
STATES OF JERSEY



PFAS AND WATER QUALITY IN JERSEY 2020: AN UPDATE REPORT FROM THE GOVERNMENT OF JERSEY OFFICER TECHNICAL GROUP

Presented to the States on 6th November 2020
by the Minister for the Environment

STATES GREFFE

PFAS and water quality in Jersey 2020

**An update report from the
Government of Jersey Officer Technical Group**

November 2020



Note from the Minister for the Environment

In January 2019, the Environmental Health team tested a private drinking water source for PFOS/PFOA. The test had been requested by a householder who was aware of the historic use of products containing PFAS's¹ at the airport.

Traces of PFOS and PFOA were identified in the sample. Further testing showed that background trace levels existed across the Island and that this was common with many other countries, being a testament to the historic and widespread use of products containing PFAS compounds. The testing further identified that contamination of PFOS and PFOA was slightly raised to the north and south of the airport. As already known, PFOS and PFOA already exist in the St Ouen's Bay aquifer below the airport.

As a result, I instructed that an Officer Technical Group be established, reporting to a political board, to oversee a programme of work to understand the distribution, risk and implications posed by PFAS in the Island's water environment.

An interim report on PFAS and water quality in Jersey was published in July 2019. It contained 18 recommendations and marked a milestone in understanding the distribution of PFAS across the island, including the identification of areas of particular concern, and the ubiquity of PFOS and PFOA in the wider environment.

The purpose of this, the second update report on the work of the Officer Technical Group, is to keep the public informed of the progress of our work on PFAS in the Island. It presents updates on the original 18 recommendations and contains further recommendations which have been included as a result of comments from the public and our developing understanding of PFAS globally.

While progress has been slowed by COVID-19, we have managed to achieve progress on a broad front.

Given the increasing science both in terms of the ability to test for a larger array of PFAS chemicals and the increasing concern on health, I have asked that the Officer Technical Group to extend the original remit to concentrate more on the Pont Marquet Catchment (south of the airport) and the St Ouen's Bay Plume.

I have recently submitted a proposal for funding of hydrogeological surveys in the historic St Ouen's Bay plume and the Pont Marquet catchment. This will present a significant step towards understanding the issues in the area and one which I hope would lead to the remediation of the PFAS in the future, where practicable.

Our understanding of PFAS has historically been focussed on the use of PFOS/PFOA in fire-fighting foam, but this is no longer the case, and our understanding and ability to test for the myriad of PFAS compounds that have been used in large numbers of differing products is only set to increase.

¹ PFOS and PFOA are two of many compounds that make up the group of PFAS compounds.

PFAS compounds will be around for a very long time and will present significant risks and challenges going forward, not only for our Island, but also for many other countries. We must work to mitigate these risks wherever possible in order to protect our environment and safeguard important water resources.

The work of the Officer Technical Group will continue and update reports of this important issue will be published.

Deputy John Young
Minister for the Environment
November 2020

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Executive summary

The report is the second report issued by the Government Officer Technical Group.

The group will publish updates to keep the public informed of the work being undertaken. Updates will enable the group to be reactive to the unfolding science and any change in international regulatory limits for PFAS. It will also ensure that PFAS is kept as a subject on the political agenda to help facilitate resourcing and action where needed. A timeline of planned activities is given in Appendix 1.

The 2020 update report details the work on the 18 recommendations contained in the 2019 report. The current report identifies further recommendations that lead on from these. These reflect the increased understanding of PFAS since 2019 and the comments and concerns from the public.

The historic contamination with PFAS of St Ouen's Bay was not a specific objective of the 2019 study. However, developing an increased understanding of the current plume was included as a recommendation in the 2019 report and, as the major PFAS problem in the Island, it will be fully considered moving forward.

This is purposely not a final report as PFAS will be a work area that will remain for some considerable time. Not only because of the longevity of the various compounds, but also because of the analysis routines and science which is developing day by day. This is particularly the case around our understanding of the shorter chained PFAS compounds.

1. Headlines

- 1.1. A system to enable the public to get their water tested has been developed. Very few households have made use of this.
- 1.2. Jersey Water continue to sample public water and this remains compliant with all current regulatory limits.
- 1.3. More PFAS compounds are now able to analysed by UK laboratories. Analysis of PFAS chemicals has been conducted on key boreholes and streams. Jersey Water do the equivalent monitoring suite at key points in their raw water network and at the treatment works prior to public supply. Two sampled boreholes south of the airport exceed the current Drinking Water limit, however the area is served by mains public water supply.
- 1.4. A targeted risk-based monitoring strategy is being developed. The data will inform long-term changes both around the Airport and across the Island.
- 1.5. Ports of Jersey have confirmed that they have moved to a fluorine free fire-fighting foam and no longer have stocks of any chemical containing PFAS compounds (fire fighting foams containing PFOS/PFOA were removed from service some time ago). The Town Fire Service have been using a fluorine free foam for a number of years.
- 1.6. Ports of Jersey are in the process of undertaking a desktop study and sampling programme within the Airport to determine whether hot spots are present (see timeline- Appendix 1). Results will determine whether it is possible to remove these and so prevent ongoing contamination arising from the site (primarily relating to Pont Marquet catchment, however not discounting other pathways).
- 1.7. Jersey Water are in the process of extending mains water to the St Peter's Village area north of the Airport, giving the option for those households who wish to connect to the Public Supply.

- 1.8. The officer technical team has held preliminary discussions with Arcadis who are one of the leading experts in PFAS and who identified and remediated PFAS contamination at Guernsey Airport.
- 1.9. A funding request has been submitted to the Government Plan to enable recommendations 8 and 10 of the 2019 PFAS Report to be actioned (hydrogeological studies of the St Ouen's Bay plume and Pont Marquet catchment). Once these are completed, we will be better placed to determine future pressures and what remediation (if any) can be put in place (Recommendations 9 & 11).

2. Recommendations (2019)

Sampling program and further investigation

2.1. Recommendation 1

Shallow boreholes and wells close to Jubilee Hill, north of the airport that are used for drinking water are identified and sampled.

2.2. Recommendation 2

An investigation is undertaken to determine the sources of these higher levels of PFOS and PFOA, especially those emanating from the drainage of the airport. This is a view to potential remediation. As a result, the formal regulatory position should at this stage be reserved.

2.3. Recommendation 3

More detailed testing of rainwater for PFAS is undertaken.

2.4. Recommendation 4

Further sampling and investigation of the efficacy of various household treatment systems is undertaken so that Environmental Health can advise the public. This should include the potential impact of waste streams from such systems.

2.5. Recommendation 5

A system is developed to enable private households and businesses to test their water for pesticides and PFAS and their derivatives.

2.6. Recommendations 6

Further work is undertaken to lower nitrate and pesticide levels both in surface and groundwater. These areas were identified in the 'Challenges for the water environment of Jersey' and the 'Water Management Plan' which was agreed by the States in Dec. 2016. Certain elements of the implementation of the Plan have progressed. These are mainly through voluntary initiatives of the agricultural and dairy sectors through the Action for Cleaner Water Group. However, the easy wins have been made. The Water Management Orders and new Water Code brought in under the Water Pollution (Jersey) Law 2000 will shortly be enacted and these elements and the Plan now require adequate funding, if nitrates and pesticide levels are to be properly addressed. Further work remains to be undertaken in terms of updating the Pesticides (Jersey) Law, 1991.

