

Drinking Water Quality in Northern Ireland, 2016

A Report by the Drinking Water Inspectorate for Northern Ireland





Northern Ireland Environment Agency

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Foreword

I am pleased to present the 21st annual report on the quality of drinking water in Northern Ireland. The report provides a regulatory assessment of the quality of both public and private water supplies for the calendar year 2016.

This is the first report relating to drinking water quality following the changes to government departments. In May 2016 the Drinking Water Inspectorate (DWI) moved from the Department of the Environment to the newly formed Department of Agriculture, Environment and Rural Affairs (DAERA).

The Drinking Water Inspectorate's primary role is to protect public health by safeguarding drinking water quality through effective regulation. In Northern Ireland over 99% of the population receive their drinking water from Northern Ireland Water Limited (NI Water). The remainder is served by private water supplies.

Drinking water quality compliance is assessed against the European Directive on Drinking Water Quality which is enacted through National legislation. Overall public drinking water quality remains high for 2016 at 99.86%, a slight increase from 99.83% in 2015.

I am concerned however that the previous increasing trend in trihalomethane (THM) compliance experienced since 2012 has not continued in 2016. In fact contraventions increased, with 3.06% of tests failing the regulatory standards, a highly significant increase in non-compliance compared to 0.26% in 2015. We will continue to focus our efforts to ensure that NI Water put the necessary measures in place to reverse this increase in failures.

This report also considers drinking water quality events that NI Water must report to us, as well as consumer contacts for those experiencing problems with their water supply, and comments on how these are managed by NI Water to protect public health.

Although less than one per cent of the population receives water from a private supply, the number of registered supplies is increasing steadily with fifteen new supplies being registered in 2016. Water from these supplies is used for a range of purposes, from domestic dwellings to large commercial and public premises such as schools and hospitals. Overall compliance with the regulatory standards for private supplies was 98.85% for 2016, a slight decrease from 98.94% in 2015 and considerably lower than for public supplies. The quality of some private water supplies can be highly variable.

I embrace the opportunities for us to continue to work constructively with other stakeholders to maintain our high quality of public drinking water and further improve the quality for the users of private water supplies across Northern Ireland. Our priority remains ensuring safe, clean drinking water for all. I trust you will find that this report is both an interesting and useful reference document on drinking water quality in Northern Ireland.



Catriona Davis
Chief Inspector of Drinking Water
August 2017

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Executive Summary

This is the 21st report in a series published by the Drinking Water Inspectorate, acting in our role as the drinking water quality regulator for both public and private water supplies. Following the changes to local government in May 2016, this is the first report to be published under the new Department of Agriculture, Environment and Rural Affairs (DAERA).

The report gives an independent commentary on our assessment of the quality of drinking water provided by Northern Ireland Water Ltd. (NI Water). It also presents details of the quality of private water supplies for which we deliver a regulatory monitoring programme through our delivery partners in local councils.

Public Water Supplies

Comprehensive monitoring is undertaken by NI Water to assess public drinking water quality, and compliance is based on the results of key tests carried out throughout the water supply chain: from water treatment works; service reservoirs; and consumers' taps.

Compliance is assessed against EU and national standards and in 2016 the overall public drinking water compliance remained high at 99.86%. The 0.14% non-compliance relates to 139 tests that failed to meet the required standard, a lower figure than 167 (0.17%) in 2015.

Compliance at consumers' taps also remained high at 99.77% in 2016, a slight increase from 2015 (99.74%), however of the 43 regulatory parameters tested, thirteen did not achieve full compliance. Those parameters failing to meet full compliance were: trihalomethanes (THMs); lead; iron; coliform bacteria; aluminium; odour; taste; *Clostridium perfringens*; manganese; turbidity; hydrogen ion and individual pesticides (MCPA and Clopyralid).

The parameter with the lowest reported compliance in 2016 was trihalomethanes (THMs) at 96.94%, a highly significant decrease from the 2015 compliance figure of 99.74% and the previous year on year improvements in compliance noted from 2012. Operational practices at water treatment works and water travelling longer distances, thus spending more time in the distribution system are contributing factors to this downturn in compliance.

Lead compliance remains similar to 2015 figures, at 97.96% (97.94% in 2015). As there are only trace amounts of lead in the water leaving the water treatment works (WTWs), contamination of the supply occurs in the distribution system, including where lead has been used for service pipes or in domestic plumbing. This increases the risk of lead exceedences at the consumers' tap. NI Water's lead strategy is key to addressing non-compliances and improving drinking water quality in the longer term. It is important that the necessary structures are maintained to ensure the implementation of this strategy and we fully support NI Water in its delivery.

Contraventions of microbiological parameters may indicate a failure in the treatment process or a breach in the integrity of the water supply system. A slightly lower compliance figure for coliform bacteria at consumers' taps was reported in 2016 with 99.27% compliance compared

to 99.32% in 2015. This is reflected in the overall microbiological compliance figure at consumers' taps of 99.68% compared to 99.70% in 2015. No *E. coli* was detected by NI Water during the 2016 monitoring programme.

All contraventions must be investigated by NI Water and in some cases may be traced to internal plumbing systems in domestic dwellings or distribution systems within public buildings. In 2016, 35 reported contraventions related to internal plumbing systems in domestic properties. Two further contraventions were attributed to lead pipework within the domestic distribution systems of public buildings. NI Water's Water Fittings Team assist in identifying contraventions relating to internal and domestic distribution systems and notify us to follow up with appropriate advice or action as required.

To enable us to evaluate consumer confidence in the quality of drinking water at their taps, we receive information relating to consumer concerns and complaints from NI Water. As expected the highest number of contacts relating to drinking water quality relate to the visual appearance, with 64.7% of total contacts relating to this in 2016. The overall number of contacts decreased by 3.4% in 2016 (6,961 compared to 7,183).

Although compliance was high in 2016, water quality events did occur. NI Water must report these events to us. Of the 50 events reported, we categorised 27 as Significant, 9 as Minor and 14 as Not Significant. 19 of the Significant events occurred at water treatment works (WTWs) and were primarily attributed to treatment difficulties or deficiencies at the works. An event at a WTWs triggers a review of the risk assessment for that works to ensure appropriate mitigation measures are identified for all risks to drinking water quality.

Where necessary we take enforcement action to ensure the delivery of remedial action within specified timeframes. In 2016 a second stage enforcement was issued to address recurring contraventions of the pesticide, MCPA. The first stage of this enforcement was also closed in 2016.

Private Water Supplies

The same drinking water quality standards apply for private water supplies as for the public water supply. Although less than 1% of the population receives water from a private supply many more are exposed to them through their use in both commercial activities and public buildings. A number of premises in Northern Ireland that have a private supply also have a mains supply. Private supplies are used as an alternative to, or in conjunction with the public supply for a range of activities including food processors, holiday accommodation, and public buildings, mainly for economic reasons.

During 2016 our private water supply sampling programme, which is delivered on our behalf by local council staff, monitored 154 sites. 15 new sites were registered in 2016. Overall compliance for 2016 is reported as 98.85%, a slight decrease from 98.94% in 2015. Full compliance was not achieved for 23 parameters. These were coliform bacteria; manganese; hydrogen ion; iron; enterococci; *E. coli*; *Clostridium perfringens*; ammonium; sodium; individual pesticides (glyphosate, clopyralid, mecoprop); turbidity; lead; total pesticides; bromate; sulphate; boron; nickel; fluoride; trihalomethanes (THMs); colour and radon.

Full compliance was achieved for 98 out of the 154 registered sites (64%). Of the 56 sites that did not fully comply with the regulatory standards, 33 use their private supply as the primary source of drinking water; sixteen supplies are used for washing equipment and surfaces in contact with food or drink; four are used solely for personal hygiene (wash hand basins); and three use the supply as an ingredient in food or drink.

Microbiological contamination of a private water supply may occur at source or at any point throughout the distribution system. Indicators of faecal contamination (*E. coli* or enterococci) were found at 13 supplies in 2016; 8 small shared domestic supplies with no treatment and 5 commercial/public supplies.

Iron and manganese continue to be the chemical parameters with the highest incidence of non-compliance at private supplies. In 2016, fourteen sites were found to have contraventions for either iron or manganese or both. Metal failures were identified for lead and nickel at two sites due to the use of inappropriate fittings.

Pesticides were identified at two sites in 2016; a golf club and a workplace.

All contraventions at private water supply sites are investigated and action taken dependent on the severity of the failure which may include the service of a notice. In 2016, of the 127 contraventions identified, 69 (55 microbiological; 14 chemical) were notified to the Public Health Agency (PHA) for advice; 22 of which resulted in restrictions on usage.

We continue to work with owners and users of private water supplies to assist them in meeting their regulatory duty to provide safe, clean wholesome water by providing technical advice and guidance.

In 2016 we continued to develop our risk assessment application to assist in the completion of the effective identification and assessment of all risks associated with a private supply. This will be implemented in 2017.

Looking Forward

The challenge of ensuring the provision of safe, clean, sustainable drinking water supplies into 2017 and beyond continues.

During 2016 we worked alongside NI Water, the Utility Regulator, the Department for Infrastructure and the Consumer Council as well as our Northern Ireland Environment Agency (NIEA) colleagues in monitoring the PC15 investment programme. We acknowledge the financial constraints within the PC15 process and the requirement to re-prioritize work programmes to reflect funding availability. Looking forward, we will continue our stakeholder engagement in preparation for the PC15 mid-term review in 2017 and the preliminary work involved preparing for the next price control process, PC21. Throughout this we will continue to ensure that the provision of safe, clean drinking water remains a key priority for NI Water.

We will continue to work with NI Water in their ongoing management of our drinking water supplies, and provide advice and guidance to ensure an effective risk management process is implemented. We will actively engage with all stakeholders in the delivery of the goals set within the Long Term Water Strategy.

Protecting the catchments from which water is abstracted not only improves the raw water quality and reduces the potential contamination risks, but it can also reduce the need for additional treatment and purification processes. We will continue to advocate the improvement in quality of abstraction sources through working with colleagues in the NIEA and NI Water, in the development of the second cycle of River Basin Management Plans (RBMPs), and to enhance the protection of sources used for abstraction through the identification of drinking water protected areas and safeguard zones.

The working relationship between ourselves and local councils, delivering monitoring and risk assessment functions on our behalf, was formalised through a Service Level Agreement (SLA) between both parties. This SLA provides clarity on roles and responsibilities in relation to the regulation of private water supplies.

We plan to implement our new risk assessment application for private water supplies in consultation with local councils to provide comprehensive identification of risks and facilitate effective risk management at private drinking water supplies.

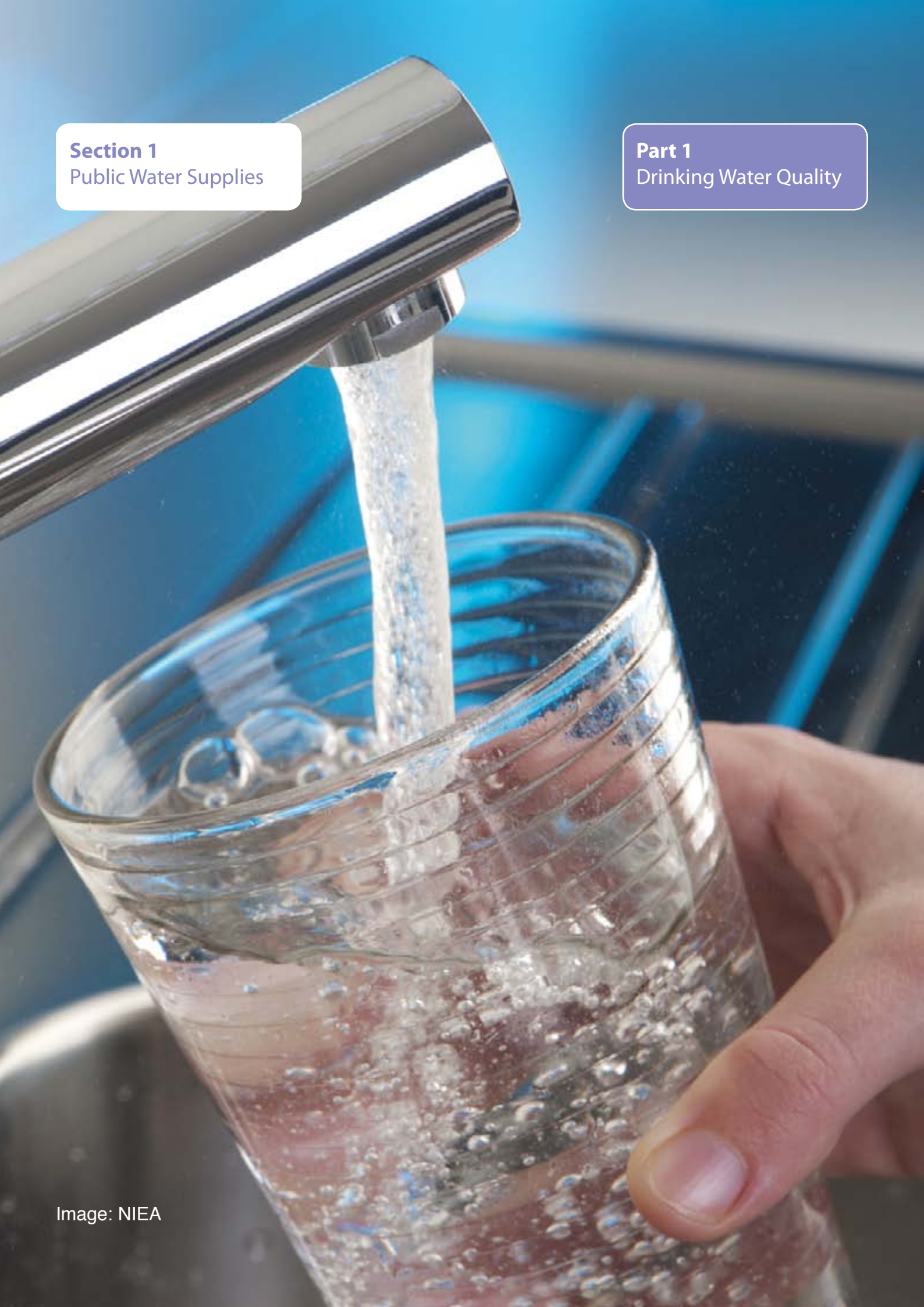
The new European Directive, 2015/1787, revises the monitoring and analysis requirements set in Annex II and Annex III of Directive 98/86/EC (the Drinking Water Directive). Member States are required to bring into force the regulations necessary to comply with this revised Drinking Water Directive by 27 October 2017. Two consultations on amended regulations to transpose the changes to the DWD were published in 2017.

