Drinking Water Quality Regulator for Scotland

DRINKING WATER QUALITY
IN SCOTLAND 2016

PRIVATE WATER SUPPLIES

CONTENTS

Executive Summary

The Drinking Water Quality Regulator for Scotland (DWQR) has a role in ensuring that local authorities are meeting their responsibilities to regulate the quality of private water supplies. DWQR also regulates the quality of water supplied by Scottish Water. The role of DWQR was created by the Water Industry (Scotland) Act 2002 ("the Act"), which gives the Regulator powers to obtain information. This report fulfils the requirement under the Act that the DWQR publishes a report on the exercise of the Regulator's functions during the previous year. This report relates to the calendar year 2016 and is for private water supplies, a similar report on the quality of water supplied by Scottish Water was published in July.

Private water supplies (PWS) are drinking water supplies which are not the responsibility of Scottish Water but of their owners and users. The Private Water Supplies (Scotland) Regulations 2006 ("the 2006 Regulations") are enforced by local authorities, and the DWQR supervises this enforcement.

The sources of PWS are many and varied, and a large number of householders and businesses depend on them for their drinking water supplies. In 2016 local authorities reported to DWQR that there were 22,118 registered PWS in Scotland, 2,458 Type A and 19,660 Type B. Type A supplies are those which supply 50 or more people or 10m^3 water or more, and any PWS which is used in a commercial or public activity. The Type B classification relates to smaller, domestic supplies. Around 3.6% of Scotland's population relies on PWS for their drinking water, but a significant number of others, for example visitors and tourists, will also consume these supplies.

Environmental Health teams from local authorities annually review risk assessments and sample larger Type A PWS. In 2016, 93% of Type A PWS had either a completed or reviewed risk assessment, with 16 local authorities reporting that they had reviewed risk assessments for all of their Type A supplies. A total of 47,737 tests were carried out on samples taken from Type A PWS, with 94% of tests complying with the standards. The smaller Type B supplies fall out-with the prescribed monitoring regime but some are sampled at the request of users, grant applications or as part of public health investigations. Of those sampled, 13,472 tests were undertaken, of which 87% met the required standard.

E. coli, which has the potential to cause illness and provides an indication that faecal contamination of the supply has occurred, was detected in 11% of Type A private water supply samples taken across Scotland. This is almost unchanged from the previous year. The presence of *E. coli* indicates that the supplies or properties served by them, are either not receiving the appropriate amount of treatment before use, or that the existing treatment is not being satisfactorily managed and maintained. Given the potential risks to public health, all failures are thoroughly investigated by the local authority. Where there is a need for immediate action to safeguard their health in the short term, users are advised to boil water for human consumption or to use an alternative supply, including bottled water. Users will also be informed of any required improvement works and the timescales in which these

works must be carried out and enforcement work is initiated with the owners/users, where necessary, to improve the supply.

In 2016, a single improvement notice was served on failing supplies across the whole of Scotland. This is a significant decrease on the previous year. A number of Type A supplies continue to fail for *E. coli* every year. It is vital that such supplies are tackled and, although responsibility for private supplies rests with owners and users, local authorities are urged to continue to provide appropriate advice and DWQR expects them to make full use of the enforcement powers available to tackle such supplies.

Other parameters which recorded significant numbers of failures on private water supplies in 2016 included coliforms, colour, iron, manganese, lead and hydrogen ion (pH). Although the quality of private supplies is a complex area and improvements are not always easy to achieve or maintain, DWQR believes owners and users must take greater responsibility for the quality of their private supplies, especially where the parameters failing are of significance for health, such as *E. coli*. It is essential that owners and users recognise their responsibilities and the risk of consuming poor quality untreated water, and that they work with local authorities to obtain support to improve their private water supplies.

The data presented in this report does not indicate that there have been significant improvements in the quality of private water supplies, but it is important to recognise that there is considerable work being undertaken by local authorities and also through initiatives such as the Private Water Supplies Improvement Strategy and the VTEC/*E. coli* O157 Action Plan. These initiatives aim to secure lasting improvements not only to the quality of private water supplies but also to reduce the risk to health.

The Scottish Government does provide financial support for owners and users of PWS to support improvements through the provision of a non-means tested grant of up to £800 per property. These are available from local authorities to all who own or use a PWS. In 2016-2017, £644,088 was awarded for PWS improvements. According to the data provided by local authorities this funding improved 390 supplies.

1 Types of Private Water Supplies in Scotland

Private water supplies (PWS) are drinking water supplies which are not provided by Scottish Water and are the responsibility of the owners and users of the supplies.

In 2016, the data provided to the Drinking Water Quality Regulator for Scotland (DWQR) by local authorities stated that there are 22,118 private supplies in Scotland. This data shows that around 192,952 people (3.6% of Scotland's population) live or work in premises that rely daily on a private water supply. This figure, however, does not take into account the large numbers of the public who may use premises with a private water supply in the course of leisure activities, or visitors to Scotland each year who use these private water supplies.

