

Drinking Water Quality in Northern Ireland, 2017

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 22nd 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 2017.

The Drinking Water Inspectorate's (DWI'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 2017 at 99.88%, a slight increase from 99.86% in 2016.

This report considers drinking water quality events that NI Water report to us, along with consumer contacts for those experiencing problems with their water supply. An assessment on how these are managed by NI Water in ensuring the ongoing provision of safe, clean drinking water is also included in this report.

Consumer complaints received by NI Water decreased by 17.2% in 2017 compared to 2016, which is a positive outcome for the company. The highest percentage of consumer concerns continues to relate to the appearance of the water.

Of notable concern was the DWI sampling procedures audit finding that a non-trivial sampling shortfall had occurred in 2017. This resulted in 312 tests covering six parameters not being completed by NI Water at a service reservoir. DWI issued a Warning Letter in relation to this regulatory non-compliance.

Although less than one per cent of the population receives water from a private supply, water from these supplies is used for a range of purposes, from domestic dwellings to large commercial and public premises such as hospitals and universities. It is important that these supplies are also monitored to ensure public health protection. Overall compliance with the regulatory standards for private supplies was 98.74% for 2017, a slight decrease from 98.85% in 2016 and considerably lower than for public water supplies. The number of registered supplies is increasing steadily with eleven new supplies being registered in 2017. Over 80 council officers were trained in sampling techniques during 2017.

I embrace the opportunities for us to continue to work with other stakeholders to maintain our high quality drinking water across Northern Ireland. Our priority remains to ensure the work of DWI continues to actively contribute to 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
September 2018

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Executive Summary

This is the 22nd 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.

The report provides an independent 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 undertake a regulatory monitoring programme.

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 2017 the overall public drinking water compliance remained high at 99.88%. The 0.12% non-compliance relates to 122 tests that failed to meet the required standard, a lower figure than 139 (0.14%) in 2016.

Compliance at consumers' taps also remained high at 99.81% in 2017, a slight increase from 2016 (99.77%). However, of the 43 regulatory parameters tested, thirteen did not achieve full compliance. Those parameters failing to meet full compliance were: lead; trihalomethanes (THMs); iron; odour; taste; total pesticides; coliform bacteria; copper; nickel; aluminium; manganese; *E. coli*; and the individual herbicide, MCPA.

The parameter with the lowest reported compliance in 2017 was lead at 96.72%. This compares to 97.96% in 2016. There is no specific reason identified for the reported decrease in lead compliance and it is considered that the fluctuations are partially due to the low numbers of compliance samples taken for this parameter. This relates to 5 additional samples failing in 2017 (13 fails out of 396 samples) as compared to 2016 (8 fails out of 392 samples). 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 contraventions at the consumers' tap. NI Water's lead strategy, along with key targets within the [Long Term Water Strategy \(LTWS\)](#), is vital to addressing non-compliances and improving drinking water quality for the future.

Total trihalomethanes (THMs) reported 98.48% compliance in 2017, an improvement from the 2016 compliance figure of 96.94%, but still remaining below the 2014 and 2015 compliance levels. Operational practices at water treatment works, and water travelling longer distances and thus spending more time in the distribution system, are contributing factors to the presence of THMs.

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 higher compliance figure for coliform bacteria at consumers' taps was reported in 2017 with 99.61% compliance compared to 99.27% in 2016. This is reflected in the overall microbiological compliance figure at

consumers' taps of 99.82% compared to 99.68% in 2016. *E. coli* were detected on three occasions at consumers' taps by NI Water during the 2017 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 2017, 23 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 concerned the visual appearance, with 66.57% of total contacts reported in 2017 related to this. The overall number of contacts decreased by 17.2% in 2017 (5,764 compared to 6,961).

In relation to NI Water's sampling programme a significant shortfall was reported in 2017. The majority of this shortfall was discovered during a DWI audit and concerned a Service Reservoir which had not been identified on NI Water's sampling programme. DWI subsequently issued a warning letter to NI Water in relation to this.

Although compliance was high in 2017, water quality events (Annex 2) continued to occur within the water supply system. NI Water must report these events to us. Of the 49 events reported, we categorised one as Serious, 27 as Significant, 7 as Minor and 14 as Not Significant. There were 15 Significant events reported at water treatment works (WTWs) and these 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 (Annex 4) to ensure the delivery of remedial action within specified timeframes. In 2017 a Consideration of Provisional Enforcement Order (CPEO) was issued requiring remedial works to be undertaken at Ballinrees WTWs following contraventions for the herbicide MCPA. A Regulation 27(5) Notice was also issued requiring a review of NI Water's Risk Assessment for Dorisland WTWs in response to a water quality event related to sampling.

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 2017 our private water supply sampling programme, monitored 157 sites, with 11 new sites being registered during that period. Samples at private water supplies are collected by Environmental Health staff, acting on our behalf.

Overall compliance for 2017 is reported as 98.74%, a slight decrease from 98.85% in 2016. Full compliance was not achieved for 22 parameters. These were coliform bacteria; manganese; hydrogen ion; iron; enterococci; *E. coli*; *Clostridium perfringens*; ammonium; sodium; individual pesticides (asulam, glyphosate, mecoprop, and trichlopyr); turbidity; lead; sulphate; bromate; boron, fluoride; trihalomethanes (THMs); colour and radon.

Full compliance was achieved for 91 out of the 157 registered sites (58%). Of the 66 sites that did not comply with the regulatory standards, 48 use their private supply as the primary source of drinking water; thirteen supplies are used for washing equipment and surfaces in contact with food or drink; and five 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 19 supplies in 2017; 11 small shared domestic supplies with no treatment and eight commercial/public supplies.

Iron and manganese continue to be the chemical parameters with the highest incidence of non-compliance at private supplies. In 2017, nineteen sites were found to have contraventions for either iron or manganese or both.

Pesticide contraventions were identified at five sites in 2017; a golf club, two dog kennels, a restaurant and a holiday let. 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 2017, of the 129 contraventions identified, 73 (55 microbiological; 18 chemical) were notified to the Public Health Agency (PHA) for health advice; resulting in new restrictions on water usage at 16 sites.

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 2017 we continued to develop and test our risk assessment application to assist in the effective identification and assessment of all risks associated with a private water supply. This new risk assessment process will be implemented in 2018.

Regulatory Changes

New regulations were transposed in Northern Ireland to implement the changes introduced by the European Directive, 2015/1787. The Private Water Supply Regulations (NI) 2017 and The Water Supply (Water Quality) Regulations (NI) 2017 came into force on 27 October 2017. These new regulations consolidated the previous sets of regulations and added a number of new Directive requirements. Details on the new regulations and the changes are contained within this report.

Looking Forward

The challenge of ensuring the provision of safe, clean, sustainable drinking water supplies into 2018 and beyond continues.

During 2017 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 the PC15 process and the 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 implementation 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. We will sit on the project board for the 'Source to Tap' Interreg VA funded project focusing on the management of Derg and Erne catchments.

A Drinking Water Working Group has been set up with local councils under the new service level agreements, signed off in 2017, for the provision of services by council staff to DWI in relation to the regulation of private water supplies. This group, which met for the first time in April 2018, provides a forum for DWI and council officers, undertaking sampling and risk assessment of private water supplies on our behalf, to discuss common issues, share information on best practice across Northern Ireland and ensure a consistent approach to the delivery of these services.

We plan to implement our new risk assessment application for private water supplies in 2018 in consultation with local councils. This will provide for a comprehensive identification of risks and facilitate effective risk management at private drinking water supplies.

Section 1
Public Water Supplies

Part 1
Drinking Water Quality



Part 1

Drinking Water Quality

- Overall drinking water quality compliance remains high at 99.88% (Overall microbiological compliance: 99.93%)
- Water quality at consumers' taps remains high at 99.81% compliance (Microbiological compliance at consumers' taps: 99.82%)
- 12 parameters did not achieve full compliance at consumers' taps
- Lead was the parameter with the lowest consumer tap compliance at 96.72%
- Consumer contacts on drinking water quality decreased by 17.2%
- 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

During 2017, NI Water sampled drinking water across Northern Ireland to test for compliance with the standards in The Water Supply (Water Quality) Regulations (Northern Ireland) 2007¹ (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 (WSPs) - samples taken at WTWs as no significant change during distribution; and consumers' taps in water supply zones (WSZs).

In 2017, 99,206 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.

In 2017, the regulations required NI Water to carry out 99,587 individual tests of which 99,206 tests were carried out. Of the 381 tests omitted, we identified a non-trivial shortfall for 336 tests involving nine parameters.

The majority of this shortfall (312 tests) related to 52 samples not being taken at one Service Reservoir for six parameters: Coliform bacteria, *Escherichia coli* (*E.coli*), Colony Counts at 22°C, Colony Counts at 37°C, Free Chlorine and Total Chlorine. This shortfall was identified by DWI during its Sampling Procedures audit carried out in March 2018. NI Water has now added this Service Reservoir to its 2018 sampling schedule. DWI have issued a warning letter to highlight the regulatory non-compliance to NI Water in relation to this shortfall.

