

Drinking water 2018

Private water supplies in England

July 2019

A report by the Chief Inspector of Drinking Water

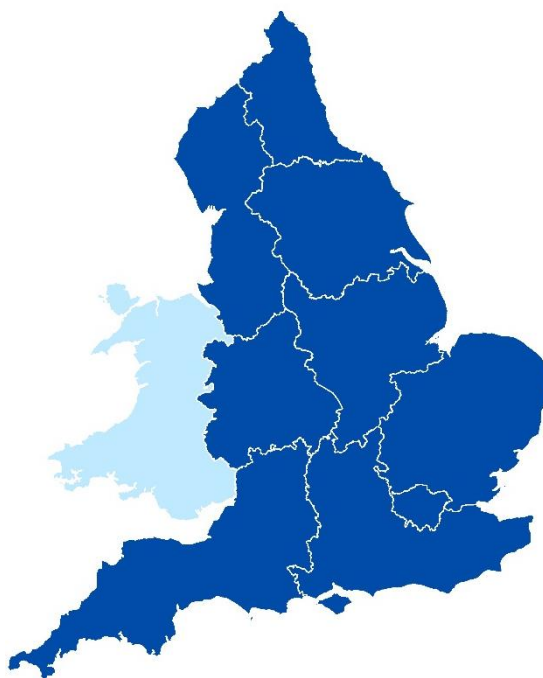


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Chapter 1: Summary

Chapter 1:

- Introduces the reader to the report and its contents.
- Summarises changes in numbers of private supplies
- 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 2018 is the annual publication of the Chief Inspector of Drinking Water for England and Wales. It is the 29th report of the work of the Inspectorate and presents information about drinking water quality for the calendar year of 2018. Two reports describe private water supplies. This report is about private supplies in England.

This report is the eighth of its type and presents information based on the updated private supply records provided to the Inspectorate by local authorities in January 2019. 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 2018, local authority records reported a total of 37,261 private supplies in England, 68% of which serve a single household. In England, over 994,000 live or work in a premises that relies on a private supply. Whereas the quality of public water supplies in England in 2018 was very high, with only 0.05% of tests failing to meet the European Union (EU) and national standards, the quality of private water supplies remains a concern, with 4.8% of tests failing to meet the European and national standards in 2018. 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 2018 demonstrate that private supplies in England and Wales, while showing an overall improvement over previous years, continue to be of unsafe microbiological quality, with 6.4% of samples containing *E.coli* and 8.0% 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. In England 4.9% samples contained *E.coli* and 5.8% failed for enterococci. In Wales, 13.2% of samples contained *E.coli* and 14.6% contained enterococci. More detailed information about private supply test results can be found in *Chapter 4* and *Annex 2*.

Chapter 2 of this report contains information about the different types of private supplies throughout England and Wales. Unfortunately, 12 local authorities in England (Barnsley Borough Council, Brentwood Borough Council, Cheltenham Borough Council, East Dorset District Council, East Hertfordshire Council, Enfield Council, Hackney Council, Mole Valley District Council, Rochdale Metropolitan Borough Council, Tandridge District Council, Torbay Council, Wigan Metropolitan Borough Council) failed to comply with Regulation 13 by not providing a valid annual return to the Inspectorate in

2018. In addition, South Hams District Council, and West Devon District Council provided returns which contained information which was not in the specified format and their information could not be compiled into the national record.

The records reported in *Chapter 3* show that in 2018 there were 498 private supplies (362 in England and 136 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 England and a slight decrease in Wales when compared to 2017, when action to safeguard public health was taken in relation to 467 private supplies (301 in England and 166 in Wales). In England, around three quarters (77%) 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 six 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 8,965 (7,729 in England, 1,236 in Wales) covering three quarters (74%) of all relevant private supplies. This is comparable to the situation published in *Drinking water 2017* where it was reported that 69% of relevant private supplies had been risk assessed after five years. In England, local authorities still have 36% of assessments to do representing one in three private supplies with an unknown risk to those who drink from these supplies and where, on average one in eight of these may be faecally contaminated. A detailed breakdown of performance on risk assessment at local authority level is provided in *Annex 1*. Overall, this information shows that 88 local authorities (eight of which were in Wales) have fully complied with the duty to risk assess all relevant 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 2018, the Inspectorate has continued its advisory service to local authorities, private supply owners or the industry associated with private supplies who make contact with an Inspector through the Inspectorate's website or public phone enquiry line.

During 2018 inspectors handled 480 contacts in total (compared to 507 in 2017). Enquiries from local authorities which form the majority of enquiries declined slightly down to 309 from 361 however, enquiries from owners or

operators of supplies nearly doubled, from 55 to 104. Details about the use of the enquiry service 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 from 2013. There have been regular updates to this tool based on feedback received from local authorities and during 2018 the Drinking Water Inspectorate, together with a selection of local authorities, made updates to this tool to take into account change requests and also to reflect changes in the new Regulations. There is also 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 2018, three research projects were commissioned, focussing on potential ways to simplify the requirements of monitoring of the quality of private supplies, these are described in detail in *Chapter 4*. The Drinking Water Inspectorate is also progressing a sampler certification scheme to comply with the new Drinking Water Directive. 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 certification of local authority samplers.

Following the transposition of the Drinking Water Directive, new Regulations have been enacted for Private Water Supplies in England and Wales, (implemented in 2017 in Wales and in July 2018 for England). This has required an update of all the guidance documents on the Drinking Water Inspectorate's website to reflect the new Regulations. Details of the key changes to the Regulations can be found in *Chapter 6*.

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 of the European Union (EU) Drinking Water Directive. 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 EU monitoring and reporting, whereas for small, shared domestic supplies such monitoring is a national requirement. Supplies serving only single domestic premises are exempt from monitoring and risk assessment 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 2019. Anyone wishing to understand these figures in the context of a particular local authority area should refer to *Annex 1*, a look-up table listing the figures and other information by each local authority in England and Wales.

In England, 12 local authorities (Barnsley Borough Council, Brentwood Borough Council, Cheltenham Borough Council, East Dorset District Council, East Hertfordshire Council, Enfield Council, Hackney Council, Mole Valley District Council, Rochdale Metropolitan Borough Council, Tandridge District Council, Torbay Council, Wigan Metropolitan Borough Council). The Inspectorate provides assistance to local authorities in correcting minor format issues however local authorities whose data returns could not be loaded are requested to ensure that future returns comply with the data schema published on the Inspectorate's website. In 2018 two local authorities, South Hams District Council and West Devon Borough Council provided returns that could not be used because information contained in the return was not as required and the Inspectorate was unable to correct the errors.

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 32 local authority returns for Regulation 9 supplies, which are reportable to the European Commission. For seven of the local authorities in England (Blackpool Borough Council, Bolton Metropolitan Borough Council, Dacorum Borough Council, Dover District Council, Stoke on Trent City Council, Tendring District Council, 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. Huntingdonshire District Council, Shropshire Council, St Albans District Council have not supplied evidence of annual monitoring of Regulation 9 supplies for three years in a row.

From Table 2 it can be seen that in 2018 there were 74,533 private supplies in the whole of the UK, of which 37,261 were in England. During 2018, 811 private supplies were added to the register in England, from the total of 36,450 reported in *Drinking water 2017*. 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) and the Inspectorate is satisfied that all local authorities have met the basic requirements of Regulation 14 (keeping records) within the period of five years allowed for implementation of the new Regulations. The Inspectorate is also satisfied that all but five of the local authorities in England have met the requirements of Regulation 15 (notification of information to the Secretary of State).

The area of England with the most private supplies (32%) is the South West of England. There are also significant numbers of private supplies in the West Midlands (16%), the North West (15%), East of England (12%) and Yorkshire and Humberside (12%). Table 2 also illustrates that private supplies can be found anywhere in the country with 13% (4,852) of all private supplies being located 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 2018, by region

Region	Large supplies and any size supply used in a public building or a commercial activity (Reg 9)	Small, shared domestic supplies (Reg 10)	Single domestic dwellings	Private distribution systems (Reg 8)	Domestic purposes – other	Total
East Midlands	232	196	996	15	2	1,441
West Midlands	618	529	4,963	9	2	6,121
East of England	793	482	2,814	224	6	4,319
North East England	502	273	636	7	0	1,418
North West England	1,091	981	3,437	17	17	5,543
Yorkshire and Humberside	861	888	2,801	2	3	4,555
London and South East	382	361	1,207	37	6	1,993
South West England	2,302	1,183	8,330	53	3	11,871
England total	6,781	4,893	25,184	364	39	37,261
Wales total						14,846
Northern Ireland*						157
Scotland*						22,269
UK total						74,533
*2017 data from the drinking water regulators for Scotland and Northern Ireland. 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 12,077 supplies, 11,674 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 (18%) or are small, shared domestic supplies (13%). The rest provide supplies via piped systems that further distribute mains water or are used for domestic purposes (other) and 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	75	190	50
West Midlands	5	6	128	272	74
East of England	9	6	176	484	152
North East England	1	1	99	422	127
North West England	4	3	247	710	111
Yorkshire and Humberside	6	4	400	778	212
London and South East	6	9	140	225	88
South West England	9	8	383	1,478	346
England total	41	39	1,648	4,559	1,160
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 2018, local authorities reported 617 more such supplies (a total of 6,781 compared to 6,164 in 2017). Just over two-thirds (67%) of these supplies are used by the tourism and leisure sector (hotels, bed and breakfast accommodation, campsites, and hostels). Of the remainder, around a fifth serve food premises (24%) and 17% 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). Table 3 also highlights where highly vulnerable

individuals are exposed to private supplies, for example, there are private supplies serving 39 hospitals and 41 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 the 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 take into account 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 transposes into law, actions required under Articles 3, 7, 8, 9 and 13 of the European Union (EU) Drinking Water Directive to safeguard human health and inform 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

Local authorities were given five years from 1 January 2010 to 31 December 2014 to identify and risk assess all relevant private supplies in their area and the Inspectorate has reported on progress each year. The methodology of risk assessment is based on the World Health Organisation's (WHO) *Guidelines for Drinking water quality*¹ and *Water Safety Plan Manual*² and local authorities have been provided with a risk assessment tool³ 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

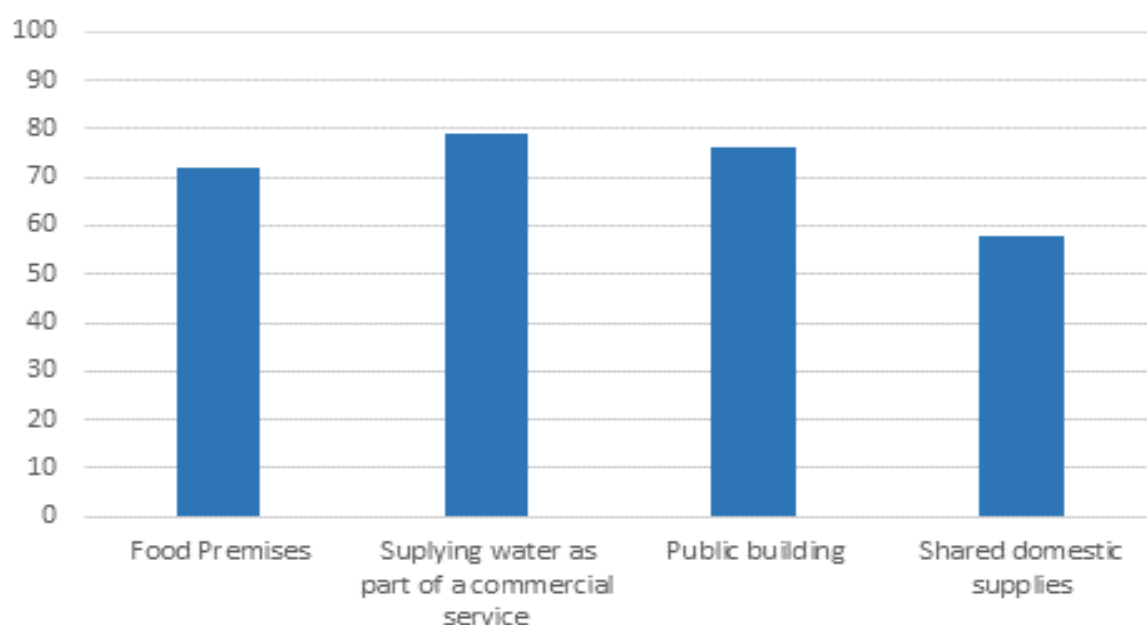
Use of supply*	Percentage of reported supplies risk assessed with risk assessment in last five years 2014-2018**	% of risk assessments in place				Total number of risk assessments in place**
		Food premises	Premises supplying water as part of a commercial service	Public buildings	Shared domestic supplies	
East Midlands	61	63	76	58	49	272
West Midlands	51	77	78	76	30	592
East of England	65	78	67	72	60	838
North East England	69	54	80	68	60	540
North West England	57	67	71	72	49	1,201
Yorkshire and Humberside	75	83	81	68	71	1,321
London and South East	75	73	80	76	79	583
South West England	67	67	85	88	60	2,382
England Total	64	72	79	76	58	7,729
*Double counting may occur as some premises have more than one commercial activity.						
** England - Includes all Reg 8, Reg 9 and Reg 10 supplies.						
Wales – Includes all Reg 8, Reg 9 and Reg 11 supplies						

In England the number of relevant private water supplies that had been risk assessed was 7,729, just under two-thirds (64%) of those required. This compares favourably with the situation reported in *Drinking water 2014* where only 55% of risk assessments had been completed and a slight reduction from 2017 where 67% of risk assessments were completed. However, it highlights that even five years after the deadline for completion of all private water supply risk assessments, there is still a substantial gap in securing safe drinking water supplies. In addition there are notable regional variations, for example in the Yorkshire and Humberside area, 75% of risk assessments have been completed, despite that area having the second highest total number of risk assessments to complete (1,321). In contrast, East Midlands and West Midlands have completed a relatively small

proportion (61% and 51% respectively) while having a lot fewer risk assessments to complete (272 and 592 respectively).

Local authorities were advised to prioritise risk assessing those private supplies which are reportable under the EU Drinking Water Directive and are used in the provision of services to the public (known as Regulation 9 private supplies). From Figure 5 it can be seen that this approach has generally been followed across England with higher levels of risk assessments having been completed these types of private supply: public buildings (76%), food premises (72%) and Bed and Breakfast/Hotel establishments (79%).

Figure 5: Percentage of risk assessments carried out



Considerable variability remains in achieving full risk assessment of supplies. In the case of Regulation 9 supplies 22 local authorities did not have in-date risk assessments for any of their Regulation 9 supplies. This was as a result of earlier risk assessments having expired after five years or the risk assessments having not yet been carried out or a combination of the two reasons.

Table 6: Local authorities reporting no in-date risk assessments for Regulation 9 supplies

	Reason (and if lapsed, year of initial assessment)	Number of supplies
Bassetlaw BC	Lapsed (2013)	10
Blackpool Borough Council	Not completed	2
Bolton Metropolitan Borough Council	Not completed	1
Bromley (London Borough of)	Not completed	3
Chiltern District Council	Not completed	1
Colchester Borough Council	Lapsed (2012)	2
East Staffordshire Borough Council	Lapsed (2011-2013)	4
Gravesham Borough Council	Lapsed (2013)	1
Guildford Borough Council	Not completed	1
Hart District Council	Lapsed (2012-2013)	2
Hartlepool Borough Council	Lapsed (2012)	1
Huntingdonshire District Council	Lapsed (2012)	1
Ipswich Borough Council	Lapsed (2010)	1
North Kesteven District Council	Lapsed (2013)	4
Reading Borough Council	Lapsed (2012-2013)	2
South Holland District Council	Not completed	1
South Ribble Borough Council	Lapsed (2013)	2
St Albans District Council	Not completed	4
Stoke-on-Trent City Council	Not completed	1
Teignbridge District Council	Not completed	100
Three Rivers District Council	Lapsed (2013)	3
Westminster City Council	Lapsed (2012)	1

The numbers of Regulation 9 supplies not risk assessed by these local authorities is small with most only reporting one or two supplies in this category, 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. This may be as simple confirming nothing has changed with a risk assessment. The exception is Teignbridge where there is no report of any of the 100 Reg 9 supplies in its area having been risk assessed. The Private Supply Team will liaise with the Local authority to establish the circumstances around this.

The more detailed information in *Annex 1* shows that, overall, 74 local authorities achieved 100% compliance with the duty to risk assess all relevant (Regulation 8, 9 and 10) private water supplies in their area.

In 2012, the Inspectorate developed an Excel based risk assessment tool to assist local authorities in England and Wales discharge their duties to carry out risk assessments. This was to replace an existing tool which users were finding unsatisfactory for a number of reasons.