The consultation on the draft Private Water Supply Regulations (NI) 2017 was published on 15 June 2017 with a closing date for comment of 10 August 2017.

The consultation on the draft Water Supply (Water Quality) Regulations (NI) 2017 was published on 10 July 2017 with a closing date for comment of 21 August 2017.

Section 1
Public Water Supplies

Part 1
Drinking Water Quality



Part 1

Drinking Water Quality

- Overall drinking water quality remains high at 99.86%
- Water quality at consumers' taps remains high at 99.77% compliance
- 13 parameters did not achieve full compliance at consumers' taps
- A high level of microbiological quality was achieved at 99.68% compliance
- Total trihalomethanes was the parameter with the lowest compliance at 96.94%
- Consumer contacts on drinking water quality decreased by 3.1% and discoloured water is still the main issue of concern to consumers

NI Water is a government-owned company with responsibility for supplying and distributing public drinking water throughout Northern Ireland.

Drinking Water Quality Testing

Throughout 2016, NI Water sampled drinking water across Northern Ireland to test for compliance with the standards in The Water Supply (Water Quality) Regulations (Northern Ireland) 2007 (as amended). The Regulations require sampling programmes to be in place to ensure that water quality is monitored at: water treatment works (WTWs); service reservoirs (SRs); water supply points; and consumers' taps in water supply zones (WSZs).

In 2016, 99,506 tests were carried out for a range of different parameters. A description of each parameter and its regulatory limit (or prescribed concentration or value [PCV]) is available on our [website](#).

Sampling and Analysis Frequencies

Under the Regulations, NI Water is required to meet specified sampling frequencies in demonstrating the wholesomeness of drinking water supplies. We undertake an assessment of these requirements throughout the water supply chain: at water treatment works; at service reservoirs; and in water supply zones.

During 2016, out of the 99,506 tests carried out, we identified a non-trivial shortfall of 20 parameters. Thirteen of these were for samples taken from consumers' taps, and eight from service reservoirs.

Overall Drinking Water Quality

Compliance with the standards is important as contraventions may indicate a failure in the treatment process or a breach in the integrity of the water supply system which could pose a potential risk to public health. The standards also ensure that water quality meets aesthetic standards and is acceptable to consumers.

The results confirm that overall drinking water quality in 2016, for the key parameters monitored at water treatment works, service reservoirs and consumers' taps remains high (99.86%), a

slight increase on the 2015 compliance (99.83%) and the same as the 2014 figure, as illustrated in Figure 1.1.

Of the 99,506 tests we used to assess overall compliance, 139 (0.14%) failed to meet the standards (167; 0.17% in 2015). Table 1.1 provides further information on parameters that failed regulatory standards and where those failures occurred within the treatment and distribution systems.

Water Quality at Consumers' Taps

To assess the overall quality of water that is being supplied to consumers, we look at results of regulatory samples taken by NI Water from consumers' taps. Table 1.2 shows the percentage compliance for 34 of the Schedule 1 (directive and national) parameters and nine of the Schedule 2 (indicator) parameters. Overall drinking water quality at consumers' taps has increased from 99.74% in 2015 to 99.77% in 2016.

Thirteen parameters did not achieve full compliance at consumers' taps in 2016: Total trihalomethanes (THMs), lead, iron, coliform bacteria, aluminium, odour, taste, *Clostridium perfringens*, manganese, turbidity, hydrogen ion (pH), and pesticides - individual (MCPA & Clopyralid).

Chemical/Physical Quality

Trihalomethanes (THMs)

In 2016, THMs was the parameter with the lowest percentage compliance (96.94%), a highly significant decrease from 99.74% in 2015. Further discussion on THMs is contained in Part 2.

Figure 1.1: Overall Drinking Water Quality, 2012 – 2016

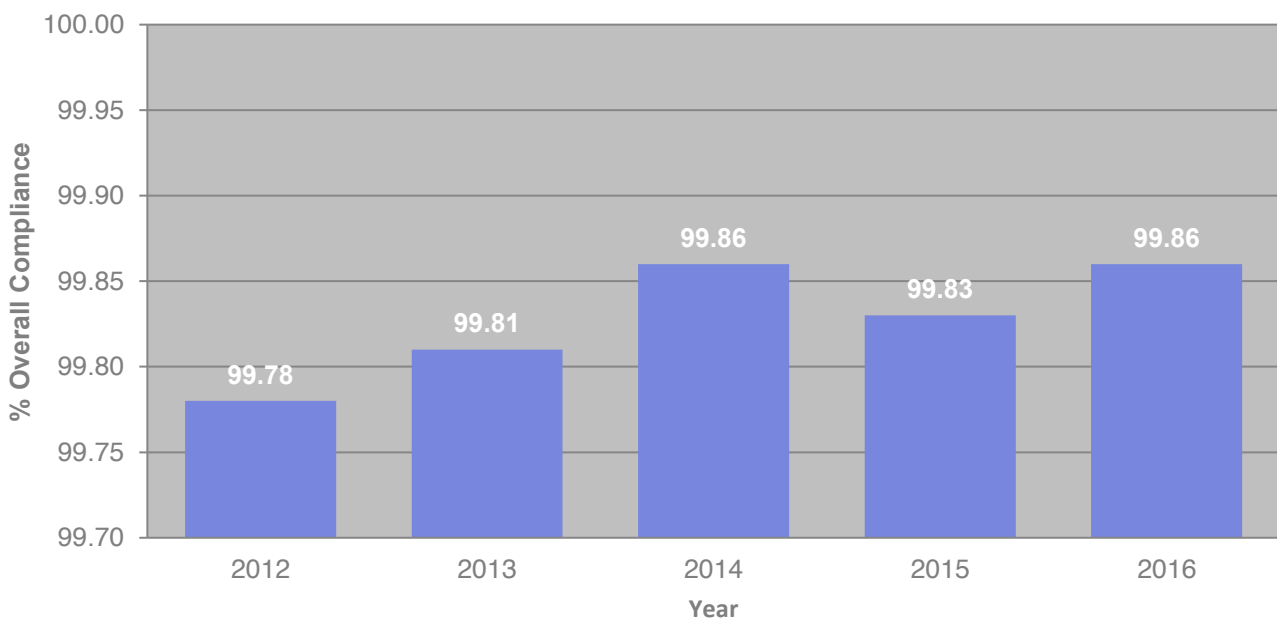


Table 1.1: Overall Drinking Water Quality in 2016

	No. of Tests	No. of Tests not Meeting the Standards
Water Leaving Water Treatment Works (WTWs)		
<i>E. coli</i>	6380	0
Coliform Bacteria	6380	2
Microbiological Total	12760	2
Nitrite	227	0
Turbidity	6380	7
Chemical Total	6607	7
Total (Microbiological and Chemical)	19367	9 (0.05%)
Water in Service Reservoirs (SRs)		
<i>E. coli</i>	15213	0
Coliform Bacteria	15213	15
Total	30426	15 (0.05%)
Water at Consumers' Taps or Supply Points (WSZs)		
<i>E. coli</i>	5172	0
Coliform Bacteria	5172	38
Enterococci	392	0
<i>Clostridium perfringens</i>	2291	4
Microbiological Total	13027	42 (0.32%)
Zone Chemical Analysis	26220	70
Supply Point Chemical Analysis**	10466	3
Chemical Total	36686	73
Total (Microbiological and Chemical)	49713	115 (0.23%)
Overall Water Quality		
Overall Microbiological Quality	56213	59 (0.10%)
Overall Chemical Quality	43293	80 (0.18%)
Overall Drinking Water Quality	99506	139 (0.14%)

**Collected at WTWs as no significant change occurs during distribution.

Lead

In 2016, lead compliance has remained similar to that reported in 2015 (97.96% and 97.94% respectively). However lead compliance is prone to fluctuations due to the low sampling frequency required by the regulations.

In 2016, of the 392 tests carried out for lead, eight (2.04%) contravened the standard of 10µg/l. Two contraventions were related to lead pipe-work and/or fittings belonging to both NI Water and the consumer, three were related to lead pipework and/or fittings belonging solely to the consumer & three were undetermined.

Table 1.2: Consumer Tap Compliance 2016

	No. of Samples	No. samples not Compliant	% Compliance
Schedule 1 (Directive and National parameters)			
Total Trihalomethanes	392	12	96.94
Lead	392	8	97.96
Iron	1868	25	98.66
Aluminium	1868	12	99.36
Odour	1868	4	99.79
Taste	1868	4	99.79
Manganese	1868	3	99.84
Turbidity	1868	1	99.95
Pesticides – individual	7672	3	99.96
1,2 Dichloroethane	392	0	100
Antimony	392	0	100
Arsenic	392	0	100
Benzene	392	0	100
Benzo(a)pyrene	392	0	100
Boron	392	0	100
Bromate	392	0	100
Cadmium	392	0	100
Chromium	392	0	100
Colour	1868	0	100
Copper	392	0	100
Cyanide	226	0	100
<i>E. coli</i>	5172	0	100
Enterococci	392	0	100
Fluoride	392	0	100
Mercury	392	0	100
Nickel	392	0	100
Nitrate	392	0	100
Nitrite	392	0	100
PAH - Sum of four substances	392	0	100
Pesticides - Total Substances	226	0	100
Selenium	392	0	100
Sodium	392	0	100
Tetrachloroethene/Trichloroethene - Sum	392	0	100
Tetrachloromethane	392	0	100
Total (Schedule 1)	35388	72	99.80
Schedule 2 (Indicator parameters)			
Coliform bacteria	5172	38	99.27
<i>Clostridium perfringens</i>	2291	4	99.83
Hydrogen Ion (pH)	1868	1	99.95
Ammonium	1868	0	100
Chloride	392	0	100
Conductivity	2292	0	100
Sulphate	392	0	100
Total Indicative Dose	25	0	100
Tritium	25	0	100
Total (Indicator parameters)	14325	43	99.70
Overall Total	49713	115	99.77

When a sample has contravened the standard and investigations show the property’s service pipe contains lead, NI Water notifies the consumer, and provides the advice leaflet “Lead in Drinking Water” (see Figure 1.2). It is the owner’s decision whether or not to replace their supply pipe and any other lead pipes within their property.

The Regulations require NI Water to reduce the likelihood of water supplies to pick up lead from pipes and fittings. NI Water have a lead strategy in place to deliver improved compliance for lead.

Through the use of treatment and lead pipe replacement, the strategy involves:

- optimisation of orthophosphoric acid dosing and pH control at WTWs;
- monitoring lead and phosphate levels throughout the distribution networks;
- regulatory requirement to replace lead service pipes where there is a lead failure, or at the request of the consumer; and
- targeted replacement of lead service pipes within identified hotspots

Looking at the overall trend in lead compliance in Figure 1.3, there is a gradual trend upwards. However, a significant amount of work is required to further improve compliance with the lead standard in 2017 and beyond.

Figure 1.2: Lead Leaflet

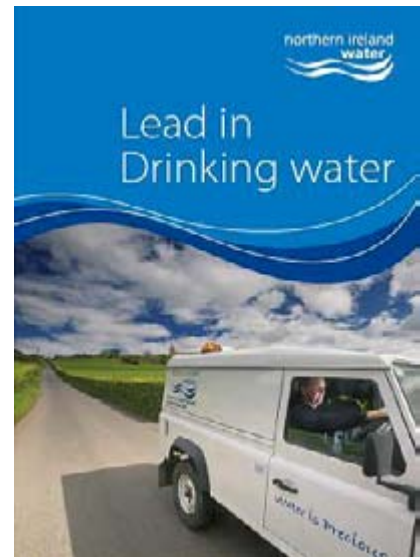
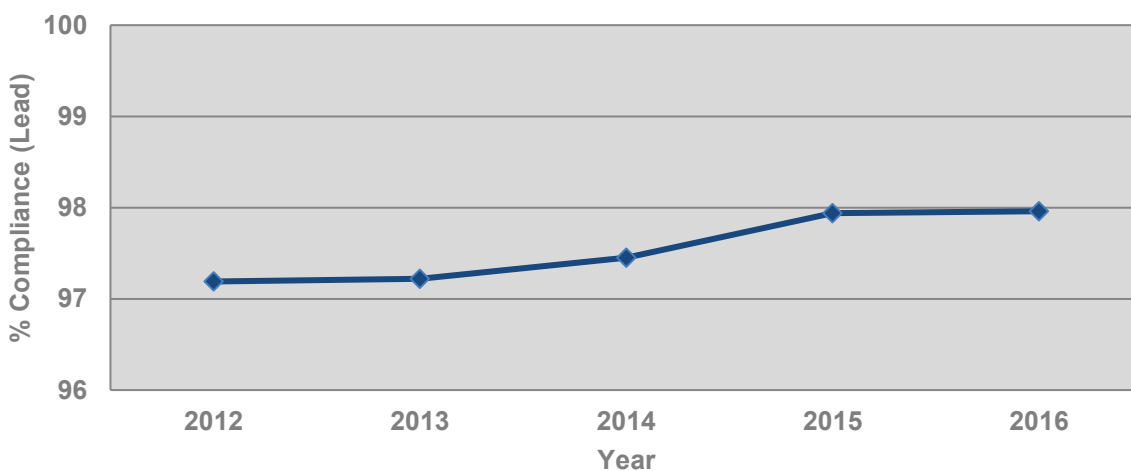


Figure 1.3: Percentage of Tests Meeting the Lead Standard, 2012 – 2016



In addition to the sampling requirements for lead compliance in the Regulations, NI Water undertakes an extensive operational sampling programme. Results from this sampling programme highlight those water supply areas which have not achieved the optimisation target of 98%. Four of the 25 lead zones (16%) did not achieve the 98% target. The majority of lead contraventions occurred in the greater Belfast area.

