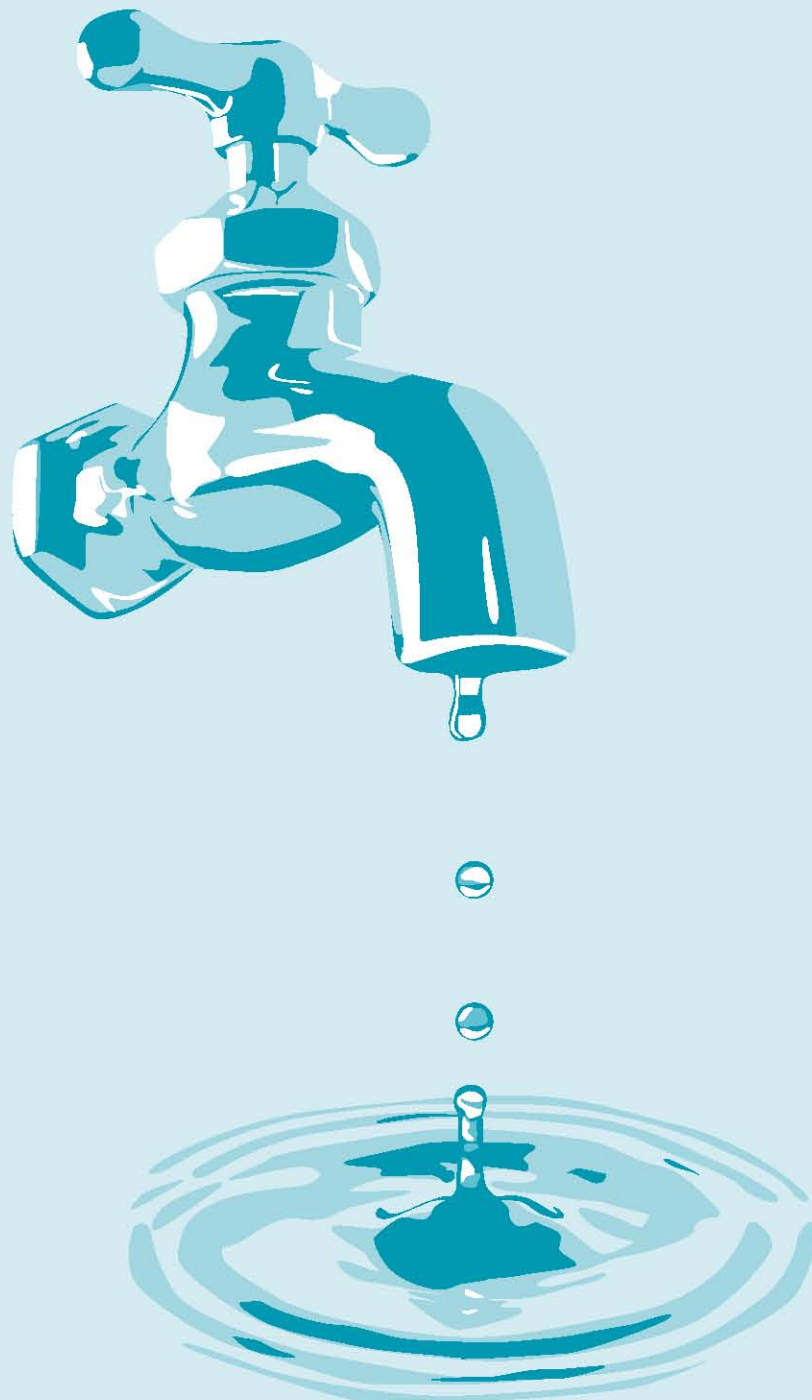


# Drinking water 2010

## Private water supplies in Wales

July 2011

A report by the Chief Inspector of Drinking Water





Drinking water 2010

Private water supplies in Wales



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## Introduction

*Drinking water 2010* is published as a series of nine reports, two describe private water supplies in England and Wales and seven cover public water supplies.

This report, the first of its type, presents information about the quality of private water supplies in Wales. The data derive from records of private water supplies held by local authorities. The records were sent by local authorities to the Drinking Water Inspectorate on or before 31 January 2011 and are reported here in a form that meets the needs of all those who have an interest in the quality and safe management of these supplies.

For the purposes of the report, data provided by local authorities have been allocated to three regions of Wales as illustrated below.

The report describes the number, nature and usage of private supplies. It also discusses local authority activities in relation to carrying out risk assessment and requiring supplies to be improved. The results of testing are summarised in tables with commentary by the Inspectorate.



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Private water supplies are water supplies which are not provided by water companies or licensees, but instead they are the responsibility of the owners and users. They supply water to just over one million of the resident population of England and Wales, but many more people are exposed to them when they are travelling through, or taking a holiday in, more rural areas of the country. The quality and safety of these supplies is controlled by the Private Water Supply Regulations<sup>1</sup> which implement the European Drinking Water Directive. The standards and principles of regulation are the same for both public and private supplies: self-regulation by the owner/user and independent scrutiny; however, across the whole of Europe it has been recognised for some time that small private or community supplies are more often of poor quality and linked to illness than public water supplies. A recent WHO/UNECE report<sup>2</sup> points out that, typically, it is not size that sets them apart from larger supplies, but rather their 'administrative, managerial and operational characteristics'. This situation is, in part, due to the fact that owners/users of private supplies tend to lack access to appropriate technical knowledge and consequently have insufficient understanding of the hazards and how these can be best controlled practically. Environmental health staff of local authorities therefore have an important role in relation to private supplies within their area by identifying where they are and by arranging for risk assessments (including monitoring) to ensure owners/users become better informed and are therefore enabled to manage supplies safely and, where necessary, required to make improvements.

Private supplies vary greatly in their nature ranging from springs and boreholes serving individual properties, to larger groundwater or surface water supplies serving hotels, businesses, holiday accommodation, leisure facilities, and small communities. However, not all private supplies are in rural areas, many can be found in larger towns and cities serving factories, business parks, educational centres, visitor attractions and healthcare premises. Under the previous 1991 regulations, information about private supplies in Wales was compiled and held only at a local level; there were no checks on the accuracy and completeness of these records, and no impartial scrutiny of the adequacy of monitoring or enforcement. Accordingly, there was no transparency regarding the quality of private supplies for the wider public, government or those with responsibility for public health protection. Additionally, the United Kingdom could not report, to the European Union (EU), on the quality of private water supplies in England and Wales, a duty of the United Kingdom government.

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<sup>1</sup> Private Water Supplies (Wales) Regulations 2010

<sup>2</sup> WHO/UNECE Small Scale water supplies in the pan-European region. WHO Regional Office for Europe 2010 at [http://www.unece.org/env/water/publications/documents/Small\\_scale\\_supplies\\_e.pdf](http://www.unece.org/env/water/publications/documents/Small_scale_supplies_e.pdf)

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Historically, therefore, the safety of most of these supplies was largely determined by local environmental health and political priorities. This situation was further compounded by the fact that the provisions for improving these supplies (enforcement) in the previous 1991 regulations were ineffective and not compliant with European law.

One of the main changes introduced by the new regulations was the setting up of arrangements for supervision, reporting, and technical support. Since 1 January 2010, local authorities have been under a duty to keep records of all private supplies in their area and to report key information in these records to the Inspectorate. The Inspectorate has a supervising role in relation to how well local authorities are carrying out their duties, providing technical guidance and support, and reporting on compliance with the European Drinking Water Directive. This report is therefore the first to set out information about private water supplies in Wales. It is necessarily limited in scope because local authorities have five years (until 2015) to fully implement the new regulations. It is expected that the completeness and accuracy of the information available for publication in annual reports will improve year-on-year. The main purpose of *Drinking water 2010* is to describe what is currently known about the types and numbers of private water supplies in Wales and to summarise the work of local authorities in relation to carrying out risk assessments, requiring improvements to safeguard public health and checking compliance with European and national drinking water standards. The information is provided in five sections in the form of tables with commentary, case examples and regional maps. *Annex 1* of the report shows, by region, the location of private supplies and indicates where some, or all, of the required information has been provided to the Inspectorate by local authorities, or where information is not required (because there are no private supplies in the local authority's area).

The legislation affecting private water supplies can be found on the Inspectorate's website together with guidance on the implementation of the regulations and other explanatory notes and leaflets, (<http://dwi.defra.gov.uk/stakeholders/private-water-supplies/index.htm>).

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## Number and nature of private water supplies in Wales

The regulations classify private water supplies according to their size and usage and these two factors denote their status in relation to the requirements of the EU Drinking Water Directive. Large supplies are those where monitoring and other information must be collected and entered by the Inspectorate on behalf of the UK into WISE (the Water Information System for Europe). Small supplies are those where usage of the water determines whether or not the information is reportable to the EU Commission. The Inspectorate has noted that it is a common misunderstanding that size alone determines the reporting requirements, whereas the usage of a supply, irrespective of its size, is also a relevant factor. The current reporting classification is set out in the following paragraphs:

**Regulation 9 supplies – supplying more than 1,000m<sup>3</sup> of water per day or more than 5,000 people.** These supplies are reportable under the EU Drinking Water Directive in the same way as public water supplies.

**Regulation 9 supplies – supplying from 10m<sup>3</sup> to 1,000m<sup>3</sup> of water per day or from 50 to 5,000 people.** These supplies are reportable regardless of the use to which the water is put.

**Regulation 9 supplies – supplying less than 10m<sup>3</sup> of water per day or fewer than 50 people.** These supplies are reportable where water is used for a commercial or public activity, including food production.

**Regulation 10 small domestic supplies – supplying less than 10m<sup>3</sup> water per day and less than 50 people.** Some information is reportable where water is used only for domestic purposes in two or more premises.

**Exempt supplies** – where the supply serves a single dwelling and is used only for domestic purposes.

The Inspectorate has also noted a further common misunderstanding about exempt supplies. The exemption relates only to the scope and frequency of testing; it is not an exemption from the requirement, under the EU Drinking Water Directive, to inform all users of an unsafe supply, about the steps which need to be taken to safeguard human health in the short term and to mitigate the risk in the longer term.

Tables 1 and 2 summarise the information provided by local authorities to the Inspectorate about the nature and number of private water supplies in Wales. The data are from records covering the 2010 calendar year. In making use of this information, it is important to be aware that not all local authorities were in a position to make a full return to the Inspectorate on or before 31 January 2011. This means that the tables do not reflect the

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totality of all private supplies in 2010. For more detail on data returns see *Annex 1* which lists, by local authority, whether the return to the Inspectorate was complete, partial, missing or where the local authority has no private supplies in its area. In addition, the Inspectorate advises that some local authority returns were not in the required format. The Inspectorate will work closely with local authorities to improve the accuracy and completeness of their returns so that a more complete picture can be published in *Drinking water 2011*.

