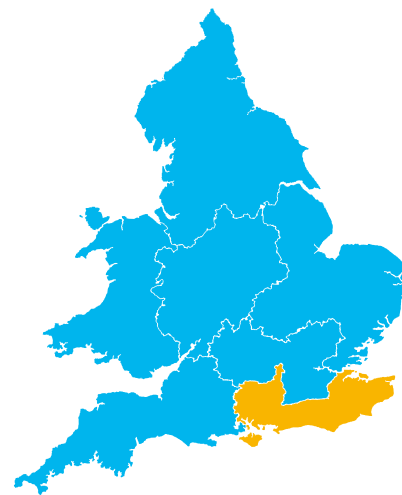


Drinking water 2009

Southern region of England

July 2010

A report by the Chief Inspector of Drinking Water





Drinking water 2009

Southern region of England



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Contents

Introduction	4
Water supply arrangements	8
Drinking water quality testing	10
Drinking water quality results	11
Private water supplies	30
Risk assessments	33
Drinking water quality events	36
Technical audit activity	40
Public confidence in drinking water quality	41
Annex 1: Further sources of information	46
Annex 2: Glossary and description of standards	47
Annex 3: Significant drinking water quality events	60
Annex 4: Planned drinking water quality improvements	71
Annex 5: Competition in the water industry	76
Annex 6: Water company indices	78

Drinking Water 2009 is the annual report of the Drinking Water Inspectorate and comprises a number of parts.

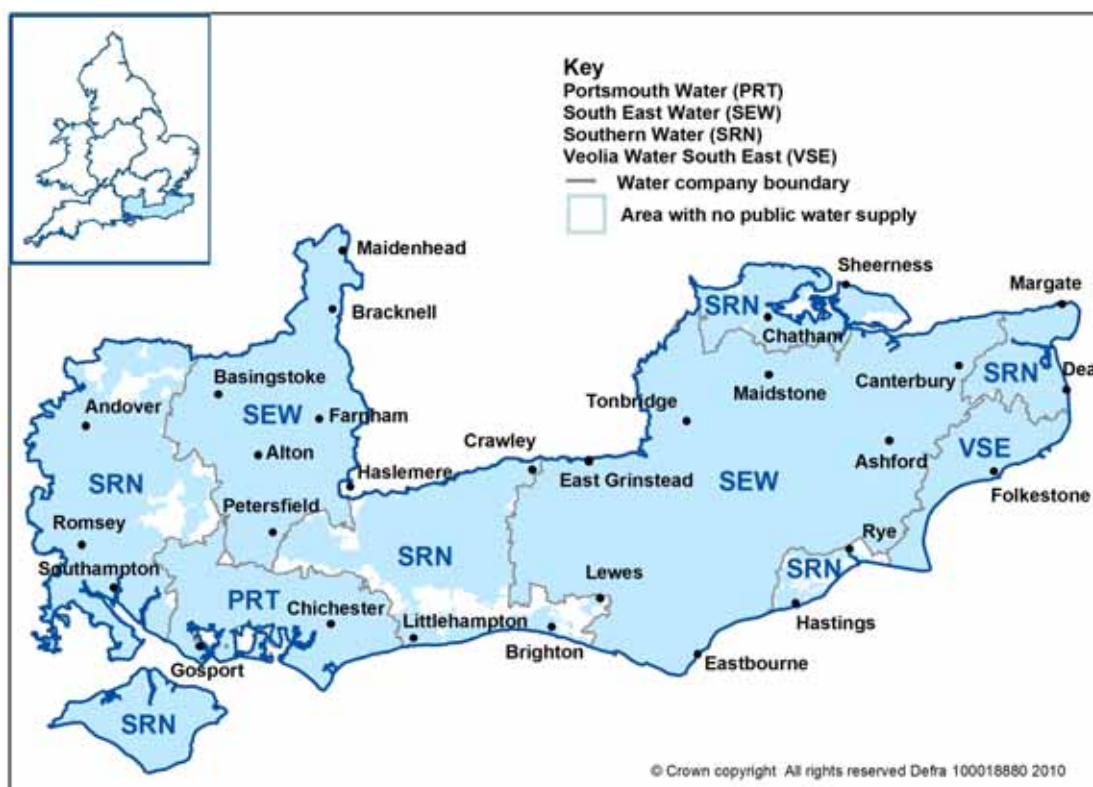
This part describes drinking water quality in the Southern region. The Inspectorate also publishes a series of companion reports for other regions of England (Central, Eastern, Northern, Thames and Western regions) and a separate report for Wales.

All parts are available on the Inspectorate's website <http://www.dwi.gov.uk> and on the CD accompanying this report along with separate summary data for water company sampling programmes.

Introduction to the report for the Southern region

Drinking Water 2009 is published as a series of seven reports covering Wales and the six regions of England. Each report presents information about drinking water quality in a form that meets the needs of those who have an interest in the quality and safe management of drinking water supplies from the consumer perspective, namely the local authorities and the regional committees of the Consumer Council for Water.

The report describes the key facts about the quality of drinking water in the Southern region, which is served by four water companies; Portsmouth Water (PRT), South East Water (SEW), Southern Water (SRN) and Veolia Water Southeast Ltd (VSE), delivering public water supplies to over five million consumers.



The results of testing in 2009 demonstrated that the overall quality of drinking water in the Southern region was good. The figure for compliance with drinking water standards at consumers' taps was 99.97%, up from 2008 and above the industry figure of 99.95%. This figure is made up of the results of all the tests for 39 parameters with European or national standards. A single parameter, pesticides, has been a cause for concern due to metaldehyde, discussed in more detail below. However, the Inspectorate has calculated that if the companies' metaldehyde monitoring data is disregarded, then the region's compliance figure in 2009 would

have been higher at 99.98%. The circumstances of the few failures of standards and the actions taken to safeguard public health are discussed in the body of the report.

When the Southern region is judged by the Inspectorate's four indices of water quality performance, which look in turn at water treatment, service reservoir integrity and network maintenance, in 2009 there has been improvement in all but the service reservoir maintenance figure (99.95%) which was unchanged and remains below the industry average of 99.96%. The largest improvement was in the figure for network maintenance, up from 99.83% in 2008 to 99.92%. Individual water company figures are reported in *Annex 6*.

This is the first year where reporting on water quality events uses the Inspectorate's new risk-based approach to classification and assessment. Events are classified into five categories: Not significant, Minor, Significant, Serious and Major. In total, there were 44 events across the Southern region and around half (21) were of a type that necessitated a detailed investigation by an inspector. None were serious enough to warrant a major investigation. This compares unfavourably with other regions of England in respect of the risk-related resource demand on the Inspectorate. In terms of the nature of the events reported this year, there was a theme around discolouration and chemical failures, however, the focus of the Inspectorate's work in the region this year has been auditing and enforcing improvement by Southern Water in relation to the adequacy of disinfection. There has been high level regular dialogue with the company which has responded positively by putting in place a major programme of work to secure essential improvements at many of its treatment works. As described in the report, Southern Water recently pleaded guilty to three offences of failing to adequately prepare, disinfect and continuously operate an adequate treatment process at Matts Hill works in November 2008 in contravention of Regulation 26(1)(a) and 26(1)(b) and 26(3). Detailed findings regarding all the significant events in 2009 can be found in *Annex 3*.

There is a longer term and positive improving trend in public confidence in the region's drinking water quality, as measured by consumers.

The number of people across the region expressing concern about the quality of their tap water (appearance, taste and illness) has continued to fall. By comparison to the other regions in England, the region now compares relatively favourably with a contact rate of 1.5 per 1,000 population, driven predominantly by a decline in numbers reporting discoloured water (black, brown or orange) from over 5,100 contacts in 2006 to below 3,500 in 2009. Last year the Inspectorate reported a rising trend in the number of consumers in the region reporting a chlorine taste and odour. The picture in 2009 is more encouraging with the figures down

to about 1,000 from a peak in 2008 of 1,250. Overall, these public confidence figures demonstrate the benefits already realised by the industry's investment to date in drinking water quality. *Annex 4* provides information about the schemes of work delivered in 2009 and those planned for delivery over the next five years.

Looking forward, the standard for lead becomes stricter in 2013. Progress made towards meeting the future standard is shown in a graph in the body of the report. The Inspectorate has calculated that if the stricter standard had been in force in 2009, then the figure for overall regional compliance with drinking water standards would have been unchanged at 99.97%. Despite the good progress being made, it remains important for companies to investigate all failures of the future standard and enter into water safety plan commitments to minimise consumer exposure to lead in older housing in collaboration with local authorities.

During 2009, the Government took steps to safeguard those consumers who are served by about 645 private water supplies in the Southern region. Details of the new risk-based regulations and how they will work are described in this report, together with a case example showing how the new powers have been put into immediate and good effect by one local authority in England. This change marks an important step forward; action can more readily be taken by local authorities to improve those private supplies that pose a risk to health and the information provided to the Inspectorate will enable open reporting on all drinking water supplies in the region.

Returning to the pesticide problem mentioned above, metaldehyde is a molluscicide commonly incorporated into some pellets used for the control of slugs. It has a low risk toxicological profile and it is a valuable agricultural product. The presence of metaldehyde in raw water first came to attention late in 2007 and once it was established that occurrence was more widespread, a national action group was formed. The Metaldehyde Stewardship Group (MSG) comprises the principal metaldehyde manufacturer and pellet formulators and reports to a wider industry steering group co-ordinated by the water companies of England and Wales, but also including the Environment Agency, Natural England, the Health and Safety Executive (Chemicals Regulation Directorate), the Inspectorate and agricultural industry representatives such as agronomists, slug pellet distributors, and catchment consultants.

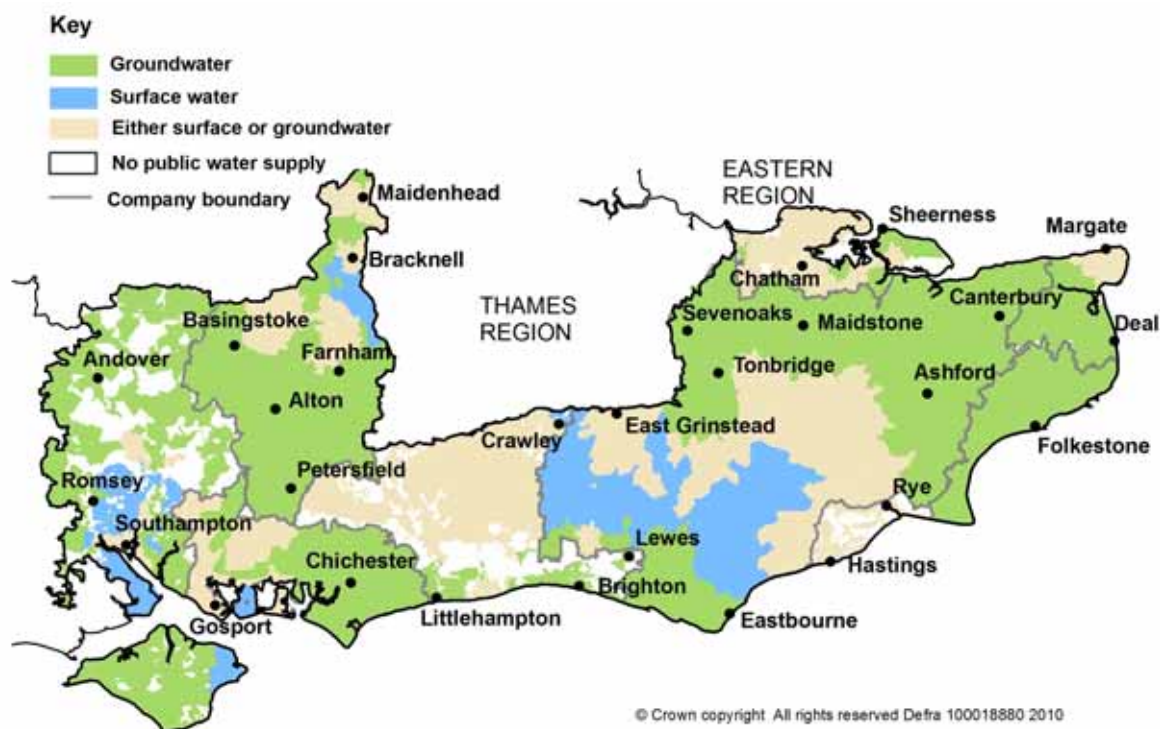
The work carried out to understand and remedy the problem since April 2008 has involved the MSG in advising, training and raising awareness of the issue with farmers and promoting best practice of the use of metaldehyde in agriculture. There has been sharing of data to identify the highest risk catchments and research into possible water treatment

technologies. These activities support the legally binding programmes of work on catchment control that the Inspectorate has put in place in relation to directly affected water supplies. During 2009, companies have reported that concentrations of metaldehyde in water sources have fallen. Additionally, slug pellet sales were approximately 70% lower than in 2008. Awareness of the issue among farmers has risen and practices relating to the supply, use and spreading of slug pellets have generally improved.

Water supply arrangements

Four water companies supply drinking water in the Southern region: Portsmouth Water (PRT), South East Water (SEW), Southern Water (SRN) and Veolia Water Southeast Ltd (VSE).

Figure 1: Map illustrating sources of drinking water by zone across the region



Much of the water supplied to consumers in the region is derived from groundwater (66%) with most boreholes drawing water from the chalk aquifers of the North and South Downs. Most companies also abstract water from the green sandstone aquifers, while South East Water abstract from the Ashdown sandstones to supply the Weald area. Veolia Water Southeast relies exclusively on groundwater, mostly from the chalk aquifers, with the Denge peninsular supplied by abstractions from a shallow gravel aquifer. Surface water also provides a valuable source of water (19%) in the region with river abstractions from the Great Stour, Itchen, Medway, Ouse (Sussex), Test, Thames, Wallers Haven, Western Rother and the River Yar on the Isle of Wight. Water is also drawn from the following reservoirs: Ardingley, Arlington, Bewl, Darwell, Powdermill and Weirwood. Due to the complex supply arrangements in the region, a relatively high proportion (15%) of water supplies can be drawn from either surface or groundwater sources.

Summary facts about the drinking water supply infrastructure of the region are given in Tables 2 and 3 with outline geographical and demographic information.

Table 2: Number of abstraction points (for Regulation 16a purposes)

Company	Groundwater	Surface Water	Total
Portsmouth Water	18	4	22
South East Water	172	11	183
Southern Water	108	14	122
Veolia Water Southeast	42	0	42
Total	340	29	369

Table 3: Key facts about the Southern region supply arrangements

Key facts			
Population supplied	5,079,291	Treatment works	232
Water supplied (l/day)	1,285 million	Service reservoirs	518
Number of local authorities	32	Water supply zones	196
(with a further 16 partially covering the region)		Length of mains pipe (km)	32,046
Approximate number of private water supplies	645		
Area of supply		Water composition	
Berkshire (part), East Sussex, Hampshire (part), Isle of Wight, Kent (part), Surrey (part), West Sussex (part)		Surface sources	19%
		Groundwater sources	66%
		Mixed sources	15%

Drinking water quality testing

Throughout 2009, water companies sampled drinking water across the region to test for compliance with the standards in the drinking water regulations. More than one-third of the tests were carried out on drinking water drawn from consumers' taps selected at random. For monitoring purposes, company water supply areas are divided into zones based on population (maximum 100,000). Generally, zones are sampled at consumers' taps with the number of required tests being greatest in zones with larger populations. Other sample locations are water treatment works and treated water (service) reservoirs. Collectively, the four water companies carried out a total of 478,416 tests during 2009. Only 166 of these tests failed to meet the standards set down in the regulations.

