



Drinking Water Quality Regulator
for Scotland

DRINKING WATER QUALITY REGULATOR
FOR SCOTLAND



Private Water Supplies

Drinking Water Quality in Scotland 2021

Contents

EXECUTIVE SUMMARY	1
1. TYPES OF PRIVATE WATER SUPPLIES IN SCOTLAND.....	4
2. RISK ASSESSMENT.....	7
3. THE QUALITY OF PRIVATE WATER SUPPLIES.....	11
3.1 Regulated Private Water Supplies.....	11
3.1.1 Sampling and Overall Performance.....	11
3.1.2 Microbiology.....	15
3.1.3 Metals.....	17
3.1.4 Enforcements and Outcomes.....	19
3.2 Type B Private Water Supplies.....	22
4. DWQR ACTIVITY AND RESEARCH	24
5. ANNEXES.....	25
5.1 Information Letters issued during 2021.....	25
5.2 Regulatory Framework.....	25

Index of tables

Table 1 Summary of Private Water Supplies by Local Authority Area	5
Table 2: Risk Assessment of Regulated Supplies.....	9
Table 3: Regulated Supplies Sampling Compliance.....	12
Table 4: Regulated Private Water Supply Compliance for Key Parameters.....	13
Table 5: Microbiological Compliance 2021 by Local Authority Based on Supplies Sampled...	16
Table 6: Metals Compliance 2021 by Local Authority	18
Table 7: Investigations and Enforcement Notices 2021.....	20
Table 8: Type B Supplies Key Parameters Compliance.....	22

Index of figures

Figure 1: Private Water Supplies by Type.....	4
Figure 2: Numbers of Private Water Supplies by Local Authority.....	6
Figure 3: DWQR Risk Assessment Tool.....	7
Figure 4: Number of Councils Grouped by % Risk Assessment Completion for Regulated Supplies.....	8
Figure 5: Highest Average Mitigated Scores in DWQR Risk Assessment Tool	10
Figure 7: Type B Supplies Compliance by Source 2021	23

EXECUTIVE SUMMARY

Private water supplies (PWS) are drinking water supplies that are not the responsibility of Scottish Water but of their owners and users. PWS regulations are enforced by local authorities. The Drinking Water Quality Regulator for Scotland (DWQR) supervises local authorities' compliance with their regulatory duties in regard to the quality of PWS. 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. It relates to the calendar year 2021 and is for PWS. A similar report on the quality of water supplied by Scottish Water was published on 23 August 2022.

The PWS regulations were revised in October 2017, bringing into force The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017 ("the 2017 regulations"). These cover large domestic or commercial supplies. Smaller household PWS (referred to as Type B supplies) continue to be governed by The Private Water Supplies (Scotland) Regulations 2006 ("the 2006 regulations").

Local Authorities are responsible for maintaining a register of all PWS, annual sampling of Regulated Supplies, conducting risk assessments for all Regulated supplies, providing advice and the administering grant. They are required to submit this information annually to the DWQR. This report is based on these data returns and whilst this report aims to draw out key trends, the quality of data from some local authorities is poor; with Angus Council not submitting a return at all and others sending incomplete returns. This is a perennial problem which has not been resolved despite issuing standardised reporting templates and providing training courses.

In 2021 local authorities reported to DWQR that there are 22,459 PWS in Scotland, supplying around 185,850 people. Of these 4,417 are Regulated (formerly "Type A") supplies and 18,042 are Type B. Regulated supplies are large domestic supplies and any PWS which is used in a commercial or public activity (including privately rented accommodation) irrespective of size. The Type B classification relates to smaller, domestic supplies. 3% of Scotland's population relies on PWS for their drinking water, but a significant number of others will also use these supplies regularly, including visitors and tourists.

Environmental Health teams from local authorities are required to sample Regulated supplies annually and undertake a full risk assessment every five years. These frequencies are set out in the 2017 regulations. In 2021, only 53% of Regulated supplies registered with local authorities were sampled. This is partly due to the impacts of the Covid-19 pandemic and partly because the reclassification of privately rented properties from Type B to Regulated increased the number of Regulated supplies significantly for some councils.

Risk assessment is an important way of ensuring supplies remain consistently safe. Every Regulated PWS is required to be fully risk assessed every five years, and these must be recorded on the DWQR's web-based Risk Assessment Tool. By June 2022, 20% of the 4,417

Regulated PWS had a completed risk assessment recorded on the Tool. The 2017 regulations require that all Regulated supplies were risk assessed by 1 January 2022.

39,496 tests were carried out for key parameters on samples taken from Regulated PWS to check for a range of contaminants. In total, 91.5% of these tests complied with the standards. Type B supplies fall outside the prescribed monitoring regime but some are sampled at the request of users, prior to grant applications or as part of public health investigations. Of those that were sampled, 8,181 tests were undertaken for key parameters and 86% of these met the required standards.

E. coli provides an indication that faecal contamination of the supply has occurred, and has the potential to cause illness. It was detected in 12.1% of Regulated supply samples taken across Scotland during 2021. The presence of *E. coli* indicates that the supplies are either not receiving the appropriate amount of treatment before use, or that the existing treatment is not being satisfactorily managed and maintained. Enforcement action may be initiated by local authorities on owners and/or users to ensure necessary improvements are made.

In 2021, two Enforcement Notices were served by local authorities across Scotland. Although responsibility for PWS rests with owners and/or users, local authorities continue to provide appropriate advice and support. DWQR expects them to make full use of the enforcement powers available to tackle and deliver improvements where other methods are not successful.

In considering this report, it is important to recognise the ongoing impact the Covid-19 pandemic had in private water supply activities throughout 2021. The trends and figures in this report when compared to previous years should therefore be treated with caution. The lockdown restrictions through parts of the year resulted in non-essential businesses closing and the movement of people restricted. Local authority services were paused (other than essential services) and environmental health teams took on new additional duties, together with Police Scotland, to enforce the restrictions with businesses and communities. The impact on private water supply activities was as follows:

- A reduction in the ability of local authorities to take samples from private water supplies.
- Inability to progress risk assessments at the planned pace.
- Lack of progress with grant scheme due to inability of contractors to undertake work.
- Difficulties in accessing materials and systems because of Covid-19 restrictions on work and travel. This was particularly an issue for ferries to island communities.