¹ Superseded by The Water Supply (Water Quality) Regulations (Northern Ireland) 2017

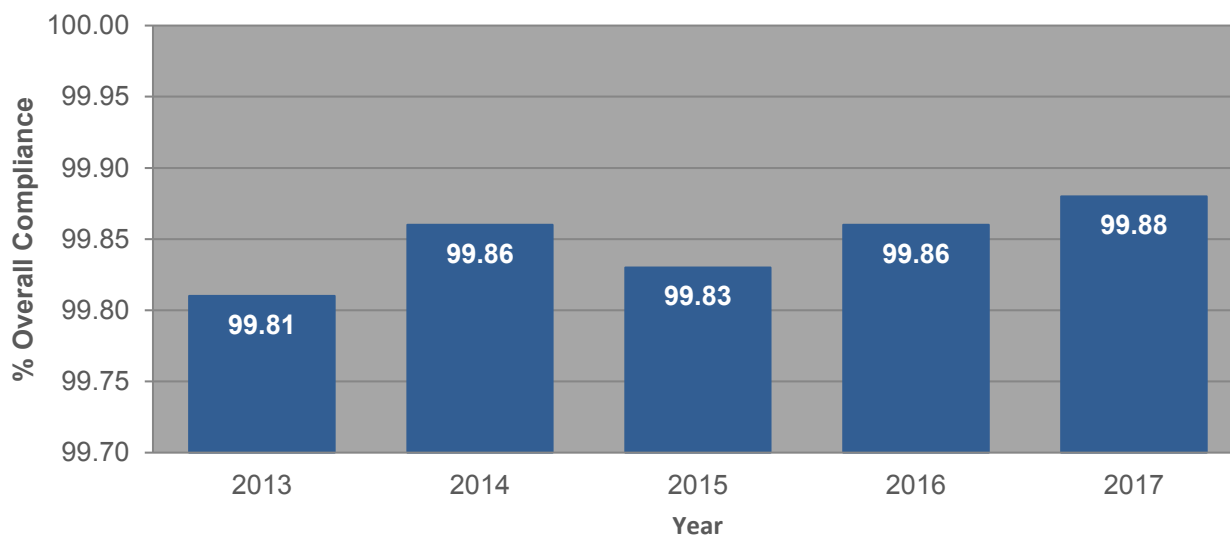
Twenty three of the tests not completed, were for samples taken from consumers’ taps for two parameters – Boron and Chromium. Lastly, there was one test not undertaken for the parameter glyphosate from a supply point.

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 human 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 2017, for the key parameters monitored at water treatment works, service reservoirs and consumers’ taps remains high at 99.88%, a slight increase on the 2016 compliance (99.86%). Figure 1.1 illustrates the percentage compliance over the last five years.

Figure 1.1: Overall Drinking Water Quality, 2013 – 2017



Of the 99,206 tests we used to assess overall compliance, 122 (0.12%) failed to meet the standards (139; 0.14% in 2016). Table 1.1 provides further information on parameters that failed regulatory standards and where those failures occurred within the treatment and distribution systems.

Table 1.1: Overall Drinking Water Quality in 2017

	No. of Tests	No. of Tests not Meeting the Standards
Water Leaving Water Treatment Works (WTWs)		
<i>E. coli</i>	6246	0
Coliform Bacteria	6246	0
Microbiological Total	12492	0
Nitrite	236	0
Turbidity	6246	10
Chemical Total	6482	10
Total (Microbiological and Chemical)	18974	10 (0.05%)
Water in Service Reservoirs (SRs)		
<i>E. coli</i>	14897	2
Coliform Bacteria	14897	14
Total	29794	16 (0.05%)
Water at Consumers' Taps or Supply Points (WSZs)		
<i>E. coli</i>	5148	3
Coliform Bacteria	5148	20
Enterococci	396	0
<i>Clostridium perfringens</i>	2329	0
Microbiological Total	13021	23
Zone Chemical Analysis	30829	73
Supply Point Chemical Analysis	6588	0
Chemical Total	37417	73
Total (Microbiological and Chemical)	50438	96 (0.19%)
Overall Water Quality		
Overall Microbiological Quality	55307	39 (0.07%)
Overall Chemical Quality	43899	83 (0.19%)
Overall Drinking Water Quality	99206	122 (0.12%)

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 increased from 99.77% in 2016 to 99.81% in 2017.

Thirteen parameters did not achieve full compliance at consumers' taps in 2017: lead, total trihalomethanes (THMs), iron, odour, taste, pesticides (total), coliform bacteria, copper, nickel, aluminium, manganese, *E. coli*, and pesticides - individual (MCPA).

Table 1.2: Consumer Tap Compliance 2017

	No. of Samples	No. of Tests not Meeting the Standards	% Compliance
Schedule 1 (Directive and National parameters)			
Lead	396	13	96.72
Total Trihalomethanes	396	6	98.48
Iron	1916	22	98.85
Odour	1916	12	99.37
Taste	1916	9	99.53
Pesticides - Total Substances	236	1	99.58
Nickel	396	1	99.75
Copper	396	1	99.75
Aluminium	1916	4	99.79
Manganese	1916	2	99.90
E. Coli	5148	3	99.94
Pesticides – individual	8256	2	99.98
1,2 Dichloroethane	396	0	100
Antimony	396	0	100
Arsenic	396	0	100
Benzene	396	0	100
Benzo(a)pyrene	396	0	100
Boron	385	0	100
Bromate	396	0	100
Cadmium	396	0	100
Chromium	384	0	100
Colour	1916	0	100
Cyanide	236	0	100
Enterococci	396	0	100
Fluoride	396	0	100
Mercury	396	0	100
Nitrate	396	0	100
Nitrite	396	0	100
PAH - Sum of four substances	396	0	100
Selenium	396	0	100
Sodium	396	0	100
Tetrachloroethene/Trichloroethene - Sum	396	0	100
Tetrachloromethane	396	0	100
Turbidity	1916	0	100
Total (Schedule 1)	36373	76	99.79
Schedule 2 (Indicator parameters)			
Coliform bacteria	5148	20	99.61
Ammonium	1916	0	100
Chloride	396	0	100
<i>Clostridium perfringens</i>	2329	0	100
Conductivity	1916	0	100
Hydrogen Ion (pH)	1916	0	100
Sulphate	396	0	100
Total Indicative Dose	24	0	100
Tritium	24	0	100
Total (Indicator parameters)	14065	20	99.86
Overall Total	50438	96	99.81

Chemical/Physical Quality

Lead

In 2017, lead was the parameter with the lowest percentage compliance at 96.72%. This is a decrease in compliance from the 97.96% reported for 2016, so the previous upward trend did not continue in 2017. However, it is recognised that the percentage lead compliance is prone to fluctuations due to the low sampling frequency required by the regulations.

In 2017, of the 396 tests carried out for lead, thirteen (3.28%) 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, five were related to lead pipework and/or fittings belonging solely to the consumer and the reason for six of the contraventions was undetermined.

When a sample has contravened the standard and NI Water's investigation finds 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 the 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 to reduce the uptake of lead from pipes and fittings;
- 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

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%. Five of the 25 lead zones (20%) did not achieve the 98% target (four in 2016). The majority of lead contraventions occurred in the greater Belfast area.

Looking at the overall trend in lead compliance in Figure 1.3, there has been a gradual trend upwards. However as highlighted earlier in this section, there was a decrease in compliance in 2017. A significant amount of work is still required to ensure compliance with the lead standard improves in 2018 and beyond.

Figure 1.2 Lead Leaflet

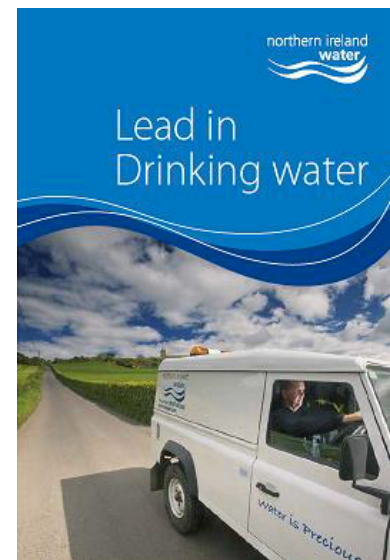
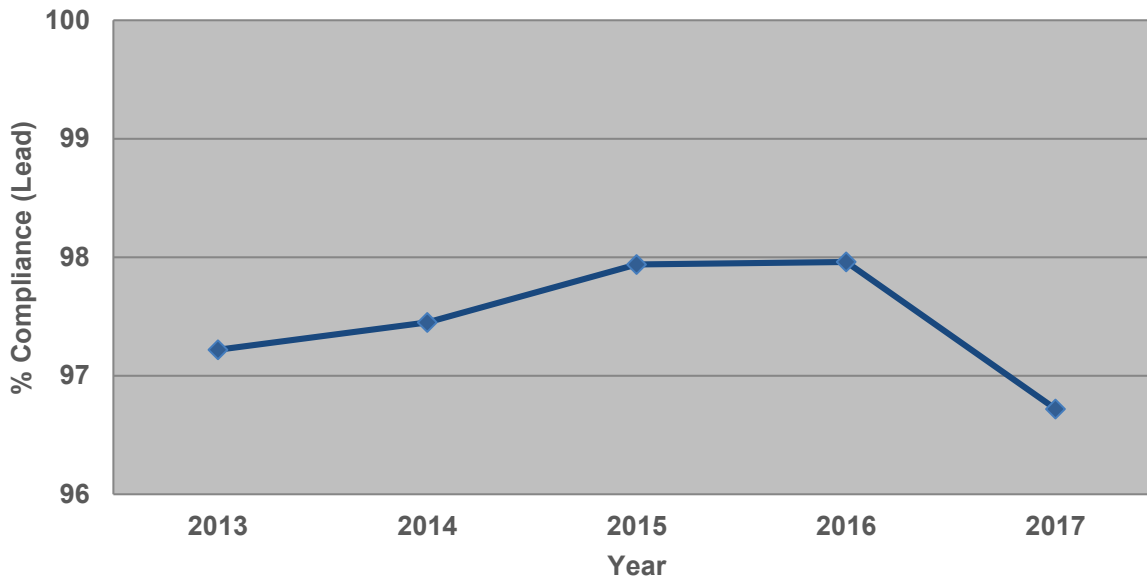


Figure 1.3: Percentage of Tests Meeting the Lead Standard, 2013 – 2017

Trihalomethanes (THMs)

In 2017, THMs saw an improvement in compliance, 98.48%, compared to 96.94% reported in 2016. Further discussion on THMs is contained in Part 2.

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 2017, iron was again the chemical parameter for which there was the greatest number of tests failing to comply with the regulatory standard. Of the 1,916 samples taken, 22 (1.15%) failed to meet the 200µg/l standard. This is an improvement on 2016 figures when 25 (1.34%) samples 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.

Microbiological Quality

The overall safety of drinking water at consumers' taps in 2017 is confirmed with a high level of microbiological compliance (99.82%), (see Table 1.1). This is an increase in compliance from the 99.68% reported in 2016 and relates to the higher compliance reported for coliform bacteria at consumers' taps (99.61% compared to 99.27% in 2016). Of the 20 instances coliform bacteria were detected in 2017, *E. coli* was detected on three occasions.