Table 4: Number of tests carried out by companies in the region

Company	Place of sampling			Number of tests per company	Estimate of population
	Water treatment works	Service reservoirs	Consumers' taps (zones)		
Portsmouth Water	12,735 (19)	9,124 (31)	15,071 (13)	36,930	666,000
South East Water	66,268 (93)	67,926 (224)	70,598 (93)	204,792	1,979,786
Southern Water	71,322 (91)	64,602 (206)	84,330 (84)	220,254	2,275,505
Veolia Water Southeast	8,719 (16)	3,120 (12)	4,601 (6)	16,440	158,000
Region overall	159,044 (219)	144,772 (473)	174,600 (196)	478,416	5,079,291

Note: Numbers in brackets reflect the number of works, reservoirs or zones operated by that company in the region in 2009. Some companies are permitted to carry out some tests on samples taken from supply points rather than from consumers' taps.

The regulations require companies to test for specified parameters at prescribed frequencies. Most of the testing is for parameters with European or national standards, however, water companies are also required by the regulations to test for other parameters such as ammonium, sulphate and colony counts.

Results of interest are discussed in this report. A full summary of the results of testing by each company can be found on the DWI website

(www.dwi.gov.uk) and on the CD accompanying this report.

The tables summarising the results of testing provide the annual minimum, maximum and mean levels for individual parameters for each company.

Drinking water quality results

The key water quality results for the Southern region are presented in two tables, one showing the results for microbiological parameters (Table 5), the other dealing with chemical and physical parameters (Table 7).

The microbiological quality of water is discussed first. Companies report all the results of the tests on a monthly basis to the Inspectorate.

A summary of the results of the tests from each company is presented on the Inspectorate's website (www.dwi.gov.uk) and is also available on the CD accompanying this report. Additionally, statistics describing the performance of each company supplying in the region are summarised in *Annex 6*.

Microbiological quality

To protect public health, microbiological standards have to be met at each individual treatment works and service reservoir. The results confirm the overall microbiological safety of drinking water supplies in the region.

The significance of the individual test results for each microbiological parameter at each location varies and a single positive result cannot be interpreted without other information. All companies are expected to follow best practice as set out in *The Microbiology of Drinking Water* published by the Standing Committee of Analysts (SCA) which can be found by visiting the Environment Agency's website (www.environment-agency.gov.uk).

Table 5: Microbiological tests
The number of tests performed and the number of tests not meeting the standard

Parameter	Current standard	Total number of tests	Number of tests not meeting the standard	Additional information
Water leaving water treatment works				
<i>E.coli</i>	0/100ml	24,203	5	SRN (5)
Coliform bacteria	0/100ml	24,202	22	SEW (6), SRN (16)
<i>Clostridium perfringens</i>	0/100ml	2,767	3	SRN (3)
Turbidity ¹	1NTU	21,337	13	SEW (7), SRN (5), VSE (1)
Water leaving service reservoirs				
<i>E.coli</i>	0/100ml	24,182	3	SEW (1), SRN (2)
Coliform bacteria	0/100ml in 95% of tests at each reservoir	24,181	19	SEW (9), SRN (10) All 473 service reservoirs in the region meet the 95% compliance
Water sampled at consumers' taps				
<i>E.coli</i>	0/100ml	13,717	2	SEW (1), VSE (1)
Enterococci	0/100ml	1,421	0	
Notes:				
¹ Turbidity is a critical control parameter for water treatment and disinfection.				

***E.coli* at works and service reservoirs**

In 2009, across the region, a total of 24,203 tests were carried out at works and *E.coli* was detected in five samples (5 SRN). A total of 24,182 tests were carried out at service reservoirs and *E.coli* was detected on three occasions (1 SEW, 2 SRN). On detecting *E.coli*, companies are required to act promptly to protect public health. Their immediate response when finding *E.coli* at a works is to sample again, and more widely, to confirm that water being received by consumers is safe. In 2009, these additional tests gave satisfactory results in all cases.

In February, at Broadwater works, near Worthing, West Sussex, *E.coli* and coliforms were detected in a sample collected by Southern Water. A detailed investigation found no treatment irregularities and further samples from the works and downstream network were satisfactory. However, the Inspectorate noted a history of intermittent occurrence of

coliforms at this site and suggested to the company that this be reflected in the regulatory risk assessment along with the need to evaluate filter performance in more depth. In September, there was a further *E.coli* failure at Broadwater works. On this occasion the failure was linked to contemporaneous failures at other works: Otterbourne and Twyford works (supplying South Hampshire) and Burham (serving the Medway towns in Kent). The investigation, which included analysis of retained portions of the original samples, pointed towards all these failures being unrepresentative of water in supply. More detailed studies identified that the strain of *E.coli* in each of the samples was the same strain as used for quality control purposes by the analytical service provider (Eurofins). The Inspectorate was satisfied that the company had obtained strong evidence that the cause of these failures was cross contamination within the laboratory and not a result of inadequate disinfection at the works.

Prior to the above mentioned episode of laboratory cross contamination, in 2008 there had been another series of temporally related coliform failures which had triggered an audit by the Inspectorate of the Eurofins laboratory. Among the issues identified was the competency of analysts, including failings in relation to aseptic handling of samples and monitoring of sampling transportation. The Inspectorate also noted that the laboratory had commenced operations before attaining full UKAS accreditation for drinking water analysis. Disappointingly, delays were allowed to occur in making the necessary improvements in laboratory practice with the effect that some actions remained outstanding into 2009. The consequence of this tardiness was a spate of unrepresentative results from works. Companies must demand high standards from analytical service providers and drive improvements with pace.

A sample taken from Southern Water's Luton works, in September, contained both *E.coli* and coliforms after a period of heavy rainfall. This works draws water from a number of boreholes, all with a previous history of stable and good quality. No evidence was found to indicate surface run off into the boreholes and all investigational samples gave satisfactory results. There have been no further failures to date.

In July, South East Water reported *E.coli* in a sample taken from Bullock Down service reservoir, near Newhaven. This reservoir consists of two separate tanks, only one compartment was implicated, however, the company took the whole site out of supply for inspection. Points of potential ingress were identified and improvements made to the waterproofing of the reservoir roof. Since returning the site to service in the autumn of 2009, all samples have given satisfactory results.

At Kingsclere reservoir, near Basingstoke, operated by Southern Water, *E.coli* was detected in January. This site also comprises two separate

compartments. The site was taken out of service and the inspection did not reveal any structural issues. The company uses two sample points at this site. Both of these taps became inoperable in the freezing weather and a consumer's tap had to be used to investigate the failure. Consumers' taps are not suitable points to use for monitoring the quality of water in service reservoirs. Companies should provide adequate sampling facilities at each asset and such points must be protected from cold weather and contamination.

In December, *E.coli* was detected at Southern Water's Horseshoe Hill reservoir, near Broughton in Hampshire. The company took the site out of supply and maintained supplies via Tytherley booster station. The internal inspection did not reveal any breach of integrity and all subsequent samples have been satisfactory.

Table 6: Detection of *E.coli* and Enterococci at treatment works, service reservoirs and consumers' taps

Company	<i>E.coli</i> in water leaving treatment works	<i>E.coli</i> in water leaving service reservoirs	<i>E.coli</i> at consumers' taps	Enterococci at consumers' taps
Portsmouth Water	0 – 1,999	0 – 1,487	0 – 1,748	0 – 118
South East Water	0 – 10,425	1 – 11,303	1 – 5,419	0 – 663
Southern Water	5 – 10,346	2 – 10,768	0 – 6,142	0 – 596
Veolia Water Southeast	0 – 1,433	0 – 624	1 – 408	0 – 44
Region overall	5 – 24,203	3 – 24,182	2 – 13,717	0 – 1,421
Note: Results are shown as the number of positive tests – the total number of tests.				

Coliform bacteria at works

Testing for coliform bacteria gives reassurance that water entering supply has been treated adequately to remove bacterial and viral pathogens. Repeated occurrences of coliform bacteria in samples from the same works in one year are thus of concern and require action to be taken. In 2009, this situation occurred at four sites: Bewl Bridge, (SEW) and Burham, Shoreham, and Broadwater (SRN).

In October and then in December, South East Water reported coliform bacteria at its Bewl Bridge works near Wadhurst in Kent. This site exhibited similar failures in 2007 and 2008. In a past audit the Inspectorate made a number of recommendations and the company has since upgraded treatment at the site. The Inspectorate noted that the microbiological results were not reflected in the company's risk assessment. Companies are reminded that information gained from water quality monitoring must be reflected in the company's risk assessment together with appropriate control measures.

South East Water reported a coliform failure at Pembury works in July. This site has a history of higher than expected levels of turbidity caused by inadequate mixing of treatment chemicals, however, this fault has been remedied and turbidity was normal at the time of the coliform detection. The investigation established that the sample was unrepresentative because the works was not in supply at the time. Companies are reminded that sampling protocols must be designed so that samples are not taken when pumps are not operating.

Southern Water detected coliform bacteria in a routine sample from Burham works in August. Subsequently the organism was identified as *E.coli* and the sample was part of the laboratory cross contamination event reported earlier (see *E.coli at works and service reservoirs* section). A second coliform failure occurred at this site in October. Investigational sampling ruled out a wider problem. The Inspectorate noted that the risk assessment did not adequately reflect the microbiological risks and control measures at this site. Companies should use the information gained from failures to review and evaluate the contents of their risk assessment reports. The control measures in place at Burham works include three stage treatment with coagulation and ozone.

Shoreham works in Sussex operated by Southern Water exhibited coliform failures in July and August. Disinfection at this site has been identified by the company as inadequate. The company has plans to upgrade the chlorination system. The site was audited by the Inspectorate and a Regulation 28(4) Notice has been issued.

A coliform failure at Hardham, in June, is discussed elsewhere in the context of other failures at this site (see *Clostridium perfringens* section).

During December, Southern Water completed a legally binding programme of work at Twyford works, near Winchester, to address a disinfection risk identified previously through detections of *E.coli*, coliforms and Enterococci. The scheme involved the construction of a new main between Twyford works and Twyford service reservoir to provide additional disinfection contact time.

The Inspectorate has noted that coliform bacteria were found in 22 samples from treatment works in the Southern region during the year. This compares to 13 unsatisfactory samples in 2008. This deterioration reflects adversely on the performance of two of the companies, South East Water and Southern Water. By contrast, Portsmouth Water and Veolia Water Southeast reported no failures in 2009.

Clostridium perfringens

This organism is a spore-forming bacterium that is exceptionally resistant to unfavourable conditions in the water environment, such as extremes of temperature and pH, and disinfection processes, such as chlorination and ultraviolet light. It is a normal component of the intestinal flora of up to 35% of humans and other warm-blooded animals. These characteristics make it a useful indicator of either intermittent or historical faecal contamination of a groundwater source or surface water filtration plant performance. The detection of any *Clostridium perfringens* in the supply should trigger an investigation by the water company.

In 2009, out of 2,767 samples taken in the region just three did not meet the specified value (3 SRN).

In January, a routine sample taken at Southover works did not meet the specified value for *Clostridium perfringens*. This works depends on groundwater of variable water quality. The company's risk assessment process highlighted an unacceptable residual microbiological risk and the Inspectorate has issued a Regulation 28(4) Notice requiring Southern Water to carry out further work to understand the potential for contamination of the boreholes and also to ensure that the water is receiving adequate disinfection under all conditions.

Southern Water reported a detection of *Clostridium perfringens* in a sample taken at Minster works in August. At the time there had been changes in flow from the borehole. The company has identified an unacceptable residual microbiological risk at this site and the need for improved disinfection contact time. The Inspectorate has issued a Notice under Regulation 28(4) to require the company to complete this work by a specified time.

Southern Water reported the detection of *Clostridium perfringens* at its Hardham High works near Amberley in September. There was a coliform failure at this site in June and a history of previous failures for both indicator organisms in 2008. Following a detection of Clostridia in September, the company identified rainfall induced turbidity issues in the raw water in the week preceding the failure, although the company investigation demonstrated there was no significant impact on the final

treated water. The company has highlighted in its Regulation 28 risk assessment, the control measures at this works to address increases in turbidity and any subsequent microbiological challenge. To date there have been no further detections of *Clostridium perfringens*.

Turbidity at works

Turbidity is a measure of how much light can pass through water and indicates the condition or 'cloudiness' of water. Turbidity is caused by particles suspended in the water and is an important critical control measure for disinfection. Turbidity is measured at two points in the water supply chain, at treatment works where a value of 1NTU applies and at consumers' taps where the standard of 4NTU applies. The following discussion focuses on the results of samples taken at treatment works. For information on tests taken at consumers' taps, see the heading *Turbidity* in the *Chemical quality* section.

During 2009 there were 13 samples (7 SEW, 5 SRN, 1 VSE) in the Southern region which exhibited turbidity above 1NTU in water leaving a works. At two sites this occurred on more than one occasion; Saints Hill works (SEW) and Selling works (SRN). This compares to 38 samples not meeting the turbidity specification in 2008 and reflects an overall improvement in performance across the Southern region in 2009. Actions taken by companies have included the installation of on-line monitors and the optimisation of treatment.

Veolia Water Southeast reported a turbidity value of 5.4NTU at Rakeshole South works in October. Previous turbidity problems at this site had been attributed to power dips and software issues when both pumps started up simultaneously. On this occasion, the company's investigation found that the turbidity was associated with elevated levels of iron pointing towards an additional factor, the condition of a cast iron main on the site. Veolia Water Southeast is looking at further steps that can be taken to address turbidity issues at this site.

At Saints Hill works, operated by South East Water, a result of 9.6NTU was reported in January and a further value of 17NTU occurred in June. On both occasions the turbidity was linked to iron derived from the main serving the sampling facilities. The company has since installed additional equipment to monitor turbidity throughout the process and also replaced the sample line. Subsequent results have been satisfactory.

In July a turbidity level of 1.44NTU at Boxalls Lane works occurred when one of the boreholes was brought back into use. South East Water demonstrated that the turbidity was caused by elevated levels of iron.

The company has since modified its procedures for returning boreholes into service.

A turbidity of 1.39NTU was reported at South East Water's Bray works in February. There were six high turbidity results at this site in 2008 and it is disappointing that the company have reported a further problem in 2009. The company was intermittently operating this works to facilitate a strategic trunk main project and the high turbidity results were linked to a surge vessel mitigating large changes in flow. Following the failure in 2009, the company has undertaken work to improve the operating regime at the site. In July the Inspectorate visited the site (see *Technical audit activity* section).

Southern Water reported high turbidity in samples taken on two consecutive days at Selling works in January. The company attributed the problem to changes in flow when different boreholes were brought into service. New procedures for sampling to obtain representative results were introduced and all further samples have given satisfactory results.

In June, Southern Water recorded a value of 1.04NTU at Testwood works. At the time algal numbers in the River Test had increased and the company was blending river water with stored reservoir water to minimise loading on the treatment process. The on-line monitors at the works were recording turbidity as less than 1NTU at the time. The Inspectorate visited this site in November when a number of recommendations were made (see *Technical audit activity* section).

Coliform bacteria at service reservoirs

Testing for coliform bacteria gives reassurance that the quality of water held at these strategic points in the distribution system is adequately maintained. The national standard requires that at least 95% of no less than 50 samples collected from each service reservoir throughout one year are free from all coliform bacteria.

Cranbrook reservoir was brought into use in October and South East Water reported a coliform detection in a sample collected in December. The company took action to improve turnover and residual chlorine concentration. All subsequent samples have met the standards.