During 2016, the Inspectorate, in response to user feedback, improved the 'lite' tool, which unsurprisingly had become the more common tool used by local authorities. Although local authorities found the tool easier to use than the original full version, they were experiencing difficulties due to compatibility issues with more recent versions of Microsoft Excel.

In 2017, the tool was modified to make its use simpler without losing key functionality, not least the need for an action plan to result from any hazards or groups of hazards that presented high or very high risks. Following beta testing by some local authorities, notably Powys County Council in Wales, version 2 of the Risk assessment 'lite' tool was released on the Inspectorate's website in September 2017 along with a training package. In the months following its release, the Inspectorate received several contacts from local authorities who had noticed some small software issues that were preventing the tool from operating effectively, which were subsequently fixed.

While in 2017, an updated Risk Assessment Lite tool V2 was introduced and made available, 2018 saw the release of the remaining three tools into the new format with improved functionality and a new interface. All tools still exist within the Excel format and are accessed via the DWI private water supplies webpages.

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 being 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,

After the first full year of the amended regulations in England (revised regulations in Wales) requiring the submission of risk assessment summaries of private water supplies, which are assessed as being either high or very high risk to consumers, the Inspectorate has received, to date, 320 risk assessment summaries.

The most popular risk assessment tool was the 'lite' version having been used 276 times, but the full tool had also been used for a substantial proportion of the assessments (38).

34 Local Authorities have submitted risk assessment summaries to the Inspectorate in 2018. The highest number of high and very high risk supply summaries were submitted by Powys and Cornwall. No risk assessment summaries were received from the remaining 315 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.

Table 7: Type of tool used for risk assessments submitted to the Inspectorate

Tool used	Number of times tool used
RA Full	38
RA Lite	276
Reg 8	6
Toilet flush	0
Total	320

Table 8: Type of supply assessed

Regulation type	
Regulation 8 - Private Distribution Systems	5
Regulation 9 - Large supplies (10m ³ /day or more) and those used as part of a commercial or public activity	180
Regulation 10 (England) – Small or shared (>1 property) supplies, up to 10m ³ day	57
Regulation 10 (England) - A supply to a single dwelling not provided as part of a commercial or public activity	8
Regulation 10 (Wales) – A supply to a single untenanted dwellings only not used as part of a commercial or public activity.	1
Regulation 11 (Wales) - Shared supplies to >1 properties up to 10m ³ day and those to single tenanted dwellings.	69
Total	320

To date the quality of submissions has been variable with some local authorities choosing to save the files as PDF documents or Word documents which require additional time spent by the Inspectorate to either request the correct data submission or make amendments to the submitted data format so it can be loaded. Local Authorities are requested to submit the summaries by simply copying and pasting the summary worksheet into a blank email and sending this to the DWI Enquiries mailbox.

The Inspectorate is seeking to develop an online risk assessment tool similar to ones which are currently utilised by colleagues in Scotland and Northern Ireland. It is hoped that the online risk assessment tool will add additional features to the current, Excel based, tool such as the ability to produce a location map of the supply, upload schematics and photos and potentially to use as a store for sample results which will make the annual data return to the Inspectorate automated

3.2: Risk Management

Risk management, in the context of the private water 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 particular 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 in light of knowledge gained through the risk assessment about the particular 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 take into account the competence, attitude and behaviour of the supply owner/manager, thereby focusing their own resources proportionately towards those situations where they add

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 with regard to 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 as a consequence 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.

The Private Water Supplies (England) Regulations 2016 have been amended to close the previous gap whereby under Regulation 16 a local authority had an option, if it could not resolve the problem informally, not to serve a Section 80 Notice. In effect this meant that neither informal or formal action was secured to resolve a wholesomeness or sufficiency problem. The revised Regulations allow for a period of time to enable a relevant person to take action without the need for a Notice (28 days), after which a Notice must be served to secure the relevant improvements. The new Private Water Supplies (England) Regulations 2018 (which commenced on 11 July 2018) and the Private Water Supplies (Wales) Regulations 2017, give greater powers for local authorities to recover costs from 'relevant person(s)' for work carried out by third parties in default after non-compliance with required Notice actions.

Table 9 shows that in England in 2017 there were 362 private supplies in 72 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 2017 when 301 supplies in England were subject to such a Notice. Seventy-seven 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 10m³ per day.

Table 9: Number of supplies where local authorities have served Regulation 18 Notices in 2018

Region	Number of local authorities serving Notices	Reg 8	Reg 9	Reg 10	SDDW	Domestic - other	Total
East Midlands	12 local authorities	0	8	6	2	0	16
West Midlands	7 local authorities	0	21	1	2	0	24
East of England	8 local authorities	0	24	2	2	0	28
North East England	3 local authorities	0	8	0	0	0	8
North West England	9 local authorities	0	134	20	9	0	163
Yorkshire and Humberside	5 local authorities	0	14	3	0	0	17
London and South East	14 local authorities	0	27	8	0	1	36
South West England	14 local authorities	1	42	21	0	6	70
England total	72 local authorities	1	278	61	0	22	362

Table 10: Number of supplies where local authorities have served Section 80 Notices in 2018

Region	Number of local authorities	Reg 8	Reg 9	Reg 10	SDDW	Domestic - other	Total
East Midlands	1 local authority	0	1	0	0	0	1
West Midlands	2 local authorities	0	3	0	0	0	3
East of England	1 local authority	0	0	1	0	0	1
North East England	1 local authority	0	1	0	0	0	1
North West England	5 local authorities	0	17	3	2	0	22
Yorkshire and Humberside	1 local authority	0	2	0	0	0	2
London and South East	0 local authorities	0	0	0	0	0	0
South West England	5 local authorities	0	8	2	0	0	10
England total	16 local authorities	0	32	6	2	0	40

Table 10 shows that in England 40 supplies were the subject of a Section 80 improvement Notice, of which 80% were used in the provision of water to the public, for a commercial activity or which supply more than 10m³ per day. Half of these were served by local authorities in the North 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.

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, it is clear that in each year from 2014 to 2018, not all Notices have been sent as required. 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 2014-2018 has consistently shown that the majority of Notices are served in response to an exceedance of a microbiological standard. In 2018 76% 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 (8%). 5% of Notices were served in response to the identification of unacceptable risks to the supply identified during the risk assessment process.

In 2018 copies of 11 Section 80 Notices have been forwarded to the Inspectorate, the majority of these were served for issues surrounding insufficiency (55%). The second most common reason for serving a Section 80 Notice were due to exceedances associated with iron or manganese (27%). 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 work and charge back the cost .

Advice to Local Authorities

In *Drinking water 2017*, the Inspectorate gave advice to local authorities as to how to appropriately issue a Notice. This follows on from a detailed review of Notices which had been served. The advice is repeated below:

- Copies of Notices are required to be provided to the Drinking Water Inspectorate and should tally with local authority data returns.
- A Notice **MUST** be served where a potential risk to human health has been identified
- A Notice must be clear as to why it is being served (the grounds) and where water is unwholesome, the reason for this should be recorded;
- Notices should be served in response to deficiencies and risks identified from the risk assessment process and not only in response to sample failures;
- Notices should be unambiguous, contain appropriate short, medium and long-term actions for mitigation with clear accountabilities and timelines being documented;
- Notices should not be used as a mechanism to restrict supplies (boil water, do not drink, do not use) for an indefinite period.

Notice Examples

To help assist local authorities with correct Notice preparation, examples and explanations of common issues found with Notices which have been issued to supply owners are provided below. Common issues have been identified in following themes:

- Restriction of use advice (short term measures to protect health)
- Long term actions
- Notice formatting

Restriction of use advice (short-term measures to protect health)

There are three types of restriction of use advice which are available to local authorities to restrict consumers from using the supply. The type of restriction of use advice will depend on the type and health implication of the contamination identified or suspected to be in the supply:

‘Boil Water Advice’ is required when microbiological contamination has been identified or is suspected. By advising consumers to boil the water before

consumption, any microbiological contaminants that are present in the water will be rendered harmless.

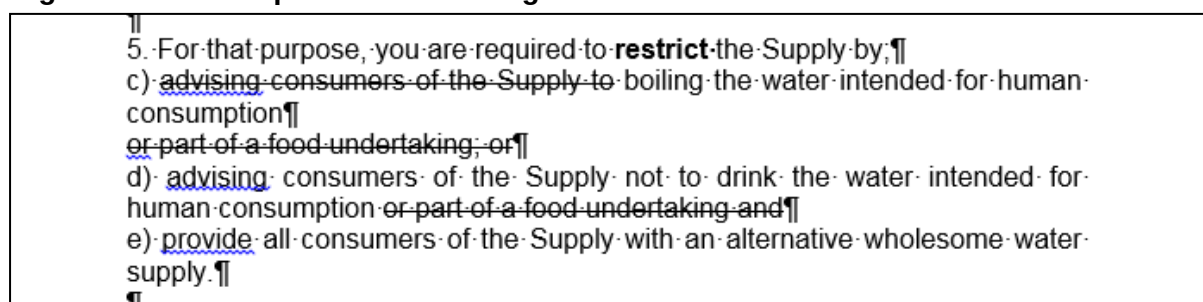
‘Do Not Drink’ advice is required should chemical contamination be identified or is suspected in the supply. By advising the consumers of the supply not to drink the water, the risk of exposure to the contaminant will be reduced. By issuing the ‘Do Not Drink’ advice the water supply can still be used for other purposes such as bathing and toilet flushing.

‘Do Not Use’ advice is required should the use of the supply pose such a risk, or potential risk (such is the concern) that it shouldn’t be used for any purpose. For example levels of a chemical contaminant may cause skin irritation as well as being unsafe to drink.

It is advised that local authorities liaise with public health colleagues when determining the correct type of short term restriction of use advice.

Common issues with the issuing of restriction of use advice have been identified including the issuing of more than one type of advice. An example of incorrect advice has been given below. This Regulation 18 Notice was issued following the identification of microbiological contamination and the short-term measure to protect health should be to boil the water before consumption. However in this example the Notice also included advice not to drink the water and to provide an alternative supply. This is confusing as the boiled water will be safe to drink so there is no need to instruct consumers not to drink it and similarly there is no need to also provide an alternative supply. The Notice templates that are provided on the Inspectorate’s website have standard text for the different types of restriction of use advice, the most appropriate text should be used and the other options deleted so this is not ambiguous to the users the Notice is served on.

Figure 11: Example of confusing short-term restriction of use advice



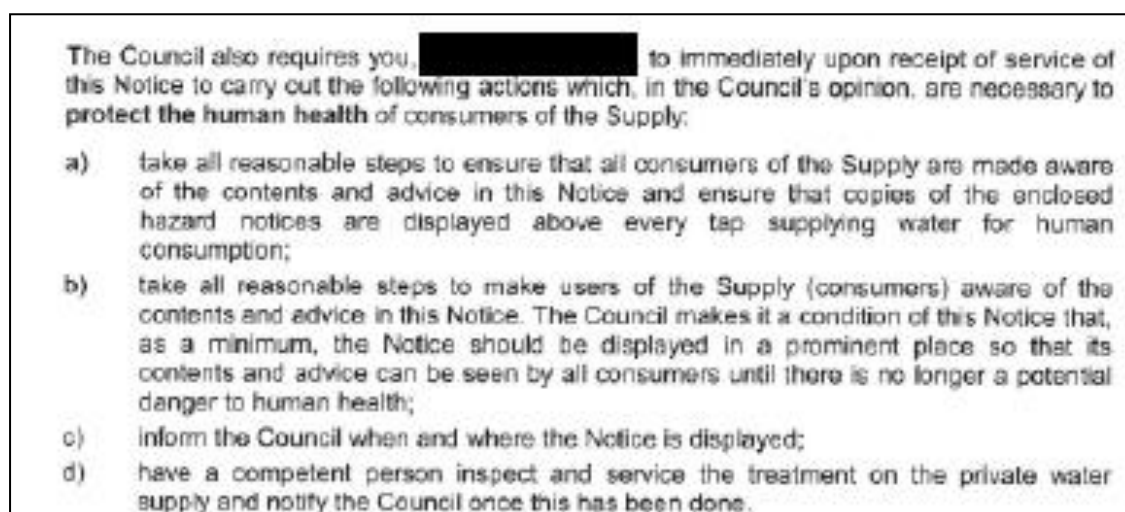
Long-term Actions

Regulation 20 and Section 80 Notices should always contain longer-term actions requiring the relevant person(s) to complete remedial measures to make the supply wholesome. In some circumstances it may be that a Regulation 20 Notice is required to be served immediately with short-term measures to restrict the supply when investigations into the cause of the problem which is causing a potential/actual danger to health is investigated. In these circumstances the investigations should be completed as soon as possible and an amended Notice should be served with the longer-term actions included. It is not acceptable for a Notice with restriction of use advice to be in place indefinitely with no longer-term actions included or subsequently identified.

Local authorities are reminded that long-term actions should be appropriate to the identified risk and fully mitigate the issues. Notices reviewed by the Inspectorate have identified inadequate longer-term actions. For example, one Notice included steps to inspect and service a treatment system which was served in response to a microbiological failure.

However the inspection and service of the treatment system alone may not be sufficient to remove the microbiological contamination. The wording of the Notice should have been more explicit to ensure that any work completed on the treatment system or supply was sufficient to mitigate the existing risk and therefore deliver water to the consumers which was compliant with the standards set out in the regulations.

Figure 11: Inappropriate Notice wording on long term actions to improve treatment on a supply



The following example also has inappropriate longer-term actions detailed which may not fully mitigate against the risk to human health, in this case microbiological contamination. In this example, requiring a relevant person to satisfy themselves an essential treatment stage such as UV treatment is 'working properly to ensure a wholesome supply' is not specific enough and should require them to ensure any pre-treatment is effective and that the equipment is operating and being maintained within the conditions for which it was designed and to manufacturer's instructions (e.g. frequency of bulb changes).

Figure 12: Vague long-term remedial measures wording

4. For that purpose you are required to **restrict** the supply by:

a) advising all consumers of the supply to boil the water intended for human consumption within the next 24 hours

The supply will remain restricted until the Council is of the opinion that the supply is no longer a potential risk to health or the requirements of a) to c) below have been met:

5. The council also requires you to carry out the following actions which, in the Council's opinion are necessary to **protect the human health** of the consumers of the supply by **1st May 2016**

a) advise consumers of the water supply at the above two properties to boil their water before consumption

b) check with [REDACTED] and [REDACTED] whether the water supplied to the farms is used for human consumption and if so advise the occupants of the contents of this notice and to boil the water before human consumption

c) check the condition of the point of use treatment is the pre-filter and UV [REDACTED] and [REDACTED] and satisfy yourself that this is working properly to ensure a wholesome water supply

Please see the conditions overleaf.

It is an offence to fail to comply with this Notice

Another common long-term action which was identified during the review of Notices which is inappropriate is the instruction to undertake a one-off chlorination or chlorine flush of the supply system, without any other specified remedial actions. Chlorination of a supply or part of a supply alone is not an appropriate long-term measure, as it simply ensures short-term compliance with microbiological standards and does not address or mitigate the root cause of the contamination. Until that has been identified and remediated it will only be a matter of time before the supply becomes unwholesome and a potential danger to health again.

Figure 13: Inappropriate long-term actions to chlorinate the supply system

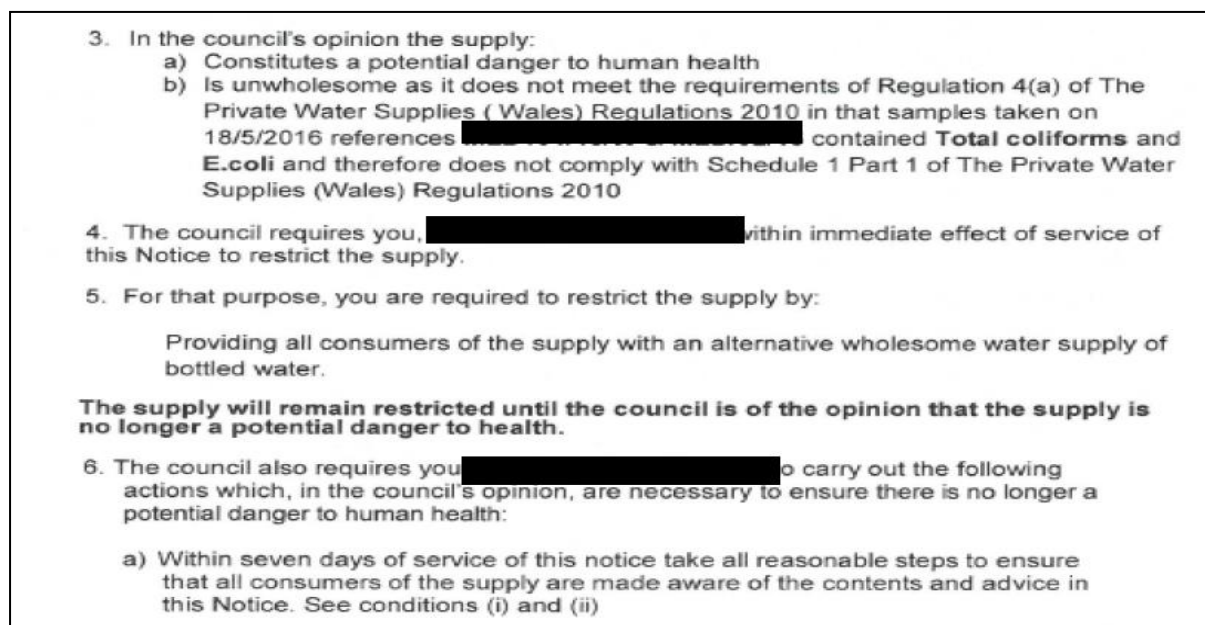
6. The Council also requires you, A [REDACTED] to, upon service of this Notice, carry out the following actions which, in the Council's opinion, are necessary to **protect the human health** of consumers of the Supply:

(a) Employ the services of a water treatment specialist to undertake a professional chlorine flush of the whole water supply.

