Drinking water 2019
Private water supplies in England

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Chapter 1:

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- Puts the quality of private supplies in context relative to public supplies.
- Reports on the performance of local authorities in making returns.
- Indicates the extent to which local authorities are exercising powers to improve failing private supplies.
- Records the Inspectorate's support of local authorities in answering queries and providing technical advice.

Drinking water 2019 is the annual publication of the Chief Inspector of Drinking Water for England and Wales. It is the 30th report of the work of the Inspectorate and presents information about drinking water quality for the calendar year of 2019. Two reports describe private water supplies. This report is about private supplies in England.

This report is the ninth of its type and presents information based on the updated private supply records provided to the Inspectorate by local authorities in January 2020. Due to the geographical dispersion of private supplies across the country the information in this report is generally presented by grouping local authority information into nine geographical regions as illustrated in Figure 1. The more detailed information about private supplies in each individual local authority area can be found in *Annex 1*.

In 2019, local authority records reported a total of 37,702 private supplies in England, 68% of which serve a single household. In England, over 795,000 live or work in a premises that relies on a private supply. Whereas the quality of public water supplies in England in 2019 was very high, with only 0.04% of tests failing to meet the national standards, the quality of private water supplies remains a concern, with 3.4% of tests failing to meet the European and national standards in 2019. Nonetheless, this figure represents an improvement when compared to the 9.6% of tests that failed in 2010, the year when reporting for private supplies was first introduced.

Figure 1: Reporting regions

The results of testing during 2019 demonstrate that private supplies in England and Wales, while showing an overall improvement over previous years, continue to be of unsafe microbiological quality, with 5.4% of samples containing *E.coli* and 6.6% containing Enterococci. Failures of these two standards mean that the water supply is contaminated with faecal matter and there is a risk that harmful pathogens will also be present. More detailed information about private supply test results can be found in *Chapter 4* and *Annex 2.*

The records reported in *Chapter 3* show that in 2019 there were 669 private supplies (495 in England and 174 in Wales) that are a potential danger to human health where local authorities had to require the owners to make improvements and take steps to protect public health. This represents an increase in risk management activity in both countries compared to 2018, when action to safeguard public health was taken in relation to 498 private supplies (362 in England and 136 in Wales). In England, over three-quarters (78%) of these failing private supplies are large supplies or supplies to commercial or public premises. More information about failing private water

supplies can be found in *Chapter 3* together with five new case studies with learning points.

Chapter 3 also summarises the progress that local authorities have made towards completing risk assessments of each private supply other than a supply to a single dwelling not used for any commercial activity and not a public building. Across England and Wales as a whole, the number of private supplies that have been risk assessed was 8,261 (6,805 in England, 1,456 in Wales) covering just under two-thirds (64%) of all relevant private supplies. This is a reduction to the situation published in *Drinking water 2018* where it was reported that 74% of relevant private supplies had been risk assessed after five years. In England, local authorities still have 44% of assessments to do representing more than two out of five private supplies with an unknown risk to those who drink from these supplies and where, on average just over 6% of these may contain faecal contamination. A detailed breakdown of performance on risk assessment at local authority level is provided in *Annex 1*. This information shows that 24 local authorities in England have complied with the duty to risk assess all Regulation 9 and 10 type supplies in their area. It is apparent, in some returns, that risk assessments that were carried out are now lapsing and local authorities are not reporting that they have updated these on the five-year cycle as required. Local authorities should note that changes to the supply may require them to be reviewed earlier than the five-year review cycle. The Inspectorate reminds local authorities that risk assessments carried out during 2015 will require updating at an appropriate point in 2020.

During 2019, the Inspectorate has continued its advisory service to local authorities, private supply owners or the industry associated with private supplies who contact an Inspector through the Inspectorate's website or public phone enquiry line.

During 2019 inspectors handled 480 contacts in total (which is the same number of enquiries received in 2018). Enquiries from local authorities have generally stabilised over the past three years and in 2019 stood at 279 down slightly from the 309 reported last year. The Inspectorate responded to 94 enquiries from owners or operators of private supplies in 2019 and 107 enquiries from other bodies or companies about private supplies. The Inspectorate has seen an increase in cases where there are disputes between the relevant persons leading to the threat of termination of supplies. Many of these are disputes that can only be resolved by civil action. Details about the use of the enquiry service in England since 2008 can be found in *Annex 4*.

The Inspectorate also provides its private supply risk assessment tool which is being widely used by local authorities and their contractors. This is supplied under a non-commercial government licence protecting the intellectual property. There have been regular updates to this tool based on feedback received from local authorities and there is an ongoing project within the Inspectorate to look at making this a web-based tool that could

incorporate annual data returns, risk assessment summaries and risk assessment mitigation plans. This work is in collaboration with other UK regulators and more detail can be found in *Chapter 3.*

During 2019, one research project was completed, focussing on chemical disinfection of private water supplies and there is one project ongoing looking at whether it is possible to produce risk maps for parameters failing the prescribed standard, these are described in detail in *Chapter 4*. The Drinking Water Inspectorate is also progressing a sampler certification scheme to comply with the Private Water Supplies (England) (Amendment) Regulations 2018 and the Private Water Supplies (Wales) Regulations 2017. The sampling procedures manual is available on the Inspectorate's website and the manual is to be used as the reference document for ISO 17024 accreditation of local authority samplers.

Chapter 2: Number and nature of private water supplies in England

Chapter 2:

- Provides details of private supply numbers by type and region.
- Summarises numbers of private supplies used in the provision of services to the public.
- Reports on the performance of local authorities in making returns.

The Regulations classify private water supplies according to their size and usage. These two factors denote their status in relation to the monitoring and reporting requirements. Large supplies and supplies of any size serving public premises or where the water is used as part of a commercial activity, comprise those that fall in scope of regulatory monitoring and reporting, as are small, shared domestic supplies. Supplies serving only single domestic premises are exempt from monitoring unless the owner requests this, or where a supply to a single dwelling in Wales is tenanted. The Regulations also recognise another category of private supply, where a person or organisation other than a licensed public water supplier further distributes water that originates from a public supply. These supplies require monitoring as determined by a risk assessment. The tables in this chapter summarise the number and nature of each type of private supply derived from the returns provided by local authorities in January 2020. Anyone wishing to understand these figures in the context of a particular local authority area should refer to *Annex 1*, a table listing the figures and other information by each local authority in England and Wales.

In England, 46 local authorities failed to provide a return for 2019 (Annex 1), 21 of which have reported private supplies within their area in recent years (Blackpool Borough Council, Bolsover District Council, Boston Borough Council, Cheltenham Borough Council, Daventry District Council, Enfield, Forest Heath District Council, Gateshead Metropolitan Borough Council, Hillingdon, Mole Valley District Council, North East Derbyshire District Council, North West Leicestershire District Council, Sevenoaks District Council, St Edmundsbury Borough Council, Sunderland City Council, Sutton, Tandridge District Council, Taunton Deane Borough Council, Torbay Council, Warrington Borough Council and West Somerset District Council). Three local authorities submitted data returns however these could not be loaded due to issues with file formats, retrieving the return from a file transfer site or being returned late (Dartford Borough Council, West Devon Borough Council, Wigan Metropolitan Borough Council).

The failure to provide returns or usable returns limits the national understanding of risk to private supply users. Local authorities are reminded

of their duties under Regulation 14 to provide the annual return to the Inspectorate, by the 31 January after the reporting year.

In England, a basic check to establish evidence of local authorities having carried out the required sampling for higher priority supplies identified that sample data was missing from 18 local authority returns for Regulation 9 supplies. For 9 of the local authorities (Arun District Council, Blaby District Council, Brentwood Borough Council, Dover District Council, Huntingdonshire District Council, Isles of Scilly, Stoke-on-Trent City Council, Tendring District Council and Watford Borough Council) this represents two consecutive years where the local authority did not provide evidence of having carried out the annual requirement to sample Regulation 9 supplies. As a reminder, these supplies serve either a commercial activity and/or supply on average or more than 10,000 litres per day. These are very significant and large supplies. The absence of data can only be interpreted as the requirements to risk assess and sample are not being or have not been carried out by the local authorities concerned. This represents an unknown risk to those who use these supplies as there is an absence of evidence as to the condition, particularly if there is a contamination risk with the supply.

From Table 2 in 2019 there were 37,702 private supplies in England. During 2019, 441 private supplies were added to the register in England, from the total of 37,261 reported in *Drinking water 2018*. It is to be expected that there will be some year-on-year variations in the number of private supplies for operational reasons (new supplies being commissioned, and old supplies being abandoned).

The area of England with the most private supplies (34%) is the South West. There are also significant numbers of private supplies in the West Midlands (16%), the North West (15%), East of England (11%) and Yorkshire and Humberside (12%). Table 2 also illustrates that private supplies can be found anywhere in the country with 12% (4,631) of all private supplies being in the other regions of England.

Looking at Table 2, details have been provided of those private supplies used only for a domestic purpose other than drinking, cooking and personal hygiene (showering and bathing). The main use of these ‘non-human consumption’ supplies for domestic purposes is toilet flushing, but this category of supply can also include a supply used only for clothes washing (laundry). The separate recording of this type of private supply is necessary because while such supplies are required to be wholesome (Water Industry Act 1991), the current definition of wholesome in the Regulations does not apply.

Table 2: Number of private supplies reported in 2019, by region

Region	Large supplies and any size supply used in a public building or a commercial activity	Small, shared domestic supplies	Single domestic dwellings	Private distribution systems	Domestic purposes – other	Total
East Midlands	212	159	803	12	1	1,187
West Midlands	633	517	4,968	12	2	6,132
East of England	820	456	2,817	42	33	4,168
North East England	519	263	643	7		1,432
North West England	1,109	1,007	3,445	14	16	5,591
Yorkshire and Humberside	865	865	2,824	4		4,558
London and South East	384	350	1,236	37	5	2,012
South West England	2,511	1,130	9,079	49	5	12,881
England total	**6,901**	**4,747**	**25,815**	**177**	**62**	**37,702**

Data excludes for local authorities that did not provide a return in time for inclusion or whose data could not be loaded due to errors.

Table 2 illustrates how more than two-thirds (68%) of all private supplies in England serve a single domestic dwelling. Apart from recording the location of this type of supply, local authorities are not currently required to risk assess and check the quality unless requested to do so by the owner, or if the supply comes to the attention of environmental health professionals for some other reason, for example, where there is a change of ownership or use, or a complaint about quality or sufficiency. Accordingly, less is known about these supplies and they have been excluded from the other tables in this chapter describing the characteristics of private supplies. Of the remaining 11,887 supplies, 11,648 require risk assessment and monitoring because they are either large supplies or supplies of any size used in the provision of services to the public (58%) or small, shared domestic supplies (40%). Supplies via piped systems that further distribute mains water and domestic purposes (other) require risk assessment on which any monitoring should be based.

Table 3: Numbers of private water supplies used for commercial and public activity

Region	Educational and training establishments	Hospitals/care facilities	Food premises	Supplying water as part of a commercial service	Public buildings
East Midlands	1	2	56	183	23
West Midlands	6	5	129	373	81
East of England	6	7	189	510	138
North East England		1	98	462	142
North West England	5	4	245	702	111
Yorkshire and Humberside	8	5	253	785	231
London and South East	7	5	141	268	84
South West England	10	7	394	1761	208
England total	**43**	**36**	**1,505**	**5,044**	**1,018**

Some supplies have more than one type of activity.

Table 3 provides more detail about the private supplies in England used to provide water for drinking, cooking and washing as part of a public or commercial activity. In 2019, local authorities reported 865 additional supplies (a total of 7,646 compared to 6,781 in 2018). Two-thirds (66%) of these supplies include use by the tourism and leisure sector (hotels, bed and breakfast accommodation, campsites, and hostels). Of the remainder, a fifth serve food premises (20%) and 13% supply public buildings. These figures reinforce the important contribution that private supplies make to the economy of England (particularly in the North West and the South West regions, which account for almost half (49%) of all the private supplies used in the provision of services to the public). Table 3 also highlights where highly vulnerable individuals are exposed to private supplies, for example, there are private supplies serving 36 hospitals and 43 schools or other educational establishments. Local authorities should always consider the nature of the establishment and the potential consumers when risk assessing

a supply, as for some establishments there are greater consequences of failures such as an insufficient supply with no contingency in place.

In some rural communities there are significant numbers of private supplies where no mains connections exist or the supplies cannot be easily connected, largely due to the remote geography of the communities. It is clear from data recorded in this report since 2010 that the failure rate for private supplies is much worse than for public supplies and addressing inability to access a safe and reliable water supply through the provision of a public supply would be a preferable arrangement. It is necessary for local authorities to consider the residual risk of such supplies, particularly in context of commercial operations and apply the requirements of the Private Water Supplies Regulations to ensure all people have access to a wholesome supply. However local authorities are advised to explore the possibility for connection to the public mains with local water companies so that all options are considered when providing advice for the protection of health to private supply owners.

Chapter 3: Improving private water supplies

Chapter 3:

- Describes the progress of local authorities in risk assessing private supplies.
- Records the work of local authorities in relation to improving failing water supplies.
- Reviews the records and content of Notices issued by local authorities.
- Highlights good practice learning points about risk management through case studies.

From the beginning of 2010, local authorities have been required to carry out a risk assessment of each relevant private supply in their area. This is to determine whether it poses a potential danger to human health and, if so, to take action to safeguard public health in the short term and to improve the supply in the long term. This duty informs consumers about the quality of their water supply, with details of the nature and timescale of any necessary safeguards and improvements.

3.1: Risk assessments

The methodology of a risk assessment is based on the World Health Organisation's (WHO) *Guidelines for Drinking water quality*[1] and *Water Safety Plan Manual*[2]. They seek to minimise the chance of failure by promoting a hazard analysis approach. This is a very similar methodology to that used in food assessments and will be familiar to local authorities. Local authorities have been provided with a risk assessment tool[3] created by the Inspectorate to enable this work to be carried out in a consistent manner across the country. Enquiries about the tool and feedback from its use should be sent to dwi.enquiries@defra.gov.uk.

[1] Guidelines for Drinking-water quality 4th Edition WHO, 2011.

[2] Water Safety Plan Manual (WSP manual): Step-by-step risk management for drinking-water suppliers – How to develop and implement a Water Safety Plan – A step-by-step approach using 11 learning modules. WHO 2009.

[3] DWI risk assessment tool is the subject of a non-commercial government licence which prohibits any change or use of the tool for commercial gain.

The duty to carry out a risk assessment of every relevant supply is set out in Regulation 6. Table 4 summarises the overall compliance of local authorities with this Regulation and detailed information showing the performance of each individual local authority is set out in *Annex 1*.

Table 4: Percentage of supplies with risk assessments

Use of supply*	Percentage of reported supplies risk assessed with risk assessment in last five years 2015-2019*	% of risk assessments in place				
		Food premises	Premises supplying water as part of a commercial service	Public buildings	Shared domestic supplies	Total number of risk assessments in place**
East Midlands	56%	66%	74%	70%	36%	216
West Midlands	44%	67%	68%	62%	25%	511
East of England	58%	69%	60%	65%	54%	762
North East England	58%	65%	68%	69%	51%	459
North West England	48%	71%	71%	65%	32%	1,016
Yorkshire and Humberside	62%	71%	68%	61%	57%	1,082
London and South East	58%	62%	67%	68%	53%	445
South West England	62%	71%	76%	75%	46%	2,297
England Total	56%	69%	71%	67%	44%	6,805

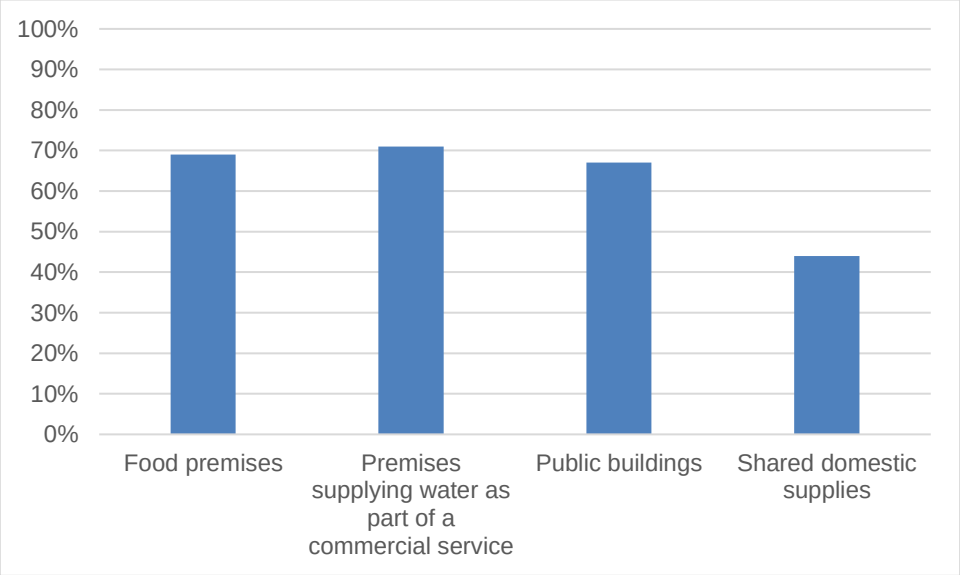
***Double counting may occur as some premises have more than one commercial activity.
** England - Includes all Reg 8, Reg 9 and Reg 10 supplies.