In Scotland PWS fall into one of two categories, either A or B. Type A PWS are those which supply 50 or more people, provide 10 or more cubic metres a day, or regardless of the number of people served or the volume supplied, are supplying premises that are part of a commercial or public activity. These Type A supplies serve a variety of holiday lets, B&Bs, hotels, caravan parks/campsites, community halls and a range of other facilities. Type B PWS are all other domestic PWS, many of which serve single properties. **Figure 1** illustrates the data reported to DWQR for 2016 for the two different categories of supply.

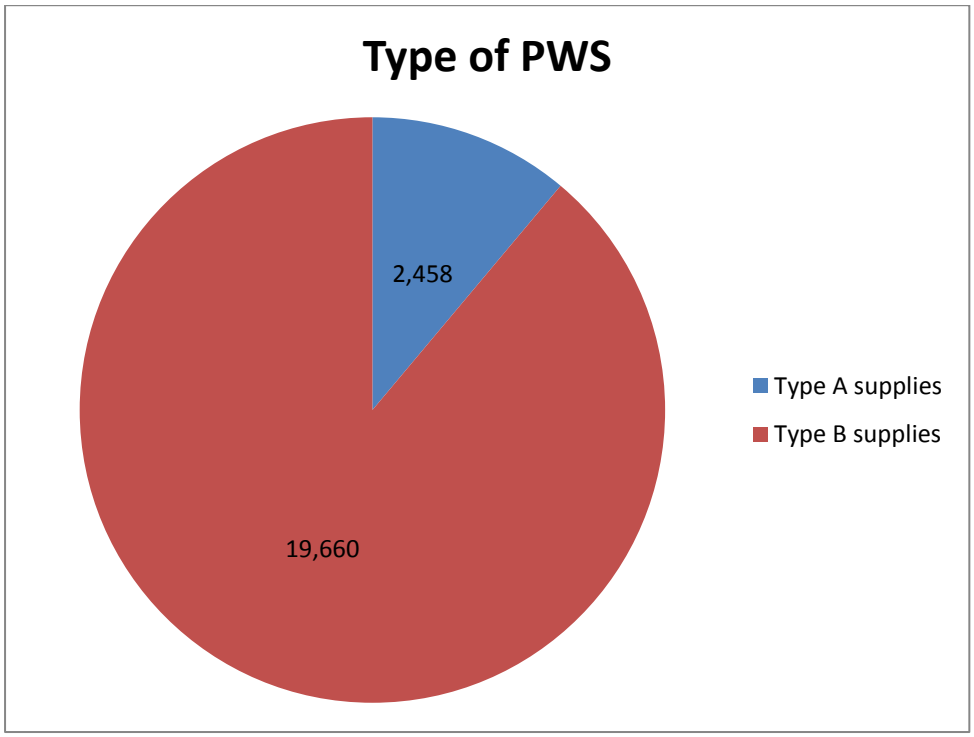

Figure 1 Private Water Supplies by Type

Private supplies vary greatly in their nature, ranging from springs and boreholes serving individual properties to larger groundwater or surface water supplies. The majority of private water supplies are located in rural areas. Some are located in areas where there is a public

supply of water available. **Table 1** provides a summary of private water supplies in each local authority area, and the population reliant upon them.

Table 1 Summary of Private Water Supplies by Local Authority Area

Local Authority	Number of Type A supplies	Number of Type B supplies	% of Population served by PWS
Aberdeen City	0	54	0.1
Aberdeenshire	234	7,571	13.7
Angus	43	405	2.9
Argyll and Bute	477	2,884	31.4
City of Edinburgh	1	16	0.0
Clackmannanshire	4	22	0.7
Comhairle nan Eilean Siar	12	39	1.8
Dumfries and Galloway	157	1,264	14.1
Dundee City	0	1	0.0
East Ayrshire	2	206	0.7
East Dunbartonshire	1	18	0.2
East Lothian	4	34	0.5
East Renfrewshire	3	131	1.4
Falkirk	2	8	0.0
Fife	34	301	1.1
Glasgow City	0	0	0.0
Highland	758	1,690	14.1
Inverclyde	7	55	1.7
Midlothian	6	58	0.5
Moray	103	714	4.7
North Ayrshire	12	266	1.9
North Lanarkshire	0	15	0.0
Orkney Islands	29	209	7.1
Perth and Kinross	288	1,304	19.7
Renfrewshire	4	122	0.4
Scottish Borders	152	1,298	13.0
Shetland Islands	2	55	0.7
South Ayrshire	28	208	1.0
South Lanarkshire	16	284	0.3
Stirling	62	368	6.1
West Dunbartonshire	7	13	0.2
West Lothian	10	47	0.3
SCOTLAND	**2,458**	**19,660**	**3.6**

Whilst on average, 3.6% of the population in Scotland use a private water supply, this can vary significantly between local authority areas, for example, a very small proportion of the population in Aberdeen City (0.1%) are reliant on a PWS compared to over 31% in Argyll and Bute.

The pie chart shown in **Figure 2** sets out those local authority areas with the greatest proportion of PWS. Almost 84% of the population served by private water supplies are contained in six local authority areas.