Table 1 describes the number of private supplies according to where they are located in the country. This shows that local authorities have provided information about 14,212 private supplies in Wales and 66% of all these private water supplies are located in South Wales. It can also be seen that three-quarters (75%) of all private supplies in Wales provide a supply of water for domestic purposes to a single dwelling. Generally, these exempt supplies – the majority – are only known about when, at some time in the past, the owner has requested that the quality of the supply is checked or the supply has come to the attention of local environmental health professionals for some other reason, such as insufficiency of supply, change of ownership or use, or land development and planning consents. Under the regulations these exempt supplies are not reportable, therefore they are not included in tables 3-15 which give more detail of the characteristics of private water supplies.

Table 1 also shows that whereas 25% of all private supplies require some monitoring under the regulations, only 10% of all private water supplies in Wales are of a type that require full check and audit monitoring (Regulation 9). This shows that more than half (59%) of those supplies which require monitoring benefit from the provisions of the new regulations, whereby monitoring is restricted to only a few essential tests alongside risk assessment (Regulations 5 and 10). Therefore, overall, more than four-fifths (90%) of private water supplies in Wales are either exempt from monitoring entirely or exempt from testing for many of the parameters in the EU Drinking Water Directive. This is important because testing does not make water safe. Protection of human health comes from the assessment of risk, the provision of appropriate information to users, and advice to owners to enable good management and therefore risk mitigation. The *Case studies* section gives examples of how the new provisions in the regulations have worked to the benefit of owners and users alike.

**Table 1: Number of private supplies reported in 2010, by region.**

Region	Regulation 9 supplies		Regulation 10 supplies	Exempt supplies	Total
	10m <sup>3</sup> /day or more	Less than 10m <sup>3</sup> /day	Small domestic supplies	Single domestic dwellings	
North Wales	152	132	309	1,349	1,942
Mid and West Wales	81	927	647	1,248	2,903
South Wales	109	56	1,131	8,071	9,367
Total	342	1,115	2,087	10,668	14,212

Table 2 looks at the usage of private water supplies. It excludes supplies where the water is used only for domestic purposes. Out of the total of 505 supplies for which information was available in 2010, a sizeable number (21%) are used for tourism and leisure (hotels, bed and breakfast accommodation, camp sites, hostels etc). There are also an additional number of supplies used in premises serving food (15%) or public buildings (10%). From the figures in Table 2 it can be seen that close to half (47%) are used to provide water for drinking, cooking or washing in the provision of services to the public. This confirms that there is a sizeable daily exposure to private water supplies among the wider general public. This is an important fact, because the public at large, unlike long-term owner occupiers of dwellings served by private supplies, expect that water in all such establishments is safe and to the same high standard everywhere in the country. Furthermore, travellers and visitors to an area cannot be presumed to have any acquired immunity that would protect them from water-related illness. One of the most frequent comments made to local authorities by owners seeking to assert that a given private supply is safe (and thus does not require either checking or improving) are along the lines of 'my supply has been drunk without ill effect by generations'. The inherent problems underpinning this attitude by owner occupiers are twofold: firstly, immunity is only acquired as a consequence of infection, therefore, it is dismissive of the wellbeing of certain vulnerable family members (such as infants, young children or the elderly and other vulnerable adults) for whom a gastrointestinal illness is not only unpleasant, but can have very serious long-term health consequences; secondly, the immunity-based assertion does not hold true for visitors and the wider public to whom leisure or hospitality services are being sold.

When confronted by owners with the above mentioned inappropriate attitude, local authorities need to be robust in response and mindful of the following conclusions of a recently published study<sup>3</sup> *‘Most of the burden of waterborne disease falls heavily on the young who have an increased fatality risk or severe sequelae. Very small rural supplies and private supplies are a significant threat to child health and as such deserve much greater consideration by public health agencies than they currently receive’.*

**Table 2: Uses of private water supplies**

Use of supply*	Regulation 9 supplies		Regulation 10 supplies	Total
	10m <sup>3</sup> /day or more	Less than 10m <sup>3</sup> /day		
Food premises	27	50	0	77
Milking parlours (dairy farms)	15	221	0	236
Bed and breakfast / hotels	33	72	3*	108
Temporary events	1	3	0	4
Public buildings	18	34	0	52
Other	12	16	0	28
* Some local authorities have incorrectly classified a number of supplies as domestic use only while also indicating a use in one of the categories in the table ** Regulation 10 supplies exclude single domestic dwellings *** Some supplies have more than one use				

Table 3 summarises the sources used for private water supplies in Wales. Out of the total of 3,544 supplies for which information was available in 2010, only one-eighth (12%) come from groundwater in the form of a dedicated borehole. Out of the remainder, the most common source types are springs (31%) or boreholes influenced by surface water (10%). A further 9% rely on a surface water source (stream, lake, pond, or river). These types of source serve the majority (88%) of private supplies in Wales. This is an important point because of the greater vulnerability of these sources to faecal contamination.

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<sup>3</sup> Hunter P R, Anderle de Saylor M, Risebro H L, Nichols G L, Kay D, and Hartemann P. 2011. Quantitative Microbial Risk Assessment of Cryptosporidiosis and Giardiasis from very small water supplies. Risk Analysis, Volume 31 (2) pages 228-236

**Table 3: Nature of the source of private water supplies.**

Nature of source	Regulation 9 supplies		Regulation 10 supplies*	Total
	10m <sup>3</sup> /day or more	Less than 10m <sup>3</sup> /day		
Borehole	61	249	104	414
Spring	62	351	686	1,099
Borehole or spring (influenced by surface water)	15	279	52	346
Surface Water	80	57	166	303
Combination of borehole and spring	1	1	0	2
Rainwater	2	1	0	3
Estuarine or brackish water	0	0	0	0
Not recorded	121	177	1,079	1,377
<b>Total</b>	<b>342</b>	<b>1,115</b>	<b>2,087</b>	<b>3,544</b>
* Regulation 10 supplies excludes single domestic dwellings				

Tables 4a, 4b and 4c provide a more detailed breakdown of the information available in 2010 on the nature and type of sources used for private water supplies by region. These tables show that 39% of the 3,544 private supply records provided by local authorities in Wales for 2010 are incomplete, for example no source type recorded. Looking in more detail at the information it can be seen that much of the deficit relates to the smaller supplies used for domestic purposes with approximately one half (52%) of these records being incomplete (Table 4c). However, there is similar deficit of information relating to supplies used for commercial purposes; 35% for the larger supplies (Table 4a) and 16% for the smaller supplies (Table 4b). The Inspectorate will work closely with local authorities to improve the accuracy and completeness of their returns with a particular focus on supplies which are reportable under European legislation.

**Table 4a: Number of large supplies used for commercial purposes including food premises and public buildings – nature of the source.**

**Regulation 9 supplies - 10m<sup>3</sup>/day or more**

	Borehole	Spring	Borehole or spring (influenced by surface water)	Surface water	Combination of borehole and spring	Rainwater	Esturine or brackish water	Not recorded	Total
North Wales	19	11	2	74	0	0	0	46	152
Mid and West Wales	33	35	4	5	0	1	0	3	81
South Wales	9	16	9	1	1	1	0	72	109
Total	61	62	15	80	1	2	0	121	342

**Table 4b: Number of small supplies used for commercial purposes including food premises and public buildings by region – nature of the source.**

**Regulation 9 supplies – Less than 10m<sup>3</sup>/day**

	Borehole	Spring	Borehole or spring (influenced by surface water)	Surface water	Combination of borehole and spring	Rainwater	Esturine or brackish water	Not recorded	Total
North Wales	34	32	6	46	0	0	0	14	132
Mid and West Wales	183	296	272	11	1	1	0	163	927
South Wales	32	23	1	0	0	0	0	0	56
Total	249	351	279	57	1	1	0	177	1,115

**Table 4c: Number of small supplies used for domestic purposes only by region – nature of the source.**

**Regulation 10 supplies (excluding single domestic dwellings)**

	Borehole	Spring	Borehole or spring (influenced by surface water)	Surface water	Combination of borehole and spring	Rainwater	Esturine or brackish water	Not recorded	Total
North Wales	39	97	13	157	0	0	0	3	309
Mid and West Wales	24	291	11	3	0	0	0	315	644
South Wales	41	298	28	6	0	0	0	761	1,134
Total	104	686	52	166	0	0	0	1,079	2,087

Tables 5a, 5b, 5c summarise the information available for 2010 about the number of people who are served by private water supplies in Wales. The tables show that local authorities were aware of 73,763 people who were reliant on a private water supply at home or at work in 2010. Just over one-third (40%) of these people depend on a borehole supply while the remainder, the majority, rely on a supply that is wholly or partially dependant on a source that is more vulnerable to faecal contamination. When looked at overall, the figures are important in terms of public health because they quantify the scale of community exposure to water of a quality that is either unknown or potentially unsafe. Small supplies stand out in terms of exposure risk with almost all of the small supply population (97%) depending on water from a vulnerable source type.

**Table 5a: Number of people supplied by different source categories for Regulation 9 supplies - 10m<sup>3</sup>/day or more.**

	Borehole	Spring	Borehole or spring (influenced by surface water)	Surface water	Combination of borehole and spring	Rainwater	Esturine or brackish water	Not recorded	Total
North Wales	248	104	0	6,416	0	0	0	1,412	8,180
Mid and West Wales	21,975	3,382	1,129	1,300	0	100	0	694	28,580
South Wales	2,855	590	202	55	200	50	0	4,195	8,147
Total	25,078	4,076	1,331	7,771	200	150	0	6,301	44,907

**Table 5b: Number of people supplied by different source categories for Regulation 9 supplies - less than 10 m<sup>3</sup>/day.**

	Borehole	Spring	Borehole or spring (influenced by surface water)	Surface water	Combination of borehole and spring	Rainwater	Esturine or brackish water	Not recorded	Total
North Wales	1,178	52	9	570	0	0	0	85	1,894
Mid and West Wales	2,492	3,330	1,611	119	25	10	0	587	8,174
South Wales	445	383	4	0	0	0	0	0	832
Total	4,115	3,765	1,624	689	25	10	0	672	10,900

**Table 5c: Number of people supplied by different source categories for Regulation 10 supplies (excluding single domestic dwellings).**

	Borehole	Spring	Borehole or spring (influenced by surface water)	Surface water	Combination of borehole and spring	Rainwater	Esturine or brackish water	Not recorded	Total
North Wales	107	237	29	535	0	0	0	4	912
Mid and West Wales	244	6,075	49	52	0	0	0	6,605	13,025
South Wales	246	682	216	15	0	0	0	2,860	4,019
Total	597	6,994	294	602	0	0	0	9,469	17,956

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## Improving private water supplies

The overarching purpose of the new private water supply regulations is to protect human health. The evidence demonstrating the scale of the risk associated with small-scale private supplies is summarised in *Small-scale Water Supplies in the Pan-European Region (2010)* published by the joint WHO/UNECE Regional Officer for Europe (<http://www.euro.who>). The need to improve private water supplies by regulating for risk assessment in the UK was first recognised in Scotland in 2006 where, out of 1,750 samples taken from private water supplies over a six-year period between 1992 and 1998, 30% contained *E.coli*. The combined failure rate for all drinking water parameters was 48%. After introducing a systematic approach to evaluating risk through new regulations, the 2008 data from Scotland showed that 23% of the 2,650 samples taken did not comply with the standard for *E.coli* and between 1 January 2006 and 15 October 2008 there were 48 confirmed clinical cases of *E.coli* 0157 infection in which *E.coli* 0157 contamination of a private water supply was either confirmed or suspected. In England and Wales, the need to improve private water supplies was confirmed by a similar analysis of data collected by 150 local authorities over a seven-year period between 1996 and 2003 covering approximately 11,200 private supplies and 35,000 samples. This showed that *E.coli* was detected in 19% of samples with at least one positive sample recorded for 32% of private supplies. In addition, 36% of water-related disease outbreaks were associated with private supplies.