2.7. Recommendation 7

In the absence of a specific compliance parameter in the Water (Jersey) Law 1972 for PFAS, the wide variety of limits internationally and the proposals by the EU to adopt new parameters within the forthcoming Drinking Water Directive, the Government of Jersey should clarify its position in respect of acceptable PFAS concentrations in drinking water

and consider the introduction of scientifically derived parameter compliance limits for PFAS within the forthcoming planned amendment to the Water (Jersey) Law 1972

2.8. Recommendation 8

A hydrogeological study to determine the extent of the PFAS in St Ouen's Bay, the likely direction of travel of the plume and prognosis for the future is undertaken.

2.9. Recommendation 9

Based on the output from the hydrogeological study, a study to investigate and implement options for the remediation of the PFAS in St Ouen's Bay is undertaken.

2.10. Recommendation 10

That a hydrogeological study to confirm the initial results and determine the extent of the PFAS in the Pont Marquet catchment (including the effect on boreholes and wells), the likely direction of travel of the plume and prognosis for the future is undertaken.

2.11. Recommendation 11

Based on the output from the hydrogeological study, an investigation of the options for the remediation of the PFAS in the Pont Marquet catchment is undertaken.

2.12. Recommendation 12

To permanently offset the inherent risk to groundwater and to safeguard public health, the island-wide distribution of both mains drains, and mains water is recommended. Noting that this will have implications for water resources in the Island.

2.13. Recommendation 13

That any on-island use of shorter-chained PFAS compounds is identified and a precautionary approach for early withdrawal of those products is undertaken.

Health impacts

2.14. Recommendation 14

With their own and families health as the main concern, islanders with private water supplies should ensure they are tested regularly, and pursue measures recommended by their water treatment company to ensure their water is as safe as possible. Environmental Health will continue to produce and update information leaflets and webpages about water quality in private supplies. Individuals with any health concerns should consult their general practitioner.

2.15. Recommendation 15

Government does not need at this point to intervene in the water supply from a public health standpoint as tests show that levels of PFAS are generally well within expected regulatory levels. This message will need to be communicated to residents at the same time of the publication of this report, and an ongoing engagement be designed on all issues relating to water quality.

Public engagement

2.16. Recommendation 16

Improve awareness of the need to register boreholes and ensure that those with private water supplies are aware of the possibility of pollution from a variety of sources, and the importance of regular testing and management of their source (leaflets are in the process of being produced which will support this).

2.17. Recommendation 17

Ensure that gov.je is a reliable source of information on water quality and testing methods, and direct those seeking information to the gov.je using social media and traditional media

where necessary. This will need to be supplemented by activity for those who do not use digital communication channels.

2.18. Recommendation 18

Subject to Data Protection and other regulations, create a database of emails of registered borehole users, to be held by Environmental Health, so that users can be contacted quickly and directly in the event of issues being found.

Additional recommendations (2020)

2.19. Recommendation 19

Publish the results on-line of the monitoring undertaken by Jersey Water (some raw water sources and pre and post treatment water quality) and the monitoring undertaken by Infrastructure, Housing and Environment (IHE), so that the public are kept informed of current levels and trends.

2.20. Recommendation 20

Implement a targeted risk-based programme of long-term sampling of surface and groundwater across the Island to inform the ongoing trend at identified sentinel sites for all PFAS determinands deemed relevant, including St Ouen's Bay and the Airport. This will be in coordination with Ports.

2.21. Recommendation 21

Identify remediation strategies alongside the hydrogeological study, especially from a water resources perspective.

- i. Concurrent investigation into remediation of water resources in the catchment through treatment.
- ii. Post hydrogeological study or concurrent investigation into remediation options for ground water contamination and environmental clean-up.

2.22. Recommendation 22

The Officer Technical Group to keep updated on any changes to regulatory limits regarding PFAS, developments in understanding of PFAS compounds and changes to the ability to analyse for separate PFAS compounds. Where extra compounds can be analysed, then the monitoring program should, where appropriate, immediately reflect these.

2.23. Recommendation 23

To continue to sample in-situ reverse osmosis systems and in doing so analyse for all PFAS compounds.

2.24. Recommendation 24

Sampling to determine the impact of the waste streams from osmosis systems on controlled water.

2.25. Recommendation 25

The Officer Technical Group to keep updated on any changes that increase the understanding and efficacy of testing blood for PFAS.

3. Background of the PFAS work and subsequent developments

- 3.1. In January 2019, the Environmental Health team with IHE sampled a private drinking water source from north of the airport. The resident had specifically asked for a PFOS/PFOA test as they were aware of the historic use at the airport.
- 3.2. As a result of this test, traces of PFOS and PFOA were found in the sample and further testing of private water supplies in that immediate vicinity and a wider radius was undertaken. Results from all these tests identified traces of PFOS and PFOA. As a result, the Minister for the Environment requested that a Technical Officer Group was established that reported to a Political Board to oversee a programme of work to understand the distribution, risk and implications posed by PFAS² in the Island's water environment. Findings were presented in the 2019 PFAS Report. This concluded that there were three areas of differing contamination with the Island.
 - 3.2.1. Background levels of PFOS and PFOA across the Island that reflected those initially sampled north of the airport and which are characteristic of water sources found in many other countries.
 - 3.2.2. Higher levels of PFOS and PFOA in streams to the north and south of the airport that appeared to be coming from the Airport aerodrome. The higher levels in the south were impacting the Pont Marquet catchment that is used as a raw water source prior to treatment by Jersey Water.
 - 3.2.3. Historic plume area in St Ouen's Bay. This was already identified and was the subject of various actions by the then Airport Authority including the supply of mains water to the area and the development of the Fire Training Ground
- 3.3. The 2019 PFAS report contained 18 recommendations. These included measures to help protect public health by increasing availability of water testing and further sampling. Also included were recommendations to increase our understanding of the St Ouen's Bay and Pont Marquet catchments and to ensure that the public are kept updated with the work.
- 3.4. The 2019 PFAS Report was not specifically designed to address the historic PFAS in St Ouen's Bay 'Plume Area'. Recommendations were however included so as to establish a wider island wide approach to PFAS.

4. Update of the 2019 PFAS Report recommendations

Updates on work on the 18 recommendations are detailed below.

4.1 Recommendation

Shallow boreholes and wells close to Jubilee Hill, north of the Airport that are used for drinking water are identified and sampled.

The objective of the sampling strategy to date has been two-fold.

1. **Island sampling:** To sample a representative selection of groundwater private water supplies (boreholes and wells), surface water streams (public water catchments) to understand the distribution, variation and levels of PFAS across the Island.
2. **Sampling around the airport:** To undertake comprehensive sampling to the north, east and south of the airport to identify whether surface and groundwater supplies are impacted by contamination from within the airport perimeter.

² PFOS and PFOA are two of many compounds that make up the group of PFAS compounds.

Island sampling - groundwater

Action 1 above for testing of water across the Island is complete and reported on in the first interim report. The finding has enabled Environmental Health officers to assess the levels in relation to current drinking water standards. It remains that all sampled ground and surface water to date are below the current drinking water standard ³.

It is important that these are also assessed against any:

- a. proposed and new drinking water standards
- b. any new PFAS compounds which are able to be analysed as laboratory techniques develop.

The above points are relevant being that:

- the EU proposed drinking water limits are proposed to reduce to 0.1 µg/l for a single PFAS and to 0.5 µg/l for the total of PFAS.
- ALS laboratories, UK are now able to analyse for 16 separate PFAS compounds⁴.

As a result of the above two factors eight water samples from those groundwater supplies which had the highest recorded levels of PFOS and PFOA were re-sampled for the 14 determinands. Results are given in Table 1.

Table 1. The levels of 14 PFAS determinands recorded in nine groundwater sources which had the highest levels of PFOS and PFOA from previous sampling and one control site (results in brackets).

