

Drinking Water Quality in Northern Ireland, 2012

A Report by the Drinking Water Inspectorate for Northern Ireland



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Environment
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Regional Development
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Northern Ireland Environment Agency

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Printed and published by Northern Ireland Environment Agency

July 2013

ISBN 978-1-907053-56-6

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Foreword

I am pleased to present our 17th annual report, in which we provide a regulatory assessment of the quality of both public and private water supplies here, in Northern Ireland.

To obtain high quality public drinking water, significant capital investment was required in the last 17 years to enhance treatment processes at many water treatment works across Northern Ireland. This has resulted in significant improvements being gained in pathogen removal (notably for *Cryptosporidium*), more effective treatment to remove natural organic matter prior to disinfection and reducing levels of aluminium being present in our drinking water supplies. Exposure to lead in drinking water has also reduced significantly, particularly since 2004, as a result of chemical treatment and communication pipe replacement.

Overall public drinking water quality, based on results of key tests carried out at water treatment works, service reservoirs and consumers' taps, remains high with full compliance being achieved for many parameters in 2012. However, there has been a significant increase in the number of microbiological, trihalomethanes, iron, turbidity and pesticide tests not complying with the standards. I am therefore disappointed that the previously reported upward trend has not been maintained, with a further drop in the level of overall compliance in 2012: 99.78%, compared with 99.83% in 2011 and 99.86% in 2010.

While it is good to report on the achievements that have been made by NI Water to improve drinking water quality, these must be maintained and any downward trends reversed.

To enable us to uphold consumer confidence regarding the quality of their water supplies, we also look at other data to help us assess how well NI Water carries out its responsibilities to supply safe, clean drinking water. This includes the reporting of events and the number of consumer contacts from those who have experienced problems with their drinking water quality. Once again, I highlight the number of events that have arisen, particularly, due to operational issues relating to the ineffective performance of water treatment works. I also note consumers' concerns continue to relate mainly to the appearance of their water, particularly where it is discoloured.

It is important for NI Water to remain vigilant, and to proactively manage its business so that public health incidents are not caused by the water supply. NI Water has the responsibility to make sure that consumers continue to be provided with safe, clean drinking water supplies.

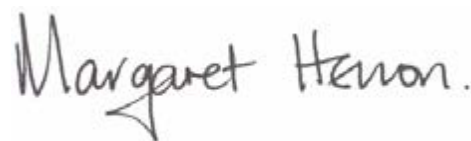
Risk management and the development of drinking water safety plans are an integral part of the regulations. I am fully supportive of proactive planning to build in contamination risk resilience strategies, to secure our drinking water supplies. I look forward to seeing the incorporation of improved assessment of risk particularly for lead, disinfection by-products, iron, pesticides and addressing consumers concerns.

A small percentage (less than 1%) of the water supply in Northern Ireland is from private water supplies. Water from these supplies is used for a range of purposes (from domestic dwellings to those supplying large commercial and public premises). The quality of some of these supplies is highly variable. Overall compliance with the regulatory standards in 2012 for private supplies is 97.66%; a level notably lower than that for public supplies.

Ongoing work with the adoption of a risk based approach is necessary to help identify and solve the problems particularly of the untreated, more rural supplies. I recognise that we need to continue to educate and inform those private water supply owners and users to identify where improvements need to be made to address the contamination risks (in particular, for iron, manganese and microbiological parameters).

I look forward to embracing the opportunities for us to continue to work constructively with other stakeholders as we aim to maintain our high quality of public drinking water and further improve the water quality for the users of private supplies across Northern Ireland.

I hope you find that this report is both an interesting and useful reference source on drinking water quality in Northern Ireland.



Margaret Herron
Chief Inspector of Drinking Water
July 2013

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Executive Summary

This is the 17th report in a series published by the Drinking Water Inspectorate, acting in our regulatory role in matters relating to drinking water quality. We act on behalf of the Department for Regional Development (DRD) in respect of public water supplies, and on behalf of the Department of the Environment (DoE) in relation to private water supplies.

Our report gives an independent commentary on our assessment of, and our checks on, the quality of drinking water provided by Northern Ireland Water Ltd (NI Water). It also presents details of the quality of the private water supplies for which we have regulatory responsibility.

Public Water Supplies

Overall public drinking water quality, which includes results of key tests carried out at water treatment works, service reservoirs and consumers' taps, is of a high quality. There has, however, been a reduced level of overall compliance reported in 2012: 99.78%, compared with 99.83% in 2011. While high levels of compliance have been achieved for many parameters, there have been significant increases in the numbers of contraventions of the microbiological, trihalomethanes (THMs), iron, turbidity and pesticides standards.

Compliance with microbiological standards is important as contraventions may indicate a breach in the integrity of the water supply system or a failure in the treatment process. Results confirm that the general safety of drinking water supplies is good, with overall microbiological quality at 99.82%. However, there has been a significantly reduced level of compliance from the 99.91% achieved in 2011. This is mainly attributed to a significantly increased number of consumers' taps failing to meet the microbiological standard for coliform bacteria. We are currently assessing this data with a view to taking forwards enforcement action in 2013 to address contraventions of the microbiological standards in the distribution system and at consumers' taps.

Unrepresentative sampling caused by the condition of the consumers' tap or contamination at the time of sampling have been given as the main reason by NI Water for 75% of these microbiological samples being non-compliant. I am concerned that this high percentage is reported as the primary cause, given that all aspects of sample collection and transportation, from the appropriate sampling points are within NI Water's control.

Samplers used by NI Water are required to be appropriately trained to collect and transport samples. We continue to stress the importance to NI Water of collecting representative samples so as to prevent the integrity of the sample being compromised. This will enable a robust assessment of the monitoring results to be made, to provide the assurance that the regulatory requirements are being met to protect public health.

Looking at the overall quality of water that consumers received in 2012, we report on compliance with the regulatory standards for 42 key parameters (38 chemical and four microbiological). Full compliance has been achieved for 27 of these parameters. Compliance still has to be achieved for the following 15 parameters: iron, THMs, coliform bacteria, lead, aluminium, pesticides - total substances, turbidity, bromate, *Clostridium perfringens*, manganese, odour, pesticides - other substances (MCPA, mecoprop, linuron and metoxuron), *E. coli*, taste and hydrogen ion.

Following investigation of each contravention by NI Water to identify the cause, the necessary corrective action is required to be put in place to prevent recurrence. The scale of this work varies: it may be that planned investment in the water infrastructure is necessary; or that changes to operational practices are required. Where necessary, particularly for persistent contravention of the regulations, we take enforcement action to ensure delivery of the required corrective action. In 2012, enforcement action was required to address issues of non-compliance for the pesticide MCPA, aluminium, iron, hydrogen ion, THMs and turbidity.

The reporting of 'key' statistics, using data from the regulatory monitoring programmes is required for compliance monitoring purposes not only at a regional level but also at the national level to meet the requirements of the European Union. In addition to these regulatory sampling programmes, NI Water undertakes operational monitoring aimed at ensuring a comprehensive understanding of water quality from the abstraction sources and its treatment and distribution systems.

The high levels of compliance do not guarantee that events that have the potential to affect water quality will not happen. Of the 69 events reported in 2012, 38 (55%) were categorized as 'Significant'. Of these, 74% related to the ineffective performance of the water treatment works. The remaining 26% were caused by issues in the distribution system. As part of the event assessment process, it is essential that NI Water continues to put learning and appropriate mitigation measures in place as part of its drinking water safety plan approach to prevent the recurrence of drinking water quality events.

NI Water must ensure that: water treatment works are operated effectively; distribution systems are adequately managed; and samples taken are representative, thereby fulfilling the regulatory requirements.

Consumers expect safe, clean, drinking water supplies. To enable us to evaluate consumers' confidence in the quality of drinking water at their taps, we receive information from NI Water on the complaints and concerns expressed by consumers. The overall number of complaints and concerns reported in 2012 was 6,188 (6,207 in 2011); of these 64% were related to appearance (59% in 2011). Of the complaints regarding appearance, 63% were regarding discoloured water. NI Water has a planned long-term programme of work to rehabilitate its network of water mains, which, as it completes, should assist in addressing many of these consumers' concerns relating to discoloured water.

Private Water Supplies

To improve the quality and safety of private water supplies an updated regulatory framework was put in place with the introduction of new regulations in 2009. This is our third year of reporting under this new monitoring regime. As with previous reports, we continue to identify the persistent nature of recurring failures, in particular iron, manganese, hydrogen ion and microbiological contraventions of the regulatory standards.

For 2012, the sampling programme included two additional elements: disinfection by-products relating to the use of chlorine dioxide where it is used as a primary disinfectant; and a radioactivity screening programme.

For the 122 private water supplies that we monitored in 2012, overall compliance is reported as 97.66% (98.03% in 2011). This significant decrease in compliance is due mainly to an increased number

of microbiological contraventions, particularly at sites with inadequate source protection.

Where compliance with the regulatory standards has not been achieved, these contraventions have occurred at a range of supplies from: small domestic types; public buildings such as universities and hospitals; and larger commercial supplies, where there is either no treatment in place or where this treatment has been inadequately operated or maintained.

We continue to work with private water supply owners and the local councils to make improvements to these supplies. As the necessary remedial action identified in the drinking water safety plans at individual private supplies is undertaken throughout 2012, compliance should improve.

Regulatory Framework

Regulatory changes in 2010, covering both public and private water supplies included a duty to minimize disinfection by-products (DBPs). The use of chemical disinfectants in water treatment can cause the formation of chemical DBPs (e.g. THMs, chlorite and chlorate).

While we recognize there has been significant investment to upgrade and enhance many of NI Water's treatment works; there has been a significant drop in THM compliance (97.45% in 2012 compared to 99.26% in 2011) for our public supplies. The regulatory standard for THMs is 100µg/l. To further evaluate how effective NI Water is at minimizing the level of these DBPs, we report using a broad indicator on the annual average concentration of THMs. For 2012 this was 52.3µg/l, with 60% of zones identified where the annual average exceeds 50µg/l. This is a significant increase compared to 2011, where 30% of zones had an annual average THM that exceeded 50µg/l.

NI Water is required to look at its risk assessments for these supplies to assess if additional control measures are needed to minimize the production of these DBPs to reverse this increasing trend of DBPs formation.

During 2012, we enhanced our disinfection by-product monitoring programme for private water supplies where chlorine dioxide is used as the primary means of disinfection. Eight sites were monitored from July 2012 for the DBPs chlorite and chlorate. Four of these sites reported levels above that required to comply with the national conditions

of use for products and processes that are approved for drinking water purposes.¹ The results from the monitoring of chlorite and chlorate are currently being assessed by us.

Risk Assessments

Risk assessment is an integral part of our public and private water supplies regulation. The adoption of a drinking water safety plan approach is an effective way of protecting human health and ensuring good water supply practice through: minimization of contamination of source waters; reduction or removal of contamination through effective treatment processes; and prevention of contamination of the distribution systems.

With an increased number of pesticides being reported in 2012, we have asked NI Water to reassess the associated risk from land use practices in the catchments of their abstraction sources and to review the operation of the associated water treatment works to secure compliant water supplies.

We have also asked NI Water to continue to develop its risk assessments of its distribution systems. We welcome the ongoing work being undertaken by NI Water to develop its lead strategy including a prioritised replacement of its lead pipes; its recent refinement of its mains rehabilitation programme with a more focused approach to addressing consumers' discoloured water quality concerns; and the development of its disinfection policy to include minimization of DBPs.

In relation to private water supplies, we will carry on working with supply owners and the local councils, with the aim of reducing the contamination risks at these sites and improving their water quality.

Looking Forwards

Looking forwards we have specific challenges to ensure the continuing provision of safe, clean, sustainable drinking water supplies. Managing the pressures that can arise in the water supply chain from the risk of contamination will remain at the heart of our work.

We are currently working with the Northern Ireland Environment Agency and NI Water to produce guidance which will clarify the individual roles and responsibilities to ensure appropriate raw water monitoring is undertaken. This is to satisfy the needs of both informing drinking water safety plans and to enable better protection of sources used for abstraction through identification of drinking water

protected areas. We look forward to seeing how this 'joined up' working will provide enhanced monitoring data to better inform the risks of contamination and to the improvement in raw water quality which will reduce the level of purification required.

The final European drinking water standard for lead (10µg/l) comes into force at the end of 2013. Exposure to lead in drinking water has reduced significantly as a result of a 'twin track' approach adopted by NI Water of chemical treatment (orthophosphate dosing) and communication pipe replacement. While there has been an improving trend in overall compliance with the current 25µg/l standard since orthophosphate treatment began in 2004 (99.49% in 2012; 94.92% in 2004), there is still a significant amount of work required to comply with the final 10µg/l standard with 97.19% achieved in 2012.

For pipes that are not the responsibility of NI Water, we welcome the integrated work that is ongoing with us, NI Water, the district councils, health professionals, the Department of Education and the Housing Executive, to further reduce consumer exposure to lead in drinking water, particularly, where lead pipe work and fittings remain in older buildings.

To sustain the delivery of high quality public drinking water supplies, we uphold a 'Partnership Agreement'² to achieve this commonly shared goal. We will continue to engage with NI Water, the Northern Ireland Authority for Utility Regulation (Utility Regulator), the Department for Regional Development, the Consumer Council for Northern Ireland, and the Northern Ireland Environment Agency as part of the investment planning process to identify funding priorities.

We recognize that competing priorities exist, and our primary objective is to progress programmes of work that are necessary to secure compliance with drinking water quality standards across Northern Ireland, thereby ensuring safe, clean drinking water.

¹<http://dwi.defra.gov.uk/drinking-water-products/approved-products/soslistcurrent.pdf>

²www.drdni.gov.uk/water_stakeholders_partnership_agreement_2012.pdf

Part 1
Public Water Supplies



Drinking Water Quality

In this section of the report we give an overview of the quality of drinking water supplied by Northern Ireland Water Ltd (NI Water).

We look at the results from the regulatory compliance sampling programme, the events notified to us and the consumer contacts made about drinking water quality.

Where the regulatory requirements have not been met, we provide detail on what corrective action has been taken.

NI Water is a government-owned company with responsibility for supplying and distributing public drinking water throughout Northern Ireland. Figure 1.1 below provides some details about the company.

Drinking Water Quality Testing

Throughout 2012, 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 2012, over 98,000 tests were carried out for a range of different parameters. A description of each and the regulatory limits (or prescribed concentration or value [PCV]) is available on our website.¹

Figure 1.1: NI Water Supply Details, 2012



¹ www.doeni.gov.uk/niea/water-home/drinking_water/public_water/regulations_guidance.htm

Overall Drinking Water Quality

Overall drinking water quality in 2012, for the key parameters monitored at water treatment works, service reservoirs and consumers' taps remains high (99.78%). Of the 98,066 tests we used to assess overall compliance, 217 (0.22%) failed to meet the standards (Table 1.1 refers). This is a significant increase in the number of tests failing compared with the 177 (0.17%) tests which failed in 2011 (Figure 1.2 refers).

This decrease in compliance was caused by significant increases in the number of contraventions for:

- trihalomethanes at consumers taps - 2.55% in 2012, 0.74% in 2011;
- iron at consumers' taps - 2.75% in 2012, 1.73% in 2011;
- pesticides at consumers' taps - 0.15% in 2012, 0.02% in 2011;

- turbidity at consumer's taps - 0.35% in 2012, 0.06% in 2011; and
- overall microbiological parameters (for coliform bacteria, *Clostridium perfringens* and *Escherichia coli* (*E. Coli*)) - 0.18% in 2012, 0.09% in 2011.

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. While overall results confirm that the general safety of drinking water supplies still good, this is the second year when we have seen a downward trend from the 99.86% achieved for overall compliance in 2010. We have noted our concerns to NI Water in particular with regard to coliform bacteria, iron, THM and pesticide contraventions. Investigation and appropriate remedial action is being progressed to ensure compliance for these drinking water supplies.

Figure 1.2: Overall Drinking Water Quality, 2008 - 2012

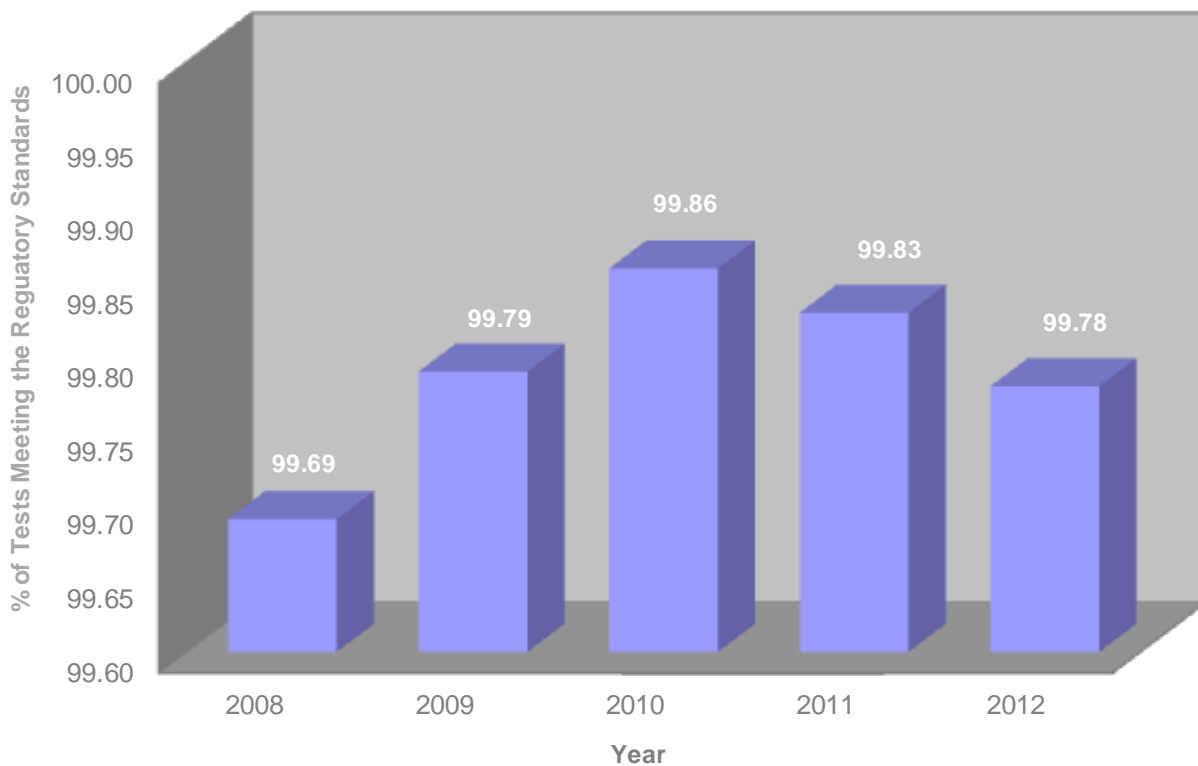


Table 1.1: Overall Drinking Water Quality in 2012

	No. of Tests	No. of Tests not Meeting the Standards
Water Leaving Water Treatment Works (WTWs)		
<i>E. coli</i>	6,617	0
Coliform Bacteria	6,617	3
Microbiological Total	13,234	3
Nitrite	232	0
Turbidity*	6,617	11
Chemical Total	6,849	11
Total (Microbiological and Chemical)	20,083	14 (0.07%)
Water in Service Reservoirs (SRs)		
<i>E. coli</i>	16,690	7
Coliform Bacteria**	16,690	27
Total	33,380	34 (0.10%)
Water at Consumers' Taps or Supply Points (WSZs)		
<i>E. coli</i>	4,704	6
Coliform Bacteria*	4,704	59
Enterococci	392	0
<i>Clostridium perfringens</i> *	2,731	7
Microbiological Total	12,531	72
Zone Chemical Analysis	20,203	82
Supply Point Chemical Analysis***	10,159	14
Hydrogen Ion*	1,710	1
Chemical Total	32,072	97
Total (Microbiological and Chemical)	44,603	169 (0.38%)
Overall Water Quality		
Overall Microbiological Quality	59,145	109 (0.18%)
Overall Chemical Quality	38,921	108 (0.28%)
Overall Drinking Water Quality****	98,066	217 (0.22%)

*The four key Indicator parameters.

**One SR did not meet the 95% compliance rule.

***Collected at WTWs as no significant changes occur during distribution.

****Calculated from the mandatory parameters and the four key indicator parameters.

Water Quality at Consumers' Taps

Fifteen parameters did not achieve full compliance in 2012: iron, THMs, coliform bacteria, lead, aluminium, pesticides – total substances, turbidity, bromate, *Clostridium perfringens*, manganese

odour, pesticides – other substances (MCPA, mecoprop, linuron and metoxuron), *E. coli*, taste and hydrogen ion. A summary is provided in Table 1.2.

Table 1.2: Parameters not Meeting Full Compliance at Consumers' Taps, 2011 - 2012

Parameter	No of Samples Taken in 2012	No. of non-compliant Samples in 2012	% Compliance in 2012	% Compliance in 2011
Iron	1,710	47	97.25	98.27
Total trihalomethanes	392	10	97.45	99.26
Coliform bacteria*	4,704	59	98.75	99.43
Lead	392	2	99.49	99.75
Aluminium	1,710	8	99.53	98.85
Pesticides – total substances	231	1	99.57	100
Turbidity	1,710	6	99.65	99.94
Bromate	392	1	99.74	99.75
<i>Clostridium perfringens</i> *	2,731	7	99.74	100
Manganese	1,710	3	99.82	99.88
Odour	1,711	3	99.82	98.61
Pesticides - other substances**	8,545	13	99.85	99.98
<i>E. coli</i>	4,704	6	99.87	99.96
Taste	1,710	2	99.88	99.65
Hydrogen ion*	1,710	1	99.94	99.88
All other analysed parameters	10,541	0	100	99.83***
% Compliance at Consumers' taps	44,603	170	99.62	99.57

*Key indicator parameters.

**All pesticides other than aldrin, dieldrin, heptachlor and heptachlor epoxide.

***Enterococci and PAH failures in 2011 but full compliance in 2012.

The parameter with the lowest reported compliance is iron at 97.25% (98.27% in 2011). The presence of iron is mainly related to the condition of the water mains system. NI Water has 26,500kms of water mains supplying water across Northern Ireland. NI Water has a water mains rehabilitation programme in which water quality issues are considered as part of how the rehabilitation work is prioritised to deliver improved compliance with the iron parameter and to also reduce the number of consumer complaints/concerns regarding the appearance of their water.

The parameter with the second lowest compliance reported is THMs at 97.45%. The decrease in THM compliance (from 99.26% in 2011) is primarily symptomatic of issues with water treatment processes but THMs can also further increase in

distribution systems particularly if the mains are not well maintained and free of organic matter. NI Water must ensure that treatment processes are optimized for efficient removal of naturally occurring organics, the precursors for THM formation and that the distribution system does not adversely affect the water quality from the water treatment works before it is supplied to consumers.

Assessment of overall microbiological quality is important as it looks at water quality throughout the supply chain from the water treatment works, the service reservoirs and at the consumers' taps. As previously mentioned there has been an increase in the number of microbiological contraventions reported in 2012.

This increase in the number of contraventions was mainly due to the presence of:

- coliform bacteria at consumers' taps which increased very significantly from 27 in 2011 to 59 in 2012;
- coliform bacteria at service reservoirs which increased from 22 in 2011 to 27 in 2012; and
- *Clostridium perfringens* at water supply points which increased from zero in 2011 to seven in 2012

We are currently assessing all the microbiological data for 2012 with a view to taking forward enforcement action in 2013 to address the significant increase reported for microbiological non-compliances within the distribution system.

Water Quality Related to Domestic Distribution Systems

Domestic Dwellings

NI Water is required to investigate all contraventions of the drinking water quality standards, including those due to the internal distribution system within buildings. Where these failures are within domestic dwellings, NI Water must inform the owner with the details of the failure and provide appropriate advice in relation to what actions the owner may take to rectify the contravention and, to protect public health.

NI Water is not responsible for putting remedial measures in place to rectify where the contraventions have been caused by the owners pipe work and distribution systems within the boundary of the owners premises, unless the failure is related to a breach of The Water Fittings Regulations.¹ There were 51 contraventions reported to us in 2012 which NI Water determined to be due to the internal plumbing within domestic properties and these were related to the following parameters: 44 coliform bacteria; four *E. Coli*; two iron; and one lead.

