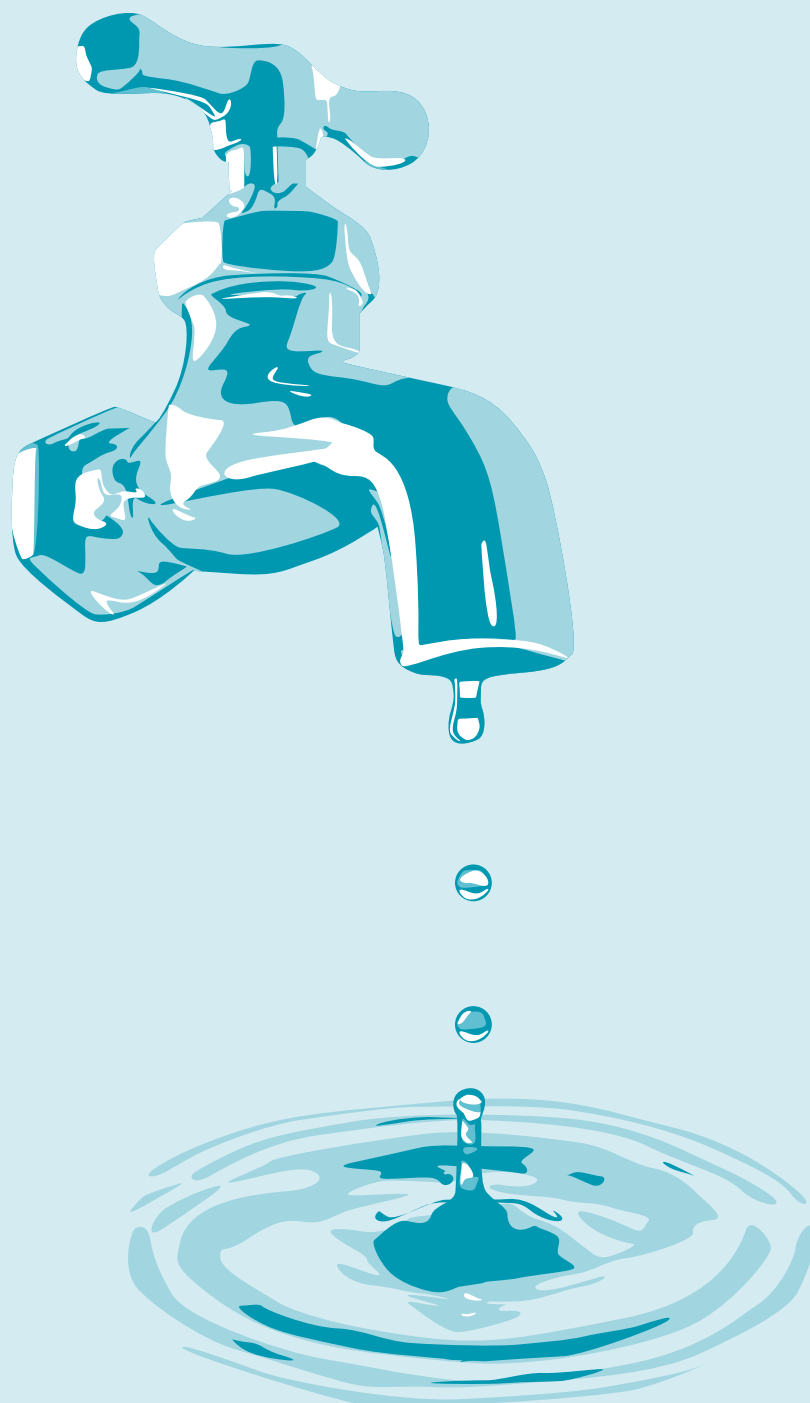


Drinking water 2013

Private water supplies in England

July 2014

A report by the Chief Inspector of Drinking Water





Drinking water 2013

Private water supplies in England



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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 using the powers within the regulations.
- Illustrates the proportion of local authorities' populations served by a public water supply.
- Records the Inspectorate's support of local authorities in answering enquiries and providing technical advice.

Drinking water 2013 is the annual publication of the Chief Inspector of Drinking Water for England and Wales. It is the 24th report of the work of the Inspectorate and presents information about drinking water quality for the calendar year of 2013. It is published as series of seven reports, five of which cover public water supplies and two describe private water supplies. This report is about private supplies in England.

This report describes the key facts about the quality of the private supplies in England. This report is the fourth of its type and presents information based on the private supply records provided to the Inspectorate by the local authorities in England for the calendar year of 2013. To highlight the variable nature of private supplies and the regulatory activity of local authorities, the data on individual supplies have been grouped into nine geographical regions as illustrated in Figure 1. Detailed information about private supplies at local authority level is set out in *Annex 1*.

Figure 1: Reporting regions



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In 2013, local authority records contained the details of a total of 34,221 private supplies in England out of which more than half (18,976) served a single household. These records show that just under half a million (494,759) people in England, lived or worked in a premises that relied on a private supply and a further 7.8 million people will have attended festivals, shows and other events served by a temporary supply of water. Whereas the quality of public water supplies in England in 2013 was very high, with only 0.03% of tests failing to meet the European Union (EU) and national standards, the quality of private water supplies remains a concern with 7% of tests failing to meet the standards in 2013. 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.

Compared to 2012, the results of testing during 2013 demonstrated that fewer private supplies in England and Wales were of unsafe microbiological quality, with 10.9% of samples containing *E.coli* (compared to 13.9% in 2012) and 11.1% containing Enterococci (compared to 13.2%

in 2012). Failures of these two standards mean that the water supply is faecally contaminated and there is a risk that harmful pathogens will also be present. More detailed information about private supply test results can be found in *Chapter 4* and *Annex 2*.

Overall, in 2013, local authorities improved the completeness and accuracy of their records. All but three local authorities were able to provide the Inspectorate with a return for 2013. In order to provide a complete picture in this year's report, the Inspectorate has made use of the figures contained in either the 2012 or 2011 return for these three local authorities. For the first time, therefore, *Chapter 2* provides complete information about the nature and type of private supplies throughout England and Wales.

The records show that there are 478 private supplies (386 in England) 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 is a decrease of 48 private supplies identified as being in need of risk management during 2013 (a total of 526 recorded in 2012). In England, half (50%) of these failing private supplies are ones used in the provision of services to the public. The remaining improvement Notices were served on small, shared domestic supplies (46%), single domestic dwellings (3.0%) and private distribution systems (0.5%). In addition another 16 private supplies were the subject of a Section 80 improvement Notice because the supply was either insufficient or unwholesome, although not considered an immediate danger to human health. More information about failing private water supplies can be found in *Chapter 3* together with 21 new case studies with learning points.

Chapter 3 also summarises the progress that local authorities have made towards compliance with Regulation 6 (duty to carry out a risk assessment within five years 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 had been risk assessed after four years was 5,573 (4,551 in England, 1,022 in Wales) covering approximately one-third (32%) of all relevant private supplies. This compares favourably to the situation published in *Drinking water 2012* where it was reported that only around one-fifth (19%) of relevant private supplies had been risk assessed after three years.

Notwithstanding the good progress being made generally towards implementing the private supply regulations, the Inspectorate has noted that there is a substantial shortfall to be addressed by some local authorities. A detailed breakdown of performance on risk assessment at local authority level is provided in *Annex 1* and reveals that the situation is highly variable. For example, 81 local authorities in England have already

risk assessed all their priority Regulation 9 private supplies, whereas 42 local authorities have not carried out any priority risk assessments at all after four years. Out of these 42 local authorities, the size of the task to be completed by the end of 2014 is manageable (five private supplies or less); however, the deficit is more substantial in the following cases: Teignbridge District Council (101 supplies), Daventry District Council (31 supplies), Suffolk Coastal District Council (22 supplies), Rossendale Borough Council (18 supplies), North East Derbyshire District Council (14 supplies), South Derbyshire District Council (13 supplies), South Cambridgeshire District Council (7 supplies) and North Warwickshire Borough Council (6 supplies).

During 2013, the Inspectorate has continued its programme of providing technical advice to local authorities. Primarily this service is by way of the Inspectorate's enquiry service, where an inspector responds to a contact giving advice by phone or email. Details about the use of the enquiry service are provided in *Annex 4*. However, in addition, during 2013, inspectors attended and gave technical presentations at eight regional local authority forums. They also carried out a further 11 visits to individual local authorities, some of which included site visits to assist with the risk assessment of a specific private supply. Also, during 2013, the Inspectorate was granted a non-commercial government licence for its private supply risk assessment tool and this is now being widely used by local authorities and their contractors. The Inspectorate publishes advice and guidance relevant to private water supplies on its website, and *Annex 3* lists these publications along with outputs of Defra drinking water quality and health research programmes managed by the Inspectorate.

Drinking water 2013 marks the creation of the national private supply record and, as a first step in realising the added value of this resource, the Inspectorate has carried out an exercise looking at where in the country private water supplies should be expected to feature as a significant component of a local authority's health protection risk management strategy. The exercise ranked each local authority according to the percentage of the total population served by a private, as opposed to a public, water supply. Figure 2 shows that there are 77 local authorities in England where more than 1% of the resident population do not enjoy access to a reliable piped supply of mains water. This is an important statistic to be considered by government at local and national level in the context of the international human right to water debate¹.

¹ UN Human Right to Water and Sanitation – UN resolution 64/292
http://www.un.org/waterforlifedecade/human_right_to_water.shtml

Figure 2: Estimate of the percentage of local authority population served by a private water supply

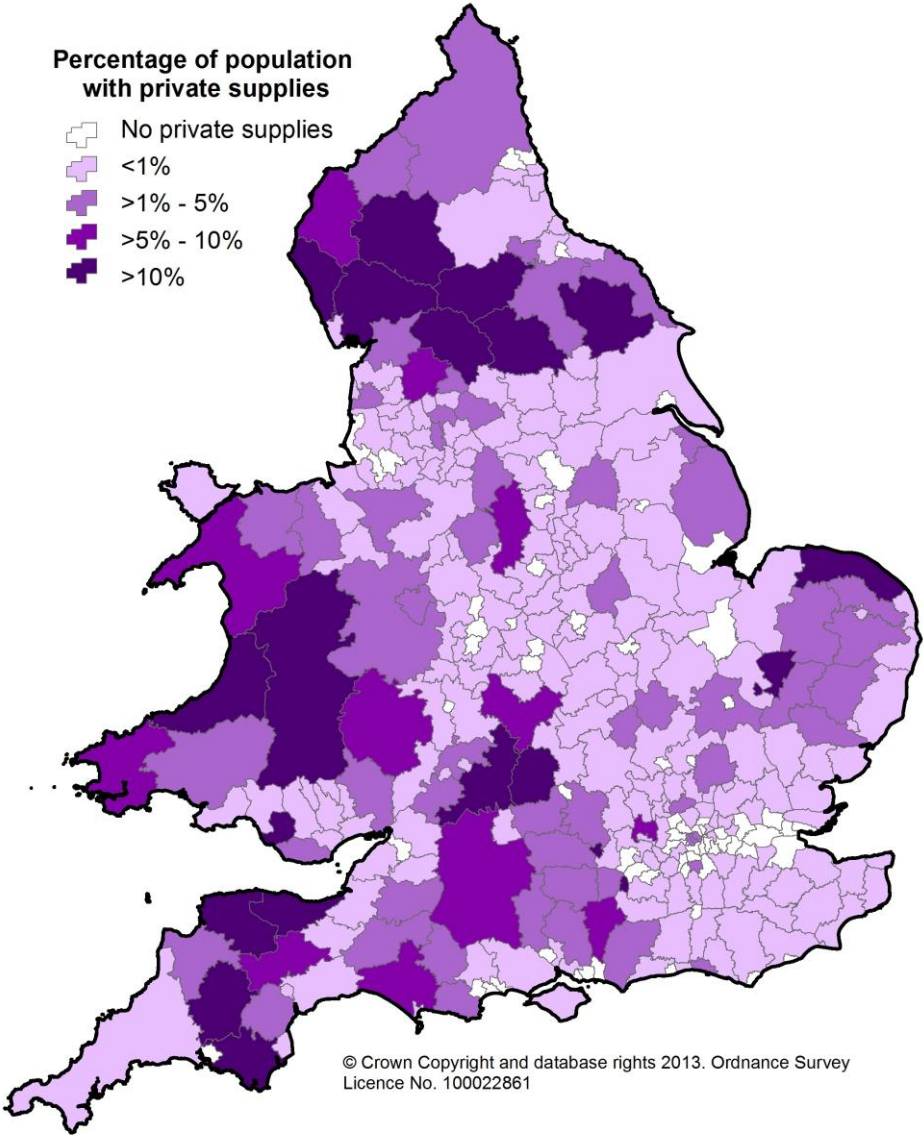


Figure 2 also demonstrates where in the country the safety of private water supplies should feature as an explicit component of the local authority public health protection strategy. For example, in England it would be expected that health strategies in Cumbria, Yorkshire, East Anglia, Central South and parts of Devon would contain explicit water improvement plans, because more than 5% of the population relies on a private supply.

The Inspectorate has recommended that particular local authorities identified in this exercise use the population-based risk information available from the Inspectorate, to ensure that the risk management of private supplies is prioritised within the authority’s health protection strategy. The Inspectorate also recommends that, where necessary,

enhancements are made to the resource allocated to risk manage and improve private supplies in accordance with the regulations. Additionally, the Inspectorate has recommended that all local health protection strategies should in future reference the local figure for access to a reliable to supply of water.

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.
- Estimates the population served by private supplies according to the type of water source.
- Reports on the performance of local authorities in making returns.
- Records the number of people attending events supplied by a temporary supply of water.
- Comments on the work done to verify local authority returns indicating no private water supplies.
- Illustrates the percentage of local authorities' population served by private water supplies.

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 a public building or used in a commercial activity, require greater scrutiny and monitoring than small, shared, domestic supplies. Supplies serving only a single domestic dwelling are exempt from monitoring unless the owner requests this. The regulations also recognise another category of private supply, where a person or organisation other than a licenced public water supplier further distributes water that originates from a public supply. These supplies require monitoring as determined by a risk assessment. Although not mentioned in the regulations, short-term temporary event water supplies, where the infrastructure usually comprises standpipes, with or without above ground tanks and pipes serving mobile toilets, washbasins and catering outlets, will require scrutiny as either a public or a private water supply depending upon the source(s) of water being used. The tables in this chapter summarise the number and nature of each type of private supply derived from the annual returns provided in January 2014 by local authorities to the Inspectorate². Anyone wishing to understand

² On receipt of returns from local authorities the Inspectorate carries out checks and makes changes where there are obvious miscategorisations of a supply.

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 *Drinking water 2012*, the Inspectorate reported that the national record of private water supplies remained incomplete because ten local authorities had not submitted an annual data return to the Inspectorate by the end of January 2012 as required. During 2013, the Inspectorate has been in close contact with these local authorities to facilitate the provision of returns in the future. As a consequence of this activity by the Inspectorate it is pleasing to report that, for the first time, the report includes a return from every local authority in England and Wales, so there are no gaps in the national record as regards details about the number and nature of private supplies. However, for three local authorities, the information included in this report is not the most up to date for the following reasons: Breckland District Council's return for 2013 could not be loaded into the Inspectorate's database because the errors were of sufficient magnitude that they could not be remedied by the Inspectorate, therefore, data from the most recent complete return (2011) has been used; Daventry District Council indicated they would be sending a 2013 return in late, but this was never received so data from the 2012 return has been used; Liverpool City Council has failed to send a return for the last two years, therefore, data from the 2011 return has been used. In summary, when reading this report it is important to bear in mind that it is the first complete picture and therefore the figures will differ from, and supersede, those published in *Drinking water 2012*.

From Table 3 it can be seen that there are records for 72,312 private supplies in the whole of the UK, of which 34,221 are in England. The area of England with the most private supplies (36%) is the South West of England. During 2013, local authorities in this region of England made good progress with classifying private supplies. The outcome is that the total number of private supplies in the region is more accurately quantified and now stands at 12,155 (down from the figure of 15,155 reported in 2012), with only a small number (2%) remaining unclassified. There are also significant numbers of private supplies in the North West (17%), the West Midlands (13%) and in Yorkshire and Humberside (12%). Local authorities in these regions have also made improvements to their private supply records, with a consequential fall in the number of supplies and fewer (2.2%) not yet classified. Table 3 also shows how there has been similar improvement in the other regions of England, which account for the remaining 7,744 (23%) of private supplies and where just 1.5% are yet to be classified. In summary, therefore, across the whole of England 686 (2%) private supply records require additional information to enable classification before the end of 2014. *This compares favourably to the*

previous year when 1,166 private supplies did not have sufficient information in the returns of local authorities to classify them.

Table 3: Number of private supplies reported in 2013, by region.

Region	Large supplies and any size supply used in a public building or a commercial activity	Small, shared domestic supplies	Single domestic dwellings	Private distribution systems	Insufficient information to categorise supplies	Total
East Midlands	156	249	951	19	14	1,389
West Midlands	480	679	3,036	76	105	4,376
East of England	378	533	2,202	32	30	3,176
North East England	248	493	458	1	18	1,218
North West England	929	1,261	3,310	191	127	5,820
Yorkshire and Humberside	595	1,163	2,271	10	86	4,126
London and South East	370	355	1,130	51	55	1,961
South West England	2,230	3,967	5,618	87	251	12,155
England Total	5,386	8,700	18,976	467	686	34,221
Wales Total	1,085	1,308	11,571	25	64	14,053
Northern Ireland*						4,122
Scotland*						19,916

*2012 data from the drinking water regulators for Scotland and Northern Ireland. Data excludes for local authorities that did not provide a return within the required timeframe or whose data could not be loaded due to errors: Liverpool City Council, Daventry District Council and Breckland District Council.

Looking at Table 3 it can be seen that more than half (55%) 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 of these supplies unless requested to do so by the owner, or if the supply comes to the attention of environmental health professionals for some other reason, such as where a risk assessment is advisable, for example where there is a change of

ownership or use. Accordingly, less is known about this type of supply and they have been excluded from the other tables in this chapter describing the characteristics of private supplies. The remaining 14,553 supplies in England that require risk assessment and monitoring are large supplies and supplies of any size used in the provision of services to the public (16%), small, shared domestic supplies (25%) or private distribution systems (1.4%).

Table 4 looks at those supplies in England used to provide water for drinking, cooking and washing in the provision of services to the public. In 2013, local authorities identified 5,261 such supplies, four more than recorded in 2012. Around two-fifths (42%) of these supplies are used by the tourism and leisure sector (hotels, bed and breakfast accommodation, campsites, and hostels). Of the remainder, more than a quarter are used in a food premises (28%) and around a fifth supply public buildings (21%). The rest (9%) are premises where the water is used for a range of commercial purposes. These figures reinforce the important contribution that private supplies make to the economy of England, particularly in the North West and the South West regions, which account for over half (55%) of all the private supplies used in the provision of services to the public.

Table 4: Numbers of private water supplies used for commercial and public activity

	Food premises	B & B/ hotels/camp sites/hostels	Public buildings	Other	Total
East Midlands	69	75	61	15	220
West Midlands	104	126	33	57	320
East of England	154	138	100	50	442
North East England	71	96	25	2	194
North West England	344	582	425	48	1,399
Yorkshire and Humberside	204	345	162	117	828
London and South East	138	70	70	68	346
South West England	383	760	236	133	1,512
England Total	1,467	2,192	1,112	490	5,261
Wales Total	225	709	157	58	1,149
This table excludes small, shared domestic supplies and single domestic dwellings. Some supplies have more than one type of commercial activity.					

Table 5 shows that in 2013, about half a million (494,759) people in England were reliant on a private supply, but Table 6 illustrates that many more people (7,759,937) were exposed to a temporary private supply when attending a leisure event, reinforcing the importance to public health protection of securing the safety of private supplies.

The data in Table 5 also illustrate the for the majority (67%) of people who use private water supplies, their supply is drawn from groundwater, but there are regional differences. For example, in the North West of England, half (50%) of the private supply population is reliant on surface water influenced supplies, likewise in Yorkshire and Humberside (49%). There is also a substantial exposure (41%) to surface water influenced private supplies in the South West of England. The figures for 2013 continue to show very few people relying on rainwater or brackish water sources across England.

Table 5: Estimate of population served

	Boreholes	Surface water influenced supplies	Rainwater	Estuarine or brackish water	Not recorded	Total
East Midlands	26,599	7,135	21		1,877	35,631
West Midlands	12,904	8,933	22		425	22,284
East of England	101,136	3,630	3		4,179	108,948
North East England	3,393	3,185			6	6,584
North West England	21,609	36,847	22		14,787	73,266
Yorkshire and Humberside	38,062	38,246	0		1,439	77,747
London and South East	83,672	8,309	2		99	92,082
South West England	45,470	31,905	30	5	808	78,218
England Total	332,844	138,190	100	5	23,621	494,759
Wales Total	17,510	37,058	109	5	17,566	72,248
Note: Surface water influenced supplies category include supplies where both surface and groundwater are used. Not all registered supplies (in Table 3) have a population reported. Excludes supplies reliant on further distribution of mains water.						

