Drinking water 2016

Quarter 3
July – September 2016

January 2017

A report by the Chief Inspector of Drinking Water

Drinking water 2016

Public water supplies for England and Wales

Quarter 3
July – September 2016

Published by
Drinking Water Inspectorate
Area 7e
9 Millbank
c/o Nobel House
17 Smith Square
London
SW1P 3JR

Tel: 0300 068 6400

Website: http://www.dwi.defra.gov.uk

ISBN: 978-1-911087-14-4

Contents

Foreword

Drinking Water 2016 Q3 is part of the annual publication of the Chief Inspector of Drinking Water for England and Wales. It is published as a series of quarterly reports which cover public water supplies in England and Wales.

The report sets out to develop a source to tap approach in the supply of water, developing learning points from recent data, events and company strategies and, in this instance, follows the first annual resubmission of Regulations 28 and 29. It builds upon the strategic objective of the Drinking Water Inspectorate (DWI) for safe, clean and wholesome drinking water to all consumers at all times.

Risk management of catchments is developed by taking raw water data for pesticides which exceed 0.1µg/l, adopting the principle that to ensure water meets regulatory standards for drinking, mitigation and/or treatment is necessary. Current data suggest that improvement in environmental pesticides is yet to significantly improve and water companies are having to manage this through their activities in abstraction. For drinking water storage in clean water tanks and service reservoirs, evidence indicates that some companies still depend upon reactive strategies to respond to failures rather than develop a long-term proactive strategy. Nevertheless, generally companies seem content to run a significant residual risk and it is only when this risk is strategically driven down that long-term benefits and a reduction in failures will be found. Finally, there are clear differences in the way companies allocate or categorise risk and comparisons become difficult. This is most evident in the consumer distribution system where the interpretation of 'partial mitigation' varies widely between some companies. To develop this learning the Inspectorate will run workshops and continue to discuss differences in the Chief Inspector's Report. For future improvement, companies will need to align their understanding and work together to implement long-term solutions in those areas and develop wider stakeholder engagement and collaboration for strategies to be effective.

Chapter 1: Drinking water sources and catchment management

The Inspectorate supports the view that management of catchments is a crucial approach to reducing water treatment and the inherent costs to water companies, as well as providing wider benefits for the environment, wildlife and their habitats.

Water companies determine the suite of pesticides to be monitored and where monitoring should take place in response to their assessment of risk. As a result of this monitoring is only required where the company's assessment determines there is a risk.

For this report, the Inspectorate reviewed data for pesticides for untreated water and treated water for the last three years.

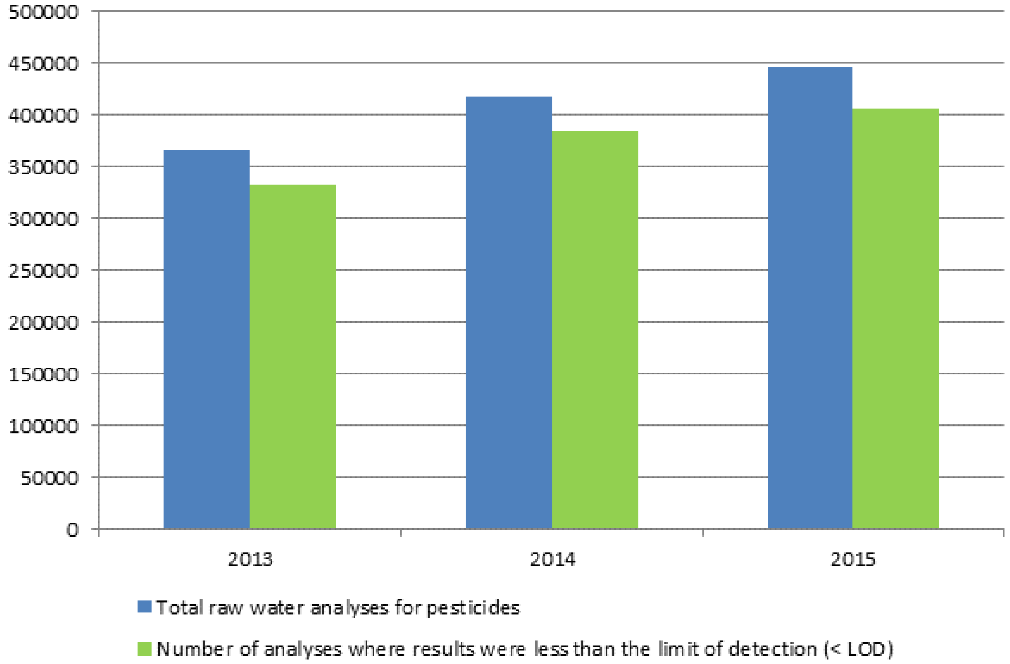
Untreated water monitoring

The review of untreated water identified that over the last three years, the number of analyses carried out by companies for pesticides has increased by just over 20% from 366,890 in 2013 to 446,264 in 2015. During this period, the percentage of samples where pesticides have been detected remains consistent at around 9% of samples confirming that pesticides continue to be a challenge and highlighting the need for all stakeholders involved in managing the environment and water abstraction to produce and maintain an effective strategy to tackle the problem.

Table 1: Analysis of pesticide data from analyses of untreated water 2013-2015

	2013	2014	2015
Total raw water analyses for pesticides	366,890	417,612	446,264
Number of analyses where results were less than the limit of detection (< LOD)	333,392	384,296	406,069
Percentage of analyses where results were less than the limit of detection (< LOD)	91%	92%	91%
Percentage of analyses where results were above the general pesticide standard for treated water (0.1µg/l)	0.58%	0.46%	0.43%
Number of abstraction points sampled	1,476	1,497	1,509
Number of abstraction points with detections above the general pesticide standard for treated water (0.1µg/l)	167	177	159
Percentage of abstraction points with detections above the general pesticide standard for treated water (0.1µg/l) from those deemed at risk.	11.3%	11.8%	10.5%

Figure 2: Total analyses for pesticides in untreated water and number exceeding 0.1µg/l 2013-2015