## Risk assessments

From 2010, local authorities in Wales have been required to carry out a risk assessment of each private water supply in their area 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 (Regulation 5) transposes into law, actions required under Articles 6 and 8 of the EU Drinking Water Directive.

In 2006, the Scottish Government published *Private Water Supplies: Technical Manual*<sup>4</sup> as a substantive reference document intended to assist professionals regulating, surveying and maintaining private water supplies. Section 4 of the technical manual sets out the risk assessment methodology based on the *WHO Guidelines for Drinking Water Quality and Water Safety Plan Methodology*<sup>5</sup>. The Inspectorate has recommended that

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<sup>4</sup> Available at <http://www.privatewatersupplies.gov.uk/>

<sup>5</sup> Available at [http://www.who.int/water\\_sanitation\\_health/dwq/guidelines/en/](http://www.who.int/water_sanitation_health/dwq/guidelines/en/)

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during the five-year implementation period (2010 – 2014) local authorities in Wales follow the principles in the Scottish *Technical Manual* when carrying out a risk assessment under Regulation 5. Additionally, the Inspectorate has recommended that local authorities follow this risk assessment methodology when investigating the cause of failures of drinking water standards (Regulation 15), detected by monitoring (Regulations 9 and 10). Experience gained with the methodology will enable its refinement, as necessary, to any different circumstances identified in Wales.

Local authorities have been given five years to risk assess all relevant supplies in their area. Table 6 summarises information provided to the Inspectorate by local authorities in Wales about the number of risk assessments carried out in year one of five. In using this information, it is important to be aware that not all local authorities were in a position to make a full return to the Inspectorate on or before 31 January 2011. This means that the tables do not reflect the totality of all private supplies in 2010. However, the information demonstrates that in relation to those supplies for which details are available, local authorities carried out 297 risk assessments in Wales. The rate of progress and consequently, the percentage of risk assessments still to be carried out before the end of 2014 varies across local authorities in Wales.

Table 6 shows why action in relation to private water supplies needs to be considered and prioritised in terms of local public health policy. For some local authorities there is already a clear recognition of the risk posed by private supplies in their area. Whereas for others, the need to prioritise the development or deployment of resources and expertise has yet to be fully recognised or, in some instances, where private supplies are not prevalent, the priority is necessarily lower. For example, in North Wales, in 2010, Denbighshire County Council risk assessed all (100%) of its 119 private supplies whereas in the same period Gwynedd County Council had risk assessed just eight (<10%) out of the 109 private supplies for which it holds records. Generally, the level of activity in mid-Wales was lower. For example, Ceredigion County Council risk assessed 26 out of 470 private supplies and Powys County Council risk assessed 32 out of 587 of the private supplies for which it holds records. In South Wales, where there are fewer private supplies, local authorities collectively risk assessed 10 out of the 77 known supplies. Overall, close to one-sixth of private supplies in Wales were risk assessed in 2010.

**Table 6: Local authority progress with risk assessments.**

Region and local authority name	Total of risk assessments required (all groups)	Total risk assessments completed	% Risk assessments to be completed by end of 2014
<b>North Wales Total</b>	<b>593</b>	<b>223</b>	<b>62</b>
Anglesey	205	70	66
Conwy	90	3	97
Denbighshire	119	119	0
Flintshire	34	3	91
Gwynedd	109	8	93
Wrexham	36	20	44
<b>Mid and West Wales Total</b>	<b>1,223</b>	<b>64</b>	<b>95</b>
Ceredigion	470	26	94
Pembrokeshire	166	6	96
Powys	587	32	95
<b>South Wales Total</b>	<b>77</b>	<b>10</b>	<b>87</b>
Bridgend	16	1	94
Merthyr Tydfil	2	2	0
Swansea	25	4	84
Torfaen	14	1	93
Vale of Glamorgan	20	2	90

## Case studies

During the first year of implementation of the new private water supply regulations, local authorities in England and Wales have notified the Inspectorate of 170 (114 in England and 56 in Wales) improvement notices put in place in relation to private water supplies identified as posing a potential danger to human health. These notices and other enforcement activities in Wales are summarised in Table 7. Notices place short-term restrictions on the use of the supply, requiring either water to be boiled before use or the use of an alternative supply such as bottled water. They also specify a timetable for the implementation by the owner of steps to mitigate the risk in the longer term. In every instance, once aware of the hazards, owners have co-operated in making immediate improvements to the management and maintenance of the supply and, where necessary, they have developed longer term plans to secure a safe, sustainable supply.

**Table 7: Records the enforcement activities of local authorities in Wales for 2010.**

	Regulation 9 supplies			Regulation 10 supplies
	1000 m <sup>3</sup> /day or more	10m <sup>3</sup> /day or more	Less than 10m <sup>3</sup> /day	
Regulation 18 Notices	<b>1</b> Gwynedd-1	<b>7</b> Gwynedd-5 Powys-2	<b>36</b> Powys-33 Flintshire-2 Anglesey-1	<b>7</b> Swansea-6 Powys-1
Appeals against Regulation 18 Notices	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Section 80 Notices	<b>0</b>	<b>5</b> Gwynedd-5	<b>0</b>	<b>0</b>
Appeals against Section 80 Notices	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Informal action	<b>0</b>	<b>16</b> Ceredigion-13 Bridgend-1 Cardiff-1 Vale of Glamorgan-1	<b>29</b> Powys-17 Ceredigion-10 Denbighshire-2	<b>6</b> Swansea-3 Ceredigion-3

Examples of how the risk assessment and enforcement provisions of the new regulations have been applied during 2010 are set out below. The Inspectorate is pleased to acknowledge the following local authorities for providing the case studies in this section: Cardiff Council, Gwynedd County Council, Swansea City and Borough Council. Additional case studies can be found in the companion report *Drinking water 2010 - Public water supplies in England*<sup>6</sup>.

### **Case study 1 – Small domestic surface water supply.**

The supply in this case study is a small supply that serves two domestic dwellings. The dwellings are owner occupied, but the land where the source is located is owned by the local authority and the distribution network crosses Forestry Commission land. Unlike many small supplies, in this case there was a history of annual monitoring because of the presence of a rural estate office, however, since closure of the office, the supply had reverted to a small supply. A planned sample (Regulation 10)

<sup>6</sup> Available on the Inspectorate's website at <http://www.dwi.gov.uk>

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contained coliform bacteria. The finding of these indicator organisms requires an investigation by the local authority (Regulation 15). The approach taken was to notify the owners that a risk assessment would be carried out to enable advice to be given on the nature of any hazards, the effectiveness of the existing arrangements to protect water quality (risk mitigation) and the need for any additional safeguards.



Lake used as a water source

The risk assessment identified uncontrolled hazards in relation to the water source (a lake in the bottom of a limestone quarry) which feeds a large storage chamber in the woods. The distribution pipes buried at a shallow depth pass through the woods to the domestic dwellings. There is abundant wildlife in proximity to the network and there is no water treatment in place contrary to past recommendations by the local authority.

There was historical information showing that *E.coli* had been detected in past samples confirming the source was at risk of containing pathogens due to contamination with faecal matter. The risk assessment informed by the monitoring information demonstrated that the supply posed a potential danger to human health enabling the local authority to issue a Regulation 18 Notice. The Notice, which was served on both owners, documented the risks and restricted the supply (so that all users were made aware of how to safeguard their health by boiling water before use or using bottled water). The Notice also set a timescale by when the owners should provide a proposal for permanent improvements to the supply (disinfection) to enable unrestricted use. Other advice, about the need for the supply to be maintained and the performance of any treatment monitored by the owner was given in an advisory letter rather than in the Notice because this is now a small domestic supply where the owners will be in control of the treatment. There was no appeal by the owners in relation to this Notice. This case study illustrates how the risk assessment approach in the new private water supply regulations can be used as an effective tool for investigating unsatisfactory monitoring results, providing robust evidence as to whether or not a supply poses a risk to human health and warrants action. It also illustrates how the revised Notice powers available to local authorities in the new regulations can be used straightforwardly to encourage health-based action to be taken; it should be noted that even though *E.coli* was found in tests under the previous 1991 regulatory regime

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nothing was done. Under the previous 1991 regulations, enforcement by the local authority was discretionary and therefore not prioritised.

### **Case study 2 – Spring supply to a holiday cottage.**

The subject of this case study is a small supply serving a domestic dwelling and a holiday cottage. The source is a spring surrounded by pasture land grazed by domestic livestock (cattle and sheep). Water is collected in a chamber and piped to each dwelling where it is treated by UV. A planned annual sample by the local authority contained *E.coli*. The approach taken by the local authority was to advise the owner that a risk assessment would be carried out to enable advice to be given about the nature of the hazards, the effectiveness of the existing arrangements to protect water quality (risk mitigation) and the need for any additional safeguards.

The risk assessment identified that the owner, in response to the detection of *E.coli*, had already carried out some improvement work at the source, replacing the cover on the collection chamber and erecting stock proof fencing. However, the overflow pipe was unprotected, therefore small animals could gain access and contaminate the supply with faeces and pathogens. Additionally and importantly, it was found that the UV treatment system was not working because although there was electricity to the unit, the starter device had not been checked or changed. The risk assessment enabled the local authority to conclude that the supply was a potential danger to human health and serve a Regulation 18(a) Notice restricting the supply (so that all users were made aware of how to safeguard their health by boiling water before use or by using bottled water). The Notice set out the improvements required, including a written procedure for carrying out and recording maintenance, and monitoring of the disinfection unit. The owners co-operated fully and completed all the necessary work within 15 days. There was no appeal to the Notice.