In England the number of relevant private water supplies that had been risk assessed was 6,805, just over half (56%) of those required. This is a substantial gap in securing safe drinking water supplies. This represents little improvement on the situation reported in *Drinking water 2014* where only 55% of risk assessments had been completed and a deterioration from 2018 where 64% of risk assessments were completed. Risk assessment are valid for five years and the reduction in the number of supplies with a valid risk assessment in place is likely due to earlier assessments expiring and the local authority not yet completing the re-assessment. There are notable

regional variations, for example in the Yorkshire and Humberside area, 62% of risk assessments have been completed, despite that area having the second highest total number of risk assessments to complete (1,318). In contrast West Midlands has completed a lower proportion (44%) whilst having fewer numbers of risk assessments to complete (1,162).

Local authorities were advised to prioritise risk assessing those private supplies which are large and/or are used in the provision of services to the public as they represent a greater consequential impact should there be a failure. From Figure 5 this approach has generally been followed across England with higher levels of risk assessments having been completed these types of private supply: public buildings (67%), food premises (69%) and premises supplying water as part of a commercial service (71%).

Figure 5: Percentage of risk assessments carried out



Considerable variability remains in achieving full risk assessment of supplies. In the case of these large and/or commercial, (Regulation 9) supplies, 35 local authorities reported that they did not have in-date risk assessments for any of their Regulation 9 supplies. The numbers of Regulation 9 supplies not risk assessed by these local authorities is relatively small with most only reporting one or two supplies in this category, but nevertheless this represents an unmitigated risk, consequently the Inspectorate considers that the task of completing or updating risk assessments for these priority supplies should be carried out as soon as possible.

The more detailed information in *Annex 1* shows that, overall, 24 local authorities achieved 100% compliance with the duty to risk assess all relevant Regulation 9 and 10 private water supplies in their area.

In 2018, a change in the regulations in England brought about the requirement for local authorities to provide the Secretary of State (effectively the Inspectorate) within 12 months of having carried out a risk assessment, a summary of the results of that assessment. This requirement had previously been transposed into The Private Water Supplies (Wales) Regulations in October 2017. To implement this change on a practical level, an additional section on the risk assessment tool was developed, which pulls the necessary information from the other tabs to populate a summary tab. The submission requires the investigating officer to copy and paste the summary worksheet into an email and submit it to the Inspectorate through the DWI Enquiries email address. The Inspectorate can then extract this information and enter it into a database for later use. This procedure is only applicable for supplies that were assessed as high or very high risk. In addition to this, local authorities must record the rating of all supplies in its annual data return at the end of every January, by which time the hazards relating to those high and very high risk supplies may have been mitigated and the rating (and therefore risk) reduced, thus providing an update of those supplies of greatest risk.

In 2019, the Inspectorate received summaries of 213 risk assessment submitted by 28 English local authorities.

The most popular risk assessment tool was the ‘lite’ version having been used 168 times, but the full tool had also been used for a substantial proportion of the assessments (44).

Tool Used	Risk assessments received
Full RA Tool	44
RA Lite	168
Reg 8 Tool	1
Toilet flush	0

The highest number of high and very high-risk supply summaries were submitted by Cornwall. No risk assessment summaries were received from the remaining 303 local authorities. While it is likely that some of the local authorities will not have any high or very high risk supplies the likelihood is that there are a number of local authorities who are not fulfilling their duties under Regulation 6 by forwarding a summary of the risk assessment for the high and very high-risk supplies to the Inspectorate.

3.2: Risk Management

Risk management, in the context of the private supply Regulations, refers to the decisions and actions that local authorities are required to take when

they become aware, through risk assessment, monitoring or by other means (such as consumer complaints or reports of water-related illness from health professionals) that a supply may pose a potential danger to human health or is insufficient or unwholesome. Risk management involves interpreting the results of either the risk assessment or any water quality tests or user complaints in the context of the water supply arrangements (source, infrastructure, treatment and management arrangements). It is particularly important that when a local authority receives a report of an adverse sample result from the laboratory that this is interpreted and acted upon considering knowledge gained through the risk assessment about the hazards and controls (risk mitigation) pertaining to the supply in question. Where a risk assessment is in place, the decision making of the local authority should be relatively straightforward, with no need for repeated sampling or time spent seeking the opinion of health professionals. Instead, checks can be made immediately with the owner/manager of the supply to establish if there has been any change in the supply circumstances or any malfunction of control measures. The local authority can then decide if there is a good reason to carry out a site visit to update the risk assessment and independently validate the controls. In making this judgement, the local authority should consider the competence, attitude and behaviour of the supply owner/manager, thereby focusing their own resources proportionately towards those situations where they add the greatest value in terms of public health protection.

Once a local authority has identified that a supply poses a potential danger to human health, or the quality of a private supply is not wholesome or the volume of water output is insufficient, then action must be taken to ensure that all consumers are informed and given appropriate advice to safeguard their health in the short term. Consumers must also be informed of the nature and timescale of any improvement works needed to affect a permanent remedy. This is achieved by putting in place a Notice formally setting out the requirements. There are two Notice options: for situations where there is a potential danger to human health a Regulation 18 Notice is used; for other situations where there is a problem only about sufficiency or wholesomeness, a Notice under Section 80 of the Water Industry Act 1991 is used. In certain instances, it may be appropriate to put in place both a Regulation 18 and a Section 80 Notice. Both types of Notice are flexible instruments that can be varied to reflect the owner's preferred option for providing a permanent remedy or to include additional requirements that come to light because of an investigation. The benefits of a Notice (compared to informal verbal or written advice) are twofold. If there is disagreement about the need for a supply to be improved, or there is a dispute over who is responsible for carrying out the work, the Notice provides for a formal process of mediation (appeal) and thereafter, the relevant person(s) is under a legal duty to carry out the necessary improvements.

Sometimes a local authority will encounter a lack of co-operation by a private supply owner and in these circumstances, if necessary, a stand-off situation can be resolved by the local authority serving the owner with a third type of Notice (Section 85 Notice under the Water Industry Act 1991). This type of Notice makes it an offence for the person on whom it is served not to provide specified information by a given date. Local authorities should advise residents within its area that they must register any new private water supplies with them, in order that it can carry out its duties under Section 77-82 of the Act. Failure to do so may result in a Section 85 Notice, with which failure to comply is an offence. In addition, if access to the premises for the purpose of carrying out a risk assessment or sampling is being denied, the Act gives local authorities specific powers of entry that they can and should exercise to gain entry.

Table 6 shows that in England in 2019 there were 494 private supplies in 66 different local authority areas where improvements were required to protect public health by means of a Regulation 18 Notice. This represents an increase in this type of risk management activity compared to 2018 when 362 supplies in England were subject to such a Notice. Seventy-eight per cent of these were served on supplies used in the provision of water to the public, for a commercial activity or which supply more than 10m^3 per day.

Table 6: Number of supplies where local authorities have served Regulation 18 Notices in 2019

Region	Number of LA's serving Notices	Reg 8	Reg 9	Reg 10	SDDW	Domestic - other	Total
East Midlands	8	0	10	2	4	0	16
West Midlands	6	0	10	4	1	0	16
East of England	8	0	20	7	2	0	29
North East England	3	0	6	1	0	0	7
North West England	13	0	205	41	5	0	251
Yorkshire and Humberside	5	0	15	2	1	0	18
London and South East	11	0	20	2	2	1	25
South West England	12	0	101	26	6	0	133
England total	66	**0**	**387**	85	21	1	494

Table 7: Number of supplies where local authorities have served Section 80 Notices in 2019

Region	Number of local authorities	Reg 8	Reg 9	Reg 10	SDDW	Domestic - other	Total
East Midlands	0	0	0	0	0	0	0
West Midlands	2	0	2	2	2	0	6
East of England	3	0	3	2	0	0	5
North East England	1	0	1	0	0	0	1
North West England	5	0	21	4	6	0	31
Yorkshire and Humberside	1	0	2	0	0	0	2
London and South East	0	0	0	0	0	0	0
South West England	5	0	31	2	3	0	36
England total	**17**	**0**	**60**	**10**	**11**	**0**	**81**

Table 7 shows that in England 81 supplies were the subject of a Section 80 improvement Notice, of which around 74% were used in the provision of water to the public, for a commercial activity or which supply more that 10m^3 per day. Over half of these were served by local authorities in the South West of England.

3.3 Review of notices

Local authorities are required under Regulation 14 (2) by 31 January every year to send the Secretary of State (in effect the Inspectorate), a copy of the records mentioned in Schedule 4. These include any Notices served under Section 80 of the Water Industry Act or under Regulation 18 (or Regulation 20 in Wales).

Since 2014, the Inspectorate has assessed these Notices for the completeness of the records, the reasons for serving the Notices and the detail of the content of the Notices in order to identify any learning for local authorities and to provide advice on how to improve the outcome from the serving of Notices.

Completeness of the records

Despite the requirement for local authorities to send copies of Notices served to the Inspectorate and reporting of progress against this requirement in the annual report, in each year from 2014 to 2018, not all Notices have been sent as required.

In 2014 the Inspectorate received 66% of Notices served but this has declined each year and was only 13% in 2019. The Inspectorate reminds local authorities of the need to send a copy of each Regulation 18 and Section 80 notices served on relevant persons to the Inspectorate at dwi.enquiries@defra.gov.uk

Reasons for Serving Notices

The review of Notices each year from 2014-2019 has consistently shown that most Notices are served in response to an exceedance of a microbiological standard. In 2019 79% of the Notices which have been forwarded to the Inspectorate were found to be served in response to the detection of microbiological contamination. Hazards associated with the plumbing metals lead or nickel being detected in the water supply were the next most common reason for a Notice to be served (11%).

In 2019 a copy of a single Section 80 Notice was forwarded to the Inspectorate which was served following an exceedance associated with manganese. Iron and manganese are not necessarily a potential danger to health at concentrations above the PCV however can cause issues with the aesthetic quality of the water. Any parameter that is in excess of the PCV in the Table A and B of Schedule 1 in the Regulations is a breach of regulation 4 and renders the supply unwholesome. Local authorities should consult with public health colleagues if they are unsure whether the presence of a contaminant in a supply would pose a potential danger to health and a Regulation 18 notice must be served.

Section 80 notices must be served if a supply is deemed unwholesome which requires the relevant person to complete necessary remedial works within a 28-day period otherwise the local authority can complete the works in default.

Appeals

Reported in CIR 2018 was the case study concerning a private water supply which originated from a well and supplied a downstream rental house. Occupants of the downstream property believe that their supply of water is granted by a “Deed of Easement” dated 1973 which entitles them to a supply of free water through a pipe from the land owner’s premises to their property, which also allows them to maintain a pump and gain access onto his land for carrying out any necessary maintenance and repairs.

A section 80 Notice was served by the local authority, as is the discretionary power of local authorities under the Water Industry Act 1991, in March 2018, in recognition that the private water supply was “likely to become insufficient”. The Notice required the land owner to continue with the private

water supply, giving the downstream property "reasonable" time to find an alternative supply.

In April 2018 an appeal to the Notice was received from the downstream consumers on the basis that the deeds entitled a continued supply. Section 80 Notice Appeals are heard by the Chief Inspector DWI (on behalf of the Secretary of State). Under section 81 of the Act, he must consider whether the section 80 Notice served by the Council should be confirmed (with or without modifications) or not. If the Notice is confirmed, he may modify the relevant person(s) on which the Notice was served or any other aspect of the Notice (e.g. timeframes, remedial steps etc.). The Chief Inspector concluded that the most appropriate way to deal with this matter was by written representation.

The Chief Inspector in 2018 upheld the notice to ensure that a wholesome and sufficient supply is maintained reserving the private law land rights for a civil remedy.

Following this an application for Judicial Review was made. A Judicial Review is the process where a judge reviews the lawfulness of a regulation, rule or order or the decision or action of a person or body exercising a public duty, in this case the decision to uphold the Notice by the Chief Inspector.

Those proceedings were concluded with a consent order maintaining the status of the Notice as undetermined until the appeal was reconsidered by the Chief Inspector.

The appeal was reconsidered in 2019. It noted the reliance on private legal rights and obligations and recognised that the appropriate body to determine the dispute about those legal rights and obligations is the county court, in which proceedings have been issued. The appeal concluded that the disputed issues of fact and of law are uniquely suited to resolution through the court's processes rather than any administrative procedure conducted by the Chief Inspector or by the local authority, neither of whom has the necessary expertise or resources to fully investigate and determine the dispute.

As the termination of the existing water supply would have consequences as to the health and habitability of the property and its inhabitants, the Notice was upheld but modified. The modification prevented the termination of the existing water supply until such time as either a new agreement, or a determination of the issues of private law between the parties is made by a civil court and allowing a period thereafter for any arrangements consequent to the agreement or court order to be put in place.

3.4 Risk management case studies

The Inspectorate has included case studies to illustrate the range and scope of the situations that can arise in the risk management of private supplies in each of its annual reports. This aspect of the report is particularly appreciated by local authorities and has been continued again this year. The selection of case studies is guided by enquiries received during 2019, either from local authorities or private supply owners and their service providers. The Inspectorate also draws on records of events notified to the Inspectorate by water companies to highlight, for learning purposes, those scenarios where the task of safeguarding water supplies relies on effective local collaboration and communications between the local authority and its local water company. The case studies published in *Drinking water 2019* will be added to the archive of published case studies as a learning tool for anyone coming new to the subject and they can be accessed at http://www.dwi.gov.uk/private-water-supply/local-auth/case-studies.html

Case Study 1. Identification of a Regulation 8 supply and successful joint working

When drinking water is discoloured, consumers will almost always contact their water company as clearly such water is not suitable for consumption. Whilst it is part of normal business for a company to respond by investigating the cause, less frequent, but by no means unusual, is that such investigations discover the supply is not the responsibility of the water company, has cross connections or is constructed with unsuitable materials by today's standards. In August 2019, the Inspectorate was notified by a water company of an event involving the issue of 'Do Not Drink' advice to an agricultural college in Worcestershire. This arose following a report of brown water being supplied for several days. The company's investigation found that the cause of the discoloured water was the result of an untreated private water supply being illegally cross connected to the college's public supply from a private supply which was being used to irrigate crops. Furthermore, the company discovered that there was an onward supply to other houses and additionally that the piping material was older black pipe made of a material called alkathene.

In their investigation of this event the water company recognised that some additional properties downstream of the college were also affected by discoloured water. It was suspected that these were being supplied via a private water supply commonly known as an onward-distribution system, or regulation 8 private water supply, as the consumers affected were not customers of the water company. For (water company), which is then further distributed by a person (in this case, the college) other than a water company or licensed water supplier. The company duly informed the local authority's environmental health department of this supply as the local authority is the

regulator of private water supplies. Although those affected by the discolouration included consumers on a regulation 8 private water supply, the water company nevertheless took a responsible action to protect all concerned by providing temporary ‘Do not Drink’ advice whilst their investigations were being conducted. Their investigations also included sampling from the regulation 8 supply properties as well as at the college. This temporary advice was rescinded later once the cause of the discolouration had been mitigated.

In December 2019, the local authority confirmed to the Inspectorate that they had acknowledged that the supply arrangements to these properties did constitute a regulation 8 private water supply and that they had added it to their private water supplies records, in accordance with regulation 14 of the private water supplies regulations. They had not yet undertaken a risk assessment at this time, but a site visit had been planned for January 2020. The most common risks posed by these types of supplies relate to contraventions of The Water Supply (Water Fittings) Regulations 1999, which are enforced by water companies. These regulations apply to regulation 8 private water supplies because they comprise a physical connection to the public supply network.