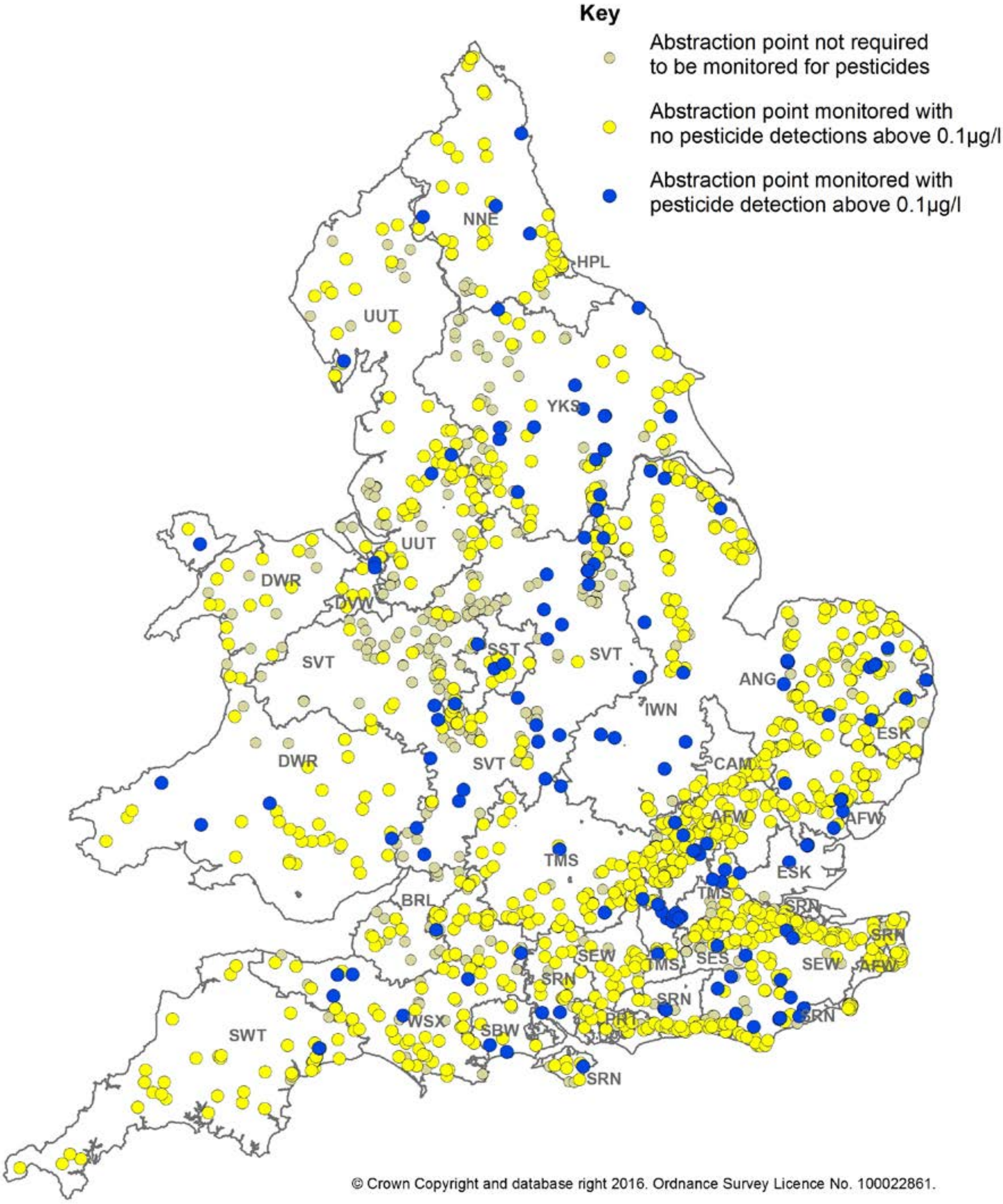


The top ten pesticides detected in untreated water from 2013-2015 are shown in Table 3, the location of detections can be seen in Figure 4. The type and locations of the detections compare with those pesticides found in surface and groundwaters at risk in drinking water protected areas published in November 2015 by the Environment Agency.

Table 3: Numbers of detections above 0.1µg/l in untreated water

	Year		
Pesticide	**2013**	**2014**	**2015**
Metaldehyde	806	609	590
Propyzamide	339	318	430
Glyphosate	188	268	319
Carbetamide	265	54	91
Bentazone	61	72	44
MCPP (Mecoprop)	61	73	27
MCPA	35	83	39
Atrazine	18	61	62
Clopyralid	70	30	35
Qunimerac	35	48	40
Total	1,878	1,616	1,677

Figure 4: Abstraction points, monitoring and detections of pesticides in untreated water in 2015

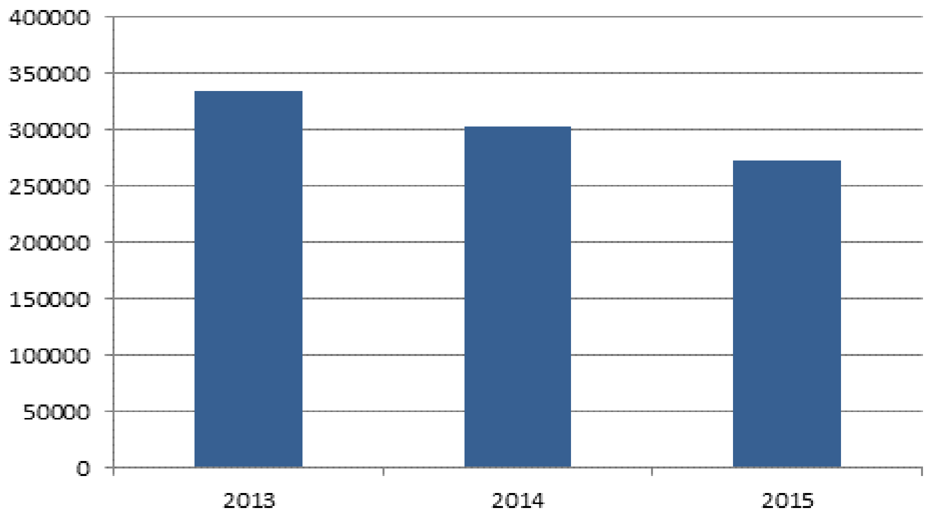


There is no standard for pesticides in untreated water, but the Water Framework Directive (2000/60) requires ‘the necessary protection for the bodies of water identified with the aim of avoiding deterioration in their quality to reduce the level of purification treatment required in the production of drinking water’. For the majority of pesticides in treated water the standard is 0.1µg/l, so the untreated water data was reviewed to identify the extent of samples exceeding this level and thus warranting treatment. The percentage of analyses where a pesticide was detected at greater than 0.1µg/l has fallen very slightly over the three years from 0.58% in 2013 to 0.43% in 2015 and this may indicate some success with application strategies reducing the quantity in the environment. Further assessment of the numbers of abstraction points where one or more pesticides were detected in 2015 showed 10.5% of abstraction points that companies chose to monitor based on risk assessment had a sample that exceeded the 0.1µg/l drinking water standard for pesticides. This means one in ten abstraction points used for drinking water requires treatment to meet drinking water regulations.