The Domestic Distribution System Regulations

On undertaking its investigations into contraventions, if the cause is attributed to the internal domestic distribution system, in premises where water is made available to members of the public (such as schools, hospitals or restaurants), NI Water is required to notify us under The Domestic Distribution Systems Regulations.² If the

failure is assessed as likely to recur or constitutes a potential danger to human health, we may serve a Notice in writing to the owner of the premises or establishment, outlining the actions required to remedy the contravention within a specified period. Where the premises' owner fails to comply with the Notice, we may then undertake to complete the remedial actions specified and recover any costs incurred.

In 2012, there were no contraventions notified to us from NI Water's compliance sampling programme under these Regulations.

In addition to the regulatory sampling programme NI Water carries out operational and survey sampling. From this testing programme in 2012 we received four notifications where compliance with the regulatory standards was not achieved: two for lead; one for taste and odour; and one for odour, turbidity, iron, manganese and microbiological failures. No Notices were required to be served under these Regulations as full and timely co-operation was received from the owners enabling the remedial measures to be put in place to bring the water supplies into compliance.

We acknowledge the ongoing assistance and co-operation afforded to us by NI Water, local council staff, and the premises owners in investigating and resolving these contraventions.

Events Affecting Drinking Water Quality

We require NI Water to 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. This information must be provided according to agreed guidance and reporting procedures. We also encourage NI Water to notify us of events that may fall outside the criteria, but which could, nonetheless, impact on water quality or cause concern to consumers.

In 2012, a new categorization system for events was introduced. When notified of an event, we assess NI Water's provisional information to allow us to assess the event into one of the following five categories: Not Significant; Minor; Significant; Serious; or Major. If the event category is Significant, Serious or Major, NI Water is required to provide us with more detailed information within 20 working days of the event.

There is always the potential for events to happen. What matters is how well NI Water minimizes both

¹www.legislation.gov.uk/nisr/2009/255/contents/made

²www.legislation.gov.uk/nisr/2010/157/contents/made

the risks of occurrence and the consequences of events as it acts to protect public health at all times.

We assess all the information available to determine:

- what caused the problem and whether or not it was avoidable;
- what NI Water did in response and how it handled the situation;
- what lessons can be learned to prevent similar incidents in the future; and
- if there were any contraventions of the Regulations.

In 2012, as in 2011, 69 events were reported to us; 74% of which occurred at 16 WTWs (64%) and were attributed to ineffective water treatment. While the total number of events has limited use as a meaningful indicator, what is important is the significance of each event. Of the 69 events reported, 38 (55%) were categorized as Significant; 21 (30%) were categorized as Minor; and ten (14%) were categorized as Not Significant (Annex 4 provides more details).

Of the 38 **Significant** events:

- 28 (74%) occurred at water treatment works and were related to difficulties with the performance of the coagulation processes, or deficiencies at the water treatment works which led to aluminium, iron, manganese, pesticide, THM and turbidity contraventions. There was also a disinfection failure, one detection of *Cryptosporidium oocysts*; and one detection of *Clostridium perfringens* (for which no reason was identified); and
- ten (26%) were caused by issues in the distribution system: three bacteriological failures, one of which required a 'Boil Water Before Use' notice" (precautionary measure for public health protection) at a single property; one caused by mains contamination during mains rehabilitation work and one at a service reservoir; three iron and/or turbidity contraventions due to the condition of old iron mains with customers supplied with or purchasing

bottled water; one odour (bitumen lining related requiring the issue of a 'Do Not Use Tap Water for Drinking or Cooking' notice); one relating to an odour during networks operational activity; one relating to consumer concern following a delay in receipt of notification of an elevated lead result; and one bromate contravention for which the cause was not determined.

We recognize the operational nature of water treatment and supply and that events will occur which require immediate corrective action to be taken by NI Water. What is important is that lessons are learnt and any necessary remedial action is undertaken by NI Water and is reflected in its risk assessments as part of its drinking water safety plan approach to prevent recurrence of drinking water quality events.

Overview of Consumer Complaints

NI Water provides us with data on the contacts and concerns of its consumers each year as we are interested in consumer confidence in drinking water quality.

The data we received for 2012 is presented in Figure 1.2 and shows that, as with previous years, the highest percentage of contacts and concerns (63.6%) continues to relate to the appearance of drinking water.

We have been collecting data from NI Water for several years to better understand consumers' concerns (Table 1.3 refers). The information illustrates the high percentage of consumer contacts made relating to the appearance of water, particularly, colour. Concerns about colour can arise when the water appears orange or brown due to suspended particles of iron, or black due to suspended particles of manganese. Iron and manganese may be present in the raw water passing through inadequate treatment or from corrosion of cast-iron distribution mains.

Ongoing and planned long-term mains rehabilitation programmes need to target these consumer concerns. More detail on consumer concerns is provided in the Consumer's Taps section.

Figure 1.2: Consumer Contacts and Concerns Received by NI Water in 2012

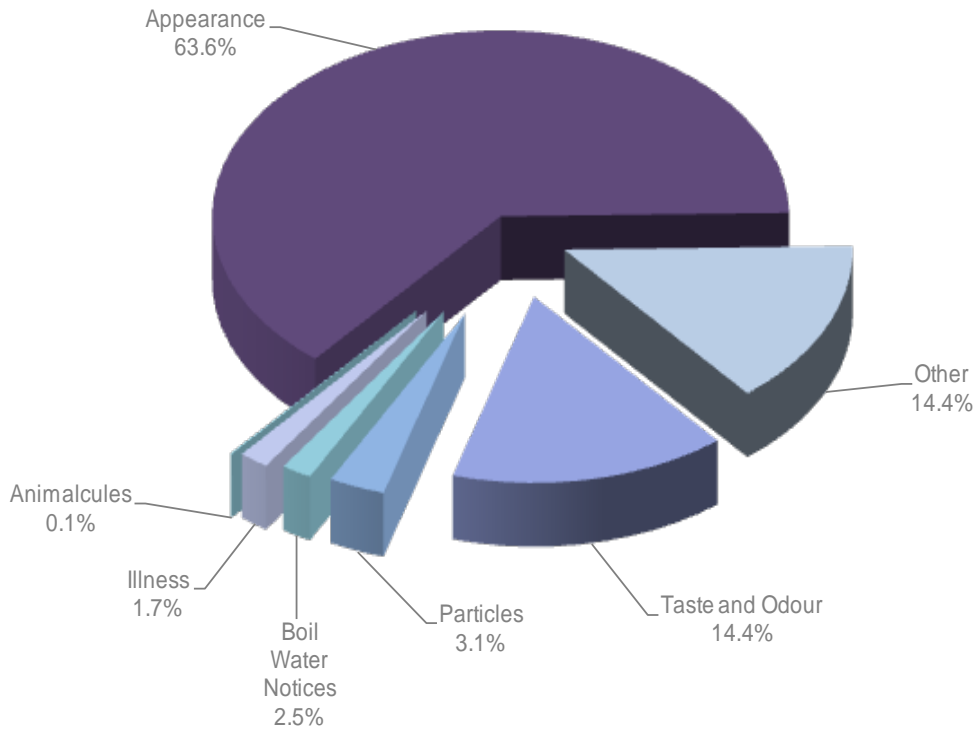


Table 1.3: Consumer Contacts Relating to Appearance, 2010 - 2012

	Overall Number of Contacts	% of all Contacts Relating to Appearance	% of Appearance Category Relating to Colour
2012	6,188	63.6	62.6
2011	6,207	59.2	63.8
2010	7,008*	67.3	63.9

**This figure does not include the additional number of consumer contacts (approx. 33,350) related to the major 'freeze/thaw' incident that occurred in December 2010/January 2011.*

The Technical Audit Process

Technical audit process is the term used to describe how we check that NI Water is complying with its statutory obligations. The audit process allows us to observe whether good practice is being followed. We operate a risk-based approach to technical audit which allows us to take into consideration factors such as water quality monitoring, events and

previous audits, and enables us to prioritize and focus the technical audit work to have the most benefit. Any corrective action that follows on from our recommendations and suggestions following the audit process is monitored by us to ensure satisfactory completion. A summary of the 2012 Technical Audit Programme is detailed in Annex 5.

Drinking Water Quality Contraventions

Where NI Water supplies water that does not meet the drinking water standards, it must investigate the cause of the problem and notify us and, where appropriate, the health authorities of its findings (see Annex 4 for further details). It is incumbent upon NI Water to promptly provide substantive details and comments in its investigation reports.

We assess each notification and determine if the failure is likely to recur. If we consider this to be the case, NI Water is required to put a programme of remedial work in place to improve drinking water quality. We may also implement the appropriate statutory mechanism (e.g. enforcement orders) to secure or facilitate compliance, where appropriate.

Risk Management

As part of its regulatory requirements, NI Water must carry out a risk assessment, commonly referred to as a drinking water safety plan (DWSP), at every treatment works, associated catchment and supply system. This is a process which is required to be kept under review in relation to NI Water’s ongoing assessment of risk.

These assessments identify and quantify the inherent risks throughout individual water supply systems and detail mitigation measures through adoption of effective controls to protect drinking water quality.

These control measures may involve actions relating to: minimizing the potential contamination of

source waters; reducing or removing contaminants through appropriate treatment processes; and measures preventing contamination within the distribution network and domestic water systems within buildings.

The risk assessment scores, which are used to categorize the individual risks are based on calculations associated with the significance of results obtained from sampling programmes, along with other factors to take account, for example, of the significance of any water quality events, or enforcement activity within the water supply area, or any other information which identifies potential or quantified risks. The risk assessment scores are then placed into risk categories from ‘Low’ to ‘Very High’. NI Water’s procedures also quantify risk through determining a graded risk to take account of risks which fall outside of the risk scoring mechanism.

NI Water uses the risk scores generated as part of its risk assessment to prioritise its investment and to feed this into its business planning cycle. Table 1.4 provides a summary of the risk categorization process as undertaken by NI Water and the relevant action level associated with each risk category.

The individual sections that follow in this report provide more detail on how the risk assessment process is undertaken in the specific parts of the water supply chain: catchment; treatment; distribution; and supply systems to the consumer.

Table 1.4: NI Water’s Risk Categorization and Risk Scoring Matrix*

	Risk Category	Risk Score	Action	Graded Risk Assessment
1	Low	1 and 2	No action required	A
2		3 to 6	Some concerns - keep under review	B
3	Medium	7 to 13	Possible capital investment	C
4	High	14 to 19	Probable action / capital investment required	D
5	Very High	20 to 25	Urgent action / capital investment required	E

*Risk Matrix from ‘NI Water Drinking Water Safety Plan – Risk Assessment Guidance’ is reproduced with kind permission from NI Water.

Drinking Water and Health Guidance

A guidance document, 'Drinking water and health: a guide for public and environmental health professionals and for those in the water industry in Northern Ireland', was produced through the collaborative working of a cross Departmental Drinking Water Liaison Group. This group has representation from the Chief Environmental Health Officers' Group; the Department of Health, Social Services and Public Safety; the Drinking Water Inspectorate; the Northern Ireland Public Health Laboratory; Northern Ireland Water; and the Public Health Agency.

The purpose of the document is to set out the roles and responsibilities of the different organizations with an involvement in the safety of drinking water. The guidance is available through the NI Water website.¹

Regulatory Processes - Enforcement Orders

Where NI Water has failed to comply with its regulatory duties, there are a range of statutory processes to ensure that compliance is achieved.

Details of our Enforcement and Prosecution Policy are available on our website.² As part of the enforcement process we may commence with the issue of a 'Consideration of Provisional Enforcement Order' (CPEO), whereby, NI Water is required to submit an Undertaking to demonstrate what steps it has taken, or is going to take, to ensure compliance with the requirements of the Regulations.

If NI Water does not comply with the requirements of an Undertaking, then we may issue a Provisional Enforcement Order (PEO), which requires NI Water to undertake certain remedial measures within a maximum 12 week timeframe. Failure to comply with a PEO would result in the issuing of an Enforcement Order.

During 2012, there were eight CPEOs and one PEO in place:

- five CPEOs completed during 2012: one relating to a breach of NI Water's requirement to schedule its samples at regular intervals; three relating to non-compliance with the regulatory standard for iron; and one for non-compliance with the regulatory standard for taste and odour;
- three CPEOs issued during 2012: the first related to non-compliance with the regulatory standard for MCPA; the second addressed significant failures for aluminium, iron, hydrogen ion, THMs and turbidity; and the third was to address significant failures for THMs.
- one PEO issued in 2012 relating to non-compliance with the regulatory standard for THMs.

For further details on these enforcement actions, refer to Annex 6.

¹www.niwater.com/drinking-water-guidance/

²www.doeni.gov.uk/niea/dwi_prosecution_policy_-_march_2012.pdf

Catchment



Image: Killylane Reservoir - NIEA

Catchment

This section of the report looks at the catchment: the start of the 'water supply chain' from which NI Water abstracts water before it is treated and distributed onwards to consumers' taps. We look at how catchments are managed as part of the drinking water safety plan approach to provide safe, clean drinking water.

In Northern Ireland, public water supplies are mainly obtained from surface water sources, with only one source, on Rathlin Island, being supplied from a borehole. Historically the nature and structure of the landscape, together with well distributed rainfall, have led to the development of upland and lowland reservoirs and direct river abstractions to meet both urban and rural centres of water demand.

Water sources contain naturally occurring organic materials as well as other potential contaminants which need to be removed by suitable water treatment processes.

Water quality can vary between sources due to factors such as, the nature and structure of the rock types, soil, vegetation, and land use. These are important factors that may have an impact on the properties of a drinking water supply, such as taste, hardness, acidity (pH), organic and mineral content, and will determine the level of treatment required within the water treatment works.

Water Abstraction

In Northern Ireland the abstraction of raw water from rivers, reservoirs and loughs is controlled by Abstraction Licensing Regulations¹ which require major water abstractors to obtain a licence from the Northern Ireland Environment Agency (NIEA). NI Water is authorised to abstract up to 1,075 Ml/d under license from NIEA² and, in 2012, water was abstracted from 34 sources across Northern Ireland.

NI Water has developed a strategic plan to ensure that appropriate resources are in place to maintain drinking water supplies for predicted usage up to the year 2035. This is detailed in the Water Resource Management Plan (WRMP)³ and takes account of population changes, housing and water usage, as well as predicted changes to our climate.

Catchment Risk Assessment

As part of managing the risk of contamination through the water supply chain from 'source to tap', NI Water is required to ensure that it has assessed all current and potential risks within the catchments and keep its drinking water safety plans (DWSPs) under review, as necessary. The DWSPs must then detail the arrangements NI Water is putting in place to mitigate these risks to protect the catchment and preserve the quality of its source waters.

In the management of the risks within these catchments, NI Water is required to undertake a monitoring programme to determine the raw water quality throughout the year. The frequency and range of parameters to be tested should be in line with the level of risk as identified within its regulatory risk assessments.

If NI Water, in undertaking its risk assessments, identifies the potential for contaminants as listed under EU priority substances⁴ being present in the raw water, then NI Water is required to monitor for these. There are minimum raw water sampling frequencies set within the Regulations for such substances, and these are based on the population served by the water treatment works.

Monitoring is also necessary for the management of NI Water's water treatment works as changes in the raw water quality can require adjustments to be made to the treatment process to ensure the ongoing provision of safe drinking water supplies. This is particularly important in relation to establishing baseline information, for example monitoring for seasonal changes in natural organic matter which can be prevalent in upland peaty surface water sources.

To protect catchments and to keep itself informed of potential contamination and associated risks, NI Water must liaise closely with other stakeholders such as the environmental regulator NIEA, the Department of Agriculture and Rural Development (DARD), and Forestry Service to ensure appropriate lines of communication are in place.

Potential Contaminants

Many factors in catchments have the potential to influence the raw water quality. In general, this is influenced by both natural and human elements.

¹www.legislation.gov.uk/nisr/2006/482/contents/made

²www.doeni.gov.uk/niea/water-home/water_resources/abstraction.htm

³www.niwater.com/managing-northern-irelands-water-resources/

⁴http://ec.europa.eu/environment/water/water-dangersub/pri_substances.htm

Important natural factors include: wildlife; climate; topography; geology; and vegetation. Human use factors include: point sources (e.g. waste water treatment discharges); and non-point sources (e.g. surface run-off).

Many sources contain significant numbers of bacteria, hence the importance of having adequate treatment and effective disinfection to make the water safe to drink. As part of the drinking water safety plan approach, drinking water sources are also risk assessed for other potential pathogens, such as *Cryptosporidium*. In some catchments the presence of undesirable biologically derived contaminants arising from aquatic micro-organisms such as algae may have the potential to cause taste and odour issues within the water leaving the water treatment works.

NI Water must also consider the impact of more sudden changes in raw water quality resulting from increased run-off from the surrounding catchment, for example heavy rainfall or snow melt. In dealing with such risks within the catchment, NI Water is required to have robust monitoring and controls in place to enable treatment processes to be adapted quickly to deal effectively with changes in raw water quality. This ability to adapt to changing water quality within the catchment provides the first barrier in the provision of safe, clean drinking water.

Pesticides

Pesticides are a group of substances that include insecticides, herbicides, fungicides and algicides that are commonly used as part of land management practices in catchments. The Regulations set standards for individual pesticides as well as a standard for the sum of all pesticides, 'the total pesticide' standard. Monitoring is required to be undertaken for those pesticides, as identified through NI Water's risk assessments, which are used on catchments and could potentially be at levels which the current treatment barriers may not be effective at reducing below the regulatory standards. Water sources may contain traces of pesticide residues as a result of agricultural use (e.g. pest control on crops) and non-agricultural use (e.g. herbicide for weed control on roads).

During 2012, 41 individual pesticides were monitored. Of the 9,465 determinations, 13 regulatory samples failed the individual pesticide standard of 0.1 µg/l and one failed the regulatory standard for Total Pesticides of 0.5 µg/l.

Ten of these were for MCPA in five separate water supply areas; one was for linuron in the Caugh Hill water supply area; one was for mecoprop in the Seagahan water supply area; and one was for metoxuron in the Clay Lake water supply area.

The number of regulatory pesticide contraventions reported has significantly increased from four in 2011 to 13 in 2012 (Figure 1.5 refers). NI Water reported that heavy rainfall events and increased pesticide usage were contributing factors in increasing the levels of pesticides being present in the raw water. These increased levels in the raw water challenged the water treatment processes at seven sites which resulted in the presence of pesticides contravening the regulatory standard. Of these sites, two (Lough Fea and Caugh Hill) did not have a specific treatment stream such as Granular Activated Carbon (GAC) to remove pesticides.

The four individual pesticides detected above the regulatory limit during 2012 have the following uses:

- **MCPA** is a herbicide widely used for controlling broad-leaved weeds in grass and cereal crops.
- **Linuron** is a herbicide, applied to soils before plants emerge and also to soils around growing crops and is used mainly to control grasses and other weeds amongst cereal crops and vegetables.
- **Mecoprop** is a selective herbicide used to control weeds amongst cereal crops and fruit trees.
- **Metoxuron** is a herbicide used for weed control mainly on carrot and parsnip crops but is no longer approved for use in the UK since December 2007.

NI Water must investigate all pesticide contraventions. This will include liaison with the NIEA's Pollution Control Team regarding pesticide usage and control within the relevant catchments. The outcomes from these investigations are then used to review the risk categorization for pesticides in NI Water's DWSPs. NI Water must, where required, identify appropriate remedial measures to be put in place to mitigate against the risk of pesticides making their way into the drinking water supply.

Table 1.5: Regulatory Pesticide Sample Failures, 2009 - 2012

Water Treatment Works		2012					2011	2010	2009
		Linuron	MCPA	Mecoprop	Metoxuron	Total Pesticides	MCPA	MCPA	MCPA
W1302	Lough Fea		1						
W1701P	Ballinrees						1		
W2509	Clay Lake		2		1				
W2514	Seagahan		2	1					
W2802	Carran Hill		3					2	
W3317	Dorisland		1			1			
W4306	Caugh Hill	1				1			
W4501	Derg		1			1		1	
W4701	Killyhevlin					1			
W4722	Belleek					1			
Totals		1	10	1	1	1	4	1	3

Catchments Identified at Risk from Pesticides

Lough Fea WTWs and Catchment

Lough Fea WTWs has no specific treatment in place for removal of pesticides. The catchment was assessed as being low risk with regard to pesticide usage for 2012 given the previous history; the failure noted in 2012 has marginally increased the risk score and initiated increased pesticide monitoring.

Clay Lake WTWs and Catchment

Clay Lake WTWs had two GAC filters in place as a barrier to pesticides at the time of the metoxuron and MCPA detections. As part of a planned works upgrade an additional GAC filter is to be installed and the two existing GAC filters are to be replenished. This work is ongoing and is due for completion in 2013. The risk assessment scores for

pesticides have increased following the contraventions reported in 2012, and remedial measures are ongoing.

Seagahan WTWs and Catchment

There are six GAC filters to remove pesticides in place at Seagahan WTWs. These filters were identified during 2011 as requiring replacement carbon. This work was not carried out by NI Water in advance of the high-risk period in Spring/Summer 2012, and, although the pesticide levels were reduced by the treatment process, over a two month period there were levels above the regulatory limit reported. The carbon has since been replaced in five of the six GAC filters. The risk assessment for pesticides within the catchment and WTWs has been reviewed with the risk category increasing from low to medium risk.

Carran Hill WTWs and Catchment

There are three GAC filters at Carran Hill WTWs for the removal of organics/pesticides, but there is a history of dumping/fly-tipping in the catchment and these pollution incidents have the potential to reduce the effectiveness of the GAC filters.

Treatment was inadequate at removing sufficient MCPA to ensure compliance with the regulatory standards, with contraventions of the pesticide standard reported from July to October 2012. The risk assessment for pesticides within the catchment and WTWs has been reviewed with the risk category increasing from low to medium risk. Further investigations and remedial measures are planned for completion during 2013, along with an enhanced monitoring programme being put in place.

Dorisland WTWs and Catchment

Dorisland WTWs does not have appropriate treatment in place for the effective removal of pesticides, and following the MCPA contravention in 2011, we issued a Consideration of Provisional Enforcement Order (CPEO) to NI Water in May 2012 (refer to Annex 6 for further details). The risk assessment process for Dorisland has identified an upward trend in the pesticide risk scores, with the latest assessment from 2012 placing pesticides within the high risk category. As a consequence of this, a Provisional Enforcement Order (PEO) issued by us in 2013 requiring NI Water to take additional remedial measures. The installation of GAC for the removal of pesticides has been identified by NI Water as an additional treatment process for this WTWs to ensure compliance.

Caugh Hill WTWs and Catchment

Caugh Hill WTWs does not have specific treatment in place for removal of pesticides as there is no pesticide history reported for this catchment. Linuron is primarily used for weed control on carrots, parsnips and also potato crops. It is undetermined how it was present in the catchment which consists of a coniferous forest within an extensive bog area, but increased herbicide run-off from the Sperrins into the catchment was indicated as a possible explanation. All linuron and other pesticide sample results prior to and following this contravention have been below the limits of detection. The risk assessment scores for pesticides have increased from low to medium following these pesticide detections. Remedial measures identified by NI Water include additional pesticide monitoring for 2013.

Derg WTWs and Catchment

Pesticides have been identified as high risk in the catchment for the Derg WTWs and as medium risk following treatment. As part of the treatment process for the removal of pesticides there are five GAC filters at the WTWs.

The filters are on a regeneration schedule, and two of them were regenerated in 2012 following MCPA contraventions in 2011. NI Water is actively engaged with stakeholders within this catchment through a pesticide working group which has a three to five year programme to look at ways of controlling pesticide usage through enhanced education and information provision. It also liaises closely with NIEA who, as part of its surface water monitoring programme, have put in place passive samplers for pesticide monitoring within the catchment.

Treatment to Remove Pesticides from Drinking Water

NI Water use GAC filters within a number of its treatment processes to reduce the levels of pesticides in drinking water below the regulatory limits. As part of its operational practices, NI Water has a programme of GAC regeneration that is based both on the use of iodine number analysis, and other analytical data to determine when a GAC filter is required to be taken out of service for carbon renewal/regeneration. The testing programme is scheduled to take place in March and September each year with the aim of ensuring that the GAC filters are operating within their design capacity, especially at periods of high risk within the catchment.

Reducing the Levels of Pesticides

There are regulations and guidance in place to ensure pesticides are used with care in the vicinity of water ways for example DARD's Code of Practice for using Plant Protection Products¹ to farmers. NI Water is working proactively by participating in workshops and in educating stakeholders within catchments on the potential for the misuse of pesticides near water ways and the subsequent impact such activities may have on drinking water quality.