Clostridium perfringens was not found in any of the 2,329 samples tested in 2017. This is an increase in compliance compared to 2016 when it was found in four (0.17%) of the 2,291 samples taken.

Enterococci were not detected in any of the 396 samples taken by NI Water at consumers' taps in 2017 (the same as 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 2017, there were 23 contraventions reported to us which NI Water determined were due to the internal plumbing within domestic properties. These were related to the following parameters: 5 coliform bacteria; one *E.coli*; thirteen lead; two odour; one copper; and one nickel. 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 457 samples taken during 2017. Of these, ten contravened the drinking water quality standards: one for coliform bacteria; one for *E.coli*; three for iron; two for lead; one for odour; 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 2017 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.

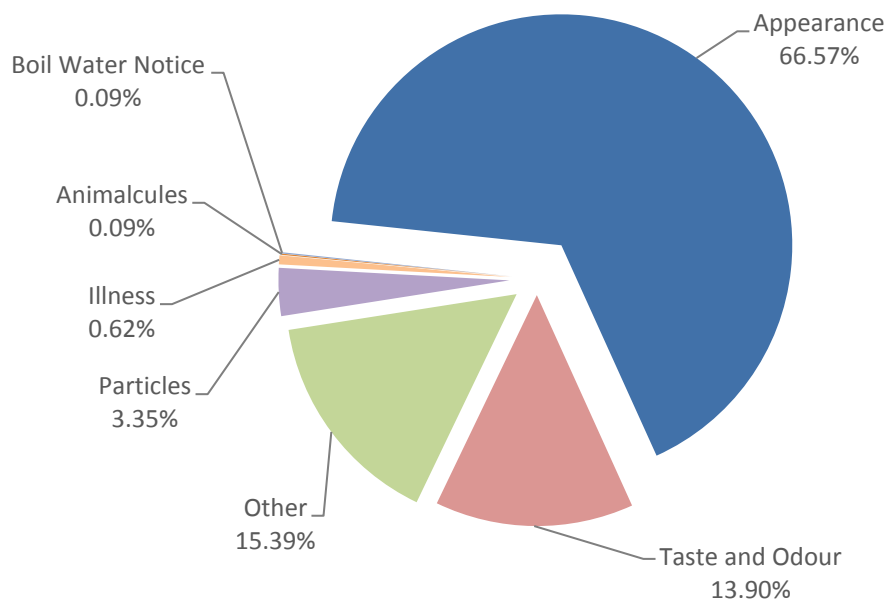
Consumer Contacts

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 2017 was 5764 compared to 6961 in 2016, a decrease of 1197 (17.2%).

Table 1.3: Water Quality Contacts received by NI Water in 2017

Contact Category	Contact Sub-Category	Number of Contacts
Appearance	Colour	2632
	General	125
	Hardness	13
	Stained Washing	11
	White - Air	702
	White - Chalk	354
Taste and Odour	Chlorinous	292
	Earthy/Musty	180
	Other	277
	Petrol/Diesel	27
	TCP	25
Illness		36
Particles		193
Animalcules		5
Boil Water Notice		5
Other	Water Quality Concern - Campaigns	0
	Water Quality Concern - Incident Related	31
	Water Quality Concern - Lifestyle	2
	Water Quality Concern - Pets/Animals	3
	Water Quality Concern - Sample	483
	Water Quality Concern - Lead	303
	Water Quality (No Concern) Fluoride	2
	Water Quality (No Concern) Other Information	29
	Water Quality (No Concern) Water Hardness	21
	Water Quality (No Concern) Water Quality Report	13
TOTAL		5764

As expected and as with previous years, the highest percentage of contacts and concerns continues to relate to the appearance of drinking water, with 66.6% in 2017 (64.7% in 2016). This is illustrated in Figure 1.4.

Figure 1.4: Consumer Contacts and Concerns received by NI Water in 2017

Appearance

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

Colour

In 2017, 68.6% of consumer concerns related to discoloured water (67.3% in 2016). 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 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 27.5% of appearance concerns in 2017.

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 13.9% of the total consumer concerns in 2017.

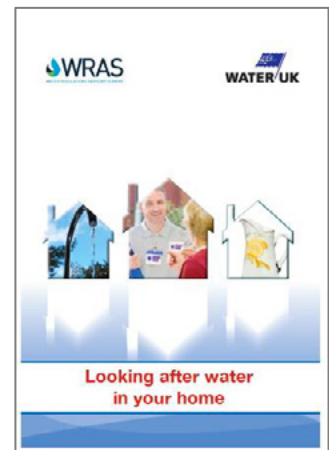
Chlorinous

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 seven per cent of taste and odour consumer contacts in 2017 were related to a chlorinous taste and odour in the water.

Consumer Advice

A useful consumer guide, '[Looking after water in your home](#)', was produced by the water industry to help you maintain and enjoy the quality of tap water once it enters your home.

It contains a number of household tips, from how to reduce unwanted taste and odours and address appearance issues, to advice on water filters and storage tanks.



Section 1

Public Water Supplies

Part 2

The Drinking Water Cycle

Drinking Water Inspectorate

Protecting Public Health
through Drinking Water Regulation

Where
does our
water come
from?



Catchment

What
happens
before we
drink it?



**Treatment &
Distribution**

Do you
know it's
regularly
tested?



**Consumer
Tap**

Part 2

The Drinking Water Cycle

- Catchment: MCPA continues to be the pesticide most commonly detected in 2017
- Treatment & Distribution: THM compliance improved in 2017
- Events: There were 27 Significant Events reported in 2017 with 16 of these relating to 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 onto 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 38 sources including rivers and loughs (56.2%), impounding reservoirs (43.7%), and one borewell which supplies a small resident population of around 150 people on 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

During 2017, 35 individual pesticides were monitored by NI Water under its sampling programmes. There are two separate sampling programmes in place; (i) the compliance programme is the set regulatory frequencies which are required to be monitored by NI Water for assessing compliance and (ii) the operational monitoring programme which NI Water use to ensure any risks are fully assessed and to assist in the operation of its treatment processes.

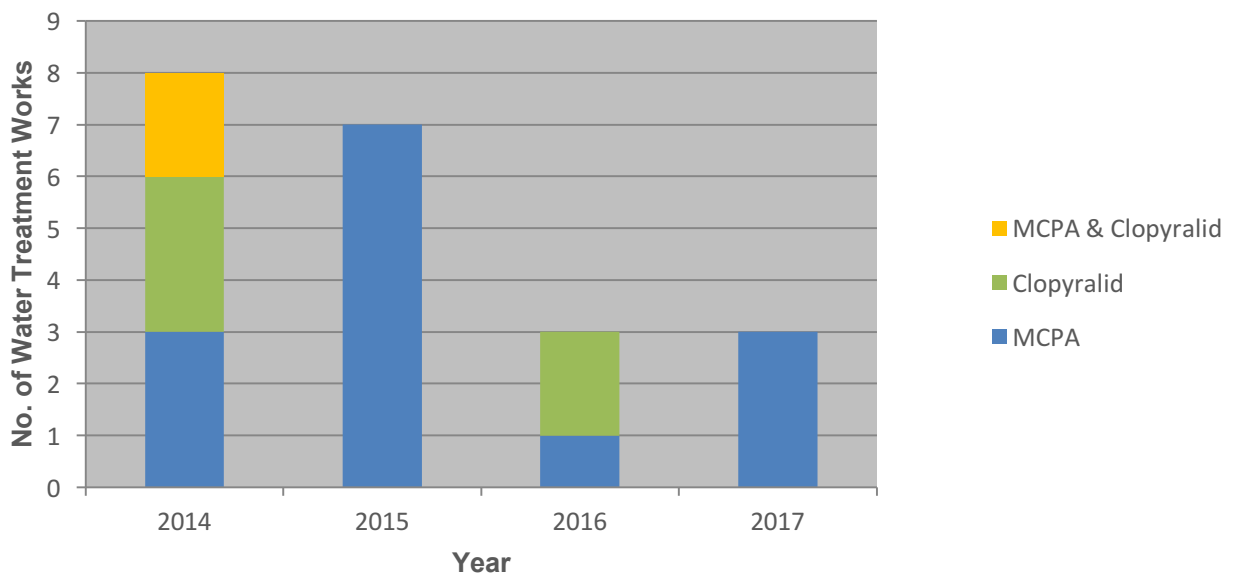
Within the compliance programme there were 236 samples taken resulting in a total of 8,256 determinations. From these two samples contravened the regulatory limit for MCPA (Derg WTWs & Glenhordial WTWs). MCPA is a herbicide, widely used in Northern Ireland for controlling broadleaved weeds in grass and cereal crops, and clearing rushes. Although, MCPA is a herbicide, it falls within the monitoring programmes set up for pesticides under the regulations.

During 2017, within the Operational Sampling programme NI Water identified pesticides above the regulatory limit from sampling undertaken at Ballinrees WTWs, Derg WTWs and Glenhordial WTWs.

Water treatment works with contraventions for pesticides from 2014 to 2017 are summarized within Figure 2.1.

The number of pesticide contraventions in 2017 (23 contraventions) is higher than for 2016 (9 contraventions). DWI have initiated enforcement action at Ballinrees WTWs in 2017 to ensure appropriate remedial measures are undertaken by NI Water to deal with the increase in detections for MCPA (see Annex 4 for details).

Figure 2.1: Number of WTWs where pesticides have been detected above the regulatory limit 2014 – 2017.



NI Water liaise with the Northern Ireland Environment Agency’s (NIEA’s) Pollution Control Team regarding pesticide detections, usage, and the control measures in place within drinking water catchments. There are a range of mitigation and control measures for pesticides which NI Water has in place. These include liaison with and providing advice to groups and individuals who use pesticides through Water Catchment Partnerships. NI Water is also developing catchment management plans and implementing sustainable catchment management solutions. Where catchment solutions alone are unable to reduce the risks sufficiently, NI Water must ensure that it has appropriate treatment processes in place.