Treated water

The review also considered treated water and over the three years the number of samples taken in treated water has decreased by approximately 20% from 334,164 to 272,332. The reduction in numbers reflects two key actions by companies: substitution of repetitive zonal sampling with samples taken at a supply point and reduction of unnecessary sampling in final water when the risk of the pesticide can be shown to be absent from raw water monitoring and effective risk management. The latter of these two actions will reflect the risk-based monitoring requirements set out in the next revision of the regulations.

Figure 5: Number of pesticide analyses in treated water 2013-2015



For all but four pesticides, the standard set is as a surrogate zero, the original objective of the Drinking Water Directive in 1980, reflecting that consumers do not want to receive water containing pesticides. The standard adopted is lower than that which would cause a health impact, hence a breach of the standard does not automatically mean that there would be an impact on human health. It would depend on the levels detected and which pesticide was present.

Since 2013, 13 pesticides have been detected at a level above the standard in treated water supplies. The number of samples not meeting the relevant standards has been dominated by detections of metaldehyde, however, these have reduced by 80% over the three-year period from 325 to 65. Other pesticides are detected sporadically and have also reduced from 25 detections in 2013 to just 4 in 2015. The data indicates improvement in water quality in the catchment is not visible and improvements are attributable to treatment and management processes of water companies.

There is very little effective treatment for metaldehyde, and where treatment is in place, it is very expensive. The improvements have come about by the water industry’s adoption of more effective monitoring strategies combined with active abstraction management with a view to improving water quality with some very limited additional treatment. Having to manage abstraction to avoid the presence of pesticides reduces the opportunities for abstraction and any impact water resources and supplies, and treatment of metaldehyde may run the unknown risk of degradation products of treatment, which themselves, while not pesticides, may result in greater concern.

Considering the whole picture presented by analysis of treated and untreated water, while the proportion of untreated water samples above 0.1ug/l has not appreciably changed, this is in stark contrast to the detections in treated water which have reduced markedly.

Table 6: Number of treated water samples breaching standard for pesticides 2013-2105

	Year		
Pesticide	**2013**	**2014**	**2015**
Metaldehyde	325	134	65
Carbetamide	7		
2,4-D	4	1	1
MCPA	4	4	
Propyzamide	3		2
Clopyralid	2	1	
MCPP(Mecoprop)	2		
Quinmerac	2		
Carbendazim		1	
Mecoprop-P			1
Oxadixyl		1	
Pendimethalin		1	
Trichlopyr	1		
Total	350	143	69

When considering the wider picture of risk assessments submitted by companies, 213,791 total hazards/risks for catchment were assessed by companies in 2016, of these 134 require mitigation as none is in place. An example of one such risk other than pesticides is for odour from geosmin created by algae blooms in catchment. The Inspectorate has put a legally binding instrument in place to compel the company to take a number of steps reduce the risk. These include management of the reservoir abstraction and further studies of conditions which encourage algal growth.

Figure 7 shows the smallest percentage relates to those risks where additional control measures which will materially reduce risk and where the control measures are being validated, (B) risks (77). The largest number of risks, 84,415, are categorised by companies as those which have no mitigation in place and none is required, (H).

It is of note that all but one of the companies with bulk supplies categorised the target risk mitigation achieved, verified and maintained, (A), and therefore are considered low risk with only one company identifying additional control measures required to materially reduce risk, (D). This largely arises from the assumption that the exporting company is taking actions to address any known risks and the importing company accepting the supply without any further mitigation measures. The occurrence of past events, where for instance pesticides have been exported to an unsuspecting company, would indicate that the responsibility for understanding risk and being responsible for mitigation must rest with both parties. The Inspectorate is currently working with companies and incoming new appointees such as Icosa Water to ensure understanding of the likely impacts of receiving a bulk supply and the use of risk assessments as the water market widens. The Inspectorate expects companies to continue to work with those to whom they provide a bulk supply to share hazard information as part of the bulk supply agreement and to continue to implement drinking water safety plans as a dynamic and proactive business tool.

Figure 7: Numbers of risks by category in catchment

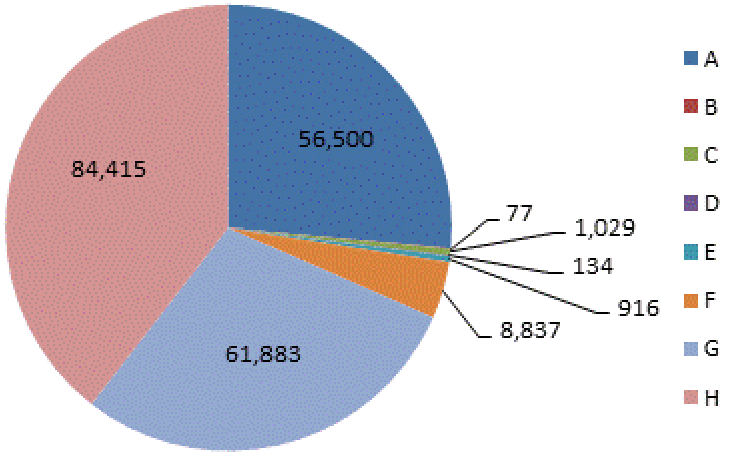


Table 8: Table of risk assessment categories

Category	Description
A	Target risk mitigation achieved, verified and maintained.
B	Additional control measures which will materially reduce risk are being validated
C	Additional control measures which will materially reduce risk are being delivered
D	Additional control measures are required to materially reduce risk
E	Mitigation under investigation
F	Partial mitigation
G	No mitigation in place: control point downstream
H	No mitigation in place and none required

During Q3, the Inspectorate concluded the assessment of an event arising from deterioration of raw water in the River Dee which affected Huntington Works.