During 2012 NI Water has, in conjunction with DARD, the Rivers Agency, NIEA, Ulster Farmer's Union, and the Loughs Agency, produced an advice leaflet entitled, 'Using Pesticides... Stop and Think about the water you drink' (Figure 1.4 refers).

<http://www.dardni.gov.uk/cop-plant-protection-final.pdf>

Through a number of forums the leaflet has been circulated to those who use pesticides to raise awareness of the potential negative impacts of using pesticides in the vicinity of drinking water sources.

Figure 1.4: Information Leaflet Providing Advice on the Use of Pesticides



In July 2012 new legislation came into force throughout the UK, The Plant Protection Products (Sustainable Use) Regulations 2012¹. A number of provisions under this legislation are aimed at achieving the sustainable use of pesticides, by reducing risks and impacts on human health and the environment, which includes measures on protecting water, and promotion of low pesticide usage regimes.

Through carrying out its risk assessments, NI Water continues to identify the ongoing potential risk of a number of pesticides being present at elevated levels within individual catchments, along with the risks associated with insufficient treatment being in place. The increase in detections in 2012 has increased the risk score for these individual pesticides and this has led NI Water to consider

additional remediation measures being put in place at a number of catchments and WTWs.

The level of risk identified requires NI Water to have in place, or be working towards, remedial measures to ensure levels of pesticide remain below the regulatory standard, and these can include a combination of:

- measures to influence the usage/application and disposal of MCPA within the catchment (e.g. land use management, liaison with stakeholders);
- balancing flows and abstraction points to reduce the risks of increased MCPA levels during periods of high risk (e.g. following heavy rainfall);
- maintaining and optimizing its treatment for removal of pesticides (e.g. GAC); and
- undertaking feasibility studies of the treatment options available for the reduction of pesticide levels at high risk catchments and WTWs.

Drinking Water Protected Areas (DWPAs)

Surface waters which are abstracted for the production of drinking water for both public and private drinking water supplies are required to be identified and mapped, as Drinking Water Protected Areas (DWPAs), within NIEA's river basin management plans². Under Article 8 of the Water Framework Directive (WFD), there is a requirement to put in place an appropriate sampling programme to monitor substances discharged within DWPAs that may cause deterioration in the status of the water body.

As part of the WFD requirements, NIEA has identified three river basin management plans which cover Northern Ireland: the North Eastern; the North Western; and the Neagh Bann. These plans detail the water environment within each area. They also provide information on the measures required to be put in place to monitor and improve the status of the water environment. The designation and monitoring of water quality within DWPAs is an integral part of the River Basin Management Planning Cycle which ensures appropriate measures are put in place and monitored. There are nine surface water bodies and 48 river systems designated as DWPAs in Northern Ireland. NIEA may designate safeguard zones within a DWPA as part of its cycle of monitoring and review, to address specific identified contamination risks.

¹<http://www.legislation.gov.uk/uksi/2012/1657/made>
²<http://www.doeni.gov.uk/niea/water/wfd.htm>

NI Water has a regulatory requirement to have a DWSP in place for each water supply system and these must be reviewed as part of the cycle of monitoring data, and reviewing the outcomes from interventions in the catchment. In relation to the water sources, it is important that NI Water's drinking water safety plans, associated catchment management plans, and raw water sampling programmes are closely aligned with the requirements in the WFD to have clearly defined DWSPAs for all of NI Water's drinking water abstraction. The relationship and transfer of information between NIEA and NI Water is summarised within Figure 1.5.

Sustainable Catchment Management

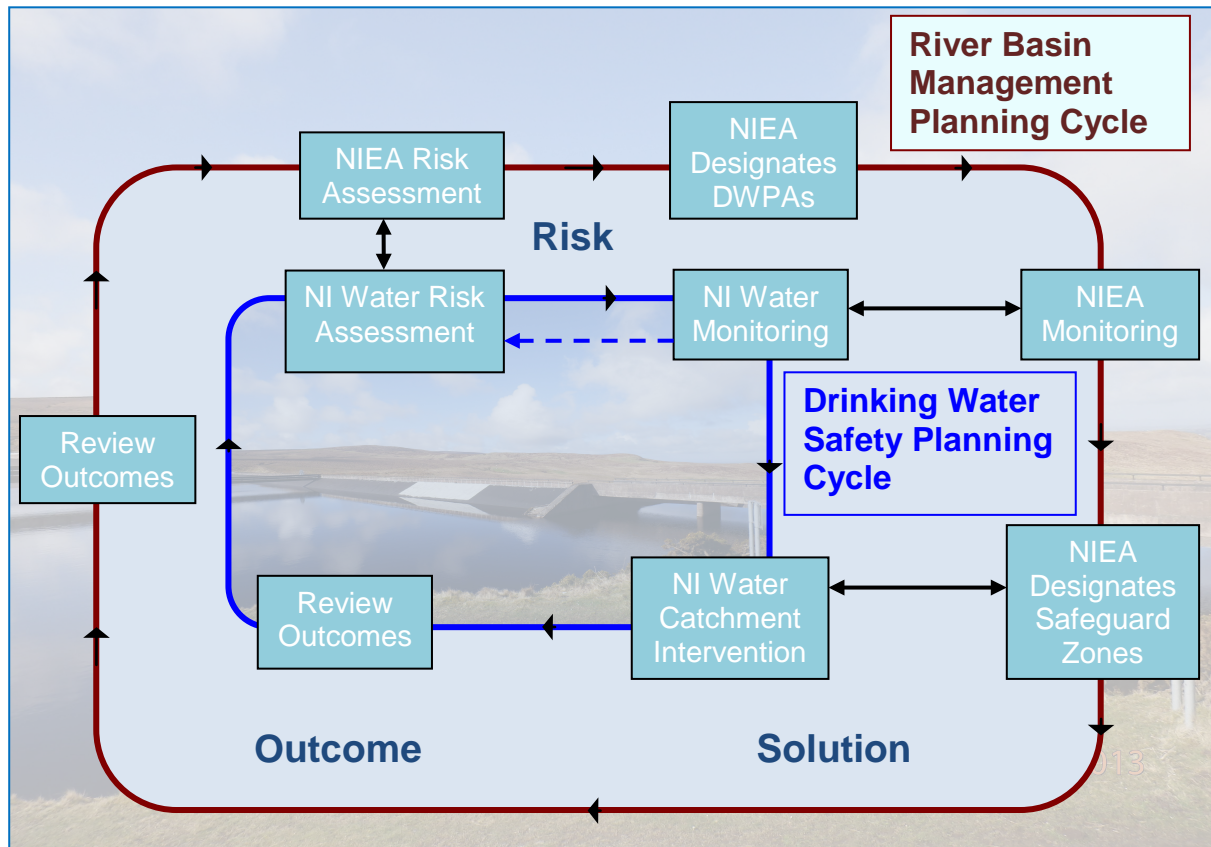
In managing its catchments and water treatment processes, NI Water has been adopting the principles of Sustainable Catchment Management Planning (SCaMP), within a number of its catchments. During 2012 it has continued its involvement with a number of organizations, including The Royal Society for the Protection of

Birds (RSPB), The Mourne Heritage Trust, The Woodlands Trust, and The Ulster Wildlife Trust, on a number of projects. In 2012, these projects covered the catchments for Dungonnell WTWs, Killylane WTWs and Moyola WTWs.

This type of work looks at sustainable solutions as a way to improve land management practices within catchments to improve the quality of raw water being used for abstraction purposes. In particular a tree planting project was undertaken within the catchment for Killylane WTWs, and a programme of work relating to wildfires prevention was undertaken in the Mournes. Such improvements should provide more cost-effective treatment options, with potential cost savings and environmental benefits associated with a reduction in energy and chemical usage in water treatment.

NI Water is continuing to work alongside other key stakeholders in identifying SCaMP solutions and additional pilot projects are planned.

Figure 1.5: Broad Relationships between the River Basin Management Planning and Drinking Water Safety Plans*



*Adapted from Figure 2 within 'The Contribution of the Water Supply (Water Quality) Regulations to the implementation of the Water Framework Directive in England & Wales' published June 2012.

Water Treatment



Image: Killylane WTWs - NIEA

Water Treatment

After source protection, water treatment is the next control measure to remove contaminants. In this section of the report we have provided details of the key parameters such as trihalomethanes, turbidity and aluminium, which are used to monitor the effectiveness of the treatment processes.

NI Water must ensure that the treatment processes it has in place at each water treatment works (WTWs) are robust and designed to deal with the range of raw water quality which could occur within the water source.

In Northern Ireland, surface waters provide the main source for drinking water supplies. Water treatment processes are used as barriers to control the risk of contaminants entering water supplies.

Water treatment processes include the physical removal of potential contaminants by using chemical coagulation/flocculation, sedimentation or flotation, and filtration to prepare the water for disinfection. The primary aim of water treatment is to eliminate any pathogenic micro-organisms and provide a safe, clean drinking water supply.

The drinking water safety plan (DWSP) approach requires an assessment to be made between the source water and the type of water treatment in place at each water treatment works. This assessment should identify and quantify the risks

within the source water and ensure that appropriate remediation measures are in place to reduce these risks. These measures involve suitable water treatment processes being in place to deal with the specific risks within each source. They should take into account the wide variations in the quality of the source water caused by seasonal change and adverse weather. The risk assessment should also take account of the risks which may be encountered within the treatment processes and proper controls should be in place to mitigate these.

One 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 and entering distribution. In Table 1.6, groupings of two sets of parameters are used to describe the effectiveness of water treatment processes: process control parameters; and disinfection parameters.

Process Control Parameters

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

In 2012, results from the regulatory monitoring programme shown in Table 1.6 report non-compliance occurred for three of the process control parameters, notably trihalomethanes (THMs) and aluminium.

Table 1.6: Water Quality at Water Treatment Works, 2012

Parameters	Place of Sampling	Total No. of Tests in 2012	No. of Tests not Meeting the Standards in 2012	% of Tests Meeting the Standards	
				2012	2011
Process Control Parameters					
Trihalomethanes	WSZ	392	10	97.45	99.26
Aluminium	WSZ	1,710	8	99.53	98.85
Bromate	WSZ	392	1	99.74	99.75
Disinfection Parameters					
Coliform bacteria	WTWs	6,617	3	99.95	100
<i>E. coli</i>	WTWs	6,617	0	100	100
Turbidity	WTWs	6,617	11	99.83	99.60
Number of Water Supply Zones (WSZs) - 50			Number of Water Treatment Works (WTWs) - 25		

The implementation of good operational practice at water treatment works during both routine operation and when normal operating circumstances do not prevail, is critical in ensuring a continuation in the supply of high quality drinking water and improvement in compliance with the process control standards. It is important that there is appropriate monitoring and control of the treatment processes in place in order to deal effectively with changes in the quality of the water being abstracted from within the catchment.

The implementation of DWSPs highlights that good operational monitoring is fundamental to assess whether the control measures in a treatment works are operating properly. NI Water monitors critical parameters at different stages of the water treatment process to ensure process control is effective.

Trihalomethanes (THMs)

THMs are disinfection by-products that arise when chlorine, which is used to disinfect the water and make it microbiologically safe to drink, is added to water containing naturally occurring organic substances.

In 2012, ten samples contravened the standard (100µg/l), a significant increase on 2011. NI Water must fully consider the formation of THMs and other

disinfection by-products as part of its overall disinfection policy. Where possible, without compromising disinfection, NI Water must continue to keep all disinfection by-products, including THMs, to as low a level as possible. Figure 1.6 displays the trend in THM compliance over the last four years.

Aluminium

We note that aluminium compliance, which is measured at the consumers' taps, significantly increased in 2012: there were eight contraventions compared with the 20 that occurred in 2011. NI Water was unable to determine the cause for four of the contraventions and attributed the other four to disturbance of mains deposits. However, problems with the treatment processes are not always discovered through the compliance sampling programme.

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 earlier detections limit the impact of a water quality event on the public drinking water supply. Figure 1.7 demonstrates the trend in aluminium compliance at consumers' taps over the last four years.

Figure 1.6: Percentage of Tests Meeting the Regulatory Standard for THMs at Consumers' Taps, 2009 - 2012

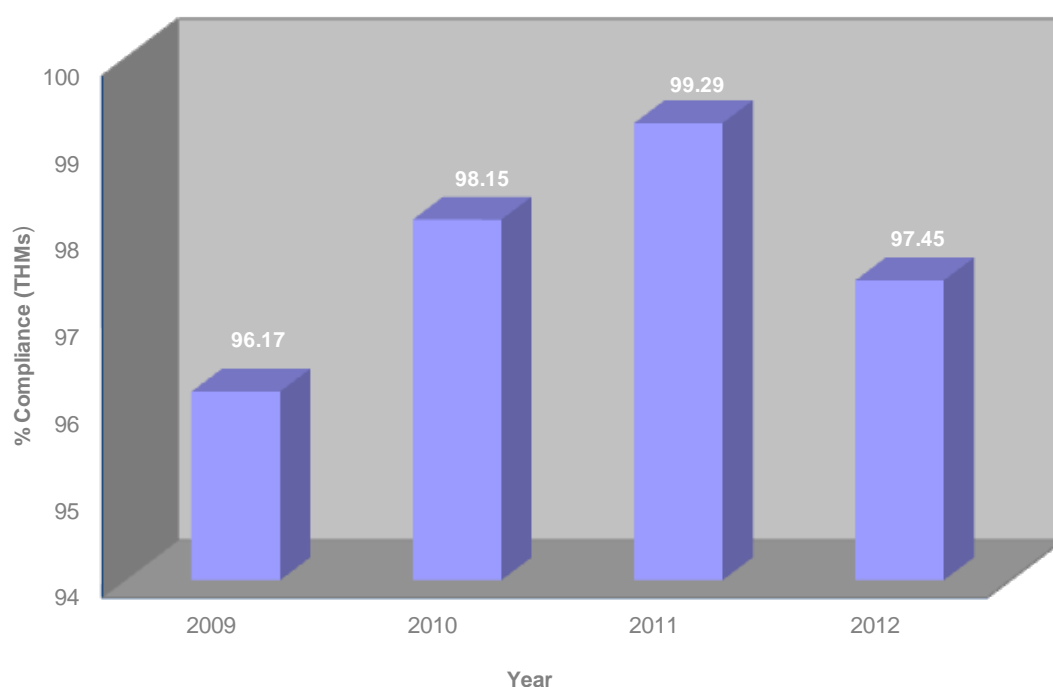
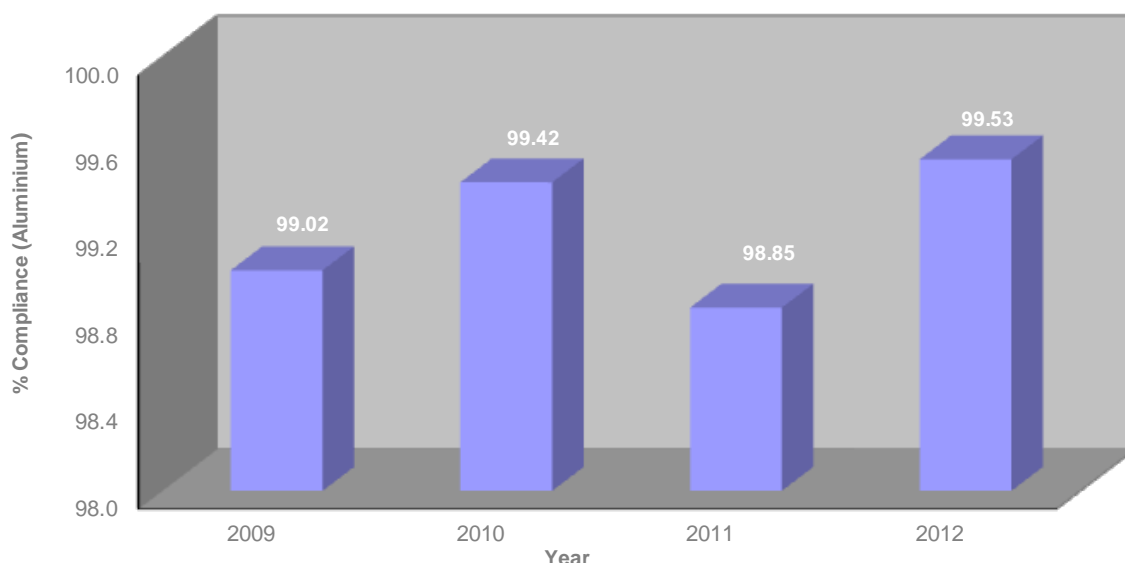


Figure 1.7: Percentage of Tests Meeting the Regulatory Standard for Aluminium at Consumers' Taps, 2009 - 2012



Disinfection Parameters

The disinfection parameters (Table 1.6 refers) look at the effectiveness of disinfection and pathogen removal. To safeguard drinking water from the risk of microbiological organisms being present, effective disinfection is fundamental to treatment works' operation. NI Water must achieve its primary duty of disinfecting drinking water before it is supplied to consumers.

E. coli and Coliform Bacteria

Testing for *E. coli* and coliform bacteria at water treatment works provides assurance that water is being treated adequately to remove bacterial and viral pathogens.

In 2012, NI Water reported full compliance for *E. coli* and 99.95% compliance for coliform bacteria at water treatment works (coliform bacteria were detected at three of the 25 water treatment works that supply water in Northern Ireland).

Turbidity

The regulatory standard for turbidity leaving a water treatment works is 1NTU. The finely suspended particles which cause turbidity in water must be removed by effective water treatment in preparation for the disinfection process.

Where treatment is inadequate or there is disturbance during onward transmission and storage, these particles may increase turbidity levels in the water going into supply.

As well as being a regulatory requirement, it is also considered good operational practice to ensure that a turbidity value below 1NTU is achieved post treatment to ensure effective disinfection.

There was an increase in compliance with the turbidity standard in 2012 (99.83%; 99.60% in 2011). Turbidity contraventions occurred at seven (28%) water treatment works in 2012. Of the 6,617 samples taken for turbidity analysis from water treatment works, 11 (0.17%) failed to meet the standard.

Of these failures: three were due to unrepresentative sampling; two were related to treatment problems; one was caused by ingress to a borehole; one was caused by disturbance of a tank; and the causes for the other four could not be determined following investigation by NI Water. Figure 1.8 shows on-line turbidity monitors at a water treatment works.

Figure 1.8: On-line Turbidity Monitors



Through the ongoing review and implementation of its disinfection policy, NI Water should continue to ensure that the high level of compliance noted for the disinfection parameters is maintained and improved where possible. During 2012, NI Water reviewed its disinfection policy and produced individual disinfection statements for each WTWs. These statements should inform, and be linked into, NI Water's risk-based approach within its DWSPs and to its regulation 28 risk assessment reports. This will provide an assurance that the disinfection process is appropriately managed and, where it is not, risk factors will be identified through individual DWSPs and the necessary mitigation measures put in place.

Indicator Parameters

Clostridium perfringens

The Regulations require monitoring for *Clostridium perfringens* as an indicator parameter, and it can be used in association with other parameters to assess the efficiency of water treatment processes. This organism is a spore-forming bacterium that is exceptionally resistant to unfavourable conditions in the water environment: extremes of temperature and pH; and disinfection processes such as chlorination and ultraviolet light.

In 2012, 2,731 tests were carried out for *Clostridium perfringens* on samples collected from water treatment works. Seven (0.26%) contravened the standard at five water treatment works (there were two occurrences each at Drumaroad and Castor Bay WTWs). All seven were notified by NI Water as water quality events. Investigations by NI Water were unable to identify the cause of the contraventions. There were no specific issues identified with the water treatment processes or subsequent analysis at the times of the contraventions and all follow-up samples taken in relation to the contraventions were satisfactory.

Significant Events

There were 28 significant events at 16 (64%) water treatment works in 2012: Altnahinch; Ballinrees; Carran Hill; Castor Bay; Caugh Hill; Clay Lake; Derg; Dorisland; Dungonnell; Glenhordial; Killyhevlin; Killylane; Lough Bradan; Lough Fea; Rathlin; and Seagahan.

The majority of these were related to difficulties with the performance of the coagulation processes, or deficiencies at the water treatment works which led to: aluminium; iron; manganese; pesticide; THMs; and turbidity contraventions.

The other event causes were attributed to: the malfunction of chlorine dosing equipment leading to a disinfection failure at one site; *Cryptosporidium oocysts* detected at another site; and *Clostridium perfringens* being detected at a third site (for which no reason was identified).

Details of all water quality events in 2012 are provided in Annex 4.

Drinking Water Quality Improvements

In order to protect, maintain and improve drinking water supplies, NI Water continues to complete infrastructure, treatment and distribution projects. These programmes of work may be driven by remedial actions relating to, Enforcement Orders, Notices and other regulatory processes.

Enforcement Action

During 2012, NI Water completed the remedial actions associated with the Consideration of a Provisional Enforcement Order (CPEO) for taste and odour contraventions at Killyhevlin WTWs. We also issued three CPEO's and one Provisional Enforcement Order (PEO) to address non-compliances in 2012.

The following CPEO's were required to improve the treatment processes at:

- Dorisland WTWs to address contraventions of the standard for the pesticide, MCPA;
- Caugh Hill WTWs to address contraventions of the standards for aluminium, iron, hydrogen ion, THMs, and turbidity; and
- Lough Bradan WTWs to address contraventions of the standard for THMs.

A PEO was required to have an auto-coagulation unit installed at Caugh Hill WTWs to address ongoing THM contraventions.

Further details on our enforcement action are provided within Annex 6.

Water Distribution Systems



Water Distribution Systems

In this section of the report we provide details of the quality of treated water which is supplied through the distribution system. The protection of the distribution system, which is an extensive network of storage reservoirs and pipes, is essential for providing safe drinking water.

The water distribution system in Northern Ireland is an extensive and complex network, consisting of 326 service reservoirs and approximately 26,500 kilometres of mains pipe, which facilitate the delivery of treated water from the water treatment works to the point of supply 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.

The water quality in the distribution system depends on the structural integrity of the distribution system, the materials it comes into contact with and the nature of the water itself. For example, service reservoirs whose structural integrity has not been maintained are at risk from ingress of contaminants and old cast-iron pipes which have corroded over time may result in sediment being deposited under low flow conditions. An increase in flow rate or operational activity can cause disturbance to the mains network, which may result in particles being re-suspended and transported through the system, resulting in discoloured water at the tap.

Monitoring the quality of the water using indicator parameters is important for identifying potential deficiencies with the integrity of the service reservoirs, and within the distribution system. In Table 1.8, two measures are used which describe the water quality within a distribution system: reservoir integrity, and distribution networks. The selection of these distribution parameters is to reflect the age, condition and maintenance status both of the reservoirs and the pipes (water mains) which comprise the distribution networks.

Microbiological Quality

Water entering the distribution systems must be microbiologically safe. The distribution system itself must have sufficient controls in place to prevent contamination of drinking water supplies, as the water is delivered to the user.

Service reservoir integrity should be maintained at all times. The prevention of stagnation throughout the distribution system is also a way of controlling potential contamination. A disinfectant residual is maintained throughout the distribution network to provide ongoing protection against recontamination and limit the potential for microbial growth problems. NI Water carries out additional disinfection (often referred to as 'secondary disinfection') through chlorine boosting at selected service reservoirs, particularly those with long distribution networks. This additional disinfection is necessary to maintain the good water quality achieved at the water treatment works, but NI Water must ensure its disinfection policy limits the formation of disinfection by-products e.g. THMs, without compromising the bacteriological quality of the water.

It is imperative that this 'secondary disinfection' does not disguise a more fundamental problem such as compromised reservoir integrity because of the structural condition of the reservoir or the hydraulic flow of water through the system. NI Water must review its control measures to ensure that an adequate disinfection residual is effectively maintained throughout the distribution network. NI Water has incorporated this approach within their drinking water safety plans and following the introduction of disinfection statements for individual WTWs in 2012 they are now working on extending this approach to include statements which will cover onward disinfection within individual distribution networks.

E. coli at Service Reservoirs

In 2012 a total of 16,690 samples for *E. coli* testing were collected at service reservoirs across Northern Ireland. *E. coli* was detected in seven of these samples at seven different service reservoirs. On detecting *E. coli*, NI Water must act promptly to protect public health and ensure that the water being received by consumers is safe. Investigations are carried out to identify the cause of all contraventions.

One of the *E. coli* contraventions was caused by inadequate disinfection. Three of the contraventions were attributed to contamination at the time of sampling and it was recommended that new sampling boxes were fitted. At the time of writing, two of the sample boxes have been replaced. After investigation, NI Water was unable to determine the reason for the other three contraventions.