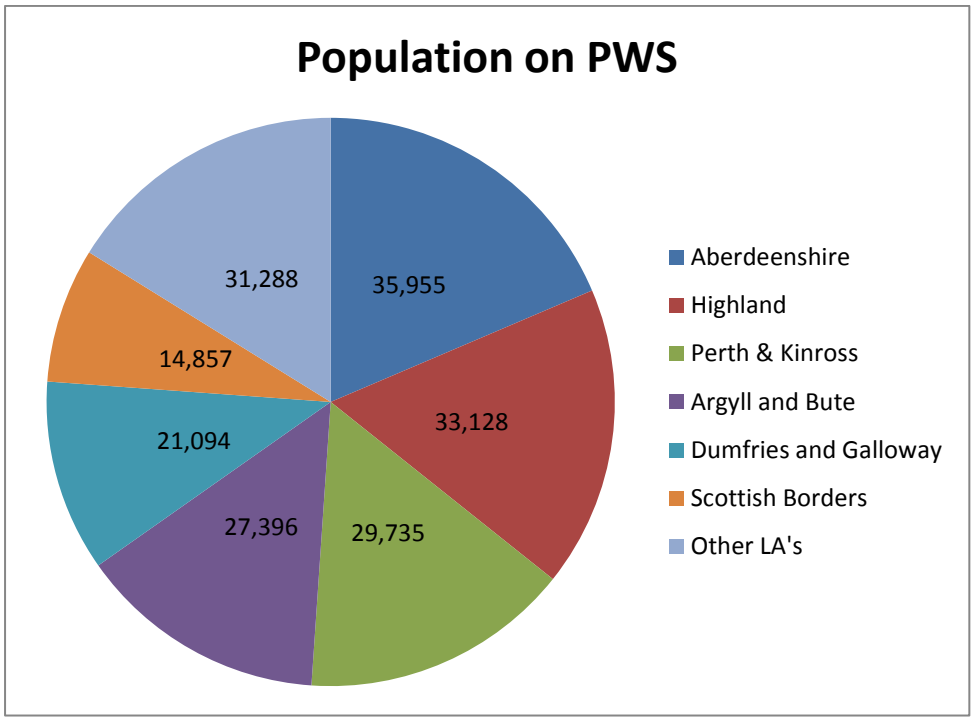

Figure 2 Distribution of Population on Private Supplies across Scotland

2 Risk Assessment and Sampling

Risk Assessment

The Private Water Supplies (Scotland) Regulations 2006 ("the 2006 Regulations") place a duty on local authorities to risk assess all Type A supplies and to review these risk assessments annually. Additionally, local authorities must provide advice and assistance on risk assessments to those responsible for Type B supplies on request. These risk assessments should determine whether the supply poses a potential risk to health and, if so, the action required to safeguard health in the short term and improve the supply in the longer term.

Table 2 below shows that in 2016, just over 93% of Type A supplies had a completed or reviewed risk assessment. This is a poorer position than last year when 96% had a completed or reviewed risk assessment.

Just over half of local authorities completed risk assessments or risk assessment reviews on all their Type A supplies; with 16 reporting 100% completion of reviews. A further eight authorities achieved compliance with requirements to assess in excess of 90% of their supplies. Four local authorities – Clackmannanshire, Orkney Islands, Scottish Borders and West Dunbartonshire completed less than 90%. The table shows that seven authorities improved on their 2015 position, eight had a poorer performance and 14 showed no change.

DWQR considers the risk assessment process to be a vital part of the management of private water supplies. Although analysis of water samples is a useful tool, this only provides an indication of the water quality at the time a sample is collected. A comprehensive and regularly updated risk assessment is a means of examining all the challenges to a supply and provides the opportunity to discuss specific issues and improvements with users of supplies. It is also the first step towards the creation of a drinking water safety plan to comprehensively manage those risks.

Table 2 Risk Assessment of Type A Supplies

Local Authority	Number of Type A Supplies	Type A Risk Assessment or Review	Risk Assessment Compliance	Comparison with 2015
Aberdeen City	0	-	-	
Aberdeenshire	234	234	100.0	No Change
Angus	43	40	93.0	Down
Argyll and Bute	477	459	96.2	Up
Clackmannanshire	4	1	25.0	Down
Dumfries and Galloway	157	155	98.7	Up
Dundee City	0	-	-	
East Ayrshire	2	2	100.0	No Change
East Dunbartonshire	1	1	100.0	No Change
East Lothian	4	4	100.0	No Change
East Renfrewshire	3	3	100.0	No Change
City of Edinburgh	1	1	100.0	Up
Comhairle nan Eilean Siar	12	11	91.7	Down
Falkirk	2	2	100.0	No Change
Fife	34	34	100.0	No Change
Glasgow City	-	-	-	
Highland	758	747	98.5	Down
Inverclyde	7	7	100.0	No Change
Midlothian	6	6	100.0	No Change
Moray	103	100	97.1	Up
North Ayrshire	12	12	100.0	No Change
North Lanarkshire	0	-	-	
Orkney Islands	29	8	27.6	Down
Perth and Kinross	288	286	99.3	Up
Renfrewshire	4	4	100.0	No Change
Scottish Borders	152	54	35.5	Down
Shetland Islands	2	2	100.0	No Change
South Ayrshire	28	28	100.0	No Change
South Lanarkshire	16	16	100.0	Up
Stirling	62	60	96.8	Up
West Dunbartonshire	7	6	85.7	Down
West Lothian	10	10	100.0	No Change
Scotland	**2,458**	**2,293**	**93.3**	

Sampling

Local authorities are required by the 2006 Regulations to sample each Type A supply in their area at least once a year. Type B supplies must be sampled by local authorities within 28 days of being requested by the owner or user of the supply and are not subject to routine annual monitoring.