Huntington works is a strategically important works typically providing 250Ml/d to approximately 1,250,000 consumers in Cheshire and Merseyside through the company's Large Diameter Trunk Main system (LDTM). The works abstracts water from the River Dee and has very limited bankside storage, making it potentially vulnerable to any prolonged adverse changes in the river water quality. The raw water is treated through three process streams, each involving pH correction, coagulation, sedimentation, rapid gravity filtration, second stage filtration for manganese removal and addition of chlorine before passing through two baffled tanks to enable a sufficient contact time for disinfection prior to release into the Dee LDTM system.

The company has, for many years, participated in the Dee Steering Committee whose remit is to provide online monitoring at upstream points in the river and spot samples of the raw water in the River Dee. This intelligence allows changes to the treatment processes and intake status proactively at the works in response to prevailing water quality changes in the river. The procedures covering abnormal river water quality are defined in a quality management procedure shared by the abstractors (United Utilities, Dŵr Cymru Welsh Water and Dee Valley Water). Alerts generated are known as Dee Pollution or DEEPOLs. Natural Resources Wales follow up pollution events and share the information with abstractors.

During 14 and 15 June 2016 water quality abstracted at the works became gradually more turbid after heavy rain in the Dee catchment. Due to the challenge to the treatment process over two days, causing the works to operate outside its' normal design, the works was shut down. However, this was not before turbid water had arrived in the contact tank used for disinfection. Turbid water can affect disinfection and the company had to dispose of the water in the tanks and shut down the supply to the Dee LDTM to avoid potentially undisinfected water entering supply. After treated water was circulated throughout the works and evaluated as satisfactory, it was returned to supply on the 16 June.

The River Dee is known to contain *Cryptosporidium* oocysts and the company has continuous sampling and continuous online monitoring of other critical parameters at appropriate points in the treatment stages to assess the challenge to the treatment barriers in place.

Following the return of the site into supply, two positive samples containing *Cryptosporidium* at low concentrations were found. The company then had to drain and clean the contact tanks to remove any *Cryptosporidium* oocysts remaining in the tanks. The operation was carried out on one tank at a time, with the other still in service. The site has a history of occasional detections of low concentrations of *Cryptosporidium* oocysts. Based on these two factors and the actions taken, Public Health England agreed with the company that no further action was necessary to advise consumers to boil water before consumption, or any other protective measures, unless further sample results indicated a change.

The company missed an opportunity to act on proactive information to protect the works from unnecessary challenges while knowing the residual risk. Reactively, however, the company, once it had identified the challenges, resourcefully managed the circumstance so that consumers were not affected.

The Inspectorate concluded that on this occasion the water supplied from Huntington works was unwholesome and that the company had failed to comply fully with the requirements of Regulation 26(4) to continuously operate an adequate treatment process. A number of recommendations were made, including that the company should find a more effective method of removing oocysts from the treatment plant after running the plant to waste, and to improve its approach for managing and investigating such events. The Inspectorate was not wholly satisfied with the company's response to these recommendations and is working with the company to ensure that our concerns are taken seriously and acted upon.

Chapter 2: Water quality at treatment works

During the third quarter of 2016, the Inspectorate has continued assessing the compliance data supplied by companies.

Review of compliance – microbiological failures at treatment works

During Q3, companies reported 14 failures (DWR 1, ESK 1, SEW 2, SVT 5, TMS 2, UUT 2, WSX 1) to meet coliform standards in samples taken at treatment works. There were no detections of *E.coli*

Table 9: Q2: 2016 – Microbiological tests
The number of tests performed and the number of tests not meeting the standard

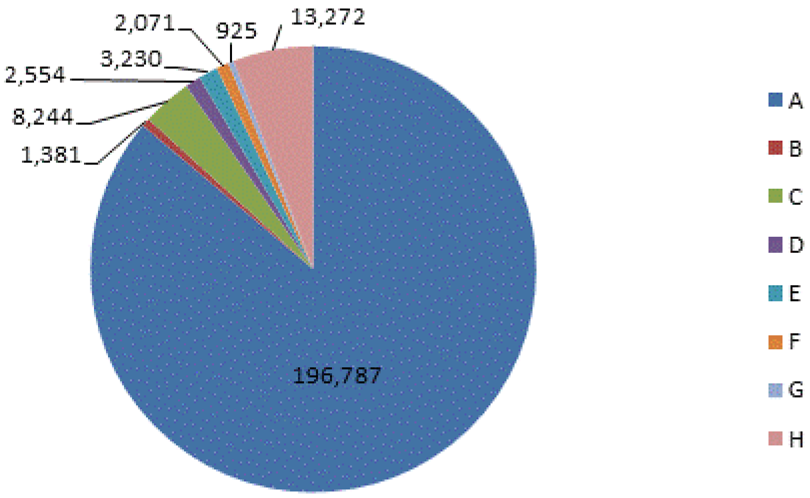
Parameter	Total number of tests	Number of tests not meeting the standard
Water leaving water treatment works		
E.coli	41,461	0
Coliform bacteria	41,561	14

A review of the outcomes of investigations by companies revealed three types of response: No cause found; a problem with the sample tap; or some evidence there was an issue with an on-site storage tank. In a few cases, it was a combination of these, for instance, there was no cause found but work was carried out on the sample tap or on the tank. The reality is that it is sometimes difficult to determine the cause of a single failure, particularly if it was a single coliform. It is no use whatsoever, as in one case, to decide to take a tank out for its ten-year inspection after the failure. This is both reactive and has failed to drive risk down by assessing the condition of, and risk from, the asset, because inevitably there will be a failure. What is clear is that sites are entirely within the control of the water companies and where companies have taken a strategic view to risk assess assets and have then put into place an action plan to govern the inspection, repair and replacement of those assets which are below a set standard, the improvement in failures is apparent over time. The outcome is that water quality is improved, something both the company and its consumers benefit from.