When considering the potential health risk relating to private supplies, it is important to be aware of the use of water for temporary events such as festivals, shows and other public cultural and leisure events. Table 6 shows that these events occur across the whole country, attended by close to eight million people. *In Drinking water 2012*, the Inspectorate recommended that local authorities worked closely with water companies to document and risk assess all temporary event sites and Regulation 8

supplies in their area. Table 6 shows that local authorities have recorded that the majority of people at temporary events (92%) are exposed to Regulation 8 private supplies (supplies derived from mains water that are further distributed by someone other than a licenced water supplier³). During 2013, the Inspectorate attended nine water company health liaison meetings to provide information about temporary event water supplies. The Inspectorate explained that in the majority of these situations the water supply arrangements will be a public supply, not a Regulation 8 private supply, and therefore subject to inspection and regulation by the water company through the fittings regulations. *During 2014, the Inspectorate will be contacting local authorities to check the accuracy of temporary event records and ensure those recorded as Regulation 8 supplies have been verified as such by the local water company.*

Table 6: Temporary events – population supplied

Region	Large supplies and any size supply used in a business or public building	Small, shared, domestic supplies	Single domestic dwellings	Private distribution systems	Insufficient information to categorise supplies	Total
East Midlands	14,810	-	1	19,738	-	34,549
West Midlands	15,994	-	-	5,857,000	2,025	5,875,019
East of England	112,193	49	24	88,106	-	200,372
North East England	1,611	2	6	1,000	-	2,619
North West England	150,308	691	48	30,700	54	181,801
Yorkshire and Humberside	69,043	-	80	115,000	-	184,123
London and South East	223,318	72	14	55,006	2	278,412
South West England	64,599	1,259	504	935,980	700	1,003,042
England Total	651,876	2,073	677	7,102,530	2,781	7,759,937
Wales	21,736	86	76	248,500	-	270,398

³ For details refer to <http://dwi.defra.gov.uk/stakeholders/guidance-and-codes-of-practice/pws-pds.pdf>

One purpose of the new private supply regulations, introduced with effect from 1 January 2010, was the creation of a national record of private water supplies. The purpose of this national record is two-fold: to enable effective public health protection (through improved transparency) and to make it possible for the Inspectorate (on behalf of the UK Government) to submit data to the EU Commission and therefore comply with the law as set out in the EU Drinking Water Directive. From the outset, the Inspectorate recognised that local authorities required a reasonable period of time to fully meet the reporting requirements before introducing more formal supervisory audits of performance. Accordingly, the first two annual reports on private supplies (*Drinking water 2010* and *2011*) did not contain a detailed assessment, instead the focus of these reports was to highlight and share good practice, addressing the common practical problems being experienced by local authorities. In *Drinking water 2013*, it was felt appropriate to provide a more detailed breakdown of the situation in relation to each local authority. This enabled the Inspectorate to identify those local authorities where tailored support and advice, by way of contact and visits, was required to secure compliance with Regulation 13 (provision to the Secretary of State of Schedule 4 private supply records). As mentioned earlier, this activity by the Inspectorate has enabled nearly all local authorities to provide a return for 2013, with most being received by the end of January 2014 or shortly thereafter.

Last year, the Inspectorate reported that 44 local authorities had submitted a 'nil return' declaring that there were no private supplies in their area. During 2013, the Inspectorate carried out an exercise to check the veracity of these returns. Various different data sources were used in these checks; for example, records of returns made to Defra under the old private supply regulations were retrieved from archive and reviewed. This identified that a few of these 44 local authorities had previously declared private supplies in their area. However, after further checks it was established that these supplies had either been abandoned or were no longer used for domestic purposes. Another approach used by the Inspectorate involved the use of geographic information systems (GIS) to create maps of local authority areas overlaid by water company supply zone boundaries. An examination of these maps enabled areas not served by a public water supply to be identified. The relevant local authorities were then contacted to establish the nature of these 'open spaces' and the likelihood of them being served by a private supply. In all but one case, these 'open spaces' with no public supply were verified as recreational or municipal amenities (such as nature reserves, sports fields, golf courses and cemeteries) where a piped supply of water for domestic purposes was not required. However, the exercise did yield valuable information for one of the 'nil return' local authorities as described below.

An 'open space' area identified by the Inspectorate's mapping exercise (see Figure 7) proved to be a naval base, which had been served by a public supply until recently when large parts of the site had been sold for development. This raised the possibility that Regulation 8 supplies may have been created in this part of the local authority area and a collaborative investigation with the water company has been initiated to establish the situation at the site. Depending upon the outcome the 'nil return' status of this local authority may change. *The Inspectorate is drawing this case to the attention of all local authorities because it illustrates the need for each local authority to have a joint strategy in place with the local water company to enable changes in water service provision to be identified. For its part, the Inspectorate can carry out a mapping exercise of any local authority area on request and has recommended to Defra that consideration should be given to amending the regulations to require premises owners to notify the local authority when a licenced water supplier does not provide the water supply for domestic purposes.*

Figure 7: Properties outside the water company supply area

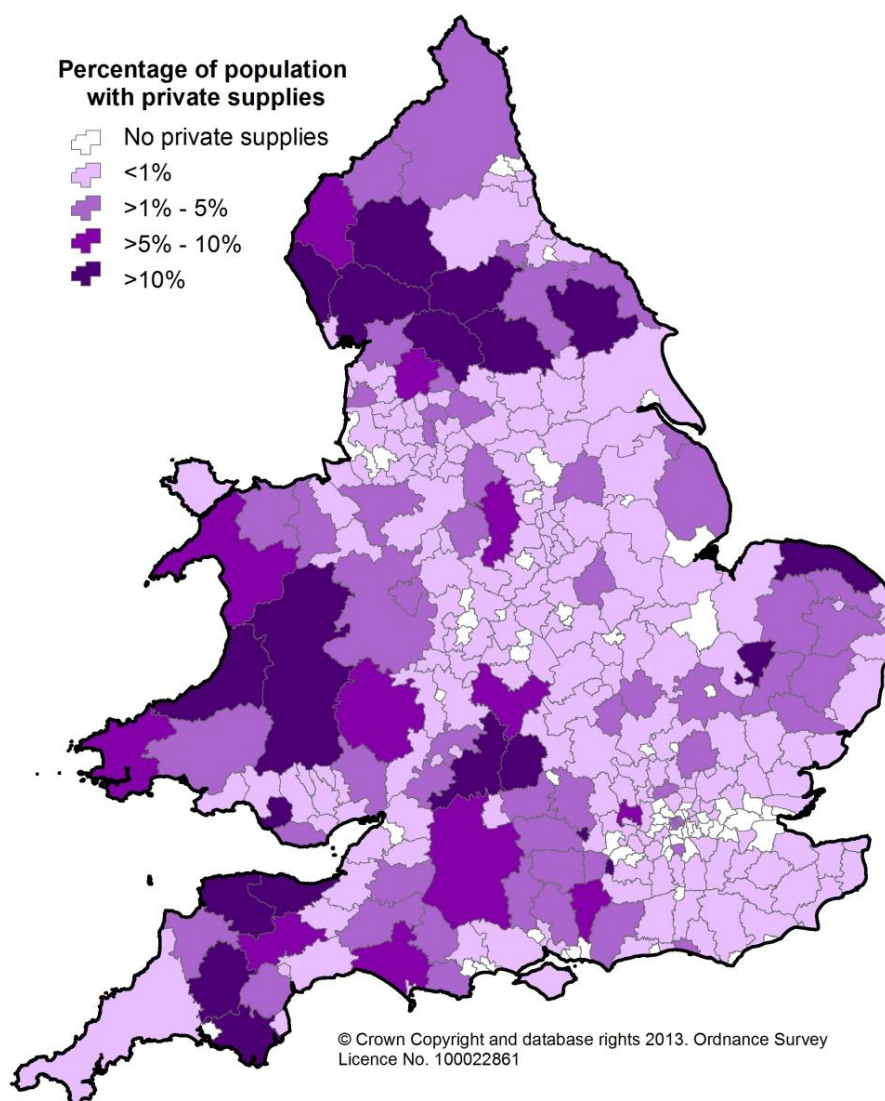


As mentioned above, the overarching purpose of the creation of a national private supply record is public health protection. Following the reorganisation of the health service in April 2013, responsibility for determining public health protection priorities and resources has been transferred to local authorities as advised by Public Health England. Through the improved transparency of consistently recorded private supply information held by the Inspectorate in the annually updated national record, there is now an information resource that can be called upon by local authorities and health protection teams when required to make decisions about the management and control of water-related disease outbreaks and water quality incidents.

As a first step to illustrating the potential of the national record, the Inspectorate has carried out an exercise looking at where in the country private water supplies should be expected to feature as a significant component of a local authority's health protection risk management strategy. The exercise ranked each local authority according to the percentage of the total population served by a private, as opposed to a public, water supply. From Figure 8 it can be seen that there are 77 where more than 1% of the resident population do not enjoy access to a reliable piped supply of mains water. This is an important statistic to be considered by government at local and national level in the context of the international human right to water debate⁴.

⁴ UN Human Right to Water and Sanitation – UN resolution 64/292
http://www.un.org/waterforlifedecade/human_right_to_water.shtml

Figure 8: Estimate of the percentage of local authority population served by a private water supply



*Data for three local authorities (Breckland District Council, Daventry District Council and Liverpool City Council) are from earlier submissions as no return was provided in 2013.

Figure 8 also demonstrates where in the country the safety of private water supplies should feature as an explicit component of the local authority public health protection strategy. For example, in England it would be expected that health strategies in Cumbria, Yorkshire, East Anglia, Central South and parts of Devon would contain explicit water improvement plans because greater than 5% of the population relies on a private supply.

The Inspectorate recommends that those local authorities listed in Table 9, should use the population-based risk information, available from the Inspectorate, to proactively address any deficit in current health protection

strategies and the resources available to risk manage and improve private supplies in accordance with the regulations. Additionally, the Inspectorate recommends that all local authorities should take steps to ensure that the local health protection strategy includes the figure for access to a reliable supply of water and introduces action plans wherever this is figure is less than 99%.

Table 9: Councils with an estimated population* reliant on private water supplies of greater than 5%

Allerdale Borough Council	Ribble Valley Borough Council
Copeland Borough Council	Richmondshire District Council
Cotswold District Council	Rushmoor Borough Council
Craven District Council	Ryedale District Council
Derbyshire Dales District Council	South Buckinghamshire District Council
East Hampshire District Council	South Hams District Council
Eden District Council	South Lakeland District Council
Forest Heath District Council	Stratford-on-Avon District Council
Harrogate Borough Council	West Devon Borough Council
Herefordshire Council	West Dorset District Council
Mid Devon District Council	West Oxfordshire District Council
North Devon District Council	West Somerset District Council
North Norfolk District Council	Wiltshire Council
Reading Borough Council	
*Estimate of total population taken from Census data provided by UK National Statistics. Estimate of population reliant on private water supplies taken from local authority returns to the Drinking Water Inspectorate.	

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.
- Highlights best 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 to identify and risk assess all relevant private supplies in their area (Regulation 6), and the Inspectorate has been tracking the progress being made providing technical support in relation to methodology and, where necessary, the enforcement or improvements to supplies. The methodology of risk assessment is based on the World Health Organisation's (WHO) *Guidelines for Drinking water quality*⁵ and *Water Safety Plan Manual*⁶ and a risk assessment tool created by the Inspectorate has been provided to local authorities. This tool⁷ is now in widespread use. Enquiries about the tool and feedback from its use should be sent to dwi.enquiries@defra.gsi.gov.uk

⁵ Guidelines for Drinking-water quality 4th Edition WHO, 2011.

⁶ 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.

⁷ 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.

Table 7 summarises the progress that local authorities have made towards compliance with Regulation 6 (duty to carry out a risk assessment within five years 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 had been risk assessed after four years was 5,573 (4,551 in England, 1,022 in Wales) covering approximately one-third (32%) of all relevant private supplies. This compares favourably to the situation published in *Drinking water 2012* where it was reported that only around one-fifth (19%) of relevant private supplies had been risk assessed after three years.

Looking in more detail at Table 10 it can be seen that local authorities have prioritised their Regulation 6 duties in line with guidance provided by the Inspectorate. Nearly two-thirds of all private supplies serving food premises (64%) and public buildings (60%), and more than half (53%) of those used in tourism and leisure, have been risk assessed. This compares favourably with the position as reported in 2012, but also reveals that there is a substantial shortfall to be addressed by some local authorities during 2014. Looking at the more detailed breakdown of performance on risk assessment at local authority level (see *Annex 1*), it can be seen that the situation is highly variable. For example, 81 local authorities in England have already risk assessed all their priority Regulation 9 private supplies, whereas 42 local authorities have not carried out any priority risk assessments at all after four years. Out of these 42 local authorities, the size of the task to be completed by the end of 2014 is manageable (five private supplies or fewer); however, the deficit is more substantial in the following cases: Teignbridge District Council (101 supplies), Suffolk Coastal District Council (22 supplies), Stratford-upon-Avon (20 supplies), Rossendale Borough Council (18 supplies), Daventry District Council (17 supplies), North East Derbyshire District Council (14 supplies), South Derbyshire District Council (13 supplies), Warrington Borough Council (ten supplies), South Cambridgeshire District Council (seven supplies) and North Warwickshire Borough Council (six supplies).

The regulations also require local authorities to have risk assessed all small, shared domestic supplies (Regulation 10) by the end of 2014. From *Annex 1* it can be seen that more (58) local authorities in England had not made a start on this task after four years. Out of these 58 local authorities, most (48) have less than 20 such supplies to risk assess by the end of 2014; however, the Inspectorate is concerned to note that 12 local authorities have many more shared domestic supplies that have yet to be risk assessed: Rossendale Borough Council (181 supplies), Teignbridge District Council (89 supplies), Suffolk Coastal District Council (74 supplies), High Peak Borough Council (66 supplies), Cherwell District Council (55 supplies), Braintree District Council (45 supplies), Allerdale

Borough Council (40 supplies), Rochdale Metropolitan Borough Council (34 supplies), East Hertfordshire Council (27 supplies), North East Derbyshire District Council (29 supplies,) Malvern Hills District Council (26 supplies) and South Cambridgeshire District Council (24 supplies).

In summary, therefore, the Inspectorate is concerned that some local authorities are at risk of substantially failing to comply with their Regulation 6 risk assessment duty by the end of 2014. The most notable of these appear to be Rossendale District Council (199 supplies), Teignbridge District Council (190 supplies) and Suffolk Coastal District Council (96 supplies). *During 2014, the Inspectorate will contact all local authorities exhibiting a potential risk assessment deficit to determine that plans are in place for starting work to carry out the required risk assessments and the date by when this is expected to be complete.*

Table 10: Percentage of supplies with risk assessments

Use of supply*	Percentage of reported supplies risk assessed to date at 31 Jan 2014	Number of risk assessments in place				
		Food premises	Bed and breakfast / hotels	Public buildings	Shared domestic supplies	Total number of risk assessments in place
East Midlands	54%	72%	52%	67%	19%	132
West Midlands	62%	75%	62%	58%	22%	443
East of England	53%	67%	44%	42%	22%	333
North East England	62%	97%	95%	96%	12%	215
North West England	31%	42%	32%	32%	21%	553
Yorkshire and Humberside	78%	85%	73%	78%	36%	879
London and South East	73%	70%	73%	69%	38%	404
South West England	47%	57%	53%	87%	11%	1,564
England Total	52%	64%	53%	60%	19%	4,523
Wales Total	64%	67%	68%	57%	24%	1,010
Total	54%	64%	57%	59%	20%	5,533

*Double counting may occur as some premises have more than one commercial activity.

3.2 Risk management

Risk management, in the context of the private supply regulations, refers to the decisions and actions that local authorities are required to take when they become aware, through risk assessment, monitoring or by other means (such as consumer complaints or reports of water-related illness from health professionals) that a supply may pose a potential danger to human health or is insufficient or unwholesome. Therefore, risk management involves interpreting the results of risk assessment and any water quality tests in the context of the particular water supply arrangements (source, infrastructure, treatment and management arrangements). Increasingly, and as a consequence of the new regulations, the local authority will hold this knowledge at the time the laboratory reports an adverse result. This is because a risk assessment will have been carried out and the testing tailored to the known hazards and controls (risk mitigation) pertaining to the particular supply. In the majority of situations the decision making of the local authority should be 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 the authority's own resources proportionately towards those situations where they add the greatest value in terms of public health protection.

Once a local authority has identified that a supply poses a potential danger to human health, or the quality of a private supply is not wholesome or the volume of water output is insufficient, then action must be taken to ensure that all consumers are informed and given appropriate advice to safeguard their health in the short term. Consumers must also be informed of the nature and timescale of any improvement works 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 the supply is insufficient or unwholesome, 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 new information. 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 that proves unresolvable, there is a formal process of mediation (appeal) and thereafter, the relevant person(s) is under a legal duty to carry out the necessary improvements.

Table 11a: Number of supplies where local authorities have served Regulation 18 Notices in 2013

Region	Number of local authorities	Reg 8	Reg 9	Reg 10	SDDW	Total
East Midlands	2 local authorities	-	2	1	-	3
West Midlands	4 local authorities	-	13	6	2	21
East of England	6 local authorities	-	5	3	3	11
North East England	1 local authority	-	1	2	-	3
North West England	13 local authorities	-	36	82	1	119
Yorkshire and Humberside	7 local authorities	-	15	19	-	34
London and South East	13 local authorities	-	37	13	-	50
South West England	19 local authorities	2	85	52	6	145
England total	65 local authorities	2	194	178	12	386
Wales total	9 local authorities	-	50	38	4	92
An appeal against a Regulation 18 Notice was heard in the magistrates' court in 2013. See Case study 9 for details.						

Table 11b: Number of supplies where local authorities have served Section 80 Notices in 2013

Region	Number of local authorities	Reg 8	Reg 9	Reg 10	SDDW	Total
East Midlands	None	-	-	-	-	-
West Midlands	1 local authority	-	1	-	-	1
East of England*	4 local authorities	-	1	5	-	6
North East England	None	-	-	-	-	-
North West England	2 local authorities	-	-	2	-	2
Yorkshire and Humberside	2 local authorities	-	1	1	-	2
London and South East	1 local authority	-	-	1	-	1
South West England	3 local authorities	1	2	1	-	4
England Total	13 local authorities	1	5	10	-	16
Wales Total	None	-	-	-	-	-

Table 11a shows that across England and Wales in 2013 there were 478 private supplies (386 in England) that were considered a potential danger to human health and where the owners were required by the local authority

to make improvements to protect public health. In England, half (50%) of these failing private supplies were ones used in the provision of services to the public or which supply more than 10m³ per day. The remaining improvement Notices were served on small, shared domestic supplies (46%), private distribution systems (0.5%) and single domestic dwellings (3%). Table 11b shows that 16 other private supplies were the subject of a Section 80 improvement Notice either because the supply was insufficient or unwholesome, although it was not considered to pose a potential danger to human health.

The Inspectorate wishes to draw the attention of local authorities to this risk information because it demonstrates that it would not be appropriate to assume that large private supplies are safer or better managed than the smaller supplies. Accordingly it is recommended that the five-yearly review of a risk assessment of a Regulation 9 supply by the local authority should focus on seeking evidence of adequate records showing that the supply is being well-managed and maintained, and that any improvements that were previously recommended (or formally required) have been completed. The Inspectorate will be providing advice to local authorities on the methodology for reviewing risk assessments before the first reviews fall due in January 2015.

Looking at the performance of local authorities in pursuance of their public health protection duty to prevent the exposure of the public to water that poses a potential danger to human health, the national record collated since 2010 provides evidence of where a local authority has served at least one Section 80 or Regulation 18 Notice to improve a failing supply. and therefore have in place the necessary procedures for, and are committed to, securing improvements to a failing supply in their area. However, the data also reveals that there are local authorities with Regulation 9 supplies that have not served an improvement Notice since the commencement of the regulations. This raises a question as to whether these local authorities have not identified any failing supplies or whether there are failing supplies and the local authority has not taken appropriate action. To understand the likelihood that some local authorities have adopted a policy of non-enforcement, the Inspectorate has considered how these local authorities compare with those local authorities that have taken enforcement action. From this the hypothesis was developed that a local authority area with at least 50 or more Regulation 9 and 10 private supplies in its area has a relatively high likelihood that at least one of these supplies is failing and requires improvement. By application of this hypothesis, the Inspectorate has identified 12 local authorities who have not indicated in their annual return, that they have served a since the commencement of the current regulations and where an effective enforcement policy may not be in place. These are listed below in order of likelihood that an effective enforcement policy has not been put in place:

Northumberland County Council (618 supplies)
Rossendale District Council (199 supplies)
Teignbridge District Council (190 supplies)
Denbighshire District Council (168 supplies)
Pembrokeshire County Council (127 supplies)
Scarborough District Council (127 supplies)
Monmouthshire County Council (109 supplies)
High Peak District Council (86 supplies)
West Berkshire District Council (77 supplies)
Derbyshire District Council (72 supplies)
Staffordshire Moorlands District Council (68 supplies)
Braintree District Council (53 supplies)

Local authorities not indicating on their annual returns whether they have served a Notice to improve a failing supply are advised to make sure they do this when submitting their annual return in January 2015. Also, all local authorities are advised that the Inspectorate intends to carry out more comprehensive checks of the annual returns submitted in January 2015 to assess the adequacy of enforcement. For example, supplies with sample results in breach of selected parameter standards may be cross checked against Notice records. During 2014, the Inspectorate will also be contacting the above-mentioned local authorities to ensure there is an effective policy in place for improving failing private water supplies.

In certain situations where the quality of a water supply does not meet particular drinking water standards, the EU Drinking Water Directive permitted a member state to grant a time-limited derogation. Under the private supply regulations these derogations are known as authorised departures. In *Drinking water 2012*, the Inspectorate explained that the EU Commission had recently clarified, through a legal opinion, that the power to grant derogations under the Drinking Water Directive had time expired and therefore the powers granted to local authorities under the private supply regulations could no longer be exercised. The implication of this change was that all failing private supplies in need of improvement should be the subject of either a Section 80 or a Regulation 18 Notice, and there should be no extant authorised departures. *Following receipt of annual returns from local authorities in January 2014, the Inspectorate is pleased to report that checks made show local authorities have taken this advice and there are no longer any private water supply authorised departures on the national record.*

3.3 Risk management case studies – England and Wales

The case studies published by the Inspectorate in *Drinking water 2010*, *Drinking water 2011* and *Drinking water 2012* have been welcomed by local authorities, therefore once again case studies have been included in this chapter. The selection of case studies by the Inspectorate is once again guided by enquiries received during the year, either from local authorities or private supply owners and their service providers. However, this year, the Inspectorate has also drawn on records of events notified to the Inspectorate by water companies to highlight those scenarios where the protection of public health relies on effective local collaboration and communications between the local authority and its local water company. The case studies published in *Drinking water 2013* will be added to the archive of published case studies on its website and this can be accessed at <http://dwi.defra.gov.uk/stakeholders/private-water-supplies/case-studies> as a learning tool for anyone coming new to the subject.