PFAS name	Concentration range in µg/l (Control)	Average concentration in µg/l of those sites where the parameter was detected (Control)
Perfluoro-n-butanoic acid (PFBA)	<0.002 to 0.0623 (<0.002)	0.02567 (<0.002)
Perfluoro-n-pentanoic acid (PFPA)	<0.001 to 0.253 (<0.001)	0.06196 (<0.001)
Perfluoro-n-hexanoic acid (PFHxA)	<0.001 to 0.208 (0.00191)	0.065.74 (0.00191)
Perfluoro-1-butanefulfonate (PFBS)	0.00219 to 0.0465 (0.00713)	0.01254 (0.00713)
Perfluoro-n-heptanoic acid (PFHpA)	0.0016 to 0.0895 (0.00354)	0.02764 (0.00354)
Perfluoro-octane sulfonate 6:2 (6:2PTS)	<0.001 to 0.191 (<0.001)	0.04176 (<0.001)
Perfluoro-n-octanoic acid (PFOA)	0.00389 to 0.115 (0.0157)	0.0378 (0.0157)
Perfluoro-1-hexanesulfonate (PFHxS)	0.00541 to 0.767 (0.0142)	0.18061 (0.0142)

³ UK standards, however, these are under review with intention of tightening the recommended concentration values.

⁴ Cost of £289 per sample, excluding shipping

Perfluoro-n-nonanoic acid (PFNA)	<0.001 to 0.0161 (<0.001)	0.00872 (<0.001)
Perfluoro-1-heptanesulfonate (PFHpS)	<0.001 to 0.0194 (0.00221)	0.00713 (0.00221)
Perfluoro-n-decanoic acid (PFDA)	<0.001 (<0.001)	<0.001 (<0.001)
Perfluoro-n-undecanoic acid (PFUnA)	<0.001 (<0.001)	<0.001 (<0.001)
Perfluoro-n-dodecanoic acid (PFDoA)	<0.001 (<0.001)	<0.001 (<0.001)
Perfluoro-octanesulfonamide (PFOSA)	<0.002 to 0.0626 (<0.002)	0.0626 (<0.002)
Perfluoro-1-decanesulfonate (PFDS)	-	-
Perfluoro-1-pentanesulfonate (PFPeS)	-	-
Total PFOS	0.00451 to 1.93 (0.0148)	0.44333 (0.0148)
Total PFAS	0.02254 to 3.2898 (0.05949)	0.98959 (0.05949)

Island sampling- surface water

Jersey Water adopts a precautionary risk-based approach to raw water quality monitoring focusing on the risks inherent within the water catchments. This approach is adaptive and dynamic in which the water quality monitoring regime is updated and evolves as risks change or develop over time.

Details of all testing by Jersey Water on raw water catchments are provided in Appendix 3.

Island sampling - treated mains water

With effect from April 2019, Jersey Water has voluntarily amended its drinking water monitoring programme to increase the frequency of testing above that which would be required under the current regulation.

Results of testing indicate that the public drinking water supply is fully compliant with the forthcoming EU limits for PFAS, UK guidance from the Drinking Water Inspectorate on PFOS and PFOA and Health based guidance from the United States, Canada and Australia. Detailed results of testing are provided in Appendix 3.

Sampling around the Airport

As detailed in the first interim report, sampling by Jersey Water of the Pont Marquet stream showed higher levels of PFOS and PFOA indicating possible connection to the southern airport drainage.

Sampling of surface water, boreholes and wells to the south of the airport was therefore undertaken to assess whether any private supplies were impacted by PFAS.

Table 2 Summary of the levels of PFOS and PFOA recorded from groundwater south of the airport.⁵

⁵ All data is in the Appendix. The boundary of the southern catchment is taken as between La Route des Quennevais and the path of the stream below La Route de Francief.

Sampling site	Concentration range of PFOS in µg/l	Concentration range of PFOA in µg/l	Average concentration of PFOS in µg/l	Average concentration of PFOA in µg/l	Number of samples
South East of airport	0.00016 to 1.1	<0.0006 to 0.14	0.09696	0.02434	12
South of airport	0.000349 to 5.35	<0.0006 to 0.359	0.89843	0.09661	6
South West of airport	0.011 to 0.5	0.051 to 0.14	0.199	0.07537	3

Sampling protocol used

Samples collected for PFAS analysis can very easily become contaminated by clothing, gloves and equipment used. A strict sampling protocol is used to prevent cross contamination. The extreme susceptibility of the sampling requires that it is undertaken by officers trained in the protocol.

4.2 Recommendation 2

An investigation is undertaken to determine the sources of these higher levels of PFOS and PFOA, especially those emanating from the drainage of the airport. This is a view to potential remediation. As a result, the formal regulatory position should at this stage be reserved.

Environmental Protection officers meet regularly with Ports of Jersey (POJ) to develop a robust sampling approach for the Airport (the area within the airport perimeter fence). Given that PFAS will increase in importance and public concern, it is critical that this sampling is undertaken well and is robust. To this end, the PFAS Officer Technical Group will engage consultants (such as those from Arcadis (the company who undertook the identification and remediation work at Guernsey Airport) to meet with Ports consultants and to comment upon and review their sampling approach.

POJ has engaged their own consultants on this project and are in the process of undertaking a desk study based on historic data and practices to inform the sampling strategy that IHE officers and consultants will review. This will be completed in late 2020 and the sampling will be undertaken before the year end. The desk study will consider off site impact of both long chain and short chain PFASs.

It is anticipated that sampling intensity will be based on a risk-based approach founded on past practises (such as throw-testing of fire-fighting foam⁶) and events (such as the overturned firefighting tanker) and the hydrology and drainage of the site.

Identification of hotspots of PFAS will enable these to be risk assessed, and if a risk is posed, for it to be remediated where possible. A precautionary approach will be undertaken in all decisions (given

⁶ a training activity by the Airport Fire Service to determine the distance reached by the foam from the tender

the considerations of tighter regulatory drinking water limits and more accurate analysis of further PFAS compounds mentioned above).

The POJ have also confirmed that fluorine based fire-fighting foams have not been used at the Airport since the start of 2020 and there are no stocks of these chemicals on site (note these PFAS containing foams are different from the historic PFOS/PFOA, AFFF foams which were removed from service some time ago).

The Attorney General is regularly updated on this work. The close cooperation and engagement of POJ is welcome and will facilitate an island solution.

4.3 Recommendation 3

More detailed testing of rainwater for PFAS is undertaken.

The purpose of this recommendation was to ascertain the likely levels of PFAS in those properties who obtain their drinking water from rain capture tanks. A previous test of rainwater had shown low levels of PFAS in one property served by rainwater collection from the roof. It was however, unclear whether these low levels were due to concentrations of PFAS in the rain or whether the rain had become contaminated from roof coverings, tank liners etc.

Two further samples of rainfall showed traces of PFAS (PFOS 0.000145 & PFOA 0.00033ug/l). These were well below the current drinking water limit and therefore not of concern. Rainfall samples were taken using glassware from the Jersey Met Office. However, given the extreme risk of contamination when taking a rainfall sample the slight traces could have been due to contamination when sampling. However, given the very low trace levels it is concluded that results continue to be well below the current drinking water limits and for the purposes of this study, there is no requirement for continued sampling.

4.4 Recommendation 4

Further sampling and investigation of the efficacy of various household treatment systems is undertaken so that Environmental Health can advise the public.

This recommendation is important for those households supplied by private water supplies (boreholes and wells). Understanding which household water treatment system may be effective in removing PFAS will enable Environmental Health officers and suppliers of water treatment equipment better to advise those homeowners who would like to treat their private water supply which systems they may wish to investigate.

Four further tests of reverse osmosis treatment systems were undertaken in 2020. Results showed that in each case where any trace levels of PFOS/PFOA was detected at input, there was none detectable at the tap.