Turning to risk assessment of treatment works. Of the total risks assessed by companies (228,464), the vast majority, 196,787, (86%), are deemed in the lowest risk category A. See Figure 10.

Those risks where additional control measures are required, mitigations are under investigation or there is only a partial mitigation in place, (D,E and F categories), are largely evenly distributed between the three categories and comprise 3.4% of risks identified within treatment. Companies should consider if this level of risk remains acceptable and the consequences of an unmitigated risk resulting in a risk to consumers. The Inspectorate will continue to review these risks and will initiate enforcement where appropriate if these are not already within a pre-existing legal instrument. Equally, water companies will not be released from programmes of work and risks will remain in these categories until such time they are deemed as 'fully mitigated'.

Figure 10: Numbers of risks by category in treatment



Audits of chlorination disinfection arrangements

In the Q2 of 2016, the Inspectorate's audit programme focused on ultraviolet disinfection and the theme of assessment of disinfection continued in Q3 with the focus moving to chlorination as a means of disinfection. Eleven works were audited and different aspects of the disinfection processes at the works were considered, including the microbiological risk assessment; preparation of water for disinfection and the effectiveness of the disinfection process. Where relevant, the audit teams considered other aspects of the site operation as part of the inspection.

The sites were selected based on risk in terms of previous company performance and sites where disinfection-related issues had been identified. A small number of additional sites were selected at random. The sites were diverse in nature, from small scale groundwater works through to large surface works and chlorination was carried out using either chlorine gas or sodium hypochlorite.

In general, the audits showed the expected good level of compliance with the requirements of Regulation 26 of the Water Supply (Water Quality) Regulations and appropriate management and control of the disinfection process. However, deficiencies found at some sites led the Inspectorate to make 44 recommendations to companies for sites to remain compliant with the requirements of the Regulations.

Preparation for disinfection

As outlined in the Principles of Water Supply Hygiene, water treatment processes should be matched and optimised to the quality characteristics of the water sources and be capable of producing adequately disinfected water for all the expected variations of raw water quality. Raw water properties or substances that are known to adversely affect disinfection, for example, pH or ammonia need to be modified accordingly and the water entering the final stage of disinfection is required to have a turbidity of less than 1 Nephelometric Turbidity Unit (NTU).

It is concerning therefore that at two sites, both with an identified *Cryptosporidium* risk, Coppermills (TMS) and Sheafhouse (TMS), Inspectors identified that individual turbidimeters were not present on the outlet of individual filters as required by the recommendations of the Third Expert Group on *Cryptosporidium*, (The Bouchier report), published nearly 20 years ago. Companies are reminded of the importance of monitoring turbidity at the final pre-disinfection stage as a simple mitigation step to reduce risk. It is expected that the requirements of the expert groups on *Cryptosporidium* are implemented where these are appropriate and by not doing so a company will be considered to have ignored documented best practice.

Furthermore, at Sheafhouse works, it was found that there was no monitoring in place for *Cryptosporidium.* The Inspectorate recommended the introduction of monitoring at an appropriate frequency to ensure the efficacy of the treatment process can be verified and a known risk is adequately mitigated.

In contrast, and as an example of where best practice has been adopted, it was identified that the turbidity monitors on individual filters at Grafham works (ANG) were fitted with alarms and shutdowns to prevent a poorly performing filter affecting the disinfection process.

The raw water from each borehole at Tidworth works (VWP) passes through a dedicated GAC contactor before chlorination. The Inspectorate required assurances that robust procedures were in place to prevent the borehole supplies becoming anoxic should they remain out of service for extended periods.

An *E.coli* detection in a good quality groundwater source at Dullingham works (CAM) was attributed, by the company, to the reinstallation of a borehole pump. The site is subject to marginal chlorination only and consequently this activity presented a risk to supplies for which there was no mitigation in place. The Inspectorate recommended that procedures associated with restricted operations are reviewed.

At Tottiford works (SWT), a number of gaps were observed in record keeping for on-line monitors. Minor integrity issues identified at Chalkpit works (VWP) and a groundwater source supplying Great Wratting works (ANG) were addressed.

The disinfection process

Disinfection is a critical treatment process and as such having redundancy in the chemical dosing system is good practice to ensure the process is not interrupted and treated water supplies are not compromised. Single points of failure were identified at Tottiford works (SWT) and Sheafhouse works (TMS) whereby a single dosing control system was common to all dosing equipment. It was noted that plans are in place to install UV treatment at Tottiford works by 2019.

On a similar theme, the chlorination dosing equipment at Dullingham works (CAM) had redundancy in the way of standby pumps and two dosing lines for part of the distance between the dosing pumps and the injection point, however, a single dosing line for part of this distance represented another single point of failure.

Companies are advised to remove single points of failure for critical processes wherever possible. Where such systems remain, it is incumbent upon companies to adequately mitigate for this increased risk by enhanced measures such that the supply of inadequately disinfected water is prevented.

At Sheafhouse works, (TMS), the company applied additional control measures including restricting the flow from the works to ensure that the minimum Ct value could be maintained. While the system in place may be effective in ensuring that appropriate disinfection is maintained, the Inspectorate again reminds companies of the need for additional control measures to prevent human error or system malfunction from exposing the public to unnecessary risk. The restriction of flow equally removes any available capacity from this works should there be a demand upon resources. Companies are reminded to put long-term plans in place as new risks arise. In this case three new risks arise from the short-term solution; capacity, error and malfunction.

Following chlorination at Chalkpit works (VWP) there is no contact tank to complete the disinfection process and the company reported that this process is completed in the trunk main to the downstream service reservoir. However, the monitoring of chlorination takes place at the works and the works compliance sampling point is also on site. Monitoring at this point is not appropriate to demonstrate that appropriate disinfection has been achieved. Companies are reminded of the regulatory requirement to verify the disinfection process. Similarly, the trunk main must be considered part of the treatment process and the regulatory sample point should be located downstream of this process. Moreover, there is an inherent increase in risk to public water supplies from this arrangement and companies are encouraged to ensure that disinfection is completed on its treatment sites wherever possible and to have robust disinfection failsafe procedures in place to prevent the supply of inadequately disinfected water.