Table 1.8: Water Quality Indicators within the Distribution System

Parameters	Place of Sampling	No. of Tests in 2012	No. of Tests not Meeting the Standards in 2012	% of Tests Meeting the Standards in 2012	% of Tests Meeting the Standards in 2011
Reservoir Integrity					
Coliform bacteria	SR	16,690	27	99.84	99.87
<i>E. coli</i>	SR	16,690	7	99.96	99.98
Distribution Networks					
Turbidity	WSZ	1,710	6	99.65	99.94
Iron	WSZ	1,710	47	97.25	98.27
Manganese	WSZ	1,710	3	99.82	99.88

Coliform Bacteria at Service Reservoirs

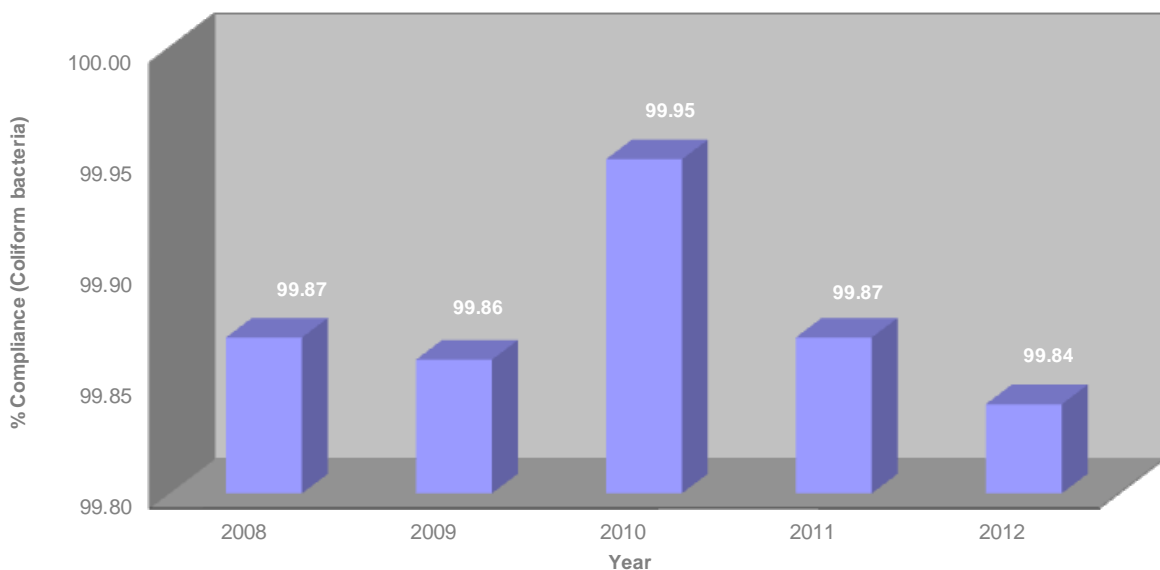
The Regulations require that at least 95% of samples collected weekly from each service reservoir throughout the year are free from all coliform bacteria. Of the 326 service reservoirs sampled in 2012, one (Ballygomartin SR) failed to meet this regulatory standard. However, coliform bacteria were detected on 27 occasions at 24 (7.4%) service reservoirs. This is an increase on 2011, when coliform bacteria were detected on 22 occasions at 20 (6.1%) service reservoirs (see Figure 1.8).

Of the 27 occasions coliform bacteria were detected in 2012, *E. coli* was also detected on seven occasions (see previous section on *E. coli*).

Of the other 20 samples which failed to meet the coliform bacteria standard, six were related to inadequate disinfection; no cause could be determined on eight occasions; and six contraventions were attributed to unrepresentative sampling. NI Water must have robust control measures in place to ensure the integrity of sample collection.

An event was reported for Bonneytober Service Reservoir following the detection of coliform bacteria and associated follow-up sample contraventions in the distribution system. Following this event, changes were made to the secondary disinfection at an upstream reservoir.

Figure 1.8: Percentage Compliance of Coliform Bacteria at Service Reservoirs 2008 - 2012



Reservoir Integrity

We assess reservoir integrity based on the microbiological quality of the water. The detection of microbial pathogens may suggest that the structure of the reservoir has been breached and these instances should be investigated further by NI Water. There was a further deterioration in the bacteriological quality of water from service reservoirs in 2012 (detailed above). NI Water must have a programme in place to ensure all service reservoirs are cleaned and checked for integrity on a regular basis. NI Water must also have a disinfection policy in place that ensures a residual disinfection is maintained throughout the distribution system for the protection of human health.

Distribution Networks

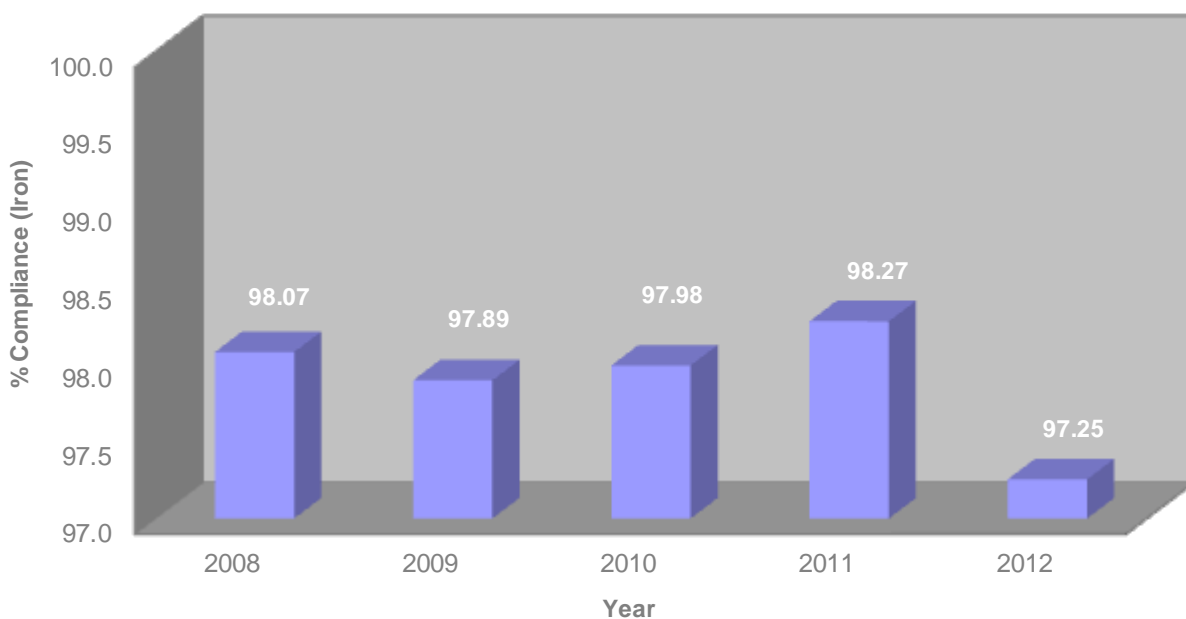
Iron in the Distribution System

In 2012 a total of 1,710 samples taken from consumers' taps were tested for iron. Of these, 47 (2.75%) contravened the iron standard. This is a significant increase on 2011 when 1.73% contravened the standard (see Figure 1.9). NI Water has an extensive network of iron water mains across Northern Ireland.

Water quality issues frequently arise in the network due to problems caused by the corrosion of older iron water mains. There is an ongoing proactive programme of flushing and cleaning of the distribution system to minimize the problem. In addition, NI Water has an ongoing Water Mains Rehabilitation Programme in which water supply zones that experience water quality and other supply problems are subjected to detailed studies to enable prioritized corrective action to be taken to improve the water quality being supplied to consumers.

NI Water uses a distribution maintenance index referred to as the Operational Performance Index (OPI [TIM]) to assist in assessing the overall water quality of its distribution system. It is calculated based on samples taken at consumers' taps for three parameters: turbidity; iron; and manganese. These parameters are used to reflect the causes of discoloured water in distribution systems. As with previous years iron continues to be the parameter which contributes the highest non-compliance in the OPI (TIM) calculation. For 2012, the OPI (TIM) was 98.86%, compared to 99.31% in 2011. This was mainly due to the significant decrease noted in the overall percentage regulatory compliance for the iron parameter in 2012, as detailed in Table 1.8.

Figure 1.9: Percentage Compliance of Iron in Distribution 2008 - 2012



Drinking Water Quality Improvements

Mains Rehabilitation Programme

NI Water’s mains rehabilitation programme restores or replaces the existing water mains pipe work. The criteria by which pipe work is prioritized for replacement under this programme takes into consideration many factors, including water quality, water pressure, leakage, bursts, consumer complaints and sufficiency of supply. 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 or manganese.

Over many years there will be an accumulation of iron and manganese within the distribution network either through ineffective removal of coagulation particles from the water treatment process or through corrosion of older water mains. These need to be controlled as part of ongoing distribution maintenance and NI Water operates a targeted programme of scouring and cleaning of water mains and service reservoirs to minimize water quality problems associated with these accumulations.

Discoloration of tap water often prompts consumers to contact NI Water. The overall number of consumers’ complaints and concerns reported in 2012 was 6,188 (6,207 in 2,011). Of these, 63% of the total contacts were related to appearance, of which 64% (2,344) were regarding discoloured water.

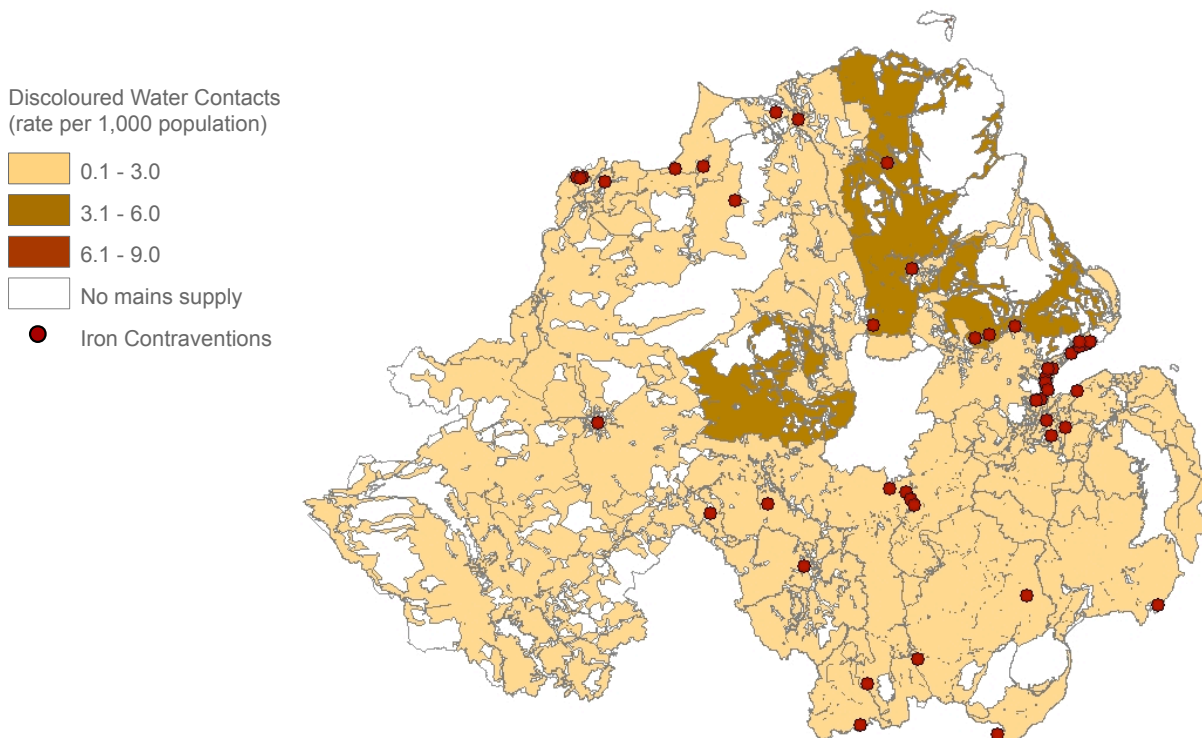
Figure 1.10 graphically illustrates the rate of consumer contacts per 1,000 population in water supply zones throughout Northern Ireland for 2012. Also included on the map is a plot of regulatory contraventions of the iron standard (>200µg/l). Mains rehabilitation work has been ongoing throughout Northern Ireland and consumer contacts relating to discoloured water can be triggered before, during and for short periods after the completion of the work.

Enforcement Action

In order to protect, maintain and improve drinking water supplies, NI Water continues to complete infrastructure, treatment and distribution projects. These programmes of work although mainly driven by NI Water’s assessment of need may also be driven by remedial actions relating to, Enforcement Orders, Notices and other regulatory processes.

During 2012, NI Water completed the remedial actions associated with three Consideration of Provisional Enforcement Orders (CPEOs) for iron contraventions within the distribution systems serving the Dorisland, Altmore, and Altnahinch water supply area (refer to Annex 6 for more detail). There were no enforcements initiated in 2012 relating to the distribution system.

Figure 1.10: Consumer Contacts per 1,000 Population Reporting Discoloured Water in 2012



Consumers' Taps



Consumers' Taps

In this part of the report we look at the quality of water at the end of the water supply chain, where after it has been treated, it is distributed and made available at consumers' taps.

Once water has passed through NI Water's distribution network, it will then come into contact with water systems within buildings. These systems can be those in individual domestic properties or in larger commercial or public premises. In the development of its drinking water safety plans (DWSPs), NI Water must take account of the potential for the water it supplies to become contaminated by these systems through, for example, the condition and maintenance of the pipe work or storage facilities. NI Water's sampling programme within water supply zones is randomly generated to take samples from consumers' properties. NI Water must keep a record of the type of property the sample was taken from (e.g. a residential property or a public building).

The Regulations require that sampling must take place at consumers' drinking water taps. Some of the parameters that are monitored for at consumers' taps may not be totally within NI Water's control. Certain parameters such as lead, copper, and nickel are influenced by the nature and condition of water distribution systems in buildings.

In instances where water quality issues have been identified as being caused by the distribution system within a building, NI Water is required to investigate to determine the cause. Following the introduction in 2010 of new Domestic Distribution Systems Regulations¹, where this water quality issue is within a building where water is available to the public (such as a school, hospital or restaurant), we have a responsibility to ensure that the necessary remedial action is taken by the owners to ensure that the water supply is safe and clean.

Drinking Water Quality

To assess the overall quality of water that is being supplied to consumers' we look at the results of samples taken by NI Water from consumers' taps. In Table 1.10 we record the percentage compliance for 39 Schedule 1 (mandatory) parameters and three key Schedule 2 (indicator) parameters. For 2012, overall drinking water quality at consumers' taps is 99.62%; a significantly reduced level of compliance when compared to the 99.74% reported

in 2011. While high levels of compliance have been achieved for many parameters, there have been significant increases in the numbers of coliform bacteria, iron, THM, pesticide and turbidity tests not complying with the standards.

Another measure referred to as percentage 'mean zonal compliance' (% MZC) is used as an indicator index to assess water quality at consumers' taps as part of monitoring NI Water's operational performance. This is not a regulatory requirement; it is a calculation using 39 parameters from the regulatory sampling programme, and it also makes a statistical adjustment to take into account the number of samples in each specific water supply zone. The overall % MZC for 2012 was 99.80%, a reduced level compared to 99.83% in 2011.

It is important for the reader to note that, based on what indicator is being used, there will be different values reported to reflect water quality at the consumer's tap. Both measures used to assess water quality at consumers' taps show a reduced level of compliance in 2012 when compared to 2011.

Chemical/Physical Quality

Iron

The regulatory standard for iron has been set for aesthetic reasons because levels persistently above the standard can give rise to discoloured water. The presence of excessive iron may make the appearance and taste of the water unacceptable to consumers. There are various reasons why iron might be present in the water: it may be present in the raw water; iron compounds may be added as part of water treatment; or it can be released as a consequence of the corrosion of iron water mains.

In 2012, iron was the parameter for which there was the greatest number of tests failing to comply with the regulatory standard. Of the 1,710 samples taken, 47 (2.75%) failed to meet the 200 µg/l standard. This is a significant increase on 2011 when 1.73% contravened the standard (see Distribution Systems section for more details). These contraventions were mainly due to the condition of the distribution network.

¹<http://www.legislation.gov.uk/uk/si/2010/157/contents/made>

Table 1.10: Overall Drinking Water Quality at Consumers' Taps, 2012

	Number of Samples	Number of Samples not Meeting the Standards	% Compliance
Schedule 1 Parameters			
Iron	1,710	47	97.25
Total trihalomethanes	392	10	97.45
Lead	392	2	99.49
Aluminium	1,710	8	99.53
Pesticides - total substances	231	1	99.57
Turbidity	1,710	6	99.65
Bromate	392	1	99.74
Manganese	1,710	3	99.82
Odour	1,711	3	99.82
Other pesticides	8,545	13	99.85
<i>E. coli</i>	4,704	6	99.87
Taste	1,710	2	99.88
<i>Enterococci</i>	392	0	100
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
Cadmium	392	0	100
Chromium	392	0	100
Colour	1,710	0	100
Copper	392	0	100
Mercury	392	0	100
Nickel	392	0	100
Nitrate	392	0	100
Nitrite	392	0	100
Nitrate/Nitrite formula	392	0	100
Selenium	392	0	100
Sodium	392	0	100
PAH - sum of four substances	392	0	100
Tetrachloroethene/Trichloroethene - sum	392	0	100
Tetrachloromethane	392	0	100
Cyanide	231	0	100
Fluoride	232	0	100
Aldrin	230	0	100
Dieldrin	230	0	100
Heptachlor	230	0	100
Heptachlor epoxide	230	0	100
Total (Schedule 1)	35,850	102	99.72
Key Indicator parameters			
Coliform bacteria	4,704	59	98.75
<i>Clostridium perfringens</i>	2,731	7	99.74
Hydrogen ion	1,710	1	99.94
Total (Key Indicator Parameters)	9,145	67	99.27
Overall Drinking Water Quality at Consumers' taps	44,995	169	99.62

The Undertakings for three Consideration of Provisional Enforcement Orders (CPEOs) in the Dorisland Carrick/Whiteabbey, Altnahinch Bushmills, and Altmore Cabragh Water Supply Zones were completed during 2012 (Annex 6 provides more detail). These contraventions were mainly due to the condition of the distribution network. The Undertakings for three Consideration of Provisional Enforcement Orders (CPEOs) in the Dorisland Carrick/Whiteabbey, Altnahinch Bushmills, and Altmore Cabragh Water Supply Zones were completed during 2012 (Annex 6 provides more detail).

Trihalomethanes

Trihalomethanes (THMs) arise when chlorine, which is used to disinfect the water and make it microbiologically safe to drink, is added to water containing naturally occurring organic substances. Drinking water in Northern Ireland is predominantly obtained from surface waters, which contain naturally occurring organic materials. The leaching of this organic content into water supplies is affected by seasonal variations. Water treatment is necessary to remove the organic material prior to disinfection, and optimization of these processes minimizes the production of THMs. Water treatment processes must be robust enough to remove the organic matter which may result from any changes in the raw water quality.

NI Water must fully consider the formation of THMs and other disinfection by-products (DBPs) as part of its overall disinfection policy. Where possible, without compromising disinfection, it has a regulatory responsibility to maintain disinfection processes so as to keep the presence of disinfection by-products, including THMs, as low as possible.

Despite the significant investment to upgrade and enhance many of NI Water's treatment works (WTWs), there has been a significant decrease in THM compliance (97.45% in 2012 compared to 99.26% in 2011) for our public supplies. Of the 392 tests carried out, ten (2.55%) exceeded the regulatory standard of 100µg/l. Most of these contraventions occurred in the Caugh Hill and Lough Bradan water supply areas.

A CPEO was issued in December 2012 due to contraventions of the THM standard in water supplied from Lough Bradan WTWs. One Provisional Enforcement Order (PEO) was also issued for Caugh Hill WTWs during 2012 due to delays in completing work relating to NI Water's Undertaking to install the necessary treatment controls at this works.

To further evaluate how NI Water is meeting its regulatory requirement to keep the disinfection by-products as low as possible through controlling THM formation, we report that in 2012 the average concentration of THMs was 52.3µg/l with 60% of zones identified where the annual average exceeds 50µg/l (50% of the standard (Figure 1.11 refers). This is a significant increase compared to 2011, where 16 zones (30%) had an annual average above 50µg/l. We will continue to use this annual average value of 50µg/l to assess how NI Water is controlling the level of these disinfection by-products.

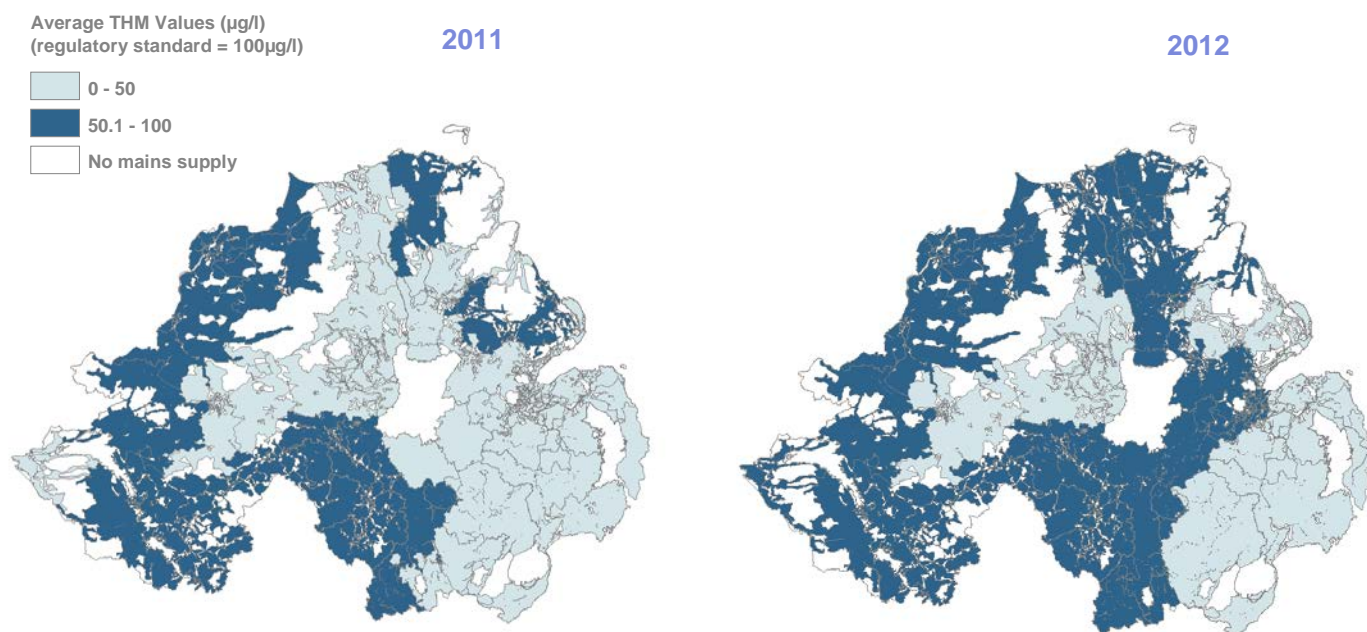
NI Water is required to have appropriate control measures in place to ensure that in the design, operation and maintenance of its disinfection processes the formation of DBPs are minimized. In doing so it must continue to assess the performance of its water treatment works and the quality of the water in the associated distribution systems as part of its ongoing work to review and update its risk assessments using the drinking water safety plan approach. During 2012, NI Water reviewed its disinfection policy and produced individual disinfection statements for each WTWs and is now working towards a similar approach being adopted within distribution systems.

Lead

The regulatory requirements are set as an interim lead standard of 25µg/l which was to be met by 25 December 2003, with a final standard of 10µg/l to be met by 25 December 2013.

Meeting the lead standard is a complex matter because although some lead pipes are owned by NI Water, most belong to consumers, i.e. building owners.

Figure 1.11: Average THM Values in Water Supply Zones across Northern Ireland in 2011 and 2012



Many older properties still have service pipes and internal plumbing, wholly or partly, comprised of lead (the use of lead pipes has been banned since the early seventies).

Some lead in drinking water may be due to the use of lead solder on copper pipes not owned by NI Water (the use of lead solder on copper pipes has been banned since the eighties). Whether or not the lead standard is exceeded at a particular tap depends on a number of factors, an important one being the plumbosolvency of the water (the tendency for lead to dissolve in water).