Iron

The regulatory standard for iron is set for aesthetic reasons as levels above the standard can give rise to discoloured water. Corrosion of iron water mains is the most common reason for contraventions. In 2016, iron was the chemical parameter for which there was the greatest number of tests failing to comply with the regulatory standard. Of the 1,868 samples taken, 25 (1.34%) failed to meet the 200µg/l standard. This is an improvement on 2015 figures when 1.60% contravened the standard. These contraventions were mostly due to the build-up, and subsequent disturbance, of deposits found within water mains. Where this is identified, there are a number of remedial measures which NI Water will carry out, including scheduled flushing programmes and replacement of older iron mains. NI Water have an extensive mains rehabilitation programme ongoing to replace old cast iron mains to improve water quality in the longer term.

Aluminium

Aluminium can occur naturally in many water sources, particularly those derived from upland areas. Aluminium compounds may also be used as a coagulant during the water treatment process. The regulatory standard for aluminium is based on aesthetic considerations because high concentrations in water may cause discolouration.

In 2016, a total of 1,868 samples were tested for aluminium of which twelve (0.64%) contravened the 200µg/l regulatory standard. This is an improvement from 2015 when 0.75% contravened the standard. Following investigations, NI Water found eight contraventions were linked to localised disturbances of mains deposits; two occurred as a result of events at both Dorisland WTWs and Drumaroad WTWs following treatment difficulties; and the remaining two were undetermined.

It is important to note that aluminium contraventions at consumer taps originate from issues at the WTWs as there are no sources of aluminium in the distribution network. In some cases, however the aluminium has entered the distribution network at some point in the past. Tighter controls of treatment processes are required to limit the levels of aluminium entering the distribution system. Remedial measures to reduce the aluminium levels within the distribution system include flushing and cleaning of the system.

Microbiological Quality

The overall safety of drinking water at consumer taps in 2016 is confirmed with a high level of microbiological compliance (99.68%), (see Table 1.1). This is a slight decrease in compliance from the 99.70% reported in 2015 however, and relates to the lower compliance reported for coliform bacteria at consumers' taps (99.27% compared to 99.32% in 2015). Of the 38 instances coliform bacteria were detected in 2016, *E. coli* was not detected on any occasion.

Clostridium perfringens was found in four (0.17%) of the 2,291 samples tested in 2016. This is a slight decrease in compliance compared to 2015 when it was found in three (0.14%) of the 2,197 samples lifted. NI Water's investigations found that one contravention was due to treatment difficulties at the works, one was caused by contamination from a leak in a newly installed sample tap and the remaining two were undetermined.

Enterococci were not detected in any of the 392 samples taken by NI Water at consumers' taps in 2016.

Domestic Dwellings Distribution Systems

NI Water's investigation into contraventions of the drinking water quality standards must determine if it is due to the internal distribution system within a domestic dwelling. Where this is identified they must inform the owner with details of the failure and provide appropriate advice in relation to actions the owner may take to rectify the contravention and protect public health. The investigations, where appropriate, should also ensure consumers' internal plumbing is compliant with The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009.

In 2016, there were 35 contraventions reported to us which NI Water determined were due to the internal plumbing within domestic properties. These were related to the following parameters: 23 coliform bacteria; seven lead; four odour; and one taste. These contraventions were investigated by NI Water and letters sent to consumers advising them of the contraventions and offering appropriate advice to protect public health.

Public Buildings Distribution Systems

At premises where water is made available to members of the public (such as schools, hospitals or restaurants) there were 491 samples taken during 2016. Of these, ten contravened the drinking water quality standards: four for coliform bacteria; three for aluminium; one for iron; one for taste; and one for trihalomethanes.

NI Water must take appropriate action to rectify the failure where it is attributable to either the water supplied by them, or is a contravention of the Water Fittings Regulations. For any other failures within such premises, we are required to follow-up with the owners under The Water Supply (Domestic Distribution Systems) Regulations (Northern Ireland) 2010. If we assess the failure as likely to recur, or if it constitutes a potential risk to human health, a notice may be served on the owner to undertake the necessary actions to protect public health and bring the supply back into compliance.

In 2016 we received notification from NI Water of two public premises where the contraventions were attributed to the internal domestic distribution system. We issued letters to each of these premises, requiring them to put in place the appropriate measures to deal with these contraventions. Both contraventions were due to the presence of lead pipework within the properties.

Consumer Contacts

Every year NI Water provides us with consumer contact information to help us understand consumers' concerns (Table 1.3 refers). The total number of consumer contacts reported in 2016 was 6,961 compared to 7,183 in 2015, a decrease of 222 (3.1%).

As expected and as with previous years, the highest percentage of contacts and concerns continues to relate to the appearance of drinking water, with 64.7% in 2016 (68.3% in 2015). This is illustrated in Figure 1.4.

Table 1.3: Water Quality Contacts received by NI Water in 2016

Contact Category	Contact Sub-Category	Number of Contacts
Appearance	Colour	3029
	General	190
	Hardness	13
	Stained Washing	17
	White - Air	870
	White - Chalk	382
Taste and Odour	Chlorinous	411
	Earthy/Musty	164
	Other	390
	Petrol/Diesel	41
	TCP	62
Illness		73
Particles		192
Animalcules		8
Boil Water Notice		1
Other	Water Quality Concern - Campaigns	3
	Water Quality Concern - Incident Related	33
	Water Quality Concern - Lifestyle	5
	Water Quality Concern - Pets/Animals	7
	Water Quality Concern - Sample	671
	Water Quality Concern - Lead	318
	Water Quality (No Concern) Fluoride	0
	Water Quality (No Concern) Other Information	24
	Water Quality (No Concern) Water Hardness	43
	Water Quality (No Concern) Water Quality Report	13
TOTAL		6961

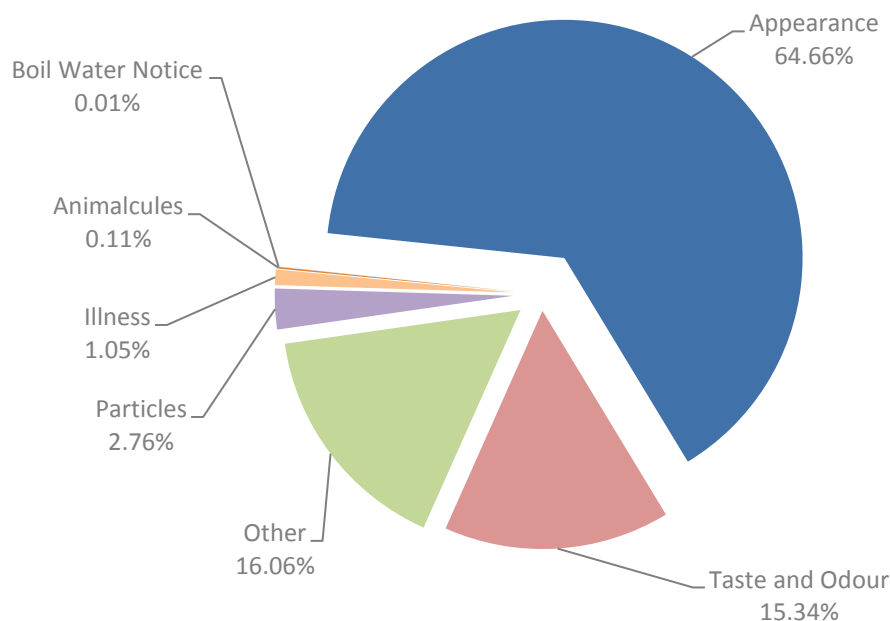
Appearance

Within the overall appearance categories we look closer at the different sub-categories that are a cause of concern for consumers.

Colour

Within the appearance category, 67.3% of consumer concerns related to discoloured water in 2016 (64.8% in 2015). The most common cause of coloured water concerns is an orange, brown or black discoloration caused by suspended particles of iron (orange/brown) and manganese (black).

Iron discoloration may occur through natural iron present in the raw water passing through inadequate treatment, from the treatment process, or from corrosion of cast-iron distribution

Figure 1.4: Consumer Contacts and Concerns received by NI Water in 2016

mains as discussed earlier. Manganese is naturally present in some raw waters and may not be removed if treatment is inadequate.

White Water

'White water' is mainly caused by air dissolved in the water, making it appear cloudy or milky white. A number of causes include burst mains, malfunctioning pumps, and consumer stop taps. Where air is the cause of white water, the cloudy appearance will clear in a glass of water from the bottom up.

Another cause of white water may be chalk. Chalk has a white powdery appearance and is made up of natural minerals found in water which form what is known as 'hardness'. A glass of water containing chalk will take up to an hour to clear from the top downwards, leaving fine white sediment in the bottom of the glass.

'White water' accounted for 27.8% of appearance concerns in 2016.

Taste and Odour

All water sources contain naturally occurring minerals. Water also contains dissolved gases, such as oxygen and carbon dioxide, which give tap water a characteristic taste. There may be other substances present in the water which can give rise to consumer complaints. One such substance, which is intentionally added to drinking water, is chlorine, which accounts for the highest number of taste and odour complaints reported by consumers in Northern Ireland.

Other taste and odours should not be present in drinking water for aesthetic reasons (e.g. TCP or earthy/musty) or health reasons (e.g. petrol/diesel).

Taste and odour complaints accounted for 15.3% of the total consumer concerns in 2016.

Chlorinous

Some individuals are more sensitive than others to the taste and odour of chlorine which is used to maintain hygienic conditions within the water supply network. Thirty eight per cent of taste and odour consumer contacts in 2016 were related to a chlorinous taste and odour in the water.

Advice on steps you can take to reduce the effect of chlorinous taste and odours on your household water supply can be obtained from the leaflet, '[Looking after water in your home](#)'.

Investment Planning

NI Water's investment programme is controlled by the Price Control process (PC15). This is a six year investment programme which started in April 2015 and ends in March 2021. As the Drinking Water Quality Regulator we are very much involved in this process. Our main aim is to work with NI Water and the other stakeholders to ensure that the work programmes required to improve compliance with drinking water quality standards are delivered.



Part 2

The Drinking Water Cycle

- Catchment: MCPA continues to be the pesticide most commonly detected in 2016
- Treatment & Distribution: Highly Significant decrease in THM compliance in 2016
- Events: There were 27 Significant Events reported in 2016 with 19 of these occurring at Water Treatment Works
- Risk Management: NI Water have 23 Risk assessments in place to cover each Water Treatment Works and associated supply area

This part of the report will detail the drinking water cycle, from the **catchment** through to **treatment** at Water Treatment Works and through NI Water's **distribution network** to consumers. It also summarises the **risk management** approach adopted by NI Water in ensuring that water supplies remain safe and wholesome throughout its journey to homes and businesses.

Catchments

NI Water mainly abstracts its raw water from 34 sources including rivers and loughs (51.4%), impounding reservoirs (48.5%) and one borewell (0.1%) which supplies Rathlin Island.

NI Water is required to assess all the potential risks within its catchments through a risk assessment process. As the potential list of contaminants within catchments is diverse, NI Water must risk assess each catchment to determine the specific risks, and to ensure appropriate mitigation is in place. NI Water undertakes a risk based annual monitoring programme to determine water quality within the catchment and at its abstraction points.

This monitoring is important as it provides information on the risks within the catchment and also for the operational management of water treatment works to ensure treatment processes provide an effective barrier against contaminants.