These works must be completed within 56 days of the date of this Notice.

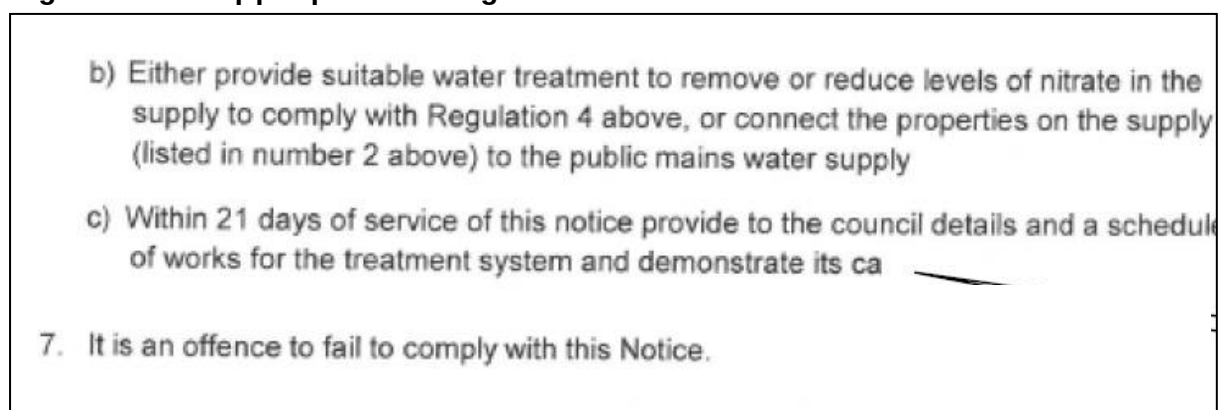
Long-term measures should be appropriate for the hazard that has been identified from either the risk assessment or due to identification of contamination through sampling. The following Notice example requires the relevant persons to provide bottled water when boiling would have been a more appropriate action.

Figure 14: Inappropriate short term restriction of use advice



In the following example the long-term action specified is to install treatment to reduce nitrate levels, despite the grounds for the Notice being a microbiological failure. While some treatment stages contribute to the reduction of a number of different parameters by physical or chemical means, nitrate removal treatment does not mitigate a microbiological risk. Note that there is also an unfinished sentence in action c).

Figure 15: Inappropriate mitigation actions



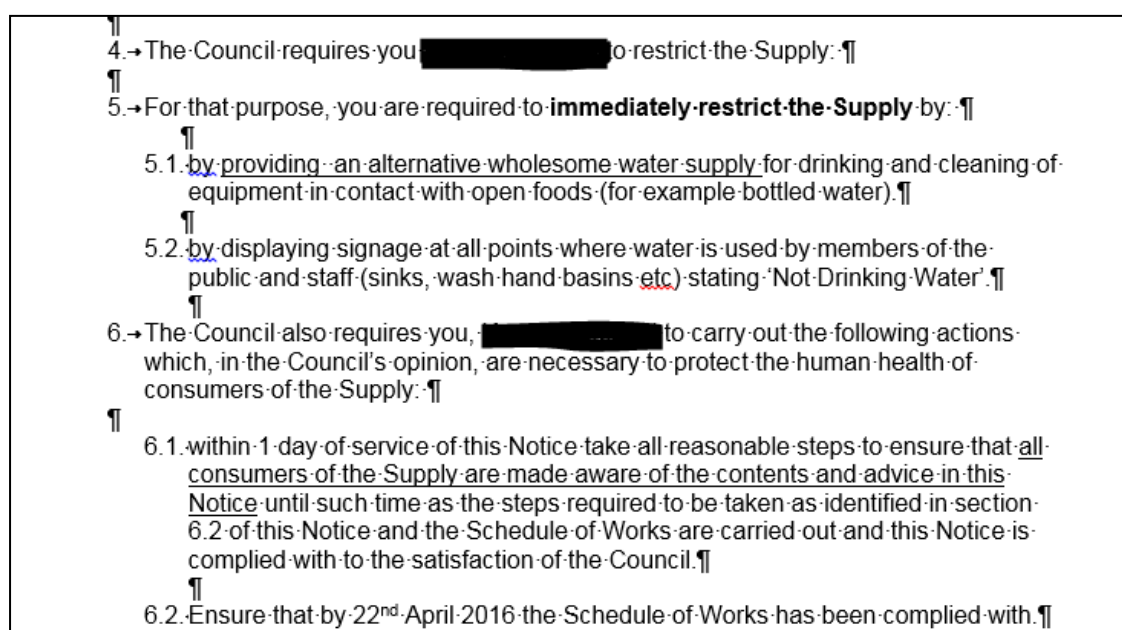
Local authorities are also reminded to consider the multi-barrier (source to tap) approach when specifying longer-term actions. For example source improvements identified from the risk assessment should be considered being specified in a Notice as well as just the installation of a treatment system. Having a secure, well protected source, will help prevent ingress of contaminants into the supply. It is important to reduce the chance of contaminants entering the supply rather than just relying on a the treatment system to remove or render harmless. During periods of heavy rainfall it may be that the treatment system may not be able to cope with a large increase in contamination and source protection measures will help reduce the likelihood of contamination entering the source.

Both the short-term and long-term mitigating actions should include an appropriate timescale for completion. The timescale will be dependent on the required action, some actions can be completed relatively quickly however more complex actions such as repairs to sources or installation of treatment may require more time to complete. Local authorities are advised to use judgement on a case-by-case basis when detailing the timescales to complete remedial actions.

Notice Formatting

In this example (Figure 17), the Notice refers to actions being completed which are detailed in a Schedule of Works, however, no schedule of works was attached to the Notice. Local authorities are advised to include short and long-term mitigating actions in the main body of the Notice so these are clear and visible to the relevant person. It is not necessary, nor deemed appropriate, to have a separate document appended to the back of the Notice.

Figure 16: Formatting issues



Other common issues with Notice formatting include references to previous versions of the regulations, Notices not being dated, not having a reason included as to why they are being served and not having a unique reference number.

Local authorities are reminded to:

- Use the most up-to-date template. Refer to the Inspectorate's website as the templates are updated from time to time;
- Address Notices to all relevant person or persons;
- State reason why they are served;
- State the name of supply;
- Have a unique reference number;
- Date the Notice;
- Ensure Notices are signed.

In summary:

- Notices should include all relevant details and be formatted in accordance to the template (the relevant person the Notice is served on, state the reason why it has been served, have unique ref. no. Notices must be dated.
- Have clear, unambiguous short-term measures to protect health (boil advice or provision of alternative supplies);
- Have clear, unambiguous longer-term measures to protect health;
- Consider multi-barrier approach;
- Both short and long-term measures should be suitable and have appropriate deadlines.

Appeals

In 2018, In England, two Section 80 Notices were appealed by the relevant person(s) on whom they were served. If there are any objections to Notices served, the Inspectorate hears the appeal in the most appropriate forum; it may be dealt with by correspondence (exchange of information), a meeting between the key parties may be held, or a public meeting can be convened. Once all the available and relevant information has been assessed, the Chief Inspector may decide to uphold the Notice with or without modification, or revoke it. The appeal process can be found on the Drinking Water Inspectorate's website and requires the local authority to inform the

Inspectorate of any objections raised, details of the objections, and a copy of the original Notice. Both of these are explained in more detail as case studies below.

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 2018, 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 2018* 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> on the Inspectorate's website.

Case Study 1: Rainwater harvesting private water supply

This case study concerns a private supply which uses rainwater as the source. The supply feeds an 'off grid' eco centre, which is used as an educational centre and hosts events such as weddings. The supply is classed as a Regulation 9 supply as the centre is used by members of the public. A rainwater harvesting system collects rainwater from the roof area which then goes through a coarse gravel screen, a vortex filter, four storage tanks, pumps, two filtration units and UV disinfection. The supply feeds a kitchen area and bathroom facility with a shower.

The local authority served a Regulation 18 Notice in 2012 due to the supply being identified as a potential danger to health following detections of *E.coli* and Enterococci in samples collected from the kitchen and bathroom taps. The Notice specified restriction of use advice (boil water and do not drink advice) and prohibition of use for toilet flushing and showering. The specification of both 'boil water' and 'do not drink' advice is confusing, typically 'boil water' advice is sufficient where there is a microbiological contamination concern. The Notice included a longer-term step requiring the supply operator to provide, within 28 days, a report detailing measures to be taken to ensure compliance with the standards. No long-term mitigation measures were included such as the implementation of suitable treatment upgrades and ongoing management and maintenance.

Local authorities are reminded of the need to have clearly defined and appropriate remedial measures specified in Regulation 18 Notices both in the short to medium-term AND in the long-term, along with reasonable timescales for their implementation. Regulation 18 Notices should not be used purely as restriction of use Notices, a measure which should only serve as a means of short-term protection whilst other more permanent solutions are sought and put in place.

No further work was carried out to improve the supply at the eco-centre until 2017 when the rainwater harvesting treatment facilities were upgraded. A new UV treatment system was installed which was capable of treating the microbiological quality and anticipated flow of the harvested water. Further samples collected in 2017 and 2018 verified that the treatment system was working effectively due to the absence of microbiological indicator organisms. However the samples did show that antimony was present in excess of the regulatory standard. Antimony is a metalloid and is unlikely to be found in the source (rainwater), thereby indicating that the contamination must have been associated with the 'catchment' (the roof), the treatment process or domestic distribution system.

A subsequent site visit to carry out a Regulation 6 risk assessment identified that solar panels had been installed on the eco-centre roof from where the rainwater is harvested. Antimony is a common component of solar panels and is therefore a potential source of the antimony detected in this supply. However, the local authority did not further investigate the cause to narrow down the likely source of the contaminant. Local Authorities are encouraged to carry out comprehensive investigations as required under Regulation 16 (18 in Wales), which should include sampling at the various stages from source to tap in the supply system. This can help determine where a contaminant may be entering the system, so that suitable mitigation measures can be considered and implemented.

This case study illustrates the importance carrying out timely and thorough investigations into the source of contamination, as required under Regulation 16 (Regulation 18, Wales). Local authorities should also be issuing Regulation 18 (Regulation 20, Wales) Notices with clearly defined long-term measures, to suitably mitigate any risk where the supply presents a potential danger to human health, with appropriate short-term actions and appropriate deadlines .

Figure 17: Solar panels installed on the roof which is used for rainwater collection.



Case Study 2: Prosecution for non-compliance of Regulation 18 Notice

This case study concerns a supply to a salad growing nursery in the south east of England. This is one of a number of such nurseries, which formed the basis of previous case studies in the Chief Inspector's reports of 2015 and 2016, which detailed the wider issues and associated disputes between the parties concerned. As this case study illustrates, remedial work to mitigate the risks at these supplies remains ongoing and can be very protracted, although some are now on a public supply with consumers now enjoying wholesome water.

In this particular case the supply was deemed a potential danger to human health in September 2017 by virtue of the risk assessment and the repeat detection of faecal indicators. The risk assessment highlighted a number of very high-risk hazards including lack of segregation of irrigation water and domestic water as well as those related to poor asset quality. Resident migrant workers were subsequently compelled to boil the water before consumption to protect their health until further Notice. Two months later, in November, the council then served a Regulation 18 Notice on two relevant persons giving them four months to comply. The Notice set out two options; the owner must either provide a wholesome mains supply, or improve the existing private supply by completing a list of specified actions. The owner subsequently confirmed that, on exploring both options, the situation was that a mains connection was too expensive, so his preferred option was to improve the existing supply. This was accepted by the local authority who amended and extended the Notice by two months to accommodate these agreed changes. Improvement works on site commenced in May 2018, but progress by the contractor to complete the work was slow resulting in the nursery owners requesting a further extension to complete the work. This was not granted as six months had already been agreed in total. The deadline for completion of work as specified in the Notice was eventually exceeded and the council duly initiated proceedings to prosecute the relevant persons for non-compliance with the Notice and failing to provide a wholesome supply within a reasonable timescale. A court date was set and a summons was issued for the Magistrates' Court for September 2018.

In mid-July 2018 an email was received by the council which confirmed that new treatment facilities (UV, filters and a pressure vessel) were in place. These treatment options were not part of the agreed solutions specified by the council in the Notices, and no post treatment sample results were provided by the contractor to the council to verify the efficacy of the treatment stages. This further raised the council's concerns about the adequacy of the work being undertaken.

Figure 18: Distribution pipework before major corrective work



The council instructed that further work on site ceased until they had undertaken their own site inspection to satisfy themselves that the remedial works were appropriate and progressing in accordance with the terms of the Notice. This inspection, which was carried out at the start of August, revealed a series of inadequacies related to the suitability of the above-ground pipework, the depth of the below-ground pipework, the protection of the borehole against ingress and the UV alarm mechanism. The contractor had inserted a pump to draw water from the brick lined well which the council had specified needed to be made water tight. The area had many other horticultural nurseries and private sewage systems within a small geographic area, which may in part have caused the original bacterial contamination.

Figure 19: Water storage facilities prior to improvements



In September an adjournment of one month was agreed between the defendant's solicitor and the council's legal executive to allow completion of works. In mid-September the contractor for the remedial work on site proposed a new schedule of work for the site in order to comply with the Notices. After a few amendments were agreed, including filling and sealing the well, it was approved by the council and mostly completed by early October. A site inspection was conducted by the council later that month, but they confirmed their intention to proceed with the planned prosecution as there was insufficient time to verify the efficacy of the solution through sampling prior to the now imminent court date. One day prior to the planned court date, the site owner's solicitor submitted a lengthy document as mitigation to the council and requested the prosecution be dropped. The request was declined due to the lack of time to review such a document.

Some months earlier, in August 2018, the council had received confirmation that the supply owners had submitted an appeal to the Court objecting to the original Regulation 18 Notice on the grounds that the conditions in the Notice were unreasonable. The council responded to the points in the appeal to the site owners' solicitor and also requested that the Court reject the appeal because it was well outside of 28 days in which the Notice specifies an appeal should be submitted.

The case was finally brought to court in October and one of the two relevant persons was found guilty and fined by the magistrate more than £500 and ordered to pay council fees and a victim surcharge, bringing the total to around £1,150, for supplying water that presented a danger to human health. It should be noted that the Magistrates themselves were unsure on the associated penalties for such an offence as they had never seen a case like it. The council agreed to withdraw the prosecution in relation to the second relevant person on the basis that among other factors, the first had pleaded guilty.

Unfortunately, samples of the final treated water taken in October and November 2018 showed that the water remained unwholesome by virtue of concentrations of nickel, iron and pesticides which exceeded the regulatory standard. Iron in excess of the standard was found at all locations throughout the site, however the nickel was only found from the tap in the staff canteen. Upon inspecting the cartridge particulate filters on site, the owners found a very heavy orange iron-based particulate that will likely require further filters or an automated iron removal system to be installed. Following advice from the Drinking water Inspectorate the council was advised to serve a Section 80 Notice on the relevant persons, should the necessary work to mitigate these risks not be completed within 28 days, in accordance with Regulation 16 of the Private Water Supplies (England) Regulations 2016 (as amended). As the immediate health risks have been mitigated and microbiological contamination risk has been addressed, the Regulation 18 Notices were revoked.

In January 2019, the site owners confirmed to the council that they intended to urgently put in place measures to ensure that the water was wholesome and compliant with the regulatory standards and submitted potential solutions for approval. Nickel was not found in the raw water or any other outlets, so the contractor theorised that the source was be slightly aggressive, stripping nickel from fittings. The owners have now changed pipework and fittings within the staff canteen as the pipework to this tap was original and may have contained solder or fittings which were a source of nickel. The pipework feeding the rest of the site is new MDPE pipe and so does not have solder or fittings that could be leaching nickel. It is hoped that changing pipework will be enough to reduce nickel without further treatment.