Some of the samples taken from the properties on the regulation 8 supply by the water company identified an odour described as “pencil.” This was not present in any of the samples taken at the college. The odour was attributed to the likely presence of alkathene pipework, which was believed to constitute either part or the whole of the private supply network. It has long since been established that alkathene plastic pipes will produce a “pencil” odour within the water. The presence of this abnormal odour indicates that water supplied to consumers is unwholesome, in contravention of regulation 4(1) of the private water supplies regulations. In the case of the regulation 8 supply the local authority was obliged to take action in accordance with regulation 16 of the regulations

Regulation 16 (3) requires local authorities to investigate the cause and promptly inform those people likely to be affected. They must also offer them advice on measures necessary for the protection of health, which in this case the local authority did do, by instructing them to flush the tap before use.

In January2020, the company’s water fittings Inspector met with the local authority and resolved the onward supply by transferring each of the households onto a new dedicated meter supply pipe connected directly to the water company distribution network.

This case study illustrates how a regulation 8 supply, previously unknown to a local authority, will typically come to light, i.e. through water company investigations following reports of an abnormal taste, odour or appearance.

In these instances, any newly identified regulation 8 supply must be added to local authority records.

This case study also shows good working practices between water companies and local authorities. Here, both parties worked in an effective collaborative manner to protect consumers and ensured that they discharged the duties for which they are accountable under the respective public and private water supply regulations.

Case Study 2. Establishing what constitutes a private water supply

This case study also highlights a further example of a water company and local authority cooperation. Private and public water supplies can sometimes be very difficult to differentiate and therefore resolve. Where there are added complexities then it is not unusual for the Inspectorate to provide additional advice. One such case arose in March 2019 when a water company discovered a particular property was not on their billing records following a request by the local authority. The assumption must therefore be

that the property possessed a private supply. Unexpectedly, after the local authority contacted the property owner it was discovered that they were in possession of an historic covenant associated with the property, which allowed them a supply of water free of charge from their nearby water treatment works owned by the water company.

On further investigation the water company discovered that this land had previously been part of a wider private country estate, and that this parcel of land had been sold off by the then owner in 1907 to the water company's pre-privatised predecessor. An apparent condition of the sale was that properties fed from this site would continue to receive a free supply of water as set out in the above-mentioned covenant. The arrangement is therefore a historical concession granted by the water company.

Such a type of supply is far from unusual and is known as a concessionary supply, which is one that is owned by a water company, yet one or more of its assets (including distribution mains) are located on and/or accessed via privately owned land. In these cases, water company staff are permitted access for maintenance and sampling purposes by way of an historical legally binding agreement between the land owner and the water company. This is on condition that no charges for water consumption will be made to the land owner.

To complicate matters further other properties on the estate, including a number that had been built since 1907 were however being fed from a water company distribution main but historically the occupiers had never paid for it. Their reasoning for this was based on rights as they understood it, which they were afforded under the afore-mentioned covenant. This is now a matter

of dispute since many of these houses are being fed from the water company assets located on their land, via public supply distribution mains. The status of these whether, public supply, onward distribution and therefore private supply or concession remain as of February 2020. Furthermore, the legal implications of the covenant at the properties remain unclear.

The company continues to work with the local authority to understand which set of water supply (water quality) regulations apply and where, so that the appropriate set of regulatory requirements (public or private) can be applied and public health standards are maintained. This is essential should any enforcement be necessary where the water is shown or suspected to be unwholesome.

The Inspectorate is regularly contacted by local authorities seeking to understand the classification of supplies in their area, often where arrangements have changed over time. Some arrangements are covered by property law and without specialist knowledge in this field it is difficult to determine the classification of supplies and the rights of relevant persons on the supply. Local authorities should seek legal advice on any agreements or deeds relating to water supplies in order to help determine rights and responsibilities in relation to supplies.

Case Study 3. Multiple uses of a private water supply

Private water supplies can be used for several purposes, but they do not always fall within scope of the regulations. This case study shows just such an example at an historic water supply where the water was being used for a diverse range of uses in different buildings and the difficulties that local authorities sometimes face in interpreting the regulations due to the context in which they apply.

The supply is in an English city popular with tourists, where it forms part of a busy heritage attraction associated with Roman occupation. The water for this supply is derived from three hydraulically linked springs used historically for bathing and medicinal purposes due to its warm temperature (45˚ C), although the old baths are no longer used due to amoebic contamination. Today the springs are intercepted by three boreholes, providing water at three locations in the city for several purposes, which depending on the activity at the respective location, comprise of a public activity, a commercial activity and for domestic purposes. Another use is regulated under mineral and bottled water regulations for historical reasons.

The supplies are also unusual in that the springs, which provide the source water, are owned by the local authority under an ancient Royal Charter. Furthermore, due to its multiple use, its sensitivity as a public amenity and its high profile as an internationally renowned heritage attraction, the number of stakeholders and relevant persons is diverse and numerous. With

these factors in mind, the local authority contacted the Inspectorate requesting a visit to clarify and verify how and where the Private Water Supply regulations apply, given these unique arrangements. Consequently, in November 2019, the Inspectorate met with the authority and visited the sites concerned.

Two boreholes (including the Roman baths borehole) comprise one supply, which is blended. This is treated to reduce iron and manganese, chlorinated and then UV irradiated before being used at four leisure pools as a spa facility for paying patrons to bathe in the water. This is part of a commercial business. The water quality at this site is under constant scrutiny through in-house monitoring, which the local authority and spa undertake as part of the local water quality and supply agreements that have been established with several stakeholders in the interests of public health.

The local authority sought clarification as to whether the regulations were applicable at the spa, and in particular if they were required to carry out a risk assessment here as part of their regulatory duties. Bathing in the context of the regulations refers to sanitary ablutions as part of the definition of Domestic Purposes, as defined in section 218 of The Water Industry Act 1991. In this case the supply to the spa is not within scope of the private water supplies regulations because it has a capacity over 230 litres.

Water that is used exclusively for pool and spa activities is covered under different regulations. If, however the water from the private supply at these types of facilities is also provided for domestic purposes (including sanitary purposes) or it is used in food production where the product is intended for human consumption, e.g. at a café or tea room, then it would be within scope and is subject to the requirements of regulation 9. Drinking water is however made available at the spa facility and is provided from a public supply for this purpose.

The third borehole intercepts a third ancient thermal spring and provides water for bathing purposes to three exclusive en-suite bathrooms and a treatment room, in addition to three spa pools, at a separate city hotel. This supply is treated by a similar treatment setup as for the spa. The water in this instance is classified as being used for ‘domestic purposes’ in the Act since it is used for washing, bathing or showering.

Up until now the local authority had relied on information from a contracted service (weekly in-house monitoring) to undertake routine checks and inspections of the water distribution network throughout the hotel to ensure the supply was safe. Although the local authority deemed the supply to be safe based on this information, they were advised that under Regulation 6 of the regulations they must complete a risk assessment and provide a summary of the findings of such an assessment to the Inspectorate. Those records and checks undertaken by the hotel, whilst essential and relevant, should be used as part of the overall wider assessment by the local authority, not instead of it. The local authority was advised that they have to

undertake a regulatory sampling regime based around the taps located in the four rooms.

A water tasting experience is also provided in two locations at two respective water fountains (see figures 1 and 2) within the confines of the city museum and the Roman baths, the source of which comes directly from the Roman Baths borehole (which is also one of the boreholes above, part supplying the spa). Under normal circumstances this would constitute a private water supply since the water is being consumed as part of a public activity; however, in this instance the water is exempt from monitoring and all other requirements under Regulation 9, on account of it being afforded natural mineral water status, and it is instead regulated under the Natural Mineral Water, Spring Water and Bottled Drinking Water (England) (Amendment) Regulations 2018. This supply is therefore not within scope of the private water supplies regulations.

Figures 6 and 7: water fountains for the provision of public tasting opportunities

The application of, and adherence to, the regulations do not always align perfectly with the supply being assessed. In this instance the water at the point of consumption is unusually warm yet samples must be cooled to around 3° C on being transported and stored in order to comply with sampling procedures.

The multiplicity of stakeholders and relevant persons involved; the physical and historic nature of the waters and its ownership; and the various sets of regulations which apply at different points for different reasons make this complex but interesting and informative. This is all added to the importance of an internationally recognised heritage attraction which gives it a high public profile.

Following this visit, the Inspectorate updated its guidance in its Information Notes on regulations 3 and 9 respectively with regards to water used in spas and pools. It is grateful to the local authority for sharing the complexities of these unique supplies and for bringing the need for additional guidance to its attention.

Case Study 4. Regulation 9 Supply Undertaking Maintenance

This case study involves a Regulation 9 supply in the south of England which feeds a large city department store. The store comprises several restaurants and multiple points where customers and staff can consume the water. The supply consists of three abstraction boreholes and the water is treated by a sand filtration system, reverse osmosis filtration and disinfection using sodium hypochlorite.

The local authority contacted the Inspectorate to seek technical advice as the supply operator was proposing to take the reverse osmosis (RO) off line for a period to undertake maintenance. Once this work had been completed, they intended to replace the disinfection stage with a new chlorine dioxide dosing system. In May 2019, the Inspectorate met and undertook a site visit with the local authority to observe and provide technical and regulatory advice in relation to the supply and its operation. A meeting was held onsite to discuss the proposed planned work with the supply operator and their contractor.

The visit established that the supply had a history of fluoride exceedances in the raw water, thought to be the reason why the RO system was originally installed, and the removal of which would constitute a risk to the supply of wholesome water. The risk and impact of this and any subsequent interruption would be a breach of the regulations, unacceptable to consumers have an impact on the store’s brand.

The local authority was advised to ensure a full risk assessment was carried out to identify risks during the work together with an operational monitoring strategy and a comprehensive contingency plan. The contingency plan should include arrangements for the issuing of any restriction of use advice and suitable arrangements for the provision of an alternative supply in a timely manner as the site is solely reliant on the in-situ water source, without any backup arrangements. Equally, any components of the new treatment system and the new type of disinfection chemicals met the requirements of

Regulation 5 and BS EN 12671:2016, as well as the national conditions of use, prior to their use.

A local authority may place all reliance on the supply operator's contractor to collect and analyse samples to the Regulatory requirements. In this case, although the local authority had a good historic set of water quality data the monitoring it did not consist of all of the parameters as required by the Regulations. Any consideration on the monitoring parameters including any reduction or cessation of monitoring should only be considered if a risk assessment indicates that that there were no factors likely to cause a contaminant to be present in the supply or to cause a deterioration of the quality of the water.

Taking with all matters together, the completion of the maintenance works, installation of the new disinfection system and a limited contingency plan, this would represent a significant change in the supply system. The local authority was advised to carry out a new risk assessment on the completion of the work.

Private water supplies serving large public amenities or establishments like department stores or public events are commonly run and maintained by contracted services that have been employed for many years. Whilst this is reassuring in some respects, unfortunately historic local custom and practice does not always align with regulatory requirements or make for suitable water safety plans. The Inspectorate has found that in these cases it is not unusual for local authorities to place over reliance and unfounded confidence in the actions of such contractors. Local Authorities are therefore reminded that assumptions should not be made in this respect and that as regulators they, not contractors, are responsible for, and are duty bound by the obligations of the Regulations to protect consumers.

Case Study 5. Classification of an historic private supply

This case study relates to a supply of water that is derived from an historic holy well which is a scheduled grade 1 historic monument. The earliest confirmed record of the site dates to 1138, although it is believed to be much older. It is steeped in legend and tells of a spring that arose from the ground at the spot where a virgin martyr's head fell. It is believed that this site has been in continuous use as a place of Christian pilgrimage for thirteen centuries, making it the oldest such site in continuous use in the UK. The site is owned by the county council, but an agreement is in place for its use by diocesan trustees. The Welsh Government's historic environment service (CADW) are responsible for the ancient monument status and assesses any alterations to the site's infrastructure to preserve the status.

The site attracts significant numbers of pilgrims and tourists and traditionally supplied water to pilgrims to consume at a hand pumped drinking water tap,

as well as providing an historic stone pool in which pilgrims can immerse themselves to enjoy the alleged healing properties of the water. The well and pool are known to be supplied by the drainage water from a mine drainage adit. The adit collects water from the area with inputs from the old lead and silver mines before eventually discharging into a local watercourse. The operators of the site reported in February 2019 that turbidity increases substantially in the bathing pool after it rains. The whole site is vulnerable to ingress because of the 'cut and cover' nature of the culvert, the steep catchment it drains into and the location of the tanks feeding the attraction. The elderly nature of the tanks and supply mains adds to the complexity of the site's management and schedule 1 designation.

The first risk assessment of this supply was carried out in December 2018 by the local council. Routes of ingress by vermin and surface water existed due to the piping arrangements, and tanks were open to the elements. In addition to the microbiological risks that these hazards present, the water exhibited a range of other natural characteristics making it unwholesome: Lead (>32 µg/l) iron (>1,840 µg/l), aluminium >1,990 µg/l), turbidity (37.7NTU). To mitigate the microbiological risks by disinfection requires the turbidity associated with the iron and aluminium to be reduced substantively so that any disinfection that is installed is effective.

Given that the water offered to consumers was historically, in part, intended for the purposes of human consumption as part of a public activity, the supply was, at the time the Private Water Supplies (Wales) Regulations were implemented in 2010, subject to the requirements of regulation 9 of the regulations (the regulations have since been revised in 2017).

Inspectors first visited the site with the local authority in February 2019 and established that they had served a Water Industry Act 1991 Section 80 Notice on relevant persons following samples, which confirmed microbiological contamination and lead concentrations above the regulatory standard. The notice outlined measures to be taken to protect the sufficiency and wholesomeness of the supply, including adequate treatment. A temporary sign had also been fixed to the water tap adjacent to the pool requesting visitors not to "drink or ingest the water," as part of the mitigation. This was presumed to be a short-term measure whilst longer term treatment had been completed.

The Inspectorate carried out a follow up site visit in November 2019 to review progress with actions to meet the notice stipulations. It was found that since April 2019 remedial works had been undertaken on both the take-off from the cut and cover culvert stream to the bathing pool to improve water quality. Furthermore, the hand pump had been permanently removed and the signage at the point at which visitors could draw water had been improved and was now a permanent fixture, thus preventing any consumption from the tap going forward. An inline multiple cartridge treatment system has also been installed to treat the water used in the pool for spiritual bathing.

Part of the reason for this visit was to provide clarity around the classification of this supply in view of the completion of these measures. The local authority were advised that the usage of the pool for spiritual/healing purposes did not constitute a domestic purpose in the context of the definition specified in regulation 3 of the Regulations, i.e. it was not used for drinking, cooking, food preparation or other domestic purposes (as defined in The Water Industry Act 1991, which includes sanitary purposes). If the supply is therefore not used for any such purpose it was no longer within scope of the Regulations, although the quality of the water used for the specific type of public activities in the pool would likely require monitoring under different legislation, such as those applied to swimming pools.

This case study illustrates the confusion that can arise over the classification of private water supplies when considering its usage, and when a supply is used for more than one purpose, or where circumstances change following remedial actions. In this case the supply was at the time of the initial risk assessment within scope of the Regulations as it provided water intended for human consumption. The water was however found to be unwholesome and because of this, treatment was installed after enforcement by the local authority to ensure that the regulatory standards were met. It is noted that the local authority in this instance served a Section 80 notice when there was evidence of the supply being a potential danger to human health by virtue of health-based parameter exceedances. Local authorities are reminded that where such risks are identified they are duty bound to serve a Regulation 20 notice in accordance with the regulations.

As part of the remedial measures to mitigate the risks, members of the public were permanently denied the ability to access drinking water from the hand pumped tap but were still permitted to use the pool for spiritual healing purposes. Consequently, although the water was, and still is, in use for the primary purpose of providing spiritual healing, the supply is now not within scope of the regulations as it is no longer provided for human consumption.

Local authorities are reminded to review the classification of a private supply, or indeed whether the regulations still apply, when circumstances change, whether as a result of actions specified in a notice or otherwise. This is important as ultimately these may have implications on changes in monitoring and other costs levied on the relevant person(s).

Figure 8. Well located in the chapel

Figure 9. Hand pump and temporary restriction of use signage

Figure 10. Spiritual well-being pool, February 2019

Chapter 4: Summary of research on private water supplies and collaborative work by the Inspectorate

Chapter 4:

- Summarises the commissioning and outcome of research specific to private water supplies, the updating of guidance and summarises work carried out with local authorities in 2019

During 2019 one research project covering Private Water Supplies was completed (DWI 70/2/322) and a further project is continuing (DWI 70/2/319). These two projects are summarised below and further information on all of the completed research projects can be found on the Inspectorates website.