Pesticides/Herbicides

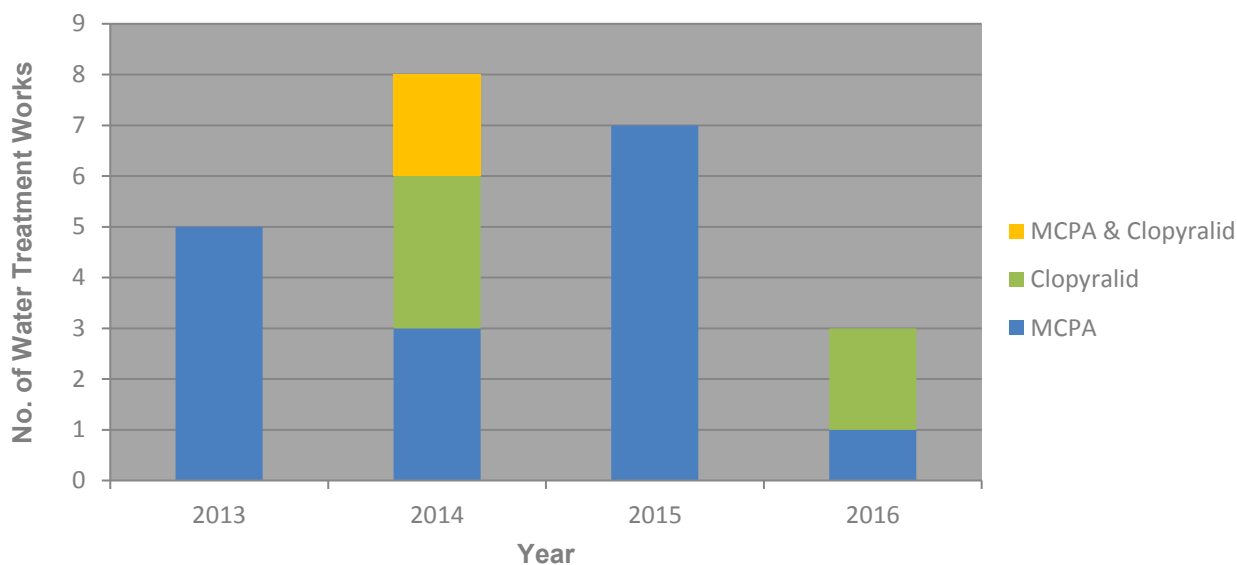
During 2016, 34 individual pesticides were monitored for under the compliance sampling programme. There were 226 samples taken resulting in a total of 7,672 pesticide determinations. From these samples, two contravened for Clopyralid (Castor Bay and Carran Hill WTWs) and one for MCPA (Derg WTWs). Clopyralid is a herbicide used to control annual and perennial broadleaved weeds, particularly thistles and clover. MCPA is a herbicide which is widely used in Northern Ireland for controlling broadleaved weeds in grass and cereal crops, and in the clearing of rushes.

NI Water also undertakes an operational monitoring programme. The outputs from this are used to inform its risk assessments and ensure treatment and catchment control measures are effective. During 2016 this identified pesticides above the regulatory limit from Derg WTWs.

All water treatment works with contraventions for pesticides from 2013 to 2016 are summarized within Figure 2.1.

The number of pesticide contraventions in 2016 is lower than for 2015, however a number of catchments remain where NI Water has assessed pesticides as a high or medium risk.

Figure 2.1: Number of WTWs where pesticides have been detected above the regulatory limit 2013 – 2016.

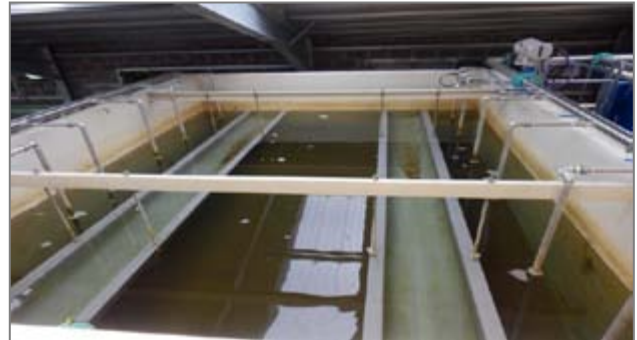


NI Water liaise with the Northern Ireland Environment Agency's (NIEA's) Pollution Control Team regarding pesticide usage and control measures within drinking water catchments. There are a range of mitigation and control measures for pesticides which NI Water has in place within the catchment and treatment processes at Water Treatment Works. These include liaison and providing advice to groups and individuals who use pesticides/herbicides through Water Catchment Partnerships, along with the development of catchment management plans and implementation of sustainable catchment management solutions. Where catchment solutions alone are unable to reduce the risks sufficiently, NI Water must ensure that it has appropriate treatment in place to remove the levels of pesticides/herbicides to below the regulatory limit.

Water Treatment

NI Water must ensure that the treatment processes in place at all water treatment works (WTWs) are able to deal with variations in the raw water quality. Water treatment processes normally include the physical removal of potential contaminants by using chemical coagulation/flocculation, sedimentation or flotation (Figure 2.2), and filtration (Figure 2.3) before disinfection.

An important measure of the effectiveness of treatment is the assessment of the water quality throughout the treatment process and the quality of the final water leaving the works.

Figure 2.2: Flotation Stage**Figure 2.3: Filtration Stage**

In Table 2.1, two sets of parameters are used to describe the effectiveness of water treatment processes: process control parameters; and disinfection parameters.

Table 2.1: Water Quality at Water Treatment Works, 2016

Parameters	Place of Sampling	Total No. of Tests in 2016	No. of Tests not Meeting the Standards in 2016	% of Tests Meeting the Standards	
				2016	2015
Process Control Parameters					
Aluminium	WSZ	1868	12	99.36	99.25
Trihalomethanes	WSZ	392	12	96.94	99.74
Disinfection Parameters					
Coliform bacteria	WTWs	6380	2	99.97	99.98
<i>E. coli</i>	WTWs	6380	0	100	100
Turbidity	WTWs	6380	7	99.89	99.69
Indicator Parameter					
<i>Clostridium perfringens</i>	WTWs	2291	4	99.83	99.86

WSZ = Water Supply Zone (consumer tap sample)

Process Control Parameters

Process control parameters are used to measure the effectiveness of water treatment, and are based on a selection of chemical parameters relevant to the processes in place at the water treatment works.

In 2016, results from the regulatory monitoring programme, shown in Table 2.1, report non-compliances for two of the process control parameters: aluminium and trihalomethanes (THMs).

Aluminium

Aluminium compliance, which is measured at consumers' taps, improved slightly in 2016. There were twelve regulatory contraventions (0.64%) compared with the fourteen (0.74%) in 2015.

Operational sample results and traces from on-line monitors often highlight elevated aluminium levels at WTWs before they become apparent in distribution. In many cases the remedial measures taken by NI Water in response to these early detections, limit the impact of a water quality event. Overall, there were eight “Significant” events at WTWs in 2016 relating to elevated levels of aluminium. Although these events do not always directly correlate with regulatory contraventions at consumers’ taps, they can lead to the accumulation of aluminium in the distribution system and contribute to contraventions at a later date. The levels of aluminium compliance have remained consistent over the last five years.

Trihalomethanes (THMs)

THMs are a group of disinfection by-products that form when naturally occurring organic substances combine with chlorine, which is added to disinfect the water and make it microbiologically safe to drink. Effective and well managed treatment processes reduces the levels of these organics, which are directly related to the level of THMs that occur in the final water.

It is disappointing to report a highly significant decrease in THM compliance in 2016, with twelve samples (3.06%) contravening the standard of $100\mu\text{g/l}$, compared to one (0.26%) in 2015. This is contrary to the year on year improvements in compliance that occurred from 2012 up to 2015. The lower compliance in 2016 is due to a combination of factors including operational practices at water treatment works and water travelling further and therefore remaining longer in, distribution systems.

Figure 2.4: Percentage Compliance for THMs at Consumers’ Taps, 2012 – 2016

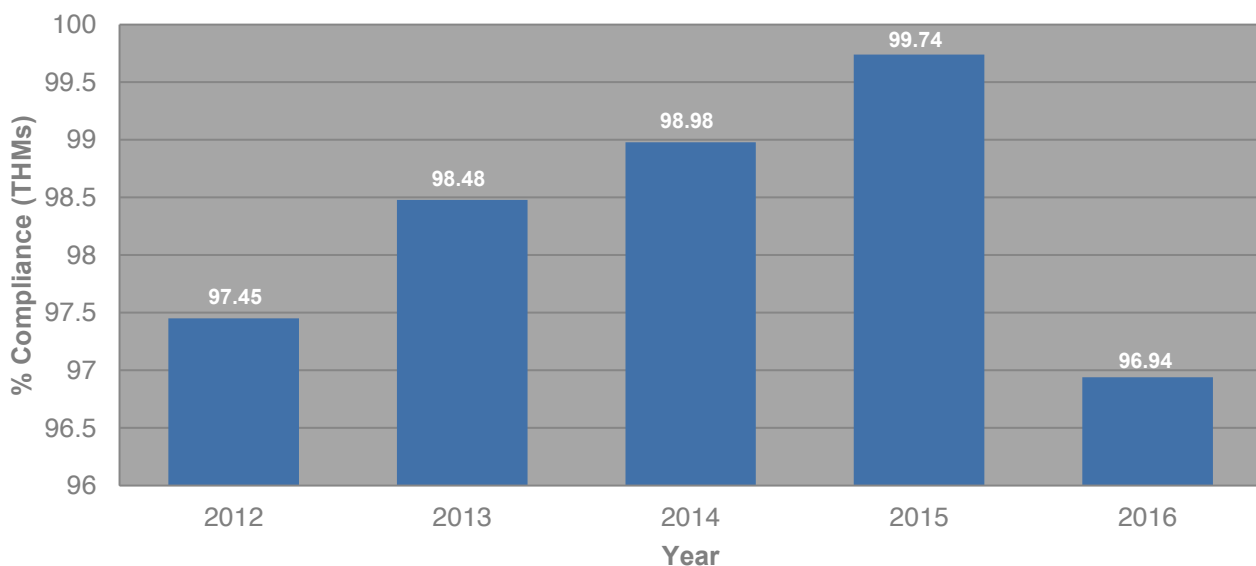


Figure 2.4 displays the levels of THM compliance at consumers’ taps over the last five years. NI Water must fully consider the formation of THMs and other disinfection by-products as part of its overall disinfection policy and through its risk assessment process have in place appropriate mitigations and controls to prevent future contraventions. NI Water must ensure good operational practices at water treatment works and appropriate maintenance of the distribution network to improve THM compliance in 2017.

Disinfection Parameters

The parameters, coliform bacteria, *E. coli* and turbidity (Table 2.2 refers) look at the effectiveness of disinfection and pathogen removal. To safeguard consumers from the risk of microbiological organisms being present in drinking water, effective disinfection is fundamental to treatment works' operation. Testing for *E. coli* and coliform bacteria at water treatment works provides a level of assurance that water is being adequately treated to ensure safe, clean drinking water. In 2016, NI Water reported 100% compliance for *E. coli* and 99.97% compliance for coliform bacteria at water treatment works.

Turbidity is caused by finely suspended particles in the water and these must be removed by effective water treatment in preparation for the disinfection process. As well as being a regulatory requirement, it is good operational practice that a turbidity value below 1 NTU is achieved post treatment to ensure effective disinfection. There was a slight increase in compliance with the turbidity standard in 2016 (99.89% compared to 99.69% in 2015). Turbidity contraventions occurred at seven (28%) water treatment works in 2016. Of the 6,380 samples taken for turbidity analysis from WTWs, seven (0.11%) failed to meet the standard. Of these failures, four were due to unrepresentative sampling and/or analyses, and three were caused by treatment difficulties.

Indicator Parameter

Clostridium perfringens

Clostridium perfringens can be used in association with other parameters to assess the efficiency of the water treatment processes. 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 by chlorination.

In 2016, of the 2,291 tests carried out for *Clostridium perfringens*, four (0.17%) contravened the standard: one each at Killylane, Castor Bay, Clay Lake and Fofanny WTWs. Investigations identified: a possible source of contamination for one of the contraventions; a link to a works shutdown resulting in treatment difficulties for another contravention; and for the remaining two, no cause was determined.

Distribution

The water distribution network in Northern Ireland is extensive, consisting of 294 service reservoirs (SRs) and approximately 26,700 km of mains pipe. The mains transfer drinking water from the water treatment works to service reservoirs and onwards to the consumer. Service reservoirs provide storage close to the point of distribution to help ensure that sufficient water is available to meet the varying demands of consumers.

In Table 2.2 two measures are used to describe the water quality within a distribution system: reservoir integrity, and distribution networks.

Table 2.2: Water Quality Indicators within the Distribution System

Parameters	Place of Sampling	No. of Tests in 2016	No. of Tests not Meeting the Standards in 2016	% of Tests Meeting the Standards in 2016	% of Tests Meeting the Standards in 2015
Reservoir Integrity					
Coliform bacteria	SR	15213	15	99.90	99.87
<i>E. coli</i>	SR	15213	0	100	99.99
Distribution Networks					
Turbidity	WSZ	1868	1	99.95	99.73
Iron	WSZ	1868	25	98.66	98.40
Manganese	WSZ	1868	3	99.84	99.89

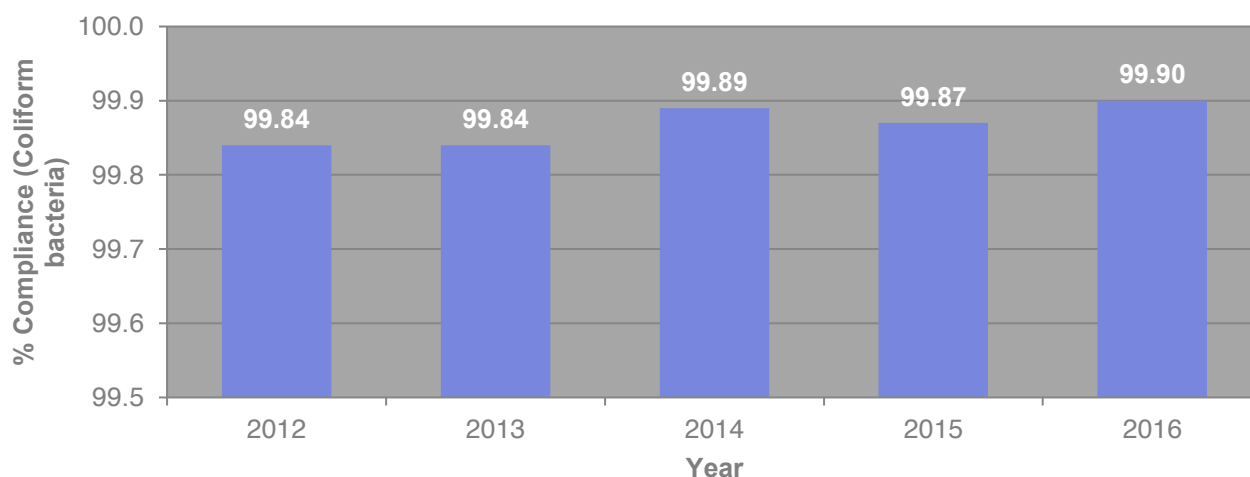
Service Reservoirs

Samples are collected weekly at every service reservoir in Northern Ireland. An example of such a reservoir is shown in Figure 2.5. It is a regulatory requirement that at least 95% of samples collected annually from each service reservoir are free from coliform bacteria. All 294 service reservoirs sampled in 2016 met this regulatory requirement. As illustrated in Figure 2.6, 99.90% coliform bacteria compliance was achieved in 2016, a slight improvement on 99.87% in 2015. Coliform bacteria however, were detected on 15 occasions at 15 (5.1%) different service reservoirs. This is also an improvement from the 20 occasions reported in 2015. Full compliance was attained for *E. coli*, which is an improvement from 2015 when *E. coli* was detected on two occasions at two different service reservoirs.