Drinking Water Quality in Scotland 2021

Private Water Supplies (PWS)

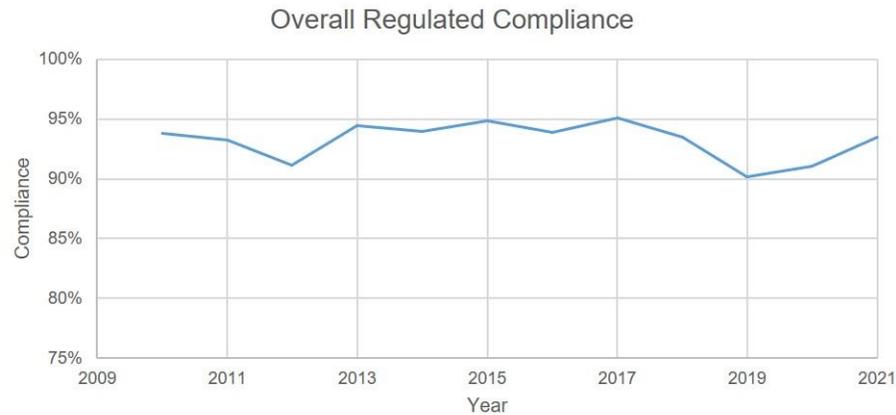
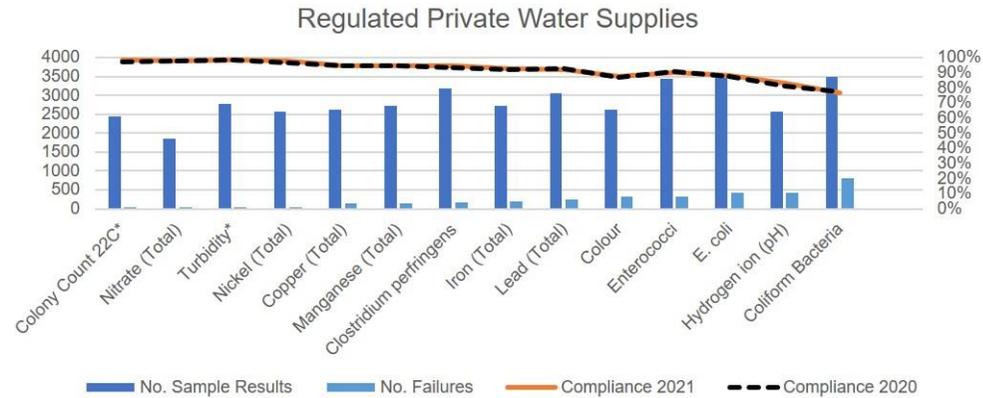
Data Source: Local Authorities are responsible for maintaining a register of all PWS, annual sampling of Regulated Supplies, conducting risk assessments for all Regulated supplies, providing advice and the administering grant. This information is submitted annually to the DWQR.

There are 22,459 numbers of Private Water Supplies serving 185,850 in Scotland

4,417 are Regulated Supplies
18,042 are Type B



Key Parameters



Local Authority Statutory Work

53% of Regulated Private Water Supplies Sampled in 2021

20% of Risk Assessments carried out in last 5 years

2 Enforcement Notices Failing Regulated PWS

1,146 Investigations undertaken

Information based on data returns from local authorities with the aim to draw out key trends. Some Local Authorities did not supply datasets, and others were incomplete.

1. TYPES OF PRIVATE WATER SUPPLIES IN SCOTLAND

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 2021, the data provided to the DWQR by local authorities showed that there are 22,459 private supplies in Scotland. This data confirms that around 185,850 people live or work in premises that rely daily on a PWS. This figure, however, does not take into account the large numbers of people such as visitors and tourists who may use premises with a private water supply.

In Scotland, PWS fall into one of two categories. Those which supply 50 or more people, provide 10m³ or more of water per 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 are Regulated supplies (formerly known as Type A supplies). These supplies serve a variety of premises, e.g. holiday lets, B&Bs, hotels, caravan parks/campsites, schools, community halls and a range of other facilities. Type B supplies are all other domestic PWS, many of which serve single properties. Figure 1 illustrates the relative proportions of the two different categories of supply reported to DWQR for 2021.

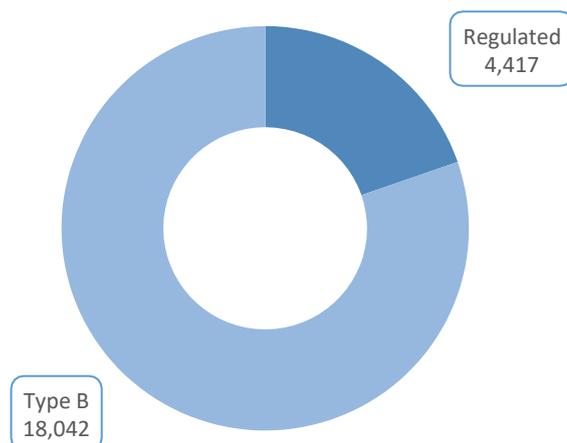


Figure 1: Private Water Supplies by Type

Water sources for PWS vary greatly in their size and nature. These range from springs and boreholes serving single dwellings to larger boreholes or surface water supplies supplying a community.

The majority of PWS are located in rural areas, though some are located in areas where there is a public supply of water available. Table 1 provides a summary of PWS in each local authority area.

Table 1 Summary of Private Water Supplies by Local Authority Area

Local Authority	No. Regulated Supplies	No. Type B Supplies	Total Supplies
Aberdeen City	6	46	52
Aberdeenshire	581	7470	8051
Angus	No data	No data	No data
Argyll and Bute	509	2844	3353
City of Edinburgh	7	6	13
Clackmannanshire	5	24	29
Comhairle nan Eilean Siar	16	39	55
Dumfries and Galloway	517	957	1474
Dundee City	1	1	2
East Ayrshire	28	213	241
East Dunbartonshire	1	16	17
East Lothian	26	18	44
East Renfrewshire	7	132	139
Falkirk	1	5	6
Fife	74	229	303
Glasgow City	0	0	0
Highland	1056	1681	2737
Inverclyde	11	49	60
Midlothian	37	26	63
Moray	269	567	836
North Ayrshire	26	259	285
North Lanarkshire	6	15	21
Orkney	31	210	241
Perth and Kinross	636	1012	1648
Renfrewshire	17	82	99
Scottish Borders	283	1208	1491
Shetland	1	57	58
South Ayrshire	133	159	292
South Lanarkshire	42	265	307
Stirling	77	394	471
West Dunbartonshire	5	15	20
West Lothian	8	43	51
Total	4,417	18,042	22,459

Whilst on average 3% of the population in Scotland use a PWS, this can vary significantly between local authority areas. For example, a very small proportion of the population in both Aberdeen City and Midlothian areas (<0.4%) are reliant on a PWS, compared to over 31% in Argyll and Bute.

The chart shown in Figure 2 sets out those local authority areas with the greatest numbers of PWS. Almost 85% of PWS in Scotland are contained in six local authority areas.

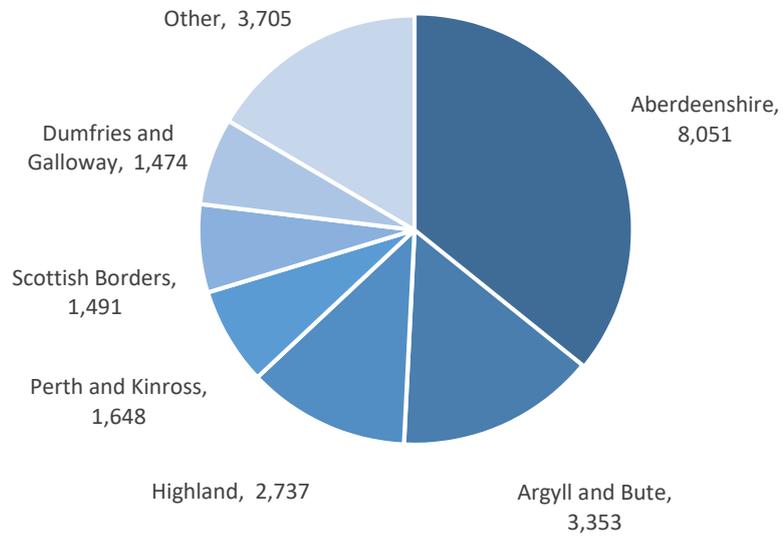


Figure 2: Numbers of Private Water Supplies by Local Authority

2. RISK ASSESSMENT

Risk assessment plays a vital role in assuring the safety of PWS and identifying any improvements that are required. This is because risk assessments consider all possible factors that could affect the safety of the supply under all conditions, whereas sampling only gives a snapshot of water quality at the time and location of sampling. The process also takes account of any mitigating measures that are in place to reduce risk and ensures that these are documented.