Research on Private Water Supply Chemical Disinfection Systems (Ref: DWI 70/2/322)

Regulatory sampling of drinking water in England and Wales shows that the microbiological quality of public water supplies is much better than that of private water supplies. The current regulations do not require private water supplies to be disinfected but where disinfection is used it must be verified. This suggests that where disinfection is being applied in private supplies it may not always effective in removing or inactivating potentially harmful microorganisms.

The aim of this project was to investigate how the implementation of chemical disinfection by private water supplies might be improved. The project was carried out by WRc who established the range of different chemical disinfection types used on public and private supplies and evaluated the differences. They also reviewed international standards for chemical disinfection systems to compare validation criteria and identified which criteria would demonstrate suitability for use in private supplies. Finally, WRc produced simple guidance for householders and local authorities to help in the selection and assessment of chemical disinfection systems used in private supplies

Commercial sodium hypochlorite is the most commonly used chemical disinfectant for potable water supplies. OSE-generated sodium hypochlorite and chlorine dioxide are also used. Chlorine dioxide is commonly used for supplies provided for food and drink processing.

Private supplies are unlikely to incorporate a purpose-designed contact tank to provide the contact time for disinfection. Contact time is likely to be provided by storage tanks or reservoirs.

Chemical disinfection of private supplies is likely to be operated based on maintaining a target residual concentration entering the distribution system.

Community supplies (those serving only, or predominantly, domestic properties):

- are likely to be reliant upon manual sampling to monitor residual disinfectant concentration;
- are unlikely to routinely monitor any other water quality parameter;
- are unlikely to include any remote monitoring or detection of failures (such as devices that might provide automated warning of power outages);
- often have a long history and incorporate legacy infrastructure, notably service reservoirs, the condition of which can be difficult to assess.

Commercial supplies (those operated by commercial entities to serve their commercial activities):

- are likely to include continuous monitoring of residual disinfectant concentration;
- are likely to monitor residual concentration, and other operational parameters, remotely;
- are likely to sample for water quality parameters other than residual disinfectant concentration, including for microbiological analyses.

Some users of commercial sodium hypochlorite are storing high-strength (14%) solutions for up to 6 months. Over time the release of chlorate from hypochlorite decay has implications under the current regulatory requirement to minimise formation of disinfection by-products but will potentially be a more significant issue if a more stringent standard is introduced.

Where chlorine dioxide is used, there is often no monitoring of chlorite or chlorate, either by the local authority or the operator of the supply.

Risk assessments by local authorities (LAs) are a valuable mechanism for identifying vulnerabilities in private supplies. Constructive relationships between LA staff and supply owners were evident at all the supplies visited.

Several key suggestions are made that would improve the reliability and performance of chemical disinfection for private supplies. These suggestions and other findings of the report have brought the attention of local authorities and private water supply users through a workshop and the publication of two leaflets on the DWI website: http://dwi.defra.gov.uk/private-water-supply/regs-guidance/guidance.html

Risk Maps for parameters in the Drinking Water Directive (Ref: DWI 70/2/319)

The aim of this project is to produce risk maps for England and Wales for most of the chemical parameters in the Drinking Water Directive. These will facilitate potential future reductions in monitoring and associated cost savings for private supply owners. This project will integrate currently available data sets on raw water quality (for example British Geological Survey (BGS), Environment Agency, local authority, water company data) for water bodies and hydrogeological data such as bedrock type and aquifer boundaries to create a risk map for each parameter in the Directive. Maps will be produced for both surface and groundwater sources for each of the chemical parameters for which this method has been deemed suitable.

These maps can then be used by the Inspectorate and local authorities to support decisions on whether reduced monitoring for parameters arising in the catchment is justified. The maps are not a substitute for submission of the data specified in the regulations or provision of an adequate risk assessment. The project will also report on the limitations and any potential risks which could arise from use of the maps. The project was originally due for completion in autumn 2019 however has seen some minor delays and will now be completed in early 2020.

Development of a web-based risk assessment tool

The Drinking Water Inspectorate has a statutory role to act as technical advisors to local authorities in relation to the implementation of the Private Water Supplies Regulations. The 2009 Regulations replaced the 1991 Regulations and introduced the requirement for certain supplies to be risk assessed every 5 years. To assist the local authorities in discharging their regulatory duties the Inspectorate, in 2012, made freely available an Excel based risk assessment tool. The tool has seen several revisions and there are now 4 versions of the tool available for download from the Inspectorates website:
http://dwi.defra.gov.uk/private-water-supply/local-auth/risk-assessment.html

The Excel based tool is used widely by local authorities however due to functional constraints using spreadsheets and feedback given by users of the tool the Inspectorate is currently developing a more modern, user friendly web-based tool. Moving to an online risk assessment tool will also provide other benefits including the ability for local authorities to view, edit and manage the information currently provided in the annual data return.

The tool will provide:

- A more modern user interface and experience;

- Ability to upload/append documentation, photos or other files to supply risk assessments;
- A mapping tool to show the private supply location and location of main assets;
- Ability for local authorities to view water quality data for supplies which they have uploaded sampling data for;
- Ability to view progress with completion of risk assessments to the applicable private supplies in a local authority's area;

The tool will also remove the current requirement for LAs to submit risk assessment summary information to the Inspectorate for high and very high risks.

Welsh Government have funded a pilot trial of the tool. Feedback will be sought from local authorities during attendance at regional and other meetings surrounding the development and roll out of the tool.

Sampler certification scheme

The Inspectorate has reported on the development of the ISO17024 scheme in previous annual reports.

To summarise, the Private Water Supplies (England) (Amendment) Regulations 2018 and the Private Water Supplies (Wales) Regulations 2017 were updated to reflect changes in EC Directive 98/83/EC. These updates require local authorities to demonstrate that the sampling, transportation, and storage of private water supplies complies with the ISO/IEC 17024 standard or alternatively the parent standard, ISO/IEC 17025.

Prior to the transposition into the regulations of these requirements, the Inspectorate investigated options for achieving compliance with the Directive. The practicalities, accreditation options and costs to local authorities, who generally have small numbers of samplers, were all considered. The Inspectorate concluded that a scheme accredited to ISO/IEC 17024 would allow local authorities, as regulators, to achieve compliance with the directive without excessive cost. Fundamental to this scheme is a sampling procedures manual, comprising methodology prescribed in accordance with The Standard Committee of Analysts guidance. This is both considered Water Industry good practice and meets the regulatory required BSEN standards.

Both the sampling procedures manual and a manual describing the scheme are available at:
http://www.dwi.gov.uk/private-water-supply/local-auth/index.html

CATG are the nominated body responsible for training and awarding ISO/IEC 17024 certification of successful applicants. Due to national restrictions following the CoViD-19 outbreak, accreditation of the ISO17024 scheme (by UKAS) to enable roll out has been delayed. Unlike ISO17024, the scheme for ISO17025 is accredited but CoViD-19 restrictions are impacting its delivery. DWI will update local authorities as soon as there is any change to the situation.

DWI will be monitoring progress with training and accreditation, and report on the position at the end of 2021. Local authorities are reminded that they have a duty to comply with the certification requirement.

For further information concerning costs, training and assessment, for the ISO/IEC 17024 scheme, please contact CATG on 01524 400632 or via their website at:
https://www.catg.co.uk/contact

Local Authority visits 2019

As part of the Inspectorate's role as technical advisors to local authorities, inspectors each year undertake a series of visits to meet with officers responsible for private water supplies in their areas. The drivers for these visits are variable and may be at the request of local authorities for the provision of advice or assistance or in some cases are carried out where information provided in a local authority annual data returns suggests deficiencies, or misunderstandings in the way in which a local authority is discharging its duties under the regulations. Additionally, Inspectors may target local authorities where it believes consumers of private water supplies may be most at risk, or where a local authority appears to be falling short in sampling or risk assessments. Whilst these visits provide a forum for the Inspectorate to understand and report the causes of non-compliance, they also drive improved local authority performance, facilitate additional DWI guidance and enhancements to its risk assessment tool. Additionally, these visits provide a platform for collaborative working.

In 2019 the Inspectorate carried out 12 visits to local authorities (nine in England and three in Wales). The Inspectorate bases some local authority visits on a risk-based theme and in 2019 the theme was high risk Regulation 9 supplies (hospitals) as well as general visits to assess implementation of the regulations and/or provide technical assistance and support. The reasons for the visits completed in 2019 are shown in Table 8 and the outcome of the learning from the Regulation 9 Hospital visits detailed below the table:

Table 8. Details of local authority visits held in 2019

Local Authority	Reason
Monmouthshire County Council North East Lincolnshire Council Reading Borough Council Sutton Council* Teignbridge District Council Wirral County Council	Assess progress with implementation of the regulations and undertake a visit to a Regulation 9 hospital private water supply as part of the Inspectorate's risk-based visit theme
Bath & North East Somerset District Council Epping Forest DC Flintshire County Council Northumberland County Council Royal Borough of Kensington and Chelsea Council Wrexham County Borough Council	Assess progress with implementation of the regulations and/or provide technical assistance

* Visit took place in early 2020

Regulation 9 Private supplies to hospitals

Site inspections of a sample of hospitals fed by private water supplies were undertaken this year as a risk-based theme by DWI. Some hospital patients are potentially more at risk from any water borne infection. As such ensuring the wholesomeness and sanitary condition of their water supplies is self-evidently important.

The annual returns from local authorities in England and Wales were examined, and a sample of hospitals were selected. Our intention was to understand if there were any common risk themes and to find examples of best practice to share. Hospitals in the North West, East Midlands, South West and South East of England were visited along with a hospital in South East Wales.

Hospitals fall under Regulation 9 of the regulations as water is supplied to members of the public and they also generally supply more than 10m^3/d

The overall findings are set below:

Risk assessment themes

All but one of the hospitals visited had undertaken risk assessments of the supplies in line with Regulation 6. These were produced by local authorities and shared with DWI for advice on technical or regulatory matters before and during the site visit. Inspectors noted that the local authorities had made use of the risk assessment tool on the DWI website: http://www.dwi.gov.uk/private-water-supply/local-auth/risk-assessment.html

All hospitals are required to follow Health and Safety Executive (HSE) guidelines as set out in "*Legionnaires' disease. The control of legionella bacteria in water systems. Approved Code of Practice and guidance L8*". These guidelines give a clear focus to understanding how the water supply on site can be best managed to reduce the potential risk from this disease. The benefit of this approach is that in order to comply with HSE's code of practice, the site staff generally have a good understanding of the water systems lay out. In general, we saw evidence of very good site schematics in hospital plant rooms and understanding of the pipe runs at site. However, one hospital had no site schematic and showed a lack of familiarity with all the borehole locations.

The Legionella Code of Practice does not consider wholesomeness of potable water directly as defined in the regulations, or in terms of its use for human consumption in the regulations. So, this must be a clear priority in the water management strategy of risk.

Legionella risk assessments consider the risk of contracting the disease from within buildings so, on their own, are not a substitute for a comprehensive source to tap assessment as required under the regulations. At one site there was over reliance on the legionella risk assessment and acceptance from the local authority that the risk to water quality had not been appropriately assessed. The legionella risk assessment did not consider risks to the water abstraction point or raw water storage points. This demonstrated the need that a site-specific risk assessment of the supply in accordance with Regulation 16 must always be carried out by the local authority.

Working relationships

Inspectors were generally encouraged by the good working relationships between the local authorities responsible for enforcing the Regulations and the hospital staff and its water service contractors charged with making improvements and maintaining the water quality systems. This is a key relationship to ensure that confidence in the management of the supply is maintained and is important to nurture for times when any water quality problems occur.

However, it was noted on several sites that the monitoring points would not have provided a sample representative of the general supply. Local authorities should satisfy themselves that the monitoring in place on site is both representative of the supplies to consumers and is after any water treatment. Should local authorities rely on appointed contractors to conduct the regulatory sampling they should satisfy themselves that the persons responsible for collecting the samples are competent and accredited to either ISO/IEC 17024 or ISO/IEC 17025.

Local Authorities should ensure that the treatment facilities in place to make the supply wholesome are fit for purpose, well maintained in accordance with manufacturer's instruction and that records for maintenance are inspected.

Boreholes

All the sites used borehole water for all or part of the supply to the hospital.

Catchment protection is the first line of defence against contamination of the supplies and the multi-barrier approach should be given due consideration in the risk assessment process. This is particularly important for any spring source contributing to the supply.

Local authorities should take steps to ensure that headworks of boreholes are suitably protected from ingress. There were some sub-standard examples at some locations. Typically raising the headworks chamber above ground and the level of any potential flooding is best practice, particularly when these may be in areas where this could be a risk from accidental spills e.g., car parks or loading bays.

Figure 11: Borehole chamber in car park (showing location of borehole headworks chamber)

At one of the hospitals visited neither the local authority, staff, or its contactors appeared to understand the location of the borehole, which was determined to be in a road where ambulances regularly pull up. This was downhill of a parking area, giving rise to a risk of potentially contaminated (hydrocarbons) surface water ingress into the source. It is also essential that the supply configuration is fully understood by all relevant site personnel and that this can be demonstrated to the local authority as part of the risk assessment. Schematics must be kept up to date in procedures and where they are displayed on site.

Figure11: Example of raised chamber to protect well head from ingress

Raw water storage

Where raw water is collected and stored in tanks prior to treatment, points of ingress such as chamber covers should be secure. Vents should be fitted with insect proof mesh and check for vermin damage, any valve spindles sealed and access doors to chambers, in kiosks or in plant rooms containing control equipment, should also be sealed and secured to prevent risk from vermin e.g. rodents or birds. Areas should be restricted to authorised access only and where plant rooms had been used as a "dumping ground" for abandoned equipment were observed. As a matter of good housekeeping these should be kept clean and. Disposal and storage of redundant equipment and chemicals should also be strictly controlled by a designated responsible manager. Evidence of this should form part of the local authority's risk assessment.

Water treatment equipment

All hospitals we visited sub-contracted the management of water treatment to specialist contractors. At some sites it was noted that the local authority sometimes lacked the confidence to challenge the specialist contractors employed, and placed too much reliance on their assumed expertise, without a view to the regulatory requirements. Local Authorities should ensure that the treatment processes present can mitigate the relevant challenges identified in the risk assessment and challenge as necessary. As part of this they should always inspect maintenance and inspection records to ensure that the process equipment is appropriate and well maintained, including any in-house monitoring data. Such information should be readily accessible for inspection on site.

Treated water must be securely stored and protected from extremes of weather, wildlife and vermin, in order to prevent contamination and deterioration of stored water quality. Local authorities should be familiar with Water UK's 'Principles of Water Supply Hygiene', Technical guidance notes 7 on catchment management, 8 on water treatment and 9 on the storage of treated water, for further information see:
https://www.water.org.uk/guidance/principles-of-water-supply-hygiene/

In addition, there are the DWI's risk assessment tools available on the inspectorate's website at:
http://www.dwi.gov.uk

It is relatively common for chlorine dioxide to be used for disinfection on hospital sites. Local authorities should be aware of the need for careful control of the treatment process as this process can generate by-products chlorate and chlorite) that are detrimental to health.

Figure12: Insulated and protected treated water storage tanks

Resilience

The hospitals visited had, in most cases, arrangements in place with either the local water undertaker or contractors to provide a backup supply in the event of loss of the private supply due to routine maintenance or catastrophic failure.

The possibility of a simultaneous failure of the raw water and mains supply should be considered e.g., a tanker supply being used to support the storage tanks. Any potential cross connection between the public and private supplies should be explored and documented. Local authorities are advised to work with water companies in this respect, notably by way of water fittings inspections, for which the water companies are empowered to enforce. There should be written procedures to govern these contingencies and appropriate back flow protection between public and private supplies as necessary. Any backup generators for loss of power to borehole pumps or treatment process units should be tested regularly and under load conditions at least annually.

Local authorities should check for the existence of an emergency plan from the source owner to cover such contingencies. To improve resilience at site alternative arrangements for maintaining the supply should be considered in such a plan, for example, injection points for tankers to supply water direct into the pipe network and temporary overland mains to the public supply.

In summary

The Local Authority should satisfy itself that the management of private water supplies where they are used for human consumption at hospitals fully align with the requirements of the regulations and that any identified risks are appropriately and adequately mitigated. Protection of the supply must be considered from source to tap and consequently the monitoring and maintenance of the supply should include the source and any raw water storage tanks.