This case study provides an example of where local authorities have successfully applied their enforcement powers to compel a supply owner to mitigate risks to health to its workers on a failing and deficient supply. This serves to remind other supply owners, notably those of the same local industry, of the importance of complying with regulatory actions specifying appropriate measures to protect human health when required to do so by the regulator. Failure to do so will be acted upon and is likely to incur unwanted financial penalties.

Case Study 3: Private water supply dispute and disconnection threat

This case study concerns a private water supply which originates from a well and supplies a house, and a downstream rented property constituting a Regulation 9 supply. 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 free supply of water through a pipe from the land owner’s premises to their property, which also allows them access onto this land to maintain a pump and carry out any other necessary maintenance and repairs. They also claim that the historical nature of the arrangement has conferred additional rights over this water supply by prescription.

Following unrelated disagreements and disputes between the relevant persons involved, the land owner decided he wished to terminate this private water supply. In order to secure the supply while the matter was being explored, the local authority served a Section 80 Notice, using their discretionary power under the Water Industry Act 1991, in March 2018, on the grounds that the 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. Their objections to the Notice were based on the belief that their deeds entitled them to a continued supply and therefore an alternative was not required. They asserted that intentionally terminating a wholesome supply (that was otherwise not a failing or unwholesome water source) was

outwith the scope of Section 80. They indicated their intent to seek an injunction to prevent the disconnection.

Objection or representations in respect of a Section 80 Notice are heard by the Chief Inspector of DWI (on behalf of the Secretary of State). Under Section 81 of the Act, he/she 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 occupier of the downstream property believed that the obligations or entitlements arguably afforded to them by a deed of easement on the premises prevented the land owner from taking the proposed actions to terminate the supply. In consideration of the appeal, the Chief Inspector concluded that determining a civil dispute and land rights are outwith the scope of the DWI. In this instance the Local Authority required the supplier to continue supply for a reasonable period of time until the occupier could source an alternative. The Notice was therefore upheld but advised all parties to seek legal advice. At this point in the process there is no right of further appeal. The Chief Inspector's overriding priority must be to ensure that a wholesome and sufficient supply is maintained.

The occupier of the downstream property, sought legal advice and initiated a Judicial Review of that decision. Judicial Review (JR) is the process where a judge reviews the lawfulness of a regulation, or action of a person or body exercising a public duty; in this case the decision to uphold the Notice by the Chief Inspector. In considering if the matter be subject to JR the presiding judge deemed that there was sufficient grounds to consider any easement or deed when considering a supply of water. As a result the supplying property must continue to supply water under the terms of the easement. To cease supply therefore would require a civil application to remove the easement.

The case highlights the impact of disputes between relevant persons involved with private water supplies where the origin of the dispute may have little to do with the supply itself and also the importance of establishing roles and responsibilities for any future maintenance or improvements to these assets. Establishing roles may well need to apportion responsibility for maintenance, provision of a supply and costs incurred by the local authority before any appeal can be fully considered.

Case Study 4 – Change of supply for long-term remediation

This case study concerns another example of a high risk private water supply at a salad growing nursery in south east England. In this instance the water was again derived from ground water sources and consumed by owners and migrant workers for domestic purposes, as well as used for watering crops. The supply was risk assessed in September 2017 and deemed to be a very high risk on account of a number of high risk hazards, all of which indicated that the supply was a potential danger to human health. Subsequent detections of *E.coli* and Enterococci from samples taken the following month further confirmed the risk and consumers were advised, by way of physically displaying Notices in positions on site where they were visible to consumers, to boil the water before consumption until longer-term mitigation had been put in place.

Figure 20 : Vegetation covering poorly constructed well cover



Figure 21: Supply pipework in an inadequate and unacceptable environment



Figure 22: Header tank with overlaid polystyrene strips as a cover



In addition to the microbiological hazards, sampling also revealed the presence of nickel and nitrate above the regulatory standard. The nitrate levels detected were 55mg/l so above the regulatory standard of 50mg/l. In November, subsequent to the previous advice to boil the water, the local authority wrote to consumers advising them of the further risk of elevated nitrate levels to infants, and highlighted that any visitors should be warned

not to make babies' feed with the water.

In December the local authority, somewhat belatedly, served a Regulation 18 Notice on the owners of the supply. However, this delay was brought about by a lack of information to enable the local authority to establish who exactly the relevant persons were. Confusingly, the Notice specified short-term restrictions of use by means of either *boiling the water* or *not using it* for drinking, cleaning teeth, food preparation (includes ice cubes and salads) cooking, preparing babies' feeds, washing open wounds and for disinfecting feeding equipment. The risks from nitrate and nickel would not have been addressed by boiling the water.

Local authorities are advised to serve Regulation 18 (Regulation 20 in Wales) Notices as soon as practicable – for example where a potential danger to human health has been identified through the risk assessment, rather than reactively and later when a parameter has breached its respective standard. This should not preclude them from providing restrictions of use advice in the meantime, whilst the Regulation 18 Notice is being prepared. Appropriate restrictions of use should be based on health advice from Public Health England (or Public Health Wales) taking into account all breached parameters and based on the worse case. In this case advice was confusing and consumers would have been better advised not to use the water at all and to seek other alternatives, such as bottled water. The owners were advised to seek long-term mitigation through a connection to a public supply or to substantially improve the supply to the satisfaction of the local authority. The owners submitted an application for a mains connection to the local water company in February, who responded after some delays in payment, by April by stating that a connection was highly unlikely due to the distance from the nearest main. The owner was advised to approach any private pipe owners in the vicinity of the site. Unhelpfully the water company did not provide a connection estimate.

In February 2018, the local authority revisited the supply and collected samples from one of two well sources to determine the concentrations of a range of chemical parameters in the source water contained within the local aquifer. The water from this well was reportedly only being used for irrigation purposes.

The results for nickel and nitrate were again above the regulatory drinking water standard. The site owners were advised that should they wish to continue using the supply, appropriate and extensive treatment would be necessary to mitigate the existing chemical risks.

In March, in view of the approaching deadline for the completion of remedial work specified in the Notice, the local authority was informed, by the site owner, that they were still waiting to hear from the water company with regard to their application to connect to the public supply. As the deadline for the connection drew nearer it became increasingly apparent to the owner

that the water company would not meet the deadline set by the local authority to mitigate the risk, due to delays caused by the water company, and hence were beyond his control. In response to this the owner asked the local authority if the completion date could be extended to the end of June, which was granted. The connection to the public supply met the revised deadline.

This case study illustrates that where co-operation exists between relevant persons and the local authority, remediation can be achieved in a reasonably timely manner. In this instance the necessary work was held up, although it was through no fault of the owner and the local authority were content to extend the completion deadline to accommodate the delays caused by the third party. However in practice the timely resolution in this instance was largely due to the presence of a ready solution (i.e. connecting to a private main nearby), enabling the owners to put in place a relatively affordable, long term, sustainable solution.

Local authorities are reminded that Regulation 18 (20 in Wales) Notices must be served as soon as a potential danger to human health is identified by the risk assessment. Confirmation, by way of sampling, only causes further delay in protecting consumers, and the information it provides is limited by the number of parameters analysed for. Furthermore, where regulatory standards are met through sampling, it does not necessarily evidence that a supply is safe at all times, or negate the need to serve a Notice based on potential risk. In this case the local authority did, however, seek to immediately protect consumers by the provision of restriction of use by boiling the water, but this did not take into account potential risks of chemical contamination, such as nickel, that were later confirmed by sampling. Appropriate restriction of use should be guided by advice from health professionals.

Case Study 5: Long standing water quality contamination

In October 2018, Inspectors met with representatives from a local authority in North Wales to provide advice in relation to mitigating some long-standing water quality risks associated with a Regulation 9 private supply in their area. This supply is derived from a stream, located about a mile from the properties supplied and had a history, over many years, of elevated iron levels and periodic detections of microbiological indicator organisms associated with the source water, which had led to a loss of confidence in its fitness for consumption by consumers. The supply in question serves around 100 residential chalets, some of which are occupied as permanent dwellings, while some are let as holiday homes and therefore subject to transient use for part of the year. This site and its supply are positioned in an elevated and exposed rural location, which experiences extremes of weather. The owner of the land, including initially the land where the source is located (the owner later sold this part of the land), and the commercial holiday business,

does not live on site but nevertheless exercises control over the supply without permanent on-site assistance. In 2011, when the local authority carried out its initial risk assessment the raw water was being filtered through sand. The local authority had concerns around its effective management and maintenance and bromine was being used as a disinfectant, which the local authority correctly deemed inappropriate. The water was then pumped to storage vessels before being piped to consumers' properties.

In April 2011, the local authority served a Regulation 18 Notice (now Regulation 20) requiring improvements to the supply. This resulted in the installation of a chlorine dioxide disinfection system in June 2011. At the same time a large treated water storage vessel was removed by the owner, possibly due to its poor internal condition, following advice from a contractor and new storage tanks were installed, along with locks on hatches and valves. However these new storage tanks subsequently became corroded due to their exposed location. The newly replaced treatment plant was installed in a garden shed, which afforded little protection and security.

Residents were reportedly suspicious about the quality of, or extent of, the works done, and a site visit by the local authority in 2011 revealed tampering with the treatment system, and padlocks sawn off the treatment hut door, which the owner attributed to the residents. The local authority suspected that, if this was the case, they were probably seeking to confirm for themselves that new equipment had been installed as they had no trust in the information that the owner provided.

Throughout the next seven years, regulatory samples taken by the local authority contained, periodically, elevated concentrations of iron, some of which were above the regulatory standard of 200µg/l. In addition samples taken in 2012, 2015, 2016 and 2017 contained *E.coli* resulting in consumers being advised to boil the water before consumption. The restrictions were lifted once satisfactory sample results were obtained and by November 2017 point-of-use treatment had been installed at some of the chalets to mitigate the ongoing microbiological risks in the longer term.

Despite this, consumers continued to experience discoloured water and although they regularly complained to the owner, he continued to refute that the supply was unacceptable and unsafe, and threatened to cut off both electricity and the water if they continued to harass him.

Furthermore, residents were not satisfied that these issues were being adequately tackled by the local authority to bring about a solution from the owner and they made a formal complaint to the local authority's ombudsman, whose investigation concluded that the council had acted appropriately. Unfortunately residents inferred from this that the council was protecting its own interests, and subsequently contacted Welsh Government, the Inspectorate and their local MP at various times asking for support.

Figure 23: Extent of discolouration of water



By 2016, the local authority were required to carry out another risk assessment of the supply as required under the regulations. On this occasion the local authority used the Inspectorate's risk assessment tool. This identified a number of high risk hazards and an action plan required the owner to complete a number of remedial actions to mitigate a number of high risks including work to clean around the abstraction point, cut back vegetation, remove sediment from the storage vessels (which appeared poorly maintained) and repair exposed pipes on the distribution network caused by storm damage.

Although the owner had employed a contractor to routinely take samples, there was no water safety plan in place for the supply and the owner refused to provide a schematic of the site, so preventing the local authority from fully assessing the extent of the supply. The local authority had limited confidence in management of the supply, and concluded that it was vulnerable. They also determined that the point-of-use devices fitted a year earlier were now blocked, a consequence of the persistently elevated iron levels, due to no effective removal and this was compounded by a suspected accumulation of sediment in the storage tanks.

The owner insisted that these were property specific issues caused by poor plumbing and as such refused to take responsibility for the cause. The owner did not complete the actions as required and in August 2018 the local authority served a Regulation 20 Notice compelling him to mitigate the potential danger to human health, which the various inadequacies constituted.

Various correspondence to Government departments came to the attention of the Inspectorate via one of the residents. The Inspectorate's main legislative remit for private water supply regulation is to provide technical advice to the regulator (the local authority), and as such and in view of the protracted nature of the issue, we subsequently met with the local authority concerned at their office in north Wales; a meeting which in part was attended by the site owner by invitation by the local authority. The Inspectorate concluded the following:

- The site owner's attitude and past behaviours suggested that he had no intention of mitigating the water quality risks and never had. Furthermore he considered that the consumers had no right to complain;
- The supply was a potential danger to human health by virtue of its lack of adequate treatment, management and maintenance;
- The owner appeared to have been poorly advised by his contractor when installing an iron removal process, which later proved inadequate for the raw water challenge;
- The local authority had chosen not to serve a Section 80 Notice at any time for unwholesome water (notably iron above the regulatory standard) due to the lack of consequences if not complied with. The only option open to them if the relevant person does not comply is to carry out the works in default. Although the costs of the work are technically recoverable from the relevant persons retrospectively, this has been shown to be a potentially lengthy, costly and unsuccessful;
- Although the local authority had acted on isolated parameter breaches over a prolonged period, and protected consumers in the short-term, it had not applied risk based methodology to effect a robust long-term solution in a timely manner. While sympathetic to their reasons, the local authority had not properly addressed the root causes of water quality risks using effective enforcement.

DWI recommended that the local authority update the current Regulation 20 Notice, or revoke it and serve a new one with a three month completion date for actions and, if this is not achieved to carry out the actions themselves, which is permissible and can be done at their discretion under Regulation 20 (7) and (8) of the regulations. Furthermore, that it should consider legal action, taken in the local Magistrates' Court, against the site owner for non-compliance with the Notice by virtue of inadequate mitigation of risks to human health. The local authority is currently working to implement these measures.

This case study illustrates the importance of ensuring that root causes of water quality risks are identified and mitigated in a timely manner. In this instance the cause of periodic sample result breaches was in part due to

poor supply infrastructure and inadequate treatment; however this was symptomatic of the fundamental inability and refusal of the person exercising control to adequately manage the supply. This was compounded both by the fact that the owner lived off-site, several hours drive from supply, and that his attitude and behaviour to residents led to their distrust and disrespect for him. Although the council broadly complied with their regulatory duties and endeavoured to provide solutions, water quality parameter breaches continued to recur over many years, resulting in residents losing confidence in the quality of the supply.

These sample failures were almost certainly a manifestation of the deficiencies highlighted in the two risk assessments, which were never adequately addressed and remedial work was never completed. Any resamples that were satisfactory were considered, by the local authority, to indicate a safe and wholesome supply. However, these were only indicative of quality at the moment they were taken and in reality the supply was inherently a potential risk to health due to the deficiencies identified in the risk assessments. Although microbiological risks were mitigated to some extent (at least initially) by point-of-use devices in the chalets, these quickly became blocked and ineffective due to elevated iron in the raw water for which treatment was inadequate. Indeed this was verified by the results of samples taken by the owner's contractor, which the owner failed to act upon. The elevated iron in the final water was also self-evident by its visual appearance (see Figure 24).

The local authority chose not to serve a Section 80 Notice to the relevant person in response to elevated iron, which the Water Industry Act 1991 gives discretion over. Their reasoning was to avoid potential additional burdens, both to themselves and local residents; however unfortunately this only served to prolong the issue further without resolution. The Inspectorate has found that due to resourcing and financial constraints within local authorities, there exists a general reluctance to commit to the completion of remedial work in default, which further hampers any progress to fix the inherent problem and so creating ongoing. Furthermore local authorities generally continue to enforce under Regulation 18 (20 in Wales) only when an actual risk manifests through the detection of a health based parameter, rather than observed potential risk, as informed by risk assessments. Both deficiencies serve only to prolong and increase the risk to consumers, as this case study clearly illustrates.

Case Study 6 – Section 80 Notice appeal

In March 2018, a rural community in south west England, which is supplied by a Regulation 9 private water supply, experienced a loss of water and periods of insufficiency. The source of the supply is a spring supply that passes through an Ultra Violet (UV) disinfection unit before serving approximately 14 properties. The supply was originally utilised by a trading company set up by the farm owners in the 1980s for both their own domestic purposes and for watering cattle. When they purchased the farm an obligation came with it to maintain the part of the supply on their land and pay for a third of any costs in maintenance of the upstream part of the supply. They recovered these cost by charging the downstream users.

Following the episode of insufficiency in 2018 the local authority did not carry out a site investigation to determine the cause or extent of the issue. The local authority did however, serve a Section 80 Notice under the Water Industry Act 1991 for insufficiency on both the consumers and the trading company. The grounds for serving the Notice was described in the Notice as *'a total loss of pressure leading to a complete failure of the water supply'*.