The 2017 regulations place a duty on local authorities to carry out risk assessments on all Regulated supplies. Each supply must be risk assessed once every five years. Additionally, local authorities must provide, on request, advice and assistance on risk assessments to those responsible for Type B supplies. 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.

DWQR has provided local authorities with an online tool to manage and store risk assessments (Figure 3). A risk assessment has to be carried out in accordance with a method approved by DWQR. Currently, only the online tool meets this criterion, and the expectation has been communicated that all Regulated supply risk assessments are to be stored on the tool. This ensures that all risk assessments are undertaken to a minimum standard and enables DWQR to monitor progress and report on risks as well as sample data.

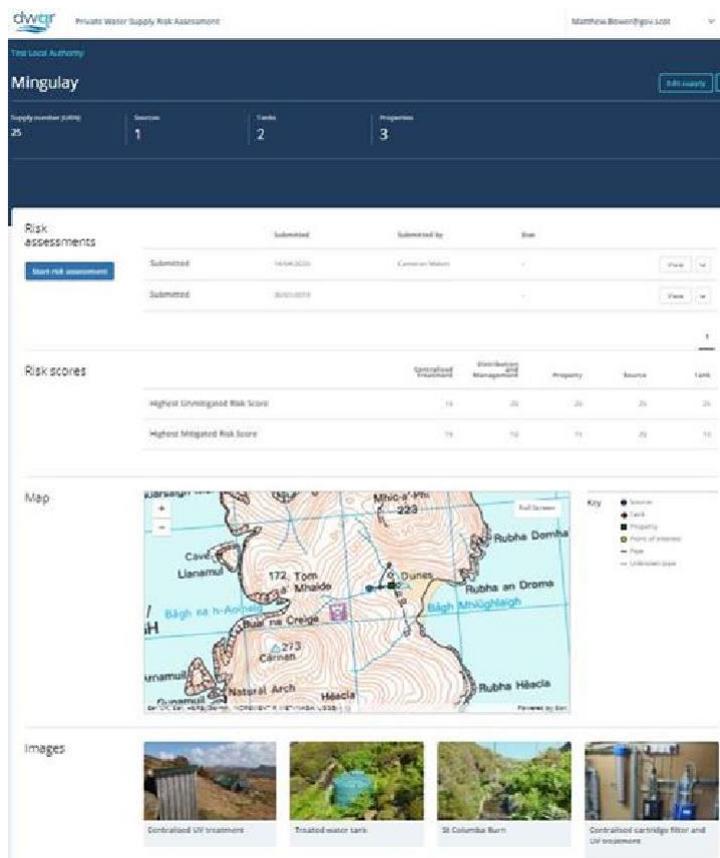


Figure 3: DWQR Risk Assessment Tool

The 2017 regulations require all initial risk assessments to be completed by 1 January 2022. It was accepted that this target would be difficult for local authorities to meet, with delays in the deployment of the risk assessment tool and the Covid-19 pandemic both making a contribution. However, it is clear from the data that progress falls far short of what might be considered acceptable. Figure 4 shows that more than half of local authorities have risk assessed less than 50% of their Regulated supplies. Six councils have risk assessed less than 10% of their Regulated supplies.

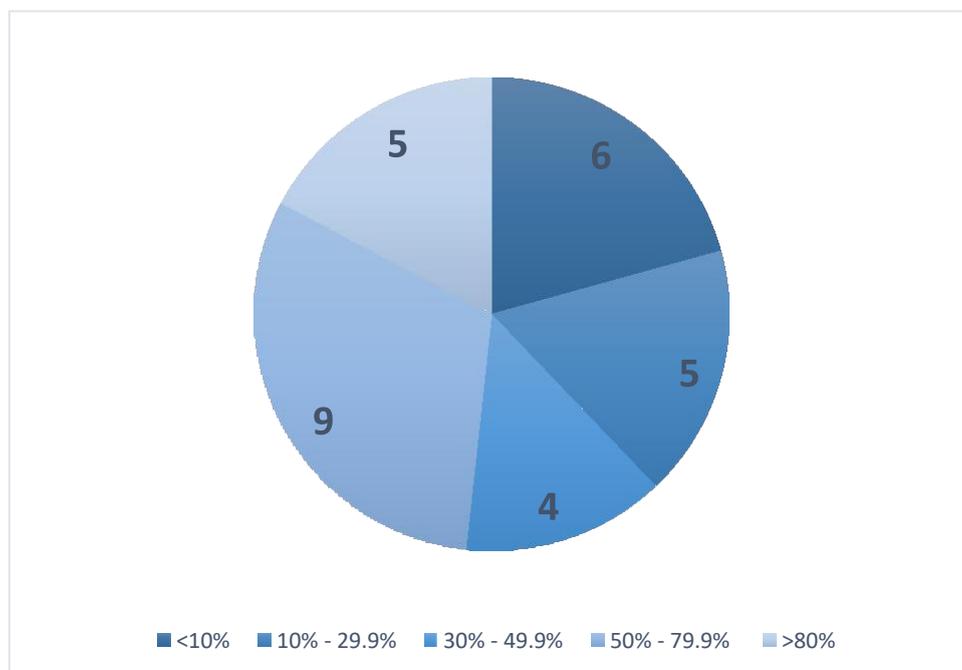


Figure 4: Number of Councils Grouped by % Risk Assessment Completion for Regulated Supplies

Table 2 shows progress made by individual local authorities. It is apparent that there is significant variation in the progress made, and this is not always related to the number of supplies in the council area. Some councils are beginning to make progress compared with the picture in 2021, although for most there is a long way to go, with only around a fifth of Regulated supplies having been risk assessed.