The local authority should also ensure that the hospital water quality monitoring schedule is fully aligned with the requirements of the regulations in terms of both parameters monitored for and frequencies of sample collection, as well as ensuring regulatory sampling locations are suitably representative of the water being consumed. Should local authorities rely on appointed contractors to conduct the regulatory sampling they should satisfy themselves that the persons responsible for collecting the samples are competent and accredited either to ISO/IEC 17024 or ISO/IEC 17025.

Regional private water supplies meetings in 2019

Since the implementation of private water supplies regulations in 2010, some local authorities have set up regular private water supply meetings between collections of regionally based local authorities England.

The Inspectorate is frequently asked by the respective chairpersons of these regional groups to attend and or present at these meetings for the purposes of guidance or the provision of updates in matters ongoing. In 2019 inspectors attended two such meetings in England:

The West Yorkshire Private Water Supplies group, which met at Wakefield in June the North Yorkshire Group, which met in Northallerton in July.

The main purpose for the Inspectorate's attendance was to provide an update on developments with on the implementation of an ISO/IEC 17024 standard for samplers of private water supplies. In addition, inspectors used this meeting to seek feedback from local authorities on their views concerning the development of a new central web-based private water supplies risk assessment and data repository tool. Work to create such a tool has since received funding and is currently under development by the Inspectorate.

As always, both regional meetings in England provided an opportunity for local authorities to seek clarification, guidance or advice on any technical matter relating to private water supplies. This year the most frequently asked questions concerned guidance on monitoring variations, following changes in the 2018 amended regulations.

Water company Health Liaison meetings

The Inspectorate regularly attends meetings held by water companies that are commonly known as health liaison meetings. These are attended by a wide range of stakeholders primarily from the health professional community. Inspectors from the private water supplies team attended and presented updates and or case studies at the following water companies health liaison meetings in 2019

Severn Trent Water, February

United Utilities, June

Yorkshire, July

Craven Open Day 2019

On the 10 October 2019 Craven District Council held an open day at their offices in Skipton, North Yorkshire, to offer advice and information to users of private supplies in their local authority area. Craven District Council have many private supplies as due to the local geography and topology there is a relatively higher percentage of the population who are not served by mains water. Prior to 2019, the last time the local authority held a private supply open day was in 2014.

The open day gave an opportunity for private supply users and operators to meet representatives from borehole drilling and treatment contractors, health professionals, the local authority and the Drinking Water Inspectorate. The event was very well attended with information provided to users and operators of private supplies as to the importance of being served by a private supply and how the regulations set out to secure a safe and wholesome supply. The exhibiting water and treatment contractors provided a wealth of information on the different types of engineering and treatment technologies available, the services they provide and how these can be best used to help improve private water supply quality.

As well as manning an information stall during the event, the Inspectorate gave two presentations during the course of the day giving an overview of how private water supplies are regulated in England and Wales (including the role of the local authority and the Inspectorate), the changes brought about by the 2018 amendment regulations including the sampling arrangements for the large and commercial (Regulation 9) supplies. Following each of the presentations members of the public who are users and operators of private supplies were able to ask questions to the Inspectors who attended the event.

The local authority provided some excellent 'before and after' photos of improvements which had been made to private supplies following the identification of risks and specification of remedial actions arising from the risk assessment process. The photos demonstrated the importance of taking the multi barrier approach to improve supplies, the majority of which tended to be relatively minor interventions such as source protection improvements, to help ensure a safe and wholesome supply.

Feedback from the members of the public who attended the event was very positive and the Inspectorate welcomes this initiative to raise awareness of private supplies and the actions operators and users can take to ensure a safe and wholesome provision of drinking water. The Inspectorate will endeavour to support any future similar events.

Figure 14: Craven Open Day

Chapter 5: Drinking water testing results

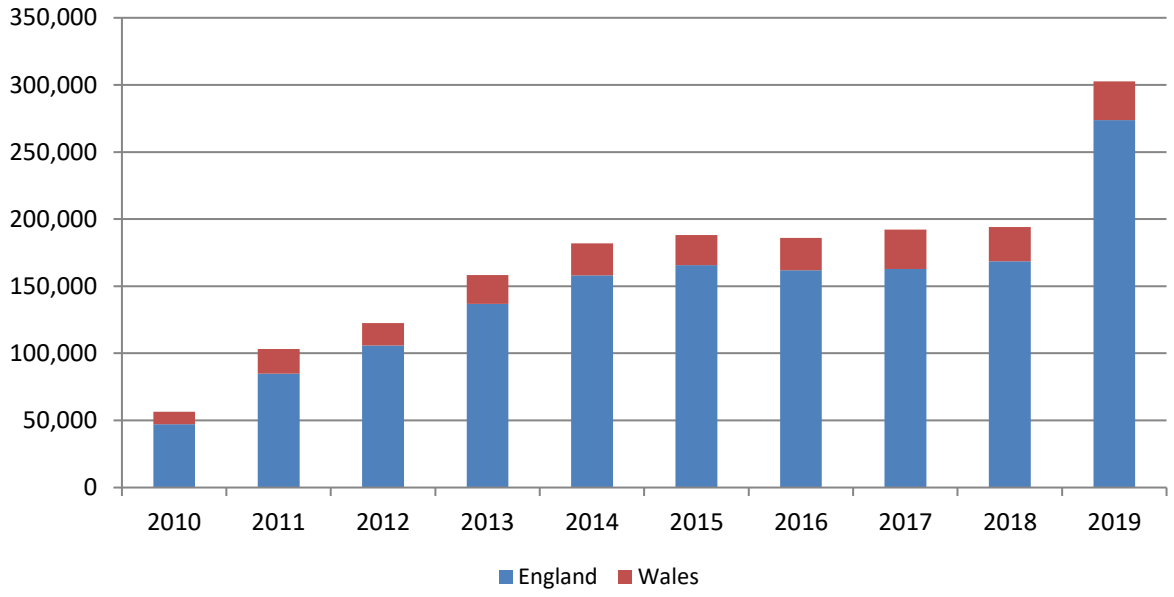
Chapter 5:

- Describes the progress of local authorities in providing test results.
- Summarises the results of private supply testing.

5.1 Local authority progress in reporting test results

This chapter summarises the information provided by local authorities to the Inspectorate about the results of the testing of private water supplies. In total, for the calendar year of 2019, there were 302,606 test results submitted to the Inspectorate by local authorities, an increase in the number from 2018 which was 194,153. The number of tests for England and Wales both increased significantly which is likely due the changes for Group A and B monitoring for certain supplies which the 2018 amendment to the Regulations brought in.

Figure 15: Numbers of test results sent to the Inspectorate 2010–2019



5.2 Results of 2019 monitoring

In preparing Tables 9 to 10, it should be noted that when pooling data from local authorities, the Inspectorate checked for, and corrected any simple errors (incorrect units, obvious input errors such as decimal point in the wrong place) to enable these results to be included in the report. Where the Inspectorate corrected data, the local authority was contacted, and the problem and changes explained and agreed. Some of the typical issues identified with annual returns can include:

- Analytical sample results entered in the wrong units.
- There was inappropriate use of < (less than) symbols, for example, nickel reported as <20µg/l when the standard is 20µg/l. This is either a shortcut being used by local authorities to speed data entry (saying in effect the sample did not fail, or that the method is not sufficiently sensitive and that the limit of detection is at the same value as the standard.
- There was inappropriate use of > (greater than symbols) on chemical parameters.
- Some analyses for taste and odour do not comply with the required method.
- Obvious typing errors.
- Poor correlation between samples flagged as failing with those actually failing the standard.
- Confusion of nitrate and nitrite results with figures for nitrate (NO_3) being entered instead of figures for nitrite (NO_2).

The drinking water standards in the private water supply Regulations are the same as those that apply to public water supplies and most derive from the EU Drinking Water Directive. An explanation of the standards can be found in *Annex 5*.

In considering this year's data a source to tap approach has been considered and the parameters have been divided into three groups:

- Those which arise in the source water, are present pre-abstraction and are due to the quality of untreated raw water in the catchment,
- Those which arise due to conditions post-abstraction, either within treatment or distribution,
- Those which may arise at any point in the supply chain.

Table 9: Parameters generally arising due to quality of water in the catchment

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting the standard or specification	Percentage of tests not meeting the standard
EU Parameters				
Nitrate	50µg/l	7,229	545	7.5%
Fluoride	1.5mg/l	3,867	103	2.7%
Arsenic	10µg/l	4,412	58	1.3%
Pesticides (Individual)*	0.1ug/l	46,765	43	0.1%
Trichloroethene and Tetrachloroethene	10µg/l	1,210	1	0.1%
Boron	1mg/l	4,235	52	1.2%
Selenium	10µg/l	4,117	2	0.1%
Benzo(a)pyrene	0.01µg/l	1,951	9	0.50%
Pesticides (Total by Calculation)	0.5µg/l	1,358	3	0.2%
Benzene	1µg/l	2,290	2	0.1%
Cyanide	50µg/l	3,060	4	0.1%
Polycyclic Aromatic Hydrocarbons (Total by Calculation)	0.1µg/l	899	2	0.2%
1,2-Dichloroethane	3µg/l	2,166	0	0%
National Parameters				
Manganese	50µg/l	6,688	389	5.80%
Sodium	200mg/l	3,977	83	2.1%
Tetrachloromethane	3µg/l	2,037	0	0%
Aluminium	200µg/l	5,572	100	1.8%
Colour	20mg/l Pt/Co	6,644	96	1.4%
Indicator parameters				
Hydrogen ion (pH)	6.5 – 9.5	10,295	619	6.0%
Sulphate	250mg/l	2,011	28	1.4%
Chloride	250mg/l	2,057	33	1.6%
Ammonium	0.5mg/l	5,990	147	2.5%
Conductivity	2500µS/cm	10,117	7	0.1%
Total Organic Carbon	No abnormal change	1,066	0	0%
Radioactivity – Gross Alpha	0.1Bq/l	934	30	3.2%
Radioactivity – Gross Beta	1.0Bq/l	934	4	0.4%
Tritium	50µg/l	167	0	0.0%
Indicative Dose	0.10mSv/year	81	0	0.0%
Radon	100Bq/l	64	1	1.6%

Nitrate is detected in drinking water usually because of agricultural activity and continues to pose a challenge for those supplies in rural areas where access to an alternative supply or treatment is difficult. With 545 failing samples in 2019 (7.5% from 7,229 total samples taken), nitrate continues to be the biggest risk to water quality in the catchment. The presence of nitrate

in drinking water can pose a risk to bottle-fed infants and consideration should be given to this when assessing risk and considering Notices.

Equally, natural fluoride also plays an important factor when assessing catchments, 2.7% (103 failures from a total of 3,867 samples). Fluoride is a common element distributed within the earth's crust and the detection of this element above the standard may result in skeletal or dental fluorosis. Local Authorities should consider mitigation strategies to reduce risk to the consumer which may include active removal, dilution or an alternative supply.

Arsenic continues to be detected in private supplies where 1.3% of 4,412 samples failed (58 failures). Arsenic is often introduced into water through dissolution of rocks, minerals and ores, from industrial effluents, including mining wastes and via atmospheric deposition and is known to be toxic and a carcinogen to humans. There are a number of treatments which can reduce arsenic which may, like fluoride include active removal, dilution or an alternative supply where practicable. Nevertheless, identification of this element requires appropriate action.

Trichloroethene has been detected in a private supply where a single sample out 1,210 samples failed (0.1%). Trichloroethene is a solvent that is particularly used as a degreasant for metals, and also has a number of other current and historical uses such as a solvent in dry cleaning. A synthetic chemical widely distributed in the environment, it may be introduced into surface and groundwater in industrial effluents and as a consequence of poor handling and spills. Concentrations in surface water are usually low, due to the high volatility of trichloroethene, but it may occur at higher concentrations in groundwater in the event of nearby contamination and leaching or due to the biodegradation of tetrachloroethene. The odour of trichloroethene is described as 'solventy', 'etheral' and 'chloroform-like' and can be removed by aeration or the use of carbon. However, failure to remove this solvent will pose not just a hazard for consumption but also bathing and food preparation and should be considered a potential harm to health.

Looking at the National parameters: manganese is one of the most abundant metals in the Earth's crust, usually occurring with iron and is often found in water supplies. It is an element essential to the proper functioning of both humans and animals, as it is required for the functioning of many cellular enzymes. At concentrations exceeding 0.1 mg/l, manganese imparts an undesirable taste to beverages and stains plumbing fixtures and laundry. At concentrations as low as 0.02 mg/l, manganese can form coatings on water pipes that may later slough off as a black precipitate. In 2019, 389, out of a total of 6,688 samples (5.8%) failed for manganese.

Sodium showed a 2.1% failure rate (from 3,977 samples), this element is often found where water softeners are used prior to the drinking water tap. A simple bypass of the softener for drinking water is recommended. More rarely sodium may be due to influence from saline intrusion into water

courses or aquifers. The geology of an area and usage patterns determine the likelihood of saline intrusion. Sodium salts are generally highly soluble in water and are leached from the terrestrial environment to groundwater and surface water. They have a variable influence on taste and odours of drinking waters.

Generally, private water supplies exhibit a degree of variation in hydrogen ion (pH) levels which indicate the acidity or alkalinity of water. Differences are due to the range of geological conditions, rocks or peat moors and their effects on water being abstracted. Samples fail to meet the guide value when they are below pH 6.5 (acidic) or above 9.5 (alkaline). Consideration of hydrogen ion concentration is important due to treatment options and the influence of pH on dissolution of metals

With the second year of returns being made for radioactivity 3.2% were found to have exceeded the screening value for gross alpha, (30 out of 934 samples). Analysis for alpha radiation is a simple, cost effective and practical approach to screening supplies to determine if further specific analysis is required. Whilst the screening level is highly conservative, where exceeded, concentrations of individual radionuclides should be determined. Results contribute to the indicative dose and the standard for this is less than a third of an equivalent dose received by a person from the average annual exposure to the sun. There were no failures on further testing.

Table 10: Parameters generally arising from treatment or in distribution

	Current standard or specified concentration	Total number of tests	Number of tests not meeting the standard or specification	Percentage of tests not meeting the standard
EU and national parameters*				
Nitrite – Treatment Works	0.1mg/l	886	18	2.0%
Lead	10µg/l	5,613	205	3.7%
Nickel	20µg/l	4,416	123	2.8%
Copper	2mg/l	4,384	111	2.5%
Antimony	5µg/l	4,019	12	0.3%
Nitrite – Consumer's Taps	0.5µg/l	6,176	66	1.1%
Bromate	10µg/l	2,520	0	0%
Cadmium	5µg/l	4,194	2	0.1%
Trihalomethanes (Total by Calculation)	100µg/l	2,099	1	0.0%
Chromium	50µg/l	4,010	2	0.1%
Mercury	1µg/l	3,874	0	0%
*No indicator parameters were assigned to the post abstraction table				

The biggest influence on the failure rate in post-treatment samples is from lead, with 205 samples from a total of 5,613 (3.7%) failing for lead. There were also 111 failures of copper (2.5%), attributable to leaching from copper pipework and 123 nickel failures from 4,416 samples (2.8%) associated with nickel presence in chrome taps. It is important to consider the whole system when risk assessing a site. Simple replacement of part of a system does not necessarily exclude it from further investigation of failures.

Table 11: Parameters that can arise throughout the catchment and in distribution

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting the standard or specification	Percentage of tests not meeting the standard
EU and national parameters				
*Pseudomonas aeruginosa**	0/250ml	266	2	0.8%
Enterococci	0/100ml	7,201	473	6.6%
Escherichia coli (*E.coli*)	0/100ml	12,890	701	5.4%
Iron	200µg/l	6,722	333	5.0%
Odour	No abnormal change	8,422	1,293	15.4%
Taste	No abnormal change	6,947	872	12.6%
Turbidity	4 NTU	10,171	142	1.4%
Indicator parameters				
Coliform bacteria	0/100ml	11,786	1,427	12.1%
Turbidity	1 NTU	705	22	3.1%
Clostridium perfringens	0/100ml	5,495	289	5.3%
**Pseudomonas aeruginosa* only sampled in the case of water in bottles or containers				

Taste and odour represent the large proportion of failures. This could be down to variations of water quality from source, presences of algae or due to microbial growth in parts of the distribution. During 2019, 12.6% of samples failed for taste and 15.4% failed for odour. It is important to capture the taste or odour descriptor as this often points to the source of the problem for example the descriptions ‘earthy’ or ‘musty’ may indicate algal problems, or ‘woody/pencil shavings’ indicate black alkathene pipework. The detection of *Pseudomonas aeruginosa* often points to a regrowth in the network that could be contributing to taste or odour issues.