A new sodium hypochlorite dosing system was installed at Dullingham works (CAM) in 2016. This led to a number of issues with the chlorination process, which the company considered were associated with ‘gassing off’. A number of issues with the new dosing system were identified including a failure to carry out a hazard and operability study (HAZOP) on the new dosing system and not updating the operating manual. The company subsequently removed the works from supply, pending resolution of chlorination issues.

The design of the contact tank at Elan works (DWR), which had no baffles nor a full height wall, had not been checked to ensure short-circuiting was not occurring. Companies are reminded of the need to verify the effectiveness of the disinfection process and are advised to take steps to understand the flow through contact tanks using techniques such as tracer testing or computational fluid dynamics (CFD) modelling as appropriate.

Contact tanks, particularly where they are formed of a single compartment may be difficult to bypass to permit internal inspection. This was found to be the case at Elan works (DWR). Facilities should be available to isolate the structure from service and allow continuation of supply, for example, bypass facilities or multiple compartments in line with good practice specified in the *Principles of Water Supply Hygiene*.

Disinfection failsafe

Inspection at Coppermills works (TMS), Chellow Heights works (YKS) and Gunnerton works (NNE), identified that they do not have auto-shutdown or run to waste systems in place, should a disinfection failure occur, but instead rely on other mitigation measures, including chlorination downstream of the contact tank. Companies should ensure that these mitigation measures are fit for purpose, appropriately tested, that they operate when required and provide sufficient protection for public health.

Where the company is unable to demonstrate that this is the case, the Inspectorate expects companies to reflect this in their risk assessments and develop short-term and longer-term mitigation measures to ensure the required level of protection of public health is provided.

Disinfection by-products

The Inspectorate found that there was no monitoring of disinfection by-products in place at Dullingham works (CAM) that were appropriate to the disinfectant in use, sodium hypochlorite.

Companies are reminded of the potential health risks associated with disinfection by-products and the need for appropriate risk assessment and targeted operational monitoring to be able to demonstrate compliance with the requirements of Regulation 26 (2).

Good practice

The Inspectorate welcomed a number of points of good practice seen during the audits including Northumbrian Water’s implementation of a ‘food factory’ culture at its treatment works.

Regulation 31

At Coppermills works (TMS), records of treatment chemical compliance with the requirements of Regulation 31 were not easily determined on site. An audit programme to look at all aspects of the use of treatment chemicals will be reported in a future report.

Enforcement orders relating to treatment solutions

During 2016, the Inspectorate has issued a number of enforcement orders which have been made under section 18 of the Water Industry Act 1991, in contrast to undertakings which are offered under section 19 of the Act and Notices and authorisations which are made under Regulations 28 and 20 (respectively).

There are two types of order which may be issued, a provisional order or a final enforcement order dependent on circumstance. In each instance where orders are considered there may have been a failure of the company to act on pre-existing legal instruments and/or a breach of the agreed conditions. There may also be consideration that contraventions would not be addressed through the Regulation 28 Notice route and that an order is required to protect public health, for instance where there is a failure to meet the standards for *E.coli* or Enterococci at consumers' taps.

A provisional enforcement order (PEO) is effective immediately, as soon as a section 20(1) Notice **proposing to confirm** the PEO is issued, and one of the primary considerations for opting for a PEO rather than a final enforcement order (FEO) is section 18(3) which states

*'…the extent to which any person is likely to sustain **loss or damage** in consequence of anything which, in contravention of any condition or of any statutory or other requirement enforceable under this section, is likely to be done, or omitted to be done, **before a final enforcement order may be made**.'*

The Inspectorate has made provisional enforcement orders for issues where there is an immediate risk. Historically this has occurred for water treatment works not meeting the standards with deficiencies having potential to lead to breach of Regulation 26.

The final enforcement order differs in that there is a consultation period in which the company may present compelling evidence of why an order is not required.

In January 2014, the Inspectorate served a Regulation 28(4) Notice on Southern Water for its water treatment works at Hardham works, due to deficiencies with the wash water handling system. The deficiencies posed a risk to treatment at the site by virtue of poor quality treated wash water being returned to the head of the works. The company delivered a scheme in accordance with the Notice, with the delivery of a new wash water handling system. However, it has subsequently emerged that the new system had been designed to handle the average raw water turbidity handled by the works and not the maximum levels that the site regularly experiences during the winter.

The company have therefore failed to deliver the solution and are in breach of the Notice. Furthermore, the company failed to communicate with the Inspectorate the difficulties they were facing in a timely manner. The company have submitted a scheme change application to install an extension to the wash water handling system, which has been subject to further delays. The Inspectorate conducted an audit of the site during November, which included an audit of the Notice requirements. While the long-term solution had not been delivered, the company were found to be in compliance with the other requirements of the Notice and the audit was generally satisfactory. Public health is currently being protected, with all wash water being discharged rather than returned to the head of the works.

Breach of the Notice cannot be ignored and companies are reminded of the serious and binding nature of any legal instruments. Failure to promptly communicate with the Inspectorate and breach of a Regulation 28(4) Notice are a serious matter. The Inspectorate has therefore taken the action to issue a final enforcement order, which contains enhanced reporting requirements, to ensure successful delivery of the scheme and that the Inspectorate is kept informed of progress. The company has a consultation period in which they may provide evidence to show that an order is not required.

Chapter 3: Water quality at service reservoirs and in distribution

In Q3, one company reported detection of *E.coli* at a service reservoir (WSX 1) and there were 48 coliform detections at service reservoirs (AFW 7, ANG 2, BRL 1, DVW 1, DWR 4, ESK 1, SEW 2, SRN 1, SST 1, SVT 9, SWT 3, TMS 7, UUT 1, VWP 1, WSX 4, YKS 3). In two cases (AFW – Dovercourt New Reservoir and SVT – Masson Reservoir) there were repeat detections within the Q3 and in two other cases there was a failure at a site that has had a detection earlier in the year (Fryerning Reservoir Compartment 2 and SEW – Cranbrook Reservoir compartments 2 and 4).