This case study illustrates how the risk assessment approach in the new private water supply regulations can be used effectively to impart essential knowledge to owners about how to keep their private supply safe by carrying out regular checks and maintenance. If the local authority had not visited this supply then it would have remained contaminated throughout the whole of the holiday season without the knowledge of the owners or visitors. Owners need to understand that testing on its own does not make water safe; the carrying out of simple frequent checks and maintenance by owners is far more important than occasional sampling carried out by the local authority.

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### **Case study 3 – Spring supply to rented property.**

This water supply serves six dwellings; five of which are rented out and the sixth is occupied by the landlord. The source is a lowland shallow spring with no treatment. Spring water is pumped from a collection chamber to a relatively new storage tank serving all of the properties. A risk assessment was carried out which documented the following uncontrolled hazards:

- wildlife and grazing of livestock around the source;
- storage tanks not adequately protected due to deterioration of the structure;
- septic tank discharge in the vicinity and uphill from the source;
- no screens to prevent access by vermin;
- no treatment;
- an oil tank with no spillage bunding.

The risk assessment provided compelling evidence that the supply posed a potential danger to human health. Even though past testing had been satisfactory, it was clear that harmful material in the immediate local environment (fuel oil and faecal matter potentially containing pathogens) could gain direct access to the water supply due to the lack of safeguards and inadequate maintenance. Hazards were present from source to tap; in the catchment, from livestock and wildlife close to the source, direct ingress into water storage tanks and indirect seepage of oil or faecal matter through the ground into the source or by migration through plastic pipes or leaking joints. The lack of any treatment meant that the risk of water drawn from taps containing harmful contaminants was high.

The risk assessment enabled the local authority to issue a Regulation 18 Notice. The Notice documented the risk and restricted the supply (so that all users were made aware of how to safeguard their health by boiling water before use or using bottled water). The Notice required the owner to undertake maintenance so that the storage tank was sealed and water tight, to install effective treatment and put in place a written procedure for the maintenance and monitoring of the disinfection equipment. A timescale was set stating the time by which the owner should provide a proposal for permanent improvements to the supply to enable unrestricted use. There was no appeal by the owner in relation to this Notice.

This case study illustrates how the risk assessment approach in the new private water supply regulations can provide robust evidence as to whether or not a supply poses a risk to human health and warrants action. It should be noted that those renting the properties were ignorant of the risk and

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therefore unable to safeguard their health. Also, when the landlord was making improvements in respect of sufficiency (quantity) by means of installing a storage tank, he lacked the knowledge to understand the need for quality improvements, such as protection of the collection chamber or installation of treatment. This case therefore shows how putting reliance on very infrequent testing, under the previous 1991 regulations, resulted in a false sense of reassurance about the security of a supply. Testing on its own does not make water safe, whereas risk assessment empowers local authorities to encourage health-based action.

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## Drinking water quality testing

This section summarises the information provided by local authorities to the Inspectorate about the results of the testing of private water supplies in Wales. The results cover the 2010 calendar year. In making use of this information, it is important to be aware that not all local authorities were in a position to make a full return to the Inspectorate on or before 31 January 2011. This means that the tables in this section do not reflect all the testing carried out in 2010. Furthermore, as explained below, many private supplies are exempt from testing or require only limited, or occasional testing depending on their classification. Therefore the tables in this section summarise only the results of testing carried out by those local authorities listed in *Annex 1* who provided the Inspectorate with a complete return. The Inspectorate advises that some of the data in these local authority returns were not in the required format and have therefore been excluded from this year's report.

The drinking water standards in the private water supply regulations are the same as those which apply to public water supplies and mostly derive from the EU Drinking Water Directive. An explanation of the standards can be found in *Annex 4*. A more detailed explanation of the standards can be found in both the legislation and the guidance published on the Inspectorate's website (<http://www.dwi.gov.uk>).

The standards are set out in Schedule 1 of the regulations by parameter. Schedule 1 is divided into three tables: Table A covers microbiological standards; Table B sets out chemical standards and the national standards and Table C covers indicator parameters. For ease of reference, the tables in this section of the report are set out in Schedule 1 format and list 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. *Annex 2* contains an overall summary of drinking water quality results.

Tables 8a-d and 9a-d give the results of testing of the large Regulation 9 supplies (more than 1,000m<sup>3</sup>/day or more than 5,000 people) which are treated in the European legislation in the same way as public water supplies. These private water supplies were required to be monitored under the previous 1991 regulations, but this is the first time such information has been made available for reporting on a national basis. Tables 8a-d give the combined results for England and Wales and Tables 9a-d give the results for just Wales.

In relation to the frequency of testing by local authorities, the Inspectorate is concerned that there may have been a substantial shortfall in 2010.

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Tables 8a-d summarise the local authority information returns regarding the testing of 199 large supplies (more than 1,000m<sup>3</sup>/day) in England and Wales. The regulations require check monitoring of these supplies at a frequency of no less than 10 samples per year, however, it can be seen from Table 8a that the number of tests for the most commonly used check parameter (coliform bacteria) was only 249. By averaging this equates to fewer than two check samples for each supply. This means that either local authorities were not carrying out check monitoring in 2010 or the testing was being done but the results were not included in local authority returns. The Inspectorate will work closely with local authorities to identify the nature of this shortfall problem with a view to it being rectified as soon as practicable and before the Inspectorate is required to enter the data into the water information system for Europe (WISE).

Despite the limited data available, Tables 8a-d clearly show that the quality of some of the larger private water supplies in England and Wales is unsatisfactory in respect of a wide range of parameters. Close to 5% of samples contained *E.coli* or Enterococci or both. The finding of these organisms demonstrates that a water supply has been contaminated with faecal matter and may contain pathogenic organisms. This means that the water, if consumed, could give rise to infection and cases of water-related illness. Tables 8b-d also show a relatively high failure rate for a number of substances potentially harmful to human health: arsenic (20%), boron (7%), copper (16%), nitrate (25%), solvents (5%), sodium (17%). The highest failure rates were for pH and turbidity: one-quarter of all samples fell outside the pH range set in the standards (6.5 – 9.5) and 80% of turbidity results were above the standard of 1NTU. These findings are of concern because they indicate that any treatment in place to disinfect these supplies may not be working effectively. Also, it may indicate that the water supply is aggressive towards plumbing metals causing deposits to form within tanks and pipes with consequences for maintenance and the general acceptability of the water to consumers.

Tables 9a-d show the portion of the large supplies data in Table 8a-d which are attributable to supplies in Wales. The Inspectorate is concerned to note that there appears to be a very high shortfall in the monitoring and reporting of large supplies by local authorities in Wales: it would appear that only 19 samples have been collected during 2010 (in relation to 33 supplies) and furthermore the scope of monitoring is limited to only a few microbiological and indicator parameters, with little or no testing for chemical parameters.

The Inspectorate has become aware that many local authorities did not update their monitoring contracts with laboratories to reflect the new regulations at the beginning of 2010. As a consequence, the testing carried out by local authorities is not fully compliant with the regulations.

Of particular concern is the lack of testing for Enterococci. Table 9a shows that none of the samples from supplies in Wales were tested for Enterococci. Testing for this faecal indicator organism is a requirement of audit monitoring under Regulation 9 (large supplies) and it is a mandatory test for small supplies (Regulation 10). Testing for Enterococci provides useful information to support risk assessment in relation to the likelihood and origin of faecal contamination.

Many of the laboratories accredited for testing drinking water are owned or managed by water companies and the Inspectorate will be recommending to water companies that they review and update their contracts with local authorities to reflect the new private water supply regulations. The Inspectorate is aware that some of the errors in microbiological testing may be occurring where a local authority is sending water samples to a local hospital pathology laboratory. Local authorities should establish whether the health service laboratory they are using is providing a service accredited by the United Kingdom Accreditation Service (UKAS) and meeting the Drinking Water Testing Specification (DWTS) standard. The regulations require local authorities to ensure that samples from private water supplies are analysed by competent persons and attention is drawn to the Inspectorate's published guidance on these requirements. It is important that local authorities and health professionals collectively recognise that the primary role of the Health Protection Agency (HPA) is not routine testing; rather it is the examination of stool, food and water samples for pathogens in the context of a community outbreak of food or water-borne disease.

**Table 8: England and Wales drinking water quality.  
Regulation 9 large supplies (Supplying more than 1,000m<sup>3</sup>/day)**

Table 8a: Schedule 1 Table A – Microbiological parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
<i>E.coli</i>	0/100ml	213	9	4.23
Enterococci	0/100ml	47	1	2.13

Table 8b: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Antimony	5.0µg/l	23	0	0
Arsenic	10µg/l	25	5	20.00
Benzene	1.0µg/l	8	0	0
Benzo(a)pyrene	0.01µg/l	17	0	0
Boron	1.0µg/l	28	2	7.14
Cadmium	5.0µg/l	23	0	0
Chromium	50µg/l	23	0	0
Copper	2.0mg/l	37	6	16.22
Cyanide	50µg/l	15	0	0
<b>Disinfection by-products*</b>				
Bromate	10µg/l	5	0	0
Trihalomethanes	100µg/l	10	0	0
Fluoride	1.5mg/l	22	0	0
Lead (current standard)	25µg/l	33	0	0
Lead (future standard)	10µg/l	33	0	0
Mercury	1.0µg/l	15	0	0
Nickel	20µg/l	26	0	0
Nitrate	50µg/l	127	31	24.41
Nitrite – Consumer's tap	0.5µg/l	65	0	0
Nitrite – Treatment	0.1µg/l	62	6	9.68
<b>Pesticides</b>				
Aldrin	0.03µg/l	14	0	0
Dieldrin	0.03µg/l	12	0	0
Heptachlor	0.03µg/l	13	0	0
Heptachlor Epoxide	0.03µg/l	5	0	0
Other pesticides	0.1µg/l	283	0	0
Polycyclic aromatic hydrocarbons	0.1µg/l	16	0	0
Selenium	10µg/l	20	1	5.00
<b>Solvents</b>				
Tetrachloroethene and Trichloroethene	10µg/l	22	1	4.55
1,2 Dichloroethane	3.0µg/l	6	0	0
*Standards are not set for all disinfection by-products				