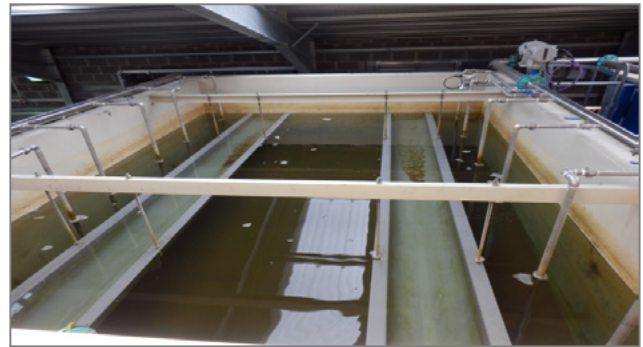
Water Treatment

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. Additional treatments such as ozone dosing and GAC (Granular Activated Carbon) filtration can also be required to remove unpleasant tastes and odours, and for pesticide reduction.

Figure 2.2: Flotation Stage



Figure 2.3: Filtration Stage



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.

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, 2017

Parameters	Place of Sampling	Total No. of Tests in 2017	No. of Tests not Meeting the Standards in 2017	% of Tests Meeting the Standards	
				2017	2016
Process Control Parameters					
Aluminium	WSZ	1916	4	99.79	99.36
Trihalomethanes	WSZ	396	6	98.48	96.94
Disinfection Parameters					
Coliform bacteria	WTWs	6246	0	100	99.97
<i>E. coli</i>	WTWs	6246	0	100	100
Turbidity	WTWs	6246	10	99.84	99.97
Indicator Parameter					
<i>Clostridium perfringens</i>	WTWs	2329	0	100	99.83

WSZ = Water Supply Zone (consumer tap sample)

Process Control Parameters

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

In 2017, results from the compliance monitoring programme, shown in Table 2.1, reported non-compliances for two of the process control parameters: aluminium and trihalomethanes (THMs).

Aluminium

Aluminium compliance, which is measured at consumers’ taps, improved significantly in 2017. Only four regulatory contraventions (0.21%) were reported compared with twelve (0.64%) in 2016.

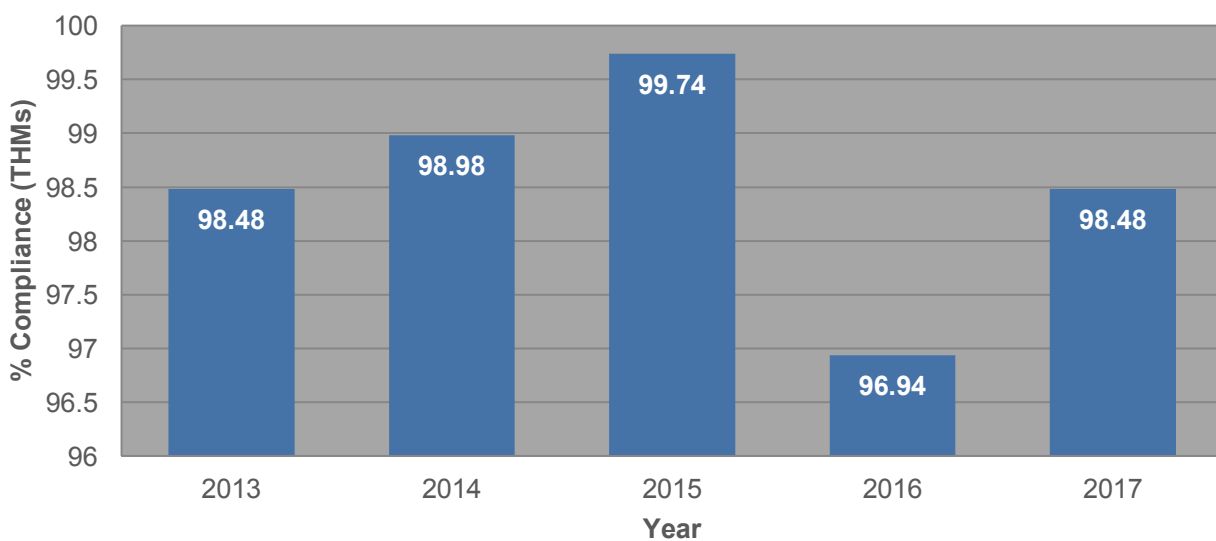
Operational sample results and traces from on-line monitors often highlight elevated aluminium levels at WTWs before they become apparent in distribution. In many cases the remedial measures taken by NI Water in response to these early detections, limit the impact of a water quality event. Overall, there were four “Significant” events at WTWs in 2017 relating to elevated levels of aluminium – see Annex 2 for details. 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. There has been a general improvement in aluminium compliance over the last five years. However, NI Water must continue to operate its treatment works effectively to maintain this level of compliance.

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 reduce the levels of these organics, which are directly related to the level of THMs that occur in the final water.

Figure 2.4 displays the levels of THM compliance at consumers’ taps over the last five years. DWI notes the improvement in THM compliance in 2017 with six samples (1.52%) contravening the standard of 100 µg/l, compared to the disappointing twelve samples (3.06%) contravening the standard in 2016. The percentage compliance for 2017 is however still below that obtained in 2014 and 2015.

Figure 2.4: Percentage Compliance for THMs at Consumers’ Taps, 2013 – 2017



There are a number of reasons for THM non-compliance including: the quality of the raw water; the performance of the water treatment works; the condition of the networks; and the increased time water now spends in the distribution system (residence time). NI Water must ensure that: good operational practices prevail within the catchments and at water treatment works; there is careful management of the storage levels in service reservoirs; the distribution network is adequately maintained; and a suitable disinfection policy is in place to further improve THM compliance in 2018.

It is important that NI Water has an overarching strategy in place to improve THM compliance in support of its Action Plans already in place for individual water supplies. The strategy should consider the factors and synergies which affect THM production from the catchment through to treatment and distribution.

Disinfection Parameters

The parameters, coliform bacteria, E. coli and turbidity (Table 2.1 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 2017, NI Water reported 100% microbiological compliance 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. It is a regulatory requirement that turbidity values are below 1 NTU post treatment before disinfection takes place. There was a slight decrease in compliance with the turbidity standard in 2017 (99.84% compared to 99.89% in 2016). Turbidity contraventions occurred at eight (33.3%) water treatment works in 2017. Of the 6,246 samples taken for turbidity analysis from WTWs, ten (0.16%) failed to meet the standard. Of these failures, one was caused by operational work related to the serious flooding event in the north-west; three were due to disturbance of either the clear water tank or sample line; and the other six were due to unrepresentative sampling and/or analyses.

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 2017, full compliance was achieved for *Clostridium perfringens*. This is compared to 99.83% in 2016, when four contraventions were reported.

Distribution

The water distribution network in Northern Ireland is extensive, consisting of 290 service reservoirs (SRs) and approximately 26,800 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 2017	No. of Tests not Meeting the Standards in 2017	% of Tests Meeting the Standards in 2017	% of Tests Meeting the Standards in 2016
Reservoir Integrity					
Coliform bacteria	SR	14897	14	99.91	99.90
<i>E. coli</i>	SR	14897	2	99.99	100
Distribution Networks					
Turbidity	WSZ	1916	0	100	99.95
Iron	WSZ	1916	22	98.85	98.66
Manganese	WSZ	1916	2	99.90	99.84

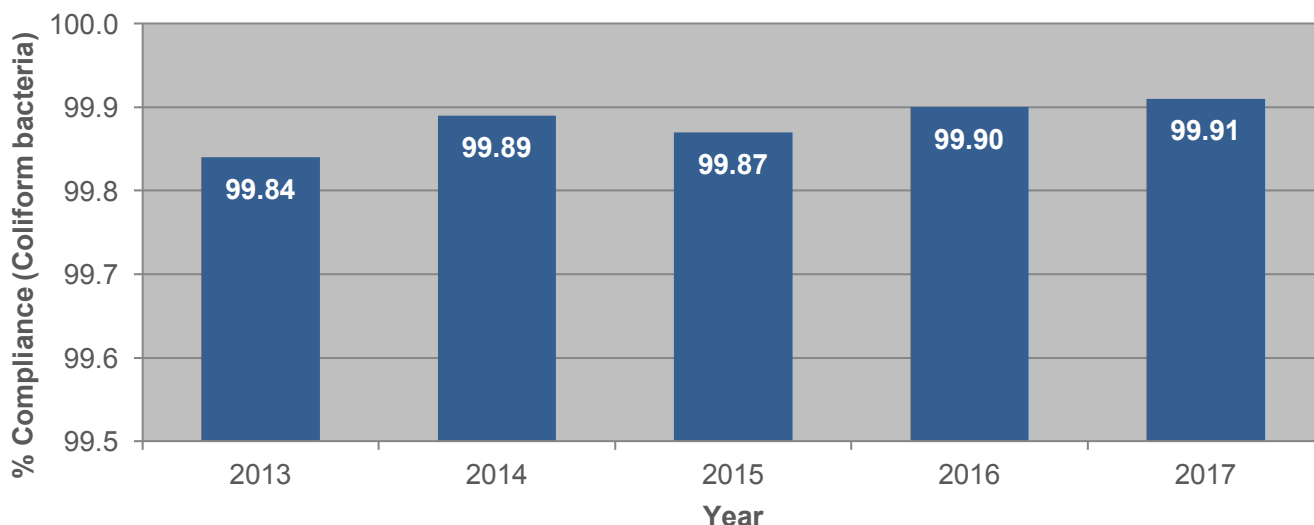
Service Reservoirs

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. The 289 service reservoirs sampled in 2017 met this regulatory requirement. As illustrated in Figure 2.6, coliform bacteria compliance was 99.91% in 2017, thus maintaining the level of compliance reported in 2016 of 99.90%. Coliform bacteria were detected on 14 occasions at 13 (4.5%) different service reservoirs. This is a slight improvement from the 15 detections reported in 2016. *E. coli* were detected on two occasions at two different service reservoirs in 2017 (no detections reported in 2016).