Table 11: Q3: 2016 – Microbiological tests
The number of tests performed and the number of tests not meeting the standard

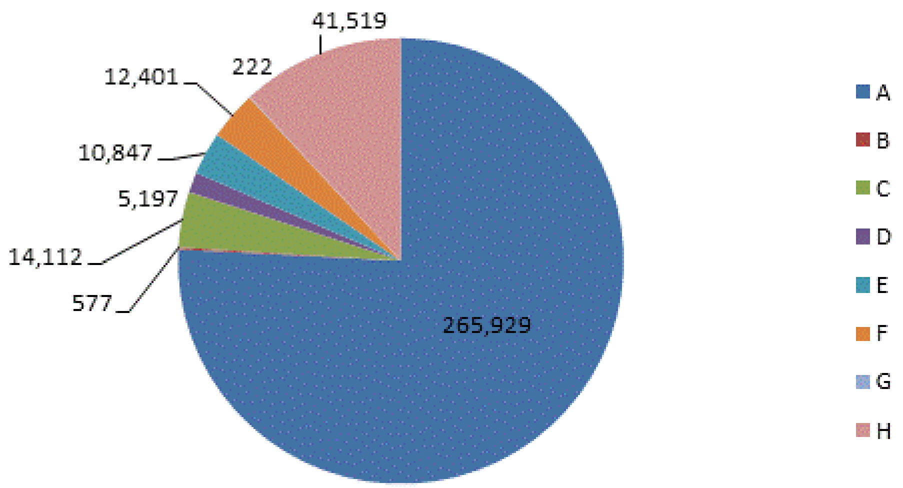
Parameter	Total number of tests	Number of tests not meeting the standard
Water leaving service reservoirs		
E.coli	52,269	1
Coliform bacteria	52,269	48

Analysis of the outcomes of company investigations present similar data to storage tanks on treatment works presented in section 2 of this report with equal weighting between problems associated with sample taps, structural ingress and no cause found, with a very small number with other reasons such as turnover of the supply being a contributing factor to a failure. In the latter case companies should install, maintain and design systems appropriate for the supply system risk assessment. Companies should also realise that if they are experiencing a disproportionate number of failures compared to the size of their supply system and that action is reactive to failures or if inspection is not proactive or risk based, then strategic planning is necessary. From the information above, one company should be able to identify they are below standard.

Reviewing the risk assessments for this part of the supply, from a total 638,981 risks declared by companies, there were 288,177 risks associated with distribution systems and 350,804 risks associated with storage such as service reservoirs. From the total risks, 499,557 were shown to have the target risk mitigation achieved, verified and maintained, (A), of which 265,929 were accounted for in storage. It is of concern, however, that those categories in storage which require additional measures, remain under investigation or are only partially mitigated, (D, E, F), there are a total of 28,445 risks which constitute 8% of the total. This is over twice the residual risk when compared to those risks associated with treatment. Company Directors would be advised to consider if this level of risk is acceptable to the business and the consumer. Certainly, failures associated with storage clearly remain a challenge.

It is worth noting that even in the low risk category where the target risk mitigation is achieved, verified and maintained in a company risk assessment there is an example of microbiological failure caused by service reservoirs running over their maximum inspection interval. In this example the company has cited that their control measures include an externally certified ISO system and monthly management and overview of inspection programme, internal procedures, and verification and validation of the process. The intent of a risk management programme is to ensure the controls and mitigations are adhered to and by allowing the maximum interval to overrun an undesirable outcome could have been avoided.

Figure 12: Numbers of risks by category in storage



Water quality at consumers' taps

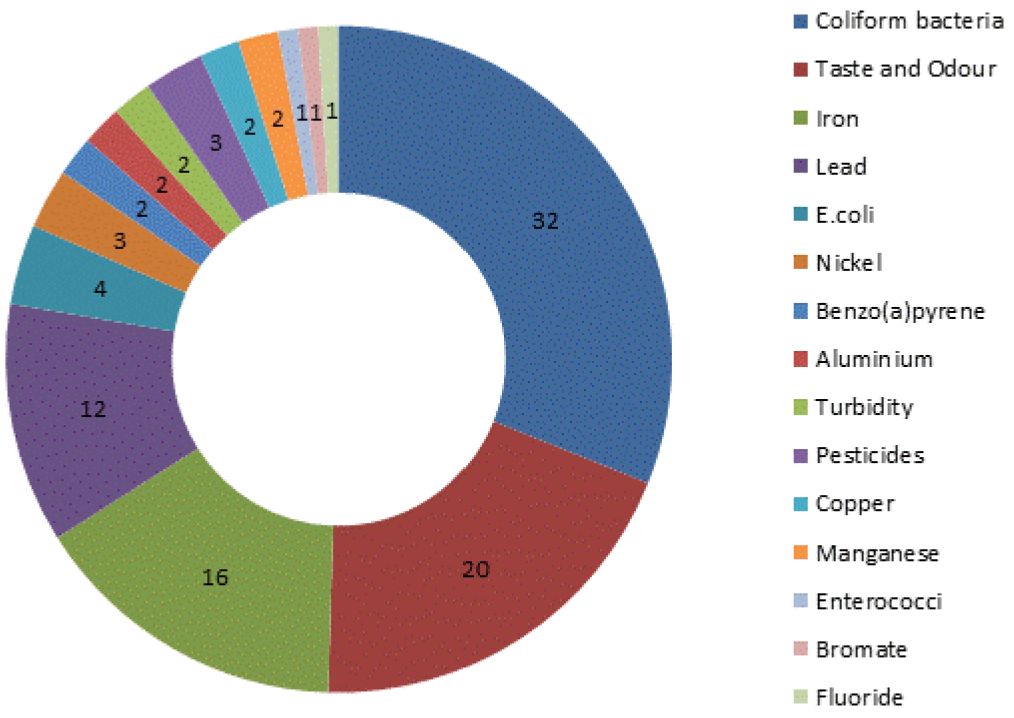
Assessment of compliance

Most samples taken to assess regulatory compliance are taken from consumers' taps, and testing takes place for 51 parameters that have numerical standards. Sampling frequencies are determined by the size of the population in the water supply zone. The vast majority of samples taken complied fully with regulatory requirements. From the samples taken to demonstrate compliance with a Directive or national standards, there were a total of 199 failures for 18 parameters in Q3 2016.

For microbiological parameters, seven samples contained *E.coli* and two contained Enterococci. With regard to chemical parameters, the most prevalent detections were for iron, odour, lead and taste which accounted for 95 failures (48% of the total).

Looking at the 199 failures in more detail, Figure 13 shows the proportion of failures for the 18 parameters.