Table 2: Risk Assessment of Regulated Supplies*

* Data collected June 2022

Local Authority Name	Regulated PWS reported in Annual Return (Total)	Regulated Supplies Registered on RA Tool (Total)	Regulated RAs Completed on RA Portal (Total at June 2022)	Regulated PWS Risk Assessed (% at June 2022)	Regulated RAs Partially Complete (Total at June 2022)	Regulated RAs Completed In Year (Total June 2021-June 2022)
Aberdeen City Council	6	8	7	116.7	0	0
Aberdeenshire Council	581	394	118	20.3	70	56
Angus Council	no data	53	4	no data	15	4
Argyll and Bute Council	509	555	55	10.8	20	50
City of Edinburgh Council	7	4	2	28.6	1	2
Clackmannanshire Council	5	6	2	40.0	3	0
Comhairle nan Eilean Siar	16	15	5	31.3	7	5
Dumfries and Galloway Coun	517	226	88	17.0	8	54
Dundee City Council	1	0	0	0.0	0	0
East Ayrshire Council	28	2	0	0.0	1	0
East Dunbartonshire Council	1	1	1	100.0	0	0
East Lothian Council	26	24	12	46.2	14	1
East Renfrewshire Council	7	5	0	0.0	4	0
Falkirk Council	1	1	1	100.0	1	1
Fife Council	74	75	43	58.9	0	31
Glasgow City Council	0	0	0	n/a	0	0
Highland Council	1056	875	190	18.0	25	120
Inverclyde Council	11	12	8	72.7	0	3
Midlothian Council	37	37	3	8.1	21	0
Moray Council	269	226	125	46.5	5	53
North Ayrshire Council	26	26	3	11.5	0	3
North Lanarkshire Council	6	5	4	66.7	0	3
Orkney Islands Council	31	36	21	70.0	4	0
Perth and Kinross Council	636	345	79	12.4	4	49
Renfrewshire Council	17	6	3	17.6	2	2
Scottish Borders Council	283	274	96	33.9	3	8
Shetland Islands Council	1	3	0	0.0	2	0
South Ayrshire Council	133	27	7	5.3	4	7
South Lanarkshire Council	42	49	26	61.9	14	5
Stirling Council	77	72	3	3.9	0	0
West Dunbartonshire Council	5	5	4	80.0	1	4
West Lothian Council	8	9	5	62.5	3	5

The DWQR PWS Risk Assessment Tool contains 23 separate modules of risk questions. The choice of modules depends on the characteristics of the supply and the nature of the treatment processes present. Most PWS are relatively simple and only require a proportion of the modules to be completed. Each risk is given two risk scores; one for the basic risk itself, and a second score that takes into account any mitigating measures that are present. For example, a PWS source may be at high risk of microbiological contamination, but it may be possible to reduce the risk score due to treatment that is present downstream. The tool enables DWQR to analyse the risks that have been entered into the tool. Figure 5 shows the ten highest average risk scores across all supplies, after any mitigating measures have been considered. This provides a useful indication of the most significant risks facing PWS.

From this analysis, the highest overall risk is poor management of the supply. This relates to the way in which the supply is organised and administered; including documentation, regular maintenance and monitoring tasks and the keeping of stocks of spare parts. There are few, if any, factors that will mitigate against risks from inadequate management.

Storage tanks also feature prominently, as they are often inadequately constructed and poorly maintained. This can be a major source of contamination of the supply.

The risk of un-disinfected water passing through an ultra-violet (UV) treatment unit features in the table, with minimal difference between unmitigated and mitigated score. This suggests that few of the protective measures for UV treatment units, such as flow shutdowns on loss of power and flow restriction devices are present on many of the UV units used in Scotland.

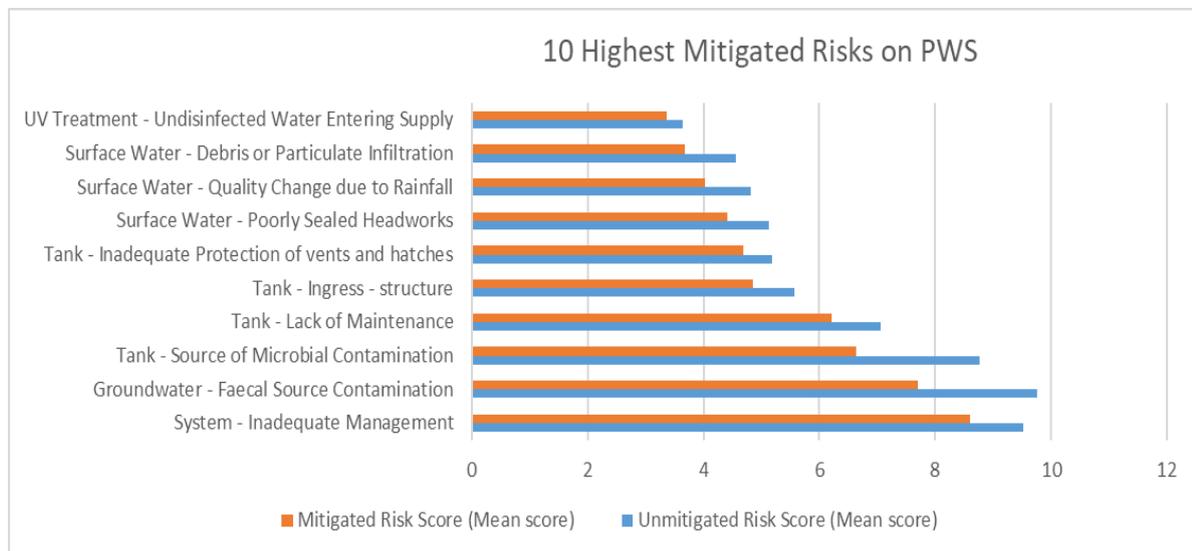


Figure 5: Highest Average Mitigated Scores in DWQR Risk Assessment Tool

3. THE QUALITY OF PRIVATE WATER SUPPLIES

3.1 Regulated Private Water Supplies

3.1.1 Sampling and Overall Performance

Local authorities are required by the 2017 regulations to sample all Regulated supplies in their area at least once a year.

All supplies must be tested individually for certain parameters that are especially important or that vary significantly from supply to supply. The 2017 regulations specify a number of parameters that must be included in this, such as *E. coli* and lead. The local authority can add to this, using the risk assessment as a guide to determine which other potential contaminants should be sampled for. Other parameters are sampled using a “supply zone” approach. This enables a sample to be taken at one supply to broadly represent the quality across a whole area or zone. Zonal sampling is only done for parameters that are found at a reasonably constant concentration in water supplies across the area. This approach greatly reduces the number of tests that need to be carried out on individual supplies and the associated cost burden this would place on individual supply users.

Table 3 provides a breakdown of the number of Regulated supplies per local authority, that were sampled for at least one parameter for the past three years.

This report identifies that 13 local authorities sampled over 90% of their Regulated supplies. Of these local authorities that achieved this level of sampling compliance, 10 of them had fewer than 25 Regulated supplies under their jurisdiction.

In 2021, only 53% of Regulated supplies were sampled, however this is an improvement from the 38% reported in 2020. The low number of Regulated supplies sampled may still be as a result of the Covid-19 pandemic, with rural local authorities with the largest number of supplies being more affected. However, this measure of performance has been in decline since 2015, when 94% of supplies were sampled.

Although the pandemic has had a significant impact, a continuing factor in the reduced sampling performance is the resourcing necessary for the wider monitoring required by the 2017 Regulations. PWS serving privately rented properties are now considered to be Regulated supplies because of their commercial nature. This led to an increase in the number of Regulated supplies per local authority, and therefore an increase in sampling requirements. Local authorities have had to review their arrangements and charging regimes, and for many rural authorities, seek approval for recruitment of additional resources to provide capacity to undertake the new statutory duties for Regulated supplies.

It was expected that as local authorities adjusted to the 2017 Regulations, continued improvement would be demonstrated, had there not been a Covid-19 pandemic. It is promising, however, that despite the ongoing impacts of the Covid-19 pandemic through 2021, the number of Regulated supplies sampled has improved but there is still much to do to achieve the frequency required by the regulations.