Chillies service reservoir operated by South East Water exhibited three failures in April and June (twice from cell 2, once from cell 1). This reservoir, along with Best Beech reservoir, is supplied by Barcombe Mills works, near Lewes and there was a failure at Best Beech reservoir, near Wadhurst, in November. This reservoir was cleaned in 2008 in response to failures in that year. South East Water considers that the

underlying cause of this series of water quality problems is the age of the water in this relatively large distribution system. The company has since made changes to the configuration of the Barcombe network and installed booster chlorination at Popeswood reservoir upstream of Chillies reservoir. Since taking this action results have been satisfactory.

Southern Water reported two coliform detections in August and September from Rake reservoir near Liphook in West Sussex. The failure in August coincided with a period of heavy rainfall raising concerns about the integrity of the reservoir. However, high summer demand and the lack of an alternate means of supply meant that the reservoir remained in service. After the second failure in September the reservoir was isolated and inspected. Southern Water completed repairs to joints and seals and returned the site to supply in October. There have been no subsequent failures. Companies are reminded of the importance of investing in assets so that arrangements are in place to make it possible to promptly isolate every reservoir from supply.

The Inspectorate has noted that coliform bacteria were found in 19 samples from service reservoirs in the Southern region during the year and this information will be taken into account during the Inspectorate's risk-based programme of technical audit.

***E.coli* and Enterococci at consumers' taps**

A total of 13,717 consumers' taps were tested in 2009 for *E.coli* and two were positive (1 SEW, 1 VSE). Like *E.coli*, the presence of Enterococci is indicative of faecal contamination and neither bacterium should be found in any sample. There was no indication, from information gathered by the two water companies, of a faecal contamination event affecting other properties in these zones. In 2009, the companies carried out 1,421 tests for Enterococci at consumers' taps and all samples met the standard.

In July, South East Water reported *E.coli* in a consumer's tap sample in the Coombe water supply zone. The same sample also contained elevated levels of nickel. This is a small zone and the same property had been sampled before in 2007 when it was found to be positive for coliform bacteria. In the absence of any wider problems in the area at that time the company planned to carry out a fittings inspection. The failure in 2009 brought to light the fact that the planned fittings inspection had not taken place. Companies are reminded that unexplained failures at consumers' taps must be followed up by a fittings inspection to rule out irregularities that could pose a risk to water quality. Failure to take such action ignores what may be the only indication of a potentially serious defect and is not consistent with a water safety plan approach.

In the Dover zone, Veolia Water Southeast reported a consumer's tap sample containing *E.coli* as an event which the Inspectorate classified as minor because other samples from adjacent properties and the upstream reservoir were satisfactory. The company obtained evidence to show the cause was localised contamination of the tap within the property. A single household boil water notice was put in place during the investigation.

Chemical quality

The drinking water regulations set out the minimum testing requirements for all chemical and physical parameters. A full summary of the results of testing by each company, including the results for indicator parameters, is provided on the DWI website and on the CD accompanying this report.

The following text and Table 7 set out the results for those parameters where there has been a failure to meet a European or national standard (mandatory quality standards) and any other parameter of interest. In addition, at the request of local authorities, the results of testing for fluoride, iron, lead, manganese, nitrate, nitrite and pesticides are given.

Table 7: Chemical and physical parameters
The number of tests performed and the number of tests not meeting the standard

Parameter	Current standard or specified concentration ¹	Total number of tests	Number of tests not meeting the standard	Additional information
Aesthetic parameters				
– odour	No abnormal change	2,972	12	SEW (12)
– taste		3,025	5	SRN (5)
Aluminium	200µg/l	2,561	2	SRN (2)
Copper	2mg/l	1,418	1	SRN (1)
Fluoride	1.5mg/l	1,417	0	
Iron	200µg/l	3,388	11	SEW (3), SRN (8)
Lead (current standard)	25µg/l	1,417	2	PRT (1), SEW (1)
Lead (future standard)	10µg/l	1,417	7	PRT (1), SEW (2), SRN (4)
Manganese	50µg/l	2,517	0	
Nickel	20µg/l	1,418	2	SEW (1), SRN (1)
Nitrate	50mg/l	1,425	0	
Nitrite	0.5mg/l	1,427	0	
Pesticides – total	0.5µg/l	1,436	0	
Pesticide – individual ²	0.1µg/l	56,584	19	Chlortoluron SRN (1) Isoproturon SRN (1) Metaldehyde SEW (17)
Notes:				
¹ For comparison, 1mg/l is one part in a million, 1µg/l is one part in a thousand million.				
² A further 5,344 tests were done for aldrin, dieldrin, heptachlor, heptachlor epoxide, all of which met the relevant standard.				

Aesthetic parameters

Consumers expect their drinking water to be clear and bright in appearance and free from discernible taste or odour. In recognition of this the regulations stipulate national standards for colour, odour and taste.

In 2009, a total of 17 samples from consumers' taps in the region exhibited a positive taste or odour. All tests in the region met the standard for colour.

The positive detections of taste and odour are summarised below in relation to their nature and cause as determined by the investigations

carried out by the companies. From this information it can be seen that many were confined to a single property and related to household pipes or fittings.

- Bitter/Flat: 2 (SRN): these descriptors relate to samples where tap water is artificially softened or otherwise treated within the home; the remedy is to advise the householder to draw water for drinking and cooking from the tap connected directly to the mains (or to fit a mains fed tap if one does not exist). Southern Water's investigations confirmed that the taste reported from the Fleete zone in February was due to a water softener, while the other in Deal zone, in June, was a tap fed from a tank and fitted with a filter. Advice on caring for water in the home was provided to the householders.
- Earthy/Musty/Mouldy/: 9 (SEW) these descriptors usually relate to situations where harmless, but objectionable, substances are produced by the growth of algae in raw water storage reservoirs or there is growth of fungi in poorly designed plumbing systems. Each of the six odour cases in 2009 was an isolated occurrence in a different zone and the common factor reported by South East Water was a low residual chlorine value at the tap. However, the Inspectorate had noted that in the Blackhurst zone, near Tunbridge Wells, there have been six odour reports over a two-year period. The zone receives water from a groundwater source at Pembury works, therefore a wider odour problem would not be expected. The Inspectorate considers that companies should use water fittings inspections to identify the prevalence of poor plumbing practices or unsuitable fittings in a zone exhibiting an unusual pattern of taste or odour reports.
- Sulphur: 1 (SEW) this descriptor relates to carrying out the test where excess dechlorinating agent remains in the sample as presented to the panellists; the Inspectorate has issued guidance to companies which should ensure these errors are not repeated in future years.
- Soapy: 2 (SEW); Sweet: 1 (SEW); Polish: 1 (SEW). All these reports were isolated occurrences and company investigations did not identify any wider problem. It is probable that the cause was residues of household cleaning products on the taps or in the sink area. A rise in this type of positive detection should trigger an investigation by the company of sampling procedures to ensure taps are being flushed thoroughly before samples are collected.

Aluminium

Aluminium can occur naturally in some drinking water sources. Also, aluminium-based water treatment chemicals may be used at surface water works to aid the process of filtration.

In 2009, a total of 2,561 samples were tested for aluminium in the Southern region. Portsmouth Water, South East Water and Veolia Water Southeast achieved 100% compliance with the aluminium standard. Just two tests exceeded the standard (2 SRN) and none of these were found to be related to process control at the works.

The two failures of the aluminium standard were linked on investigation to contamination during manufacture of the plastic disposable sample containers. Following complaints by several water companies the manufacturer identified the contaminant as drill fines from the production of moulds. Water companies have worked together to identify the cause of these unrepresentative results and the lesson to be learnt is the need for companies to assure themselves that analytical service providers have adequate procedures in place to verify that equipment, including sampling bottles, is fit for purpose.

Copper

Copper in drinking water usually derives from copper pipes and fittings in household plumbing. In general, water supplies in the UK are not aggressive towards copper, but there can be occasional problems with new plumbing installations. In 2009, a total of 1,418 tests were carried out for copper across the region and all but one met the standard (2mg/l).

A level of 3.29mg/l copper was reported in a sample from a consumer's tap in the Kingsclere zone in Hampshire. Southern Water's investigation confirmed the cause was the internal plumbing at the property and gave advice to the householder.

Fluoride

Traces of fluoride occur naturally in many water sources, particularly in groundwaters. For example, fluoride is found in the north east Kent coastal area around Whitstable and Herne Bay. Consumers can obtain specific information on the level of fluoride in the drinking water supply to their home or workplace from their water company.

Fluoride is not removed by conventional water treatment. Some companies fluoridate water supplies at the request of the local health authority as a

protection against tooth decay. There are no fluoridation schemes in the Southern region, however, in May 2008 the South Central Strategic Health Authority announced plans for a new fluoridation scheme in Southampton and the surrounding area. The consultation finished in December 2008 and a decision to proceed with the scheme for Southampton and south west Hampshire was announced in February 2009. However, the decision was challenged by a local resident and a Judicial Review announced in June 2009. Until the outcome is known of the Judicial Review, due to take place in 2010, the new fluoridation scheme cannot be implemented by Southern Water.

In 2009, all 1,417 tests for fluoride taken across the region met the regulatory standard (1.5mg/l). For more information on fluoridation please refer to the DWI website (www.dwi.gov.uk).

Iron

Iron may be present naturally in raw water, iron compounds may be added as part of water treatment or it can be released as a consequence of the corrosion of iron mains. Effective water treatment prevents these problems arising at source. Nowadays, most samples failing the standard for iron are from places where the distribution network contains a large proportion of old cast iron pipes. When deposits in these pipes are disturbed by an operational problem (such as a burst main), they turn the water orange-brown. Elevated levels of iron are objectionable to consumers because the water may appear turbid, it may have an astringent or bitter taste and the deposits are unsightly and may stain water fittings.

All companies in the Southern region have completed their long-term strategic programmes of mains renovation work. In 2009 the number of iron failures totalled 11, compared to a total of 22 failures at consumers' taps in 2008. The improvement reflects the benefits of the earlier work to rehabilitate or refurbish water mains. Future issues with meeting the standard for iron will be addressed through companies' Distribution, Operation and Maintenance Strategies (DOMS).

In 2009, South East Water reported three failures of the iron standard, each of which was considered to be an isolated event caused by a localised disturbance of the main dealt with by flushing of the main at the time and not indicative of a wider problem.

A failure in the Halling zone, in August, was found by South East Water to be linked to a section of unlined main that had been missed out of the companies strategic mains renovation programme in 2001. The failure has been taken into account for future maintenance work planned through the company's Distribution, Operation and Maintenance Strategy.

A failure of the iron standard in October in South East Waters' Surrey Hills zone, near Guildford, was attributed to a section of main where there was low flow and deposits had accumulated. The company has made plans to remove the main to improve flow and hence water quality.

In 2009, Southern Water reported eight failures of the iron standard. Three of these iron failures occurred in the Rownhams zone, near Southampton, in March, June and July. The failure in March was linked to a galvanised iron supply pipe, but the subsequent failures point to wider problems in the area and the company has identified the need to address water quality problems linked to cast iron mains in the area. The company is in the process of entering into a legally binding programme of works to address discoloured water by systematic mains cleaning and flushing.

In March and April, Southern Water reported failures of the iron standard in its Woolmans Wood zone. The problem of discoloured water in this zone was reported in *Drinking Water 2008*. A legally binding programme of work to refurbish mains in this zone during the AMP5 period is to be put in place. An additional programme of work will cover Asheys zone, on the Isle of Wight, where an iron failure was recorded in October.

In 2009, three major schemes to tackle water quality problems linked to iron and manganese were completed across the region. In March, Portsmouth Water completed work in Farlington, near Portsmouth, to remove or prevent the accumulation of sediment in trunk mains and larger diameter distribution mains in Portsmouth, Southsea, Havant and Hayling Island. This will benefit approximately 222,690 consumers in the area. Also, South East Water completed a scheme in Trosley and Borough Green to commission a new water main in December between Borough Green and Trosley works, benefiting around 44,458 consumers in the Kemsing and Tonbridge area in Kent. A South East Water programme of work in the Greatham and Headley area in Surrey was aimed at removing historic manganese deposits in the area. Following two water quality events in 2007 and 2008, the Inspectorate examined the effectiveness of the scheme. There have been no further discolouration events and, from an assessment of consumer complaints in 2009, the Inspectorate considers that the actions taken by South East Water have addressed the discolouration issues in the area.

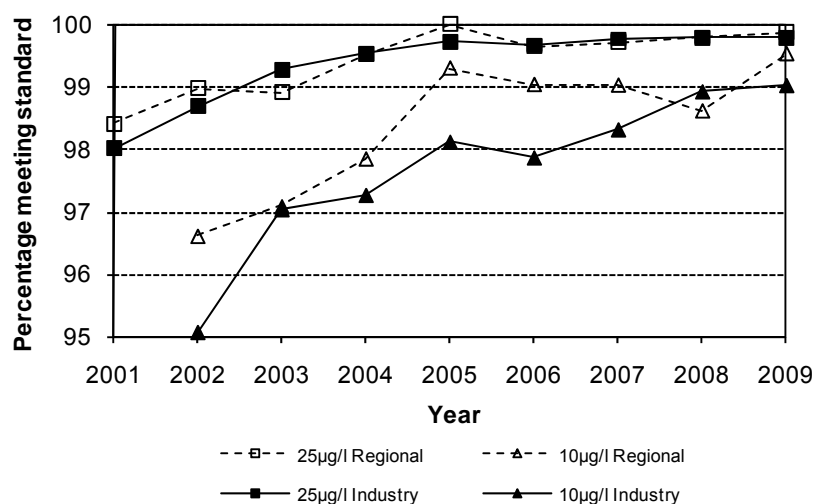
Lead

The pipe connecting a property to the water company main, together with internal plumbing, is the most common source of lead in drinking water. Properties built or renovated since 1970 are unlikely to have lead pipes and lead solder was banned for use with copper drinking water

installations in the early 1970's. The only other recognised source of lead in drinking water in some buildings is fittings made from brass. The extent of lead pick up depends on various factors; temperature, acidity (pH), water hardness, the length of pipe and the time that water is left to stand in the pipe (stagnation) before it is drawn off.

The monitoring data collected by companies during 2009 has been added by the Inspectorate to that gathered in previous years to provide an updated picture of progress in the region and for the industry, towards meeting the future standard for lead of 10µg/l by the end of 2013 (see Figure 8).

Figure 8: Percentage of tests meeting the current and future standard for lead between 2001 and 2009



Water companies notify both the consumer and the relevant local authority whenever a failure of the lead standard occurs. In 2009, the Inspectorate was notified of a total of two failures in the region (1 PRT, 1 SEW) compared to three failures in 2008. Across the region, out of total of 14,177 tests there were seven samples which exhibited a lead value above the future standard of 10µg/l (1 PRT, 2 SEW, 4 SRN). Generally, the region is making good progress towards securing compliance with the future lead standard by 2013.

The Inspectorate's *Guidance on the Regulations* issued in 2008 reminded companies that they should be notifying local authorities of breaches of the future (as well as the current standard) and giving advice to householders whenever lead is found in a tap sample. Figure 8 illustrates the importance of companies and local authorities acting now to secure compliance with the future lead standard by 2013.

Portsmouth Water reported a failure in its Fareham zone in January. The company's investigation did not identify any lead pipework in the property, therefore the cause was most likely to be due to the presence of lead solder. Advice was given to the householder.