Figure 2.5: Service Reservoir



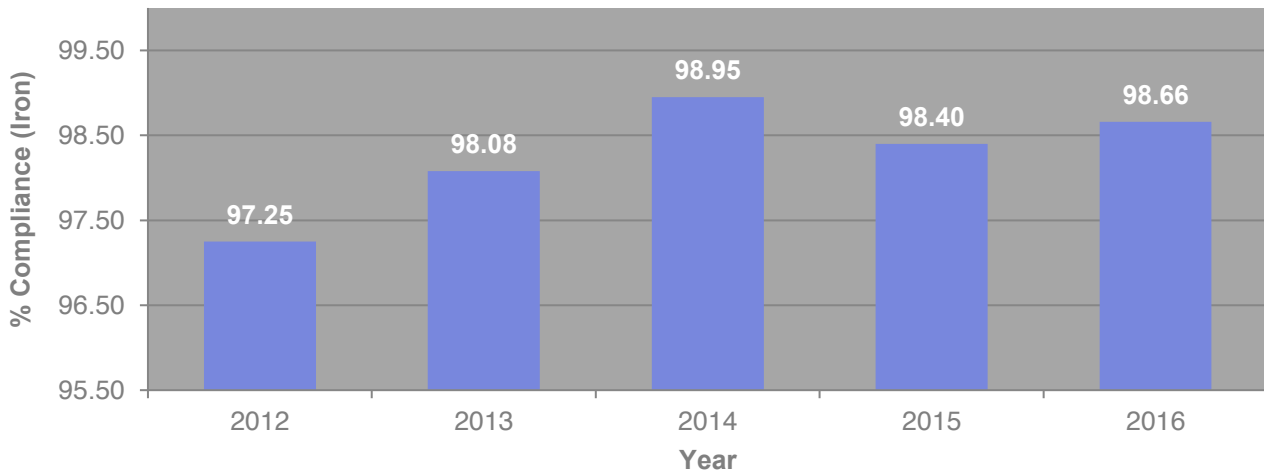
Figure 2.6: Percentage Compliance of Coliform Bacteria at Service Reservoirs, 2012 - 2016



Water Mains

In 2016 a total of 1,868 samples taken from consumers' taps were tested for iron. Of these, 25 (1.34%) contravened the regulatory standard of 200µg/l. This reflects an improvement in compliance from 2015 when 30 (1.60%) contravened the standard as illustrated in Figure 2.7.

Figure 2.7: Percentage Compliance of Iron in Distribution, 2012 – 2016



Many of the mains delivering water to consumers' taps are made of cast iron and the deterioration of older water mains may result in consumers receiving discoloured drinking water due to the presence of iron and manganese. NI Water has an ongoing Water Mains Rehabilitation Programme and this enables corrective action to be taken on a priority basis to improve the water quality being supplied to consumers. A typical new mains installation is shown in Figure 2.8.

Figure 2.8: New Mains Installation



Events and Risk Management

Drinking Water Quality Events

NI Water must inform us of all events that have affected, or are likely to affect, drinking water quality or sufficiency of supplies, and, where as a result, there may be a risk to consumers' health. Each event notified to us is assessed into one of five categories based on severity from *not significant*, to *minor*, *significant*, *serious* and *major*. It is important that lessons are learnt from events and any necessary remedial action is undertaken. The risk assessments in place for each water supply system are also required to be reviewed following an event.

Fifty events were reported to us in 2016. Of these, we categorised 27 as Significant; 9 as Minor; and 14 as Not Significant. There were 19 Significant events which occurred at 12 water treatment works: Altnahinch; Carmoney; Carran Hill; Castor Bay; Caugh Hill; Derg; Dorisland; Drumaroad; Dungonnell; Glenhordial; Killylane; and Rathlin. The majority of these were related to difficulties with the performance of the treatment processes, or deficiencies at the WTWs

which led to: aluminium; *Clostridium perfringens*; iron; pesticide (MCPA & Clopyralid); THMs; and turbidity contraventions (**Annex 2** provides further information on all events notified to us in 2016).

Risk Management

NI Water are required to carry out a risk assessment of each water supply system. This is part of the drinking water safety plan (DWSP) approach adopted by NI Water at every treatment works, associated catchment and supply system. It is a 'source to tap' approach in the management and control of the potential risks within drinking water supplies. The assessments are kept under review by NI Water and from 2017 an annual return must be made to DWI for each incoming year. We assess these plans to ensure risks are adequately identified and that control measures are in place to ensure the protection of public health. There are currently 23 risk assessments in place covering all of NI Water's drinking water supplies.

Regulatory Control

The Technical Audit Process

Through a process of technical audits we check NI Water's compliance with statutory obligations and best practice. We operate a risk-based approach to technical audit which takes into consideration factors such as water quality monitoring, events and previous audits. The recommendations from technical audits forms part of the risk management approach in protecting drinking water supplies. A summary of the 2016 Technical Audit Programme is detailed in **Annex 3**.

Enforcement Action

In order to protect, maintain and improve drinking water supplies, NI Water has investment programmes and systems of work in place to manage the risks. These programmes are driven by NI Water's assessment of need and large scale investments are managed through the Price Control process (PC15). However, there are occasions when it is necessary for DWI to ensure compliance with the regulatory standards, and the ongoing provision of safe clean drinking water, through taking forward enforcement. These include the issuing of Notices and Enforcement Orders details of which can be found in **Annex 4**.

Section 2
Private Water Supplies



Section 2

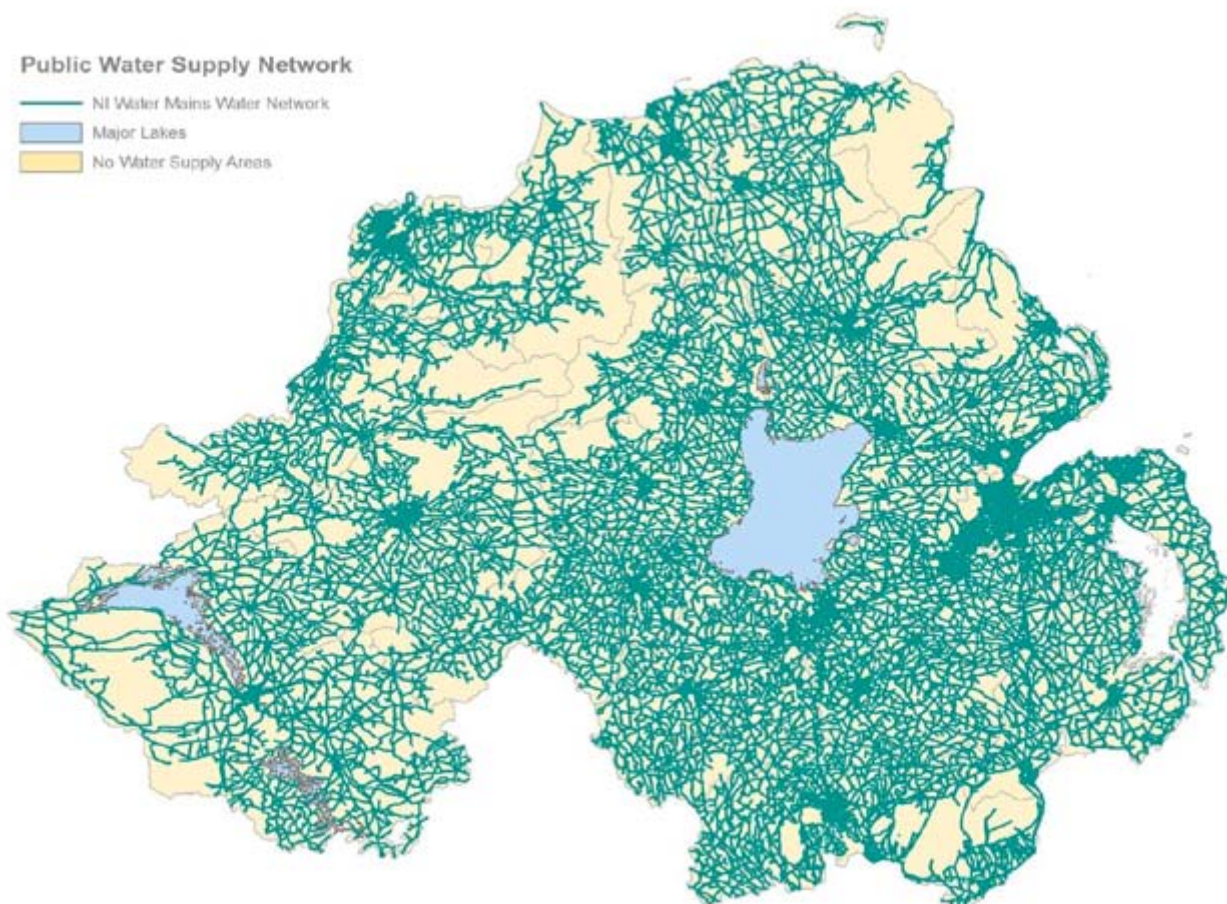
Private Drinking Water Supplies

- 154 registered private water supplies in 2016, including 15 new supplies
- 86% are commercial / public supplies; and 14% are small domestic supplies
- 99.4% of the supplies are from groundwater sources
- Of the 11,050 tests taken, 98.85% complied with the regulatory standards
- Full compliance was achieved at 64% of registered private water supply sites
- 43% of non-compliant sites showed microbiological contraventions, 45% chemical contraventions and 12% had both microbiological and chemical contraventions

NI Water supplies water to over 99% of the Northern Ireland population; the remainder is served by private water supplies. The extent of the NI Water mains network is shown in Figure 1.1. The areas of no water supply are those where domestic properties are most likely to be served by a private water supply.

Consumers often assume the water they are drinking is the public water supply. However, although the number of people directly served by a private supply may be small, many more people are exposed to them through their use in both commercial activities and public buildings.

Figure 1.1: NI Water Mains Network (and no water supply areas)



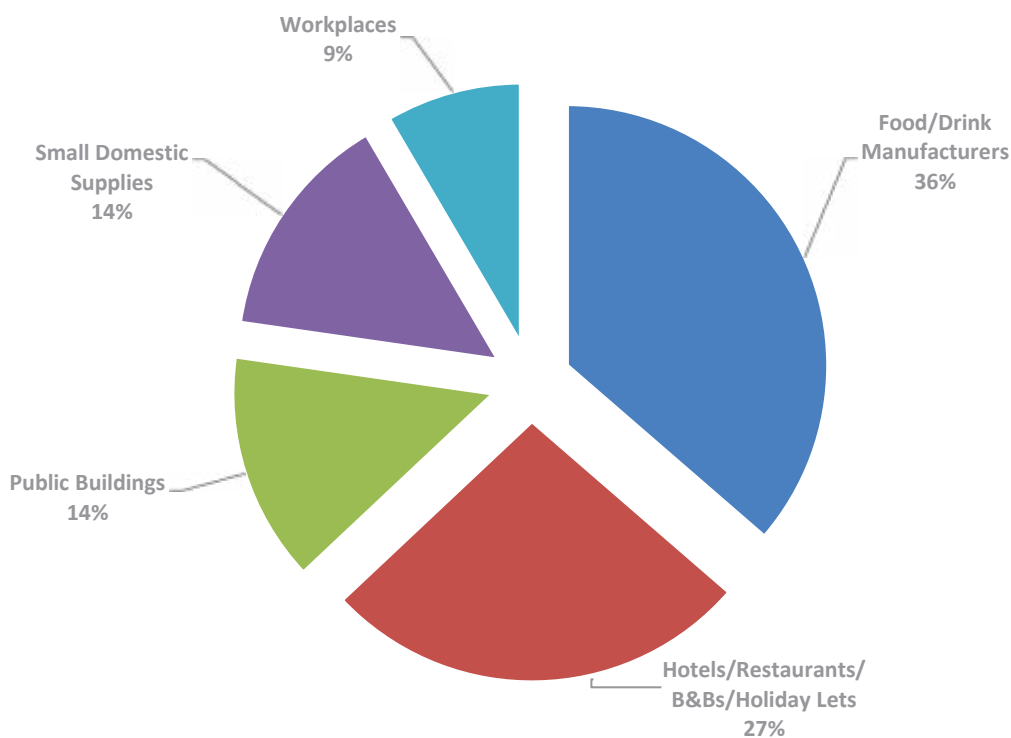
Private water supplies are often used as an alternative to or in conjunction with the public water supply at a range of sites such as:

- food and drink manufacturers;
- public buildings including hospitals, workplaces and universities; and
- within the hospitality industry such as hotels, restaurants, or bed & breakfast facilities.