Table 3: Regulated Supplies Sampling Compliance

Local Authority	No. Supplies 2021	No. Supplies sampled 2021	% Supplies sampled 2021	% Supplies sampled 2020	% Supplies sampled 2019
Aberdeen City	6	6	100%	100%	100%
Aberdeenshire	581	387	67%	58%	97%
Angus	No data	No data	No data	100%	65%
Argyll and Bute	509	473	93%	73%	98%
City of Edinburgh	7	4	57%	100%	17%
Clackmannanshire	5	5	100%	17%	100%
Comhairle nan Eilean Siar	16	9	56%	60%	73%
Dumfries and Galloway	517	214	41%	20%	30%
Dundee City	1	0	0%	0%	N/A
East Ayrshire	28	25	89%	30%	44%
East Dunbartonshire	1	1	100%	100%	100%
East Lothian	26	26	100%	100%	100%
East Renfrewshire	7	7	100%	86%	100%
Falkirk	1	1	100%	100%	100%
Fife	74	73	99%	99%	92%
Glasgow City	0	0	N/A	N/A	N/A
Highland	1056	373	35%	17%	71%
Inverclyde	11	11	100%	45%	100%
Midlothian	37	2	5%	100%	97%
Moray	269	183	68%	30%	78%
North Ayrshire	26	21	81%	71%	87%
North Lanarkshire	6	6	100%	100%	25%
Orkney	31	17	55%	50%	73%
Perth and Kinross	636	221	35%	18%	43%
Renfrewshire	17	4	24%	100%	100%
Scottish Borders	283	177	63%	52%	80%
Shetland	1	1	100%	0%	100%
South Ayrshire	133	32	24%	92%	74%
South Lanarkshire	42	16	38%	24%	78%
Stirling	77	13	17%	5%	70%
West Dunbartonshire	5	5	100%	100%	100%
West Lothian	8	8	100%	0%	100%
Total	4,417	2,321	53%	38%	68%

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

The data shows an overall compliance of 91.5 %. The most commonly failing parameters are coliforms, pH, and *E. coli*, illustrating that the long term issues associated with PWS remain unchanged.

Table 4: Regulated Private Water Supply Compliance for Key Parameters

Parameter	No. Failures	No. Sample Results	Compliance 2021	Compliance 2020
Colony Count 22C*	36	2437	98.5%	97.1%
Nitrate (Total)	37	1866	98.0%	97.8%
Turbidity*	37	2764	98.7%	98.3%
Nickel (Total)	50	2564	98.0%	96.3%
Copper (Total)	142	2630	94.6%	94.5%
Manganese (Total)	145	2714	94.7%	94.7%
<i>Clostridium perfringens</i>	177	3196	94.5%	93.1%
Iron (Total)	198	2720	92.7%	91.8%
Lead (Total)	243	3045	92.0%	92.4%
Colour	326	2616	87.5%	87.1%
<i>Enterococci</i>	328	3433	90.4%	90.6%
<i>E. coli</i>	421	3475	87.9%	87.7%
Hydrogen ion (pH)	432	2558	83.1%	81.2%
Coliform Bacteria	804	3478	76.9%	77.5%
Total	3376	39496	91.5%	91.0%

* Under the 2017 regulations, turbidity and colony counts do not have a numerical standard (Prescribed Concentration or Value (PCV)). The turbidity should be acceptable to consumers with no abnormal change and the colony counts should have no abnormal change. The samples that have been considered as failing for these parameters are the ones declared by local authorities as such.

Figure 6 illustrates the trend of water quality compliance for Regulated PWS since 2010.

These results suggest that, at a national level, the quality compliance of Regulated supplies has been within the range of 90% to 95%, with no improvement, despite ongoing efforts by local authorities and the availability of a Scottish Government-funded grant. There is a continuing need to better understand the reasons for this, which could be due to the random nature of the sampling requirements; the monitoring of unsatisfactory supplies as part of the grant application process; or the lack of treatment system maintenance from the users of PWS.

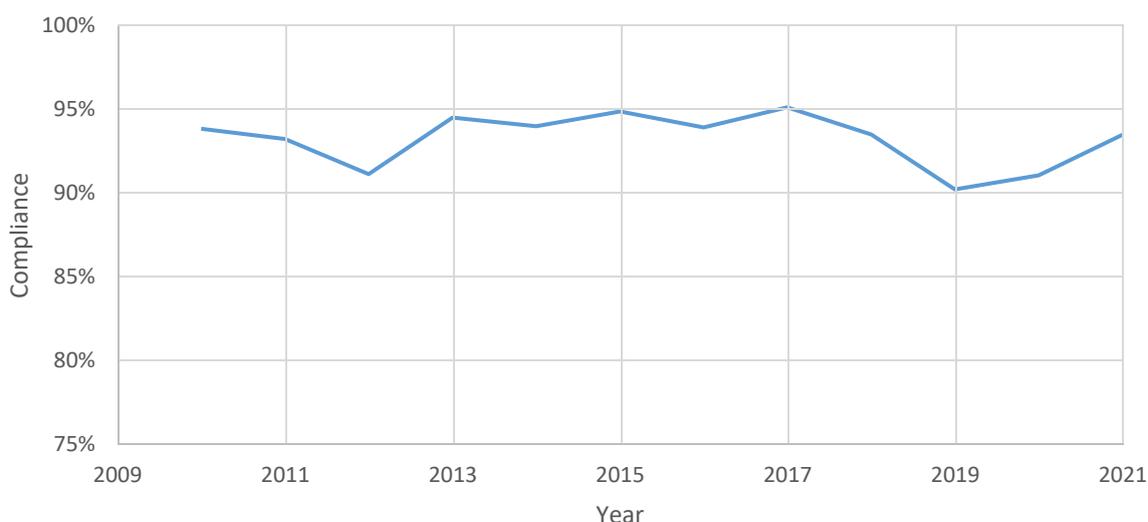


Figure 6: Regulated Private Water Supplies Year on Year quality compliance

3.1.2 Microbiology

The microbiological quality of the PWS remains a concern. It is difficult to make comparisons of compliance with standards with previous years given the reduction in sample numbers due to the pandemic, but in general, compliance was very similar to the previous two years.

E. coli is found in the gut of warm blooded animals, and its presence in drinking water samples shows clear evidence of faecal contamination. It should be easily killed by disinfection processes in water treatment, so its presence indicates that either disinfection has been ineffective, or that there has been contamination after the disinfection process. It is of great concern that 12.1% of samples taken for *E. coli* failed the standard. While not all strains are pathogenic to humans, some, such as *E. coli* O157, can be particularly harmful to health.

Similarly, the presence of Enterococci shows that there has been contamination from a faecal source, and as with *E. coli*, its presence can indicate a risk from harmful microorganisms originating from faeces. Almost one in ten tests showed the presence of Enterococci, which shows no improvement from 2020.

Clostridium perfringens is found in the environment as well as in the gut of many mammals. It is spore-forming and therefore survives well in the environment. It is highly resistant to disinfection processes. Its presence can indicate that there has been historic contamination of the supply, and its detection should always lead to investigations into the source of the contamination and the effectiveness of filtration processes in water treatment. 5.5% of samples failed the standard for *Clostridium perfringens*.