In 2012, of the 392 tests carried out for lead, two (0.51%) contravened the standard. These contraventions were most likely due to internal lead piping or service pipes. When a sample has contravened the standard and investigations show the property's service pipe contains lead, NI Water notifies the consumer, offering advice on what action they may take, and also notifies the local Environmental Health Officer. The responsibility and cost for replacing lead pipes within the owner's building is not a drinking water quality regulatory requirement: rather, it is a choice that the owner has to make.

Improving Compliance to meet the Final Lead Standard

The Regulations require NI Water to carry out a programme of measures (water treatment) to reduce the tendency of water supplies to pick up lead from pipes and fittings. A plumbosolvency strategy to deliver improved compliance for the interim lead standard of $25\mu\text{g/l}$ introduced orthophosphate treatment at all the major water treatment works and this has been ongoing since 2004. Through the use of treatment and lead pipe replacement, the strategy aims to:

- optimize orthophosphate treatment throughout distribution networks to achieve compliance with the $10\mu\text{g/l}$ lead standard by December 2013;
- continue opportunistic replacement of lead service pipes;
- replace lead pipe work at the request of the consumer or due to a regulatory requirement; and
- replace lead pipe work as part of the mains rehabilitation programme.

Looking at the overall trend in lead compliance, it is encouraging to see the overall improvement in compliance with the interim $25\mu\text{g/l}$ standard since 2007 (Figure 1.12 refers).

Figure 1.12: Percentage of Tests Meeting the Interim and Final Standards for Lead, 2007 - 2012

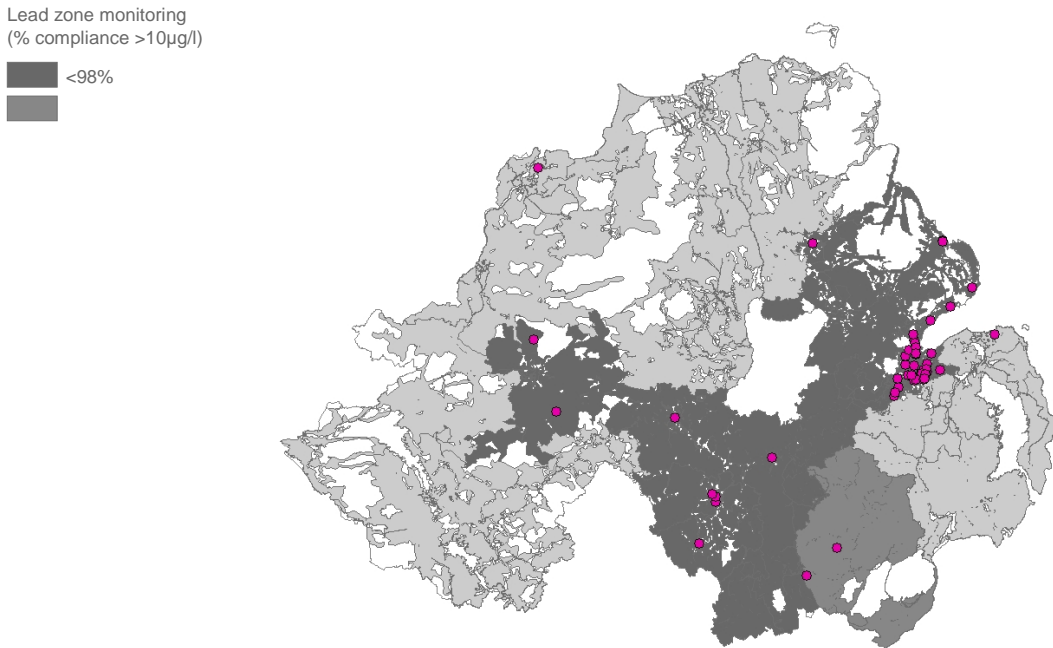


The graph shows that there has also been improved compliance with the 10µg/l standard: 97.19% in 2012 compared with 96.81% in 2011. A significant amount of work is required to further improve compliance with the final lead standard of 10µg/l by December 2013.

In addition to the sampling requirements required under the Regulations, NI Water undertakes a more extensive operational sampling programme for lead.

Results from this sampling programme highlight those water supply areas which have not achieved a compliance target of 98% for 10µg/l (Figure 1.13 refers). Following the introduction of new water treatment processes and the rezoning of water supply zones over recent years, NI Water needs to keep its lead reduction strategy under review to ensure that it is able to demonstrate that treatment processes including orthophosphate dosing and pH control have been optimized.

Figure 1.13: Lead Zone Monitoring, 2012 - Results >10µg/l



Aluminium

Aluminium can occur naturally in many water sources, particularly those derived from upland areas. Aluminium compounds may also be used as part of the water treatment processes used in the purification of water, including the removal of harmful organisms. In addition to this primary role, aluminium-based water treatment removes naturally occurring aluminium from water. The regulatory standard for aluminium is based on aesthetic considerations because high concentrations in water may cause discoloration.

In 2012, a total of 1,710 samples were tested for aluminium: eight (0.47%) contravened the regulatory standard of 200µg/l. The failures were most likely caused by disturbances of mains deposits, normally related to operational activities, or of unknown origin. These mains deposits result from previous water quality events where inadequate treatment or poor control of the coagulation process has led to aluminium passing through the treatment works and into the supply, where it may have accumulated in the distribution network. NI Water must ensure that good operational performance is achieved at its water treatment works to ensure a continuous provision of safe, clean drinking water.

Pesticides - total substances

Pesticides are a large group of chemicals used to control plant and animal infestations. There are several different types of pesticide: these include insecticides, herbicides, fungicides and algacides. The Regulations set standards for individual pesticides as well as a standard for the sum of all pesticides, 'the total pesticide' standard.

During 2012, 41 individual pesticides were monitored. Of the 231 samples taken only one (0.43%) contravened the 'total pesticide' limit of 0.5µg/l. This contravention was caused by the individual pesticide linuron in the Caugh Hill WTWs supply area. Linuron is a herbicide which is approved for both agricultural (cereals, grapes, vegetables and sunflowers) and horticultural use (ornamentals).

Turbidity

Turbidity measurements provide an assessment of the fine particles suspended in water. This parameter is often, but not always, associated with discoloration, which in turn can be caused by corrosion within the distribution system.

Excessive turbidity can make the appearance of the water unacceptable to consumers.

Of the 1,710 samples taken in 2012, six (0.35%) failed to meet the turbidity standard of 4NTU for consumers' taps, and this was most probably caused by disturbance of the mains, either from operational activities by NI Water or other utility providers, or of unknown origin. One contravention, after investigation was also related to a private distribution system.

Bromate

Bromate may be generated in the manufacture of sodium hypochlorite disinfectant. It may also be formed during disinfection of drinking water through a reaction between naturally occurring bromide with strong oxidants (usually ozone).

During 2012, one of the 392 samples tested for bromate (0.26%) failed to meet the 10µg/l standard. The cause of this contravention was not determined by NI Water. Follow-up samples, taken in response to this contravention, were all significantly below the regulatory limit.

Manganese

The regulatory standard for manganese has been set for aesthetic reasons. Manganese occurs naturally in many of Northern Ireland's water sources and is normally removed by effective water treatment. Where treatment is inadequate, manganese and iron can accumulate in distribution pipes. Manganese is also present in old iron mains due to corrosion.

Of the 1,710 samples taken for manganese in 2012, the regulatory standard of 50µg/l was not met on three (0.18%) occasions. On investigation, NI Water were unable to determine the cause of two of these contraventions and one was reported to have been likely related to a disturbance of mains deposits. All follow-up samples were satisfactory.

Odour

Naturally occurring substances which have odour properties are present in many water sources. In the purification of water supplies, the treatment process may remove or introduce odour to the water supply. In addition, odour may develop during storage and in distribution due to microbiological activity.

In 2012, of the 1,711 samples taken for odour, three (0.18%) failed to comply with the regulations. No cause was determined by NI Water for these contraventions and follow-up samples were satisfactory.

Other Pesticides

Of the 9,465 determinations, thirteen (0.15%) contravened the regulatory standard of 0.1 µg/l for individual pesticides. Ten failed to meet the regulatory standard for the individual pesticide, MCPA. These occurred in the water being supplied from: Carran Hill; Clay Lake; Derg; Dorisland; Lough Fea; and Seagahan WTWs. Metoxuron, which is not approved for use in Northern Ireland, was detected in a sample taken in the Clay Lake water supply area; and mecoprop was detected in a sample of Seagahan WTWs final water. Linuron was detected in the Caugh Hill WTWs supply area (see Pesticides - total substances). More detail on pesticides can be found in the catchment section of this report.

Taste

Taste can occur naturally in water, particularly in surface sources during the summer due to increased biological activity of micro-organisms. Water treatment aims to remove the organic material that may cause taste problems to arise.

In 2012, of the 1,710 samples taken for taste, two (0.12%) failed to comply with the regulations. No cause was determined by NI Water for these contraventions and follow-up samples were satisfactory.

Microbiological Quality

To protect public health, microbiological standards have to be met at consumers' taps. The significance of the individual test results for each microbiological parameter cannot be fully interpreted without information being assessed from other monitoring data related to the contravention.

Results confirm the general safety of drinking water supplies, with a high level of microbiological quality compliance (99.43%) being achieved in 2012 as is shown in Table 1.11. However, this is a reduced level of compliance from the 99.76% reported in 2011. The most significant factor in the lower level of compliance in 2012 is the increased number of coliform bacteria contraventions being detected at consumers' taps.

Unrepresentative sampling caused by the condition of the consumers' tap or contamination at the time of sampling have been given as the main reason by NI Water for 75% of these microbiological samples being non compliant. NI Water continues to investigate the cause for this increase in non-compliance to enable effective corrective measures to be put in place. We are currently assessing this data with a view to taking forwards enforcement action in 2013 to address contraventions of the microbiological standards in the distribution system and at consumers' taps.

Coliform Bacteria

In 2012 there has been a significant increase in non-compliance with the coliform bacteria standard at consumers' taps. The level of compliance has decreased from 99.43% in 2011 to 98.75% in 2012. Of the 59 occasions coliform bacteria were detected in 2012, *E. coli* was also detected on six occasions (see following section on *E. coli*).

NI Water advises the consumer where the contravention has been attributed to the domestic plumbing and what action, if any, they may take. Samplers used by NI Water for regulatory samples are trained and accredited to ISO 17025 and DWTS (Drinking Water Testing Standard)¹ to collect samples from consumers' taps. We continue to stress the importance to NI Water of collecting representative samples so as to prevent the integrity of the sample being compromised.

Table 1.11: Microbiological Quality at Consumers' Taps

Parameter	Number of Tests	Number of Tests not Meeting the Standards	% of Tests Meeting the Standards in 2012	% of Tests Meeting the Standards in 2011
Coliform bacteria	4,704	59	98.75	99.43
<i>Clostridium perfringens</i>	2,731	7	99.74	100
<i>E. coli</i>	4,704	6	99.87	99.96
Enterococci	392	0	100	99.75
Total	12,531	72	99.43	99.76

¹www.ukas.com/library/Technical-Information/Pubs-Technical-Articles/Pubs-List/LAB37%20Edition%203%20Jun%2013%20final.pdf

Clostridium perfringens, *E. coli* and Enterococci

The presence of bacterium such as, *Clostridium perfringens*, *E. coli* and enterococci, is indicative of faecal contamination and they should not be found in any drinking water sample. There were no enterococci detected in any of the 392 samples taken at consumers' taps by NI Water in 2012.

There were 2,731 samples tested for *Clostridium perfringens* in 2012 and seven (0.26%) tested positive. NI Water's investigations into these contraventions were unable to determine the reasons for the results. The water treatment works involved all appeared to be operating normally at the time and all follow-up samples were satisfactory. There was full compliance for *Clostridium perfringens* in 2011 (Table 1.11 refers).

A total of 4,704 samples were tested for the presence of *E. coli* and six (0.13%) tested positive.

Investigation by NI Water concluded that three of these contraventions were attributable to consumers' taps or contamination at the time of sampling; one was due to an internal plumbing issue; and no cause could be determined for the remaining two contraventions. The level of *E. coli* compliance has declined from 99.96% in 2011 to 99.87% in 2012 (Table 1.11 refers).

NI Water Consumer Contacts

To enable us to make an assessment of consumer confidence in the quality of drinking water at consumers' taps, NI Water provided us with information on the complaints and concerns of its customers during 2012 (Table 1.12 below refers). The overall number reported in 2012 was 6,188; 63.6% of which related to appearance (See Figure 1.14).

Table 1.12: Categories of Water Quality Contacts Received by NI Water in 2012

Contact Category		Number of Contacts
Appearance	Colour	2,464
	General	202
	Hardness	33
	Stained Washing	14
	White - Air	910
	White - Chalk	312
Taste and Odour	Chlorinous	378
	Earthy/Musty	137
	Other	385
	Petrol/Diesel	25
	TCP	33
Illness		103
Particles		194
Animalcules		5
Boil Water Notice		105
Other	Water Quality Concern - Campaigns	10
	Water Quality Concern - Incident Related - General	60
	Water Quality Concern - Lifestyle	6
	Water Quality Concern - Pets/Animals	8
	Water Quality Concern - Sample	600
	Water Quality Concern - Lead	86
	Water Quality (No Concern) Fluoride	3
	Water Quality (No Concern) Other Information	29
	Water Quality (No Concern) Water Hardness	71
	Water Quality (No Concern) Water Quality Report	15
TOTAL		6,188

Appearance

Within the overall appearance categories we look closer at the reason for the contact from consumers.

Colour

Within the appearance category, the main concern (62.6%) relates to discoloured water (see Figure 1.14). 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 or from corrosion of cast-iron distribution mains. Manganese is present in some raw waters and may not be removed if treatment is inadequate. It is expected that the long-term mains rehabilitation programme of the distribution system will improve the appearance of the water being provided to consumers.

White Water - Air

Another appearance concern is 'white water'. This is most commonly caused by air dissolved in the water, causing it to appear cloudy or milky white. A number of possible causes include burst mains, malfunctioning pumps and consumer stop taps. If air is the cause of white water, the cloudy appearance will clear in a glass of water from the bottom up.

White Water - 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.

Hardness

Temporary water hardness, usually caused by dissolved calcium carbonate, can give rise to complaints as it causes scale to form in kettles and other household appliances.

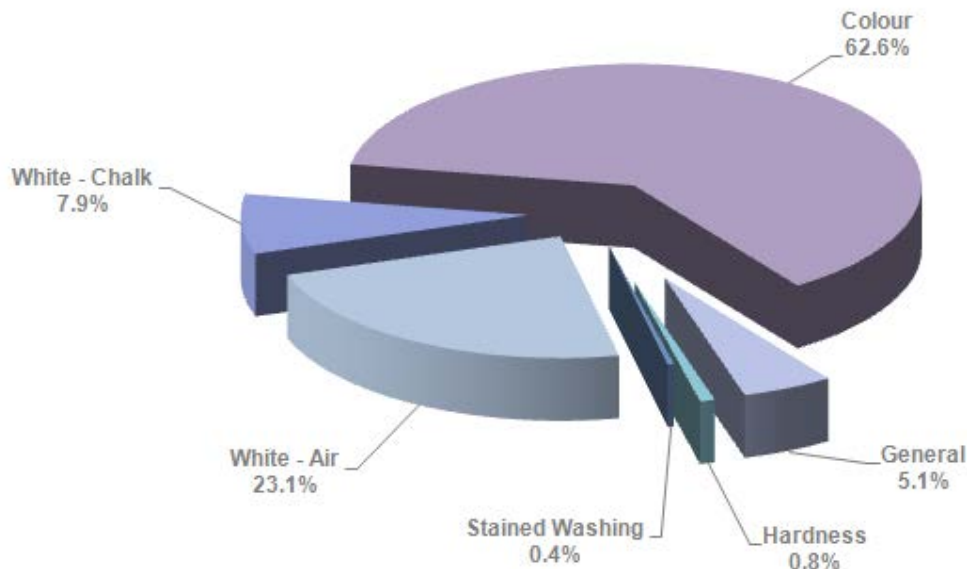
Stained Washing

Brown or black staining of clothes can occur in clothes inadvertently washed in discoloured water. However, staining may also arise from faults with washing machines.

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 also cause consumer complaints. One such substance, which is intentionally added to drinking water, is chlorine.

Figure 1.14: Percentage of Consumer Contacts that Fall Under the Appearance Category, 2012



Other taste and odours should not be present in drinking water for aesthetic reasons (TCP or earthy/musty) or health reasons (petrol/diesel). Forty per cent of these concerns fall under the sub-category 'other', which covers a range of complaints from grassy and fruity to rotten eggs. Thirty-nine per cent of taste and odour consumer contacts in 2012 were related to a chlorinous taste and odour in the water. Figure 1.15 illustrates the number of consumer complaints regarding taste and odour per 1,000 population reported throughout Northern Ireland in 2012. Also included on the map is a plot of the three odour and two taste detections reported from the compliance sampling programme.

Chlorinous

Some people are sensitive to the taste and odour of chlorine which is used to maintain hygienic conditions within the water supply network.

Petrol/Diesel

Spillages of petrol, diesel or paraffin can percolate through the soil and penetrate plastic water mains.

Earthy/Musty

Earthy and musty tastes can arise due to naturally occurring compounds present in raw waters that have not been removed by the treatment process.

TCP

Phenolic tastes can occur when chlorine reacts with components in household appliances or plumbing. Common sources of phenol include washing machine hoses, tap washers and kettles. British Standard approved plumbing products, which do not contain phenol, should be used in all plumbing installations.

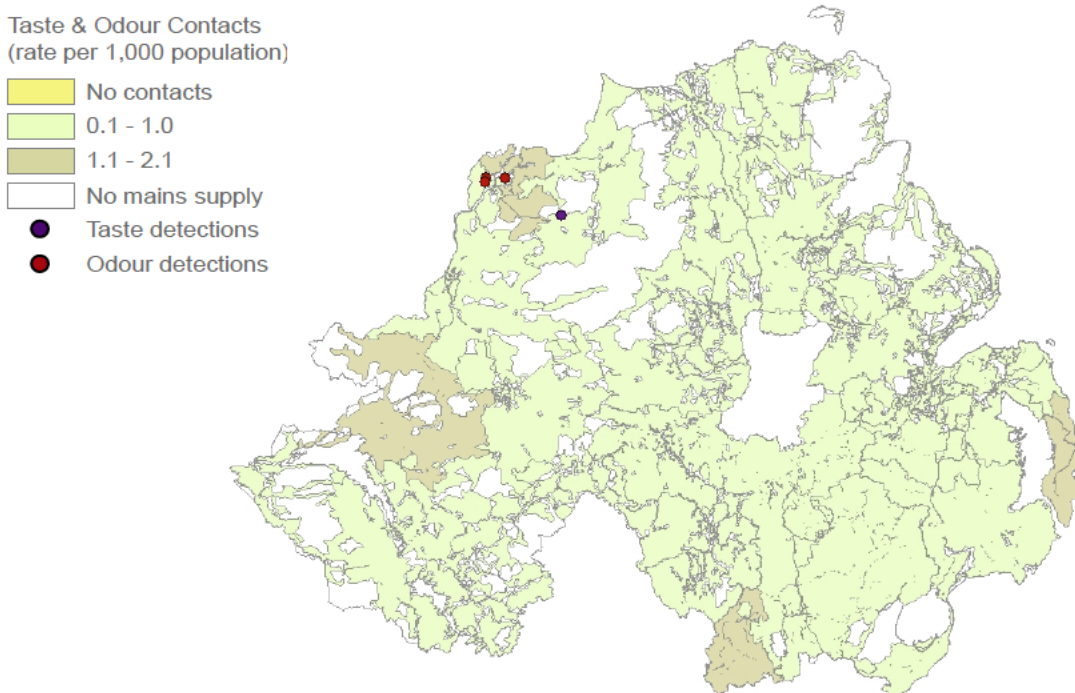
Particles

The presence of visible particulate matter in water which is otherwise not discoloured can be caused by corrosion of iron mains or deposits of sand, grit or other material present in the main. These may be re-suspended following a change in the flow of the main.

Animalcules

A small proportion of contacts received concern animalcules. Very occasionally, water systems can contain animals which may arise from the raw water, treatment works or within the mains themselves.

Figure 1.15: Rate of Consumer Contacts per 1,000 Population Reporting Taste and Odour in 2012



Samples at Public Buildings

NI Water, in undertaking its compliance monitoring programme, is required to randomly select properties throughout Northern Ireland from which to take samples; some of these locations will be public buildings. In 2012, 147 samples were identified by NI Water as being taken from taps within public buildings.

From the 147 samples taken, five were notified to us as contravening the drinking water quality standards for the following parameters:

- two for iron: one was related to possible scouring of the main due to increases in flow within the distribution system, while the other one is still under investigation, initial investigations, however, indicate that the cause may be due to the internal distribution system;
- two for coliform bacteria: investigations report the most likely cause of one of the contraventions to be due to contamination from the tap at the time of sampling, while the cause of the other one was undetermined; and
- one for THMs, caused by elevated levels of THMs in the final water from Caugh Hill WTWs.

There were no instances where it was determined that the contraventions were due to the internal distribution system in the building. While there were no notifications to us under the Water Supply (Domestic Distribution System) Regulations by NI Water from its compliance monitoring programme, there were four failures notified to us from their operational and survey sampling programme. The details of these notifications are reported on in the Drinking Water Quality Section under 'Water Quality Related to Domestic Distribution Systems'.

Risk Management

The overall drinking water safety plan approach adopted by NI Water is to protect its drinking water supplies by identifying any potential risks of contamination and having appropriate control measures in place, to best ensure that water is safe and clean to be used by consumers. These plans also require NI Water to undertake a risk assessment of potential issues within the distribution system which also includes general risks which may be identified within properties.

Some of these control measures are the responsibility of NI Water; others such as internal plumbing at domestic households are the responsibility of the owner.

Where there is a potential risk to the drinking water supplies from internal pipe work within domestic, industrial or other properties, NI Water offers advice as to what steps the property owner can take to safeguard their supply of drinking water.

To prevent potential contamination, the Water Fittings Regulations¹ require that all plumbing systems, water fittings and equipment connected to the public water supply are of an appropriate quality and standard. These Regulations apply from the point where water leaves the water main and enters the property's service pipe.

Owners and occupiers of premises and anyone who installs plumbing systems or water fittings must comply with these Regulations. More information on the Water Fittings Regulations is available from NI Water's website: www.niwater.com/information-leaflets

Further Sources of Information

If you want to find out about the quality of drinking water supplied to your home or workplace, or if you have a drinking water quality concern or complaint, then you should first contact NI Water at its Customer Service Unit on 08457 440088 (further details can be found in Annex 9).

If you have discussed your concerns with NI Water and feel that the issue has not been satisfactorily resolved, you may contact the Consumer Council for Northern Ireland on (028) 9031 1575 (see Annex 9 for further details). For advice on how to maintain the quality of tap water in your home, a guide called 'Looking after WATER in your home' is available from NI Water's website: www.niwater.com/information-leaflets

General information on drinking water quality matters is also available on our website².

¹www.legislation.gov.uk/nisr/2009/255/contents/made
²www.doeni.gov.uk/niea/water-home/drinking_water/consumer.htm

Part 2 Private Water Supplies



Image: Borehole - NIEA

Private Drinking Water Supplies

In this section of the report we give details of the private water supplies which we are required to regulate. We report on the results from the monitoring programme and look at the main factors which influence the quality of these supplies.

Register of Supplies

NI Water supplies water to over 99% of the Northern Ireland population; the remainder of the population is served by private water supplies. Although the number of people directly served by a private supply may be small, many more people are exposed to them through holiday accommodation (e.g. hotels, bed & breakfast facilities), public buildings (e.g. hospitals, universities), and from the use of private supplies for the manufacture of food and drinks (see Figure 2.1).

There were a total of 122 supplies on our register in 2012. It is estimated that there are approximately a further 4,000 private supplies to single private dwellings, which are not required to be monitored under the regulations. As in 2012, private water supplies in use on dairy farms (i.e. within milking parlours) are not included in the register of private supplies on which we report.

The quality of water required within primary production (including dairy farms) remains under consideration by the Food Standards Agency.

The information held on registered supplies is required to be reviewed on an annual basis. During 2012, the private water supplies sampling programme required adjustment where: the nature or purpose of supplies changed; sites switched to the public water supply; and new supplies were notified to us.