Officers from the Technical Group met with one of the main island water treatment companies and the results were passed to them.

Reverse osmosis systems commonly are small and relatively inexpensive units that are fitted beneath the kitchen sink supplying a single outlet tap that can be used for drinking water, kettle and cooking. The filters need to be regularly be replaced to remain effective. There are alternative

treatment technologies available (i.e. granular activated carbon filters/Ion exchange resins) which can be used instead of or in conjunction with reverse osmosis units.

A meeting with a supplier of water treatment equipment indicated that they were routinely fitting reverse osmosis systems to households supplied by private water supplies.

It must be stressed that testing was only undertaken against PFOS and PFOA only and that it did not include the extended 16 PFAS compounds that can now be analysed for. A recommendation to test reverse osmosis treatment systems for all available PFAS compounds is given in this report.

Sampling to determine the impact of the waste stream on controlled water, being that the wastewater from treatment can be up to 40% of the incoming volume and often flows direct into septic tanks and soakaways, has not yet been tested and is included as a recommendation in this report.

It should be noted that Environmental Health does not specify equipment or systems for treatment, but are happy to discuss aspects of treatment. Manufacturers advice and guidance should always be sought.

4.5 Recommendation 5

A system is developed to enable private households and businesses to test their water for pesticides and PFAS and their derivatives.

The Official Analyst Department in Jersey has developed a test that can ascertain whether a water sample exceeds 0.1 micrograms per litre of PFOS. More detailed tests to determine the actual level of PFOS and PFOA through a UK accredited laboratory are more complex and expensive (approx. £300 per sample excluding shipping costs). The limit of detection will be all important when assessing low level concentrations and it is for this reason that the use of a UK-accredited laboratory is recommended.

It was decided to determine the level of uptake from the public before using the simpler test before investing in the more complex test for water. It remains that very few households (single digit) have wanted their water testing for PFOS and PFOA.

Notwithstanding, the Official Analyst and Jersey Water have come together to sample household water where required. These samples will be sent to UK accredited laboratories. As well as tests for the 16 PFAS compounds (cost £289 per sample) in water, this facility also exists for pesticides analysis of private water sources⁷ (cost is dependent on the suite being tested for). People are advised to contact the Official Analyst⁸ for further information should they wish to have their water tested.

A tick box agreement for testing pesticides and PFAS has been included on Official Analyst sheet that households complete. This will enable the results to be shared with IHE (Infrastructure, Housing and Environment) so that overall trends can be determined.

Regular testing of (£67.73 per sample) and microbiological (bacteria) levels (£51.45 per sample) of water and a simple nitrate test (priced £16.28 per sample) also remain available through the Official

⁷ The chemical analysis suite currently undertaken at the Official Analysts dept does not include pesticides

⁸ Official Analyst Department, Pier Road, St Helier, JE2 4XW. tel: 736455

Analyst Department, Pier Road. If you think your borehole may be contaminated with PFAS please [contact Environmental Health](#)⁹, who will advise you on water testing.

4.6 Recommendations 6

Further work is undertaken to lower nitrate and pesticide levels both in surface and groundwater. These areas were identified in the 'Challenges for the water environment of Jersey' and the 'Water Management Plan' which was agreed by the States in Dec. 2016. Certain elements of the implementation of the Plan have progressed. These are mainly through voluntary initiatives of the agricultural and dairy sectors through the Action for Cleaner Water Group. However, the easy wins have been made. The Water Management Orders and new Water Code brought in under the Water Pollution (Jersey) Law 2000 will shortly be enacted and these elements and the Plan now require adequate funding, if nitrates and pesticide pollution is to be properly addressed. Further work remains to be undertaken in terms of updating the Pesticides (Jersey) Law, 1991.

This recommendation is reported separately through the work of the Action for Cleaner Water Group.

The work of the Action for Cleaner Water Group can be viewed on a video produced by Jersey Water at <https://www.jerseywater.je/action-for-cleaner-water-group/>

4.7 Recommendation 7

In the current absence of a specific compliance parameter in the Water (Jersey) Law 1972 for PFAS, the wide variety of limits internationally and the proposals by the EU to adopt new parameters within the forthcoming Drinking Water Directive, the Government of Jersey should clarify its position in respect of acceptable PFAS concentrations in drinking water and consider the introduction of scientifically derived parameter compliance limits for PFAS.

In the proposed new Water Law, which it is proposed will replace the Water (Jersey) Law 1972, it will include recommended maximum levels for Private Water Supplies.

4.8 Recommendation 8

A hydrogeological study to determine the extent of the PFAS in St Ouen's Bay, the likely direction of travel of the plume and prognosis for the future is undertaken.

This will inform whether any remediation is possible or not and whether the plume has moved placing further households and the well fields operated by Jersey Water at risk (Jersey Water continue to monitor these supply boreholes to ensure the safety of the public water supply).

⁹ Email; environmentalhealth@gov.je, tel: 01534 445808

The impact of future use in the area, such as the development of the Simon sand site, need to be fully incorporated into the findings of the hydrogeological study.

Officers from the Technical Group have met with consultants from Arcadis who categorised and remediated the PFAS contamination at Guernsey Airport.

A proposal has been submitted to the Government Plan 2021-2024 to undertake a hydrogeological study of both the St Ouen's Bay plume and the Pont Marquet catchment. The Government Plan is due to be debated by the States Assembly in early December. If the proposal for funding is successful, then work on the study will be progressed.

4.9 Recommendation 9 -

Based on the output from the hydrogeological study, a study to investigate and implement options for the remediation of the PFAS in St Ouen's Bay is undertaken.

This recommendation is dependent on establishing a greater understanding of the contamination in the St Ouen's Bay plume by undertaking a hydrogeological study (see Recommendation 8). Linked however, is to assess the feasibility of investigating the remediation of surface and groundwater water resources in the catchment (see Recommendation 2.1 above).

4.10 Recommendation 10

That a hydrogeological study to confirm the initial results and determine the extent of the PFAS in the Pont Marquet catchment (including the effect on boreholes and wells), the likely direction of travel of the plume and prognosis for the future is undertaken.

Pont Marquet is an important source of raw water for Jersey Water, generating up to 2,250,000 litres per day for transfer to Val De La Mare reservoir, where it mixes with water from other catchments and is then blended with other sources with lower levels of PFAS prior to treatment. PFAS levels are closely monitored to ensure that the public water supply remains safe and fully compliant with regulatory limits. The ability to utilise raw water from Pont Marquet catchment however could be impacted in future by tighter regulatory limits. This action is therefore critical given the Island's current and future water demand.

Pont Marquet catchment and Les Blanchés Banques boreholes form an important part of the overall Jersey Water catchment and storage system. Jersey already has a very low level of resilience to extreme droughts partly due to the low level of storage available in the company's 6 main reservoirs. Stopping abstraction from the PFAS affected sources would significantly lower that level of resilience, placing real threat to the security of supply during droughts. Increased production from the desalination plant could provide compensation for loss of source waters in all except very dry years when all sources are required. Desalination however comes at a very high cost and brings other water quality challenges which would require further treatment or blending mitigations. The presence of PFAS in the Pont Marquet catchment is possibly linked to sources from the airport aerodrome and the investigation any subsequent clean-up will help remediate the catchment (see Recommendation 2).

A proposal has been submitted to the Government Plan 2021-2024 to undertake a hydrogeological study of both the St Ouen's Bay plume and the Pont Marquet catchment. The Government Plan is due to be debated by the States Assembly in early December. If the proposal for funding is successful, then work on the study will be progressed.

4.11 Recommendation 11

Based on the output from the hydrogeological study, an investigation of the options for the remediation of the PFAS in the Pont Marquet catchment is undertaken.