Coliform bacteria are widely found in the environment, and some, although not all, are of faecal origin. Their presence in a drinking water supply is a good indication that the disinfection process is not effective – no samples should contain Coliform bacteria. In 2021 more than a fifth of samples failed the Coliform bacteria standard.

Unsurprisingly, PWS sourced from boreholes were of a better microbiological quality than supplies with surface water influence, as there is less chance of faecal contamination. The compliance of rainwater harvesting systems is of concern, with a fifth of samples from rainwater harvesting systems failing the *E. coli* standard. It is essential that rainwater harvesting systems are properly operated, adequately maintained, and that appropriate disinfection is in place.

All microbiological failures should be thoroughly investigated and the reasons for the failures determined and rectified. As Covid-19 restrictions are eased, it is expected that local authorities rectify this situation as a matter of urgency.

Table 5: Microbiological Compliance 2021 by Local Authority Based on Supplies Sampled

Local Authority	E. coli	Enterococci	Clostridium perfringens	Coliform Bacteria
Aberdeen City	100.0%	100.0%	100.0%	100.0%
Aberdeenshire	91.1%	92.4%	98.4%	76.8%
Angus	No data	No data	No data	No data
Argyll and Bute	84.8%	85.3%	93.4%	72.9%
City of Edinburgh	100.0%	100.0%	100.0%	50.0%
Clackmannanshire	100.0%	100.0%	100.0%	100.0%
Comhairle nan Eilean Siar	79.3%	78.6%	93.3%	69.0%
Dumfries and Galloway	83.9%	90.3%	95.1%	76.2%
Dundee City	No data	No data	No data	No data
East Ayrshire	76.0%	76.0%	88.00%	72.0%
East Dunbartonshire	100.00%	100.0%	100.0%	100.0%
East Lothian	77.1%	88.6%	91.4%	68.6%
East Renfrewshire	100.0%	100.0%	100.0%	100.0%
Falkirk	No data	100.0%	100.0%	100.0%
Fife	93.5%	93.3%	98.7%	83.70%
Glasgow City	N/A	N/A	N/A	N/A
Highland	89.6%	93.5%	93.3%	78.6%
Inverclyde	77.3%	77.3%	95.5%	54.5%
Midlothian	66.7%	66.7%	33.3%	0.00%
Moray	96.4%	97.1%	96.3%	84.8%
North Ayrshire	86.7%	93.3%	93.3%	76.7%
North Lanarkshire	83.3%	83.3%	83.3%	83.3%
Orkney	100.0%	95.5%	100.0%	90.9%
Perth and Kinross	84.1%	88.7%	91.4%	72.8%
Renfrewshire	100.0%	75.0%	100%	75.0%
Scottish Borders	87.4%	91.2%	92.5%	82.5%
Shetland	100.0%	100.0%	100.0%	0.0%
South Ayrshire	77.6%	89.8%	83.3%	63.3%
South Lanarkshire	87.5%	93.8%	100.0%	87.5%
Stirling	100.0%	100.0%	100.0%	100.0%
West Dunbartonshire	100.0%	100.0%	100.0%	100.0%
West Lothian	100.0%	88.9%	100.0%	88.9%
Total	87.9%	90.4%	94.5%	76.9%

3.1.3 Metals

Figure 7 shows overall compliance with standards for a number of the key metals for those supplies that had samples taken (not all supplies were sampled in 2021) and Table 6 gives this data by local authority area.

There are still a significant number of properties which have lead pipework, tanks or fittings as part of their supply systems. Lead ingestion is particularly harmful to young children and to unborn babies, and it is strongly recommended that any lead pipework or fittings identified through sampling and analysis, or through seeing lead, are removed. 8.0% of samples analysed for lead failed the standard. Figure 7 shows 92.0% compliance with the lead standard.

The source of iron in drinking water in PWS can either be naturally occurring in the raw water, or from cast iron pipework. Manganese is derived from raw water sources. Both metals can cause discolouration of supplies, and can cause marks and stains on sanitary ware and laundry. In addition, particles of iron or manganese, or a build-up of manganese on UV disinfection systems, can interfere with disinfection processes. In 2021, 92.7% of samples complied with the iron standard, and 94.7% with the manganese standard.

Copper and nickel are both likely to come from domestic pipework and taps and fittings. It is recommended that only taps and fittings which comply with the Water Regulations Approval Scheme (WRAS) are used for drinking water supplies. In 2021 94.6% of samples taken complied with the copper standard, and 98.0% with the nickel standard.