A failure in South East Water's Langton zone occurred at a property built in the 14th century where a variety of different types of material had been used in the internal plumbing. The water company worked with the estate manager using sampling and analysis to establish the locations of different sections of pipe made from lead, copper and galvanised iron. The local authority was made aware of the situation.

In addition, during 2009, companies in the region have responded to 194 consumer requests to check the level of lead in drinking water in their property.

Manganese

Manganese occurs naturally in many sources of water. It can be removed from raw water by converting the soluble form to an insoluble precipitate (oxidation). Treatment can be simple to achieve (aeration), but for some waters more complex processes are needed. If effective treatment is not in place then black deposits may collect in the distribution pipes.

When disturbed, such deposits may turn the water black. Even small traces of manganese are objectionable to consumers. Typical complaints relate to the staining of laundry or the discolouration of vegetables during washing or cooking. The purpose of the standard for manganese is to minimise these problems. In 2009, all 2,157 tests in the region met the standard (50µg/l).

Nickel

Nickel may be present in coatings on modern tap fittings. In 2009, a total of 1,418 tests were carried out for nickel and all but two met the standard (20µg/l). A level of 26.8µg/l nickel was reported in a sample from a consumer's tap in the Langton zone. South East Water identified, by carrying out a fittings inspection, that this failure coincided with building work. The company offered the householder advice on replacement of the fittings.

A nickel level of 20.8µg/l was reported by Southern Water in a consumer's tap sample in Rainham Mark zone, near Gillingham. Although there had been recent plumbing work carried out at the property it was thought that a nickel coated tap fitting was the probable cause. Southern Water advised

the consumer about flushing the tap prior to use for drinking or food preparation.

Nitrate and nitrite

Nitrate occurs naturally in all source waters due to the decay of vegetable material in soil. Nitrogenous fertilisers used on arable farmland are a significant source of nitrate in groundwater. Rainfall washes nitrate from the soil into lakes, rivers and streams. Nitrate levels can be reduced by water treatment or by blending with another, low nitrate, water source. In 2009, a total of 1,425 tests were carried out and all met the standard (50mg/l).

From extensive information gathered by the water companies, a likelihood of drinking water supplies in the region failing the nitrate standard in the longer term has been confirmed at some sites. As a consequence, legally binding agreements are in place for additional treatment (see *Annex 4*).

Two nitrate improvement programmes in the Portsmouth Water area were due to be completed in 2009, but both encountered delays due to issues with pre-planned maintenance (Northbrook works) and highway restrictions (Maindell works). Both these schemes were finally completed in early 2010. Over 158,000 people will benefit from a more secure water supply following completion of the work at Maindell and over 32,000 consumers will benefit similarly from the Northbrook improvements.

Nitrite may be formed when chloramine is used as the residual disinfectant to maintain the microbiological quality in the distribution network. The formation of nitrite is controlled by careful optimisation of the chloramination process. No company in the Southern region practices chloramination, however, South East Water receives a bulk supply of treated water with a chloramines residual from Sutton and East Surrey. Nitrite can also form in samples of water, after collection and before analysis, especially if the sample is not kept cool. In 2009, all 1,427 tests carried out across the region for nitrite met the standard (0.5mg/l).

Pesticides and related products

This group of substances, generically called pesticides, includes many organic chemicals ranging from weed killers, to insecticides and fungicides. Water sources may contain traces of pesticide residues as a result of agricultural use (pest control on crops) and non-agricultural uses (herbicides for weed control on highways etc.). Water companies are required to assess the risk to drinking water supplies of pesticide use in their catchments and test for those which might be present.

Companies have documented potential and actual pesticide hazards through their Regulation 27 risk assessments, which are informed by raw water monitoring and identify the control measures in place.

When pesticides are first detected, water companies will enhance their monitoring of raw water and notify the Environment Agency to facilitate appropriate action to safeguard drinking water quality.

In 2009, none of the tests in the region exceeded the standard for total pesticides. Likewise there was 100% compliance (5,344) for the four pesticides with a standard of 0.03µg/l. Out of a total of 56,584 tests for those individual pesticides (with a standard of 0.1µg/l) 19 exceeded the standard. The circumstances and substances involved are summarised below.

Chlorotoluron

Chlorotoluron is a herbicide for use in winter cereal crops. The standard is 0.1µg/l. A level of 0.11µg/l occurred at Beauport Hastings works in November. The works, operated by Southern Water, abstracts water from the river Rother, a storage reservoir at Darwell and boreholes at Filsham. This works currently has no treatment in place that will remove herbicides and control measures depend on the ability to switch between sources. The company investigation failed to identify the source of chlorotoluron in the catchment. The Inspectorate expects the company to reflect the event in its risk assessment and include this hazard in the control measures specified in respect of other pesticide hazards affecting this water supply (see *Isoproturon* section).

Isoproturon

Isoproturon is a widely used herbicide for the control of annual weeds in cereal crops. The standard is 0.1µg/l. In February, isoproturon was detected at a level 0.17µg/l in a sample from Beauport Hastings works. The Inspectorate classified the report as a significant event. Isoproturon at levels above the standard were present during February and March in one of the sources (Darwell reservoir). The maximum concentration recorded was 0.21µg/l similar to levels seen in the previous three years.

Southern Water is working closely with the Environment Agency and ADAS to protect this source. There are plans to establish a drinking water protected area where use of specified agrochemicals will be prohibited and ADAS are currently progressing the employment of a catchment sensitive farming officer.

Metaldehyde

During 2009, metaldehyde, the active ingredient of some slug pellets, has been identified by South East Water as a new pesticide hazard in the Bewl and Arlington supply and in bulk supplies from Bough Beech (provided by

Sutton and East Surrey) and Burham (Southern Water). When detected in samples, the levels found range from 0.11µg/l to 0.41µg/l. The Health Protection Agency has advised that no adverse health effects are expected from these levels in drinking water. The companies have initiated a sampling programme to monitor the levels of metaldehyde in both raw and treated waters from each of the 'at risk' treatment works. Legally binding programmes of work have been put in place detailing short, medium and long-term plans to mitigate the impact of this pesticide (see *Annex 4*).

Private water supplies

New private water supply regulations came into effect in England on 1 January 2010. These regulations implement the 1998 European Drinking Water Directive and replace the previous 1991 regulations. Initial guidance for local authorities on the implementation of the new legislation is available on www.privatewatersupplies.gov.uk and the Inspectorate's website (www.dwi.gov.uk). Whereas in the past the approach to improving these small water supplies has been informal and based on advice and encouragement, it is now an enforceable duty for these supplies to be risk assessed, reported and enforcement action taken whenever there is evidence of a breach of the drinking water standards or a potential risk to public health. The principle changes are summarised below.

Private distribution systems

The new regulations close a gap in the old legislation which could not be used to improve the quality of drinking water from privately operated distribution systems. The new regulations now cover water that is *'...supplied by a water undertaker or licensed water supplier and then further distributed by a person other than a water undertaker or licensed water supplier...'*

Private water distribution systems occur when the water originates from a public water supply but is then distributed on to buildings/properties within premises whose occupants are often charged for the supply by a person other than the public water supply company. Typical examples of where this type of private supply may be found are:

- caravan and camp sites;
- military establishments;
- hospitals, school, college and university campuses where water is distributed to buildings which are occupied by other organisations;

- shopping centres where the water is distributed to organisations in shopping outlets, administration offices and other public buildings;
- airports/ports/train stations where water is distributed to organisations in various buildings within the transport site; and
- estates where water is distributed to organisations occupying other buildings such as the National Trust.

Local authorities will work in collaboration with water companies to identify those situations where a distribution system is subject to the private water supply regulations. Water companies will provide guidance on situations controlled by the Water Supply (Water Fittings) Regulations 1999.

Main duties on local authorities

Local authorities must keep and maintain records of all private water supplies and forward these each year to the Inspectorate. This ensures that in future, national reports about drinking water quality will include information on all supplies to consumers, apart from those serving a single private household where there is no commercial activity.

Local authorities must risk assess all private supplies in their area within five years. Once completed these risk assessments must be kept under regular review. See the Inspectorate's website (www.dwi.gov.uk) or www.privatewatersupplies.gov.uk for guidance on carrying out a risk assessment.

Local authorities must continue to monitor all 'large' private supplies in accordance with frequencies set according to the volume of water used. However, risk assessment enables local authorities to tailor the scope of monitoring and exclude parameters where there is reliable data to verify compliance with the drinking water standard. Large supplies are those providing 10m³/day or more (serving more than 50 persons). Monitoring is also required for any supply, irrespective of size which is part of a commercial or public activity.

Local authorities have more discretion over monitoring smaller supplies and private distribution systems. Within five years, each of these supplies must be tested for a few very important parameters (known as Regulation 10 monitoring) and any other parameters as indicated by the risk assessment.

Private supplies serving a single dwelling are exempt, but a local authority must carry out monitoring if requested to do so by the occupant or owner.

Local authorities must take steps to safeguard consumers if, as a consequence of their risk assessment or monitoring, a potential danger to human health is identified. These steps involve serving a Notice to prohibit or restrict the use of the supply until appropriate remedial action has been taken. It is an offence for the relevant person not to comply with a Notice and the local authority can have the Notice enforced on application to the Magistrates' courts. The relevant person also has the right of appeal to the Magistrates' courts, if they are aggrieved by the Notice.

Local authorities must investigate and determine the cause of all breaches of standards and ensure that appropriate remedial action is taken by the serving of a Notice. Local authorities may provide advice and negotiate with owners on the exact nature of the improvements required.

Implementing the new private water supply regulations – case example

The first Notice under the new English private water supply regulations was served by Sevenoaks District Council on 23 March 2010.

This Regulation 18 Notice identified that a private water supply serving 76 domestic dwellings and four commercial properties was a potential danger to human health due to the presence of organisms indicative of faecal contamination (*E.coli*, coliform bacteria and *Clostridium perfringens*). The risk assessment and investigation by the local authority and the private water supply manager identified structural and integrity issues with a storage reservoir. The new regulations enabled the local authority to document in the Notice the nature of the steps that need to be taken to improve the water supply, such as requiring a structural report identifying the remedial measures needed to prevent ingress of contaminants. The benefit of the new type of Notice to the local authority and consumers is that non-compliance by the relevant person (owner, operator etc) is an offence, so the provisions of the Notice can be enforced relatively straightforwardly by the courts, if necessary.

Sevenoaks District Council had tested the supply six times a year under the old private supply regulations in England. Although some of the samples had given unsatisfactory results and despite the local authority being aware that maintenance of the supply had been sporadic and not sufficient, the prescriptive regime of relatively infrequent monitoring meant that the contamination went largely unobserved. The absence of successive failures of the drinking water standards made it difficult for the local authority to take action because monitoring was insufficient to confirm that the failures were not trivial and likely to recur.

Sevenoaks District Council are to be commended for promptly taking advantage of the risk-based approach in the new regulations by assessing

the whole supply, including the network, and identifying appropriate remedies that will safeguard water quality and consumers in the future. This case example clearly demonstrates the deficiencies of infrequent monitoring of small supplies, which was at the heart of the old style approach to private water supplies. The Inspectorate looks forward to supporting other local authorities in improving drinking water quality for all consumers reliant on small supplies.

Risk assessments

The changes to the drinking water regulations in 2007 required water companies to risk assess all of their water supply systems using methodology based on the water safety plan approach in the World Health Organisations' *Guidelines for Drinking Water Quality*. The approach includes identifying actual and potential hazards throughout the water supply system from the catchment to consumers' taps. For each identified hazard, the company determines the associated risk considering any control measures already in place. In some cases, the company will conclude that the risk is sufficiently mitigated through existing controls. Where this is not the case, the residual risk is highlighted as needing further mitigation measures and an action plan put in place.

The regulatory reporting process required companies to provide the Inspectorate by October 2008 with information about the hazards which the company considers to be adequately controlled, together with details of the action plans relating to those hazards for which further mitigating measures have been identified as necessary. Where the Inspectorate considers that there has been or may be a risk of supplying water that would constitute a potential risk to public health, it may serve a Regulation 28(4) Notice to enforce and, if needs be, vary the mitigating steps set out by the company in its action plan. The Notices typically specify the following types of actions: maintenance, regular reviews and audits of controls, conditions under which supply is prohibited, progress reporting and information requirements.

Table 9 shows the mitigation actions being carried out by companies in the Southern region as a result of their risk assessment of drinking water supplies. Out of a total of 227 supply system risk assessments in the region, the Inspectorate has put in place 77 Regulation 28(4) Notices. Most of the Notices address improvements at works and the majority relate to deficiencies identified by South East Water.

Table 9: Outputs of risk assessments within the region

Company	Number of risk assessments	Number of Reg 28(4) Notices ¹	What is Notice about?			
			Source protection	Change in source of supply	Distribution maintenance	Improvements at works
Portsmouth Water	9	-	-	-	-	-
South East Water	99	56	2	-	8	46
Southern Water	95	21	-	-	-	21
Veolia Water Southeast	24	-	-	-	-	-
Region overall	227	77	2	-	8	67
England and Wales	857	238	7	28	52	159

¹Some notices are classified under more than one category

The action plans delivered through Notices make up part of the overall, rolling, drinking water quality improvement programme of each water company. *Annex 4* summarises all legally binding schemes of work (known as undertakings) put in place through the Periodic Price Review process together with remedial work specified in Regulation 28(4) Notices.

An important element of the risk assessment and risk management processes now in place is the monitoring of raw water quality. Each water company has put in place a regulatory raw water monitoring programme for each of its abstraction points. The main purpose of this testing is to inform the management of risk and to ensure that all hazards are identified promptly and controlled effectively. During 2009, companies have worked with the Inspectorate (and carried out pilot studies) to facilitate the future transfer of raw water quality data to the regulators. Table 10 summarises the scope and scale of the raw water quality monitoring data gathered by water companies in the Southern region in 2009. This water company information is being shared by the Inspectorate with the Environment Agency and contributes to the overall monitoring of environmental water quality required by European law.

Table 10: Numbers of tests taken at abstraction points in 2009

Nature of parameter	Company				
	Portsmouth Water	South East Water	Southern Water	Veolia Water Southeast	Total
Natural properties	1,647	9,223	14,402	2,816	28,088
General water quality indicators	2,043	10,690	11,602	6,898	31,233
Microbiological indicators	2,213	9,246	20,388	3,881	35,728
Microbiological pathogens	0	1,078	487	2	1,567
Pesticides	2,219	6,922	34,889	2,922	46,952
Chemicals other than pesticides	1,760	8,481	11,265	737	22,243
Total tests	9,882	45,640	93,033	17,256	165,811
Number of abstraction points	22	183	122	42	369

Catchment risk assessment - case example

During 2008, Portsmouth Water conducted a risk-based analysis to identify a rising nitrate trend in many groundwater sources. In line with its Drinking Water Safety Plan approach, the company chose to actively manage this catchment risk by tackling diffuse pollution at source. This work, in collaboration with the Environment Agency and Natural England, led to a catchment management scheme known as the Downs and Harbours Clean Water Partnership. Over the next ten years the Partnership plans to influence both land management and nutrient management practices affecting the local rivers and Portsmouth, Langstone and Chichester Harbours.

Drinking water quality events

From 1 January 2009, in line with the Hampton Principles in the *Regulator's Compliance Code*, the Inspectorate has applied an updated approach to the assessment of water quality events. The risk-based approach enables the Inspectorate to target resources where they can be most effective in terms of maintaining public confidence in drinking water quality. Based on the preliminary information provided by the company (three day report), an event is classified into one of the following five categories:

Not significant (category 1): no further information required by inspector to assess the event.