Figure 2.5: Service Reservoir



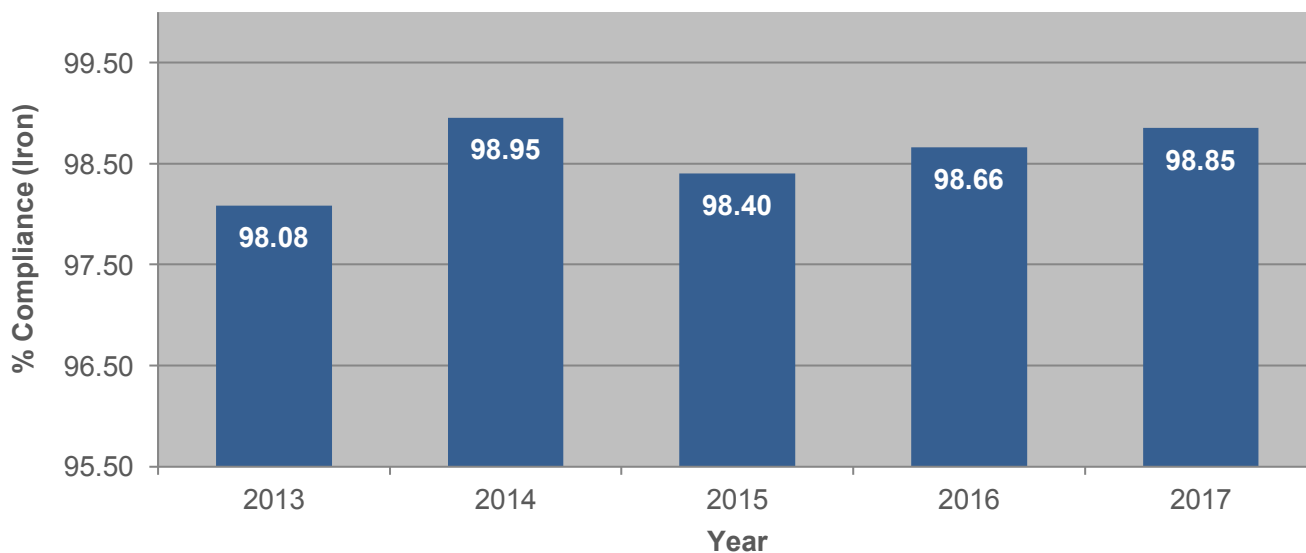
Figure 2.6: Percentage Compliance of Coliform Bacteria at Service Reservoirs, 2013 – 2017



Water Mains

In 2017 a total of 1,916 samples taken from consumers’ taps were tested for iron. Of these, 22 (1.15%) contravened the regulatory standard of 200 µg/l. This reflects an improvement in compliance from 2016 when 25 (1.34%) contravened the standard as illustrated in Figure 2.7.

Figure 2.7: Percentage Compliance of Iron in Distribution, 2013 – 2017



Many of the mains delivering water to consumers' taps are made of cast iron and the deterioration of older 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.

49 events were reported to us in 2017. Of these, we categorised one as Serious; 27 as Significant; seven as Minor; and 14 as Not Significant. There were 15 Significant events at nine WTWs (Altnahinch; Ballinrees; Carmoney; Castor Bay; Derg; Dorisland; Dungonnell; Glenhordial and Killylane) in 2017. The majority of these events were due to treatment difficulties or lack of adequate treatment [aluminium, hydrogen ion (pH), iron, manganese, pesticide (MCPA), taste & odour, THMs and turbidity contraventions]. (Annex 2 provides further information on the one Serious event and the 27 Significant events notified to us in 2017).

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 monitor these plans to ensure where risks are identified there are control measures 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 2017 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 enforcement. This includes the issuing of Notices and Enforcement Orders, details of which can be found in Annex 4.

Legislative Changes

New legislation for the regulation of public water supplies was introduced in October 2017, [The Water Supply \(Water Quality\) Regulations \(Northern Ireland\) 2017](#). These new regulations replace and consolidate the 2007 regulations and subsequent amendments. The regulations were required to implement the revisions to the Drinking Water Directive (98/83/EC) by the amending Directive (EU) 2015/1787. An information letter highlighting the main changes to the regulatory regime was issued in October 2017, [Information Letter 02/17 – Introduction of the Water Supply \(Water Quality\) Regulations \(Northern Ireland\) 2017](#).

Section 2

Private Water Supplies



Section 2

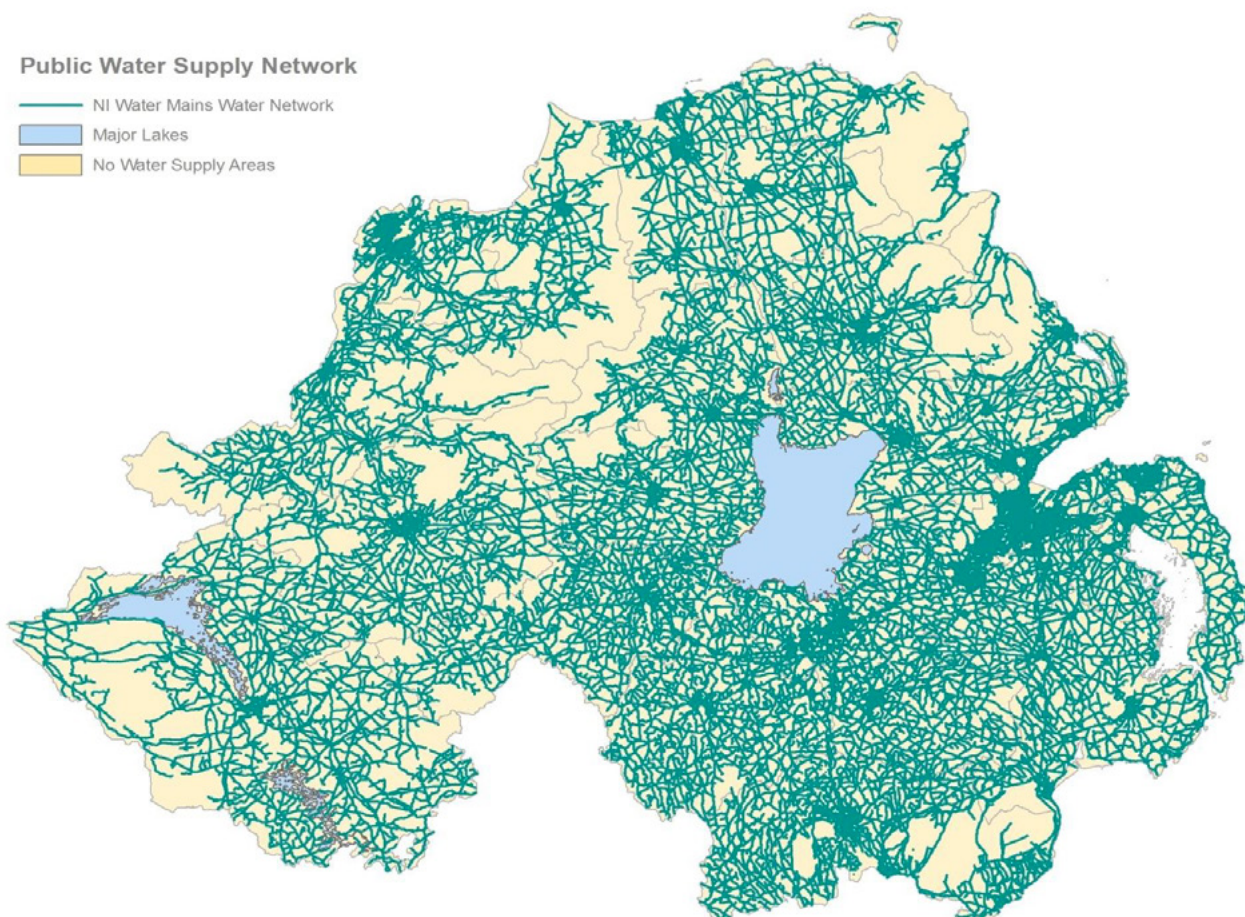
Private Drinking Water Supplies

- 157 registered private water supplies in 2017, including 11 new supplies
- 83% are commercial / public supplies; and 17% are small domestic supplies
- 99.4% of the supplies are from groundwater sources
- Of the 10,205 tests taken, 98.74% complied with the regulatory standards
- Full compliance was achieved at 58% of registered private water supply sites
- 35% of non-compliant sites showed microbiological contraventions, 50% chemical contraventions and 15% 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)



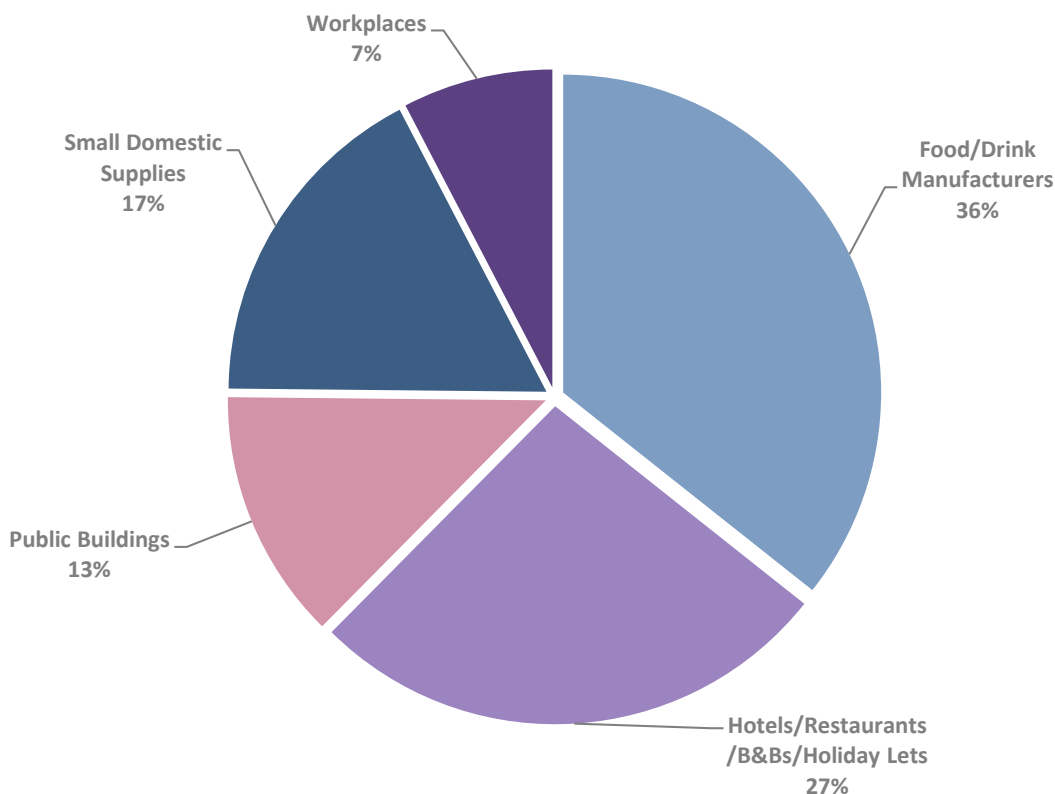
Private water supplies are often used as an alternative to or in conjunction with the public water supply at a range of sites such as:

- 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 157 supplies on our register in 2017 required to be monitored under The Private Water Supplies Regulations (Northern Ireland) 2009 (superseded by the 2017 regulations in October 2017). 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 test these supplies on request.