Microbiological parameters remain of huge concern in England. Two of the 266 taken samples taken for *Pseudomonas aeruginosa (0.8%),* failed for *Pseudomonas aeruginosa*, an organism often associated with colonising tap outlets or unsuitable materials in the system such as decomposing rubber washers. The presence of *E.coli*, enterococci and *Clostridium perfringens* indicates the water has been contaminated by faecal material and risk assessments should look to mitigate any contamination arising from animal or human faeces. The presence of coliforms suggests environmental contamination not containing faeces.

The largest proportion of failures are for coliforms and *E.coli*, which represent a treatment challenge if present in the source water. If present in catchment water, then suitable treatment to remove these organisms, does need to be installed and where there is an identifiable source, remediated. During 2019, 5.4% of 12,890 samples failed for *E.coli* while 12.1% of 11,786 samples failed for coliforms.

Given the failure rate is still unacceptably high for Private Water Supplies across England, it is important that careful consideration is given to specifics at each site during risk assessment. With the new Regulations that came into force in June 2018, this will allow local authorities to sample based on perceived risks and it is therefore critical to carefully consider the whole picture and capture pertinent risks that may need monitoring.

Chapter 6: Legislative updates

Chapter 6:

- Highlights work on the revision of the regulations and accompanying guidance.

Whilst there have been no updates to the regulations in 2019 the Inspectorate issues updated guidance for local authorities when investigating nitrate exceedances following updated guidance from Public Health England and Public Health Wales:

Change in Advice and Guidance on Nitrate Concentrations 2019

In 2019 Public Health England and Public Health Wales reviewed and changed their guidance in relation to nitrate in drinking water considering new health-based information:

"In light of more recent concerns over potential effects on the thyroid expressed by the WHO and Health Canada and because total intake from water and diet could exceed the [Acceptable Daily Intake] ADI for adults above a water concentration of 50 mg/l we do not recommend that anyone should regularly consume water above 50 mg/l."

The revised concentration of 50mg/l for action in all cases is effective immediately. However, we recognise that local authorities are not going to be able to respond to the necessary changes immediately, for all supplies in their area that breach the standard for nitrate. For this reason, we suggest local authorities adopt a risk-based approach and pay due regard to the new limit by prioritising Regulation 9 (England and Wales) supplies, including those where the water is consumed at rented premises, which constitute part of a commercial activity, and Regulation 11 (Wales only) supplies.

The Drinking Water Inspectorate has updated its guidance on nitrate following these changes.

http://www.dwi.gov.uk/stakeholders/guidance-and-codes-of-practice/pws-nitrates.pdf

Annex 1: Number of supplies, risk assessments and evidence of monitoring and enforcement

Local Authority	Single domestic dwellings	Further distribution of mains water by someone other than a licensed water supplier (Reg 8)	Large supplies and any used in a public building or a commercial activity (Reg 9)	Small Shared Supplies (Reg 10 England)	Small shared supplies and domestic tennancies (Reg 11 Wales)	Domestic purposes - other	% risk assessments completed for Reg 9 supplies	% risk assessments completed for Reg 10 supplies	% risk assessments completed for Reg 11 supplies	Evidence of monitoring of Reg 9 supplies provided?	Evidence of monitoring of Reg 8 supplies provided?	Evidence of monitoring of Reg 10 supplies (England only) provided?	Evidence of monitoring of Reg 11 supplies (Wales only) provided?	Evidence of serving Reg 18, Reg 20 or S.80 notice?
Adur District Council	0	0	1	2	-	0	0%	50%	-	Y	-	Y	-	N
Allerdale Borough Council	146	0	109	15	-	13	93%	80%	-	Y	-	N	-	Y
Amber Valley Borough Council	38	1	4	11	-	0	25%	18%	-	Y	N	Y	-	N
Arun District Council	7	6	5	4	-	0	40%	25%	-	N	N	N	-	N
Ashfield District Council	1	0	0	1	-	0	-	100%	-	-	-	N	-	Y
Ashford Borough Council	6	0	0	1	-	0	-	100%	-	-	-	N	-	N
Aylesbury Vale District Council	24	0	6	6	-	0	100%	100%	-	Y	-	N	-	N
Babergh District Council	81	1	19	21	-	0	89%	76%	-	Y	N	Y	-	N
Barking and Dagenham Borough Council	0	0	0	0	-	0	-	0%	-	-	-	-	-	N
Barnet Borough Council	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Barnsley Borough Council	33	0	6	3	-	0	100%	100%	-	Y	-	N	-	N
Barrow-in-Furness Borough Council	2	0	1	0	-	0	100%	0%	-	Y	-	-	-	Y
Basildon District Council	0		0	0	-	0	-	-	-	-	-	-	-	-
Basingstoke & Deane Borough Council	47	2	14	45	-	0	0%	2%	-	Y	Y	Y	-	Y
Bassetlaw Borough Council	10	0	11	2	-	0	82%	100%	-	Y	-	Y	-	N
Bath & North East Somerset District Council	46	1	17	10	-	0	100%	100%	-	Y	N	Y	-	Y
Bedford Borough Council	10	0	3	2	-	0	100%	100%	-	Y	-	N	-	N
Bexley Borough Council														
Birmingham City Council	0	0	2	0	-	0	0%	0%	-	Y	-	-	-	N

Blaby District Council	7	0	1	0	-	0	100%	0%	-	N	-	-	-	N
Blackburn with Darwen Borough Council	64	0	4	21	-	0	100%	71%	-	Y	-	Y	-	Y
Blackpool Borough Council														
Blaenau Gwent County Borough Council	27	0	3	-	0	0	100%	-	-	Y	-	-	-	N
Bolsover District Council														
Bolton Metropolitan Borough Council	12	0	2	17	-	0	100%	100%	-	Y	-	Y	-	Y
Boston Borough Council														
Bournemouth Borough Council														
Bracknell Forest Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Bradford Metropolitan District Council	217	2	79	91	-	0	52%	53%	-	Y	N	Y	-	Y
Braintree District Council	142	0	22	24	-	0	73%	92%	-	Y	-	Y	-	N
Breckland District Council	549	0	204	72	-	0	63%	51%	-	Y	-	Y	-	Y
Brent	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Brentwood Borough Council	3	0	1	0	-	1	0%	0%	-	N	-	-	-	N
Bridgend County Borough Council	63	0	4	-	12	0	100%	-	17%	Y	-	-	Y	Y
Brighton & Hove City Council	1	1	3	0	-	0	100%	0%	-	N	N	-	-	N
Bristol City Council	1	0	0	0	-	0	-	-	-	-	-	-	-	-
Broadland District Council	415	0	120	54	-	0	68%	54%	-	Y	-	Y	-	Y
Bromley	0	0	3	0	-	0	100%	0%	-	Y	-	-	-	N
Bromsgrove District Council	24	0	1	3	-	0	100%	67%	-	Y	-	Y	-	N
Broxbourne Borough Council	6	0	0	0	-	3	-	0%	-	-	-	-	-	N
Broxtowe Borough Council	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Burnley Borough Council	45	3	33	9	-	0	76%	22%	-	Y	N	N	-	Y
Bury Metropolitan Borough Council	44	5	7	12	-	0	0%	0%	-	Y	N	N	-	N
Caerphilly County Borough Council	68	0	2	-	2	0	0%	-	0%	Y	-	-	Y	Y
Calderdale Metropolitan Borough Council	548	0	51	197	-	0	63%	62%	-	N	-	N	-	N
Cambridge City Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Camden	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Cannock Chase District Council														
Canterbury City Council	5	0	2	1	-	0	0%	0%	-	N	-	N	-	Y

Cardiff Council	12	0	2	-	6	0	100%	-	17%	Y	-	-	Y	Y
Carlisle City Council	115	0	26	18	-	0	38%	11%	-	Y	-	Y	-	N
Carmarthenshire County Council	2089	6	41	-	17	150	32%	-	18%	Y	N	-	Y	N
Castle Point Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Central Bedfordshire Council	23	4	9	1	-	0	78%	100%	-	Y	Y	Y	-	N
Ceredigion County Council	1317	0	84	-	80	0	100%	-	100%	Y	-	-	Y	Y
Charnwood Borough Council	14	0	0	3	-	0	-	100%	-	-	-	N	-	N
Chelmsford Borough Council	12	1	1	1	-	0	0%	0%	-	Y	N	N	-	N
Cheltenham Borough Council														
Cherwell District Council	101	1	14	27	-	0	50%	52%	-	Y	N	Y	-	N
Cheshire East Council	367	0	58	18	-	0	91%	56%	-	Y	-	Y	-	Y
Cheshire West & Chester Council	45	0	12	10	-	0	17%	20%	-	Y	-	Y	-	N
Chesterfield Borough Council														
Chichester District Council	30	6	22	18	-	0	73%	56%	-	Y	N	Y	-	Y
Chiltern District Council	18	0	3	2	-	0	0%	0%	-	Y	-	Y	-	N
Chorley Borough Council	15	0	2	2	-	0	100%	100%	-	N	-	N	-	N
Christchurch Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
City of London	0	0	2	0	-	0	50%	0%	-	Y	-	-	-	N
Colchester Borough Council	48	0	2	2	-	0	100%	100%	-	Y	-	Y	-	N
Conwy County Borough Council	427	1	83	-	26	1	46%	-	12%	Y	Y	-	Y	Y
Copeland Borough Council	150	0	103	47	-	3	2%	0%	-	Y	-	Y	-	Y
Corby Borough Council														
Cornwall Council	2659	4	702	209	-	0	95%	92%	-	Y	Y	Y	-	Y
Cotswold District Council	94	0	104	27	-	0	67%	74%	-	Y	-	Y	-	Y
Coventry City Council	0	0	1	0	-	0	0%	0%	-	Y	-	-	-	N
Craven District Council	375	0	223	146	-	0	98%	98%	-	Y	-	Y	-	Y
Crawley Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Croydon	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Dacorum Borough Council	24	7	4	6	-	0	100%	100%	-	Y	Y	Y	-	N
Darlington Borough Council	1	0	5	0	-	0	100%	0%	-	Y	-	-	-	N

Dartford Borough Council														
Daventry District Council														
Denbighshire County Council	479	0	64	-	115	0	47%	-	25%	Y	-	-	Y	Y
Derby City Council														
Derbyshire Dales District Council	156	0	40	24	-	0	65%	33%	-	Y	-	Y	-	Y
Doncaster Metropolitan Borough Council	14	2	11	2	-	0	64%	50%	-	Y	N	N	-	N
Dover District Council	3	0	1	0	-	0	100%	0%	-	N	-	-	-	N
Dudley Metropolitan Borough Council	2	0	0	0	-	0	-	0%	-	-	-	-	-	N
Durham County Council	142	0	113	83	-	0	52%	48%	-	Y	-	Y	-	Y
Ealing	0	0	0	0	-	0	-	-	-	-	-	-	-	-
East Cambridgeshire District Council	25	2	12	2	-	0	100%	100%	-	Y	Y	Y	-	N
East Devon District Council	852	0	175	134	-	0	48%	10%	-	Y	-	Y	-	Y
East Dorset District Council	23	1	8	15	-	0	0%	7%	-	Y	Y	Y	-	N
East Hampshire District Council	35	3	7	7	-	1	57%	14%	-	N	N	N	-	Y
East Hertfordshire Council	95	0	19	0	-	25	32%	0%	-	Y	-	-	-	N
East Lindsey District Council	158	4	15	26	-	0	53%	4%	-	Y	Y	Y	-	N
East Northamptonshire District Council	16	0	7	4	-	0	57%	75%	-	Y	-	Y	-	N
East Riding of Yorkshire Council	114	0	46	11	-	0	98%	82%	-	Y	-	Y	-	Y
East Staffordshire Borough Council	12	1	4	1	-	0	0%	0%	-	Y	N	N	-	N
East Suffolk	317	3	34	76	-	0	62%	63%	-	Y	Y	Y	-	Y
Eastbourne Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Eastleigh Borough Council	1	0	0	0	-	0	-	0%	-	-	-	-	-	N
Eden District Council	303	0	118	169	-	0	53%	9%	-	Y	-	Y	-	Y
Elmbridge Borough Council	10	0	0	0	-	0	-	0%	-	-	-	-	-	N
Enfield														
Epping Forest District Council	35	14	22	10	-	0	68%	80%	-	Y	Y	Y	-	Y
Epsom and Ewell Borough Council	1	0	0	0	-	0	-	0%	-	-	-	-	-	N
Erewash Borough Council	1	0	0	0	-	0	-	0%	-	-	-	-	-	N
Exeter City Council	0	0	2	0	-	0	100%	0%	-	Y	-	-	-	N
Fareham Borough Council	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N

Fenland District Council	1	0	0	0	-	0	-	-	-	-	-	-	-	-
Flintshire County Council	96	11	30	-	24	0	33%	-	4%	Y	N	-	Y	Y
Forest Heath District Council														
Forest of Dean District Council	57	0	13	6	-	0	54%	67%	-	Y	-	Y	-	Y
Fylde Borough Council	1	1	1	0	-	0	100%	0%	-	N	N	-	-	N
Gateshead Metropolitan Borough Council														
Gedling Borough Council	4	0	5	8	-	1	80%	88%	-	Y	-	N	-	N
Gloucester City Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Gosport Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Gravesham Borough Council	3	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Great Yarmouth Borough Council	44	0	7	3	-	0	71%	0%	-	Y	-	N	-	Y
Greenwich														
Guildford Borough Council	6	0	1	1	-	0	0%	0%	-	Y	-	Y	-	N
Gwynedd County Council	570	4	316	-	46	6	71%	-	57%	Y	N	-	Y	Y
Hackney	0	0	0	1	-	0	-	0%	-	-	-	N	-	N
Halton Borough Council	1	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Hambleton District Council	144	0	39	12	-	0	82%	92%	-	Y	-	Y	-	N
Hammersmith and Fulham	0	0	1	0	-	0	0%	0%	-	N	-	-	-	N
Harborough District Council	21	0	5	7	-	0	0%	0%	-	N	-	Y	-	Y
Haringey														
Harlow District Council	1	0	0	1	-	0	-	100%	-	-	-	Y	-	N
Harrogate Borough Council	331	0	130	128	-	0	62%	51%	-	Y	-	Y	-	N
Harrow														
Hart District Council	6	2	2	0	-	0	100%	0%	-	Y	N	-	-	N
Hartlepool Borough Council	0	0	1	0	-	0	0%	0%	-	Y	-	-	-	N
Hastings Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Havant Borough Council														
Havering														
Herefordshire	2152	1	260	138	-	0	70%	10%	-	Y	Y	Y	-	Y
Hertsmere Borough Council	3	2	3	1	-	0	0%	0%	-	Y	Y	Y	-	N

High Peak Borough Council	207	0	48	47	-	0	92%	30%	-	Y	-	Y	-	Y
Hillingdon														
Hinckley and Bosworth Borough Council	47	2	6	3	-	0	83%	67%	-	Y	N	N	-	Y
Horsham District Council	1	0	3	3	-	2	100%	33%	-	Y	-	Y	-	Y
Hounslow														
Hull City Council														
Huntingdonshire District Council	8	0	1	0	-	0	0%	0%	-	N	-	-	-	N
Hyndburn Borough Council	32	0	3	5	-	0	100%	80%	-	N	-	Y	-	Y
Ipswich Borough Council	1	0	1	0	-	0	0%	0%	-	Y	-	-	-	N
Isle of Anglesey County Council	174	0	20	-	7	0	20%	-	0%	Y	-	-	Y	Y
Isle of Wight Council	14	0	5	1	-	0	80%	100%	-	Y	-	Y	-	Y
Isles of Scilly	6	0	23	2	-	2	100%	100%	-	N	-	N	-	N
Islington														
Kensington and Chelsea	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Kettering Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
King's Lynn and West Norfolk Borough Council	37	1	38	7	-	0	34%	29%	-	Y	N	N	-	N
Kingston upon Thames														
Kirklees Council	165	0	20	53	-	0	60%	0%	-	Y	-	Y	-	Y
Knowsley MBC	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Lambeth														
Lancaster City Council	129	0	43	35	-	0	14%	3%	-	Y	-	Y	-	N
Leeds City Council	17	0	17	11	-	0	47%	0%	-	Y	-	N	-	N
Leicester City Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Lewes District Council	2	0	8	5	-	0	0%	20%	-	Y	-	Y	-	N
Lewisham														
Lichfield District Council	7	0	5	0	-	0	100%	0%	-	Y	-	-	-	N
Lincoln Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Liverpool City Council	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Luton Borough Council														
Maidstone Borough Council	8	0	1	4	-	0	100%	75%	-	Y	-	N	-	N