Case study 1: Why having regard to Regulation 5 is preventative and will save costly complex investigations and remedies

During August 2013, and by arrangement with the relevant local authorities, the Inspectorate visited a number of private supplies as part of a programme of technical audit looking at the implementation of Regulation 5 of the Private Water Supplies Regulations. This regulation prohibits the use of products that are not approved or the use of approved products in a manner that does not adhere to any conditions of use specified in the approval (<http://dwi.defra.gov.uk/stakeholders/private-water-supplies/reg5.pdf>). This case study describes the findings and learning points from a risk assessment of a private supply serving a population of 55 people (large Regulation 9 supply based on the volume of water used).

The supply derives from several spring sources. Water is collected in a holding tank and feeds by gravity to a service reservoir located downhill where the water is dosed with chlorine dioxide by means of a flow proportional system. The Inspectorate's audit confirmed two contraventions of Regulation 5.

First, the raw water holding tank had been rendered using an unapproved cementitious product. The use of an unapproved product in this context poses a risk for two reasons: there may be substances in the material that will leach out into the water impairing its quality and posing a potential danger to human health; additionally, if any material is not cured fully before water is reintroduced into the tank, then reactions may occur between the water and the uncured material giving rise to a subsequent deterioration in the condition of the structure or water quality or both.

Figure 12: Leachate floating on the water surface



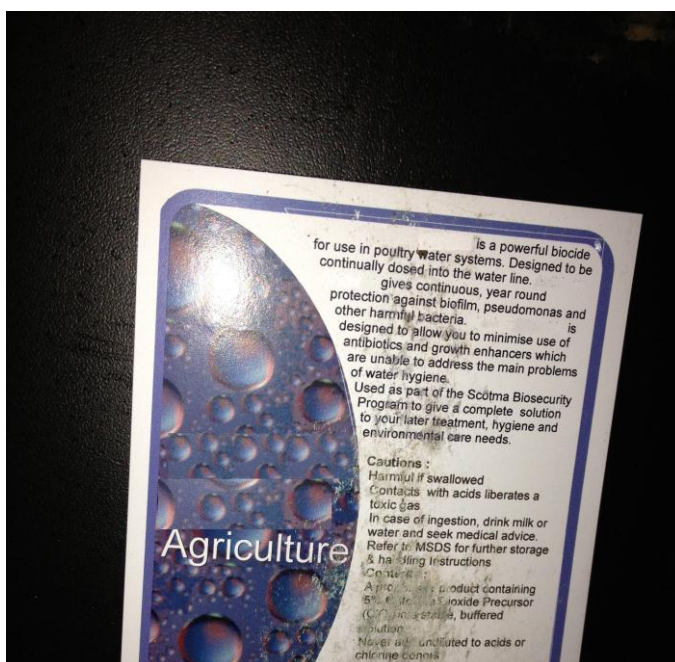
Figure 12 shows the leachate from the material floating on top of the water in the holding tank and illustrates the relatively large surface area to which the unapproved material was applied. This indicates how the exposure to potentially harmful substances from the use of unapproved products can be substantial and why contravention of Regulation 5 should not be regarded as a trivial matter.

The action taken by the local authority had been to sample and test the floating material in the holding tank in an endeavour to determine whether this posed a risk to health. However, this sampling approach does not provide an equivalent level of public health protection to Regulation 5. The approval process for cementitious products involves a rigorous regime of evaluating the formulation of the product and testing of product samples prepared in accordance with the manufacturer's instructions to BS EN standards by accredited laboratories. The purpose of such testing is to verify that there will be no adverse effect on water quality or health. Approval also involves a review of the manufacturers' instructions for use and the setting of any conditions that need to be adhered to when the product is applied on site. Retrospective testing after a problem has occurred, as carried out in this case, cannot determine reliably if the cause is due to the material itself or whether it has arisen as a consequence of the instructions for use being incorrect, or not followed correctly. Likewise, retrospective testing, without a full knowledge of the material composition and its method of application, cannot provide a robust assurance as to the future safety of the water supply. The second contravention came to light when the chemical dosing equipment and associated chemicals were checked. The system installed was a chlorine dioxide dosing system. The manufacturer of the system was one that does supply products listed by the Inspectorate as approved for use with drinking water; however, the

product used was not approved. Instead, as shown in Figure 13, the product was intended for general agricultural purposes.

Fig 13: Evidence that the dosing system was not of an approved type

The consequences of the use of a system intended for general agricultural purposes, as opposed to one specifically approved for drinking water, is that the chemical being dosed may be of a grade that is not sufficiently pure and thus contains contaminants, such as heavy metals, that will be added to the water. Additionally, the concentration of the active ingredient may be either too low or too high resulting in disinfection and water quality being compromised through under or overdosing. This contravention of Regulation 5 is particularly concerning because the system was sourced from a manufacturer and supplier of approved products, yet the wrong type of system was purchased and installed.



This case study illustrates two contraventions of Regulation 5 on one private supply where unapproved products were used, despite the ready availability of equivalent approved products. *The Inspectorate recommends that when carrying out risk assessments, investigating complaints or sample failures, and when enforcing private supply improvements, local authorities have regard to Regulation 5. Raising the awareness of private supply owners and operators whenever the opportunity presents will encourage compliant behaviour and prevent problems arising that can be difficult and costly to remediate retrospectively. For its part the Inspectorate has provided information to support awareness raising on its website (see <http://dwi.defra.gov.uk/stakeholders/private-water-supplies/reg5.pdf>).*

Case study 2: The risk to water safety posed by eco-building design and the absence of effective procedures for scrutiny of the water supply aspects of planning applications

In August 2013, the Inspectorate provided on-site technical support to a local authority when carrying out a private supply risk assessment at premises owned by the local authority. The premises was a public building providing educational facilities, including water sports for schools in the area. The design was intended to be an eco-building and the private supply, which derived from a shallow well in gravel strata, provided water for all domestic purposes other than drinking (including heating, toilet flushing, hand-washing and showering). The building has a separate public supply of water for the provision of drinking water.

The risk assessment was triggered by complaints from the manager of the centre about the water being discoloured (see Figure 14) and there was staining of the sanitary wear, including the showers. When the facility was first granted planning permission and built, the new private supply was added to the local authority private supply record, however, at that time none of the parties involved (planners, engineers, council staff) understood that while the supply was not intended for drinking, it was still being used for domestic purposes and therefore needed to be wholesome as defined by the regulations.

Figure 14: Discoloured water at a handbasin



The well water is pumped into a tank and then passes to a treatment system comprising a sand filter for particle and turbidity removal, an ion-exchange unit (possibly for water softening but no design records as to purpose exist) and an ultraviolet (UV) disinfection system, all of which is powered by electricity generated on site by wind and photovoltaic cells. There was a history of interruptions to the power supply with consequential losses of the water supply and members of staff were in the habit of resetting the system whenever this occurred. This action prevented the correct cycling of the backwashing treatment programme and was therefore leading to the filters and the ion-exchange media becoming saturated and failing to adequately treat the water supply.

This case study demonstrates a common problem that arises in relation to public buildings, especially eco buildings, namely those who finance, design and commission such water systems frequently fail to make provision for onward safe operation and do not recognise or have regard for the regulatory regime for water supplied for domestic purposes. In this case, in response to an obvious design fault with the power supply, staff using the building were accessing and operating a critical part of the water system without having any knowledge or understanding of the consequences of their actions for the safety and quality of the water. Workarounds, such as resetting a system each time a fault occurs, introduce risks and hazards that go beyond causing the water treatment to fail and the water supply to be unwholesome, they potentially create risks to the health and safety of staff or users of the facility.

In premises served by both a private and a public water supply, specific risks can arise to the public water supply, therefore it is important that the water company is notified by the premises owner, as required by the Water Fittings Regulations 1999, so an inspection can be carried out to verify that the supply arrangements are satisfactory. Following the risk assessment the local authority has put in place procedures for the food safety team (who deal with private water supplies) to be notified of planning applications for new private water supplies. As regards the eco-building it was decided to abandon the private supply and rely solely on the mains water supply by installing two public supply storage tanks.

This audit enabled the Inspectorate to verify that the risk assessment tool provided to local authorities places appropriate weight on the management aspects of private supplies so that the risks illustrated in this case study will be identified and acted upon. *The Inspectorate recommends that local authorities put in place effective procedures for scrutinising the water supply aspects of planning applications and always notify the local water company whenever it is discovered that both a public and a private water supply serve a premises.*

Case study 3: Commissioning of a private supply to a large hospital

This case study relates to a decision by a large National Health Service (NHS) hospital to develop a private water supply. It was intended by the hospital management that this private supply would replace the existing mains water supply and be used for all domestic purposes, including drinking, food preparation and washing, by staff, patients and visitors. The objectives of the scheme were to realise what were felt to be extensive cost savings in water charges, and to improve resilience. It was intended that the existing mains water supply connection would be kept only as a standby facility. In November 2010, work commenced on drilling a new borehole on site and in August 2012, an abstraction licence was applied for and granted by the Environment Agency (EA). In October 2012, a third party informed the local authority that a borehole had been constructed and made operational, and was shortly to be commissioned into service to supply the hospital. When the local authority made enquiries, it quickly came to light that the hospital management was not aware that private supplies used for domestic purposes are regulated under the Water Industry Act 1991 by local authorities. It was agreed to delay commissioning of the private supply until the local authority had carried out a risk assessment and satisfied itself that the supply was wholesome and safe, and met all regulatory requirements.

During 2011 the borehole contractors had carried out studies, the purpose of which was to support an application for an abstraction licence to the EA. These studies were documented in a pre-feasibility report (March 2011) and, after the borehole was drilled, in a post-feasibility report (March 2012). Between October and November 2011 the feasibility of the borehole to yield the required volume of water was confirmed. The report contained basic borehole water quality test results to determine the characteristics of the borehole water for licensing purposes and to a lesser extent, to identify the need for water treatment. The scope of the report stopped short of determining all existing and potential hazards, and was insufficient in scope for a private water supply regulatory risk assessment. For example, in relation to catchment risks, it contained a recommendation that the EA be contacted to discuss the likely groundwater quality. Furthermore, at a later stage when the Inspectorate became involved in giving advice, it was found that the borehole had been constructed without a 'run to waste' facility, preventing any additional raw water quality monitoring.

As part of the programme of works, the hospital had contracted the services of another company to supply and install water treatment equipment. This system included chlorination, pH correction (using sodium hydroxide) and UV disinfection. This contractor had collected an extensive

number of samples to verify that the treated water complied with the drinking water standards. However, no regard had been paid in the design of the system to Regulation 5 requirements and the chemicals being used were not approved for use with drinking water, and the UV system was not validated. Unapproved chemicals can contain harmful impurities and the concentration of the active ingredient may not be suitable for the intended dosing regime. UV disinfection does not leave a residual that can be measured to verify that the correct dose has been applied and the intensity of the UV light varies within each reactor. Microorganisms passing through a reactor are not all subjected to the same dose because of variations in the water systems as regards residence time, hydraulics and UV intensity. Therefore a process of dose validation is required to demonstrate that a UV system will apply a target dose under defined operating conditions. Validation comprises independent third party testing, commissioned by the manufacturers, in respect of the different models they sell. The Inspectorate is of the opinion that in this type of circumstance (a large private supply to a public building such as a hospital replacing an existing mains supply) it should be mandatory to use only a validated UV system.

The local authority was not satisfied that the water quality information provided by the hospital was sufficient to establish the degree of risk posed by the catchment. In particular, the local authority was aware of several historic, disused landfill sites within a radius of five miles around the new borehole. As a result, the hospital was required to demonstrate that they had considered all risks from the catchment by the provision of further monitoring data and evidence that any identified risks are mitigated by the installed treatment or by other relevant control measures. This led the hospital to contact the EA for information on the catchment risks. In response, the EA referred the hospital back to the local authority because landfill records are held by local authorities. The EA felt that it was the duty of the local authority, not the EA or the supply owner, to carry out the risk assessment.

Faced with this impasse, the hospital installed a run to waste facility and contracted the services of a consultant to undertake further monitoring with the borehole in continuous operation. This established the water met all the drinking water standards. Based on the consultant's report and substantial additional testing data, the hospital was confident that there were no apparent catchment risks that required additional control measures, other than a regime of operational monitoring for indicator parameters. Despite this additional information, the local authority remained uncomfortable about the use of the private supply by the hospital. This uncertainty centred on a focus by the local authority on hazards, rather than risk. The local authority had developed an inexhaustible theoretical list of possible toxic waste substances with a view to requiring extensive monitoring by the hospital for a 'catch-all'

range of analytical parameters. The Inspectorate advised that this list was excessive and unrealistic, and not in the spirit of the risk-based regime of drinking water regulation. A compromise was reached whereby both parties would carry out an agreed set of actions to a deadline, after which the supply would be turned on.

This case study is one of a number of situations, which have come to the attention of the Inspectorate during 2013 whereby a public building (for example, hospitals and food premises) has been switched from a public to a private supply without the prior involvement or knowledge of the local authority. In each case deficiencies have been found with the private supply arrangements that posed a potential or actual danger to human health. This situation comes about because the existing legislation does not compel anyone (premises owners or their contractors) to register a new, existing or standby private water supply with the local authority whereupon they could be made aware of their responsibilities under drinking water law. *The Inspectorate has recommended to Defra that the private supply regulations are revised to include a duty on owners to notify the local authority. Meanwhile, local authorities need to act on any intelligence pointing towards changes in the water supply arrangements at public buildings.*

The Inspectorate draws the attention of local authorities to the need to be proportionate, reasonable and timely in relation to their requests for additional monitoring evidence to support a risk assessment. Whereas it is important to seek out available information about potential and actual hazards in the catchment, particularly in relation to records held by the local authority regarding contaminated land and information held by the EA, the duty of the local authority is to make a judgement of risk, taking into account the controls in place. Monitoring requests should be limited to that which is clearly necessary to validate controls and for ongoing verification of the risk assessment. Guidance embedded in the Inspectorate's risk assessment tool should be followed to identify suitable controls and indicator parameters for different hazard types. In complex supply situations, additional technical advice can be obtained by contacting the Inspectorate.

Case study 4: Options for dealing with non-compliance with a Notice

This case study involves a small, shared domestic supply serving three properties where the private supply is the responsibility of the owner of one of the properties. The spring source arises in a field used for grazing cattle and sheep. The supply is not treated either at source or any point downstream. Users had observed that the supply was discoloured on occasions, particularly after heavy rainfall.

The risk assessment carried out by the local authority confirmed a number of hazards and concluded the supply posed a potential danger to human health. The risk assessment was verified by the detection of *E.coli*, coliforms and *Clostridium perfringens* in samples. A Regulation 18 Notice was served requiring source protection measures and the installation of appropriate treatment within 90 days; however, the deadline for the Notice passed without any remedial work having been carried out. The owner of the supply stated that they were boiling the water and in his opinion this was an appropriate remedial measure for the other users. The local authority reiterated that boiling is only a short-term safeguard until long-term remedial action as set out in the Notice was complete, ensuring that all users had a safe and secure supply by means of pipes.

The local authority identified, in discussion with the Inspectorate, that they had two main routes to progress the improvement works. Firstly, they could give short notice (for example, seven days) of their intention to revoke the Regulation 18 Notice and serve a new Section 80 Notice for unwholesomeness, as in this instance they had evidence from the sample failures. This would allow them to identify that the remedial work had not been carried out enabling the works to be carried out in default by the authority under Section 81 of the Water Industry Act 1991. Alternatively, they could take the case to the magistrates' court for non-compliance with the existing Regulation 18 Notice, ask that it be made into an order and the works carried out in default under that mechanism. However, in this case the owner of the supply was elderly and frail, so the authority decided they would prefer to use the Section 80 Notice route.

Shortly after the Regulation 18 Notice deadline expired, the owner became ill and had to transfer power of attorney to her solicitor, a process that took several months to conclude. Once complete, the solicitor explored a number of options, including a connection to the mains supply. By then one of the other properties had already made a connection to the mains supply. The remaining property was boiling their water for drinking and cooking, and the owner's property was vacant as she had moved into sheltered accommodation.

This case illustrates the options for dealing with non-compliance with a Notice, which can be considered on a case-by-case basis as various factors, including the particular local supply arrangements, will influence the agreed route. However, where risks to health are identified it is imperative that actions are pursued in a timely manner even when the situation is complicated. *The Inspectorate reminds local authorities that their duty to secure a safe water supply is not satisfied by putting in place an open-ended boil water advice notice. It is known from behavioural studies that boil water notices are not complied with by everyone initially and over a relatively short period of time non-compliance becomes widespread, as a consequence of inconvenience or change of occupancy. As a general rule, a boil water notice must be followed up with a Regulation 18 remedial action Notice to bring about a permanent remedy, even where all that is needed is better management and maintenance (see also the Regulation 8 case study below for further evidence of the adverse consequences of issuing open ended and unqualified boil water advice).*

Case study 5: Enforcement action where covenants exist

This case study describes a common barrier that was encountered repeatedly by one local authority when seeking to improve various private supplies in its area. After identifying the need for a supply to be improved through risk assessment, the local authority would then be confronted by the supply owner seeking to fall back on property deeds, as a justification for refusing to carry out the required supply improvements. This situation arose in relation to both Regulation 9 and Regulation 10 supplies. It occurred even in cases when the potential danger to health of the supply had been verified by sampling and additionally showed the water was not wholesome.

Property deeds (or covenants) are concerned with the rights of a premises owner to access a source of water that arises on another person's land. They can also confer duties on one premises owner to give access to their premises to other persons for the purpose of allowing them to draw on and maintain the source, and associated tanks, pumps or pipes. These deeds made under property law are put in place to deal with what in lay terms is usually referred to as the 'right to water'. The purpose of these deeds and covenants is to provide a framework for the use of a common water resource in private ownership and they provide a means of redress in civil law if one party acts outside the framework to the detriment of the other parties; however, such civil agreements do not negate or overrule the duty that falls to a relevant person to ensure that a water supply for domestic purposes is wholesome, sufficient and safe, as set out by Parliament in the Water Industry Act 1991 (and associated regulations). Accordingly an owner of a private supply may only have recourse to such deeds and

covenants as a means of clarifying to the local authority the persons responsible for access or maintenance, and therefore either directly or indirectly who is responsible for the costs of any required improvements. Where such deeds or covenants are silent regarding the costs of protecting or treating the water to ensure it is wholesome at the point of use, then these costs fall on all relevant persons as defined by the Water Industry Act 1991.

In this case, the Inspectorate advised the local authority that when dealing with a failing private supply where there are deeds or covenants in place, they should explain that the Water Industry Act 1991 puts a duty on each and every relevant person to ensure that the supply is sufficient and wholesome, and the deeds and covenants can serve only to indicate where the duty has been assigned differently. For example, if a deed or covenant establishes a committee or a company or a responsible person and assigns to them full responsibility for management or control of the supply. The Inspectorate also advised the local authority that it should not be overly prescriptive about the technical means by which a supply is improved. While it is important that supply owners are given advice about the nature of the risk and best practice in terms of mitigation of these risks, relevant persons must be afforded the opportunity to choose between methods of source protection and water treatment that are equally effective. For example, central treatment versus point of use treatment can be equally effective, but have different maintenance requirements and those concerned must be cognisant of what is entailed, including the keeping of records.

After receipt of the Inspectorate's advice, this local authority has been able to more confidently deal with this type of barrier. For example, in one case the private supply was abandoned in favour of a connection to the mains supply. In summary, the existence of property deeds and covenants, are not a barrier to improving failing private supplies. A Regulation 18 Notice should be served on all relevant persons requiring improvement action. The Notice should specify the nature of the risks and what constitutes an appropriate mitigating control measure, and require proposals for remediation to be put forward by a given date. If the Notice is not complied with then a magistrate should be asked to convert the Notice to an Order. To date, magistrates have always upheld Regulation 18 Notices in the face of objections from supply owners.

Local authorities should be confident that the typical argument put up by a supply owner that 'they have drunk the water and breached the Act for years but have not come to harm' is not a due diligence defence. *Local authorities should be aware that the Inspectorate is able to act as independent technical expert and can be asked to give evidence in support of any hearing in the magistrates' courts about a private supply notice.*

Case study 6: Case of *E.coli* 0157 associated with a private supply to a rented property

This case study involves a private supply to two domestic premises; one owner-occupied, the other rented out. In November 2013, the local authority was notified by Public Health England (PHE) that the tenant had been hospitalised due to a confirmed infection with *E.coli* 0157. Other sources of *E.coli* 0157 infection having been ruled out, the water supply was considered the most probable route of transmission.

The source of the water supply was a well sunk into a minor aquifer, deemed vulnerable to pollution by the EA due to the nature of the overlying soil and flow characteristics of the aquifer itself. However, the well was located in a field used for grazing cattle. The wellhead works were raised above ground level and protected with a suitable inspection cover. Water from the well is fed into two black plastic tanks located inside a secure outbuilding.

Water from the tanks is passed under pressure through pH correction media and is then disinfected with UV. The treated water is then distributed to each of the properties.

In June, some time before the tenant fell ill, the local authority had carried out a risk assessment, which identified the need for stock proof fencing around the well and an appropriate maintenance schedule for the treatment system. Monitoring carried out at the time showed the pH level was below the drinking water standard (6.0) and the supply also failed the standard for manganese at a level of 86µg/l. To remedy this, the owner arranged for the pH media to be replaced and set up a maintenance schedule. The local authority had a policy of not taking formal action to secure private supply improvements with action being left to the discretion of the supply owner.

Figure 15: Black plastic storage tanks



When the local authority and PHE visited the site in response to the tenant contracting an *E.coli* 0157 infection, it was evident that the stock proof fencing had only just been erected. Additionally, it was found that the UV disinfection system lacked a pre-filter and the water exhibited a turbidity value of 8.5NTU (compared to the standard of 1NTU for water prior to disinfection). *E.coli* 0157 was detected in a sample of the raw water together with other faecal indicators. The local authority formalised advice to boil water in a Regulation 18 Notice and required the water supply system to be cleaned and disinfected, and a filter to be installed before the UV unit.