This recommendation is dependent on establishing a greater understanding of the contamination in the Pont Marquet catchment by undertaking a hydrogeological study (see Recommendation 10).

4.12 Recommendation 12

To permanently offset the inherent risk to the pollution of groundwater and to safeguard public health, the island-wide distribution of both mains drains and mains water is recommended, noting that this will have implications for water resources in the Island.

Jersey Water (JW) have commenced laying public water supply in St Peter's Village, north of the airport. This will include the area where the initial water sample from a private borehole was tested.

JW has applied for £4m funding from the Covid-19 Fiscal Stimulus fund to connect a further 500 properties to mains water in 2021.

4.13 Recommendation 13

That any on-island use of shorter-chained PFAS compounds is identified and a precautionary approach for early withdrawal of those products is undertaken.

Longer-chained PFAS chemicals were replaced by shorter chained PFAS chemicals. Recent evidence shows that these are as much of a potential concern as the longer chained chemicals responsible for PFAS in St Ouen's Bay.

It is vital therefore that shorter chained PFAS chemicals are removed from use as soon as possible. This includes their safe removal from the Island. To this end, Ports are moving to a fluorine and PFAS free foam early this year.

Ports of Jersey have confirmed that they had moved across to a fluorine free fire-fighting foam and no longer have stocks of any chemical containing PFAS compounds. Note that fire-fighting foam containing PFOS/PFOA were removed from service in the first quarter 2020. Old stocks of the previous chemical have been appropriately disposed of/returned to the manufacturer. This occurred in Quarter 1 of 2020. The Town Fire Service also use fluorine free foam.

Recommendations - Health impacts

4.14 Recommendation 14

With their own and families' health as the main concern, islanders with private water supplies should ensure they are tested regularly, and pursue measures recommended by their water treatment company to ensure their water is as safe as possible. Environmental Health will continue to produce and update information leaflets and webpages about water quality in private supplies. Individuals with any health concerns should consult their general practitioner.

The leaflet, 'Private water supplies: essential information' continues to be distributed to islanders through all available channels. It will also be updated as and when appropriate. A page on the Government website (gov.je/privatewater) which is dedicated to this subject continues to be updated as and when appropriate.

4.15 Recommendation 15

Government does not need at this point to intervene in the water supply from a public health standpoint as tests of water show that levels of PFAS are generally well within expected regulatory levels. This message will need to be communicated to residents at the same time of the publication of this report, and an ongoing engagement be designed on all issues relating to water quality.

The leaflet, 'Private water supplies: essential information' continues to be distributed to islanders through all available channels. It will also be updated as and when appropriate. A page on the Government website (gov.je/privatewater) which is dedicated to this subject continues to be updated as and when appropriate.

4.16 Recommendation 16

Improve awareness of the need to register boreholes and ensure that those with private water supplies are aware of the possibility of pollution, and the importance of regular testing and management of their source.

The details of all boreholes and wells that have been licensed and registered according to the Water Resources (Jersey) Law 2007 is administered by Environmental Protection. This includes 3200 of the estimated 3500 private water supplies existing on the Island.

An advantage of registering a borehole, as required by the law, is that officers are able to better protect it from pollution from a variety of sources. For example, informing the users directly should a pollution event occur close by or by including the position of the borehole on the Farm Risk Map¹⁰ that farmers can view to avoid spreading organic manure according to a traffic light system for fields and a 50m exclusion zone around boreholes, wells or springs.

The list of registered and licensed water sources has also been used to target information on water testing (the private water supplies- essential information leaflet 11) to users in order to ensure that

¹⁰

<https://statesofjersey.maps.arcgis.com/apps/webappviewer/index.html?id=08c3015f8e8e4a3c961701390d3c2d29>

¹¹

<https://www.gov.je/SiteCollectionDocuments/Environment%20and%20greener%20living/ID%20Private%20Water%20Supplies%20-%2020190702%20CLeM.pdf>

they are kept informed of the best practise they need to follow for their water supply. It is therefore important that householders update their details or transfer their borehole registration when they move property¹².

4.17 Recommendation 17

Ensure that gov.je is a reliable source of information on water quality and testing methods, and direct those seeking information to the gov.je using social media and traditional media where necessary. This will need to be supplemented by activity for those who do not use digital communication channels.

The dedicated page on the Government website (gov.je/privatewater) continues to be updated as and when appropriate, and Government social media accounts and traditional media used to promote it when required.

4.18 Recommendation 18

Subject to Data Protection and other regulations, create a database of emails of registered borehole users, to be held by Environmental Health, so that users can be contacted quickly and directly in the event of issues being found.

The details of all boreholes and wells that have been licensed and registered according to the Water Resources (Jersey) Law 2007 is administered by Environmental Protection, IHE. This includes 3200 of the estimated 3500 private water supplies existing on the Island.

An advantage of registering a borehole, as required by the Law, is that officers are able to better protect it from pollution from a variety of sources. For example, informing the users directly should a pollution event occur close by or by including the position of the borehole on the Farm Risk Map¹³ that farmers can view to avoid spreading organic manure according to a traffic light system for fields and a 50m exclusion zone around boreholes, wells or springs.

The list of registered and licensed water sources has also been used to target information on water testing (the private water supplies- essential information leaflet¹⁴) to users in order to ensure that they are kept informed of the best practise they need to follow for their water supply.

It is therefore important that users of boreholes and wells keep their contact details updated. This is especially the case when the property changes ownership. Details for each borehole can be checked by phoning the officer on 01534 441600.

¹²

<https://www.gov.je/SiteCollectionDocuments/Environment%20and%20greener%20living/F%20Amendment%20of%20Registration%20form%2020181213%20CLeM.pdf>

¹³

<https://statesofjersey.maps.arcgis.com/apps/webappviewer/index.html?id=08c3015f8e8e4a3c961701390d3c2d29>

¹⁴

<https://www.gov.je/SiteCollectionDocuments/Environment%20and%20greener%20living/ID%20Private%20Water%20Supplies%20-%2020190702%20CLeM.pdf>

5. Other associated work

Email correspondence has sought clarity on the efficacy of undertaking blood tests to determine the levels of PFAS. This is with respect to concerns from the public arising from long-term exposure to PFAS.

The position of the Medical Officer for Health is as follows:

While it remains good advice for people to avoid exposure to these substances where possible, complete avoidance of PFAS exposure is impossible as the substances are present at low levels in the environment in all societies in western civilisation.

GPs will refer people with concerns to an appropriate expert in toxicological medicine, but blood tests are not recommended to determine whether any medical condition is attributable to exposure to PFOS or PFOA and have no current value in informing clinical management.

Worldwide, there has been considerable research into the relationship between PFAS exposure and health effects. The national public health authorities in Australia, Canada and the United States have all concluded that there is no evidence confirming adverse effects on human health caused by exposure to PFAS and that no specific health screening is appropriate or warranted.

Appendix 1. Timeline of planned activities of the Technical Officer Group

Hydrogeological survey of the St Ouen's Bay plume and the Pont Marquet catchment to develop a greater understanding and target future actions

Dec 2021	Debate on the Government Plan
Dec 2021	If successful, scope of works established
May 2021	Identification of consultants to undertake this work
June 2021	Hydrogeological survey of St Ouen's Bay and Pont Marquet catchments.
Nov 2021	2021 PFAS update report published

Investigation into the Airport contamination

April 2020- present	Collect historic data on the extent and type of use and of PFAS containing products, including accidents/pollution incidents to inform areas for detailed sampling and hotspots.
Dec 2021	Review of proposed sampling strategy by the Officer Technical Group
Jan 2021	Commencement of sampling by Ports

Ongoing testing program

Ongoing	Weekly sampling by Jersey Water of raw water supply and treated public water for 16 PFAS compounds (results updated to Jersey Water web site). Targeted risk-based sampling of groundwater and streams across the Island for 16 PFAS compounds. Testing facility for the public wishing to test their private water supplies.
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Appendix 2 Results (in µg/l) from the sampling undertaken around the airport.