Maldon District Council	16	0	1	4	-	0	100%	100%	-	Y	-	N	-	N
Malvern Hills District Council	209	0	16	8	-	0	44%	38%	-	Y	-	Y	-	Y
Manchester City Council	0	0	3	0	-	0	100%	0%	-	Y	-	-	-	N
Mansfield District Council	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Medway Council	0	3	0	0	-	0	-	0%	-	-	Y	-	-	N
Melton Borough Council	7	0	8	0	-	0	75%	0%	-	Y	-	-	-	Y
Mendip District Council	72	5	39	42	-	0	5%	12%	-	Y	Y	Y	-	N
Merthyr Tydfil County Borough Council	16	0	1	-	0	0	0%	-	-	Y	-	-	-	N
Merton	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Mid Devon District Council	1013	0	164	67	-	0	57%	69%	-	Y	-	Y	-	Y
Mid Suffolk District Council	81	1	29	6	-	0	97%	100%	-	Y	N	Y	-	N
Mid Sussex District Council	3	0	2	2	-	0	100%	100%	-	Y	-	N	-	N
Middlesbrough Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Milton Keynes Council	8	0	1	1	-	0	100%	100%	-	Y	-	N	-	N
Mole Valley District Council														
Monmouthshire County Council	547	0	63	-	119	0	46%	-	61%	Y	-	-	Y	N
Neath Port Talbot County Borough Council	164	0	10	-	8	0	100%	-	38%	Y	-	-	Y	Y
New Forest District Council	15	0	7	2	-	0	71%	100%	-	Y	-	Y	-	Y
Newark and Sherwood District Council	12	2	2	2	-	0	100%	100%	-	Y	N	Y	-	Y
Newcastle-under-Lyme Borough Council	9	1	5	11	-	0	80%	91%	-	Y	Y	Y	-	Y
Newcastle-upon-Tyne City Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Newham Council														
Newport City Council	23	0	5	-	0	0	0%	-	-	Y	-	-	-	N
North Devon District Council	842	1	240	92	-	0	81%	45%	-	Y	N	Y	-	N
North Dorset District Council	36	2	36	12	-	0	89%	33%	-	Y	N	Y	-	N
North East Derbyshire District Council														
North East Lincolnshire Council	35	0	8	2	-	0	88%	100%	-	Y	-	Y	-	N
North Hertfordshire District Council	36	0	7	17	-	1	100%	100%	-	Y	-	Y	-	Y
North Kesteven District Council	6	0	3	0	-	0	0%	0%	-	Y	-	-	-	N
North Lincolnshire Council	12	0	3	5	-	0	100%	100%	-	Y	-	Y	-	N

North Norfolk District Council	217	0	126	30	-	2	56%	10%	-	Y	-	Y	-	N
North Somerset District Council	6	2	2	2	-	0	50%	50%	-	Y	Y	N	-	N
North Tyneside Metropolitan Borough Council														
North Warwickshire Borough Council	8	0	6	4	-	0	83%	0%	-	Y	-	Y	-	N
North West Leicestershire District Council														
Northampton Borough Council	0	1	0	0	-	0	-	0%	-	-	N	-	-	N
Northumberland County Council	474	5	395	168	-	0	66%	55%	-	Y	Y	Y	-	Y
Norwich City Council	0	0	3	0	-	0	0%	0%	-	Y	-	-	-	N
Nottingham City Council	0	0	3	0	-	0	100%	0%	-	Y	-	-	-	N
Nuneaton & Bedworth Borough Council	1	0	0	0	-	0	-	-	-	-	-	-	-	-
Oadby and Wigston Borough Council														
Oldham Metropolitan Borough Council	148	0	9	30	-	0	44%	27%	-	Y	-	Y	-	N
Oxford City Council	1	0	0	0	-	0	-	-	-	-	-	-	-	-
Pembrokeshire County Council	762	0	81	-	0	0	100%	-	-	Y	-	-	-	Y
Pendle Borough Council	181	0	29	58	-	0	69%	78%	-	Y	-	Y	-	Y
Peterborough City Council	3	0	1	3	-	1	100%	100%	-	Y	-	N	-	N
Plymouth City Council														
Poole Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Portsmouth City Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Powys County Council	4395	1	527	-	182	0	89%	-	86%	Y	N	-	Y	Y
Preston City Council	8	0	6	4	-	0	0%	0%	-	Y	-	N	-	N
Purbeck District Council	34	0	22	6	-	0	95%	83%	-	Y	-	Y	-	Y
Reading Borough Council	10	0	2	1	-	0	50%	100%	-	Y	-	N	-	N
Redbridge	1	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Redcar & Cleveland Borough Council	22	2	5	12	-	0	20%	8%	-	N	N	N	-	Y
Redditch Borough Council	4	0	0	0	-	0	-	0%	-	-	-	-	-	N
Reigate and Banstead Borough Council	1	0	0	0	-	0	-	0%	-	-	-	-	-	N
Rhondda Cynon Taff County Borough Council	68	0	12	-	1	0	75%	-	100%	Y	-	-	N	Y
Ribble Valley Borough Council	171	0	94	50	-	0	27%	56%	-	Y	-	Y	-	Y
Richmond upon Thames	0	0	0	0	-	0	-	-	-	-	-	-	-	-

Richmondshire District Council	289	0	84	80	-	0	54%	34%	-	Y	-	Y	-	Y
Rochdale Metropolitan Borough Council	65	0	11	42	-	0	100%	31%	-	Y	-	Y	-	Y
Rochford District Council														
Rossendale Borough Council	250	0	11	196	-	0	82%	11%	-	Y	-	Y	-	Y
Rother and Wealden District Council	21	1	4	3	-	1	25%	33%	-	Y	N	N	-	N
Rotherham Metropolitan Borough Council	1	0	0	3	-	0	-	100%	-	-	-	Y	-	N
Rugby Borough Council	20	0	0	1	-	0	-	100%	-	-	-	N	-	N
Runnymede Borough Council	3	1	0	0	-	0	-	0%	-	-	N	-	-	N
Rushcliffe Borough Council	1	0	0	1	-	0	-	100%	-	-	-	Y	-	Y
Rushmoor Borough Council	0	2	0	0	-	0	-	0%	-	-	Y	-	-	N
Rutland County Council District Council	15	2	6	1	-	0	100%	100%	-	Y	N	Y	-	N
Ryedale District Council	164	0	58	48	-	0	40%	88%	-	Y	-	Y	-	N
Salford City Council	1	0	0	0	-	0	-	0%	-	-	-	-	-	N
Sandwell Metropolitan Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Scarborough Borough Council	177	0	75	54	-	0	29%	15%	-	Y	-	Y	-	N
Sedgmoor District Council	13	0	19	0	-	0	100%	0%	-	Y	-	-	-	Y
Sefton Metropolitan Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Selby District Council	14	0	6	15	-	0	0%	0%	-	Y	-	Y	-	N
Sevenoaks District Council														
Sheffield City Council	160	0	5	1	-	0	20%	100%	-	N	-	N	-	N
Shropshire Council	1661	4	223	263	-	2	37%	16%	-	Y	Y	Y	-	N
Slough Borough Council	1	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Solihull Metropolitan Borough Council	16	0	1	0	-	0	0%	0%	-	N	-	-	-	Y
South Buckinghamshire District Council	3	2	2	0	-	0	100%	0%	-	Y	Y	-	-	N
South Cambridgeshire District Council	108	0	10	23	-	0	50%	74%	-	Y	-	Y	-	Y
South Derbyshire District Council	8	0	12	5	-	0	100%	20%	-	Y	-	N	-	N
South Gloucestershire Council	30	2	9	2	-	0	89%	0%	-	Y	Y	N	-	Y
South Hams District Council	479	0	152	107	-	2	43%	16%	-	Y	-	Y	-	Y
South Holland District Council	6	0	1	1	-	0	100%	100%	-	Y	-	Y	-	N
South Kesteven District Council	28	0	18	5	-	0	39%	0%	-	Y	-	N	-	N

South Lakeland District Council	1080	4	403	230	-	0	83%	49%	-	Y	N	Y	-	Y
South Norfolk Council	190	0	51	36	-	0	18%	0%	-	Y	-	Y	-	N
South Northamptonshire Council	28	0	11	7	-	0	100%	100%	-	Y	-	Y	-	N
South Oxfordshire District Council	109	1	32	7	-	0	97%	86%	-	Y	Y	Y	-	Y
South Ribble Borough Council	2	0	2	0	-	0	100%	0%	-	Y	-	-	-	N
South Somerset District Council	326	1	31	74	-	1	87%	57%	-	Y	N	Y	-	Y
South Staffordshire District Council	43	0	4	8	-	0	0%	0%	-	N	-	N	-	N
South Tyneside Metropolitan Borough Council	1	0	0	0	-	0	-	0%	-	-	-	-	-	N
Southampton City Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Southend-on-Sea Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Southwark	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Spelthorne Borough Council	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
St Albans District Council	48	0	4	7	-	0	0%	0%	-	N	-	Y	-	N
St Edmundsbury Borough Council														
St Helens Metropolitan Borough Council														
Stafford Borough Council	131	0	10	22	-	0	90%	82%	-	Y	-	Y	-	N
Staffordshire Moorlands District Council	332	0	36	9	-	0	92%	89%	-	Y	-	Y	-	Y
Stevenage Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Stockport MBC	29	0	3	7	-	0	100%	86%	-	Y	-	Y	-	N
Stockton on Tees Borough Council	3	0	0	0	-	0	-	0%	-	-	-	-	-	N
Stoke-on-Trent City Council	1	0	1	0	-	0	0%	0%	-	N	-	-	-	N
Stratford-on-Avon District Council	143	4	29	15	-	0	86%	87%	-	Y	N	N	-	Y
Stroud District Council	112	0	33	17	-	0	97%	59%	-	Y	-	Y	-	N
Sunderland City Council														
Surrey Heath Borough Council	0	0	1	0	-	0	0%	0%	-	N	-	-	-	N
Sutton														
Swale Borough Council	4	0	10	1	-	0	30%	0%	-	Y	-	Y	-	N
Swansea City and Borough Council	82	0	7	-	11	0	100%	-	100%	Y	-	-	N	Y
Swindon Borough Council	3	0	4	5	-	0	25%	40%	-	Y	-	Y	-	N
Tameside Metropolitan Borough	23	0	2	8	-	0	100%	50%	-	Y	-	Y	-	N

Tamworth Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Tandridge District Council														
Taunton Deane Borough Council														
Teignbridge District Council	390	1	99	97	-	0	0%	0%	-	Y	N	Y	-	N
Telford & Wrekin Council	63	0	13	14	-	0	85%	86%	-	Y	-	Y	-	Y
Tendring District Council	100	1	9	17	-	0	0%	0%	-	N	N	N	-	N
Test Valley Borough Council	139	0	20	85	-	0	90%	58%	-	Y	-	Y	-	Y
Tewkesbury Borough Council	62	9	12	26	-	0	0%	0%	-	Y	Y	Y	-	N
Thanet District Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Three Rivers District Council	15	0	1	3	-	0	0%	0%	-	N	-	N	-	N
Thurrock Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Tonbridge and Malling Borough Council	20	0	3	2	-	0	67%	50%	-	Y	-	Y	-	N
Torbay Council														
Torfaen County Borough Council	55	0	1	-	9	0	100%	-	89%	Y	-	-	Y	N
Torridge District Council	552	1	91	18	-	0	26%	6%	-	Y	Y	Y	-	Y
Tower Hamlets	1	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Trafford Metropolitan Borough Council														
Tunbridge Wells Borough Council	3	0	2	1	-	0	50%	0%	-	Y	-	N	-	N
Uttlesford District Council	30	5	10	7	-	0	70%	43%	-	Y	N	Y	-	N
Vale of Glamorgan Council	20	1	7	-	9	0	100%	-	67%	Y	N	-	N	N
Vale of White Horse District Council	31	0	23	6	-	0	100%	83%	-	Y	-	Y	-	Y
Wakefield Metropolitan District Council	1	0	1	1	-	0	100%	100%	-	Y	-	N	-	N
Walsall Metropolitan Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Waltham Forest	0	0	1	0	-	0	0%	0%	-	N	-	-	-	N
Wandsworth	0	0	1	0	-	0	0%	0%	-	Y	-	-	-	N
Warrington Borough Council														
Warwick District Council	25	0	3	5	-	0	0%	0%	-	Y	-	Y	-	N
Watford Borough Council	2	0	1	0	-	0	100%	0%	-	N	-	-	-	N
Waverley Borough Council	14	0	4	1	-	0	75%	100%	-	Y	-	Y	-	N
Wealden District Council	28	3	3	3	-	0	33%	33%	-	Y	N	N	-	N

Wellingborough Borough Council	3	0	0	0	-	0	-	0%	-	-	-	-	-	N
Welwyn Hatfield District Council	10	0	4	1	-	0	100%	100%	-	Y	-	Y	-	N
West Berkshire District Council	128	0	47	35	-	0	34%	31%	-	Y	-	Y	-	N
West Devon Borough Council	741													
West Dorset District Council	314	2	133	94	-	0	95%	91%	-	Y	N	Y	-	N
West Lancashire District Council	2	0	0	0	-	0	-	0%	-	-	-	-	-	N
West Lindsey District Council	9	0	4	1	-	0	100%	100%	-	Y	-	N	-	N
West Oxfordshire District Council	42	0	64	11	-	0	59%	36%	-	Y	-	Y	-	Y
West Somerset District Council														
West Suffolk	81	0	41	19	-	0	93%	79%	-	Y	-	Y	-	Y
Westminster City Council	1	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Weymouth and Portland Borough Council	0	0	0	1	-	0	-	100%	-	-	-	N	-	N
Weymouth PHA	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Wigan Metropolitan Borough Council														
Wiltshire Council	316	17	229	65	-	0	63%	71%	-	Y	Y	Y	-	Y
Winchester City Council	96	0	19	52	-	0	100%	98%	-	Y	-	Y	-	N
Windsor and Maidenhead	77	1	3	0	-	0	67%	0%	-	Y	Y	-	-	N
Wirral Metropolitan Borough Council	0	1	2	0	-	0	50%	0%	-	Y	N	-	-	N
Woking Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Wokingham Borough Council	94	0	13	4	-	0	54%	100%	-	Y	-	Y	-	N
Wolverhampton City Council	0	0	1	0	-	0	100%	0%	-	Y	-	-	-	N
Worcester City Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Worthing Borough Council	0	0	0	0	-	0	-	-	-	-	-	-	-	-
Wrexham County Borough Council	168	3	12	-	25	0	92%	-	64%	Y	Y	-	Y	Y
Wychavon District Council	86	1	9	10	-	0	89%	50%	-	Y	N	N	-	N
Wycombe District Council	53	2	7	5	-	1	100%	80%	-	Y	N	Y	-	N
Wyre Borough Council	14	0	9	4	-	0	22%	0%	-	Y	-	Y	-	N
Wyre Forest District Council	19	0	3	5	-	0	100%	60%	-	Y	-	Y	-	N
York City Council	13	0	3	2	-	0	100%	100%	-	Y	-	N	-	N
Total supplies reported for 2019	*37437*	*204*	*8276r*	*4747*	*699*	*219*	-	-	-	-	-	-	-	-