Although there are some (mainly commercial) private supplies in urban areas, the majority are situated in the more remote, rural parts of Northern Ireland. Private water supplies may be drawn from a variety of surface and groundwater sources. Surface sources include streams, rivers and reservoirs; groundwater sources include wells, boreholes and springs. The majority (98%) of private supplies in Northern Ireland are from groundwater sources, most commonly, boreholes.

Schematic drawings of the typical construction of the main sources for private water supplies together with photographic examples of registered supplies are shown in Figure 2.2.

Figure 2.1: Categories of Private Water Supplies in Northern Ireland

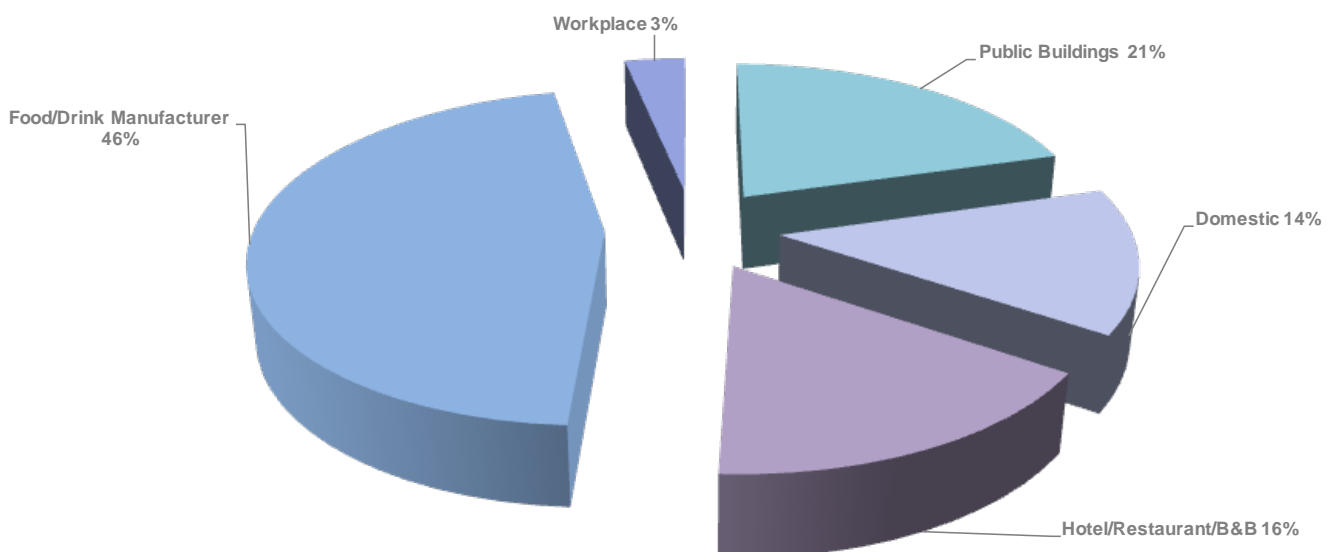


Figure 2.2: Sources of Private Water Supplies



Note: Schematic drawings taken from *Private Water Supplies Technical Manual*.¹

¹www.privatewatersupplies.gov.uk

Monitoring of Supplies

An annual sampling programme is in place for each registered private 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 122 private water supplies on our monitoring schedule for 2012, 88% are large or commercial/public supplies; and 12% are small domestic supplies (groupings of two or more houses). A breakdown of the numbers and types of private water supplies, together with the monitoring frequencies, is shown in Table 2.1.

A breakdown of registered private water supplies in Northern Ireland in 2012 by district council area is shown in Figure 2.3.

Risk Assessment of Supplies

The Regulations¹ 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 are similar to the drinking water safety plans in place for the public water supply.

A total of eight risk assessments were undertaken in 2012 for newly registered supplies. The information gathered through this process is beneficial in identifying appropriate actions required when investigating contraventions at private supply sites. The risk assessment is required to be updated where there have been significant changes made to the supply. In 2012 the risk assessments for seven sites were reviewed following improvements to the level of source protection and/or installation of treatment to bring these water supplies into compliance.

The risk assessments have also been used to adjust the monitoring programme at private supplies. Where the assessment and previous results indicate that certain parameters are unlikely to be present, and are of low risk, the monitoring for these parameters may be removed or reduced. Equally, where a risk has been identified additional monitoring may be undertaken to quantify the risk. Following a review of historical monitoring data for registered supplies at the end of 2011 many parameters, which routinely had full compliance and no associated risk identified in the risk assessment of the supply, were removed from the sampling programme. These included parameters such as antimony, arsenic, boron, cadmium, chromium, copper, cyanide, fluoride, mercury, nickel, selenium and sulphate. Newly registered supplies continue to receive an initial full suite of analysis based on the supply type.

Table 2.1: Number of Private Water Supplies by Type and Size in 2012

Types of Private Water Supplies Volume (m ³ /day)	Sampling Frequency (per Annum)	Parameters Analysed	Number of Supplies	% of Supplies
(i) Large or Commercial/Public Supplies				
>1000 ≤2000	10	Suite of regulatory check and audit parameters	2	1.6
>100 ≤1000	4		18	14.8
>10 ≤100	2		47	38.5
≤10	1		40	32.8
(ii) Small Domestic Supplies (two or more dwellings)				
≤10	1	Small supply suite of regulatory parameters	15	12.3
TOTAL			122	100

Note: There are no registered private water supplies in Northern Ireland with usage greater than 2,000 m³ per day.

¹ www.legislation.gov.uk/nisr/2009/413/contents/made

Figure 2.3: Distribution of Registered Private Water Supplies by Council Area in 2012

Supply Type

- Large or Commercial/Public (>1000 ≤2000 m3/day)
- Large or Commercial/Public (>100 ≤1000 m3/day)
- Large or Commercial/Public (>10 ≤100 m3/day)
- Commercial/Public (≤10 m3/day)
- Small Domestic (<10 m3/day)



● Number of private water supplies in each council area, due to scale not all sites are distinguishable on the map.

Note: Carrickfergus, Castlereagh, and North Down Councils had no registered private water supplies in our 2012 sampling programme.

Overall Drinking Water Quality

We have been monitoring private water supplies since 1999, and 2012 provides the third year of monitoring data under the 2009 Regulations. While a similar number of private water supplies are registered with us as in previous years, a review of the risk assessments and historical monitoring data led to a reduction in the number of parameters analysed for each supply in 2012.

The results in Table 2.2 show that, out of a total of 6,121 tests carried out in 2012, 97.66% met the regulatory standards. The regulatory requirements were not met on 143 occasions for 19 parameters, namely: iron; manganese; coliform bacteria;

Enterococci; *E. coli*; hydrogen ion; *Clostridium perfringens*; ammonium; odour; colour; trihalomethanes; aluminium; taste; nitrite; turbidity; nickel; sulphate; sodium; and bromate.

The low compliance figures for nickel, sulphate, sodium and bromate are reflective of the low number of tests performed. These parameters were not routinely tested for in all supplies in 2012. Apart from newly registered supplies where all four parameters were included: bromate was only tested for at sites where chlorination was in use; sodium was only included where softening was practised; and nickel and sulphate were only included where a supply had a history of contraventions for these parameters.

Table 2.2: Overall Water Quality in Private Water Supplies in 2012

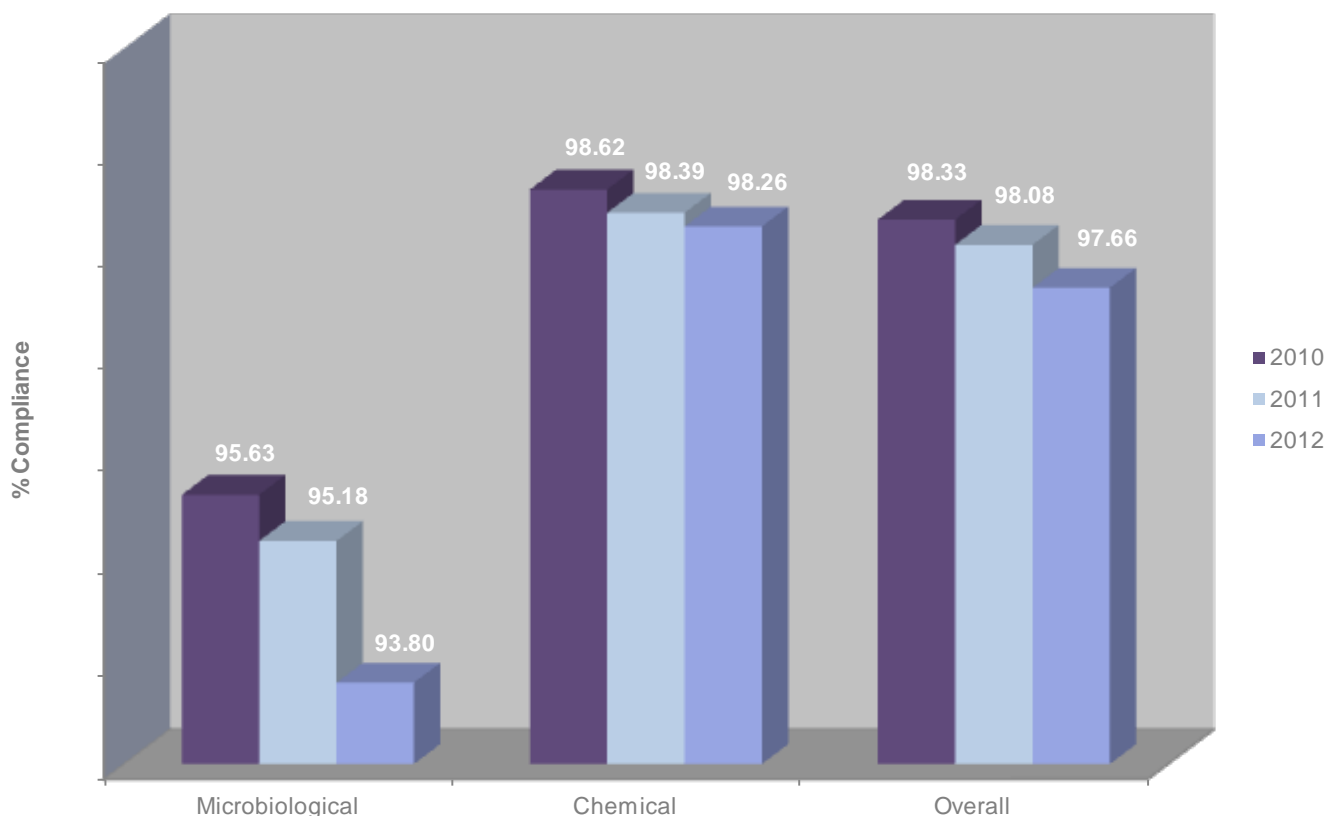
Parameters	Determinations in 2012		
	Total No. of Tests	No. of Tests not Meeting the Standards	% Compliance
Coliform bacteria	238	24	89.92
Enterococci	125	9	92.80
<i>E. coli</i>	238	11	95.38
<i>Clostridium perfringens</i>	221	7	96.83
Microbiological Total	822	51 (6.20%)	93.80
Iron	219	27	87.67
Manganese	219	27	87.67
Hydrogen ion (pH)	234	10	95.73
Ammonium	219	5	97.72
Odour (quantitative)	219	5	97.72
Colour	219	4	98.17
Trihalomethanes	107	1	99.07
Aluminium	219	2	99.09
Taste (quantitative)	204	1	99.51
Nitrite	219	1	99.54
Turbidity	234	1	99.57
Nitrate	219	0	100.00
Individual pesticides	635	0	100.00
Total pesticides	108	0	100.00
Nickel*	14	4	71.43
Sulphate*	14	1	92.86
Sodium*	40	2	95.00
Bromate*	36	1	97.22
Other parameters	1,921	0	100.00
Chemical Total	5,299	92 (1.74%)	98.26
Overall Total	6,121	143 (2.34%)	97.66

*Parameters on reduced monitoring frequency

Full compliance was achieved for 52% of all registered private water supplies. Of the 58 sites which were non-compliant, 18 sites use the water for the washing of equipment and surfaces in contact with food or drink. For the remaining 40 sites the purpose of the private water supply is as drinking water or as an ingredient in food or drink. These contraventions are addressed through restrictions on the use of the supplies and implementation of appropriate corrective actions such as improved source protection or installation of, or improvement to, treatment systems and maintenance programmes.

A comparison of the monitoring data since the introduction of the regulations in 2010 shows a decrease in the overall compliance: 98.33% in 2010; 98.08% in 2011; and 97.66% in 2012 (Figure 2.4 refers). In particular, there has been a notable decrease in the level of microbiological compliance in 2012 with 93.80% reported, when compared to 95.18% in 2011. This was due to an increase in the number of contraventions for *Clostridium perfringens* and coliform bacteria particularly at sites with inadequate source protection leading to contamination of the supply.

Figure 2.4: Comparison of Compliance in Private Water Supplies, 2010 - 2012



Microbiological failures account for 51(36%) of the 143 contraventions at private water supplies in 2012. These contraventions, occurring at 29 out of 122 sites, continue to be a major concern with 38% supplying domestic properties and 62% serving commercial or public supplies. We are prioritising improvements to their water quality through the provision of advice on effective corrective actions and the promotion of the development of water safety plans for the ongoing management of their supplies.

Contraventions of the chemical standards have been reported for a range of parameters listed in Table 2.2. The level of chemical compliance also indicates a downward trend. This is in some part due to the reduction in the number of chemical parameters tested for in 2012 compared with 2011 (Table 2.3).

The actual number of chemical contraventions has decreased from 114 in 2011 to 92 in 2012. Food or drink manufacturing sites account for 26 out of the 39 sites showing chemical contraventions (66%). As with previous years where the standards have not been met, they relate mainly to contraventions for iron (12.33%) and manganese (12.33%).

Factors Affecting Drinking Water Quality

Contraventions of the regulatory standards at private supplies are reported to the relevant district councils who inform the owners/users. We work closely with local Environmental Health departments when following up on all contraventions to establish the cause, resample the supply and identify any remedial actions needed to restore a wholesome water supply.

Table 2.3: Chemical Water Quality in Private Water Supplies in 2010 - 2012

Year	Chemical Parameters	
	No. of Tests	No. of Tests not Meeting the Standards
2010	6,678	92
2011	7,099	114
2012	5,299	92

A summary of the factors causing the 51 microbiological and 92 chemical contraventions reported in 2012 is presented in Figure 2.5. The categories for cause are divided into catchment (including source protection), treatment, distribution and point of use (sample tap) issues.

The owners/users of the supply are provided with practical advice on source protection and treatment options to reduce the potential risks of contamination. Depending on the nature and significance of the contraventions, it may be necessary for us to arrange a site visit. A total of 15 site visits were conducted in 2012.

Catchment

Inadequate source protection was identified as the cause of 57% of microbiological failures of private water supplies in 2012. From a total of 122 supplies monitored during 2012, 29 sites failed to be microbiologically satisfactory: 55% (16) of these were from untreated supplies mainly in rural areas with poor levels of source water protection.

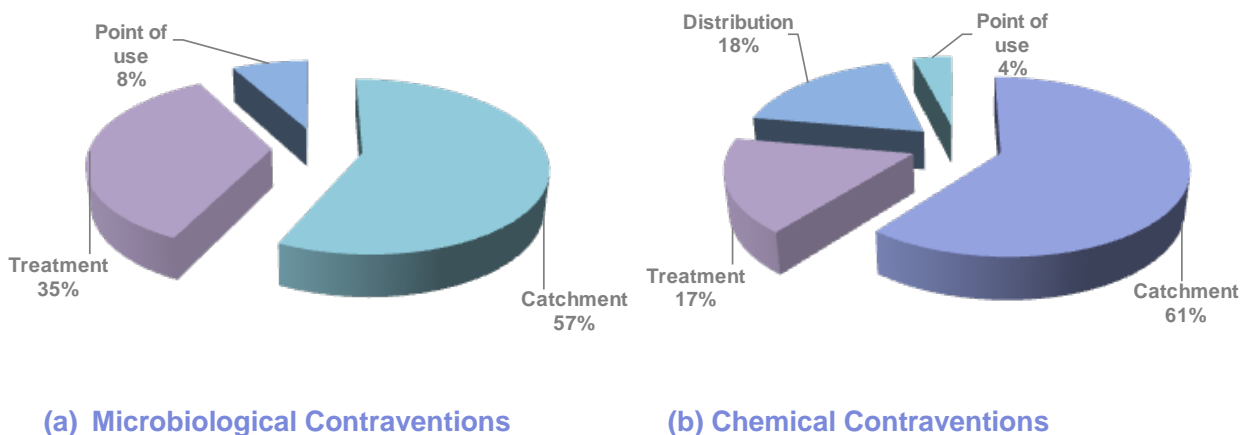
Water supplies in the vicinity of farmland, where animals graze or manure is spread, are most at risk and this is particularly noticeable at times of heavy rainfall, when water may run directly off farmland and carry micro-organisms into unprotected private supplies. Guidance on source protection is available in the private water supplies technical manual¹.

Microbiological contraventions were reported for six commercial sites with poor source protection. These were supplies to small business operators where no disinfection treatment was present. In these instances, adequate source protection is crucial however where there is a known risk of microbial contamination the installation of appropriate disinfection treatment is recommended.

Although there have been no pesticide contraventions noted for private supplies in 2012 this is based on limited data due the low regulatory monitoring frequency in place for pesticides. Trace levels of pesticides below the regulatory limit of 0.10µg/l for individual pesticides, and 0.030µg/l for heptachlor epoxide, were detected at 16 sites in 2012 and are summarised in Table 2.4. Pesticides should not be stored or sprayed within the vicinity of drinking water sources. Where pesticides are of concern in the vicinity of a private supply, appropriate measures should be put in place to reduce the risk of them entering the water supply through better management of the catchment area and improved source protection.

In July 2012 new legislation came into force throughout the UK, The Plant Protection Products (Sustainable Use) Regulations 2012². A number of provisions under this legislation are aimed at achieving the sustainable use of pesticides, by reducing risks and impacts on human health and the environment, which includes measures on protecting water, and promotion of low pesticide usage regimes.

Figure 2.5: Summary of Factors Affecting Compliance in 2012



¹www.privatewatersupplies.gov.uk
²www.legislation.gov.uk/ukksi/2012/1657/made

Table 2.4: Pesticide Detections in Private Water Supplies in 2012

Pesticide	No. of Supplies	Maximum Value Detected ($\mu\text{g/l}$)
Atrazine	6	0.052
Diuron	1	0.022
Glyphosate	2	0.060
MCP	4	0.042
MCPA	2	0.048
Heptachlor epoxide	1	0.027

Some groundwaters can contain high levels of naturally occurring iron and manganese. Of the 54 contraventions reported for these metals in 2012, 80% (43) were due to the quality of the source water. High levels of iron and manganese may affect the appearance, taste or smell of the water resulting in turbidity, colour, taste and odour contraventions. Their presence at high levels can interfere with the disinfection process. There are effective treatments which can be installed to reduce the levels of these metals in private supplies and nine sites are currently using these technologies. Further information on these treatment options is available in the technical manual on private water supplies.¹

The private water supplies regulations require the monitoring of supplies for radioactivity with parametric values set for Total Indicative Dose (TID) at 0.10mSv/year (excluding tritium, potassium-40, radon and radon decay products) and tritium at 100Bq/l. The requirement to undertake this radiochemical monitoring can be excluded where the risk assessment of the supplies identifies no potential risk. In 2012, we undertook a radioactivity screening survey to provide data that would enable an assessment of any associated risk for private drinking water supplies to be made.

All 122 registered private water supplies were sampled, screened for gross alpha and beta activity and tested for levels of tritium. Where gross alpha levels were reported as <0.1Bq/l and gross beta levels <1.0Bq/l, the TID was taken to be <0.10mSv/year. The following are the initial key findings from the survey:

All sites were reported with tritium levels <100Bq/l and gross beta activity <1.0Bq/l;

96% of supplies had a TID of <0.10mSv/year; and

4% of supplies (5 sites) reported gross alpha levels >0.1Bq/l though less than the health limit of 0.5Bq/l.

We consulted with the Public Health Agency for advice on the significance of these initial test results on public health. It was concluded that there was no associated health risk from ingestion of these supplies.

Radiochemical specification was undertaken to determine the source of the gross alpha activity in these five supplies. Initial results indicate that natural uranium in the rocks from which the groundwater is drawn is the primary contributor.

Treatment

A significant number of microbiological contraventions (35%) were due to a failure to appropriately maintain existing treatment systems. These contraventions highlight an ongoing area of concern for private supplies serving larger premises where treatment is not being operated correctly, routinely checked, or maintained as required. We continue to work with the owners/users of these supplies to put procedures in place to address these issues and encourage sites to develop 'Water Safety Plans' for the management of their water supplies.

During 2012, we enhanced our disinfection by-products (DBPs) monitoring programme for sites where chlorine dioxide is used as the means of primary disinfection of their water supply. A total of eight sites were monitored for the DBPs, chlorite and chlorate. Four of these sites are food manufacturers where the water is used for the washing down of equipment and surfaces used in the manufacturing process. The other four sites are used as a supply to which the public has access: two healthcare facilities; and two educational institutions. Following the detection of raised levels of chlorite, the four sites used to supply the public were put on a monthly sampling programme. The information gathered through this increased monitoring will be used to assess the risk associated with DBPs at these sites and determine what action may be required.

¹www.privatewatersupplies.gov.uk

It is a requirement of the regulations that any product or substance introduced to a private water supply must be permitted for use. A list of products approved for use in the public water supply is established.¹ This list equally applies to private water supplies and provides national conditions of use for chlorine dioxide disinfection. It requires that the dosing of chlorine dioxide should be controlled so that the combined concentration of total oxidants does not exceed 0.5 mg/l. Owners should be able to demonstrate that the design, operation and maintenance of the disinfection process ensures that disinfection by-products are as low as possible without compromising its effectiveness for the disinfection of drinking water.

Distribution

A number of iron contraventions, 11 out of 27 (41%), reported for private water supplies in 2012 were due to cast iron pipe work and/or storage tanks within the distribution system. High levels of iron in a water supply can cause aesthetic problems including metallic taste and discoloration of water fittings such as ultra-violet lamps thus reducing their effectiveness for disinfection. Sites are encouraged to clean out storage tanks and flush through pipe work or refurbish their distribution network to reduce the levels of iron in their supplies.

Another issue which can arise through lack of maintenance of distribution systems is the occurrence of raised levels of colony counts in supplies. This occurred at four out of 122 sites in 2012. Colony counts are useful in assessing the cleanliness and integrity of distribution systems. High levels of background bacterial growth can often lead to an increase in taste and odour complaints. Owners are advised to flush and disinfect their distribution network to rectify this problem. Guidance on carrying this out is available in BS 8558:2011: Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.

Point of Use

The sample point for private water supplies is always post any treatment and should be representative of the water supply at the point of use. The quality of water in use at a site is assessed by means of approved sampling procedures to prevent contamination when samples are being collected.

Samplers are trained to collect the samples required as part of the regulatory monitoring programme to help ensure the integrity of the sample is not compromised. Guidance on sampling of water supplies is available in the 'Private Water Supplies Sampling Manual: A Field Guide'.² In 2012, four out of 51 microbiological contraventions were attributed to unrepresentative sampling.

There were four contraventions of the nickel standard at private water supplies in 2012. In three cases follow up investigations determined the source of nickel to be as a result of the use of inappropriate tap fittings. These sites were advised to replace the taps which brought this parameter into compliance. Only products and substances approved for use with drinking water supplies should be used in contact with the water. In addition, plumbing systems should be designed and installed to reduce the risk of contamination of water supplies through inappropriate cross connections or misuse of fittings. The Water Regulations Advisory Scheme web site provides guidance on this.³

Health Notifications

A guidance document on 'Drinking Water and Health' is available which sets out the roles and responsibilities for professionals and organisations involved in safeguarding drinking water health.⁴ This document details protocols we have in place to inform the Public Health Agency (PHA) in instances where a contravention at a private supply is considered to be a risk to human health. The PHA provides appropriate health advice in such cases. Where necessary, the regulations contain a provision to issue Notices which can be used to restrict or prohibit the use of a supply.

Any contraventions at private water supplies where the water is used as an ingredient in food production or as drinking water which are considered as a risk to health are reported to the PHA for advice. In 2012, 29 failures were notified to PHA: 22 microbiological and seven chemical (notably coliform bacteria, *E. coli*, Enterococci, manganese, chlorite and nickel).