Minor (category 2): no further information required by inspector to assess the event.

Significant (category 3): full company report required to enable inspector to assess the event.

Serious (category 4): in addition to a full company report, the assessment requires action by more than one inspector.

Major (category 5): in addition to a full company report, the assessment requires action by senior inspectors.

In 2009 companies in the Southern region notified the Inspectorate of 44 events. Table 11 shows how these events were classified.

Table 11: Water quality events in the region in 2009

Nature of event	Risk assessment category (DWI)				
	1	2	3	4	5
Air in water	-	2	-	-	-
Chemical	-	-	5	-	-
Discoloured water	-	4	8	-	-
Inadequate treatment	-	1	1	-	-
Loss of supplies/poor pressure	2	2	-	-	-
Microbiological	-	11	4	-	-
Taste/Odour	-	-	1	-	-
Health concern	-	-	-	-	-
Public concern	-	-	-	-	-
Other	-	1	2	-	-
Region overall	2	21	21	-	-
England and Wales	63	213	141	4	1
Category 1 = Not significant, Category 2 = Minor, Category 3 = Significant, Category 4 = Serious, Category 5 = Major.					

A summary of the nature, cause and duration of each event categorised Significant, Serious or Major, along with details of the Inspectorate findings, are set out in *Annex 3*. Most of these events were of relatively short duration and the company took action to inform and safeguard consumers and other stakeholders as appropriate.

About one-half (21 out of 44) of the events in the Southern region during 2009 were of a type that necessitated a detailed investigation by an inspector. None were serious enough to warrant a major investigation by the Inspectorate. This compares unfavourably to the other regions in England in terms of the amount of inspector effort spent on investigating events

Five events which occurred in 2009 are summarised below because of the learning points highlighted by the findings of the Inspectorate's investigation.

Taste and odour, Clanfield, Hampshire

- Clanfield service reservoir was returned to supply in April following refurbishment work involving the sealing of joints. The next day consumers contacted Portsmouth Water reporting an objectionable odour described as 'cat litter'. The odour persisted after flushing of the local mains so a link to work on the reservoir was made and the site removed from service. Checks by the company found uncured sealant. The product was of a type listed in the WRAS Water Fittings and Materials Directory. It had been applied in accordance with the manufacturer's instructions for use and therefore the company had complied with Regulation 31 requirements. Portsmouth Water has since changed its procedures to include checks to verify that repair products are cured. This event revolved around a particular sealant product in wide use across the industry. Portsmouth Water has worked with the manufacturer to understand the cause and to ensure the manufacturer's advice to users is updated to reflect learning from this event and prevent a recurrence.

Discoloured water, Hindhead, Surrey

- In June, the booster pumps to Hindhead service reservoir in Surrey failed and the water level in the reservoir fell causing loss of supplies in the downstream network. When supplies were restored consumers received discoloured water over a two to three day period. This event came about because critical low level alarms from the reservoir were not responded to in a timely fashion. It was noted that the number of alarms in the control room was excessive and above that recommended by the Health and Safety Executive. Companies are reminded that control room arrangements and the

frequency and types of alarms are critical to the safe management of water quality. Following this event the Inspectorate initiated enforcement action requiring South East Water to enter into a legally binding agreement to take action to address the risk of discolouration in the Hindhead area.

Discoloured water, Amport, Hampshire

- In April, Southern Water began receiving discoloured water complaints from the village of Amport in Hampshire, however, it was only several weeks later, in May, that the cause was investigated. The company failed to take samples before carrying out remedial flushing therefore the cause could not be pinpointed with certainty. The Inspectorate expects companies to track and identify trends in consumer contacts applying knowledge of the water supply. This event demonstrates that simplistic reliance on a daily count of the total number of consumer contacts is not sufficient.

Pumping station shutdown failure, Selsted

- In October, Rakeshole South works, near Selsted, automatically shut down as a result of a low chlorine residual signal. At the time of the shutdown both of the remote boreholes (Tappington North and Denton) were in use. The works shutdown signal is transmitted to both boreholes via radio links. At the time, Denton shut down immediately but Tappington North did not stop pumping and, as a consequence, inadequately disinfected water entered into the 24" diameter treated water trunk main that feeds Paddlesworth service reservoir for approximately one hour. Paddlesworth provides the supply to about 33,000 consumers. Public health was protected because the untreated water was retained within the trunk main and subsequently run to waste. Veolia Water Southeast concluded that a fault with the radio receiver unit at Tappington North was the cause of this event.

The Inspectorate was critical that a failed communication link between the treatment works and the operations centre meant that the company failed to notice that although the works had shut down, the borehole at Tappington North had continued to run. The Inspectorate further criticised the company for failing to identify and rectify the fault with the radio receiver unit during recent routine maintenance at the site. Veolia Water Southeast has since carried out remedial actions, including putting in place a new shutdown procedure for Rakeshole works and carrying out technical modifications to the radio system at both borehole sites.

Companies are increasingly relying on automatic shutdown mechanisms to meet the requirements of Regulation 26, which are intended to safeguard public health by requiring water to be adequately treated and disinfected at all times. It is essential, therefore, that companies' verify the performance of fail safe shutdown mechanisms on a regular basis satisfying themselves that testing and maintenance regimes are rigorous and include all associated communications systems.

Disinfection failure, Matts Hill, Medway area, Kent

- Matts Hill groundwater works contributes about one-quarter of the total volume of water supplied to 145,000 consumers in the Medway area of Kent. At the time of the event, treatment at the site was by chlorination only. In November 2008, heavy rainfall impacted on borehole water quality resulting in automatic shutdown of the site triggered by the on-line turbidity monitor. The next morning, over a period of three hours, attempts were made to restart the plant by manually overriding the controls. This action resulted in turbid water from the borehole entering the disinfection contact tank. The controls continued to be overridden even though there was no measurable residual chlorine and turbidity exceeded 1NTU. The design of the works was such that once turbid water was inside the contact tank then each further attempt to restart the plant pushed this poor quality water directly into supply.

Long before this event, the company had identified the Matts Hill supply as being at high risk in respect of *Cryptosporidium*, particularly at times of rainfall turbidity events. The control measure in place was automatic shutdown triggered by the turbidity monitor. At the time of this event oocysts were present in water samples. Typing showed that the oocysts detected were not *C.hominis* or *C.parvum*, a finding that was very fortunate in terms of public health.

As long ago as 2006, the Inspectorate had been caused to warn Southern Water in writing about the risks associated with the configuration of the plant in respect of the turbidity control measure. In response, Southern Water had given the Inspectorate a written assurance that action had been taken by the company to prevent the exact circumstances that transpired subsequently during the course of the event in November 2008.

On 17 May 2010, Southern Water pleaded guilty to three offences of failing to adequately prepare, disinfect and continuously operate an adequate treatment process at Matts Hill works in contravention of Regulation 26(1)(a) and 26(1)(b) and 26(3). The company was fined £2,500 for each of the three offences, totalling £7,500, agreed to

pay £23,932.36 costs, and in his summing up District Judge Kelly said "...the matter was all about risk and *Cryptosporidium* presents risk". He went on to say "...This was both a system and a procedural failure..."

As a consequence of learning from the incident at Matts Hill, Southern Water are currently installing a run to waste facility and an ultraviolet (UV) disinfection plant. As a temporary measure, Southern Water have installed a UV and filtration system which will operate until the permanent solution is in place. The company is also making substantive improvements to the disinfection and monitoring arrangements at a further 89 sites at a cost of approximately £41 million.

Technical audit activity

The Inspectorate has operated a risk-based approach to technical audit since 2005. In line with better regulation principles, no technical audit takes place without a reason and those that are carried out are targeted on the basis of an assessment of risk.

The Inspectorate's tool for generating the technical audit programme looks at the critical components of the safe management of drinking water supplies, including information on water quality monitoring, event assessments, previous audits, consumer complaints and other relevant intelligence. Through this ranking of all relevant water company assets, procedures and practices, inspectors are able to prioritise and focus their technical audit work where it will have most benefit.

Information on the key findings of the technical audits undertaken during 2009 in the Southern region is set out in Table 12.

Table 12: Summary of the Inspectorate's technical audits in the region

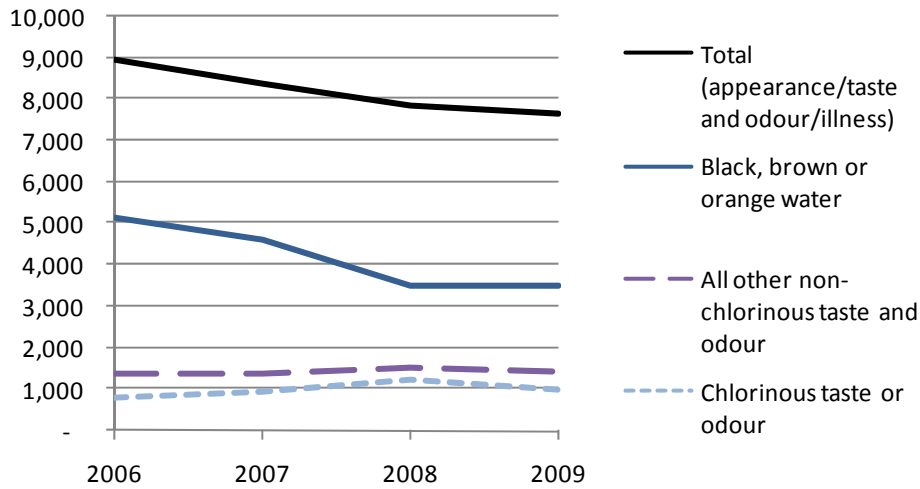
Site name	Audit topic	Main findings from audit
South East Water		
Stocks reservoir	Microbiology.	Generally satisfactory. <ul style="list-style-type: none"> Recommended actions to ensure satisfactory turnover and improve procedures and records concerning inspections.
Bray works	Turbidity.	Generally satisfactory. <ul style="list-style-type: none"> Recommended action to improve raw water safety planning and risk assessment and treatment procedures.
Southern Water		
Shoreham works	Disinfection.	Generally satisfactory. Recommendations were made relating to: <ul style="list-style-type: none"> Record keeping, procedures and chlorine concentration/time (Ct).
Testwood works	Turbidity and water quality event.	Unsatisfactory. Recommendations were made relating to: <ul style="list-style-type: none"> Policy and monitoring arrangements relating to raw water. Calibration of on-line monitors and associated record keeping. Hygiene cards. Site schematic. Coagulation control. Calibration of manual testing equipment and associated record keeping.

Public confidence in drinking water quality

When consumers have a question or a concern about drinking water quality their first point of contact is the water company. All companies record these contacts using definitions agreed with the Inspectorate.

In the Southern region, the number of consumers reporting concerns about the quality of their tap water (appearance, taste and odour, or illness) has continued to decline and the improvement made since 2006 is mainly driven by a fall in the number of consumers reporting black, brown or orange water. In 2009, chlorine taste reports were fewer than the peak numbers reported in 2008, but overall across the region there has been little change in the number of consumer contacts about chlorine since 2006. This is illustrated in Figure 13.

Figure 13: Numbers of consumer contacts 2006–2009



Discoloured water – black, brown or orange

Compared to other regions of England and Wales, the Southern region exhibits a relatively low contact rate for black, brown or orange water, 0.7 contacts per 1,000 population in 2009, down from one contact per 1,000 population in 2006. The range for all the English regions is 0.3 to 3.1 contacts per 1,000 population. Most of the improvement since 2006, from over 5,100 contacts to below 3,500 in 2009, occurred in the first two years and reports of discoloured water were similar in 2008 and 2009.

Looking more widely at all appearance categories, Figures 14 and 15 illustrate the contact rates in 2006 and 2009 for comparison.

Figure 14: Rate of consumer contacts per 1,000 population for appearance in 2006

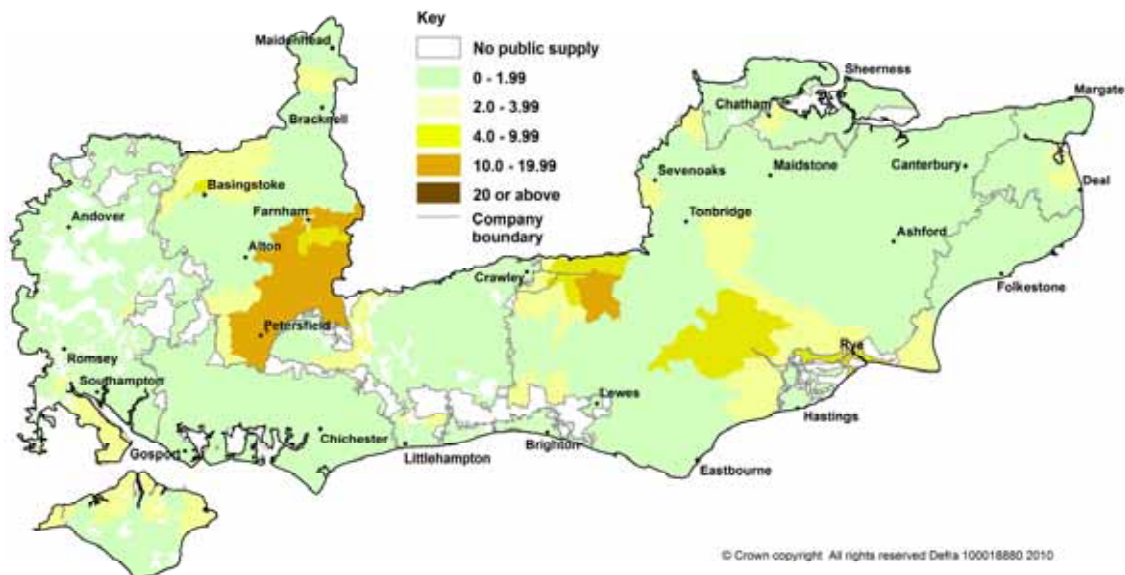
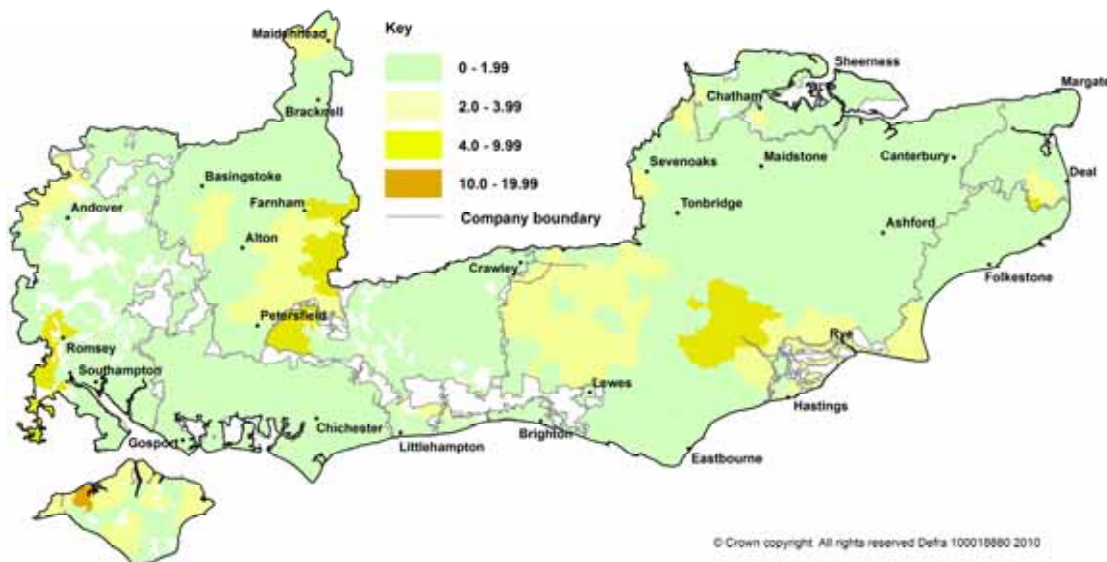


Figure 15: Rate of consumer contacts per 1,000 population for appearance in 2009



The maps illustrate the general fall in the number of contacts in the area between Petersfield and Farnham and to the east of Crawley, however, despite this, higher than average rates of contact persist in these areas and to the north west of Hastings.