In an effort to restore the supply as quickly as possible, some of the consumers conducted their own investigation into the cause of the insufficiency. The period of insufficiency had been caused initially by a burst on an unoccupied property following the freeze-thaw event (known as 'The Beast from the East' that occurred between February and March 2018). The increased flow-demand during the burst caused rapid drainage of the upstream storage reservoirs. This caused a decrease in pressure to an upstream property, situated on a branch of the distribution network. Consequently, the property owners operated a valve (that had not been identified as critical in the council's risk assessment) overnight to increase the pressure to their own property and by doing so, reduced the flow to the downstream network. The initial burst was addressed and the valve opened, restoring the supply to normal. Nevertheless its quality remained unwholesome, and in the subsequent view of the Inspectorate, a potential danger to human health. DWI based this on a previous 2016 asset condition report and the local authorities own risk assessment, which had been carried out in 2011.

Figure 24: Unmaintained spring



Figure 25: Tights being used as filters in a collection chamber



Figure 26: Sediment in pipework



Figure 27: Poorly constructed headworks on source



Following an earlier episode of insufficiency of the village supply in 2015, the trading company had ceased to accept any responsibility to provide or maintain the supply upstream of their farm and had stopped charging the villagers for the provision of water. This decision was a direct result of them being served a previous Section 80 Notice in 2015 to effect a solution. In this instance the Notice was also served on the basis that the water supplied was unwholesome by virtue of test results which exceeded the regulatory standards. The trading company appealed this Notice, which in turn was confirmed with modifications by the incumbent DWI Chief Inspector in 2015. These modifications required that an asset condition survey be undertaken on the supply by the trading company. This survey concluded that the supply had a number of deficiencies.

In response to this, the trading company informed users to seek an alternative supply. Representatives of the trading company, with other users, established a new company and constructed an alternative and entirely new supply, which was offered villagers in return for a connection fee, becoming a stakeholder in the company and ongoing liability for supply and maintenance costs. Although some villagers did connect to the new supply, many chose not to, partly through lack of confidence in the management of the supply and lack of funds, but largely because it believed the trading company was legally obliged to continue to provide and manage the old

supply under the terms of their property deeds. The consumers consequently continued to make regular payments into an account for the supply, despite the trading company no longer accepting the money on the basis that its responsibilities had ceased; a responsibility which they claimed was always undertaken entirely voluntarily. Those consumers still on this supply however, continued to use it, although being concerned for their safety in its consumption they first boiled it before drinking, cooking or cleaning teeth. Without any further maintenance and ongoing management the supply regularly lost pressure through leaks and burst pipes. Indeed such was the case at the time that DWI Inspectors subsequently visited the village in 2018.

Figure 28: Leak on the old supply



A number of representations and objections were made to the council by those served with the 2018 Notice, which was submitted to the Chief Inspector (as the appointed representative for the Secretary of State) for confirmation in April 2018. Under Section 81 of the Act, the Chief Inspector 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, the Chief Inspector may modify who the Notice is served upon or any other aspect of the Notice (e.g. time frames, remedial steps etc.). In this instance the villagers refused to accept any responsibility as relevant persons to mitigate the risks on the basis that they felt the trading company had legal obligations under the terms of their property deeds to provide them with a supply of water.

They further objected on the grounds that the alternative means of securing a safe supply of water as specified in the Notice were not feasible for various reasons, lack of funding being one of them. The options were (1) connecting to a public supply (2) sourcing wholesome water privately by any other means or (3) connecting to the new village supply. The trading company claimed that since 2016 they no longer had any responsibility to provide, maintain or manage the old supply and that they had met the terms of the 2015 Notice by offering an alternative supply to the consumers.

It should be noted that the 'relevant person' in relation to a private supply, is

defined in Section 80(7) of the Water Industry Act 1991 as; *The owners and occupiers of the premises supplied; and, the owners and occupiers of the premises where that source is situated (even if the source lies outside the local authority's area); and, any other person who exercises powers of management or control in relation to that source.*

Under Section 80(1) Notices can be served on one or more relevant persons as the local authority sees fit on a case-by-case basis. It is current understanding that where a dispute exists between relevant persons over the responsibilities to supply and maintain a supply, that the parties concerned must pursue the matter separately as a civil case by legal representation if necessary.

Between 19 June and 21 June 2018, all persons who made an appeal, as well as the council, were afforded an opportunity of meeting with DWI Inspectors, as appointed representatives for the Secretary of State, for this purpose. Other relevant persons were visited or given the opportunity to be visited to help inform the Chief Inspector's confirmation decision. As some of the representations and objections were sent directly to the Secretary of State, the Chief Inspector consulted the Secretary of State and Ministers prior to making/issuing his decision.

The Chief Inspector reviewed the 2018 Notice and concluded that it should be confirmed with modifications as summarised below:

The confirmed Notice (with modifications) was to be served upon more relevant persons than the original Notice (including those upstream of the storage tank who were previously excluded from the Notice).

The supply was a potential and actual danger to human health. As such, the requirement for wholesomeness was to be added to the confirmed Notice (with modifications), which had been originally served only on the grounds of insufficiency). Consequently the confirmed Notice would include the formalisation of boil water advice.

The Notice (with modifications) was amended to ensure that any new connections to the more recently constructed supply under the Notice only be made once the supply had been confirmed as wholesome by the local authority.

The confirmed Notice was modified to clarify that the existing older supply can continued to be used, provided it is made wholesome and sufficient through improvements.

The immediate timescale of the confirmed Notice was to be amended to a more practicable approach of a short, medium and long-term timescale.

The Chief Inspector also concluded that there was no decisive evidence to suggest that there was one specific appropriate relevant person and

therefore all the relevant persons should be included in the Notice and that this included the trading company.

The Chief Inspector and his representatives met with the local authority in February 2019 to relay his confirmation decision and the confirmed Notice (with modifications), was served on the relevant persons the next day.

This case study highlights the complexities involving a large private supply which becomes insufficient and/or unwholesome due to ambiguities around who is a relevant person and the wide differences in deeds and easements. Those consumers that were served the Notice appealed for reasons that amounted to a civil dispute over the terms of their property deeds. While it is reasonable to consider all deeds, where there are wide differences, relevant persons in the context of the Act's definition, are likely to be included if there is any control exerted on the supply system. The Inspectorate has interpreted the Act's definition of relevant person to include all person relevant to a private supply under the wording '*in relation to the source*' (as per the regulations) and within the spirit of the Act, i.e. including those that control treatment or any other part of the supply regardless of proximity to the borehole or well. This decision to retain the trading company as a relevant person was taken in the interest of human health protection.

This case study illustrates how the quality of a private supplies can deteriorate over time, in this case decades, where they are not properly maintained. Without sufficient maintenance a danger to human health and wholesomeness is presented. It is essential that all relevant persons agree unambiguously and in advance, who is responsible. This should include agreeing ongoing management and maintenance of the system, (according to written procedures and instructions), covering treatment, and distribution arrangements (including valve configurations), as well as ensuring that sources are robustly protected and treatment processes suitable and effective. It is the duty of local authorities to ensure such measures are put in place where this is not the case, by virtue of risk assessments using appropriate enforcement where necessary. Local authorities should not rely on testing alone to measure whether a supply is compliant with the regulations or not, which the Inspectorate has found to often be the case.

As this case study shows, where deficiencies exist, consumers can become at risk unless suitable action is taken proactively and, where necessary, reactively when supplies fail. It is unfortunate that the particular legal complexities surrounding this case has resulted in a divided community, many of which have lost all confidence in those that they consider accountable for the protection of their health.

It is anticipated that this case will help inform future confirmation decisions.

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.
- Outlines work carried out with local authorities in 2018

During 2018 one research project related to Private Water Supplies was completed (DWI 70/2/318) and a further two projects are continuing (DWI 70/2/319 and DWI 70/2/322). These three projects are summarised below and further information on these projects can be found on the Inspectorate's website.

Private Water Supply Zones Feasibility Project (Ref : DWI 70/2/318)

The aims of the project were to investigate the feasibility of grouping private water supplies into supply zones so that regulatory monitoring by local authorities could be reduced by sampling from a single source, which is representative of the water quality in those supplies across a defined area, and secondly to investigate how this may be best achieved. A supply zone is a geographically defined area within which water intended for human consumption is drawn from one or more sources and water quality may be considered as being approximately uniform.

The project was completed in late 2018 and proposed grouping criteria separately for surface and groundwater private supply sources using delineations such as Water Framework Directive water bodies, bedrock geology and aquifer vulnerability. Criteria were grouped in two different ways, one simpler and the other more complex.

The homogeneity of water quality within these proposed zones, and differences between them, were then assessed using historical water quality data from private supplies in two trial local authority areas: Conwy and West Dorset.

Historical water quality data was interrogated using a number of methods to determine whether or not the source water quality was consistent for the conceptual zones. Summary statistics for the conceptual zones and determinands were produced, but were not very useful in proving or disproving the hypothesis that the zones were consistent. Kruskal-Wallis tests for differences were used to determine whether the results from sample points within conceptual zones came from different distributions. However, it was found that there was not enough data per determinand at each sample point to complete enough analyses over the local authority area in order to

validate the conceptual zoning method.

For a limited number of conceptual zones and determinands, evidence of homogeneity was found using the Kruskal-Wallis test. These zones and determinands were taken forward to assess whether sampling rates could be reduced. If all the results for a conceptual zone and determinands were below 60% of the PCV then the number of sample points and the annual sampling rate was analysed. Where sample results were below 60% of the PCV there were a limited number of sample points. Based on this statistical approach, and taking account of risk, the annual cost savings by reducing sampling and/or individual analyses were found to be negligible for those parameters which could be grouped. Results indicated that only laboratory analytical savings would be achieved as the sample points would still need to be visited to collect samples for other determinands.

Due to limitations with the number of data points available, a harmonised and statistically acceptable approach has not been identified. The grouping of private supplies may be revisited in several years' time when more private water supply water quality data is available.

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

The aim of this project was 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 will also provide a means of justifying any decisions to the Commission in the implementation of the provision of Annex II of the Directive. 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 and is due for completion in autumn 2019.

Private Water Supply Chemical Disinfection Systems (DWI 70/2/322)

This project started in January 2018 and is due for completion in 2019. It is being undertaken by WRc on behalf of DEFRA. This project follows on from the Comparison of Private Water Supply and Public Water Supply Ultraviolet (UV) Systems (DWI 70/2/306) project by looking at chemical based disinfection systems. Like project DWI 70/2/306, this project will visit a number of private water supplies with relevant systems to provide empirical evidence to support any findings.

The objectives are to:

- Establish the range of different chemical disinfection types used on public and private supplies and establish the critical differences in functionality and application;
- Review International standards for chemical disinfection systems to compare validation criteria and identify which criteria would demonstrate suitability for use in private supplies;
- Produce simple guidance for private supply owners/users and local authorities to help in the selection and assessment of chemical disinfection systems used in private supplies.

On completion of the study, the report will make conclusions detailing the common types of chemical disinfection that are used in both public and private supplies and how disinfection is validated and verified.

Recommendations will be made as to how private supplies should be operated to ensure effective disinfection and provide good practice surrounding the storage and handling of disinfection solutions.

Recommendation will also be made surrounding monitoring of breakdown products in distribution when disinfection by chlorine dioxide is practiced.

ISO 17024 Sampler certification scheme

The Inspectorate has reported on the development of this scheme in previous annual reports. To summarise, the Private Water Supplies Regulations 2016 (as amended) in England and the Private Water Supplies Regulations 2017 in Wales were updated to reflect changes in EC Directive 98/83/EC. This includes an obligation to employ a system of control that is subject to checking, from time to time, by an approved body in respect of the collection, transport and analysis of samples for analysis under Regulations 8, 9, 10 and, in Wales, Regulation 11. The regulations require that this be in place by July 2020.

Prior to the transposition into the regulations of these requirements, the Inspectorate investigated options for achieving compliance with the Directive, and considered the practicalities, the accreditation options and

costs that this would impose on local authorities, who generally have small numbers of samplers.

The Inspectorate concluded that a scheme accredited to ISO 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 practise, and meets the regulatory required BSEN standards. A request was made to all local authorities who wished to take part in a pilot to trial the scheme to contact UKAS to register a willingness to participate. At the beginning of 2019, UKAS engaged with a prospective certification body on a pilot of the scheme which is expected to run between May and September 2019. Under this pilot scheme individual samplers will be certificated to sample in accordance with the regulations.

Following this, the opportunity to be certificated under this accredited scheme will be opened up to all individuals who sample private water supplies for, or on behalf of, local authorities, and to other organisations that wish to become UKAS accredited certification bodies to run the scheme. Local authorities should note that the scheme will certify individuals rather than organisations. Training and successful completion of an examination will lead to certification of individual samplers by a certification body. Certification will last for three years, following which time, individuals will be required to undergo re-assessment and in the meantime may also wish to undergo refresher training. The Inspectorate will initially be the scheme owner, but a certification body or other organisation may ultimately take this role. This will allow individuals to become certificated by the above stated deadline of 11 July 2020 when the requirement comes into force.

Costs of training and certification under the scheme will be determined by the certification body and the Inspectorate will publish more information on this and other aspects of the scheme following the successful conclusion of the pilot trial.

In the meantime, the Inspectorate encourages samplers and local authorities to familiarise themselves with and follow the sampling manual that has been published at www.dwi.gov.uk. This manual represents good sampling practice for private water supplies, and the scheme is based on this document.

Local Authority visits 2018

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 particular 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. While 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 2018, the Inspectorate carried out six visits to local authorities (Gwynedd, Doncaster, Stafford, Scarborough, East Devon and Hammersmith and Fulham). The reasons and conclusions for these visits are shown below:

Gwynedd Council

In November 2018 the Inspectorate met with officers and managers of Gwynedd Council in Wales in relation to long-standing water quality deficiencies at a Regulation 9 supply in its area. The issue was compounded by a civil dispute between the site owner, who exercises control and management over the supply and its residents who are consumers of the supply. The purpose of the visit was to provide advice to bring about a satisfactory solution to the root causes of discoloured water and breaches in microbiological standards, in light of numerous complaints from the consumers to the council's ombudsman, Welsh Government and Central UK Government. The Inspectorate considered that the owner had not complied with the Notice and provided an opinion to the local authority. The local authority may wish to pursue legal proceedings within the scope of their powers. The Inspectorate has agreed to assist the local authority if they wish to re-draft the Notice for the owner to make improvements in the best interest of public health.

Doncaster council

A visit to this local authority was selected because it has a large Regulation 9 supply, which provides water for domestic purposes at a hospital in its area. Part of the visit, which took place in October 2018, included an informal inspection of this supply. The visit also included a review of the local authority's last data return and its progress to date in terms of meeting its regulatory monitoring and risk assessment obligations.

Inspectors were very much encouraged by the positive and professional approach that the council is taking in respect of its duties under the regulations. They noted that some of the Regulation 8 supplies on the council's last data return were not within scope of the regulations but these would be removed from forthcoming returns. Inspectors also confirmed that the use of water at one of the private supplies on the council's record is not within scope of the regulations and is therefore not reportable as per Regulation 14 (2) of the regulations. The Inspectorate advised that the

council retains a local record of this supply should it become subject to Regulation 13 (new supplies) of the regulations at some time in the future. In all other respects officers were conversant with the regulations and up to date with their regulatory obligations.

Inspectors were pleased to observe that, as part of their visit to the said hospital supply, an officer identified a potential water quality hazard which was swiftly raised with the necessary relevant/responsible person to ensure that any risk it presented was mitigated in a timely fashion. The supply otherwise appeared well managed maintained with robust source protection and employing a multi barrier approach.

Figure 29: Robust source protection on a private supply to a hospital



Stafford Council

On 8 November 2018, an inspector met with representatives of the Environmental Protection and Environmental Health teams at Stafford Borough Council. The purpose of this visit was to review the council's progress to date in implementing the Private Water Supplies (England) Regulations 2016, as amended. This visit also included an informal inspection of the source and treated water storage facilities of a Regulation 9 supply, which uses the water in a food manufacturing process. The treated water is also used for domestic purposes by employees and the residents of a few neighbouring private dwellings, which formally belonged to the factory premises for housing some workers, under different ownership.

The Inspectorate concluded from this visit that the council was not complying with its regulatory obligations in full. Although it has a record of private

water supplies in its area, which it submits to the Inspectorate each year, this was inaccurate and was not being maintained or kept up-to-date. Furthermore, the council was failing in its duty to protect consumers by not fully investigating breaches of regulatory standards and not applying its enforcement powers where necessary. The visit to the supply, which serves a food manufacturing plant and some private domestic dwellings, identified a number of hazards. The council noted these hazards with a view to revisiting the supply to undertake a formal Regulation 6 risk assessment the following week.

The Inspectorate is of the view that, not uncommonly, the deficiencies were not related to complacency or a lack of understanding of the regulations by the officers responsible, but more a reflection of resource constraints and conflicts in prioritisation. We are concerned that the necessary time and focus on private water supplies was lacking, which in turn was hampering development of knowledge, experience and proficiency of officers in this field.