The local authority returned to the site a month later to verify that the remedial works had been carried out. Although samples on this occasion were satisfactory for turbidity and faecal indicators, there were still elevated levels of manganese and also aluminium, and the pH levels were not stable. On this occasion the local authority advised the owner of the supply to install iron and manganese removal treatment, and to fit a pH monitor that could be used to regularly check and adjust the treatment.

Figure 16: New 5 micron cartridge filter prior to UV disinfection



The case study highlights why the Inspectorate recommends that local authorities should be reviewing and updating local policies governing how they discharge their private supply duties. In this instance, although deficiencies in the supply were identified during the original risk assessment, because the local authority obtained a satisfactory sample at the time, only informal advice was given. It remains a common misperception that a risk assessment cannot or should not be acted upon if a sample taken at the time is satisfactory. Some local policies take a generic approach, assigning small supplies to a lower risk than large supplies; however, this too is misguided. The approach to enforcement should have regard to the risks inherent in the behaviour known to be associated with the persons responsible for different types of private supply. Non-compliant behaviour is far more frequent among owners of small domestic supplies and this group are also more likely to take a DIY approach to maintenance of the water supply when they lack appropriate knowledge.

This case study also emphasises the importance of classifying tenanted properties as Regulation 9, thereby subjecting them to more robust scrutiny. Tenants are a transient population who are more at risk than owner-occupiers. In this case, the person who fell ill was an otherwise healthy adult, which reaffirms that poorly managed private supplies are a risk to wider public health, not just an issue for especially vulnerable individuals.

The Inspectorate recommends that those few local authorities that have adopted a policy of not classifying rented properties as Regulation 9 take special note of this case study and reconsider, especially in light of their responsibilities under the housing law and a landlord's duty to provide a wholesome supply of water. It should be noted also that, in this case, neither the landlord nor the local authority has a robust due diligence defence against a claim from damages made by the injured party.

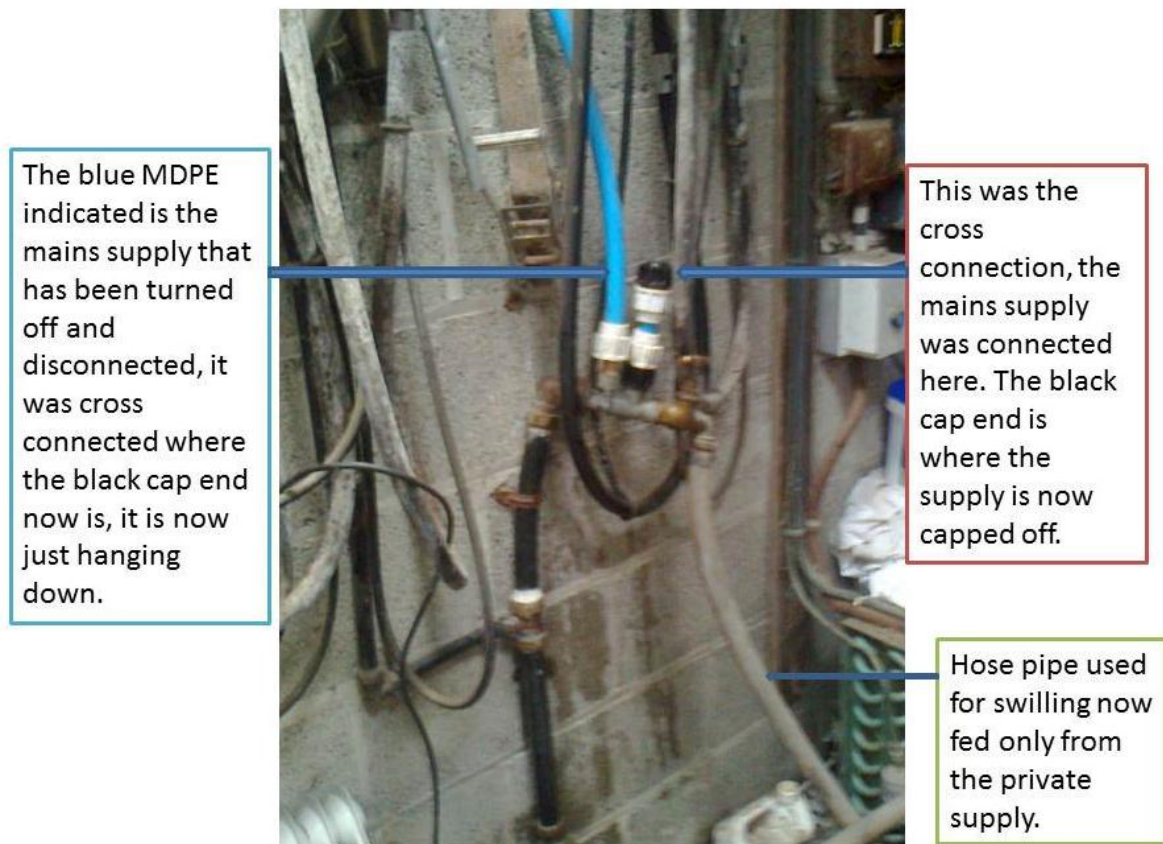
Case study 7: Further evidence of farms as a category of premises at high risk of causing water to be unsafe as a consequence of unsuitable water supply arrangements

In October, the occupier of a farm premises reported discoloured tap water to the water company shortly after fire fighting activity in the neighbourhood. Samples collected by the water company contained *E.coli* and Clostridia. A fittings inspection carried out at the farm premises identified a cross connection between a raw water source intended for cattle troughs and the mains water supply used for domestic purposes in the dwelling.

The owner of the farm premises had no understanding of the origin of the raw water source on his premises. The water company later established that the raw water came from a connection into a transfer main between a raw water storage reservoir and a canal. When a hydrant on the local mains supply was used by the fire brigade this would have caused a fall in mains pressure that would have been sufficient to draw raw water back through the illegal connection into the mains. Figure 17 shows how the two water supplies were connected (and subsequently disconnected) on the farm premises. Note how originally both supplies were feeding into a cistern and only a manually operated gate valve separated them.

The water company explained the serious infringement and served a fittings regulations Notice under Section 75 of the Water Industry Act 1991. The customer immediately disconnected the cross connection (see Figure 17). Following the removal of the cross connection and disinfection of the pipework to the property, the water supply to the property was found to be of good quality.

Figure 17: Supply arrangements



This case study is one of a growing number demonstrating how the water supply arrangements on farm premises can often lack essential safeguards. Water used for livestock watering can be derived from all manner of sources and quite often these will be connected up to the domestic water supply (public or private) as a standby arrangement. These connections are often not made by a competent plumber (for example, one registered under the WaterSafe scheme). *The Inspectorate advises local authorities to work collaboratively with water companies to raise awareness of risk through providing owners of farm premises in their area with the relevant Water Regulations Advisory Scheme (WRAS) leaflet and by sharing intelligence about non-compliant behaviour associated with a farm premises with the local water company. The leaflet may be found at [http://www.wras.co.uk/pdf_files/WRAS Agricultural Premises 2012.pdf](http://www.wras.co.uk/pdf_files/WRAS_Agricultural_Premises_2012.pdf)*

Case study 8: The public health value of keeping records of private supplies whether or not these are used for domestic purposes

This case study concerns a situation that arose in a rural supply area where the domestic water supplies are made up of a mixture of public and private supplies. A householder contacted the local water company when he suspected illness in the family was due to the water supply. The water company took samples straightaway from the property and one nearby. The next day the results of both samples showed the presence of *E.coli* (>100 per 100ml) and boil water advice was given by the water company while they investigated further. It was noted that the microbiological failures were associated with water of a distinctly different chemistry to the mains water supply; for example, low pH and high conductivity. This observation was strongly suggestive of a cross connection with another source of water in use on a local premises, so the company extended the boil water advice to all 47 properties located downstream of their local service reservoir. The area assessed at risk and safeguarded was defined by drawing on additional information such as satisfactory samples upstream of the service reservoir, knowledge of the network and sampler observations (water appeared discoloured).

The water company informed the local authority and PHE. There was just one private water supply on the local authority register and this was a single domestic dwelling for which there was no other information, as the owner had not requested monitoring and risk assessment. The water company carried out a fittings inspection at this premises and found no cross connection to the mains water supply.

Extensive sampling of consumers' taps in the area by the water company uncovered three other premises with a mains water supply and a private water supply (details not on the local authority register). Tap samples from two of these premises contained *E.coli*. Local authority site checks established that these private supplies fed animal troughs on the farms and were not used as part of a milking parlour or for any domestic purpose. Of these three supplies, the water company's inspector found one farm with an operational milking parlour, where mains water and a private supply were being blended in a storage tank. The fittings inspection showed that there were adequate air gaps to prevent back siphonage from the water storage tank and the animal water troughs.

During the event investigation, the local authority and water company met with the owner of the unoccupied farmhouse with a milking parlour. The farmhouse owner lived in an adjacent cottage that was connected to the mains supply. He had previously notified the local authority that the farmhouse was unoccupied and the milking parlour not in use, but intended

to connect the farmhouse and milking parlour to the mains. The consequence of this notification was that the local authority removed details of this private supply from its records.

As part of this joint investigation, the water company installed double check valves on the mains connection to each of the premises where another source of water was found. After dealing with these potential sources of contamination and mitigating the risk to the mains supply, the water company flushed and disinfected its network and increased the residual chlorine level at the upstream service reservoir.

Although the source of the contamination could not be definitively traced, water samples from the private supply serving the unoccupied farmhouse contained *E.coli* and the water chemistry was different to mains water. In all likelihood this event occurred when some type of temporary cross connection was made on this or another premises in the locality.

This case study illustrates the heightened risk to mains water supplies in rural areas where there is a mix of public and private supplies. It shows the public health value of local authorities recording the details of all sources of water used on premises in their area, whether or not these are single dwellings, and irrespective of whether they are used for domestic purposes. A local authority record is not intended to be solely about private supplies used for domestic purposes that require sampling and risk assessment. Keeping as full a record as practicable, covering all types of private supply, enables a rapid and effective multiagency response to a wide range of situations, not just suspected water supply contamination events, but also, for example, flooding events.

The Inspectorate recommends that local authorities develop links with property management and letting agents, estate agents and local solicitors advising them, by leaflet, about private supplies and encouraging them to provide information to help with the development of the private supply record.

Case study 9: Magistrates dismiss an appeal by a private supply owner against a Regulation 18 Notice

This case study is about a large historic building open to the public regularly throughout the year. The private water supply comprised two sources: a borehole and well. The borehole water was combined with well water and disinfected with UV light just prior to where it was used in the kitchens. Untreated borehole water was used to supply a shower block, toilets and animal troughs.

Historically, under the old 1991 regulations, the local authority monitored the water quality of each source six times a year. Between February 2002 and August 2004 the borehole samples failed for coliform bacteria on ten of the 16 occasions, with four samples containing *E.coli*. The results from the well supply showed this to be of worse quality, with coliform bacteria detected in 11 out of the 16 samples and *E.coli* present in five. Under the old regulations the local authority took no action until they received sample results with higher than usual counts in a well sample in August 2004. At this point the local authority advised cessation of the use of the well supply for any domestic purpose. Believing the well to have been taken out of service, the local authority then continued to monitor just the borehole. Between 2005 and 2009 the results show that coliform bacteria continued to be present in borehole samples (eight out of 27 samples with *E.coli* present on one occasion).

When the new 2009 regulations came into force, the local authority carried out a risk assessment of the supply. A report was sent to the owner making a number of recommendations to improve the safety of the supply. This report reinforced the earlier advice that the well supply should not be used for domestic purposes without boiling due to its poor microbiological quality. However, it also identified manganese concentrations above the standard and a concern that this would deposit on the UV bulb rendering disinfection ineffective. Notwithstanding this potential health risk (ineffective disinfection), the local authority served a Section 80 improvement Notice (not a Regulation 18 Notice) requiring treatment for manganese removal on the grounds that the water was not wholesome by virtue of manganese being present above the standard. The Notice was put in place in July 2011 and the owner subsequently installed filtration on the borehole; however, the level of manganese at the kitchen tap continued to exceed the manganese standard. The owner attributed this to deposits in the pipes, but agreed to put in place a programme of maintenance for the UV unit.

In September 2012, a planned audit sample contained *E.coli* and coliform bacteria. When the local authority investigated it found the well was back in use and the UV treatment unit was not being adequately maintained.

The owner explained the well had been brought into use earlier in the year because low rainfall had reduced the yield from the borehole. The local authority advised the owner to take remedial action to make the wellhead watertight (to prevent the ingress of surface water) and to examine the capacity of the UV unit to ensure that it is designed to treat the maximum flow rate. At this time, there was a large public event due to take place with many visitors on site over a weekend. The local authority therefore asked the owner to provide the public attending this event with bottled water or boiled water (hot drinks).

At this stage the local authority had clear information showing that the owner had only carried out one of the actions identified as necessary by the risk assessment report in 2010 (capping of the borehole). There was no regular maintenance programme for the UV unit, no log being kept of any maintenance or other operational actions, and the well was being used. It was also realised that the requirement for water for other domestic purposes (shower block) to be wholesome had not been adequately addressed before this point in time. A Regulation 18 Notice was therefore issued setting out the following: restriction of the drinking water supply so that consumers were informed about the safeguards they should take to protect public health (achieved through notices around the site), work to render the well watertight, treatment to ensure water supplied to the shower block was wholesome, a maintenance programme and the development of a water safety plan.

The owner appealed the Regulation 18 Notice. His objections were as follows: he considered the Notice invalid because it did not specifically refer to which of the two sources it applied (the well or the borehole). He also felt that the grounds for serving the Notice had not been set out and he disputed that the supply was a risk to human health because not all of the samples had failed. The local authority sought advice from the Inspectorate and this enabled them to be satisfied that the Notice was set out correctly as it applied to 'the water supply', and a water supply comprises 'all of the physical assets, from source(s) to tap(s) including all pumps, tanks, pipes, valves, treatment units and taps inside every building'. Furthermore, the Notice clearly set out the grounds on which it was served. The risk assessment verified by the historic monitoring had confirmed the risk to health from faecal contamination and the elevated manganese had been shown to interfere with the disinfection. Additionally, the supply arrangements were not safe because the well disconnection was not permanent; it was by means of a valve that could be operated at any time.

The appeal was heard in the magistrates' court in March 2013. A drinking water inspector attended as expert witness for the local authority. The court upheld the definition of a water supply as the entire supply system,

including all sources, treatment and distribution system. The court further confirmed that the grounds for serving the Notice were adequately described and the supply presented a potential risk to human health on the basis of the risk assessment. The court ruled that the Notice should stand and the appeal by the owner was dismissed. Within two months the owner had carried out most of the remedial actions, including the physical disconnection of the well from the supply system.

This case illustrates the weaknesses inherent in the old regulatory regime and reinforces, for local authorities, the robustness of the new regulatory regime when remedial action identified through risk assessment is set out in a Notice. It also provides a good example of the ineffectiveness of informal action and advice, and the need for this approach, if used, to be put in a letter and strictly time bounded. *The Inspectorate recommends that those local authorities that have adopted a policy of informal action to improve failing private supplies take note of this case study and reconsider their policy. At the very least, such local authorities must satisfy themselves that they could demonstrate, if challenged, that their policy of informal action is effective and in the public interest.*

Case study 10: Managing the risk to private supplies from chemical spills

This case study relates to a spillage of approximately 60,000 litres of liquid fertilizer from two storage tanks on a farm in a rural location. The tanks contained a mixture of urea, ammonium nitrate and sulphur, and the spillage is thought to have arisen as consequence of vandals opening tank valves.

The local authority was informed about the spillage by the EA on the same day that it came to their attention. The local authority was able to identify that there were eight private water supplies, all served by boreholes, within 2km of the spill. One served a milking parlour and the others were domestic supplies, four serving single dwellings and the other three were shared domestic supplies (classed as Regulation 10 supplies). At the time of the spillage the local authority had no quality information about any of these supplies and the Regulation 10 supplies had not been risk assessed.

In response, the local authority collaborated with the EA and the local PHE to assess the risk posed to the private supply consumers. The likelihood of the fertiliser reaching the groundwater and the borehole abstraction points could not be determined from the available information, therefore samples were taken from the three supplies closest to the spill location. While this monitoring was undertaken letters were hand delivered to consumers on all

eight supplies to notify them of the situation and to advise them not to drink the water, as a precautionary measure.

The samples were found to be free from ammonium (<0.02mg/l) and all but one exhibited nitrate at levels below the standard of 50mg/l. The higher value of 58.2mg/l was not thought to be attributable to the fertiliser spill. A further set of samples were taken for nitrate and ammonium a week later. During these sampling visits the Inspectorate's Information Note on Nitrates was provided to all consumers, with a cover letter from the local authority. This second set of samples gave similar results to those found previously; ammonium was not detected and the nitrate levels were satisfactory in all cases except for the sample from the property that previously failed, where a similar value of 57.4mg/l was obtained. These observations were reassuring when considered in the context of other information provided after two weeks by a specialist acting on behalf of the farmer's insurance company. This investigation had identified that the spillage site comprised mainly of clay and this would have prevented the fertiliser from soaking straight down through the soil. In addition, soil samples had shown no evidence of fertiliser at a depth of one meter. Based on these findings the warning notice to the consumers was lifted.

About one month later, the specialist reported that the results of the ongoing investigations were showing low nitrate levels in all further soil samples. They concluded that the farmer's immediate action of removing the top layer of soil at the earliest possible opportunity had been significant and beneficial in its effect. This was supported by high nitrate results in the soil which had been removed.

This case study illustrates the importance of prompt and effective communication by the EA to the local authority of an environmental event with the potential to impact adversely on the quality of private supplies. This enabled a public health risk assessment to be carried out, leading to an agreed collaborative action plan and a prompt decision to warn consumers about the short-term steps they needed to take to safeguard themselves.

One objective of the new private supply regulations was to ensure that an accurate up-to-date record of the location and nature of private supplies is available to support the public health function of local authorities. A learning point from this case study is the way it highlights the value of the geographic information (such as grid references) that forms part of the information the Inspectorate requires local authorities to include in their records and annual returns. In this instance, the local authority used historical maps to establish the locations of private water supplies in proximity to the spill area.

The Inspectorate advises all local authorities to develop and keep up to date private supply maps, if a readily accessible mapping facility is not an integral part of the system containing the private supply records. If needs be, local authorities may contact the Inspectorate for assistance with mapping. When providing grid references in annual returns to the Inspectorate, local authorities should be aware that one purpose of this information is to develop the capacity of the Inspectorate to provide bespoke combined public and private supply maps to assist with risk management of serious emergencies and incidents requiring a multi-agency response (see case study below on the wider public health benefits of the regulations).

Case study 11: Regulation 8 supplies: out of sight out of mind?

This case study concerns the unintentional identification of a Regulation 8 private water supply to 25 properties through the compliance monitoring programme of a water company. On detecting coliforms in a random sample, the company took further samples from the same property and a neighbouring one upstream. Both of these additional samples contained coliforms, so the company investigated further and found that these and other properties were connected to the water supply via a water storage tank that was in a poor hygienic condition with inadequate seals as evidenced by slugs and snails on the roof and walls of the tank, and no overflow insect guard.

Jointly the water company and local authority issued a boil water notice and bottled water was provided until the owners had cleaned the tank and dealt with the ingress points. The local authority wrote to all the householders, but did not serve a Regulation 18 Notice. This decision, based on the fact that a risk assessment had yet to be done and further satisfactory results had been obtained, meant that the owner of the supply was not compelled to complete the remedial work in a reasonable time period. As a consequence the boil water notice remained in place for longer than three months and the management company responsible for the tank was able to defer a decision on a suitable solution to secure the long-term security of the supply (renovation or replacement).

This case demonstrates the lack of historic local authority or water company records about situations where third parties are further distributing water (Regulation 8). Such arrangements pose a high risk because they usually involve a storage structure that is poorly designed or maintained and it is inevitable, therefore, that at some stage water in the tank will become contaminated unbeknown to those using the water for domestic purposes. Joint working to raise the awareness of property management and letting companies of the need to report such water

supply arrangements to the water company and the local authority is recommended by the Inspectorate as a way of reducing the risk and avoiding costly incident investigations and remedies.

This case also highlights how informal action by the local authority is frequently ineffective in achieving a timely or permanent remedy. As indicated in an earlier case study it is not acceptable for consumers to be expected to have to boil water for anything other than a short period of time. A Regulation 18 Notice requiring both short-term and long-term remediation with target dates would have gone a long way towards reassuring consumers, and minimising the inconvenience to them by focusing the minds of the relevant persons.

Case study 12: Deciding whether a situation comprises a public or a private water supply

This case study concerns a large estate with a land area of around 35sq/km comprising farms, schools, industrial sites and houses. The estate is managed by a trust, the responsibilities of which include the operation, maintenance and management of the water supply. The trust has been abstracting water to supply the estate since the mid-1920s and over the years, a total of five wells have been developed and used. Only two wells of the five remain in current use; the *old well* (commissioned in the 1960s) and the *new well* (commissioned in 1995). Water from each well is piped to its own raw water storage tank. Stored water from each raw water reservoir is then filtered and chlorinated via a single treatment plant before being pumped to two treated water tanks from where it is distributed by gravity to serve all the premises on the estate.

The way that the water industry has been restructured over time provides important context for this case study. Before the mid-1970s, many relatively small water boards provided all the public water supplies in England and Wales. In 1975, ten water authorities were formed, each based on a river catchment, and these water authorities took over and consolidated the water supply functions of the water boards. A few of the water boards remained as separate entities where these were constituted as private companies. In 1989, the water authorities were privatised and became water companies. Since that time all public water supplies have been provided by water companies and, more recently, by licenced water suppliers.