Taste and odour

Last year the Inspectorate reported a substantial rise in the number of consumers experiencing a chlorine taste and odour in their water nationally and this pattern was seen to a lesser degree in the Southern region. The picture in 2009 is more encouraging with the figures showing some improvement; chlorine taste and odour contacts across the region have reduced from their peak of close to 1,250 in 2008 to just over 1,000 in 2009 but there is no clear longer-term downward trend.

Complaints to the Inspectorate

When the response of a company to a consumer contact about drinking water quality fails to provide the necessary reassurance or remedy then the consumer may contact the Inspectorate for advice. In 2009, there were five consumers in the Southern region sufficiently dissatisfied with the water company's initial response to raise the matter further with the

Inspectorate and the reasons for contacting the Inspectorate are provided in Table 16.

Table 16: Contacts from consumers in the region received by the Inspectorate

Category ¹	Number of contacts
Appearance	4
Taste and odour	0
Report of illness	1
Water quality concern	0
Number of contacts to DWI from consumers by company. SEW (3), SRN (2)	
¹ Categories are as defined in Information Letter 1/2006.	

Case examples

In February, the Inspectorate was contacted by a consumer living on a small estate near Crawley, East Sussex. She had been in contact with South East Water about discoloured tap water several months before, but remained concerned. The company had identified a long length of cast iron pipe as the cause. Flushing at the time did not remedy the problem and due to its age and condition the pipe was to be replaced. As an interim step, the company was supplying the estate by means of a temporary overland pipe. This case example illustrates the need for companies to maintain public confidence in drinking water by always fully explaining the nature of any water quality problem and the short, medium and long-term actions being taken to improve drinking water quality.

A consumer from the Southampton area of Hampshire contacted Southern Water in January to report brown particles in the cold water supply. The company had carried out an inspection and concluded that the cause of the problem was the age and condition of the service pipe to the property. In this case the consumer was a tenant so the long-term solution, replacement of the pipe, was the responsibility of the landlord. The Inspectorate noted that the water company's sampling technician had advised the consumer to drink bottled water and this advice had contributed to the loss of confidence displayed by the consumer. Companies must ensure customer-facing staff provide appropriate advice based on sound evidence.

For further information on the Water Supply (Water Quality) Regulations 2000, or the microbiological and chemical parameters covered by the regulations please refer to the DWI website (www.dwi.gov.uk).

If you have a need for more specific information than that on our website, please contact us on the DWI enquiry line: 030 0068 6400.

Annex 1

Further sources of information

The publication *Drinking water 2009* comprises the regional reports for England and a report covering Wales. There are six regional reports for England (Central, Eastern, Northern, Southern, Thames and Western) and one for Wales (in two languages). Each report presents information from 2009 under the following headings:

- Introduction to the report.
- Water supply arrangements.
- Drinking water quality testing.
- Drinking water quality results.
- Private water supplies.
- Risk assessments.
- Drinking water quality events.
- Technical audit activity.
- Public confidence in drinking water quality.

The reports and other content are published on the DWI website (www.dwi.gov.uk).

Content of the CD

The CD supplied with the printed report holds all of the above content and additionally it contains:

Water company look-up tables

These summarise all the results of water company monitoring in 2009. They provide information on:

- what was tested;
- how many tests were performed;
- the range of the results of testing; and
- how many tests failed to meet the standards.

Significant drinking water quality events in England and Wales 2009

To promote shared learning, the Inspectorate has compiled a list of all incidents that occurred in 2009 which illustrate the nature and cause of each incident, the main actions by the company and findings from the inspectors' assessments. Relevant content from this overall list is contained in an annex to each regional report.

Annex 2

Glossary and description of standards

These definitions will assist the understanding of the report where technical terms have been used.

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. A European health-based standard of 3µg/l applies.
Acrylamide	European health-based standard. A monomer is not normally found in drinking water. It is produced in the manufacture of polyacrylamides occasionally used in water treatment. Its presence in drinking water is limited by control of the product specification. Standard is 0.1µg/l.
Aggressive	a term used to indicate that the water has a tendency to dissolve copper (and other metals) from the inner surface of a pipe or water fitting such as a tap.
Aesthetic	associated with the senses of taste, smell and sight.
Alkali	a solution containing an excess of free hydroxyl ions, with a pH greater than seven.
Aluminium	occurs naturally in some source waters. It is removed from drinking water by conventional water treatment (coagulation and filtration). Aluminium sulphate and polyaluminium chloride may be used as water treatment chemicals at some water treatment works. A national standard of 200µg/l applies.
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. An indicator parameter with a guide value of 0.5mg/l.
Analytical quality control (AQC)	the method used to ensure that laboratory analysis methods are performing correctly.

Antimony	is rarely found in drinking water. Trace amounts can be derived from brass tap fittings and solders. A European health-based standard of 5µg/l applies.
Aquifer	water-containing underground strata.
Arsenic	occurs naturally in only a few sources of groundwater. Specific water treatment is required to remove it. A European health-based standard of 10µg/l applies.
Authorised departure	authorisation for a water company to temporarily supply water exceeding a drinking water standard, granted by the authorities only when there is no risk to human health.
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. A European health-based standard of 1µg/l applies.
Benzo(a)pyrene (BaP)	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 many years ago was used to line water pipes. Due to extensive water mains refurbishment and renewal it is now rare to detect this substance in drinking water. A European health-based standard of 0.01µg/l applies.
Boron	in surface water sources comes from industrial discharges or from detergents in treated sewage effluents. The very low concentrations found in some drinking waters are not a concern to public health. A European health-based standard of 1mg/l applies.
Bromate	can be formed during disinfection of drinking water through a reaction between naturally occurring bromide and strong oxidants (usually ozone). It may be generated in the manufacture of sodium hypochlorite disinfectant. Exceptionally, groundwater beneath an industrial site can become contaminated with bromate. A European health-based standard of 10µg/l applies.

Bulk supply	water supplied in bulk, usually in treated form, from one water company to another.
Cadmium	is rarely detected in drinking water and trace amounts are usually due to dissolution of impurities from plumbing fittings. A European health-based standard of 5µg/l applies.
Chloramine	a substance formed by reaction between chlorine and ammonia, used as a disinfectant in distribution systems because of its long-lasting properties compared to chlorine.
Chloramination	the process of generating a chloramine disinfectant residual in water leaving a treatment works.
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. An indicator parameter with a guide value of 250mg/l.
Chlorine residual	the small amount of chlorine or chloramines present in drinking water to maintain its quality as it passes through the water company's network of pipes and household plumbing.
Chromium	is not present in drinking water. A European health-based standard of 50µg/l applies.
<i>Clostridium perfringens</i>	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 indicates historic contamination that requires investigation. The standard is 0 per 100ml.
Coagulation	a process employed during drinking water treatment to assist with the removal of particulate matter.
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. It is removed by conventional water treatment. A national standard of 20mg/l on the Platinum/Cobalt (Pt/Co) scale applies.
Communication pipe	the connection from the water main to the consumer's property boundary.
Compliance assessment	a comparison made by the Inspectorate of data gathered by water companies against standards and other regulatory requirements.
Compound	a compound consists of two or more elements in chemical combination.
Concessionary supplies	historical free supplies of water for a householder, established when a company wanted to lay mains across land and the landowner might agree, subject to a permission, to take a supply of water from the main.
Conductivity	is a non-specific measure of the amount of natural dissolved inorganic substances in source waters. An indicator parameter with a guide value of 2,500 μ S/cm.
Contact tank	a tank, normally situated on a treatment works site, which forms part of the disinfection process. A disinfectant chemical (normally chlorine) is dosed into the water as it flows into the tank. The period of time that the water takes to flow through the tank allows sufficient 'contact' time for the chemical to kill, or deactivate, any viruses or pathogenic organisms that may be present in the water.
Contravention	a breach of a regulatory requirement.
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 on new housing estates. These 'blue water' events can be avoided by good plumbing practices. A European health-based standard of 2mg/l applies.

<i>Cryptosporidium</i>	is a parasite that causes severe gastroenteritis and can survive disinfection. In the UK, continuous monitoring is undertaken at works classified by the company as being at significant risk.
Cyanide	is not present in drinking water. A European health-based standard of 50µg/l applies.
Dead leg	refers to a piece of piping which is stopped off at one end, but is connected to the supply at the other end and can result in stagnant water in the pipework.
Distribution systems	a water company's network of mains, pipes, pumping stations and service reservoirs through which treated water is conveyed to consumers.
Drinking water standards	the prescribed concentrations or values listed in regulations.
EC Drinking Water Directive	Council Directive 98/83/EC December 1998 – setting out drinking water standards to be applied in member states.
Enforcement action	the means, as set out in the Water Act 1989 and consolidated into the Water Industry Act 1991, by which the Secretary of State requires a water company to comply with certain regulatory requirements.
Enterococci	see <i>Escherichia coli</i> .
Environment Agency	the Environment Agency is responsible for maintaining or improving the quality of fresh, marine, surface and underground water in England and Wales.
Epichlorhydrin	can be found in trace amounts in polyamine water treatment chemicals. Its presence in drinking water is limited by control of the product specification. A European health-based standard of 0.1µg/l applies.
Epidemiology	a process of studying the distribution of cases of disease within a population in relation to exposure to possible sources of the infection, with a view to establishing the actual source of the infection.

<i>Escherichia coli</i> and Enterococci	are bacteria present in the gut of warm-blooded animals. They should not be present in drinking water and, if present, immediate action is required to identify and remove any source of faecal contamination that is found. The standard is 0 per 100ml.
Event	water companies have to inform the Inspectorate about occasions when water quality or sufficiency is affected or when public confidence in drinking water quality may be impacted. The Inspectorate refer to these instances as 'Events'.
Filtration	the separation of suspended particulate matter from a fluid.
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. Some water companies are required by the local health authority to fluoridate water supplies as a protection against tooth decay. The drinking water standard ensures levels are safe in either circumstance. Fluoridation of water is a Department of Health policy. A European health-based standard of 1.5mg/l applies.
Geosmin	a substance produced by the growth of algae, normally in surface waters which gives rise to a characteristic 'earthy' or 'musty' taste or odour.
Granular activated carbon	an adsorbent filtration media used to remove trace organic compounds from water.
Groundwater	water from aquifers or other underground sources.
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. A specification of between 6.5 and 9.5 applies.
Improvement programmes	water company improvement works, these are legally binding on the company and each programme will remedy an actual or potential breach of a drinking water standard within a specified time period.

Indicator parameter	something that is measured to check that control measures, such as water treatment, are working effectively.
Indicator organism	an organism which indicates the presence of contamination and hence the possible presence of pathogens.
Information Letter	formal guidance to water companies given by the Inspectorate and published on the Inspectorate's website at www.dwi.gov.uk
Inspectorate	The Drinking Water Inspectorate.
Iron	is present naturally in many water sources. It is removed by water treatment. Some iron compounds are used as water treatment chemicals. However, the commonest source of iron in drinking water is corrosion of iron water mains. A national standard of 200µg/l applies.
Lead	very occasionally occurs naturally in raw waters, but the usual reason for its presence in drinking water is plumbing in older properties. If the water supply has a tendency to dissolve lead then water companies treat the water to reduce consumer exposure. The permanent remedy is for householders to remove lead pipes and fittings. A European health-based standard of 25µg/l applies, but 10µg/l will apply from 2013 onwards.
Manganese	is present naturally in many sources and is usually removed during treatment. A national standard of 50µg/l applies.
Mean zonal compliance percentage	a measure of compliance with drinking water standards introduced by the Inspectorate in 2004.
Mercury	is not found in sources of drinking water. A European health-based standard of 1µg/l applies.
Microbiological	associated with the study of microbes.
m³/d	cubic metre per day.
mg/l	milligram per litre (one thousandth of a gram per litre).

MI/d	megalitre per day (one MI/d is equivalent to 1,000 m ³ /d, or to 220,000 gallon/d).
µg/l	microgram per litre (one millionth of a gram per litre).
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. A European health-based standard of 20µg/l applies.
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. A European health-based standard of 50mg/l applies.
Nitrite	is sometimes produced as a by-product when chloramine is used as the essential residual disinfectant in a public water supply. Chloramine is the residual disinfectant of choice in large distributions systems because it is more stable and long-lasting. Careful operation of the disinfection process ensures levels of nitrite are kept below the standard. A European health-based standard of 0.5mg/l applies.
Odour	can arise as a consequence of natural processes in surface waters, particularly between late spring and early autumn. Water treatment with activated carbon or ozone will remove natural substances causing taste. The standard relates to the evaluations of a panel of people assessing samples in the laboratory.
Ofwat	the water industry's economic regulator.
Oocyst	the resistant form in which <i>Cryptosporidium</i> occurs in the environment, and which is capable of causing infection.
Organoleptic	characteristics of a substance as detected by our senses, for example taste, odour or colour.
Ozone process (ozonation)	the application of ozone gas in drinking water treatment.

Parameters	the substances, organisms and properties listed in Schedule 2 and Regulation 3 of the regulations. Parameter definitions can be found further on in this annex.
Pathogen	an organism which can infect humans and cause disease.
PCV	see 'Prescribed concentration or value'.
Periodic review	the economic regulator's process of setting water prices.
Pesticides	any fungicide, herbicide, insecticide or related product (excluding medicines) used for the control of pests or diseases.
Pesticides – organochlorine compounds (aldrin, dieldrin, heptachlor, heptachlor epoxide)	are no longer used in the UK because they are persistent in the environment. They are not found in drinking water. A European chemical standard of 0.03µg/l for each compound applies.
Pesticides – other than organochlorine compounds	is 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 and non-agricultural uses, mainly on crops and for weed control on highways and in gardens. Where needed, water companies have installed water treatment (activated carbon and ozone) so that pesticides are not found in drinking water. Water companies must test for those pesticides used widely in their area of supply. Pesticide monitoring thus varies according to risk. A European chemical standard of 0.1µg/l for each individual substance and 0.5µg/l for the total of all pesticides applies.
Phosphate dosing	treatment of water that results in a protective film building up on the inside of pipes minimising the likelihood of lead being present in drinking water supplied through lead pipes.
Plumbosolvency	the tendency for lead to dissolve in water.
Polycyclic aromatic hydrocarbons (PAHs)	is a group name for several substances present in petroleum-based products such as coal tar. (see Benzo(a)pyrene listed above for more information). A European health-based standard of 0.1µg/l for the sum of all the substances applies.