The Inspectorate is pleased to report that the council fully acknowledged the need to make improvements in line with its suggested actions. It subsequently developed a comprehensive action plan to address the identified shortfalls, the progress of which the Inspectorate may revisit at a later date.

Scarborough Borough Council

In February 2018, inspectors met with representatives from the Environmental Health service, at their council offices in Scarborough, the purpose being to review progress to date with regard to the council's duties to implement the Private Water Supplies Regulations 2016. It found that none of the advice provided to the council following an earlier visit in 2014 had become embedded in practice or protocol and as a result the council has made little, if any, real progress in complying with its duties as regulators of private water supplies since 2014, and arguably since the implementation of the regulations in 2009. The visit in February was mentioned in The Chief Inspector's annual report in 2018 (covering 2017) and can be found on page 42. In October 2018, the Inspectorate wrote to the Council requesting an update of the Council's progress to date in respect of implementing the actions that were previously agreed in February. The Council duly responded in November 2018, firstly providing reassurance that it would make the required 2018 return to the DWI by the end of January 2019, which previously it had failed to do. It also confirmed that it was employing the services of a specialist contractor, to undertake risk assessments of the most overdue and high risk supplies within the borough. These assessments were completed after visits in May and June 2018. In addition, the council had since applied enforcement measures, as required under Regulation 18 at the high risk site that inspectors had visited in conjunction with a council

officer earlier in the year, and made some advancements in improving knowledge and competency of its staff in matters relating to private water supply regulation.

The Inspectorate welcomes the step changes made in light of the concerning deficiencies it identified in February 2018. It concludes that there remains further work by the council to make up for lost time since the implementation of the original regulations in 2010, but offers continued support in its role as technical advisors to local authorities to assist with this. It may schedule a further visit to meet with the Council in the future in this capacity.

East Devon Council

In October 2018, inspectors met with representatives from the Environmental Health department at offices in Exmouth, Devon. The purpose of this visit was to review the council's progress to date in implementing the Private Water Supplies (England) Regulations 2016, as amended.

The Inspectorate concluded that the local authority has historically not always issued a required Regulation 18 Notice when a supply has been identified as a potential danger to health. During the visit, the local authority reported they will serve Regulation 18 Notices when a supply presents what they consider an actual risk to human health by virtue of samples failing health based standards. The Inspectorate reminds local authorities that they **MUST** serve Regulation 18 Notices when there is a potential danger to human health to ensure that risks are mitigated proactively prior to any hazard manifesting and presenting an actual risk. Furthermore some of the local authority's historic Regulation 18 Notices have been issued without longer-term actions and with indefinite restriction of use advice given only. The local authority assured the Inspectorate that Regulation 18 Notices will now include medium and longer-term actions with typical timescales for completion of three to six months. It was suggested that the local authority review and update those Regulation 18 Notices that have been served without longer-term actions and if necessary reissued with appropriate remedial actions included.

The visit also included an informal inspection of a Regulation 9 supply. The supply is a small groundwater supply, situated in a forest area which feeds two properties, one of which is rented as a holiday let.

Samples were collected on the day of the visit. In discussions it was apparent that plumbing metals including lead were not being collected. This is for several reasons including the (low) concentration of metals in the host aquifer, risk assessment observations and the pH of the water being supplied.

On further examination of the 2017 data return it was apparent that only 7 of the Regulation 9 and 10 supplies were being sampled for lead. As lead is a health based parameter it was suggested that the local authority revise its

procedure to include lead (and other plumbing materials) as part of its regulatory sampling obligations (unless the local authority could demonstrate the supply pipe was all plastic).

On the day of the visit it was reported that there is a regional local authority group which meet regularly to discuss private supply regulation and monitoring. The Inspectorates welcome this approach and the value that shared learning will inevitably bring.

Hammersmith and Fulham Council

In October 2018, Inspectors met with representatives from the Environmental Quality team at their offices in London. The purpose of this visit was to review the council's progress to date in implementing the Private Water Supplies (England) Regulations 2016, as amended.

Hammersmith and Fulham Council have only a single private water supply reported and detailed in the 2017 data return. The supply is to a hospital and is a Regulation 9 type supply due to the volume supplied (around 600m³/d) and use (water supplied to the public).

The hospital supply consists of one operational borehole and treatment includes reverse osmosis (RO), pH correction and disinfection by addition of sodium hypochlorite. The borehole water is blended with mains water, due to high concentrations of ammonium, fluoride and sodium. The treated water is stored in on-site treated water tanks before being pumped into the hospital ring main system.

At the time of the visit, it was reported that the borehole was not in use and has been out of use for some time, with the hospital relying on the public water feed.

A second abstraction borehole was identified as being located at the hospital. It was advised that the current status of this borehole be investigated to determine whether this is in use to supply water for domestic purposes. If this second borehole is abandoned the local authority should give consideration to whether the presence of this structure poses any risk to groundwater quality.

The hospital supply is managed by a third party who are also responsible for carrying out regular sampling and analysis. The local authority should satisfy themselves that the third party are suitably competent to be undertaking representative sampling to a suitable risk based frequency and the laboratory they use is UKAS accredited. The third party will need to be certified for sampling to ISO 17024 by 11 July 2020.

The supply will require reassessing and further sampling to be completed prior to the borehole being returned to supply, as per the requirement of Regulation 13 (Regulation 15 Wales).

Chapter 5: Drinking water testing results

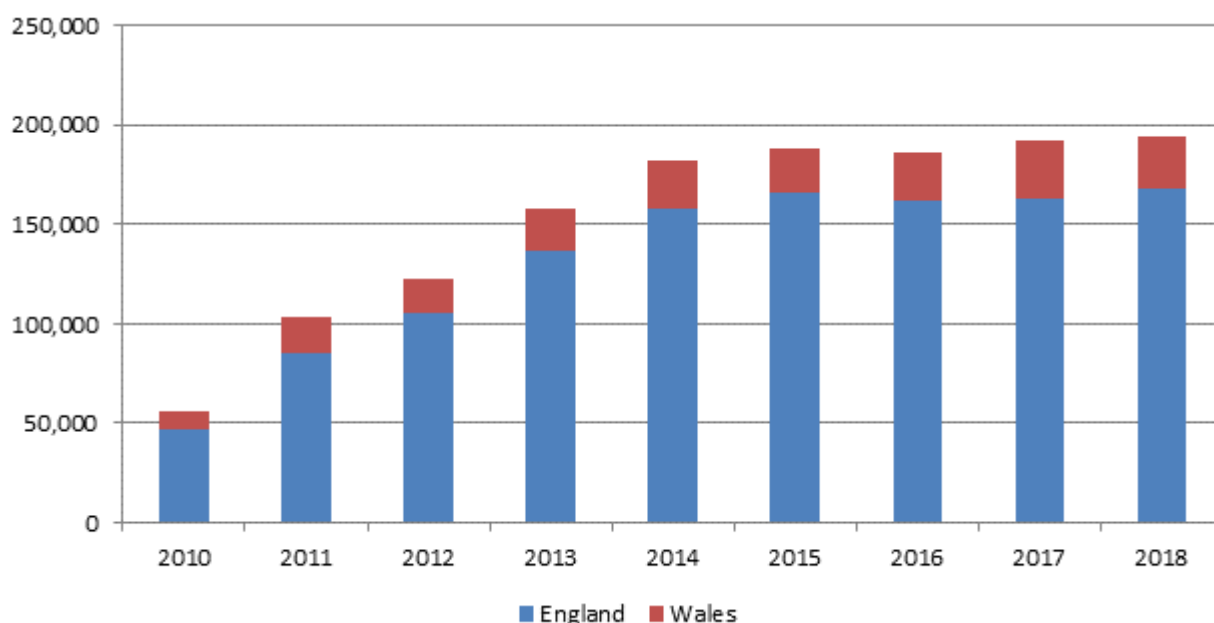
Chapter 5:

- 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 2018, there were 194,153 test results submitted to the Inspectorate by local authorities, a slight overall increase in the number from 2017 which was 192,087. The number of tests for England increased slightly but for Wales the number reduced slightly.

Figure 30: Numbers of test results sent to the Inspectorate 2010–2018



5.2 Results of 2018 monitoring

In preparing Tables 31 to 33, 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 issues identified with annual returns were:

- 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.
- Analytical data for parameters not contained within the Regulations.
- 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 (NO₃) being entered instead of figures for nitrite (NO₂).
- Information in some cells was not as required by the specification.

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 31: 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	5,896	523	8.9
Fluoride	1.5mg/l	1,330	111	8.3
Arsenic	10µg/l	2,452	110	4.5
Pesticides (Individual)*	0.1ug/l	15,362	163	1.1
Trichloroethene and Tetrachloroethene	10µg/l	340	4	1.2
Boron	1mg/l	1,054	36	3.4
Selenium	10µg/l	1,046	18	1.7
Benzo(a)pyrene	0.01µg/l	478	29	6.1
Pesticides (Total by Calculation)	0.5µg/l	418	9	2.2
Benzene	1µg/l	628	6	1.0
Cyanide	50µg/l	643	9	1.4
Polycyclic Aromatic Hydrocarbons (Total by Calculation)	0.1µg/l	289	9	3.1
1,2-Dichloroethane	3µg/l	500	8	1.6
National Parameters				
Manganese	50µg/l	6,184	460	7.4
Sodium	200mg/l	1,157	71	6.1
Tetrachloromethane	3µg/l	506	8	1.6
Aluminium	200µg/l	4,348	148	3.4
Colour	20mg/l Pt/Co	5,295	141	2.7
Indicator Parameters				
Hydrogen ion (pH)	6.5 – 9.5	8,161	800	9.8
Sulphate	250mg/l	885	36	4.1
Chloride	250mg/l	984	39	4.0
Ammonium	0.5mg/l	6,089	258	4.2
Conductivity	2500µS/cm	8,173	105	1.3
Total Organic Carbon	No abnormal change	283	1	0.4
Radioactivity – Gross Alpha	0.1Bq/l	418	20	4.8
Radioactivity – Gross Beta	1.0Bq/l	411	8	1.9
Tritium	50µg/l	122	0	0.0
Indicative Dose	0.10mSv/year	28	0	0.0
Radon	100Bq/l	67	2	3.0

Nitrate is present in drinking water usually as a consequence 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 423 failing samples in 2018 (8.9% from 5,896 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 is also an important consideration when assessing catchments, in 2018 8.3% of samples contained fluoride above the standard (111 failures from a total of 1,330 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 water supplies, with 4.5% of 2,452 samples exceeding the regulatory standard (110 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 carcinogenic 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 private supplies with 1.2% of 340 samples failing the meet the standard (four failures). 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 0.1mg/l, manganese imparts an undesirable taste to beverages and stains plumbing fixtures and laundry. At concentrations as low as 0.02mg/l, manganese can form coatings on water pipes that may later slough off as a black precipitate. In 2018, 460 out of a total of 6,184 samples (7.4%) exceeded the standard for manganese.

Sodium exceeded the standard in 6.1% of samples (from 1,157 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). It is more common for supplies to be acidic (8.9% of tests) than alkaline (0.9% of tests). Consideration of hydrogen ion concentration is important due to impact on some treatment processes and the influence of pH on dissolution of metals.

With the third year of returns being made for radioactivity 4.8% were found to have exceeded the screening value for gross alpha (20 out of 418 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 subsequent failures on further testing.

Table 32: 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	448	2	0.4
Lead	10µg/l	3,344	225	6.7
Nickel	20µg/l	1,795	99	5.5
Copper	2mg/l	2,336	94	4.0
Antimony	5µg/l	1,307	16	1.2
Nitrite – Consumer's Taps	0.5µg/l	5,208	216	4.1
Bromate	10µg/l	693	17	2.5
Cadmium	5µg/l	1,317	27	2.1
Trihalomethanes (Total by Calculation)	100µg/l	508	10	2.0
Chromium	50µg/l	1,304	32	2.5
Mercury	1µg/l	590	9	1.5
*No indicator parameters were assigned to the post abstraction table				

The biggest influence in post-treatment samples is from nitrite possibly due to the influence of ammonia present in the catchment or stagnation of water in the pipework. A total of 216 samples from 5,208 samples taken, failed for nitrite (4.1%). We also see the influence plumbing metals have on the number of failures, 225 samples from a total of 3,344 (6.7%) exceeded the standard for lead. There were 94 instances where copper exceeded the standard (4.0% of all samples), attributable to leaching from copper pipework and 99 nickel failures from 1795 samples (5.5%) associated with nickel presence in chrome taps.

Table 33: 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				
<i>Pseudomonas aeruginosa</i> *	0/250ml	171	9	5.3
Enterococci	0/100ml	5,676	428	7.5
<i>Escherichia coli</i> (<i>E.coli</i>)	0/100ml	10,405	606	5.8
Iron	200µg/l	6,320	490	7.8
Odour	No abnormal change	6,531	1328	20.3
Taste	No abnormal change	5,171	869	16.8
Turbidity	4 NTU	6,724	234	3.5
Indicator parameters				
Coliform bacteria	0/100ml	9,943	1406	14.1
Turbidity	1 NTU	2,166	92	4.2
<i>Clostridium perfringens</i>	0/100ml	4,858	287	5.9
* <i>Pseudomonas aeruginosa</i> only sampled in the case of water in bottles or containers				

Microbiological parameters remain of huge concern in England, with 5.3% of 171 samples indicating the presence of *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 or *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 the raw water, then measures to protect the source from ingress, or suitable treatment to remove these organisms needs to be installed. During 2018, 5.8% of 10,405 samples contained *E.coli* while 14.1% of 9,943 samples contained coliforms.

Taste and odour represents a large proportion of failures, this could be down to variations of water quality from source, the presence of algae or due to microbial growth in parts of the distribution. During 2018, 16.8% of samples failed the standard for taste and 20.3% failed the standard 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.

The unacceptably high rate of samples not meeting the regulatory standards for private water supplies across England reinforces the need for careful consideration of actual and potential hazards during risk assessments. In so doing pertinent and appropriate risk based monitoring should be put in place.

Chapter 6: Legislative updates

Chapter 6:

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

6.1 2018 Amendment regulations in England

The Private Water Supplies (England) (Amendment) Regulations 2018 came into force on 11 July 2018 and amend the existing 2016 regulations. These regulations transpose the requirement of European Council Directive 98/83/EC on the quality of water intended for human consumption and were made following a public consultation, as required by Article 9 of Regulation (EC) No. 178/2002 of The European Parliament.

The same Directive requirements were previously transposed into the revised regulations in Wales in 2017, namely the Private Water Supplies (Wales) Regulations 2017, which revoked and replaced the Private Water Supplies (Wales) Regulations 2010. The same regulations consolidate the amendment regulation of 2016 in Wales, which transposed the Council Directive 2013/51/Euratom.

The changes to the revised regulations in Wales were covered in the Inspectorate's annual report, *Drinking water 2017, Private water supplies in Wales*, published in August 2018.

The key changes to the 2016 Regulations in England, which the 2018 Amendment Regulations implement, are summarised in Table 34.

Table 34: Key changes to 2016 regulations in England

Relevant 2016 regulation	Subject	2018 amendment
6	Risk assessment	This regulation now includes the requirement that risk assessment methodology complies with EN1597-2 standard*. Local Authorities must within 12 months of carrying out a risk assessment send a summary of the results of the risk assessment to the Secretary of State (in practice, DWI). See changes to Schedule 4 below.
7	Monitoring	Criteria for variations in monitoring frequencies have been introduced in a new Schedule 2A section (see below).
12	Sampling and analysis	All sampling for chemical parameters must be taken in accordance with ISO 5667-5, and for microbiological parameters, EN ISO 19458. In the collection, handling, transportation and storing of samples local authorities must comply with EN ISO/IEC 17024, EN ISO/IEC 17025, or equivalent on or after 11th July 2020. Analysis of samples must be carried out to the EN ISO/IEC 17025 standard.
12	Sampling and analysis	This requires that random daytime samples for copper, lead and nickel are collected prior to any flushing of the tap.
16 (4) (b)	Investigations	The revision has altered the wording requiring a local authority to serve a Section 80 Notice within 28 days of establishing the cause, whereas previously it stated “becoming aware of the failure.”
18	Notices	A local authority may recover any expenses incurred by it in taking action itself (i.e. carry out works in default)

*In 2017 DWI carried out a review of its licenced risk assessment tool to determine whether or not the methodology of its use met the criteria specified in EN1597-2. The Inspectorate concluded that the tool did meet the required standard and as such those local authorities using any of the risk

assessment tools made available on the Inspectorate's website would comply with this regulatory requirement.

Other changes:

Schedule 2 (Monitoring)

The terms "check monitoring" and "audit monitoring" are no longer applicable. The schedule now refers to monitoring of group A (formerly check monitoring parameters) and group B parameters (formerly audit monitoring parameters).