Table 8c: Schedule 1 Table B – National requirements

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Aluminium	200µg/l	90	2	2.22
Colour	20mg/l Pt/Co	172	1	0.58
Iron	200µg/l	135	14	10.37
Manganese	50µg/l	125	8	6.40
Odour	No abnormal change	172	16	9.30
Sodium	200mg/l	24	4	16.67
Taste	No abnormal change	159	14	8.81
Tetrachloromethane	3.0µg/l	16	0	0
Turbidity (at consumer's tap)	4NTU	169	0	0

Table 8d: Schedule 1 Table C – Indicator parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting the standard	Percentage of tests not meeting the standard
Ammonium	0.5mg/l	155	3	1.94
Chloride	250mg/l	21	0	0
<i>Clostridium perfringens</i>	0/100ml	75	2	2.67
Coliform bacteria	0/100ml	249	17	6.83
Conductivity	2500µS/cm at 20°C	168	1	0.60
Hydrogen ion (pH)	6.5 – 9.5	177	47	26.55
Sulphate	250mg/l	22	0	0
Turbidity (at treatment works)	1NTU	10	8	80.00

**Table 9: Drinking water quality testing in Wales. Regulation 9 large supplies (supplying more than 1,000m<sup>3</sup>/day)**

Table 9a: Schedule 1 Table A – Microbiological parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
<i>E.coli</i>	0/100ml	19	0	0
Enterococci	0/100ml	0	N/A	-

Table 9b: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Antimony	5.0µg/l	0	N/A	-
Arsenic	10µg/l	0	N/A	-
Benzene	1.0µg/l	0	N/A	-
Benzo(a)pyrene	0.01µg/l	0	N/A	-
Boron	1.0µg/l	0	N/A	-
Cadmium	5.0µg/l	0	N/A	-
Chromium	50µg/l	0	N/A	-
Copper	2.0mg/l	0	N/A	-
Cyanide	50µg/l	0	N/A	-
<b>Disinfection by-products*</b>				
Bromate	10µg/l	0	N/A	-
Trihalomethanes	100µg/l	0	N/A	-
Fluoride	1.5mg/l	0	N/A	-
Lead (current standard)	25µg/l	0	N/A	-
Lead (future standard)	10µg/l	0	N/A	-
Mercury	1.0µg/l	0	N/A	-
Nickel	20µg/l	0	N/A	-
Nitrate	50µg/l	1	0	0
Nitrite – Consumer's tap	0.5µg/l	1	0	0
Nitrite – Treatment	0.1µg/l	0	N/A	-
<b>Pesticides</b>				
Aldrin	0.03µg/l	0	N/A	-
Dieldrin	0.03µg/l	0	N/A	-
Heptachlor	0.03µg/l	0	N/A	-
Heptachlor Epoxide	0.03µg/l	0	N/A	-
Other pesticides	0.1µg/l	0	N/A	-
Polycyclic aromatic hydrocarbons	0.1µg/l	0	N/A	-
Selenium	10µg/l	0	N/A	-
<b>Solvents</b>			N/A	-
Tetrachloroethene and Trichloroethene	10µg/l	0	N/A	-
1,2 Dichloroethane	3.0µg/l	0	N/A	-
*Standards are not set for all disinfection by-products				

Table 9c: Schedule 1 Table B – National requirements

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Aluminium	200µg/l	10	1	10.00
Colour	20mg/l Pt/Co	17	0	0
Iron	200µg/l	10	0	0
Manganese	50µg/l	10	2	20.00
Odour	No abnormal change	19	0	0
Sodium	200mg/l	0	N/A	-
Taste	No abnormal change	17	0	0
Tetrachloromethane	3.0µg/l	0	N/A	-
Turbidity (at consumer's tap)	4NTU	19	0	0

Table 9d: Schedule 1 Table C – Indicator parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Ammonium	0.5mg/l	19	0	0
Chloride	250mg/l	0	N/A	-
<i>Clostridium perfringens</i>	0/100ml	11	2	18.18
Coliform bacteria	0/100ml	19	3	15.79
Conductivity	2500µS/cm at 20°C	17	0	0
Hydrogen ion (pH)	6.5 – 9.5	19	7	36.84
Sulphate	250mg/l	0	N/A	-
Turbidity (at treatment works)	1NTU	0	N/A	-

In the earlier discussion about the different sources of water used for private water supplies (Table 3), attention was drawn to the greater vulnerability to contamination of sources other than discrete boreholes. This point is clearly illustrated in Tables 10a-d and 11a-d. Tables 10a-d summarise the results of all the testing carried out by local authorities in 2010 for supplies in Wales which draw water only from a borehole. Tables 11a-d summarise the test results for supplies reliant on other sources: springs, surface water, and boreholes influenced by surface water or used in conjunction with a spring source. From these two tables it can be seen that whereas about 8% of samples from borehole supplies contained *E.coli* or Enterococci, these organisms were detected in more than one-fifth (26%) of samples from other sources.

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However, despite the generally better quality of borehole derived private supplies, it should be noted that at least one-twentieth of those sampled by local authorities in 2010 contained *E.coli* and therefore posed a potential danger to human health. On investigation using risk assessment a common theme has emerged, namely the substandard way in which some boreholes had been constructed, in particular, the absence of safeguards against the ingress of surface water. For example, in one case where a borehole had been installed for an owner at a cost of approximately £8,000 it was found that head works were below ground and completely open, with no protective chamber at ground level and no watertight and lockable cover to prevent contamination by surface water ingress. In addition no log was provided of the strata identified during drilling and no record of the material used in the below ground construction, both of which comprise necessary information to determine quality and appropriate treatment. Before selecting the location of a new borehole, contact should be made with the local water company, the local authority and the Environment Agency to seek advice and information about local water quality risks. When planning a new borehole, drillers are required to notify the British Geological Survey to ensure that groundwater and any other local water supplies will not be adversely affected by the work. After drilling, a competent borehole driller would sample the emerging raw ground water and arrange for analysis to verify the chemical and microbiological quality and need for water treatment to be installed.



Example of inappropriate arrangements for a borehole. Note the lack of cover and the risk of ingress as the headworks are below the level of the surrounding ground and not protected.

The Inspectorate commends local authorities such as Powys County Council who have approached borehole installers in their area to advise them of best practice as set out in the *Private Water Supplies: Technical Manual*. Within the manual there is a description of the different types of borehole installation, detailing the construction method and materials which should be used to safeguard a new supply from contamination by surface water.

**Table 10: Drinking water quality testing – Boreholes.  
(Excluding single domestic dwellings).**

Table 10a: Schedule 1 Table A – Microbiological Parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
<i>E.coli</i>	0/100ml	240	19	7.92
Enterococci	0/100ml	30	2	6.67

Table 10b: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Antimony	5.0µg/l	8	0	0
Arsenic	10µg/l	7	0	0
Benzene	1.0µg/l	2	0	0
Benzo(a)pyrene	0.01µg/l	1	0	0
Boron	1.0µg/l	6	1	16.67
Cadmium	5.0µg/l	10	0	0
Chromium	50µg/l	9	0	0
Copper	2.0mg/l	162	1	0.62
Cyanide	50µg/l	3	0	0
<b>Disinfection by-products*</b>				
Bromate	10µg/l	4	0	0
Trihalomethanes	100µg/l	3	0	0
Fluoride	1.5mg/l	10	1	10.00
Lead (current standard)	25µg/l	173	1	0.58
Lead (future standard)**	10µg/l	122	4	3.28
Mercury	1.0µg/l	3	0	0
Nickel	20µg/l	9	0	0
Nitrate	50µg/l	91	6	6.59
Nitrite – Consumer’s tap	0.5µg/l	20	0	0
Nitrite – Treatment	0.1µg/l	8	0	0

Table 10b continued: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
<b>Pesticides</b>				
Aldrin	0.03µg/l	1	0	0
Dieldrin	0.03µg/l	1	0	0
Heptachlor	0.03µg/l	1	0	0
Heptachlor Epoxide	0.03µg/l	1	0	0
Other pesticides	0.1µg/l	0	0	0
Polycyclic aromatic hydrocarbons	0.1µg/l	2	1	
Selenium	10µg/l	5	0	0
<b>Solvents</b>				
Tetrachloroethene and Trichloroethene	10µg/l	3	0	0
1,2 Dichloroethane	3.0µg/l	2	0	0
*Standards are not set for all disinfection by-products				
** Sample numbers differ for Lead (25µg/l) and Lead (10µg/l) due to excluding samples from one council where it was not possible to determine actual sample results				

Table 10c: Schedule 1 Table B – National requirements

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Aluminium	200µg/l	119	2	1.68
Colour	20mg/l Pt/Co	104	1	0.96
Iron	200µg/l	178	10	5.62
Manganese	50µg/l	183	43	23.50
Odour	No abnormal change	24	1	4.17
Sodium	200mg/l	8	0	0
Taste	No abnormal change	17	0	0
Tetrachloromethane	3.0µg/l	3	0	0
Turbidity (at consumer's tap)	4NTU	161	4	2.48

Table 10d: Schedule 1 Table C – Indicator parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Ammonium	0.5mg/l	105	9	8.57
Chloride	250mg/l	7	0	0
<i>Clostridium perfringens</i>	0/100ml	109	6	5.50
Coliform bacteria	0/100ml	244	38	15.57
Conductivity	2500µS/cm at 20°C	175	0	0
Hydrogen ion (pH)	6.5 – 9.5	180	21	11.67
Sulphate	250mg/l	9	0	0
Turbidity (at treatment works)	1NTU	3	0	0

**Table 11: Drinking water quality testing- sources other than boreholes (Excluding single domestic dwellings).**

Table 11a: Schedule 1 Table A – Microbiological parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
<i>E.coli</i>	0/100ml	633	166	26.22
Enterococci	0/100ml	81	16	19.75

Table 11b: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Antimony	5.0µg/l	13	0	0
Arsenic	10µg/l	12	0	0
Benzene	1.0µg/l	0	N/A	-
Benzo(a)pyrene	0.01µg/l	0	N/A	-
Boron	1.0µg/l	7	0	0
Cadmium	5.0µg/l	13	0	0
Chromium	50µg/l	13	0	0
Copper	2.0mg/l	351	18	5.13
Cyanide	50µg/l	4	0	0
<b>Disinfection by-products*</b>				
Bromate	10µg/l	0	N/A	-
Trihalomethanes	100µg/l	0	N/A	-
Fluoride	1.5mg/l	0	N/A	-
Lead (current standard)	25µg/l	356	6	1.69