A river runs through the estate and in the 1960s the then local *water board* sank a well on the opposite side of the river bank to the estate's *old well*. The *water board well* was of a specific shallow horizontal type known as a radial collector (Ranney), designed for installation in shallow sub-surfaces

to collect water as it infiltrates from a riverbed. At the time of its construction, it was alleged that the Ranney would compromise the yield from the *old well* on the opposite bank, due to its depth and close proximity. In response, the water board made a verbal agreement with the trust to augment the *old well* supply at no cost to the trust and constructed a raw water main to enable a transfer of water directly from the Ranney to the *old well*.

When, after 2010, the local authority came to implement the new private water supply regulations, believing from historic records that the estate was a private water supply, the local authority planned to carry out a risk assessment. An important first step in the process of risk assessment requires the water supply layout and assets to be understood and documented from source to tap.

Figure 18: Old Well Headworks in foreground and pump house in background.



Figure 19: Old Well interior showing iron-ductile pipework rising main, incoming raw water supply from South West Water



As a consequence of this activity it came to light that a water company was operating one of the sources of water to the estate. The Inspectorate became involved at this stage because water provided free of charge by a water company normally constitutes a *concessionary supply* – a type of supply that is regulated by the Inspectorate as a public water supply. It was necessary, therefore, for the current *water company* to work with the local authority and the trust to clarify the source water arrangements on which the estate's water supply relied.

This joint investigation revealed that the original verbal agreement between the water board and the trust was subsequently formalised in a written legal agreement in 1976, not long after responsibility for the Ranney was transferred from the water board to the water authority. This written agreement stated that for as long as the *water authority's* well was

in use, the water authority would continue to augment the estate's *old well* source free of charge. At face value this agreement implied that the arrangement was a *concessionary supply*. However, a concessionary supply comprises a supply of water for domestic purposes to premises and, on closer scrutiny, it was determined that the written agreement was concerned wholly with the transfer of raw water from one source to another (to manage the yield from the *old well*). Crucially the water company assets (Ranney and raw water transfer main) did not supply water for domestic purposes directly and the trust alone exercised control from source to tap of the domestic water supply on the estate. This clarification of the source water arrangements, combined with the fact that the recorded volume of water used by the estate was 605m³/d (>10m³/d), meant that the local authority could be confident that the estate's supply should be recorded and regulated by them as a Regulation 9 private water supply.

This case study illustrates why the Inspectorate's risk assessment tool emphasises the importance of local authorities obtaining an up-to-date and accurate schematic of the water supply from source to tap that is underpinned by formal documentation of the roles of responsibilities of all the relevant persons. It shows how there can be long-standing arrangements between various parties that have become clouded with time, illustrating the importance of ensuring that critical management and control arrangements are documented, and correctly interpreted in the context of the Water Industry Act 1991. The absence of clarity about any aspect of the ownership or operation of part of a private supply should be regarded as a potential risk to its safety and sufficiency, and local authorities should require action to be taken, because if matters are left unclear, this can lead to damaging disputes and consequentially inappropriate behaviour regarding the maintenance of the water supply.

The Inspectorate is pleased to commend this case study as an exemplary example of the close collaboration between a local authority and a water company that is promoted by the Inspectorate as a crucially important factor in safeguarding water supplies. In this instance, there were both public and private water sources in close proximity, therefore, the water company held water quality information that was directly relevant to the operation of the private supply. Likewise, details of the private supply arrangements were something that needed to be fully documented by the water company as part of the risk assessment and risk management of the public supply.

Case study 13: The challenge of keeping private water supply records up to date – a joint local authority and water company task

This case study concerns a farm premises comprising the farm and three other properties, one of which is a holiday let. The premises was connected to the mains and therefore recorded on the local water company customer records. In October, a sample was collected from one of the properties as part of the water company's random sampling programme in the water supply zone. The sample contained *E.coli* and coliform bacteria. The water company immediately advised the occupiers to boil their water and commenced an investigation. From this it was established that while the farm premises was connected to the mains, all water used for both domestic and non-domestic purposes on the farm was derived from a spring. The farm owner indicated that the mains supply was being kept solely as a backup. The water company checked their meter readings and these confirmed that no mains water had been used in the past year.

The water company contacted the local authority and from this it was found that the private supply was not on their register. Although local authorities are required to keep and maintain records of all private water supplies in their area (Regulation 12) there is no statutory requirement for premises owners to notify the local authority of an intention to use a private supply for domestic purposes. Once aware of the situation, the local authority wrote to the owner of the supply informing them about the private supply regulations and to arrange to carry out a risk assessment and monitoring.

Meanwhile, the water company took investigatory samples and carried out a fittings inspection. This revealed that the mains water supply and the spring supply were separated by a stop valve which appeared to be secure, and posed no immediate risk of cross contamination. However, because the spring derived water is pumped to a reservoir on high ground that then gravity fed to the farmhouse and animal troughs, there was insufficient protection from contamination of the mains supply through the back pressure. This risk was verified by the investigational samples, which also contained *E.coli* and coliform bacteria. The company therefore served a fittings regulations Notice requiring a double stop valve to be installed. The owner took prompt action to install the double check valve, he also repaired the tank and put in treatment.

Figure 20: Spring collection chamber



Figure 21: Treatment arrangements showing filter and UV tube



In November, the local authority carried out its risk assessment and sampling. By this stage the supply configuration comprised the spring chamber from where water was pumped to a reservoir and then filtered and disinfected with UV before passing on to the properties. At the holiday let there was a point of use UV unit as a further barrier. The risk assessment revealed gaps in the record keeping and documentation regarding management of the supply. It also documented hazards in relation to the source and storage arrangements; however, it was concluded these risks were adequately mitigated by treatment. The sampling verified the risk assessment although it revealed that the pH was just below the standard.

This case study highlights how the maintenance of private supply records is a challenge that is shared jointly by water companies and local authorities. Like other case studies published by the Inspectorate, it points to the need for awareness-raising measures to be taken to ensure that premises owners know how to make their water supply arrangements safe. For its part, as mentioned in the earlier hospital case study, the Inspectorate has recommended to Defra that the private supply regulations are revised to include a duty on owners to notify the local authority.

Case study 14: Land agents – a sectorial group in need of water safety information?

In October, after power was restored to a public supply booster station, an operational sample was collected by the water company from a farmhouse and found to contain *E.coli*. On investigation the company identified that the contamination was likely to be arising in two privately owned tanks providing water to the farmhouse and three other properties. Boil water advice was given to the occupiers of all four properties who were also provided with a bowser and bottled water. It was found that the metered mains supply filled an underground break pressure tank. Water from this tank was then pumped to another storage tank and from there water fed by gravity to the farmhouse, the other three properties and six cattle troughs.

After seeking advice from the Inspectorate, the water company and local authority sought to clarify whether the water supply arrangements were within the scope of the private supply regulations. The land agent was uncooperative, but it was eventually established that all the properties were situated on one premises, therefore, this was not a Regulation 8 private supply, but instead it was a public supply, albeit the arrangements were unusual with only one property, the farmhouse, registered as a water company customer. Since the local authority was unable to serve a private water supply Notice to secure improvements, they instead used powers under the Housing Act to remind the land agent of his responsibilities and expedite action to secure a wholesome water supply.

Figure 22: Situation of tank



Figure 23: Interior of tank



Figures 22 and 23 illustrate the poor condition of the underground tank. A temporary overland supply was put in place comprising a new temporary water storage tank feeding the existing booster pumps and bypassing both existing tanks. The water company verified that this temporary arrangement was compliant with fittings regulations. The water company and local authority then established a co-regulation arrangement for managing the ongoing risk. This involved the local authority assessing the supply as a 'temporary supply' against the Code of Practice for Provision and Management of Temporary Water supplies and Distribution Networks (BS 8551:2011) with the water company sampling four times a year alongside checks and, if necessary, enforcement of the fittings regulations. This co-regulation arrangement was considered necessary because information had come to light demonstrating how the land agent had ignored previous advice from consultants in 2012 about the need to improve the water supply arrangements. The temporary supply and co-regulation arrangements will remain in place until a permanent supply is provided that is demonstrably compliant with the fittings regulations.

This case study serves as a salutary reminder of the low priority afforded by some in society towards their responsibilities in relation to making sure that water supplies are safe. It further highlights the importance of local authorities and water companies sharing local intelligence to target areas at high risk of unusual water supply arrangements, thereby making appropriate risk-based adaptations to monitoring, inspection and enforcement. *The Inspectorate recommends that water companies and local authorities jointly develop educational materials targeted specifically at land agents, for example, a WRAS sector leaflet that local authorities can distribute.*

Case study 15: Realising wider benefits from local authority private supply data returns

This case study provides local authorities with an insight into the wider public health benefits that were envisaged when the new private supply regulations were introduced and the Inspectorate acquired a supervisory role on behalf of the Secretary of State. In particular, the case study examines one aim of the Regulation 13 duty on local authorities to provide the Inspectorate with details of the location and nature of private supplies in their area enabling the Inspectorate to integrate private supplies into the existing wider national arrangements for safeguarding drinking water.

The Inspectorate has in place a range of intelligence sharing arrangements that provide alerts to circumstances that may threaten drinking water quality. In particular, the Inspectorate is alerted by the EA to events that may affect the quality of surface or groundwater and also receives bespoke media monitoring and other situation reports specifically aimed at identifying developing situations with a potential to impact on drinking water. In 2013 three such events, described below, were identified and acted upon by the Inspectorate to quickly identify any at risk private supplies.

At the end of 2013, stormy weather brought down power cables across the South East of England. The Inspectorate was notified by the EA that an oil-filled power cable damaged in the storm was leaking. Some power cables are oil filled for performance and insulation purposes. The initial report from the EA did not indicate whether consideration had been given to a risk to any private water supplies and so the Inspectorate quickly contacted the EA controller to confirm what was known. It was established that the EA had been unable to source location details for private supplies in the vicinity, so using the relevant local authority data returns the Inspectorate was able to quickly map the location of the nearest private supplies and establish these were all over 2km away from the incident site. This response allowed the EA to confirm that the remediation approach being adopted by the power company would not put private supplies at risk.

In January 2014, the Inspectorate picked up on a breaking news story that a large fire at a waste management site (vehicle tyre store) had been burning since October 2013 because the fire brigade were disinclined to put out the fire due to concerns about run-off firewater polluting local water supplies. The Inspectorate quickly checked the location of public abstraction points and private supplies in the area and then directly challenged the media story as inaccurate. This action revealed that the actual media concern was for wildlife (Greater Crested Newts, a protected species resident in the vicinity of the site of the fire). A rapid response is

essential to the task of successfully heading off inaccurate media reporting that, if left to run uncorrected, would cause public concern about drinking water.

In January 2014, when severe flooding occurred in South West England, the water company notified the Inspectorate that public supplies to the affected communities such as Muchelney were unaffected (piped supplies being underground and under positive pressure). By using this information about the extent of the flooded area, the Inspectorate mapped the location of private supplies potentially at risk from the local authority's data return and this identified an inundated caravan park. However, a check with the local authority confirmed that the water supply to the site originated from the local mains. In emergency situations the Inspectorate inputs information about drinking water risks to the daily national situation reports compiled by Cabinet Office. Fast access to both public and private supply data enables the Inspectorate to manage the accuracy of these fast moving flows of information so that they provide reassurance, where that is appropriate, or focus attention on only those situations where a risk has been identified and is being responded to by the relevant agencies.

These and other case studies provide good evidence that local authority data returns (Regulation 13) are making a positive contribution to the national framework for risk management of drinking water safety. The Inspectorate is aware that hitherto some local authorities may not have fully appreciated the public health protection purpose and use of annual private supply data returns. This case study, along with case studies 8 and 13, provide local authorities with the wider context and necessary insight to address any outstanding local policy or resource issues impeding the delivery of complete and accurate private supply returns going forward.

Case study 16: Are local authority records of private supplies being taken into account proactively and beneficially during planning and housing decisions?

This case study concerns a shared private water supply for domestic purposes serving four properties. The source of the supply is a borehole sunk in the 1960s from where water is pumped to a large concrete storage tank. Water then gravity feeds, by means of alkathene pipes, to each of the properties. Residents had made the local authority aware that the large storage tank can run dry in the summer months, therefore they are all aware of the need to conserve water to ensure the sufficiency of the supply.

In July, after one of the properties had been sold, the new owner applied for planning permission to develop outbuildings into several holiday

cottages. The other residents contacted the environmental health team of the local authority to express concern about the additional demand this development would put on the supply, particularly in light of the change of use from owner-occupied to holiday let (Regulation 10 to Regulation 9). It was felt that visitors would not necessarily be motivated to conserve water putting the whole supply at greater risk.

The environmental health team, being familiar with the water supply situation, was able to explain this to the planning department, specifically the sufficient and wholesome duties on local authorities in the Water Industry Act 1991. They requested that any planning permission should be subject to a condition requiring a separate water supply for the development of new holiday cottages. This was put in place and the owner did not appeal the planning condition. A drilling company was engaged to install a new borehole to supply the holiday cottages; however, a new source with sufficient yield could not be established easily. Not wishing to expend further drilling costs with no guarantee of success, the owner did not proceed with the development.

This case study illustrates the importance of the questions about sufficiency embedded in the Inspectorate's risk assessment tool. Specifically when carrying out a risk assessment of a shared supply, local authorities should ensure information is sought from all the residents. *The Inspectorate recommends that local authorities put in place procedures that ensure the planning application process and housing health and safety rating system (HHSRS) takes full account of private supply records and duties in relation to both sufficiency and quality. Also see Case study 2.*

Case study 17: Illness reported by a visitor to a holiday cottage where the multi-barrier approach to water treatment had not been followed

This case study involves a private supply to two cottages, one of which is let out as a holiday cottage. Spring water collects into a holding tank on the hillside and then passes through a coarse filter (approximately 50 microns) and feeds by gravity through plastic pipework to both houses. At the holiday cottage the water is filtered again through a 50 micron filter before being disinfected with ultraviolet (UV) light before it is drawn from kitchen and bathroom taps. There is a completely separate untreated rainwater supply for toilet flushing at the holiday cottage. The two coarse filters on the spring supply are changed weekly and the lamp on the UV unit is changed annually.

After returning home to Scotland from a week's stay in September in a holiday cottage in Wales, a lady contacted the Inspectorate to report her concerns about the water supply at the cottage. She had fallen ill with a

stomach upset on the third day of her stay. Her partner who had chosen only to drink bottled water during the stay was not ill. Suspecting the water supply, she and her partner had investigated its origins by climbing up the hillside where they had observed the water flowing down overgrown land prior to being collected in the holding tank. They were concerned that there appeared to be no protection against faecal contamination from wildlife or grazing animals. Back home the lady discussed her concern for others staying in the holiday cottage with a friend who worked for a water company. It was only through this link that the lady was able to identify a route by which she could raise her concerns. Following this contact the Inspectorate notified the local authority of her complaint and asked that it be investigated.

The local authority had a record of the supply, but it was registered as a single domestic dwelling not as a shared domestic supply to two properties (Regulation 10) or a holiday let (Regulation 9). This meant that the local authority had not carried out a risk assessment, although samples had been taken in 2012 and again in 2013 on the request of the owner. It transpired that shortly before the Inspectorate referred the complaint to the local authority, the owner had informed the local authority that he was letting the property out to visitors. Based on this information, the local authority reclassified the supply as Regulation 9 and this meant that a risk assessment would have been carried out in the fullness of time.

Following the complaint, the local authority visited the site in November 2013 to carry out a risk assessment and to discuss matters with the owner. At that time, the owner of the land on which the source was located was not available so the source could not be assessed. Ever since that time, the weather conditions have been such that access to the source has not been practicable. At the time of the visit, the local authority was able to confirm that treatment was in place and appeared to be working, although they did make recommendations about the need for keeping records of maintenance. The owner reported a concern that there may have been some vandalism of the upper part of the supply; however, even under normal operating conditions the Inspectorate is of the opinion that the coarse filters would not have been sufficient to adequately prepare the water for disinfection. Spring sources are prone to rapid water quality changes and any suspended or dissolved matter can mask contaminants from exposure to UV light, as well as fouling the lamp, leading to a failure of inactivation of pathogens like *Cryptosporidium*.

Local authorities are advised to ensure that UV disinfection units installed on private supplies with a surface water source are protected by first passing through a series of two filters, for example a 10 micron filter followed by a 1 micron filter. A single coarse filter (50 micron) will be ineffective and a single 1 micron filter is likely to quickly become blocked

and malfunction. This advice follows the well established 'multi-barrier' principle advocated by WHO.

Case study 18: Private supplies require active management to ensure they are safe

This case study concerns a private supply serving a premises used by a charity for the provision of children's adventure holidays. When the charity purchased the property it was registered as a private supply to a single domestic dwelling and no enquiries were made about the water supply, therefore it was not appreciated that the previous occupier had had no regard for the water quality. After the sale and during renovation works the charity became very concerned when the water supply turned brown in colour after heavy rainfall.

The charity contacted the local authority and was, quote, 'horrified' by the findings of the subsequent risk assessment, which confirmed that the source was a boggy area located on the steep hillside above the property that was contaminated with animal faeces and frogs. When rain flowed across the land into a collection chamber it carried faecal matter with it into the tank. This was verified by failed microbiological samples. In light of this, the charity decided to develop an alternative borehole supply.

A specialist water contractor was engaged to design and install a treatment system that met the specific challenges of the newly drilled borehole water quality. The treatment comprised iron and manganese removal, pH adjustment, filtration and UV disinfection. The charity also arranged with another contractor for an annual inspection and maintenance contract.

The charity's site manager was provided with instructions for the operation of the treatment system, but over time she became concerned that the treatment system might not be functioning correctly. In particular, she noted that they were using half the amount of chemicals compared to the quantity used in the previous year. The installers were contacted and they identified that the backwash frequency had been set incorrectly during the previous annual service. After this, the manager of the site introduced a checklist for staff to use to determine that the system was operating correctly on a day-to-day basis.

This case study illustrates that private supplies require to be actively managed if they are to provide a safe supply at all times. Premises owners must appreciate that water treatment is not 'fit and forget' and those who provide water treatment equipment and services should include operator training and logbooks with check lists. Relatively simple advice and guidance will ensure that potential problems are quickly identified enabling

specialist service providers to be called out when required, not just on an annual basis. *The Inspectorate's risk assessment tool puts emphasis on the importance of active management arrangements and the Inspectorate recommends that local authorities should regard the absence of a regime of regular appropriate checks as a risk that requires mitigation.*

Case study 19: Water safety plan approach to improving the safety of a private supply

This case study concerns a private water supply serving a large estate where the original outbuildings and stables had been converted into 34 domestic dwellings. The source of the supply was two spring collection chambers from which water is piped for 2km into a large brick-built Victorian underground reservoir (20m³). At this point water was treated (UV treatment and pH correction) before being distributed to the properties.

In March 2011, the local authority carried out a risk assessment and this identified a risk of contamination from slurry spreading around the springs. In response, a 50m exclusion zone was created around the springs as a risk mitigation measure. In the following spring (April 2012) several of the householders contacted the local authority reporting discoloured water, with a smell of manure. On investigation slurry spreading outside the 50m exclusion zone was noted and the exclusion zone was extended to include the entire hill slope above the spring to its crest.

In September 2012, the tenant farmer spread slurry on an area outside the exclusion zone (the hill slope on the opposite side to the spring) taking care first to check the forecast was for dry weather. However, within hours, consumers were once again contacting the local authority to report problems with the water supply. The owner of the supply issued boil water advice to all the properties and commenced an investigation.

The owner found that only one spring was affected and immediately instigated his emergency plan. This comprised diverting the spring to waste (through the overflow) and blocking off the pipework to the reservoir to prevent any more contaminated water entering the supply. However, the water in the reservoir was already contaminated. The local authority attended the site and endorsed the owner's alternative supply arrangement. It was felt that the spring that was unaffected could still be used if the reservoir was bypassed. The reservoir was isolated and flow from the uncontaminated spring (chamber) diverted into a temporary reservoir (two water tanks). The tanks were then connected to existing downstream pipework to the properties. This allowed the reservoir to be drained to waste.

Figure 24: Cleaning inside the vaulted brick reservoir



At the time of the site visit the local authority formalised the boil water advice in a Regulation 18 Notice. The potential risk to health was verified subsequently by the detection of *E.coli* in samples. The Notice also set out the need for the treatment system to be checked and, if necessary, improved by a competent person, together with cleaning out the reservoir, widening the exclusion zone to above the contour line of both spring sources and development of a water safety plan.

The owner engaged a specialist water contractor to uprate the treatment system so that it was capable of dealing with the raw water quality challenges of high colour and turbidity due to natural organic matter. A sand filter was installed as additional pre-treatment and the owner arranged for annual inspections thereafter. The reservoir was cleaned out by jet spray and then disinfected and flushed, likewise the downstream pipework. While these works were taking place, the owner checked the location and condition of the existing pipework and replaced a section in poor condition. A bypass valve was installed after each spring chamber to facilitate running to waste, enabling timely and effective action in any future event and to improve resilience generally (enabling each source to be operated independently of the other).

Figure 25: Valve chamber



By the date set in the notice (13 December 2012), all the required improvement works were complete, apart from the water safety plan.

During 2013, the supply owner put in place a system of weekly operating checks by a nominated person living on site. These involved weekly visual checks and recording of the UV system and pre-filter to assess whether parts needed replacement. By August the water safety plan was complete and detailed the weekly checks, annual servicing, alternative supply arrangements and instructions on how to use new diversion valves to

isolate a source from the reservoir, as and when required.

This case study highlights how the safety of a private supply relies on a comprehensive risk management plan based on the specific risks of the supply. For example, exclusion zones need to be tailored to the situation; the generic 50m rule is only a general guide. Likewise, through the addition of valves, overflows and bypass pipes, the resilience of a supply is enhanced, so it is easy to deal with adverse situations and carry out routine maintenance. The Inspectorate's risk assessment tool is based on the WHO safety plan approach and its outputs are designed to identify what can be done to develop a comprehensive risk management plan. Specifically the tool is designed to produce action plans that local authorities should be passing on to owners so that water safety planning knowledge is transferred to those who are responsible for the safety of the supply. *The Inspectorate recommends that when carrying out the five-year review of a risk assessment, local authorities utilise the action plan component of the risk assessment tool.*

Case study 20: Exercising the power to enhance monitoring as a means of overcoming obdurate owners

This case study concerns a private water supply serving a small village, comprising dwellings, a shop, a public house and a primary school. From the spring collection chambers water is piped to a large covered storage tank where chorine is added before the water is distributed to the village.