Table 3 shows the number of Type A supplies that were tested for at least one parameter during the year, broken down by local authority. In 2016, across Scotland 88% of supplies were sampled which is markedly less than the 94% in 2015 and the poorest performance over the past four years. Nineteen local authorities sampled more than 90% of their Type A supplies, and of these, 12 achieved 100% compliance. Eight local authorities have consistently achieved 100% sampling of Type A supplies over the past four years, all of which have fewer than ten Type A supplies. Of the local authorities with large numbers of supplies, only Aberdeenshire, Argyll and Bute and Dumfries and Galloway were able to sample 95% or more of their Type A supplies.

DWQR has met with senior Environmental Health staff at Scottish Borders Council to review the reasons for poor sampling compliance and risk assessment review. Scottish Borders Council have shared their improvement proposals and DWQR expects to see a better compliance for 2017, but it is likely to be 2018 before the expected level of performance is achieved.

In 2016 a total of 61,209 tests were carried out on PWS; 47,737 from Type A supplies and 13,472 from Type B supplies.

Sample rates for colour, taste and odour across private water supplies remain low. Coloured water is very common in Scottish surface waters and many PWS have no treatment that will remove it. Colour is an important parameter because it provides an indication of the organic content of the water, which can have a detrimental effect on the efficacy of UV disinfection, and must be sampled at the required frequency. Taste and odour has a lower sampling compliance because analysis is not undertaken where the microbiological quality of the sample is unsatisfactory due to the potential health risks to the health and safety to staff in the laboratory.

Table 3 Type A Supply Sampling Compliance

Local Authority	Number of Type A Supplies	Supplies Sampled	2016 Compliance	2015 Compliance
Aberdeen City	-	-	-	*100*
Aberdeenshire	234	232	99	*99*
Angus	43	36	84	*93*
Argyll and Bute	477	472	99	*96*
Clackmannanshire	4	4	100	*100*
Dumfries and Galloway	157	150	96	*92*
Dundee City	-	-	-	*-*
East Ayrshire	2	0	0	*100*
East Dunbartonshire	1	1	100	*100*
East Lothian	4	4	100	*50*
East Renfrewshire	3	3	100	*100*
Edinburgh City of	1	1	100	*100*
Eilean Siar	12	8	67	*69*
Falkirk	2	2	100	*100*
Fife	34	33	97	*100*
Glasgow City	-	-	-	*-*
Highland	758	658	87	*96*
Inverclyde	7	7	100	*100*
Midlothian	6	6	100	*100*
Moray	103	100	97	*96*
North Ayrshire	12	12	100	*95*
North Lanarkshire	-	-	-	*-*
Orkney Islands	29	15	52	*71*
Perth & Kinross	288	250	87	*91*
Renfrewshire	4	4	100	*100*
Scottish Borders	152	58	38	*77*
Shetland Islands	2	1	50	*0*
South Ayrshire	28	26	93	*100*
South Lanarkshire	16	0	0	*96*
Stirling	62	60	97	*98*
West Dunbartonshire	7	7	100	*83*
West Lothian	10	10	100	*100*
SCOTLAND	**2,458**	**2,160**	**88**	***94***

3 The Quality of Private Water Supplies

Many private water supplies suffer from inadequate treatment and poor or variable raw water quality. Consequently, compliance with the standards for drinking water quality is often much lower than for Scottish Water's public supplies.

Type A Private Water Supplies

Table 4 shows some of the key parameters that Type A supplies are monitored for and how supplies are complying with the relevant standards.

Table 4 Type A Private Water Supply Compliance for Key Parameters

Parameter	No. Type A Samples	No. Type A Samples Failed	Type A % Samples Failed	Type A % Compliance
All Parameters	47,737	2,558	5.36	94.64
Coliform Bacteria	2,251	493	21.90	78.10
E. coli	2,251	245	10.88	89.12
Colour	2,171	358	16.49	83.51
Turbidity	2,226	46	2.07	97.93
Hydrogen ion (pH)	2,236	430	19.23	80.77
Aluminium	1,129	18	1.59	98.41
Iron	1,131	135	11.94	88.06
Manganese	1,002	81	8.08	91.92
Lead (10)	1,107	72	6.50	93.50

Overall, Type A compliance decreased slightly, from 94.8% last year to this year's 94.6%. **Figure 3** shows percentage compliance for Type A supplies over the past 6 years.