Sampling date 05-06 March 2020. All locations represent a single sample.

	Distance from the Airport (m)	PFBA (357-22-4) Perfluoro-n-butyric acid SWARL's - 24hr 180 ug/l, 7day 90 ug/l	PFPA (2706-90-3) Perfluoro-n-pentanoic acid SWARL's - none listed	PFHxA (307-24-4) Perfluoro-n-hexanoic acid SWARL's - 24hr 4500 ug/l, 7day 2250 ug/l	PFBS (375-73-5) Perfluoro-1-butylsulfonate SWARL's - 24hr 1800 ug/l, 7day 900 ug/l	PFHpA (375-85-9) Perfluoro-n-heptanoic acid SWARL's - none listed	PFOTS (276197-2) Perfluoro-octane sulfonate 6:2 SWARL's - none listed	PFDA (335-67-1) Perfluoro-n-octanoic acid SWARL's - 24hr 45 ug/l, 7day 23 ug/l	PFHxS (355-46-4) Perfluoro-1-hexanesulfonate SWARL's - 24hr 0.6 ug/l, 7day 0.3 ug/l	PFNA (375-95-1) Perfluoro-n-nonanoic acid SWARL's - 24hr 0.09 ug/l, 7day 0.045 ug/l	PFHpS (375-92-8) Perfluoro-1-heptanesulfonate SWARL's - none listed	PFDA (335-76-2) Perfluoro-n-decanoic acid SWARL's - 24hr 9 ug/l, 7day 4.5 ug/l	Linear PFOS(1763-23-1) Perfluoro-1-octanesulfonate	Branched PFOS	PFUnA (2058-94-8) Perfluoro-n-undecanoic acid SWARL's - 24hr 9 ug/l, 7day 4.5ug/l	PFDoA (307-55-1) Perfluoro-n-dodecanoic acid SWARL's - 24hr 30 ug/l, 7day 15 ug/l	PFOSA (754-91-6) Perfluoro-octanesulfonamide SWARL's - 24hr 86 ug/l, 7day none	PFDS (335-73-3) Perfluoro-1-decenesulfonate	PFPeS (2706-91-4) Perfluoro-1-pentanesulfonate	Total PFOS (sum of linear and branched) SWARL's - 24hr 9 ug/l, 7day 4.5 ug/l	Total PFAS
North West Airport - St Ouen's Bay plume	1470	<0.020	0.0091	0.0153	0.0057	0.0083	0.0083	9.9100	0.0417	<0.001	0.0014	<0.001	0.0417	0.0271	<0.001	<0.001	<0.002	-	-	0.0688	0.2103
South West Airport	570	0.0286	0.0919	0.0872	0.0066	0.0531	0.0164	60.6000	0.1680	0.0161	0.0056	<0.001	0.3400	0.1630	<0.001	<0.001	<0.002	-	-	0.5030	1.0371
North Airport groundwater	1290	0.0094	0.0228	0.0326	0.0069	0.0156	0.0110	17.5000	0.1460	0.0057	0.0052	<0.001	0.4800	0.1960	<0.001	<0.001	<0.002	-	-	0.6760	0.9487
East Airport groundwater	289	0.0447	0.1010	0.1390	0.0326	0.0564	13.5000	0.1150	0.7670	0.0106	0.0194	<0.001	1.2100	0.7180	<0.001	<0.001	0.0626	-	-	1.9300	3.2898
South Airport groundwater	159	0.0623	0.2530	0.2080	0.0465	0.0895	191.0000	0.0763	0.4540	0.0069	0.0142	<0.001	0.3630	0.2870	<0.001	<0.001	<0.002	-	-	0.6500	2.0517
South West Airport groundwater	955	0.0051	0.0014	0.0022	0.0022	0.0027	<0.001	0.0039	0.0092	<0.001	<0.001	<0.001	0.0022	0.0024	<0.001	<0.001	<0.002	-	-	0.0045	0.0313
East Airport surface drainage	0	0.0039	0.0022	0.0050	0.0042	0.0030	10.4000	0.0042	0.0165	<0.001	<0.001	<0.001	0.0168	0.0208	<0.001	<0.001	<0.002	-	-	0.0376	0.0869
South West Airport - St Ouen's Bay plume	2800	<0.020	0.0143	0.0366	0.0071	0.0186	<0.001	0.0471	0.0177	0.0043	0.0026	<0.001	0.0342	0.0785	<0.001	<0.001	<0.002	-	-	0.1130	0.2610
St Brelade - Island control	n/a	<0.002	<0.001	<0.001	0.0012	0.0016	<0.001	0.0058	0.0054	<0.001	0.0016	<0.001	0.0020	0.0051	<0.001	<0.001	<0.002	-	-	0.0071	0.0225
St Clement - Island Control	n/a	<0.002	<0.001	0.0019	0.0071	0.0035	<0.001	0.0157	0.0142	<0.001	0.0022	<0.001	0.0028	0.0120	<0.001	<0.001	<0.002	-	-	0.0148	0.0595

Table 2 Levels of PFOS and PFOA recorded from groundwater south of the airport

Date Sampled	Location	Approximate distance (m) away from central airport car park (long stay)	PFOS Result µg/l	PFOA Result µg/l
27/08/19	South East	1520	0.00455	0.011
27/08/19	South East	1510	0.007	0.0124
27/08/19	South East	1790	0.000229	<0.0006
27/08/19	South East	1810	0.00016	<0.0006
27/08/19	South	1890	0.00356	<0.0006
27/08/19	South East	1520	0.00971	0.0159
27/08/19	South East	1520	0.000149	<0.0006
27/08/19	South East	1300	0.0097	0.00315
27/08/19	South	1020	0.000349	<0.0006
27/08/19	South	1090	0.0126	0.00799
27/08/19	South	1010	0.0051	0.00244
27/08/19	South East	480	0.00448	0.00174
27/08/19	South East	1180	0.0244	0.0279
27/08/19	South East	230	1.100	0.140
27/08/19	South West	850	0.086	0.081
27/08/19	South East	750	0.0029	0.0062
27/08/19	South East	630	0.00028	0.00076
27/08/19	South West	1400	0.0011	0.0051
27/08/19	South West	650	0.500	0.140
28/08/19	South	2320	0.019	0.017
30/08/19	South	1410	5.350	0.359

Appendix 3 Results from the sampling undertaken by Jersey Water.