Following investigations of these incidences remedial actions were successfully completed at 20 of these sites. A further six remain on a boil water notice, one site switched to the public water supply and two are still under investigation. We continue to work with the owners and users of private water supplies and Environmental Health using the information collated during the risk assessment process, to bring supplies into compliance.

¹<http://dwi.defra.gov.uk/drinking-water-products/approved-products/soslistcurrent.pdf>

²http://www.doeni.gov.uk/niea/private_water_supplies_sampling_manual_-_december_2009.pdf

³<http://www.wras.co.uk/>

⁴<http://www.niwater.com/sitefiles/resources/pdf/guidancedocumentondrinkingwaterandhealth13.06.04.pdf>

Technical Guidance

The technical manual on private supplies provides comprehensive guidance for owners/users along with other general information relating to private supplies.¹

The World Health Organization (WHO) publication 'Guidelines for drinking-water quality' (fourth edition) provides detail on the occurrence and removal of microbial and chemical hazards in drinking water, and the preventive risk management approach for ensuring drinking water quality.²

A document on 'Water Safety in Buildings', published by WHO, is also available and provides guidance for managing water supplies in buildings.³

Acknowledgements

We acknowledge the ongoing co-operation and assistance of staff from the Environmental Health Departments of district councils in helping us meet the regulatory requirements for private water supplies.

We also recognize the Public Health Agency for the guidance and advice it continues to provide on the health significance when the water quality standards have been contravened at our private water supplies.

¹www.privatewatersupplies.gov.uk

²http://whqlibdoc.who.int/publications/2011/9789241548151_eng.pdf

³http://whqlibdoc.who.int/publications/2011/9789241548106_eng.pdf

Annexes

Annex 1 - Glossary and Definition of Terms

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Annex 1

Glossary and Definition of Terms

Aesthetic	associated with the senses of taste, smell and sight.	Event	a situation affecting, or threatening to affect, drinking water quality.
Animalcule	a tiny or microscopic life form.	Faecal Coliforms	a sub-group of coliforms, almost exclusively faecal in origin.
Catchment	the area of land that drains into a watercourse.	Filtration	the separation of suspended particulate matter from a fluid.
<i>Clostridium perfringens</i>	a spore-forming bacterium which is exceptionally resistant to unfavourable conditions in the water environment.	Flocculation	a process where colloids come out of suspension in the form of floc or flakes.
Coagulation	a process employed during drinking water treatment to assist in the removal of particulate matter.	Granular Activated Carbon (GAC)	an absorbent filtration media used to remove trace organic compounds from water.
Coliforms	a group of bacteria which may be faecal or environmental in origin.	Groundwater	water from aquifers or other underground sources.
Communication Pipe	the connection from the water main to the consumer property boundary (normally at the outside stop tap).	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.
Compound	a compound consists of two or more elements in chemical combination.	Incident	an event where there has been a demonstrable deterioration in the quality of drinking water.
Contravention	a breach of the regulatory requirement.	Indicator Parameter	something that is measured to check that the control measures, such as water treatment, are working effectively.
<i>Cryptosporidium oocyst</i>	a protozoan parasite.	Leaching	to lose, or cause to lose, soluble substances by the action of a percolating liquid.
Determination	an analysis for a specific parameter.	Linuron	a herbicide mainly used to control grasses and other weeds amongst cereal crops and vegetables.
Drinking Water Standards	the prescribed concentrations or values listed in the Regulations.	MCPA	(4-chloro-2-methylphenoxy) acetic acid: an aryloxyalkanoic acid herbicide used for controlling broad-leaved weeds in grass or cereal crops.
Enterococci	a sub-group of faecal streptococci commonly found in the faeces of humans and warm-blooded animals.		
<i>Escherichia coli (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.		

Mean Zonal Compliance (%)	a measure of compliance with drinking water standards. It is the average of the zonal percentage compliances of all water supply zones in a region.	Sedimentation	the tendency for particles in suspension to settle out of the water under the influence of gravity.
Mecoprop (MCP)	2-(4-chloro-2-methylphenoxy) propanoic acid: an aryloxyalkanoic acid herbicide used for controlling broad-leaved weeds in grass or cereal crops.	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.
Microbiological	associated with the study of microbes.	Service Reservoir	a water tower, tank or other reservoir used for the storage of treated water within the distribution system.
m³/d	cubic metres per day.	Supply Point	a point, other than a consumer's tap, authorised for the taking of samples for compliance with the Regulations.
mg/l	milligrammes per litre (one thousandth of a gramme per litre).	Surface Water	untreated water from rivers, impounding reservoirs or other surface water sources.
MI/d	megalitres per day (one MI/d is equivalent to 1,000 m ³ /d or 220,000 gallon/d).	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 dichlorobromomethane.
µg/l	microgrammes per litre (one millionth of a gramme per litre).	Water Supply Zone	a pre-defined area of supply for establishing sampling frequencies, compliance with standards and information to be made publicly available.
Oocyst	the resistant form in which <i>Cryptosporidium</i> occurs in the environment, and which is capable of causing infection.	Wholesome/Wholesomeness	a concept of water quality which is defined by reference to standards and other requirements set out in the Regulations.
Parameters	the substances, organisms and properties listed in Schedules 1 and 2, and regulation 2 of the Regulations.		
Pathogen	an organism which causes disease.		
Pesticides	any fungicide, herbicide, insecticide or related product (excluding medicines) used for the control of pests or diseases.		
Plumbosolvency	the tendency for lead to dissolve in water.		
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.		
Raw Water	water prior to receiving treatment for the purpose of drinking.		
Remedial Action	action taken to improve a situation.		

Annex 2

The Regulatory Framework

In Northern Ireland, the primary legislative powers for transposition of the Council Directive (98/83/EC) ([the Drinking Water Directive](#)) relating to the quality of water intended for human consumption are contained in [The Water and Sewerage Services \(Northern Ireland\) Order 2006](#).

The Drinking Water Inspectorate is a statutory appointee, acting on behalf of the Department for Regional Development in respect of public water supplies, and on behalf of the Department of the Environment in relation to private water supplies. The Order confers enforcement powers on us in matters arising from both public and private water supplies.

Public Water Supplies

Northern Ireland Water Ltd (NI Water) began to operate as a government-owned company from 1 April 2007, and is the sole supplier of public drinking water in Northern Ireland. [The Water Supply \(Water Quality\) Regulations \(Northern Ireland\) 2007](#) have been in operation since that date and implement the requirements of the Drinking Water Directive. They define wholesomeness by setting standards for 39 parameters and a further 11 indicator parameters; and they specify sampling requirements for samples taken at taps, within water supply zones, at service reservoirs and water treatment works.

Regulation 30 controls the application and introduction of products and substances. The Drinking Water Inspectorate for England and Wales provides a technical resource to facilitate this approval in the United Kingdom. The current "[List of Approved Products for use in Public Water Supply in the United Kingdom](#)" can be obtained from the Drinking Water Inspectorate for England and Wales.

The 2007 Regulations were amended by the [Water Supply \(Water Quality\) \(Amendment\) Regulations \(Northern Ireland\) 2009](#), which came into operation on 15 July 2009 and included new requirements in relation to disinfection, risk assessment and monitoring of drinking water abstraction points. In addition to implementing the Drinking Water Directive (DWD), they implement parts of Council Directive 2000/60/EC ("the Water Framework Directive") and

Council Directive 2008/99/EC ("the Environmental Crime Directive").

They were further amended by [The Water Supply \(Water Quality\) \(Amendment\) Regulations \(Northern Ireland\) 2010](#) which came into operation on 20 April 2010, and include clarification of the Department's responsibilities and powers of enforcement in respect of implementation of the Regulations.

[The Water Supply \(Domestic Distribution Systems\) Regulations \(Northern Ireland\) 2010](#), which came into operation on 20 April 2010, require NI Water to report [to us] instances of water quality failures caused by the internal distribution system occurring within public buildings. It would then be our responsibility to assess the significance of these failures and, where required, ensure remedial action is undertaken by the person responsible for the building.

[The Water Supply \(Water Fittings\) Regulations \(Northern Ireland\) 2009](#) came into operation on 3 August 2009. These regulations make provisions for preventing contamination of drinking water by ensuring that all plumbing systems, water fittings and equipment connected to the public water supply are of an appropriate quality and standard. These regulations apply from the point where water leaves the water main and enters the property's service pipe. Owners and occupiers of premises and anyone who installs plumbing systems or water fittings must comply with these regulations.

[The EU Water Framework Directive](#) (WFD 2000/60/EC) came into force on 22 December 2000. Its aim is to protect all surface waters and ground waters and prevent any deterioration in quality. In the protection of drinking water sources, the WFD sets out a requirement to identify points for drinking water abstraction to be included in river basin management plans.

Private Water Supplies

[The Private Water Supplies Regulations \(Northern Ireland\) 2009](#) came into operation on 18 January 2010 and implement Council Directive 98/83/EC on the quality of water intended for human consumption in relation to private water supplies.

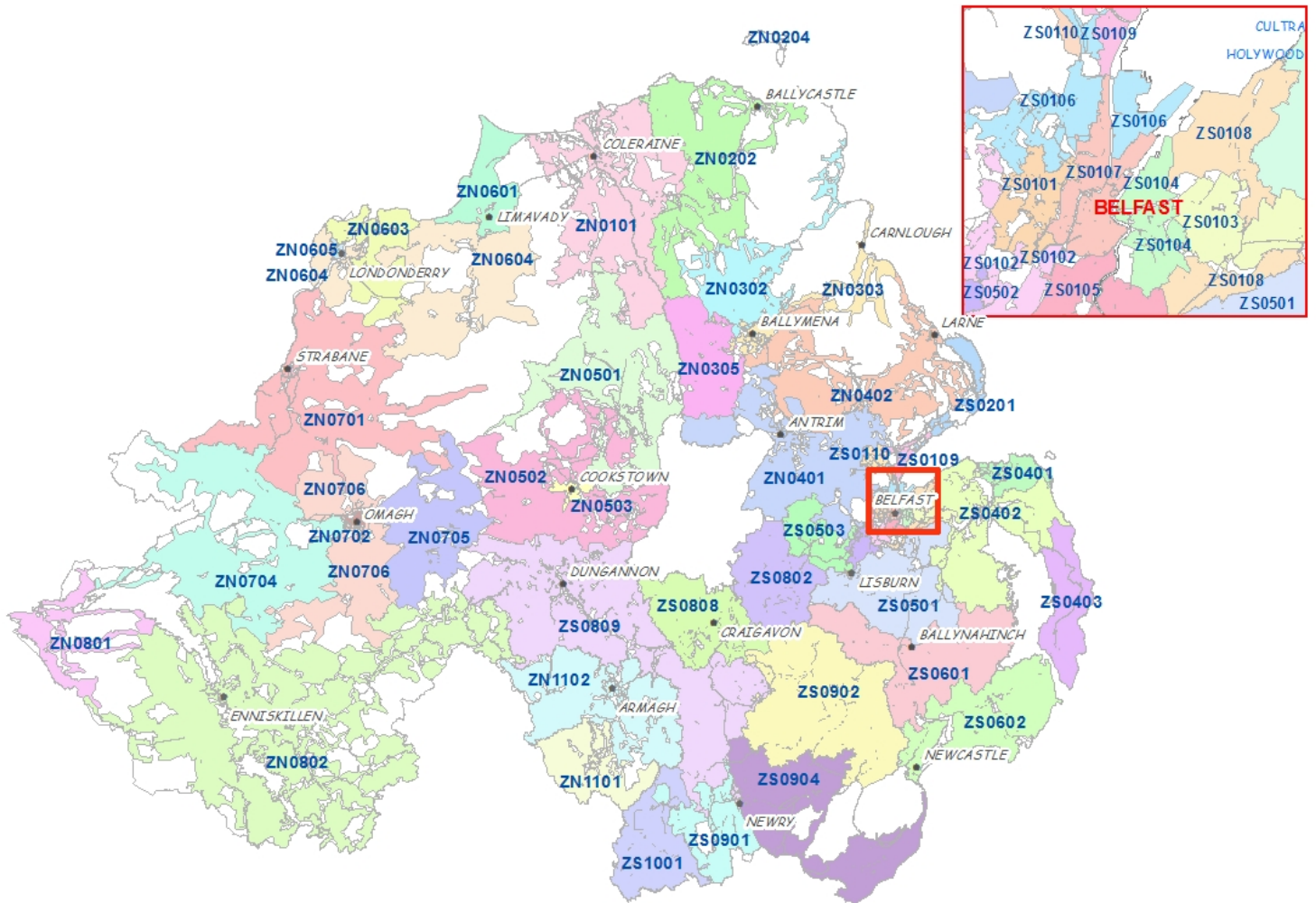
They were amended by [The Private Water Supplies \(Amendment\) Regulations \(Northern Ireland\) 2010](#), which came into operation on 20 April 2010 and provide clarification of some aspects of the 2009 Regulations, including the requirement to use only specified products or substances for private water supplies and to limit disinfection by-products to residual levels. They complete the transposition of Council Directive 98/83/EC.

Annex 3

Drinking Water Quality Tables

The following tables provide more detail of where full compliance with the regulatory standards has not been met in the individual water supply zones. The tables present, by parameter, all the contraventions and the ‘% compliance’ that occurred in water supply zones and at supply points at water treatment works during 2012. The map in Figure 3.1 shows the water supply zones from which samples are collected across Northern Ireland. These will, when used in conjunction with the information in the parameter tables that follow, allow the reader to have a more local focus on water quality issues.

Figure 3.1 Map showing Water Supply Zones across Northern Ireland



Water Quality in Water Supply Zones in 2012

Table 3.1: % Compliance - Aluminium

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0402, Killylane Ballynure	35	1	97.14
ZN0603, Carmoney Eglinton	36	1	97.22
ZS0103, Belfast Ballyhanwood	52	1	98.08
ZS0104, Dunore Breda North	36	1	97.22
ZS0105, Dunore Breda South	52	1	98.08
ZS0109, Dorisland Whiteabbey	36	1	97.22
ZS0403, Drumaroad Peninsula	24	1	95.83
ZS0808, Castor Bay Craigavon	76	1	98.68
All other zones	1,363	0	100.00
Overall	1,710	8	99.53

Table 3.2: % Compliance - Bromate

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZS0110, Dunore Point Glengormley	8	1	87.50
All other zones	384	0	100.00
Overall	392	1	99.74

Table 3.3: % Compliance - *Clostridium perfringens*

Sampling Location - Supply Points	Number of Samples	Number of Tests not Meeting the Standards per Supply Point	% Compliance
W1303, Dungonnell	36	1	97.22
W2308P, Castor Bay	260	2	99.23
W2509, Clay Lake	24	1	95.83
W3301P, Dunore Point	730	1	99.86
W3801, Drumaroad	365	2	99.45
All other supply points	1,316	0	100.00
Overall	2,731	7	99.74

Table 3.4: % Compliance - Coliform bacteria

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0401, Dunore Point Antrim	144	2	98.61
ZN0402, Killylane Ballynure	120	1	99.17
ZN0601, Ballinrees Limavady	48	1	97.92
ZN0604, Caugh Hill Dungiven	120	1	99.17
ZN0605, Creggan Derry	60	1	98.33
ZN0701, Derg Strabane	84	1	98.81
ZS0101, Dunore Ballygomartin North	108	2	98.15
ZS0102, Dunore Ballygomartin South	120	4	96.67
ZS0103, Belfast Ballyhanwood	144	3	97.92
ZS0104, Dunore Breda North	108	8	92.59
ZS0105, Dunore Breda South	132	5	96.21
ZS0106, Dunore Belfast North	120	4	96.67
ZS0107, Belfast Oldpark	108	3	97.22
ZS0108, Belfast Purdysburn	96	3	97.88
ZS0109, Dorisland Whiteabbey	108	3	97.22
ZS0110, Dunore Point Glengormley	72	2	97.22
ZS0201, Dorisland Carrick	108	5	95.37
ZS0401, Drumaroad Bangor	192	1	99.48
ZS0402, Drumaroad Comber	168	1	99.40
ZS0403, Drumaroad Peninsula	48	1	97.92
ZS0501, Drumaroad Lisburn	156	2	98.72
ZS0802, Castor Bay Lurgan	60	1	98.33
ZS0809, Castor Bay Dungannon	216	3	98.61
ZS0901, Camlough Newry West	60	1	98.33
All other zones	2,004	0	100.00
Overall	4,704	59	98.75

Table 3.5: % Compliance - *E. coli*

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0701, Derg Strabane	96	1	98.96
ZS0104, Dunore Breda North	108	2	98.15
ZS0106, Dunore Belfast North	120	1	99.17
ZS0108, Belfast Purdysburn	96	1	98.96
ZS0201, Dorisland Carrick	108	1	99.07
All other zones	4,176	0	100.00
Overall	4,704	6	99.87

Table 3.6: % Compliance - Hydrogen ion

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZS0904, Fofanny Mourne	52	1	98.08
All other zones	1,658	0	100.00
Overall	1,710	1	99.94

Table 3.7: % Compliance - Iron

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0101, Ballinrees Coleraine	76	3	96.05
ZN0202, Altnahinch Bushmills	24	1	95.83
ZN0302, Dungonnell Glarryford	24	1	95.83
ZN0305, Dungonnell Ahoghill	24	1	95.83
ZN0402, Killylane Ballynure	36	3	91.67
ZN0601, Ballinrees Limavady	24	2	91.67
ZN0603, Carmoney Eglinton	36	4	88.89
ZN0604, Caugh Hill Dungiven	36	1	97.22
ZN0702, Glenhordial Omagh	12	1	91.67
ZN0802, Killyhevlin Enniskillen	52	1	98.08
ZN1102, Seagahan Armagh	24	1	95.83
ZS0104, Dunore Breda North	36	1	97.22
ZS0107, Belfast Oldpark	36	1	97.22
ZS0108, Belfast Purdysburn	35	1	97.14
ZS0109, Dorisland Whiteabbey	36	5	86.11
ZS0201, Dorisland Carrick	36	3	91.67
ZS0501, Drumaroad Lisburn	52	1	98.08
ZS0602, Drumaroad Downpatrick	36	1	97.22
ZS0802, Castor Bay Lurgan	24	1	95.83
ZS0808, Castor Bay Craigavon	76	5	93.42
ZS0809, Castor Bay Dungannon	76	3	96.05
ZS0901, Camlough Newry West	24	2	91.67
ZS0902, Fofanny Dromore	24	1	95.83
ZS0904, Fofanny Mourne	52	2	96.15
ZS1001, Carran Hill Crossmaglen	24	1	95.83
All other zones	776	0	100.00
Overall	1,710	47	97.25

Table 3.8: % Compliance - Lead

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZS0101, Dunore Ballygomartin North	8	1	87.50
ZS0110, Dunore Point Glengormley	8	1	87.50
All other zones	376	0	100.00
Overall	392	2	99.49

Table 3.9: % Compliance - Manganese

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0603, Carmoney Eglinton	36	2	94.44
ZN0701, Derg Strabane	36	1	97.22
All other zones	1,638	0	100.00
Overall	1,710	3	99.82

Table 3.10: % Compliance - Odour

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0604, Caugh Hill Dungiven	36	2	94.44
ZN0605, Creggan Derry	24	1	95.83
All other zones	1,651	0	100.00
Overall	1,711	3	99.82

Table 3.11: % Compliance - Pesticides - Other Substances*

Sampling Location - Supply Points	Number of Samples	Number of Tests not Meeting the Standards per Supply Point	% Compliance
W1302, Lough Fea	296	1	99.66
W2509, Clay Lake	261	3	98.99
W2514, Seagahan	296	3	98.99
W2802, Carran Hill	296	3	98.99
W3317, Dorisland	296	1	99.66
W4306, Caugh Hill	296	1	99.66
W4501, Derg	296	1	99.66
All other supply points	6,508	0	100.00
Overall	8,545	13	99.85

*All pesticides other than aldrin, dieldrin, heptachlor and heptachlor epoxide

Table 3.12: % Compliance - Pesticides - Total Substances

Sampling Location - Supply Points	Number of Samples	Number of Tests not Meeting the Standards per Supply Point	% Compliance
W4306, Caugh Hill	8	1	97.50
All other supply points	223	0	100.00
Overall	231	1	99.57

Table 3.13: % Compliance - Taste

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0604, Caugh Hill Dungiven	36	2	94.44
All other zones	1,674	0	100.00
Overall	1,710	2	99.88

Table 3.14: % Compliance - Total Trihalomethanes

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0202, Altnahinch Bushmills	8	1	87.50
ZN0603, Carmoney Eglinton	8	1	87.50
ZN0604, Caugh Hill Dungiven	8	3	62.50
ZN0605, Creggan Derry	8	2	75.00
ZN0704, Lough Bradan Drumquin	8	2	75.00
ZN1101, Clay Lake Keady	8	1	87.50
All other zones	344	0	100.00
Overall	392	10	97.45

Table 3.15: % Compliance - Turbidity

Sampling Location - Zones	Number of Samples	Number of Tests not Meeting the Standards per Zone	% Compliance
ZN0402, Killylane Ballynure	35	1	97.14
ZN0601, Ballinrees Limavady	24	1	95.83
ZS0808, Castor Bay Craigavon	76	1	98.68
ZS0809, Castor Bay Dungannon	76	2	97.37
ZS0901, Camlough Newry West	24	1	95.83
All other zones	1,475	0	100.00
Overall	1,710	6	99.65

Annex 4

Events

The tables below provide a list of all notified events in 2012. These are presented in the categories: significant (Table 4.1); minor (Table 4.2); and not significant (Table 4.3).

Table 4.1: **Significant** Drinking Water Quality Events in 2012

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
2 January 2012	Killylane WTWs (47,000 population)	Treatment process compromised resulting in aluminium contraventions in the final water.	Antrim, Ballymena, Carrickfergus, Larne and Newtownabbey
7 January 2012	Caugh Hill WTWs (73,500 population)	Treatment difficulties caused by problems with the waste water recovery system and exacerbated by a non-functioning monitor led to a turbidity contravention in the final water.	Derry, Limavady and Strabane
21 & 22 January 2012	Lough Fea WTWs (29,500 population)	Problems with the pH adjustment process caused treatment difficulties and led to aluminium contraventions in the final water and related supply area.	Cookstown, Dungannon & South Tyrone, Magherafelt and Omagh
24 January 2012	Rathlin WTWs (120 population)	A turbidity contravention occurred after surface water ingress to the borehole during a period of heavy rainfall.	Moyle
27 January 2012 to date	Gelvin Road, Dungiven	Significant recurring iron contraventions at a number of properties from 2 to 63 Gelvin Road.	Limavady
13 February 2012	Lough Fea WTWs (29,500 population)	Problems with the pH adjustment process caused treatment difficulties and led to aluminium contraventions in the final water.	Cookstown, Dungannon & South Tyrone, Magherafelt and Omagh
16 March 2012	Rathlin WTWs (120 population)	Inadequate disinfection occurred after the failure of chlorine dosing equipment.	Moyle
21 – 24 March 2012	Dungonnell WTWs (33,000 population)	A malfunction in the coagulant dosing system caused loss of effective treatment. There were aluminium, iron and THM contraventions in the final water.	Antrim, Ballymena, Ballymoney, Magherafelt and Moyle
21 May – August 2012	Seagahan WTWs (30,000 population)	Lack of adequate pesticide removal treatment led to persistent MCPA and mecoprop contraventions in the final water.	Armagh, Dungannon & South Tyrone and Newry & Mourne
11 June 2012	Killyhevlin WTWs (62,000 population)	Lack of adequate treatment resulted in the presence of Cryptosporidium Oocysts in the final water.	Dungannon & South Tyrone, Fermanagh and Omagh
14 & 15 June 2012	Ballinrees WTWs (104,500 population)	A change to the raw water abstraction point significantly affected the raw water quality. This challenged the treatment process resulting in manganese contraventions in the final water.	Ballymoney, Coleraine, Limavady, Magherafelt and Moyle

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
15 & 16 June 2012	Bonneytober SR (820 properties)	Coliform bacteria were detected at the service reservoir and in the related supply area due to inadequate disinfection.	Larne
20 June – 24 July 2012	Dorisland WTWs (123,000 population)	Absence of specific pesticide removal treatment led to three MCPA contraventions in the final water.	Belfast, Carrickfergus, Larne and Newtownabbey
20 June 2012	Killyhevin WTWs (62,000 population)	Lack of adequate pesticide removal treatment led to an MCPA contravention in the final water.	Dungannon & South Tyrone, Fermanagh and Omagh
23 – 25 June 2012	Spring Hill, Glenarm (21 properties)	Coliform bacteria and <i>E. coli</i> were detected following contamination of the mains which occurred during the installation of a new section of main.	Larne
25 June 2012	Derg WTWs (35,500 population)	Lack of adequate pesticide removal treatment led to an MCPA contravention in the final water.	Derry, Omagh and Strabane
25 June 2012	Lough Fea WTWs (29,500 population)	Absence of specific pesticide removal treatment led to an MCPA contravention in the final water.	Cookstown, Dungannon & South Tyrone, Magherafelt and Omagh
28 & 29 June 2012	Glenhordial WTWs (29,500 population)	A PLC fault resulted in problems with the coagulant dosing system which caused loss of effective treatment.	Dungannon and South Tyrone, Fermanagh, Omagh and Strabane
9 July – October 2012	Carran Hill WTWs (11,000 population)	Lack of adequate pesticide removal treatment led to persistent MCPA contraventions in the final water.	Armagh and Newry & Mourne
11 - 14 July 2012	Killylane WTWs (47,000 population)	A rapid increase in raw water colour caused treatment difficulties. This resulted in an aluminium contravention in the final water.	Antrim, Ballymena, Carrickfergus, Larne and Newtownabbey
23 July 2012	Caugh Hill WTWs ¹ (49,500 population)	Lack of adequate pesticide removal treatment led to Linuron and Total Pesticide contraventions in the final water.	Derry, Limavady and Strabane
24 July – December 2012	Clay Lake WTWs (7,500 population)	Lack of adequate pesticide removal treatment led to Metoxuron and MCPA contraventions in the final water.	Armagh and Newry & Mourne
25 July – 27 September 2012	Lough Bradan Drumquin Water Supply Zone (19,000)	Treatment difficulties at Lough Bradan WTWs resulted in THM contraventions in the related supply area for approximately two months.	Dungannon & South Tyrone, Fermanagh, Omagh and Strabane
31 July – 28 August 2012	Ballinrees WTWs (104,500 population)	Lack of adequate pesticide removal treatment led to MCPA contraventions in the final water.	Ballymoney, Coleraine, Limavady, Magherafelt and Moyle
2 – 8 August 2012	Glenhordial WTWs (29,500 population)	An increase in manganese levels in the raw water led to manganese contraventions in the final water before treatment was optimized.	Dungannon and South Tyrone, Fermanagh, Omagh and Strabane

¹Although normally supplied by Caugh Hill WTWs, Creggan Derry zone was supplied by Carmoney WTWs at this time.