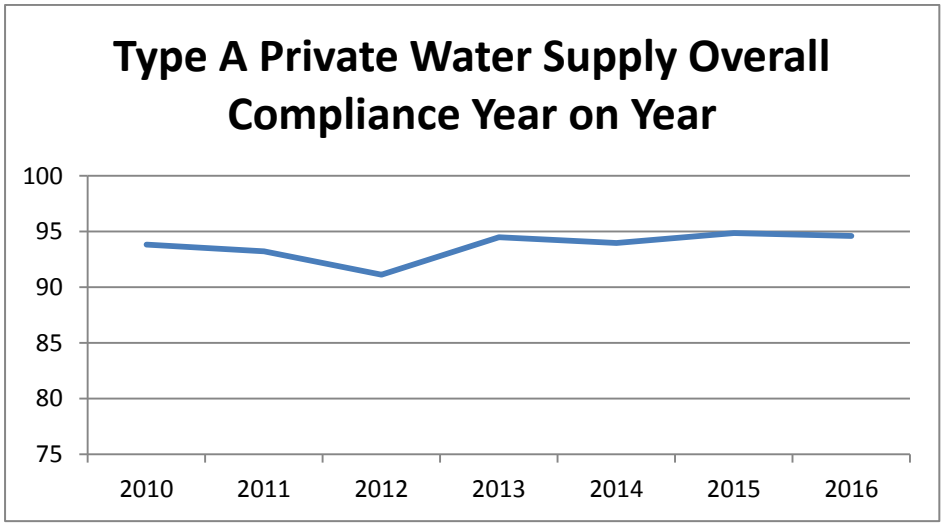

Figure 3 Type A Private Water Supply Overall Compliance Year on Year

These results suggest that, at a national level at least, the quality of Type A private water supplies has not improved overall since 2010, in spite of ongoing efforts by local authorities and the availability of a Scottish Government-funded grant to incentivise improvements.

Compliance rates for individual parameters also show little change that could be considered significant. Of the key microbiological parameters, *E.coli* improved slightly but coliform compliance deteriorated.

Simple, but well managed Type A PWS

Metals

Many Type A private water supplies in Scotland do not comply with the standards for a number of metals. Iron (11.9% of samples failing), manganese (8.1% of samples failing) and aluminium (1.6% of samples failing) are mainly naturally occurring, and many private water supplies have no treatment process capable of removing them. In many cases, simple filtration is all that is required, although in some cases a pre-oxidation stage is also needed. Iron can also be derived from corroding iron pipework and fittings within the private water supply itself.

The effect of these metals is mostly aesthetic, although they can clog filters and coat ultra-violet disinfection lamps, rendering them ineffective and potentially exposing the users to unseen microbiological hazards.

Compliance for lead and other metals found in plumbing systems such as copper is poor. These metals can dissolve into water where the water is corrosive. 6.5% of samples from Type A supplies failed the standard for lead, which is a slight improvement on last year but still of concern. Lead is a very important parameter and the standard is set for health based reasons because exposure to lead can have serious implications, particularly for young children. Compliance for copper has improved, with 4.9% of samples taken from Type A

supplies in 2016 not meeting the standard, compared with a 30% failure rate in 2015 with a similar sampling rate. On a similar theme, there were 19 nickel failures (2.7%), also likely to be related to plumbing.

Many Scottish waters are naturally soft and corrosive to metals without further treatment and conditioning. This is an essential but often neglected part of the treatment process, and many private water supplies do not have any adequate water conditioning stage to reduce the corrosivity of the water. This is also reflected in the compliance figure for hydrogen ion (pH) which shows that 19.2% of samples were outside the permitted range for this parameter.

In order to prevent dissolution of plumbing metals, soft waters need to have their alkalinity increased, which, in simple terms, means the pH and the concentration of dissolved minerals needs to be increased so that the water no longer has a tendency to corrode metals. This can be achieved simply and at low cost through the use of a filter containing a suitably alkaline medium such as limestone chips, although its success is dependent on the specific supply and raw water quality.

This issue can additionally be controlled through careful design of the plumbing system and use of the appropriate, approved, materials. Knowledge and control of the materials used in the distribution of private water supplies is often poor, and a thorough water safety plan for a supply should aim to document all materials used in the system and assess any potential impact they might have on water quality. It is worth noting that, currently, even some metal alloy fittings that are approved for water use may contain quantities of lead, so care should be taken in product selection.

Microbiology

In 2016, over 78% of samples taken from Type A private water supplies across Scotland did not contain any coliforms. This leaves 493 samples that contained at least one coliform, indicating that the disinfection process may not be operating effectively or that water was being contaminated after disinfection.

Simple UV Disinfection process at an island PWS

The percentage of water supplies failing for *E. coli* is slightly improved on 2016, with 10.9% of samples containing *E. coli*. This is still of significant concern as *E. coli* can cause illness in humans. Another faecal indicator organism, *Enterococci*, was present in 7.1% of Type A water supplies. This is unacceptable, given that Type A supplies are those most likely to be consumed by members of the public visiting a commercial enterprise or staying in tourist accommodation. In public health terms, it is standard practice by local authorities to inform users on unsatisfactory supplies where *E. coli* is isolated as a precaution and to implement appropriate controls to minimise any risk to health. These measures could include a notice to boil water for human consumption or use of an alternative supply. As part of these investigations, consideration is given to additional monitoring and sampling; discussion on the availability of grant; and potential enforcement action to secure improvements.