When, in January 2012, the local authority carried out a risk assessment the supply was considered a potential danger to human health because the source was not protected, the infrastructure was in poor condition, disinfection with chlorine was ineffective and the management procedures inadequate. Overall, it was felt that the supply was particularly at risk from *Cryptosporidium*. The local authority put in place a Regulation 18 Notice based on the risk and provided the owner with a summary of the gaps in control measures together with the improvement works required to mitigate the risks.

The owner of the supply disputed that the supply was at risk from *Cryptosporidium* on the grounds that the source originated from a deep groundwater spring and previous samples taken throughout the year had given satisfactory results. In response, the local authority was able to show that they had gathered information from consumers as part of the risk assessment process showing that the water at their taps turned brown and contained sediment after heavy rainfall, which blocked the filters on the supply causing low flows. This evidence clearly pointed to surface water ingress with local land use conditions such that *Cryptosporidium* oocysts could be present.

The local authority took samples from the supply four times a year and, unsurprisingly, the majority of these historic samples had been microbiologically satisfactory. Rainfall initiated events are often short lived and not picked up by occasional regulatory sampling. However, one particular consumer had been sampling twice a month at his supply and also a nearby supply. An examination of the combined data over a period of four years provided further supportive evidence that the source was not stable and prone to regular contamination events with the highest risk manifesting in the autumn. Such a pattern is entirely consistent with the large body of knowledge that underpins the risk assessment process embedded in the Inspectorate's tool.

This case study reinforces the dangers inherent in the old regulatory regime, which has encouraged owners of private supplies to develop undue faith on sample results, which in turn reinforces mythology about the purity of spring water. The case study also highlights an aspect of the regulations that local authorities could make more use of when faced with obdurate owners unable to accept the findings of a risk assessment. The

regulations give local authorities the power to increase the frequency of monitoring or tailor it to periods of highest risk. Where an owner refuses to accept the outcome of a risk assessment and persists in challenging behaviour in the face of published evidence such as that contained in the Bouchier report⁸ then a regime of enhanced monitoring for faecal indicators and turbidity may prove educative and move the situation forward. Such operational monitoring can be set out in a Regulation 18 Notice and this would be desirable, if there are concerns about recovering the costs of enhanced monitoring. Doing so would also facilitate communicating the continuing unmitigated risk to all of the users of the supply, itself a step that can be persuasive.

Case study 21: An example of a simple, but effective, regime for managing a private supply serving a public building

This case study concerns a private supply serving a sports clubhouse with residential facilities and communal kitchen. A committee of volunteers runs the clubhouse. The facility is let out on an informal basis to other members and visitors. The supply to the premises is a spring.

The local authority identified this as a Regulation 9 supply and carried out a risk assessment. This identified a catchment risk of faecal contamination from livestock and wildlife that was verified by the detection of *E.coli* in samples. A Regulation 18 Notice was put in place requiring the relevant persons to take action to install a spring collection chamber with a diversion ditch for surface water run-off together with appropriate treatment.

Once the improvements had been carried out, including the installation of a UV unit with a pre-filter, the committee identified the importance of putting in place management arrangements for the water supply. They drew up a schematic showing the key assets and critical control points from source to tap. Operating instructions were prepared, laminated and placed on the wall above the treatment system describing how to replace the pre-filter whenever visual checks showed there was a build up of organic matter and sediment. The instructions were written in a way that allowed anyone occupying the clubhouse to be able to take action without a committee member being on site. They also served to capture knowledge about the water supply developing resilience given the regular turnover of

⁸ <http://dwi.defra.gov.uk/research/bouchier/index.htm>) *Cryptosporidium* in Water Supplies -Third Report of the Group of Experts to:Department of the Environment, Transport and the Regions & Department of Health Chairman – Professor Ian Bouchier November 1998.

committee members. In particular, the procedures provided a simple way of achieving handover of critical information in a volunteer setting.

Effective active management is a critical control in securing the safety of a private supply. This case study illustrates how 'active management' can be introduced simply and does not require onerous operating manuals or special skills. A simple hand-drawn schematic is sufficient to record the critical assets within a supply system and instructions for regular checks of critical controls can often be summarised in a few bullet points. *The Inspectorate recommends that local authorities' formal improvement notices or written advice letters to private supply owners always include a requirement for a management system to be put in place.*

Chapter 4: Drinking water testing results

Chapter 4:

- Describes the progress of local authorities in providing sample results and highlights common errors in returns to the Inspectorate.
- Summarises the results of private supply testing.
- Provides advice on the approach to be taken in relation to certain parameters.
- Reports on work by the Inspectorate to simplify production of returns and in providing an enquiry service to local authorities and private supply owners.

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 2013, there were 151,669 test results submitted to the Inspectorate by local authorities and this compares favourably to the situation in previous years (105,901 in 2012, 84,917 in 2011 and 47,262 in 2010). The Inspectorate is pleased to note that this year, many more local authorities had been able to put in place arrangements to enable them to comply with this aspect of Regulation 13 (Schedule 4 Part 2 monitoring records), indicating that the activities of the Inspectorate during 2014 (described later in this chapter) have proved helpful in overcoming the perceived or actual barriers to the reporting of sample results.

When making use of the summary information presented in Tables 26–29, it is important to be aware that this is not yet a complete picture of private supply quality, since not all local authorities provided the Inspectorate with sample data by 31 January 2014. It is also important to appreciate that over half (55%) of all private supplies in England serve only a single household and these are tested infrequently, only at the request of the owner. It also needs to be understood that whereas Regulation 9 supplies are required to be tested annually, for Regulation 10 supplies the minimum testing frequency is only once every five years and for Regulation 8 supplies the testing frequency is set at the discretion of the local authority on the basis of risk assessment. Accordingly Tables 26–29 are mostly made up of samples collected from private distribution systems (Regulation 8), supplies used in the provision of services to the public or supplying more than 10m³/day (Regulation 9) and small, shared domestic supplies (Regulation 10).

From the summary information in *Annex 1*, it can be seen that 208 local authorities in England and Wales provided monitoring results to the

Inspectorate in January 2014 covering samples taken in 2013. Out of the remaining local authorities that should have provided monitoring returns, but did not do so, there were 43 that failed to provide monitoring data for their Regulation 9 supplies and there were 72 that did not submit monitoring data for their Regulation 8 or 10 supplies. The deficit of Regulation 9 monitoring returns is more serious because these supplies should have been sampled during 2013. Furthermore, the missing data has national implications because the results from these supplies will not be included in the annual returns that the Inspectorate is required to provide to the European Union (EU) Commission.

The shortfall of Regulation 9 sample data, while significant (365 supplies), is less than that reported in 2012 when the shortfall was 862 supplies. Around four-fifths (85%) of the shortfall in 2013 was accounted for by just two English local authorities: Craven District Council (164 supplies) and Shropshire County Council (146 supplies). Since Regulation 8 and 10 supplies are tested less often it is to be expected that not all of these supplies will have been sampled until the end of 2014. *Local authorities are reminded that they must submit a Schedule 4 Part 2 monitoring data return to the Inspectorate for each year in which samples have been collected. In Drinking water 2014, the Inspectorate intends to report the outcome of checks to determine if local authorities are complying with the frequency of testing rules for each type of private supply.*

In preparing Tables 26–29, the Inspectorate has excluded any parameter where there was no failure of the standard or specification recorded during 2013. However, for reference purposes a full listing of testing for all parameters has been provided in *Annex 3*. 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.
- Analytical results from years other than 2013 were on the return.
- Industrial chemicals were entered as pesticides.
- 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).

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- There was inappropriate use of > (greater than symbols), for example, bacterial plate counts given as >1, although it is accepted that some laboratories will give a figure of >201, for example, where there are many organisms on a plate.
 - Analytical data for some parameters not contained within the regulations are being sent to the Inspectorate.
 - There was confusion between nitrate and nitrite results.

The drinking water standards in the private water supply regulations are the same as those that apply to public water supplies and most derive from the EU Drinking Water Directive. An explanation of the standards can be found in *Annex 6*. In the regulations⁹, the standards are set out by parameter in Schedule 1. Four tables represent this schedule: Tables 26a–29a cover microbiological standards; Tables 26–29b and 26–29c set out the health-related chemical standards and the national standards while Tables 26–29d cover the indicator parameters. For ease of reference, Tables 26–29 are set out following the Schedule 1 format and show the following information for each parameter: the standard or prescribed concentration; the total number of tests; the number of tests not meeting the standard or prescribed concentration; and the percentage of samples not meeting the standard or prescribed concentration.

The results of testing during 2013 demonstrated that a smaller proportion (about one-tenth) of private supplies in England and Wales were of unsafe microbiological quality, with 10.9% of samples containing *E.coli* (compared to 13.9% in 2012) and 11.1% containing Enterococci (compared to 13.2% in 2012). Failures of these two standards mean that the water supply is faecally contaminated and there is a risk that pathogens will also be present. Therefore, on receipt of such results, local authorities are under a duty to advise consumers that they must boil water before use in the short term and require the supply to be improved as soon as practicable (see *Chapter 3: Risk management*).

When comparing the different types of supply it can be seen that there are clear differences in microbiological quality. In England, 7.0% of samples from Regulation 9 supplies contained *E.coli*, whereas the failure rates for Regulation 10 supplies and single domestic dwellings were 18.3% and 14.9% respectively. This pattern was verified by the figures for Enterococci: Regulation 9 supplies (6.7%), Regulation 10 supplies (16.1%), and single domestic dwellings (14.6%). *The evidence is therefore compelling that intervention is justified to improve the management and safety of small private supplies, irrespective of the strongly held*

⁹ The Private Water Supplies Regulations 2009.

contradictory views of a vociferous minority of persons who rely on a small supply. Local authorities are encouraged to use and promote this information, together with the illness case studies (case studies 6, 8 and 17) published this year, to constructively address the arguments of private supply owners, especially those who are landlords who should have regard in law for the wellbeing of their tenants

When considering the appropriate risk mitigation following an *E.coli* or Enterococci failure in a sample taken from a tap in a property served by a private supply, local authorities should have regard to the turbidity result. Looking at Annex 2, there were 12,082 samples tested for *E.coli*, but only 8,400 samples for turbidity, and an inspection of Tables 26a–d, 27a–d, 28a–d and 29a–d reveals this deficit in turbidity monitoring occurs in both Regulation 9 supplies (7,276 *E.coli* tests, but only 4,511 turbidity tests) and Regulation 10 supplies (1,904 *E.coli* tests, but only 1,015 turbidity tests). Disinfection of water can be compromised where the turbidity is >1NTU and this parameter gives useful information that can point to the cause and mitigation of microbiological failures. Specifically, such information should guide the need for questions to be asked about the adequacy of the servicing and maintenance of ultraviolet (UV) lamps and associated pre-filters. Water may also be turbid due to the presence of inorganic sediment containing substances like iron and manganese that interfere with disinfection. For example, the transmissivity of UV lamps is reduced because the lamp surface develops a coating, and chlorine or chlorine dioxide will be rapidly consumed and lost through reactions with these natural contaminants. *Local authorities are reminded that they should not be taking and testing samples just for microbiological parameters, instead turbidity and other indicators must also be tested for at the same time, as set out in the regulations. The Inspectorate will be carrying out checks during 2014 to identify those local authorities that are not following the regulations in terms of the parameters they should be testing for in different types of sample. Local authorities should keep in mind that parameter selection is not a decision that should be determined by the owner of a private supply or the laboratory.*

England – Regulation 9 supplies – numbers of tests and percentage not meeting the standard

Table 26a: Schedule 1 Table A – microbiological parameters

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
Escherichia coli (<i>E.coli</i>)	0/100ml	7,276	509	7.0
Enterococci	0/100ml	3,446	230	6.7

Table 26b: Schedule 1 Table B – chemical parameters

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
Antimony	5µg/l	565	1	0.2
Arsenic	10µg/l	962	34	3.5
Benzene	1µg/l	342	-	-
Benzo(a)pyrene	0.01µg/l	273	5	1.8
Boron	1mg/l	587	19	3.2
Bromate	10µg/l	411	3	0.7
Cadmium	5µg/l	726	1	0.1
Chromium	50µg/l	680	-	-
Copper	2mg/l	921	32	3.5
Cyanide	50µg/l	341	1	0.3
1-2 Dichloroethane	3µg/l	314	1	0.3
Fluoride	1.5mg/l	712	26	3.7
Lead	10µg/l	1,470	27	1.8
Mercury	1µg/l	357	-	-
Nickel	20µg/l	841	28	3.3
Nitrate	50µg/l	3,937	424	10.8
Nitrite – consumers' taps	0.5µg/l	2,404	13	0.5
Nitrite – treatment works	0.1µg/l	1,041	61	5.9
Pesticides				
Aldrin	0.03µg/l	232	-	-
Dieldrin	0.03µg/l	231	-	-
Heptachlor	0.03µg/l	230	-	-
Heptachlor Epoxide	0.03µg/l	234	-	-
Other pesticides	0.1µg/l	8,230	23	0.3
Total pesticides	0.5µg/l	176	1	0.6
Polycyclic aromatic hydrocarbons	0.1µg/l	233	8	3.4
Selenium	10µg/l	550	3	0.5
Trichloroethene & Tetrachloroethene	10µg/l	284	3	1.1
Trihalomethanes	100µg/l	255	-	-

*Standards are not set for all disinfection by-products.

England – Regulation 9 supplies – numbers of tests and percentage not meeting the standard

Table 26c: Schedule 1 Table B – national requirements

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
Aluminium	200µg/l	2,951	48	1.6
Colour	20mg/l Pt/Co	3,930	28	0.7
Iron	200µg/l	3,763	280	7.4
Manganese	50µg/l	3,620	315	8.7
Odour	No abnormal change	3,544	839	23.7
Sodium	200mg/l	822	31	3.8
Taste	No abnormal change	2,995	650	21.7
Tetrachloromethane	3µg/l	342	-	-
Turbidity	4NTU	4,511	107	2.4

Table 26d: Schedule 1 Table C – indicator parameters

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
Ammonium	0.5mg/l	4,030	56	1.4
Chloride	250mg/l	636	14	2.2
Clostridium perfringens	0/100ml	2,898	203	7.0
Coliform bacteria (indicator)	0/100ml	7,208	1,216	16.9
Colony Counts After 3 Days At 22°C	No abnormal change	5,404	-	-
Colony Counts After 48 Hours At 37°C	No abnormal change	5,310	-	-
Conductivity	2500µS/cm	4,903	6	0.1
Hydrogen ion (pH) (indicator)	6.5 – 9.5	5,082	529	10.4
Sulphate	250mg/l	675	16	2.4
Total Indicative dose	mSv/year	17	1	5.9
Total Organic Carbon	No abnormal change	352	-	-
Tritium	100Bq/l	93	-	-
Turbidity (at treatment works)	1NTU	776	64	8.2

England – Regulation 10 supplies – numbers of tests and percentage not meeting the standard

Table 27a: Schedule 1 Table A – microbiological parameters

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
Escherichia coli (<i>E.coli</i>)	0/100ml	1,904	349	18.3
Enterococci	0/100ml	1,335	215	16.1

Table 27b: Schedule 1 Table B – chemical parameters

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
Antimony	5µg/l	50	-	-
Arsenic	10µg/l	119	10	8.4
Benzene	1µg/l	20	-	-
Benzo(a)pyrene	0.01µg/l	16	-	-
Boron	1mg/l	52	2	3.8
Bromate	10µg/l	11	-	-
Cadmium	5µg/l	67	-	-
Chromium	50µg/l	62	-	-
Copper	2mg/l	216	10	4.6
Cyanide	50µg/l	13	-	-
1-2 Dichloroethane	3µg/l	13	-	-
Fluoride	1.5mg/l	48	1	2.1
Lead	10µg/l	336	17	5.1
Mercury	1µg/l	28	1	3.6
Nickel	20µg/l	94	12	12.8
Nitrate	50µg/l	843	156	18.5
Nitrite – consumers' taps	0.5µg/l	546	3	0.5
Nitrite – treatment works	0.1µg/l	139	39	28.1
Pesticides				
Aldrin	0.03µg/l	15	-	-
Dieldrin	0.03µg/l	15	-	-
Heptachlor	0.03µg/l	15	-	-
Heptachlor Epoxide	0.03µg/l	16	-	-
Other pesticides	0.1µg/l	662	3	0.5
Total pesticides	0.5µg/l	17	-	-
Polycyclic aromatic hydrocarbons	0.1µg/l	16	-	-
Selenium	10µg/l	50	-	-
Trichloroethene & Tetrachloroethene	10µg/l	6	-	-
Trihalomethanes	100µg/l	19	-	-

*Standards are not set for all disinfection by-products.

England – Regulation 10 supplies – numbers of tests and percentage not meeting the standard

Table 27c: Schedule 1 Table B – national requirements

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
Aluminium	200µg/l	510	35	6.9
Colour	20mg/l Pt/Co	565	21	3.7
Iron	200µg/l	726	77	10.6
Manganese	50µg/l	700	81	11.6
Odour	No abnormal change	445	106	23.8
Sodium	200mg/l	74	4	5.4
Taste	No abnormal change	303	66	21.8
Tetrachloromethane	3µg/l	8	-	-
Turbidity	4NTU	1,015	38	3.7

Table 27d: Schedule 1 Table C – indicator parameters

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
Ammonium	0.5mg/l	545	7	1.3
Chloride	250mg/l	60	-	-
Clostridium perfringens	0/100ml	705	117	16.6
Coliform bacteria (indicator)	0/100ml	1,732	682	39.4
Colony Counts After 3 Days At 22°C	No abnormal change	699	-	-
Colony Counts After 48 Hours At 37°C	No abnormal change	690	-	-
Conductivity	2500µS/cm	1,196	1	0.1
Hydrogen ion (pH) (indicator)	6.5 – 9.5	1,206	220	18.2
Sulphate	250mg/l	66	1	1.5
Total Indicative dose	mSv/year	-	-	-
Total Organic Carbon	No abnormal change	104	-	-
Tritium	100Bq/l	-	-	-
Turbidity (at treatment works)	1NTU	178	15	8.4

England – Regulation 8 supplies – numbers of tests and percentage not meeting the standard

Table 28a: Schedule 1 Table A – microbiological parameters

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
Escherichia coli (<i>E.coli</i>)	0/100ml	356	5	1.4
Enterococci	0/100ml	91	3	3.3

Table 28b: Schedule 1 Table B – chemical parameters

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
Antimony	5µg/l	16	-	-
Arsenic	10µg/l	16	-	-
Benzene	1µg/l	17	-	-
Benzo(a)pyrene	0.01µg/l	19	1	5.3
Boron	1mg/l	16	-	-
Bromate	10µg/l	31	-	-
Cadmium	5µg/l	18	-	-
Chromium	50µg/l	18	-	-
Copper	2mg/l	28	-	-
Cyanide	50µg/l	10	-	-
1-2 Dichloroethane	3µg/l	30	-	-
Fluoride	1.5mg/l	16	-	-
Lead	10µg/l	24	-	-
Mercury	1µg/l	16	-	-
Nickel	20µg/l	23	-	-
Nitrate	50µg/l	79	-	-
Nitrite – consumers’ taps	0.5µg/l	61	-	-
Nitrite – treatment works	0.1µg/l	19	-	-
Pesticides				
Aldrin	0.03µg/l	12	-	-
Dieldrin	0.03µg/l	12	-	-
Heptachlor	0.03µg/l	8	-	-
Heptachlor Epoxide	0.03µg/l	12	-	-
Other pesticides	0.1µg/l	521	3	0.6
Total pesticides	0.5µg/l	17	-	-
Polycyclic aromatic hydrocarbons	0.1µg/l	8	-	-
Selenium	10µg/l	16	-	-
Trichloroethene & Tetrachloroethene	10µg/l	8	-	-
Trihalomethanes	100µg/l	12	-	-
*Standards are not set for all disinfection by-products.				

England – Regulation 8 supplies – numbers of tests and percentage not meeting the standard

Table 28c: Schedule 1 Table B – national requirements

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
Aluminium	200µg/l	201	-	-
Colour	20mg/l Pt/Co	42	-	-
Iron	200µg/l	206	2	1.0
Manganese	50µg/l	207	3	1.4
Odour	No abnormal change	49	5	10.2
Sodium	200mg/l	67	-	-
Taste	No abnormal change	47	3	6.4
Tetrachloromethane	3µg/l	18	-	0.0
Turbidity	4NTU	269	2	0.7

Table 28d: Schedule 1 Table C – indicator parameters

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
Ammonium	0.5mg/l	74	-	-
Chloride	250mg/l	57	-	-
Clostridium perfringens	0/100ml	44	-	-
Coliform bacteria (indicator)	0/100ml	353	13	3.7
Colony Counts After 3 Days At 22°C	No abnormal change	337	-	-
Colony Counts After 48 Hours At 37°C	No abnormal change	332	-	-
Conductivity	2500µS/cm	224	-	-
Hydrogen ion (pH) (indicator)	6.5 – 9.5	212	-	-
Sulphate	250mg/l	52	-	-
Total Indicative dose	mSv/year	-	-	-
Total Organic Carbon	No abnormal change	8	-	-
Tritium	100Bq/l	8	-	-
Turbidity (at treatment works)	1NTU	3	-	-

England – Single domestic dwellings – numbers of tests and percentage not meeting the standard

Table 29a: Schedule 1 Table A – microbiological parameters

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
<i>Escherichia coli (E.coli)</i>	0/100ml	758	113	14.9
Enterococci	0/100ml	547	80	14.6

Table 29b: Schedule 1 Table B – chemical parameters

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
Antimony	5µg/l	11	1	9.1
Arsenic	10µg/l	44	4	9.1
Benzene	1µg/l	5	-	-
Benzo(a)pyrene	0.01µg/l	1	-	-
Boron	1mg/l	8	6	75.0
Bromate	10µg/l	6	1	16.7
Cadmium	5µg/l	32	-	-
Chromium	50µg/l	17	-	-
Copper	2mg/l	168	14	8.3
Cyanide	50µg/l	2	-	-
1-2 Dichloroethane	3µg/l	1	-	-
Fluoride	1.5mg/l	19	-	-
Lead	10µg/l	221	4	1.8
Mercury	1µg/l	2	-	-
Nickel	20µg/l	26	4	15.4
Nitrate	50µg/l	317	44	13.9
Nitrite – consumers' taps	0.5µg/l	251	3	1.2
Nitrite – treatment works	0.1µg/l	42	4	9.5
Pesticides				
Aldrin	0.03µg/l	3	-	-
Dieldrin	0.03µg/l	3	-	-
Heptachlor	0.03µg/l	3	-	-
Heptachlor Epoxide	0.03µg/l	2	-	-
Other pesticides	0.1µg/l	69	-	-
Total pesticides	0.5µg/l	4	-	-
Polycyclic aromatic hydrocarbons	0.1µg/l	1	-	-
Selenium	10µg/l	12	-	-
Trichloroethene & Tetrachloroethene	10µg/l	2	-	-
Trihalomethanes	100µg/l	2	-	-
*Standards are not set for all disinfection by-products.				