3.1 Treated Water Testing

Table xx.1 Treated water entering supply – Handois Water Treatment Works

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
03/08/20	0.0040	0.0040	0.0040	0.0050	0.0340
13/07/20	0.0050	0.0050	0.0050	0.0050	0.0630
01/06/20	0.0060	0.0060	0.0290	0.0120	0.0750
05/05/20	0.0060	0.0050	0.0060	0.0100	0.0430
10/03/20	0.0040	0.0040	0.0050	0.0010	0.0630
20/01/20	0.0050	0.0070	0.0060	0.0150	0.0530
18/12/19	0.0040	0.0050	0.0040	0.0183	0.0419
07/11/19	0.0040	0.0120	0.0052	0.0263	0.0792
17/07/19			0.0000	0.0272	
07/06/19			0.0000	0.0226	
07/05/19			0.0000	0.0235	
19/02/19			0.0000	0.0241	

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
03/05/17	0.0000	0.0000	0.0000	0.0000	
12/04/16	0.0000	0.0000	0.0000	0.0000	
01/06/15	0.0000	0.0210	0.0000	0.0000	
28/08/14	0.0440	0.0140		0.0000	
16/01/02		0.0000		0.0000	
13/10/99				0.0000	

Table **xx.2** Treated water entering supply – Augres Water Treatment Works

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
03/08/20	0.0030	0.0020	0.0030	0.0040	0.0230
13/07/20	0.0040	0.0030	0.0050	0.0060	0.0480
01/06/20	0.0040	0.0040	0.0050	0.0060	0.0330
05/05/20	0.0030	0.0040	0.0030	0.0060	0.0320
10/03/20	0.0030	0.0020	0.0040	0.0060	0.0520
20/01/20	0.0040	0.0050	0.0050	0.0130	0.0410
18/12/19	0.0030	0.0040	0.0040	0.0120	0.0410
07/11/19	0.0030	0.0080	0.0045	0.0174	0.0515
17/07/19			0.0000	0.0000	
07/06/19			0.0000	0.0131	
07/05/19			0.0000	0.0121	
19/02/19			0.0000	0.0224	
03/05/17	0.0000	0.0000	0.0000	0.0000	
12/04/16	0.0000	0.0000	0.0000	0.0000	
01/06/15	0.0000	0.0000	0.0000	0.0000	
28/08/14	0.0260	0.0000		0.0000	

3.2 Raw (untreated) Water Testing

Data tables based on format used in the PFAS and Water Quality in Jersey 2019 report

Section 6.3.3

Table **xx** Pont Marquet

Date	PFOS (µg/l)	PFOA (µg/l)
21/07/2020	0.186	0.018
07/11/2019	0.4600	0.036
11/04/2019	0.0635 ¹	0.0073 ¹
04/03/2019	0.2030 ¹	0.0147 ¹

¹ Values corrected from the July 2019 reporting following correction issued by the contracting laboratory

Table **xx** Raw water – Val de la Mare Reservoir

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
01/09/20	0.0060	0.0090	0.0090	0.0190	0.0680
28/07/20	0.0040	0.0060	0.0070	0.0100	0.0530

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
29/06/20	0.0050	0.0060	0.0070	0.0100	0.0460
01/06/20	0.0050	0.0060	0.0170	0.0110	0.0740
27/04/20	0.0060	0.0070	0.0070	0.0100	0.0650
20/04/20	0.0040	0.0060	0.0060	0.0100	0.0650
14/04/20	0.0030	0.0070	0.0070	0.0120	0.0610
30/03/20	0.0050	0.0070	0.0070	0.0120	0.0560
03/03/20	0.0030	0.0070	0.0060	0.0110	0.0450
05/02/20	0.0040	0.0080	0.0060	0.0160	0.0660
20/01/20	0.0050	0.0100	0.0090	0.0210	0.0690
06/01/20	0.0030	0.0080	0.0070	0.0210	0.0650
05/12/19	0.0040	0.0110	0.0062	0.0279	0.1089
07/11/19	0.0040	0.0160	0.0076	0.0401	0.1016
27/08/19			0.0000	0.0423	
02/08/19			0.0137	0.0688	
03/07/19			0.0000	0.0351	
04/06/19			0.0000	0.0394	
01/05/19			0.0000	0.0392	
19/02/19			0.0000	0.0499	
03/05/17	0.0000	0.0000	0.0000	0.0000	
12/04/16	0.0000	0.0000	0.0000	0.0000	
01/06/15	0.0000	0.0200	0.0000	0.0230	
28/08/14	0.0000	0.0000		0.0240	
14/01/10	0.0000	0.0340		0.0680	
23/06/09		0.0000		0.0000	
12/03/09	0.0000	0.0000		0.0480	

Section 6.3.4

Table xx Raw water testing²

Name	Date Sampled	PFOS (µg/l)	PFOA (µg/l)
Bellozanne	12/04/2019	0.00730	0.00440
Dannemarche	12/04/2019	0.00846	0.00456
Ferlands	12/04/2019	0.00246	0.00148
Grand Vaux Pump	11/04/2019	0.00644	0.00334
Grands Vaux stream	12/04/2019	0.00595	0.00267
Greve de Lecq stream	11/04/2019	0.00303	0.00340
Handois stream	12/04/2019	0.00972	0.01000
Handois reservoir outlet	11/04/2019	0.02430	0.00671
Handois west	12/04/2019	0.00867	0.00492
La Hague	12/04/2019	0.00403	0.00376
La Hague dip	11/04/2019	0.00683	0.00343
Le Mourier	12/04/2019	0.00318	0.00506
Little Tesson	12/04/2019	0.00258	0.00269
Millbrook reservoir	11/04/2019	0.01480	0.00494
Millbrook stream	12/04/2019	0.00912	0.00424

Queens valley pump	11/04/2019	0.00572	0.00330
Queens valley side stream	12/04/2019	0.00392	0.00396
Queens valley stream	12/04/2019	0.01350	0.02130
Rue a la Dame	12/04/2019	0.00386	0.00248
St. Catherine	12/04/2019	0.00572	0.00246
Tesson	12/04/2019	0.00793	0.00383
Vallee des Vaux	12/04/2019	0.00743	0.00539
VDLM Stream pt 1	11/04/2019	0.04580	0.00771
VDLM Stream pt 2	11/04/2019	0.00371	0.00748
VDLM Stream pt 3	11/04/2019	0.04300	0.00729
VDLM Stream pt 4	11/04/2019	0.00221	0.00282
VDLM Stream pt 5	11/04/2019	0.00288	0.02050
VDLM West Stream Pt A	11/04/2019	0.00396	0.00828

² No change from the July 2019 report. Raw water sampling was undertaken for September 2020 but results not available at time of publication

3.1 Treated Water Testing

Table xx.1 Treated water entering supply – Handois Water Treatment Works

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
03/08/20	0.0040	0.0040	0.0040	0.0050	0.0340
13/07/20	0.0050	0.0050	0.0050	0.0050	0.0630
01/06/20	0.0060	0.0060	0.0290	0.0120	0.0750
05/05/20	0.0060	0.0050	0.0060	0.0100	0.0430
10/03/20	0.0040	0.0040	0.0050	0.0010	0.0630
20/01/20	0.0050	0.0070	0.0060	0.0150	0.0530
18/12/19	0.0040	0.0050	0.0040	0.0183	0.0419
07/11/19	0.0040	0.0120	0.0052	0.0263	0.0792
17/07/19	-	-	0.0000	0.0272	-
07/06/19	-	-	0.0000	0.0226	-
07/05/19	-	-	0.0000	0.0235	-
19/02/19	-	-	0.0000	0.0241	-
03/05/17	0.0000	0.0000	0.0000	0.0000	-
12/04/16	0.0000	0.0000	0.0000	0.0000	-
01/06/15	0.0000	0.0210	0.0000	0.0000	-
28/08/14	0.0440	0.0140	-	0.0000	-
16/01/02	-	0.0000	-	0.0000	-
13/10/99	-	-	-	0.0000	-

Table xx.2 Treated water entering supply – Augres Water Treatment Works

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
03/08/20	0.0030	0.0020	0.0030	0.0040	0.0230
13/07/20	0.0040	0.0030	0.0050	0.0060	0.0480
01/06/20	0.0040	0.0040	0.0050	0.0060	0.0330
05/05/20	0.0030	0.0040	0.0030	0.0060	0.0320