The amendment regulations introduce a new section, Part 2A, Variation of monitoring for Group A and group B parameters. This sets out the criteria for when a local authority may reduce or cease monitoring of these parameters. Broadly speaking the amended regulations require that monitoring of these parameters may not be reduced or ceased unless the results from samples taken at regular intervals over a period of at least three years for those parameters are all less than a percentage, specified in Schedule 2A, of the parametric value.

Schedule 3 (Sampling and Analysis)

The schedule requires that the local authority must demonstrate that its sampling and analysis compliance with any of EN ISO/IEC 17024, EN ISO/IEC 17025, or another equivalent standard accepted at international Level. The Inspectorate is currently facilitating the establishment of a scheme which accredits sampling procedures for individuals under ISO 17024 by means of certification of individuals to demonstrate competence.

Schedule 4 (records)

Local authorities must now include a summary of the results of each of its risk assessments to the Secretary of State (in reality DWI) within 12 months of having carried out a risk assessment. This will in reality form part of local authority annual data returns for the private water supplies in their areas, the next submission being due at the end of January 2020. However Local authorities are asked to provide a summary of each risk assessment at the time of completion in cases where the risk has been shown to be high or very high.

Schedule 6 (fees)

The requirement that a local authority must charge no more than a maximum amount previously specified in Schedule 6 has been removed.

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

England Council name Note Councils marked with a * did not make a valid return or returned too late to have their data incorporated. Where no return, most recent data is shown.	Total monitored supplies	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 domestic supplies (Reg 10)	% risk assessments completed for Reg 9 supplies	% risk assessments completed for Regulation 8 and 10 supplies	Evidence of monitoring of Reg 9 supplies provided?	Evidence of monitoring of Reg 8 and Reg 10 supplies provided?	Evidence of having served Regulation 18 or Section 80 Notices?	Non domestic purposes or Domestic purposes – other
Adur District Council	3	0		1	2	100	100	Y	Y		
Allerdale Borough Council	126	126	4	104	18	83	36	Y	Y	Y	13
Amber Valley Borough Council	15	46	1	4	10	25	18	Y	Y		
Arun District Council	8	1		4	4	75	25	N	Y		
Ashfield District Council	1	1			1	N/A	100	N/A	N	Y	1
Ashford Borough Council	1	6			1	N/A	100	N/A	N		
Aylesbury Vale District Council	12	23		6	6	100	100	Y	Y		
Babergh District Council	41	111	1	19	21	100	86	Y	Y		
Barking and Dagenham Borough Council* (2017 data)	0	0									1
Barnet Borough Council	1	0		1		100	N/A	Y	N/A		
Barnsley Borough Council* (2017 data)	9	31		6	3						
Barrow-in-Furness Borough Council	1	2		1		100	N/A	N	N/A		
Basingstoke & Deane Borough Council	58	46	2	14	42	36	89	Y	Y	Y	
Bassetlaw Borough Council	13	10		10	3	0	0	Y	Y	Y	
Bath & North East Somerset District Council	29	45	2	17	10	100	92	Y	Y	Y	
Bedford Borough Council	5	8		3	2	100	100	Y	Y		
Birmingham City Council	2	0		2		100	N/A	Y	N/A		
Blaby District Council	1	7		1		100	N/A	N	N/A		

Drinking water 2018 – Private water supplies in England

England Council name Note Councils marked with a * did not make a valid return or returned too late to have their data incorporated. Where no return, most recent data is shown.	Total monitored supplies	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 domestic supplies (Reg 10)	% risk assessments completed for Reg 9 supplies	% risk assessments completed for Regulation 8 and 10 supplies	Evidence of monitoring of Reg 9 supplies provided?	Evidence of monitoring of Reg 8 and Reg 10 supplies provided?	Evidence of having served Regulation 18 or Section 80 Notices?	Non domestic purposes or Domestic purposes – other
Blackburn with Darwen Borough Council	25	65		4	21	100	86	Y	Y	Y	
Blackpool Borough Council	2	0		2		0	N/A	N	N/A		
Bolsover District Council	1	3			1	N/A	0	N/A	Y		
Bolton Metropolitan Borough Council	18	13		1	17	0	100	N	Y		1
Boston Borough Council	1	0	1			N/A	100	N/A	Y		
Bradford Metropolitan District Council	171	215		82	89	56	79	Y	Y	Y	1
Braintree District Council	47	142		22	25	91	84	Y	Y		1
Breckland District Council	273	532		201	72	62	46	Y	Y	Y	
Brentwood Borough Council * (2017 data)	0	3									
Brighton & Hove City Council	4	1	1	3		33	0	Y	Y		
Broadland District Council	172	443		118	54	100	100	Y	Y	Y	
Bromley (London Borough of)	3	0		3		0	N/A	Y	N/A		
Bromsgrove District Council	4	24		1	3	100	100	Y	Y		
Broxbourne Borough Council	0	6				N/A	N/A	N/A	N/A		3
Broxtowe Borough Council	2	0		2		100	N/A	Y	N/A		
Burnley Borough Council	43	44	3	29	11	48	14	Y	Y		
Bury Metropolitan Borough Council	24	44	5	7	12	14	47	Y	Y		
Calderdale Metropolitan Borough Council	249	549		51	198	73	77	Y	Y		
Canterbury City Council	1	4			1	N/A	100	N/A	Y		
Carlisle City Council	45	234		28	17	68	59	Y	Y	Y	
Central Bedfordshire Council	11	23	1	9	1	89	50	Y	Y		

England Council name Note Councils marked with a * did not make a valid return or returned too late to have their data incorporated. Where no return, most recent data is shown.	Total monitored supplies	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 domestic supplies (Reg 10)	% risk assessments completed for Reg 9 supplies	% risk assessments completed for Regulation 8 and 10 supplies	Evidence of monitoring of Reg 9 supplies provided?	Evidence of monitoring of Reg 8 and Reg 10 supplies provided?	Evidence of having served Regulation 18 or Section 80 Notices?	Non domestic purposes or Domestic purposes – other
Charnwood Borough Council	3	14			3	N/A	100	N/A	Y		
Chelmsford Borough Council	3	12	1	1	1	100	100	Y	Y		
Cheltenham Borough Council* (2017 data)	8	13		1	7						
Cherwell District Council	40	102	1	12	27	75	89	Y	Y		
Cheshire East Council	73	369		54	19	94	89	Y	Y	Y	1
Cheshire West & Chester Council	22	41		10	12	80	75	Y	Y		4
Chichester District Council	46	30	6	19	21	68	56	Y	Y	Y	
Chiltern District Council	1	18		1		0	N/A	N	N/A		
Chorley Borough Council	4	15		2	2	100	100	Y	Y		
City of London	2	0		2		100	N/A	Y	N/A		
Colchester Borough Council	4	41		2	2	0	0	Y	Y		
Copeland Borough Council	136	140		92	44	7	55	Y	Y	Y	3
Cornwall Council	906	2648	4	691	211	93	84	Y	Y	Y	
Cotswold District Council	156	92	9	123	24	43	30	Y	Y	Y	
Coventry City Council	1	0		1		100	N/A	Y	N/A		
Craven District Council	366	377		222	144	96	96	Y	Y		
Dacorum Borough Council	16	23	6	4	6	25	50	N	N		
Darlington Borough Council	5	0		5		100	N/A	Y	N/A		
Dartford Borough Council	1	0			1	N/A	0	N/A	Y		
Daventry District Council	6	59			6	N/A	100	N/A	Y		5
Derbyshire Dales District Council	66	155		42	24	69	46	Y	Y	Y	

Drinking water 2018 – Private water supplies in England

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Doncaster Metropolitan Borough Council	16	13	2	13	1	77	33	Y	N		
Dover District Council	1	3		1		100	N/A	N	N/A		
Dudley Metropolitan Borough Council	0	2				N/A	N/A	N/A	N/A		
Durham County Council	189	139		104	85	63	46	Y	Y	Y	
East Cambridgeshire District Council	14	24	1	11	2	100	100	Y	Y		
East Devon District Council	308	853		172	136	62	26	Y	Y	Y	
East Dorset District Council* (2017 data)	22	23		8	14						
East Hampshire District Council	19	37	2	9	8	78	30	Y	Y	Y	2
East Hertfordshire Council* (2017 data)	18	94		18							25
East Lindsey District Council	42	152	4	14	24	71	7	Y	Y	Y	1
East Northamptonshire District Council	11	16		7	4	100	100	Y	Y		
East Riding of Yorkshire Council	56	113		43	13	98	100	Y	Y	Y	85
East Staffordshire Borough Council	6	12	1	4	1	0	50	Y	Y		
Eastleigh Borough Council	1	1		1		100	N/A	Y	N/A	Y	
Eden District Council	285	304		116	169	60	54	Y	Y	Y	
Elmbridge Borough Council	0	10				N/A	N/A	N/A	N/A		
Enfield (London Borough of)* 2017 data	3	2		3							
Epping Forest District Council	48	29	3	33	12	70	42	Y	Y	Y	
Epsom and Ewell Borough Council	0	1				N/A	N/A	N/A	N/A		
Erewash Borough Council	2	0		2		100	N/A	N	N/A		

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Exeter City Council	2			2		100	N/A	Y	N/A		
Fareham Borough Council	1			1		100	N/A	N	N/A		
Forest Heath District Council	29	21		16	13	88	85	Y	Y		
Forest of Dean District Council	18	49		14	4	57	75	Y	Y		
Fylde Borough Council	2	1	1	1		100	0	Y	N		
Gateshead Metropolitan Borough Council	0	1				N/A	N/A	N/A	N/A		
Gedling Borough Council	13	4		5	8	100	88	Y	Y		2
Gravesham Borough Council	1	3		1		0	N/A	Y	N/A		
Great Yarmouth Borough Council	9	44		6	3	67	0	Y	Y	Y	
Guildford Borough Council	2	6		1	1	0	0	Y	Y	Y	
Hackney (London Borough of)* 2017 data	1				1						
Halton Borough Council	1	1		1		100	N/A	Y	N/A		
Hambleton District Council	84	155		49	35	84	57	Y	Y	Y	3
Hammersmith and Fulham	1			1		100	N/A	N	N/A		
Harborough District Council	12	21		5	7	80	100	Y	Y	Y	
Harlow District Council	1	1			1	N/A	100	N/A	Y		
Harrogate Borough Council	256	332		128	128	71	67	Y	Y		
Hart District Council	5	6	3	2		0	0	Y	N		
Hartlepool Borough Council	1	0		1		0	N/A	Y	N/A		
Herefordshire Council	398	2142	1	257	140	75	23	Y	Y	Y	
Hertsmere Borough Council	6	3	2	3	1	67	100	Y	Y		

Drinking water 2018 – Private water supplies in England

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High Peak Borough Council	94	206		47	47	98	60	Y	Y	Y	
Hillingdon (London Borough of)	2	0		2		100	N/A	Y	N/A		
Hinckley and Bosworth Borough Council	11	47	2	6	3	83	100	N	N	Y	1
Horsham District Council	5	8		3	2	100	100	Y	Y	Y	2
Huntingdonshire District Council	1	8		1		0	N/A	N	N/A		
Hyndburn Borough Council	8	32		3	5	100	0	Y	Y		
Ipswich Borough Council	1	1		1		0	N/A	Y	N/A		
Isle of Wight Council	7	14		6	1	83	100	Y	Y	Y	
Council of the Isles of Scilly	25	35		23	2	100	100	N	N		8
Kensington and Chelsea (Royal Borough of)	1	0		1		100	N/A	Y	N/A		
Kettering Borough Council	0	1				N/A	N/A	N/A	N/A		
King's Lynn and West Norfolk Borough Council	44	35		37	7	49	29	Y	Y		
Kirklees Council	71	165		18	53	28	0	Y	Y		
Knowsley Metropolitan Borough Council	2	0		2		100	N/A	Y	N/A		
Lancaster City Council	76	119		43	33	16	3	Y	Y	Y	
Leeds City Council	28	17		15	13	87	69	Y	Y		1
Lewes District Council	13	2		8	5	75	100	N	N		
Lichfield District Council	5	7		5		100	N/A	Y	N/A		
Liverpool City Council	1	0		1		100	N/A	Y	N/A		

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Maidstone Borough Council	6	8		2	4	100	100	Y	Y		
Maldon District Council	5	16		1	4	100	100	Y	Y		
Malvern Hills District Council	24	207		16	8	63	75	Y	Y	Y	
Manchester City Council	3	0		3		100	N/A	Y	N/A		
Medway Council	3	0	3			N/A	100	N/A	Y		
Melton Borough Council	8	7		8		50	N/A	Y	N/A		
Mendip District Council	67	72	3	26	38	81	68	Y	Y	Y	
Mid Devon District Council	218	1013		161	57	8	11	Y	Y		
Mid Suffolk District Council	37	80	1	21	15	90	81	Y	Y	Y	
Mid Sussex District Council	3	3		1	2	100	100	N	Y		
Milton Keynes Council	2	8		1	1	100	100	Y	N		
Mole Valley District Council* (2017 data)	3	5			3						
New Forest District Council	9	16			9	N/A	89	N/A	Y	Y	
Newark and Sherwood District Council	7	13	2	4	1	100	67	Y	N	Y	
Newcastle-under-Lyme Borough Council	14	14	1	3	10	33	55	Y	Y	Y	
North Devon District Council	321	842	1	232	88	77	70	Y	Y	Y	
North Dorset District Council	49	34	2	22	25	64	81	Y	Y	Y	
North East Derbyshire District Council	45	121		24	21	71	48	N	Y		
North East Lincolnshire Council	10	35		8	2	88	100	Y	Y		
North Hertfordshire District Council	25	34		7	18	86	94	Y	Y	Y	1
North Kesteven District Council	7	6		4	3	0	33	Y	Y	Y	

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North Lincolnshire Council	10	11		5	5	100	100	Y	Y		
North Norfolk District Council	157	283		126	31	50	10	Y	Y	Y	15
North Somerset District Council	5	6	1	2	2	50	67	Y	Y		
North Warwickshire Borough Council	9	9		5	4	100	50	Y	Y		2
Northamptonshire County Council	1	0	1			N/A	0	N/A	N		
Northumberland County Council	567	470	5	386	176	78	65	Y	Y	Y	
Norwich City Council	3	1		3		33	N/A	Y	N/A		
Nottingham City Council	3	0		3		67	N/A	Y	N/A		
North West Leicestershire District Council	8	10	2	2	4	100	50	Y	Y	Y	
Oldham Metropolitan Borough Council	39	148		9	30	100	90	Y	Y		
Pendle Borough Council	90	185		26	64	58	91	Y	Y	Y	3
Peterborough City Council	6	4		2	4	50	100	N	Y	Y	
Preston City Council	10	8		6	4	100	100	Y	Y		
Purbeck District Council	29	37		24	5	100	40	Y	Y	Y	
Reading Borough Council	3	10		2	1	0	100	Y	N		
Redbridge Council	1	0		1		100	N/A	Y	N/A		
Redcar & Cleveland Borough Council	19	22	2	5	12	60	57	N	Y	Y	2
Redditch Borough Council	0	4				N/A	N/A	N/A	N/A		
Reigate and Banstead Borough Council	0	1				N/A	N/A	N/A	N/A		
Ribble Valley Borough Council	143	171		93	50	68	84	Y	Y		
Richmondshire District Council	163	288		79	84	75	42	Y	Y	Y	

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Rochdale Metropolitan Borough Council* (2017 data)	54	60		11	43						
Rossendale Borough Council	207	250		11	196	91	11	N	Y	Y	
Rother District Council	8	21	1	4	3	75	50	Y	N		2
Rotherham Metropolitan Borough Council	2	0		1	1	100	100	N	Y		
Rugby Borough Council	1	20			1	N/A	100	N/A	Y		
Runnymede Borough Council	1	3	1			N/A	100	N/A	N		
Rushcliffe Borough Council	1	1			1	N/A	100	N/A	Y	Y	
Rushmoor Borough Council	2	0	2			N/A	100	N/A	Y		
Rutland County Council	8	15	2	1	5	100	14	N	N		
Ryedale District Council	106	164		58	48	78	90	Y	Y		1
Salford City Council	0	1				N/A	N/A	N/A	N/A		
Scarborough Borough Council	129	179		75	54	85	85	Y	Y	Y	
Sedgemoor District Council	20	13		18	2	94	100	Y	Y	Y	
Selby District Council	21	14		6	15	67	53	Y	Y		7
Sevenoaks District Council	11	5	4	5	2	80	100	Y	Y		
Sheffield City Council	6	160		5	1	60	100	Y	Y		
Shepway District Council* (2017 data)	1	2			1						
Shropshire Council	488	1664	2	212	274	54	17	N	N		7
Slough Borough Council	2	0		2		100	N/A	Y	N/A		
Solihull Metropolitan Borough Council	3	16		3		67	N/A	N	N/A	Y	1
South Buckinghamshire District Council	4	3	2	2		100	100	Y	Y		