Figure 1.2: Categories of Private Water Supplies in Northern Ireland in 2017



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. Samples at private water supplies are collected by Environmental Health staff, acting on our behalf.

Of the 157 private water supplies on our monitoring schedule for 2017, 83% are commercial/public supplies; and 17% are small domestic supplies (groupings of two or more houses). A breakdown of the numbers and sizes of private water supplies in 2017 is shown in Table 1.1.

Table 1.1: Numbers and Types of Private Water Supplies in 2017

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	51	2
≤10	55	1
(ii) Small Domestic Supplies (two or more dwellings)		
≤10	29	1
TOTAL	157	

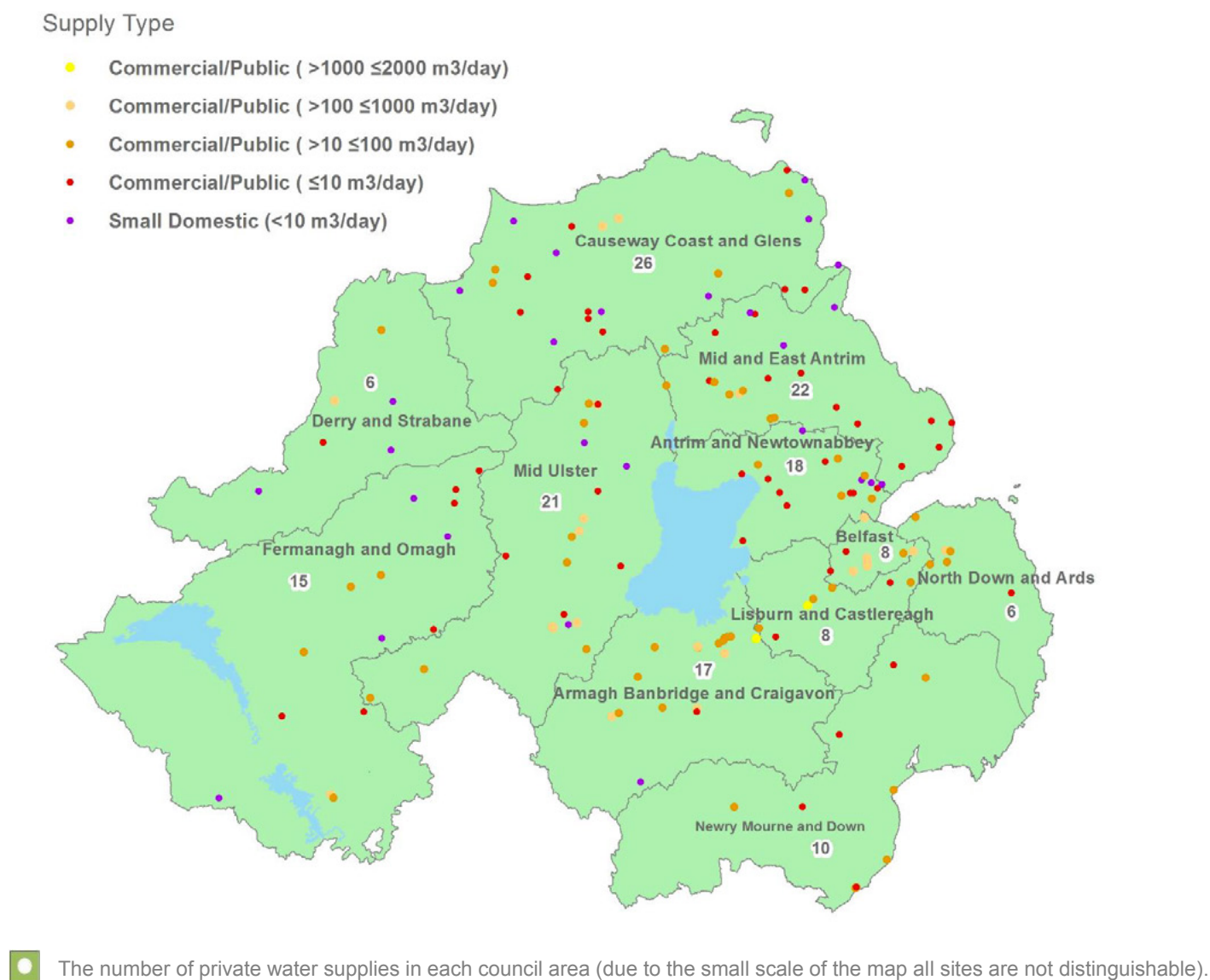
During 2017, seven sites were removed from the sampling programme as they no longer met the criteria to be registered. In addition a total of 11 new supplies registered with us, these were:

- five small domestic supplies serving two or more properties;
- two food/drink manufacturers;
- two restaurant/bars;
- a public building; and
- a hotel.

Although the sampling frequency for compliance sampling is set within the regulations, many supplementary 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 2017, a total of 144 ancillary samples were collected. The results of the individual tests of 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 2017, categorised by size, is shown in Figure 1.3. The 2017 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 2017



Risk Assessment

The regulations require a risk assessment to be carried out for each supply 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 for the risk assessment of private water supplies underwent further development during 2017 and testing of the application was rolled out to nominated local council staff in August 2017 for the risk assessment of priority private water supply sites.

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

Overall Drinking Water Quality

Drinking water regulations in Northern Ireland apply equivalent water quality standards to private drinking water supplies as to public water supplies. Although the number of private water supplies registered with us in 2017 was higher than in 2016, the overall number of parameters analysed for in 2017 was slightly lower due to a reduction in the number of pesticides tested.

The results in Table 1.2 show that, out of a total of 10,205 tests carried out in 2017, 98.74% met the regulatory standards. The regulatory requirements were not met on 129 occasions for 22 parameters, namely: coliform bacteria; manganese; hydrogen ion; iron; enterococci; *E.coli*; *Clostridium perfringens*; ammonium; sodium; individual pesticides (asulam, glyphosate, mecoprop, trichlopyr); turbidity; lead; sulphate; bromate; boron; fluoride; trihalomethanes (THMs), colour and radon.

Table 1.2: Overall Water Quality in Private Water Supplies in 2017

Parameters	Determinations in 2017		
	Total Number of Tests	Number of Tests not Meeting the Standards	% Compliance
Coliform bacteria	276	27	90.22
Enterococci	160	12	92.50
<i>E. coli</i>	276	12	95.65
<i>Clostridium perfringens</i>	247	4	98.38
Microbiological Total	959	55	94.26
Manganese	247	22	91.09
Hydrogen ion (pH)	276	15	94.57
Iron	248	8	96.77
Ammonium	247	4	98.38
Turbidity	276	3	98.91
Trihalomethanes	129	1	99.22
Colour	247	1	99.60
Individual pesticides	5498	5	99.91
Total pesticides	131	0	100.00
Other parameters	1560	0	100.00
Sulphate*	12	2	83.33
Sodium*	52	6	88.46
Boron*	11	1	90.91
Fluoride*	12	1	91.67
Bromate*	40	1	97.50
Lead*	83	1	98.80
Chemical Total	9069	71	99.22
Radon	158	3	98.10
Radioactivity	19	0	100.00
Radiochemical	177	3	98.31
Overall Total	10205	129	98.74