Register of Supplies

There was a total of 154 supplies on our register in 2016 required to be monitored under The Private Water Supplies Regulations (Northern Ireland) 2009. The categories of these registered supplies are presented in Figure 1.2. It is estimated that there are approximately a further 1,200 supplies to single private dwellings which are not required to be monitored under the regulations. The Environmental Health departments of local councils may test these supplies on request.

Figure 1.2: Categories of Private Water Supplies in Northern Ireland in 2016



Private water supplies may be drawn from either surface or groundwater sources. Surface sources can include streams, rivers and reservoirs; groundwater sources include wells, boreholes and springs. Presently, 99.4% of registered private supplies in Northern Ireland are from groundwater sources, most commonly, boreholes.

Monitoring of Supplies

An annual sampling programme is in place for each registered supply. The frequency of the sampling and the range of parameters tested for are determined by the type of the supply and the volume of water used or population served.

Of the 154 private water supplies on our monitoring schedule for 2016, 86% are commercial/public supplies; and 14% are small domestic supplies (groupings of two or more houses). A breakdown of the numbers and sizes of private water supplies in 2016 is shown in Table 1.1.

Table 1.1: Numbers and Types of Private Water Supplies in 2016

Types of Private Water Supplies - Volume (m ³ /day)	Number of Supplies	Frequency of Sampling (per annum)
(i) Commercial/Public Supplies		
>1000 ≤2000	2	10
>100 ≤1000	20	4
>10 ≤100	52	2
≤10	58	1
(ii) Small Domestic Supplies (two or more dwellings)		
≤10	22	1
TOTAL	154	

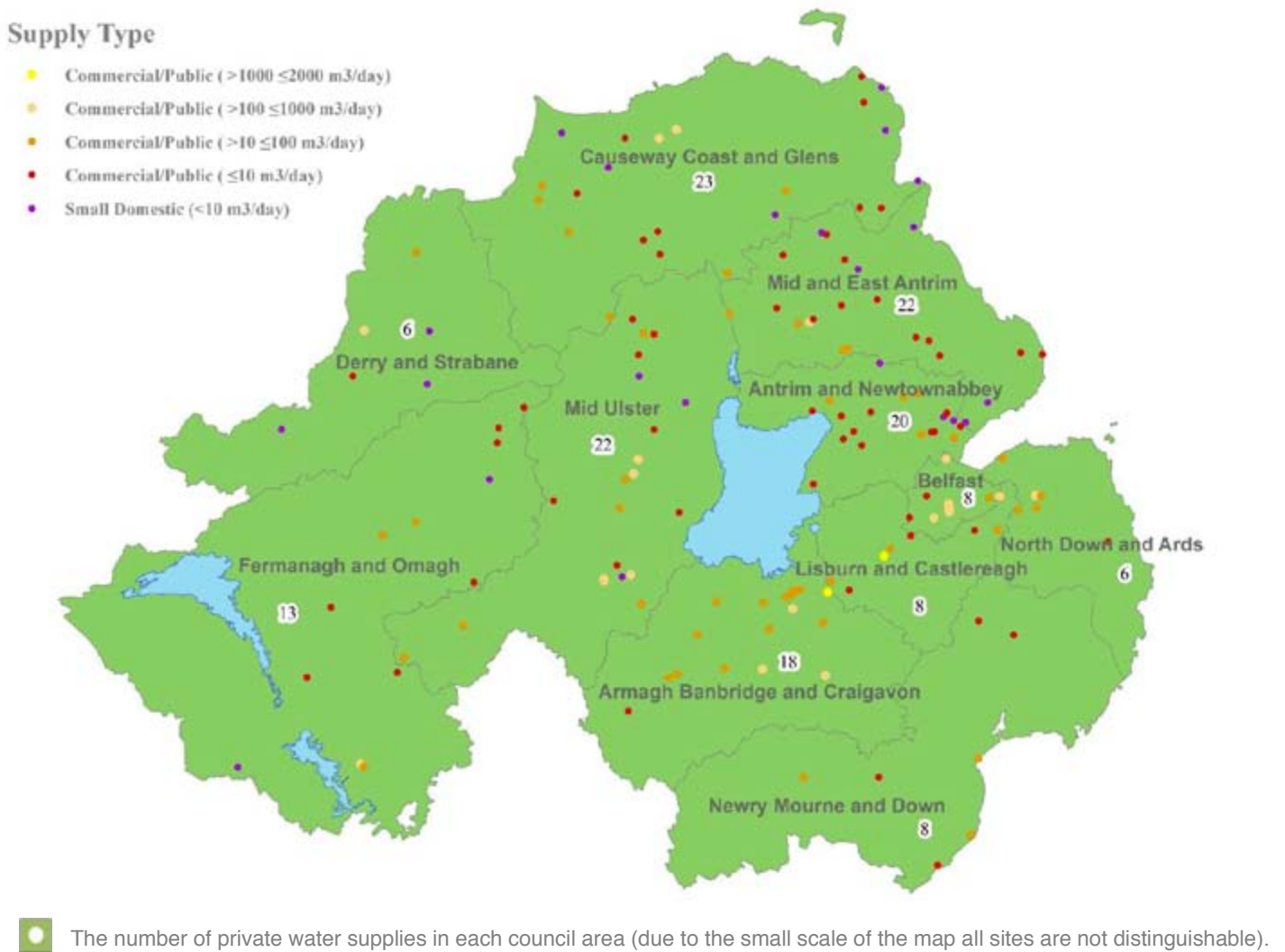
During 2016, eight sites were removed from the sampling programme as they no longer met the criteria to be registered. In addition a total of 15 new supplies registered with us, these were:

- five small domestic supplies serving two or more properties;
- three food/drink manufacturers;
- two hotels;
- two holiday lets;
- one public building;
- one restaurant; and
- a workplace.

Although the sampling frequency for compliance sampling is set within the regulations, many additional samples are taken throughout the year during follow-up investigations. In addition, where necessary, sites can be put on an increased sampling frequency for a set period of time to monitor any parameters identified as a risk in the supply. During 2016, a total of 208 ancillary samples were collected. These samples are not included in the calculation of the overall compliance for private water supplies.

A breakdown of registered supplies in Northern Ireland in 2016, categorised by size, is shown in Figure 1.3. The 2016 sampling programme included premises using private water supplies in all eleven council areas.

Figure 1.3: Distribution of Registered Private Water Supplies by Council Area in 2016



Risk Assessment

The regulations require a risk assessment to be carried out for each supply, within six months of registration, to identify areas where there may be potential risks to the water quality. This assessment includes the whole private water supply system, from source to the point where the water is used. These assessments follow the same principles used in the risk assessments in place for the public water supply.

A new web based application was developed for the risk assessment of private water supplies. This new application is being launched in 2017.

A total of nine site visits were undertaken in 2016 for the risk assessment of newly registered supplies.

The information gathered through the risk assessment process is used to provide sites with an action plan to mitigate identified risks. It can also be used to fine-tune the monitoring requirements for each site.

Overall Drinking Water Quality

Equivalent regulatory standards apply to private drinking water supplies as to public water supplies. The number of private water supplies registered with us in 2016 was higher than in 2015, therefore overall the number of parameters analysed for in 2016 was higher than in 2015.

The results in Table 1.2 show that, out of a total of 11,050 tests carried out in 2016, 98.85% met the regulatory standards. The regulatory requirements were not met on 127 occasions for 23 parameters, namely: coliform bacteria; manganese; hydrogen ion; iron; enterococci; *E.coli*; *Clostridium perfringens*; ammonium; sodium; individual pesticides (glyphosate, clopyralid, mecoprop); turbidity; lead; total pesticides; sulphate; bromate; boron; nickel; fluoride; trihalomethanes (THMs), colour and radon.

The low compliance figures for sodium, lead, sulphate and bromate are a consequence of the low number of tests performed for these parameters as they were not routinely tested for in all supplies. Apart from newly registered supplies: bromate was only tested at sites where chlorination was in use; sodium was only included where softening was practised; sulphate was only included where a supply had a history of contraventions for this parameter; and lead was only tested at sites where a potential risk was identified.

Table 1.2: Overall Water Quality in Private Water Supplies in 2016

Parameters	Determinations in 2016		
	Total Number of Tests	Number of Tests not Meeting the Standards	% Compliance
Coliform bacteria	274	28	89.78
Enterococci	153	10	93.46
<i>E. coli</i>	274	9	96.72
<i>Clostridium perfringens</i>	250	5	98.00
Microbiological Total	951	52 (5.47%)	94.53
Manganese	250	19	92.37
Hydrogen ion (pH)	271	18	93.36
Iron	250	11	95.58
Ammonium	250	4	98.40
Total pesticides	129	1	99.22
Turbidity	271	2	99.26
Other parameters	1984	7	99.65
Individual pesticides	6373	3	99.95
Sodium*	38	4	89.47
Sulphate*	13	1	92.31
Lead*	63	2	96.83
Bromate*	34	1	97.06
Chemical Total	9926	73 (0.74%)	99.26
Radon	148	2	98.65
Radioactivity	25	0	100.00
Radiochemical	173	2 (1.16%)	98.84
Overall Total	11050	127 (1.15%)	98.85

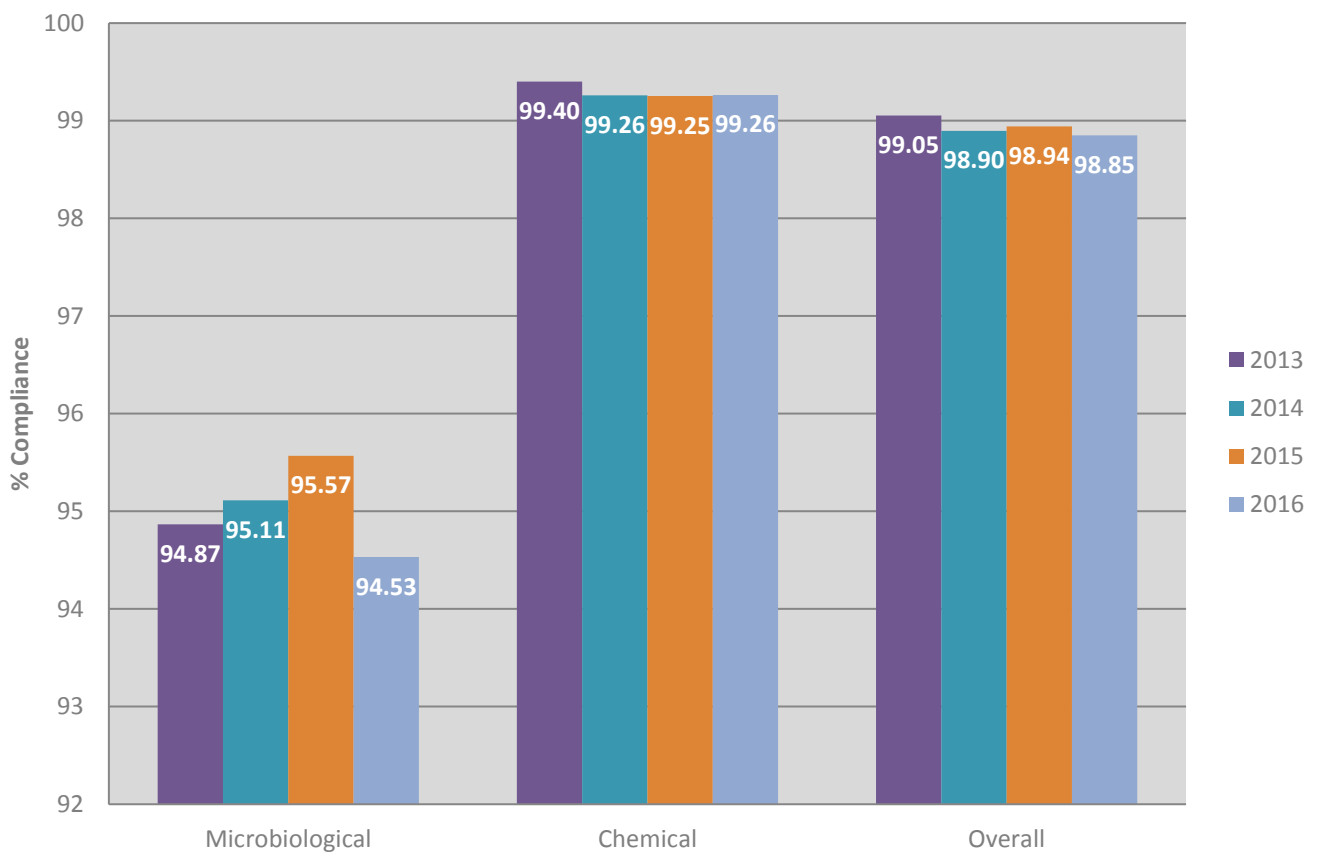
*Parameters on reduced monitoring frequency

Microbiological contraventions account for 52 (40.94%) of the 127 contraventions at private water supplies in 2016. There has been a slight decrease in the level of microbiological compliance reported as 94.53% in 2016, compared to 95.57% in 2015 and 95.11% in 2014, as illustrated in figure 1.4.

