1), NES (2), PRT (1), SES (1), SRN (2), SVT (12), SEW (1), TMS (17), WSX (1), SST (2), SWB (4), YKS (5)
Manganese	50 µg/L	49,008	14	AFW (1), ANH (2), ISC (1), SRN (1), SVT (2), UUT (6), WSX (1),
Mercury	1 µgHg/L	8,517	0	
Nickel	20 µg/L	11,238	43	AFW (5), ANH (6), BRL (1), DWR (1), ISC (1), IWN (2), NES (8), SVT (2), SEW (4), TMS (5), WSX (3), SST (2), YKS (3)
Nitrate	50 mg/L	22,154	0	
Nitrite	0.5 mg/L	22,180	3	NES (2), TMS (1)
Nitrite (taken at works)	0.1 mg/L	23,400	0	
Pesticides – total	0.5 µg/L	7,297	0	

Parameter	Current standard or specified concentration <sup>1</sup>	Total number of tests	Number of tests not meeting the standard	Number of tests not meeting the standard per company
Pesticide – individual <sup>3</sup>	0.1 µg/L	171,746	3	Metazachlor NES (1) Propyzamide NES (2)
pH (Hydrogen ion)	6.5 – 9.5	53,199	3	TMS (1), UUT (1), YKS (1)
Polycyclic Aromatic Hydrocarbons (PAH)	0.1 µg/L	12,281	1	AFW (1)
<b>Radioactivity</b>				
Gross alpha	0.1 Bq/L	1,434	55	ANH (1), ISC (19), LNW (1), SVT (13), TMS (1), UUT (6), SST (12), VWP (2)
Gross beta	1.0 Bq/L	1,430	6	ISC (2), VWP (4)
Total indicative dose	0.1m Sv/year	2	2	VWP (2)
Tritium	100 Bq/L	316	4	VWP (4)
Selenium	0.1 µg/L	12,226	0	
Sodium	200 mg Na/L	12,398	1	AFW (1)
Sulphate	250 mg SO <sub>4</sub> /L	10,248	0	
Tetrachloroethene & Trichloroethene (sum of)	10 µg/L	11,415	1	SVT (1)
Tetrachloromethane	3 µg/L	11,495	1	ANH (1)
Trihalomethanes Total	100 µg/L	12,390	0	
Tritium	100 Bq/L	316	0	
Turbidity (at consumers' taps)	4 NTU	53,175	8	AFW (1), SRN (1), TMS (2), UUT (2), WSX (1), YKS (1)

Notes:

<sup>1</sup>For comparison, 1 mg/L is one part in a million, 1 µg/L is one part in a thousand million.

<sup>2</sup>The value of 2 mg/L at the consumer's tap is a screening value set by the Inspectorate.

<sup>3</sup>A further 16,677 tests were done for aldrin, dieldrin, heptachlor, heptachlor epoxide, all of which met the relevant standard of 0.03 µg/L.

<sup>4</sup>These are screening values to trigger action. The standard is 'Total Indicative Dose'.