England – Single domestic dwellings – numbers of tests and percentage not meeting the standard

Table 29c: Schedule 1 Table B – national requirements

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
Aluminium	200µg/l	183	4	2.2
Colour	20mg/l Pt/Co	164	7	4.3
Iron	200µg/l	356	51	14.3
Manganese	50µg/l	352	91	25.9
Odour	No abnormal change	203	58	28.6
Sodium	200mg/l	30	3	10.0
Taste	No abnormal change	148	33	22.3
Tetrachloromethane	3µg/l	1	-	-
Turbidity	4NTU	366	28	7.7

Table 29d: Schedule 1 Table C – indicator parameters

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
Ammonium	0.5mg/l	207	9	4.3
Chloride	250mg/l	21	-	-
Clostridium perfringens	0/100ml	199	23	11.6
Coliform bacteria (indicator)	0/100ml	707	195	27.6
Colony Counts After 3 Days At 22°C	No abnormal change	230	-	-
Colony Counts After 48 Hours At 37°C	No abnormal change	235	-	-
Conductivity	2500µS/cm	506	2	0.4
Hydrogen ion (pH) (indicator)	6.5 – 9.5	512	56	10.9
Sulphate	250mg/l	20	2	10.0
Total Indicative Dose	mSv/year	-	-	-
Total Organic Carbon	No abnormal change	6	-	-
Tritium	100Bq/l	-	-	-
Turbidity (at treatment works)	1NTU	141	37	26.2

The results in Tables 26–29 b and c demonstrate the extent of non-compliance of private water supplies in England with the health-related chemical standards and national standards, with 3,533 failures of 27 parameters being recorded in 2013. The majority (85%) of these failures are associated with Regulation 9 supplies, because the scope and frequency of testing of small supplies and private distribution systems is more limited, with many parameters only included if a risk assessment has been done that highlights the need.

In England, over three-fifths (68%) of these failures are due to two parameters, taste/odour (50%) and nitrate (18%). Around a further quarter (26%) of all the failures were for two national standards: iron (12%) and manganese (14%). There were relatively few (4%) failures due to the plumbing metals: lead (48), copper (56) and nickel (44). Four other naturally occurring chemicals (arsenic, fluoride, boron and selenium) accounted for another 2% of failures. The results for 2013 also confirm that only a very few private supplies are adversely affected by man-made substances and pollutants such as solvents, bromate, benzene, cyanide, mercury, pesticides, polycyclic aromatic hydrocarbons and trihalomethanes. The glossary in *Annex 5* explains the likely origin and significance of these parameters.

During 2013, the Inspectorate either spoke with or visited 26 different local authorities, selected because a review of the 2012 annual returns highlighted parameter failures with no evidence of action to improve supplies in the form of Notices. This exercise brought to light a common problem in relation to the taste and odour parameters. It was found that the failures being reported in annual returns were not derived from a sample submitted to a laboratory and tested by the accredited method¹⁰. Instead, it came to light that local authorities were carrying out an on-site assessment of taste and odour, and recording a code of 1 on the sample sheet. The laboratory was then logging this code electronically against the sample, and this was then appearing on the certificate of analysis and being transcribed subsequently by the local authority to the annual data return with the effect that many failures were being flagged. The Inspectorate is of the opinion that this practice probably accounts for the unusually high number of taste and odour failures recorded in Table 26c. *When a local authority carries out an on-site taste and odour assessment and obtains a positive result, the appropriate action to initiate an investigation is to send a sample to the laboratory for taste and odour analysis. The Standing Committee of Analysts (SCA) methodology used by the laboratory will verify the qualitative presence of an objectionable taste*

10 Standing Committee of Analysts: The Determination of Taste and Odour in Drinking Water (2014) <http://dwi.defra.gov.uk/stakeholders/guidance-and-codes-of-practice/SCA-TandO-130514.pdf>

and odour by the use of trained panellists, and if confirmed, the taste and odour will be semi-quantified (dilution number) and assigned a recognised descriptor. Local authorities are reminded that on site taste and odour monitoring is a non-reportable qualitative assessment. The taste and odour parameter on annual returns should be reserved for the recording of results generated by the laboratory after testing using the accredited method. The descriptor assigned by the laboratory will point to the likely cause(s) enabling the local authority to carry out an appropriate investigation and risk assessment of the private supply. Extensive information about taste and odour causes and remedies can be found in the Taste and odour sections of Drinking water 2013 covering public supplies and also in the SCA method which is published on the Inspectorate's website.

Another common issue was identified by the Inspectorate's contacts and visits with local authorities, namely there were a number of local authorities (17) that were only arranging for private supplies to be tested for microbiological parameters. In some cases this was found to be due to the work having been contracted out or the results having been supplied by contractors to a private supply owner. Sometimes, the samples were not from a private supply being used for domestic purposes, and in other instances, the sample was from a single domestic dwelling where the local authority had acceded to the owners' opinion as to which parameters should be tested for. *The Inspectorate reminds local authorities that decisions about testing a private supply to determine wholesomeness and compliance with the regulations are for the local authority to make. Private supply owners and contractors whose results are being accepted must be made aware of the parameter requirements, and contractors employed directly by the local authority must be properly supervised. As a general rule, when samples are requested from single domestic dwellings, as well as explaining that a risk assessment, not sampling, is the means of determining whether the supply is safe, the appropriate suite of parameters to test for are those set out in Regulation 10.*

The microbiological parameter, *Pseudomonas aeruginosa*, is not required to be tested for in relation to private water supplies, except in the case of water being provided in bottles or containers. This year, in Annex 3, we have reported that local authority returns showed that 137 samples for this parameter had been tested for at private supplies and six of these samples failed the standard of 0 in 250mls. This testing for *Ps. aeruginosa* was being carried out by 33 local authorities at 58 different locations. It would be expected that testing for this parameter would be limited to food premises (Regulation 9 supplies) where locally bottled water as opposed to a purchased supply of bottled water was being served, however, the Inspectorate has noted that nine local authorities were testing for *Ps.aeruginosa* at sites classified as Regulation 10. Additionally, among the

Regulation 9 supplies being tested for this parameter, it was clear from the supply description or name that many of these sites were not food premises. Instead, much of this testing appeared to be taking place at airfields and leisure sites. *The Inspectorate recommends that local authorities review the use of this parameter to ensure it is only being tested for and included in the annual Schedule 4 Part 2 monitoring return when required by the regulations. This should not be at sites where the private supply of water is being provided by means of pipes, instead it should be done only where the supply of water is by means of bottles or containers that are being filled on site and, in such cases, the samples must be collected from a bottle or container after it has been filled, not from the water source itself. Local authorities are also reminded that the Schedule 4 Part 2 annual return should not contain the results of samples collected from a private supply that is only used for a non-domestic purpose, irrigation of open spaces, animal water troughs, for example, and vehicle washing. Although it is important for local authorities to maintain details on such supplies on their appropriately classified record, the Schedule 4 Part 2 Monitoring Return is a record of the quality of water used for domestic purposes. The inclusion of results of testing of other water sources (of dubious quality) has the effect that the national record and the Inspectorate's return to the EU Commission is not a fair reflection of the quality of private supplies used for drinking and other domestic purposes.*

In *Drinking water 2012* the Inspectorate reported on the work it was undertaking, through direct dialogue with the accredited laboratories providing analytical services to local authorities, to bring about an improvement in their reporting practices since these were the root cause of many of the errors in local authority Schedule 4 Part 2 monitoring returns. The Inspectorate has continued this work during 2014, focusing particularly on supporting those local authorities that had requested assistance with securing a modern electronic reporting arrangement. As a consequence of this activity, a number of laboratories have improved their service to local authorities and have created a private supply electronic data reporting system, not dissimilar to that already in place for all water companies. The benefits for local authorities are:

- Data can be swiftly transposed from the laboratory report to the annual Schedule 4 Part 2 return.
- Data entry is significantly minimised, if not eliminated.
- Qualifying 'failure' flags are recorded in the correct places where appropriate.

South East Water Scientific Services were the most responsive and now provide a private water supply annual return compatible electronic

reporting service. Other laboratories with similar systems under development include ALS Laboratories, United Utilities Laboratory, Wessex Water Scientific Services and Alcontrol. *Local authorities should expect and require their chosen accredited laboratory to provide a reporting service that meets modern best practice, thereby minimising the administrative workload and reducing reporting errors to a minimum. To assist local authorities in obtaining an efficient and effective level of service from laboratories, the Inspectorate now maintains a list of laboratories, able to provide an electronic annual return-friendly service, on its website.*

During 2013, in addition to the activities described in *Chapters 3 and 4* of this report, the Inspectorate has continued to provide an enquiry service for local authorities and the owners of private supplies. *Annex 3* summarises this aspect of the Inspectorate's work since the time when changes in the private supply regulations were first proposed in 2008. Over this six-year period the Inspectorate has provided support and advice in response to 1,307 unique enquiries about private supplies in England and Wales (122 in Wales). *Annex 4* shows how the annual pattern of enquiries reached a peak in 2011. This coincided with the publication of *Drinking water 2010*, the first ever report on the quality of private supplies in England, which made transparent the poor quality of private supplies and explained the new regulations that were being implemented to address the issue. This high annual enquiry rate continued through 2012 and during 2011–2012 there were 853 enquiries (91 in Wales), but in 2013 the rate has fallen to a level of around one-third (32%) of the peak demonstrating the effectiveness of the Inspectorate's activities aimed at enhancing the capacity of local authorities. The nature of the enquiries received during 2013 has also changed with most now being about specific cases, where more specialised advice regarding the problem cause and remedy is required. Accordingly the Inspectorate's enquiry service is now tending to be used by both local authorities, owners and users to enable solutions to be found to situations where either there have been long-standing disputes between the relevant persons or previous inaction (or informal action) by the local authority has not led to a satisfactory outcome for all concerned. The scope of this aspect of the Inspectorate's work is reflected in the risk management case studies published in *Chapter 3*.

Annex 1 – Numbers of supplies, risk assessments and evidence of monitoring and enforcement.

ENGLAND and WALES Council name Note Councils marked with a * did not make a valid return or returned too late to have their data incorporated in 2013 so the latest available data has been used.	Total regulated supplies (includes those not categorised)	Single domestic dwellings	Further distribution of mains water by someone other than a licensed water supplier (Reg 8)	Large supplies and any size supply 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?
Adur District Council	3	0		1	2	0	0	Y	N	N
Allerdale Borough Council	269	102		124	40	15	0	Y	Y	Y
Amber Valley Borough Council	75	55	2	7	10	86	0	Y	Y	N
Arun District Council	12	6		2	4	100	100	Y	Y	Y
Ashfield District Council	2	1			1	N/A	100	N/A	N	N
Ashford Borough Council	9	9			1	N/A	0	N/A	N	N
Aylesbury Vale District Council	39	24		3	5	33	0	Y	N	N
Babergh District Council	146	108		14	21	86	90	Y	Y	N
Barking and Dagenham Borough Council	1	0		1		0	N/A	N	N/A	N
Barnet Borough Council	1	0		1		100	N/A	Y	N/A	N
Barnsley Borough Council	47	45		4	9	100	56	Y	Y	Y
Barrow-in-Furness Borough Council	2	1		1		100	N/A	Y	N/A	Y
Basingstoke & Deane Borough Council	66	40		11	9	100	0	Y	Y	Y

ENGLAND and WALES

Council name

Note

Councils marked with a * did not make a valid return or returned too late to have their data incorporated in 2013 so the latest available data has been used.

	Total regulated supplies (includes those not categorised)	Single domestic dwellings	Further distribution of mains water by someone other than a licensed water supplier (Reg 8)	Large supplies and any size supply 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?
Bassetlaw Borough Council	14	10		11	3	100	100	N	N	N
Bath & North East Somerset District Council	87	60		3	24	67	71	Y	Y	Y
Bedford Borough Council	26	9	13	2	2	100	13	Y	N	N
Birmingham City Council	7	0	4	3		0	0	N	Y	N
Blaby District Council	8	7			1	N/A	0	N/A	N	N
Blackburn with Darwen Borough Council	85	30		2	24	100	17	Y	Y	Y
Blackpool Borough Council	2			2		0	N/A	N	N/A	N
Blaenau Gwent County Borough Council	30	26		4		100	N/A	Y	N/A	N
Bolsover District Council	1				1	N/A	100	N/A	N	N
Bolton Metropolitan Borough Council	31	13		1	16	0	81	N	Y	N
Bradford Metropolitan District Council	179	151		36	129	100	9	Y	Y	Y
Braintree District Council	187	133		8	45	38	0	Y	Y	N
*Breckland District Council-2011 data	762	567		54	141	81	11	Y	Y	Y
Brentwood Borough Council	3	3				N/A	N/A	N/A	N/A	N
Bridgend County Borough Council	84	71	8	3		100	25	Y	Y	N

ENGLAND and WALES

Council name

Note

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Brighton & Hove City Council	1			1		100	N/A	N	N/A	N
Broadland District Council	584	420		55	110	62	10	Y	Y	Y
Bromley (London Borough of)	3	8		3		100	N/A	Y	N/A	N
Bromsgrove District Council	29	22		1	6	100	0	Y	N	Y
Broxbourne Borough Council	4	2	2			N/A	0	N/A	N	N
Broxtowe Borough Council	5	1		2	2	0	0	N	N	N
Burnley Borough Council	52	39			13	N/A	100	N/A	Y	N
Bury Metropolitan Borough Council	68	41	5	7	15	43	10	Y	Y	N
Caerphilly County Borough Council	93	93			7	N/A	0	N/A	N	N
Calderdale Metropolitan Borough Council	822	514		38	227	76	54	Y	Y	Y
Canterbury City Council	5	4			1	N/A	0	N/A	N	N
Cardiff Council	24	17		2	5	100	100	Y	Y	Y
Carlisle City Council	385	150	1	89	123	34	43	Y	Y	Y
Carmarthenshire County Council	2,331	2233		41	57	66	0	Y	N	Y
Central Bedfordshire Council	28	20		6		83	N/A	Y	N/A	Y

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Ceredigion County Council	1,502	1,281	3	85	180	98	47	Y	Y	Y
Charnwood Borough Council	21	15		2	4	100	100	N	N	N
Chelmsford Borough Council	17	11	1	2	3	100	50	Y	Y	N
Cheltenham Borough Council	22	13		1	8	0	13	N	N	N
Cherwell District Council	163	94	3	9	55	22	0	Y	Y	N
Cheshire East Council	444	377		31	25	29	20	Y	Y	Y
Cheshire West & Chester Council	64	36		11	16	55	31	Y	Y	N
Chichester District Council	62	24		9	28	89	11	Y	N	N
Chiltern District Council	22	16		2	4	100	100	Y	Y	Y
Chorley Borough Council	19	13		3	3	0	0	N	N	N
Colchester Borough Council	44	40		2	2	100	100	Y	Y	N
Conwy County Borough Council	513	413		74	26	20	81	Y	Y	Y
Copeland Borough Council	237	140		48	52	88	54	Y	Y	Y
Cornwall Council	3,881	705	1	845	2313	17	1	Y	Y	Y
Cotswold District Council	297	17	58	114	20	96	29	Y	Y	Y
Craven District Council	726	362		164	184	95	63	N	N	Y

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Dacorum Borough Council	31	20		8	3	88	33	Y	Y	N
Darlington Borough Council	4			4		100	N/A	Y	N/A	N
*Daventry District Council-2012 data	132	101		17	14	12	14	N	Y	N
Denbighshire County Council	666	536	1	62	106	0	0	Y	Y	N
Derbyshire Dales District Council	236	156		38	34	53	35	Y	Y	N
Doncaster Metropolitan Borough Council	30	12	8	6	4	67	8	Y	Y	Y
Dover District Council	2	2				N/A	N/A	N/A	N/A	N
Dudley Metropolitan Borough Council	2	2				N/A	N/A	N/A	N/A	N
Durham County Council	105	214		49	47	98	100	Y	Y	Y
East Cambridgeshire District Council	35	23	1	11	1	91	50	Y	N	N
East Devon District Council	818	414	6	166	242	55	48	Y	Y	Y
East Dorset District Council	48	22		8	17	38	18	Y	Y	N
East Hampshire District Council	53	34	2	9	8	100	70	Y	Y	Y
East Hertfordshire Council	76	35		14	27	29	0	Y	Y	Y
East Lindsey District Council	187	149	1	14	25	50	4	Y	Y	N

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East Northamptonshire District Council	25	19			6	N/A	0	N/A	Y	N
East Riding of Yorkshire Council	164	123		17	24	100	46	Y	Y	N
East Staffordshire Borough Council	19	10		8	1	100	0	Y	N	Y
Eastleigh Borough Council	1	1				N/A	N/A	N/A	N/A	N
Eden District Council	566	266	2	111	195	50	45	Y	Y	Y
Elmbridge Borough Council	11	11				N/A	N/A	N/A	N/A	N
Enfield (London Borough of)	4	1		2	1	0	0	Y	N	N
Epping Forest District Council	46	32		2	10	100	40	Y	Y	N
Erewash Borough Council	1	1				N/A	N/A	N/A	N/A	N
Exeter City Council	1	1		1		100	N/A	N	N/A	N
Fareham Borough Council	1			1		0	N/A	Y	N/A	N
Flintshire County Council	83	65		7		71	N/A	Y	N/A	N
Forest Heath District Council	46	20		12	12	100	75	Y	Y	Y
Forest of Dean District Council	70	40		19	12	58	0	Y	Y	Y
Fylde Borough Council	2	1		1		100	N/A	Y	N/A	N

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Gateshead Metropolitan Borough Council	1	1				N/A	N/A	N/A	N/A	N
Gedling Borough Council	14	12		1	1	100	0	Y	Y	N
Gloucester City Council	1		1			N/A	0	N/A	N	N
Gravesham Borough Council	4	3		1		100	N/A	Y	N/A	N
Great Yarmouth Borough Council	53	44		5	4	80	0	Y	N	N
Guildford Borough Council	8	6		1	1	0	0	Y	Y	N
Gwynedd County Council	384	94	7	255	26	41	9	Y	Y	Y
Hackney (London Borough of)	1			1		0	N/A	N	N/A	N
Halton Borough Council	1	1				N/A	N/A	N/A	N/A	N
Hambleton District Council	268	171		27	69	63	14	Y	Y	Y
Hammersmith and Fulham	2			2		0	N/A	Y	N/A	N
Harborough District Council	45	27	2	5	11	40	8	N	N	N
Harlow District Council	1			1		100	N/A	Y	N/A	N
Harrogate Borough Council	593	346		64	188	92	35	Y	Y	Y
Hart District Council	21	2	10	2	7	100	0	Y	Y	N

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Hartlepool Borough Council	1			1		100	N/A	Y	N/A	N
Herefordshire Council	2,489	2095		198	194	95	58	Y	Y	Y
Hertsmere Borough Council	14	3	5	6		33	100	Y	Y	N
High Peak Borough Council	291	212		20	66	65	0	Y	Y	N
Hillingdon (London Borough of)	3			3		0	N/A	N	N/A	N
Hinckley and Bosworth Borough Council	54	51	3			N/A	0	N/A	N	N
Horsham District Council	7	13		3	2	100	100	Y	Y	Y
Huntingdonshire District Council	10	8		2		100	N/A	N	N/A	N
Hyndburn Borough Council	36	30		2	4	50	0	N	N	N
Ipswich Borough Council	2	1		1		100	N/A	Y	N/A	N
Isle of Anglesey County Council	204	164	1	20	15	90	56	Y	Y	Y
Isle of Wight Council	23	12		3	8	0	0	Y	Y	Y
Kensington and Chelsea (Royal Borough of)	3			3		33	N/A	Y	N/A	N
Kettering Borough Council	1	1				N/A	N/A	N/A	N/A	N

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King's Lynn and West Norfolk Borough Council	77	44		18	15	56	13	Y	N	Y
Kirklees Council	85	157		21	61	86	64	Y	Y	Y
Knowsley Metropolitan Borough Council	2			2		100	N/A	Y	N/A	N
Lancaster City Council	190	288		40	30	43	37	Y	Y	Y
Leeds City Council	49	16	2	15	16	100	61	Y	Y	N
Lewes District Council	15	2		9	3	22	0	N	N	N
Lichfield District Council	1	8		1		100	N/A	N	N/A	N
*Liverpool City Council-2011data	1			1		0	N/A	Y	N/A	Y
Maidstone Borough Council	6			4	2	75	0	Y	N	N
Maldon District Council	22	15		2	5	100	80	Y	N	N
Malvern Hills District Council	234	188		19	26	58	0	Y	N	Y
Manchester City Council	2			2		50	N/A	Y	N/A	N
Mansfield District Council	4		3	1		0	67	N	N	N
Melton Borough Council	14	7		5		100	N/A	Y	N/A	Y
Mendip District Council	142	73	3	27	38	30	22	Y	Y	Y