Contraventions of the chemical standards have been reported for a range of parameters listed in Table 1.2. Overall, the number of chemical contraventions has decreased slightly from 77 in 2015 to 73 in 2016. There has however been no significant change in chemical compliance for 2016, 99.26% compared with 99.25% in 2015, also illustrated in figure 1.4.

As with previous years, where the standards have not been met, they relate mainly to contraventions for manganese, hydrogen ion and iron.

Figure 1.4: Comparison of Compliance in Private Water Supplies, 2013 – 2016



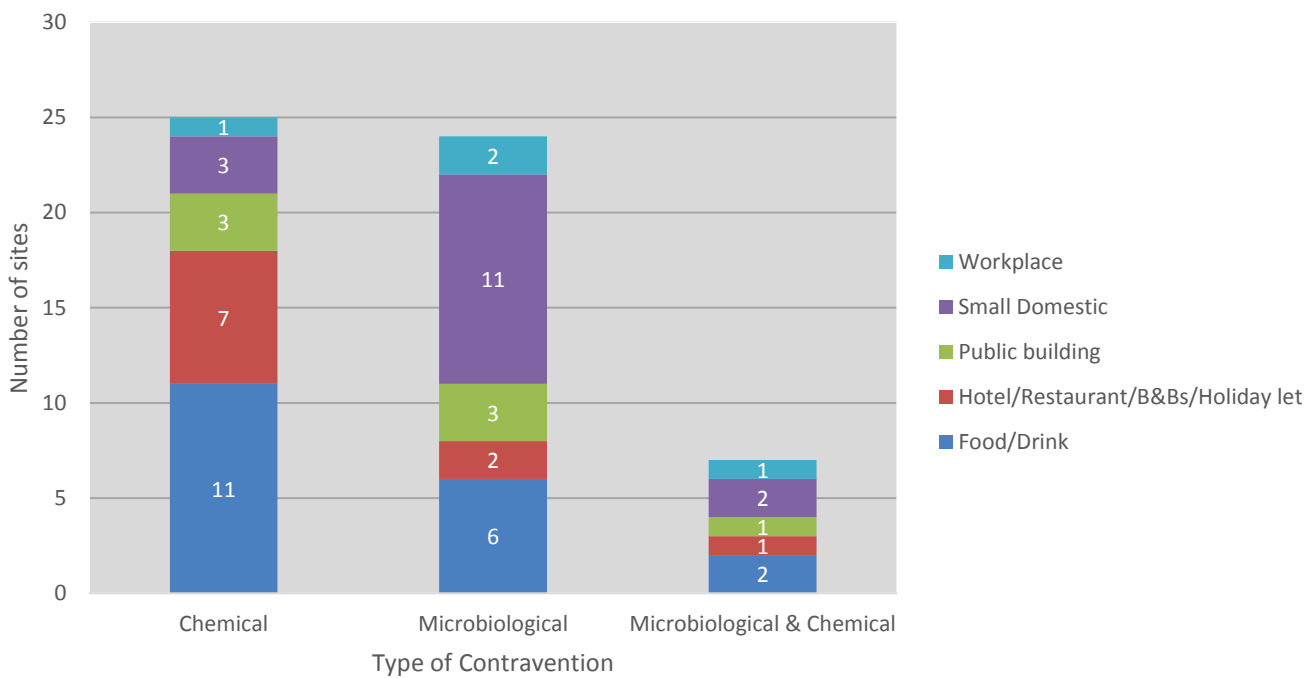
Full compliance was achieved for 64% (98 sites) of the private water supplies tested in 2016. Of the 56 sites which did not comply with the regulatory standards, 43% (24 sites) contravened microbiological standards; 45% (25 sites) chemical standards; and 12% (7 sites) failed to comply with both microbiological and chemical standards.

The categories of these non-compliant sites, presented in Figure 1.5, show that the chemical only contraventions occurred largely at commercial/public sites such as food/drink manufacturers, hotels, or holiday lets whereas for the microbiological only contraventions 46% were at small domestic supplies and 54% were at commercial/public sites.

The significance of each contravention does not only depend on the category or size of the sites but often more importantly the purpose for which the water is used at the sites. In summary,

- 33 use the private water supply as the primary source of drinking water;
- 16 use the water for the washing of equipment and surfaces in contact with food or drink;
- four are used solely for personal hygiene (wash hand basins); and
- three use the supply as an ingredient in food or drink.

Figure 1.5: Categories of Non-Compliant Private Water Supply Sites in 2016



Factors Affecting Drinking Water Quality

The different aspects of the water supply chain contribute to the microbiological and chemical quality contraventions reported in 2016 such as; catchment (including source protection); treatment; distribution; and sampling point (tap) issues.

Micro-Organisms

The presence of micro-organisms in a private water supply is indicative of contamination of the water either at source or at some point within the distribution system. In particular, the detection of *E. coli* or enterococci bacteria specifically indicates faecal contamination of a water supply and can be a risk to public health. These faecal indicators were found to be present in 13 supplies during 2016, 8 small shared domestic supplies with no treatment and 5 commercial/public supplies, 3 of which had disinfection treatment in place at the time of sampling.

Rural water supplies in the vicinity of where animals graze or manure is spread are most at risk. This is particularly prevalent at times of heavy rainfall, when water may run directly off farmland

and carry micro-organisms into unprotected private supplies. Guidance on source protection is available in the [Private Water Supplies Technical Manual](#).

Poor microbiological quality also highlights where there is a lack of suitable treatment or the treatment installed is not being operated and maintained appropriately. The quality of the raw water is a key element in selecting the correct treatment for a private water supply which may require pre-treatment prior to disinfection.

Metals

Some groundwaters may contain high levels of naturally occurring iron and manganese. Iron levels can also be raised due to deterioration of cast iron pipe work and/or storage tanks within the distribution system. In 2016, 14 sites reported contraventions for one or both of these metals.

High levels of iron and manganese may affect the appearance, taste or smell of the water resulting in turbidity, colour, taste, and odour contraventions and discoloration or staining of water fittings. It can also affect treatment systems, such as ultra-violet lamps, due to metal deposits causing a reduction in their effectiveness for disinfection. Sites are encouraged to purge wells/boreholes, clean out storage tanks and flush through pipe work or, where required, replace parts of their distribution network to reduce the levels of iron in their supplies.

Contraventions were reported for two sites in 2016 due to the use of inappropriate fixtures and fittings, one for lead and one for nickel and lead. The regulations specify that only products and substances approved for use with drinking water supplies should be used.

Details of [approved products](#) are available through the Drinking Water Inspectorate for England and Wales web site.

Pesticides

Pesticide contraventions were identified at two private water supplies in 2016: a golf club and a workplace. Trace levels of a range of other pesticides below the regulatory limit of 0.10 µg/l for individual pesticides were also detected at 28 other sites.

Actions in the Event of Failure

Contraventions are investigated through site visits conducted by Environmental Health staff and the collection of follow up samples. Depending on the nature and significance of the contraventions, it may also be necessary for us to carry out a site inspection. Site visits ensure owners/users of the supply are provided with practical advice on source protection and treatment options and best practice for the management of their water supply to reduce the potential risks of contamination.

Any contraventions at supplies, where the water is used as an ingredient in food production or as drinking water, and that are considered as a potential risk to health, are reported to the Public Health Agency (PHA) for appropriate health advice. Where necessary, the regulations contain a provision to issue Notices which can be used to restrict or prohibit the use of a supply.

Out of the 127 contraventions identified in 2016, 69 were notified to PHA for advice: 55 microbiological and 14 chemical. As a consequence, new restrictions in the use of the private water supply were put in place at 22 sites to protect public health. These restrictions can include switching to, or blending with, the public water supply (where this was available), boil water before use notifications, and do not use instructions.

We continue to work with the owners and users of private water supplies and Environmental Health staff to bring these supplies into compliance. Priority is given to advancing improvements to the water quality through:

- provision of advice and guidance;
- agreeing action plans (particularly at the larger commercial/public sites); and
- promotion of water safety plans for the ongoing management of these supplies.

Legislative Changes

With the introduction of The Private Water Supplies (Amendment) Regulations (Northern Ireland) 2015 in November 2015 came the requirement to monitor radon in private water supplies at risk. During 2016, a second survey was carried out at all registered private supplies to gather further information on the level of risk from radon. The radon data collected to date will help inform the future requirement for radon monitoring in these supplies.

Update on Private Water Supplies Work

In February 2016, the Foods Standards Agency released [new guidance](#) on the use of private water supplies in primary production. This guidance is designed to assist in determining the use of appropriate water supplies in primary production activities.

There has been continued development of the web based application for the risk assessment of private water supplies throughout 2016. This has included working closely with Environmental Health staff and departmental IT services towards the delivery of this project in 2017.

Annexes

Annex 1 **Glossary**

Annex 2 **Events**

Annex 3 **Technical Audit Programme**

Annex 4 **Enforcement Orders**



Annex 1

Glossary and Definition of Terms

Aesthetic	associated with the senses of taste, smell and sight.	Drinking Water Standards	the prescribed concentrations or values listed in the Regulations.
Animalcule	a tiny or microscopic life form.	Enterococci	a sub-group of faecal streptococci commonly found in the faeces of humans and warm-blooded animals.
Catchment	the area of land that drains into a watercourse.	<i>Escherichia coli</i> (<i>E. coli</i>)	a type of faecal coliform bacteria commonly found in the intestines of animals and humans. The presence of <i>E. coli</i> in water is a strong indication of recent sewage or animal waste contamination.
Clopyralid	a herbicide used for controlling broad-leaved weeds such as docks and creeping thistle in grassland.	Event	a situation affecting, or threatening to affect, drinking water quality.
<i>Clostridium perfringens</i>	a spore-forming bacterium which is exceptionally resistant to unfavourable conditions in the water environment.	Faecal Coliform	a sub-group of coliforms, almost exclusively faecal in origin.
Coagulation	a process employed during drinking water treatment to assist in the removal of particulate matter.	Filtration	the separation of suspended particulate matter from a fluid.
Coliforms	a group of bacteria which may be faecal or environmental in origin.	Flocculation	a process where colloids come out of suspension in the form of floc or flakes.
Communication Pipe	the connection from the water main to the consumer property boundary (normally at the outside stop tap).	Glyphosate	a herbicide used to control broadleaved weeds and grasses amongst crops.
Compound	a compound consists of two or more elements in chemical combination.	Granular Activated Carbon (GAC)	an absorbent filtration media used to remove trace organic compounds from water.
Contravention	a breach of the regulatory requirement.		
Determination	an analysis for a specific parameter.		

Groundwater	water from aquifers or other underground sources.	Parameters	the substances, organisms and properties listed in Schedules 1 and 2, and regulation 2 of the Regulations.
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 above 7 are alkaline. A low pH water may result in pipe corrosion. This is corrected by adding alkali during water treatment.	Pathogen	an organism which causes disease.
Impounding reservoir	is a reservoir of stored water that may be used when supply is insufficient.	Pesticides	any fungicide, herbicide, insecticide or related product (excluding medicines) used for the control of pests or diseases.
Indicator Parameter	something that is measured to check that the control measures, such as water treatment, are working effectively.	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.
MCPA	a herbicide used for controlling broad-leaved weeds in grass or cereal crops.	Raw Water	water prior to receiving treatment abstracted for the purpose of drinking water provision.
Mecoprop (MCP)	a herbicide used for controlling broad-leaved weeds in grass or cereal crops.	Remedial Action	action taken to improve a situation.
Microbiological	associated with the study of microbes.	Sedimentation	the tendency for particles in suspension to settle out of the water under the influence of gravity.
m³/d	cubic metres per day.	Service Pipe	pipe that connects the consumer's property to NI Water's 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.
mg/l	milligrams per litre (one thousandth of a gram per litre).		
MI/d	megalitres per day (one MI/d is equivalent to 1,000 m ³ /d or 220,000 gallon/d).		
µg/l	micrograms per litre (one millionth of a gram per litre).		

Service Reservoir	a water tower, tank or other reservoir used for the storage of treated water within the distribution system.
Supply Point	a point, other than a consumer's tap, authorised for the taking of samples for compliance with the Regulations.
Trihalomethanes (THMs)	a group of organic substances comprising, for the purposes of the Regulations, four substances: trichloromethane (also known as chloroform), tribromomethane (also known as bromoform), dibromochloromethane and bromodichloromethane.
Water Supply Zone	a pre-defined area of supply for establishing sampling frequencies, compliance with standards and information to be made publicly available.
Wholesome/Wholesomeness	a concept of water quality which is defined by reference to standards and other requirements set out in the Regulations.