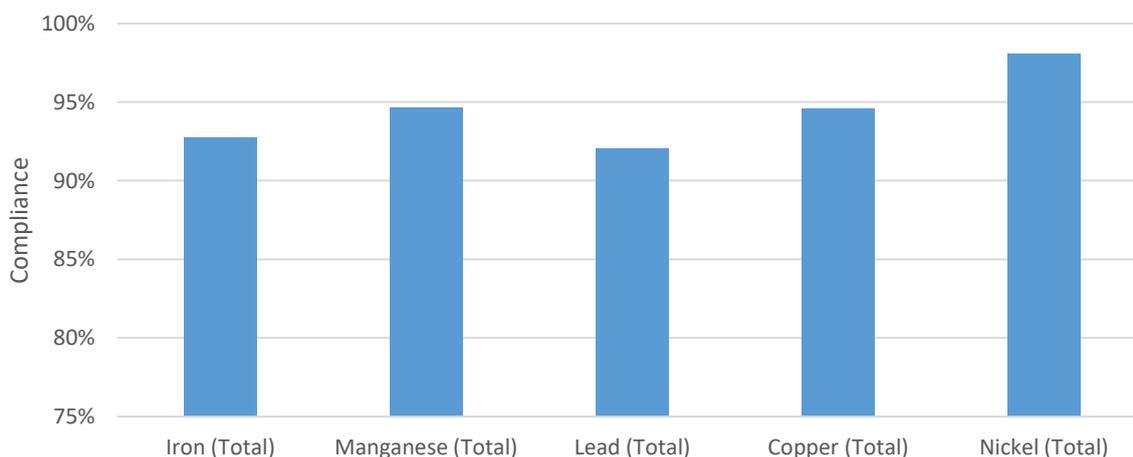


Figure 7: Metals Compliance 2021

Table 6: Metals Compliance 2021 by Local Authority

Local Authority	Iron (Total)	Manganese (Total)	Lead (Total)	Copper (Total)	Nickel (Total)
Aberdeen City	100.0%	100.0%	100.0%	100.0%	100.0%
Aberdeenshire	97.9%	97.3%	97.8%	98.7%	100.0%
Angus	No data	No data	No data	No data	No data
Argyll and Bute	86.0%	93.5%	96.3%	95.0%	98.1%
City of Edinburgh	100.0%	100.0%	100.0%	100.0%	100.0%
Clackmannanshire	80.0%	60.0%	100.0%	100.0%	100.0%
Comhairle nan Eilean Siar	82.8%	93.3%	77.8%	73.3%	92.9%
Dumfries and Galloway	95.2%	95.2%	85.1%	85.5%	96.3%
Dundee City	No data	No data	No data	No data	No data
East Ayrshire	88.0%	76.0%	88.0%	100.0%	100.0%
East Dunbartonshire	100.0%	100.0%	100.0%	100.0%	100.0%
East Lothian	100.0%	96.3%	100.0%	96.3%	100.0%
East Renfrewshire	100.0%	83.3%	100.0%	100.0%	100.0%
Falkirk	100.0%	100.0%	100.0%	100.0%	100.0%
Fife	97.3%	97.3%	93.8%	98.6%	98.6%
Glasgow City	N/A	N/A	N/A	N/A	N/A
Highland	87.3%	92.9%	94.3%	95.9%	97.7%
Inverclyde	91.7%	100.0%	91.7%	100.0%	100.0%
Midlothian	100.0%	100.0%	100.0%	100.0%	100.0%
Moray	97.1%	98.2%	90.3%	89.5%	94.5%
North Ayrshire	91.7%	100.0%	95.8%	100.0%	100.0%
North Lanarkshire	100.0%	83.3%	83.3%	100.0%	83.3%
Orkney	100.0%	86.4%	100.0%	100.0%	100.0%
Perth and Kinross	91.0%	99.5%	92.2%	98.6%	99.5%
Renfrewshire	100.0%	100.0%	100.0%	100.0%	100.0%
Scottish Borders	98.9%	88.7%	82.9%	93.5%	98.2%
Shetland	100.0%	100.0%	100.0%	100.0%	100.0%
South Ayrshire	85.0%	92.5%	87.2%	97.5%	100.0%
South Lanarkshire	100.0%	100.0%	93.8%	92.3%	100.0%
Stirling	100.0%	100.0%	100.0%	100.0%	100.0%
West Dunbartonshire	100.0%	100.0%	100.0%	100.0%	100.0%
West Lothian	100.0%	100.0%	100.0%	100.0%	100.0%
Total	92.7%	94.7%	92.0%	94.6%	98.0%

3.1.4 Enforcements and Outcomes

When a local authority identifies that a supply has quality or quantity issues and poses a risk to health, they take action to ensure that all users are informed and given appropriate advice to safeguard their health in the short term (e.g. to boil water). Owners and users are then informed by the local authority of any improvement work required and the timescales in which these works must be carried out. Local authorities provide advice in relation to cleaning and disinfecting storage tanks, replacing UV tubes or filter cartridges and cleaning out the supply intake. Local authorities work with owners and users of the supply to achieve improvements and only where this is unsuccessful is a formal Enforcement Notice issued.

The DWQR is of the opinion that when local authorities' efforts to bring about improvements through the provision of advice and support have failed, lasting improvements must be achieved by putting in place an Enforcement Notice ("Notice"). 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 a legal duty on the relevant person(s) to carry out necessary improvements. It also ensures any required works are carried out in a timely manner, as determined by the local authority based on the risk to health and the extent of the improvement works required.

In 2021, two Notices were served on failing Regulated PWS, the same number as during 2020. Argyll and Bute Council served Section 28 Notices on the owners of two supplies where communication and cooperation had historically been poor. The use of these Notices has resulted in the owners engaging fully with the local authority and fitting new treatment to their supplies.

There was a continued increase in PWS investigations during 2021 (1,146), in line with the increase seen during 2020 (1,028), compared with 290 during 2019. The increased activity is shown in Table 7. However, as can be seen from this Table, fourteen local authorities either did not carry out investigations despite failing supplies, or failed to provide DWQR with this information.

From discussions with local authorities it is clear that enforcement action is initiated as a last resort. However, Notices are a valuable 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. DWQR hopes that local authorities will consider more often the need for enforcement action to bring lasting improvements. This will form the basis of discussions between DWQR and local authorities where there are persistently failing supplies.

Table 7: Investigations and Enforcement Notices 2021

Local Authority	Investigations 2021	Investigations 2020	Enforcements 2021
Aberdeenshire	711	523	
Highland	141		
Scottish Borders	108	137	
Argyll and Bute	89	221	2
South Lanarkshire	52	53	
Fife	21	31	
East Ayrshire	13	1	
East Lothian	8	1	
Midlothian	3	3	
Angus	No data	3	
Stirling		45	
Dumfries and Galloway		5	
East Renfrewshire		2	
Inverclyde		2	
City of Edinburgh		1	
North Lanarkshire			
West Dunbartonshire			
North Ayrshire			
North Lanarkshire			
Stirling			
East Dunbartonshire			
Falkirk			
Shetland			
Moray			
Aberdeen City			
Clackmannanshire			
Comhairle nan Eilean Siar			
Dundee			
Orkney			
Perth and Kinross			
Renfrewshire			
South Ayrshire			
West Lothian			
Total	1,146	1,028	2

An example of a local authority working informally with a private water supply owner to successfully resolve a contamination issue was provided by Aberdeenshire Council:

"At the end of April 2021, we were contacted by the operations team at a distillery in northwest Aberdeenshire who advised that a fuel leak had been identified during maintenance work on the heating system. The company confirmed that works were underway to establish the extent and duration of the leak. Remedial work had also commenced.

One of the initial concerns identified by the business and their contractors was the presence of buried services in proximity to the leak, one of which being pipework for the incoming water supply and connections to provide water to other parts of the premises. Given the potential impact on water quality and production, our advice was sought regarding the risks posed and future action required. In addition to the distillery, the water supply serves other commercial premises (tenanted properties, holiday lets, agricultural) and owner-occupied properties.

The enquiry was passed to the Technical Officer responsible for the supply who arranged to visit the following morning. During the visit the officer undertook a review of the water supply, pipework, treatment, and associated infrastructure within the premises. It was confirmed by the Technical Officer that buried alkathene pipework was present in the area of the leak and therefore susceptible to permeation by hydrocarbon compounds.

The operators confirmed that no issues with taste or odour had been reported. It was decided that the risks to the water supply could not be discounted, and that detailed hydrocarbon analysis should be undertaken to evaluate the presence of compounds below taste and odour thresholds. The purpose of the analysis was also to identify any compounds indicative of pipework deterioration and therefore the potential that water quality had been impaired by the leak. It was also agreed that a full regulatory sample should be taken to provide information for other parameters and overall water quality. The regulatory sample was taken during the initial visit. Owing to the need for appropriate containers and discussions with the laboratory regarding the analysis required, a second visit took place to collect samples for hydrocarbon analysis. Further regulatory samples were taken in November 2021 as part of our sampling programme.

No evidence of hydrocarbon contamination was identified in the samples collected. Dialogue with the business and their proactive approach throughout the incident ensured that potential risks to water quality were mitigated."

3.2 Type B Private Water Supplies

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 8 illustrates the compliance of Type B PWS for a group of key parameters in 2021 and 2020.

Table 8: Type B Supplies Key Parameters Compliance

Name	No. Sample Results 2021	No. Failures 2021	Compliance 2021	Compliance 2020
Aluminium (Total)	126	6	95.2%	92.7%
Coliform Bacteria	873	291	66.7%	68.7%
Colour	302	51	83.1%	85.2%
Conductivity	597	0	100.0%	99.8%
E. coli	878	142	83.8%	85.3%
Enterococci	861	123	85.7%	85.9%
Hydrogen ion (pH)	793	211	73.4%	76.4%
Iron (Total)	651	87	86.6%	84.3%
Lead (Total)	793	78	90.2%	92.6%
Manganese (Total)	638	67	89.5%	88.5%
Nitrate (Total)	678	36	94.7%	93.9%
Qualitative Odour*	123	2	98.4%	97.8%
Qualitative Taste*	92	6	93.5%	98.8%
Turbidity	776	46	94.1%	94.8%
Total	8,181	1,146	86.0%	86.7%

* Qualitative Odour and Qualitative Taste do not have a numerical standard. Therefore a failure would have only been assigned if a Local Authority marked a sample as failing for these parameters in their return.