Table 11b continued: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Lead (future standard)**	10µg/l	220	7	3.18
Mercury	1.0µg/l	4	0	0
Nickel	20µg/l	13	0	0
Nitrate	50µg/l	187	3	1.60
Nitrite – Consumer's tap	0.5µg/l	37	5	13.51
Nitrite – Treatment	0.1µg/l	16	0	0
<b>Pesticides</b>				
Aldrin	0.03µg/l	0	N/A	-
Dieldrin	0.03µg/l	0	N/A	-
Heptachlor	0.03µg/l	0	N/A	-
Heptachlor Epoxide	0.03µg/l	0	N/A	-
Other pesticides	0.1µg/l	0	N/A	-
Polycyclic aromatic hydrocarbons	0.1µg/l	0	N/A	-
Selenium	10µg/l	7	0	0
<b>Solvents</b>				
Tetrachloroethene and Trichloroethene	10µg/l	0	N/A	-
1,2 Dichloroethane	3.0µg/l	0	N/A	-
*Standards are not set for all disinfection by-products				
** Sample numbers differ for Lead (25µg/l) and Lead (10µg/l) due to excluding samples from one council where it was not possible to determine actual sample results				

Table 11c: Schedule 1 Table B – National requirements

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Aluminium	200µg/l	228	6	2.63
Colour	20mg/l Pt/Co	209	2	0.96
Iron	200µg/l	382	18	4.71
Manganese	50µg/l	383	22	5.74
Odour	No abnormal change	56	0	0
Sodium	200mg/l	15	0	0
Taste	No abnormal change	35	1	2.86
Tetrachloromethane	3.0µg/l	0	N/A	-
Turbidity (at consumer's tap)	4NTU	362	9	2.49

Table 11d: Schedule 1 Table C – Indicator parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Ammonium	0.5mg/l	210	2	0.95
Chloride	250mg/l	15	0	0
<i>Clostridium perfringens</i>	0/100ml	297	40	13.47
Coliform bacteria	0/100ml	629	227	36.09
Conductivity	2500µS/cm at 20°C	386	0	0
Hydrogen ion (pH)	6.5 – 9.5	394	136	34.52
Sulphate	250mg/l	17	0	0
Turbidity (at treatment works)	1NTU	10	1	10.00

Tables 10b-d also illustrate another reason why private supply owners should exercise care when commissioning a new borehole. It is evident from the results of testing that many installers are not carrying out essential checks on the quality of the groundwater to establish if it is chemically fit for purpose. This explains the relatively high number of samples reported by local authorities in 2010 as failing to meet the standard for chemicals such as arsenic (10%), boron (17%), fluoride (10%), nitrate (7%), iron (6%), manganese (24%), sodium (6%), pH (12%), ammonium (9%) and turbidity (3%). This is an important observation because it shows how owners are unaware of various chemical hazards. It may also mean that any treatment installed may be ineffective or too costly to install retrospectively. The Inspectorate notes that some local authorities have been liaising with the Environment Agency with a view to jointly promoting the requirements for the responsible development and improvement of boreholes.

Collectively, tables 12a-d, 13a-d, 14a-d and 15a-d summarise the results of testing in relation to the use of the water supply. This testing is from supplies used for commercial purposes and services to the wider public. Overall, the tables show that one out of every 40 of these supplies failed to meet one or more of the drinking water standards. This is the first time that objective evidence of the extent of non-compliance with the EU Drinking Water Directive has been available.

Tables 12a-d cover the results of samples collected from public buildings served by a private water supply. In Wales, one-fifth (20%) of public building samples contained either *E.coli* or Enterococci indicating that the supply was a potential danger to human health. The tables also show that samples from public buildings also failed a wide range of chemical and other standards.

**Table 12: Drinking water quality testing – Public Buildings  
(Excluding single domestic dwellings)**

Table 12a: Schedule 1 Table A – Microbiological parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting standard
<i>E.coli</i>	0/100ml	122	24	19.67
Enterococci	0/100ml	7	0	0

Table 12b: Schedule 1 Table B – Chemical Parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting standard
Antimony	5.0µg/l	6	0	0
Arsenic	10µg/l	6	0	0
Benzene	1.0µg/l	0	N/A	-
Benzo(a)pyrene	0.01µg/l	0	N/A	-
Boron	1.0µg/l	5	0	0
Cadmium	5.0µg/l	6	0	0
Chromium	50µg/l	6	0	0
Copper	2.0mg/l	73	10	13.70
Cyanide	50µg/l	5	0	0
<b>Disinfection by products*</b>				
Bromate	10µg/l	1	0	0
Trihalomethanes	100µg/l	1	0	0
Fluoride	1.5mg/l	10	4	40.00
Lead (current standard)	25µg/l	73	1	1.37
Lead (future standard)**	10µg/l	10	0	0
Mercury	1.0µg/l	5	0	0
Nickel	20µg/l	6	0	0
Nitrate	50µg/l	56	1	1.79
Nitrite – Consumer’s tap	0.5µg/l	9	4	44.44
Nitrite – Treatment	0.1µg/l	1	0	0
<b>Pesticides</b>				
Aldrin	0.03µg/l	0	N/A	-
Dieldrin	0.03µg/l	0	N/A	-
Heptachlor	0.03µg/l	0	N/A	-
Heptachlor Epoxide	0.03µg/l	0	N/A	-
Other pesticides	0.1µg/l	0	N/A	-
Polycyclic aromatic hydrocarbons	0.1µg/l	0	N/A	-
Selenium	10µg/l	5	0	0
<b>Solvents</b>				
Tetrachloroethene and Trichloroethene	10µg/l	1	0	0
1,2 Dichloroethane	3.0µg/l	0	N/A	-
*Standards are not set for all disinfection by-products				
** Sample numbers differ for Lead (25µg/l) and Lead (10µg/l) due to excluding samples from one council where it was not possible to determine actual sample results				

Table 12c: Schedule 1 Table B – National Requirements

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Aluminium	200µg/l	10	0	0
Colour	20mg/l Pt/Co	9	0	0
Iron	200µg/l	73	5	6.85
Manganese	50µg/l	73	2	2.74
Odour	Positive detection	1	0	0
Sodium	200mg/l	10	0	0
Taste	Positive detection	1	0	0
Tetrachloromethane	3.0µg/l	1	0	0
Turbidity (at consumer's tap)	4NTU	65	3	4.62

Table 12d: Schedule 1 Table C – Indicator parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Ammonium	0.5mg/l	10	0	0
Chloride	250mg/l	10	0	0
<i>Clostridium perfringens</i>	0/100ml	25	17	68.00
Coliform bacteria	0/100ml	120	33	27.50
Conductivity	2500µS/cm at 20°C	74	0	0
Hydrogen ion (pH)	6.5 – 9.5	73	18	24.66
Sulphate	250mg/l	10	0	0
Turbidity (at treatment works)	1NTU	8	0	0

Tables 13a-d cover the results of samples collected from food premises, such as restaurants and cafes, served by a private water supply. In Wales, more than one-fifth (21%) of samples from food premises contained either *E.coli* or Enterococci indicating that the supply was a potential danger to human health. The tables also show that samples from food premises also failed a wide range of chemical and other standards.

**Table 13: Drinking water quality testing – Food Premises (Excluding single domestic dwellings).**

Table 13a: Schedule 1 Table A – Microbiological parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
<i>E.coli</i>	0/100ml	90	19	21.11
Enterococci	0/100ml	36	4	11.11

Table 13b: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Antimony	5.0µg/l	14	0	0
Arsenic	10µg/l	10	0	0
Benzene	1.0µg/l	2	0	0
Benzo(a)pyrene	0.01µg/l	1	0	0
Boron	1.0µg/l	7	1	14.29
Cadmium	5.0µg/l	14	0	0
Chromium	50µg/l	14	0	0
Copper	2.0mg/l	33	1	3.03
Cyanide	50µg/l	3	0	0
<b>Disinfection by-products*</b>				
Bromate	10µg/l	4	0	0
Trihalomethanes	100µg/l	3	0	0
Fluoride	1.5mg/l	14	0	0
Lead (current standard)	25µg/l	34	0	0
Lead (future standard)**	10µg/l	19	0	0
Mercury	1.0µg/l	3	0	0
Nickel	20µg/l	14	0	0
Nitrate	50µg/l	38	3	7.89
Nitrite – Consumer’s tap	0.5µg/l	7	0	0
Nitrite – Treatment	0.1µg/l	15	0	0
<b>Pesticides</b>				
Aldrin	0.03µg/l	1	0	0
Dieldrin	0.03µg/l	1	0	0
Heptachlor	0.03µg/l	1	0	0
Heptachlor Epoxide	0.03µg/l	1	0	0
Other pesticides	0.1µg/l	0	N/A	-
Polycyclic aromatic hydrocarbons	0.1µg/l	1	0	0
Selenium	10µg/l	7	0	0
<b>Solvents</b>				
Tetrachloroethene and Trichloroethene	10µg/l	3	0	0
1,2 Dichloroethane	3.0µg/l	2	0	0
*Standards are not set for all disinfection by-products				
** Sample numbers differ for Lead (25µg/l) and Lead (10µg/l) due to excluding samples from one council where it was not possible to determine actual sample results				

Table 13c: Schedule 1 Table B – National requirements

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Aluminium	200µg/l	16	0	0
Colour	20mg/l Pt/Co	11	0	0
Iron	200µg/l	37	10	27.03
Manganese	50µg/l	36	5	13.89
Odour	No abnormal change	10	0	0
Sodium	200mg/l	12	0	0
Taste	No abnormal change	8	0	0
Tetrachloromethane	3.0µg/l	3	0	0
Turbidity (at consumer's tap)	4NTU	39	1	2.56

Table 13d: Schedule 1 Table C – Indicator parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Ammonium	0.5mg/l	11	0	0
Chloride	250mg/l	10	0	0
<i>Clostridium perfringens</i>	0/100ml	24	0	0
Coliform bacteria	0/100ml	94	30	31.91
Conductivity	2500µS/cm at 20°C	41	0	0
Hydrogen ion (pH)	6.5 – 9.5	41	8	19.51
Sulphate	250mg/l	14	0	0
Turbidity (at treatment works)	1NTU	2	0	0

Tables 14a-d cover the results of samples collected from premises where accommodation is being offered to the public in the form of hotels, holiday lets or bed and breakfast arrangements. In Wales, around one-sixth (17%) of samples from accommodation contained either *E.coli* or Enterococci indicating that the supply was a potential danger to human health. The tables also show that samples from accommodation also failed a wide range of chemical and other standards.