Powdered activated carbon (PAC)	powdered activated carbon is employed in treatment processes to remove pollutants.
Pre- and post- renovation assessment (PPRA)	a programme of assessment before and after mains renovation to demonstrate justification for the work, and the improvements achieved by the renovation.
Prescribed concentration or value (PCV)	the numerical value assigned to drinking water standards defining the maximal or minimal legal concentration or value of a parameter.
PR09	the periodic review process for setting water prices for 2010-2015.
Private supplies	water taken from private sources or supplied by non-licensed suppliers; supplies of water provided otherwise than by a statutorily appointed water undertaker.
Protozoan parasites	a single cell organism that can only survive by infecting a host.
Public Register	drinking water quality information made available to the public by water companies as required by regulations.
Public supplies	water supplied by a company licensed for that purpose.
Raw water	water prior to receiving treatment for the purpose of drinking.
Regulations	The Water Supply (Water Quality) Regulations 2000 (England), 2010 (Wales).
Remedial action	action taken to improve a situation.
Residual disinfectant	the small amount of chlorine or chloramines present in drinking water to maintain its quality as it passes through the water company's network of pipes and household plumbing.
Secretary of State	Secretary of State for Environment, Food and Rural Affairs.
Selenium	is an essential element and a necessary dietary component. Amounts in drinking water are usually well below the standard. A European health-based standard of 10µg/l applies.

Service connection	connection between the water company's main to a consumer's property.
Service pipe	the service pipe is the pipe that connects the consumer's property to the water company main. It comprises two parts – the communication pipe, which is the connection from the water main to the consumer's property boundary (normally at the outside stop tap), and the supply pipe, which runs from the boundary of the property to the consumer's inside stop tap.
Service reservoir	a water tower, tank or other reservoir used for the storage of treated water within the distribution system.
Sodium	is a component of common salt. It is present in seawater and brackish groundwater. Some treatment chemicals contain sodium. Concentrations in drinking water are extremely low, but some water softeners can add significant amounts to drinking water where they are installed in homes or factories. A national standard of 200mg/l applies.
Springs	groundwater appearing at the surface at the outcrop of the junction of a permeable stratum with an impermeable stratum.
Sulphate	occurs naturally in all waters and is difficult to remove by treatment. An indicator parameter with a guide value of 250mg/l.
Supply pipe	pipe connecting between the boundary of a consumer's property to the inside stop tap.
Supply point	a point other than a consumer's tap authorised for the taking of samples for compliance with the regulations.
Surface water	untreated water from rivers, impounding reservoirs or other surface water source.
Taste	can arise as a consequence of natural processes in surface waters, particularly between late spring and early autumn. Water treatment with activated carbon or ozone will remove natural substances causing taste. The standard relates to the evaluations of a panel of people assessing samples in the laboratory.
Technical audit	the means of checking that water companies are complying with their statutory obligations.

Tetrachloroethane and Trichloroethene	are solvents that may occur in groundwater in the vicinity of industrial sites. Where necessary they are removed by specialist treatment. A European health-based standard of 10µg/l for the sum of both substances applies.
Tetrachloromethane	is a solvent that may occur in groundwater in the vicinity of industrial sites. Where necessary it is removed by specialist water treatment. A national standard of 3µg/l applies.
Time of supply	the moment when water passes from the water company's pipework into a consumer's pipework.
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. An indicator parameter with a guide value of 0.10mSv/year.
Total organic carbon	represents the total amount of organic matter present in water. An indicator parameter with a guide value of 'no abnormal change'.
Toxicology	the study of the health effects of substances.
Treated water	water treated for use for domestic purposes as defined in the regulations.
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. A European health-based standard of 100µg/l applies.
Tritium	is a radioactive isotope of hydrogen. Discharges to the environment are strictly controlled and there is a national programme of monitoring surface waters. An indicator parameter with a guide value of 100Bq/l.

Turbidity	<p>is a measure of the cloudiness of water.</p> <p>At treatment works, measurement is an important non-specific water quality control parameter 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. An indicator parameter with a guide value of 1NTU.</p> <p>When detected at the consumer's tap it can arise from disturbance of sediment within water mains. A national standard of 4NTU applies in this case.</p>
Vinyl chloride	<p>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. A European health-based standard of 0.5µg/l applies.</p>
Water supply zone	<p>a pre-defined area of supply for establishing sampling frequencies, compliance with standards and information to be made publicly available.</p>
WHO	<p>World Health Organisation.</p>
Wholesome/wholesomeness	<p>a legal concept of water quality which is defined by reference to standards and other requirements set out in the regulations.</p>

Annex 3

Significant drinking water quality events

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
20 Jan 2009 For 36 hours (SRN)	Shoreham-by-Sea	1,000	Brown discolouration due to planned work.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Review of procedures. • Repaired main. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Inadequate risk assessment. • The Inspectorate was critical that no flushing was undertaken.
27 Jan 2009 For 4 weeks (SEW)	Burham works, operated by Southern Water, Kent	44,150	Metaldehyde in raw water.	<p>The Inspectorate classified this event as significant.</p> <p>South East Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommend that reports are submitted in the required timescales. • Enforcement action initiated.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
29 Jan 2009 For 30 days (SRN)	Beauport works, Hastings, West Sussex	104,000	Isoproturon in raw water.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Liaising with the Environment Agency and ADAS to undertake work in the catchment regarding the usage of isoproturon. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Investigation ongoing. • Recommended company keeps Inspectorate informed of investigations.
12 Feb 2009 For 14 days (SEW)	Bough Beech works, operated by Sutton and East Surrey Water, supplying East Surrey	215	Carbetamide in raw water.	<p>The Inspectorate classified this event as significant.</p> <p>South East Water action:</p> <ul style="list-style-type: none"> • Carbetamide included with metaldehyde in legally binding to provide alternative to bulk supply from Sutton and East Surrey Water. • Events are related to bulk water import. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommended reporting of events in a more timely manner following failure to meet the requirements of Section 7 of the Water Undertakers (Information) Direction 2004. • The Inspectorate initiated enforcement action.
16 Feb 2009 For 1 day (SRN)	Broadwater works supplying parts of West Sussex	98,456	Detection of <i>E.coli</i> in treated water.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Investigated the treatment process. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • The Inspectorate suggested that the company review and update its Regulation 27 risk assessment and consider further investigation of the granular activated carbon (GAC) filters on site.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
21 Feb 2009 For 6 hours (SRN)	Beauport works supplying parts of West Sussex	104,000	Loss of dosing due to plant failure.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Repaired faulty equipment. • Sampled affected area. • Reminded staff of the importance of the use of the run to waste facility and review of associated procedure. • Installed new turbidity meters on the filter outlets. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommended comprehensive sampling for the appropriate parameters. • Recommended review and update of risk assessment with regard to disinfection and loss of poly dosing risks Critical of discrepancy between turbidity meter and sample and recommended this be further investigated and problems rectified. • Recommended the company ensures appropriate procedures are in place in the interim period before disinfection system upgrade completed.
18 Mar 2009 For 2 days (SRN)	Burham works, Kent	44,150	Carbetamide in raw water.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Regenerated GAC unit. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommended the company ensures GAC units were regenerated at different frequencies and regime to ensure that works has capacity to deal with varying flow and demand.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
24 Mar 2009 For 1 day (SEW)	Burham works, operated by Southern Water, Kent	44,150	Carbetamide in raw water.	<p>The Inspectorate classified this event as significant.</p> <p>South East Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Liaised with Southern Water, the provider of the bulk supply. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Event related to bulk water import from Southern Water. (See above) Recommended the company ensures GAC units were regenerated at different frequencies and regime to ensure that works has capacity to deal with varying flow and demand.
07 Apr 2009 For 1 day (PRT)	Clanfield area	8,250	Cat litter odour due to uncured sealant following service reservoir refurbishment.	<p>The Inspectorate classified this event as significant.</p> <p>Portsmouth Water action:</p> <ul style="list-style-type: none"> • Removed service reservoir from supply. • Flushed mains. • Sampled affected area. • Review of procedures. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • The Inspectorate noted the company actions to put in place procedures to address verification of repairs using sealant and work with manufacturer to address issue.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
04 May 2009 For 4 weeks (SRN)	Amport, near Andover	125	Green/brown discolouration.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Flushed mains. • Provided bottled water on request. • Rezoned area (brought in water from different source). • Sampled affected area. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Cause not identified by company, but potential boundary valve operation by unauthorised third party or back siphonage. • Recommend future investigational sampling is conducted before and after flushing activities to ensure that the source of contamination can be identified.
15 May 2009 For 12 hours (SEW)	Bexhill on Sea, Sussex	16,405	Brown discolouration of unknown cause.	<p>The Inspectorate classified this event as significant.</p> <p>South East Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Flushed mains. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Cause not identified by company, however, there was some network activity in the area to repair a leak in the days prior to the event. • Recommend future investigational sampling is conducted before and after flushing activities to ensure that the source of contamination can be identified.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
03 Jun 2009 For 12 hours (SEW)	Farnham	12,000	Brown discolouration due to planned work.	<p>The Inspectorate classified this event as significant.</p> <p>South East Water action:</p> <ul style="list-style-type: none"> • Flushed mains. • Sampled affected area. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Inadequate risk assessment. • Initiated enforcement action requiring the company to enter into a legally binding agreement to take action to investigate and mitigate against further discolouration by investigation of Bourne works and supplying distribution system.
05 Jun 2009 For 3 days (SEW)	Chilles service reservoir supplying parts of East Sussex	70,000	Detection of coliforms in treated water.	<p>The Inspectorate classified this event as significant.</p> <p>South East Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • The Inspectorate suggested that the company continue to optimise treatment to ensure that water leaving the works was of satisfactory quality. • The Inspectorate suggested that the company prioritise monitoring and maintenance of this area of their network.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
09 Jun 2009 For 1 day (SEW)	Hindhead service reservoir supplying Hindhead	8,969	Brown discolouration due to loss of supplies (service reservoir emptying).	<p>The Inspectorate classified this event as significant.</p> <p>South East Water action:</p> <ul style="list-style-type: none"> • Flushed mains. • Sampled affected area. • Reinstated booster pumps. • Reviewed alarm settings and alarm levels in the control room. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Sampling was not timely enough. • Samples not analysed for appropriate parameters. • Recommended the company review the need for risk assessments to be completed in all circumstances, prior to the commencement of any work. • Recommended the company continue to investigate the cause of the failure of the booster pumps. • Recommended the company continue to investigate the cause of the discolouration events to determine the nature, cause and extent of the mains deposits and sediment. • Recommended the company ensure they report all relevant samples and information is provided in the relevant event report. • Recommended the company carries out appropriate sampling/analysis during all events. • Enforcement action under consideration.
16 Sep 2009 For 4 days (SRN)	Luton works supplying parts of Kent	190,000	Detection of <i>E.coli</i> and coliforms in treated water.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Increased chlorine residuals at treatment works. • Sampled affected area. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Regulation 28(4) Notice issued as deficiency noted with works performance under full flow conditions.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
20 Sep 2009 For 1 day (SRN)	Burham works, Otterbourne works, Twyford works and Broadwater works supplying West Sussex	340,000	Coliforms and <i>E.coli</i> due to laboratory contamination.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Typing of <i>E.coli</i> showed it to be the result of laboratory contamination. • Full investigation undertaken by external consultants of analytical service provider. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Incomplete separation of the routine analysis and the analytical quality control tests. • Highly critical that this deficiency had not been identified earlier by the laboratories. • Recommended that investigations are conducted when negative controls contain colonies. Abnormally high counts and failed quality control plate were not investigated. • Recommended that the laboratory reviews its procedures for the checking and interpretation of results associated with environmental monitoring. • Recommended that laboratories ensure good aseptic technique is practiced throughout the laboratories at all times. • Recommended Southern Water continues to carefully monitor the practices at the laboratories to ensure an adequate response to all the recommendations by its consultants. • Recommended that evidence is provided, to demonstrate the analysts and/or their team leader are compliant with Regulation 16(2)(d)(i). • Recommended the company review its arrangements for notifying the Inspectorate of events to ensure it complies with the requirements of the Direction.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
19 Oct 2009 For 1 day (VSE)	Rakeshole works supplying parts of south east Kent	33,059	Inadequate disinfection.	<p>The Inspectorate classified this event as significant.</p> <p>Veolia Water Southeast action:</p> <ul style="list-style-type: none"> • Flushed mains. • Repaired faulty equipment. • Review of procedures. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Improvements needed to automated control system. • Critical that operations staff did not initially identify problem.
19 Oct 2009 For 3 hours (SRN)	Burham works, Kent	332,000	Loss of disinfection due to plant failure.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Repaired faulty equipment. • Shut down treatment works. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommended the company update its disinfection policy to include the method outlining how the disinfection standard is derived. This should also define the means by which the company carries out monitoring to show that the company is meeting its own policy.
26 Nov 2009 For 2 days (SEW)	Heathfield, East Sussex	5,000	Brown discolouration due to planned work.	<p>The Inspectorate classified this event as significant.</p> <p>South East Water action:</p> <ul style="list-style-type: none"> • Flushed mains. • Repaired main. • Sampled affected area. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Company should work with third party contractor to ensure that essential equipment such as large volume pumps, are available promptly as part of contingency planning.

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
15 Dec 2009 For 5 days (SRN)	Romsey, Hampshire	17,500	Brown discolouration due to planned work.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Provided bottled water on request. • Flushed mains. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Recommended that network operators use (and can demonstrate application of) informed technical judgement and guidance via robust procedures to ensure that actions taken to prevent discolouration are effective. • Recommended that the company takes a more proactive and informed approach to planned work and rezoning. • Recommended that the company reviews and updates its risk assessments in light of the hazards and risks identified by this event.
17 Dec 2009 For 24 hours (SRN)	Areas of Hythe, Dibden Purlieu, Blackfield, Fawley	59,081	Brown discolouration due to third party damage to main.	<p>The Inspectorate classified this event as significant.</p> <p>Southern Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Repaired main. • Review of procedures. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Delay in company notification to the Inspectorate arising from issues at company call centre.

Events in the Southern region outstanding from 2008

Date and duration	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the Inspectorate investigation
05 Nov 2008 For 1 day (SRN)	Matts Hill works supplying parts of Mid Kent (see below)	133,000	Turbidity in raw water.	<p>Southern Water action:</p> <ul style="list-style-type: none"> • Sampled affected area. • Review of procedures. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Inadequate procedures. • Inadequate treatment process – filtration. • Inadequate communication caused delay in response. • Supplied unwholesome water in breach of regulations. • The company pleaded guilty to three offences on 17 May 2010 (see <i>Drinking water quality events</i> section)
01 Dec 2008 For 1 day (SRN)	Matts Hill works supplying parts of Mid Kent	133,000	<i>Cryptosporidium.</i>	<p>Southern Water action:</p> <ul style="list-style-type: none"> • Shut down treatment works. • Sampled affected area. <p>DWI comments and findings:</p> <ul style="list-style-type: none"> • Satisfied with the company response

Note: A complete table of significant events in England and Wales in 2009 can be found on the CD in the folder. It is named **Significant drinking water quality events in England and Wales 2009.pdf**. It is also available on the DWI website (www.dwi.gov.uk).