Since Type B supplies are sampled on request, the supply systems from which samples are taken are different each year and a direct comparison of the data is difficult.

For most of the main parameters, Type B supplies show a similar trend to Regulated supplies, although compliance is worse, reflecting a tendency for there to be minimal treatment and management of the supply.

This is particularly relevant for microbiological compliance, with 16.2% of samples containing *E. coli* and 33.3% containing coliforms in 2021. It appears that disinfection on Type B supplies is only present/effective in a small subset, and a significant proportion of users may be placing themselves at risk by consuming the water.

Overall, Type B compliance against regulatory standards for key parameters shows little change since last year, at 86.0% for 2021 compared with 86.7% in 2020.

Figure 7 illustrates the compliance by source type for Type B supplies. In both 2020 and 2021, Type B supplies served from surface sources overall had lower compliance compared to Type B supplies served by groundwater sources. This indicates the higher variability and vulnerability of surface sources to contamination, which can make them more difficult to adequately treat.

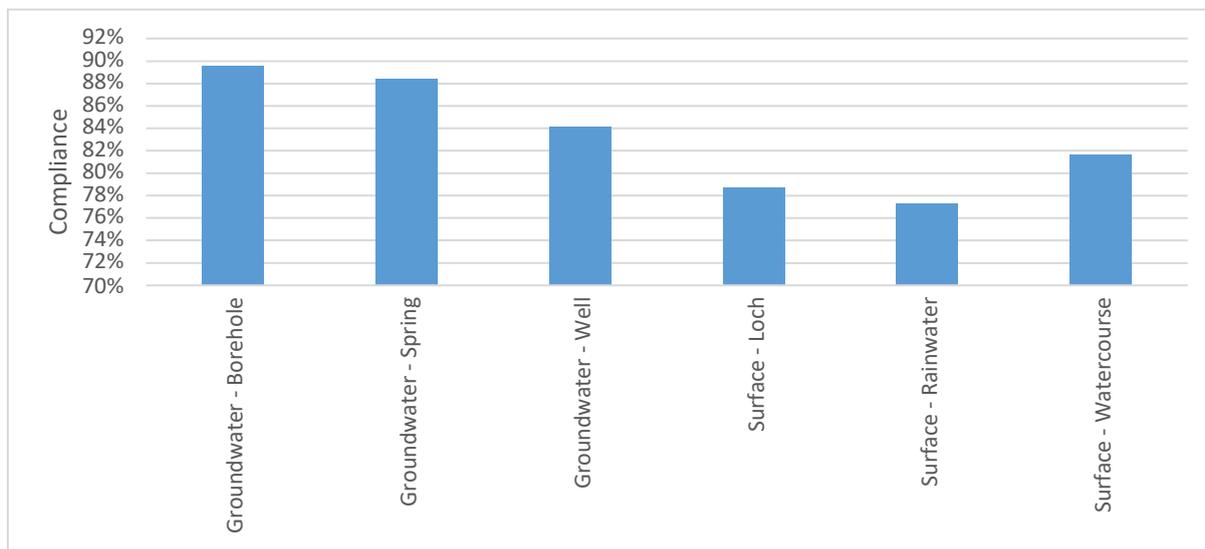


Figure 6: Type B Supplies Compliance by Source 2021

4. DWQR ACTIVITY AND RESEARCH

DWQR works with other professionals, including environmental health colleagues, to review and identify areas for action to improve drinking water quality in PWS.

During 2021 DWQR staff were involved in a number of activities and strands of work involving PWS. This includes:

Local Authority Training and Support

The DWQR provided tailored training to local authorities on data returns and the Risk Assessment Tool. This is to ensure that the correct data is submitted so that an all Scotland picture can be provided in this report. Positive feedback was received.

Policy Development/Recast Drinking Water Directive

The DWQR has supported policy development work led by the Scottish Government that is required to take on board the requirements of the EU's recast Drinking Water Directive and to reflect these in Scottish legislation. It is providing advice on technical matters associated with risk assessments, treatment and monitoring of water supplies. It is also providing advice on current levels of compliance and how greater compliance might be achieved.

Climate Change

The DWQR has noted that raw water quality is changing that this is generating complaints where no treatment is in place. The DWQR supported research into the impacts of climate change on standing waters: [Assessing climate change impacts on the water quality of Scottish standing waters | CREW | Scotland's Centre of Expertise for Waters](#). This research confirms that standing waters are warming faster than air and that there are consequences for water quality particularly in relation to algal blooms. Algal blooms may change the taste and odour of drinking water unless appropriate treatment is in place.

Lead Research

The DWQR commissioned research on the impact of changing the standard for lead in drinking water. This was undertaken by Cranfield University and examined the case and timescale for removing lead from drinking water. The output of this research is under consideration in the context of aligning with the recast Drinking Water Directive.

5. ANNEXES

5.1 Information Letters issued during 2021

No information letters were issued in 2021.

5.2 Regulatory Framework

The regulatory standards for drinking water quality in Scotland stem from European Directives. A recast Drinking Water Directive was adopted in December 2020. Scottish legislation will be aligned with the new requirements over the coming years. The standards in the Directives are based on guidelines developed by the World Health Organisation to protect public health. Water quality legislation relating to PWS includes:

Water (Scotland) Act 1980 (as amended)

This Act requires local authorities to secure improvements to PWS if they consider them necessary.

Water Industry (Scotland) Act 2002

This Act created the role of the DWQR, who is independent of Scottish Ministers. In relation to PWS, the DWQR is required to supervise the enforcement by local authorities of their drinking water quality duties. Local authorities are required to provide the DWQR with any information necessary to undertake that supervisory role. The DWQR is required to submit and publish an annual report to Scottish Ministers on her activities.

The Private Water Supplies (Scotland) Regulations 2006

These regulations define wholesomeness of drinking water by reference to the European Drinking Water Directive which came into force in 1998 (98/83/EC). These reflect the recommendations made by the World Health Organisation on the appropriate standards for drinking water to protect human health.

These regulations have been amended substantially over the years but retain the provisions for Type B supplies relating to monitoring and the provision of advice.

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

These regulations provide for local authorities to pay a non-means tested grant of up to £800 to eligible persons (on both Regulated and Type B supplies) to enable them to improve their PWS.

The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017

These regulations came into force on 27 October 2017 replacing (and partly re-enacting with modifications) the provisions of The Private Water Supplies (Scotland) Regulations 2006 with respect to Regulated supplies, formerly defined as "Type A" supplies.

They apply to:

- Any supply which supplies 50 or more persons or more than 10m³ of water per day;
- Any supply which forms part of a commercial or public activity, or where the water is used in a commercial or public activity or where water is supplied to the public.

Guidance on the regulations issued by DWQR clarifies that domestic rented premises fall into the scope of commercial activity.



© Crown copyright 2022. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.

Published for the Drinking Water Quality Regulator for Scotland, September 2022.