#### **Table 14: Drinking water quality testing – Properties providing accommodation (Excluding single domestic dwelling)**

Table 14a: Schedule 1 Table A – Microbiological parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
<i>E.coli</i>	0/100ml	122	21	17.21
Enterococci	0/100ml	45	7	15.56

Table 14b: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Antimony	5.0µg/l	10	0	0
Arsenic	10µg/l	6	0	0
Benzene	1.0µg/l	1	0	0
Benzo(a)pyrene	0.01µg/l	0	N/A	-
Boron	1.0µg/l	10	0	0
Cadmium	5.0µg/l	10	0	0
Chromium	50µg/l	10	0	0
Copper	2.0mg/l	53	9	16.98
Cyanide	50µg/l	6	0	0
<b>Disinfection by-products*</b>				
Bromate	10µg/l	3	0	0
Trihalomethanes	100µg/l	2	0	0
Fluoride	1.5mg/l	14	4	28.57
Lead (current standard)	25µg/l	58	2	3.45
Lead (future standard)**	10µg/l	34	2	5.88
Mercury	1.0µg/l	6	0	0
Nickel	20µg/l	10	0	0
Nitrate	50µg/l	55	1	1.82
Nitrite – Consumer's tap	0.5µg/l	22	5	22.73
Nitrite – Treatment	0.1µg/l	7	0	0
<b>Pesticides</b>				
Aldrin	0.03µg/l	0	N/A	-
Dieldrin	0.03µg/l	0	N/A	-
Heptachlor	0.03µg/l	0	N/A	-
Heptachlor Epoxide	0.03µg/l	0	N/A	-
Other pesticides	0.1µg/l	0	N/A	-
Polycyclic aromatic hydrocarbons	0.1µg/l	1	1	100.00
Selenium	10µg/l	10	0	0
<b>Solvents</b>				
Tetrachloroethene and Trichloroethene	10µg/l	2	0	0
1,2 Dichloroethane	3.0µg/l	1	0	0
*Standards are not set for all disinfection by-products				
** Sample numbers differ for Lead (25µg/l) and Lead (10µg/l) due to excluding samples from one council where it was not possible to determine actual sample results				

Table 14c: Schedule 1 Table B – National requirements

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Aluminium	200µg/l	25	0	0
Colour	20mg/l Pt/Co	23	0	0
Iron	200µg/l	61	5	8.20
Manganese	50µg/l	61	4	6.56
Odour	No abnormal change	17	0	0
Sodium	200mg/l	13	0	0
Taste	No abnormal change	9	0	0
Tetrachloromethane	3.0µg/l	2	0	0
Turbidity (at consumer's tap)	4NTU	51	1	1.96

Table 14d: Schedule 1 Table C – Indicator parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Ammonium	0.5mg/l	15	0	0
Chloride	250mg/l	10	0	0
<i>Clostridium perfringens</i>	0/100ml	47	19	40.43
Coliform bacteria	0/100ml	124	33	26.61
Conductivity	2500µS/cm at 20°C	67	0	0
Hydrogen ion (pH)	6.5 – 9.5	67	12	17.91
Sulphate	250mg/l	14	0	0
Turbidity (at treatment works)	1NTU	9	0	0

Tables 15a-d cover the results of samples collected from milking parlours served by a private water supply. In Wales, close to one-fifth (18%) of these samples contained either *E.coli* or Enterococci indicating that the supply was a potential danger to human health. The tables also show that samples from public buildings also failed a wide range of chemical and other standards.

### Table 15: Drinking water quality testing – Milking parlours (Excluding single domestic dwellings)

Table 15a: Schedule 1 Table A – Microbiological parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
<i>E.coli</i>	0/100ml	47	8	17.02
Enterococci	0/100ml	11	2	18.18

Table 15b: Schedule 1 Table B – Chemical parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Antimony	5.0µg/l	6	0	0
Arsenic	10µg/l	5	0	0
Benzene	1.0µg/l	0	N/A	-
Benzo(a)pyrene	0.01µg/l	0	N/A	-
Boron	1.0µg/l	1	0	0
Cadmium	5.0µg/l	6	0	0
Chromium	50µg/l	6	0	0
Copper	2.0mg/l	28	0	0
Cyanide	50µg/l	0	N/A	-
<b>Disinfection by-products*</b>				
Bromate	10µg/l	0	N/A	-
Trihalomethanes	100µg/l	0	N/A	-
Fluoride	1.5mg/l	6	0	0
Lead (current standard)	25µg/l	28	0	0
Lead (future standard)**	10µg/l	11	0	0
Mercury	1.0µg/l	0	N/A	-
Nickel	20µg/l	6	0	0
Nitrate	50µg/l	38	4	10.53
Nitrite – Consumer's tap	0.5µg/l	16	0	0
Nitrite – Treatment	0.1µg/l	7	0	0
<b>Pesticides</b>				
Aldrin	0.03µg/l	0	N/A	-
Dieldrin	0.03µg/l	0	N/A	-
Heptachlor	0.03µg/l	0	N/A	-
Heptachlor Epoxide	0.03µg/l	0	N/A	-
Other pesticides	0.1µg/l	0	N/A	-
Polycyclic aromatic hydrocarbons	0.1µg/l	0	N/A	-
Selenium	10µg/l	1	0	0%
<b>Solvents</b>				
Tetrachloroethene and Trichloroethene	10µg/l	0	N/A	-
1,2 Dichloroethane	3.0µg/l	0	N/A	-
*Standards are not set for all disinfection by-products				
** Sample numbers differ for Lead (25µg/l) and Lead (10µg/l) due to excluding samples from one council where it was not possible to determine actual sample results				

Table 15c: Schedule 1 Table B – National requirements

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Aluminium	200µg/l	16	0	0
Colour	20mg/l Pt/Co	13	0	0
Iron	200µg/l	40	5	12.50
Manganese	50µg/l	40	11	27.50
Odour	No abnormal change	16	0	0
Sodium	200mg/l	5	0	0
Taste	No abnormal change	10	0	0
Tetrachloromethane	3.0µg/l	0	N/A	-
Turbidity (at consumer's tap)	4NTU	40	2	5.00

Table 15d: Schedule 1 Table C – Indicator parameters

Parameter	Current standard or specified concentration	Total number of tests	Number of tests not meeting standard	Percentage of tests not meeting the standard
Ammonium	0.5mg/l	16	1	6.25
Chloride	250mg/l	6	0	0
<i>Clostridium perfringens</i>	0/100ml	11	0	0
Coliform bacteria	0/100ml	47	12	25.53
Conductivity	2500µS/cm at 20°C	40	0	0
Hydrogen ion (pH)	6.5 – 9.5	40	7	17.50
Sulphate	250mg/l	6	0	0
Turbidity (at treatment works)	1NTU	0	N/A	-

When looked at overall, the results of testing of private supplies in 2010 (*Annex 2*) reveal widespread failures across 41 regulated chemical and microbiological parameters. These findings confirm the ineffectiveness of the former regulatory regime (1991-2009) and demonstrate why intervention was necessary in the public interest.

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## Conclusions and comments of the Inspectorate

When viewed overall, and regardless of the coverage not yet being comprehensive, there is only one conclusion that can be drawn from the information provided by local authorities about the quality of private supplies in 2010; that is one out of every four private water supplies being used for commercial purposes and services to the wider public in Wales were not fit for purpose. Around one-tenth (9.6%) of all samples tested in England and Wales in 2010 failed to comply with one or more of the standards in the EU Drinking Water Directive and failures were recorded for 41 different regulated parameters (see *Annex 2*). On this basis, it is also reasonable to conclude that the remainder of private supplies, the majority of which are of a similar nature and are exempt from monitoring (because they are used for domestic purposes in a single dwelling), are equally unsatisfactory. It therefore follows that the introduction of the new regulations (and a more effective risk-based enforcement regime) was a necessary health-based intervention in the public interest.

While the report shows that there are many different reasons why an individual private water supply may be unsatisfactory, the root cause is a common one, best summarised as 'a complete failure of the past regime of management and control'. Under this past failed regime, owners and users of private water supplies, as well as the wider public, did not benefit from access to reliable information alerting them to the risk posed by private water supplies. This lack of transparency enabled a complacent attitude to develop among the community of 'relevant persons' (those responsible for the safety of private supplies under the Water Industry Act 1991) and also within the regulatory authorities. This complacency also extends to the service industry which designs, constructs, installs and advises private water supply owners.

Despite the concerning nature of the Inspectorate's conclusions about the quality of private water supplies in Wales in 2010, the report also clearly shows that the new regulatory risk-based regime is already turning this situation around. The Inspectorate is pleased to acknowledge those local authorities who have intervened effectively and proportionally to safeguard public health in 2010 by informing and advising owners and users of the risks. It is also noteworthy, from case studies detailed in the report, that owners, once informed and given sound advice, have responded constructively through the taking of both short term action and the planning of long term remedial action, where necessary. The Inspectorate has observed that where local authorities have served Improvement Notices there have been no appeals by owners. This illustrates the incentive-based nature of the negotiable element of enforcement covering the actual remedies and timescales. However, the Inspectorate has noted that some local authorities have chosen to continue with the practice of

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informal negotiations with owners, instead of using the new enforcement powers. This information will be taken into account during the Inspectorate's forward work programme of independent scrutiny of local authorities and public reporting. In particular, where there is evidence that a local authority is not implementing the new regulations in the public interest, then the Inspectorate will consider the need to direct that local authority by exercising delegated powers in the Water Act 1991 and the regulations.

Local authorities were given five years to implement the new regulatory regime of risk assessment. In the first year, about 13% of required risk assessments have been carried out. The Inspectorate has noted that the way in which the new regulatory regime has been communicated to owners of small supplies has not been always helpful. For example, it is clear that local authorities have not always been explaining clearly that a risk assessment is required only once in five years and, if satisfactory, it can lead to exemption from future monitoring. Generally, local authorities have chosen instead to communicate the maximum permitted charge in the regulations and, as a consequence of this, some owners have been caused concern regarding the costs of regulation. The Inspectorate has established that the typical time required to complete a simple risk assessment and associated report is five hours and the typical hourly charge is around £40. The cost of testing under the previous 1991 regulations based on testing was around £50 a sample each year (*Annex 3*). Therefore, for a small supply there is unlikely to be a significant difference in cost over the five-year period between the previous 1991 regulations and new regime for these small supplies and, the new regime provides additional benefits to private supply owners in the form of usable practical information and reduced testing thereafter.