Figure 13: Directive and national parameters failing in Q3 2016 – percentage of the 199 failures recorded

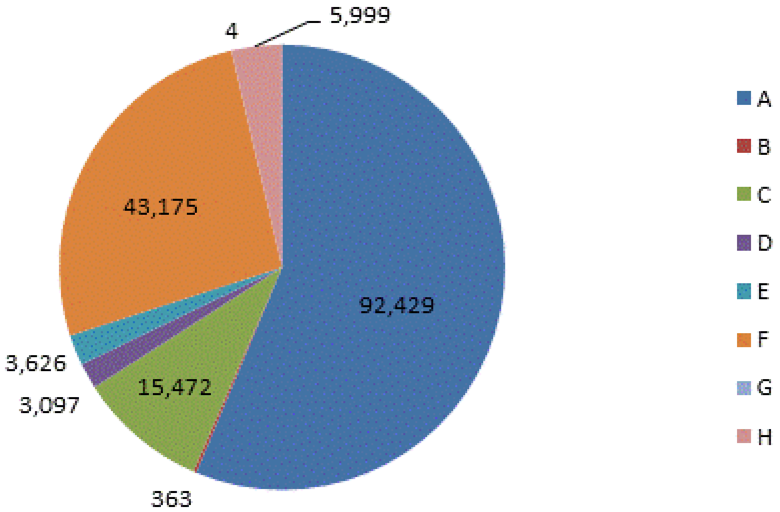


In Q3 there were two unusual occurrences. Firstly, Wessex Water reported three breaches of the copper standard which is very rare across the industry and exceptional for one company. In the last two years, there has only been one copper failure each year across the whole of England and Wales. The company have contracted expert assistance to establish the cause. Secondly, three companies (DWR 1, SVT 1, UUT 2) reported a total of four benzo(a)pyrene failures and in the previous three years there have been only one or two detections for the whole year. The detection of this chemical parameter indicates the presence of deteriorating coal tar pipe linings. In two cases company records were insufficient to confirm whether there were any bitumen-lined mains in the locality of the failure, something both companies would do well to establish before there is the inevitable uncontrolled progressive deterioration and a consequent increasing risk to the consumers.

Turning to the risk assessments, the number of risks attributed to the consumers' part of the supply system total 164,165. The companies have assessed the largest percentage of risks as being category A which is 'fully mitigated', but then proportionally category F ('partial mitigation'),and category C ('additional control measures are being validated') when combined are a similar number. This shows that considerable work is needed to mitigate any risks leading to failures within the consumer's distribution system.

This area of company risk assessments show considerable inconsistencies in the designation of risk status. For example, Thames Water and Southern Water have no 'partial mitigation', (F), whereas Severn Trent water being a similar size business cite 10,329 category F hazards associated with domestic distribution. The company with the largest percentage of risks needing further mitigation (category D) attributed to consumers' distribution is Northumbrian Water (2,722 in total). The Inspectorate will continue to review these inconsistencies to understand why this is occurring and what implications this might have for risk management and communicate this to the industry in this report and in workshops.

Figure 14: Numbers of risks by category in consumers' distribution systems



Companies are reminded that a long-term strategy is needed to mitigate risks within consumers' distribution systems. These should include a long-term lead strategy, working with other stakeholders such as the Water Regulations Advisory Scheme (WRAS) on the approval of products and materials and training, education and certification of those working in the domestic water sector. While we expect to see shifts in all the other risk categories as companies progress work at treatment works and within catchment, the proportion of risks in the consumer category would be expected to change at a slower rate.

In Q3, the Inspectorate completed the assessment of an event which affected the supply to a consumer and highlights the need for companies to ensure that procedures are in place to check that new connections are made appropriately and checked at the time of connection.

The background to the more recent event was that in 2010 the company concerned admitted supplying water to consumers in East Grimstead that was unfit for human consumption, as a result of misconnecting a new service pipe to a sewer. Supplying water that is unfit for human consumption is an offence under section 70 of the Water Industry Act 1991. The company accepted a formal caution for this offence. Following this event the company implemented a procedure whereby on completion of a new connection, a competent person should carry out a visual check of the water at the consumer's tap and perform an on-site odour test.

In December 2015, the company completed a new connection to a single property in Chard, Wiltshire. The consumer subsequently contacted the company to complain that their water supply was discoloured and had an unacceptable odour. On investigating the complaint, the company found that the new connection had been made to a stagnant section of an asbestos cement main. Although the company reported that the on-site checks of the water supply at the consumer's tap were carried out correctly on completion of the new connection, nothing abnormal was noticed at the time. The consumer was advised not to drink the water, and was provided with bottled water until the problem had been rectified.

The Inspectorate's investigation of this event identified that a developer carrying out a conversion of a single domestic property into flats had applied to the company for a new connection in accordance with the company's normal procedure. A technician inspected the site and agreed with the developer where the new connection would be made. The technician used the company's records of water mains in the locality to determine the water main, and the position on the main, to which the new service would be connected. The developer laid the supply pipe, but when the company came to complete the connection, it was not possible to make the connection at the original agreed point on the main. Despite this, the company proceeded with the connection without instructing the developer to relay the service to the agreed location.

The consumer subsequently complained to the company about discoloured water and an unacceptable (tarmac) odour. After taking an unusually long time to arrange an appointment with the consumer to take investigatory samples, the company found that the new service had been connected to the wrong point on an old asbestos cement main. The company's mains records showed that this main had 17 services connected in that section, but the proximity of this new connection to a closed valve and very low flows in the main caused the water supply to the consumer to be unwholesome. The company has since moved the connection to a different main in the same street and strengthened its procedures to include photographing a sample and undertaking a chlorine test at the consumer's property on completion of new connections.

The Inspectorate is critical of the company because it failed to follow its own procedures, which are in place to safeguard consumers, to ensure that new connections are made safely to a live main, and that the service pipe is not unnecessarily long. Additionally, in this instance, the company's mains records were out of date. The Inspectorate issued a formal warning letter to the company because this event was a repeat of the similar previous misconnection event in East Grimstead.

dwi

Drinking Water Inspectorate | Nobel House, 17 Smith Square | London | SW1P 3JR | Tel: 0300 068 6400
www.dwi.gov.uk