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South Cambridgeshire District Council	33	109		8	25	100	48	Y	Y		
South Derbyshire District Council	13	8		7	6	86	17	Y	Y	Y	1
South Gloucestershire Council	11	31	1	8	2	100	100	Y	Y	Y	8
South Hams District Council (data errors -could not load return again)											
South Holland District Council	3	6		1	2	0	50	Y	Y		
South Kesteven District Council	24	25		20	4	35	25	Y	Y		
South Lakeland District Council	660	1055	4	419	237	77	44	Y	Y	Y	
South Norfolk Council	91	190		55	36	24	22	Y	Y		
South Northamptonshire Council	19	28		12	7	100	71	Y	N		
South Oxfordshire District Council	39	111	1	32	6	100	100	Y	Y	Y	
South Ribble Borough Council	2	2		2		0	N/A	Y	N/A		
South Somerset District Council	105	327	1	32	72	97	79	Y	Y	Y	8
South Staffordshire District Council	12	43		4	8	100	100	N	Y		
South Tyneside Metropolitan Borough Council	0	1				N/A	N/A	N/A	N/A		
Spelthorne Borough Council	1	0		1		100	N/A	Y	N/A		
St Albans District Council	11	49		4	7	0	0	N	Y		
St Edmundsbury Borough Council	30	61		16	14	94	57	Y	Y		
Stafford Borough Council	34	132		9	25	89	64	Y	Y		
Staffordshire Moorlands District Council	42	332		38	4	95	75	Y	Y	Y	
Stockport Metropolitan Borough Council	10	29		3	7	100	0	Y	Y		

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Stockton on Tees Borough Council	0	3				N/A	N/A	N/A	N/A		
Stoke-on-Trent City Council	1	1		1		0	N/A	N	N/A		
Stratford-on-Avon District Council	48	143	4	29	15	100	68	Y	Y	Y	
Stroud District Council	54	110	1	32	21	94	91	Y	Y		2
Suffolk Coastal District Council	107	293	2	32	73	78	81	Y	Y		
Sunderland City Council	1	0		1		100	N/A	Y	N/A		
Sutton (London Borough of)	1	0		1		100	N/A	Y	N/A		
Swale Borough Council	11	4		10	1	30	0	Y	Y		
Swindon Borough Council	8	3		3	5	100	100	Y	Y		
Tameside Metropolitan Borough Council	10	24		2	8	100	100	Y	Y		
Tandridge District Council* (2017 data)	1	1		1							
Taunton Deane Borough Council	91	192		31	60	71	55	Y	Y		
Teignbridge District Council	195	388	1	100	94	0	0	Y	Y		1
Telford & Wrekin Council	26	64		12	14	42	50	Y	Y	Y	1
Tendring District Council	25	106	1	8	16	0	0	N	N		
Test Valley Borough Council	104	139		20	84	95	85	Y	Y	Y	
Tewkesbury Borough Council	46	62	8	12	26	25	24	Y	Y		1
Three Rivers District Council	6	15		3	3	0	0	Y	N		
Thurrock Council	0					N/A	N/A	N/A	N/A		1
Tonbridge and Malling Borough Council	5	20		3	2	100	100	Y	Y	Y	1
Torbay Council* (2017 data)	3	1		3							

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Torridge District Council	99	403		78	21	22	0	Y	Y	Y	
Tower Hamlets (London Borough of)	1	0		1		100	N/A	Y	N/A		
Tunbridge Wells Borough Council	3	3		2	1	100	100	Y	Y		
Uttlesford District Council	22	29	5	10	7	60	67	Y	Y		
Vale of White Horse District Council	28	32		23	5	96	100	Y	Y	Y	2
Wakefield Metropolitan District Council	2	1		1	1	100	100	Y	Y		
Waltham Forest Council	0					N/A	N/A	N/A	N/A		1
Wandsworth (London Borough of)	1	0		1		100	N/A	N	N/A		
Warrington Borough Council	4	0		4		100	N/A	Y	N/A		
Warwick District Council	8	25		3	5	100	60	Y	Y		
Watford Borough Council	1	1		1		100	N/A	N	N/A		
Waveney District Council	10	26		5	5	60	0	Y	Y		
Waverley Borough Council	7	18		4	3	100	100	Y	Y		
Wealden District Council	18	28	4	8	6	50	40	Y	Y		1
Wellingborough Borough Council	0	3				N/A	N/A	N/A	N/A		
Welwyn Hatfield District Council	5	10		4	1	100	0	Y	Y	Y	
West Berkshire District Council	80	123		42	38	76	47	Y	Y	Y	6
West Devon Borough Council (data errors -could not load return)											
West Dorset District Council	230	311	2	116	112	91	86	Y	Y		
West Lancashire District Council	0	2				N/A	N/A	N/A	N/A		

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West Lindsey District Council	4	10		3	1	100	100	Y	Y		
West Oxfordshire District Council	77	8	1	66	10	41	9	Y	Y	Y	
West Somerset District Council	237	480	1	140	96	96	73	Y	Y	Y	
Westminster City Council	1	1		1		0	N/A	N	N/A		
Weymouth and Portland Borough Council	1	0			1	N/A	100	N/A	Y		
Wigan Metropolitan Borough Council* (2017 data)	1	10			1						
Wiltshire Council	308	313	16	223	69	75	89	Y	Y	Y	
Winchester City Council	69	97		20	49	95	94	Y	Y		
Windsor and Maidenhead	7	77	1	4	2	100	100	Y	Y		
Wirral Metropolitan Borough Council	2	0		2		50	N/A	N	N/A		
Wokingham Borough Council	18	94		13	5	85	100	Y	Y		
Wolverhampton City Council	1	0		1		100	N/A	Y	N/A		
Wychavon District Council	20	85		9	11	100	73	Y	Y		
Wycombe District Council	14	52	2	7	5	86	100	Y	Y		7
Wyre Borough Council	15	12		10	5	80	80	Y	Y		
Wyre Forest District Council	9	17		3	6	100	67	Y	Y		
York City Council	5	13		2	3	50	33	Y	N		

Councils reporting no private water supplies

Basildon District Council	Haringey (London Borough of)	Oxford City Council
Bexley Borough Council	Harrow (London Borough of)	Plymouth City Council
Bournemouth Borough Council	Hastings Borough Council	Poole Borough Council
Bracknell Forest Borough Council	Havant Borough Council	Portsmouth City Council
Brent (London Borough of)	Havering (London Borough of)	Richmond upon Thames (London Borough of)
Bristol City Council	Hounslow (London Borough of)	Rochford District Council
Cambridge City Council	Hull City Council	Sandwell Metropolitan Borough Council
Camden (London Borough of)	Islington (London Borough of)	Sefton Metropolitan Borough Council
Cannock Chase District Council	Kingston upon Thames (Royal Borough of)	Southampton City Council
Castle Point Borough Council	Lambeth (London Borough of)	Southend-on-Sea Borough Council
Chesterfield Borough Council	Leicester City Council	Southwark (London Borough of)
Christchurch Borough Council	Lewisham (London Borough of)	St Helens Metropolitan Borough Council
Corby Borough Council	Lincoln Council	Stevenage Borough Council
Crawley Borough Council	Luton Borough Council	Surrey Heath Borough Council
Croydon (London Borough of)	Mansfield District Council	Tamworth Borough Council
Dartford Borough Council	Merton (London Borough of)	Thanet District Council
Derby City Council	Middlesbrough Borough Council	Trafford Metropolitan Borough Council
Ealing (London Borough of)	Newcastle-upon-Tyne City Council	Walsall Metropolitan Borough Council
Eastbourne Borough Council	Newham (London Borough of)	Woking Borough Council
Fenland District Council	Northampton Borough Council	Worcester City Council
Gloucester City Council	North Tyneside Metropolitan Borough Council	Worthing Borough Council
Gosport Borough Council	Nuneaton and Bedworth Borough Council	
Greenwich (Royal Borough of)	Oadby and Wigston Borough Council	

Wales Council name	Total monitored supplies	Single domestic dwellings (Reg 10)	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)	Supplies as part of a domestic tenancy (Reg 11)	% risk assessments completed for Reg 9 supplies	% risk assessments completed for Regulation 8 and 11 supplies	Evidence of monitoring of Reg 9 supplies provided?	Evidence of monitoring of Reg 8 and Reg 11 supplies provided?	Evidence of having served Regulation 18 or Section 80 Notices?	Non domestic purposes or Domestic purposes – other
Blaenau Gwent CBC	4	27		4		100	N/A	N	N/A		
Bridgend CBC	4	78		4		0	N/A	Y	N/A	Y	
Caerphilly CBC	4	67		3	1	100	100	N	Y	Y	
Cardiff Council	8	17		2	6	50	0	Y	Y		
Carmarthenshire CC	65	2082	6	44	15	48	62	Y	N		150
Ceredigion CC	170	1303		85	85	100	100	Y	Y	Y	
Conwy CBC	108	427		81	27	75	33	Y	Y	Y	
Denbighshire CC	181	481		67	114	61	36	Y	Y	Y	4
Flintshire CC	18	76		12	6	58	100	Y	Y	Y	
Gwynedd CC	334	563	4	300	30	75	50	Y	Y		20
Isle of Anglesey CC	22	172		19	3	37	33	Y	Y	Y	
Merthyr Tydfil CBC	1	15		1		100	N/A	Y	N/A		
Monmouthshire CC	165	533		56	109	34	85	Y	Y	Y	
Neath Port Talbot CBC	17	165		10	7	100	57	Y	Y		
Newport City Council	5	23		5		100	N/A	N	N/A		
Pembrokeshire CC	84	807		84		37	N/A	Y	N/A		
Powys CC	527	4430	1	526		76	0	Y	Y		196
Rhondda Cynon Taff CBC	11	68		10	1	40	100	Y	Y	Y	
Swansea City and Borough Council	18	84		7	11	0	100	Y	N	Y	

Wales Council name	Total monitored supplies	Single domestic dwellings (Reg 10)	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)	Supplies as part of a domestic tenancy (Reg 11)	% risk assessments completed for Reg 9 supplies	% risk assessments completed for Regulation 8 and 11 supplies	Evidence of monitoring of Reg 9 supplies provided?	Evidence of monitoring of Reg 8 and Reg 11 supplies provided?	Evidence of having served Regulation 18 or Section 80 Notices?	Non domestic purposes or Domestic purposes – other
Torfaen CBC	11	56		2	9	100	89	Y	Y	Y	
Vale of Glamorgan Council	13	16		7	6	100	100	Y	N		
Wrexham CBC	18	197	3	11	7	45	60	Y	Y	Y	

Annex 2: Summary of monitoring data for England and Wales

Parameter	Standard	Number of samples	Number of failures	Percentage of failures in 2018	Percentage of failures in 2017
<i>Escherichia coli</i>	0/100 ml	12,766	819	6.4	7.3
Enterococci	0/100 ml	7,526	602	8.0	7.4
Colony counts after 48 hours at 37°C	No abnormal change	8,328	-	-	-
Colony counts after 3 days at 22°C	No abnormal change	9,552	-	-	-
Coliform bacteria	0/100 ml	11,948	1,735	14.5	15.1
<i>Clostridium perfringens</i>	0/100 ml	6,016	310	5.2	5.9
<i>Pseudomonas aeruginosa</i>	0/250ml	178	8	4.5	9.7
1,2-Dichloroethane	3.0µg/l	525	0	0.0	0.0
Aluminium	200µg/l	5,325	102	1.9	1.9
Ammonium	0.5mg/l	6,635	161	2.4	2.1
Antimony	5.0µg/l	1,508	4	0.3	0.2
Arsenic	10µg/l	2,733	62	2.3	2.4
Benzene	1.0µg/l	656	0	0.0	0.0
Benzo(a)pyrene	0.01µg/l	484	8	1.7	1.1
Boron	1.0µg/l	1,098	22	2.0	6.3
Bromate	10µg/l	722	5	0.7	0.5
Cadmium	5.0µg/l	1,532	1	0.1	0.1
Chloride	250mg/l	1,096	22	2.0	2.7
Chromium	50µg/l	1,554	0	0.0	0.0
Colour	20mg/l Pt/Co	6,518	84	1.3	1.6
Conductivity	2500 µS/cm at 20°C	9,795	3	0.0	0.1
Copper	2.0mg/l	3,151	71	2.3	3.1
Cyanide	50µg/l	671	0	0.0	0.0
Fluoride	1.5mg/l	1,574	109	6.9	9.1
Hydrogen ion (pH)	6.5 – 9.5	9,748	985	10.1	11.2
Iron	200µg/l	7,368	487	6.6	5.9
Lead	10µg/l	4,445	216	4.9	4.1
Manganese	50µg/l	7,281	525	7.2	7.3
Mercury	1.0µg/l	624	0	0.0	0.0
Nickel	20µg/l	1,992	47	2.4	2.1
Nitrate	50µg/l	6,349	470	7.4	7.4
Nitrite – consumers' taps	0.5µg/l	5,568	143	2.6	1.6
Nitrite – treatment works	0.1µg/l	495	2	0.4	16.4
Odour	No abnormal change	6,951	1,268	18.2	17.8
Polycyclic Aromatic Hydrocarbons	0.1µg/l	290	2	0.7	0.0
Radon	100 Bq/l	75	2	2.7	0.0
Selenium	10µg/l	1,138	0	0.0	0.2
Sodium	200mg/l	1,227	62	5.1	4.5
Sulphate	250mg/l	981	28	2.9	2.5
Taste	No abnormal change	5,486	802	14.6	13.4
Tetrachloromethane	3.0µg/l	531	0	0.0	0.0
Total indicative dose	0.1mS/year	28	0	0.0	0.0
Total Organic Carbon	No abnormal change	294	0	0.0	0.0
Trichloroethene and Tetrachloroethene	10µg/l	344	2	0.6	3.0
Trihalomethanes	100µg/l	534	5	0.9	2.4
Tritium	100 Bq/l	127	0	0.0	0.0
Turbidity at tap	4NTU	8,355	175	2.1	2.1
Turbidity at works	1NTU	2,219	94	4.2	4.1

Annex 2: continued

Parameter	Standard	Number of samples	Number of failures	Percentage of failures in 2018	Percentage of failures in 2017
Pesticides					
Aldrin	0.03µg/l	484	0	0.0	0.0
Dieldrin	0.03µg/l	501	0	0.0	1.0
Heptachlor	0.03µg/l	478	0	0.0	0.0
Heptachlor Epoxide	0.03µg/l	494	0	0.0	0.3
Other pesticides*	0.1µg/l	13,719	24	0.2	0.2
Total pesticides	0.5µg/l	422	2	0.5	0.4
Total		190,439	9,469	5.0	5.3

Annex 3: Guidance and technical advice

The following updates were made to the documents specified in the table below during 2018. These updates have been made to provide additional clarity in light of reviews and local authority feedback.

Protecting your supply(version 2)	November 2018	England and Wales	Updated to reflect 2016 regulations
House-buyer's guidance note	October 2018	England and Wales	Update to include provision of additional and more comprehensive guidance
Information Note 7 (version 2.1)	October 2018	England	Correction to example parameter, and missing footnote inserted.
Information Notes Reg 2 - 10, 12-21 (<i>Note 11 update to follow shortly</i>)	September 2018	England	Information notes updated due to amendment of Private Water Supply Regulations 2016
Private Water Supplies Sampling Procedures Manual (version 1.3)	July 2018	England and Wales	To include the new regulatory requirement to collect, specifically, a 1L sample for copper lead and nickel as a random daytime before flush sample.
Information Note Regulation 9 Large and Commercial Supplies (version 3)	July 2018	Wales	Change on page 4 from "single rented dwelling" to "A supply to a single dwelling, which is rented to tenants."
Information Notes 2-23 all translated into Welsh	April 2018	Wales	Addition of Welsh translations of all the information notes.
Information Note Regulation 9 Large and Commercial Supplies (version 2)	March 2018	Wales	Inclusion of mention of exemption where Regulation 3(b) applies in relation to Regulation 9 supplies
All Information Notes 2 - 23	January 2018	Wales	All information notes updated due to publication of new Welsh Private Water Supply Regulations 2017

Annex 4: Enquiries about private water supplies handled by the Drinking Water Inspectorate

Numbers of enquiries received 2008–2018 for England and Wales

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

Number of enquiries received from 2008–2018 indicating the origin of the enquiry – England and Wales



Annex 5: 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 NH₄/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 BrO₃/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-Dichloroethane 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 currently 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 NO₃/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 NO₂/l in water leaving water treatment works and 0.5mg NO₂/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 SO₄/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.



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