Table 5 shows compliance for *E. coli* by local authority. It is difficult to compare compliance results between local authorities due to the wide disparity in the numbers of supplies between local authorities and the number of different factors which may influence sample results.

Table 5 Sample Compliance for *E. coli* – Type A Supplies

Local Authority	Number of Type A Tests	Number of Type A Fails	Compliance (%)
Aberdeen City	0	-	-
Aberdeenshire	231	26	88.74
Angus	36	2	94.44
Argyll & Bute	495	92	81.41
Clackmannanshire	10	0	100.00
Dumfries and Galloway	178	9	94.94
Dundee City	0	-	-
East Ayrshire	0	-	-
East Dunbartonshire	1	0	100.00
East Lothian	7	0	100.00
East Renfrewshire	3	0	100.00
City of Edinburgh	1	0	100.00
Comhairle nan Eilean Siar	8	2	75.00
Falkirk	3	0	100.00
Fife	33	5	84.85
Glasgow City	0	-	-
Highland	660	69	89.55
Inverclyde	7	1	85.71
Midlothian	6	2	66.67
Moray	98	7	92.86
North Ayrshire	14	1	92.86
North Lanarkshire	0	-	-
Orkney	15	1	93.33

Local Authority	Number of Type A Tests	Number of Type A Fails	Compliance (%)
Perth and Kinross	269	34	87.36
Renfrewshire	5	0	100.00
Scottish Borders	58	15	74.14
Shetland	0	-	-
South Ayrshire	25	2	92.00
South Lanarkshire	11	3	72.73
Stirling	60	8	86.67
West Dunbartonshire	7	0	100.00
West Lothian	10	2	80.00
SCOTLAND	**2,251**	**281**	**87.52**

As in previous years, DWQR had met with local authorities to discuss private water supplies that have recorded *E. coli* failures for a number of years in succession. These discussions have identified that fluctuating raw water quality, inadequate or inconsistent treatment processes and poor or no maintenance of treatments systems are common causes for failure. With Type A supplies, the requirement to take a representative sample of the supply invariably results in some samples being taken from properties where the water may be untreated or treated to a lower quality than the standard of treatment in the commercial properties on the supply. The discussions will seek to understand the reasons for the recurring failures and what the local authority has done in an effort to improve the quality of the supply.

Although the quality of private supplies is a complex area and improvements are not always easy to achieve or maintain, DWQR and local authorities believe that owners and users must take greater responsibility for the quality of their private supplies, especially where the parameters failing are of significance for health, such as *E. coli*.

Enforcement and Outcomes

Once a local authority has identified that a supply has quality or quantity issues and poses a risk to health, action is taken by local authorities to ensure that all users are informed and given appropriate advice to safeguard their health in the short term (e.g. boil water for human consumption). Users must also be informed of any required improvement works and the timescales in which these works must be carried out. Where public health is not at risk, other advice may relate to cleaning and disinfecting storage tanks, replacing UV tubes or filter cartridges or cleaning out the catchment area. In many instances, local authorities work with users of the supply to achieve improvement and only where this is unsuccessful, is a formal Improvement Notice issued.

DWQR is of the opinion that when local authorities' efforts to bring about improvements through the provision of advice and support for owners and users have failed, then lasting

improvements must be achieved by putting in place a Notice formally setting out the requirements. The benefit of a Notice compared to informal advice is that if there is any disagreement about the need for a supply to be improved or who is responsible for carrying out the work, there is a formal legal process in place and the relevant person(s) is under a legal duty to carry out the necessary improvements. It also ensures any required works are carried out in a suitable timescale, as this is determined by the local authority based on the risk to health and the extent of the improvement works required.

In 2016, a single Notice was served across the whole of Scotland for a failing supply. DWQR finds this very disappointing considering the number of supplies failing to meet drinking water quality standards. From discussions with local authorities, it is clear that all approaches are tried before formal enforcement action is initiated as a last resort, and rightly so. However, improvement notices are an important tool that should be used in circumstances where other approaches have been attempted and a supply continues to fail water quality standards, potentially with health consequences for those drinking the water.

Type B Private Water Supplies

Table 6 shows some of the key parameters that Type B supplies are monitored for and how supplies are complying with the relevant standards.