Annex 2: Summary of monitoring data for England and Wales

Parameter	Standard	Number of samples	Number of failures	Percentage of failures in 2019	Percentage of failures in 2018
Escherichia coli	0/100 ml	15,412	969	6.3	6.4
Enterococci	0/100 ml	9,377	686	7.3	8.0
Colony counts after 48 hours at 37°C	No abnormal change	7,305	-	-	-
Colony counts after 3 days at 22°C	No abnormal change	10,644	-	-	-
Coliform bacteria (Indicator)	0/100 ml	13,947	1,842	13.2	14.5
Clostridium perfringens	0/100 ml	6,954	394	5.7	5.2
Pseudomonas aeruginosa	0/250ml	307	2	0.7	4.5
1 2-Dichloroethane	3.0µg/l	2,201	0	0	0.0
Aluminium	200µg/l	6,603	130	2.0	1.9
Ammonium	0.5mg/l	6,553	152	2.3	2.4
Antimony	5.0µg/l	4,237	13	0.3	0.3
Arsenic	10µg/l	4,736	59	1.2	2.3
Benzene	1.0µg/l	2,329	2	0.1	0.0
Benzo(a)pyrene	0.01µg/l	1,958	9	0.5	1.7
Boron	1.0µg/l	4,274	52	1.2	2.0
Bromate	10µg/l	2,579	0	0	0.7
Cadmium	5.0µg/l	4,425	3	0.1	0.1
Chloride	250mg/l	2,174	35	1.6	2.0
Chromium	50µg/l	4,279	2	0.1	0.0
Colour	20mg/l Pt/Co	7,963	135	1.7	1.3
Conductivity	2500 µS/cm at 20°C	11,799	9	0.1	0.0
Copper	2.0mg/l	5,225	129	2.5	2.3
Cyanide	50µg/l	3,075	4	0.1	0.0
Fluoride	1.5mg/l	4,101	105	2.6	6.9
Hydrogen ion (pH)	6.5 – 9.5	12,066	828	6.9	10.1
Iron	200µg/l	7,902	412	5.2	6.6
Lead	10µg/l	6,696	231	3.4	4.9
Manganese	50µg/l	7,903	502	6.4	7.2
Mercury	1.0µg/l	3,912	0	0	0.0
Nickel	20µg/l	4,647	128	2.8	2.4
Nitrate	50µg/l	7,717	558	7.2	7.4
Nitrite – consumers' taps	0.5µg/l	6,599	71	1.1	2.6
Nitrite – treatment works	0.1µg/l	928	19	2.0	0.4
Odour	No abnormal change	8,912	1,294	14.5	18.2
Polycyclic Aromatic Hydrocarbons	0.1µg/l	902	2	0.2	0.7
Radon	100 Bq/l	68	1	1.5	2.7
Selenium	10µg/l	4,207	2	0.1	0.0
Sodium	200mg/l	4,049	83	2.0	5.1
Sulphate	250mg/l	2,114	28	1.3	2.9
Taste	No abnormal change	7,371	872	11.8	14.6
Tetrachloromethane	3.0µg/l	2,073	0	0.0	0.0
Total indicative dose	0.1mS/year	83	0	0.0	0.0
Total Organic Carbon	No abnormal change	1,097	0	0.	0.0
Trichloroethene and Tetrachloroethene	10µg/l	1,216	1	0.1	0.6
Trihalomethanes	100µg/l	2,152	4	0.2	0.9
Tritium	100 Bq/l	172	0	0.0	0.0

Annex 2: continued

Parameter	Standard	Number of samples	Number of failures	Percentage of failures in 2019	Percentage of failures in 2018
Turbidity at tap	4NTU	11,862	172	1.5	2.1
Turbidity at works	1NTU	7,43	28	3.8	4.2
Pesticides					
Aldrin	0.03µg/l	1484	0	0.0	0.0
Dieldrin	0.03µg/l	1593	12	0.8	0.0
Heptachlor	0.03µg/l	1468	0	0.0	0.0
Heptachlor Epoxide	0.03µg/l	1608	0	0.0	0.0
Other pesticides*	0.1µg/l	41439	31	0.1	0.2
Total pesticides	0.5µg/l	1369	3	0.2	0.5
Total		296,066	10,014	3.4	5.0

Annex 3: Guidance and technical advice

The following updates were made to the documents specified in the table below during 2019. These updates have been made to provide additional clarity in light of reviews and local authority feedback.

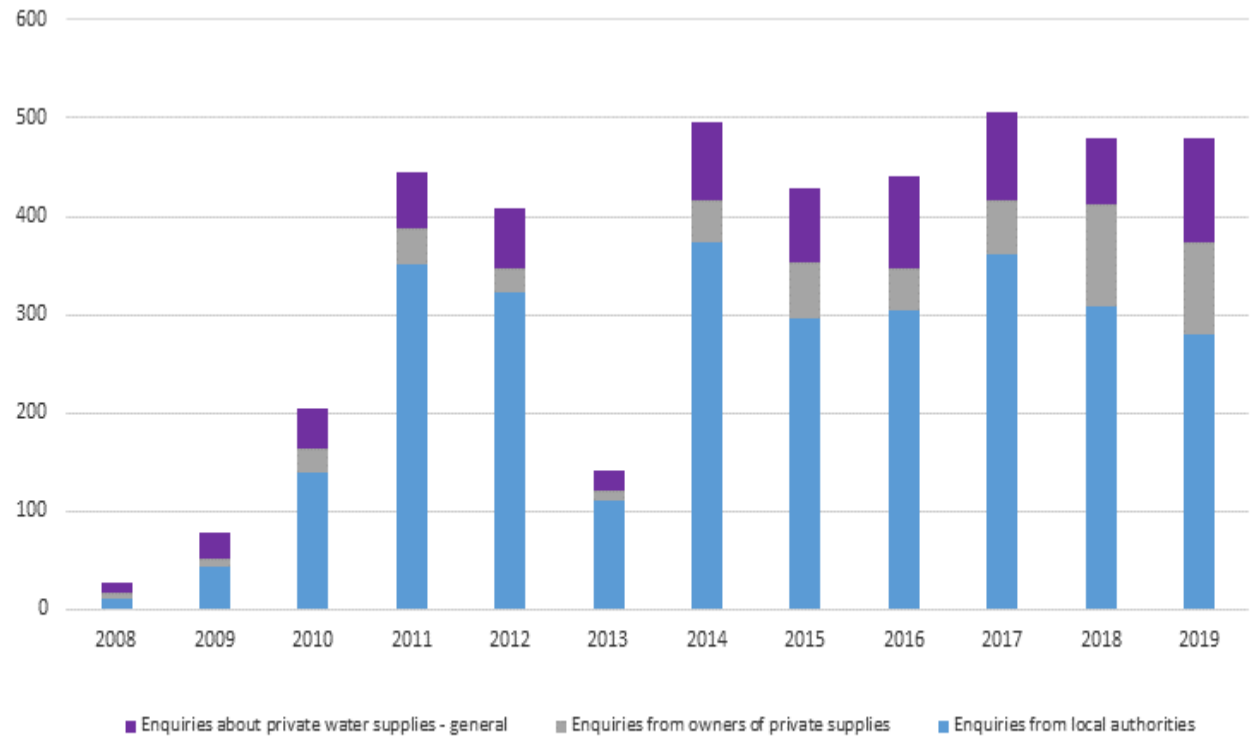
Item	Date	Country	Update
Information note on Regulation 18	February 2019	England	Amended text to avoid confusion
Private Water Supplies Sampling Procedures Manual	March 2019	England and Wales	Text on page 22 changed to bring it in line with Blue Book methodology
Information Note 6 (version 1.1)	April 2019	England	Inclusion of reference to the Reduction and Prevention of Agricultural Diffuse Pollution regulations
Information Note 6 (Version 1.2 England) Version 1.1 Wales)	May 2019	England and Wales	Inclusion of further guidance for the provision of water to temporary events.
Nitrate and PWS (version 4.4)	August 2019	England and Wales	The standard of 50 mg/l is now absolute.
Information Note 7 (Version 2.2 England) (Version 1.1 Wales	October 2019	England and Wales	Update to clarify that Group B parameters do not need to be monitored for if these are listed and being monitored for as a Group A parameter.

Annex 4: Enquiries about private water supplies

Numbers of enquiries received 2008–2019 for England and Wales

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Enquiries from local authorities	10	43	140	352	322	110	374	296	305	361	309	279
Enquiries from owners of private supplies	6	9	23	36	25	11	43	57	43	55	104	94
Enquiries about private water supplies – general	12	27	42	56	62	21	78	75	92	91	67	107
Total	**28**	**79**	**205**	**444**	**409**	**142**	**495**	**428**	**440**	**507**	**480**	**480**

Number of enquiries received from 2008–2019 indicating the origin of the enquiry in England and Wales



Annex 5: Glossary and descriptions of standards

Aluminium occurs naturally in some source waters. It is removed from drinking water by conventional water treatment (coagulation and filtration). The standard is 200µg Al/l.

Ammonium salts are naturally present in trace amounts in most waters. Their presence might indicate contamination of sanitary significance and they interfere with the operation of the disinfection process. The guide value is 0.5mg NH_4/l.

Antimony is rarely found in drinking water. Trace amounts can be derived from brass tap fittings and solders. The standard is 5µg Sb/l.

Arsenic occurs naturally in only a few sources of groundwater. Specific water treatment is required to remove it. The standard is 10µg As/l.

Benzene is present in petrol. It is not found in drinking water, but it can migrate through underground plastic water pipes if petrol is spilt in the vicinity. Some bottled waters and soft drinks which include sodium benzoate as an ingredient have been reported as containing benzene.
The standard is 1µg/l.

Benzo(a)pyrene is one of several compounds known as polycyclic aromatic hydrocarbons (PAHs). Their source in drinking water is as a result of the deterioration of coal tar which was used to line water pipes up until the early 1970s. The standard is 0.01µg/l.

Boron in surface water sources comes from industrial discharges or from detergents in treated sewage effluents. It can be present in partially desalinated seawater when this is used to supplement drinking water supplies. Concentrations found in drinking waters are generally very low. The standard is 1mg B/l.

Bromate can be formed during disinfection of drinking water as a result of a reaction between naturally occurring bromide and strong oxidants (usually ozone). It may be generated in the manufacture of sodium hypochlorite disinfectant. It can also arise from using an inappropriate grade of sodium hypochlorite for water treatment. Exceptionally, groundwater beneath an industrial site can become contaminated with bromate. The standard is 10µg BrO_3/l.

Cadmium is rarely detected in drinking water and trace amounts are usually due to the dissolution of impurities from plumbing fittings. The standard is 5µg Cd/l.

Chloride is a component of common salt. It may occur in water naturally, but it may also be present due to local use of de-icing salt or saline intrusion. The guide value is 250mg Cl/l.

Clostridium perfringens is a spore-forming bacterium that is present in the gut of warm-blooded animals. The spores can survive disinfection. The presence of spores in drinking water in the absence of *E.coli* and Enterococci indicates historic or remote faecal contamination that requires investigation. The standard is 0 per 100ml.

Chromium in drinking water comes from the coatings on some taps and plumbing fittings. The standard is 50µg Cr/l.

Coliform bacteria are widely distributed in the environment often as a result of human or animal activity, but some grow on plant matter. Their presence in a water supply indicates a need to investigate the integrity of the water supply system. The standard is 0 per 100ml.

Colony counts are general techniques for detecting a wide range of bacteria, the types and numbers being dependent on the conditions of the test. These counts, if done regularly, can help to inform water management, but they have no direct health significance. The standard is 'no abnormal change'.

Colour occurs naturally in upland water sources and is caused by natural organics which are characteristic of these catchments. Colour can be the cause of elevated disinfection byproducts where chlorine is used for disinfection. The standard is 20mg/l on the Pt/Co scale.

Conductivity is a non-specific measure of the amount of natural dissolved inorganic substances in source waters. The guide value is 2,500µS/cm.

Copper in drinking water comes mostly from copper pipes and fittings in households. In general, water sources are not aggressive towards copper, but problems very occasionally occur in new installations. These 'blue water' events can be avoided by good plumbing practices. The standard is 2mg Cu/l.

Cyanide is not normally present in drinking water, but could be present in surface water as a result of a specific industrial contamination incident. The standard is 50µg CN/l.

1,2-Dicholoroethane is a solvent that may be found in groundwater in the vicinity of industrial sites. Where necessary it can be removed by special water treatment. The standard is 3µg/l.

Escherichia coli (E.coli) **and Enterococci** are bacteria present in the gut of warm-blooded animals. They should not be present in drinking water and, if found, immediate action is required to identify and remove any source of faecal contamination that is found. The standard is 0 per 100ml.

Fluoride occurs naturally in many water sources, especially groundwater. It cannot be removed by conventional water treatment, so high levels must be reduced by blending with another low fluoride water source. The standard is 1.5mg F/l.

Hydrogen ion (pH) gives an indication of the degree of acidity of the water. A pH of 7 is neutral; values below 7 are acidic and values above 7 are alkaline. A low pH water may result in pipe corrosion. This is corrected by adding an alkali during water treatment. The guide value is a range between 6.5 and 9.5.

Iron is present naturally in many water sources. However, the most common source of iron in drinking water is corrosion of iron water mains. The standard is 200µg Fe/l.

Lead very occasionally occurs naturally in raw waters, but the usual reason for its presence in drinking water is lead plumbing in older properties. The permanent remedy is for householders to remove lead pipes and fittings. The standard is 10µg Pb/l.

Mercury is not normally found in sources of drinking water in the UK. The standard is 1µg Hg/l.

Nickel occurs naturally in some groundwater and, where necessary, special treatment can be installed to remove it. Another source of nickel in drinking water is the coatings on modern taps and other plumbing fittings. The standard is 20µg Ni/l.

Nitrate occurs naturally in all source waters although higher concentrations tend to occur where fertilisers are used on the land. Nitrate can be removed by ion exchange water treatment or through blending with other low nitrate sources. The standard is 50mg NO_3/l.

Nitrite may occur where ammonia is present in the source and chlorine is used for disinfection. Careful operation of the disinfection process ensures that levels of nitrite are below the standards of 0.1mg NO_2/l in water leaving water treatment works and 0.5mg NO_2/l at consumers' taps.

Odour and taste can arise as a consequence of natural substances in surface waters, particularly between late spring through to early autumn. The standard is described as acceptable to consumers and no abnormal change in odour or taste.

Pesticides – organochlorine compounds (aldrin, dieldrin, heptachlor, heptachlor epoxide) are no longer used in the UK because they are persistent in the environment. They are very unlikely to be found in drinking water. The standard for each compound is 0.03µg/l.

Pesticides – other than organochlorine compounds are a diverse and large group of organic compounds used as weed killers, insecticides and fungicides. Many water sources contain traces of one or more pesticides as a result of both agricultural uses mainly on crops and non-agricultural uses, mainly for weed control on highways and in gardens. The standard is 0.1µg/l for each individual substance and 0.5µg/l for the total of all pesticides.

Polycyclic aromatic hydrocarbons is a group name for several substances present in petroleum-based products such as coal tar. The standard is 0.1µg/l for the sum of all the substances (see Benzo(a)pyrene listed above for more information).

Radon is a colourless, odourless radioactive gas. It is formed by the radioactive decay of the small amounts of uranium that occur naturally in all rocks and soils. The guide value is 100Bq/l.

Selenium is an essential element and a necessary dietary component. Amounts in drinking water are usually well below the standard of 10µg Se/l.

Sodium is a component of common salt (sodium chloride). It is present in seawater and brackish groundwater. Some water treatment chemicals contain sodium. Concentrations in drinking water are extremely low, but some water softeners can add significant amounts where they are installed in homes or factories. The standard is 200mg Na/l.

Sulphate occurs naturally in all waters and cannot be removed by treatment. The guide value is 250mg SO_4/l.

Tetrachloroethane and Trichloroethene are solvents that may occur in groundwater in the vicinity of industrial sites. Where necessary they are removed by specialist treatment. The standard is 10µg/l for the sum of both substances.

Trihalomethanes are formed during disinfection of water by a reaction between chlorine and naturally occurring organic substances. Their production is minimised by good operational practice. The standard is 100µg/l.

Vinyl chloride may be present in plastic pipes as a residual of the manufacturing process of polyvinyl chloride (PVC) water pipes. Its presence in drinking water is controlled by product specification.
The standard is 0.5µg/l.

Tetrachloromethane is a solvent that may occur in groundwater in the vicinity of industrial sites. Where necessary it is removed by specialist water treatment. The standard is 3µg/l.

Total Indicative Dose is a measure of the effective dose of radiation the body will receive from consumption of the water. It is calculated only when screening values for gross alpha or gross beta (radiation) are exceeded. The guide value is 0.10mSv/year.

Total Organic Carbon represents the total amount of organic matter present in water. The guide value is 'no abnormal change'.

Tritium is a radioactive isotope of hydrogen. Discharges to the environment are strictly controlled and there is a national programme of monitoring surface waters. The guide value for drinking water sources is 100Bq/l.

Turbidity measurement is an important non-specific water quality control parameter at water treatment works because it can be monitored continuously on line and alarms set to alert operators to deterioration in raw water quality or the need to optimise water treatment. The standard at treatment works is 1NTU. Turbidity can also arise at consumers' taps following disturbance of sediment within water mains; the standard at consumers' taps is 4NTU.