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Merthyr Tydfil County Borough Council	14	12			2	N/A	100	N/A	Y	Y
Mid Devon District Council	343	885		79	177	58	2	Y	Y	Y
Mid Suffolk District Council	114	80	1	15	18	93	37	Y	Y	N
Mid Sussex District Council	4	2		1	1	100	0	Y	N	N
Milton Keynes Council	15	8	5	1	1	100	17	Y	N	N
Mole Valley District Council	10	6		1	3	0	0	N	N	N
Monmouthshire County Council	494	371		29	80	83	1	Y	Y	N
Neath Port Talbot County Borough Council	179	188		8	11	50	27	Y	Y	N
New Forest District Council	8	25		1	7	100	100	Y	Y	N
Newark and Sherwood District Council	14	11	2	1		100	0	N	N	N
Newcastle-under-Lyme Borough Council	64	16		9	39	11	5	Y	Y	N
Newport City Council	39	26		3	10	67	10	Y	Y	N
North Devon District Council	1,119	779	2	187	140	87	4	Y	Y	Y
North Dorset District Council	78	28		15	35	80	26	Y	Y	Y
North East Derbyshire District Council	151	108		14	29	0	0	Y	Y	N

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North East Lincolnshire Council	44	33		8	3	100	0	Y	N	N
North Hertfordshire District Council	59	32		6	21	100	81	Y	Y	N
North Kesteven District Council	13	6		4	3	100	67	Y	N	N
North Lincolnshire Council	19	10		3	2	0	0	N	N	N
North Norfolk District Council	416	267		81	70	7	1	Y	Y	Y
North Somerset District Council	13	8	3	1	1	100	75	Y	Y	N
North Warwickshire Borough Council	20	12		6	2	0	0	Y	N	N
Northampton Borough Council	2		2			N/A	0	N/A	N	N
Northumberland County Council	1,061	433		189	429	52	2	Y	Y	N
Norwich City Council	4	1		3		100	N/A	Y	N	Y
Nottingham City Council	5			5		40	N/A	Y	N	N
North West Leicestershire District Council	20	9	4	2	4	100	13	Y	Y	N
Oldham Metropolitan Borough Council	179	113		11		36	N/A	Y	N	N
Pembrokeshire County Council	963	835		93	34	66	56	Y	Y	N
Pendle Borough Council	275	190		15	70	100	41	Y	Y	Y

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Peterborough City Council	9	4		1	3	100	100	Y	N	Y
Powys County Council	5,986	4,946		364	676	86	24	Y	Y	Y
Preston City Council	15	6		2	7	50	0	Y	N	N
Purbeck District Council	60	36		12	7	67	43	Y	Y	Y
Reading Borough Council	14	6		5	3	80	33	Y	N	N
Redbridge (London Borough of)	1			1		100	N/A	Y	N/A	Y
Redcar & Cleveland Borough Council	41	19	1	4	17	50	22	Y	Y	N
Redditch Borough Council	4	4				N/A	N/A	N/A	N/A	N
Reigate and Banstead Borough Council	1	1				N/A	N/A	N/A	N/A	N
Rhondda Cynon Taff County Borough Council	92	65	1	7	19	86	0	Y	N	N
Ribble Valley Borough Council	296	168		37	91	14	3	Y	Y	Y
Richmondshire District Council	444	275		65	104	62	9	Y	Y	N
Richmond upon Thames (London Borough of)	13	13		13		100	N/A	N	N/A	N
Rochdale Metropolitan Borough Council	105	200		14	34	14	0	Y	N	Y

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Rochford District Council	1		1			N/A	0	N/A	N	N
Rossendale Borough Council	470	271		18	181	0	0	N	N	N
Rother District Council	24	18	1	2	3	50	25	Y	Y	N
Rugby Borough Council	19	19				N/A	N/A	N/A	N/A	N
Runnymede Borough Council	9	5	2	1		0	0	N	N	N
Rushcliffe Borough Council	3	1			2	N/A	0	N/A	N	N
Rushmoor Borough Council	1		1			N/A	0	N/A	Y	N
Rutland County Council	23	13		1	6	100	100	Y	Y	Y
Ryedale District Council	270	153		51	66	45	8	Y	Y	Y
Salford City Council	3	2		1		100	N/A	Y	N/A	N
Scarborough Borough Council	325	188		64	63	47	11	Y	Y	N
Sedgmoor District Council	21	10		10	3	100	100	Y	Y	Y
Selby District Council	39	14		7	11	43	18	Y	N	Y
Sevenoaks District Council	11	4		4	2	75	50	Y	N	N
Sheffield City Council	4	160		4		50	N/A	Y	N/A	N
Shepway District Council	3	2			1	N/A	100	N/A	Y	Y

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Shropshire Council	522	1,350	1	146	295	29	4	N	N	N
Slough Borough Council	2			2		0	N/A	N	N/A	N
Solihull Metropolitan Borough Council	18	15		3		100	N/A	Y	N/A	N
South Buckinghamshire District Council	6	3		3		100	N/A	N	N/A	N
South Cambridgeshire District Council	139	105		7	24	0	0	Y	N	N
South Derbyshire District Council	33	13		13	6	0	0	N	N	N
South Gloucestershire Council	47	29	6	3	9	33	27	Y	Y	Y
South Hams District Council	797	512		133	147	27	12	Y	Y	Y
South Holland District Council	7	6			1	N/A	0	N/A	N	N
South Kesteven District Council	50	33		2	14	100	100	Y	Y	N
South Lakeland District Council	1,880	1,038	181	327	300	18	1	Y	Y	Y
South Norfolk Council	282	203		49	36	71	58	Y	Y	Y
South Northamptonshire Council	51	31		6	14	100	7	Y	Y	N
South Oxfordshire District Council	146	108	1	27	9	100	70	Y	Y	Y
South Ribble Borough Council	6	2		2		100	N/A	Y	N/A	N
South Somerset District Council	421	312		29	79	93	70	Y	Y	Y

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South Staffordshire District Council	55	42		4	8	0	0	Y	Y	N
South Tyneside Metropolitan Borough Council	1	1				N/A	N/A	N/A	N/A	N
Spelthorne Borough Council	1				1	N/A	100	N/A	N	N
St Albans District Council	57	46		3	7	0	0	N	N	N
St Edmundsbury Borough Council	91	20		11	14	100	43	Y	Y	N
Stafford Borough Council	61	94		4	15	100	13	Y	Y	N
Staffordshire Moorlands District Council	435	369		33	35	64	3	Y	Y	N
Stockport Metropolitan Borough Council	42	30	2	3		33	0	Y	N	Y
Stockton on Tees Borough Council	3	3				N/A	N/A	N/A	N/A	N
Stoke-on-Trent City Council	3	1	2			N/A	0	N/A	N	N
Stratford-on-Avon District Council	138	225	69	20	4	0	0	Y	Y	N
Stroud District Council	169	110		14	41	93	2	Y	Y	N
Suffolk Coastal District Council	385	283	1	22	74	0	0	Y	Y	Y
Sunderland City Council	1			1		100	N/A	Y	N/A	N
Sutton (London Borough of)	1			1		0	N/A	Y	N/A	N

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Swale Borough Council	13	2	1	7	2	100	100	Y	Y	N
Swansea City and Borough Council	105	77	4	8	16	88	20	Y	Y	N
Swindon Borough Council	14	5		2	7	0	0	N	Y	N
Tameside Metropolitan Borough Council	34	23		2	9	100	56	Y	Y	Y
Tandridge District Council	2	1		1		100	N/A	Y	N/A	N
Taunton Deane Borough Council	250	156		30	64	100	47	Y	Y	Y
Teignbridge District Council	566	373		101	89	0	0	Y	Y	N
Telford & Wrekin Council	88	64		9	16	100	88	Y	Y	N
Tendring District Council	126	106	1	8	16	38	12	N	N	N
Test Valley Borough Council	236	130	8	36	61	81	48	Y	Y	Y
Tewkesbury Borough Council	107	61	5	12	29	92	53	Y	Y	Y
Thanet District Council	1			1		0	N/A	N	N/A	N
Three Rivers District Council	22	15		4	3	75	33	Y	N	N
Tonbridge and Malling Borough Council	9	4		1	4	100	0	N	N	N
Torbay Council	3			2		100	N/A	Y	N/A	N
Torfaen County Borough Council	55	43		8	5	50	40	Y	Y	N

ENGLAND and WALES

Council name

Note

Councils marked with a * did not make a valid return or returned too late to have their data incorporated in 2013 so the latest available data has been used.

Council name	Total regulated supplies (includes those not categorised)	Single domestic dwellings	Further distribution of mains water by someone other than a licensed water supplier (Reg 8)	Large supplies and any size supply 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?
Torridge District Council	522	384		74	64	66	11	Y	Y	Y
Tower Hamlets (London Borough of)	3			3		100	N/A	Y	N/A	N
Trafford Metropolitan Borough Council	1			1		100	N/A	N	N/A	N
Tunbridge Wells Borough Council	6	3		3		0	N/A	Y	N/A	N
Uttlesford District Council	48	25	6	4	13	100	58	Y	Y	Y
Vale of Glamorgan Council	28	15		6	7	50	0	Y	N	N
Vale of White Horse District Council	66	35	4	9	4	100	0	Y	N	Y
Wakefield Metropolitan District Council	1	1				N/A	N/A	N/A	N/A	N
Waltham Forest (London Borough of)	2			2		0	N/A	N	N/A	N
Warrington Borough Council	10			10		0	N/A	Y	N/A	N
Warwick District Council	33	25		3	5	0	40	N	Y	N
Watford Borough Council	1	1				N/A	N/A	N/A	N/A	N
Waveney District Council	32	25		4	2	50	0	N	N	N
Waverley Borough Council	23	13		3	10	100	0	Y	N	N
Wealden District Council	46	28		10	6	20	0	Y	Y	N
Wellingborough Borough Council	3	2				N/A	N/A	N/A	N/A	N

ENGLAND and WALES

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	Total regulated supplies (includes those not categorised)	Single domestic dwellings	Further distribution of mains water by someone other than a licensed water supplier (Reg 8)	Large supplies and any size supply 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?
Welwyn Hatfield District Council	13	10		3		100	N/A	Y	N/A	N
West Berkshire District Council	204	127		45	32	56	34	Y	Y	N
West Devon Borough Council	973	752		106	110	42	5	Y	Y	Y
West Dorset District Council	581	253	60	103	165	73	6	Y	Y	N
West Lancashire District Council	1	1				N/A	N/A	N/A	N/A	N
West Lindsey District Council	16	9		2	5	0	0	Y	N	N
West Oxfordshire District Council	94	8	13	61	10	97	43	Y	Y	Y
West Somerset District Council	711	468	1	130	112	89	53	Y	Y	Y
Westminster City Council	3	2		1		100	N/A	Y	N/A	N
Weymouth and Portland Borough Council	13		11		2	0	0	N/A	Y	N
Wigan Metropolitan Borough Council	13	10		2	1	0	100	Y	Y	N
Wiltshire Council	574	256	1	106	181	75	32	Y	Y	N
Winchester City Council	157	89		17	50	100	80	Y	Y	Y
Windsor and Maidenhead	105	100		5		0	N/A	N	N/A	N
Wirral Metropolitan Borough Council	3	1		2		100	N/A	Y	N/A	N

ENGLAND and WALES

Council name

Note

Councils marked with a * did not make a valid return or returned too late to have their data incorporated in 2013 so the latest available data has been used.

Council name	Total regulated supplies (includes those not categorised)	Single domestic dwellings	Further distribution of mains water by someone other than a licensed water supplier (Reg 8)	Large supplies and any size supply 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?
Wokingham Borough Council	113	92		10		60	N/A	Y	N/A	N
Wolverhampton City Council	8			8		13	N/A	Y	N/A	N
Wrexham County Borough Council	184	158		5	26	80	35	Y	Y	Y
Wychavon District Council	104	76		3	25	100	4	Y	N	N
Wycombe District Council	56	47		5	4	0	0	Y	Y	N
Wyre Borough Council	30	11		7	12	57	0	Y	N	N
Wyre Forest District Council	23	13		2	8	100	0	Y	N	N
York City Council	17	11		1	4	100	75	N	N	N

Councils reporting no private water supplies

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

Annex 2: Summary of test results for 2013 (England and Wales)

Parameter	Standard	Number of samples	Number of failures	Percentage of failures in 2013	Percentage of failures in 2012
<i>Escherichia coli</i>	0/100 ml	12,082	1,321	10.9	13.9
Enterococci	0/100 ml	6,795	7,56	11.1	13.2
Colony counts after 48 hours at 37°C	No abnormal change	7,658	-	-	
Colony counts after 3 days at 22°C	No abnormal change	7,549	-	-	
Coliform bacteria (Indicator)	0/100 ml	11,524	2,578	22.4	24.7
<i>Clostridium perfringens</i>	0/100 ml	5,015	452	9.0	9.0
<i>Pseudomonas aeruginosa</i>	0/250ml	137	6	4.4	
1 2-Dichloroethane	3.0µg/l	347	1	0.3	0
Aluminium	200µg/l	4,544	109	2.4	33
Ammonium	0.5mg/l	5,706	80	1.4	1.8
Antimony	5.0µg/l	764	2	0.3	0.6
Arsenic	10µg/l	1,247	61	4.9	3.2
Benzene	1.0µg/l	398	0	-	-
Benzo(a)pyrene	0.01µg/l	303	6	2.0	3.8
Boron	1.0µg/l	702	27	3.8	3.1
Bromate	10µg/l	472	4	0.8	1.0
Cadmium	5.0µg/l	991	2	0.2	0.1
Chloride	250mg/l	824	16	1.9	1.1
Chromium	50µg/l	932	0	-	-
Colour	20mg/l Pt/Co	5,577	68	1.2	1.8
Conductivity	2500 µS/cm at 20°C	8,003	10	0.1	0.1
Copper	2.0mg/l	2,174	92	4.2	2.0
Cyanide	50µg/l	370	1	0.3	-
Fluoride	1.5mg/l	921	27	2.9	3.0
Hydrogen ion (pH) (Indicator)	6.5 – 9.5	8,152	1,126	13.8	15.3
Iron	200µg/l	5,968	472	7.9	7.3
Lead	25µg/l	2,918	74	2.5	3.1
Manganese	50µg/l	5,770	587	10.2	9.4
Mercury	1.0µg/l	401	1	0.2	0.2
Nickel	20µg/l	1,137	49	4.3	3.6
Nitrate	50µg/l	5,623	658	11.7	11.0
Nitrite – consumers' taps	0.5µg/l	3,492	25	0.7	1.5
Nitrite – treatment works	0.1µg/l	1,293	104	8.0	5.7
Odour	No abnormal change	4,621	1,059	22.9	15.4
Polycyclic Aromatic Hydrocarbons	0.1µg/l	259	11	4.2	2.6
Selenium	10µg/l	677	3	0.4	0.4
Sodium	200mg/l	1,004	44	4.4	3.8
Sulphate	250mg/l	854	19	2.2	3.5
Taste	No abnormal change	3,758	789	21.0	16.2
Tetrachloromethane	3.0µg/l	376	0	-	2.6
Total indicative dose	0.1mS/year	19	1	5.3	10.0
Total Organic Carbon	No abnormal change	497	0	-	-
Trichloroethene and Tetrachloroethene	10µg/l	302	3	1.0	-
Trihalomethanes	100µg/l	286	0	-	0.8
Tritium	100 Bq/l	93	0	-	-
Turbidity	4NTU	7,300	201	2.8	3.5
Turbidity	1NTU	1,110	119	10.7	7.2

Annex 2: continued

Parameter	Standard	Number of samples	Number of failures	Percentage of failures in 2013	Percentage of failures in 2012
Pesticides					
Aldrin	0.03µg/l	259	0	-	0.4
Dieldrin	0.03µg/l	258	0	-	0.4
Heptachlor	0.03µg/l	257	0	-	0.4
Heptachlor Epoxide	0.03µg/l	261	0	-	4.5
Other pesticides*	0.1µg/l	9,540	26	0.3	0.5
Total pesticides	0.5µg/l	210	1	0.5	2.5
Total		151,669	10,985	7.2	8.0

- Other pesticides detected (and failures in brackets) Bentazone (7), Clopyralid (2), Diuron (4), Isoproturon (1), Hexachlorobutadiene (1), benazolin (1), Mecoprop-P (4) and un-named (6).
- The data set reported this year had a small number (124) samples removed where they were taken at an inappropriate location, for example, source and there was evidence that a sample had been taken on the same day from the correct location (for example, kitchen tap).

Annex 3: Guidance and technical advice

The following guidance, technical advice notes and information letters with application to private water supplies have been published by the Drinking Water Inspectorate on the website <http://www.dwi.gov.uk>

Date issued	Title
November 2013	New European requirements for monitoring for radioactivity in drinking water supplies.
November 2013	Drinking water analysis and the regulatory requirements.
September 2013	Collection of data under the Private Water Supplies Regulations 2009 and the Private Water Supplies (Wales) Regulations 2010.
June 2013	Technical advice note: Regulation 17 – Authorisation of different standards.
May 2013	Potential contaminants in drinking water treatment chemicals.
April 2013	DWI technical advice note on Regulation 8.
April 2013	Viruses in raw and partially treated water: targeted monitoring using latest methods.
2013	Health-based targets for drinking water safety and regulation.
2013	Probabilistic modelling for assessment of exposure via drinking water.
October 2012	Collection of data under the Private Water Supplies Regulations 2009 and the Private Water Supplies (Wales) Regulations 2010.
April 2012	Legislation of private water supplies and drought.
February 2012	Publication of research report on human pharmaceuticals in raw and treated river water to inform regulatory risk assessment methodology.
February 2012	Arrangements for demonstrating that the laboratory analysis of samples of drinking water and the associated reporting of analytical results meet regulatory requirements.

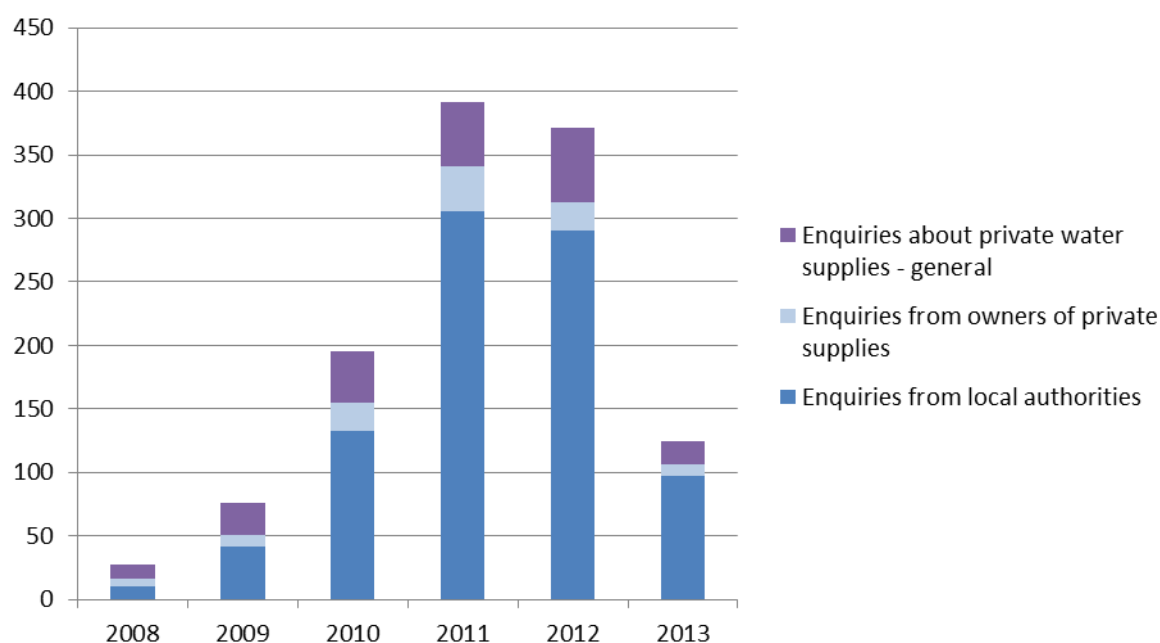
Date issued	Title
December 2011	BS 8551:2011 – Provision and management of temporary water supplies and distribution networks (not including provisions for statutory emergencies). Code of practice. available at http://shop.bsigroup.com/
December 2011	Provision of alternative supplies in emergency and non-emergency situations.
November 2011	Guidance to local authorities in England on charging arrangements under the Private Water Supplies Regulations 2009.
October 2011	Information Letter 09/2011 Collection of data under the Private Water Supplies Regulations 2009 and the Private Water Supplies (Wales) Regulations 2010.
October 2011	Private distribution systems.
September 2011	Chlorine residual testing.
July 2011	Roles and responsibilities of HPA, local authorities and DWI.
March 2011	Milking parlours served by a small private supply.
March 2011	Nitrate and private water supplies.
January 2011	Regulation 5(1)1 – Use of products or substances in private water supplies.
October 2010	Legislative background to the Private Water Supplies Regulations 2009.
October 2010	Guidance on using contractors to deliver Local Authority duties under the Private Water Supplies Regulations.
October 2010	Guidance to local authorities in England on charging arrangements under the Private Water Supplies Regulation 2009.
April 2010	Collection of data under the Private Water Supplies Regulations 2009.
February 2010	The use of ultraviolet (UV) irradiation (written for public supplies, but the advice can be applied to private water supplies).

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

Numbers of enquiries received 2008–2013 for England

	2008	2009	2010	2011	2012	2013
Enquiries from local authorities	10	42	133	306	290	97
Enquiries from owners of private supplies	6	9	22	35	23	9
Enquiries about private water supplies (general)	11	25	40	50	58	19
Total	27	76	195	391	371	125

Number of enquiries received from 2008–2013 indicating the origin of the enquiry – England



Annex 5: Glossary and description 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 by-products 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 25µg Pb/l. A stricter standard of 10µg Pb/l will apply from 2013 onwards.

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).

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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