Table 6 Type B Private Water Supply Compliance for Key Parameters

Parameter	No. Type B samples	No. Type B Samples Failed	Type B % Samples Failed	Type B % Compliance
All Parameters	13,472	1,722	12.78	87.22
Coliform Bacteria	1,074	454	42.27	57.73
E. coli	1,075	222	20.65	79.35
Colour	211	40	18.96	81.04
Turbidity	956	47	4.92	95.08
Hydrogen ion (pH)	1,010	278	27.52	72.48
Aluminium	105	5	4.76	95.24
Iron	596	79	13.26	86.74
Manganese	568	62	10.92	89.08
Lead (10)	955	80	8.38	91.62

Type B PWS are monitored mainly on the request of the owner or user of the supply. Consequently, the supplies sampled vary from year to year and a direct comparison of the data is difficult. For most of the main parameters, the smaller Type B supplies show a similar trend to the Type A supplies, although compliance is often slightly worse, reflecting an even greater tendency for there to be minimal treatment and management of the supply. This is

especially true with microbiological compliance where nearly 21% of samples contained *E.coli* and 42% contained coliforms. This suggests that disinfection of these supplies is only present and consistently effective in less than two thirds of supplies, and a significant proportion of users may be placing themselves at risk by consuming the water.

Compliance against the regulatory standards fell in 2016 for almost all parameters.

As in previous years, source type appears to have a significant bearing on microbiological quality of both Type A and Type B supplies. **Table 7** shows compliance of scheduled samples for microbiological parameters (in this instance, comprising coliforms, *E. coli, Clostridium perfringens, Enterococci*) by water source type, regardless of any treatment present on the supply. This clearly shows that groundwater sources, especially boreholes, are far less likely to suffer from microbiological contamination than surface water sources. Having said this, they are not completely compliant and it should not be assumed that underground waters are immune from contamination. In Scotland many groundwater supplies are heavily influenced by surface water, so are vulnerable to faecal contamination and consequently require robust treatment. Further contamination may occur between the point of abstraction and the point at which the water is consumed.

Table 7 Microbiological Compliance by Source Type

Source Type	Compliance %	
	Type A	Type B
Groundwater Borehole	96	90
Groundwater Spring	90	72
Groundwater Well	90	72
Surface Water Loch	82	85
Surface Water	92	69
Surface Water	83	66

A rudimentary, and vulnerable, surface water abstraction point for a small private water supply

4 Private Water Supply Grant

The Scottish Government introduced a grant scheme in conjunction with the 2006 Regulations to assist owners and users of private supplies to bring their supplies up to modern standards. The scheme is non-means tested and available to domestic households and businesses. The maximum grant which may be awarded is £800 per property. However the local authority may pay in excess of £800 where they are satisfied that the eligible person could not, without undue hardship, finance the expense of the approved works without such a grant.

The scheme is intended to assist with the one-off capital cost of installing treatment to help ensure the provision of safe drinking water. It does not cover the ongoing maintenance and disinfection of a private supply which is the responsibility of the user.

In the 2016-2017 financial year £644,088 was awarded for PWS improvements. According to the data provided by local authorities this money improved 390 supplies.

An example of where grant funding has made a significant difference to the consumers of a private supply is from an estate near Inverness. In 2015 Environmental Health in Highland Council were alerted by NHS Highland to a case of bacterial food poisoning where the patient lived in a dwelling served by a private water supply. An investigation by environmental health identified that the spring supply may have been the cause of the infection as the supply had no treatment and previous water samples had shown that the water was contaminated with faecal bacteria. The officer followed up this investigation by offering a grant to the estate to upgrade the supply which served three cottages. This was taken up and during 2016 the supply to the cottages was upgraded, which included source protection works, the installation of a central pH correction unit and UV filtration system. The grant funding resource for the three properties was combined and £2400 was provided in funding for the upgrade. Since the installation, the water complies with quality standards and no residents have reported illness that could be related to the water supply.

5 DWQR Activity and Research

DWQR Activity

During 2016 DWQR staff were involved in a number of activities and strands of work involving private supplies. A lot of this work will only fully show benefits in the longer term.

This includes:

PWS Strategy

The three main objectives which the strategy aims to ensure are:

- A robust, clear regulatory framework to ensure that Scotland is complying with European obligations;
- Comprehensive information and advice is available for owners and users of private water supplies and local authorities; and
- Measurable improvements in compliance and reduction in risk to public health.

Verotoxigenic *E.coli* (VTEC) Action Group

Following *E. coli* outbreaks in Scotland a multi-agency group was formed to consider ways to disrupt the transmission of VTEC/ *E. coli* O157 from source to humans. The resulting Action Plan comprises 86 recommendations designed to tackle VTEC/ *E. coli* O157 infection in Scotland. An Implementation Group oversees the progress on implementation of the recommendations and is expected to formally report on progress with the Action Plan in 2018. A number of the recommendations relate to drinking water and DWQR is represented on the public and private water supply sub-groups, which report to the Implementation Group. These actions have been included in the PWS Strategy. A copy of the Action Plan can be found at http://www.scotland.gov.uk/Publications/2013/11/8897/0

Rural Provision

DWQR are working with the Scottish Government Rural Provision Group to support the delivery of the Scottish Government priorities in rural communities, in particular with a view to improving water and sewerage provision in rural areas.

Communication

DWQR have been increasing the amount of information on the website www.dwqr.scot/private-supply/ to assist local authorities and owners and users of private water supplies. The Technical Handbook has been separated into its different sections for ease of use, and the owners and users section has been expanded.