Annex 2 - Events

Significant Drinking Water Quality Events in 2016

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
16/01/16 – 16/05/17	Donegore SR (2,000 properties)	Water quality was impacted following a burst water main.	Antrim & Newtownabbey
22/01/16 - 23/01/16	Drumaroad WTWs (515,000 population)	An aluminium contravention was reported in the Drumaroad WTWs supply area when base maintenance was being undertaken at the works. No cause was determined.	Ards & North Down, Belfast, Lisburn & Castlereagh and Newry, Mourne & Down
27/01/16	Drumaroad WTWs (515,000 population)	Elevated aluminium levels were observed in the works final water due to treatment difficulties.	Ards & North Down, Belfast, Lisburn & Castlereagh and Newry, Mourne & Down
02/02/16	Drumaroad WTWs (515,000 population)	An aluminium contravention was reported in the Drumaroad WTWs final water. No cause was determined but base maintenance was ongoing at this time.	Ards & North Down, Belfast, Lisburn & Castlereagh and Newry, Mourne & Down
10/02/16	Killylane WTWs (51,000 population)	An aluminium contravention occurred in a sample taken at a consumer tap to represent the works final water. No cause was determined.	Antrim & Newtownabbey and Mid & East Antrim
19/02/16 - Ongoing	Glenhugh Road, Ahoghill (20 properties)	Persistent contraventions of the iron parameter were reported after a local political representative raised residents concerns over water quality in the area.	Mid & East Antrim
22/02/16	Carran Hill WTWs (14,000 population)	A contravention of the individual pesticide standard for Clopyralid occurred in the works final water. No cause was determined.	Newry, Mourne & Down

Significant Drinking Water Quality Events in 2016

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
07/03/16	Castor Bay WTWs (362,000 population)	A contravention of the individual pesticide standard for Clopyralid occurred in the works final water. No cause was determined.	Armagh City, Banbridge & Craigavon; Belfast City; Lisburn & Castlereagh; Mid Ulster; and Newry, Mourne & Down
09/04/16 - 10/04/16	Castor Bay WTWs (362,000 population)	Contraventions of the <i>Clostridium perfringens</i> and aluminium parameters were related to treatment difficulties which occurred following a works shutdown.	Armagh City, Banbridge & Craigavon; Belfast City; Lisburn & Castlereagh; Mid Ulster; and Newry, Mourne & Down
25/04/16 - 26/04/16	Dorisland WTWs (128,000 population)	Works shutdowns and the resultant treatment difficulties led to contraventions of the aluminium and turbidity parameters in the works final water.	Antrim & Newtownabbey, Belfast City; and Mid & East Antrim
25/05/16 – 24/03/17	Derg WTWs (38,000 population)	Lack of adequate pesticide removal treatment led to persistent MCPA contraventions in the works final water.	Derry City & Strabane and Fermanagh & Omagh
01/06/16 - 10/06/16	Rathlin Island (300 population)	A contravention of the taste parameter was reported for a sample taken on Rathlin Island. There was potential for seawater contamination at this location.	Causeway Coast & Glens
16/06/16 - 27/06/16	Sunningdale Drive, Belfast (30 properties)	Accidental contamination of the mains during rehabilitation work led to contraventions of the odour parameter.	Belfast City
18/07/16 - 07/10/16	Derg WTWs (38,000 population)	Lack of adequate treatment led to persistent THM contraventions in the works final water.	Derry City & Strabane and Fermanagh & Omagh
18/07/16 - 30/08/16	Dungonnell WTWs (31,000 population)	Treatment difficulties led to persistent THM contraventions in the area supplied by Dungonnell WTWs.	Causeway Coast & Glens and Mid & East Antrim

Significant Drinking Water Quality Events in 2016

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
01/08/16 - 03/08/16	Carmony WTWs (50,000 population)	The upper catchment of the River Faughan was polluted with silage. Carmony WTWs was shut down for almost 2 days as a precaution.	Derry City & Strabane
25/08/16 - 31/08/16	Rathlin WTWs (300 population)	A contravention of the WHO Index for THMs occurred in the works final water. This event followed an increase in the chlorine dose made in response to a low level of chlorine detected.	Causeway Coast & Glens
26/08/16 - 30/08/16	Silverstream Avenue, Belfast (11 properties)	Coliform bacteria were detected in a small localised area of Silverstream Avenue for four days. No cause was determined.	Belfast City
30/08/16 - 03/10/16	Caugh Hill WTWs (72,000 population)	Treatment difficulties led to persistent THM contraventions in Caugh Hill WTWs final water and in the related distribution system.	Causeway Coast & Glens and Derry City & Strabane
30/08/16	Killylane WTWs (51,000 population)	There was a marginal THM contravention in the Killylane supply area due to a combination of factors. All re-samples were satisfactory.	Antrim & Newtownabbey and Mid & East Antrim
10/09/16 – 22/09/16	Loughabin Road, Ballymoney (3 properties)	Following the detection of significantly elevated iron and turbidity levels, a “ Do Not Use ” notice was issued to 3 properties.	Causeway Coast & Glens
11/09/16	Derg WTWs (38,000 population)	A contravention of the turbidity standard occurred in the works final water. This occurred after a works shutdown.	Derry City & Strabane and Fermanagh & Omagh

Significant Drinking Water Quality Events in 2016

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
15/09/16 – 23/11/16	Stewarts Road, Annalong (5 properties)	Persistent contraventions of the aluminium and hydrogen ion (pH) parameters occurred. Remedial work was carried out and all re-samples were satisfactory.	Newry, Mourne & Down
19/09/16 – 22/09/16	Glenhordial WTWs (11,000 population)	A contravention of the iron standard occurred in the works final water. No cause was determined.	Fermanagh & Omagh, Mid Ulster
30/11/16 – 05/12/16	Altnahinch WTWs (31,000 population)	Treatment difficulties led to a contravention of the aluminium standard in the works final water.	Causeway Coast & Glens
07/12/16 - 08/12/16	Castor Bay WTWs (362,000 population)	A contravention of the turbidity standard occurred in Forked Bridge WTWs final water following treatment difficulties at Castor Bay WTWs following a works shutdown.	Armagh City, Banbridge & Craigavon; Belfast City; Lisburn & Castlereagh; Mid Ulster; and Newry, Mourne & Down
21/12/16 – 22/12/16	Belfast City Centre	A number of burst mains in Belfast City Centre caused sufficiency and water quality issues. There was local media interest.	Belfast City

Minor Drinking Water Quality Events in 2016

Date of Minor Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
29/01/16 – 09/02/16	Dungonnell WTWs (31,000 population)	Loss of automatic disinfection due to component failure. However disinfection was manually maintained.	Causeway Coast & Glens; and Mid & East Antrim
16/02/16 – 17/02/16	Fofanny WTWs (103,000 population)	No cause was determined for a Clostridium perfringens contravention. All resamples were satisfactory.	Newry, Mourne & Down
03/03/16 – 22/04/17	Dorisland WTWs (128,000 population)	Loss of automatic disinfection due to component failure. However disinfection was manually maintained.	Antrim & Newtownabbey; Belfast City; and Mid & East Antrim
04/03/16 – 09/03/16	Cohannon Inn, Coalisland (One property)	A “ Boil Water Before Use ” Notice was issued to this property after a recurring coliform bacteria contravention.	Mid-Ulster
20/03/16 – 23/03/16	Dungonnell WTWs (31,000 population)	Loss of automatic disinfection due to issue with salt used in process. However disinfection was manually maintained.	Causeway Coast & Glens and Mid & East Antrim
01/05/16 – 03/05/16	Rathlin WTWs (300 population)	Loss of automatic disinfection due to component failure. However disinfection was manually maintained.	Causeway Coast & Glens
20/07/16 – 23/07/16	Shankill Road, Belfast (10 properties)	Coliform bacteria contraventions occurred following mains replacement in the area. It is likely there was contamination of the pre-chlorinated main during this process.	Belfast City
20/09/16 – 23/03/16	Altnahinch WTWs (31,000 population)	Loss of automatic disinfection due to component failure. However disinfection was manually maintained.	Causeway Coast & Glens and Mid & East Antrim
20/11/16 – 21/11/16	Dorisland WTWs (128,000 population)	No cause was determined for a coliform bacteria contravention in the works final water. All resamples were satisfactory.	Antrim & Newtownabbey; Belfast City; and Mid & East Antrim

Not Significant Drinking Water Quality Events in 2016

Date of Not Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
02/02/16 – 03/02/16	Lough Macrory WTWs (34,000 population)	No cause was determined for an aluminium contravention in the works final water. All re-samples were satisfactory.	Fermanagh & Omagh
18/02/16 – 19/02/16	Lough Fea WTWs (43,000 population)	Aluminium, iron and turbidity contraventions occurred due to unrepresentative sampling. All re-samples were satisfactory.	Mid-Ulster
02/03/16 – 03/03/16	Killyhevlin WTWs (76,000 population)	A turbidity contravention occurred due to unrepresentative sampling. All re-samples were satisfactory.	Fermanagh & Omagh and Mid-Ulster
02/03/16 – 03/03/16	Caugh Hill WTWs (72,000 population)	A turbidity contravention occurred due to unrepresentative sampling. All re-samples were satisfactory.	Causeway Coast & Glens and Derry City & Strabane
04/04/16 – 05/04/16	Clay Lake WTWs (9,000 population)	No cause was determined for a Clostridium perfringens contravention. All re-samples were satisfactory.	Armagh City, Banbridge & Craigavon and Newry, Mourne & Down
22/05/16	Seagahan WTWs (35,000 population)	Minor pollution of the impounding reservoir remote from the intake may have been caused by slurry spreading. The final water was not impacted.	Armagh City, Banbridge & Craigavon
05/07/16 – 07/05/16	Carmony WTWs (50,000 population)	An odour contravention occurred due to unrepresentative sampling. All re-samples were satisfactory.	Derry City & Strabane
11/07/16 – 14/07/16	Glenhordial WTWs (92,000 population)	A turbidity contravention occurred due to unrepresentative sampling. All re-samples were satisfactory.	Fermanagh & Omagh, Mid Ulster

Date of Not Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
25/07/16 – 02/08/16	Mullaghanagh SR (7,000 population)	Recurring coliform bacteria contraventions occurred due to unrepresentative sampling. Further re-samples were satisfactory.	Mid-Ulster
03/08/16	Mullaghanagh SR (1,662 properties)	Alternative water supplies were provided after loss of supply following operational work.	Mid-Ulster
29/09/16 – 30/09/16	Rehaghy SR (253 properties)	Tankering into the service reservoir was required after a burst main.	Mid-Ulster
11/11/16 – 12/11/16	Killylane WTWs (51,000 population)	Contamination at the time of sampling led to a coliform bacteria contravention in the works final water. All re-samples were satisfactory.	Antrim & Newtownabbey and Mid & East Antrim
30/11/16 – 03/12/16	Glen Road, Belfast (414 properties)	Coliform bacteria contraventions occurred following the repair of a burst main. No cause was determined.	Belfast City
05/12/16 – 06/12/16	Killylane WTWs (51,000 population)	No cause was determined for a <i>Clostridium perfringens</i> contravention. All re-samples were satisfactory.	Antrim & Newtownabbey and Mid & East Antrim

Annex 3

Technical Audit Programme

In 2016, the technical audit programme of the public water supplies was satisfactorily undertaken and we acknowledge NI Water's continued co-operation. NI Water has implemented or provided comment on the recommendations and suggestions we provided in our audit reports.

The following table provides a summary of our 2016 Inspection Programme.

Table 5.1: Summary of the 2016 Inspection Programme

Location	Audit Activity	Number of Recommendations ¹	Number of Suggestions ²
Donegore SR	To check that good practice in the water distribution system is being operated.	2	4
'Laboratory Information Management System' (LIMS)	To check that data is adequately managed by the 'Laboratory Information Management System'	4	1

¹Recommendations are made where, in our opinion, action is required to avoid a foreseeable risk or a breach of a regulatory duty. If such a breach occurs, then we may consider 'enforcement action'. A formal written response from NI Water is required.

²Suggestions are made in relation to matters which relate to an aspect of best practice.

Annex 4

Enforcement Orders and Notices 2016

The [DWI website](#) provides full details on each Consideration of Provisional Enforcement Order (CPEO) and Provisional Enforcement Order (PEO) for 2016.

Table 6.1: Summary of Enforcements issued in 2016

Type of Enforcement	Water Treatment Works (WTWs) and/or Water Supply Areas	Reason for Undertaking Or Notice	Progress made in 2016
PEO/16/01 (issued 24/03/2016)	Derg WTWs	Pesticide - MCPA	DWI accepted and published on the 30/06/2016 a series of eight Undertakings from NI Water with the final one to be completed by the 31/03/2019. The first of these undertakings to carry out pilot plant testing was completed on schedule by the 31/12/2016. There are 3 further undertakings to be delivered in 2017.

Table 6.2: Summary of Enforcements closed in 2016

Type of Enforcement	Water Treatment Works (WTWs) and/or Water Supply Areas	Reason for Undertaking Or Notice	Progress made in 2016
CPEO/15/01 (issued 06/03/2015)	Derg WTWs	Pesticide - MCPA	Notice of acceptance of Undertakings published 14/04/2015. This included carrying out treatability and feasibility studies on treatment options for preferred treatment options. This work was completed on 31/12/2015 and a completion of Undertakings notice was issued 26/01/2016.

Useful Information

(To access the information click on the links below)

[Regulatory Framework](#) – provides details and links to current legislation relating to drinking water quality.

[Drinking Water Quality Tables](#) – provides details of drinking water compliance within individual water supply zones.

Drinking Water Advice and Guidance for [Public](#) and [Private](#) Supplies – provides a list of links for consumers and professionals requiring further information on drinking water quality.

[Useful Contacts](#) – provides a list of organisations and contact details related to drinking water.

Request for Feedback on this Report

Did you find what you were looking for?

The Drinking Water Inspectorate is constantly aiming to improve the standard of information provided in this report; our Annual Drinking Water Quality Report is designed to provide clear information and statistics detailing the quality of drinking water supplies in Northern Ireland.

Any views or opinions you may have would be highly valued by us and we would greatly appreciate your feedback.

For your convenience we would encourage you to provide feedback by either

Email: dwi@daera-ni.gov.uk

or

Post: **Drinking Water Inspectorate**
Northern Ireland Environment Agency
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Cromac Avenue
Gasworks Business Park
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