Annex 4

Planned drinking water quality improvements

Company	Parameter, hazard or driver	Site	Due for completion	Status	Legal instrument
PRT	Iron and Manganese	Farlington	30-Jun-06	Completed 31-Mar-09	Undertaking
PRT	Nitrate	Maindell	31-May-09	Completed 30-Mar-10	Undertaking
PRT	Nitrate	Northbrook	28-Feb-09	Completed 9-Feb-10	Undertaking
PRT	Total Trihalomethanes	River Itchen	31-Mar-13	Ongoing	Undertaking
SEW	<i>Cryptosporidium</i>	Arlington	31-Feb-15	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Barcombe	31-Mar-13	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Bray	31-Mar-12	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Cow Wish	31-Mar-12	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Crowhurst Bridge	31-Mar-14	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Deep Dean	31-Mar-12	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Filching	31-Mar-11	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Friston	31-Mar-14	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Greywell	31-Mar-14	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Hazards Green	31-Mar-15	Ongoing	Notice
SEW	<i>Cryptosporidium</i>	Tonbridge	31-Mar-13	Ongoing	Notice
SEW	<i>E.coli</i>	Forstal	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Barcombe	31-Mar-10	Ongoing	Notice
SEW	Inadequate disinfection	Birling farm works	31-Dec-12	Ongoing	Notice
SEW	Inadequate disinfection	Clayton	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Cliddesden	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Coombe	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Cornish	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Cow Wish	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Cramptons	31-Dec-10	Ongoing	Notice

Company	Parameter, hazard or driver	Site	Due for completion	Status	Legal instrument
SEW	Inadequate disinfection	Deep Dean	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Filching	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Friston	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Greywell	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Hackenden	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Holywell Eastbourne	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Lasham	31-Dec-11	Ongoing	Notice
SEW	Inadequate disinfection	Maidenhead College Avenue	31-Dec-11	Ongoing	Notice
SEW	Inadequate disinfection	Newnham	31-Dec-12	Ongoing	Notice
SEW	Inadequate disinfection	Oak Lane	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Offham	31-Mar-11	Ongoing	Notice
SEW	Inadequate disinfection	Poverty Bottom 4	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Poverty Bottom 6	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Rathfinney	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Saddlescombe	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Trosley	31-Dec-09	Ongoing	Notice
SEW	Inadequate disinfection	Waterworks Road	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Whitelands	31-Mar-12	Ongoing	Notice
SEW	Inadequate disinfection	Winecockshaw	31-Dec-10	Ongoing	Notice
SEW	Inadequate disinfection	Woodgarston	31-Dec-10	Ongoing	Notice
SEW	Insufficient treatment/control (pesticide)	Pembury	31-Mar-10	Ongoing	Notice
SEW	Insufficient treatment/control (turbidity)	Pembury	31-Mar-10	Ongoing	Notice
SEW	Integrity	Blackhill, Frith Hill and Hale Tower	31-Mar-11	Ongoing	Notice

Company	Parameter, hazard or driver	Site	Due for completion	Status	Legal instrument
SEW	Integrity	Butlers Green, Chillies, Cottage Hill and Cuckfield reservoir	TBC	Ongoing	Notice
SEW	Integrity	Cargate and Hog Backs	31-Mar-11	Ongoing	Notice
SEW	Integrity	Clayton	31-Mar-11	Ongoing	Notice
SEW	Integrity	Hindhead reservoir	TBC	Ongoing	Notice
SEW	Integrity	Hindhead works	31-Dec-11	Ongoing	Notice
SEW	Integrity	Maidenhead College Avenue	31-Dec-11	Ongoing	Notice
SEW	Integrity	Meads and Mill Gap	31/03/2010, 31/03/2015	Ongoing	Notice
SEW	Integrity	St Lawrence	31-Mar-15	Ongoing	Notice
SEW	Integrity	Telham Tower	31-Mar-10	Ongoing	Notice
SEW	Integrity	Tilmore and Wetherdown	31-Mar-11	Ongoing	Notice
SEW	Integrity	Wych Cross	31-Mar-15	Ongoing	Notice
SEW	Iron	Ashford Distribution	31-Dec-14	Ongoing	Undertaking
SEW	Iron	Greatham and Headley	No construction – investigation only	Completed	Undertaking
SEW	Iron	Trosley and Borough Green	31-Dec-09	Completed 18-Dec-09	Undertaking
SEW	Metaldehyde	Arlington	31-Mar-15	Ongoing	Undertaking
SEW	Metaldehyde	Barcombe	31-Mar-15	Ongoing	Undertaking
SEW	Metaldehyde	Bewl	31-Mar-15	Ongoing	Undertaking
SEW	Metaldehyde	Bray	31-Mar-15	Ongoing	Undertaking
SEW	Metaldehyde	Burham Bulk Supply	31-Mar-15	Ongoing	Undertaking
SEW	Metaldehyde	Crowhurst Bridge	31-Mar-15	Ongoing	Undertaking
SEW	Metaldehyde	Furnace Wood Zone	31-Dec-11	Ongoing	Undertaking
SEW	Metaldehyde	Hazards Green	31-Mar-15	Ongoing	Undertaking
SEW	Metaldehyde	North Surrey Bulk Supply	31-Mar-15	Ongoing	Undertaking

Company	Parameter, hazard or driver	Site	Due for completion	Status	Legal instrument
SEW	Raw water protection	Forest Row	31-Mar-15	Ongoing	Notice
SEW	Raw water protection	Waterworks Road	31-Mar-12	Ongoing	Notice
SEW	Taste and Odour	Shellbrook	31-Mar-11	Ongoing	Undertaking
SRN	Coliform, <i>E.coli</i> , Enterococci	Twyford	31-Dec-09	Completed 4-Dec-09	Undertaking
SRN	<i>Cryptosporidium</i> / Turbidity	Matts Hill	31-Mar-11	Ongoing	Notice
SRN	Inadequate disinfection	Broadwater	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Calbourne	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Chilbolton	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Chillerton	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Gore	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Housedean	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Lord of the Manor	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Luton	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Minster	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Mossy Bottom	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Nashenden	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Newmarket	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Shoreham	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Sompting	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Sondhurst	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Southover	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Stanhope lodge	31-Mar-15	Ongoing	Notice
SRN	Inadequate disinfection	Twyford	TBC	Ongoing	Notice
SRN	Inadequate disinfection	Ventnor	31-Mar-15	Ongoing	Notice
SRN	Iron	Distribution system	30-Sep-13	Ongoing	Undertaking

Company	Parameter, hazard or driver	Site	Due for completion	Status	Legal instrument
SRN	Iron	Woolmans Wood	31-Mar-12	Ongoing	Undertaking
SRN	Metaldehyde	Burham	31-Mar-15	Ongoing	Undertaking
SRN	Metaldehyde and Isoproturon	Beauport	31-Dec-13	Ongoing	Undertaking
SRN	Metaldehyde, 2.4-D and MCPA	Brede	31-Dec-13	Ongoing	Undertaking
SRN	Tetrachloroethane /Trichloroethane – sum of two substances	Fawkham	31-Mar-11	Ongoing	Notice
VSE	Turbidity, Iron and Manganese	Denge	28-Feb-13	Ongoing	Undertaking

Annex 5 Competition in the water industry

The following table indicates the extent of competition in the water industry in England and Wales.

Inset appointments in place in 2009

Site	Appointee	Incumbent and region	Status
Buxted Chicken, Flixton	Anglian Water	Essex and Suffolk Water, Eastern region	Supplying water
Shotton Paper, Shotton	Albion Water	Dŵr Cymru, Wales	Supplying water
Fairfield Park and Lower Wilbury Farm, Arlesey	Veolia Water Central	Anglian Water, Eastern region	Supplying water
The Portway, near Salisbury	SSE Water	Wessex Water, Western region	Supplying water
Wynyard, near Wolviston	Hartlepool Water	Northumbrian Water, Northern region	Supplying water
Long Croft Road, Corby	Independent Water Networks Ltd	Anglian Water, Eastern region	Supplying water
Priors Hall, Corby	Independent Water Networks Ltd	Anglian Water, Eastern region	Supplying water
Great Billing Way, Northampton	Independent Water Networks Ltd	Anglian Water, Eastern region	Supplying water
Media City, Salford Quays	Peel Water Networks Ltd	United Utilities, Northern region	Supplying water
MoD Tidworth near Andover	Veolia Water Projects	Wessex Water, Western region	Supplying water
Hale Village, Tottenham	SSE Water	Thames Water, Thames region	Supplying water

New inset appointments in place for 2010 (by 31 May 2010)

Site	Appointee	Incumbent and region	Status
Llanilid Park, South Wales	SSE Water	Dŵr Cymru, Wales	Appointment granted
Kennet Island, Reading	SSE Water	Thames Water, Thames region	Supplying water
Brooklands, Milton Keynes	Independent Water Networks Ltd	Anglian Water, Eastern region	Supplying water
Bromley Common, Bromley	SSE Water	Thames Water, Thames region	Supplying water
Park Views, Epsom	SSE Water	Thames Water, Thames region	Supplying water
The Bridge, Dartford	Independent Water Networks Ltd	Thames Water, Thames region	Appointment granted

Water supply licenses in place in 2010

Name of company	License type	Date license granted by Ofwat	Status
Aquavitae	Combined	1 December 05	Licence revoked
Watercall Ltd	Combined	1 December 05	Inactive
Severn Trent Water Select Ltd	Combined	1 December 05	One retail customer Eastern region
YorWater Ltd	Retail	21 March 06	Not yet operating
Satec Ltd	Combined	24 May 06	Not yet operating
UU Water Sales Ltd	Combined	3 January 07	Not yet operating
Osprey Water Services Ltd	Combined	5 January 07	Not yet operating
Business Stream	Retail	23 January 09	Not yet operating

Annex 6

Water company indices

Portsmouth Water Ltd

Water supply arrangements

Company assets		Water supplied	
Number of treatment works	19	Water supplied (MI/day)	182
Number of service reservoirs	32	Percentage from surface sources	42
Number of water supply zones	13	Percentage from ground sources	58
Length of mains pipe (km)	3,273	Percentage from mixed sources	0
Population served		Area of supply	
Population supplied	666,000	Hampshire, West Sussex	
Number of local authorities	9		

Drinking water quality summary data

	Company figure			Industry average
	2007	2008	2009	2009
Overall drinking water quality¹	99.97%	99.95%	99.98%	99.95%
Water treatment				
Process Control Index	100%	99.99%	100%	99.97%
Disinfection Index	100%	100%	100%	99.94%
Distribution systems				
Distribution Maintenance Index	99.95%	100%	100%	99.86%
Reservoir Integrity Index	100%	100%	100%	99.96%
Building water systems				
Parameters influenced by domestic water systems	99.79%	99.89%	99.88%	99.87%

Consumer contacts

	Company figure			Industry average
	2007	2008	2009	2009
Informing consumers				
Total number	148	329	309	N/A
Rate per 1,000 population	0.22	0.5	0.46	1.38
Acceptability of water to consumers				
Total number	214	427	373	N/A
Rate per 1,000 population	0.32	0.65	0.56	2.21

Complaints to the Drinking Water Inspectorate

No consumers of Portsmouth Water Ltd directly contacted DWI in 2009.

Note: Summary results for each company of tests for individual parameters are supplied on the DWI website at www.dwi.gov.uk

¹Overall drinking water quality as represented by mean zonal compliance for 39 parameters.

South East Water Ltd

Water supply arrangements

Company assets		Water supplied	
Number of treatment works	96	Water supplied (MI/day)	504
Number of service reservoirs	237	Percentage from surface sources	9
Number of water supply zones	93	Percentage from ground sources	85
Length of mains pipe (km)	14,177	Percentage from mixed sources	6
Population served		Area of supply	
Population supplied	1,979,786	Parts of West Sussex, East Sussex, Kent, Hampshire, Berkshire and Surrey	
Number of local authorities	30		

Drinking water quality summary data

	Company figure			Industry average
	2007	2008	2009	2009
Overall drinking water quality¹	99.95%	99.93%	99.97%	99.95%
Water treatment				
Process Control Index	100%	100%	100%	99.97%
Disinfection Index	99.94%	99.92%	99.97%	99.94%
Distribution systems				
Distribution Maintenance Index	99.79%	99.75%	99.93%	99.86%
Reservoir Integrity Index	99.86%	99.91%	99.94%	99.96%
Building water systems				
Parameters influenced by domestic water systems	99.52%	99.71%	99.84%	99.87%

Consumer contacts

	Company figure			Industry average
	2007	2008	2009	2009
Informing consumers				
Total number	2,361	1,313	1,787	N/A
Rate per 1,000 population	1.61	0.65	0.87	1.38
Acceptability of water to consumers				
Total number	2,985	4,321	3,770	N/A
Rate per 1,000 population	2.03	2.12	1.83	2.21

Complaints to the Drinking Water Inspectorate

A total of three consumers of South East Water Ltd directly contacted DWI in 2009.

Note: Summary results for each company of tests for individual parameters are supplied on the DWI website at www.dwi.gov.uk

¹Overall drinking water quality as represented by mean zonal compliance for 39 parameters.

Southern Water Services Ltd

Water supply arrangements

Company assets		Water supplied	
Number of treatment works	99	Water supplied (MI/day)	556
Number of service reservoirs	237	Percentage from surface sources	22
Number of water supply zones	84	Percentage from ground sources	48
Length of mains pipe (km)	13,480	Percentage from mixed sources	30
Population served		Area of supply	
Population supplied	2,275,505	Isle of Wight and parts of Kent, Sussex and Hampshire	
Number of local authorities	27		

Drinking water quality summary data

	Company figure			Industry average
	2007	2008	2009	2009
Overall drinking water quality¹	99.94%	99.97%	99.97%	99.95%
Water treatment				
Process Control Index	>99.99%	99.94%	99.97%	99.97%
Disinfection Index	99.94%	99.93%	99.92%	99.94%
Distribution systems				
Distribution Maintenance Index	99.85%	99.88%	99.89%	99.86%
Reservoir Integrity Index	99.96%	99.98%	99.94%	99.96%
Building water systems				
Parameters influenced by domestic water systems	99.75%	99.94%	99.92%	99.87%

Consumer contacts

	Company figure			Industry average
	2007	2008	2009	2009
Informing consumers				
Total number	343	298	563	N/A
Rate per 1,000 population	0.15	0.13	0.24	1.38
Acceptability of water to consumers				
Total number	4,167	3,260	3,687	N/A
Rate per 1,000 population	1.8	1.4	1.58	2.21
Complaints to the Drinking Water Inspectorate				
A total of two consumers of Southern Water Services Ltd directly contacted DWI in 2009.				

Note: Summary results for each company of tests for individual parameters are supplied on the DWI website at www.dwi.gov.uk

¹Overall drinking water quality as represented by mean zonal compliance for 39 parameters.

Veolia Water Southeast Ltd

Water supply arrangements

Company assets		Water supplied	
Number of treatment works	18	Water supplied (MI/day)	44
Number of service reservoirs	12	Percentage from surface sources	0
Number of water supply zones	6	Percentage from ground sources	100
Length of mains pipe (km)	1,116	Percentage from mixed sources	0
Population served		Area of supply	
Population supplied	158,000	Kent	
Number of local authorities	4		

Drinking water quality summary data

	Company figure			Industry average
	2007	2008	2009	2009
Overall drinking water quality¹	100%	100%	>99.99%	99.95%
Water treatment				
Process Control Index	100%	100%	100%	99.97%
Disinfection Index	99.76%	99.93%	99.98%	99.94%
Distribution systems				
Distribution Maintenance Index	100%	100%	100%	99.86%
Reservoir Integrity Index	100%	100%	100%	99.96%
Building water systems				
Parameters influenced by domestic water systems	99.94%	99.96%	99.92%	99.87%

Consumer contacts

	Company figure			Industry average
	2007	2008	2009	2009
Informing consumers				
Total number	45	31	17	N/A
Rate per 1,000 population	0.28	0.2	0.11	1.38
Acceptability of water to consumers				
Total number	285	257	210	N/A
Rate per 1,000 population	1.80	1.62	1.33	2.21
Complaints to the Drinking Water Inspectorate				
No consumers of Veolia Water Southeast Ltd directly contacted DWI in 2009.				

Note: Summary results for each company of tests for individual parameters are supplied on the DWI website at www.dwi.gov.uk

¹Overall drinking water quality as represented by mean zonal compliance for 39 parameters.



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