Lead

Lead in drinking water arises mostly from plumbing in buildings: from lead pipes, lead tanks, lead solder on copper pipes or inferior quality brass fittings and taps. The Scottish Government, with support from DWQR, has established a project to review policy to drive achievement of a reduction of exposure to lead in drinking water, both in private and public supplies. The project is looking to identify enablers and to strengthen or introduce mechanisms with a range of stakeholders and influencers for the removal of lead services pipes and plumbing. The project update can be found at http://dwqr.scot/media/14148/research-current-dwqr-lead-in-drinking-water-project-briefing.pdf

Current and Completed Research

During 2016 DWQR contributed to and supported a number of research projects commissioned either by the Scottish Government or other agencies, which relate to private water supplies. Completed research papers are available either on our website: http://dwqr.scot/information/research/previous-research-projects/ or on the Centre of Expertise for Waters (CREW) website: http://www.crew.ac.uk/publications

Epidemiological Impact of Private Water Supplies

This project commenced during 2015 and aims to assess the health risks from exposure to a range of microbiological contaminants commonly found in private water supply source waters. The study will also examine existing water quality data and reported cases of illness in order to quantify the potential disease burden from untreated private water supplies. This project will report during 2017.

Innovative Solutions for Sustainable Drinking Water Treatment at Small to Medium Scale

This project aimed to survey the technology landscape (national and international) and develop a rationale for assessing the technology across a range of operational scenarios predominantly in managed private water systems. This report is now available on the CREW website: http://www.crew.ac.uk/publication/innovative-solutions-sustainable-drinking-water-treatment-small-medium-scales

Engaging Communities Around Private Supplies

The primary aim of this project is to engage communities about PWS issues and to identify improvements in engagement practices specifically relating to private/waste water supply challenges. The project also aimed to understand where there is a perceived lack of need, whether this is associated with a lack of interest or a lack of knowledge and understanding about the health risks associated with PWS. The report is now available on the CREW website: http://www.crew.ac.uk/publication/engaging-communities-private-water-supplies

ANNEX A THE REGULATORY FRAMEWORK

The regulatory standards for drinking water quality in Scotland largely stem from European Directives. These standards are based on guidelines developed by the World Health Organisation to protect public health.

Our key domestic water quality legislation includes:

Water (Scotland) Act 1980 (as amended)

- Scottish Water must supply wholesome water for domestic purposes. It is a criminal offence to supply water unfit for human consumption;
- Scottish Ministers must take enforcement action against Scottish Water if it fails in its duty to supply wholesome water (as defined in the relevant regulations) unless the failure is trivial or Scottish Water is complying with a legally binding undertaking to remedy the matter;
- Local authorities must take appropriate steps to keep themselves informed about the wholesomeness of public water supplies in their area and notify Scottish Water if not satisfied; and
- Local authorities are required to secure improvements to private water supplies if they consider them necessary.

Water Industry (Scotland) Act 2002

- Created the post of Drinking Water Quality Regulator for Scotland (DWQR);
- Set out responsibility for enforcing the Water Supply (Water Quality) (Scotland) Regulations 2001;
- Defines DWQR's independent status;
- Defines DWQR power to obtain information, power of entry or inspection and power of enforcement; and
- DWQR also has emergency power to require a water supplier to carry out works to ensure quality of water supplied is safe for public consumption.

The Private Water Supplies (Scotland) Regulations 2006

- Define wholesomeness in accordance with the EC Drinking Water Directive 98/83/EC;
- Require local authorities to classify private supplies according to size and use;

- Require local authorities to monitor, risk assess and report on private supplies in their area according to classification and risk; and

- Require local authorities to provide advice to private supply owners and ensure improvements are carried out.

The Private Water Supplies (Grants) (Scotland) Regulations 2006

- Provides for grants to be paid to eligible persons to enable them to improve their private water supply; and

- Is administered by local authorities and provides for non-means tested grants of up to £800 per property.

The Water Quality (Scotland) Regulations 2010

- Further transpose the requirements of Directive 98/83/EC most particularly in respect of water quality failures which are attributable to the domestic distribution system in establishments and premises where water is supplied to the public;

- Require local authorities to investigate such water quality failures to determine its cause;

- Instruct remedial action through the service of a Notice on the person who owns, or is responsible for, the domestic distribution system;

- Ensure that affected consumers are notified of any risk to their health;

- The 2010 Regulations also make a number of technical amendments to The Water Supply (Water Quality) (Scotland) Regulations 2001 and The Private Water Supplies (Scotland) Regulations 2006; and

- Create a duty to minimise contamination from disinfection by-products and to verify the effectiveness of the disinfection process.

The Private and Public Supplies (Miscellaneous Amendments) (Scotland) Regulations 2015

- Adds radon as an indicator parameter; and

- Moves colour, taste and odour and pH from national parameters to indicator parameters.

ANNEX B PWS INFORMATION LETTERS ISSUED DURING 2016

There were no Information Letters issued during 2016 in relation to private water supplies.

Copies of letters issued are available on the DWQR website:

www.dwqr.scot

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