Date of Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Significant Event	Associated Council Area(s)
13 – 24 August 2012	Altnahinch WTWs (28,000 population)	Problems with the pH adjustment process adversely affected coagulation and led to aluminium contraventions in the final water and related supply area.	Ballymena, Ballymoney, Coleraine and Moyle
1 September 2012	Altnahinch Bushmills Water Supply Zone (28,000)	Problems with the pH adjustment process adversely affected coagulation at Altnahinch WTWs which led to a THM contravention in the related supply area.	Ballymena, Ballymoney, Coleraine and Moyle
10 September 2012	Church Hall, Glarryford (Single Property)	A 'Do Not Use Tap Water For Drinking or Cooking' notice was issued following a significant odour contravention.	Ballymena
13 September – 2 October 2012	Caugh Hill WTWs (73,500 population)	Inadequate coagulation control for removal of organic compounds led to THM contraventions in the final water.	Derry, Limavady and Strabane
13 September 2012	Derryhennet Road, Armagh (5 Properties)	Significant iron and turbidity contraventions occurred due to the condition of an old iron main.	Armagh
14 September 2012	Ballyhagan Road, Maghera (Single property)	A 'Boil Water Before Use' notice was issued to a single property after two coliform bacteria contraventions.	Magherafelt
18 September 2012	Ballyportery Road, Dunloy (2 Properties)	Significant iron and turbidity contraventions occurred due to the condition of an old iron main.	Ballymoney
16 October 2012	Dunore Point Glengormley Zone (1,500 properties)	A bromate contravention was reported. After investigation by NI Water a cause was not determined.	Antrim, Belfast and Newtownabbey
29 October 2012	York Park, Belfast (155 properties)	There was media interest in a lead contravention after the consumer expressed concern at the delay in receiving the notification from NI Water.	Belfast
1 November 2012	Caugh Hill WTWs (73,500 population)	A monitor fault resulted in problems with the coagulant dosing system which caused loss of effective treatment and led to a turbidity contravention.	Derry, Limavady and Strabane
2 November 2012	Cahard/Drumgiven Roads, Ballynahinch (50 properties)	Significant odour contraventions occurred in customer complaint samples after operational work by NI Water caused reverse flow in an old section of mains.	Down
22 November 2012	Dungonnell WTWs (33,000 population)	Treatment difficulties caused by poor optimisation of the coagulation process led to aluminium, iron and turbidity contraventions in the final water.	Antrim, Ballymena, Ballymoney, Magherafelt and Moyle
29 November 2012	Castor Bay WTWs (292,000 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined. This event was significant due to the recurring nature of the contravention.	Antrim, Armagh, Banbridge, Cookstown, Craigavon, Dungannon & South Tyrone, Lisburn, Newry & Mourne and Omagh

Table 4.2: Minor Drinking Water Quality Events in 2012

Date of Minor Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Minor Event	Associated Council Area(s)
19 January 2012	Drummaroad WTWs (384,000 population)	A coliform bacteria contravention was most likely due to unrepresentative sampling.	Ards, Banbridge, Belfast, Castlereagh, Down, Lisburn, and North Down
13 February 2012	Dungonnell WTWs (33,000 population)	An aluminium contravention in the final water did not affect the related supply area.	Antrim, Ballymena, Ballymoney, Magherafelt and Moyle
5 March 2012	Glenhordial WTWs (29,500 population)	A turbidity contravention was reported due to unrepresentative sampling.	Dungannon & South Tyrone, Fermanagh, Omagh and Strabane
13 March 2012	Rathlin WTWs (120 population)	A turbidity contravention was reported due to unrepresentative sampling.	Moyle
13 March 2012	Drummaroad WTWs (384,000 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Ards, Banbridge, Belfast, Castlereagh, Down, Lisburn, and North Down
22 March 2012	Dunore Point WTWs (500,000 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Antrim, Ards, Ballymena, Ballymoney, Belfast, Castlereagh, Larne, Lisburn, Magherafelt, Moyle, Newtownabbey and North Down
17 April 2012	Drummaroad WTWs (384,000 population)	An elevated level of aluminium detected in the final water did not affect the related supply area.	Ards, Banbridge, Belfast, Castlereagh, Down, Lisburn, and North Down
20 April 2012	Castor Bay WTWs (292,000 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Antrim, Armagh, Banbridge, Cookstown, Craigavon, Dungannon & South Tyrone, Lisburn, Newry & Mourne and Omagh
30 April 2012	Rathlin WTWs (120 population)	A turbidity contravention was reported due to unrepresentative sampling.	Moyle
8 June 2012	Rathlin WTWs (120 population)	Temporary loss of automatic disinfection but manual dosing prevented a significant event.	Moyle
19 July 2012	Drummaroad WTWs (384,000 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Ards, Banbridge, Belfast, Castlereagh, Down, Lisburn, and North Down
22 July 2012	Ballinrees WTWs (104,500 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Ballymoney, Coleraine, Limavady, Magherafelt and Moyle
25 July 2012	Castor Bay WTWs (292,000 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Antrim, Armagh, Banbridge, Cookstown, Craigavon, Dungannon & South Tyrone, Lisburn, Newry & Mourne and Omagh

Date of Minor Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Minor Event	Associated Council Area(s)
31 July 2012	Lough Bradan WTWs (38,500 population)	A hydrogen ion contravention in the final water did not affect the related supply area.	Dungannon & South Tyrone, Fermanagh, Omagh and Strabane
11 September 2012	Lough Bradan WTWs (38,500 population)	A hydrogen ion contravention in the final water did not affect the related supply area.	Dungannon & South Tyrone, Fermanagh, Omagh and Strabane
15 October 2012	Dungonnell WTWs (33,000 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Antrim, Ballymena, Ballymoney, Magherafelt and Moyle
17 October 2012	Drummaroad WTWs (384,000 population)	A turbidity contravention was reported due to the disturbance of particles in a break pressure tank.	Ards, Banbridge, Belfast, Castlereagh, Down, Lisburn, and North Down
14 November 2012	Dorisland WTWs (123,000 population)	A coliform bacteria contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Belfast, Carrickfergus, Larne and Newtownabbey
29 November 2012	Moyola WTWs (73,000 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Antrim, Coleraine, Cookstown and Magherafelt
3 December 2012	Killyhevlin WTWs (62,000 population)	A minor manganese contravention in the final water did not affect the related supply area.	Dungannon & South Tyrone, Fermanagh and Omagh
19 December 2012	Carran Hill WTWs (11,000 population)	A coliform bacteria contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Armagh and Newry & Mourne

Table 4.3: Not Significant Drinking Water Quality Events in 2012

Date of Not Significant Event	Area and Estimate of Population/ Properties Potentially Affected	Nature and Cause of Not Significant Event	Associated Council Area(s)
30 March 2012	Clay Lake WTWs (7,500 population)	A <i>Clostridium perfringens</i> contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Armagh and Newry & Mourne
11 June 2012	Longland Road, Dunnamanagh (Single Property)	A ' Boil Water Before Use ' notice was issued to a single property after Coliform bacteria and <i>E. coli</i> were detected. The contravention occurred due to the condition of an internal storage tank.	Strabane
12 June 2012	Castor Bay WTWs (292,000 population)	A coliform bacteria contravention was most likely due to unrepresentative sampling.	Antrim, Armagh, Banbridge, Cookstown, Craigavon, Dungannon & South Tyrone, Lisburn, Newry & Mourne and Omagh
24 June 2012	Carran Hill WTWs (11,000 population)	Potential pollution risk at Lough Ross from suspected fuel laundering did not affect the water treatment works.	Armagh and Newry & Mourne
17 July 2012	Camlough WTWs (21,000 population)	A turbidity contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Armagh and Newry & Mourne
24 July 2012	Armaghbrague Road, Armagh (450 properties)	Potential pollution risk after diesel waste was dumped adjacent to a Pressure Reducing Valve chamber.	Armagh
12 August 2012	Killyhevlin WTWs (62,000 population)	A turbidity contravention was reported due to unrepresentative sampling.	Dungannon & South Tyrone, Fermanagh and Omagh
6 September 2012	Clay Lake WTWs (7,500 population)	An aluminium contravention was reported due to unrepresentative sampling.	Armagh and Newry & Mourne
26 October 2012	Carmoney WTWs (42,500 population)	A turbidity contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Derry, Limavady and Strabane
31 October 2012	Camlough WTWs (21,000 population)	A turbidity contravention was reported in the final water. After investigation by NI Water a cause was not determined.	Armagh and Newry & Mourne

Annex 5

Technical Audit Programme

In 2012, 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 substantive comment on the recommendations and suggestions we provided in our audit reports.

The following table provides a summary of our 2012 Inspection Programme.

Table 5.1: Summary of the 2012 Inspection Programme

Location	Audit Activity	Number of Recommendations ¹	Number of Suggestions ²
'Laboratory Information Management System' (LIMS)	To check that data is adequately managed by the 'Laboratory Information Management System'.	5	0
Operational Networks	To check that good practice is being followed in repair and maintenance of the network.	8	7
Purdysburn SR	To check that good practice is being followed in the storage and distribution of treated water.	4	2
Westland House Laboratory	A vertical audit of two samples to check that good practice in the analysis of water samples is being operated and appropriate records maintained.	4	2
Glenhordial WTWs	To check that good practice in the water treatment process is being operated.	9	3
Drinking Water Safety Plans (DWSPs)	To check that good practice in the assessment and mitigation of risks to drinking water safety, from source to tap, is being operated.	13	11

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 6

Enforcement Orders

Table 6.1 provides a summary of enforcement action taken by us under Section 30, and Section 31(3)(a) of The Water and Sewerage Services (Northern Ireland) Order 2006. On our website¹ you can access full details on Enforcement Notices issued in respect of each Consideration of Provisional Enforcement Order (CPEO) and Provisional Enforcement Order (PEO). It details the remedial actions to be completed by NI Water, in the form of an Undertaking which are accepted as part of the CPEO process, or as a requirement under a PEO.

Table 6.1: A Summary of PEOs and CPEOs in Place during 2012

CPEO or PEO Reference	Water Treatment Works (WTWs) and Associated Water Supply Areas	Parameter	Progress made in 2012
2010			
CPEO/10/01	Dorisland Whiteabbey and Dorisland Carrick Water Supply Zones	Iron	The mains rehabilitation work associated with this Undertaking is complete. A 'Completion of Undertaking' notice was issued to NI Water in July 2012.
CPEO/10/02	Altmore Cabragh Water Supply Zone	Iron	The zone is now supplied from Castor Bay WTWs from April 2011. The other mains rehabilitation work associated with this Undertaking is also complete. A 'Completion of Undertaking' notice was issued to NI Water in July 2012.
CPEO/10/03	Altnahinch Bushmills Water Supply Zone	Iron	The mains rehabilitation work associated with this Undertaking is complete. A 'Completion of Undertaking' notice was issued to NI Water in July 2012.
2011			
CPEO/11/01	Not Applicable	Breach of regulation 9(3) – requirement to schedule it's samples at regular intervals	In relation to the remediation measures associated with this Undertaking, NI Water now has new internal procedures and reporting arrangements to ensure an appropriate spread of samples are taken throughout the year. A 'Completion of Undertaking' notice was issued to NI Water in December 2012.
CPEO/11/02	Killyhevlin WTWs and Associated Supply Area	Taste and odour	As part of the remediation measures associated with this Undertaking includes NI Water completing a feasibility study into treatment arrangements at this works, along with the refurbishment of filters, and additional sampling. These actions were completed during 2012 and a 'Completion of Undertaking' notice was issued to NI Water in December 2012.

¹www.doeni.gov.uk/niea/water-home/drinking_water/public_water/enforcement_and_legal_action-2.htm

CPEO or PEO Reference	Water Treatment Works (WTWs) and Associated Water Supply Areas	Parameter	Progress made in 2012
2012			
CPEO/12/01	Dorisland WTWs and Associated Supply Area	MCPA	The remediation measures associated with this Undertaking required NI Water to complete a feasibility study into treatment arrangements at this works, along with additional sampling, and catchment management solutions. The actions for completion in 2012 were finished on schedule; other actions are scheduled for completion in 2013.
CPEO/12/02	Caugh Hill WTWs and Associated Supply Area	Aluminium, iron, hydrogen ion (pH), Trihalomethanes (THMs), and turbidity	Part of the remediation measures associated with this Undertaking includes NI Water putting in place additional treatment controls at this works, along with additional sampling, and catchment management solutions. The actions for completion in 2012 fell behind schedule and a PEO 12/01 was issued requiring NI Water to have appropriate treatment control in place; other actions remain scheduled for completion in 2013.
CPEO/12/03	Lough Bradan WTWs and Associated Supply Area	Trihalomethanes (THMS)	The CPEO was issued in December 2012 and a series of remedial measures were accepted in the form of an Undertaking and published in 2013.
PEO/12/01	Caugh Hill WTWs and Associated Supply Area	Trihalomethanes (THMS)	The PEO which required NI Water to complete the installation of additional measures in relation to treatment control was issued in October 2012 with completion of this work required in early 2013.

Annex 7

Research Programme

Drinking Water Quality and Health Research Programme

The Department of the Environment, Food and Rural Affairs (DEFRA) in England funds a wide range of research into drinking water quality and health. On DEFRA's behalf, the Drinking Water Inspectorate for England and Wales manages the national Drinking Water Quality and Health Research Programme (DWQH) with input from relevant stakeholders, including the drinking water quality regulators for Scotland and Northern Ireland.

The objective of the DWQH is to provide the science base for policy on drinking water quality, encompassing both health and consumer acceptability issues.

Further information on current and future research is available from the 'Drinking Water Inspectorate for England and Wales' website¹.

¹<http://dwi.defra.gov.uk/research/index.htm>

Annex 8

Private Water Supplies

Private water supplies are defined in The Water and Sewerage Services (Northern Ireland) Order 2006 as any supplies of water provided otherwise than by Northern Ireland Water Ltd (NI Water). Private water supplies are diverse in nature and range from those which serve single domestic dwellings through to those supplying large commercial and public premises.

Private Water Supplies Regulations

[The Private Water Supplies Regulations \(Northern Ireland\) 2009](#) (as amended in 2010) transpose the 1998 European Drinking Water Directive in respect of private supplies. Accordingly, the same drinking water quality standards are applied to private water supplies as for the public water supply.

Private supplies to single domestic dwellings are not required to be monitored under the 2009 Regulations. We do, however, continue to offer appropriate advice to all private water supply owners and users. The regulations also exclude bottled water suppliers, who are regulated under [The Natural Mineral Water, Spring Water and Bottled Water Regulations \(Northern Ireland\) 2007](#).

As well as establishing a monitoring programme for all registered private water supplies, the regulations require that a risk assessment is carried out for each supply to identify areas where there may be potential risks of contamination. This assessment includes the whole private water supply system, from source to tap. These assessments are similar to the drinking water safety plans in place for the public water supply.

In the event of a failure, any contraventions of the wholesomeness standards in the regulations must be investigated and followed up to ensure compliance. If compliance cannot be achieved through informal agreement, we can apply more formal mechanisms to secure the required improvement (e.g. Notices). The regulations also contain provision for the issuing of Notices which could be used to

restrict the use of a supply in circumstances where there is a risk to health from consuming or using the water.

There is a further requirement in the regulations for any newly installed products or substances, used in the provision of a private supply, to be approved for use with drinking water. The current "[List of Approved Products for use in Public Water Supply in the United Kingdom](#)" can be obtained from the Drinking Water Inspectorate for England and Wales.

Roles and Responsibilities

The Drinking Water Inspectorate, acting on behalf of the Department of the Environment, has a regulatory responsibility for private supplies which are used for drinking, cooking, food preparation or other domestic purposes (including personal hygiene); or those used in commercial food production: the manufacture, processing, preservation, or marketing of food or drink for human consumption.

We implement these regulations with the support of staff from the Environmental Health Department of local councils who collect samples, assist in follow-up investigations and carry out risk assessments at private water supplies.

The regulations require that the sampling and risk assessments of private water supplies are undertaken by a competent person. We have a training programme in place for Environmental Health officers carrying out these duties on our behalf. The '[Private Water Supplies Sampling Manual - A Field Guide](#)', published by us in December 2009, provides details of our standardized sampling methods which have been adopted as guidance throughout the UK.

Persons involved in supplying water from a private water source to others, either as a shared domestic supply or through a supply to public premises or a food business, have a duty of care for the safety of the water being provided. They also have a responsibility to take any appropriate remedial actions identified by risk assessment or following an

investigation into a failure of the supply to meet the drinking water quality standards.

In addition, we offer advice to owners/users of all private supplies, including those to single domestic dwellings, on action that can be taken to protect human health from the potential adverse effects of a contaminated water supply. An advice leaflet, '[Is your private water supply safe?](#)' (published by us in December 2010) is available on our website or by contacting us. This leaflet highlights the risks associated with private supplies and how to protect against them.

Register of Supplies

We are required to hold a register of private supplies to which the regulations apply. The owners/users of private water supplies for

commercial or domestic purposes, other than to single domestic dwellings, must register their supply with us by completing a [Private Water Supplies Registration Form](#).

Monitoring of Supplies

Private supplies are split into two main types for the purposes of monitoring under the regulations:

- (i) large supplies (≥ 10 cubic metres or ≥ 50 persons per day) or any commercial/public supplies (irrespective of volume used); and
- (ii) small domestic supplies to two or more private dwellings (< 10 cubic metres or < 50 persons per day).

Annex 9

Useful Contacts

Northern Ireland Water Ltd (NI Water)

NI Water is responsible for providing all public water supplies and sewerage services in Northern Ireland.

Web address: www.niwater.com

Tel: 08457 440088

E-mail: waterline@niwater.com

Address: Northern Ireland Water Ltd
PO Box 1026

Northern Ireland Utility Regulator

The 'Utility Regulator' focuses on ensuring that value for money water and sewerage services are provided.

Web address: www.uregni.gov.uk/water

Tel: +44 (028) 9031 1575

E-mail: info@uregni.gov.uk

Address: Queens House
14 Queen Street
Belfast BT1 6ED

Consumer Council for Northern Ireland (CCNI)

CCNI aims to promote and safeguard the interests of all consumers in Northern Ireland.

Web address: www.consumerCouncil.org.uk

Tel: +44 (0) 28 9067 2488 (Enquiries)
or 0800 121 6022 (Complaints)

E-mail: info@consumerCouncil.org.uk or
complaints@consumerCouncil.org.uk

Address: The Consumer Council
116 Holywood Road
Belfast BT4 1NY

Northern Ireland Environment Agency (NIEA)

NIEA has a duty to maintain or improve the quality of surface and underground waters in Northern Ireland.

Web address: www.doeni.gov.uk/niea/water-home

Tel: +44 (028) 9262 3100

E-mail: waterInfo@doeni.gov.uk

Public Health Agency (PHA)

PHA has responsibility for a range of functions, including: improvement in health and social wellbeing; health protection; and supporting commissioning health and social care services.

Web address: www.publichealth.hscni.net

Tel: +44 (028) 9032 1313

Address: Public Health Agency
Linenhall Street Unit
12-22 Linenhall Street
Belfast BT2 8BS

Food Standards Agency (FSA)

FSA protects the public's health and consumer interests in relation to food, including the use of water in food production.

Web address: www.food.gov.uk/northern-ireland/

Tel: +44 (028) 9041 7700

E-mail:

infosani@foodstandards.gsi.gov.uk

Address: Food Standards Agency NI
10c Clarendon Road
Belfast BT1 3BG

Local District Councils

District council's Environmental Health Departments can be contacted if you have a private water supply serving a single domestic dwelling.

Web address:

www.nidirect.gov.uk/index/contacts/local-councils-in-northern-ireland

Drinking Water Inspectorate (DWI)

DWI for England and Wales regulates public water supplies in England and Wales.

Web address: www.dwi.gov.uk

Tel: +44 (0)30 0068 6400

E-mail: dwi.enquiries@defra.gsi.gov.uk

Drinking Water Quality Regulator (DWQR)

DWQR exists to ensure that drinking water in Scotland is safe to drink.

Web address: www.dwqr.org.uk
Tel: +44 (0)131 244 0190
Address: DWQR
PO Box 23598
Edinburgh EH6 6WW

Environmental Protection Agency (EPA)

EPA is a statutory body responsible for protecting the environment in Ireland.

Web address: www.epa.ie
Tel: +353 (0) 53 916 0600
E-mail: info@epa.ie

Water UK

Water UK is the industry association that represents all UK water and waste water service suppliers at national and European level.

Web address: www.water.org.uk/home
Tel: +44 (0)207 344 1844
Address: Water UK head office
1 Queen Anne's Gate
London SW1H 9BT

UK Water Industry Research (UKWIR)

UKWIR facilitates collaborative research for UK water operators. The UKWIR programme generates sound science for regulation and practice.

Web address: www.ukwir.co.uk
Tel: +44 (0)207 344 1807
E-mail: mail@ukwir.org.uk

Foundation for Water Research (FWR)

FWR shares and disseminates knowledge about water, waste water and research into related environmental issues.

Web address: www.fwr.org
Tel: +44 (0)162 889 1589
E-mail: office@fwr.org.uk

Water Regulations Advisory Scheme (WRAS)

WRAS is an advisory scheme which aims to promote knowledge of the water regulations throughout the UK.

Web address: www.wras.co.uk
Tel: +44 (0)1495 248454
E-mail: info@wras.co.uk

The Health and Safety Executive for Northern Ireland (HSENI)

HSENI is the lead body responsible for the promotion and enforcement of health and safety at work standards in Northern Ireland.

Web address: www.hseni.gov.uk
Tel: 028 9024 3249
E-mail: mail@hseni.gov.uk
Address: 83 Ladas Drive
Belfast
BT6 9FR

World Health Organization (WHO)

WHO produces international norms on water quality and human health in the form of guidelines that are used as the basis for regulation and standard setting, in developing and developed countries.

Web address: www.who.int/water_sanitation_health/dwq/en/
E-mail: info@who.int



Create prosperity and well being through
environment and heritage excellence.

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Environmental Protection
Northern Ireland Environment Agency
Klondyke Building
Cromac Avenue
Gasworks Business Park
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ISBN 978-1-907053-56-6