*Parameters on reduced monitoring frequency

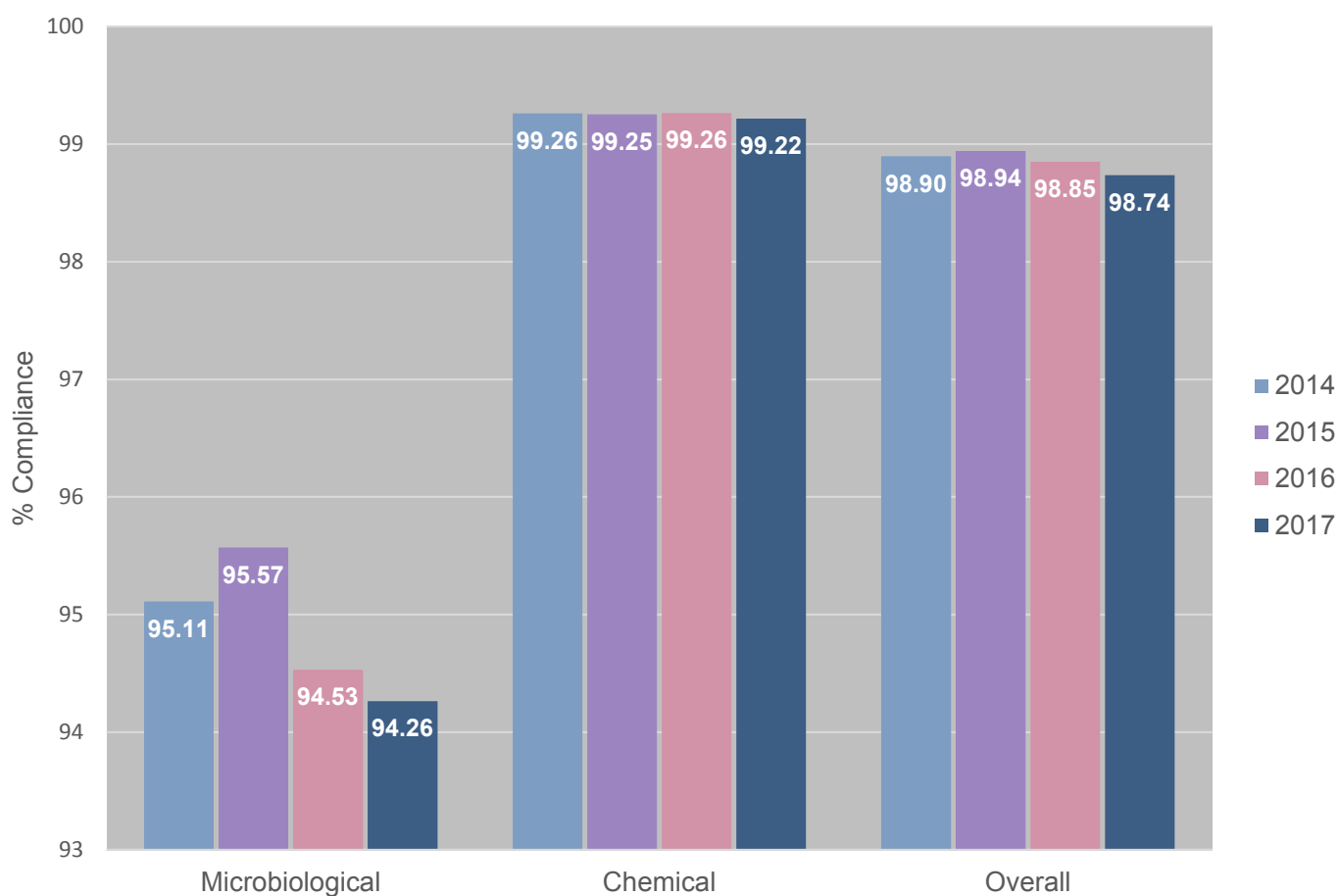
The low compliance figures for sodium, lead, sulphate, boron, fluoride and bromate are a consequence of the low number of tests performed for these parameters as they were not routinely tested for in all supplies. Apart from newly registered supplies: bromate was only tested at sites where chlorination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

Microbiological contraventions account for 55 (42.64%) of the 129 contraventions at private water supplies in 2017. There has been a decrease in the level of microbiological compliance reported as 94.26% in 2017, compared to 94.53% in 2016 and 95.57% in 2015, 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 73 in 2016 to 71 in 2017. There has however been no significant change in chemical compliance for 2017, 99.22% compared with 99.26% in 2016, also illustrated in figure 1.4.

As with previous years, where the chemical 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, 2014 – 2017



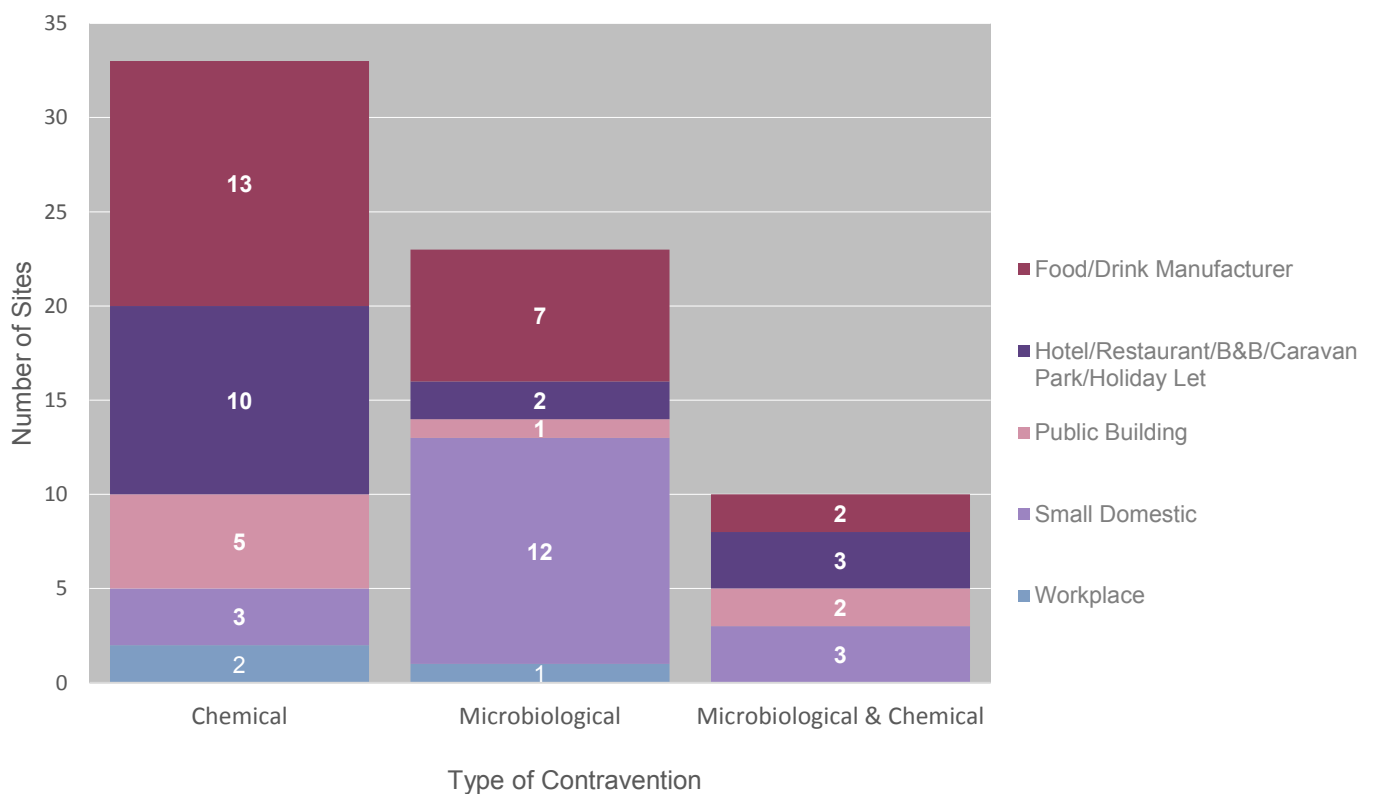
Full compliance was achieved for 58% (91 sites) of the private water supplies tested in 2017. Of the 66 sites which did not comply with the regulatory standards, 35% (23 sites) contravened microbiological standards; 50% (33 sites) chemical standards; and 15% (10 sites) failed to comply with both microbiological 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 52% were at small shared domestic supplies and 48% were at commercial/public sites.

The significance of each contravention not only depends on the category or size of the sites but often, more importantly, on the purpose for which the water is used at the sites. In summary, for the 66 sites which did not comply with all the drinking water standards in 2017:

- 48 use the private water supply as the primary source of drinking water;
- 13 are used for the washing of equipment and surfaces in contact with food or drink; and
- 5 use the supply as an ingredient in food or drink.

Figure 1.5: Categories of Non-Compliant Private Water Supply Sites in 2017



Factors Affecting Drinking Water Quality

Different aspects of the water supply chain contributed to the microbiological and chemical water quality contraventions reported in 2017 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 19 supplies during 2017, 11 small shared domestic supplies with no treatment and 8 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 2017, 19 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.

One site had a lead contravention in 2017 but investigations determined the sample was lifted at an outside tap not used for drinking water. Lead, and other heavy metals such as nickel, may be detected at elevated levels due to the use of inappropriate fixtures and fittings. 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 five private water supplies in 2017: a golf club, two dog kennels, a restaurant and a holiday let. Trace levels of a range of other pesticides below the regulatory limit of 0.10 µg/l for individual pesticides were also detected at 72 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 129 contraventions identified in 2017, 73 were notified to PHA for advice: 55 microbiological and 18 chemical. As a consequence, new restrictions in the use of the private water supply were put in place at 16 sites to protect public health. These restrictions can include switching to, or blending with, the public water supply (where this is 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

New legislation for the regulation of private water supplies was introduced in October 2017, [The Private Water Supplies Regulations \(Northern Ireland\) 2017](#). These new regulations replace and consolidate the 2009 private water supplies regulations (as amended in 2010 and 2015) and implement the revisions to the Drinking Water Directive (98/83/EC) by the amending Directive (EU) 2015/1787. An information letter highlighting the main changes to the regulatory regime was issued in October 2017, [Information Letter 03/17 – Introduction of the Private Water Supplies Regulations \(Northern Ireland\) 2017](#).