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
10/03/20	0.0030	0.0020	0.0040	0.0060	0.0520
20/01/20	0.0040	0.0050	0.0050	0.0130	0.0410
18/12/19	0.0030	0.0040	0.0040	0.0120	0.0410
07/11/19	0.0030	0.0080	0.0045	0.0174	0.0515
17/07/19	-	-	0.0000	0.0000	-
07/06/19	-	-	0.0000	0.0131	-
07/05/19	-	-	0.0000	0.0121	-
19/02/19	-	-	0.0000	0.0224	-
03/05/17	0.0000	0.0000	0.0000	0.0000	-
12/04/16	0.0000	0.0000	0.0000	0.0000	-
01/06/15	0.0000	0.0000	0.0000	0.0000	-
28/08/14	0.0260	0.0000	-	0.0000	-

Table 9 St Ouen's borehole field testing results

Table 9.1 Borehole A1

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
21/07/20	0.0240	0.4220	0.0440	0.7910	1.5550
07/11/19	0.0190	0.2600	0.0482	0.6450	1.3492
19/02/19			0.0443	0.8000	
03/05/17	0.0140	0.2000	0.0340	0.4600	
12/04/16	0.0000	0.4100	0.0590	0.5900	
01/06/15	0.0310	0.4200	0.0590	0.8500	
28/08/14	0.0360	0.0200		0.8700	
10/01/12	0.0350	0.5800		0.9900	
30/11/11	0.0380	0.5100		0.9600	
20/10/11	0.0360	0.5400		0.8800	
14/01/10	0.0000	0.5300		1.2000	
23/06/09		1.5000		0.4700	
12/03/09	0.0000	0.7000		1.7000	
01/10/08	0.0000	0.6900		1.5000	
22/05/08	0.0000	0.6700		1.1000	
10/10/06		0.6100		0.9800	
22/06/05		1.0000		1.9000	
23/09/03		0.3400		1.1000	
29/04/03		1.1000		0.9800	
19/02/03		0.3600		0.9400	
22/05/02		0.1600		0.6100	
16/01/02		0.4100		1.0000	
16/10/01		0.6500		0.9800	
05/09/01		0.9900		0.9200	
22/06/01		0.0000		0.8300	
07/12/99		0.9000		0.6800	
28/07/99		2.5600		0.8500	
09/06/99		1.4000		0.6600	

Table 9.2 Borehole A2

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
21/07/20	0.0060	0.0720	0.0130	0.1160	0.3200
07/11/19	0.0080	0.0990	0.0155	0.2080	0.4956
19/02/19			0.0161	0.2130	
03/05/17	0.0000	0.1100	0.0000	0.2100	
12/04/16	0.0000	0.1400	0.0000	0.2300	
01/06/15	0.0000	0.1200	0.0000	0.2300	
28/08/14	0.0000	0.1100		0.2100	
10/01/12	0.0000	0.2100		0.2500	
30/11/11	0.0170	0.1800		0.2400	
20/10/11	0.0210	0.1900		0.2400	
14/01/10	0.0000	0.2000		0.2400	
23/06/09		0.1700		0.1800	
12/03/09	0.0000	0.2300		0.2100	
01/10/08	0.0000	0.2000		0.2400	
22/05/08	0.0000	0.2000		0.2600	
10/10/06		0.1700		0.3000	
22/06/05		0.3300		0.6900	
23/09/03		0.2200		0.0000	
29/04/03		0.0000		0.0000	
19/02/03		0.0000		0.0000	
22/05/02		0.1600		0.0000	
16/01/02		0.0000		0.0000	
16/10/01		0.0000		0.0000	
05/09/01		0.0000		0.0000	
22/06/01		0.0000		0.0000	
07/12/99		0.2000		0.0000	
28/07/99		0.2400		0.0000	
11/06/99		0.2900		0.6500	

Table 9.3 Borehole A3

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
07/11/19	0.0020	0.0050	0.0000	0.0000	0.0113
19/02/19			0.0000	0.0000	
03/05/17	0.0000	0.0000	0.0000	0.0000	
12/04/16	0.0000	0.0000	0.0000	0.0000	
01/06/15	0.0000	0.0130	0.0000	0.0000	
28/08/14	0.0000	0.0000		0.0000	
10/01/12	0.0000	0.0000		0.0000	
30/11/11	0.0000	0.0000		0.0000	
20/10/11	0.0000	0.0000		0.0000	
14/01/10	0.0000	0.0000		0.0000	
23/06/09		0.0000		0.0000	
12/03/09	0.0000	0.0000		0.0000	
01/10/08	0.0000	0.0000		0.0000	
22/05/08	0.0000	0.0000		0.0000	
10/10/06		0.0100		0.1300	

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
22/06/05		0.0000		0.0000	
23/09/03		0.0000		0.0000	
29/04/03		0.0000		0.0000	
19/02/03		0.0000		0.0000	
22/05/02		0.0000		0.0000	
16/01/02		0.0000		0.0000	
16/10/01		0.0000		0.0000	
05/09/01		0.0000		0.0000	
22/06/01		0.0000		0.0000	
28/07/99		0.0000		0.0000	
11/06/99		0.0000		0.2800	

Table 9.4 Borehole A4

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
21/07/20	0.0020	0.0060	0.0020	0.0060	0.0160
19/02/19			0.0000	0.0000	
03/05/17	0.0000	0.0000	0.0000	0.0000	
12/04/16	0.0000	0.0000	0.0000	0.0000	
01/06/15	0.0000	0.1000	0.0570	0.2100	
28/08/14	0.0000	0.0000		0.0000	
10/01/12	0.0000	0.0000		0.0000	
30/11/11	0.0000	0.0000		0.0000	
20/10/11	0.0000	0.0100		0.0000	
14/01/10	0.0000	0.0000		0.0000	
23/06/09		0.0000		0.0000	
12/03/09	0.0000	0.0000		0.0000	
01/10/08	0.0000	0.0000		0.0000	
22/05/08	0.0000	0.0000		0.0000	
10/10/06		0.0200		0.1200	
22/06/05		0.0000		0.0000	
23/09/03		0.0000		0.0000	
29/04/03		0.0000		0.0000	
19/02/03		0.0000		0.0000	
22/05/02		0.0000		0.0000	
16/01/02		0.0000		0.5000	
16/10/01		0.0000		0.0000	
05/09/01		0.0000		0.0000	
22/06/01		0.0000		0.0000	
28/07/99		0.0000		0.0000	
11/06/99		0.0000		0.0000	

Table 9.5 Borehole A5

Date	PFBS (µg/l)	PFHS (µg/l)	PFOA (µg/l)	PFOS (µg/l)	PFAS (µg/l)
21/07/20	0.0050	0.0720	0.0110	0.0620	0.2190
07/11/19	0.0040	0.0650	0.0092	0.0956	0.2445
19/02/19			0.0123	0.1020	
03/05/17	0.0000	0.0000	0.0000	0.0000	
12/04/16	0.0000	0.0690	0.0000	0.0000	
01/06/15	0.0000	0.0800	0.0460	0.0000	
28/08/14	0.0300	0.0600		0.0220	
10/01/12	0.0000	0.1400		0.0700	
30/11/11	0.0000	0.1400		0.0800	
20/10/11	0.0000	0.1400		0.0450	
14/01/10	0.0000	0.1300		0.0780	
23/06/09		0.0900		0.0000	
12/03/09	0.0000	0.1200		0.0000	
01/10/08	0.0000	0.2000		0.1100	
22/05/08	0.0000	0.2500		0.0000	
10/10/06		0.1200		0.1400	
22/06/05		0.0000		0.0000	
23/09/03		0.2600		0.0000	
29/04/03		0.0000		0.0000	
19/02/03		0.0000		0.0000	
22/05/02		0.0000		0.0000	
16/01/02		0.0000		0.0000	
16/10/01		0.0000		0.0000	
05/09/01		0.0000		0.0000	
22/06/01		0.0000		0.0000	
28/07/99		0.2900		0.0000	
11/06/99		0.1800		0.0000	