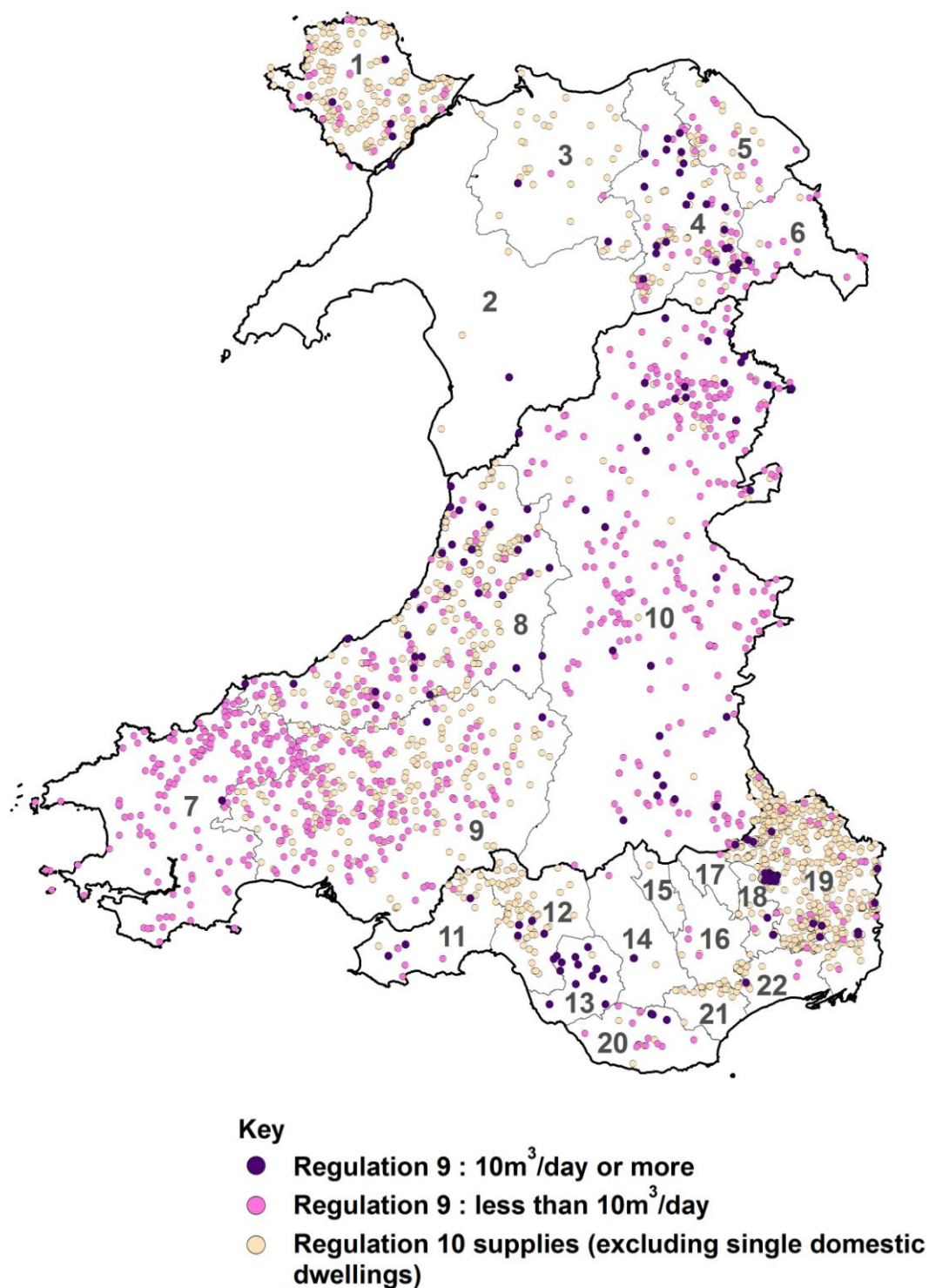
The Inspectorate carried out preliminary checks on the information about testing and charges that local authorities were providing to private supply owners in March 2011. These checks have confirmed that few (25) local authorities had detailed information available on their websites. In addition, only 15 local authorities responded to the Inspectorate's request to provide a copy of the charging scheme in current use. A greater number of local authorities (76) have adopted the approach of providing a link on their website giving details of the department or person to contact regarding private water supply testing. The Inspectorate also noted that the websites of a further 58 local authorities provided no information at all on private water supplies. This preliminary information, together with that contained in local authority returns, will be used by the Inspectorate to develop its methodology for evaluating the implementation of the new regulations over the five-year period ending December 2014.

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It is very evident that one of the major weaknesses of the previous regulatory regime was the way in which it gave owners and users of private water supplies a false sense of assurance. The previous regime was based on very occasional testing of a supply. However, testing, especially when it is infrequent does not make water safe and the Inspectorate considers that this is a very important message that needs to be promoted to all concerned. The new regulatory regime puts the role of testing on a much firmer scientific footing as a tool to inform risk assessment. The case studies in this report show very clearly how the safety of a supply can be determined in most instances from simple observations combined with appropriate technical knowledge translated into practical steps of management and maintenance, which is what the risk assessment process at the heart of the new regulatory regime achieves.

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## Annex 1: Locations of private water supplies and the status of local authority data returns



<b>Local authorities that provided a full return under Regulation 13</b>	<b>Number</b>
Ceredigion County Council	8
Pembrokeshire County Council	7
Powys County Council	10
Conwy County Borough Council	3
Denbighshire County Council	4
Flintshire County Council	5
Gwynedd County Council	2
Isle of Anglesey County Council	1
Wrexham County Borough Council	6
Blaenau Gwent County Borough Council	17
Bridgend County Borough Council	13
Cardiff Council	21
Monmouthshire County Council	19
Newport City Council	22
Swansea City and Borough Council	11
Torfaen County Borough Council	18
Vale of Glamorgan Council	20

<b>Local authorities that provided a partial return under Regulation 13</b>	<b>Number</b>
Carmarthenshire County Council	9
Caerphilly County Borough Council	16
Merthyr Tydfil County Borough Council	15
Neath Port Talbot County Borough Council	12
Rhondda Cynon Taff County Borough Council	14

## Annex 2: Summary of all sample results reported in 2010 (England and Wales)

Parameter	Number of samples	Number of failures	% failures
1, 2-Dichloroethane	91	0	0.0
Aluminium	1,239	33	2.7
Ammonium	2,064	54	2.6
Antimony	194	3	1.5
Arsenic	361	30	8.3
Benzene	101	0	0.0
Benzo[a]Pyrene	110	3	2.7
Boron	305	40	13.1
Bromate	79	1	1.3
Cadmium	233	1	0.4
Chloride	242	4	1.7
Chromium	210	1	0.5
<i>Clostridium perfringens</i>	1,175	87	7.4
Coliform Bacteria	5,056	1,425	28.2
Colour	1,879	29	1.5
Conductivity	2,750	2	0.1
Copper	1,083	93	8.6
Cyanide	104	0	0.0
Enterococci	1,780	217	12.2
<i>Escherichia coli (E.coli)</i>	5,041	689	13.7
Fluoride	300	25	8.3
Hydrogen ion (pH)	2,948	497	16.9
Iron	2,016	188	9.3
Lead - current standard 25µg/l	1,208	22	1.8
Lead - future standard of 10µg/l - will apply 25/12/2013	1,208	58	4.8
Manganese	1,960	265	13.5
Mercury	114	0	0.0
Nickel	242	3	1.2
Nitrate	2,040	227	11.1
Nitrite - Consumer's tap	777	12	1.5
Nitrite - Treatment	725	35	4.8
Odour	1,685	244	14.5
Pesticides			
Aldrin	142	2	1.4
Dieldrin	133	2	1.5
Heptachlor	142	1	0.7
Heptachlor Epoxide	107	1	0.9
Individual Pesticides	2,617	4	0.2
Total Pesticides	78	3	3.8
Polycyclic Aromatic Hydrocarbons	117	2	1.7
Selenium	139	1	0.7
Sodium	285	11	3.9
Sulphate	225	4	1.8
Taste	1,453	187	12.9
Tetrachloromethane	142	0	0.0
Total indicative dose (for radioactivity)	2	0	0.0
Total Organic Carbon	137	0	0.0
Trichloroethene and Tetrachloroethene	148	3	2.0
Trihalomethanes	93	0	0.0
Tritium	29	0	0.0
Turbidity - Consumer's tap	2,465	91	3.7
Turbidity - Works	362	34	9.4
Total	48,136	4,634	9.6

## Annex 3: Overview of local authority charging arrangements

Activity	Maximum Charge Permitted	Example Charging Scheme	Comments
Risk Assessment	£500	Hourly rate x time	Minimum charge £50, simple risk assessment and report typically 5 hours
Sampling	£100	£74	Charge for a visit and to take a sample
Investigation	£100	Hourly rate+any analysis costs	Carried out in the event of test failure, can be substituted by risk assessment
Authorisation	£100	Hourly rate x time	Application by the owner of a supply for permission to breach a standard temporarily whilst remedial work is carried out
Analysis:-			
Under Reg. 10 (Domestic Supplies)	£25	£13.50	Where a supply provides <10m <sup>3</sup> /day or <50 people and is used for domestic purposes
Check Monitoring (Commercial Supplies)	£100	£38.25 for boreholes £56.50 for all other types of supply including springs, wells, etc	Check monitoring is carried out to ensure that water complies with the standards. Where possible it should be carried out at the same time as any requirement for Audit monitoring, to keep cost down
Audit Monitoring (Commercial Supplies)	£500	£40.50+cost of check monitoring (£78.75 for boreholes, all others including springs, wells, etc £97)	Additional parameters sampled less often to ensure the water complies with all safety standards

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## Annex 4: 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 200 µg 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 0.5 mg NH<sub>4</sub>/l

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

**Arsenic** occurs naturally in only a few sources of groundwater. Specific water treatment is required to remove it. The standard is 10 µg 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 1 µg/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 deterioration of coal tar which was used to line water pipes up until the early 1970s. The standard is 0.01 µg/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 1 mg 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 10 µg BrO<sub>3</sub>/l.

**Cadmium** is rarely detected in drinking water and trace amounts are usually due to dissolution of impurities from plumbing fittings. The standard is 5 µg 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 250 mg Cl/l.

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***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 50 µg 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 20 mg/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 2,500 µS/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 2 mg 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 50 µg 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 3 µg/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.

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**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 1.5 mg 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 200 µg 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 25 µg Pb/l. A stricter standard of 10 µg Pb/l will apply from 2013 onwards.

**Mercury** is not normally found in sources of drinking water in the UK. The standard is 1 µg 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 20 µg 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 50 mg NO<sub>3</sub>/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 0.1 mg NO<sub>2</sub>/l in water leaving water treatment works and 0.5 mg NO<sub>2</sub>/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 0.03 µg/l.

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**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 0.1 µg/l for each individual substance and 0.5 µg/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 0.1 µg/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 10 µg 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 200 mg Na/l.

**Sulphate** occurs naturally in all waters and cannot be removed by treatment. The guide value is 250 mg SO<sub>4</sub>/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 10 µg/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 100 µg/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 0.5 µg/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 3 µg/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 0.10 mSv/year.

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**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 100 Bq/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 1 NTU. Turbidity can also arise at consumers' taps following disturbance of sediment within water mains; the standard at consumers' taps is 4 NTU.



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