Update on Private Water Supplies Work

During 2017 Service Level Agreements were put in place for the provision of services by local councils to the Drinking Water Inspectorate in relation to the regulation of private water supplies. As part of the commitment under this agreement, DWI delivered sampling training to over 80 Environmental Health staff within the councils 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

Serious Drinking Water Quality Events in 2017

Date of Serious Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
22/08/17	North-western area of Northern Ireland (51,470 population)	Extremely heavy rainfall caused a series of flooding events in the North West. Carmoney WTWs was off supply for five days and there were eight burst mains.	Derry City & Strabane District

Significant Drinking Water Quality Events in 2017

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
16/01/17 - 01/02/17	Killylane WTWs (51,120 population)	Treatment difficulties led to aluminium and iron contraventions in the Killylane WTWs final water.	Mid & East Antrim Borough
26/01/17 - 01/02/17	Aird Close, Antrim (29 properties)	Mains disturbance caused by mains replacement in this area led to one coliform bacteria, four odour and two turbidity contraventions.	Antrim & Newtownabbey Borough
28/01/17 - 30/01/17	Dorisland WTWs (41,660 population)	Contraventions of the turbidity standard in the works final water were not representative of the water going into supply. DWI dealt with this matter by issuing a Regulation 27(5) Notice.	Antrim & Newtownabbey Borough; and Mid & East Antrim Borough
01/03/17 - 08/09/17	Iveagh Nursery School (272 population)	Contraventions of the iron standard were caused by the age and condition of the supplying cast iron main.	Newry, Mourne & Down District
30/03/17 - 20/04/17	Glenhordial WTWs (10,694 population)	Contraventions of the turbidity standard in the works final water were probably caused by disturbance in the clear water tanks and/or in the sample line.	Fermanagh & Omagh District

Significant Drinking Water Quality Events in 2017

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
12/04/17 - 12/05/17	Stormont Castle (170 population)	After the installation of a new chiller unit by an external contractor, backflow occurred which introduced ethylene glycol into the drinking water system. This event occurred due to non-compliance with the Water Fittings Regulations by the external contractor. There was local media interest. This event was not caused by NI Water.	Belfast City
17/04/17 - 10/08/17	Ballinrees WTWs (168,204 population)	Contraventions of the individual pesticide standard for MCPA occurred in the works final water due to insufficient treatment. A Consideration of Provisional Enforcement Order (CPEO) has been issued by the Inspectorate.	Causeway Coast & Glens Borough; and Derry City & Strabane District
06/06/17 - 07/06/17	Dungonnell WTWs (33,446 population)	A contravention of the turbidity standard was caused by disturbance in a Clear Water Tank (CWT) as it was being drained down for cleaning.	Mid & East Antrim Borough
06/06/17 - 07/09/17	Derg WTWs (38,989 population)	Contraventions of the individual pesticide standard for MCPA occurred in the works final water due to insufficient treatment. A Consideration of Provisional Enforcement Order (CPEO) has been issued by the Inspectorate.	Derry City & Strabane District; and Fermanagh & Omagh District
26/06/17 - 30/06/17	Castor Bay WTWs (364,673 population)	Contraventions of the taste & odour parameters occurred in the works final water due to insufficient treatment.	Armagh City, Banbridge & Craigavon Borough; Belfast City; Lisburn & Castlereagh City; Mid-Ulster District; and Newry, Mourne & Down District
03/07/17 - 07/07/17	Strand Road, Portstewart – Irish Open (Approximately 80,000 population)	Contamination of a temporary drinking water supply led to coliform bacteria contraventions.	Causeway Coast & Glens Borough
05/07/17 - 12/07/17	Drumagarner Road, Kilrea (471 properties)	Coliform bacteria contraventions occurred after a new mains was connected in Drumagarner Road. A “Boil Water Before Use” notice was issued to a single property.	Causeway Coast & Glens Borough

Significant Drinking Water Quality Events in 2017

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
24/07/17 - 01/02/18	Glenhordial WTWs (10,694 population)	Contraventions of the individual pesticide standard for MCPA occurred in the works final water due to insufficient treatment. The Pesticides – Total Substances standard was also contravened. A Consideration of Provisional Enforcement Order (CPEO) has been issued by the Inspectorate.	Fermanagh & Omagh District
25/07/17 - 30/11/17	Dungonnell WTWs (33,446 population)	A contravention of the trihalomethanes (THMs) standard occurred in the Dungonnell WTWs supply area. Four THM samples taken in August 2017 were in the “likely to fail” category. The elevated results are probably due to a combination of poor organics removal during the treatment process combined with increasing levels in the distribution system.	Mid & East Antrim Borough
14/08/17 - 11/09/17	Ballylagan Road, Garvagh (22 properties)	Operational work in this area led to iron, manganese and odour contraventions in properties on the Ballylagan Road.	Causeway Coast & Glens Borough
24/08/17 - 31/08/17	Carmoney WTWs (51,470 population)	Aluminium, iron, manganese and turbidity contraventions were reported in the Carmoney WTWs final water. Our assessment is that the contraventions were related to disturbance caused by the operational activities regarding the re-zoning of Ballinrees and Caugh Hill WTWs. This event was related to the “Serious” flooding event reported previously.	Derry City & Strabane District
30/08/17 - 03/09/17	Drumagarner Road, Kilrea (471 properties)	Coliform bacteria contraventions occurred after a new mains was connected in Drumagarner Road. A “ Boil Water Before Use ” notice was issued to two properties.	Causeway Coast & Glens Borough

Significant Drinking Water Quality Events in 2017

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
04/09/17 - 16/10/17	Upper Malone Road, Belfast (286,407 population)	A contravention of the trihalomethanes (THMs) standard occurred in the Dunore Point WTWs supply area. It is probable that the THM contravention was mainly caused by Disinfection By-Product precursors being present in the works final water, the condition of the distribution system and the long residence time (estimated at 4 days).	Antrim & Newtownabbey Borough; Belfast City; Causeway Coast & Glens Borough; Lisburn & Castlereagh City; and Mid & East Antrim Borough
05/09/17 - 15/09/17	Cargagh Road, Downpatrick (25 properties)	Coliform bacteria contraventions were reported after contamination of the mains occurred during a burst main repair on the Cargagh Road. A “Boil Water Before Use” notice was issued to the 25 affected properties.	Newry, Mourne & Down District
05/09/17 - 20/09/17	Altnahinch WTWs (31,486 population)	Contraventions of the trihalomethanes (THMs) standard occurred in the Altnahinch WTWs final water and in the related supply area. The contraventions were due to inadequate treatment.	Causeway Coast & Glens Borough
06/09/17 - Present	Gransha Road, Dromara (10 properties)	Contraventions of the iron and turbidity standards were caused by the age and condition of the supplying cast iron main.	Armagh City, Banbridge & Craigavon Borough
18/09/17 – 03/10/17	Ballinrees WTWs (168,204 population)	A contravention of the trihalomethanes (THMs) standard occurred in the Ballinrees WTWs supply area. This contravention occurred following a period when there was full treatment was not in operation.	Causeway Coast & Glens Borough; and Derry City & Strabane District

Significant Drinking Water Quality Events in 2017

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
06/10/17 - Present	Gorticross Road, Drumahoe (17 properties)	Aluminium, iron, manganese and turbidity contraventions occurred in Ardmore, Gosheden and Kildoag roads. These contraventions occurred after re-zoning work carried out following the flooding event which caused damage to a main on Gorticross Road. This event was related to the "Serious" flooding event reported previously.	Derry City & Strabane District
16/10/17 - 02/03/18	Rathlin Island - (10 properties)	A value greater than the World Health Organization Index for trihalomethanes was reported due to naturally occurring bromide in the source water, and low flows to the west of the island in the autumn. A Consideration of Provisional Enforcement Order (CPEO) has been issued by the Inspectorate.	Causeway Coast & Glens Borough
13/11/17 - 14/11/17	Dorisland WTWs (127,451 population)	Aluminium, manganese and turbidity contraventions were reported in the Dorisland WTWs final water due to unrepresentative sampling.	Antrim & Newtownabbey Borough; Belfast City; and Mid & East Antrim Borough
29/11/17 - 04/12/17	Dungonnell WTWs (33,446 population)	Contraventions of the pH standard occurred in Dungonnell WTWs supply area. This was due to overdosing of orthophosphoric acid (used for plumbosolvency control) at Dungonnell WTWs.	Mid & East Antrim Borough
14/12/17 - 15/12/17	Castor Bay WTWs (364,673 population)	A contravention of the aluminium standard was caused by a problem with the pH monitoring regime which led to sub-optimal treatment.	Armagh City, Banbridge & Craigavon Borough; Belfast City; Lisburn & Castlereagh City; Mid-Ulster District; and Newry, Mourne & Down District

Annex 3

Technical Audit Programme

In 2017, 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 2017 Inspection Programme.

Table 5.1: Summary of the 2017 Inspection Programme

Date of Audit	Location	Audit Activity	Number of Recommendations ¹	Number of Suggestions ²
01/03/17	Dungonnell WTWs	To check that good operational practice is used in the water treatment process.	6	5
15/03/17	Caugh Hill WTWs	To check that good operational practice is used in the water treatment process.	7	3
14/11/17	Laboratory Information Management System (LIMS)	To check that data is adequately managed by the 'Laboratory Information Management System'	3	0
15/11/17	Glenhordial WTWs	To check that good operational practice is used in the water treatment process.	7	8
22/11/17	Killylane WTWs	To check that good operational practice is used in the water treatment process.	4	4
29/11/17	Castor Bay WTWs	To check that good operational practice is used in the water treatment process.	8	9

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 best practice.

Annex 4

Enforcements in 2017

The [DWI website](#) provides full details on each Consideration of Provisional Enforcement Order (CPEO) and Enforcement Notices for 2017.

Table 4.1: Summary of Enforcements issued in 2017

Type of Enforcement	Water Treatment Works (WTWs)	Reason for Undertaking Or Notice	Summary
DWI Notice/17/01 [Regulation 27(5)]	Dorisland WTWs	A Review of the Dorisland WTWs Risk Assessment was required following Event 02/17	Following an assessment of Event 02/17 DWI determined that further action was required by NI Water. The event highlighted samples from the WTWs did not comply with regulation 16, in that they were unrepresentative. It further identified issues in relation to inadequate lines of communication internally within NI Water. The Notice required NI Water to review and re-issue its Risk Assessment. The Notice was issued on the 14 February 2017 and required the review to be completed by the 31 March 2017.
CPEO/17/01	Ballinrees WTWs	Contravention of the regulatory standard for the herbicide, MCPA ¹	Following ongoing and non-trivial contraventions for the parameter, MCPA, DWI determined that further action was required by NI Water. DWI issued a CPEO on the 20 June 2017 requesting undertakings from NI Water by the 18 July 2017. These were received, accepted and published by DWI on the 24 July 2017. The undertakings included the replacement of filter media, and the consideration of more effective treatment options, alongside work to be undertaken within the catchment. An extension to an undertaking completion date for the replacement of filter media was granted by DWI on the 21 December 2017.

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
Klondyke Building
Cromac Avenue
Gasworks Business Park
Malone Lower
BELFAST
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